



## NEAR-FIELD POWER DENSITY EVALUATION REPORT

**Applicant Name**

Samsung Electronics Co., Ltd.  
129, Samsung-ro, Maetan dong,  
Yeongtong-gu, Suwon-si  
Gyeonggi-do, 16677, Korea

**Date of Testing**

04/15/2020 - 04/21/2020

**Test Site/Location**

PCTEST, Columbia, MD, USA

**Document Serial No:**

1M2003090034-27-R1.A3L

**FCC ID:**

**A3LSMG981V**

**APPLICANT:**

**Samsung Electronics Co., Ltd.**

**DUT Type:**

Portable Handset

**Application Type:**

Certification

**FCC Rule Part(s):**

CFR §2.1093

**Model:**

SM-G981V

| Band & Mode                 | Tx Frequency  | Measured psPD      | Report psPD        |
|-----------------------------|---------------|--------------------|--------------------|
|                             | MHz           | mW/cm <sup>2</sup> | mW/cm <sup>2</sup> |
| 5G NR - n261                | 27500 - 28350 | 0.665              | 0.750              |
| 5G NR - n260                | 37000 - 40000 | 0.495              | 0.750              |
| <b>Total Exposure Ratio</b> |               | <b>0.977</b>       |                    |
| <b>Verdict</b>              |               | <b>PASS</b>        |                    |

Note: This revised Test Report (S/N: 1M1912300227-17-R1.ZNF) supersedes and replaces the previously issued test report on the same subject device for the same type of testing as indicated. Please discard or destroy the previously issued test report(s) and dispose of it accordingly.

I attest to the accuracy of data. All measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them. Test results reported herein relate only to the item(s) tested.

  
Randy Ortanez  
President



|                                         |                                                                                     |                                               |                                                                                       |                                 |
|-----------------------------------------|-------------------------------------------------------------------------------------|-----------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------|
| FCC ID:<br>A3LSMG981V                   |  | NEAR-FIELD POWER DENSITY<br>EVALUATION REPORT |  | Approved by:<br>Quality Manager |
| Document S/N:<br>1M2003090034-27-R1.A3L | Test Dates:<br>04/15/2020 - 04/21/2020                                              | DUT Type:<br>Portable Handset                 | Page 1 of 21                                                                          |                                 |

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# 1 DEVICE UNDER TEST

## 1.1 Device Overview

**Table 1-1**  
**5G mmWave NR Device Overview**

| NR FR2 Operations Information               |                                                                          |                 |         |                 |         |                 |
|---------------------------------------------|--------------------------------------------------------------------------|-----------------|---------|-----------------|---------|-----------------|
| Form Factor                                 | Portable Handset                                                         |                 |         |                 |         |                 |
| Channel Bandwidths per NR Band              | NR Band n261: 50MHz, 100MHz                                              |                 |         |                 |         |                 |
| Channel Bandwidths per NR Band              | NR Band n260: 50MHz, 100MHz                                              |                 |         |                 |         |                 |
| Channel Numbers and Frequencies             |                                                                          |                 |         |                 |         |                 |
|                                             | Low                                                                      |                 | Mid     |                 | High    |                 |
|                                             | Channel                                                                  | Frequency (MHz) | Channel | Frequency (MHz) | Channel | Frequency (MHz) |
| NR Band n261: 50MHz BW                      | 2071413                                                                  | 27534.8         | 2077891 | 27923.5         | 2084491 | 28319.5         |
| NR Band n261: 100MHz BW                     | 2071821                                                                  | 27559.3         | 2077891 | 27923.5         | 2084035 | 28292.2         |
| NR Band n260: 50MHz BW                      | 2229621                                                                  | 37027.3         | 2253331 | 38449.9         | 2278603 | 39966.2         |
| NR Band n260: 100MHz BW                     | 2230029                                                                  | 37051.8         | 2253331 | 38449.9         | 2278331 | 39949.9         |
| Subcarrier Spacing (kHz)                    | 120                                                                      |                 |         |                 |         |                 |
| Total Number of Supported Uplink CCs (SISO) | 2                                                                        |                 |         |                 |         |                 |
| Total Number of Supported Uplink CCs (MIMO) | 2 (CP-OFDM only)                                                         |                 |         |                 |         |                 |
| Total Number of Supported DL CCs            | 8                                                                        |                 |         |                 |         |                 |
| Modulations Supported in UL                 | CP-OFDM: QPSK, 16QAM, 64QAM<br>DFT-s-OFDM: P1/2 BPSK, QPSK, 16QAM, 64QAM |                 |         |                 |         |                 |
| LTE Anchor Bands (n260)                     | LTE B2/4/5/13/66                                                         |                 |         |                 |         |                 |
| LTE Anchor Bands (n261)                     | LTE B2/4/5/13/66                                                         |                 |         |                 |         |                 |
| Duplex Type (mmWave)                        | TDD                                                                      |                 |         |                 |         |                 |

## 1.2 Time-Averaging Algorithm for RF Exposure Compliance

The equipment under test (EUT) contains:

- Qualcomm® SM8250 modem supporting 2G/3G/4G/5G NR WWAN
- Qualcomm® SDX55 modem supporting 5G mmW NR and 5G Sub-6 NR technologies

Both of Qualcomm® SM8250 and SDX55 modems are enabled with Qualcomm® Smart Transmit feature. This feature performs time averaging algorithm in real time to control and manage transmitting power and ensure the time-averaged RF exposure is in compliance with FCC requirements all the time. Refer to Compliance Summary document for detailed description of Qualcomm® Smart Transmit feature (report SN could be found in Section 1.7).

Note that WLAN operations are not enabled with Smart Transmit.

The Smart Transmit algorithm maintains the time-averaged transmit power, in turn, time-averaged RF exposure of *SAR\_design\_target* or *PD\_design\_target*, below the predefined time-averaged power limit (i.e.,  $P_{limit}$  for sub-6 radio, and *input.power.limit* for 5G mmW NR), for each characterized technology and band (see RF Exposure Part 0 Test Report, report SN could be found in Section 1.7).

Smart Transmit allows the device to transmit at higher power instantaneously when needed, but manages power limiting to maintain time-averaged transmit power to *input.power.limit* listed in Section 1.3.

The purpose of this report (Part 1 test) is to demonstrate that the EUT meets FCC PD limits when transmitting in static transmission scenario at maximum allowable time-averaged power level given by *input.power.limit*.

|                                         |                                                                                                                                  |                                               |                                                                                       |                                 |
|-----------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------|
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### 1.3 Input Power Specifications

All power density measurements for this device were performed at the *input.power.limit* given in below tables. Input power is per antenna element and polarization for each antenna module. When input.power.limit is calculated to be above the maximum input power, the device is limited to the maximum input power.

**Table 1-2**  
**5G mmWave NR Band n261 Antenna L**

| Band | Beam ID1 | Beam ID2 | input.power.limit (dBm) |
|------|----------|----------|-------------------------|
| n261 | 1        |          | 11.4                    |
| n261 | 4        |          | 7.7                     |
| n261 | 5        |          | 8.0                     |
| n261 | 6        |          | 9.1                     |
| n261 | 8        |          | 7.6                     |
| n261 | 9        |          | 8.7                     |
| n261 | 15       |          | 6.5                     |
| n261 | 16       |          | 4.7                     |
| n261 | 17       |          | 4.7                     |
| n261 | 18       |          | 5.2                     |
| n261 | 19       |          | 5.7                     |
| n261 | 24       |          | 5.5                     |
| n261 | 25       |          | 4.8                     |
| n261 | 26       |          | 4.6                     |
| n261 | 27       |          | 5.7                     |
| n261 |          | 129      | 12.3 -> 12.0            |
| n261 |          | 132      | 7.7                     |
| n261 |          | 133      | 6.9                     |
| n261 |          | 134      | 7.9                     |
| n261 |          | 136      | 7.1                     |
| n261 |          | 137      | 7.2                     |
| n261 |          | 143      | 7.4                     |
| n261 |          | 144      | 5.1                     |
| n261 |          | 145      | 4.6                     |
| n261 |          | 146      | 4.8                     |
| n261 |          | 147      | 5.0                     |
| n261 |          | 152      | 6.2                     |
| n261 |          | 153      | 4.6                     |
| n261 |          | 154      | 4.8                     |
| n261 |          | 155      | 5.0                     |
| n261 | 1        | 129      | 9.5 -> 9.0              |
| n261 | 4        | 134      | 3.9                     |
| n261 | 5        | 133      | 3.1                     |
| n261 | 6        | 132      | 4.2                     |
| n261 | 8        | 137      | 3.4                     |
| n261 | 9        | 136      | 3.5                     |
| n261 | 15       | 147      | 1.1                     |
| n261 | 16       | 146      | 0.2                     |
| n261 | 17       | 145      | 0.3                     |
| n261 | 18       | 144      | 0.4                     |
| n261 | 19       | 143      | 2.0                     |
| n261 | 24       | 155      | 0.6                     |
| n261 | 25       | 154      | 0.2                     |
| n261 | 26       | 153      | 0.5                     |
| n261 | 27       | 152      | 1.1                     |

|                                         |                                                                                                                                                                                                              |                                                       |                                                                                       |                                 |
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**Table 1-3**  
**5G mmWave NR Band n261 Antenna M**

| Band | Beam ID1 | Beam ID2 | input.power.limit (dBm) |
|------|----------|----------|-------------------------|
| n261 | 0        |          | 11.2                    |
| n261 | 2        |          | 8.0                     |
| n261 | 3        |          | 8.3                     |
| n261 | 7        |          | 7.6                     |
| n261 | 10       |          | 6.6                     |
| n261 | 11       |          | 4.8                     |
| n261 | 12       |          | 4.9                     |
| n261 | 13       |          | 5.2                     |
| n261 | 14       |          | 5.5                     |
| n261 | 20       |          | 5.9                     |
| n261 | 21       |          | 4.9                     |
| n261 | 22       |          | 4.8                     |
| n261 | 23       |          | 5.5                     |
| n261 |          | 128      | 10.6                    |
| n261 |          | 130      | 7.6                     |
| n261 |          | 131      | 8.0                     |
| n261 |          | 135      | 6.9                     |
| n261 |          | 138      | 5.8                     |
| n261 |          | 139      | 4.8                     |
| n261 |          | 140      | 4.9                     |
| n261 |          | 141      | 4.9                     |
| n261 |          | 142      | 4.9                     |
| n261 |          | 148      | 5.5                     |
| n261 |          | 149      | 4.8                     |
| n261 |          | 150      | 4.8                     |
| n261 |          | 151      | 5.1                     |
| n261 | 0        | 128      | 7.0                     |
| n261 | 2        | 131      | 4.2                     |
| n261 | 3        | 130      | 4.2                     |
| n261 | 7        | 135      | 3.5                     |
| n261 | 10       | 142      | 1.2                     |
| n261 | 11       | 141      | 0.4                     |
| n261 | 12       | 139      | 0.9                     |
| n261 | 13       | 138      | 1.3                     |
| n261 | 14       | 140      | 2.6                     |
| n261 | 20       | 151      | 1.3                     |
| n261 | 21       | 150      | 0.4                     |
| n261 | 22       | 149      | 0.4                     |
| n261 | 23       | 148      | 1.0                     |

|                                         |                                                                                                                                                                                                                                 |                                 |
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**Table 1-4**  
**5G mmWave NR Band n260 Antenna L**

| Band | Beam ID1 | Beam ID2 | input.power.limit (dBm) |
|------|----------|----------|-------------------------|
| n260 | 1        |          | 9.5                     |
| n260 | 5        |          | 7.0                     |
| n260 | 6        |          | 7.3                     |
| n260 | 7        |          | 6.4                     |
| n260 | 10       |          | 7.2                     |
| n260 | 11       |          | 7.0                     |
| n260 | 17       |          | 5.0                     |
| n260 | 18       |          | 4.8                     |
| n260 | 19       |          | 4.5                     |
| n260 | 20       |          | 4.4                     |
| n260 | 21       |          | 4.6                     |
| n260 | 26       |          | 5.0                     |
| n260 | 27       |          | 5.1                     |
| n260 | 28       |          | 4.4                     |
| n260 | 29       |          | 4.3                     |
| n260 |          | 129      | 9.0                     |
| n260 |          | 133      | 6.8                     |
| n260 |          | 134      | 6.8                     |
| n260 |          | 135      | 6.4                     |
| n260 |          | 138      | 7.0                     |
| n260 |          | 139      | 6.5                     |
| n260 |          | 145      | 4.8                     |
| n260 |          | 146      | 4.8                     |
| n260 |          | 147      | 4.4                     |
| n260 |          | 148      | 4.3                     |
| n260 |          | 149      | 4.5                     |
| n260 |          | 154      | 4.7                     |
| n260 |          | 155      | 4.7                     |
| n260 |          | 156      | 4.3                     |
| n260 |          | 157      | 4.3                     |
| n260 | 1        | 129      | 5.2                     |
| n260 | 5        | 134      | 3.0                     |
| n260 | 6        | 133      | 3.0                     |
| n260 | 7        | 135      | 2.8                     |
| n260 | 10       | 138      | 3.1                     |
| n260 | 11       | 139      | 3.0                     |
| n260 | 17       | 148      | 0.9                     |
| n260 | 18       | 147      | 0.4                     |
| n260 | 19       | 146      | 0.5                     |
| n260 | 20       | 145      | 0.8                     |
| n260 | 21       | 149      | 1.7                     |
| n260 | 26       | 156      | 0.6                     |
| n260 | 27       | 155      | 0.6                     |
| n260 | 28       | 154      | 0.4                     |
| n260 | 29       | 157      | 0.8                     |

|                                         |                                                                                                                                                                                                                                 |                                 |
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**Table 1-5**  
**5G mmWave NR Band n260 Antenna M**

| Band | Beam ID1 | Beam ID2 | input.power.limit (dBm) |
|------|----------|----------|-------------------------|
| n260 | 0        |          | 8.2                     |
| n260 | 2        |          | 5.5                     |
| n260 | 3        |          | 6.4                     |
| n260 | 4        |          | 5.7                     |
| n260 | 8        |          | 6.5                     |
| n260 | 9        |          | 5.8                     |
| n260 | 12       |          | 3.7                     |
| n260 | 13       |          | 4.0                     |
| n260 | 14       |          | 4.0                     |
| n260 | 15       |          | 3.2                     |
| n260 | 16       |          | 3.2                     |
| n260 | 22       |          | 3.7                     |
| n260 | 23       |          | 4.2                     |
| n260 | 24       |          | 3.4                     |
| n260 | 25       |          | 3.1                     |
| n260 |          | 128      | 8.0                     |
| n260 |          | 130      | 5.6                     |
| n260 |          | 131      | 5.8                     |
| n260 |          | 132      | 5.3                     |
| n260 |          | 136      | 6.2                     |
| n260 |          | 137      | 5.2                     |
| n260 |          | 140      | 3.3                     |
| n260 |          | 141      | 3.8                     |
| n260 |          | 142      | 3.8                     |
| n260 |          | 143      | 3.2                     |
| n260 |          | 144      | 3.2                     |
| n260 |          | 150      | 3.7                     |
| n260 |          | 151      | 3.9                     |
| n260 |          | 152      | 3.4                     |
| n260 |          | 153      | 3.2                     |
| n260 | 0        | 128      | 5.8                     |
| n260 | 2        | 131      | 2.6                     |
| n260 | 3        | 130      | 1.9                     |
| n260 | 4        | 132      | 2.2                     |
| n260 | 8        | 136      | 1.9                     |
| n260 | 9        | 137      | 1.9                     |
| n260 | 12       | 143      | -0.3                    |
| n260 | 13       | 142      | -0.7                    |
| n260 | 14       | 141      | -0.9                    |
| n260 | 15       | 140      | -0.3                    |
| n260 | 16       | 144      | 0.0                     |
| n260 | 22       | 153      | 0.0                     |
| n260 | 23       | 151      | -0.9                    |
| n260 | 24       | 150      | -0.6                    |
| n260 | 25       | 152      | 0.5                     |

|                                         |                                                                                                                                                                                                                                 |                                 |
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## 1.4 DUT Antenna Locations

This device has 2 patch antenna arrays (L Patch and M Patch). Table below indicates the surfaces evaluated for near field power density (part 1) evaluation. Refer to Section 4.6 of RF Exposure Part 0 Test Report (report SN could be found in Section 1.7) on justification of these worst-surfaces.

**Table 1-6**  
**5G mmWave NR Device Surfaces**

| Band | Module | Back | Front | Top | Bottom | Right | Left |
|------|--------|------|-------|-----|--------|-------|------|
| n261 | L      | Yes  | No    | No  | No     | No    | Yes  |
| n261 | M      | Yes  | No    | No  | No     | Yes   | No   |
| n260 | L      | Yes  | No    | No  | No     | No    | Yes  |
| n260 | M      | Yes  | No    | No  | No     | Yes   | No   |

## 1.5 Simultaneous Transmission Capabilities

According to FCC KDB Publication 447498 D01v06, transmitters are considered to be operating simultaneously when there is overlapping transmission, with the exception of transmissions during network hand-offs with maximum hand-off duration less than 30 seconds.

This device contains multiple transmitters that may operate simultaneously, and therefore requires a simultaneous transmission analysis according to FCC KDB Publication 447498 D01v06 4.3.2 procedures.

**Table 1-7**  
**5G mmWave NR Simultaneous Tx**

| Capable Transmit Configuration                      | Head | Body-Worn Accessory | Wireless Router | Phablet | Notes                              |
|-----------------------------------------------------|------|---------------------|-----------------|---------|------------------------------------|
| LTE + 5G NR                                         | Yes  | Yes                 | N/A             | Yes     |                                    |
| LTE + 2.4 GHz WI-FI + 5G NR                         | Yes  | Yes                 | Yes             | Yes     |                                    |
| LTE + 5 GHz WI-FI + 5G NR                           | Yes  | Yes                 | Yes             | Yes     |                                    |
| LTE + 2.4 GHz Bluetooth + 5G NR                     | Yes^ | Yes                 | Yes^            | Yes^    | ^Bluetooth Tethering is considered |
| LTE + 2.4 GHz Bluetooth + 5 GHz WI-FI + 5G NR       | Yes^ | Yes                 | Yes^            | Yes^    | ^Bluetooth Tethering is considered |
| LTE + 2.4 GHz WI-FI MIMO + 5G NR                    | Yes  | Yes                 | Yes             | Yes     |                                    |
| LTE + 5 GHz WI-FI MIMO + 5G NR                      | Yes  | Yes                 | Yes             | Yes     |                                    |
| LTE + 2.4 GHz WI-FI + 5 GHz WI-FI + 5G NR           | Yes  | Yes                 | Yes             | Yes     |                                    |
| LTE + 2.4 GHz WI-FI MIMO + 5 GHz WI-FI MIMO + 5G NR | Yes  | Yes                 | Yes             | Yes     |                                    |
| LTE + 2.4 GHz Bluetooth + 5 GHz WI-FI MIMO + 5G NR  | Yes^ | Yes                 | Yes^            | Yes^    | ^Bluetooth Tethering is considered |

### NOTE:

1. 5G NR Operations are limited to Non-Standalone (EN-DC) operations only.
2. NR antenna arrays cannot transmit simultaneously.
3. Simultaneous 5G NR FR2 + LTE operations are possible only with LTE B2/4/5/13/66.
4. 2.4 GHz WLAN, and 2.4 GHz Bluetooth share the same antenna path and cannot transmit simultaneously.
5. All non-5G NR licensed modes share the same antenna path and cannot transmit simultaneously.
6. 5G NR bands cannot transmit simultaneously.
7. This device supports time averaging smart transmit algorithm in WWAN. Smart transmit adds directly the time-averaged RF exposure from 4G and time-averaged RF exposure from 5G mmW NR to ensure that the normalized RF exposure from both 4G and 5G mmW NR does not exceed FCC limit.

|                                         |                                                                                                                                                                                                              |                                               |                                                                                       |                                 |
|-----------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------|
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## 1.6 Guidance Applied

- November 2017, October 2018, April 2019, November 2019 TCBC Workshop Notes
- SPEAG DASY6 System Handbook (September 2019)
- IEC TR 63170:2018
- FCC KDB 865664 D02 v01r04
- FCC KDB 447498 D01 v02r01

## 1.7 Bibliography

**Table 1-8**  
**5G mmWave NR Bibliography**

| Report Type                               | Report Serial Number   |
|-------------------------------------------|------------------------|
| FCC SAR Evaluation Report (Part 1)        | 1M2003090034-20-R1.A3L |
| Power Density Exposure Part 0 Test Report | Revision B             |
| SAR Exposure Part 0 Test Report           | 1M2003090034-21.A3L    |
| RF Exposure Part 2 Test Report            | 1M2003090034-22.A3L    |
| RF Exposure Compliance Summary Report     | 1M2003090034-28.A3L    |
| Power Density Simulation Report           | Revision A             |

|                                                |                                                                                                                                                                                                                                 |                                        |
|------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|
| <b>FCC ID:</b><br>A3LSMG981V                   |  <b>NEAR-FIELD POWER DENSITY<br/>EVALUATION REPORT</b>  | <b>Approved by:</b><br>Quality Manager |
| <b>Document S/N:</b><br>1M2003090034-27-R1.A3L | <b>Test Dates:</b><br>04/15/2020 - 04/21/2020                                                                                                                                                                                   | <b>DUT Type:</b><br>Portable Handset   |
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## 2 MEASUREMENT SYSTEM

### 2.1 Measurement Setup

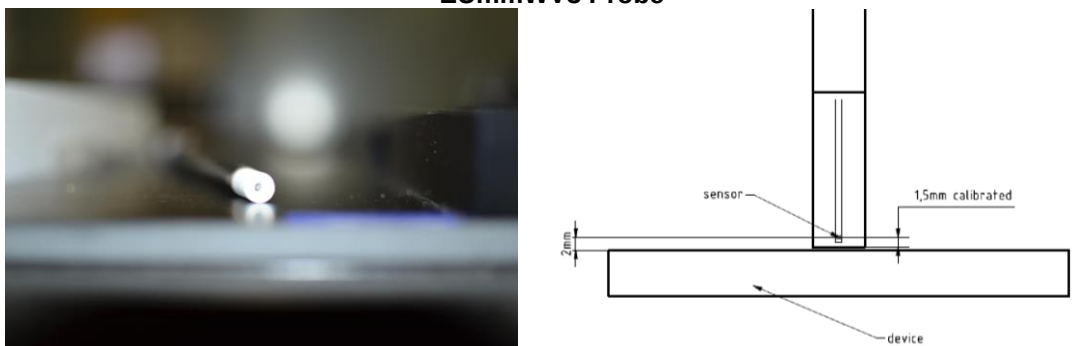
Peak spatially averaged power density (psPD) measurements for mmWave frequencies were performed using the DASY6 with cDASY6 5G module. The DASY6 is made by Schmid & Partner Engineering AG (SPEAG) in Zurich, Switzerland and consists of a high precision robotics system (Staubli), robot controller, desktop computer, near-field probe, probe alignment sensor, and the 5G phantom. The robot is a six-axis industrial robot, performing precise movements to position the probe to the location (points) of maximum electromagnetic field (EMF).

### 2.2 SPEAG EUmWV3 Probe / E-Field 5G Probe

The EUmWV3 probe consists of two dipoles optimally arranged to obtain pseudo-vector information.

|                           |                                                                                                                                                                                                                                                                  |
|---------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Frequency Range</b>    | 750 MHz – 110 GHz                                                                                                                                                                                                                                                |
| <b>Dynamic Range</b>      | < 20 V/m – 10,000 V/m with PRE-10 (min < 50 V/m – 3,000 V/m)                                                                                                                                                                                                     |
| <b>Position Precision</b> | < 0.2 mm (cDASY6)                                                                                                                                                                                                                                                |
| <b>Dimensions</b>         | Probe Overall Length: 320 mm<br>Probe Body Diameter: 8 mm<br>Probe Tip Length: 23 mm<br>Probe Tip Diameter: Encapsulation 8 mm<br>Distance from Probe Tip to Sensor X Calibration Point: 1.5 mm<br>Distance from Probe Tip to Sensor Y Calibration Point: 1.5 mm |
| <b>Applications</b>       | E-field measurements of 5G devices and other mm-wave transmitters operating above 10 GHz in < 2 mm distance from device (free-space)<br>Power density, H-field and far-field analysis using total field reconstruction                                           |
| <b>Compatibility</b>      | cDASY6 + 5G-Module SW2.0.2.34                                                                                                                                                                                                                                    |

**Figure 2-1**  
**EUmWV3 Probe**



|                                                |                                                                                                                                                                                                                                 |                                        |
|------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|
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| <b>Document S/N:</b><br>1M2003090034-27-R1.A3L | <b>Test Dates:</b><br>04/15/2020 - 04/21/2020                                                                                                                                                                                   | <b>DUT Type:</b><br>Portable Handset   |

## 2.3 Peak Spatially Averaged Power Density Assessment Based on E-field Measurements

Within a short distance from the transmitting source, power density was determined based on both electric and magnetic fields. Generally, the magnitude and phase of two components of either the E-field or H-field were needed on a sufficiently large surface to fully characterize the total E-field and H-field distributions. Nevertheless, solutions based on direct measurement of E-field and H-field can be used to compute power density. The general measurement approach used for this device was:

- The local E field on the measurement surface was measured at a reference location where the field is well above the noise level. This reference level was used at the end of this procedure to assess output power drift of the DUT during the measurement.
- The electric field on the measurement surface was scanned. Measurements are conducted according to the instructions provided by the measurement system manufacturer. Measurement spatial resolution can depend on the measured field characteristic and measurement methodology used by the system. The planar scan step size was configured at  $\lambda/4$ .
- For cDASY6, H-field was calculated from the measured E-field using a reconstruction algorithm. As the power density calculation requires knowledge of both amplitude and phase, reconstruction algorithms can also be used to obtain field information from the measured E-field data (e.g. the phase from the amplitude if only the amplitude is measured). H-field and phase data was reconstructed from repeated measurements (three per measurement point) on two measurement planes separated by  $\lambda/4$ .
- The total Peak spatially averaged power density (psPD) distribution on the evaluation surface is determined per the below equation. The spatial averaging area,  $A$ , is specified by the applicable exposure limits or regulatory requirements. A circular shape was used.

$$psPD = \frac{1}{2A_{av}} \iint_{A_{av}} || Re\{E \times H^*\} || dA$$

- The maximum spatial-average on the evaluation surface is the final quantity to determine compliance against applicable limits.
- The local E field reference value, at the same location as step 2, was re-measured after the scan was complete to calculate the power drift. If the drift deviated by more than 5%, the power density test and drift measurements were repeated.

## 2.4 Reconstruction Algorithm

Computation of the power density in general requires measurement information from the both E-field and H-field amplitudes and phases in the plane of incidence. Reconstruction of these quantities from pseudo-vector E-field measurements is feasible according to the manufacturer, as they are determined via Maxwell's equations. As such, the SPEAG reconstruction approach was based on the Gerchberg-Saxton algorithm, which benefits from the availability of the E-field polarization ellipse information obtained with the EUmmWV3 probe.

|                                         |                                                                                                                                                                                                              |                                               |                                                                                       |                                 |
|-----------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------|
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| Document S/N:<br>1M2003090034-27-R1.A3L | Test Dates:<br>04/15/2020 - 04/21/2020                                                                                                                                                                       | DUT Type:<br>Portable Handset                 |                                                                                       | Page 11 of 21                   |

### 3.1 Uncontrolled Environment

UNCONTROLLED ENVIRONMENTS are defined as locations where there is the exposure of individuals who have no knowledge or control of their exposure. The general population/uncontrolled exposure limits are applicable to situations in which the general public may be exposed or in which persons who are exposed as a consequence of their employment may not be made fully aware of the potential for exposure or cannot exercise control over their exposure. Members of the general public would come under this category when exposure is not employment-related; for example, in the case of a wireless transmitter that exposes persons in its vicinity.

### 3.2 Controlled Environment

CONTROLLED ENVIRONMENTS are defined as locations where there is exposure that may be incurred by persons who are aware of the potential for exposure, (i.e. as a result of employment or occupation). In general, occupational/controlled exposure limits are applicable to situations in which persons are exposed as a consequence of their employment, who have been made fully aware of the potential for exposure and can exercise control over their exposure. This exposure category is also applicable when the exposure is of a transient nature due to incidental passage through a location where the exposure levels may be higher than the general population/uncontrolled limits, but the exposed person is fully aware of the potential for exposure and can exercise control over his or her exposure by leaving the area or by some other appropriate means.

### 3.3 RF Exposure Limits for Frequencies Above 6 GHz

Per §1.1310 (d)(3), the MPE limits are applied for frequencies above 6 GHz. Power Density is expressed in units of  $W/m^2$  or  $mW/cm^2$ .

Peak Spatially Averaged Power Density was evaluated over a circular area of  $4\text{ cm}^2$  per interim FCC Guidance for near-field power density evaluations per October 2018 TCB Workshop notes.

