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： Tablet PC

Trademark： Azeyou

Model Name： AT1013U

Family Model： M17QF3U-T610, AT1013E, AT1013Q, M17QF3U

Report No.： S21090603503001

FCC ID： 2A27O-AT1013U

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TEST RESULT CERTIFICATION

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Manufacturer's Name.....: Dongguan Lianzhou Electronic Technology Co., Ltd.

Address.....: Building 1, No. 10, Feng Gang Technology Road, Feng Gang Town, DongGuan City, GuangDong Province, China

Product description

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Model Name .....: AT1013U

Family Model.....: M17QF3U-T610, AT1013E, AT1013Q, M17QF3U

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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Date of Test

Date (s) of performance of tests.....: Sep. 12, 2021 ~ Sep. 25, 2021

Date of Issue .....: Oct. 19, 2021

Test Result .....: **Pass**

Prepared By (Test Engineer) : Jacob. chen
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※ ※ Revision History ※ ※

REV.	DESCRIPTION	ISSUED DATE	REMARK
Rev.1.0	Initial Test Report Release	Oct. 19, 2021	Jacob Chen

TABLE OF CONTENTS

1. General Information 6
   1.1. RF exposure limits 6
   1.2. Statement of Compliance 7
   1.3. EUT Description 7
   1.4. Test specification(s) 9
   1.5. Ambient Condition 9
2. SAR Measurement System 10
   2.1. SATIMO SAR Measurement Set-up Diagram 10
   2.2. Robot 11
   2.3. E-Field Probe 12
      2.3.1. E-Field Probe Calibration 12
   2.4. SAM phantoms 13
      2.4.1. Technical Data 14
   2.5. Device Holder 15
   2.6. Test Equipment List 16
3. SAR Measurement Procedures 18
   3.1. Power Reference 18
   3.2. Area scan & Zoom scan 18
   3.3. Description of interpolation/extrapolation scheme 20
   3.4. Volumetric Scan 20
   3.5. Power Drift 20
4. System Verification Procedure 21
   4.1. Tissue Verification 21
      4.1.1. Tissue Dielectric Parameter Check Results 22
   4.2. System Verification Procedure 23
      4.2.1. System Verification Results 24
5. SAR Measurement variability and uncertainty 25
   5.1. SAR measurement variability 25
   5.2. SAR measurement uncertainty 25
6. RF Exposure Positions 26
   6.1. Tablet host platform exposure conditions 26
7. RF Output Power 27
   7.1. GSM Conducted Power 27
   7.2. WCDMA Conducted Power 28
   7.3. LTE Conducted Power 29
   7.4. WLAN & Bluetooth Output Power 37
      7.4.1. Output Power Results Of WLAN 37
      7.4.2. Output Power Results Of Bluetooth 39
8. Antenna Location 40

9. Stand-alone SAR test exclusion 49
10. SAR Results 50
10.1. SAR measurement results 50
10.1.1. SAR measurement Result of GSM850 50
10.1.2. SAR measurement Result of GSM1900 50
10.1.3. SAR measurement Result of WCDMA Band 2 50
10.1.4. SAR measurement Result of WCDMA Band 4 51
10.1.5. SAR measurement Result of WCDMA Band 5 51
10.1.6. SAR measurement Result of LTE Band 2 51
10.1.7. SAR measurement Result of LTE Band 4 52
10.1.8. SAR measurement Result of LTE Band 5 53
10.1.9. SAR measurement Result of LTE Band 7 54
10.1.10. SAR measurement Result of LTE Band 17 55
10.1.11. SAR measurement Result of WLAN 2.4G 55
10.1.12. SAR measurement Result of WLAN 5.2G 55
10.1.13. SAR measurement Result of WLAN 5.3G 56
10.1.14. SAR measurement Result of WLAN 5.6G 56
10.1.15. SAR measurement Result of WLAN 5.8G 56
10.2. SAR Summation Scenario 57
11. Appendix A. Photo documentation 58
12. Appendix B. System Check Plots 58
13. Appendix C. Plots of High SAR Measurement 77
14. Appendix D. Calibration Certificate 108

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
TRUNK LIMIT
1.6 W/kg
APPLIED TO THIS EUT

1.2. Statement of Compliance

The maximum results of Specific Absorption Rate (SAR) found during testing for AT1013U are as follows.

RF Exposure Conditions		Equipment Class -Highest Reported SAR (W/kg)			
		PCE	DTS	NII	DSS
1-g Body (Separation distance of 0mm)		1.169	0.120	0.162	N/A
Max Simultaneous Tx	Body	1.561	1.289	1.331	1.561

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) 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	Tablet PC		
Trade Name	Azeyou		
Model Name	AT1013U		
Family Model	M17QF3U-T610, AT1013E, AT1013Q, M17QF3U		
FCC ID	2A27O-AT1013U		
Device Phase	Identical Prototype		
Exposure Category	General population / Uncontrolled environment		
Antenna	PIFA Antenna		
Battery Information	DC 3.8V, 6000mAh		
HW Version	P30-T618-V2.0		
SW Version	Android 11		
Device Operating Configurations			
Supporting Mode(s)	GSM 850/1900, WCDMA Band 2/4/5, LTE Band 2/4/5/7/17, WLAN 2.4G/5G, Bluetooth		
Test Modulation	GSM(GMSK), WCDMA(QPSK), LTE(QPSK/16QAM), WLAN(DSSS/OFDM), Bluetooth(GFSK, π/4-DQPSK, 8DPSK)		
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
	LTE Band 17	704-716	734-746
	WLAN 2.4G	2412-2462	
	WLAN 5.2G	5180-5240	
	WLAN 5.3G	5260-5320	
	WLAN 5.6G	5500-5700	
	WLAN 5.8G	5745-5825	
	Bluetooth	2402-2480	
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)		
	3, tested with power control all Max.(LTE Band 17)		

1.4. Test specification(s)

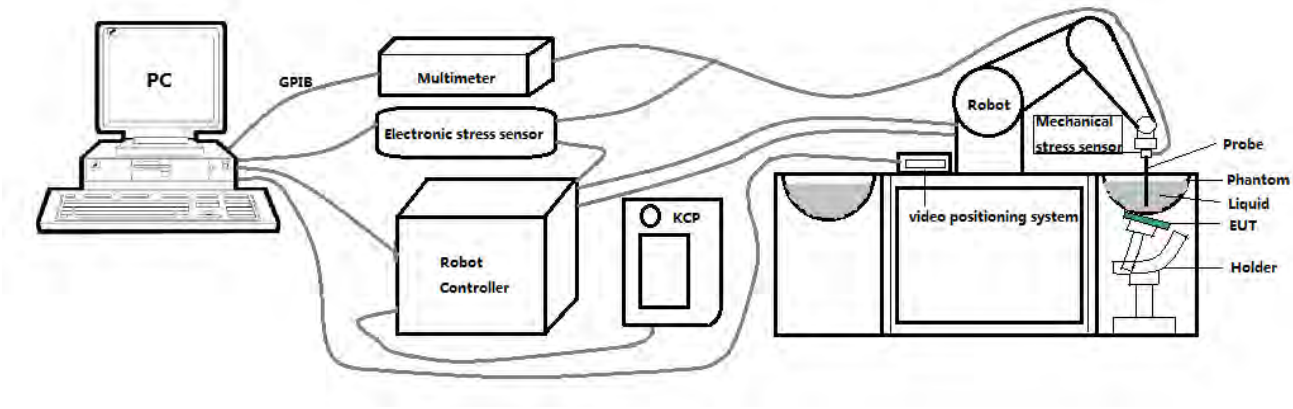
FCC 47 CFR Part 2(2.1093)
ANSI/IEEE C95.1-1992
IEEE Std 1528-2013
KDB 865664 D01 SAR measurement 100 MHz to 6 GHz
KDB 865664 D02 RF Exposure Reporting
KDB 447498 D01 General RF Exposure Guidance
KDB 248227 D01 802.11 Wi-Fi SAR
KDB 941225 D01 3G SAR Procedures
KDB 941225 D05 SAR for LTE Devices
KDB 616217 D04 SAR for laptop and tablets

1.5. Ambient Condition

Ambient temperature	20°C – 24℃
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.

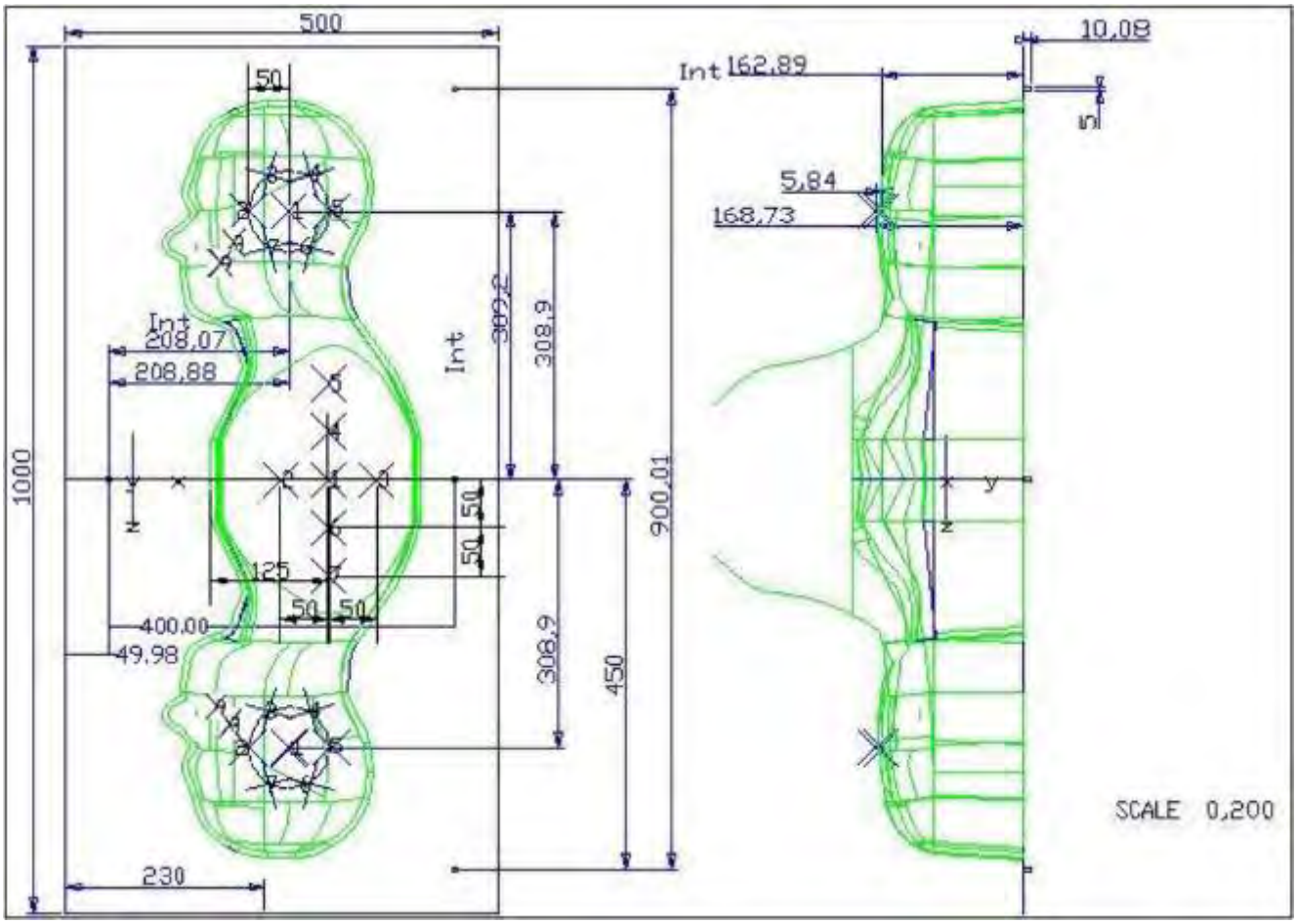
2.4. SAM phantoms

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

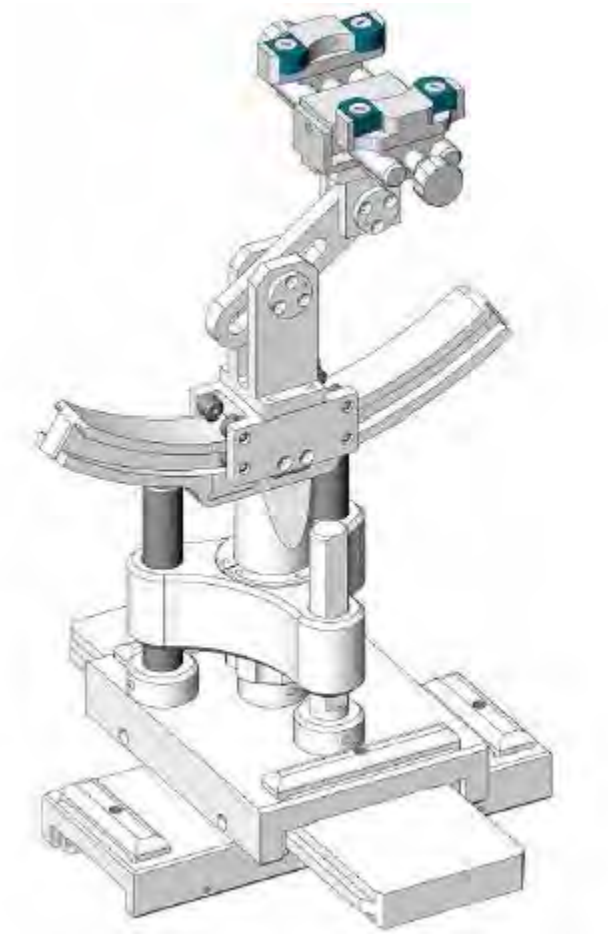


Serial Number	Left Head(mm)		Right Head(mm)		Flat Part(mm)	
SN 16/15 SAM119	2	2.02	2	2.08	1	2.09
	3	2.05	3	2.06	2	2.06
	4	2.07	4	2.07	3	2.08
	5	2.08	5	2.08	4	2.10
	6	2.05	6	2.07	5	2.10
	7	2.05	7	2.05	6	2.07
	8	2.07	8	2.06	7	2.07
	9	2.08	9	2.06	-	-

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	Mar. 01, 2021	Feb. 28, 2022
☒	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.

			≤ 3 GHz	> 3 GHz
Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface			5 ± 1 mm	½·δ·ln(2) ± 0.5 mm
Maximum probe angle from probe axis to phantom surface normal at the measurement location			30° ± 1°	20° ± 1°
Maximum area scan spatial resolution: Δx_{Area}, Δy_{Area}			≤ 2 GHz: ≤ 15 mm 2 – 3 GHz: ≤ 12 mm	3 – 4 GHz: ≤ 12 mm 4 – 6 GHz: ≤ 10 mm
			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.	
Maximum zoom scan spatial resolution: Δx_{Zoom}, Δy_{Zoom}			≤ 2 GHz: ≤ 8 mm 2 – 3 GHz: ≤ 5 mm*	3 – 4 GHz: ≤ 5 mm* 4 – 6 GHz: ≤ 4 mm*
Maximum zoom scan spatial resolution, normal to phantom surface	uniform grid: $\Delta z_{Zoom}(n)$		≤ 5 mm	3 – 4 GHz: ≤ 4 mm 4 – 5 GHz: ≤ 3 mm 5 – 6 GHz: ≤ 2 mm
	graded grid	$\Delta z_{Zoom}(1)$: between 1st two points closest to phantom surface	≤ 4 mm	3 – 4 GHz: ≤ 3 mm 4 – 5 GHz: ≤ 2.5 mm 5 – 6 GHz: ≤ 2 mm
		$\Delta z_{Zoom}(n>1)$: between subsequent points	$\leq 1.5 \cdot \Delta z_{Zoom}(n-1)$	
Minimum zoom scan volume	x, y, z		≥ 30 mm	3 – 4 GHz: ≥ 28 mm 4 – 5 GHz: ≥ 25 mm 5 – 6 GHz: ≥ 22 mm

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.

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.

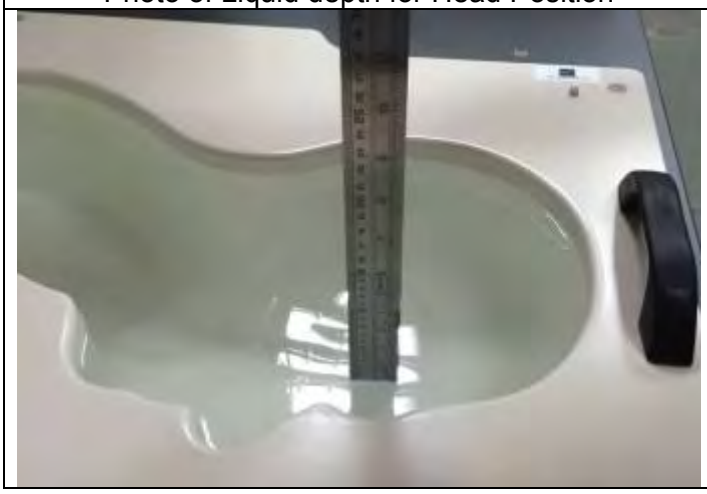
4. System Verification Procedure

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.

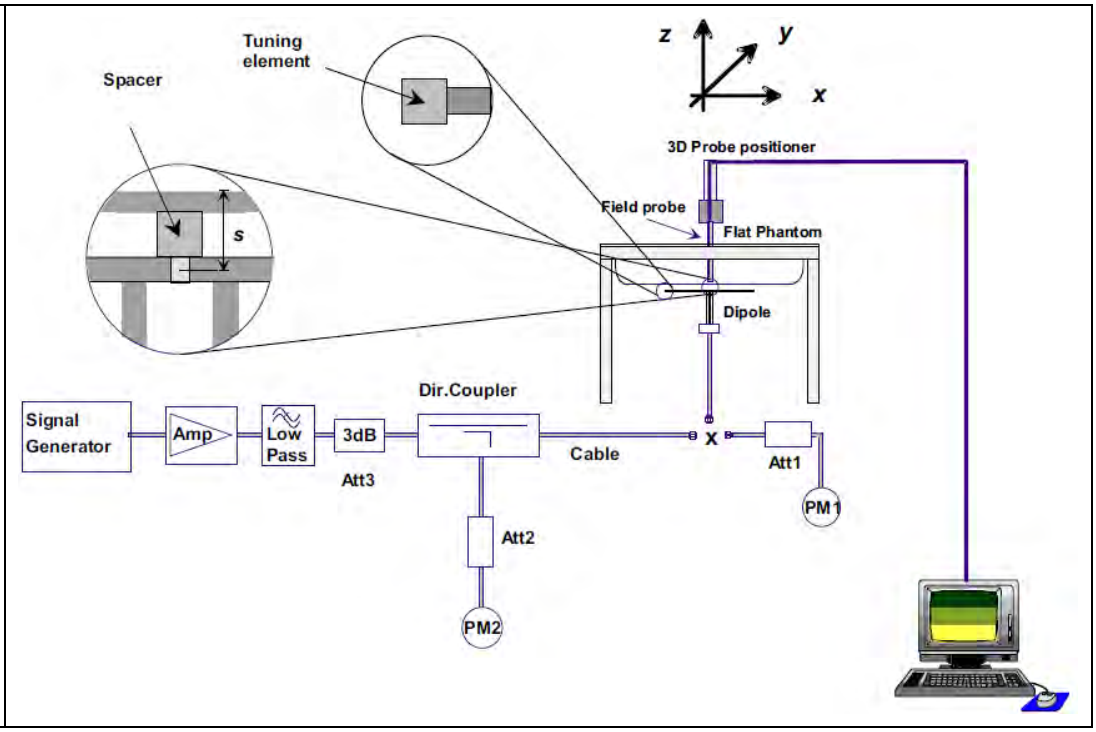
Tissue Type	Measured Frequency (MHz)	Target Tissue		Measured Tissue		Liquid Temp.	Test Date
		εr (±5%)	σ (S/m) (±5%)	εr	σ (S/m)		
Head 750	750	41.96 (39.86~44.06)	0.89 (0.85~0.93)	41.72	0.90	21.5 °C	Sep. 15, 2021
Head 850	835	41.50 (39.43~43.58)	0.90 (0.86~0.95)	43.17	0.89	21.5 °C	Sep. 13, 2021
Head 1800	1800	40.00 (38.00~42.00)	1.40 (1.33~1.47)	39.61	1.41	21.7 °C	Sep. 17, 2021
Head 1900	1900	40.00 (38.00~42.00)	1.40 (1.33~1.47)	38.58	1.46	21.5 °C	Sep. 20, 2021
Head 2450	2450	39.20 (37.24~41.16)	1.80 (1.71~1.89)	40.41	1.82	21.5 °C	Sep. 22, 2021
Head 2600	2600	39.01 (37.06~40.96)	1.96 (1.86~2.06)	39.43	1.99	21.4 °C	Sep. 23, 2021
Head 5200	5200	36.00 (34.20~37.80)	4.66 (4.43~4.89)	37.40	4.67	21.5 °C	Sep. 12, 2021
Head 5600	5600	35.50 (33.73~37.28)	5.07 (4.82~5.32)	36.41	5.05	21.6 °C	Sep. 24, 2021
Head 5800	5800	35.30 (33.54~37.07)	5.27 (5.01~5.53)	35.98	5.28	21.9 °C	Sep. 25, 2021

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)		
750MHz	8.53 (7.68~9.38)	5.56 (5.01~6.11)	8.66	5.68	21.5 °C	Sep. 15, 2021
835MHz	9.84 (8.86~10.82)	6.22 (5.60~6.84)	9.27	6.22	21.5 °C	Sep. 13, 2021
1800MHz	37.96 (34.17~41.75)	19.81 (17.83~21.79)	39.76	19.20	21.7 °C	Sep. 17, 2021
1900MHz	40.37 (36.34~44.40)	20.48 (18.44~22.52)	40.85	20.88	21.5 °C	Sep. 20, 2021
2450MHz	53.69 (48.33~59.05)	23.94 (21.55~26.33)	56.86	24.33	21.5 °C	Sep. 22, 2021
2600MHz	55.83 (50.25~61.41)	24.19 (21.78~26.60)	57.74	24.48	21.4 °C	Sep. 23, 2021
5200MHz	162.34 (146.11~178.57)	55.42 (49.88~60.96)	162.56	57.25	21.5 °C	Sep. 12, 2021
5600MHz	174.92 (157.43~192.41)	58.63 (52.77~64.49)	171.85	60.29	21.6 °C	Sep. 24, 2021
5800MHz	178.89 (161.01~196.77)	59.32 (53.39~65.25)	181.27	62.84	21.9 °C	Sep. 25, 2021

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. Tablet host platform exposure conditions

Refer to KDB616217 D04, when the modular approach is used, transmitters and modules must be initially tested for standalone operations in generic host conditions according to the following minimum test separation distance and antenna installation requirements for incorporation in the tablet platform. The separation distance required for incorporation in qualified hosts is described in KDB 447498; item 5) of section 4.1 and item 1) of section 5.2.2 etc.

- ≤ 5 mm between the antenna and user for both back surface and edge exposure conditions
- the antennas used by the host must have been tested for equipment approval or qualify for SAR test exclusion
- the antenna polarization, physical orientation, rotation and installation configurations used by the host must have been tested for compliance or qualify for test exclusion
- when the *SAR Test Exclusion Threshold* in KDB 447498 applies, a *test separation distance* of 5 mm is required to determine test exclusion for the tablet platform

The antennas embedded in tablets are typically ≤ 5mm from the outer housing. The required antenna to user test separation distance is a “not to exceed test” distance required to apply the modular approach. Instead of the typical zero gap tablet edge test requirement between the edge of a tablet and the user, when an antenna has been tested at ≤ 5 mm according to the modular approach it can be incorporated into tablets with at least twice the tested distance from the outer housing of the tablet edge; otherwise, the tablet edge zero gap test requirement applies. When the dedicated host approach is applied, the back surface and edges of the tablet should be tested for SAR compliance with the tablet 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)	32.00	31.02	31.47	31.55	22.97	21.99	22.44	22.52
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)	27.50	27.02	26.89	26.62	18.47	17.99	17.86	17.59

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	20.00	19.46	19.52	19.47
HSDPA Subtest-1	19.50	18.56	18.33	19.14
HSDPA Subtest-2	19.00	18.23	18.10	18.91
HSDPA Subtest-3	18.50	17.73	17.79	18.35
HSDPA Subtest-4	18.50	17.77	17.53	18.37
HSUPA Subtest-1	19.00	18.56	18.14	19.00
HSUPA Subtest-2	19.50	18.59	18.29	19.19
HSUPA Subtest-3	19.00	18.19	17.92	18.69
HSUPA Subtest-4	19.50	18.26	18.33	19.15
HSUPA Subtest-5	19.00	18.28	18.21	18.78
Band	WCDMA Band 4			
Tx Channel	Tune-up	1312	1413	1513
Frequency (MHz)		1712.4	1732.6	1752.6
RMC12.2K	20.50	20.19	19.83	20.01
HSDPA Sub 1	20.00	19.13	18.44	19.63
HSDPA Sub 2	19.50	18.94	18.15	19.30
HSDPA Sub 3	19.50	18.50	17.80	19.02
HSDPA Sub 4	19.00	18.14	17.50	18.68
HSUPA Sub 1	20.00	19.00	18.38	19.56
HSUPA Sub 2	20.00	19.18	18.55	19.60
HSUPA Sub 3	19.50	19.02	18.15	19.24
HSUPA Sub 4	20.00	19.18	18.60	19.58
HSUPA Sub 5	19.50	18.89	18.31	19.37
Band	WCDMA Band 5			
Tx Channel	Tune-up	4132	4182	4233
Frequency (MHz)		826.4	836.4	846.6
RMC12.2K	22.00	21.93	21.93	21.91
HSDPA Sub 1	22.00	21.93	21.82	21.42
HSDPA Sub 2	22.00	21.66	21.65	21.18
HSDPA Sub 3	21.50	21.30	21.25	21.02
HSDPA Sub 4	21.50	21.08	21.07	20.58
HSUPA Sub 1	22.00	21.77	21.52	21.31
HSUPA Sub 2	22.00	21.85	21.82	21.30
HSUPA Sub 3	21.50	21.41	21.46	21.11

HSUPA Sub 4	22.00	21.57	21.84	21.38
HSUPA Sub 5	21.50	21.48	21.48	21.25

7.3. LTE Conducted Power

Band	Band Width	Modulation	RB Configuration		Tune-up	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	22.77	22.72	22.79
			1	2	23.00	22.77	22.72	22.79
			1	5	23.00	22.75	22.72	22.83
			3	0	23.00	22.72	22.54	22.76
			3	1	23.00	22.78	22.61	22.72
			3	2	23.00	22.75	22.59	22.62
			6	0	22.00	21.72	21.61	21.65
		16QAM	1	0	23.00	22.69	21.75	21.93
			1	2	23.00	22.67	21.69	21.97
			1	5	23.00	22.68	21.74	21.95
			3	0	22.50	21.94	21.66	22.09
			3	1	22.50	21.97	21.68	22.00
			3	2	22.50	21.95	21.69	22.00
			6	0	21.00	20.86	20.67	20.91
Band	Band Width	Modulation	RB Configuration		Tune-up	Channel/Frequency(MHz)		
			RB Size	RB Offset		18615/1851.5	18900/1880	19185/1908.5
LTE Band 2	3MHz	QPSK	1	0	23.00	22.70	22.71	22.83
			1	7	23.00	22.67	22.69	22.81
			1	14	23.00	22.61	22.77	22.78
			8	0	22.00	21.71	21.60	21.68
			8	4	22.00	21.65	21.65	21.68
			8	7	22.00	21.66	21.69	21.53
			15	0	22.00	21.61	21.50	21.60
		16QAM	1	0	23.00	22.84	21.67	22.03
			1	7	23.00	22.82	21.70	21.98
			1	14	23.00	22.71	21.79	21.87
			8	0	21.00	20.73	20.74	20.76
			8	4	21.00	20.71	20.65	20.76
			8	7	21.00	20.62	20.70	20.71
			15	0	21.00	20.87	20.59	20.79
Band	Band Width	Modulation	RB Configuration		Tune-up	Channel/Frequency(MHz)		
			RB Size	RB Offset		18625/1852.5	18900/1880	19175/1907.5
LTE Band 2	5MHz	QPSK	1	0	23.00	22.63	22.66	22.41
			1	12	23.00	22.48	22.64	22.43
			1	24	23.00	22.49	22.68	22.41
			12	0	22.00	21.67	21.59	21.61

