

| Mode/ Band                                                        |                  | Tones            | 26T     |         | 52T     |         | 106T    |         | 242T    |         | 484T    |         | 996T    |         |
|-------------------------------------------------------------------|------------------|------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
|                                                                   |                  | Channel          | Maximum | Nominal | Maximum | Nominal | Maximum | Nominal | Maximum | Nominal | Maximum | Nominal | Maximum | Nominal |
| Modulated Average -<br>2 Tx Chain (dBm)<br>CDD - 5GHz<br>ANTlower | 20 MHz Bandwidth | 36               | 8.00    | 6.50    | 11.00   | 9.50    | 14.00   | 12.50   | 14.00   | 12.50   |         |         |         |         |
|                                                                   |                  | 40               | 8.00    | 6.50    | 11.00   | 9.50    | 14.00   | 12.50   | 17.00   | 15.50   |         |         |         |         |
|                                                                   |                  | 44               | 8.00    | 6.50    | 11.00   | 9.50    | 14.00   | 12.50   | 17.00   | 15.50   |         |         |         |         |
|                                                                   |                  | 48               | 8.00    | 6.50    | 11.00   | 9.50    | 14.00   | 12.50   | 17.00   | 15.50   |         |         |         |         |
|                                                                   |                  | 52               | 8.00    | 6.50    | 11.00   | 9.50    | 14.00   | 12.50   | 16.75   | 15.25   |         |         |         |         |
|                                                                   |                  | 56               | 8.00    | 6.50    | 11.00   | 9.50    | 14.00   | 12.50   | 16.75   | 15.25   |         |         |         |         |
|                                                                   |                  | 60               | 8.00    | 6.50    | 11.00   | 9.50    | 14.00   | 12.50   | 16.75   | 15.25   |         |         |         |         |
|                                                                   |                  | 64               | 8.00    | 6.50    | 11.00   | 9.50    | 13.00   | 11.50   | 13.00   | 11.50   |         |         |         |         |
|                                                                   |                  | 100              | 7.00    | 5.50    | 10.00   | 8.50    | 12.75   | 11.25   | 12.75   | 11.25   |         |         |         |         |
|                                                                   |                  | 104              | 7.00    | 5.50    | 10.00   | 8.50    | 13.00   | 11.50   | 15.50   | 14.00   |         |         |         |         |
|                                                                   |                  | 108              | 7.00    | 5.50    | 10.00   | 8.50    | 13.00   | 11.50   | 15.50   | 14.00   |         |         |         |         |
|                                                                   |                  | 112              | 7.00    | 5.50    | 10.00   | 8.50    | 13.00   | 11.50   | 15.50   | 14.00   |         |         |         |         |
|                                                                   |                  | 116              | 7.00    | 5.50    | 10.00   | 8.50    | 13.00   | 11.50   | 15.50   | 14.00   |         |         |         |         |
|                                                                   |                  | 120              | 7.00    | 5.50    | 10.00   | 8.50    | 13.00   | 11.50   | 15.50   | 14.00   |         |         |         |         |
|                                                                   |                  | 124              | 7.00    | 5.50    | 10.00   | 8.50    | 13.00   | 11.50   | 15.50   | 14.00   |         |         |         |         |
|                                                                   |                  | 128              | 7.00    | 5.50    | 10.00   | 8.50    | 13.00   | 11.50   | 15.50   | 14.00   |         |         |         |         |
|                                                                   |                  | 132              | 7.00    | 5.50    | 10.00   | 8.50    | 13.00   | 11.50   | 15.50   | 14.00   |         |         |         |         |
|                                                                   |                  | 136              | 7.00    | 5.50    | 10.00   | 8.50    | 13.00   | 11.50   | 15.50   | 14.00   |         |         |         |         |
|                                                                   |                  | 140              | 7.00    | 5.50    | 10.00   | 8.50    | 10.50   | 9.00    | 10.50   | 9.00    |         |         |         |         |
|                                                                   | 144              | 7.00             | 5.50    | 10.00   | 8.50    | 13.00   | 11.50   | 15.50   | 14.00   |         |         |         |         |         |
|                                                                   | 149              | 15.50            | 14.00   | 15.50   | 14.00   | 15.50   | 14.00   | 15.50   | 14.00   |         |         |         |         |         |
|                                                                   | 153              | 15.50            | 14.00   | 15.50   | 14.00   | 15.50   | 14.00   | 15.50   | 14.00   |         |         |         |         |         |
|                                                                   | 157              | 15.50            | 14.00   | 15.50   | 14.00   | 15.50   | 14.00   | 15.50   | 14.00   |         |         |         |         |         |
|                                                                   | 161              | 15.50            | 14.00   | 15.50   | 14.00   | 15.50   | 14.00   | 15.50   | 14.00   |         |         |         |         |         |
|                                                                   | 165              | 15.50            | 14.00   | 15.50   | 14.00   | 15.50   | 14.00   | 15.50   | 14.00   |         |         |         |         |         |
|                                                                   | 40 MHz Bandwidth | 38               | 8.00    | 6.50    | 11.00   | 9.50    | 11.50   | 10.00   | 11.50   | 10.00   | 11.50   | 10.00   | 11.50   | 10.00   |
|                                                                   |                  | 46               | 8.00    | 6.50    | 11.00   | 9.50    | 14.00   | 12.50   | 17.00   | 15.50   | 17.00   | 15.50   |         |         |
|                                                                   |                  | 54               | 8.00    | 6.50    | 11.00   | 9.50    | 14.00   | 12.50   | 16.75   | 15.25   | 16.75   | 15.25   |         |         |
|                                                                   |                  | 62               | 8.00    | 6.50    | 11.00   | 9.50    | 11.25   | 9.75    | 11.25   | 9.75    | 11.25   | 9.75    |         |         |
|                                                                   |                  | 102              | 7.00    | 5.50    | 10.00   | 8.50    | 10.50   | 9.00    | 10.50   | 9.00    | 10.50   | 9.00    |         |         |
|                                                                   |                  | 110              | 7.00    | 5.50    | 10.00   | 8.50    | 13.00   | 11.50   | 15.50   | 14.00   | 15.50   | 14.00   |         |         |
|                                                                   |                  | 118              | 7.00    | 5.50    | 10.00   | 8.50    | 13.00   | 11.50   | 15.50   | 14.00   | 15.50   | 14.00   |         |         |
|                                                                   |                  | 126              | 7.00    | 5.50    | 10.00   | 8.50    | 13.00   | 11.50   | 15.50   | 14.00   | 15.50   | 14.00   |         |         |
|                                                                   |                  | 134              | 7.00    | 5.50    | 10.00   | 8.50    | 13.00   | 11.50   | 13.75   | 12.25   | 13.75   | 12.25   |         |         |
|                                                                   |                  | 142              | 7.00    | 5.50    | 10.00   | 8.50    | 13.00   | 11.50   | 10.50   | 9.00    | 15.50   | 14.00   |         |         |
|                                                                   |                  | 151              | 15.50   | 14.00   | 15.50   | 14.00   | 15.50   | 14.00   | 15.50   | 14.00   | 15.50   | 14.00   |         |         |
|                                                                   |                  | 159              | 15.50   | 14.00   | 15.50   | 14.00   | 15.50   | 14.00   | 15.50   | 14.00   | 15.50   | 14.00   |         |         |
|                                                                   |                  | 80 MHz Bandwidth | 42      | 8.00    | 6.50    | 10.50   | 9.00    | 10.50   | 9.00    | 10.50   | 9.00    | 10.50   | 9.00    | 10.50   |
|                                                                   | 58               |                  | 8.00    | 6.50    | 10.00   | 8.50    | 10.00   | 8.50    | 10.00   | 8.50    | 10.00   | 8.50    | 10.00   | 8.50    |
|                                                                   | 106              |                  | 7.00    | 5.50    | 10.00   | 8.50    | 10.00   | 8.50    | 10.00   | 8.50    | 10.00   | 8.50    | 10.00   | 8.50    |
|                                                                   | 122              |                  | 7.00    | 5.50    | 10.00   | 8.50    | 13.00   | 11.50   | 15.50   | 14.00   | 15.50   | 14.00   | 15.50   | 14.00   |
|                                                                   | 138              |                  | 7.00    | 5.50    | 10.00   | 8.50    | 13.00   | 11.50   | 10.50   | 9.00    | 13.75   | 12.25   | 15.50   | 14.00   |
|                                                                   | 155              |                  | 14.00   | 12.50   | 14.00   | 12.50   | 14.00   | 12.50   | 14.00   | 12.50   | 14.00   | 12.50   | 14.00   | 12.50   |

|                                        |                                                                                                   |                       |                                 |
|----------------------------------------|---------------------------------------------------------------------------------------------------|-----------------------|---------------------------------|
| FCC ID: BCGA2232                       |  <b>PCTEST</b> | SAR EVALUATION REPORT | Reviewed by:<br>Quality Manager |
| Test Dates:<br>12/20/2019 – 02/05/2020 | DUT Type:<br>Tablet Device                                                                        |                       | APPENDIX H:<br>Page 5 of 25     |

| Mode/ Band                                                        |                  | Tones   | 26T     |         | 52T     |         | 106T    |         | 242T    |         | 484T    |         | 996T    |         |
|-------------------------------------------------------------------|------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
|                                                                   |                  | Channel | Maximum | Nominal | Maximum | Nominal | Maximum | Nominal | Maximum | Nominal | Maximum | Nominal | Maximum | Nominal |
| Modulated Average -<br>2 Tx Chain (dBm)<br>SDM - 5GHz<br>ANTlower | 20 MHz Bandwidth | 36      | 8.00    | 6.50    | 11.00   | 9.50    | 14.00   | 12.50   | 14.00   | 12.50   |         |         |         |         |
|                                                                   |                  | 40      | 8.00    | 6.50    | 11.00   | 9.50    | 14.00   | 12.50   | 17.00   | 15.50   |         |         |         |         |
|                                                                   |                  | 44      | 8.00    | 6.50    | 11.00   | 9.50    | 14.00   | 12.50   | 17.00   | 15.50   |         |         |         |         |
|                                                                   |                  | 48      | 8.00    | 6.50    | 11.00   | 9.50    | 14.00   | 12.50   | 17.00   | 15.50   |         |         |         |         |
|                                                                   |                  | 52      | 8.00    | 6.50    | 11.00   | 9.50    | 14.00   | 12.50   | 16.75   | 15.25   |         |         |         |         |
|                                                                   |                  | 56      | 8.00    | 6.50    | 11.00   | 9.50    | 14.00   | 12.50   | 16.75   | 15.25   |         |         |         |         |
|                                                                   |                  | 60      | 8.00    | 6.50    | 11.00   | 9.50    | 14.00   | 12.50   | 16.75   | 15.25   |         |         |         |         |
|                                                                   |                  | 64      | 8.00    | 6.50    | 11.00   | 9.50    | 13.00   | 11.50   | 13.00   | 11.50   |         |         |         |         |
|                                                                   |                  | 100     | 8.00    | 6.50    | 11.00   | 9.50    | 12.75   | 11.25   | 12.75   | 11.25   |         |         |         |         |
|                                                                   |                  | 104     | 8.00    | 6.50    | 11.00   | 9.50    | 14.00   | 12.50   | 15.50   | 14.00   |         |         |         |         |
|                                                                   |                  | 108     | 8.00    | 6.50    | 11.00   | 9.50    | 14.00   | 12.50   | 15.50   | 14.00   |         |         |         |         |
|                                                                   |                  | 112     | 8.00    | 6.50    | 11.00   | 9.50    | 14.00   | 12.50   | 15.50   | 14.00   |         |         |         |         |
|                                                                   |                  | 116     | 8.00    | 6.50    | 11.00   | 9.50    | 14.00   | 12.50   | 15.50   | 14.00   |         |         |         |         |
|                                                                   |                  | 120     | 8.00    | 6.50    | 11.00   | 9.50    | 14.00   | 12.50   | 15.50   | 14.00   |         |         |         |         |
|                                                                   |                  | 124     | 8.00    | 6.50    | 11.00   | 9.50    | 14.00   | 12.50   | 15.50   | 14.00   |         |         |         |         |
|                                                                   |                  | 128     | 8.00    | 6.50    | 11.00   | 9.50    | 14.00   | 12.50   | 15.50   | 14.00   |         |         |         |         |
|                                                                   |                  | 132     | 8.00    | 6.50    | 11.00   | 9.50    | 14.00   | 12.50   | 15.50   | 14.00   |         |         |         |         |
|                                                                   |                  | 136     | 8.00    | 6.50    | 11.00   | 9.50    | 14.00   | 12.50   | 15.50   | 14.00   |         |         |         |         |
|                                                                   |                  | 140     | 8.00    | 6.50    | 10.50   | 9.00    | 10.50   | 9.00    | 10.50   | 9.00    |         |         |         |         |
|                                                                   |                  | 144     | 8.00    | 6.50    | 11.00   | 9.50    | 14.00   | 12.50   | 15.50   | 14.00   |         |         |         |         |
|                                                                   |                  | 149     | 15.50   | 14.00   | 15.50   | 14.00   | 15.50   | 14.00   | 15.50   | 14.00   |         |         |         |         |
|                                                                   |                  | 153     | 15.50   | 14.00   | 15.50   | 14.00   | 15.50   | 14.00   | 15.50   | 14.00   |         |         |         |         |
|                                                                   |                  | 157     | 15.50   | 14.00   | 15.50   | 14.00   | 15.50   | 14.00   | 15.50   | 14.00   |         |         |         |         |
|                                                                   |                  | 161     | 15.50   | 14.00   | 15.50   | 14.00   | 15.50   | 14.00   | 15.50   | 14.00   |         |         |         |         |
|                                                                   |                  | 165     | 15.50   | 14.00   | 15.50   | 14.00   | 15.50   | 14.00   | 15.50   | 14.00   |         |         |         |         |
|                                                                   | 40 MHz Bandwidth | 38      | 8.00    | 6.50    | 11.00   | 9.50    | 11.50   | 10.00   | 11.50   | 10.00   | 11.50   | 10.00   |         |         |
|                                                                   |                  | 46      | 8.00    | 6.50    | 11.00   | 9.50    | 14.00   | 12.50   | 17.00   | 15.50   | 17.00   | 15.50   |         |         |
|                                                                   |                  | 54      | 8.00    | 6.50    | 11.00   | 9.50    | 14.00   | 12.50   | 16.75   | 15.25   | 16.75   | 15.25   |         |         |
|                                                                   |                  | 62      | 8.00    | 6.50    | 11.00   | 9.50    | 11.25   | 9.75    | 11.25   | 9.75    | 11.25   | 9.75    |         |         |
|                                                                   |                  | 102     | 8.00    | 6.50    | 11.00   | 9.50    | 10.50   | 9.00    | 10.50   | 9.00    | 10.50   | 9.00    |         |         |
|                                                                   |                  | 110     | 8.00    | 6.50    | 11.00   | 9.50    | 14.00   | 12.50   | 15.50   | 14.00   | 15.50   | 14.00   |         |         |
|                                                                   |                  | 118     | 8.00    | 6.50    | 11.00   | 9.50    | 14.00   | 12.50   | 15.50   | 14.00   | 15.50   | 14.00   |         |         |
|                                                                   |                  | 126     | 8.00    | 6.50    | 11.00   | 9.50    | 14.00   | 12.50   | 15.50   | 14.00   | 15.50   | 14.00   |         |         |
|                                                                   |                  | 134     | 8.00    | 6.50    | 11.00   | 9.50    | 13.75   | 12.25   | 13.75   | 12.25   | 13.75   | 12.25   |         |         |
|                                                                   |                  | 142     | 8.00    | 6.50    | 11.00   | 9.50    | 14.00   | 12.50   | 10.50   | 9.00    | 15.50   | 14.00   |         |         |
|                                                                   |                  | 151     | 15.50   | 14.00   | 15.50   | 14.00   | 15.50   | 14.00   | 15.50   | 14.00   | 15.50   | 14.00   |         |         |
|                                                                   |                  | 159     | 15.50   | 14.00   | 15.50   | 14.00   | 15.50   | 14.00   | 15.50   | 14.00   | 15.50   | 14.00   |         |         |
|                                                                   | 80 MHz Bandwidth | 42      | 8.00    | 6.50    | 10.50   | 9.00    | 10.50   | 9.00    | 10.50   | 9.00    | 10.50   | 9.00    | 10.50   | 9.00    |
|                                                                   |                  | 58      | 8.00    | 6.50    | 10.00   | 8.50    | 10.00   | 8.50    | 10.00   | 8.50    | 10.00   | 8.50    | 10.00   | 8.50    |
|                                                                   |                  | 106     | 8.00    | 6.50    | 10.00   | 8.50    | 10.00   | 8.50    | 10.00   | 8.50    | 10.00   | 8.50    | 10.00   | 8.50    |
|                                                                   |                  | 122     | 8.00    | 6.50    | 11.00   | 9.50    | 14.00   | 12.50   | 15.50   | 14.00   | 15.50   | 14.00   | 15.50   | 14.00   |
|                                                                   |                  | 138     | 8.00    | 6.50    | 11.00   | 9.50    | 14.00   | 12.50   | 10.50   | 9.00    | 13.75   | 12.25   | 15.50   | 14.00   |
|                                                                   |                  | 155     | 14.00   | 12.50   | 14.00   | 12.50   | 14.00   | 12.50   | 14.00   | 12.50   | 14.00   | 12.50   | 14.00   | 12.50   |

Note: In MIMO operations, 5GHz ANTlower transmits at maximum allowed powers as indicated above for both 2 Tx CDD and 2 Tx SDM.

|                                               |                                                                                                   |                              |                                        |
|-----------------------------------------------|---------------------------------------------------------------------------------------------------|------------------------------|----------------------------------------|
| FCC ID: BCGA2232                              |  <b>PCTEST</b> | <b>SAR EVALUATION REPORT</b> | <b>Reviewed by:</b><br>Quality Manager |
| <b>Test Dates:</b><br>12/20/2019 – 02/05/2020 | <b>DUT Type:</b><br>Tablet Device                                                                 |                              | <b>APPENDIX H:</b><br>Page 6 of 25     |

## D. 5GHz ANTupper

| Mode/ Band                                                         |                  | Tones   | 26T     |         | 52T     |         | 106T    |         | 242T    |         | 484T    |         | 996T    |         |
|--------------------------------------------------------------------|------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
|                                                                    |                  | Channel | Maximum | Nominal | Maximum | Nominal | Maximum | Nominal | Maximum | Nominal | Maximum | Nominal | Maximum | Nominal |
| Modulated Average -<br>Single Tx Chain<br>(dBm) - 5GHz<br>ANTupper | 20 MHz Bandwidth | 36      | 11.00   | 9.50    | 14.00   | 12.50   | 15.00   | 13.50   | 15.00   | 13.50   |         |         |         |         |
|                                                                    |                  | 40      | 11.00   | 9.50    | 14.00   | 12.50   | 17.00   | 15.50   | 17.00   | 15.50   |         |         |         |         |
|                                                                    |                  | 44      | 11.00   | 9.50    | 14.00   | 12.50   | 17.00   | 15.50   | 17.00   | 15.50   |         |         |         |         |
|                                                                    |                  | 48      | 11.00   | 9.50    | 14.00   | 12.50   | 17.00   | 15.50   | 17.00   | 15.50   |         |         |         |         |
|                                                                    |                  | 52      | 11.00   | 9.50    | 14.00   | 12.50   | 16.75   | 15.25   | 16.75   | 15.25   |         |         |         |         |
|                                                                    |                  | 56      | 11.00   | 9.50    | 14.00   | 12.50   | 16.75   | 15.25   | 16.75   | 15.25   |         |         |         |         |
|                                                                    |                  | 60      | 11.00   | 9.50    | 14.00   | 12.50   | 16.75   | 15.25   | 16.75   | 15.25   |         |         |         |         |
|                                                                    |                  | 64      | 11.00   | 9.50    | 14.00   | 12.50   | 14.00   | 12.50   | 14.00   | 12.50   |         |         |         |         |
|                                                                    |                  | 100     | 11.00   | 9.50    | 14.00   | 12.50   | 14.00   | 12.50   | 14.00   | 12.50   |         |         |         |         |
|                                                                    |                  | 104     | 11.00   | 9.50    | 14.00   | 12.50   | 15.50   | 14.00   | 15.50   | 14.00   |         |         |         |         |
|                                                                    |                  | 108     | 11.00   | 9.50    | 14.00   | 12.50   | 15.50   | 14.00   | 15.50   | 14.00   |         |         |         |         |
|                                                                    |                  | 112     | 11.00   | 9.50    | 14.00   | 12.50   | 15.50   | 14.00   | 15.50   | 14.00   |         |         |         |         |
|                                                                    |                  | 116     | 11.00   | 9.50    | 14.00   | 12.50   | 15.50   | 14.00   | 15.50   | 14.00   |         |         |         |         |
|                                                                    |                  | 120     | 11.00   | 9.50    | 14.00   | 12.50   | 15.50   | 14.00   | 15.50   | 14.00   |         |         |         |         |
|                                                                    |                  | 124     | 11.00   | 9.50    | 14.00   | 12.50   | 15.50   | 14.00   | 15.50   | 14.00   |         |         |         |         |
|                                                                    |                  | 128     | 11.00   | 9.50    | 14.00   | 12.50   | 15.50   | 14.00   | 15.50   | 14.00   |         |         |         |         |
|                                                                    |                  | 132     | 11.00   | 9.50    | 14.00   | 12.50   | 15.50   | 14.00   | 15.50   | 14.00   |         |         |         |         |
|                                                                    |                  | 136     | 11.00   | 9.50    | 14.00   | 12.50   | 15.50   | 14.00   | 15.50   | 14.00   |         |         |         |         |
|                                                                    |                  | 140     | 10.00   | 8.50    | 11.50   | 10.00   | 11.50   | 10.00   | 11.50   | 10.00   |         |         |         |         |
|                                                                    |                  | 144     | 11.00   | 9.50    | 14.00   | 12.50   | 15.50   | 14.00   | 15.50   | 14.00   |         |         |         |         |
|                                                                    | 40 MHz Bandwidth | 149     | 15.75   | 14.25   | 15.75   | 14.25   | 15.75   | 14.25   | 15.75   | 14.25   |         |         |         |         |
|                                                                    |                  | 153     | 15.75   | 14.25   | 15.75   | 14.25   | 15.75   | 14.25   | 15.75   | 14.25   |         |         |         |         |
|                                                                    |                  | 157     | 15.75   | 14.25   | 15.75   | 14.25   | 15.75   | 14.25   | 15.75   | 14.25   |         |         |         |         |
|                                                                    |                  | 161     | 15.75   | 14.25   | 15.75   | 14.25   | 15.75   | 14.25   | 15.75   | 14.25   |         |         |         |         |
|                                                                    |                  | 165     | 15.75   | 14.25   | 15.75   | 14.25   | 15.75   | 14.25   | 15.75   | 14.25   |         |         |         |         |
|                                                                    |                  | 38      | 11.00   | 9.50    | 12.50   | 11.00   | 12.50   | 11.00   | 12.50   | 11.00   | 12.50   | 11.00   |         |         |
|                                                                    |                  | 46      | 11.00   | 9.50    | 14.00   | 12.50   | 17.00   | 15.50   | 17.00   | 15.50   | 17.00   | 15.50   |         |         |
|                                                                    |                  | 54      | 11.00   | 9.50    | 14.00   | 12.50   | 16.75   | 15.25   | 16.75   | 15.25   | 16.75   | 15.25   |         |         |
|                                                                    |                  | 62      | 11.00   | 9.50    | 12.50   | 11.00   | 12.50   | 11.00   | 12.50   | 11.00   | 12.50   | 11.00   |         |         |
|                                                                    |                  | 102     | 11.00   | 9.50    | 12.00   | 10.50   | 12.00   | 10.50   | 12.00   | 10.50   | 12.00   | 10.50   |         |         |
|                                                                    |                  | 110     | 11.00   | 9.50    | 14.00   | 12.50   | 15.50   | 14.00   | 15.50   | 14.00   | 15.50   | 14.00   |         |         |
|                                                                    |                  | 118     | 11.00   | 9.50    | 14.00   | 12.50   | 15.50   | 14.00   | 15.50   | 14.00   | 15.50   | 14.00   |         |         |
|                                                                    |                  | 126     | 11.00   | 9.50    | 14.00   | 12.50   | 15.50   | 14.00   | 15.50   | 14.00   | 15.50   | 14.00   |         |         |
|                                                                    |                  | 134     | 11.00   | 9.50    | 14.00   | 12.50   | 15.00   | 13.50   | 15.00   | 13.50   | 15.00   | 13.50   |         |         |
|                                                                    |                  | 142     | 11.00   | 9.50    | 14.00   | 12.50   | 15.50   | 14.00   | 11.50   | 10.00   | 15.50   | 14.00   |         |         |
|                                                                    |                  | 151     | 15.75   | 14.25   | 15.75   | 14.25   | 15.75   | 14.25   | 15.75   | 14.25   | 15.75   | 14.25   |         |         |
|                                                                    |                  | 159     | 15.75   | 14.25   | 15.75   | 14.25   | 15.75   | 14.25   | 15.75   | 14.25   | 15.75   | 14.25   |         |         |
|                                                                    | 80 MHz Bandwidth | 42      | 11.00   | 9.50    | 12.00   | 10.50   | 12.00   | 10.50   | 12.00   | 10.50   | 12.00   | 10.50   | 12.00   | 10.50   |
|                                                                    |                  | 58      | 11.00   | 9.50    | 11.50   | 10.00   | 11.50   | 10.00   | 11.50   | 10.00   | 11.50   | 10.00   | 11.50   | 10.00   |
|                                                                    |                  | 106     | 11.00   | 9.50    | 11.00   | 9.50    | 11.00   | 9.50    | 11.00   | 9.50    | 11.00   | 9.50    | 11.00   | 9.50    |
|                                                                    |                  | 122     | 11.00   | 9.50    | 14.00   | 12.50   | 15.50   | 14.00   | 15.50   | 14.00   | 15.50   | 14.00   | 15.50   | 14.00   |
|                                                                    |                  | 138     | 11.00   | 9.50    | 14.00   | 12.50   | 15.50   | 14.00   | 11.50   | 10.00   | 15.00   | 13.50   | 15.50   | 14.00   |
|                                                                    |                  | 155     | 15.50   | 14.00   | 15.50   | 14.00   | 15.50   | 14.00   | 15.50   | 14.00   | 15.50   | 14.00   | 15.50   | 14.00   |

|                                        |                                                                                                   |                       |                                 |
|----------------------------------------|---------------------------------------------------------------------------------------------------|-----------------------|---------------------------------|
| FCC ID: BCGA2232                       |  <b>PCTEST</b> | SAR EVALUATION REPORT | Reviewed by:<br>Quality Manager |
| Test Dates:<br>12/20/2019 – 02/05/2020 | DUT Type:<br>Tablet Device                                                                        |                       | APPENDIX H:<br>Page 7 of 25     |

| Mode/ Band                                                        |                  | Tones   | 26T     |         | 52T     |         | 106T    |         | 242T    |         | 484T    |         | 996T    |         |
|-------------------------------------------------------------------|------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
|                                                                   |                  | Channel | Maximum | Nominal | Maximum | Nominal | Maximum | Nominal | Maximum | Nominal | Maximum | Nominal | Maximum | Nominal |
| Modulated Average -<br>2 Tx Chain (dBm)<br>CDD - 5GHz<br>ANTupper | 20 MHz Bandwidth | 36      | 8.00    | 6.50    | 11.00   | 9.50    | 14.00   | 12.50   | 14.00   | 12.50   |         |         |         |         |
|                                                                   |                  | 40      | 8.00    | 6.50    | 11.00   | 9.50    | 14.00   | 12.50   | 17.00   | 15.50   |         |         |         |         |
|                                                                   |                  | 44      | 8.00    | 6.50    | 11.00   | 9.50    | 14.00   | 12.50   | 17.00   | 15.50   |         |         |         |         |
|                                                                   |                  | 48      | 8.00    | 6.50    | 11.00   | 9.50    | 14.00   | 12.50   | 17.00   | 15.50   |         |         |         |         |
|                                                                   |                  | 52      | 8.00    | 6.50    | 11.00   | 9.50    | 14.00   | 12.50   | 16.75   | 15.25   |         |         |         |         |
|                                                                   |                  | 56      | 8.00    | 6.50    | 11.00   | 9.50    | 14.00   | 12.50   | 16.75   | 15.25   |         |         |         |         |
|                                                                   |                  | 60      | 8.00    | 6.50    | 11.00   | 9.50    | 14.00   | 12.50   | 16.75   | 15.25   |         |         |         |         |
|                                                                   |                  | 64      | 8.00    | 6.50    | 11.00   | 9.50    | 13.00   | 11.50   | 13.00   | 11.50   |         |         |         |         |
|                                                                   |                  | 100     | 7.00    | 5.50    | 10.00   | 8.50    | 12.75   | 11.25   | 12.75   | 11.25   |         |         |         |         |
|                                                                   |                  | 104     | 7.00    | 5.50    | 10.00   | 8.50    | 13.00   | 11.50   | 15.50   | 14.00   |         |         |         |         |
|                                                                   |                  | 108     | 7.00    | 5.50    | 10.00   | 8.50    | 13.00   | 11.50   | 15.50   | 14.00   |         |         |         |         |
|                                                                   |                  | 112     | 7.00    | 5.50    | 10.00   | 8.50    | 13.00   | 11.50   | 15.50   | 14.00   |         |         |         |         |
|                                                                   |                  | 116     | 7.00    | 5.50    | 10.00   | 8.50    | 13.00   | 11.50   | 15.50   | 14.00   |         |         |         |         |
|                                                                   |                  | 120     | 7.00    | 5.50    | 10.00   | 8.50    | 13.00   | 11.50   | 15.50   | 14.00   |         |         |         |         |
|                                                                   |                  | 124     | 7.00    | 5.50    | 10.00   | 8.50    | 13.00   | 11.50   | 15.50   | 14.00   |         |         |         |         |
|                                                                   |                  | 128     | 7.00    | 5.50    | 10.00   | 8.50    | 13.00   | 11.50   | 15.50   | 14.00   |         |         |         |         |
|                                                                   |                  | 132     | 7.00    | 5.50    | 10.00   | 8.50    | 13.00   | 11.50   | 15.50   | 14.00   |         |         |         |         |
|                                                                   |                  | 136     | 7.00    | 5.50    | 10.00   | 8.50    | 13.00   | 11.50   | 15.50   | 14.00   |         |         |         |         |
|                                                                   |                  | 140     | 7.00    | 5.50    | 10.00   | 8.50    | 10.50   | 9.00    | 10.50   | 9.00    |         |         |         |         |
|                                                                   |                  | 144     | 7.00    | 5.50    | 10.00   | 8.50    | 13.00   | 11.50   | 15.50   | 14.00   |         |         |         |         |
|                                                                   |                  | 149     | 15.75   | 14.25   | 15.75   | 14.25   | 15.75   | 14.25   | 15.75   | 14.25   |         |         |         |         |
|                                                                   |                  | 153     | 15.75   | 14.25   | 15.75   | 14.25   | 15.75   | 14.25   | 15.75   | 14.25   |         |         |         |         |
|                                                                   |                  | 157     | 15.75   | 14.25   | 15.75   | 14.25   | 15.75   | 14.25   | 15.75   | 14.25   |         |         |         |         |
|                                                                   |                  | 161     | 15.75   | 14.25   | 15.75   | 14.25   | 15.75   | 14.25   | 15.75   | 14.25   |         |         |         |         |
|                                                                   |                  | 165     | 15.75   | 14.25   | 15.75   | 14.25   | 15.75   | 14.25   | 15.75   | 14.25   |         |         |         |         |
|                                                                   | 40 MHz Bandwidth | 38      | 8.00    | 6.50    | 11.00   | 9.50    | 11.50   | 10.00   | 11.50   | 10.00   | 11.50   | 10.00   |         |         |
|                                                                   |                  | 46      | 8.00    | 6.50    | 11.00   | 9.50    | 14.00   | 12.50   | 17.00   | 15.50   | 17.00   | 15.50   |         |         |
|                                                                   |                  | 54      | 8.00    | 6.50    | 11.00   | 9.50    | 14.00   | 12.50   | 16.75   | 15.25   | 16.75   | 15.25   |         |         |
|                                                                   |                  | 62      | 8.00    | 6.50    | 11.00   | 9.50    | 11.25   | 9.75    | 11.25   | 9.75    | 11.25   | 9.75    |         |         |
|                                                                   |                  | 102     | 7.00    | 5.50    | 10.00   | 8.50    | 10.50   | 9.00    | 10.50   | 9.00    | 10.50   | 9.00    |         |         |
|                                                                   |                  | 110     | 7.00    | 5.50    | 10.00   | 8.50    | 13.00   | 11.50   | 15.50   | 14.00   | 15.50   | 14.00   |         |         |
|                                                                   |                  | 118     | 7.00    | 5.50    | 10.00   | 8.50    | 13.00   | 11.50   | 15.50   | 14.00   | 15.50   | 14.00   |         |         |
|                                                                   |                  | 126     | 7.00    | 5.50    | 10.00   | 8.50    | 13.00   | 11.50   | 15.50   | 14.00   | 15.50   | 14.00   |         |         |
|                                                                   |                  | 134     | 7.00    | 5.50    | 10.00   | 8.50    | 13.00   | 11.50   | 13.75   | 12.25   | 13.75   | 12.25   |         |         |
|                                                                   |                  | 142     | 7.00    | 5.50    | 10.00   | 8.50    | 13.00   | 11.50   | 10.50   | 9.00    | 15.50   | 14.00   |         |         |
|                                                                   |                  | 151     | 15.75   | 14.25   | 15.75   | 14.25   | 15.75   | 14.25   | 15.75   | 14.25   | 15.75   | 14.25   |         |         |
|                                                                   |                  | 159     | 15.75   | 14.25   | 15.75   | 14.25   | 15.75   | 14.25   | 15.75   | 14.25   | 15.75   | 14.25   |         |         |
|                                                                   |                  | 42      | 8.00    | 6.50    | 10.50   | 9.00    | 10.50   | 9.00    | 10.50   | 9.00    | 10.50   | 9.00    | 10.50   | 9.00    |
|                                                                   |                  | 58      | 8.00    | 6.50    | 10.00   | 8.50    | 10.00   | 8.50    | 10.00   | 8.50    | 10.00   | 8.50    | 10.00   | 8.50    |
|                                                                   | 80 MHz Bandwidth | 106     | 7.00    | 5.50    | 10.00   | 8.50    | 10.00   | 8.50    | 10.00   | 8.50    | 10.00   | 8.50    | 10.00   | 8.50    |
|                                                                   |                  | 122     | 7.00    | 5.50    | 10.00   | 8.50    | 13.00   | 11.50   | 15.50   | 14.00   | 15.50   | 14.00   | 15.50   | 14.00   |
|                                                                   |                  | 138     | 7.00    | 5.50    | 10.00   | 8.50    | 13.00   | 11.50   | 10.50   | 9.00    | 10.50   | 9.00    | 15.50   | 14.00   |
|                                                                   |                  | 155     | 14.00   | 12.50   | 14.00   | 12.50   | 14.00   | 12.50   | 14.00   | 12.50   | 14.00   | 12.50   | 14.00   | 12.50   |
|                                                                   |                  |         |         |         |         |         |         |         |         |         |         |         |         |         |

|                                        |                                                                                                   |                       |                                 |
|----------------------------------------|---------------------------------------------------------------------------------------------------|-----------------------|---------------------------------|
| FCC ID: BCGA2232                       |  <b>PCTEST</b> | SAR EVALUATION REPORT | Reviewed by:<br>Quality Manager |
| Test Dates:<br>12/20/2019 – 02/05/2020 | DUT Type:<br>Tablet Device                                                                        |                       | APPENDIX H:<br>Page 8 of 25     |

| Mode/ Band                                                        |                  | Tones   | 26T     |         | 52T     |         | 106T    |         | 242T    |         | 484T    |         | 996T    |         |
|-------------------------------------------------------------------|------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
|                                                                   |                  | Channel | Maximum | Nominal | Maximum | Nominal | Maximum | Nominal | Maximum | Nominal | Maximum | Nominal | Maximum | Nominal |
| Modulated Average -<br>2 Tx Chain (dBm)<br>SDM - 5GHz<br>ANTupper | 20 MHz Bandwidth | 36      | 8.00    | 6.50    | 11.00   | 9.50    | 14.00   | 12.50   | 14.00   | 12.50   |         |         |         |         |
|                                                                   |                  | 40      | 8.00    | 6.50    | 11.00   | 9.50    | 14.00   | 12.50   | 17.00   | 15.50   |         |         |         |         |
|                                                                   |                  | 44      | 8.00    | 6.50    | 11.00   | 9.50    | 14.00   | 12.50   | 17.00   | 15.50   |         |         |         |         |
|                                                                   |                  | 48      | 8.00    | 6.50    | 11.00   | 9.50    | 14.00   | 12.50   | 17.00   | 15.50   |         |         |         |         |
|                                                                   |                  | 52      | 8.00    | 6.50    | 11.00   | 9.50    | 14.00   | 12.50   | 16.75   | 15.25   |         |         |         |         |
|                                                                   |                  | 56      | 8.00    | 6.50    | 11.00   | 9.50    | 14.00   | 12.50   | 16.75   | 15.25   |         |         |         |         |
|                                                                   |                  | 60      | 8.00    | 6.50    | 11.00   | 9.50    | 14.00   | 12.50   | 16.75   | 15.25   |         |         |         |         |
|                                                                   |                  | 64      | 8.00    | 6.50    | 11.00   | 9.50    | 13.00   | 11.50   | 13.00   | 11.50   |         |         |         |         |
|                                                                   |                  | 100     | 8.00    | 6.50    | 11.00   | 9.50    | 12.75   | 11.25   | 12.75   | 11.25   |         |         |         |         |
|                                                                   |                  | 104     | 8.00    | 6.50    | 11.00   | 9.50    | 14.00   | 12.50   | 15.50   | 14.00   |         |         |         |         |
|                                                                   |                  | 108     | 8.00    | 6.50    | 11.00   | 9.50    | 14.00   | 12.50   | 15.50   | 14.00   |         |         |         |         |
|                                                                   |                  | 112     | 8.00    | 6.50    | 11.00   | 9.50    | 14.00   | 12.50   | 15.50   | 14.00   |         |         |         |         |
|                                                                   |                  | 116     | 8.00    | 6.50    | 11.00   | 9.50    | 14.00   | 12.50   | 15.50   | 14.00   |         |         |         |         |
|                                                                   |                  | 120     | 8.00    | 6.50    | 11.00   | 9.50    | 14.00   | 12.50   | 15.50   | 14.00   |         |         |         |         |
|                                                                   |                  | 124     | 8.00    | 6.50    | 11.00   | 9.50    | 14.00   | 12.50   | 15.50   | 14.00   |         |         |         |         |
|                                                                   |                  | 128     | 8.00    | 6.50    | 11.00   | 9.50    | 14.00   | 12.50   | 15.50   | 14.00   |         |         |         |         |
|                                                                   |                  | 132     | 8.00    | 6.50    | 11.00   | 9.50    | 14.00   | 12.50   | 15.50   | 14.00   |         |         |         |         |
|                                                                   |                  | 136     | 8.00    | 6.50    | 11.00   | 9.50    | 14.00   | 12.50   | 15.50   | 14.00   |         |         |         |         |
|                                                                   |                  | 140     | 8.00    | 6.50    | 10.50   | 9.00    | 10.50   | 9.00    | 10.50   | 9.00    |         |         |         |         |
|                                                                   |                  | 144     | 8.00    | 6.50    | 11.00   | 9.50    | 14.00   | 12.50   | 15.50   | 14.00   |         |         |         |         |
|                                                                   |                  | 149     | 15.75   | 14.25   | 15.75   | 14.25   | 15.75   | 14.25   | 15.75   | 14.25   |         |         |         |         |
|                                                                   |                  | 153     | 15.75   | 14.25   | 15.75   | 14.25   | 15.75   | 14.25   | 15.75   | 14.25   |         |         |         |         |
|                                                                   |                  | 157     | 15.75   | 14.25   | 15.75   | 14.25   | 15.75   | 14.25   | 15.75   | 14.25   |         |         |         |         |
|                                                                   |                  | 161     | 15.75   | 14.25   | 15.75   | 14.25   | 15.75   | 14.25   | 15.75   | 14.25   |         |         |         |         |
|                                                                   |                  | 165     | 15.75   | 14.25   | 15.75   | 14.25   | 15.75   | 14.25   | 15.75   | 14.25   |         |         |         |         |
|                                                                   | 40 MHz Bandwidth | 38      | 8.00    | 6.50    | 11.00   | 9.50    | 11.50   | 10.00   | 11.50   | 10.00   | 11.50   | 10.00   |         |         |
|                                                                   |                  | 46      | 8.00    | 6.50    | 11.00   | 9.50    | 14.00   | 12.50   | 17.00   | 15.50   | 17.00   | 15.50   |         |         |
|                                                                   |                  | 54      | 8.00    | 6.50    | 11.00   | 9.50    | 14.00   | 12.50   | 16.75   | 15.25   | 16.75   | 15.25   |         |         |
|                                                                   |                  | 62      | 8.00    | 6.50    | 11.00   | 9.50    | 11.25   | 9.75    | 11.25   | 9.75    | 11.25   | 9.75    |         |         |
|                                                                   |                  | 102     | 8.00    | 6.50    | 11.00   | 9.50    | 10.50   | 9.00    | 10.50   | 9.00    | 10.50   | 9.00    |         |         |
|                                                                   |                  | 110     | 8.00    | 6.50    | 11.00   | 9.50    | 14.00   | 12.50   | 15.50   | 14.00   | 15.50   | 14.00   |         |         |
|                                                                   |                  | 118     | 8.00    | 6.50    | 11.00   | 9.50    | 14.00   | 12.50   | 15.50   | 14.00   | 15.50   | 14.00   |         |         |
|                                                                   |                  | 126     | 8.00    | 6.50    | 11.00   | 9.50    | 14.00   | 12.50   | 15.50   | 14.00   | 15.50   | 14.00   |         |         |
|                                                                   |                  | 134     | 8.00    | 6.50    | 11.00   | 9.50    | 13.75   | 12.25   | 13.75   | 12.25   | 13.75   | 12.25   |         |         |
|                                                                   |                  | 142     | 8.00    | 6.50    | 11.00   | 9.50    | 14.00   | 12.50   | 10.50   | 9.00    | 15.50   | 14.00   |         |         |
|                                                                   |                  | 151     | 15.75   | 14.25   | 15.75   | 14.25   | 15.75   | 14.25   | 15.75   | 14.25   | 15.75   | 14.25   |         |         |
|                                                                   |                  | 159     | 15.75   | 14.25   | 15.75   | 14.25   | 15.75   | 14.25   | 15.75   | 14.25   | 15.75   | 14.25   |         |         |
|                                                                   | 80 MHz Bandwidth | 42      | 8.00    | 6.50    | 10.50   | 9.00    | 10.50   | 9.00    | 10.50   | 9.00    | 10.50   | 9.00    | 10.50   | 9.00    |
|                                                                   |                  | 58      | 8.00    | 6.50    | 10.00   | 8.50    | 10.00   | 8.50    | 10.00   | 8.50    | 10.00   | 8.50    | 10.00   | 8.50    |
|                                                                   |                  | 106     | 8.00    | 6.50    | 10.00   | 8.50    | 10.00   | 8.50    | 10.00   | 8.50    | 10.00   | 8.50    | 10.00   | 8.50    |
|                                                                   |                  | 122     | 8.00    | 6.50    | 11.00   | 9.50    | 14.00   | 12.50   | 15.50   | 14.00   | 15.50   | 14.00   | 15.50   | 14.00   |
|                                                                   |                  | 138     | 8.00    | 6.50    | 11.00   | 9.50    | 14.00   | 12.50   | 13.75   | 12.25   | 13.75   | 12.25   | 15.50   | 14.00   |
|                                                                   |                  | 155     | 14.00   | 12.50   | 14.00   | 12.50   | 14.00   | 12.50   | 14.00   | 12.50   | 14.00   | 12.50   | 14.00   | 12.50   |

Note: In MIMO operations, 5GHz ANTupper transmits at maximum allowed powers as indicated above for both 2 Tx CDD and 2 Tx SDM.

|                                               |                                                                                                   |                              |                                        |
|-----------------------------------------------|---------------------------------------------------------------------------------------------------|------------------------------|----------------------------------------|
| FCC ID: BCGA2232                              |  <b>PCTEST</b> | <b>SAR EVALUATION REPORT</b> | <b>Reviewed by:</b><br>Quality Manager |
| <b>Test Dates:</b><br>12/20/2019 – 02/05/2020 | <b>DUT Type:</b><br>Tablet Device                                                                 |                              | <b>APPENDIX H:</b><br>Page 9 of 25     |

## 1.2.2 Reduced 802.11ax RU WLAN Output Power

### A. Antenna 2A

Below table is applicable in the following conditions:

- Simultaneous conditions with Licensed Bands Antenna 2A/2B
- Simultaneous conditions with LTE Inter-band ULCA

| Mode/ Band                                             |                  | Tones   | 26T     |         | 52T     |         | 106T    |         | 242T    |         |
|--------------------------------------------------------|------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
|                                                        |                  | Channel | Maximum | Nominal | Maximum | Nominal | Maximum | Nominal | Maximum | Nominal |
| Modulated Average - Single Tx Chain (dBm) - Antenna 2A | 20 MHz Bandwidth | 1       | 7.00    | 5.50    | 7.00    | 5.50    | 7.00    | 5.50    | 7.00    | 5.50    |
|                                                        |                  | 2       | 7.00    | 5.50    | 7.00    | 5.50    | 7.00    | 5.50    | 7.00    | 5.50    |
|                                                        |                  | 3       | 7.00    | 5.50    | 7.00    | 5.50    | 7.00    | 5.50    | 7.00    | 5.50    |
|                                                        |                  | 4       | 7.00    | 5.50    | 7.00    | 5.50    | 7.00    | 5.50    | 7.00    | 5.50    |
|                                                        |                  | 5       | 7.00    | 5.50    | 7.00    | 5.50    | 7.00    | 5.50    | 7.00    | 5.50    |
|                                                        |                  | 6       | 7.00    | 5.50    | 7.00    | 5.50    | 7.00    | 5.50    | 7.00    | 5.50    |
|                                                        |                  | 7       | 7.00    | 5.50    | 7.00    | 5.50    | 7.00    | 5.50    | 7.00    | 5.50    |
|                                                        |                  | 8       | 7.00    | 5.50    | 7.00    | 5.50    | 7.00    | 5.50    | 7.00    | 5.50    |
|                                                        |                  | 9       | 7.00    | 5.50    | 7.00    | 5.50    | 7.00    | 5.50    | 7.00    | 5.50    |
|                                                        |                  | 10      | 7.00    | 5.50    | 7.00    | 5.50    | 7.00    | 5.50    | 7.00    | 5.50    |
|                                                        |                  | 11      | 7.00    | 5.50    | 7.00    | 5.50    | 7.00    | 5.50    | 7.00    | 5.50    |
|                                                        |                  | 12      | 7.00    | 5.50    | 7.00    | 5.50    | 7.00    | 5.50    | 7.00    | 5.50    |
|                                                        |                  | 13      | N/A     | N/A     | N/A     | N/A     | N/A     | N/A     | N/A     | N/A     |

Below table is applicable in the following conditions:

- Simultaneous conditions with Licensed Bands Antenna 2A/2B
- Simultaneous conditions with LTE Inter-band ULCA

| Mode/ Band                                        |                  | Tones   | 26T     |         | 52T     |         | 106T    |         | 242T    |         |
|---------------------------------------------------|------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
|                                                   |                  | Channel | Maximum | Nominal | Maximum | Nominal | Maximum | Nominal | Maximum | Nominal |
| Modulated Average - 2 Tx Chain (dBm) - Antenna 2A | 20 MHz Bandwidth | 1       | 7.00    | 5.50    | 7.00    | 5.50    | 7.00    | 5.50    | 7.00    | 5.50    |
|                                                   |                  | 2       | 7.00    | 5.50    | 7.00    | 5.50    | 7.00    | 5.50    | 7.00    | 5.50    |
|                                                   |                  | 3       | 7.00    | 5.50    | 7.00    | 5.50    | 7.00    | 5.50    | 7.00    | 5.50    |
|                                                   |                  | 4       | 7.00    | 5.50    | 7.00    | 5.50    | 7.00    | 5.50    | 7.00    | 5.50    |
|                                                   |                  | 5       | 7.00    | 5.50    | 7.00    | 5.50    | 7.00    | 5.50    | 7.00    | 5.50    |
|                                                   |                  | 6       | 7.00    | 5.50    | 7.00    | 5.50    | 7.00    | 5.50    | 7.00    | 5.50    |
|                                                   |                  | 7       | 7.00    | 5.50    | 7.00    | 5.50    | 7.00    | 5.50    | 7.00    | 5.50    |
|                                                   |                  | 8       | 7.00    | 5.50    | 7.00    | 5.50    | 7.00    | 5.50    | 7.00    | 5.50    |
|                                                   |                  | 9       | 7.00    | 5.50    | 7.00    | 5.50    | 7.00    | 5.50    | 7.00    | 5.50    |
|                                                   |                  | 10      | 7.00    | 5.50    | 7.00    | 5.50    | 7.00    | 5.50    | 7.00    | 5.50    |
|                                                   |                  | 11      | 7.00    | 5.50    | 7.00    | 5.50    | 7.00    | 5.50    | 7.00    | 5.50    |
|                                                   |                  | 12      | 7.00    | 5.50    | 7.00    | 5.50    | 7.00    | 5.50    | 7.00    | 5.50    |
|                                                   |                  | 13      | N/A     | N/A     | N/A     | N/A     | N/A     | N/A     | N/A     | N/A     |

Note: In MIMO operations, Antenna 2A transmits at maximum allowed powers at indicated above.

### B. Antenna 4A

Below table is applicable in the following conditions:

- Simultaneous conditions with Licensed Bands Antenna 4A/4B
- Simultaneous conditions with LTE Inter-band ULCA

| Mode/ Band                                             |                  | Tones   | 26T     |         | 52T     |         | 106T    |         | 242T    |         |
|--------------------------------------------------------|------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
|                                                        |                  | Channel | Maximum | Nominal | Maximum | Nominal | Maximum | Nominal | Maximum | Nominal |
| Modulated Average - Single Tx Chain (dBm) - Antenna 4A | 20 MHz Bandwidth | 1       | 6.75    | 5.25    | 6.75    | 5.25    | 6.75    | 5.25    | 6.75    | 5.25    |
|                                                        |                  | 2       | 6.75    | 5.25    | 6.75    | 5.25    | 6.75    | 5.25    | 6.75    | 5.25    |
|                                                        |                  | 3       | 6.75    | 5.25    | 6.75    | 5.25    | 6.75    | 5.25    | 6.75    | 5.25    |
|                                                        |                  | 4       | 6.75    | 5.25    | 6.75    | 5.25    | 6.75    | 5.25    | 6.75    | 5.25    |
|                                                        |                  | 5       | 6.75    | 5.25    | 6.75    | 5.25    | 6.75    | 5.25    | 6.75    | 5.25    |
|                                                        |                  | 6       | 6.75    | 5.25    | 6.75    | 5.25    | 6.75    | 5.25    | 6.75    | 5.25    |
|                                                        |                  | 7       | 6.75    | 5.25    | 6.75    | 5.25    | 6.75    | 5.25    | 6.75    | 5.25    |
|                                                        |                  | 8       | 6.75    | 5.25    | 6.75    | 5.25    | 6.75    | 5.25    | 6.75    | 5.25    |
|                                                        |                  | 9       | 6.75    | 5.25    | 6.75    | 5.25    | 6.75    | 5.25    | 6.75    | 5.25    |
|                                                        |                  | 10      | 6.75    | 5.25    | 6.75    | 5.25    | 6.75    | 5.25    | 6.75    | 5.25    |
|                                                        |                  | 11      | 6.75    | 5.25    | 6.75    | 5.25    | 6.75    | 5.25    | 6.75    | 5.25    |
|                                                        |                  | 12      | 6.75    | 5.25    | 6.75    | 5.25    | 6.75    | 5.25    | 6.75    | 5.25    |
|                                                        |                  | 13      | N/A     | N/A     | N/A     | N/A     | N/A     | N/A     | N/A     | N/A     |

|                                        |                                                                                                                  |                                 |
|----------------------------------------|------------------------------------------------------------------------------------------------------------------|---------------------------------|
| FCC ID: BCGA2232                       |  <b>SAR EVALUATION REPORT</b> | Reviewed by:<br>Quality Manager |
| Test Dates:<br>12/20/2019 – 02/05/2020 | DUT Type:<br>Tablet Device                                                                                       | APPENDIX H:<br>Page 10 of 25    |

Below table is applicable in the following conditions:

- Simultaneous conditions with Licensed Bands Antenna 4A/4B
- Simultaneous conditions with LTE Inter-band ULCA

| Mode/ Band                                        |                  | Tones   | 26T     |         | 52T     |         | 106T    |         | 242T    |         |
|---------------------------------------------------|------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
|                                                   |                  | Channel | Maximum | Nominal | Maximum | Nominal | Maximum | Nominal | Maximum | Nominal |
| Modulated Average - 2 Tx Chain (dBm) - Antenna 4A | 20 MHz Bandwidth | 1       | 6.75    | 5.25    | 6.75    | 5.25    | 6.75    | 5.25    | 6.75    | 5.25    |
|                                                   |                  | 2       | 6.75    | 5.25    | 6.75    | 5.25    | 6.75    | 5.25    | 6.75    | 5.25    |
|                                                   |                  | 3       | 6.75    | 5.25    | 6.75    | 5.25    | 6.75    | 5.25    | 6.75    | 5.25    |
|                                                   |                  | 4       | 6.75    | 5.25    | 6.75    | 5.25    | 6.75    | 5.25    | 6.75    | 5.25    |
|                                                   |                  | 5       | 6.75    | 5.25    | 6.75    | 5.25    | 6.75    | 5.25    | 6.75    | 5.25    |
|                                                   |                  | 6       | 6.75    | 5.25    | 6.75    | 5.25    | 6.75    | 5.25    | 6.75    | 5.25    |
|                                                   |                  | 7       | 6.75    | 5.25    | 6.75    | 5.25    | 6.75    | 5.25    | 6.75    | 5.25    |
|                                                   |                  | 8       | 6.75    | 5.25    | 6.75    | 5.25    | 6.75    | 5.25    | 6.75    | 5.25    |
|                                                   |                  | 9       | 6.75    | 5.25    | 6.75    | 5.25    | 6.75    | 5.25    | 6.75    | 5.25    |
|                                                   |                  | 10      | 6.75    | 5.25    | 6.75    | 5.25    | 6.75    | 5.25    | 6.75    | 5.25    |
|                                                   |                  | 11      | 6.75    | 5.25    | 6.75    | 5.25    | 6.75    | 5.25    | 6.75    | 5.25    |
|                                                   |                  | 12      | 6.75    | 5.25    | 6.75    | 5.25    | 6.75    | 5.25    | 6.75    | 5.25    |
|                                                   |                  | 13      | N/A     | N/A     | N/A     | N/A     | N/A     | N/A     | N/A     | N/A     |

Note: In MIMO operations, Antenna 4A transmits at maximum allowed powers at indicated above.

### C. 5GHz ANTLower

Below table is applicable in the following conditions:

- Simultaneous conditions with Licensed Bands Antenna 2A
- Simultaneous conditions with LTE Inter-band ULCA

| Mode/ Band                                                |                  | Tones   | 26T     |         | 52T     |         | 106T    |         | 242T    |         | 484T    |         | 996T    |         |
|-----------------------------------------------------------|------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
|                                                           |                  | Channel | Maximum | Nominal | Maximum | Nominal | Maximum | Nominal | Maximum | Nominal | Maximum | Nominal | Maximum | Nominal |
| Modulated Average - Single Tx Chain (dBm) - 5GHz ANTLower | 20 MHz Bandwidth | 36      | 11.00   | 9.50    | 13.00   | 11.50   | 13.00   | 11.50   | 13.00   | 11.50   |         |         |         |         |
|                                                           |                  | 40      | 11.00   | 9.50    | 13.00   | 11.50   | 13.00   | 11.50   | 13.00   | 11.50   |         |         |         |         |
|                                                           |                  | 44      | 11.00   | 9.50    | 13.00   | 11.50   | 13.00   | 11.50   | 13.00   | 11.50   |         |         |         |         |
|                                                           |                  | 48      | 11.00   | 9.50    | 13.00   | 11.50   | 13.00   | 11.50   | 13.00   | 11.50   |         |         |         |         |
|                                                           |                  | 52      | 11.00   | 9.50    | 12.75   | 11.25   | 12.75   | 11.25   | 12.75   | 11.25   |         |         |         |         |
|                                                           |                  | 56      | 11.00   | 9.50    | 12.75   | 11.25   | 12.75   | 11.25   | 12.75   | 11.25   |         |         |         |         |
|                                                           |                  | 60      | 11.00   | 9.50    | 12.75   | 11.25   | 12.75   | 11.25   | 12.75   | 11.25   |         |         |         |         |
|                                                           |                  | 64      | 11.00   | 9.50    | 12.75   | 11.25   | 12.75   | 11.25   | 12.75   | 11.25   |         |         |         |         |
|                                                           |                  | 100     | 11.00   | 9.50    | 11.50   | 10.00   | 11.50   | 10.00   | 11.50   | 10.00   |         |         |         |         |
|                                                           |                  | 104     | 11.00   | 9.50    | 11.50   | 10.00   | 11.50   | 10.00   | 11.50   | 10.00   |         |         |         |         |
|                                                           |                  | 108     | 11.00   | 9.50    | 11.50   | 10.00   | 11.50   | 10.00   | 11.50   | 10.00   |         |         |         |         |
|                                                           |                  | 112     | 11.00   | 9.50    | 11.50   | 10.00   | 11.50   | 10.00   | 11.50   | 10.00   |         |         |         |         |
|                                                           |                  | 116     | 11.00   | 9.50    | 11.50   | 10.00   | 11.50   | 10.00   | 11.50   | 10.00   |         |         |         |         |
|                                                           |                  | 120     | 11.00   | 9.50    | 11.50   | 10.00   | 11.50   | 10.00   | 11.50   | 10.00   |         |         |         |         |
|                                                           |                  | 124     | 11.00   | 9.50    | 11.50   | 10.00   | 11.50   | 10.00   | 11.50   | 10.00   |         |         |         |         |
|                                                           |                  | 128     | 11.00   | 9.50    | 11.50   | 10.00   | 11.50   | 10.00   | 11.50   | 10.00   |         |         |         |         |
|                                                           |                  | 132     | 11.00   | 9.50    | 11.50   | 10.00   | 11.50   | 10.00   | 11.50   | 10.00   |         |         |         |         |
|                                                           |                  | 136     | 11.00   | 9.50    | 11.50   | 10.00   | 11.50   | 10.00   | 11.50   | 10.00   |         |         |         |         |
|                                                           |                  | 140     | 10.00   | 8.50    | 11.50   | 10.00   | 11.50   | 10.00   | 11.50   | 10.00   |         |         |         |         |
|                                                           |                  | 144     | 11.00   | 9.50    | 11.50   | 10.00   | 11.50   | 10.00   | 11.50   | 10.00   |         |         |         |         |
|                                                           |                  | 149     | 11.50   | 10.00   | 11.50   | 10.00   | 11.50   | 10.00   | 11.50   | 10.00   |         |         |         |         |
|                                                           |                  | 153     | 11.50   | 10.00   | 11.50   | 10.00   | 11.50   | 10.00   | 11.50   | 10.00   |         |         |         |         |
|                                                           |                  | 157     | 11.50   | 10.00   | 11.50   | 10.00   | 11.50   | 10.00   | 11.50   | 10.00   |         |         |         |         |
|                                                           |                  | 161     | 11.50   | 10.00   | 11.50   | 10.00   | 11.50   | 10.00   | 11.50   | 10.00   |         |         |         |         |
|                                                           |                  | 165     | 11.50   | 10.00   | 11.50   | 10.00   | 11.50   | 10.00   | 11.50   | 10.00   |         |         |         |         |
|                                                           | 40 MHz Bandwidth | 38      | 11.00   | 9.50    | 12.50   | 11.00   | 12.50   | 11.00   | 12.50   | 11.00   | 12.50   | 11.00   | 12.00   | 11.50   |
|                                                           |                  | 46      | 11.00   | 9.50    | 13.00   | 11.50   | 13.00   | 11.50   | 13.00   | 11.50   | 13.00   | 11.50   | 13.00   | 11.50   |
|                                                           |                  | 54      | 11.00   | 9.50    | 12.75   | 11.25   | 12.75   | 11.25   | 12.75   | 11.25   | 12.75   | 11.25   | 12.50   | 11.00   |
|                                                           |                  | 62      | 11.00   | 9.50    | 12.50   | 11.00   | 12.50   | 11.00   | 12.50   | 11.00   | 12.50   | 11.00   | 12.50   | 11.00   |
|                                                           |                  | 102     | 11.00   | 9.50    | 11.50   | 10.00   | 11.50   | 10.00   | 11.50   | 10.00   | 11.50   | 10.00   | 11.50   | 10.00   |
|                                                           |                  | 110     | 11.00   | 9.50    | 11.50   | 10.00   | 11.50   | 10.00   | 11.50   | 10.00   | 11.50   | 10.00   | 11.50   | 10.00   |
|                                                           |                  | 118     | 11.00   | 9.50    | 11.50   | 10.00   | 11.50   | 10.00   | 11.50   | 10.00   | 11.50   | 10.00   | 11.50   | 10.00   |
|                                                           |                  | 126     | 11.00   | 9.50    | 11.50   | 10.00   | 11.50   | 10.00   | 11.50   | 10.00   | 11.50   | 10.00   | 11.50   | 10.00   |
|                                                           |                  | 134     | 11.00   | 9.50    | 11.50   | 10.00   | 11.50   | 10.00   | 11.50   | 10.00   | 11.50   | 10.00   | 11.50   | 10.00   |
|                                                           |                  | 142     | 11.00   | 9.50    | 11.50   | 10.00   | 11.50   | 10.00   | 11.50   | 10.00   | 11.50   | 10.00   | 11.50   | 10.00   |
|                                                           |                  | 151     | 11.50   | 10.00   | 11.50   | 10.00   | 11.50   | 10.00   | 11.50   | 10.00   | 11.50   | 10.00   | 11.50   | 10.00   |
|                                                           |                  | 159     | 11.50   | 10.00   | 11.50   | 10.00   | 11.50   | 10.00   | 11.50   | 10.00   | 11.50   | 10.00   | 11.50   | 10.00   |
|                                                           | 80 MHz Bandwidth | 42      | 11.00   | 9.50    | 12.00   | 10.50   | 12.00   | 10.50   | 12.00   | 10.50   | 12.00   | 10.50   | 12.00   | 10.50   |
|                                                           |                  | 58      | 11.00   | 9.50    | 11.50   | 10.00   | 11.50   | 10.00   | 11.50   | 10.00   | 11.50   | 10.00   | 11.50   | 10.00   |
|                                                           |                  | 106     | 11.00   | 9.50    | 11.00   | 9.50    | 11.00   | 9.50    | 11.00   | 9.50    | 11.00   | 9.50    | 11.00   | 9.50    |
|                                                           |                  | 122     | 11.00   | 9.50    | 11.50   | 10.00   | 11.50   | 10.00   | 11.50   | 10.00   | 11.50   | 10.00   | 11.50   | 10.00   |
|                                                           |                  | 138     | 11.00   | 9.50    | 11.50   | 10.00   | 11.50   | 10.00   | 11.50   | 10.00   | 11.50   | 10.00   | 11.50   | 10.00   |
|                                                           |                  | 155     | 11.50   | 10.00   | 11.50   | 10.00   | 11.50   | 10.00   | 11.50   | 10.00   | 11.50   | 10.00   | 11.50   | 10.00   |

|                                        |                                                                                                   |                       |                                 |
|----------------------------------------|---------------------------------------------------------------------------------------------------|-----------------------|---------------------------------|
| FCC ID: BCGA2232                       |  <b>PCTEST</b> | SAR EVALUATION REPORT | Reviewed by:<br>Quality Manager |
| Test Dates:<br>12/20/2019 – 02/05/2020 | DUT Type:<br>Tablet Device                                                                        |                       | APPENDIX H:<br>Page 11 of 25    |

Below table is applicable in the following conditions:

