TEST REPORT

APPLICANT	:	BLU Products, Inc.
PRODUCT NAME	:	Tablet
MODEL NAME	:	M8L PLUS
BRAND NAME	:	BLU
FCC ID	:	YHLBLUM8LPS
STANDARD(S)	:	FCC 47CFR Part 2(2.1093) IEEE 1528-2013
RECEIPT DATE	:	2021-09-07
TEST DATE	:	2021-09-09 to 2021-09-25
ISSUE DATE	:	2021-10-13

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Change History		
Version	**Date**	**Reason for Change**
1.0	2021-10-13	First edition

1 SAR Results Summary

The maximum results of Specific Absorption Rate (SAR) found during test as bellows:

Frequency Band		Highest SAR Summary
		Body
		1g SAR (W/kg)
GSM	GSM 850	0.688
	GSM 1900	0.702
WCDMA	Band II	0.621
	Band IV	0.486
	Band V	0.594
LTE	Band 2	1.026
	Band 4	0.629
	Band 5	0.771
	Band 7	1.165
	Band 12/17	0.881
	Band 66	0.597
WLAN	2.4GHz WLAN	0.344
2.4GHz Band	Bluetooth (Estimated)	0.089

Max Scaled SAR_{1g} (W/Kg):	Body:	1.165 W/kg	Limit(W/kg): 1.6 W/kg

Highest Simultaneous Transmission 1g SAR (W/kg)	1.509 W/kg	Limit(W/kg): 1.6 W/kg

Note:

1. This device is compliance with Specific Absorption Rate (SAR) for general population or uncontrolled exposure limits (1.6 W/kg) specified in FCC 47 CFR part 2 (2.1093) and ANSI/IEEE C95.1-2005, and had been tested in accordance with the measurement methods and procedures specified in IEEE 1528-2013.
2. The FDD-LTE Band 17 is full covered by FDD-LTE Band 12, therefore only FDD-LTE Band 12 was tested.
3. When the test result is a critical value, we will use the measurement uncertainty give the judgment result based on the 95% risk level.

2 Technical Information

Note: Provide by applicant.

2.1 Applicant and Manufacturer Information

Applicant:	BLU Products, Inc.
Applicant Address:	10814 NW 33rd St # 100 Doral, FL 33172,USA
Manufacturer:	BLU Products, Inc.
Manufacturer Address:	10814 NW 33rd St # 100 Doral, FL 33172,USA

2.2 Equipment under Test (EUT) Description

Product Name:	Tablet
IMEI:	357960053533265 / 01
Hardware Version:	T864A_V2.0
Software Version:	BLU_M0209WW_V11.0.G.03.00_GENERIC_03-09-2021
Operation Frequency:	GSM 850: 824 MHz ~ 849 MHz GSM 1900: 1850 MHz ~ 1910 MHz WCDMA Band II: 1850 MHz ~ 1910 MHz WCDMA Band IV: 1710 MHz ~ 1755 MHz WCDMA Band V: 824 MHz ~ 849 MHz LTE Band 2: 1850 MHz ~ 1910 MHz LTE Band 4: 1710 MHz ~ 1755 MHz LTE Band 5: 824 MHz ~ 849 MHz LTE Band 7: 2500 MHz ~ 2570 MHz LTE Band 12: 699 MHz ~ 716 MHz LTE Band 17: 703 MHz ~ 716 MHz LTE Band 66: 1710 MHz ~ 1780 MHz WLAN 2.4GHz: 2412 MHz ~ 2472 MHz Bluetooth: 2402 MHz ~ 2480 MHz
Modulation technology:	GSM/GPRS: GMSK EDGE: 8PSK WCDMA: QPSK LTE: QPSK, 16QAM, 64QAM 802.11b: DSSS

	802.11g/n-HT20/n-HT40: OFDM Bluetooth BR+EDR: GFSK, π/4-DQPSK, 8-DPSK Bluetooth LE: GFSK
Antenna Type:	PIFA Antenna
SIM Cards Description:	GSM+WCDMA+LTE
	Single SIM card

2.3 Environment of Test Site

Temperature:	18°C ~25°C
Humidity:	35%~75% RH
Atmospheric Pressure:	1010 mbar

Test Frequency:	GSM 850MHz/1900MHz WCDMA Band II/IV/V FDD-LTE Band 2/4/5/7/12/17/66 WLAN2.4GHz
Power Level:	GSM 850 MHz (Maximum output power(level 5) GSM 1900MHz (Maximum output power(level 0) WCDMA Band II/IV/V (All Up Bits) FDD-LTE Band 2/4/5/7/12/17/66 (Maximum output power) WLAN 2.4GHz
Operation Mode:	Call established

During SAR test, EUT is in Traffic Mode (Channel Allocated) at Normal Voltage Condition. A communication link is set up with a System Simulator (SS) by air link, and a call is established.

The EUT shall use its internal transmitter. The antenna(s), battery and accessories shall be those specified by the Factory. The EUT battery must be fully charged and checked periodically during the test to ascertain uniform power output. If a wireless link is used, the antenna connected to the output of the base station simulator shall be placed at least 50 cm away from the handset.
The signal transmitted by the simulator to the antenna feeding point shall be lower than the output power level of the handset by at least 35 dB.

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 or controlled and general population or uncontrolled, based on a person's awareness and ability to exercise control over his or her exposure. In general, occupational or controlled exposure limits are higher than the limits for general population or 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:

$$SAR = \frac{d}{dt}\left(\frac{dU}{dm}\right) = \frac{d}{dt}\left(\frac{dU}{\rho dv}\right)$$

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 heat capacity, δT is the temperature rise and δt is the exposure duration, or related to the electrical field in the tissue by

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

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 RF Exposure Limits

4.1 Uncontrolled Environment

Uncontrolled Environments are defined as locations where there is the exposure of individuals who have no knowledge or control of their exposure. The general population/uncontrolled exposure limits are applicable to situations in which the general public may be exposed or in which persons who are exposed as a consequence of their employment may not be made fully aware of the potential for exposure or cannot exercise control over their exposure. Members of the general public would come under this category when exposure is not employment-related; for example, in the case of a wireless transmitter that exposes persons in its vicinity.

4.2 Controlled Environment

Controlled Environments are defined as locations where there is exposure that may be incurred by persons who are aware of the potential for exposure, (i.e. as a result of employment or occupation). In general, occupational/controlled exposure limits are applicable to situations in which persons are exposed as a consequence of their employment, who have been made fully aware of the potential for exposure and can exercise control over their exposure. This exposure category is also applicable when the exposure is of a transient nature due to incidental passage through a location where the exposure levels may be higher than the general population/uncontrolled limits, but the exposed person is fully aware of the potential for exposure and can exercise control over his or her exposure by leaving the area or by some other appropriate means.

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

Type Exposure	Uncontrolled Environment Limit
Spatial Peak SAR (1g cube tissue for head and trunk)	1.6 W/kg
Spatial Peak SAR (10g cube tissue for limbs)	4.0 W/kg
Spatial Peak SAR (1g cube tissue for whole body)	0.08 W/kg

Note:

1. Occupational/Uncontrolled Environments are defined as locations where there is exposure that may be incurred by people who are aware of the potential for exposure (i.e. as a result of employment or occupation).
2. Whole-Body SAR is averaged over the entire body, partial-body SAR is averaged over any 1gram of tissue defined as a tissue volume in the shape of a cube. SAR for hands, wrists, feet and ankles is averaged over any 10 grams of tissue defined as a tissue volume in the shape of a cube.

5 Applied Reference Documents

Leading reference documents for testing:

Identity	Document Title	Method Determination /Remark
FCC 47CFR Part 2(2.1093)	Radio Frequency Radiation Exposure valuation: Portable Devices	No deviation
IEEE 1528-2013	IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques	No deviation
KDB 447498 D01v06	General RF Exposure Guidance	No deviation
KDB 248227 D01v02r02	SAR Measurement Procedures for 802.11 Transmitters	No deviation
KDB 616217 D04 v01r01	SAR Evaluation Considerations for Laptop, Notebook, Notebook and Tablet Computers	No deviation
KDB 865664 D01v01r04	SAR Measurement 100 MHz to 6 GHz	No deviation
KDB 865664 D02v01r02	RF Exposure Reporting	No deviation
KDB 941225 D06v02r01	SAR Evaluation Procedures For Portable Devices With Wireless Router Capabilities	No deviation

Note 1: The test item is not applicable.
Note 2: Additions to, deviation, or exclusions from the method shall be judged in the "method determination" column of add, deviate or exclude from the specific method shall be explained in the "Remark" of the above table.

6 SAR Measurement System

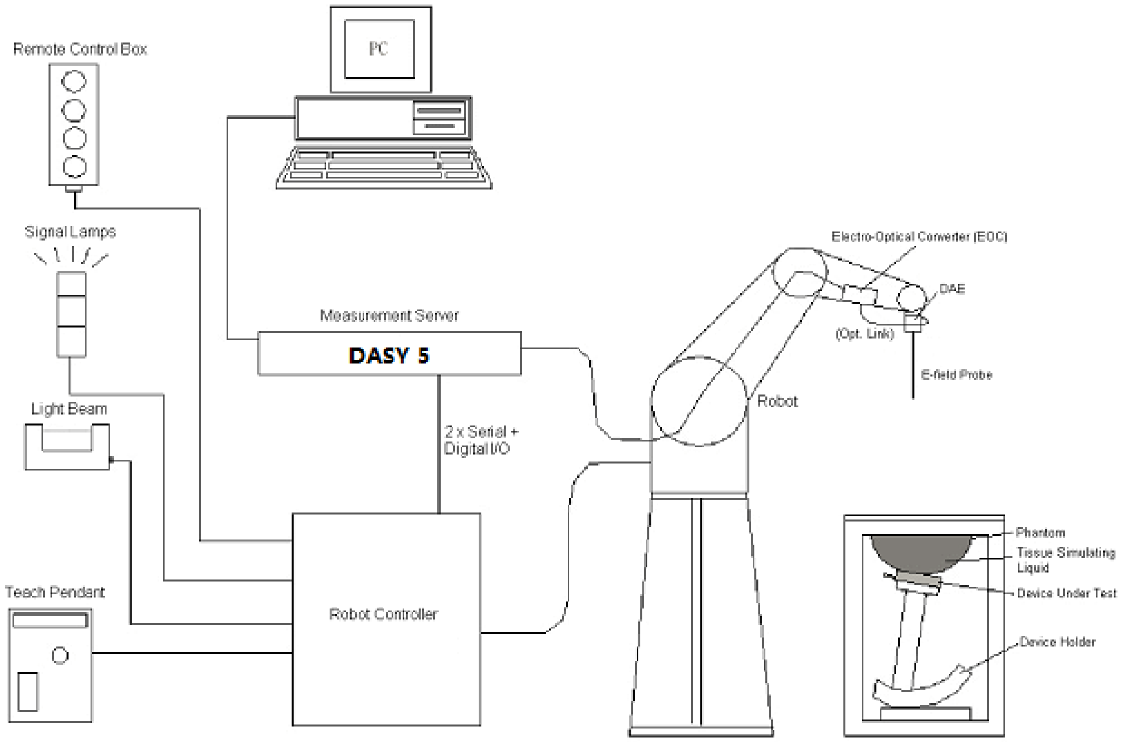

Fig.6.1 SPEAG DASY System Configurations

The DASY system for performance compliance tests is illustrated above graphically. This system consists of the following items:

- A standard high precision 6-axis robot with controller, a teach pendant and software.
- A data acquisition electronic (DAE) attached to the robot arm extension.
- A dosimetric probe equipped with an optical surface detector system.
- The electro-optical converter (EOC) performs the conversion between optical and electrical signals.
- A measurement server performs the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
- A probe alignment unit which improves the accuracy of the probe positioning.
- A computer operating Windows XP.
- DASY software.
- Remove control with teach pendant and additional circuitry for robot safety such as warming lamps, etc.
- The SAM twin phantom.
- A device holder.
- Tissue simulating liquid.

- Dipole for evaluating the proper functioning of the system.

Component details are described in the following sub-sections.

6.1 E-Field Probe

The SAR measurement is conducted with the dosimetric probe (manufactured by SPEAG). The probe is specially designed and calibrated for use in liquid with high permittivity. The dosimetric probe has special calibration in liquid at different frequency. This probe has a built in optical surface detection system to prevent from collision with phantom.

- **E-Field Probe Specification**

<EX3DV4 Probe>

Construction	Symmetrical design with triangular core Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)	
Frequency	10 MHz to 6 GHz; Linearity: ± 0.2 dB	
Directivity	± 0.3 dB in HSL (rotation around probe axis) ± 0.5 dB in tissue material (rotation normal to probe axis)	
Dynamic Range	10 µW/g to 100 mW/g; Linearity: ± 0.2 dB	
Dimensions	Overall length: 330 mm (Tip: 20 mm) Tip diameter: 2.5 mm (Body: 12 mm) Typical distance from probe tip to dipole centers: 1 mm	**Fig 6.2 Photo of EX3DV4**

- **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 (Norm X, Norm Y and Norm Z), the diode compression parameter (DCP) and the conversion factor (ConvF) of the probe are tested. The calibration data can be referred to Annex E of this report.

6.2 Data Acquisition Electronics (DAE)

The Data acquisition electronics (DAE) consists of a highly sensitive electrometer-grade preamplifier with auto-zeroing, a channel and gain-switching multiplexer, a fast 16 bit AD-converter and a command decoder and control logic unit. Transmission to the measurement server is accomplished through an optical downlink for data and status information as well as an optical uplink for commands and the clock. The input impedance of the DAE is 200 MOhm; the inputs are symmetrical and floating. Common mode rejection is above 80 dB.

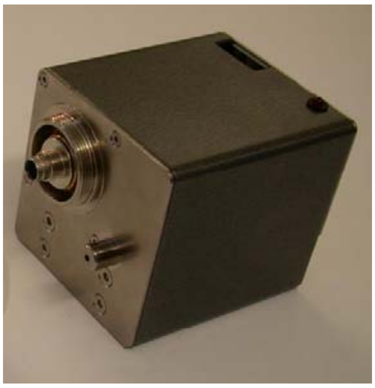

Fig 6.2 Photo of DAE

6.3 Robot

The SPEAG DASY system uses the high precision robots (DASY5: TX60XL) type from Stäubli SA (France). For the 6-axis controller system, the robot controller version (DASY5: CS8c) from Stäubliis used. The Stäublirobot series have many features that are important for our application:

- High precision (repeatability 0.02 mm)
- High reliability (industrial design)
- Low maintenance costs (virtually maintenance free due to direct drive gears; nobelt drives)
- Jerk-free straight movements
- Low ELF interference (motor control fields shielded via the closed metallic construction shields)

Fig. 6.3 Photo of Robot

6.4 Measurement Server

The measurement server is based on a PC/104 CPU board with CPU (DASY 5: 400MHz, Intel Celeron), chip-disk (DASY5: 128 MB), RAM (DASY5: 128 MB). The necessary circuits for communication with the DAE electronic box, as well as the 16 bit AD converter system for optical detection and digital I/O interface are contained on the DASY I/O board, which is directly connected to the PC/104 bus of the CPU board.
The measurement server performs all the real-time data evaluation for field measurements and surface detection, controls robot movements and handles safety operations.

Fig. 6.4 Photo of Server for DASY5

6.5 Light Beam Unit

The light beam switch allows automatic "tooling" of the probe. During the process, the actual position of the probe tip with respect to the robot arm is measured, as well as the probe length and the horizontal probe offset. The software then corrects all movements, such that the robot coordinates are valid for the probe tip.
The repeatability of this process is better than 0.1 mm. If a position has been taught with an aligned probe, the same position will be reached with another aligned probe within 0.1 mm, even if the other probe has different dimensions. During probe rotations, the probe tip will keep its actual position.

Fig. 6.5 Photo of Light Beam

6.6 Phantom

<SAM Twin Phantom>

Shell Thickness	2 ± 0.2 mm (sagging: <1%) Center ear point: 6 ± 0.2 mm
Filling Volume **Dimensions**	Approx. 25 liters Length: 1000 mm; Width: 500 mm; Height: adjustable feet
Measurement Areas	Left Head, Right Head, Flat phantom

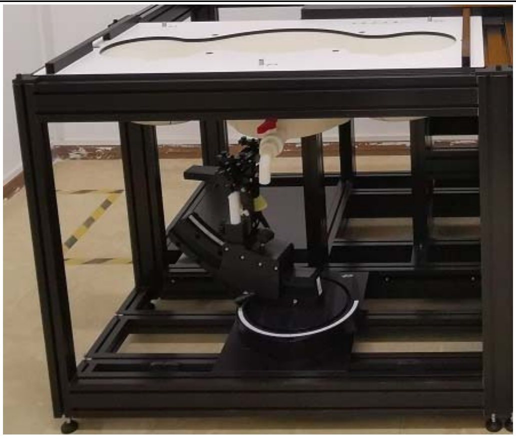

Fig. 6.6 Photo of SAM Phantom

The bottom plate contains three pair of bolts for locking the device holder. The device holder positions are adjusted to the standard measurement positions in the three sections. A white cover is provided to tap the phantom during off-periods to prevent water evaporation and changes in the liquid parameters. On the phantom top, three reference markers are provided to identify the phantom position with respect to the robot.

