

Test mode: WCDMA Band V, Middle channel (Left Head Cheek)

Product Description: Smart Phone

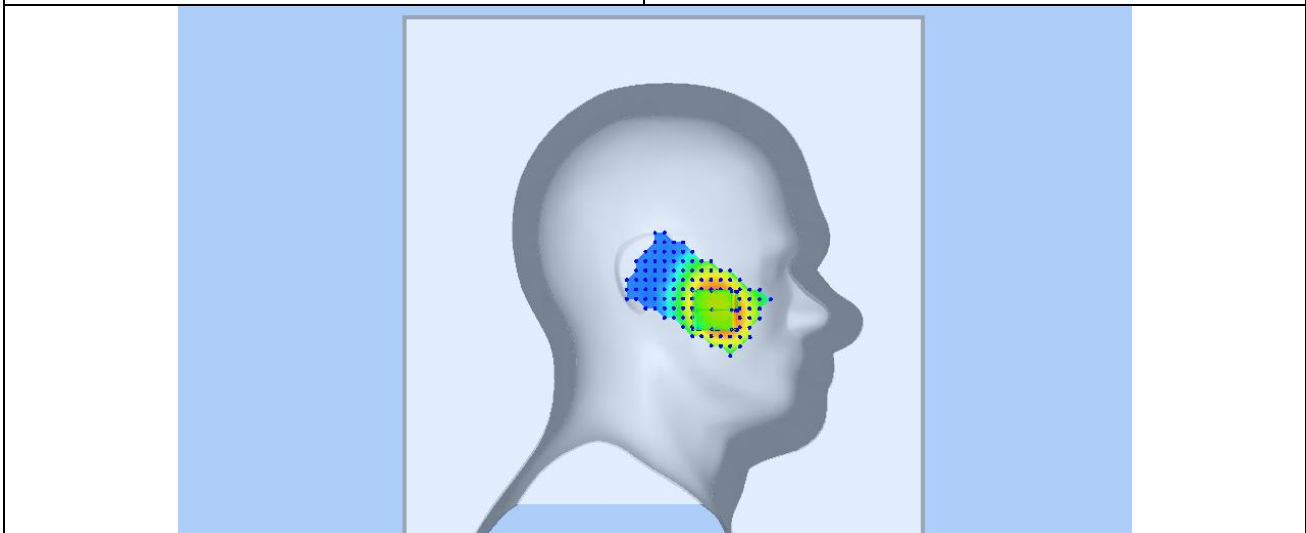
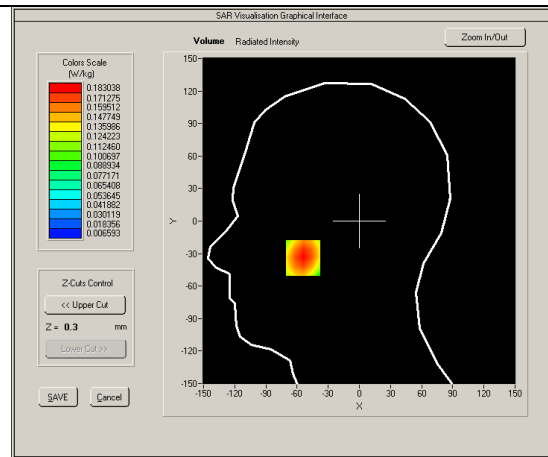
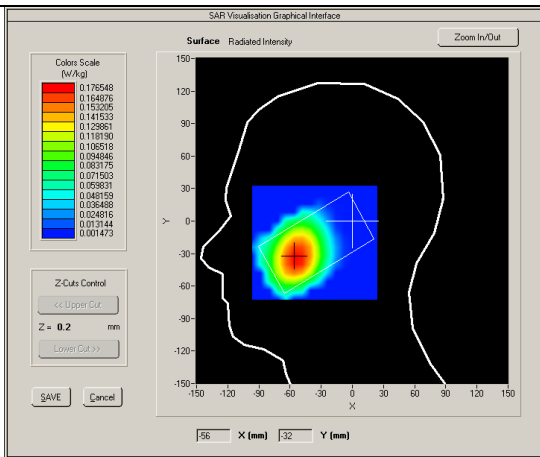
Model: M4 B2

Test Date: Dec 25,2017

| | |
|-----------------------------------|----------------------------|
| Medium(liquid type) | HSL_835 |
| Frequency (MHz) | 835.0000 |
| Relative permittivity (real part) | 41.2 |
| Conductivity (S/m) | 0.91 |
| E-Field Probe | SN 27/15 EPGO262 |
| Crest factor | 1.0 |
| Conversion Factor | 1.90 |
| Sensor-Surface | 4mm |
| Area Scan | dx=8mm dy=8mm |
| Zoom Scan | 5x5x7,dx=8mm dy=8mm dz=5mm |
| Variation (%) | 0.000000 |
| SAR 10g (W/Kg) | 0.126018 |
| SAR 1g (W/Kg) | 0.175416 |

SURFACE SAR

VOLUME SAR



Test mode: WCDMA Band V, Middle channel (Body Back Side)

Product Description: Smart Phone

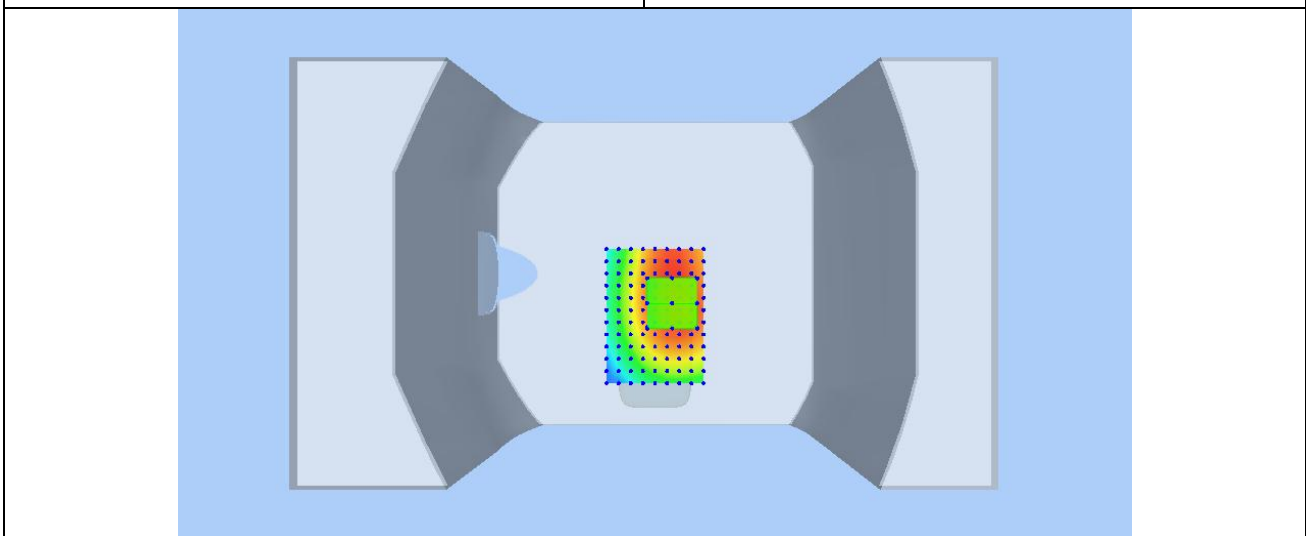
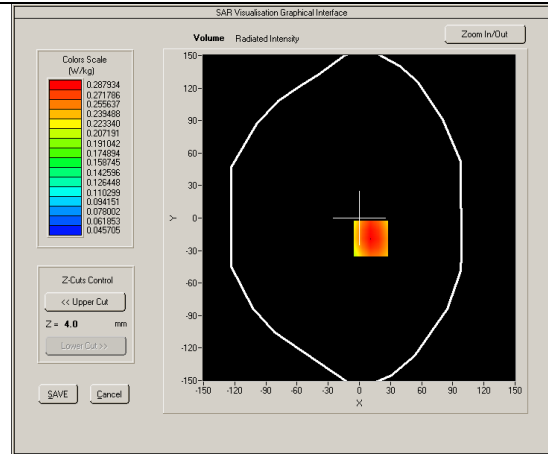
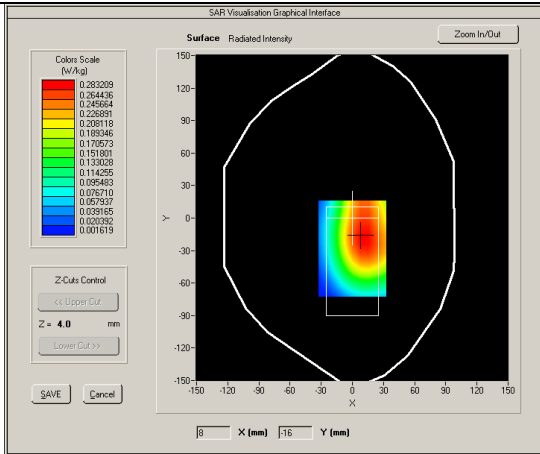
Model: M4 B2

Test Date: Dec 25,2017

| | |
|-----------------------------------|----------------------------|
| Medium(liquid type) | MSL_835 |
| Frequency (MHz) | 835.0000 |
| Relative permittivity (real part) | 55.17 |
| Conductivity (S/m) | 0.99 |
| E-Field Probe | SN 27/15 EPGO262 |
| Crest factor | 1.0 |
| Conversion Factor | 1.97 |
| Sensor-Surface | 4mm |
| Area Scan | dx=8mm dy=8mm |
| Zoom Scan | 5x5x7,dx=8mm dy=8mm dz=5mm |
| Variation (%) | -1.330000 |
| SAR 10g (W/Kg) | 0.198061 |
| SAR 1g (W/Kg) | 0.277437 |

SURFACE SAR

VOLUME SAR



Test mode: PCS1900, Middle channel (Right Head Cheek)