-Simultaneous conditions with Licensed Bands Antenna 2A

-Simultaneous conditions with LTE Inter-band ULCA

| Mode/ Band                                                        |                  | Tones   | 26T     |         | 52T     |         | 106T    |         | 242T    |         | 484T    |         | 996T    |         |
|-------------------------------------------------------------------|------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
|                                                                   |                  | Channel | Maximum | Nominal | Maximum | Nominal | Maximum | Nominal | Maximum | Nominal | Maximum | Nominal | Maximum | Nominal |
| Modulated Average -<br>2 Tx Chain (dBm)<br>CDD - 5GHz<br>ANTTower | 20 MHz Bandwidth | 36      | 8.00    | 6.50    | 11.00   | 9.50    | 13.00   | 11.50   | 13.00   | 11.50   |         |         |         |         |
|                                                                   |                  | 40      | 8.00    | 6.50    | 11.00   | 9.50    | 13.00   | 11.50   | 13.00   | 11.50   |         |         |         |         |
|                                                                   |                  | 44      | 8.00    | 6.50    | 11.00   | 9.50    | 13.00   | 11.50   | 13.00   | 11.50   |         |         |         |         |
|                                                                   |                  | 48      | 8.00    | 6.50    | 11.00   | 9.50    | 13.00   | 11.50   | 13.00   | 11.50   |         |         |         |         |
|                                                                   |                  | 52      | 8.00    | 6.50    | 11.00   | 9.50    | 12.75   | 11.25   | 12.75   | 11.25   |         |         |         |         |
|                                                                   |                  | 56      | 8.00    | 6.50    | 11.00   | 9.50    | 12.75   | 11.25   | 12.75   | 11.25   |         |         |         |         |
|                                                                   |                  | 60      | 8.00    | 6.50    | 11.00   | 9.50    | 12.75   | 11.25   | 12.75   | 11.25   |         |         |         |         |
|                                                                   |                  | 64      | 8.00    | 6.50    | 11.00   | 9.50    | 12.75   | 11.25   | 12.75   | 11.25   |         |         |         |         |
|                                                                   |                  | 100     | 7.00    | 5.50    | 10.00   | 8.50    | 11.50   | 10.00   | 11.50   | 10.00   |         |         |         |         |
|                                                                   |                  | 104     | 7.00    | 5.50    | 10.00   | 8.50    | 11.50   | 10.00   | 11.50   | 10.00   |         |         |         |         |
|                                                                   |                  | 108     | 7.00    | 5.50    | 10.00   | 8.50    | 11.50   | 10.00   | 11.50   | 10.00   |         |         |         |         |
|                                                                   |                  | 112     | 7.00    | 5.50    | 10.00   | 8.50    | 11.50   | 10.00   | 11.50   | 10.00   |         |         |         |         |
|                                                                   |                  | 116     | 7.00    | 5.50    | 10.00   | 8.50    | 11.50   | 10.00   | 11.50   | 10.00   |         |         |         |         |
|                                                                   |                  | 120     | 7.00    | 5.50    | 10.00   | 8.50    | 11.50   | 10.00   | 11.50   | 10.00   |         |         |         |         |
|                                                                   |                  | 124     | 7.00    | 5.50    | 10.00   | 8.50    | 11.50   | 10.00   | 11.50   | 10.00   |         |         |         |         |
|                                                                   |                  | 128     | 7.00    | 5.50    | 10.00   | 8.50    | 11.50   | 10.00   | 11.50   | 10.00   |         |         |         |         |
|                                                                   |                  | 132     | 7.00    | 5.50    | 10.00   | 8.50    | 11.50   | 10.00   | 11.50   | 10.00   |         |         |         |         |
|                                                                   |                  | 136     | 7.00    | 5.50    | 10.00   | 8.50    | 11.50   | 10.00   | 11.50   | 10.00   |         |         |         |         |
|                                                                   |                  | 140     | 7.00    | 5.50    | 10.00   | 8.50    | 10.50   | 9.00    | 10.50   | 9.00    |         |         |         |         |
|                                                                   |                  | 144     | 7.00    | 5.50    | 10.00   | 8.50    | 11.50   | 10.00   | 11.50   | 10.00   |         |         |         |         |
|                                                                   |                  | 149     | 11.50   | 10.00   | 11.50   | 10.00   | 11.50   | 10.00   | 11.50   | 10.00   |         |         |         |         |
|                                                                   |                  | 153     | 11.50   | 10.00   | 11.50   | 10.00   | 11.50   | 10.00   | 11.50   | 10.00   |         |         |         |         |
|                                                                   |                  | 157     | 11.50   | 10.00   | 11.50   | 10.00   | 11.50   | 10.00   | 11.50   | 10.00   |         |         |         |         |
|                                                                   |                  | 161     | 11.50   | 10.00   | 11.50   | 10.00   | 11.50   | 10.00   | 11.50   | 10.00   |         |         |         |         |
|                                                                   |                  | 165     | 11.50   | 10.00   | 11.50   | 10.00   | 11.50   | 10.00   | 11.50   | 10.00   |         |         |         |         |
|                                                                   | 40 MHz Bandwidth | 38      | 8.00    | 6.50    | 11.00   | 9.50    | 11.50   | 10.00   | 11.50   | 10.00   | 11.50   | 10.00   |         |         |
|                                                                   |                  | 46      | 8.00    | 6.50    | 11.00   | 9.50    | 13.00   | 11.50   | 13.00   | 11.50   | 13.00   | 11.50   |         |         |
|                                                                   |                  | 54      | 8.00    | 6.50    | 11.00   | 9.50    | 12.75   | 11.25   | 12.75   | 11.25   | 12.75   | 11.25   |         |         |
|                                                                   |                  | 62      | 8.00    | 6.50    | 11.00   | 9.50    | 11.25   | 9.75    | 11.25   | 9.75    | 11.25   | 9.75    |         |         |
|                                                                   |                  | 102     | 7.00    | 5.50    | 10.00   | 8.50    | 10.50   | 9.00    | 10.50   | 9.00    | 10.50   | 9.00    |         |         |
|                                                                   |                  | 110     | 7.00    | 5.50    | 10.00   | 8.50    | 11.50   | 10.00   | 11.50   | 10.00   | 11.50   | 10.00   |         |         |
|                                                                   |                  | 118     | 7.00    | 5.50    | 10.00   | 8.50    | 11.50   | 10.00   | 11.50   | 10.00   | 11.50   | 10.00   |         |         |
|                                                                   |                  | 126     | 7.00    | 5.50    | 10.00   | 8.50    | 11.50   | 10.00   | 11.50   | 10.00   | 11.50   | 10.00   |         |         |
|                                                                   |                  | 134     | 7.00    | 5.50    | 10.00   | 8.50    | 11.50   | 10.00   | 11.50   | 10.00   | 11.50   | 10.00   |         |         |
|                                                                   |                  | 142     | 7.00    | 5.50    | 10.00   | 8.50    | 11.50   | 10.00   | 10.50   | 9.00    | 11.50   | 10.00   |         |         |
|                                                                   |                  | 151     | 11.50   | 10.00   | 11.50   | 10.00   | 11.50   | 10.00   | 11.50   | 10.00   | 11.50   | 10.00   |         |         |
|                                                                   |                  | 159     | 11.50   | 10.00   | 11.50   | 10.00   | 11.50   | 10.00   | 11.50   | 10.00   | 11.50   | 10.00   |         |         |
|                                                                   | 80 MHz Bandwidth | 42      | 8.00    | 6.50    | 10.50   | 9.00    | 10.50   | 9.00    | 10.50   | 9.00    | 10.50   | 9.00    | 10.50   | 9.00    |
|                                                                   |                  | 58      | 8.00    | 6.50    | 10.00   | 8.50    | 10.00   | 8.50    | 10.00   | 8.50    | 10.00   | 8.50    | 10.00   | 8.50    |
|                                                                   |                  | 106     | 7.00    | 5.50    | 10.00   | 8.50    | 10.00   | 8.50    | 10.00   | 8.50    | 10.00   | 8.50    | 10.00   | 8.50    |
|                                                                   |                  | 122     | 7.00    | 5.50    | 10.00   | 8.50    | 11.50   | 10.00   | 11.50   | 10.00   | 11.50   | 10.00   | 11.50   | 10.00   |
|                                                                   |                  | 138     | 7.00    | 5.50    | 10.00   | 8.50    | 11.50   | 10.00   | 10.50   | 9.00    | 11.50   | 10.00   | 11.50   | 10.00   |
|                                                                   |                  | 155     | 11.50   | 10.00   | 11.50   | 10.00   | 11.50   | 10.00   | 11.50   | 10.00   | 11.50   | 10.00   | 11.50   | 10.00   |

|                                        |                                                                                                           |                                 |
|----------------------------------------|-----------------------------------------------------------------------------------------------------------|---------------------------------|
| FCC ID: BCGA2232                       |  SAR EVALUATION REPORT | Reviewed by:<br>Quality Manager |
| Test Dates:<br>12/20/2019 – 02/05/2020 | DUT Type:<br>Tablet Device                                                                                | APPENDIX H:<br>Page 12 of 25    |

Below table is applicable in the following conditions:

-Simultaneous conditions with Licensed Bands Antenna 2A

-Simultaneous conditions with LTE Inter-band ULCA

| Mode/ Band                                                        |                  | Tones   | 26T     |         | 52T     |         | 106T    |         | 242T    |         | 484T    |         | 996T    |         |       |       |
|-------------------------------------------------------------------|------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|-------|-------|
|                                                                   |                  | Channel | Maximum | Nominal | Maximum | Nominal | Maximum | Nominal | Maximum | Nominal | Maximum | Nominal | Maximum | Nominal |       |       |
| Modulated Average -<br>2 Tx Chain (dBm)<br>SDM - 5GHz<br>ANTlower | 20 MHz Bandwidth | 36      | 8.00    | 6.50    | 11.00   | 9.50    | 13.00   | 11.50   | 13.00   | 11.50   |         |         |         |         |       |       |
|                                                                   |                  | 40      | 8.00    | 6.50    | 11.00   | 9.50    | 13.00   | 11.50   | 13.00   | 11.50   |         |         |         |         |       |       |
|                                                                   |                  | 44      | 8.00    | 6.50    | 11.00   | 9.50    | 13.00   | 11.50   | 13.00   | 11.50   |         |         |         |         |       |       |
|                                                                   |                  | 48      | 8.00    | 6.50    | 11.00   | 9.50    | 13.00   | 11.50   | 13.00   | 11.50   |         |         |         |         |       |       |
|                                                                   |                  | 52      | 8.00    | 6.50    | 11.00   | 9.50    | 12.75   | 11.25   | 12.75   | 11.25   |         |         |         |         |       |       |
|                                                                   |                  | 56      | 8.00    | 6.50    | 11.00   | 9.50    | 12.75   | 11.25   | 12.75   | 11.25   |         |         |         |         |       |       |
|                                                                   |                  | 60      | 8.00    | 6.50    | 11.00   | 9.50    | 12.75   | 11.25   | 12.75   | 11.25   |         |         |         |         |       |       |
|                                                                   |                  | 64      | 8.00    | 6.50    | 11.00   | 9.50    | 12.75   | 11.25   | 12.75   | 11.25   |         |         |         |         |       |       |
|                                                                   |                  | 100     | 8.00    | 6.50    | 11.00   | 9.50    | 11.50   | 10.00   | 11.50   | 10.00   |         |         |         |         |       |       |
|                                                                   |                  | 104     | 8.00    | 6.50    | 11.00   | 9.50    | 11.50   | 10.00   | 11.50   | 10.00   |         |         |         |         |       |       |
|                                                                   |                  | 108     | 8.00    | 6.50    | 11.00   | 9.50    | 11.50   | 10.00   | 11.50   | 10.00   |         |         |         |         |       |       |
|                                                                   |                  | 112     | 8.00    | 6.50    | 11.00   | 9.50    | 11.50   | 10.00   | 11.50   | 10.00   |         |         |         |         |       |       |
|                                                                   |                  | 116     | 8.00    | 6.50    | 11.00   | 9.50    | 11.50   | 10.00   | 11.50   | 10.00   |         |         |         |         |       |       |
|                                                                   |                  | 120     | 8.00    | 6.50    | 11.00   | 9.50    | 11.50   | 10.00   | 11.50   | 10.00   |         |         |         |         |       |       |
|                                                                   |                  | 124     | 8.00    | 6.50    | 11.00   | 9.50    | 11.50   | 10.00   | 11.50   | 10.00   |         |         |         |         |       |       |
|                                                                   |                  | 128     | 8.00    | 6.50    | 11.00   | 9.50    | 11.50   | 10.00   | 11.50   | 10.00   |         |         |         |         |       |       |
|                                                                   |                  | 132     | 8.00    | 6.50    | 11.00   | 9.50    | 11.50   | 10.00   | 11.50   | 10.00   |         |         |         |         |       |       |
|                                                                   |                  | 136     | 8.00    | 6.50    | 11.00   | 9.50    | 11.50   | 10.00   | 11.50   | 10.00   |         |         |         |         |       |       |
|                                                                   |                  | 140     | 8.00    | 6.50    | 10.50   | 9.00    | 10.50   | 9.00    | 10.50   | 9.00    |         |         |         |         |       |       |
|                                                                   |                  | 144     | 8.00    | 6.50    | 10.50   | 9.00    | 10.50   | 9.00    | 11.50   | 10.00   |         |         |         |         |       |       |
|                                                                   | 149              | 11.50   | 10.00   | 11.50   | 10.00   | 11.50   | 10.00   | 11.50   | 10.00   |         |         |         |         |         |       |       |
|                                                                   | 153              | 11.50   | 10.00   | 11.50   | 10.00   | 11.50   | 10.00   | 11.50   | 10.00   |         |         |         |         |         |       |       |
|                                                                   | 157              | 11.50   | 10.00   | 11.50   | 10.00   | 11.50   | 10.00   | 11.50   | 10.00   |         |         |         |         |         |       |       |
|                                                                   | 161              | 11.50   | 10.00   | 11.50   | 10.00   | 11.50   | 10.00   | 11.50   | 10.00   |         |         |         |         |         |       |       |
|                                                                   | 165              | 11.50   | 10.00   | 11.50   | 10.00   | 11.50   | 10.00   | 11.50   | 10.00   |         |         |         |         |         |       |       |
|                                                                   | 40 MHz Bandwidth | 38      | 8.00    | 6.50    | 11.00   | 9.50    | 11.50   | 10.00   | 11.50   | 10.00   | 11.50   | 10.00   |         |         |       |       |
|                                                                   |                  | 46      | 8.00    | 6.50    | 11.00   | 9.50    | 13.00   | 11.50   | 13.00   | 11.50   | 13.00   | 11.50   |         |         |       |       |
|                                                                   |                  | 54      | 8.00    | 6.50    | 11.00   | 9.50    | 12.75   | 11.25   | 12.75   | 11.25   | 12.75   | 11.25   |         |         |       |       |
|                                                                   |                  | 62      | 8.00    | 6.50    | 11.00   | 9.50    | 11.25   | 9.75    | 11.25   | 9.75    | 11.25   | 9.75    |         |         |       |       |
|                                                                   |                  | 102     | 8.00    | 6.50    | 11.00   | 9.50    | 10.50   | 9.00    | 10.50   | 9.00    | 10.50   | 9.00    |         |         |       |       |
|                                                                   |                  | 110     | 8.00    | 6.50    | 11.00   | 9.50    | 11.50   | 10.00   | 11.50   | 10.00   | 11.50   | 10.00   |         |         |       |       |
|                                                                   |                  | 118     | 8.00    | 6.50    | 11.00   | 9.50    | 11.50   | 10.00   | 11.50   | 10.00   | 11.50   | 10.00   |         |         |       |       |
|                                                                   |                  | 126     | 8.00    | 6.50    | 11.00   | 9.50    | 11.50   | 10.00   | 11.50   | 10.00   | 11.50   | 10.00   |         |         |       |       |
|                                                                   |                  | 134     | 8.00    | 6.50    | 11.00   | 9.50    | 11.50   | 10.00   | 11.50   | 10.00   | 11.50   | 10.00   |         |         |       |       |
|                                                                   |                  | 142     | 8.00    | 6.50    | 11.00   | 9.50    | 11.50   | 10.00   | 10.50   | 9.00    | 11.50   | 10.00   |         |         |       |       |
|                                                                   | 80 MHz Bandwidth | 151     | 11.50   | 10.00   | 11.50   | 10.00   | 11.50   | 10.00   | 11.50   | 10.00   | 11.50   | 10.00   |         |         |       |       |
|                                                                   |                  | 159     | 11.50   | 10.00   | 11.50   | 10.00   | 11.50   | 10.00   | 11.50   | 10.00   | 11.50   | 10.00   |         |         |       |       |
|                                                                   |                  | 42      | 8.00    | 6.50    | 10.50   | 9.00    | 10.50   | 9.00    | 10.50   | 9.00    | 10.50   | 9.00    |         |         | 10.50 | 9.00  |
|                                                                   |                  | 58      | 8.00    | 6.50    | 10.00   | 8.50    | 10.00   | 8.50    | 10.00   | 8.50    | 10.00   | 8.50    |         |         | 10.00 | 8.50  |
|                                                                   |                  | 106     | 8.00    | 6.50    | 10.00   | 8.50    | 10.00   | 8.50    | 10.00   | 8.50    | 10.00   | 8.50    |         |         | 10.00 | 8.50  |
|                                                                   |                  | 122     | 8.00    | 6.50    | 11.00   | 9.50    | 11.50   | 10.00   | 11.50   | 10.00   | 11.50   | 10.00   |         |         | 11.50 | 10.00 |
|                                                                   |                  | 138     | 8.00    | 6.50    | 11.00   | 9.50    | 11.50   | 10.00   | 10.50   | 9.00    | 11.50   | 10.00   |         |         | 11.50 | 10.00 |
|                                                                   | 155              | 11.50   | 10.00   | 11.50   | 10.00   | 11.50   | 10.00   | 11.50   | 10.00   | 11.50   | 10.00   | 11.50   | 10.00   |         |       |       |

Note: In MIMO operations, 5GHz ANTlower transmits at maximum allowed powers as indicated above for both 2 Tx CDD and 2 Tx SDM.

|                                        |                                                                                                                  |                                 |
|----------------------------------------|------------------------------------------------------------------------------------------------------------------|---------------------------------|
| FCC ID: BCGA2232                       |  <b>SAR EVALUATION REPORT</b> | Reviewed by:<br>Quality Manager |
| Test Dates:<br>12/20/2019 – 02/05/2020 | DUT Type:<br>Tablet Device                                                                                       | APPENDIX H:<br>Page 13 of 25    |

## D. 5GHz ANTupper

Below table is applicable in the following conditions:

-Simultaneous conditions with Licensed Bands Antenna 3

-Simultaneous conditions with LTE Inter-band ULCA

| Mode/ Band                                                         |                  | Tones            | 26T     |         | 52T     |         | 106T    |         | 242T    |         | 484T    |         | 996T    |         |
|--------------------------------------------------------------------|------------------|------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
|                                                                    |                  | Channel          | Maximum | Nominal | Maximum | Nominal | Maximum | Nominal | Maximum | Nominal | Maximum | Nominal | Maximum | Nominal |
| Modulated Average -<br>Single Tx Chain<br>(dBm) - 5GHz<br>ANTupper | 20 MHz Bandwidth | 36               | 11.00   | 9.50    | 12.00   | 10.50   | 12.00   | 10.50   | 12.00   | 10.50   |         |         |         |         |
|                                                                    |                  | 40               | 11.00   | 9.50    | 12.00   | 10.50   | 12.00   | 10.50   | 12.00   | 10.50   |         |         |         |         |
|                                                                    |                  | 44               | 11.00   | 9.50    | 12.00   | 10.50   | 12.00   | 10.50   | 12.00   | 10.50   |         |         |         |         |
|                                                                    |                  | 48               | 11.00   | 9.50    | 12.00   | 10.50   | 12.00   | 10.50   | 12.00   | 10.50   |         |         |         |         |
|                                                                    |                  | 52               | 11.00   | 9.50    | 11.75   | 10.25   | 11.75   | 10.25   | 11.75   | 10.25   |         |         |         |         |
|                                                                    |                  | 56               | 11.00   | 9.50    | 11.75   | 10.25   | 11.75   | 10.25   | 11.75   | 10.25   |         |         |         |         |
|                                                                    |                  | 60               | 11.00   | 9.50    | 11.75   | 10.25   | 11.75   | 10.25   | 11.75   | 10.25   |         |         |         |         |
|                                                                    |                  | 64               | 11.00   | 9.50    | 11.75   | 10.25   | 11.75   | 10.25   | 11.75   | 10.25   |         |         |         |         |
|                                                                    |                  | 100              | 10.50   | 9.00    | 10.50   | 9.00    | 10.50   | 9.00    | 10.50   | 9.00    |         |         |         |         |
|                                                                    |                  | 104              | 10.50   | 9.00    | 10.50   | 9.00    | 10.50   | 9.00    | 10.50   | 9.00    |         |         |         |         |
|                                                                    |                  | 108              | 10.50   | 9.00    | 10.50   | 9.00    | 10.50   | 9.00    | 10.50   | 9.00    |         |         |         |         |
|                                                                    |                  | 112              | 10.50   | 9.00    | 10.50   | 9.00    | 10.50   | 9.00    | 10.50   | 9.00    |         |         |         |         |
|                                                                    |                  | 116              | 10.50   | 9.00    | 10.50   | 9.00    | 10.50   | 9.00    | 10.50   | 9.00    |         |         |         |         |
|                                                                    |                  | 120              | 10.50   | 9.00    | 10.50   | 9.00    | 10.50   | 9.00    | 10.50   | 9.00    |         |         |         |         |
|                                                                    |                  | 124              | 10.50   | 9.00    | 10.50   | 9.00    | 10.50   | 9.00    | 10.50   | 9.00    |         |         |         |         |
|                                                                    |                  | 128              | 10.50   | 9.00    | 10.50   | 9.00    | 10.50   | 9.00    | 10.50   | 9.00    |         |         |         |         |
|                                                                    |                  | 132              | 10.50   | 9.00    | 10.50   | 9.00    | 10.50   | 9.00    | 10.50   | 9.00    |         |         |         |         |
|                                                                    |                  | 136              | 10.50   | 9.00    | 10.50   | 9.00    | 10.50   | 9.00    | 10.50   | 9.00    |         |         |         |         |
|                                                                    |                  | 140              | 10.00   | 8.50    | 10.50   | 9.00    | 10.50   | 9.00    | 10.50   | 9.00    |         |         |         |         |
|                                                                    |                  | 144              | 10.50   | 9.00    | 10.50   | 9.00    | 10.50   | 9.00    | 10.50   | 9.00    |         |         |         |         |
|                                                                    | 149              | 10.75            | 9.25    | 10.75   | 9.25    | 10.75   | 9.25    | 10.75   | 9.25    |         |         |         |         |         |
|                                                                    | 153              | 10.75            | 9.25    | 10.75   | 9.25    | 10.75   | 9.25    | 10.75   | 9.25    |         |         |         |         |         |
|                                                                    | 157              | 10.75            | 9.25    | 10.75   | 9.25    | 10.75   | 9.25    | 10.75   | 9.25    |         |         |         |         |         |
|                                                                    | 161              | 10.75            | 9.25    | 10.75   | 9.25    | 10.75   | 9.25    | 10.75   | 9.25    |         |         |         |         |         |
|                                                                    | 165              | 10.75            | 9.25    | 10.75   | 9.25    | 10.75   | 9.25    | 10.75   | 9.25    |         |         |         |         |         |
|                                                                    | 40 MHz Bandwidth | 38               | 11.00   | 9.50    | 12.00   | 10.50   | 12.00   | 10.50   | 12.00   | 10.50   | 12.00   | 10.50   |         |         |
|                                                                    |                  | 46               | 11.00   | 9.50    | 12.00   | 10.50   | 12.00   | 10.50   | 12.00   | 10.50   | 12.00   | 10.50   |         |         |
|                                                                    |                  | 54               | 11.00   | 9.50    | 11.75   | 10.25   | 11.75   | 10.25   | 11.75   | 10.25   | 11.75   | 10.25   |         |         |
|                                                                    |                  | 62               | 11.00   | 9.50    | 11.75   | 10.25   | 11.75   | 10.25   | 11.75   | 10.25   | 11.75   | 10.25   |         |         |
|                                                                    |                  | 102              | 10.50   | 9.00    | 10.50   | 9.00    | 10.50   | 9.00    | 10.50   | 9.00    | 10.50   | 9.00    |         |         |
|                                                                    |                  | 110              | 10.50   | 9.00    | 10.50   | 9.00    | 10.50   | 9.00    | 10.50   | 9.00    | 10.50   | 9.00    |         |         |
|                                                                    |                  | 118              | 10.50   | 9.00    | 10.50   | 9.00    | 10.50   | 9.00    | 10.50   | 9.00    | 10.50   | 9.00    |         |         |
|                                                                    |                  | 126              | 10.50   | 9.00    | 10.50   | 9.00    | 10.50   | 9.00    | 10.50   | 9.00    | 10.50   | 9.00    |         |         |
|                                                                    |                  | 134              | 10.50   | 9.00    | 10.50   | 9.00    | 10.50   | 9.00    | 10.50   | 9.00    | 10.50   | 9.00    |         |         |
|                                                                    |                  | 142              | 10.50   | 9.00    | 10.50   | 9.00    | 10.50   | 9.00    | 10.50   | 9.00    | 10.50   | 9.00    |         |         |
|                                                                    |                  | 151              | 10.75   | 9.25    | 10.75   | 9.25    | 10.75   | 9.25    | 10.75   | 9.25    | 10.75   | 9.25    |         |         |
|                                                                    |                  | 159              | 10.75   | 9.25    | 10.75   | 9.25    | 10.75   | 9.25    | 10.75   | 9.25    | 10.75   | 9.25    |         |         |
|                                                                    |                  | 80 MHz Bandwidth | 42      | 11.00   | 9.50    | 12.00   | 10.50   | 12.00   | 10.50   | 12.00   | 10.50   | 12.00   |         |         |
|                                                                    | 58               |                  | 11.00   | 9.50    | 11.50   | 10.00   | 11.50   | 10.00   | 11.50   | 10.00   | 11.50   | 10.00   | 11.50   | 10.00   |
|                                                                    | 106              |                  | 10.50   | 9.00    | 10.50   | 9.00    | 10.50   | 9.00    | 10.50   | 9.00    | 11.00   | 9.50    | 10.50   | 9.00    |
|                                                                    | 122              |                  | 10.50   | 9.00    | 10.50   | 9.00    | 10.50   | 9.00    | 10.50   | 9.00    | 10.50   | 9.00    | 10.50   | 9.00    |
|                                                                    | 138              |                  | 10.50   | 9.00    | 10.50   | 9.00    | 10.50   | 9.00    | 10.50   | 9.00    | 10.50   | 9.00    | 10.50   | 9.00    |
|                                                                    | 155              |                  | 10.75   | 9.25    | 10.75   | 9.25    | 10.75   | 9.25    | 10.75   | 9.25    | 10.75   | 9.25    | 10.75   | 9.25    |

|                                        |                                                                                                   |                       |                                 |
|----------------------------------------|---------------------------------------------------------------------------------------------------|-----------------------|---------------------------------|
| FCC ID: BCGA2232                       |  <b>PCTEST</b> | SAR EVALUATION REPORT | Reviewed by:<br>Quality Manager |
| Test Dates:<br>12/20/2019 – 02/05/2020 | DUT Type:<br>Tablet Device                                                                        |                       | APPENDIX H:<br>Page 14 of 25    |

Below table is applicable in the following conditions:

-Simultaneous conditions with Licensed Bands Antenna 3

-Simultaneous conditions with LTE Inter-band ULCA

| Mode/ Band                                                        |                  | Tones   | 26T     |         | 52T     |         | 106T    |         | 242T    |         | 484T    |         | 996T    |         |
|-------------------------------------------------------------------|------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
|                                                                   |                  | Channel | Maximum | Nominal | Maximum | Nominal | Maximum | Nominal | Maximum | Nominal | Maximum | Nominal | Maximum | Nominal |
| Modulated Average -<br>2 Tx Chain (dBm)<br>CDD - 5GHz<br>ANTupper | 20 MHz Bandwidth | 36      | 8.00    | 6.50    | 11.00   | 9.50    | 12.00   | 10.50   | 12.00   | 10.50   |         |         |         |         |
|                                                                   |                  | 40      | 8.00    | 6.50    | 11.00   | 9.50    | 12.00   | 10.50   | 12.00   | 10.50   |         |         |         |         |
|                                                                   |                  | 44      | 8.00    | 6.50    | 11.00   | 9.50    | 12.00   | 10.50   | 12.00   | 10.50   |         |         |         |         |
|                                                                   |                  | 48      | 8.00    | 6.50    | 11.00   | 9.50    | 12.00   | 10.50   | 12.00   | 10.50   |         |         |         |         |
|                                                                   |                  | 52      | 8.00    | 6.50    | 11.00   | 9.50    | 11.75   | 10.25   | 11.75   | 10.25   |         |         |         |         |
|                                                                   |                  | 56      | 8.00    | 6.50    | 11.00   | 9.50    | 11.75   | 10.25   | 11.75   | 10.25   |         |         |         |         |
|                                                                   |                  | 60      | 8.00    | 6.50    | 11.00   | 9.50    | 11.75   | 10.25   | 11.75   | 10.25   |         |         |         |         |
|                                                                   |                  | 64      | 8.00    | 6.50    | 11.00   | 9.50    | 11.75   | 10.25   | 11.75   | 10.25   |         |         |         |         |
|                                                                   |                  | 100     | 7.00    | 5.50    | 10.00   | 8.50    | 10.50   | 9.00    | 10.50   | 9.00    |         |         |         |         |
|                                                                   |                  | 104     | 7.00    | 5.50    | 10.00   | 8.50    | 10.50   | 9.00    | 10.50   | 9.00    |         |         |         |         |
|                                                                   |                  | 108     | 7.00    | 5.50    | 10.00   | 8.50    | 10.50   | 9.00    | 10.50   | 9.00    |         |         |         |         |
|                                                                   |                  | 112     | 7.00    | 5.50    | 10.00   | 8.50    | 10.50   | 9.00    | 10.50   | 9.00    |         |         |         |         |
|                                                                   |                  | 116     | 7.00    | 5.50    | 10.00   | 8.50    | 10.50   | 9.00    | 10.50   | 9.00    |         |         |         |         |
|                                                                   |                  | 120     | 7.00    | 5.50    | 10.00   | 8.50    | 10.50   | 9.00    | 10.50   | 9.00    |         |         |         |         |
|                                                                   |                  | 124     | 7.00    | 5.50    | 10.00   | 8.50    | 10.50   | 9.00    | 10.50   | 9.00    |         |         |         |         |
|                                                                   |                  | 128     | 7.00    | 5.50    | 10.00   | 8.50    | 10.50   | 9.00    | 10.50   | 9.00    |         |         |         |         |
|                                                                   |                  | 132     | 7.00    | 5.50    | 10.00   | 8.50    | 10.50   | 9.00    | 10.50   | 9.00    |         |         |         |         |
|                                                                   |                  | 136     | 7.00    | 5.50    | 10.00   | 8.50    | 10.50   | 9.00    | 10.50   | 9.00    |         |         |         |         |
|                                                                   |                  | 140     | 7.00    | 5.50    | 10.00   | 8.50    | 10.50   | 9.00    | 10.50   | 9.00    |         |         |         |         |
|                                                                   |                  | 144     | 7.00    | 5.50    | 10.00   | 8.50    | 10.50   | 9.00    | 10.50   | 9.00    |         |         |         |         |
|                                                                   | 40 MHz Bandwidth | 149     | 10.75   | 9.25    | 10.75   | 9.25    | 10.75   | 9.25    | 10.75   | 9.25    |         |         |         |         |
|                                                                   |                  | 153     | 10.75   | 9.25    | 10.75   | 9.25    | 10.75   | 9.25    | 10.75   | 9.25    |         |         |         |         |
|                                                                   |                  | 157     | 10.75   | 9.25    | 10.75   | 9.25    | 10.75   | 9.25    | 10.75   | 9.25    |         |         |         |         |
|                                                                   |                  | 161     | 10.75   | 9.25    | 10.75   | 9.25    | 10.75   | 9.25    | 10.75   | 9.25    |         |         |         |         |
|                                                                   |                  | 165     | 10.75   | 9.25    | 10.75   | 9.25    | 10.75   | 9.25    | 10.75   | 9.25    |         |         |         |         |
|                                                                   |                  | 38      | 8.00    | 6.50    | 11.00   | 9.50    | 11.50   | 10.00   | 11.50   | 10.00   | 11.50   | 10.00   |         |         |
|                                                                   |                  | 46      | 8.00    | 6.50    | 11.00   | 9.50    | 12.00   | 10.50   | 12.00   | 10.50   | 12.00   | 10.50   |         |         |
|                                                                   |                  | 54      | 8.00    | 6.50    | 11.00   | 9.50    | 11.75   | 10.25   | 11.75   | 10.25   | 11.75   | 10.25   |         |         |
|                                                                   |                  | 62      | 8.00    | 6.50    | 11.00   | 9.50    | 11.25   | 9.75    | 11.25   | 9.75    | 11.25   | 9.75    |         |         |
|                                                                   |                  | 102     | 7.00    | 5.50    | 10.00   | 8.50    | 10.50   | 9.00    | 10.50   | 9.00    | 10.50   | 9.00    |         |         |
|                                                                   |                  | 110     | 7.00    | 5.50    | 10.00   | 8.50    | 10.50   | 9.00    | 10.50   | 9.00    | 10.50   | 9.00    |         |         |
|                                                                   |                  | 118     | 7.00    | 5.50    | 10.00   | 8.50    | 10.50   | 9.00    | 10.50   | 9.00    | 10.50   | 9.00    |         |         |
|                                                                   |                  | 126     | 7.00    | 5.50    | 10.00   | 8.50    | 10.50   | 9.00    | 10.50   | 9.00    | 10.50   | 9.00    |         |         |
|                                                                   |                  | 134     | 7.00    | 5.50    | 10.00   | 8.50    | 10.50   | 9.00    | 10.50   | 9.00    | 10.50   | 9.00    |         |         |
|                                                                   | 80 MHz Bandwidth | 142     | 7.00    | 5.50    | 10.00   | 8.50    | 10.50   | 9.00    | 10.50   | 9.00    | 10.50   | 9.00    |         |         |
|                                                                   |                  | 151     | 10.75   | 9.25    | 10.75   | 9.25    | 10.75   | 9.25    | 10.75   | 9.25    | 10.75   | 9.25    |         |         |
|                                                                   |                  | 159     | 10.75   | 9.25    | 10.75   | 9.25    | 10.75   | 9.25    | 10.75   | 9.25    | 10.75   | 9.25    |         |         |
|                                                                   |                  | 42      | 8.00    | 6.50    | 10.50   | 9.00    | 10.50   | 9.00    | 10.50   | 9.00    | 10.50   | 9.00    | 10.50   | 9.00    |
|                                                                   |                  | 58      | 8.00    | 6.50    | 10.00   | 8.50    | 10.00   | 8.50    | 10.00   | 8.50    | 10.00   | 8.50    | 10.00   | 8.50    |
|                                                                   |                  | 106     | 7.00    | 5.50    | 10.00   | 8.50    | 10.00   | 8.50    | 10.00   | 8.50    | 10.00   | 8.50    | 10.00   | 8.50    |
|                                                                   |                  | 122     | 7.00    | 5.50    | 10.00   | 8.50    | 10.50   | 9.00    | 10.50   | 9.00    | 10.50   | 9.00    | 10.50   | 9.00    |
|                                                                   |                  | 138     | 7.00    | 5.50    | 10.00   | 8.50    | 10.50   | 9.00    | 10.50   | 9.00    | 10.50   | 9.00    | 10.50   | 9.00    |
|                                                                   |                  | 155     | 10.75   | 9.25    | 10.75   | 9.25    | 10.75   | 9.25    | 10.75   | 9.25    | 10.75   | 9.25    | 10.75   | 9.25    |

|                                        |                                                                                                           |                                 |
|----------------------------------------|-----------------------------------------------------------------------------------------------------------|---------------------------------|
| FCC ID: BCGA2232                       |  SAR EVALUATION REPORT | Reviewed by:<br>Quality Manager |
| Test Dates:<br>12/20/2019 – 02/05/2020 | DUT Type:<br>Tablet Device                                                                                | APPENDIX H:<br>Page 15 of 25    |

Below table is applicable in the following conditions:

-Simultaneous conditions with Licensed Bands Antenna 3

-Simultaneous conditions with LTE Inter-band ULCA

| Mode/ Band                                                        |                  | Tones   | 26T     |         | 52T     |         | 106T    |         | 242T    |         | 484T    |         | 996T    |         |
|-------------------------------------------------------------------|------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
|                                                                   |                  | Channel | Maximum | Nominal | Maximum | Nominal | Maximum | Nominal | Maximum | Nominal | Maximum | Nominal | Maximum | Nominal |
| Modulated Average -<br>2 Tx Chain (dBm)<br>SDM - 5GHz<br>ANTupper | 20 MHz Bandwidth | 36      | 8.00    | 6.50    | 11.00   | 9.50    | 12.00   | 10.50   | 12.00   | 10.50   |         |         |         |         |
|                                                                   |                  | 40      | 8.00    | 6.50    | 11.00   | 9.50    | 12.00   | 10.50   | 12.00   | 10.50   |         |         |         |         |
|                                                                   |                  | 44      | 8.00    | 6.50    | 11.00   | 9.50    | 12.00   | 10.50   | 12.00   | 10.50   |         |         |         |         |
|                                                                   |                  | 48      | 8.00    | 6.50    | 11.00   | 9.50    | 12.00   | 10.50   | 12.00   | 10.50   |         |         |         |         |
|                                                                   |                  | 52      | 8.00    | 6.50    | 11.00   | 9.50    | 11.75   | 10.25   | 11.75   | 10.25   |         |         |         |         |
|                                                                   |                  | 56      | 8.00    | 6.50    | 11.00   | 9.50    | 11.75   | 10.25   | 11.75   | 10.25   |         |         |         |         |
|                                                                   |                  | 60      | 8.00    | 6.50    | 11.00   | 9.50    | 11.75   | 10.25   | 11.75   | 10.25   |         |         |         |         |
|                                                                   |                  | 64      | 8.00    | 6.50    | 11.00   | 9.50    | 11.75   | 10.25   | 11.75   | 10.25   |         |         |         |         |
|                                                                   |                  | 100     | 8.00    | 6.50    | 10.50   | 9.00    | 10.50   | 9.00    | 10.50   | 9.00    |         |         |         |         |
|                                                                   |                  | 104     | 8.00    | 6.50    | 10.50   | 9.00    | 10.50   | 9.00    | 10.50   | 9.00    |         |         |         |         |
|                                                                   |                  | 108     | 8.00    | 6.50    | 10.50   | 9.00    | 10.50   | 9.00    | 10.50   | 9.00    |         |         |         |         |
|                                                                   |                  | 112     | 8.00    | 6.50    | 10.50   | 9.00    | 10.50   | 9.00    | 10.50   | 9.00    |         |         |         |         |
|                                                                   |                  | 116     | 8.00    | 6.50    | 10.50   | 9.00    | 10.50   | 9.00    | 10.50   | 9.00    |         |         |         |         |
|                                                                   |                  | 120     | 8.00    | 6.50    | 10.50   | 9.00    | 10.50   | 9.00    | 10.50   | 9.00    |         |         |         |         |
|                                                                   |                  | 124     | 8.00    | 6.50    | 10.50   | 9.00    | 10.50   | 9.00    | 10.50   | 9.00    |         |         |         |         |
|                                                                   |                  | 128     | 8.00    | 6.50    | 10.50   | 9.00    | 10.50   | 9.00    | 10.50   | 9.00    |         |         |         |         |
|                                                                   |                  | 132     | 8.00    | 6.50    | 10.50   | 9.00    | 10.50   | 9.00    | 10.50   | 9.00    |         |         |         |         |
|                                                                   |                  | 136     | 8.00    | 6.50    | 10.50   | 9.00    | 10.50   | 9.00    | 10.50   | 9.00    |         |         |         |         |
|                                                                   |                  | 140     | 8.00    | 6.50    | 10.50   | 9.00    | 10.50   | 9.00    | 10.50   | 9.00    |         |         |         |         |
|                                                                   |                  | 144     | 8.00    | 6.50    | 10.50   | 9.00    | 10.50   | 9.00    | 10.50   | 9.00    |         |         |         |         |
|                                                                   |                  | 149     | 10.75   | 9.25    | 10.75   | 9.25    | 10.75   | 9.25    | 10.75   | 9.25    |         |         |         |         |
|                                                                   |                  | 153     | 10.75   | 9.25    | 10.75   | 9.25    | 10.75   | 9.25    | 10.75   | 9.25    |         |         |         |         |
|                                                                   |                  | 157     | 10.75   | 9.25    | 10.75   | 9.25    | 10.75   | 9.25    | 10.75   | 9.25    |         |         |         |         |
|                                                                   |                  | 161     | 10.75   | 9.25    | 10.75   | 9.25    | 10.75   | 9.25    | 10.75   | 9.25    |         |         |         |         |
|                                                                   |                  | 165     | 10.75   | 9.25    | 10.75   | 9.25    | 10.75   | 9.25    | 10.75   | 9.25    |         |         |         |         |
|                                                                   | 40 MHz Bandwidth | 38      | 8.00    | 6.50    | 11.00   | 9.50    | 11.50   | 10.00   | 11.50   | 10.00   | 11.50   | 10.00   |         |         |
|                                                                   |                  | 46      | 8.00    | 6.50    | 11.00   | 9.50    | 12.00   | 10.50   | 12.00   | 10.50   | 12.00   | 10.50   |         |         |
|                                                                   |                  | 54      | 8.00    | 6.50    | 11.00   | 9.50    | 11.75   | 10.25   | 11.75   | 10.25   | 11.75   | 10.25   |         |         |
|                                                                   |                  | 62      | 8.00    | 6.50    | 11.00   | 9.50    | 11.25   | 9.75    | 11.25   | 9.75    | 11.25   | 9.75    |         |         |
|                                                                   |                  | 102     | 8.00    | 6.50    | 10.50   | 9.00    | 10.50   | 9.00    | 10.50   | 9.00    | 10.50   | 9.00    |         |         |
|                                                                   |                  | 110     | 8.00    | 6.50    | 10.50   | 9.00    | 10.50   | 9.00    | 10.50   | 9.00    | 10.50   | 9.00    |         |         |
|                                                                   |                  | 118     | 8.00    | 6.50    | 10.50   | 9.00    | 10.50   | 9.00    | 10.50   | 9.00    | 10.50   | 9.00    |         |         |
|                                                                   |                  | 126     | 8.00    | 6.50    | 10.50   | 9.00    | 10.50   | 9.00    | 10.50   | 9.00    | 10.50   | 9.00    |         |         |
|                                                                   |                  | 134     | 8.00    | 6.50    | 10.50   | 9.00    | 10.50   | 9.00    | 10.50   | 9.00    | 10.50   | 9.00    |         |         |
|                                                                   |                  | 142     | 8.00    | 6.50    | 10.50   | 9.00    | 10.50   | 9.00    | 10.50   | 9.00    | 10.50   | 9.00    |         |         |
|                                                                   |                  | 151     | 10.75   | 9.25    | 10.75   | 9.25    | 10.75   | 9.25    | 10.75   | 9.25    | 10.75   | 9.25    |         |         |
|                                                                   |                  | 159     | 10.75   | 9.25    | 10.75   | 9.25    | 10.75   | 9.25    | 10.75   | 9.25    | 10.75   | 9.25    |         |         |
|                                                                   |                  | 42      | 8.00    | 6.50    | 10.50   | 9.00    | 10.50   | 9.00    | 10.50   | 9.00    | 10.50   | 9.00    | 10.50   | 9.00    |
|                                                                   |                  | 58      | 8.00    | 6.50    | 10.00   | 8.50    | 10.00   | 8.50    | 10.00   | 8.50    | 10.00   | 8.50    | 10.00   | 8.50    |
|                                                                   |                  | 106     | 8.00    | 6.50    | 10.00   | 8.50    | 10.00   | 8.50    | 10.00   | 8.50    | 10.00   | 8.50    | 10.00   | 8.50    |
|                                                                   | 80 MHz Bandwidth | 122     | 8.00    | 6.50    | 10.50   | 9.00    | 10.50   | 9.00    | 10.50   | 9.00    | 10.50   | 9.00    | 10.50   | 9.00    |
|                                                                   |                  | 138     | 8.00    | 6.50    | 10.50   | 9.00    | 10.50   | 9.00    | 10.50   | 9.00    | 10.50   | 9.00    | 10.50   | 9.00    |
|                                                                   |                  | 155     | 10.75   | 9.25    | 10.75   | 9.25    | 10.75   | 9.25    | 10.75   | 9.25    | 10.75   | 9.25    | 10.75   | 9.25    |
|                                                                   |                  |         |         |         |         |         |         |         |         |         |         |         |         |         |
|                                                                   |                  |         |         |         |         |         |         |         |         |         |         |         |         |         |

Note: In MIMO operations, 5GHz ANTupper transmits at maximum allowed powers as indicated above for both 2 Tx CDD and 2 Tx SDM.

|                                               |                                                                                                   |                              |                                        |
|-----------------------------------------------|---------------------------------------------------------------------------------------------------|------------------------------|----------------------------------------|
| FCC ID: BCGA2232                              |  <b>PCTEST</b> | <b>SAR EVALUATION REPORT</b> | <b>Reviewed by:</b><br>Quality Manager |
| <b>Test Dates:</b><br>12/20/2019 – 02/05/2020 | <b>DUT Type:</b><br>Tablet Device                                                                 |                              | <b>APPENDIX H:</b><br>Page 16 of 25    |

### 1.3 IEEE 802.11ax Measured Powers

**Table 1**  
**Maximum 2.4 GHz 802.11ax RU Output Power – Ant 2a**

| Freq [MHz] | Channel | Tones | RU Index | Avg Conducted Powers (dBm) | Freq [MHz] | Channel | Tones | RU Index | Avg Conducted Powers (dBm) |
|------------|---------|-------|----------|----------------------------|------------|---------|-------|----------|----------------------------|
| 2412       | 1       | 26T   | 0        | 9.61                       | 2412       | 1       | 52T   | 37       | 10.38                      |
|            |         |       | 4        | 10.15                      |            |         |       | 38       | 10.42                      |
|            |         |       | 8        | 10.47                      |            |         |       | 40       | 10.50                      |
| 2417       | 2       | 26T   | 0        | 13.06                      | 2417       | 2       | 52T   | 37       | 13.85                      |
|            |         |       | 4        | 13.65                      |            |         |       | 38       | 14.00                      |
|            |         |       | 8        | 13.98                      |            |         |       | 40       | 13.90                      |
| 2437       | 6       | 26T   | 0        | 13.70                      | 2437       | 6       | 52T   | 37       | 13.83                      |
|            |         |       | 4        | 13.56                      |            |         |       | 38       | 14.00                      |
|            |         |       | 8        | 13.91                      |            |         |       | 40       | 13.70                      |
| 2452       | 9       | 26T   | 0        | 12.32                      | 2452       | 9       | 52T   | 37       | 13.85                      |
|            |         |       | 4        | 13.99                      |            |         |       | 38       | 14.00                      |
|            |         |       | 8        | 12.89                      |            |         |       | 40       | 14.00                      |
| 2457       | 10      | 26T   | 0        | 11.50                      | 2457       | 10      | 52T   | 37       | 11.42                      |
|            |         |       | 4        | 11.01                      |            |         |       | 38       | 11.49                      |
|            |         |       | 8        | 10.28                      |            |         |       | 40       | 11.38                      |
| 2462       | 11      | 26T   | 0        | 9.95                       | 2462       | 11      | 52T   | 37       | 10.00                      |
|            |         |       | 4        | 9.98                       |            |         |       | 38       | 10.00                      |
|            |         |       | 8        | 9.90                       |            |         |       | 40       | 9.93                       |
| 2467       | 12      | 26T   | 0        | 7.91                       | 2467       | 12      | 52T   | 37       | 8.00                       |
|            |         |       | 4        | 8.00                       |            |         |       | 38       | 7.87                       |
|            |         |       | 8        | 6.02                       |            |         |       | 40       | 8.00                       |

|                                               |                                                                                                                  |                                        |
|-----------------------------------------------|------------------------------------------------------------------------------------------------------------------|----------------------------------------|
| <b>FCC ID:</b> BCGA2232                       |  <b>SAR EVALUATION REPORT</b> | <b>Reviewed by:</b><br>Quality Manager |
| <b>Test Dates:</b><br>12/20/2019 – 02/05/2020 | <b>DUT Type:</b><br>Tablet Device                                                                                | <b>APPENDIX H:</b><br>Page 17 of 25    |

| Freq [MHz] | Channel | Tones | RU Index | Avg Conducted Powers (dBm) |  |  |  |  |  |
|------------|---------|-------|----------|----------------------------|--|--|--|--|--|
| 2412       | 1       | 106T  | 53       | 10.30                      |  |  |  |  |  |
|            |         |       | 54       | 10.50                      |  |  |  |  |  |
| 2417       | 2       | 106T  | 53       | 13.93                      |  |  |  |  |  |
|            |         |       | 54       | 13.93                      |  |  |  |  |  |
| 2437       | 6       | 106T  | 53       | 13.92                      |  |  |  |  |  |
|            |         |       | 54       | 14.00                      |  |  |  |  |  |
| 2452       | 9       | 106T  | 53       | 14.00                      |  |  |  |  |  |
|            |         |       | 54       | 13.92                      |  |  |  |  |  |
| 2457       | 10      | 106T  | 53       | 11.50                      |  |  |  |  |  |
|            |         |       | 54       | 11.48                      |  |  |  |  |  |
| 2462       | 11      | 106T  | 53       | 10.00                      |  |  |  |  |  |
|            |         |       | 54       | 10.00                      |  |  |  |  |  |
| 2467       | 12      | 106T  | 53       | 8.00                       |  |  |  |  |  |
|            |         |       | 54       | 7.99                       |  |  |  |  |  |
| Freq [MHz] | Channel | Tones | RU Index | Avg Conducted Powers (dBm) |  |  |  |  |  |
| 2412       | 1       | 242T  | 61       | 10.45                      |  |  |  |  |  |
| 2417       | 2       | 242T  | 61       | 13.90                      |  |  |  |  |  |
| 2437       | 6       | 242T  | 61       | 14.00                      |  |  |  |  |  |
| 2452       | 9       | 242T  | 61       | 13.93                      |  |  |  |  |  |
| 2457       | 10      | 242T  | 61       | 11.40                      |  |  |  |  |  |
| 2462       | 11      | 242T  | 61       | 9.74                       |  |  |  |  |  |
| 2467       | 12      | 242T  | 61       | 8.00                       |  |  |  |  |  |

|                                        |                                                                                                   |                       |                                 |
|----------------------------------------|---------------------------------------------------------------------------------------------------|-----------------------|---------------------------------|
| FCC ID: BCGA2232                       |  <b>PCTEST</b> | SAR EVALUATION REPORT | Reviewed by:<br>Quality Manager |
| Test Dates:<br>12/20/2019 – 02/05/2020 | DUT Type:<br>Tablet Device                                                                        |                       | APPENDIX H:<br>Page 18 of 25    |

**Table 2**  
**Maximum 2.4 GHz 802.11ax RU Output Power – Ant 4a**

| Freq [MHz] | Channel | Tones | RU Index | Avg Conducted Powers (dBm) | Freq [MHz] | Channel | Tones | RU Index | Avg Conducted Powers (dBm) |
|------------|---------|-------|----------|----------------------------|------------|---------|-------|----------|----------------------------|
| 2412       | 1       | 26T   | 0        | 12.45                      | 2412       | 1       | 52T   | 37       | 12.45                      |
|            |         |       | 4        | 12.50                      |            |         |       | 38       | 12.50                      |
|            |         |       | 8        | 12.40                      |            |         |       | 40       | 12.44                      |
| 2417       | 2       | 26T   | 0        | 13.70                      | 2417       | 2       | 52T   | 37       | 13.75                      |
|            |         |       | 4        | 13.68                      |            |         |       | 38       | 13.64                      |
|            |         |       | 8        | 13.75                      |            |         |       | 40       | 13.75                      |
| 2437       | 6       | 26T   | 0        | 13.75                      | 2437       | 6       | 52T   | 37       | 13.75                      |
|            |         |       | 4        | 13.73                      |            |         |       | 38       | 13.73                      |
|            |         |       | 8        | 13.75                      |            |         |       | 40       | 13.45                      |
| 2452       | 9       | 26T   | 0        | 13.75                      | 2452       | 9       | 52T   | 37       | 13.75                      |
|            |         |       | 4        | 13.63                      |            |         |       | 38       | 13.55                      |
|            |         |       | 8        | 13.75                      |            |         |       | 40       | 13.75                      |
| 2457       | 10      | 26T   | 0        | 13.47                      | 2457       | 10      | 52T   | 37       | 13.50                      |
|            |         |       | 4        | 13.35                      |            |         |       | 38       | 13.50                      |
|            |         |       | 8        | 13.41                      |            |         |       | 40       | 13.47                      |
| 2462       | 11      | 26T   | 0        | 12.00                      | 2462       | 11      | 52T   | 37       | 11.83                      |
|            |         |       | 4        | 11.99                      |            |         |       | 38       | 11.77                      |
|            |         |       | 8        | 11.96                      |            |         |       | 40       | 12.00                      |
| 2467       | 12      | 26T   | 0        | 9.87                       | 2467       | 12      | 52T   | 37       | 9.88                       |
|            |         |       | 4        | 10.00                      |            |         |       | 38       | 10.00                      |
|            |         |       | 8        | 9.96                       |            |         |       | 40       | 9.60                       |
| Freq [MHz] | Channel | Tones | RU Index | Avg Conducted Powers (dBm) |            |         |       |          |                            |
| 2412       | 1       | 106T  | 53       | 12.46                      |            |         |       |          |                            |
|            |         |       | 54       | 12.48                      |            |         |       |          |                            |
| 2417       | 2       | 106T  | 53       | 13.68                      |            |         |       |          |                            |
|            |         |       | 54       | 13.69                      |            |         |       |          |                            |
| 2437       | 6       | 106T  | 53       | 13.67                      | Freq [MHz] | Channel | Tones | RU Index | Avg Conducted Powers (dBm) |
|            |         |       | 54       | 13.75                      |            |         |       |          |                            |
| 2452       | 9       | 106T  | 53       | 13.75                      | 2412       | 1       | 242T  | 61       | 12.49                      |
|            |         |       | 54       | 13.63                      | 2417       | 2       | 242T  | 61       | 13.75                      |
| 2457       | 10      | 106T  | 53       | 13.50                      | 2437       | 6       | 242T  | 61       | 13.75                      |
|            |         |       | 54       | 13.46                      | 2452       | 9       | 242T  | 61       | 13.64                      |
| 2462       | 11      | 106T  | 53       | 12.00                      | 2457       | 10      | 242T  | 61       | 13.21                      |
|            |         |       | 54       | 12.00                      | 2462       | 11      | 242T  | 61       | 12.00                      |
| 2467       | 12      | 106T  | 53       | 10.00                      | 2462       | 11      | 242T  | 61       | 12.00                      |
|            |         |       | 54       | 9.92                       | 2467       | 12      | 242T  | 61       | 9.95                       |

|                                        |                                                                                                                  |                                 |
|----------------------------------------|------------------------------------------------------------------------------------------------------------------|---------------------------------|
| FCC ID: BCGA2232                       |  <b>SAR EVALUATION REPORT</b> | Reviewed by:<br>Quality Manager |
| Test Dates:<br>12/20/2019 – 02/05/2020 | DUT Type:<br>Tablet Device                                                                                       | APPENDIX H:<br>Page 19 of 25    |

**Table 3**  
**Maximum 5 GHz 802.11ax RU Output Power – 5GHz ANTlower**

| 20MHz BW | Band | Freq [MHz] | Channel | Tones | Avg Conducted Power (dBm) |       |       | 20MHz BW | Band | Freq [MHz] | Channel | Tones | Avg Conducted Power (dBm) |       |       |
|----------|------|------------|---------|-------|---------------------------|-------|-------|----------|------|------------|---------|-------|---------------------------|-------|-------|
|          |      |            |         |       | RU Index                  |       |       |          |      |            |         |       | RU Index                  |       |       |
|          |      |            |         |       | 0                         | 4     | 8     |          |      |            |         |       | 37                        | 39    | 40    |
|          | 1    | 5180       | 36      | 26T   | 10.15                     | 10.74 | 10.91 |          | 1    | 5180       | 36      | 52T   | 13.28                     | 13.99 | 13.99 |
| 5200     |      | 40         | 26T     | 10.04 | 10.74                     | 10.87 | 5200  | 40       |      | 52T        | 13.45   | 14.00 | 14.00                     |       |       |
| 5240     |      | 48         | 26T     | 10.06 | 10.68                     | 10.83 | 5240  | 48       |      | 52T        | 13.25   | 13.97 | 13.91                     |       |       |
| 2A       | 5260 | 52         | 26T     | 10.08 | 10.98                     | 10.76 | 2A    | 5260     | 52   | 52T        | 13.27   | 13.91 | 14.00                     |       |       |
|          | 5300 | 60         | 26T     | 10.04 | 10.59                     | 10.61 |       | 5280     | 56   | 52T        | 13.23   | 13.92 | 13.87                     |       |       |
|          | 5320 | 64         | 26T     | 10.32 | 10.87                     | 10.95 |       | 5320     | 64   | 52T        | 13.64   | 14.00 | 13.98                     |       |       |
| 2C       | 5500 | 100        | 26T     | 10.65 | 10.96                     | 10.86 | 2C    | 5500     | 100  | 52T        | 13.63   | 14.00 | 13.93                     |       |       |
|          | 5520 | 104        | 26T     | 10.53 | 11.00                     | 10.92 |       | 5520     | 104  | 52T        | 13.66   | 13.90 | 14.00                     |       |       |
|          | 5580 | 116        | 26T     | 10.50 | 10.98                     | 11.00 |       | 5580     | 116  | 52T        | 13.79   | 14.00 | 13.98                     |       |       |
|          | 5660 | 132        | 26T     | 9.94  | 10.33                     | 10.28 |       | 5660     | 132  | 52T        | 13.34   | 13.54 | 13.34                     |       |       |
|          | 5680 | 136        | 26T     | 10.83 | 11.00                     | 11.00 |       | 5680     | 136  | 52T        | 13.62   | 14.00 | 13.89                     |       |       |
|          | 5700 | 140        | 26T     | 9.59  | 9.85                      | 9.70  |       | 5700     | 140  | 52T        | 11.18   | 11.47 | 11.40                     |       |       |
|          | 5720 | 144        | 26T     | 10.76 | 11.00                     | 11.00 |       | 5720     | 144  | 52T        | 13.70   | 13.85 | 13.82                     |       |       |
| 3        | 5745 | 149        | 26T     | 15.21 | 15.50                     | 15.37 | 3     | 5745     | 149  | 52T        | 15.28   | 15.50 | 15.38                     |       |       |
|          | 5785 | 157        | 26T     | 15.30 | 15.50                     | 15.45 |       | 5785     | 157  | 52T        | 15.43   | 15.50 | 15.50                     |       |       |
|          | 5825 | 165        | 26T     | 15.15 | 15.50                     | 15.35 |       | 5825     | 165  | 52T        | 15.22   | 15.40 | 15.50                     |       |       |

| 20MHz BW | Band | Freq [MHz] | Channel | Tones | Avg Conducted Power (dBm) |       |     | 20MHz BW | Band | Freq [MHz] | Channel | Tones | Avg Conducted Power (dBm) |     |     |
|----------|------|------------|---------|-------|---------------------------|-------|-----|----------|------|------------|---------|-------|---------------------------|-----|-----|
|          |      |            |         |       | RU Index                  |       |     |          |      |            |         |       | RU Index                  |     |     |
|          |      |            |         |       | 53                        | 54    | N/A |          |      |            |         |       | 61                        | N/A | N/A |
|          | 1    | 5180       | 36      | 106T  | 14.51                     | 15.00 |     |          | 1    | 5180       | 36      | 242T  | 15.00                     |     |     |
|          |      | 5200       | 40      | 106T  | 16.43                     | 16.94 |     |          |      | 5200       | 40      | 242T  | 16.81                     |     |     |
|          |      | 5240       | 48      | 106T  | 16.56                     | 16.99 |     |          |      | 5240       | 48      | 242T  | 16.86                     |     |     |
|          | 2A   | 5260       | 52      | 106T  | 16.43                     | 16.75 |     |          | 2A   | 5260       | 52      | 242T  | 16.73                     |     |     |
|          |      | 5300       | 60      | 106T  | 16.26                     | 16.73 |     |          |      | 5300       | 60      | 242T  | 16.70                     |     |     |
|          |      | 5320       | 64      | 106T  | 13.70                     | 14.00 |     |          |      | 5320       | 64      | 242T  | 13.98                     |     |     |
|          | 2C   | 5500       | 100     | 106T  | 13.75                     | 13.96 |     |          | 2C   | 5500       | 100     | 242T  | 14.00                     |     |     |
|          |      | 5520       | 104     | 106T  | 15.18                     | 15.41 |     |          |      | 5520       | 104     | 242T  | 15.50                     |     |     |
|          |      | 5580       | 116     | 106T  | 15.16                     | 15.50 |     |          |      | 5580       | 116     | 242T  | 15.49                     |     |     |
|          |      | 5660       | 132     | 106T  | 15.13                     | 15.42 |     |          |      | 5660       | 132     | 242T  | 15.14                     |     |     |
|          |      | 5680       | 136     | 106T  | 15.07                     | 15.34 |     |          |      | 5680       | 136     | 242T  | 15.50                     |     |     |
|          |      | 5700       | 140     | 106T  | 11.12                     | 11.13 |     |          |      | 5700       | 140     | 242T  | 11.50                     |     |     |
|          |      | 5720       | 144     | 106T  | 15.34                     | 15.48 |     |          |      | 5720       | 144     | 242T  | 15.44                     |     |     |
|          | 3    | 5745       | 149     | 106T  | 15.36                     | 15.50 |     |          | 3    | 5745       | 149     | 242T  | 15.45                     |     |     |
|          |      | 5785       | 157     | 106T  | 15.39                     | 15.50 |     |          |      | 5785       | 157     | 242T  | 15.49                     |     |     |
|          |      | 5825       | 165     | 106T  | 15.39                     | 15.50 |     |          |      | 5825       | 165     | 242T  | 15.50                     |     |     |

|                                        |                                                                                                           |                                 |
|----------------------------------------|-----------------------------------------------------------------------------------------------------------|---------------------------------|
| FCC ID: BCGA2232                       |  SAR EVALUATION REPORT | Reviewed by:<br>Quality Manager |
| Test Dates:<br>12/20/2019 – 02/05/2020 | DUT Type:<br>Tablet Device                                                                                | APPENDIX H:<br>Page 20 of 25    |

| 40MHz BW | Band | Freq [MHz] | Channel | Tones | Avg Conducted Power (dBm) |       |       | 40MHz BW | Band | Freq [MHz] | Channel | Tones | Avg Conducted Power (dBm) |       |       |
|----------|------|------------|---------|-------|---------------------------|-------|-------|----------|------|------------|---------|-------|---------------------------|-------|-------|
|          |      |            |         |       | RU Index                  |       |       |          |      |            |         |       | RU Index                  |       |       |
|          |      |            |         |       | 0                         | 8     | 17    |          |      |            |         |       | 37                        | 40    | 44    |
|          | 1    | 5190       | 38      | 26T   | 10.05                     | 11.00 | 10.91 |          | 1    | 5190       | 38      | 52T   | 11.39                     | 12.50 | 11.94 |
|          |      | 5230       | 46      | 26T   | 10.34                     | 11.00 | 11.00 |          |      | 5230       | 46      | 52T   | 13.41                     | 14.00 | 13.87 |
|          | 2A   | 5270       | 54      | 26T   | 10.43                     | 11.00 | 11.00 |          | 2A   | 5270       | 54      | 52T   | 13.45                     | 14.00 | 13.90 |
|          |      | 5310       | 62      | 26T   | 10.51                     | 11.00 | 11.00 |          |      | 5310       | 62      | 52T   | 12.08                     | 12.50 | 12.44 |
|          | 2C   | 5510       | 102     | 26T   | 10.80                     | 11.00 | 11.00 |          | 2C   | 5510       | 102     | 52T   | 11.80                     | 12.00 | 11.89 |
|          |      | 5550       | 110     | 26T   | 10.98                     | 11.00 | 11.00 |          |      | 5550       | 110     | 52T   | 13.76                     | 14.00 | 13.92 |
|          |      | 5590       | 118     | 26T   | 10.68                     | 10.97 | 11.00 |          |      | 5590       | 118     | 52T   | 13.77                     | 14.00 | 13.88 |
| 5630     |      | 126        | 26T     | 10.94 | 11.00                     | 11.00 | 5630  | 126      |      | 52T        | 13.81   | 13.95 | 13.84                     |       |       |
| 5670     |      | 134        | 26T     | 10.87 | 11.00                     | 11.00 | 5670  | 134      |      | 52T        | 13.80   | 14.00 | 13.88                     |       |       |
| 5710     |      | 142        | 26T     | 10.89 | 11.00                     | 11.00 | 5710  | 142      |      | 52T        | 13.95   | 13.91 | 13.88                     |       |       |
| 3        | 5755 | 151        | 26T     | 15.50 | 15.50                     | 15.50 | 3     | 5755     | 151  | 52T        | 15.45   | 15.50 | 15.50                     |       |       |
|          | 5795 | 159        | 26T     | 15.33 | 15.50                     | 15.50 |       | 5795     | 159  | 52T        | 15.41   | 15.38 | 15.30                     |       |       |

| 40MHz BW | Band | Freq [MHz] | Channel | Tones | Avg Conducted Power (dBm) |       |       | 40MHz BW | Band | Freq [MHz] | Channel | Tones | Avg Conducted Power (dBm) |       |     |
|----------|------|------------|---------|-------|---------------------------|-------|-------|----------|------|------------|---------|-------|---------------------------|-------|-----|
|          |      |            |         |       | RU Index                  |       |       |          |      |            |         |       | RU Index                  |       |     |
|          |      |            |         |       | 53                        | 54    | 56    |          |      |            |         |       | 61                        | 62    | N/A |
|          | 1    | 5190       | 38      | 106T  | 12.01                     | 12.50 | 12.50 |          | 1    | 5190       | 38      | 242T  | 12.50                     | 12.50 |     |
|          |      | 5230       | 46      | 106T  | 16.68                     | 16.97 | 17.00 |          |      | 5230       | 46      | 242T  | 16.98                     | 16.92 |     |
|          | 2A   | 5270       | 54      | 106T  | 16.55                     | 16.50 | 16.51 |          | 2A   | 5270       | 54      | 242T  | 16.75                     | 16.75 |     |
|          |      | 5310       | 62      | 106T  | 12.08                     | 12.49 | 12.50 |          |      | 5310       | 62      | 242T  | 12.42                     | 12.50 |     |
|          | 2C   | 5510       | 102     | 106T  | 11.87                     | 12.00 | 12.00 |          | 2C   | 5510       | 102     | 242T  | 12.00                     | 12.00 |     |
|          |      | 5550       | 110     | 106T  | 15.07                     | 15.30 | 15.32 |          |      | 5550       | 110     | 242T  | 15.50                     | 15.50 |     |
|          |      | 5590       | 118     | 106T  | 15.38                     | 15.50 | 15.50 |          |      | 5590       | 118     | 242T  | 15.37                     | 15.50 |     |
| 5630     |      | 126        | 106T    | 15.39 | 15.50                     | 15.50 | 5630  | 126      |      | 242T       | 15.00   | 15.38 |                           |       |     |
| 5670     |      | 134        | 106T    | 14.84 | 14.99                     | 14.93 | 5670  | 134      |      | 242T       | 14.94   | 15.00 |                           |       |     |
| 5710     |      | 142        | 106T    | 15.39 | 15.50                     | 15.50 | 5710  | 142      |      | 242T       | 11.49   | 11.50 |                           |       |     |
| 3        | 5755 | 151        | 106T    | 15.48 | 15.50                     | 15.50 | 3     | 5755     | 151  | 242T       | 15.00   | 15.06 |                           |       |     |
|          | 5795 | 159        | 106T    | 15.49 | 15.50                     | 15.50 |       | 5795     | 159  | 242T       | 15.06   | 15.18 |                           |       |     |

| 40MHz BW | Band | Freq [MHz] | Channel | Tones | Avg Conducted Power (dBm) |     |     |
|----------|------|------------|---------|-------|---------------------------|-----|-----|
|          |      |            |         |       | RU Index                  |     |     |
|          |      |            |         |       | 65                        | N/A | N/A |
|          | 1    | 5190       | 38      | 484T  | 12.02                     |     |     |
|          |      | 5230       | 46      | 484T  | 16.94                     |     |     |
|          | 2A   | 5270       | 54      | 484T  | 16.75                     |     |     |
|          |      | 5310       | 62      | 484T  | 12.42                     |     |     |
|          | 2C   | 5510       | 102     | 484T  | 11.98                     |     |     |
|          |      | 5550       | 110     | 484T  | 15.50                     |     |     |
|          |      | 5590       | 118     | 484T  | 15.42                     |     |     |
|          |      | 5630       | 126     | 484T  | 15.50                     |     |     |
|          |      | 5670       | 134     | 484T  | 15.00                     |     |     |
|          |      | 5710       | 142     | 484T  | 15.40                     |     |     |
|          |      | 5755       | 151     | 484T  | 15.40                     |     |     |
|          | 3    | 5795       | 159     | 484T  | 15.26                     |     |     |

|                                        |                                                                                                           |                                 |
|----------------------------------------|-----------------------------------------------------------------------------------------------------------|---------------------------------|
| FCC ID: BCGA2232                       |  SAR EVALUATION REPORT | Reviewed by:<br>Quality Manager |
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| 80MHz BW | Band | Freq [MHz] | Channel | Tones | Avg Conducted Power (dBm) |       |       |
|----------|------|------------|---------|-------|---------------------------|-------|-------|
|          |      |            |         |       | RU Index                  |       |       |
|          |      |            |         |       | 0                         | 18    | 36    |
|          |      |            |         |       |                           |       |       |
| 80MHz BW | 1    | 5210       | 42      | 26T   | 10.53                     | 11.00 | 11.00 |
|          | 2A   | 5290       | 58      | 26T   | 10.61                     | 11.00 | 11.00 |
|          | 2C   | 5530       | 106     | 26T   | 10.65                     | 10.92 | 10.96 |
|          |      | 5610       | 122     | 26T   | 10.70                     | 11.00 | 11.00 |
|          |      | 5690       | 138     | 26T   | 10.39                     | 11.00 | 10.68 |
|          | 3    | 5775       | 155     | 26T   | 15.39                     | 15.50 | 15.45 |
| 80MHz BW | Band | Freq [MHz] | Channel | Tones | Avg Conducted Power (dBm) |       |       |
|          |      |            |         |       | RU Index                  |       |       |
|          |      |            |         |       | 53                        | 56    | 60    |
|          |      |            |         |       |                           |       |       |
| 80MHz BW | 1    | 5210       | 42      | 106T  | 11.59                     | 12.00 | 11.82 |
|          | 2A   | 5290       | 58      | 106T  | 11.17                     | 11.50 | 11.50 |
|          | 2C   | 5530       | 106     | 106T  | 10.74                     | 11.00 | 11.00 |
|          |      | 5610       | 122     | 106T  | 15.27                     | 15.50 | 15.50 |
|          |      | 5690       | 138     | 106T  | 15.40                     | 15.50 | 15.48 |
|          | 3    | 5775       | 155     | 106T  | 15.50                     | 15.50 | 15.50 |
| 80MHz BW | Band | Freq [MHz] | Channel | Tones | Avg Conducted Power (dBm) |       |       |
|          |      |            |         |       | RU Index                  |       |       |
|          |      |            |         |       | 65                        | 66    | N/A   |
|          |      |            |         |       |                           |       |       |
| 80MHz BW | 1    | 5210       | 42      | 484T  | 11.95                     | 11.94 |       |
|          | 2A   | 5290       | 58      | 484T  | 11.42                     | 11.50 |       |
|          | 2C   | 5530       | 106     | 484T  | 11.00                     | 11.00 |       |
|          |      | 5610       | 122     | 484T  | 15.50                     | 15.49 |       |
|          |      | 5690       | 138     | 484T  | 15.00                     | 15.00 |       |
|          | 3    | 5775       | 155     | 484T  | 15.47                     | 15.50 |       |

|                                        |                                                                                                   |                       |                                 |
|----------------------------------------|---------------------------------------------------------------------------------------------------|-----------------------|---------------------------------|
| FCC ID: BCGA2232                       |  <b>PCTEST</b> | SAR EVALUATION REPORT | Reviewed by:<br>Quality Manager |
| Test Dates:<br>12/20/2019 – 02/05/2020 | DUT Type:<br>Tablet Device                                                                        |                       | APPENDIX H:<br>Page 22 of 25    |