6.7 Device Holder

<Device Holder for SAM Twin Phantom>

The SAR in the phantom is approximately inversely proportional to the square of the distance between the source and the liquid surface. For a source at 5 mm distance, a positioning uncertainty of ±0.5 mm would produce a SAR uncertainty of ± 20 %. Accurate device positioning is therefore crucial for accurate and repeatable measurements. The positions in which the devices must be measured are defined by the standards.

The DASY device holder is designed to cope with different positions given in the standard. It has two scales for the device rotation (with respect to the body axis) and the device inclination (with respect to the line between the ear reference points). The rotation center for both scales is the ear reference point (ERP).

Thus the device needs no repositioning when changing the angles.

The DASY device holder is constructed of low-low POM material having the following dielectric parameters: relative permittivity $\varepsilon = 3$ and loss tangent $\delta = 0.02$. The amount of dielectric material has been reduced in the closest vicinity of the device, since measurements have suggested that the influence of the clamp on the test results could thus be lowered.

<Laptop Extension Kit>

The extension is lightweight and made of POM, acrylic glass and foam. It fits easily on the upper part of the mounting device in place of the phone positioned. The extension is fully compatible with the SAM Twin and ELI phantoms.

Fig 6.7 Device Holder

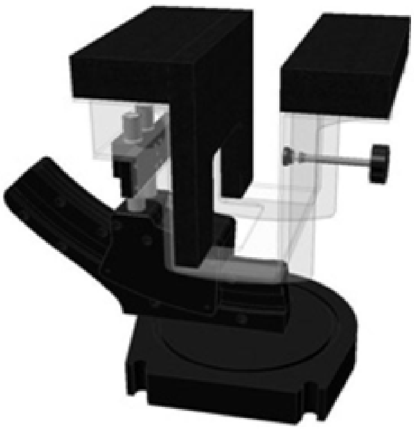

Fig 6.8 Laptop Extension Kit

6.8 Data storage and Evaluation

➢ **Data Storage**

The DASY software stores the assessed data from the data acquisition electronics as raw data (in microvolt readings from the probe sensors), together with all the necessary software parameters for the data evaluation (probe calibration data, liquid parameters and device frequency and modulation data) in measurement files. The post-processing software evaluates the desired unit and format for output each time the data is visualized or exported. This allows verifications of the complete software setup even after the measurement and allows correction of erroneous parameter settings. For example, if a measurement has been performed with an incorrect crest factor parameter in the device setup, the parameter can be corrected afterwards and the data can be reevaluated.

The measured data can be visualized or exported in different units or formats, depending on the selected probe type (e.g., [V/m], [mW/g]). Some of these units are not available in certain situations or give meaningless results, e.g., a SAR-output in a non-lose media, will always be zero. Raw data can also be exported to perform the evaluation with other software packages.

➢ **Data Evaluation**

The DASY post-processing software (SEMCAD) automatically executes the following procedures to calculate the field units from the microvolt readings at the probe connector. The parameters used in the evaluation are stored in the configuration modules of the software:

Probe Parameters:	- Sensitivity	$Norm_i$, a_{i0}, a_{i1}, a_{i2}
	- Conversion	$ConvF_i$
	- Diode compression point	dcp_i
Device Parameters:	- Frequency	f
	- Crest	cf
Media Parameters:	- Conductivity	σ
	- Density	ρ

These parameters must be set correctly in the software. They can be found in the component documents or they can be imported into the software from the configuration files issued for the DASY components. In the direct measuring mode of the multi-meter option, the parameters of the actual system setup are used. In the scan visualization and export modes, the parameters stored in the corresponding document files are used.

The first step of the evaluation is a linearization of the filtered input signal to account for the compression characteristics of the detector diode. The compensation depends on the input signal, the diode type and the DC-transmission factor from the diode to the evaluation electronics. If the exciting field is pulsed, the crest factor of the signal must be known to correctly compensate for peak power.

The formula for each channel can be given as:

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

With V_i = compensated signal of channel i, (i = x, y, z)
U_i= input signal of channel i, (i = x, y, z)
cf = crest factor of exciting field (DASY parameter)
dcp^i= diode compression point (DASY parameter)
From the compensated input signals, the primary field data for each channel can be evaluated:

E- Field Probes: $E_i = \sqrt{\frac{v_i}{Norm_i \cdot ConvF}}$

H-Field Probes: $H_i = \sqrt{V_i} \cdot \frac{a_{i0} + a_{i1} f + a_{i2} f^2}{f}$

With V_i = compensated signal of channel i, (i = x, y, z)
$Norm_i$= senor sensitivity of channel i, (i = x, y, z), μV/ $(V/m)^2$
ConvF = sensitivity enhancement in solution
a_{ij} = sensor sensitivity factors for H-field probes
f = carrier frequency (GHz)
E_i = electric field strength of channel i in V/m
Hi = magnetic field strength of channel i in A/m
The RSS value of the field components gives the total field strength (Hermitian magnitude):

$$E_{tot} = \sqrt{E_x^2 + E_y^2 + E_z^2}$$

The primary field data are used to calculate the derived field units.

$$SAR = E_{tot}^2 \cdot \frac{\sigma}{\rho \cdot 1000}$$

With SAR = local specific absorption rate in mW/g
Etot= total field strength in V/m
σ = conductivity in (mho/m) or (Siemens/m)
ρ= equipment tissue density in g/cm3
Note that the density is set to 1, to account for actual head tissue density rather than the density of the tissue simulating liquid.

6.9 Test Equipment List

Manufacturer	Name of Equipment	Type/Model	Serial Num.	Calibration	
				Last Cal.	Due Date
SPEAG	750MHz System Validation Kit	D750V2	1173	2021.06.21	2024.06.20
SPEAG	900MHz System Validation Kit	D900V2	1d064	2018.10.29	2021.10.28
SPEAG	1800MHz System Validation Kit	D1800V2	2d158	2018.10.31	2021.10.30
SPEAG	2000MHz System Validation Kit	D2000V2	1050	2018.10.31	2021.10.30
SPEAG	2450MHz System Validation Kit	D2450V2	805	2018.10.26	2021.10.25
SPEAG	2600MHz System Validation Kit	D2600V2	1139	2021.06.25	2024.06.24
SPEAG	DOSIMETRIC ASSESSMENT SYSTEM	DASY52	52.10.4.1527	NCR	NCR
SPEAG	Dosimetric E-Field Probe	EX3DV4	7608	2020.11.27	2021.11.26
SPEAG	Data Acquisition Electronics	DAE4	1643	2020.11.30	2021.11.29
SPEAG	Dielectric Assessment KIT	DAK-3.5	1279	2020.10.20	2021.10.19
SPEAG	Twin-SAM	QD 000 P41 Ax	2020	NCR	NCR
SPEAG	Phone Positioner	N/A	N/A	NCR	NCR
R&S	Network Emulator	CMW500	165755	2021.02.25	2022.02.24
Agilent	Network Analyzer	E5071B	MY42404762	2021.03.29	2022.03.28
mini-circuits	Amplifier	ZHL-42W+	608501717	NCR	NCR
Agilent	Signal Generator	N5182B	MY53050509	2021.03.25	2022.03.24
Agilent	Power Senor	N8482A	MY41090849	2020.10.19	2021.10.18
Agilent	Power Meter	E4416A	MY45102093	2020.10.19	2021.10.18
Anritsu	Power Sensor	MA2411B	N/A	2020.10.19	2021.10.18
Anritsu	Power Meter	NRVD	101066	2020.10.19	2021.10.18
Agilent	Dual Directional Coupler	778D	50422	NA	NA
MCL	Attenuation	351-218-010	N/A	NA	NA
KTJ	Thermo meter	TA298	N/A	2021.01.15	2022.01.14
N/A	Tissue Simulating Liquids	700-6000MHz	N/A	24H	

Note:
1. The calibration certificate of DASY can be referred to Annex F of this report.
2. Referring to KDB 865664 D01v01r04, the dipole calibration interval can be extended to 3 years with justification. The dipoles are also not physically damaged, or repaired during the interval.
3. The Insertion Loss calibration of Dual Directional Coupler and Attenuator were characterized via the network analyzer and compensated during system check.
4. The dielectric probe kit was calibrated via the network analyzer, with the specified procedure

(calibrated in pure water) and calibration kit (standard) short circuit, before the dielectric measurement. The specific procedure and calibration kit are provided by Speag.

5. In system check we need to monitor the level on the power meter, and adjust the power amplifier level to have precise power level to the dipole; the measured SAR will be normalized to 1W input power according to the ratio of1W to the input power to the dipole. For system check, the calibration of the power amplifier is deemed not critically required for correct measurement; the power meter is critical and we do have calibration for it
6. Attenuator insertion loss is calibrated by the network Analyzer, which the calibration is valid, before system check.
7. N.C.R means No Calibration Requirement.

7 Tissue Simulating Liquids

For the measurement of the field distribution inside the SAM phantom with DASY, the phantom must be filled with around 25 liters of homogeneous body tissue simulating liquid. For head SAR testing, the liquid height from the ear reference point (ERP) of the phantom to the liquid top surface is larger than 15 cm, which is shown in Fig. 7.1, for body SAR testing, the liquid height from the centre of the flat phantom to liquid top surface is larger than 15 cm, which is shown in Fig. 7.2.

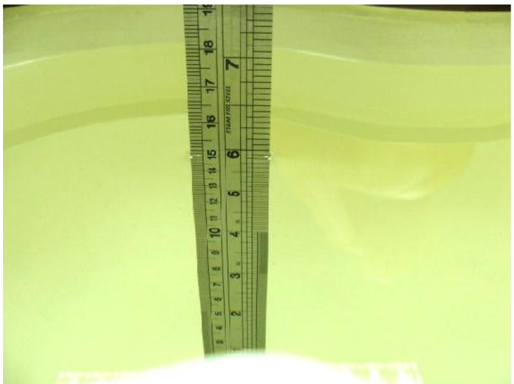

Fig 7.1 Photo of Liquid Height for Head SAR

Fig 7.2 Photo of Liquid Height for Body SAR

The following table gives the recipes for tissue simulating liquids

Frequency (MHz)	Water (%)	Sugar (%)	Cellulose (%)	Salt (%)	Preventol (%)	DGBE (%)	Conductivity (σ)	Permittivity (εr)
Head								
750	41.1	57.0	0.2	1.4	0.2	0	0.89	41.9
835	40.3	57.9	0.2	1.4	0.2	0	0.90	41.5
1800,1900,2000	55.2	0	0	0.3	0	44.5	1.40	40.0
2450	55.0	0	0	0	0	45.0	1.80	39.2
2600	54.8	0	0	0.1	0	45.1	1.96	39.0

Simulating Liquid for 5GHz, Manufactured by SPEAG

Ingredients	(% by weight)
Water	64~78%
Mineral oil	11~18%
Emulsifiers	9~15%
Additives and Salt	2~3%

The relative permittivity and conductivity of the tissue material should be within ±5% of the values given in the table below recommended by the FCC OET 65supplement C and RSS 102 Issue 5.

Target Frequency	Head		Body	
(MHz)	ε r	σ (S/m)	ε r	σ (S/m)
150	52.3	0.76	61.9	0.80
300	45.3	0.87	58.2	0.92
450	43.5	0.87	56.7	0.94
835	41.5	0.90	55.2	0.97
900	41.5	0.97	55.0	1.05
915	41.5	0.98	55.0	1.06
1450	40.5	1.20	54.0	1.30
1610	40.3	1.29	53.8	1.40
1800-2000	40.0	1.40	53.3	1.52
2450	39.2	1.80	52.7	1.95
3000	38.5	2.40	52.0	2.73
5800	35.3	5.27	48.2	6.00

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

The dielectric parameters of liquids were verified prior to the SAR evaluation using a Speag Dielectric Probe Kit and an Agilent Network Analyzer.

The following table shows the measuring results for simulating liquid.

Table 1: Dielectric Performance of Tissue Simulating Liquid

Frequency (MHz)	Tissue Type	Liquid Temp.(℃)	Conductivity (σ)	Conductivity Target (σ)	Delta (σ) (%)	Limit (%)	Date
750	HSL	22.2	0.912	0.89	2.47	±5	2021.09.21
900	HSL	22.2	0.996	0.97	2.68	±5	2021.09.24
1800	HSL	22.1	1.437	1.40	2.64	±5	2021.09.11
2000	HSL	22.1	1.442	1.40	3.00	±5	2021.09.10
2450	HSL	22.1	1.856	1.80	3.11	±5	2021.09.25
2600	HSL	22.2	2.016	1.96	2.86	±5	2021.09.09

Frequency (MHz)	Tissue Type	Liquid Temp.(℃)	Permittivity (εr)	Permittivity Target (εr)	Delta (εr) (%)	Limit (%)	Date
750	HSL	22.2	41.922	41.90	0.05	±5	2021.09.21
900	HSL	22.2	41.673	41.50	0.42	±5	2021.09.24
1800	HSL	22.1	40.222	40.00	0.56	±5	2021.09.11
2000	HSL	22.1	40.316	40.00	0.79	±5	2021.09.10
2450	HSL	22.1	39.538	39.20	0.86	±5	2021.09.25
2600	HSL	22.2	39.258	39.00	0.66	±5	2021.09.09

Note：
According to April 2019 TCB Workshop that FCC has permitted the use of single head-tissue simulating liquid specified in IEC 62209-1 for all SAR tests.

8 SAR System Verification

Each DASY system is equipped with one or more system validation kits. These units, together with the predefined measurement procedures within the DASY 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 Validation**

According to FCC KDB 865664 D02, SAR system verification is required to confirm measurement accuracy. The SAR systems (including SAR probes, system components and software versions) used for this device were validated against its performance specifications prior to the SAR measurements. Reference dipoles are used with the required tissue-equivalent media for system validation, according to the procedures outlined in FCC KDB 865664 D01 and IEEE 1528-2013. Since SAR probe calibrations are frequency dependent, each probe calibration point must be validated at a frequency within the valid frequency range of the probe calibration point, using the system that normally operates with the probe for routine SAR measurements and according to the required tissue-equivalent media. A tabulated summary of the system validation status, measurement frequencies, SAR probes, calibrated signal type(s) and tissue dielectric parameters has been included.

- **Purpose of System Performance check**

The system performance check verifies that the system operates within its specifications. System and operator errors can be detected and corrected. It is recommended that the system performance check be performed prior to any usage of the system in order to guarantee reproducible results. The system performance check uses normal SAR measurements in a simplified setup with a well characterized source. This setup was selected to give a high sensitivity to all parameters that might fail or vary over time. The system check does not intend to replace the calibration of the components, but indicates situations where the system uncertainty is exceeded due to drift or failure.