**Table 3-1**  
**Human Exposure Limits Specified in FCC 47 CFR §1.1310**

| Human Exposure to Radiofrequency (RF) Radiation Limits        |                                        |                           |
|---------------------------------------------------------------|----------------------------------------|---------------------------|
| Frequency Range<br>[MHz]                                      | Power Density<br>[mW/cm <sup>2</sup> ] | Average Time<br>[Minutes] |
| (A) Limits For Occupational / Controlled Environments         |                                        |                           |
| 1,500 – 100,000                                               | 5.0                                    | 6                         |
| (B) Limits For General Population / Uncontrolled Environments |                                        |                           |
| 1,500 – 100,000                                               | 1.0                                    | 30                        |

Note:  $1.0\text{ mW/cm}^2$  is  $10\text{ W/m}^2$

|                                         |                                                                                                                                                                                                              |                                               |                                                                                       |                                 |
|-----------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------|
| FCC ID:<br>A3LSMG981V                   |  <b>PCTEST</b><br>Proud to be part of  | NEAR-FIELD POWER DENSITY<br>EVALUATION REPORT |  | Approved by:<br>Quality Manager |
| Document S/N:<br>1M2003090034-27-R1.A3L | Test Dates:<br>04/15/2020 - 04/21/2020                                                                                                                                                                       | DUT Type:<br>Portable Handset                 | Page 12 of 21                                                                         |                                 |

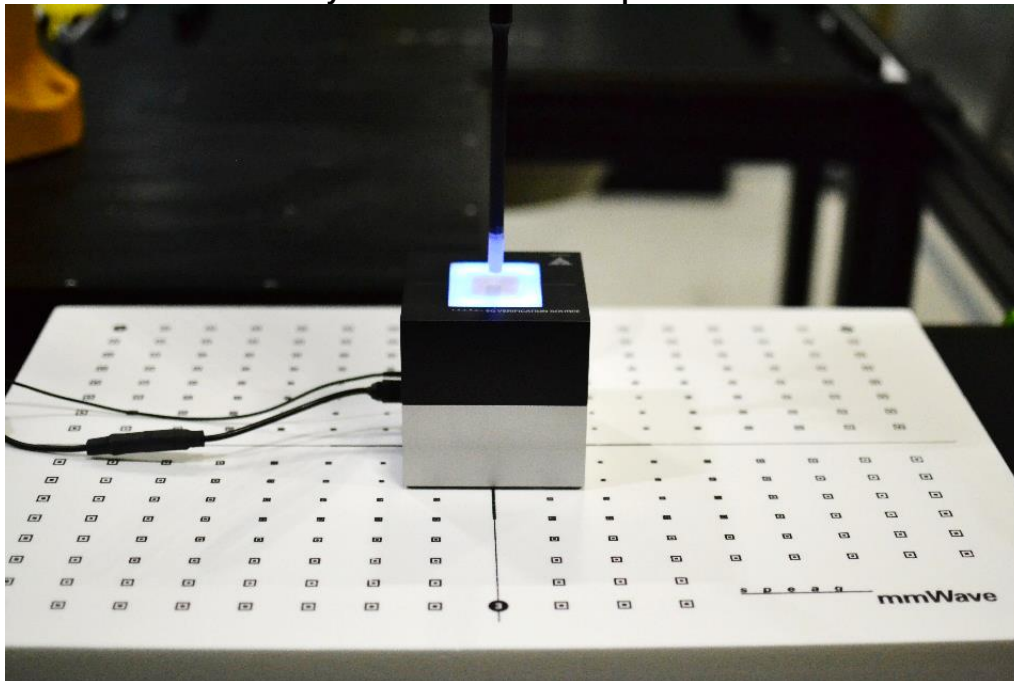
## 4 SYSTEM VERIFICATION

### 4.1 Test System Verification

The system was verified to be within  $\pm 0.66$  dB of the power density targets on the calibration certificate according to the test system specification in the user's manual and calibration facility recommendation. The 0.66 dB deviation threshold represents the expanded uncertainty for system performance checks using SPEAG's mmWave verification sources. The same spatial resolution and measurement region used in the source calibration was applied during the system check.

The measured power density distribution of verification source was also confirmed through visual inspection to have no noticeable differences, both spatially (shape) and numerically (level) from the distribution provided by the manufacturer, per November 2017 TCBC Workshop Notes.

**Figure 4-1**  
**System Verification Setup Photo**



|                                         |                                                                                                                                                                                                              |                                               |                                                                                       |                                 |
|-----------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------|
| FCC ID:<br>A3LSMG981V                   |  <b>PCTEST</b><br>Proud to be part of  | NEAR-FIELD POWER DENSITY<br>EVALUATION REPORT |  | Approved by:<br>Quality Manager |
| Document S/N:<br>1M2003090034-27-R1.A3L | Test Dates:<br>04/15/2020 - 04/21/2020                                                                                                                                                                       | DUT Type:<br>Portable Handset                 |                                                                                       | Page 13 of 21                   |

**Table 4-1**  
**5G mmWave NR Frequency 30 GHz Verifications**

| System Verification |             |            |           |          |                                                        |        |                |                                                       |        |                |
|---------------------|-------------|------------|-----------|----------|--------------------------------------------------------|--------|----------------|-------------------------------------------------------|--------|----------------|
| Syst.               | Freq. (GHz) | Date       | Source SN | Probe SN | Normal psPD (W/m <sup>2</sup> over 4 cm <sup>2</sup> ) |        | Deviation (dB) | Total psPD (W/m <sup>2</sup> over 4 cm <sup>2</sup> ) |        | Deviation (dB) |
|                     |             |            |           |          | measured                                               | target |                | measured                                              | target |                |
| R                   | 30          | 04/15/2020 | 1035      | 9407     | 31.40                                                  | 32.10  | -0.10          | 31.90                                                 | 32.50  | -0.08          |
| R                   | 30          | 04/16/2020 | 1035      | 9407     | 31.60                                                  | 32.10  | -0.07          | 32.20                                                 | 32.50  | -0.04          |
| R                   | 30          | 04/17/2020 | 1035      | 9407     | 31.80                                                  | 32.10  | -0.04          | 32.40                                                 | 32.50  | -0.01          |
| R                   | 30          | 04/20/2020 | 1035      | 9407     | 31.60                                                  | 32.10  | -0.07          | 32.10                                                 | 32.50  | -0.05          |
| R                   | 30          | 04/21/2020 | 1035      | 9407     | 30.50                                                  | 32.10  | -0.22          | 31.00                                                 | 32.50  | -0.21          |

Note: A **10 mm distance spacing** was used from the reference horn antenna aperture to the probe element. This includes 4.45 mm from the reference antenna horn aperture to the surface of the verification source plus 5.55 mm from the surface to the probe. The SPEAG software requires a setting of "5.55 mm" for the correct set up.

|                                         |                                                                                                                                                                                                                                 |                                 |
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## 5 POWER DENSITY DATA @ INPUT.POWER.LIMIT

### 5.1 Power Density Results

Power density measurements were performed with DUT transmitting at *input.power.limit* for one single beam for each polarization (H & V) and one beam-pair, for each antenna on each worst-surfaces as shown in **Table 1-6**.

**Table 5-1**  
**5G mmWave NR Band n261**

| MEASUREMENT RESULTS                                                                            |         |           |         |          |          |                   |             |         |                                                  |                |             |             |            |        |
|------------------------------------------------------------------------------------------------|---------|-----------|---------|----------|----------|-------------------|-------------|---------|--------------------------------------------------|----------------|-------------|-------------|------------|--------|
| Band                                                                                           | Antenna | Frequency | Channel | Beam ID1 | Beam ID2 | input.power.limit | Signal Type | DUT S/N | Power Drift                                      | Eval. Distance | DUT Surface | Normal psPD | Total psPD | Plot # |
|                                                                                                |         | MHz       |         | V        | H        | dBm               |             |         | dB                                               |                |             | mW/cm²      | mW/cm²     |        |
| n261                                                                                           | L       | 28292.2   | High    | 26       | -        | 4.6               | CW          | 33784   | -0.15                                            | 2              | Left        | 0.479       | 0.544      |        |
| n261                                                                                           | L       | 27923.5   | Mid     | -        | 153      | 4.6               | CW          | 33784   | -0.15                                            | 2              | Left        | 0.496       | 0.593      | A1     |
| n261                                                                                           | L       | 27559.3   | Low     | 16       | 146      | 0.2               | CW          | 33784   | -0.12                                            | 2              | Left        | 0.321       | 0.414      |        |
| n261                                                                                           | L       | 27923.5   | Mid     | 26       | -        | 4.6               | CW          | 33784   | -0.20                                            | 2              | Back        | 0.427       | 0.463      |        |
| n261                                                                                           | L       | 27559.3   | Low     | -        | 147      | 5.0               | CW          | 33784   | -0.20                                            | 2              | Back        | 0.416       | 0.476      |        |
| n261                                                                                           | L       | 27559.3   | Low     | 16       | 146      | 0.2               | CW          | 33784   | -0.16                                            | 2              | Back        | 0.323       | 0.341      |        |
| n261                                                                                           | M       | 27559.3   | Low     | 11       | -        | 4.8               | CW          | 33784   | -0.12                                            | 2              | Right       | 0.465       | 0.525      |        |
| n261                                                                                           | M       | 27559.3   | Low     | -        | 149      | 4.8               | CW          | 33784   | -0.05                                            | 2              | Right       | 0.581       | 0.650      |        |
| n261                                                                                           | M       | 27559.3   | Low     | 22       | 149      | 0.4               | CW          | 33784   | 0.03                                             | 2              | Right       | 0.558       | 0.665      | A2     |
| n261                                                                                           | M       | 27559.3   | Low     | 22       | -        | 4.8               | CW          | 33784   | 0.20                                             | 2              | Back        | 0.495       | 0.537      |        |
| n261                                                                                           | M       | 27923.5   | Mid     | -        | 142      | 4.9               | CW          | 33784   | -0.05                                            | 2              | Back        | 0.185       | 0.209      |        |
| n261                                                                                           | M       | 27559.3   | Low     | 22       | 149      | 0.4               | CW          | 33784   | 0.06                                             | 2              | Back        | 0.575       | 0.602      |        |
| 47 CFR §1.1310 - SAFETY LIMIT<br>Spatial Average<br>Uncontrolled Exposure / General Population |         |           |         |          |          |                   |             |         | Power Density<br>1 mW/cm²<br>averaged over 4 cm² |                |             |             |            |        |

|                                         |                                                                                                                                                                                                              |                                               |                                                                                       |                                 |
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| Document S/N:<br>1M2003090034-27-R1.A3L | Test Dates:<br>04/15/2020 - 04/21/2020                                                                                                                                                                       | DUT Type:<br>Portable Handset                 | Page 15 of 21                                                                         |                                 |

**Table 5-2**  
**5G mmWave NR Band n260**

| MEASUREMENT RESULTS                                                                            |         |           |         |          |          |                   |             |                                                  |             |                |             |             |            |        |
|------------------------------------------------------------------------------------------------|---------|-----------|---------|----------|----------|-------------------|-------------|--------------------------------------------------|-------------|----------------|-------------|-------------|------------|--------|
| Band                                                                                           | Antenna | Frequency | Channel | Beam ID1 | Beam ID2 | input.power.limit | Signal Type | DUT S/N                                          | Power Drift | Eval. Distance | DUT Surface | Normal psPD | Total psPD | Plot # |
|                                                                                                |         | MHz       |         | V        | H        | dBm               |             |                                                  | dB          |                |             | mW/cm²      | mW/cm²     |        |
| n260                                                                                           | L       | 38449.9   | Mid     | 29       | -        | 4.3               | CW          | 33784                                            | -0.05       | 2              | Left        | 0.347       | 0.481      |        |
| n260                                                                                           | L       | 38449.9   | Mid     | -        | 148      | 4.3               | CW          | 33784                                            | -0.06       | 2              | Left        | 0.407       | 0.495      | A3     |
| n260                                                                                           | L       | 37051.8   | Low     | 18       | 147      | 0.4               | CW          | 33784                                            | 0.20        | 2              | Left        | 0.180       | 0.214      |        |
| n260                                                                                           | L       | 38449.9   | Mid     | 29       | -        | 4.3               | CW          | 33784                                            | 0.05        | 2              | Back        | 0.348       | 0.383      |        |
| n260                                                                                           | L       | 38449.9   | Mid     | -        | 147      | 4.4               | CW          | 33784                                            | -0.20       | 2              | Back        | 0.265       | 0.283      |        |
| n260                                                                                           | L       | 37051.8   | Low     | 28       | 154      | 0.4               | CW          | 33784                                            | -0.15       | 2              | Back        | 0.238       | 0.246      |        |
| n260                                                                                           | M       | 38449.9   | Mid     | 25       | -        | 3.1               | CW          | 33784                                            | -0.18       | 2              | Right       | 0.347       | 0.435      | A4     |
| n260                                                                                           | M       | 38449.9   | Mid     | -        | 153      | 3.2               | CW          | 33784                                            | -0.17       | 2              | Right       | 0.315       | 0.393      |        |
| n260                                                                                           | M       | 38449.9   | Mid     | 14       | 141      | -0.9              | CW          | 33784                                            | -0.04       | 2              | Right       | 0.169       | 0.181      |        |
| n260                                                                                           | M       | 38449.9   | Mid     | 25       | -        | 3.1               | CW          | 33784                                            | -0.17       | 2              | Back        | 0.314       | 0.341      |        |
| n260                                                                                           | M       | 38449.9   | Mid     | -        | 153      | 3.2               | CW          | 33784                                            | 0.05        | 2              | Back        | 0.286       | 0.319      |        |
| n260                                                                                           | M       | 38449.9   | Mid     | 23       | 151      | -0.9              | CW          | 33784                                            | -0.14       | 2              | Back        | 0.147       | 0.150      |        |
| 47 CFR §1.1310 - SAFETY LIMIT<br>Spatial Average<br>Uncontrolled Exposure / General Population |         |           |         |          |          |                   |             | Power Density<br>1 mW/cm²<br>averaged over 4 cm² |             |                |             |             |            |        |

|                                         |                                                                                                                                                                                                                                 |                                 |
|-----------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|
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| Document S/N:<br>1M2003090034-27-R1.A3L | Test Dates:<br>04/15/2020 - 04/21/2020                                                                                                                                                                                          | DUT Type:<br>Portable Handset   |
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**Table 5-3**  
**5G mmWave NR Band n261 – Additional Surfaces**

| MEASUREMENT RESULTS                                                                            |         |           |         |          |          |                   |             |                                                  |             |                |             |             |            |        |
|------------------------------------------------------------------------------------------------|---------|-----------|---------|----------|----------|-------------------|-------------|--------------------------------------------------|-------------|----------------|-------------|-------------|------------|--------|
| Band                                                                                           | Antenna | Frequency | Channel | Beam ID1 | Beam ID2 | input.power.limit | Signal Type | DUT S/N                                          | Power Drift | Eval. Distance | DUT Surface | Normal psPD | Total psPD | Plot # |
|                                                                                                |         | MHz       |         | V        | H        | dBm               |             |                                                  | dB          |                |             | mW/cm²      | mW/cm²     |        |
| n261                                                                                           | M       | 27559.3   | Low     | 21       | 150      | 0.40              | CW          | 33784                                            | 0.08        | 10             | Back        | 0.264       | 0.280      |        |
| 47 CFR §1.1310 - SAFETY LIMIT<br>Spatial Average<br>Uncontrolled Exposure / General Population |         |           |         |          |          |                   |             | Power Density<br>1 mW/cm²<br>averaged over 4 cm² |             |                |             |             |            |        |

**Table 5-4**  
**5G mmWave NR Band n260 – Additional Surfaces**

| MEASUREMENT RESULTS                                                                            |         |           |         |          |          |                   |             |                                                  |             |                |             |             |            |        |
|------------------------------------------------------------------------------------------------|---------|-----------|---------|----------|----------|-------------------|-------------|--------------------------------------------------|-------------|----------------|-------------|-------------|------------|--------|
| Band                                                                                           | Antenna | Frequency | Channel | Beam ID1 | Beam ID2 | input.power.limit | Signal Type | DUT S/N                                          | Power Drift | Eval. Distance | DUT Surface | Normal psPD | Total psPD | Plot # |
|                                                                                                |         | MHz       |         | V        | H        | dBm               |             |                                                  | dB          |                |             | mW/cm²      | mW/cm²     |        |
| n260                                                                                           | M       | 38449.9   | Mid     | 14       | 141      | -0.9              | CW          | 33784                                            | -0.15       | 10             | Back        | 0.090       | 0.091      |        |
| 47 CFR §1.1310 - SAFETY LIMIT<br>Spatial Average<br>Uncontrolled Exposure / General Population |         |           |         |          |          |                   |             | Power Density<br>1 mW/cm²<br>averaged over 4 cm² |             |                |             |             |            |        |

|                                         |                                                                                                                                                                                                                                 |                                 |
|-----------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|
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| Document S/N:<br>1M2003090034-27-R1.A3L | Test Dates:<br>04/15/2020 - 04/21/2020                                                                                                                                                                                          | DUT Type:<br>Portable Handset   |

## 5.2 Power Density Test Notes

### General Notes:

1. The manufacturer has confirmed that the devices tested have the same physical, mechanical and thermal characteristics and are within operational tolerances expected for production units.
2. Batteries are fully charged at the beginning of the measurements. The DUT was connected to a wall charger for some measurements due to the test duration. It was confirmed that the charger plugged into this DUT did not impact the near-field PD test results.
3. Power density was calculated by repeated E-field measurements on two measurement planes separated by  $\lambda/4$ . Please see Section 2.3 for more details of the evaluation process.
4. DUT was configured to transmit with a manufacturer provided test software to control specific antenna(s), Beam ID(s), and signal type to ensure the test configurations constant for the entire evaluation.
5. This device utilizes power reduction for some WLAN wireless modes and technologies for simultaneous transmission compliance. These mechanisms are assessed in the SAR Test Report. The report SN could be found in Section 1.7.
6. *PD design target* of 0.6166 mW/cm<sup>2</sup> was used with mmW device design related uncertainty of 2.1 dB.
7. *Input.power.limit* parameter for 5G mmW NR radio was calculated in RF Exposure Part 0 test report. The report SN can be found in Section 1.7.
8. This device is enabled with Qualcomm® Smart Transmit feature to control and manage transmitting power in real time and to ensure that the time-averaged RF exposure from WWAN is in compliance with FCC requirements. Per FCC guidance for devices enabled with Qualcomm® Smart Transmit feature, 4G LTE and 5G mmW NR simultaneous transmission scenario does not need to be evaluated under Total Exposure Ratio (TER). The validation of the time-averaging algorithm and compliance under the Tx varying transmission scenario for WWAN technologies are reported in Part 2 report. The report SN can be found in Section 1.7.
9. Per FCC guidance for devices enabled with Qualcomm® Smart Transmit feature, simultaneous transmission analysis is evaluated by combining the exposure from each WWAN and WLAN antenna. 5G mmW NR and WLAN simultaneous transmission scenario is evaluated under the Total Exposure Ratio (TER) in Appendix D.
10. The Beam IDs with one of the highest initial simulated power density for that surface and distance was selected for Part 1 Power Density measurements.
11. The device was configured to transmit CW wave signal for testing. Per FCC guidance for devices enabled with Qualcomm® Smart Transmit feature, additional testing was not required for different modulations (CP-OFDM QPSK, CP-OFDM 16QAM, CP-OFDM 64QAM, DFT-s-OFDM pi/2 BPSK, DFT-s-OFDM QPSK, DFT-s-OFDM QPSK, DFT-s-OFDM 16QAM, DFT-s-OFDM 64QAM), RB configurations, component carriers, channel configurations (low channel, mid channel, high channel) since the smart transmit algorithm monitors powers on a per symbol basis, which is independent of these signal characteristics.
12. The device was configured to MIMO configuration with H and V polarization beams transmitting together, as indicated in Section 5.1.

|                                                |                                                                                                                                                 |                                                       |                                                                                       |                                        |
|------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------|---------------------------------------------------------------------------------------|----------------------------------------|
| <b>FCC ID:</b><br>A3LSMG981V                   |  <b>PCTEST</b><br><small>Proud to be part of element</small> | <b>NEAR-FIELD POWER DENSITY<br/>EVALUATION REPORT</b> |  | <b>Approved by:</b><br>Quality Manager |
| <b>Document S/N:</b><br>1M2003090034-27-R1.A3L | <b>Test Dates:</b><br>04/15/2020 - 04/21/2020                                                                                                   | <b>DUT Type:</b><br>Portable Handset                  |                                                                                       | Page 18 of 21                          |

**Table 6-1**  
**5G mmWave NR Equipment List**

| Manufacturer          | Model         | Description                                       | Cal Date   | Cal Interval | Cal Due    | Serial Number |
|-----------------------|---------------|---------------------------------------------------|------------|--------------|------------|---------------|
| -                     | WL25-1        | Conducted Cable Set (25GHz)                       | 10/30/2019 | Annual       | 10/30/2020 | WL25-1        |
| -                     | WL40-1        | Conducted Cable Set (40GHz)                       | 10/30/2019 | Annual       | 10/30/2020 | WL40-1        |
| Agilent               | N9038A        | MXE EMI Receiver                                  | 07/17/2019 | Annual       | 07/17/2020 | MY51210133    |
| Agilent               | N9030A        | PXA Signal Analyzer (44GHz)                       | 06/12/2019 | Annual       | 06/12/2020 | MY52350166    |
| Com-Power             | PAM-103       | Pre-Amplifier (1-1000MHz)                         | 05/10/2019 | Annual       | 05/10/2020 | 441112        |
| EMCO                  | 3160-09       | Small Horn (18 - 26.5GHz)                         | 08/09/2018 | Biennial     | 08/09/2020 | 135427        |
| Emco                  | 3116.00       | Horn Antenna (18 - 40GHz)                         | 06/07/2018 | Triennial    | 06/07/2021 | 9203-2178     |
| Rohde & Schwarz       | ESU40         | EMI Test Receiver (40GHz)                         | 09/23/2019 | Annual       | 09/23/2020 | 100348        |
| Rohde & Schwarz       | SFUNIT-Rx     | Shielded Filter Unit                              | 07/08/2019 | Annual       | 07/08/2020 | 102133        |
| Rohde & Schwarz       | FSW67         | Signal / Spectrum Analyzer                        | 05/06/2019 | Annual       | 05/06/2020 | 103200        |
| SPEAG                 | EUmmWV3       | EUmmWV3 Probe                                     | 12/10/2019 | Annual       | 12/10/2020 | 9407          |
| SPEAG                 | SM 003 100 AA | 30GHz System Verification Ka- Band Source Antenna | 02/12/2020 | Annual       | 02/12/2021 | 1035          |
| SPEAG                 | DAE4          | Dasy Data Acquisition Electronics                 | 02/20/2020 | Annual       | 02/20/2021 | 1272          |
| Agilent               | N9030A        | PXA Signal Analyzer (44GHz)                       | 06/12/2019 | Annual       | 06/12/2020 | MY52350166    |
| Com-Power             | AL-130        | 9kHz - 30MHz Loop Antenna                         | 10/10/2019 | Biennial     | 10/10/2021 | 121034        |
| Com-Power             | PAM-103       | Pre-Amplifier (1-1000MHz)                         | 05/10/2019 | Annual       | 05/10/2020 | 441112        |
| Keysight Technologies | N9030A        | 3Hz-44GHz PXA Signal Analyzer                     | 05/02/2019 | Annual       | 05/02/2020 | MY49430494    |
| Rohde & Schwarz       | 180-442-KF    | Horn (Small)                                      | 08/21/2018 | Biennial     | 08/21/2020 | U157403-01    |
| Rohde & Schwarz       | ESU26         | EMI Test Receiver (26.5GHz)                       | 06/05/2019 | Annual       | 06/05/2020 | 100342        |
| Rohde & Schwarz       | SFUNIT-Rx     | Shielded Filter Unit                              | 07/11/2019 | Annual       | 07/11/2020 | 102134        |
| Virginia Diodes Inc   | SAX252        | Spectrum Analyzer Extension Module                | 09/30/2019 | Annual       | 09/30/2020 | SAX252        |
| Virginia Diodes Inc   | SAX253        | Spectrum Analyzer Extension Module                | 09/30/2019 | Annual       | 09/30/2020 | SAX253        |
| Virginia Diodes Inc   | SAX254        | Spectrum Analyzer Extension Module                | 09/30/2019 | Annual       | 09/30/2020 | SAX254        |

Note:

- Each equipment item was used solely within its respective calibration period.

|                                         |                                                                                                                                                                                                                                 |                                 |
|-----------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|
| FCC ID:<br>A3LSMG981V                   |  <b>NEAR-FIELD POWER DENSITY<br/>EVALUATION REPORT</b>  | Approved by:<br>Quality Manager |
| Document S/N:<br>1M2003090034-27-R1.A3L | Test Dates:<br>04/15/2020 - 04/21/2020                                                                                                                                                                                          | DUT Type:<br>Portable Handset   |

## 7

## MEASUREMENT UNCERTAINTIES

| a                                            | b          | c     | d    | e   | f =         | g  |
|----------------------------------------------|------------|-------|------|-----|-------------|----|
|                                              |            |       |      |     | b x e/d     |    |
| Uncertainty Component                        | Unc.       | Prob. |      |     | ui          |    |
|                                              | (± dB)     | Dist. | Div. | ci  | (± dB)      | vi |
| Calibration                                  | 0.49       | N     | 1    | 1.0 | 0.49        | ∞  |
| Probe correction                             | 0          | R     | 1.73 | 1.0 | 0.00        | ∞  |
| Frequency Response (BW ≤ 1 GHz)              | 0.20       | R     | 1.73 | 1.0 | 0.12        | ∞  |
| Sensor cross coupling                        | 0          | R     | 1.73 | 1.0 | 0.00        | ∞  |
| Isotropy                                     | 0.50       | R     | 1.73 | 1.0 | 0.29        | ∞  |
| Linearity                                    | 0.20       | R     | 1.73 | 1.0 | 0.12        | ∞  |
| Probe Scattering                             | 0          | R     | 1.73 | 1.0 | 0           | ∞  |
| Probe Positioning Offset                     | 0.30       | R     | 1.73 | 1.0 | 0.17        | ∞  |
| Probe Positioning Repeatability              | 0.04       | R     | 1.73 | 1.0 | 0.02        | ∞  |
| Sensor Mechanical Offset                     | 0          | R     | 1.73 | 1.0 | 0           | ∞  |
| Probe Spatial Resolution                     | 0          | R     | 1.73 | 1.0 | 0           | ∞  |
| Field Impedance Dependence                   | 0          | R     | 1.73 | 1.0 | 0           | ∞  |
| Amplitude and phase drift                    | 0          | R     | 1.73 | 1.0 | 0           | ∞  |
| Amplitude and phase noise                    | 0.04       | R     | 1.73 | 1.0 | 0.02        | ∞  |
| Measurement area truncation                  | 0          | R     | 1.73 | 1.0 | 0           | ∞  |
| Data acquisition                             | 0.03       | N     | 1    | 1.0 | 0.03        | ∞  |
| Sampling                                     | 0          | R     | 1.73 | 1.0 | 0           | ∞  |
| Field Reconstruction                         | 0.60       | R     | 1.73 | 1.0 | 0.35        | ∞  |
| Forward Transformation                       | 0          | R     | 1.73 | 1.0 | 0           | ∞  |
| Power Density Scaling                        | -          | R     | 1.73 | 1.0 | -           | ∞  |
| Spatial Averaging                            | 0.10       | R     | 1.73 | 1.0 | 0.06        | ∞  |
| System Detection Limit                       | 0.04       | R     | 1.73 | 1.0 | 0.02        | ∞  |
| <b>Test Sample and Environmental Factors</b> |            |       |      |     |             |    |
| Probe Coupling with DUT                      | 0          | R     | 1.73 | 1.0 | 0           | ∞  |
| Modulation Response                          | 0.40       | R     | 1.73 | 1.0 | 0.23        | ∞  |
| Integration Time                             | 0          | R     | 1.73 | 1.0 | 0           | ∞  |
| Response Time                                | 0          | R     | 1.73 | 1.0 | 0           | ∞  |
| Device Holder Influence                      | 0.10       | R     | 1.73 | 1.0 | 0.06        | ∞  |
| DUT Alignment                                | 0          | R     | 1.73 | 1.0 | 0           | ∞  |
| RF Ambient Conditions                        | 0.04       | R     | 1.73 | 1.0 | 0.02        | ∞  |
| Ambient Reflections                          | 0.04       | R     | 1.73 | 1.0 | 0.02        | ∞  |
| Immunity / Secondary Reception               | 0          | R     | 1.73 | 1.0 | 0           | ∞  |
| Drift of the DUT                             | 0.22       | R     | 1.73 | 1.0 | 0.13        | ∞  |
| Combined Standard Uncertainty (k=1)          |            | RSS   |      |     | 0.76        | ∞  |
| <b>Expanded Uncertainty</b>                  | <b>k=2</b> |       |      |     | <b>1.53</b> |    |
| <b>(95% CONFIDENCE LEVEL)</b>                |            |       |      |     |             |    |

|                                         |                                                                                                                                                                                                              |                                                       |                                                                                       |                                 |
|-----------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------|
| FCC ID:<br>A3LSMG981V                   |  <b>PCTEST</b><br>Proud to be part of  | <b>NEAR-FIELD POWER DENSITY<br/>EVALUATION REPORT</b> |  | Approved by:<br>Quality Manager |
| Document S/N:<br>1M2003090034-27-R1.A3L | Test Dates:<br>04/15/2020 - 04/21/2020                                                                                                                                                                       | DUT Type:<br>Portable Handset                         |                                                                                       | Page 20 of 21                   |

### 8.1 Measurement Conclusion

The power density measurements and total exposure ratio analysis indicate that the DUT complies with the RF radiation exposure limits of the FCC, with respect to all parameters subject to this test. These measurements were taken to simulate the RF effects of RF exposure under worst-case conditions. Precise laboratory measures were taken to assure repeatability of the tests. The results and statements relate only to the item(s) tested.

