TEST REPORT

of

FCC/IC SAR

☐ New Application; ☐ Class I PC; ☒ Class II PC

Product Description:	**10.1" Tablet PC**
Brand Name:	**BARTEC**
Model Name:	**Agile X IS**
Model Difference:	**N/A**
FCC ID:	**Wifi/BT: TBUAGXISWL** **WWAN: TBUAGXISWW**
IC ID:	**Wifi/BT: 5736C-AGXISWL** **WWAN: 5736C-AGXISWW**
Standard:	**IEEE 1528: 2013** **FCC KDB 447498: 2015** **RSS-102 issue 5: 2015**
Applicant:	**BARTEC GmbH**
Address:	**Max-Eyth-Strasse 16, Bad Mergentheim 97980, Germany**

Test Performed by:
International Standards Laboratory
<Lung-Tan LAB>
*Site Registration No.: TAF: 0997
*Address:
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Report No.: **ISL-16LR283FSAR**
Issue Date : **2017/01/11**

Testing Laboratory
0997

Test results given in this report apply only to the specific sample(s) tested and are traceable to national or international standard through calibration of the equipment and evaluating measurement uncertainty herein.
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VERIFICATION OF COMPLIANCE

Applicant:	BARTEC GmbH
Product Description:	10.1" Tablet PC
Brand Name:	BARTEC
Host Model No.:	Agile X IS
Model Difference:	N/A
FCC ID:	Wifi/BT: TBUAGXISWL WWAN: TBUAGXISWW
IC ID:	Wifi/BT: 5736C-AGXISWL WWAN: 5736C-AGXISWW
Date of Receipt:	2016/12/21
Date of Test:	2016/12/22 ~ 2016/12/28
Standard:	IEEE 1528: 2013 FCC KDB 447498: 2015 RSS-102 issue 5: 2015

We hereby certify that:

All the tests in this report have been performed and recorded in accordance with the standards described above and performed by an independent electromagnetic compatibility consultant, International Standards Laboratory.

The test results contained in this report accurately represent the measurements of the characteristics and the energy generated by sample equipment under test at the time of the test. The sample equipment tested as described in this report is in compliance with the limits of above standards.

Test By:	Dino Chen ***Dino Chen / Engineer***	***Date:***	2017/01/11
Prepared By:	Dino Chen ***Dino Chen / Engineer***	***Date:***	2017/01/11
Approved By:	Vincent Su ***Vincent Su / Technical Manager***	***Date:***	2017/01/11

Version

Version No.	Date	Description
00	2017/01/11	Initial creation of document

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1 Statement of Compliance

The maximum results of Specific Absorption Rate (SAR) were found during testing for EUT, which are as follows (with expanded uncertainty 21.4 % for 300 MHz to 3 GHz).

FCC **SAR Value**

Type	FCC Equipment Class	Position	SAR 1g(W/kg)
802.11b	DSSS	Body, 0cm	0.710
802.11g	OFDM	Body, 0cm	0.345
802.11n 20	OFDM	Body, 0cm	0.309
802.11n 40	OFDM	Body, 0cm	0.421
BT BDR	FHSS	Body, 0cm	0.002
802.11a B1 and B2	OFDM	Body, 0cm	0.970
802.11n 20 B1 and B2	OFDM	Body, 0cm	0.643
802.11n 40 B1 and B2	OFDM	Body, 0cm	0.802
802.11ac 80 B1 and B2	OFDM	Body, 0cm	0.307
802.11a B3	OFDM	Body, 0cm	0.804
802.11n 20 B3	OFDM	Body, 0cm	0.698
802.11n 40 B3	OFDM	Body, 0cm	0.656
802.11ac 80 B3	OFDM	Body, 0cm	0.413
802.11a B4	OFDM	Body, 0cm	0.277
802.11n 20 B4	OFDM	Body, 0cm	0.241
802.11n 40 B4	OFDM	Body, 0cm	0.400
802.11ac 80 B4	OFDM	Body, 0cm	0.449
GPRS 850	GPRS	Body, 0cm	0.478
GPRS 1900	GPRS	Body, 0cm	0.112
WCDMA B2	WCDMA	Body, 0cm	0.339
WCDMA B4	WCDMA	Body, 0cm	0.589
WCDMA B5	WCDMA	Body, 0cm	0.899
LTE Band 2	LTE	Body, 0cm	0.167
LTE Band 4	LTE	Body, 0cm	0.496
LTE Band 5	LTE	Body, 0cm	0.865
LTE Band 13	LTE	Body, 0cm	0.968
LTE Band 17	LTE	Body, 0cm	0.966
The worst case at same side of LTE + wifi + BT	LTE + wifi + BT	Body, 0cm	0.981

IC △ **SAR Value**

Type	FCC Equipment Class	Position	SAR 1g(W/kg)
802.11b	DSSS	Body, 0cm	0.605
802.11g	OFDM	Body, 0cm	0.324
802.11n 20	OFDM	Body, 0cm	0.278
802.11n 40	OFDM	Body, 0cm	0.374
BT BDR	FHSS	Body, 0cm	0.001
802.11a B1 and B2	OFDM	Body, 0cm	0.760
802.11n 20 B1 and B2	OFDM	Body, 0cm	0.555
802.11n 40 B1 and B2	OFDM	Body, 0cm	0.679
802.11ac 80 B1 and B2	OFDM	Body, 0cm	0.210
802.11a B3	OFDM	Body, 0cm	0.715
802.11n 20 B3	OFDM	Body, 0cm	0.621
802.11n 40 B3	OFDM	Body, 0cm	0.527
802.11ac 80 B3	OFDM	Body, 0cm	0.262
802.11a B4	OFDM	Body, 0cm	0.218
802.11n 20 B4	OFDM	Body, 0cm	0.195
802.11n 40 B4	OFDM	Body, 0cm	0.302
802.11ac 80 B4	OFDM	Body, 0cm	0.268
GPRS 850	GPRS	Body, 0cm	0.327
GPRS 1900	GPRS	Body, 0cm	0.074
WCDMA B2	WCDMA	Body, 0cm	0.235
WCDMA B4	WCDMA	Body, 0cm	0.589
WCDMA B5	WCDMA	Body, 0cm	0.548
LTE Band 2	LTE	Body, 0cm	0.125
LTE Band 4	LTE	Body, 0cm	0.390
LTE Band 5	LTE	Body, 0cm	0.652
LTE Band 13	LTE	Body, 0cm	0.652
LTE Band 17	LTE	Body, 0cm	0.609
The worst case at same side of LTE + wifi + BT	LTE + wifi + BT	Body, 0cm	0.771

The 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), RSS-102 Issue5:2015 and had been tested in accordance with the measurement methods and procedures specified in IEEE1528: 2013 and FCC OET Bulletin 65 Supplement C (Edition 01-01).

2 General Information

2.1 Description of Device Under Test (DUT)

General:

Product Name:	10.1" Tablet PC	
Brand (Trade) Name:	BARTEC	
Model Name:	Agile X IS	
Model Difference:	N/A	
Power Supply:	19Vdc from AC/DC adapter or 7.6V battery	
	Battery:	Model: IS-E-Bat-Replaceable-V1 Model: IS-I-Bat-V1
	Adaptor:	1. Model: EA10633B-190 ; Supplier: EDAC
Voice function	No	
DFS function	Non-DFS slaver	
Simultaneous transmissions:	Yes, WLAN, BT and WWAN 2.4GHz WLAN, 5GHz WLAN would not work at same time.	
Wifi/BT Modular ID:	FCC ID: TBUAGXISWL IC: 5736C-AGXISWL (HVIN: AP6356SDPB)	
WWAN modular ID	FCC ID: TBUAGXISWW IC: 5736C-AGXISWW (HVIN: PLS8-X)	
System ID(NFC):	FCC ID: TBUAGXISNFC IC: 5736C-AGXISNFC (HVIN: Agile X IS)	

IC RSS-Gen for end system:

HVIN (Hardware Version Identification Number)	BTIF-200
FVIN (Firmware Version Identification Number)	BIOS V010
Test SoftWare Version	Win 10

Wifi: 2Tx, 2Rx, SM-MIMO

Wi-Fi	Frequency Range (MHz)	Channels	Peak / Average Power	Modulation Technology
802.11b	2412 – 2462(DTS)	11	17.22dBm (PK)/ 14.03 dBm (AV)	DSSS
802.11n (2.4G)	2412 – 2462(DTS)	11	22.00dBm (PK) /14.22 dBm (AV)	OFDM
	HT20 2412 – 2462(DTS)	11	25.12dBm (PK) /14.20 dBm (AV)	
	HT40 2422 – 2452(DTS)	7	24.89dBm (PK) /14.22 dBm (AV)	
802.11n (5G)	5180 – 5240(NII)	4	11.50dBm (AV)	
	5260 – 5320(NII)	4	11.29dBm (AV)	
	5500 – 5700(NII)	11	12.07dBm (AV)	
	5745 – 5825(NII)	5	11.54dBm (AV)	
	HT20 5180 – 5240(NII)	4	11.95dBm (AV)	
	HT20 5260 – 5320 (NII)	4	11.65 dBm (AV)	
	HT20 5500 – 5700 (NII)	11	11.75 dBm (AV)	
	HT20 5745 – 5825(NII)	5	11.35 dBm (AV)	
	HT40 5190 – 5230(NII)	3	11.76dBm (AV)	
	HT40 5270 – 5310(NII)	3	11.17dBm (AV)	
	HT40 5510 – 5670(NII)	9	11.31dBm (AV)	
	HT40 5755 – 5795(NII)	3	11.05dBm (AV)	
802.11ac	HT80 5210(NII)	1	11.12dBm (AV)	
	HT80 5290(NII)	1	11.08dBm (AV)	
	HT80 5530(NII)	1	11.31dBm (AV)	
	HT80 5775(NII)	1	10.56dBm (AV)	
Modulation type	CCK, DQPSK, DBPSK for DSSS 256QAM.64QAM. 16QAM, QPSK, BPSK for OFDM			
Antenna Designation	Type: PIFA Antenna, 2.0 dBi max			
Tune up power (Average)	+/- 0.5 dBm			

The EUT is compliance with IEEE 802.11 a/b/g/n/ac Standard.

BT: 1Tx, 1Rx

Bluetooth Version	V2.1 + EDR (GFSK + π /4 DQPSK + 8DPSK)	BLE (GFSK)
Frequency Range:	2402 – 2480MHz	2402 – 2480MHz
Channel number:	79 channels	40 channels
Modulation type:	Frequency Hopping Spread Spectrum (FHSS)	Wide band Modulation
Transmit Power: (Peak)	6.01dBm	2.68dBm
Dwell Time:	<= 0.4s	N/A
Antenna Designation:	Type: PIFA Antenna, 2.0 dBi max	
Tune up Power(Average)	+/- 0.5 dBm	

The EUT is compliance with Bluetooth V2.1 + EDR and BT4.1.

GPRS / WCDMA/LTE: 1Tx, 2Rx

Cellular Phone Standards Frequency Range and Power:	Operating Frequency		Rated Power	Tune up Power
	GPRS/EDGE850, Class 12	824MHz – 849MHz	33dBm	+/- 1 dBm
	GPRS/EDGE1900, Class 12	1850MHz-1910MHz	30dBm	+/- 1 dBm
	WCDMA/HSPA Band 2	1852.4MHz-1907.6MHz	24dBm	+/- 1 dBm
	WCDMA/HSPA Band 4	1712.4MHz-1752.6MHz	24dBm	+/- 1 dBm
	WCDMA/HSPA Band 5	826.4MHz – 846.6MHz	24dBm	+/- 1 dBm
	LTE Band 2	1850MHz – 1910MHz	23dBm	+/- 1 dBm
	LTE Band 4	1710MHz – 1755MHz	23dBm	+/- 1 dBm
	LTE Band 5	824MHz – 849MHz	23dBm	+/- 1 dBm
	LTE Band 14	788MHz – 798MHz	23dBm	+/- 1 dBm
	LTE Band 17	704MHz – 716MHz	23dBm	+/- 1 dBm
Antenna Designation	Type: PIFA Antenna			
DTM Function	No，Device only support data function(GPRS / EGPRS)			

This test report applies for Body SAR of wifi/ BT/GPRS 850 /GPRS 1900 /WCDMA Band 2, 4, 5 and LTE Band 2, 4, 5, 13, 17.

Remark: The above DUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.

2.2 DUT Photos

Please refer to Appendix B.

2.3 Applied Standards

The Specific Absorption Rate (SAR) testing specification, method and procedure for this Notebook Computer is in accordance with the following standards:
IEEE 1528: 2013
RSS-102 Issue 5: 2015

FCC KDB 447498 D01 General RF Exposure Guidance v06
FCC KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz v01r04
FCC KDB 941225 D01 3G SAR Procedures v03r01
FCC KDB 941225 D05 SAR for LTE Devices v02r05
FCC KDB 248227 D01 802.11 Wi-Fi SAR v02r02
FCC KDB 616217 D04 SAR for laptop and tablets v01r02

2.4 Test Facility

The measurement facilities used to collect the SAR data are located on the address of International Standards Laboratory <Lung-Tan LAB> No. 120, Lane 180, Hsin Ho Rd., Lung-Tan Dist., Tao Yuan City 325, Taiwan. FCC Registration Number is: TW1036, Canada Registration Number: 4067B.

2.5 Device Category and SAR Limits

This device belongs to **portable** device category because its radiating structure is allowed to be used within 20 centimeters of the body of the user. Limit for **General Population/Uncontrolled** exposure should be applied for this device, it is **1.6 W/kg** as averaged over any 1 gram of tissue.

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

Type Exposure	Uncontrolled Environment Limit
Spatial Peak SAR (1g cube tissue for brain or body)	1.60 W/kg
Spatial Average SAR (whole body)	0.08 W/kg
Spatial Peak SAR (10g for hands, feet, ankles and wrist)	4.00 W/kg

2.6 Test Environment

Item	Required	Actual
Temperature (°C)	18-25°C	20 to 24 °C
Humidity (%RH)	30-70 %	< 60 %

2.7 Test Configuration

The device was controlled by using a test software to transmit TX power level at max continuously. Modulation type and Channel number are selected by software also.

3 Specific Absorption Rate (SAR)

3.1 Introduction

SAR is related to the rate at which energy is absorbed per unit mass in an object exposed to a radio field. The SAR distribution in a biological body is complicated and is usually carried out by experimental techniques or numerical modeling. The standard recommends limits for two tiers of groups, occupational/controlled and general population/uncontrolled, based on a person's awareness and ability to exercise control over his or her exposure. In general, occupational/controlled exposure limits are higher than the limits for general population/uncontrolled.

3.2 SAR Definition

The SAR definition is the time derivative (rate) of the incremental energy (dW) absorbed by (dissipated in) an incremental mass (dm) contained in a volume element (dv) of a given density (ρ). The equation description is as below:

$$SAR = \frac{d}{dt}\left(\frac{dW}{dm}\right) = \frac{d}{dt}\left(\frac{dW}{\rho dV}\right)$$

SAR is expressed in units of Watts per kilogram (W/kg)

SAR measurement can be either related to the temperature elevation in tissue by

$$SAR = C\left(\frac{\delta T}{\delta t}\right)$$

Where: C is the specific head capacity, δT is the temperature rise and δt is the exposure duration, or related to the electrical field in the tissue by

$$SAR = \frac{\sigma |E|^2}{\rho}$$

Where: σ is the conductivity of the tissue, ρ is the mass density of the tissue and E is the RMS electrical field strength.

However for evaluating SAR of low power transmitter, electrical field measurement is typically applied.

4 SAR Measurement System

4.1 ALSAS-10U System Description

APREL Laboratories ALSAS-10U is fully optimized for the dosimetric evaluation of a broad range of wireless transceivers and antennas. Developed in line with the latest methodologies it is fully compliant with the technical and scientific requirements of IEEE 1528: 2013, IEC 62209 Part 1 & 2 (draft), CENELEC, ARIB, ACA, and the Federal Communications Commission. The system comprises of a six axes articulated robot which utilizes a dedicated controller.

ALSAS-10U uses the latest methodologies and FDTD odeling to provide a platform which is repeatable with minimum uncertainty.

Applications

ALSAS-10U is designed to cover the frequency range from 30MHz to 6GHz as per the IEC 62209 Part II (draft) standard. There is no limiting factor to the operating RF carrier frequency range for the ALSAS-10U system other than the phantoms chosen for testing. The ALSAS-10U has been designed to be modular and phantoms are integrated onto the Universal Workstation ™ so as to allow for complete flexibility of the measurement process. This unique design allows for a fully flexible system which can be built around the exact needs of the user.

Area Scans

Area scans are defined prior to the measurement process being executed with a user defined variable spacing between each measurement point (integral) allowing low uncertainty measurements to be conducted. Scans defined for FCC applications utilize a $10mm^2$ step integral, with 1mm interpolation used to locate the peak SAR area used for zoom scan assessments.

Where the system identifies multiple SAR peaks (which are within 25% of peak value) the system will provide the user with the option of assessing each peak location individually for zoom scan averaging.

Zoom Scan (Cube Scan Averaging)

The averaging zoom scan volume utilized in the ALSAS-10U software is in the shape of a cube and the side dimension of a 1 g or 10 g mass is dependent on the density of the liquid representing the simulated tissue. A density of 1000 kg/m³ is used to represent the head and body tissue density and not the phantom liquid density, in order to be consistent with the definition of the liquid dielectric properties, i.e. the side length of the 1 g cube is 10mm, with the side length of the 10 g cube 21,5mm.

When the cube intersects with the surface of the phantom, it is oriented so that 3 vertices touch the surface of the shell or the center of a face is tangent to the surface. The face of the cube closest to the surface is modified in order to conform to the tangent surface.

The zoom scan integer steps can be user defined so as to reduce uncertainty, but normal practice for typical test applications (including FCC) utilize a physical step of 5x5x8 (8mmx8mmx5mm) providing a volume of 32mm in the X & Y axis, and 35mm in the Z axis.

ALSAS-10U Interpolation and Extrapolation Uncertainty

The overall uncertainty for the methodology and algorithms the used during the SAR calculation was evaluated using the data from IEEE 1528: 2013 based on the example f3 algorithm:

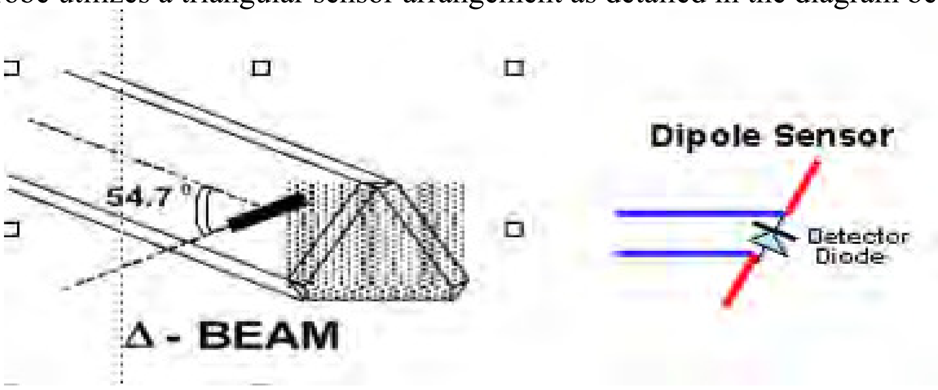
$$f_3(x, y, z) = A\frac{a^2}{\frac{a^2}{4} + x'^2 + y'^2} \cdot \left(e^{-\frac{2z}{a}} + \frac{a^2}{2(a+2z)^2} \right)$$

Refer to raw data for measurement uncertainty

4.2 E-Field Probe ALS-E-020S

The isotropic E-Field probe has been fully calibrated and assessed for isotropicity, and boundary effect within a controlled environment. Depending on the frequency for which the probe is calibrated the method utilized for calibration will change. A number of methods is used for calibrating probes, and these are outlined in the table below:

The E-Field probe utilizes a triangular sensor arrangement as detailed in the diagram below:



SAR is assessed with a calibrated probe which moves at a default height of 5mm from the center of the diode, which is mounted to the sensor, to the phantom surface (in the Z Axis). The 5mm offset height has been selected so as to minimize any resultant boundary effect due to the probe being in close proximity to the phantom surface.

The following algorithm is an example of the function used by the system for linearization of the output from the probe when measuring complex modulation schemes.

$$V_i = U_i + U_i^2 \cdot \frac{cf}{dcp_i}$$

4.2.1 E-Field Probe Specification

Model: ALS-E-020S

Compliant Standards	IEEE 1528: 2013
Frequency Range	30 MHz ~ 6 GHz
Sensitivity	Better than 0.8 μV/(V/m)2
Dynamic Range SAR	0. 001 W/kg to 100 W/kg
Isotropic Response Axial	Typically ± 0.1dB
Hemispherical isotropy	±0.3 dB or better
Linearity	±0.2 dB or better
Probe Tip Radius	User selectable all <5 mm
Sensor Offset	1.56 (± 0.02 mm)
Probe Length	290 mm
Video Bandwidth	@ 500 Hz: 1 dB @ 1K Hz: 3 dB
Boundary Effect	Less than 2% for distances greater than 2.4 mm
Material	Ertalyte™
Connector	6 Pin Bayonet

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 ± 0.25 dB. The sensitivity parameters (NormX, NormY, and NormZ), the diode compression parameter (DCP) and the conversion factor (ConvF) of the probe are tested. The calibration data can be referred to appendix C of this report.

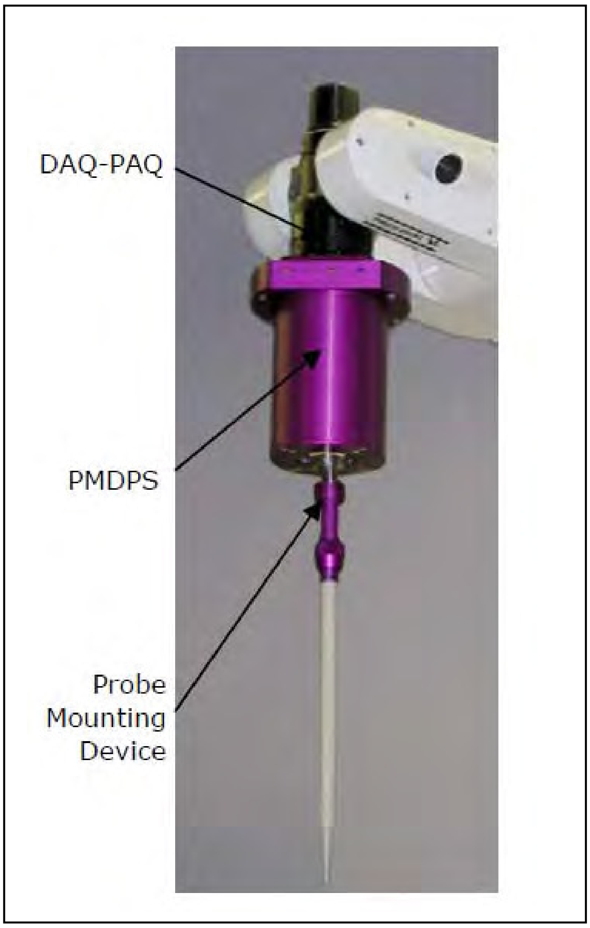
Boundary Detection Unit and Probe Mounting Device

ALSAS-10U incorporates a boundary detection unit with a sensitivity of 0.05mm for detecting all types of surfaces. The robust design allows for detection during probe tilt (probe normalize) exercises, and utilizes a second stage emergency stop. The signal electronics are fed directly into the robot controller for high accuracy surface detection in lateral and axial detection modes (X, Y, & Z).

The probe is mounted directly onto the Boundary Detection unit for accurate tooling and displacement calculations controlled by the robot kinematics. The probe is connect to an isolated probe interconnect where the output stage of the probe is fed directly into the amplifier stage of the Daq-Paq.

4.3 DAQ-PAQ (Analog to Digital Electronics) ALS-DAQ-PAQ-3 Boundary Detection Unit ALS-PMDPS-3

ALSAS-10U incorporates a fully calibrated Daq-Paq (analog to digital conversion system) which has a 4 channel input stage, sent via a 2 stage auto-set amplifier module. The input signal is amplified accordingly so as to offer a dynamic range from 4 µV to 330 mV. Integration of the fields measured is carried out at board level utilizing a Co-Processor which then sends the measured fields down into the main computational module in digitized form via an RS232 communications port. Probe linearity and duty cycle compensation is carried out within the main Daq-Paq module.



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PMDPS is used to hold a probe and to detect complex boundary locations (curved and flat surfaces) during a SAR or HAC assessment process. It utilizes relative movements of internal components to trigger integrated micro-sensor mechanisms in order to detect boundary(s) and consequently position the probe at the specified distance relative to a boundary in order to achieve accurate and repeatable measurements.

