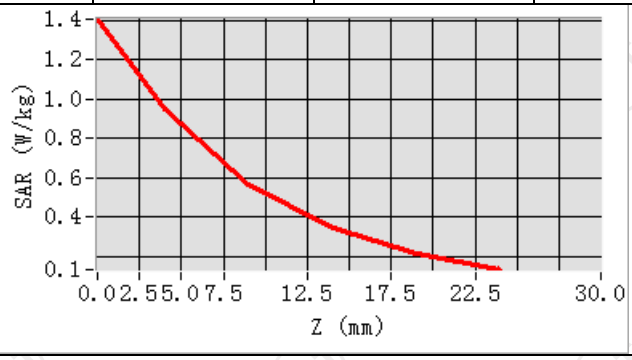
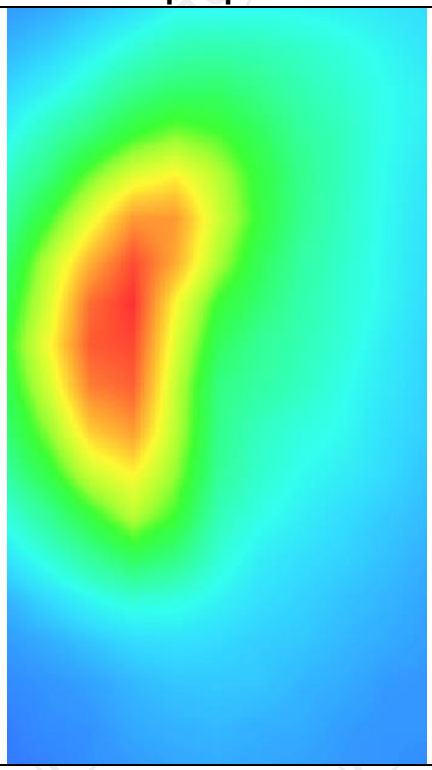
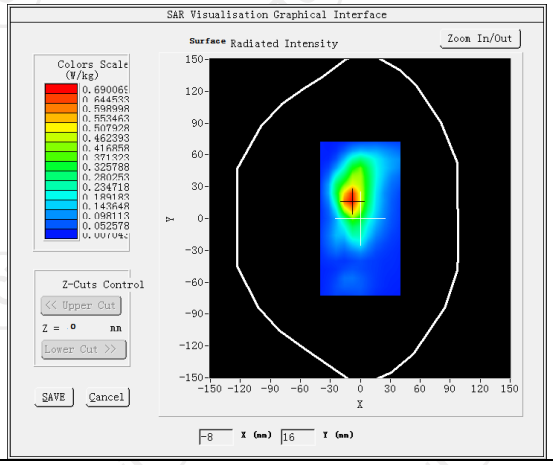
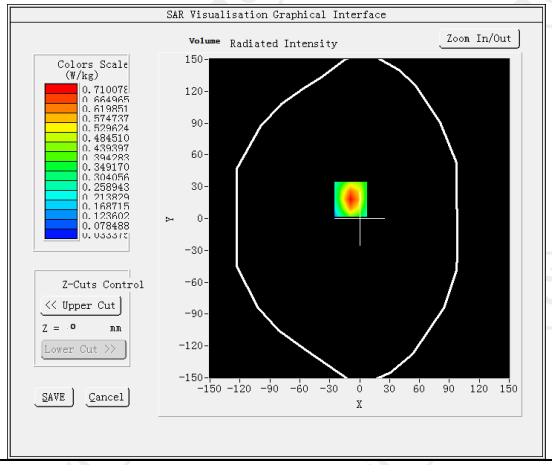
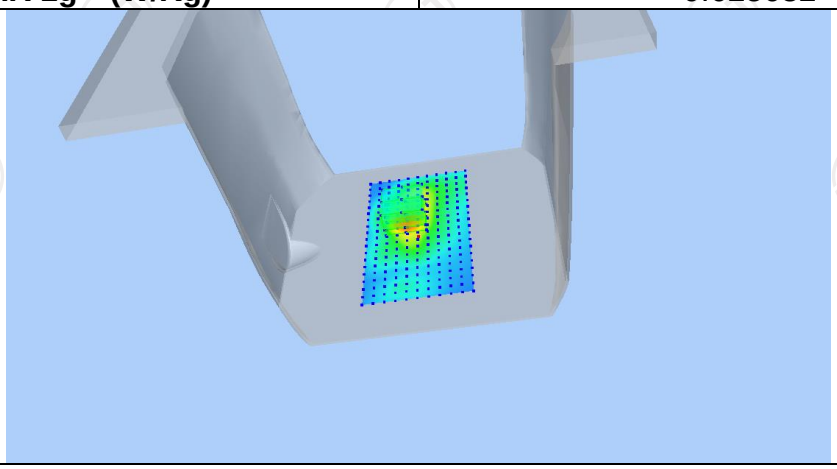
| Z (mm) | 0.00 | 4.00 | 9.00 | 14.00 | 19.00 |
|---|---|---|---|---|---|
| SAR (W/Kg) | 1.4075 | 0.9477 | 0.5692 | 0.3451 | 0.2163 |



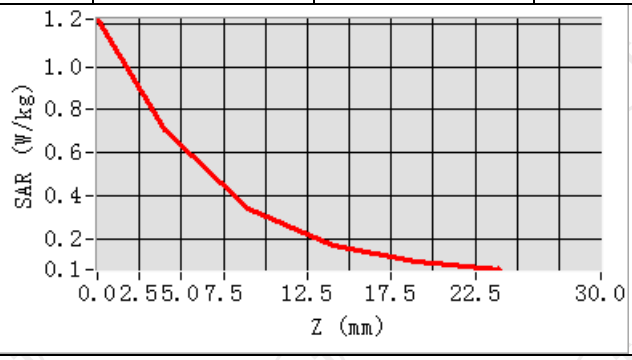

**Hot spot position**



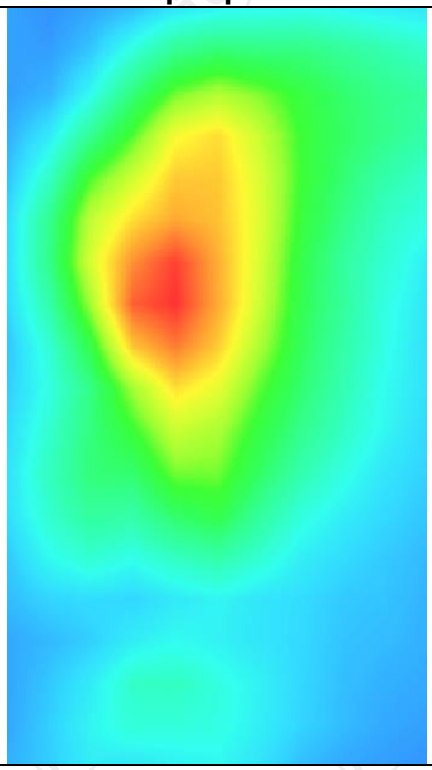
GSM1900

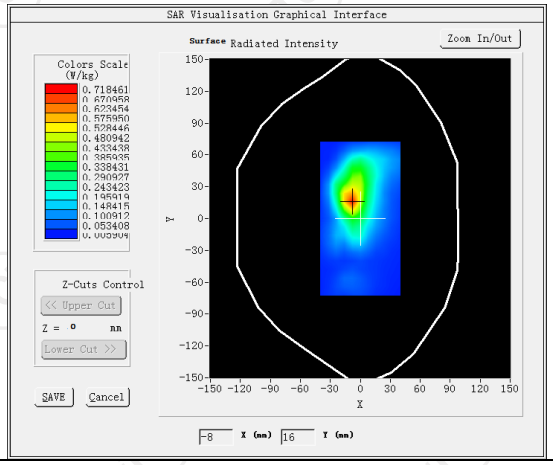
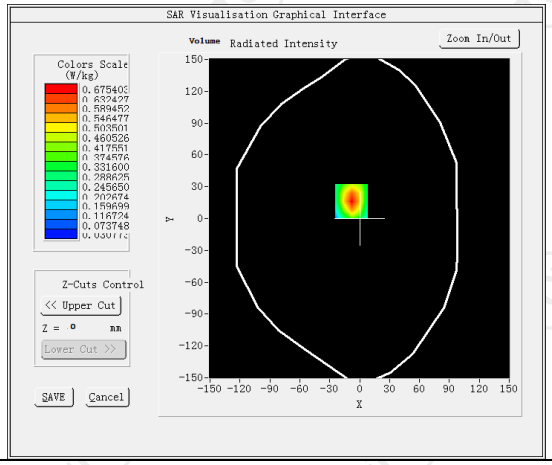
| **MEASUREMENT 1** | |
|---|---|
| Middle Band SAR (Channel 661): | Date: 12/19/2023 |
| **Frequency (MHz)** | 1880.000000 |
| **Relative permittivity (real part)** | 40.000000 |
| **Relative permittivity (imaginary part)** | 13.408000 |
| **Conductivity (S/m)** | 1.400391 |
| **Variation (%)** | 3.510000 |
| **Crest Factor** | 1.0 |
| **Probe Conversion factor** | 2.32 |
| **E-Field Probe:** | SSE2 (SN 25/22 EPGO375) |
| **Area Scan** | dx=8mm dy=8mm, h= 5.00 mm |
| **ZoomScan** | 5x5x7,dx=8mm dy=8mm dz=5mm,Complete/ndx=8mm dy=8mm, h= 5.00 mm |
| **Phantom** | Validation plane |
| **Device Position** | Body back(0mm) |
| **Band** | GSM1900(voice) |
| **SURFACE SAR** | **VOLUME SAR** |
|  |  |
| **Maximum location: X=-9.00, Y=18.00 SAR Peak: 1.22 W/kg** | |
| **SAR 10g (W/Kg)** | 0.334060 |
| **SAR 1g (W/Kg)** | 0.625682 |
|  | |

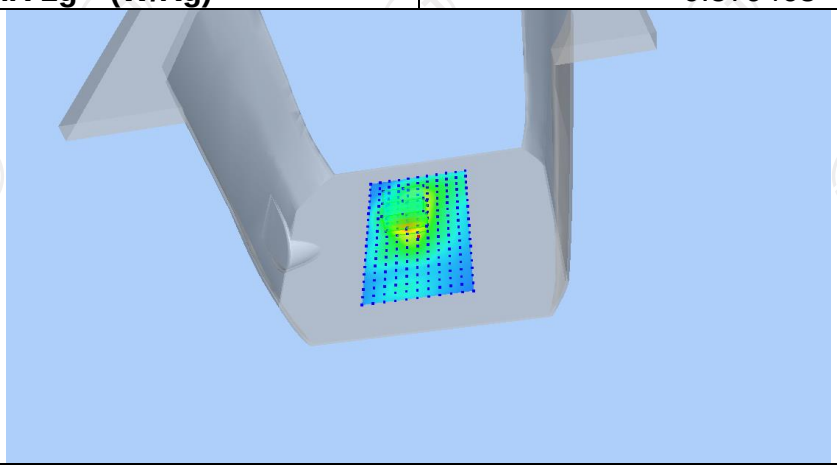
| Z (mm) | 0.00 | 4.00 | 9.00 | 14.00 | 19.00 |
|---|---|---|---|---|---|
| SAR (W/Kg) | 1.2196 | 0.7101 | 0.3463 | 0.1730 | 0.0983 |



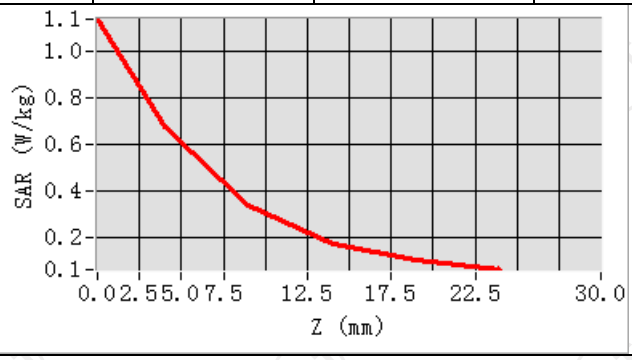

**Hot spot position**



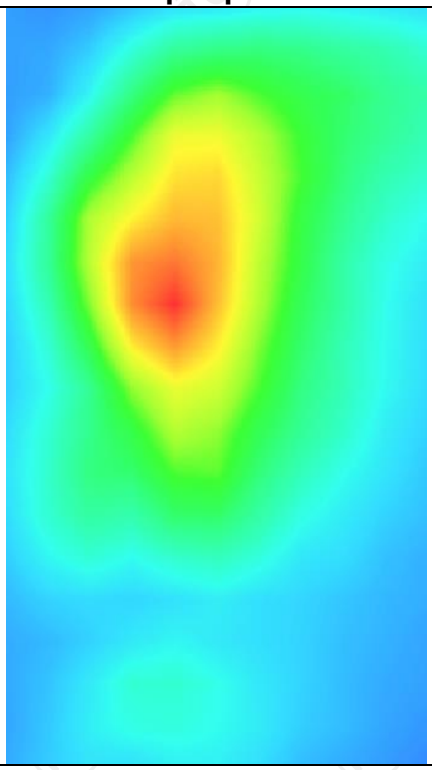
| MEASUREMENT 2 | |
|---|---|
| Middle Band SAR (Channel 661): | Date: 12/19/2023 |
| **Frequency (MHz)** | 1880.000000 |
| **Relative permittivity (real part)** | 40.000000 |
| **Relative permittivity (imaginary part)** | 13.408000 |
| **Conductivity (S/m)** | 1.400391 |
| **Variation (%)** | 4.250000 |
| **Crest Factor** | 1.0 |
| **Probe Conversion factor** | 2.23 |
| **E-Field Probe:** | SSE2 (SN 25/22 EPGO375) |
| **Area Scan** | dx=8mm dy=8mm, h= 5.00 mm |
| **ZoomScan** | 5x5x7,dx=8mm dy=8mm dz=5mm,Complete/ndx=8mm dy=8mm, h= 5.00 mm |
| **Phantom** | Validation plane |
| **Device Position** | Body back(0mm) |
| **Band** | GSM1900(GPRS 2slot) |
| **SURFACE SAR** | **VOLUME SAR** |
|  |  |
| **Maximum location: X=-8.00, Y=16.00 SAR Peak:1.14 W/kg** | |
| **SAR 10g (W/Kg)** | 0.319427 |
| **SAR 1g (W/Kg)** | 0.579468 |

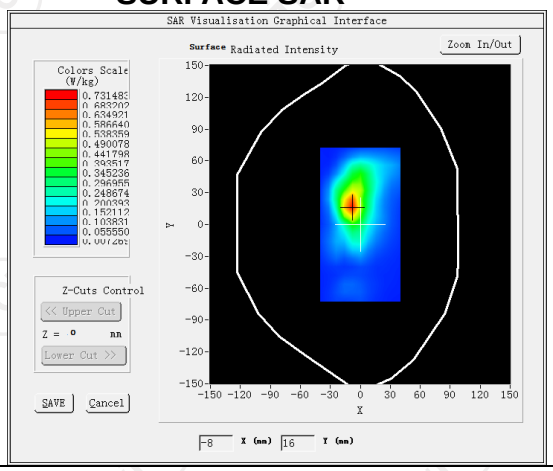
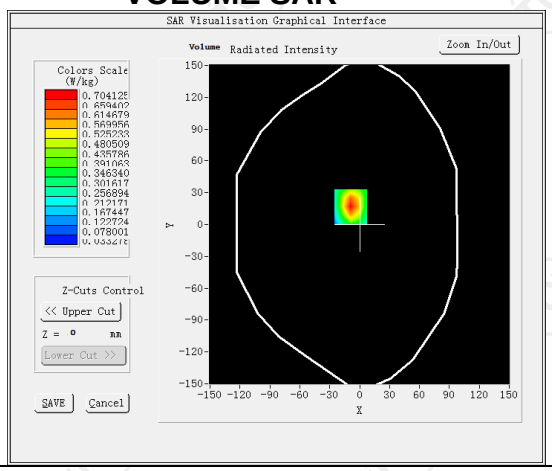
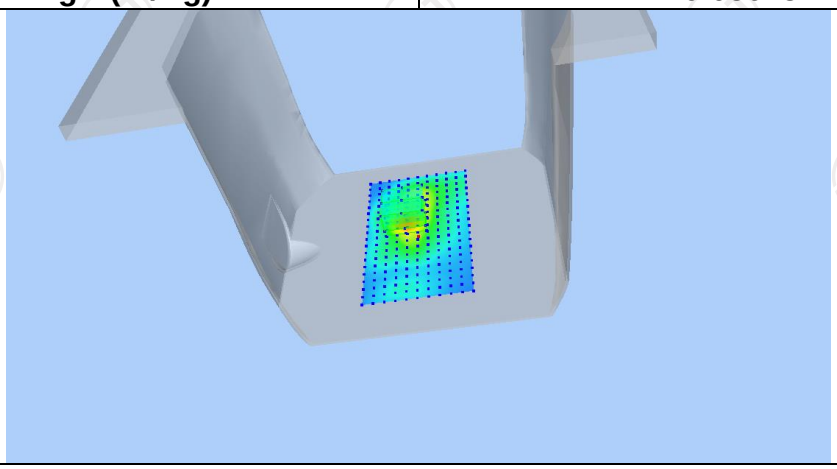


| Z (mm) | 0.00 | 4.00 | 9.00 | 14.00 | 19.00 |
|---|---|---|---|---|---|
| SAR (W/Kg) | 1.1359 | 0.6754 | 0.3401 | 0.1753 | 0.1010 |

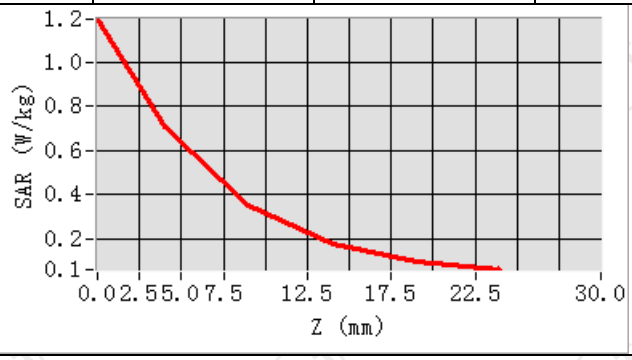



**Hot spot position**

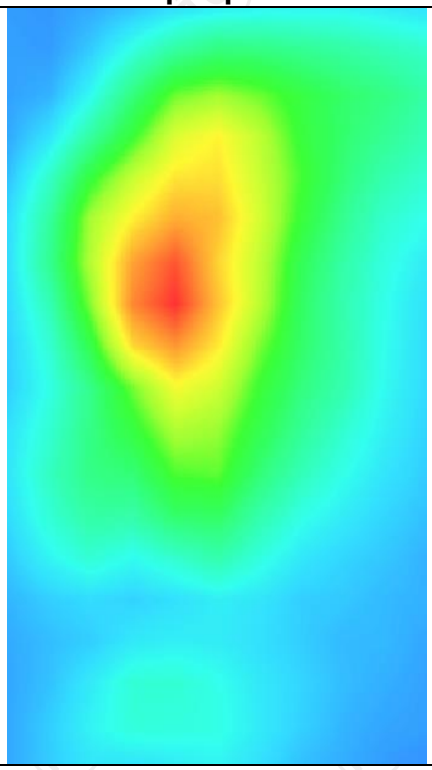


| MEASUREMENT 3 | |
|---|---|
| Middle Band SAR (Channel 661): | Date: 12/19/2023 |
| **Frequency (MHz)** | 1880.000000 |
| **Relative permittivity (real part)** | 40.000000 |
| **Relative permittivity (imaginary part)** | 13.408000 |
| **Conductivity (S/m)** | 1.400391 |
| **Variation (%)** | -1.660000 |
| **Crest Factor** | 1.0 |
| **Probe Conversion factor** | 2.23 |
| **E-Field Probe:** | SSE2 (SN 25/22 EPGO375) |
| **Area Scan** | dx=8mm dy=8mm, h= 5.00 mm |
| **ZoomScan** | 5x5x7,dx=8mm dy=8mm dz=5mm,Complete/ndx=8mm dy=8mm, h= 5.00 mm |
| **Phantom** | Validation plane |
| **Device Position** | Body back(0mm) |
| **Band** | GSM1900(GPRS 2slot hotspot) |
| **SURFACE SAR** | **VOLUME SAR** |
|   |   |
| **Maximum location: X=-9.00, Y=-17.00 SAR Peak: 1.20W/kg** | |
| **SAR 10g (W/Kg)** | 0.323140 |
| **SAR 1g (W/Kg)** | 0.636434 |
|  | |

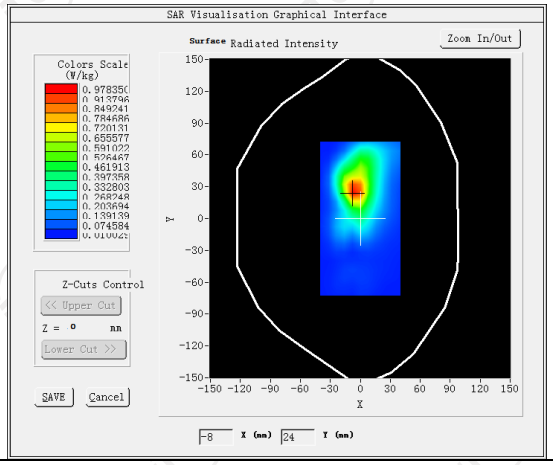
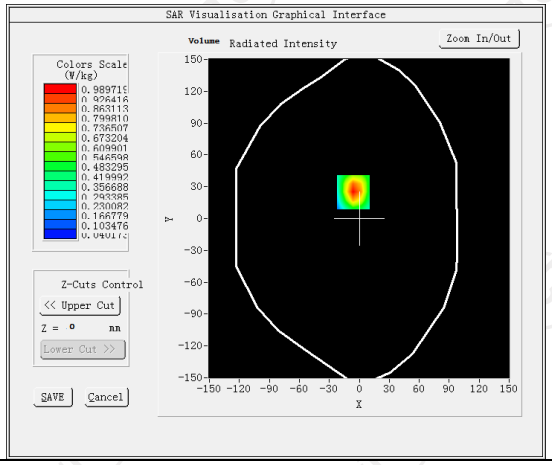
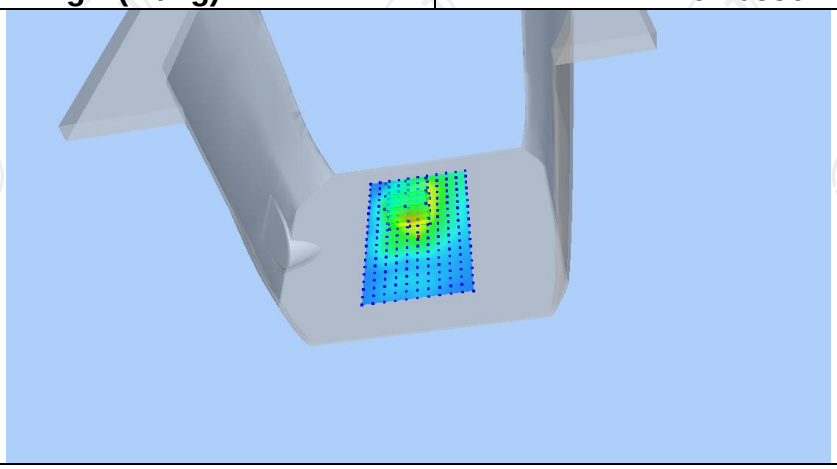
| Z (mm) | 0.00 | 4.00 | 9.00 | 14.00 | 19.00 |
|---|---|---|---|---|---|
| SAR (W/Kg) | 1.1923 | 0.7041 | 0.3509 | 0.1790 | 0.1026 |



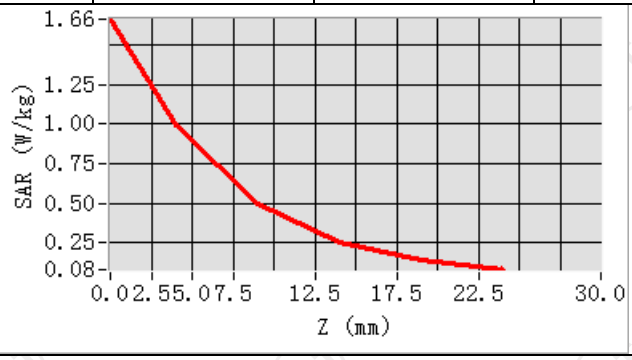

**Hot spot position**



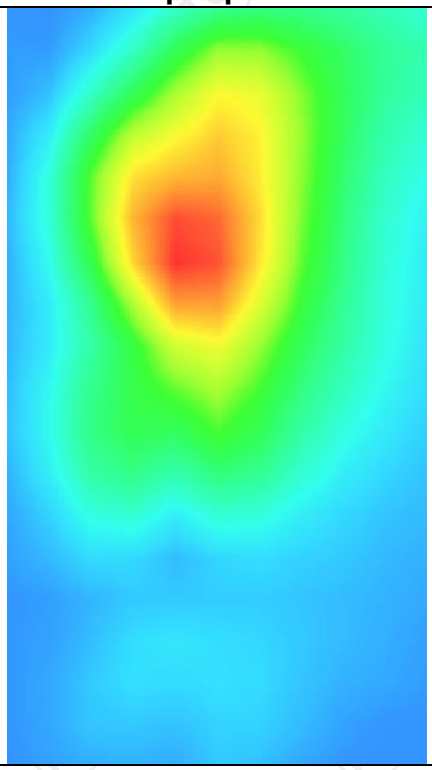
WCDMA Band II

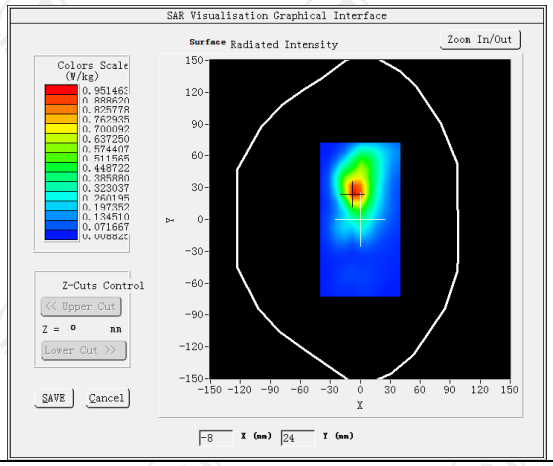
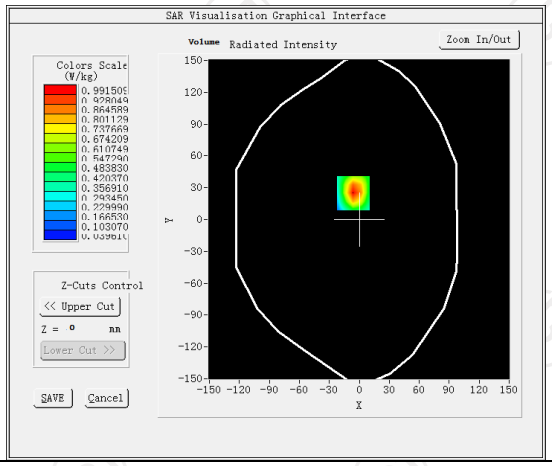
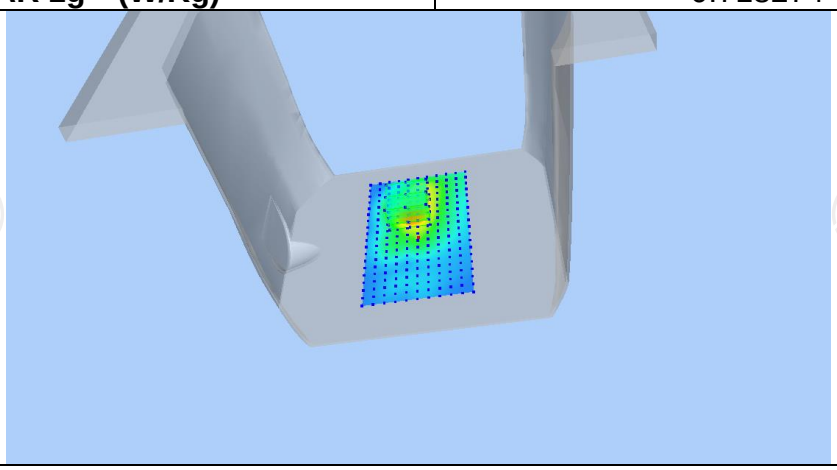
| **MEASUREMENT 1** | |
|---|---|
| Middle Band SAR (Channel 9400): | Date: 12/19/2023 |
| **Frequency (MHz)** | 1880.000000 |
| **Relative permittivity (real part)** | 40.000000 |
| **Relative permittivity (imaginary part)** | 13.408000 |
| **Conductivity (S/m)** | 1.400391 |
| **Variation (%)** | 2.570000 |
| **Crest Factor** | 1.0 |
| **Probe Conversion factor** | 2.23 |
| **E-Field Probe:** | SSE2 (SN 25/22 EPGO375) |
| **Area Scan** | dx=8mm dy=8mm, h= 5.00 mm |
| **ZoomScan** | 5x5x7,dx=8mm dy=8mm dz=5mm,Complete/ndx=8mm dy=8mm, h= 5.00 mm |
| **Phantom** | Validation plane |
| **Device Position** | Body back(0mm) |
| **Band** | BAND2_WCDMA1900 |
| **SURFACE SAR** | **VOLUME SAR** |
|  |  |
| **Maximum location: X=-6.00, Y=25.00 SAR Peak:1.68 W/kg** | |
| **SAR 10g (W/Kg)** | 0.370217 |
| **SAR 1g (W/Kg)** | 0.708361 |
|  | |

| Z (mm) | 0.00 | 4.00 | 9.00 | 14.00 | 19.00 |
|---|---|---|---|---|---|
| SAR (W/Kg) | 1.6650 | 0.9897 | 0.4958 | 0.2507 | 0.1386 |