- **System Setup**

In the simplified setup for system evaluation, the EUT 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:

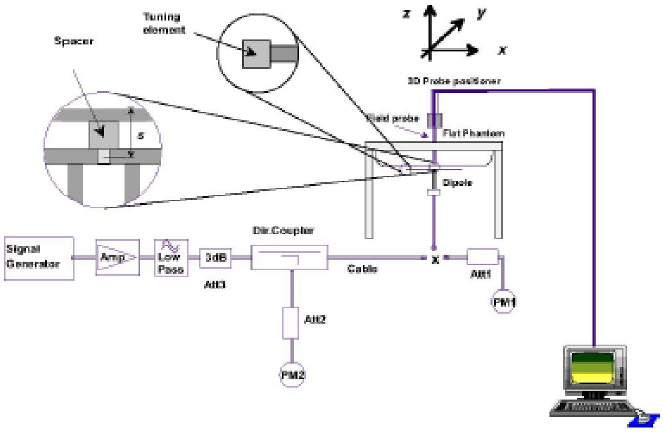

Fig 8.1 Photo of Dipole Setup **Fig 8.2 System Setup for System Evaluation**

➢ **System Verification Results**

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

Dipole S/N	Probe S/N	DAE S/N
D750V3-1173	7608	1643
D900V2-1d064	7608	1643
D1800V2-2d158	7608	1643
D2000V2-1050	7608	1643
D2450V2-805	7608	1643
D2600V2-1139	7608	1643

Frequency (MHz)	Tissue Type	Conductivity (σ)	Permittivity (εr)	CW Signal Validation		
				Sensitivity	Probe Linearity	Probe Isotropy
750	HSL	0.851	42.43	PASS	PASS	PASS
835	HSL	0.898	41.88	PASS	PASS	PASS
1750	HSL	1.386	39.91	PASS	PASS	PASS
1800	HSL	1.449	41.26	PASS	PASS	PASS
1900	HSL	1.435	39.65	PASS	PASS	PASS

2000	HSL	1.451	39.42	PASS	PASS	PASS
2300	HSL	1.764	38.99	PASS	PASS	PASS
2450	HSL	1.863	38.85	PASS	PASS	PASS
2600	HSL	1.973	38.58	PASS	PASS	PASS
5250	HSL	4.528	35.32	PASS	PASS	PASS
5600	HSL	4.905	34.89	PASS	PASS	PASS
5750	HSL	5.077	34.28	PASS	PASS	PASS

Frequency (MHz)	**Tissue Type**	**Conductivity (σ)**	**Permittivity (εr)**	**Modulation Signal Validation**		
				Mod. Type	**Duty Factor**	**PAR**
750	HSL	0.851	42.43	N/A	N/A	N/A
835	HSL	0.898	41.88	GMSK	PASS	N/A
1750	HSL	1.386	39.91	N/A	N/A	N/A
1800	HSL	1.449	41.26	N/A	N/A	N/A
1900	HSL	1.435	39.65	GMSK	PASS	N/A
2000	HSL	1.451	39.42	GMSK	PASS	N/A
2300	HSL	1.764	38.99	OFDM	PASS	PASS
2450	HSL	1.863	38.85	OFDM	PASS	PASS
2600	HSL	1.973	38.58	TDD	PASS	N/A
5250	HSL	4.528	35.32	OFDM	N/A	PASS
5600	HSL	4.905	34.89	OFDM	N/A	PASS
5750	HSL	5.077	34.28	OFDM	N/A	PASS

<Validation Results>

Date	Freq. (MHz)	Tissue Type	Input Power (mW)	Measured 1g SAR (W/kg)	Targeted 1g SAR (W/kg)	Normalized 1g SAR (W/kg)	Deviation (%)
2021.09.21	750	HSL	250	2.14	8.26	8.56	3.63
2021.09.24	900	HSL	250	2.82	10.90	11.28	3.49
2021.09.11	1800	HSL	250	10.05	39.30	40.2	2.29
2021.09.10	2000	HSL	250	10.34	40.90	41.36	1.12
2021.09.25	2450	HSL	250	13.33	52.00	53.32	2.54
2021.09.09	2600	HSL	250	13.72	54.00	54.88	1.63

Date	Freq. (MHz)	Tissue Type	Input Power (mW)	Measured 1g SAR (W/kg)	Targeted 1g SAR (W/kg)	Normalized 1g SAR (W/kg)	Deviation (%)
2021.09.21	750	HSL	250	1.40	5.45	5.6	2.75
2021.09.24	900	HSL	250	1.77	6.97	7.08	1.58
2021.09.11	1800	HSL	250	5.26	20.60	21.04	2.14
2021.09.10	2000	HSL	250	5.38	20.90	21.52	2.97
2021.09.25	2450	HSL	250	6.24	24.10	24.96	3.57
2021.09.09	2600	HSL	250	6.29	24.50	25.16	2.69

Note: System checks the specific test data please see Annex C.

9 EUT Testing Position

This EUT was tested in six different positions. They are right cheek/right tilted/left cheek/left tilted for head, Front/Back of the EUT with phantom 0 mm gap, as illustrated below, please refer to Annex B for the test setup photos.

9.1 Body-Supported Device Configurations

According to KDB 616217 section 4.3, SAR should be separately assessed with each surface and separation distance positioned against the flat phantom that correspond to the intended use as specified by the manufacturer. The antennas in tablets are typically located near the back (bottom) surface and/or along the edges of the devices; therefore, SAR evaluation is required for these configurations. Exposures from antennas through the front (top) surface of the display section of a full-size tablet, away from the edges, are generally limited to the user’s hands. Exposures to hands for typical consumer transmitters used in tablets are not expected to exceed the extremity SAR limit; therefore, SAR evaluation for the front surface of tablet display screens are generally not necessary, except for tablets that are designed to require continuous operations with the hand(s) next to the antenna(s).

- To position the device parallel to the phantom surface with either keypad up or down.
- To adjust the device parallel to the flat phantom.
- To adjust the distance between the device surface and the flat phantom to 0 mm.
- When each surface is measurement, the SAR Test Exclusion Threshold in KDB 447498 should be applied.

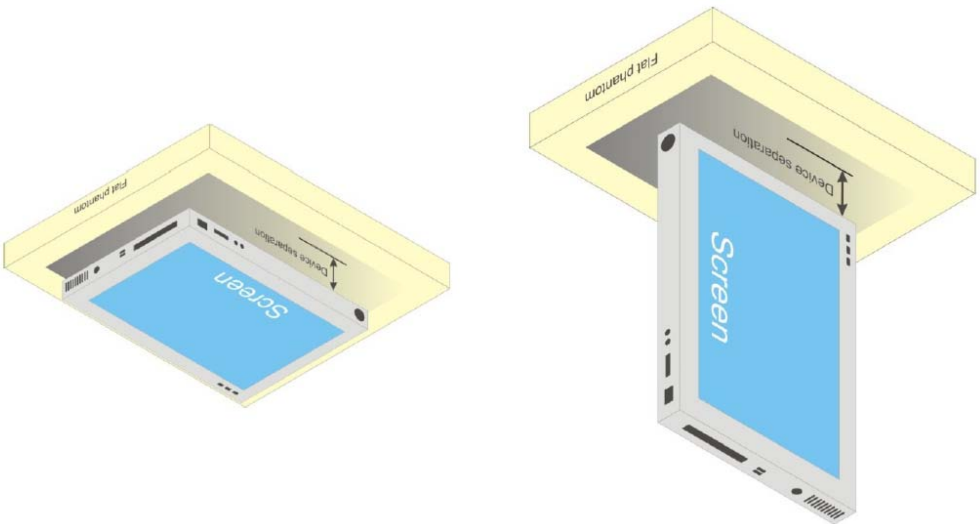

Fig.9.1 Illustration for Body Position

9.2 Wireless Router (Hotspot) Configurations

Some battery-operated handsets have the capability to transmit and receive internet connectivity through simultaneous transmission of WIFI in conjunction with a separate licensed transmitter. The FCC has provided guidance in KDB Publication 941225 D06 where SAR test considerations for handsets (L x W ≥
9 cm x 5 cm) are based on a composite test separation distance of 10 mm from the front, back and edges of the device with antennas 2.5 cm or closer to the edge of the device, determined from general mixed use conditions for this type of devices. Since the hotspot SAR results may overlap with the body-worn accessory SAR requirements, the more conservative configurations can be considered, thus excluding some body-worn accessory SAR tests.

When the user enables the personal wireless router functions for the handset, actual operations include simultaneous transmission of both the WIFI transmitter and another licensed transmitter. Both transmitters often do not transmit at the same transmitting frequency and thus cannot be evaluated for SAR under actual use conditions. Therefore, SAR must be evaluated for each frequency transmission and mode separately and summed with the WIFI transmitter according to KDB 648474 publication procedures. The “Portable Hotspot” feature on the handset was NOT activated, to ensure the SAR measurements were evaluated for a single transmission frequency RF signal.

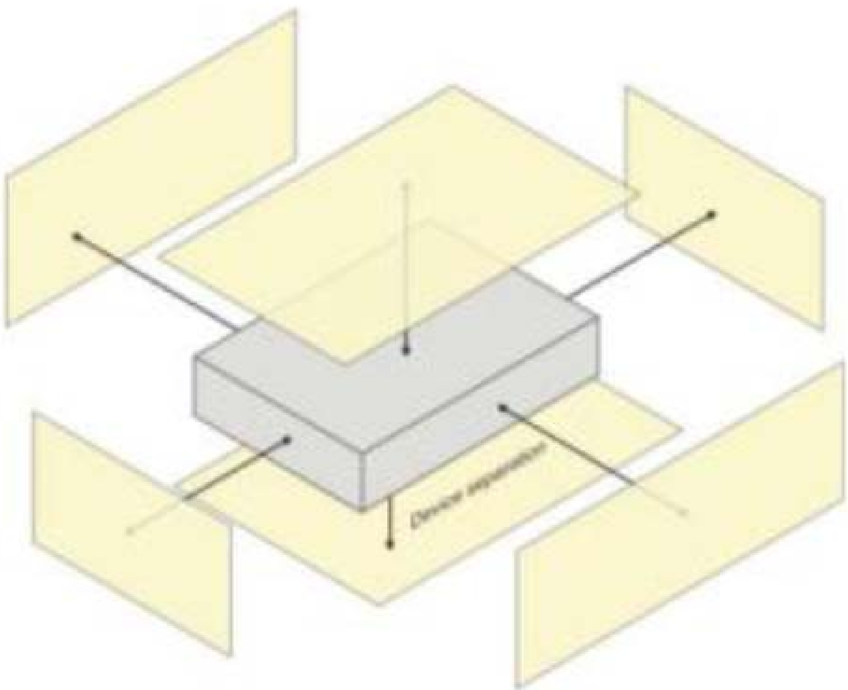

Fig.9.2 Illustration for Hotspot Position

10 Measurement Procedures

The measurement procedures are as bellows:

<Conducted power measurement>

- For WWAN power measurement, use base station simulator to configure EUT WWAN transition in conducted connection with RF cable, at maximum power in each supported wireless interface and frequency band.
- Read the WWAN RF power level from the base station simulator.
- For WLAN/BT power measurement, use engineering software to configure EUT WLAN/BT continuously transmission, at maximum RF power in each supported wireless interface and frequency band.
- Connect EUT RF port through RF cable to the power meter or spectrum analyzer, and measure WLAN/BT output power.

<Conducted power measurement>

- Use base station simulator to configure EUT WWAN transmission in radiated connection, and engineering software to configure EUT WLAN/BT continuously transmission, at maximum RF power, in the highest power channel.
- Place the EUT in positions as Annex B demonstrates.
- Set scan area, grid size and other setting on the DASY software.
- Measure SAR results for the highest power channel on each testing position.
- Find out the largest SAR result on these testing positions of each band.
- Measure SAR results for other channels in worst SAR testing position if the Reported SAR or highest power channel is larger than 0.8 W/kg.

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

- Power reference measurement.
- Area scan.
- Zoom scan.
- Power drift measurement.

10.1 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 DASY 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 10 g 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 1g and 10g cubes. The algorithm to find the cube with highest averaged SAR is divided into the following stages:

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

10.2 Power Reference Measurement

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

10.3 Area Scan Procedures

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 a10mm^2 step integral, with 1mm interpolation used to locate the peak SAR area used for zoom scan assessments.

When an Area Scan has measured all reachable points, it computes the field maxima found in the scanned area, within a range of the global maximum. The range (in dB) is specified in the standards for compliance testing.

10.4 Zoom Scan Procedures

Zoom Scans are used to assess the peak spatial SAR values within a cubic averaging volume containing 1 g and 10 g of simulated tissue. A density of 1000 kg/m^3 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 1g cube is 10mm, with the side length of the 10 g cube 21,5mm.The zoom scan integer steps can be user defined so as to reduce uncertainty, but normal practice for typical test applications utilize a physical step of 5x5x7 (8mmx8mmx5mm) providing a volume of 32mm in the X & Y axis, and 30mm in the Z axis.

10.5 SAR Averaged Methods

In DASY, the interpolation and extrapolation are both based on the modified Quadratic Sheppard'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 1g and 10g cubes, the extrapolation distance should not be larger than 5 mm.

10.6 Power Drift Monitoring

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

11 SAR Test Configuration

<GSM Mode>

A summary of these settings are illustrated below:

For GSM850 frequency band, the power control is set to 5 for GSM/GPRS mode (GSMK-CS1) and set to 8 for EDGE mode (MCS5); For GSM1900 frequency band, the power control is set to 0 for GSM/GPRS mode (GSMK-CS1) and set to 2 for EDGE mode (MCS5).

1. Per KDB 447498 D01v06, the maximum output power channel is used for SAR testing and for further SAR test reduction.
2. Per KDB 941225 D01v03r01, SAR test reduction for GSM / GPRS / EDGE modes is determined by the source-based time-averaged output power including tune-up tolerance. The 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. Therefore, the GPRS (4Tx slots) for GSM850/GSM1900 is considered as the primary mode.
3. Other configurations of GSM / GPRS / EDGE are considered as secondary modes.

Timeslot consignations:

Remark:

1. The frame-averaged power is linearly reported the maximum burst averaged power over 8 time slots. The calculated method are shown as below:

The duty cycle "x" of different time slots as below:

1 TX slot is 1/8, 2 TX slots is 2/8, 3 TX slots is 3/8 and 4 TX slots is 4/8

Based on the calculation formula:

Frame-averaged power = Burst averaged power + 10 1og (x)

So,

Frame-averaged power (1 TX slot) = Burst averaged power (1 TX slot)– 9.03

Frame-averaged power (2 TX slots) = Burst averaged power (2 TX slots)– 6.02

Frame-averaged power (3 TX slots) = Burst averaged power (3 TX slots)– 4.26

Frame-averaged power (4 TX slots) = Burst averaged power (4 TX slots) – 3.01

2. CS1 coding scheme was used in GPRS conducted power measurements and SAR testing, MCS5 coding scheme was used in EGPRS conducted power measurements and SAR testing (if necessary).

No. of Slots:	Slot 1	Slot 2	Slot 3	Slot 4
Slot Consignation:	1Up4Down	2Up3Down	3Up2Down	4Up1Down
Duty Cycle:	1:8.3	1:4.15	1:2.77	1:2.08
Correct Factor:	-9.03dB	-6.02dB	-4.26dB	-3.01dB

<WCDMA Mode>

Summary of UMTS conducted power measurement:

1. The 3G SAR test reduction procedure is applied, when the maximum output power and tune-up tolerance specified for production units in a secondary mode is ≤ ¼ dB higher than the primary mode, SAR measurement is not required for the secondary mode.
2. The following tests were conducted according to the test requirements outlines in 3GPP TS 34.121 specification.
3. The procedures in KDB 941225 D01v03r01 are applied for 3GPP Rel. 6 HSPA to configure the device in the required sub-test mode(s) to determine SAR test exclusion.
4. For HSPA+ devices supporting 16 QAM in the uplink, power measurements procedure is according to the configurations in Table C.11.1.4 of 3GPP TS 34.121-1.
5. Per KDB 941225 D01v03r01, RMC 12.2kbps setting is used to evaluate SAR. The maximum output power and tune-up tolerance specified for production units in HSDPA / HSUPA / DC-HSDPA / HSPA+ is ≤ ¼ dB higher than RMC 12.2Kbps or when the highest reported SAR of the RMC12.2Kbps is scaled by the ratio of specified maximum output power and tune-up tolerance of HSDPA / HSUPA / DC-HSDPA / HSPA+ to RMC12.2Kbps and the adjusted SAR is ≤ 1.2 W/kg, SAR measurement is not required for HSDPA / HSUPA / DC-HSDPA / HSPA+, and according to the following RF output power, the output power results of the secondary modes (HSDPA / HSUPA / DC-HSDPA / HSPA+) are less than ¼ dB higher than the primary modes; therefore, SAR measurement is not required for HSDPA / HSUPA / DC-HSDPA / HSPA+.
6. A fixed level power reduction is applied for WCDMA Band II when handset open Hotspot mode, the power reduction triggered.

HSDPA Setup Configuration

Sub-test	β_c	β_d	β_d (SF)	β_c/β_d	β_{hs} (1)	CM (dB) (2)
1	2/15	15/15	64	2/15	4/15	0.0
2	12/15 (3)	15/15 (3)	64	12/15 (3)	24/15	1.0
3	15/15	8/15	64	15/8	30/15	1.5
4	15/15	4/15	64	15/4	30/15	1.5

Note 1: Δ_{ACK}, Δ_{NACK} and $\Delta_{CQI} = 8 \Leftrightarrow A_{hs} = \beta_{hs}/\beta_c = 30/15 \Leftrightarrow \beta_{hs} = 30/15 *\beta_c$

Note 2: CM = 1 for β_c/β_d =12/15, β_{hs}/β_c=24/15.

Note 3: For subtest 2 the β_c/β_d ratio of 12/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signaled gain factors for the reference TFC (TF1, TF1) to β_c = 11/15 and β_d = 15/15.