			12	6	22.00	21.69	21.49	21.63
			12	11	22.00	21.53	21.61	21.56
			25	0	22.00	21.52	21.55	21.61
		16QAM	1	0	22.00	21.72	21.21	21.56
			1	12	22.00	21.65	21.24	21.60
			1	24	22.00	21.66	21.27	21.54
			12	0	21.00	20.77	20.52	20.76
			12	6	21.00	20.61	20.56	20.74
			12	11	21.00	20.58	20.59	20.63
			25	0	21.00	20.80	20.70	20.65
Band	Band Width	Modulation	RB Configuration		Tune-up	Channel/Frequency(MHz)		
			RB Size	RB Offset		18650/1855	18900/1880	19150/1905
LTE Band 2	10MHz	QPSK	1	0	23.00	22.64	22.53	22.84
			1	24	23.00	22.49	22.54	22.86
			1	49	23.00	22.53	22.57	22.85
			25	0	22.00	21.64	21.62	21.51
			25	12	22.00	21.61	21.55	21.62
			25	24	22.00	21.53	21.56	21.61
			50	0	22.00	21.58	21.60	21.55
		16QAM	1	0	23.00	22.78	21.58	21.64
			1	24	23.00	22.75	21.62	21.65
			1	49	23.00	22.76	21.71	21.62
			25	0	21.00	20.65	20.71	20.74
			25	12	21.00	20.64	20.74	20.71
			25	24	21.00	20.54	20.75	20.72
			50	0	21.00	20.73	20.77	20.67
Band	Band Width	Modulation	RB Configuration		Tune-up	Channel/Frequency(MHz)		
			RB Size	RB Offset		18675/1857.5	18900/1880	19125/1902.5
LTE Band 2	15MHz	QPSK	1	0	23.00	22.69	22.72	22.56
			1	37	23.00	22.52	22.58	22.41
			1	74	23.00	22.50	22.69	22.46
			36	0	22.00	21.57	21.47	21.63
			36	18	22.00	21.57	21.43	21.59
			36	37	22.00	21.53	21.52	21.59
			75	0	22.00	21.61	21.52	21.59
		16QAM	1	0	23.00	22.87	21.65	22.44
			1	37	23.00	22.73	21.59	22.27
			1	74	23.00	22.77	21.65	22.22
			36	0	21.00	20.73	20.77	20.65
			36	18	21.00	20.68	20.78	20.68
			36	37	21.00	20.71	20.72	20.66
			75	0	21.00	20.71	20.59	20.80
Band	Band Width	Modulation	RB Configuration		Tune-up	Channel/Frequency(MHz)		
			RB Size	RB Offset		18700/1860	18900/1880	19100/1900

LTE Band 2	20MHz	QPSK	1	0	23.00	22.85	22.45	22.83
			1	49	23.00	22.71	22.45	22.66
			1	99	23.00	22.64	22.58	22.75
			50	0	22.00	21.52	21.59	21.62
			50	24	22.00	21.54	21.46	21.57
			50	49	22.00	21.49	21.55	21.53
			100	0	22.00	21.59	21.53	21.55
		16QAM	1	0	22.00	21.39	21.25	21.56
			1	49	22.00	21.28	21.29	21.45
			1	99	22.00	21.29	21.43	21.43
			50	0	21.00	20.78	20.66	20.71
			50	24	21.00	20.69	20.64	20.67
			50	49	21.00	20.74	20.72	20.67
			100	0	21.00	20.68	20.61	20.76

Band	Band Width	Modulation	RB Configuration		Tune-up	Channel/Frequency(MHz)		
			RB Size	RB Offset		19957/1710.7	20175/1732.5	20393/1754.3
LTE Band 4	1.4MHz	QPSK	1	0	23.50	22.80	22.48	22.95
			1	2	23.50	22.70	22.54	22.99
			1	5	23.50	22.66	22.51	22.96
			3	0	23.00	22.69	22.61	22.76
			3	1	23.00	22.73	22.65	22.79
			3	2	23.00	22.67	22.59	22.80
			6	0	22.00	21.64	21.57	21.76
		16QAM	1	0	23.00	22.73	22.26	22.24
			1	2	23.00	22.68	22.37	22.34
			1	5	23.00	22.80	22.35	22.24
			3	0	22.50	21.93	21.77	22.12
			3	1	22.50	21.94	21.77	22.09
			3	2	22.50	21.92	21.77	22.03
			6	0	21.00	20.80	20.61	20.94

Band	Band Width	Modulation	RB Configuration		Tune-up	Channel/Frequency(MHz)		
			RB Size	RB Offset		19965/1711.5	20175/1732.5	20385/1753.5
LTE Band 4	3MHz	QPSK	1	0	23.50	22.67	22.51	22.93
			1	7	23.50	22.79	22.56	22.99
			1	14	23.50	22.69	22.63	22.97
			8	0	22.00	21.67	21.62	21.63
			8	4	22.00	21.68	21.55	21.64
			8	7	22.00	21.66	21.53	21.72
			15	0	22.00	21.65	21.62	21.76
		16QAM	1	0	23.00	22.87	22.28	22.22
			1	7	23.00	22.89	22.30	22.35
			1	14	23.00	22.84	22.35	22.26
			8	0	21.00	20.68	20.95	20.90
			8	4	21.00	20.73	20.93	20.92
			8	7	21.00	20.70	20.97	20.90

			15	0	21.00	20.86	20.74	20.84
Band	Band Width	Modulation	RB Configuration		Tune-up	Channel/Frequency(MHz)		
			RB Size	RB Offset		19975/1712.5	20175/1732.5	20375/1752.5
LTE Band 4	5MHz	QPSK	1	0	23.50	22.63	22.69	22.57
			1	12	23.50	22.57	22.69	22.61
			1	24	23.50	22.55	22.73	22.65
			12	0	22.00	21.70	21.53	21.70
			12	6	22.00	21.66	21.63	21.63
			12	11	22.00	21.77	21.52	21.61
			25	0	22.00	21.74	21.57	21.68
		16QAM	1	0	22.50	21.96	21.28	21.95
			1	12	22.50	22.07	21.30	21.91
			1	24	22.50	21.97	21.35	21.95
			12	0	21.00	20.68	20.54	20.86
			12	6	21.00	20.69	20.58	20.84
			12	11	21.00	20.76	20.62	20.83
			25	0	21.00	20.87	20.76	20.83
Band	Band Width	Modulation	RB Configuration		Tune-up	Channel/Frequency(MHz)		
			RB Size	RB Offset		20000/1715	20175/1732.5	20350/1750
LTE Band 4	10MHz	QPSK	1	0	23.50	22.62	22.61	22.89
			1	24	23.50	22.66	22.60	23.12
			1	49	23.50	22.59	22.66	23.05
			25	0	22.00	21.72	21.56	21.76
			25	12	22.00	21.70	21.69	21.72
			25	24	22.00	21.70	21.69	21.83
			50	0	22.00	21.71	21.57	21.79
		16QAM	1	0	23.00	22.87	21.71	21.98
			1	24	23.00	22.96	21.71	22.09
			1	49	23.00	22.93	21.74	22.08
			25	0	21.00	20.77	20.74	20.83
			25	12	21.00	20.74	20.76	20.88
			25	24	21.00	20.77	20.73	20.80
			50	0	21.00	20.78	20.79	20.93
Band	Band Width	Modulation	RB Configuration		Tune-up	Channel/Frequency(MHz)		
			RB Size	RB Offset		20025/1717.5	20175/1732.5	20325/1747.5
LTE Band 4	15MHz	QPSK	1	0	23.50	23.24	23.14	23.01
			1	37	23.50	23.16	23.12	23.08
			1	74	23.50	23.09	23.13	23.17
			36	0	22.00	21.74	21.69	21.62
			36	18	22.00	21.71	21.52	21.72
			36	37	22.00	21.66	21.65	21.70
			75	0	22.00	21.77	21.55	21.59
		16QAM	1	0	23.50	23.42	22.29	22.92
			1	37	23.50	23.42	22.24	22.99

			1	74	23.50	23.31	22.26	23.00
			36	0	21.00	20.76	20.91	20.76
			36	18	21.00	20.79	20.81	20.78
			36	37	21.00	20.76	20.90	20.80
			75	0	21.00	20.89	20.74	20.93
Band	Band Width	Modulation	RB Configuration		Tune-up	Channel/Frequency(MHz)		
			RB Size	RB Offset		20050/1720	20175/1732.5	20300/1745
LTE Band 4	20MHz	QPSK	1	0	23.50	23.39	23.27	23.10
			1	49	23.50	23.29	23.29	23.23
			1	99	23.50	23.36	23.32	23.36
			50	0	22.00	21.73	21.61	21.57
			50	24	22.00	21.61	21.62	21.65
			50	49	22.00	21.56	21.63	21.88
			100	0	22.00	21.64	21.64	21.66
		16QAM	1	0	23.00	22.52	22.11	21.55
			1	49	23.00	22.41	22.10	21.61
			1	99	23.00	22.43	22.10	21.70
			50	0	21.50	20.80	20.71	20.84
			50	24	21.50	20.83	20.76	20.87
			50	49	21.50	20.69	20.76	21.07
			100	0	21.00	20.78	20.78	20.80

Band	Band Width	Modulation	RB Configuration		Tune-up	Channel/Frequency(MHz)		
			RB Size	RB Offset		20407/824.7	20525/836.5	20643/848.3
LTE Band 5	1.4MHz	QPSK	1	0	23.00	22.48	22.21	22.47
			1	2	23.00	22.48	22.25	22.40
			1	5	23.00	22.48	22.28	22.38
			3	0	22.50	22.39	22.33	22.18
			3	1	22.50	22.41	22.31	22.36
			3	2	22.50	22.42	22.30	22.33
			6	0	22.00	21.24	21.54	21.14
		16QAM	1	0	22.50	22.38	21.85	22.12
			1	2	22.50	22.39	22.22	22.03
			1	5	22.50	22.40	22.21	22.19
			3	0	22.00	21.48	21.63	21.54
			3	1	22.00	21.58	21.61	21.60
			3	2	22.00	21.64	21.60	21.63
			6	0	21.00	20.83	20.55	20.69
Band	Band Width	Modulation	RB Configuration		Tune-up	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	22.39	22.23	22.39
			1	7	23.00	22.32	22.22	22.34
			1	14	23.00	22.38	22.18	22.47
			8	0	22.00	21.35	21.30	21.13

			8	4	22.00	21.34	21.55	21.17
			8	7	22.00	21.31	21.52	21.17
			15	0	22.00	21.41	21.62	21.17
		16QAM	1	0	22.50	22.13	21.85	22.02
			1	7	22.50	22.11	22.22	22.02
			1	14	22.50	22.13	22.11	22.09
			8	0	21.00	20.53	20.33	20.53
			8	4	21.00	20.52	20.76	20.57
			8	7	21.00	20.27	20.75	20.58
			15	0	21.00	20.71	20.66	20.54
Band	Band Width	Modulation	RB Configuration		Tune-up	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	22.17	22.29	22.00
			1	12	23.00	22.23	22.30	22.02
			1	24	23.00	22.23	22.23	22.04
			12	0	22.00	21.42	21.30	21.07
			12	6	22.00	21.31	21.63	21.18
			12	11	22.00	21.38	21.56	21.14
			25	0	22.00	21.36	21.58	21.19
		16QAM	1	0	21.50	21.47	20.96	21.16
			1	12	21.50	21.47	21.24	21.11
			1	24	21.50	21.45	21.27	21.07
			12	0	21.00	20.58	20.19	20.54
			12	6	21.00	20.26	20.53	20.51
			12	11	21.00	20.31	20.44	20.49
			25	0	21.00	20.40	20.66	20.49
Band	Band Width	Modulation	RB Configuration		Tune-up	Channel/Frequency(MHz)		
			RB Size	RB Offset		20450/829	20525/836.5	20600/844
LTE Band 5	10MHz	QPSK	1	0	23.00	22.37	22.14	22.46
			1	24	23.00	22.35	22.22	22.51
			1	49	23.00	22.30	22.18	22.43
			25	0	22.00	21.34	21.26	21.16
			25	12	22.00	21.30	21.54	21.46
			25	24	22.00	21.25	21.62	21.15
			50	0	22.00	21.44	21.59	21.63
		16QAM	1	0	22.50	22.36	21.23	21.51
			1	24	22.50	22.45	21.55	21.49
			1	49	22.50	22.33	21.18	21.21
			25	0	21.00	20.23	20.32	20.66
			25	12	21.00	20.24	20.62	20.57
			25	24	21.00	20.58	20.66	20.55
			50	0	21.00	20.34	20.68	20.63

Band	Band Width	Modulation	RB Configuration		Tune-up	Channel/Frequency(MHz)		
			RB	RB		20775/2502.5	21100/2535	21425/2567.5

			Size	Offset				
LTE Band 7	5MHz	QPSK	1	0	22.50	21.91	21.91	22.16
			1	12	22.50	21.92	21.86	22.03
			1	24	22.50	21.95	21.86	22.12
			12	0	21.50	20.94	21.05	21.08
			12	6	21.50	20.81	21.02	21.14
			12	11	21.50	20.96	20.89	21.11
			25	0	21.50	20.96	21.06	21.01
		16QAM	1	0	22.00	21.14	21.25	21.56
			1	12	22.00	21.09	21.19	21.40
			1	24	22.00	21.11	21.19	21.46
			12	0	20.50	19.80	20.10	20.01
			12	6	20.50	19.83	20.12	19.97
			12	11	20.50	19.82	20.02	20.00
			25	0	20.50	20.04	20.13	20.15
Band	Band Width	Modulation	RB Configuration		Tune-up	Channel/Frequency(MHz)		
			RB Size	RB Offset		20800/2505	21100/2535	21400/2565
LTE Band 7	10MHz	QPSK	1	0	22.50	21.79	21.99	22.38
			1	24	22.50	21.78	22.00	22.44
			1	49	22.50	21.79	22.06	22.41
			25	0	21.50	20.88	20.98	20.98
			25	12	21.50	21.00	21.03	21.15
			25	24	21.50	20.91	20.95	21.08
			50	0	21.50	20.94	21.08	21.23
		16QAM	1	0	22.50	22.06	21.82	21.24
			1	24	22.50	22.05	21.76	21.31
			1	49	22.50	22.11	21.82	21.25
			25	0	20.50	19.92	20.13	20.20
			25	12	20.50	19.97	20.16	20.35
			25	24	20.50	19.98	20.16	20.24
			50	0	20.50	19.91	20.21	20.34
Band	Band Width	Modulation	RB Configuration		Tune-up	Channel/Frequency(MHz)		
			RB Size	RB Offset		20825/2507.5	21100/2535	21375/2562.5
LTE Band 7	15MHz	QPSK	1	0	22.50	21.88	22.18	22.03
			1	37	22.50	21.86	22.06	22.02
			1	74	22.50	22.02	22.15	22.10
			36	0	21.50	20.99	21.12	21.14
			36	18	21.50	20.99	20.98	21.01
			36	37	21.50	21.01	21.01	21.03
			75	0	21.50	20.97	21.05	21.08
		16QAM	1	0	22.50	22.16	21.10	21.86
			1	37	22.50	22.23	21.06	21.86
			1	74	22.50	22.35	21.02	21.91
			36	0	20.50	20.05	20.29	20.26
			36	18	20.50	20.08	20.33	20.15

			36	37	20.50	20.10	20.37	20.16
			75	0	20.50	20.16	20.14	20.27
Band	Band Width	Modulation	RB Configuration		Tune-up	Channel/Frequency(MHz)		
			RB Size	RB Offset		20850/2510	21100/2535	21350/2560
LTE Band 7	20MHz	QPSK	1	0	22.50	21.92	21.94	22.01
			1	49	22.50	21.87	21.82	22.05
			1	99	22.50	22.03	21.93	22.14
			50	0	21.50	21.01	21.09	21.04
			50	24	21.50	20.96	21.05	21.13
			50	49	21.50	20.97	21.12	21.22
			100	0	21.50	20.98	20.98	21.15
		16QAM	1	0	21.50	20.72	21.42	20.99
			1	49	21.50	20.74	21.28	21.05
			1	99	21.50	21.08	21.30	21.18
			50	0	20.50	20.16	20.09	20.21
			50	24	20.50	20.14	20.14	20.23
			50	49	20.50	20.22	20.24	20.31
			100	0	20.50	20.14	20.10	20.22

Band	Band Width	Modulation	RB Configuration		Tune-up	Channel/Frequency(MHz)		
			RB Size	RB Offset		23755/706.5	23790/710	23825/713.5
LTE Band 17	5MHz	QPSK	1	0	20.00	19.30	19.15	19.47
			1	12	20.00	19.36	19.48	19.39
			1	24	20.00	18.94	19.45	18.99
			12	0	19.00	18.52	18.16	18.44
			12	6	19.00	18.56	18.53	18.39
			12	11	19.00	18.23	18.47	18.42
			25	0	19.00	18.50	18.50	18.44
		16QAM	1	0	19.50	19.09	18.20	18.05
			1	12	19.50	19.18	18.60	18.11
			1	24	19.50	18.77	18.52	17.80
			12	0	18.00	17.51	17.48	17.38
			12	6	18.00	17.46	17.39	17.32
			12	11	18.00	17.45	17.43	17.31
			25	0	18.00	17.60	17.61	17.53
Band	Band Width	Modulation	RB Configuration		Tune-up	Channel/Frequency(MHz)		
			RB Size	RB Offset		23780/709	23790/710	23800/711
LTE Band 17	10MHz	QPSK	1	0	20.00	19.36	19.47	19.79
			1	24	20.00	19.09	19.51	19.70
			1	49	20.00	19.42	19.42	19.30
			25	0	19.00	18.59	18.25	18.19
			25	12	19.00	18.23	18.50	18.52
			25	24	19.00	18.52	18.48	18.47
			50	0	18.50	18.20	18.48	18.46

		16QAM	1	0	19.50	19.37	19.13	18.46
			1	24	19.50	19.04	19.06	18.46
			1	49	19.50	19.38	19.10	18.13
			25	0	18.00	17.37	17.67	17.63
			25	12	18.00	17.43	17.56	17.55
			25	24	18.00	17.44	17.60	17.54
			50	0	18.00	17.46	17.59	17.54

7.4. WLAN & Bluetooth Output Power

7.4.1. Output Power Results Of WLAN

Mode	Channel	Frequency (MHz)	Tune-up	Output Power (dBm)
802.11b	1	2412	15.50	14.90
	6	2437	15.50	15.05
	11	2462	15.50	15.17
802.11g	1	2412	15.00	14.02
	6	2437	15.00	14.32
	11	2462	15.00	14.50
802.11n HT20	1	2412	15.00	14.14
	6	2437	15.00	14.52
	11	2462	15.00	14.78
802.11n HT40	3	2422	14.00	13.65
	6	2437	14.00	13.97
	9	2452	14.00	13.96

NOTE: Power measurement results of WLAN 2.4G.

Mode	Channel	Frequency (MHz)	Tune-up	Output Power (dBm)
802.11a	36	5180	10.000	9.666
	40	5200	10.000	9.650
	48	5240	10.000	9.986
802.11n HT20	36	5180	10.500	9.965
	40	5200	10.500	9.942
	48	5240	10.500	10.264
802.11n HT40	38	5190	10.000	9.607
	46	5230	10.000	9.968
802.11ac VHT20	36	5180	10.500	9.970
	40	5200	10.500	10.108
	48	5240	10.500	10.227
802.11ac VHT40	38	5190	10.500	9.656
	46	5230	10.500	10.010

802.11ac VHT80	42	5210	10.500	10.117

NOTE: Power measurement results of WLAN 5.2G.

Mode	Channel	Frequency (MHz)	Tune-up	Output Power (dBm)
802.11a	52	5260	10.500	9.505
	56	5280	10.500	9.471
	64	5320	10.500	10.089
802.11n HT20	52	5260	10.500	9.879
	56	5280	10.500	9.569
	64	5320	10.500	10.389
802.11n HT40	54	5270	11.000	10.607
	62	5310	11.000	10.422
802.11ac VHT20	52	5260	11.000	9.610
	56	5280	11.000	9.672
	64	5320	11.000	10.511
802.11ac VHT40	54	5270	11.000	10.610
	62	5310	11.000	10.251
802.11ac VHT80	58	5290	11.500	11.442

NOTE: Power measurement results of WLAN 5.3G

Mode	Channel	Frequency (MHz)	Tune-up	Output Power (dBm)
802.11a	100	5500	10.000	9.673
	120	5600	10.000	9.666
	140	5700	10.000	9.965
802.11n	100	5500	10.500	10.020
	120	5600	10.500	9.864
	140	5700	10.500	10.257
802.11n	102	5510	10.500	9.779
	118	5590	10.500	9.824
	134	5670	10.500	10.359
802.11ac (VHT20)	100	5500	10.500	9.940
	120	5600	10.500	9.816
	140	5700	10.500	10.320
802.11ac (VHT40)	102	5510	10.500	9.808
	118	5590	10.500	9.877
	134	5670	10.500	10.371
802.11ac (VHT80)	106	5530	11.500	11.117

	122	5610	11.500	11.257

NOTE: Power measurement results of WLAN 5.6G

Mode	Channel	Frequency (MHz)	Tune-up	Output Power (dBm)
802.11a	149	5745	10.500	10.438
	157	5785	10.500	10.223
	165	5825	10.500	10.324
802.11n HT20	149	5745	10.500	10.496
	157	5785	10.500	10.316
	165	5825	10.500	10.209
802.11n HT40	151	5755	11.000	10.053
	159	5795	11.000	10.595
802.11ac VHT20	149	5745	10.500	10.469
	157	5785	10.500	10.420
	165	5825	10.500	10.383
802.11ac VHT40	151	5755	11.000	9.977
	159	5795	11.000	10.602
802.11ac VHT80	155	5775	12.000	11.889

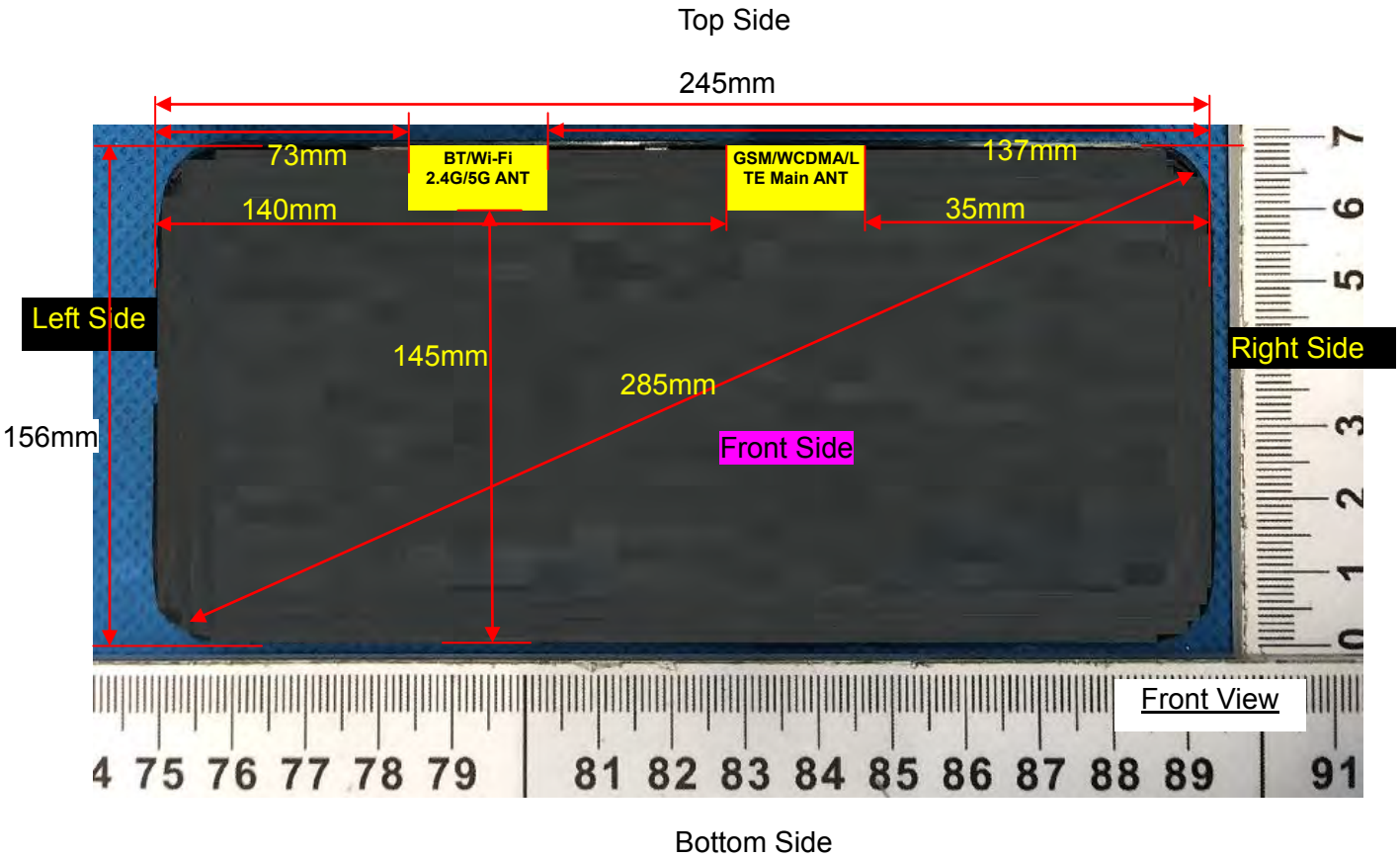
NOTE: Power measurement results of WLAN 5.8G

7.4.2. Output Power Results Of Bluetooth

	Output Power (dBm)				
	Data Rates	Tune-up	Channel		
			0CH	39CH	78CH
BR+EDR	1M	7.500	5.578	7.496	6.219
	2M	9.400	7.437	9.376	8.086
	3M	9.700	7.764	9.691	8.408

	Channel	Tune-up	Output Power (dBm)	
			1M	2M
BLE	0CH	6.000	5.418	5.306
	19CH	7.000	6.730	6.666
	39CH	7.000	6.088	6.035

8. Antenna Location



Note: Since the confidentiality request of EUT，the antenna location example diagram see as above.