**Table 4**  
**Maximum 5 GHz 802.11ax RU Output Power – 5GHz ANTupper**

| 20MHz BW | Band | Freq [MHz] | Channel | Tones | Avg Conducted Power (dBm) |       |       | 20MHz BW | Band | Freq [MHz] | Channel | Tones | Avg Conducted Power (dBm) |       |       |
|----------|------|------------|---------|-------|---------------------------|-------|-------|----------|------|------------|---------|-------|---------------------------|-------|-------|
|          |      |            |         |       | RU Index                  |       |       |          |      |            |         |       | RU Index                  |       |       |
|          |      |            |         |       | 0                         | 4     | 8     |          |      |            |         |       | 37                        | 39    | 40    |
|          | 1    | 5180       | 36      | 26T   | 10.06                     | 10.68 | 10.92 |          | 1    | 5180       | 36      | 52T   | 13.31                     | 14.00 | 13.97 |
| 5200     |      | 40         | 26T     | 10.16 | 10.79                     | 10.98 | 5200  | 40       |      | 52T        | 13.42   | 14.00 | 14.00                     |       |       |
| 5240     |      | 48         | 26T     | 10.41 | 10.99                     | 11.00 | 5240  | 48       |      | 52T        | 13.39   | 13.79 | 13.86                     |       |       |
| 2A       | 5260 | 52         | 26T     | 10.32 | 10.89                     | 11.00 | 2A    | 5260     | 52   | 52T        | 13.52   | 13.87 | 13.74                     |       |       |
|          | 5300 | 60         | 26T     | 10.31 | 10.84                     | 11.00 |       | 5280     | 56   | 52T        | 13.45   | 13.89 | 13.82                     |       |       |
|          | 5320 | 64         | 26T     | 10.48 | 10.96                     | 11.00 |       | 5320     | 64   | 52T        | 13.81   | 14.00 | 14.00                     |       |       |
| 2C       | 5500 | 100        | 26T     | 10.62 | 11.00                     | 10.80 | 2C    | 5500     | 100  | 52T        | 13.90   | 14.00 | 14.00                     |       |       |
|          | 5520 | 104        | 26T     | 10.46 | 10.95                     | 11.00 |       | 5520     | 104  | 52T        | 13.88   | 14.00 | 14.00                     |       |       |
|          | 5580 | 116        | 26T     | 10.69 | 11.00                     | 10.98 |       | 5580     | 116  | 52T        | 14.00   | 14.00 | 14.00                     |       |       |
|          | 5660 | 132        | 26T     | 10.43 | 10.81                     | 10.71 |       | 5660     | 132  | 52T        | 13.71   | 13.93 | 13.94                     |       |       |
|          | 5680 | 136        | 26T     | 10.54 | 10.94                     | 10.91 |       | 5680     | 136  | 52T        | 13.59   | 14.00 | 13.91                     |       |       |
|          | 5700 | 140        | 26T     | 9.51  | 10.00                     | 9.94  |       | 5700     | 140  | 52T        | 11.03   | 11.41 | 11.34                     |       |       |
|          | 5720 | 144        | 26T     | 10.62 | 10.96                     | 10.87 |       | 5720     | 144  | 52T        | 13.63   | 14.00 | 13.89                     |       |       |
|          | 5745 | 149        | 26T     | 15.40 | 15.75                     | 15.69 |       | 5745     | 149  | 52T        | 15.44   | 15.75 | 15.75                     |       |       |
| 3        | 5785 | 157        | 26T     | 15.32 | 15.73                     | 15.64 | 3     | 5785     | 157  | 52T        | 15.25   | 15.70 | 15.59                     |       |       |
|          | 5825 | 165        | 26T     | 15.30 | 15.70                     | 15.62 |       | 5825     | 165  | 52T        | 15.17   | 15.51 | 15.46                     |       |       |

| 20MHz BW | Band | Freq [MHz] | Channel | Tones | Avg Conducted Power (dBm) |       |      | 20MHz BW | Band | Freq [MHz] | Channel | Tones | Avg Conducted Power (dBm) |     |     |
|----------|------|------------|---------|-------|---------------------------|-------|------|----------|------|------------|---------|-------|---------------------------|-----|-----|
|          |      |            |         |       | RU Index                  |       |      |          |      |            |         |       | RU Index                  |     |     |
|          |      |            |         |       | 53                        | 54    | N/A  |          |      |            |         |       | 61                        | N/A | N/A |
|          | 1    | 5180       | 36      | 106T  | 14.63                     | 15.00 |      |          | 1    | 5180       | 36      | 242T  | 14.19                     |     |     |
| 5200     |      | 40         | 106T    | 16.69 | 16.98                     |       | 5200 | 40       |      | 242T       | 16.81   |       |                           |     |     |
| 5240     |      | 48         | 106T    | 16.69 | 17.00                     |       | 5240 | 48       |      | 242T       | 16.15   |       |                           |     |     |
| 2A       | 5260 | 52         | 106T    | 16.43 | 16.75                     |       | 2A   | 5260     | 52   | 242T       | 16.75   |       |                           |     |     |
|          | 5300 | 60         | 106T    | 16.58 | 16.75                     |       |      | 5300     | 60   | 242T       | 16.69   |       |                           |     |     |
|          | 5320 | 64         | 106T    | 13.48 | 13.99                     |       |      | 5320     | 64   | 242T       | 14.00   |       |                           |     |     |
| 2C       | 5500 | 100        | 106T    | 13.41 | 13.58                     |       | 2C   | 5500     | 100  | 242T       | 14.00   |       |                           |     |     |
|          | 5520 | 104        | 106T    | 15.24 | 15.40                     |       |      | 5520     | 104  | 242T       | 15.50   |       |                           |     |     |
|          | 5580 | 116        | 106T    | 15.28 | 15.47                     |       |      | 5580     | 116  | 242T       | 15.43   |       |                           |     |     |
|          | 5660 | 132        | 106T    | 15.39 | 15.40                     |       |      | 5660     | 132  | 242T       | 15.29   |       |                           |     |     |
|          | 5680 | 136        | 106T    | 15.33 | 15.50                     |       |      | 5680     | 136  | 242T       | 15.45   |       |                           |     |     |
|          | 5700 | 140        | 106T    | 11.35 | 11.50                     |       |      | 5700     | 140  | 242T       | 11.47   |       |                           |     |     |
|          | 5720 | 144        | 106T    | 15.44 | 15.50                     |       |      | 5720     | 144  | 242T       | 15.50   |       |                           |     |     |
|          | 5745 | 149        | 106T    | 15.72 | 15.75                     |       |      | 5745     | 149  | 242T       | 15.74   |       |                           |     |     |
| 3        | 5785 | 157        | 106T    | 15.54 | 15.67                     |       | 3    | 5785     | 157  | 242T       | 15.68   |       |                           |     |     |
|          | 5825 | 165        | 106T    | 15.43 | 15.66                     |       |      | 5825     | 165  | 242T       | 15.75   |       |                           |     |     |

|                                        |                                                                                                           |                                 |
|----------------------------------------|-----------------------------------------------------------------------------------------------------------|---------------------------------|
| FCC ID: BCGA2232                       |  SAR EVALUATION REPORT | Reviewed by:<br>Quality Manager |
| Test Dates:<br>12/20/2019 – 02/05/2020 | DUT Type:<br>Tablet Device                                                                                | APPENDIX H:<br>Page 23 of 25    |

| 40MHz BW | Band | Freq [MHz] | Channel | Tones | Avg Conducted Power (dBm) |       |       | Band | Freq [MHz] | Channel | Tones | Avg Conducted Power (dBm) |       |       |
|----------|------|------------|---------|-------|---------------------------|-------|-------|------|------------|---------|-------|---------------------------|-------|-------|
|          |      |            |         |       | RU Index                  |       |       |      |            |         |       | RU Index                  |       |       |
|          |      |            |         |       | 0                         | 8     | 17    |      |            |         |       | 37                        | 40    | 44    |
|          | 1    | 5190       | 38      | 26T   | 9.89                      | 11.00 | 10.55 | 1    | 5190       | 38      | 52T   | 11.35                     | 12.47 | 12.16 |
|          |      | 5230       | 46      | 26T   | 10.24                     | 10.69 | 11.00 |      | 5230       | 46      | 52T   | 13.08                     | 13.75 | 13.96 |
|          | 2A   | 5270       | 54      | 26T   | 10.28                     | 10.93 | 10.96 | 2A   | 5270       | 54      | 52T   | 13.25                     | 13.83 | 13.94 |
|          |      | 5310       | 62      | 26T   | 10.21                     | 10.80 | 10.94 |      | 5310       | 62      | 52T   | 11.64                     | 12.34 | 12.49 |
|          | 2C   | 5510       | 102     | 26T   | 11.00                     | 11.00 | 11.00 | 2C   | 5510       | 102     | 52T   | 11.67                     | 11.93 | 11.94 |
|          |      | 5550       | 110     | 26T   | 10.98                     | 11.00 | 11.00 |      | 5550       | 110     | 52T   | 13.95                     | 13.98 | 14.00 |
|          |      | 5590       | 118     | 26T   | 11.00                     | 10.98 | 10.93 |      | 5590       | 118     | 52T   | 13.82                     | 13.89 | 14.00 |
| 5630     |      | 126        | 26T     | 10.75 | 10.81                     | 10.97 | 5630  |      | 126        | 52T     | 13.93 | 13.94                     | 14.00 |       |
| 5670     |      | 134        | 26T     | 10.52 | 10.92                     | 10.98 | 5670  |      | 134        | 52T     | 14.00 | 14.00                     | 14.00 |       |
| 5710     |      | 142        | 26T     | 10.79 | 10.93                     | 11.00 | 5710  |      | 142        | 52T     | 13.65 | 13.80                     | 13.99 |       |
| 3        | 5755 | 151        | 26T     | 15.38 | 15.45                     | 15.50 | 3     | 5755 | 151        | 52T     | 15.48 | 15.41                     | 15.75 |       |
|          | 5795 | 159        | 26T     | 15.02 | 15.32                     | 15.42 |       | 5795 | 159        | 52T     | 15.51 | 15.48                     | 15.74 |       |

| 40MHz BW | Band | Freq [MHz] | Channel | Tones | Avg Conducted Power (dBm) |       |       | Band | Freq [MHz] | Channel | Tones | Avg Conducted Power (dBm) |       |     |
|----------|------|------------|---------|-------|---------------------------|-------|-------|------|------------|---------|-------|---------------------------|-------|-----|
|          |      |            |         |       | RU Index                  |       |       |      |            |         |       | RU Index                  |       |     |
|          |      |            |         |       | 53                        | 54    | 56    |      |            |         |       | 61                        | 62    | N/A |
|          | 1    | 5190       | 38      | 106T  | 11.57                     | 12.42 | 11.72 | 1    | 5190       | 38      | 242T  | 12.50                     | 12.48 |     |
|          |      | 5230       | 46      | 106T  | 16.65                     | 17.00 | 16.98 |      | 5230       | 46      | 242T  | 16.77                     | 16.91 |     |
|          | 2A   | 5270       | 54      | 106T  | 16.26                     | 16.70 | 16.36 | 2A   | 5270       | 54      | 242T  | 16.74                     | 16.61 |     |
|          |      | 5310       | 62      | 106T  | 12.07                     | 12.42 | 12.14 |      | 5310       | 62      | 242T  | 12.32                     | 12.50 |     |
|          | 2C   | 5510       | 102     | 106T  | 11.77                     | 11.91 | 11.75 | 2C   | 5510       | 102     | 242T  | 11.90                     | 11.99 |     |
|          |      | 5550       | 110     | 106T  | 15.35                     | 15.50 | 15.23 |      | 5550       | 110     | 242T  | 15.31                     | 15.50 |     |
|          |      | 5590       | 118     | 106T  | 15.31                     | 15.47 | 15.23 |      | 5590       | 118     | 242T  | 15.49                     | 15.50 |     |
| 5630     |      | 126        | 106T    | 15.35 | 15.39                     | 15.16 | 5630  |      | 126        | 242T    | 15.50 | 15.46                     |       |     |
| 5670     |      | 134        | 106T    | 14.80 | 14.95                     | 14.76 | 5670  |      | 134        | 242T    | 14.92 | 15.00                     |       |     |
| 5710     |      | 142        | 106T    | 15.32 | 15.50                     | 15.40 | 5710  |      | 142        | 242T    | 11.49 | 11.50                     |       |     |
| 3        | 5755 | 151        | 106T    | 15.55 | 15.70                     | 15.60 | 3     | 5755 | 151        | 242T    | 15.60 | 15.69                     |       |     |
|          | 5795 | 159        | 106T    | 15.60 | 15.75                     | 15.51 |       | 5795 | 159        | 242T    | 15.72 | 15.65                     |       |     |

| 40MHz BW | Band | Freq [MHz] | Channel | Tones | Avg Conducted Power (dBm) |     |     |
|----------|------|------------|---------|-------|---------------------------|-----|-----|
|          |      |            |         |       | RU Index                  |     |     |
|          |      |            |         |       | 65                        | N/A | N/A |
|          | 1    | 5190       | 38      | 484T  | 12.35                     |     |     |
|          |      | 5230       | 46      | 484T  | 17.00                     |     |     |
|          | 2A   | 5270       | 54      | 484T  | 16.67                     |     |     |
|          |      | 5310       | 62      | 484T  | 12.47                     |     |     |
|          | 2C   | 5510       | 102     | 484T  | 11.98                     |     |     |
|          |      | 5550       | 110     | 484T  | 15.50                     |     |     |
|          |      | 5590       | 118     | 484T  | 15.50                     |     |     |
|          |      | 5630       | 126     | 484T  | 15.50                     |     |     |
|          |      | 5670       | 134     | 484T  | 15.00                     |     |     |
|          |      | 5710       | 142     | 484T  | 15.50                     |     |     |
|          | 3    | 5755       | 151     | 484T  | 15.68                     |     |     |
|          |      | 5795       | 159     | 484T  | 15.75                     |     |     |

|                                        |                                                                                                           |                                 |
|----------------------------------------|-----------------------------------------------------------------------------------------------------------|---------------------------------|
| FCC ID: BCGA2232                       |  SAR EVALUATION REPORT | Reviewed by:<br>Quality Manager |
| Test Dates:<br>12/20/2019 – 02/05/2020 | DUT Type:<br>Tablet Device                                                                                | APPENDIX H:<br>Page 24 of 25    |

| 80MHz BW | Band | Freq [MHz] | Channel | Tones | Avg Conducted Power (dBm) |       |       |
|----------|------|------------|---------|-------|---------------------------|-------|-------|
|          |      |            |         |       | RU Index                  |       |       |
|          |      |            |         |       | 0                         | 18    | 36    |
|          |      |            |         |       |                           |       |       |
| 80MHz BW | 1    | 5210       | 42      | 26T   | 10.31                     | 10.93 | 10.72 |
|          | 2A   | 5290       | 58      | 26T   | 10.37                     | 10.90 | 10.83 |
|          | 2C   | 5530       | 106     | 26T   | 10.58                     | 10.96 | 10.48 |
|          |      | 5610       | 122     | 26T   | 10.67                     | 11.00 | 10.66 |
|          |      | 5690       | 138     | 26T   | 10.98                     | 10.99 | 10.74 |
|          | 3    | 5775       | 155     | 26T   | 15.26                     | 15.48 | 15.10 |
| 80MHz BW | Band | Freq [MHz] | Channel | Tones | Avg Conducted Power (dBm) |       |       |
|          |      |            |         |       | RU Index                  |       |       |
|          |      |            |         |       | 53                        | 56    | 60    |
|          |      |            |         |       |                           |       |       |
| 80MHz BW | 1    | 5210       | 42      | 106T  | 11.32                     | 11.78 | 11.81 |
|          | 2A   | 5290       | 58      | 106T  | 10.97                     | 11.50 | 11.38 |
|          | 2C   | 5530       | 106     | 106T  | 10.77                     | 10.88 | 10.81 |
|          |      | 5610       | 122     | 106T  | 15.24                     | 15.50 | 15.29 |
|          |      | 5690       | 138     | 106T  | 15.29                     | 15.48 | 15.35 |
|          | 3    | 5775       | 155     | 106T  | 15.36                     | 15.50 | 15.45 |
| 80MHz BW | Band | Freq [MHz] | Channel | Tones | Avg Conducted Power (dBm) |       |       |
|          |      |            |         |       | RU Index                  |       |       |
|          |      |            |         |       | 65                        | 66    | N/A   |
|          |      |            |         |       |                           |       |       |
| 80MHz BW | 1    | 5210       | 42      | 484T  | 12.00                     | 12.00 |       |
|          | 2A   | 5290       | 58      | 484T  | 11.47                     | 11.49 |       |
|          | 2C   | 5530       | 106     | 484T  | 10.97                     | 11.00 |       |
|          |      | 5610       | 122     | 484T  | 15.49                     | 15.50 |       |
|          |      | 5690       | 138     | 484T  | 15.00                     | 15.00 |       |
|          | 3    | 5775       | 155     | 484T  | 15.50                     | 15.50 |       |

|                                        |                                                                                                   |                       |                                 |
|----------------------------------------|---------------------------------------------------------------------------------------------------|-----------------------|---------------------------------|
| FCC ID: BCGA2232                       |  <b>PCTEST</b> | SAR EVALUATION REPORT | Reviewed by:<br>Quality Manager |
| Test Dates:<br>12/20/2019 – 02/05/2020 | DUT Type:<br>Tablet Device                                                                        |                       | APPENDIX H:<br>Page 25 of 25    |

## APPENDIX I: PROBE AND DIPOLE CALIBRATION CERTIFICATES

**Calibration Laboratory of  
Schmid & Partner  
Engineering AG**  
Zeughausstrasse 43, 8004 Zurich, Switzerland



**S** Schweizerischer Kalibrierdienst  
**C** Service suisse d'étalonnage  
**S** Servizio svizzero di taratura  
**S** Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)  
The Swiss Accreditation Service is one of the signatories to the EA  
Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 0108**

Client: **PG-Test**

Certificate No.: **D750V3-1097\_Sep17**

## CALIBRATION CERTIFICATE

Object: **D750V3 - SN:1097**

Calibration procedure(s): **QA-CAL-05.v9**  
**Calibration procedure for dipole validation kits above 700 MHz**

Calibration date: **September 08, 2017**

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).  
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature  $(22 \pm 3)^\circ\text{C}$  and humidity  $< 70\%$ .

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards           | ID #               | Cal Date (Certificate No.)        | Scheduled Calibration  |
|-----------------------------|--------------------|-----------------------------------|------------------------|
| Power meter NRP             | SN: 104778         | 04-Apr-17 (No. 217-02521/02522)   | Apr-18                 |
| Power sensor NRP-Z91        | SN: 103244         | 04-Apr-17 (No. 217-02521)         | Apr-18                 |
| Power sensor NRP-Z91        | SN: 103245         | 04-Apr-17 (No. 217-02522)         | Apr-18                 |
| Reference 20 dB Attenuator  | SN: 5058 (20k)     | 07-Apr-17 (No. 217-02528)         | Apr-18                 |
| Type-N mismatch combination | SN: 5047.2 / 06327 | 07-Apr-17 (No. 217-02529)         | Apr-18                 |
| Reference Probe EX3DV4      | SN: 7349           | 31-May-17 (No. EX3-7349_May17)    | May-18                 |
| DAE4                        | SN: 601            | 28-Mar-17 (No. DAE4-601_Mar17)    | Mar-18                 |
| Secondary Standards         | ID #               | Check Date (in house)             | Scheduled Check        |
| Power meter EPM-442A        | SN: GB37480704     | 07-Oct-15 (in house check Oct-16) | In house check: Oct-18 |
| Power sensor HP 8481A       | SN: US37292763     | 07-Oct-15 (in house check Oct-16) | In house check: Oct-18 |
| Power sensor HP 8481A       | SN: MY41092317     | 07-Oct-15 (in house check Oct-16) | In house check: Oct-18 |
| RF generator R&S SMT-06     | SN: 100972         | 15-Jun-15 (in house check Oct-16) | In house check: Oct-18 |
| Network Analyzer HP 8753E   | SN: US37390585     | 18-Oct-01 (in house check Oct-16) | In house check: Oct-17 |

Calibrated by: **Claudio Leubler** (Name) **Laboratory Technician** (Function)

Approved by: **Katja Pokóvic** (Name) **Technical Manager** (Function)

Signature

Issued: September 8, 2017

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.



Accredited by the Swiss Accreditation Service (SAS)  
The Swiss Accreditation Service is one of the signatories to the EA  
Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 0108**

**Glossary:**

|       |                                 |
|-------|---------------------------------|
| TSL   | tissue simulating liquid        |
| ConvF | sensitivity in TSL / NORM x,y,z |
| N/A   | not applicable or not measured  |

**Calibration is Performed According to the Following Standards:**

- IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
- IEC 62209-1, "Measurement procedure for the assessment of Specific Absorption Rate (SAR) from hand-held and body-mounted devices used next to the ear (frequency range of 300 MHz to 6 GHz)", July 2016
- IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
- KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

**Additional Documentation:**

- DASY4/5 System Handbook

**Methods Applied and Interpretation of Parameters:**

- Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- Antenna Parameters with TSL:* The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- Feed Point Impedance and Return Loss:* These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- SAR measured:* SAR measured at the stated antenna input power.
- SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor  $k=2$ , which for a normal distribution corresponds to a coverage probability of approximately 95%.

## Measurement Conditions

DASY system configuration, as far as not given on page 1.

|                              |                        |             |
|------------------------------|------------------------|-------------|
| DASY Version                 | DASY5                  | V52.10.0    |
| Extrapolation                | Advanced Extrapolation |             |
| Phantom                      | Modular Flat Phantom   |             |
| Distance Dipole Center - TSL | 15 mm                  | with Spacer |
| Zoom Scan Resolution         | dx, dy, dz = 5 mm      |             |
| Frequency                    | 750 MHz $\pm$ 1 MHz    |             |

## Head TSL parameters

The following parameters and calculations were applied.

|                                         | Temperature         | Permittivity   | Conductivity         |
|-----------------------------------------|---------------------|----------------|----------------------|
| Nominal Head TSL parameters             | 22.0 °C             | 41.9           | 0.89 mho/m           |
| Measured Head TSL parameters            | (22.0 $\pm$ 0.2) °C | 41.2 $\pm$ 6 % | 0.90 mho/m $\pm$ 6 % |
| Head TSL temperature change during test | < 0.5 °C            | ----           | ----                 |

## SAR result with Head TSL

| SAR averaged over 1 cm <sup>3</sup> (1 g) of Head TSL | Condition          |                              |
|-------------------------------------------------------|--------------------|------------------------------|
| SAR measured                                          | 250 mW input power | 2.08 W/kg                    |
| SAR for nominal Head TSL parameters                   | normalized to 1W   | 8.22 W/kg $\pm$ 17.0 % (k=2) |

| SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL | condition          |                              |
|---------------------------------------------------------|--------------------|------------------------------|
| SAR measured                                            | 250 mW input power | 1.36 W/kg                    |
| SAR for nominal Head TSL parameters                     | normalized to 1W   | 5.39 W/kg $\pm$ 16.5 % (k=2) |

## Body TSL parameters

The following parameters and calculations were applied.

|                                         | Temperature         | Permittivity   | Conductivity         |
|-----------------------------------------|---------------------|----------------|----------------------|
| Nominal Body TSL parameters             | 22.0 °C             | 55.5           | 0.96 mho/m           |
| Measured Body TSL parameters            | (22.0 $\pm$ 0.2) °C | 55.5 $\pm$ 6 % | 0.96 mho/m $\pm$ 6 % |
| Body TSL temperature change during test | < 0.5 °C            | ----           | ----                 |

## SAR result with Body TSL

| SAR averaged over 1 cm <sup>3</sup> (1 g) of Body TSL | Condition          |                              |
|-------------------------------------------------------|--------------------|------------------------------|
| SAR measured                                          | 250 mW input power | 2.14 W/kg                    |
| SAR for nominal Body TSL parameters                   | normalized to 1W   | 8.56 W/kg $\pm$ 17.0 % (k=2) |

| SAR averaged over 10 cm <sup>3</sup> (10 g) of Body TSL | condition          |                              |
|---------------------------------------------------------|--------------------|------------------------------|
| SAR measured                                            | 250 mW input power | 1.42 W/kg                    |
| SAR for nominal Body TSL parameters                     | normalized to 1W   | 5.68 W/kg $\pm$ 16.5 % (k=2) |

## Appendix (Additional assessments outside the scope of SCS 0108)

### Antenna Parameters with Head TSL

|                                      |                                |
|--------------------------------------|--------------------------------|
| Impedance, transformed to feed point | 54.4 $\Omega$ - 0.6 j $\Omega$ |
| Return Loss                          | - 27.5 dB                      |

### Antenna Parameters with Body TSL

|                                      |                                |
|--------------------------------------|--------------------------------|
| Impedance, transformed to feed point | 50.0 $\Omega$ - 3.6 j $\Omega$ |
| Return Loss                          | - 28.8 dB                      |

### General Antenna Parameters and Design

|                                  |          |
|----------------------------------|----------|
| Electrical Delay (one direction) | 1.034 ns |
|----------------------------------|----------|

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

### Additional EUT Data

|                 |               |
|-----------------|---------------|
| Manufactured by | SPEAG         |
| Manufactured on | July 05, 2013 |

## DASY5 Validation Report for Head TSL

Date: 08.09.2017

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 750 MHz; Type: D750V3; Serial: D750V3 - SN:1097**

Communication System: UID 0 - CW; Frequency: 750 MHz

Medium parameters used:  $f = 750 \text{ MHz}$ ;  $\sigma = 0.9 \text{ S/m}$ ;  $\epsilon_r = 41.2$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(10.49, 10.49, 10.49); Calibrated: 31.05.2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 28.03.2017
- Phantom: Flat Phantom 4.9 (front); Type: QD 00L P49 AA; Serial: 1001
- DASY52 52.10.0(1446); SEMCAD X 14.6.10(7417)

### **Dipole Calibration for Head Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:**

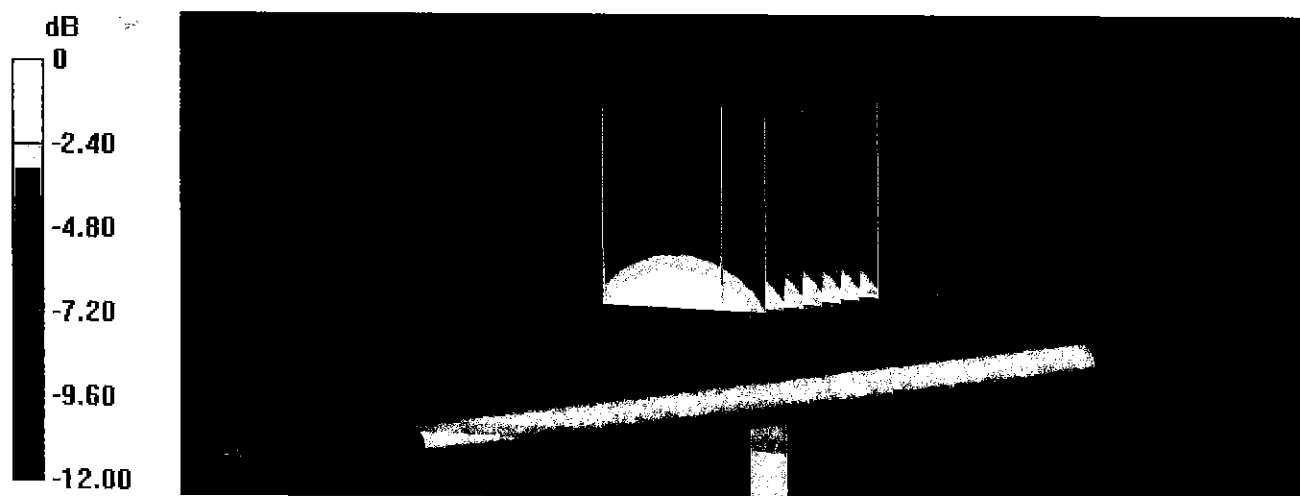
Measurement grid:  $dx=5\text{mm}$ ,  $dy=5\text{mm}$ ,  $dz=5\text{mm}$

Reference Value = 58.59 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 3.19 W/kg

**SAR(1 g) = 2.08 W/kg; SAR(10 g) = 1.36 W/kg**

Maximum value of SAR (measured) = 2.80 W/kg



0 dB = 2.80 W/kg = 4.47 dBW/kg

# Impedance Measurement Plot for Head TSL

8 Sep 2017 13:09:24  
 CH1 S11 1 U FS 1: 54.383  $\Omega$  -552.73 m $\Omega$  383.92 pF 750.000 000 MHz

\*

De1

CA

Avg  
16

H1d

CH2 S11 LOG 5 dB/REF -20 dB 1:-27.463 dB 750.000 000 MHz

CA

Avg  
16

H1d

START 550.000 000 MHz

STOP 950.000 000 MHz

## DASY5 Validation Report for Body TSL

Date: 08.09.2017

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 750 MHz; Type: D750V3; Serial: D750V3 - SN:1097**

Communication System: UID 0 - CW; Frequency: 750 MHz

Medium parameters used:  $f = 750 \text{ MHz}$ ;  $\sigma = 0.96 \text{ S/m}$ ;  $\epsilon_r = 55.5$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(10.35, 10.35, 10.35); Calibrated: 31.05.2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 28.03.2017
- Phantom: Flat Phantom 4.9 (Back); Type: QD 00R P49 AA; Serial: 1005
- DASY52 52.10.0(1446); SEMCAD X 14.6.10(7417)

### Dipole Calibration for Body Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

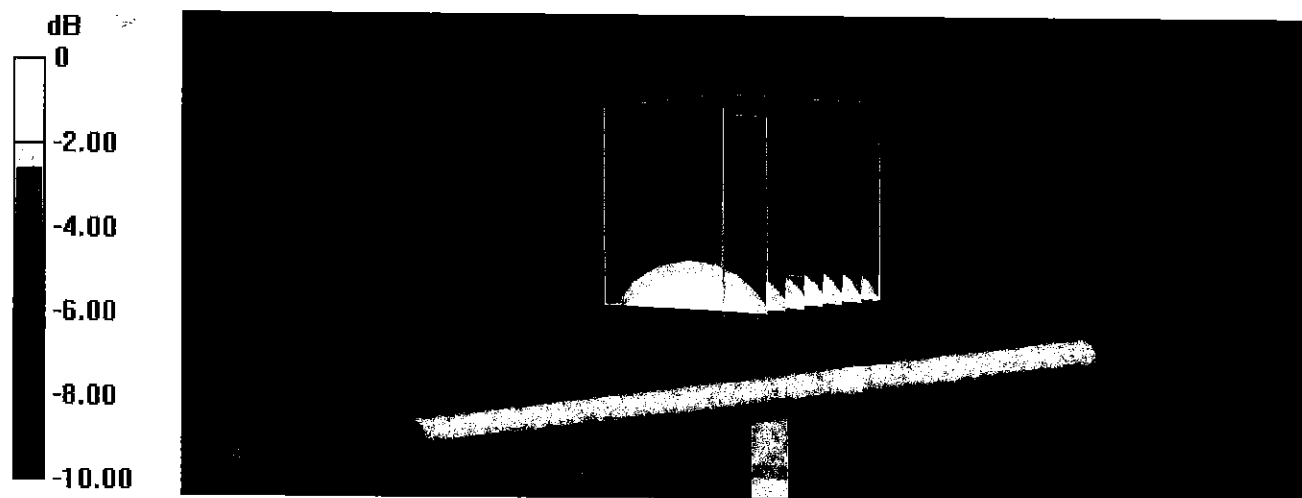
Measurement grid:  $dx=5\text{mm}$ ,  $dy=5\text{mm}$ ,  $dz=5\text{mm}$

Reference Value = 56.96 V/m; Power Drift = -0.00 dB

Peak SAR (extrapolated) = 3.16 W/kg

**SAR(1 g) = 2.14 W/kg; SAR(10 g) = 1.42 W/kg**

Maximum value of SAR (measured) = 2.81 W/kg



0 dB = 2.81 W/kg = 4.49 dBW/kg

# Impedance Measurement Plot for Body TSL

8 Sep 2017 13:08:43  
 CH1 S11 1 U FS 1: 49.951  $\Omega$  -3.6172  $\Omega$  58.666 pF 750.000 000 MHz

\*  
 De1  
 CA

Avg  
 15

H1d

CH2 S11 LOG 5 dB/REF -20 dB 1: -28.833 dB 750.000 000 MHz

CA

Avg  
 16

H1d

START 550.000 000 MHz

STOP 950.000 000 MHz

# Certification of Calibration

Object D750V3 – SN: 1097

Calibration procedure(s) Procedure for Calibration Extension for SAR Dipoles.

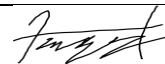
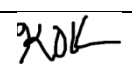
Extended Calibration date: September 08, 2018

Description: SAR Validation Dipole at 750 MHz.

## Calibration Equipment used:

| Manufacturer          | Model     | Description                                             | Cal Date   | Cal Interval | Cal Due    | Serial Number |
|-----------------------|-----------|---------------------------------------------------------|------------|--------------|------------|---------------|
| Agilent               | 8753ES    | S-Parameter Network Analyzer                            | 9/14/2017  | Annual       | 9/14/2018  | US39170118    |
| Agilent               | N5182A    | MXG Vector Signal Generator                             | 3/19/2018  | Annual       | 3/19/2019  | US46240505    |
| Amplifier Research    | 15S1G6    | Amplifier                                               | CBT        | N/A          | CBT        | 343972        |
| Anritsu               | ML2496A   | Power Meter                                             | 10/9/2017  | Annual       | 10/9/2018  | 1138001       |
| Anritsu               | MA2411B   | Pulse Power Sensor                                      | 11/15/2017 | Annual       | 11/15/2018 | 1339007       |
| Anritsu               | MA2411B   | Pulse Power Sensor                                      | 11/22/2017 | Annual       | 11/22/2018 | 1339008       |
| Control Company       | 4040      | Temperature / Humidity Monitor                          | 2/28/2018  | Biennial     | 2/28/2020  | 150761911     |
| Control Company       | 4352      | Ultra Long Stem Thermometer                             | 2/14/2017  | Biennial     | 2/14/2019  | 170112507     |
| Keysight              | 772D      | Dual Directional Coupler                                | CBT        | N/A          | CBT        | MY52180215    |
| Keysight Technologies | 85033E    | Standard Mechanical Calibration Kit (DC to 9GHz, 3.5mm) | 6/4/2018   | Annual       | 6/4/2019   | MY53401181    |
| Mini-Circuits         | BW-N20W5+ | DC to 18 GHz Precision Fixed 20 dB Attenuator           | CBT        | N/A          | CBT        | N/A           |
| Mini-Circuits         | NLP-2950+ | Low Pass Filter DC to 2700 MHz                          | CBT        | N/A          | CBT        | N/A           |
| Narda                 | 4772-3    | Attenuator (3dB)                                        | CBT        | N/A          | CBT        | 9406          |
| Pasternack            | PE2209-10 | Bidirectional Coupler                                   | CBT        | N/A          | CBT        | N/A           |
| Pasternack            | PE5011-1  | Torque Wrench                                           | 7/19/2017  | Biennial     | 7/19/2019  | N/A           |
| SPEAG                 | DAK-3.5   | Dielectric Assessment Kit                               | 5/15/2018  | Annual       | 5/15/2019  | 1070          |
| SPEAG                 | ES3DV3    | SAR Probe                                               | 9/18/2017  | Annual       | 9/18/2018  | 3287          |
| SPEAG                 | DAE4      | Data Acquisition Electronics                            | 1/26/2018  | Annual       | 1/26/2019  | 1533          |
| SPEAG                 | EX3DV4    | SAR Probe                                               | 7/20/2018  | Annual       | 7/20/2019  | 7416          |
| SPEAG                 | DAE4      | Dasy Data Acquisition Electronics                       | 1/18/2018  | Annual       | 1/18/2019  | 793           |

Measurement Uncertainty =  $\pm 23\%$  (k=2)

|                | Name            | Function                 | Signature                                                                             |
|----------------|-----------------|--------------------------|---------------------------------------------------------------------------------------|
| Calibrated By: | Sangmin Cha     | Team Lead Engineer       |  |
| Approved By:   | Kaitlin O'Keefe | Senior Technical Manager |  |

# DIPOLE CALIBRATION EXTENSION

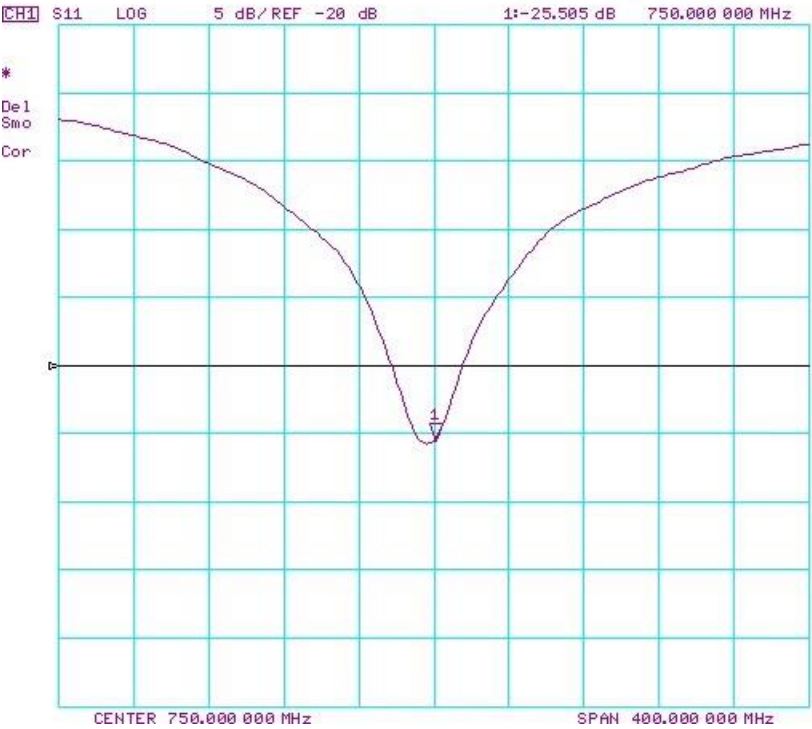
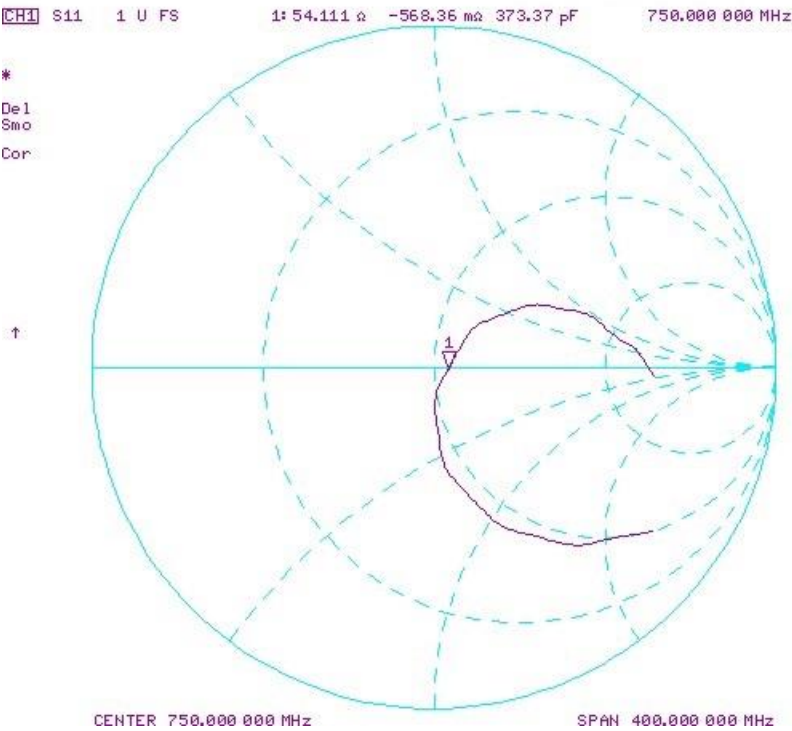
Per KDB 865664 D01, calibration intervals of up to three years may be considered for reference dipoles when it is demonstrated that the SAR target, impedance and return loss of a dipole have remained stable according to the following requirements:

1. The measured SAR does not deviate more than 10% from the target on the calibration certificate.
2. The return-loss does not deviate more than 20% from the previous measurement and meets the required 20dB minimum return-loss requirement.
3. The measurement of real or imaginary parts of impedance does not deviate more than 5Ω from the previous measurement.

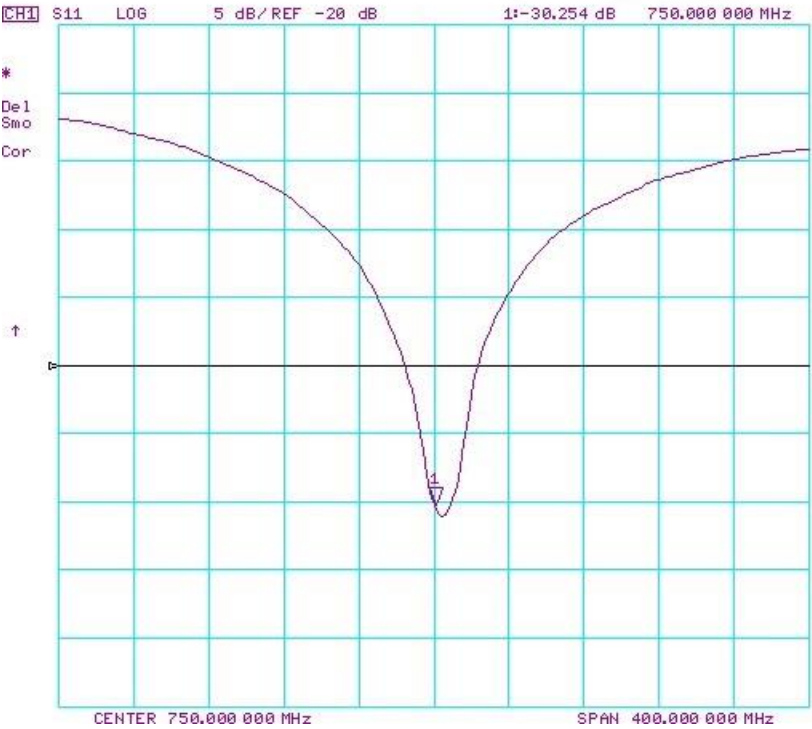
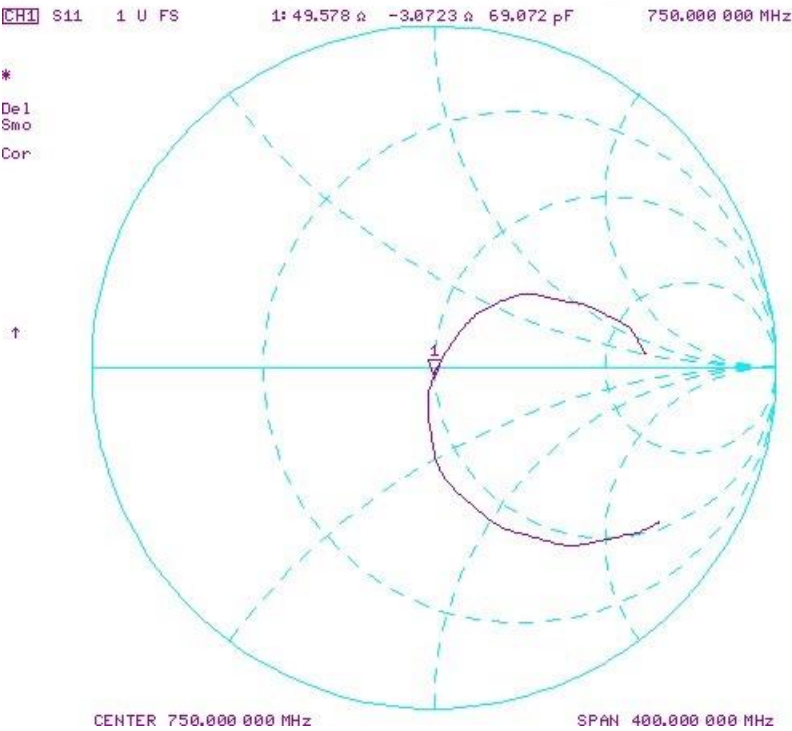
The following dipole was checked to pass the above 3 requirements to have 2-year calibration period from the calibration date:

| Calibration Date | Extension Date | Certificate Electrical Delay (ns) | Certificate SAR Target Head (1g) W/kg @ 23.0 dBm | Measured Head SAR (1g) W/kg @ 23.0 dBm | Deviation 1g (%) | Certificate SAR Target Body (10g) W/kg @ 23.0 dBm | Measured Body SAR (10g) W/kg @ 23.0 dBm | Deviation 10g (%) | Certificate Impedance Head (Ohm) Real | Measured Impedance Head (Ohm) Real | Difference (Ohm) Real | Certificate Impedance Head (Ohm) Imaginary | Measured Impedance Head (Ohm) Imaginary | Difference (Ohm) Imaginary | Certificate Return Loss Head (dB) | Measured Return Loss Head (dB) | Deviation (%) | PASS/FAIL |
|------------------|----------------|-----------------------------------|--------------------------------------------------|----------------------------------------|------------------|---------------------------------------------------|-----------------------------------------|-------------------|---------------------------------------|------------------------------------|-----------------------|--------------------------------------------|-----------------------------------------|----------------------------|-----------------------------------|--------------------------------|---------------|-----------|
| 9/8/2017         | 9/8/2018       | 1.034                             | 1.644                                            | 1.7                                    | 3.41%            | 1.078                                             | 1.12                                    | 3.90%             | 54.4                                  | 54.1                               | 0.3                   | -0.6                                       | -0.6                                    | 0                          | -27.5                             | -25.5                          | 7.30%         | PASS      |
| Calibration Date | Extension Date | Certificate Electrical Delay (ns) | Certificate SAR Target Body (1g) W/kg @ 23.0 dBm | Measured Body SAR (1g) W/kg @ 23.0 dBm | Deviation 1g (%) | Certificate SAR Target Body (10g) W/kg @ 23.0 dBm | Measured Body SAR (10g) W/kg @ 23.0 dBm | Deviation 10g (%) | Certificate Impedance Body (Ohm) Real | Measured Impedance Body (Ohm) Real | Difference (Ohm) Real | Certificate Impedance Body (Ohm) Imaginary | Measured Impedance Body (Ohm) Imaginary | Difference (Ohm) Imaginary | Certificate Return Loss Body (dB) | Measured Return Loss Body (dB) | Deviation (%) | PASS/FAIL |
| 9/8/2017         | 9/8/2018       | 1.034                             | 1.712                                            | 1.78                                   | 3.97%            | 1.136                                             | 1.17                                    | 2.99%             | 50                                    | 49.6                               | 0.4                   | -3.6                                       | -3.1                                    | 0.5                        | -28.8                             | -30.3                          | -5.20%        | PASS      |

Impedance & Return-Loss Measurement Plot for Head TSL



Impedance & Return-Loss Measurement Plot for Body TSL



# Certification of Calibration

Object D750V3 – SN: 1097

Calibration procedure(s) Procedure for Calibration Extension for SAR Dipoles.

Extended Calibration date: September 8, 2019

Description: SAR Validation Dipole at 750 MHz.

## Calibration Equipment used:

| Manufacturer          | Model     | Description                                             | Cal Date   | Cal Interval | Cal Due    | Serial Number |
|-----------------------|-----------|---------------------------------------------------------|------------|--------------|------------|---------------|
| Agilent               | 8753ES    | S-Parameter Network Analyzer                            | 10/2/2018  | Annual       | 10/2/2019  | US39170118    |
| Agilent               | E4438C    | ESG Vector Signal Generator                             | 6/27/2019  | Annual       | 6/27/2020  | MY45093852    |
| Amplifier Research    | 15S1G6    | Amplifier                                               | CBT        | N/A          | CBT        | 343972        |
| Anritsu               | ML2495A   | Power Meter                                             | 10/21/2018 | Annual       | 10/21/2019 | 941001        |
| Anritsu               | MA2411B   | Pulse Power Sensor                                      | 10/30/2018 | Annual       | 10/30/2019 | 1207470       |
| Anritsu               | MA2411B   | Pulse Power Sensor                                      | 11/20/2018 | Annual       | 11/20/2019 | 1339007       |
| Control Company       | 4040      | Temperature / Humidity Monitor                          | 2/28/2018  | Biennial     | 2/28/2020  | 150761911     |
| Control Company       | 4352      | Ultra Long Stem Thermometer                             | 2/28/2018  | Biennial     | 2/28/2020  | 170330160     |
| Keysight Technologies | 85033E    | Standard Mechanical Calibration Kit (DC to 9GHz, 3.5mm) | 7/2/2019   | Annual       | 7/2/2020   | MY53401181    |
| Keysight              | 772D      | Dual Directional Coupler                                | CBT        | N/A          | CBT        | MY52180215    |
| Mini-Circuits         | BW-N20W5+ | DC to 18 GHz Precision Fixed 20 dB Attenuator           | CBT        | N/A          | CBT        | N/A           |
| Mini-Circuits         | NLP-2950+ | Low Pass Filter DC to 2700 MHz                          | CBT        | N/A          | CBT        | N/A           |
| Narda                 | 4772-3    | Attenuator (3dB)                                        | CBT        | N/A          | CBT        | 9406          |
| Pasternack            | PE2208-6  | Bidirectional Coupler                                   | CBT        | N/A          | CBT        | N/A           |
| Pasternack            | NC-100    | Torque Wrench                                           | 11/1/2017  | Biennial     | 11/1/2019  | N/A           |
| SPEAG                 | DAK-3.5   | Dielectric Assessment Kit                               | 5/7/2019   | Annual       | 5/7/2020   | 1070          |
| SPEAG                 | EX3DV4    | SAR Probe                                               | 1/24/2019  | Annual       | 1/24/2020  | 7490          |
| SPEAG                 | DAE4      | Data Acquisition Electronics                            | 1/15/2019  | Annual       | 1/15/2020  | 1532          |

Measurement Uncertainty =  $\pm 23\%$  (k=2)

|                | Name            | Function                 | Signature           |
|----------------|-----------------|--------------------------|---------------------|
| Calibrated By: | Parker Jones    | Team Lead Engineer       | <i>Parker Jones</i> |
| Approved By:   | Kaitlin O'Keefe | Senior Technical Manager | <i>KOK</i>          |

# DIPOLE CALIBRATION EXTENSION

Per KDB 865664 D01, calibration intervals of up to three years may be considered for reference dipoles when it is demonstrated that the SAR target, impedance and return loss of a dipole have remained stable according to the following requirements:

1. The measured SAR does not deviate more than 10% from the target on the calibration certificate.
2. The return-loss does not deviate more than 20% from the previous measurement and meets the required 20dB minimum return-loss requirement.
3. The measurement of real or imaginary parts of impedance does not deviate more than 5Ω from the previous measurement.

The following dipole was checked to pass the above 3 requirements to have 3-year calibration period from the calibration date:

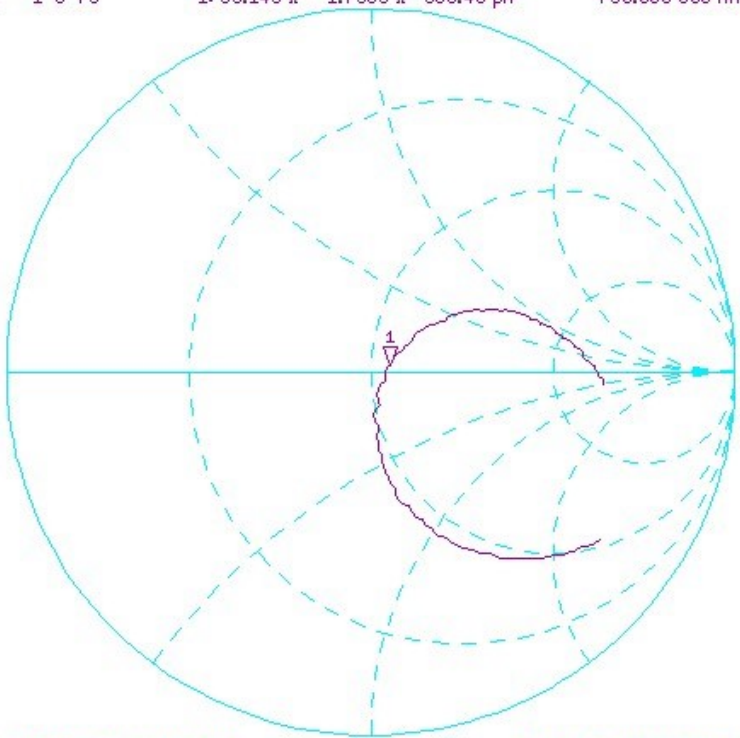
| Calibration Date | Extension Date | Certificate Electrical Delay (ns) | Certificate SAR Target Head (1g) W/kg @ 23.0 dBm | Measured Head SAR (1g) W/kg @ 23.0 dBm | Deviation 1g (%) | Certificate SAR Target Body (10g) W/kg @ 23.0 dBm | Measured Body SAR (10g) W/kg @ 23.0 dBm | Deviation 10g (%) | Certificate Impedance Head (Ohm) Real | Measured Impedance Head (Ohm) Real | Difference (Ohm) Real | Certificate Impedance Head (Ohm) Imaginary | Measured Impedance Head (Ohm) Imaginary | Difference (Ohm) Imaginary | Certificate Return Loss Head (dB) | Measured Return Loss Head (dB) | Deviation (%) | PASS/FAIL |
|------------------|----------------|-----------------------------------|--------------------------------------------------|----------------------------------------|------------------|---------------------------------------------------|-----------------------------------------|-------------------|---------------------------------------|------------------------------------|-----------------------|--------------------------------------------|-----------------------------------------|----------------------------|-----------------------------------|--------------------------------|---------------|-----------|
| 9/8/2017         | 9/8/2019       | 1.034                             | 1.644                                            | 1.55                                   | -5.11%           | 1.078                                             | 1.03                                    | -4.45%            | 54.4                                  | 55.1                               | 0.7                   | -0.6                                       | 1.7                                     | 2.3                        | -27.5                             | -25                            | 5.50%         | PASS      |
| Calibration Date | Extension Date | Certificate Electrical Delay (ns) | Certificate SAR Target Body (1g) W/kg @ 23.0 dBm | Measured Body SAR (1g) W/kg @ 23.0 dBm | Deviation 1g (%) | Certificate SAR Target Body (10g) W/kg @ 23.0 dBm | Measured Body SAR (10g) W/kg @ 23.0 dBm | Deviation 10g (%) | Certificate Impedance Body (Ohm) Real | Measured Impedance Body (Ohm) Real | Difference (Ohm) Real | Certificate Impedance Body (Ohm) Imaginary | Measured Impedance Body (Ohm) Imaginary | Difference (Ohm) Imaginary | Certificate Return Loss Body (dB) | Measured Return Loss Body (dB) | Deviation (%) | PASS/FAIL |
| 9/8/2017         | 9/8/2019       | 1.034                             | 1.712                                            | 1.65                                   | -3.62%           | 1.136                                             | 1.1                                     | -3.17%            | 50                                    | 51                                 | 1                     | -3.6                                       | -1.3                                    | 2.3                        | -28.8                             | -31.9                          | -10.80%       | PASS      |

Impedance & Return-Loss Measurement Plot for Head TSL

CH1 S11 1 U FS 1: 55.143  $\Omega$  1.7363  $\Omega$  368.46 pF 750.000 000 MHz

\*  
De1  
Cor

↑



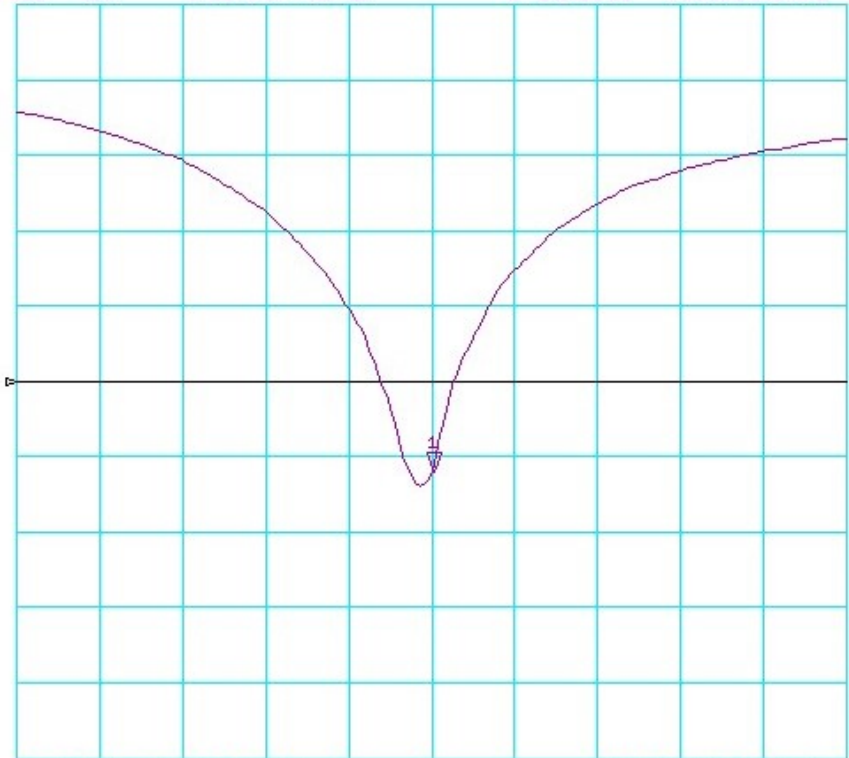
CENTER 750.000 000 MHz

SPAN 400.000 000 MHz

CH1 S11 LOG 5 dB/REF -20 dB 1:-26.011 dB 750.000 000 MHz

\*  
De1  
Smo  
Cor

↑



CENTER 750.000 000 MHz

SPAN 400.000 000 MHz

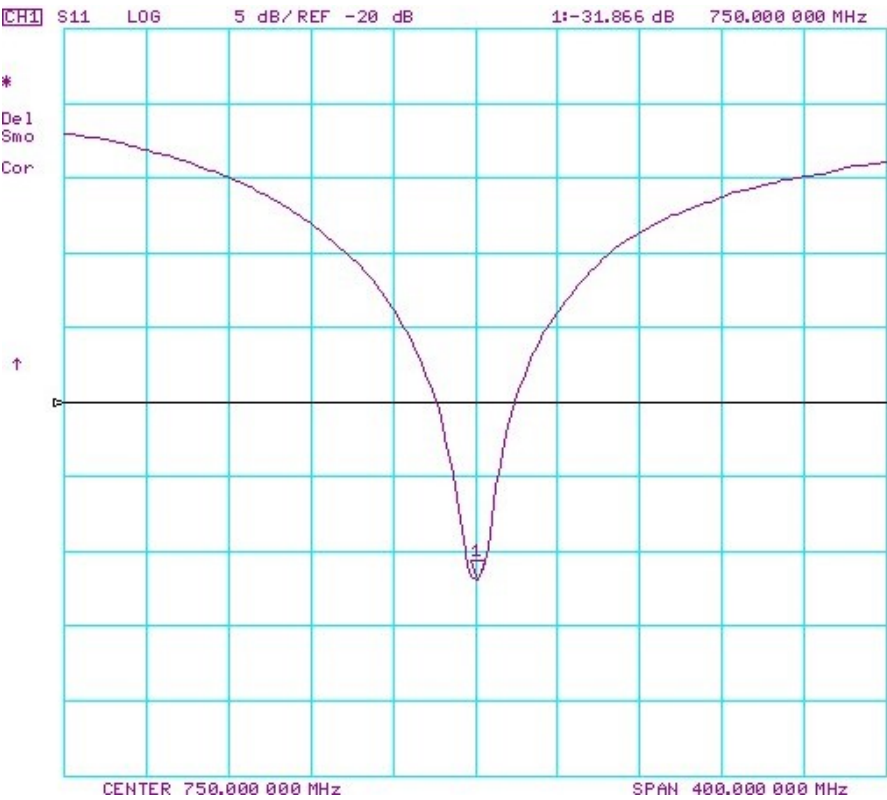
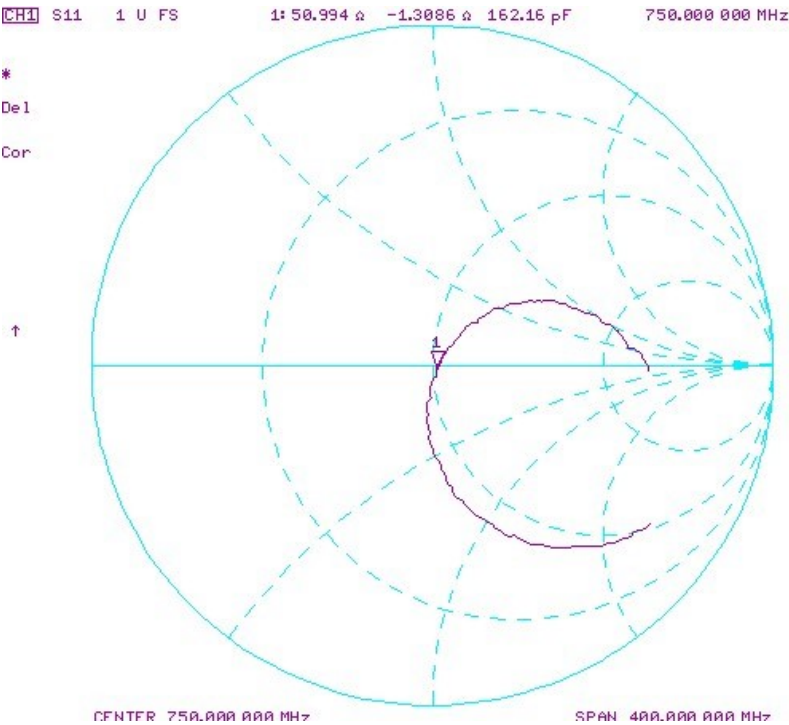
Object:

D750V3 – SN: 1097

Date Issued:

09/08/2019

Impedance & Return-Loss Measurement Plot for Body TSL





Accredited by the Swiss Accreditation Service (SAS)  
 The Swiss Accreditation Service is one of the signatories to the EA  
 Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 0108**

Client **PC Test**

Certificate No: **D835V2-4d040\_Jun19**

## CALIBRATION CERTIFICATE

Object **D835V2 - SN:4d040**

Calibration procedure(s) **QA CAL-05.v11**  
**Calibration Procedure for SAR Validation Sources between 0.7-3 GHz**

✓  
 ATM  
 6/28/19

Calibration date: **June 20, 2019**

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).  
 The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature  $(22 \pm 3)^\circ\text{C}$  and humidity  $< 70\%$ .

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards               | ID #               | Cal Date (Certificate No.)        | Scheduled Calibration  |
|---------------------------------|--------------------|-----------------------------------|------------------------|
| Power meter NRP                 | SN: 104778         | 03-Apr-19 (No. 217-02892/02893)   | Apr-20                 |
| Power sensor NRP-Z91            | SN: 103244         | 03-Apr-19 (No. 217-02892)         | Apr-20                 |
| Power sensor NRP-Z91            | SN: 103245         | 03-Apr-19 (No. 217-02893)         | Apr-20                 |
| Reference 20 dB Attenuator      | SN: 5058 (20k)     | 04-Apr-19 (No. 217-02894)         | Apr-20                 |
| Type-N mismatch combination     | SN: 5047.2 / 06327 | 04-Apr-19 (No. 217-02895)         | Apr-20                 |
| Reference Probe EX3DV4          | SN: 7349           | 29-May-19 (No. EX3-7349_May19)    | May-20                 |
| DAE4                            | SN: 601            | 30-Apr-19 (No. DAE4-601_Apr19)    | Apr-20                 |
| Secondary Standards             | ID #               | Check Date (in house)             | Scheduled Check        |
| Power meter E4419B              | SN: GB39512475     | 30-Oct-14 (in house check Feb-19) | In house check: Oct-20 |
| Power sensor HP 8481A           | SN: US37292783     | 07-Oct-15 (in house check Oct-18) | In house check: Oct-20 |
| Power sensor HP 8481A           | SN: MY41092317     | 07-Oct-15 (in house check Oct-18) | In house check: Oct-20 |
| RF generator R&S SMT-06         | SN: 100972         | 15-Jun-15 (in house check Oct-18) | In house check: Oct-20 |
| Network Analyzer Agilent E8358A | SN: US41080477     | 31-Mar-14 (in house check Oct-18) | In house check: Oct-19 |

Calibrated by: **Manu Seitz** **Laboratory Technician**

*[Signature]*

Approved by: **Katja Pokovic** **Technical Manager**

*[Signature]*

Issued: June 21, 2019

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.