Amplifier Range	4 μV to 330 mV
ADC	16 Bit optically isolated
Built-in E-Stop Feature	Emergency Stop feature to prevent damage of equipment and for user safety purposes
Field Integration	Local Co-Processor utilizing proprietary integration algorithms
SAR Dynamic Range	0.001 W/kg -100 W/kg.
Ambient Noise	Below 0.001 W/kg measured with probe in tissue
LED Indication	Boundary detection and DAQ-PAQ State
Number of Input Channels	4 in total 3 dedicated and 1 spare for future upgrades (when and if needed)
Communication	Optically isolated packet data via RS232
Robot Arm Integration	DAQ-PAQ and Boundary Detection Unit are mounted directly onto joint 6 of the F3 arm utilizing joint 6 tool (ISO Standard M8 Mounting Plate) to allow easy integration and removal (no angular interface)
Supply	DC supply powered by an isolated external supply unit (no battery required)
LED Indicators	Probe status (amplifier on) and boundary detection

PMDPS Specification details

Accuracy of Positioning	Better than 10μm at 6GHz
SAR Uncertainty	Better than 0.01 W/kg SAR at 6Gz
Detection Mechanism	2 x 360° Stage Axial and Lateral Detection at 6GHz
Emergency Stop	4 Stage 360° Axial and Lateral Detection at 6GHz
Probe Mounting	6 Pin Bayonet for Fast Probe Change
Calibration	Every PMDPS is Calibrated to 0.01 W/kg SAR at 6GHz
Reliability Expectations	Better Than 10,000,000 Cycles

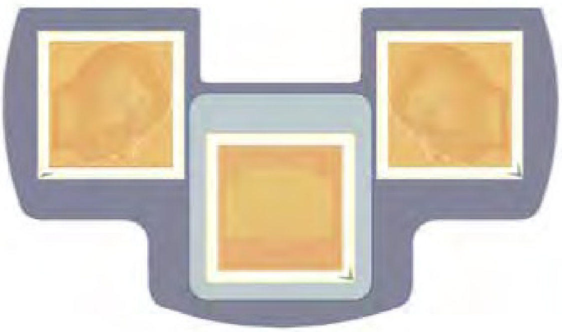
4.4 Axis Articulated Robot ALS-F3

ALSAS-10U utilizes a six axis articulated robot, which is controlled using a Pentium based real-time movement controller. The movement kinematics engine utilizes proprietary (Thermo CRS) interpolation and extrapolation algorithms, which allow full freedom of movement for each of the six joints within the working envelope. Utilization of joint 6 allows for full probe rotation with a tolerance better than 0.05mm around the central axis.

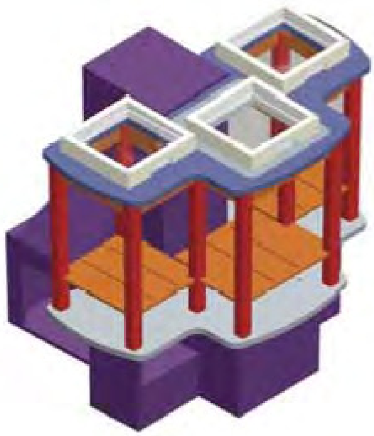
Robot/Controller Manufacturer	Thermo CRS
Number of Axis	Six independently controlled axis
Positioning Resolution	0.05mm
Controller Type	Single phase Pentium based C500C
Robot Reach	710mm
Repeatability	0.05mm or better
Communication	RS232 and LAN compatible

4.5 ALSAS Universal Workstation ALS-UWS

ALSAS Universal workstation allows for repeatability and fast adaptability. It allows users to do calibration, testing and measurements using different types of phantoms with one set up, which significantly speeds up the measurement process.



Workstation.
Top view (rendering)

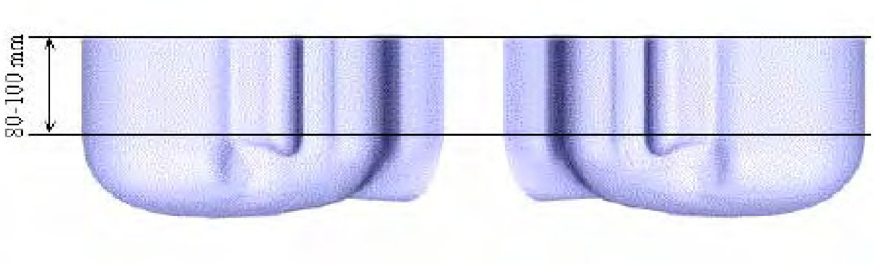


Workstation
without robot (rendering)

4.6 SAM Phantoms ALS-P-SAM-L / ALS-P-SAM-R

The ALSAS-10U allows the integration of multiple phantom types. SAM Phantoms fully compliant with IEEE 1528: 2013, Universal Phantom, and Universal Flat.

APREL SAM Phantoms
The SAM phantoms developed using the IEEE SAM CAD file. They are fully compliant with the requirements for both IEEE 1528: 2013 and FCC Supplement C. Both the left and right SAM phantoms are interchangeable, transparent and include the IEEE 1528: 2013 grid with visible NF and MB lines.



Compliant Standards	IEEE-1528: 2013
SAM	In accordance with the IEEE 1528: 2013 standard
Material	Composite urethane which allows for the device to be viewed through the phantom, resistant to DGBE
Phantom Shell Shape Tolerance	Fully calibrated to be better than ± 0.2 mm
Frame Material	Corian®
Tissue Simulation Volume	7 liter with 15.0 ± 0.5 cm tissue
Thickness	2 mm ± 0.2 mm 6 mm ± 0.2 mm at NF/MB intersection
Loss Tangent	<0.05
Relative Permittivity	<5
Resistant to Solvents	Resistant to all solvents used for tissue manufacturing detailed in IEEE 1528: 2013
Load Deflection	<1mm with sugar water compositions
Manufacturing Process	Injection Molded
Phantom Weight	Less than 10kg when filled with 15cm of simulation tissue

Universal Phantom ALS-P-UP-1

The Universal Phantom is used on the ALSAS-10U as a system validation phantom. The Universal Phantom has been fully validated both experimentally from 800MHz to 6GHz and numerically using XFDTD numerical software. The shell thickness is 2mm overall, with a 4mm spacer located at the NF/MB intersection providing an overall thickness of 6mm in line with the requirements of IEEE-1528: 2013.

The design allows for fast and accurate measurements, of handsets, by allowing the conservative SAR to be evaluated at on frequency for both left and right head experiments in one measurement.

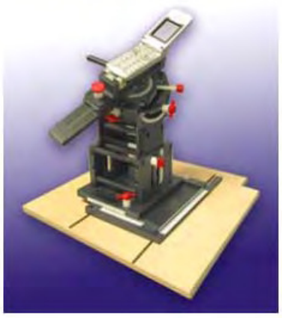
Compliant Standards	IEEE-1528: 2013
Manufacturing Process	Injection molded
Material	Vivac
Phantom Shell Shape Tolerance	Less than ± 0.2 mm
Frame Material	Corian®
Tissue Simulation Volume	8 liter with 15.0 ± 0.5 cm tissue
Thickness	2mm ± 0.2mm 6mm at NF/MB intersection
Loss Tangent	<0.05
Relative Permittivity	<5
Resistant to Solvents	Resistant to all solvents detailed in IEEE 1528: 2013
Load Deflection	<1mm with heaviest tissue (sugar water compositions)
Dimensions	Length 220mm x breadth 170mm
Phantom Weight	Less than 10kg when filled with 15cm of simulation tissue

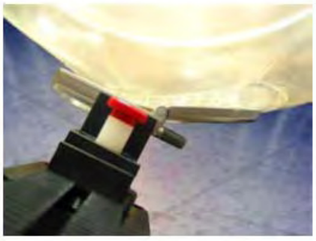
4.7 Universal Device Positioner

ALS-H-E-SET-2

The universal device positioner allows complete freedom of movement of the EUT. Developed to hold a EUT in a free-space scenario any additional loading attributable to the material used in the construction of the positioner has been eliminated. Repeatability has been enhanced through the linear scales which form the design used to indicate positioning for any given test scenario in all major axes. A 15° tilt indicator is included for the of aid cheek to tilt movements for head SAR analysis. Overall uncertainty for measurements has been reduced due to the design of the Universal device positioner, which allows positioning of a device in as near to a free-space scenario as possible, and by providing the means for complete repeatability.

Compliant Standards	IEEE 1528: 2013
Dielectric constant	Less than 5.0
Loss Tangent	Less than 0.05
Number of Axis	6 axis freedom of movement (8 when utilized with ALSAS-10U Workstation
Translation Along MB Line	± 76.2 mm
Translation Along NF Line	± 38.1 mm
Translation Along Z Axis	± 25.4 mm (expandable up to 500 mm)
Rotation Around MB Line (yaw)	±10°
Rotation Around NF (pitch)	± 30°
Line Rotation (roll)	360° full circle
Maximum Grip Range	0 mm to 150 mm
Material	Resistant to DGBE and all other tissue stimulant materials as listed in IEEE 1528: 2013 Annex C.1.
Tilt Movement	Full movement with built-in 15° gauge






4.8 Test Equipment List

Equipment Type	MFR	Model No.	Serial No.	Last Cal.	Cal. Due Date
Thermo Hygro Recorder	SATO	NS II-Q	1605426	05/25/2016	05/24/2017
Vector Network Analyzer	Agilent	E5071B	MY42402726	12/21/2016	12/20/2017
Dielectric Probe Kit	Aglient	85070E	MY44300124	N/A	N/A
Vector Signal Generator	R&S	SMU200A	102330	03/11/2016	03/10/2017
Power Meter	Anritsu	ML2495A	1116010	05/07/2016	05/06/2017
Power Sensor	Anritsu	MA2411B	34NKF50	05/07/2016	05/06/2017
Data Acquisition Package	Aprel	ALS-DAQ-PAQ-3	110-00220	NA	NA
Aprel Laboratories Probe	Aprel	ALS-E020	500-00266	02/18/2016	02/17/2017
Aprel Reference Dipole 700MHz	Aprel	ALS-D-700-S-2	176-00502	02/18/2016	02/17/2017
Aprel Reference Dipole 835MHz	Aprel	ALS-D-835-S-2	180-005533	01/12/2015	01/11/2018
Aprel Reference Dipole 1750MHz	Aprel	ALS-D-1750-S-2	198-00303	02/17/2016	02/16/2019
Aprel Reference Dipole 1900MHz	Aprel	ALS-D-1900-S-2	210-00703	01/12/2015	01/11/2018
Aprel Reference Dipole 2450MHz	Aprel	ALS-D-2450-S-2	2450-220-00753	01/12/2015	01/11/2018
Aprel Reference Dipole 5250MHz	Aprel	ALS-D-5200-S-2	5200-230-00802	01/12/2015	01/11/2018
Aprel Reference Dipole 5600MHz	Aprel	ALS-D-5600-S-2	234-00702	01/12/2015	01/11/2018
Aprel Reference Dipole 5800MHz	Aprel	ALS-D-5800-S-2	240-00852	01/12/2015	01/11/2018
Boundary Detection Sensor System	Aprel	ALS-PMDPS-3	120-00266	N/A	N/A
Universal Work Station	Aprel	ALS-UWS	100-00153	N/A	N/A
Device Holder 2.0	Aprel	ALS-H-E-SET-2	170-00503	N/A	N/A
Left Ear SAM Phantom	Aprel	ALS-P-SAM-L	130-00305	N/A	N/A
Right Ear SAM Phantom	Aprel	ALS-P-SAM-R	140-00359	N/A	N/A
Universal Phantom	Aprel	ALS-P-UP-1	150-00405	N/A	N/A
Aprel Dipole Spacer	Aprel	ALS-DS-U	250-00903	N/A	N/A

Note: All equipment upon which need to be calibrated are with calibration period of 1 year.

5 Tissue Simulating Liquids

Tissue Dielectric Parameters for Head and Body Phantoms

The head tissue dielectric parameters recommended by the IEEE SCC-34/SC-2 in IEEE1528: 2013 have been incorporated in the following table. These head parameters are derived from planar layer models simulating the highest expected SAR for the dielectric properties and tissue thickness variations in a human head. Other head and body tissue parameters that have not been specified in IEEE1528: 2013 are derived from the tissue dielectric parameters computed from the 4-Cole-Cole equations described in Reference [12] and extrapolated according to the head parameters specified in IEEE1528: 2013.

Target Frequency	Parameters(Body) IEEE1528: 2013 OTE 65		Parameters(Head) IEEE1528: 2013 OET65	
(MHz)	ε_r	σ (S/m)	ε_r	σ (S/m)
835	55.2	0.97	41.5	0.90
900	55.0	1.05	41.5	0.97
1800 – 2000	53.3	1.52	40.0	1.4
2450	52.7	1.95	39.2	1.8
5800	48.2	6.00	35.3	5.27

(ε_r = relative permittivity, σ = conductivity and ρ = 1000 kg/m^3)

Ingredients (% by weight)	**Frequency (MHz)**									
	450		835		915		1900		2450	
Tissue Type	Head	Body	Head	Body	Head	Body	Head	Body	Head	Body
Water	38.56	51.16	41.45	52.4	41.05	56.0	54.9	40.4	62.7	73.2
Salt (NaCl)	3.95	1.49	1.45	1.4	1.35	0.76	0.18	0.5	0.5	0.04
Sugar	56.32	46.78	56.0	45.0	56.5	41.76	0.0	58.0	0.0	0.0
HEC	0.98	0.52	1.0	1.0	1.0	1.21	0.0	1.0	0.0	0.0
Bactericide	0.19	0.05	0.1	0.1	0.1	0.27	0.0	0.1	0.0	0.0
Triton X-100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	36.8	0.0
DGBE	0.0	0.0	0.0	0.0	0.0	0.0	44.92	0.0	0.0	26.7
Dielectric Constant	43.42	58.0	42.54	56.1	42.0	56.8	39.9	54.0	39.8	52.5
Conductivity (S/m)	0.85	0.83	0.91	0.95	1.0	1.07	1.42	1.45	1.88	1.78

Tissue Calibration Result

The dielectric parameters of the liquids were verified prior to the SAR evaluation using Agilent Dielectric Probe Kit 85070E and Agilent E5071B Vector Network Analyzer

Body Tissue Simulant Measurement				
Frequency [MHz]	Description	Dielectric Parameters		Tissue Temp. [°C]
		ε r	σ [s/m]	
	Reference result ± 5% window	**52.7 50.065 to 55.335**	**1.95 1.8525 to 2.0475**	N/A
2412MHz	Dec 22, 2016	54.642	1.929	21.5
2437MHz	Dec 22, 2016	54.288	1.930	21.5
2462MHz	Dec 22, 2016	54.164	1.933	21.5

Body Tissue Simulant Measurement				
Frequency [MHz]	Description	Dielectric Parameters		Tissue Temp. [°C]
		ε r	σ [s/m]	
	Reference result ± 5% window	**48.95 46.50 to 51.39**	**5.36 5.092 to 5.628**	N/A
5180MHz	Dec 23, 2016	47.956	5.476	21.5
5260MHz	Dec 23, 2016	47.231	5.484	21.5
5320MHz	Dec 23, 2016	47.077	5.498	21.5

Body Tissue Simulant Measurement				
Frequency [MHz]	Description	Dielectric Parameters		Tissue Temp. [°C]
		ε r	σ [s/m]	
	Reference result ± 5% window	**48.5 46.075 to 50.925**	**5.7 5.415 to 5.985**	N/A
5500MHz	Dec 23, 2016	46.381	5.647	21.5
5600MHz	Dec 23, 2016	46.273	5.665	21.5
5700MHz	Dec 23, 2016	46.148	5.682	21.5

Body Tissue Simulant Measurement				
Frequency [MHz]	Description	Dielectric Parameters		Tissue Temp. [°C]
		ε r	σ [s/m]	
	Reference result ± 5% window	**48.2 45.79 to 50.61**	**6 5.7 to 6.3**	N/A
5745MHz	Dec 24, 2016	46.224	5.682	21.5
5785MHz	Dec 24, 2016	46.188	5.687	21.5
5825MHz	Dec 24, 2016	46.006	5.691	21.5

Body Tissue Simulant Measurement				
Frequency [MHz]	Description	Dielectric Parameters		Tissue Temp. [°C]
		ε r	σ [s/m]	
	Reference result ± 5% window	**55.5 52.725 to 58.275**	**0.96 0.912 to 1.008**	N/A
704MHz	Dec 28, 2016	54.008	0.971	21.5
710MHz	Dec 28, 2016	53.642	0.974	21.5
716MHz	Dec 28, 2016	54.085	0.979	21.5

Body Tissue Simulant Measurement				
Frequency [MHz]	Description	Dielectric Parameters		Tissue Temp. [°C]
		ε r	σ [s/m]	
	Reference result ± 5% window	**55.2 52.44 to 57.96**	**0.97 0.921 to 1.018**	N/A
824.2MHz	Dec 26, 2016	55.899	0.929	21.5
836MHz	Dec 26, 2016	54.342	0.931	21.5
848.8MHz	Dec 26, 2016	53.005	0.935	21.5
826.4MHz	Dec 27, 2016	56.087	0.921	21.5
836.6MHz	Dec 27, 2016	54.522	0.924	21.5
846.6MHz	Dec 27, 2016	53.175	0.931	21.5
777MHz	Dec 28, 2016	57.823	0.922	21.5
782MHz	Dec 28, 2016	55.466	0.928	21.5
787MHz	Dec 28, 2016	54.157	0.931	21.5

Body Tissue Simulant Measurement				
Frequency [MHz]	Description	Dielectric Parameters		Tissue Temp. [°C]
		εr	σ [s/m]	
	Reference result ± 5% window	**53.3 50.635 to 55.965**	**1.52 1.444 to 1.596**	N/A
1712.4	Dec 27, 2016	54.416	1.539	21.5
1732.6	Dec 27, 2016	54.337	1.543	21.5
1752.6	Dec 27, 2016	54.268	1.548	21.5
1710	Dec 28, 2016	54.604	1.546	21.5
1732.5	Dec 28, 2016	54.389	1.551	21.5
1755	Dec 28, 2016	54.173	1.533	21.5

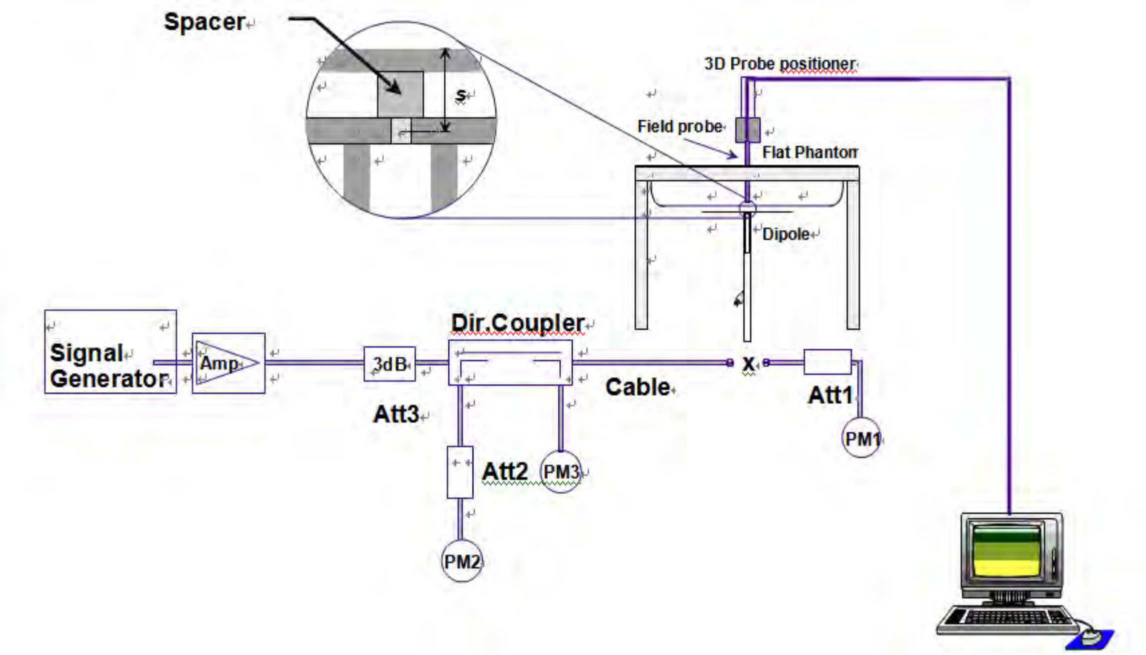
Body Tissue Simulant Measurement				
Frequency [MHz]	Description	Dielectric Parameters		Tissue Temp. [°C]
		εr	σ [s/m]	
	Reference result ± 5% window	**53.3 50.635 to 55.965**	**1.52 1.444 to 1.596**	N/A
1850.2MHz	Dec 26, 2016	53.421	1.515	21.5
1880MHz	Dec 26, 2016	52.358	1.519	21.5
1909.8MHz	Dec 26, 2016	51.853	1.524	21.5
1852.4MHz	Dec 27, 2016	53.094	1.528	21.5
1880MHz	Dec 27, 2016	52.766	1.534	21.5
1907.6MHz	Dec 27, 2016	51.801	1.539	21.5
1850MHz	Dec 28, 2016	53.225	1.498	21.5
1880MHz	Dec 28, 2016	52.307	1.501	21.5
1910MHz	Dec 28, 2016	51.644	1.515	21.5

6 SAR Measurement Evaluation

Each system is equipped with one or more system validation kits. These units, together with the predefined measurement procedures within the APREL SAR software, enable the user to conduct the system performance check and system validation. System validation kit includes a dipole, tripod holder to fix it underneath the flat phantom and a corresponding distance holder.

System Setup

In the simplified setup for system evaluation, the DUT is replaced by a calibrated dipole and the power source is replaced by a continuous wave that comes from a signal generator. The calibrated dipole must be placed beneath the flat phantom section of the SAM twin phantom with the correct distance holder. The distance holder should touch the phantom surface with a light pressure at the reference marking and be oriented parallel to the long side of the phantom. The equipment setup is shown below:



1. Signal Generator
2. Amplifier
3. Directional Coupler
4. Power Meter
5. Calibrated Dipole

Validation Dipoles

The dipoles used is based on the IEEE-1528: 2013 standard, and is complied with mechanical and electrical specifications in line with the requirements of both IEEE and FCC Supplement C. the table below provides details for the mechanical and electrical specifications for the dipoles.

*	Frequency	L (mm)	h (mm)	d (mm)
v	700MHz	196.0	112	3.6
v	835MHz	161.0	89.8	3.6
v	1800MHz	72.0	41.7	3.6
v	1900MHz	68.0	39.5	3.6
v	2450MHz	51.5	30.4	3.6
v	5250MHz	23.6	14.0	3.6
v	5600MHz	21.61	18.22	3.6
v	5800MHz	21.6	12.6	3.6

*Note: "V" indicates Frequency used of EUT

The output power on dipole port must be calibrated to 30 dBm (1W) before dipole is connected.

Validation Result

Comparing to the Yearly Calibration SAR value provided by APREL, the validation data should be within its specification of 5 %. Table shows the target SAR and measured SAR after normalized to 1W input power. The table below indicates the system performance check can meet the variation criterion and the plots can be referred to Appendix E of this report.

Frequency [MHz]	Description	SAR [w/kg] 1g	SAR [w/kg] 10g	Tissue Temp. [°C]
2450 MHz	**Reference result ± 5% window**	**53.46 50.787 to 56.133**	**24.89 23.645 to 26.134**	N/A
	22-Dec-2016	54.121	24.762	21.5

Frequency [MHz]	Description	SAR [w/kg] 1g	SAR [w/kg] 10g	Tissue Temp. [°C]
5250 MHz	**Reference result ± 5% window**	**63.18 60.021 to 66.339**	**21.24 20.178 to 22.302**	N/A
	23-Dec-2016	61.024	22.056	21.5

Frequency [MHz]	Description	SAR [w/kg] 1g	SAR [w/kg] 10g	Tissue Temp. [°C]
5600 MHz	**Reference result ± 5% window**	**68.71 65.274 to 72.145**	**22.06 20.957 to 23.163**	N/A
	23-Dec-2016	65.564	22.013	21.5

Frequency [MHz]	Description	SAR [w/kg] 1g	SAR [w/kg] 10g	Tissue Temp. [°C]
5800 MHz	**Reference result ± 5% window**	**59.95 56.952 to 62.947**	**18.61 17.679 to 19.540**	N/A
	24-Dec-2016	61.003	19.018	21.5

Frequency [MHz]	Description	SAR [w/kg] 1g	SAR [w/kg] 10g	Tissue Temp. [°C]
700 MHz	**Reference result ± 5% window**	**7.944 7.5468 to 8.3412**	**5.207 4.9466 to 5.4673**	N/A
	28-Dec-2016	8.015	5.234	21.5

Frequency [MHz]	Description	SAR [w/kg] 1g	SAR [w/kg] 10g	Tissue Temp. [°C]
835 MHz	**Reference result ± 5% window**	**9.11** **8.6545 to 9.5655**	**6.23** **5.9185 to 6.5415**	N/A
	12-Dec-2016	9.432	6.352	21.5

Frequency [MHz]	Description	SAR [w/kg] 1g	SAR [w/kg] 10g	Tissue Temp. [°C]
1800MHz (1750 MHz)	**Reference result ± 5% window**	**36.666** **34.832 to 38.493**	**19.293** **18.328 to 20.257**	N/A
	27-Dec-2016	35.316	19.942	21.5

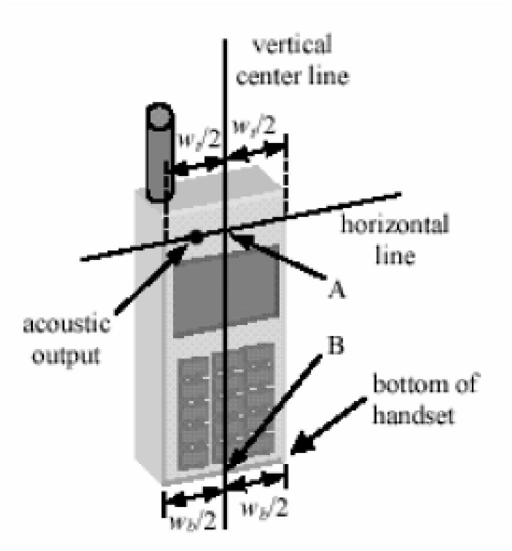
Frequency [MHz]	Description	SAR [w/kg] 1g	SAR [w/kg] 10g	Tissue Temp. [°C]
1900 MHz	**Reference result ± 5% window**	**38.474** **36.5503 to 40.3977**	**20.466** **19.442 to 21.489**	N/A
	26-Dec-2016	40.091	20.726	21.5

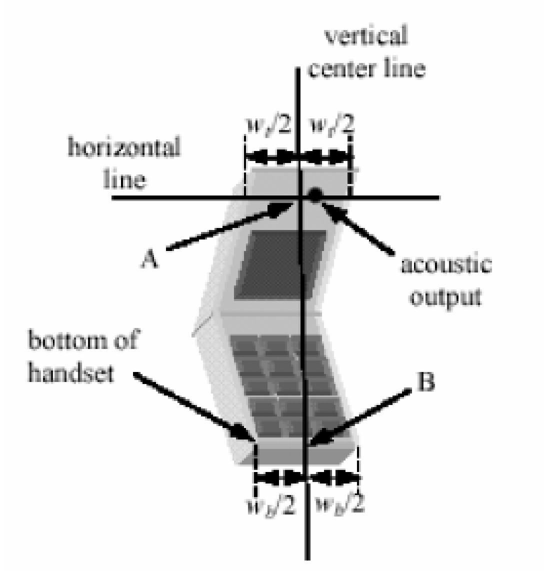
Note: All SAR values are normalized 1W.