Distance of the Antenna to the EUT surface/edge						
Antennas	Front Side	Back Side	Left Side	Right Side	Top Side	Bottom Side
WWAN Main	5	5	140	35	5	145
WLAN & Bluetooth	5	5	73	137	5	145

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

Positions for SAR tests		
Test separation distances ≤ 50 mm		
Exposure Positions	Tune-up Maximum power of WLAN 2.4G	
	15.5dBm	
Front Side	Antenna to user(mm)	5
	SAR exclusion threshold	11.1
	SAR testing required?	YES
Back Side	Antenna to user(mm)	5
	SAR exclusion threshold	11.1
	SAR testing required?	YES
Top Side	Antenna to user(mm)	5

	SAR exclusion threshold	11.1
	SAR testing required?	YES
Exposure Positions	Tune-up Maximum power of WLAN 5.2G	
	10.5dBm	
Front Side	Antenna to user(mm)	5
	SAR exclusion threshold	5.1
	SAR testing required?	YES
Back Side	Antenna to user(mm)	5
	SAR exclusion threshold	5.1
	SAR testing required?	YES
Top Side	Antenna to user(mm)	5
	SAR exclusion threshold	5.1
	SAR testing required?	YES
Exposure Positions	Tune-up Maximum power of WLAN 5.3G	
	11.5dBm	
Front Side	Antenna to user(mm)	5
	SAR exclusion threshold	6.5
	SAR testing required?	YES
Back Side	Antenna to user(mm)	5
	SAR exclusion threshold	6.5
	SAR testing required?	YES
Top Side	Antenna to user(mm)	5
	SAR exclusion threshold	6.5
	SAR testing required?	YES
Exposure Positions	Tune-up Maximum power of WLAN 5.6G	
	11.5dBm	
Front Side	Antenna to user(mm)	5
	SAR exclusion threshold	6.7
	SAR testing required?	YES
Back Side	Antenna to user(mm)	5
	SAR exclusion threshold	6.7
	SAR testing required?	YES
Top Side	Antenna to user(mm)	5
	SAR exclusion threshold	6.7
	SAR testing required?	YES
Exposure Positions	Tune-up Maximum power of WLAN 5.8G	
	12dBm	
Front Side	Antenna to user(mm)	5
	SAR exclusion threshold	7.7
	SAR testing required?	YES

Back Side	Antenna to user(mm)	5
	SAR exclusion threshold	7.7
	SAR testing required?	YES
Top Side	Antenna to user(mm)	5
	SAR exclusion threshold	7.7
	SAR testing required?	YES
Exposure Positions	Tune-up Maximum power of GSM850	
	32dBm	
Front Side	Antenna to user(mm)	5
	SAR exclusion threshold	292.2
	SAR testing required?	YES
Back Side	Antenna to user(mm)	5
	SAR exclusion threshold	292.2
	SAR testing required?	YES
Right Side	Antenna to user(mm)	35
	SAR exclusion threshold	41.7
	SAR testing required?	YES
Top Side	Antenna to user(mm)	5
	SAR exclusion threshold	292.2
	SAR testing required?	YES
Exposure Positions	Tune-up Maximum power of GSM1900	
	27.5dBm	
Front Side	Antenna to user(mm)	5
	SAR exclusion threshold	155.4
	SAR testing required?	YES
Back Side	Antenna to user(mm)	5
	SAR exclusion threshold	155.4
	SAR testing required?	YES
Right Side	Antenna to user(mm)	35
	SAR exclusion threshold	22.2
	SAR testing required?	YES
Top Side	Antenna to user(mm)	5
	SAR exclusion threshold	155.4
	SAR testing required?	YES
Exposure Positions	Tune-up Maximum power of WCDMA Band 2	
	20dBm	
Front Side	Antenna to user(mm)	5
	SAR exclusion threshold	27.6
	SAR testing required?	YES
Back Side	Antenna to user(mm)	5

	SAR exclusion threshold	27.6
	SAR testing required?	YES
Right Side	Antenna to user(mm)	35
	SAR exclusion threshold	3.9
	SAR testing required?	YES
Top Side	Antenna to user(mm)	5
	SAR exclusion threshold	27.6
	SAR testing required?	YES
Exposure Positions	Tune-up Maximum power of WCDMA Band 4	
	20.5dBm	
Front Side	Antenna to user(mm)	5
	SAR exclusion threshold	30.1
	SAR testing required?	YES
Back Side	Antenna to user(mm)	5
	SAR exclusion threshold	30.1
	SAR testing required?	YES
Right Side	Antenna to user(mm)	35
	SAR exclusion threshold	4.3
	SAR testing required?	YES
Top Side	Antenna to user(mm)	5
	SAR exclusion threshold	30.1
	SAR testing required?	YES
Exposure Positions	Tune-up Maximum power of WCDMA Band 5	
	22dBm	
Front Side	Antenna to user(mm)	5
	SAR exclusion threshold	29.2
	SAR testing required?	YES
Back Side	Antenna to user(mm)	5
	SAR exclusion threshold	29.2
	SAR testing required?	YES
Right Side	Antenna to user(mm)	35
	SAR exclusion threshold	4.2
	SAR testing required?	YES
Top Side	Antenna to user(mm)	5
	SAR exclusion threshold	29.2
	SAR testing required?	YES
Exposure Positions	Tune-up Maximum power of LTE Band 2	
	23dBm	
Front Side	Antenna to user(mm)	5
	SAR exclusion threshold	55.2

	SAR testing required?	YES
Back Side	Antenna to user(mm)	5
	SAR exclusion threshold	55.2
	SAR testing required?	YES
Right Side	Antenna to user(mm)	35
	SAR exclusion threshold	7.9
	SAR testing required?	YES
Top Side	Antenna to user(mm)	5
	SAR exclusion threshold	55.2
	SAR testing required?	YES
Exposure Positions	Tune-up Maximum power of LTE Band 4	
	23.5dBm	
Front Side	Antenna to user(mm)	5
	SAR exclusion threshold	60.1
	SAR testing required?	YES
Back Side	Antenna to user(mm)	5
	SAR exclusion threshold	60.1
	SAR testing required?	YES
Right Side	Antenna to user(mm)	35
	SAR exclusion threshold	8.6
	SAR testing required?	YES
Top Side	Antenna to user(mm)	5
	SAR exclusion threshold	60.1
	SAR testing required?	YES
Exposure Positions	Tune-up Maximum power of LTE Band 5	
	23dBm	
Front Side	Antenna to user(mm)	5
	SAR exclusion threshold	36.8
	SAR testing required?	YES
Back Side	Antenna to user(mm)	5
	SAR exclusion threshold	36.8
	SAR testing required?	YES
Right Side	Antenna to user(mm)	35
	SAR exclusion threshold	5.3
	SAR testing required?	YES
Top Side	Antenna to user(mm)	5
	SAR exclusion threshold	36.8
	SAR testing required?	YES
Exposure Positions	Tune-up Maximum power of LTE Band 7	
	22.5dBm	

Front Side	Antenna to user(mm)	5
	SAR exclusion threshold	57.0
	SAR testing required?	YES
Back Side	Antenna to user(mm)	5
	SAR exclusion threshold	57.0
	SAR testing required?	YES
Right Side	Antenna to user(mm)	35
	SAR exclusion threshold	8.1
	SAR testing required?	YES
Top Side	Antenna to user(mm)	5
	SAR exclusion threshold	57.0
	SAR testing required?	YES
Exposure Positions	Tune-up Maximum power of LTE Band 17	
	20dBm	
Front Side	Antenna to user(mm)	5
	SAR exclusion threshold	17.3
	SAR testing required?	YES
Back Side	Antenna to user(mm)	5
	SAR exclusion threshold	17.3
	SAR testing required?	YES
Right Side	Antenna to user(mm)	35
	SAR exclusion threshold	2.5
	SAR testing required?	**NO**
Top Side	Antenna to user(mm)	5
	SAR exclusion threshold	17.3
	SAR testing required?	YES

NOTE: Refer to section 4.3.1 of KDB 447498 D01.

Positions for SAR tests		
Test separation distances > 50 mm		
Exposure Positions	Tune-up Maximum power of WLAN 2.4G	
	15.50dBm	35.48mW
Left Side	Antenna to user(mm)	73
	SAR exclusion threshold(mW)	326
	SAR testing required?	NO
Right Side	Antenna to user(mm)	137
	SAR exclusion threshold(mW)	966
	SAR testing required?	NO
Bottom Side	Antenna to user(mm)	145
	SAR exclusion threshold(mW)	1046

	SAR testing required?	NO
Exposure Positions	Tune-up Maximum power of WLAN 5.2G	
	10.50dBm	11.22mW
Left Side	Antenna to user(mm)	73
	SAR exclusion threshold(mW)	296
	SAR testing required?	NO
Right Side	Antenna to user(mm)	137
	SAR exclusion threshold(mW)	936
	SAR testing required?	NO
Bottom Side	Antenna to user(mm)	145
	SAR exclusion threshold(mW)	1016
	SAR testing required?	NO
Exposure Positions	Tune-up Maximum power of WLAN 5.3G	
	11.50dBm	14.13mW
Left Side	Antenna to user(mm)	73
	SAR exclusion threshold(mW)	295
	SAR testing required?	NO
Right Side	Antenna to user(mm)	137
	SAR exclusion threshold(mW)	935
	SAR testing required?	NO
Bottom Side	Antenna to user(mm)	145
	SAR exclusion threshold(mW)	1015
	SAR testing required?	NO
Exposure Positions	Tune-up Maximum power of WLAN 5.6G	
	11.50dBm	14.13mW
Left Side	Antenna to user(mm)	73
	SAR exclusion threshold(mW)	293
	SAR testing required?	NO
Right Side	Antenna to user(mm)	137
	SAR exclusion threshold(mW)	933
	SAR testing required?	NO
Bottom Side	Antenna to user(mm)	145
	SAR exclusion threshold(mW)	1013
	SAR testing required?	NO
Exposure Positions	Tune-up Maximum power of WLAN 5.8G	
	12.00dBm	15.85mW
Left Side	Antenna to user(mm)	73
	SAR exclusion threshold(mW)	292
	SAR testing required?	NO
Right Side	Antenna to user(mm)	137

	SAR exclusion threshold(mW)	932
	SAR testing required?	NO
Bottom Side	Antenna to user(mm)	145
	SAR exclusion threshold(mW)	1012
	SAR testing required?	NO
Exposure Positions	Tune-up Maximum power of GSM850	
	32.00dBm	1584.89mW
Left Side	Antenna to user(mm)	140
	SAR exclusion threshold(mW)	665
	SAR testing required?	**YES**
Bottom Side	Antenna to user(mm)	145
	SAR exclusion threshold(mW)	693
	SAR testing required?	**YES**
Exposure Positions	Tune-up Maximum power of GSM1900	
	27.50dBm	562.34mW
Left Side	Antenna to user(mm)	140
	SAR exclusion threshold(mW)	1009
	SAR testing required?	NO
Bottom Side	Antenna to user(mm)	145
	SAR exclusion threshold(mW)	1059
	SAR testing required?	NO
Exposure Positions	Tune-up Maximum power of WCDMA Band 2	
	20.00dBm	100mW
Left Side	Antenna to user(mm)	140
	SAR exclusion threshold(mW)	1009
	SAR testing required?	NO
Bottom Side	Antenna to user(mm)	145
	SAR exclusion threshold(mW)	1059
	SAR testing required?	NO
Exposure Positions	Tune-up Maximum power of WCDMA Band 4	
	20.50dBm	112.20mW
Left Side	Antenna to user(mm)	140
	SAR exclusion threshold(mW)	1009
	SAR testing required?	NO
Bottom Side	Antenna to user(mm)	145
	SAR exclusion threshold(mW)	1059
	SAR testing required?	NO
Exposure Positions	Tune-up Maximum power of WCDMA Band 5	
	22.00dBm	158.49mW
Left Side	Antenna to user(mm)	140

	SAR exclusion threshold(mW)	665
	SAR testing required?	NO
Bottom Side	Antenna to user(mm)	145
	SAR exclusion threshold(mW)	693
	SAR testing required?	NO
Exposure Positions	Tune-up Maximum power of LTE Band 2	
	23.00dBm	199.52mW
Left Side	Antenna to user(mm)	140
	SAR exclusion threshold(mW)	1009
	SAR testing required?	NO
Bottom Side	Antenna to user(mm)	145
	SAR exclusion threshold(mW)	1059
	SAR testing required?	NO
Exposure Positions	Tune-up Maximum power of LTE Band 4	
	23.50dBm	223.87mW
Left Side	Antenna to user(mm)	140
	SAR exclusion threshold(mW)	1009
	SAR testing required?	NO
Bottom Side	Antenna to user(mm)	145
	SAR exclusion threshold(mW)	1059
	SAR testing required?	NO
Exposure Positions	Tune-up Maximum power of LTE Band 5	
	23.00dBm	199.52mW
Left Side	Antenna to user(mm)	140
	SAR exclusion threshold(mW)	665
	SAR testing required?	NO
Bottom Side	Antenna to user(mm)	145
	SAR exclusion threshold(mW)	693
	SAR testing required?	NO
Exposure Positions	Tune-up Maximum power of LTE Band 7	
	22.50dBm	177.83mW
Left Side	Antenna to user(mm)	140
	SAR exclusion threshold(mW)	979
	SAR testing required?	NO
Bottom Side	Antenna to user(mm)	145
	SAR exclusion threshold(mW)	1029
	SAR testing required?	NO
Exposure Positions	Tune-up Maximum power of LTE Band 17	
	20.00dBm	100mW
Left Side	Antenna to user(mm)	140

	SAR exclusion threshold(mW)	665
	SAR testing required?	NO
Bottom Side	Antenna to user(mm)	145
	SAR exclusion threshold(mW)	693
	SAR testing required?	NO

NOTE: Refer to section 4.3.1 of KDB 447498 D01.

9. 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	9.70	9.33	5	2.480	2.94	3	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	Body	9.70	9.33	5	2.48	7.5	0.392

NOTE: Estimated SAR calculation for Bluetooth.

10. SAR Results

10.1. SAR measurement results

10.1.1. SAR measurement Result of GSM850

Test Position of Body with 0mm	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 Side	189/836.4	GSM Voice	0.435	0.218	-1.00	31.47	32.00	0.491	2021/9/13
Back Side	189/836.4	GSM Voice	0.823	0.416	-3.31	31.47	32.00	0.930	2021/9/13
Back Side Repeated	189/836.4	GSM Voice	0.818	0.412	0.33	31.47	32.00	0.924	2021/9/13
Left Side	189/836.4	GSM Voice	0.069	0.034	0.49	31.47	32.00	0.078	2021/9/13
Right Side	189/836.4	GSM Voice	0.085	0.042	-3.26	31.47	32.00	0.096	2021/9/13
Top Side	189/836.4	GSM Voice	0.588	0.288	-1.14	31.47	32.00	0.664	2021/9/13
Bottom Side	189/836.4	GSM Voice	0.075	0.037	-3.18	31.47	32.00	0.085	2021/9/13
Back Side	128/824.2	GSM Voice	0.664	0.329	0.08	31.02	32.00	0.832	2021/9/13
Back Side	251/848.8	GSM Voice	0.730	0.365	-1.31	31.55	32.00	0.810	2021/9/13

NOTE: Body SAR test results of GSM850

10.1.2. SAR measurement Result of GSM1900

Test Position of Body with 0mm	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 Side	661/1880	GSM Voice	0.156	0.065	-2.01	26.89	27.50	0.180	2021/9/20
Back Side	661/1880	GSM Voice	0.221	0.096	0.30	26.89	27.50	0.254	2021/9/20
Right Side	661/1880	GSM Voice	0.030	0.012	-2.40	26.89	27.50	0.035	2021/9/20
Top Side	661/1880	GSM Voice	0.175	0.075	-2.30	26.89	27.50	0.201	2021/9/20

NOTE: Body SAR test results of GSM1900

10.1.3. SAR measurement Result of WCDMA Band 2

Test Position of Body with 0mm	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 Side	9400/1880	RMC12.2K	0.185	0.076	0.64	19.52	20.00	0.207	2021/9/20
Back Side	9400/1880	RMC12.2K	0.330	0.140	-0.71	19.52	20.00	0.369	2021/9/20

Right Side	9400/1880	RMC12.2K	0.038	0.015	-2.45	19.52	20.00	0.042	2021/9/20
Top Side	9400/1880	RMC12.2K	0.231	0.094	3.59	19.52	20.00	0.258	2021/9/20

NOTE: Body SAR test results of WCDMA Band 2

10.1.4. SAR measurement Result of WCDMA Band 4

Test Position of Body with 0mm	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 Side	1413/1732.6	RMC12.2K	0.355	0.169	-1.34	19.83	20.50	0.414	2021/9/17
Back Side	1413/1732.6	RMC12.2K	0.710	0.341	-3.98	19.83	20.50	0.828	2021/9/17
Right Side	1413/1732.6	RMC12.2K	0.071	0.034	1.95	19.83	20.50	0.083	2021/9/17
Top Side	1413/1732.6	RMC12.2K	0.532	0.253	0.83	19.83	20.50	0.621	2021/9/17
Back Side	1312/1712.4	RMC12.2K	0.608	0.277	2.78	20.19	20.50	0.653	2021/9/17
Back Side	1513/1752.6	RMC12.2K	0.623	0.293	-2.06	20.01	20.50	0.697	2021/9/17

NOTE: Body SAR test results of WCDMA Band 4

10.1.5. SAR measurement Result of WCDMA Band 5

Test Position of Body with 0mm	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 Side	4182/836.4	RMC12.2K	0.485	0.255	1.24	21.93	22.00	0.493	2021/9/13
Back Side	4182/836.4	RMC12.2K	0.937	0.502	-0.46	21.93	22.00	0.952	2021/9/13
Back Side Repeated	4182/836.4	RMC12.2K	0.930	0.496	1.23	21.93	22.00	0.945	2021/9/13
Right Side	4182/836.4	RMC12.2K	0.095	0.051	0.22	21.93	22.00	0.097	2021/9/13
Top Side	4182/836.4	RMC12.2K	0.658	0.335	-3.95	21.93	22.00	0.669	2021/9/13
Back Side	4132/826.4	RMC12.2K	0.780	0.410	-2.21	21.93	22.00	0.793	2021/9/13
Back Side	4233/846.6	RMC12.2K	0.872	0.458	-1.16	21.91	22.00	0.890	2021/9/13

NOTE: Body SAR test results of WCDMA Band 5

10.1.6. SAR measurement Result of LTE Band 2

Test Position of Body with 0mm	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 Side	18900/1880	20M QPSK(1,0)	0.175	0.073	3.58	22.45	23.00	0.199	2021/9/20
Back Side	18900/1880	20M QPSK(1,0)	0.338	0.142	-2.56	22.45	23.00	0.384	2021/9/20
Right Side	18900/1880	20M QPSK(1,0)	0.038	0.015	1.86	22.45	23.00	0.043	2021/9/20
Top Side	18900/1880	20M QPSK(1,0)	0.252	0.104	-3.67	22.45	23.00	0.286	2021/9/20
50%RB									
Front Side	18900/1880	20M QPSK(50,0)	0.101	0.044	1.84	21.59	22.00	0.111	2021/9/20
Back Side	18900/1880	20M QPSK(50,0)	0.182	0.071	-2.88	21.59	22.00	0.200	2021/9/20
Right Side	18900/1880	20M QPSK(50,0)	0.020	0.008	3.75	21.59	22.00	0.022	2021/9/20
Top Side	18900/1880	20M QPSK(50,0)	0.138	0.061	1.83	21.59	22.00	0.152	2021/9/20

NOTE: Body SAR test results of LTE Band 2

10.1.7. SAR measurement Result of LTE Band 4

Test Position of Body with 0mm	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 Side	20175/1732.5	20M QPSK(1,0)	0.420	0.202	0.01	23.27	23.50	0.443	2021/9/17
Back Side	20175/1732.5	20M QPSK(1,0)	0.823	0.395	1.23	23.27	23.50	0.868	2021/9/17
Right Side	20175/1732.5	20M QPSK(1,0)	0.084	0.040	-1.96	23.27	23.50	0.089	2021/9/17
Top Side	20175/1732.5	20M QPSK(1,0)	0.609	0.286	0.87	23.27	23.50	0.642	2021/9/17
Back Side	20050/1720	20M QPSK(1,0)	0.757	0.375	-1.76	23.39	23.50	0.776	2021/9/17
Back Side	20300/1745	20M QPSK(1,0)	0.939	0.439	-1.84	23.10	23.50	1.030	2021/9/17
Back Side Repeated	20300/1745	20M QPSK(1,0)	0.930	0.434	0.27	23.10	23.50	1.020	2021/9/17

50%RB									
Front Side	20175/1732.5	20M QPSK(50,49)	0.216	0.116	0.01	21.63	22.00	0.235	2021/9/17
Back Side	20175/1732.5	20M QPSK(50,49)	0.436	0.213	3.59	21.63	22.00	0.475	2021/9/17
Right Side	20175/1732.5	20M QPSK(50,49)	0.042	0.023	-0.12	21.63	22.00	0.046	2021/9/17
Top Side	20175/1732.5	20M QPSK(50,49)	0.341	0.155	4.07	21.63	22.00	0.371	2021/9/17
100%RB									
Back Side	20175/1732.5	20M QPSK(100,0)	0.411	0.208	1.77	21.64	22.00	0.447	2021/9/17

NOTE: Body SAR test results of LTE Band 4

10.1.8. SAR measurement Result of LTE Band 5

Test Position of Body with 0mm	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 Side	20525/836.5	10M QPSK(1,24)	0.505	0.266	0.24	22.22	23.00	0.604	2021/9/13
Back Side	20525/836.5	10M QPSK(1,24)	0.977	0.526	-0.80	22.22	23.00	1.169	2021/9/13
Back Side Repeated	20525/836.5	10M QPSK(1,24)	0.971	0.520	1.18	22.22	23.00	1.162	2021/9/13
Right Side	20525/836.5	10M QPSK(1,24)	0.102	0.054	0.53	22.22	23.00	0.122	2021/9/13
Top Side	20525/836.5	10M QPSK(1,24)	0.655	0.369	-3.00	22.22	23.00	0.784	2021/9/13
Back Side	20450/829	10M QPSK(1,24)	0.800	0.413	1.95	22.35	23.00	0.929	2021/9/13
Back Side	20600/844	10M QPSK(1,24)	0.847	0.447	-3.73	22.51	23.00	0.948	2021/9/13
50%RB									
Front Side	20525/836.5	10M QPSK(25,24)	0.289	0.156	2.30	21.62	22.00	0.315	2021/9/13
Back Side	20525/836.5	10M QPSK(25,24)	0.555	0.313	1.89	21.62	22.00	0.606	2021/9/13

Right Side	20525/836.5	10M QPSK(25,24)	0.058	0.029	3.66	21.62	22.00	0.063	2021/9/13
Top Side	20525/836.5	10M QPSK(25,24)	0.368	0.198	1.41	21.62	22.00	0.402	2021/9/13
100%RB									
Back Side	20525/836.5	10M QPSK(50,0)	0.510	0.302	0.44	21.59	22.00	0.560	2021/9/13

NOTE: Body SAR test results of LTE Band 5

10.1.9. SAR measurement Result of LTE Band 7

Test Position of Body with 0mm	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 Side	21100/2535	20M QPSK(1,99)	0.505	0.196	-2.66	21.93	22.50	0.576	2021/9/23
Back Side	21100/2535	20M QPSK(1,99)	0.972	0.377	2.33	21.93	22.50	1.108	2021/9/23
Right Side	21100/2535	20M QPSK(1,99)	0.102	0.038	1.35	21.93	22.50	0.116	2021/9/23
Top Side	21100/2535	20M QPSK(1,99)	0.700	0.263	-1.57	21.93	22.50	0.798	2021/9/23
Back Side	20850/2510	20M QPSK(1,99)	0.925	0.364	-0.55	22.03	22.50	1.031	2021/9/23
Back Side	21350/2560	20M QPSK(1,99)	1.041	0.401	1.14	22.14	22.50	1.131	2021/9/23
Back Side Repeated	21350/2560	20M QPSK(1,99)	1.035	0.389	0.34	22.14	22.50	1.124	2021/9/23
50%RB									
Front Side	21100/2535	20M QPSK(50,49)	0.299	0.110	0.28	21.12	21.50	0.326	2021/9/23
Back Side	21100/2535	20M QPSK(50,49)	0.501	0.224	0.66	21.12	21.50	0.547	2021/9/23
Right Side	21100/2535	20M QPSK(50,49)	0.052	0.022	-4.28	21.12	21.50	0.057	2021/9/23
Top Side	21100/2535	20M QPSK(50,49)	0.392	0.138	-0.85	21.12	21.50	0.428	2021/9/23
100%RB									
Back Side	21100/2535	20M	0.488	0.211	0.27	20.98	21.50	0.550	2021/9/23

		QPSK(100,0)							

NOTE: Body SAR test results of LTE Band 7

10.1.10. SAR measurement Result of LTE Band 17

Test Position of Body with 0mm	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 Side	23790/710	10M QPSK(1,0)	0.275	0.155	2.38	19.47	20.00	0.311	2021/9/15
Back Side	23790/710	10M QPSK(1,0)	0.544	0.307	0.22	19.47	20.00	0.615	2021/9/15
Top Side	23790/710	10M QPSK(1,0)	0.413	0.221	3.44	19.47	20.00	0.467	2021/9/15
50%RB									
Front Side	23790/710	10M QPSK(25,0)	0.156	0.080	-3.09	18.25	19.00	0.185	2021/9/15
Back Side	23790/710	10M QPSK(25,0)	0.326	0.174	3.42	18.25	19.00	0.387	2021/9/15
Top Side	23790/710	10M QPSK(25,0)	0.210	0.126	0.67	18.25	19.00	0.250	2021/9/15

NOTE: Body SAR test results of LTE Band 17

10.1.11. SAR measurement Result of WLAN 2.4G

Test Position of Body with 0mm	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 Side	6/2437	802.11b	0.083	0.031	-3.31	15.05	15.50	0.092	2021/9/22
Back Side	6/2437	802.11b	0.108	0.041	-2.21	15.05	15.50	0.120	2021/9/22
Top Side	6/2437	802.11b	0.084	0.030	-0.87	15.05	15.50	0.093	2021/9/22

NOTE: Body SAR test results of WLAN 2.4G

10.1.12. SAR measurement Result of WLAN 5.2G

Test Position of Body with 0mm	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 Side	40/5200	802.11n HT20	0.083	0.043	-1.76	9.942	10.500	0.094	2021/9/12
Back Side	40/5200	802.11n HT20	0.114	0.062	-0.26	9.942	10.500	0.130	2021/9/12
Top Side	40/5200	802.11n HT20	0.112	0.058	2.72	9.942	10.500	0.127	2021/9/12

NOTE: Body SAR test results of WLAN 5.2G

10.1.13. SAR measurement Result of WLAN 5.3G

Test Position of Body with 0mm	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 Side	58/5290	802.11ac VHT80	0.072	0.041	2.03	11.442	11.500	0.073	2021/9/12
Back Side	58/5290	802.11ac VHT80	0.111	0.065	-1.49	11.442	11.500	0.112	2021/9/12
Top Side	58/5290	802.11ac VHT80	0.091	0.052	2.94	11.442	11.500	0.092	2021/9/12

NOTE: Body SAR test results of WLAN 5.3G

10.1.14. SAR measurement Result of WLAN 5.6G

Test Position of Body with 0mm	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 Side	122/5610	802.11ac (VHT80)	0.072	0.042	3.30	11.257	11.500	0.076	2021/9/24
Back Side	122/5610	802.11ac (VHT80)	0.103	0.063	-1.81	11.257	11.500	0.109	2021/9/24
Top Side	122/5610	802.11ac (VHT80)	0.077	0.047	-0.52	11.257	11.500	0.081	2021/9/24

NOTE: Body SAR test results of WLAN 5.6G

10.1.15. SAR measurement Result of WLAN 5.8G

Test Position of Body with 0mm	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 Side	155/5775	802.11ac VHT80	0.099	0.055	-1.25	11.889	12.000	0.102	2021/9/25
Back Side	155/5775	802.11ac VHT80	0.158	0.093	3.06	11.889	12.000	0.162	2021/9/25
Top Side	155/5775	802.11ac VHT80	0.133	0.078	-1.86	11.889	12.000	0.136	2021/9/25

NOTE: Body SAR test results of WLAN 5.8G

10.2. SAR Summation Scenario

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			
Body	Front Side	0.604	0.092	0.696	N/A	N/A
	Back Side	1.169	0.120	1.289	N/A	N/A
	Left Side	0.078	N/A	0.078	N/A	N/A
	Right Side	0.122	N/A	0.122	N/A	N/A
	Top Side	0.798	0.093	0.891	N/A	N/A
	Bottom Side	0.085	N/A	0.085	N/A	N/A

Test Position		Scaled SAR_{MAX}		∑1-g SAR (W/Kg)	SPLSR	Remark
		WWAN	NII			
Body	Front Side	0.604	0.102	0.706	N/A	N/A
	Back Side	1.169	0.162	1.331	N/A	N/A
	Left Side	0.078	N/A	0.078	N/A	N/A
	Right Side	0.122	N/A	0.122	N/A	N/A
	Top Side	0.798	0.136	0.934	N/A	N/A
	Bottom Side	0.085	N/A	0.085	N/A	N/A

Test Position		Scaled SAR_{MAX}		∑1-g SAR (W/Kg)	SPLSR	Remark
		WWAN	DSS			
Body	Front Side	0.604	0.392	0.996	N/A	N/A
	Back Side	1.169	0.392	1.561	N/A	N/A
	Left Side	0.078	0.392	0.470	N/A	N/A