HSUPA Setup Configuration

Sub-test	β_c	β_d	β_d (SF)	β_c/β_d	β_{hs} (1)	β_{ec}	β_{ed}	β_{ed} (SF)	β_{ed} (codes)	CM (2) (dB)	MPR (dB)	AG (4) Index	E-TFCI
1	11/15 (3)	15/15 (3)	64	11/15 (3)	22/15	209/225	1039/225	4	1	1.0	0.0	20	75
2	6/15	15/15	64	6/15	12/15	12/15	94/75	4	1	3.0	2.0	12	67
3	15/15	9/15	64	15/9	30/15	30/15	β_{ed1}: 47/15 β_{ed2}: 47/15	4	2	2.0	1.0	15	92
4	2/15	15/15	64	2/15	4/15	2/15	56/75	4	1	3.0	2.0	17	71
5	15/15 (4)	15/15 (4)	64	15/15 (4)	30/15	24/15	134/15	4	1	1.0	0.0	21	81

Note 1: Δ_{ACK}, Δ_{NACK} and $\Delta_{CQI} = 8 \Leftrightarrow A_{hs} = \beta_{hs}/\beta_c = 30/15 \Leftrightarrow \beta_{hs} = 30/15 * \beta_c$.

Note 2: CM = 1 for $\beta_c/\beta_d = 12/15$, $\beta_{hs}/\beta_c = 24/15$. For all other combinations of DPDCH, DPCCH, HS- DPCCH, E-DPDCH and E-DPCCH the MPR is based on the relative CM difference.

Note 3: For subtest 1 the β_c/β_d ratio of 11/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signaled gain factors for the reference TFC (TF1, TF1) to $\beta_c = 10/15$ and $\beta_d = 15/15$.

Note 4: For subtest 5 the β_c/β_d ratio of 15/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signaled gain factors for the reference TFC (TF1, TF1) to $\beta_c = 14/15$ and $\beta_d = 15/15$.

Note 5: Testing UE using E-DPDCH Physical Layer category 1 Sub-test 3 is not required according to TS 25.306 Table 5.1g.

Note 6: β_{ed} cannot be set directly; it is set by Absolute Grant Value.

HSPA+ 3GPP release 7 (uplink category 7) 16QAM, Setup Configuration:

Table C.11.1.4: β values for transmitter characteristics tests with HS-DPCCH and E-DCH with 16QAM

Sub-test	β_c (Note3)	β_d	β_{HS} (Note1)	β_{ec}	β_{ed} (2xSF2) (Note 4)	β_{ed} (2xSF4) (Note 4)	CM (dB) (Note 2)	MPR (dB) (Note 2)	AG Index (Note 4)	E-TFCI (Note 5)	E-TFCI (boost)
1	1	0	30/15	30/15	β_{ed}1: 30/15 β_{ed}2: 30/15	β_{ed}3: 24/15 β_{ed}4: 24/15	3.5	2.5	14	105	105

Note 1: Δ_{ACK}, Δ_{NACK} and Δ_{CQI} = 30/15 with $\beta_{hs} = 30/15 * \beta_c$.

Note 2: CM = 3.5 and the MPR is based on the relative CM difference, MPR = MAX(CM-1,0).

Note 3: DPDCH is not configured, therefore the β_c is set to 1 and β_d = 0 by default.

Note 4: β_{ed} can not be set directly; it is set by Absolute Grant Value.

Note 5: All the sub-tests require the UE to transmit 2SF2+2SF4 16QAM EDCH and they apply for UE using E-DPDCH category 7. E-DCH TTI is set to 2ms TTI and E-DCH table index = 2. To support these E-DCH configurations DPDCH is not allocated. The UE is signaled to use the extrapolation algorithm.

DC-HSDPA Setup Configuration

The following tests were completed according to procedures in section 7.3.13 of 3GPP TS34.108 v9.5.0. A summary of these settings are illustrated below:

Downlink Physical Channels are set as per 3GPP TS34.121-1 v9.0.0 E.5.

Table E.5.0: Levels for HSDPA connection setup

Parameter During Connection setup	Unit	Value
P-CPICH_Ec/Ior	dB	-10
P-CCPCH and SCH_Ec/Ior	dB	-12
PICH _Ec/Ior	dB	-15
HS-PDSCH	dB	off
HS-SCCH_1	dB	off
DPCH_Ec/Ior	dB	-5
OCNS_Ec/Ior	dB	-3.1

Call is set up as per 3GPP TS34.108 v9.5.0 sub clause 7.3.13

The configurations of the fixed reference channels for HSDPA RF tests are described in 3GPP TS 34.121, annex C for FDD and 3GPP TS 34.122.

Table C.8.1.12: Fixed Reference Channel H-Set 12

Parameter	Unit	Value
Nominal Avg. Inf. Bit Rate	kbps	60
Inter-TTI Distance	TTI's	1
Number of HARQ Processes	Processes	6
Information Bit Payload (N_{INF})	Bits	120
Number Code Blocks	Blocks	1
Binary Channel Bits Per TTI	Bits	960
Total Available SML's in UE	SML's	19200
Number of SML's per HARQ Proc.	SML's	3200
Coding Rate		0.15
Number of Physical Channel Codes	Codes	1
Modulation		QPSK
Note 1: The RMC is intended to be used for DC-HSDPA mode and both cells shall transmit with identical parameters as listed in the table. Note 2: Maximum number of transmission is limited to 1, i.e., retransmission is not allowed. The redundancy and constellation version 0 shall be used.		

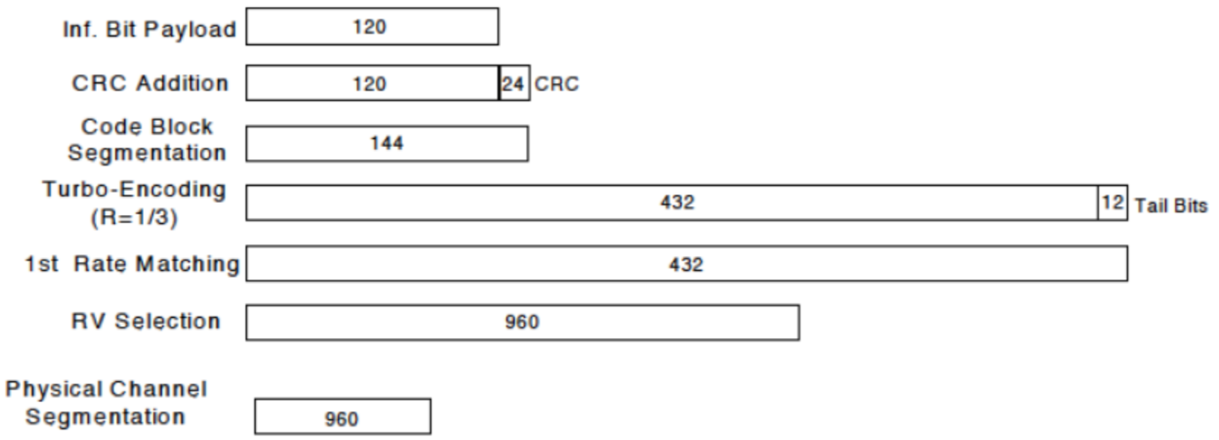

Figure C.8.19: Coding rate for Fixed reference Channel H-Set 12 (QPSK)

<LTE Mode>

LTE Target MPR level

The device implements maximum power reduction per 3GPP 36.101 requirements where the MPR target is as below table. The MPR settings are implemented configured into firmware and cannot be disabled by the end user or LTE carrier network.

Modulation	el bandwidth / Transmission bandwidth configuration [RB]						MPR Target (dB)	3GPP
	1.4 MHz	3.0 MHz	5	10	15	20		
QPSK	> 5	> 4	> 8	> 12	> 16	> 18	1	≤ 1
16 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	1	≤ 1
64 QAM	> 5	> 4	> 8	> 12	> 16	> 18	2	≤ 2

Note: The measurement result showed some difference from the target MPR level, due to expected 0.5dBmeasurement tolerance

LTE Bands

LTE Bands	el bandwidth / Transmission bandwidth configuration [RB]					
	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz
2	√	√	√	√	√	√
4	√	√	√	√	√	√
5	√	√	√	√	N/A	N/A
7	N/A	N/A	√	√	√	√
12	√	√	√	√	N/A	N/A
17	N/A	N/A	√	√	N/A	N/A
66	√	√	√	√	√	√

Note:

1. Per KDB 941225 D05v02r05, when a properly configured base station simulator is used for the SAR and power measurements, spectrum plots for each RB allocation and offset configuration is not required.
2. Per KDB 941225 D05v02r05, start with the largest channel bandwidth and measure SAR for QPSK with 1 RB allocation, using the RB offset and required test channel combination with the highest maximum output power for RB offsets at the upper edge, middle and lower edge of each required test channel.
3. Per KDB 941225 D05v02r05, 50% RB allocation for QPSK SAR testing follows 1RB QPSK allocation procedure.
4. Per KDB 941225 D05v02r05, 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 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. Per KDB 941225 D05v02r05, 16QAM/64QAM output power for each RB allocation configuration is > not ½ dB higher than the same configuration in QPSK and the reported SAR for the QPSK configuration is ≤ 1.45 W/kg; Per KDB941225 D05v02r05, 16QAM/64QAM SAR testing is not required.
6. Per KDB 941225 D05v02r05, smaller bandwidth output power for each RB allocation configuration is > not ½ Db higher than the same configuration in the largest supported bandwidth, and the reported SAR for the largest supported band width is ≤ 1.45 W/kg; Per KDB 941225 D05v02r05, smaller bandwidth SAR testing is not required.
7. For LTE B4 / B5 / B7 / B17 the maximum bandwidth does not support three non-overlapping channels, per KDB941225 D05v02r05, when a device supports overlapping channel assignment in a channel bandwidth configuration, the middle channel of the group of overlapping channels should be selected for testing.
8. LTE band 17 SAR test was covered by Band 12; according to April 2015 TCB workshop, SAR test for overlapping LTE bands can be reduced if
   a. The maximum output power, including tolerance, for the smaller band is ≤ the larger band to qualify for the SAR test exclusion.
   b. The channel bandwidth and other operating parameters for the smaller band are fully supported by the larger band.
9. According to 2017 TCB workshop, for 64 QAM and 16 QAM should be verified by checking the signal constellation with a call box to avoid incorrect maximum power levels due to MPR and other requirements associated with signal modulation, and the following figure is taken from the "Fundamental Measurement >> Modulation Analysis >>constellation" mode of the device connect to the CMW500 base station, therefore, the device 64QAM and 16QAMsignal modulation are correct. Identify if Maximum Power Reduction (MPR) is optional or mandatory, i.e. built-in by design: only mandatory MPR may be considered during SAR testing, when the maximum output power is permanently limited by the MPR implemented within the UE; and only for the applicable RB (resource block) configurations specified in LTE standards: b) A-MPR (additional MPR) must be disabled.
10. Per KDB 447498 D01v06, the reported SAR is the measured SAR value adjusted for maximum tune-up tolerance.
    a. Tune-up scaling Factor = tune-up limit power (mW) / EUT RF power (mW), where tune-up limit is the maximum rated power among all production units.
    b. For SAR testing of WLAN signal with non-100% duty cycle, the measured SAR is scaled-up by the duty cycle scaling factor which is equal to "1/(duty cycle)"
    c. For WWAN: Reported SAR(W/kg)= Measured SAR(W/kg)*Tune-up Scaling Factor
    d. For WLAN/Bluetooth: Reported SAR(W/kg)= Measured SAR(W/kg)* Duty Cycle scaling

factor * Tune-up scaling factor

e. For TDD LTE SAR measurement, the duty cycle 1:1.59 (62.9 %) was used perform testing and considering the theoretical duty cycle of 63.3% for extended cyclic prefix in the uplink, and the theoretical duty cycle of 62.9% for normal cyclic prefix in uplink, a scaling factor of extended cyclic prefix 63.3%/62.9% = 1.006 is applied to scale-up the measured SAR result. The Reported TDD LTE SAR = measured SAR (W/kg)* Tune-up Scaling Factor* scaling factor for extended cyclic prefix.

11. Per KDB 447498 D01v06, for each exposure position, testing of other required channels within the operating mode of a frequency band is not required when the reported 1-g or 10-g SAR for the mid-band or highest output power channel is:≤ 0.8 W/kg or 2.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≤ 100 MHz≤ 0.6 W/kg or 1.5 W/kg, for 1-g or 10-g respectively, when the transmission band is between 100 MHz and 200 MHz≤ 0.4 W/kg or 1.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≥ 200 MHz
12. Per KDB 865664 D01v01r04, for each frequency band, repeated SAR measurement is required only when the measured SAR is ≥0.8W/kg.
13. Per KDB 648474 D04v01r03, when the reported SAR for a body-worn accessory measured without a headset connected to the handset is ≤ 1.2 W/kg, SAR testing with a headset connected to the handset is not required.

<WLAN 2.4GHz>

1. SAR is measured for 2.4 GHz 802.11b DSSS using either the fixed test position or, when applicable, the initial test position procedure. SAR test reduction is determined according to the following:
   a. When the reported SAR of the highest measured maximum output power channel for the exposure configuration is ≤ 0.8 W/kg, no further SAR testing is required for 802.11b DSSS in that exposure configuration.
   b. When the reported SAR is > 0.8 W/kg, SAR is required for that position using the next highest measured output power channel. When any reported SAR is > 1.2 W/kg, SAR is required for the third channel; i.e., all channels require testing.
2. 2.4 GHz 802.11 g/n OFDM are additionally evaluated for SAR if the highest reported SAR for 802.11b, adjusted by the ratio of the OFDM to DSSS specified maximum output power, is > 1.2 W/kg. When SAR is required for OFDM modes in 2.4 GHz band, the Initial Test configuration Procedures should be followed.
3. For held-to-ear and hotspot operations, the initial test position procedures were applied. The test position with the highest extrapolated peak SAR will be used as the initial test position. When reported SAR for the initial test position is ≤ 0.4 W/kg, no additional testing for the remaining test positions was required. Otherwise, SAR is evaluated at the subsequent highest peak SAR positions until the reported SAR result is ≤ 0.8 W/kg or all test positions are measured.
4. Justification for test configurations for WLAN per KDB Publication 248227 D02DR02-41929 for

2.4 GHz WI-FI single transmission chain operations, the highest measured maximum output power channel for DSSS was selected for SAR measurement. SAR for OFDM modes (2.4 GHz802.11g/n) was not required due to the maximum allowed powers and the highest reported SAR.

5. A fixed level power reduction is applied for WiFi when handset operates "held to the body" condition or "held to the ear" condition, the power reduction triggered by audio receiver detection and call establish status.
6. Per KDB 248227 D01v02r02, In the 2.4 GHz band, separate SAR procedures are applied to DSSS and OFDM configurations to simplify DSSS test requirements.SAR is not required for the following 2.4 GHz OFDM conditions:
   a. When KDB Publication 447498 SAR test exclusion applies to the OFDM configuration.
   b. When the highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power and the adjusted SAR is ≤ 1.2 W/kg.

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12 Proximity Sensor Considerations

12.1 Proximity Sensor Triggering Distances

➢ **P-sensor triggering distance Testing**

Proximity sensor triggering distances measurement was performed according to the procedures outlined in KDB 616217 D04 section 6.2. The EUT should be moved further away from and toward the flat phantom that fill with the tissue simulating liquid to determine the proximity sensor triggering distances. Conducted power is monitored qualitatively to identify the general triggering characteristics and recorded quantitatively, versus spacing, as required by the procedures.

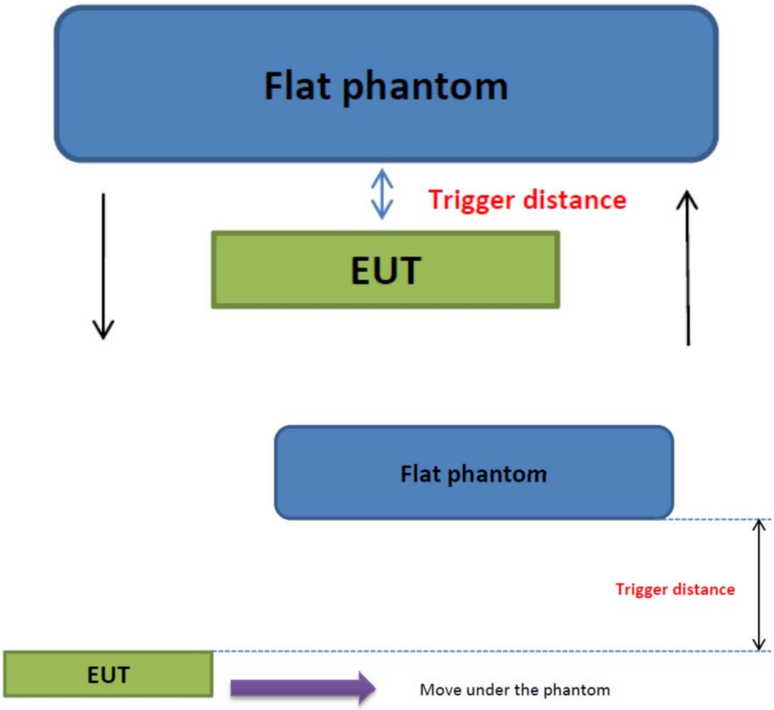


Fig.12.1 Illustration for proximity sensor trigger

➢ **P-sensor triggering distance**

<WWAN>

Proximity Sensor Trigger Distance (mm)		
Exposure Position	Bottom Face	Edge 3
Minimum	25	9

12.2 Proximity Sensor Coverage

Proximity sensors are not normally designed to cover the entire back surface or edges of a tablet. The sensing regions are usually limited to areas near the sensor element. If a sensor is spatially offset from the antenna(s), it is necessary to verify sensor triggering for conditions where the antenna is next to the user but the sensor is laterally further away to ensure sensor coverage is sufficient for reducing the power to maintain compliance. For P-sensor coverage testing, the device is moved and “along the direction of maximum antenna and sensor offset”. Illustrating in the internal photo exhibit, although the sensor spatially offset, there is no trigger condition where the antenna is next to the user, the sensor is laterally further away, therefore proximity sensor coverage testing is not required.
This procedure is not required since the antenna, sensor and peak SAR location is overlapped with the sensor.

