

FCC SAR TEST REPORT

FCC ID : 2A4DX-2195873-1
Equipment : LEMBAS LTE/GNSS USB Modem
Brand Name : LEMBAS USB Modem
Model Name : 2195873-1
Applicant : TE Connectivity Corporation
6900 Paseo Padre Pkwy, Fremont, California, United States, 94555
Manufacturer : TE Connectivity Corporation
6900 Paseo Padre Pkwy, Fremont, California, United States, 94555
Standard : FCC 47 CFR Part 2 (2.1093)

The product was received on Aug. 23, 2022 and testing was started from Sep. 08, 2022 and completed on Sep. 08, 2022. 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



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Table of Contents

1. Statement of Compliance	4
2. Guidance Applied.....	4
3. Equipment Under Test (EUT) Information	4
3.1 General Information	4
3.2 General LTE SAR Test and Reporting Considerations	5
4. Proximity Sensor Triggering Test.....	6
5. RF Exposure Limits.....	14
5.1 Uncontrolled Environment.....	14
5.2 Controlled Environment.....	14
6. Specific Absorption Rate (SAR).....	15
6.1 Introduction	15
6.2 SAR Definition.....	15
7. System Description and Setup	16
7.1 Test Site Location.....	16
7.2 E-Field Probe	17
7.3 Data Acquisition Electronics (DAE)	17
7.4 Phantom.....	18
7.5 Device Holder.....	19
8. Measurement Procedures	20
8.1 Spatial Peak SAR Evaluation.....	20
8.2 Power Reference Measurement.....	21
8.3 Area Scan	21
8.4 Zoom Scan.....	22
8.5 Volume Scan Procedures.....	22
8.6 Power Drift Monitoring.....	22
9. Test Equipment List	23
10. System Verification	24
10.1 Tissue Verification	24
10.2 System Performance Check Results.....	24
11. RF Exposure Positions	25
11.1 SAR Testing for USB Dongle	25
12. LTE Output Power (Unit: dBm)	26
13. Antenna Location	39
14. SAR Test Results	40
14.1 Body SAR	41
15. Uncertainty Assessment	43
16. References.....	43
Appendix A. Plots of System Performance Check	
Appendix B. Plots of High SAR Measurement	
Appendix C. DASY Calibration Certificate	
Appendix D. Test Setup Photos	



History of this test report

Report No.	Version	Description	Issued Date
FA261635	01	Initial issue of report	Oct. 14, 2022



1. Statement of Compliance

The maximum results of Specific Absorption Rate (SAR) for TE Connectivity Corporation, LEMBAS LTE/GNSS USB Modem, 2195873-1, are as follows.

Equipment Class		Frequency Band	Highest SAR Summary
			Body
			1g SAR (W/kg)
Licensed	LTE	LTE Band 2	0.92
		LTE Band 4	0.86
		LTE Band 12	0.40
Date of Testing:		2022/9/8	

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: Carlie Tsai

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 447498 D02 SAR Procedures for Dongle Xmtr v02r01
- FCC KDB 941225 D05 SAR for LTE Devices v02r05

3. Equipment Under Test (EUT) Information

3.1 General Information

Product Feature & Specification	
Equipment Name	LEMBAS LTE/GNSS USB Modem
Brand Name	LEMBAS USB Modem
Model Name	2195873-1
FCC ID	2A4DX-2195873-1
Wireless Technology and Frequency Range	LTE Band 2: 1850 MHz ~ 1910 MHz LTE Band 4: 1710 MHz ~ 1755 MHz LTE Band 12: 699 MHz ~ 716 MHz
Mode	LTE: QPSK, 16QAM