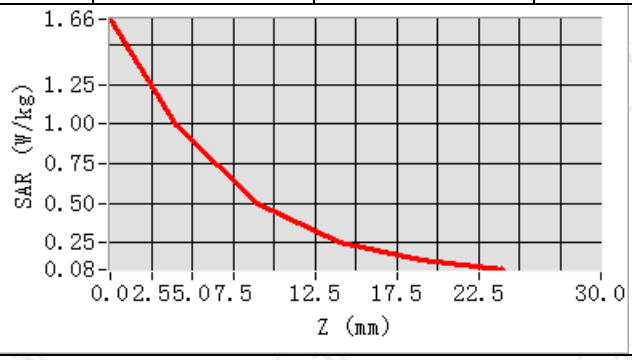



**Hot spot position**

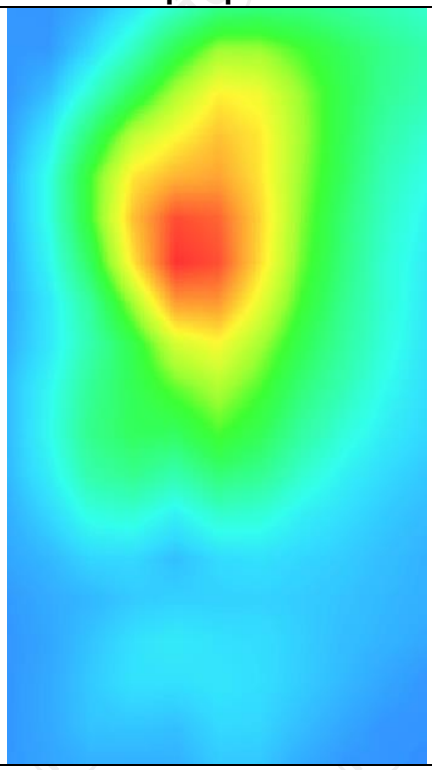


| MEASUREMENT 2 | |
|---|---|
| Middle Band SAR (Channel 9400): | Date: 12/19/2023 |
| **Frequency (MHz)** | 1880.000000 |
| **Relative permittivity (real part)** | 40.000000 |
| **Relative permittivity (imaginary part)** | 13.408000 |
| **Conductivity (S/m)** | 1.400391 |
| **Variation (%)** | 4.050000 |
| **Crest Factor** | 1.0 |
| **Probe Conversion factor** | 2.23 |
| **E-Field Probe:** | SSE2 (SN 25/22 EPGO375) |
| **Area Scan** | dx=8mm dy=8mm, h= 5.00 mm |
| **ZoomScan** | 5x5x7,dx=8mm dy=8mm dz=5mm,Complete/ndx=8mm dy=8mm, h= 5.00 mm |
| **Phantom** | Validation plane |
| **Device Position** | Body back(0mm) |
| **Band** | BAND2_WCDMA1900(hotspot) |
| **SURFACE SAR** | **VOLUME SAR** |
|  |  |
| **Maximum location: X=-6.00, Y=25.00 SAR Peak: 1.68 W/kg** | |
| **SAR 10g (W/Kg)** | 0.370039 |
| **SAR 1g (W/Kg)** | 0.718274 |
|  | |

| Z (mm) | 0.00 | 4.00 | 9.00 | 14.00 | 19.00 |
|---|---|---|---|---|---|
| SAR (W/Kg) | 1.6643 | 0.9915 | 0.4984 | 0.2531 | 0.1404 |




**Hot spot position**



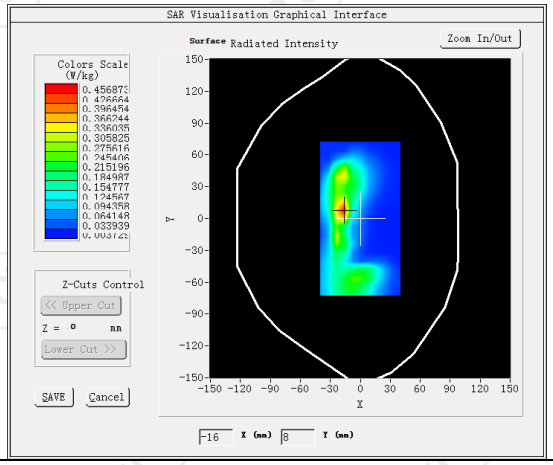
WCDMA Band IV

**MEASUREMENT 1**

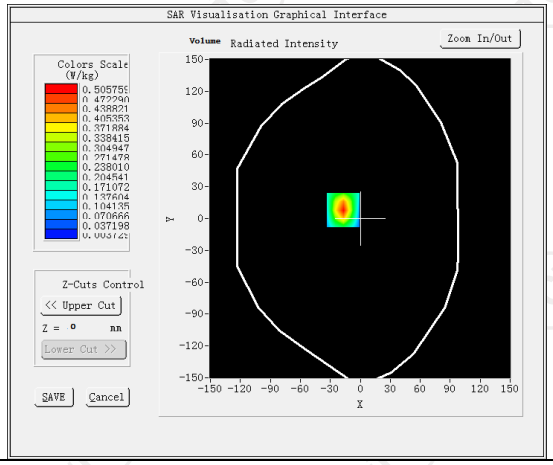
High Band SAR (Channel 1513): Date: 12/18/2023

| | |
|---|---|
| **Frequency (MHz)** | 1752.600000 |
| **Relative permittivity (real part)** | 41.500000 |
| **Relative permittivity (imaginary part)** | 19.400000 |
| **Conductivity (S/m)** | 0.901453 |
| **Variation (%)** | 3.400000 |
| **Crest Factor** | 1.0 |
| **Probe Conversion factor** | 2.08 |
| **E-Field Probe:** | SSE2 (SN 25/22 EPGO375) |
| **Area Scan** | dx=8mm dy=8mm, h= 5.00 mm |
| **ZoomScan** | 5x5x7,dx=8mm dy=8mm dz=5mm,Complete/ndx=8mm dy=8mm, h= 5.00 mm |
| **Phantom** | Validation plane |
| **Device Position** | Body back(0mm) |
| **Band** | BAND4_WCDMA1700 |

**SURFACE SAR**

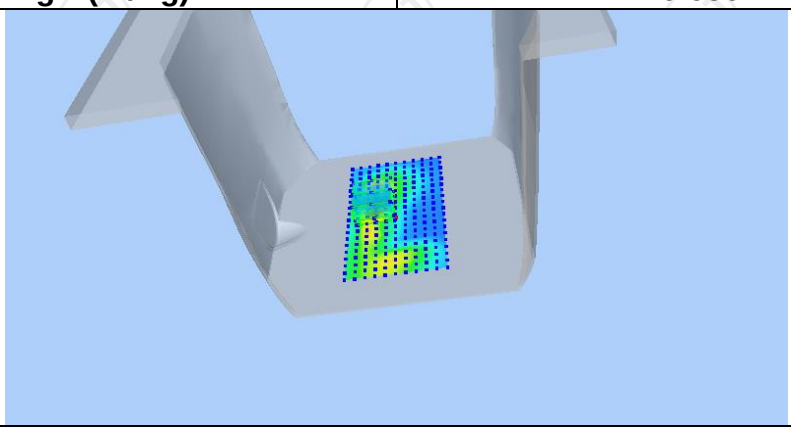



**VOLUME SAR**

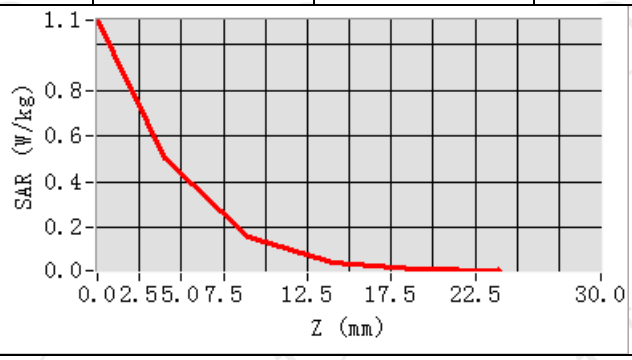



**Maximum location: X=-17.00, Y=8.00 SAR Peak:1.10 W/kg**

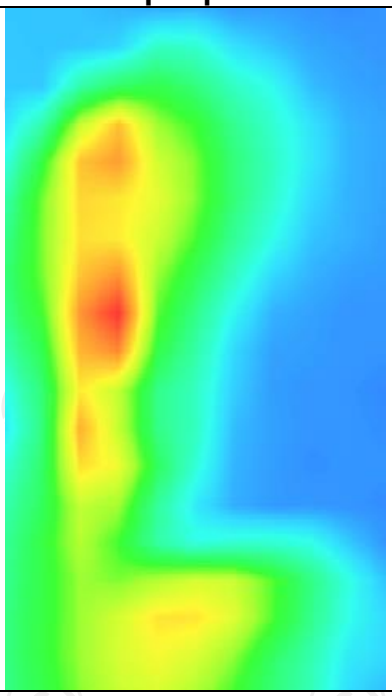
| | |
|---|---|
| **SAR 10g (W/Kg)** | 0.312897 |
| **SAR 1g (W/Kg)** | 0.656171 |

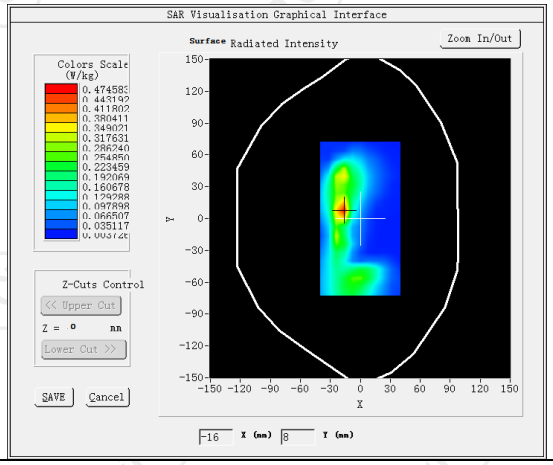
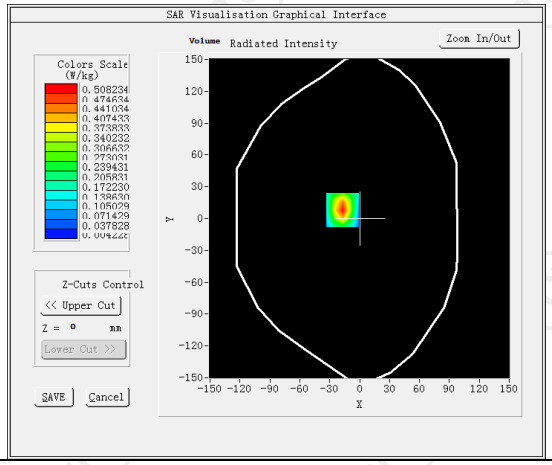
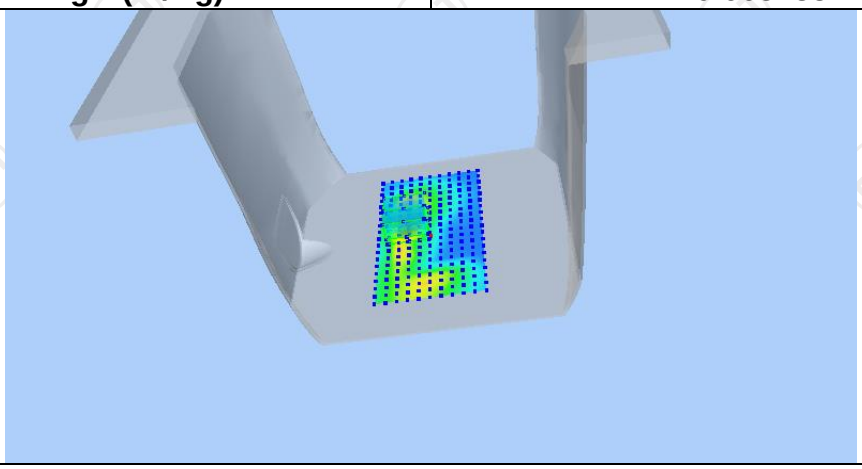


| Z (mm) | 0.00 | 4.00 | 9.00 | 14.00 | 19.00 |
|---|---|---|---|---|---|
| SAR (W/Kg) | 1.1085 | 0.5058 | 0.1563 | 0.0429 | 0.0165 |

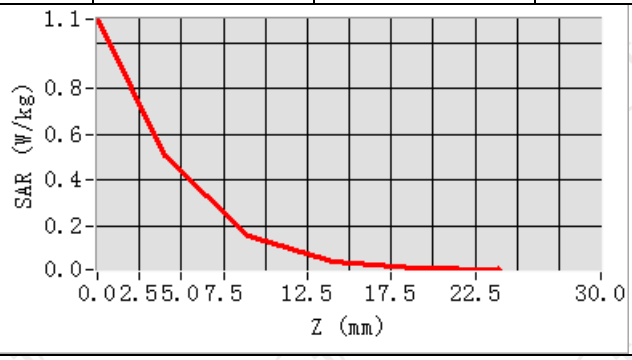



**Hot spot position**

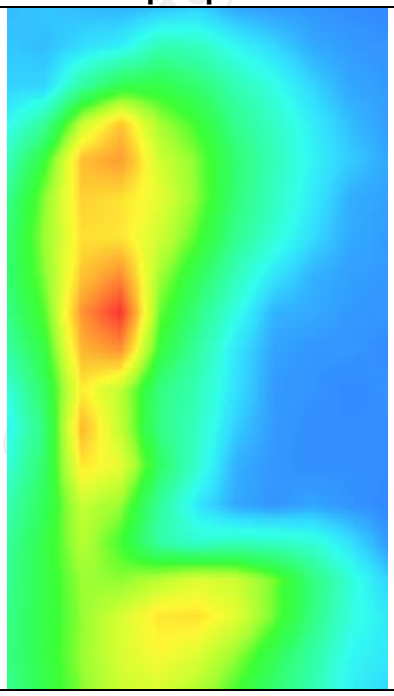


| MEASUREMENT 2 | |
|---|---|
| High Band SAR (Channel 1513): | Date: 12/18/2023 |
| **Frequency (MHz)** | 1752.600000 |
| **Relative permittivity (real part)** | 40.116364 |
| **Relative permittivity (imaginary part)** | 14.137455 |
| **Conductivity (S/m)** | 1.360337 |
| **Variation (%)** | 3.250000 |
| **Crest Factor** | 1.0 |
| **Probe Conversion factor** | 2.08 |
| **E-Field Probe:** | SSE2 (SN 25/22 EPGO375) |
| **Area Scan** | dx=8mm dy=8mm, h= 5.00 mm |
| **ZoomScan** | 5x5x7,dx=8mm dy=8mm dz=5mm,Complete/ndx=8mm dy=8mm, h= 5.00 mm |
| **Phantom** | Validation plane |
| **Device Position** | Body back(hotspot 0mm) |
| **Band** | BAND4_WCDMA1700 |
| **SURFACE SAR** | **VOLUME SAR** |
|  |  |
| **Maximum location: X=-17.00, Y=8.00 SAR Peak: 1.10 W/kg** | |
| **SAR 10g (W/Kg)** | 0.291353 |
| **SAR 1g (W/Kg)** | 0.668183 |
|  | |

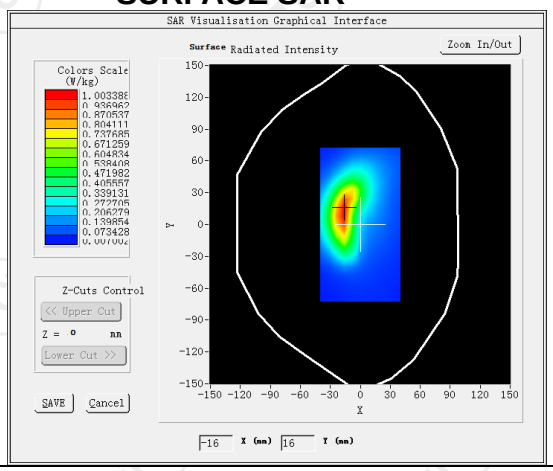
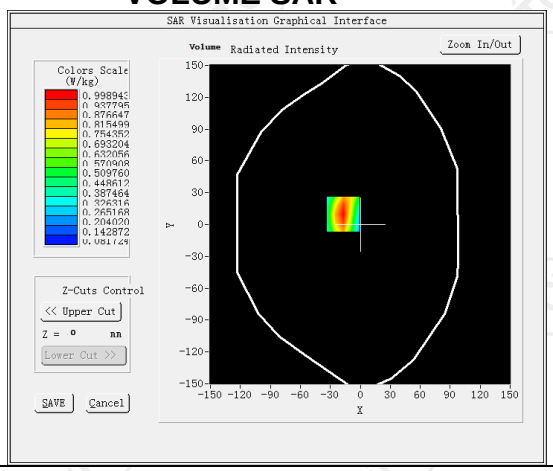
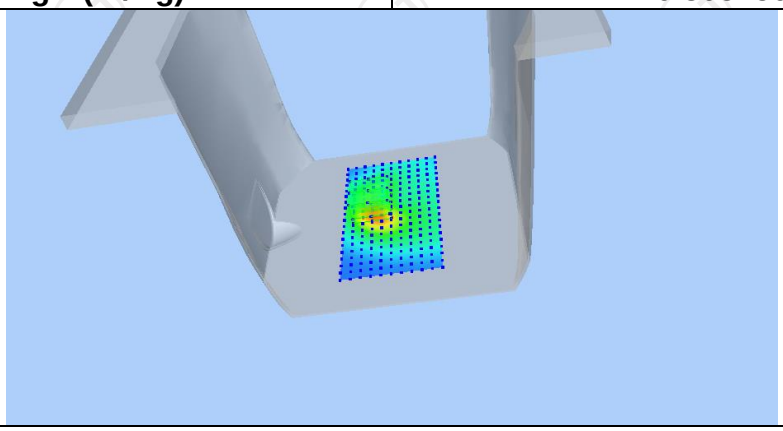
| Z (mm) | 0.00 | 4.00 | 9.00 | 14.00 | 19.00 |
|---|---|---|---|---|---|
| SAR (W/Kg) | 1.1034 | 0.5082 | 0.1600 | 0.0448 | 0.0169 |



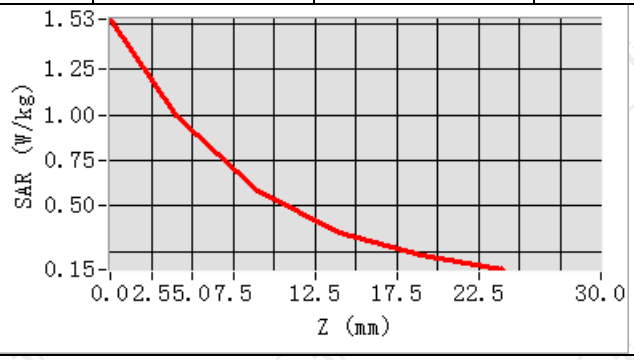

**Hot spot position**



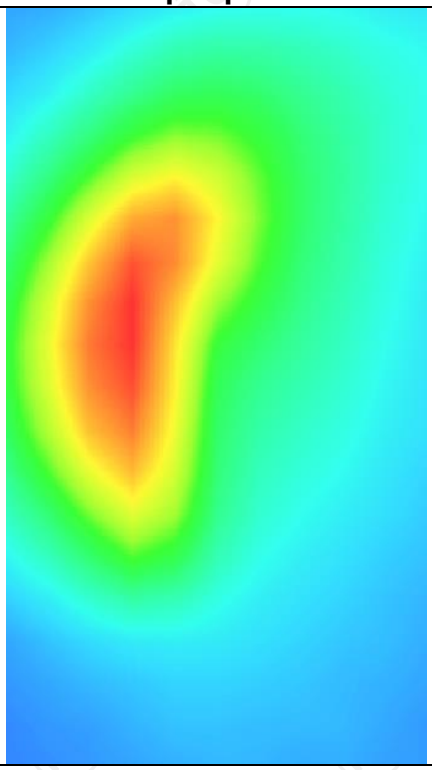
WCDMA Band V

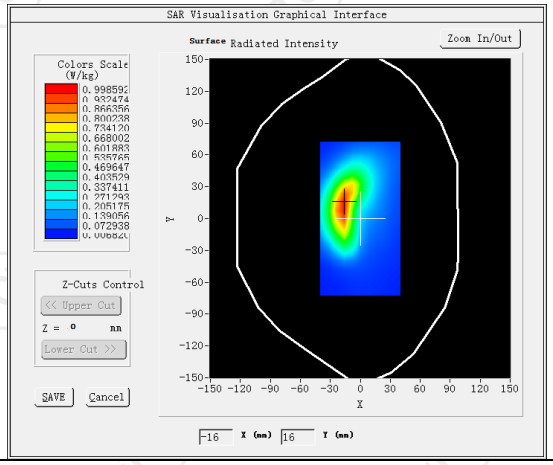
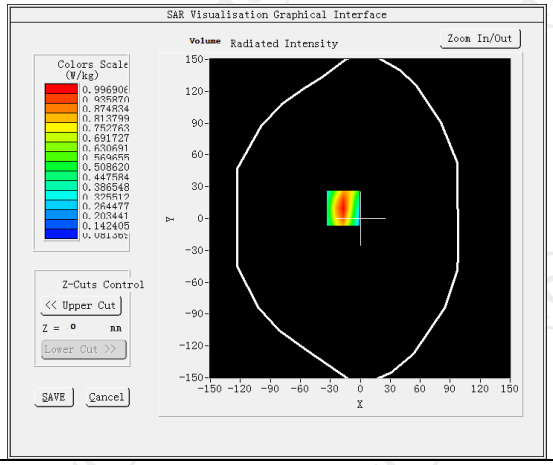
| **MEASUREMENT 1** | |
|---|---|
| Low Band SAR (Channel 4132): | Date: 12/14/2023 |
| **Frequency (MHz)** | 826.400000 |
| **Relative permittivity (real part)** | 41.500000 |
| **Relative permittivity (imaginary part)** | 19.400000 |
| **Conductivity (S/m)** | 0.901453 |
| **Variation (%)** | 2.680000 |
| **Crest Factor:** | 1.0 |
| **Probe Conversion factor** | 1.80 |
| **E-Field Probe:** | SSE2 (SN 25/22 EPGO375) |
| **Area Scan** | dx=8mm dy=8mm, h= 5.00 mm |
| **ZoomScan** | 5x5x7,dx=8mm dy=8mm dz=5mm,Complete/ndx=8mm dy=8mm, h= 5.00 mm |
| **Phantom** | Validation plane |
| **Device Position** | Body back(0mm) |
| **Band** | BAND5_WCDMA850 |
| **SURFACE SAR** | **VOLUME SAR** |
|  |  |
| **Maximum location: X=-17.00, Y=10.00 SAR Peak: 1.53 W/kg** | |
| **SAR 10g (W/Kg)** | 0.201201 |
| **SAR 1g (W/Kg)** | 0.303150 |
|  | |

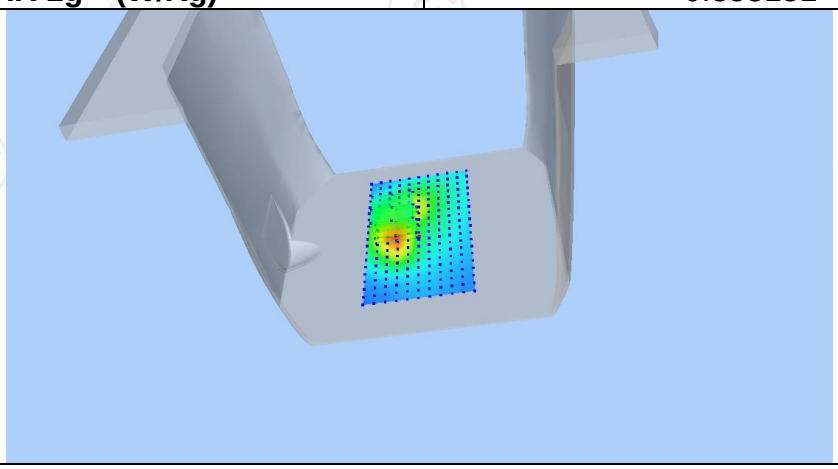
| Z (mm) | 0.00 | 4.00 | 9.00 | 14.00 | 19.00 |
|---|---|---|---|---|---|
| SAR (W/Kg) | 1.5251 | 0.9989 | 0.5827 | 0.3510 | 0.2279 |



