FCC SAR TEST REPORT

FCC ID	:	**ZMOFB520**
Equipment	:	**CAT-M module**
Brand Name	:	**Fibocom**
Model Name	:	**FB520**
Applicant	:	**Fibocom Wireless Inc 1101, Tower A, Building 6, Shenzhen International Innovation Valley, Dashi 1st Rd, Nanshan, Shenzhen, China**
Manufacturer	:	**Fibocom Wireless Inc 1101, Tower A, Building 6, Shenzhen International Innovation Valley, Dashi 1st Rd, Nanshan, Shenzhen, China**
Standard	:	**FCC 47 CFR Part 2 (2.1093)**

The product was installed into Notebook Computer (Brand Name: HP, Model Name: HSN-I59C) during test.

The product was received on Dec. 30, 2022 and testing was started from Dec. 31, 2022 and completed on Jan. 19, 2023. We, SPORTON INTERNATIONAL INC., would like to declare that the tested sample provide by manufacturer and the test data has been evaluated in accordance with the test procedures given in 47 CFR Part 2.1093 and FCC KDB and has been pass the FCC requirement.

The test results in this report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL INC. Laboratory, the test report shall not be reproduced except in full.

Approved by: Cona Huang / Deputy Manager

Sporton International Inc. Wensan Laboratory
No.58, Aly. 75, Ln. 564, Wenhua 3rd, Rd., Guishan Dist., Taoyuan City 333010, Taiwan

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History of this test report

Report No.	Version	Description	Issued Date
FA2N1807	01	Initial issue of report	Jan. 30, 2023
FA2N1807	02	Update section 1, 3.2, 10 and 12	Feb. 06, 2023

1. Statement of Compliance

The maximum results of Specific Absorption Rate (SAR) for Fibocom Wireless Inc, CAT-M module, FB520, are as follows.

Equipment Class	Frequency Band		Highest SAR Summary Body (Separation 0mm) 1g SAR (W/kg)	Highest Simultaneous Transmission 1g SAR (W/kg)
Licensed	GSM	GSM850	1.05	1.46
		GSM1900	1.07	
	LTE	LTE Band 12	0.22	
		LTE Band 13	0.20	
		LTE Band 14	0.17	
		LTE Band 2 / 25	0.96	
		LTE Band 5 / 26	0.23	
		LTE Band 4 / 66	1.02	
		LTE Band 85	0.19	
Date of Testing:			2022/12/31 ~ 2023/01/19	

Sporton Lab is accredited to ISO 17025 by Taiwan Accreditation Foundation and the FCC designation No. TW3786 under the FCC 2.948(e) by Mutual Recognition Agreement (MRA) in FCC test. This device is in compliance with Specific Absorption Rate (SAR) for general population/uncontrolled exposure limits (1.6 W/kg for Partial-Body 1g SAR) specified in FCC 47 CFR part 2 (2.1093) and ANSI/IEEE C95.1-1992, and had been tested in accordance with the measurement methods and procedures specified in IEEE 1528-2013 and FCC KDB publications.

Reviewed by: Jason Wang
Report Producer: Paula Chen

2. Guidance Applied

The Specific Absorption Rate (SAR) testing specification, method, and procedure for this device is in accordance with the following standards, the below KDB standard may not including in the TAF code without accreditation.

- FCC 47 CFR Part 2 (2.1093)
- ANSI/IEEE C95.1-1992
- IEEE 1528-2013
- FCC KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz v01r04
- FCC KDB 865664 D02 SAR Reporting v01r02
- FCC KDB 447498 D01 General RF Exposure Guidance v06
- FCC KDB 616217 D04 SAR for laptop and tablets v01r02
- FCC KDB 941225 D01 3G SAR Procedures v03r01
- FCC KDB 941225 D05 SAR for LTE Devices v02r05

3. Equipment Under Test (EUT) Information

3.1 General Information

Product Feature & Specification	
Equipment Name	CAT-M module
Brand Name	Fibocom
Model Name	FB520
FCC ID	ZMOFB520
Wireless Technology and Frequency Range	GSM850: 824.2 MHz ~ 848.8 MHz GSM1900: 1850.2 MHz ~ 1909.8 MHz LTE Band 2: 1850 MHz ~ 1910 MHz LTE Band 4: 1710 MHz ~ 1755 MHz LTE Band 5: 824 MHz ~ 849 MHz LTE Band 12: 699 MHz ~ 716 MHz LTE Band 13: 777 MHz ~ 787 MHz LTE Band 14: 788 MHz ~ 798 MHz LTE Band 25: 1850 MHz ~ 1915 MHz LTE Band 26: 814 MHz ~ 849 MHz LTE Band 66: 1710 MHz ~ 1780 MHz LTE Band 85: 698 MHz ~ 716 MHz
Mode	GSM/GPRS/EGPRS LTE: QPSK, 16QAM

Host Information	
Equipment Name	Notebook Computer
Brand Name	HP
Model Name	HSN-I59C
Integrated WLAN Module	Brand Name: Intel Model Name: AX211D2W
Integrated NFC Module	Brand Name: WNC Model Name: XRAV-1
Wireless Technology and Frequency Range	WLAN 2.4 GHz Band: 2400 MHz ~ 2483.5 MHz WLAN 5.2 GHz Band: 5150 MHz ~ 5250 MHz WLAN 5.3 GHz Band: 5250 MHz ~ 5350 MHz WLAN 5.6 GHz Band: 5470 MHz ~ 5725 MHz WLAN 5.8 GHz Band: 5725 MHz ~ 5850 MHz WLAN 6GHz: 5925 MHz ~ 6425 MHz, 6425 MHz ~ 6525 MHz, 6525 MHz ~ 6875 MHz, 6875 MHz ~ 7125 MHz Bluetooth: 2400 MHz ~ 2483.5 MHz NFC : 13.56 MHz
Mode	WLAN: 802.11a/b/g/n/ac/ax HT20/HT40/VHT20/VHT40/VHT80/VHT160/HE20/HE40/HE80/HE160 Bluetooth BR/EDR/LE NFC: ASK
EUT Stage	Production Unit

Remark:

1. The Intel AX211D2W WLAN/BT module is integrated into this host. The WLAN 2.4GHz/5GHz SAR result is referenced from Intel SAR report, report No.:201120-03.TR07 / 210325-01.TR27 (FCC ID: PD9AX211D2), WLAN 6GHz SAR result refers to report No.:201120-03.TR40 (FCC ID: PD9AX211D2) and these SAR results are also used to perform simultaneous transmission analysis.
2. This device has two antenna vendors, RF exposure evaluation selects Vendor 2 as the main test, Vendor 1 will spot check worst case found in Vendor 2.

Antenna Information									
Vendor 1 (Ant5 TX/RX) 6036B0303501 (81EABL15.G31)	Ant. Type	PIFA	Peak Gain	GSM850:-2.53 GSM1900:-0.49	Vendor 1 (Ant5 TX/RX) 6036B0303501 (81EABL15.G31)	Ant. Type	PIFA	Peak Gain	LTE Band 2: -0.49 LTE Band 4: 0.08 LTE Band 5: -2.53 LTE Band 12: 0.11 LTE Band 13: -2.05 LTE Band 14: -2.08 LTE Band 25: -0.49 LTE Band 26: -2.41 LTE Band 66: 0.11 LTE Band 85: 0.11
Vendor 2 (Ant5 TX/RX) 6036B0305001 (00-2602748450)	Ant. Type	PIFA	Peak Gain	GSM850:-1.74 GSM1900:0.93	Vendor 2 (Ant5 TX/RX) 6036B0305001 (00-2602748450)	Ant. Type	PIFA	Peak Gain	LTE Band 2: 0.93 LTE Band 4: 1.26 LTE Band 5:-1.74 LTE Band 12: -0.72 LTE Band 13: -1.47 LTE Band 14: -2.85 LTE Band 25: 0.93 LTE Band 26: -1.74 LTE Band 66: 1.26 LTE Band 85: -2.35

3.2 General LTE SAR Test and Reporting Considerations

Summarized necessary items addressed in KDB 941225 D05 v02r05	
FCC ID	ZMOFB520
Equipment Name	CAT-M module
Operating Frequency Range of each LTE transmission band	LTE Band 2: 1850 MHz ~ 1910 MHz LTE Band 4: 1710 MHz ~ 1755 MHz LTE Band 5: 824 MHz ~ 849 MHz LTE Band 12: 699 MHz ~ 716 MHz LTE Band 13: 777 MHz ~ 787 MHz LTE Band 14: 788 MHz ~ 798 MHz LTE Band 25: 1850 MHz ~ 1915 MHz LTE Band 26: 814 MHz ~ 849 MHz LTE Band 66: 1710 MHz ~ 1780 MHz LTE Band 85: 698 MHz ~ 716 MHz
Channel Bandwidth	LTE Band 2:1.4MHz, 3MHz, 5MHz LTE Band 4:1.4MHz, 3MHz, 5MHz LTE Band 5:1.4MHz, 3MHz, 5MHz LTE Band 12:1.4MHz, 3MHz, 5MHz LTE Band 13: 5MHz LTE Band 14: 5MHz LTE Band 25:1.4MHz, 3MHz, 5MHz LTE Band 26:1.4MHz, 3MHz, 5MHz LTE Band 66:1.4MHz, 3MHz, 5MHz LTE Band 85: 5MHz
uplink modulations used	QPSK / 16QAM
LTE Voice / Data requirements	Data only
LTE MPR permanently built-in by design	**Table 6.2.3-1: Maximum Power Reduction (MPR) for Power Class 1, 2 and 3**

Modulation	Channel bandwidth / Transmission bandwidth (N_{RB})						MPR (dB)
	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz	
QPSK	> 5	> 4	> 8	> 12	> 16	> 18	≤ 1
16 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	≤ 1
16 QAM	> 5	> 4	> 8	> 12	> 16	> 18	≤ 2
64 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	≤ 2
64 QAM	> 5	> 4	> 8	> 12	> 16	> 18	≤ 3
256 QAM	≥ 1						≤ 5

LTE A-MPR	In the base station simulator configuration, Network Setting value is set to NS_01 to disable A-MPR during SAR testing and the LTE SAR tests was transmitting on all TTI frames (Maximum TTI)
Spectrum plots for RB configuration	A properly configured base station simulator was used for the SAR and power measurement; therefore, spectrum plots for each RB allocation and offset configuration are not included in the SAR report.