7 DUT Testing Position

Test Positions of Device Relative to Head

This specifies exactly two test positions for the handset against the head phantom, the “cheek” position and the “tilted” position. The handset should be tested in both positions on the left and right sides of the SAM phantom. If the handset construction is such that it cannot be positioned using the handset positioning procedures described in 4.2.2.1 and 4.2.2.2 to represent normal use conditions (e.g., asymmetric handset), alternative alignment procedures should be considered with details provided in the test report.



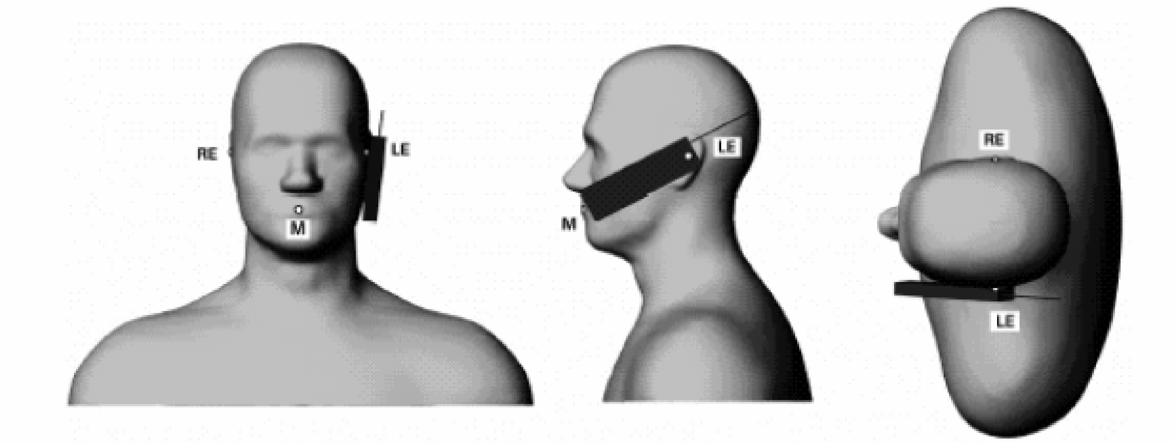


Definition of the “Cheek” Position

The “cheek” position is defined as follows:

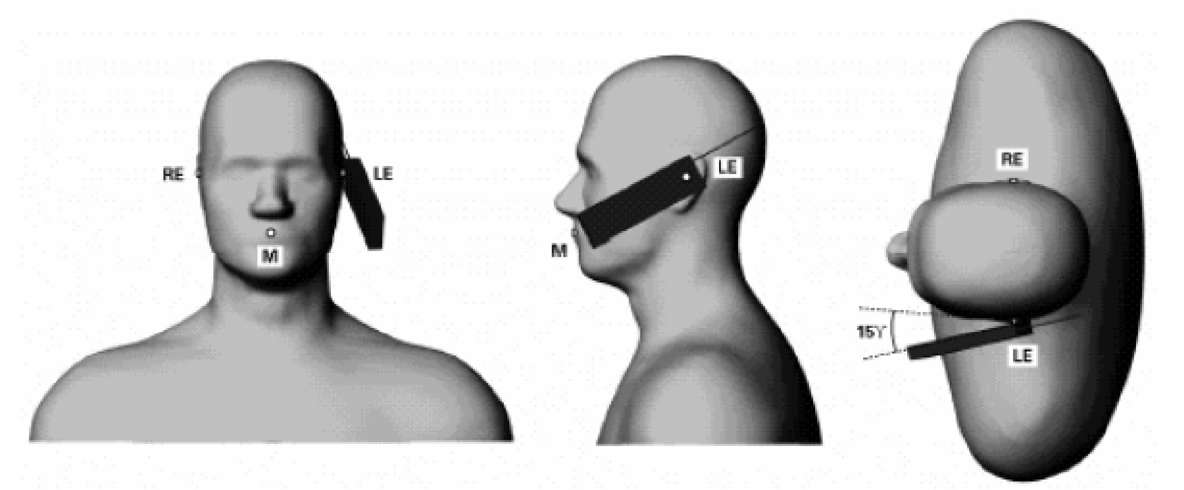
a. Ready the handset for talk operation, if necessary. For example, for handsets with a cover piece, open the cover. (If the handset can also be used with the cover closed both configurations must be tested.)
b. Define two imaginary lines on the handset: the vertical centerline and the horizontal line. The vertical centerline passes through two points on the front side of the handset: the midpoint of the width wt of the handset at the level of the acoustic output (point A on Figures 4.1a and 4.1b), and the midpoint of the width wb of the bottom of the handset (point B). The horizontal line is perpendicular to the vertical centerline and passes through the center of the acoustic output (see Figure 4.1a). The two lines intersect at point A. Note that for many handsets, point A coincides with the center of the acoustic output. However, the acoustic output may be located elsewhere on the horizontal line. Also note that the vertical centerline is not necessarily parallel to the front face of the handset (see Figure 4.1b), especially for clamshell handsets, handsets with flip pieces, and other irregularly-shaped handsets.
c. Position the handset close to the surface of the phantom such that point A is on the (virtual) extension of the line passing through points RE and LE on the phantom (see Figure 4.2), such that the plane defined by the vertical center line and the horizontal line of the handset is approximately parallel to the sagittal plane of the phantom.

d. Translate the handset towards the phantom along the line passing through RE and LE until the handset touches the pinna.
e. While maintaining the handset in this plane, rotate it around the LE-RE line until the vertical centerline is in the plane normal to MB-NF including the line MB (called the reference plane).
f. Rotate the handset around the vertical centerline until the handset (horizontal line) is symmetrical with respect to the line NF.
g. While maintaining the vertical centerline in the reference plane, keeping point A on the line passing through RE and LE and maintaining the handset contact with the pinna, rotate the handset about the line NF until any point on the handset is in contact with a phantom point below the pinna (cheek). See Figure 4.2 the physical angles of rotation should be noted.



Definition of the "Tilted" Position

The "tilted" position is defined as follows:
a. Repeat steps (a) – (g) of 4.2.1.1 to place the device in the "cheek position."
b. While maintaining the orientation of the handset move the handset away from the pinna along the line passing through RE and LE in order to enable a rotation of the handset by 15 degrees.
c. Rotate the handset around the horizontal line by 15 degrees.
d. While maintaining the orientation of the handset, move the handset towards the phantom on a line passing through RE and LE until any part of the handset touches the ear. The tilted position is obtained when the contact is on the pinna. If the contact is at any location other than the pinna (e.g., the antenna with the back of the phantom head), the angle of the handset should be reduced. In this case, the tilted position is obtained if any part of the handset is in contact with the pinna as well as a second part of the handset is contact with the phantom (e.g., the antenna with the back of the head).



Test Positions for body-worn

Body-worn operating configurations should be tested without the belt-clips and holsters attached to the device and positioned against a flat phantom in normal use configurations. A separation distance of **0** cm between the back of the device and a flat phantom is recommended for testing body-worn SAR compliance under such circumstances. Other separation distance may be use, but not exceed 2.5 cm.

The DUT has only body mode test positions and test mode refer to section 8.2

8 SAR Measurement Procedures

The measurement procedures are as follows:

(a) through software control to continuous transmit

(b) Set software to maximum output power and data rate

(c) Measure output power through RF cable and power meter

(d) Place the DUT in the positions described in the last section

(e) Set scan area, grid size and other setting on the APREL software

(f) Taking data for the maximum power on each testing position

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

(h) Measure SAR results for the other channels in worst SAR testing position

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

Spatial Peak SAR Evaluation

The procedure for spatial peak SAR evaluation has been implemented according to the test standard. It can be conducted for 1g and 10g, as well as for user-specific masses. The APREL SAR software includes all numerical procedures necessary to evaluate the spatial peak SAR value.

The base for the evaluation is a "cube" measurement. The measured volume must include the 1g and 10g cubes with the highest averaged SAR values. For that purpose, the center of the measured volume is aligned to the interpolated peak SAR value of a previously performed area scan.

The entire evaluation of the spatial peak values is performed within the post-processing engine (SEMCAD). The system always gives the maximum values for the 1g and 10g cubes. The algorithm to find the cube with highest averaged SAR is divided into the following stages:

(a) Extraction of the measured data (grid and values) from the Zoom Scan
(b) Calculation of the SAR value at every measurement point based on all stored data (A/D values and measurement parameters)
(c) Generation of a high-resolution mesh within the measured volume
(d) Interpolation of all measured values form the measurement grid to the high-resolution grid
(e) Extrapolation of the entire 3-D field distribution to the phantom surface over the distance from sensor to surface
(f) Calculation of the averaged SAR within masses of 1g and 10g

Scan Procedures

First Area Scan is used to locate the approximate location(s) of the local peak SAR value(s). The measurement grid within an Area Scan is defined by the grid extent, grid step size and grid offset. Next, in order to determine the EM field distribution in a three-dimensional spatial extension, Zoom Scan is required. The Zoom Scan measures 5x5x7 points with step size 8, 8 and 5 mm for 300 MHz to 3 GHz. The Zoom Scan is performed around the highest E-field value to determine the averaged SAR-distribution over 10 g.

SAR Averaged Methods

In APREL, the interpolation and extrapolation are both based on the modified Quadratic Shepard’s method. The interpolation scheme combines a least-square fitted function method and a weighted average method which are the two basic types of computational interpolation and approximation.

Extrapolation routines are used to obtain SAR values between the lowest measurement points and the inner phantom surface. The extrapolation distance is determined by the surface detection distance and the probe sensor offset. The uncertainty increases with the extrapolation distance. To keep the uncertainty within 1% for the 1 g and 10 g cubes, the extrapolation distance should not be larger than 5 mm.

9 SAR Test Results

9.1 Conducted power table:

Wifi :

802.11b

Cable loss = 0	Output Power		Limit (dBm)
CH	Detector		
	PK (dBm)	AV (dBm)	
Low	16.92	13.63	30.00
Mid	17.22	14.03	
High	16.83	13.65	

Peak

Channel		Output Chain (dBm)		Combined Output Power (dBm)
		Chain 1	chain 2	
g mode	Low	18.04	18.82	21.46
	Mid	18.36	19.54	22.00
	High	17.73	18.77	21.29
N HT20	Low	20.63	21.29	23.98
	Mid	21.03	21.88	24.49
	High	21.59	22.57	25.12
N HT40	Low	21.26	21.67	24.48
	Mid	21.09	21.71	24.42
	High	21.57	22.17	24.89

Average

Channel		Output Chain (dBm)		Combined Output Power (dBm)
		Chain 1	chain 2	
g mode	Low	11.04	10.96	14.01
	Mid	10.97	11.44	14.22
	High	10.55	11.05	13.82
N HT20	Low	11.04	11.28	14.17
	Mid	10.54	11.02	13.80
	High	11.02	11.36	14.20
N HT40	Low	11.06	11.22	14.15
	Mid	10.30	10.76	13.55
	High	10.65	10.98	13.83

Mode	Freq(MHz)	Output Chain (dBm)		Combine Output Power (dBm)
		Chain A	chain B	
a mode	5180	8.86	8.08	11.50
	5220	8.93	7.56	11.31
	5240	9.25	7.13	11.33
	5260	9.21	6.7	11.14
	5300	9.14	6.76	11.12
	5320	9.37	6.82	11.29
	5500	9.26	8.85	12.07
	5580	9.11	8.63	11.89
	5700	9.03	7.81	11.47
	5745	8.94	8.07	11.54
	5785	8.89	7.76	11.37
	5825	8.56	7.19	10.94

Mode	Freq(MHz)	Output Chain (dBm)		Combine Output Power (dBm)
		Chain A	chain B	
AN HT20	5180	8.81	7.47	11.20
	5220	9.55	8.22	11.95
	5240	9.03	7.58	11.38
	5260	9.54	7.13	11.51
	5300	9.71	7.22	11.65
	5320	9.66	7.18	11.60
	5500	9.11	8.33	11.75
	5580	9.02	8.14	11.61
	5700	8.73	7.23	11.05
	5745	8.85	7.76	11.35
	5785	8.88	7.55	11.28
	5825	8.64	7.65	11.18

Mode	Freq(MHz)	Output Chain (dBm)		Combine Output Power (dBm)
		Chain A	chain B	
AN HT40	5190	8.93	8.02	11.51
	5230	9.63	7.65	11.76
	5270	9.11	6.72	11.09
	5310	9.16	6.86	11.17
	5510	8.46	7.75	11.13
	5550	8.71	7.85	11.31
	5670	8.42	7.13	10.83
	5755	8.52	7.23	10.93
	5795	8.01	8.06	11.05

Mode	Freq(MHz)	Output Chain (dBm)		Combine Output Power (dBm)
		Chain A	chain B	
AC HT80	5210	9.05	6.92	11.12
	5290	9.03	6.83	11.08
	5530	9.27	7.05	11.31
	5775	8.12	6.89	10.56

BT:

BDR Mode

Frequency (MHz)	Peak Reading Power (dBm)	Cable Loss	Output Power (dBm)	Output Power (W)	Limit (W)
Low	5.14	0.00	5.14	0.00327	1
Mid	5.87	0.00	5.87	0.00386	1
High	6.01	0.00	6.01	0.00399	1

EDR 2M Mode

Frequency (MHz)	Peak Reading Power (dBm)	Cable Loss	Output Power (dBm)	Output Power (W)	Limit (W)
Low	2.77	0.00	2.77	0.00189	0.125
Mid	3.43	0.00	3.43	0.00220	0.125
High	4.11	0.00	4.11	0.00258	0.125

EDR 3M Mode

Frequency (MHz)	Peak Reading Power (dBm)	Cable Loss	Output Power (dBm)	Output Power (W)	Limit (W)
Low	2.87	0.00	2.87	0.00194	0.125
Mid	3.55	0.00	3.55	0.00226	0.125
High	4.19	0.00	4.19	0.00262	0.125

LE Mode

Frequency (MHz)	Peak Reading Power (dBm)	Cable Loss	Output Power (dBm)	Output Power (W)	Limit (W)
Low	1.22	0.00	1.22	0.00132	1
Mid	2.13	0.00	2.13	0.00163	1
High	2.68	0.00	2.68	0.00185	1

WWAN

GPRS – Peak Power

Frequency (MHz)	CH	1 Time Slot				2 Time Slot			
		GMSK Mode		8-PSK Mode		GMSK Mode		8-PSK Mode	
		Peak Power (dBm)	AV Power (dBm)	Peak Power (dBm)	AV Power (dBm)	Peak Power (dBm)	AV Power (dBm)	Peak Power (dBm)	AV Power (dBm)
824.2	128	32.50	32.20	29.40	26.10	32.30	32.00	29.20	25.80
836.6	190	32.40	32.10	29.30	26.00	32.20	31.90	29.20	25.80
848.8	251	32.40	32.10	29.20	25.80	32.20	31.80	29.00	25.60
1850.2	512	29.40	29.20	28.70	25.20	29.20	28.90	28.40	25.10
1880	661	29.60	29.40	29.10	25.60	29.40	29.10	28.60	25.30
1909.8	810	29.40	29.20	28.60	24.80	29.30	29.00	28.30	24.70

Frequency (MHz)	CH	3 Time Slot				4 Time Slot			
		GMSK Mode		8-PSK Mode		GMSK Mode		8-PSK Mode	
		Peak Power (dBm)	AV Power (dBm)	Peak Power (dBm)	AV Power (dBm)	Peak Power (dBm)	AV Power (dBm)	Peak Power (dBm)	AV Power (dBm)
824.2	128	32.10	31.80	29.10	25.60	31.50	31.30	28.70	25.40
836.6	190	32.00	31.70	29.00	25.60	31.40	31.20	28.60	25.30
848.8	251	32.20	31.90	28.80	25.50	31.50	31.30	28.50	25.30
1850.2	512	29.00	28.70	28.20	24.90	28.30	28.10	28.10	24.60
1880	661	29.20	28.90	28.40	25.10	28.60	28.40	28.20	24.80
1909.8	810	29.30	29.00	28.10	24.50	29.00	28.80	27.90	24.10

GPRS –Time slot average factor

Frequency (MHz)	CH	1 Time Slot		2 Time Slot		3 Time Slot		4 Time Slot	
		GMSK Mode	8-PSK Mode	GMSK Mode	8-PSK Mode	GMSK Mode	8-PSK Mode	GMSK Mode	8-PSK Mode
		AV Power (dBm)	AV Power (dBm)	AV Power (dBm)	AV Power (dBm)	AV Power (dBm)	AV Power (dBm)	AV Power (dBm)	AV Power (dBm)
824.2	128	23.17	17.07	25.98	19.78	27.54	21.34	28.29	22.39
836.6	190	23.07	16.97	25.88	19.78	27.44	21.34	28.19	22.29
848.8	251	23.07	16.77	25.78	19.58	27.64	21.24	28.29	22.29
1850.2	512	20.17	16.17	22.88	19.08	24.44	20.64	25.09	21.59
1880	661	20.37	16.57	23.08	19.28	24.64	20.84	25.39	21.79
1909.8	810	20.17	15.77	22.98	18.68	24.74	20.24	25.79	21.09

Note:
Time slot average factor is as follows:
1 Tx slot = 9.03 dB, Frame-Average output power = Burst-Average output power – 9.03 dB
2 Tx slot = 6.02 dB, Frame-Average output power = Burst-Average output power – 6.02 dB
3 Tx slot = 4.26 dB, Frame-Average output power = Burst-Average output power – 4.26 dB
4 Tx slot = 3.01 dB, Frame-Average output power = Burst-Average output power – 3.01 dB

R99

EUT Mode	Frequency (MHz)	CH	Avg Power (dBm)
WCDMA Band II	1852.4	9262	23.43
	1880	9400	23.86
	1907.6	9538	23.12

EUT Mode	Frequency (MHz)	CH	Avg Power (dBm)
WCDMA Band IV	1712.4	1312	23.18
	1732.6	1413	23.84
	1752.6	1513	23.89

EUT Mode	Frequency (MHz)	CH	Avg Power (dBm)
WCDMA Band V	826.4	4132	23.48
	836.6	4183	23.41
	846.6	4233	23.37

HSDPA MPR

Mode	Sub-test	Avg Power (dBm) Channel		
		9262	9400	9538
HSDPA Band II	1	23.26	23.75	22.98
	2	23.31	23.72	22.97
	3	22.95	23.49	22.79
	4	23.02	23.42	22.71

Mode	Sub-test	Avg Power (dBm) Channel		
		1312	1413	1513
HSDPA Band IV	1	23.10	23.81	23.67
	2	23.06	23.75	23.78
	3	22.88	23.50	23.62
	4	22.79	23.47	23.59

Mode	Sub-test	Avg Power (dBm) Channel		
		4132	4183	4233
HSDPA Band V	1	23.36	23.36	23.35
	2	23.41	23.30	23.24
	3	23.12	23.03	23.10
	4	23.15	23.02	22.98

HSUPA MPR

Mode	Sub-test	Avg Power (dBm) Channel		
		9262	9400	9538
HSUPA Band II	1	23.35	23.84	23.06
	2	21.59	22.06	21.35
	3	22.64	23.03	22.24
	4	21.67	22.02	21.33
	5	23.31	23.72	23.03

Mode	Sub-test	Avg Power (dBm) Channel		
		1312	1413	1513
HSUPA Band IV	1	23.07	23.76	23.83
	2	21.41	22.05	22.11
	3	22.30	23.05	23.09
	4	21.39	22.02	22.08
	5	23.06	23.69	23.86

Mode	Sub-test	Avg Power (dBm) Channel		
		4132	4183	4233
HSUPA Band V	1	23.44	23.34	23.29
	2	21.69	21.57	21.49
	3	22.68	22.58	22.49
	4	21.71	21.55	21.53
	5	23.33	23.24	23.32

DC-HSDPA

Mode	Sub-test	Avg Power (dBm) Channel		
		9262	9400	9538
DC-HSDPA Band II	1	23.02	23.48	22.68
	2	23.07	23.53	22.8
	3	22.21	22.71	21.76
	4	22.42	22.65	21.94

Mode	Sub-test	Avg Power (dBm) Channel		
		1312	1413	1513
DC-HSDPA Band IV	1	22.76	23.45	23.36
	2	22.80	23.30	23.41
	3	21.81	22.41	22.62
	4	21.79	22.36	22.59

Mode	Sub-test	Avg Power (dBm) Channel		
		4132	4183	4233
DC-HSDPA Band V	1	22.94	22.93	22.98
	2	23.05	22.92	22.91
	3	22.12	22.03	22.10
	4	22.15	22.02	21.98

LTE Band	Bandwidth (MHz)	modulation	RB Size	RB offset	channel low Power Reading (dbm)	channel mid Power Reading (dbm)	channel high Power Reading (dbm)	MPR(dB)
II	20	QPSK	1	low	22.56	22.72	22.49	0
	20	QPSK	1	mid	22.34	22.68	22.31	0
	20	QPSK	1	high	21.77	21.84	21.23	0
	20	QPSK	50	low	20.88	20.92	20.85	1
	20	QPSK	50	mid	20.75	20.88	20.71	1
	20	QPSK	50	high	20.64	20.72	20.66	1
	20	QPSK	100	full RB	21.73	21.63	21.66	1
	20	16QAM	1	low	20.94	20.82	20.55	1
	20	16QAM	1	mid	20.85	20.62	20.37	1
	20	16QAM	1	high	20.19	20.16	20.04	1
	20	16QAM	50	low	20.07	20.13	19.75	2
	20	16QAM	50	mid	20.01	20.05	19.68	2
	20	16QAM	50	high	19.95	19.96	19.61	2
	20	16QAM	100	full RB	20.84	20.18	20.99	2
	15	QPSK	1	low	22.01	22.07	21.76	0
	15	QPSK	1	mid	21.73	21.65	21.42	0
	15	QPSK	1	high	20.96	20.92	20.01	0
	15	QPSK	36	low	20.83	21.09	20.7	1
	15	QPSK	36	mid	20.54	20.85	20.52	1
	15	QPSK	36	high	20.32	20.68	20.31	1
	15	QPSK	75	full RB	21.88	21.65	21.38	1
	15	16QAM	1	low	21.11	20.94	20.65	1
	15	16QAM	1	mid	20.56	20.33	20.16	1
	15	16QAM	1	high	20.12	20.23	19.96	1
	15	16QAM	36	low	20.07	19.94	19.83	2
	15	16QAM	36	mid	19.67	19.45	19.41	2
	15	16QAM	36	high	19.32	19.21	19.05	2
	15	16QAM	75	full RB	20.54	20.29	20.44	2
	10	QPSK	1	low	21.55	22.18	22.04	0
	10	QPSK	1	mid	21.37	21.58	21.63	0
	10	QPSK	1	high	21.13	21.19	21.05	0
	10	QPSK	25	low	20.66	21.25	21.03	1
	10	QPSK	25	mid	20.16	20.76	20.69	1
	10	QPSK	25	high	19.88	20.31	20.28	1
	10	QPSK	50	full RB	22.17	22.03	21.58	1
	10	16QAM	1	low	20.99	20.95	20.96	1
	10	16QAM	1	mid	20.46	20.42	20.47	1
	10	16QAM	1	high	20.11	20.28	20.08	1