3.2 General LTE SAR Test and Reporting Considerations

Summarized necessary items addressed in KDB 941225 D05 v02r05												
FCC ID			2A4DX-2195873-1									
Equipment Name			LEMBAS LTE/GNSS USB Modem									
Operating Frequency Range of each LTE transmission band			LTE Band 2: 1850 MHz ~ 1910 MHz LTE Band 4: 1710 MHz ~ 1755 MHz LTE Band 12: 699 MHz ~ 716 MHz									
Channel Bandwidth			LTE Band 2:1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz, 20MHz LTE Band 4:1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz, 20MHz LTE Band 12:1.4MHz, 3MHz, 5MHz, 10MHz									
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.									
Power reduction applied to satisfy SAR compliance			Yes, Proximity Sensor.									
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		Bandwidth 10 MHz		Bandwidth 15 MHz		Bandwidth 20 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	18607	1850.7	18615	1851.5	18625	1852.5	18650	1855	18675	1857.5	18700	1860
M	18900	1880	18900	1880	18900	1880	18900	1880	18900	1880	18900	1880
H	19193	1909.3	19185	1908.5	19175	1907.5	19150	1905	19125	1902.5	19100	1900
LTE Band 4												
	Bandwidth 1.4 MHz		Bandwidth 3 MHz		Bandwidth 5 MHz		Bandwidth 10 MHz		Bandwidth 15 MHz		Bandwidth 20 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	19957	1710.7	19965	1711.5	19975	1712.5	20000	1715	20025	1717.5	20050	1720
M	20175	1732.5	20175	1732.5	20175	1732.5	20175	1732.5	20175	1732.5	20175	1732.5
H	20393	1754.3	20385	1753.5	20375	1752.5	20350	1750	20325	1747.5	20300	1745
LTE Band 12												
	Bandwidth 1.4 MHz		Bandwidth 3 MHz		Bandwidth 5 MHz		Bandwidth 10 MHz		Bandwidth 15 MHz		Bandwidth 20 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	23017	699.7	23025	700.5	23035	701.5	23060	704	23095	707.5	23130	711
M	23095	707.5	23095	707.5	23095	707.5	23095	707.5	23095	707.5	23095	707.5
H	23173	715.3	23165	714.5	23155	713.5	23130	711	23100	708.5	23075	706.5

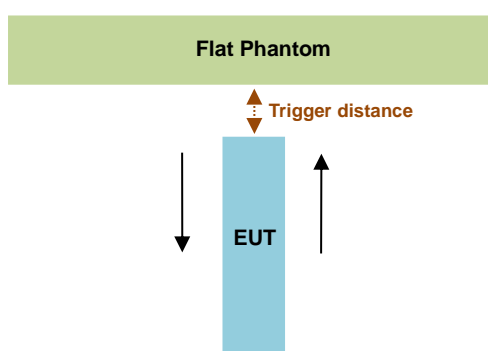
4. Proximity Sensor Triggering Test

<Proximity Sensor Triggering Distance (KDB 616217 D04 section 6.2)>:

For the device is fully integrated, touch sensing capacitive sensor. It uses a charge transfer capacitive acquisition method that is capable of near range proximity detection. In this device offers a state of the art capacitive sensing engine with an embedded sampling capacitor and voltage regulator allowing the overall solution cost to be reduced and improving system immunity in noisy environments.

Proximity sensor triggering distance testing was performed according to the procedures outlined in KDB 616217 D04 section 6.2, and EUT moving further away from the flat phantom and EUT moving toward the flat phantom were both assessed. The details are illustrated as following, and the shortest triggering distances were reported and used for SAR assessment.

In the preliminary triggering distance testing, the tissue-equivalent medium for different frequency bands were used for verification; no other frequency bands tissue-equivalent medium was found to result in shortest triggering distance than that for 1900MHz, and the tissue-equivalent medium for 1900MHz was used for formal proximity sensor triggering testing.