	Right Side	0.122	0.392	0.514	N/A	N/A
	Top Side	0.798	0.392	1.190	N/A	N/A
	Bottom Side	0.085	0.392	0.477	N/A	N/A

11. Appendix A. Photo documentation

Refer to appendix Test Setup photo---SAR

12. Appendix B. System Check Plots

Table of contents
MEASUREMENT 1 System Performance Check - 750MHz
MEASUREMENT 2 System Performance Check - 835MHz
MEASUREMENT 3 System Performance Check - 1800MHz
MEASUREMENT 4 System Performance Check - 1900MHz
MEASUREMENT 5 System Performance Check - 2450MHz
MEASUREMENT 6 System Performance Check - 2600MHz
MEASUREMENT 7 System Performance Check - 5200MHz
MEASUREMENT 8 System Performance Check - 5600MHz
MEASUREMENT 9 System Performance Check - 5800MHz

MEASUREMENT 1

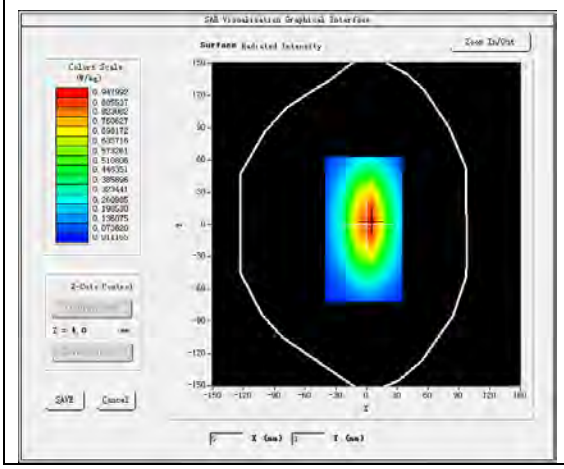
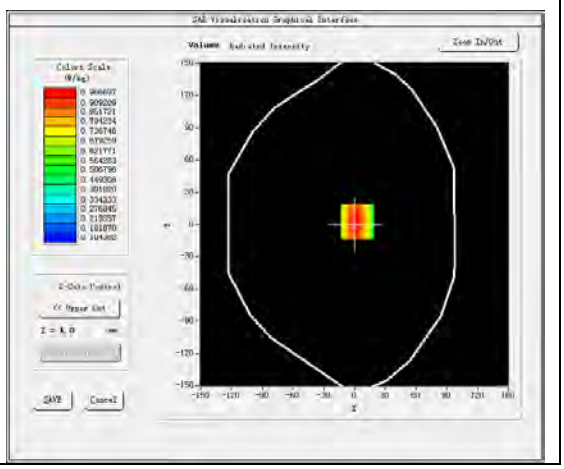
Date of measurement: 15/9/2021

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	CW750
Channels	Middle
Signal	CW (Crest factor: 1.0)

B. SAR Measurement Results

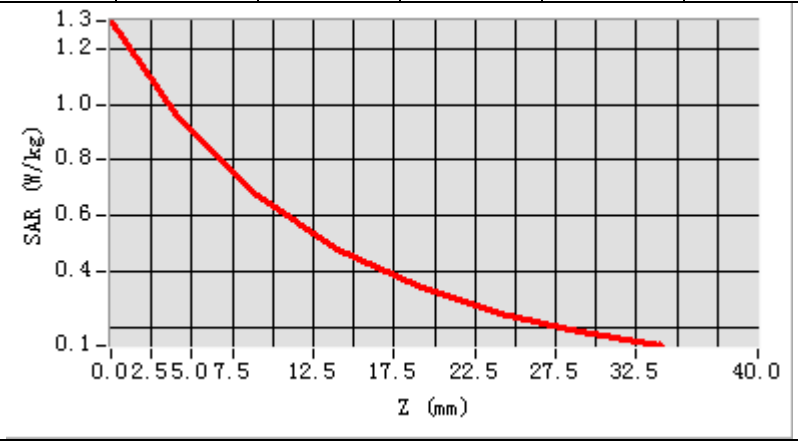
Frequency (MHz)	750.000000
Relative permittivity (real part)	41.718777
Relative permittivity (imaginary part)	21.641540
Conductivity (S/m)	0.901731
Variation (%)	-3.810000

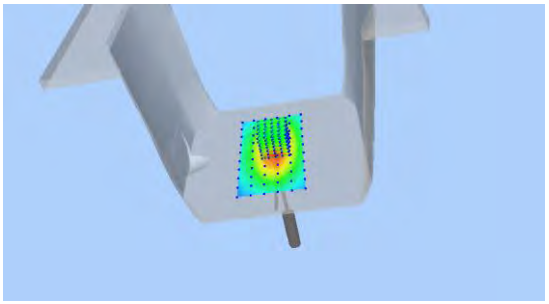
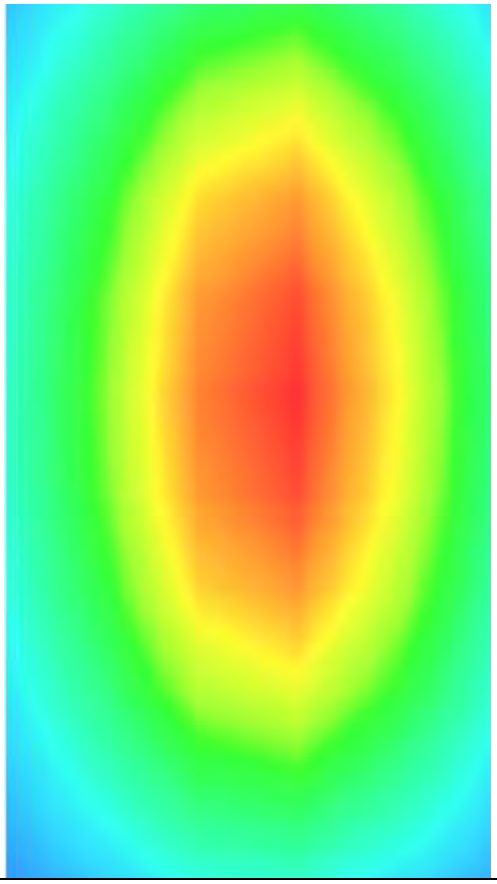
SURFACE SAR	VOLUME SAR
	

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

SAR 10g (W/Kg)	0.568218
SAR 1g (W/Kg)	0.866362

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	1.2913	0.9633	0.6716	0.4837	0.3478	0.2536	0.1837



3D screen shot	Hot spot position
	

MEASUREMENT 2

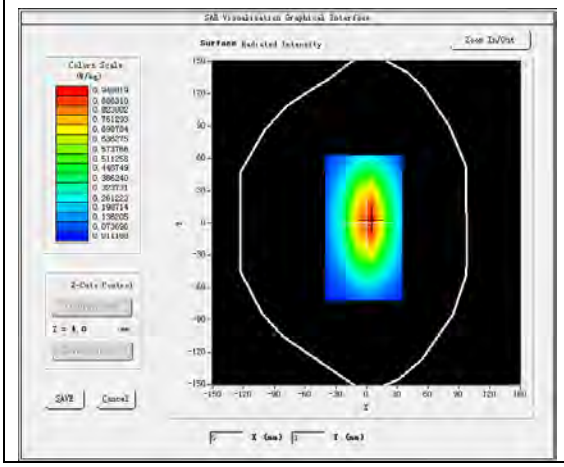
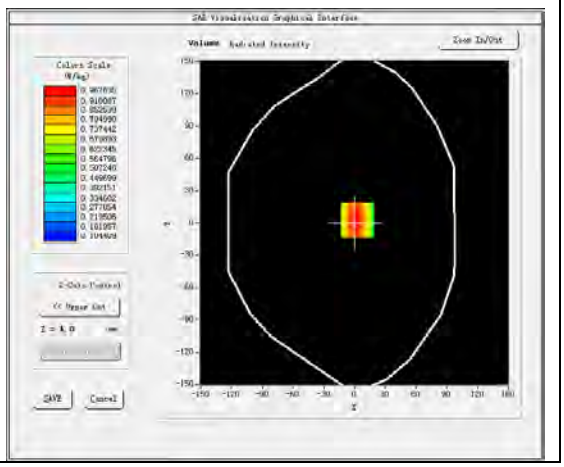
Date of measurement: 13/9/2021

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

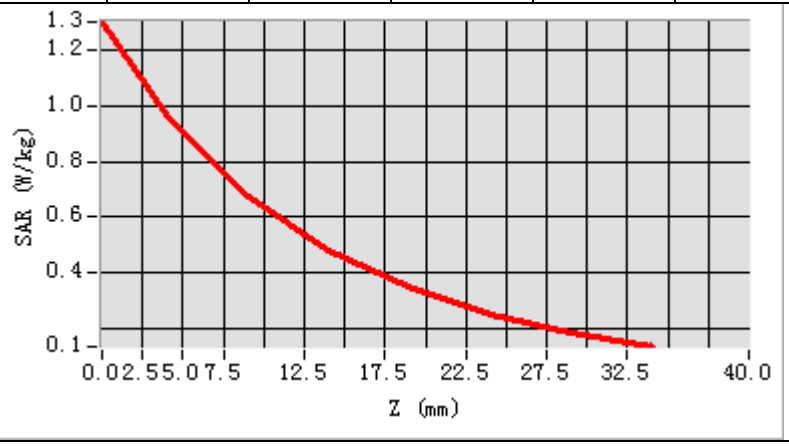
Frequency (MHz)	835.000000
Relative permittivity (real part)	43.172807
Relative permittivity (imaginary part)	19.283209
Conductivity (S/m)	0.894527
Variation (%)	1.870000

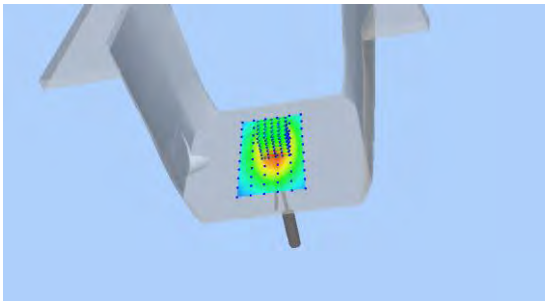
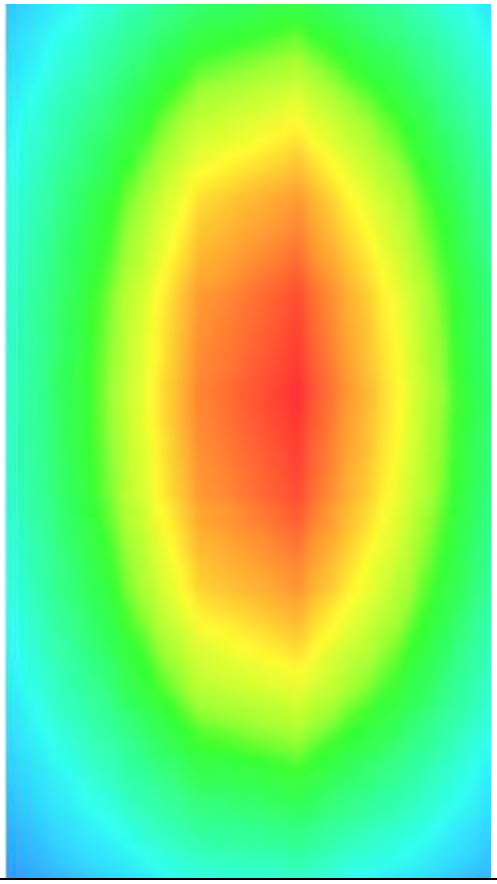
SURFACE SAR	VOLUME SAR
	

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

SAR 10g (W/Kg)	0.622036
SAR 1g (W/Kg)	0.927031

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	1.3026	0.9678	0.6705	0.4851	0.3491	0.2507	0.1863



3D screen shot	Hot spot position
	

MEASUREMENT 3

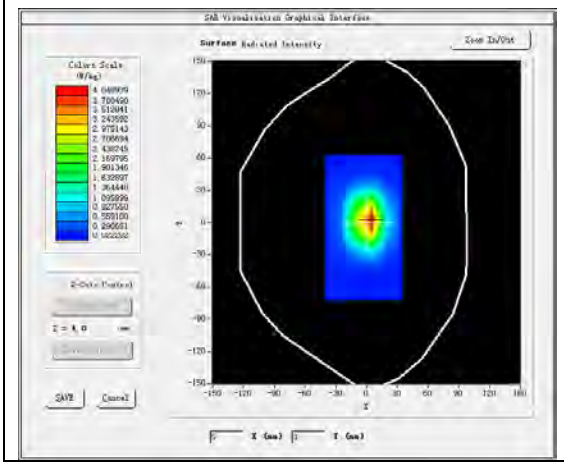
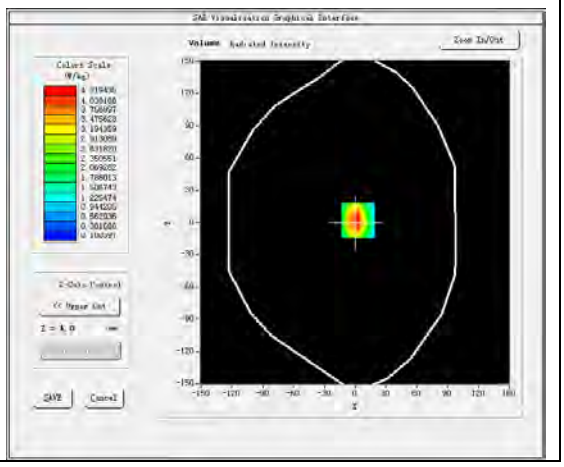
Date of measurement: 17/9/2021

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

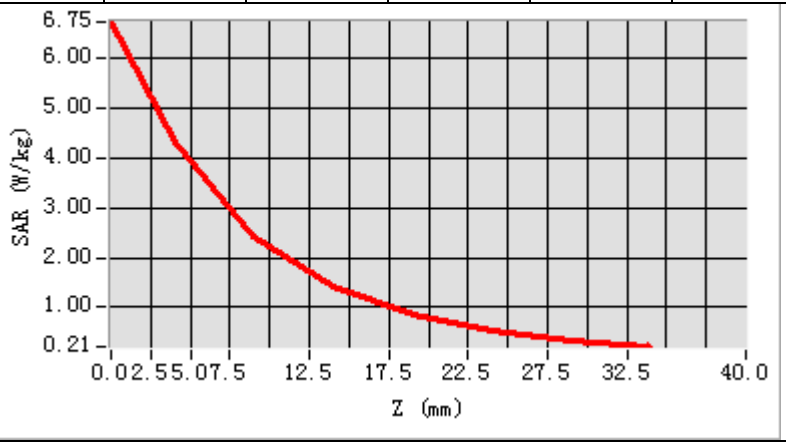
Frequency (MHz)	1800.000000
Relative permittivity (real part)	39.606403
Relative permittivity (imaginary part)	14.067180
Conductivity (S/m)	1.406718
Variation (%)	-0.140000

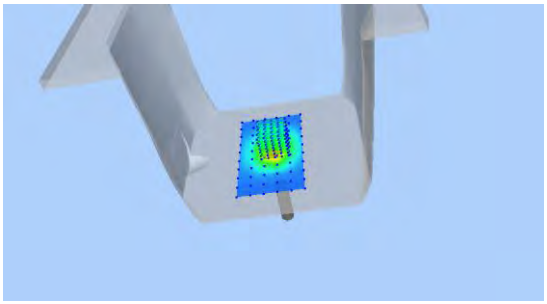
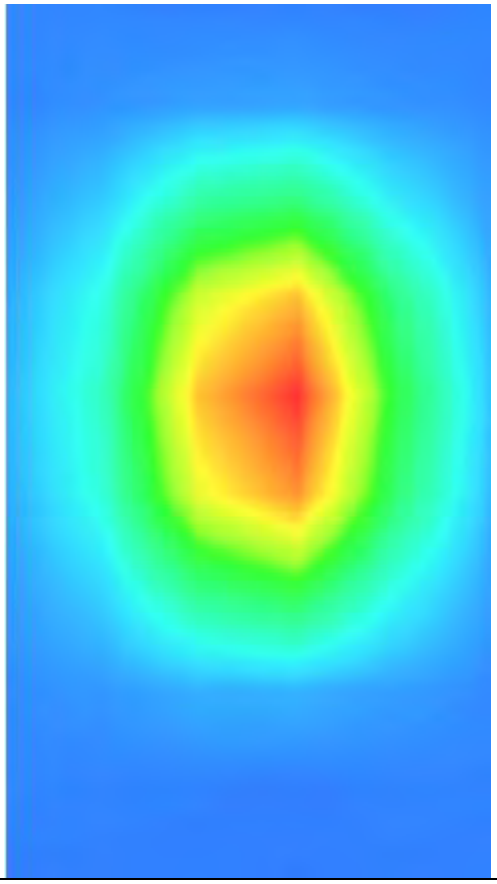
SURFACE SAR	VOLUME SAR
	

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

SAR 10g (W/Kg)	1.920336
SAR 1g (W/Kg)	3.976133

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	6.7448	4.3176	2.4344	1.4222	0.8541	0.5203	0.3261



3D screen shot	Hot spot position
	

MEASUREMENT 4

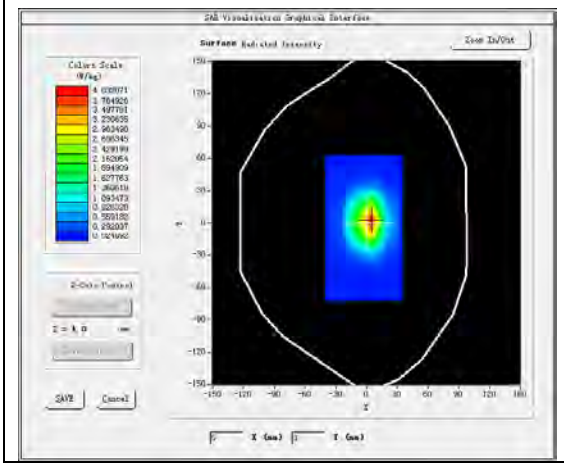
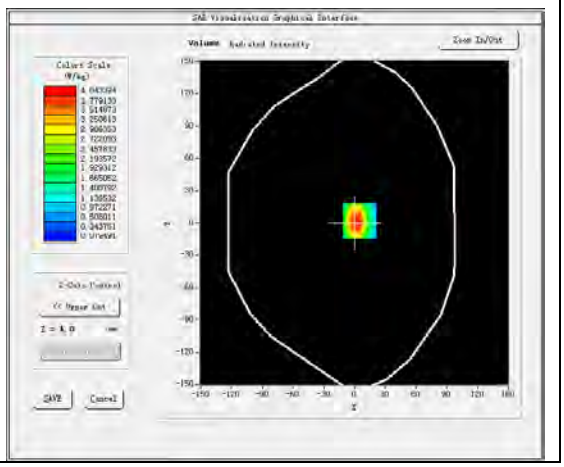
Date of measurement: 20/9/2021

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

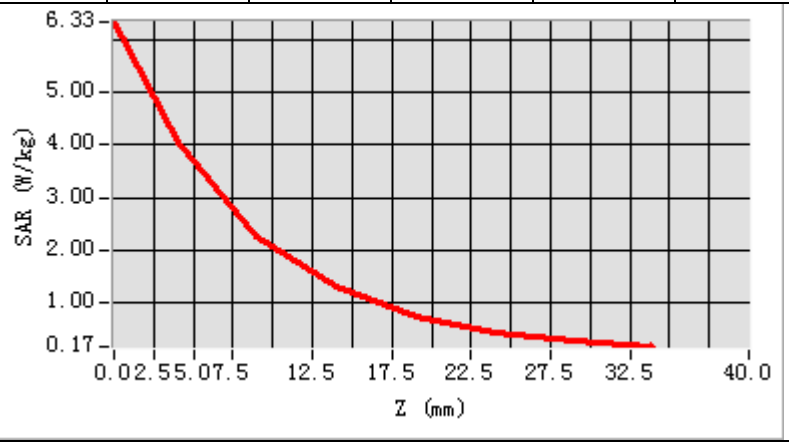
Frequency (MHz)	1900.000000
Relative permittivity (real part)	38.576182
Relative permittivity (imaginary part)	13.828755
Conductivity (S/m)	1.459702
Variation (%)	-1.430000

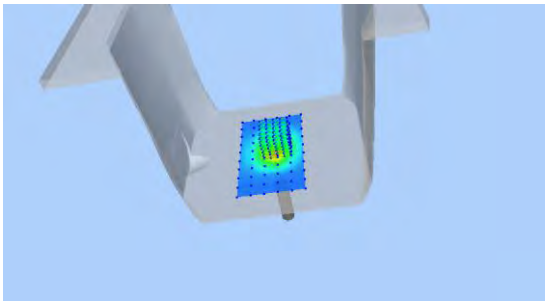
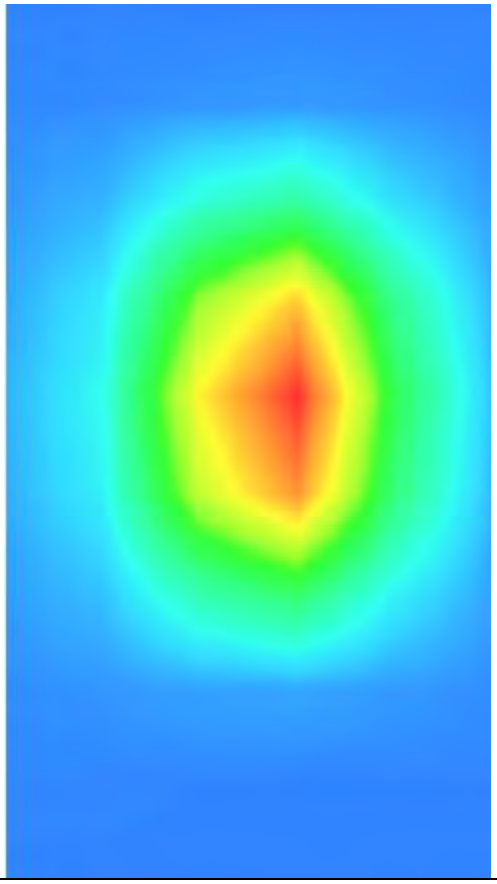
SURFACE SAR	VOLUME SAR
	

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

SAR 10g (W/Kg)	2.088114
SAR 1g (W/Kg)	4.085137

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	6.3211	4.0432	2.2653	1.3077	0.7635	0.4533	0.2735



3D screen shot	Hot spot position
	

MEASUREMENT 5

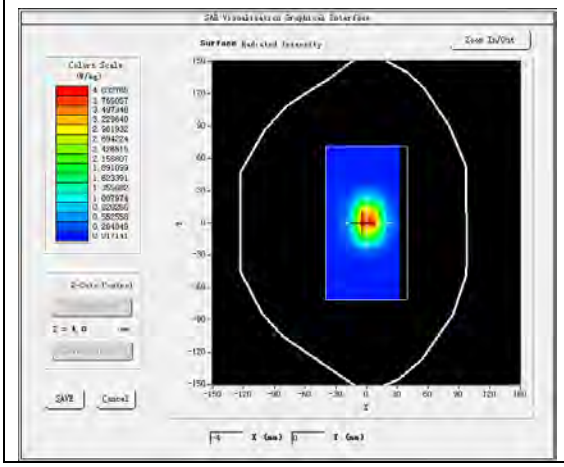
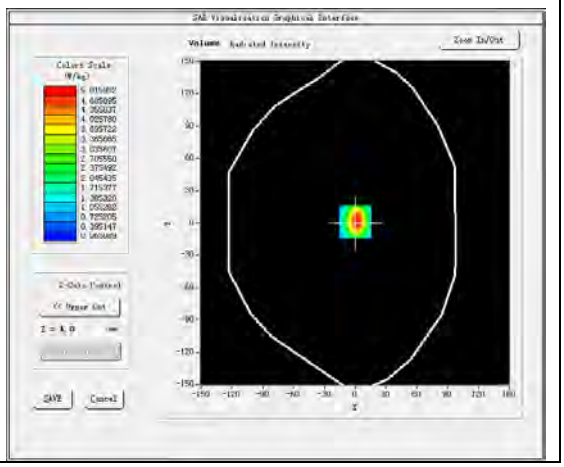
Date of measurement: 22/9/2021

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

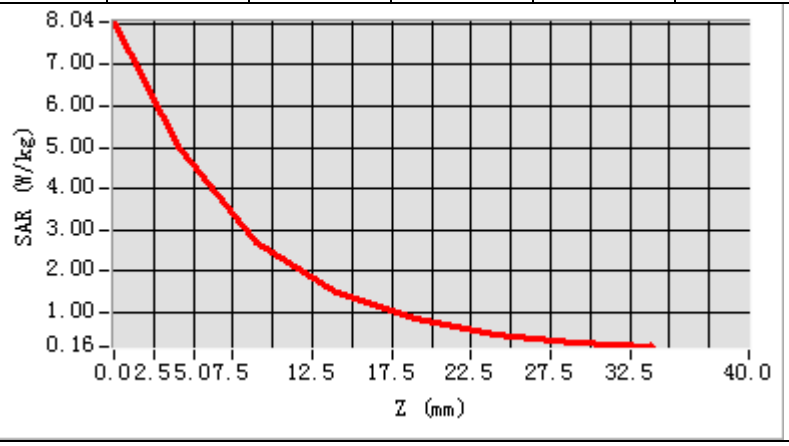
Frequency (MHz)	2450.000000
Relative permittivity (real part)	40.408511
Relative permittivity (imaginary part)	13.399264
Conductivity (S/m)	1.823789
Variation (%)	-1.250000

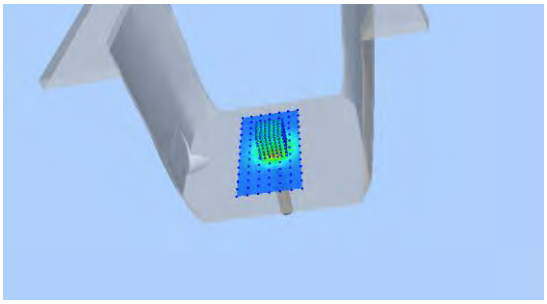
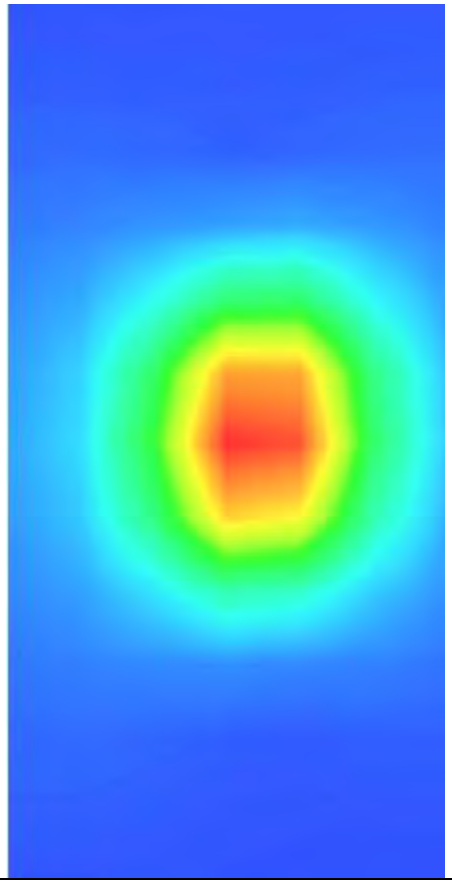
SURFACE SAR	VOLUME SAR
	

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

SAR 10g (W/Kg)	2.433178
SAR 1g (W/Kg)	5.686142

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	8.0377	5.0155	2.6978	1.4825	0.8316	0.4674	0.2681