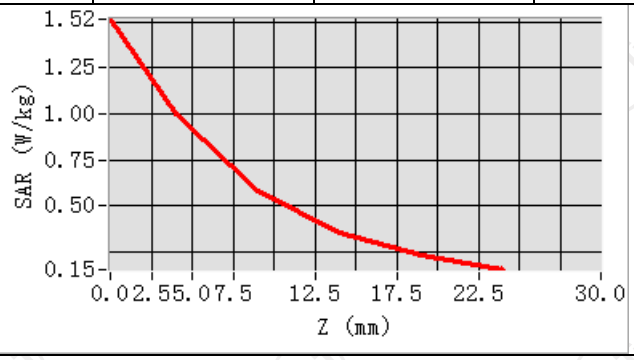

**Hot spot position**



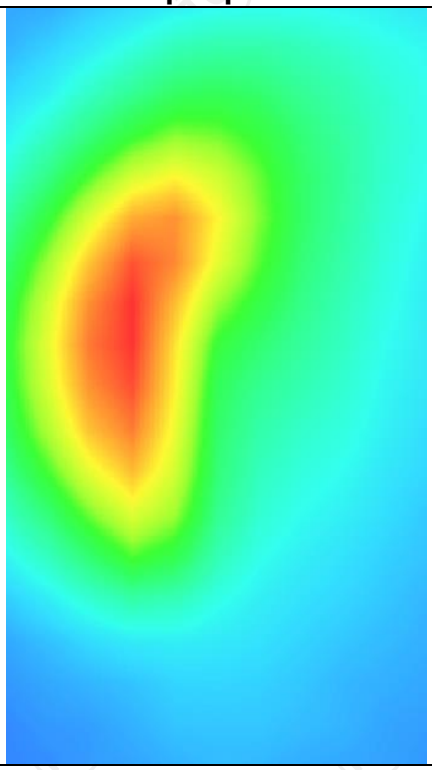
| MEASUREMENT 2 | |
|---|---|
| Low Band SAR (Channel 4132): | Date: 12/14/2023 |
| Low Band SAR (Channel 4132): | 826.400000 |
| **Relative permittivity (real part)** | 41.500000 |
| **Relative permittivity (imaginary part)** | 19.400000 |
| **Conductivity (S/m)** | 0.901453 |
| **Variation (%)** | 1.520000 |
| **Crest Factor:** | 1.0 |
| **Probe Conversion factor** | 1.80 |
| **E-Field Probe:** | SSE2 (SN 25/22 EPGO375) |
| **Area Scan** | dx=8mm dy=8mm, h= 5.00 mm |
| **ZoomScan** | 5x5x7,dx=8mm dy=8mm dz=5mm,Complete/ndx=8mm dy=8mm, h= 5.00 mm |
| **Phantom** | Validation plane |
| **Device Position** | Body back(0mm) |
| **Band** | BAND5_WCDMA850(hotspot) |
| **SURFACE SAR** | **VOLUME SAR** |
|   |   |
| **Maximum location: X=-17.00, Y=10.00 SAR Peak:1.52 W/kg** | |
| **SAR 10g (W/Kg)** | 0.231588 |
| **SAR 1g (W/Kg)** | 0.353151 |



| Z (mm) | 0.00 | 4.00 | 9.00 | 14.00 | 19.00 |
|---|---|---|---|---|---|
| SAR (W/Kg) | 1.5162 | 0.9969 | 0.5845 | 0.3536 | 0.2301 |

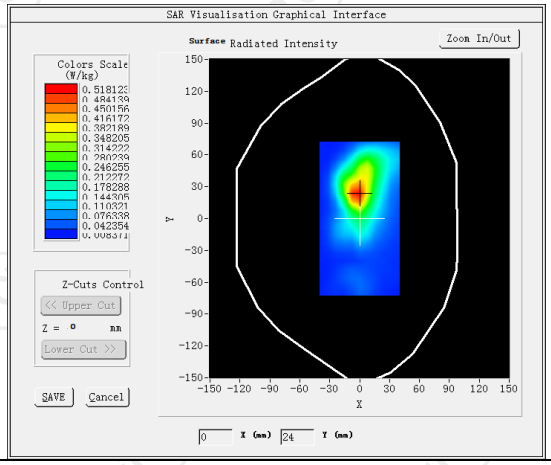


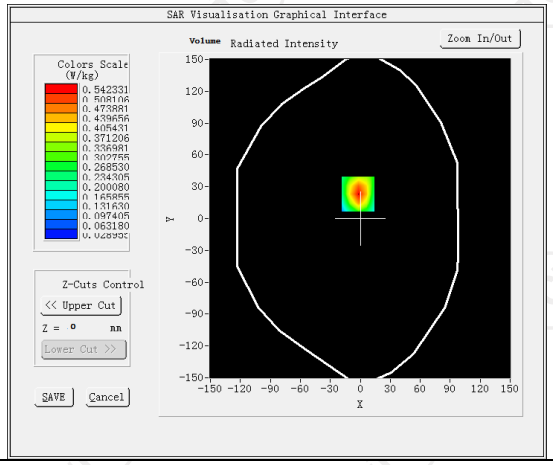

**Hot spot position**



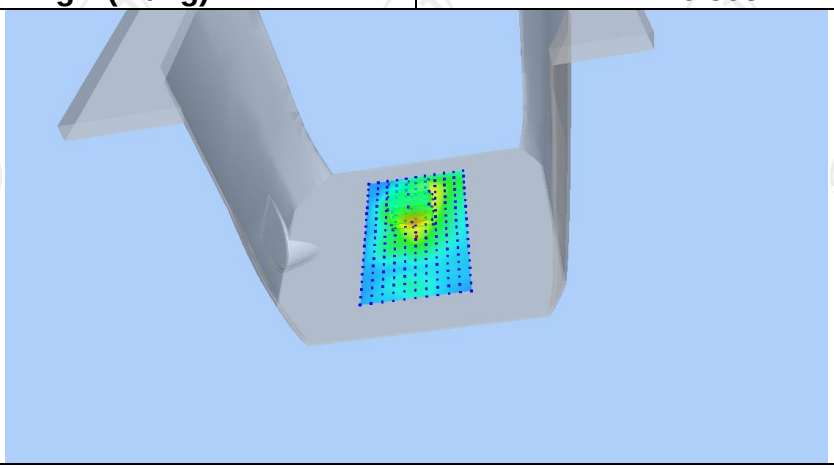
LTE Band 2

| MEASUREMENT 1 | |
|---|---|
| Low Band SAR (Channel 18700): | Date: 12/19/2023 |
| **Frequency (MHz)** | 1860.000000 |
| **Relative permittivity (real part)** | 40.000000 |
| **Relative permittivity (imaginary part)** | 13.411700 |
| **Conductivity (S/m)** | 1.400405 |
| **Variation (%)** | 2.650000 |
| **Crest Factor** | 1.0 |
| **Probe Conversion factor** | 2.23 |
| **E-Field Probe:** | SSE2 (SN 25/22 EPGO375) |
| **Area Scan** | dx=8mm dy=8mm, h= 5.00 mm |
| **ZoomScan** | 5x5x7,dx=8mm dy=8mm dz=5mm,Complete/ndx=8mm dy=8mm, h= 5.00 mm |
| **Phantom** | Validation plane |
| **Device Position** | Body back(0mm) |
| **Band** | LTE band 2 (1 RB#49) |
| **SURFACE SAR** | **VOLUME SAR** |

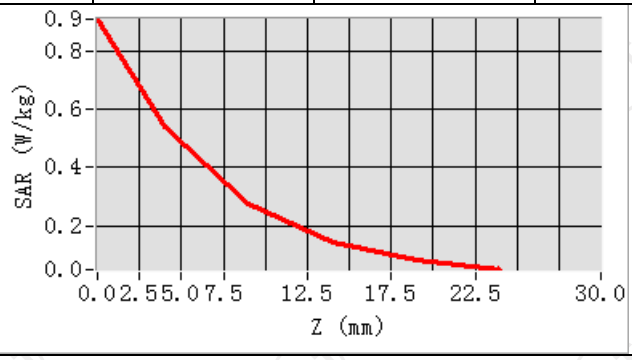


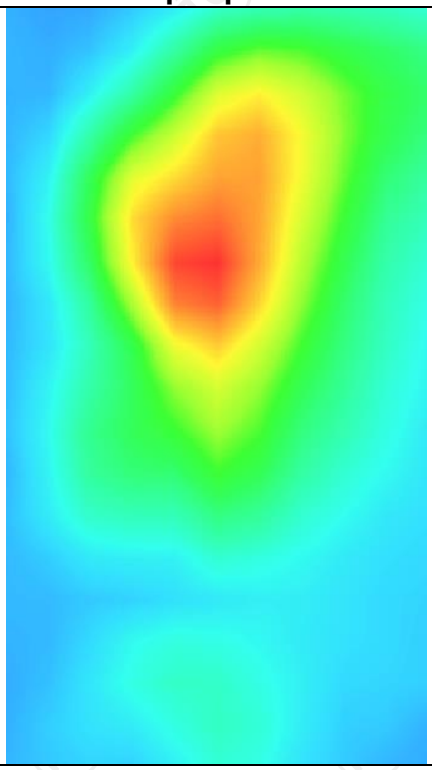

| Maximum location: X=-2.00, Y=23.00 SAR Peak: 0.91 W/kg | |
|---|---|
| **SAR 10g (W/Kg)** | 0.259421 |
| **SAR 1g (W/Kg)** | 0.595141 |



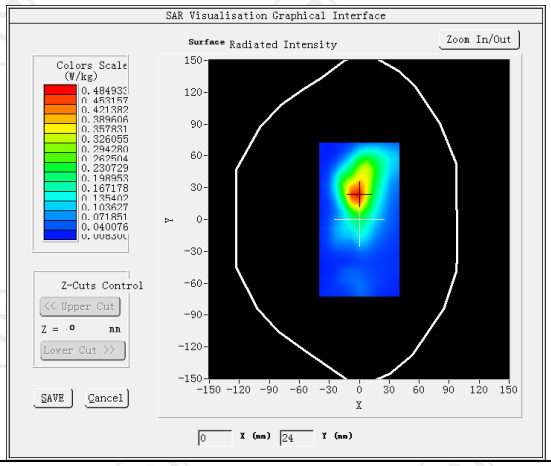
| Z (mm) | 0.00 | 4.00 | 9.00 | 14.00 | 19.00 |
|---|---|---|---|---|---|
| SAR (W/Kg) | 0.9110 | 0.5423 | 0.2733 | 0.1405 | 0.0802 |

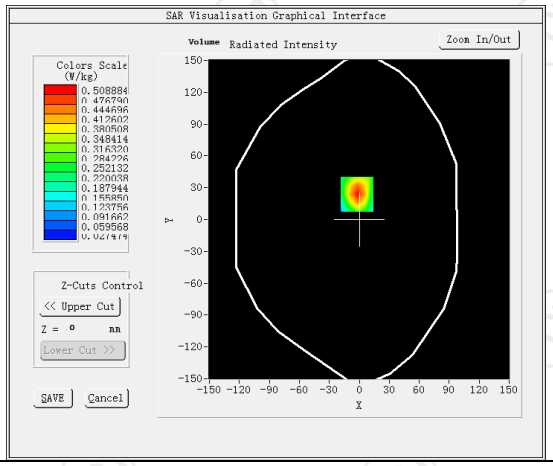



**Hot spot position**

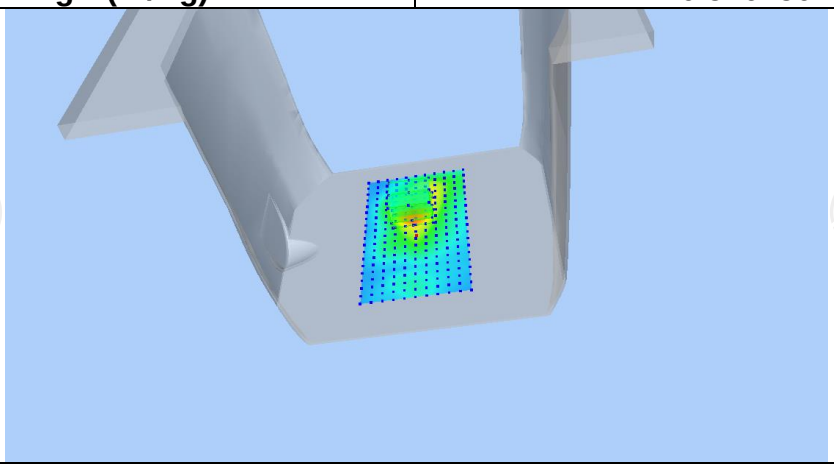


| MEASUREMENT 2 | |
|---|---|
| Low Band SAR (Channel 18700): | Date: 12/19/2023 |
| **Frequency (MHz)** | 1860.000000 |
| **Relative permittivity (real part)** | 40.000000 |
| **Relative permittivity (imaginary part)** | 13.411700 |
| **Conductivity (S/m)** | 1.400405 |
| **Variation (%)** | -3.250000 |
| **Crest Factor** | 1.0 |
| **Probe Conversion factor** | 2.23 |
| **E-Field Probe:** | SSE2 (SN 25/22 EPGO375) |
| **Area Scan** | dx=8mm dy=8mm, h= 5.00 mm |
| **ZoomScan** | 5x5x7,dx=8mm dy=8mm dz=5mm,Complete/ndx=8mm dy=8mm, h= 5.00 mm |
| **Phantom** | Validation plane |
| **Device Position** | Body back(hotspot 0mm) |
| **Band** | LTE band 2 (1 RB#49) |
| **SURFACE SAR** | **VOLUME SAR** |

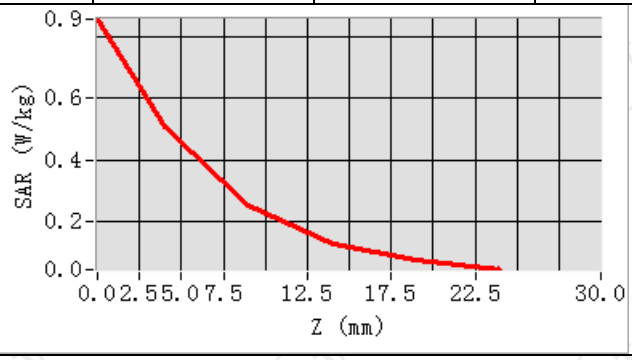


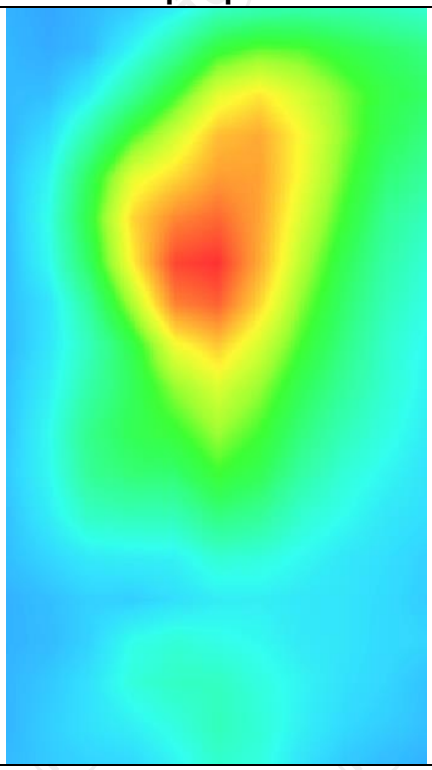

| Maximum location: X=-2.00, Y=24.00 SAR Peak: 0.86 W/kg | |
|---|---|
| **SAR 10g (W/Kg)** | 0.251371 |
| **SAR 1g (W/Kg)** | 0.576750 |



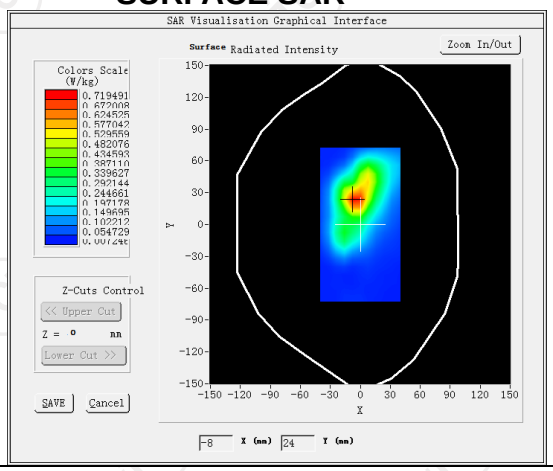
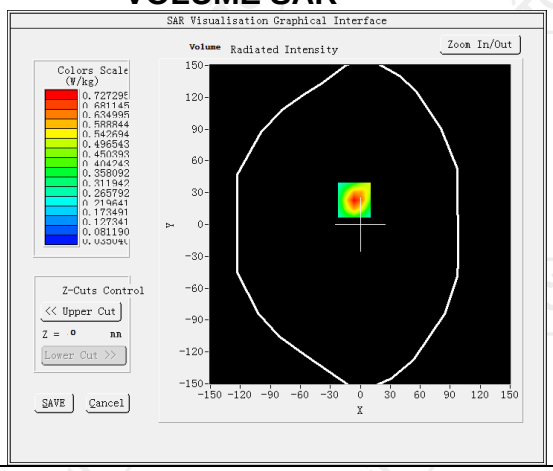
| Z (mm) | 0.00 | 4.00 | 9.00 | 14.00 | 19.00 |
|---|---|---|---|---|---|
| SAR (W/Kg) | 0.8584 | 0.5089 | 0.2545 | 0.1295 | 0.0730 |

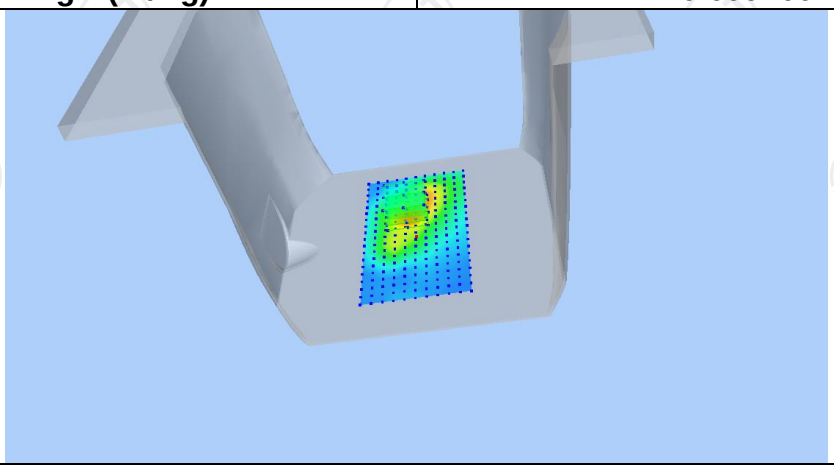



**Hot spot position**

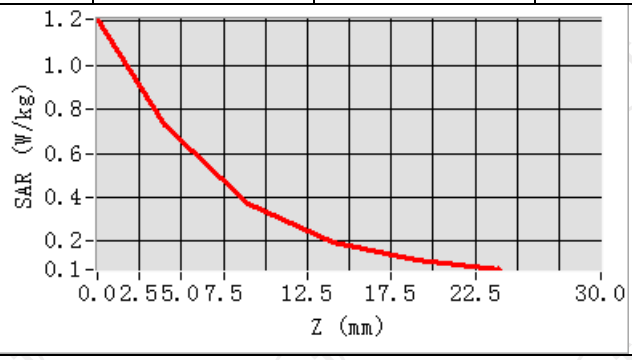


LTE Band 4

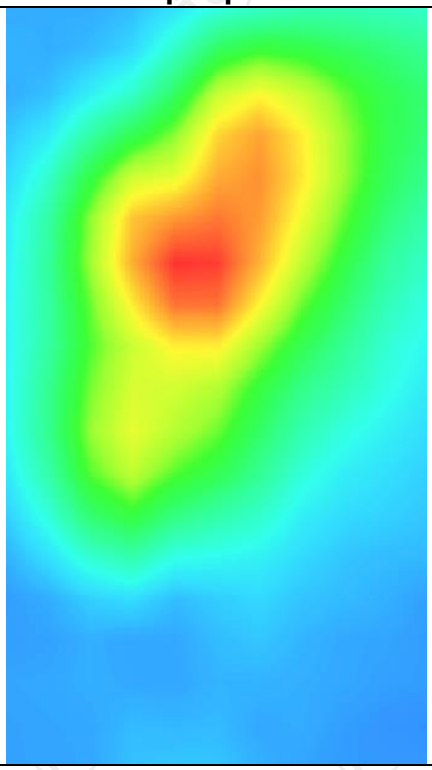
| **MEASUREMENT 1** | |
|---|---|
| High Band SAR (Channel 20300): | Date: 12/18/2023 |
| **Frequency (MHz)** | 1745.000000 |
| **Relative permittivity (real part)** | 40.115910 |
| **Relative permittivity (imaginary part)** | 14.136136 |
| **Conductivity (S/m)** | 1.360603 |
| **Variation (%)** | 3.580000 |
| **Crest Factor** | 1.0 |
| **Probe Conversion factor** | 2.08 |
| **E-Field Probe:** | SSE2 (SN 25/22 EPGO375) |
| **Area Scan** | dx=8mm dy=8mm, h= 5.00 mm |
| **ZoomScan** | 5x5x7,dx=8mm dy=8mm dz=5mm,Complete/ndx=8mm dy=8mm, h= 5.00 mm |
| **Phantom** | Validation plane |
| **Device Position** | Body back(0mm) |
| **Band** | LTE band 4(1 RB#0) |
| **SURFACE SAR** | **VOLUME SAR** |
|  |  |
| **Maximum location: X=-6.00, Y=23.00 SAR Peak: 1.21 W/kg** | |
| **SAR 10g (W/Kg)** | 0.356790 |
| **SAR 1g (W/Kg)** | 0.699160 |

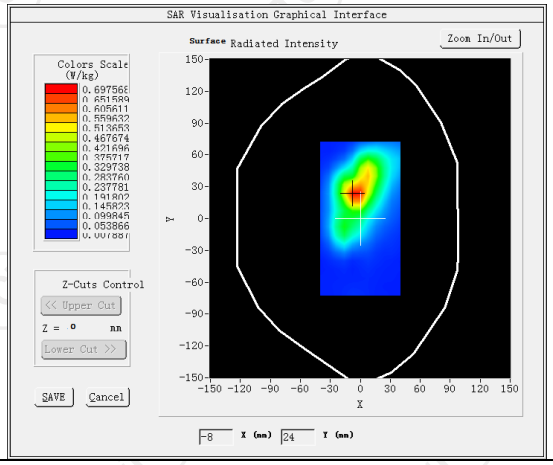
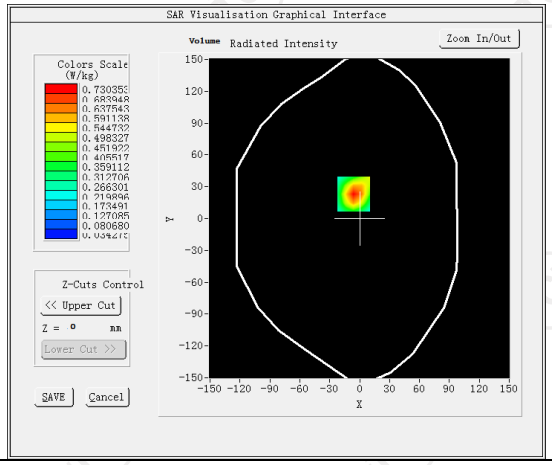
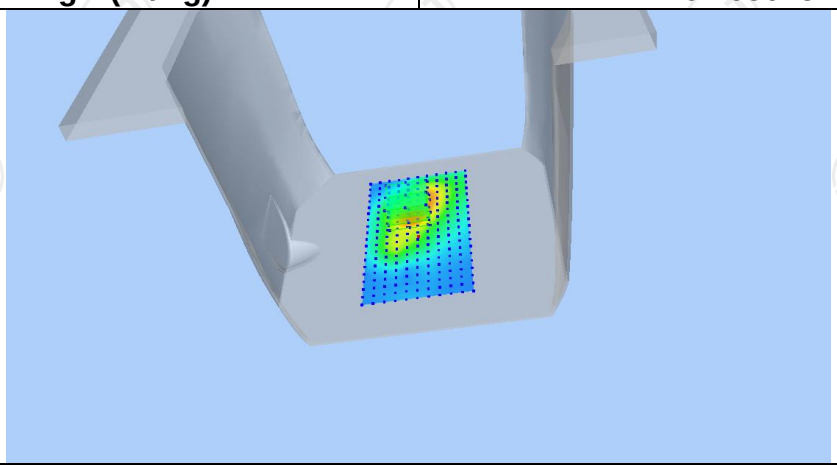


| Z (mm) | 0.00 | 4.00 | 9.00 | 14.00 | 19.00 |
|---|---|---|---|---|---|
| SAR (W/Kg) | 1.2095 | 0.7273 | 0.3730 | 0.1965 | 0.1154 |

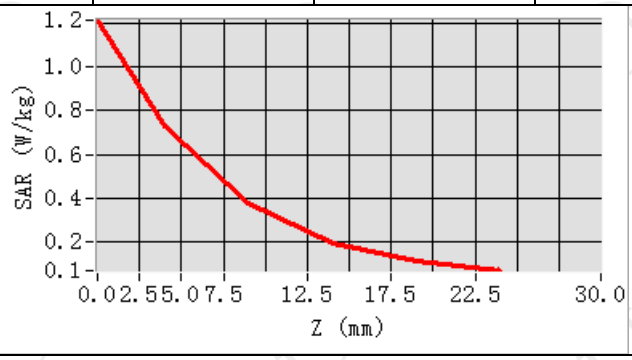



**Hot spot position**

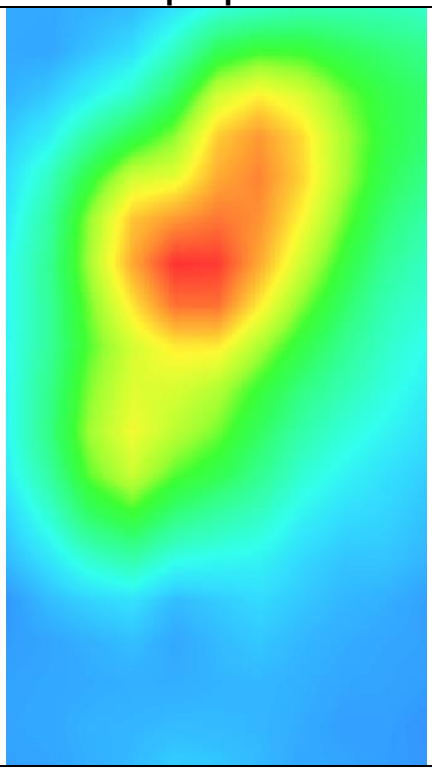


| MEASUREMENT 2 | |
|---|---|
| High Band SAR (Channel 20300): | Date: 12/18/2023 |
| **Frequency (MHz)** | 1745.000000 |
| **Relative permittivity (real part)** | 40.115910 |
| **Relative permittivity (imaginary part)** | 14.136136 |
| **Conductivity (S/m)** | 1.360603 |
| **Variation (%)** | -1.200000 |
| **Crest Factor** | 1.0 |
| **Probe Conversion factor** | 2.08 |
| **E-Field Probe:** | SSE2 (SN 25/22 EPGO375) |
| **Area Scan** | dx=8mm dy=8mm, h= 5.00 mm |
| **ZoomScan** | 5x5x7,dx=8mm dy=8mm dz=5mm,Complete/ndx=8mm dy=8mm, h= 5.00 mm |
| **Phantom** | Validation plane |
| **Device Position** | Body back(hotspot 0mm) |
| **Band** | LTE band 4(1 RB#0) |
| **SURFACE SAR** | **VOLUME SAR** |
|   |   |
| **Maximum location: X=-6.00, Y=23.00 SAR Peak: 1.22 W/kg** | |
| **SAR 10g (W/Kg)** | 0.355407 |
| **SAR 1g (W/Kg)** | 0.705625 |
|  | |