Please note that the RF Exposure and distribution of electromagnetic energy in the body are very complex phenomena that depend on the mass, shape, and size of the body, the orientation of the body with respect to the field vectors, and the electrical properties of both the body and the environment. Other variables that may play a substantial role in possible biological effects are those that characterize the environment (e.g. ambient temperature, air velocity, relative humidity, and body insulation) and those that characterize the individual (e.g. age, gender, activity level, debilitation, or disease). Because various factors may interact with one another to vary the specific biological outcome of an exposure to electromagnetic fields, any protection guide should consider maximal amplification of biological effects as a result of field-body interactions, environmental conditions, and physiological variables.

|                                         |                                                                                                                                                                                                              |                                               |                                                                                       |                                 |
|-----------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------|
| FCC ID:<br>A3LSMG981V                   |  <b>PCTEST</b><br>Proud to be part of  | NEAR-FIELD POWER DENSITY<br>EVALUATION REPORT |  | Approved by:<br>Quality Manager |
| Document S/N:<br>1M2003090034-27-R1.A3L | Test Dates:<br>04/15/2020 - 04/21/2020                                                                                                                                                                       | DUT Type:<br>Portable Handset                 |                                                                                       | Page 21 of 21                   |

- [1] ANSI/IEEE C95.1-1992, American National Standard safety levels with respect to human exposure to radio frequency electromagnetic fields, 3kHz to 300GHz, New York: IEEE, Sept. 1992.
- [2] IEC TR 63170:2018, Measurement Procedure for the Evaluation of Power Density Related to Human Exposure to Radiofrequency Fields from Wireless Communication Devices Operating between 6 GHz and 100 GHz
- [3] IEC TR 62630 : 2010, Guidance for Evaluating Exposure from Multiple Electromagnetic Sources
- [4] K. Pokovic, T. Schmid, J. Frohlich, and N. Kuster. Novel Probes and Evaluation Procedures to Assess Field Magnitude and Polarization. IEEE Transactions on Electromagnetic Compatibility 42(2): 240 -244, 2000
- [5] R. W. Gerchberg and W. O. Saxton. A Practical Algorithm for the Determination of Phase from Image and Diffraction Plane Pictures. Optik 35(2): 237 – 246, 1972
- [6] A. P. Anderson and S. Sali. New Possibilities for Phaseless Microwave Diagnostics. Part 1: Error Reduction Techniques. IEE Proceedings H – Microwaves, Antennas and Propagation 132(5): 290 – 298, 1985
- [7] FCC KDB 865664 D02 v01r04: SAR Measurement Requirements for 100 MHz to 6 GHz. Federal Communications Commission – Office of Engineering and Technology, Laboratory Division.
- [8] FCC KDB 447498 D01 v02r01: RF Exposure Procedures and Equipment Authorization Policies for Mobile and Portable Devices. Federal Communications Commission – Office of Engineering and Technology, Laboratory Division.
- [9] November 2017 Telecommunications Certification Body Council (TCBC) Workshop Notes
- [10] October 2018 Telecommunications Certification Body Council (TCBC) Workshop Notes
- [11] April 2019 Telecommunications Certification Body Council (TCBC) Workshop Notes
- [12] November 2019 Telecommunications Certification Body Council (TCBC) Workshop Notes
- [13] SPEAG DASY6 System Handbook (September 2019)

|                                         |                                                                                                                                                                                                              |                                               |                                                                                       |                                 |
|-----------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------|
| FCC ID:<br>A3LSMG981V                   |  <b>PCTEST</b><br>Proud to be part of  | NEAR-FIELD POWER DENSITY<br>EVALUATION REPORT |  | Approved by:<br>Quality Manager |
| Document S/N:<br>1M2003090034-27-R1.A3L | Test Dates:<br>04/15/2020 - 04/21/2020                                                                                                                                                                       | DUT Type:<br>Portable Handset                 |                                                                                       | Page 22 of 21                   |

## APPENDIX A: POWER DENSITY TEST PLOTS

# PCTEST

Date: 2020-04-20

Antenna L Beam 153; H; Mid Ch.; CW

## Device Under Test Properties

| DUT        | Serial Number | DUT Type |
|------------|---------------|----------|
| A3LSMG981V | 33784         | Phone    |

## Exposure Conditions

| Phantom Section | Position | Test Distance [mm] | Band | Frequency [MHz] |
|-----------------|----------|--------------------|------|-----------------|
| 5G              | LEFT     | 2.00               | n261 | 27923.5         |

## Hardware Setup

| Probe, Calibration Date               | DAE, Calibration Date   |
|---------------------------------------|-------------------------|
| EUmmWV3 - SN9407_F1-78GHz, 2019-12-10 | DAE4 Sn1272, 2020-02-20 |

## Software Setup

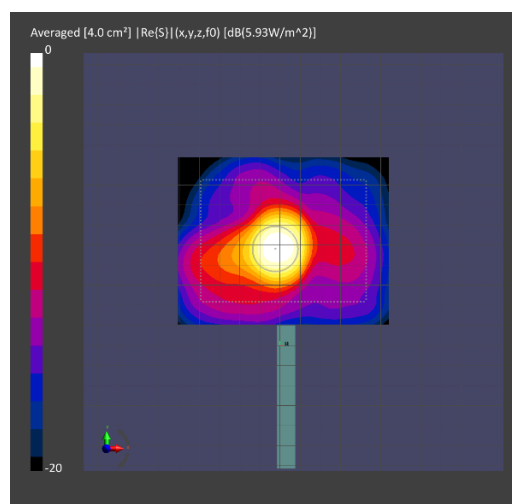
| Software             | Software Version |
|----------------------|------------------|
| cDASY6 Module mmWave | 2.0.2.34         |

## Scans Setup

|                     |              |
|---------------------|--------------|
| Scan Type           | 5G Scan      |
| Grid Extents [mm]   | 100.0 x 80.0 |
| Grid Steps [lambda] | 0.25 x 0.25  |
| Sensor Surface [mm] | 2.0          |

## Measurement Results

|                                           |         |
|-------------------------------------------|---------|
| Scan Type                                 | 5G Scan |
| Avg. Area [cm <sup>2</sup> ]              | 4.00    |
| pS <sub>tot</sub> avg [W/m <sup>2</sup> ] | 5.93    |
| pS <sub>n</sub> avg [W/m <sup>2</sup> ]   | 4.96    |
| E <sub>peak</sub> [V/m]                   | 86.5    |
| Power Drift [dB]                          | -0.15   |



# PCTEST

Date: 2020-04-21

Antenna M Beam 22/149; H+V; Low Ch.; CW

## Device Under Test Properties

| DUT        | Serial Number | DUT Type |
|------------|---------------|----------|
| A3LSMG981V | 33784         | Phone    |

## Exposure Conditions

| Phantom Section | Position | Test Distance [mm] | Band | Frequency [MHz] |
|-----------------|----------|--------------------|------|-----------------|
| 5G              | RIGHT    | 2.00               | n261 | 27559.3         |

## Hardware Setup

| Probe, Calibration Date               | DAE, Calibration Date   |
|---------------------------------------|-------------------------|
| EUmmWV3 - SN9407_F1-78GHz, 2019-12-10 | DAE4 Sn1272, 2020-02-20 |

## Software Setup

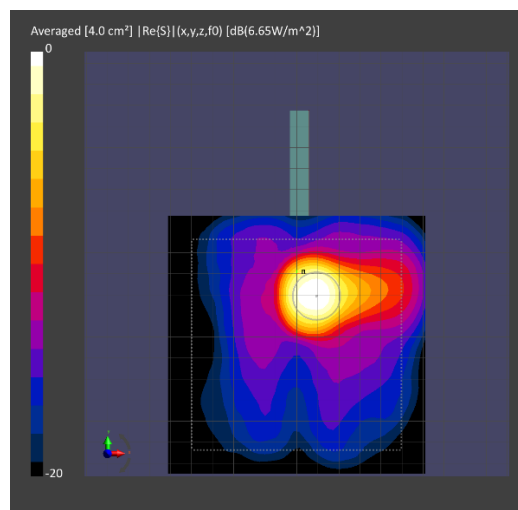
| Software             | Software Version |
|----------------------|------------------|
| cDASY6 Module mmWave | 2.0.2.34         |

## Scans Setup

|                     |               |
|---------------------|---------------|
| Scan Type           | 5G Scan       |
| Grid Extents [mm]   | 120.0 x 120.0 |
| Grid Steps [lambda] | 0.25 x 0.25   |
| Sensor Surface [mm] | 2.0           |

## Measurement Results

|                                           |         |
|-------------------------------------------|---------|
| Scan Type                                 | 5G Scan |
| Avg. Area [cm <sup>2</sup> ]              | 4.00    |
| pS <sub>tot</sub> avg [W/m <sup>2</sup> ] | 6.65    |
| pS <sub>n</sub> avg [W/m <sup>2</sup> ]   | 5.58    |
| E <sub>peak</sub> [V/m]                   | 89.4    |
| Power Drift [dB]                          | 0.03    |



# PCTEST

Date: 2020-04-15

Antenna L Beam 148; H; Mid Ch.; CW

## Device Under Test Properties

| DUT        | Serial Number | DUT Type |
|------------|---------------|----------|
| A3LSMG981V | 33784         | Phone    |

## Exposure Conditions

| Phantom Section | Position | Test Distance [mm] | Band | Frequency [MHz] |
|-----------------|----------|--------------------|------|-----------------|
| 5G              | LEFT     | 2.00               | n260 | 38449.9         |

## Hardware Setup

| Probe, Calibration Date               | DAE, Calibration Date   |
|---------------------------------------|-------------------------|
| EUmmWV3 - SN9407_F1-78GHz, 2019-12-10 | DAE4 Sn1272, 2020-02-20 |

## Software Setup

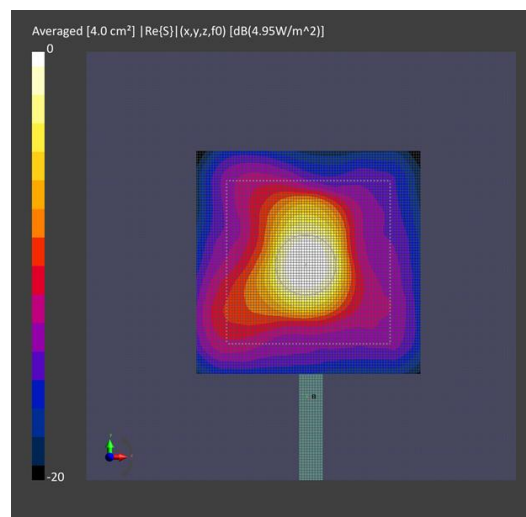
| Software             | Software Version |
|----------------------|------------------|
| cDASY6 Module mmWave | 2.0.2.34         |

## Scans Setup

| Scan Type           | 5G Scan     |
|---------------------|-------------|
| Grid Extents [mm]   | 80.0 x 80.0 |
| Grid Steps [lambda] | 0.25 x 0.25 |
| Sensor Surface [mm] | 2.0         |

## Measurement Results

| Scan Type                | 5G Scan |
|--------------------------|---------|
| Avg. Area [cm²]          | 4.00    |
| $p_{S_{tot}}$ avg [W/m²] | 4.95    |
| $p_{S_n}$ avg [W/m²]     | 4.07    |
| $E_{peak}$ [V/m]         | 100     |
| Power Drift [dB]         | -0.06   |



# PCTEST

Date: 2020-04-17

Antenna M Beam 25; V; Mid Ch.; CW

## Device Under Test Properties

| DUT        | Serial Number | DUT Type |
|------------|---------------|----------|
| A3LSMG981V | 33784         | Phone    |

## Exposure Conditions

| Phantom Section | Position | Test Distance [mm] | Band | Frequency [MHz] |
|-----------------|----------|--------------------|------|-----------------|
| 5G              | RIGHT    | 2.00               | n260 | 38449.9         |

## Hardware Setup

| Probe, Calibration Date               | DAE, Calibration Date   |
|---------------------------------------|-------------------------|
| EUmmWV3 - SN9407_F1-78GHz, 2019-12-10 | DAE4 Sn1272, 2020-02-20 |

## Software Setup

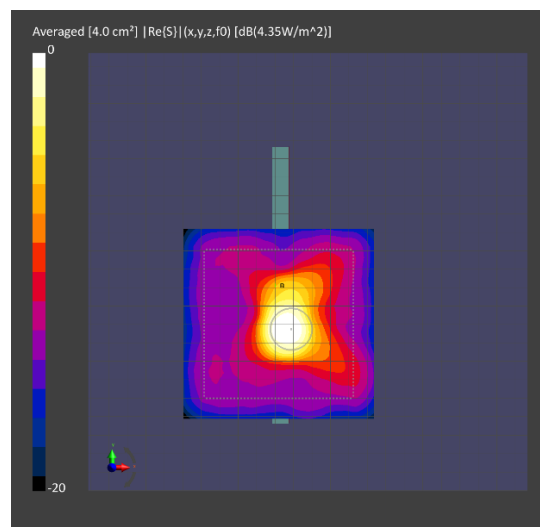
| Software             | Software Version |
|----------------------|------------------|
| cDASY6 Module mmWave | 2.0.2.34         |

## Scans Setup

| Scan Type           | 5G Scan       |
|---------------------|---------------|
| Grid Extents [mm]   | 100.0 x 100.0 |
| Grid Steps [lambda] | 0.25 x 0.25   |
| Sensor Surface [mm] | 2.0           |

## Measurement Results

| Scan Type                                 | 5G Scan |
|-------------------------------------------|---------|
| Avg. Area [cm <sup>2</sup> ]              | 4.00    |
| pS <sub>tot</sub> avg [W/m <sup>2</sup> ] | 4.35    |
| pS <sub>n</sub> avg [W/m <sup>2</sup> ]   | 3.47    |
| E <sub>peak</sub> [V/m]                   | 82.0    |
| Power Drift [dB]                          | -0.18   |



## APPENDIX B: POWER DENSITY SYSTEM VERIFICATION PLOTS

# PCTEST

Date: 2020-04-21

## 30 GHz System Verification

### Device Under Test Properties

| DUT                        | Serial Number |
|----------------------------|---------------|
| 30 GHz Verification Source | 1035          |

### Exposure Conditions

| Phantom Section | Position | Test Distance [mm] | Band            | Frequency [MHz] |
|-----------------|----------|--------------------|-----------------|-----------------|
| 5G              | FRONT    | 5.55               | Validation band | 30000.0         |

### Hardware Setup

| Probe, Calibration Date               | DAE, Calibration Date   |
|---------------------------------------|-------------------------|
| EUmmWV3 - SN9407_F1-78GHz, 2019-12-10 | DAE4 Sn1272, 2020-02-20 |

### Software Setup

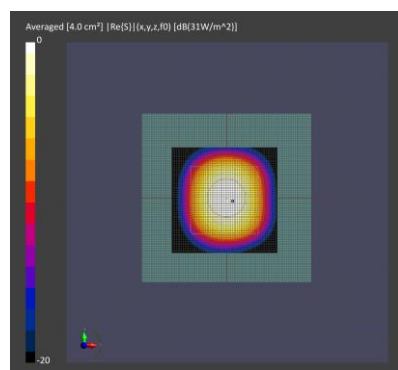
| Software             | Software Version |
|----------------------|------------------|
| cDASY6 Module mmWave | 2.0.2.34         |

### Scans Setup

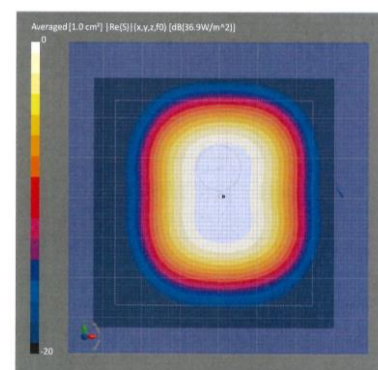
|                     |             |
|---------------------|-------------|
| Scan Type           | 5G Scan     |
| Grid Extents [mm]   | 60.0 x 60.0 |
| Grid Steps [lambda] | 0.25 x 0.25 |
| Sensor Surface [mm] | 5.55        |

### Measurement Results

|                                           |         |
|-------------------------------------------|---------|
| Scan Type                                 | 5G Scan |
| Avg. Area [cm <sup>2</sup> ]              | 4.00    |
| pS <sub>tot</sub> avg [W/m <sup>2</sup> ] | 31.0    |
| pS <sub>n</sub> avg [W/m <sup>2</sup> ]   | 30.5    |
| E <sub>peak</sub> [V/m]                   | 128     |
| Deviation (dB)                            | -0.21   |



30GHz System Verification



Calibration Certificate

## APPENDIX C: EQUIPMENT CERTIFICATIONS



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: **DAE4-1272\_Feb20**

## CALIBRATION CERTIFICATE

Object **DAE4 - SD 000 D04 BM - SN: 1272**

Calibration procedure(s) **QA CAL-06.v30**  
**Calibration procedure for the data acquisition electronics (DAE)**

Calibration date: **February 20, 2020**

*BNV*  
*02-26-2020*

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  |
|-------------------------------|--------------------|----------------------------|------------------------|
| Keithley Multimeter Type 2001 | SN: 0810278        | 03-Sep-19 (No:25949)       | Sep-20                 |
| Secondary Standards           | ID #               | Check Date (in house)      | Scheduled Check        |
| Auto DAE Calibration Unit     | SE UWS 053 AA 1001 | 09-Jan-20 (in house check) | In house check: Jan-21 |
| Calibrator Box V2.1           | SE UMS 006 AA 1002 | 09-Jan-20 (in house check) | In house check: Jan-21 |

Calibrated by: **Name**  
**Adrian Gehring** **Function**  
**Laboratory Technician**

Approved by: **Sven Kühn** **Deputy Manager**

Signature

*[Signature]*  
*[Signature]*

Issued: February 20, 2020

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

DAE data acquisition electronics  
Connector angle information used in DASY system to align probe sensor X to the robot coordinate system.

## Methods Applied and Interpretation of Parameters

- **DC Voltage Measurement:** Calibration Factor assessed for use in DASY system by comparison with a calibrated instrument traceable to national standards. The figure given corresponds to the full scale range of the voltmeter in the respective range.
- **Connector angle:** The angle of the connector is assessed measuring the angle mechanically by a tool inserted. Uncertainty is not required.
- The following parameters as documented in the Appendix contain technical information as a result from the performance test and require no uncertainty.
  - **DC Voltage Measurement Linearity:** Verification of the Linearity at +10% and -10% of the nominal calibration voltage. Influence of offset voltage is included in this measurement.
  - **Common mode sensitivity:** Influence of a positive or negative common mode voltage on the differential measurement.
  - **Channel separation:** Influence of a voltage on the neighbor channels not subject to an input voltage.
  - **AD Converter Values with inputs shorted:** Values on the internal AD converter corresponding to zero input voltage
  - **Input Offset Measurement:** Output voltage and statistical results over a large number of zero voltage measurements.
  - **Input Offset Current:** Typical value for information; Maximum channel input offset current, not considering the input resistance.
  - **Input resistance:** Typical value for information: DAE input resistance at the connector, during internal auto-zeroing and during measurement.
  - **Low Battery Alarm Voltage:** Typical value for information. Below this voltage, a battery alarm signal is generated.
  - **Power consumption:** Typical value for information. Supply currents in various operating modes.

## DC Voltage Measurement

A/D - Converter Resolution nominal

High Range: 1LSB = 6.1 $\mu$ V , full range = -100...+300 mV

Low Range: 1LSB = 61nV , full range = -1.....+3mV

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

| Calibration Factors | X                         | Y                         | Z                         |
|---------------------|---------------------------|---------------------------|---------------------------|
| High Range          | 404.505 $\pm$ 0.02% (k=2) | 404.783 $\pm$ 0.02% (k=2) | 405.108 $\pm$ 0.02% (k=2) |
| Low Range           | 3.97748 $\pm$ 1.50% (k=2) | 3.99349 $\pm$ 1.50% (k=2) | 3.99462 $\pm$ 1.50% (k=2) |

## Connector Angle

|                                           |                   |
|-------------------------------------------|-------------------|
| Connector Angle to be used in DASY system | 209.5 ° $\pm$ 1 ° |
|-------------------------------------------|-------------------|

## Appendix (Additional assessments outside the scope of SCS0108)

### 1. DC Voltage Linearity

| High Range        | Reading ( $\mu\text{V}$ ) | Difference ( $\mu\text{V}$ ) | Error (%) |
|-------------------|---------------------------|------------------------------|-----------|
| Channel X + Input | 200031.23                 | -4.10                        | -0.00     |
| Channel X + Input | 20005.33                  | -0.57                        | -0.00     |
| Channel X - Input | -20004.24                 | 1.25                         | -0.01     |
| Channel Y + Input | 200031.06                 | -4.29                        | -0.00     |
| Channel Y + Input | 20004.08                  | -1.59                        | -0.01     |
| Channel Y - Input | -20006.39                 | -0.77                        | 0.00      |
| Channel Z + Input | 200031.03                 | -6.83                        | -0.00     |
| Channel Z + Input | 20003.34                  | -2.41                        | -0.01     |
| Channel Z - Input | -20005.95                 | -0.19                        | 0.00      |

| Low Range         | Reading ( $\mu\text{V}$ ) | Difference ( $\mu\text{V}$ ) | Error (%) |
|-------------------|---------------------------|------------------------------|-----------|
| Channel X + Input | 2001.75                   | 0.24                         | 0.01      |
| Channel X + Input | 201.38                    | -0.16                        | -0.08     |
| Channel X - Input | -198.31                   | 0.14                         | -0.07     |
| Channel Y + Input | 2001.42                   | 0.07                         | 0.00      |
| Channel Y + Input | 200.57                    | -0.77                        | -0.38     |
| Channel Y - Input | -199.72                   | -1.17                        | 0.59      |
| Channel Z + Input | 2001.27                   | 0.00                         | 0.00      |
| Channel Z + Input | 200.65                    | -0.70                        | -0.35     |
| Channel Z - Input | -199.36                   | -0.73                        | 0.37      |

### 2. Common mode sensitivity

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

|           | Common mode<br>Input Voltage (mV) | High Range<br>Average Reading ( $\mu\text{V}$ ) | Low Range<br>Average Reading ( $\mu\text{V}$ ) |
|-----------|-----------------------------------|-------------------------------------------------|------------------------------------------------|
| Channel X | 200                               | 7.28                                            | 5.79                                           |
|           | - 200                             | -5.58                                           | -7.20                                          |
| Channel Y | 200                               | 2.07                                            | 1.56                                           |
|           | - 200                             | -3.56                                           | -3.84                                          |
| Channel Z | 200                               | -9.40                                           | -9.24                                          |
|           | - 200                             | 8.03                                            | 7.70                                           |

### 3. Channel separation

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

|           | Input Voltage (mV) | Channel X ( $\mu\text{V}$ ) | Channel Y ( $\mu\text{V}$ ) | Channel Z ( $\mu\text{V}$ ) |
|-----------|--------------------|-----------------------------|-----------------------------|-----------------------------|
| Channel X | 200                | -                           | -0.99                       | -3.47                       |
| Channel Y | 200                | 7.00                        | -                           | 0.48                        |
| Channel Z | 200                | 8.94                        | 3.97                        | -                           |

#### 4. AD-Converter Values with inputs shorted

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

|           | High Range (LSB) | Low Range (LSB) |
|-----------|------------------|-----------------|
| Channel X | 15753            | 15328           |
| Channel Y | 15849            | 15204           |
| Channel Z | 15884            | 15754           |

#### 5. Input Offset Measurement

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

Input 10M $\Omega$

|           | Average ( $\mu$ V) | min. Offset ( $\mu$ V) | max. Offset ( $\mu$ V) | Std. Deviation ( $\mu$ V) |
|-----------|--------------------|------------------------|------------------------|---------------------------|
| Channel X | 0.85               | 0.05                   | 2.21                   | 0.40                      |
| Channel Y | 0.05               | -1.24                  | 1.34                   | 0.51                      |
| Channel Z | 1.25               | 0.11                   | 3.06                   | 0.54                      |

#### 6. Input Offset Current

Nominal Input circuitry offset current on all channels: <25fA

#### 7. Input Resistance (Typical values for information)

|           | Zeroing (kOhm) | Measuring (MOhm) |
|-----------|----------------|------------------|
| Channel X | 200            | 200              |
| Channel Y | 200            | 200              |
| Channel Z | 200            | 200              |

#### 8. Low Battery Alarm Voltage (Typical values for information)

| Typical values | Alarm Level (VDC) |
|----------------|-------------------|
| Supply (+ Vcc) | +7.9              |
| Supply (- Vcc) | -7.6              |

#### 9. Power Consumption (Typical values for information)

| Typical values | Switched off (mA) | Stand by (mA) | Transmitting (mA) |
|----------------|-------------------|---------------|-------------------|
| Supply (+ Vcc) | +0.01             | +6            | +14               |
| Supply (- Vcc) | -0.01             | -8            | -9                |



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Accreditation No.: **SCS 0108**

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 Multilateral Agreement for the recognition of calibration certificates

Client **PC Test**

Certificate No: **EUmmWV3-9407\_Dec19**

## CALIBRATION CERTIFICATE

Object **EUmmWV3 - SN:9407**

Calibration procedure(s) **QA CAL-02.v9, QA CAL-25.v7, QA CAL-42.v2**  
 Calibration procedure for E-field probes optimized for close near field  
 evaluations in air

Calibration date: **December 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)

*MAS*  
*4/10/20*

| 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                 |
| Reference Probe ER3DV6     | SN: 2328         | 05-Oct-19 (No. ER3-2328_Oct19)    | Oct-20                 |
| DAE4                       | SN: 789          | 14-Jan-19 (No. DAE4-789_Jan19)    | Jan-20                 |
| 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 HP 8753E  | SN: US37390585   | 18-Oct-01 (in house check Oct-19) | In house check: Oct-20 |

|                                                                                                                 | Name           | Function              | Signature |
|-----------------------------------------------------------------------------------------------------------------|----------------|-----------------------|-----------|
| Calibrated by:                                                                                                  | Jeton Kastrati | Laboratory Technician |           |
| Approved by:                                                                                                    | Katja Pokovic  | Technical Manager     |           |
| Issued: December 17, 2019                                                                                       |                |                       |           |
| This calibration certificate shall not be reproduced except in full without written approval of the laboratory. |                |                       |           |



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### Glossary:

|                          |                                                                                                                                                         |
|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| NORM <sub>x,y,z</sub>    | sensitivity in free space                                                                                                                               |
| DCP                      | diode compression point                                                                                                                                 |
| CF                       | crest factor (1/duty_cycle) of the RF signal                                                                                                            |
| A, B, C, D               | modulation dependent linearization parameters                                                                                                           |
| Polarization $\phi$      | $\phi$ rotation around probe axis                                                                                                                       |
| Polarization $\vartheta$ | $\vartheta$ rotation around an axis that is in the plane normal to probe axis (at measurement center),<br>i.e., $\vartheta = 0$ is normal to probe axis |
| Connector Angle          | information used in DASY system to align probe sensor X to the robot coordinate system                                                                  |
| Sensor Angles            | sensor deviation from the probe axis, used to calculate the field orientation and polarization                                                          |
| $k$                      | is the wave propagation direction                                                                                                                       |

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

- IEEE Std 1309-2005, "IEEE Standard for calibration of electromagnetic field sensors and probes, excluding antennas, from 9 kHz to 40 GHz", December 2005

### Methods Applied and Interpretation of Parameters:

- NORM<sub>x,y,z</sub>**: Assessed for E-field polarization  $\vartheta = 0$  for XY sensors and  $\vartheta = 90$  for Z sensor ( $f \leq 900$  MHz in TEM-cell;  $f > 1800$  MHz: R22 waveguide). For frequencies  $> 6$  GHz, the far field in front of waveguide horn antennas is measured for a set of frequencies in various waveguide bands up to 110 GHz.
- DCP<sub>x,y,z</sub>**: DCP are numerical linearization parameters assessed based on the data of power sweep with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- PAR**: PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics
- The frequency sensor model parameters are determined prior to calibration based on a frequency sweep (sensor model involving resistors R,  $R_p$ , inductance L and capacitors C,  $C_p$ ).
- A<sub>x,y,z</sub>; B<sub>x,y,z</sub>; C<sub>x,y,z</sub>; D<sub>x,y,z</sub>; V<sub>Rx,y,z</sub>**: A, B, C, D are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. V<sub>R</sub> is the maximum calibration range expressed in RMS voltage across the diode.
- Sensor Offset**: The sensor offset corresponds to the mechanical from the probe tip (on probe axis). No tolerance required.
- Connector Angle**: The angle is assessed using the information gained by determining the NORM<sub>x</sub> (no uncertainty required).
- Equivalent Sensor Angle**: The two probe sensors are mounted in the same plane at different angles. The angles are assessed using the information gained by determining the NORM<sub>x</sub> (no uncertainty required).
- Spherical isotropy (3D deviation from isotropy)**: in a locally homogeneous field realized using an open waveguide / horn setup.

## DASY - Parameters of Probe: EUmmWV3 - SN:9407

### Basic Calibration Parameters

|                                              | Sensor X | Sensor Y | Unc (k=2)     |
|----------------------------------------------|----------|----------|---------------|
| Norm ( $\mu\text{V}/(\text{V}/\text{m})^2$ ) | 0.02290  | 0.02745  | $\pm 10.1 \%$ |
| DCP (mV) <sup>B</sup>                        | 102.0    | 113.0    |               |
| Equivalent Sensor Angle                      | -58.6    | 31.2     |               |

### Calibration results for Frequency Response (750 MHz – 110 GHz)

| Frequency GHz | Target E-Field V/m | Deviation Sensor X dB | Deviation Sensor Y dB | Unc (k=2) dB  |
|---------------|--------------------|-----------------------|-----------------------|---------------|
| 0.75          | 77.2               | -0.15                 | 0.33                  | $\pm 0.43$ dB |
| 1.8           | 140.4              | 0.13                  | 0.23                  | $\pm 0.43$ dB |
| 2             | 133.0              | 0.07                  | 0.13                  | $\pm 0.43$ dB |
| 2.2           | 124.8              | 0.05                  | 0.04                  | $\pm 0.43$ dB |
| 2.5           | 123.0              | -0.07                 | -0.19                 | $\pm 0.43$ dB |
| 3.5           | 256.2              | 0.02                  | -0.32                 | $\pm 0.43$ dB |
| 3.7           | 249.8              | 0.08                  | -0.30                 | $\pm 0.43$ dB |
|               |                    |                       |                       |               |
| 6.6           | 41.8               | 0.47                  | 0.49                  | $\pm 0.98$ dB |
| 8             | 48.4               | -0.03                 | -0.20                 | $\pm 0.98$ dB |
| 10            | 54.4               | -0.04                 | 0.00                  | $\pm 0.98$ dB |
| 15            | 71.5               | 0.36                  | -0.21                 | $\pm 0.98$ dB |
| 18            | 85.3               | -0.36                 | 0.03                  | $\pm 0.98$ dB |
|               |                    |                       |                       |               |
| 26.6          | 96.9               | -0.14                 | 0.03                  | $\pm 0.98$ dB |
| 30            | 92.6               | 0.12                  | 0.08                  | $\pm 0.98$ dB |
| 35            | 93.7               | -0.37                 | -0.21                 | $\pm 0.98$ dB |
| 40            | 91.5               | -0.62                 | -0.59                 | $\pm 0.98$ dB |
|               |                    |                       |                       |               |
| 50            | 19.6               | -0.07                 | 0.01                  | $\pm 0.98$ dB |
| 55            | 22.4               | 0.68                  | 0.42                  | $\pm 0.98$ dB |
| 60            | 23.0               | 0.06                  | 0.02                  | $\pm 0.98$ dB |
| 65            | 27.4               | -0.38                 | -0.09                 | $\pm 0.98$ dB |
| 70            | 23.9               | -0.15                 | -0.23                 | $\pm 0.98$ dB |
| 75            | 20.0               | -0.09                 | -0.06                 | $\pm 0.98$ dB |
|               |                    |                       |                       |               |
| 75            | 14.8               | 0.10                  | 0.21                  | $\pm 0.98$ dB |
| 80            | 22.5               | 0.38                  | 0.35                  | $\pm 0.98$ dB |
| 85            | 22.8               | 0.13                  | 0.09                  | $\pm 0.98$ dB |
| 90            | 23.8               | -0.03                 | 0.04                  | $\pm 0.98$ dB |
| 92            | 23.9               | 0.12                  | -0.08                 | $\pm 0.98$ dB |
| 95            | 20.5               | -0.03                 | -0.19                 | $\pm 0.98$ dB |
| 97            | 24.4               | -0.06                 | -0.15                 | $\pm 0.98$ dB |
| 100           | 22.6               | 0.09                  | -0.07                 | $\pm 0.98$ dB |
| 105           | 22.7               | -0.08                 | 0.00                  | $\pm 0.98$ dB |
| 110           | 19.7               | 0.08                  | 0.23                  | $\pm 0.98$ dB |

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%.

