FCC SAR EVALUATION REPORT

In accordance with the requirements of
FCC 47 CFR Part 2(2.1093), ANSI/IEEE C95.1-1992 and
IEEE Std 1528-2013

Product Name : Pudu Watch

Trademark : PUDU

Model Name : PWIT11

Family Model : PWIT21

FCC ID : 2AXDW-PWIT11

Report No. : S21112200911001

Prepared for

SHENZHEN PUDU TECHNOLOGY CO., LTD.

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TEST RESULT CERTIFICATION

Applicant's name	SHENZHEN PUDU TECHNOLOGY CO., LTD.
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Manufacturer's Name	SHENZHEN PUDU TECHNOLOGY CO., LTD.
Address	Room 501, Building A, Block 1, Phase 1, Shenzhen International Inno Valley, Dashi 1st Road, Nanshan District, Shenzhen, China 518057

Product description

Product name	Pudu Watch
Trademark	PUDU
Model Name	PWIT11
Family Model	PWIT21
Standards	FCC 47 CFR Part 2(2.1093) ANSI/IEEE C95.1-1992;IEEE Std 1528-2013 Published RF exposure KDB procedures

This device described above has been tested by Shenzhen NTEK. In accordance with the measurement methods and procedures specified in IEEE Std 1528-2013 and KDB 865664 D01. Testing has shown that this device is capable of compliance with localized specific absorption rate (SAR) specified in FCC 47 CFR Part 2(2.1093) and ANSI/IEEE C95.1-1992. The test results in this report apply only to the tested sample of the stated device/equipment. Other similar device/equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.

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Test Sample Number S211122009006

Date of Test

Date (s) of performance of tests	Mar. 21, 2022 ~ May 13, 2022
Date of Issue	May 23, 2022
Test Result	**Pass**

Prepared By (Test Engineer) : Jacob . chen

(Jacob Chen)

Approved By (Lab Manager) : Alex

(Alex Li)

※ ※ Revision History ※ ※

REV.	DESCRIPTION	ISSUED DATE	REMARK
Rev.1.0	Initial Test Report Release	May 23, 2022	Jacob Chen

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1. General Information

1.1. RF exposure limits

(A).Limits for Occupational/Controlled Exposure (W/kg)

Whole-Body	Partial-Body	Hands, Wrists, Feet and Ankles
0.4	8.0	20.0

(B).Limits for General Population/Uncontrolled Exposure (W/kg)

Whole-Body	Partial-Body	Hands, Wrists, Feet and Ankles
0.08	1.6	4.0

NOTE: ***Whole-Body SAR*** is averaged over the entire body, ***partial-body SAR*** is averaged over any 1 gram of tissue defined as a tissue volume in the shape of a cube. ***SAR for hands, wrists, feet and ankles*** is averaged over any 10 grams of tissue defined as a tissue volume in the shape of a cube.

Occupational/Controlled Environments:

Are defined as locations where there is exposure that may be incurred by people who are aware of the potential for exposure, (i.e. as a result of employment or occupation).

General Population/Uncontrolled Environments:

Are defined as locations where there is the exposure of individuals who have no knowledge or control of their exposure.

NOTE

Face Limit 1.6 W/kg and Wristbands Limit 4.0W/kg

APPLIED TO THIS EUT

1.2. Statement of Compliance

The maximum results of Specific Absorption Rate (SAR) found during testing for PWIT11 are as follows.

RF Exposure Conditions		Equipment Class -Highest Reported SAR (W/kg)			
		PCB	DTS	NII	DSS
1-g Front-of-Face (Separation distance of 10mm)		0.633	0.200	N/A	N/A
10-g Back-of-Wristbands (Separation distance of 0mm)		1.033	0.250	N/A	N/A
Max Simultaneous Tx	1-g Front-of-Face	0.833	0.833	N/A	0.659
	10-g Back-of-Wristbands	1.283	1.283	N/A	1.054

Note: The Max Simultaneous Tx is calculated based on the same configuration and test position.
This device is in compliance with Specific Absorption Rate (SAR) for general population /uncontrolled exposure limits (1.6 W/kg for Face,4.0W/Kg for Wristbands) specified in FCC 47 CFR Part 2(2.1093) and ANSI/IEEE C95.1-1992, and had been tested in accordance with the measurement methods and procedures specified in IEEE Std 1528-2013 & KDB 865664 D01.

1.3. EUT Description

Device Information	
Product Name	Pudu Watch
Trade Name	PUDU
Model Name	PWIT11
Family Model	PWIT21
FCC ID	2AXDW-PWIT11
Device Phase	Identical Prototype
Exposure Category	General population / Uncontrolled environment
Antenna Type	PIFA Antenna
Battery Information	DC 3.85V,700mAh, 2.7Wh
Hard Ware Version	MZ3183-MB-V1.1
Soft Ware Version	MZ3183(PD4G)
Device Operating Configurations	
Supporting Mode(s)	GSM 850/1900, WCDMA Band 2/4/5, LTE Band2/4/5/7 , WLAN 2.4G, Bluetooth, RFID
Test Modulation	GSM(GMSK/8PSK), WCDMA(QPSK), LTE(QPSK/16QAM), WLAN(DSSS/OFDM), Bluetooth(GFSK, π/4-DQPSK, 8DPSK), RFID(ASK)

Device Class	B		
Operating Frequency Range(s)	Band	Tx (MHz)	Rx (MHz)
	GSM 850	824-849	869-894
	GSM 1900	1850-1910	1930-1990
	WCDMA Band 2	1850-1910	1930-1990
	WCDMA Band 4	1710-1755	2110-2155
	WCDMA Band 5	824-849	869-894
	LTE Band 2	1850-1910	1930-1990
	LTE Band 4	1710-1755	2110-2155
	LTE Band 5	824-849	869-894
	LTE Band 7	2500-2570	2620-2690
	WLAN 2.4G	2412-2462	
	Bluetooth	2402-2480	
	RFID	13.56	
GPRS Multislot Class(12)	Max Number of Timeslots in Uplink	4	
	Max Number of Timeslots in Downlink	4	
	Max Total Timeslot	5	
EDGE Multislot Class(12)	Max Number of Timeslots in Uplink	4	
	Max Number of Timeslots in Downlink	4	
	Max Total Timeslot	5	
Power Class	4, tested with power level 5(GSM 850)		
	1, tested with power level 0(GSM 1900)		
	3, tested with power control “all 1”(WCDMA Band 2)		
	3, tested with power control “all 1”(WCDMA Band 4)		
	3, tested with power control “all 1”(WCDMA Band 5)		
	3, tested with power control all Max.(LTE Band 2)		
	3, tested with power control all Max.(LTE Band 4)		
	3, tested with power control all Max.(LTE Band 5)		
	3, tested with power control all Max.(LTE Band 7)		

1.4. Test specification(s)

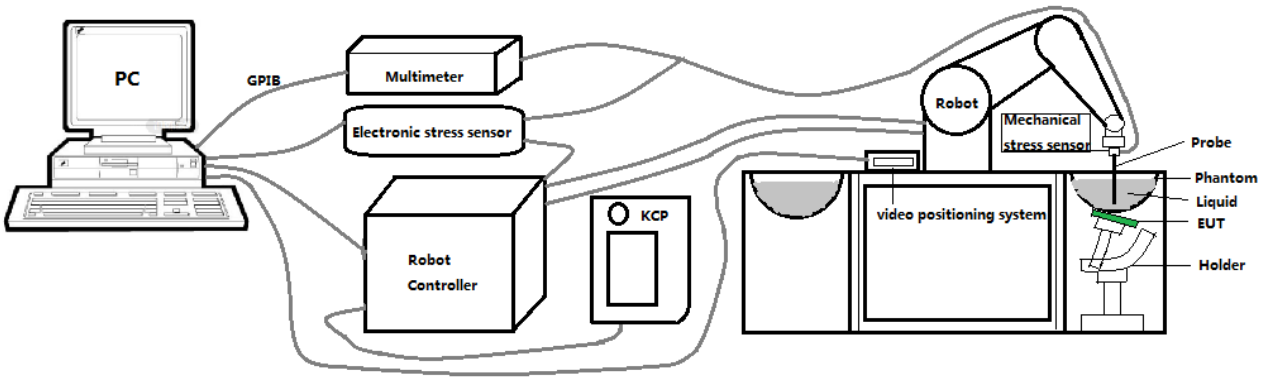
FCC 47 CFR Part 2(2.1093)
ANSI/IEEE C95.1-1992
IEEE Std 1528-2013
KDB 865664 D01 SAR measurement 100 MHz to 6 GHz
KDB 865664 D02 RF Exposure Reporting
KDB 447498 D01 General RF Exposure Guidance
KDB 248227 D01 802.11 Wi-Fi SAR
KDB 941225 D01 3G SAR Procedures
KDB 941225 D05 SAR for LTE Devices

1.5. Ambient Condition

Ambient temperature	20°C – 24°C
Relative Humidity	30% – 70%

2. SAR Measurement System

2.1. SATIMO SAR Measurement Set-up Diagram



These measurements were performed with the automated near-field scanning system OPENSAR from SATIMO. The system is based on a high precision robot (working range: 901 mm), which positions the probes with a positional repeatability of better than ±0.03 mm. The SAR measurements were conducted with dosimetric probe (manufactured by SATIMO), designed in the classical triangular configuration and optimized for dosimetric evaluation.

The first step of the field measurement is the evaluation of the voltages induced on the probe by the device under test. Probe diode detectors are nonlinear. Below the diode compression point, the output voltage is proportional to the square of the applied E-field; above the diode compression point, it is linear to the applied E-field. The compression point depends on the diode, and a calibration procedure is necessary for each sensor of the probe.

The Keithley multimeter reads the voltage of each sensor and send these three values to the PC. The corresponding E field value is calculated using the probe calibration factors, which are stored in the working directory. This evaluation includes linearization of the diode characteristics. The field calculation is done separately for each sensor. Each component of the E field is displayed on the "Dipole Area Scan Interface" and the total E field is displayed on the "3D Interface"

2.2. Robot

The SATIMO SAR system uses the high precision robots from KUKA. For the 6-axis controller system, the robot controller version (KUKA) from KUKA is used. The KUKA robot series have many features that are important for our application:

- High precision (repeatability ±0.03 mm)
- High reliability (industrial design)
- Jerk-free straight movements
- Low ELF interference (the closed metallic construction shields against motor control fields)

2.3. E-Field Probe

This E-field detection probe is composed of three orthogonal dipoles linked to special Schottky diodes with low detection thresholds. The probe allows the measurement of electric fields in liquids such as the one defined in the IEEE and CENELEC standards.

For the measurements the Specific Dosimetric E-Field Probe SN 08/16 EPGO287 with following specifications is used

- Dynamic range: 0.01-100 W/kg
- Tip Diameter : 2.5 mm
- Distance between probe tip and sensor center: 1 mm
- Distance between sensor center and the inner phantom surface: 2 mm (repeatability better than ±1 mm).
- Probe linearity: ±0.08 dB
- Axial isotropy: ±0.01 dB
- Hemispherical Isotropy: ±0.01 dB
- Calibration range: 650MHz to 5900MHz for head & body simulating liquid.
- Lower detection limit: 8mW/kg

Angle between probe axis (evaluation axis) and surface normal line: less than 30°.

2.3.1. E-Field Probe Calibration

Each probe needs to be calibrated according to a dosimetric assessment procedure with accuracy better than ±10%. The spherical isotropy shall be evaluated and within ±0.25dB. The sensitivity parameters (Norm X, Norm Y, and Norm Z), the diode compression parameter (DCP) and the conversion factor (Conv F) of the probe are tested. The calibration data can be referred to appendix D of this report.

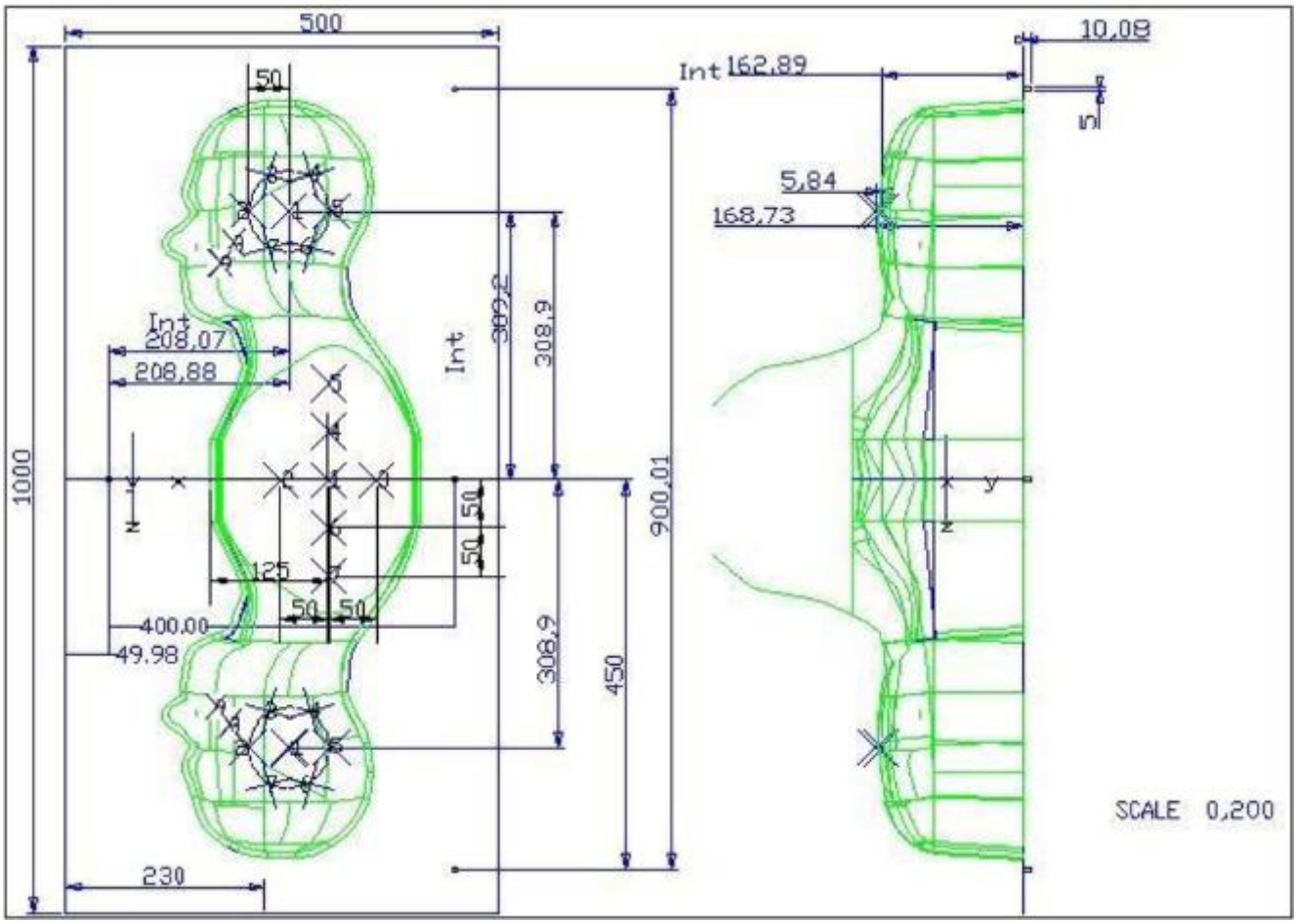
2.4. SAM phantoms

Photo of SAM phantom SN 16/15 SAM119

The SAM phantom is used to measure the SAR relative to people exposed to electro-magnetic field radiated by mobile phones.

2.4.1. Technical Data

Serial Number	Shell thickness	Filling volume	Dimensions	Positionner Material	Permittivity	Loss Tangent
SN 16/15 SAM119	2 mm ±0.2 mm	27 liters	Length:1000 mm Width:500 mm Height:200 mm	Gelcoat with fiberglass	3.4	0.02

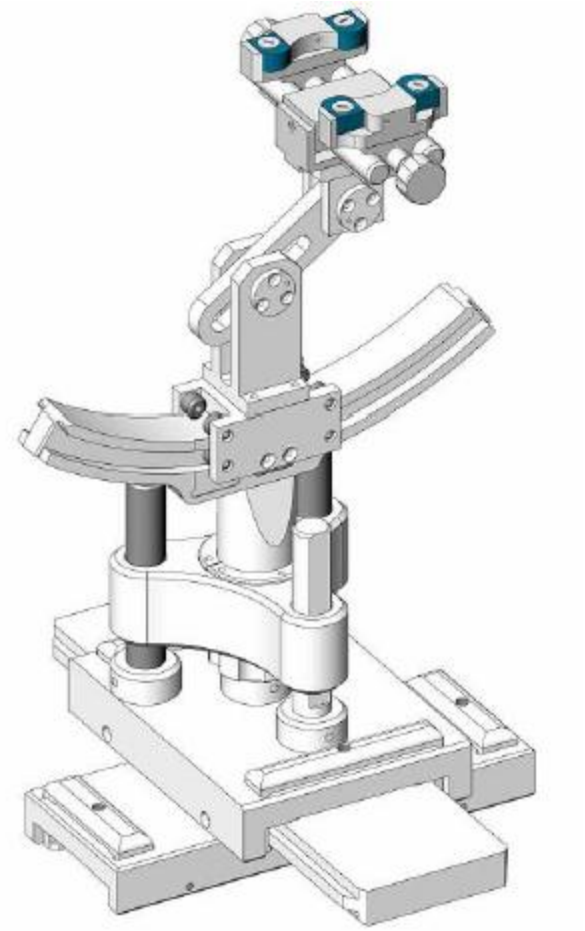


Serial Number	Left Head(mm)		Right Head(mm)		Flat Part(mm)	
SN 16/15 SAM119	2	2.02	2	2.08	1	2.09
	3	2.05	3	2.06	2	2.06
	4	2.07	4	2.07	3	2.08
	5	2.08	5	2.08	4	2.10
	6	2.05	6	2.07	5	2.10
	7	2.05	7	2.05	6	2.07
	8	2.07	8	2.06	7	2.07
	9	2.08	9	2.06	-	-

The test, based on ultrasonic system, allows measuring the thickness with an accuracy of 10 µm.

2.5. Device Holder

The positioning system allows obtaining cheek and tilting position with a very good accuracy. In compliance with CENELEC, the tilt angle uncertainty is lower than 1 degree.



Serial Number	Holder Material	Permittivity	Loss Tangent
SN 16/15 MSH100	Delrin	3.7	0.005

2.6. Test Equipment List

This table gives a complete overview of the SAR measurement equipment.

Devices used during the test described are marked ☒

	Manufacturer	Name of Equipment	Type/Model	Serial Number	Calibration	
					Last Cal.	Due Date
☒	MVG	E FIELD PROBE	SSE2	SN 08/16 EPGO287	Feb. 01, 2022	Jan. 31, 2023
☐	MVG	750 MHz Dipole	SID750	SN 03/15 DIP 0G750-355	Mar. 01, 2021	Feb. 28, 2024
☒	MVG	835 MHz Dipole	SID835	SN 03/15 DIP 0G835-347	Mar. 01, 2021	Feb. 28, 2024
☐	MVG	900 MHz Dipole	SID900	SN 03/15 DIP 0G900-348	Mar. 01, 2021	Feb. 28, 2024
☒	MVG	1800 MHz Dipole	SID1800	SN 03/15 DIP 1G800-349	Mar. 01, 2021	Feb. 28, 2024
☒	MVG	1900 MHz Dipole	SID1900	SN 03/15 DIP 1G900-350	Mar. 01, 2021	Feb. 28, 2024
☐	MVG	2000 MHz Dipole	SID2000	SN 03/15 DIP 2G000-351	Mar. 01, 2021	Feb. 28, 2024
☒	MVG	2450 MHz Dipole	SID2450	SN 03/15 DIP 2G450-352	Mar. 01, 2021	Feb. 28, 2024
☒	MVG	2600 MHz Dipole	SID2600	SN 03/15 DIP 2G600-356	Mar. 01, 2021	Feb. 28, 2024
☐	MVG	5000 MHz Dipole	SWG5500	SN 13/14 WGA 33	Mar. 01, 2021	Feb. 28, 2024
☒	MVG	Liquid measurement Kit	SCLMP	SN 21/15 OCPG 72	NCR	NCR
☒	MVG	Power Amplifier	N.A	AMPLISAR_28/14_003	NCR	NCR
☒	KEITHLEY	Millivoltmeter	2000	4072790	NCR	NCR
☒	R&S	Universal radio communication tester	CMU200	117858	Jul. 01, 2021	Jun. 30, 2022
☒	R&S	Wideband radio communication tester	CMW500	103917	Jul. 01, 2021	Jun. 30, 2022
☒	HP	Network Analyzer	8753D	3410J01136	Jul. 01, 2021	Jun. 30, 2022
☒	Agilent	PSG Analog Signal Generator	E8257D	MY51110112	Jul. 01, 2021	Jun. 30, 2022

☒	Agilent	Power meter	E4419B	MY45102538	Jul. 01, 2021	Jun. 30, 2022
☒	Agilent	Power sensor	E9301A	MY41495644	Jul. 01, 2021	Jun. 30, 2022
☒	Agilent	Power sensor	E9301A	US39212148	Jul. 01, 2021	Jun. 30, 2022
☒	MCLI/USA	Directional Coupler	CB11-20	0D2L51502	Jul. 17, 2020	Jul. 16, 2023

3. SAR Measurement Procedures

The measurement procedures are as follows:

<Conducted power measurement>

(a) For WWAN power measurement, use base station simulator to configure EUT WWAN transmission in conducted connection with RF cable, at maximum power in each supported wireless interface and frequency band.

(b) Read the WWAN RF power level from the base station simulator.