	10	16QAM	25	low	19.94	20.16	20.07	2
	10	16QAM	25	mid	19.66	19.78	19.63	2
	10	16QAM	25	high	19.24	19.39	10.25	2
	10	16QAM	50	full RB	20.77	20.98	20.59	2
	5	QPSK	1	low	21.77	22.52	22.28	0
	5	QPSK	1	mid	21.85	22.34	22.18	0
	5	QPSK	1	high	22.16	22.29	22.03	0
	5	QPSK	12	low	21.08	21.21	20.92	1
	5	QPSK	12	mid	20.95	21.11	20.82	1
	5	QPSK	12	high	20.74	21.01	20.71	1
	5	QPSK	25	full RB	21.06	21.27	20.95	1
	5	16QAM	1	low	21.07	21.38	21.15	1
	5	16QAM	1	mid	21.01	21.25	21.11	1
	5	16QAM	1	high	21.03	21.17	21.04	1
	5	16QAM	12	low	20.05	20.15	20.01	2
	5	16QAM	12	mid	19.96	20.03	19.84	2
	5	16QAM	12	high	19.62	19.99	19.76	2
	5	16QAM	25	full RB	20.08	20.11	20.03	2
	3	QPSK	1	low	21.94	22.43	21.95	0
	3	QPSK	1	mid	20.06	22.38	21.79	0
	3	QPSK	1	high	22.11	22.19	21.66	0
	3	QPSK	8	low	21.16	21.2	20.93	1
	3	QPSK	8	mid	21.08	21.11	20.89	1
	3	QPSK	8	high	21.03	21.09	20.77	1
	3	QPSK	15	full RB	21.09	21.18	21.04	1
	3	16QAM	1	low	21.22	21.19	21.17	1
	3	16QAM	1	mid	21.23	21.14	21.15	1
	3	16QAM	1	high	21.26	20.99	21.05	1
	3	16QAM	8	low	20.11	20.31	20.92	2
	3	16QAM	8	mid	20.09	20.24	20.87	2
	3	16QAM	8	high	20.03	20.21	20.76	2
	3	16QAM	15	full RB	20.07	20.18	20.07	2
	1.4	QPSK	1	low	22.04	22.38	21.95	0
	1.4	QPSK	1	mid	22.01	22.31	21.92	0
	1.4	QPSK	1	high	22.07	22.24	21.91	0
	1.4	QPSK	3	low	22.36	22.28	21.93	1
	1.4	QPSK	3	mid	22.31	22.22	21.91	1
	1.4	QPSK	3	high	22.28	22.18	21.87	1
	1.4	QPSK	6	full RB	21.14	21.32	21.15	1
	1.4	16QAM	1	low	21.04	21.02	20.87	1
	1.4	16QAM	1	mid	21.01	20.98	20.81	1
	1.4	16QAM	1	high	21.05	20.99	20.67	1
	1.4	16QAM	3	low	20.93	21.38	21.11	2

	1.4	16QAM	3	mid	20.88	21.32	21.01	2
	1.4	16QAM	3	high	20.84	21.29	21.08	2
	1.4	16QAM	6	full RB	20.16	20.33	20.07	2

LTE Band	Bandwidth (MHz)	modulation	RB Size	RB offset	channel low Power Reading (dbm)	channel mid Power Reading (dbm)	channel high Power Reading (dbm)	MPR(dB)
IV	20	QPSK	1	low	22.62	22.98	23.07	0
	20	QPSK	1	mid	22.43	22.85	23.01	0
	20	QPSK	1	high	22.09	22.62	22.58	0
	20	QPSK	50	low	21.46	21.37	21.15	1
	20	QPSK	50	mid	21.32	21.26	21.11	1
	20	QPSK	50	high	21.28	21.16	21.04	1
	20	QPSK	100	full RB	21.22	21.08	21.13	1
	20	16QAM	1	low	20.88	20.91	21.04	1
	20	16QAM	1	mid	20.95	20.65	20.95	1
	20	16QAM	1	high	21.15	20.59	20.76	1
	20	16QAM	50	low	20.33	20.26	20.11	2
	20	16QAM	50	mid	20.21	20.13	20.05	2
	20	16QAM	50	high	20.17	20.05	20.01	2
	20	16QAM	100	full RB	20.28	20.27	20.33	2
	15	QPSK	1	low	22.01	21.76	21.66	0
	15	QPSK	1	mid	22.14	21.64	21.78	0
	15	QPSK	1	high	22.21	22.13	22.17	0
	15	QPSK	36	low	21.28	21.24	21.22	1
	15	QPSK	36	mid	21.17	21.13	21.14	1
	15	QPSK	36	high	21.14	21.07	21.11	1
	15	QPSK	75	full RB	21.19	21.27	21.03	1
	15	16QAM	1	low	21.03	20.55	20.72	1
	15	16QAM	1	mid	21.09	20.62	20.51	1
	15	16QAM	1	high	21.15	20.83	20.99	1
	15	16QAM	36	low	20.18	20.11	20.26	2
	15	16QAM	36	mid	20.11	20.01	20.14	2
	15	16QAM	36	high	20.02	19.96	20.11	2
	15	16QAM	75	full RB	20.13	20.32	20.07	2
	10	QPSK	1	low	22.19	22.28	22.34	0
	10	QPSK	1	mid	22.23	22.51	22.38	0
	10	QPSK	1	high	22.28	22.85	22.41	0
	10	QPSK	25	low	21.43	21.39	21.18	1
	10	QPSK	25	mid	21.38	21.24	21.09	1
	10	QPSK	25	high	21.25	21.15	21.02	1
	10	QPSK	50	full RB	21.32	21.44	21.04	1
	10	16QAM	1	low	21.06	21.02	21.25	1
	10	16QAM	1	mid	21.11	21.65	21.32	1
	10	16QAM	1	high	21.17	21.71	21.44	1

	10	16QAM	25	low	20.43	20.32	20.22	2
	10	16QAM	25	mid	20.37	20.17	20.11	2
	10	16QAM	25	high	20.31	20.09	20.01	2
	10	16QAM	50	full RB	20.16	20.18	20.11	2
	5	QPSK	1	low	22.43	22.76	22.19	0
	5	QPSK	1	mid	22.38	22.54	22.38	0
	5	QPSK	1	high	22.48	22.23	22.51	0
	5	QPSK	12	low	21.37	21.32	21.54	1
	5	QPSK	12	mid	21.31	21.27	21.34	1
	5	QPSK	12	high	21.28	21.15	21.26	1
	5	QPSK	25	full RB	21.29	21.11	21.6	1
	5	16QAM	1	low	21.18	21.85	21.21	1
	5	16QAM	1	mid	21.24	21.63	21.38	1
	5	16QAM	1	high	21.36	21.13	21.45	1
	5	16QAM	12	low	20.31	20.48	20.26	2
	5	16QAM	12	mid	20.29	20.31	20.12	2
	5	16QAM	12	high	20.27	20.27	20.03	2
	5	16QAM	25	full RB	20.19	20.21	20.27	2
	3	QPSK	1	low	22.32	22.71	22.58	0
	3	QPSK	1	mid	22.28	22.54	22.39	0
	3	QPSK	1	high	22.31	22.01	22.43	0
	3	QPSK	8	low	21.45	21.36	21.53	1
	3	QPSK	8	mid	21.35	21.29	21.49	1
	3	QPSK	8	high	21.24	21.21	21.38	1
	3	QPSK	15	full RB	21.27	21.23	21.39	1
	3	16QAM	1	low	21.3	21.27	21.56	1
	3	16QAM	1	mid	21.21	21.16	21.44	1
	3	16QAM	1	high	21.29	21.02	21.24	1
	3	16QAM	8	low	20.26	20.45	20.63	2
	3	16QAM	8	mid	20.16	20.31	20.54	2
	3	16QAM	8	high	20.19	20.29	20.42	2
	3	16QAM	15	full RB	20.44	20.27	20.48	2
	1.4	QPSK	1	low	22.43	22.27	22.55	0
	1.4	QPSK	1	mid	22.38	22.19	22.42	0
	1.4	QPSK	1	high	22.31	22.2	22.38	0
	1.4	QPSK	3	low	22.33	22.18	22.23	1
	1.4	QPSK	3	mid	22.28	22.09	22.17	1
	1.4	QPSK	3	high	22.19	22.03	22.13	1
	1.4	QPSK	6	full RB	21.35	21.44	21.39	1
	1.4	16QAM	1	low	21.37	21.08	21.56	1
	1.4	16QAM	1	mid	21.28	20.95	21.42	1
	1.4	16QAM	1	high	21.27	20.85	21.4	1
	1.4	16QAM	3	low	21.48	21.37	21.33	2

	1.4	16QAM	3	mid	21.35	21.26	21.29	2
	1.4	16QAM	3	high	21.21	21.22	21.21	2
	1.4	16QAM	6	full RB	20.29	20.42	20.55	2

LTE Band	Bandwidth (MHz)	modulation	RB Size	RB offset	channel low Power Reading (dbm)	channel mid Power Reading (dbm)	channel high Power Reading (dbm)	MPR(dB)
V	10	QPSK	1	low	22.63	22.57	22.44	0
	10	QPSK	1	mid	22.55	22.42	22.32	0
	10	QPSK	1	high	21.85	21.84	22.03	0
	10	QPSK	25	low	20.88	20.99	21.15	1
	10	QPSK	25	mid	20.75	20.86	21.07	1
	10	QPSK	25	high	20.68	20.79	21.01	1
	10	QPSK	50	full RB	20.63	20.79	20.98	1
	10	16QAM	1	low	20.74	20.56	20.92	1
	10	16QAM	1	mid	20.77	20.62	20.82	1
	10	16QAM	1	high	20.82	20.77	20.7	1
	10	16QAM	25	low	19.95	20.08	19.94	2
	10	16QAM	25	mid	19.88	19.98	19.85	2
	10	16QAM	25	high	19.76	19.84	19.77	2
	10	16QAM	50	full RB	19.68	19.79	19.83	2
	5	QPSK	1	low	22.11	22.08	22.04	0
	5	QPSK	1	mid	22.12	22.05	22.01	0
	5	QPSK	1	high	22.14	22.03	21.97	0
	5	QPSK	12	low	21.26	21.11	21.09	1
	5	QPSK	12	mid	21.17	21.01	21.03	1
	5	QPSK	12	high	21.09	20.95	20.92	1
	5	QPSK	25	full RB	20.83	20.99	20.94	1
	5	16QAM	1	low	20.93	20.88	20.85	1
	5	16QAM	1	mid	20.88	20.75	20.81	1
	5	16QAM	1	high	20.89	20.64	20.77	1
	5	16QAM	12	low	20.23	20.01	20.03	2
	5	16QAM	12	mid	20.16	19.96	19.95	2
	5	16QAM	12	high	20.07	19.86	19.82	2
	5	16QAM	25	full RB	19.85	19.98	20.1	2
	3	QPSK	1	low	22.21	22.09	22.14	0
	3	QPSK	1	mid	22.17	21.99	22.03	0
	3	QPSK	1	high	22.13	22.05	21.93	0
	3	QPSK	8	low	21.18	21.12	21.05	1
	3	QPSK	8	mid	21.14	21.09	21.01	1
	3	QPSK	8	high	21.11	21.01	20.97	1
	3	QPSK	15	full RB	21.1	21.08	21.11	1
	3	16QAM	1	low	21.03	20.55	20.99	1
	3	16QAM	1	mid	21.09	20.66	20.92	1
	3	16QAM	1	high	21.12	20.85	20.84	1

	3	16QAM	8	low	20.19	20.04	20.07	2
	3	16QAM	8	mid	20.15	20.01	20.01	2
	3	16QAM	8	high	20.11	19.94	19.95	2
	3	16QAM	15	full RB	20.22	20.09	20.13	2
	1.4	QPSK	1	low	22.41	22.29	22.32	0
	1.4	QPSK	1	mid	22.33	22.15	22.65	0
	1.4	QPSK	1	high	22.28	22.16	21.87	0
	1.4	QPSK	3	low	22.33	22.15	22.03	1
	1.4	QPSK	3	mid	22.27	22.07	21.98	1
	1.4	QPSK	3	high	22.21	22.01	21.91	1
	1.4	QPSK	6	full RB	21.29	21.35	21.11	1
	1.4	16QAM	1	low	21.36	21.04	21.05	1
	1.4	16QAM	1	mid	21.28	20.88	20.98	1
	1.4	16QAM	1	high	21.22	20.72	20.83	1
	1.4	16QAM	3	low	21.18	21.2	21.06	2
	1.4	16QAM	3	mid	21.11	21.14	21.01	2
	1.4	16QAM	3	high	21.05	21.09	20.99	2
	1.4	16QAM	6	full RB	20.33	20.17	20.01	2

LTE Band	Bandwidth (MHz)	modulation	RB Size	RB offset	channel low Power Reading (dbm)	channel mid Power Reading (dbm)	channel high Power Reading (dbm)	MPR(dB)
XIII	10	QPSK	1	low	22.13	22.08	22.04	0
	10	QPSK	1	mid	22.08	22.01	22.01	0
	10	QPSK	1	high	22.02	21.83	21.99	0
	10	QPSK	25	low	21.55	20.85	21.28	1
	10	QPSK	25	mid	21.43	20.77	21.19	1
	10	QPSK	25	high	21.41	20.69	21.11	1
	10	QPSK	50	full RB	21.43	20.39	21.14	1
	10	16QAM	1	low	20.98	20.18	21.05	1
	10	16QAM	1	mid	21.01	20.56	21.17	1
	10	16QAM	1	high	21.03	20.66	21.22	1
	10	16QAM	25	low	19.86	19.62	20.03	2
	10	16QAM	25	mid	19.77	19.56	19.89	2
	10	16QAM	25	high	19.67	19.43	19.78	2
	10	16QAM	50	full RB	19.79	19.49	20.01	2
	5	QPSK	1	low	21.33	21.89	21.84	0
	5	QPSK	1	mid	21.44	21.91	21.85	0
	5	QPSK	1	high	21.95	21.92	21.89	0
	5	QPSK	12	low	20.77	20.98	20.67	1
	5	QPSK	12	mid	20.61	20.87	20.59	1
	5	QPSK	12	high	20.66	20.81	20.54	1
	5	QPSK	25	full RB	20.82	20.75	20.63	1
	5	16QAM	1	low	20.19	20.84	20.78	1
	5	16QAM	1	mid	20.74	20.81	20.77	1
	5	16QAM	1	high	20.88	20.79	20.66	1
	5	16QAM	12	low	19.72	19.76	19.55	2
	5	16QAM	12	mid	19.67	19.71	19.44	2
	5	16QAM	12	high	19.65	19.66	19.45	2
	5	16QAM	25	full RB	19.73	19.58	19.86	2

LTE Band	Bandwidth (MHz)	modulation	RB Size	RB offset	channel low Power Reading (dbm)	channel mid Power Reading (dbm)	channel high Power Reading (dbm)	MPR(dB)
XIV	10	QPSK	1	low	22.09	22.06	22.08	0
	10	QPSK	1	mid	21.91	21.92	21.88	0
	10	QPSK	1	high	21.73	21.78	21.73	0
	10	QPSK	25	low	20.44	20.37	20.6	1
	10	QPSK	25	mid	20.41	20.35	20.51	1
	10	QPSK	25	high	20.37	20.22	20.49	1
	10	QPSK	50	full RB	20.21	10.29	20.11	1
	10	16QAM	1	low	20.18	19.79	20.22	1
	10	16QAM	1	mid	20.16	20.11	20.22	1
	10	16QAM	1	high	20.15	20.14	20.25	1
	10	16QAM	25	low	19.31	19.46	19.38	2
	10	16QAM	25	mid	19.25	19.43	19.33	2
	10	16QAM	25	high	19.21	19.34	19.28	2
	10	16QAM	50	full RB	19.43	19.19	19.27	2
	5	QPSK	1	low	21.82	21.91	21.66	0
	5	QPSK	1	mid	21.81	21.85	21.55	0
	5	QPSK	1	high	21.79	21.78	21.32	0
	5	QPSK	12	low	20.66	20.45	20.37	1
	5	QPSK	12	mid	20.58	20.35	20.26	1
	5	QPSK	12	high	20.61	20.33	20.21	1
	5	QPSK	25	full RB	20.73	20.6	20.55	1
	5	16QAM	1	low	20.58	20.63	20.61	1
	5	16QAM	1	mid	20.59	20.58	20.52	1
	5	16QAM	1	high	20.6	20.54	20.39	1
	5	16QAM	12	low	19.53	19.61	19.28	2
	5	16QAM	12	mid	19.47	19.55	19.18	2
	5	16QAM	12	high	19.41	19.52	19.11	2
	5	16QAM	25	full RB	19.74	19.55	19.54	2

9.2 Test Records for Body SAR Test

1.According KDB447498 the maximum output power channel is used for SAR testing and reduction

2.According KDB 941225 D01 RMC 12.2kbps setting is used to evaluate SAR. If the maximum output power and tune-up tolerance specified for production units in HSDPA / HSUPA / DC-HSDPA is ≤ ¼ dB higher than RMC 12.2Kbps

3.According KDB 941225 D05

5.2.1. QPSK with 1 RB allocation

Start with the largest channel bandwidth then measure SAR for QPSK with 1 RB allocation, using the RB offset and required test channel combination with the highest maximum output power among RB offsets at the upper edge, middle, and lower edge of each required test channel. When the reported SAR is ≤ 0.8 W/kg, testing of the remaining RB offset configurations and required test channels is not required for 1 RB allocation; otherwise, SAR is required for the remaining required test channels and only for the RB offset configuration with the highest output power for that channel.6 When the reported SAR of a required test channel is > 1.45 W/kg, SAR is required for all three RB offset configurations for that required test channel.

5.2.2. QPSK with 50% RB allocation

The procedures required for 1 RB allocation in 5.2.1 are applied to measure the SAR for QPSK with 50% RB allocation.

5.2.3. QPSK with 100% RB allocation

For QPSK with 100% RB allocation, SAR is not required when the highest maximum output power for 100 % RB allocation is less than the highest maximum output power in 50% and 1 RB allocations, and the highest reported SAR for 1 RB and 50% RB allocation in 5.2.1 and 5.2.2 are ≤ 0.8 W/kg. Otherwise, SAR is measured for the highest output power channel; and if the reported SAR is > 1.45 W/kg, the remaining required test channels must also be tested.

5.2.4. Higher order modulations

For each modulation besides QPSK; e.g., 16-QAM, 64-QAM, apply the QPSK procedures in 5.2.1, 5.2.2, and 5.2.3 to determine the QAM configurations that may need SAR measurement. For each configuration identified as required for testing, SAR is required only when the highest maximum output power for the configuration in the higher order modulation is > ½ dB higher than the same configuration in QPSK or when the reported SAR for the QPSK configuration is > 1.45 W/kg.

5.3. Other channel bandwidth standalone SAR test requirements

For the other channel bandwidths used by the device in a frequency band, apply all the procedures required for the largest channel bandwidth in 5.2 to determine the channels and RB configurations that need SAR testing, then only measure SAR when the highest maximum output power of a configuration requiring testing in the smaller channel bandwidth is > ½ dB higher than the equivalent channel configurations in the largest channel bandwidth configuration, or the reported SAR of a configuration for the largest channel bandwidth is > 1.45 W/kg. The equivalent channel configuration for the RB allocation, RB offset and modulation, etc., is determined for the smaller channel bandwidth according to the same number of RB allocated in the largest channel bandwidth. For example, 50 RB in 10 MHz channel bandwidth does not apply to 5 MHz channel bandwidth; therefore, this cannot be tested in the smaller channel bandwidth. However, 50% RB allocation in 10 MHz channel bandwidth is equivalent to 100% RB allocation in 5 MHz channel bandwidth; therefore, these are the equivalent configurations to be compared to determine the specific channel and configuration in the smaller channel bandwidth that need SAR testing.

4. According KDB 941225 D01SAR test reduction for GPRS and EDGE modes is determined by the source-based time-averaged output power specified for production units, including tune-up tolerance. The data mode with highest specified time-averaged output power should be tested for SAR compliance in the applicable exposure conditions. For modes with the same specified maximum output power and tolerance, the higher number time-slot configuration should be tested. GSM voice and GPRS data use GMSK, which is a constant amplitude modulation with minimal peak to average power difference within the time-slot burst. For EDGE, GMSK is used for MCS 1 – MCS 4 and 8-PSK is used for MCS 5 – MCS 9; where 8-PSK has an inherently higher peak-to-average power ratio. The GMSK and 8-PSK EDGE configurations are considered separately for SAR compliance. The GMSK EDGE configurations are grouped with GPRS and considered with respect to time-averaged maximum output power to determine compliance. The 3G SAR test reduction procedure is applied to 8-PSK EDGE with GMSK GPRS/EDGE as the primary mode.

5. According KDB 248227 all positions/configuration , when SAR is >0.8W/kg , SAR is measured positions/configuration for next highest output power channels or all required channel are tested

6. SAR evaluation is required if the separation distance between the user and the antenna and/or radiating element of the device is less than or equal to 20 cm, According KDB 447498 and RSS 102 Standalone SAR test exclusion considerations:

For test separation distance <50mm

[(*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

For test separation distance >50mm

1) {[Power allowed at *numeric threshold* for 50 mm in step a)] + [(test separation distance – 50 mm)·($f_{(MHz)}$/150)]} mW, for 100 MHz to 1500 MHz

2) {[Power allowed at *numeric threshold* for 50 mm in step a)] + [(test separation distance – 50 mm)·10]} mW, for > 1500 MHz and ≤ 6 GHz

or complied KDB 447498 Appendix A and B Table and RSS102 2.5.1 Table 1

Table1

For IC RSS102

Frequency (MHz)	Exemption Limits (mW)				
	At separation distance of ≤5 mm	At separation distance of 10 mm	At separation distance of 15 mm	At separation distance of 20 mm	At separation distance of 25 mm
≤300	71 mW	101 mW	132 mW	162 mW	193 mW
450	52 mW	70 mW	88 mW	106 mW	123 mW
835	17 mW	30 mW	42 mW	55 mW	67 mW
1900	7 mW	10 mW	18 mW	34 mW	60 mW
2450	4 mW	7 mW	15 mW	30 mW	52 mW
3500	2 mW	6 mW	16 mW	32 mW	55 mW
5800	1 mW	6 mW	15 mW	27 mW	41 mW

Frequency (MHz)	Exemption Limits (mW)				
	At separation distance of 30 mm	At separation distance of 35 mm	At separation distance of 40 mm	At separation distance of 45 mm	At separation distance of ≥50 mm
≤300	223 mW	254 mW	284 mW	315 mW	345 mW
450	141 mW	159 mW	177 mW	195 mW	213 mW
835	80 mW	92 mW	105 mW	117 mW	130 mW
1900	99 mW	153 mW	225 mW	316 mW	431 mW
2450	83 mW	123 mW	173 mW	235 mW	309 mW
3500	86 mW	124 mW	170 mW	225 mW	290 mW
5800	56 mW	71 mW	85 mW	97 mW	106 mW

Table 2

For KDB447498

test separation distance <50mm

MHz	5	10	15	20	25	mm
150	39	77	116	155	194	*SAR Test Exclusion Threshold* (mW)
300	27	55	82	110	137	
450	22	45	67	89	112	
835	16	33	49	66	82	
900	16	32	47	63	79	
1500	12	24	37	49	61	
1900	11	22	33	44	54	
2450	10	19	29	38	48	
3600	8	16	24	32	40	
5200	7	13	20	26	33	
5400	6	13	19	26	32	
5800	6	12	19	25	31	
MHz	30	35	40	45	50	mm
150	232	271	310	349	387	*SAR Test Exclusion Threshold* (mW)
300	164	192	219	246	274	
450	134	157	179	201	224	
835	98	115	131	148	164	
900	95	111	126	142	158	
1500	73	86	98	110	122	
1900	65	76	87	98	109	
2450	57	67	77	86	96	
3600	47	55	63	71	79	
5200	39	46	53	59	66	
5400	39	45	52	58	65	
5800	37	44	50	56	62	

test separation distance >50mm

MHz	50	60	70	80	90	100	110	120	130	140	150	160	170	180	190	mm
100	474	481	487	494	501	507	514	521	527	534	541	547	554	561	567	
150	387	397	407	417	427	437	447	457	467	477	487	497	507	517	527	
300	274	294	314	334	354	374	394	414	434	454	474	494	514	534	554	
450	224	254	284	314	344	374	404	434	464	494	524	554	584	614	644	
835	164	220	275	331	387	442	498	554	609	665	721	776	832	888	943	
900	158	218	278	338	398	458	518	578	638	698	758	818	878	938	998	
1500	122	222	322	422	522	622	722	822	922	1022	1122	1222	1322	1422	1522	mW
1900	109	209	309	409	509	609	709	809	909	1009	1109	1209	1309	1409	1509	
2450	96	196	296	396	496	596	696	796	896	996	1096	1196	1296	1396	1496	
3600	79	179	279	379	479	579	679	779	879	979	1079	1179	1279	1379	1479	
5200	66	166	266	366	466	566	666	766	866	966	1066	1166	1266	1366	1466	
5400	65	165	265	365	465	565	665	765	865	965	1065	1165	1265	1365	1465	
5800	62	162	262	362	462	562	662	762	862	962	1062	1162	1262	1362	1462	

6. SAR test worst modulation and Mode

Per Conducted power test and KDB request the worst evaluate as below for SAR testing :

6.1.GPRS/EDGE

SAR test reduction is determination for GPRS and EDGE mode by the average output power, the each mode with maximum average output power should be tested , therefore , the GPRS 4Tx slots mode was selected for SAR test

6.2.WCDMA/HSPA/DC-HSDPA

SAR test reduction is determination for HSDPA/HSUPA/DC-HSDPA <=0.25db higher than WCDMA by the average output power , Therefore , the WCDMA mode was selected for SAR test