12.3 Tablet Tilt Angle Influences to P-Sensor Triggering

- **P-sensor triggering distance Testing**

The influence of table tilt angles to proximity sensor triggering is determined by positioning each tablet edge that contains a transmitting antenna, perpendicular to the flat phantom, at the smallest sensor triggering test distance determined in 6.2 and 6.3 by rotating the tablet around the edge next to the phantom in ≤ 10 increments until the tablet is 45° or more from the vertical position at 0°.

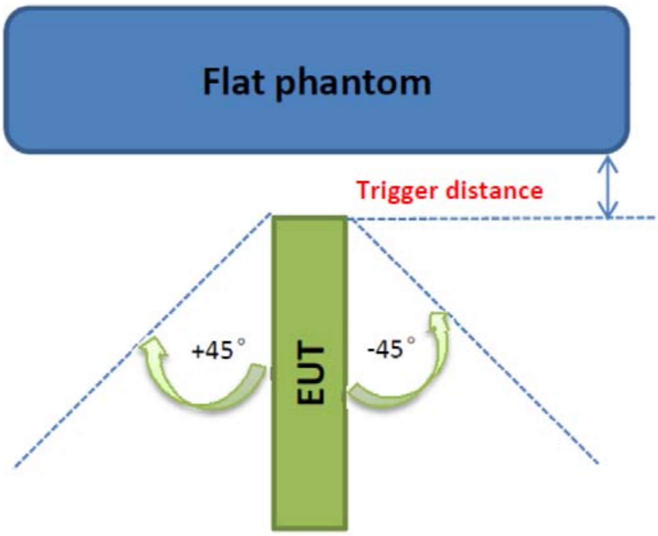


Fig.12.2 Illustration for proximity sensor trigger for tablet tilt angle influences

➢ **P-sensor triggering distance**

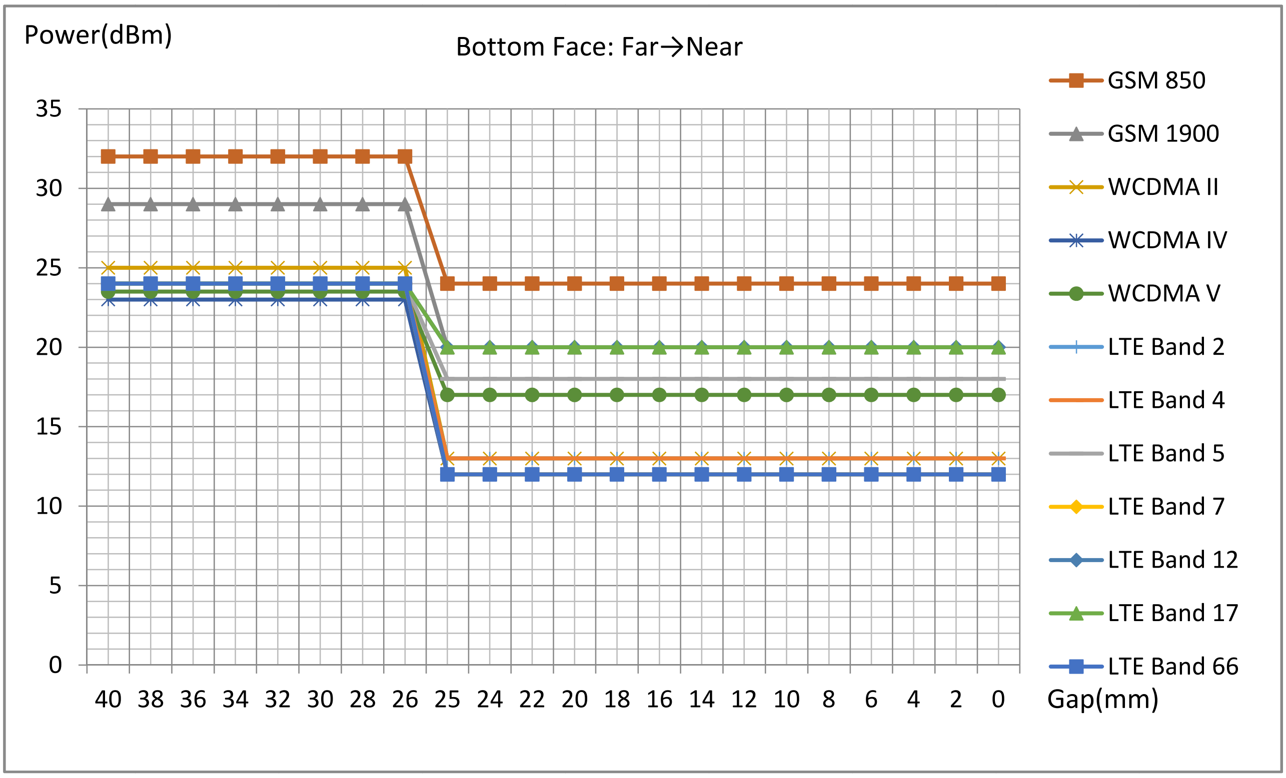
Proximity Sensor Trigger Distance (mm)	
Exposure Position	Curved surface of Edge 3
Minimum	9

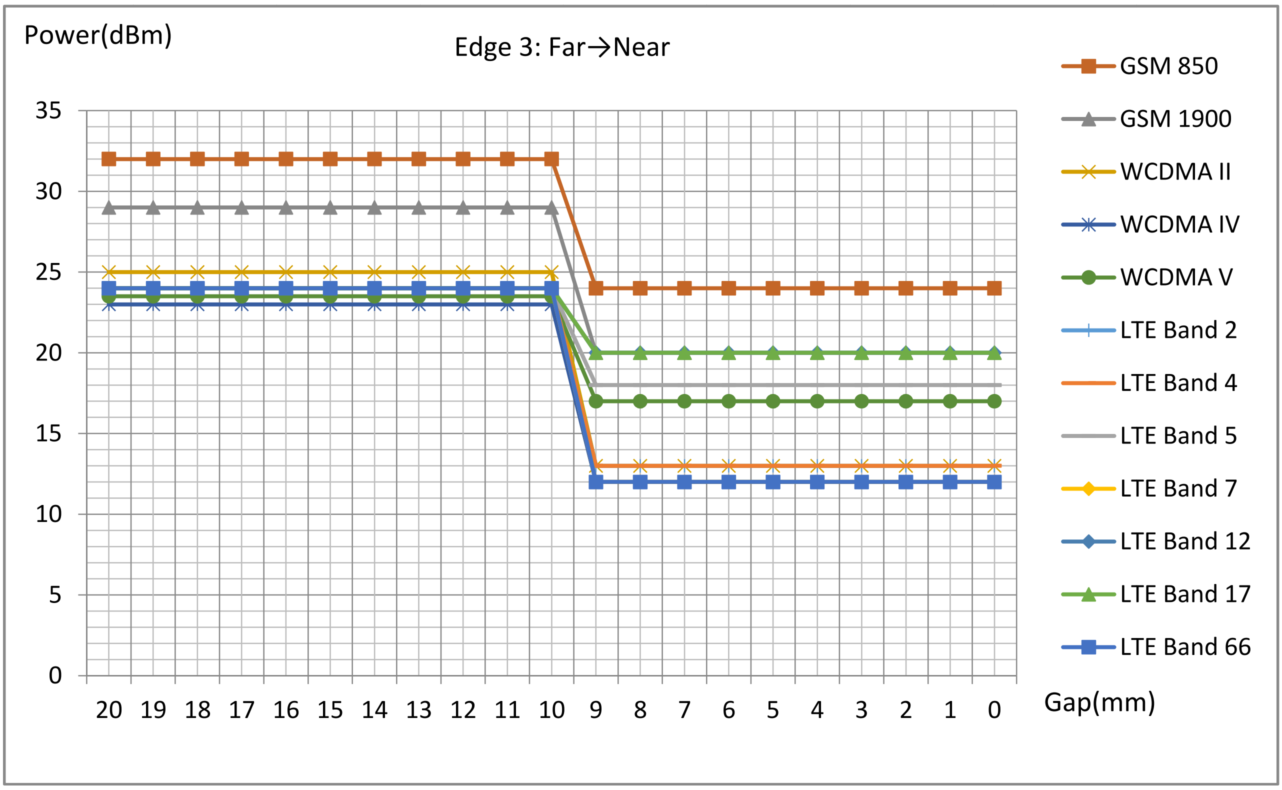
12.4 Proximity Sensor Power Reduction

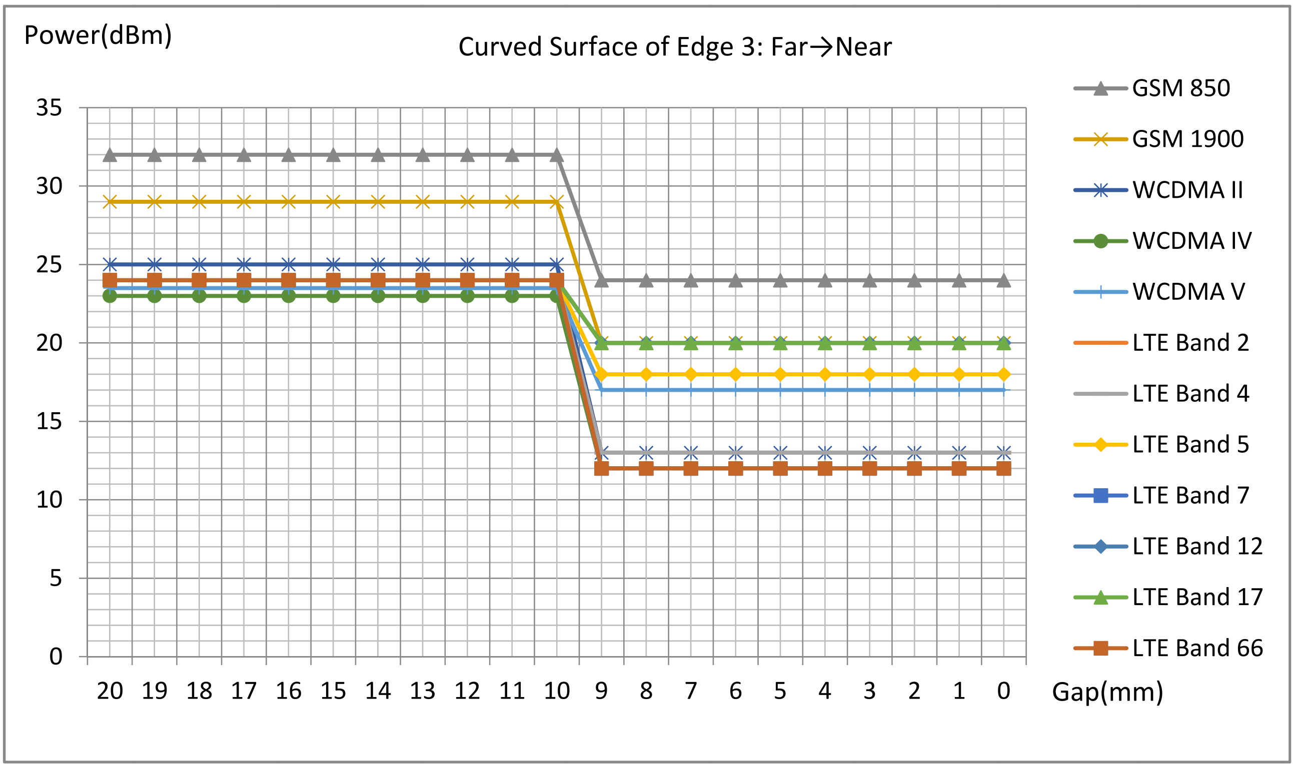
➢ **Power Reduction List**

Wireless band	Bottom Face	Edge 1	Edge 2	Edge 3	Edge 4
GSM 850	8dB	0	0	8dB	0
GSM 1900	9dB	0	0	9dB	0
WCDMA II	12dB	0	0	12dB	0
WCDMA IV	11dB	0	0	11dB	0
WCDMA V	6.5dB	0	0	6.5dB	0
LTE Band 2	11dB	0	0	11dB	0
LTE Band 4	11dB	0	0	11dB	0
LTE Band 5	6dB	0	0	6dB	0
LTE Band 7	12dB	0	0	12dB	0
LTE Band 12	4dB	0	0	4dB	0
LTE Band 17	4dB	0	0	4dB	0
LTE Band 66	12dB	0	0	12dB	0

➢ Graphs of Power Reduction







13 Conducted Output Power

Remark: The output power of GSM/WCDMA/LTE/WLAN/Bluetooth refers to the annex E of this report.

14 Exposure Positions Consideration

14.1 EUT Antenna Locations

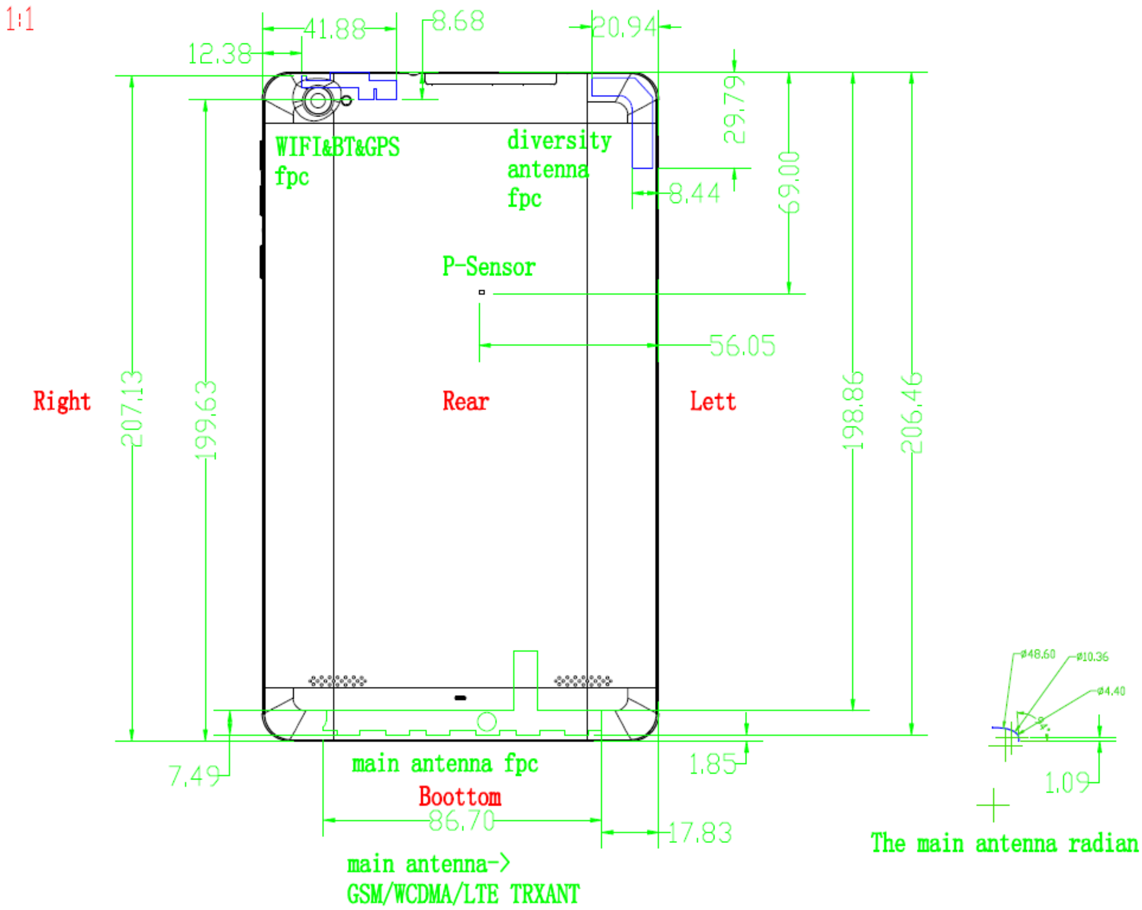


Fig.11.1 EUT Antenna Locations

14.2 Test Positions Consideration

Bands	Frequency (MHz)	Maximum Power		Exposure Position/Distance between the antennas and edge/surface of EUT (mm)				
		dBm	mW	Bottom Face	Edge 1	Edge 2	Edge 3	Edge 4
GSM 850	849	32	1584.89	5	207	5	5	17.8
GSM 1900	1910	29	794.33	5	207	5	5	17.8
WCDMA II	1910	25	316.23	5	207	5	5	17.8
WCDMA IV	1755	23	199.53	5	207	5	5	17.8
WCDMA V	849	23.5	223.87	5	207	5	5	17.8
LTE Band 2	1910	24	251.19	5	207	5	5	17.8
LTE Band 4	1755	24	251.19	5	207	5	5	17.8
LTE Band 5	849	24	251.19	5	207	5	5	17.8
LTE Band 7	2570	24	251.19	5	207	5	5	17.8
LTE Band 12	716	24	251.19	5	207	5	5	17.8
LTE Band 17	716	24	251.19	5	207	5	5	17.8
LTE Band 66	1780	24	251.19	5	207	5	5	17.8
WLAN 2.4G	2472	11	13.00	5	5	5	207	80.1
Bluetooth	2480	2.5	1.78	5	5	5	207	80.1