Accredited by the Swiss Accreditation Service (SAS)

Accreditation No.: **SCS 0108**

The Swiss Accreditation Service is one of the signatories to the EA  
Multilateral Agreement for the recognition of calibration certificates

### Glossary:

|       |                                 |
|-------|---------------------------------|
| TSL   | tissue simulating liquid        |
| ConvF | sensitivity in TSL / NORM x,y,z |
| N/A   | not applicable or not measured  |

### Calibration is Performed According to the Following Standards:

- IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
- IEC 62209-1, "Measurement procedure for the assessment of Specific Absorption Rate (SAR) from hand-held and body-mounted devices used next to the ear (frequency range of 300 MHz to 6 GHz)", July 2016
- IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
- KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

### Additional Documentation:

- DASY4/5 System Handbook

### Methods Applied and Interpretation of Parameters:

- Measurement Conditions:** Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- Antenna Parameters with TSL:** The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- Feed Point Impedance and Return Loss:** These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- Electrical Delay:** One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- SAR measured:** SAR measured at the stated antenna input power.
- SAR normalized:** SAR as measured, normalized to an input power of 1 W at the antenna connector.
- SAR for nominal TSL parameters:** The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor  $k=2$ , which for a normal distribution corresponds to a coverage probability of approximately 95%.

## Measurement Conditions

DASY system configuration, as far as not given on page 1.

|                                     |                        |             |
|-------------------------------------|------------------------|-------------|
| <b>DASY Version</b>                 | DASY5                  | V52.10.2    |
| <b>Extrapolation</b>                | Advanced Extrapolation |             |
| <b>Phantom</b>                      | Modular Flat Phantom   |             |
| <b>Distance Dipole Center - TSL</b> | 15 mm                  | with Spacer |
| <b>Zoom Scan Resolution</b>         | dx, dy, dz = 5 mm      |             |
| <b>Frequency</b>                    | 835 MHz $\pm$ 1 MHz    |             |

## Head TSL parameters

The following parameters and calculations were applied.

|                                                | Temperature         | Permittivity   | Conductivity         |
|------------------------------------------------|---------------------|----------------|----------------------|
| <b>Nominal Head TSL parameters</b>             | 22.0 °C             | 41.5           | 0.90 mho/m           |
| <b>Measured Head TSL parameters</b>            | (22.0 $\pm$ 0.2) °C | 41.8 $\pm$ 6 % | 0.91 mho/m $\pm$ 6 % |
| <b>Head TSL temperature change during test</b> | < 0.5 °C            | ----           | ----                 |

## SAR result with Head TSL

|                                                             |                    |                                                |
|-------------------------------------------------------------|--------------------|------------------------------------------------|
| <b>SAR averaged over 1 cm<sup>3</sup> (1 g) of Head TSL</b> | Condition          |                                                |
| SAR measured                                                | 250 mW input power | 2.39 W/kg                                      |
| SAR for nominal Head TSL parameters                         | normalized to 1W   | <b>9.50 W/kg <math>\pm</math> 17.0 % (k=2)</b> |

|                                                               |                    |                                                |
|---------------------------------------------------------------|--------------------|------------------------------------------------|
| <b>SAR averaged over 10 cm<sup>3</sup> (10 g) of Head TSL</b> | condition          |                                                |
| SAR measured                                                  | 250 mW input power | 1.54 W/kg                                      |
| SAR for nominal Head TSL parameters                           | normalized to 1W   | <b>6.13 W/kg <math>\pm</math> 16.5 % (k=2)</b> |

## Body TSL parameters

The following parameters and calculations were applied.

|                                                | Temperature         | Permittivity   | Conductivity         |
|------------------------------------------------|---------------------|----------------|----------------------|
| <b>Nominal Body TSL parameters</b>             | 22.0 °C             | 55.2           | 0.97 mho/m           |
| <b>Measured Body TSL parameters</b>            | (22.0 $\pm$ 0.2) °C | 55.4 $\pm$ 6 % | 0.98 mho/m $\pm$ 6 % |
| <b>Body TSL temperature change during test</b> | < 0.5 °C            | ----           | ----                 |

## SAR result with Body TSL

|                                                             |                    |                                                |
|-------------------------------------------------------------|--------------------|------------------------------------------------|
| <b>SAR averaged over 1 cm<sup>3</sup> (1 g) of Body TSL</b> | Condition          |                                                |
| SAR measured                                                | 250 mW input power | 2.40 W/kg                                      |
| SAR for nominal Body TSL parameters                         | normalized to 1W   | <b>9.53 W/kg <math>\pm</math> 17.0 % (k=2)</b> |

|                                                               |                    |                                                |
|---------------------------------------------------------------|--------------------|------------------------------------------------|
| <b>SAR averaged over 10 cm<sup>3</sup> (10 g) of Body TSL</b> | condition          |                                                |
| SAR measured                                                  | 250 mW input power | 1.57 W/kg                                      |
| SAR for nominal Body TSL parameters                           | normalized to 1W   | <b>6.24 W/kg <math>\pm</math> 16.5 % (k=2)</b> |

## Appendix (Additional assessments outside the scope of SCS 0108)

### Antenna Parameters with Head TSL

|                                      |                                |
|--------------------------------------|--------------------------------|
| Impedance, transformed to feed point | 49.6 $\Omega$ - 4.1 j $\Omega$ |
| Return Loss                          | - 27.7 dB                      |

### Antenna Parameters with Body TSL

|                                      |                                |
|--------------------------------------|--------------------------------|
| Impedance, transformed to feed point | 46.6 $\Omega$ - 6.5 j $\Omega$ |
| Return Loss                          | - 22.4 dB                      |

### General Antenna Parameters and Design

|                                  |          |
|----------------------------------|----------|
| Electrical Delay (one direction) | 1.393 ns |
|----------------------------------|----------|

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

### Additional EUT Data

|                 |       |
|-----------------|-------|
| Manufactured by | SPEAG |
|-----------------|-------|

## DASY5 Validation Report for Head TSL

Date: 20.06.2019

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:4d040**

Communication System: UID 0 - CW; Frequency: 835 MHz

Medium parameters used:  $f = 835 \text{ MHz}$ ;  $\sigma = 0.91 \text{ S/m}$ ;  $\epsilon_r = 41.8$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(9.89, 9.89, 9.89) @ 835 MHz; Calibrated: 29.05.2019
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.04.2019
- Phantom: Flat Phantom 4.9 (front); Type: QD 00L P49 AA; Serial: 1001
- DASY52 52.10.2(1504); SEMCAD X 14.6.12(7470)

### Dipole Calibration for Head Tissue/ $P_{in}=250 \text{ mW}$ , $d=15\text{mm}$ /Zoom Scan (7x7x7)/Cube 0:

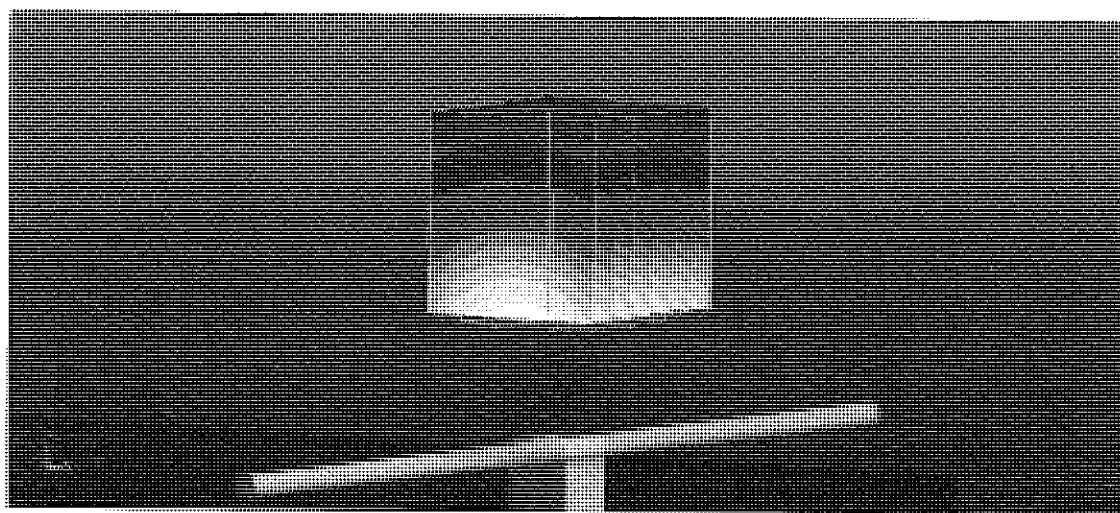
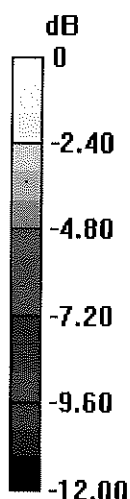
Measurement grid:  $dx=5\text{mm}$ ,  $dy=5\text{mm}$ ,  $dz=5\text{mm}$

Reference Value = 63.05 V/m; Power Drift = -0.08 dB

Peak SAR (extrapolated) = 3.60 W/kg

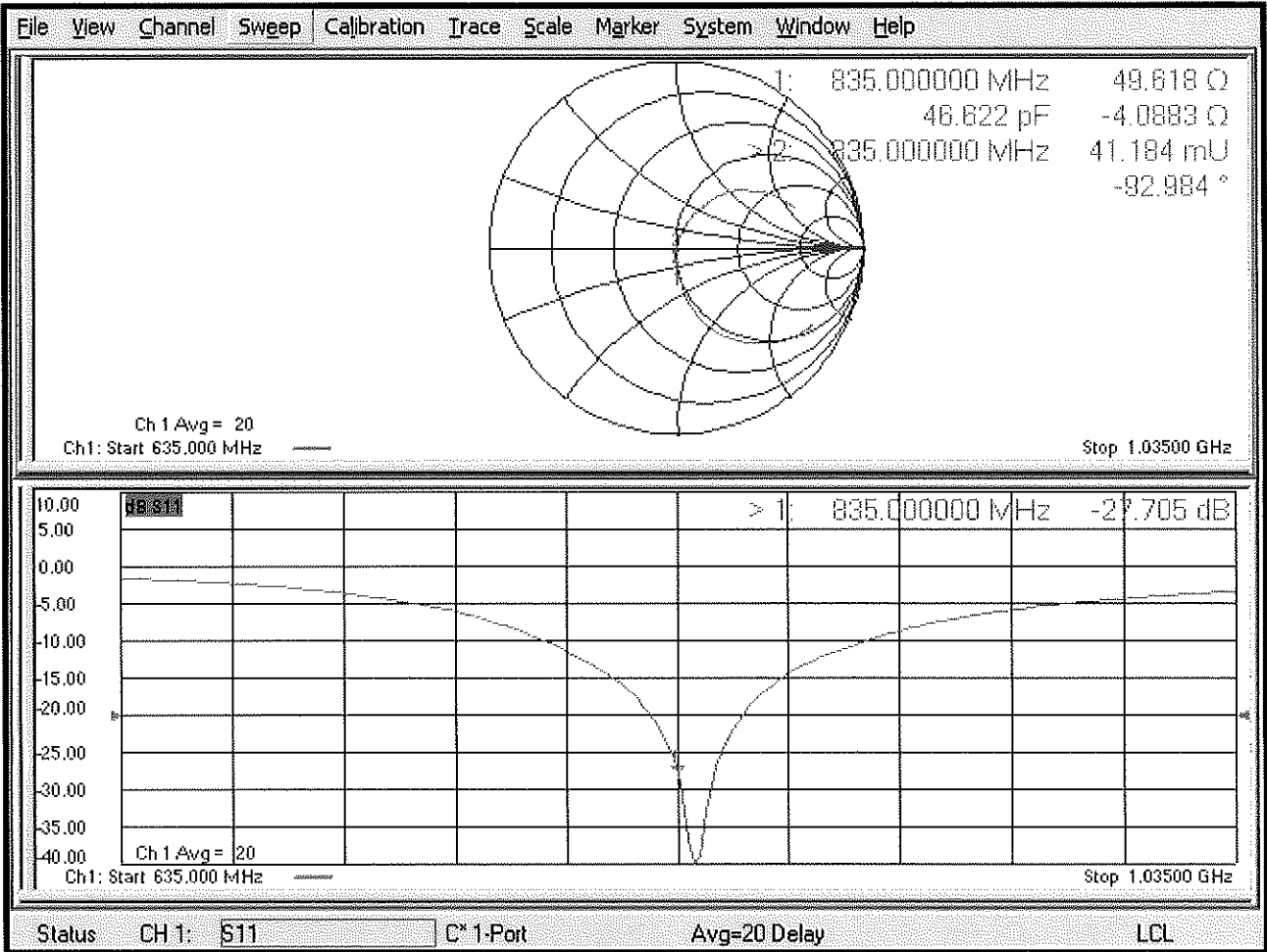
**SAR(1 g) = 2.39 W/kg; SAR(10 g) = 1.54 W/kg**

Maximum value of SAR (measured) = 3.19 W/kg



0 dB = 3.19 W/kg = 5.04 dBW/kg

Impedance Measurement Plot for Head TSL



## DASY5 Validation Report for Body TSL

Date: 13.06.2019

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:4d040**

Communication System: UID 0 - CW; Frequency: 835 MHz

Medium parameters used:  $f = 835 \text{ MHz}$ ;  $\sigma = 0.98 \text{ S/m}$ ;  $\epsilon_r = 55.4$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(10.16, 10.16, 10.16) @ 835 MHz; Calibrated: 29.05.2019
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.04.2019
- Phantom: Flat Phantom 4.9 (Back); Type: QD 00R P49 AA; Serial: 1005
- DASY52 52.10.2(1504); SEMCAD X 14.6.12(7470)

### Dipole Calibration for Body Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

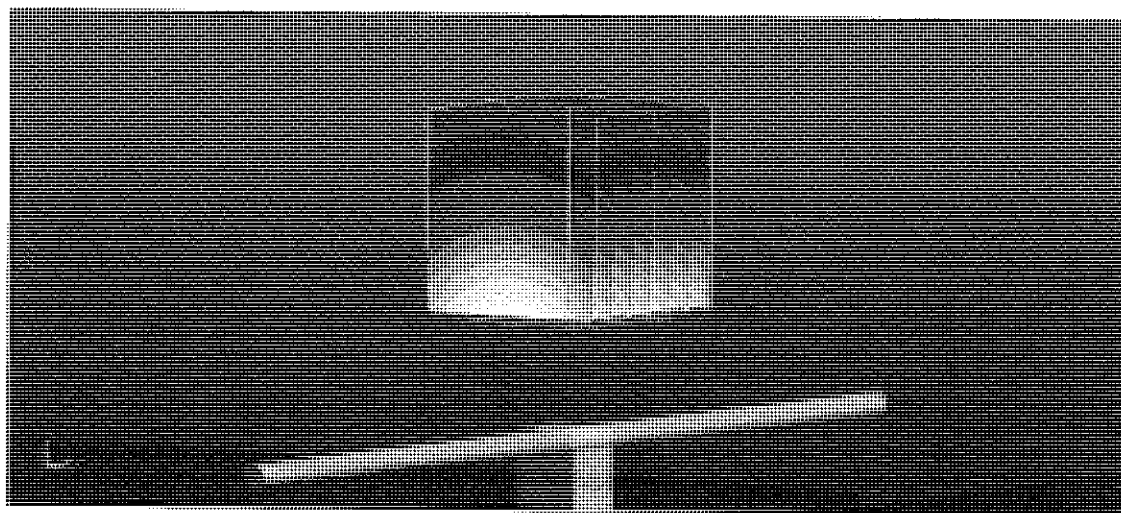
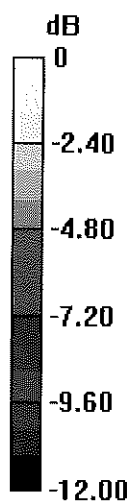
Measurement grid:  $dx=5\text{mm}$ ,  $dy=5\text{mm}$ ,  $dz=5\text{mm}$

Reference Value = 57.73 V/m; Power Drift = -0.08 dB

Peak SAR (extrapolated) = 3.59 W/kg

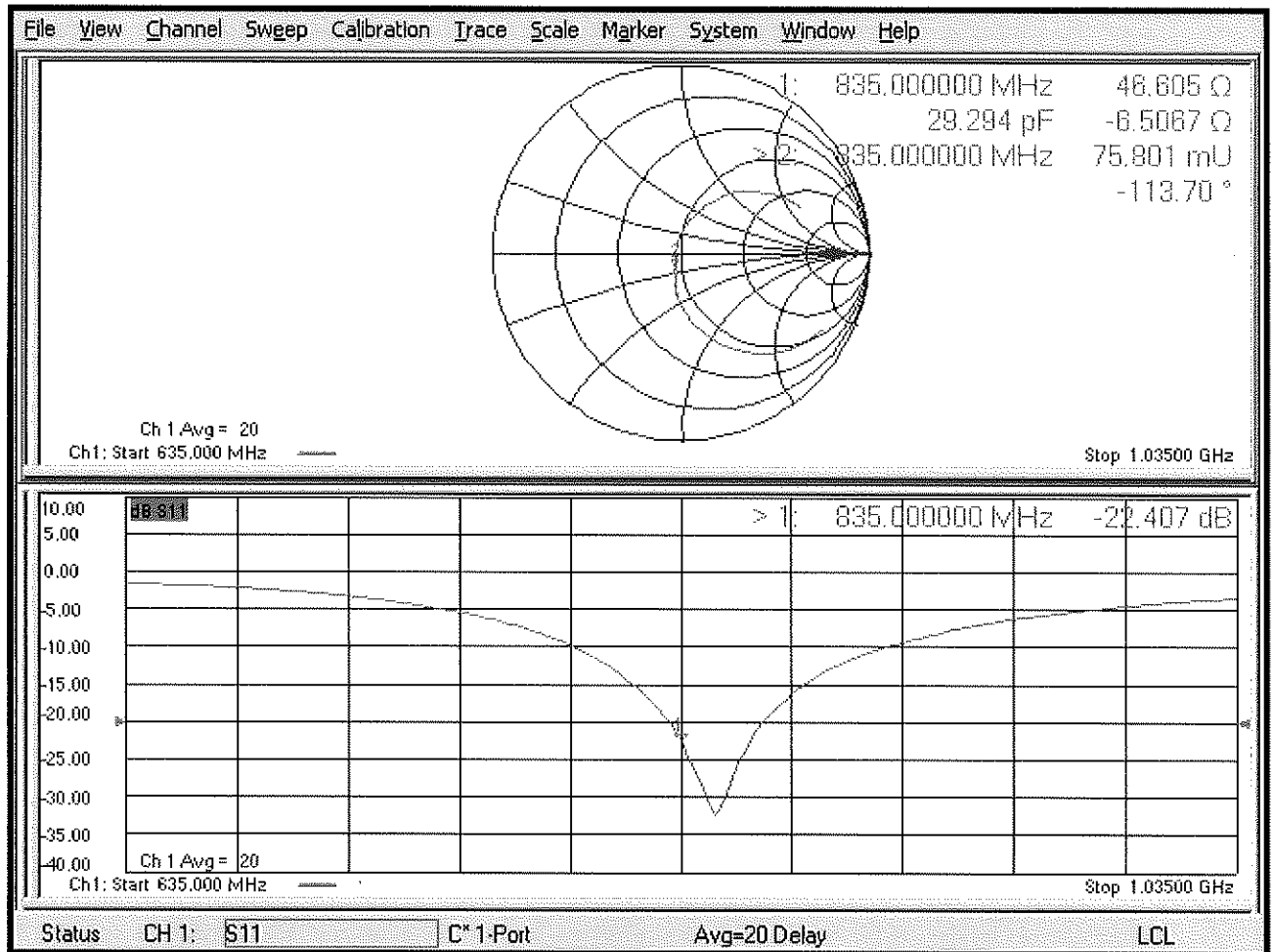
**SAR(1 g) = 2.4 W/kg; SAR(10 g) = 1.57 W/kg**

Maximum value of SAR (measured) = 3.21 W/kg



0 dB = 3.21 W/kg = 5.07 dBW/kg

## Impedance Measurement Plot for Body TSL





Accredited by the Swiss Accreditation Service (SAS)

Accreditation No.: **SCS 0108**

The Swiss Accreditation Service is one of the signatories to the EA  
Multilateral Agreement for the recognition of calibration certificates

Client **PC Test**

Certificate No: **D1750V2-1083\_Jun19**

## CALIBRATION CERTIFICATE

Object **D1750V2 - SN:1083**

Calibration procedure(s) **QA CAL-05.v11  
Calibration Procedure for SAR Validation Sources between 0.7-3 GHz**

Calibration date: **June 19, 2019**

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).  
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature ( $22 \pm 3$ )°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards           | ID #               | Cal Date (Certificate No.)      | Scheduled Calibration |
|-----------------------------|--------------------|---------------------------------|-----------------------|
| Power meter NRP             | SN: 104778         | 03-Apr-19 (No. 217-02892/02893) | Apr-20                |
| Power sensor NRP-Z91        | SN: 103244         | 03-Apr-19 (No. 217-02892)       | Apr-20                |
| Power sensor NRP-Z91        | SN: 103245         | 03-Apr-19 (No. 217-02893)       | Apr-20                |
| Reference 20 dB Attenuator  | SN: 5058 (20k)     | 04-Apr-19 (No. 217-02894)       | Apr-20                |
| Type-N mismatch combination | SN: 5047.2 / 06327 | 04-Apr-19 (No. 217-02895)       | Apr-20                |
| Reference Probe EX3DV4      | SN: 7349           | 29-May-19 (No. EX3-7349_May19)  | May-20                |
| DAE4                        | SN: 601            | 30-Apr-19 (No. DAE4-601_Apr19)  | Apr-20                |

| Secondary Standards             | ID #           | Check Date (in house)             | Scheduled Check        |
|---------------------------------|----------------|-----------------------------------|------------------------|
| Power meter E4419B              | SN: GB39512475 | 30-Oct-14 (in house check Feb-19) | In house check: Oct-20 |
| Power sensor HP 8481A           | SN: US37292783 | 07-Oct-15 (in house check Oct-18) | In house check: Oct-20 |
| Power sensor HP 8481A           | SN: MY41092317 | 07-Oct-15 (in house check Oct-18) | In house check: Oct-20 |
| RF generator R&S SMT-06         | SN: 100972     | 15-Jun-15 (in house check Oct-18) | In house check: Oct-20 |
| Network Analyzer Agilent E8358A | SN: US41080477 | 31-Mar-14 (in house check Oct-18) | In house check: Oct-19 |

Calibrated by: **Claudio Leubler** Function: **Laboratory Technician**

Approved by: **Katja Pokovic** Technical Manager

Signature

Issued: June 20, 2019

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.



Accredited by the Swiss Accreditation Service (SAS)

Accreditation No.: **SCS 0108**

The Swiss Accreditation Service is one of the signatories to the EA  
Multilateral Agreement for the recognition of calibration certificates

### Glossary:

|       |                                 |
|-------|---------------------------------|
| TSL   | tissue simulating liquid        |
| ConvF | sensitivity in TSL / NORM x,y,z |
| N/A   | not applicable or not measured  |

### Calibration is Performed According to the Following Standards:

- IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
- IEC 62209-1, "Measurement procedure for the assessment of Specific Absorption Rate (SAR) from hand-held and body-mounted devices used next to the ear (frequency range of 300 MHz to 6 GHz)", July 2016
- IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
- KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

### Additional Documentation:

- DASY4/5 System Handbook

### Methods Applied and Interpretation of Parameters:

- Measurement Conditions:** Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- Antenna Parameters with TSL:** The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- Feed Point Impedance and Return Loss:** These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- Electrical Delay:** One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- SAR measured:** SAR measured at the stated antenna input power.
- SAR normalized:** SAR as measured, normalized to an input power of 1 W at the antenna connector.
- SAR for nominal TSL parameters:** The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor  $k=2$ , which for a normal distribution corresponds to a coverage probability of approximately 95%.

## Measurement Conditions

DASY system configuration, as far as not given on page 1.

|                                     |                        |             |
|-------------------------------------|------------------------|-------------|
| <b>DASY Version</b>                 | DASY5                  | V52.10.2    |
| <b>Extrapolation</b>                | Advanced Extrapolation |             |
| <b>Phantom</b>                      | Modular Flat Phantom   |             |
| <b>Distance Dipole Center - TSL</b> | 10 mm                  | with Spacer |
| <b>Zoom Scan Resolution</b>         | dx, dy, dz = 5 mm      |             |
| <b>Frequency</b>                    | 1750 MHz $\pm$ 1 MHz   |             |

## Head TSL parameters

The following parameters and calculations were applied.

|                                                | Temperature         | Permittivity   | Conductivity         |
|------------------------------------------------|---------------------|----------------|----------------------|
| <b>Nominal Head TSL parameters</b>             | 22.0 °C             | 40.1           | 1.37 mho/m           |
| <b>Measured Head TSL parameters</b>            | (22.0 $\pm$ 0.2) °C | 40.0 $\pm$ 6 % | 1.34 mho/m $\pm$ 6 % |
| <b>Head TSL temperature change during test</b> | < 0.5 °C            | ----           | ----                 |

## SAR result with Head TSL

|                                                             |                    |                                                |
|-------------------------------------------------------------|--------------------|------------------------------------------------|
| <b>SAR averaged over 1 cm<sup>3</sup> (1 g) of Head TSL</b> | Condition          |                                                |
| SAR measured                                                | 250 mW input power | 8.91 W/kg                                      |
| SAR for nominal Head TSL parameters                         | normalized to 1W   | <b>36.1 W/kg <math>\pm</math> 17.0 % (k=2)</b> |

|                                                               |                    |                                                |
|---------------------------------------------------------------|--------------------|------------------------------------------------|
| <b>SAR averaged over 10 cm<sup>3</sup> (10 g) of Head TSL</b> | condition          |                                                |
| SAR measured                                                  | 250 mW input power | 4.70 W/kg                                      |
| SAR for nominal Head TSL parameters                           | normalized to 1W   | <b>19.0 W/kg <math>\pm</math> 16.5 % (k=2)</b> |

## Body TSL parameters

The following parameters and calculations were applied.

|                                                | Temperature         | Permittivity   | Conductivity         |
|------------------------------------------------|---------------------|----------------|----------------------|
| <b>Nominal Body TSL parameters</b>             | 22.0 °C             | 53.4           | 1.49 mho/m           |
| <b>Measured Body TSL parameters</b>            | (22.0 $\pm$ 0.2) °C | 53.9 $\pm$ 6 % | 1.46 mho/m $\pm$ 6 % |
| <b>Body TSL temperature change during test</b> | < 0.5 °C            | ----           | ----                 |

## SAR result with Body TSL

|                                                             |                    |                                                |
|-------------------------------------------------------------|--------------------|------------------------------------------------|
| <b>SAR averaged over 1 cm<sup>3</sup> (1 g) of Body TSL</b> | Condition          |                                                |
| SAR measured                                                | 250 mW input power | 9.14 W/kg                                      |
| SAR for nominal Body TSL parameters                         | normalized to 1W   | <b>37.1 W/kg <math>\pm</math> 17.0 % (k=2)</b> |

|                                                               |                    |                                                |
|---------------------------------------------------------------|--------------------|------------------------------------------------|
| <b>SAR averaged over 10 cm<sup>3</sup> (10 g) of Body TSL</b> | condition          |                                                |
| SAR measured                                                  | 250 mW input power | 4.88 W/kg                                      |
| SAR for nominal Body TSL parameters                           | normalized to 1W   | <b>19.7 W/kg <math>\pm</math> 16.5 % (k=2)</b> |

## Appendix (Additional assessments outside the scope of SCS 0108)

### Antenna Parameters with Head TSL

|                                      |                                |
|--------------------------------------|--------------------------------|
| Impedance, transformed to feed point | 50.6 $\Omega$ - 1.1 j $\Omega$ |
| Return Loss                          | - 38.0 dB                      |

### Antenna Parameters with Body TSL

|                                      |                                |
|--------------------------------------|--------------------------------|
| Impedance, transformed to feed point | 46.1 $\Omega$ - 2.4 j $\Omega$ |
| Return Loss                          | - 28.0 dB                      |

### General Antenna Parameters and Design

|                                  |          |
|----------------------------------|----------|
| Electrical Delay (one direction) | 1.220 ns |
|----------------------------------|----------|

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

### Additional EUT Data

|                 |       |
|-----------------|-------|
| Manufactured by | SPEAG |
|-----------------|-------|

## DASY5 Validation Report for Head TSL

Date: 19.06.2019

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 1750 MHz; Type: D1750V2; Serial: D1750V2 - SN:1083**

Communication System: UID 0 - CW; Frequency: 1750 MHz

Medium parameters used:  $f = 1750$  MHz;  $\sigma = 1.34$  S/m;  $\epsilon_r = 40$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(8.67, 8.67, 8.67) @ 1750 MHz; Calibrated: 29.05.2019
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.04.2019
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.10.2(1504); SEMCAD X 14.6.12(7470)

### Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 105.8 V/m; Power Drift = 0.04 dB

Peak SAR (extrapolated) = 16.7 W/kg

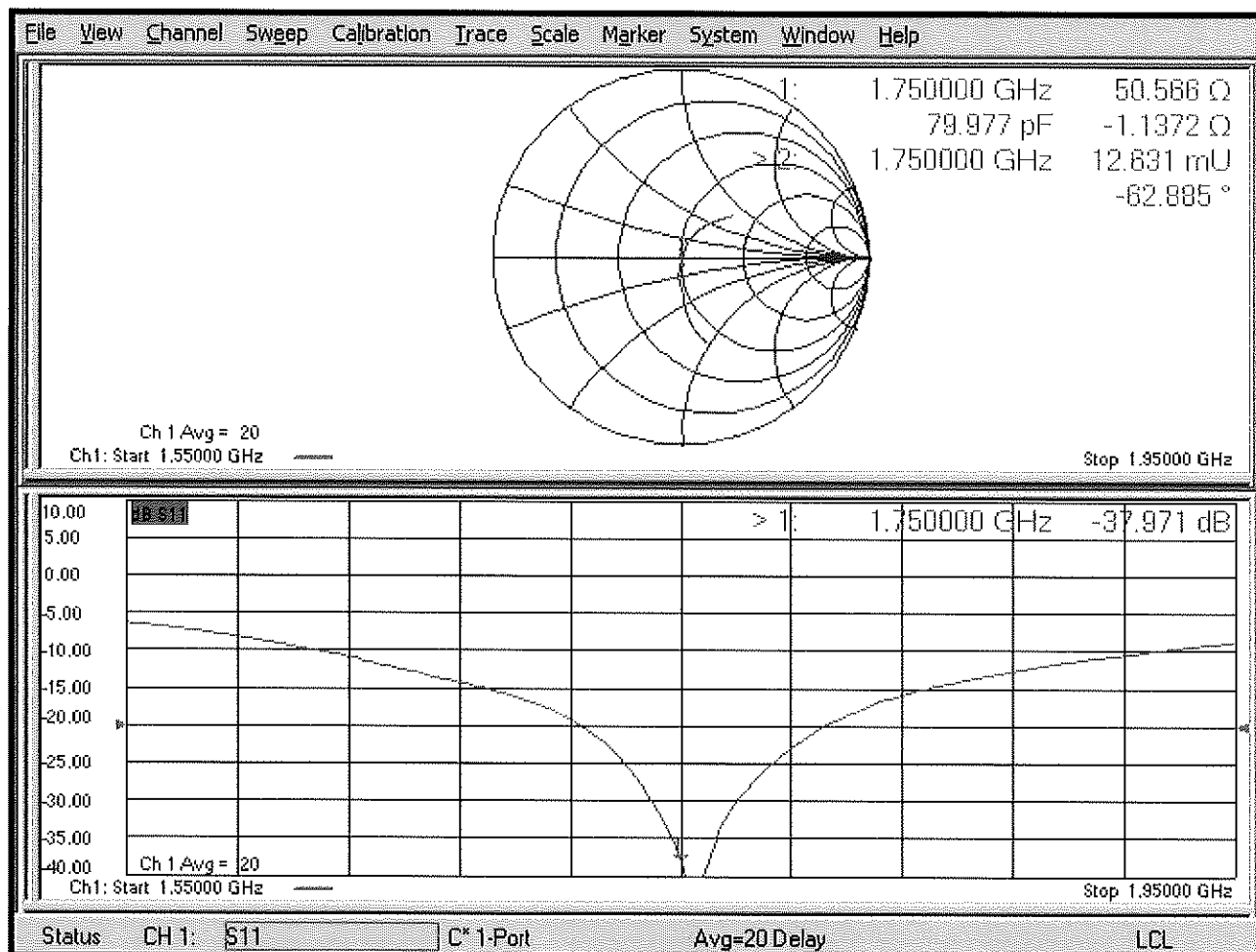
**SAR(1 g) = 8.91 W/kg; SAR(10 g) = 4.7 W/kg**

Maximum value of SAR (measured) = 13.9 W/kg



0 dB = 13.9 W/kg = 11.43 dBW/kg

## Impedance Measurement Plot for Head TSL



## DASY5 Validation Report for Body TSL

Date: 13.06.2019

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 1750 MHz; Type: D1750V2; Serial: D1750V2 - SN:1083**

Communication System: UID 0 - CW; Frequency: 1750 MHz

Medium parameters used:  $f = 1750$  MHz;  $\sigma = 1.46$  S/m;  $\epsilon_r = 53.9$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(8.45, 8.45, 8.45) @ 1750 MHz; Calibrated: 29.05.2019
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.04.2019
- Phantom: Flat Phantom 5.0 (back); Type: QD 000 P50 AA; Serial: 1002
- DASY52 52.10.2(1504); SEMCAD X 14.6.12(7470)

### Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

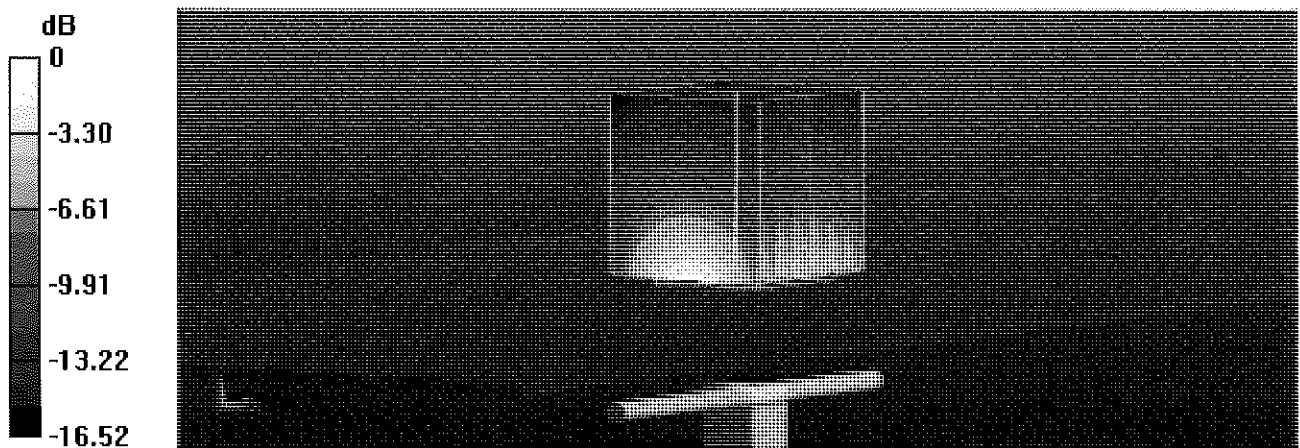
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 101.8 V/m; Power Drift = -0.04 dB

Peak SAR (extrapolated) = 16.2 W/kg

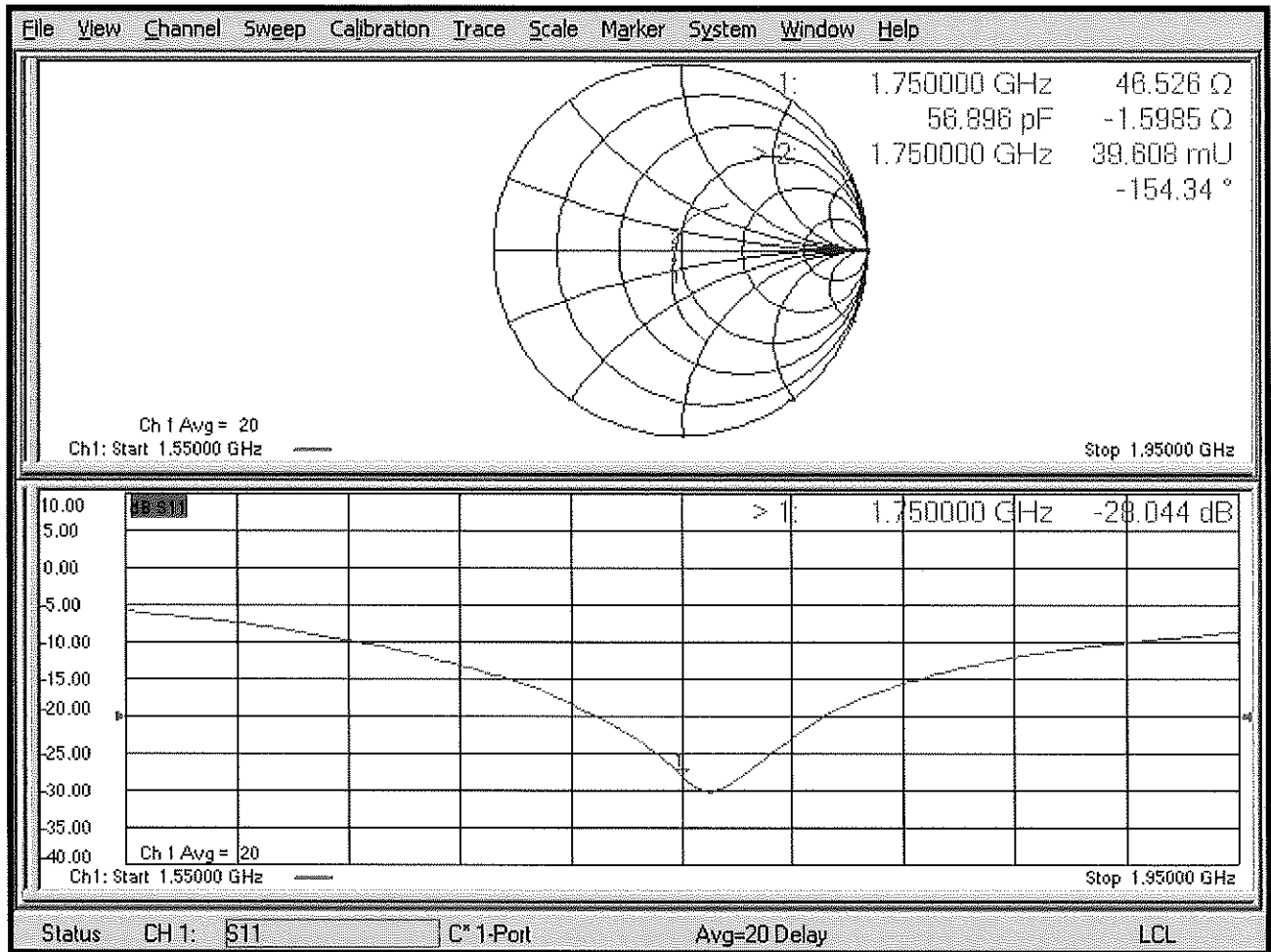
**SAR(1 g) = 9.14 W/kg; SAR(10 g) = 4.88 W/kg**

Maximum value of SAR (measured) = 13.7 W/kg



0 dB = 13.7 W/kg = 11.37 dBW/kg

## Impedance Measurement Plot for Body TSL





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 Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 0108**

Client **PC Test**

Certificate No: **D1900V2-5d026\_May18**

## CALIBRATION CERTIFICATE

Object **D1900V2 - SN:5d026**

Calibration procedure(s) **Cal. Cal-15 v10  
 Calibration procedure for cable validation with above 700 MHz**

Calibration date: **May 14, 2018**

SC ✓  
 7/31/2018

BN ✓  
 06/01/2019

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).  
 The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards           | ID #               | Cal Date (Certificate No.)        | Scheduled Calibration  |
|-----------------------------|--------------------|-----------------------------------|------------------------|
| Power meter NRP             | SN: 104778         | 04-Apr-18 (No. 217-02672/02673)   | Apr-19                 |
| Power sensor NRP-Z91        | SN: 103244         | 04-Apr-18 (No. 217-02672)         | Apr-19                 |
| Power sensor NRP-Z91        | SN: 103245         | 04-Apr-18 (No. 217-02673)         | Apr-19                 |
| Reference 20 dB Attenuator  | SN: 5058 (20k)     | 04-Apr-18 (No. 217-02682)         | Apr-19                 |
| Type-N mismatch combination | SN: 5047.2 / 06327 | 04-Apr-18 (No. 217-02683)         | Apr-19                 |
| Reference Probe EX3DV4      | SN: 7349           | 30-Dec-17 (No. EX3-7349_Dec17)    | Dec-18                 |
| DAE4                        | SN: 601            | 26-Oct-17 (No. DAE4-601_Oct17)    | Oct-18                 |
| Secondary Standards         | ID #               | Check Date (in house)             | Scheduled Check        |
| Power meter EPM-442A        | SN: GB37480704     | 07-Oct-15 (in house check Oct-16) | In house check: Oct-18 |
| Power sensor HP 8481A       | SN: US37292783     | 07-Oct-15 (in house check Oct-16) | In house check: Oct-18 |
| Power sensor HP 8481A       | SN: MY41092317     | 07-Oct-15 (in house check Oct-16) | In house check: Oct-18 |
| RF generator R&S SMT-06     | SN: 100972         | 15-Jun-15 (in house check Oct-16) | In house check: Oct-18 |
| Network Analyzer HP 8753E   | SN: US37390585     | 18-Oct-01 (in house check Oct-17) | In house check: Oct-18 |

Calibrated by: **Jeton Kastrati** Name **Laboratory Technician** Function

Signature

Approved by: **Katja Pokovic** Technical Manager

Signature

Issued: May 14, 2018

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.



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Accreditation No.: **SCS 0108**

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Multilateral Agreement for the recognition of calibration certificates

**Glossary:**

|       |                                 |
|-------|---------------------------------|
| TSL   | tissue simulating liquid        |
| ConvF | sensitivity in TSL / NORM x,y,z |
| N/A   | not applicable or not measured  |

**Calibration is Performed According to the Following Standards:**

- IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
- IEC 62209-1, "Measurement procedure for the assessment of Specific Absorption Rate (SAR) from hand-held and body-mounted devices used next to the ear (frequency range of 300 MHz to 6 GHz)", July 2016
- IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
- KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

**Additional Documentation:**

- DASY4/5 System Handbook

**Methods Applied and Interpretation of Parameters:**

- Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- Antenna Parameters with TSL:* The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- Feed Point Impedance and Return Loss:* These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- SAR measured:* SAR measured at the stated antenna input power.
- SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor  $k=2$ , which for a normal distribution corresponds to a coverage probability of approximately 95%.

## Measurement Conditions

DASY system configuration, as far as not given on page 1.

|                              |                        |             |
|------------------------------|------------------------|-------------|
| DASY Version                 | DASY5                  | V52.10.1    |
| Extrapolation                | Advanced Extrapolation |             |
| Phantom                      | Modular Flat Phantom   |             |
| Distance Dipole Center - TSL | 10 mm                  | with Spacer |
| Zoom Scan Resolution         | dx, dy, dz = 5 mm      |             |
| Frequency                    | 1900 MHz $\pm$ 1 MHz   |             |

## Head TSL parameters

The following parameters and calculations were applied.

|                                         | Temperature         | Permittivity   | Conductivity         |
|-----------------------------------------|---------------------|----------------|----------------------|
| Nominal Head TSL parameters             | 22.0 °C             | 40.0           | 1.40 mho/m           |
| Measured Head TSL parameters            | (22.0 $\pm$ 0.2) °C | 41.2 $\pm$ 6 % | 1.35 mho/m $\pm$ 6 % |
| Head TSL temperature change during test | < 0.5 °C            | ----           | ----                 |

## SAR result with Head TSL

|                                                       |                    |                              |
|-------------------------------------------------------|--------------------|------------------------------|
| SAR averaged over 1 cm <sup>3</sup> (1 g) of Head TSL | Condition          |                              |
| SAR measured                                          | 250 mW input power | 9.78 W/kg                    |
| SAR for nominal Head TSL parameters                   | normalized to 1W   | 40.2 W/kg $\pm$ 17.0 % (k=2) |

|                                                         |                    |                              |
|---------------------------------------------------------|--------------------|------------------------------|
| SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL | condition          |                              |
| SAR measured                                            | 250 mW input power | 5.19 W/kg                    |
| SAR for nominal Head TSL parameters                     | normalized to 1W   | 21.1 W/kg $\pm$ 16.5 % (k=2) |

## Body TSL parameters

The following parameters and calculations were applied.

|                                         | Temperature         | Permittivity   | Conductivity         |
|-----------------------------------------|---------------------|----------------|----------------------|
| Nominal Body TSL parameters             | 22.0 °C             | 53.3           | 1.52 mho/m           |
| Measured Body TSL parameters            | (22.0 $\pm$ 0.2) °C | 55.3 $\pm$ 6 % | 1.46 mho/m $\pm$ 6 % |
| Body TSL temperature change during test | < 0.5 °C            | ----           | ----                 |

## SAR result with Body TSL

|                                                       |                    |                              |
|-------------------------------------------------------|--------------------|------------------------------|
| SAR averaged over 1 cm <sup>3</sup> (1 g) of Body TSL | Condition          |                              |
| SAR measured                                          | 250 mW input power | 9.65 W/kg                    |
| SAR for nominal Body TSL parameters                   | normalized to 1W   | 39.9 W/kg $\pm$ 17.0 % (k=2) |

|                                                         |                    |                              |
|---------------------------------------------------------|--------------------|------------------------------|
| SAR averaged over 10 cm <sup>3</sup> (10 g) of Body TSL | condition          |                              |
| SAR measured                                            | 250 mW input power | 5.19 W/kg                    |
| SAR for nominal Body TSL parameters                     | normalized to 1W   | 21.2 W/kg $\pm$ 16.5 % (k=2) |

## Appendix (Additional assessments outside the scope of SCS 0108)

### Antenna Parameters with Head TSL

|                                      |                             |
|--------------------------------------|-----------------------------|
| Impedance, transformed to feed point | $53.0 \Omega + 8.0 j\Omega$ |
| Return Loss                          | - 21.6 dB                   |

### Antenna Parameters with Body TSL

|                                      |                             |
|--------------------------------------|-----------------------------|
| Impedance, transformed to feed point | $47.1 \Omega + 7.4 j\Omega$ |
| Return Loss                          | - 21.8 dB                   |

### General Antenna Parameters and Design

|                                  |          |
|----------------------------------|----------|
| Electrical Delay (one direction) | 1.199 ns |
|----------------------------------|----------|

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

### Additional EUT Data

|                 |                   |
|-----------------|-------------------|
| Manufactured by | SPEAG             |
| Manufactured on | December 17, 2002 |

## DASY5 Validation Report for Head TSL

Date: 14.05.2018

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:5d026**

Communication System: UID 0 - CW; Frequency: 1900 MHz

Medium parameters used:  $f = 1900$  MHz;  $\sigma = 1.35$  S/m;  $\epsilon_r = 41.2$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(8.18, 8.18, 8.18) @ 1900 MHz; Calibrated: 30.12.2017
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 26.10.2017
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.10.1(1476); SEMCAD X 14.6.11(7439)

### **Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:**

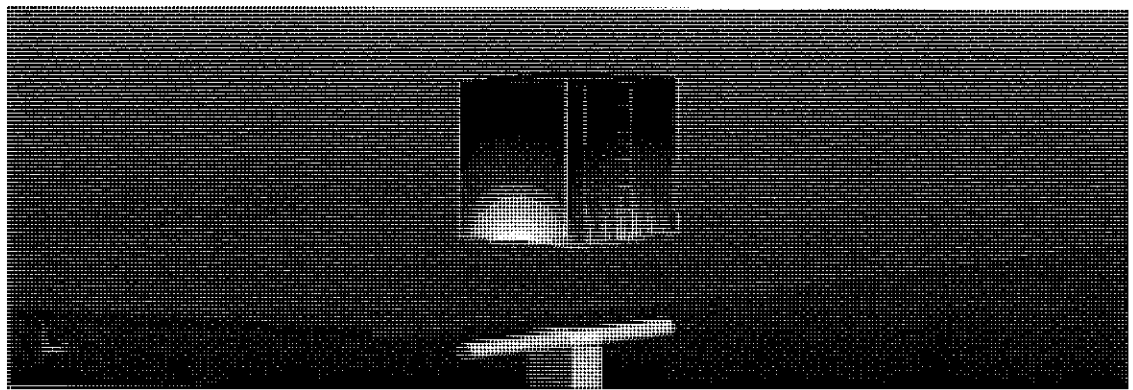
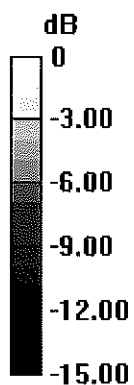
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 109.9 V/m; Power Drift = -0.04 dB

Peak SAR (extrapolated) = 17.8 W/kg

**SAR(1 g) = 9.78 W/kg; SAR(10 g) = 5.19 W/kg**

Maximum value of SAR (measured) = 15.0 W/kg

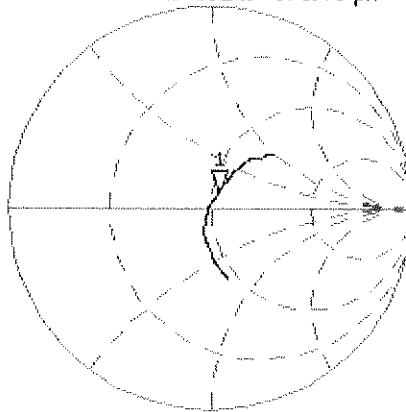


0 dB = 15.0 W/kg = 11.76 dBW/kg

# Impedance Measurement Plot for Head TSL

14 May 2018 09:14:41  
 [CH1] S11 1 U FS 1: 52.955  $\Omega$  8.0391  $\Omega$  673.40  $\mu$ H 1 900.000 000 MHz

\*  
 Del  
 CA



Avg  
 16

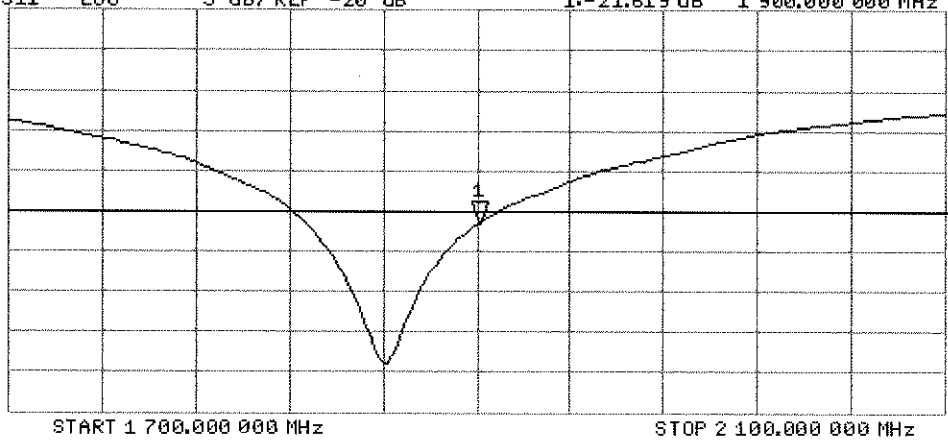
H1d

CH2 S11 LOG 5 dB/REF -20 dB 1:-21.619 dB 1 900.000 000 MHz

CA

Avg  
 16

H1d



## DASY5 Validation Report for Body TSL

Date: 14.05.2018

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:5d026**

Communication System: UID 0 - CW; Frequency: 1900 MHz

Medium parameters used:  $f = 1900$  MHz;  $\sigma = 1.46$  S/m;  $\epsilon_r = 55.3$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(8.15, 8.15, 8.15) @ 1900 MHz; Calibrated: 30.12.2017
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 26.10.2017
- Phantom: Flat Phantom 5.0 (back); Type: QD 000 P50 AA; Serial: 1002
- DASY52 52.10.1(1476); SEMCAD X 14.6.11(7439)

### **Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:**

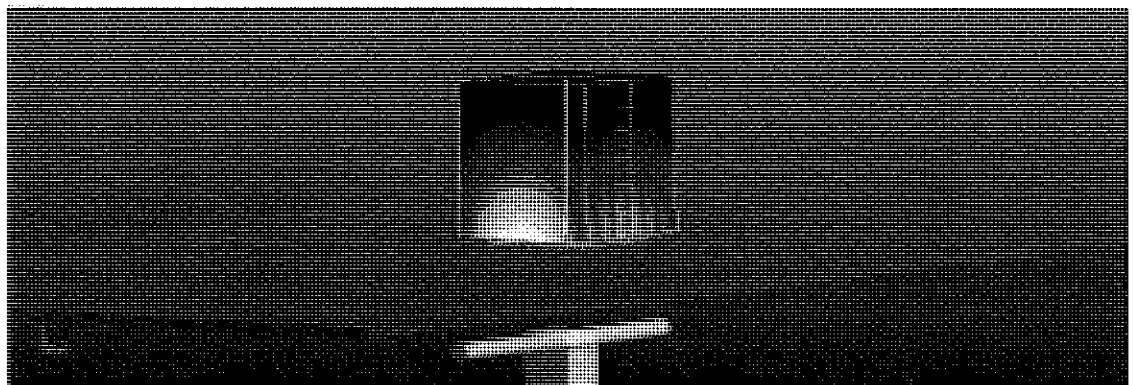
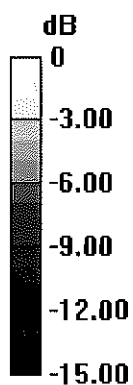
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 104.5 V/m; Power Drift = -0.02 dB

Peak SAR (extrapolated) = 16.7 W/kg

**SAR(1 g) = 9.65 W/kg; SAR(10 g) = 5.19 W/kg**

Maximum value of SAR (measured) = 14.4 W/kg

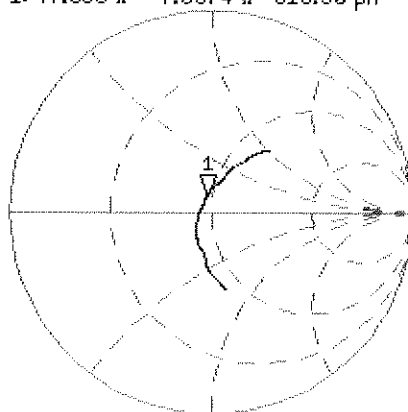


0 dB = 14.4 W/kg = 11.58 dBW/kg

# Impedance Measurement Plot for Body TSL

14 May 2018 09:13:46  
 [CH1] S11 1 U FS 1: 47.053  $\Omega$  7.3574  $\Omega$  616.30 pF 1 900.000 000 MHz

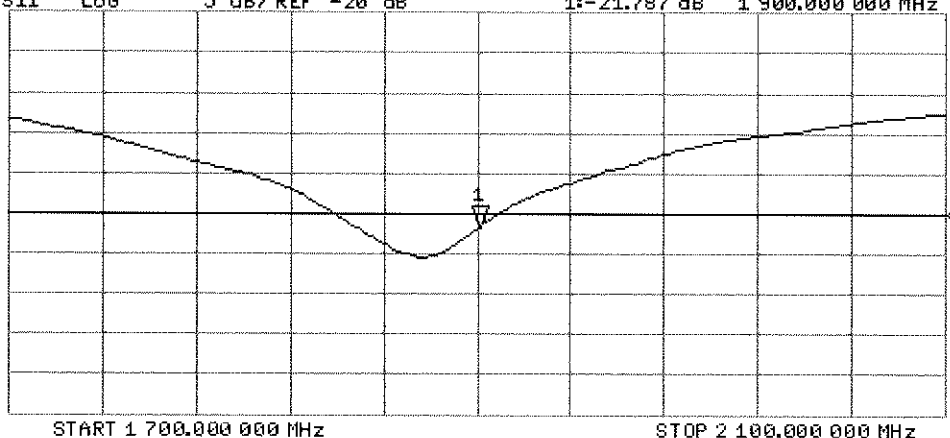
\*  
 Del  
 CA



Avg  
 16  
 H1d

CH2 S11 LOG 5 dB/REF -20 dB 1:-21.787 dB 1 900.000 000 MHz

CA  
 Avg  
 16  
 H1d



# Certification of Calibration

Object D1900V2 – SN: 5d026

Calibration procedure(s) Procedure for Calibration Extension for SAR Dipoles.

Extended Calibration date: May 14, 2019

Description: SAR Validation Dipole at 1900 MHz.

## Calibration Equipment used:

| Manufacturer          | Model     | Description                                             | Cal Date   | Cal Interval | Cal Due    | Serial Number |
|-----------------------|-----------|---------------------------------------------------------|------------|--------------|------------|---------------|
| Agilent               | 8753ES    | S-Parameter Network Analyzer                            | 10/2/2018  | Annual       | 10/2/2019  | US39170118    |
| Agilent               | N5182A    | MXG Vector Signal Generator                             | 6/15/2018  | Annual       | 6/15/2019  | MY47420837    |
| Amplifier Research    | 15S1G6    | Amplifier                                               | CBT        | N/A          | CBT        | 343972        |
| Anritsu               | ML2495A   | Power Meter                                             | 10/21/2018 | Annual       | 10/21/2019 | 941001        |
| Anritsu               | MA2411B   | Pulse Power Sensor                                      | 10/30/2018 | Annual       | 10/30/2019 | 1207470       |
| Anritsu               | MA2411B   | Pulse Power Sensor                                      | 11/20/2018 | Annual       | 11/20/2019 | 1339007       |
| Control Company       | 4040      | Temperature / Humidity Monitor                          | 2/28/2018  | Biennial     | 2/28/2020  | 150761911     |
| Control Company       | 4352      | Ultra Long Stem Thermometer                             | 2/28/2018  | Biennial     | 2/28/2020  | 170330160     |
| Keysight              | 772D      | Dual Directional Coupler                                | CBT        | N/A          | CBT        | MY52180215    |
| Keysight Technologies | 85033E    | Standard Mechanical Calibration Kit (DC to 9GHz, 3.5mm) | 6/4/2018   | Annual       | 6/4/2019   | MY53401181    |
| Mini-Circuits         | BW-N20W5+ | DC to 18 GHz Precision Fixed 20 dB Attenuator           | CBT        | N/A          | CBT        | N/A           |
| Mini-Circuits         | NLP-2950+ | Low Pass Filter DC to 2700 MHz                          | CBT        | N/A          | CBT        | N/A           |
| Narda                 | 4772-3    | Attenuator (3dB)                                        | CBT        | N/A          | CBT        | 9406          |
| Pasternack            | PE2209-10 | Bidirectional Coupler                                   | CBT        | N/A          | CBT        | N/A           |
| Pasternack            | PE5011-1  | Torque Wrench                                           | 7/19/2017  | Biennial     | 7/19/2019  | N/A           |
| SPEAG                 | DAKS-3.5  | Portable DAK                                            | 9/11/2018  | Annual       | 9/11/2019  | 1045          |
| SPEAG                 | EX3DV4    | SAR Probe                                               | 7/20/2018  | Annual       | 7/20/2019  | 7416          |
| SPEAG                 | DAE4      | Dasy Data Acquisition Electronics                       | 7/10/2018  | Annual       | 7/10/2019  | 1402          |

Measurement Uncertainty =  $\pm 23\%$  (k=2)

|                | Name            | Function                 | Signature           |
|----------------|-----------------|--------------------------|---------------------|
| Calibrated By: | Parker Jones    | Team Lead Engineer       | <i>Parker Jones</i> |
| Approved By:   | Kaitlin O'Keefe | Senior Technical Manager | <i>KOK</i>          |

# DIPOLE CALIBRATION EXTENSION

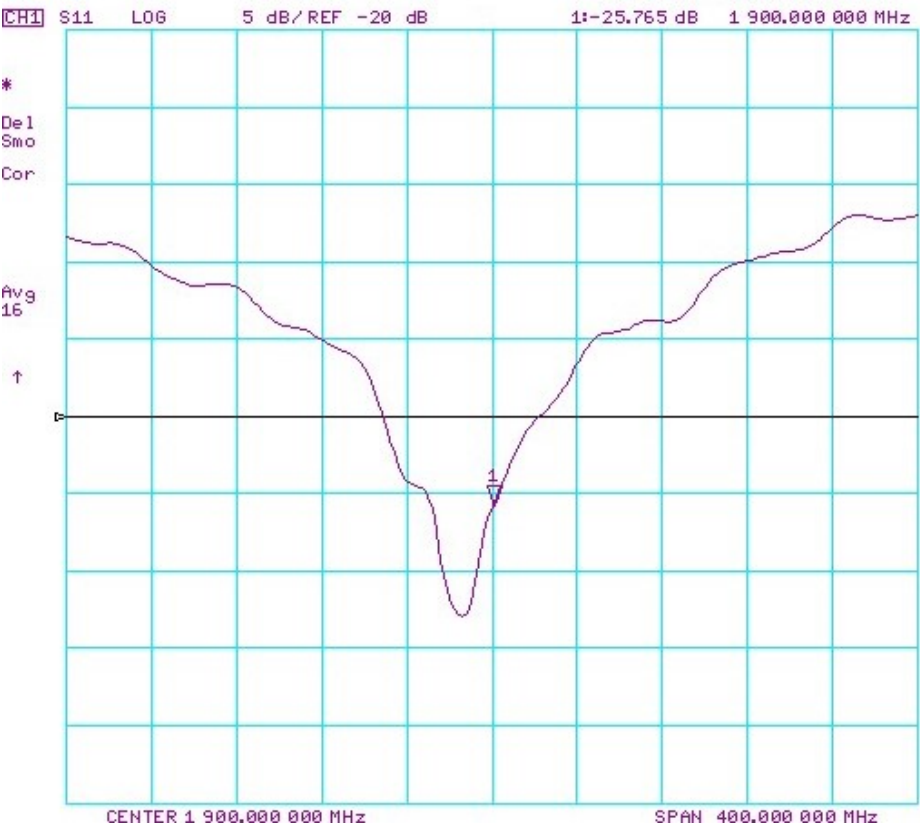
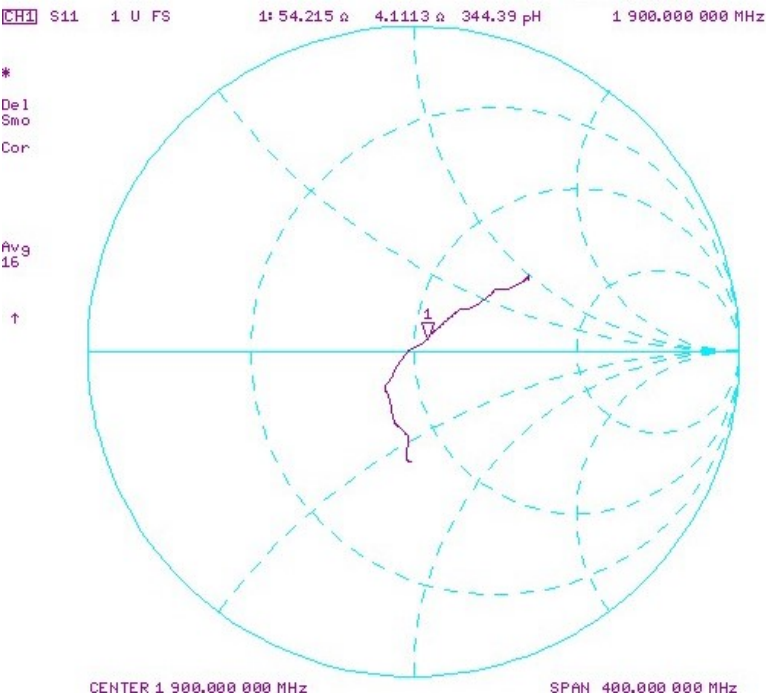
Per KDB 865664 D01, calibration intervals of up to three years may be considered for reference dipoles when it is demonstrated that the SAR target, impedance and return loss of a dipole have remained stable according to the following requirements:

1. The measured SAR does not deviate more than 10% from the target on the calibration certificate.
2. The return-loss does not deviate more than 20% from the previous measurement and meets the required 20dB minimum return-loss requirement.
3. The measurement of real or imaginary parts of impedance does not deviate more than 5Ω from the previous measurement.