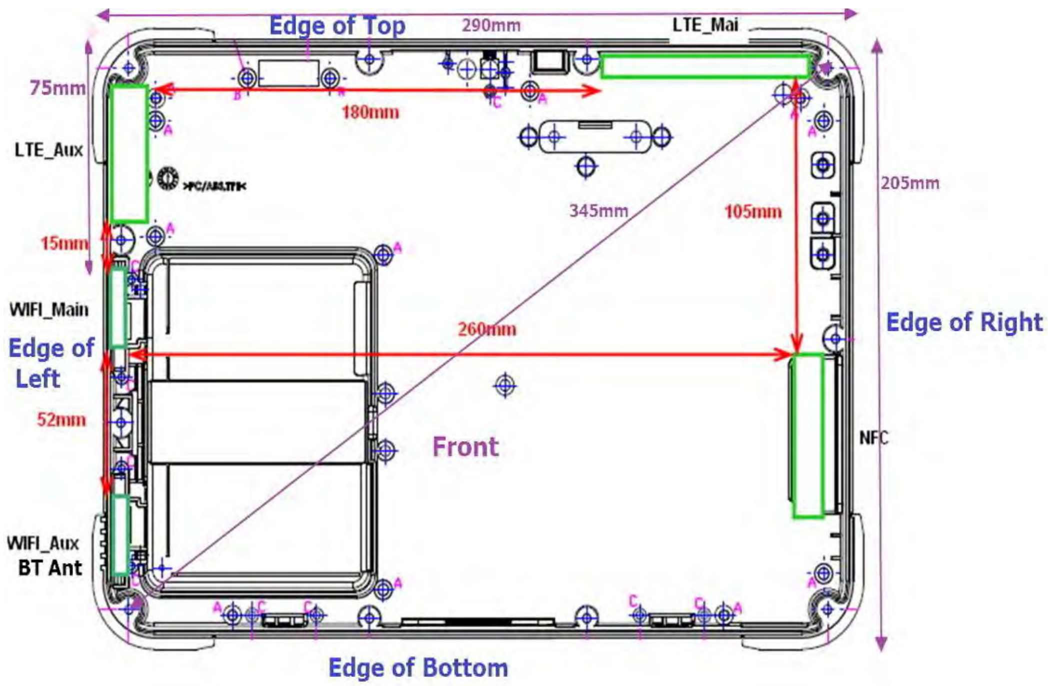
6.3.According KDB 941225 D05 LTE SAR Test worst was selected QPSK modulation and Minimum bandwidth with 1RB and 50% RB

6.4.Bluetooth SAR testing was selected BDR modulation, due to its highest average output power

7. SAR Test Exclusion evaluate Table:

Exposure Position	Testing required	GPRS	WCDMA	LTE	BT	2.4GHz WLAN	5GHz WLAN
Bottom	Yes/no	Yes	Yes	Yes	Yes	Yes	Yes
Edge of Top	Yes/no	Yes	Yes	Yes	No	Yes	Yes
Edge of Bottom	Yes/no	Yes	No	No	Yes	Yes	Yes
Edge of Left	Yes/no	Yes	No	No	Yes	Yes	Yes
Edge of Right	Yes/no	Yes	Yes	Yes	No	Yes	Yes

Antenna Location



Ambient Temperature (°C) : 21.5	Relative Humidity (%):60
Liquid Temperature (°C) : 21.5	Depth of Liquid (cm):>15

Stand- Alone SAR

Data No.	Mode	Band	Test Position	Separation Distance (cm)	Channel	SAR 1g(W/kg)
1	Wifi	802.11b	Bottom	0	6	0.052
2	Wifi	802.11b	Edge of Top	0	6	0.001
3	Wifi	802.11b	Edge of Bottom	0	6	0.004
4	Wifi	802.11b	Edge of Left	0	6	0.597
5	Wifi	802.11b	Edge of Right	0	6	0.017
6	Wifi	802.11b	Edge of Left	0	1	0.530
7	Wifi	802.11b	Edge of Left	0	11	0.578
8	Wifi	802.11g	Edge of Left	0	6	0.320
9	Wifi	802.11n 20	Edge of Left	0	11	0.274
10	Wifi	802.11n 40	Edge of Left	0	3	0.369
11	BT	BDR	Edge of Left	0	78	0.001
12	Wifi	802.11a B1 and B2	Bottom	0	36	0.001
13	Wifi	802.11a B1 and B2	Edge of Top	0	36	0.010
14	Wifi	802.11a B1 and B2	Edge of Bottom	0	36	0.020
15	Wifi	802.11a B1 and B2	Edge of Left	0	36	0.763
16	Wifi	802.11a B1 and B2	Edge of Right	0	36	0.001
17	Wifi	802.11a B1 and B2	Edge of Left	0	52	0.531
18	Wifi	802.11a B1 and B2	Edge of Left	0	64	0.566
19	Wifi	802.11n 20 B1 and B2	Edge of Left	0	64	0.557
20	Wifi	802.11n 40 B1 and B2	Edge of Left	0	54	0.681
21	Wifi	802.11ac 80 B1 and B2	Edge of Left	0	42	0.211

22	Wifi	802.11a B3	Edge of Left	0	100	0.721
23	Wifi	802.11n 20 B3	Edge of Left	0	100	0.626
24	Wifi	802.11n 40 B3	Edge of Left	0	110	0.532
25	Wifi	802.11ac 80 B3	Edge of Left	0	106	0.264
26	Wifi	802.11a B4	Edge of Left	0	149	0.220
27	Wifi	802.11n 20 B4	Edge of Left	0	149	0.197
28	Wifi	802.11n 40 B4	Edge of Left	0	159	0.305
29	Wifi	802.11ac 80 B4	Edge of Left	0	155	0.271
30	GSM	GPRS 835	Bottom	0	128	0.231
31	GSM	GPRS 835	Edge of Top	0	128	0.316
32	GSM	GPRS 835	Edge of Bottom	0	128	0.001
33	GSM	GPRS 835	Edge of Left	0	128	0.009
34	GSM	GPRS 835	Edge of Right	0	128	0.001
35	GSM	GPRS 835	Edge of Top	0	190	0.236
36	GSM	GPRS 835	Edge of Top	0	251	0.239
37	GSM	GPRS 1900	Edge of Top	0	512	0.074
38	GSM	GPRS 1900	Edge of Top	0	661	0.057
39	GSM	GPRS 1900	Edge of Top	0	810	0.037
40	WCDMA	WCDMA B2	Edge of Top	0	9262	0.236
41	WCDMA	WCDMA B2	Edge of Top	0	9400	0.200
42	WCDMA	WCDMA B2	Edge of Top	0	9538	0.117
43	WCDMA	WCDMA B4	Edge of Top	0	1312	0.591
44	WCDMA	WCDMA B4	Edge of Top	0	1413	0.467
45	WCDMA	WCDMA B4	Edge of Top	0	1513	0.500
46	WCDMA	WCDMA B5	Edge of Top	0	4132	0.462
47	WCDMA	WCDMA B5	Edge of Top	0	4183	0.526
48	WCDMA	WCDMA B5	Edge of Top	0	4233	0.473
49	LTE	LTE Band 2	Edge of Top	0	1835	0.059
50	LTE	LTE Band 2	Edge of Top	0	1880	0.124
51	LTE	LTE Band 2	Edge of Top	0	1910	0.111
52	LTE	LTE Band 4	Edge of Top	0	1710	0.284
53	LTE	LTE Band 4	Edge of Top	0	1732	0.392
54	LTE	LTE Band 4	Edge of Top	0	1755	0.311
55	LTE	LTE Band 5	Edge of Top	0	824	0.486

56	LTE	LTE Band 5	Edge of Top	0	836	0.622
57	LTE	LTE Band 5	Edge of Top	0	849	0.573
58	LTE	LTE Band 13	Edge of Top	0	777	0.496
59	LTE	LTE Band 13	Edge of Top	0	782	0.622
60	LTE	LTE Band 13	Edge of Top	0	787	0.562
61	LTE	LTE Band 17	Edge of Top	0	704	0.522
62	LTE	LTE Band 17	Edge of Top	0	710	0.618
63	LTE	LTE Band 17	Edge of Top	0	716	0.556
64	BT	BDR	Bottom	0	78	0.001
65	BT	BDR	Edge of Bottom	0	78	0.001
66	LTE	LTE Band 13	Bottom	0	777	0.407
67	LTE	LTE Band 13	Edge of Right	0	777	0.030
68	Wifi	802.11a B3	Bottom	0	100	0.001
69	Wifi	802.11a B4	Bottom	0	149	0.001
70	GSM	GPRS 1900	Bottom	0	512	0.001
71	GSM	GPRS 1900	Edge of Right	0	512	0.001
72	WCDMA	WCDMA B2	Bottom	0	9262	0.167
73	WCDMA	WCDMA B2	Edge of Right	0	9262	0.001
74	WCDMA	WCDMA B4	Bottom	0	1312	0.438
75	WCDMA	WCDMA B4	Edge of Right	0	1312	0.106
76	WCDMA	WCDMA B5	Bottom	0	4183	0.392
77	WCDMA	WCDMA B5	Edge of Right	0	4183	0.067
78	LTE	LTE Band 2	Bottom	0	1880	0.017
79	LTE	LTE Band 2	Edge of Right	0	1880	0.001
80	LTE	LTE Band 4	Bottom	0	1755	0.281
81	LTE	LTE Band 4	Edge of Right	0	1755	0.002
82	LTE	LTE Band 5	Bottom	0	824	0.448
83	LTE	LTE Band 5	Edge of Right	0	824	0.135
84	LTE	LTE Band 17	Bottom	0	704	0.399
85	LTE	LTE Band 17	Edge of Right	0	704	0.026

LTE 50%RB SAR:

Data No.	Band	Mode	Test Position	Separation Distance (cm)	Channel	SAR 1g(W/kg)
86	LTE	LTE Band 2	Bottom	0	1880	0.014
87	LTE	LTE Band 2	Edge of Top	0	1880	0.119
88	LTE	LTE Band 2	Edge of Right	0	1880	0.001
89	LTE	LTE Band 2	Edge of Top	0	1835	0.116
90	LTE	LTE Band 2	Edge of Top	0	1910	0.104
91	LTE	LTE Band 4	Bottom	0	1732	0.275
92	LTE	LTE Band 4	Edge of Top	0	1732	0.388
93	LTE	LTE Band 4	Edge of Right	0	1732	0.001
94	LTE	LTE Band 4	Edge of Top	0	1710	0.376
95	LTE	LTE Band 4	Edge of Top	0	1755	0.365
96	LTE	LTE Band 5	Bottom	0	836	0.432
97	LTE	LTE Band 5	Edge of Top	0	836	0.609
98	LTE	LTE Band 5	Edge of Right	0	836	0.128
99	LTE	LTE Band 5	Edge of Top	0	824	0.596
100	LTE	LTE Band 5	Edge of Top	0	849	0.571
101	LTE	LTE Band 13	Bottom	0	777	0.391
102	LTE	LTE Band 13	Edge of Top	0	777	0.604
103	LTE	LTE Band 13	Edge of Right	0	777	0.022
104	LTE	LTE Band 13	Edge of Top	0	782	0.591
105	LTE	LTE Band 13	Edge of Top	0	787	0.566
106	LTE	LTE Band 17	Bottom	0	704	0.377
107	LTE	LTE Band 17	Edge of Top	0	704	0.601
108	LTE	LTE Band 17	Edge of Right	0	704	0.022
109	LTE	LTE Band 17	Edge of Top	0	710	0.588
110	LTE	LTE Band 17	Edge of Top	0	716	0.541

Note : Reference to Appendix D for worst Raw data

FCC Scaled up SAR

Data No:	Band	Test Mode	Test Position	Separation Distance (cm)	Ch.	Measured Avg Power (dBm)	Tune-up maximum limit(dBm)	Scaling factor	duty cycle (%)	duty fact	Measured SAR 1g(W/kg)	Scaled SAR 1g(W/kg)
1	Wifi	802.11b	Bottom	0.0	6	14.03	14.50	1.11	99.0	1.01	0.052	0.059
2	Wifi	802.11b	Edge of Top	0.0	6	14.03	14.50	1.11	99.0	1.01	0.001	0.001
3	Wifi	802.11b	Edge of Bottom	0.0	6	14.03	14.50	1.11	99.0	1.01	0.004	0.005
4	Wifi	802.11b	Edge of Left	0.0	6	14.03	14.50	1.11	99.0	1.01	0.597	0.672
5	Wifi	802.11b	Edge of Right	0.0	6	14.03	14.50	1.11	99.0	1.01	0.017	0.019
6	Wifi	802.11b	Edge of Left	0.0	1	13.63	14.50	1.22	99.0	1.01	0.530	0.654
7	Wifi	802.11b	Edge of Left	0.0	11	13.65	14.50	1.22	99.0	1.01	0.578	0.710
8	Wifi	802.11g	Edge of Left	0.0	6	14.22	14.50	1.07	99.0	1.01	0.320	0.345
9	Wifi	802.11n 20	Edge of Left	0.0	11	14.20	14.50	1.07	95.0	1.05	0.274	0.309
10	Wifi	802.11n 40	Edge of Left	0.0	3	14.15	14.50	1.08	95.0	1.05	0.369	0.421
11	BT	BDR	Edge of Left	0.0	78	6.01	6.50	1.12	70.0	1.43	0.001	0.002
12	Wifi	802.11a B1 and B2	Bottom	0.0	36	11.50	12.50	1.26	99.0	1.01	0.001	0.001
13	Wifi	802.11a B1 and B2	Edge of Top	0.0	36	11.50	12.50	1.26	99.0	1.01	0.010	0.013
14	Wifi	802.11a B1 and B2	Edge of Bottom	0.0	36	11.50	12.50	1.26	99.0	1.01	0.020	0.025
15	Wifi	802.11a B1 and B2	Edge of Left	0.0	36	11.50	12.50	1.26	99.0	1.01	0.763	0.970
16	Wifi	802.11a B1 and B2	Edge of Right	0.0	36	11.50	12.50	1.26	99.0	1.01	0.001	0.001
17	Wifi	802.11a B1 and B2	Edge of Left	0.0	52	11.14	12.50	1.37	99.0	1.01	0.531	0.734
18	Wifi	802.11a B1 and B2	Edge of Left	0.0	64	11.29	12.50	1.32	99.0	1.01	0.566	0.755
19	Wifi	802.11n 20 B1 and B2	Edge of Left	0.0	64	11.60	12.00	1.10	95.0	1.05	0.557	0.643
20	Wifi	802.11n 40 B1 and B2	Edge of Left	0.0	38	11.51	12.00	1.12	95.0	1.05	0.681	0.802
21	Wifi	802.11ac 80 B1 and B2	Edge of Left	0.0	42	11.12	11.50	1.09	75.0	1.33	0.211	0.307
22	Wifi	802.11a B3	Edge of Left	0.0	100	12.07	12.50	1.10	99.0	1.01	0.721	0.804

23	Wifi	802.11n 20 B3	Edge of Left	0.0	100	11.75	12.00	1.06	95.0	1.05	0.626	0.698
24	Wifi	802.11n 40 B3	Edge of Left	0.0	110	11.31	12.00	1.17	95.0	1.05	0.532	0.656
25	Wifi	802.11a c 80 B3	Edge of Left	0.0	106	11.31	12.00	1.17	75.0	1.33	0.264	0.413
26	Wifi	802.11a B4	Edge of Left	0.0	149	11.54	12.50	1.25	99.0	1.01	0.220	0.277
27	Wifi	802.11n 20 B4	Edge of Left	0.0	149	11.35	12.00	1.16	95.0	1.05	0.197	0.241
28	Wifi	802.11n 40 B4	Edge of Left	0.0	159	11.05	12.00	1.24	95.0	1.05	0.305	0.400
29	Wifi	802.11a c 80 B4	Edge of Left	0.0	155	10.56	11.50	1.24	75.0	1.33	0.271	0.449
30	GSM	GPRS 835	Bottom	0.0	128	32.20	34.00	1.51	NA	NA	0.231	0.350
63	GSM	GPRS 835	Edge of Top	0.0	128	32.20	34.00	1.51	NA	NA	0.316	0.478
32	GSM	GPRS 835	Edge of Bottom	0.0	128	32.20	34.00	1.51	NA	NA	0.001	0.002
33	GSM	GPRS 835	Edge of Left	0.0	128	32.20	34.00	1.51	NA	NA	0.001	0.002
34	GSM	GPRS 835	Edge of Right	0.0	128	32.20	34.00	1.51	NA	NA	0.009	0.014
35	GSM	GPRS 835	Edge of Top	0.0	190	32.10	34.00	1.55	NA	NA	0.236	0.366
36	GSM	GPRS 835	Edge of Top	0.0	251	32.10	34.00	1.55	NA	NA	0.239	0.370
37	GSM	GPRS 1900	Edge of Top	0.0	512	29.20	31.00	1.51	NA	NA	0.074	0.112
38	GSM	GPRS 1900	Edge of Top	0.0	661	29.40	31.00	1.45	NA	NA	0.057	0.082
39	GSM	GPRS 1900	Edge of Top	0.0	810	29.20	31.00	1.51	NA	NA	0.037	0.056
40	WCDM A	WCDM A B2	Edge of Top	0.0	9262	23.43	25.00	1.44	NA	NA	0.236	0.339
41	WCDM A	WCDM A B2	Edge of Top	0.0	9400	23.86	25.00	1.30	NA	NA	0.200	0.260
42	WCDM A	WCDM A B2	Edge of Top	0.0	9538	23.12	25.00	1.54	NA	NA	0.117	0.180
43	WCDM A	WCDM A B4	Edge of Top	0.0	1312	23.18	25.00	1.52	NA	NA	0.591	0.899
44	WCDM A	WCDM A B4	Edge of Top	0.0	1413	23.84	25.00	1.31	NA	NA	0.467	0.610
45	WCDM A	WCDM A B4	Edge of Top	0.0	1513	23.89	25.00	1.29	NA	NA	0.500	0.646
46	WCDM A	WCDM A B5	Edge of Top	0.0	4132	23.48	25.00	1.42	NA	NA	0.462	0.656
47	WCDM A	WCDM A B5	Edge of Top	0.0	4183	23.41	25.00	1.44	NA	NA	0.526	0.759
48	WCDM A	WCDM A B5	Edge of Top	0.0	4233	23.37	25.00	1.46	NA	NA	0.473	0.688
49	LTE	LTE Band 2	Edge of Top	0.0	1835	22.56	24.00	1.39	NA	NA	0.059	0.082
50	LTE	LTE Band 2	Edge of Top	0.0	1880	22.72	24.00	1.34	NA	NA	0.124	0.167
51	LTE	LTE Band 2	Edge of Top	0.0	1910	22.49	24.00	1.42	NA	NA	0.111	0.157
52	LTE	LTE Band 4	Edge of Top	0.0	1710	22.62	24.00	1.37	NA	NA	0.284	0.390
53	LTE	LTE Band 4	Edge of Top	0.0	1732	22.98	24.00	1.26	NA	NA	0.392	0.496
54	LTE	LTE Band 4	Edge of Top	0.0	1755	23.07	24.00	1.24	NA	NA	0.311	0.385
55	LTE	LTE Band 5	Edge of Top	0.0	824	22.63	24.00	1.37	NA	NA	0.486	0.666
56	LTE	LTE Band 5	Edge of Top	0.0	836	22.57	24.00	1.39	NA	NA	0.622	0.865
57	LTE	LTE Band 5	Edge of Top	0.0	849	22.44	24.00	1.43	NA	NA	0.573	0.821

58	LTE	LTE Band 13	Edge of Top	0.0	777	22.13	24.00	1.54	NA	NA	0.496	0.763
59	LTE	LTE Band 13	Edge of Top	0.0	782	22.08	24.00	1.56	NA	NA	0.622	0.968
60	LTE	LTE Band 13	Edge of Top	0.0	787	22.04	24.00	1.57	NA	NA	0.562	0.883
61	LTE	LTE Band 17	Edge of Top	0.0	704	22.09	24.00	1.55	NA	NA	0.522	0.810
62	LTE	LTE Band 17	Edge of Top	0.0	710	22.06	24.00	1.56	NA	NA	0.618	0.966
63	LTE	LTE Band 17	Edge of Top	0.0	716	22.08	24.00	1.56	NA	NA	0.556	0.865
64	BT	BDR	Bottom	0.0	78	6.01	6.50	1.12	70.0	1.43	0.001	0.001
65	BT	BDR	Edge of Bottom	0.0	78	6.01	6.50	1.12	70.0	1.43	0.001	0.001
66	LTE	LTE Band 13	Bottom	0.0	777	22.13	24.00	1.54	NA	NA	0.407	0.626
67	LTE	LTE Band 13	Edge of Right	0.0	777	22.13	24.00	1.54	NA	NA	0.030	0.046
68	Wifi	802.11 a B3	Bottom	0.0	100	12.07	12.50	1.10	95.00	1.05	0.001	0.001
69	Wifi	802.11 a B4	Bottom	0.0	149	11.54	12.50	1.25	95.00	1.05	0.001	0.001
70	GSM	GPRS 1900	Bottom	0.0	512	29.20	31.00	1.51	NA	NA	0.001	0.002
71	GSM	GPRS 1900	Edge of Right	0.0	512	29.20	31.00	1.51	NA	NA	0.001	0.002
72	WCD MA	WCD MA B2	Bottom	0.0	9262	23.43	25.00	1.44	NA	NA	0.167	0.240
73	WCD MA	WCD MA B2	Edge of Right	0.0	9262	23.43	25.00	1.44	NA	NA	0.001	0.001
74	WCD MA	WCD MA B4	Bottom	0.0	1312	23.18	25.00	1.52	NA	NA	0.438	0.666
75	WCD MA	WCD MA B4	Edge of Right	0.0	1312	23.18	25.00	1.52	NA	NA	0.106	0.161
76	WCD MA	WCD MA B5	Bottom	0.0	4183	23.48	25.00	1.42	NA	NA	0.392	0.556
77	WCD MA	WCD MA B5	Edge of Right	0.0	4183	23.48	25.00	1.42	NA	NA	0.067	0.095
78	LTE	LTE Band 2	Bottom	0	1880	22.72	24.00	1.34	NA	NA	0.017	0.023
79	LTE	LTE Band 2	Edge of Right	0	1880	22.72	24.00	1.34	NA	NA	0.001	0.001
80	LTE	LTE Band 4	Bottom	0.0	1755	23.07	24.00	1.24	NA	NA	0.281	0.348
81	LTE	LTE Band 4	Edge of Right	0.0	1755	23.07	24.00	1.24	NA	NA	0.002	0.002
82	LTE	LTE Band 5	Bottom	0.0	824	22.63	24.00	1.37	NA	NA	0.448	0.614
83	LTE	LTE Band 5	Edge of Right	0.0	824	22.63	24.00	1.37	NA	NA	0.135	0.185

84	LTE	LTE Band 17	Bottom	0.0	704	22.09	24.00	1.55	NA	NA	0.399	0.619
85	LTE	LTE Band 17	Edge of Right	0.0	704	22.09	24.00	1.55	NA	NA	0.026	0.040
86	LTE	LTE Band 2	Bottom	0.0	1880	22.72	24.00	1.34	NA	NA	0.014	0.019
87	LTE	LTE Band 2	Edge of Top	0.0	1880	22.72	24.00	1.34	NA	NA	0.119	0.160
88	LTE	LTE Band 2	Edge of Right	0.0	1880	22.72	24.00	1.34	NA	NA	0.001	0.001
89	LTE	LTE Band 2	Edge of Top	0.0	1835	22.56	24.00	1.39	NA	NA	0.116	0.162
90	LTE	LTE Band 2	Edge of Top	0.0	1910	22.49	24.00	1.42	NA	NA	0.104	0.147
91	LTE	LTE Band 4	Bottom	0.0	1732	22.98	24.00	1.26	NA	NA	0.275	0.348
92	LTE	LTE Band 4	Edge of Top	0.0	1732	22.98	24.00	1.26	NA	NA	0.388	0.491
93	LTE	LTE Band 4	Edge of Right	0.0	1732	22.98	24.00	1.26	NA	NA	0.001	0.001
94	LTE	LTE Band 4	Edge of Top	0.0	1710	22.62	24.00	1.37	NA	NA	0.376	0.517
95	LTE	LTE Band 4	Edge of Top	0.0	1755	23.07	24.00	1.24	NA	NA	0.365	0.452
96	LTE	LTE Band 5	Bottom	0.0	836	22.57	24.00	1.39	NA	NA	0.432	0.600
97	LTE	LTE Band 5	Edge of Top	0.0	836	22.57	24.00	1.39	NA	NA	0.609	0.846
98	LTE	LTE Band 5	Edge of Right	0.0	836	22.57	24.00	1.39	NA	NA	0.128	0.178
99	LTE	LTE Band 5	Edge of Top	0.0	824	22.63	24.00	1.37	NA	NA	0.596	0.817
100	LTE	LTE Band 5	Edge of Top	0.0	849	22.44	24.00	1.43	NA	NA	0.571	0.818
101	LTE	LTE Band 13	Bottom	0.0	777	22.13	24.00	1.54	NA	NA	0.391	0.601
102	LTE	LTE Band 13	Edge of Top	0.0	777	22.13	24.00	1.54	NA	NA	0.604	0.929
103	LTE	LTE Band 13	Edge of Right	0.0	777	22.13	24.00	1.54	NA	NA	0.022	0.034
104	LTE	LTE Band 13	Edge of Top	0.0	782	22.08	24.00	1.56	NA	NA	0.591	0.920
105	LTE	LTE Band 13	Edge of Top	0.0	787	22.04	24.00	1.57	NA	NA	0.566	0.889
106	LTE	LTE Band 17	Bottom	0.0	704	22.09	24.00	1.55	NA	NA	0.377	0.585
107	LTE	LTE Band 17	Edge of Top	0.0	704	22.09	24.00	1.55	NA	NA	0.601	0.933
108	LTE	LTE Band 17	Edge of Right	0.0	704	22.09	24.00	1.55	NA	NA	0.022	0.034

109	LTE	LTE Band 17	Edge of Top	0.0	710	22.06	24.00	1.56	NA	NA	0.588	0.919
110	LTE	LTE Band 17	Edge of Top	0.0	716	22.08	24.00	1.56	NA	NA	0.541	0.842

9.3 RSS 102, IC NOTICE 2012-DRS0529: SAR CORRECTION FOR MEASURED CONDUCTIVITY AND RELATIVE PERMITTIVITY

Body Tissue Simulant Measurement									
Frequency [MHz]	Description	Dielectric Parameters		Tissue Temp.					
		e r	s [s/m]	[°C]					
	Reference result	**52.7**	**1.95**	N/A	$C\varepsilon$	$C\sigma$	$\Delta\varepsilon$	$\Delta\sigma$	ΔSAR SAR
	± 5% window	**50.067 to 55.335**	**1.8525 to 2.0475**						
2412	Dec. 22, 2016	54.642	1.929	21.5	-0.23	0.49	3.69	-1.08	-1.36
2437	Dec. 22, 2016	54.288	1.93	21.5	-0.22	0.48	3.01	-1.03	-1.17
2462	Dec. 22, 2016	54.164	1.933	21.5	-0.22	0.48	2.78	-0.87	-1.04