(c) For WLAN/Bluetooth power measurement, use engineering software to configure EUT WLAN/Bluetooth continuously transmission, at maximum RF power in each supported wireless interface and frequency band.

(d) Connect EUT RF port through RF cable to the power meter, and measure WLAN/Bluetooth output power.

<SAR measurement>

(a) Use base station simulator to configure EUT WWAN transmission in radiated connection, and engineering software to configure EUT WLAN/Bluetooth continuously transmission, at maximum RF power, in the highest power channel.

(b) Place the EUT in the positions as Appendix A demonstrates.

(c) Set scan area, grid size and other setting on the OPENSAR software.

(d) Measure SAR results for the highest power channel on each testing position.

(e) Find out the largest SAR result on these testing positions of each band.

(f) Measure SAR results for other channels in worst SAR testing position if the reported SAR of highest power channel is larger than 0.8 W/kg.

According to the test standard, the recommended procedure for assessing the peak spatial-average SAR value consists of the following steps:

(a) Power reference measurement

(b) Area scan

(c) Zoom scan

(d) Power drift measurement

3.1. Power Reference

The Power Reference Measurement and Power Drift Measurements are for monitoring the power drift of the device under test in the batch process. The minimum distance of probe sensors to surface determines the closest measurement point to phantom surface. This distance cannot be smaller than the distance of sensor calibration points to probe tip as defined in the probe properties.

3.2. Area scan & Zoom scan

The area scan is a 2D scan to find the hot spot location on the DUT. The zoom scan is a 3D scan above the hot spot to calculate the 1g and 10g SAR value.

Measurement of the SAR distribution with a grid of 8 to 16 mm * 8 to 16 mm and a constant distance to the inner surface of the phantom. Since the sensors cannot directly measure at the inner phantom surface, the values between the sensors and the inner phantom surface are extrapolated. With these values the area of the maximum SAR is calculated by an interpolation scheme. Around this point, a cube of 30 * 30 *30 mm or 32 * 32 * 32 mm is assessed by measuring 5 or 8 * 5 or 8 * 4 or 5 mm. With these data, the peak spatial-average SAR value can be calculated.

From the scanned SAR distribution, identify the position of the maximum SAR value, in addition identify the positions of any local maxima with SAR values within 2 dB of the maximum value that will not be within the zoom scan of other peaks; additional peaks shall be measured only when the primary peak is within 2 dB of the SAR compliance limit (e.g., 1 W/kg for 1,6 W/kg 1 g limit, or 1,26 W/kg for 2 W/kg, 10 g limit).

Area scan & Zoom scan scan parameters extracted from FCC KDB 865664 D01 SAR measurement 100 MHz to 6 GHz.

<table>
<tr><td colspan="3"></td><td>≤ 3 GHz</td><td>> 3 GHz</td></tr>
<tr><td colspan="3">Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface</td><td>5 ± 1 mm</td><td>½·δ·ln(2) ± 0.5 mm</td></tr>
<tr><td colspan="3">Maximum probe angle from probe axis to phantom surface normal at the measurement location</td><td>30° ± 1°</td><td>20° ± 1°</td></tr>
<tr><td colspan="3" rowspan="2">Maximum area scan spatial resolution: Δx_{Area}, Δy_{Area}</td><td>≤ 2 GHz: ≤ 15 mm
2 – 3 GHz: ≤ 12 mm</td><td>3 – 4 GHz: ≤ 12 mm
4 – 6 GHz: ≤ 10 mm</td></tr>
<tr><td colspan="2">When the x or y dimension of the test device, in the measurement plane orientation, is smaller than the above, the measurement resolution must be ≤ the corresponding x or y dimension of the test device with at least one measurement point on the test device.</td></tr>
<tr><td colspan="3">Maximum zoom scan spatial resolution: Δx_{Zoom}, Δy_{Zoom}</td><td>≤ 2 GHz: ≤ 8 mm
2 – 3 GHz: ≤ 5 mm*</td><td>3 – 4 GHz: ≤ 5 mm*
4 – 6 GHz: ≤ 4 mm*</td></tr>
<tr><td rowspan="3">Maximum zoom scan spatial resolution, normal to phantom surface</td><td colspan="2">uniform grid: $\Delta z_{Zoom}(n)$</td><td>≤ 5 mm</td><td>3 – 4 GHz: ≤ 4 mm
4 – 5 GHz: ≤ 3 mm
5 – 6 GHz: ≤ 2 mm</td></tr>
<tr><td rowspan="2">graded grid</td><td>$\Delta z_{Zoom}(1)$: between 1st two points closest to phantom surface</td><td>≤ 4 mm</td><td>3 – 4 GHz: ≤ 3 mm
4 – 5 GHz: ≤ 2.5 mm
5 – 6 GHz: ≤ 2 mm</td></tr>
<tr><td>$\Delta z_{Zoom}(n>1)$: between subsequent points</td><td colspan="2">≤ 1.5·$\Delta z_{Zoom}(n-1)$</td></tr>
<tr><td>Minimum zoom scan volume</td><td colspan="2">x, y, z</td><td>≥ 30 mm</td><td>3 – 4 GHz: ≥ 28 mm
4 – 5 GHz: ≥ 25 mm
5 – 6 GHz: ≥ 22 mm</td></tr>
<tr><td colspan="5">Note: δ is the penetration depth of a plane-wave at normal incidence to the tissue medium; see draft standard IEEE P1528-2011 for details.
* When zoom scan is required and the reported SAR from the area scan based 1-g SAR estimation procedures of KDB 447498 is ≤ 1.4 W/kg, ≤ 8 mm, ≤ 7 mm and ≤ 5 mm zoom scan resolution may be applied, respectively, for 2 GHz to 3 GHz, 3 GHz to 4 GHz and 4 GHz to 6 GHz.</td></tr>
</table>

3.3. Description of interpolation/extrapolation scheme

The local SAR inside the phantom is measured using small dipole sensing elements inside a probe body. The probe tip must not be in contact with the phantom surface in order to minimise measurements errors, but the highest local SAR will occur at the surface of the phantom.
An extrapolation is using to determinate this highest local SAR values. The extrapolation is based on a fourth-order least-square polynomial fit of measured data. The local SAR value is then extrapolated from the liquid surface with a 1 mm step.
The measurements have to be performed over a limited time (due to the duration of the battery) so the step of measurement is high. It could vary between 5 and 8 mm. To obtain an accurate assessment of the maximum SAR averaged over 10 grams and 1 gram requires a very fine resolution in the three dimensional scanned data array.

3.4. Volumetric Scan

The volumetric scan consists to a full 3D scan over a specific area. This 3D scan is useful form multi Tx SAR measurement. Indeed, it is possible with OpenSAR to add, point by point, several volumetric scan to calculate the SAR value of the combined measurement as it is define in the standard IEEE1528 and IEC62209.

3.5. Power Drift

All SAR testing is under the EUT install full charged battery and transmit maximum output power. In OpenSAR measurement software, the power reference measurement and power drift measurement procedures are used for monitoring the power drift of EUT during SAR test. Both these procedures measure the field at a specified reference position before and after the SAR testing. The software will calculate the field difference in V/m. If the power drifts more than ±5%, the SAR will be retested.

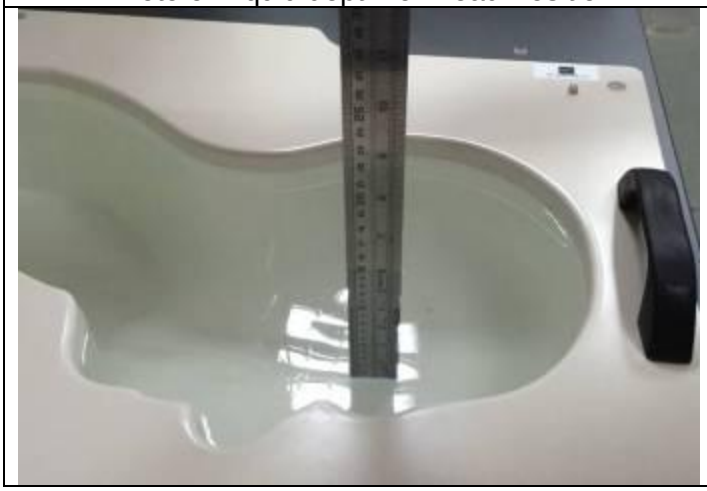
4. System Verification Procedure

4.1. Tissue Verification

The following tissue formulations are provided for reference only as some of the parameters have not been thoroughly verified. The composition of ingredients may be modified accordingly to achieve the desired target tissue parameters required for routine SAR evaluation.

Ingredients (% of weight)	Head Tissue									
Frequency Band (MHz)	750	835	900	1800	1900	2000	2450	2600	5200	5800
Water	34.40	34.40	34.40	55.36	55.36	57.87	57.87	57.87	65.53	65.53
NaCl	0.79	0.79	0.79	0.35	0.35	0.16	0.16	0.16	0.00	0.00
1,2-Propanediol	64.81	64.81	64.81	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Triton X-100	0.00	0.00	0.00	30.45	30.45	19.97	19.97	19.97	24.24	24.24
DGBE	0.00	0.00	0.00	13.84	13.84	22.00	22.00	22.00	10.23	10.23

For SAR measurement of the field distribution inside the phantom, the phantom must be filled with homogeneous tissue simulating liquid to a depth of at least 15 cm. For head SAR testing, the liquid depth from the ear reference point (ERP) of the phantom to the liquid top surface is larger than 15 cm.

Photo of Liquid depth for Head Position	Photo of Liquid depth for Body Position
	

4.1.1. Tissue Dielectric Parameter Check Results

The simulating liquids should be checked at the beginning of a series of SAR measurements to determine of the dielectric parameter are within the tolerances of the specified target values. The measured conductivity and relative permittivity should be within ±5% of the target values.

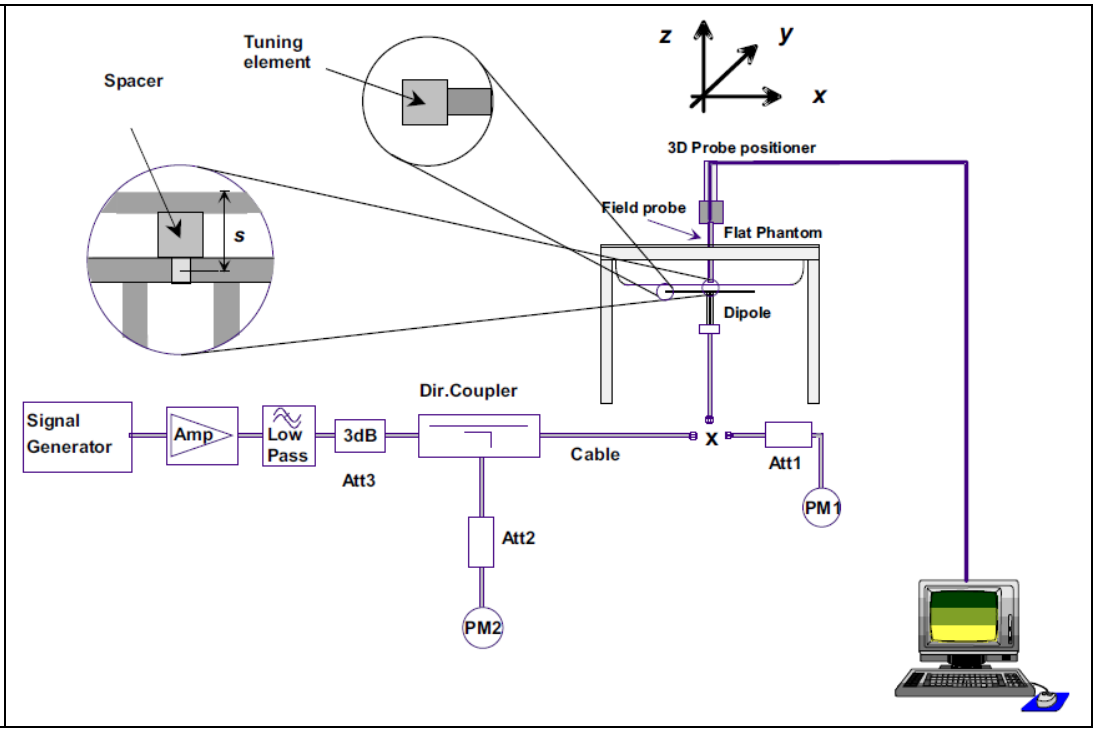
Tissue Type	Measured Frequency (MHz)	Target Tissue		Measured Tissue		Liquid Temp.	Test Date
		εr (±5%)	σ (S/m) (±5%)	εr	σ (S/m)		
Head 850	835	41.50 (39.43~43.58)	0.90 (0.86~0.95)	42.33	0.93	21.3 °C	Mar. 21, 2022
Head 1800	1800	40.00 (38.00~42.00)	1.40 (1.33~1.47)	38.92	1.40	21.7 °C	May 07, 2022
Head 1900	1900	40.00 (38.00~42.00)	1.40 (1.33~1.47)	38.44	1.46	21.2 °C	May 09, 2022
Head 2450	2450	39.20 (37.24~41.16)	1.80 (1.71~1.89)	38.80	1.83	21.4 °C	May 10, 2022
Head 2600	2600	39.01 (37.06~40.96)	1.96 (1.86~2.06)	38.62	2.04	21.8 °C	May 13, 2022

NOTE: The dielectric parameters of the tissue-equivalent liquid should be measured under similar ambient conditions and within 2 °C of the conditions expected during the SAR evaluation to satisfy protocol requirements.

4.2. System Verification Procedure

The system verification is performed for verifying the accuracy of the complete measurement system and performance of the software. The dipole is connected to the signal source consisting of signal generator and amplifier via a directional coupler, N-connector cable and adaption to SMA. It is fed with a power of 100mW (below 5GHz) or 100mW (above 5GHz). To adjust this power a power meter is used. The power sensor is connected to the cable before the system verification to measure the power at this point and do adjustments at the signal generator. At the outputs of the directional coupler both return loss as well as forward power are controlled during the system verification to make sure that emitted power at the dipole is kept constant. This can also be checked by the power drift measurement after the test (result on plot).

The system verification is shown as below picture:



4.2.1. System Verification Results

Comparing to the original SAR value provided by SATIMO, the verification data should be within its specification of ±10%. Below table shows the target SAR and measured SAR after normalized to 1W input power. The table below indicates the system performance verification can meet the variation criterion and the plots can be referred to Appendix B of this report.

System Verification	Target SAR (1W) (±10%)		Measured SAR (Normalized to 1W)		Liquid Temp.	Test Date
	1-g (W/Kg)	10-g (W/Kg)	1-g (W/Kg)	10-g (W/Kg)		
835MHz	9.84 (8.86~10.82)	6.22 (5.60~6.84)	9.62	6.22	21.3 °C	Mar. 21, 2022
1800MHz	37.96 (34.17~41.75)	19.81 (17.83~21.79)	37.20	18.07	21.7 °C	May 07, 2022
1900MHz	40.37 (36.34~44.40)	20.48 (18.44~22.52)	38.08	20.63	21.2 °C	May 09, 2022
2450MHz	53.69 (48.33~59.05)	23.94 (21.55~26.33)	49.70	23.30	21.4 °C	May 10, 2022
2600MHz	55.83 (50.25~61.41)	24.19 (21.78~26.60)	60.85	25.80	21.8 °C	May 13, 2022

5. SAR Measurement variability and uncertainty

5.1. SAR measurement variability

Per KDB865664 D01 SAR measurement 100 MHz to 6 GHz, SAR measurement variability must be assessed for each frequency band, which is determined by the SAR probe calibration point and tissue-equivalent medium used for the device measurements. The additional measurements are repeated after the completion of all measurements requiring the same head or body tissue-equivalent medium in a frequency band. The test device should be returned to ambient conditions (normal room temperature) with the battery fully charged before it is re-mounted on the device holder for the repeated measurement(s) to minimize any unexpected variations in the repeated results.

1) Repeated measurement is not required when the original highest measured SAR is < 0.80 W/kg; steps 2) through 4) do not apply.
2) When the original highest measured SAR is ≥ 0.80 W/kg, repeat that measurement once.
3) Perform a second repeated measurement only if the ratio of largest to smallest SAR for the original and first repeated measurements is > 1.20 or when the original or repeated measurement is ≥ 1.45 W/kg (~ 10% from the 1-g SAR limit).
4) Perform a third repeated measurement only if the original, first or second repeated measurement is ≥1.5 W/kg and the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20.

5.2. SAR measurement uncertainty

Per KDB865664 D01 SAR Measurement 100 MHz to 6 GHz, when the highest measured 1-g SAR within a frequency band is < 1.5 W/kg, the extensive SAR measurement uncertainty analysis described in IEEE Std 1528-2013 is not required in SAR reports submitted for equipment approval. The equivalent ratio (1.5/1.6) is applied to extremity and occupational exposure conditions.

6. RF Exposure Positions

6.1. Wrist watch and wrist-worn transmitters

Refer to KDB 447498 D01. Transmitters that are built-in within a wrist watch or similar wrist-worn devices typically operate in speaker mode for voice communication, with the device worn on the wrist and positioned next to the mouth. Next to the mouth exposure requires 1-g SAR and the wrist-worn condition requires 10-g extremity SAR. The 10-g extremity and 1-g SAR test exclusions may be applied to the wrist and face exposure conditions. When SAR evaluation is required, next to the mouth use is evaluated with the front of the device positioned at 10 mm from a flat phantom filled with head tissue-equivalent medium. The wrist bands should be strapped together to represent normal use conditions. SAR for wrist exposure is evaluated with the back of the device positioned in direct contact against a flat phantom filled with body tissue-equivalent medium. The wrist bands should be unstrapped and touching the phantom.

7. RF Output Power

7.1. GSM Conducted Power

Band GSM850	Burst-Averaged output Power (dBm)				Frame-Averaged output Power (dBm)			
Tx Channel	Tune-up	128	189	251	Tune-up	128	189	251
Frequency (MHz)	(dBm)	824.2	836.4	848.8	(dBm)	824.2	836.4	848.8
GSM (GMSK)	32.50	32.02	32.28	32.00	23.47	22.99	23.25	22.97
GPRS(GMSK, 1 TS)	32.50	31.97	32.23	31.97	23.47	22.94	23.20	22.94
GPRS(GMSK, 2 TS)	31.50	31.23	31.48	31.21	25.48	25.21	25.46	25.19
GPRS(GMSK, 3 TS)	30.00	29.47	29.73	29.47	25.74	25.21	25.47	25.21
GPRS(GMSK, 4 TS)	29.00	28.39	28.65	28.40	25.99	25.38	25.64	25.39
EDGE(GMSK, 1 TS)	25.50	25.00	24.98	25.07	16.47	15.97	15.95	16.04
EDGE(GMSK, 2 TS)	24.50	23.61	24.13	24.05	18.48	17.59	18.11	18.03
EDGE(GMSK, 3 TS)	22.00	21.76	21.43	21.54	17.74	17.50	17.17	17.28
EDGE(GMSK, 4 TS)	20.50	20.21	20.40	20.33	17.49	17.20	17.39	17.32
Band GSM1900	Burst-Averaged output Power (dBm)				Frame-Averaged output Power (dBm)			
Tx Channel	Tune-up	512	661	810	Tune-up	512	661	810
Frequency (MHz)	(dBm)	1850.2	1880.0	1909.8	(dBm)	1850.2	1880.0	1909.8
GSM (GMSK)	29.50	29.41	29.41	29.24	20.47	20.38	20.38	20.21
GPRS(GMSK, 1 TS)	29.50	29.38	29.38	29.21	20.47	20.35	20.35	20.18
GPRS(GMSK, 2 TS)	29.00	28.69	28.69	28.57	22.98	22.67	22.67	22.55
GPRS(GMSK, 3 TS)	27.00	26.97	26.92	26.71	22.74	22.71	22.66	22.45
GPRS(GMSK, 4 TS)	26.00	25.85	25.81	25.56	22.99	22.84	22.80	22.55
EDGE(GMSK, 1 TS)	24.50	24.26	23.95	24.15	15.47	15.23	14.92	15.12
EDGE(GMSK, 2 TS)	23.00	22.44	22.47	22.90	16.98	16.42	16.45	16.88
EDGE(GMSK, 3 TS)	21.00	20.79	20.42	20.47	16.74	16.53	16.16	16.21
EDGE(GMSK, 4 TS)	19.50	19.13	19.03	19.34	16.49	16.12	16.02	16.33

Note: The frame-averaged power is linearly scaled the maximum burst averaged power over 8 time slots.
The calculated method are shown as below:
Frame-averaged power = Maximum burst averaged power (1 TS) - 9.03 dB
Frame-averaged power = Maximum burst averaged power (2 TS) - 6.02 dB
Frame-averaged power = Maximum burst averaged power (3 TS) - 4.26 dB
Frame-averaged power = Maximum burst averaged power (4 TS) - 3.01 dB

7.2. WCDMA Conducted Power

Band	WCDMA Band 2			
Tx Channel	Tune-up	9262	9400	9538
Frequency (MHz)		1852.4	1880	1907.6