Product Description: Smart Phone

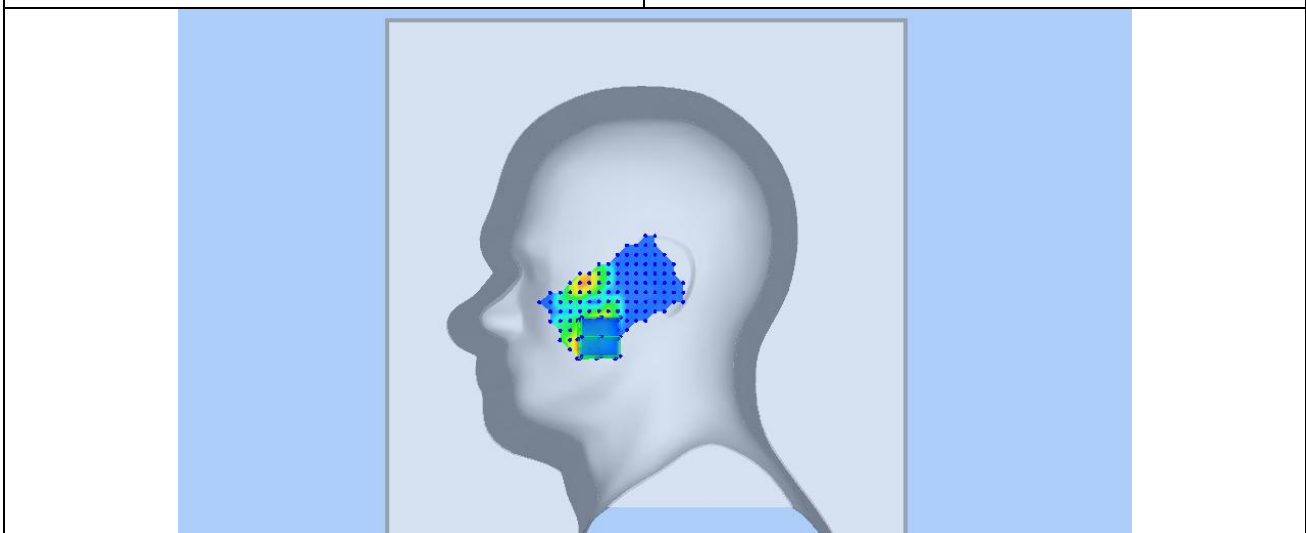
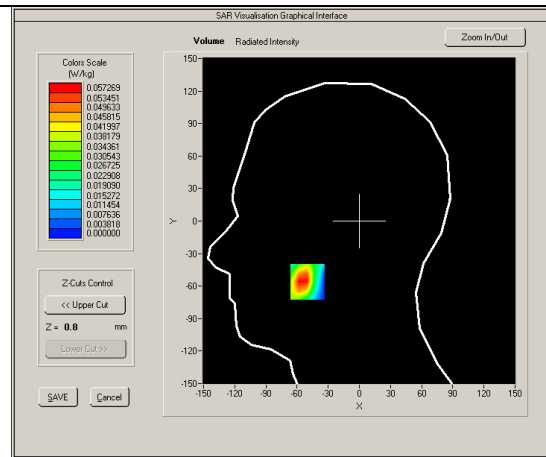
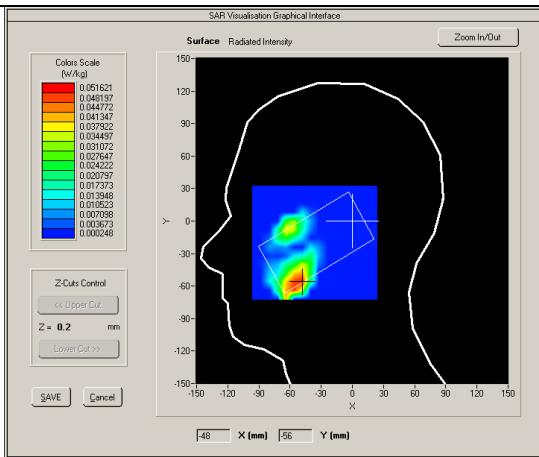
Model: M4 B2

Test Date: Dec 29,2017

| | |
|-----------------------------------|----------------------------|
| Medium(liquid type) | HSL 1900 |
| Frequency (MHz) | 1880.000 |
| Relative permittivity (real part) | 40.02 |
| Conductivity (S/m) | 1.37 |
| E-Field Probe | SN 27/15 EPGO262 |
| Crest factor | 8.0 |
| Conversion Factor | 2.26 |
| Sensor-Surface | 4mm |
| Area Scan | dx=8mm dy=8mm |
| Zoom Scan | 5x5x7,dx=8mm dy=8mm dz=5mm |
| Variation (%) | 0.000000 |
| SAR 10g (W/Kg) | 0.023556 |
| SAR 1g (W/Kg) | 0.058539 |

SURFACE SAR

VOLUME SAR



Test mode: GPRS1900, Middle channel (Body Bottom Side)

Product Description: Smart Phone

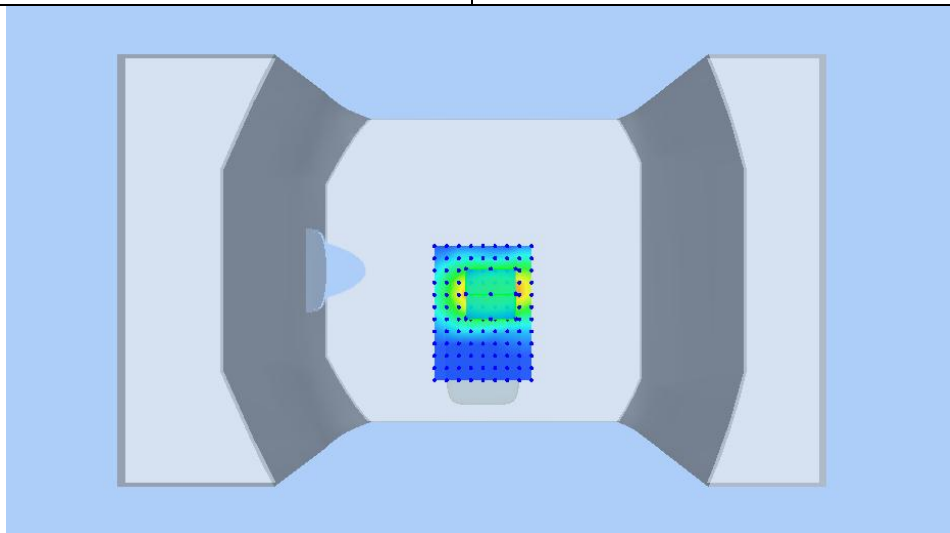
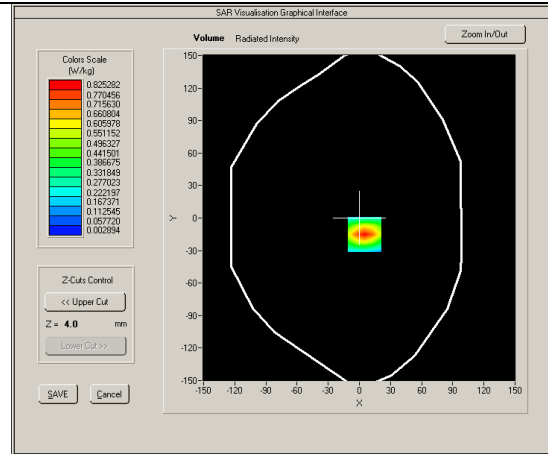
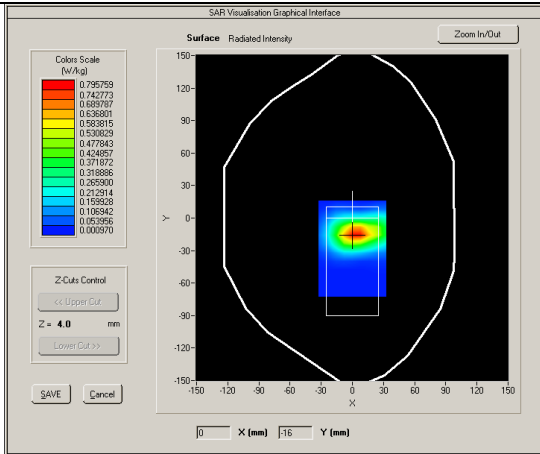
Model: M4 B2

Test Date: Dec 29,2017

| | |
|-----------------------------------|----------------------------|
| Medium(liquid type) | MSL_1900 |
| Frequency (MHz) | 1850.200 |
| Relative permittivity (real part) | 53.29 |
| Conductivity (S/m) | 1.51 |
| E-Field Probe | SN 27/15 EPGO262 |
| Crest factor | 2.0 |
| Conversion Factor | 2.32 |
| Sensor-Surface | 4mm |
| Area Scan | dx=8mm dy=8mm |
| Zoom Scan | 5x5x7,dx=8mm dy=8mm dz=5mm |
| Variation (%) | -0.500000 |
| SAR 10g (W/Kg) | 0.370174 |
| SAR 1g (W/Kg) | 0.755881 |

SURFACE SAR

VOLUME SAR



Test mode: WCDMA Band II , Middle channel (Right Head Cheek)

Product Description: Smart Phone

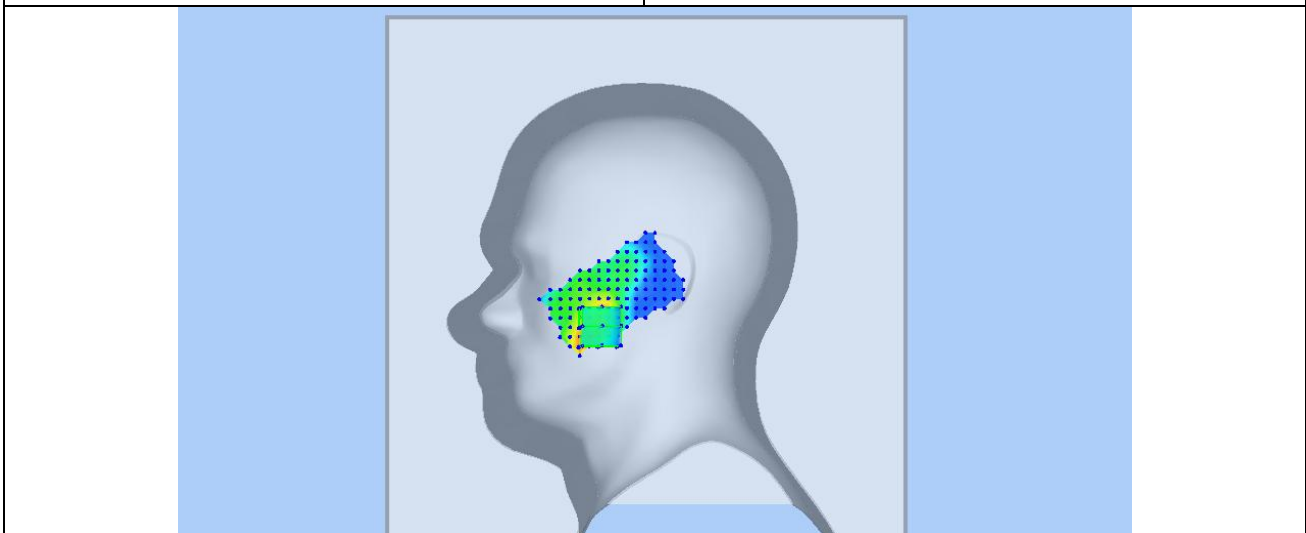
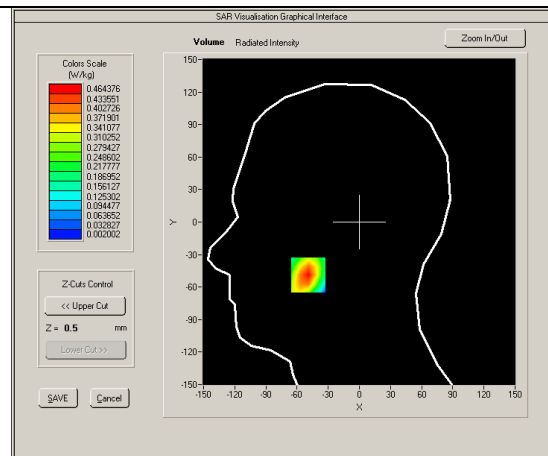
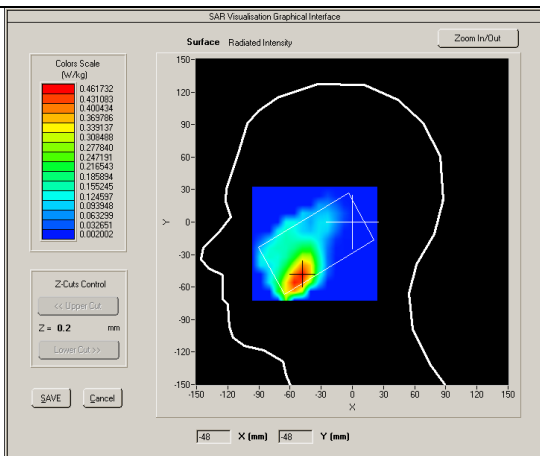
Model: M4 B2

Test Date: Dec 29,2017

| | |
|-----------------------------------|----------------------------|
| Medium(liquid type) | HSL_1900 |
| Frequency (MHz) | 1880.000 |
| Relative permittivity (real part) | 40.02 |
| Conductivity (S/m) | 1.37 |
| E-Field Probe | SN 27/15 EPGO262 |
| Crest factor | 1.0 |
| Conversion Factor | 2.26 |
| Sensor-Surface | 4mm |
| Area Scan | dx=8mm dy=8mm |
| Zoom Scan | 5x5x7,dx=8mm dy=8mm dz=5mm |
| Variation (%) | 0.000000 |
| SAR 10g (W/Kg) | 0.229962 |
| SAR 1g (W/Kg) | 0.434787 |