Body Tissue Simulant Measurement									
Frequency [MHz]	Description	Dielectric Parameters		Tissue Temp.					
		e r	s [s/m]	[°C]					
	Reference result	**48.95**	**5.36**	N/A	$C\varepsilon$	$C\sigma$	$\Delta\varepsilon$	$\Delta\sigma$	ΔSAR SAR
	± 5% window	**46.50 to 51.39**	**5.092 to 5.628**						
5180	Dec. 23, 2016	47.956	5.476	21.5	-0.20	-0.02	-2.03	2.16	0.36
5260	Dec. 23, 2016	47.231	5.484	21.5	-0.20	-0.03	-3.51	2.31	0.64
5320	Dec. 23, 2016	47.077	5.498	21.5	-0.20	-0.03	-3.83	2.57	0.68

Body Tissue Simulant Measurement									
Frequency [MHz]	Description	Dielectric Parameters		Tissue Temp.					
		e r	s [s/m]	[°C]					
	Reference result	**48.5**	**5.7**	N/A	$C\varepsilon$	$C\sigma$	$\Delta\varepsilon$	$\Delta\sigma$	ΔSAR SAR
	± 5% window	**46.075 to 50.925**	**5.415 to 5.985**						
5500	Dec. 23, 2016	46.481	5.647	21.5	-0.20	-0.04	-4.16	-0.93	0.87
5600	Dec. 23, 2016	46.273	5.665	21.5	-0.20	-0.04	-4.59	-0.61	0.94
5800	Dec. 24, 2016	46.123	5.686	21.5	-0.20	-0.04	-4.90	-0.25	0.98

Body Tissue Simulant Measurement									
Frequency [MHz]	Description	Dielectric Parameters		Tissue Temp.					
		e r	s [s/m]	[°C]					
	Reference result	**55.2**	**0.97**	N/A	$C\varepsilon$	$C\sigma$	$\Delta\varepsilon$	$\Delta\sigma$	ΔSAR SAR
	± 5% window	**52.44 to 57.96**	**0.921 to 1.018**						
824.2	Dec. 26, 2016	55.899	0.929	21.5	-0.22	0.75	1.27	-4.23	-3.47
836	Dec. 26, 2016	54.342	0.931	21.5	-0.22	0.75	-1.55	-4.02	-2.69
848.8	Dec. 26, 2016	53.005	0.935	21.5	-0.22	0.75	-3.98	-3.61	-1.84
826.4	Dec. 27, 2016	56.087	0.921	21.5	-0.22	0.75	1.61	-5.05	-4.16
836.6	Dec. 27, 2016	54.522	0.924	21.5	-0.22	0.75	-1.23	-4.74	-3.30
846.6	Dec. 27, 2016	53.175	0.931	21.5	-0.22	0.75	-3.67	-4.02	-2.22
777	Dec. 28, 2016	57.823	0.922	21.5	-0.22	0.76	4.75	-4.95	-4.79
782	Dec. 28, 2016	55.466	0.928	21.5	-0.22	0.76	0.48	-4.33	-3.39
787	Dec. 28, 2016	54.157	0.931	21.5	-0.22	0.76	-1.89	-4.02	-2.63

Body Tissue Simulant Measurement									
Frequency [MHz]	Description	Dielectric Parameters e_r	s [s/m]	Tissue Temp. [°C]					
	Reference result	55.5	0.96	N/A	$C\varepsilon$	$C\sigma$	$\Delta\varepsilon$	$\Delta\sigma$	ΔSAR SAR
	± 5% window	52.725 to 58.275	0.912 to 1.008						
704	Dec. 28, 2016	54.008	0.971	21.5	-0.22	0.76	-2.69	1.15	1.46
710	Dec. 28, 2016	53.642	0.974	21.5	-0.22	0.76	-3.35	1.46	1.84
716	Dec. 28, 2016	54.085	0.979	21.5	-0.22	0.76	-2.55	1.98	2.07

Body Tissue Simulant Measurement									
Frequency [MHz]	Description	Dielectric Parameters e_r	s [s/m]	Tissue Temp. [°C]					
	Reference result	53.3	1.52	N/A	$C\varepsilon$	$C\sigma$	$\Delta\varepsilon$	$\Delta\sigma$	ΔSAR SAR
	± 5% window	50.635 to 55.965	1.444 to 1.596						
1712.4	Dec. 27, 2016	54.416	1.539	21.5	-0.23	0.63	2.09	1.25	0.31
1732.6	Dec. 27, 2016	54.377	1.543	21.5	-0.23	0.63	2.02	1.51	0.49
1752.6	Dec. 27, 2016	54.268	1.548	21.5	-0.23	0.62	1.82	1.84	0.74
1710	Dec. 28, 2016	54.604	1.546	21.5	-0.23	0.63	2.45	1.71	0.52
1732.5	Dec. 28, 2016	54.389	1.551	21.5	-0.23	0.63	2.04	2.04	0.81
1755	Dec. 28, 2016	54.173	1.569	21.5	-0.23	0.62	1.64	3.22	1.63

Body Tissue Simulant Measurement									
Frequency [MHz]	Description	Dielectric Parameters e_r	s [s/m]	Tissue Temp. [°C]					
	Reference result	53.3	1.52	N/A	$C\varepsilon$	$C\sigma$	$\Delta\varepsilon$	$\Delta\sigma$	ΔSAR SAR
	± 5% window	50.635 to 55.965	1.444 to 1.596						
1850.2	Dec. 26, 2016	53.421	1.515	21.5	-0.23	0.60	0.23	-0.33	-0.25
1880	Dec. 26, 2016	52.358	1.519	21.5	-0.23	0.60	-1.77	-0.07	0.36
1909.8	Dec. 26, 2016	51.853	1.524	21.5	-0.23	0.59	-2.71	0.26	0.77
1852.4	Dec. 27, 2016	53.094	1.528	21.5	-0.23	0.60	-0.39	0.53	0.40
1880	Dec. 27, 2016	52.766	1.534	21.5	-0.23	0.60	-1.00	0.92	0.78
1907.6	Dec. 27, 2016	51.801	1.539	21.5	-0.23	0.59	-2.81	1.25	1.38
1850	Dec. 28, 2016	53.225	1.498	21.5	-0.23	0.60	-0.14	-1.45	-0.84
1880	Dec. 28, 2016	52.307	1.501	21.5	-0.23	0.60	-1.86	-1.25	-0.33
1910	Dec. 28, 2016	51.644	1.515	21.5	-0.23	0.59	-3.11	-0.33	0.51

F.2 SAR correction formula

From [13] and [14], a linear relationship was found between the percent change in SAR (denoted ΔSAR) and the percent change in the permittivity and conductivity from the target values in Table 1 (denoted $\Delta\varepsilon_r$ and $\Delta\sigma$, respectively). This linear relationship agrees with the results of Kuster and Balzano [48] and Bit-Babik et al. [2]. The relationship is given by:

$$\Delta SAR = c_\varepsilon \, \Delta\varepsilon_r + c_\sigma \, \Delta\sigma \qquad \text{(F.1)}$$

where

$c_\varepsilon = \partial(\Delta SAR)/\partial(\Delta\varepsilon)$	is the coefficients representing the sensitivity of SAR to permittivity where SAR is normalized to output power;
$c_\sigma = \partial(\Delta SAR)/\partial(\Delta\sigma)$	is the coefficients representing the sensitivity of SAR to conductivity, where SAR is normalized to output power.

The values of c_ε and c_σ have a simple relationship with frequency that can be described using polynomial equations. For the 1 g averaged SAR c_ε and c_σ are given by

$$c_\varepsilon = -7{,}854\times10^{-4} f^3 + 9{,}402\times10^{-3} f^2 - 2{,}742\times10^{-2} f - 0{,}202\,6 \qquad \text{(F.2)}$$

$$c_\sigma = 9{,}804\times10^{-3} f^3 - 8{,}661\times10^{-2} f^2 + 2{,}981\times10^{-2} f + 0{,}782\,9 \qquad \text{(F.3)}$$

where

f is the frequency in GHz.

Corrected SAR = Measured SAR * ((100 + (ΔSAR x -1)) /100) (Equation 1)

IC Correction SAR data

Data No.	Mode	Band	Test Position	Separation Distance (cm)	Channel	Measured SAR 1g(W/kg)	Corrected SAR 1g(W/kg)
1	Wifi	802.11b	Bottom	0	6	0.059	0.060
2	Wifi	802.11b	Edge of Top	0	6	0.001	0.001
3	Wifi	802.11b	Edge of Bottom	0	6	0.005	0.005
4	Wifi	802.11b	Edge of Left	0	6	0.672	0.681
5	Wifi	802.11b	Edge of Right	0	6	0.019	0.019
6	Wifi	802.11b	Edge of Left	0	1	0.654	0.663
7	Wifi	802.11b	Edge of Left	0	11	0.710	0.720
8	Wifi	802.11g	Edge of Left	0	6	0.345	0.350
9	Wifi	802.11n 20	Edge of Left	0	11	0.309	0.313
10	Wifi	802.11n 40	Edge of Left	0	3	0.421	0.427
11	BT	BDR	Edge of Left	0	78	0.002	0.002
12	Wifi	802.11a B1 and B2	Bottom	0	36	0.001	0.001
13	Wifi	802.11a B1 and B2	Edge of Top	0	36	0.013	0.013
14	Wifi	802.11a B1 and B2	Edge of Bottom	0	36	0.025	0.025
15	Wifi	802.11a B1 and B2	Edge of Left	0	36	0.970	0.967
16	Wifi	802.11a B1 and B2	Edge of Right	0	36	0.001	0.001
17	Wifi	802.11a B1 and B2	Edge of Left	0	52	0.734	0.731
18	Wifi	802.11a B1 and B2	Edge of Left	0	64	0.755	0.752
19	Wifi	802.11n 20 B1 and B2	Edge of Left	0	64	0.643	0.641
20	Wifi	802.11n 40 B1 and B2	Edge of Left	0	38	0.802	0.799
21	Wifi	802.11ac 80 B1 and B2	Edge of Left	0	42	0.307	0.306
22	Wifi	802.11a B3	Edge of Left	0	100	0.804	0.801
23	Wifi	802.11n 20 B3	Edge of Left	0	100	0.698	0.695
24	Wifi	802.11n 40 B3	Edge of Left	0	110	0.656	0.654
25	Wifi	802.11ac 80 B3	Edge of Left	0	106	0.413	0.412
26	Wifi	802.11a B4	Edge of Left	0	149	0.277	0.276

27	Wifi	802.11n 20 B4	Edge of Left	0	149	0.241	0.240
28	Wifi	802.11n 40 B4	Edge of Left	0	159	0.400	0.399
29	Wifi	802.11ac 80 B4	Edge of Left	0	155	0.449	0.447
30	GSM	GPRS 835	Bottom	0	128	0.350	0.362
31	GSM	GPRS 835	Edge of Top	0	128	0.478	0.495
32	GSM	GPRS 835	Edge of Bottom	0	128	0.002	0.002
33	GSM	GPRS 835	Edge of Left	0	128	0.002	0.002
34	GSM	GPRS 835	Edge of Right	0	128	0.014	0.014
35	GSM	GPRS 835	Edge of Top	0	190	0.366	0.379
36	GSM	GPRS 835	Edge of Top	0	251	0.370	0.383
37	GSM	GPRS 1900	Edge of Top	0	512	0.112	0.112
38	GSM	GPRS 1900	Edge of Top	0	661	0.082	0.082
39	GSM	GPRS 1900	Edge of Top	0	810	0.056	0.056
40	WCDMA	WCDMA B2	Edge of Top	0	9262	0.339	0.338
41	WCDMA	WCDMA B2	Edge of Top	0	9400	0.260	0.259
42	WCDMA	WCDMA B2	Edge of Top	0	9538	0.180	0.179
43	WCDMA	WCDMA B4	Edge of Top	0	1312	0.899	0.896
44	WCDMA	WCDMA B4	Edge of Top	0	1413	0.610	0.608
45	WCDMA	WCDMA B4	Edge of Top	0	1513	0.646	0.644
46	WCDMA	WCDMA B5	Edge of Top	0	4132	0.656	0.683
47	WCDMA	WCDMA B5	Edge of Top	0	4183	0.759	0.791
48	WCDMA	WCDMA B5	Edge of Top	0	4233	0.688	0.717
49	LTE	LTE Band 2	Edge of Top	0	1835	0.082	0.083
50	LTE	LTE Band 2	Edge of Top	0	1880	0.167	0.168
51	LTE	LTE Band 2	Edge of Top	0	1910	0.157	0.158
52	LTE	LTE Band 4	Edge of Top	0	1710	0.390	0.388
53	LTE	LTE Band 4	Edge of Top	0	1732	0.496	0.493
54	LTE	LTE Band 4	Edge of Top	0	1755	0.385	0.383
55	LTE	LTE Band 5	Edge of Top	0	824	0.666	0.694
56	LTE	LTE Band 5	Edge of Top	0	836	0.865	0.901

57	LTE	LTE Band 5	Edge of Top	0	849	0.821	0.855
58	LTE	LTE Band 13	Edge of Top	0	777	0.763	0.800
59	LTE	LTE Band 13	Edge of Top	0	782	0.968	1.014
60	LTE	LTE Band 13	Edge of Top	0	787	0.883	0.925
61	LTE	LTE Band 17	Edge of Top	0	704	0.810	0.798
62	LTE	LTE Band 17	Edge of Top	0	710	0.966	0.952
63	LTE	LTE Band 17	Edge of Top	0	716	0.865	0.852
64	BT	BDR	Bottom	0	78	0.001	0.002
65	BT	BDR	Edge of Bottom	0	78	0.001	0.002
66	LTE	LTE Band 13	Bottom	0	777	0.626	0.656
67	LTE	LTE Band 13	Edge of Right	0	777	0.046	0.048
68	Wifi	802.11a B3	Bottom	0	100	0.001	0.001
69	Wifi	802.11a B4	Bottom	0	149	0.001	0.001
70	GSM	GPRS 1900	Bottom	0	512	0.002	0.002
71	GSM	GPRS 1900	Edge of Right	0	512	0.002	0.002
72	WCDMA	WCDMA B2	Bottom	0	9262	0.240	0.239
73	WCDMA	WCDMA B2	Edge of Right	0	9262	0.001	0.001
74	WCDMA	WCDMA B4	Bottom	0	1312	0.666	0.896
75	WCDMA	WCDMA B4	Edge of Right	0	1312	0.161	0.161
76	WCDMA	WCDMA B5	Bottom	0	4183	0.556	0.579
77	WCDMA	WCDMA B5	Edge of Right	0	4183	0.095	0.099
78	LTE	LTE Band 2	Bottom	0	1880	0.023	0.023
79	LTE	LTE Band 2	Edge of Right	0	1880	0.001	0.001
80	LTE	LTE Band 4	Bottom	0	1755	0.348	0.346
81	LTE	LTE Band 4	Edge of Right	0	1755	0.002	0.002
82	LTE	LTE Band 5	Bottom	0	824	0.614	0.640
83	LTE	LTE Band 5	Edge of Right	0	824	0.185	0.193
84	LTE	LTE Band 17	Bottom	0	704	0.619	0.610
85	LTE	LTE Band 17	Edge of Right	0	704	0.040	0.039

LTE 50%RB SAR:

Data No.	Mode	Band	Test Position	Separation Distance (cm)	Channel	Measured SAR 1g(W/kg)	Corrected SAR 1g(W/kg)
86	LTE	LTE Band 2	Bottom	0	1880	0.019	0.019
87	LTE	LTE Band 2	Edge of Top	0	1880	0.160	0.161
88	LTE	LTE Band 2	Edge of Right	0	1880	0.001	0.001
89	LTE	LTE Band 2	Edge of Top	0	1835	0.162	0.163
90	LTE	LTE Band 2	Edge of Top	0	1910	0.147	0.148
91	LTE	LTE Band 4	Bottom	0	1732	0.348	0.346
92	LTE	LTE Band 4	Edge of Top	0	1732	0.491	0.488
93	LTE	LTE Band 4	Edge of Right	0	1732	0.001	0.001
94	LTE	LTE Band 4	Edge of Top	0	1710	0.517	0.514
95	LTE	LTE Band 4	Edge of Top	0	1755	0.452	0.450
96	LTE	LTE Band 5	Bottom	0	836	0.600	0.625
97	LTE	LTE Band 5	Edge of Top	0	836	0.846	0.881
98	LTE	LTE Band 5	Edge of Right	0	836	0.178	0.185
99	LTE	LTE Band 5	Edge of Top	0	824	0.817	0.851
100	LTE	LTE Band 5	Edge of Top	0	849	0.818	0.852
101	LTE	LTE Band 13	Bottom	0	777	0.601	0.630
102	LTE	LTE Band 13	Edge of Top	0	777	0.929	0.973
103	LTE	LTE Band 13	Edge of Right	0	777	0.034	0.036
104	LTE	LTE Band 13	Edge of Top	0	782	0.920	0.964
105	LTE	LTE Band 13	Edge of Top	0	787	0.889	0.932
106	LTE	LTE Band 17	Bottom	0	704	0.585	0.576
107	LTE	LTE Band 17	Edge of Top	0	704	0.933	0.919
108	LTE	LTE Band 17	Edge of Right	0	704	0.034	0.034
109	LTE	LTE Band 17	Edge of Top	0	710	0.919	0.906
110	LTE	LTE Band 17	Edge of Top	0	716	0.842	0.830

Simultaneous Mode (FCC)

WWAN Band		Exposure Position	Corrected WWAN 1g SAR(W/kg)	Corrected 2.4G WLAN 1g SAR(W/kg)	Corrected 5G WLAN 1g SAR(W/kg)	Corrected BT 1g SAR(W/kg)	Summed 1g SAR(W/kg)	SPLSR
GSM	GPRS 850	Bottom	0.350	0.059	0.001	0.001	0.410	
		Edge of Top	0.478	0.001	0.013	N/A	0.491	
		Edge of Bottom	0.002	0.005	0.025	0.001	0.028	
		Edge of Left	0.002	0.710	0.970	0.002	0.974	
		Edge of Right	0.014	0.019	0.001	N/A	0.033	
	GPRS 1900	Bottom	0.002	0.059	0.001	0.001	0.062	
		Edge of Top	0.112	0.001	0.013	N/A	0.125	
		Edge of Bottom	N/A	0.005	0.025	0.001	0.026	
		Edge of Left	N/A	0.710	0.970	0.002	0.972	
		Edge of Right	0.002	0.019	0.001	N/A	0.021	
WCDMA	Band II	Bottom	0.240	0.059	0.001	0.001	0.300	
		Edge of Top	0.339	0.001	0.013	N/A	0.352	
		Edge of Bottom	N/A	0.005	0.025	0.001	0.026	
		Edge of Left	N/A	0.710	0.970	0.002	0.972	
		Edge of Right	0.001	0.019	0.001	N/A	0.020	
	Band IV	Bottom	0.666	0.059	0.001	0.001	0.726	
		Edge of Top	0.589	0.001	0.013	N/A	0.602	
		Edge of Bottom	N/A	0.005	0.025	0.001	0.026	
		Edge of Left	N/A	0.710	0.970	0.002	0.972	
		Edge of Right	0.161	0.019	0.001	N/A	0.180	
	Band V	Bottom	0.556	0.059	0.001	0.001	0.626	
		Edge of Top	0.899	0.001	0.013	N/A	0.912	
		Edge of Bottom	N/A	0.005	0.025	0.001	0.026	
		Edge of Left	N/A	0.710	0.970	0.002	0.972	
		Edge of Right	0.095	0.019	0.001	N/A	0.114	

LTE	Band 2	Bottom	0.023	0.059	0.001	0.001	0.083	
		Edge of Top	0.167	0.001	0.013	N/A	0.180	
		Edge of Bottom	N/A	0.005	0.025	0.001	0.026	
		Edge of Left	N/A	0.710	0.970	0.001	0.971	
		Edge of Right	0.001	0.019	0.001	N/A	0.020	
	Band 4	Bottom	0.348	0.059	0.001	0.001	0.408	
		Edge of Top	0.496	0.001	0.013	N/A	0.509	
		Edge of Bottom	N/A	0.005	0.025	0.001	0.026	
		Edge of Left	N/A	0.710	0.970	0.001	0.971	
		Edge of Right	0.002	0.019	0.001	N/A	0.021	
	Band 5	Bottom	0.614	0.059	0.001	0.001	0.674	
		Edge of Top	0.865	0.001	0.013	N/A	0.878	
		Edge of Bottom	N/A	0.005	0.025	0.001	0.026	
		Edge of Left	N/A	0.710	0.970	0.001	0.971	
		Edge of Right	0.185	0.019	0.001	N/A	0.204	
	Band 13	Bottom	0.626	0.059	0.001	0.001	0.686	
		Edge of Top	0.968	0.001	0.013	N/A	0.981	
		Edge of Bottom	N/A	0.005	0.025	0.001	0.026	
		Edge of Left	N/A	0.710	0.970	0.001	0.971	
		Edge of Right	0.046	0.019	0.001	N/A	0.065	
	Band 17	Bottom	0.619	0.059	0.001	0.001	0.679	
		Edge of Top	0.966	0.001	0.013	N/A	0.979	
		Edge of Bottom	N/A	0.005	0.025	0.001	0.026	
		Edge of Left	N/A	0.710	0.970	0.001	0.971	
		Edge of Right	0.040	0.019	0.001	N/A	0.059	

Simultaneous Mode (IC)

WWAN Band		Exposure Position	Corrected WWAN 1g SAR(W/kg)	Corrected 2.4G WLAN 1g SAR(W/kg)	Corrected 5G WLAN 1g SAR(W/kg)	Corrected BT 1g SAR(W/kg)	Summed 1g SAR(W/kg)	SPLSR
GSM	GPRS 850	Bottom	0.362	0.060	0.001	0.002	0.424	
		Edge of Top	0.495	0.001	0.013	N/A	0.508	
		Edge of Bottom	0.002	0.005	0.025	0.002	0.029	
		Edge of Left	0.002	0.720	0.967	0.002	0.971	
		Edge of Right	0.014	0.019	0.001	N/A	0.034	
	GPRS 1900	Bottom	0.002	0.060	0.001	0.002	0.064	
		Edge of Top	0.112	0.001	0.013	N/A	0.125	
		Edge of Bottom	N/A	0.005	0.025	0.002	0.027	
		Edge of Left	N/A	0.720	0.967	0.002	0.969	
		Edge of Right	0.002	0.019	0.001	N/A	0.021	
WCDMA	Band II	Bottom	0.239	0.060	0.001	0.002	0.301	
		Edge of Top	0.338	0.001	0.013	N/A	0.351	
		Edge of Bottom	N/A	0.005	0.025	0.002	0.027	
		Edge of Left	N/A	0.720	0.967	0.002	0.969	
		Edge of Right	0.001	0.019	0.001	N/A	0.020	
	Band IV	Bottom	0.664	0.060	0.001	0.002	0.726	
		Edge of Top	0.896	0.001	0.013	N/A	0.909	
		Edge of Bottom	N/A	0.005	0.025	0.002	0.027	
		Edge of Left	N/A	0.720	0.967	0.002	0.969	
		Edge of Right	0.161	0.019	0.001	N/A	0.180	
	Band V	Bottom	0.579	0.060	0.001	0.002	0.641	
		Edge of Top	0.791	0.001	0.013	N/A	0.804	
		Edge of Bottom	N/A	0.005	0.025	0.002	0.027	
		Edge of Left	N/A	0.720	0.967	0.002	0.969	
		Edge of Right	0.099	0.019	0.001	N/A	0.118	

LTE	Band 2	Bottom	0.023	0.060	0.001	0.002	0.085	
		Edge of Top	0.168	0.001	0.013	N/A	0.181	
		Edge of Bottom	N/A	0.005	0.025	0.002	0.027	
		Edge of Left	N/A	0.720	0.967	0.002	0.969	
		Edge of Right	0.001	0.019	0.001	N/A	0.020	
	Band 4	Bottom	0.346	0.060	0.001	0.002	0.408	
		Edge of Top	0.493	0.001	0.013	N/A	0.506	
		Edge of Bottom	N/A	0.005	0.025	0.002	0.027	
		Edge of Left	N/A	0.720	0.967	0.002	0.969	
		Edge of Right	0.002	0.019	0.001	N/A	0.021	
	Band 5	Bottom	0.640	0.060	0.001	0.002	0.701	
		Edge of Top	0.901	0.001	0.013	N/A	0.914	
		Edge of Bottom	N/A	0.005	0.025	0.002	0.027	
		Edge of Left	N/A	0.720	0.967	0.002	0.969	
		Edge of Right	0.193	0.019	0.001	N/A	0.212	
	Band 13	Bottom	0.656	0.060	0.001	0.002	0.718	
		Edge of Top	1.014	0.001	0.013	N/A	1.027	
		Edge of Bottom	N/A	0.005	0.025	0.002	0.027	
		Edge of Left	N/A	0.720	0.967	0.002	0.969	
		Edge of Right	0.048	0.019	0.001	N/A	0.067	
	Band 17	Bottom	0.610	0.060	0.001	0.002	0.672	
		Edge of Top	0.952	0.001	0.013	N/A	0.965	
		Edge of Bottom	N/A	0.005	0.025	0.002	0.027	
		Edge of Left	N/A	0.720	0.967	0.002	0.969	
		Edge of Right	0.039	0.019	0.001	N/A	0.059	