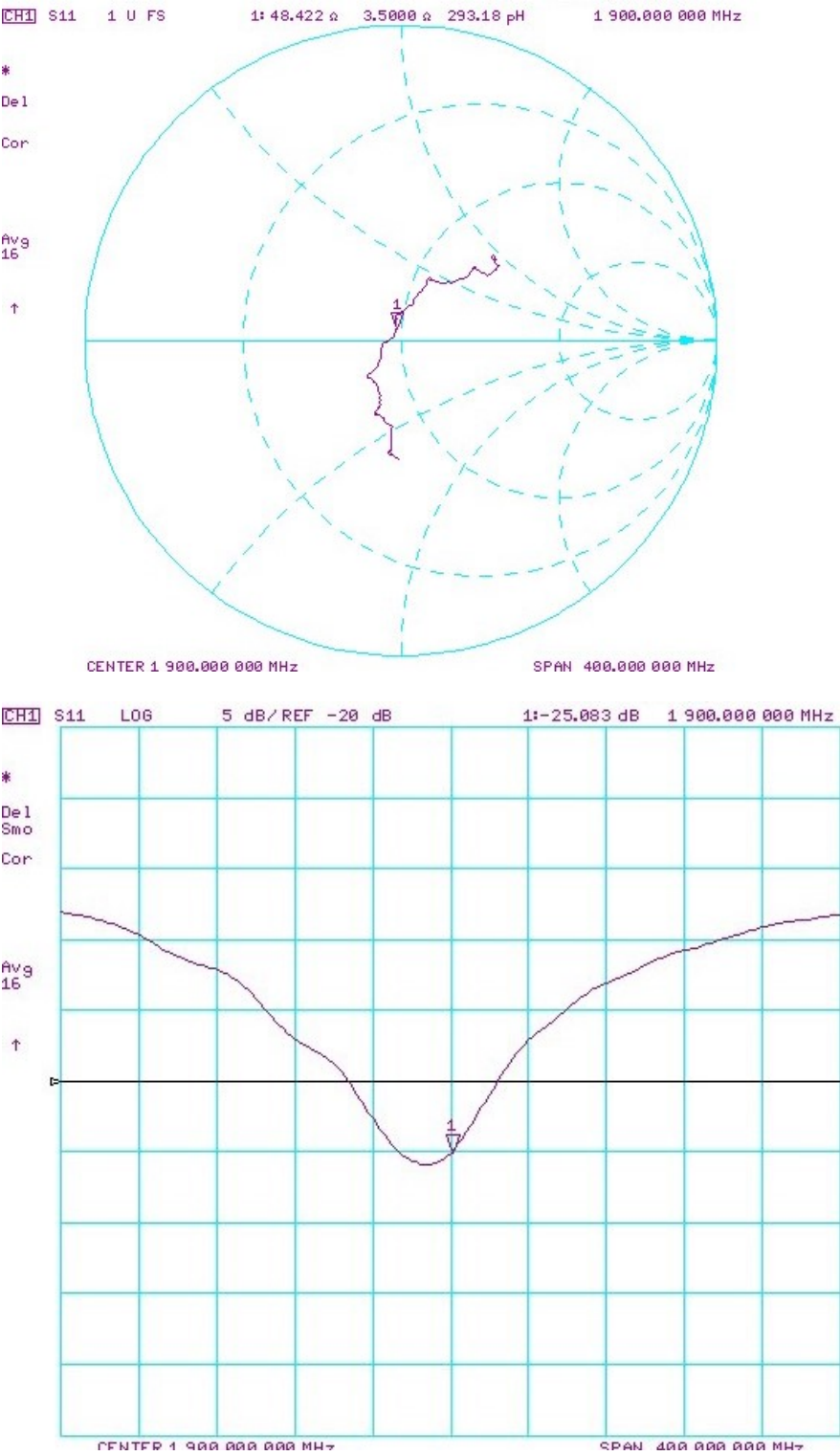
The following dipole was checked to pass the above 3 requirements to have 2-year calibration period from the calibration date:

| Calibration Date | Extension Date | Certificate Electrical Delay (ns) | Certificate SAR Target Head (1g) W/kg @ 20.0 dBm | Measured Head SAR (1g) W/kg @ 20.0 dBm | Deviation 1g (%) | Certificate SAR Target Head (10g) W/kg @ 20.0 dBm | Measured Head SAR (10g) W/kg @ 20.0 dBm | Deviation 10g (%) | Certificate Impedance Head (Ohm) Real | Measured Impedance Head (Ohm) Real | Difference (Ohm) Real | Certificate Impedance Head (Ohm) Imaginary | Measured Impedance Head (Ohm) Imaginary | Difference (Ohm) Imaginary | Certificate Return Loss Head (dB) | Measured Return Loss Head (dB) | Deviation (%) | PASS/FAIL |
|------------------|----------------|-----------------------------------|--------------------------------------------------|----------------------------------------|------------------|---------------------------------------------------|-----------------------------------------|-------------------|---------------------------------------|------------------------------------|-----------------------|--------------------------------------------|-----------------------------------------|----------------------------|-----------------------------------|--------------------------------|---------------|-----------|
| 5/14/2018        | 5/14/2019      | 1.199                             | 4.02                                             | 3.98                                   | -1.00%           | 2.11                                              | 2.05                                    | -2.84%            | 53                                    | 54.2                               | 1.2                   | 8                                          | 4.1                                     | 3.9                        | -21.6                             | -25.8                          | -19.30%       | PASS      |
| Calibration Date | Extension Date | Certificate Electrical Delay (ns) | Certificate SAR Target Body (1g) W/kg @ 20.0 dBm | Measured Body SAR (1g) W/kg @ 20.0 dBm | Deviation 1g (%) | Certificate SAR Target Body (10g) W/kg @ 20.0 dBm | Measured Body SAR (10g) W/kg @ 20.0 dBm | Deviation 10g (%) | Certificate Impedance Body (Ohm) Real | Measured Impedance Body (Ohm) Real | Difference (Ohm) Real | Certificate Impedance Body (Ohm) Imaginary | Measured Impedance Body (Ohm) Imaginary | Difference (Ohm) Imaginary | Certificate Return Loss Body (dB) | Measured Return Loss Body (dB) | Deviation (%) | PASS/FAIL |
| 5/14/2018        | 5/14/2019      | 1.199                             | 3.99                                             | 3.97                                   | -0.50%           | 2.12                                              | 2.04                                    | -3.77%            | 47.1                                  | 46.4                               | 1.3                   | 7.4                                        | 3.5                                     | 3.9                        | -21.8                             | -25.1                          | -15.10%       | PASS      |

Impedance & Return-Loss Measurement Plot for Head TSL



Impedance & Return-Loss Measurement Plot for Body TSL





Accredited by the Swiss Accreditation Service (SAS)  
 The Swiss Accreditation Service is one of the signatories to the EA  
 Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 0108**

Client **PC Test**

Certificate No: **D2300V2-1038\_Mar18**

## CALIBRATION CERTIFICATE

Object **D2300V2 - SN:1038**

Calibration procedure(s) **QA CAL-05.v10**  
**Calibration procedure for dipole validation kits above 700 MHz**

Calibration date: **March 07, 2018**

SC ✓  
 3/21/18  
 SC ✓  
 4/25/19

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).  
 The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature ( $22 \pm 3$ )°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards           | ID #               | Cal Date (Certificate No.)        | Scheduled Calibration  |
|-----------------------------|--------------------|-----------------------------------|------------------------|
| Power meter NRP             | SN: 104778         | 04-Apr-17 (No. 217-02521/02522)   | Apr-18                 |
| Power sensor NRP-Z91        | SN: 103244         | 04-Apr-17 (No. 217-02521)         | Apr-18                 |
| Power sensor NRP-Z91        | SN: 103245         | 04-Apr-17 (No. 217-02522)         | Apr-18                 |
| Reference 20 dB Attenuator  | SN: 5058 (20k)     | 07-Apr-17 (No. 217-02528)         | Apr-18                 |
| Type-N mismatch combination | SN: 5047.2 / 06327 | 07-Apr-17 (No. 217-02529)         | Apr-18                 |
| Reference Probe EX3DV4      | SN: 7349           | 30-Dec-17 (No. EX3-7349_Dec17)    | Dec-18                 |
| DAE4                        | SN: 601            | 26-Oct-17 (No. DAE4-601_Oct17)    | Oct-18                 |
| Secondary Standards         | ID #               | Check Date (in house)             | Scheduled Check        |
| Power meter EPM-442A        | SN: GB37480704     | 07-Oct-15 (in house check Oct-16) | In house check: Oct-18 |
| Power sensor HP 8481A       | SN: US37292783     | 07-Oct-15 (in house check Oct-16) | In house check: Oct-18 |
| Power sensor HP 8481A       | SN: MY41092317     | 07-Oct-15 (in house check Oct-16) | In house check: Oct-18 |
| RF generator R&S SMT-06     | SN: 100972         | 15-Jun-15 (in house check Oct-16) | In house check: Oct-18 |
| Network Analyzer HP 8753E   | SN: US37390585     | 18-Oct-01 (in house check Oct-17) | In house check: Oct-18 |

Calibrated by: **Claudio Leubler** **Laboratory Technician**

Signature

Approved by: **Katja Pokovic** **Technical Manager**

Issued: March 9, 2018

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.



Accredited by the Swiss Accreditation Service (SAS)  
The Swiss Accreditation Service is one of the signatories to the EA  
Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 0108**

**Glossary:**

|       |                                 |
|-------|---------------------------------|
| TSL   | tissue simulating liquid        |
| ConvF | sensitivity in TSL / NORM x,y,z |
| N/A   | not applicable or not measured  |

**Calibration is Performed According to the Following Standards:**

- IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
- IEC 62209-1, "Measurement procedure for the assessment of Specific Absorption Rate (SAR) from hand-held and body-mounted devices used next to the ear (frequency range of 300 MHz to 6 GHz)", July 2016
- IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
- KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

**Additional Documentation:**

- DASY4/5 System Handbook

**Methods Applied and Interpretation of Parameters:**

- Measurement Conditions:** Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- Antenna Parameters with TSL:** The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- Feed Point Impedance and Return Loss:** These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- Electrical Delay:** One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- SAR measured:** SAR measured at the stated antenna input power.
- SAR normalized:** SAR as measured, normalized to an input power of 1 W at the antenna connector.
- SAR for nominal TSL parameters:** The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor  $k=2$ , which for a normal distribution corresponds to a coverage probability of approximately 95%.

## Measurement Conditions

DASY system configuration, as far as not given on page 1.

|                              |                        |             |
|------------------------------|------------------------|-------------|
| DASY Version                 | DASY5                  | V52.10.0    |
| Extrapolation                | Advanced Extrapolation |             |
| Phantom                      | Modular Flat Phantom   |             |
| Distance Dipole Center - TSL | 10 mm                  | with Spacer |
| Zoom Scan Resolution         | dx, dy, dz = 5 mm      |             |
| Frequency                    | 2300 MHz $\pm$ 1 MHz   |             |

## Head TSL parameters

The following parameters and calculations were applied.

|                                         | Temperature         | Permittivity   | Conductivity         |
|-----------------------------------------|---------------------|----------------|----------------------|
| Nominal Head TSL parameters             | 22.0 °C             | 39.5           | 1.67 mho/m           |
| Measured Head TSL parameters            | (22.0 $\pm$ 0.2) °C | 38.6 $\pm$ 6 % | 1.70 mho/m $\pm$ 6 % |
| Head TSL temperature change during test | < 0.5 °C            | ----           | ----                 |

## SAR result with Head TSL

|                                                       |                    |                              |
|-------------------------------------------------------|--------------------|------------------------------|
| SAR averaged over 1 cm <sup>3</sup> (1 g) of Head TSL | Condition          |                              |
| SAR measured                                          | 250 mW input power | 12.5 W/kg                    |
| SAR for nominal Head TSL parameters                   | normalized to 1W   | 49.3 W/kg $\pm$ 17.0 % (k=2) |

|                                                         |                    |                              |
|---------------------------------------------------------|--------------------|------------------------------|
| SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL | condition          |                              |
| SAR measured                                            | 250 mW input power | 5.94 W/kg                    |
| SAR for nominal Head TSL parameters                     | normalized to 1W   | 23.6 W/kg $\pm$ 16.5 % (k=2) |

## Body TSL parameters

The following parameters and calculations were applied.

|                                         | Temperature         | Permittivity   | Conductivity         |
|-----------------------------------------|---------------------|----------------|----------------------|
| Nominal Body TSL parameters             | 22.0 °C             | 52.9           | 1.81 mho/m           |
| Measured Body TSL parameters            | (22.0 $\pm$ 0.2) °C | 51.6 $\pm$ 6 % | 1.86 mho/m $\pm$ 6 % |
| Body TSL temperature change during test | < 0.5 °C            | ----           | ----                 |

## SAR result with Body TSL

|                                                       |                    |                              |
|-------------------------------------------------------|--------------------|------------------------------|
| SAR averaged over 1 cm <sup>3</sup> (1 g) of Body TSL | Condition          |                              |
| SAR measured                                          | 250 mW input power | 11.9 W/kg                    |
| SAR for nominal Body TSL parameters                   | normalized to 1W   | 46.7 W/kg $\pm$ 17.0 % (k=2) |

|                                                         |                    |                              |
|---------------------------------------------------------|--------------------|------------------------------|
| SAR averaged over 10 cm <sup>3</sup> (10 g) of Body TSL | condition          |                              |
| SAR measured                                            | 250 mW input power | 5.69 W/kg                    |
| SAR for nominal Body TSL parameters                     | normalized to 1W   | 22.5 W/kg $\pm$ 16.5 % (k=2) |

## Appendix (Additional assessments outside the scope of SCS 0108)

### Antenna Parameters with Head TSL

|                                      |                                |
|--------------------------------------|--------------------------------|
| Impedance, transformed to feed point | 47.8 $\Omega$ - 4.9 j $\Omega$ |
| Return Loss                          | - 25.2 dB                      |

### Antenna Parameters with Body TSL

|                                      |                                |
|--------------------------------------|--------------------------------|
| Impedance, transformed to feed point | 45.9 $\Omega$ - 3.4 j $\Omega$ |
| Return Loss                          | - 25.0 dB                      |

### General Antenna Parameters and Design

|                                  |          |
|----------------------------------|----------|
| Electrical Delay (one direction) | 1.170 ns |
|----------------------------------|----------|

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

### Additional EUT Data

|                 |               |
|-----------------|---------------|
| Manufactured by | SPEAG         |
| Manufactured on | July 02, 2013 |

## DASY5 Validation Report for Head TSL

Date: 07.03.2018

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 2300 MHz; Type: D2300V2; Serial: D2300V2 - SN:1038**

Communication System: UID 0 - CW; Frequency: 2300 MHz

Medium parameters used:  $f = 2300$  MHz;  $\sigma = 1.7$  S/m;  $\epsilon_r = 38.6$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(8.08, 8.08, 8.08); Calibrated: 30.12.2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 26.10.2017
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.10.0(1446); SEMCAD X 14.6.10(7417)

### **Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:**

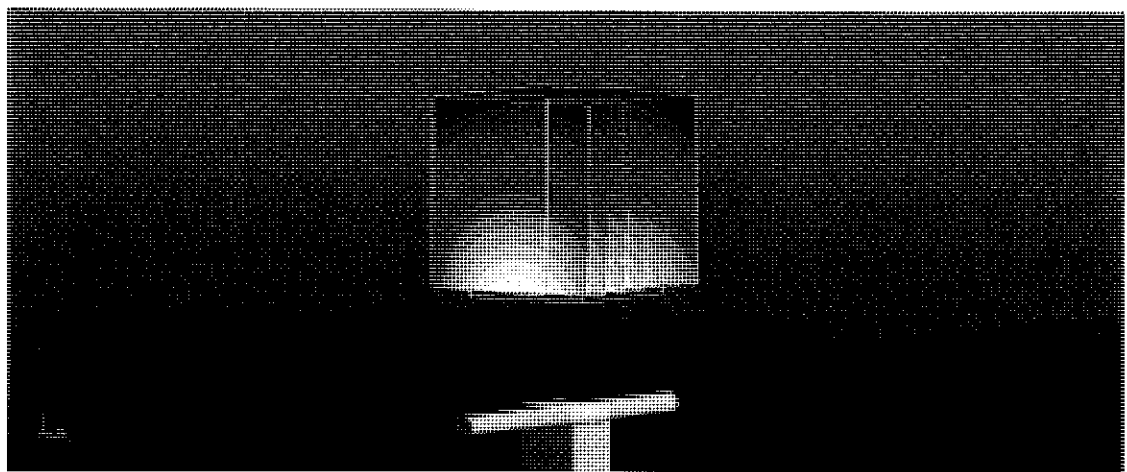
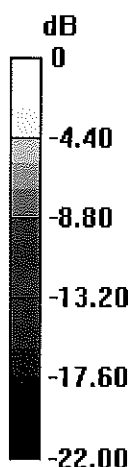
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 112.4 V/m; Power Drift = -0.07 dB

Peak SAR (extrapolated) = 24.5 W/kg

**SAR(1 g) = 12.5 W/kg; SAR(10 g) = 5.94 W/kg**

Maximum value of SAR (measured) = 19.6 W/kg



0 dB = 19.6 W/kg = 12.92 dBW/kg

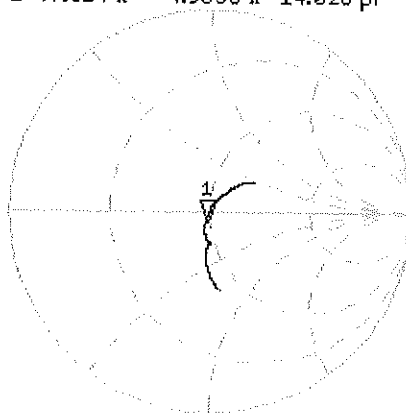
# Impedance Measurement Plot for Head TSL

7 Mar 2018 13:16:07  
 CH1 S11 1 U FS 1: 47.824  $\Omega$  -4.9336  $\Omega$  14.026 pF 2 300.000 000 MHz

\*  
 Del  
 Cor

Avg  
 16

H1d

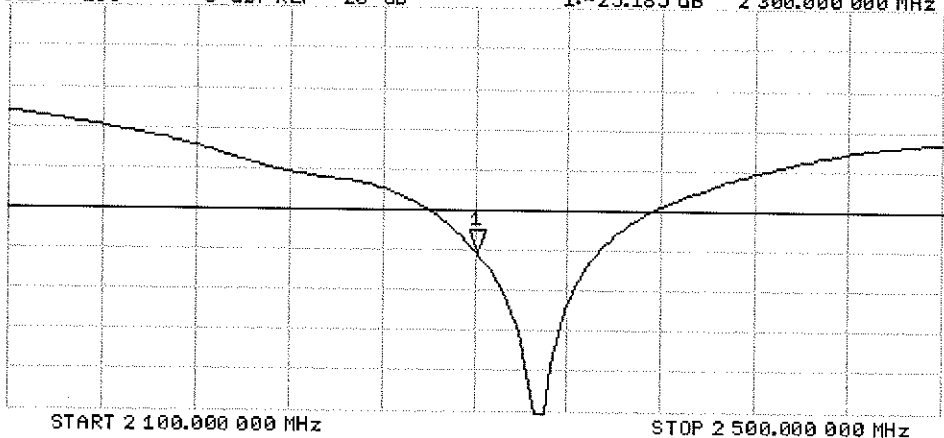


CH2 S11 LOG 5 dB/REF -20 dB 1:-25.185 dB 2 300.000 000 MHz

Cor

Avg  
 16

H1d



## DASY5 Validation Report for Body TSL

Date: 07.03.2018

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 2300 MHz; Type: D2300V2; Serial: D2300V2 - SN:1038**

Communication System: UID 0 - CW; Frequency: 2300 MHz

Medium parameters used:  $f = 2300$  MHz;  $\sigma = 1.86$  S/m;  $\epsilon_r = 51.6$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(8.08, 8.08, 8.08); Calibrated: 30.12.2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 26.10.2017
- Phantom: Flat Phantom 5.0 (back); Type: QD 000 P50 AA; Serial: 1002
- DASY52 52.10.0(1446); SEMCAD X 14.6.10(7417)

**Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:**

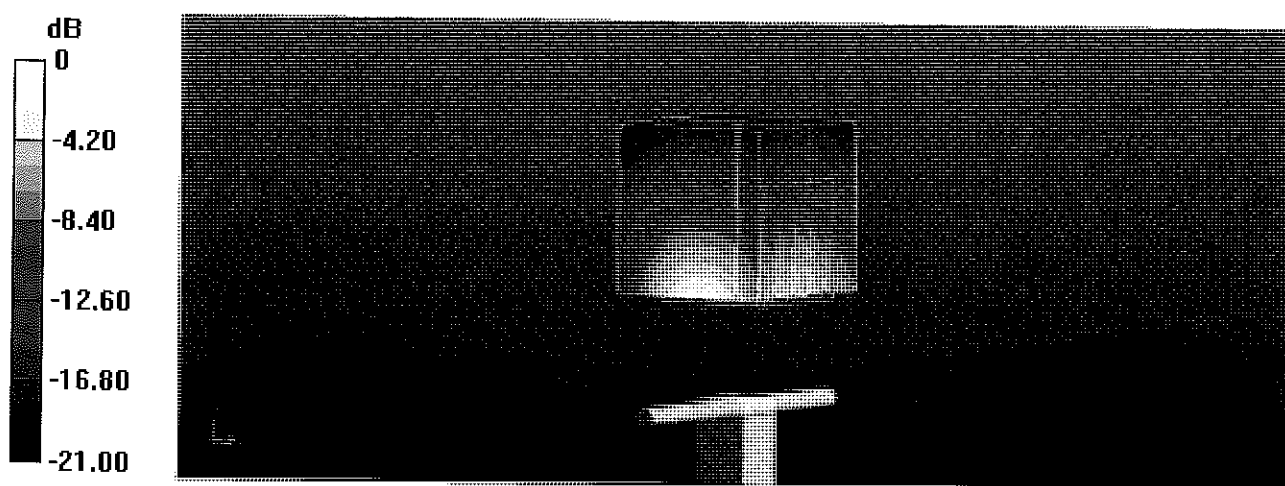
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 104.5 V/m; Power Drift = 0.06 dB

Peak SAR (extrapolated) = 23.0 W/kg

**SAR(1 g) = 11.9 W/kg; SAR(10 g) = 5.69 W/kg**

Maximum value of SAR (measured) = 18.2 W/kg

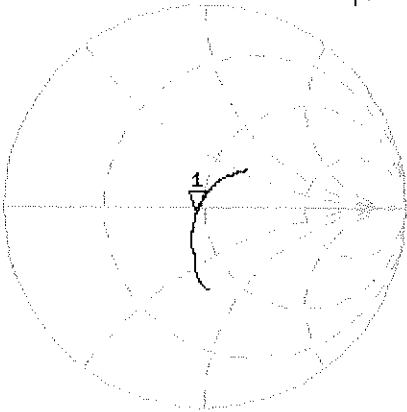


0 dB = 18.2 W/kg = 12.60 dBW/kg

Impedance Measurement Plot for Body TSL

7 Mar 2018 13:11:08  
CH1 S11 1 U FS 1: 45.861  $\Omega$  -3.4160  $\Omega$  20.257 pF 2 300.000 000 MHz

\*  
De1  
Cor

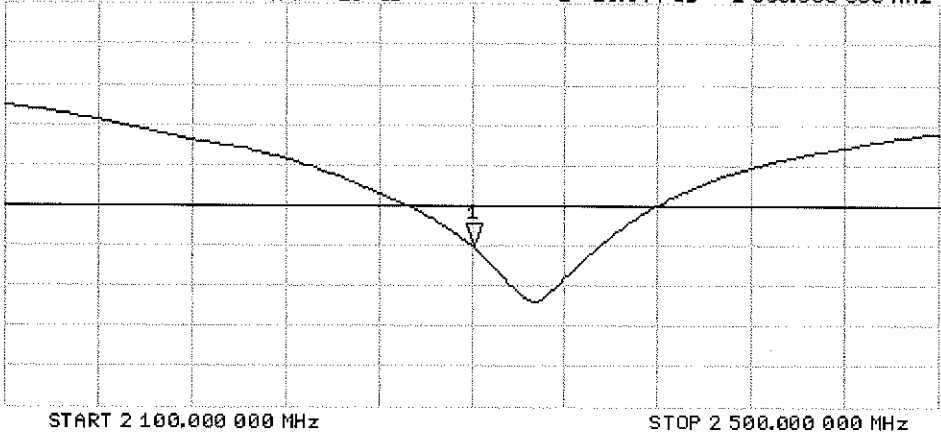


Avg  
16  
H1d

CH2 S11 LOG 5 dB/REF -20 dB 1:-25.044 dB 2 300.000 000 MHz

Cor

Avg  
16  
H1d



# Certification of Calibration

Object D2300V2 – SN: 1038

Calibration procedure(s) Procedure for Calibration Extension for SAR Dipoles.

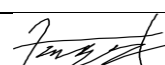
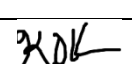
Extended Calibration date: February 25, 2019

Description: SAR Validation Dipole at 2300 MHz.

## Calibration Equipment used:

| Manufacturer       | Model     | Description                                   | Cal Date   | Cal Interval | Cal Due    | Serial Number |
|--------------------|-----------|-----------------------------------------------|------------|--------------|------------|---------------|
| Agilent            | 8753ES    | S-Parameter Network Analyzer                  | 10/2/2018  | Annual       | 10/2/2019  | US39170118    |
| Agilent            | N5182A    | MXG Vector Signal Generator                   | 6/15/2018  | Annual       | 6/15/2019  | MY47420837    |
| Amplifier Research | 15S1G6    | Amplifier                                     | CBT        | N/A          | CBT        | 343972        |
| Anritsu            | MA2411B   | Pulse Power Sensor                            | 10/30/2018 | Annual       | 10/30/2019 | 1207470       |
| Anritsu            | MA2411B   | Pulse Power Sensor                            | 11/20/2018 | Annual       | 11/20/2019 | 1339007       |
| Anritsu            | ML2496A   | Power Meter                                   | 10/21/2018 | Annual       | 10/21/2019 | 1138001       |
| Control Company    | 4040      | Therm./Clock/Humidity Monitor                 | 3/31/2017  | Biennial     | 3/31/2019  | 170232394     |
| Control Company    | 4352      | Ultra Long Stem Thermometer                   | 5/2/2017   | Biennial     | 5/2/2019   | 170330156     |
| Keysight           | 772D      | Dual Directional Coupler                      | CBT        | N/A          | CBT        | MY52180215    |
| Agilent            | 85033E    | 3.5mm Standard Calibration Kit                | 8/13/2018  | Annual       | 8/13/2019  | MY53402352    |
| MiniCircuits       | VLF-6000+ | Low Pass Filter                               | CBT        | N/A          | CBT        | N/A           |
| Mini-Circuits      | BW-N20W5+ | DC to 18 GHz Precision Fixed 20 dB Attenuator | CBT        | N/A          | CBT        | N/A           |
| Narda              | 4772-3    | Attenuator (3dB)                              | CBT        | N/A          | CBT        | 9406          |
| Seekonk            | NC-100    | Torque Wrench                                 | 7/11/2018  | Annual       | 7/11/2019  | N/A           |
| SPEAG              | DAE4      | Dasy Data Acquisition Electronics             | 4/12/2018  | Annual       | 4/12/2019  | 501           |
| SPEAG              | DAE4      | Dasy Data Acquisition Electronics             | 10/18/2018 | Annual       | 10/18/2019 | 1364          |
| SPEAG              | DAK-3.5   | Dielectric Assessment Kit                     | 5/15/2018  | Annual       | 5/15/2019  | 1070          |
| SPEAG              | ES3DV3    | SAR Probe                                     | 4/12/2018  | Annual       | 4/12/2019  | 3275          |
| SPEAG              | EX3DV4    | SAR Probe                                     | 7/20/2018  | Annual       | 7/20/2019  | 7491          |

Measurement Uncertainty =  $\pm 23\%$  (k=2)

|                | Name            | Function           | Signature                                                                             |
|----------------|-----------------|--------------------|---------------------------------------------------------------------------------------|
| Calibrated By: | Sangmin Cha     | Team Lead Engineer |  |
| Approved By:   | Kaitlin O'Keefe | Managing Director  |  |

# DIPOLE CALIBRATION EXTENSION

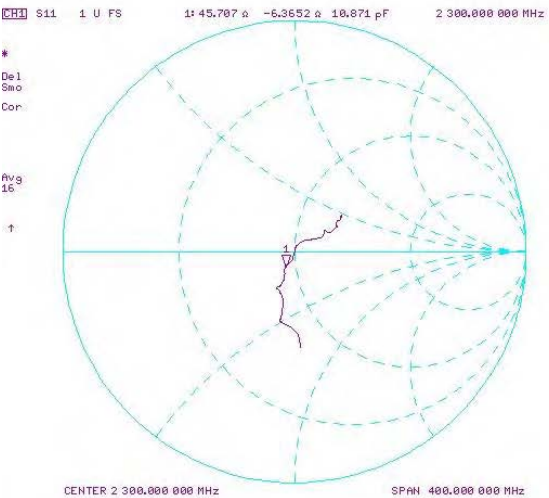
Per KDB 865664 D01, calibration intervals of up to three years may be considered for reference dipoles when it is demonstrated that the SAR target, impedance and return loss of a dipole have remained stable according to the following requirements:

1. The measured SAR does not deviate more than 10% from the target on the calibration certificate.
2. The return-loss does not deviate more than 20% from the previous measurement and meets the required 20dB minimum return-loss requirement.
3. The measurement of real or imaginary parts of impedance does not deviate more than 5Ω from the previous measurement.

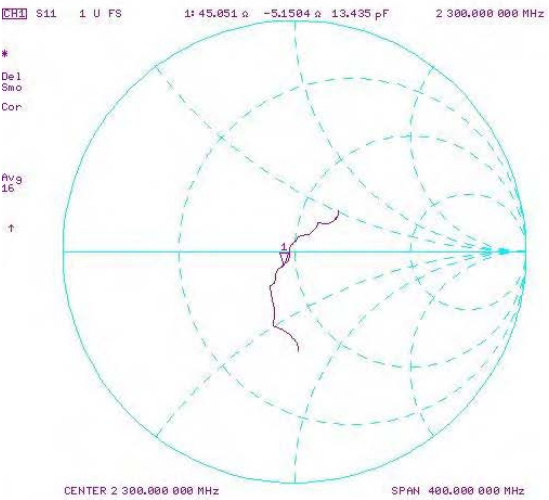
The following dipole was checked to pass the above 3 requirements to have 2-year calibration period from the calibration date:

| Calibration Date | Extension Date | Certificate Electrical Delay (ns) | Certificate SAR Target Head (1g) W/kg @ 20.0 dBm | Measured Head SAR (1g) W/kg @ 20.0 dBm | Deviation 1g (%) | Certificate SAR Target Head (10g) W/kg @ 20.0 dBm | Measured Head SAR (10g) W/kg @ 20.0 dBm | Deviation 10g (%) | Certificate Impedance Head (Ohm) Real | Measured Impedance Head (Ohm) Real | Difference (Ohm) Real | Certificate Impedance Head (Ohm) Imaginary | Measured Impedance Head (Ohm) Imaginary | Difference (Ohm) Imaginary | Certificate Return Loss Head (dB) | Measured Return Loss Head (dB) | Deviation (%) | PASS/FAIL |
|------------------|----------------|-----------------------------------|--------------------------------------------------|----------------------------------------|------------------|---------------------------------------------------|-----------------------------------------|-------------------|---------------------------------------|------------------------------------|-----------------------|--------------------------------------------|-----------------------------------------|----------------------------|-----------------------------------|--------------------------------|---------------|-----------|
| 3/7/2018         | 2/25/2019      | 1.17                              | 4.93                                             | 4.77                                   | -3.25%           | 2.36                                              | 2.29                                    | -2.97%            | 47.8                                  | 45.7                               | 2.1                   | -4.9                                       | -6.4                                    | 1.5                        | -25.2                             | -22.1                          | 12.30%        | PASS      |
| Calibration Date | Extension Date | Certificate Electrical Delay (ns) | Certificate SAR Target Body (1g) W/kg @ 20.0 dBm | Measured Body SAR (1g) W/kg @ 20.0 dBm | Deviation 1g (%) | Certificate SAR Target Body (10g) W/kg @ 20.0 dBm | Measured Body SAR (10g) W/kg @ 20.0 dBm | Deviation 10g (%) | Certificate Impedance Body (Ohm) Real | Measured Impedance Body (Ohm) Real | Difference (Ohm) Real | Certificate Impedance Body (Ohm) Imaginary | Measured Impedance Body (Ohm) Imaginary | Difference (Ohm) Imaginary | Certificate Return Loss Body (dB) | Measured Return Loss Body (dB) | Deviation (%) | PASS/FAIL |
| 3/7/2018         | 2/25/2019      | 1.17                              | 4.67                                             | 4.82                                   | 3.21%            | 2.25                                              | 2.27                                    | 0.89%             | 45.9                                  | 45.1                               | 0.8                   | -3.4                                       | -5.2                                    | 1.8                        | -25                               | -22.7                          | 9.20%         | PASS      |

Impedance & Return-Loss Measurement Plot for Head TSL



Impedance & Return-Loss Measurement Plot for Body TSL





Accredited by the Swiss Accreditation Service (SAS)  
 The Swiss Accreditation Service is one of the signatories to the EA  
 Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 0108**

Client **PC Test**

Certificate No: **D2450V2-921 Nov18**

## CALIBRATION CERTIFICATE

Object **D2450V2 - SN:921**

Calibration procedure(s) **QA CAL-05.v10**  
**Calibration procedure for dipole validation kits above 700 MHz**

Calibration date: **November 12, 2018**

SC ✓  
 12/11/2018  
 BNV ✓  
 12/31/2019

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).  
 The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature  $(22 \pm 3)^{\circ}\text{C}$  and humidity  $< 70\%$ .

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards               | ID #               | Cal Date (Certificate No.)        | Scheduled Calibration  |
|---------------------------------|--------------------|-----------------------------------|------------------------|
| Power meter NRP                 | SN: 104778         | 04-Apr-18 (No. 217-02672/02673)   | Apr-19                 |
| Power sensor NRP-Z91            | SN: 103244         | 04-Apr-18 (No. 217-02672)         | Apr-19                 |
| Power sensor NRP-Z91            | SN: 103245         | 04-Apr-18 (No. 217-02673)         | Apr-19                 |
| Reference 20 dB Attenuator      | SN: 5058 (20k)     | 04-Apr-18 (No. 217-02682)         | Apr-19                 |
| Type-N mismatch combination     | SN: 5047.2 / 06327 | 04-Apr-18 (No. 217-02683)         | Apr-19                 |
| Reference Probe EX3DV4          | SN: 7349           | 30-Dec-17 (No. EX3-7349_Dec17)    | Dec-18                 |
| DAE4                            | SN: 601            | 04-Oct-18 (No. DAE4-601_Oct18)    | Oct-19                 |
| Secondary Standards             | ID #               | Check Date (in house)             | Scheduled Check        |
| Power meter EPM-442A            | SN: GB37480704     | 07-Oct-15 (in house check Oct-18) | In house check: Oct-20 |
| Power sensor HP 8481A           | SN: US37292783     | 07-Oct-15 (in house check Oct-18) | In house check: Oct-20 |
| Power sensor HP 8481A           | SN: MY41092317     | 07-Oct-15 (in house check Oct-18) | In house check: Oct-20 |
| RF generator R&S SMT-06         | SN: 100972         | 15-Jun-15 (in house check Oct-18) | In house check: Oct-20 |
| Network Analyzer Agilent E8358A | SN: US41080477     | 31-Mar-14 (in house check Oct-18) | In house check: Oct-19 |

Calibrated by: **Manu Seitz** **Laboratory Technician**

Approved by: **Katja Pokovic** **Technical Manager**

Signature

Issued: November 12, 2018

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.



Accredited by the Swiss Accreditation Service (SAS)

The Swiss Accreditation Service is one of the signatories to the EA  
Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 0108**

### Glossary:

|       |                                 |
|-------|---------------------------------|
| TSL   | tissue simulating liquid        |
| ConvF | sensitivity in TSL / NORM x,y,z |
| N/A   | not applicable or not measured  |

### Calibration is Performed According to the Following Standards:

- IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
- IEC 62209-1, "Measurement procedure for the assessment of Specific Absorption Rate (SAR) from hand-held and body-mounted devices used next to the ear (frequency range of 300 MHz to 6 GHz)", July 2016
- IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
- KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

### Additional Documentation:

- DASY4/5 System Handbook

### Methods Applied and Interpretation of Parameters:

- Measurement Conditions:** Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- Antenna Parameters with TSL:** The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- Feed Point Impedance and Return Loss:** These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- Electrical Delay:** One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- SAR measured:** SAR measured at the stated antenna input power.
- SAR normalized:** SAR as measured, normalized to an input power of 1 W at the antenna connector.
- SAR for nominal TSL parameters:** The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor  $k=2$ , which for a normal distribution corresponds to a coverage probability of approximately 95%.

## Measurement Conditions

DASY system configuration, as far as not given on page 1.

|                                     |                        |             |
|-------------------------------------|------------------------|-------------|
| <b>DASY Version</b>                 | DASY5                  | V52.10.2    |
| <b>Extrapolation</b>                | Advanced Extrapolation |             |
| <b>Phantom</b>                      | Modular Flat Phantom   |             |
| <b>Distance Dipole Center - TSL</b> | 10 mm                  | with Spacer |
| <b>Zoom Scan Resolution</b>         | dx, dy, dz = 5 mm      |             |
| <b>Frequency</b>                    | 2450 MHz $\pm$ 1 MHz   |             |

## Head TSL parameters

The following parameters and calculations were applied.

|                                                | <b>Temperature</b>  | <b>Permittivity</b> | <b>Conductivity</b>  |
|------------------------------------------------|---------------------|---------------------|----------------------|
| <b>Nominal Head TSL parameters</b>             | 22.0 °C             | 39.2                | 1.80 mho/m           |
| <b>Measured Head TSL parameters</b>            | (22.0 $\pm$ 0.2) °C | 37.9 $\pm$ 6 %      | 1.86 mho/m $\pm$ 6 % |
| <b>Head TSL temperature change during test</b> | < 0.5 °C            | ----                | ----                 |

## SAR result with Head TSL

|                                                             |                    |                                                |
|-------------------------------------------------------------|--------------------|------------------------------------------------|
| <b>SAR averaged over 1 cm<sup>3</sup> (1 g) of Head TSL</b> | Condition          |                                                |
| SAR measured                                                | 250 mW input power | 13.6 W/kg                                      |
| SAR for nominal Head TSL parameters                         | normalized to 1W   | <b>53.1 W/kg <math>\pm</math> 17.0 % (k=2)</b> |

|                                                               |                    |                                                |
|---------------------------------------------------------------|--------------------|------------------------------------------------|
| <b>SAR averaged over 10 cm<sup>3</sup> (10 g) of Head TSL</b> | condition          |                                                |
| SAR measured                                                  | 250 mW input power | 6.28 W/kg                                      |
| SAR for nominal Head TSL parameters                           | normalized to 1W   | <b>24.8 W/kg <math>\pm</math> 16.5 % (k=2)</b> |

## Body TSL parameters

The following parameters and calculations were applied.

|                                                | <b>Temperature</b>  | <b>Permittivity</b> | <b>Conductivity</b>  |
|------------------------------------------------|---------------------|---------------------|----------------------|
| <b>Nominal Body TSL parameters</b>             | 22.0 °C             | 52.7                | 1.95 mho/m           |
| <b>Measured Body TSL parameters</b>            | (22.0 $\pm$ 0.2) °C | 51.4 $\pm$ 6 %      | 2.02 mho/m $\pm$ 6 % |
| <b>Body TSL temperature change during test</b> | < 0.5 °C            | ----                | ----                 |

## SAR result with Body TSL

|                                                             |                    |                                                |
|-------------------------------------------------------------|--------------------|------------------------------------------------|
| <b>SAR averaged over 1 cm<sup>3</sup> (1 g) of Body TSL</b> | Condition          |                                                |
| SAR measured                                                | 250 mW input power | 13.0 W/kg                                      |
| SAR for nominal Body TSL parameters                         | normalized to 1W   | <b>50.8 W/kg <math>\pm</math> 17.0 % (k=2)</b> |

|                                                               |                    |                                                |
|---------------------------------------------------------------|--------------------|------------------------------------------------|
| <b>SAR averaged over 10 cm<sup>3</sup> (10 g) of Body TSL</b> | condition          |                                                |
| SAR measured                                                  | 250 mW input power | 6.03 W/kg                                      |
| SAR for nominal Body TSL parameters                           | normalized to 1W   | <b>23.8 W/kg <math>\pm</math> 16.5 % (k=2)</b> |

## Appendix (Additional assessments outside the scope of SCS 0108)

### Antenna Parameters with Head TSL

|                                      |                             |
|--------------------------------------|-----------------------------|
| Impedance, transformed to feed point | $54.7 \Omega + 6.5 j\Omega$ |
| Return Loss                          | - 22.3 dB                   |

### Antenna Parameters with Body TSL

|                                      |                             |
|--------------------------------------|-----------------------------|
| Impedance, transformed to feed point | $50.7 \Omega + 7.8 j\Omega$ |
| Return Loss                          | - 22.2 dB                   |

### General Antenna Parameters and Design

|                                  |          |
|----------------------------------|----------|
| Electrical Delay (one direction) | 1.157 ns |
|----------------------------------|----------|

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

### Additional EUT Data

|                 |                    |
|-----------------|--------------------|
| Manufactured by | SPEAG              |
| Manufactured on | September 26, 2013 |

## DASY5 Validation Report for Head TSL

Date: 12.11.2018

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:921**

Communication System: UID 0 - CW; Frequency: 2450 MHz

Medium parameters used:  $f = 2450$  MHz;  $\sigma = 1.86$  S/m;  $\epsilon_r = 37.9$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(7.88, 7.88, 7.88) @ 2450 MHz; Calibrated: 30.12.2017
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.10.2018
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.10.2(1495); SEMCAD X 14.6.12(7450)

### Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

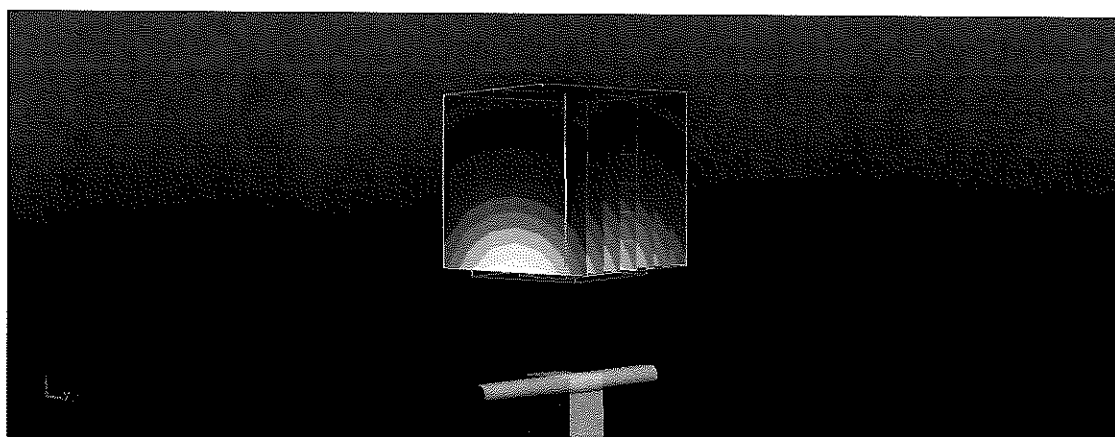
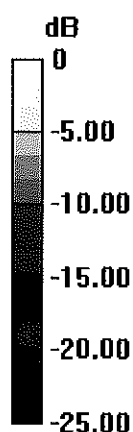
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 117.7 V/m; Power Drift = -0.09 dB

Peak SAR (extrapolated) = 27.4 W/kg

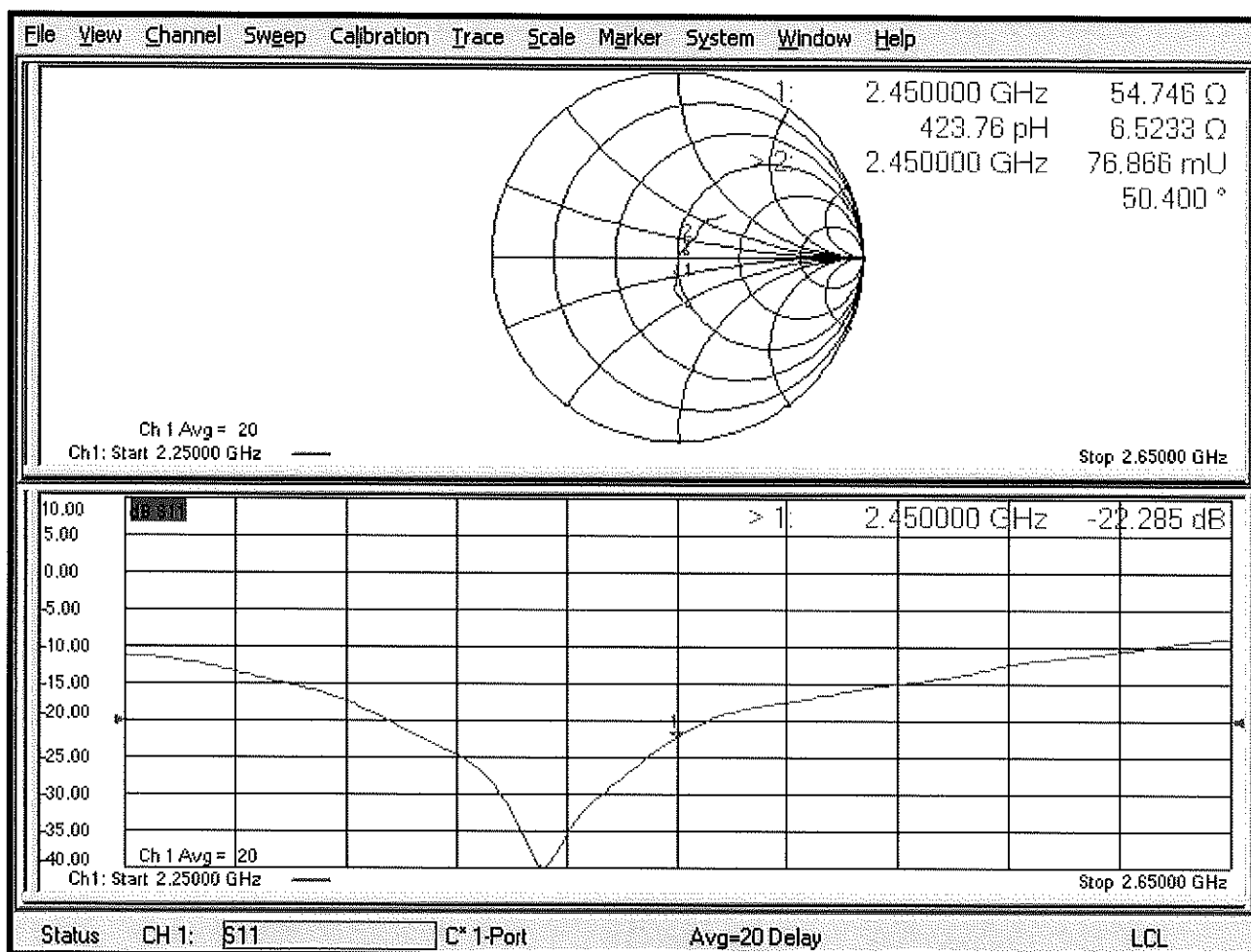
**SAR(1 g) = 13.6 W/kg; SAR(10 g) = 6.28 W/kg**

Maximum value of SAR (measured) = 22.4 W/kg



0 dB = 22.4 W/kg = 13.50 dBW/kg

## Impedance Measurement Plot for Head TSL



## DASY5 Validation Report for Body TSL

Date: 12.11.2018

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:921**

Communication System: UID 0 - CW; Frequency: 2450 MHz

Medium parameters used:  $f = 2450$  MHz;  $\sigma = 2.02$  S/m;  $\epsilon_r = 51.4$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(8.01, 8.01, 8.01) @ 2450 MHz; Calibrated: 30.12.2017
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.10.2018
- Phantom: Flat Phantom 5.0 (back); Type: QD 000 P50 AA; Serial: 1002
- DASY52 52.10.2(1495); SEMCAD X 14.6.12(7450)

### **Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:**

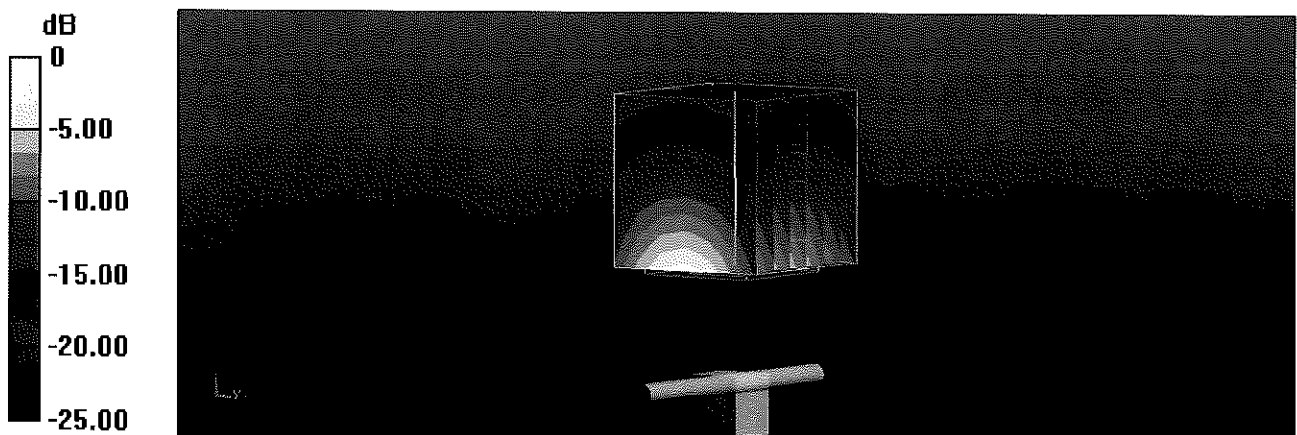
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 108.6 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 26.1 W/kg

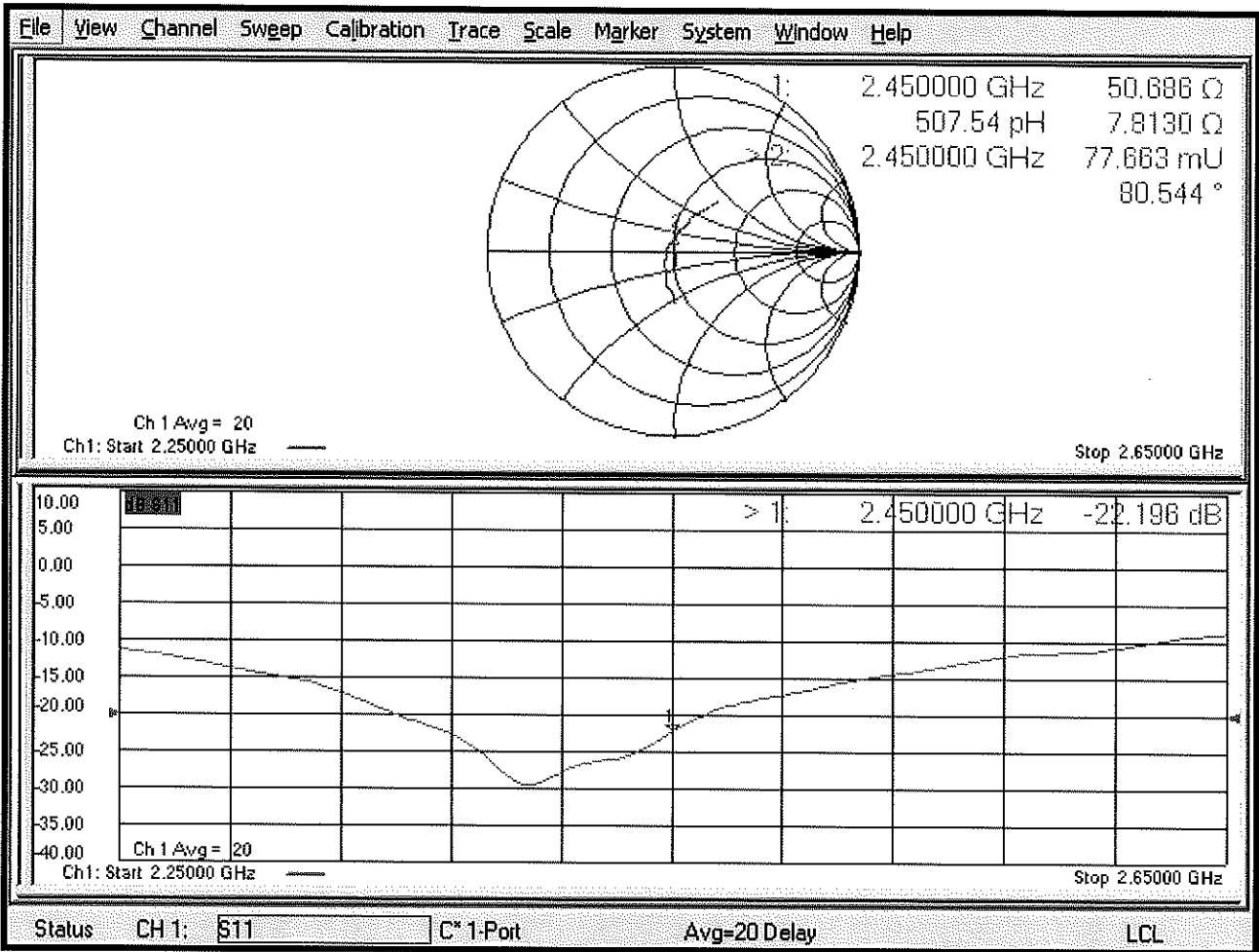
**SAR(1 g) = 13 W/kg; SAR(10 g) = 6.03 W/kg**

Maximum value of SAR (measured) = 21.3 W/kg



0 dB = 21.3 W/kg = 13.28 dBW/kg

Impedance Measurement Plot for Body TSL



# Certification of Calibration

Object D2450V2 – SN: 921

Calibration procedure(s) Procedure for Calibration Extension for SAR Dipoles.

Extended Calibration date: November 11, 2019

Description: SAR Validation Dipole at 2450 MHz.

## Calibration Equipment used:

| Manufacturer          | Model     | Description                                             | Cal Date   | Cal Interval | Cal Due    | Serial Number |
|-----------------------|-----------|---------------------------------------------------------|------------|--------------|------------|---------------|
| Agilent               | 8753ES    | S-Parameter Network Analyzer                            | 8/26/2019  | Annual       | 8/26/2020  | MY40000670    |
| Agilent               | E4438C    | ESG Vector Signal Generator                             | 6/27/2019  | Annual       | 6/27/2020  | MY45093852    |
| Amplifier Research    | 15S1G6    | Amplifier                                               | CBT        | N/A          | CBT        | 343972        |
| Anritsu               | ML2495A   | Power Meter                                             | 11/20/2018 | Annual       | 11/20/2019 | 1039008       |
| Anritsu               | MA2411B   | Pulse Power Sensor                                      | 11/20/2018 | Annual       | 11/20/2019 | 1027293       |
| Anritsu               | MA2411B   | Pulse Power Sensor                                      | 11/20/2018 | Annual       | 11/20/2019 | 1339007       |
| Control Company       | 4040      | Temperature / Humidity Monitor                          | 2/28/2018  | Biennial     | 2/28/2020  | 150761911     |
| Control Company       | 4352      | Ultra Long Stem Thermometer                             | 2/28/2018  | Biennial     | 2/28/2020  | 170330160     |
| Keysight Technologies | 85033E    | Standard Mechanical Calibration Kit (DC to 9GHz, 3.5mm) | 7/2/2019   | Annual       | 7/2/2020   | MY53401181    |
| Keysight              | 772D      | Dual Directional Coupler                                | CBT        | N/A          | CBT        | MY52180215    |
| Mini-Circuits         | BW-N20W5+ | DC to 18 GHz Precision Fixed 20 dB Attenuator           | CBT        | N/A          | CBT        | N/A           |
| Mini-Circuits         | NLP-2950+ | Low Pass Filter DC to 2700 MHz                          | CBT        | N/A          | CBT        | N/A           |
| Narda                 | 4772-3    | Attenuator (3dB)                                        | CBT        | N/A          | CBT        | 9406          |
| Pasternack            | PE2209-10 | Bidirectional Coupler                                   | CBT        | N/A          | CBT        | N/A           |
| Seekonk               | NC-100    | Torque Wrench                                           | 5/4/2018   | Biennial     | 5/4/2020   | 22216         |
| SPEAG                 | DAK-3.5   | Dielectric Assessment Kit                               | 5/7/2019   | Annual       | 5/7/2020   | 1070          |
| SPEAG                 | EX3DV4    | SAR Probe                                               | 1/24/2019  | Annual       | 1/24/2020  | 7490          |
| SPEAG                 | DAE4      | Data Acquisition Electronics                            | 1/15/2019  | Annual       | 1/15/2020  | 1532          |

Measurement Uncertainty =  $\pm 23\%$  (k=2)

|                | Name            | Function                 | Signature           |
|----------------|-----------------|--------------------------|---------------------|
| Calibrated By: | Parker Jones    | Team Lead Engineer       | <i>Parker Jones</i> |
| Approved By:   | Kaitlin O'Keefe | Senior Technical Manager | <i>KOK</i>          |

# DIPOLE CALIBRATION EXTENSION

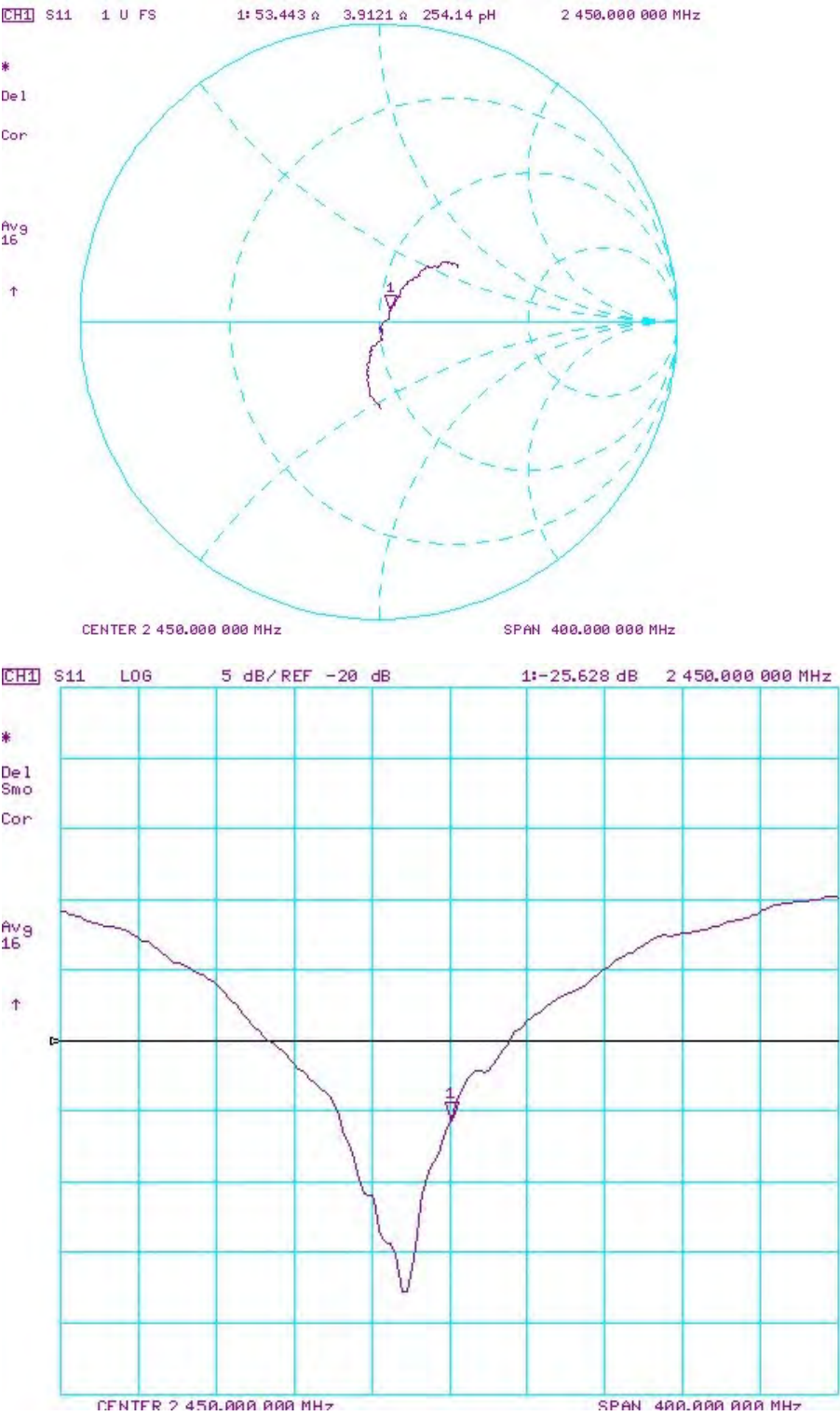
Per KDB 865664 D01, calibration intervals of up to three years may be considered for reference dipoles when it is demonstrated that the SAR target, impedance and return loss of a dipole have remained stable according to the following requirements:

1. The measured SAR does not deviate more than 10% from the target on the calibration certificate.
2. The return-loss does not deviate more than 20% from the previous measurement and meets the required 20dB minimum return-loss requirement.
3. The measurement of real or imaginary parts of impedance does not deviate more than 5Ω from the previous measurement.

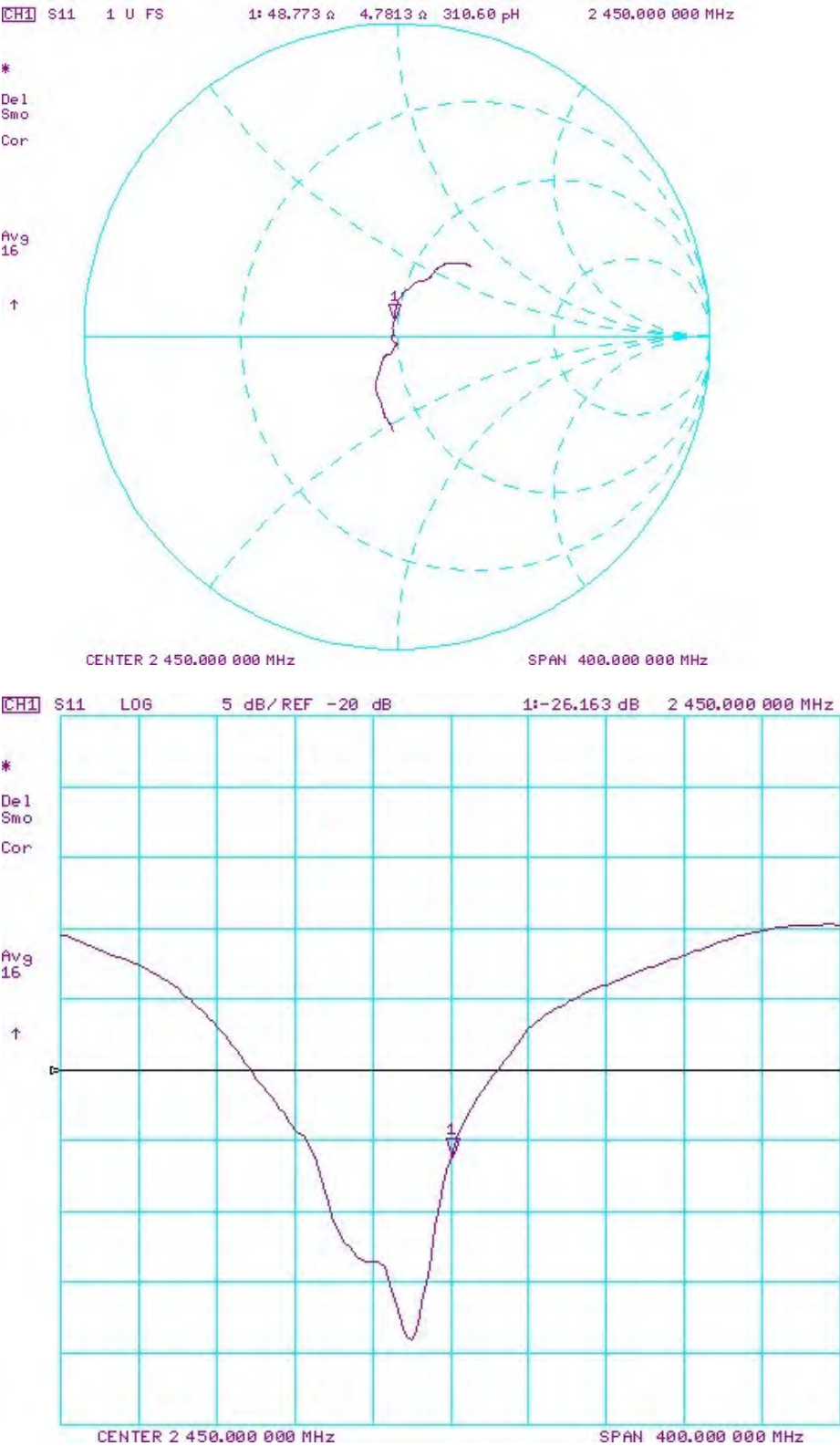
The following dipole was checked to pass the above 3 requirements to have 2-year calibration period from the calibration date:

| Calibration Date | Extension Date | Certificate Electrical Delay (ns) | Certificate SAR Target Head (1g) W/kg @ 20.0 dBm | Measured Head SAR (1g) W/kg @ 20.0 dBm | Deviation 1g (%) | Certificate SAR Target Body (10g) W/kg @ 20.0 dBm | Measured Body SAR (10g) W/kg @ 20.0 dBm | Deviation 10g (%) | Certificate Impedance Head (Ohm) Real | Measured Impedance Head (Ohm) Real | Difference (Ohm) Real | Certificate Impedance Head (Ohm) Imaginary | Measured Impedance Head (Ohm) Imaginary | Difference (Ohm) Imaginary | Certificate Return Loss Head (dB) | Measured Return Loss Head (dB) | Deviation (%) | PASS/FAIL |
|------------------|----------------|-----------------------------------|--------------------------------------------------|----------------------------------------|------------------|---------------------------------------------------|-----------------------------------------|-------------------|---------------------------------------|------------------------------------|-----------------------|--------------------------------------------|-----------------------------------------|----------------------------|-----------------------------------|--------------------------------|---------------|-----------|
| 11/12/2018       | 11/11/2019     | 1.157                             | 5.31                                             | 5.28                                   | -0.56%           | 2.48                                              | 2.38                                    | -4.03%            | 54.7                                  | 53.4                               | 1.3                   | 6.5                                        | 3.9                                     | 2.6                        | -22.3                             | -25.6                          | -14.80%       | PASS      |
| Calibration Date | Extension Date | Certificate Electrical Delay (ns) | Certificate SAR Target Body (1g) W/kg @ 20.0 dBm | Measured Body SAR (1g) W/kg @ 20.0 dBm | Deviation 1g (%) | Certificate SAR Target Body (10g) W/kg @ 20.0 dBm | Measured Body SAR (10g) W/kg @ 20.0 dBm | Deviation 10g (%) | Certificate Impedance Body (Ohm) Real | Measured Impedance Body (Ohm) Real | Difference (Ohm) Real | Certificate Impedance Body (Ohm) Imaginary | Measured Impedance Body (Ohm) Imaginary | Difference (Ohm) Imaginary | Certificate Return Loss Body (dB) | Measured Return Loss Body (dB) | Deviation (%) | PASS/FAIL |
| 11/12/2018       | 11/11/2019     | 1.157                             | 5.08                                             | 5.41                                   | 6.50%            | 2.38                                              | 2.47                                    | 3.78%             | 50.7                                  | 48.8                               | 1.9                   | 7.8                                        | 4.8                                     | 3                          | -22.2                             | -26.2                          | -18.00%       | PASS      |

Impedance & Return-Loss Measurement Plot for Head TSL



Impedance & Return-Loss Measurement Plot for Body TSL





Accredited by the Swiss Accreditation Service (SAS)  
 The Swiss Accreditation Service is one of the signatories to the EA  
 Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 0108**

Client **PC Test**

Certificate No: **D2450V2-945\_May18**

## CALIBRATION CERTIFICATE

Object **D2450V2 - SN:945**

Calibration procedure(s) **QA CAL-05.v10**  
**Calibration procedure for dipole validation kits above 700 MHz**

Calibration date: **May 16, 2018**

*SCV*  
*5/31/2018*  
*BNV*  
*06/01/2019*

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).  
 The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature ( $22 \pm 3$ )°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards           | ID #               | Cal Date (Certificate No.)      | Scheduled Calibration |
|-----------------------------|--------------------|---------------------------------|-----------------------|
| Power meter NRP             | SN: 104778         | 04-Apr-18 (No. 217-02672/02673) | Apr-19                |
| Power sensor NRP-Z91        | SN: 103244         | 04-Apr-18 (No. 217-02672)       | Apr-19                |
| Power sensor NRP-Z91        | SN: 103245         | 04-Apr-18 (No. 217-02673)       | Apr-19                |
| Reference 20 dB Attenuator  | SN: 5058 (20k)     | 04-Apr-18 (No. 217-02682)       | Apr-19                |
| Type-N mismatch combination | SN: 5047.2 / 06327 | 04-Apr-18 (No. 217-02683)       | Apr-19                |
| Reference Probe EX3DV4      | SN: 7349           | 30-Dec-17 (No. EX3-7349_Dec17)  | Dec-18                |
| DAE4                        | SN: 601            | 26-Oct-17 (No. DAE4-601_Oct17)  | Oct-18                |

| Secondary Standards       | ID #           | Check Date (in house)             | Scheduled Check        |
|---------------------------|----------------|-----------------------------------|------------------------|
| Power meter EPM-442A      | SN: GB37480704 | 07-Oct-15 (in house check Oct-16) | In house check: Oct-18 |
| Power sensor HP 8481A     | SN: US37292783 | 07-Oct-15 (in house check Oct-16) | In house check: Oct-18 |
| Power sensor HP 8481A     | SN: MY41092317 | 07-Oct-15 (in house check Oct-16) | In house check: Oct-18 |
| RF generator R&S SMT-06   | SN: 100972     | 15-Jun-15 (in house check Oct-16) | In house check: Oct-18 |
| Network Analyzer HP 8753E | SN: US37390585 | 18-Oct-01 (in house check Oct-17) | In house check: Oct-18 |

|                |               |                       |                    |
|----------------|---------------|-----------------------|--------------------|
|                | Name          | Function              | Signature          |
| Calibrated by: | Manu Seltz    | Laboratory Technician | <i>[Signature]</i> |
| Approved by:   | Katja Pokovic | Technical Manager     | <i>[Signature]</i> |

Issued: May 17, 2018

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.