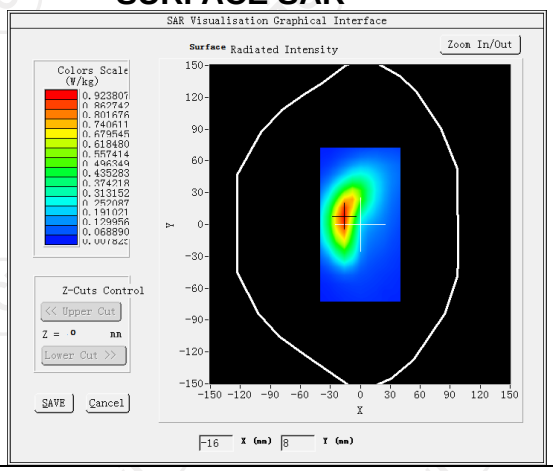
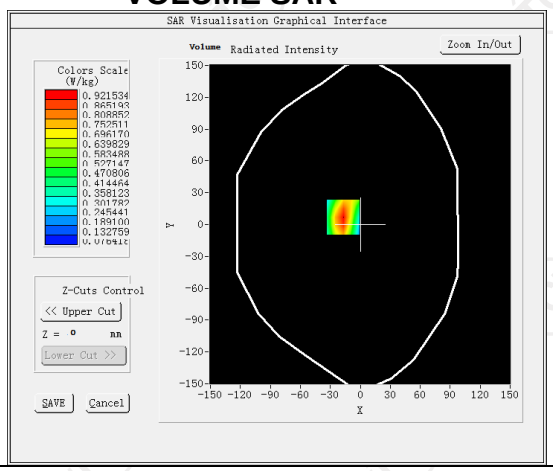
| Z (mm) | 0.00 | 4.00 | 9.00 | 14.00 | 19.00 |
|---|---|---|---|---|---|
| SAR (W/Kg) | 1.2140 | 0.7304 | 0.3741 | 0.1956 | 0.1128 |

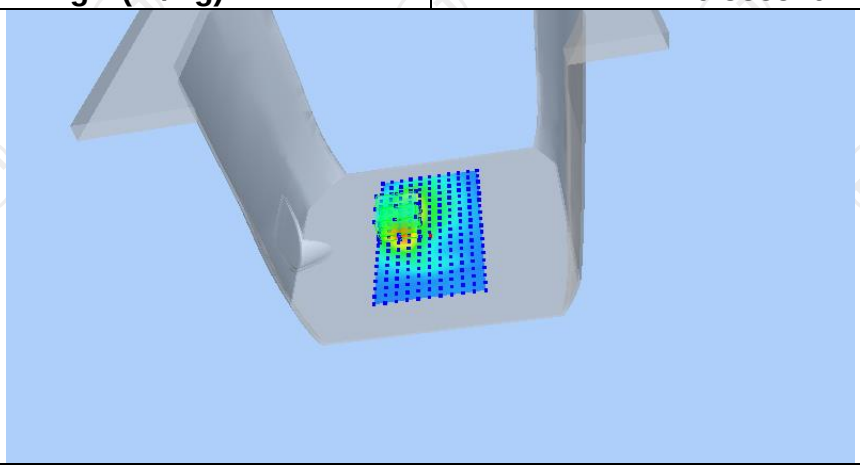



**Hot spot position**

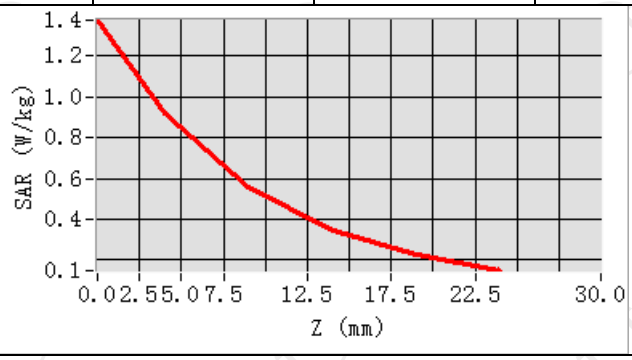


LTE Band 5

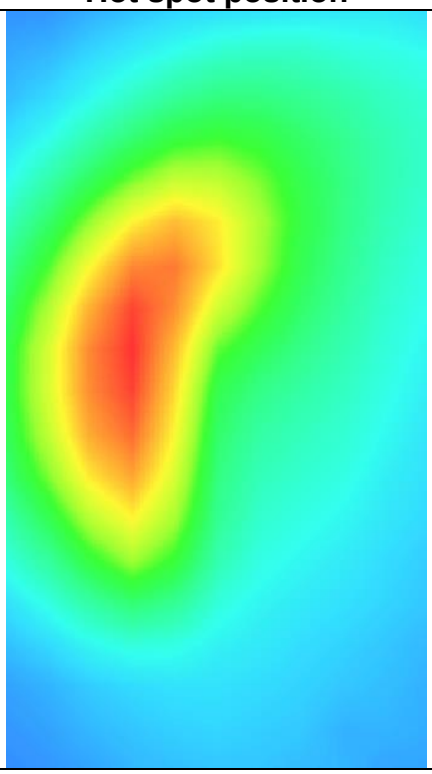
| **MEASUREMENT 1** | |
|---|---|
| High Band SAR (Channel 20600): | Date: 12/14/2023 |
| **Frequency (MHz)** | 844.000000 |
| **Relative permittivity (real part)** | 41.500000 |
| **Relative permittivity (imaginary part)** | 19.400000 |
| **Conductivity (S/m)** | 0.901561 |
| **Variation (%)** | 1.270000 |
| **Crest Factor** | 1.0 |
| **Probe Conversion factor** | 1.80 |
| **E-Field Probe:** | SSE2 (SN 25/22 EPGO375) |
| **Area Scan** | dx=8mm dy=8mm, h= 5.00 mm |
| **ZoomScan** | 5x5x7,dx=8mm dy=8mm dz=5mm,Complete/ndx=8mm dy=8mm, h= 5.00 mm |
| **Phantom** | Validation plane |
| **Device Position** | Body back(0mm) |
| **Band** | LTE band 5(1 RB#0) |
| **SURFACE SAR** | **VOLUME SAR** |
|   |   |
| **Maximum location: X=-17.00, Y=7.00 SAR Peak: 1.38 W/kg** | |
| **SAR 10g (W/Kg)** | 0.192668 |
| **SAR 1g (W/Kg)** | 0.383510 |



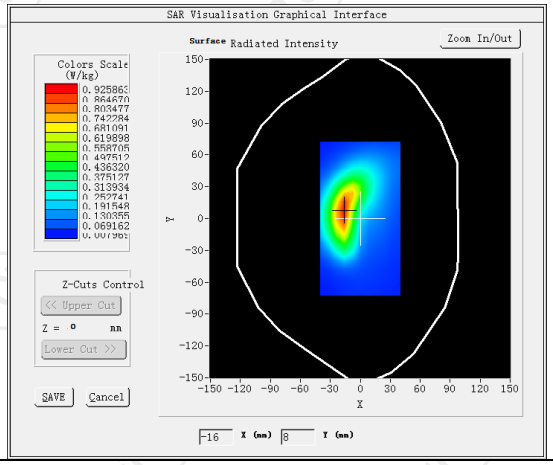
| Z (mm) | 0.00 | 4.00 | 9.00 | 14.00 | 19.00 |
|---|---|---|---|---|---|
| SAR (W/Kg) | 1.3740 | 0.9215 | 0.5545 | 0.3424 | 0.2242 |

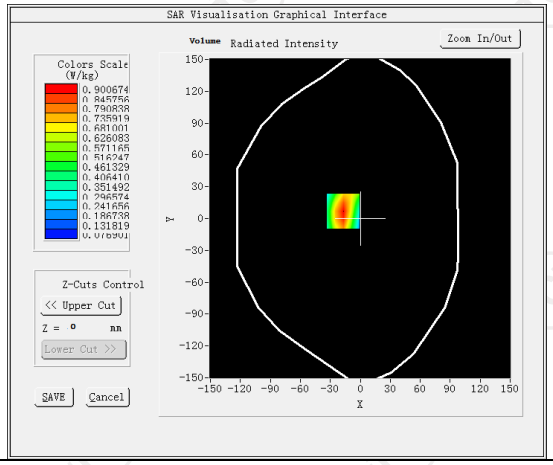



**Hot spot position**

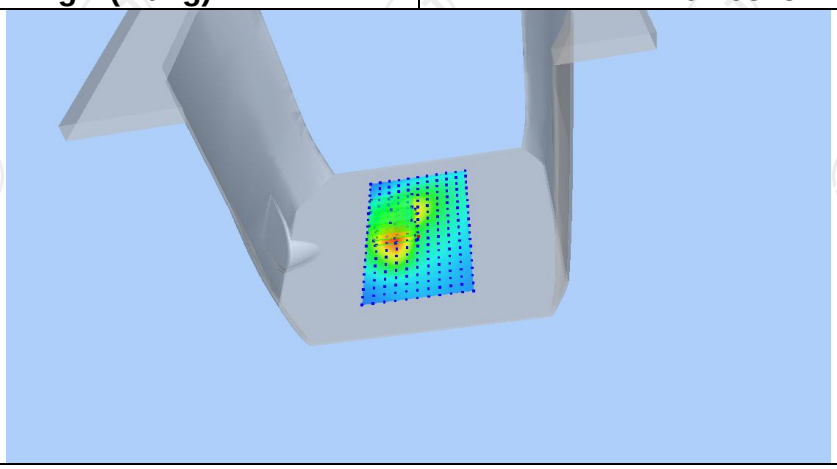


| MEASUREMENT 2 | |
|---|---|
| High Band SAR (Channel 20600): | Date: 12/14/2023 |
| **Frequency (MHz)** | 844.000000 |
| **Relative permittivity (real part)** | 41.500000 |
| **Relative permittivity (imaginary part)** | 19.400000 |
| **Conductivity (S/m)** | 0.901561 |
| **Variation (%)** | 3.720000 |
| **Crest Factor** | 1.0 |
| **Probe Conversion factor** | 1.80 |
| **E-Field Probe:** | SSE2 (SN 25/22 EPGO375) |
| **Area Scan** | dx=8mm dy=8mm, h= 5.00 mm |
| **ZoomScan** | 5x5x7,dx=8mm dy=8mm dz=5mm,Complete/ndx=8mm dy=8mm, h= 5.00 mm |
| **Phantom** | Validation plane |
| **Device Position** | Body back((hotspot 0mm) |
| **Band** | LTE band 5(1 RB#0) |
| **SURFACE SAR** | **VOLUME SAR** |

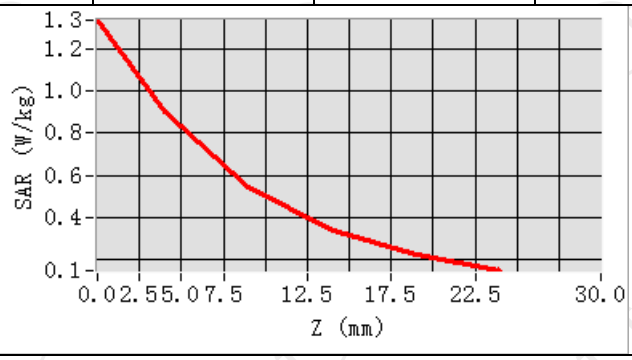


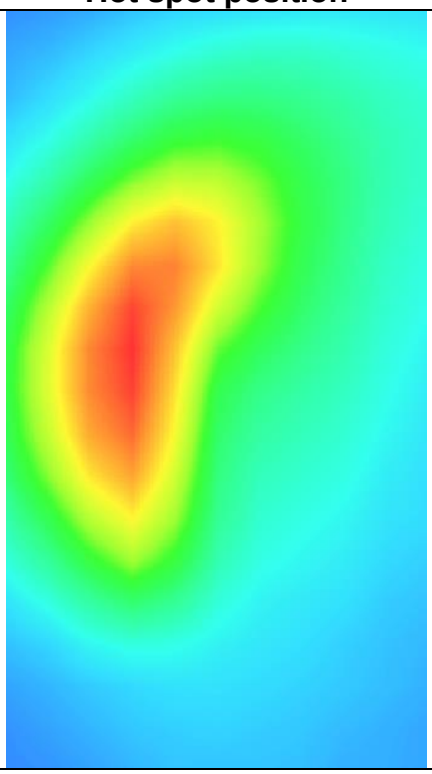

| Maximum location: X=-17.00, Y=7.00 SAR Peak: 1.34 W/kg | |
|---|---|
| **SAR 10g (W/Kg)** | 0.196979 |
| **SAR 1g (W/Kg)** | 0.403452 |



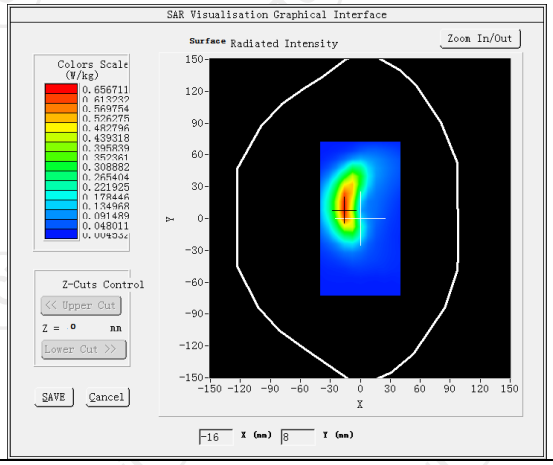
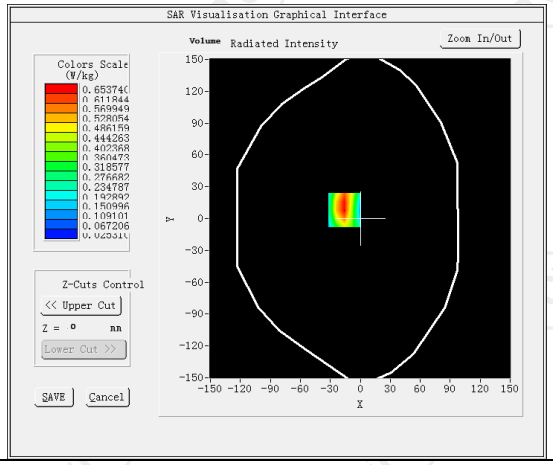
| Z (mm) | 0.00 | 4.00 | 9.00 | 14.00 | 19.00 |
|---|---|---|---|---|---|
| SAR (W/Kg) | 1.3381 | 0.9007 | 0.5445 | 0.3375 | 0.2212 |

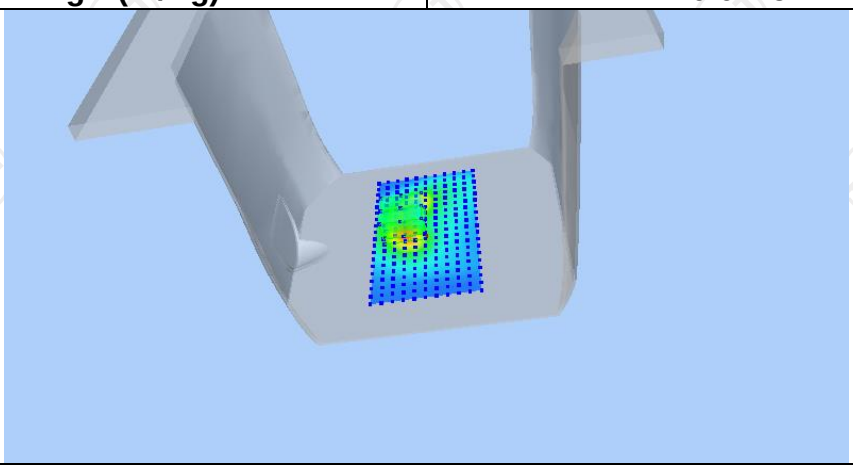



**Hot spot position**

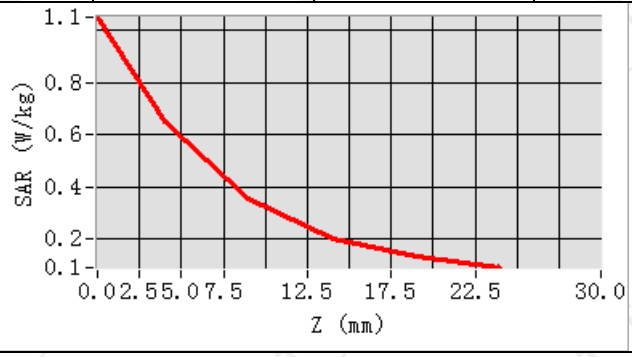


LTE Band 12

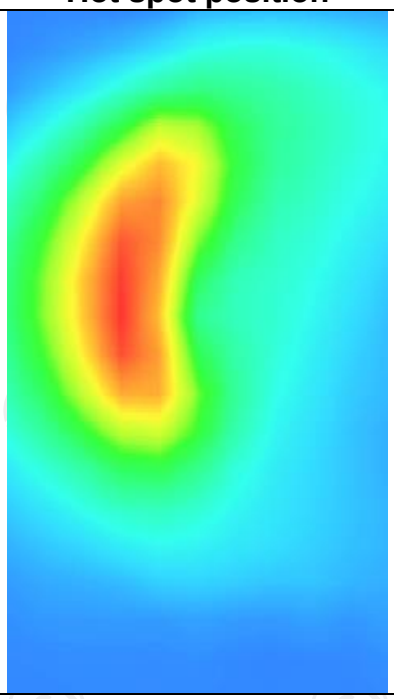
| MEASUREMENT 1 | |
|---|---|
| Low Band SAR (Channel 23060): | Date: 12/11/2023 |
| **Frequency (MHz)** | 704.000000 |
| **Relative permittivity (real part)** | 42.126667 |
| **Relative permittivity (imaginary part)** | 23.264000 |
| **Conductivity (S/m)** | 0.914404 |
| **Variation (%)** | 2.040000 |
| **Crest Factor** | 1.0 |
| **Probe Conversion factor** | 1.71 |
| **E-Field Probe:** | SSE2 (SN 25/22 EPGO375) |
| **Area Scan** | dx=8mm dy=8mm, h= 5.00 mm |
| **ZoomScan** | 5x5x7,dx=8mm dy=8mm dz=5mm,Complete/ndx=8mm dy=8mm, h= 5.00 mm |
| **Phantom** | Validation plane |
| **Device Position** | Body back(0mm) |
| **Band** | LTE band 12(1 RB#0) |
| **SURFACE SAR** | **VOLUME SAR** |
|  |  |
| **Maximum location: X=-16.00, Y=8.00 SAR Peak:1.07 W/kg** | |
| **SAR 10g (W/Kg)** | 0.337382 |
| **SAR 1g (W/Kg)** | 0.627512 |

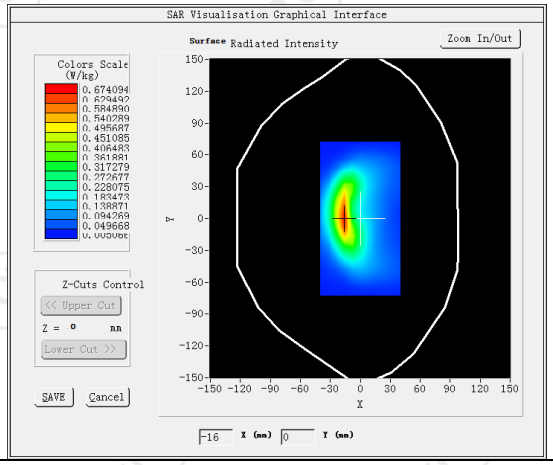
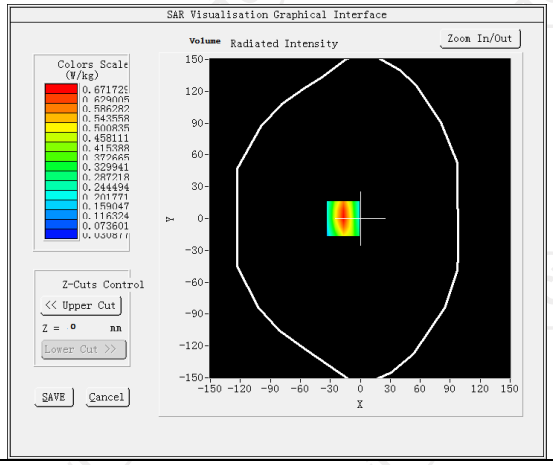
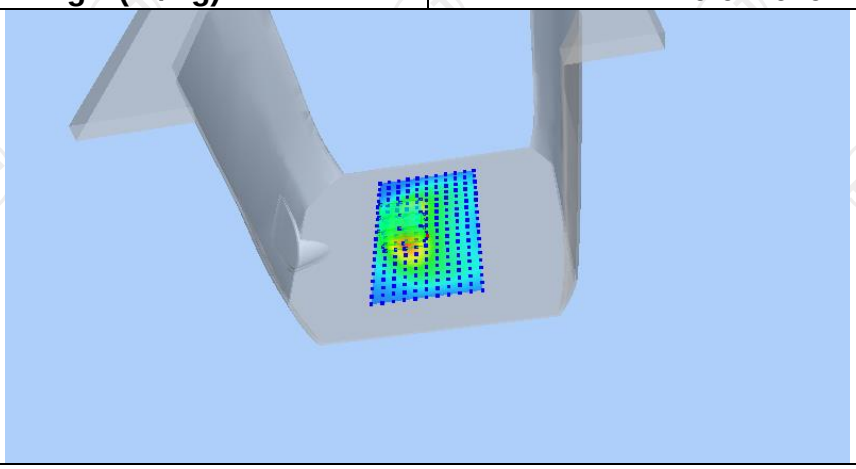


| Z (mm) | 0.00 | 4.00 | 9.00 | 14.00 | 19.00 |
|---|---|---|---|---|---|
| SAR (W/Kg) | 1.0511 | 0.6537 | 0.3557 | 0.2029 | 0.1306 |

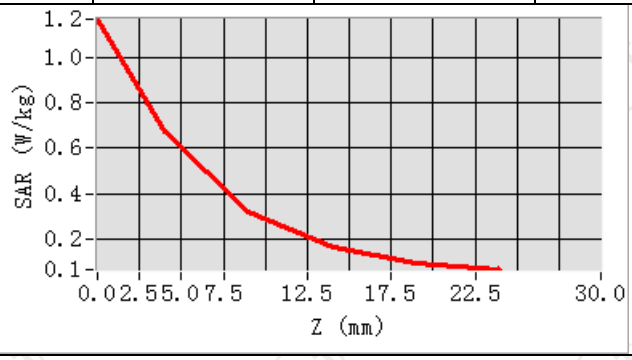



**Hot spot position**

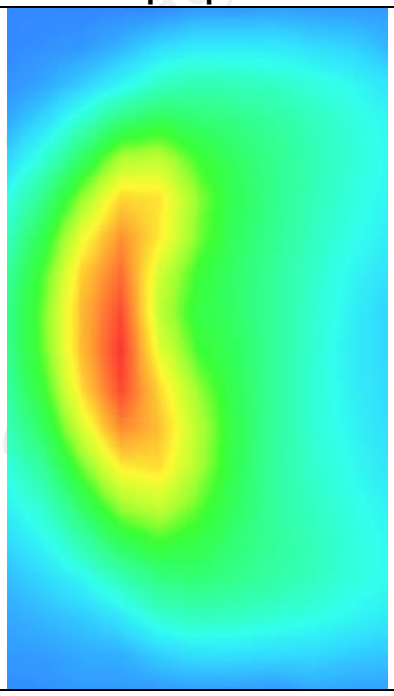


| MEASUREMENT 2 | |
|---|---|
| Low Band SAR (Channel 23060): | Date: 12/11/2023 |
| **Frequency (MHz)** | 704.000000 |
| **Relative permittivity (real part)** | 42.126667 |
| **Relative permittivity (imaginary part)** | 23.264000 |
| **Conductivity (S/m)** | 0.914404 |
| **Variation (%)** | 2.640000 |
| **Crest Factor** | 1.0 |
| **Probe Conversion factor** | 1.71 |
| **E-Field Probe:** | SSE2 (SN 25/22 EPGO375) |
| **Area Scan** | dx=8mm dy=8mm, h= 5.00 mm |
| **ZoomScan** | 5x5x7,dx=8mm dy=8mm dz=5mm,Complete/ndx=8mm dy=8mm, h= 5.00 mm |
| **Phantom** | Validation plane |
| **Device Position** | Body back(hotspot 0mm) |
| **Band** | LTE band 12(1 RB#0) |
| **SURFACE SAR** | **VOLUME SAR** |
|  |  |
| **Maximum location: X=-17.00, Y=0.00 SAR Peak: 1.18W/kg** | |
| **SAR 10g (W/Kg)** | 0.326643 |
| **SAR 1g (W/Kg)** | 0.641629 |
|  | |

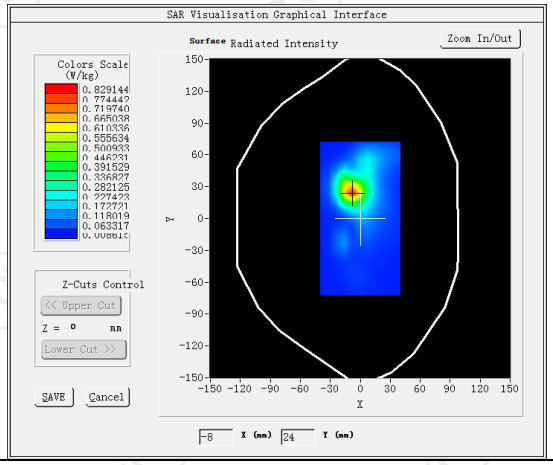
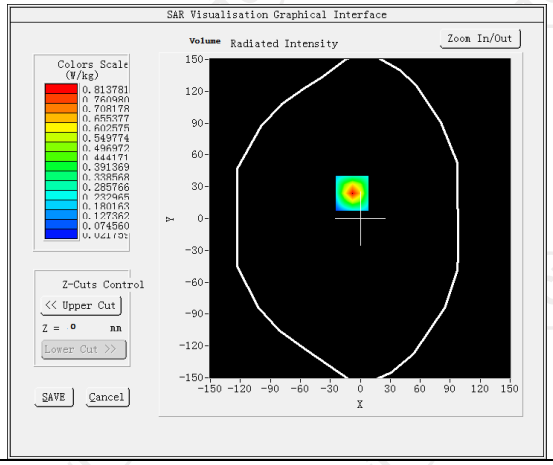
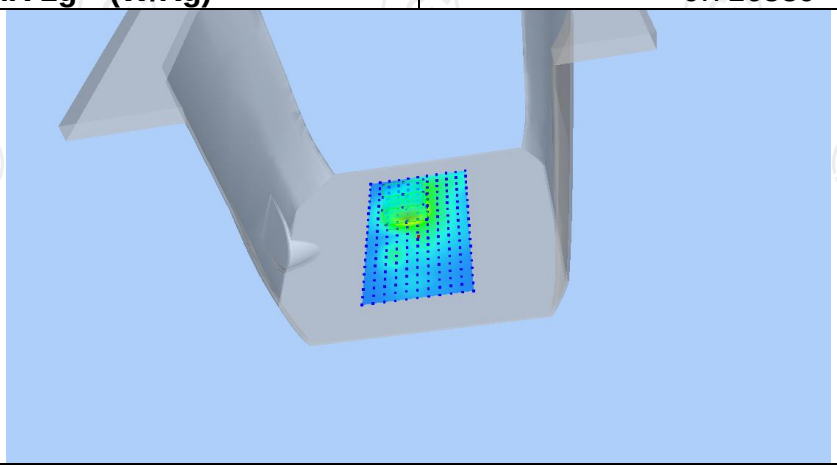
| Z (mm) | 0.00 | 4.00 | 9.00 | 14.00 | 19.00 |
|---|---|---|---|---|---|
| SAR (W/Kg) | 1.1685 | 0.6717 | 0.3234 | 0.1630 | 0.0975 |