Transmission (H, M, L) channel numbers and frequencies in each LTE band

LTE Band 2

	Bandwidth 1.4 MHz		Bandwidth 3 MHz		Bandwidth 5 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	18607	1850.7	18615	1851.5	18625	1852.5
M	18900	1880	18900	1880	18900	1880
H	19193	1909.3	19185	1908.5	19175	1907.5

LTE Band 4

	Bandwidth 1.4 MHz		Bandwidth 3 MHz		Bandwidth 5 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	19957	1710.7	19965	1711.5	19975	1712.5
M	20175	1732.5	20175	1732.5	20175	1732.5
H	20393	1754.3	20385	1753.5	20375	1752.5

LTE Band 5						
	Bandwidth 1.4 MHz		Bandwidth 3 MHz		Bandwidth 5 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	20407	824.7	20415	825.5	20425	826.5
M	20525	836.5	20525	836.5	20525	836.5
H	20643	848.3	20635	847.5	20625	846.5
LTE Band 12						
	Bandwidth 1.4 MHz		Bandwidth 3 MHz		Bandwidth 5 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	23017	699.7	23025	700.5	23035	701.5
M	23095	707.5	23095	707.5	23095	707.5
H	23173	715.3	23165	714.5	23155	713.5
LTE Band 13						
	Bandwidth 5 MHz					
	Channel #		Freq.(MHz)			
L	23205		779.5			
M	23230		782			
H	23255		784.5			
LTE Band 14						
	Bandwidth 5 MHz					
	Channel #		Channel #			
L	23305		790.5			
M	23330		793			
H	23355		795.5			
LTE Band 25						
	Bandwidth 1.4 MHz		Bandwidth 3 MHz		Bandwidth 5 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	26047	1850.7	26055	1851.5	26065	1852.5
M	26340	1880	26340	1880	26340	1880
H	26683	1914.3	26675	1913.5	26665	1912.5
LTE Band 26						
	Bandwidth 1.4 MHz		Bandwidth 3 MHz		Bandwidth 5 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	26697	814.7	26705	815.5	26715	816.5
M	26865	831.5	26865	831.5	26865	831.5
H	27033	848.3	27025	847.5	27015	846.5
LTE Band 66						
	Bandwidth 1.4 MHz		Bandwidth 3 MHz		Bandwidth 5 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	131979	1710.7	131987	1711.5	131997	1712.5
M	132322	1745	132322	1745	132322	1745
H	132665	1779.3	132657	1778.5	132647	1777.5
LTE Band 85						
	Bandwidth 5 MHz					
	Channel #		Channel #			
L	134027		700.5			
M	134092		707			
H	134157		713.5			

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. The 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 Occupational/Controlled Exposure (W/kg)

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

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

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

1. 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. Specific Absorption Rate (SAR)

5.1 Introduction

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

5.2 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:

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

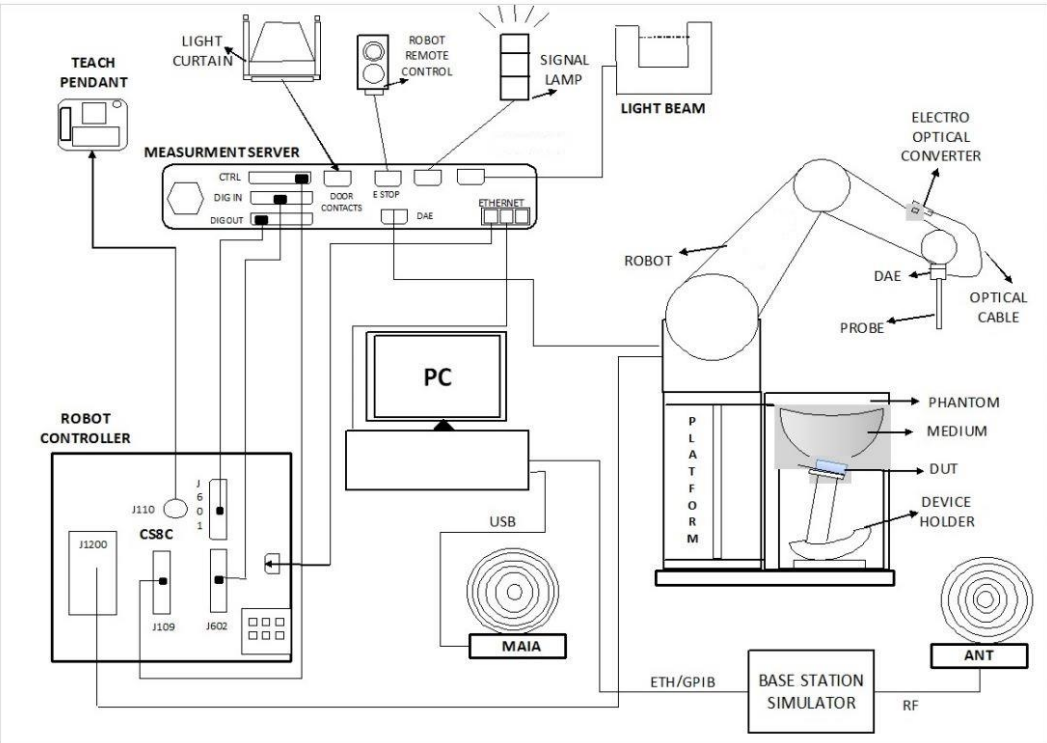
SAR is expressed in units of Watts per kilogram (W/kg)

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

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

6. System Description and Setup

The DASY system used for performing compliance tests consists of the following items:



- The DASY system in SAR Configuration is shown above
- A standard high precision 6-axis robot with controller, teach pendant and software. An arm extension for accommodating the data acquisition electronics (DAE).
- An isotropic Field probe optimized and calibrated for the targeted measurement.
- A data acquisition electronics (DAE) which performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.
- The Electro-optical converter (EOC) performs the conversion from optical to electrical signals for the digital communication to the DAE. To use optical surface detection, a special version of the EOC is required. The EOC signal is transmitted to the measurement server.
- The function of the measurement server is to perform the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
- The Light Beam used is for probe alignment. This improves the (absolute) accuracy of the probe positioning.
- A computer running windows software and the DASY software.
- Remote control and teach pendant as well as additional circuitry for robot safety such as warning lamps, etc.
- The phantom, the device holder and other accessories according to the targeted measurement.

6.1 Test Site Location

The SAR measurement facilities used to collect data are within both Sporton Lab list below test site location are accredited to ISO 17025 by Taiwan Accreditation Foundation (TAF code: 1190 and 3786) and the FCC designation No. TW1190 and TW3786 under the FCC 2.948(e) by Mutual Recognition Agreement (MRA) in FCC test.

Test Site	EMC & Wireless Communications Laboratory		Wensan Laboratory		
Test Site Location	TW1190 No.52, Huaya 1st Rd., Guishan Dist., Taoyuan City 333, Taiwan		TW3786 No.58, Aly. 75, Ln. 564, Wenhua 3rd, Rd., Guishan Dist., Taoyuan City 333010, Taiwan		
Test Site No.	SAR01-HY	SAR03-HY	SAR08-HY	SAR09-HY	SAR15-HY
	SAR04-HY	SAR05-HY	SAR11-HY	SAR12-HY	SAR16-HY
	SAR06-HY	SAR10-HY	SAR13-HY	SAR14-HY	SAR17-HY

6.2 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.

<ES3DV3 Probe>

Construction	Symmetric design with triangular core Interleaved sensors Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)	
Frequency	10 MHz – 4 GHz; Linearity: ±0.2 dB (30 MHz – 4 GHz)	
Directivity	±0.2 dB in TSL (rotation around probe axis) ±0.3 dB in TSL (rotation normal to probe axis)	
Dynamic Range	5 µW/g – >100 mW/g; Linearity: ±0.2 dB	
Dimensions	Overall length: 337 mm (tip: 20 mm) Tip diameter: 3.9 mm (body: 12 mm) Distance from probe tip to dipole centers: 3.0 mm	

<EX3DV4 Probe>

Construction	Symmetric design with triangular core Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)	
Frequency	10 MHz – >6 GHz Linearity: ±0.2 dB (30 MHz – 6 GHz)	
Directivity	±0.3 dB in TSL (rotation around probe axis) ±0.5 dB in TSL (rotation normal to probe axis)	
Dynamic Range	10 µW/g – >100 mW/g Linearity: ±0.2 dB (noise: typically <1 µW/g)	
Dimensions	Overall length: 337 mm (tip: 20 mm) Tip diameter: 2.5 mm (body: 12 mm) Typical distance from probe tip to dipole centers: 1 mm	

6.3 Data Acquisition Electronics (DAE)

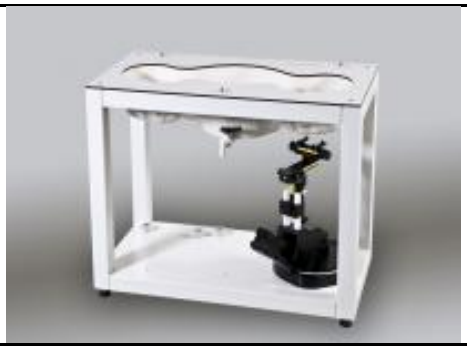
The data acquisition electronics (DAE) consists of a highly sensitive electrometer-grade preamplifier with auto-zeroing, a channel and gain-switching multiplexer, a fast 16 bit AD-converter and a command decoder and control logic unit. Transmission to the measurement server is accomplished through an 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 5.1 Photo of DAE

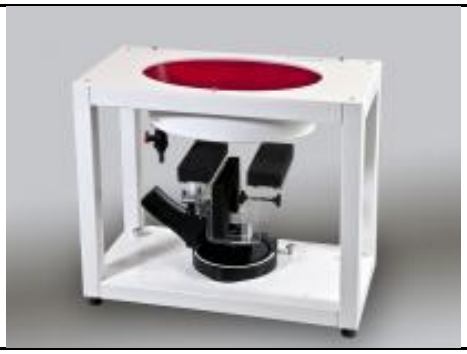
6.4 Phantom

<SAM Twin Phantom>

Shell Thickness	2 ± 0.2 mm; Center ear point: 6 ± 0.2 mm	
Filling Volume	Approx. 25 liters	
Dimensions	Length: 1000 mm; Width: 500 mm; Height: adjustable feet	
Measurement Areas	Left Hand, Right Hand, Flat 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.