Proximity Sensor Trigger Distance (mm)										
Position	Front		Back		Right Side		Left Side		Top Side	
Minimum	moving toward	moving away	moving toward	moving away	moving toward	moving away	moving toward	moving away	moving toward	moving away
	28	27	24	25	26	25	21	19	31	30

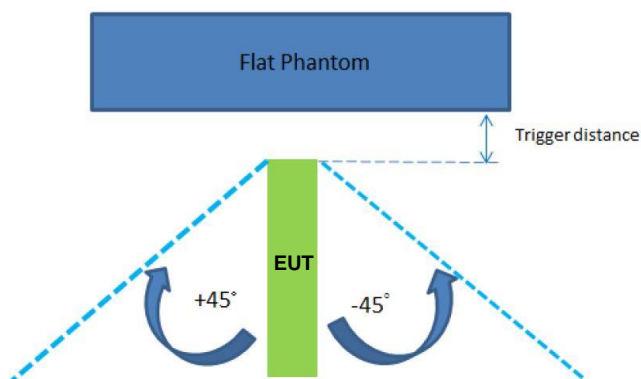
<Proximity Sensor Triggering Coverage (KDB 616217 D04 section 6.3)>:

Since the antenna and sensor are collocated and all of the peak SAR location is overlapping with the sensor pad for this device, therefore, According to KDB 616217 section6.3, these procedures do not apply and are not required for this device. Due to the antenna and sensor are collocated and the peak SAR location is overlapping with the sensor on this device.

<USB Dongle Tilt angle influences to proximity sensor triggering (KDB 616217 D04 section 6.4)>:

The influence of table tilt angles to proximity sensor triggering was determined by positioning each tablet edge that contains a transmitting antenna, perpendicular to the flat phantom, at above separation distance.

Rotating the tablet around the edge next to the phantom in $\leq 10^\circ$ increments until the tablet is $\pm 45^\circ$ from the vertical position at 0° , and the maximum output power remains in the reduced mode.