Accredited by the Swiss Accreditation Service (SAS)

The Swiss Accreditation Service is one of the signatories to the EA  
Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 0108**

**Glossary:**

|       |                                 |
|-------|---------------------------------|
| TSL   | tissue simulating liquid        |
| ConvF | sensitivity in TSL / NORM x,y,z |
| N/A   | not applicable or not measured  |

**Calibration is Performed According to the Following Standards:**

- IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
- IEC 62209-1, "Measurement procedure for the assessment of Specific Absorption Rate (SAR) from hand-held and body-mounted devices used next to the ear (frequency range of 300 MHz to 6 GHz)", July 2016
- IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
- KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

**Additional Documentation:**

- DASY4/5 System Handbook

**Methods Applied and Interpretation of Parameters:**

- Measurement Conditions:** Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- Antenna Parameters with TSL:** The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- Feed Point Impedance and Return Loss:** These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- Electrical Delay:** One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- SAR measured:** SAR measured at the stated antenna input power.
- SAR normalized:** SAR as measured, normalized to an input power of 1 W at the antenna connector.
- SAR for nominal TSL parameters:** The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor  $k=2$ , which for a normal distribution corresponds to a coverage probability of approximately 95%.

## Measurement Conditions

DASY system configuration, as far as not given on page 1.

|                                     |                        |             |
|-------------------------------------|------------------------|-------------|
| <b>DASY Version</b>                 | DASY5                  | V52.10.1    |
| <b>Extrapolation</b>                | Advanced Extrapolation |             |
| <b>Phantom</b>                      | Modular Flat Phantom   |             |
| <b>Distance Dipole Center - TSL</b> | 10 mm                  | with Spacer |
| <b>Zoom Scan Resolution</b>         | dx, dy, dz = 5 mm      |             |
| <b>Frequency</b>                    | 2450 MHz $\pm$ 1 MHz   |             |

## Head TSL parameters

The following parameters and calculations were applied.

|                                                | Temperature         | Permittivity   | Conductivity         |
|------------------------------------------------|---------------------|----------------|----------------------|
| <b>Nominal Head TSL parameters</b>             | 22.0 °C             | 39.2           | 1.80 mho/m           |
| <b>Measured Head TSL parameters</b>            | (22.0 $\pm$ 0.2) °C | 38.2 $\pm$ 6 % | 1.85 mho/m $\pm$ 6 % |
| <b>Head TSL temperature change during test</b> | < 0.5 °C            | ----           | ----                 |

## SAR result with Head TSL

|                                                             |                    |                                                |
|-------------------------------------------------------------|--------------------|------------------------------------------------|
| <b>SAR averaged over 1 cm<sup>3</sup> (1 g) of Head TSL</b> | Condition          |                                                |
| SAR measured                                                | 250 mW input power | 13.0 W/kg                                      |
| SAR for nominal Head TSL parameters                         | normalized to 1W   | <b>51.0 W/kg <math>\pm</math> 17.0 % (k=2)</b> |

|                                                               |                    |                                                |
|---------------------------------------------------------------|--------------------|------------------------------------------------|
| <b>SAR averaged over 10 cm<sup>3</sup> (10 g) of Head TSL</b> | condition          |                                                |
| SAR measured                                                  | 250 mW input power | 6.02 W/kg                                      |
| SAR for nominal Head TSL parameters                           | normalized to 1W   | <b>23.8 W/kg <math>\pm</math> 16.5 % (k=2)</b> |

## Body TSL parameters

The following parameters and calculations were applied.

|                                                | Temperature         | Permittivity   | Conductivity         |
|------------------------------------------------|---------------------|----------------|----------------------|
| <b>Nominal Body TSL parameters</b>             | 22.0 °C             | 52.7           | 1.95 mho/m           |
| <b>Measured Body TSL parameters</b>            | (22.0 $\pm$ 0.2) °C | 52.3 $\pm$ 6 % | 1.99 mho/m $\pm$ 6 % |
| <b>Body TSL temperature change during test</b> | < 0.5 °C            | ----           | ----                 |

## SAR result with Body TSL

|                                                             |                    |                                                |
|-------------------------------------------------------------|--------------------|------------------------------------------------|
| <b>SAR averaged over 1 cm<sup>3</sup> (1 g) of Body TSL</b> | Condition          |                                                |
| SAR measured                                                | 250 mW input power | 12.5 W/kg                                      |
| SAR for nominal Body TSL parameters                         | normalized to 1W   | <b>49.4 W/kg <math>\pm</math> 17.0 % (k=2)</b> |

|                                                               |                    |                                                |
|---------------------------------------------------------------|--------------------|------------------------------------------------|
| <b>SAR averaged over 10 cm<sup>3</sup> (10 g) of Body TSL</b> | condition          |                                                |
| SAR measured                                                  | 250 mW input power | 5.83 W/kg                                      |
| SAR for nominal Body TSL parameters                           | normalized to 1W   | <b>23.2 W/kg <math>\pm</math> 16.5 % (k=2)</b> |

## Appendix (Additional assessments outside the scope of SCS 0108)

### Antenna Parameters with Head TSL

|                                      |                               |
|--------------------------------------|-------------------------------|
| Impedance, transformed to feed point | $56.1\ \Omega + 3.7\ j\Omega$ |
| Return Loss                          | - 23.5 dB                     |

### Antenna Parameters with Body TSL

|                                      |                               |
|--------------------------------------|-------------------------------|
| Impedance, transformed to feed point | $51.9\ \Omega + 5.0\ j\Omega$ |
| Return Loss                          | - 25.7 dB                     |

### General Antenna Parameters and Design

|                                  |          |
|----------------------------------|----------|
| Electrical Delay (one direction) | 1.157 ns |
|----------------------------------|----------|

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

### Additional EUT Data

|                 |                |
|-----------------|----------------|
| Manufactured by | SPEAG          |
| Manufactured on | March 15, 2014 |

## DASY5 Validation Report for Head TSL

Date: 16.05.2018

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:945**

Communication System: UID 0 - CW; Frequency: 2450 MHz

Medium parameters used:  $f = 2450$  MHz;  $\sigma = 1.85$  S/m;  $\epsilon_r = 38.2$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(7.88, 7.88, 7.88) @ 2450 MHz; Calibrated: 30.12.2017
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 26.10.2017
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.10.1(1476); SEMCAD X 14.6.11(7439)

### **Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:**

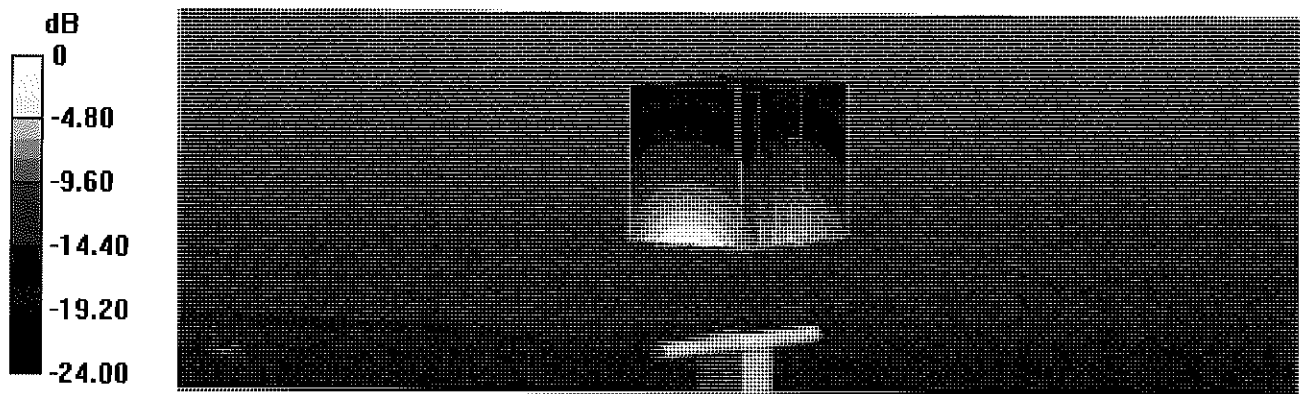
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 114.8 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 25.9 W/kg

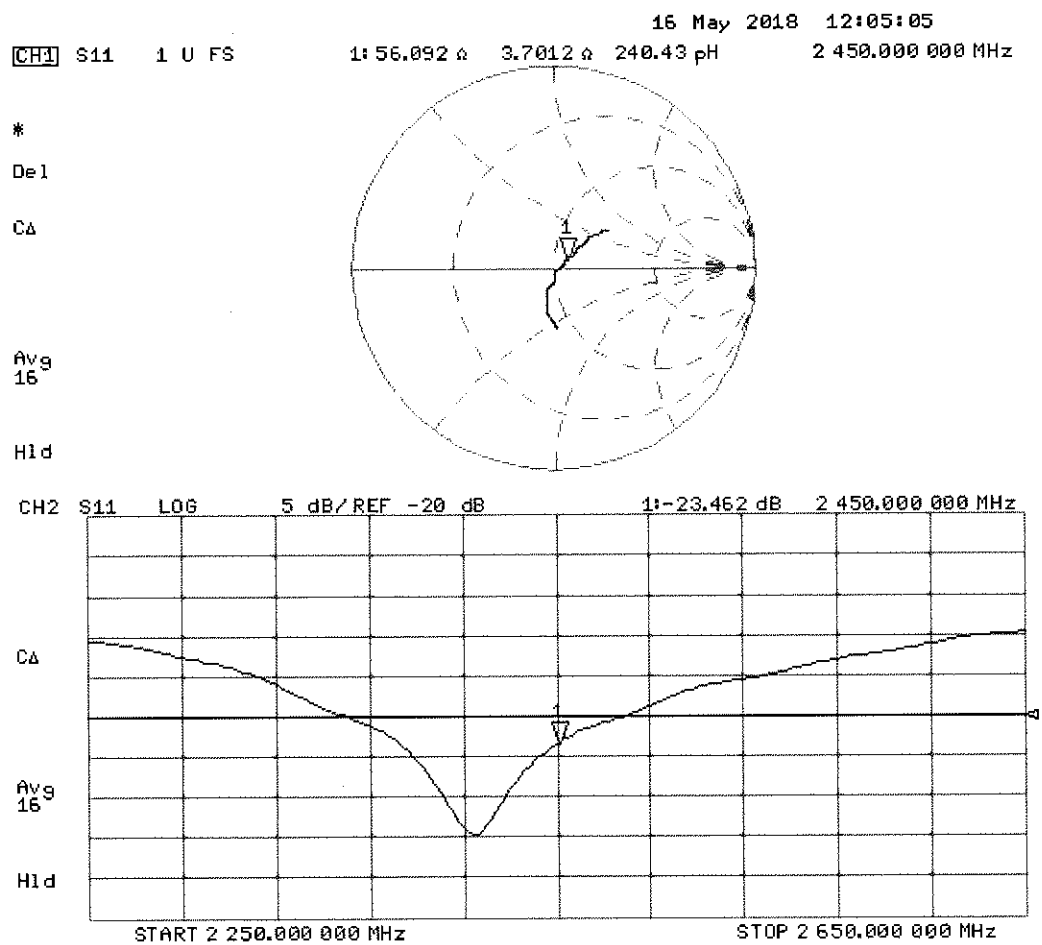
**SAR(1 g) = 13 W/kg; SAR(10 g) = 6.02 W/kg**

Maximum value of SAR (measured) = 21.4 W/kg



0 dB = 21.4 W/kg = 13.30 dBW/kg

# Impedance Measurement Plot for Head TSL



## DASY5 Validation Report for Body TSL

Date: 16.05.2018

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:945**

Communication System: UID 0 - CW; Frequency: 2450 MHz

Medium parameters used:  $f = 2450$  MHz;  $\sigma = 1.99$  S/m;  $\epsilon_r = 52.3$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(8.01, 8.01, 8.01) @ 2450 MHz; Calibrated: 30.12.2017
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 26.10.2017
- Phantom: Flat Phantom 5.0 (back); Type: QD 000 P50 AA; Serial: 1002
- DASY52 52.10.1(1476); SEMCAD X 14.6.11(7439)

### **Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:**

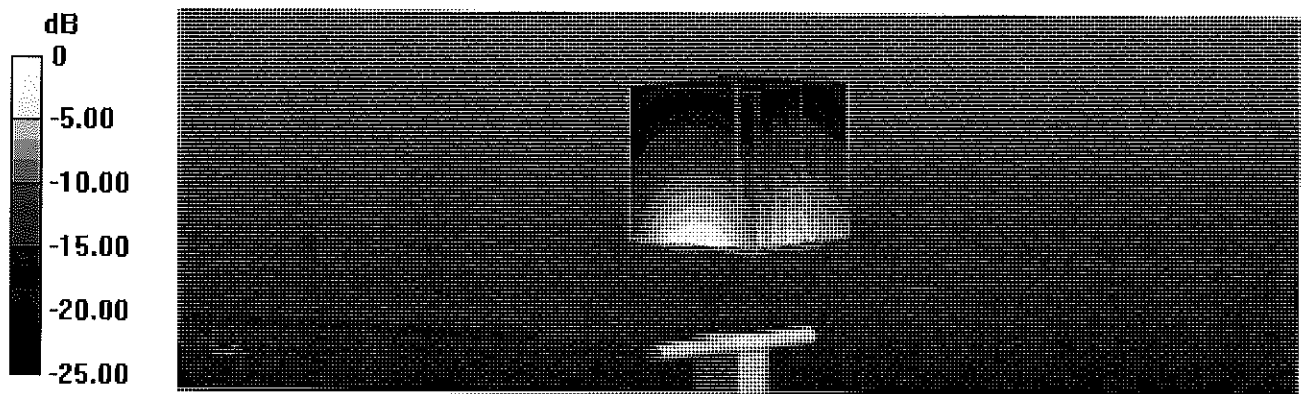
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 106.8 V/m; Power Drift = -0.09 dB

Peak SAR (extrapolated) = 25.0 W/kg

**SAR(1 g) = 12.5 W/kg; SAR(10 g) = 5.83 W/kg**

Maximum value of SAR (measured) = 20.2 W/kg

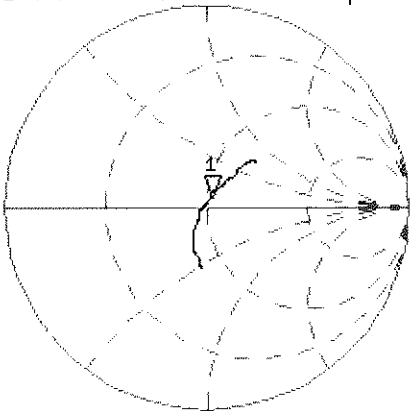


0 dB = 20.2 W/kg = 13.05 dBW/kg

Impedance Measurement Plot for Body TSL

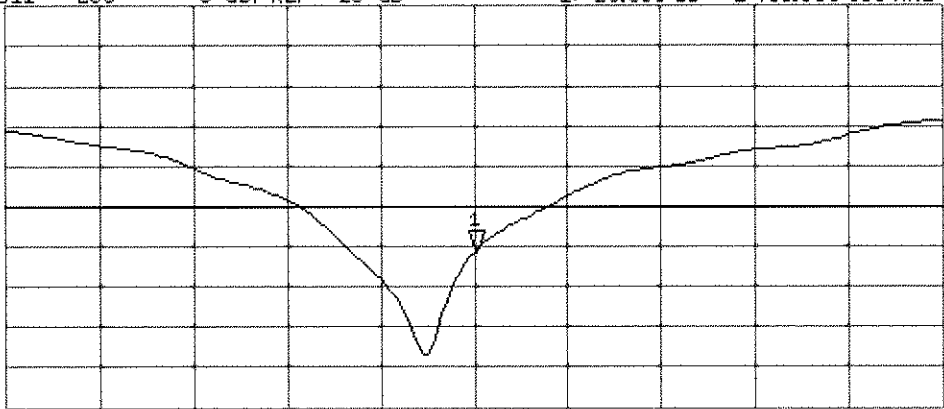
16 May 2018 12:03:43  
[CH1] S11 1 U FS 1: 51.910  $\Omega$  4.9629  $\Omega$  322.40  $\mu$ H 2 450.000 000 MHz

\*  
De1  
CA  
Avg  
16  
H1d



CH2 S11 LOG 5 dB/REF -20 dB 1:-25.659 dB 2 450.000 000 MHz

CA  
Avg  
16  
H1d



START 2 250.000 000 MHz STOP 2 650.000 000 MHz

# Certification of Calibration

Object D2450V2 – SN: 945

Calibration procedure(s) Procedure for Calibration Extension for SAR Dipoles.

Extended Calibration date: May 16, 2019

Description: SAR Validation Dipole at 2450 MHz.

## Calibration Equipment used:

| Manufacturer          | Model     | Description                                             | Cal Date   | Cal Interval | Cal Due    | Serial Number |
|-----------------------|-----------|---------------------------------------------------------|------------|--------------|------------|---------------|
| Agilent               | 8753ES    | S-Parameter Network Analyzer                            | 10/2/2018  | Annual       | 10/2/2019  | US39170118    |
| Agilent               | N5182A    | MXG Vector Signal Generator                             | 6/15/2018  | Annual       | 6/15/2019  | MY47420837    |
| Amplifier Research    | 15S1G6    | Amplifier                                               | CBT        | N/A          | CBT        | 343972        |
| Anritsu               | ML2495A   | Power Meter                                             | 10/21/2018 | Annual       | 10/21/2019 | 941001        |
| Anritsu               | MA2411B   | Pulse Power Sensor                                      | 10/30/2018 | Annual       | 10/30/2019 | 1207470       |
| Anritsu               | MA2411B   | Pulse Power Sensor                                      | 11/20/2018 | Annual       | 11/20/2019 | 1339007       |
| Control Company       | 4040      | Temperature / Humidity Monitor                          | 2/28/2018  | Biennial     | 2/28/2020  | 150761911     |
| Control Company       | 4352      | Ultra Long Stem Thermometer                             | 2/28/2018  | Biennial     | 2/28/2020  | 170330160     |
| Keysight              | 772D      | Dual Directional Coupler                                | CBT        | N/A          | CBT        | MY52180215    |
| Keysight Technologies | 85033E    | Standard Mechanical Calibration Kit (DC to 9GHz, 3.5mm) | 6/4/2018   | Annual       | 6/4/2019   | MY53401181    |
| Mini-Circuits         | BW-N20W5+ | DC to 18 GHz Precision Fixed 20 dB Attenuator           | CBT        | N/A          | CBT        | N/A           |
| Mini-Circuits         | NLP-2950+ | Low Pass Filter DC to 2700 MHz                          | CBT        | N/A          | CBT        | N/A           |
| Narda                 | 4772-3    | Attenuator (3dB)                                        | CBT        | N/A          | CBT        | 9406          |
| Pasternack            | PE2209-10 | Bidirectional Coupler                                   | CBT        | N/A          | CBT        | N/A           |
| Pasternack            | PE5011-1  | Torque Wrench                                           | 7/19/2017  | Biennial     | 7/19/2019  | N/A           |
| SPEAG                 | DAKS-3.5  | Portable DAK                                            | 9/11/2018  | Annual       | 9/11/2019  | 1045          |
| SPEAG                 | EX3DV4    | SAR Probe                                               | 7/20/2018  | Annual       | 7/20/2019  | 7416          |
| SPEAG                 | DAE4      | Dasy Data Acquisition Electronics                       | 7/10/2018  | Annual       | 7/10/2019  | 1402          |

Measurement Uncertainty =  $\pm 23\%$  (k=2)

|                | Name            | Function                 | Signature           |
|----------------|-----------------|--------------------------|---------------------|
| Calibrated By: | Parker Jones    | Team Lead Engineer       | <i>Parker Jones</i> |
| Approved By:   | Kaitlin O'Keefe | Senior Technical Manager | <i>KOK</i>          |

# DIPOLE CALIBRATION EXTENSION

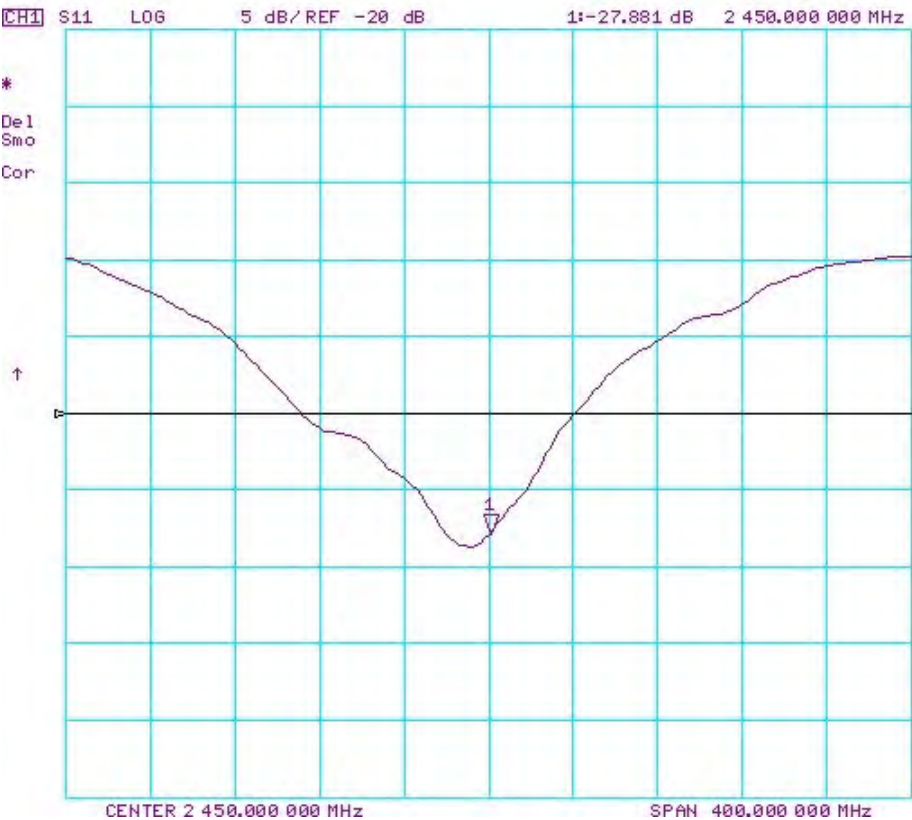
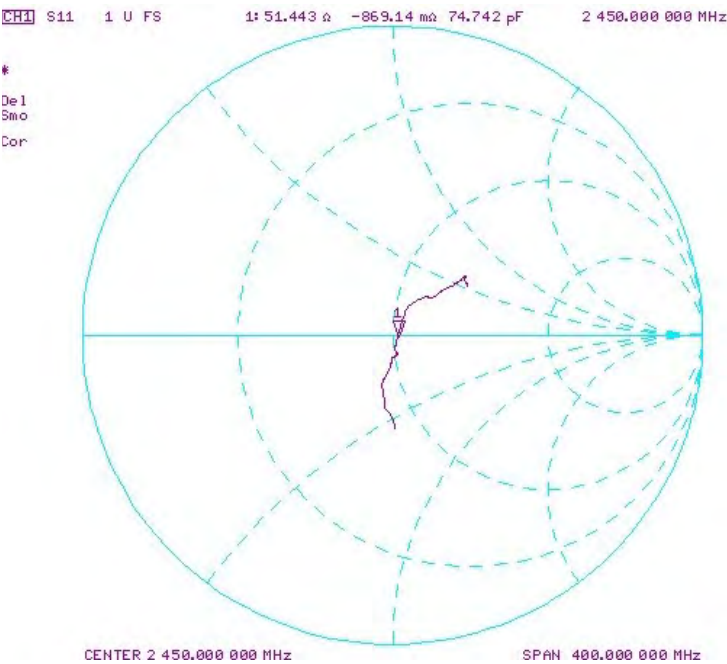
Per KDB 865664 D01, calibration intervals of up to three years may be considered for reference dipoles when it is demonstrated that the SAR target, impedance and return loss of a dipole have remained stable according to the following requirements:

1. The measured SAR does not deviate more than 10% from the target on the calibration certificate.
2. The return-loss does not deviate more than 20% from the previous measurement and meets the required 20dB minimum return-loss requirement.
3. The measurement of real or imaginary parts of impedance does not deviate more than 5Ω from the previous measurement.

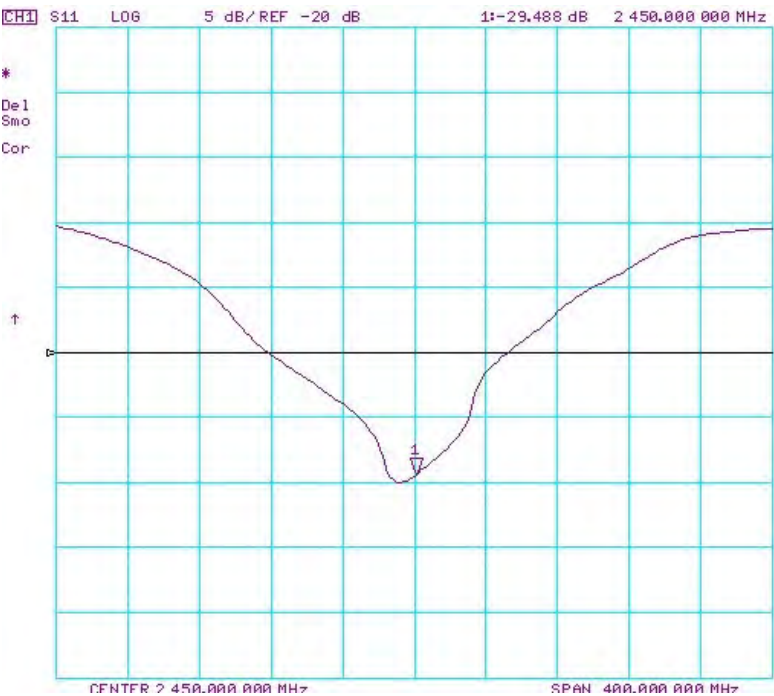
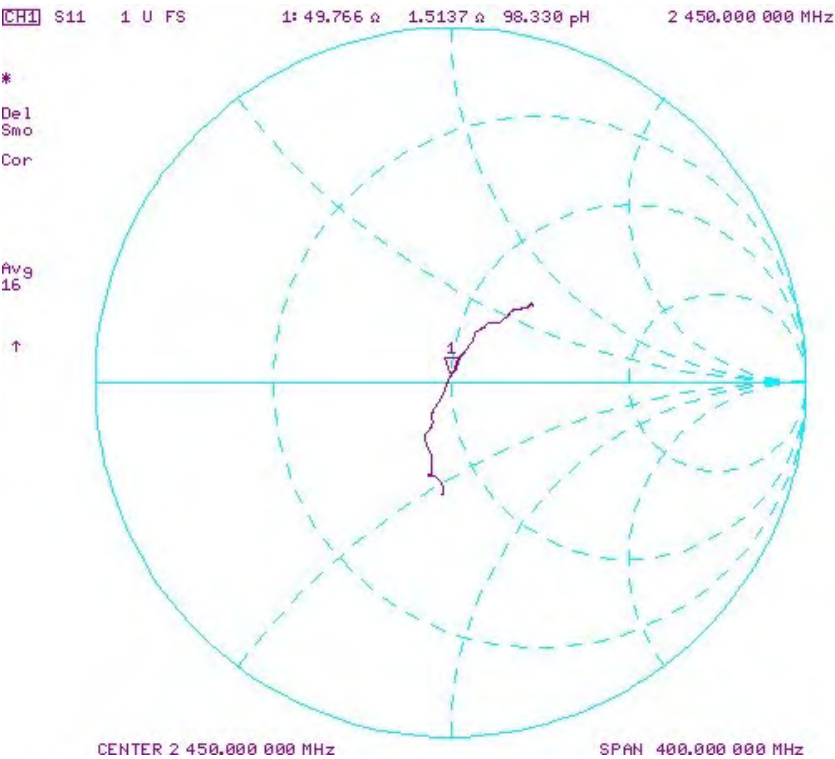
The following dipole was checked to pass the above 3 requirements to have 2-year calibration period from the calibration date:

| Calibration Date | Extension Date | Certificate Electrical Delay (ns) | Certificate SAR Target Head (1g) W/kg @ 20.0 dBm | Measured Head SAR (1g) W/kg @ 20.0 dBm | Deviation 1g (%) | Certificate SAR Target Body (10g) W/kg @ 20.0 dBm | Measured Body SAR (10g) W/kg @ 20.0 dBm | Deviation 10g (%) | Certificate Impedance Head (Ohm) Real | Measured Impedance Head (Ohm) Real | Difference (Ohm) Real | Certificate Impedance Head (Ohm) Imaginary | Measured Impedance Head (Ohm) Imaginary | Difference (Ohm) Imaginary | Certificate Return Loss Head (dB) | Measured Return Loss Head (dB) | Deviation (%) | PASS/FAIL |
|------------------|----------------|-----------------------------------|--------------------------------------------------|----------------------------------------|------------------|---------------------------------------------------|-----------------------------------------|-------------------|---------------------------------------|------------------------------------|-----------------------|--------------------------------------------|-----------------------------------------|----------------------------|-----------------------------------|--------------------------------|---------------|-----------|
| 5/16/2018        | 5/16/2019      | 1.157                             | 5.1                                              | 5.23                                   | 3.73%            | 2.38                                              | 2.44                                    | 2.52%             | 56.1                                  | 51.4                               | 4.7                   | 3.7                                        | -0.9                                    | 4.6                        | -23.5                             | -27.9                          | -18.60%       | PASS      |
| Calibration Date | Extension Date | Certificate Electrical Delay (ns) | Certificate SAR Target Body (1g) W/kg @ 20.0 dBm | Measured Body SAR (1g) W/kg @ 20.0 dBm | Deviation 1g (%) | Certificate SAR Target Body (10g) W/kg @ 20.0 dBm | Measured Body SAR (10g) W/kg @ 20.0 dBm | Deviation 10g (%) | Certificate Impedance Body (Ohm) Real | Measured Impedance Body (Ohm) Real | Difference (Ohm) Real | Certificate Impedance Body (Ohm) Imaginary | Measured Impedance Body (Ohm) Imaginary | Difference (Ohm) Imaginary | Certificate Return Loss Body (dB) | Measured Return Loss Body (dB) | Deviation (%) | PASS/FAIL |
| 5/16/2018        | 5/16/2019      | 1.157                             | 4.94                                             | 5.21                                   | 5.47%            | 2.32                                              | 2.38                                    | 2.59%             | 51.9                                  | 49.8                               | 2.1                   | 5                                          | 1.5                                     | 3.5                        | -25.7                             | -29.5                          | -14.70%       | PASS      |

Impedance & Return-Loss Measurement Plot for Head TSL



Impedance & Return-Loss Measurement Plot for Body TSL





Accredited by the Swiss Accreditation Service (SAS)  
 The Swiss Accreditation Service is one of the signatories to the EA  
 Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 0108**

Client **PG Test**

Certificate No: **D2600V2-1009 Jun18**

## CALIBRATION CERTIFICATE

Object **D2600V2 - SN:1009**

Calibration procedure(s) **QA CAL-05.v10**  
**Calibration procedure for dipole validation kits above 700 MHz**

Calibration date: **June 19, 2018**

SC ✓  
 6/28/18

BN ✓  
 7/01/18

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).  
 The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature ( $22 \pm 3$ )°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards           | ID #               | Cal Date (Certificate No.)      | Scheduled Calibration |
|-----------------------------|--------------------|---------------------------------|-----------------------|
| Power meter NRP             | SN: 104778         | 04-Apr-18 (No. 217-02672/02673) | Apr-19                |
| Power sensor NRP-Z91        | SN: 103244         | 04-Apr-18 (No. 217-02672)       | Apr-19                |
| Power sensor NRP-Z91        | SN: 103245         | 04-Apr-18 (No. 217-02673)       | Apr-19                |
| Reference 20 dB Attenuator  | SN: 5058 (20k)     | 04-Apr-18 (No. 217-02682)       | Apr-19                |
| Type-N mismatch combination | SN: 5047.2 / 06327 | 04-Apr-18 (No. 217-02683)       | Apr-19                |
| Reference Probe EX3DV4      | SN: 7349           | 30-Dec-17 (No. EX3-7349_Dec17)  | Dec-18                |
| DAE4                        | SN: 601            | 26-Oct-17 (No. DAE4-601_Oct17)  | Oct-18                |

| Secondary Standards       | ID #           | Check Date (in house)             | Scheduled Check        |
|---------------------------|----------------|-----------------------------------|------------------------|
| Power meter EPM-442A      | SN: GB37480704 | 07-Oct-15 (in house check Oct-16) | In house check: Oct-18 |
| Power sensor HP 8481A     | SN: US37292783 | 07-Oct-15 (in house check Oct-16) | In house check: Oct-18 |
| Power sensor HP 8481A     | SN: MY41092317 | 07-Oct-15 (in house check Oct-16) | In house check: Oct-18 |
| RF generator R&S SMT-06   | SN: 100972     | 15-Jun-15 (in house check Oct-16) | In house check: Oct-18 |
| Network Analyzer HP 8753E | SN: US37390585 | 18-Oct-01 (in house check Oct-17) | In house check: Oct-18 |

Calibrated by: **Claudio Leubler** **Laboratory Technician**

Approved by: **Katja Pokovic** **Technical Manager**

Signature

Issued: June 21, 2018

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.



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The Swiss Accreditation Service is one of the signatories to the EA  
Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 0108**

### Glossary:

|       |                                 |
|-------|---------------------------------|
| TSL   | tissue simulating liquid        |
| ConvF | sensitivity in TSL / NORM x,y,z |
| N/A   | not applicable or not measured  |

### Calibration is Performed According to the Following Standards:

- IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
- IEC 62209-1, "Measurement procedure for the assessment of Specific Absorption Rate (SAR) from hand-held and body-mounted devices used next to the ear (frequency range of 300 MHz to 6 GHz)", July 2016
- IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
- KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

### Additional Documentation:

- DASY4/5 System Handbook

### Methods Applied and Interpretation of Parameters:

- Measurement Conditions:** Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- Antenna Parameters with TSL:** The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- Feed Point Impedance and Return Loss:** These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- Electrical Delay:** One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- SAR measured:** SAR measured at the stated antenna input power.
- SAR normalized:** SAR as measured, normalized to an input power of 1 W at the antenna connector.
- SAR for nominal TSL parameters:** The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor  $k=2$ , which for a normal distribution corresponds to a coverage probability of approximately 95%.

## Measurement Conditions

DASY system configuration, as far as not given on page 1.

|                              |                        |             |
|------------------------------|------------------------|-------------|
| DASY Version                 | DASY5                  | V52.10.1    |
| Extrapolation                | Advanced Extrapolation |             |
| Phantom                      | Modular Flat Phantom   |             |
| Distance Dipole Center - TSL | 10 mm                  | with Spacer |
| Zoom Scan Resolution         | dx, dy, dz = 5 mm      |             |
| Frequency                    | 2600 MHz $\pm$ 1 MHz   |             |

## Head TSL parameters

The following parameters and calculations were applied.

|                                         | Temperature         | Permittivity   | Conductivity         |
|-----------------------------------------|---------------------|----------------|----------------------|
| Nominal Head TSL parameters             | 22.0 °C             | 39.0           | 1.96 mho/m           |
| Measured Head TSL parameters            | (22.0 $\pm$ 0.2) °C | 37.4 $\pm$ 6 % | 2.03 mho/m $\pm$ 6 % |
| Head TSL temperature change during test | < 0.5 °C            | ----           | ----                 |

## SAR result with Head TSL

|                                                             |                    |                                                |
|-------------------------------------------------------------|--------------------|------------------------------------------------|
| <b>SAR averaged over 1 cm<sup>3</sup> (1 g) of Head TSL</b> | Condition          |                                                |
| SAR measured                                                | 250 mW input power | 14.3 W/kg                                      |
| SAR for nominal Head TSL parameters                         | normalized to 1W   | <b>55.8 W/kg <math>\pm</math> 17.0 % (k=2)</b> |

|                                                               |                    |                                                |
|---------------------------------------------------------------|--------------------|------------------------------------------------|
| <b>SAR averaged over 10 cm<sup>3</sup> (10 g) of Head TSL</b> | condition          |                                                |
| SAR measured                                                  | 250 mW input power | 6.38 W/kg                                      |
| SAR for nominal Head TSL parameters                           | normalized to 1W   | <b>25.1 W/kg <math>\pm</math> 16.5 % (k=2)</b> |

## Body TSL parameters

The following parameters and calculations were applied.

|                                         | Temperature         | Permittivity   | Conductivity         |
|-----------------------------------------|---------------------|----------------|----------------------|
| Nominal Body TSL parameters             | 22.0 °C             | 52.5           | 2.16 mho/m           |
| Measured Body TSL parameters            | (22.0 $\pm$ 0.2) °C | 51.8 $\pm$ 6 % | 2.22 mho/m $\pm$ 6 % |
| Body TSL temperature change during test | < 0.5 °C            | ----           | ----                 |

## SAR result with Body TSL

|                                                             |                    |                                                |
|-------------------------------------------------------------|--------------------|------------------------------------------------|
| <b>SAR averaged over 1 cm<sup>3</sup> (1 g) of Body TSL</b> | Condition          |                                                |
| SAR measured                                                | 250 mW input power | 14.1 W/kg                                      |
| SAR for nominal Body TSL parameters                         | normalized to 1W   | <b>55.5 W/kg <math>\pm</math> 17.0 % (k=2)</b> |

|                                                               |                    |                                                |
|---------------------------------------------------------------|--------------------|------------------------------------------------|
| <b>SAR averaged over 10 cm<sup>3</sup> (10 g) of Body TSL</b> | condition          |                                                |
| SAR measured                                                  | 250 mW input power | 6.31 W/kg                                      |
| SAR for nominal Body TSL parameters                           | normalized to 1W   | <b>25.0 W/kg <math>\pm</math> 16.5 % (k=2)</b> |

## Appendix (Additional assessments outside the scope of SCS 0108)

### Antenna Parameters with Head TSL

|                                      |                                |
|--------------------------------------|--------------------------------|
| Impedance, transformed to feed point | 49.8 $\Omega$ - 5.0 j $\Omega$ |
| Return Loss                          | - 26.0 dB                      |

### Antenna Parameters with Body TSL

|                                      |                                |
|--------------------------------------|--------------------------------|
| Impedance, transformed to feed point | 44.3 $\Omega$ - 4.8 j $\Omega$ |
| Return Loss                          | - 22.1 dB                      |

### General Antenna Parameters and Design

|                                  |          |
|----------------------------------|----------|
| Electrical Delay (one direction) | 1.153 ns |
|----------------------------------|----------|

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

### Additional EUT Data

|                 |                |
|-----------------|----------------|
| Manufactured by | SPEAG          |
| Manufactured on | April 12, 2007 |

## DASY5 Validation Report for Head TSL

Date: 13.06.2018

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 2600 MHz; Type: D2600V2; Serial: D2600V2 - SN:1009**

Communication System: UID 0 - CW; Frequency: 2600 MHz

Medium parameters used:  $f = 2600$  MHz;  $\sigma = 2.03$  S/m;  $\epsilon_r = 37.4$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(7.7, 7.7, 7.7) @ 2600 MHz; Calibrated: 30.12.2017
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 26.10.2017
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.10.1(1476); SEMCAD X 14.6.11(7439)

### **Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:**

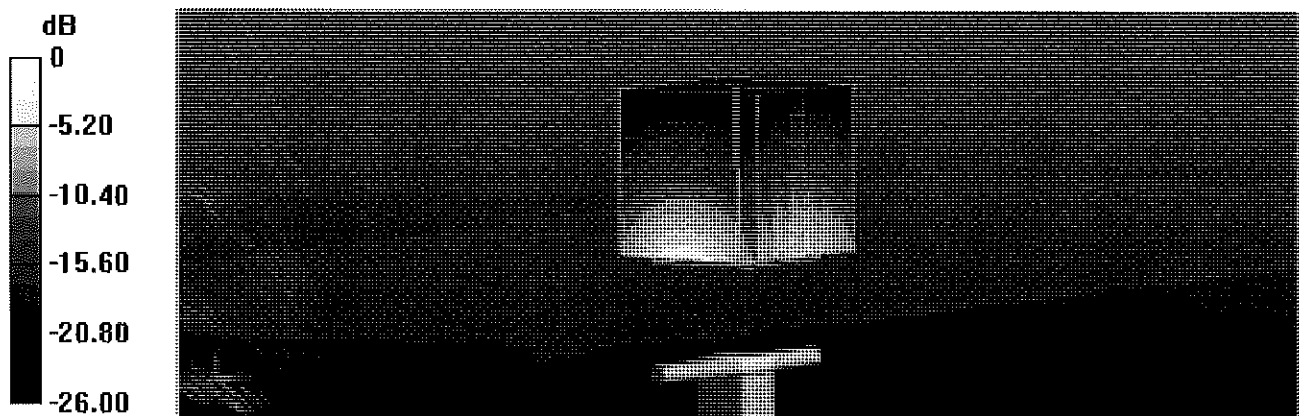
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 117.9 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 28.4 W/kg

**SAR(1 g) = 14.3 W/kg; SAR(10 g) = 6.38 W/kg**

Maximum value of SAR (measured) = 23.7 W/kg

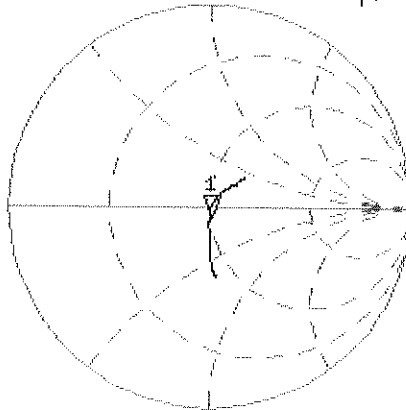


0 dB = 23.7 W/kg = 13.75 dBW/kg

# Impedance Measurement Plot for Head TSL

13 Jun 2018 12:15:33  
 CH1 S11 1 U FS 1: 49.844  $\Omega$  -4.9863  $\Omega$  12.276 pF 2 500.000 000 MHz

\*  
 Del  
 CA



Avg  
 16

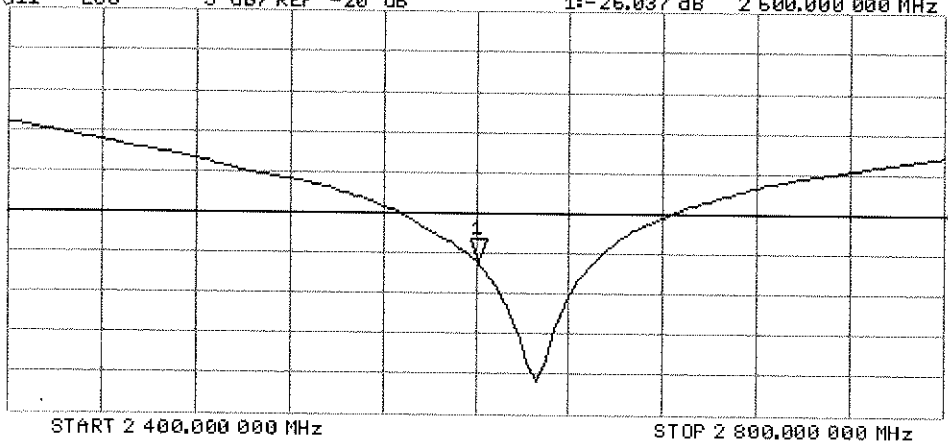
H1d

CH2 S11 LOG 5 dB/REF -20 dB 1: -26.037 dB 2 500.000 000 MHz

CA

Avg  
 16

H1d



## DASY5 Validation Report for Body TSL

Date: 19.06.2018

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 2600 MHz; Type: D2600V2; Serial: D2600V2 - SN:1009**

Communication System: UID 0 - CW; Frequency: 2600 MHz

Medium parameters used:  $f = 2600$  MHz;  $\sigma = 2.22$  S/m;  $\epsilon_r = 51.8$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(7.81, 7.81, 7.81) @ 2600 MHz; Calibrated: 30.12.2017
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 26.10.2017
- Phantom: Flat Phantom 5.0 (back); Type: QD 000 P50 AA; Serial: 1002
- DASY52 52.10.1(1476); SEMCAD X 14.6.11(7439)

### **Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:**

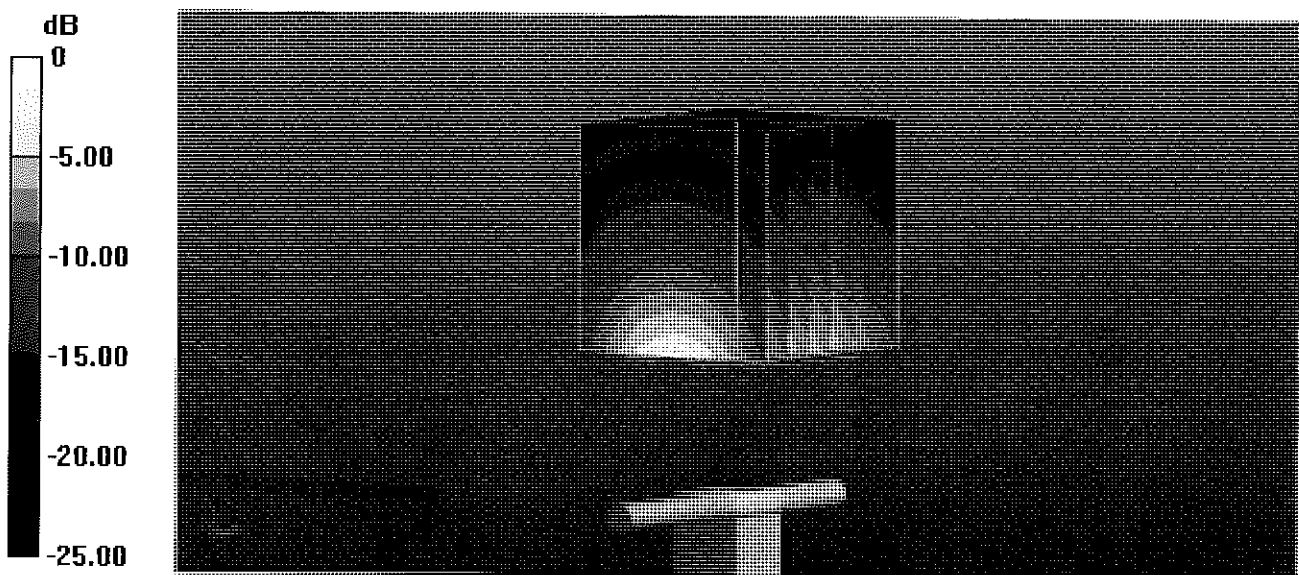
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 109.4 V/m; Power Drift = -0.07 dB

Peak SAR (extrapolated) = 28.7 W/kg

**SAR(1 g) = 14.1 W/kg; SAR(10 g) = 6.31 W/kg**

Maximum value of SAR (measured) = 23.7 W/kg

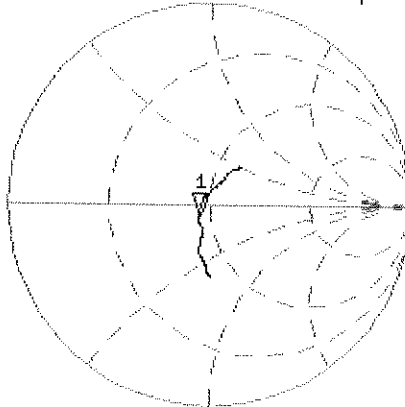


0 dB = 23.7 W/kg = 13.75 dBW/kg

# Impedance Measurement Plot for Body TSL

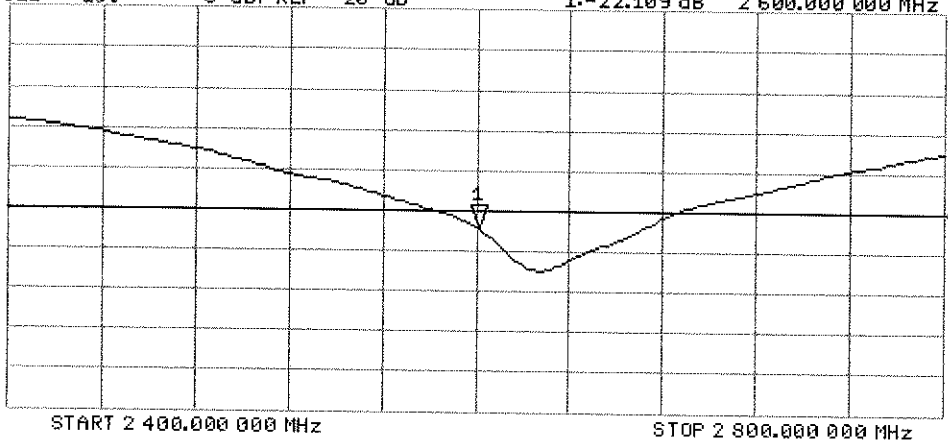
19 Jun 2018 10:04:18  
 CH1 S11 1 U FS 1: 44.344  $\Omega$  -4.7832  $\Omega$  12.798 pF 2 500.000 000 MHz

\*  
 Del  
 CA  
 Avg  
 16  
 H1d



CH2 S11 LOG 5 dB/REF -20 dB 1:-22.109 dB 2 500.000 000 MHz

CA  
 Avg  
 16  
 H1d



# Certification of Calibration

Object D2600V2 – SN: 1009

Calibration procedure(s) Procedure for Calibration Extension for SAR Dipoles.

Extended Calibration date: June 19, 2019

Description: SAR Validation Dipole at 2600 MHz.

## Calibration Equipment used:

| Manufacturer       | Model     | Description                                   | Cal Date   | Cal Interval | Cal Due    | Serial Number |
|--------------------|-----------|-----------------------------------------------|------------|--------------|------------|---------------|
| Agilent            | 8753ES    | S-Parameter Network Analyzer                  | 10/2/2018  | Annual       | 10/2/2019  | US39170118    |
| Agilent            | E4438C    | ESG Vector Signal Generator                   | 6/26/2018  | Annual       | 6/26/2019  | MY42081752    |
| Agilent            | 85033E    | 3.5mm Standard Calibration Kit                | 8/13/2018  | Annual       | 8/13/2019  | MY53402352    |
| Amplifier Research | 1551G6    | Amplifier                                     | CBT        | N/A          | CBT        | 343972        |
| Anritsu            | ML2495A   | Power Meter                                   | 10/21/2018 | Annual       | 10/21/2019 | 941001        |
| Anritsu            | MA2411B   | Pulse Power Sensor                            | 10/30/2018 | Annual       | 10/30/2019 | 1207470       |
| Anritsu            | MA2411B   | Pulse Power Sensor                            | 11/20/2018 | Annual       | 11/20/2019 | 1339007       |
| Control Company    | 4040      | Temperature / Humidity Monitor                | 2/28/2018  | Biennial     | 2/28/2020  | 150761911     |
| Control Company    | 4352      | Ultra Long Stem Thermometer                   | 2/28/2018  | Biennial     | 2/28/2020  | 170330160     |
| Keysight           | 772D      | Dual Directional Coupler                      | CBT        | N/A          | CBT        | MY52180215    |
| Mini-Circuits      | BW-N20W5+ | DC to 18 GHz Precision Fixed 20 dB Attenuator | CBT        | N/A          | CBT        | N/A           |
| Mini-Circuits      | NLP-2950+ | Low Pass Filter DC to 2700 MHz                | CBT        | N/A          | CBT        | N/A           |
| Narda              | 4772-3    | Attenuator (3dB)                              | CBT        | N/A          | CBT        | 9406          |
| Pasternack         | PE2209-10 | Bidirectional Coupler                         | CBT        | N/A          | CBT        | N/A           |
| Pasternack         | PE5011-1  | Torque Wrench                                 | 7/19/2017  | Biennial     | 7/19/2019  | N/A           |
| SPEAG              | DAKS-3.5  | Portable DAK                                  | 9/11/2018  | Annual       | 9/11/2019  | 1045          |
| SPEAG              | ES3DV3    | SAR Probe                                     | 11/19/2018 | Annual       | 11/19/2019 | 3318          |
| SPEAG              | EX3DV4    | E-field Probes                                | 2/19/2019  | Annual       | 2/19/2020  | 7427          |
| SPEAG              | DAE4      | Dasy Data Acquisition Electronics             | 8/14/2018  | Annual       | 8/14/2019  | 1408          |
| SPEAG              | DAE4      | Dasy Data Acquisition Electronics             | 2/13/2019  | Annual       | 2/13/2020  | 1403          |

Measurement Uncertainty =  $\pm 23\%$  (k=2)

|                | Name            | Function                 | Signature           |
|----------------|-----------------|--------------------------|---------------------|
| Calibrated By: | Parker Jones    | Team Lead Engineer       | <i>Parker Jones</i> |
| Approved By:   | Kaitlin O'Keefe | Senior Technical Manager | <i>KOK</i>          |

# DIPOLE CALIBRATION EXTENSION

Per KDB 865664 D01, calibration intervals of up to three years may be considered for reference dipoles when it is demonstrated that the SAR target, impedance and return loss of a dipole have remained stable according to the following requirements:

1. The measured SAR does not deviate more than 10% from the target on the calibration certificate.
2. The return-loss does not deviate more than 20% from the previous measurement and meets the required 20dB minimum return-loss requirement.
3. The measurement of real or imaginary parts of impedance does not deviate more than 5Ω from the previous measurement.

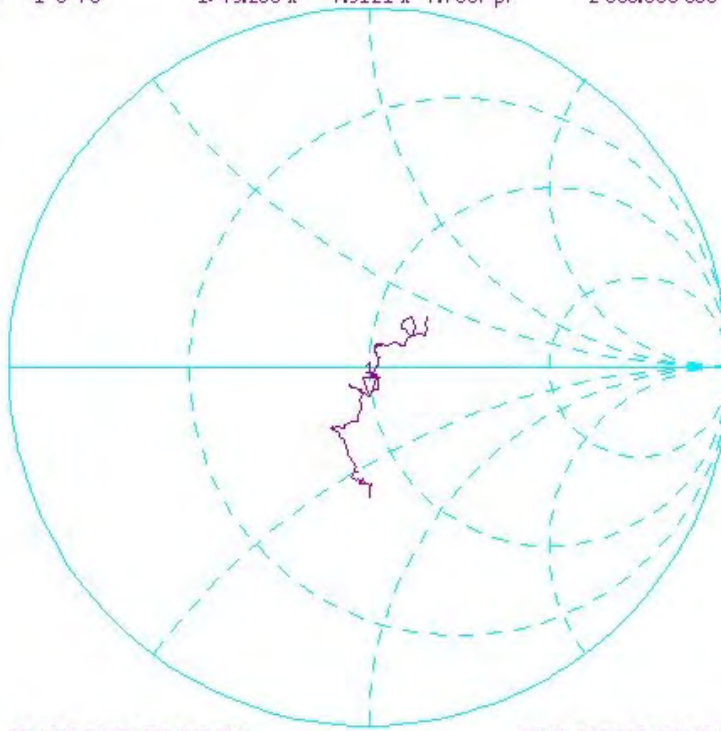
The following dipole was checked to pass the above 3 requirements to have 2-year calibration period from the calibration date:

| Calibration Date | Extension Date | Certificate Electrical Delay (ns) | Certificate SAR Target Head (1g) W/kg @ 20.0 dBm | Measured Head SAR (1g) W/kg @ 20.0 dBm | Deviation 1g (%) | Certificate SAR Target Body (10g) W/kg @ 20.0 dBm | Measured Body SAR (10g) W/kg @ 20.0 dBm | Deviation 10g (%) | Certificate Impedance Head (Ohm) Real | Measured Impedance Head (Ohm) Real | Difference (Ohm) Real | Certificate Impedance Head (Ohm) Imaginary | Measured Impedance Head (Ohm) Imaginary | Difference (Ohm) Imaginary | Certificate Return Loss Head (dB) | Measured Return Loss Head (dB) | Deviation (%) | PASS/FAIL |
|------------------|----------------|-----------------------------------|--------------------------------------------------|----------------------------------------|------------------|---------------------------------------------------|-----------------------------------------|-------------------|---------------------------------------|------------------------------------|-----------------------|--------------------------------------------|-----------------------------------------|----------------------------|-----------------------------------|--------------------------------|---------------|-----------|
| 6/19/2018        | 6/19/2019      | 1.153                             | 5.58                                             | 5.87                                   | 5.20%            | 2.51                                              | 2.61                                    | 3.98%             | 49.8                                  | 49.3                               | 0.5                   | -5                                         | -7.9                                    | 2.9                        | -26                               | -23.2                          | 10.70%        | PASS      |
| Calibration Date | Extension Date | Certificate Electrical Delay (ns) | Certificate SAR Target Body (1g) W/kg @ 20.0 dBm | Measured Body SAR (1g) W/kg @ 20.0 dBm | Deviation 1g (%) | Certificate SAR Target Body (10g) W/kg @ 20.0 dBm | Measured Body SAR (10g) W/kg @ 20.0 dBm | Deviation 10g (%) | Certificate Impedance Body (Ohm) Real | Measured Impedance Body (Ohm) Real | Difference (Ohm) Real | Certificate Impedance Body (Ohm) Imaginary | Measured Impedance Body (Ohm) Imaginary | Difference (Ohm) Imaginary | Certificate Return Loss Body (dB) | Measured Return Loss Body (dB) | Deviation (%) | PASS/FAIL |
| 6/19/2018        | 6/19/2019      | 1.153                             | 5.55                                             | 5.39                                   | -2.88%           | 2.5                                               | 2.39                                    | -4.40%            | 44.3                                  | 46.7                               | 2.3                   | -4.8                                       | -5.3                                    | 0.5                        | -22.1                             | -24.1                          | -8.90%        | PASS      |

# Impedance & Return-Loss Measurement Plot for Head TSL

CH1 S11 1 U FS 1: 49.258  $\Omega$  -7.9121  $\Omega$  7.7367 pF 2 600.000 000 MHz

\*  
De1  
Cor  
Avg  
16  
↑

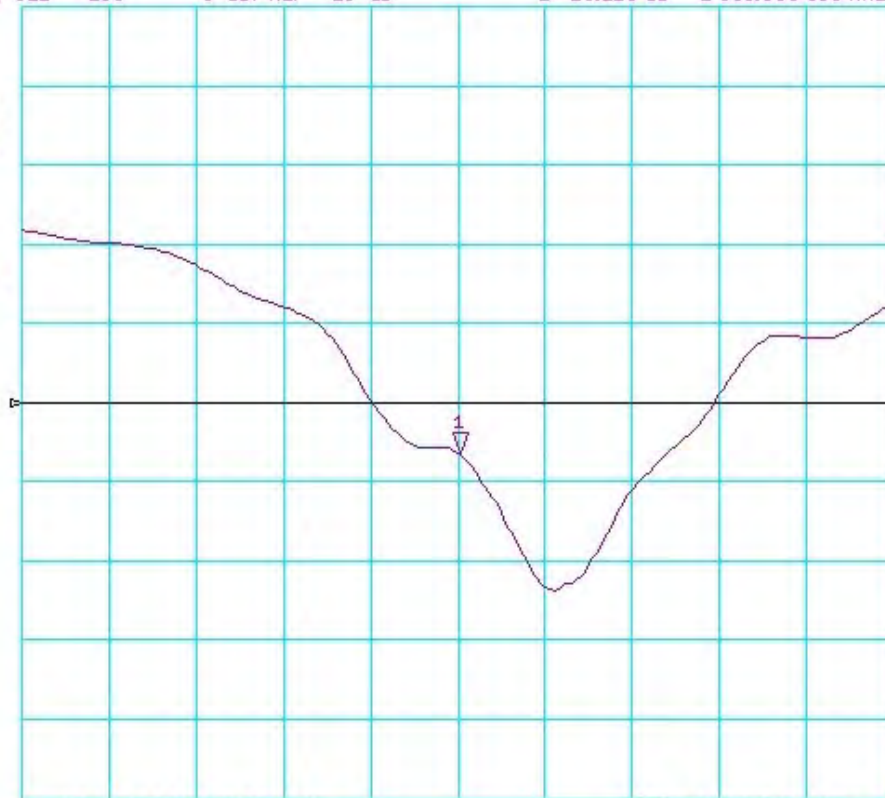


CENTER 2 600.000 000 MHz

SPAN 400.000 000 MHz

CH1 S11 LOG 5 dB/REF -20 dB 1: -23.218 dB 2 600.000 000 MHz

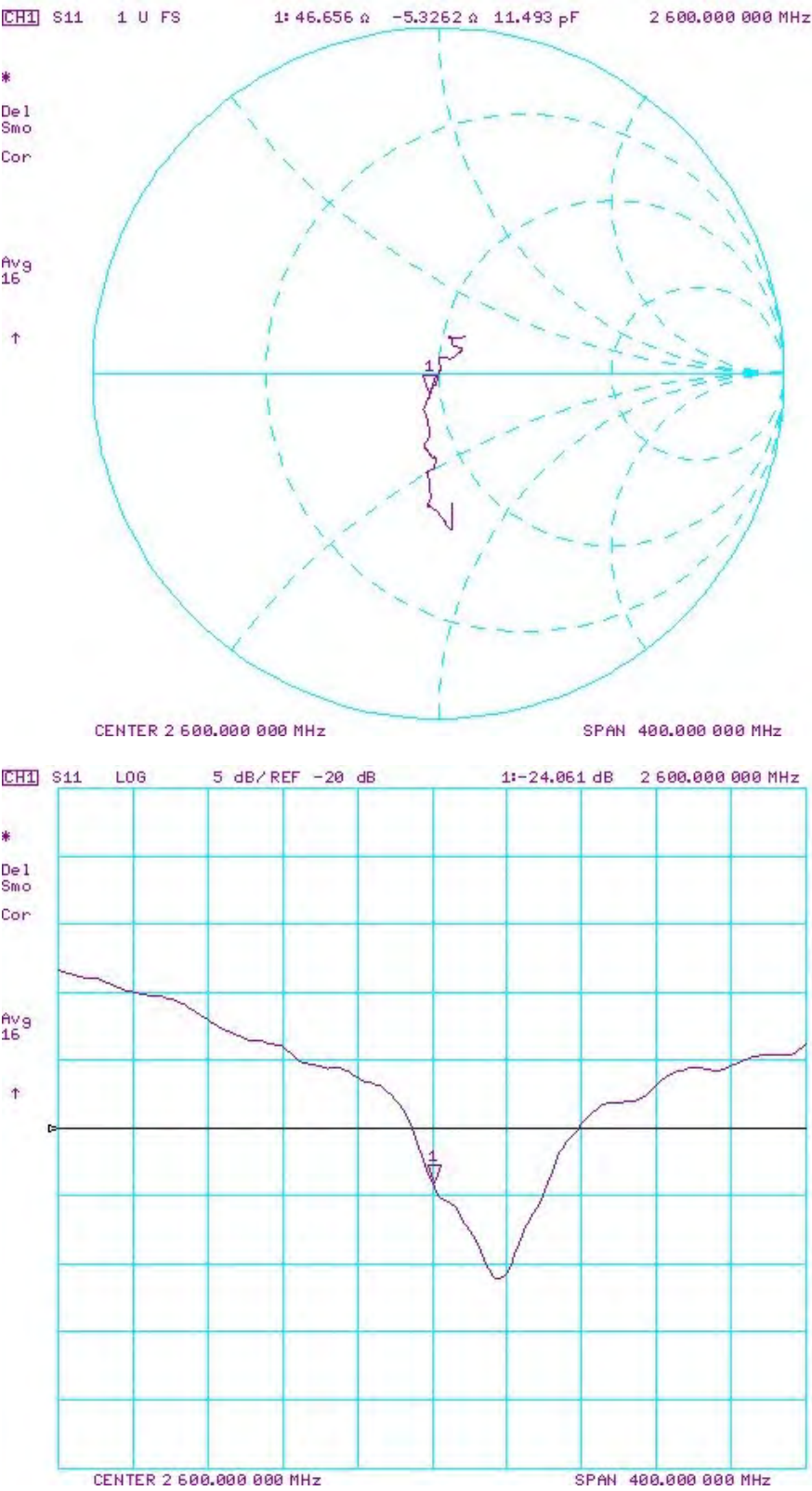
\*  
De1  
Smo  
Cor  
Avg  
12  
↑



CENTER 2 600.000 000 MHz

SPAN 400.000 000 MHz

Impedance & Return-Loss Measurement Plot for Body TSL



**Calibration Laboratory of  
Schmid & Partner  
Engineering AG**  
Zeughausstrasse 43, 8004 Zurich, Switzerland



**S** Schweizerischer Kalibrierdienst  
**C** Service suisse d'étalonnage  
**S** Servizio svizzero di taratura  
**S** Swiss Calibration Service

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The Swiss Accreditation Service is one of the signatories to the EA  
Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 0108**

Client **PC Test**

Certificate No: **D2600V2-1069\_Sep17**

## CALIBRATION CERTIFICATE

Object **D2600V2 - SN:1069**

Calibration procedure(s) **QA CAL-05.v9**  
Calibration procedure for dipole validation kits above 700 MHz

SCV  
10/03/2017

Calibration date: **September 11, 2017**

SCV  
9/10/2018

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).  
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

BNV  
10/10/2019

All calibrations have been conducted in the closed laboratory facility: environment temperature ( $22 \pm 3$ )°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards           | ID #               | Cal Date (Certificate No.)      | Scheduled Calibration |
|-----------------------------|--------------------|---------------------------------|-----------------------|
| Power meter NRP             | SN: 104778         | 04-Apr-17 (No. 217-02521/02522) | Apr-18                |
| Power sensor NRP-Z91        | SN: 103244         | 04-Apr-17 (No. 217-02521)       | Apr-18                |
| Power sensor NRP-Z91        | SN: 103245         | 04-Apr-17 (No. 217-02522)       | Apr-18                |
| Reference 20 dB Attenuator  | SN: 5058 (20k)     | 07-Apr-17 (No. 217-02528)       | Apr-18                |
| Type-N mismatch combination | SN: 5047.2 / 06927 | 07-Apr-17 (No. 217-02529)       | Apr-18                |
| Reference Probe EX3DV4      | SN: 7349           | 31-May-17 (No. EX3-7349_May17)  | May-18                |
| DAE4                        | SN: 601            | 28-Mar-17 (No. DAE4-601_Mar17)  | Mar-18                |

| Secondary Standards       | ID #           | Check Date (in house)             | Scheduled Check        |
|---------------------------|----------------|-----------------------------------|------------------------|
| Power meter EPM-442A      | SN: GB37480704 | 07-Oct-15 (in house check Oct-16) | In house check: Oct-18 |
| Power sensor HP 8481A     | SN: US37292783 | 07-Oct-15 (in house check Oct-16) | In house check: Oct-18 |
| Power sensor HP 8481A     | SN: MY41092317 | 07-Oct-15 (in house check Oct-16) | In house check: Oct-18 |
| RF generator R&S SMT-06   | SN: 100972     | 15-Jun-15 (in house check Oct-16) | In house check: Oct-18 |
| Network Analyzer HP 8753E | SN: US37390585 | 18-Oct-01 (in house check Oct-16) | In house check: Oct-17 |

Calibrated by: **Michael Weber**      Name: **Michael Weber**      Function: **Laboratory Technician**

Signature

*M. Weber*

Approved by: **Katja Pokovic**      Name: **Katja Pokovic**      Technical Manager

*K. Pokovic*

Issued: September 11, 2017

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.