SURFACE SAR

VOLUME SAR



Test mode: WCDMA Band II , Middle channel (Body Bottom Side)

Product Description: Smart Phone

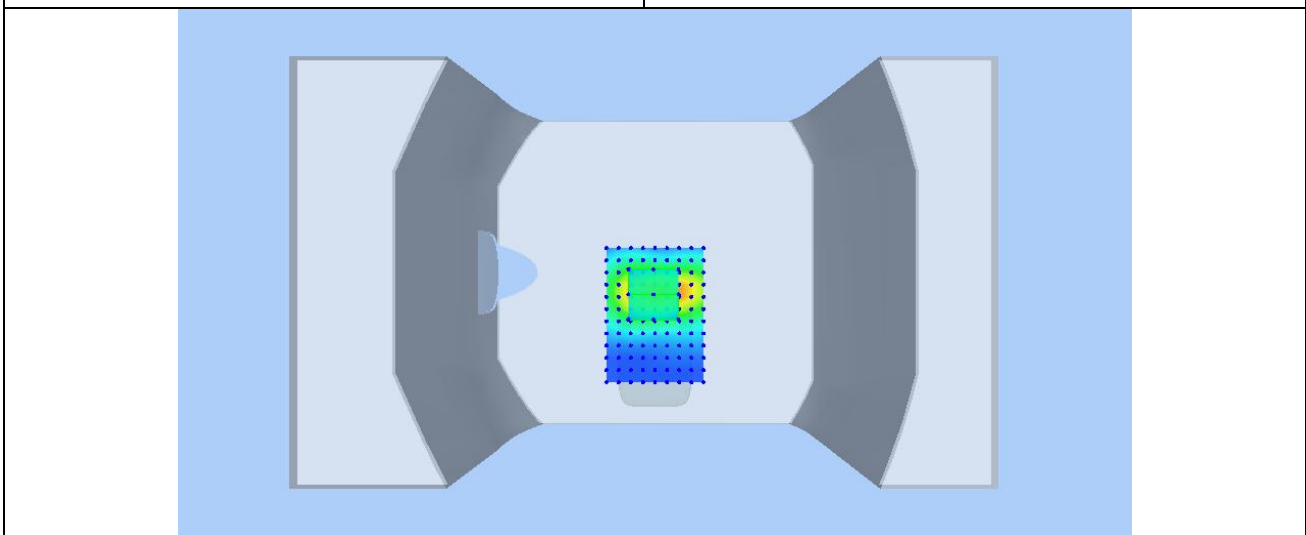
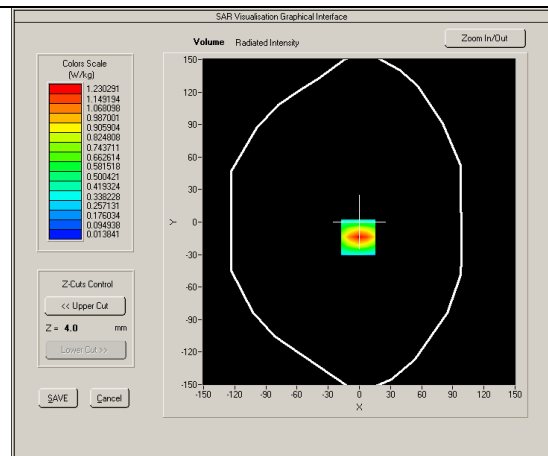
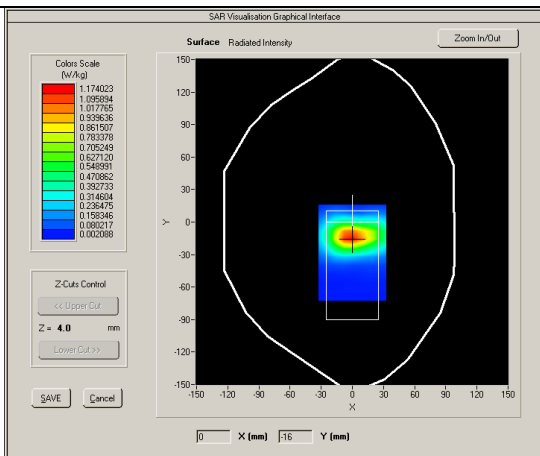
Model: M4 B2

Test Date: Dec 29,2017

| | |
|-----------------------------------|----------------------------|
| Medium(liquid type) | MSL_1900 |
| Frequency (MHz) | 1880.000 |
| Relative permittivity (real part) | 53.29 |
| Conductivity (S/m) | 1.51 |
| E-Field Probe | SN 27/15 EPGO262 |
| Crest factor | 1.0 |
| Conversion Factor | 2.32 |
| Sensor-Surface | 4mm |
| Area Scan | dx=8mm dy=8mm |
| Zoom Scan | 5x5x7,dx=8mm dy=8mm dz=5mm |
| Variation (%) | -1.460000 |
| SAR 10g (W/Kg) | 0.579101 |
| SAR 1g (W/Kg) | 1.130286 |

SURFACE SAR

VOLUME SAR



Test mode: LTE BAND 12, Middle channel (Left Head Cheek)

Product Description: Smart Phone

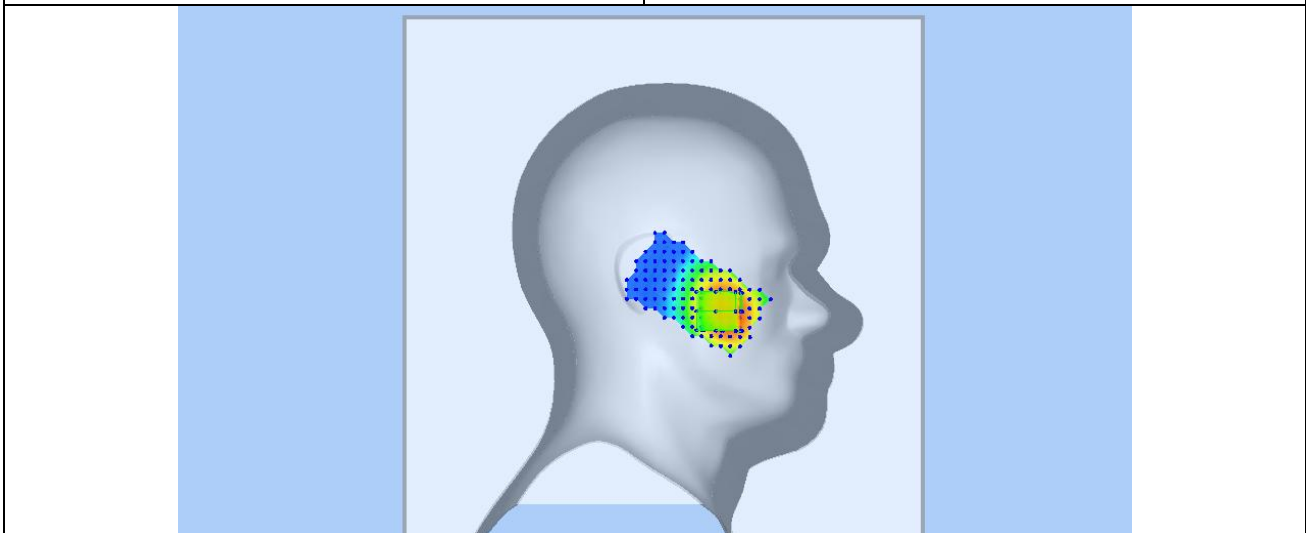
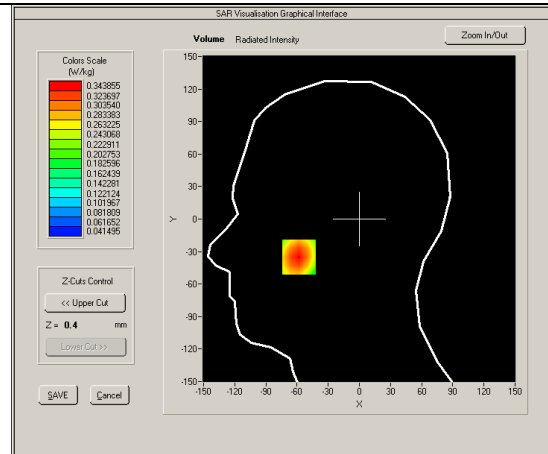
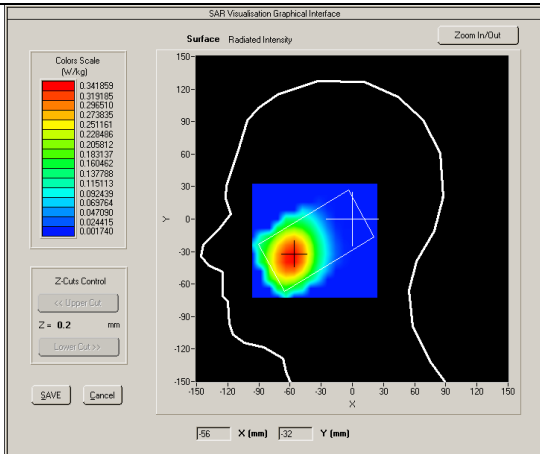
Model: M4 B2

Test Date: Dec 22,2017

| | |
|-----------------------------------|----------------------------|
| Medium(liquid type) | HSL_750 |
| Frequency (MHz) | 710.0000 |
| Relative permittivity (real part) | 41.95 |
| Conductivity (S/m) | 0.91 |
| E-Field Probe | SN 27/15 EPGO262 |
| Crest factor | 1.0 |
| Conversion Factor | 1.68 |
| Sensor-Surface | 4mm |
| Bandwidth(MHz) | 10 |
| RB Allocation | 1 |
| RB Offset | 24 |
| Area Scan | dx=8mm dy=8mm |
| Zoom Scan | 5x5x7,dx=8mm dy=8mm dz=5mm |
| Variation (%) | 0.000000 |
| SAR 10g (W/Kg) | 0.260910 |
| SAR 1g (W/Kg) | 0.350140 |

SURFACE SAR

VOLUME SAR



Test mode: LTE BAND 12, Middle channel (Body Back Side)