RMC 12.2Kbps	23.00	22.55	22.57	22.62
HSDPA Subtest-1	22.00	21.62	21.67	21.69
HSDPA Subtest-2	21.50	21.15	21.24	21.22
HSDPA Subtest-3	20.50	19.99	19.93	20.20
HSDPA Subtest-4	20.50	20.01	20.26	20.39
HSUPA Subtest-1	22.00	20.43	21.50	21.53
HSUPA Subtest-2	22.00	21.51	21.60	21.65
HSUPA Subtest-3	20.50	19.78	20.38	20.49
HSUPA Subtest-4	22.00	21.60	21.67	21.70
HSUPA Subtest-5	21.50	20.14	20.92	21.09
Band	WCDMA Band 4			
Tx Channel	Tune-up	1312	1413	1513
Frequency (MHz)		1712.4	1732.6	1752.6
RMC 12.2Kbps	22.50	22.29	22.28	22.42
HSDPA Subtest-1	21.50	21.36	21.36	21.44
HSDPA Subtest-2	21.00	21.00	20.91	20.96
HSDPA Subtest-3	20.50	19.89	19.56	20.06
HSDPA Subtest-4	20.50	20.07	19.91	19.97
HSUPA Subtest-1	21.50	20.28	21.22	21.23
HSUPA Subtest-2	21.50	21.26	21.17	21.33
HSUPA Subtest-3	20.50	19.51	20.10	20.29
HSUPA Subtest-4	21.50	21.37	21.33	21.45
HSUPA Subtest-5	21.00	19.98	20.62	20.70
Band	WCDMA Band 5			
Tx Channel	Tune-up	4132	4182	4233
Frequency (MHz)		826.4	836.4	846.6
RMC 12.2Kbps	23.00	22.56	22.53	22.35
HSDPA Subtest-1	22.00	21.60	21.58	21.42
HSDPA Subtest-2	21.50	21.20	21.22	20.90
HSDPA Subtest-3	20.50	20.35	19.75	20.00
HSDPA Subtest-4	20.50	20.16	20.04	19.79
HSUPA Subtest-1	21.50	20.27	21.42	21.22
HSUPA Subtest-2	22.00	21.50	21.47	21.30
HSUPA Subtest-3	20.50	20.05	20.34	19.95
HSUPA Subtest-4	22.00	21.59	21.54	21.38
HSUPA Subtest-5	21.00	20.23	20.87	20.76

7.3. LTE Conducted Power

Band	Band Width	Modulation	RB Configuration		Tune-up (dBm)	Channel/Frequency(MHz)		
			RB Size	RB Offset		18607/1850.7	18900/1880	19193/1909.3
LTE Band 2	1.4MHz	QPSK	1	0	23.00	22.53	22.52	22.56
			1	2	23.00	22.72	22.62	22.68
			1	5	23.00	22.51	22.53	22.43
			3	0	23.00	22.62	22.59	22.19
			3	1	23.00	22.57	22.59	22.18
			3	2	23.00	22.59	22.56	22.18
			6	0	22.00	21.58	21.56	21.03
		16QAM	1	0	22.00	21.78	21.46	21.28
			1	2	22.00	21.96	21.60	21.41
			1	5	22.00	21.83	21.45	21.21
			3	0	22.00	21.99	21.81	21.36
			3	1	22.00	21.97	21.83	21.38
			3	2	22.00	21.99	21.87	21.32
			6	0	21.00	20.78	20.75	20.30
Band	Band Width	Modulation	RB Configuration		Tune-up (dBm)	Channel/Frequency(MHz)		
			RB Size	RB Offset		18615/1851.5	18900/1880	19185/1908.5
LTE Band 2	3MHz	QPSK	1	0	23.00	22.63	22.22	22.14
			1	7	23.00	22.86	22.41	22.52
			1	14	23.00	22.24	22.08	22.14
			8	0	21.50	21.10	21.13	21.14
			8	4	21.50	21.15	21.10	21.17
			8	7	21.50	21.19	21.07	21.13
			15	0	21.50	21.13	21.07	21.12
		16QAM	1	0	22.00	21.08	21.64	21.38
			1	7	22.00	21.45	21.90	21.71
			1	14	22.00	21.06	21.62	21.34
			8	0	20.50	20.10	20.15	20.16
			8	4	20.50	20.16	20.17	20.20
			8	7	20.50	20.14	20.11	20.14
			15	0	20.50	20.23	20.13	20.09
Band	Band	Modulation	RB		Tune-up	Channel/Frequency(MHz)		

	Width		Configuration		(dBm)			
			RB Size	RB Offset		18625/1852.5	18900/1880	19175/1907.5
LTE Band 2	5MHz	QPSK	1	0	23.00	22.09	22.00	22.08
			1	12	23.00	22.38	22.39	22.46
			1	24	23.00	22.07	22.02	22.05
			12	0	21.50	21.13	21.18	21.15
			12	6	21.50	21.24	21.15	21.22
			12	11	21.50	21.17	21.09	21.08
			25	0	21.50	21.20	21.15	21.14
		16QAM	1	0	22.50	21.73	21.40	21.43
			1	12	22.50	22.14	21.79	21.87
			1	24	22.50	21.67	21.42	21.41
			12	0	20.50	20.18	20.18	20.27
			12	6	20.50	20.29	20.16	20.28
			12	11	20.50	20.16	20.09	20.14
			25	0	20.50	20.18	20.18	20.15
Band	Band Width	Modulation	RB Configuration		Tune-up (dBm)	Channel/Frequency(MHz)		
			RB Size	RB Offset		18650/1855	18900/1880	19150/1905
LTE Band 2	10MHz	QPSK	1	0	23.00	22.16	22.10	22.20
			1	24	23.00	22.25	22.22	22.26
			1	49	23.00	22.12	22.09	22.12
			25	0	21.50	21.24	21.27	21.21
			25	12	21.50	21.20	21.14	21.24
			25	24	21.50	21.27	21.07	21.14
			50	0	21.50	21.27	21.22	21.20
		16QAM	1	0	22.00	21.59	21.33	21.09
			1	24	22.00	21.74	21.45	21.17
			1	49	22.00	21.57	21.29	21.03
			25	0	20.50	20.30	20.26	20.24
			25	12	20.50	20.29	20.17	20.18
			25	24	20.50	20.34	20.10	20.16
			50	0	20.50	20.26	20.26	20.19
Band	Band Width	Modulation	RB Configuration		Tune-up (dBm)	Channel/Frequency(MHz)		
			RB Size	RB Offset		18675/1857.5	18900/1880	19125/1902.5

LTE Band 2	15MHz	QPSK	1	0	23.00	22.15	22.09	22.15
			1	37	23.00	22.39	22.33	22.46
			1	74	23.00	22.14	22.01	22.07
			36	0	21.50	21.21	21.24	21.14
			36	18	21.50	21.24	21.18	21.19
			36	37	21.50	21.27	21.03	21.09
			75	0	21.50	21.32	21.19	21.16
		16QAM	1	0	22.00	21.33	21.22	21.61
			1	37	22.00	21.69	21.67	21.98
			1	74	22.00	21.36	21.18	21.50
			36	0	20.50	20.35	20.21	20.23
			36	18	20.50	20.35	20.16	20.24
			36	37	20.50	20.38	20.06	20.18
			75	0	20.50	20.28	20.20	20.14

Band	Band Width	Modulation	RB Configuration		Tune-up (dBm)	Channel/Frequency(MHz)		
			RB Size	RB Offset		18700/1860	18900/1880	19100/1900
LTE Band 2	20MHz	QPSK	1	0	23.00	22.01	22.01	22.01
			1	49	23.00	22.37	22.25	22.36
			1	99	23.00	21.99	21.92	21.95
			50	0	21.50	21.21	21.34	21.18
			50	24	21.50	21.27	21.20	21.30
			50	49	21.50	21.38	21.03	21.08
			100	0	21.50	21.32	21.19	21.19
		16QAM	1	0	22.00	21.29	21.36	21.33
			1	49	22.00	21.55	21.63	21.62
			1	99	22.00	21.31	21.27	21.22
			50	0	20.50	20.30	20.39	20.20
			50	24	20.50	20.39	20.33	20.28
			50	49	20.50	20.47	20.06	20.11
			100	0	20.50	20.33	20.20	20.17

Band	Band Width	Modulation	RB Configuration		Tune-up (dBm)	Channel/Frequency(MHz)		
			RB Size	RB Offset		19957/1710.7	20175/1732.5	20393/1754.3
LTE Band 4	1.4MHz	QPSK	1	0	22.50	22.21	21.70	21.84
			1	5	22.50	21.71	21.65	21.82
			3	0	22.50	21.76	21.72	21.80

			3	2	22.50	21.73	21.72	21.79
			6	0	21.00	20.69	20.70	20.94
		16QAM	1	0	21.00	20.84	20.90	20.54
			1	5	21.00	20.84	20.91	20.53
			3	0	21.00	20.97	20.97	20.89
			3	2	21.00	20.95	20.96	20.96
			6	0	20.00	19.86	19.83	19.95
Band	Band Width	Modulation	RB Configuration		Tune-up (dBm)	Channel/Frequency(MHz)		
			RB Size	RB Offset		19965/1711.5	20175/1732.5	20385/1753.5
LTE Band 4	3MHz	QPSK	1	0	22.50	21.80	21.77	21.93
			1	14	22.50	21.84	21.73	21.90
			8	0	21.00	20.80	20.74	20.90
			8	7	21.00	20.79	20.75	20.92
			15	0	21.00	20.74	20.78	20.87
		16QAM	1	0	21.50	20.65	21.20	20.98
			1	14	21.50	20.57	21.19	20.94
			8	0	20.00	19.77	19.79	19.85
			8	7	20.00	19.75	19.83	19.81
			15	0	20.00	19.80	19.77	19.76
Band	Band Width	Modulation	RB Configuration		Tune-up (dBm)	Channel/Frequency(MHz)		
			RB Size	RB Offset		19975/1712.5	20175/1732.5	20375/1752.5
LTE Band 4	5MHz	QPSK	1	0	22.50	21.66	21.68	21.84
			1	24	22.50	21.61	21.78	21.82
			12	0	21.00	20.73	20.75	20.92
			12	11	21.00	20.73	20.73	20.84
			25	0	21.00	20.78	20.78	20.92
		16QAM	1	0	21.50	20.96	21.21	21.10
			1	24	21.50	20.87	21.26	21.02
			12	0	20.00	19.78	19.79	19.84
			12	11	20.00	19.81	19.80	19.76
			25	0	20.00	19.74	19.75	19.84
Band	Band Width	Modulation	RB Configuration		Tune-up (dBm)	Channel/Frequency(MHz)		
			RB Size	RB Offset		20000/1715	20175/1732.5	20350/1750

LTE Band 4	10MHz	QPSK	1	0	22.50	21.81	21.74	21.90
			1	49	22.50	21.89	21.87	21.88
			25	0	21.00	20.75	20.79	20.95
			25	24	21.00	20.79	20.74	20.87
			50	0	21.00	20.78	20.83	20.88
		16QAM	1	0	21.50	20.94	20.55	21.30
			1	49	21.50	20.93	20.69	21.18
			25	0	20.00	19.77	19.76	19.92
			25	24	20.00	19.75	19.78	19.86
			50	0	20.00	19.80	19.78	19.89
Band	Band Width	Modulation	RB Configuration		Tune-up (dBm)	Channel/Frequency(MHz)		
			RB Size	RB Offset		20025/1717.5	20175/1732.5	20325/1747.5
LTE Band 4	15MHz	QPSK	1	0	22.50	21.77	21.63	21.77
			1	74	22.50	21.75	21.72	21.80
			36	0	21.00	20.80	20.82	20.97
			36	37	21.00	20.87	20.78	20.98
			75	0	21.50	20.85	20.82	21.01
		16QAM	1	0	21.50	20.85	20.72	21.22
			1	74	21.50	20.76	20.87	21.05
			36	0	20.00	19.86	19.75	20.00
			36	37	20.00	19.92	19.73	19.93
			75	0	20.00	19.79	19.81	19.97
Band	Band Width	Modulation	RB Configuration		Tune-up (dBm)	Channel/Frequency(MHz)		
			RB Size	RB Offset		20050/1720	20175/1732.5	20300/1745
LTE Band 4	20MHz	QPSK	1	0	22.50	21.54	21.54	21.60
			1	99	22.50	21.55	21.62	21.66
			50	0	21.50	20.71	20.80	21.09
			50	49	21.50	20.85	20.70	20.88
			100	0	21.00	20.79	20.76	20.94
		16QAM	1	0	21.50	20.80	20.76	20.84
			1	99	21.50	20.79	21.02	20.78
			50	0	20.50	19.73	19.78	20.05
			50	49	20.50	19.88	19.79	19.86
			100	0	20.00	19.79	19.77	19.99

Band	Band	Modulation	RB	Tune-up	Channel/Frequency(MHz)

	Width		Configuration		(dBm)			
			RB Size	RB Offset		20407/824.7	20525/836.5	20643/848.3
LTE Band 5	1.4MHz	QPSK	1	0	23.00	22.36	22.38	22.26
			1	2	23.00	22.40	22.46	22.40
			1	5	23.00	22.41	22.35	22.23
			3	0	23.00	22.43	22.42	22.28
			3	1	23.00	22.44	22.44	22.30
			3	2	23.00	22.44	22.45	22.26
			6	0	21.50	21.46	21.41	21.29
		16QAM	1	0	22.00	21.49	21.55	21.12
			1	2	22.00	21.60	21.63	21.24
			1	5	22.00	21.49	21.51	21.09
			3	0	22.00	21.59	21.64	21.42
			3	1	22.00	21.60	21.63	21.42
			3	2	22.00	21.57	21.63	21.45
			6	0	21.00	20.55	20.53	20.44
Band	Band Width	Modulation	RB Configuration		Tune-up (dBm)	Channel/Frequency(MHz)		
			RB Size	RB Offset		20415/825.5	20525/836.5	20635/847.5
LTE Band 5	3MHz	QPSK	1	0	23.00	22.46	22.42	22.33
			1	7	23.00	22.76	22.74	22.67
			1	14	23.00	22.30	22.39	22.34
			8	0	21.50	21.46	21.45	21.31
			8	4	21.50	21.48	21.44	21.35
			8	7	21.50	21.45	21.39	21.30
			15	0	21.50	21.42	21.37	21.30
		16QAM	1	0	22.50	21.76	21.59	21.15
			1	7	22.50	22.04	21.93	21.43
			1	14	22.50	21.85	21.56	21.12
			8	0	20.50	20.42	20.41	20.25
			8	4	20.50	20.46	20.42	20.30
			8	7	20.50	20.41	20.34	20.26
			15	0	20.50	20.40	20.31	20.35
Band	Band Width	Modulation	RB Configuration		Tune-up (dBm)	Channel/Frequency(MHz)		
			RB Size	RB Offset		20425/826.5	20525/836.5	20625/846.5

LTE Band 5	5MHz	QPSK	1	0	23.00	22.34	22.36	22.20
			1	12	23.00	22.80	22.81	22.57
			1	24	23.00	22.39	22.28	22.13
			12	0	21.50	21.36	21.43	21.07
			12	6	21.50	21.48	21.44	21.10
			12	11	21.50	21.43	21.39	21.14
			25	0	21.50	21.41	21.43	20.94
		16QAM	1	0	22.50	21.78	21.61	21.09
			1	12	22.50	22.21	22.03	21.42
			1	24	22.50	21.86	21.61	20.98
			12	0	20.50	20.40	20.37	19.91
			12	6	20.50	20.46	20.41	19.83
			12	11	20.50	20.41	20.36	19.77
			25	0	20.50	20.38	20.43	19.97

Band	Band Width	Modulation	RB Configuration		Tune-up (dBm)	Channel/Frequency(MHz)		
			RB Size	RB Offset		20450/829	20525/836.5	20600/844
LTE Band 5	10MHz	QPSK	1	0	23.00	22.43	21.94	21.85
			1	24	23.00	22.59	22.06	21.86
			1	49	23.00	22.47	21.89	21.77
			25	0	21.50	21.49	20.96	20.84
			25	12	21.50	21.47	20.92	20.84
			25	24	21.50	21.44	20.94	20.82
			50	0	21.50	21.49	20.94	20.82
		16QAM	1	0	22.00	21.43	20.76	21.21
			1	24	22.00	21.50	20.90	21.24
			1	49	22.00	21.34	20.72	21.14
			25	0	20.50	20.22	20.03	19.86
			25	12	20.50	20.10	19.97	19.87
			25	24	20.50	20.10	19.98	19.81
			50	0	20.50	20.32	19.97	19.87

Band	Band Width	Modulation	RB Configuration		Tune-up (dBm)	Channel/Frequency(MHz)		
			RB Size	RB Offset		20775/2502.5	21100/2535	21425/2567.5
LTE Band	5MHz	QPSK	1	0	23.00	22.28	22.37	22.29
			1	12	23.00	22.71	22.82	22.77

7			1	24	23.00	22.31	22.39	22.31
			12	0	22.00	21.40	21.50	21.42
			12	6	22.00	21.43	21.53	21.47
			12	11	22.00	21.41	21.45	21.40
			25	0	22.00	21.41	21.50	21.47
		16QAM	1	0	22.50	21.80	21.70	21.59
			1	12	22.50	22.23	22.08	22.02
			1	24	22.50	21.83	21.69	21.62
			12	0	21.00	20.39	20.48	20.52
			12	6	21.00	20.45	20.47	20.53
			12	11	21.00	20.39	20.37	20.46
			25	0	20.50	20.36	20.49	20.43
Band	Band Width	Modulation	RB Configuration		Tune-up (dBm)	Channel/Frequency(MHz)		
			RB Size	RB Offset		20800/2505	21100/2535	21400/2565
LTE Band 7	10MHz	QPSK	1	0	23.00	22.41	22.42	22.37
			1	24	23.00	22.58	22.61	22.53
			1	49	23.00	22.59	22.48	22.41
			25	0	22.00	21.38	21.52	21.46
			25	12	22.00	21.44	21.55	21.44
			25	24	22.00	21.53	21.57	21.49
			50	0	22.00	21.45	21.54	21.52
		16QAM	1	0	22.00	21.24	21.85	21.54
			1	24	22.00	21.41	21.97	21.64
			1	49	22.00	21.37	21.85	21.55
			25	0	21.00	20.36	20.50	20.43
			25	12	21.00	20.42	20.53	20.47
			25	24	21.00	20.45	20.51	20.48
			50	0	21.00	20.42	20.48	20.53
Band	Band Width	Modulation	RB Configuration		Tune-up (dBm)	Channel/Frequency(MHz)		
			RB Size	RB Offset		20825/2507.5	21100/2535	21375/2562.5
LTE Band 7	15MHz	QPSK	1	0	23.00	22.38	22.40	22.39
			1	37	23.00	22.73	22.74	22.64
			1	74	23.00	22.41	22.42	22.36
			36	0	22.00	21.40	21.53	21.46

			36	18	22.00	21.47	21.56	21.49
			36	37	22.00	21.55	21.54	21.49
			75	0	22.00	21.48	21.59	21.52
		16QAM	1	0	22.50	21.53	21.53	21.76
			1	37	22.50	21.92	21.84	22.15
			1	74	22.50	21.54	21.56	21.73
			36	0	21.00	20.42	20.47	20.51
			36	18	21.00	20.55	20.53	20.53
			36	37	21.00	20.61	20.47	20.42
			75	0	21.00	20.43	20.56	20.47

Band	Band Width	Modulation	RB Configuration		Tune-up (dBm)	Channel/Frequency(MHz)		
			RB Size	RB Offset		20850/2510	21100/2535	21350/2560
LTE Band 7	20MHz	QPSK	1	0	23.00	22.18	22.23	22.26
			1	49	23.00	22.53	22.49	22.51
			1	99	23.00	22.24	22.29	22.24
			50	0	22.00	21.40	21.55	21.49
			50	24	22.00	21.46	21.57	21.47
			50	49	22.00	21.54	21.59	21.42
			100	0	22.00	21.46	21.56	21.50
		16QAM	1	0	22.00	21.44	21.48	21.54
			1	49	22.00	21.81	21.74	21.81
			1	99	22.00	21.38	21.53	21.53
			50	0	21.00	20.30	20.54	20.52
			50	24	21.00	20.40	20.53	20.57
			50	49	21.00	20.48	20.59	20.57
			100	0	21.00	20.41	20.51	20.47

7.4. WLAN & Bluetooth Output Power

Mode	Channel	Frequency (MHz)	Tune-up	Output Power (dBm)
802.11b	1	2412	14.00	12.63
	6	2437	14.00	13.76
	11	2462	14.00	13.79
802.11g	1	2412	11.00	8.72
	6	2437	11.00	9.91
	11	2462	11.00	10.53
802.11n	1	2412	11.50	8.97

HT20	6	2437	11.50	11.02
	11	2462	11.50	10.73
802.11n HT40	3	2422	11.00	10.82
	6	2437	11.00	10.57
	9	2452	11.00	9.94

NOTE: Power measurement results of WLAN 2.4G.

	Output Power (dBm)				
BR+EDR	Channel	Tune-up	Data Rates		
			1M	2M	3M
	0CH	0.000	-0.127	-0.132	-0.240
	39CH	0.000	-0.514	-1.259	-0.951
	78CH	0.000	-0.055	-0.908	-0.782

	Channel	Tune-up	Output Power (dBm)
BLE	0CH	1.000	0.722
	19CH	1.000	0.076
	39CH	1.000	0.239

NOTE: Power measurement results of Bluetooth.

8. Stand-alone SAR test exclusion

Refer to FCC KDB 447498D01, the 1-g SAR and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances ≤ 50 mm are determined by:

[(max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)]·[$\sqrt{f_{(GHZ)}}$] ≤ 3.0 for 1-g SAR and ≤ 7.5 for 10-g extremity SAR, where:

- $f_{(GHZ)}$ is the RF channel transmit frequency in GHz
- Power and distance are rounded to the nearest mW and mm before calculation
- The result is rounded to one decimal place for comparison

When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion.

Mode	P_{max} (dBm)	P_{max} (mW)	Distance (mm)	f (GHz)	Calculation Result	SAR Exclusion threshold	SAR test exclusion
Bluetooth	1.00	1.26	10	2.480	0.40	3.0	Yes
Bluetooth	1.00	1.26	5	2.480	0.40	7.5	Yes

NOTE: Standalone SAR test exclusion for Bluetooth.