3D screen shot	Hot spot position
	

MEASUREMENT 6

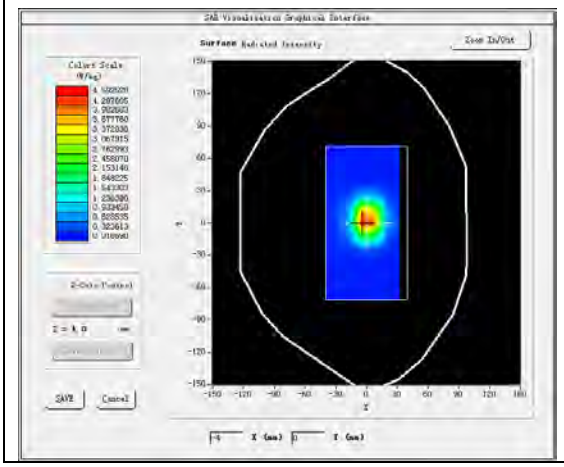
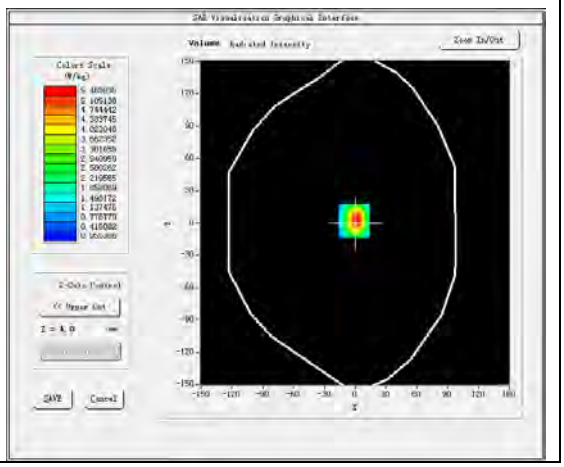
Date of measurement: 23/9/2021

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

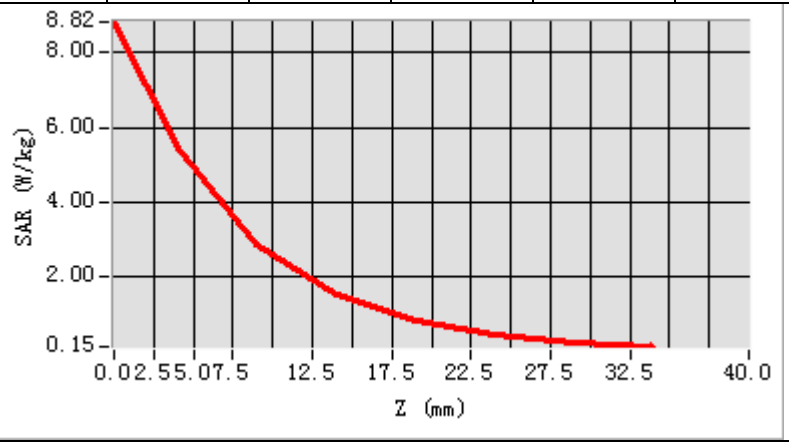
Frequency (MHz)	2600.000000
Relative permittivity (real part)	39.432362
Relative permittivity (imaginary part)	13.768602
Conductivity (S/m)	1.988798
Variation (%)	-3.980000

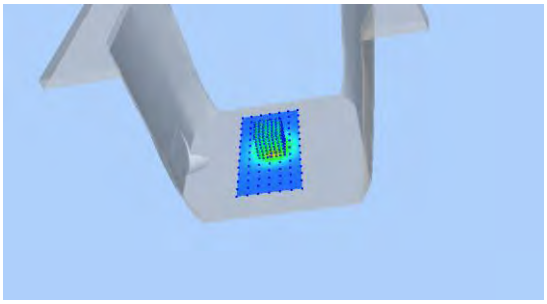
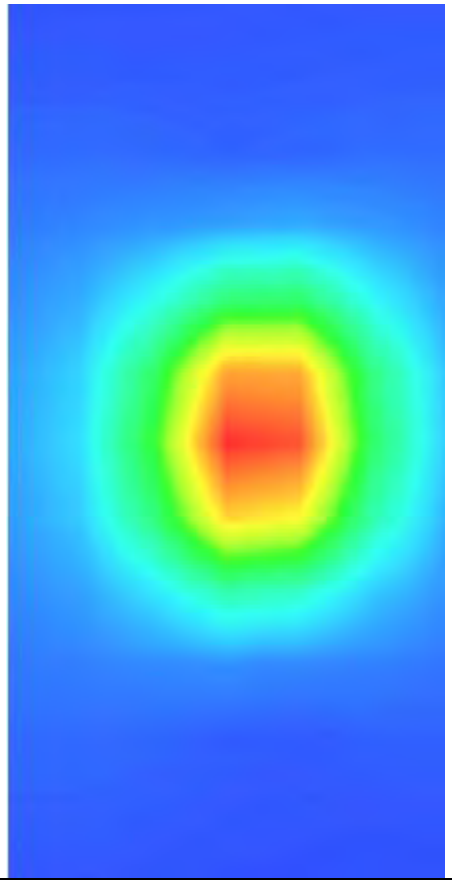
SURFACE SAR	VOLUME SAR
	

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

SAR 10g (W/Kg)	2.448137
SAR 1g (W/Kg)	5.773652

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	8.8184	5.4635	2.8983	1.5672	0.8594	0.4716	0.2634



3D screen shot	Hot spot position
	

MEASUREMENT 7

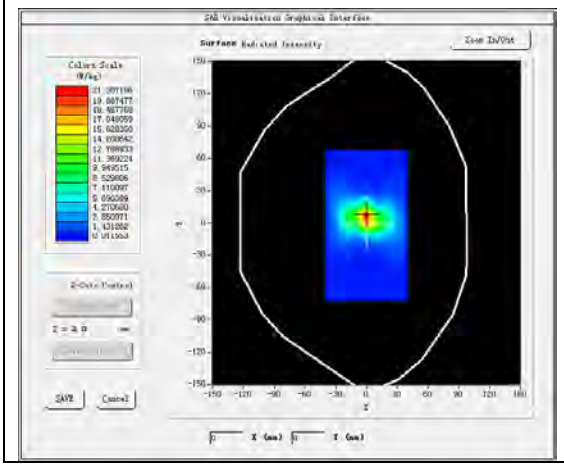
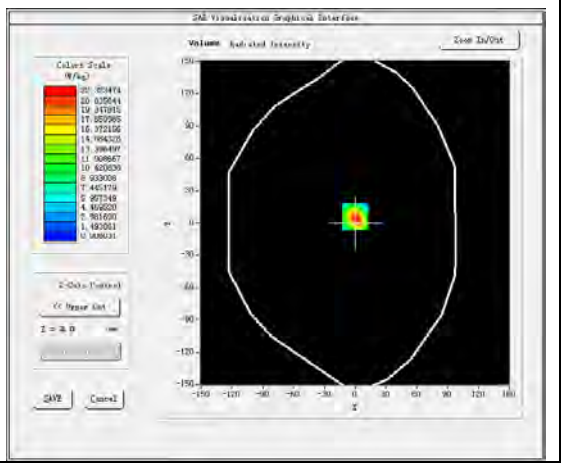
Date of measurement: 12/9/2021

A. Experimental conditions.

Area Scan	dx=10mm dy=10mm, h= 2.00 mm
ZoomScan	7x7x12,dx=4mm dy=4mm dz=2mm
Phantom	Validation plane
Device Position	Dipole
Band	CW5200
Channels	Middle
Signal	CW (Crest factor: 1.0)

B. SAR Measurement Results

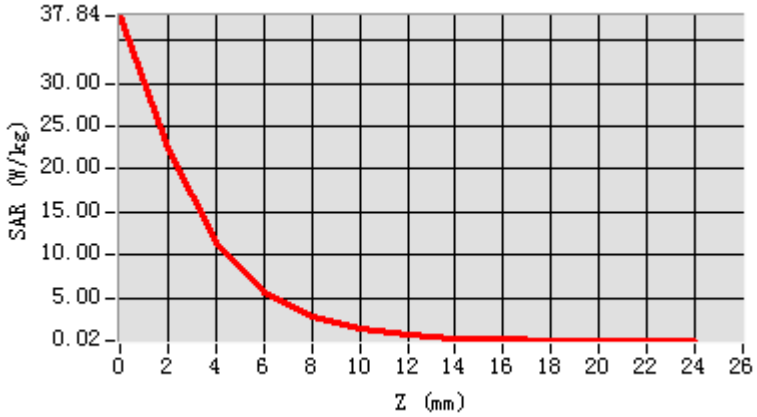
Frequency (MHz)	5200.000000
Relative permittivity (real part)	37.396885
Relative permittivity (imaginary part)	16.163410
Conductivity (S/m)	4.669430
Variation (%)	-2.690000

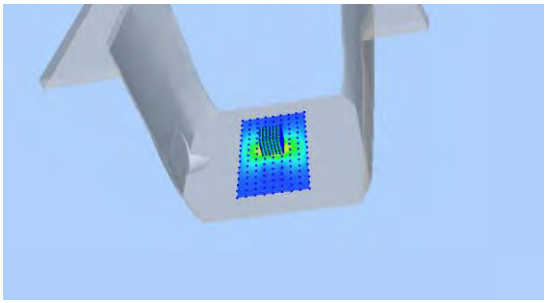
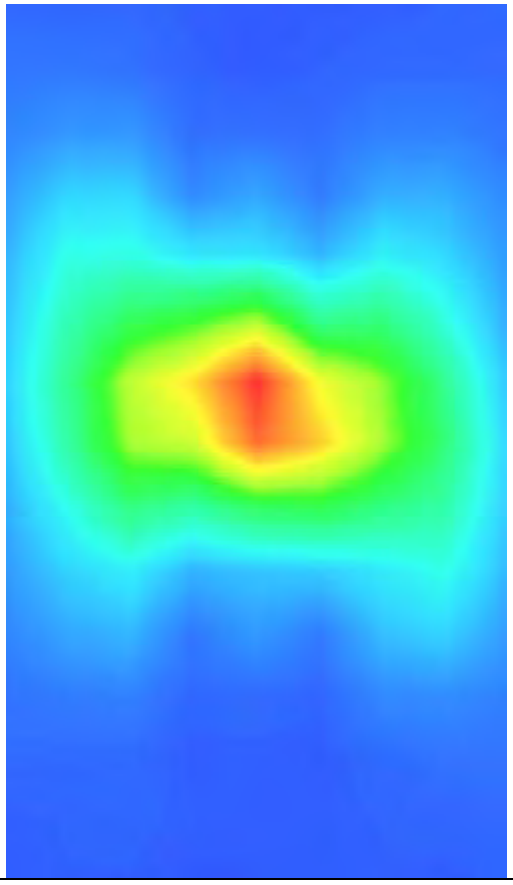
SURFACE SAR	VOLUME SAR
	

Maximum location: X=0.00, Y=6.00
SAR Peak: 40.06 W/kg

SAR 10g (W/Kg)	5.724640
SAR 1g (W/Kg)	16.256420

Z (mm)	0.00	2.00	4.00	6.00	8.00	10.00	12.00	14.00	16.00	18.00	20.00	22.00
SAR (W/Kg)	37.8358	22.3234	11.3793	5.6682	2.8232	1.4055	0.7132	0.3651	0.1858	0.1013	0.0545	0.0312



3D screen shot	Hot spot position
	

MEASUREMENT 8

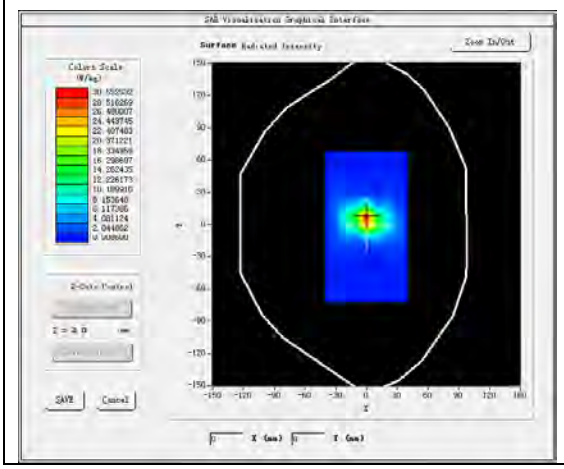
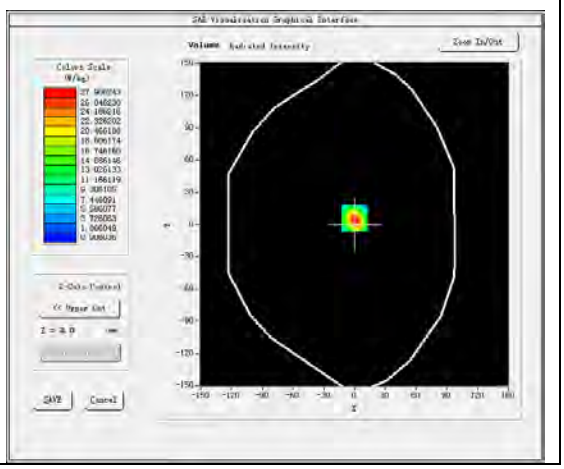
Date of measurement: 24/9/2021

A. Experimental conditions.

Area Scan	dx=10mm dy=10mm, h= 2.00 mm
ZoomScan	7x7x12,dx=4mm dy=4mm dz=2mm
Phantom	Validation plane
Device Position	Dipole
Band	CW5600
Channels	Middle
Signal	CW (Crest factor: 1.0)

B. SAR Measurement Results

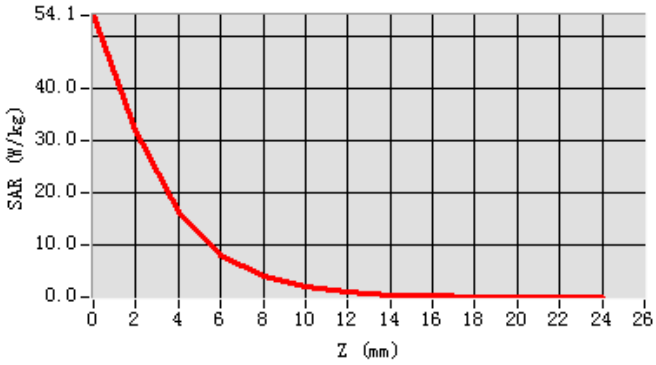
Frequency (MHz)	5600.000000
Relative permittivity (real part)	36.413311
Relative permittivity (imaginary part)	16.243014
Conductivity (S/m)	5.053382
Variation (%)	0.134270

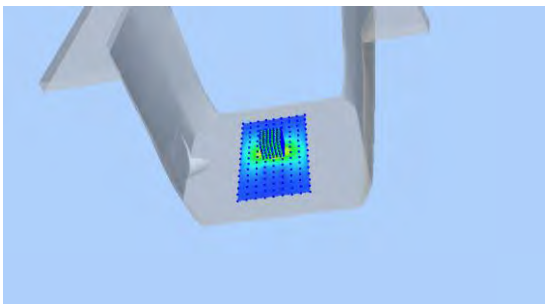
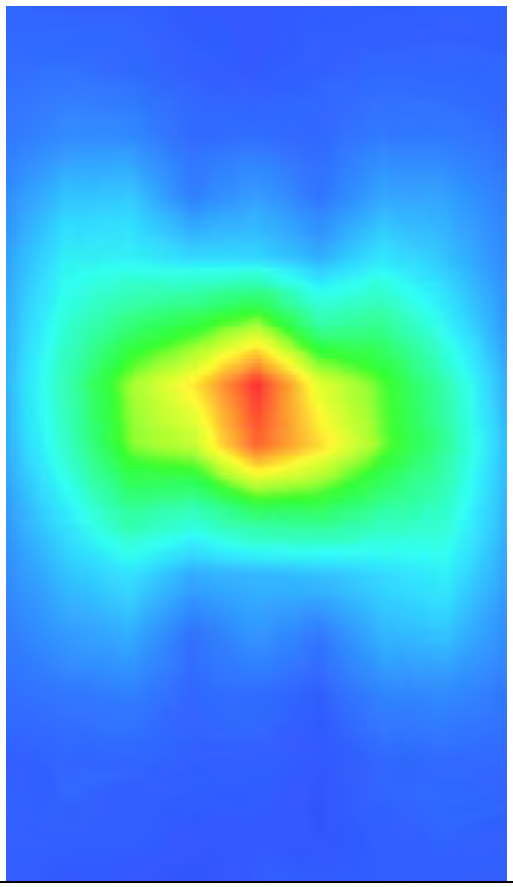
SURFACE SAR	VOLUME SAR
	

Maximum location: X=0.00, Y=6.00
SAR Peak: 51.23 W/kg

SAR 10g (W/Kg)	6.029048
SAR 1g (W/Kg)	17.185001

Z (mm)	0.00	2.00	4.00	6.00	8.00	10.00	12.00	14.00	16.00	18.00	20.00	22.00
SAR (W/Kg)	54.1388	31.9062	16.3510	8.1783	4.0824	3.8166	1.0345	0.4687	0.2729	0.1326	0.0755	0.0502



3D screen shot	Hot spot position
	

MEASUREMENT 9

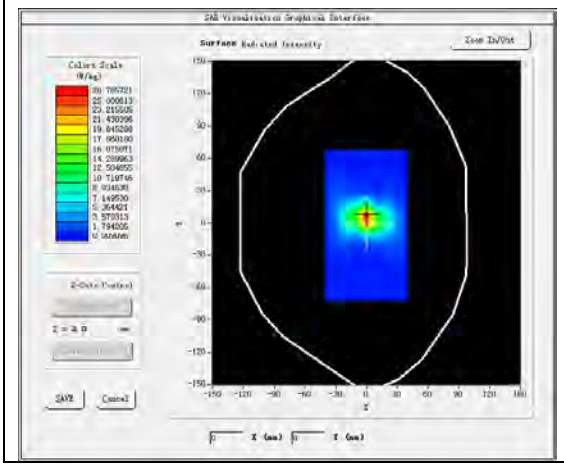
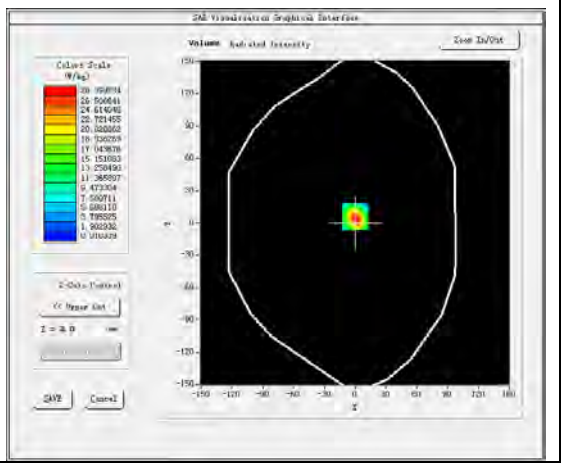
Date of measurement: 25/9/2021

A. Experimental conditions.

Area Scan	dx=10mm dy=10mm, h= 2.00 mm
ZoomScan	7x7x12,dx=4mm dy=4mm dz=2mm
Phantom	Validation plane
Device Position	Dipole
Band	CW5800
Channels	Middle
Signal	CW (Crest factor: 1.0)

B. SAR Measurement Results

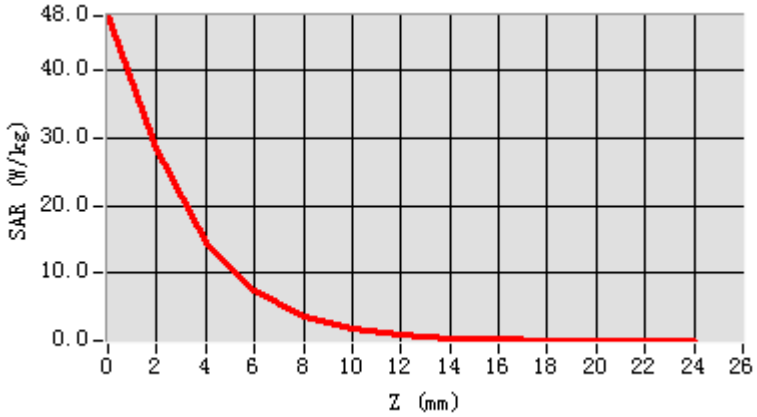
Frequency (MHz)	5800.000000
Relative permittivity (real part)	35.976461
Relative permittivity (imaginary part)	16.387217
Conductivity (S/m)	5.280325
Variation (%)	-0.890000

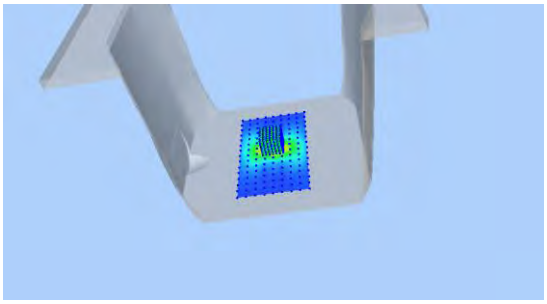
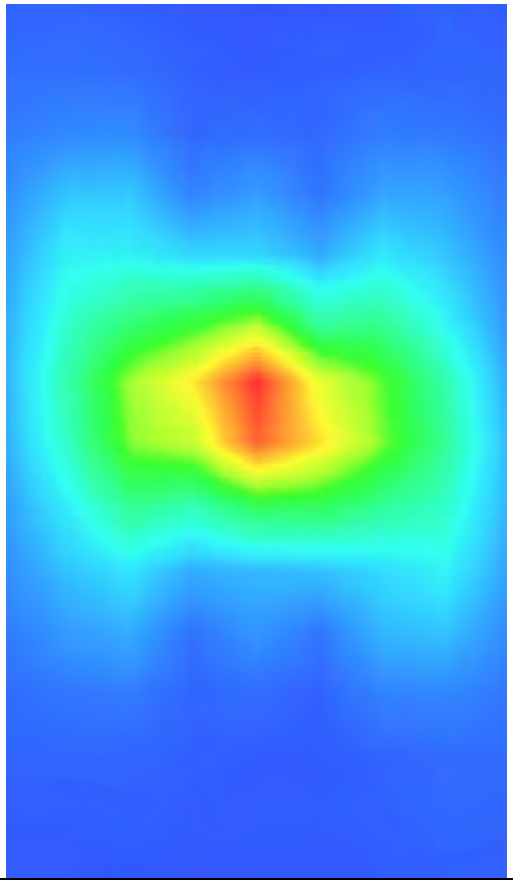
SURFACE SAR	VOLUME SAR
	

Maximum location: X=0.00, Y=6.00
SAR Peak: 50.97 W/kg

SAR 10g (W/Kg)	6.284133
SAR 1g (W/Kg)	18.127354

Z (mm)	0.00	2.00	4.00	6.00	8.00	10.00	12.00	14.00	16.00	18.00	20.00	22.00
SAR (W/Kg)	48.0321	28.3992	14.4531	7.2934	3.6495	1.8203	0.9244	0.4665	0.2494	0.1382	0.0726	0.0491



3D screen shot	Hot spot position
	

13. Appendix C. Plots of High SAR Measurement

Table of contents
MEASUREMENT 1 GSM 850 Body
MEASUREMENT 2 GSM 1900 Body
MEASUREMENT 3 WCDMA Band 2 Body
MEASUREMENT 4 WCDMA Band 4 Body
MEASUREMENT 5 WCDMA Band 5 Body
MEASUREMENT 6 WLAN 2.4G Body
MEASUREMENT 7 WLAN 5.2G Body
MEASUREMENT 8 WLAN 5.3G Body
MEASUREMENT 9 WLAN 5.6G Body
MEASUREMENT 10 WLAN 5.8G Body
MEASUREMENT 11 LTE Band 2 Body
MEASUREMENT 12 LTE Band 4 Body
MEASUREMENT 13 LTE Band 5 Body
MEASUREMENT 14 LTE Band 7 Body
MEASUREMENT 15 LTE Band 17 Body

MEASUREMENT 1

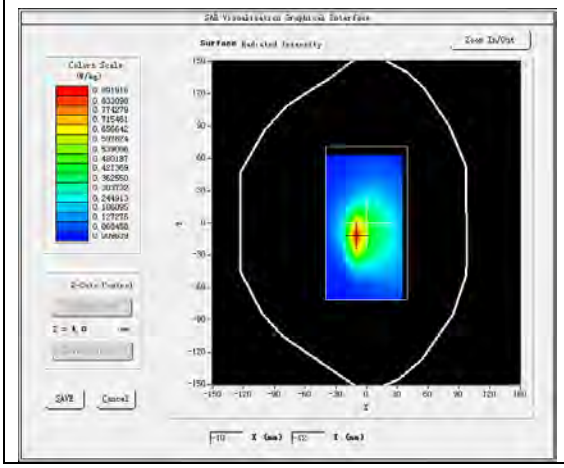
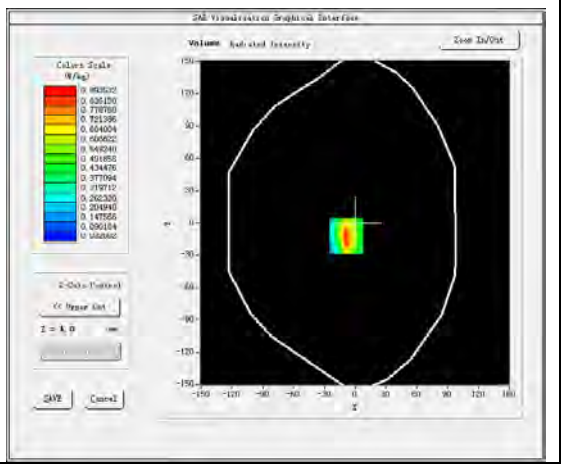
Date of measurement: 13/9/2021

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: 8.0)

B. SAR Measurement Results

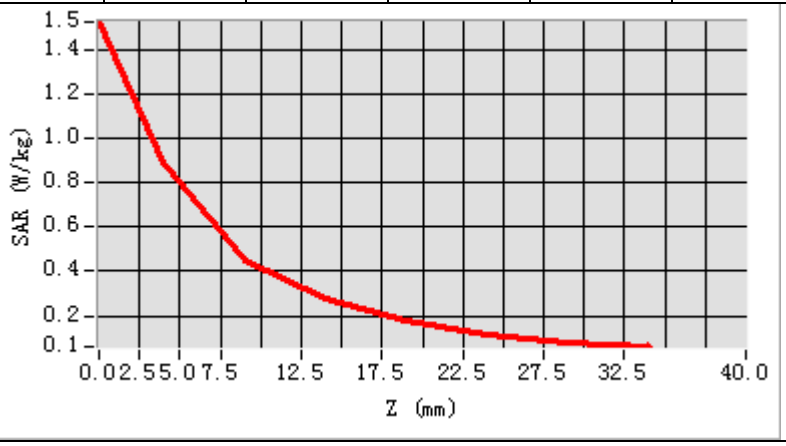
Frequency (MHz)	836.400000
Relative permittivity (real part)	43.088467
Relative permittivity (imaginary part)	19.309050
Conductivity (S/m)	0.897227
Variation (%)	-3.310000

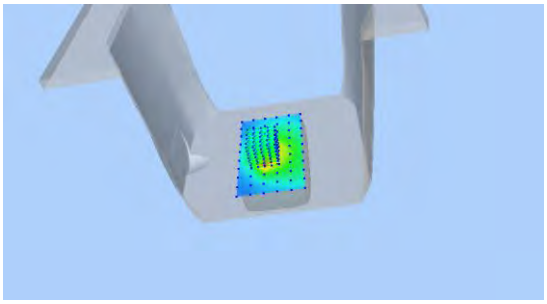
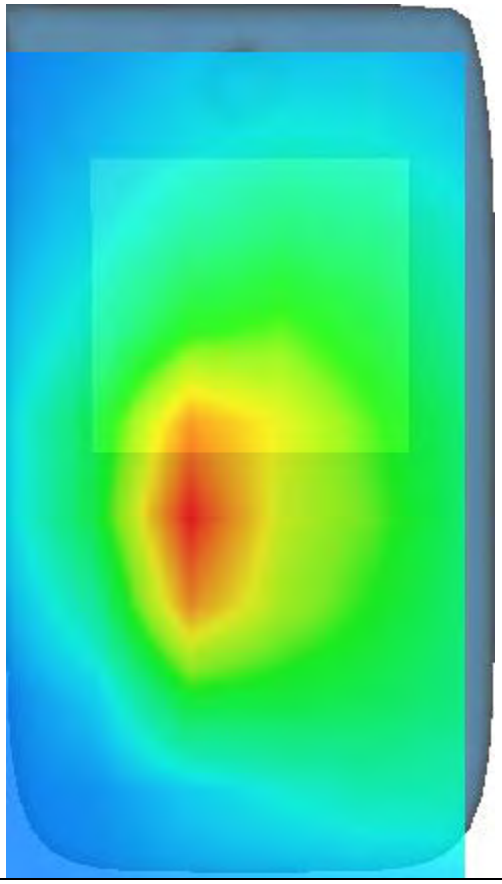
SURFACE SAR	VOLUME SAR
	