<sup>B</sup> Numerical linearization parameter: uncertainty not required.

<sup>E</sup> Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

## DASY - Parameters of Probe: EUmmWV3 - SN:9407

### Calibration Results for Modulation Response

| UID           | Communication System Name   |   | A<br>dB | B<br>dB/μV | C     | D<br>dB | VR<br>mV | Max<br>dev. | Max<br>Unc <sup>E</sup><br>(k=2) |
|---------------|-----------------------------|---|---------|------------|-------|---------|----------|-------------|----------------------------------|
| 0             | CW                          | X | 0.00    | 0.00       | 1.00  | 0.00    | 109.4    | ± 2.7 %     | ± 4.7 %                          |
|               |                             | Y | 0.00    | 0.00       | 1.00  |         | 86.2     |             |                                  |
| 10352-<br>AAA | Pulse Waveform (200Hz, 10%) | X | 2.12    | 60.00      | 13.39 | 10.00   | 6.0      | ± 1.3 %     | ± 9.6 %                          |
|               |                             | Y | 1.41    | 60.00      | 14.71 |         | 6.0      |             |                                  |
| 10353-<br>AAA | Pulse Waveform (200Hz, 20%) | X | 1.37    | 60.00      | 12.36 | 6.99    | 12.0     | ± 0.8 %     | ± 9.6 %                          |
|               |                             | Y | 0.94    | 60.00      | 13.81 |         | 12.0     |             |                                  |
| 10354-<br>AAA | Pulse Waveform (200Hz, 40%) | X | 0.78    | 60.00      | 11.17 | 3.98    | 23.0     | ± 1.0 %     | ± 9.6 %                          |
|               |                             | Y | 0.56    | 60.00      | 12.74 |         | 23.0     |             |                                  |
| 10355-<br>AAA | Pulse Waveform (200Hz, 60%) | X | 0.48    | 60.00      | 10.18 | 2.22    | 27.0     | ± 0.9 %     | ± 9.6 %                          |
|               |                             | Y | 0.38    | 60.00      | 11.82 |         | 27.0     |             |                                  |
| 10387-<br>AAA | QPSK Waveform, 1 MHz        | X | 1.19    | 117.15     | 13.96 | 0.00    | 22.0     | ± 1.1 %     | ± 9.6 %                          |
|               |                             | Y | 3.79    | 84.56      | 1.83  |         | 22.0     |             |                                  |
| 10388-<br>AAA | QPSK Waveform, 10 MHz       | X | 1.27    | 60.00      | 11.50 | 0.00    | 22.0     | ± 0.6 %     | ± 9.6 %                          |
|               |                             | Y | 1.17    | 60.00      | 11.99 |         | 22.0     |             |                                  |
| 10396-<br>AAA | 64-QAM Waveform, 100 kHz    | X | 1.93    | 60.00      | 13.68 | 3.01    | 17.0     | ± 0.6 %     | ± 9.6 %                          |
|               |                             | Y | 1.90    | 60.00      | 13.43 |         | 17.0     |             |                                  |
| 10399-<br>AAA | 64-QAM Waveform, 40 MHz     | X | 2.13    | 60.00      | 12.16 | 0.00    | 19.0     | ± 0.7 %     | ± 9.6 %                          |
|               |                             | Y | 1.93    | 60.00      | 12.50 |         | 19.0     |             |                                  |
| 10414-<br>AAA | WLAN CCDF, 64-QAM, 40MHz    | X | 3.20    | 60.00      | 12.63 | 0.00    | 12.0     | ± 0.8 %     | ± 9.6 %                          |
|               |                             | Y | 2.86    | 60.00      | 12.92 |         | 12.0     |             |                                  |

Note: For details on all calibrated UID parameters see Appendix

### Calibration Results for Linearity Response

| Frequency<br>GHz | Target E-Field<br>V/m | Deviation Sensor X dB | Deviation Sensor Y dB | Unc (k=2)<br>dB |
|------------------|-----------------------|-----------------------|-----------------------|-----------------|
| 0.9              | 50.0                  | 0.10                  | -0.02                 | ± 0.2 dB        |
| 0.9              | 100.0                 | 0.01                  | 0.02                  | ± 0.2 dB        |
| 0.9              | 500.0                 | 0.00                  | -0.02                 | ± 0.2 dB        |
| 0.9              | 1000.0                | 0.03                  | 0.01                  | ± 0.2 dB        |
| 0.9              | 1500.0                | 0.00                  | 0.00                  | ± 0.2 dB        |
| 0.9              | 2000.0                | -0.04                 | 0.01                  | ± 0.2 dB        |

### Sensor Frequency Model Parameters (750 MHz – 78 GHz)

|                     | Sensor X | Sensor Y |
|---------------------|----------|----------|
| R (Ω)               | 47.82    | 49.82    |
| R <sub>p</sub> (Ω)  | 92.12    | 88.50    |
| L (nH)              | 0.03674  | 0.04042  |
| C (pF)              | 0.2744   | 0.2956   |
| C <sub>p</sub> (pF) | 0.1087   | 0.1004   |

### Sensor Frequency Model Parameters (55 GHz – 110 GHz)

|                     | Sensor X | Sensor Y |
|---------------------|----------|----------|
| R (Ω)               | 34.05    | 43.37    |
| R <sub>p</sub> (Ω)  | 97.85    | 91.31    |
| L (nH)              | 0.03646  | 0.02927  |
| C (pF)              | 0.1587   | 0.3237   |
| C <sub>p</sub> (pF) | 0.1222   | 0.1221   |

## DASY - Parameters of Probe: EUmmWV3 - SN:9407

### Sensor Model Parameters

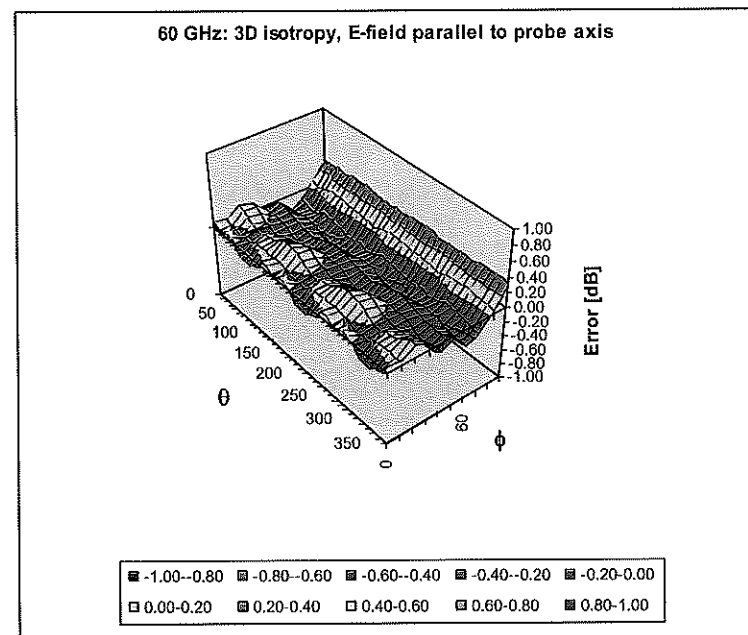
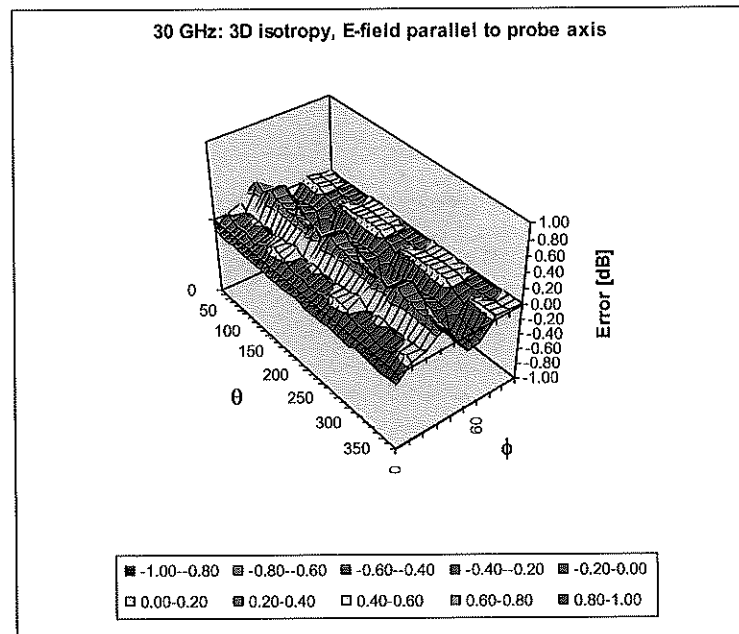
|   | C1<br>fF | C2<br>fF | $\alpha$<br>$V^{-1}$ | T1<br>$ms.V^{-2}$ | T2<br>$ms.V^{-1}$ | T3<br>ms | T4<br>$V^{-2}$ | T5<br>$V^{-1}$ | T6   |
|---|----------|----------|----------------------|-------------------|-------------------|----------|----------------|----------------|------|
| X | 28.4     | 213.34   | 35.57                | 0.92              | 3.76              | 4.99     | 0.00           | 1.13           | 1.01 |
| Y | 28.5     | 198.32   | 31.35                | 0.92              | 2.68              | 5.01     | 0.00           | 1.20           | 1.00 |

### Other Probe Parameters

|                                         |             |
|-----------------------------------------|-------------|
| Sensor Arrangement                      | Rectangular |
| Connector Angle (°)                     | 201.2       |
| Mechanical Surface Detection Mode       | enabled     |
| Optical Surface Detection Mode          | disabled    |
| Probe Overall Length                    | 320 mm      |
| Probe Body Diameter                     | 8 mm        |
| Tip Length                              | 23 mm       |
| Tip Diameter                            | 8.0 mm      |
| Probe Tip to Sensor X Calibration Point | 1.5 mm      |
| Probe Tip to Sensor Y Calibration Point | 1.5 mm      |

## Deviation from Isotropy in Air

$f = 30, 60 \text{ GHz}$



Probe isotropy for  $E_{\text{tot}}$ : probe rotated  $\phi = 0^\circ$  to  $360^\circ$ , tilted from field propagation direction  $\vec{k}$   
 Parallel to the field propagation ( $\psi = 0^\circ - 90^\circ$ ) at 30 GHz: deviation within  $\pm 0.39 \text{ dB}$   
 Parallel to the field propagation ( $\psi = 0^\circ - 90^\circ$ ) at 60 GHz: deviation within  $\pm 0.30 \text{ dB}$

**Appendix: Modulation Calibration Parameters**

| UID   | Rev | Communication System Name                           | Group     | PAR (dB) | Unc <sup>E</sup> (k=2) |
|-------|-----|-----------------------------------------------------|-----------|----------|------------------------|
| 0     |     | CW                                                  | CW        | 0.00     | ± 4.7 %                |
| 10010 | CAA | SAR Validation (Square, 100ms, 10ms)                | Test      | 10.00    | ± 9.6 %                |
| 10011 | CAB | UMTS-FDD (WCDMA)                                    | WCDMA     | 2.91     | ± 9.6 %                |
| 10012 | CAB | IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps)            | WLAN      | 1.87     | ± 9.6 %                |
| 10013 | CAB | IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps)       | WLAN      | 9.46     | ± 9.6 %                |
| 10021 | DAC | GSM-FDD (TDMA, GMSK)                                | GSM       | 9.39     | ± 9.6 %                |
| 10023 | DAC | GPRS-FDD (TDMA, GMSK, TN 0)                         | GSM       | 9.57     | ± 9.6 %                |
| 10024 | DAC | GPRS-FDD (TDMA, GMSK, TN 0-1)                       | GSM       | 6.56     | ± 9.6 %                |
| 10025 | DAC | EDGE-FDD (TDMA, 8PSK, TN 0)                         | GSM       | 12.62    | ± 9.6 %                |
| 10026 | DAC | EDGE-FDD (TDMA, 8PSK, TN 0-1)                       | GSM       | 9.55     | ± 9.6 %                |
| 10027 | DAC | GPRS-FDD (TDMA, GMSK, TN 0-1-2)                     | GSM       | 4.80     | ± 9.6 %                |
| 10028 | DAC | GPRS-FDD (TDMA, GMSK, TN 0-1-2-3)                   | GSM       | 3.55     | ± 9.6 %                |
| 10029 | DAC | EDGE-FDD (TDMA, 8PSK, TN 0-1-2)                     | GSM       | 7.78     | ± 9.6 %                |
| 10030 | CAA | IEEE 802.15.1 Bluetooth (GFSK, DH1)                 | Bluetooth | 5.30     | ± 9.6 %                |
| 10031 | CAA | IEEE 802.15.1 Bluetooth (GFSK, DH3)                 | Bluetooth | 1.87     | ± 9.6 %                |
| 10032 | CAA | IEEE 802.15.1 Bluetooth (GFSK, DH5)                 | Bluetooth | 1.16     | ± 9.6 %                |
| 10033 | CAA | IEEE 802.15.1 Bluetooth (PI/4-DQPSK, DH1)           | Bluetooth | 7.74     | ± 9.6 %                |
| 10034 | CAA | IEEE 802.15.1 Bluetooth (PI/4-DQPSK, DH3)           | Bluetooth | 4.53     | ± 9.6 %                |
| 10035 | CAA | IEEE 802.15.1 Bluetooth (PI/4-DQPSK, DH5)           | Bluetooth | 3.83     | ± 9.6 %                |
| 10036 | CAA | IEEE 802.15.1 Bluetooth (8-DPSK, DH1)               | Bluetooth | 8.01     | ± 9.6 %                |
| 10037 | CAA | IEEE 802.15.1 Bluetooth (8-DPSK, DH3)               | Bluetooth | 4.77     | ± 9.6 %                |
| 10038 | CAA | IEEE 802.15.1 Bluetooth (8-DPSK, DH5)               | Bluetooth | 4.10     | ± 9.6 %                |
| 10039 | CAB | CDMA2000 (1xRTT, RC1)                               | CDMA2000  | 4.57     | ± 9.6 %                |
| 10042 | CAB | IS-54 / IS-136 FDD (TDMA/FDM, PI/4-DQPSK, Halfrate) | AMPS      | 7.78     | ± 9.6 %                |
| 10044 | CAA | IS-91/EIA/TIA-553 FDD (FDMA, FM)                    | AMPS      | 0.00     | ± 9.6 %                |
| 10048 | CAA | DECT (TDD, TDMA/FDM, GFSK, Full Slot, 24)           | DECT      | 13.80    | ± 9.6 %                |
| 10049 | CAA | DECT (TDD, TDMA/FDM, GFSK, Double Slot, 12)         | DECT      | 10.79    | ± 9.6 %                |
| 10056 | CAA | UMTS-TDD (TD-SCDMA, 1.28 Mcps)                      | TD-SCDMA  | 11.01    | ± 9.6 %                |
| 10058 | DAC | EDGE-FDD (TDMA, 8PSK, TN 0-1-2-3)                   | GSM       | 6.52     | ± 9.6 %                |
| 10059 | CAB | IEEE 802.11b WiFi 2.4 GHz (DSSS, 2 Mbps)            | WLAN      | 2.12     | ± 9.6 %                |
| 10060 | CAB | IEEE 802.11b WiFi 2.4 GHz (DSSS, 5.5 Mbps)          | WLAN      | 2.83     | ± 9.6 %                |
| 10061 | CAB | IEEE 802.11b WiFi 2.4 GHz (DSSS, 11 Mbps)           | WLAN      | 3.60     | ± 9.6 %                |
| 10062 | CAC | IEEE 802.11a/h WiFi 5 GHz (OFDM, 6 Mbps)            | WLAN      | 8.68     | ± 9.6 %                |
| 10063 | CAC | IEEE 802.11a/h WiFi 5 GHz (OFDM, 9 Mbps)            | WLAN      | 8.63     | ± 9.6 %                |
| 10064 | CAC | IEEE 802.11a/h WiFi 5 GHz (OFDM, 12 Mbps)           | WLAN      | 9.09     | ± 9.6 %                |
| 10065 | CAC | IEEE 802.11a/h WiFi 5 GHz (OFDM, 18 Mbps)           | WLAN      | 9.00     | ± 9.6 %                |
| 10066 | CAC | IEEE 802.11a/h WiFi 5 GHz (OFDM, 24 Mbps)           | WLAN      | 9.38     | ± 9.6 %                |
| 10067 | CAC | IEEE 802.11a/h WiFi 5 GHz (OFDM, 36 Mbps)           | WLAN      | 10.12    | ± 9.6 %                |
| 10068 | CAC | IEEE 802.11a/h WiFi 5 GHz (OFDM, 48 Mbps)           | WLAN      | 10.24    | ± 9.6 %                |
| 10069 | CAC | IEEE 802.11a/h WiFi 5 GHz (OFDM, 54 Mbps)           | WLAN      | 10.56    | ± 9.6 %                |
| 10071 | CAB | IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 9 Mbps)       | WLAN      | 9.83     | ± 9.6 %                |
| 10072 | CAB | IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 12 Mbps)      | WLAN      | 9.62     | ± 9.6 %                |
| 10073 | CAB | IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 18 Mbps)      | WLAN      | 9.94     | ± 9.6 %                |
| 10074 | CAB | IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 24 Mbps)      | WLAN      | 10.30    | ± 9.6 %                |
| 10075 | CAB | IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 36 Mbps)      | WLAN      | 10.77    | ± 9.6 %                |
| 10076 | CAB | IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 48 Mbps)      | WLAN      | 10.94    | ± 9.6 %                |
| 10077 | CAB | IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 54 Mbps)      | WLAN      | 11.00    | ± 9.6 %                |
| 10081 | CAB | CDMA2000 (1xRTT, RC3)                               | CDMA2000  | 3.97     | ± 9.6 %                |
| 10082 | CAB | IS-54 / IS-136 FDD (TDMA/FDM, PI/4-DQPSK, Fullrate) | AMPS      | 4.77     | ± 9.6 %                |
| 10090 | DAC | GPRS-FDD (TDMA, GMSK, TN 0-4)                       | GSM       | 6.56     | ± 9.6 %                |
| 10097 | CAB | UMTS-FDD (HSDPA)                                    | WCDMA     | 3.98     | ± 9.6 %                |
| 10098 | CAB | UMTS-FDD (HSUPA, Subtest 2)                         | WCDMA     | 3.98     | ± 9.6 %                |
| 10099 | DAC | EDGE-FDD (TDMA, 8PSK, TN 0-4)                       | GSM       | 9.55     | ± 9.6 %                |
| 10100 | CAE | LTE-FDD (SC-FDMA, 100% RB, 20 MHz, QPSK)            | LTE-FDD   | 5.67     | ± 9.6 %                |
| 10101 | CAE | LTE-FDD (SC-FDMA, 100% RB, 20 MHz, 16-QAM)          | LTE-FDD   | 6.42     | ± 9.6 %                |
| 10102 | CAE | LTE-FDD (SC-FDMA, 100% RB, 20 MHz, 64-QAM)          | LTE-FDD   | 6.60     | ± 9.6 %                |
| 10103 | CAG | LTE-TDD (SC-FDMA, 100% RB, 20 MHz, QPSK)            | LTE-TDD   | 9.29     | ± 9.6 %                |
| 10104 | CAG | LTE-TDD (SC-FDMA, 100% RB, 20 MHz, 16-QAM)          | LTE-TDD   | 9.97     | ± 9.6 %                |
| 10105 | CAG | LTE-TDD (SC-FDMA, 100% RB, 20 MHz, 64-QAM)          | LTE-TDD   | 10.01    | ± 9.6 %                |
| 10108 | CAG | LTE-FDD (SC-FDMA, 100% RB, 10 MHz, QPSK)            | LTE-FDD   | 5.80     | ± 9.6 %                |

|       |     |                                                |         |       |         |
|-------|-----|------------------------------------------------|---------|-------|---------|
| 10109 | CAG | LTE-FDD (SC-FDMA, 100% RB, 10 MHz, 16-QAM)     | LTE-FDD | 6.43  | ± 9.6 % |
| 10110 | CAG | LTE-FDD (SC-FDMA, 100% RB, 5 MHz, QPSK)        | LTE-FDD | 5.75  | ± 9.6 % |
| 10111 | CAG | LTE-FDD (SC-FDMA, 100% RB, 5 MHz, 16-QAM)      | LTE-FDD | 6.44  | ± 9.6 % |
| 10112 | CAG | LTE-FDD (SC-FDMA, 100% RB, 10 MHz, 64-QAM)     | LTE-FDD | 6.59  | ± 9.6 % |
| 10113 | CAG | LTE-FDD (SC-FDMA, 100% RB, 5 MHz, 64-QAM)      | LTE-FDD | 6.62  | ± 9.6 % |
| 10114 | CAC | IEEE 802.11n (HT Greenfield, 13.5 Mbps, BPSK)  | WLAN    | 8.10  | ± 9.6 % |
| 10115 | CAC | IEEE 802.11n (HT Greenfield, 81 Mbps, 16-QAM)  | WLAN    | 8.46  | ± 9.6 % |
| 10116 | CAC | IEEE 802.11n (HT Greenfield, 135 Mbps, 64-QAM) | WLAN    | 8.15  | ± 9.6 % |
| 10117 | CAC | IEEE 802.11n (HT Mixed, 13.5 Mbps, BPSK)       | WLAN    | 8.07  | ± 9.6 % |
| 10118 | CAC | IEEE 802.11n (HT Mixed, 81 Mbps, 16-QAM)       | WLAN    | 8.59  | ± 9.6 % |
| 10119 | CAC | IEEE 802.11n (HT Mixed, 135 Mbps, 64-QAM)      | WLAN    | 8.13  | ± 9.6 % |
| 10140 | CAE | LTE-FDD (SC-FDMA, 100% RB, 15 MHz, 16-QAM)     | LTE-FDD | 6.49  | ± 9.6 % |
| 10141 | CAE | LTE-FDD (SC-FDMA, 100% RB, 15 MHz, 64-QAM)     | LTE-FDD | 6.53  | ± 9.6 % |
| 10142 | CAE | LTE-FDD (SC-FDMA, 100% RB, 3 MHz, QPSK)        | LTE-FDD | 5.73  | ± 9.6 % |
| 10143 | CAE | LTE-FDD (SC-FDMA, 100% RB, 3 MHz, 16-QAM)      | LTE-FDD | 6.35  | ± 9.6 % |
| 10144 | CAE | LTE-FDD (SC-FDMA, 100% RB, 3 MHz, 64-QAM)      | LTE-FDD | 6.65  | ± 9.6 % |
| 10145 | CAF | LTE-FDD (SC-FDMA, 100% RB, 1.4 MHz, QPSK)      | LTE-FDD | 5.76  | ± 9.6 % |
| 10146 | CAF | LTE-FDD (SC-FDMA, 100% RB, 1.4 MHz, 16-QAM)    | LTE-FDD | 6.41  | ± 9.6 % |
| 10147 | CAF | LTE-FDD (SC-FDMA, 100% RB, 1.4 MHz, 64-QAM)    | LTE-FDD | 6.72  | ± 9.6 % |
| 10149 | CAE | LTE-FDD (SC-FDMA, 50% RB, 20 MHz, 16-QAM)      | LTE-FDD | 6.42  | ± 9.6 % |
| 10150 | CAE | LTE-FDD (SC-FDMA, 50% RB, 20 MHz, 64-QAM)      | LTE-FDD | 6.60  | ± 9.6 % |
| 10151 | CAG | LTE-TDD (SC-FDMA, 50% RB, 20 MHz, QPSK)        | LTE-TDD | 9.28  | ± 9.6 % |
| 10152 | CAG | LTE-TDD (SC-FDMA, 50% RB, 20 MHz, 16-QAM)      | LTE-TDD | 9.92  | ± 9.6 % |
| 10153 | CAG | LTE-TDD (SC-FDMA, 50% RB, 20 MHz, 64-QAM)      | LTE-TDD | 10.05 | ± 9.6 % |
| 10154 | CAG | LTE-FDD (SC-FDMA, 50% RB, 10 MHz, QPSK)        | LTE-FDD | 5.75  | ± 9.6 % |
| 10155 | CAG | LTE-FDD (SC-FDMA, 50% RB, 10 MHz, 16-QAM)      | LTE-FDD | 6.43  | ± 9.6 % |
| 10156 | CAG | LTE-FDD (SC-FDMA, 50% RB, 5 MHz, QPSK)         | LTE-FDD | 5.79  | ± 9.6 % |
| 10157 | CAG | LTE-FDD (SC-FDMA, 50% RB, 5 MHz, 16-QAM)       | LTE-FDD | 6.49  | ± 9.6 % |
| 10158 | CAG | LTE-FDD (SC-FDMA, 50% RB, 10 MHz, 64-QAM)      | LTE-FDD | 6.62  | ± 9.6 % |
| 10159 | CAG | LTE-FDD (SC-FDMA, 50% RB, 5 MHz, 64-QAM)       | LTE-FDD | 6.56  | ± 9.6 % |
| 10160 | CAE | LTE-FDD (SC-FDMA, 50% RB, 15 MHz, QPSK)        | LTE-FDD | 5.82  | ± 9.6 % |
| 10161 | CAE | LTE-FDD (SC-FDMA, 50% RB, 15 MHz, 16-QAM)      | LTE-FDD | 6.43  | ± 9.6 % |
| 10162 | CAE | LTE-FDD (SC-FDMA, 50% RB, 15 MHz, 64-QAM)      | LTE-FDD | 6.58  | ± 9.6 % |
| 10166 | CAF | LTE-FDD (SC-FDMA, 50% RB, 1.4 MHz, QPSK)       | LTE-FDD | 5.46  | ± 9.6 % |
| 10167 | CAF | LTE-FDD (SC-FDMA, 50% RB, 1.4 MHz, 16-QAM)     | LTE-FDD | 6.21  | ± 9.6 % |
| 10168 | CAF | LTE-FDD (SC-FDMA, 50% RB, 1.4 MHz, 64-QAM)     | LTE-FDD | 6.79  | ± 9.6 % |
| 10169 | CAE | LTE-FDD (SC-FDMA, 1 RB, 20 MHz, QPSK)          | LTE-FDD | 5.73  | ± 9.6 % |
| 10170 | CAE | LTE-FDD (SC-FDMA, 1 RB, 20 MHz, 16-QAM)        | LTE-FDD | 6.52  | ± 9.6 % |
| 10171 | AAE | LTE-FDD (SC-FDMA, 1 RB, 20 MHz, 64-QAM)        | LTE-FDD | 6.49  | ± 9.6 % |
| 10172 | CAG | LTE-TDD (SC-FDMA, 1 RB, 20 MHz, QPSK)          | LTE-TDD | 9.21  | ± 9.6 % |
| 10173 | CAG | LTE-TDD (SC-FDMA, 1 RB, 20 MHz, 16-QAM)        | LTE-TDD | 9.48  | ± 9.6 % |
| 10174 | CAG | LTE-TDD (SC-FDMA, 1 RB, 20 MHz, 64-QAM)        | LTE-TDD | 10.25 | ± 9.6 % |
| 10175 | CAG | LTE-FDD (SC-FDMA, 1 RB, 10 MHz, QPSK)          | LTE-FDD | 5.72  | ± 9.6 % |
| 10176 | CAG | LTE-FDD (SC-FDMA, 1 RB, 10 MHz, 16-QAM)        | LTE-FDD | 6.52  | ± 9.6 % |
| 10177 | CAI | LTE-FDD (SC-FDMA, 1 RB, 5 MHz, QPSK)           | LTE-FDD | 5.73  | ± 9.6 % |
| 10178 | CAG | LTE-FDD (SC-FDMA, 1 RB, 5 MHz, 16-QAM)         | LTE-FDD | 6.52  | ± 9.6 % |
| 10179 | CAG | LTE-FDD (SC-FDMA, 1 RB, 10 MHz, 64-QAM)        | LTE-FDD | 6.50  | ± 9.6 % |
| 10180 | CAG | LTE-FDD (SC-FDMA, 1 RB, 5 MHz, 64-QAM)         | LTE-FDD | 6.50  | ± 9.6 % |
| 10181 | CAE | LTE-FDD (SC-FDMA, 1 RB, 15 MHz, QPSK)          | LTE-FDD | 5.72  | ± 9.6 % |
| 10182 | CAE | LTE-FDD (SC-FDMA, 1 RB, 15 MHz, 16-QAM)        | LTE-FDD | 6.52  | ± 9.6 % |
| 10183 | AAD | LTE-FDD (SC-FDMA, 1 RB, 15 MHz, 64-QAM)        | LTE-FDD | 6.50  | ± 9.6 % |
| 10184 | CAE | LTE-FDD (SC-FDMA, 1 RB, 3 MHz, QPSK)           | LTE-FDD | 5.73  | ± 9.6 % |
| 10185 | CAE | LTE-FDD (SC-FDMA, 1 RB, 3 MHz, 16-QAM)         | LTE-FDD | 6.51  | ± 9.6 % |
| 10186 | AAE | LTE-FDD (SC-FDMA, 1 RB, 3 MHz, 64-QAM)         | LTE-FDD | 6.50  | ± 9.6 % |
| 10187 | CAF | LTE-FDD (SC-FDMA, 1 RB, 1.4 MHz, QPSK)         | LTE-FDD | 5.73  | ± 9.6 % |
| 10188 | CAF | LTE-FDD (SC-FDMA, 1 RB, 1.4 MHz, 16-QAM)       | LTE-FDD | 6.52  | ± 9.6 % |
| 10189 | AAF | LTE-FDD (SC-FDMA, 1 RB, 1.4 MHz, 64-QAM)       | LTE-FDD | 6.50  | ± 9.6 % |
| 10193 | CAC | IEEE 802.11n (HT Greenfield, 6.5 Mbps, BPSK)   | WLAN    | 8.09  | ± 9.6 % |
| 10194 | CAC | IEEE 802.11n (HT Greenfield, 39 Mbps, 16-QAM)  | WLAN    | 8.12  | ± 9.6 % |
| 10195 | CAC | IEEE 802.11n (HT Greenfield, 65 Mbps, 64-QAM)  | WLAN    | 8.21  | ± 9.6 % |
| 10196 | CAC | IEEE 802.11n (HT Mixed, 6.5 Mbps, BPSK)        | WLAN    | 8.10  | ± 9.6 % |
| 10197 | CAC | IEEE 802.11n (HT Mixed, 39 Mbps, 16-QAM)       | WLAN    | 8.13  | ± 9.6 % |
| 10198 | CAC | IEEE 802.11n (HT Mixed, 65 Mbps, 64-QAM)       | WLAN    | 8.27  | ± 9.6 % |
| 10219 | CAC | IEEE 802.11n (HT Mixed, 7.2 Mbps, BPSK)        | WLAN    | 8.03  | ± 9.6 % |