Bands	Frequency (MHz)	Exposure Position/Calculated Threshold Value (SAR test exclusion power, mW)				
		Bottom Face	Edge 1	Edge 2	Edge 3	Edge 4
GSM 850	849	291.9	1050.0	83.4	291.9	81.9
GSM 1900	1910	219.4	1679.0	62.7	219.4	61.5
WCDMA II	1910	87.3	1679.0	24.9	87.3	24.5
WCDMA IV	1755	52.9	1683.0	15.1	52.9	14.8
WCDMA V	849	41.2	1049.0	11.8	41.2	11.6
LTE Band 2	1910	69.4	1679.0	19.8	69.4	19.5
LTE Band 4	1755	66.5	1683.0	19.0	66.5	18.6
LTE Band 5	849	46.2	1050.0	13.2	46.2	13.0
LTE Band 7	2570	80.5	1664.0	23.0	80.5	22.6
LTE Band 12	716	69.5	1678.0	19.8	69.5	19.5
LTE Band 17	716	69.5	1678.0	19.8	69.5	19.5
LTE Band 66	1780	82.3	1661.0	23.5	82.3	23.1
WLAN 2.4G	2472	4.1	4.1	4.1	207.0	397.0
Bluetooth	2480	0.6	0.6	0.6	1665.0	396.0

Note:

1. Per KDB 616217 D04v01r02, when the overall diagonal dimension of display is > 20 cm, the test distance is 0mm; the SAR Test Exclusion Threshold in KDB 447498 section 4.3.1 can be applied to determine SAR test exclusion for adjacent edge configurations.
2. Per KDB 616217 D04v01r02, SAR evaluation for the front surface of tablet display screens is generally not necessary.
3. Per KDB 616217 D04v01r02, additional testing for hotspot SAR is not required.

15 SAR Test Results Summary

15.1 Test Guidance

1. The reported SAR is the measured SAR value adjusted for maximum tune-up tolerance.
    a. Tune-up scaling Factor = tune-up limit power (mW) / EUT RF power (mW), where tune-up limit is the maximum rated power among all production units.
    b. For SAR testing of WLAN signal with non-100% duty cycle, the measured SAR is scaled-up by the duty cycle scaling factor which is equal to "1/(duty cycle)".
    c. For WLAN/Bluetooth: Reported SAR(W/kg)= Measured SAR(W/kg)* Duty Cycle scaling factor * Tune-up scaling factor.
2. Per KDB 447498 D01v06, for each exposure position, testing of other required channels within the operating mode of a frequency band is not required when the *reported* 1-g or 10-g SAR for the mid-band or highest output power channel is:
    a. ≤ 0.8 W/kg or 2.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≤ 100 MHz
    b. ≤ 0.6 W/kg or 1.5 W/kg, for 1-g or 10-g respectively, when the transmission band is between 100 MHz and 200 MHz
    c. ≤ 0.4 W/kg or 1.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≥ 200 MHz
3. Per KDB248227 D01v02r02, a Wi-Fi device must be configured to transmit continuously at the required data rate, channel bandwidth and signal modulation, using the highest transmission duty factor supported by the test mode tools for SAR measurement. The test frequencies established using test mode must correspond to the actual channel frequencies required for operations in the U.S. When 802.11 frame gaps are accounted for in the transmission, a maximum transmission duty factor of 92 - 96% is typically achievable in most test mode configurations. A minimum transmission duty factor of 85% is required to avoid certain hardware and device implementation issues related to wide range SAR scaling. In addition, a periodic transmission duty factor is required for current generation SAR systems to measure SAR correctly. Unless it is permitted by specific KDB procedures or continuous transmission is specifically restricted by the device, the reported SAR must be scaled to 100% transmission duty factor to determine compliance at the maximum tune-up tolerance limit. When a device is not capable of sustaining continuous transmission or the output can become nonlinear, and it is limited by hardware design and unable to transmit at higher than 85% duty factor, a periodic duty factor within 15% of the maximum duty factor the device is capable of transmitting should be used. The reported SAR must be scaled to the maximum transmission duty factor to determine compliance. Descriptions of the procedures applied to establish the specific duty factor used for SAR testing are required in SAR reports to support the test results.

15.2 Body SAR Data

Band/Mode	Test Position	Gap (mm)	CH.	Ave. Power (dBm)	Tune-up Limit (dBm)	Tune-up Scaling Factor	Meas. SAR_{1g} (W/kg)	Reported SAR_{1g} (W/kg)
Sensor off/Full Power								
GPRS850/2TX slots	Bottom Face	25mm	189	31.45	32.00	1.135	0.194	0.220
GPRS850/2TX slots	Edge 1	0mm	189	31.45	32.00	1.135	0.063	0.071
GPRS850/2TX slots	Edge 2	0mm	189	31.45	32.00	1.135	0.302	0.343
GPRS850/2TX slots	Edge 3	9mm	189	31.45	32.00	1.135	0.350	0.397
GPRS850/2TX slots	Edge 4	0mm	189	31.45	32.00	1.135	0.292	0.331
GPRS850/2TX slots	Curved surface of Edge 3	9mm	189	31.45	32.00	1.135	0.353	0.401
Sensor on/Reduced Power								
GPRS850/2TX slots	Bottom Face	0mm	189	23.58	24.00	1.102	0.625	0.688
GPRS850/2TX slots	Edge 3	0mm	189	23.58	24.00	1.102	0.329	0.362
GPRS850/2TX slots	Curved surface of Edge 3	0mm	189	23.58	24.00	1.102	0.367	0.404
Sensor off/Full Power								
GPRS1900/2TX slots	Bottom Face	25mm	661	28.67	29.00	1.079	0.103	0.111
GPRS1900/2TX slots	Edge 2	0mm	661	28.67	29.00	1.079	0.058	0.063
GPRS1900/2TX slots	Edge 3	9mm	661	28.67	29.00	1.079	0.101	0.109
GPRS1900/2TX slots	Edge 4	0mm	661	28.67	29.00	1.079	0.334	0.360
GPRS1900/2TX slots	Curved surface of Edge 3	9mm	661	28.67	29.00	1.079	0.087	0.094
Sensor on/Reduced Power								
GPRS1900/2TX slots	Bottom Face	0mm	661	19.46	20.00	1.132	0.620	0.702
GPRS1900/2TX slots	Edge 3	0mm	661	19.46	20.00	1.132	0.330	0.374
GPRS1900/2TX slots	Curved surface of Edge 3	0mm	661	19.46	20.00	1.132	0.400	0.453
Sensor off/Full Power								
Band II/RMC 12.2Kbps	Bottom Face	25mm	9400	24.38	25.00	1.153	0.184	0.212
Band II/RMC 12.2Kbps	Edge 2	0mm	9400	24.38	25.00	1.153	0.095	0.110
Band II/RMC 12.2Kbps	Edge 3	9mm	9400	24.38	25.00	1.153	0.071	0.082
Band II/RMC 12.2Kbps	Edge 4	0mm	9400	24.38	25.00	1.153	0.417	0.481
Band II/RMC 12.2Kbps	Curved surface of Edge 3	9mm	9400	24.38	25.00	1.153	0.069	0.080
Sensor on/Reduced Power								
Band II/RMC 12.2Kbps	Bottom Face	0mm	9400	12.38	13.00	1.153	0.538	0.621
Band II/RMC 12.2Kbps	Edge 3	0mm	9400	12.38	13.00	1.153	0.244	0.281
Band II/RMC 12.2Kbps	Curved surface of Edge 3	0mm	9400	12.38	13.00	1.153	0.260	0.300
Sensor off/Full Power								
Band IV/RMC 12.2Kbps	Bottom Face	25mm	1413	22.54	23.00	1.112	0.275	0.306

Band IV/RMC 12.2Kbps	Edge 2	0mm	1413	22.54	23.00	1.112	0.056	0.062
Band IV/RMC 12.2Kbps	Edge 3	9mm	1413	22.54	23.00	1.112	0.115	0.128
Band IV/RMC 12.2Kbps	Edge 4	0mm	1413	22.54	23.00	1.112	0.429	0.477
Band IV/RMC 12.2Kbps	Curved surface of Edge 3	9mm	1413	22.54	23.00	1.112	0.126	0.140
Sensor on/Reduced Power								
Band IV/RMC 12.2Kbps	Bottom Face	0mm	1413	11.54	12.00	1.112	0.437	0.486
Band IV/RMC 12.2Kbps	Edge 3	0mm	1413	11.54	12.00	1.112	0.221	0.246
Band IV/RMC 12.2Kbps	Curved surface of Edge 3	0mm	1413	11.54	12.00	1.112	0.275	0.306
Sensor off/Full Power								
Band V/RMC 12.2Kbps	Bottom Face	25mm	4182	22.85	23.50	1.161	0.140	0.163
Band V/RMC 12.2Kbps	Edge 2	0mm	4182	22.85	23.50	1.161	0.179	0.208
Band V/RMC 12.2Kbps	Edge 3	9mm	4182	22.85	23.50	1.161	0.200	0.232
Band V/RMC 12.2Kbps	Edge 4	0mm	4182	22.85	23.50	1.161	0.173	0.201
Band V/RMC 12.2Kbps	Curved surface of Edge 3	9mm	4182	22.85	23.50	1.161	0.238	0.276
Sensor on/Reduced Power								
Band V/RMC 12.2Kbps	Bottom Face	0mm	4182	16.35	17.00	1.161	0.511	0.594
Band V/RMC 12.2Kbps	Edge 3	0mm	4182	16.35	17.00	1.161	0.268	0.311
Band V/RMC 12.2Kbps	Curved surface of Edge 3	0mm	4182	16.35	17.00	1.161	0.280	0.325
Sensor off/Full Power								
LTE Band 2/1RB#0 20M	Bottom Face	25mm	18900	23.62	24.00	1.091	0.138	0.151
LTE Band 2/1RB#0 20M	Edge 2	0mm	18900	23.62	24.00	1.091	0.076	0.083
LTE Band 2/1RB#0 20M	Edge 3	9mm	18900	23.62	24.00	1.091	0.144	0.157
LTE Band 2/1RB#0 20M	Edge 4	0mm	18900	23.62	24.00	1.091	0.436	0.476
LTE Band 2/1RB#0 20M	Curved surface of Edge 3	9mm	18900	23.62	24.00	1.091	0.151	0.165
Sensor on/Reduced Power								
LTE Band 2/1RB#0 20M	Bottom Face	0mm	18900	12.62	13.00	1.091	0.940	1.026
LTE Band 2/1RB#0 20M	Edge 3	0mm	18900	12.62	13.00	1.091	0.440	0.480
LTE Band 2/1RB#0 20M	Curved surface of Edge 3	0mm	18900	12.62	13.00	1.091	0.530	0.578
LTE Band 2/1RB#0 20M	Bottom Face	0mm	18700	12.59	13.00	1.099	0.725	0.797
LTE Band 2/1RB#0 20M	Bottom Face	0mm	19100	12.56	13.00	1.107	0.871	0.964
LTE Band 2/**100RB#0** 20M	Bottom Face	0mm	18900	11.60	12.00	1.096	0.713	0.782
Sensor off/Full Power								
LTE Band 2/50RB#0 20M	Bottom Face	25mm	18900	22.61	23.00	1.094	0.105	0.115
LTE Band 2/50RB#0 20M	Edge 2	0mm	18900	22.61	23.00	1.094	0.062	0.068
LTE Band 2/50RB#0 20M	Edge 3	9mm	18900	22.61	23.00	1.094	0.081	0.088
LTE Band 2/50RB#0 20M	Edge 4	0mm	18900	22.61	23.00	1.094	0.364	0.398
LTE Band 2/50RB#0 20M	Curved surface of Edge 3	9mm	18900	22.61	23.00	1.094	0.087	0.095
Sensor on/Reduced Power								

LTE Band 2/50RB#0 20M	Bottom Face	0mm	18900	11.61	12.00	1.094	0.699	0.765
LTE Band 2/50RB#0 20M	Edge 3	0mm	18900	11.61	12.00	1.094	0.274	0.300
LTE Band 2/50RB#0 20M	Curved surface of Edge 3	0mm	18900	11.61	12.00	1.094	0.328	0.359
Sensor off/Full Power								
LTE Band 4/1RB#0 20M	Bottom Face	25mm	20175	23.67	24.00	1.079	0.275	0.297
LTE Band 4/1RB#0 20M	Edge 2	0mm	20175	23.67	24.00	1.079	0.051	0.054
LTE Band 4/1RB#0 20M	Edge 3	9mm	20175	23.67	24.00	1.079	0.180	0.194
LTE Band 4/1RB#0 20M	Edge 4	0mm	20175	23.67	24.00	1.079	0.420	0.453
LTE Band 4/1RB#0 20M	Curved surface of Edge 3	9mm	20175	23.67	24.00	1.079	0.203	0.219
Sensor on/Reduced Power								
LTE Band 4/1RB#0 20M	Bottom Face	0mm	20175	12.67	13.00	1.079	0.583	0.629
LTE Band 4/1RB#0 20M	Edge 3	0mm	20175	12.67	13.00	1.079	0.312	0.337
LTE Band 4/1RB#0 20M	Curved surface of Edge 3	0mm	20175	12.67	13.00	1.079	0.339	0.366
Sensor off/Full Power								
LTE Band 4/50RB#0 20M	Bottom Face	25mm	20175	22.62	23.00	1.091	0.221	0.241
LTE Band 4/50RB#0 20M	Edge 2	0mm	20175	22.62	23.00	1.091	0.041	0.045
LTE Band 4/50RB#0 20M	Edge 3	9mm	20175	22.62	23.00	1.091	0.142	0.155
LTE Band 4/50RB#0 20M	Edge 4	0mm	20175	22.62	23.00	1.091	0.350	0.382
LTE Band 4/50RB#0 20M	Curved surface of Edge 3	9mm	20175	22.62	23.00	1.091	0.159	0.174
Sensor on/Reduced Power								
LTE Band 4/50RB#0 20M	Bottom Face	0mm	20175	11.62	12.00	1.091	0.466	0.509
LTE Band 4/50RB#0 20M	Edge 3	0mm	20175	11.62	12.00	1.091	0.252	0.275
LTE Band 4/50RB#0 20M	Curved surface of Edge 3	0mm	20175	11.62	12.00	1.091	0.277	0.302
Sensor off/Full Power								
LTE Band 5/1RB#0 10M	Bottom Face	25mm	20525	23.42	24.00	1.143	0.134	0.153
LTE Band 5/1RB#0 10M	Edge 2	0mm	20525	23.42	24.00	1.143	0.246	0.281
LTE Band 5/1RB#0 10M	Edge 3	9mm	20525	23.42	24.00	1.143	0.250	0.286
LTE Band 5/1RB#0 10M	Edge 4	0mm	20525	23.42	24.00	1.143	0.171	0.195
LTE Band 5/1RB#0 10M	Curved surface of Edge 3	9mm	20525	23.42	24.00	1.143	0.380	0.434
Sensor on/Reduced Power								
LTE Band 5/1RB#0 10M	Bottom Face	0mm	20525	17.42	18.00	1.143	0.675	0.771
LTE Band 5/1RB#0 10M	Edge 3	0mm	20525	17.42	18.00	1.143	0.412	0.471
LTE Band 5/1RB#0 10M	Curved surface of Edge 3	0mm	20525	17.42	18.00	1.143	0.361	0.413
Sensor off/Full Power								
LTE Band 5/25RB#0 10M	Bottom Face	25mm	20525	22.74	23.00	1.062	0.109	0.116
LTE Band 5/25RB#0 10M	Edge 2	0mm	20525	22.74	23.00	1.062	0.197	0.209
LTE Band 5/25RB#0 10M	Edge 3	9mm	20525	22.74	23.00	1.062	0.250	0.265
LTE Band 5/25RB#0 10M	Edge 4	0mm	20525	22.74	23.00	1.062	0.128	0.136