When standalone SAR test exclusion applies to an antenna that transmits simultaneously with other antennas, the standalone SAR must be estimated according to following to determine simultaneous transmission SAR test exclusion:

[(max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)] *

[$\sqrt{f_{(GHZ)}}$/x] W/kg for test separation distances ≤ 50mm, where x = 7.5 for 1-g SAR and x = 18.75 for 10-g SAR.

When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion.

Mode	Position	P_{max} (dBm)	P_{max} (mW)	Distance (mm)	f (GHz)	x	Estimated SAR (W/Kg)
Bluetooth	Front-of-Face	1.00	1.26	10	2.48	7.5	0.026
Bluetooth	Back-of-Wristbands	1.00	1.26	5	2.48	18.75	0.021

NOTE: Estimated SAR calculation for Bluetooth

9. SAR Results

9.1. SAR measurement results

9.1.1. SAR measurement Result of GSM850

Test Position	Test channel /Freq.	Test Mode	SAR Value (W/kg)		Power Drift (±5%)	Conducted power (dBm)	Tune-up power (dBm)	Scaled SAR 1g (W/Kg)	Date
			1g	10g					
Front-of-Face with 10mm	189/836.4	GPRS(GMSK 4TS)	0.072	0.043	0.70	28.65	29.00	0.078	2022/3/21

Note: Front-of-Face SAR test of GSM850

Test Position	Test channel /Freq.	Test Mode	SAR Value (W/kg)		Power Drift (±5%)	Conducted power (dBm)	Tune-up power (dBm)	Scaled SAR 10g (W/Kg)	Date
			1g	10g					
Back-of-Wristbands with 0mm	189/836.4	GPRS(GMSK 4TS)	0.190	0.118	-0.48	28.65	29.00	0.128	2022/3/21

Note: Back-of-Wristbands SAR test of GSM850

9.1.2. SAR measurement Result of GSM1900

Test Position	Test channel /Freq.	Test Mode	SAR Value (W/kg)		Power Drift (±5%)	Conducted power (dBm)	Tune-up power (dBm)	Scaled SAR 1g (W/Kg)	Date
			1g	10g					
Front-of-Face with 10mm	661/1880	GPRS(GMSK 4TS)	0.402	0.204	2.68	25.81	26.00	0.420	2022/5/9

Note: Front-of-Face SAR test of GSM1900

Test Position	Test channel /Freq.	Test Mode	SAR Value (W/kg)		Power Drift (±5%)	Conducted power (dBm)	Tune-up power (dBm)	Scaled SAR 10g (W/Kg)	Date
			1g	10g					
Back-of-Wristbands with 0mm	661/1880	GPRS(GMSK 4TS)	1.299	0.685	-1.34	25.81	26.00	0.716	2022/5/9

Note: Back-of-Wristbands SAR test of GSM1900

9.1.3. SAR measurement Result of WCDMA Band 2

Test Position	Test channel /Freq.	Test Mode	SAR Value (W/kg)		Power Drift (±5%)	Conducted power (dBm)	Tune-up power (dBm)	Scaled SAR 1g (W/Kg)	Date
			1g	10g					
Front-of-Face with 10mm	9400/1880	RMC12.2K	0.573	0.279	2.10	22.57	23.00	0.633	2022/5/9

Note: Front-of-Face SAR test of WCDMA Band 2

Test Position	Test channel /Freq.	Test Mode	SAR Value (W/kg)		Power Drift (±5%)	Conducted power (dBm)	Tune-up power (dBm)	Scaled SAR 10g (W/Kg)	Date
			1g	10g					
Back-of-Wristbands with 0mm	9400/1880	RMC12.2K	1.903	0.936	-1.01	22.57	23.00	1.033	2022/5/9

Note: Back-of-Wristbands SAR test of WCDMA Band 2

9.1.4. SAR measurement Result of WCDMA Band 4

Test Position	Test channel /Freq.	Test Mode	SAR Value (W/kg)		Power Drift (±5%)	Conducted power (dBm)	Tune-up power (dBm)	Scaled SAR 1g (W/Kg)	Date
			1g	10g					
Front-of-Face with 10mm	1413/1732.6	RMC12.2K	0.276	0.142	-3.78	22.28	22.50	0.290	2022/5/7

Note: Front-of-Face SAR test of WCDMA Band 4

Test Position	Test channel /Freq.	Test Mode	SAR Value (W/kg)		Power Drift (±5%)	Conducted power (dBm)	Tune-up power (dBm)	Scaled SAR 10g (W/Kg)	Date
			1g	10g					
Back-of-	1413/1732.6	RMC12.2K	0.872	0.458	-3.51	22.28	22.50	0.482	2022/5/7

Wristbands with 0mm									

Note: Back-of-Wristbands SAR test of WCDMA Band 4

9.1.5. SAR measurement Result of WCDMA Band 5

Test Position	Test channel /Freq.	Test Mode	SAR Value (W/kg)		Power Drift (±5%)	Conducted power (dBm)	Tune-up power (dBm)	Scaled SAR 1g (W/Kg)	Date
			1g	10g					
Front-of-Face with 10mm	4182/836.4	RMC12.2K	0.027	0.018	-0.10	22.53	23.00	0.030	2022/3/21

Note: Front-of-Face SAR test of WCDMA Band 5

Test Position	Test channel /Freq.	Test Mode	SAR Value (W/kg)		Power Drift (±5%)	Conducted power (dBm)	Tune-up power (dBm)	Scaled SAR 10g (W/Kg)	Date
			1g	10g					
Back-of-Wristbands with 0mm	4182/836.4	RMC12.2K	0.050	0.034	-0.57	22.53	23.00	0.038	2022/3/21

Note: Back-of-Wristbands SAR test of WCDMA Band 5

9.1.6. SAR measurement Result of LTE Band 2

Test Position	Test channel /Freq.	Test Mode	SAR Value (W/kg)		Power Drift (±5%)	Conducted power (dBm)	Tune-up power (dBm)	Scaled SAR 1g (W/Kg)	Date
			1g	10g					
1RB									
Front-of-Face with 10mm	18900/1880	20M QPSK(1,49)	0.375	0.188	3.45	22.25	23.00	0.446	2022/5/9
50%RB									
Front-of-Face with 10mm	18900/1880	20M QPSK(50,49)	0.195	0.094	3.84	21.03	21.50	0.217	2022/5/9

Note: Front-of-Face SAR test of LTE Band 2

Test Position	Test channel /Freq.	Test Mode	SAR Value (W/kg)		Power Drift (±5%)	Conducted power (dBm)	Tune-up power (dBm)	Scaled SAR 10g (W/Kg)	Date
			1g	10g					
1RB									

Back-of-Wristbands with 0mm	18900/1880	20M QPSK(1,49)	1.247	0.626	1.59	22.25	23.00	0.744	2022/5/9
50%RB									
Back-of-Wristbands with 0mm	18900/1880	20M QPSK(50,49)	0.625	0.311	1.61	21.03	21.50	0.347	2022/5/9

Note: Back-of-Wristbands SAR test of LTE Band 2

9.1.7. SAR measurement Result of LTE Band 4

Test Position	Test channel /Freq.	Test Mode	SAR Value (W/kg)		Power Drift (±5%)	Conducted power (dBm)	Tune-up power (dBm)	Scaled SAR 1g (W/Kg)	Date
			1g	10g					
1RB									
Front-of-Face with 10mm	20175/1732.5	20M QPSK(1,99)	0.207	0.106	3.99	21.62	22.50	0.253	2022/5/7
50%RB									
Front-of-Face with 10mm	20175/1732.5	20M QPSK(50,0)	0.110	0.054	-0.48	20.80	21.50	0.129	2022/5/7

Note: Front-of-Face SAR test of LTE Band 4

Test Position	Test channel /Freq.	Test Mode	SAR Value (W/kg)		Power Drift (±5%)	Conducted power (dBm)	Tune-up power (dBm)	Scaled SAR 10g (W/Kg)	Date
			1g	10g					
1RB									
Back-of-Wristbands with 0mm	20175/1732.5	20M QPSK(1,99)	0.644	0.347	1.15	21.62	22.50	0.425	2022/5/7
50%RB									
Back-of-Wristbands with 0mm	20175/1732.5	20M QPSK(50,0)	0.345	0.181	-1.84	20.80	21.50	0.213	2022/5/7

Note: Back-of-Wristbands SAR test of LTE Band 4

9.1.8. SAR measurement Result of LTE Band 5

Test Position	Test channel	Test Mode	SAR Value (W/kg)	Power Drift	Conducted power	Tune-up power	Scaled SAR	Date

	/Freq.		1g	10g	(±5%)	(dBm)	(dBm)	1g (W/Kg)	
1RB									
Front-of-Face with 10mm	20525/836.5	10M QPSK(1,24)	0.021	0.014	1.43	22.06	23.00	0.026	2022/3/21
50%RB									
Front-of-Face with 10mm	20525/836.5	10M QPSK(25,0)	0.016	0.010	1.69	20.96	21.50	0.018	2022/3/21

Note: Front-of-Face SAR test of LTE Band 5

Test Position	Test channel /Freq.	Test Mode	SAR Value (W/kg)		Power Drift (±5%)	Conducted power (dBm)	Tune-up power (dBm)	Scaled SAR 10g (W/Kg)	Date
			1g	10g					
1RB									
Back-of-Wristbands with 0mm	20525/836.5	10M QPSK(1,24)	0.042	0.029	-1.52	22.06	23.00	0.036	2022/3/21
50%RB									
Back-of-Wristbands with 0mm	20525/836.5	10M QPSK(25,0)	0.035	0.020	0.51	20.96	21.50	0.023	2022/3/21

Note: Back-of-Wristbands SAR test of LTE Band 5

9.1.9. SAR measurement Result of LTE Band 7

Test Position	Test channel /Freq.	Test Mode	SAR Value (W/kg)		Power Drift (±5%)	Conducted power (dBm)	Tune-up power (dBm)	Scaled SAR 1g (W/Kg)	Date
			1g	10g					
1RB									
Front-of-Face with 10mm	21100/2535	20M QPSK(1,49)	0.363	0.147	-1.47	22.49	23.00	0.408	2022/5/13
50%RB									
Front-of-Face with 10mm	21100/2535	20M QPSK(50,49)	0.220	0.086	-1.50	21.59	22.00	0.242	2022/5/13

Note: Front-of-Face SAR test of LTE Band 7

Test Position	Test channel /Freq.	Test Mode	SAR Value (W/kg)		Power Drift (±5%)	Conducted power (dBm)	Tune-up power (dBm)	Scaled SAR 10g	Date
			1g	10g					

								(W/Kg)	
1RB									
Back-of-Wristbands with 0mm	21100/2535	20M QPSK(1,49)	1.192	0.498	-2.97	22.49	23.00	0.560	2022/5/13
50%RB									
Back-of-Wristbands with 0mm	21100/2535	20M QPSK(50,49)	0.671	0.275	3.77	21.59	22.00	0.302	2022/5/13

Note: Back-of-Wristbands SAR test of LTE Band 7

9.1.10. SAR measurement Result of WLAN 2.4G

Test Position	Test channel /Freq.	Test Mode	SAR Value (W/kg)		Power Drift (±5%)	Conducted power (dBm)	Tune-up power (dBm)	Scaled SAR 1g (W/Kg)	Date
			1g	10g					
Front-of-Face with 10mm	6/2437	802.11b	0.189	0.074	2.73	13.76	14.00	0.200	2022/5/10

Note: Front-of-Face SAR test of WLAN 2.4G.

Test Position	Test channel /Freq.	Test Mode	SAR Value (W/kg)		Power Drift (±5%)	Conducted power (dBm)	Tune-up power (dBm)	Scaled SAR 10g (W/Kg)	Date
			1g	10g					
Back-of-Wristbands with 0mm	6/2437	802.11b	0.594	0.237	-0.93	13.76	14.00	0.250	2022/5/10

Note: Back-of-Wristbands SAR test of WLAN 2.4G.

9.2. Simultaneous Transmission Analysis

Per KDB 447498 D01, simultaneous transmission SAR is compliant if,

1) Scalar SAR summation < 1.6W/kg.

2) SPLSR = $(SAR_1 + SAR_2)^{1.5}$ / (min. separation distance, mm), and the peak separation distance is determined from the square root of $[(x_1-x_2)^2 + (y_1-y_2)^2 + (z_1-z_2)^2]$, where (x_1, y_1, z_1) and (x_2, y_2, z_2) are the coordinates of the extrapolated peak SAR locations in the zoom scan. If SPLSR ≤ 0.04, simultaneously transmission SAR measurement is not necessary.

Test Position	Scaled SAR_{MAX}		∑1-g SAR (W/Kg)	SPLSR	Remark
	WWAN	DTS			
Front-of-Face	0.633	0.200	0.833	N/A	N/A

NOTE: Front-of-Face 1-g SAR Simultaneous Tx Combination of WWAN and DTS.

Test Position	Scaled SAR_{MAX}		∑1-g SAR (W/Kg)	SPLSR	Remark
	WWAN	DSS			
Front-of-Face	0.633	0.026	0.659	N/A	N/A

NOTE: Front-of-Face 1-g SAR Simultaneous Tx Combination of WWAN and DSS.

Test Position	Scaled SAR_{MAX}		∑10-g SAR (W/Kg)	SPLSR	Remark
	WWAN	DTS			
Back-of-Wristbands	1.033	0.250	1.283	N/A	N/A

NOTE: Back-of-Wristbands 10-g SAR Simultaneous Tx Combination of WWAN and DTS.

Test Position	Scaled SAR_{MAX}		∑10-g SAR (W/Kg)	SPLSR	Remark
	WWAN	DSS			
Back-of-Wristbands	1.033	0.021	1.054	N/A	N/A

NOTE: Back-of-Wristbands 10-g SAR Simultaneous Tx Combination of WWAN and DSS.

10. Appendix A. Photo documentation

Refer to appendix Test Setup photo---SAR

11. Appendix B. System Check Plots

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MEASUREMENT 2 System Performance Check - 1800MHz
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MEASUREMENT 5 System Performance Check - 2600MHz

MEASUREMENT 1

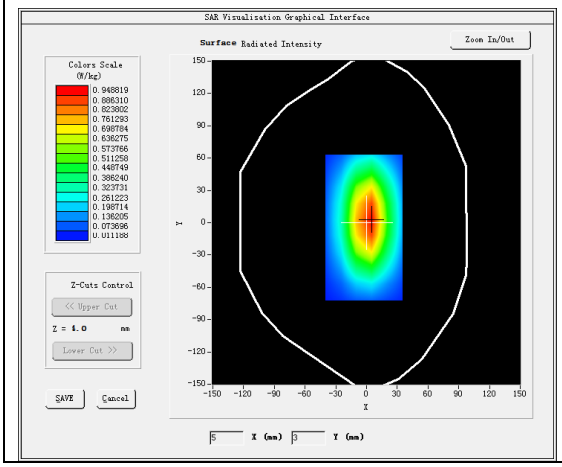
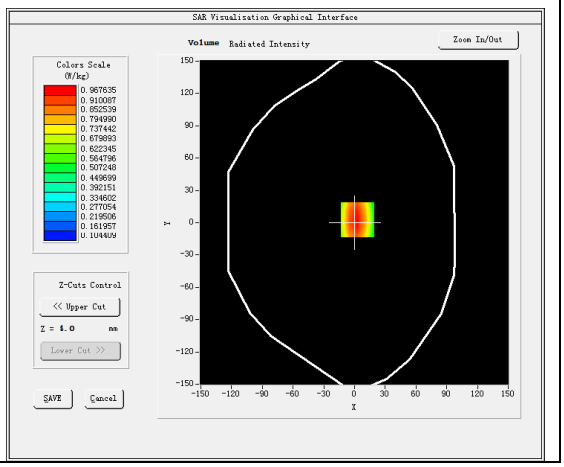
Date of measurement: 21/3/2022

A. Experimental conditions.

Area Scan	dx=15mm dy=15mm, h= 5.00 mm
ZoomScan	5x5x7,dx=8mm dy=8mm dz=5mm
Phantom	Validation plane
Device Position	Dipole
Band	CW835
Channels	Middle
Signal	CW (Crest factor: 1.0)

B. SAR Measurement Results

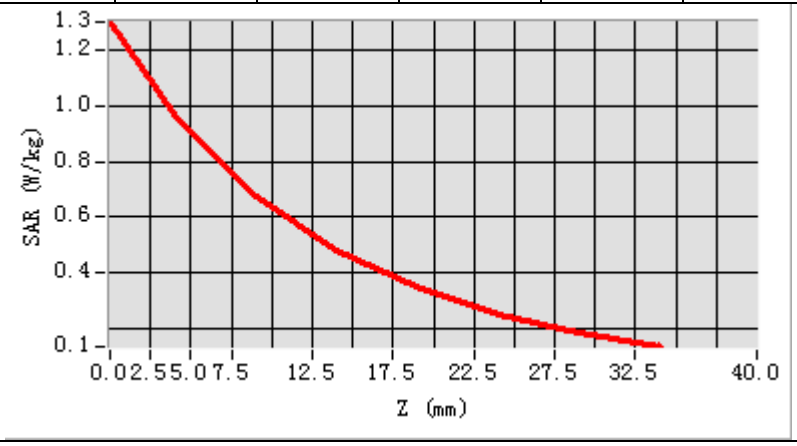
Frequency (MHz)	835.000000
Relative permittivity (real part)	42.334476
Relative permittivity (imaginary part)	20.037130
Conductivity (S/m)	0.929500
Variation (%)	-3.920000

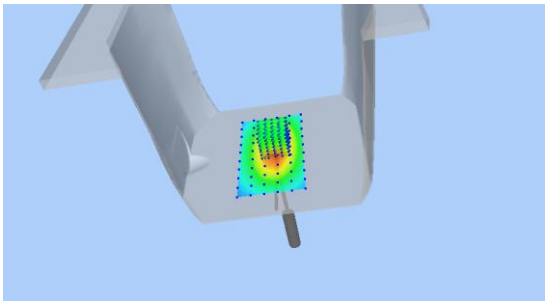
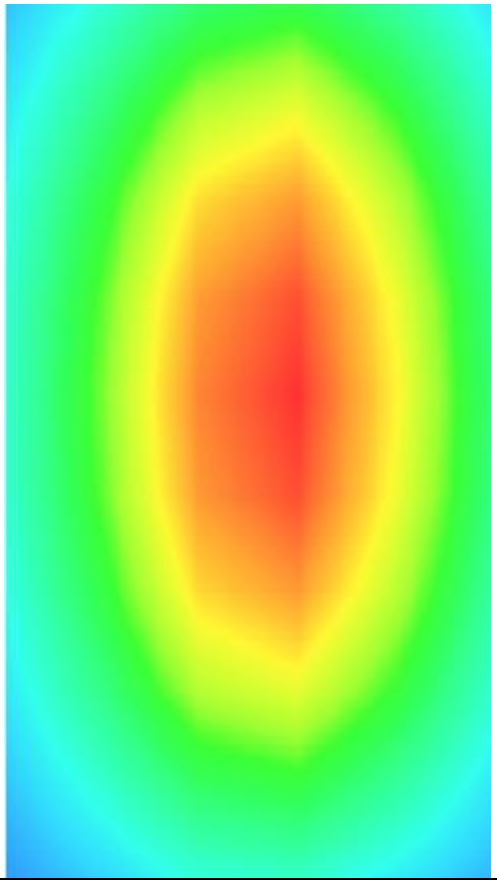
SURFACE SAR	VOLUME SAR
	

Maximum location: X=3.00, Y=3.00
SAR Peak: 1.30 W/kg

SAR 10g (W/Kg)	0.622158
SAR 1g (W/Kg)	0.962222

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	1.3013	0.9619	0.6785	0.4871	0.3420	0.2587	0.1873



3D screen shot	Hot spot position
	

MEASUREMENT 2

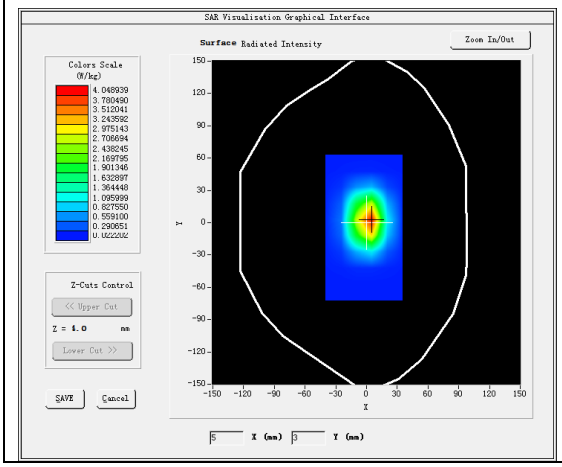
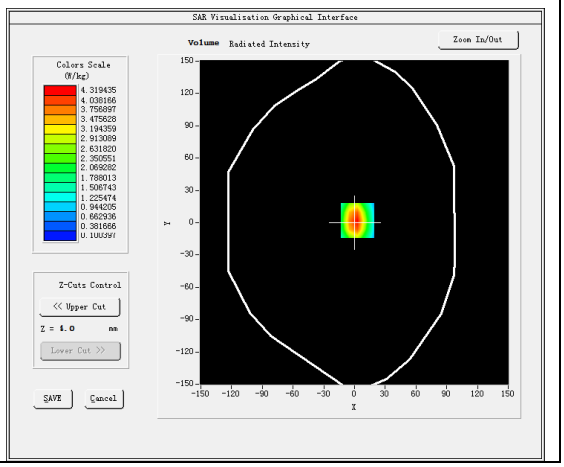
Date of measurement: 7/5/2022

A. Experimental conditions.

Area Scan	dx=15mm dy=15mm, h= 5.00 mm
ZoomScan	5x5x7,dx=8mm dy=8mm dz=5mm
Phantom	Validation plane
Device Position	Dipole
Band	CW1800
Channels	Middle
Signal	CW (Crest factor: 1.0)