<ELI Phantom>

Shell Thickness	2 ± 0.2 mm (sagging: <1%)	
Filling Volume	Approx. 30 liters	
Dimensions	Major ellipse axis: 600 mm Minor axis: 400 mm	

The ELI phantom is intended for compliance testing of handheld and body-mounted wireless devices in the frequency range of 30 MHz to 6 GHz. ELI4 is fully compatible with standard and all known tissue simulating liquids.

6.5 Device Holder

<Mounting Device for Hand-Held Transmitter>

In combination with the Twin SAM V5.0/V5.0c or ELI phantoms, the Mounting Device for Hand-Held Transmitters enables rotation of the mounted transmitter device to specified spherical coordinates. At the heads, the rotation axis is at the ear opening. Transmitter devices can be easily and accurately positioned according to IEC 62209-1, IEEE 1528, FCC, or other specifications. The device holder can be locked for positioning at different phantom sections (left head, right head, flat). And upgrade kit to Mounting Device to enable easy mounting of wider devices like big smart-phones, e-books, small tablets, etc. It holds devices with width up to 140 mm.

Mounting Device for Hand-Held Transmitters

Mounting Device Adaptor for Wide-Phones

<Mounting Device for Laptops and other Body-Worn Transmitters>

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.

Mounting Device for Laptops

7. Measurement Procedures

The measurement procedures are as follows:

(a) 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.
(b) Place the EUT in the positions as Appendix D demonstrates.
(c) Set scan area, grid size and other setting on the DASY software.
(d) Measure SAR results for the highest power channel on each testing position.
(e) Find out the largest SAR result on these testing positions of each band
(f) Measure SAR results for other channels in worst SAR testing position if the reported SAR of highest power channel is larger than 0.8 W/kg

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

(a) Power reference measurement
(b) Area scan
(c) Zoom scan
(d) Power drift measurement

7.1 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 10g cubes with the highest averaged SAR values. For that purpose, the center of the measured volume is aligned to the interpolated peak SAR value of a previously performed area scan.

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

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

7.2 Power Reference Measurement

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

7.3 Area Scan

The area scan is used as a fast scan in two dimensions to find the area of high field values, before doing a fine measurement around the hot spot. The sophisticated interpolation routines implemented in DASY software can find the maximum found in the scanned area, within a range of the global maximum. The range (in dB0 is specified in the standards for compliance testing. For example, a 2 dB range is required in IEEE standard 1528 and IEC 62209 standards, whereby 3 dB is a requirement when compliance is assessed in accordance with the ARIB standard (Japan), if only one zoom scan follows the area scan, then only the absolute maximum will be taken as reference. For cases where multiple maximums are detected, the number of zoom scans has to be increased accordingly.

Area scan parameters extracted from FCC KDB 865664 D01v01r04 SAR measurement 100 MHz to 6 GHz.

	≤ 3 GHz	> 3 GHz
Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface	5 ± 1 mm	½·δ·ln(2) ± 0.5 mm
Maximum probe angle from probe axis to phantom surface normal at the measurement location	30° ± 1°	20° ± 1°
Maximum area scan spatial resolution: Δx_{Area}, Δy_{Area}	≤ 2 GHz: ≤ 15 mm 2 – 3 GHz: ≤ 12 mm	3 – 4 GHz: ≤ 12 mm 4 – 6 GHz: ≤ 10 mm
	When the x or y dimension of the test device, in the measurement plane orientation, is smaller than the above, the measurement resolution must be ≤ the corresponding x or y dimension of the test device with at least one measurement point on the test device.	

7.4 Zoom Scan

Zoom scans are used assess the peak spatial SAR values within a cubic averaging volume containing 1 gram and 10 gram of simulated tissue. The zoom scan measures points (refer to table below) within a cube shoes base faces are centered on the maxima found in a preceding area scan job within the same procedure. When the measurement is done, the zoom scan evaluates the averaged SAR for 1 gram and 10 gram and displays these values next to the job's label.

Zoom scan parameters extracted from FCC KDB 865664 D01v01r04 SAR measurement 100 MHz to 6 GHz.

			≤ 3 GHz	> 3 GHz
Maximum zoom scan spatial resolution: Δx_{Zoom}, Δy_{Zoom}			≤ 2 GHz: ≤ 8 mm 2 – 3 GHz: ≤ 5 mm*	3 – 4 GHz: ≤ 5 mm* 4 – 6 GHz: ≤ 4 mm*
Maximum zoom scan spatial resolution, normal to phantom surface	uniform grid: $\Delta z_{Zoom}(n)$		≤ 5 mm	3 – 4 GHz: ≤ 4 mm 4 – 5 GHz: ≤ 3 mm 5 – 6 GHz: ≤ 2 mm
	graded grid	$\Delta z_{Zoom}(1)$: between 1st two points closest to phantom surface	≤ 4 mm	3 – 4 GHz: ≤ 3 mm 4 – 5 GHz: ≤ 2.5 mm 5 – 6 GHz: ≤ 2 mm
		$\Delta z_{Zoom}(n>1)$: between subsequent points	$\leq 1.5 \cdot \Delta z_{Zoom}(n-1)$	
Minimum zoom scan volume	x, y, z		≥ 30 mm	3 – 4 GHz: ≥ 28 mm 4 – 5 GHz: ≥ 25 mm 5 – 6 GHz: ≥ 22 mm

Note: δ is the penetration depth of a plane-wave at normal incidence to the tissue medium; see draft standard IEEE P1528-2011 for details.

* When zoom scan is required and the *reported* SAR from the *area scan based 1-g SAR estimation* procedures of KDB 447498 is ≤ 1.4 W/kg, ≤ 8 mm, ≤ 7 mm and ≤ 5 mm zoom scan resolution may be applied, respectively, for 2 GHz to 3 GHz, 3 GHz to 4 GHz and 4 GHz to 6 GHz.

7.5 Volume Scan Procedures

The volume scan is used for assess overlapping SAR distributions for antennas transmitting in different frequency bands. It is equivalent to an oversized zoom scan used in standalone measurements. The measurement volume will be used to enclose all the simultaneous transmitting antennas. For antennas transmitting simultaneously in different frequency bands, the volume scan is measured separately in each frequency band. In order to sum correctly to compute the 1g aggregate SAR, the EUT remain in the same test position for all measurements and all volume scan use the same spatial resolution and grid spacing. When all volume scan were completed, the software, SEMCAD postprocessor can combine and subsequently superpose these measurement data to calculating the multiband SAR.

7.6 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.

8. Test Equipment List

Manufacturer	Name of Equipment	Type/Model	Serial Number	Calibration	
				Last Cal.	Due Date
SPEAG	750MHz System Validation Kit(2)	D750V3	1012	Aug. 18, 2021	Aug. 16, 2023
SPEAG	835MHz System Validation Kit	D835V2	4d060	Mar. 24, 2022	Mar. 23, 2023
SPEAG	835MHz System Validation Kit	D835V2	4d167	Nov. 24, 2022	Nov. 23, 2023
SPEAG	1750MHz System Validation Kit	D1750V2	1112	Jun. 22, 2022	Jun. 21, 2023
SPEAG	1900MHz System Validation Kit	D1900V2	5d185	Jun. 17, 2022	Jun. 16, 2023
SPEAG	Data Acquisition Electronics	DAE4	699	Feb. 24, 2022	Feb. 23, 2023
SPEAG	Data Acquisition Electronics	DAE4	1647	Nov. 18, 2022	Nov. 17, 2023
SPEAG	Data Acquisition Electronics	DAE4	1694	Nov. 18, 2022	Nov. 17, 2023
SPEAG	Dosimetric E-Field Probe	ES3DV3	3169	May. 29, 2022	May. 28, 2023
SPEAG	Dosimetric E-Field Probe	EX3DV4	3931	Oct. 31, 2022	Oct. 30, 2023
SPEAG	Dosimetric E-Field Probe	EX3DV4	3976	Jan. 27, 2022	Jan. 26, 2023
Testo	Hygro meter	608-H1	45196600	Nov. 02, 2022	Nov. 01, 2023
Testo	Hygro meter	608-H1	45207528	Nov. 02, 2022	Nov. 01, 2023
RCPTWN	Thermometer	HTC-1	TM685-1	Jun. 27, 2022	Jun. 26, 2023
Anritsu	Radio Communication Analyzer	MT8821C	6201341950	Oct. 31, 2022	Oct. 30, 2023
Keysight	Wireless Communication Test Set	E5515C	MY50266977	May. 10, 2022	May. 09, 2023
SPEAG	Device Holder	N/A	N/A	N/A	N/A
Anritsu	Signal Generator	MG3710A	6201502524	Oct. 12, 2022	Oct. 11, 2023
Keysight	ENA Network Analyzer	E5071C	MY46104758	Sep. 22, 2022	Sep. 21, 2023
SPEAG	Dielectric Probe Kit	DAK-3.5	1126	Sep. 28, 2022	Sep. 27, 2023
LINE SEIKI	Digital Thermometer	DTM3000-spezial	2942	Oct. 31, 2022	Oct. 30, 2023
Anritsu	Power Meter	ML2495A	1419002	Aug. 16, 2022	Aug. 15, 2023
Anritsu	Power Sensor	MA2411B	1911176	Aug. 16, 2022	Aug. 15, 2023
Anritsu	Power Meter	ML2495A	1804003	Oct. 17, 2022	Oct. 16, 2023
Anritsu	Power Sensor	MA2411B	1726150	Oct. 17, 2022	Oct. 16, 2023
Anritsu	Spectrum Analyzer	MS2830A	6201396378	Jul. 21, 2022	Jul. 20, 2023
Agilent	Spectrum Analyzer	E4408B	MY44211028	Aug. 19, 2021	Aug. 17, 2023
Mini-Circuits	Power Amplifier	ZVE-8G+	6418	Oct. 14, 2022	Oct. 13, 2023
Mini-Circuits	Power Amplifier	ZVE-8G+	479102029	Sep. 15, 2022	Sep. 14, 2023
ATM	Dual Directional Coupler	C122H-10	P610410z-02	Note 1	
Warison	Directional Coupler	WCOU-10-50S-10	WR889BMC4B1	Note 1	
Woken	Attenuator 1	WK0602-XX	N/A	Note 1	
PE	Attenuator 2	PE7005-10	N/A	Note 1	
PE	Attenuator 3	PE7005- 3	N/A	Note 1	