LTE Band 5/25RB#0 10M	Curved surface of Edge 3	9mm	20525	22.74	23.00	1.062	0.333	0.354
Sensor on/Reduced Power								
LTE Band 5/25RB#0 10M	Bottom Face	0mm	20525	16.74	17.00	1.062	0.512	0.544
LTE Band 5/25RB#0 10M	Edge 3	0mm	20525	16.74	17.00	1.062	0.362	0.384
LTE Band 5/25RB#0 10M	Curved surface of Edge 3	0mm	20525	16.74	17.00	1.062	0.300	0.319
Sensor off/Full Power								
LTE Band 7/1RB#0 20M	Bottom Face	25mm	21100	23.61	24.00	1.094	0.641	0.701
LTE Band 7/1RB#0 20M	Edge 2	0mm	21100	23.61	24.00	1.094	0.081	0.088
LTE Band 7/1RB#0 20M	Edge 3	9mm	21100	23.61	24.00	1.094	0.241	0.264
LTE Band 7/1RB#0 20M	Edge 4	0mm	21100	23.61	24.00	1.094	0.331	0.362
LTE Band 7/1RB#0 20M	Curved surface of Edge 3	9mm	21100	23.61	24.00	1.094	0.337	0.369
Sensor on/Reduced Power								
LTE Band 7/1RB#0 20M	Bottom Face	0mm	21100	11.71	12.00	1.069	1.090	1.165
LTE Band 7/1RB#0 20M	Edge 3	0mm	21100	11.71	12.00	1.069	0.711	0.760
LTE Band 7/1RB#0 20M	Curved surface of Edge 3	0mm	21100	11.71	12.00	1.069	0.881	0.942
LTE Band 7/1RB#0 20M	Bottom Face	0mm	20850	11.60	12.00	1.096	0.951	1.043
LTE Band 7/1RB#0 20M	Bottom Face	0mm	21350	11.53	12.00	1.114	0.985	1.098
LTE Band 7/1RB#0 20M	Curved surface of Edge 3	0mm	20850	11.60	12.00	1.096	0.698	0.765
LTE Band 7/1RB#0 20M	Curved surface of Edge 3	0mm	21350	11.53	12.00	1.114	0.766	0.854
LTE Band 7/**100RB#0** 20M	Bottom Face	0mm	21100	10.59	11.00	1.099	0.700	0.769
Sensor off/Full Power								
LTE Band 7/50RB#0 20M	Bottom Face	25mm	21100	22.53	23.00	1.114	0.516	0.575
LTE Band 7/50RB#0 20M	Edge 2	0mm	21100	22.53	23.00	1.114	0.072	0.081
LTE Band 7/50RB#0 20M	Edge 3	9mm	21100	22.53	23.00	1.114	0.194	0.216
LTE Band 7/50RB#0 20M	Edge 4	0mm	21100	22.53	23.00	1.114	0.274	0.305
LTE Band 7/50RB#0 20M	Curved surface of Edge 3	9mm	21100	22.53	23.00	1.114	0.263	0.293
Sensor on/Reduced Power								
LTE Band 7/50RB#0 20M	Bottom Face	0mm	21100	10.65	11.00	1.084	0.720	0.780
LTE Band 7/50RB#0 20M	Edge 3	0mm	21100	10.65	11.00	1.084	0.529	0.573
LTE Band 7/50RB#0 20M	Curved surface of Edge 3	0mm	21100	10.65	11.00	1.084	0.647	0.701
Sensor off/Full Power								
LTE Band 12/1RB#0 10M	Bottom Face	25mm	23095	23.52	24.00	1.117	0.073	0.082
LTE Band 12/1RB#0 10M	Edge 2	0mm	23095	23.52	24.00	1.117	0.229	0.256
LTE Band 12/1RB#0 10M	Edge 3	9mm	23095	23.52	24.00	1.117	0.109	0.122
LTE Band 12/1RB#0 10M	Edge 4	0mm	23095	23.52	24.00	1.117	0.063	0.070
LTE Band 12/1RB#0 10M	Curved surface of Edge 3	9mm	23095	23.52	24.00	1.117	0.163	0.182
Sensor on/Reduced Power								
LTE Band 12/1RB#0 10M	Bottom Face	0mm	23095	19.52	20.00	1.117	0.789	0.881

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LTE Band 12/1RB#0 10M	Edge 3	0mm	23095	19.52	20.00	1.117	0.607	0.678
LTE Band 12/1RB#0 10M	Curved surface of Edge 3	0mm	23095	19.52	20.00	1.117	0.564	0.630
LTE Band 12/1RB#0 10M	Bottom Face	0mm	23060	19.44	20.00	1.138	0.769	0.875
LTE Band 12/1RB#0 10M	Bottom Face	0mm	23130	19.43	20.00	1.140	0.628	0.716
LTE Band 12/1RB#0 10M	Bottom Face	0mm	23095	18.34	19.00	1.164	0.592	0.689
Sensor off/Full Power								
LTE Band 12/25RB#0 10M	Bottom Face	25mm	23095	22.71	23.00	1.069	0.059	0.063
LTE Band 12/25RB#0 10M	Edge 2	0mm	23095	22.71	23.00	1.069	0.181	0.193
LTE Band 12/25RB#0 10M	Edge 3	9mm	23095	22.71	23.00	1.069	0.080	0.086
LTE Band 12/25RB#0 10M	Edge 4	0mm	23095	22.71	23.00	1.069	0.076	0.081
LTE Band 12/25RB#0 10M	Curved surface of Edge 3	9mm	23095	22.71	23.00	1.069	0.118	0.126
Sensor on/Reduced Power								
LTE Band 12/25RB#0 10M	Bottom Face	0mm	23095	22.71	23.00	1.069	0.621	0.664
LTE Band 12/25RB#0 10M	Edge 3	0mm	23095	22.71	23.00	1.069	0.434	0.464
LTE Band 12/25RB#0 10M	Curved surface of Edge 3	0mm	23095	22.71	23.00	1.069	0.468	0.500
Sensor off/Full Power								
LTE Band 66/1RB#0 20M	Bottom Face	25mm	132322	23.24	24.00	1.191	0.362	0.431
LTE Band 66/1RB#0 20M	Edge 2	0mm	132322	23.24	24.00	1.191	0.061	0.073
LTE Band 66/1RB#0 20M	Edge 3	9mm	132322	23.24	24.00	1.191	0.142	0.169
LTE Band 66/1RB#0 20M	Edge 4	0mm	132322	23.24	24.00	1.191	0.436	0.519
LTE Band 66/1RB#0 20M	Curved surface of Edge 3	9mm	132322	23.24	24.00	1.191	0.145	0.173
Sensor on/Reduced Power								
LTE Band 66/1RB#0 20M	Bottom Face	0mm	132322	11.24	12.00	1.191	0.501	0.597
LTE Band 66/1RB#0 20M	Edge 3	0mm	132322	11.24	12.00	1.191	0.271	0.323
LTE Band 66/1RB#0 20M	Curved surface of Edge 3	0mm	132322	11.24	12.00	1.191	0.327	0.390
Sensor off/Full Power								
LTE Band 66/50RB#0 20M	Bottom Face	25mm	132322	22.48	23.00	1.127	0.291	0.328
LTE Band 66/50RB#0 20M	Edge 2	0mm	132322	22.48	23.00	1.127	0.051	0.058
LTE Band 66/50RB#0 20M	Edge 3	9mm	132322	22.48	23.00	1.127	0.101	0.114
LTE Band 66/50RB#0 20M	Edge 4	0mm	132322	22.48	23.00	1.127	0.374	0.422
LTE Band 66/50RB#0 20M	Curved surface of Edge 3	9mm	132322	22.48	23.00	1.127	0.104	0.117
Sensor on/Reduced Power								
LTE Band 66/50RB#0 20M	Bottom Face	0mm	132322	10.48	11.00	1.127	0.386	0.435
LTE Band 66/50RB#0 20M	Edge 3	0mm	132322	10.48	11.00	1.127	0.214	0.241
LTE Band 66/50RB#0 20M	Curved surface of Edge 3	0mm	132322	10.48	11.00	1.127	0.241	0.272
WLAN 2.4GHz/802.11b	Bottom Face	0mm	7	10.47	11	1.130	0.299	0.344
WLAN 2.4GHz/802.11b	Edge 1	0mm	7	10.47	11	1.130	0.225	0.259

WLAN 2.4GHz/802.11b	Edge 2	0mm	7	10.47	11	1.130	0.131	0.151

Note:

1. Per KDB 447498 D01v06, for each exposure position, if the highest output channel Reported SAR ≤0.8W/kg, other channels SAR testing is not necessary.
2. Additional WLAN SAR testing was performed for simultaneous transmission analysis.
3. Per KDB 865664 D01v01r04, for each frequency band, repeated SAR measurement is required when the measured SAR is ≥0.8W/kg.
4. Per KDB248227 D01v02r02, OFDM SAR is not required when the highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power and the adjusted SAR is ≤ 1.2 W/kg.
5. According to KDB 865664 D02v01r02, SAR plot is required for the highest measured SAR in each exposure configuration, wireless mode and frequency band combination.
6. The WLAN Reported 1g SAR (W/kg) has been calculated together with the duty cycle scaling factor 1.043.
7. The curved surface of edge 3 is tested at tilt 30 degree in this report.

➢ **Bluetooth Body SAR**

When standalone SAR is not required to be measured, per FCC KDB 447498 D01v06 4.3.2), the following equation must be used to estimate the standalone 1g SAR.

$$\text{Estimated SAR} = \frac{\sqrt{f(GHz)}}{7.5} \cdot \frac{\text{Max. power of channel, mW}}{\text{Min. Separation Distance, mm}}$$

Channel	Frequency (GHz)	Max. Tune-up Power (dBm)	Max. Power(mW)	Test Distance (mm)	Result	Exclusion Thresholds for 1-g SAR
CH 39	2.441	2.5	1.78	5	0.56	3.0

Mode	Max. Tune-up Power (dBm)	Exposure Position	Body
		Test Distance (mm)	5
Bluetooth	2.5	Estimated SAR (W/kg)	0.074

Band/Mode	Test Position	Gap (mm)	CH.	Ave. Power (dBm)	Tune-up Limit (dBm)	Tune-up Scaling Factor	Meas. SAR_{1g} (W/kg)	Reported SAR_{1g} (W/kg)
Bluetooth/1Mbps	Bottom Face	0mm	39	2	2.5	1.122	0.074	0.089
Bluetooth/1Mbps	Edge 1	0mm	39	2	2.5	1.122	0.074	0.089
Bluetooth/1Mbps	Edge 2	0mm	39	2	2.5	1.122	0.074	0.089

Note:

According to 2016 Oct. TCB workshop for Bluetooth SAR consideration and the theoretical duty cycle is 83.3%, therefore the actual duty cycle will be scaled up to the theoretical value of Bluetooth reported SAR calculation. The duty cycle of Bluetooth is 77.6%, Therefore the duty cycle scaling factor 1.073 should be used to calculating the reported SAR.

15.3 Repeated SAR Assessment

In accordance with published RF Exposure KDB procedure 865664 D01 SAR measurement 100 MHz to 6 GHz. These additional measurements are repeated after the completion of all measurements requiring the same head or body tissue-equivalent medium in a frequency band. The test device should be returned to ambient conditions (normal room temperature) with the battery fully charged before it is re-mounted on the device holder for the repeated measurement(s) to minimize any unexpected variations in the repeated results.

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

➢ **Repeated SAR**

Band/Mode	Test Position	Gap (mm)	CH.	Ave. Power (dBm)	Tune-up Limit (dBm)	Tune-up Scaling Factor	Meas. SAR_{1g} (W/kg)	Reported SAR_{1g} (W/kg)
Sensor on/Reduced Power								
LTE Band 2/1RB#0 20M	Bottom Face	0mm	18900	12.62	13.00	1.091	0.935	1.020
Sensor on/Reduced Power								
LTE Band 7/1RB#0 20M	Bottom Face	0mm	21100	11.71	12.00	1.069	1.087	1.162

16 Simultaneous Transmission Analysis

16.1 Simultaneous Transmission Consideration

No.	Simultaneous Transmission Consideration	Body
1	WWAN(2G/3G/4G)+WLAN 2.4GHz	Yes
2	WWAN(2G/3G/4G)+Bluetooth	Yes

Note:

1. Simultaneous Transmission SAR evaluation is not required for BT and Wi-Fi, because the software mechanism have been incorporated to guarantee that the WLAN and Bluetooth transmitters would not simultaneously operate.
2. Per KDB 447498D01v06, simultaneous transmission SAR evaluation procedures is as followed:

Step 1: If sum of 1 g SAR <1.6 W/kg, Simultaneous SAR measurement is not required.

Step 2: If sum of 1 g SAR >1.6 W/kg, ratio of SAR to peak separation distance for pair of transmitters calculated.

Step 3: If the ratio of SAR to peak separation distance is ≤0.04, Simultaneous SAR measurement is not required.

Step 4: If the ratio of SAR to peak separation distance is >0.04, Simultaneous SAR measurement is required and simultaneous transmission SAR value is calculated.

(The ratio is determined by: $(SAR_1 + SAR_2)$ ^ 1.5/Ri ≤0.04,

R_i is the separation distance between the peak SAR locations for the antenna pair in mm.

16.2 Simultaneous Transmission Analysis

➢ **Body Simultaneous Transmission for WWAN(2/3/4G)+WLAN(2.4GHz)**

WWAN Band	Exposure Position	1	2	3	1+2 Summed 1g SAR (W/kg)	1+3 Summed 1g SAR (W/kg)
		WWAN	2.4GHz WLAN	Bluetooth		
		1g SAR (W/kg)	1g SAR (W/kg)	Estimated 1g SAR (W/kg)		
GSM850	Bottom Face at 25mm	0.220	0.344	0.089	0.564	0.309
	Edge 3 at 9mm	0.397	0.000	0.000	0.397	0.397
	Curved surface of Edge 3 at 9mm	0.401	0.000	0.000	0.401	0.401
	Bottom Face at 0mm	0.688	0.344	0.089	1.032	0.777
	Edge 1 at 0mm	0.071	0.259	0.089	0.330	0.160
	Edge 2 at 0mm	0.343	0.151	0.089	0.494	0.432
	Edge 3 at 0mm	0.362	0.000	0.000	0.362	0.362
	Edge 4 at 0mm	0.331	0.000	0.000	0.331	0.331
	Curved surface of Edge 3 at 0mm	0.404	0.000	0.000	0.404	0.404
GSM1900	Bottom Face at 25mm	0.111	0.344	0.089	0.455	0.200
	Edge 3 at 9mm	0.109	0.000	0.000	0.109	0.109
	Curved surface of Edge 3 at 9mm	0.094	0.000	0.000	0.094	0.094
	Bottom Face at 0mm	0.702	0.344	0.089	1.046	0.791
	Edge 1 at 0mm	0.000	0.259	0.089	0.259	0.089
	Edge 2 at 0mm	0.063	0.151	0.089	0.214	0.152
	Edge 3 at 0mm	0.374	0.000	0.000	0.374	0.374
	Edge 4 at 0mm	0.360	0.000	0.000	0.360	0.360
	Curved surface of Edge 3 at 0mm	0.453	0.000	0.000	0.453	0.453
WCDMA Band II	Bottom Face at 25mm	0.212	0.344	0.089	0.556	0.301
	Edge 3 at 9mm	0.082	0.000	0.000	0.082	0.082
	Curved surface of Edge 3 at 9mm	0.080	0.000	0.000	0.080	0.080
	Bottom Face at 0mm	0.621	0.344	0.089	0.965	0.710
	Edge 1 at 0mm	0.000	0.259	0.089	0.259	0.089
	Edge 2 at 0mm	0.110	0.151	0.089	0.261	0.199
	Edge 3 at 0mm	0.281	0.000	0.000	0.281	0.281
	Edge 4 at 0mm	0.481	0.000	0.000	0.481	0.481
	Curved surface of Edge 3 at 0mm	0.300	0.000	0.000	0.300	0.300
WCDMA Band IV	Bottom Face at 25mm	0.306	0.344	0.089	0.650	0.395
	Edge 3 at 9mm	0.128	0.000	0.000	0.128	0.128