|       |     |                                             |          |       |         |
|-------|-----|---------------------------------------------|----------|-------|---------|
| 10220 | CAC | IEEE 802.11n (HT Mixed, 43.3 Mbps, 16-QAM)  | WLAN     | 8.13  | ± 9.6 % |
| 10221 | CAC | IEEE 802.11n (HT Mixed, 72.2 Mbps, 64-QAM)  | WLAN     | 8.27  | ± 9.6 % |
| 10222 | CAC | IEEE 802.11n (HT Mixed, 15 Mbps, BPSK)      | WLAN     | 8.06  | ± 9.6 % |
| 10223 | CAC | IEEE 802.11n (HT Mixed, 90 Mbps, 16-QAM)    | WLAN     | 8.48  | ± 9.6 % |
| 10224 | CAC | IEEE 802.11n (HT Mixed, 150 Mbps, 64-QAM)   | WLAN     | 8.08  | ± 9.6 % |
| 10225 | CAB | UMTS-FDD (HSPA+)                            | WCDMA    | 5.97  | ± 9.6 % |
| 10226 | CAB | LTE-TDD (SC-FDMA, 1 RB, 1.4 MHz, 16-QAM)    | LTE-TDD  | 9.49  | ± 9.6 % |
| 10227 | CAB | LTE-TDD (SC-FDMA, 1 RB, 1.4 MHz, 64-QAM)    | LTE-TDD  | 10.26 | ± 9.6 % |
| 10228 | CAB | LTE-TDD (SC-FDMA, 1 RB, 1.4 MHz, QPSK)      | LTE-TDD  | 9.22  | ± 9.6 % |
| 10229 | CAD | LTE-TDD (SC-FDMA, 1 RB, 3 MHz, 16-QAM)      | LTE-TDD  | 9.48  | ± 9.6 % |
| 10230 | CAD | LTE-TDD (SC-FDMA, 1 RB, 3 MHz, 64-QAM)      | LTE-TDD  | 10.25 | ± 9.6 % |
| 10231 | CAD | LTE-TDD (SC-FDMA, 1 RB, 3 MHz, QPSK)        | LTE-TDD  | 9.19  | ± 9.6 % |
| 10232 | CAG | LTE-TDD (SC-FDMA, 1 RB, 5 MHz, 16-QAM)      | LTE-TDD  | 9.48  | ± 9.6 % |
| 10233 | CAG | LTE-TDD (SC-FDMA, 1 RB, 5 MHz, 64-QAM)      | LTE-TDD  | 10.25 | ± 9.6 % |
| 10234 | CAG | LTE-TDD (SC-FDMA, 1 RB, 5 MHz, QPSK)        | LTE-TDD  | 9.21  | ± 9.6 % |
| 10235 | CAG | LTE-TDD (SC-FDMA, 1 RB, 10 MHz, 16-QAM)     | LTE-TDD  | 9.48  | ± 9.6 % |
| 10236 | CAG | LTE-TDD (SC-FDMA, 1 RB, 10 MHz, 64-QAM)     | LTE-TDD  | 10.25 | ± 9.6 % |
| 10237 | CAG | LTE-TDD (SC-FDMA, 1 RB, 10 MHz, QPSK)       | LTE-TDD  | 9.21  | ± 9.6 % |
| 10238 | CAF | LTE-TDD (SC-FDMA, 1 RB, 15 MHz, 16-QAM)     | LTE-TDD  | 9.48  | ± 9.6 % |
| 10239 | CAF | LTE-TDD (SC-FDMA, 1 RB, 15 MHz, 64-QAM)     | LTE-TDD  | 10.25 | ± 9.6 % |
| 10240 | CAF | LTE-TDD (SC-FDMA, 1 RB, 15 MHz, QPSK)       | LTE-TDD  | 9.21  | ± 9.6 % |
| 10241 | CAB | LTE-TDD (SC-FDMA, 50% RB, 1.4 MHz, 16-QAM)  | LTE-TDD  | 9.82  | ± 9.6 % |
| 10242 | CAB | LTE-TDD (SC-FDMA, 50% RB, 1.4 MHz, 64-QAM)  | LTE-TDD  | 9.86  | ± 9.6 % |
| 10243 | CAB | LTE-TDD (SC-FDMA, 50% RB, 1.4 MHz, QPSK)    | LTE-TDD  | 9.46  | ± 9.6 % |
| 10244 | CAD | LTE-TDD (SC-FDMA, 50% RB, 3 MHz, 16-QAM)    | LTE-TDD  | 10.06 | ± 9.6 % |
| 10245 | CAD | LTE-TDD (SC-FDMA, 50% RB, 3 MHz, 64-QAM)    | LTE-TDD  | 10.06 | ± 9.6 % |
| 10246 | CAD | LTE-TDD (SC-FDMA, 50% RB, 3 MHz, QPSK)      | LTE-TDD  | 9.30  | ± 9.6 % |
| 10247 | CAG | LTE-TDD (SC-FDMA, 50% RB, 5 MHz, 16-QAM)    | LTE-TDD  | 9.91  | ± 9.6 % |
| 10248 | CAG | LTE-TDD (SC-FDMA, 50% RB, 5 MHz, 64-QAM)    | LTE-TDD  | 10.09 | ± 9.6 % |
| 10249 | CAG | LTE-TDD (SC-FDMA, 50% RB, 5 MHz, QPSK)      | LTE-TDD  | 9.29  | ± 9.6 % |
| 10250 | CAG | LTE-TDD (SC-FDMA, 50% RB, 10 MHz, 16-QAM)   | LTE-TDD  | 9.81  | ± 9.6 % |
| 10251 | CAG | LTE-TDD (SC-FDMA, 50% RB, 10 MHz, 64-QAM)   | LTE-TDD  | 10.17 | ± 9.6 % |
| 10252 | CAG | LTE-TDD (SC-FDMA, 50% RB, 10 MHz, QPSK)     | LTE-TDD  | 9.24  | ± 9.6 % |
| 10253 | CAF | LTE-TDD (SC-FDMA, 50% RB, 15 MHz, 16-QAM)   | LTE-TDD  | 9.90  | ± 9.6 % |
| 10254 | CAF | LTE-TDD (SC-FDMA, 50% RB, 15 MHz, 64-QAM)   | LTE-TDD  | 10.14 | ± 9.6 % |
| 10255 | CAF | LTE-TDD (SC-FDMA, 50% RB, 15 MHz, QPSK)     | LTE-TDD  | 9.20  | ± 9.6 % |
| 10256 | CAB | LTE-TDD (SC-FDMA, 100% RB, 1.4 MHz, 16-QAM) | LTE-TDD  | 9.96  | ± 9.6 % |
| 10257 | CAB | LTE-TDD (SC-FDMA, 100% RB, 1.4 MHz, 64-QAM) | LTE-TDD  | 10.08 | ± 9.6 % |
| 10258 | CAB | LTE-TDD (SC-FDMA, 100% RB, 1.4 MHz, QPSK)   | LTE-TDD  | 9.34  | ± 9.6 % |
| 10259 | CAD | LTE-TDD (SC-FDMA, 100% RB, 3 MHz, 16-QAM)   | LTE-TDD  | 9.98  | ± 9.6 % |
| 10260 | CAD | LTE-TDD (SC-FDMA, 100% RB, 3 MHz, 64-QAM)   | LTE-TDD  | 9.97  | ± 9.6 % |
| 10261 | CAD | LTE-TDD (SC-FDMA, 100% RB, 3 MHz, QPSK)     | LTE-TDD  | 9.24  | ± 9.6 % |
| 10262 | CAG | LTE-TDD (SC-FDMA, 100% RB, 5 MHz, 16-QAM)   | LTE-TDD  | 9.83  | ± 9.6 % |
| 10263 | CAG | LTE-TDD (SC-FDMA, 100% RB, 5 MHz, 64-QAM)   | LTE-TDD  | 10.16 | ± 9.6 % |
| 10264 | CAG | LTE-TDD (SC-FDMA, 100% RB, 5 MHz, QPSK)     | LTE-TDD  | 9.23  | ± 9.6 % |
| 10265 | CAG | LTE-TDD (SC-FDMA, 100% RB, 10 MHz, 16-QAM)  | LTE-TDD  | 9.92  | ± 9.6 % |
| 10266 | CAG | LTE-TDD (SC-FDMA, 100% RB, 10 MHz, 64-QAM)  | LTE-TDD  | 10.07 | ± 9.6 % |
| 10267 | CAG | LTE-TDD (SC-FDMA, 100% RB, 10 MHz, QPSK)    | LTE-TDD  | 9.30  | ± 9.6 % |
| 10268 | CAF | LTE-TDD (SC-FDMA, 100% RB, 15 MHz, 16-QAM)  | LTE-TDD  | 10.06 | ± 9.6 % |
| 10269 | CAF | LTE-TDD (SC-FDMA, 100% RB, 15 MHz, 64-QAM)  | LTE-TDD  | 10.13 | ± 9.6 % |
| 10270 | CAF | LTE-TDD (SC-FDMA, 100% RB, 15 MHz, QPSK)    | LTE-TDD  | 9.58  | ± 9.6 % |
| 10274 | CAB | UMTS-FDD (HSUPA, Subtest 5, 3GPP Rel8.10)   | WCDMA    | 4.87  | ± 9.6 % |
| 10275 | CAB | UMTS-FDD (HSUPA, Subtest 5, 3GPP Rel8.4)    | WCDMA    | 3.96  | ± 9.6 % |
| 10277 | CAA | PHS (QPSK)                                  | PHS      | 11.81 | ± 9.6 % |
| 10278 | CAA | PHS (QPSK, BW 884MHz, Rolloff 0.5)          | PHS      | 11.81 | ± 9.6 % |
| 10279 | CAA | PHS (QPSK, BW 884MHz, Rolloff 0.38)         | PHS      | 12.18 | ± 9.6 % |
| 10290 | AAB | CDMA2000, RC1, SO55, Full Rate              | CDMA2000 | 3.91  | ± 9.6 % |
| 10291 | AAB | CDMA2000, RC3, SO55, Full Rate              | CDMA2000 | 3.46  | ± 9.6 % |
| 10292 | AAB | CDMA2000, RC3, SO32, Full Rate              | CDMA2000 | 3.39  | ± 9.6 % |
| 10293 | AAB | CDMA2000, RC3, SO3, Full Rate               | CDMA2000 | 3.50  | ± 9.6 % |
| 10295 | AAB | CDMA2000, RC1, SO3, 1/8th Rate 25 fr.       | CDMA2000 | 12.49 | ± 9.6 % |
| 10297 | AAD | LTE-FDD (SC-FDMA, 50% RB, 20 MHz, QPSK)     | LTE-FDD  | 5.81  | ± 9.6 % |
| 10298 | AAD | LTE-FDD (SC-FDMA, 50% RB, 3 MHz, QPSK)      | LTE-FDD  | 5.72  | ± 9.6 % |
| 10299 | AAD | LTE-FDD (SC-FDMA, 50% RB, 3 MHz, 16-QAM)    | LTE-FDD  | 6.39  | ± 9.6 % |

|       |     |                                                                                 |          |       |         |
|-------|-----|---------------------------------------------------------------------------------|----------|-------|---------|
| 10300 | AAD | LTE-FDD (SC-FDMA, 50% RB, 3 MHz, 64-QAM)                                        | LTE-FDD  | 6.60  | ± 9.6 % |
| 10301 | AAA | IEEE 802.16e WiMAX (29:18, 5ms, 10MHz, QPSK, PUSC)                              | WiMAX    | 12.03 | ± 9.6 % |
| 10302 | AAA | IEEE 802.16e WiMAX (29:18, 5ms, 10MHz, QPSK, PUSC, 3 CTRL symbols)              | WiMAX    | 12.57 | ± 9.6 % |
| 10303 | AAA | IEEE 802.16e WiMAX (31:15, 5ms, 10MHz, 64QAM, PUSC)                             | WiMAX    | 12.52 | ± 9.6 % |
| 10304 | AAA | IEEE 802.16e WiMAX (29:18, 5ms, 10MHz, 64QAM, PUSC)                             | WiMAX    | 11.86 | ± 9.6 % |
| 10305 | AAA | IEEE 802.16e WiMAX (31:15, 10ms, 10MHz, 64QAM, PUSC, 15 symbols)                | WiMAX    | 15.24 | ± 9.6 % |
| 10306 | AAA | IEEE 802.16e WiMAX (29:18, 10ms, 10MHz, 64QAM, PUSC, 18 symbols)                | WiMAX    | 14.67 | ± 9.6 % |
| 10307 | AAA | IEEE 802.16e WiMAX (29:18, 10ms, 10MHz, QPSK, PUSC, 18 symbols)                 | WiMAX    | 14.49 | ± 9.6 % |
| 10308 | AAA | IEEE 802.16e WiMAX (29:18, 10ms, 10MHz, 16QAM, PUSC)                            | WiMAX    | 14.46 | ± 9.6 % |
| 10309 | AAA | IEEE 802.16e WiMAX (29:18, 10ms, 10MHz, 16QAM, AMC 2x3, 18 symbols)             | WiMAX    | 14.58 | ± 9.6 % |
| 10310 | AAA | IEEE 802.16e WiMAX (29:18, 10ms, 10MHz, QPSK, AMC 2x3, 18 symbols)              | WiMAX    | 14.57 | ± 9.6 % |
| 10311 | AAD | LTE-FDD (SC-FDMA, 100% RB, 15 MHz, QPSK)                                        | LTE-FDD  | 6.06  | ± 9.6 % |
| 10313 | AAA | IDEN 1:3                                                                        | IDEN     | 10.51 | ± 9.6 % |
| 10314 | AAA | IDEN 1:6                                                                        | IDEN     | 13.48 | ± 9.6 % |
| 10315 | AAB | IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps, 96pc duty cycle)                       | WLAN     | 1.71  | ± 9.6 % |
| 10316 | AAB | IEEE 802.11g WiFi 2.4 GHz (ERP-OFDM, 6 Mbps, 96pc duty cycle)                   | WLAN     | 8.36  | ± 9.6 % |
| 10317 | AAC | IEEE 802.11a WiFi 5 GHz (OFDM, 6 Mbps, 96pc duty cycle)                         | WLAN     | 8.36  | ± 9.6 % |
| 10352 | AAA | Pulse Waveform (200Hz, 10%)                                                     | Generic  | 10.00 | ± 9.6 % |
| 10353 | AAA | Pulse Waveform (200Hz, 20%)                                                     | Generic  | 6.99  | ± 9.6 % |
| 10354 | AAA | Pulse Waveform (200Hz, 40%)                                                     | Generic  | 3.98  | ± 9.6 % |
| 10355 | AAA | Pulse Waveform (200Hz, 60%)                                                     | Generic  | 2.22  | ± 9.6 % |
| 10356 | AAA | Pulse Waveform (200Hz, 80%)                                                     | Generic  | 0.97  | ± 9.6 % |
| 10387 | AAA | QPSK Waveform, 1 MHz                                                            | Generic  | 5.10  | ± 9.6 % |
| 10388 | AAA | QPSK Waveform, 10 MHz                                                           | Generic  | 5.22  | ± 9.6 % |
| 10396 | AAA | 64-QAM Waveform, 100 kHz                                                        | Generic  | 6.27  | ± 9.6 % |
| 10399 | AAA | 64-QAM Waveform, 40 MHz                                                         | Generic  | 6.27  | ± 9.6 % |
| 10400 | AAD | IEEE 802.11ac WiFi (20MHz, 64-QAM, 99pc duty cycle)                             | WLAN     | 8.37  | ± 9.6 % |
| 10401 | AAD | IEEE 802.11ac WiFi (40MHz, 64-QAM, 99pc duty cycle)                             | WLAN     | 8.60  | ± 9.6 % |
| 10402 | AAD | IEEE 802.11ac WiFi (80MHz, 64-QAM, 99pc duty cycle)                             | WLAN     | 8.53  | ± 9.6 % |
| 10403 | AAB | CDMA2000 (1xEV-DO, Rev. 0)                                                      | CDMA2000 | 3.76  | ± 9.6 % |
| 10404 | AAB | CDMA2000 (1xEV-DO, Rev. A)                                                      | CDMA2000 | 3.77  | ± 9.6 % |
| 10406 | AAB | CDMA2000, RC3, SO32, SCH0, Full Rate                                            | CDMA2000 | 5.22  | ± 9.6 % |
| 10410 | AAG | LTE-TDD (SC-FDMA, 1 RB, 10 MHz, QPSK, UL Subframe=2,3,4,7,8,9, Subframe Conf=4) | LTE-TDD  | 7.82  | ± 9.6 % |
| 10414 | AAA | WLAN CCDF, 64-QAM, 40MHz                                                        | Generic  | 8.54  | ± 9.6 % |
| 10415 | AAA | IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps, 99pc duty cycle)                       | WLAN     | 1.54  | ± 9.6 % |
| 10416 | AAA | IEEE 802.11g WiFi 2.4 GHz (ERP-OFDM, 6 Mbps, 99pc duty cycle)                   | WLAN     | 8.23  | ± 9.6 % |
| 10417 | AAB | IEEE 802.11a/h WiFi 5 GHz (OFDM, 6 Mbps, 99pc duty cycle)                       | WLAN     | 8.23  | ± 9.6 % |
| 10418 | AAA | IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps, 99pc duty cycle, Long preamble)   | WLAN     | 8.14  | ± 9.6 % |
| 10419 | AAA | IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps, 99pc duty cycle, Short preamble)  | WLAN     | 8.19  | ± 9.6 % |
| 10422 | AAB | IEEE 802.11n (HT Greenfield, 7.2 Mbps, BPSK)                                    | WLAN     | 8.32  | ± 9.6 % |
| 10423 | AAB | IEEE 802.11n (HT Greenfield, 43.3 Mbps, 16-QAM)                                 | WLAN     | 8.47  | ± 9.6 % |
| 10424 | AAB | IEEE 802.11n (HT Greenfield, 72.2 Mbps, 64-QAM)                                 | WLAN     | 8.40  | ± 9.6 % |
| 10425 | AAB | IEEE 802.11n (HT Greenfield, 15 Mbps, BPSK)                                     | WLAN     | 8.41  | ± 9.6 % |
| 10426 | AAB | IEEE 802.11n (HT Greenfield, 90 Mbps, 16-QAM)                                   | WLAN     | 8.45  | ± 9.6 % |
| 10427 | AAB | IEEE 802.11n (HT Greenfield, 150 Mbps, 64-QAM)                                  | WLAN     | 8.41  | ± 9.6 % |
| 10430 | AAD | LTE-FDD (OFDMA, 5 MHz, E-TM 3.1)                                                | LTE-FDD  | 8.28  | ± 9.6 % |
| 10431 | AAD | LTE-FDD (OFDMA, 10 MHz, E-TM 3.1)                                               | LTE-FDD  | 8.38  | ± 9.6 % |
| 10432 | AAC | LTE-FDD (OFDMA, 15 MHz, E-TM 3.1)                                               | LTE-FDD  | 8.34  | ± 9.6 % |
| 10433 | AAC | LTE-FDD (OFDMA, 20 MHz, E-TM 3.1)                                               | LTE-FDD  | 8.34  | ± 9.6 % |
| 10434 | AAA | W-CDMA (BS Test Model 1, 64 DPCH)                                               | WCDMA    | 8.60  | ± 9.6 % |
| 10435 | AAF | LTE-TDD (SC-FDMA, 1 RB, 20 MHz, QPSK, UL Subframe=2,3,4,7,8,9)                  | LTE-TDD  | 7.82  | ± 9.6 % |
| 10447 | AAD | LTE-FDD (OFDMA, 5 MHz, E-TM 3.1, Clipping 44%)                                  | LTE-FDD  | 7.56  | ± 9.6 % |
| 10448 | AAD | LTE-FDD (OFDMA, 10 MHz, E-TM 3.1, Clipping 44%)                                 | LTE-FDD  | 7.53  | ± 9.6 % |
| 10449 | AAC | LTE-FDD (OFDMA, 15 MHz, E-TM 3.1, Clipping 44%)                                 | LTE-FDD  | 7.51  | ± 9.6 % |
| 10450 | AAC | LTE-FDD (OFDMA, 20 MHz, E-TM 3.1, Clipping 44%)                                 | LTE-FDD  | 7.48  | ± 9.6 % |

|       |     |                                                                        |          |      |         |
|-------|-----|------------------------------------------------------------------------|----------|------|---------|
| 10451 | AAA | W-CDMA (BS Test Model 1, 64 DPCH, Clipping 44%)                        | WCDMA    | 7.59 | ± 9.6 % |
| 10456 | AAB | IEEE 802.11ac WiFi (160MHz, 64-QAM, 99pc duty cycle)                   | WLAN     | 8.63 | ± 9.6 % |
| 10457 | AAA | UMTS-FDD (DC-HSDPA)                                                    | WCDMA    | 6.62 | ± 9.6 % |
| 10458 | AAA | CDMA2000 (1xEV-DO, Rev. B, 2 carriers)                                 | CDMA2000 | 6.55 | ± 9.6 % |
| 10459 | AAA | CDMA2000 (1xEV-DO, Rev. B, 3 carriers)                                 | CDMA2000 | 8.25 | ± 9.6 % |
| 10460 | AAA | UMTS-FDD (WCDMA, AMR)                                                  | WCDMA    | 2.39 | ± 9.6 % |
| 10461 | AAB | LTE-TDD (SC-FDMA, 1 RB, 1.4 MHz, QPSK, UL<br>Subframe=2,3,4,7,8,9)     | LTE-TDD  | 7.82 | ± 9.6 % |
| 10462 | AAB | LTE-TDD (SC-FDMA, 1 RB, 1.4 MHz, 16-QAM, UL<br>Subframe=2,3,4,7,8,9)   | LTE-TDD  | 8.30 | ± 9.6 % |
| 10463 | AAB | LTE-TDD (SC-FDMA, 1 RB, 1.4 MHz, 64-QAM, UL<br>Subframe=2,3,4,7,8,9)   | LTE-TDD  | 8.56 | ± 9.6 % |
| 10464 | AAC | LTE-TDD (SC-FDMA, 1 RB, 3 MHz, QPSK, UL<br>Subframe=2,3,4,7,8,9)       | LTE-TDD  | 7.82 | ± 9.6 % |
| 10465 | AAC | LTE-TDD (SC-FDMA, 1 RB, 3 MHz, 16-QAM, UL<br>Subframe=2,3,4,7,8,9)     | LTE-TDD  | 8.32 | ± 9.6 % |
| 10466 | AAC | LTE-TDD (SC-FDMA, 1 RB, 3 MHz, 64-QAM, UL<br>Subframe=2,3,4,7,8,9)     | LTE-TDD  | 8.57 | ± 9.6 % |
| 10467 | AAF | LTE-TDD (SC-FDMA, 1 RB, 5 MHz, QPSK, UL<br>Subframe=2,3,4,7,8,9)       | LTE-TDD  | 7.82 | ± 9.6 % |
| 10468 | AAF | LTE-TDD (SC-FDMA, 1 RB, 5 MHz, 16-QAM, UL<br>Subframe=2,3,4,7,8,9)     | LTE-TDD  | 8.32 | ± 9.6 % |
| 10469 | AAF | LTE-TDD (SC-FDMA, 1 RB, 5 MHz, 64-QAM, UL<br>Subframe=2,3,4,7,8,9)     | LTE-TDD  | 8.56 | ± 9.6 % |
| 10470 | AAF | LTE-TDD (SC-FDMA, 1 RB, 10 MHz, QPSK, UL<br>Subframe=2,3,4,7,8,9)      | LTE-TDD  | 7.82 | ± 9.6 % |
| 10471 | AAF | LTE-TDD (SC-FDMA, 1 RB, 10 MHz, 16-QAM, UL<br>Subframe=2,3,4,7,8,9)    | LTE-TDD  | 8.32 | ± 9.6 % |
| 10472 | AAF | LTE-TDD (SC-FDMA, 1 RB, 10 MHz, 64-QAM, UL<br>Subframe=2,3,4,7,8,9)    | LTE-TDD  | 8.57 | ± 9.6 % |
| 10473 | AAE | LTE-TDD (SC-FDMA, 1 RB, 15 MHz, QPSK, UL<br>Subframe=2,3,4,7,8,9)      | LTE-TDD  | 7.82 | ± 9.6 % |
| 10474 | AAE | LTE-TDD (SC-FDMA, 1 RB, 15 MHz, 16-QAM, UL<br>Subframe=2,3,4,7,8,9)    | LTE-TDD  | 8.32 | ± 9.6 % |
| 10475 | AAE | LTE-TDD (SC-FDMA, 1 RB, 15 MHz, 64-QAM, UL<br>Subframe=2,3,4,7,8,9)    | LTE-TDD  | 8.57 | ± 9.6 % |
| 10477 | AAF | LTE-TDD (SC-FDMA, 1 RB, 20 MHz, 16-QAM, UL<br>Subframe=2,3,4,7,8,9)    | LTE-TDD  | 8.32 | ± 9.6 % |
| 10478 | AAF | LTE-TDD (SC-FDMA, 1 RB, 20 MHz, 64-QAM, UL<br>Subframe=2,3,4,7,8,9)    | LTE-TDD  | 8.57 | ± 9.6 % |
| 10479 | AAB | LTE-TDD (SC-FDMA, 50% RB, 1.4 MHz, QPSK, UL<br>Subframe=2,3,4,7,8,9)   | LTE-TDD  | 7.74 | ± 9.6 % |
| 10480 | AAB | LTE-TDD (SC-FDMA, 50% RB, 1.4 MHz, 16-QAM, UL<br>Subframe=2,3,4,7,8,9) | LTE-TDD  | 8.18 | ± 9.6 % |
| 10481 | AAB | LTE-TDD (SC-FDMA, 50% RB, 1.4 MHz, 64-QAM, UL<br>Subframe=2,3,4,7,8,9) | LTE-TDD  | 8.45 | ± 9.6 % |
| 10482 | AAC | LTE-TDD (SC-FDMA, 50% RB, 3 MHz, QPSK, UL<br>Subframe=2,3,4,7,8,9)     | LTE-TDD  | 7.71 | ± 9.6 % |
| 10483 | AAC | LTE-TDD (SC-FDMA, 50% RB, 3 MHz, 16-QAM, UL<br>Subframe=2,3,4,7,8,9)   | LTE-TDD  | 8.39 | ± 9.6 % |
| 10484 | AAC | LTE-TDD (SC-FDMA, 50% RB, 3 MHz, 64-QAM, UL<br>Subframe=2,3,4,7,8,9)   | LTE-TDD  | 8.47 | ± 9.6 % |
| 10485 | AAF | LTE-TDD (SC-FDMA, 50% RB, 5 MHz, QPSK, UL<br>Subframe=2,3,4,7,8,9)     | LTE-TDD  | 7.59 | ± 9.6 % |
| 10486 | AAF | LTE-TDD (SC-FDMA, 50% RB, 5 MHz, 16-QAM, UL<br>Subframe=2,3,4,7,8,9)   | LTE-TDD  | 8.38 | ± 9.6 % |
| 10487 | AAF | LTE-TDD (SC-FDMA, 50% RB, 5 MHz, 64-QAM, UL<br>Subframe=2,3,4,7,8,9)   | LTE-TDD  | 8.60 | ± 9.6 % |
| 10488 | AAF | LTE-TDD (SC-FDMA, 50% RB, 10 MHz, QPSK, UL<br>Subframe=2,3,4,7,8,9)    | LTE-TDD  | 7.70 | ± 9.6 % |
| 10489 | AAF | LTE-TDD (SC-FDMA, 50% RB, 10 MHz, 16-QAM, UL<br>Subframe=2,3,4,7,8,9)  | LTE-TDD  | 8.31 | ± 9.6 % |
| 10490 | AAF | LTE-TDD (SC-FDMA, 50% RB, 10 MHz, 64-QAM, UL<br>Subframe=2,3,4,7,8,9)  | LTE-TDD  | 8.54 | ± 9.6 % |
| 10491 | AAE | LTE-TDD (SC-FDMA, 50% RB, 15 MHz, QPSK, UL<br>Subframe=2,3,4,7,8,9)    | LTE-TDD  | 7.74 | ± 9.6 % |