Product Description: Smart Phone

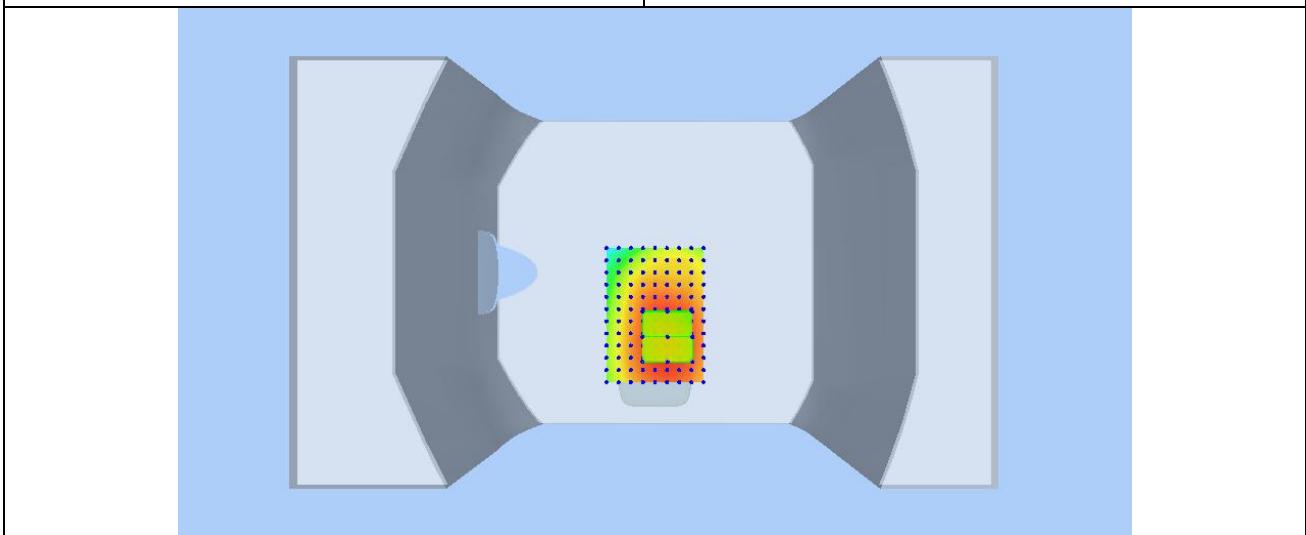
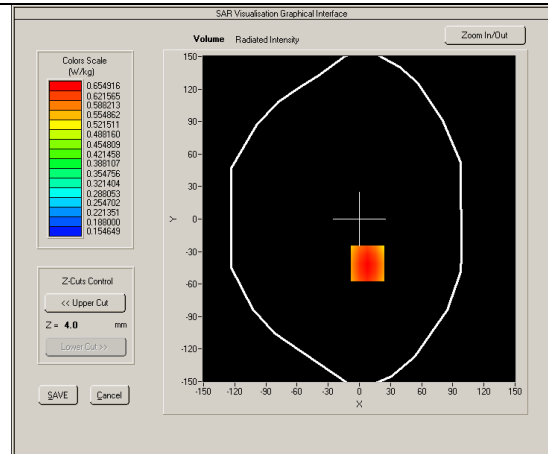
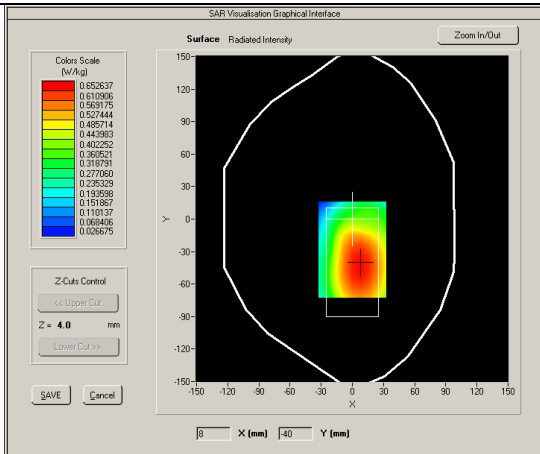
Model: M4 B2

Test Date: Dec 22,2017

| | |
|-----------------------------------|----------------------------|
| Medium(liquid type) | MSL_750 |
| Frequency (MHz) | 710.0000 |
| Relative permittivity (real part) | 55.56 |
| Conductivity (S/m) | 0.97 |
| E-Field Probe | SN 27/15 EPGO262 |
| Crest factor | 1.0 |
| Conversion Factor | 1.74 |
| Sensor-Surface | 4mm |
| Bandwidth(MHz) | 10 |
| RB Allocation | 1 |
| RB Offset | 24 |
| Area Scan | dx=8mm dy=8mm |
| Zoom Scan | 5x5x7,dx=8mm dy=8mm dz=5mm |
| Variation (%) | -0.340000 |
| SAR 10g (W/Kg) | 0.508902 |
| SAR 1g (W/Kg) | 0.671511 |

SURFACE SAR

VOLUME SAR



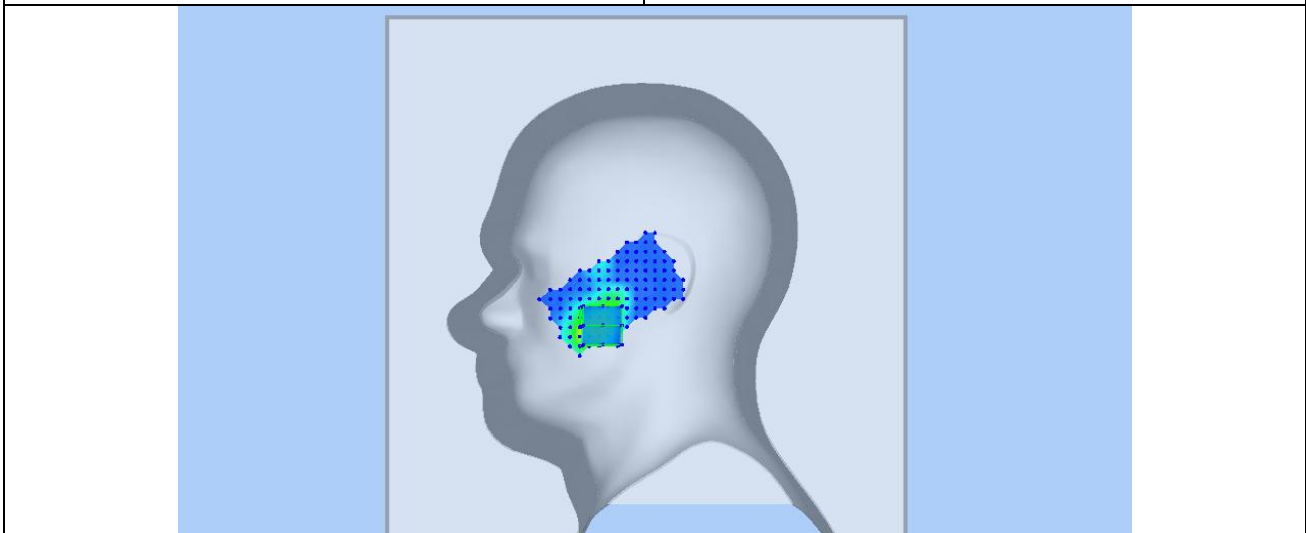
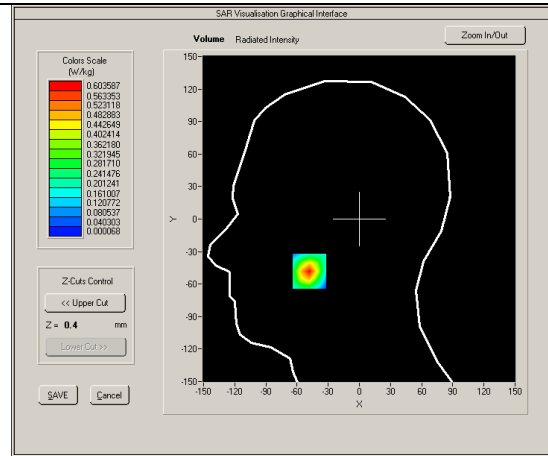
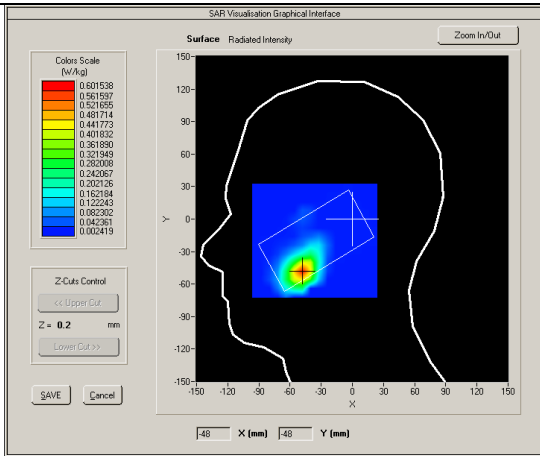
Test mode: LTE BAND 7, Middle channel (Right Head Cheek)

Product Description: Smart Phone

Model: M4 B2

Test Date: Jan 3,2018

| | |
|-----------------------------------|----------------------------|
| Medium(liquid type) | HSL 2600 |
| Frequency (MHz) | 2535.0000 |
| Relative permittivity (real part) | 55.29 |
| Conductivity (S/m) | 1.97 |
| E-Field Probe | SN 27/15 EPGO262 |
| Crest factor | 1.0 |
| Conversion Factor | 2.28 |
| Sensor-Surface | 4mm |
| Bandwidth(MHz) | 20 |
| RB Allocation | 1 |
| RB Offset | 49 |
| Area Scan | dx=8mm dy=8mm |
| Zoom Scan | 5x5x7,dx=8mm dy=8mm dz=5mm |
| Variation (%) | 0.000000 |
| SAR 10g (W/Kg) | 0.238826 |
| SAR 1g (W/Kg) | 0.546711 |
| SURFACE SAR | VOLUME SAR |



Test mode: LTE BAND 7, Mid channel (Body Back Side)

Product Description: Smart Phone

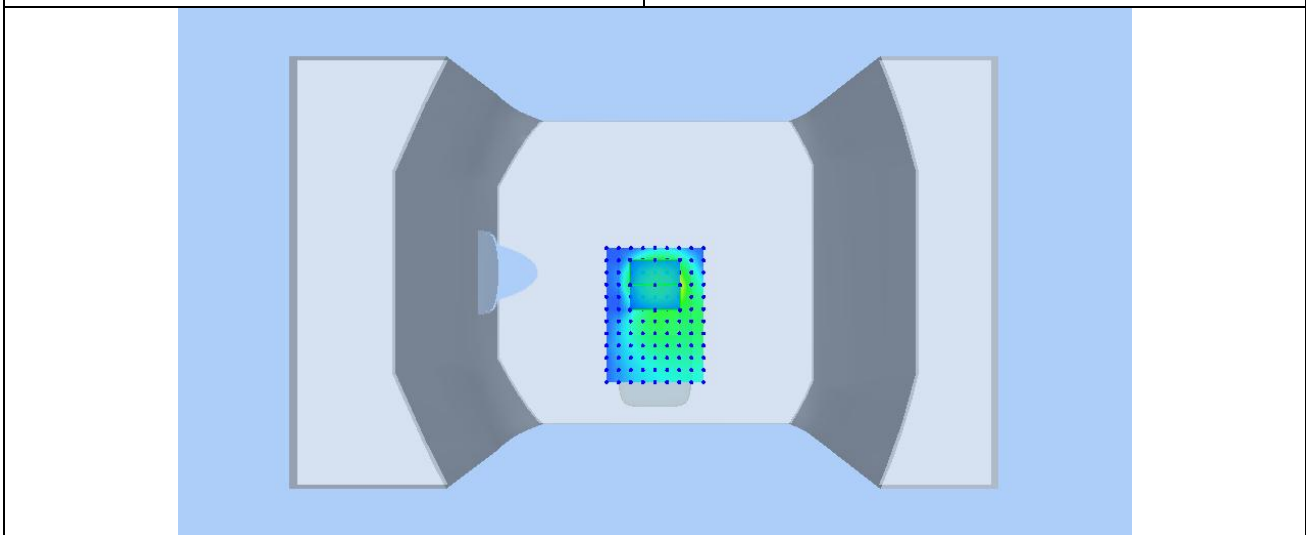
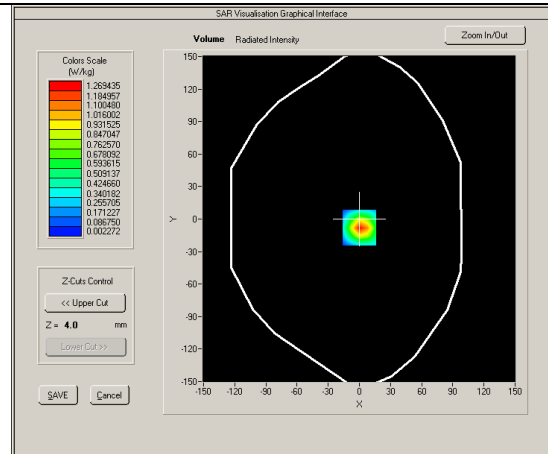
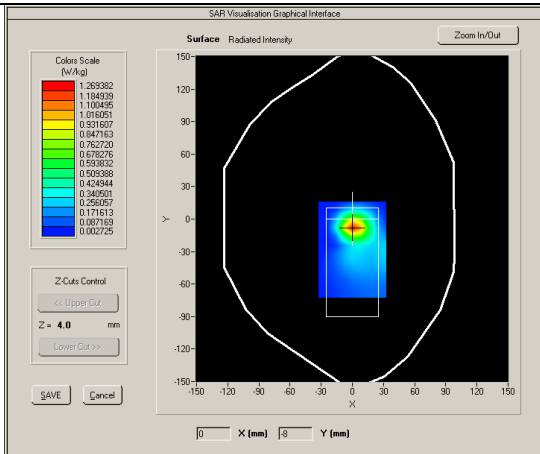
Model: M4 B2