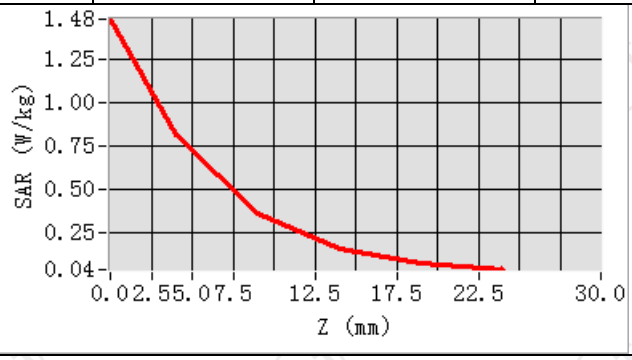

**Hot spot position**



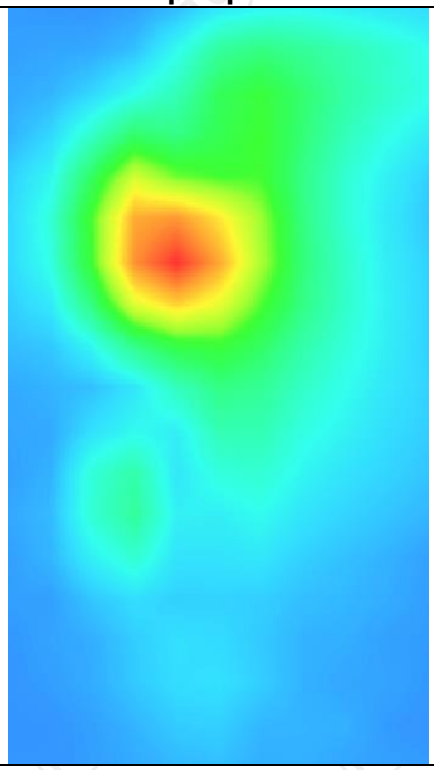
LTE Band 41

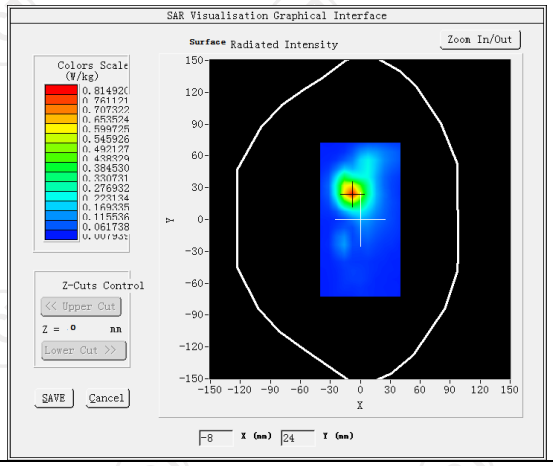
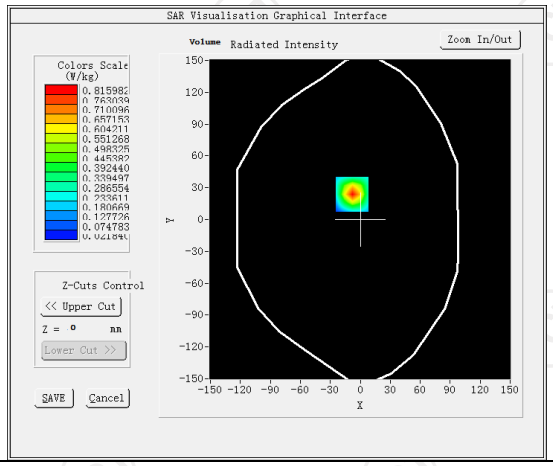
| **MEASUREMENT 1** | |
|---|---|
| Low Band SAR (Channel 39750): | Date: 12/25/2023 |
| **Frequency (MHz)** | 2506.000000 |
| **Relative permittivity (real part)** | 39.009335 |
| **Relative permittivity (imaginary part)** | 13.553667 |
| **Conductivity (S/m)** | 1.952481 |
| **Variation (%)** | 2.880000 |
| **Crest Factor** | 1.0 |
| **Probe Conversion factor** | 4.36 |
| **E-Field Probe:** | SSE2 (SN 25/22 EPGO375) |
| **Area Scan** | dx=8mm dy=8mm, h= 5.00 mm |
| **ZoomScan** | 5x5x7,dx=8mm dy=8mm dz=5mm,Complete/ndx=8mm dy=8mm, h= 5.00 mm |
| **Phantom** | Validation plane |
| **Device Position** | Body back(0mm) |
| **Band** | LTE band 41(1 RB#0) |
| **SURFACE SAR** | **VOLUME SAR** |
|  |  |
| **Maximum location: X=-8.00, Y=24.00 SAR Peak: 1.48W/kg** | |
| **SAR 10g (W/Kg)** | 0.364941 |
| **SAR 1g (W/Kg)** | 0.716889 |
|  | |

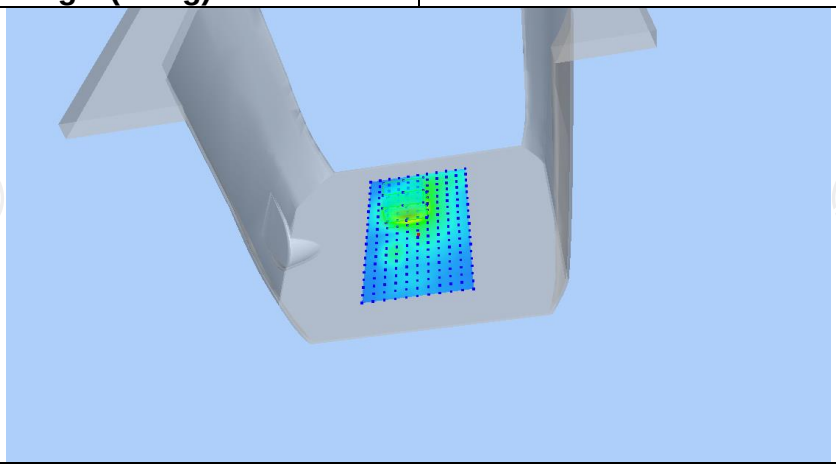
| Z (mm) | 0.00 | 4.00 | 9.00 | 14.00 | 19.00 |
|---|---|---|---|---|---|
| SAR (W/Kg) | 1.4764 | 0.8138 | 0.3601 | 0.1580 | 0.0786 |



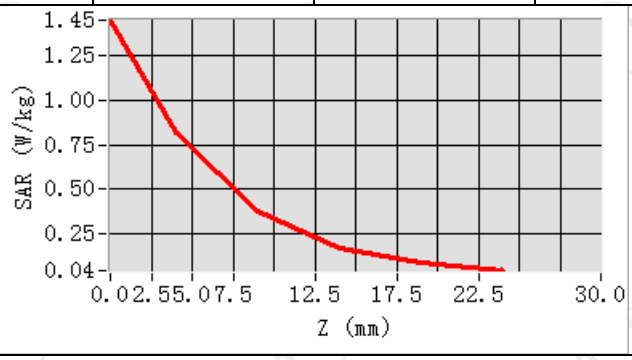

**Hot spot position**



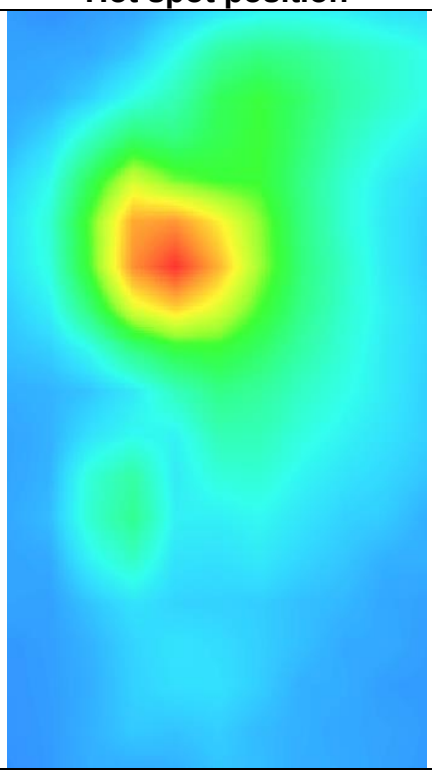
| MEASUREMENT 2 | |
|---|---|
| Low Band SAR (Channel 39750): | Date: 12/25/2023 |
| **Frequency (MHz)** | 2506.000000 |
| **Relative permittivity (real part)** | 39.009335 |
| **Relative permittivity (imaginary part)** | 13.553667 |
| **Conductivity (S/m)** | 1.952481 |
| **Variation (%)** | 3.140000 |
| **Crest Factor** | 1.0 |
| **Probe Conversion factor** | 4.36 |
| **E-Field Probe:** | SSE2 (SN 25/22 EPGO375) |
| **Area Scan** | dx=8mm dy=8mm, h= 5.00 mm |
| **ZoomScan** | 5x5x7,dx=8mm dy=8mm dz=5mm,Complete/ndx=8mm dy=8mm, h= 5.00 mm |
| **Phantom** | Validation plane |
| **Device Position** | Body back(hotspot 0mm) |
| **Band** | LTE band 41(1 RB#0) |
| **SURFACE SAR** | **VOLUME SAR** |
|   |   |
| **Maximum location: X=-8.00, Y=24.00 SAR Peak: 1.45 W/kg** | |
| **SAR 10g (W/Kg)** | 0.340238 |
| **SAR 1g (W/Kg)** | 0.726860 |



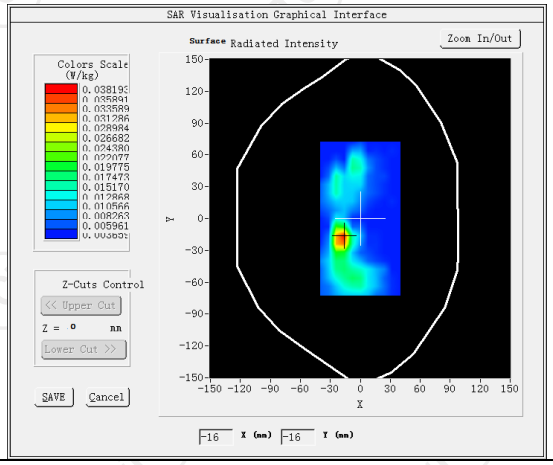
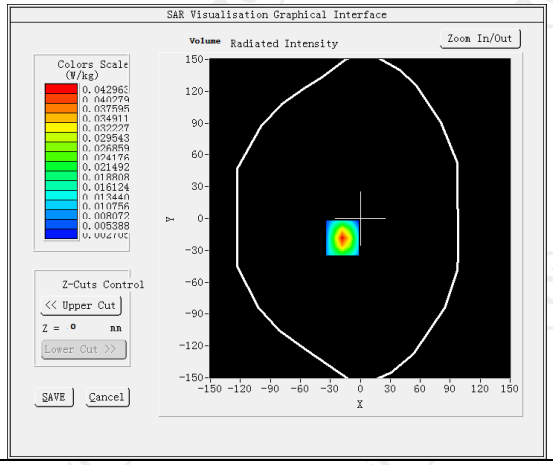
| Z (mm) | 0.00 | 4.00 | 9.00 | 14.00 | 19.00 |
|---|---|---|---|---|---|
| SAR (W/Kg) | 1.4481 | 0.8160 | 0.3736 | 0.1691 | 0.0841 |

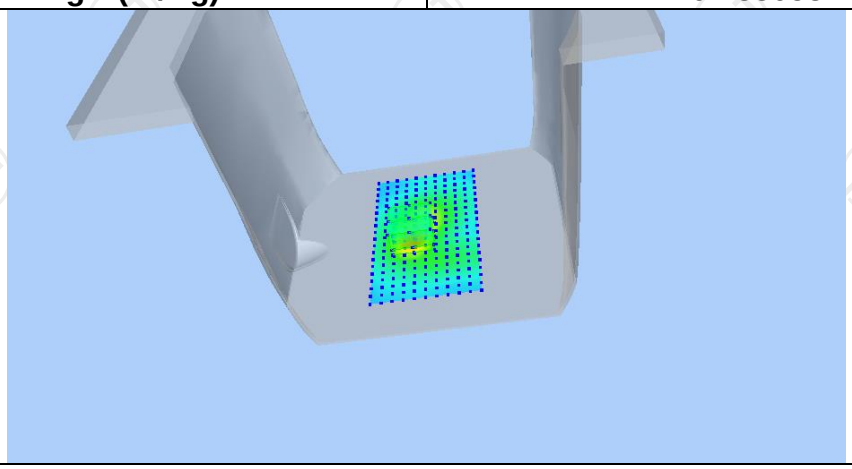



**Hot spot position**

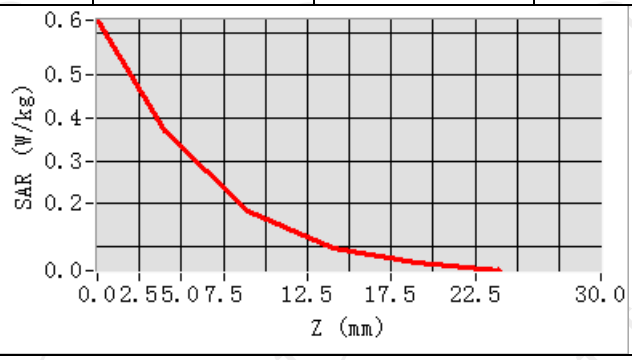


LTE Band 66

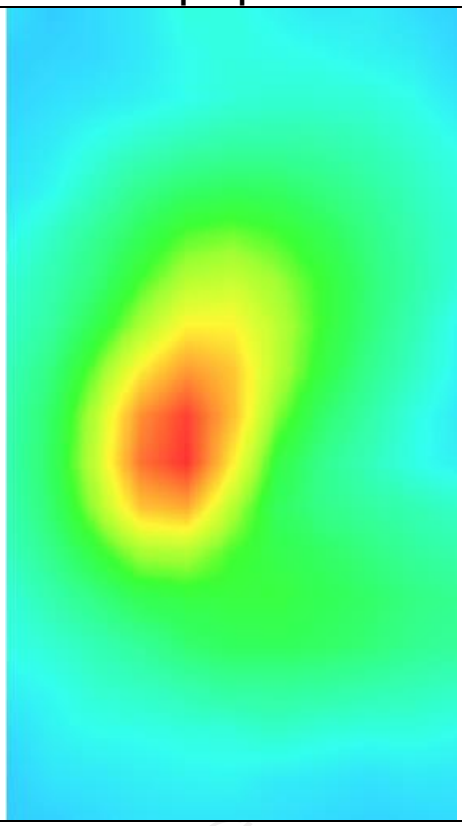
| **MEASUREMENT 1** | |
|---|---|
| Middle Band SAR (Channel132322): | Date: 12/22/2023 |
| **Frequency (MHz)** | 1748.000000 |
| **Relative permittivity (real part)** | 40.115910 |
| **Relative permittivity (imaginary part)** | 14.136136 |
| **Conductivity (S/m)** | 1.360603 |
| **Variation (%)** | -2.180000 |
| **Crest Factor** | 1.0 |
| **Probe Conversion factor** | 1.71 |
| **E-Field Probe:** | SSE2 (SN 25/22 EPGO375) |
| **Area Scan** | dx=8mm dy=8mm, h= 5.00 mm |
| **ZoomScan** | 5x5x7,dx=8mm dy=8mm dz=5mm,Complete/ndx=8mm dy=8mm, h= 5.00 mm |
| **Phantom** | Validation plane |
| **Device Position** | Body back(0mm) |
| **Band** | LTE band 66(1 RB#49) |
| **SURFACE SAR** | **VOLUME SAR** |
|  |  |
| **Maximum location: X=-18.00, Y=-18.00 SAR Peak: 0.63 W/kg** | |
| **SAR 10g (W/Kg)** | 0.302792 |
| **SAR 1g (W/Kg)** | 0.483658 |

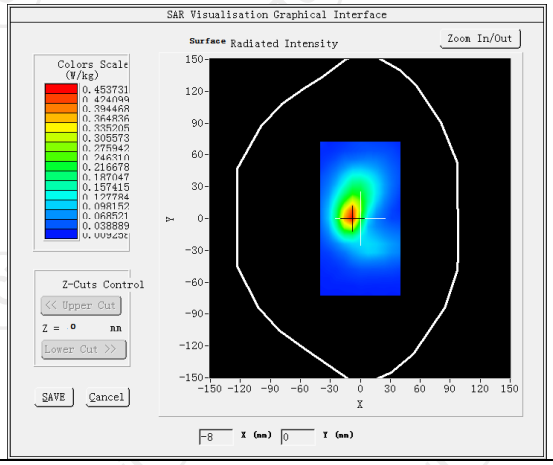
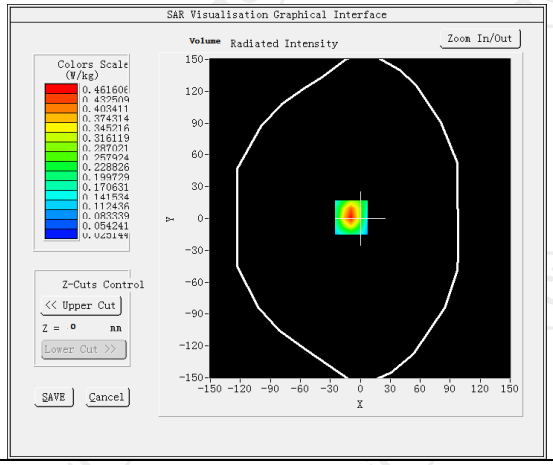


| Z (mm) | 0.00 | 4.00 | 9.00 | 14.00 | 19.00 |
|---|---|---|---|---|---|
| SAR (W/Kg) | 0.6287 | 0.3690 | 0.1845 | 0.0978 | 0.0617 |



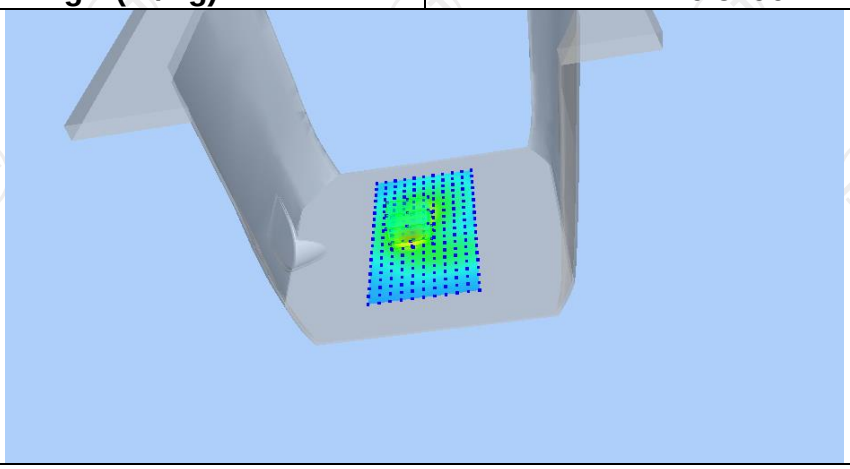

**Hot spot position**



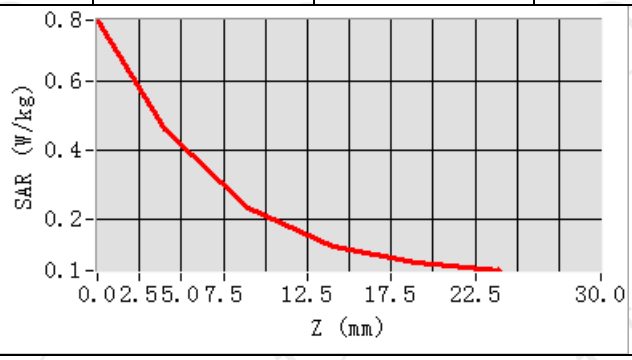
| MEASUREMENT 2 | |
|---|---|
| Middle Band SAR (Channel132322): | Date: 12/22/2023 |
| **Frequency (MHz)** | 1748.000000 |
| **Relative permittivity (real part)** | 40.115910 |
| **Relative permittivity (imaginary part)** | 14.136136 |
| **Conductivity (S/m)** | 1.360603 |
| **Variation (%)** | -0.830000 |
| **Crest Factor** | 1.0 |
| **Probe Conversion factor** | 1.71 |
| **E-Field Probe:** | SSE2 (SN 25/22 EPGO375) |
| **Area Scan** | dx=8mm dy=8mm, h= 5.00 mm |
| **ZoomScan** | 5x5x7,dx=8mm dy=8mm dz=5mm,Complete/ndx=8mm dy=8mm, h= 5.00 mm |
| **Phantom** | Validation plane |
| **Device Position** | Body back(hotspot 0mm) |
| **Band** | LTE band 66(1 RB#99) |
| **SURFACE SAR** | **VOLUME SAR** |
|  |  |
| **Maximum location: X=-9.00, Y=1.00 SAR Peak: 0.78 W/kg** | |
| **SAR 10g (W/Kg)** | 0.372906 |
| **SAR 1g (W/Kg)** | 0.529674 |



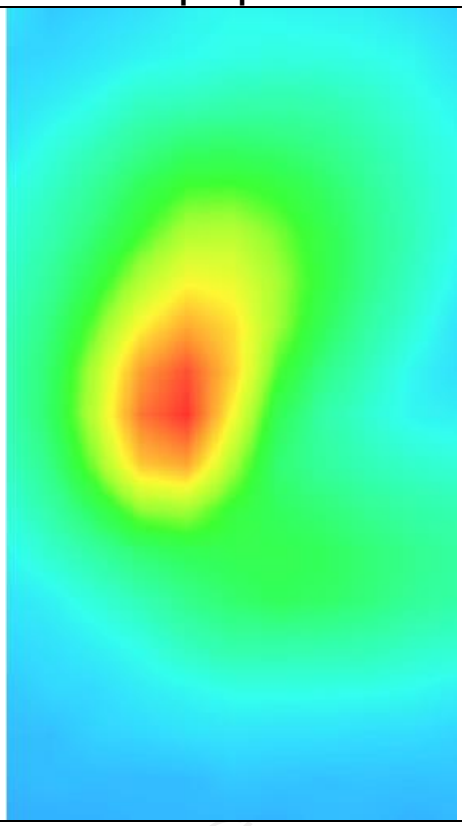




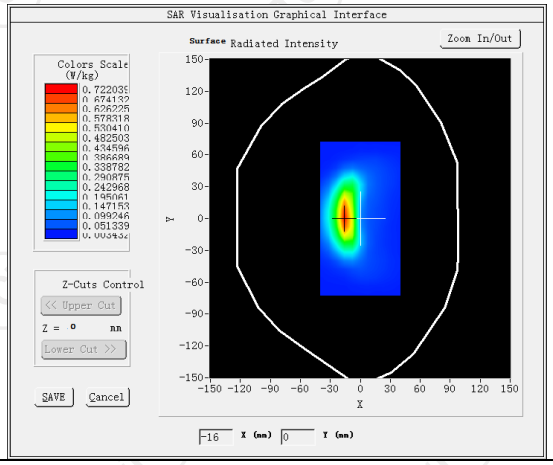
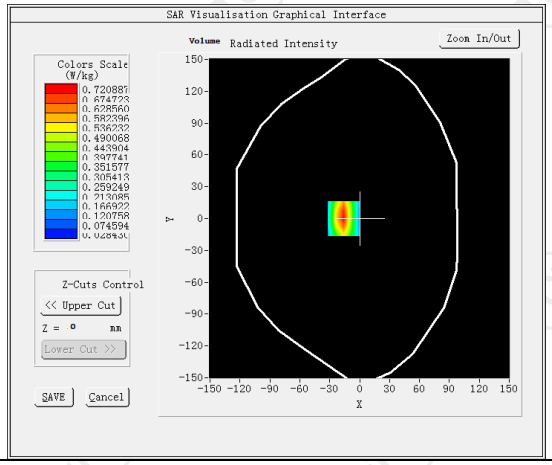
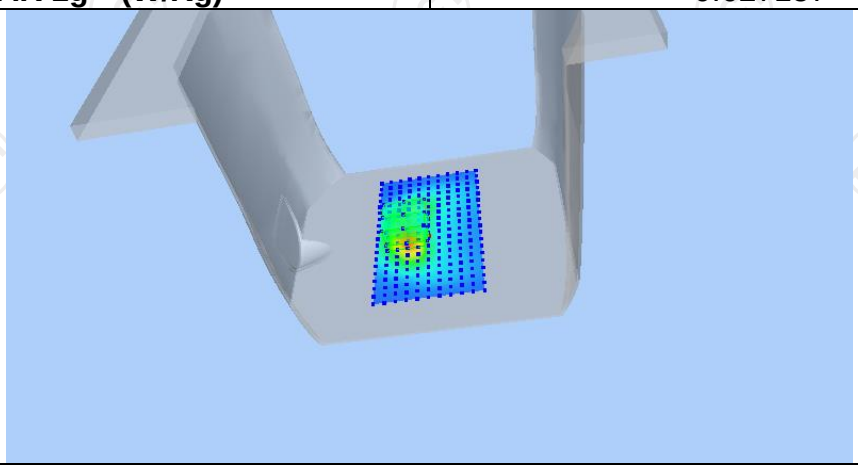
| Z (mm) | 0.00 | 4.00 | 9.00 | 14.00 | 19.00 |
|---|---|---|---|---|---|
| SAR (W/Kg) | 0.7760 | 0.4616 | 0.2349 | 0.1256 | 0.0781 |