|       |     |                                                                      |         |      |         |
|-------|-----|----------------------------------------------------------------------|---------|------|---------|
| 10492 | AAE | LTE-TDD (SC-FDMA, 50% RB, 15 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)   | LTE-TDD | 8.41 | ± 9.6 % |
| 10493 | AAE | LTE-TDD (SC-FDMA, 50% RB, 15 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)   | LTE-TDD | 8.55 | ± 9.6 % |
| 10494 | AAF | LTE-TDD (SC-FDMA, 50% RB, 20 MHz, QPSK, UL Subframe=2,3,4,7,8,9)     | LTE-TDD | 7.74 | ± 9.6 % |
| 10495 | AAF | LTE-TDD (SC-FDMA, 50% RB, 20 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)   | LTE-TDD | 8.37 | ± 9.6 % |
| 10496 | AAF | LTE-TDD (SC-FDMA, 50% RB, 20 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)   | LTE-TDD | 8.54 | ± 9.6 % |
| 10497 | AAB | LTE-TDD (SC-FDMA, 100% RB, 1.4 MHz, QPSK, UL Subframe=2,3,4,7,8,9)   | LTE-TDD | 7.67 | ± 9.6 % |
| 10498 | AAB | LTE-TDD (SC-FDMA, 100% RB, 1.4 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9) | LTE-TDD | 8.40 | ± 9.6 % |
| 10499 | AAB | LTE-TDD (SC-FDMA, 100% RB, 1.4 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9) | LTE-TDD | 8.68 | ± 9.6 % |
| 10500 | AAC | LTE-TDD (SC-FDMA, 100% RB, 3 MHz, QPSK, UL Subframe=2,3,4,7,8,9)     | LTE-TDD | 7.67 | ± 9.6 % |
| 10501 | AAC | LTE-TDD (SC-FDMA, 100% RB, 3 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)   | LTE-TDD | 8.44 | ± 9.6 % |
| 10502 | AAC | LTE-TDD (SC-FDMA, 100% RB, 3 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)   | LTE-TDD | 8.52 | ± 9.6 % |
| 10503 | AAF | LTE-TDD (SC-FDMA, 100% RB, 5 MHz, QPSK, UL Subframe=2,3,4,7,8,9)     | LTE-TDD | 7.72 | ± 9.6 % |
| 10504 | AAF | LTE-TDD (SC-FDMA, 100% RB, 5 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)   | LTE-TDD | 8.31 | ± 9.6 % |
| 10505 | AAF | LTE-TDD (SC-FDMA, 100% RB, 5 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)   | LTE-TDD | 8.54 | ± 9.6 % |
| 10506 | AAF | LTE-TDD (SC-FDMA, 100% RB, 10 MHz, QPSK, UL Subframe=2,3,4,7,8,9)    | LTE-TDD | 7.74 | ± 9.6 % |
| 10507 | AAF | LTE-TDD (SC-FDMA, 100% RB, 10 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)  | LTE-TDD | 8.36 | ± 9.6 % |
| 10508 | AAF | LTE-TDD (SC-FDMA, 100% RB, 10 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)  | LTE-TDD | 8.55 | ± 9.6 % |
| 10509 | AAE | LTE-TDD (SC-FDMA, 100% RB, 15 MHz, QPSK, UL Subframe=2,3,4,7,8,9)    | LTE-TDD | 7.99 | ± 9.6 % |
| 10510 | AAE | LTE-TDD (SC-FDMA, 100% RB, 15 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)  | LTE-TDD | 8.49 | ± 9.6 % |
| 10511 | AAE | LTE-TDD (SC-FDMA, 100% RB, 15 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)  | LTE-TDD | 8.51 | ± 9.6 % |
| 10512 | AAF | LTE-TDD (SC-FDMA, 100% RB, 20 MHz, QPSK, UL Subframe=2,3,4,7,8,9)    | LTE-TDD | 7.74 | ± 9.6 % |
| 10513 | AAF | LTE-TDD (SC-FDMA, 100% RB, 20 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)  | LTE-TDD | 8.42 | ± 9.6 % |
| 10514 | AAF | LTE-TDD (SC-FDMA, 100% RB, 20 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)  | LTE-TDD | 8.45 | ± 9.6 % |
| 10515 | AAA | IEEE 802.11b WiFi 2.4 GHz (DSSS, 2 Mbps, 99pc duty cycle)            | WLAN    | 1.58 | ± 9.6 % |
| 10516 | AAA | IEEE 802.11b WiFi 2.4 GHz (DSSS, 5.5 Mbps, 99pc duty cycle)          | WLAN    | 1.57 | ± 9.6 % |
| 10517 | AAA | IEEE 802.11b WiFi 2.4 GHz (DSSS, 11 Mbps, 99pc duty cycle)           | WLAN    | 1.58 | ± 9.6 % |
| 10518 | AAB | IEEE 802.11a/h WiFi 5 GHz (OFDM, 9 Mbps, 99pc duty cycle)            | WLAN    | 8.23 | ± 9.6 % |
| 10519 | AAB | IEEE 802.11a/h WiFi 5 GHz (OFDM, 12 Mbps, 99pc duty cycle)           | WLAN    | 8.39 | ± 9.6 % |
| 10520 | AAB | IEEE 802.11a/h WiFi 5 GHz (OFDM, 18 Mbps, 99pc duty cycle)           | WLAN    | 8.12 | ± 9.6 % |
| 10521 | AAB | IEEE 802.11a/h WiFi 5 GHz (OFDM, 24 Mbps, 99pc duty cycle)           | WLAN    | 7.97 | ± 9.6 % |
| 10522 | AAB | IEEE 802.11a/h WiFi 5 GHz (OFDM, 36 Mbps, 99pc duty cycle)           | WLAN    | 8.45 | ± 9.6 % |
| 10523 | AAB | IEEE 802.11a/h WiFi 5 GHz (OFDM, 48 Mbps, 99pc duty cycle)           | WLAN    | 8.08 | ± 9.6 % |
| 10524 | AAB | IEEE 802.11a/h WiFi 5 GHz (OFDM, 54 Mbps, 99pc duty cycle)           | WLAN    | 8.27 | ± 9.6 % |
| 10525 | AAB | IEEE 802.11ac WiFi (20MHz, MCS0, 99pc duty cycle)                    | WLAN    | 8.36 | ± 9.6 % |
| 10526 | AAB | IEEE 802.11ac WiFi (20MHz, MCS1, 99pc duty cycle)                    | WLAN    | 8.42 | ± 9.6 % |
| 10527 | AAB | IEEE 802.11ac WiFi (20MHz, MCS2, 99pc duty cycle)                    | WLAN    | 8.21 | ± 9.6 % |
| 10528 | AAB | IEEE 802.11ac WiFi (20MHz, MCS3, 99pc duty cycle)                    | WLAN    | 8.36 | ± 9.6 % |
| 10529 | AAB | IEEE 802.11ac WiFi (20MHz, MCS4, 99pc duty cycle)                    | WLAN    | 8.36 | ± 9.6 % |
| 10531 | AAB | IEEE 802.11ac WiFi (20MHz, MCS6, 99pc duty cycle)                    | WLAN    | 8.43 | ± 9.6 % |
| 10532 | AAB | IEEE 802.11ac WiFi (20MHz, MCS7, 99pc duty cycle)                    | WLAN    | 8.29 | ± 9.6 % |
| 10533 | AAB | IEEE 802.11ac WiFi (20MHz, MCS8, 99pc duty cycle)                    | WLAN    | 8.38 | ± 9.6 % |
| 10534 | AAB | IEEE 802.11ac WiFi (40MHz, MCS0, 99pc duty cycle)                    | WLAN    | 8.45 | ± 9.6 % |

|       |     |                                                                 |      |      |         |
|-------|-----|-----------------------------------------------------------------|------|------|---------|
| 10535 | AAB | IEEE 802.11ac WiFi (40MHz, MCS1, 99pc duty cycle)               | WLAN | 8.45 | ± 9.6 % |
| 10536 | AAB | IEEE 802.11ac WiFi (40MHz, MCS2, 99pc duty cycle)               | WLAN | 8.32 | ± 9.6 % |
| 10537 | AAB | IEEE 802.11ac WiFi (40MHz, MCS3, 99pc duty cycle)               | WLAN | 8.44 | ± 9.6 % |
| 10538 | AAB | IEEE 802.11ac WiFi (40MHz, MCS4, 99pc duty cycle)               | WLAN | 8.54 | ± 9.6 % |
| 10540 | AAB | IEEE 802.11ac WiFi (40MHz, MCS6, 99pc duty cycle)               | WLAN | 8.39 | ± 9.6 % |
| 10541 | AAB | IEEE 802.11ac WiFi (40MHz, MCS7, 99pc duty cycle)               | WLAN | 8.46 | ± 9.6 % |
| 10542 | AAB | IEEE 802.11ac WiFi (40MHz, MCS8, 99pc duty cycle)               | WLAN | 8.65 | ± 9.6 % |
| 10543 | AAB | IEEE 802.11ac WiFi (40MHz, MCS9, 99pc duty cycle)               | WLAN | 8.65 | ± 9.6 % |
| 10544 | AAB | IEEE 802.11ac WiFi (80MHz, MCS0, 99pc duty cycle)               | WLAN | 8.47 | ± 9.6 % |
| 10545 | AAB | IEEE 802.11ac WiFi (80MHz, MCS1, 99pc duty cycle)               | WLAN | 8.55 | ± 9.6 % |
| 10546 | AAB | IEEE 802.11ac WiFi (80MHz, MCS2, 99pc duty cycle)               | WLAN | 8.35 | ± 9.6 % |
| 10547 | AAB | IEEE 802.11ac WiFi (80MHz, MCS3, 99pc duty cycle)               | WLAN | 8.49 | ± 9.6 % |
| 10548 | AAB | IEEE 802.11ac WiFi (80MHz, MCS4, 99pc duty cycle)               | WLAN | 8.37 | ± 9.6 % |
| 10550 | AAB | IEEE 802.11ac WiFi (80MHz, MCS6, 99pc duty cycle)               | WLAN | 8.38 | ± 9.6 % |
| 10551 | AAB | IEEE 802.11ac WiFi (80MHz, MCS7, 99pc duty cycle)               | WLAN | 8.50 | ± 9.6 % |
| 10552 | AAB | IEEE 802.11ac WiFi (80MHz, MCS8, 99pc duty cycle)               | WLAN | 8.42 | ± 9.6 % |
| 10553 | AAB | IEEE 802.11ac WiFi (80MHz, MCS9, 99pc duty cycle)               | WLAN | 8.45 | ± 9.6 % |
| 10554 | AAC | IEEE 802.11ac WiFi (160MHz, MCS0, 99pc duty cycle)              | WLAN | 8.48 | ± 9.6 % |
| 10555 | AAC | IEEE 802.11ac WiFi (160MHz, MCS1, 99pc duty cycle)              | WLAN | 8.47 | ± 9.6 % |
| 10556 | AAC | IEEE 802.11ac WiFi (160MHz, MCS2, 99pc duty cycle)              | WLAN | 8.50 | ± 9.6 % |
| 10557 | AAC | IEEE 802.11ac WiFi (160MHz, MCS3, 99pc duty cycle)              | WLAN | 8.52 | ± 9.6 % |
| 10558 | AAC | IEEE 802.11ac WiFi (160MHz, MCS4, 99pc duty cycle)              | WLAN | 8.61 | ± 9.6 % |
| 10560 | AAC | IEEE 802.11ac WiFi (160MHz, MCS6, 99pc duty cycle)              | WLAN | 8.73 | ± 9.6 % |
| 10561 | AAC | IEEE 802.11ac WiFi (160MHz, MCS7, 99pc duty cycle)              | WLAN | 8.56 | ± 9.6 % |
| 10562 | AAC | IEEE 802.11ac WiFi (160MHz, MCS8, 99pc duty cycle)              | WLAN | 8.69 | ± 9.6 % |
| 10563 | AAC | IEEE 802.11ac WiFi (160MHz, MCS9, 99pc duty cycle)              | WLAN | 8.77 | ± 9.6 % |
| 10564 | AAA | IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 9 Mbps, 99pc duty cycle)  | WLAN | 8.25 | ± 9.6 % |
| 10565 | AAA | IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 12 Mbps, 99pc duty cycle) | WLAN | 8.45 | ± 9.6 % |
| 10566 | AAA | IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 18 Mbps, 99pc duty cycle) | WLAN | 8.13 | ± 9.6 % |
| 10567 | AAA | IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 24 Mbps, 99pc duty cycle) | WLAN | 8.00 | ± 9.6 % |
| 10568 | AAA | IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 36 Mbps, 99pc duty cycle) | WLAN | 8.37 | ± 9.6 % |
| 10569 | AAA | IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 48 Mbps, 99pc duty cycle) | WLAN | 8.10 | ± 9.6 % |
| 10570 | AAA | IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 54 Mbps, 99pc duty cycle) | WLAN | 8.30 | ± 9.6 % |
| 10571 | AAA | IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps, 90pc duty cycle)       | WLAN | 1.99 | ± 9.6 % |
| 10572 | AAA | IEEE 802.11b WiFi 2.4 GHz (DSSS, 2 Mbps, 90pc duty cycle)       | WLAN | 1.99 | ± 9.6 % |
| 10573 | AAA | IEEE 802.11b WiFi 2.4 GHz (DSSS, 5.5 Mbps, 90pc duty cycle)     | WLAN | 1.98 | ± 9.6 % |
| 10574 | AAA | IEEE 802.11b WiFi 2.4 GHz (DSSS, 11 Mbps, 90pc duty cycle)      | WLAN | 1.98 | ± 9.6 % |
| 10575 | AAA | IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps, 90pc duty cycle)  | WLAN | 8.59 | ± 9.6 % |
| 10576 | AAA | IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 9 Mbps, 90pc duty cycle)  | WLAN | 8.60 | ± 9.6 % |
| 10577 | AAA | IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 12 Mbps, 90pc duty cycle) | WLAN | 8.70 | ± 9.6 % |
| 10578 | AAA | IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 18 Mbps, 90pc duty cycle) | WLAN | 8.49 | ± 9.6 % |
| 10579 | AAA | IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 24 Mbps, 90pc duty cycle) | WLAN | 8.36 | ± 9.6 % |
| 10580 | AAA | IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 36 Mbps, 90pc duty cycle) | WLAN | 8.76 | ± 9.6 % |
| 10581 | AAA | IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 48 Mbps, 90pc duty cycle) | WLAN | 8.35 | ± 9.6 % |
| 10582 | AAA | IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 54 Mbps, 90pc duty cycle) | WLAN | 8.67 | ± 9.6 % |
| 10583 | AAB | IEEE 802.11a/h WiFi 5 GHz (OFDM, 6 Mbps, 90pc duty cycle)       | WLAN | 8.59 | ± 9.6 % |
| 10584 | AAB | IEEE 802.11a/h WiFi 5 GHz (OFDM, 9 Mbps, 90pc duty cycle)       | WLAN | 8.60 | ± 9.6 % |
| 10585 | AAB | IEEE 802.11a/h WiFi 5 GHz (OFDM, 12 Mbps, 90pc duty cycle)      | WLAN | 8.70 | ± 9.6 % |
| 10586 | AAB | IEEE 802.11a/h WiFi 5 GHz (OFDM, 18 Mbps, 90pc duty cycle)      | WLAN | 8.49 | ± 9.6 % |
| 10587 | AAB | IEEE 802.11a/h WiFi 5 GHz (OFDM, 24 Mbps, 90pc duty cycle)      | WLAN | 8.36 | ± 9.6 % |

|       |     |                                                            |          |       |         |
|-------|-----|------------------------------------------------------------|----------|-------|---------|
| 10588 | AAB | IEEE 802.11a/h WiFi 5 GHz (OFDM, 36 Mbps, 90pc duty cycle) | WLAN     | 8.76  | ± 9.6 % |
| 10589 | AAB | IEEE 802.11a/h WiFi 5 GHz (OFDM, 48 Mbps, 90pc duty cycle) | WLAN     | 8.35  | ± 9.6 % |
| 10590 | AAB | IEEE 802.11a/h WiFi 5 GHz (OFDM, 54 Mbps, 90pc duty cycle) | WLAN     | 8.67  | ± 9.6 % |
| 10591 | AAB | IEEE 802.11n (HT Mixed, 20MHz, MCS0, 90pc duty cycle)      | WLAN     | 8.63  | ± 9.6 % |
| 10592 | AAB | IEEE 802.11n (HT Mixed, 20MHz, MCS1, 90pc duty cycle)      | WLAN     | 8.79  | ± 9.6 % |
| 10593 | AAB | IEEE 802.11n (HT Mixed, 20MHz, MCS2, 90pc duty cycle)      | WLAN     | 8.64  | ± 9.6 % |
| 10594 | AAB | IEEE 802.11n (HT Mixed, 20MHz, MCS3, 90pc duty cycle)      | WLAN     | 8.74  | ± 9.6 % |
| 10595 | AAB | IEEE 802.11n (HT Mixed, 20MHz, MCS4, 90pc duty cycle)      | WLAN     | 8.74  | ± 9.6 % |
| 10596 | AAB | IEEE 802.11n (HT Mixed, 20MHz, MCS5, 90pc duty cycle)      | WLAN     | 8.71  | ± 9.6 % |
| 10597 | AAB | IEEE 802.11n (HT Mixed, 20MHz, MCS6, 90pc duty cycle)      | WLAN     | 8.72  | ± 9.6 % |
| 10598 | AAB | IEEE 802.11n (HT Mixed, 20MHz, MCS7, 90pc duty cycle)      | WLAN     | 8.50  | ± 9.6 % |
| 10599 | AAB | IEEE 802.11n (HT Mixed, 40MHz, MCS0, 90pc duty cycle)      | WLAN     | 8.79  | ± 9.6 % |
| 10600 | AAB | IEEE 802.11n (HT Mixed, 40MHz, MCS1, 90pc duty cycle)      | WLAN     | 8.88  | ± 9.6 % |
| 10601 | AAB | IEEE 802.11n (HT Mixed, 40MHz, MCS2, 90pc duty cycle)      | WLAN     | 8.82  | ± 9.6 % |
| 10602 | AAB | IEEE 802.11n (HT Mixed, 40MHz, MCS3, 90pc duty cycle)      | WLAN     | 8.94  | ± 9.6 % |
| 10603 | AAB | IEEE 802.11n (HT Mixed, 40MHz, MCS4, 90pc duty cycle)      | WLAN     | 9.03  | ± 9.6 % |
| 10604 | AAB | IEEE 802.11n (HT Mixed, 40MHz, MCS5, 90pc duty cycle)      | WLAN     | 8.76  | ± 9.6 % |
| 10605 | AAB | IEEE 802.11n (HT Mixed, 40MHz, MCS6, 90pc duty cycle)      | WLAN     | 8.97  | ± 9.6 % |
| 10606 | AAB | IEEE 802.11n (HT Mixed, 40MHz, MCS7, 90pc duty cycle)      | WLAN     | 8.82  | ± 9.6 % |
| 10607 | AAB | IEEE 802.11ac WiFi (20MHz, MCS0, 90pc duty cycle)          | WLAN     | 8.64  | ± 9.6 % |
| 10608 | AAB | IEEE 802.11ac WiFi (20MHz, MCS1, 90pc duty cycle)          | WLAN     | 8.77  | ± 9.6 % |
| 10609 | AAB | IEEE 802.11ac WiFi (20MHz, MCS2, 90pc duty cycle)          | WLAN     | 8.57  | ± 9.6 % |
| 10610 | AAB | IEEE 802.11ac WiFi (20MHz, MCS3, 90pc duty cycle)          | WLAN     | 8.78  | ± 9.6 % |
| 10611 | AAB | IEEE 802.11ac WiFi (20MHz, MCS4, 90pc duty cycle)          | WLAN     | 8.70  | ± 9.6 % |
| 10612 | AAB | IEEE 802.11ac WiFi (20MHz, MCS5, 90pc duty cycle)          | WLAN     | 8.77  | ± 9.6 % |
| 10613 | AAB | IEEE 802.11ac WiFi (20MHz, MCS6, 90pc duty cycle)          | WLAN     | 8.94  | ± 9.6 % |
| 10614 | AAB | IEEE 802.11ac WiFi (20MHz, MCS7, 90pc duty cycle)          | WLAN     | 8.59  | ± 9.6 % |
| 10615 | AAB | IEEE 802.11ac WiFi (20MHz, MCS8, 90pc duty cycle)          | WLAN     | 8.82  | ± 9.6 % |
| 10616 | AAB | IEEE 802.11ac WiFi (40MHz, MCS0, 90pc duty cycle)          | WLAN     | 8.82  | ± 9.6 % |
| 10617 | AAB | IEEE 802.11ac WiFi (40MHz, MCS1, 90pc duty cycle)          | WLAN     | 8.81  | ± 9.6 % |
| 10618 | AAB | IEEE 802.11ac WiFi (40MHz, MCS2, 90pc duty cycle)          | WLAN     | 8.58  | ± 9.6 % |
| 10619 | AAB | IEEE 802.11ac WiFi (40MHz, MCS3, 90pc duty cycle)          | WLAN     | 8.86  | ± 9.6 % |
| 10620 | AAB | IEEE 802.11ac WiFi (40MHz, MCS4, 90pc duty cycle)          | WLAN     | 8.87  | ± 9.6 % |
| 10621 | AAB | IEEE 802.11ac WiFi (40MHz, MCS5, 90pc duty cycle)          | WLAN     | 8.77  | ± 9.6 % |
| 10622 | AAB | IEEE 802.11ac WiFi (40MHz, MCS6, 90pc duty cycle)          | WLAN     | 8.68  | ± 9.6 % |
| 10623 | AAB | IEEE 802.11ac WiFi (40MHz, MCS7, 90pc duty cycle)          | WLAN     | 8.82  | ± 9.6 % |
| 10624 | AAB | IEEE 802.11ac WiFi (40MHz, MCS8, 90pc duty cycle)          | WLAN     | 8.96  | ± 9.6 % |
| 10625 | AAB | IEEE 802.11ac WiFi (40MHz, MCS9, 90pc duty cycle)          | WLAN     | 8.96  | ± 9.6 % |
| 10626 | AAB | IEEE 802.11ac WiFi (80MHz, MCS0, 90pc duty cycle)          | WLAN     | 8.83  | ± 9.6 % |
| 10627 | AAB | IEEE 802.11ac WiFi (80MHz, MCS1, 90pc duty cycle)          | WLAN     | 8.88  | ± 9.6 % |
| 10628 | AAB | IEEE 802.11ac WiFi (80MHz, MCS2, 90pc duty cycle)          | WLAN     | 8.71  | ± 9.6 % |
| 10629 | AAB | IEEE 802.11ac WiFi (80MHz, MCS3, 90pc duty cycle)          | WLAN     | 8.85  | ± 9.6 % |
| 10630 | AAB | IEEE 802.11ac WiFi (80MHz, MCS4, 90pc duty cycle)          | WLAN     | 8.72  | ± 9.6 % |
| 10631 | AAB | IEEE 802.11ac WiFi (80MHz, MCS5, 90pc duty cycle)          | WLAN     | 8.81  | ± 9.6 % |
| 10632 | AAB | IEEE 802.11ac WiFi (80MHz, MCS6, 90pc duty cycle)          | WLAN     | 8.74  | ± 9.6 % |
| 10633 | AAB | IEEE 802.11ac WiFi (80MHz, MCS7, 90pc duty cycle)          | WLAN     | 8.83  | ± 9.6 % |
| 10634 | AAB | IEEE 802.11ac WiFi (80MHz, MCS8, 90pc duty cycle)          | WLAN     | 8.80  | ± 9.6 % |
| 10635 | AAB | IEEE 802.11ac WiFi (80MHz, MCS9, 90pc duty cycle)          | WLAN     | 8.81  | ± 9.6 % |
| 10636 | AAC | IEEE 802.11ac WiFi (160MHz, MCS0, 90pc duty cycle)         | WLAN     | 8.83  | ± 9.6 % |
| 10637 | AAC | IEEE 802.11ac WiFi (160MHz, MCS1, 90pc duty cycle)         | WLAN     | 8.79  | ± 9.6 % |
| 10638 | AAC | IEEE 802.11ac WiFi (160MHz, MCS2, 90pc duty cycle)         | WLAN     | 8.86  | ± 9.6 % |
| 10639 | AAC | IEEE 802.11ac WiFi (160MHz, MCS3, 90pc duty cycle)         | WLAN     | 8.85  | ± 9.6 % |
| 10640 | AAC | IEEE 802.11ac WiFi (160MHz, MCS4, 90pc duty cycle)         | WLAN     | 8.98  | ± 9.6 % |
| 10641 | AAC | IEEE 802.11ac WiFi (160MHz, MCS5, 90pc duty cycle)         | WLAN     | 9.06  | ± 9.6 % |
| 10642 | AAC | IEEE 802.11ac WiFi (160MHz, MCS6, 90pc duty cycle)         | WLAN     | 9.06  | ± 9.6 % |
| 10643 | AAC | IEEE 802.11ac WiFi (160MHz, MCS7, 90pc duty cycle)         | WLAN     | 8.89  | ± 9.6 % |
| 10644 | AAC | IEEE 802.11ac WiFi (160MHz, MCS8, 90pc duty cycle)         | WLAN     | 9.05  | ± 9.6 % |
| 10645 | AAC | IEEE 802.11ac WiFi (160MHz, MCS9, 90pc duty cycle)         | WLAN     | 9.11  | ± 9.6 % |
| 10646 | AAG | LTE-TDD (SC-FDMA, 1 RB, 5 MHz, QPSK, UL Subframe=2,7)      | LTE-TDD  | 11.96 | ± 9.6 % |
| 10647 | AAF | LTE-TDD (SC-FDMA, 1 RB, 20 MHz, QPSK, UL Subframe=2,7)     | LTE-TDD  | 11.96 | ± 9.6 % |
| 10648 | AAA | CDMA2000 (1x Advanced)                                     | CDMA2000 | 3.45  | ± 9.6 % |
| 10652 | AAE | LTE-TDD (OFDMA, 5 MHz, E-TM 3.1, Clipping 44%)             | LTE-TDD  | 6.91  | ± 9.6 % |
| 10653 | AAE | LTE-TDD (OFDMA, 10 MHz, E-TM 3.1, Clipping 44%)            | LTE-TDD  | 7.42  | ± 9.6 % |
| 10654 | AAD | LTE-TDD (OFDMA, 15 MHz, E-TM 3.1, Clipping 44%)            | LTE-TDD  | 6.96  | ± 9.6 % |

|       |     |                                                 |           |       |         |
|-------|-----|-------------------------------------------------|-----------|-------|---------|
| 10655 | AAE | LTE-TDD (OFDMA, 20 MHz, E-TM 3.1, Clipping 44%) | LTE-TDD   | 7.21  | ± 9.6 % |
| 10658 | AAA | Pulse Waveform (200Hz, 10%)                     | Test      | 10.00 | ± 9.6 % |
| 10659 | AAA | Pulse Waveform (200Hz, 20%)                     | Test      | 6.99  | ± 9.6 % |
| 10660 | AAA | Pulse Waveform (200Hz, 40%)                     | Test      | 3.98  | ± 9.6 % |
| 10661 | AAA | Pulse Waveform (200Hz, 60%)                     | Test      | 2.22  | ± 9.6 % |
| 10662 | AAA | Pulse Waveform (200Hz, 80%)                     | Test      | 0.97  | ± 9.6 % |
| 10670 | AAA | Bluetooth Low Energy                            | Bluetooth | 2.19  | ± 9.6 % |
| 10671 | AAA | IEEE 802.11ax (20MHz, MCS0, 90pc duty cycle)    | WLAN      | 9.09  | ± 9.6 % |
| 10672 | AAA | IEEE 802.11ax (20MHz, MCS1, 90pc duty cycle)    | WLAN      | 8.57  | ± 9.6 % |
| 10673 | AAA | IEEE 802.11ax (20MHz, MCS2, 90pc duty cycle)    | WLAN      | 8.78  | ± 9.6 % |
| 10674 | AAA | IEEE 802.11ax (20MHz, MCS3, 90pc duty cycle)    | WLAN      | 8.74  | ± 9.6 % |
| 10675 | AAA | IEEE 802.11ax (20MHz, MCS4, 90pc duty cycle)    | WLAN      | 8.90  | ± 9.6 % |
| 10676 | AAA | IEEE 802.11ax (20MHz, MCS5, 90pc duty cycle)    | WLAN      | 8.77  | ± 9.6 % |
| 10677 | AAA | IEEE 802.11ax (20MHz, MCS6, 90pc duty cycle)    | WLAN      | 8.73  | ± 9.6 % |
| 10678 | AAA | IEEE 802.11ax (20MHz, MCS7, 90pc duty cycle)    | WLAN      | 8.78  | ± 9.6 % |
| 10679 | AAA | IEEE 802.11ax (20MHz, MCS8, 90pc duty cycle)    | WLAN      | 8.89  | ± 9.6 % |
| 10680 | AAA | IEEE 802.11ax (20MHz, MCS9, 90pc duty cycle)    | WLAN      | 8.80  | ± 9.6 % |
| 10681 | AAA | IEEE 802.11ax (20MHz, MCS10, 90pc duty cycle)   | WLAN      | 8.62  | ± 9.6 % |
| 10682 | AAA | IEEE 802.11ax (20MHz, MCS11, 90pc duty cycle)   | WLAN      | 8.83  | ± 9.6 % |
| 10683 | AAA | IEEE 802.11ax (20MHz, MCS0, 99pc duty cycle)    | WLAN      | 8.42  | ± 9.6 % |
| 10684 | AAA | IEEE 802.11ax (20MHz, MCS1, 99pc duty cycle)    | WLAN      | 8.26  | ± 9.6 % |
| 10685 | AAA | IEEE 802.11ax (20MHz, MCS2, 99pc duty cycle)    | WLAN      | 8.33  | ± 9.6 % |
| 10686 | AAA | IEEE 802.11ax (20MHz, MCS3, 99pc duty cycle)    | WLAN      | 8.28  | ± 9.6 % |
| 10687 | AAA | IEEE 802.11ax (20MHz, MCS4, 99pc duty cycle)    | WLAN      | 8.45  | ± 9.6 % |
| 10688 | AAA | IEEE 802.11ax (20MHz, MCS5, 99pc duty cycle)    | WLAN      | 8.29  | ± 9.6 % |
| 10689 | AAA | IEEE 802.11ax (20MHz, MCS6, 99pc duty cycle)    | WLAN      | 8.55  | ± 9.6 % |
| 10690 | AAA | IEEE 802.11ax (20MHz, MCS7, 99pc duty cycle)    | WLAN      | 8.29  | ± 9.6 % |
| 10691 | AAA | IEEE 802.11ax (20MHz, MCS8, 99pc duty cycle)    | WLAN      | 8.25  | ± 9.6 % |
| 10692 | AAA | IEEE 802.11ax (20MHz, MCS9, 99pc duty cycle)    | WLAN      | 8.29  | ± 9.6 % |
| 10693 | AAA | IEEE 802.11ax (20MHz, MCS10, 99pc duty cycle)   | WLAN      | 8.25  | ± 9.6 % |
| 10694 | AAA | IEEE 802.11ax (20MHz, MCS11, 99pc duty cycle)   | WLAN      | 8.57  | ± 9.6 % |
| 10695 | AAA | IEEE 802.11ax (40MHz, MCS0, 90pc duty cycle)    | WLAN      | 8.78  | ± 9.6 % |
| 10696 | AAA | IEEE 802.11ax (40MHz, MCS1, 90pc duty cycle)    | WLAN      | 8.91  | ± 9.6 % |
| 10697 | AAA | IEEE 802.11ax (40MHz, MCS2, 90pc duty cycle)    | WLAN      | 8.61  | ± 9.6 % |
| 10698 | AAA | IEEE 802.11ax (40MHz, MCS3, 90pc duty cycle)    | WLAN      | 8.89  | ± 9.6 % |
| 10699 | AAA | IEEE 802.11ax (40MHz, MCS4, 90pc duty cycle)    | WLAN      | 8.82  | ± 9.6 % |
| 10700 | AAA | IEEE 802.11ax (40MHz, MCS5, 90pc duty cycle)    | WLAN      | 8.73  | ± 9.6 % |
| 10701 | AAA | IEEE 802.11ax (40MHz, MCS6, 90pc duty cycle)    | WLAN      | 8.86  | ± 9.6 % |
| 10702 | AAA | IEEE 802.11ax (40MHz, MCS7, 90pc duty cycle)    | WLAN      | 8.70  | ± 9.6 % |
| 10703 | AAA | IEEE 802.11ax (40MHz, MCS8, 90pc duty cycle)    | WLAN      | 8.82  | ± 9.6 % |
| 10704 | AAA | IEEE 802.11ax (40MHz, MCS9, 90pc duty cycle)    | WLAN      | 8.56  | ± 9.6 % |
| 10705 | AAA | IEEE 802.11ax (40MHz, MCS10, 90pc duty cycle)   | WLAN      | 8.69  | ± 9.6 % |
| 10706 | AAA | IEEE 802.11ax (40MHz, MCS11, 90pc duty cycle)   | WLAN      | 8.66  | ± 9.6 % |
| 10707 | AAA | IEEE 802.11ax (40MHz, MCS0, 99pc duty cycle)    | WLAN      | 8.32  | ± 9.6 % |
| 10708 | AAA | IEEE 802.11ax (40MHz, MCS1, 99pc duty cycle)    | WLAN      | 8.55  | ± 9.6 % |
| 10709 | AAA | IEEE 802.11ax (40MHz, MCS2, 99pc duty cycle)    | WLAN      | 8.33  | ± 9.6 % |
| 10710 | AAA | IEEE 802.11ax (40MHz, MCS3, 99pc duty cycle)    | WLAN      | 8.29  | ± 9.6 % |
| 10711 | AAA | IEEE 802.11ax (40MHz, MCS4, 99pc duty cycle)    | WLAN      | 8.39  | ± 9.6 % |
| 10712 | AAA | IEEE 802.11ax (40MHz, MCS5, 99pc duty cycle)    | WLAN      | 8.67  | ± 9.6 % |
| 10713 | AAA | IEEE 802.11ax (40MHz, MCS6, 99pc duty cycle)    | WLAN      | 8.33  | ± 9.6 % |
| 10714 | AAA | IEEE 802.11ax (40MHz, MCS7, 99pc duty cycle)    | WLAN      | 8.26  | ± 9.6 % |
| 10715 | AAA | IEEE 802.11ax (40MHz, MCS8, 99pc duty cycle)    | WLAN      | 8.45  | ± 9.6 % |
| 10716 | AAA | IEEE 802.11ax (40MHz, MCS9, 99pc duty cycle)    | WLAN      | 8.30  | ± 9.6 % |
| 10717 | AAA | IEEE 802.11ax (40MHz, MCS10, 99pc duty cycle)   | WLAN      | 8.48  | ± 9.6 % |
| 10718 | AAA | IEEE 802.11ax (40MHz, MCS11, 99pc duty cycle)   | WLAN      | 8.24  | ± 9.6 % |
| 10719 | AAA | IEEE 802.11ax (80MHz, MCS0, 90pc duty cycle)    | WLAN      | 8.81  | ± 9.6 % |
| 10720 | AAA | IEEE 802.11ax (80MHz, MCS1, 90pc duty cycle)    | WLAN      | 8.87  | ± 9.6 % |
| 10721 | AAA | IEEE 802.11ax (80MHz, MCS2, 90pc duty cycle)    | WLAN      | 8.76  | ± 9.6 % |
| 10722 | AAA | IEEE 802.11ax (80MHz, MCS3, 90pc duty cycle)    | WLAN      | 8.55  | ± 9.6 % |
| 10723 | AAA | IEEE 802.11ax (80MHz, MCS4, 90pc duty cycle)    | WLAN      | 8.70  | ± 9.6 % |
| 10724 | AAA | IEEE 802.11ax (80MHz, MCS5, 90pc duty cycle)    | WLAN      | 8.90  | ± 9.6 % |
| 10725 | AAA | IEEE 802.11ax (80MHz, MCS6, 90pc duty cycle)    | WLAN      | 8.74  | ± 9.6 % |
| 10726 | AAA | IEEE 802.11ax (80MHz, MCS7, 90pc duty cycle)    | WLAN      | 8.72  | ± 9.6 % |
| 10727 | AAA | IEEE 802.11ax (80MHz, MCS8, 90pc duty cycle)    | WLAN      | 8.66  | ± 9.6 % |