Test Date: Jan 3,2018

| | |
|-----------------------------------|----------------------------|
| Medium(liquid type) | MSL 2600 |
| Frequency (MHz) | 2535.0000 |
| Relative permittivity (real part) | 51.96 |
| Conductivity (S/m) | 2.17 |
| E-Field Probe | SN 27/15 EPGO262 |
| Crest factor | 1.0 |
| Conversion Factor | 2.34 |
| Sensor-Surface | 4mm |
| Bandwidth(MHz) | 20 |
| RB Allocation | 1 |
| RB Offset | 49 |
| Area Scan | dx=8mm dy=8mm |
| Zoom Scan | 5x5x7,dx=8mm dy=8mm dz=5mm |
| Variation (%) | -0.890000 |
| SAR 10g (W/Kg) | 0.508040 |
| SAR 1g (W/Kg) | 1.146433 |

SURFACE SAR

VOLUME SAR



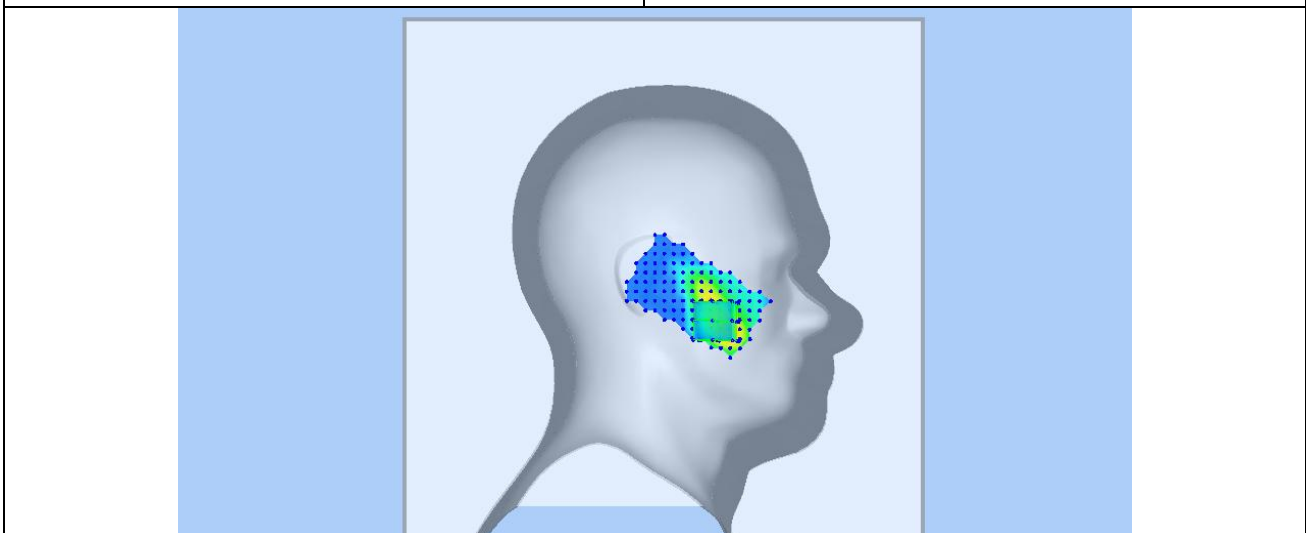
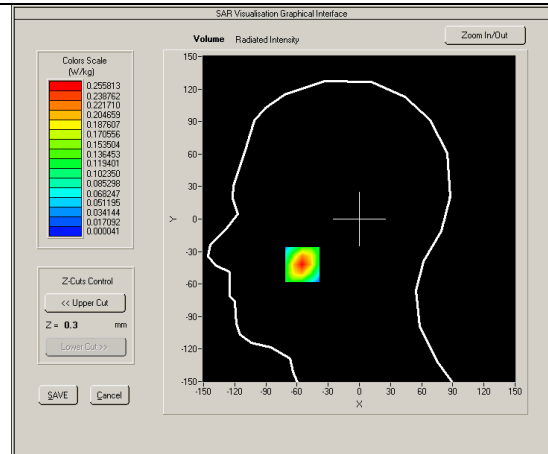
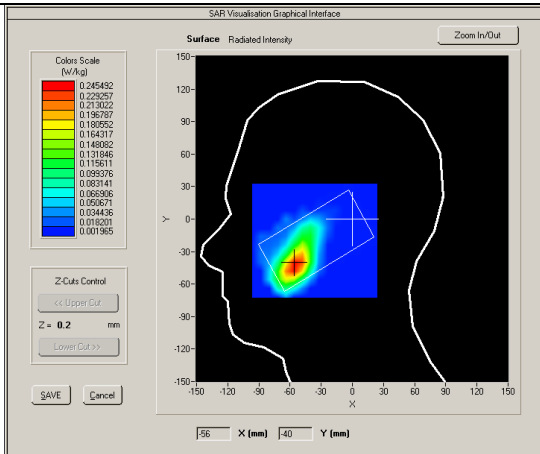
Test mode: LTE BAND 4, Middle channel (Left Head Cheek)

Product Description: Smart Phone

Model: M4 B2

Test Date: Dec 27,2017

| | |
|-----------------------------------|----------------------------|
| Medium(liquid type) | HSL 1800 |
| Frequency (MHz) | 1732.5000 |
| Relative permittivity (real part) | 39.98 |
| Conductivity (S/m) | 1.41 |
| E-Field Probe | SN 27/15 EPGO262 |
| Crest factor | 1.0 |
| Conversion Factor | 2.01 |
| Sensor-Surface | 4mm |
| Bandwidth(MHz) | 20 |
| RB Allocation | 1 |
| RB Offset | 50 |
| Area Scan | dx=8mm dy=8mm |
| Zoom Scan | 5x5x7,dx=8mm dy=8mm dz=5mm |
| Variation (%) | 0.000000 |
| SAR 10g (W/Kg) | 0.120143 |
| SAR 1g (W/Kg) | 0.234626 |
| SURFACE SAR | VOLUME SAR |



Test mode: LTE BAND 4, Middle channel (Body Back Side)

Product Description: Smart Phone

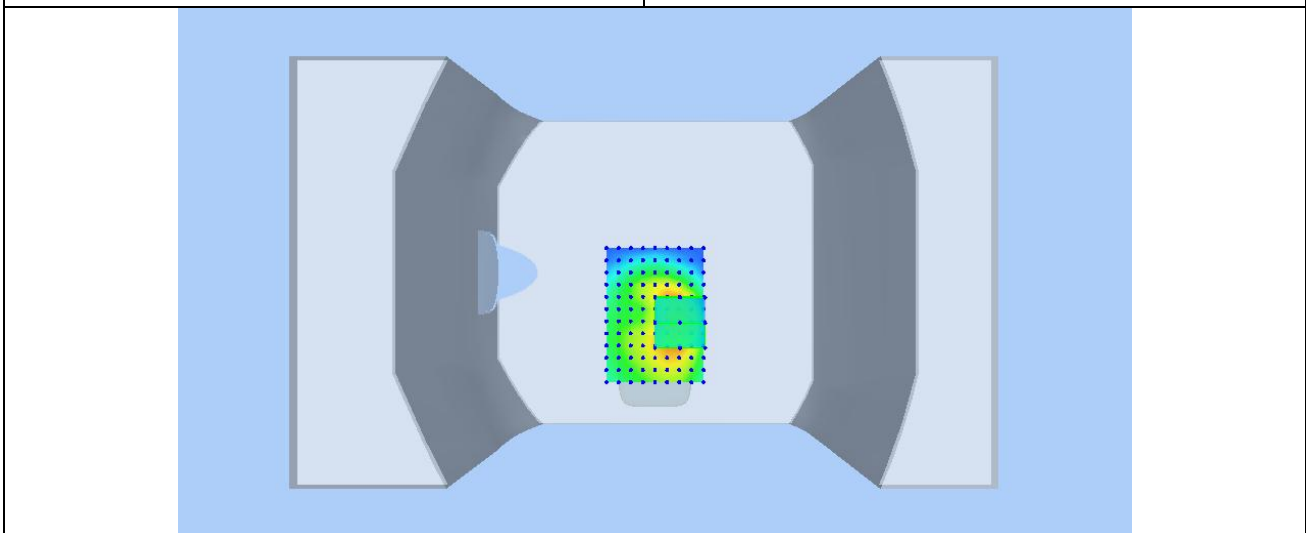
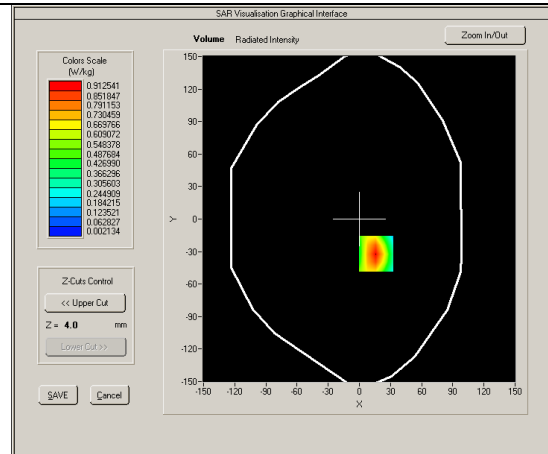
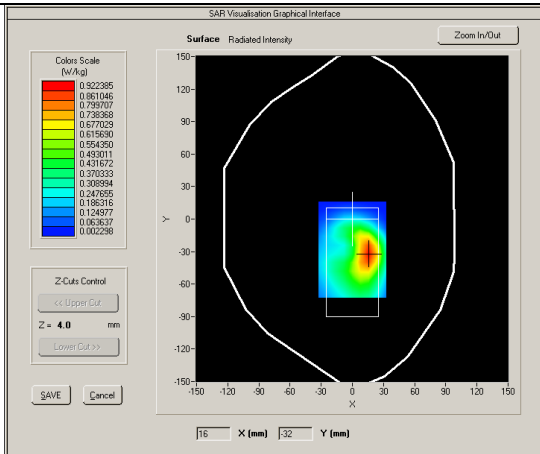
Model: M4 B2

Test Date: Dec 27,2017

| | |
|-----------------------------------|----------------------------|
| Medium(liquid type) | MSL 1800 |
| Frequency (MHz) | 1732.5000 |
| Relative permittivity (real part) | 53.25 |
| Conductivity (S/m) | 1.56 |
| E-Field Probe | SN 27/15 EPGO262 |
| Crest factor | 1.0 |
| Conversion Factor | 2.05 |
| Sensor-Surface | 4mm |
| Bandwidth(MHz) | 20 |
| RB Allocation | 1 |
| RB Offset | 50 |
| Area Scan | dx=8mm dy=8mm |
| Zoom Scan | 5x5x7,dx=8mm dy=8mm dz=5mm |
| Variation (%) | -2.010000 |
| SAR 10g (W/Kg) | 0.453634 |
| SAR 1g (W/Kg) | 0.848526 |