B. SAR Measurement Results

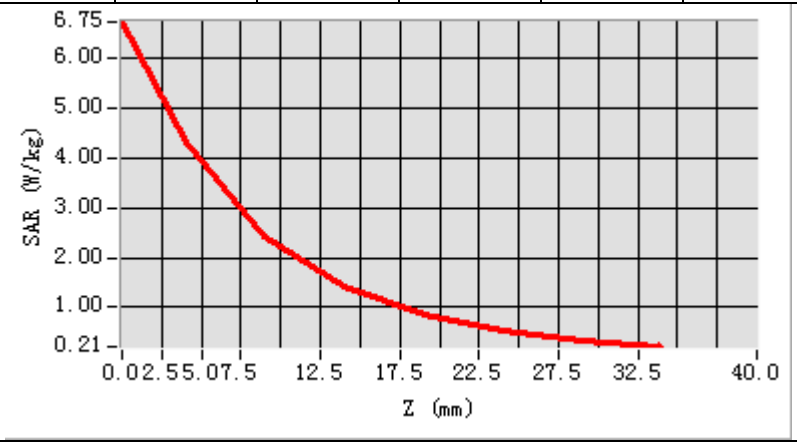
Frequency (MHz)	1800.000000
Relative permittivity (real part)	38.917511
Relative permittivity (imaginary part)	14.014966
Conductivity (S/m)	1.401497
Variation (%)	-1.080000

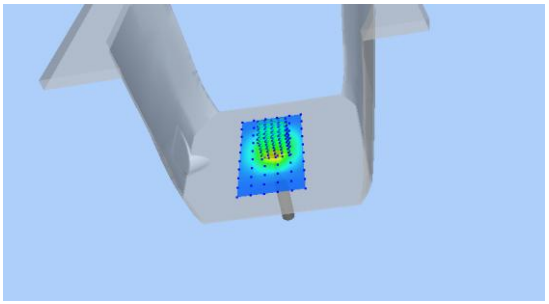
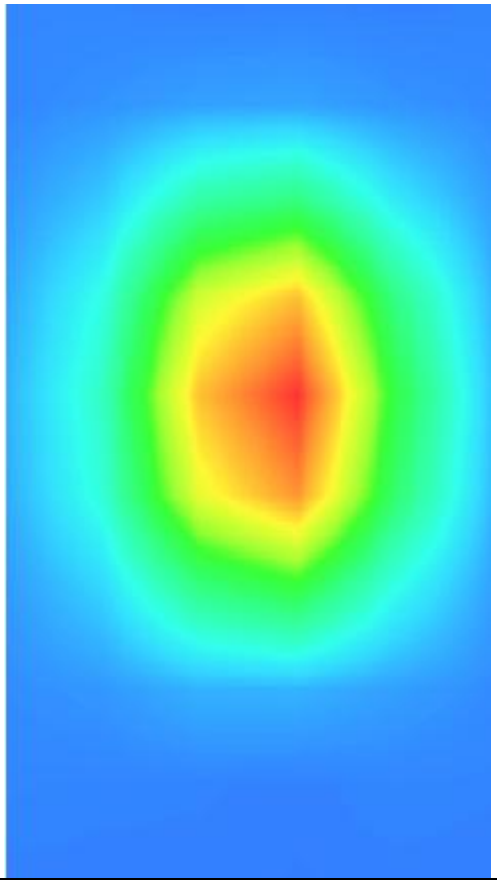
SURFACE SAR	VOLUME SAR
	

Maximum location: X=3.00, Y=2.00
SAR Peak: 6.82 W/kg

SAR 10g (W/Kg)	1.807321
SAR 1g (W/Kg)	3.720203

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	6.7453	4.3154	2.4350	1.4252	0.8599	0.5298	0.3248



3D screen shot	Hot spot position
	

MEASUREMENT 3

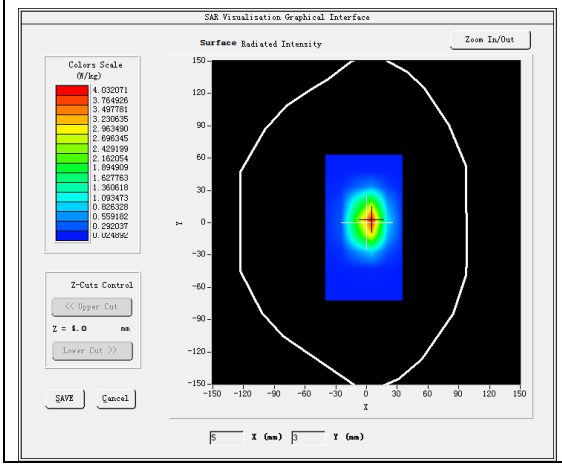
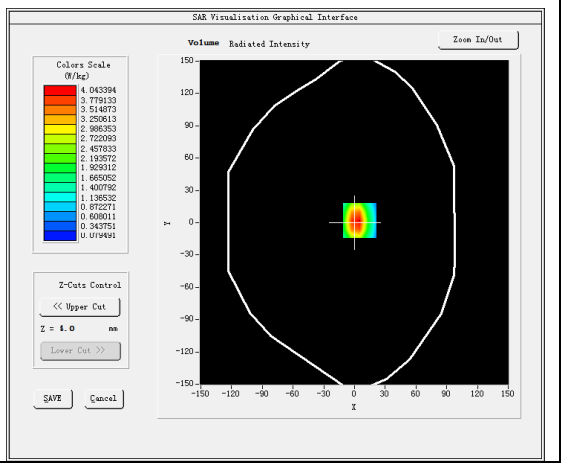
Date of measurement: 9/5/2022

A. Experimental conditions.

Area Scan	dx=15mm dy=15mm, h= 5.00 mm
ZoomScan	5x5x7,dx=8mm dy=8mm dz=5mm
Phantom	Validation plane
Device Position	Dipole
Band	CW1900
Channels	Middle
Signal	CW (Crest factor: 1.0)

B. SAR Measurement Results

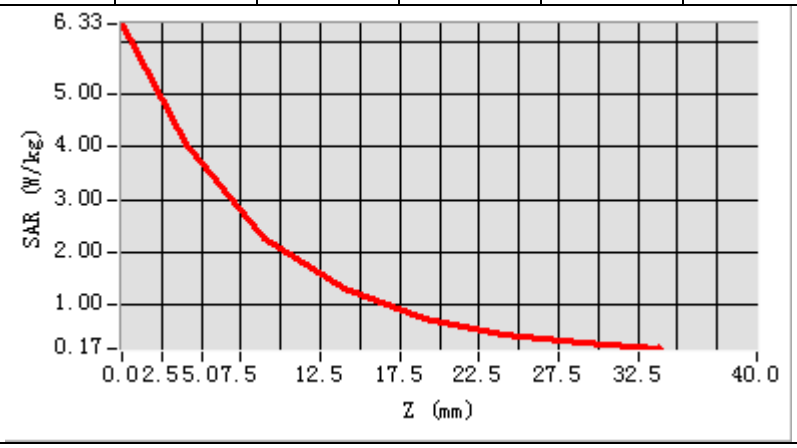
Frequency (MHz)	1900.000000
Relative permittivity (real part)	38.442235
Relative permittivity (imaginary part)	13.865546
Conductivity (S/m)	1.463585
Variation (%)	1.540000

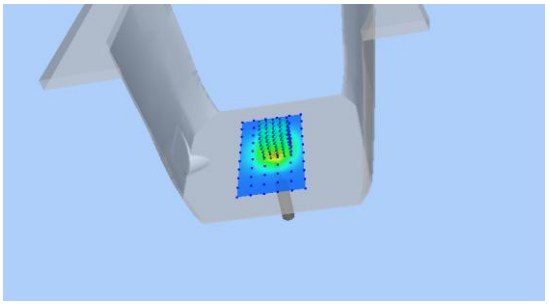
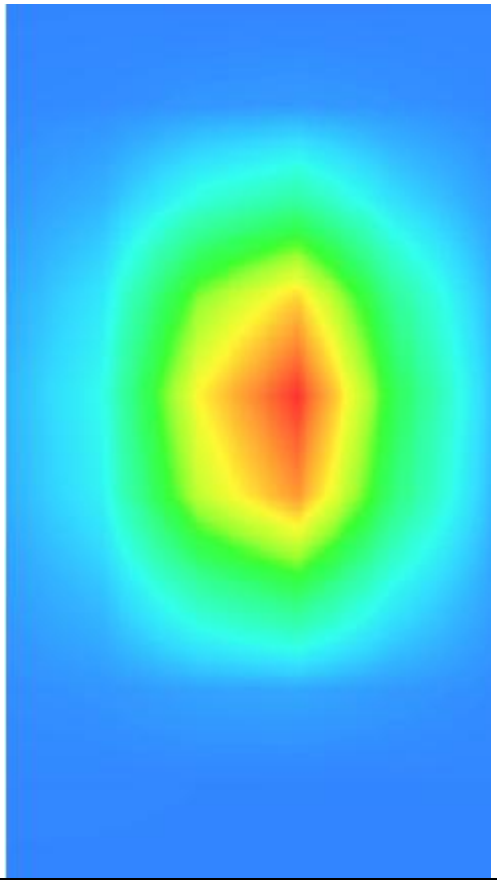
SURFACE SAR	VOLUME SAR
	

Maximum location: X=5.00, Y=2.00
SAR Peak: 6.70 W/kg

SAR 10g (W/Kg)	2.063249
SAR 1g (W/Kg)	3.808252

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	6.3211	4.0423	2.2653	1.3028	0.7633	0.4548	0.2747



3D screen shot	Hot spot position
	

MEASUREMENT 4

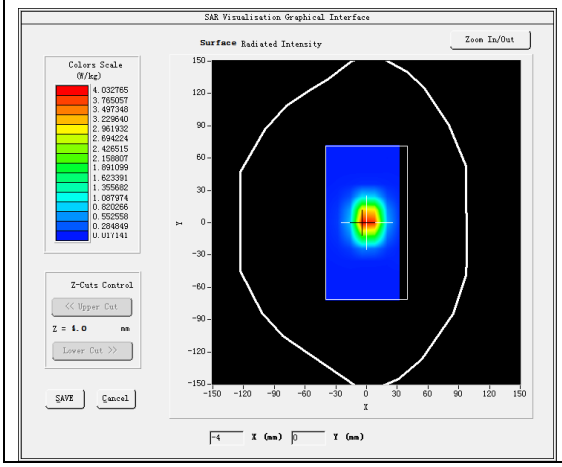
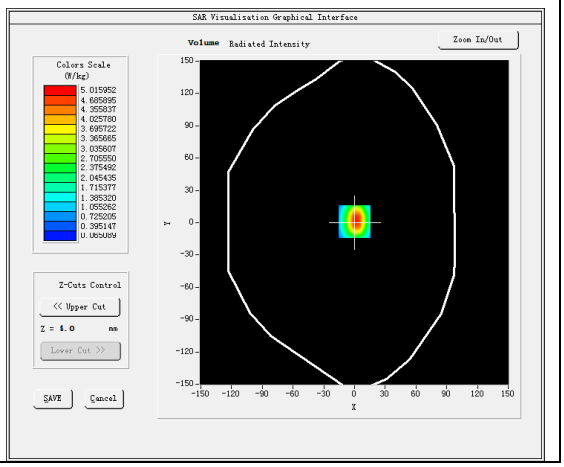
Date of measurement: 10/5/2022

A. Experimental conditions.

Area Scan	dx=12mm dy=12mm, h= 5.00 mm
ZoomScan	7x7x7,dx=5mm dy=5mm dz=5mm
Phantom	Validation plane
Device Position	Dipole
Band	CW2450
Channels	Middle
Signal	CW (Crest factor: 1.0)

B. SAR Measurement Results

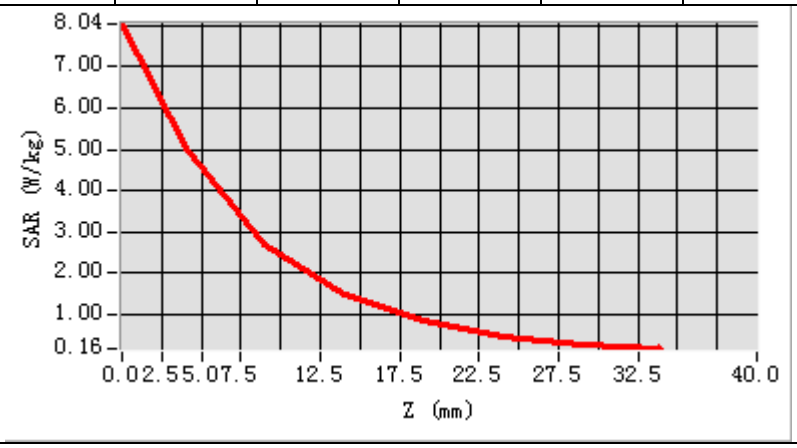
Frequency (MHz)	2450.000000
Relative permittivity (real part)	38.799542
Relative permittivity (imaginary part)	13.448170
Conductivity (S/m)	1.830445
Variation (%)	0.660000

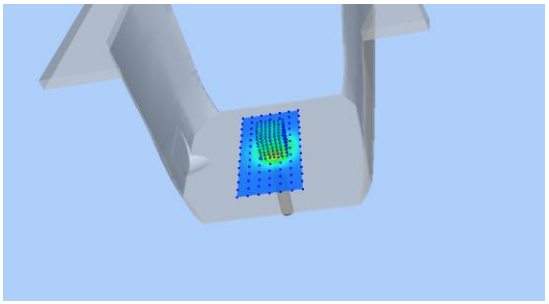
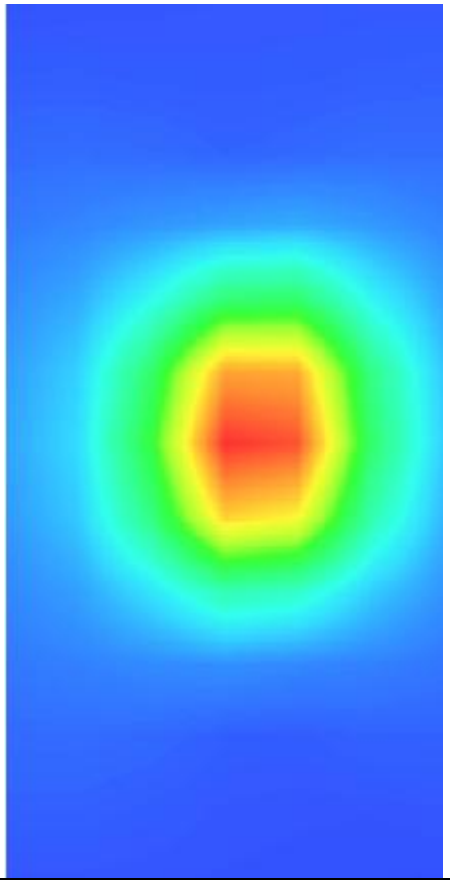
SURFACE SAR	VOLUME SAR
	

Maximum location: X=0.00, Y=1.00
SAR Peak: 8.14 W/kg

SAR 10g (W/Kg)	2.330157
SAR 1g (W/Kg)	4.970305

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	8.0374	5.0192	2.6968	1.4823	0.8302	0.4697	0.2656



3D screen shot	Hot spot position
	

MEASUREMENT 5

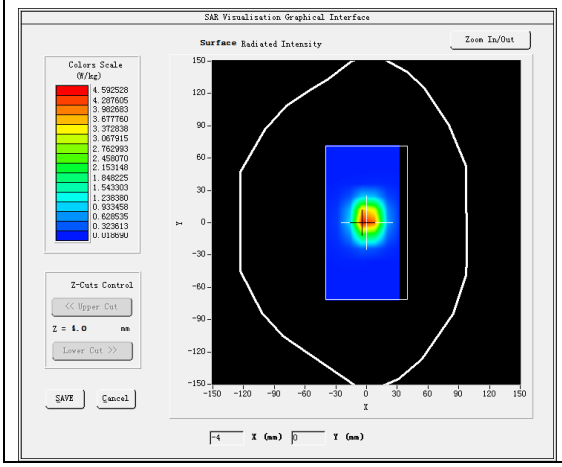
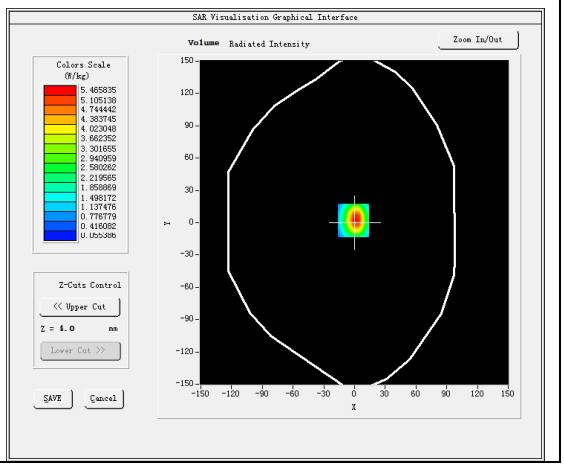
Date of measurement: 13/5/2022

A. Experimental conditions.

Area Scan	dx=12mm dy=12mm, h= 5.00 mm
ZoomScan	7x7x7,dx=5mm dy=5mm dz=5mm
Phantom	Validation plane
Device Position	Dipole
Band	CW2600
Channels	Middle
Signal	CW (Crest factor: 1.0)

B. SAR Measurement Results

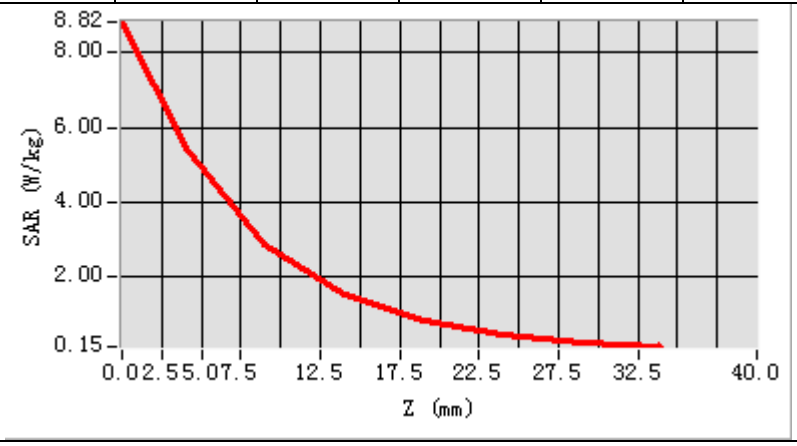
Frequency (MHz)	2600.000000
Relative permittivity (real part)	38.623356
Relative permittivity (imaginary part)	14.141450
Conductivity (S/m)	2.042654
Variation (%)	-0.680000

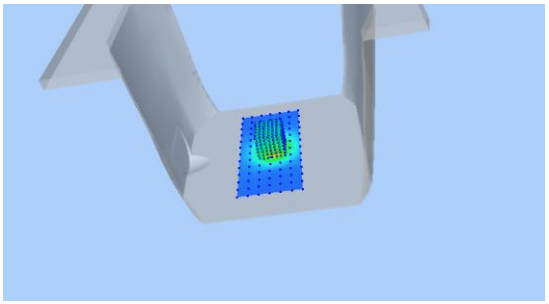
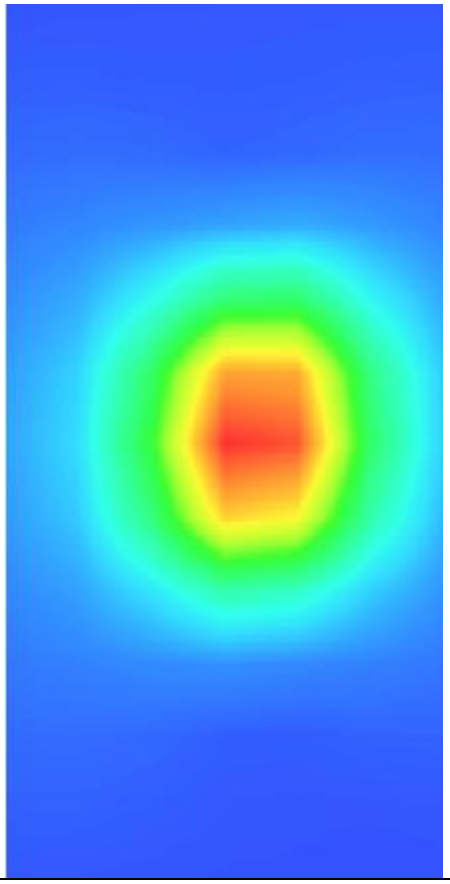
SURFACE SAR	VOLUME SAR
	

Maximum location: X=-1.00, Y=2.00
SAR Peak: 9.07 W/kg

SAR 10g (W/Kg)	2.580045
SAR 1g (W/Kg)	6.085270

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	8.8104	5.4664	2.8949	1.5695	0.8556	0.4701	0.2620



3D screen shot	Hot spot position
	

12. Appendix C. Plots of High SAR Measurement

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MEASUREMENT 8 LTE Band 4
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MEASUREMENT 1