|       |     |                                                |               |      |         |
|-------|-----|------------------------------------------------|---------------|------|---------|
| 10728 | AAA | IEEE 802.11ax (80MHz, MCS9, 90pc duty cycle)   | WLAN          | 8.65 | ± 9.6 % |
| 10729 | AAA | IEEE 802.11ax (80MHz, MCS10, 90pc duty cycle)  | WLAN          | 8.64 | ± 9.6 % |
| 10730 | AAA | IEEE 802.11ax (80MHz, MCS11, 90pc duty cycle)  | WLAN          | 8.67 | ± 9.6 % |
| 10731 | AAA | IEEE 802.11ax (80MHz, MCS0, 99pc duty cycle)   | WLAN          | 8.42 | ± 9.6 % |
| 10732 | AAA | IEEE 802.11ax (80MHz, MCS1, 99pc duty cycle)   | WLAN          | 8.46 | ± 9.6 % |
| 10733 | AAA | IEEE 802.11ax (80MHz, MCS2, 99pc duty cycle)   | WLAN          | 8.40 | ± 9.6 % |
| 10734 | AAA | IEEE 802.11ax (80MHz, MCS3, 99pc duty cycle)   | WLAN          | 8.25 | ± 9.6 % |
| 10735 | AAA | IEEE 802.11ax (80MHz, MCS4, 99pc duty cycle)   | WLAN          | 8.33 | ± 9.6 % |
| 10736 | AAA | IEEE 802.11ax (80MHz, MCS5, 99pc duty cycle)   | WLAN          | 8.27 | ± 9.6 % |
| 10737 | AAA | IEEE 802.11ax (80MHz, MCS6, 99pc duty cycle)   | WLAN          | 8.36 | ± 9.6 % |
| 10738 | AAA | IEEE 802.11ax (80MHz, MCS7, 99pc duty cycle)   | WLAN          | 8.42 | ± 9.6 % |
| 10739 | AAA | IEEE 802.11ax (80MHz, MCS8, 99pc duty cycle)   | WLAN          | 8.29 | ± 9.6 % |
| 10740 | AAA | IEEE 802.11ax (80MHz, MCS9, 99pc duty cycle)   | WLAN          | 8.48 | ± 9.6 % |
| 10741 | AAA | IEEE 802.11ax (80MHz, MCS10, 99pc duty cycle)  | WLAN          | 8.40 | ± 9.6 % |
| 10742 | AAA | IEEE 802.11ax (80MHz, MCS11, 99pc duty cycle)  | WLAN          | 8.43 | ± 9.6 % |
| 10743 | AAA | IEEE 802.11ax (160MHz, MCS0, 90pc duty cycle)  | WLAN          | 8.94 | ± 9.6 % |
| 10744 | AAA | IEEE 802.11ax (160MHz, MCS1, 90pc duty cycle)  | WLAN          | 9.16 | ± 9.6 % |
| 10745 | AAA | IEEE 802.11ax (160MHz, MCS2, 90pc duty cycle)  | WLAN          | 8.93 | ± 9.6 % |
| 10746 | AAA | IEEE 802.11ax (160MHz, MCS3, 90pc duty cycle)  | WLAN          | 9.11 | ± 9.6 % |
| 10747 | AAA | IEEE 802.11ax (160MHz, MCS4, 90pc duty cycle)  | WLAN          | 9.04 | ± 9.6 % |
| 10748 | AAA | IEEE 802.11ax (160MHz, MCS5, 90pc duty cycle)  | WLAN          | 8.93 | ± 9.6 % |
| 10749 | AAA | IEEE 802.11ax (160MHz, MCS6, 90pc duty cycle)  | WLAN          | 8.90 | ± 9.6 % |
| 10750 | AAA | IEEE 802.11ax (160MHz, MCS7, 90pc duty cycle)  | WLAN          | 8.79 | ± 9.6 % |
| 10751 | AAA | IEEE 802.11ax (160MHz, MCS8, 90pc duty cycle)  | WLAN          | 8.82 | ± 9.6 % |
| 10752 | AAA | IEEE 802.11ax (160MHz, MCS9, 90pc duty cycle)  | WLAN          | 8.81 | ± 9.6 % |
| 10753 | AAA | IEEE 802.11ax (160MHz, MCS10, 90pc duty cycle) | WLAN          | 9.00 | ± 9.6 % |
| 10754 | AAA | IEEE 802.11ax (160MHz, MCS11, 90pc duty cycle) | WLAN          | 8.94 | ± 9.6 % |
| 10755 | AAA | IEEE 802.11ax (160MHz, MCS0, 99pc duty cycle)  | WLAN          | 8.64 | ± 9.6 % |
| 10756 | AAA | IEEE 802.11ax (160MHz, MCS1, 99pc duty cycle)  | WLAN          | 8.77 | ± 9.6 % |
| 10757 | AAA | IEEE 802.11ax (160MHz, MCS2, 99pc duty cycle)  | WLAN          | 8.77 | ± 9.6 % |
| 10758 | AAA | IEEE 802.11ax (160MHz, MCS3, 99pc duty cycle)  | WLAN          | 8.69 | ± 9.6 % |
| 10759 | AAA | IEEE 802.11ax (160MHz, MCS4, 99pc duty cycle)  | WLAN          | 8.58 | ± 9.6 % |
| 10760 | AAA | IEEE 802.11ax (160MHz, MCS5, 99pc duty cycle)  | WLAN          | 8.49 | ± 9.6 % |
| 10761 | AAA | IEEE 802.11ax (160MHz, MCS6, 99pc duty cycle)  | WLAN          | 8.58 | ± 9.6 % |
| 10762 | AAA | IEEE 802.11ax (160MHz, MCS7, 99pc duty cycle)  | WLAN          | 8.49 | ± 9.6 % |
| 10763 | AAA | IEEE 802.11ax (160MHz, MCS8, 99pc duty cycle)  | WLAN          | 8.53 | ± 9.6 % |
| 10764 | AAA | IEEE 802.11ax (160MHz, MCS9, 99pc duty cycle)  | WLAN          | 8.54 | ± 9.6 % |
| 10765 | AAA | IEEE 802.11ax (160MHz, MCS10, 99pc duty cycle) | WLAN          | 8.54 | ± 9.6 % |
| 10766 | AAA | IEEE 802.11ax (160MHz, MCS11, 99pc duty cycle) | WLAN          | 8.51 | ± 9.6 % |
| 10767 | AAA | 5G NR (CP-OFDM, 1 RB, 5 MHz, QPSK, 15 kHz)     | 5G NR FR1 TDD | 7.99 | ± 9.6 % |
| 10768 | AAA | 5G NR (CP-OFDM, 1 RB, 10 MHz, QPSK, 15 kHz)    | 5G NR FR1 TDD | 8.01 | ± 9.6 % |
| 10769 | AAA | 5G NR (CP-OFDM, 1 RB, 15 MHz, QPSK, 15 kHz)    | 5G NR FR1 TDD | 8.01 | ± 9.6 % |
| 10770 | AAA | 5G NR (CP-OFDM, 1 RB, 20 MHz, QPSK, 15 kHz)    | 5G NR FR1 TDD | 8.02 | ± 9.6 % |
| 10771 | AAA | 5G NR (CP-OFDM, 1 RB, 25 MHz, QPSK, 15 kHz)    | 5G NR FR1 TDD | 8.02 | ± 9.6 % |
| 10772 | AAA | 5G NR (CP-OFDM, 1 RB, 30 MHz, QPSK, 15 kHz)    | 5G NR FR1 TDD | 8.23 | ± 9.6 % |
| 10773 | AAA | 5G NR (CP-OFDM, 1 RB, 40 MHz, QPSK, 15 kHz)    | 5G NR FR1 TDD | 8.03 | ± 9.6 % |
| 10774 | AAA | 5G NR (CP-OFDM, 1 RB, 50 MHz, QPSK, 15 kHz)    | 5G NR FR1 TDD | 8.02 | ± 9.6 % |
| 10776 | AAA | 5G NR (CP-OFDM, 50% RB, 10 MHz, QPSK, 15 kHz)  | 5G NR FR1 TDD | 8.30 | ± 9.6 % |
| 10778 | AAA | 5G NR (CP-OFDM, 50% RB, 20 MHz, QPSK, 15 kHz)  | 5G NR FR1 TDD | 8.34 | ± 9.6 % |
| 10780 | AAA | 5G NR (CP-OFDM, 50% RB, 30 MHz, QPSK, 15 kHz)  | 5G NR FR1 TDD | 8.38 | ± 9.6 % |
| 10781 | AAA | 5G NR (CP-OFDM, 50% RB, 40 MHz, QPSK, 15 kHz)  | 5G NR FR1 TDD | 8.38 | ± 9.6 % |
| 10782 | AAA | 5G NR (CP-OFDM, 50% RB, 50 MHz, QPSK, 15 kHz)  | 5G NR FR1 TDD | 8.43 | ± 9.6 % |

|       |     |                                                |               |      |         |
|-------|-----|------------------------------------------------|---------------|------|---------|
| 10783 | AAA | 5G NR (CP-OFDM, 100% RB, 5 MHz, QPSK, 15 kHz)  | 5G NR FR1 TDD | 8.31 | ± 9.6 % |
| 10784 | AAA | 5G NR (CP-OFDM, 100% RB, 10 MHz, QPSK, 15 kHz) | 5G NR FR1 TDD | 8.29 | ± 9.6 % |
| 10785 | AAA | 5G NR (CP-OFDM, 100% RB, 15 MHz, QPSK, 15 kHz) | 5G NR FR1 TDD | 8.40 | ± 9.6 % |
| 10786 | AAA | 5G NR (CP-OFDM, 100% RB, 20 MHz, QPSK, 15 kHz) | 5G NR FR1 TDD | 8.35 | ± 9.6 % |
| 10787 | AAA | 5G NR (CP-OFDM, 100% RB, 25 MHz, QPSK, 15 kHz) | 5G NR FR1 TDD | 8.44 | ± 9.6 % |
| 10788 | AAA | 5G NR (CP-OFDM, 100% RB, 30 MHz, QPSK, 15 kHz) | 5G NR FR1 TDD | 8.39 | ± 9.6 % |
| 10789 | AAA | 5G NR (CP-OFDM, 100% RB, 40 MHz, QPSK, 15 kHz) | 5G NR FR1 TDD | 8.37 | ± 9.6 % |
| 10790 | AAA | 5G NR (CP-OFDM, 100% RB, 50 MHz, QPSK, 15 kHz) | 5G NR FR1 TDD | 8.39 | ± 9.6 % |
| 10791 | AAA | 5G NR (CP-OFDM, 1 RB, 5 MHz, QPSK, 30 kHz)     | 5G NR FR1 TDD | 7.83 | ± 9.6 % |
| 10792 | AAA | 5G NR (CP-OFDM, 1 RB, 10 MHz, QPSK, 30 kHz)    | 5G NR FR1 TDD | 7.92 | ± 9.6 % |
| 10793 | AAA | 5G NR (CP-OFDM, 1 RB, 15 MHz, QPSK, 30 kHz)    | 5G NR FR1 TDD | 7.95 | ± 9.6 % |
| 10794 | AAA | 5G NR (CP-OFDM, 1 RB, 20 MHz, QPSK, 30 kHz)    | 5G NR FR1 TDD | 7.82 | ± 9.6 % |
| 10795 | AAA | 5G NR (CP-OFDM, 1 RB, 25 MHz, QPSK, 30 kHz)    | 5G NR FR1 TDD | 7.84 | ± 9.6 % |
| 10796 | AAA | 5G NR (CP-OFDM, 1 RB, 30 MHz, QPSK, 30 kHz)    | 5G NR FR1 TDD | 7.82 | ± 9.6 % |
| 10797 | AAA | 5G NR (CP-OFDM, 1 RB, 40 MHz, QPSK, 30 kHz)    | 5G NR FR1 TDD | 8.01 | ± 9.6 % |
| 10798 | AAA | 5G NR (CP-OFDM, 1 RB, 50 MHz, QPSK, 30 kHz)    | 5G NR FR1 TDD | 7.89 | ± 9.6 % |
| 10799 | AAA | 5G NR (CP-OFDM, 1 RB, 60 MHz, QPSK, 30 kHz)    | 5G NR FR1 TDD | 7.93 | ± 9.6 % |
| 10801 | AAA | 5G NR (CP-OFDM, 1 RB, 80 MHz, QPSK, 30 kHz)    | 5G NR FR1 TDD | 7.89 | ± 9.6 % |
| 10802 | AAA | 5G NR (CP-OFDM, 1 RB, 90 MHz, QPSK, 30 kHz)    | 5G NR FR1 TDD | 7.87 | ± 9.6 % |
| 10803 | AAA | 5G NR (CP-OFDM, 1 RB, 100 MHz, QPSK, 30 kHz)   | 5G NR FR1 TDD | 7.93 | ± 9.6 % |
| 10805 | AAA | 5G NR (CP-OFDM, 50% RB, 10 MHz, QPSK, 30 kHz)  | 5G NR FR1 TDD | 8.34 | ± 9.6 % |
| 10806 | AAA | 5G NR (CP-OFDM, 50% RB, 15 MHz, QPSK, 30 kHz)  | 5G NR FR1 TDD | 8.37 | ± 9.6 % |
| 10809 | AAA | 5G NR (CP-OFDM, 50% RB, 30 MHz, QPSK, 30 kHz)  | 5G NR FR1 TDD | 8.34 | ± 9.6 % |
| 10810 | AAA | 5G NR (CP-OFDM, 50% RB, 40 MHz, QPSK, 30 kHz)  | 5G NR FR1 TDD | 8.34 | ± 9.6 % |
| 10812 | AAA | 5G NR (CP-OFDM, 50% RB, 60 MHz, QPSK, 30 kHz)  | 5G NR FR1 TDD | 8.35 | ± 9.6 % |
| 10817 | AAA | 5G NR (CP-OFDM, 100% RB, 5 MHz, QPSK, 30 kHz)  | 5G NR FR1 TDD | 8.35 | ± 9.6 % |
| 10818 | AAA | 5G NR (CP-OFDM, 100% RB, 10 MHz, QPSK, 30 kHz) | 5G NR FR1 TDD | 8.34 | ± 9.6 % |
| 10819 | AAA | 5G NR (CP-OFDM, 100% RB, 15 MHz, QPSK, 30 kHz) | 5G NR FR1 TDD | 8.33 | ± 9.6 % |
| 10820 | AAA | 5G NR (CP-OFDM, 100% RB, 20 MHz, QPSK, 30 kHz) | 5G NR FR1 TDD | 8.30 | ± 9.6 % |
| 10821 | AAA | 5G NR (CP-OFDM, 100% RB, 25 MHz, QPSK, 30 kHz) | 5G NR FR1 TDD | 8.41 | ± 9.6 % |
| 10822 | AAA | 5G NR (CP-OFDM, 100% RB, 30 MHz, QPSK, 30 kHz) | 5G NR FR1 TDD | 8.41 | ± 9.6 % |
| 10823 | AAA | 5G NR (CP-OFDM, 100% RB, 40 MHz, QPSK, 30 kHz) | 5G NR FR1 TDD | 8.36 | ± 9.6 % |
| 10824 | AAA | 5G NR (CP-OFDM, 100% RB, 50 MHz, QPSK, 30 kHz) | 5G NR FR1 TDD | 8.39 | ± 9.6 % |

|       |     |                                                     |               |      |         |
|-------|-----|-----------------------------------------------------|---------------|------|---------|
| 10825 | AAA | 5G NR (CP-OFDM, 100% RB, 60 MHz, QPSK, 30 kHz)      | 5G NR FR1 TDD | 8.41 | ± 9.6 % |
| 10827 | AAA | 5G NR (CP-OFDM, 100% RB, 80 MHz, QPSK, 30 kHz)      | 5G NR FR1 TDD | 8.42 | ± 9.6 % |
| 10828 | AAA | 5G NR (CP-OFDM, 100% RB, 90 MHz, QPSK, 30 kHz)      | 5G NR FR1 TDD | 8.43 | ± 9.6 % |
| 10829 | AAA | 5G NR (CP-OFDM, 100% RB, 100 MHz, QPSK, 30 kHz)     | 5G NR FR1 TDD | 8.40 | ± 9.6 % |
| 10830 | AAA | 5G NR (CP-OFDM, 1 RB, 10 MHz, QPSK, 60 kHz)         | 5G NR FR1 TDD | 7.63 | ± 9.6 % |
| 10831 | AAA | 5G NR (CP-OFDM, 1 RB, 15 MHz, QPSK, 60 kHz)         | 5G NR FR1 TDD | 7.73 | ± 9.6 % |
| 10832 | AAA | 5G NR (CP-OFDM, 1 RB, 20 MHz, QPSK, 60 kHz)         | 5G NR FR1 TDD | 7.74 | ± 9.6 % |
| 10833 | AAA | 5G NR (CP-OFDM, 1 RB, 25 MHz, QPSK, 60 kHz)         | 5G NR FR1 TDD | 7.70 | ± 9.6 % |
| 10834 | AAA | 5G NR (CP-OFDM, 1 RB, 30 MHz, QPSK, 60 kHz)         | 5G NR FR1 TDD | 7.75 | ± 9.6 % |
| 10835 | AAA | 5G NR (CP-OFDM, 1 RB, 40 MHz, QPSK, 60 kHz)         | 5G NR FR1 TDD | 7.70 | ± 9.6 % |
| 10836 | AAA | 5G NR (CP-OFDM, 1 RB, 50 MHz, QPSK, 60 kHz)         | 5G NR FR1 TDD | 7.66 | ± 9.6 % |
| 10837 | AAA | 5G NR (CP-OFDM, 1 RB, 60 MHz, QPSK, 60 kHz)         | 5G NR FR1 TDD | 7.68 | ± 9.6 % |
| 10839 | AAA | 5G NR (CP-OFDM, 1 RB, 80 MHz, QPSK, 60 kHz)         | 5G NR FR1 TDD | 7.70 | ± 9.6 % |
| 10840 | AAA | 5G NR (CP-OFDM, 1 RB, 90 MHz, QPSK, 60 kHz)         | 5G NR FR1 TDD | 7.67 | ± 9.6 % |
| 10841 | AAA | 5G NR (CP-OFDM, 1 RB, 100 MHz, QPSK, 60 kHz)        | 5G NR FR1 TDD | 7.71 | ± 9.6 % |
| 10843 | AAA | 5G NR (CP-OFDM, 50% RB, 15 MHz, QPSK, 60 kHz)       | 5G NR FR1 TDD | 8.49 | ± 9.6 % |
| 10844 | AAA | 5G NR (CP-OFDM, 50% RB, 20 MHz, QPSK, 60 kHz)       | 5G NR FR1 TDD | 8.34 | ± 9.6 % |
| 10846 | AAA | 5G NR (CP-OFDM, 50% RB, 30 MHz, QPSK, 60 kHz)       | 5G NR FR1 TDD | 8.41 | ± 9.6 % |
| 10854 | AAA | 5G NR (CP-OFDM, 100% RB, 10 MHz, QPSK, 60 kHz)      | 5G NR FR1 TDD | 8.34 | ± 9.6 % |
| 10855 | AAA | 5G NR (CP-OFDM, 100% RB, 15 MHz, QPSK, 60 kHz)      | 5G NR FR1 TDD | 8.36 | ± 9.6 % |
| 10856 | AAA | 5G NR (CP-OFDM, 100% RB, 20 MHz, QPSK, 60 kHz)      | 5G NR FR1 TDD | 8.37 | ± 9.6 % |
| 10857 | AAA | 5G NR (CP-OFDM, 100% RB, 25 MHz, QPSK, 60 kHz)      | 5G NR FR1 TDD | 8.35 | ± 9.6 % |
| 10858 | AAA | 5G NR (CP-OFDM, 100% RB, 30 MHz, QPSK, 60 kHz)      | 5G NR FR1 TDD | 8.36 | ± 9.6 % |
| 10859 | AAA | 5G NR (CP-OFDM, 100% RB, 40 MHz, QPSK, 60 kHz)      | 5G NR FR1 TDD | 8.34 | ± 9.6 % |
| 10860 | AAA | 5G NR (CP-OFDM, 100% RB, 50 MHz, QPSK, 60 kHz)      | 5G NR FR1 TDD | 8.41 | ± 9.6 % |
| 10861 | AAA | 5G NR (CP-OFDM, 100% RB, 60 MHz, QPSK, 60 kHz)      | 5G NR FR1 TDD | 8.40 | ± 9.6 % |
| 10863 | AAA | 5G NR (CP-OFDM, 100% RB, 80 MHz, QPSK, 60 kHz)      | 5G NR FR1 TDD | 8.41 | ± 9.6 % |
| 10864 | AAA | 5G NR (CP-OFDM, 100% RB, 90 MHz, QPSK, 60 kHz)      | 5G NR FR1 TDD | 8.37 | ± 9.6 % |
| 10865 | AAA | 5G NR (CP-OFDM, 100% RB, 100 MHz, QPSK, 60 kHz)     | 5G NR FR1 TDD | 8.41 | ± 9.6 % |
| 10866 | AAA | 5G NR (DFT-s-OFDM, 1 RB, 100 MHz, QPSK, 30 kHz)     | 5G NR FR1 TDD | 5.68 | ± 9.6 % |
| 10868 | AAA | 5G NR (DFT-s-OFDM, 100% RB, 100 MHz, QPSK, 30 kHz)  | 5G NR FR1 TDD | 5.89 | ± 9.6 % |
| 10869 | AAA | 5G NR (DFT-s-OFDM, 1 RB, 100 MHz, QPSK, 120 kHz)    | 5G NR FR2 TDD | 5.75 | ± 9.6 % |
| 10870 | AAA | 5G NR (DFT-s-OFDM, 100% RB, 100 MHz, QPSK, 120 kHz) | 5G NR FR2 TDD | 5.86 | ± 9.6 % |

|       |     |                                                      |               |      |         |
|-------|-----|------------------------------------------------------|---------------|------|---------|
| 10871 | AAA | 5G NR (DFT-s-OFDM, 1 RB, 100 MHz, 16QAM, 120 kHz)    | 5G NR FR2 TDD | 5.75 | ± 9.6 % |
| 10872 | AAA | 5G NR (DFT-s-OFDM, 100% RB, 100 MHz, 16QAM, 120 kHz) | 5G NR FR2 TDD | 6.52 | ± 9.6 % |
| 10873 | AAA | 5G NR (DFT-s-OFDM, 1 RB, 100 MHz, 64QAM, 120 kHz)    | 5G NR FR2 TDD | 6.61 | ± 9.6 % |
| 10874 | AAA | 5G NR (DFT-s-OFDM, 100% RB, 100 MHz, 64QAM, 120 kHz) | 5G NR FR2 TDD | 6.65 | ± 9.6 % |
| 10875 | AAA | 5G NR (CP-OFDM, 1 RB, 100 MHz, QPSK, 120 kHz)        | 5G NR FR2 TDD | 7.78 | ± 9.6 % |
| 10876 | AAA | 5G NR (CP-OFDM, 100% RB, 100 MHz, QPSK, 120 kHz)     | 5G NR FR2 TDD | 8.39 | ± 9.6 % |
| 10877 | AAA | 5G NR (CP-OFDM, 1 RB, 100 MHz, 16QAM, 120 kHz)       | 5G NR FR2 TDD | 7.95 | ± 9.6 % |
| 10878 | AAA | 5G NR (CP-OFDM, 100% RB, 100 MHz, 16QAM, 120 kHz)    | 5G NR FR2 TDD | 8.41 | ± 9.6 % |
| 10879 | AAA | 5G NR (CP-OFDM, 1 RB, 100 MHz, 64QAM, 120 kHz)       | 5G NR FR2 TDD | 8.12 | ± 9.6 % |
| 10880 | AAA | 5G NR (CP-OFDM, 100% RB, 100 MHz, 64QAM, 120 kHz)    | 5G NR FR2 TDD | 8.38 | ± 9.6 % |
| 10881 | AAA | 5G NR (DFT-s-OFDM, 1 RB, 50 MHz, QPSK, 120 kHz)      | 5G NR FR2 TDD | 5.75 | ± 9.6 % |
| 10882 | AAA | 5G NR (DFT-s-OFDM, 100% RB, 50 MHz, QPSK, 120 kHz)   | 5G NR FR2 TDD | 5.96 | ± 9.6 % |
| 10883 | AAA | 5G NR (DFT-s-OFDM, 1 RB, 50 MHz, 16QAM, 120 kHz)     | 5G NR FR2 TDD | 6.57 | ± 9.6 % |
| 10884 | AAA | 5G NR (DFT-s-OFDM, 100% RB, 50 MHz, 16QAM, 120 kHz)  | 5G NR FR2 TDD | 6.53 | ± 9.6 % |
| 10885 | AAA | 5G NR (DFT-s-OFDM, 1 RB, 50 MHz, 64QAM, 120 kHz)     | 5G NR FR2 TDD | 6.61 | ± 9.6 % |
| 10886 | AAA | 5G NR (DFT-s-OFDM, 100% RB, 50 MHz, 64QAM, 120 kHz)  | 5G NR FR2 TDD | 6.65 | ± 9.6 % |
| 10887 | AAA | 5G NR (CP-OFDM, 1 RB, 50 MHz, QPSK, 120 kHz)         | 5G NR FR2 TDD | 7.78 | ± 9.6 % |
| 10888 | AAA | 5G NR (CP-OFDM, 100% RB, 50 MHz, QPSK, 120 kHz)      | 5G NR FR2 TDD | 8.35 | ± 9.6 % |
| 10889 | AAA | 5G NR (CP-OFDM, 1 RB, 50 MHz, 16QAM, 120 kHz)        | 5G NR FR2 TDD | 8.02 | ± 9.6 % |
| 10890 | AAA | 5G NR (CP-OFDM, 100% RB, 50 MHz, 16QAM, 120 kHz)     | 5G NR FR2 TDD | 8.40 | ± 9.6 % |
| 10891 | AAA | 5G NR (CP-OFDM, 1 RB, 50 MHz, 64QAM, 120 kHz)        | 5G NR FR2 TDD | 8.13 | ± 9.6 % |
| 10892 | AAA | 5G NR (CP-OFDM, 100% RB, 50 MHz, 64QAM, 120 kHz)     | 5G NR FR2 TDD | 8.41 | ± 9.6 % |

<sup>E</sup> Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

DASY Report

Measurement Report for 5G Verification Source 30 GHz, UID 0 -, Channel 30000 (30000.0MHz)

Device under Test Properties

| Name, Manufacturer            | Dimensions [mm]       | IMEI     | DUT Type |
|-------------------------------|-----------------------|----------|----------|
| 5G Verification Source 30 GHz | 100.0 x 100.0 x 100.0 | SN: 1035 | -        |