SURFACE SAR

VOLUME SAR



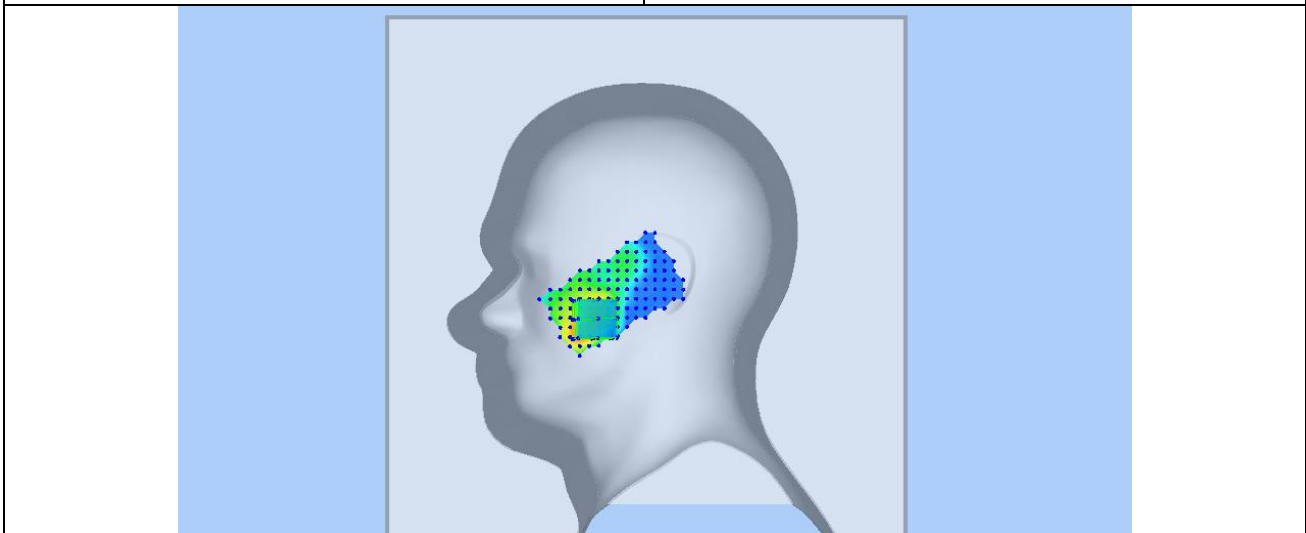
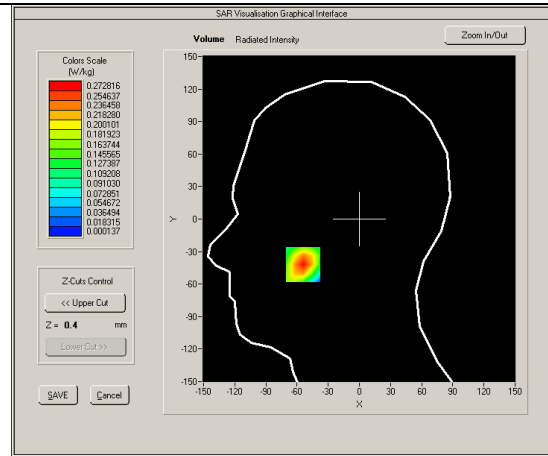
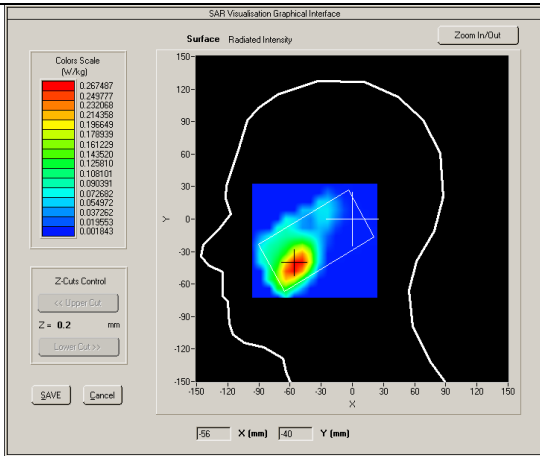
Test mode: LTE BAND 2, Middle channel (Right Head Cheek)

Product Description: Smart Phone

Model: M4 B2

Test Date: Dec 29,2017

| | |
|-----------------------------------|----------------------------|
| Medium(liquid type) | HSL 1900 |
| Frequency (MHz) | 1880.0000 |
| Relative permittivity (real part) | 40.03 |
| Conductivity (S/m) | 1.39 |
| E-Field Probe | SN 27/15 EPGO262 |
| Crest factor | 1.0 |
| Conversion Factor | 2.26 |
| Sensor-Surface | 4mm |
| Bandwidth(MHz) | 20 |
| RB Allocation | 1 |
| RB Offset | 49 |
| Area Scan | dx=8mm dy=8mm |
| Zoom Scan | 5x5x7,dx=8mm dy=8mm dz=5mm |
| Variation (%) | 0.000000 |
| SAR 10g (W/Kg) | 0.125827 |
| SAR 1g (W/Kg) | 0.252401 |
| SURFACE SAR | VOLUME SAR |



Test mode: LTE BAND 2, Middle channel (Body Back Side)

Product Description: Smart Phone

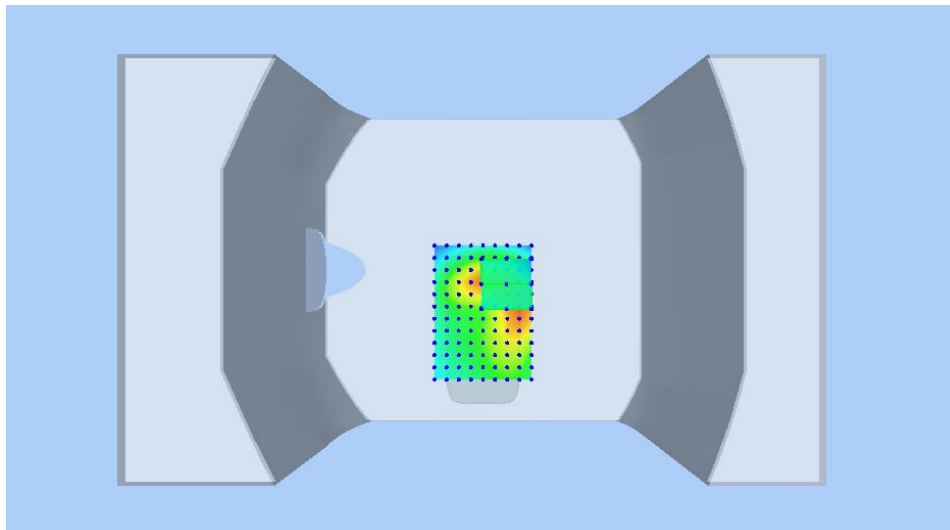
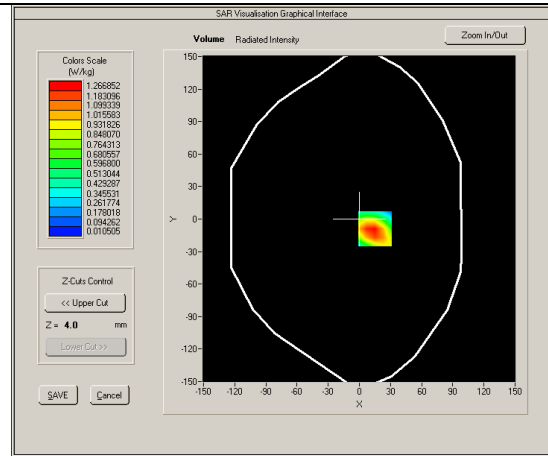
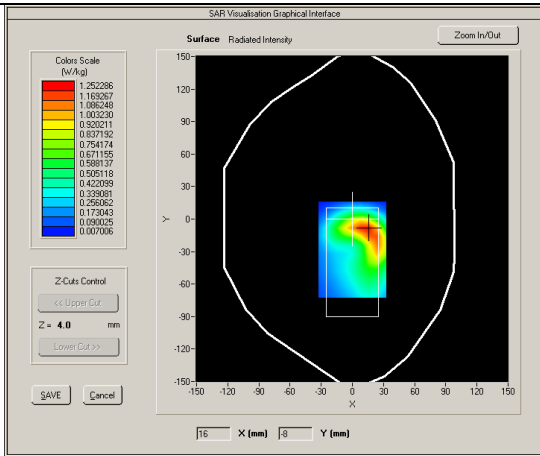
Model: M4 B2

Test Date: Dec 29,2017

| | |
|-----------------------------------|----------------------------|
| Medium(liquid type) | MSL 1900 |
| Frequency (MHz) | 1880.0000 |
| Relative permittivity (real part) | 53.28 |
| Conductivity (S/m) | 1.53 |
| E-Field Probe | SN 27/15 EPGO262 |
| Crest factor | 1.0 |
| Conversion Factor | 2.32 |
| Sensor-Surface | 4mm |
| Bandwidth(MHz) | 20 |
| RB Allocation | 1 |
| RB Offset | 49 |
| Area Scan | dx=8mm dy=8mm |
| Zoom Scan | 5x5x7,dx=8mm dy=8mm dz=5mm |
| Variation (%) | -1.840000 |
| SAR 10g (W/Kg) | 0.636958 |
| SAR 1g (W/Kg) | 1.206211 |

SURFACE SAR

VOLUME SAR

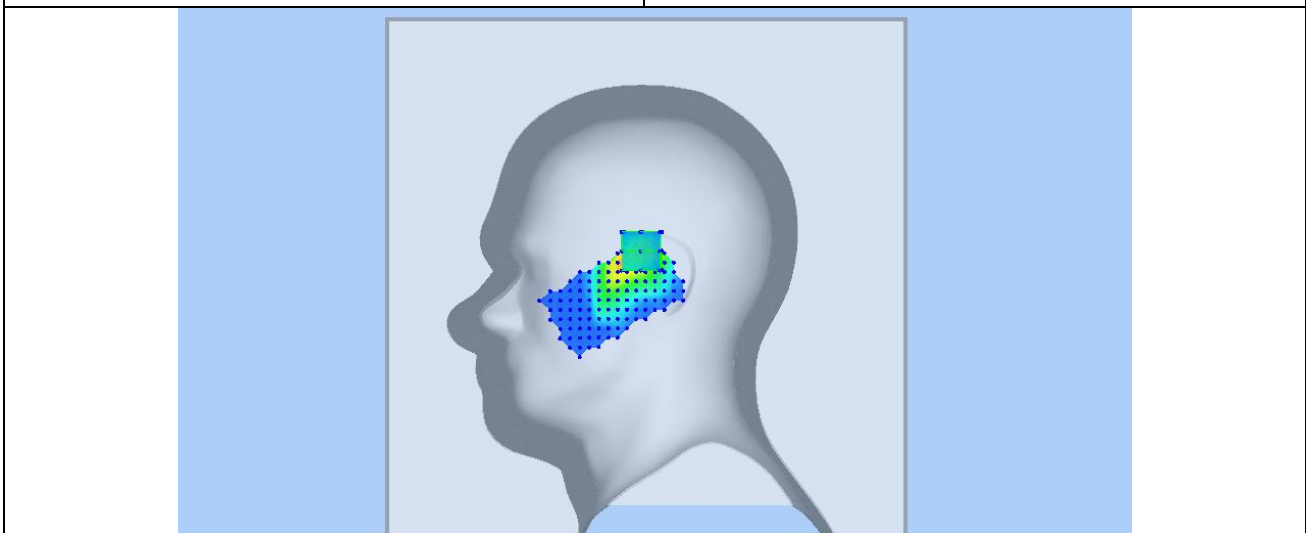
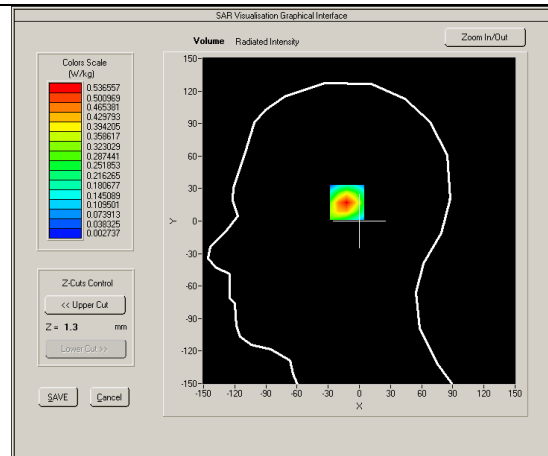
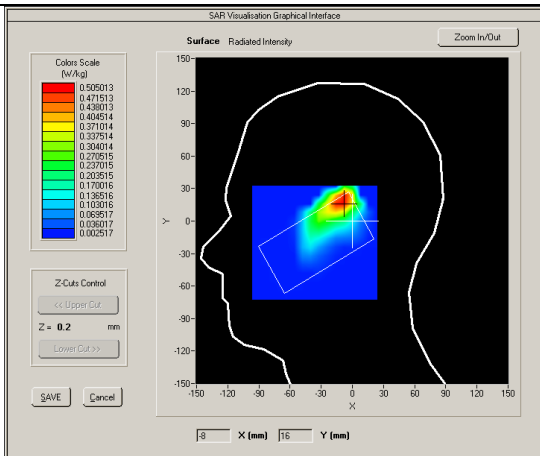