Maximum location: X=-9.00, Y=-12.00
SAR Peak: 1.51 W/kg

SAR 10g (W/Kg)	0.415875
SAR 1g (W/Kg)	0.822800

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	1.5292	0.8935	0.4517	0.2779	0.1775	0.1175	0.0821



3D screen shot	Hot spot position
	

MEASUREMENT 2

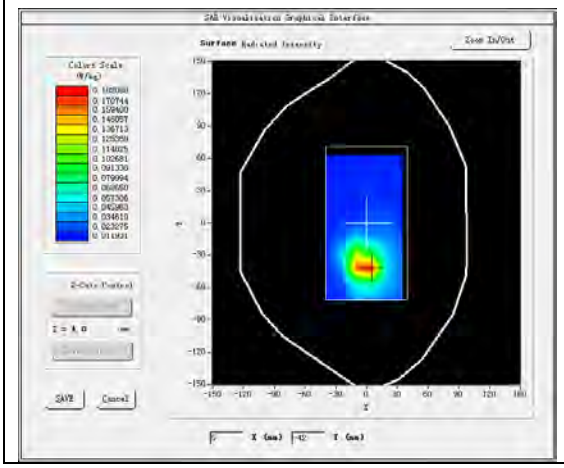
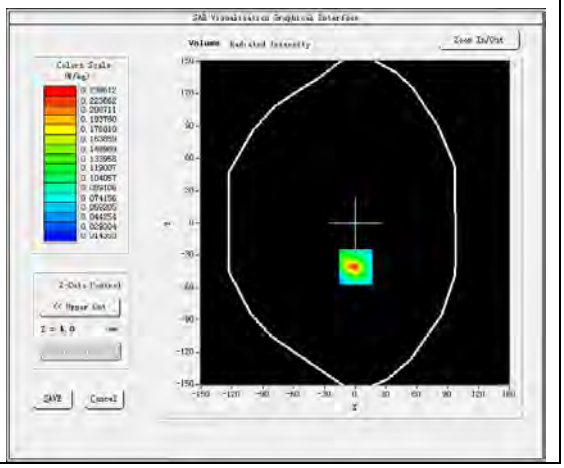
Date of measurement: 20/9/2021

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: 8.0)

B. SAR Measurement Results

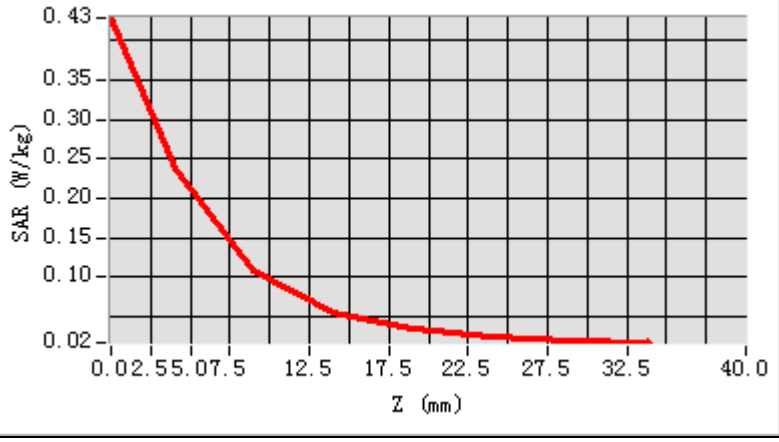
Frequency (MHz)	1880.000000
Relative permittivity (real part)	38.662582
Relative permittivity (imaginary part)	13.846555
Conductivity (S/m)	1.446196
Variation (%)	0.300000

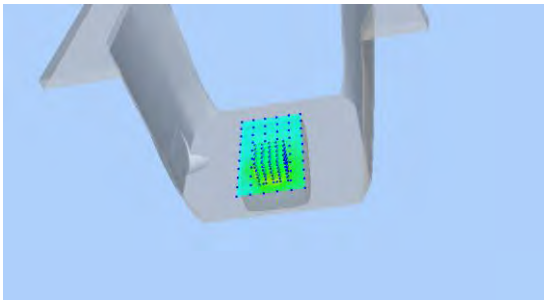
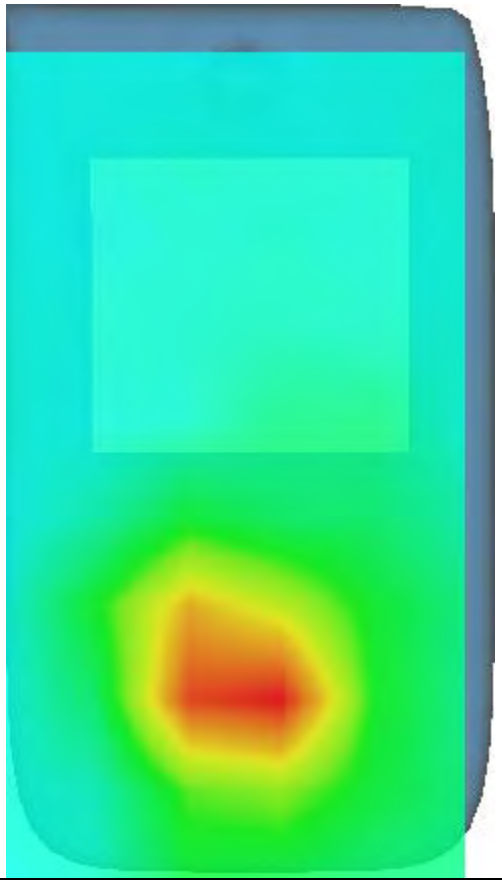
SURFACE SAR	VOLUME SAR
	

Maximum location: X=1.00, Y=-41.00
SAR Peak: 0.44 W/kg

SAR 10g (W/Kg)	0.095914
SAR 1g (W/Kg)	0.221197

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	0.4290	0.2386	0.1085	0.0556	0.0348	0.0242	0.0200



3D screen shot	Hot spot position
	

MEASUREMENT 3

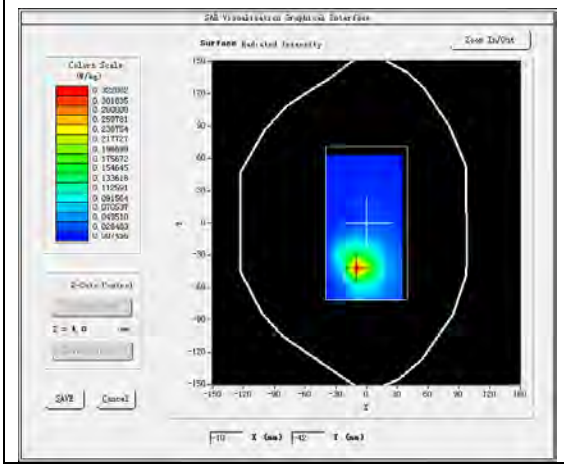
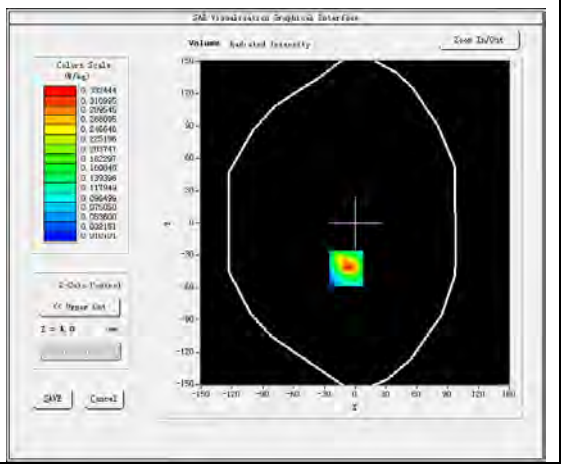
Date of measurement: 20/9/2021

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

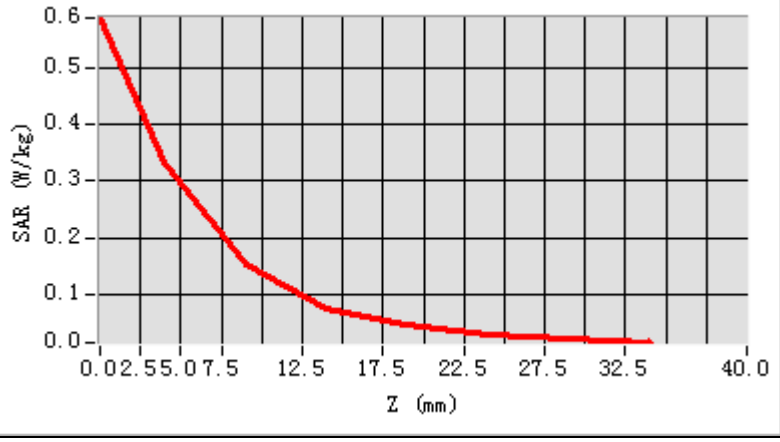
Frequency (MHz)	1880.000000
Relative permittivity (real part)	38.662582
Relative permittivity (imaginary part)	13.846555
Conductivity (S/m)	1.446196
Variation (%)	-0.710000

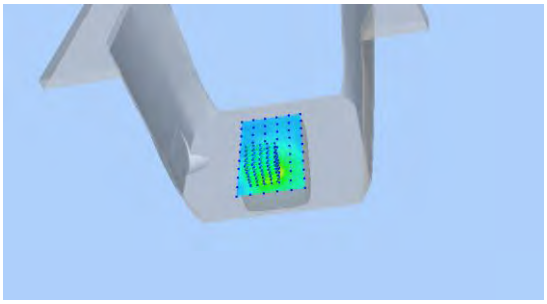
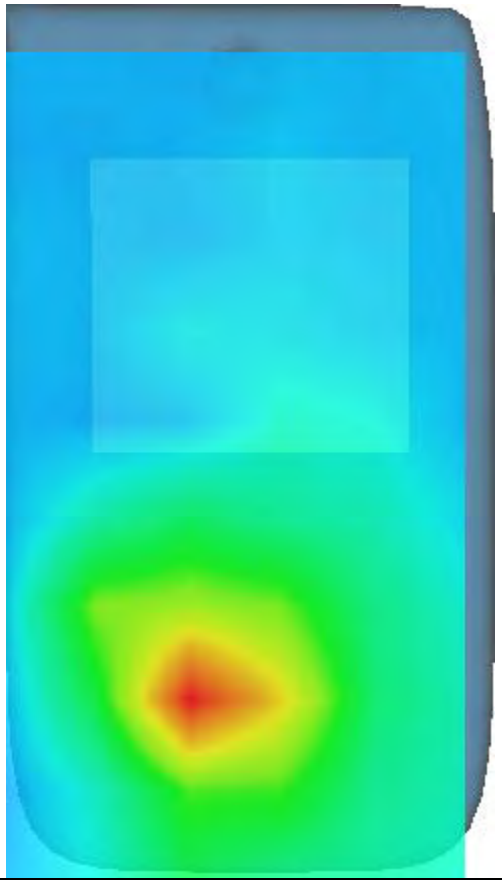
SURFACE SAR	VOLUME SAR
	

Maximum location: X=-9.00, Y=-42.00
SAR Peak: 0.65 W/kg

SAR 10g (W/Kg)	0.140222
SAR 1g (W/Kg)	0.329624

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	0.5889	0.3324	0.1536	0.0745	0.0442	0.0267	0.0199



3D screen shot	Hot spot position
	

MEASUREMENT 4

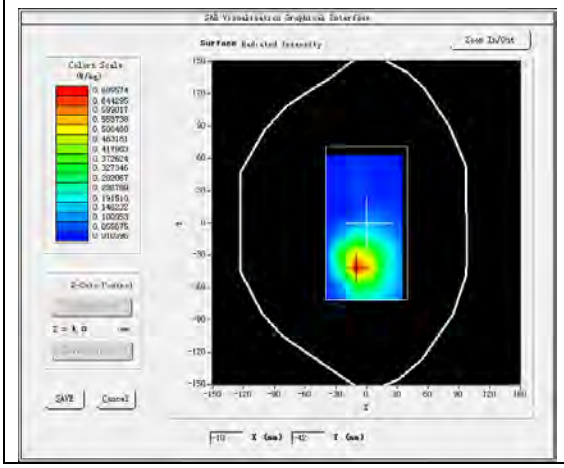
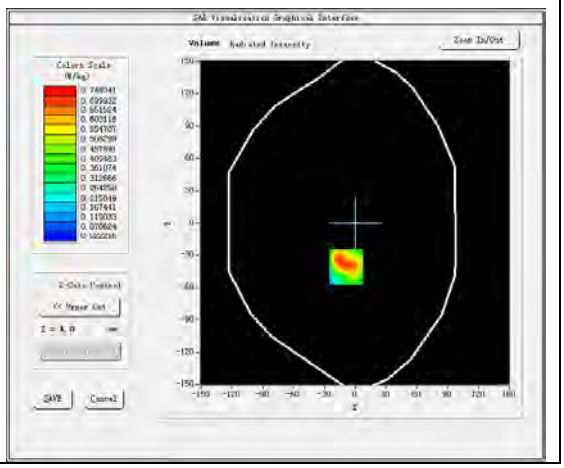
Date of measurement: 17/9/2021

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

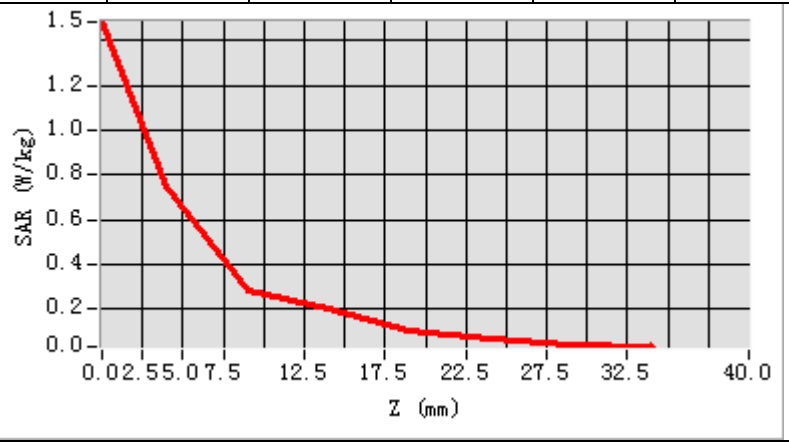
Frequency (MHz)	1732.600000
Relative permittivity (real part)	40.066105
Relative permittivity (imaginary part)	14.019480
Conductivity (S/m)	1.348986
Variation (%)	-3.980000

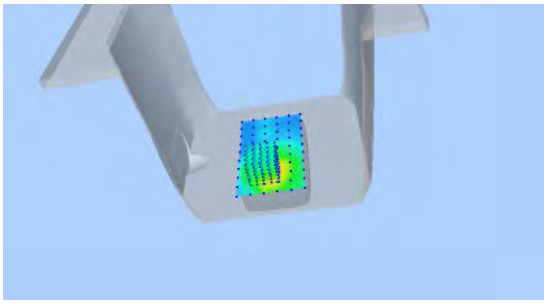
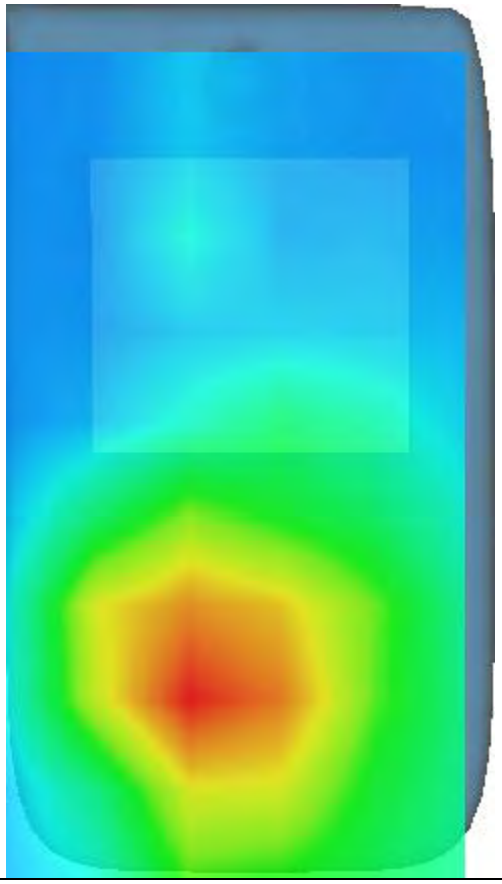
SURFACE SAR	VOLUME SAR
	

Maximum location: X=-9.00, Y=-41.00
SAR Peak: 1.32 W/kg

SAR 10g (W/Kg)	0.341364
SAR 1g (W/Kg)	0.710381

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	1.4825	0.7483	0.2818	0.1974	0.0991	0.0672	0.0387



3D screen shot	Hot spot position
	

MEASUREMENT 5

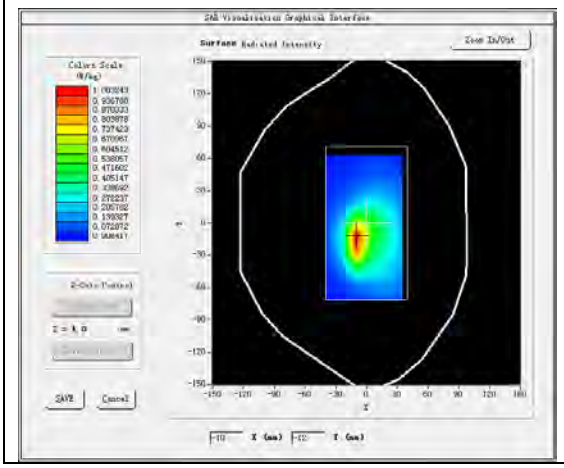
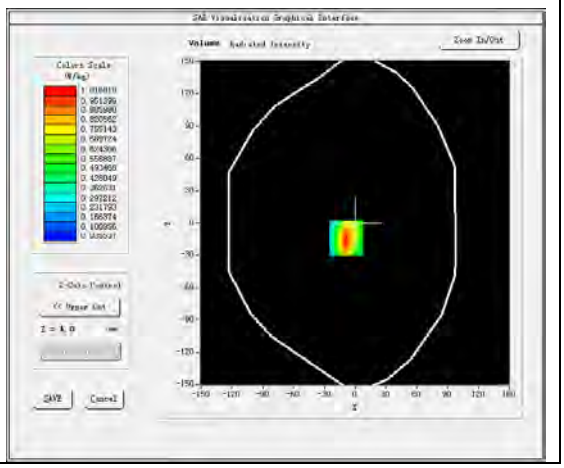
Date of measurement: 13/9/2021

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

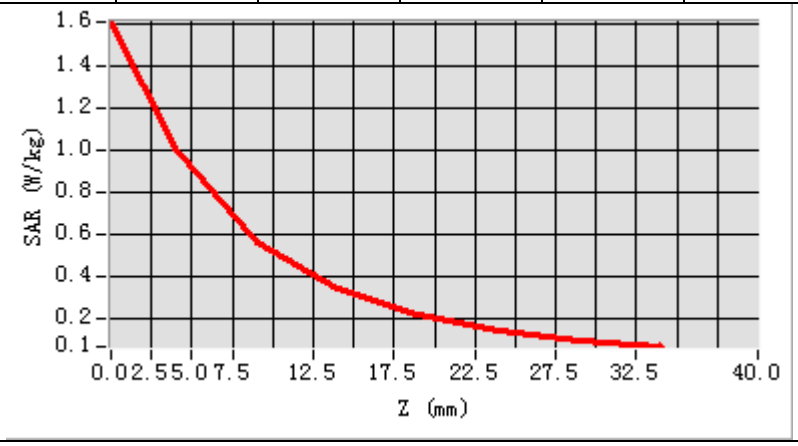
Frequency (MHz)	836.400000
Relative permittivity (real part)	43.088467
Relative permittivity (imaginary part)	19.309050
Conductivity (S/m)	0.897227
Variation (%)	-0.460000

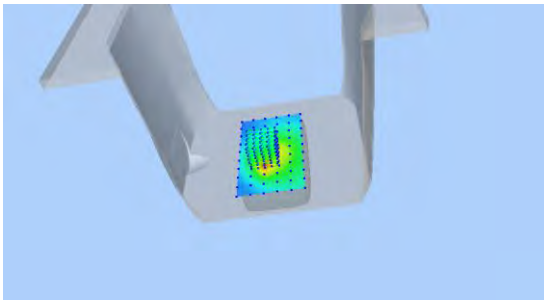
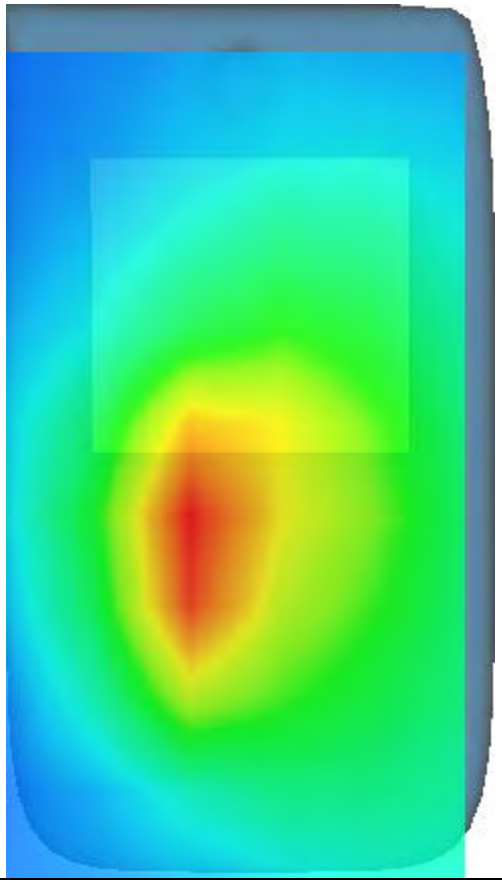
SURFACE SAR	VOLUME SAR
	

Maximum location: X=-9.00, Y=-14.00
SAR Peak: 1.61 W/kg

SAR 10g (W/Kg)	0.502099
SAR 1g (W/Kg)	0.937002

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	1.6140	1.0168	0.5702	0.3497	0.2238	0.1449	0.0986



3D screen shot	Hot spot position
	

MEASUREMENT 6

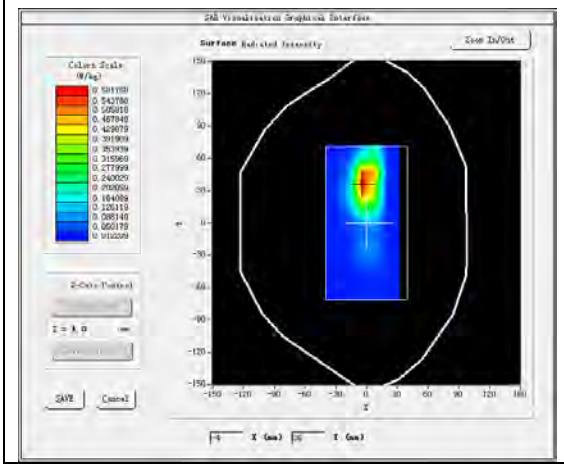
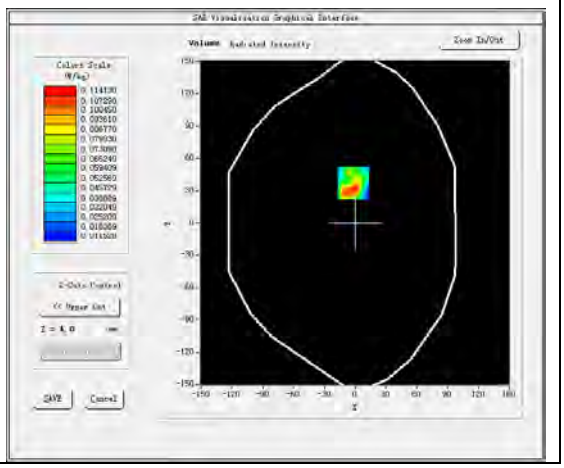
Date of measurement: 22/9/2021

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

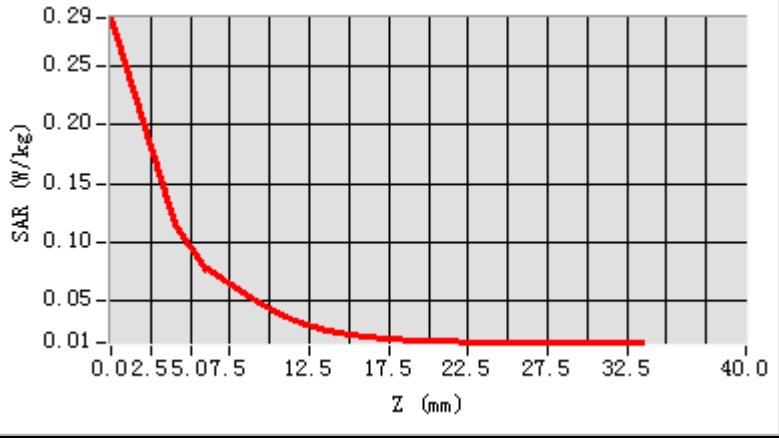
Frequency (MHz)	2437.000000
Relative permittivity (real part)	40.460609
Relative permittivity (imaginary part)	13.317764
Conductivity (S/m)	1.803077
Variation (%)	-2.210000

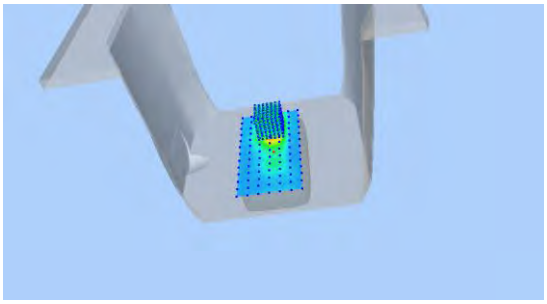
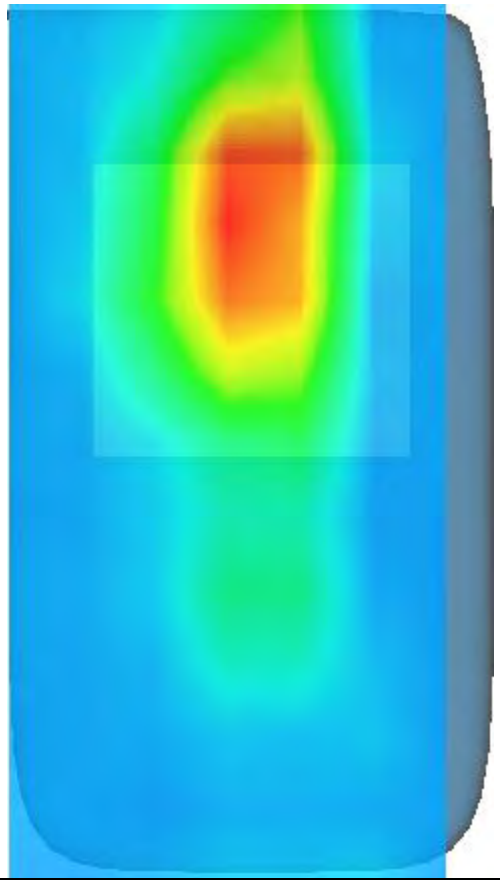
SURFACE SAR	VOLUME SAR
	

Maximum location: X=-2.00, Y=37.00
SAR Peak: 0.28 W/kg

SAR 10g (W/Kg)	0.041167
SAR 1g (W/Kg)	0.107992

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	0.2911	0.1141	0.0184	0.0146	0.0117	0.0105	0.0104