10 Exposure Assessment Measurement Uncertainty

Source of Uncertainty	Tolerance Value	Probability Distribution	Divisor	c_i[1] (1-g)	c_i[1] (10-g)	Standard Uncertainty (1-g) %	Standard Uncertainty (10-g) %
Measurement System							
Probe Calibration	3.5	normal	1	1	1	3.5	3.5
Axial Isotropy	3.7	rectangular	√3	$(1-cp)^{1/2}$	$(1-cp)^{1/2}$	2.1	2.1
Hemispherical Isotropy	10.9	rectangular	√3	√cp	√cp	6.3	6.3
Boundary Effect	1	rectangular	√3	1	1	0.6	0.6
Linearity	4.7	rectangular	√3	1	1	2.7	2.7
System Detection Limit	1	rectangular	√3	1	1	0.6	0.6
Modulation response	3	rectangular	√3	1	1	1.7	1.7
Readout Electronics	1	normal	1	1	1	1	1
Response Time	0.8	rectangular	√3	1	1	0.5	0.5
Integration Time	1.7	rectangular	√3	1	1	1.0	1.0
RF Ambient Condition -noise	3	rectangular	√3	1	1	1.7	1.7
RF ambient conditions—reflections	3	rectangular	√3	1	1	1.7	1.7
Probe positioner mechanical tolerance	0.4	rectangular	√3	1	1	0.2	0.2
Probe Positioning with respect to Phantom Shell	2.9	rectangular	√3	1	1	1.7	1.7
Extrapolation, interpolation, and integration algorithms for max. SAR evaluation	3.7	rectangular	√3	1	1	2.1	2.1
Test Sample Related							
Test Sample Positioning	4	normal	1	1	1	4.0	4.0
Device Holder Uncertainty	2	normal	1	1	1	2.0	2.0
Output power variation—SAR drift measurement	1.2	rectangular	√3	1	1	0.7	0.7

SAR scaling	2	rectangular	√3	1	1	1.2	1.2
Phantom and Tissue Parameters							
Phantom shell uncertainty—shape, thickness and permittivity	3.4	rectangular	√3	1	1	2.0	2.0
Uncertainty in SAR correction for deviations in permittivity and conductivity	1.9	normal	1	1	1	1.9	1.9
Liquid Conductivity measurement	2.9	normal	1	1	1	2.9	2.9
Liquid Permittivity measurement	3.3	normal	1	1	1	3.3	3.3
Liquid Conductivity—temperature	5	rectangular	√3	0.7	0.5	2.9	2.9
Liquid Permittivity—temperature	5	rectangular	√3	0.6	0.5	2.9	2.9
Combined Uncertainty		RSS				12.2	12.2
Combined Uncertainty (coverage factor=2)		Normal(k=2)				24.4	24.4

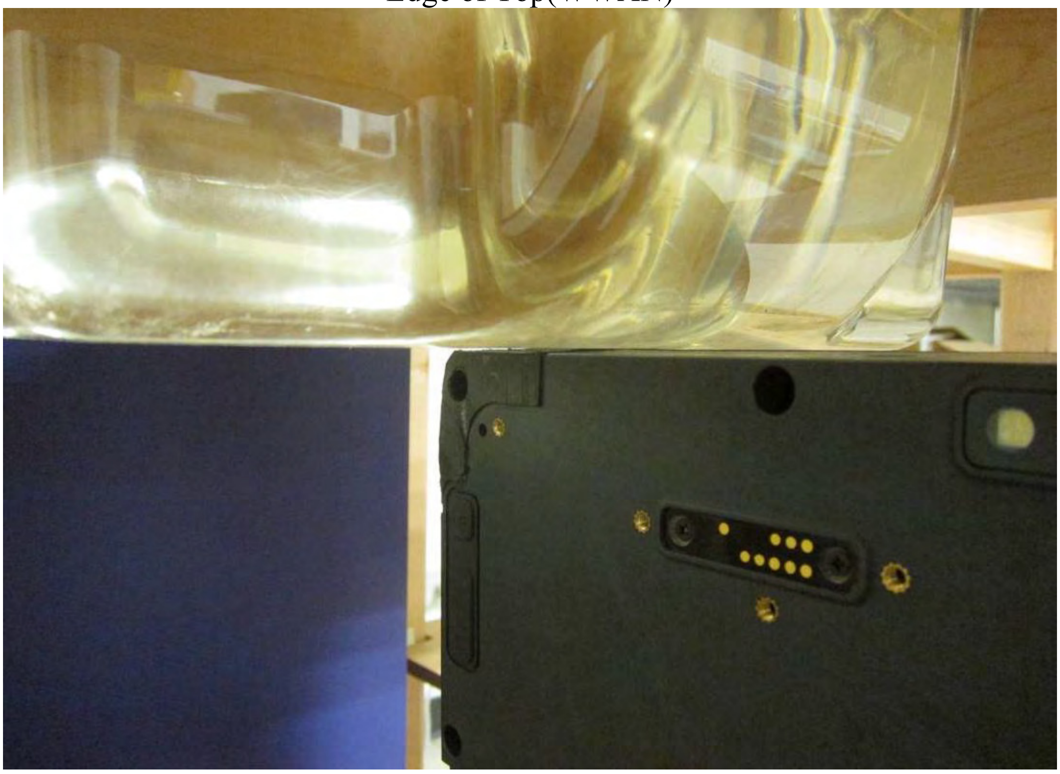
Appendix A Test Setup Photos

Bottom (Wifi)

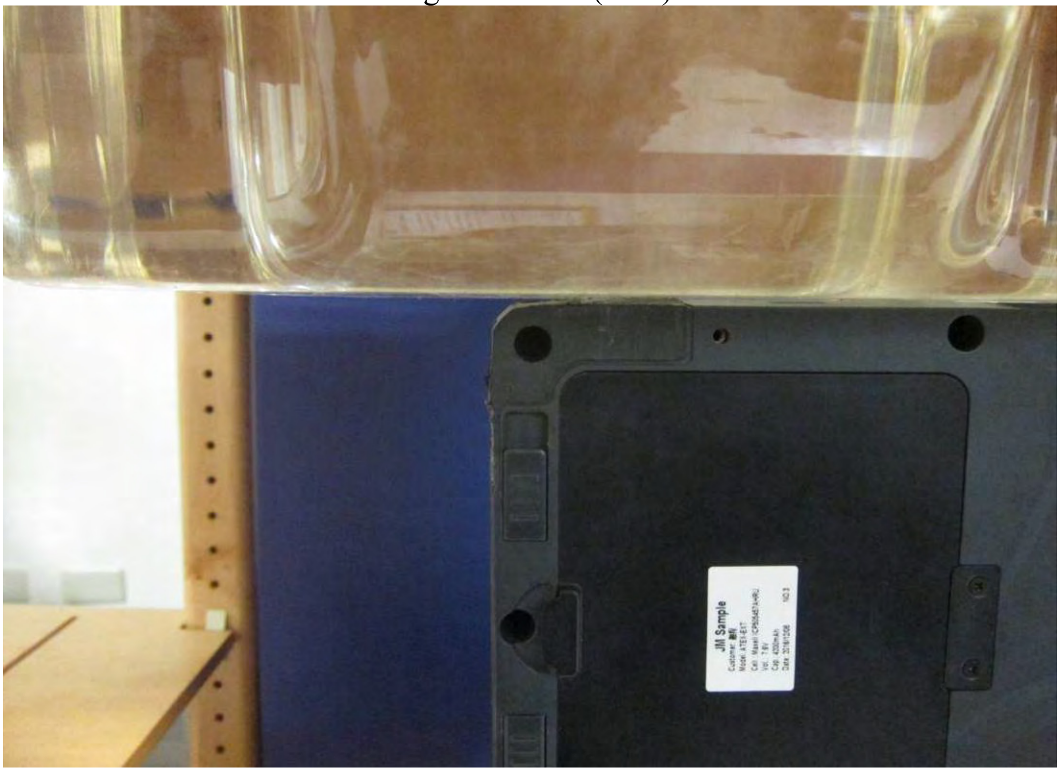
Bottom(WWAN)

Edge of Top(Wifi)

Edge of Top(WWAN)



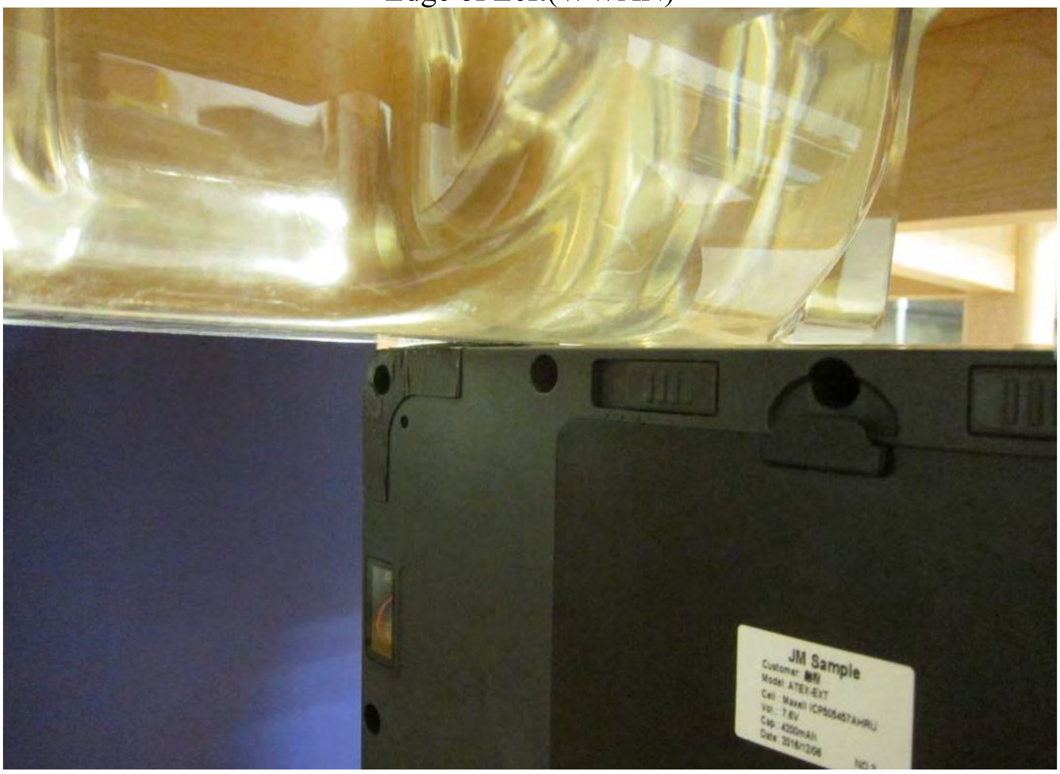
Edge of Bottom(Wifi)



Edge of Bottom(WWAN)

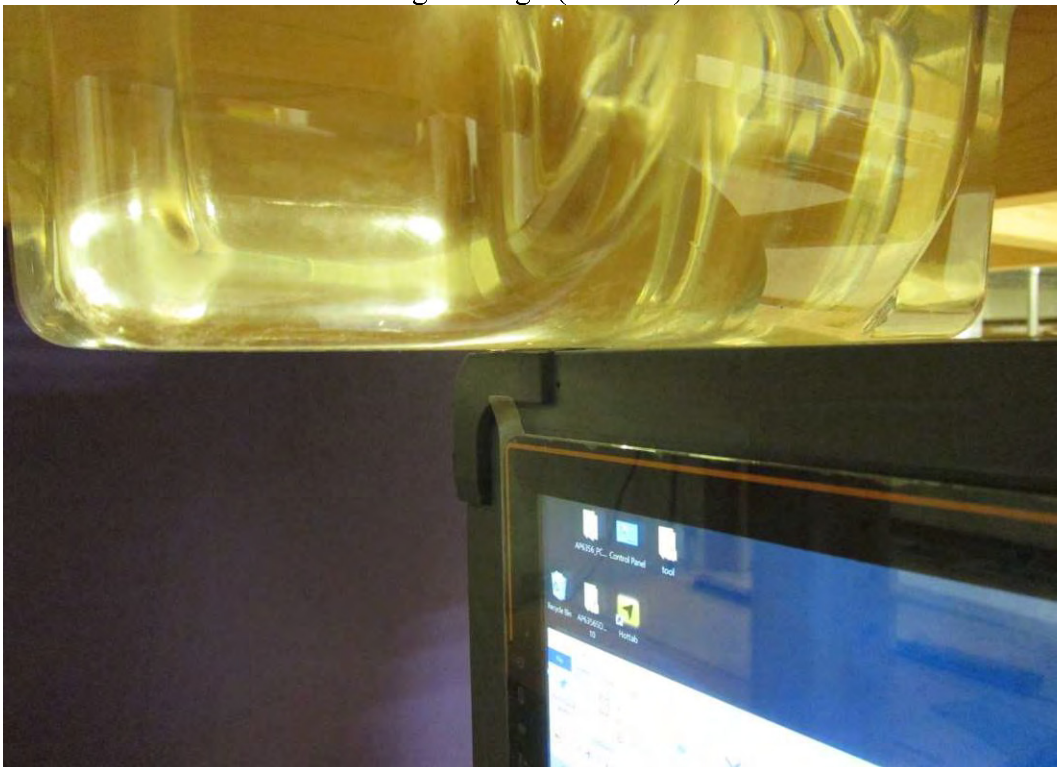
Edge of Left(Wifi)

Edge of Left(WWAN)

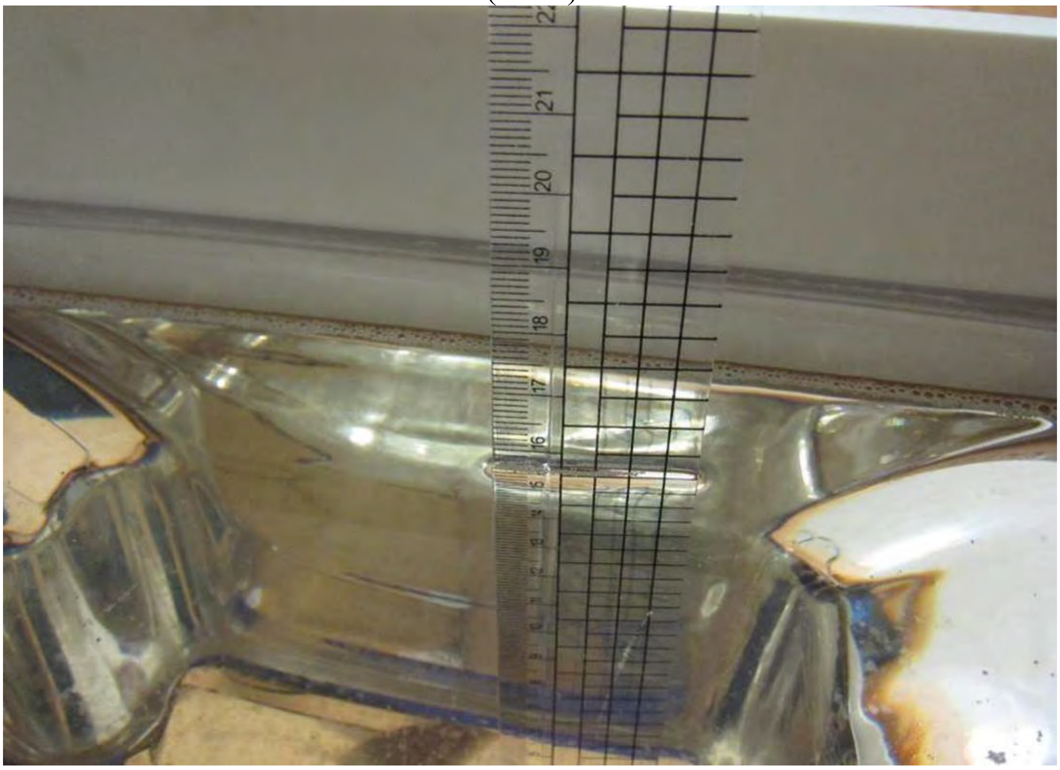


Edge of Right(Wifi)

Edge of Right(WWAN)



Tissue altitude(15cm) for Below 3G



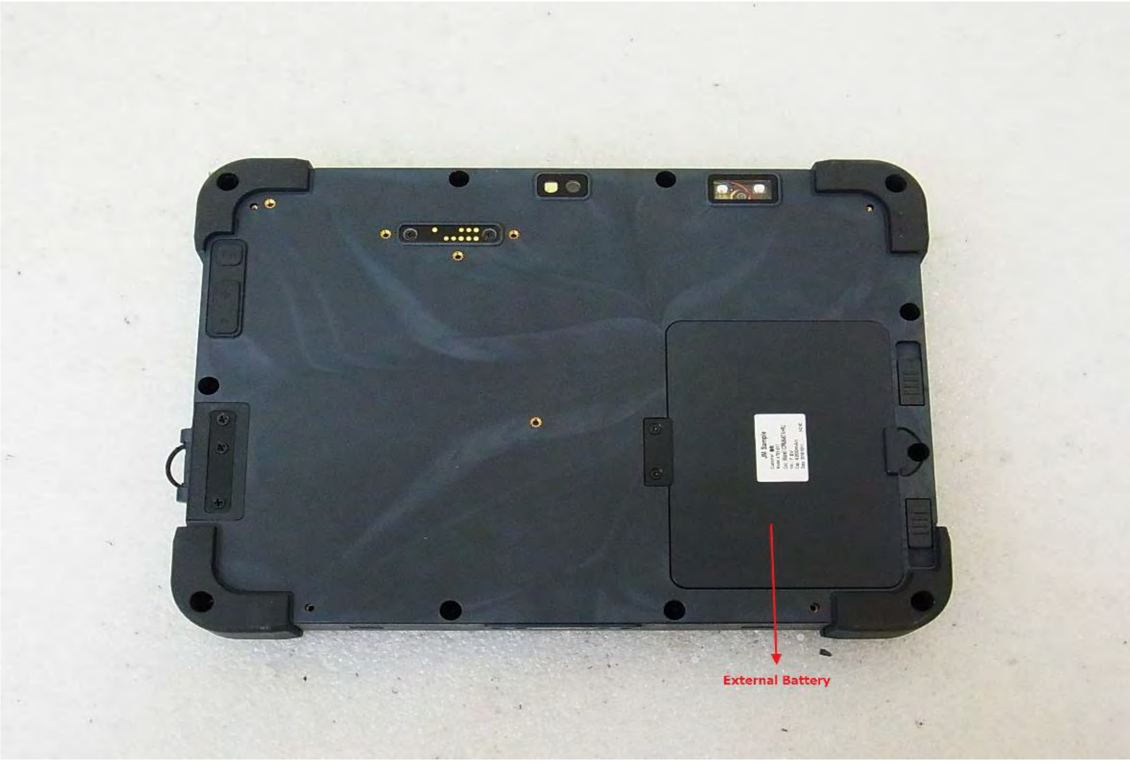
Tissue altitude(10cm) for above 3G

Appendix B DUT Photos

EUT 1

EUT 2

EUT 3



EUT 4

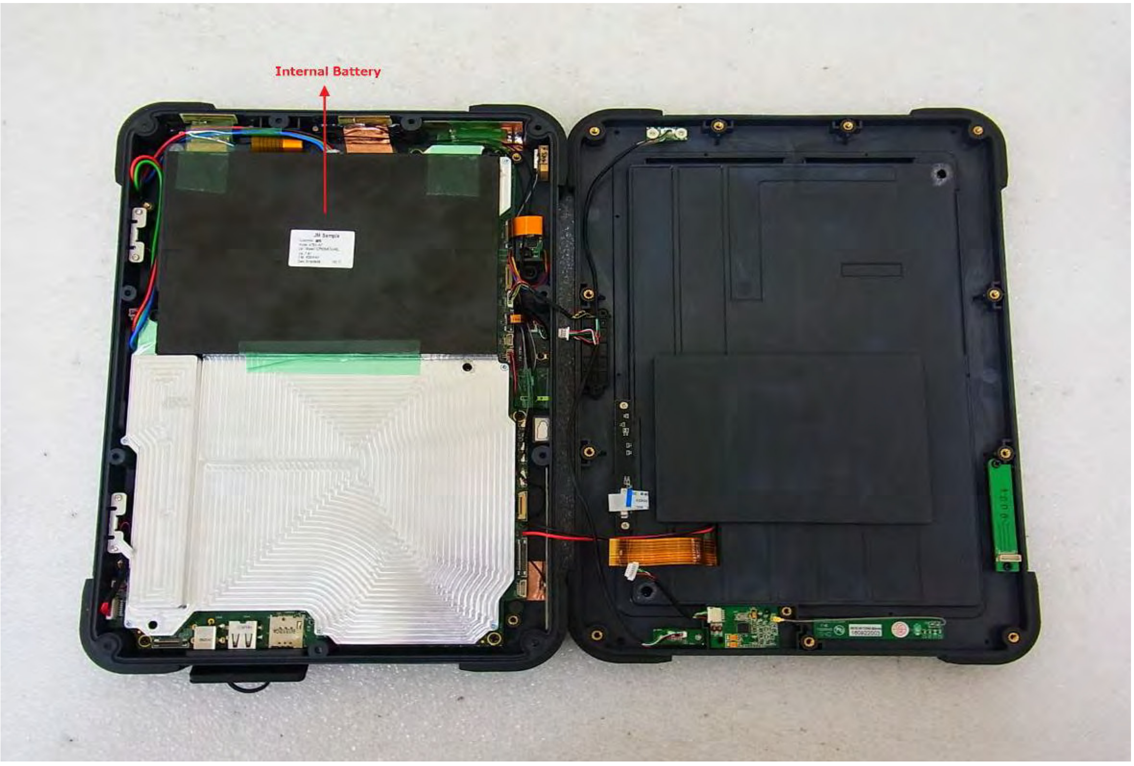
EUT 5

EUT 6

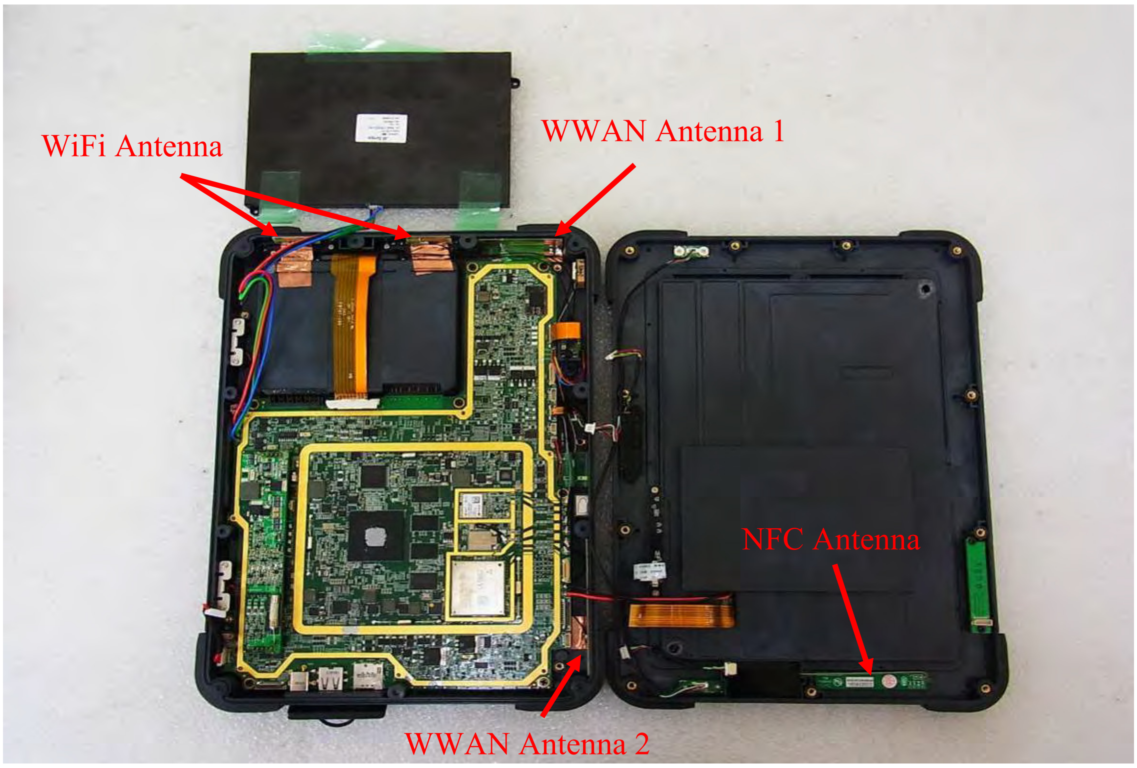
EUT 7


EDACPOWER ELEC.
AC ADAPTER 电源适配器 직류전원장치
MODEL 型号 모델명: EA10633B-190
AC INPUT 输入 정격입력: 100-240V~2.0A, 50-60Hz
DC OUTPUT 输出 정격출력: 19V ⎓ 3.42A
CAUTION 注意
FOR INDOOR USE ONLY 室内产品使用
I.T.E. USE ONLY
DATE CODE:
出厂日期
231210633015 C3 MADE IN CHINA 中国制造
LISTED
I.T.E. POWER SUPPLY
41TJ
E209833
LPS
RoHS
制造商:翌胜电子股份有限公司
此产品仅适用于非热带气候条件海拔2000m以下的地区
Local Rep: SPS Inc
Tel: +82-42-936-4905
KTL: SU10315-15001
MSIP-REM-EPE-EA10633B-190
최저소비효율기준만족
제조업자명: EDAC Power Electronics (Suzhou) Co.,Ltd.