Test mode: 802.11b, Middle channel (Right Head Cheek)
 Product Description: Smart Phone
 Model: M4 B2
 Test Date: Jan 1,2018

| | |
|-----------------------------------|-----------------------------|
| Medium(liquid type) | HSL_2450 |
| Frequency (MHz) | 2437.000 |
| Relative permittivity (real part) | 40.42 |
| Conductivity (S/m) | 1.77 |
| E-Field Probe | SN 27/15 EPGO262 |
| Crest factor | 1.0 |
| Conversion Factor | 2.04 |
| Sensor-Surface | 4mm |
| Area Scan | dx=8mm dy=8mm |
| Zoom Scan | 5x5x7, dx=8mm dy=8mm dz=5mm |
| Variation (%) | 0.930000 |
| SAR 10g (W/Kg) | 0.236916 |
| SAR 1g (W/Kg) | 0.494441 |

SURFACE SAR

VOLUME SAR



Test mode: 802.11b, Middle channel (Body Back Side)

Product Description: Smart Phone

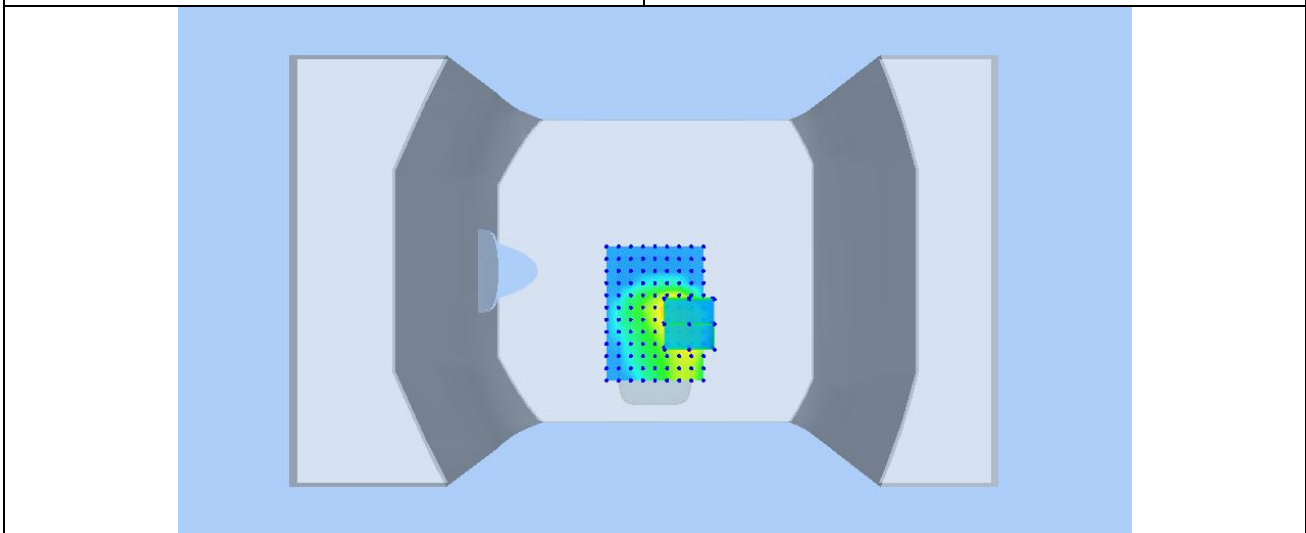
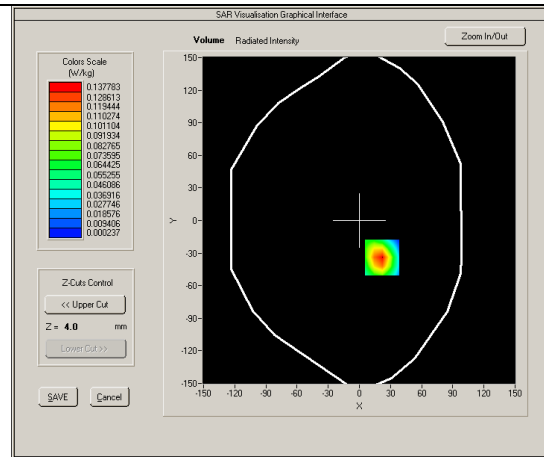
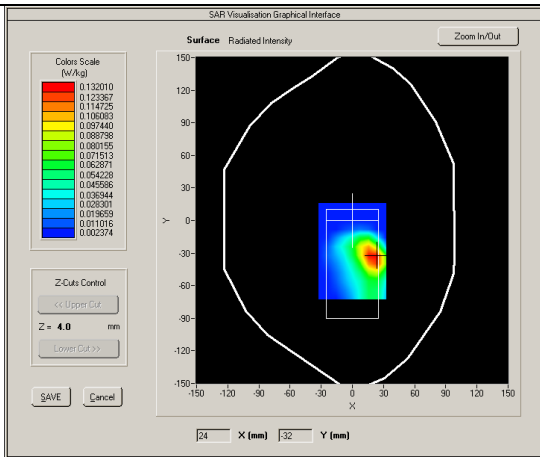
Model: M4 B2

Test Date: Jan 1,2018

| | |
|-----------------------------------|----------------------------|
| Medium(liquid type) | MSL_2450 |
| Frequency (MHz) | 2437.000 |
| Relative permittivity (real part) | 52.78 |
| Conductivity (S/m) | 1.97 |
| E-Field Probe | SN 27/15 EPGO262 |
| Crest factor | 1.0 |
| Conversion Factor | 2.12 |
| Sensor-Surface | 4mm |
| Area Scan | dx=8mm dy=8mm |
| Zoom Scan | 5x5x7,dx=8mm dy=8mm dz=5mm |
| Variation (%) | 0.000000 |
| SAR 10g (W/Kg) | 0.057231 |
| SAR 1g (W/Kg) | 0.130713 |

SURFACE SAR

VOLUME SAR



| | |
|-------------|----------------|
| Test Report | 17071442-FCC-H |
| Page | 97 of 178 |

Annex A CALIBRATION REPORTS



COMOSAR E-Field Probe Calibration Report

Ref : ACR.264.3.16.SATU.A

SIEMIC TESTING AND CERTIFICATION SERVICES
ZONE A,FLOOR 1,BUILDING 2,WAN YE LONG TECHNOLOGY PARK,SOUTH SIDE OF ZHOUSHI ROAD, SHIYAN STREET,BAO'AN DISTRICT, SHENZHEN 518108 , GUANGDONG , P.R.C.
MVG COMOSAR DOSIMETRIC E-FIELD PROBE
SERIAL NO.: SN 27/15 EPGO262

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

Calibration Date: 09/20/2016

Summary:
This document presents the method and results from an accredited COMOSAR Dosimetric E-Field Probe calibration performed in MVG USA using the CALISAR / CALIBAIR test bench, for use with a COMOSAR system only. All calibration results are traceable to national metrology institutions.

| | |
|-------------|----------------|
| Test Report | 17071442-FCC-H |
| Page | 98 of 178 |



COMOSAR E-FIELD PROBE CALIBRATION REPORT

Ref: ACR.264.3.16.SATU.A

| | <i>Name</i> | <i>Function</i> | <i>Date</i> | <i>Signature</i> |
|----------------------|---------------|-----------------|-------------|----------------------|
| <i>Prepared by :</i> | Jérôme LUC | Product Manager | 9/20/2016 | <i>JS</i> |
| <i>Checked by :</i> | Jérôme LUC | Product Manager | 9/20/2016 | <i>JS</i> |
| <i>Approved by :</i> | Kim RUTKOWSKI | Quality Manager | 9/20/2016 | <i>Kim Rutkowski</i> |

| | |
|-----------------------|---|
| | <i>Customer Name</i> |
| <i>Distribution :</i> | SIEMIC Testing and Certification Services |

| <i>Issue</i> | <i>Date</i> | <i>Modifications</i> |
|--------------|-------------|----------------------|
| A | 9/20/2016 | Initial release |
| | | |
| | | |
| | | |



TABLE OF CONTENTS

| | | |
|-----|---------------------------------------|----|
| 1 | Device Under Test | 4 |
| 2 | Product Description | 4 |
| 2.1 | General Information _____ | 4 |
| 3 | Measurement Method | 4 |
| 3.1 | Linearity _____ | 4 |
| 3.2 | Sensitivity _____ | 5 |
| 3.3 | Lower Detection Limit _____ | 5 |
| 3.4 | Isotropy _____ | 5 |
| 3.5 | Boundary Effect _____ | 5 |
| 4 | Measurement Uncertainty | 5 |
| 5 | Calibration Measurement Results | 6 |
| 5.1 | Sensitivity in air _____ | 6 |
| 5.2 | Linearity _____ | 7 |
| 5.3 | Sensitivity in liquid _____ | 7 |
| 5.4 | Isotropy _____ | 8 |
| 6 | List of Equipment | 10 |



1 DEVICE UNDER TEST

| Device Under Test | |
|--|---|
| Device Type | COMOSAR DOSIMETRIC E FIELD PROBE |
| Manufacturer | MVG |
| Model | SSE2 |
| Serial Number | SN 27/15 EPGO262 |
| Product Condition (new / used) | Used |
| Frequency Range of Probe | 0.7 GHz-6GHz |
| Resistance of Three Dipoles at Connector | Dipole 1: R1=0.221 MΩ Dipole 2: R2=0.199 MΩ Dipole 3: R3=0.199 MΩ |

A yearly calibration interval is recommended.

2 PRODUCT DESCRIPTION

2.1 GENERAL INFORMATION

MVG's COMOSAR E field Probes are built in accordance to the IEEE 1528, OET 65 Bulletin C and CEI/IEC 62209 standards.



Figure 1 – MVG COMOSAR Dosimetric E field Dipole

| | |
|--|--------|
| 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 IEEE 1528, OET 65 Bulletin C, CENELEC EN50361 and CEI/IEC 62209 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.

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 - 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°).

3.5 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.