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Accreditation No.: **SCS 0108**

The Swiss Accreditation Service is one of the signatories to the EA  
Multilateral Agreement for the recognition of calibration certificates

### Glossary:

|       |                                 |
|-------|---------------------------------|
| TSL   | tissue simulating liquid        |
| ConvF | sensitivity in TSL / NORM x,y,z |
| N/A   | not applicable or not measured  |

### Calibration is Performed According to the Following Standards:

- IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
- IEC 62209-1, "Measurement procedure for the assessment of Specific Absorption Rate (SAR) from hand-held and body-mounted devices used next to the ear (frequency range of 300 MHz to 6 GHz)", July 2016
- IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
- KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

### Additional Documentation:

- DASY4/5 System Handbook

### Methods Applied and Interpretation of Parameters:

- Measurement Conditions:** Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- Antenna Parameters with TSL:** The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- Feed Point Impedance and Return Loss:** These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- Electrical Delay:** One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- SAR measured:** SAR measured at the stated antenna input power.
- SAR normalized:** SAR as measured, normalized to an input power of 1 W at the antenna connector.
- SAR for nominal TSL parameters:** The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor  $k=2$ , which for a normal distribution corresponds to a coverage probability of approximately 95%.

## Measurement Conditions

DASY system configuration, as far as not given on page 1.

|                              |                        |             |
|------------------------------|------------------------|-------------|
| DASY Version                 | DASY5                  | V52.10.0    |
| Extrapolation                | Advanced Extrapolation |             |
| Phantom                      | Modular Flat Phantom   |             |
| Distance Dipole Center - TSL | 10 mm                  | with Spacer |
| Zoom Scan Resolution         | dx, dy, dz = 5 mm      |             |
| Frequency                    | 2600 MHz $\pm$ 1 MHz   |             |

## Head TSL parameters

The following parameters and calculations were applied.

|                                         | Temperature         | Permittivity   | Conductivity         |
|-----------------------------------------|---------------------|----------------|----------------------|
| Nominal Head TSL parameters             | 22.0 °C             | 39.0           | 1.96 mho/m           |
| Measured Head TSL parameters            | (22.0 $\pm$ 0.2) °C | 37.2 $\pm$ 6 % | 2.03 mho/m $\pm$ 6 % |
| Head TSL temperature change during test | < 0.5 °C            | ----           | ----                 |

## SAR result with Head TSL

|                                                       |                    |                              |
|-------------------------------------------------------|--------------------|------------------------------|
| SAR averaged over 1 cm <sup>3</sup> (1 g) of Head TSL | Condition          |                              |
| SAR measured                                          | 250 mW input power | 14.6 W/kg                    |
| SAR for nominal Head TSL parameters                   | normalized to 1W   | 56.9 W/kg $\pm$ 17.0 % (k=2) |

|                                                         |                    |                              |
|---------------------------------------------------------|--------------------|------------------------------|
| SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL | condition          |                              |
| SAR measured                                            | 250 mW input power | 6.45 W/kg                    |
| SAR for nominal Head TSL parameters                     | normalized to 1W   | 25.4 W/kg $\pm$ 16.5 % (k=2) |

## Body TSL parameters

The following parameters and calculations were applied.

|                                         | Temperature         | Permittivity   | Conductivity         |
|-----------------------------------------|---------------------|----------------|----------------------|
| Nominal Body TSL parameters             | 22.0 °C             | 52.5           | 2.16 mho/m           |
| Measured Body TSL parameters            | (22.0 $\pm$ 0.2) °C | 51.4 $\pm$ 6 % | 2.23 mho/m $\pm$ 6 % |
| Body TSL temperature change during test | < 0.5 °C            | ----           | ----                 |

## SAR result with Body TSL

|                                                       |                    |                              |
|-------------------------------------------------------|--------------------|------------------------------|
| SAR averaged over 1 cm <sup>3</sup> (1 g) of Body TSL | Condition          |                              |
| SAR measured                                          | 250 mW input power | 14.1 W/kg                    |
| SAR for nominal Body TSL parameters                   | normalized to 1W   | 55.3 W/kg $\pm$ 17.0 % (k=2) |

|                                                         |                    |                              |
|---------------------------------------------------------|--------------------|------------------------------|
| SAR averaged over 10 cm <sup>3</sup> (10 g) of Body TSL | condition          |                              |
| SAR measured                                            | 250 mW input power | 6.26 W/kg                    |
| SAR for nominal Body TSL parameters                     | normalized to 1W   | 24.8 W/kg $\pm$ 16.5 % (k=2) |

## Appendix (Additional assessments outside the scope of SCS 0108)

### Antenna Parameters with Head TSL

|                                      |                                |
|--------------------------------------|--------------------------------|
| Impedance, transformed to feed point | 49.1 $\Omega$ - 6.1 j $\Omega$ |
| Return Loss                          | - 24.1 dB                      |

### Antenna Parameters with Body TSL

|                                      |                                |
|--------------------------------------|--------------------------------|
| Impedance, transformed to feed point | 46.2 $\Omega$ - 4.7 j $\Omega$ |
| Return Loss                          | - 24.1 dB                      |

### General Antenna Parameters and Design

|                                  |          |
|----------------------------------|----------|
| Electrical Delay (one direction) | 1.152 ns |
|----------------------------------|----------|

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

### Additional EUT Data

|                 |               |
|-----------------|---------------|
| Manufactured by | SPEAG         |
| Manufactured on | July 17, 2013 |

## DASY5 Validation Report for Head TSL

Date: 11.09.2017

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 2600 MHz; Type: D2600V2; Serial: D2600V2 - SN: 1069**

Communication System: UID 0 - CW; Frequency: 2600 MHz

Medium parameters used:  $f = 2600$  MHz;  $\sigma = 2.03$  S/m;  $\epsilon_r = 37.2$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(7.96, 7.96, 7.96); Calibrated: 31.05.2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 28.03.2017
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.10.0(1446); SEMCAD X 14.6.10(7417)

### **Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:**

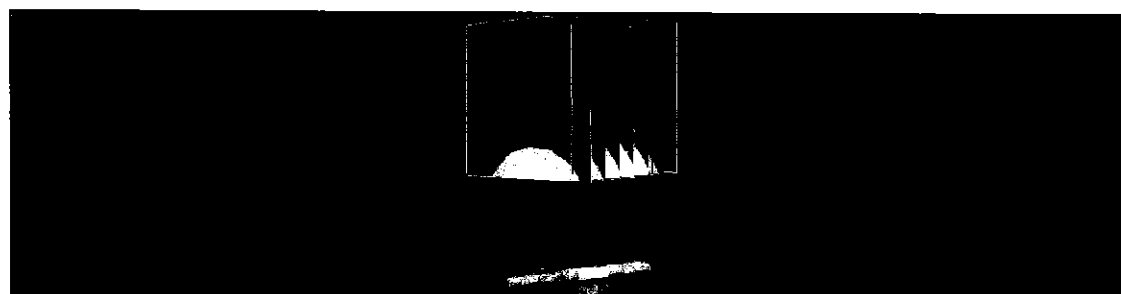
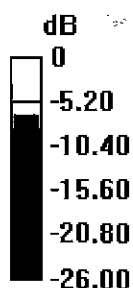
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 115.4 V/m; Power Drift = -0.06 dB

Peak SAR (extrapolated) = 31.2 W/kg

**SAR(1 g) = 14.6 W/kg; SAR(10 g) = 6.45 W/kg**

Maximum value of SAR (measured) = 24.5 W/kg

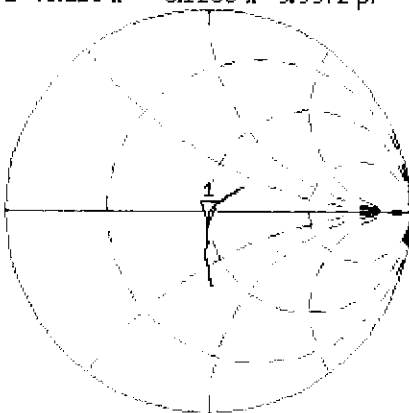


0 dB = 24.5 W/kg = 13.89 dBW/kg

# Impedance Measurement Plot for Head TSL

11 Sep 2017 12:04:09  
 [CH1] S11 1 U FS 1: 49.115  $\Omega$  -6.1230  $\Omega$  9.9972 pF 2 600.000 000 MHz

\*  
 Del  
 CA



Avg  
 16

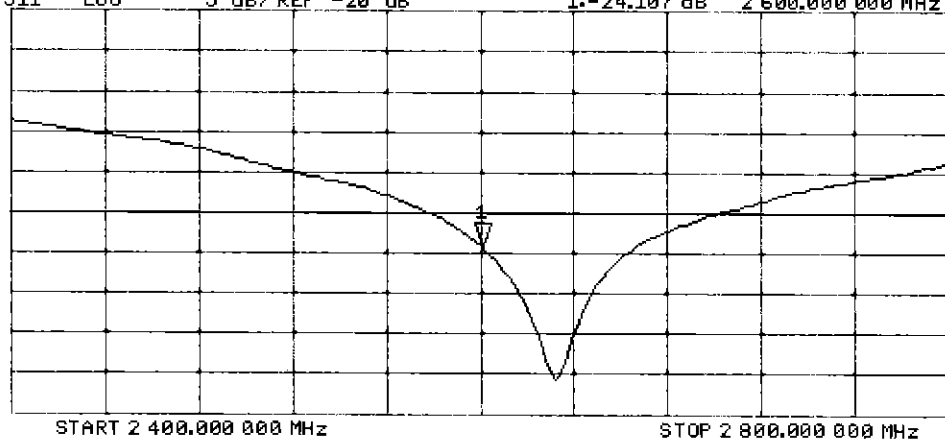
H1d

CH2 S11 LOG 5 dB/REF -20 dB 1:-24.107 dB 2 600.000 000 MHz

CA

Avg  
 16

H1d



START 2 400.000 000 MHz

STOP 2 800.000 000 MHz

## DASY5 Validation Report for Body TSL

Date: 11.09.2017

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 2600 MHz; Type: D2600V2; Serial: D2600V2 - SN: 1069**

Communication System: UID 0 - CW; Frequency: 2600 MHz

Medium parameters used:  $f = 2600$  MHz;  $\sigma = 2.23$  S/m;  $\epsilon_r = 51.4$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(7.94, 7.94, 7.94); Calibrated: 31.05.2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 28.03.2017
- Phantom: Flat Phantom 5.0 (back); Type: QD 000 P50 AA; Serial: 1002
- DASY52 52.10.0(1446); SEMCAD X 14.6.10(7417)

### Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

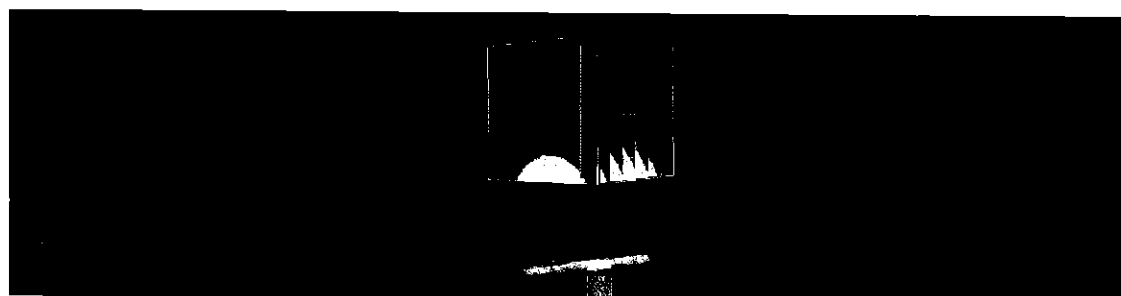
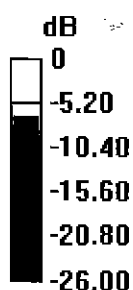
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 105.7 V/m; Power Drift = -0.09 dB

Peak SAR (extrapolated) = 29.9 W/kg

**SAR(1 g) = 14.1 W/kg; SAR(10 g) = 6.26 W/kg**

Maximum value of SAR (measured) = 22.9 W/kg

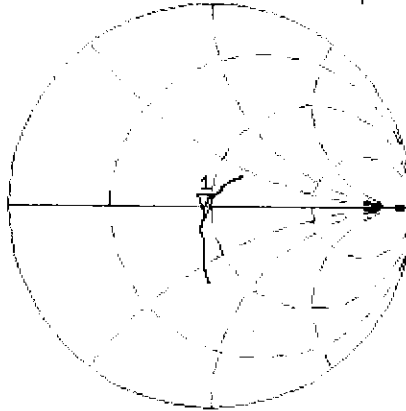


0 dB = 22.9 W/kg = 13.60 dBW/kg

# Impedance Measurement Plot for Body TSL

11 Sep 2017 12:03:28  
 CH1 S11 1 U FS 1: 46.244  $\Omega$  -4.7051  $\Omega$  13.010 pF 2 600.000 000 MHz

\*  
 Del  
 CA



Avg  
 16

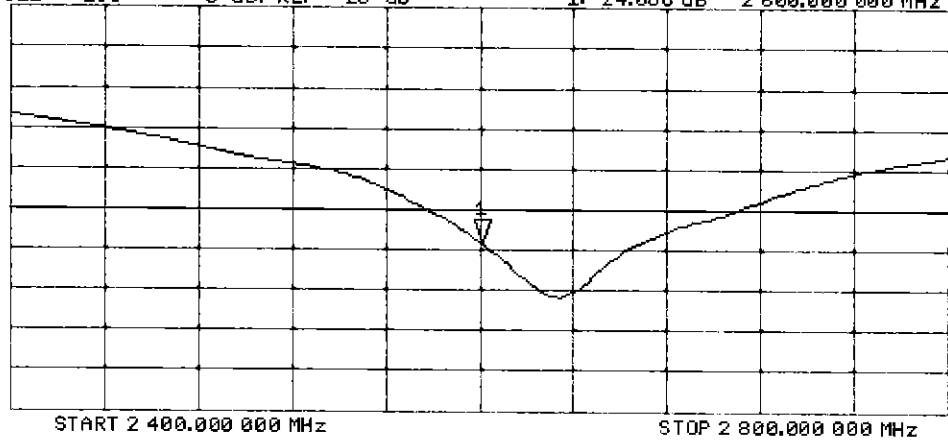
H1d

CH2 S11 L06 5 dB/REF -20 dB 1:-24.086 dB 2 600.000 000 MHz

CA

Avg  
 16

H1d



START 2 400.000 000 MHz

STOP 2 800.000 000 MHz

# Certification of Calibration

Object D2600V2 – SN: 1069

Calibration procedure(s) Procedure for Calibration Extension for SAR Dipoles.

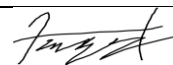
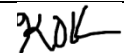
Extended Calibration date: September 10, 2018

Description: SAR Validation Dipole at 2600 MHz.

## Calibration Equipment used:

| Manufacturer          | Model     | Description                                             | Cal Date   | Cal Interval | Cal Due    | Serial Number |
|-----------------------|-----------|---------------------------------------------------------|------------|--------------|------------|---------------|
| Agilent               | 8753ES    | S-Parameter Network Analyzer                            | 9/14/2017  | Annual       | 9/14/2018  | US39170118    |
| Agilent               | N5182A    | MXG Vector Signal Generator                             | 3/19/2018  | Annual       | 3/19/2019  | US46240505    |
| Amplifier Research    | 15S1G6    | Amplifier                                               | CBT        | N/A          | CBT        | 343972        |
| Anritsu               | ML2496A   | Power Meter                                             | 10/9/2017  | Annual       | 10/9/2018  | 1138001       |
| Anritsu               | MA2411B   | Pulse Power Sensor                                      | 11/15/2017 | Annual       | 11/15/2018 | 1339007       |
| Anritsu               | MA2411B   | Pulse Power Sensor                                      | 11/22/2017 | Annual       | 11/22/2018 | 1339008       |
| Control Company       | 4040      | Temperature / Humidity Monitor                          | 2/28/2018  | Biennial     | 2/28/2020  | 150761911     |
| Control Company       | 4352      | Ultra Long Stem Thermometer                             | 2/14/2017  | Biennial     | 2/14/2019  | 170112507     |
| Keysight              | 772D      | Dual Directional Coupler                                | CBT        | N/A          | CBT        | MY52180215    |
| Keysight Technologies | 85033E    | Standard Mechanical Calibration Kit (DC to 9GHz, 3.5mm) | 6/4/2018   | Annual       | 6/4/2019   | MY53401181    |
| Mini-Circuits         | BW-N20W5+ | DC to 18 GHz Precision Fixed 20 dB Attenuator           | CBT        | N/A          | CBT        | N/A           |
| Mini-Circuits         | NLP-2950+ | Low Pass Filter DC to 2700 MHz                          | CBT        | N/A          | CBT        | N/A           |
| Narda                 | 4772-3    | Attenuator (3dB)                                        | CBT        | N/A          | CBT        | 9406          |
| Pasternack            | PE2209-10 | Bidirectional Coupler                                   | CBT        | N/A          | CBT        | N/A           |
| Pasternack            | PE5011-1  | Torque Wrench                                           | 7/19/2017  | Biennial     | 7/19/2019  | N/A           |
| SPEAG                 | DAK-3.5   | Dielectric Assessment Kit                               | 5/15/2018  | Annual       | 5/15/2019  | 1070          |
| SPEAG                 | ES3DV3    | SAR Probe                                               | 9/18/2017  | Annual       | 9/18/2018  | 3287          |
| SPEAG                 | DAE4      | Data Acquisition Electronics                            | 1/26/2018  | Annual       | 1/26/2019  | 1533          |
| SPEAG                 | ES3DV3    | SAR Probe                                               | 4/12/2018  | Annual       | 4/12/2019  | 3275          |
| SPEAG                 | DAE4      | Dasy Data Acquisition Electronics                       | 4/12/2018  | Annual       | 4/12/2019  | 501           |

Measurement Uncertainty =  $\pm 23\%$  (k=2)

|                | Name            | Function                 | Signature                                                                             |
|----------------|-----------------|--------------------------|---------------------------------------------------------------------------------------|
| Calibrated By: | Sangmin Cha     | Team Lead Engineer       |  |
| Approved By:   | Kaitlin O'Keefe | Senior Technical Manager |  |

# DIPOLE CALIBRATION EXTENSION

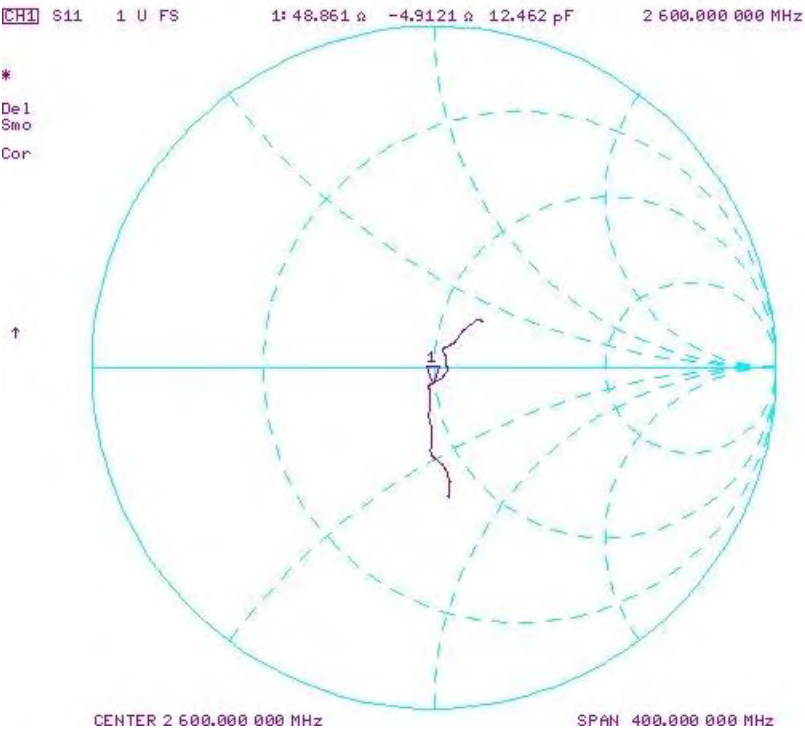
Per KDB 865664 D01, calibration intervals of up to three years may be considered for reference dipoles when it is demonstrated that the SAR target, impedance and return loss of a dipole have remained stable according to the following requirements:

1. The measured SAR does not deviate more than 10% from the target on the calibration certificate.
2. The return-loss does not deviate more than 20% from the previous measurement and meets the required 20dB minimum return-loss requirement.
3. The measurement of real or imaginary parts of impedance does not deviate more than 5Ω from the previous measurement.

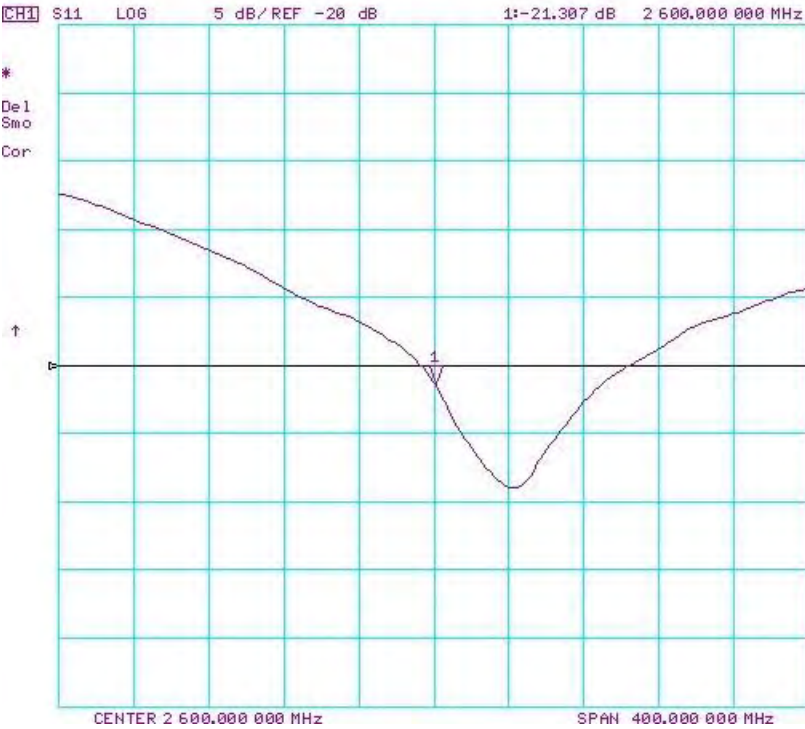
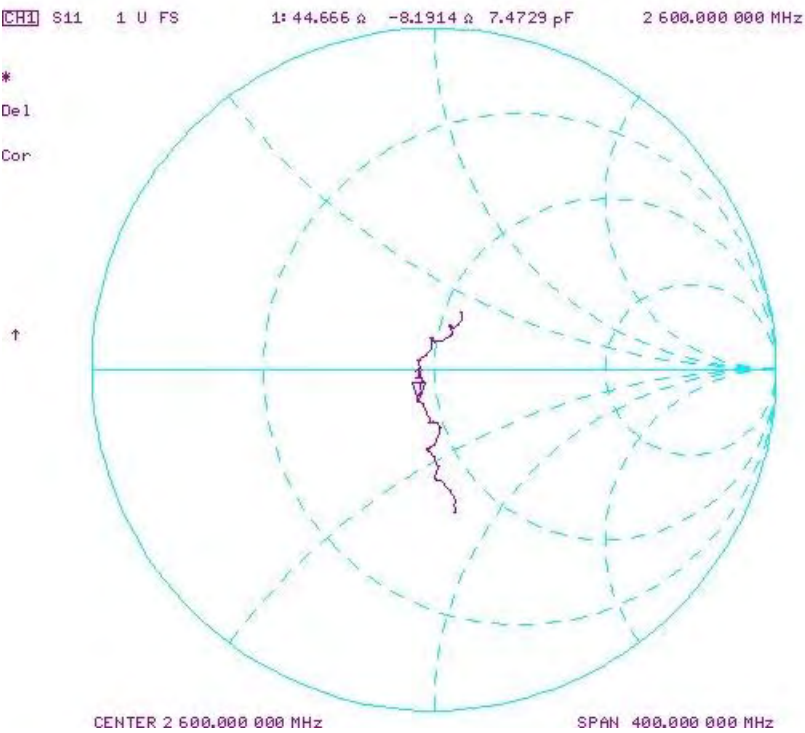
The following dipole was checked to pass the above 3 requirements to have 2-year calibration period from the calibration date:

| Calibration Date | Extension Date | Certificate Electrical Delay (ns) | Certificate SAR Target Head (1g) W/kg @ 20.0 dBm | Measured Head SAR (1g) W/kg @ 20.0 dBm | Deviation 1g (%) | Certificate SAR Target Body (10g) W/kg @ 20.0 dBm | Measured Body SAR (10g) W/kg @ 20.0 dBm | Deviation 10g (%) | Certificate Impedance Head (Ohm) Real | Measured Impedance Head (Ohm) Real | Difference (Ohm) Real | Certificate Impedance Head (Ohm) Imaginary | Measured Impedance Head (Ohm) Imaginary | Difference (Ohm) Imaginary | Certificate Return Loss Head (dB) | Measured Return Loss Head (dB) | Deviation (%) | PASS/FAIL |
|------------------|----------------|-----------------------------------|--------------------------------------------------|----------------------------------------|------------------|---------------------------------------------------|-----------------------------------------|-------------------|---------------------------------------|------------------------------------|-----------------------|--------------------------------------------|-----------------------------------------|----------------------------|-----------------------------------|--------------------------------|---------------|-----------|
| 9/11/2017        | 9/10/2018      | 1.152                             | 5.69                                             | 5.52                                   | -2.99%           | 2.54                                              | 2.51                                    | -1.18%            | 49.1                                  | 48.9                               | 0.2                   | -6.1                                       | -4.9                                    | 1.2                        | -24.1                             | -25.8                          | -7.10%        | PASS      |
| Calibration Date | Extension Date | Certificate Electrical Delay (ns) | Certificate SAR Target Body (1g) W/kg @ 20.0 dBm | Measured Body SAR (1g) W/kg @ 20.0 dBm | Deviation 1g (%) | Certificate SAR Target Body (10g) W/kg @ 20.0 dBm | Measured Body SAR (10g) W/kg @ 20.0 dBm | Deviation 10g (%) | Certificate Impedance Body (Ohm) Real | Measured Impedance Body (Ohm) Real | Difference (Ohm) Real | Certificate Impedance Body (Ohm) Imaginary | Measured Impedance Body (Ohm) Imaginary | Difference (Ohm) Imaginary | Certificate Return Loss Body (dB) | Measured Return Loss Body (dB) | Deviation (%) | PASS/FAIL |
| 9/11/2017        | 9/10/2018      | 1.152                             | 5.53                                             | 5.28                                   | -4.52%           | 2.48                                              | 2.35                                    | -5.24%            | 46.2                                  | 44.7                               | 1.5                   | -4.7                                       | -8.2                                    | 3.5                        | -24.1                             | -21.3                          | 11.60%        | PASS      |

Impedance & Return-Loss Measurement Plot for Head TSL



Impedance & Return-Loss Measurement Plot for Body TSL



# Certification of Calibration

Object D2600V2 – SN: 1069

Calibration procedure(s) Procedure for Calibration Extension for SAR Dipoles.

Extended Calibration date: September 9, 2019

Description: SAR Validation Dipole at 2600 MHz.

## Calibration Equipment used:

| Manufacturer          | Model     | Description                                             | Cal Date   | Cal Interval | Cal Due    | Serial Number |
|-----------------------|-----------|---------------------------------------------------------|------------|--------------|------------|---------------|
| Agilent               | 8753ES    | S-Parameter Network Analyzer                            | 10/2/2018  | Annual       | 10/2/2019  | US39170118    |
| Agilent               | E4438C    | ESG Vector Signal Generator                             | 6/27/2019  | Annual       | 6/27/2020  | MY45093852    |
| Amplifier Research    | 15S1G6    | Amplifier                                               | CBT        | N/A          | CBT        | 343972        |
| Anritsu               | ML2495A   | Power Meter                                             | 10/21/2018 | Annual       | 10/21/2019 | 941001        |
| Anritsu               | MA2411B   | Pulse Power Sensor                                      | 10/30/2018 | Annual       | 10/30/2019 | 1207470       |
| Anritsu               | MA2411B   | Pulse Power Sensor                                      | 11/20/2018 | Annual       | 11/20/2019 | 1339007       |
| Control Company       | 4040      | Temperature / Humidity Monitor                          | 2/28/2018  | Biennial     | 2/28/2020  | 150761911     |
| Control Company       | 4352      | Ultra Long Stem Thermometer                             | 2/28/2018  | Biennial     | 2/28/2020  | 170330160     |
| Keysight Technologies | 85033E    | Standard Mechanical Calibration Kit (DC to 9GHz, 3.5mm) | 7/2/2019   | Annual       | 7/2/2020   | MY53401181    |
| Keysight              | 772D      | Dual Directional Coupler                                | CBT        | N/A          | CBT        | MY52180215    |
| Mini-Circuits         | BW-N20W5+ | DC to 18 GHz Precision Fixed 20 dB Attenuator           | CBT        | N/A          | CBT        | N/A           |
| Mini-Circuits         | NLP-2950+ | Low Pass Filter DC to 2700 MHz                          | CBT        | N/A          | CBT        | N/A           |
| Narda                 | 4772-3    | Attenuator (3dB)                                        | CBT        | N/A          | CBT        | 9406          |
| Pasternack            | PE2209-10 | Bidirectional Coupler                                   | CBT        | N/A          | CBT        | N/A           |
| Pasternack            | NC-100    | Torque Wrench                                           | 11/1/2017  | Biennial     | 11/1/2019  | N/A           |
| SPEAG                 | DAK-3.5   | Dielectric Assessment Kit                               | 5/7/2019   | Annual       | 5/7/2020   | 1070          |
| SPEAG                 | EX3DV4    | SAR Probe                                               | 1/24/2019  | Annual       | 1/24/2020  | 7490          |
| SPEAG                 | DAE4      | Data Acquisition Electronics                            | 1/15/2019  | Annual       | 1/15/2020  | 1532          |

Measurement Uncertainty =  $\pm 23\%$  (k=2)

|                | Name            | Function                 | Signature           |
|----------------|-----------------|--------------------------|---------------------|
| Calibrated By: | Parker Jones    | Team Lead Engineer       | <i>Parker Jones</i> |
| Approved By:   | Kaitlin O'Keefe | Senior Technical Manager | <i>KOK</i>          |

# DIPOLE CALIBRATION EXTENSION

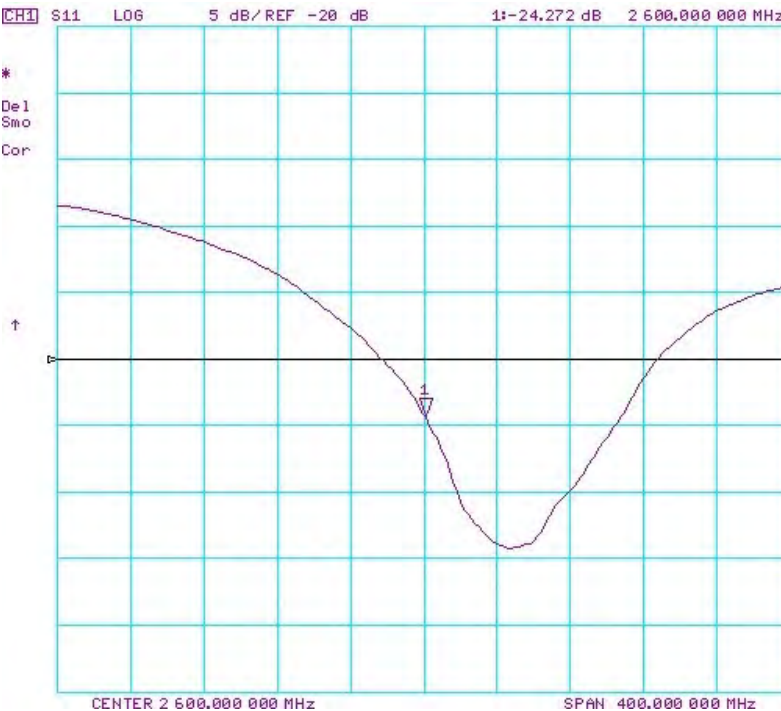
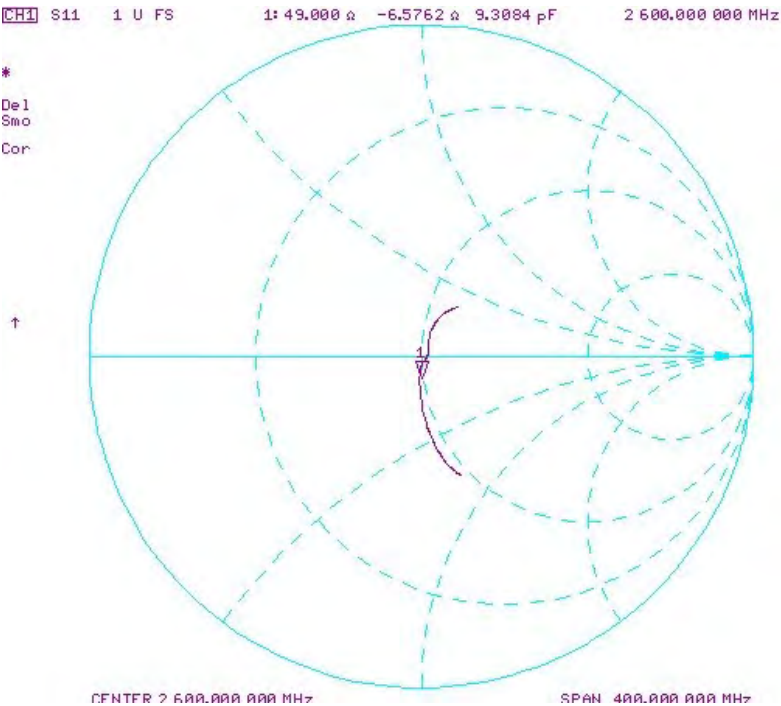
Per KDB 865664 D01, calibration intervals of up to three years may be considered for reference dipoles when it is demonstrated that the SAR target, impedance and return loss of a dipole have remained stable according to the following requirements:

1. The measured SAR does not deviate more than 10% from the target on the calibration certificate.
2. The return-loss does not deviate more than 20% from the previous measurement and meets the required 20dB minimum return-loss requirement.
3. The measurement of real or imaginary parts of impedance does not deviate more than 5Ω from the previous measurement.

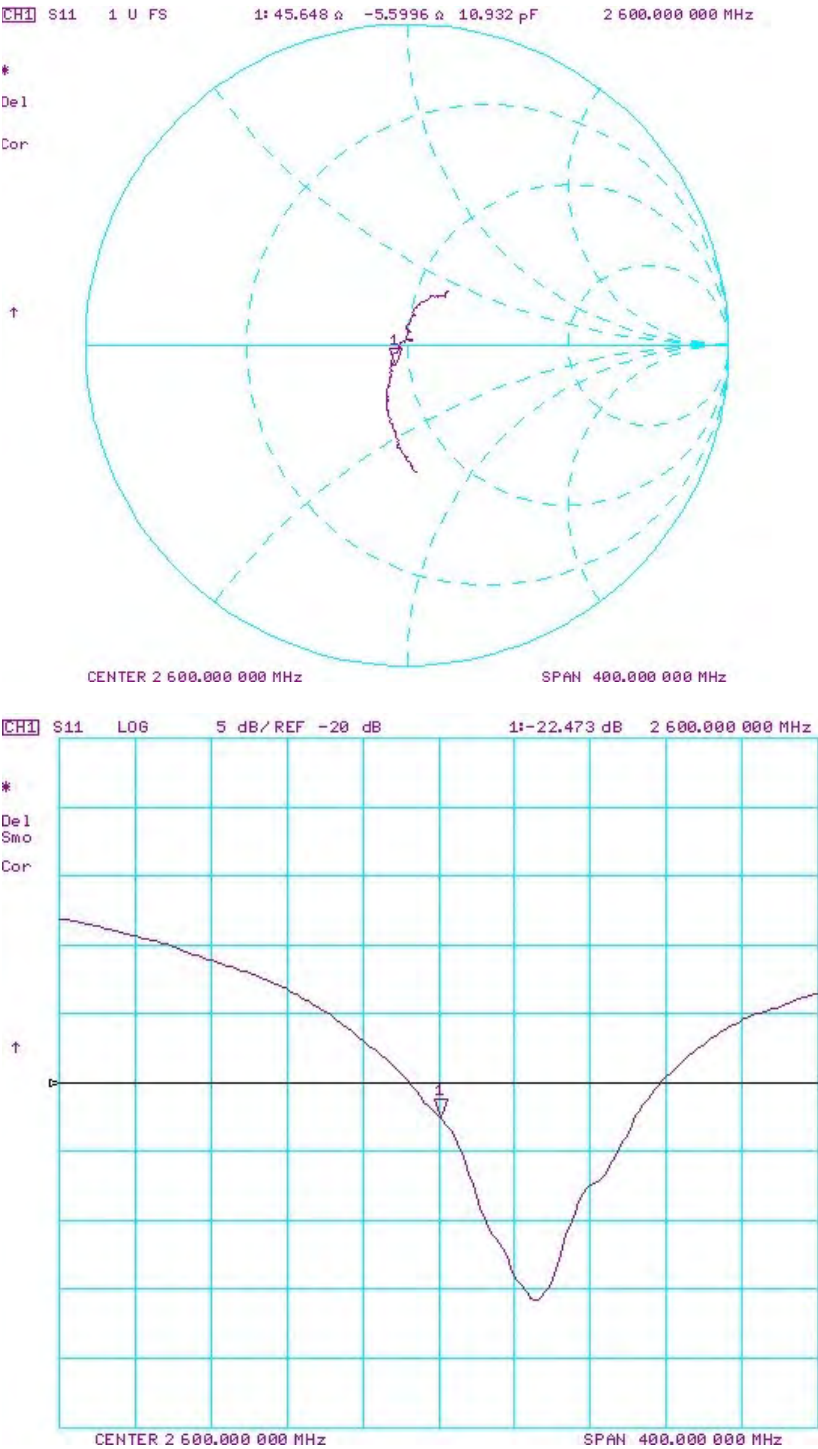
The following dipole was checked to pass the above 3 requirements to have 3-year calibration period from the calibration date:

| Calibration Date | Extension Date | Certificate Electrical Delay (ns) | Certificate SAR Target Head (1g) W/kg @ 20.0 dBm | Measured Head SAR (1g) W/kg @ 20.0 dBm | Deviation 1g (%) | Certificate SAR Target Body (10g) W/kg @ 20.0 dBm | Measured Body SAR (10g) W/kg @ 20.0 dBm | Deviation 10g (%) | Certificate Impedance Head (Ohm) Real | Measured Impedance Head (Ohm) Real | Difference (Ohm) Real | Certificate Impedance Head (Ohm) Imaginary | Measured Impedance Head (Ohm) Imaginary | Difference (Ohm) Imaginary | Certificate Return Loss Head (dB) | Measured Return Loss Head (dB) | Deviation (%) | PASS/FAIL |
|------------------|----------------|-----------------------------------|--------------------------------------------------|----------------------------------------|------------------|---------------------------------------------------|-----------------------------------------|-------------------|---------------------------------------|------------------------------------|-----------------------|--------------------------------------------|-----------------------------------------|----------------------------|-----------------------------------|--------------------------------|---------------|-----------|
| 9/11/2017        | 9/9/2019       | 1.152                             | 5.69                                             | 5.29                                   | -7.03%           | 2.54                                              | 2.37                                    | -6.69%            | 49.1                                  | 49                                 | 0.1                   | -6.1                                       | -6.6                                    | 0.5                        | -24.1                             | -24.3                          | -0.80%        | PASS      |
| Calibration Date | Extension Date | Certificate Electrical Delay (ns) | Certificate SAR Target Body (1g) W/kg @ 20.0 dBm | Measured Body SAR (1g) W/kg @ 20.0 dBm | Deviation 1g (%) | Certificate SAR Target Body (10g) W/kg @ 20.0 dBm | Measured Body SAR (10g) W/kg @ 20.0 dBm | Deviation 10g (%) | Certificate Impedance Body (Ohm) Real | Measured Impedance Body (Ohm) Real | Difference (Ohm) Real | Certificate Impedance Body (Ohm) Imaginary | Measured Impedance Body (Ohm) Imaginary | Difference (Ohm) Imaginary | Certificate Return Loss Body (dB) | Measured Return Loss Body (dB) | Deviation (%) | PASS/FAIL |
| 9/11/2017        | 9/9/2019       | 1.152                             | 5.53                                             | 6.73                                   | 3.62%            | 2.48                                              | 2.56                                    | 2.82%             | 46.2                                  | 45.6                               | 0.6                   | -4.7                                       | -5.6                                    | 0.9                        | -24.1                             | -22.5                          | 6.60%         | PASS      |

Impedance & Return-Loss Measurement Plot for Head TSL



Impedance & Return-Loss Measurement Plot for Body TSL





Accredited by the Swiss Accreditation Service (SAS)  
 The Swiss Accreditation Service is one of the signatories to the EA  
 Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 0108**

Client **PC Test**

Certificate No: **D3500V2-1068\_Dec19**

## CALIBRATION CERTIFICATE

Object **D3500V2 - SN:1068**

Calibration procedure(s) **QA CAL-22.v4**  
**Calibration Procedure for SAR Validation Sources between 3-6 GHz**

Calibration date: **December 04, 2019**

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).  
 The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature ( $22 \pm 3$ )°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards           | ID #               | Cal Date (Certificate No.)      | Scheduled Calibration |
|-----------------------------|--------------------|---------------------------------|-----------------------|
| Power meter NRP             | SN: 104778         | 03-Apr-19 (No. 217-02892/02893) | Apr-20                |
| Power sensor NRP-Z91        | SN: 103244         | 03-Apr-19 (No. 217-02892)       | Apr-20                |
| Power sensor NRP-Z91        | SN: 103245         | 03-Apr-19 (No. 217-02893)       | Apr-20                |
| Reference 20 dB Attenuator  | SN: 5058 (20k)     | 04-Apr-19 (No. 217-02894)       | Apr-20                |
| Type-N mismatch combination | SN: 5047.2 / 06327 | 04-Apr-19 (No. 217-02895)       | Apr-20                |
| Reference Probe EX3DV4      | SN: 3503           | 25-Mar-19 (No. EX3-3503_Mar19)  | Mar-20                |
| DAE4                        | SN: 601            | 30-Apr-19 (No. DAE4-601_Apr19)  | Apr-20                |

| Secondary Standards             | ID #           | Check Date (in house)             | Scheduled Check        |
|---------------------------------|----------------|-----------------------------------|------------------------|
| Power meter E4419B              | SN: GB39512475 | 30-Oct-14 (in house check Feb-19) | In house check: Oct-20 |
| Power sensor HP 8481A           | SN: US37292783 | 07-Oct-15 (in house check Oct-18) | In house check: Oct-20 |
| Power sensor HP 8481A           | SN: MY41092317 | 07-Oct-15 (in house check Oct-18) | In house check: Oct-20 |
| RF generator R&S SMT-06         | SN: 100972     | 15-Jun-15 (in house check Oct-18) | In house check: Oct-20 |
| Network Analyzer Agilent E8358A | SN: US41080477 | 31-Mar-14 (in house check Oct-19) | In house check: Oct-20 |

|                |              |                       |           |
|----------------|--------------|-----------------------|-----------|
|                | Name         | Function              | Signature |
| Calibrated by: | Leif Klysner | Laboratory Technician |           |

|              |               |                   |
|--------------|---------------|-------------------|
| Approved by: | Katja Pokovic | Technical Manager |
|--------------|---------------|-------------------|

Issued: December 6, 2019

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Accredited by the Swiss Accreditation Service (SAS)

The Swiss Accreditation Service is one of the signatories to the EA  
Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 0108**

### Glossary:

|       |                                 |
|-------|---------------------------------|
| TSL   | tissue simulating liquid        |
| ConvF | sensitivity in TSL / NORM x,y,z |
| N/A   | not applicable or not measured  |

### Calibration is Performed According to the Following Standards:

- IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
- IEC 62209-1, "Measurement procedure for the assessment of Specific Absorption Rate (SAR) from hand-held and body-mounted devices used next to the ear (frequency range of 300 MHz to 6 GHz)", July 2016
- IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
- KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

### Additional Documentation:

- DASY4/5 System Handbook

### Methods Applied and Interpretation of Parameters:

- Measurement Conditions:** Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- Antenna Parameters with TSL:** The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- Feed Point Impedance and Return Loss:** These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- Electrical Delay:** One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- SAR measured:** SAR measured at the stated antenna input power.
- SAR normalized:** SAR as measured, normalized to an input power of 1 W at the antenna connector.
- SAR for nominal TSL parameters:** The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor  $k=2$ , which for a normal distribution corresponds to a coverage probability of approximately 95%.

## Measurement Conditions

DASY system configuration, as far as not given on page 1.

|                                     |                            |                                  |
|-------------------------------------|----------------------------|----------------------------------|
| <b>DASY Version</b>                 | DASY5                      | V52.10.3                         |
| <b>Extrapolation</b>                | Advanced Extrapolation     |                                  |
| <b>Phantom</b>                      | Modular Flat Phantom       |                                  |
| <b>Distance Dipole Center - TSL</b> | 10 mm                      | with Spacer                      |
| <b>Zoom Scan Resolution</b>         | dx, dy = 4 mm, dz = 1.4 mm | Graded Ratio = 1.4 (Z direction) |
| <b>Frequency</b>                    | 3500 MHz $\pm$ 1 MHz       |                                  |

## Head TSL parameters

The following parameters and calculations were applied.

|                                                | Temperature         | Permittivity   | Conductivity         |
|------------------------------------------------|---------------------|----------------|----------------------|
| <b>Nominal Head TSL parameters</b>             | 22.0 °C             | 37.9           | 2.91 mho/m           |
| <b>Measured Head TSL parameters</b>            | (22.0 $\pm$ 0.2) °C | 37.0 $\pm$ 6 % | 2.89 mho/m $\pm$ 6 % |
| <b>Head TSL temperature change during test</b> | < 0.5 °C            | ----           | ----                 |

## SAR result with Head TSL

|                                                             |                    |                                                |
|-------------------------------------------------------------|--------------------|------------------------------------------------|
| <b>SAR averaged over 1 cm<sup>3</sup> (1 g) of Head TSL</b> | Condition          |                                                |
| SAR measured                                                | 100 mW input power | 6.71 W/kg                                      |
| SAR for nominal Head TSL parameters                         | normalized to 1W   | <b>66.9 W/kg <math>\pm</math> 19.9 % (k=2)</b> |

|                                                               |                    |                                                |
|---------------------------------------------------------------|--------------------|------------------------------------------------|
| <b>SAR averaged over 10 cm<sup>3</sup> (10 g) of Head TSL</b> | condition          |                                                |
| SAR measured                                                  | 100 mW input power | 2.52 W/kg                                      |
| SAR for nominal Head TSL parameters                           | normalized to 1W   | <b>25.1 W/kg <math>\pm</math> 19.5 % (k=2)</b> |

## Body TSL parameters

The following parameters and calculations were applied.

|                                                | Temperature         | Permittivity   | Conductivity         |
|------------------------------------------------|---------------------|----------------|----------------------|
| <b>Nominal Body TSL parameters</b>             | 22.0 °C             | 51.3           | 3.31 mho/m           |
| <b>Measured Body TSL parameters</b>            | (22.0 $\pm$ 0.2) °C | 50.0 $\pm$ 6 % | 3.34 mho/m $\pm$ 6 % |
| <b>Body TSL temperature change during test</b> | < 0.5 °C            | ----           | ----                 |

## SAR result with Body TSL

|                                                             |                    |                                                |
|-------------------------------------------------------------|--------------------|------------------------------------------------|
| <b>SAR averaged over 1 cm<sup>3</sup> (1 g) of Body TSL</b> | Condition          |                                                |
| SAR measured                                                | 100 mW input power | 6.58 W/kg                                      |
| SAR for nominal Body TSL parameters                         | normalized to 1W   | <b>65.3 W/kg <math>\pm</math> 19.9 % (k=2)</b> |

|                                                               |                    |                                                |
|---------------------------------------------------------------|--------------------|------------------------------------------------|
| <b>SAR averaged over 10 cm<sup>3</sup> (10 g) of Body TSL</b> | condition          |                                                |
| SAR measured                                                  | 100 mW input power | 2.45 W/kg                                      |
| SAR for nominal Body TSL parameters                           | normalized to 1W   | <b>24.3 W/kg <math>\pm</math> 19.5 % (k=2)</b> |

## Appendix (Additional assessments outside the scope of SCS 0108)

### Antenna Parameters with Head TSL

|                                      |                                |
|--------------------------------------|--------------------------------|
| Impedance, transformed to feed point | 53.5 $\Omega$ - 4.6 j $\Omega$ |
| Return Loss                          | - 25.1 dB                      |

### Antenna Parameters with Body TSL

|                                      |                                |
|--------------------------------------|--------------------------------|
| Impedance, transformed to feed point | 52.5 $\Omega$ - 3.5 j $\Omega$ |
| Return Loss                          | - 27.6 dB                      |

### General Antenna Parameters and Design

|                                  |          |
|----------------------------------|----------|
| Electrical Delay (one direction) | 1.132 ns |
|----------------------------------|----------|

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

### Additional EUT Data

|                 |       |
|-----------------|-------|
| Manufactured by | SPEAG |
|-----------------|-------|

## DASY5 Validation Report for Head TSL

Date: 04.12.2019

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 3500 MHz; Type: D3500V2; Serial: D3500V2 - SN:1068**

Communication System: UID 0 - CW; Frequency: 3500 MHz

Medium parameters used:  $f = 3500$  MHz;  $\sigma = 2.89$  S/m;  $\epsilon_r = 37$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(7.75, 7.75, 7.75) @ 3500 MHz; Calibrated: 25.03.2019
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.04.2019
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.10.3(1513); SEMCAD X 14.6.13(7474)

**Dipole Calibration for Head Tissue/Pin=100 mW, d=10mm, f=3500MHz/Zoom Scan, dist=1.4mm (8x8x8)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 70.28 V/m; Power Drift = 0.11 dB

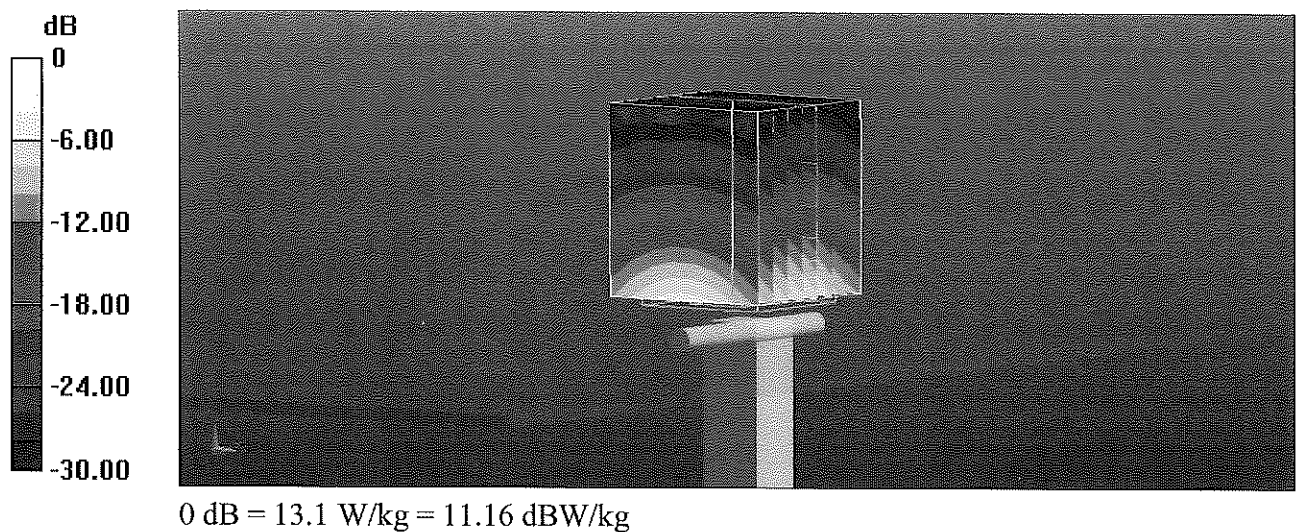
Peak SAR (extrapolated) = 18.6 W/kg

**SAR(1 g) = 6.71 W/kg; SAR(10 g) = 2.52 W/kg**

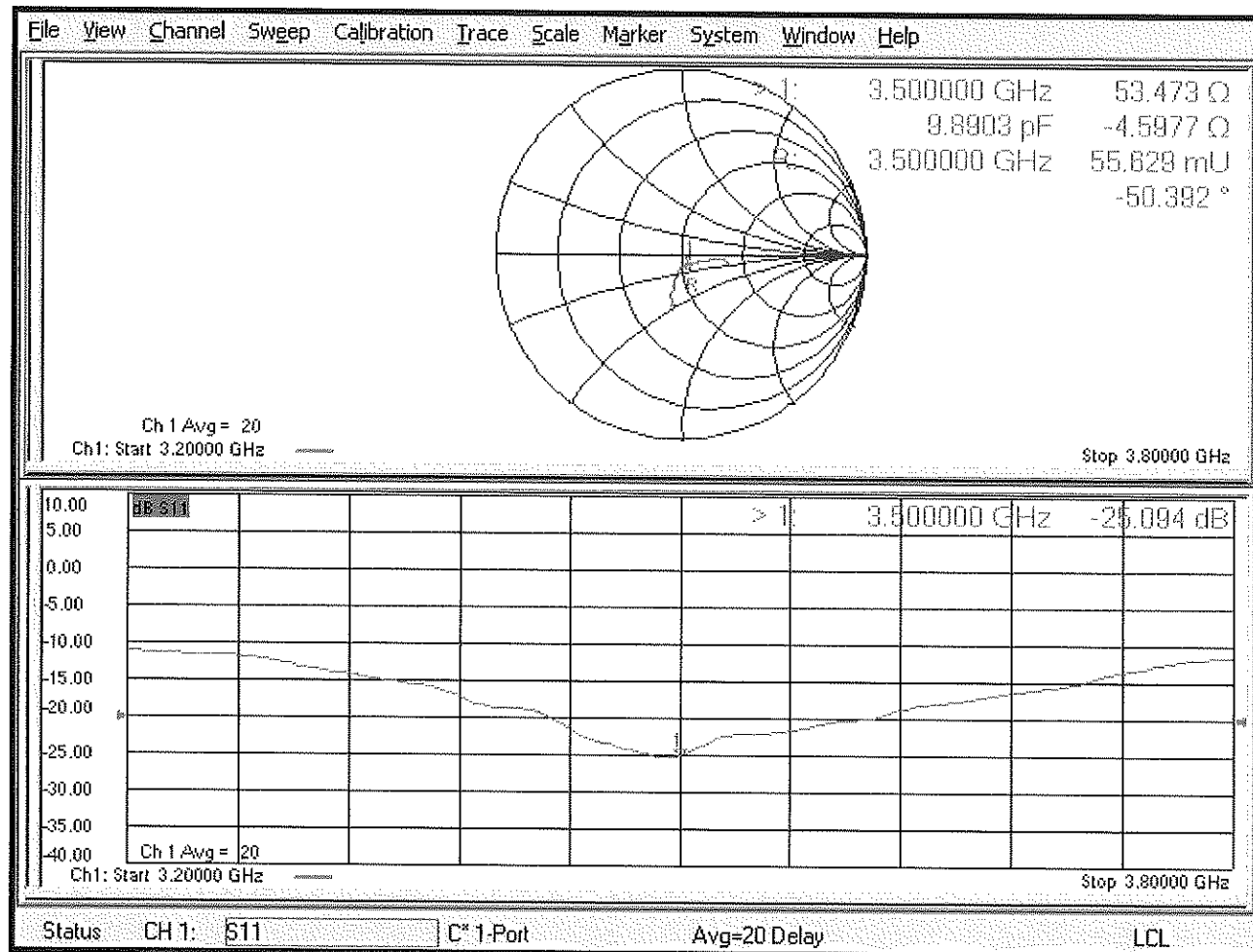
Smallest distance from peaks to all points 3 dB below = 8.4 mm

Ratio of SAR at M2 to SAR at M1 = 73.7%

Maximum value of SAR (measured) = 13.1 W/kg



# Impedance Measurement Plot for Head TSL



## DASY5 Validation Report for Body TSL

Date: 04.12.2019

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 3500 MHz; Type: D3500V2; Serial: D3500V2 - SN:1068**

Communication System: UID 0 - CW; Frequency: 3500 MHz

Medium parameters used:  $f = 3500$  MHz;  $\sigma = 3.34$  S/m;  $\epsilon_r = 50$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(7.35, 7.35, 7.35) @ 3500 MHz; Calibrated: 25.03.2019
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.04.2019
- Phantom: Flat Phantom 5.0 (back); Type: QD 000 P50 AA; Serial: 1002
- DASY52 52.10.3(1513); SEMCAD X 14.6.13(7474)

**Dipole Calibration for Body Tissue/Pin=100 mW, d=10mm, f=3500MHz/Zoom Scan , dist=1.4mm (8x8x8)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 65.74 V/m; Power Drift = -0.04 dB

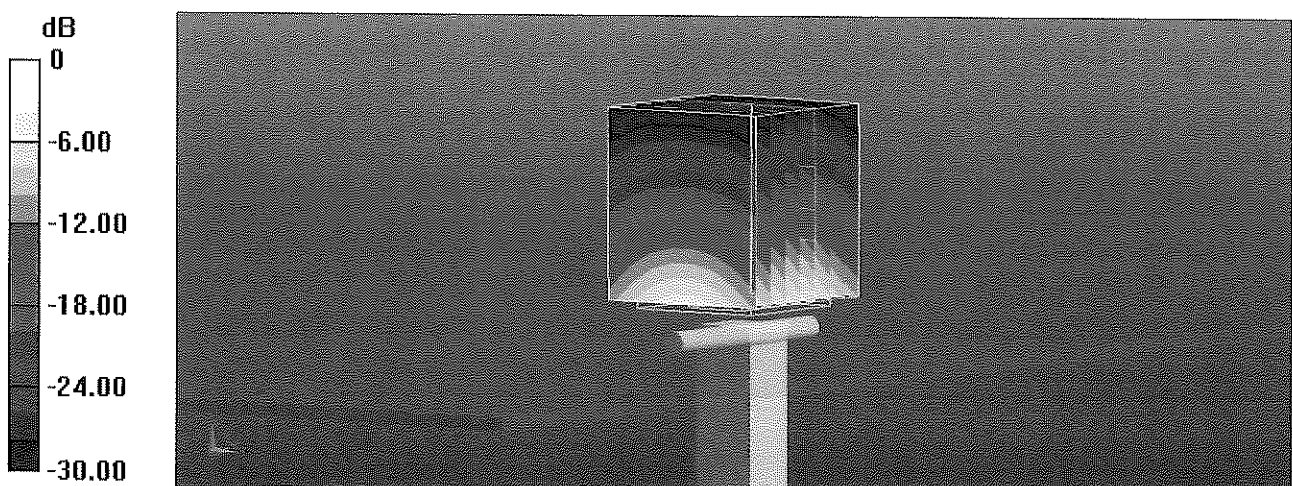
Peak SAR (extrapolated) = 17.7 W/kg

**SAR(1 g) = 6.58 W/kg; SAR(10 g) = 2.45 W/kg**

Smallest distance from peaks to all points 3 dB below = 8 mm

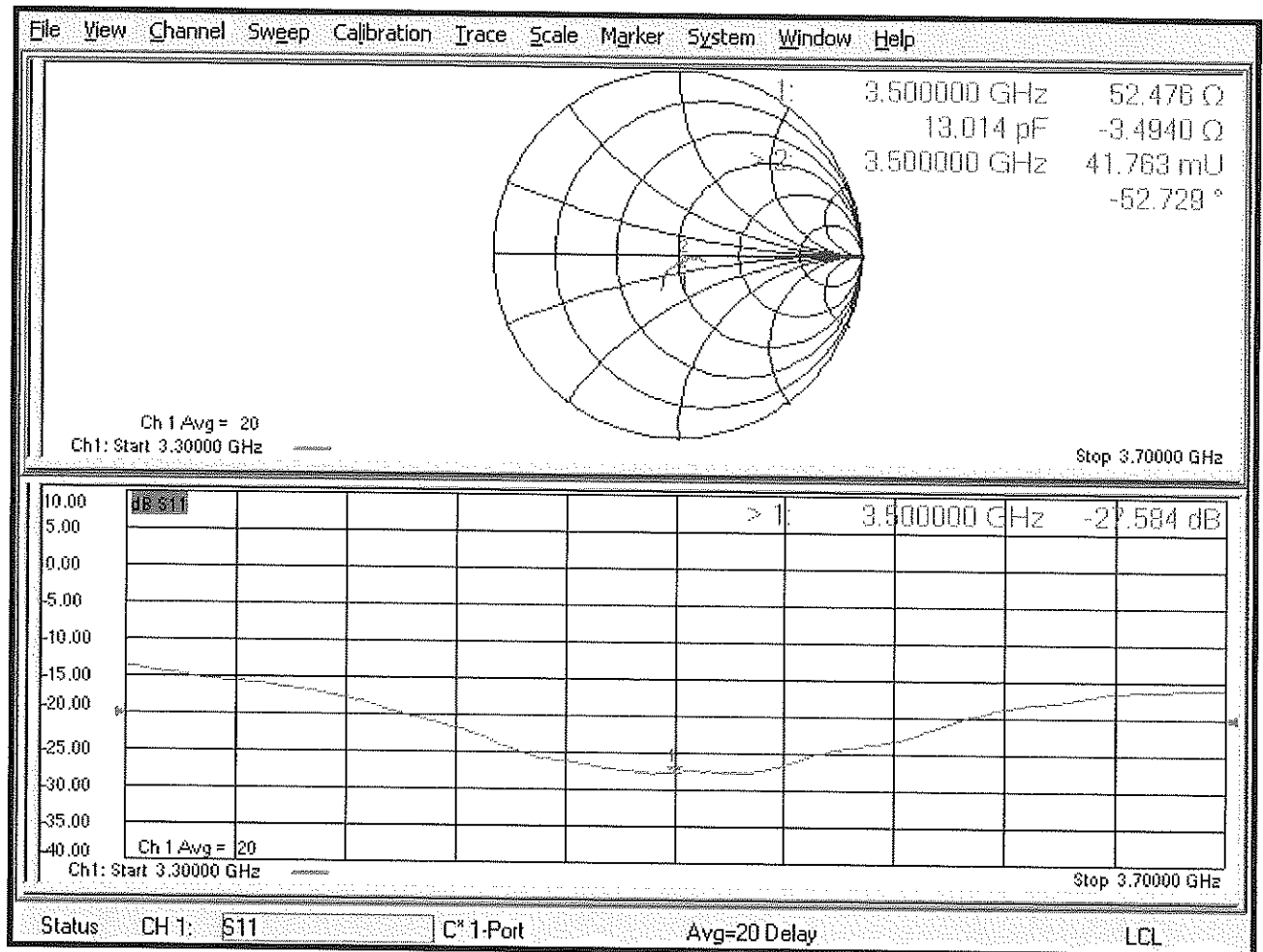
Ratio of SAR at M2 to SAR at M1 = 75%

Maximum value of SAR (measured) = 12.4 W/kg



0 dB = 12.4 W/kg = 10.95 dBW/kg

# Impedance Measurement Plot for Body TSL





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 Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 0108**

Client **PC Test**

Certificate No: **D3700V2-1029\_Dec19**

## CALIBRATION CERTIFICATE

Object **D3700V2 - SN:1029**

Calibration procedure(s) **QA CAL 22.04  
 Calibration Procedure for SAR Validation Sources between 3-6 GHz**

Calibration date: **December 04, 2019**

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).  
 The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature ( $22 \pm 3$ )°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards               | ID #               | Cal Date (Certificate No.)        | Scheduled Calibration  |
|---------------------------------|--------------------|-----------------------------------|------------------------|
| Power meter NRP                 | SN: 104778         | 03-Apr-19 (No. 217-02892/02893)   | Apr-20                 |
| Power sensor NRP-Z91            | SN: 103244         | 03-Apr-19 (No. 217-02892)         | Apr-20                 |
| Power sensor NRP-Z91            | SN: 103245         | 03-Apr-19 (No. 217-02893)         | Apr-20                 |
| Reference 20 dB Attenuator      | SN: 5058 (20k)     | 04-Apr-19 (No. 217-02894)         | Apr-20                 |
| Type-N mismatch combination     | SN: 5047.2 / 06327 | 04-Apr-19 (No. 217-02895)         | Apr-20                 |
| Reference Probe EX3DV4          | SN: 3503           | 25-Mar-19 (No. EX3-3503_Mar19)    | Mar-20                 |
| DAE4                            | SN: 601            | 30-Apr-19 (No. DAE4-601_Apr19)    | Apr-20                 |
| Secondary Standards             | ID #               | Check Date (in house)             | Scheduled Check        |
| Power meter E4419B              | SN: GB39512475     | 30-Oct-14 (in house check Feb-19) | In house check: Oct-20 |
| Power sensor HP 8481A           | SN: US37292783     | 07-Oct-15 (in house check Oct-18) | In house check: Oct-20 |
| Power sensor HP 8481A           | SN: MY41092317     | 07-Oct-15 (in house check Oct-18) | In house check: Oct-20 |
| RF generator R&S SMT-06         | SN: 100972         | 15-Jun-15 (in house check Oct-18) | In house check: Oct-20 |
| Network Analyzer Agilent E8358A | SN: US41080477     | 31-Mar-14 (in house check Oct-19) | In house check: Oct-20 |

Calibrated by: **Leif Klysner** **Function** **Laboratory Technician** **Signature**

Approved by: **Katja Pokovic** **Technical Manager**

Issued: December 6, 2019

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Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 0108**

### Glossary:

|       |                                 |
|-------|---------------------------------|
| TSL   | tissue simulating liquid        |
| ConvF | sensitivity in TSL / NORM x,y,z |
| N/A   | not applicable or not measured  |

### Calibration is Performed According to the Following Standards:

- IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
- IEC 62209-1, "Measurement procedure for the assessment of Specific Absorption Rate (SAR) from hand-held and body-mounted devices used next to the ear (frequency range of 300 MHz to 6 GHz)", July 2016
- IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
- KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

### Additional Documentation:

- DASY4/5 System Handbook

### Methods Applied and Interpretation of Parameters:

- Measurement Conditions:** Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- Antenna Parameters with TSL:** The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- Feed Point Impedance and Return Loss:** These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- Electrical Delay:** One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- SAR measured:** SAR measured at the stated antenna input power.
- SAR normalized:** SAR as measured, normalized to an input power of 1 W at the antenna connector.
- SAR for nominal TSL parameters:** The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor  $k=2$ , which for a normal distribution corresponds to a coverage probability of approximately 95%.