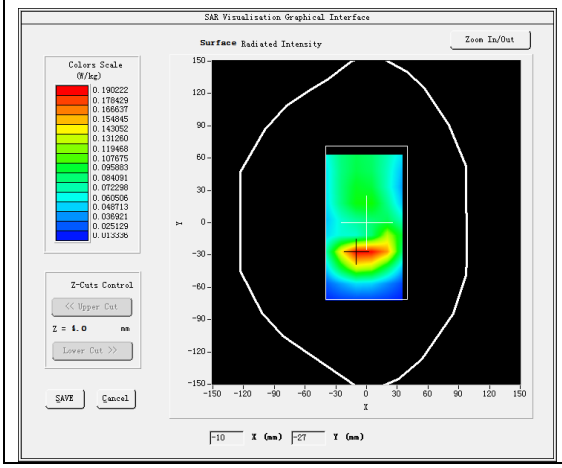
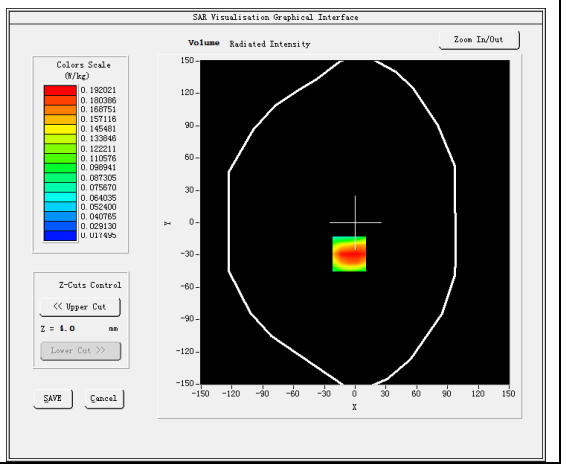
Date of measurement: 21/3/2022

A. Experimental conditions.

Area Scan	dx=15mm dy=15mm, h= 5.00 mm
ZoomScan	5x5x7,dx=8mm dy=8mm dz=5mm
Phantom	Validation plane
Device Position	Body
Band	GSM850
Channels	Middle
Signal	TDMA (Crest factor: 2.0)

B. SAR Measurement Results

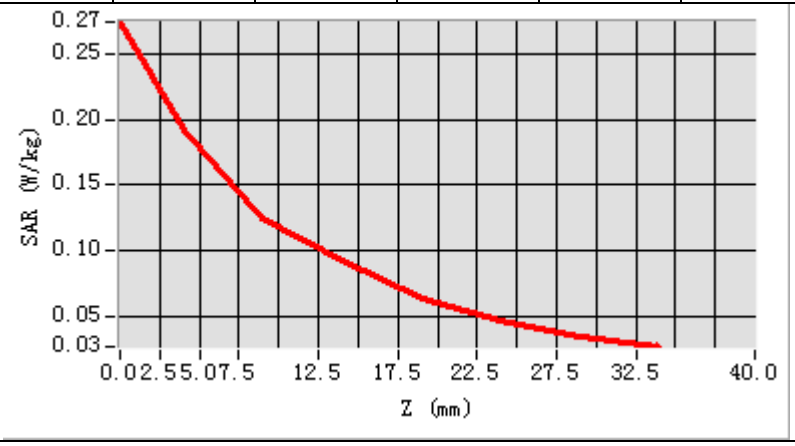
Frequency (MHz)	836.400000
Relative permittivity (real part)	42.250137
Relative permittivity (imaginary part)	20.062969
Conductivity (S/m)	0.932259
Variation (%)	-0.480000

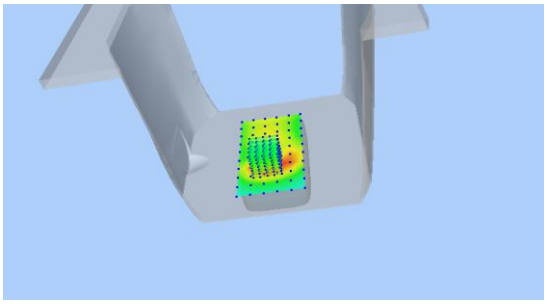
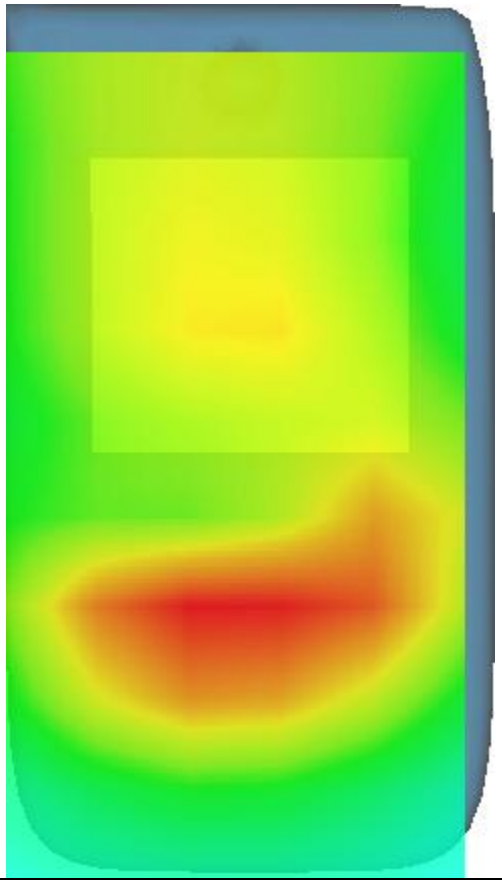
SURFACE SAR	VOLUME SAR
	

Maximum location: X=-6.00, Y=-29.00
SAR Peak: 0.29 W/kg

SAR 10g (W/Kg)	0.118306
SAR 1g (W/Kg)	0.190450

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	0.2742	0.1920	0.1253	0.0930	0.0639	0.0468	0.0347



3D screen shot	Hot spot position
	

MEASUREMENT 2

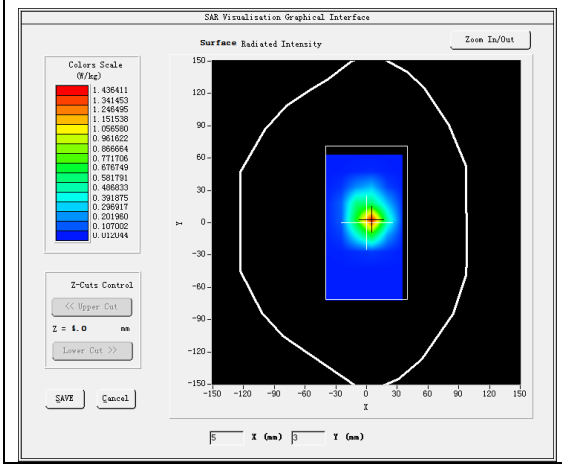
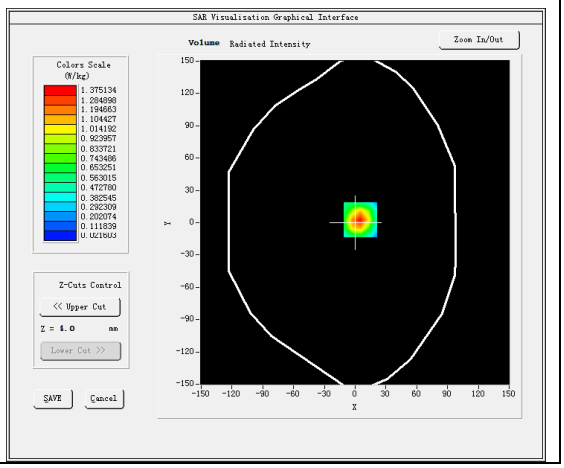
Date of measurement: 9/5/2022

A. Experimental conditions.

Area Scan	dx=15mm dy=15mm, h= 5.00 mm
ZoomScan	5x5x7,dx=8mm dy=8mm dz=5mm
Phantom	Validation plane
Device Position	Body
Band	GSM1900
Channels	Middle
Signal	TDMA (Crest factor: 2.0)

B. SAR Measurement Results

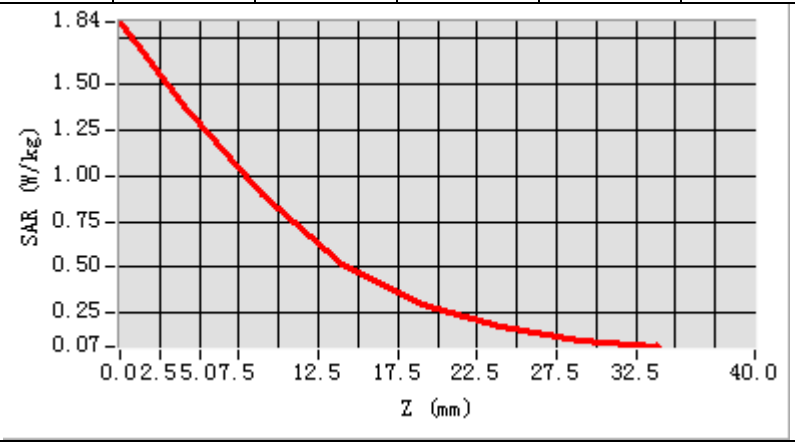
Frequency (MHz)	1880.000000
Relative permittivity (real part)	38.528633
Relative permittivity (imaginary part)	13.883346
Conductivity (S/m)	1.450038
Variation (%)	-1.340000

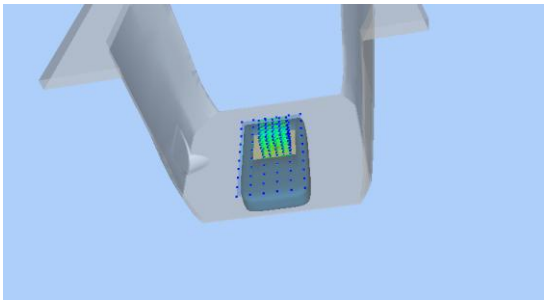
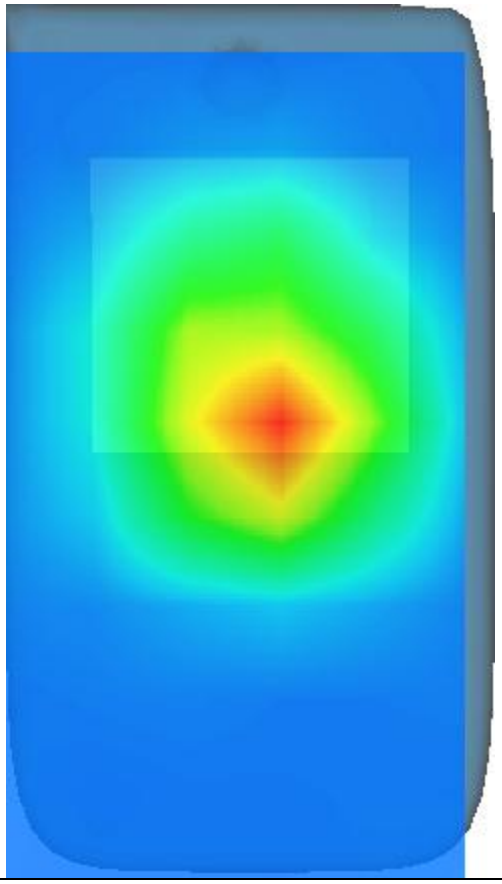
SURFACE SAR	VOLUME SAR
	

Maximum location: X=5.00, Y=3.00
SAR Peak: 1.90 W/kg

SAR 10g (W/Kg)	0.685398
SAR 1g (W/Kg)	1.299154

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	1.8381	1.3751	0.9019	0.5203	0.3001	0.1738	0.1035



3D screen shot	Hot spot position
	

MEASUREMENT 3

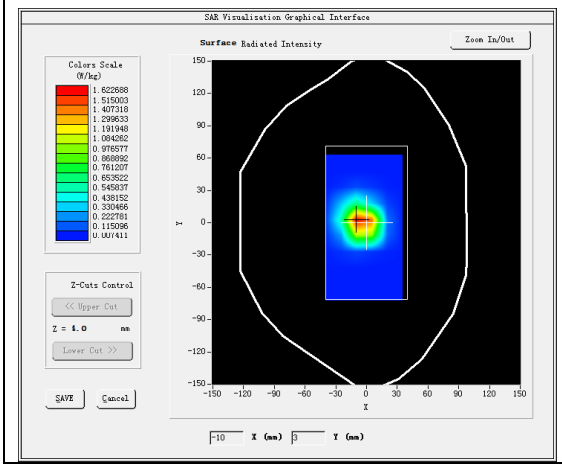
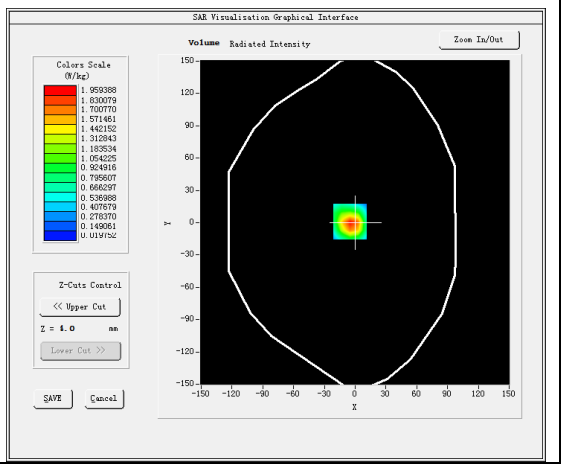
Date of measurement: 9/5/2022

A. Experimental conditions.

Area Scan	dx=15mm dy=15mm, h= 5.00 mm
ZoomScan	5x5x7,dx=8mm dy=8mm dz=5mm
Phantom	Validation plane
Device Position	Body
Band	Band2_WCDMA1900
Channels	Middle
Signal	WCDMA (Crest factor: 1.0)

B. SAR Measurement Results

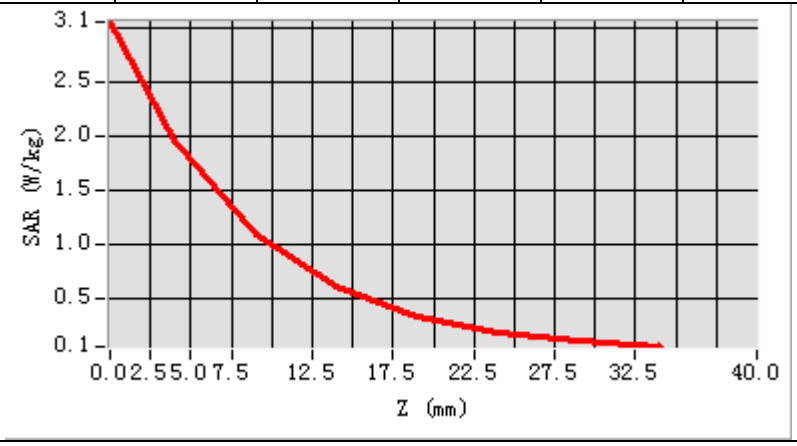
Frequency (MHz)	1880.000000
Relative permittivity (real part)	38.528633
Relative permittivity (imaginary part)	13.883346
Conductivity (S/m)	1.450038
Variation (%)	-1.010000

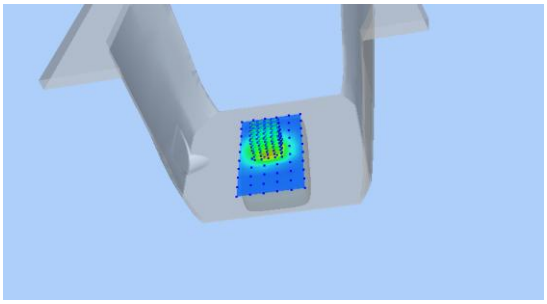
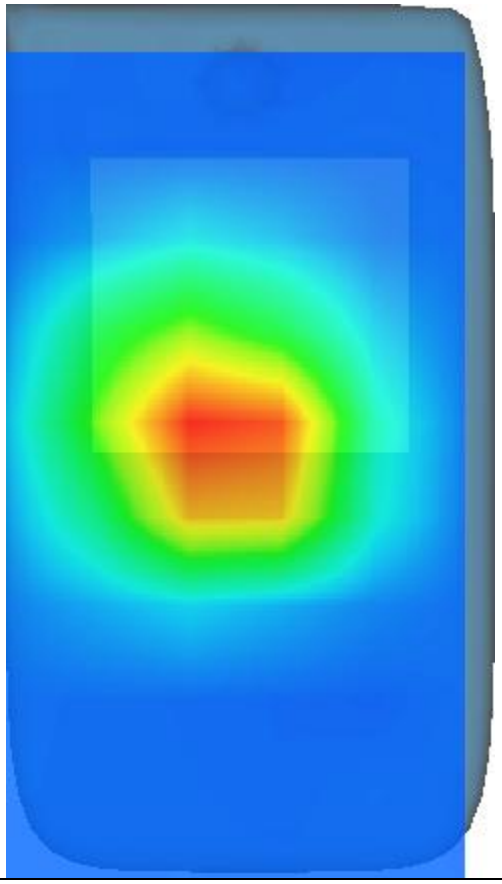
SURFACE SAR	VOLUME SAR
	

Maximum location: X=-5.00, Y=1.00
SAR Peak: 3.07 W/kg

SAR 10g (W/Kg)	0.936035
SAR 1g (W/Kg)	1.903250

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	3.0509	1.9594	1.0924	0.6149	0.3476	0.1963	0.1167



3D screen shot	Hot spot position
	

MEASUREMENT 4

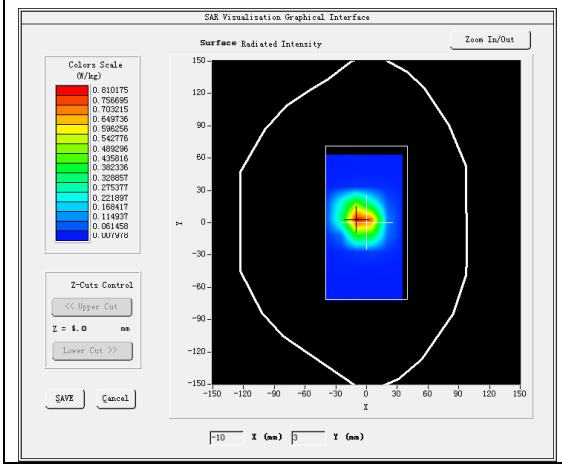
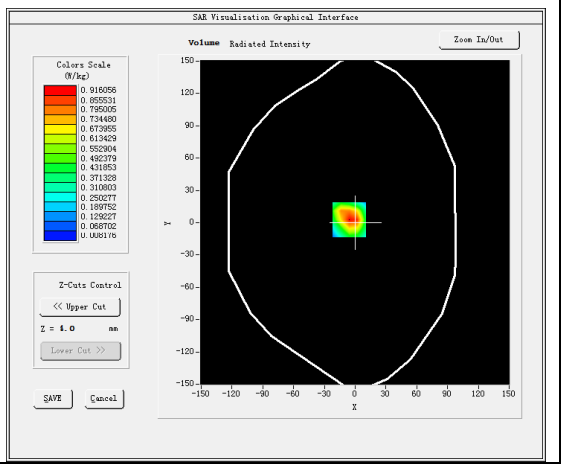
Date of measurement: 7/5/2022

A. Experimental conditions.

Area Scan	dx=15mm dy=15mm, h= 5.00 mm
ZoomScan	5x5x7,dx=8mm dy=8mm dz=5mm
Phantom	Validation plane
Device Position	Body
Band	Band4_WCDMA1700
Channels	Middle
Signal	WCDMA (Crest factor: 1.0)

B. SAR Measurement Results

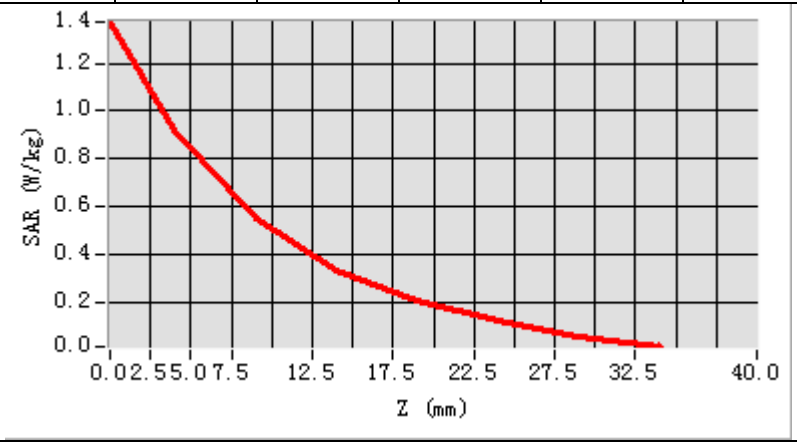
Frequency (MHz)	1732.600000
Relative permittivity (real part)	39.377213
Relative permittivity (imaginary part)	13.967266
Conductivity (S/m)	1.343961
Variation (%)	-3.510000

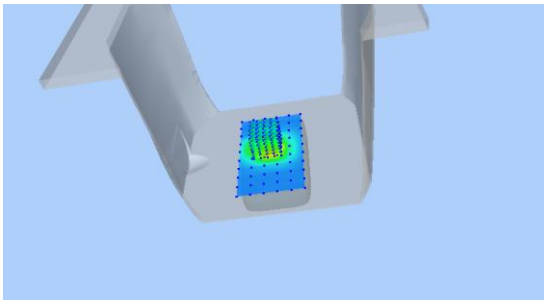
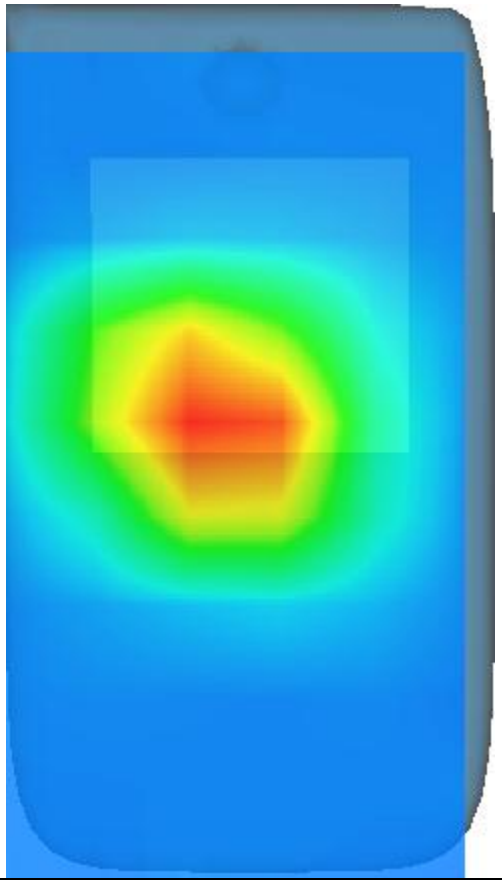
SURFACE SAR	**VOLUME SAR**
	