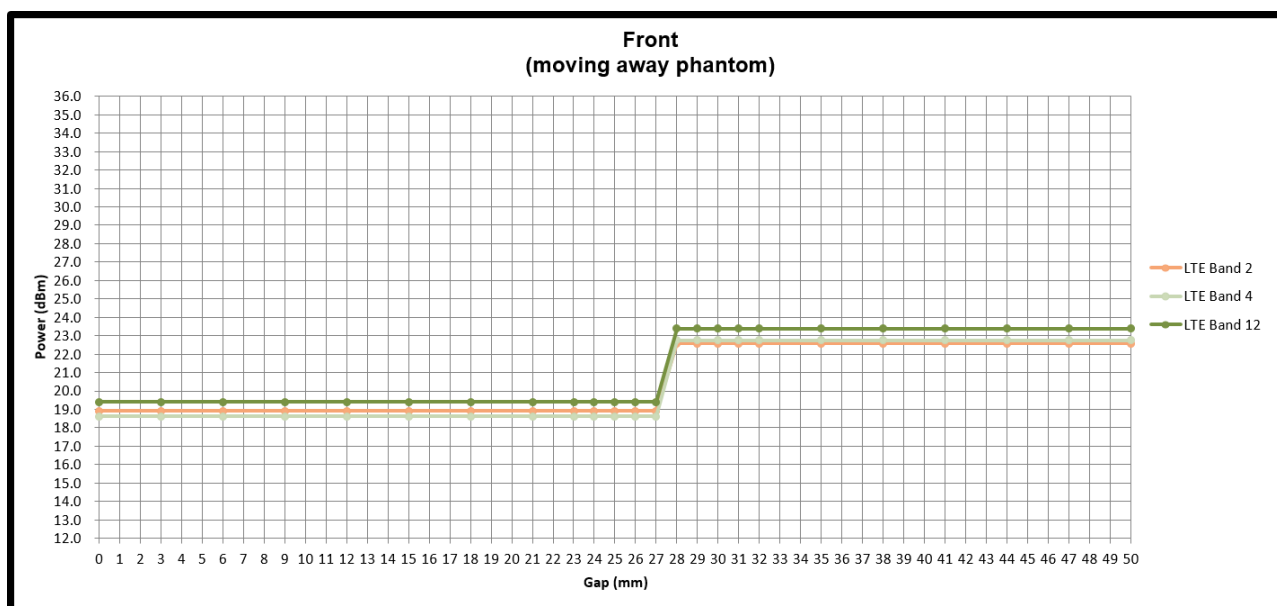
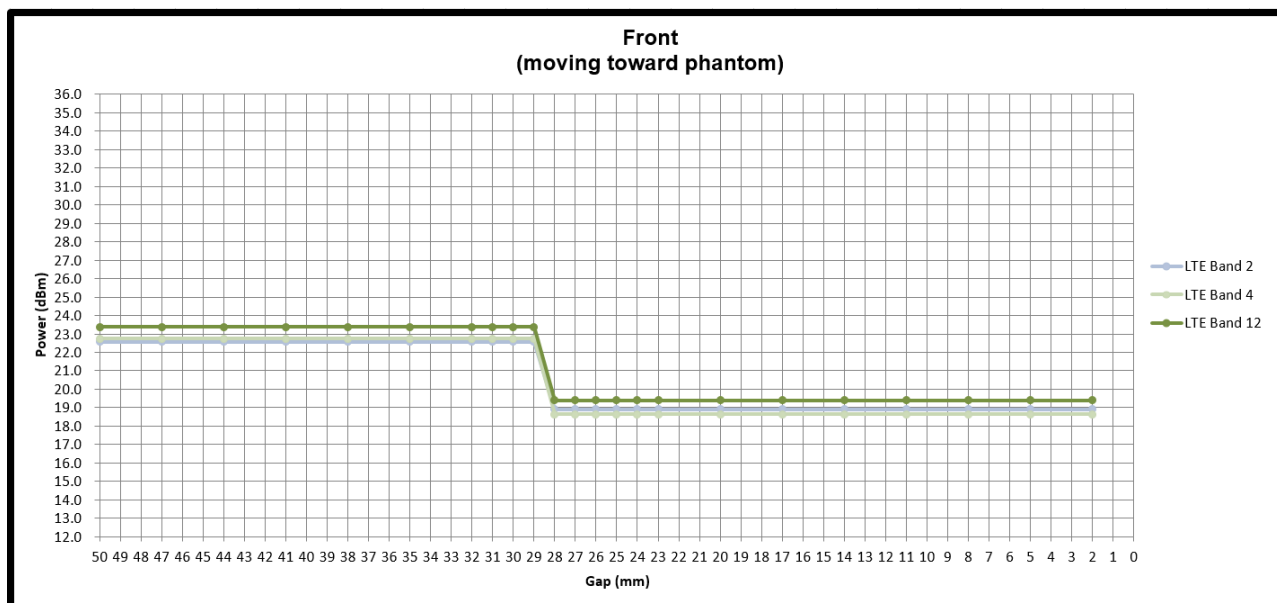
Proximity Sensor Trigger Distance (mm)						
Position	Right Side		Left Side		Top Side	
Minimum	+45	-45	+45	-45	+45	-45
	32	30	31	29	34	30