3D screen shot	Hot spot position
	

MEASUREMENT 7

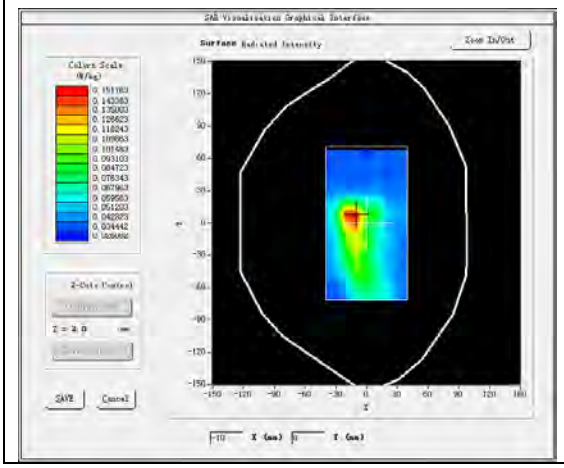
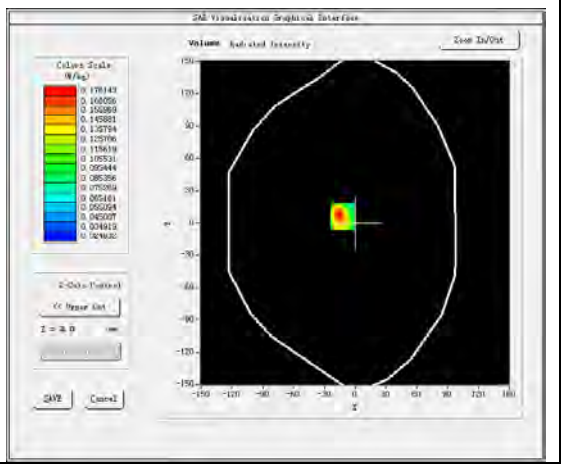
Date of measurement: 12/9/2021

A. Experimental conditions.

Area Scan	dx=10mm dy=10mm, h= 2.00 mm
ZoomScan	7x7x12,dx=4mm dy=4mm dz=2mm
Phantom	Validation plane
Device Position	Body
Band	IEEE 802.11n U-NII
Channels	Middle
Signal	IEEE802.11n (Crest factor: 1.0)

B. SAR Measurement Results

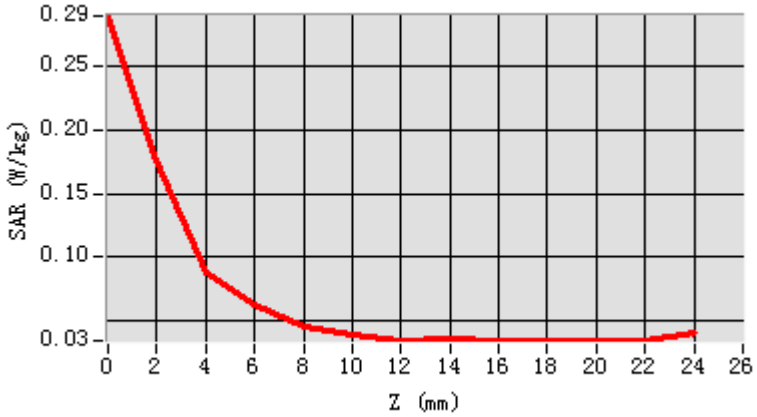
Frequency (MHz)	5200.000000
Relative permittivity (real part)	37.396885
Relative permittivity (imaginary part)	16.163410
Conductivity (S/m)	4.669430
Variation (%)	-0.260000

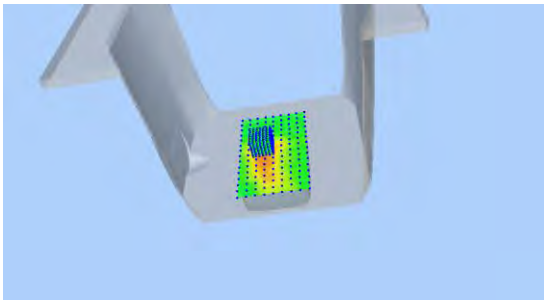
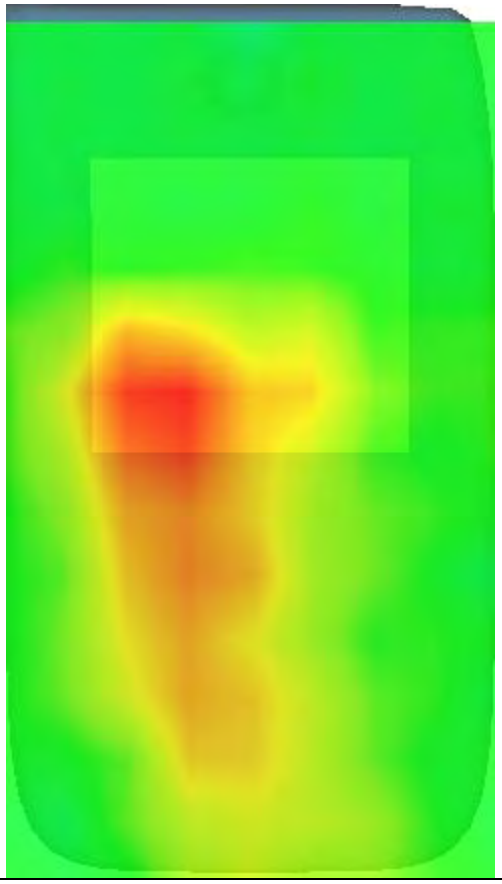
SURFACE SAR	**VOLUME SAR**
	

Maximum location: X=-12.00, Y=6.00
SAR Peak: 0.30 W/kg

SAR 10g (W/Kg)	0.062341
SAR 1g (W/Kg)	0.113786

Z (mm)	0.00	2.00	4.00	6.00	8.00	10.00	12.00	14.00	16.00	18.00	20.00	22.00
SAR (W/Kg)	0.2900	0.1761	0.0883	0.0629	0.0448	0.0384	0.0347	0.0352	0.0342	0.0342	0.0347	0.0347



3D screen shot	Hot spot position
	

MEASUREMENT 8

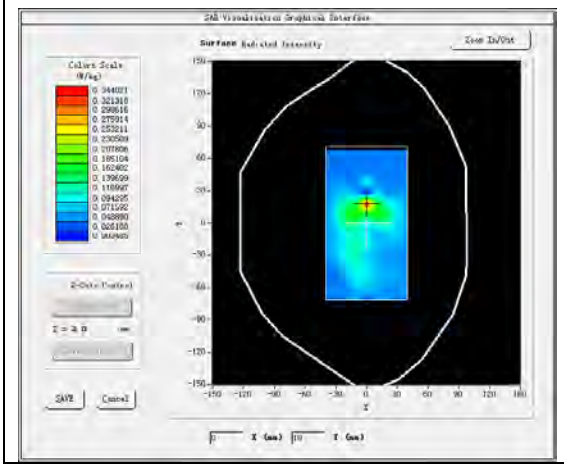
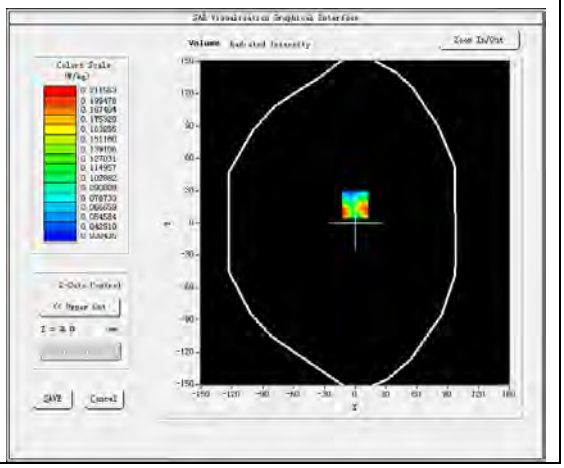
Date of measurement: 12/9/2021

A. Experimental conditions.

Area Scan	dx=10mm dy=10mm, h= 2.00 mm
ZoomScan	7x7x12,dx=4mm dy=4mm dz=2mm
Phantom	Validation plane
Device Position	Body
Band	IEEE 802.11ac U-NII
Channels	Middle
Signal	IEEE802.11ac (Crest factor: 1.0)

B. SAR Measurement Results

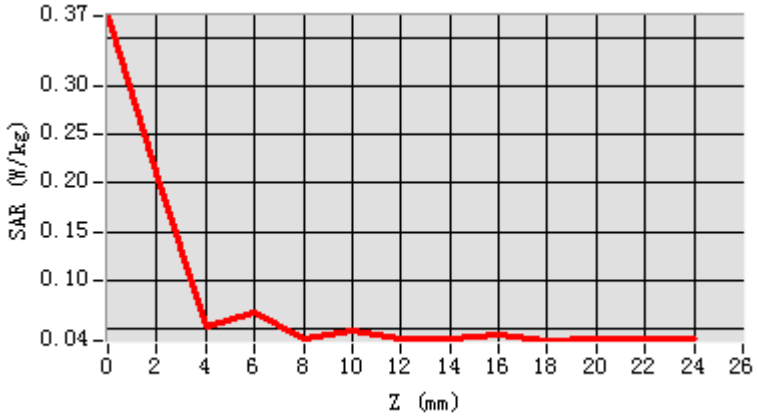
Frequency (MHz)	5290.000000
Relative permittivity (real part)	37.170980
Relative permittivity (imaginary part)	16.114835
Conductivity (S/m)	4.735971
Variation (%)	-1.490000

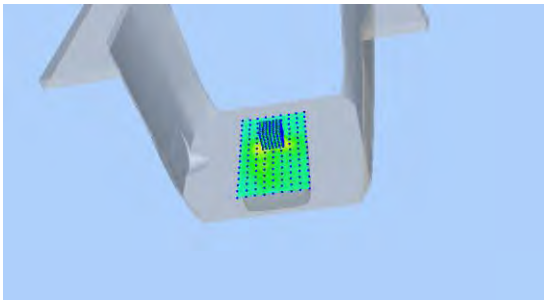
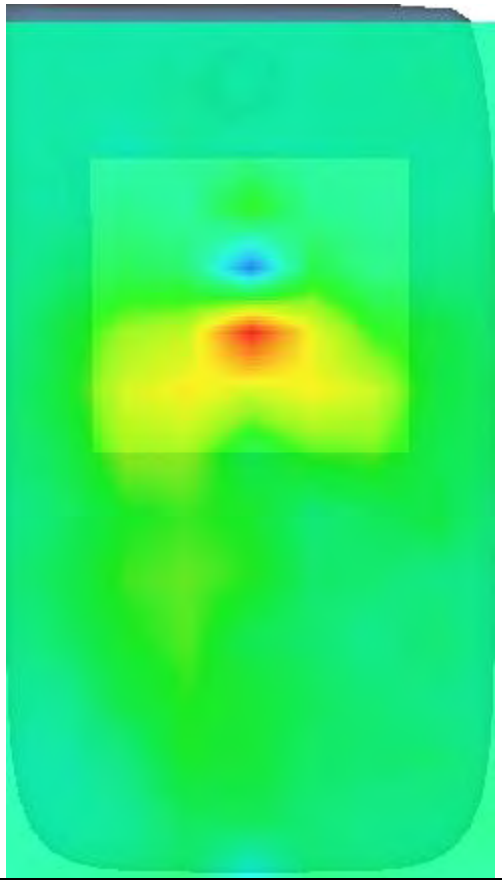
SURFACE SAR	VOLUME SAR
	

Maximum location: X=0.00, Y=17.00
SAR Peak: 0.38 W/kg

SAR 10g (W/Kg)	0.065256
SAR 1g (W/Kg)	0.111362

Z (mm)	0.00	2.00	4.00	6.00	8.00	10.00	12.00	14.00	16.00	18.00	20.00	22.00
SAR (W/Kg)	0.3729	0.2116	0.0527	0.0671	0.0402	0.0474	0.0400	0.0401	0.0437	0.0374	0.0393	0.0388



3D screen shot	Hot spot position
	

MEASUREMENT 9

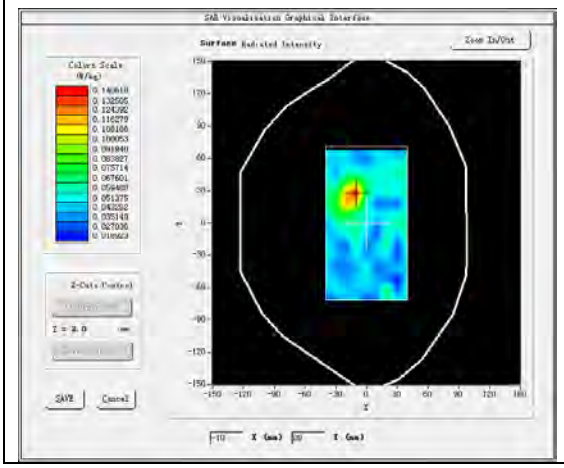
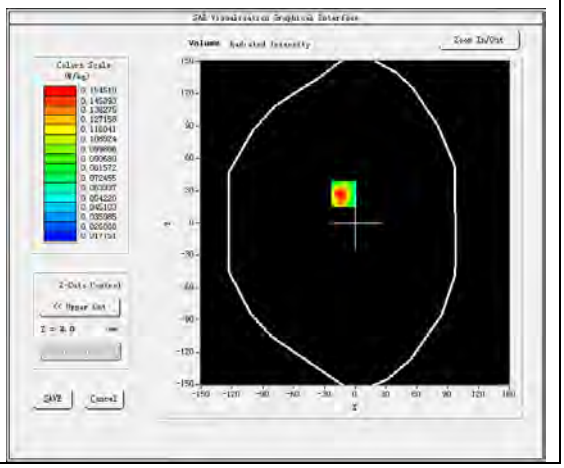
Date of measurement: 24/9/2021

A. Experimental conditions.

Area Scan	dx=10mm dy=10mm, h= 2.00 mm
ZoomScan	7x7x12,dx=4mm dy=4mm dz=2mm
Phantom	Validation plane
Device Position	Body
Band	IEEE 802.11ac U-NII
Channels	Middle
Signal	IEEE802.11ac (Crest factor: 1.0)

B. SAR Measurement Results

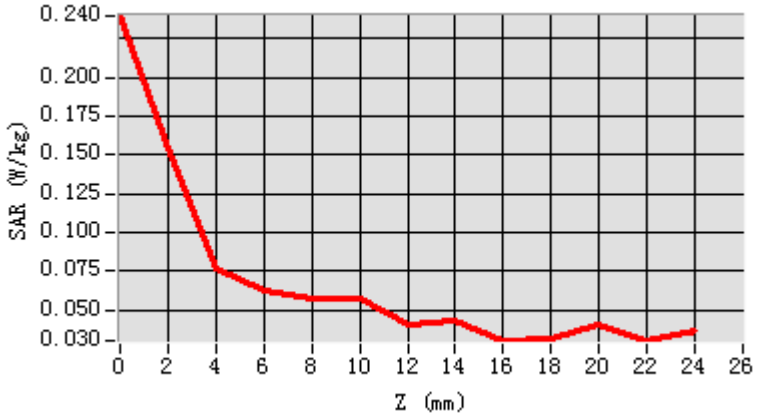
Frequency (MHz)	5610.000000
Relative permittivity (real part)	36.341216
Relative permittivity (imaginary part)	16.223372
Conductivity (S/m)	5.056284
Variation (%)	-1.810000

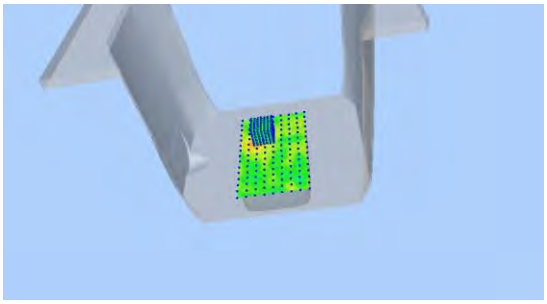
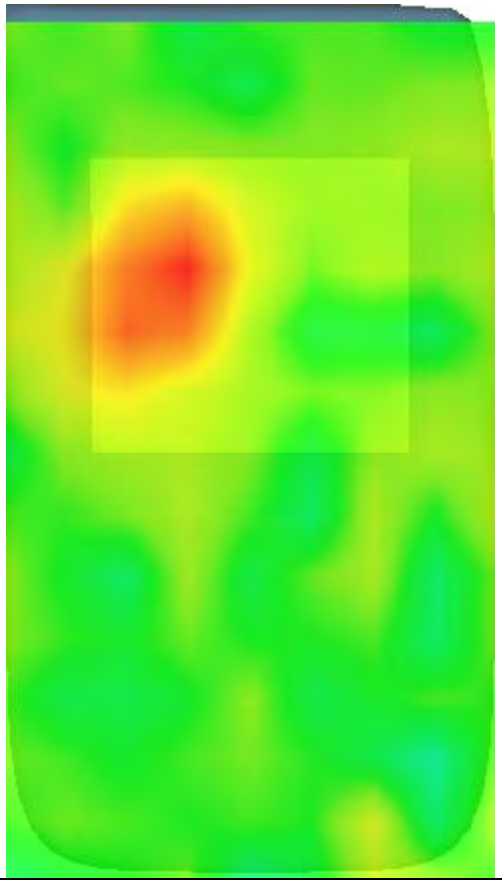
SURFACE SAR	VOLUME SAR
	

Maximum location: X=-11.00, Y=27.00
SAR Peak: 0.28 W/kg

SAR 10g (W/Kg)	0.062968
SAR 1g (W/Kg)	0.103372

Z (mm)	0.00	2.00	4.00	6.00	8.00	10.00	12.00	14.00	16.00	18.00	20.00	22.00
SAR (W/Kg)	0.2397	0.1545	0.0761	0.0628	0.0565	0.0571	0.0407	0.0434	0.0299	0.0307	0.0404	0.0304



3D screen shot	Hot spot position
	

MEASUREMENT 10

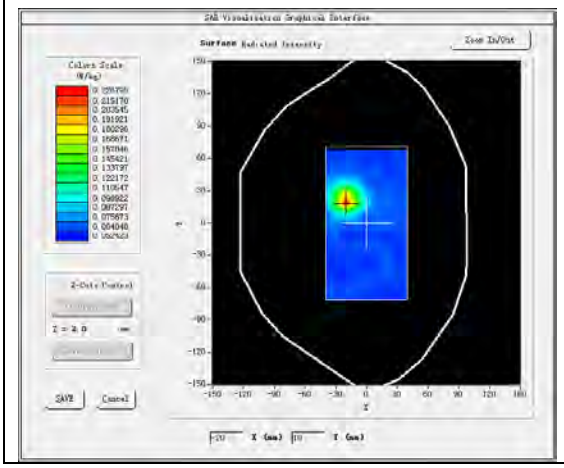
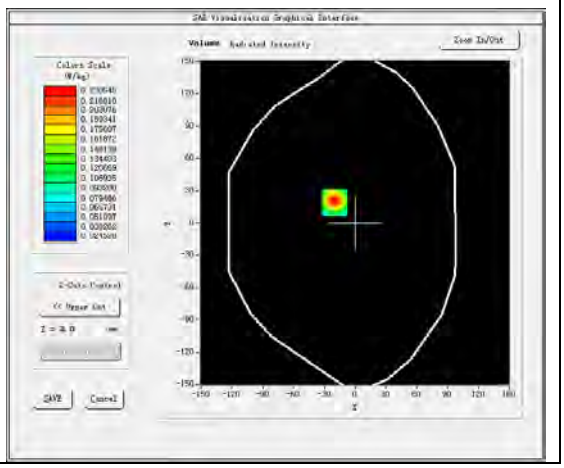
Date of measurement: 25/9/2021

A. Experimental conditions.

Area Scan	dx=10mm dy=10mm, h= 2.00 mm
ZoomScan	7x7x12,dx=4mm dy=4mm dz=2mm
Phantom	Validation plane
Device Position	Body
Band	IEEE 802.11ac U-NII
Channels	Middle
Signal	IEEE802.11ac (Crest factor: 1.0)

B. SAR Measurement Results

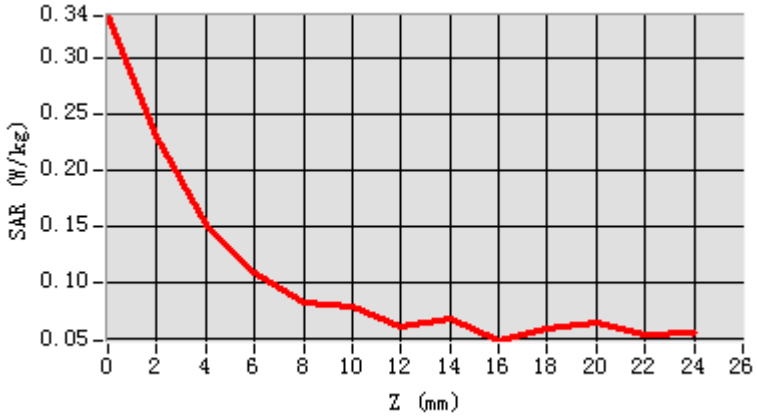
Frequency (MHz)	5775.000000
Relative permittivity (real part)	36.071482
Relative permittivity (imaginary part)	16.406653
Conductivity (S/m)	5.263801
Variation (%)	3.060000

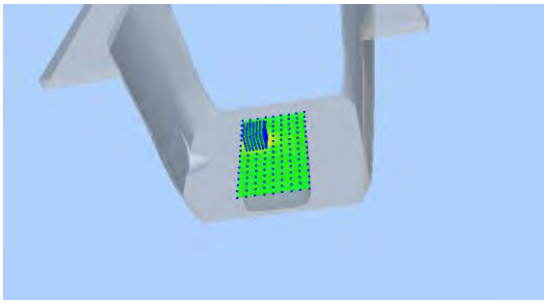
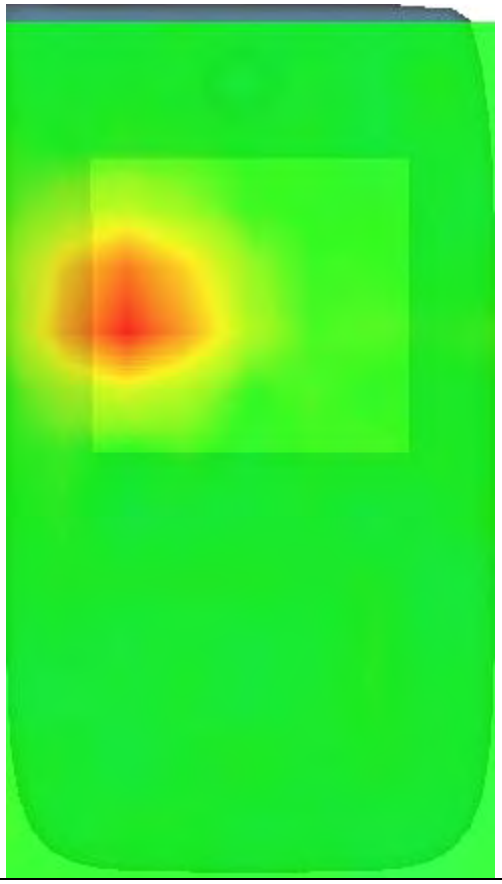
SURFACE SAR	VOLUME SAR
	

Maximum location: X=-20.00, Y=19.00
SAR Peak: 0.36 W/kg

SAR 10g (W/Kg)	0.092950
SAR 1g (W/Kg)	0.158177

Z (mm)	0.00	2.00	4.00	6.00	8.00	10.00	12.00	14.00	16.00	18.00	20.00	22.00
SAR (W/Kg)	0.3372	0.2305	0.1516	0.1090	0.0829	0.0781	0.0614	0.0683	0.0487	0.0597	0.0645	0.0545



3D screen shot	Hot spot position
	

MEASUREMENT 11

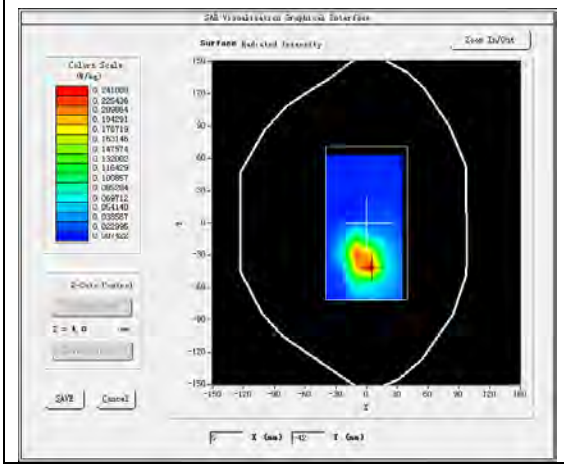
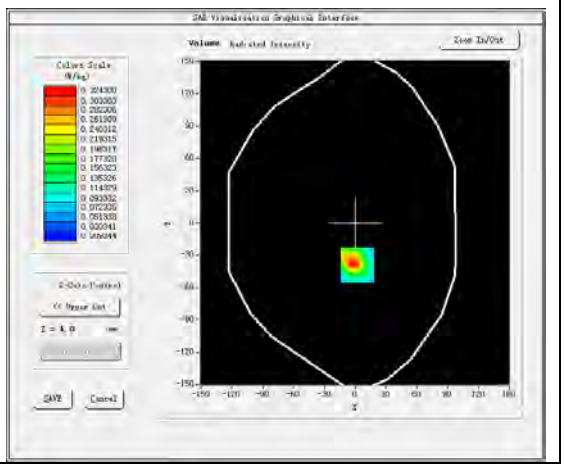
Date of measurement: 20/9/2021

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

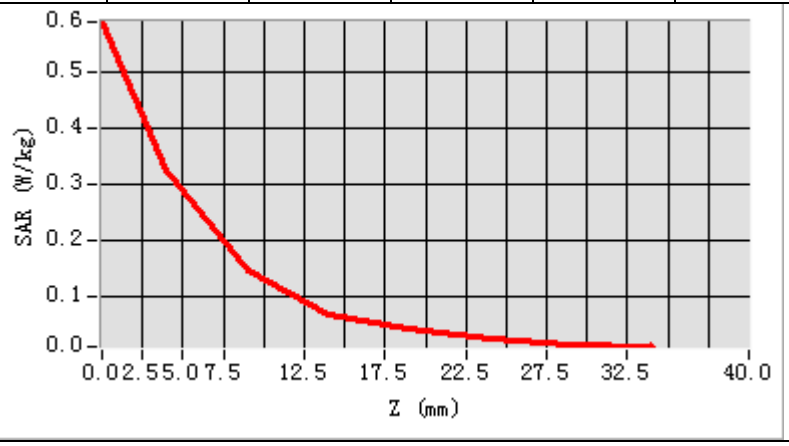
Frequency (MHz)	1880.000000
Relative permittivity (real part)	38.662582
Relative permittivity (imaginary part)	13.846555
Conductivity (S/m)	1.446196
Variation (%)	-2.560000

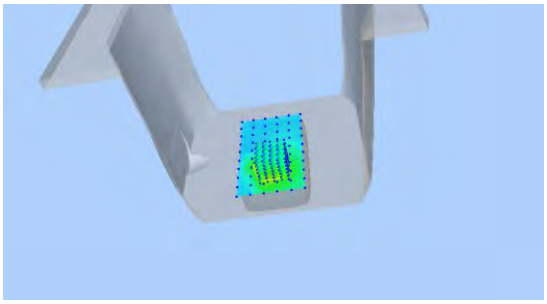
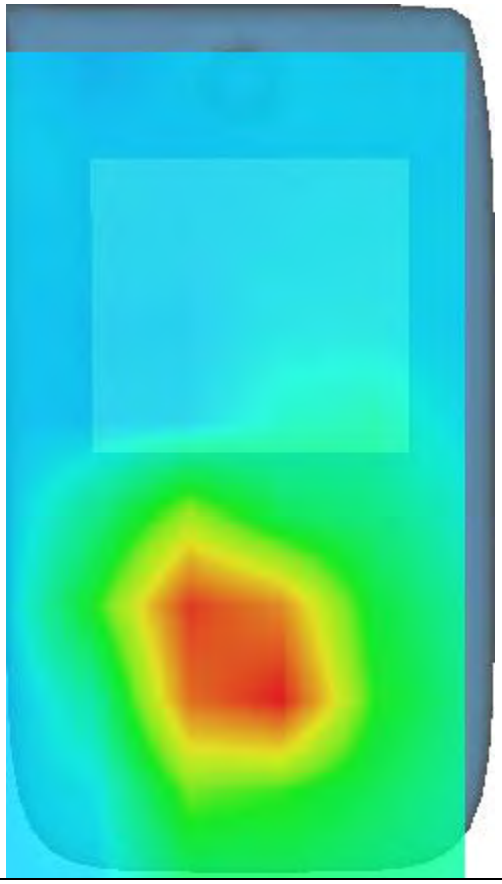
SURFACE SAR	VOLUME SAR
	