General Note:

1. Prior to system verification and validation, the path loss from the signal generator to the system check source and the power meter, which includes the amplifier, cable, attenuator and directional coupler, was measured by the network analyzer. The reading of the power meter was offset by the path loss difference between the path to the power meter and the path to the system check source to monitor the actual power level fed to the system check source.
2. The dipole calibration interval can be extended to 3 years with justification according to KDB 865664 D01. The dipoles are also not physically damaged, or repaired during the interval. The justification data in appendix C can be found which the return loss is < -20dB, within 20% of prior calibration, the impedance is within 5 ohm of prior calibration for each dipole.

9. System Verification

9.1 Tissue Verification

The tissue dielectric parameters of tissue-equivalent media used for SAR measurements must be characterized within a temperature range of 18℃ to 25℃, measured with calibrated instruments and apparatuses, such as network analyzers and temperature probes. The temperature of the tissue-equivalent medium during SAR measurement must also be within 18℃ to 25℃ and within ± 2℃ of the temperature when the tissue parameters are characterized. The tissue dielectric measurement system must be calibrated before use. The dielectric parameters must be measured before the tissue-equivalent medium is used in a series of SAR measurements.
The liquid tissue depth was at least 15cm in the phantom for all SAR testing.

<Tissue Dielectric Parameter Check Results>

Frequency (MHz)	Liquid Temp. (℃)	Conductivity (σ)	Permittivity (ε_r)	Conductivity Target (σ)	Permittivity Target (ε_r)	Delta (σ) (%)	Delta (ε_r) (%)	Limit (%)	Date
750	22.3	0.885	41.700	0.89	41.90	-0.56	-0.48	±5	2023/1/2
750	22.4	0.881	41.586	0.89	41.90	-1.01	-0.75	±5	2023/1/19
835	22.3	0.919	41.400	0.90	41.50	2.11	-0.24	±5	2023/1/2
835	22.3	0.919	41.400	0.90	41.50	2.11	-0.24	±5	2023/1/2
1750	22.5	1.350	40.500	1.37	40.10	-1.46	1.00	±5	2023/1/3
1900	22.5	1.440	39.000	1.40	40.00	2.86	-2.50	±5	2022/12/31
1900	22.5	1.430	38.900	1.40	40.00	2.14	-2.75	±5	2023/1/3

9.2 System Performance Check 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 below indicates the system performance check can meet the variation criterion and the plots can be referred to Appendix A of this report.

Test Site	Date	Frequency (MHz)	Input Power (mW)	Dipole S/N	Probe S/N	DAE S/N	Measured 1g SAR (W/kg)	Targeted 1g SAR (W/kg)	Normalized 1g SAR (W/kg)	Deviation (%)
SAR14	2023/1/2	750	50	D750V3-1012	EX3DV4 - SN3931	DAE4 Sn1694	0.391	8.560	7.82	-8.64
SAR08	2023/1/19	750	250	D750V3-1012	ES3DV3 - SN3169	DAE4 Sn1647	2.050	8.560	8.2	-4.21
SAR15	2023/1/2	835	50	D835V2-4d167	EX3DV4 - SN3976	DAE4 Sn699	0.467	9.800	9.34	-4.69
SAR14	2023/1/2	835	50	D835V2-4d060	EX3DV4 - SN3931	DAE4 Sn1694	0.492	9.730	9.84	1.13
SAR14	2023/1/3	1750	50	D1750V2-1112	EX3DV4 - SN3931	DAE4 Sn1694	1.800	36.900	36	-2.44
SAR15	2022/12/31	1900	50	D1900V2-5d185	EX3DV4 - SN3976	DAE4 Sn699	1.880	39.000	37.6	-3.59
SAR14	2023/1/3	1900	50	D1900V2-5d185	EX3DV4 - SN3931	DAE4 Sn1694	1.900	39.000	38	-2.56

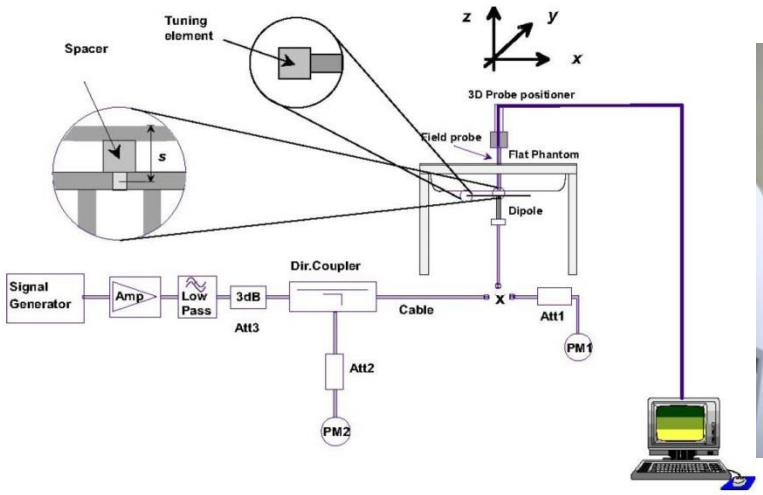


Fig 8.3.1 System Performance Check Setup

Fig 8.3.2 Setup Photo

10. GSM/LTE Output Power (Unit: dBm)

<GSM Conducted Power>

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, for SAR test reduction for GPRS and EDGE modes is determined by the source-based time-averaged output power including tune-up tolerance, 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 modes was selected when EUT operating without power back-off, the GPRS 4Tx slots modes was selected when EUT operating with power back-off, according to the highest source-based time-averaged output power.

GSM850	Burst Average Power (dBm)			Tune-up Limit (dBm)	Frame-Average Power (dBm)			Tune-up Limit (dBm)
TX Channel	128	189	251		128	189	251	
Frequency (MHz)	824.2	836.4	848.8		824.2	836.4	848.8	
GPRS 1 Tx slot	30.59	30.48	30.55	31.00	21.59	21.48	21.55	22.00
GPRS 2 Tx slots	27.25	27.14	27.22	28.00	21.25	21.14	21.22	22.00
GPRS 3 Tx slots	26.36	26.23	26.30	27.00	22.10	21.97	22.04	22.74
GPRS 4 Tx slots	26.11	26.05	26.03	26.50	23.11	23.05	23.03	23.50
EDGE 1 Tx slot	24.26	24.19	24.23	25.50	15.26	15.19	15.23	16.50
EDGE 2 Tx slots	22.62	22.47	22.55	23.50	16.62	16.47	16.55	17.50
EDGE 3 Tx slots	21.37	21.23	21.35	22.00	17.11	16.97	17.09	17.74
EDGE 4 Tx slots	19.99	19.89	19.93	21.00	16.99	16.89	16.93	18.00

GSM1900	Burst Average Power (dBm)			Tune-up Limit (dBm)	Frame-Average Power (dBm)			Tune-up Limit (dBm)
TX Channel	512	661	810		512	661	810	
Frequency (MHz)	1850.2	1880	1909.8		1850.2	1880	1909.8	
GPRS 1 Tx slot	25.15	25.05	24.71	26.00	16.15	16.05	15.71	17.00
GPRS 2 Tx slots	23.47	23.45	23.09	24.50	17.47	17.45	17.09	18.50
GPRS 3 Tx slots	22.00	21.94	21.50	22.50	17.74	17.68	17.24	18.24
GPRS 4 Tx slots	20.95	20.96	20.65	21.50	17.95	17.96	17.65	18.50
EDGE 1 Tx slot	21.27	21.20	21.05	23.00	12.27	12.20	12.05	14.00
EDGE 2 Tx slots	20.15	20.22	21.09	22.00	14.15	14.22	15.09	16.00
EDGE 3 Tx slots	19.39	19.31	19.20	20.50	15.13	15.05	14.94	16.24
EDGE 4 Tx slots	18.53	18.54	18.33	19.50	15.53	15.54	15.33	16.50

<LTE Conducted Power>

General Note:

1. Anritsu MT8820C base station simulator was used to setup the connection with EUT; the frequency band, channel bandwidth, RB allocation configuration, modulation type are set in the base station simulator to configure EUT transmitting at maximum power and at different configurations which are requested to be reported to FCC, for conducted power measurement and SAR testing.
2. 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.
3. 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.
4. Per KDB 941225 D05v02r05, 50% RB allocation for QPSK SAR testing follows 1RB QPSK allocation procedure.
5. 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.
6. Per KDB 941225 D05v02r05, 16QAM 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 KDB 941225 D05v02r05, 16QAM SAR testing is not required.
7. 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 bandwidth is ≤ 1.45 W/kg; Per KDB 941225 D05v02r05, smaller bandwidth SAR testing is not required.
8. LTE band 2/4/5 SAR test was covered by Band 25/66/26; 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

<LTE Band 2>							
BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)
Channel				18625	18900	19175	
Frequency (MHz)				1852.5	1880	1907.5	
5	QPSK	1	0	19.56	19.73	19.85	21.50
5	QPSK	1	5	19.67	19.58	19.53	
5	QPSK	3	0	19.62	19.53	19.85	20.50
5	QPSK	3	3	19.65	19.55	19.54	
5	QPSK	6	0	19.51	19.61	19.64	
5	16QAM	1	0	19.83	19.96	19.94	21.50
5	16QAM	1	5	19.60	19.65	19.64	
5	16QAM	3	0	19.51	19.65	19.72	20.50
5	16QAM	3	3	19.58	19.71	19.66	
5	16QAM	5	0	18.46	18.64	18.55	19.50
Channel				18615	18900	19185	Tune-up limit (dBm)
Frequency (MHz)				1851.5	1880	1908.5	
3	QPSK	1	0	19.59	19.82	19.61	21.50
3	QPSK	1	5	19.54	19.62	19.60	
3	QPSK	3	0	18.61	18.85	18.59	20.50
3	QPSK	3	3	18.55	18.73	18.61	
3	QPSK	6	0	17.57	17.82	17.52	19.50
3	16QAM	1	0	18.58	18.89	18.59	20.50
3	16QAM	1	5	18.53	18.62	18.54	
3	16QAM	3	0	17.59	17.90	17.64	19.50
3	16QAM	3	3	17.55	17.77	17.53	
3	16QAM	5	0	17.59	17.87	17.65	
Channel				18607	18900	19193	Tune-up limit (dBm)
Frequency (MHz)				1850.7	1880	1909.3	
1.4	QPSK	1	0	19.58	19.81	19.60	21.50
1.4	QPSK	1	5	19.54	19.59	19.57	
1.4	QPSK	3	0	18.58	18.80	18.51	20.50
1.4	QPSK	3	3	18.53	18.63	18.57	
1.4	QPSK	6	0	17.57	17.74	17.50	19.50
1.4	16QAM	1	0	18.50	18.84	18.57	20.50
1.4	16QAM	1	5	18.57	18.66	18.62	
1.4	16QAM	3	0	17.75	18.00	17.74	19.50
1.4	16QAM	3	3	17.73	17.93	17.67	
1.4	16QAM	5	0	17.78	18.01	17.77	

<LTE Band 4>							
BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)
Channel				19975	20175	20375	
Frequency (MHz)				1712.5	1732.5	1752.5	
5	QPSK	1	0	19.79	19.93	19.95	21.50
5	QPSK	1	5	19.59	19.70	19.67	
5	QPSK	3	0	19.71	19.91	19.92	20.50
5	QPSK	3	3	19.62	19.78	19.80	
5	QPSK	6	0	19.65	19.83	19.81	
5	16QAM	1	0	20.34	20.49	20.42	21.50
5	16QAM	1	5	19.86	20.08	20.09	
5	16QAM	3	0	19.98	20.18	20.11	20.50
5	16QAM	3	3	19.88	20.05	20.04	
5	16QAM	5	0	18.95	19.11	19.22	19.50
Channel				19965	20175	20385	Tune-up limit (dBm)
Frequency (MHz)				1711.5	1732.5	1753.5	
3	QPSK	1	0	19.82	19.84	20.00	21.50
3	QPSK	1	5	19.66	19.73	19.82	
3	QPSK	3	0	18.72	18.77	18.90	20.50
3	QPSK	3	3	18.61	18.64	18.72	
3	QPSK	6	0	17.56	17.74	17.70	19.50
3	16QAM	1	0	18.69	18.92	18.88	20.50
3	16QAM	1	5	18.58	18.65	18.78	
3	16QAM	3	0	17.82	17.91	17.93	19.50
3	16QAM	3	3	17.66	17.74	17.84	
3	16QAM	5	0	17.62	17.87	17.88	
Channel				19957	20175	20393	Tune-up limit (dBm)
Frequency (MHz)				1710.7	1732.5	1754.3	
1.4	QPSK	1	0	19.77	19.81	19.93	21.50
1.4	QPSK	1	5	19.67	19.70	19.85	
1.4	QPSK	3	0	18.67	18.69	18.83	20.50
1.4	QPSK	3	3	18.61	18.59	18.72	
1.4	QPSK	6	0	19.35	19.34	19.49	19.50
1.4	16QAM	1	0	18.65	18.73	18.80	20.50
1.4	16QAM	1	5	18.53	18.60	18.78	
1.4	16QAM	3	0	17.76	17.78	17.91	19.50
1.4	16QAM	3	3	17.67	17.71	17.83	
1.4	16QAM	5	0	17.69	17.66	17.83	

<LTE Band 5>							
BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)
Channel				20425	20525	20625	
Frequency (MHz)				826.5	836.5	846.5	
5	QPSK	1	0	20.24	20.12	19.98	21.50
5	QPSK	1	5	19.89	19.84	19.97	
5	QPSK	3	0	20.19	20.13	19.91	20.50
5	QPSK	3	3	20.15	19.98	19.81	
5	QPSK	6	0	19.07	18.98	19.97	
5	16QAM	1	0	20.23	20.38	19.89	21.50
5	16QAM	1	5	20.23	20.13	20.05	
5	16QAM	3	0	20.31	20.28	20.00	20.50
5	16QAM	3	3	20.25	20.14	20.04	
5	16QAM	5	0	19.00	19.18	18.68	19.50
Channel				20415	20525	20635	Tune-up limit (dBm)
Frequency (MHz)				825.5	836.5	847.5	
3	QPSK	1	0	20.22	20.05	19.84	21.50
3	QPSK	1	5	19.91	19.77	19.54	
3	QPSK	3	0	19.17	19.01	18.81	20.50
3	QPSK	3	3	18.95	18.85	18.63	
3	QPSK	6	0	18.11	17.90	17.69	19.50
3	16QAM	1	0	20.12	19.14	19.68	20.50
3	16QAM	1	5	18.94	18.85	18.56	
3	16QAM	3	0	18.36	18.19	17.96	19.50
3	16QAM	3	3	18.15	18.02	17.77	
3	16QAM	5	0	18.26	18.14	17.94	
Channel				20407	20525	20643	Tune-up limit (dBm)
Frequency (MHz)				824.7	836.5	848.3	
1.4	QPSK	1	0	20.21	20.01	19.78	21.50
1.4	QPSK	1	5	19.83	19.74	19.64	
1.4	QPSK	3	0	19.20	18.96	18.82	20.50
1.4	QPSK	3	3	18.98	18.80	18.59	
1.4	QPSK	6	0	18.09	17.95	17.71	19.50
1.4	16QAM	1	0	20.05	19.85	19.65	20.50
1.4	16QAM	1	5	19.02	18.75	18.62	
1.4	16QAM	3	0	18.35	18.16	18.03	19.50
1.4	16QAM	3	3	18.12	18.00	17.79	
1.4	16QAM	5	0	18.32	18.13	17.84	

<LTE Band 12>							
BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)
Channel				23035	23095	23155	
Frequency (MHz)				701.5	707.5	713.5	
5	QPSK	1	0	20.00	19.96	19.98	21.50
5	QPSK	1	5	19.71	19.74	19.72	
5	QPSK	3	0	19.92	19.93	19.86	20.50
5	QPSK	3	3	20.04	19.80	19.97	
5	QPSK	6	0	18.96	18.90	18.89	
5	16QAM	1	0	20.31	20.23	20.20	21.50
5	16QAM	1	5	19.97	20.01	20.03	
5	16QAM	3	0	20.25	20.22	20.22	20.50
5	16QAM	3	3	20.04	20.00	19.93	
5	16QAM	5	0	18.97	19.31	18.92	19.50
Channel				23025	23095	23165	Tune-up limit (dBm)
Frequency (MHz)				700.5	707.5	714.5	
3	QPSK	1	0	20.12	20.20	19.82	21.50
3	QPSK	1	5	19.74	19.90	19.69	
3	QPSK	3	0	18.96	19.14	18.63	20.50
3	QPSK	3	3	18.83	18.96	18.53	
3	QPSK	6	0	18.07	18.17	17.78	19.50
3	16QAM	1	0	19.13	19.25	18.79	20.50
3	16QAM	1	5	18.86	18.99	18.60	
3	16QAM	3	0	18.31	18.32	17.99	19.50
3	16QAM	3	3	17.99	18.07	17.72	
3	16QAM	5	0	18.16	18.27	17.86	
Channel				23017	23095	23173	Tune-up limit (dBm)
Frequency (MHz)				699.7	707.5	715.3	
1.4	QPSK	1	0	20.05	20.18	19.79	21.50
1.4	QPSK	1	5	19.80	19.83	19.57	
1.4	QPSK	3	0	19.01	19.09	18.68	20.50
1.4	QPSK	3	3	18.81	18.94	18.61	
1.4	QPSK	6	0	18.03	18.19	17.79	19.50
1.4	16QAM	1	0	18.53	18.60	18.79	20.50
1.4	16QAM	1	5	18.89	18.95	18.58	
1.4	16QAM	3	0	18.24	18.38	17.90	19.50
1.4	16QAM	3	3	17.97	18.11	17.75	
1.4	16QAM	5	0	18.21	18.31	17.93	