4 MEASUREMENT UNCERTAINTY

The guidelines outlined in the IEEE 1528, OET 65 Bulletin C, CENELEC EN50361 and CEI/IEC 62209 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 (%) |
| Incident or forward power | 3.00% | Rectangular | $\sqrt{3}$ | 1 | 1.732% |
| Reflected power | 3.00% | Rectangular | $\sqrt{3}$ | 1 | 1.732% |
| Liquid conductivity | 5.00% | Rectangular | $\sqrt{3}$ | 1 | 2.887% |
| Liquid permittivity | 4.00% | Rectangular | $\sqrt{3}$ | 1 | 2.309% |
| Field homogeneity | 3.00% | Rectangular | $\sqrt{3}$ | 1 | 1.732% |
| Field probe positioning | 5.00% | Rectangular | $\sqrt{3}$ | 1 | 2.887% |



COMOSAR E-FIELD PROBE CALIBRATION REPORT

Ref: ACR.264.3.16.SATU.A

| | | | | | |
|--|-------|-------------|------------|---|--------|
| Field probe linearity | 3.00% | Rectangular | $\sqrt{3}$ | 1 | 1.732% |
| Combined standard uncertainty | | | | | 5.831% |
| Expanded uncertainty 95 % confidence level k = 2 | | | | | 12.0% |

5 CALIBRATION MEASUREMENT RESULTS

| Calibration Parameters | |
|------------------------|-------|
| Liquid Temperature | 21 °C |
| Lab Temperature | 21 °C |
| Lab Humidity | 45 % |

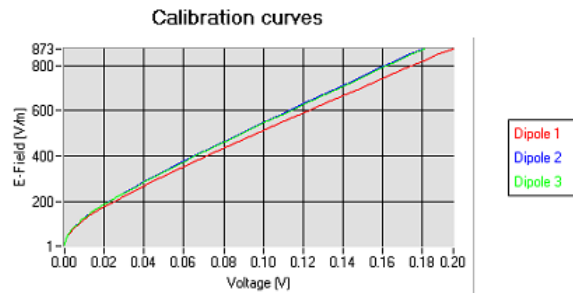
5.1 SENSITIVITY IN AIR

| Normx dipole 1 ($\mu\text{V}/(\text{V}/\text{m})^2$) | Normy dipole 2 ($\mu\text{V}/(\text{V}/\text{m})^2$) | Normz dipole 3 ($\mu\text{V}/(\text{V}/\text{m})^2$) |
|--|--|--|
| 0.80 | 0.71 | 0.72 |

| DCP dipole 1 (mV) | DCP dipole 2 (mV) | DCP dipole 3 (mV) |
|-------------------|-------------------|-------------------|
| 92 | 90 | 91 |

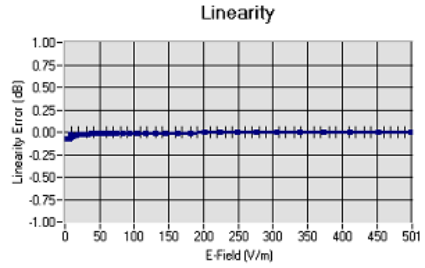
Calibration curves $e_i=f(V)$ ($i=1,2,3$) allow to obtain H-field value using the formula:

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





5.2 LINEARITY



Linearity $\pm 1.69\%$ ($\pm 0.07\text{dB}$)

5.3 SENSITIVITY IN LIQUID

| Liquid | Frequency (MHz +/- 100MHz) | Permittivity | Epsilon (S/m) | ConvF |
|--------|----------------------------------|--------------|---------------|-------|
| HL750 | 750 | 40.03 | 0.93 | 1.57 |
| BL750 | 750 | 56.83 | 1.00 | 1.62 |
| HL850 | 835 | 42.19 | 0.90 | 1.74 |
| BL850 | 835 | 54.67 | 1.01 | 1.81 |
| HL900 | 900 | 42.08 | 1.01 | 1.67 |
| BL900 | 900 | 55.25 | 1.08 | 1.73 |
| HL1800 | 1800 | 41.68 | 1.46 | 1.81 |
| BL1800 | 1800 | 53.86 | 1.46 | 1.87 |
| HL1900 | 1900 | 38.45 | 1.45 | 2.01 |
| BL1900 | 1900 | 53.32 | 1.56 | 2.05 |
| HL2000 | 2000 | 38.26 | 1.38 | 1.86 |
| BL2000 | 2000 | 52.70 | 1.51 | 1.91 |
| HL2450 | 2450 | 37.50 | 1.80 | 2.04 |
| BL2450 | 2450 | 53.22 | 1.89 | 2.12 |
| HL2600 | 2600 | 39.80 | 1.99 | 2.05 |
| BL2600 | 2600 | 52.52 | 2.23 | 2.12 |
| HL3500 | 3500 | 38.21 | 2.98 | 2.02 |
| BL3500 | 3500 | 52.95 | 3.43 | 2.08 |
| HL5200 | 5200 | 35.64 | 4.67 | 1.51 |
| BL5200 | 5200 | 48.64 | 5.51 | 1.55 |
| HL5400 | 5400 | 36.44 | 4.87 | 1.56 |
| BL5400 | 5400 | 46.52 | 5.77 | 1.61 |
| HL5600 | 5600 | 36.66 | 5.17 | 1.55 |
| BL5600 | 5600 | 46.79 | 5.77 | 1.60 |
| HL5800 | 5800 | 35.31 | 5.31 | 1.44 |
| BL5800 | 5800 | 47.04 | 6.10 | 1.48 |

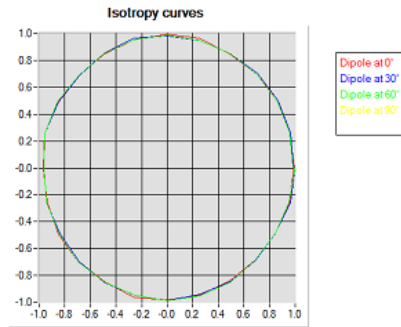
LOWER DETECTION LIMIT: 7mW/kg



5.4 ISOTROPY

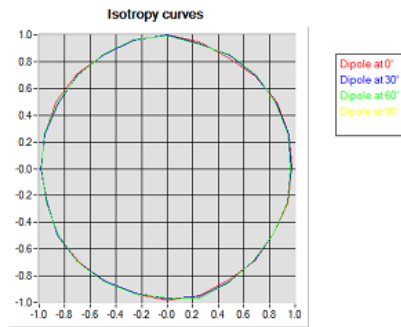
HL900 MHz

- Axial isotropy: 0.04 dB
- Hemispherical isotropy: 0.05 dB



HL1800 MHz

- Axial isotropy: 0.04 dB
- Hemispherical isotropy: 0.06 dB



| | |
|-------------|----------------|
| Test Report | 17071442-FCC-H |
| Page | 105 of 178 |

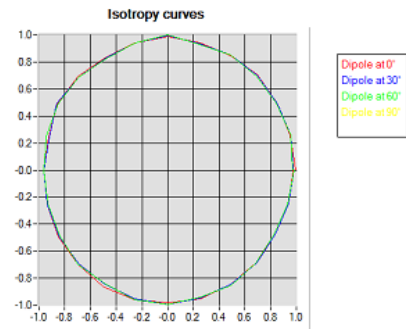


COMOSAR E-FIELD PROBE CALIBRATION REPORT

Ref: ACR.264.3.16.SATU.A

HL5600 MHz

- Axial isotropy: 0.06 dB
- Hemispherical isotropy: 0.08 dB





6 LIST OF EQUIPMENT

| Equipment Summary Sheet | | | | |
|-------------------------------|----------------------|--------------------|---|---|
| Equipment Description | Manufacturer / Model | Identification No. | Current Calibration Date | Next Calibration Date |
| Flat Phantom | MVG | SN-20/09-SAM71 | Validated. No cal required. | Validated. No cal required. |
| COMOSAR Test Bench | Version 3 | NA | Validated. No cal required. | Validated. No cal required. |
| Network Analyzer | Rhode & Schwarz ZVA | SN100132 | 02/2016 | 02/2019 |
| Reference Probe | MVG | EP 94 SN 37/08 | 10/2015 | 10/2016 |
| Multimeter | Keithley 2000 | 1188656 | 12/2013 | 12/2016 |
| Signal Generator | Agilent E4438C | MY49070581 | 12/2013 | 12/2016 |
| Amplifier | Aethercomm | SN 046 | Characterized prior to test. No cal required. | Characterized prior to test. No cal required. |
| Power Meter | HP E4418A | US38261498 | 12/2013 | 12/2016 |
| Power Sensor | HP ECP-E26A | US37181460 | 12/2013 | 12/2016 |
| Directional Coupler | Narda 4216-20 | 01386 | Characterized prior to test. No cal required. | Characterized prior to test. No cal required. |
| Waveguide | Mega Industries | 069Y7-158-13-712 | Validated. No cal required. | Validated. No cal required. |
| Waveguide Transition | Mega Industries | 069Y7-158-13-701 | Validated. No cal required. | Validated. No cal required. |
| Waveguide Termination | Mega Industries | 069Y7-158-13-701 | Validated. No cal required. | Validated. No cal required. |
| Temperature / Humidity Sensor | Control Company | 150798832 | 10/2015 | 10/2017 |

| | |
|-------------|----------------|
| Test Report | 17071442-FCC-H |
| Page | 107 of 178 |



SAR Reference Dipole Calibration Report

Ref : ACR.165.1.17.SATU.A

SIEMIC TESTING AND CERTIFICATION SERVICES

ZONE A,FLOOR 1,BUILDING 2,WAN YE LONG
TECHNOLOGY PARK,SOUTH SIDE OF ZHOUSHI ROAD,
SHIYAN STREET,BAO'AN DISTRICT, SHENZHEN 518108 ,
GUANGDONG , P.R.C.

MVG COMOSAR REFERENCE DIPOLE

FREQUENCY: 750 MHZ

SERIAL NO.: SN 26/14 DIP0G750-325

Calibrated at MVG US

2105 Barrett Park Dr. - Kennesaw, GA 30144



Calibration Date: 06/8/2017

Summary:

This document presents the method and results from an accredited SAR reference dipole calibration performed in MVG USA using the COMOSAR test bench. All calibration results are traceable to national metrology institutions.

| | |
|-------------|----------------|
| Test Report | 17071442-FCC-H |
| Page | 108 of 178 |



SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref: ACR.165.1.17.SATUA

| | <i>Name</i> | <i>Function</i> | <i>Date</i> | <i>Signature</i> |
|----------------------|---------------|-----------------|-------------|----------------------|
| <i>Prepared by :</i> | Jérôme LUC | Product Manager | 6/14/2017 | <i>JS</i> |
| <i>Checked by :</i> | Jérôme LUC | Product Manager | 6/14/2017 | <i>JS</i> |
| <i>Approved by :</i> | Kim RUTKOWSKI | Quality Manager | 6/14/2017 | <i>Kim Rutkowski</i> |

| | <i>Customer Name</i> |
|-----------------------|---|
| <i>Distribution :</i> | SIEMIC Testing and Certification Services |

| <i>Issue</i> | <i>Date</i> | <i>Modifications</i> |
|--------------|-------------|----------------------|
| A | 6/14/2017 | Initial release |
| | | |
| | | |



TABLE OF CONTENTS

| | | |
|-----|--|----|
| 1 | Introduction..... | 4 |
| 2 | Device Under Test | 4 |
| 3 | Product Description | 4 |
| 3.1 | General Information | 4 |
| 4 | Measurement Method | 5 |
| 4.1 | Return Loss Requirements | 5 |
| 4.2 | Mechanical Requirements | 5 |
| 5 | Measurement Uncertainty..... | 5 |
| 5.1 | Return Loss | 5 |
| 5.2 | Dimension Measurement | 5 |
| 5.3 | Validation Measurement | 5 |
| 6 | Calibration Measurement Results | 6 |
| 6.1 | Return Loss and Impedance In Head Liquid | 6 |
| 6.2 | Return Loss and Impedance In Body Liquid | 6 |
| 6.3 | Mechanical Dimensions | 6 |
| 7 | Validation measurement | 7 |
| 7.1 | Head Liquid Measurement | 7 |
| 7.2 | SAR Measurement Result With Head Liquid | 8 |
| 7.3 | Body Liquid Measurement | 9 |
| 7.4 | SAR Measurement Result With Body Liquid | 10 |
| 8 | List of Equipment | 11 |



1 INTRODUCTION

This document contains a summary of the requirements set forth by the IEEE 1528, FCC KDBs and CEI/IEC 62209 standards for reference dipoles used for SAR measurement system validations 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 | COMOSAR 750 MHz REFERENCE DIPOLE |
| Manufacturer | MVG |
| Model | SID750 |
| Serial Number | SN 26/14 DIP0G750-325 |
| Product Condition (new / used) | Used |

A yearly calibration interval is recommended.

3 PRODUCT DESCRIPTION

3.1 GENERAL INFORMATION

MVG's COMOSAR Validation Dipoles are built in accordance to the IEEE 1528, FCC KDBs and CEI/IEC 62209 standards. The product is designed for use with the COMOSAR test bench only.



Figure 1 – MVG COMOSAR Validation Dipole