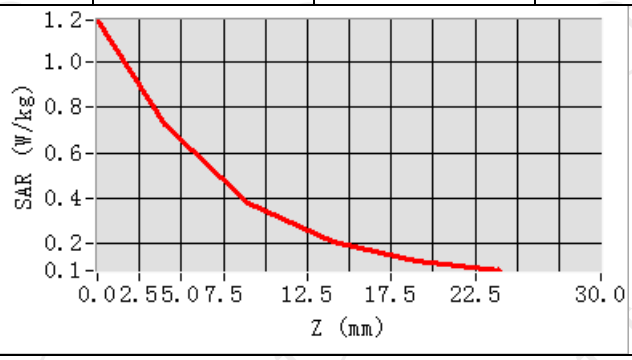

**Hot spot position**



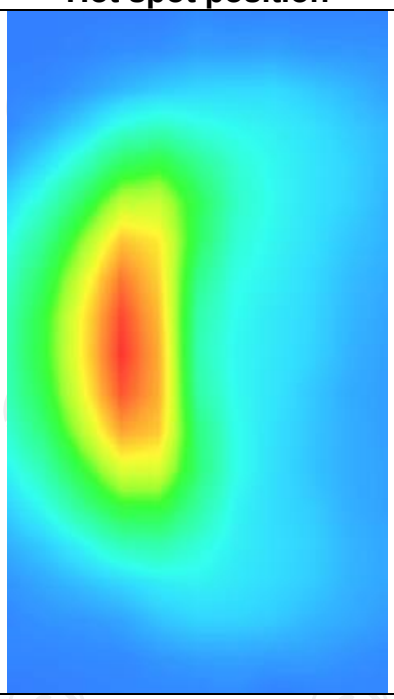
LTE Band 71

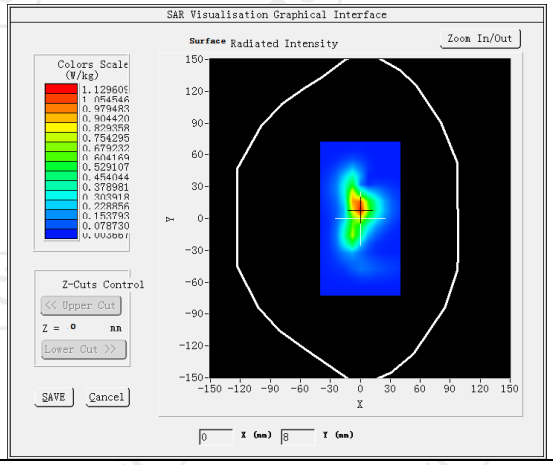
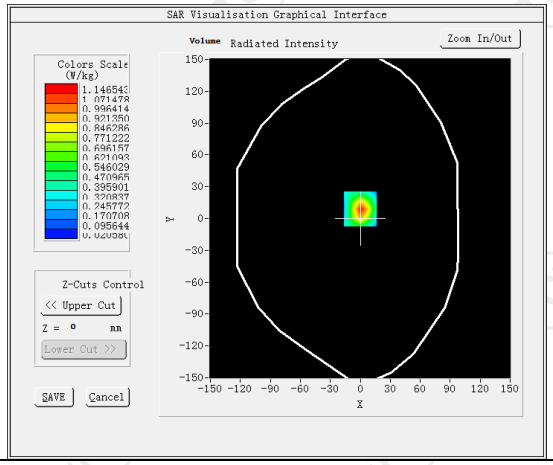
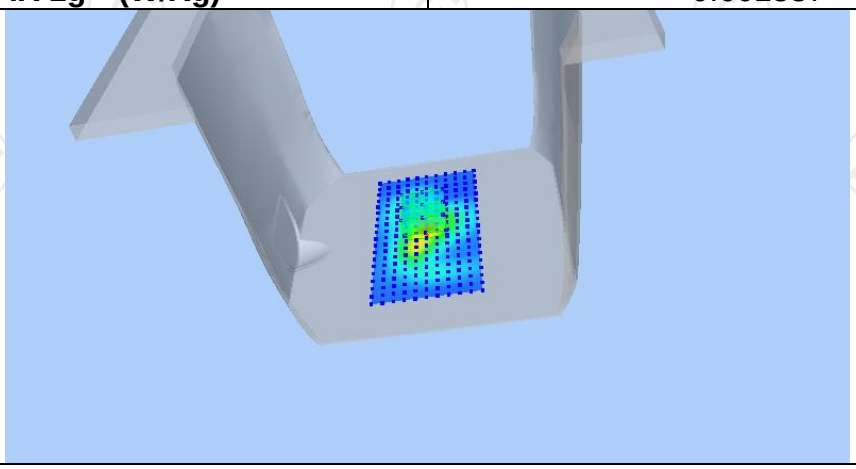
| **MEASUREMENT 1** | |
|---|---|
| High Band SAR (Channel 133372): | Date: 12/11/2023 |
| **Frequency (MHz)** | 688.000000 |
| **Relative permittivity (real part)** | 41.500000 |
| **Relative permittivity (imaginary part)** | 19.400000 |
| **Conductivity (S/m)** | 0.901561 |
| **Variation (%)** | 2.130000 |
| **Crest Factor** | 1.0 |
| **Probe Conversion factor** | 4.36 |
| **E-Field Probe:** | SSE2 (SN 25/22 EPGO375) |
| **Area Scan** | dx=8mm dy=8mm, h= 5.00 mm |
| **ZoomScan** | 5x5x7,dx=8mm dy=8mm dz=5mm,Complete/ndx=8mm dy=8mm, h= 5.00 mm |
| **Phantom** | Validation plane |
| **Device Position** | Body back(0mm) |
| **Band** | LTE band 71(1 RB#0) |
| **SURFACE SAR** | **VOLUME SAR** |
|  |  |
| **Maximum location: X=-16.00, Y=0.00 SAR Peak: 1.19 W/kg** | |
| **SAR 10g (W/Kg)** | 0.351625 |
| **SAR 1g (W/Kg)** | 0.627157 |
|  | |

| Z (mm) | 0.00 | 4.00 | 9.00 | 14.00 | 19.00 |
|---|---|---|---|---|---|
| SAR (W/Kg) | 1.1828 | 0.7209 | 0.3786 | 0.2060 | 0.1256 |

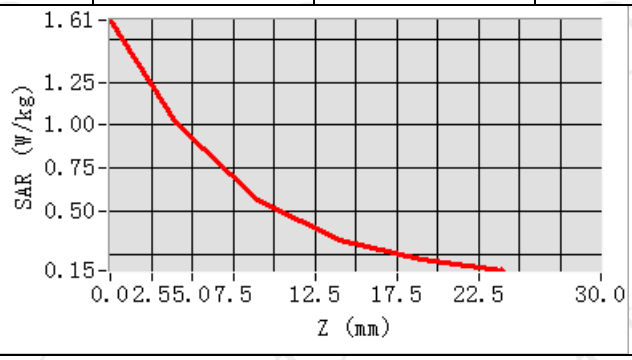



**Hot spot position**

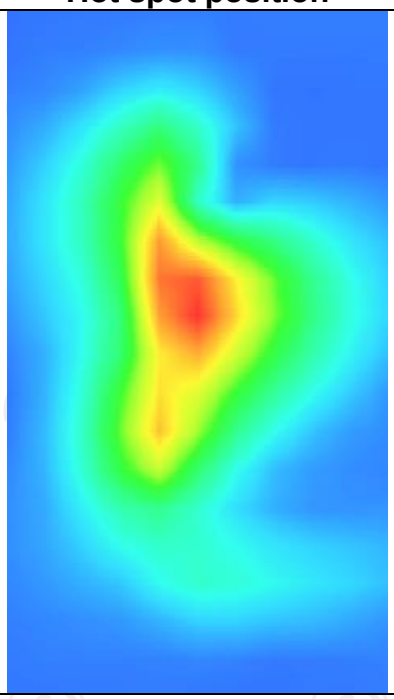


| MEASUREMENT 2 | |
|---|---|
| High Band SAR (Channel 133372): | Date: 12/11/2023 |
| **Frequency (MHz)** | 688.000000 |
| **Relative permittivity (real part)** | 41.500000 |
| **Relative permittivity (imaginary part)** | 19.400000 |
| **Conductivity (S/m)** | 0.901561 |
| **Variation (%)** | 1.570000 |
| **Crest Factor** | 1.0 |
| **Probe Conversion factor** | 4.36 |
| **E-Field Probe:** | SSE2 (SN 25/22 EPGO375) |
| **Area Scan** | dx=8mm dy=8mm, h= 5.00 mm |
| **ZoomScan** | 5x5x7,dx=8mm dy=8mm dz=5mm,Complete/ndx=8mm dy=8mm, h= 5.00 mm |
| **Phantom** | Validation plane |
| **Device Position** | Body back(hotspot 0mm) |
| **Band** | LTE band 71(1 RB#0) |
| **SURFACE SAR** | **VOLUME SAR** |
|  |  |
| **Maximum location: X=-16.00, Y=0.00 SAR Peak: 1.63 W/kg** | |
| **SAR 10g (W/Kg)** | 0.423159 |
| **SAR 1g (W/Kg)** | 0.601387 |
|  | |

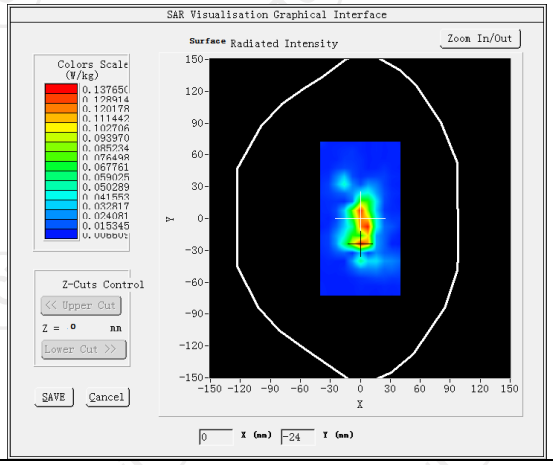
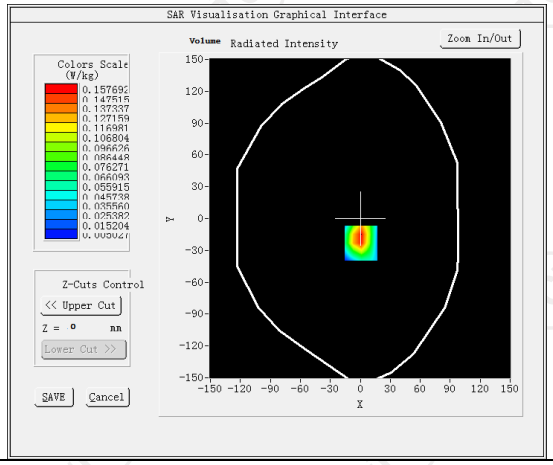
| Z (mm) | 0.00 | 4.00 | 9.00 | 14.00 | 19.00 |
|---|---|---|---|---|---|
| SAR (W/Kg) | 1.6115 | 1.0167 | 0.5657 | 0.3309 | 0.2175 |

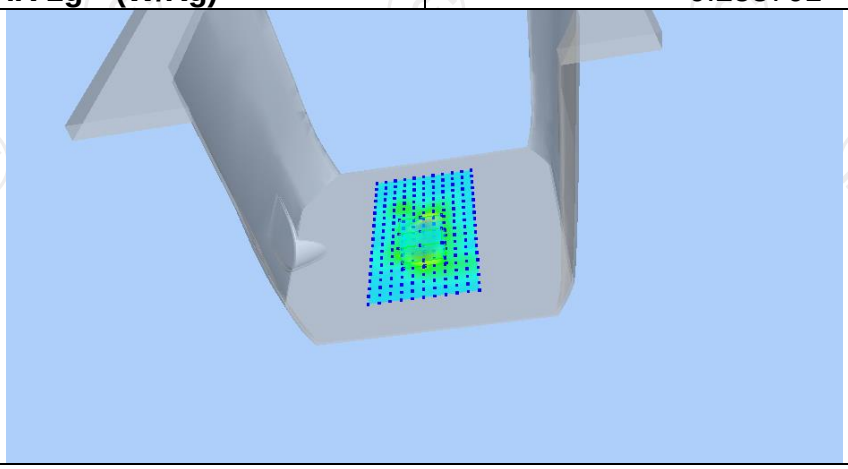



**Hot spot position**

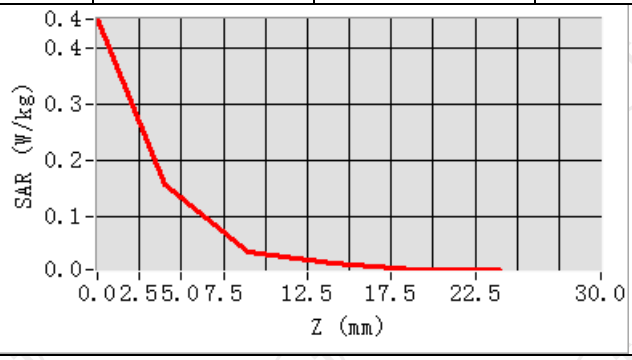


WLAN 2.4G

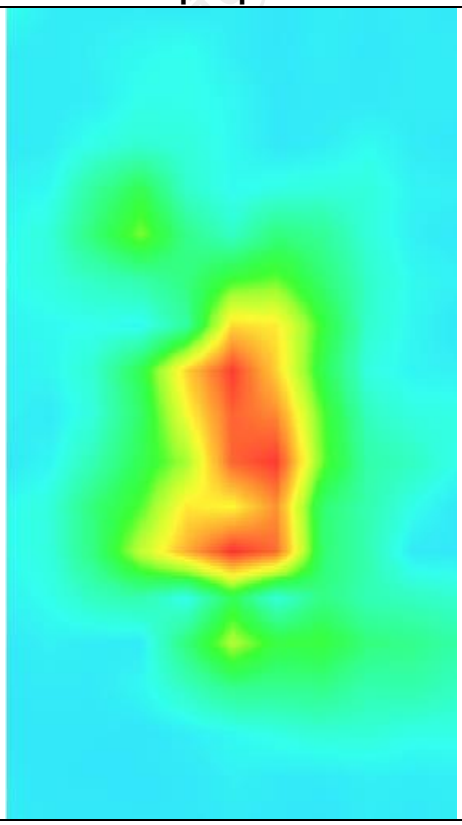
| MEASUREMENT 1 | |
|---|---|
| High Band SAR (Channel 11): | Date: 12/21/2023 |
| **Frequency (MHz)** | 2462.000000 |
| **Relative permittivity (real part)** | 39.226002 |
| **Relative permittivity (imaginary part)** | 13.207000 |
| **Conductivity (S/m)** | 1.788081 |
| **Variation (%)** | 2.140000 |
| **Crest Factor** | 1.0 |
| **Probe Conversion factor** | 2.31 |
| **E-Field Probe:** | SSE2 (SN 25/22 EPGO375) |
| **Area Scan** | dx=8mm dy=8mm, h= 5.00 mm |
| **ZoomScan** | 5x5x7,dx=8mm dy=8mm dz=5mm,Complete/ndx=8mm dy=8mm, h= 5.00 mm |
| **Phantom** | Validation plane |
| **Device Position** | Body back(0mm) |
| **Band** | IEEE 802.11b ISM |
| **SURFACE SAR** | **VOLUME SAR** |
|  |  |
| **Maximum location: X=1.00, Y=23.00 SAR Peak: 0.44 W/kg** | |
| **SAR 10g (W/Kg)** | 0.170419 |
| **SAR 1g (W/Kg)** | 0.253701 |

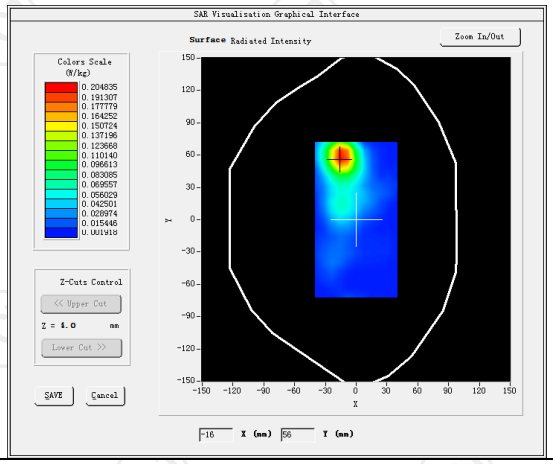
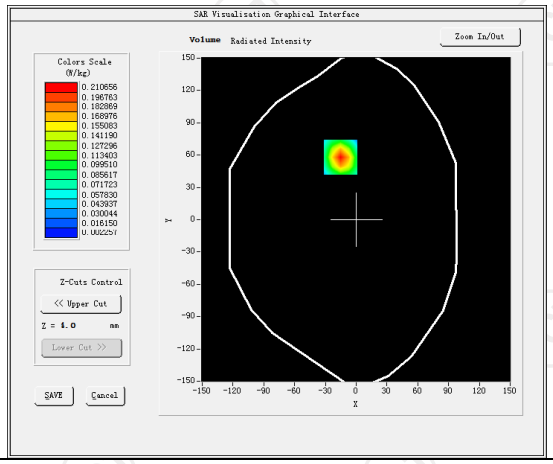


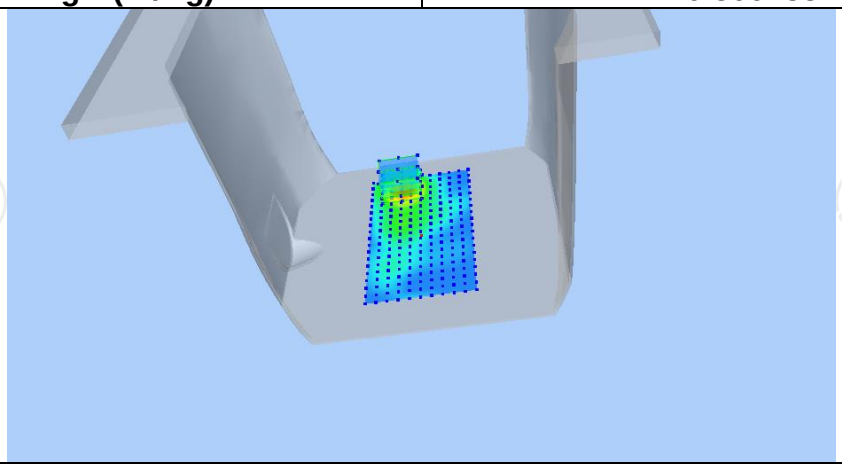
| Z (mm) | 0.00 | 4.00 | 9.00 | 14.00 | 19.00 |
|---|---|---|---|---|---|
| SAR (W/Kg) | 0.4497 | 0.1577 | 0.0368 | 0.0175 | 0.0072 |



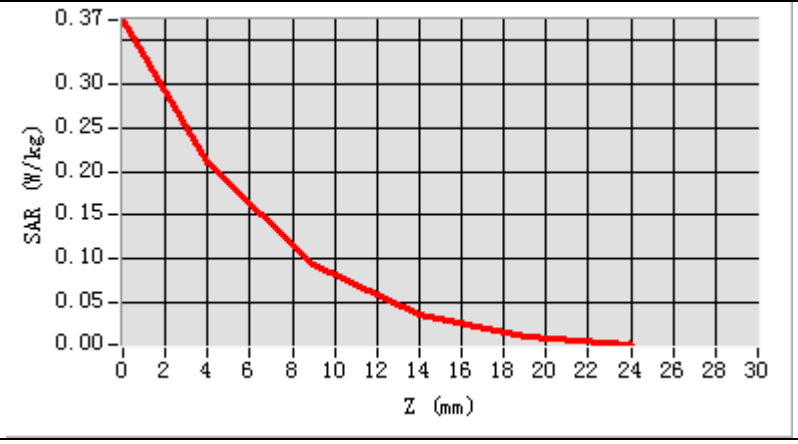

**Hot spot position**



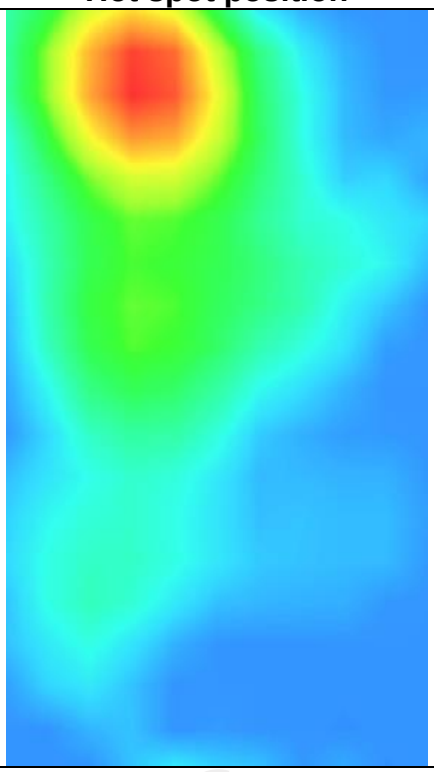
| MEASUREMENT 2 | |
|---|---|
| High Band SAR (Channel 11): | Date: 12/21/2023 |
| **Frequency (MHz)** | 2462.000000 |
| **Relative permittivity (real part)** | 39.226002 |
| **Relative permittivity (imaginary part)** | 13.207000 |
| **Conductivity (S/m)** | 1.788081 |
| **Variation (%)** | -1.380000 |
| **Crest Factor** | 1.0 |
| **Probe Conversion factor** | 2.31 |
| **E-Field Probe:** | SSE2 (SN 25/22 EPGO375) |
| **Area Scan** | dx=8mm dy=8mm, h= 5.00 mm |
| **ZoomScan** | 5x5x7,dx=8mm dy=8mm dz=5mm,Complete/ndx=8mm dy=8mm, h= 5.00 mm |
| **Phantom** | Validation plane |
| **Device Position** | Body back(0mm) |
| **Band** | IEEE 802.11b ISM(hotspot) |
| **SURFACE SAR** | **VOLUME SAR** |
|  |  |
| **Maximum location: X=-15.00, Y=58.00 SAR Peak: 0.57 W/kg** | |
| **SAR 10g (W/Kg)** | 0.192132 |
| **SAR 1g (W/Kg)** | 0.300288 |



| Z (mm) | 0.00 | 4.00 | 9.00 | 14.00 | 19.00 |
|---|---|---|---|---|---|
| SAR (W/Kg) | 0.3732 | 0.2107 | 0.0935 | 0.0368 | 0.0124 |

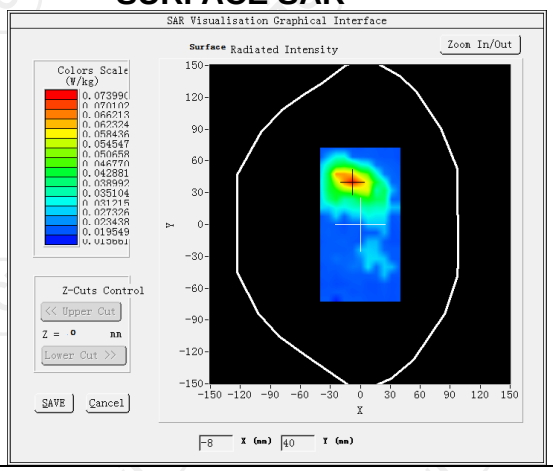


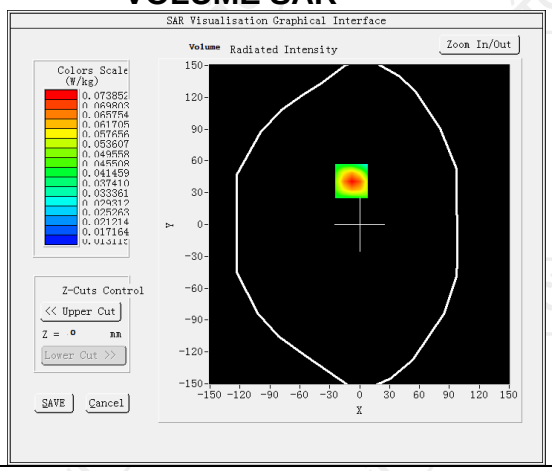

**Hot spot position**



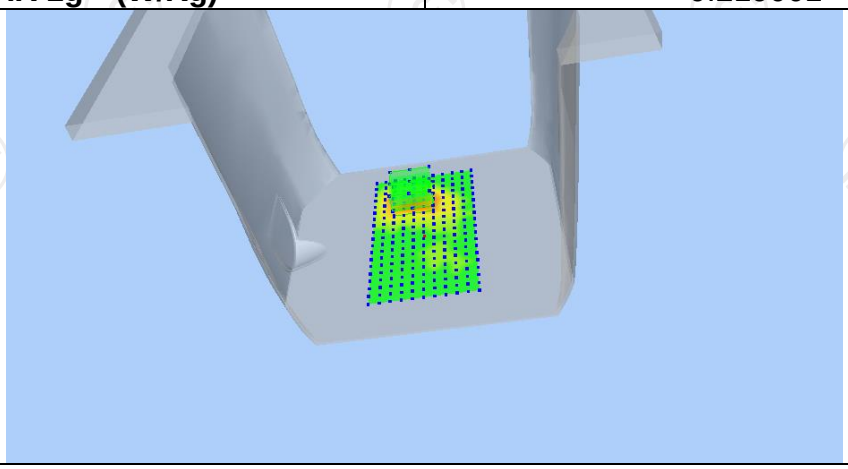
WLAN 5.2G

| **MEASUREMENT 1** | |
|---|---|
| SAR (Channel 36): | Date: 12/27/2023 |
| **Frequency (MHz)** | 5180.000000 |
| **Relative permittivity (real part)** | 35.068832 |
| **Relative permittivity (imaginary part)** | 13.679428 |
| **Conductivity (S/m)** | 5.220788 |
| **Variation (%)** | 3.120000 |
| **Crest Factor** | 1.0 |
| **Probe Conversion factor** | 2.01 |
| **E-Field Probe:** | SSE2 (SN 25/22 EPGO375) |
| **Area Scan** | dx=8mm dy=8mm, h= 5.00 mm |
| **ZoomScan** | 5x5x7,dx=8mm dy=8mm dz=5mm,Complete/ndx=8mm dy=8mm, h= 5.00 mm |
| **Phantom** | Validation plane |
| **Device Position** | Body back(0mm) |
| **Band** | IEEE 802.11a |
| **SURFACE SAR** | **VOLUME SAR** |

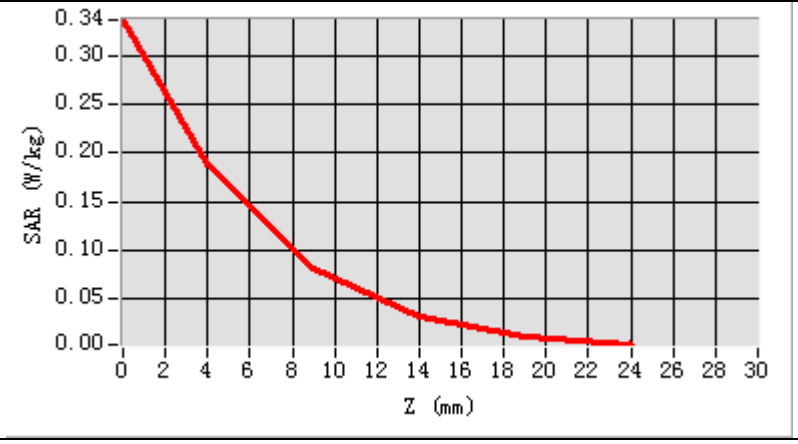


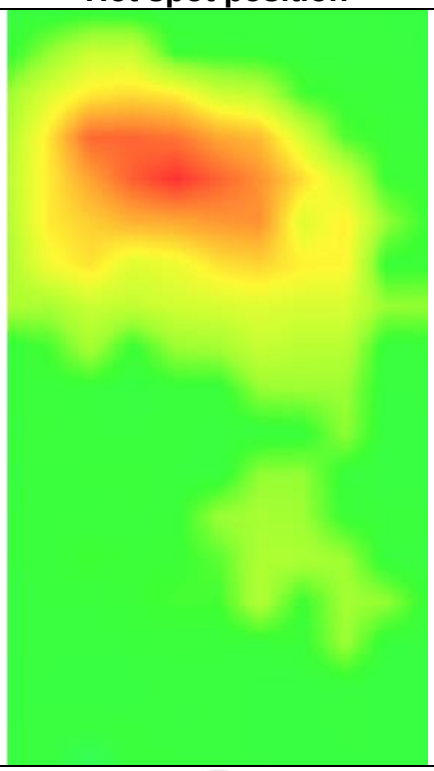

| **Maximum location: X=16.00, Y=63.00 SAR Peak: 0.30 W/kg** | |
|---|---|
| **SAR 10g (W/Kg)** | 0.138422 |
| **SAR 1g (W/Kg)** | 0.219001 |