<LTE Band 13>							
BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)
Channel				23205	23230	23255	
Frequency (MHz)				779.5	782	784.5	
5	QPSK	1	0	19.60	19.84	19.78	21.50
5	QPSK	1	5	19.64	19.58	19.64	
5	QPSK	3	0	19.49	19.77	19.63	20.50
5	QPSK	3	3	19.37	19.65	19.48	
5	QPSK	6	0	18.57	18.71	18.64	
5	16QAM	1	0	19.83	20.12	19.96	21.50
5	16QAM	1	5	19.69	19.94	19.88	
5	16QAM	3	0	19.73	19.87	19.85	20.50
5	16QAM	3	3	19.71	19.76	19.89	
5	16QAM	5	0	18.74	18.92	18.95	19.50

<LTE Band 14>							
BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)
Channel				23305	23330	23355	
Frequency (MHz)				790.5	793	795.5	
5	QPSK	1	0	19.92	20.03	19.71	21.50
5	QPSK	1	5	19.62	19.70	19.54	
5	QPSK	3	0	19.94	19.99	19.69	20.50
5	QPSK	3	3	19.75	19.76	19.57	
5	QPSK	6	0	18.95	18.95	18.65	
5	16QAM	1	0	20.27	20.30	19.98	21.50
5	16QAM	1	5	19.97	20.00	19.67	
5	16QAM	3	0	20.24	20.23	19.90	20.50
5	16QAM	3	3	19.92	20.00	19.67	
5	16QAM	5	0	18.90	19.09	19.12	19.50

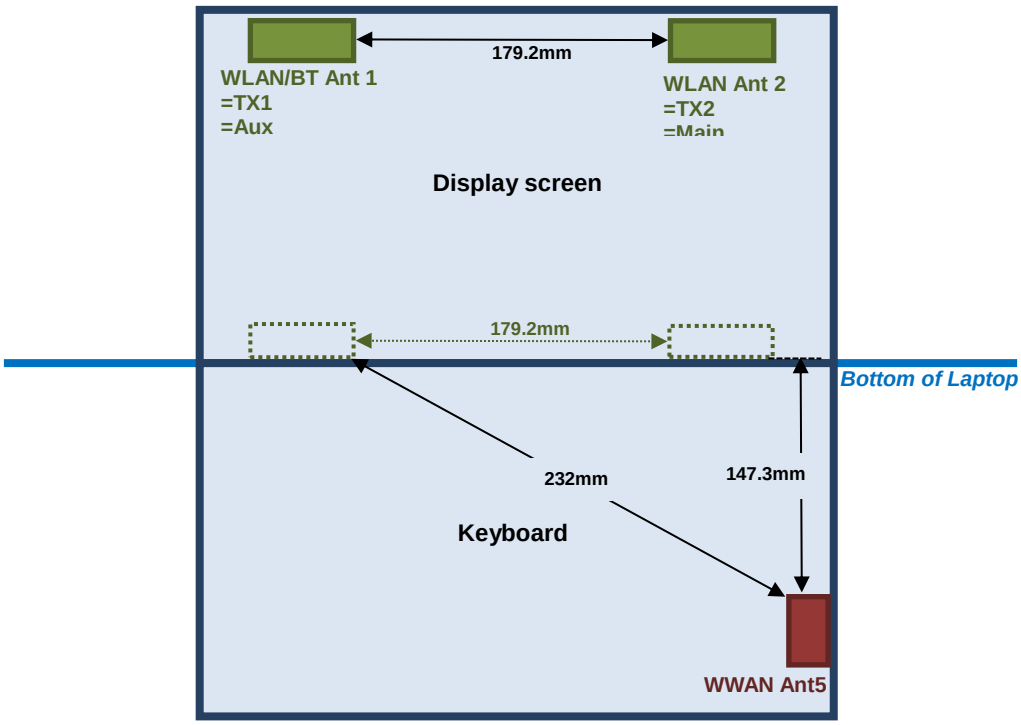
<LTE Band 25>							
BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)
Channel				26065	26365	26665	
Frequency (MHz)				1852.5	1882.5	1912.5	
5	QPSK	1	0	19.75	19.63	19.79	21.50
5	QPSK	1	5	19.58	19.53	19.61	
5	QPSK	3	0	19.78	19.75	19.84	20.50
5	QPSK	3	3	19.69	19.62	19.78	
5	QPSK	6	0	19.80	19.68	19.75	
5	16QAM	1	0	20.38	20.33	20.47	21.50
5	16QAM	1	5	20.14	20.10	20.25	
5	16QAM	3	0	20.26	20.22	20.37	20.50
5	16QAM	3	3	20.20	20.09	20.16	
5	16QAM	5	0	18.75	18.87	18.80	19.50
Channel				26055	26365	26675	Tune-up limit (dBm)
Frequency (MHz)				1851.5	1882.5	1913.5	
3	QPSK	1	0	19.63	19.87	19.65	21.50
3	QPSK	1	5	19.59	19.80	19.57	
3	QPSK	3	0	18.58	18.80	18.57	20.50
3	QPSK	3	3	18.64	18.76	18.51	
3	QPSK	6	0	17.66	17.79	17.57	19.50
3	16QAM	1	0	18.53	18.85	18.55	20.50
3	16QAM	1	5	18.52	18.60	18.57	
3	16QAM	3	0	17.58	17.84	17.61	19.50
3	16QAM	3	3	17.68	17.72	17.65	
3	16QAM	5	0	17.52	17.83	17.56	
Channel				26047	26365	26683	Tune-up limit (dBm)
Frequency (MHz)				1850.7	1882.5	1914.3	
1.4	QPSK	1	0	19.62	19.81	19.58	21.50
1.4	QPSK	1	5	19.59	19.69	19.57	
1.4	QPSK	3	0	18.69	18.79	18.60	20.50
1.4	QPSK	3	3	18.60	18.67	18.59	
1.4	QPSK	6	0	17.66	17.90	17.60	19.50
1.4	16QAM	1	0	18.59	18.84	18.61	20.50
1.4	16QAM	1	5	18.68	18.73	18.65	
1.4	16QAM	3	0	17.52	17.79	17.59	19.50
1.4	16QAM	3	3	17.55	17.71	17.64	
1.4	16QAM	5	0	17.61	17.79	17.64	

<LTE Band 26>							
BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)
Channel				26715	26865	27015	
Frequency (MHz)				816.5	831.5	846.5	
5	QPSK	1	0	20.02	20.05	20.00	21.50
5	QPSK	1	5	19.74	19.81	19.70	
5	QPSK	3	0	20.06	20.03	19.92	20.50
5	QPSK	3	3	19.84	19.85	19.73	
5	QPSK	6	0	19.91	19.92	19.87	
5	16QAM	1	0	20.24	20.29	20.22	21.50
5	16QAM	1	5	19.99	20.05	19.95	
5	16QAM	3	0	20.14	20.19	20.12	20.50
5	16QAM	3	3	20.03	20.02	19.90	
5	16QAM	5	0	18.92	19.13	18.34	19.50
Channel				26705	26865	27025	Tune-up limit (dBm)
Frequency (MHz)				815.5	831.5	847.5	
3	QPSK	1	0	19.84	19.95	19.63	21.50
3	QPSK	1	5	19.59	19.72	19.65	
3	QPSK	3	0	18.73	18.93	18.70	20.50
3	QPSK	3	3	18.66	18.70	18.81	
3	QPSK	6	0	17.79	17.97	17.61	19.50
3	16QAM	1	0	18.80	19.00	18.56	20.50
3	16QAM	1	5	18.70	18.82	18.59	
3	16QAM	3	0	17.92	18.12	17.60	19.50
3	16QAM	3	3	17.69	17.88	17.57	
3	16QAM	5	0	17.91	18.07	17.62	
Channel				26697	26865	27033	Tune-up limit (dBm)
Frequency (MHz)				814.7	831.5	848.3	
1.4	QPSK	1	0	19.74	19.85	19.63	21.50
1.4	QPSK	1	5	19.56	19.52	19.60	
1.4	QPSK	3	0	18.79	18.83	18.64	20.50
1.4	QPSK	3	3	18.60	18.75	18.51	
1.4	QPSK	6	0	17.78	17.71	17.57	19.50
1.4	16QAM	1	0	18.89	18.71	18.62	20.50
1.4	16QAM	1	5	18.60	18.73	18.53	
1.4	16QAM	3	0	17.97	18.17	17.62	19.50
1.4	16QAM	3	3	17.72	17.77	17.56	
1.4	16QAM	5	0	17.92	18.02	17.63	