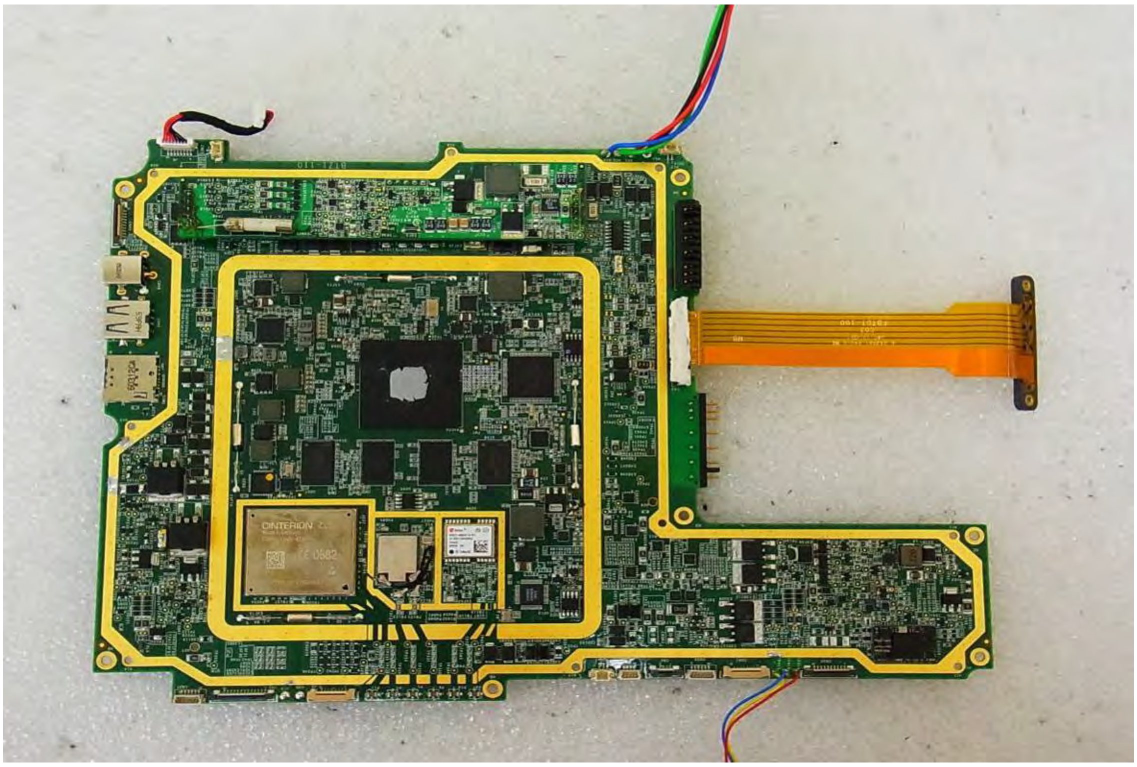
EUT 8


Internal Battery

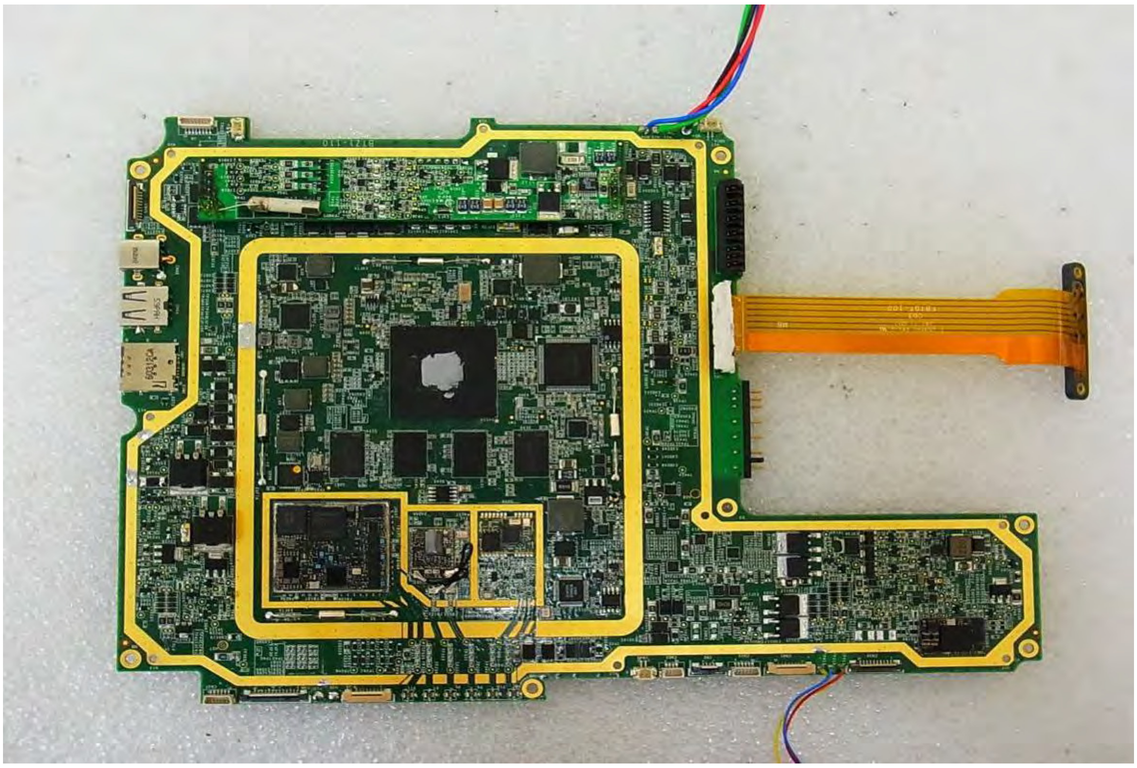
EUT 9



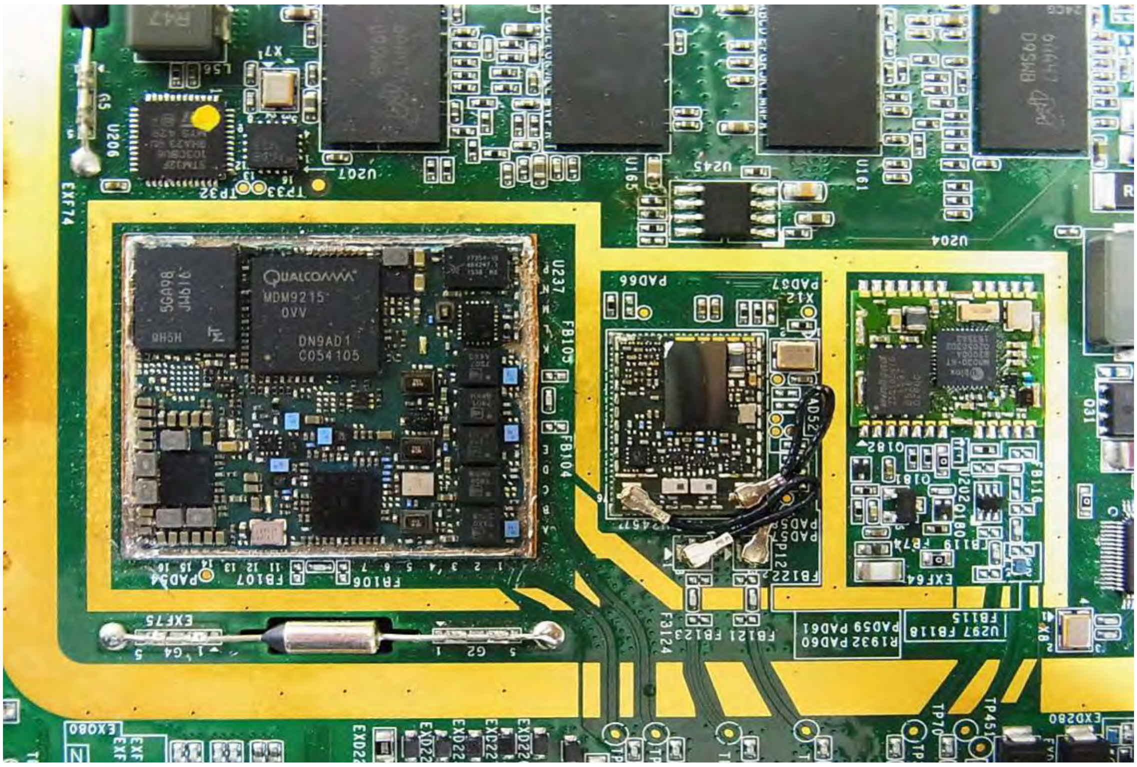
EUT 10



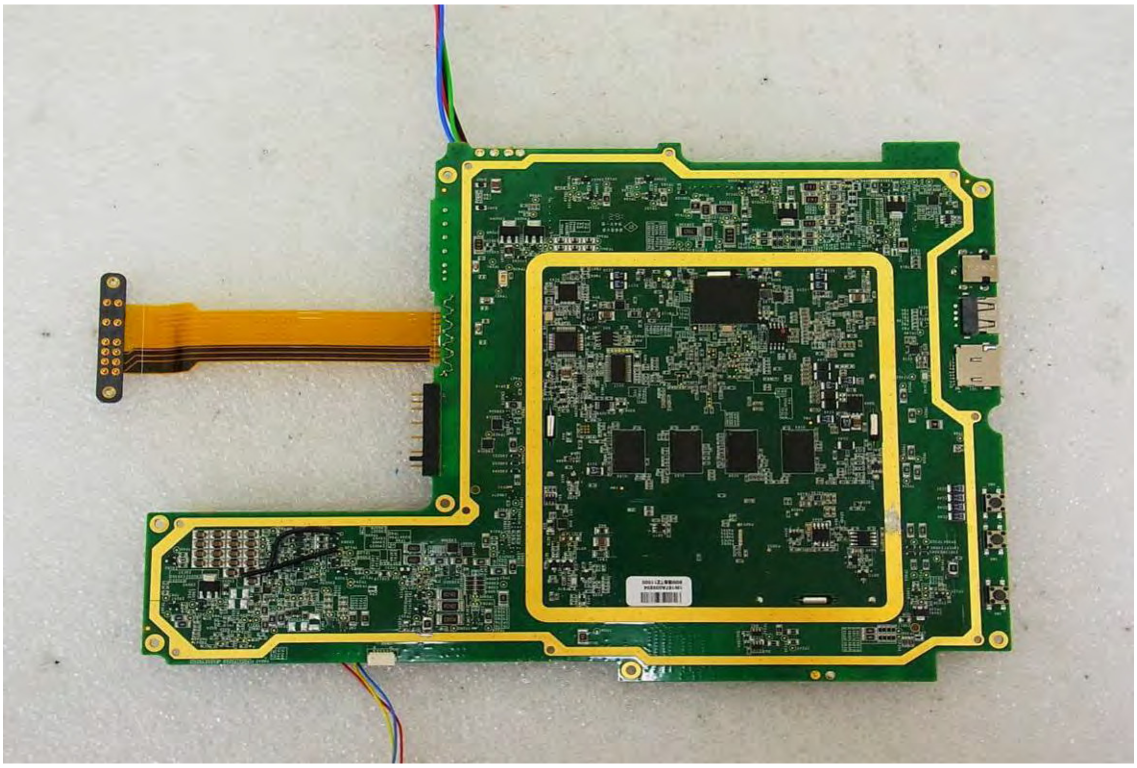
EUT 11



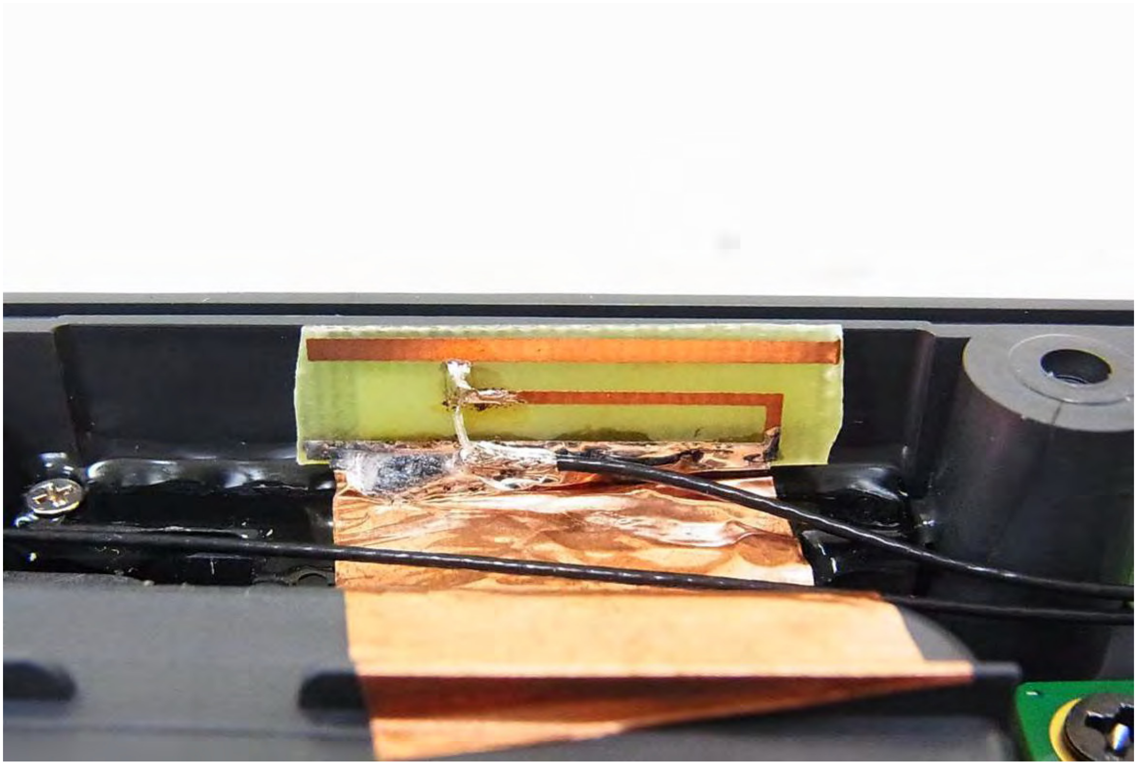
EUT 12



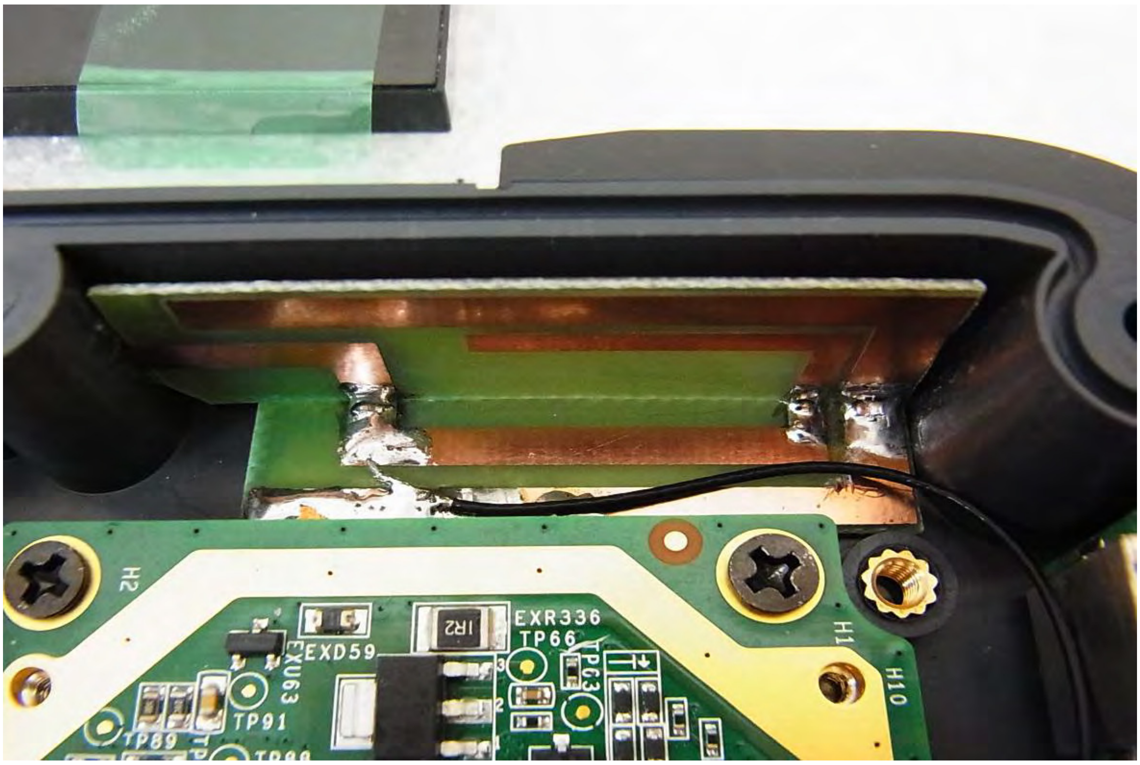
EUT 13



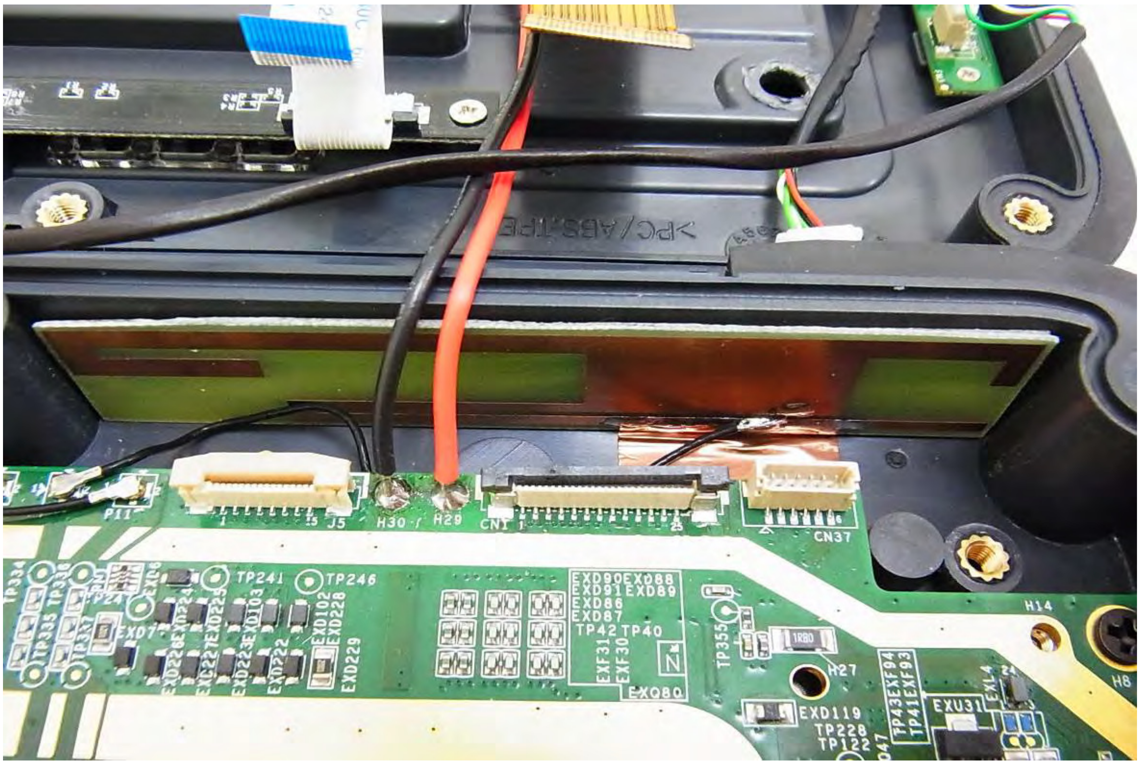
EUT 14 WiFi antenna



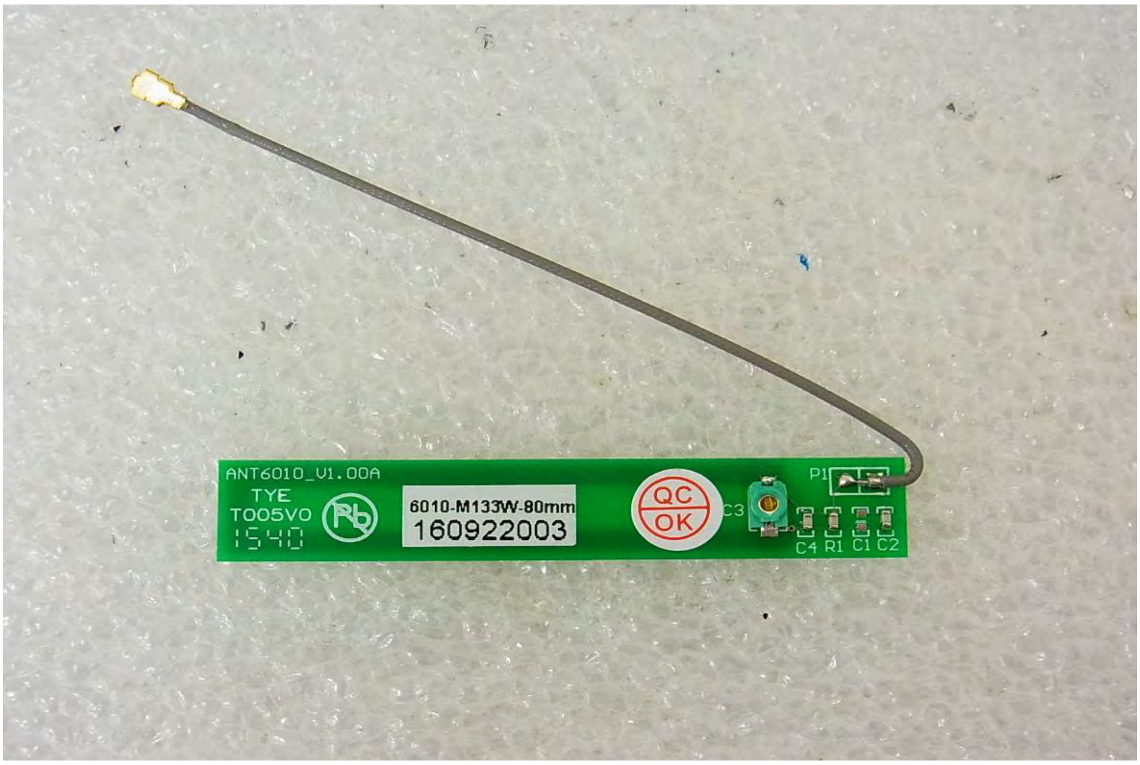
EUT 15 WWAN antenna 1



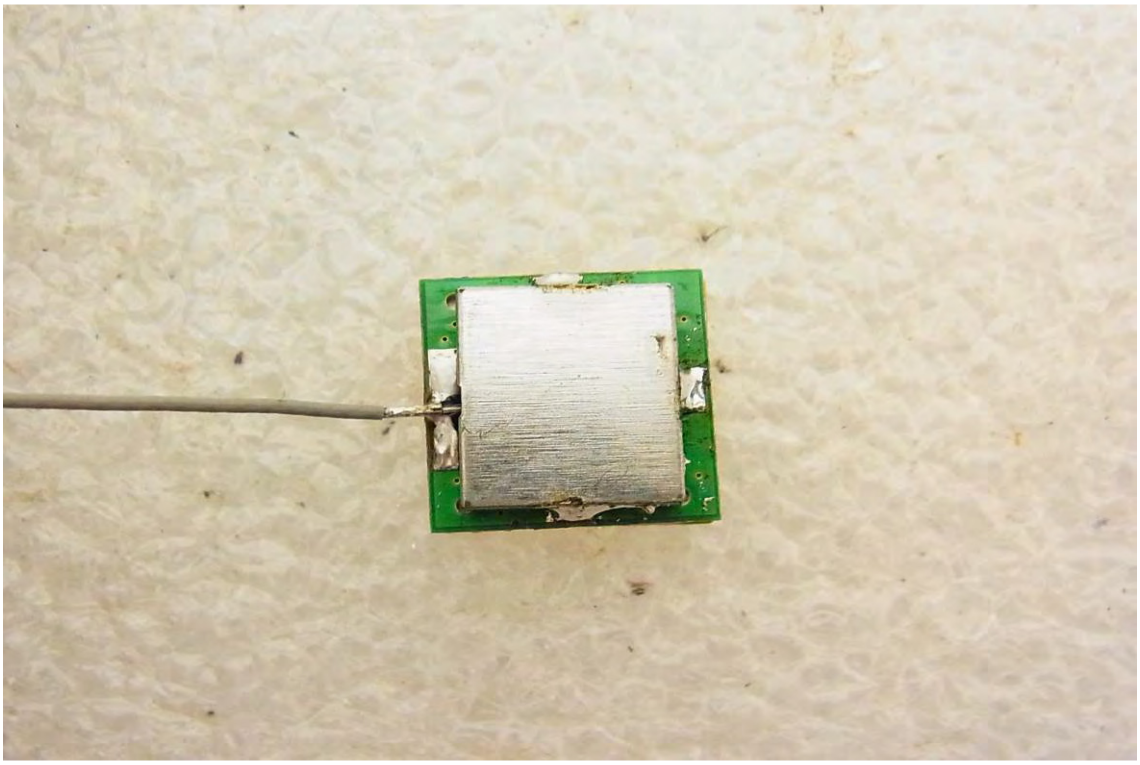
EUT 16 WWAN antenna 2



EUT 17 NFC antenna



EUT 18 GPS antenna



Appendix C System Validation

Refer to Appendix C

Appendix D SAR Worst Measurement Data

Refer to Appendix D

Appendix E Probe Calibration Certificate

Refer to Appendix E

Appendix F Dipole Calibration Certificate

Refer to Appendix F

Appendix G System Check (Annual)

Refer to Appendix G

~ end of Report ~