## Measurement Conditions

DASY system configuration, as far as not given on page 1.

|                                     |                            |                                  |
|-------------------------------------|----------------------------|----------------------------------|
| <b>DASY Version</b>                 | DASY5                      | V52.10.3                         |
| <b>Extrapolation</b>                | Advanced Extrapolation     |                                  |
| <b>Phantom</b>                      | Modular Flat Phantom       |                                  |
| <b>Distance Dipole Center - TSL</b> | 10 mm                      | with Spacer                      |
| <b>Zoom Scan Resolution</b>         | dx, dy = 4 mm, dz = 1.4 mm | Graded Ratio = 1.4 (Z direction) |
| <b>Frequency</b>                    | 3700 MHz $\pm$ 1 MHz       |                                  |

## Head TSL parameters

The following parameters and calculations were applied.

|                                                | Temperature         | Permittivity   | Conductivity         |
|------------------------------------------------|---------------------|----------------|----------------------|
| <b>Nominal Head TSL parameters</b>             | 22.0 °C             | 37.7           | 3.12 mho/m           |
| <b>Measured Head TSL parameters</b>            | (22.0 $\pm$ 0.2) °C | 36.8 $\pm$ 6 % | 3.05 mho/m $\pm$ 6 % |
| <b>Head TSL temperature change during test</b> | < 0.5 °C            | ----           | ----                 |

## SAR result with Head TSL

|                                                             |                    |                                                |
|-------------------------------------------------------------|--------------------|------------------------------------------------|
| <b>SAR averaged over 1 cm<sup>3</sup> (1 g) of Head TSL</b> | Condition          |                                                |
| SAR measured                                                | 100 mW input power | 6.87 W/kg                                      |
| SAR for nominal Head TSL parameters                         | normalized to 1W   | <b>68.6 W/kg <math>\pm</math> 19.9 % (k=2)</b> |

|                                                               |                    |                                                |
|---------------------------------------------------------------|--------------------|------------------------------------------------|
| <b>SAR averaged over 10 cm<sup>3</sup> (10 g) of Head TSL</b> | condition          |                                                |
| SAR measured                                                  | 100 mW input power | 2.48 W/kg                                      |
| SAR for nominal Head TSL parameters                           | normalized to 1W   | <b>24.7 W/kg <math>\pm</math> 19.5 % (k=2)</b> |

## Body TSL parameters

The following parameters and calculations were applied.

|                                                | Temperature         | Permittivity   | Conductivity         |
|------------------------------------------------|---------------------|----------------|----------------------|
| <b>Nominal Body TSL parameters</b>             | 22.0 °C             | 51.0           | 3.55 mho/m           |
| <b>Measured Body TSL parameters</b>            | (22.0 $\pm$ 0.2) °C | 49.7 $\pm$ 6 % | 3.55 mho/m $\pm$ 6 % |
| <b>Body TSL temperature change during test</b> | < 0.5 °C            | ----           | ----                 |

## SAR result with Body TSL

|                                                             |                    |                                                |
|-------------------------------------------------------------|--------------------|------------------------------------------------|
| <b>SAR averaged over 1 cm<sup>3</sup> (1 g) of Body TSL</b> | Condition          |                                                |
| SAR measured                                                | 100 mW input power | 6.53 W/kg                                      |
| SAR for nominal Body TSL parameters                         | normalized to 1W   | <b>64.9 W/kg <math>\pm</math> 19.9 % (k=2)</b> |

|                                                               |                    |                                                |
|---------------------------------------------------------------|--------------------|------------------------------------------------|
| <b>SAR averaged over 10 cm<sup>3</sup> (10 g) of Body TSL</b> | condition          |                                                |
| SAR measured                                                  | 100 mW input power | 2.33 W/kg                                      |
| SAR for nominal Body TSL parameters                           | normalized to 1W   | <b>23.2 W/kg <math>\pm</math> 19.5 % (k=2)</b> |

## Appendix (Additional assessments outside the scope of SCS 0108)

### Antenna Parameters with Head TSL

|                                      |                             |
|--------------------------------------|-----------------------------|
| Impedance, transformed to feed point | $45.1 \Omega - 1.9 j\Omega$ |
| Return Loss                          | - 25.1 dB                   |

### Antenna Parameters with Body TSL

|                                      |                             |
|--------------------------------------|-----------------------------|
| Impedance, transformed to feed point | $43.9 \Omega + 0.5 j\Omega$ |
| Return Loss                          | - 23.7 dB                   |

### General Antenna Parameters and Design

|                                  |          |
|----------------------------------|----------|
| Electrical Delay (one direction) | 1.139 ns |
|----------------------------------|----------|

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

### Additional EUT Data

|                 |       |
|-----------------|-------|
| Manufactured by | SPEAG |
|-----------------|-------|

## DASY5 Validation Report for Head TSL

Date: 04.12.2019

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 3700 MHz; Type: D3700V2; Serial: D3700V2 - SN:1029**

Communication System: UID 0 - CW; Frequency: 3700 MHz

Medium parameters used:  $f = 3700$  MHz;  $\sigma = 3.05$  S/m;  $\epsilon_r = 36.8$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(7.5, 7.5, 7.5) @ 3700 MHz; Calibrated: 25.03.2019
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.04.2019
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.10.3(1513); SEMCAD X 14.6.13(7474)

**Dipole Calibration for Head Tissue/Pin=100 mW, d=10mm/Zoom Scan, dist=1.4mm (8x8x8)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 71.30 V/m; Power Drift = -0.02 dB

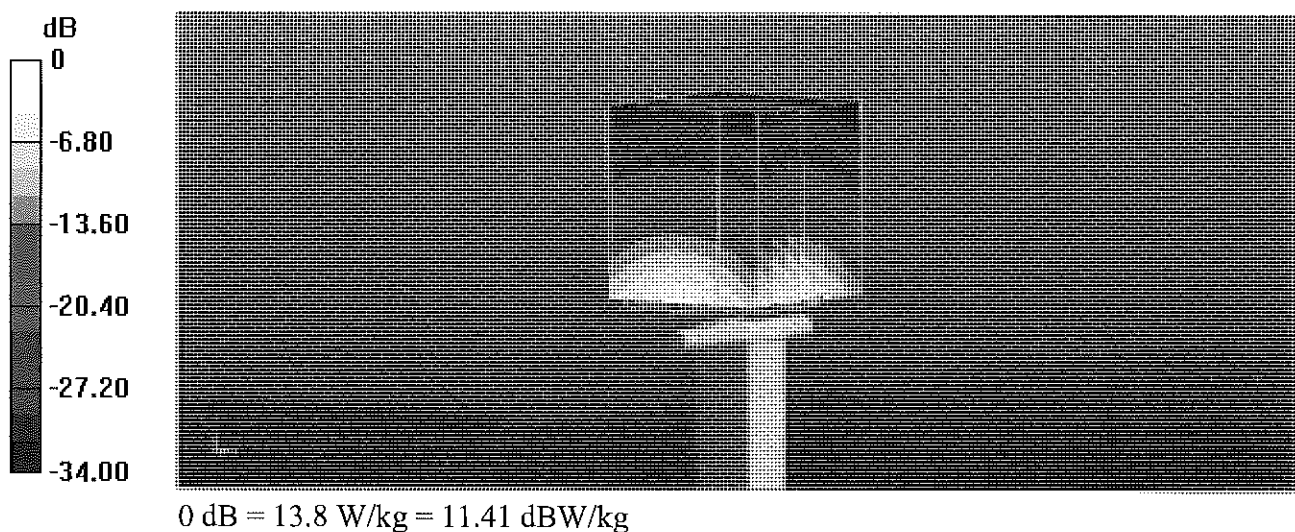
Peak SAR (extrapolated) = 19.8 W/kg

**SAR(1 g) = 6.87 W/kg; SAR(10 g) = 2.48 W/kg**

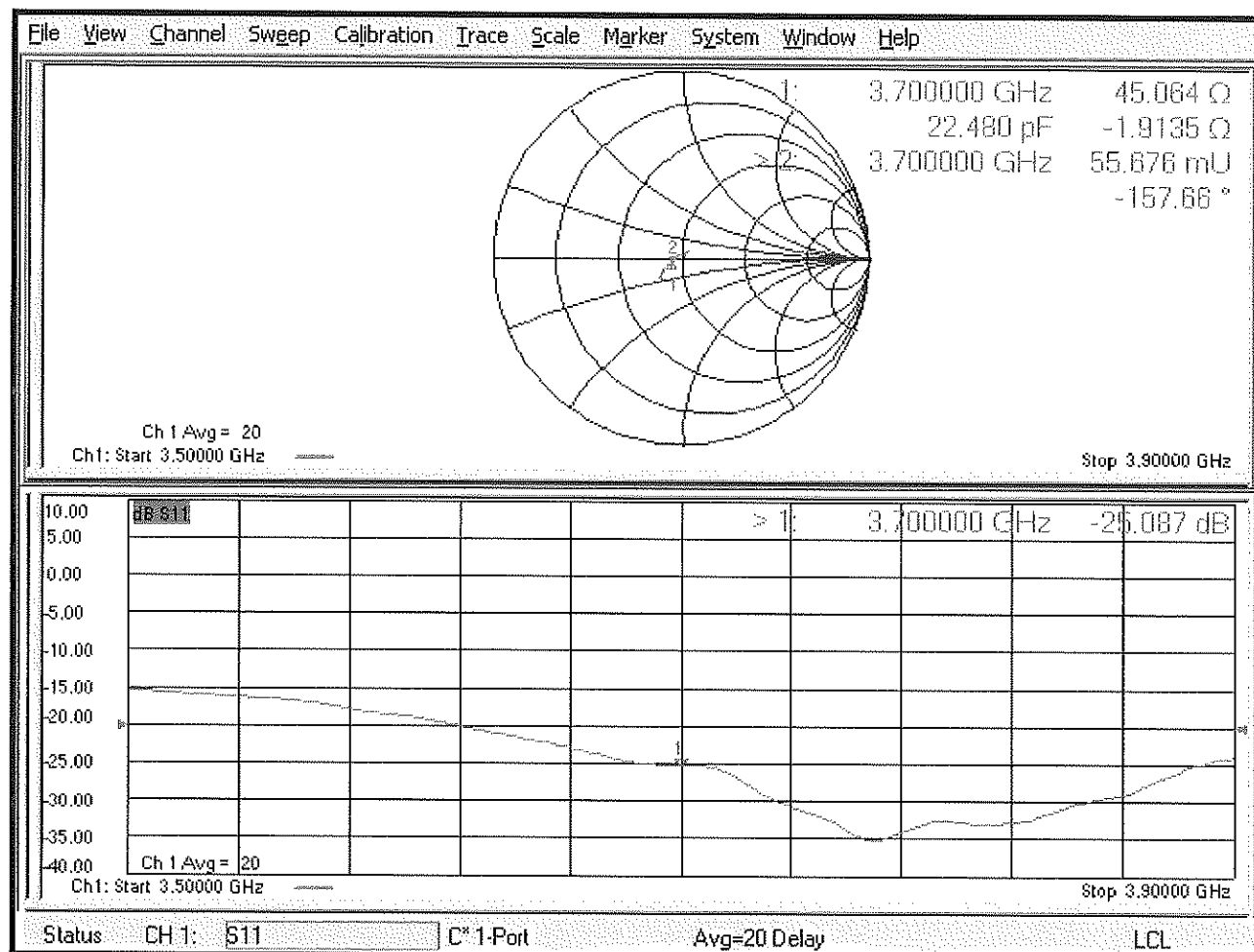
Smallest distance from peaks to all points 3 dB below = 8 mm

Ratio of SAR at M2 to SAR at M1 = 72.7%

Maximum value of SAR (measured) = 13.8 W/kg



# Impedance Measurement Plot for Head TSL



## DASY5 Validation Report for Body TSL

Date: 04.12.2019

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 3700 MHz; Type: D3700V2; Serial: D3700V2 - SN:1029**

Communication System: UID 0 - CW; Frequency: 3700 MHz

Medium parameters used:  $f = 3700$  MHz;  $\sigma = 3.55$  S/m;  $\epsilon_r = 49.7$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(7.1, 7.1, 7.1) @ 3700 MHz; Calibrated: 25.03.2019
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.04.2019
- Phantom: Flat Phantom 5.0 (back); Type: QD 000 P50 AA; Serial: 1002
- DASY52 52.10.3(1513); SEMCAD X 14.6.13(7474)

**Dipole Calibration for Body Tissue/Pin=100 mW, d=10mm/Zoom Scan , dist=1.4mm**

**(8x8x8)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 65.42 V/m; Power Drift = -0.05 dB

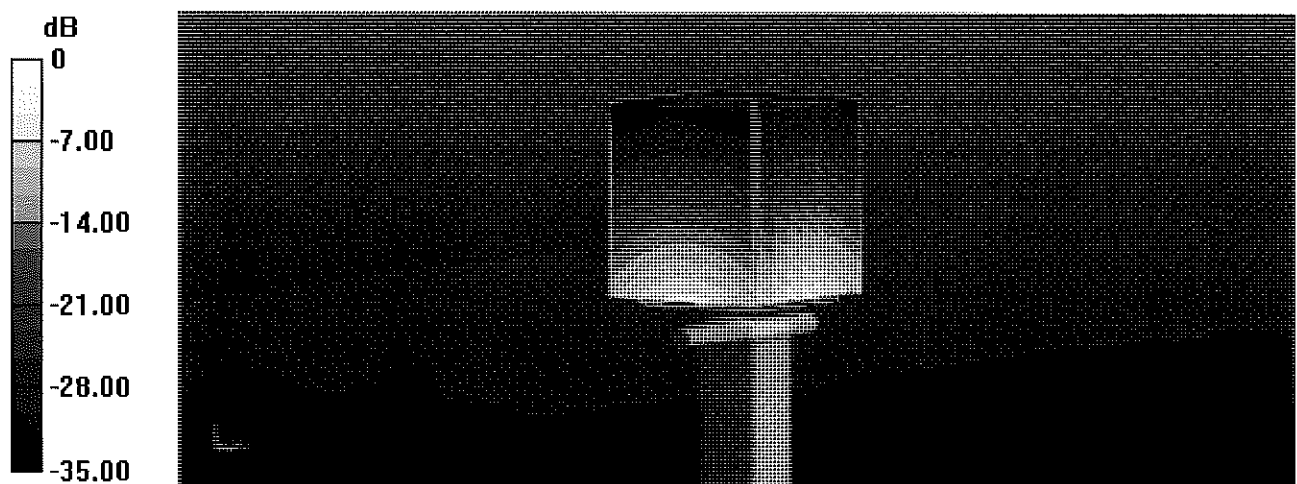
Peak SAR (extrapolated) = 18.3 W/kg

**SAR(1 g) = 6.53 W/kg; SAR(10 g) = 2.33 W/kg**

Smallest distance from peaks to all points 3 dB below = 8 mm

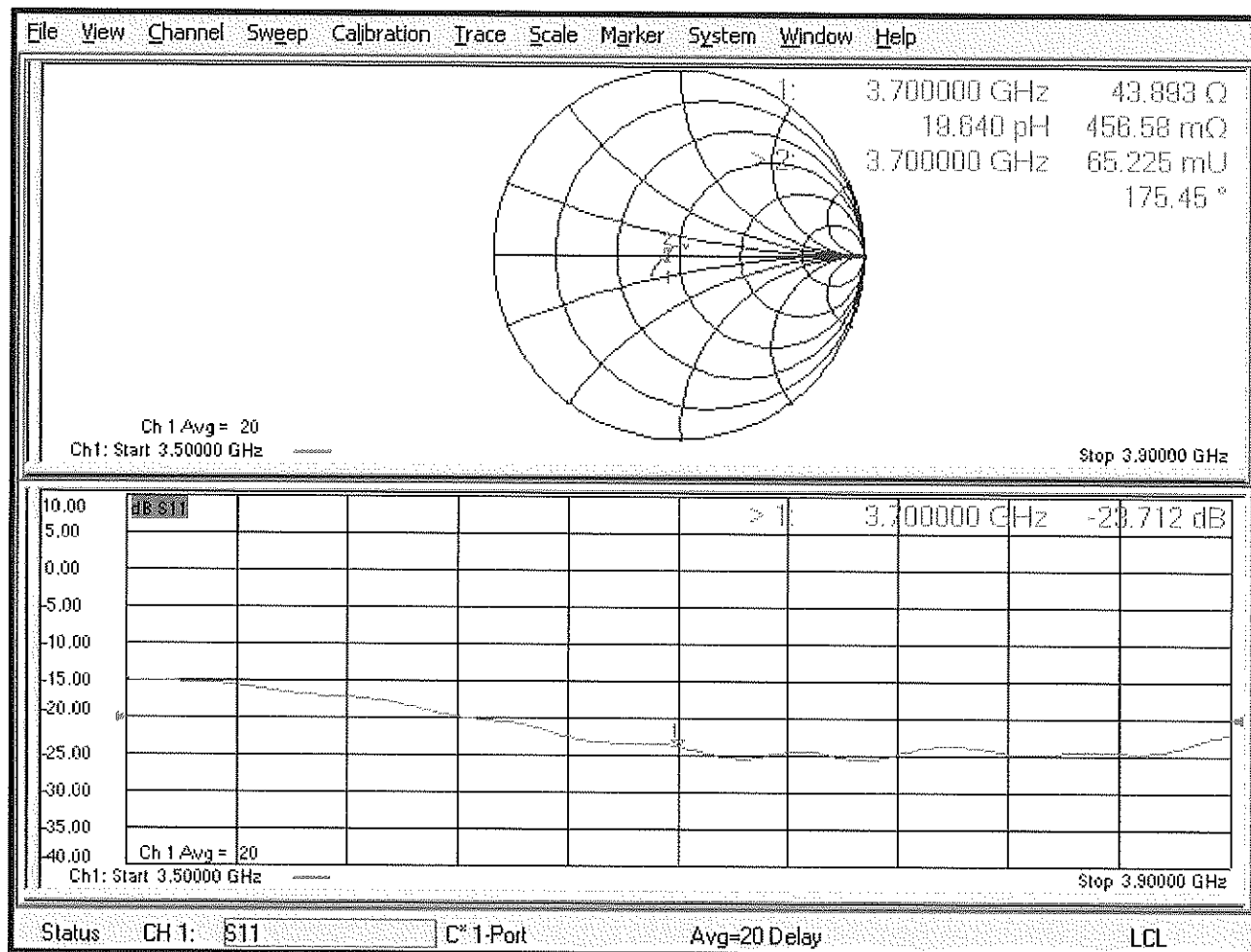
Ratio of SAR at M2 to SAR at M1 = 74.2%

Maximum value of SAR (measured) = 12.9 W/kg



0 dB = 12.9 W/kg = 11.11 dBW/kg

## Impedance Measurement Plot for Body TSL





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 The Swiss Accreditation Service is one of the signatories to the EA  
 Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 0108**

Client **PC Test**

Certificate No: **D5GHzV2-1163\_Sep18**

## CALIBRATION CERTIFICATE

Object **D5GHzV2 - SN:1163**

Calibration procedure(s) **QA CAL-22.v3**  
**Calibration procedure for dipole validation kits between 3-6 GHz**

Calibration date: **September 13, 2018**

*SC ✓*  
*9/21/2018*  
*BNW*  
*10/10/2019*

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).  
 The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature ( $22 \pm 3$ )°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards           | ID #               | Cal Date (Certificate No.)      | Scheduled Calibration |
|-----------------------------|--------------------|---------------------------------|-----------------------|
| Power meter NRP             | SN: 104778         | 04-Apr-18 (No. 217-02672/02673) | Apr-19                |
| Power sensor NRP-Z91        | SN: 103244         | 04-Apr-18 (No. 217-02672)       | Apr-19                |
| Power sensor NRP-Z91        | SN: 103245         | 04-Apr-18 (No. 217-02673)       | Apr-19                |
| Reference 20 dB Attenuator  | SN: 5058 (20k)     | 04-Apr-18 (No. 217-02682)       | Apr-19                |
| Type-N mismatch combination | SN: 5047.2 / 06327 | 04-Apr-18 (No. 217-02683)       | Apr-19                |
| Reference Probe EX3DV4      | SN: 3503           | 30-Dec-17 (No. EX3-3503_Dec17)  | Dec-18                |
| DAE4                        | SN: 601            | 26-Oct-17 (No. DAE4-601_Oct17)  | Oct-18                |

| Secondary Standards             | ID #           | Check Date (in house)             | Scheduled Check        |
|---------------------------------|----------------|-----------------------------------|------------------------|
| Power meter EPM-442A            | SN: GB37480704 | 07-Oct-15 (in house check Oct-16) | In house check: Oct-18 |
| Power sensor HP 8481A           | SN: US37292783 | 07-Oct-15 (in house check Oct-16) | In house check: Oct-18 |
| Power sensor HP 8481A           | SN: MY41092317 | 07-Oct-15 (in house check Oct-16) | In house check: Oct-18 |
| RF generator R&S SMT-06         | SN: 100972     | 15-Jun-15 (in house check Oct-16) | In house check: Oct-18 |
| Network Analyzer Agilent E8358A | SN: US41080477 | 31-Mar-14 (in house check Oct-17) | In house check: Oct-18 |

|                |               |                       |                  |
|----------------|---------------|-----------------------|------------------|
|                | <b>Name</b>   | <b>Function</b>       | <b>Signature</b> |
| Calibrated by: | Manu Seitz    | Laboratory Technician |                  |
| Approved by:   | Katja Pokovic | Technical Manager     |                  |

Issued: September 19, 2018

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.



Accredited by the Swiss Accreditation Service (SAS)

The Swiss Accreditation Service is one of the signatories to the EA  
Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 0108**

### Glossary:

|       |                                 |
|-------|---------------------------------|
| TSL   | tissue simulating liquid        |
| ConvF | sensitivity in TSL / NORM x,y,z |
| N/A   | not applicable or not measured  |

### Calibration is Performed According to the Following Standards:

- IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
- IEC 62209-1, "Measurement procedure for the assessment of Specific Absorption Rate (SAR) from hand-held and body-mounted devices used next to the ear (frequency range of 300 MHz to 6 GHz)", July 2016
- IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
- KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

### Additional Documentation:

- DASY4/5 System Handbook

### Methods Applied and Interpretation of Parameters:

- Measurement Conditions:** Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- Antenna Parameters with TSL:** The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- Feed Point Impedance and Return Loss:** These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- Electrical Delay:** One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- SAR measured:** SAR measured at the stated antenna input power.
- SAR normalized:** SAR as measured, normalized to an input power of 1 W at the antenna connector.
- SAR for nominal TSL parameters:** The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor  $k=2$ , which for a normal distribution corresponds to a coverage probability of approximately 95%.

## Measurement Conditions

DASY system configuration, as far as not given on page 1.

|                                     |                                                                      |                                  |
|-------------------------------------|----------------------------------------------------------------------|----------------------------------|
| <b>DASY Version</b>                 | DASY5                                                                | V52.10.1                         |
| <b>Extrapolation</b>                | Advanced Extrapolation                                               |                                  |
| <b>Phantom</b>                      | Modular Flat Phantom V5.0                                            |                                  |
| <b>Distance Dipole Center - TSL</b> | 10 mm                                                                | with Spacer                      |
| <b>Zoom Scan Resolution</b>         | dx, dy = 4.0 mm, dz = 1.4 mm                                         | Graded Ratio = 1.4 (Z direction) |
| <b>Frequency</b>                    | 5250 MHz $\pm$ 1 MHz<br>5600 MHz $\pm$ 1 MHz<br>5750 MHz $\pm$ 1 MHz |                                  |

## Head TSL parameters at 5250 MHz

The following parameters and calculations were applied.

|                                                | Temperature         | Permittivity   | Conductivity         |
|------------------------------------------------|---------------------|----------------|----------------------|
| <b>Nominal Head TSL parameters</b>             | 22.0 °C             | 35.9           | 4.71 mho/m           |
| <b>Measured Head TSL parameters</b>            | (22.0 $\pm$ 0.2) °C | 35.3 $\pm$ 6 % | 4.52 mho/m $\pm$ 6 % |
| <b>Head TSL temperature change during test</b> | < 0.5 °C            | ----           | ----                 |

## SAR result with Head TSL at 5250 MHz

|                                                             |                    |                                                |
|-------------------------------------------------------------|--------------------|------------------------------------------------|
| <b>SAR averaged over 1 cm<sup>3</sup> (1 g) of Head TSL</b> | Condition          |                                                |
| SAR measured                                                | 100 mW input power | 8.10 W/kg                                      |
| SAR for nominal Head TSL parameters                         | normalized to 1W   | <b>80.6 W/kg <math>\pm</math> 19.9 % (k=2)</b> |

|                                                               |                    |                                                |
|---------------------------------------------------------------|--------------------|------------------------------------------------|
| <b>SAR averaged over 10 cm<sup>3</sup> (10 g) of Head TSL</b> | condition          |                                                |
| SAR measured                                                  | 100 mW input power | 2.33 W/kg                                      |
| SAR for nominal Head TSL parameters                           | normalized to 1W   | <b>23.1 W/kg <math>\pm</math> 19.5 % (k=2)</b> |

### Head TSL parameters at 5600 MHz

The following parameters and calculations were applied.

|                                         | Temperature     | Permittivity | Conductivity     |
|-----------------------------------------|-----------------|--------------|------------------|
| Nominal Head TSL parameters             | 22.0 °C         | 35.5         | 5.07 mho/m       |
| Measured Head TSL parameters            | (22.0 ± 0.2) °C | 34.8 ± 6 %   | 4.87 mho/m ± 6 % |
| Head TSL temperature change during test | < 0.5 °C        | ----         | ----             |

### SAR result with Head TSL at 5600 MHz

|                                                             |                    |                                   |
|-------------------------------------------------------------|--------------------|-----------------------------------|
| <b>SAR averaged over 1 cm<sup>3</sup> (1 g) of Head TSL</b> | Condition          |                                   |
| SAR measured                                                | 100 mW input power | 8.43 W/kg                         |
| SAR for nominal Head TSL parameters                         | normalized to 1W   | <b>83.8 W / kg ± 19.9 % (k=2)</b> |

|                                                               |                    |                                 |
|---------------------------------------------------------------|--------------------|---------------------------------|
| <b>SAR averaged over 10 cm<sup>3</sup> (10 g) of Head TSL</b> | condition          |                                 |
| SAR measured                                                  | 100 mW input power | 2.42 W/kg                       |
| SAR for nominal Head TSL parameters                           | normalized to 1W   | <b>24.0 W/kg ± 19.5 % (k=2)</b> |

### Head TSL parameters at 5750 MHz

The following parameters and calculations were applied.

|                                         | Temperature     | Permittivity | Conductivity     |
|-----------------------------------------|-----------------|--------------|------------------|
| Nominal Head TSL parameters             | 22.0 °C         | 35.4         | 5.22 mho/m       |
| Measured Head TSL parameters            | (22.0 ± 0.2) °C | 34.6 ± 6 %   | 5.03 mho/m ± 6 % |
| Head TSL temperature change during test | < 0.5 °C        | ----         | ----             |

### SAR result with Head TSL at 5750 MHz

|                                                             |                    |                                 |
|-------------------------------------------------------------|--------------------|---------------------------------|
| <b>SAR averaged over 1 cm<sup>3</sup> (1 g) of Head TSL</b> | Condition          |                                 |
| SAR measured                                                | 100 mW input power | 8.16 W/kg                       |
| SAR for nominal Head TSL parameters                         | normalized to 1W   | <b>81.1 W/kg ± 19.9 % (k=2)</b> |

|                                                               |                    |                                 |
|---------------------------------------------------------------|--------------------|---------------------------------|
| <b>SAR averaged over 10 cm<sup>3</sup> (10 g) of Head TSL</b> | condition          |                                 |
| SAR measured                                                  | 100 mW input power | 2.32 W/kg                       |
| SAR for nominal Head TSL parameters                           | normalized to 1W   | <b>23.0 W/kg ± 19.5 % (k=2)</b> |

### Body TSL parameters at 5250 MHz

The following parameters and calculations were applied.

|                                         | Temperature     | Permittivity | Conductivity     |
|-----------------------------------------|-----------------|--------------|------------------|
| Nominal Body TSL parameters             | 22.0 °C         | 48.9         | 5.36 mho/m       |
| Measured Body TSL parameters            | (22.0 ± 0.2) °C | 46.9 ± 6 %   | 5.46 mho/m ± 6 % |
| Body TSL temperature change during test | < 0.5 °C        | ----         | ----             |

### SAR result with Body TSL at 5250 MHz

|                                                             |                    |                                 |
|-------------------------------------------------------------|--------------------|---------------------------------|
| <b>SAR averaged over 1 cm<sup>3</sup> (1 g) of Body TSL</b> | Condition          |                                 |
| SAR measured                                                | 100 mW input power | 7.83 W/kg                       |
| SAR for nominal Body TSL parameters                         | normalized to 1W   | <b>77.7 W/kg ± 19.9 % (k=2)</b> |

|                                                               |                    |                                 |
|---------------------------------------------------------------|--------------------|---------------------------------|
| <b>SAR averaged over 10 cm<sup>3</sup> (10 g) of Body TSL</b> | condition          |                                 |
| SAR measured                                                  | 100 mW input power | 2.17 W/kg                       |
| SAR for nominal Body TSL parameters                           | normalized to 1W   | <b>21.5 W/kg ± 19.5 % (k=2)</b> |

### Body TSL parameters at 5600 MHz

The following parameters and calculations were applied.

|                                         | Temperature     | Permittivity | Conductivity     |
|-----------------------------------------|-----------------|--------------|------------------|
| Nominal Body TSL parameters             | 22.0 °C         | 48.5         | 5.77 mho/m       |
| Measured Body TSL parameters            | (22.0 ± 0.2) °C | 46.3 ± 6 %   | 5.93 mho/m ± 6 % |
| Body TSL temperature change during test | < 0.5 °C        | ----         | ----             |

### SAR result with Body TSL at 5600 MHz

|                                                             |                    |                                 |
|-------------------------------------------------------------|--------------------|---------------------------------|
| <b>SAR averaged over 1 cm<sup>3</sup> (1 g) of Body TSL</b> | Condition          |                                 |
| SAR measured                                                | 100 mW input power | 8.08 W/kg                       |
| SAR for nominal Body TSL parameters                         | normalized to 1W   | <b>80.1 W/kg ± 19.9 % (k=2)</b> |

|                                                               |                    |                                 |
|---------------------------------------------------------------|--------------------|---------------------------------|
| <b>SAR averaged over 10 cm<sup>3</sup> (10 g) of Body TSL</b> | condition          |                                 |
| SAR measured                                                  | 100 mW input power | 2.25 W/kg                       |
| SAR for nominal Body TSL parameters                           | normalized to 1W   | <b>22.3 W/kg ± 19.5 % (k=2)</b> |

### Body TSL parameters at 5750 MHz

The following parameters and calculations were applied.

|                                         | Temperature     | Permittivity | Conductivity     |
|-----------------------------------------|-----------------|--------------|------------------|
| Nominal Body TSL parameters             | 22.0 °C         | 48.3         | 5.94 mho/m       |
| Measured Body TSL parameters            | (22.0 ± 0.2) °C | 46.0 ± 6 %   | 6.14 mho/m ± 6 % |
| Body TSL temperature change during test | < 0.5 °C        | ----         | ----             |

### SAR result with Body TSL at 5750 MHz

|                                                             |                    |                                 |
|-------------------------------------------------------------|--------------------|---------------------------------|
| <b>SAR averaged over 1 cm<sup>3</sup> (1 g) of Body TSL</b> | Condition          |                                 |
| SAR measured                                                | 100 mW input power | 7.85 W/kg                       |
| SAR for nominal Body TSL parameters                         | normalized to 1W   | <b>77.8 W/kg ± 19.9 % (k=2)</b> |

|                                                               |                    |                                 |
|---------------------------------------------------------------|--------------------|---------------------------------|
| <b>SAR averaged over 10 cm<sup>3</sup> (10 g) of Body TSL</b> | condition          |                                 |
| SAR measured                                                  | 100 mW input power | 2.18 W/kg                       |
| SAR for nominal Body TSL parameters                           | normalized to 1W   | <b>21.5 W/kg ± 19.5 % (k=2)</b> |

## Appendix (Additional assessments outside the scope of SCS 0108)

### Antenna Parameters with Head TSL at 5250 MHz

|                                      |                                |
|--------------------------------------|--------------------------------|
| Impedance, transformed to feed point | 48.0 $\Omega$ - 2.0 j $\Omega$ |
| Return Loss                          | - 30.9 dB                      |

### Antenna Parameters with Head TSL at 5600 MHz

|                                      |                                |
|--------------------------------------|--------------------------------|
| Impedance, transformed to feed point | 49.0 $\Omega$ + 4.4 j $\Omega$ |
| Return Loss                          | - 26.8 dB                      |

### Antenna Parameters with Head TSL at 5750 MHz

|                                      |                                |
|--------------------------------------|--------------------------------|
| Impedance, transformed to feed point | 50.9 $\Omega$ + 4.3 j $\Omega$ |
| Return Loss                          | - 27.2 dB                      |

### Antenna Parameters with Body TSL at 5250 MHz

|                                      |                                |
|--------------------------------------|--------------------------------|
| Impedance, transformed to feed point | 46.4 $\Omega$ - 0.4 j $\Omega$ |
| Return Loss                          | - 28.5 dB                      |

### Antenna Parameters with Body TSL at 5600 MHz

|                                      |                                |
|--------------------------------------|--------------------------------|
| Impedance, transformed to feed point | 50.2 $\Omega$ + 4.1 j $\Omega$ |
| Return Loss                          | - 27.8 dB                      |

### Antenna Parameters with Body TSL at 5750 MHz

|                                      |                                |
|--------------------------------------|--------------------------------|
| Impedance, transformed to feed point | 51.8 $\Omega$ + 5.9 j $\Omega$ |
| Return Loss                          | - 24.3 dB                      |

## General Antenna Parameters and Design

|                                  |          |
|----------------------------------|----------|
| Electrical Delay (one direction) | 1.202 ns |
|----------------------------------|----------|

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

### Additional EUT Data

|                 |               |
|-----------------|---------------|
| Manufactured by | SPEAG         |
| Manufactured on | June 06, 2013 |

## DASY5 Validation Report for Head TSL

Date: 13.09.2018

Test Laboratory: SPEAG, Zurich, Switzerland

### DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: D5GHzV2 - SN:1163

Communication System: UID 0 - CW; Frequency: 5250 MHz, Frequency: 5600 MHz, Frequency: 5750 MHz

Medium parameters used:  $f = 5250$  MHz;  $\sigma = 4.52$  S/m;  $\epsilon_r = 35.3$ ;  $\rho = 1000$  kg/m<sup>3</sup>,

Medium parameters used:  $f = 5600$  MHz;  $\sigma = 4.87$  S/m;  $\epsilon_r = 34.8$ ;  $\rho = 1000$  kg/m<sup>3</sup>,

Medium parameters used:  $f = 5750$  MHz;  $\sigma = 5.03$  S/m;  $\epsilon_r = 34.6$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

#### DASY52 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(5.51, 5.51, 5.51) @ 5250 MHz, ConvF(5.05, 5.05, 5.05) @ 5600 MHz, ConvF(4.98, 4.98, 4.98) @ 5750 MHz; Calibrated: 30.12.2017
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601 (5GHz); Calibrated: 26.10.2017
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.10.1(1476); SEMCAD X 14.6.11(7439)

### Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5250 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 77.54 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 26.6 W/kg

**SAR(1 g) = 8.1 W/kg; SAR(10 g) = 2.33 W/kg**

Maximum value of SAR (measured) = 17.9 W/kg

### Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5600 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 77.29 V/m; Power Drift = -0.04 dB

Peak SAR (extrapolated) = 30.6 W/kg

**SAR(1 g) = 8.43 W/kg; SAR(10 g) = 2.42 W/kg**

Maximum value of SAR (measured) = 19.3 W/kg

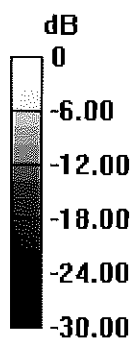
### Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5750 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 75.35 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 30.3 W/kg

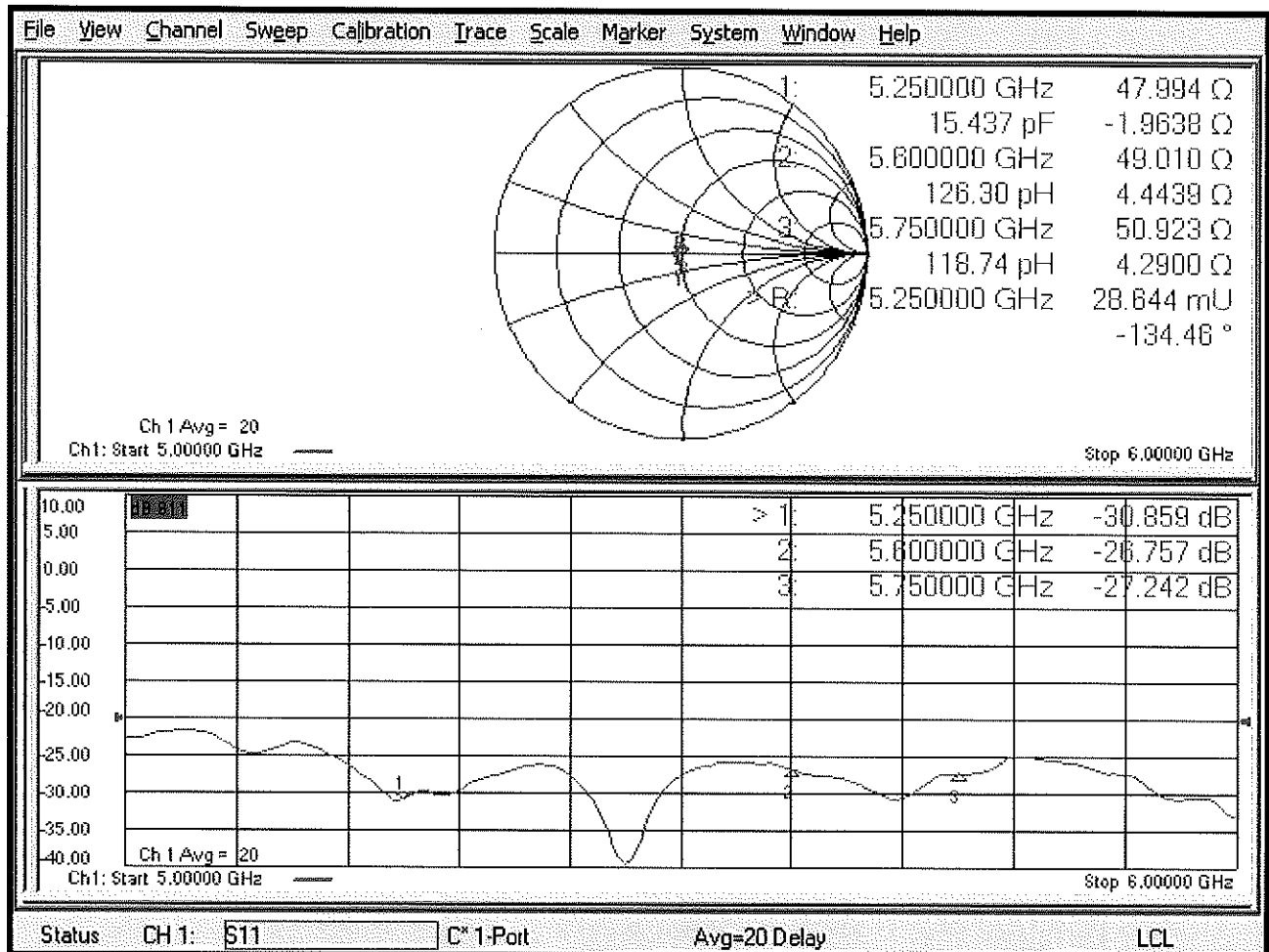
**SAR(1 g) = 8.16 W/kg; SAR(10 g) = 2.32 W/kg**

Maximum value of SAR (measured) = 18.9 W/kg



0 dB = 17.9 W/kg = 12.53 dBW/kg

## Impedance Measurement Plot for Head TSL



## DASY5 Validation Report for Body TSL

Date: 12.09.2018

Test Laboratory: SPEAG, Zurich, Switzerland

### DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: D5GHzV2 - SN:1163

Communication System: UID 0 - CW; Frequency: 5250 MHz, Frequency: 5600 MHz, Frequency: 5750 MHz

Medium parameters used:  $f = 5250$  MHz;  $\sigma = 5.46$  S/m;  $\epsilon_r = 46.9$ ;  $\rho = 1000$  kg/m<sup>3</sup>,

Medium parameters used:  $f = 5600$  MHz;  $\sigma = 5.93$  S/m;  $\epsilon_r = 46.3$ ;  $\rho = 1000$  kg/m<sup>3</sup>,

Medium parameters used:  $f = 5750$  MHz;  $\sigma = 6.14$  S/m;  $\epsilon_r = 46$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

#### DASY52 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(5.26, 5.26, 5.26) @ 5250 MHz, ConvF(4.65, 4.65, 4.65) @ 5600 MHz, ConvF(4.57, 4.57, 4.57) @ 5750 MHz; Calibrated: 30.12.2017
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601 (5GHz); Calibrated: 26.10.2017
- Phantom: Flat Phantom 5.0 (back); Type: QD 000 P50 AA; Serial: 1002
- DASY52 52.10.1(1476); SEMCAD X 14.6.11(7439)

### Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5250 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 69.57 V/m; Power Drift = -0.04 dB

Peak SAR (extrapolated) = 29.9 W/kg

**SAR(1 g) = 7.83 W/kg; SAR(10 g) = 2.17 W/kg**

Maximum value of SAR (measured) = 17.8 W/kg

### Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5600 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 68.75 V/m; Power Drift = -0.04 dB

Peak SAR (extrapolated) = 33.7 W/kg

**SAR(1 g) = 8.08 W/kg; SAR(10 g) = 2.25 W/kg**

Maximum value of SAR (measured) = 19.2 W/kg

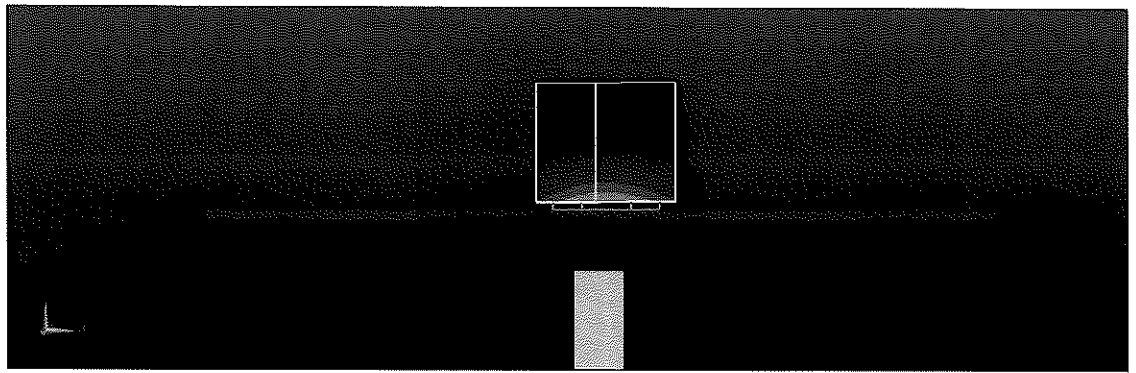
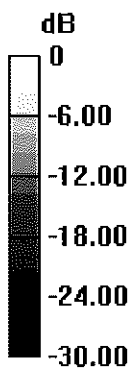
### Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5750 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 67.61 V/m; Power Drift = -0.06 dB

Peak SAR (extrapolated) = 33.2 W/kg

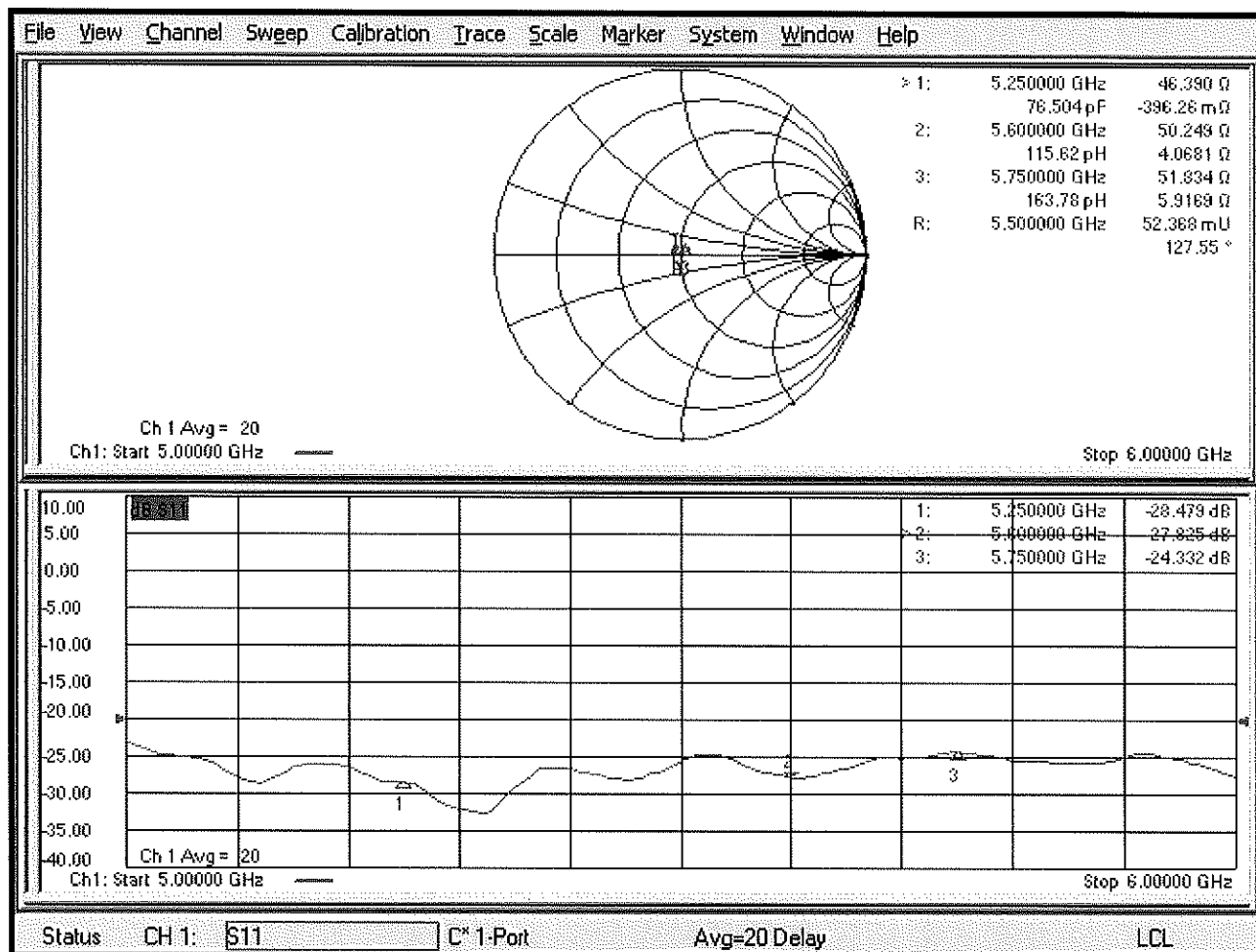
**SAR(1 g) = 7.85 W/kg; SAR(10 g) = 2.18 W/kg**

Maximum value of SAR (measured) = 18.6 W/kg



0 dB = 17.8 W/kg = 12.50 dBW/kg

## Impedance Measurement Plot for Body TSL



# Certification of Calibration

Object: D5GHzV2 – SN: 1163

Calibration procedure(s): Procedure for Calibration Extension for SAR Dipoles.

Extended Calibration date: September 11, 2019

Description: SAR Validation Dipole at 5250, 5600, and 5750 MHz.

## Calibration Equipment used:

| Manufacturer          | Model     | Description                                             | Cal Date   | Cal Interval | Cal Due    | Serial Number |
|-----------------------|-----------|---------------------------------------------------------|------------|--------------|------------|---------------|
| Agilent               | 8753ES    | S-Parameter Network Analyzer                            | 10/2/2018  | Annual       | 10/2/2019  | US39170118    |
| Agilent               | E4438C    | ESG Vector Signal Generator                             | 6/27/2019  | Annual       | 6/27/2020  | MY45093852    |
| Amplifier Research    | 15S1G6    | Amplifier                                               | CBT        | N/A          | CBT        | 343972        |
| Anritsu               | ML2495A   | Power Meter                                             | 10/21/2018 | Annual       | 10/21/2019 | 941001        |
| Anritsu               | MA2411B   | Pulse Power Sensor                                      | 10/30/2018 | Annual       | 10/30/2019 | 1207470       |
| Anritsu               | MA2411B   | Pulse Power Sensor                                      | 11/20/2018 | Annual       | 11/20/2019 | 1339007       |
| Control Company       | 4040      | Temperature / Humidity Monitor                          | 2/28/2018  | Biennial     | 2/28/2020  | 150761911     |
| Control Company       | 4352      | Ultra Long Stem Thermometer                             | 2/28/2018  | Biennial     | 2/28/2020  | 170330160     |
| Keysight Technologies | 85033E    | Standard Mechanical Calibration Kit (DC to 9GHz, 3.5mm) | 7/2/2019   | Annual       | 7/2/2020   | MY53401181    |
| Keysight              | 772D      | Dual Directional Coupler                                | CBT        | N/A          | CBT        | MY52180215    |
| Mini-Circuits         | BW-N20W5+ | DC to 18 GHz Precision Fixed 20 dB Attenuator           | CBT        | N/A          | CBT        | N/A           |
| MiniCircuits          | VLF-6000+ | Low Pass Filter                                         | CBT        | N/A          | CBT        | N/A           |
| Narda                 | 4772-3    | Attenuator (3dB)                                        | CBT        | N/A          | CBT        | 9406          |
| Pasternack            | PE2209-10 | Bidirectional Coupler                                   | CBT        | N/A          | CBT        | N/A           |
| Pasternack            | NC-100    | Torque Wrench                                           | 11/1/2017  | Biennial     | 11/1/2019  | N/A           |
| SPEAG                 | DAK-3.5   | Dielectric Assessment Kit                               | 5/7/2019   | Annual       | 5/7/2020   | 1070          |
| SPEAG                 | EX3DV4    | SAR Probe                                               | 7/16/2019  | Annual       | 7/16/2020  | 7491          |
| SPEAG                 | EX3DV4    | SAR Probe                                               | 1/28/2019  | Annual       | 1/28/2020  | 3837          |
| SPEAG                 | DAE4      | Dasy Data Acquisition Electronics                       | 7/10/2019  | Annual       | 7/10/2020  | 1402          |
| SPEAG                 | DAE4      | Dasy Data Acquisition Electronics                       | 1/15/2019  | Annual       | 1/15/2020  | 793           |

Measurement Uncertainty =  $\pm 23\%$  (k=2)

|                | Name            | Function                 | Signature           |
|----------------|-----------------|--------------------------|---------------------|
| Calibrated By: | Parker Jones    | Team Lead Engineer       | <i>Parker Jones</i> |
| Approved By:   | Kaitlin O'Keefe | Senior Technical Manager | <i>KOK</i>          |

# DIPOLE CALIBRATION EXTENSION

Per KDB 865664 D01, calibration intervals of up to three years may be considered for reference dipoles when it is demonstrated that the SAR target, impedance and return loss of a dipole have remained stable according to the following requirements:

1. The measured SAR does not deviate more than 10% from the target on the calibration certificate.
2. The return-loss does not deviate more than 20% from the previous measurement and meets the required 20dB minimum return-loss requirement.
3. The measurement of real or imaginary parts of impedance does not deviate more than 5Ω from the previous measurement.

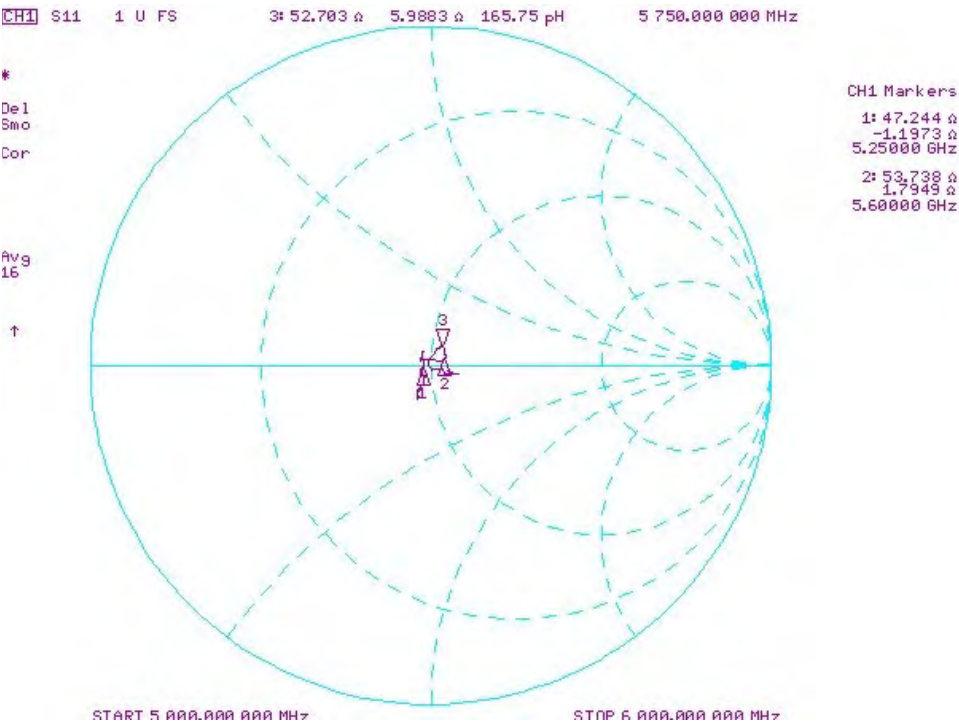
The following dipole was checked to pass the above 3 requirements to have 2-year calibration period from the calibration date:

| Frequency (MHz) | Calibration Date | Extension Date | Certificate Electrical Delay (ns) | Certificate SAR Target Head (1g) W/kg @ 17.0 dBm | Measured Head SAR (1g) W/kg @ 17.0 dBm | Deviation 1g (%) | Certificate SAR Target Head (10g) W/kg @ 17.0 dBm | Measured Head SAR (10g) W/kg @ 17.0 dBm | Deviation 10g (%) | Certificate Impedance Head (Ohm) Real | Measured Impedance Head (Ohm) Real | Difference (Ohm) Real | Certificate Impedance Head (Ohm) Imaginary | Measured Impedance Head (Ohm) Imaginary | Difference (Ohm) Imaginary | Certificate Return Loss Head (dB) | Measured Return Loss Head (dB) | Deviation (%) | PASS/FAIL |
|-----------------|------------------|----------------|-----------------------------------|--------------------------------------------------|----------------------------------------|------------------|---------------------------------------------------|-----------------------------------------|-------------------|---------------------------------------|------------------------------------|-----------------------|--------------------------------------------|-----------------------------------------|----------------------------|-----------------------------------|--------------------------------|---------------|-----------|
| 5250            | 9/13/2018        | 9/11/2019      | 1.202                             | 4.03                                             | 3.89                                   | -3.47%           | 1.15                                              | 1.14                                    | -1.30%            | 48                                    | 47.2                               | 0.8                   | -2                                         | -1.2                                    | 0.8                        | -30.9                             | -29.9                          | 3.20%         | PASS      |
| 5600            | 9/13/2018        | 9/11/2019      | 1.202                             | 4.19                                             | 3.92                                   | -6.44%           | 1.2                                               | 1.13                                    | -5.83%            | 49                                    | 53.7                               | 4.7                   | 4.4                                        | 1.8                                     | 2.6                        | -26.8                             | -26.1                          | -4.90%        | PASS      |
| 5750            | 9/13/2018        | 9/11/2019      | 1.202                             | 4.06                                             | 3.88                                   | -4.32%           | 1.15                                              | 1.12                                    | -2.61%            | 50.9                                  | 52.7                               | 1.8                   | 4.3                                        | 6                                       | 1.7                        | -27.2                             | -23.9                          | 12.10%        | PASS      |

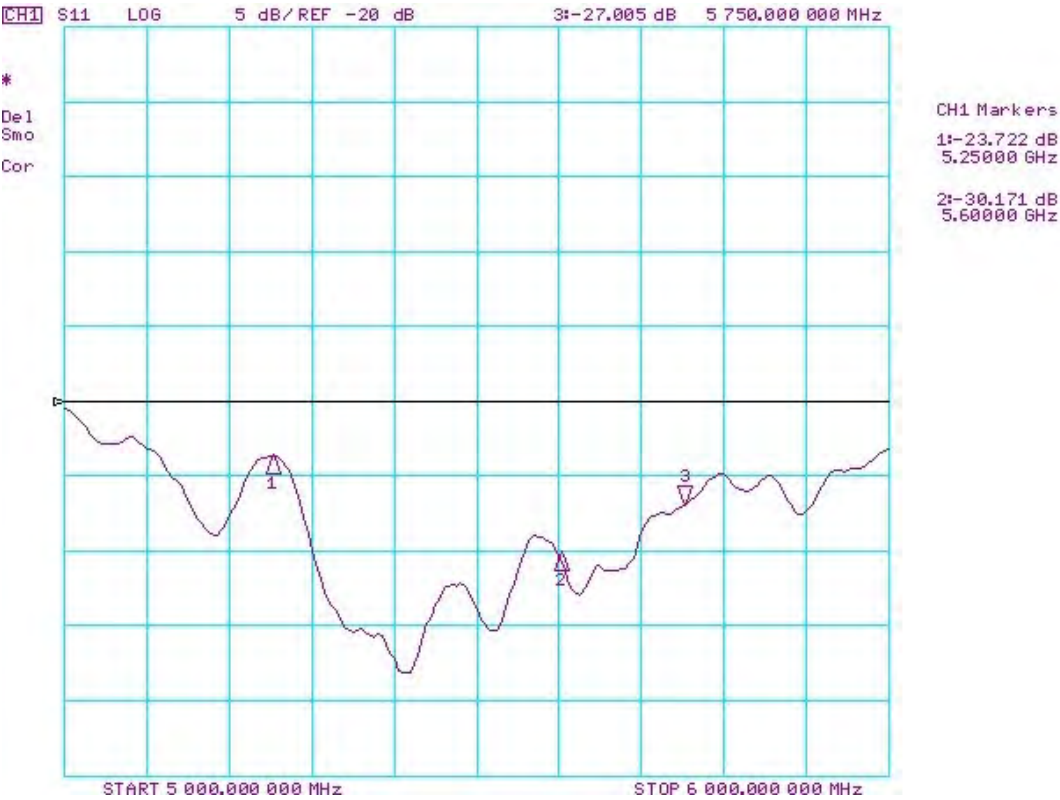
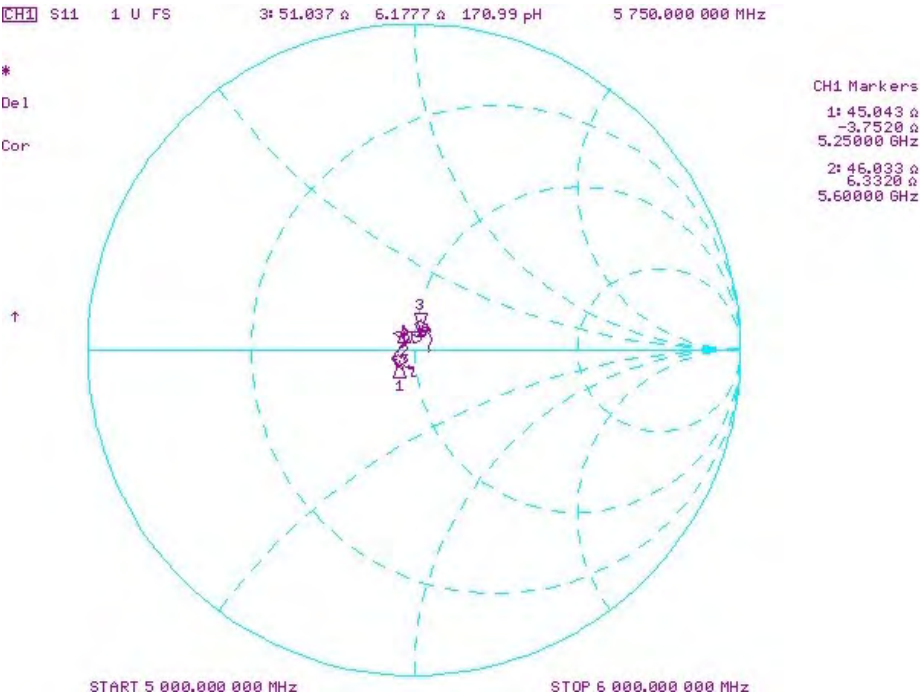
  

| Frequency (MHz) | Calibration Date | Extension Date | Certificate Electrical Delay (ns) | Certificate SAR Target Body (1g) W/kg @ 17.0 dBm | Measured Body SAR (1g) W/kg @ 17.0 dBm | Deviation 1g (%) | Certificate SAR Target Body (10g) W/kg @ 17.0 dBm | Measured Body SAR (10g) W/kg @ 17.0 dBm | Deviation 10g (%) | Certificate Impedance Body (Ohm) Real | Measured Impedance Body (Ohm) Real | Difference (Ohm) Real | Certificate Impedance Body (Ohm) Imaginary | Measured Impedance Body (Ohm) Imaginary | Difference (Ohm) Imaginary | Certificate Return Loss Body (dB) | Measured Return Loss Body (dB) | Deviation (%) | PASS/FAIL |
|-----------------|------------------|----------------|-----------------------------------|--------------------------------------------------|----------------------------------------|------------------|---------------------------------------------------|-----------------------------------------|-------------------|---------------------------------------|------------------------------------|-----------------------|--------------------------------------------|-----------------------------------------|----------------------------|-----------------------------------|--------------------------------|---------------|-----------|
| 5250            | 9/13/2018        | 9/11/2019      | 1.202                             | 3.89                                             | 3.72                                   | -4.29%           | 1.08                                              | 1.04                                    | -3.59%            | 46.4                                  | 45                                 | -1.4                  | -0.4                                       | -3.8                                    | 3.4                        | -28.5                             | -23.7                          | 16.80%        | PASS      |
| 5600            | 9/13/2018        | 9/11/2019      | 1.202                             | 4.01                                             | 3.72                                   | -7.12%           | 1.12                                              | 1.03                                    | -7.62%            | 50.2                                  | 46                                 | -4.2                  | 4.1                                        | 6.3                                     | 2.2                        | -27.8                             | -30.2                          | -8.60%        | PASS      |
| 5750            | 9/13/2018        | 9/11/2019      | 1.202                             | 3.89                                             | 3.62                                   | -6.90%           | 1.08                                              | 1.01                                    | -6.05%            | 51.8                                  | 51                                 | 0.8                   | 5.9                                        | 6.2                                     | 0.3                        | -24.3                             | -27                            | -11.10%       | PASS      |

Impedance & Return-Loss Measurement Plot for Head TSL



Impedance & Return-Loss Measurement Plot for Body TSL





Accredited by the Swiss Accreditation Service (SAS)  
 The Swiss Accreditation Service is one of the signatories to the EA  
 Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 0108**

Client **PC Test**

Certificate No: **EX3-3949\_Aug19**

## CALIBRATION CERTIFICATE

Object **EX3DV4 - SN:3949**

Calibration procedure(s) **QA CAL-01.v9, QA CAL-12.v9, QA CAL-14.v5, QA CAL-23.v5,  
 QA CAL-25.v7  
 Calibration procedure for dosimetric E-field probes**

Calibration date: **August 29, 2019**

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).  
 The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature  $(22 \pm 3)^\circ\text{C}$  and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards          | ID               | Cal Date (Certificate No.)        | Scheduled Calibration  |
|----------------------------|------------------|-----------------------------------|------------------------|
| Power meter NRP            | SN: 104778       | 03-Apr-19 (No. 217-02892/02893)   | Apr-20                 |
| Power sensor NRP-Z91       | SN: 103244       | 03-Apr-19 (No. 217-02892)         | Apr-20                 |
| Power sensor NRP-Z91       | SN: 103245       | 03-Apr-19 (No. 217-02893)         | Apr-20                 |
| Reference 20 dB Attenuator | SN: S5277 (20x)  | 04-Apr-19 (No. 217-02894)         | Apr-20                 |
| DAE4                       | SN: 660          | 19-Dec-18 (No. DAE4-660_Dec18)    | Dec-19                 |
| Reference Probe ES3DV2     | SN: 3013         | 31-Dec-18 (No. ES3-3013_Dec18)    | Dec-19                 |
| Secondary Standards        | ID               | Check Date (in house)             | Scheduled Check        |
| Power meter E4419B         | SN: GB41293874   | 06-Apr-16 (in house check Jun-18) | In house check: Jun-20 |
| Power sensor E4412A        | SN: MY41498087   | 06-Apr-16 (in house check Jun-18) | In house check: Jun-20 |
| Power sensor E4412A        | SN: 000110210    | 06-Apr-16 (in house check Jun-18) | In house check: Jun-20 |
| RF generator HP 8648C      | SN: US3642U01700 | 04-Aug-99 (in house check Jun-18) | In house check: Jun-20 |
| Network Analyzer E8358A    | SN: US41080477   | 31-Mar-14 (in house check Oct-18) | In house check: Oct-19 |

|                                                                                                                 |                       |                                   |                         |
|-----------------------------------------------------------------------------------------------------------------|-----------------------|-----------------------------------|-------------------------|
| Calibrated by:                                                                                                  | Name<br>Michael Weber | Function<br>Laboratory Technician | Signature<br>           |
| Approved by:                                                                                                    | Katja Pokovic         | Technical Manager                 |                         |
|                                                                                                                 |                       |                                   | Issued: August 31, 2019 |
| This calibration certificate shall not be reproduced except in full without written approval of the laboratory. |                       |                                   |                         |