<LTE Band 66>							
BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)
Channel				131997	132322	132647	
Frequency (MHz)				1712.5	1745	1777.5	
5	QPSK	1	0	19.52	19.66	19.90	21.50
5	QPSK	1	5	19.58	19.61	19.81	
5	QPSK	3	0	19.53	19.67	19.88	20.50
5	QPSK	3	3	19.61	19.68	19.83	
5	QPSK	6	0	19.56	19.53	19.72	
5	16QAM	1	0	19.76	20.02	19.94	21.50
5	16QAM	1	5	19.60	19.69	19.91	
5	16QAM	3	0	19.59	19.80	19.99	20.50
5	16QAM	3	3	19.64	19.67	19.90	
5	16QAM	5	0	18.61	18.77	18.90	19.50
Channel				131987	132322	132657	Tune-up limit (dBm)
Frequency (MHz)				1711.5	1745	1778.5	
3	QPSK	1	0	19.79	19.78	19.88	21.50
3	QPSK	1	5	19.67	19.75	19.88	
3	QPSK	3	0	18.64	18.67	18.83	20.50
3	QPSK	3	3	18.57	18.56	18.77	
3	QPSK	6	0	19.39	19.48	19.44	19.50
3	16QAM	1	0	18.63	18.72	18.84	20.50
3	16QAM	1	5	18.53	18.58	18.81	
3	16QAM	3	0	17.77	17.74	17.87	19.50
3	16QAM	3	3	17.63	17.71	17.84	
3	16QAM	5	0	17.67	17.67	17.88	
Channel				131979	132322	132665	Tune-up limit (dBm)
Frequency (MHz)				1710.7	1745	1779.3	
1.4	QPSK	1	0	19.74	19.73	19.83	21.50
1.4	QPSK	1	5	19.61	19.60	19.72	
1.4	QPSK	3	0	18.59	18.55	18.58	20.50
1.4	QPSK	3	3	18.62	18.58	18.72	
1.4	QPSK	6	0	19.24	19.33	19.49	19.50
1.4	16QAM	1	0	18.68	18.67	18.79	20.50
1.4	16QAM	1	5	18.58	18.63	18.76	
1.4	16QAM	3	0	17.72	17.69	17.82	19.50
1.4	16QAM	3	3	17.60	17.68	17.81	
1.4	16QAM	5	0	17.59	17.53	17.83	

<LTE Band 85>							
BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)
Channel				134027	134092	134157	
Frequency (MHz)				700.5	707	713.5	
5	QPSK	1	0	20.33	20.35	20.28	21.50
5	QPSK	1	5	20.09	20.08	20.11	
5	QPSK	3	0	20.29	20.33	20.17	20.50
5	QPSK	3	3	20.06	20.18	20.17	
5	QPSK	6	0	19.56	19.64	19.61	
5	16QAM	1	0	20.57	20.62	20.36	21.50
5	16QAM	1	5	20.38	20.41	20.30	
5	16QAM	3	0	20.33	20.30	20.20	20.50
5	16QAM	3	3	20.18	20.27	19.96	
5	16QAM	5	0	19.50	19.49	19.40	19.50

11. Antenna Location



The separation distance for antenna to edge :

Antenna	To Bottom of Laptop (mm)
WWAN Antenna 5	9.45
WLAN/BT Antenna 1	214
WLAN Antenna 2	214

12. SAR Test Results

General Note:

1. 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
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:
   - ≤ 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
3. Per KDB 865664 D01v01r04, for each frequency band, repeated SAR measurement is required only when the measured SAR is ≥0.8W/kg.

GSM Note:

1. Per KDB 941225 D01v03r01, for SAR test reduction for GPRS and EDGE modes is determined by the source-based time-averaged output power including tune-up tolerance, 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 modes was selected when EUT operating without power back-off, the GPRS 4Tx slots modes was selected when EUT operating with power back-off, according to the highest source-based time-averaged output power.

LTE Note:

1. 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.
2. Per KDB 941225 D05v02r05, 50% RB allocation for QPSK SAR testing follows 1RB QPSK allocation procedure.
3. 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.
4. Per KDB 941225 D05v02r05, 16QAM 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 KDB 941225 D05v02r05, 16QAM SAR testing is not required.
5. 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 bandwidth is ≤ 1.45 W/kg; Per KDB 941225 D05v02r05, smaller bandwidth SAR testing is not required.
6. LTE band 2/4/5 SAR test was covered by Band 25/66/26; according to 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.

12.1 Body SAR

<GSM SAR>

Plot No.	Band	Mode	Test Position	Gap (mm)	Ch.	Freq. (MHz)	Antenna Vendor	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	GSM850	GPRS (4 Tx slots)	Bottom of Laptop	0mm	128	824.2	Vendor 2	26.11	26.50	1.094	-0.14	0.733	0.802
	GSM850	GPRS (4 Tx slots)	Bottom of Laptop	0mm	189	836.4	Vendor 2	26.05	26.50	1.109	-0.1	0.939	1.042
01	GSM850	GPRS (4 Tx slots)	Bottom of Laptop	0mm	251	848.8	Vendor 2	26.03	26.50	1.114	0	0.945	1.053
	GSM850	GPRS (4 Tx slots)	Bottom of Laptop	0mm	251	848.8	Vendor 1	26.03	26.50	1.114	0.09	0.781	0.870
	GSM850	GPRS (4 Tx slots)	Bottom of Laptop	0mm	128	824.2	Vendor 1	26.11	26.50	1.094	-0.03	0.605	0.662
	GSM850	GPRS (4 Tx slots)	Bottom of Laptop	0mm	189	836.4	Vendor 1	26.05	26.50	1.109	0.03	0.776	0.861
	GSM1900	GPRS (4 Tx slots)	Bottom of Laptop	0mm	661	1880	Vendor 2	20.96	21.50	1.132	0.09	0.439	0.497
	GSM1900	GPRS (4 Tx slots)	Bottom of Laptop	0mm	512	1850.2	Vendor 2	20.95	21.50	1.135	-0.11	0.529	0.600
	GSM1900	GPRS (4 Tx slots)	Bottom of Laptop	0mm	810	1909.8	Vendor 2	20.65	21.50	1.216	-0.05	0.569	0.692
	GSM1900	GPRS (4 Tx slots)	Bottom of Laptop	0mm	661	1880	Vendor 1	20.96	21.50	1.132	0.11	0.712	0.806
	GSM1900	GPRS (4 Tx slots)	Bottom of Laptop	0mm	810	1909.8	Vendor 1	20.65	21.50	1.216	-0.17	0.709	0.862
02	GSM1900	GPRS (4 Tx slots)	Bottom of Laptop	0mm	512	1850.2	Vendor 1	20.95	21.50	1.135	-0.02	0.943	1.070

<FDD LTE SAR>

Plot No.	Band	BW (MHz)	Modulation	RB Size	RB offset	Test Position	Gap (mm)	Ch.	Freq. (MHz)	Antenna Vendor	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	LTE Band 12	5M	QPSK	1	0	Bottom of Laptop	0mm	23035	701.5	Vendor 2	20.00	21.50	1.413	0.01	0.122	0.172
03	LTE Band 12	5M	QPSK	1	0	Bottom of Laptop	0mm	23095	707.5	Vendor 2	19.96	21.50	1.426	0.04	0.154	0.220
	LTE Band 12	5M	QPSK	1	0	Bottom of Laptop	0mm	23155	713.5	Vendor 2	19.98	21.50	1.419	0	0.111	0.158
	LTE Band 12	5M	QPSK	3	3	Bottom of Laptop	0mm	23035	701.5	Vendor 2	20.04	20.50	1.112	-0.07	0.148	0.165
	LTE Band 12	5M	QPSK	1	0	Bottom of Laptop	0mm	23095	707.5	Vendor 1	19.96	21.50	1.426	0.17	0.134	0.191
	LTE Band 13	5M	QPSK	1	0	Bottom of Laptop	0mm	23230	782	Vendor 2	19.84	21.50	1.466	0.05	0.121	0.177
04	LTE Band 13	5M	QPSK	3	0	Bottom of Laptop	0mm	23230	782	Vendor 2	19.77	20.50	1.183	0.13	0.167	0.198
	LTE Band 13	5M	QPSK	3	0	Bottom of Laptop	0mm	23230	782	Vendor 1	19.77	20.50	1.183	0.06	0.122	0.144
	LTE Band 14	5M	QPSK	1	0	Bottom of Laptop	0mm	23330	793	Vendor 2	20.03	21.50	1.403	-0.17	0.122	0.171
05	LTE Band 14	5M	QPSK	3	0	Bottom of Laptop	0mm	23330	793	Vendor 2	19.99	20.05	1.014	-0.01	0.170	0.172
	LTE Band 14	5M	QPSK	3	0	Bottom of Laptop	0mm	23330	793	Vendor 1	19.99	20.05	1.014	0.11	0.127	0.129
06	LTE Band 25	5M	QPSK	1	0	Bottom of Laptop	0mm	26665	1912.5	Vendor 2	19.79	21.50	1.483	0	0.649	0.962
	LTE Band 25	5M	QPSK	1	0	Bottom of Laptop	0mm	26065	1852.5	Vendor 2	19.75	21.50	1.496	-0.09	0.493	0.738
	LTE Band 25	5M	QPSK	1	0	Bottom of Laptop	0mm	26365	1882.5	Vendor 2	19.63	21.50	1.538	-0.04	0.607	0.934
	LTE Band 25	5M	QPSK	3	0	Bottom of Laptop	0mm	26665	1912.5	Vendor 2	19.84	20.50	1.164	-0.07	0.577	0.672
	LTE Band 25	5M	QPSK	3	0	Bottom of Laptop	0mm	26065	1852.5	Vendor 2	19.78	20.50	1.180	-0.1	0.478	0.564
	LTE Band 25	5M	QPSK	3	0	Bottom of Laptop	0mm	26365	1882.5	Vendor 2	19.75	20.50	1.189	-0.16	0.599	0.712
	LTE Band 25	5M	QPSK	6	0	Bottom of Laptop	0mm	26065	1852.5	Vendor 2	19.80	20.50	1.175	0.07	0.552	0.649
	LTE Band 25	5M	QPSK	1	0	Bottom of Laptop	0mm	26665	1912.5	Vendor 1	19.79	21.50	1.483	0.11	0.607	0.900
07	LTE Band 26	5M	QPSK	1	0	Bottom of Laptop	0mm	26865	831.5	Vendor 2	20.05	21.50	1.396	0.02	0.164	0.229
	LTE Band 26	5M	QPSK	1	0	Bottom of Laptop	0mm	26715	816.5	Vendor 2	20.02	21.50	1.406	0.05	0.133	0.187
	LTE Band 26	5M	QPSK	1	0	Bottom of Laptop	0mm	27015	846.5	Vendor 2	20.00	21.50	1.413	-0.01	0.121	0.171
	LTE Band 26	5M	QPSK	3	0	Bottom of Laptop	0mm	26715	816.5	Vendor 2	20.06	20.50	1.107	-0.09	0.162	0.179
	LTE Band 26	5M	QPSK	1	0	Bottom of Laptop	0mm	26865	831.5	Vendor 1	20.05	21.50	1.396	-0.13	0.141	0.197
	LTE Band 66	5M	QPSK	1	0	Bottom of Laptop	0mm	132647	1777.5	Vendor 2	19.90	21.50	1.445	-0.09	0.599	0.866
	LTE Band 66	5M	QPSK	1	0	Bottom of Laptop	0mm	131997	1712.5	Vendor 2	19.52	21.50	1.578	0.06	0.592	0.934
08	LTE Band 66	5M	QPSK	1	0	Bottom of Laptop	0mm	132322	1745	Vendor 2	19.66	21.50	1.528	-0.01	0.666	1.017
	LTE Band 66	5M	QPSK	3	0	Bottom of Laptop	0mm	132647	1777.5	Vendor 2	19.88	20.50	1.153	0.19	0.565	0.652
	LTE Band 66	5M	QPSK	3	0	Bottom of Laptop	0mm	131997	1712.5	Vendor 2	19.53	20.50	1.250	-0.04	0.594	0.743
	LTE Band 66	5M	QPSK	3	0	Bottom of Laptop	0mm	132322	1745	Vendor 2	19.67	20.50	1.211	0.08	0.639	0.774
	LTE Band 66	5M	QPSK	6	0	Bottom of Laptop	0mm	132647	1777.5	Vendor 2	19.72	20.50	1.197	-0.11	0.585	0.700
	LTE Band 66	5M	QPSK	1	0	Bottom of Laptop	0mm	132322	1745	Vendor 1	19.66	21.50	1.528	0.09	0.639	0.976
	LTE Band 85	5M	QPSK	1	0	Bottom of Laptop	0mm	134092	707	Vendor 2	20.35	21.50	1.303	0.01	0.122	0.159
	LTE Band 85	5M	QPSK	1	0	Bottom of Laptop	0mm	134027	700.5	Vendor 2	20.33	21.50	1.309	0.02	0.089	0.117
	LTE Band 85	5M	QPSK	1	0	Bottom of Laptop	0mm	134157	713.5	Vendor 2	20.28	21.50	1.324	-0.03	0.098	0.130
	LTE Band 85	5M	QPSK	3	0	Bottom of Laptop	0mm	134092	707	Vendor 2	20.33	20.50	1.040	0.05	0.110	0.114
09	LTE Band 85	5M	QPSK	1	0	Bottom of Laptop	0mm	134092	707	Vendor 1	20.35	21.50	1.303	-0.06	0.146	0.190