	Curved surface of Edge 3 at 9mm	0.140	0.000	0.000	0.140	0.140
	Bottom Face at 0mm	0.486	0.344	0.089	0.830	0.575
	Edge 1 at 0mm	0.000	0.259	0.089	0.259	0.089
	Edge 2 at 0mm	0.062	0.151	0.089	0.213	0.151
	Edge 3 at 0mm	0.246	0.000	0.000	0.246	0.246
	Edge 4 at 0mm	0.477	0.000	0.000	0.477	0.477
	Curved surface of Edge 3 at 0mm	0.306	0.000	0.000	0.306	0.306
WCDMA Band V	Bottom Face at 25mm	0.163	0.344	0.089	0.507	0.252
	Edge 3 at 9mm	0.232	0.000	0.000	0.232	0.232
	Curved surface of Edge 3 at 9mm	0.276	0.000	0.000	0.276	0.276
	Bottom Face at 0mm	0.594	0.344	0.089	0.938	0.683
	Edge 1 at 0mm	0.000	0.259	0.089	0.259	0.089
	Edge 2 at 0mm	0.208	0.151	0.089	0.359	0.297
	Edge 3 at 0mm	0.311	0.000	0.000	0.311	0.311
	Edge 4 at 0mm	0.201	0.000	0.000	0.201	0.201
	Curved surface of Edge 3 at 0mm	0.325	0.000	0.000	0.325	0.325
LTE Band 2	Bottom Face at 25mm	0.151	0.344	0.089	0.495	0.240
	Edge 3 at 9mm	0.157	0.000	0.000	0.157	0.157
	Curved surface of Edge 3 at 9mm	0.165	0.000	0.000	0.165	0.165
	Bottom Face at 0mm	1.026	0.344	0.089	1.370	1.115
	Edge 1 at 0mm	0.000	0.259	0.089	0.259	0.089
	Edge 2 at 0mm	0.083	0.151	0.089	0.234	0.172
	Edge 3 at 0mm	0.480	0.000	0.000	0.480	0.480
	Edge 4 at 0mm	0.476	0.000	0.000	0.476	0.476
	Curved surface of Edge 3 at 0mm	0.578	0.000	0.000	0.578	0.578
LTE Band 4	Bottom Face at 25mm	0.297	0.344	0.089	0.641	0.386
	Edge 3 at 9mm	0.194	0.000	0.000	0.194	0.194
	Curved surface of Edge 3 at 9mm	0.219	0.000	0.000	0.219	0.219
	Bottom Face at 0mm	0.629	0.344	0.089	0.973	0.718
	Edge 1 at 0mm	0.000	0.259	0.089	0.259	0.089
	Edge 2 at 0mm	0.054	0.151	0.089	0.205	0.143
	Edge 3 at 0mm	0.337	0.000	0.000	0.337	0.337
	Edge 4 at 0mm	0.453	0.000	0.000	0.453	0.453
	Curved surface of Edge 3 at 0mm	0.366	0.000	0.000	0.366	0.366
LTE Band 5	Bottom Face at 25mm	0.153	0.344	0.089	0.497	0.242
	Edge 3 at 9mm	0.286	0.000	0.000	0.286	0.286
	Curved surface of Edge 3 at 9mm	0.434	0.000	0.000	0.434	0.434
	Bottom Face at 0mm	0.771	0.344	0.089	1.115	0.860

	Edge 1 at 0mm	0.000	0.259	0.089	0.259	0.089
	Edge 2 at 0mm	0.281	0.151	0.089	0.432	0.370
	Edge 3 at 0mm	0.471	0.000	0.000	0.471	0.471
	Edge 4 at 0mm	0.195	0.000	0.000	0.195	0.195
	Curved surface of Edge 3 at 0mm	0.413	0.000	0.000	0.413	0.413
LTE Band 7	Bottom Face at 25mm	0.701	0.344	0.089	1.045	0.790
	Edge 3 at 9mm	0.264	0.000	0.000	0.264	0.264
	Curved surface of Edge 3 at 9mm	0.369	0.000	0.000	0.369	0.369
	Bottom Face at 0mm	1.165	0.344	0.089	1.509	1.254
	Edge 1 at 0mm	0.000	0.259	0.089	0.259	0.089
	Edge 2 at 0mm	0.088	0.151	0.089	0.239	0.177
	Edge 3 at 0mm	0.760	0.000	0.000	0.760	0.760
	Edge 4 at 0mm	0.362	0.000	0.000	0.362	0.362
	Curved surface of Edge 3 at 0mm	0.942	0.000	0.000	0.942	0.942
LTE Band 12	Bottom Face at 25mm	0.082	0.344	0.089	0.426	0.171
	Edge 3 at 9mm	0.122	0.000	0.000	0.122	0.122
	Curved surface of Edge 3 at 9mm	0.182	0.000	0.000	0.182	0.182
	Bottom Face at 0mm	0.881	0.344	0.089	1.225	0.970
	Edge 1 at 0mm	0.000	0.259	0.089	0.259	0.089
	Edge 2 at 0mm	0.256	0.151	0.089	0.407	0.345
	Edge 3 at 0mm	0.678	0.000	0.000	0.678	0.678
	Edge 4 at 0mm	0.081	0.000	0.000	0.081	0.081
	Curved surface of Edge 3 at 0mm	0.630	0.000	0.000	0.630	0.630
LTE Band 66	Bottom Face at 25mm	0.431	0.344	0.089	0.775	0.520
	Edge 3 at 9mm	0.169	0.000	0.000	0.169	0.169
	Curved surface of Edge 3 at 9mm	0.173	0.000	0.000	0.173	0.173
	Bottom Face at 0mm	0.597	0.344	0.089	0.941	0.686
	Edge 1 at 0mm	0.000	0.259	0.089	0.259	0.089
	Edge 2 at 0mm	0.073	0.151	0.089	0.224	0.162
	Edge 3 at 0mm	0.323	0.000	0.000	0.323	0.323
	Edge 4 at 0mm	0.519	0.000	0.000	0.519	0.519
	Curved surface of Edge 3 at 0mm	0.390	0.000	0.000	0.390	0.390

17 Measurement Uncertainty

The component of uncertainly may generally be categorized according to the methods used to evaluate them. The evaluation of uncertainly by the statistical analysis of a series of observations is termed a Type A evaluation of uncertainty. The evaluation of uncertainty by means other than the statistical analysis of a series of observation is termed a Type B evaluation of uncertainty. Each component of uncertainty, however evaluated, is represented by an estimated standard deviation, termed standard uncertainty, which is determined by the positive square root of the estimated variance.

A Type A evaluation of standard uncertainty may be based on any valid statistical method for treating data. This includes calculating the standard deviation of the mean of a series of independent observations; using the method of least squares to fit a curve to the data in order to estimate the parameter of the curve and their standard deviations; or carrying out an analysis of variance in order to identify and quantify random effects in certain kinds of measurement.

A Type B evaluation of standard uncertainty is typically based on scientific judgment using all of the relevant information available. These may include previous measurement data, experience, and knowledge of the behavior and properties of relevant materials and instruments, manufacture's specification, data provided in calibration reports and uncertainties assigned to reference data taken from handbooks. Broadly speaking, the uncertainty is either obtained from an outdoor source or obtained from an assumed distribution, such as the normal distribution, rectangular or triangular distributions indicated in below Table.

Uncertainty Distributions	Normal	Rectangular	Triangular	U-Shape
Multi-plying Factor	1/k(b)	$1/\sqrt{3}$	$1/\sqrt{6}$	$1/\sqrt{2}$

Standard Uncertainty for Assumed Distribution

The combined standard uncertainty of the measurement result represents the estimated standard deviation of the result. It is obtained by combining the individual standard uncertainties of both Type A and Type B evaluation using the usual "root-sum-squares" (RSS) methods of combining standard deviations by taking the positive square root of the estimated variances.

Expanded uncertainty is a measure of uncertainty that defines an interval about the measurement result within which the measured value is confidently believed to lie. It is obtained by multiplying the combined standard uncertainty by a coverage factor. Typically, the coverage factor ranges from 2 to 3. Using a coverage factor allows the true value of a measured quantity to be specified with a defined probability within the specified uncertainty range. For purpose of this document, a coverage factor two is used, which corresponds to confidence interval of about 95 %. The SATIMO uncertainty Budget is shown in the following tables.

17.1 Uncertainty Evaluation For Handset SAR Test

a	b	c	d	e= f(d,k)	f	g	h= c*f/e	i= c*g/e	j
Uncertainty Component	Sec.	Tol (+- %)	Prob. Dist.	Div.	Ci (1g)	Ci (10g)	1g Ui (+-%)	10g Ui (+-%)	Vi
Measurement System									
Probe calibration	E.2.1	5.83	N	1	1	1	5.83	5.83	∞
Axial Isotropy	E.2.2	3.5	R	$\sqrt{3}$	1	1	2.02	2.02	∞
Hemispherical Isotropy	E.2.2	5.9	R	$\sqrt{3}$	1	1	3.41	3.41	∞
Boundary effect	E.2.3	1.0	R	$\sqrt{3}$	1	1	0.58	0.58	∞
Linearity	E.2.4	4.7	R	$\sqrt{3}$	1	1	2.71	2.71	∞
System detection limits	E.2.5	1.0	R	$\sqrt{3}$	1	1	0.58	0.58	∞
Modulation Response	E.2.4	4.1	R	$\sqrt{3}$	1	1	2.4	2.4	∞
Readout Electronics	E.2.6	0.5	N	1	1	1	0.5	0.5	∞
Reponse Time	E.2.7	3.0	R	$\sqrt{3}$	1	1	3.0	3.0	∞
Integration Time	E.2.8	1.4	R	$\sqrt{3}$	1	1	0.81	0.81	∞
RF ambient Conditions	E.6.1	3.0	R	$\sqrt{3}$	1	1	1.73	1.73	∞
Probe positioner	E.6.2	1.4	R	$\sqrt{3}$	1	1	0.81	0.81	∞
Probe positioning with respect to Phantom Shell	E.6.3	1.4	R	$\sqrt{3}$	1	1	0.81	0.81	∞
Extrapolation, interpolation and integration Algoritms for Max. SAR Evaluation	E.5.2	2.3	R	$\sqrt{3}$	1	1	1.33	1.33	∞
Test sample Related									
Test sample positioning	E.4.2.1	2.6	N	1	1	1	2.6	2.6	N-1
Device Holder Uncertainty	E.4.1.1	3.0	N	1	1	1	3.0	3.0	N-1
Output power Power drift - SAR drift measurement	6.6.2	5.0	R	$\sqrt{3}$	1	1	2.89	2.89	∞
Phantom and Tissue Parameters									
Phantom Uncertainty (Shape and thickness tolerances)	E.3.1	4.0	R	$\sqrt{3}$	1	1	2.31	2.31	∞

Liquid conductivity - deviation from target value	E.3.2	2.0	R	$\sqrt{3}$	0.64	0.43	1.69	1.13	∞
Liquid conductivity - measurement uncertainty	E.3.3	2.5	N	1	0.64	0.43	3.20	2.15	M
Liquid permittivity - deviation from target value	E.3.2	2.5	R	$\sqrt{3}$	0.6	0.49	1.28	1.04	∞
Liquid permittivity - measurement uncertainty	E.3.3	5.0	N	1	0.6	0.49	6.00	4.90	M
Liquid conductivity –temperature uncertainty	E.3.4		R	$\sqrt{3}$	0.78	0.41			∞
Liquid permittivity –temperature uncertainty	E.3.4		R	$\sqrt{3}$	0.23	0.26			∞
Combined Standard Uncertainty			RSS				11.55	12.07	
Expanded Uncertainty (95% Confidence interval)			K=2				±23.20	±24.17	

17.2 Uncertainty For System Performance Check

a	b	c	d	e= f(d,k)	f	g	h= c*f/e	i= c*g/e	k
Uncertainty Component	Sec.	Tol (+- %)	Prob. Dist.	Div.	Ci (1g)	Ci (10g)	1g Ui (+-%)	10g Ui (+-%)	Vi
Measurement System									
Probe calibration	E.2.1	4.76	N	1	1	1	4.76	4.76	∞
Axial Isotropy	E.2.2	2.5	R	$\sqrt{3}$	1	1	1.44	1.41	∞
Hemispherical Isotropy	E.2.2	4.0	R	$\sqrt{3}$	1	1	2.31	2.32	∞
Boundary effect	E.2.3	1.0	R	$\sqrt{3}$	1	1	0.58	0.58	∞
Linearity	E.2.4	5.0	R	$\sqrt{3}$	1	1	2.89	2.89	∞
System detection limits	E.2.5	1.0	R	$\sqrt{3}$	1	1	0.58	0.58	∞
Readout Electronics	E.2.6	0.02	N	1	1	1	0.02	0.02	∞
Reponse Time	E.2.7	3.0	R	$\sqrt{3}$	1	1	1.73	1.73	∞
Integration Time	E.2.8	2.0	R	$\sqrt{3}$	1	1	1.15	1.15	∞
RF ambient Conditions	E.6.1	3.0	R	$\sqrt{3}$	1	1	1.73	1.73	∞
Probe positioner Mechanical Tolerance	E.6.2	2.0	R	$\sqrt{3}$	1	1	1.15	1.15	∞
Probe positioning with respect to Phantom Shell	E.6.3	0.05	R	$\sqrt{3}$	1	1	0.03	0.03	∞
Extrapolation, interpolation and integration Algoritms for Max. SAR Evaluation	E.5.2	5.0	R	$\sqrt{3}$	1	1	2.89	2.89	∞
Dipole									
Dipole axis to liquid Distance	8,E.4.2	1.00	N	$\sqrt{3}$	1	1	0.58	0.58	∞
Input power and SAR drift measurement	8,6.6.2	4.04	R	$\sqrt{3}$	1	1	2.33	2.33	∞
Phantom and Tissue Parameters									
Phantom Uncertainty (Shape and thickness tolerances)	E.3.1	0.05	R	$\sqrt{3}$	1	1	0.03	0.03	∞
Liquid conductivity - deviation from target value	E.3.2	4.57	R	$\sqrt{3}$	0.64	0.43	1.69	1.13	∞
Liquid conductivity - measurement uncertainty	E.3.3	5.00	N	$\sqrt{3}$	0.64	0.43	1.85	1.24	M

Liquid permittivity - deviation from target value	E.3.2	3.69	R	$\sqrt{3}$	0.6	0.49	1.28	1.04	∞
Liquid permittivity - measurement uncertainty	E.3.3	10.00	N	$\sqrt{3}$	0.6	0.49	3.46	2.83	M
CombinedStandard Uncertainty			RSS				8.83	8.37	
Expanded Uncertainty (95% Confidence interval)			K=2				17.66	16.73	

18 Measurement Conclusion

The SAR evaluation indicates that the EUT complies with the RF radiation exposure limits of FCC, with respect to all parameters subject to this test. These measurements were taken to simulate the RF effects of RF exposure under worst-case conditions. Precise laboratory measures were taken to assure repeatability of the tests. The results and statements relate only to the item(s) tested. Please note that the absorption and distribution of electromagnetic energy in the body are very complex phenomena that depend on the mass, shape, and size of the body, the orientation of the body with respect to the field vectors, and the electrical properties of both the body and the environment. Other variables that may play a substantial role in possible biological effects are those that characterize the environment (e.g. ambient temperature, air velocity, relative humidity, and body insulation) and those that characterize the individual (e.g. age, gender, activity level, debilitation, or disease). Because various factors may interact with one another to vary the specific biological outcome of an exposure to electromagnetic fields, any protection guide should consider maximal amplification of biological effects as a result of field-body interactions, environmental conditions, and physiological variables.

Annex A General Information

1. Identification of the Responsible Testing Laboratory

Laboratory Name:	Shenzhen Morlab Communications Technology Co., Ltd.
Laboratory Address:	FL.1-3, Building A, FeiYang Science Park, No.8 LongChang Road, Block 67, BaoAn District, ShenZhen, GuangDong Province, P. R. China
Telephone:	+86 755 36698555
Facsimile:	+86 755 36698525

2. Identification of the Responsible Testing Location

Name:	Shenzhen Morlab Communications Technology Co., Ltd.
Address:	FL.1-3, Building A, FeiYang Science Park, No.8 LongChang Road, Block 67, BaoAn District, ShenZhen, GuangDong Province, P. R. China

3. Facilities and Accreditations

The FCC designation number is CN1192, the test firm registration number is 226174.

Note:

The main report is end here and the other Annex (B,C,D,E,F) will be submitted separately.

****** END OF MAIN REPORT ******