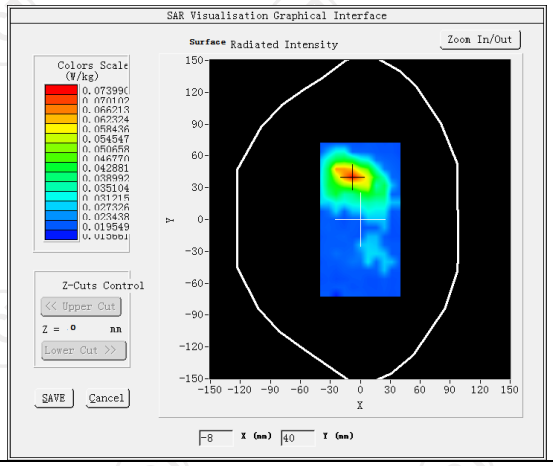
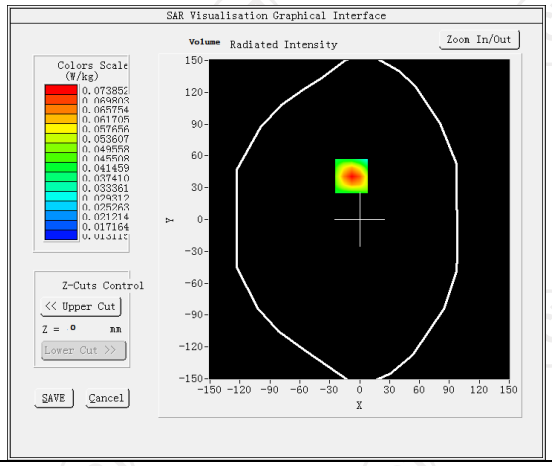
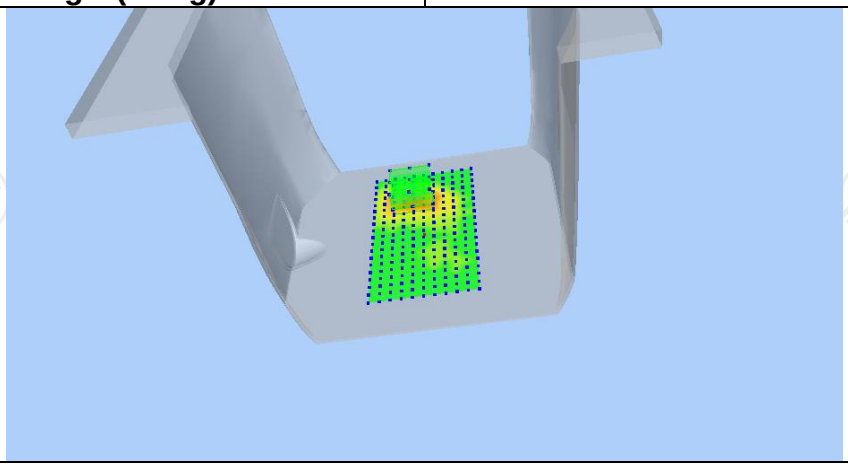


| Z (mm) | 0.00 | 4.00 | 9.00 | 14.00 | 19.00 |
|---|---|---|---|---|---|
| SAR (W/Kg) | 0.3372 | 0.1876 | 0.0816 | 0.0317 | 0.0109 |

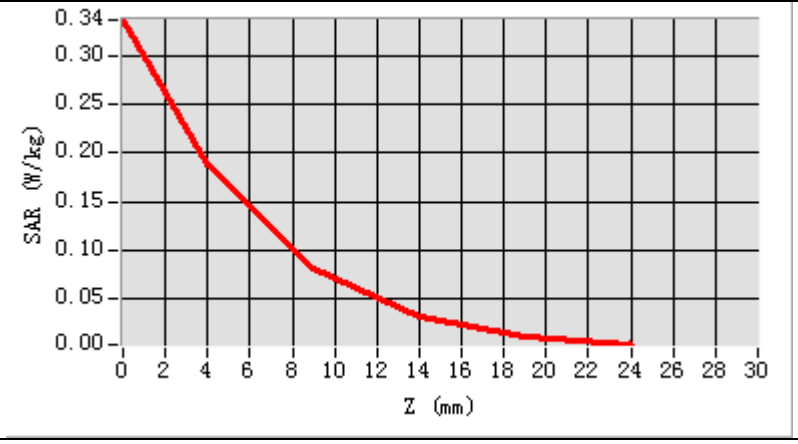



**Hot spot position**

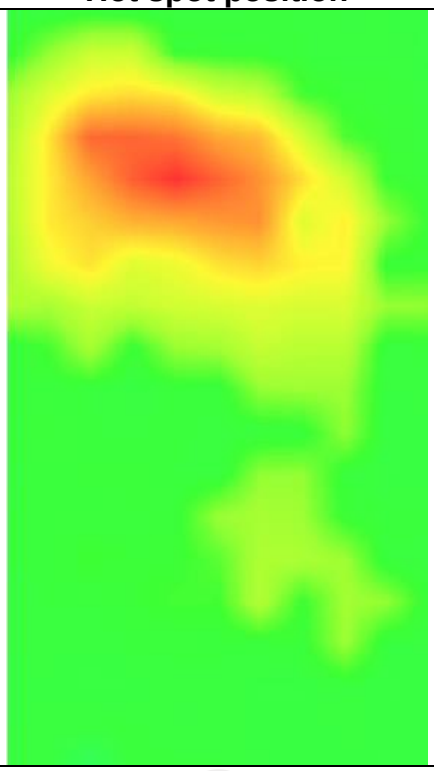


| MEASUREMENT 2 | |
|---|---|
| SAR (Channel 36): | Date: 12/27/2023 |
| **Frequency (MHz)** | 5180.000000 |
| **Relative permittivity (real part)** | 35.068832 |
| **Relative permittivity (imaginary part)** | 13.679428 |
| **Conductivity (S/m)** | 5.220788 |
| **Variation (%)** | -0.510000 |
| **Crest Factor** | 1.0 |
| **Probe Conversion factor** | 2.01 |
| **E-Field Probe:** | SSE2 (SN 25/22 EPGO375) |
| **Area Scan** | dx=8mm dy=8mm, h= 5.00 mm |
| **ZoomScan** | 5x5x7,dx=8mm dy=8mm dz=5mm,Complete/ndx=8mm dy=8mm, h= 5.00 mm |
| **Phantom** | Validation plane |
| **Device Position** | Body back(hotspot 0mm) |
| **Band** | IEEE 802.11a |
| **SURFACE SAR** | **VOLUME SAR** |
|  |  |
| **Maximum location: X=19.00, Y=-12.00 SAR Peak: 0.34 W/kg** | |
| **SAR 10g (W/Kg)** | 0.168191 |
| **SAR 1g (W/Kg)** | 0.231620 |
|  | |

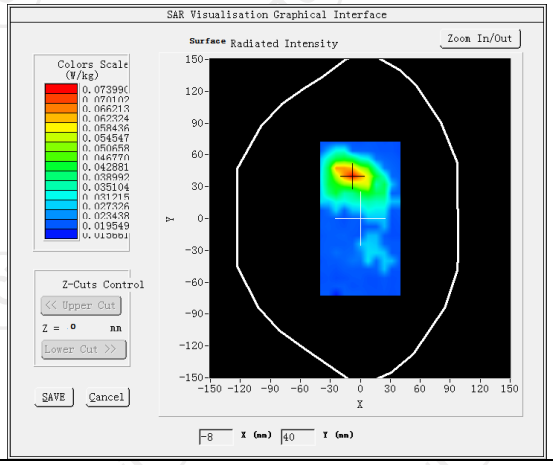
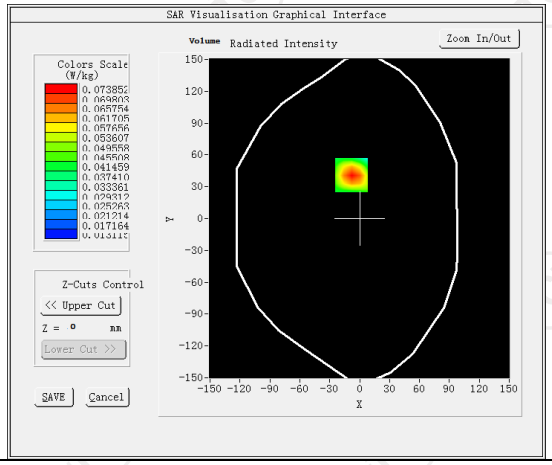
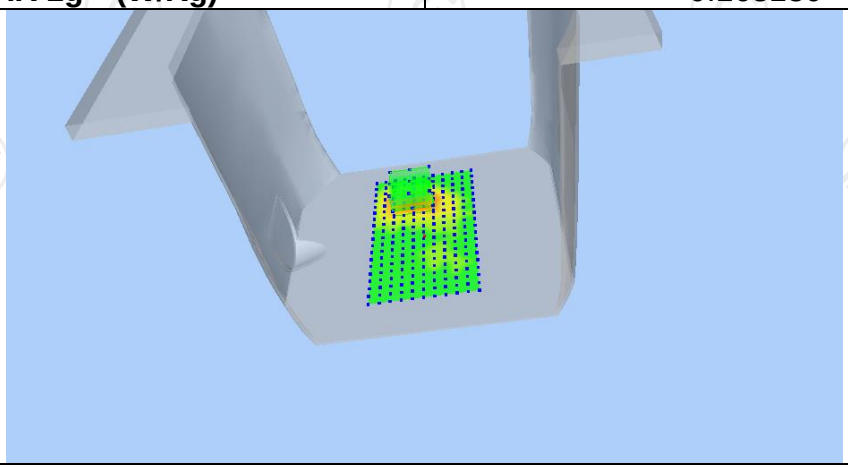
| Z (mm) | 0.00 | 4.00 | 9.00 | 14.00 | 19.00 |
|---|---|---|---|---|---|
| SAR (W/Kg) | 0.3397 | 0.1890 | 0.0823 | 0.0317 | 0.0117 |



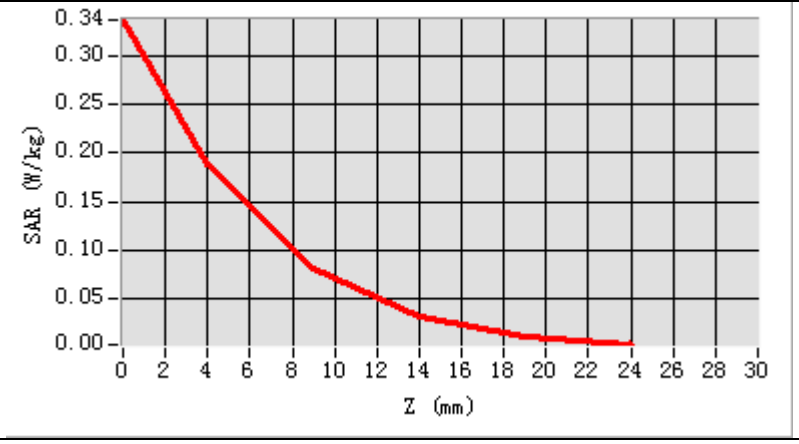

**Hot spot position**



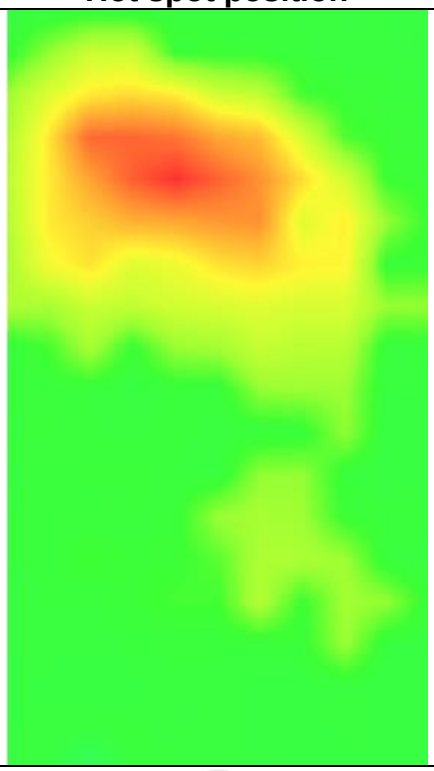
WLAN 5.8G

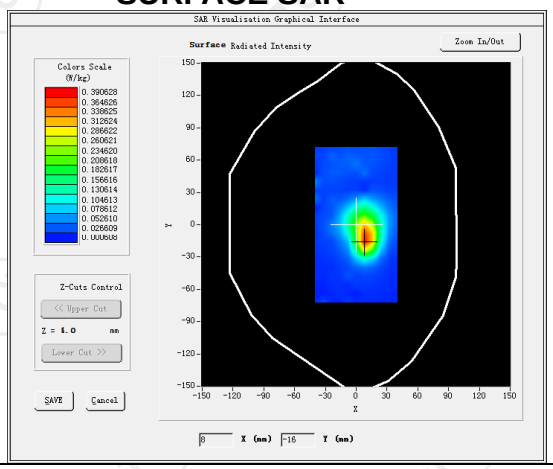
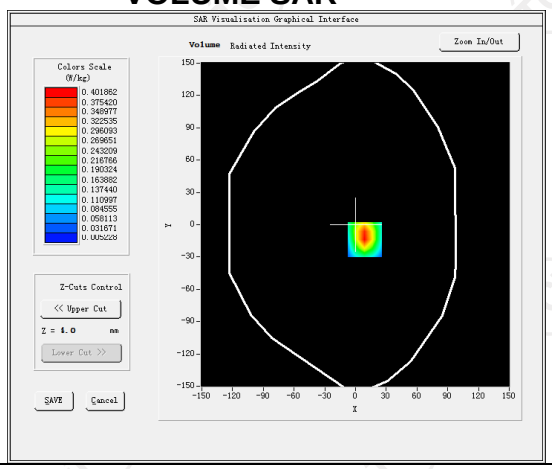
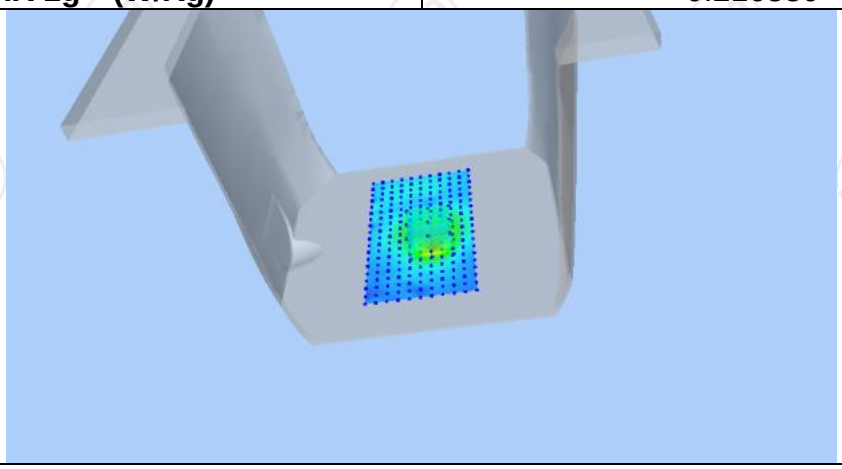
| **MEASUREMENT 1** | |
|---|---|
| SAR (Channel 157): | Date: 12/27/2023 |
| **Frequency (MHz)** | 5785.000000 |
| **Relative permittivity (real part)** | 38.352823 |
| **Relative permittivity (imaginary part)** | 13.671675 |
| **Conductivity (S/m)** | 5.430828 |
| **Variation (%)** | 2.120000 |
| **Crest Factor** | 1.0 |
| **Probe Conversion factor** | 2.13 |
| **E-Field Probe:** | SSE2 (SN 25/22 EPGO375) |
| **Area Scan** | dx=8mm dy=8mm, h= 5.00 mm |
| **ZoomScan** | 5x5x7,dx=8mm dy=8mm dz=5mm,Complete/ndx=8mm dy=8mm, h= 5.00 mm |
| **Phantom** | Validation plane |
| **Device Position** | Body back(0mm) |
| **Band** | IEEE 802.11ac VHT20 |
| **SURFACE SAR** | **VOLUME SAR** |
|  |  |
| **Maximum location: X=15.00, Y=60.00 SAR Peak: 0.34 W/kg** | |
| **SAR 10g (W/Kg)** | 0.116201 |
| **SAR 1g (W/Kg)** | 0.168130 |
|  | |

| Z (mm) | 0.00 | 4.00 | 9.00 | 14.00 | 19.00 |
|---|---|---|---|---|---|
| SAR (W/Kg) | 0.3410 | 0.1901 | 0.0791 | 0.0327 | 0.0109 |

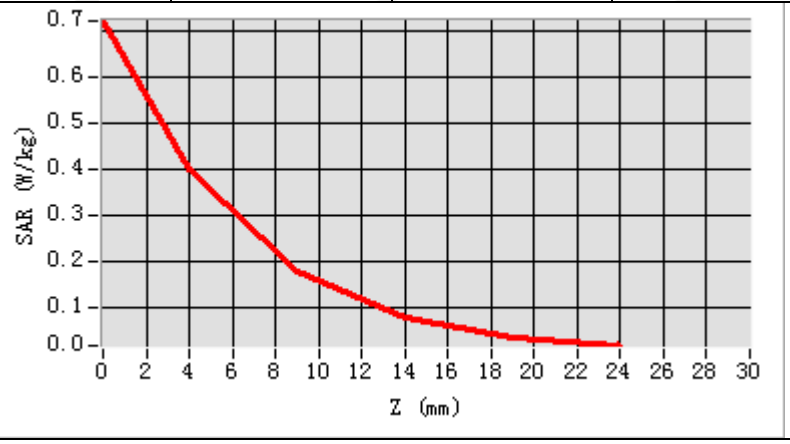



**Hot spot position**

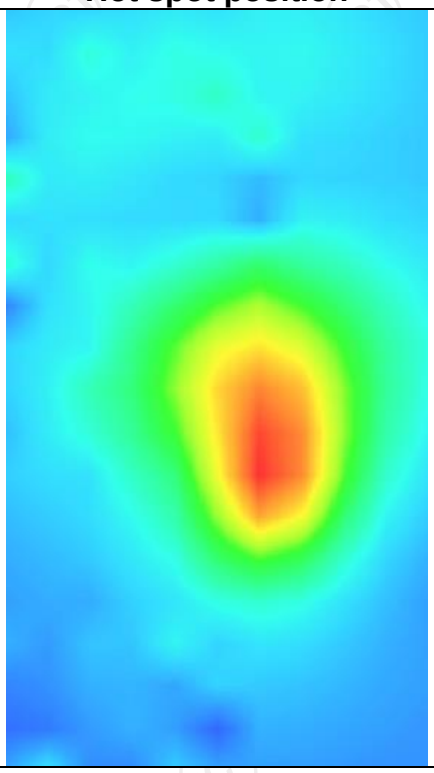


| MEASUREMENT 2 | |
|---|---|
| SAR (Channel 157): | Date: 12/27/2023 |
| **Frequency (MHz)** | 5785.000000 |
| **Relative permittivity (real part)** | 38.352823 |
| **Relative permittivity (imaginary part)** | 13.671675 |
| **Conductivity (S/m)** | 5.430828 |
| **Variation (%)** | 2.350000 |
| **Crest Factor** | 1.0 |
| **Probe Conversion factor** | 2.13 |
| **E-Field Probe:** | SSE2 (SN 25/22 EPGO375) |
| **Area Scan** | dx=8mm dy=8mm, h= 5.00 mm |
| **ZoomScan** | 5x5x7,dx=8mm dy=8mm dz=5mm,Complete/ndx=8mm dy=8mm, h= 5.00 mm |
| **Phantom** | Validation plane |
| **Device Position** | Body back(0mm) |
| **Band** | IEEE 802.11ac HT20(hotspot) |
| **SURFACE SAR** | **VOLUME SAR** |
|  |  |
| **Maximum location: X=19.00, Y=-12.00 SAR Peak: 0.69 W/kg** | |
| **SAR 10g (W/Kg)** | 0.151267 |
| **SAR 1g (W/Kg)** | 0.216830 |
|  | |

| Z (mm) | 0.00 | 4.00 | 9.00 | 14.00 | 19.00 |
|---|---|---|---|---|---|
| SAR (W/Kg) | 0.6971 | 0.3951 | 0.1904 | 0.0694 | 0.0381 |

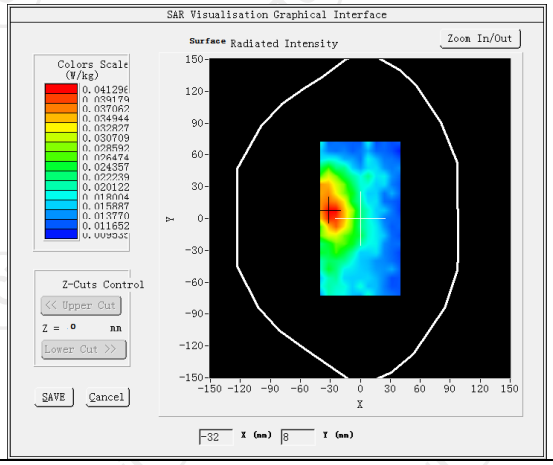


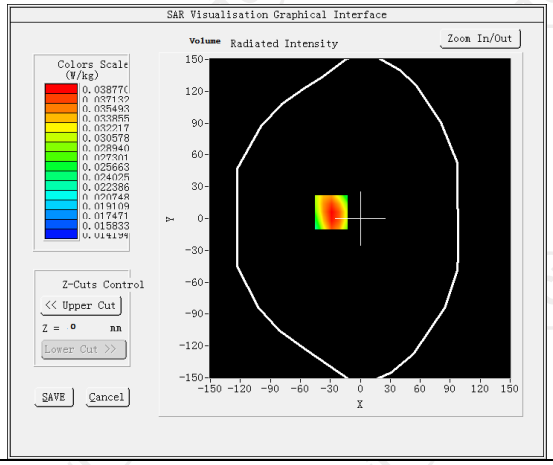

**Hot spot position**



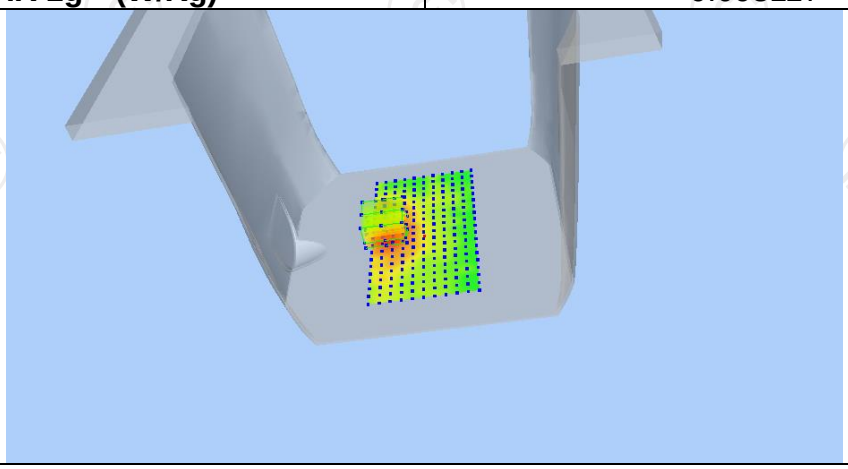
BT

| MEASUREMENT 1 | |
|---|---|
| Low Band SAR (Channel 0): | Date: 12/21/2023 |
| **Frequency (MHz)** | 2402.000000 |
| **Relative permittivity (real part)** | 39.217999 |
| **Relative permittivity (imaginary part)** | 13.211000 |
| **Conductivity (S/m)** | 1.791558 |
| **Variation (%)** | -1.420000 |
| **Crest Factor** | 1.0 |
| **Probe Conversion factor** | 2.31 |
| **E-Field Probe:** | SSE2 (SN 25/22 EPGO375) |
| **Area Scan** | dx=8mm dy=8mm, h= 5.00 mm |
| **ZoomScan** | 5x5x7,dx=8mm dy=8mm dz=5mm,Complete/ndx=8mm dy=8mm, h= 5.00 mm |
| **Phantom** | Validation plane |
| **Device Position** | Body back(0mm) |
| **Band** | GFSK |
| **SURFACE SAR** | **VOLUME SAR** |

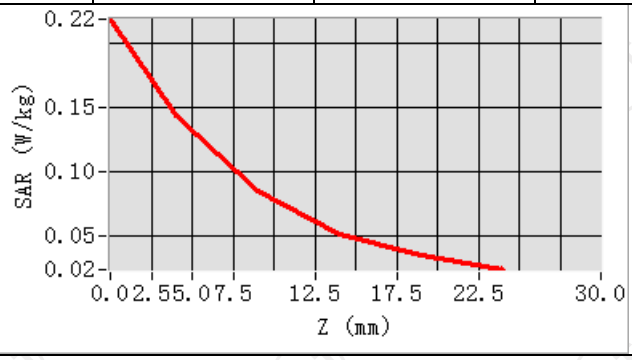


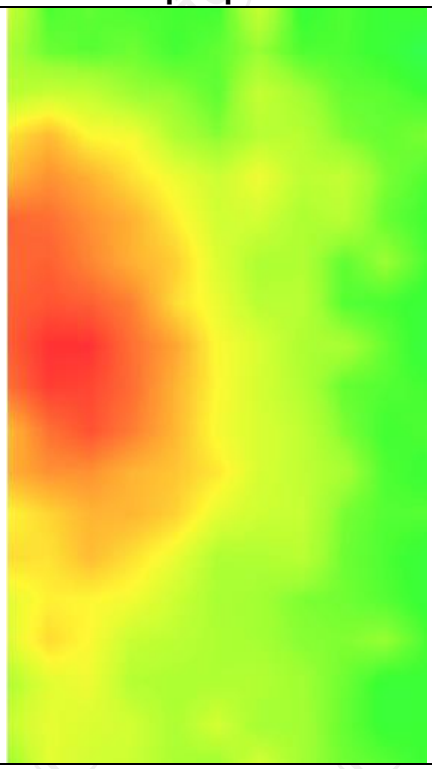

| Maximum location: X=-29.00, Y=6.00 SAR Peak: 0.22 W/kg | |
|---|---|
| **SAR 10g (W/Kg)** | 0.058107 |
| **SAR 1g (W/Kg)** | 0.098117 |



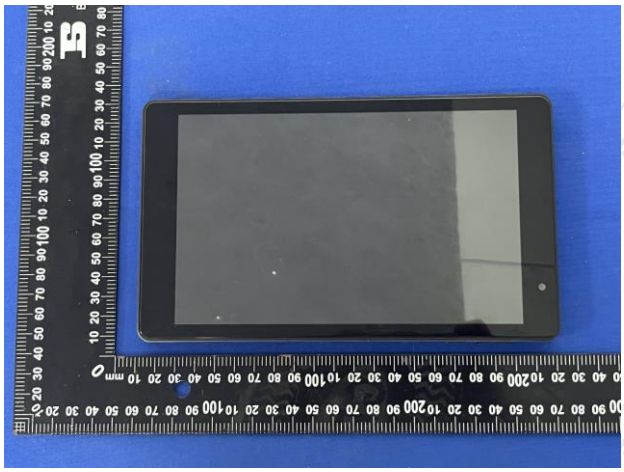
| Z (mm) | 0.00 | 4.00 | 9.00 | 14.00 | 19.00 |
|---|---|---|---|---|---|
| SAR (W/Kg) | 0.2186 | 0.1441 | 0.0851 | 0.0523 | 0.0350 |




**Hot spot position**



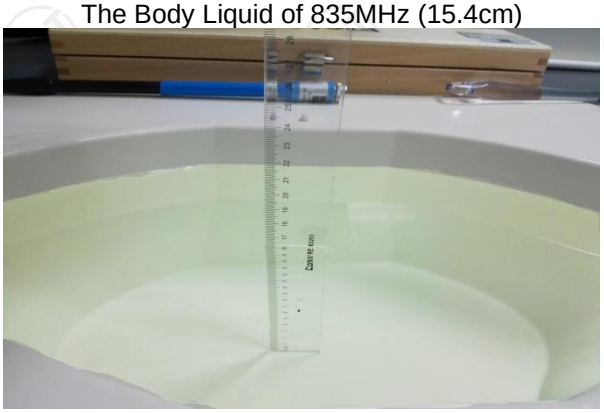
# Appendix A: EUT Photos



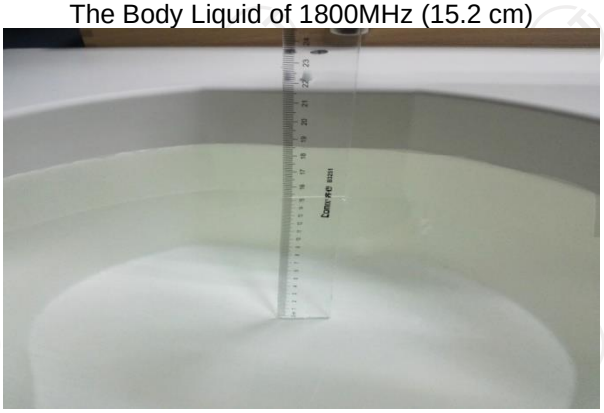
# Liquid depth

The Body Liquid of 835MHz (15.4cm)