Maximum location: X=2.00, Y=-39.00
SAR Peak: 0.66 W/kg

SAR 10g (W/Kg)	0.141633
SAR 1g (W/Kg)	0.337822

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	0.5906	0.3243	0.1457	0.0679	0.0421	0.0258	0.0153



3D screen shot	Hot spot position
	

MEASUREMENT 12

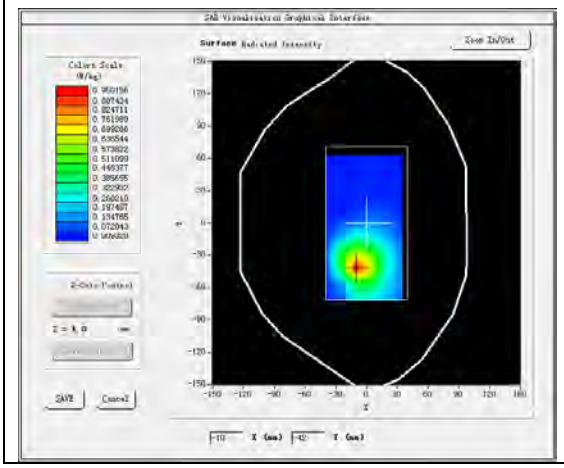
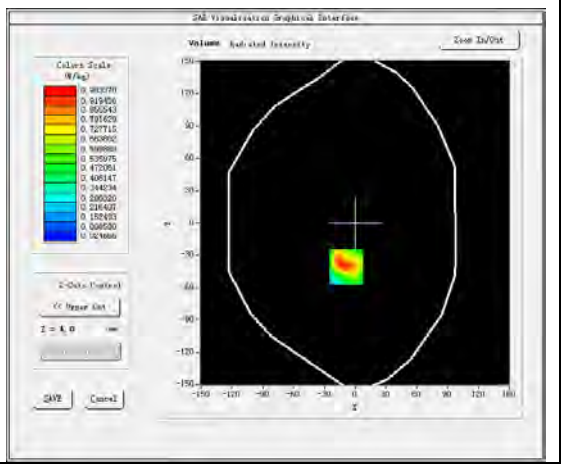
Date of measurement: 17/9/2021

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	High
Signal	LTE (Crest factor: 1.0)

B. SAR Measurement Results

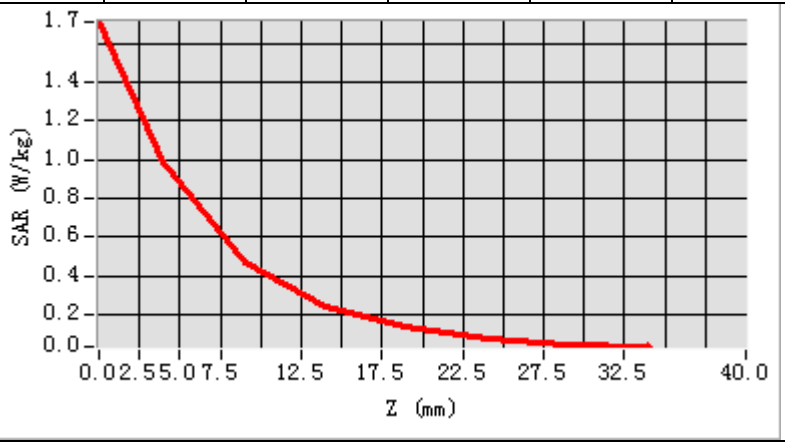
Frequency (MHz)	1745.000000
Relative permittivity (real part)	40.001755
Relative permittivity (imaginary part)	14.012730
Conductivity (S/m)	1.358067
Variation (%)	-1.840000

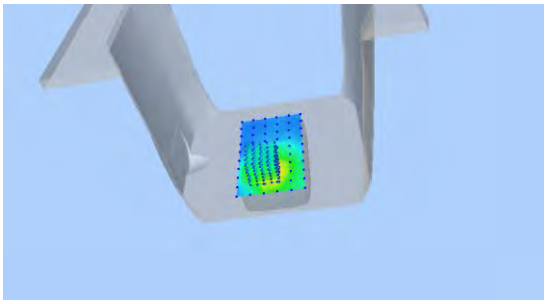
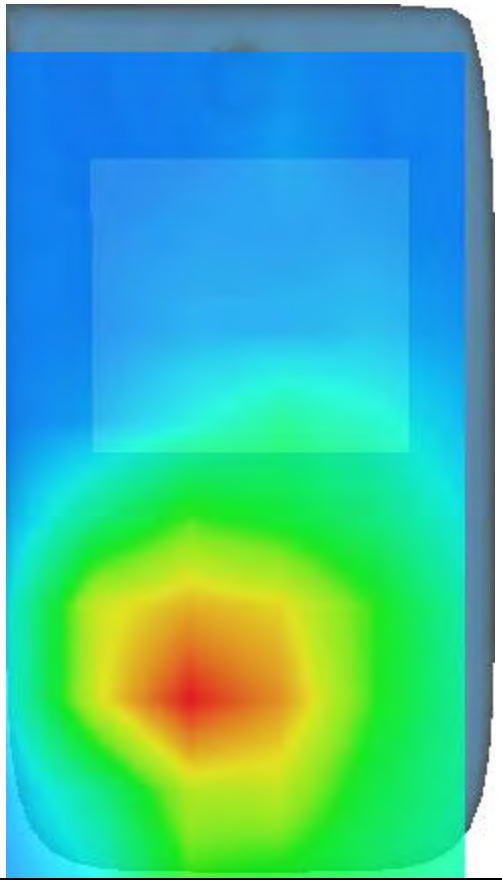
SURFACE SAR	VOLUME SAR
	

Maximum location: X=-9.00, Y=-41.00
SAR Peak: 1.77 W/kg

SAR 10g (W/Kg)	0.439467
SAR 1g (W/Kg)	0.939211

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	1.7109	0.9834	0.4700	0.2470	0.1374	0.0815	0.0492



3D screen shot	Hot spot position
	

MEASUREMENT 13

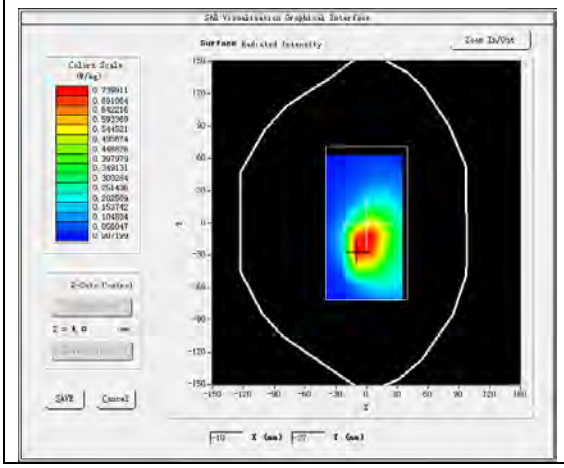
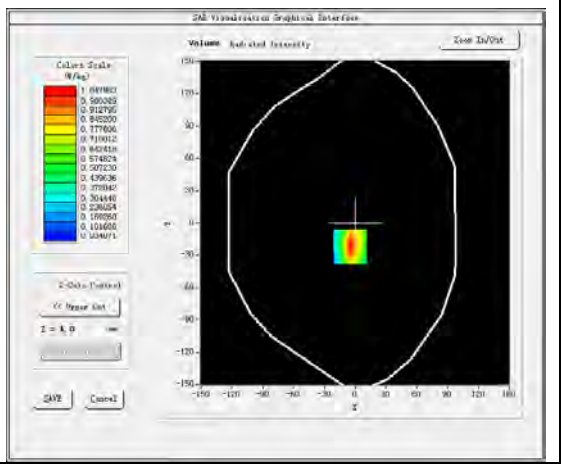
Date of measurement: 13/9/2021

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

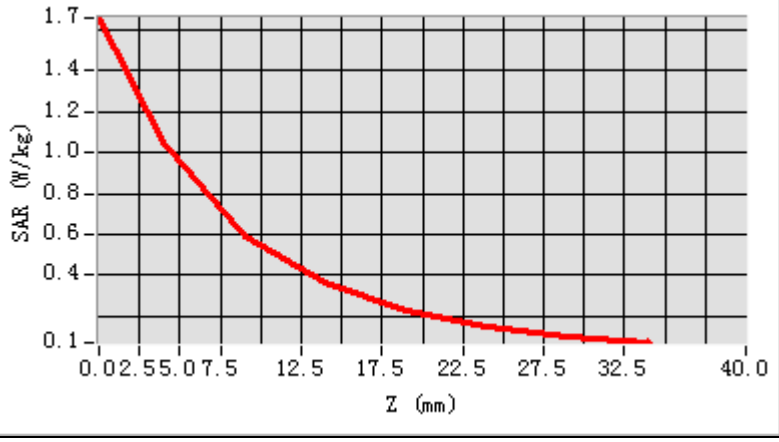
Frequency (MHz)	836.500000
Relative permittivity (real part)	43.091057
Relative permittivity (imaginary part)	19.307709
Conductivity (S/m)	0.897272
Variation (%)	-0.800000

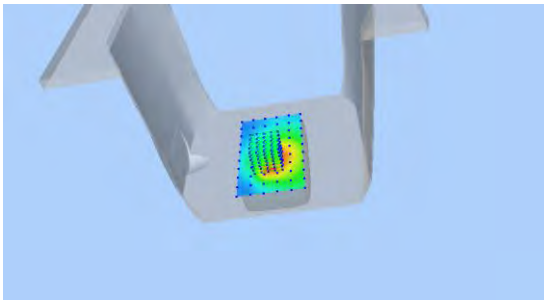
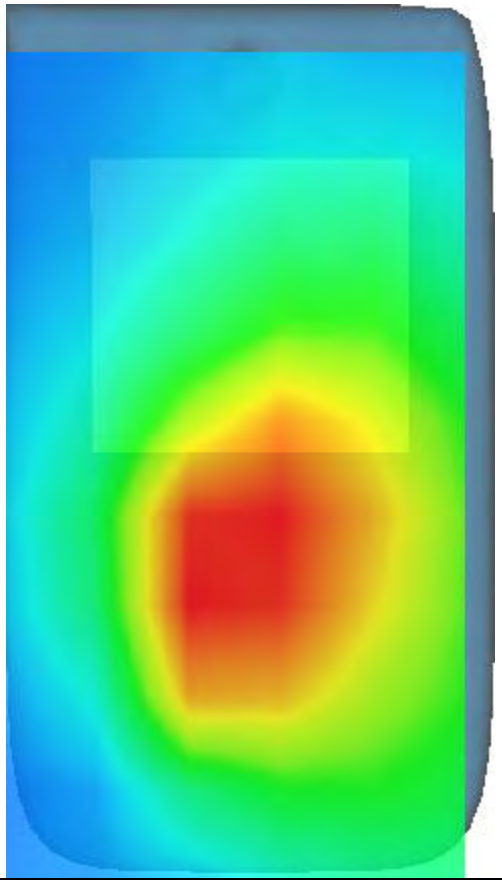
SURFACE SAR	VOLUME SAR
	

Maximum location: X=-5.00, Y=-22.00
SAR Peak: 1.65 W/kg

SAR 10g (W/Kg)	0.525976
SAR 1g (W/Kg)	0.976660

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	1.6587	1.0480	0.5881	0.3613	0.2312	0.1513	0.1050



3D screen shot	Hot spot position
	

MEASUREMENT 14

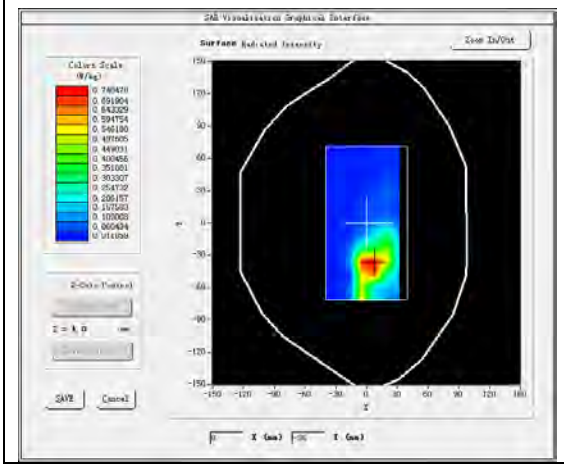
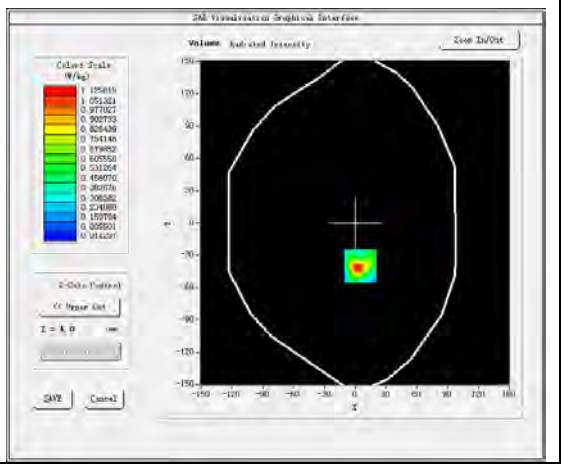
Date of measurement: 23/9/2021

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	High
Signal	LTE (Crest factor: 1.0)

B. SAR Measurement Results

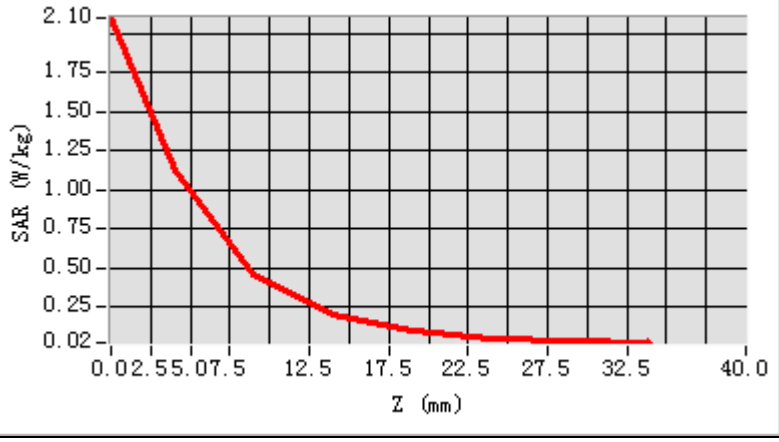
Frequency (MHz)	2560.000000
Relative permittivity (real part)	39.615162
Relative permittivity (imaginary part)	13.704202
Conductivity (S/m)	1.949042
Variation (%)	1.140000

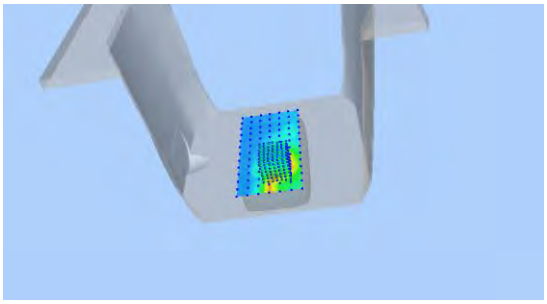
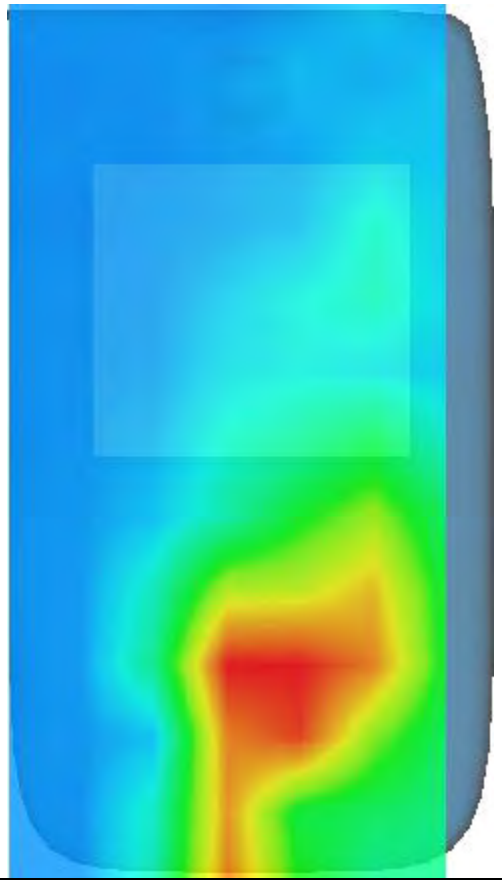
SURFACE SAR	**VOLUME SAR**
	

Maximum location: X=5.00, Y=-40.00
SAR Peak: 2.23 W/kg

SAR 10g (W/Kg)	0.401427
SAR 1g (W/Kg)	1.040826

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	2.0991	1.1256	0.4629	0.2002	0.0969	0.0452	0.0299



3D screen shot	Hot spot position
	

MEASUREMENT 15

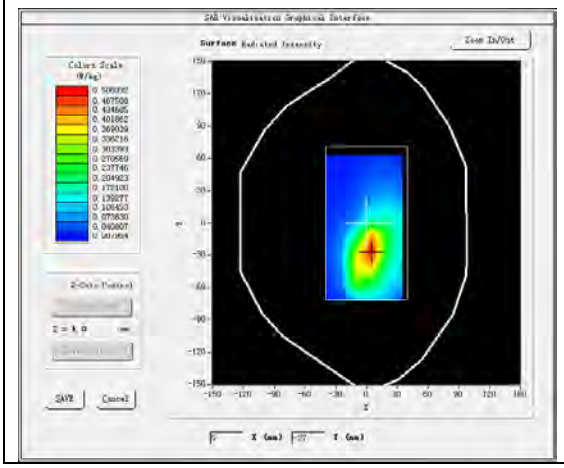
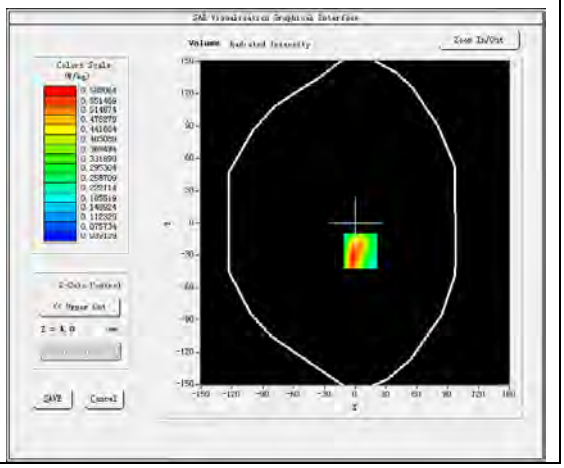
Date of measurement: 15/9/2021

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 17
Channels	Middle
Signal	LTE (Crest factor: 1.0)

B. SAR Measurement Results

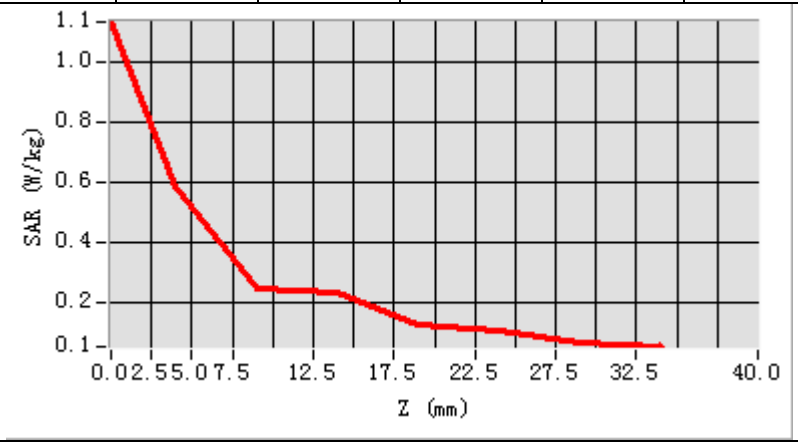
Frequency (MHz)	710.000000
Relative permittivity (real part)	42.246078
Relative permittivity (imaginary part)	21.893740
Conductivity (S/m)	0.863586
Variation (%)	0.220000

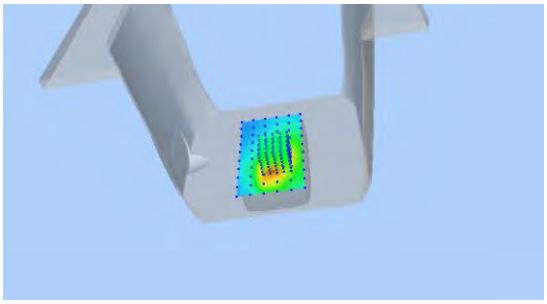
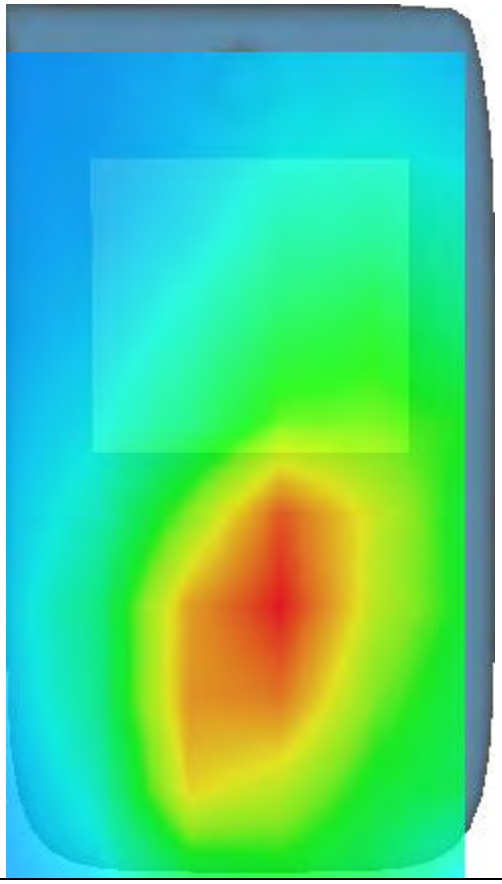
SURFACE SAR	**VOLUME SAR**
	

Maximum location: X=5.00, Y=-26.00
SAR Peak: 0.90 W/kg

SAR 10g (W/Kg)	0.306866
SAR 1g (W/Kg)	0.544374

Z (mm)	0.00	4.00	9.00	14.00	19.00	24.00	29.00
SAR (W/Kg)	1.1323	0.5881	0.2473	0.2354	0.1295	0.1090	0.0671



3D screen shot	Hot spot position
	

14. Appendix D. Calibration Certificate

Table of contents
E Field Probe - SN 08/16 EPGO287
750 MHz Dipole - SN 03/15 DIP 0G750-355
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
5000-6000 MHz Dipole - SN 13/14 WGA 33

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: 03/01/2021

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	3/1/2021	JS
Checked by :	Jérôme Luc	Technical Manager	3/1/2021	JS
Approved by :	Yann Toutain	Laboratory Director	3/1/2021	Yann Toutain 2021.03.01 13:07:12 +01'00'

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

Issue	*Name*	*Date*	*Modifications*
A	Jérôme Luc	3/1/2021	Initial release

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TABLE OF CONTENTS

1 Device Under Test 4
2 Product Description 4
2.1 General Information 4
3 Measurement Method 4
3.1 Linearity 4
3.2 Sensitivity 5
3.3 Lower Detection Limit 5
3.4 Isotropy 5
3.1 Boundary Effect 5
4 Measurement Uncertainty 6
5 Calibration Measurement Results 6
5.1 Sensitivity in air 6
5.2 Linearity 7
5.3 Sensitivity in liquid 8
5.4 Isotropy 9
6 List of Equipment 10

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1 DEVICE UNDER TEST

Device Under Test	
Device Type	COMOSAR DOSIMETRIC E FIELD PROBE
Manufacturer	MVG
Model	SSE2
Serial Number	SN 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.

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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:

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

where

$\mathrm{SAR}_{\mathrm{uncertainty}}$	is the uncertainty in percent of the probe boundary effect
d_{be}	is the distance between the surface and the closest *zoom-scan* measurement point, in millimetre
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.

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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:

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

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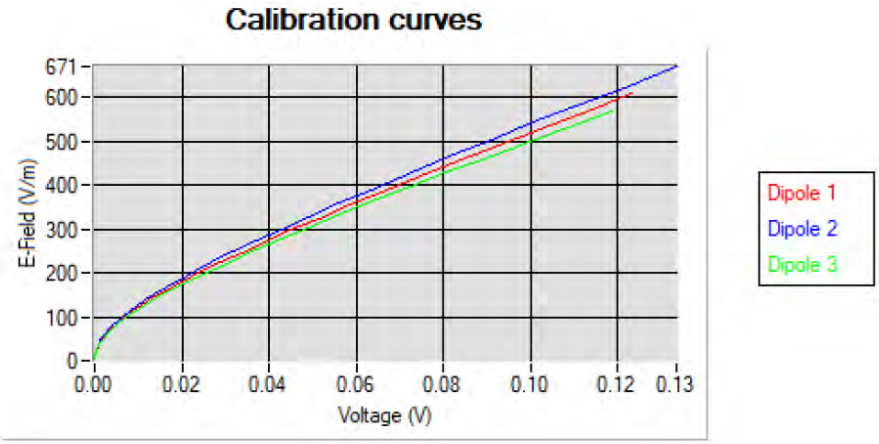
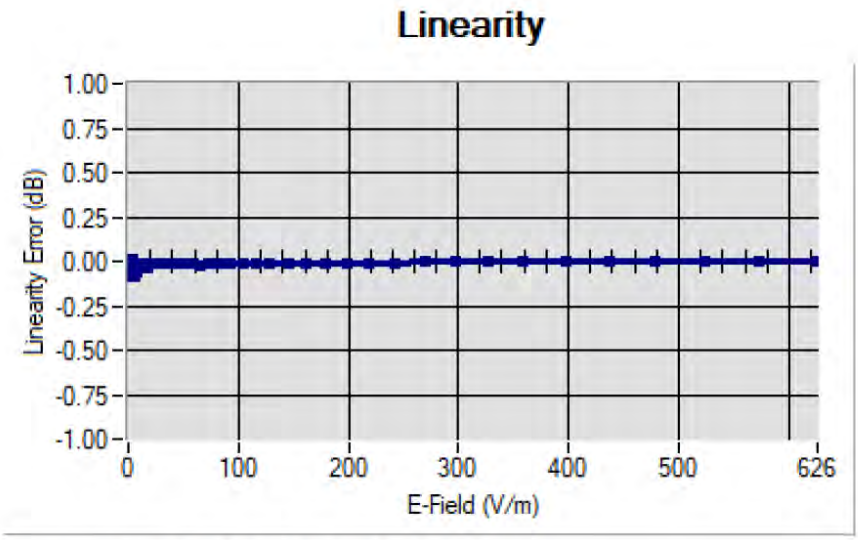


5.2 LINEARITY



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

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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

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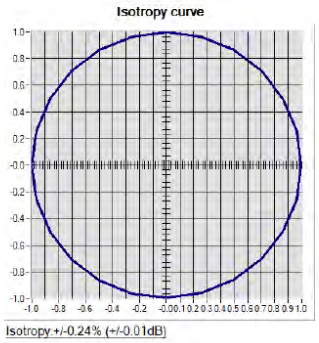
5.4 ISOTROPY

HL1800 MHz



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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

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SAR Reference Dipole Calibration Report

Ref : ACR.60.2.21.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 REFERENCE DIPOLE

FREQUENCY: 750 MHZ

SERIAL NO.: SN 03/15 DIP0G750-355

Calibrated at MVG

Z.I. de la pointe du diable

Technopôle Brest Iroise – 295 avenue Alexis de Rochon

29280 PLOUZANE - FRANCE

Calibration date: 03/01/2021

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

Summary:

This document presents the method and results from an accredited SAR reference dipole calibration performed at MVG, using the COMOSAR test bench. The test results covered by accreditation are traceable to the International System of Units (SI).

SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref: ACR.60.2.21.MVGB.A

	Name	Function	Date	Signature
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