Maximum location: X=-6.00, Y=3.00
SAR Peak: 1.45 W/kg

SAR 10g (W/Kg)	0.457707
SAR 1g (W/Kg)	0.871712

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	1.3732	0.9161	0.5505	0.3283	0.2016	0.1222	0.0546



3D screen shot	Hot spot position
	

MEASUREMENT 5

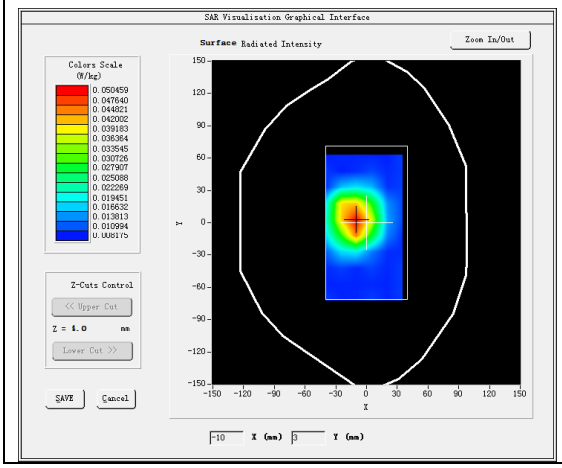
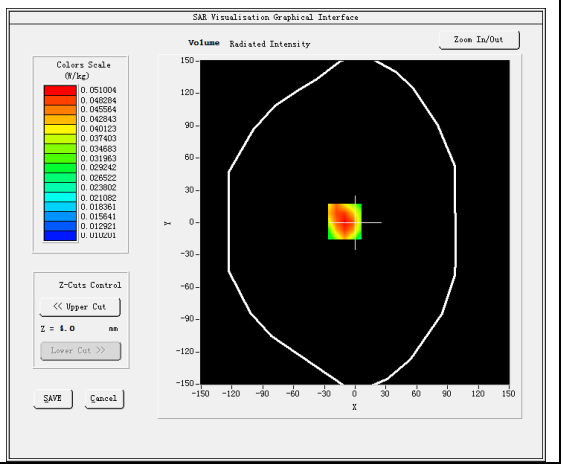
Date of measurement: 21/3/2022

A. Experimental conditions.

Area Scan	dx=15mm dy=15mm, h= 5.00 mm
ZoomScan	5x5x7,dx=8mm dy=8mm dz=5mm
Phantom	Validation plane
Device Position	Body
Band	Band5_WCDMA850
Channels	Middle
Signal	WCDMA (Crest factor: 1.0)

B. SAR Measurement Results

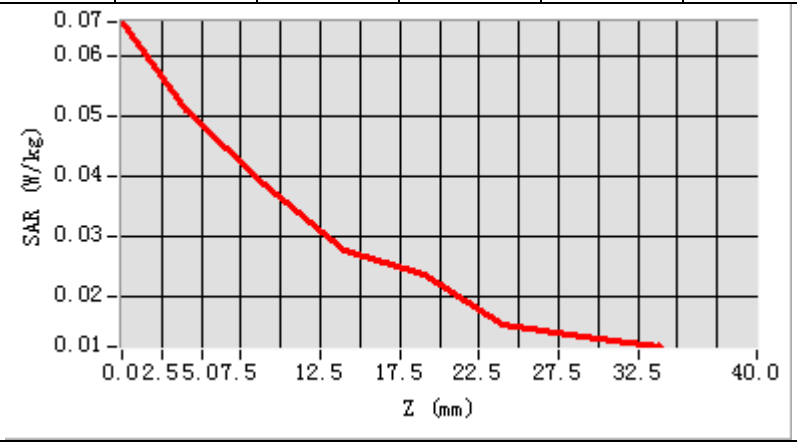
Frequency (MHz)	836.400000
Relative permittivity (real part)	42.250137
Relative permittivity (imaginary part)	20.062969
Conductivity (S/m)	0.932259
Variation (%)	-0.570000

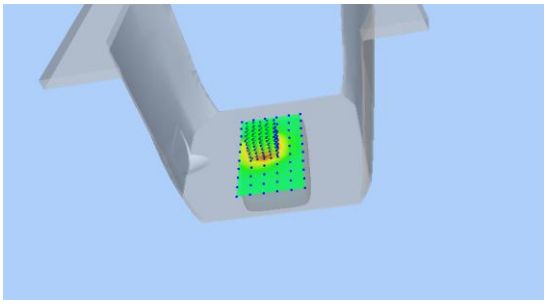
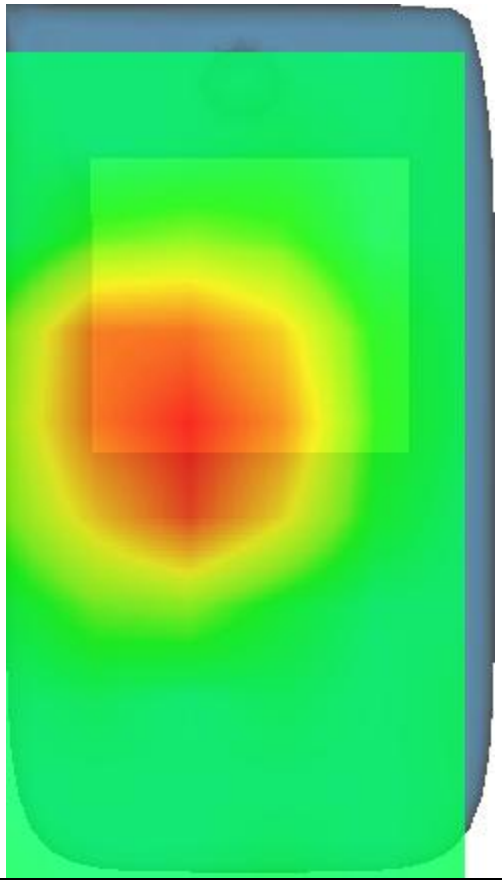
SURFACE SAR	VOLUME SAR
	

Maximum location: X=-10.00, Y=1.00
SAR Peak: 0.07 W/kg

SAR 10g (W/Kg)	0.034495
SAR 1g (W/Kg)	0.050429

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	0.0656	0.0510	0.0386	0.0276	0.0236	0.0154	0.0135



3D screen shot	Hot spot position
	

MEASUREMENT 6

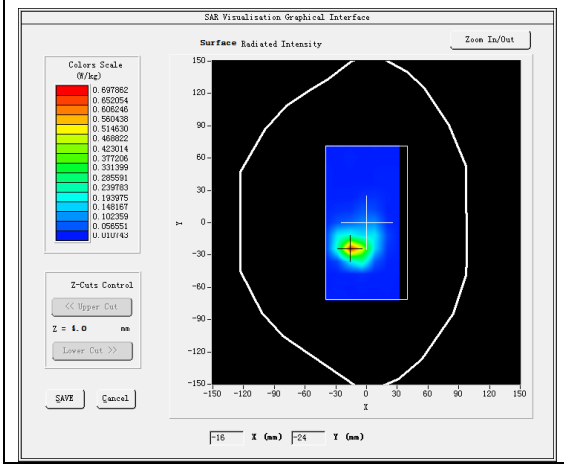
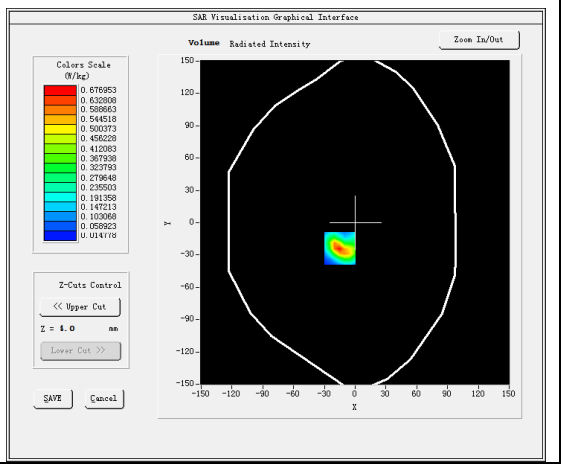
Date of measurement: 10/5/2022

A. Experimental conditions.

Area Scan	dx=12mm dy=12mm, h= 5.00 mm
ZoomScan	7x7x7,dx=5mm dy=5mm dz=5mm
Phantom	Validation plane
Device Position	Body
Band	IEEE 802.11b ISM
Channels	Middle
Signal	IEEE802.11b (Crest factor: 1.0)

B. SAR Measurement Results

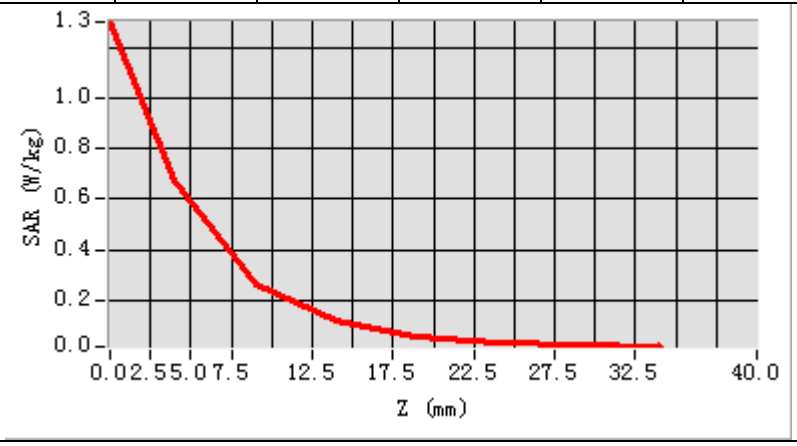
Frequency (MHz)	2437.000000
Relative permittivity (real part)	38.851643
Relative permittivity (imaginary part)	13.366670
Conductivity (S/m)	1.809699
Variation (%)	-0.930000

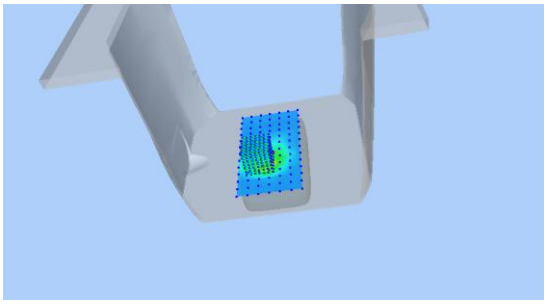
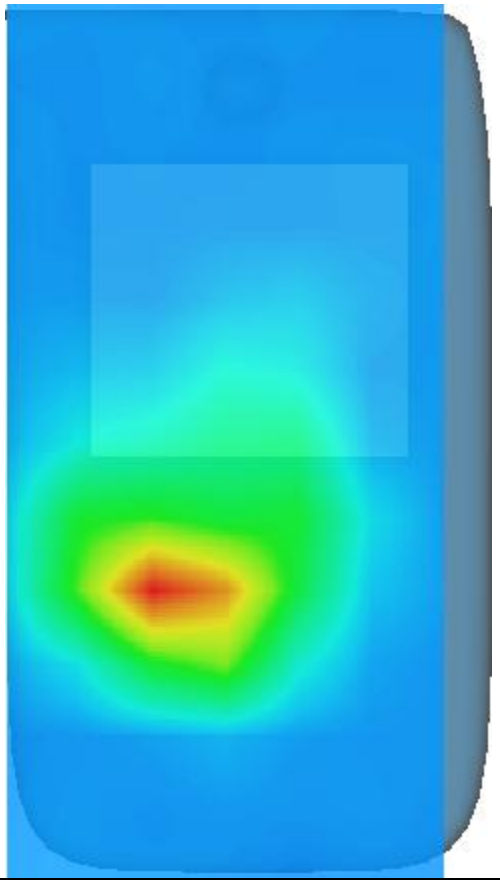
SURFACE SAR	VOLUME SAR
	

Maximum location: X=-15.00, Y=-24.00
SAR Peak: 1.29 W/kg

SAR 10g (W/Kg)	0.237492
SAR 1g (W/Kg)	0.594379

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	1.2995	0.6770	0.2649	0.1208	0.0589	0.0363	0.0227



3D screen shot	Hot spot position
	

MEASUREMENT 7

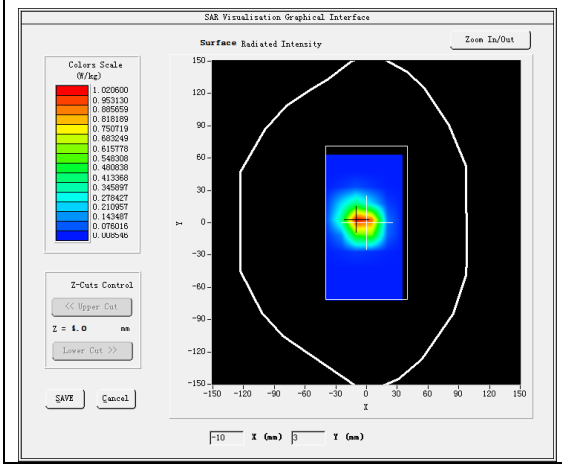
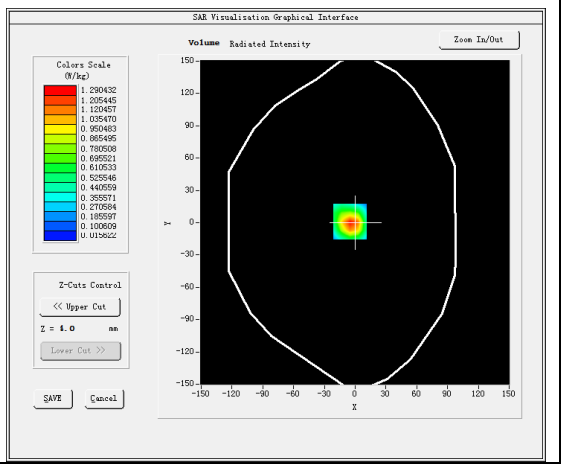
Date of measurement: 9/5/2022

A. Experimental conditions.

Area Scan	dx=15mm dy=15mm, h= 5.00 mm
ZoomScan	5x5x7,dx=8mm dy=8mm dz=5mm
Phantom	Validation plane
Device Position	Body
Band	LTE band 2
Channels	Middle
Signal	LTE (Crest factor: 1.0)

B. SAR Measurement Results

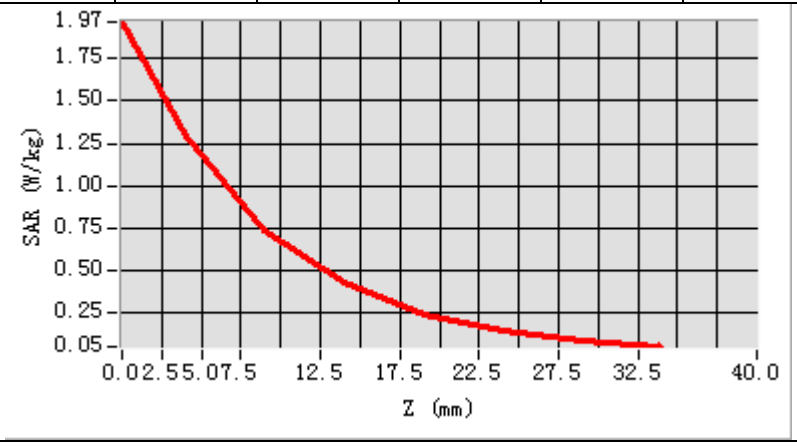
Frequency (MHz)	1880.000000
Relative permittivity (real part)	38.528633
Relative permittivity (imaginary part)	13.883346
Conductivity (S/m)	1.450038
Variation (%)	1.590000

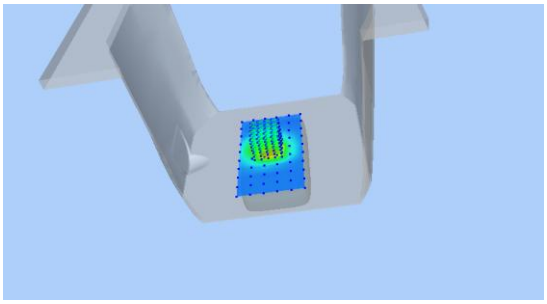
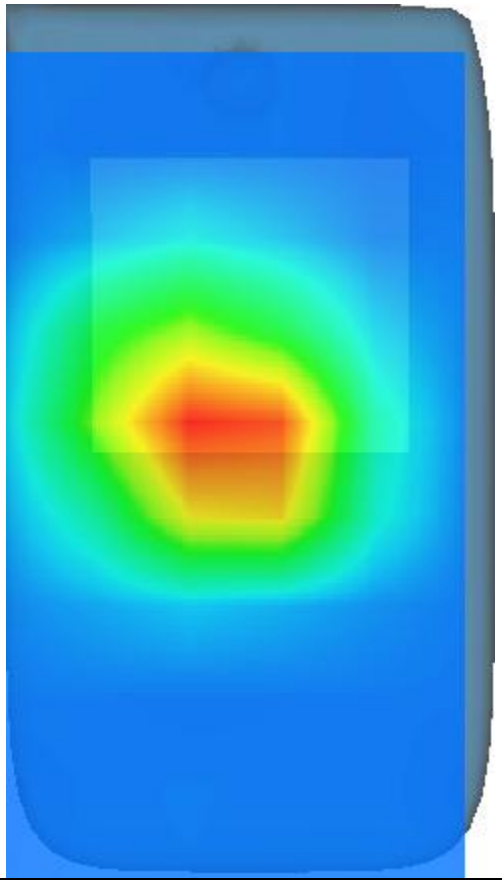
SURFACE SAR	VOLUME SAR
	

Maximum location: X=-5.00, Y=1.00
SAR Peak: 1.98 W/kg

SAR 10g (W/Kg)	0.626044
SAR 1g (W/Kg)	1.246798

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	1.9662	1.2904	0.7424	0.4255	0.2457	0.1404	0.0840



3D screen shot	Hot spot position
	

MEASUREMENT 8

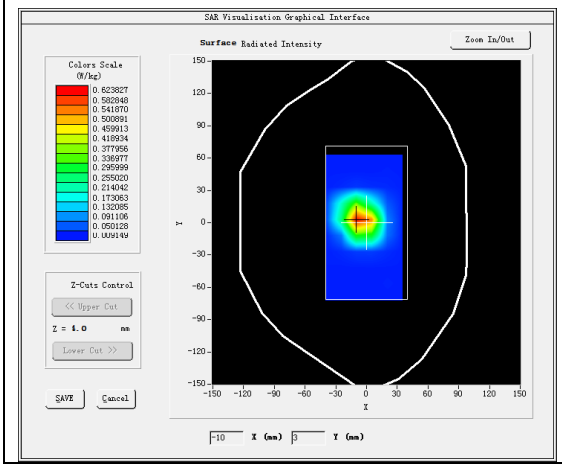
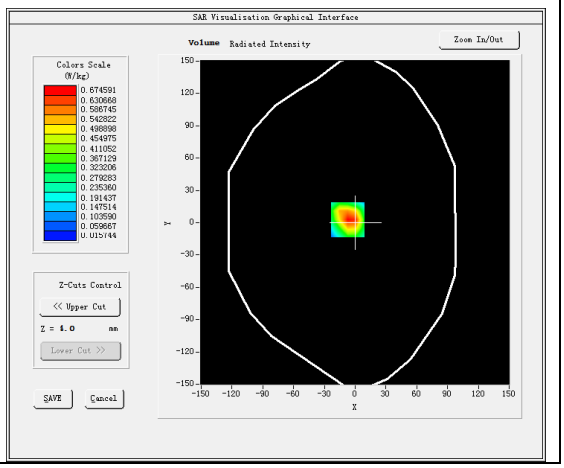
Date of measurement: 7/5/2022

A. Experimental conditions.

Area Scan	dx=15mm dy=15mm, h= 5.00 mm
ZoomScan	5x5x7,dx=8mm dy=8mm dz=5mm
Phantom	Validation plane
Device Position	Body
Band	LTE band 4
Channels	Middle
Signal	LTE (Crest factor: 1.0)

B. SAR Measurement Results

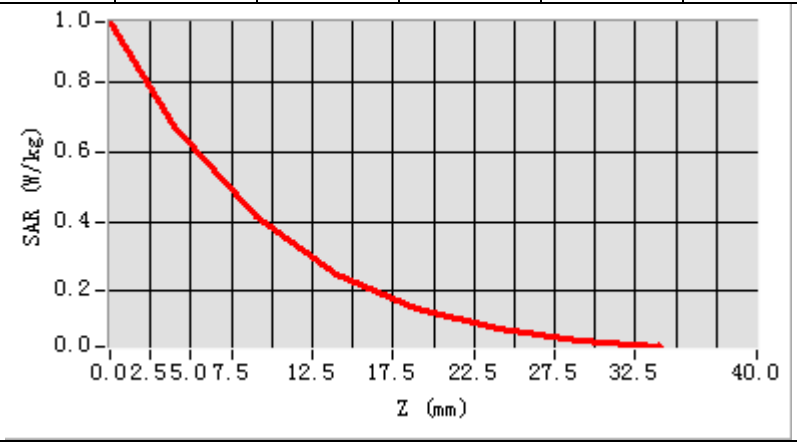
Frequency (MHz)	1732.500000
Relative permittivity (real part)	39.385113
Relative permittivity (imaginary part)	13.952116
Conductivity (S/m)	1.342891
Variation (%)	1.150000