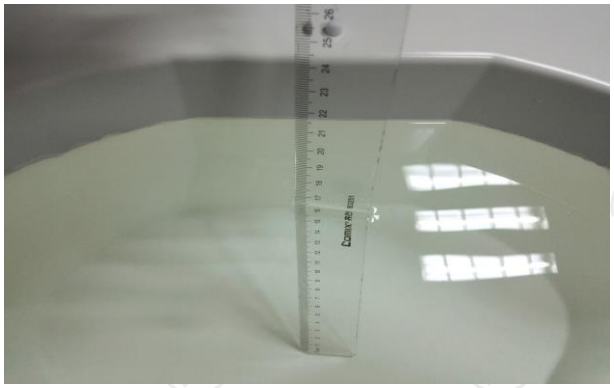
The Body Liquid of 1800MHz (15.2 cm)



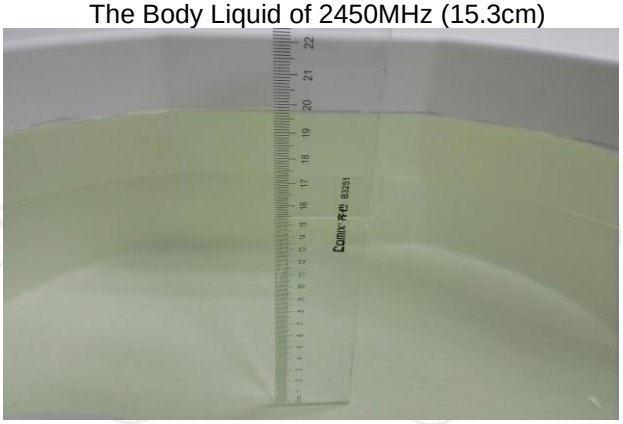
The Body Liquid of 1900MHz (16.4 cm)



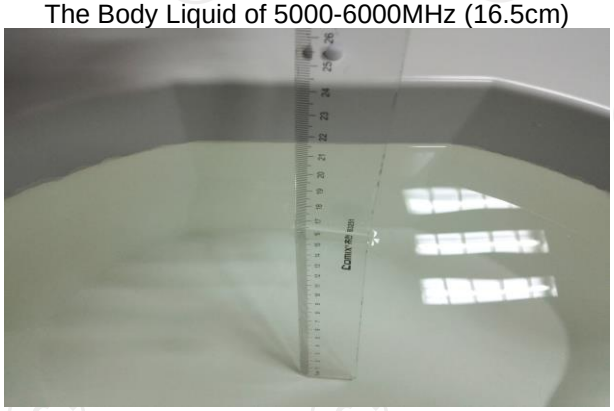
The Body Liquid of 2450MHz (15.3cm)



The Body Liquid of 5000-6000MHz (16.5cm)



The Body Liquid of 750MHz (15.4cm)



The Body Liquid of 2600MHz (16.5cm)



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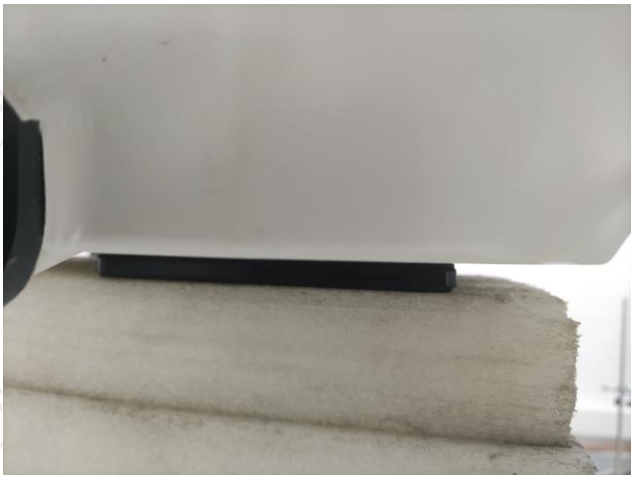
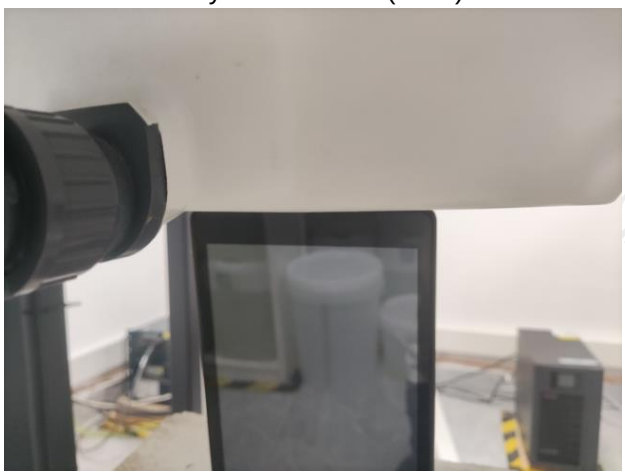
# Appendix B: Test Setup Photos

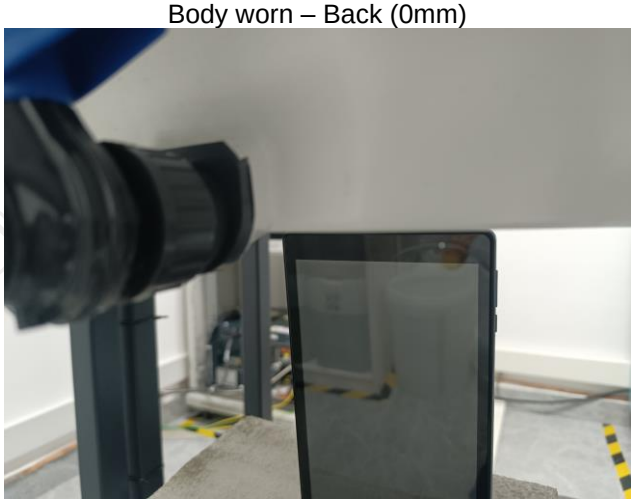
Body worn – Front (0mm)



Body worn – Back (0mm)



Body worn – Bottom (0mm)



Body worn – Top (0mm)

Hotspo Front (0mm)

Hotspo Back (0mm)

Hotspot Bottom (0mm)

Hotspot Top (0mm)

# Appendix C: Probe Calibration Certificate

COMOSAR E-FIELD Probe

## COMOSAR E-Field Probe Calibration Report

Ref : ACR.180.7.22.BES.B

**SHENZHEN TONGCE TESTING LAB**

**2101 & 2201, ZHENCHANG FACTORY RENSHAN INDUSTRIAL ZONE, FUHAI SUBDISTRICT, BAO'AN DISTRICT SHENZHEN, GUANGDONG, 518103, PEOPLE'S REPUBLIC OF CHINA**

**MVG COMOSAR DOSIMETRIC E-FIELD PROBE**

**SERIAL NO.: SN 25/22 EPGO375**

**Calibrated at MVG**

**Z.I. de la pointe du diable**

**Technopôle Brest Iroise – 295 avenue Alexis de Rochon**

**29280 PLOUZANE - FRANCE**

**Calibration date: 06/29/2023**

Accreditations #2-6789
Scope available on www.cofrac.fr

The use of the Cofrac brand and the accreditation references is prohibited from any reproduction.

*Summary:*

This document presents the method and results from an accredited COMOSAR Dosimetric E-Field Probe calibration performed at MVG, using the CALIPROBE test bench, for use with a MVG COMOSAR system only. The test results covered by accreditation are traceable to the International System of Units (SI).

| | *Name* | *Function* | *Date* | *Signature* |
|---|---|---|---|---|
| *Prepared by :* | Jérôme Le Gall | Measurement Responsible | 6/30/2023 | |
| *Checked & approved by:* | Jérôme Luc | Technical Manager | 6/30/2023 | |
| *Authorized by:* | Yann Toutain | Laboratory Director | 7/05/2023 | Yann TOUTAIN |

| | *Customer Name* |
|---|---|
| *Distribution :* | Shenzhen Tongce Testing Lab |

| *Issue* | *Name* | *Date* | *Modifications* |
|---|---|---|---|
| A | Jérôme Le Gall | 6/30/2023 | Initial release |
| | | | |
| | | | |
| | | | |



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# 1 DEVICE UNDER TEST

| Device Under Test | |
|---|---|
| Device Type | COMOSAR DOSIMETRIC E FIELD PROBE |
| Manufacturer | MVG |
| Model | SSE2 |
| Serial Number | SN 25/22 EPGO375 |
| Product Condition (new / used) | New |
| Frequency Range of Probe | 0.15 GHz-6GHz |
| Resistance of Three Dipoles at Connector | Dipole 1: R1=0.197 MΩ<br>Dipole 2: R2=0.230 MΩ<br>Dipole 3: R3=0.208 MΩ |

# 2 PRODUCT DESCRIPTION

## 2.1 GENERAL INFORMATION

MVG's COMOSAR E field Probes are built in accordance to the IEC/IEEE 62209-1528 and FCC KDB865664 D01 standards.

**Figure 1** – *MVG COMOSAR Dosimetric E field Probe*

| | |
|---|---|
| Probe Length | 330 mm |
| Length of Individual Dipoles | 2 mm |
| Maximum external diameter | 8 mm |
| Probe Tip External Diameter | 2.5 mm |
| Distance between dipoles / probe extremity | 1 mm |

# 3 MEASUREMENT METHOD

The IEC/IEEE 62209-1528 and FCC KDB865664 D01 standards provide recommended practices for the probe calibrations, including the performance characteristics of interest and methods by which to assess their affect. All calibrations / measurements performed meet the fore mentioned standards.

## 3.1 LINEARITY

The evaluation of the linearity was done in free space using the waveguide, performing a power sweep to cover the SAR range 0.01W/kg to 100W/kg.

## 3.2 SENSITIVITY

The sensitivity factors of the three dipoles were determined using a two step calibration method (air and tissue simulating liquid) using waveguides as outlined in the standards.



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### 3.3 LOWER DETECTION LIMIT

The lower detection limit was assessed using the same measurement set up as used for the linearity measurement. The required lower detection limit is 10 mW/kg.

### 3.4 ISOTROPY

The axial isotropy was evaluated by exposing the probe to a reference wave from a standard dipole with the dipole mounted under the flat phantom in the test configuration suggested for system validations and checks. The probe was rotated along its main axis from 0 to 360 degrees in 15-degree steps. The hemispherical isotropy is determined by inserting the probe in a thin plastic box filled with tissue-equivalent liquid, with the plastic box illuminated with the fields from a half wave dipole. The dipole is rotated about its axis (0°–180°) in 15° increments. At each step the probe is rotated about its axis (0°–360°).

### 3.1 BOUNDARY EFFECT

The boundary effect is defined as the deviation between the SAR measured data and the expected exponential decay in the liquid when the probe is oriented normal to the interface. To evaluate this effect, the liquid filled flat phantom is exposed to fields from either a reference dipole or waveguide. With the probe normal to the phantom surface, the peak spatial average SAR is measured and compared to the analytical value at the surface.

The boundary effect uncertainty can be estimated according to the following uncertainty approximation formula based on linear and exponential extrapolations between the surface and $d_{be}$ + $d_{step}$ along lines that are approximately normal to the surface:

$$\mathrm{SAR}_{\mathrm{uncertainty}}[\%] = \delta\mathrm{SAR}_{be}\frac{(d_{be}+d_{step})^2}{2d_{step}}\frac{\left(e^{-d_{be}/(\delta/2)}\right)}{\delta/2} \quad \text{for } (d_{be}+d_{step}) < 10\text{ mm}$$

where

| | |
|---|---|
| $\mathrm{SAR}_{\mathrm{uncertainty}}$ | is the uncertainty in percent of the probe boundary effect |
| $d_{be}$ | is the distance between the surface and the closest *zoom-scan* measurement point, in millimetre |
| $\Delta_{step}$ | is the separation distance between the first and second measurement points that are closest to the phantom surface, in millimetre, assuming the boundary effect at the second location is negligible |
| $\delta$ | is the minimum penetration depth in millimetres of the head tissue-equivalent liquids defined in this standard, i.e., $\delta \approx$ 14 mm at 3 GHz; |
| $\Delta\mathrm{SAR}_{be}$ | in percent of SAR is the deviation between the measured SAR value, at the distance $d_{be}$ from the boundary, and the analytical SAR value. |

The measured worst case boundary effect SAR uncertainty[%] for scanning distances larger than 4mm is 1.0% Limit ,2%).



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## 4 MEASUREMENT UNCERTAINTY

The guidelines outlined in the IEC/IEEE 62209-1528 and FCC KDB865664 D01 standards were followed to generate the measurement uncertainty associated with an E-field probe calibration using the waveguide technique. All uncertainties listed below represent an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2, traceable to the Internationally Accepted Guides to Measurement Uncertainty.

| Uncertainty analysis of the probe calibration in waveguide | | | | | |
|---|---|---|---|---|---|
| **ERROR SOURCES** | **Uncertainty value (%)** | **Probability Distribution** | **Divisor** | **ci** | **Standard Uncertainty (%)** |
| **Expanded uncertainty**<br>95 % confidence level k = 2 | | | | | 14 % |

## 5 CALIBRATION MEASUREMENT RESULTS

| Calibration Parameters | |
|---|---|
| Liquid Temperature | 20 +/- 1 °C |
| Lab Temperature | 20 +/- 1 °C |
| Lab Humidity | 30-70 % |

### 5.1 SENSITIVITY IN AIR

| Normx dipole 1 (μV/(V/m)$^2$) | Normy dipole 2 (μV/(V/m)$^2$) | Normz dipole 3 (μV/(V/m)$^2$) |
|---|---|---|
| 0.64 | 0.53 | 0.44 |

| DCP dipole 1 (mV) | DCP dipole 2 (mV) | DCP dipole 3 (mV) |
|---|---|---|
| 106 | 108 | 109 |

Calibration curves ei=f(V) (i=1,2,3) allow to obtain E-field value using the formula:

$$E = \sqrt{E_1^{\ 2} + E_2^{\ 2} + E_3^{\ 2}}$$



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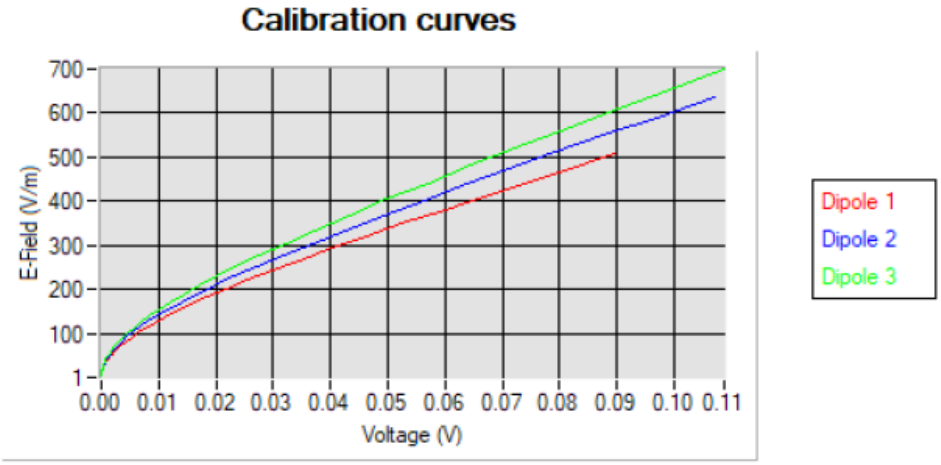
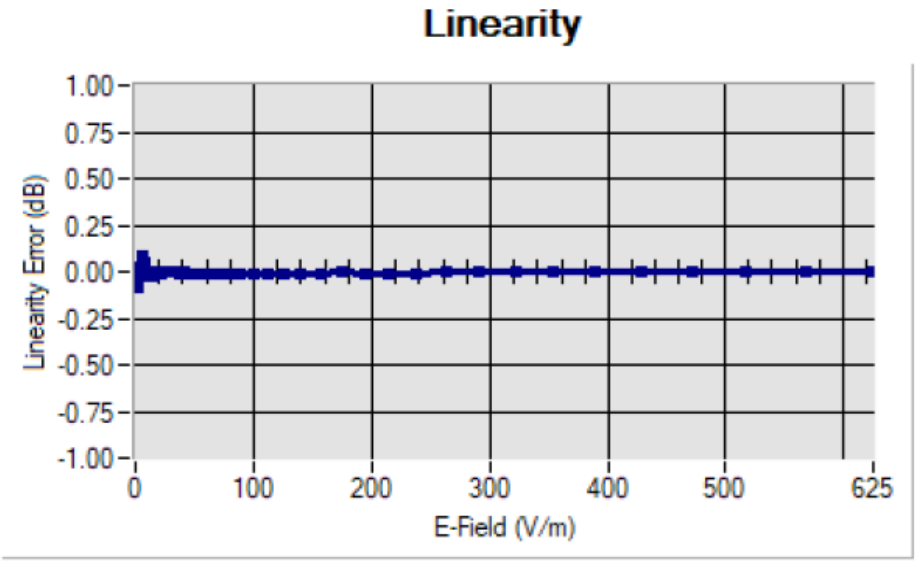



5.2 LINEARITY




Linearity:+/-1.94% (+/-0.09dB)



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## 5.3 SENSITIVITY IN LIQUID

| Liquid | Frequency (MHz +/- 100MHz) | ConvF |
|---|---|---|
| HL750 | 750 | 1.71 |
| BL750 | 750 | 1.78 |
| HL900 | 900 | 1.91 |
| BL900 | 900 | 1.96 |
| HL1800 | 1800 | 2.08 |
| BL1800 | 1800 | 2.16 |
| HL2000 | 2000 | 2.03 |
| BL2000 | 2000 | 2.10 |
| HL2450 | 2450 | 2.31 |
| BL2450 | 2450 | 2.37 |
| HL2600 | 2600 | 2.16 |
| BL2600 | 2600 | 2.23 |
| HL3500 | 3500 | 2.21 |
| BL3500 | 3500 | 2.28 |
| HL3700 | 3700 | 3.45 |
| BL3700 | 3700 | 3.15 |
| HL4600 | 4600 | 3.30 |
| BL4600 | 4600 | 3.70 |
| HL5200 | 5200 | 2.01 |
| BL5200 | 5200 | 2.08 |
| HL5600 | 5600 | 2.07 |
| BL5600 | 5600 | 2.12 |
| HL5800 | 5800 | 2.06 |
| BL5800 | 5800 | 2.13 |

LOWER DETECTION LIMIT: 7mW/kg



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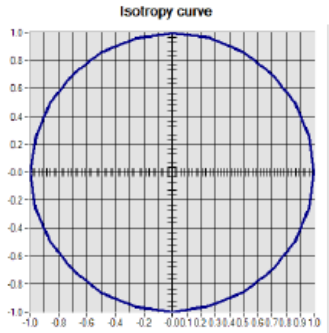
## 5.4 ISOTROPY

**HL1800 MHz**




Isotropy:+/-0.41% (+/-0.02dB)



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## 6 LIST OF EQUIPMENT

| Equipment Summary Sheet | | | | |
|---|---|---|---|---|
| **Equipment Description** | **Manufacturer / Model** | **Identification No.** | **Current Calibration Date** | **Next Calibration Date** |
| CALIPROBE Test Bench | Version 2 | NA | Validated. No cal required. | Validated. No cal required. |
| Network Analyzer | Rohde & Schwarz ZVM | 100203 | 08/2021 | 08/2024 |
| Network Analyzer | Agilent 8753ES | MY40003210 | 10/2023 | 10/2026 |
| Network Analyzer – Calibration kit | HP 85033D | 3423A08186 | 06/2021 | 06/2027 |
| Multimeter | Keithley 2000 | 1160271 | 02/2023 | 02/2026 |
| Signal Generator | Rohde & Schwarz SMB | 106589 | 03/2022 | 03/2025 |
| Amplifier | MVG | MODU-023-C-0002 | Characterized prior to test. No cal required. | Characterized prior to test. No cal required. |
| Power Meter | NI-USB 5680 | 170100013 | 06/2021 | 06/2024 |
| Power Meter | Rohde & Schwarz NRVD | 832839-056 | 11/2023 | 11/2026 |
| Directional Coupler | Krytar 158020 | 131467 | Characterized prior to test. No cal required. | Characterized prior to test. No cal required. |
| Waveguide | MVG | SN 32/16 WG4_1 | Validated. No cal required. | Validated. No cal required. |
| Liquid transition | MVG | SN 32/16 WGLIQ_0G900_1 | Validated. No cal required. | Validated. No cal required. |
| Waveguide | MVG | SN 32/16 WG6_1 | Validated. No cal required. | Validated. No cal required. |
| Liquid transition | MVG | SN 32/16 WGLIQ_1G500_1 | Validated. No cal required. | Validated. No cal required. |
| Waveguide | MVG | SN 32/16 WG8_1 | Validated. No cal required. | Validated. No cal required. |
| Liquid transition | MVG | SN 32/16 WGLIQ_1G800B_1 | Validated. No cal required. | Validated. No cal required. |
| Liquid transition | MVG | SN 32/16 WGLIQ_1G800H_1 | Validated. No cal required. | Validated. No cal required. |
| Waveguide | MVG | SN 32/16 WG10_1 | Validated. No cal required. | Validated. No cal required. |
| Liquid transition | MVG | SN 32/16 WGLIQ_3G500_1 | Validated. No cal required. | Validated. No cal required. |
| Waveguide | MVG | SN 32/16 WG12_1 | Validated. No cal required. | Validated. No cal required. |



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| | | | | |
|---|---|---|---|---|
| Liquid transition | MVG | SN 32/16 WGLIQ_5G000_1 | Validated. No cal required. | Validated. No cal required. |
| Temperature / Humidity Sensor | Testo 184 H1 | 44225320 | 06/2021 | 06/2024 |



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# Dielectric Probe Calibration Report

Ref : ACR.138.4.33.SATU.A

**SHENZHEN TONGCE TESTING LAB**
**2101&2201, ZHENCHANG FACTORY, RENSHAN INDUSTRIAL ZONE, FUHAI SUBDISTRICT, BAOAN DISTRICT, SHENZHEN, GUANGDONG, 518103, PEOPLES REPUBLIC OF CHINA**

## MVG COMOSAR DOSIMETRIC E-FIELD PROBE

**FREQUENCY: 0.3-6 GHZ**
**SERIAL NO.: SN 19/15 OCPG 71**

**Calibrated at MVG US**
**2105 Barrett Park Dr. - Kennesaw, GA 30144**

ilac-MRA ACCREDITED Calibration CERT #2246-02

**Calibration Date: 06/05/2021**

*Summary:*

This document presents the method and results from an accredited Dielectric Probe calibration performed in MVG USA using the LIMESAR test bench. All calibration results are traceable to national metrology institutions.

SAR DIELECTRIC PROBE CALIBRATION REPORT

Ref: ACR.138.4.33..SATU.A

| | Name | Function | Date | Signature |
|---|---|---|---|---|
| *Prepared by :* | Jérôme LUC | Product Manager | 06/05/2021 | |
| *Checked by :* | Jérôme LUC | Product Manager | 06/05/2021 | |
| *Approved by :* | Kim RUTKOWSKI | Quality Manager | 06/05/2021 | |

| | Customer Name |
|---|---|
| *Distribution :* | SHENZHEN TONGCE TESTING LAB |

| Issue | Date | Modifications |
|---|---|---|
| A | 06/05/2021 | Initial release |
| | | |
| | | |
| | | |



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# 1 INTRODUCTION

This document contains a summary of the suggested methods and requirements set forth by the IEEE 1528 and CEI/IEC 62209 standards for liquid permittivity measurements and the measurements that were performed to verify that the product complies with the fore mentioned standards.

# 2 DEVICE UNDER TEST

| Device Under Test | |
|---|---|
| Device Type | LIMESAR DIELECTRIC PROBE |
| Manufacturer | MVG |
| Model | SCLMP |
| Serial Number | SN 19/15 OCPG 71 |
| Product Condition (new / used) | Used |

A yearly calibration interval is recommended.

# 3 PRODUCT DESCRIPTION

## 3.1 GENERAL INFORMATION

MVG's Dielectric Probes are built in accordance to the IEEE 1528 and CEI/IEC 62209 standards. The product is designed for use with the LIMESAR test bench only.

**Figure 1** – *MVG LIMESAR Dielectric Probe*



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## 4 MEASUREMENT METHOD

The IEEE 1528, OET 65 Bulletin C and CEI/IEC 62209-1 & 2 standards outline techniques for dielectric property measurements. The LIMESAR test bench employs one of the methods outlined in the standards, using a contact probe or open-ended coaxial transmission-line probe and vector network analyzer. The standards recommend the measurement of two reference materials that have well established and stable dielectric properties to validate the system, one for the calibration and one for checking the calibration. The LIMESAR test bench uses De-ionized water as the reference for the calibration and either DMS or Methanol as the reference for checking the calibration. The following measurements were performed to verify that the product complies with the fore mentioned standards.

### 4.1 LIQUID PERMITTIVITY MEASUREMENTS

The permittivity of a liquid with well established dielectric properties was measured and the measurement results compared to the values provided in the fore mentioned standards.

## 5 MEASUREMENT UNCERTAINTY

All uncertainties listed below represent an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2, traceable to the Internationally Accepted Guides to Measurement Uncertainty.

### 5.1 DIELECTRIC PERMITTIVITY MEASUREMENT

The following uncertainties apply to the Dielectric Permittivity measurement:

| Uncertainty analysis of Permittivity Measurement | | | | | |
|---|---|---|---|---|---|
| **ERROR SOURCES** | **Uncertainty value (+/-%)** | **Probability Distribution** | **Divisor** | **ci** | **Standard Uncertainty (+/-%)** |
| Repeatability (n repeats, mid-band) | 4.00% | N | 1 | 1 | 4.000% |
| Deviation from reference liquid | 5.00% | R | √3 | 1 | 2.887% |
| Network analyser-drift, linearity | 2.00% | R | √3 | 1 | 1.155% |
| Test-port cable variations | 0.00% | U | √2 | 1 | 0.000% |
| **Combined standard uncertainty** | | | | | 5.066% |
| **Expanded uncertainty (confidence level of 95%, k = 2)** | | | | | 10.0% |

| Uncertainty analysis of Conductivity Measurement | | | | | |
|---|---|---|---|---|---|
| **ERROR SOURCES** | **Uncertainty value (+/-%)** | **Probability Distribution** | **Divisor** | **ci** | **Standard Uncertainty (+/-%)** |
| Repeatability (n repeats, mid-band) | 3.50% | N | 1 | 1 | 3.500% |
| Deviation from reference liquid | 3.00% | R | √3 | 1 | 1.732% |
| Network analyser-drift, linearity | 2.00% | R | √3 | 1 | 1.155% |
| Test-port cable variations | 0.00% | U | √2 | 1 | 0.000% |
| **Combined standard uncertainty** | | | | | 4.072% |
| **Expanded uncertainty (confidence level of 95%, k = 2)** | | | | | 8.1% |



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