12.2 Repeated SAR Measurement

No.	Band	Mode	Test Position	Gap (mm)	Ch.	Freq. (MHz)	Antenna Vendor	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Ratio	Reported 1g SAR (W/kg)
1st	GSM850	GPRS (4 Tx slots)	Bottom of Laptop	0mm	251	848.8	Vendor 2	26.03	26.50	1.114	0	0.945	-	1.053
2nd	GSM850	GPRS (4 Tx slots)	Bottom of Laptop	0mm	251	848.8	Vendor 2	26.03	26.50	1.114	0.06	0.933	1.013	1.040
1st	GSM1900	GPRS (4 Tx slots)	Bottom of Laptop	0mm	512	1850.2	Vendor 1	20.95	21.50	1.135	-0.02	0.943	-	1.070
2nd	GSM1900	GPRS (4 Tx slots)	Bottom of Laptop	0mm	512	1850.2	Vendor 1	20.95	21.50	1.135	-0.09	0.928	1.016	1.053

General Note:

1. Per KDB 865664 D01v01r04, for each frequency band, repeated SAR measurement is required only when the measured SAR is ≥0.8W/kg.
2. Per KDB 865664 D01v01r04, if the ratio among the repeated measurement is ≤ 1.2 and the measured SAR <1.45W/kg, only one repeated measurement is required.
3. The ratio is the difference in percentage between original and repeated *measured SAR*.
4. All measurement SAR result is scaled-up to account for tune-up tolerance and is compliant.

13. Simultaneous Transmission Analysis

NO.	Simultaneous Transmission Configurations	Body
1.	WWAN + 2.4GHz WLAN Ant 1 + 2.4GHz WLAN Ant 2	Yes
2.	WWAN + 2.4GHz WLAN Ant 2 + Bluetooth Ant 1	Yes
3.	WWAN + 5G/6GHz WLAN Ant 1 +5G/6GHz WLAN Ant 2 + Bluetooth Ant 1	Yes

General Note:

1. The Intel AX211D2W WLAN/BT module is integrated into this host. The WLAN 2.4GHz/5GHz SAR result is referenced from Intel SAR report, report No.:201120-03.TR07/ 210325-01.TR27 (FCC ID: PD9AX211D2), WLAN 6GHz SAR result refers to report No.:201120-03.TR40 (FCC ID: PD9AX211D2) and these SAR results are also used to perform simultaneous transmission analysis.
2. The Scaled SAR summation is calculated based on the same configuration and test position.
3. Per KDB 447498 D01v06, simultaneous transmission SAR is compliant if,
   i) Scalar SAR summation < 1.6W/kg.
   ii) SPLSR = (SAR1 + SAR2)^1.5 / (min. separation distance, mm), and the peak separation distance is determined from the square root of $[(x1-x2)^2 + (y1-y2)^2 + (z1-z2)^2]$, where (x1, y1, z1) and (x2, y2, z2) are the coordinates of the extrapolated peak SAR locations in the zoom scan.
   iii) If SPLSR ≤ 0.04, simultaneously transmission SAR measurement is not necessary.
   iv) Simultaneously transmission SAR measurement, and the reported multi-band SAR < 1.6W/kg.
   v) The SPLSR calculated results please refer to section 13.2.

13.1 Body Exposure Conditions

Exposure Position	1	2	3	4	5	6	1+3+6 Summed 1g SAR (W/kg)	1+2+3 Summed 1g SAR (W/kg)	1+4+5+6 Summed 1g SAR (W/kg)	SPLSR	Case No
	Maximum WWAN	WLAN2.4GHz Ant 1	WLAN2.4GHz Ant 2	WLAN 5G/6GHz Ant 1	WLAN 5G/6GHz Ant 2	Bluetooth Ant 1					
	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)					
Bottom of Laptop at 0mm	1.070	0.350	0.360	0.740	0.750	0.030	**1.460**	**1.780**	**2.590**	**0.02**	**Case 1**

13.2 SPLSR Evaluation and Analysis

General Note:

1. According to section11 antenna location, the minimum distance between each transmit antenna is using for SPLSR analysis
2. SPLSR = $(SAR_1 + SAR_2)^{1.5}$ / (*min. separation distance, mm*). If SPLSR ≤ 0.04, simultaneously transmission SAR measurement is not necessary
3. The detail hotspot point for each transmitter in each exposure condition are showing as below figure and the minimum 3D distance for each sum combination is used for SPLSR analysis.

	Band	Position	SAR (W/kg)	Gap (mm)	3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
Case 1	Maximum WWAN	Bottom of Laptop	1.070	0mm	232.0	1.84	0.01	Not required
	WLAN Ant 1+BT Ant 1		0.770	0mm				
	Maximum WWAN	Bottom of Laptop	1.070	0mm	147.3	1.82	0.02	Not required
	WLAN Ant 2		0.750	0mm				
	WLAN Ant 1+BT Ant 1	Bottom of Laptop	0.770	0mm	179.2	1.52	0.01	Not required
	WLAN Ant 2		0.750	0mm				

Test Engineer： Jeff Tsao and Chris Yang

14. Uncertainty Assessment

Per KDB 865664 D01 SAR measurement 100MHz to 6GHz, when the highest measured 1-g SAR within a frequency band is < 1.5 W/kg and the measured 10-g SAR within a frequency band is < 3.75 W/kg. The expanded SAR measurement uncertainty must be ≤ 30%, for a confidence interval of k = 2. If these conditions are met, extensive SAR measurement uncertainty analysis described in IEEE Std 1528-2013 is not required in SAR reports submitted for equipment approval. For this device, the highest measured 1-g SAR is less 1.5W/kg. Therefore, the measurement uncertainty table is not required in this report.
Declaration of Conformity:
The test results with all measurement uncertainty excluded is presented in accordance with the regulation limits or requirements declared by manufacturers.
Comments and Explanations:
The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.

15. References

[1] FCC 47 CFR Part 2 “Frequency Allocations and Radio Treaty Matters; General Rules and Regulations”

[2] ANSI/IEEE Std. C95.1-1992, “IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz”, September 1992

[3] IEEE Std. 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”, Sep 2013

[4] SPEAG DASY System Handbook

[5] FCC KDB 447498 D01 v06, “Mobile and Portable Device RF Exposure Procedures and Equipment Authorization Policies”, Oct 2015

[6] FCC KDB 941225 D01 v03r01, “3G SAR MEAUREMENT PROCEDURES”, Oct 2015

[7] FCC KDB 941225 D05 v02r05, “SAR Evaluation Considerations for LTE Devices”, Dec 2015

[8] FCC KDB 616217 D04 v01r02, “SAR Evaluation Considerations for Laptop, Notebook, Netbook and Tablet Computers”, Oct 2015

[9] FCC KDB 865664 D01 v01r04, "SAR Measurement Requirements for 100 MHz to 6 GHz", Aug 2015.

[10] FCC KDB 865664 D02 v01r02, “RF Exposure Compliance Reporting and Documentation Considerations” Oct 2015.