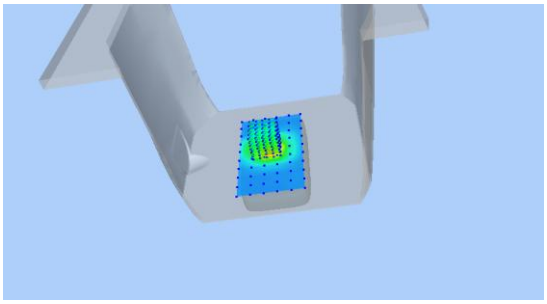
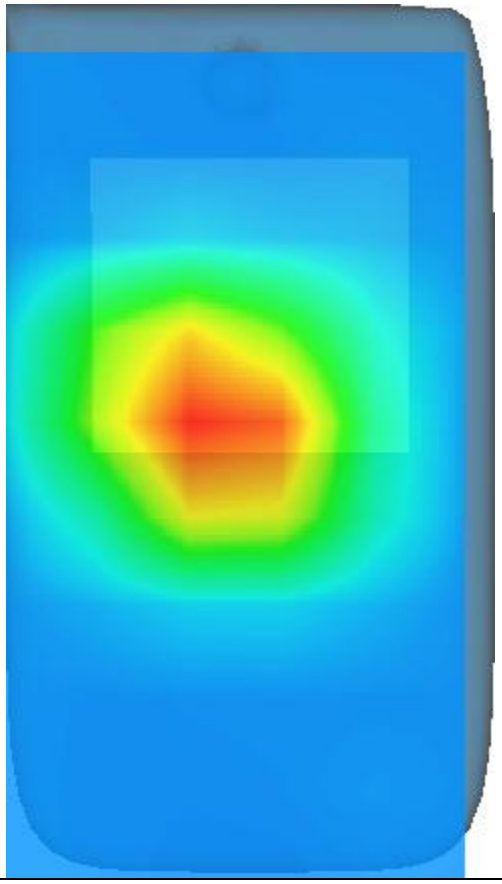
SURFACE SAR	VOLUME SAR
	

Maximum location: X=-7.00, Y=3.00
SAR Peak: 1.04 W/kg

SAR 10g (W/Kg)	0.346528
SAR 1g (W/Kg)	0.643500

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	0.9758	0.6746	0.4141	0.2486	0.1494	0.0918	0.0595



3D screen shot	Hot spot position
	

MEASUREMENT 9

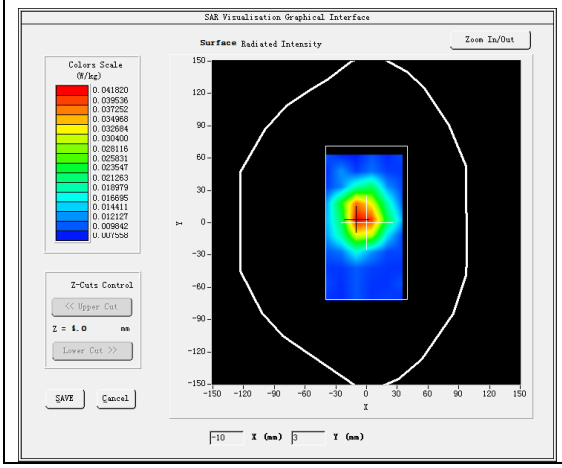
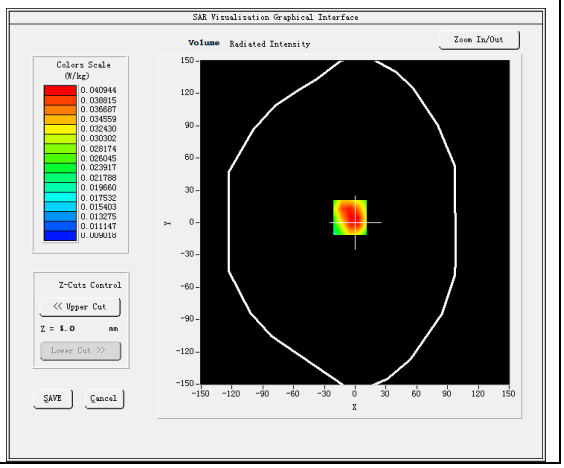
Date of measurement: 21/3/2022

A. Experimental conditions.

Area Scan	dx=15mm dy=15mm, h= 5.00 mm
ZoomScan	5x5x7,dx=8mm dy=8mm dz=5mm
Phantom	Validation plane
Device Position	Body
Band	LTE band 5
Channels	Middle
Signal	LTE (Crest factor: 1.0)

B. SAR Measurement Results

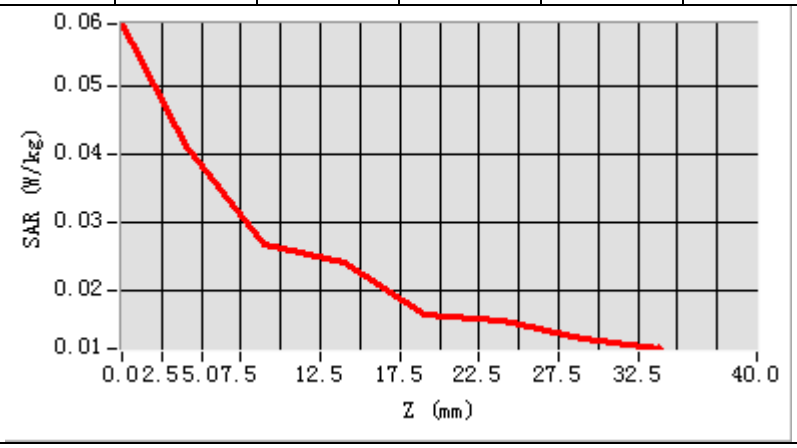
Frequency (MHz)	836.500000
Relative permittivity (real part)	42.252728
Relative permittivity (imaginary part)	20.061630
Conductivity (S/m)	0.932309
Variation (%)	-1.520000

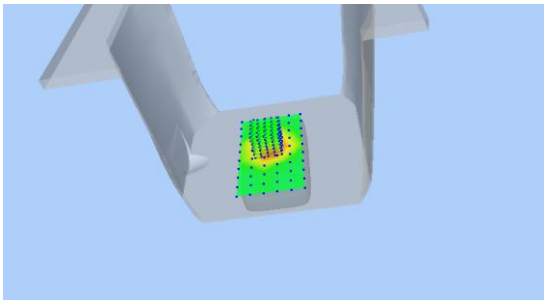
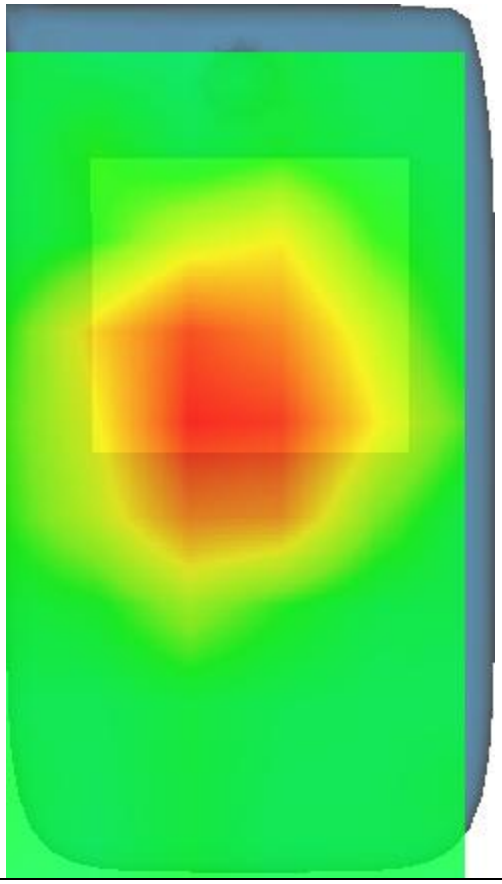
SURFACE SAR	VOLUME SAR
	

Maximum location: X=-5.00, Y=5.00
SAR Peak: 0.06 W/kg

SAR 10g (W/Kg)	0.028548
SAR 1g (W/Kg)	0.042340

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	0.0590	0.0409	0.0267	0.0238	0.0165	0.0154	0.0127



3D screen shot	Hot spot position
	

MEASUREMENT 10

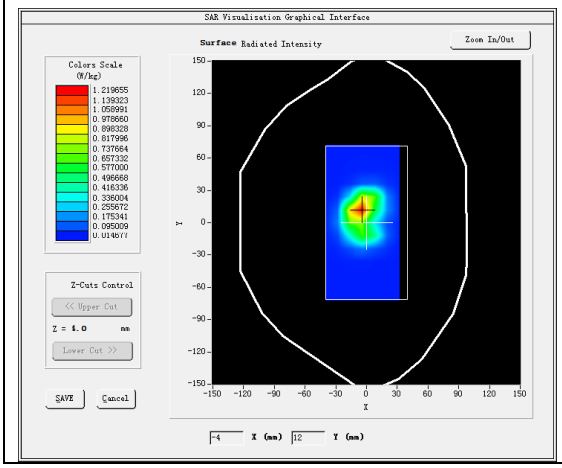
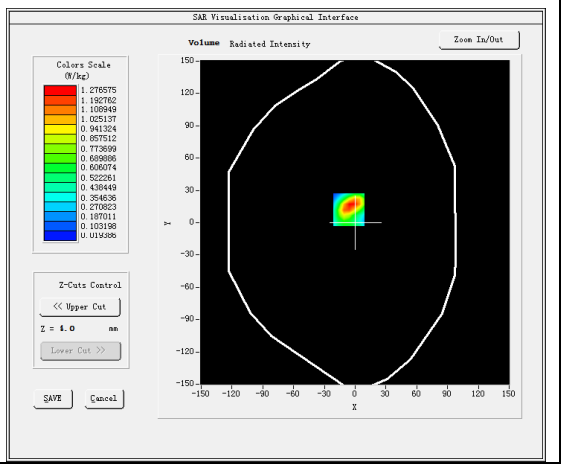
Date of measurement: 13/5/2022

A. Experimental conditions.

Area Scan	dx=12mm dy=12mm, h= 5.00 mm
ZoomScan	7x7x7,dx=5mm dy=5mm dz=5mm
Phantom	Validation plane
Device Position	Body
Band	LTE band 7
Channels	Middle
Signal	LTE (Crest factor: 1.0)

B. SAR Measurement Results

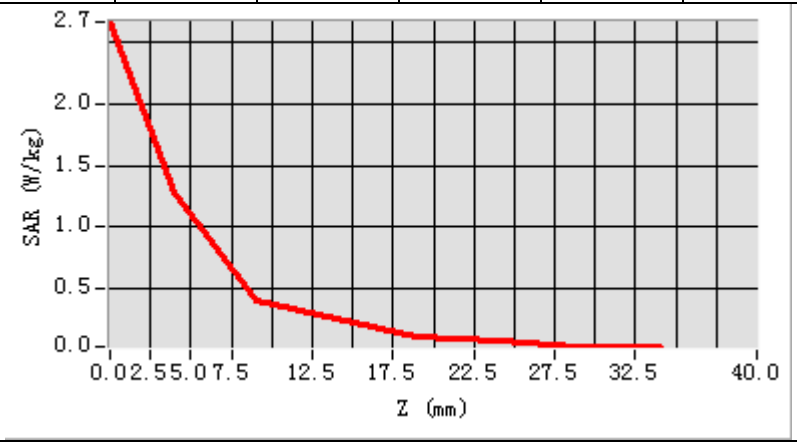
Frequency (MHz)	2535.000000
Relative permittivity (real part)	38.958656
Relative permittivity (imaginary part)	14.009350
Conductivity (S/m)	1.972983
Variation (%)	-2.970000

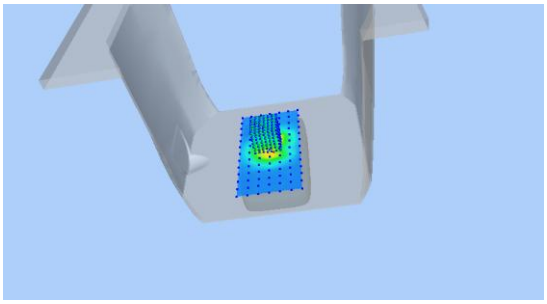
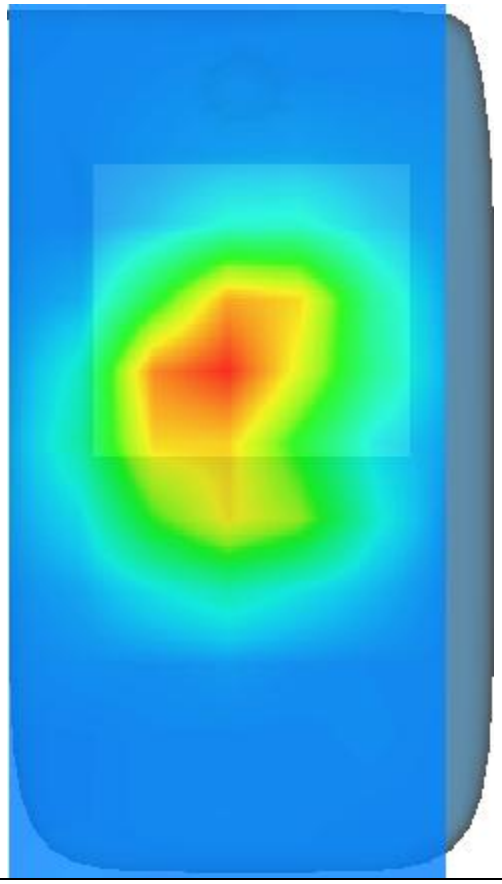
SURFACE SAR	VOLUME SAR
	

Maximum location: X=-6.00, Y=12.00
SAR Peak: 2.30 W/kg

SAR 10g (W/Kg)	0.498134
SAR 1g (W/Kg)	1.191907

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	2.6679	1.2766	0.4054	0.2559	0.1043	0.0706	0.0370



3D screen shot	Hot spot position
	

13. Appendix D. Calibration Certificate

Table of contents
E Field Probe - SN 08/16 EPGO287
835 MHz Dipole - SN 03/15 DIP 0G835-347
1800 MHz Dipole - SN 03/15 DIP 1G800-349
1900 MHz Dipole - SN 03/15 DIP 1G900-350
2450 MHz Dipole - SN 03/15 DIP 2G450-352
2600 MHz Dipole - SN 03/15 DIP 2G600-356
Extended Calibration Certificate

COMOSAR E-Field Probe Calibration Report

Ref : ACR.60.1.21.MVGB.A

SHENZHEN NTEK TESTING TECHNOLOGY CO., LTD.

BUILDING E, FENDA SCIENCE PARK, SANWEI COMMUNITY, XIXIANG STREET,

BAO'AN DISTRICT, SHENZHEN GUANGDONG, CHINA

MVG COMOSAR DOSIMETRIC E-FIELD PROBE

SERIAL NO.: SN 08/16 EPGO287

Calibrated at MVG

Z.I. de la pointe du diable

Technopôle Brest Iroise – 295 avenue Alexis de Rochon

29280 PLOUZANE - FRANCE

Calibration date: 02/01/2022

Accreditations #2-6789 and #2-6814
Scope available on www.cofrac.fr

Summary:

This document presents the method and results from an accredited COMOSAR 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).

COMOSAR E-FIELD PROBE CALIBRATION REPORT Ref: ACR.60.1.21.MVGB.A

	Name	Function	Date	Signature
Prepared by :	Jérôme Luc	Technical Manager	2/1/2022	
Checked by :	Jérôme Luc	Technical Manager	2/1/2022	
Approved by :	Yann Toutain	Laboratory Director	2/1/2022	Yann Toutain Mode d'emploi 2022.02.01 10:07:13 +01'00' PHILIPS

	Customer Name
Distribution :	SHENZHEN NTEK TESTING TECHNOLOGY CO., LTD.

Issue	Name	Date	Modifications
A	Jérôme Luc	2/1/2022	Initial release

TABLE OF CONTENTS

1 DEVICE UNDER TEST

Device Under Test	
Device Type	COMOSAR DOSIMETRIC E FIELD PROBE
Manufacturer	MVG
Model	SSE2
Serial Number	SN 08/16 EPGO287
Product Condition (new / used)	Used
Frequency Range of Probe	0.15 GHz-6GHz
Resistance of Three Dipoles at Connector	Dipole 1: R1=0.211 MΩ Dipole 2: R2=0.199 MΩ Dipole 3: R3=0.199 MΩ

2 PRODUCT DESCRIPTION

2.1 GENERAL INFORMATION

MVG's COMOSAR E field Probes are built in accordance to the IEEE 1528, FCC KDB865664 D01, CENELEC EN62209 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, FCC KDB865664 D01, CENELEC EN62209 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 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:

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

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
Δ_{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
δ	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 SARuncertainty[%] for scanning distances larger than 4mm is 1.0% Limit ,2%).

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 (%)**
Expanded uncertainty 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 %

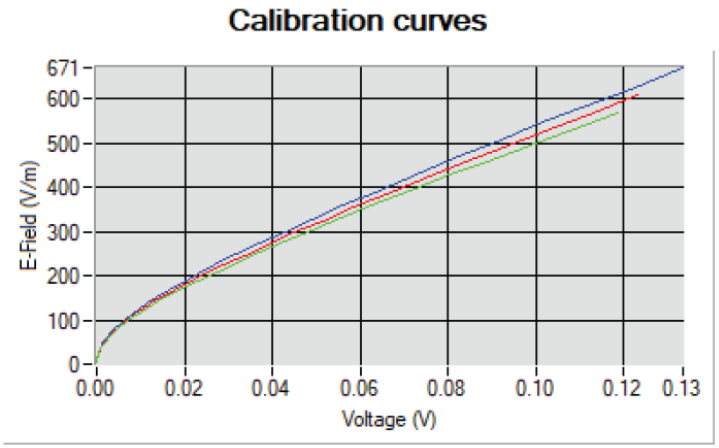
5.1 SENSITIVITY IN AIR

Normx dipole 1 (μV/(V/m)^2)	Normy dipole 2 (μV/(V/m)^2)	Normz dipole 3 (μV/(V/m)^2)
0.72	0.66	0.77

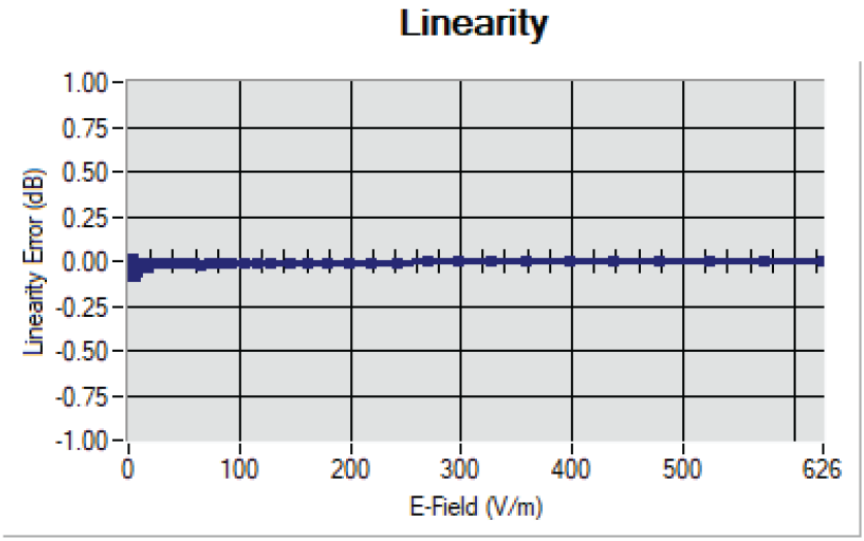
DCP dipole 1 (mV)	DCP dipole 2 (mV)	DCP dipole 3 (mV)
107	110	110

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

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



5.2 LINEARITY



Linearity:+/-1.90% (+/-0.08dB)

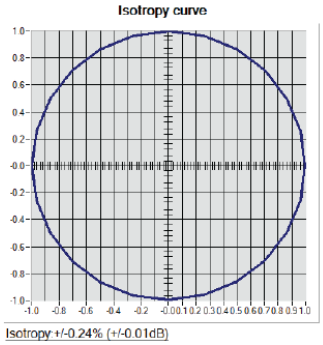
5.3 SENSITIVITY IN LIQUID

Liquid	Frequency (MHz +/- 100MHz)	ConvF
HL750	750	1.49
HL850	835	1.50
HL900	900	1.61
HL1800	1800	1.73
HL1900	1900	1.91
HL2000	2000	1.97
HL2300	2300	1.92
HL2450	2450	1.98
HL2600	2600	1.87
HL3300	3300	1.79
HL3500	3500	1.85
HL3700	3700	1.79
HL3900	3900	2.07
HL4200	4200	2.21
HL4600	4600	2.25
HL4900	4900	2.05
HL5200	5200	1.80
HL5400	5400	2.05
HL5600	5600	2.16
HL5800	5800	2.07

LOWER DETECTION LIMIT: 8mW/kg

5.4 ISOTROPY

HL1800 MHz



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	Rohde & Schwarz ZVM	100203	05/2019	05/2022
Network Analyzer – Calibration kit	Rohde & Schwarz ZV-Z235	101223	05/2019	05/2022
Multimeter	Keithley 2000	1160271	02/2020	02/2023
Signal Generator	Rohde & Schwarz SMB	106589	04/2019	04/2022
Amplifier	Aethercomm	SN 046	Characterized prior to test. No cal required.	Characterized prior to test. No cal required.
Power Meter	NI-USB 5680	170100013	05/2019	05/2022
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	Testo 184 H1	44220687	05/2020	05/2023