Exposure Conditions

| Phantom Section | Position, Test Distance [mm] | Band            | Group, | Frequency [MHz], Channel Number | Conversion Factor |
|-----------------|------------------------------|-----------------|--------|---------------------------------|-------------------|
| 5G -            | 5.55 mm                      | Validation band | CW     | 30000.0, 30000                  | 1.0               |

Hardware Setup

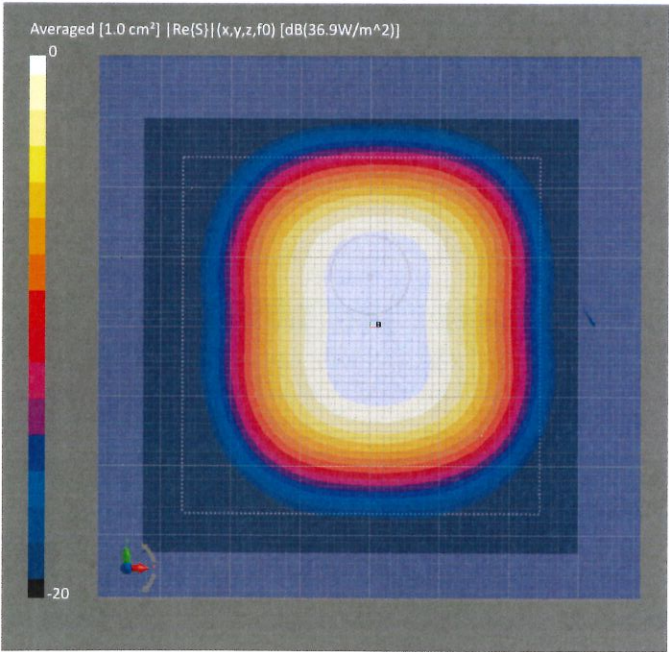
| Phantom               | Medium | Probe, Calibration Date               | DAE, Calibration Date     |
|-----------------------|--------|---------------------------------------|---------------------------|
| mmWave Phantom - 1002 | Air    | EUmmWV3 - SN9374_F1-78GHz, 2019-12-31 | DAE4ip Sn1602, 2019-10-01 |

Scan Setup

|                     | 5G Scan       |
|---------------------|---------------|
| Grid Extents [mm]   | 60.0 x 60.0   |
| Grid Steps [lambda] | 0.25 x 0.25   |
| Sensor Surface [mm] | 5.55          |
| MAIA                | MAIA not used |

Measurement Results

|                  | 5G Scan           |
|------------------|-------------------|
| Date             | 2020-02-12, 08:14 |
| Avg. Area [cm²]  | 1.00              |
| pStot avg [W/m²] | 36.9              |
| pSn avg [W/m²]   | 36.5              |
| Epeak [V/m]      | 126               |
| Power Drift [dB] | -0.05             |



## APPENDIX D: TOTAL EXPOSURE RATIO

|                                               |                                                                                                                                                                                                              |                                                       |                                                                                       |                                            |
|-----------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------|---------------------------------------------------------------------------------------|--------------------------------------------|
| <b>FCC ID:</b> A3LSMG981V                     |  <b>PCTEST</b><br>Proud to be part of  | <b>NEAR-FIELD POWER DENSITY<br/>EVALUATION REPORT</b> |  | <b>Approved by:</b><br><br>Quality Manager |
| <b>Test Dates:</b><br>04/15/2020 – 04/21/2020 | <b>DUT Type:</b><br>Portable Handset                                                                                                                                                                         | <b>APPENDIX D:</b><br>Page 1 of 7                     |                                                                                       |                                            |

The Total Exposure Ratio (TER) is calculated by combining all SAR measurements and power density measurements after normalizing to their respective limits. The general expression is below.

$$TER = \sum_{a=1}^A \frac{SAR_a}{SAR_{a,limit}} + \sum_{b=1}^B \frac{psPD_b}{psPD_{b,limit}} < 1$$

The TER shall be less than unity to ensure compliance with the limits.

$$\sum_{n=1}^N \frac{4G SAR_n}{4G SAR_{n,limit}} + \sum_{m=1}^M \frac{5G mmW NR psPD_m}{5G mmW NR psPD_{m,limit}} + \sum_{p=1}^P \frac{WLAN SAR_p}{WLAN SAR_{p,limit}} < 1$$

Qualcomm® Smart Transmit algorithm for WWAN adds directly the time-averaged RF exposure from 4G and time-averaged RF exposure from 5G mmW NR. Smart Transmit algorithm controls the total RF exposure from both 4G and 5G mmW NR to not exceed FCC limit. Therefore, per FCC guidance, TER does not need to be evaluated directly for the 4G and 5G simultaneous compliance via summation. The following equations are derived later in Appendix D. The validation of the time-averaging algorithm and compliance under the Tx varying transmission scenario for WWAN technologies are reported in Part 2 report. The report SN could be found in Bibliography section.

$$\sum_{n=1}^N \frac{4G SAR_n}{4G SAR_{n,limit}} + \sum_{p=1}^P \frac{WLAN SAR_p}{WLAN SAR_{p,limit}} < 1$$

$$\sum_{m=1}^M \frac{5G mmW NR psPD_m}{5G mmW NR psPD_{m,limit}} + \sum_{p=1}^P \frac{WLAN SAR_p}{WLAN SAR_{p,limit}} < 1$$

For 5G mmW NR, since there is total design-related uncertainty arising from TxAGC and device-to-device variation, the worst-case RF exposure should be determined by accounting for this device uncertainty of 2.1 dB. Smart Transmit algorithm limits PD exposure to 75% of maximum to provide at least 25% margin allocated for 4G LTE anchor due to the 3 dB reserve power margin used in the device. Therefore, 5G mmW NR RF exposure for this DUT is evaluated by reported psPD calculated as:

$$reported\_psPD = 75\% \times PD\_design\_target + 2.1 dB = 7.5 W/m^2$$

Note that since not all the beams supported by this EUT are measured, *reported\_psPD* cannot be computed based on limited *measured psPD* data. Alternatively, since *measured psPD* for all the beams will be  $\leq PD\_design\_target + 2.1$  dB uncertainty, *reported\_psPD* is computed based on this worst-case PSPD as shown above.

|                                        |                                                                                                                                                                                                              |                                               |                                                                                       |                                 |
|----------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------|
| FCC ID: A3LSMG981V                     |  <b>PCTEST</b><br>Proud to be part of  | NEAR-FIELD POWER DENSITY<br>EVALUATION REPORT |  | Approved by:<br>Quality Manager |
| Test Dates:<br>04/15/2020 – 04/21/2020 | DUT Type:<br>Portable Handset                                                                                                                                                                                |                                               |                                                                                       | APPENDIX D:<br>Page 2 of 7      |

The compliance analysis for simultaneous transmission scenarios of WWAN (4G LTE & 5G mmW NR) with Smart Transmit and 4G & WLAN can be found in two reports indicated in the table below. This appendix demonstrates compliance for the 5G + WLAN scenarios. The report SNs can be found in Bibliography section.

|    | Simultaneous Scenario        | Evaluation Report                  |
|----|------------------------------|------------------------------------|
| 1. | 4G LTE WWAN + WLAN           | FCC SAR Evaluation Report (Part 1) |
| 2. | 4G LTE WWAN + 5G mmW NR WWAN | RF Exposure Part 2 Test Report     |

RF exposure compliance with 5G mmW NR WWAN+WLAN simultaneous transmission scenarios is demonstrated for various radio configurations below.

Note that the above *reported psPD* applies to the worst-surface of the DUT at 2mm evaluation distance. For this DUT, the worst-surface(s) are listed in Table 1-9.

Worst-case PD on other surfaces of the DUT are calculated from simulated PD data (see Section 3.1 of Power Density Simulation Report, report SN could be found in Section 1.7 - Bibliography), by multiplying reported psPD with the highest proportion out of all beams and out of all three channels in each band, where the adjustment for each beam/channel is computed as the proportion of “simulated PD on desired surface” to “simulated PD on worst-surface”. For example, to determine worst-case PD on front surface (needed for Head RF Exposure evaluation during simultaneous transmission), highest proportion of (simulated PD on front surface)/(simulated PD on worst surface) was determined out of all supported beams and out of all three channels by the DUT in each band.

In some cases, the simulation vs measurement for some surfaces can exceed the device's total uncertainty. In those cases, if the measured psPD > simulated adjusted psPD (assuming a linear congruency of the psPD across surfaces), then 75% of the measured value (based on the 3 dB reserve power margin) should be used towards the simultaneous TX analysis. Table D-1 lists the relevant worst-case reported psPD values based on the additional surfaces and evaluation distances needed to perform the TER analysis. The highest of the adjusted Reported\_psPD and Measured Total psPD\* 0.75 was chosen for TER analysis and the chosen values are indicated by bolded psPD values.

|                                        |                                                                                                                                                                                                                                 |                                     |
|----------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|
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**Table D-1**  
**5G mmW NR psPD**

| <u>NR Band</u> | <u>Surface</u> | <u>Evaluation Distance (mm)</u> | <u>Adjustment Factor due to Simulation</u> | <u>Adjusted Reported psPD (mW/cm<sup>2</sup>)</u> | <u>Measured Total psPD (mW/cm<sup>2</sup>)</u> | <u>Measured Total psPD x 0.75 (mW/cm<sup>2</sup>)</u> | <u>Final Reported psPD (mW/cm<sup>2</sup>)</u> |
|----------------|----------------|---------------------------------|--------------------------------------------|---------------------------------------------------|------------------------------------------------|-------------------------------------------------------|------------------------------------------------|
| n261           | Back           | 2                               | 1.000                                      | 0.750                                             | 0.602                                          | 0.452                                                 | <b>0.750</b>                                   |
| n261           | Front          | 2                               | 0.295                                      | 0.221                                             | 0.090                                          | 0.068                                                 | <b>0.221</b>                                   |
| n261           | Top            | 2                               | 0.209                                      | 0.157                                             | -                                              | -                                                     | <b>0.157</b>                                   |
| n261           | Bottom         | 2                               | 0.093                                      | 0.069                                             | -                                              | -                                                     | <b>0.069</b>                                   |
| n261           | Right          | 2                               | 1.000                                      | 0.750                                             | 0.665                                          | 0.499                                                 | <b>0.750</b>                                   |
| n261           | Left           | 2                               | 1.000                                      | 0.750                                             | 0.593                                          | 0.445                                                 | <b>0.750</b>                                   |
| n260           | Back           | 2                               | 0.945                                      | 0.709                                             | 0.383                                          | 0.287                                                 | <b>0.709</b>                                   |
| n260           | Front          | 2                               | 0.409                                      | 0.306                                             | 0.160                                          | 0.120                                                 | <b>0.306</b>                                   |
| n260           | Top            | 2                               | 0.138                                      | 0.104                                             | -                                              | -                                                     | <b>0.104</b>                                   |
| n260           | Bottom         | 2                               | 0.102                                      | 0.077                                             | -                                              | -                                                     | <b>0.077</b>                                   |
| n260           | Right          | 2                               | 1.000                                      | 0.750                                             | 0.435                                          | 0.326                                                 | <b>0.750</b>                                   |
| n260           | Left           | 2                               | 1.000                                      | 0.750                                             | 0.495                                          | 0.371                                                 | <b>0.750</b>                                   |
| n261           | Back           | 10                              | 0.514                                      | 0.386                                             | 0.280                                          | 0.210                                                 | <b>0.386</b>                                   |
| n260           | Back           | 10                              | 0.481                                      | 0.361                                             | 0.091                                          | 0.068                                                 | <b>0.361</b>                                   |

Note: Adjusted factor is (simulated PD on desired exposure plane)/(PD on worst-surface at 2mm evaluation distance) out of all beams and out of all channels. See Power Density Simulation Report.

|                                               |                                                                                                                                                                                                                             |                                        |
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**Table D-2**  
**5G mmW NR Head Total Exposure Ratio**

|                  | psPD           | 2.4 GHz WLAN Ant1<br>Reported SAR | 2.4 GHz WLAN Ant2<br>Reported SAR | 2.4 GHz WLAN MIMO<br>Reported SAR | 2.4 GHz WLAN MIMO<br>Reported SAR during conditions<br>with 2.4 GHz Ant 1 & 2 | Bluetooth<br>Reported SAR | 5 GHz WLAN Ant1<br>Reported SAR | 5 GHz WLAN Ant2<br>Reported SAR | 5 GHz WLAN MIMO<br>Reported SAR | psPD + 2.4 GHz<br>WLAN Ant1 | psPD + 2.4 GHz WLAN Ant2 | psPD + 2.4 GHz<br>WLAN MIMO | psPD + 5 GHz<br>WLAN Ant 1 | psPD + 5 GHz<br>WLAN Ant 2 | psPD + 5 GHz<br>WLAN MIMO | psPD + 2.4 GHz<br>WLAN MIMO + 5 GHz<br>MIMO | psPD + BT | psPD + BT + 5 GHz WLAN Ant 1 | psPD + BT + 5 GHz WLAN Ant 2 | psPD + BT + 5 GHz WLAN MIMO |
|------------------|----------------|-----------------------------------|-----------------------------------|-----------------------------------|-------------------------------------------------------------------------------|---------------------------|---------------------------------|---------------------------------|---------------------------------|-----------------------------|--------------------------|-----------------------------|----------------------------|----------------------------|---------------------------|---------------------------------------------|-----------|------------------------------|------------------------------|-----------------------------|
|                  |                | 13.0 dBm                          | 13.0 dBm                          | 13.0 dBm                          | 13.0 dBm                                                                      | 13.0 dBm                  | 13.0 dBm                        | 13.0 dBm                        | 13.0 dBm                        | 13.0 dBm                    | 13.0 dBm                 | 13.0 dBm                    | 13.0 dBm                   | 13.0 dBm                   | 13.0 dBm                  | 13.0 dBm                                    | 13.0 dBm  | 13.0 dBm                     | 13.0 dBm                     | 13.0 dBm                    |
|                  |                | W/kg                              | W/kg                              | W/kg                              | W/kg                                                                          | W/kg                      | W/kg                            | W/kg                            | W/kg                            | W/kg                        | W/kg                     | W/kg                        | W/kg                       | W/kg                       | W/kg                      | W/kg                                        | W/kg      | W/kg                         | W/kg                         | W/kg                        |
| Applicable Limit |                | 1.0                               | 1.0                               | 1.0                               | 1.0                                                                           | 1.0                       | 1.0                             | 1.0                             | 1.0                             | 1.0                         | 1.0                      | 1.0                         | 1.0                        | 1.0                        | 1.0                       | 1.0                                         | 1.0       | 1.0                          | 1.0                          | 1.0                         |
| Front Side       | Reported Value | 0.000                             | 0.000                             | 0.000                             | 0.000                                                                         | 0.000                     | 0.000                           | 0.000                           | 0.000                           | 0.000                       | 0.000                    | 0.000                       | 0.000                      | 0.000                      | 0.000                     | 0.000                                       | 0.000     | 0.000                        | 0.000                        | 0.000                       |
|                  | Ratio to Limit | 0.000                             | 0.000                             | 0.000                             | 0.000                                                                         | 0.000                     | 0.000                           | 0.000                           | 0.000                           | 0.000                       | 0.000                    | 0.000                       | 0.000                      | 0.000                      | 0.000                     | 0.000                                       | 0.000     | 0.000                        | 0.000                        | 0.000                       |

**Table D-3**  
**5G mmW NR Body-Worn Total Exposure Ratio**

|                  | psPD           | 2.4 GHz WLAN Ant1<br>Reported SAR | 2.4 GHz WLAN Ant2<br>Reported SAR | 2.4 GHz WLAN MIMO<br>Reported SAR | Bluetooth<br>Reported SAR | 5 GHz WLAN Ant1<br>Reported SAR | 5 GHz WLAN Ant2<br>Reported SAR | 5 GHz WLAN MIMO<br>Reported SAR | psPD + 2.4 GHz<br>WLAN Ant1 | psPD + 2.4 GHz<br>WLAN Ant2 | psPD + 2.4 GHz WLAN MIMO | psPD + 5 GHz<br>WLAN Ant 1 | psPD + 5 GHz<br>WLAN Ant 2 | psPD + 5 GHz<br>WLAN MIMO | psPD + 2.4 GHz<br>WLAN MIMO + 5 GHz<br>MIMO | psPD + BT | psPD + BT + 5 GHz WLAN Ant 1 | psPD + BT + 5 GHz WLAN Ant 2 | psPD + BT + 5 GHz WLAN MIMO |
|------------------|----------------|-----------------------------------|-----------------------------------|-----------------------------------|---------------------------|---------------------------------|---------------------------------|---------------------------------|-----------------------------|-----------------------------|--------------------------|----------------------------|----------------------------|---------------------------|---------------------------------------------|-----------|------------------------------|------------------------------|-----------------------------|
|                  |                | 20.0 dBm                          | 20.0 dBm                          | 13.0 dBm                          | 13.0 dBm                  | 17.0 dBm                        | 17.0 dBm                        | 13.0 dBm                        | 13.0 dBm                    | 13.0 dBm                    | 13.0 dBm                 | 13.0 dBm                   | 13.0 dBm                   | 13.0 dBm                  | 13.0 dBm                                    | 13.0 dBm  | 13.0 dBm                     | 13.0 dBm                     | 13.0 dBm                    |
|                  |                | W/kg                              | W/kg                              | W/kg                              | W/kg                      | W/kg                            | W/kg                            | W/kg                            | W/kg                        | W/kg                        | W/kg                     | W/kg                       | W/kg                       | W/kg                      | W/kg                                        | W/kg      | W/kg                         | W/kg                         | W/kg                        |
| Applicable Limit |                | 1.0                               | 1.0                               | 1.0                               | 1.0                       | 1.0                             | 1.0                             | 1.0                             | 1.0                         | 1.0                         | 1.0                      | 1.0                        | 1.0                        | 1.0                       | 1.0                                         | 1.0       | 1.0                          | 1.0                          | 1.0                         |
| Back Side        | Reported Value | 0.000                             | 0.000                             | 0.000                             | 0.000                     | 0.000                           | 0.000                           | 0.000                           | 0.000                       | 0.000                       | 0.000                    | 0.000                      | 0.000                      | 0.000                     | 0.000                                       | 0.000     | 0.000                        | 0.000                        | 0.000                       |
|                  | Ratio to Limit | 0.000                             | 0.000                             | 0.000                             | 0.000                     | 0.000                           | 0.000                           | 0.000                           | 0.000                       | 0.000                       | 0.000                    | 0.000                      | 0.000                      | 0.000                     | 0.000                                       | 0.000     | 0.000                        | 0.000                        | 0.000                       |

**Table D-4**  
**5G mmW NR Hotspot Total Exposure Ratio**

|                  | psPD           | 2.4 GHz WLAN Ant1<br>Reported SAR | 2.4 GHz WLAN Ant2<br>Reported SAR | 2.4 GHz WLAN MIMO<br>Reported SAR | Bluetooth<br>Reported SAR | 5 GHz WLAN Ant1<br>Reported SAR | 5 GHz WLAN Ant2<br>Reported SAR | 5 GHz WLAN MIMO<br>Reported SAR | psPD + 2.4 GHz<br>WLAN Ant1 | psPD + 2.4 GHz<br>WLAN Ant2 | psPD + 2.4 GHz WLAN MIMO | psPD + 5 GHz<br>WLAN Ant 1 | psPD + 5 GHz<br>WLAN Ant 2 | psPD + 5 GHz<br>WLAN MIMO | psPD + 2.4 GHz<br>WLAN MIMO + 5 GHz<br>MIMO | psPD + BT | psPD + BT + 5 GHz WLAN Ant 1 | psPD + BT + 5 GHz WLAN Ant 2 | psPD + BT + 5 GHz WLAN MIMO |
|------------------|----------------|-----------------------------------|-----------------------------------|-----------------------------------|---------------------------|---------------------------------|---------------------------------|---------------------------------|-----------------------------|-----------------------------|--------------------------|----------------------------|----------------------------|---------------------------|---------------------------------------------|-----------|------------------------------|------------------------------|-----------------------------|
|                  |                | 13.0 dBm                          | 13.0 dBm                          | 13.0 dBm                          | 13.0 dBm                  | 13.0 dBm                        | 13.0 dBm                        | 13.0 dBm                        | 13.0 dBm                    | 13.0 dBm                    | 13.0 dBm                 | 13.0 dBm                   | 13.0 dBm                   | 13.0 dBm                  | 13.0 dBm                                    | 13.0 dBm  | 13.0 dBm                     | 13.0 dBm                     | 13.0 dBm                    |
|                  |                | W/kg                              | W/kg                              | W/kg                              | W/kg                      | W/kg                            | W/kg                            | W/kg                            | W/kg                        | W/kg                        | W/kg                     | W/kg                       | W/kg                       | W/kg                      | W/kg                                        | W/kg      | W/kg                         | W/kg                         | W/kg                        |
| Applicable Limit |                | 1.0                               | 1.0                               | 1.0                               | 1.0                       | 1.0                             | 1.0                             | 1.0                             | 1.0                         | 1.0                         | 1.0                      | 1.0                        | 1.0                        | 1.0                       | 1.0                                         | 1.0       | 1.0                          | 1.0                          | 1.0                         |
| Back Side        | Reported Value | 0.000                             | 0.000                             | 0.000                             | 0.000                     | 0.000                           | 0.000                           | 0.000                           | 0.000                       | 0.000                       | 0.000                    | 0.000                      | 0.000                      | 0.000                     | 0.000                                       | 0.000     | 0.000                        | 0.000                        | 0.000                       |
|                  | Ratio to Limit | 0.000                             | 0.000                             | 0.000                             | 0.000                     | 0.000                           | 0.000                           | 0.000                           | 0.000                       | 0.000                       | 0.000                    | 0.000                      | 0.000                      | 0.000                     | 0.000                                       | 0.000     | 0.000                        | 0.000                        | 0.000                       |

**Table D-5**  
**5G mmW NR Phablet Total Exposure Ratio**

|                  |                | psPD  | 5 GHz WLAN Ant1<br>Reported SAR | 5 GHz WLAN Ant2<br>Reported SAR | 5 GHz WLAN MIMO<br>Reported SAR | psPD + 5 GHz WLAN Ant 1 | psPD + 5 GHz WLAN Ant 2 | psPD + 5 GHz WLAN MIMO |
|------------------|----------------|-------|---------------------------------|---------------------------------|---------------------------------|-------------------------|-------------------------|------------------------|
|                  |                |       | 13.0 dBm                        | 13.0 dBm                        | 13.0 dBm                        | 13.0 dBm                | 13.0 dBm                | 13.0 dBm               |
|                  |                |       | W/kg                            | W/kg                            | W/kg                            | W/kg                    | W/kg                    | W/kg                   |
| Applicable Limit |                |       | 1.0                             | 4.0                             | 4.0                             | 4.0                     | 1.0                     | 1.0                    |
| Back Side        | Reported Value | 0.750 | 0.426                           | 0.581                           | 0.907                           | 0.857                   | 0.895                   | 0.977                  |
|                  | Ratio to Limit | 0.750 | 0.107                           | 0.145                           | 0.227                           | 0.857                   | 0.895                   | 0.977                  |
| Front Side       | Reported Value | 0.306 | 0.426                           | 0.581                           | 0.907                           | 0.413                   | 0.452                   | 0.533                  |
|                  | Ratio to Limit | 0.306 | 0.107                           | 0.145                           | 0.227                           | 0.413                   | 0.452                   | 0.533                  |
| Top Edge         | Reported Value | 0.157 | 0.426                           | 0.581                           | 0.907                           | 0.263                   | 0.302                   | 0.384                  |
|                  | Ratio to Limit | 0.157 | 0.107                           | 0.145                           | 0.227                           | 0.263                   | 0.302                   | 0.384                  |
| Bottom Edge      | Reported Value | 0.077 | 0.000                           | 0.000                           | 0.000                           | 0.077                   | 0.077                   | 0.077                  |
|                  | Ratio to Limit | 0.077 | 0.000                           | 0.000                           | 0.000                           | 0.077                   | 0.077                   | 0.077                  |
| Right Edge       | Reported Value | 0.750 | 0.000                           | 0.000                           | 0.000                           | 0.750                   | 0.750                   | 0.750                  |
|                  | Ratio to Limit | 0.750 | 0.000                           | 0.000                           | 0.000                           | 0.750                   | 0.750                   | 0.750                  |
| Left Edge        | Reported Value | 0.750 | 0.426                           | 0.581                           | 0.162                           | 0.857                   | 0.895                   | 0.903                  |
|                  | Ratio to Limit | 0.750 | 0.107                           | 0.145                           | 0.041                           | 0.857                   | 0.895                   | 0.903                  |

|                                        |                                                                                     |                                               |                                                                                       |                                     |
|----------------------------------------|-------------------------------------------------------------------------------------|-----------------------------------------------|---------------------------------------------------------------------------------------|-------------------------------------|
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**Notes:**

1. Worst-case power density results for each test configuration among all antenna arrays (L Patch, M Patch) and among all supported bands (n261, n260) were considered for TER analysis.
2. For test positions that were not required to be evaluated for WLAN SAR per FCC KDB publication 248227, the worst-case WLAN SAR result for the applicable exposure conditions was used for simultaneous transmission analysis, as indicated in the above tables in blue.
3. Per KDB Publication 248227 D01v02r02, SAR for MIMO was evaluated by following the simultaneous SAR provisions from KDB Publication 447498 D01v06 by evaluating the sum of the 1g SAR values of each antenna transmitting independently, as indicated in the above tables in green.
4. For back side, power density results at 2 mm were considered as a more conservative evaluation for 15 mm body-worn
5. For front side, top edge, left edge, and right edge, power density results at 2 mm were considered as a more conservative evaluation for 10 mm hotspot.
6. Per FCC guidance, the bands/modes that are not required to be evaluated for Phablet SAR are not considered for TER analysis.
7. Per FCC guidance, for power density measurements, a test separation distance of 2 mm was used for phablet configuration due to probe restraints.
8. Worst-case front side reported psPD was considered for Head TER analysis.
9. The worst-case between Adjusted Reported psPD and Measured Total psPD x 0.75 was chosen for TER analysis. The bolded psPD values in Table D-1 indicate the worst-case Reported psPD used in TER analysis.
10. In WLAN MIMO operations, each antenna transmits at maximum allowed powers as indicated above.

The above numerical summed PD and SAR for all the worst-case simultaneous transmission conditions were below the Total Exposure Ratio. Therefore, the above analysis is sufficient to determine no further test cases are required and that simultaneous transmission is compliant to the FCC RF Exposure Limit.

|                                                   |                                                                                                                                                                                                                                 |                                            |
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## Mathematical Derivation of TER Compliance

$$\text{Total Normalized RFx} = \text{Normalized RFx}_{\text{Time Averaged WWAN}} + \text{Normalized RFx}_{\text{WLAN}} \leq 1.0 \quad (1)$$

Since WWAN Smart Transmit algorithm adds directly the time-averaged RF exposure from 4G and time-averaged RF exposure from 5G mmW NR, per chipset manufacturer's guidance, Normalized RF exposure from 4G and from 5G mmW NR could be assumed as

$$\text{Normalized RFx}_{\text{Time Averaged WWAN}} = \frac{4G \text{ SAR}}{4G \text{ SAR Limit}} + \frac{5G \text{ mmW NR psPD}}{5G \text{ mmW NR psPD Limit}} \leq 1.0 \quad (2)$$

Smart Transmit algorithm assumes that 4G and 5G mmW NR hotspots are co-located and therefore:

$$\text{Time Averaged WWAN} = [x(t) \times A] + [(1-x(t)) \times B] \leq 1.0 \text{ Normalized Limit} \quad (3)$$

$A$  = Max normalized time-averaged SAR exposure from 4G

$B$  = Max normalized time-averaged PD exposure from 5G mmW NR

$x(t)$  = Ranges between  $[0,1]$

$x(t) \times A$  = Percentage of normalized time-averaged RF exposure from 4G

$(1-x(t)) \times B$  = Remaining percentage of RF exposure contribution from 5G mmW NR

Smart Transmit controls “ $x$ ” in real time such that the sum of these exposures never exceeds 1.0 Normalized Limit. If the equations below (4a, 4b) are proven, then, mathematically equation (5) would be proven.

$$A + \text{norm. SAR from WLAN} \leq 1.0 \text{ normalized limit} \quad (4a)$$

$$B + \text{norm. SAR from WLAN} \leq 1.0 \text{ normalized limit} \quad (4b)$$

$$[x(t) \times A] + [(1-x(t)) \times B] + \text{norm. SAR from WLAN} \leq 1.0 \text{ normalized limit} \quad (5)$$

Without 5G mmW NR, Smart Transmit limits the maximum RF exposure contributed from 4G to 100% normalized exposure. With 5G mmW NR, Smart Transmit limits the maximum RF exposure contributed from 5G mmW NR to 75% normalized exposure to guarantee at least 25% margin allocated to 4G LTE anchor to maintain the link.

Therefore,

$$\text{Smart Tx WWAN: } A = \max(\text{normalized SAR exposure from 4G}) \leq 1.0 \text{ normalized limit} \quad (6a)$$

$$\text{Smart Tx WWAN: } B = 0.75 \times \max(\text{normalized PD exposure from 5G mmW NR}) \leq 1.0 \text{ normalized limit} \quad (6b)$$

To demonstrate simultaneous transmission compliance in equation (1), below equations (7a & 7b) obtained by combining equations (4a & 4b) and (6a & 6b), should be proven for simultaneous transmission compliance:

$$\text{Total Normalized RFx} = \text{Normalized SAR}_{4G \text{ WWAN}} + \text{Normalized SAR}_{\text{WLAN}} < 1.0 \quad (7a)$$

$$\text{Total Normalized RFx} = 0.75 \times \text{Normalized psPD}_{5G \text{ mmW NR WWAN}} + \text{Normalized SAR}_{\text{WLAN}} < 1.0 \quad (7b)$$

which are re-written as:

$$\text{Total Normalized RFx} = \frac{4G \text{ SAR}}{4G \text{ SAR Limit}} + \frac{\text{WLAN SAR}}{\text{WLAN SAR Limit}} < 1 \quad (8a)$$

$$\text{Total Normalized RFx} = 0.75 \times \frac{5G \text{ mmW NR psPD}}{5G \text{ mmW NR psPD Limit}} + \frac{\text{WLAN SAR}}{\text{WLAN SAR Limit}} < 1 \quad (8b)$$

Analysis for equation (8a) is performed in Section 12 of FCC SAR Evaluation Report (Part 1). Analysis for equation (8b) is performed in this appendix, Tables D-2 to D-5.

|                                        |                                                                                                                                                                                                              |                                               |                                                                                       |                                 |
|----------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------|
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