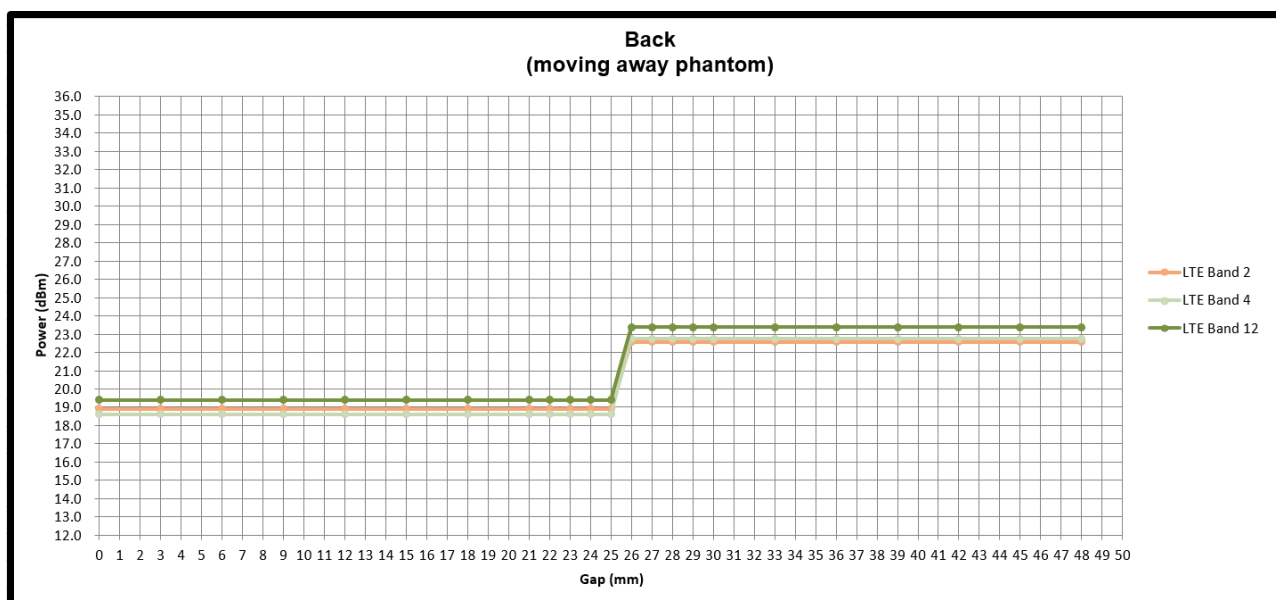
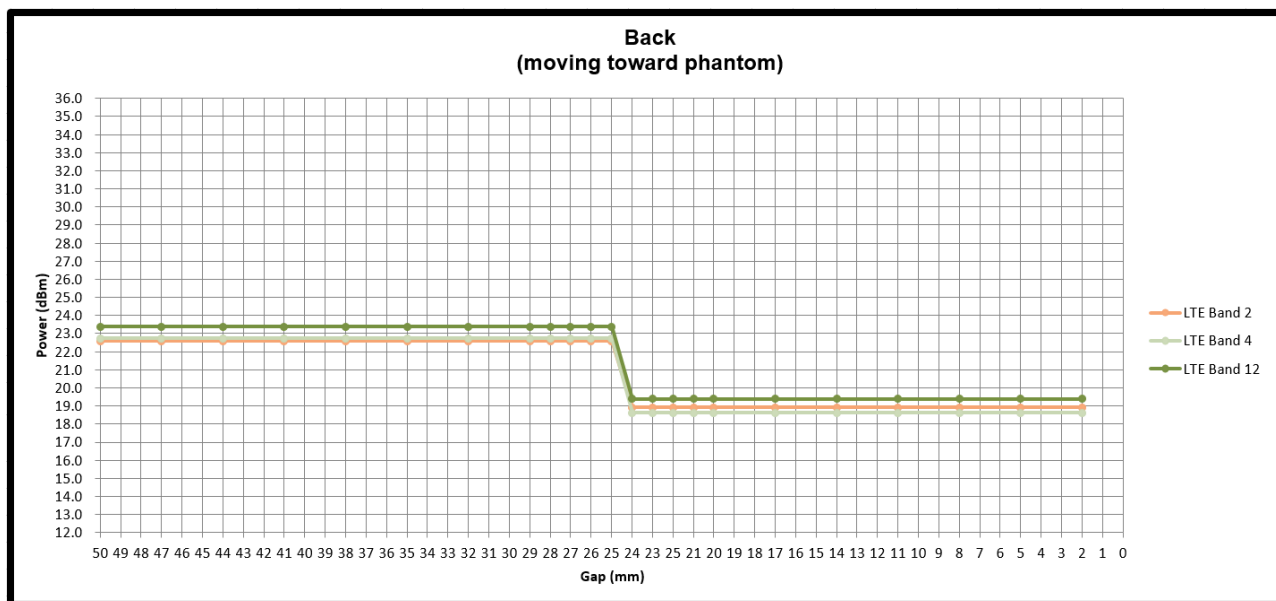
Proximity sensor power reduction

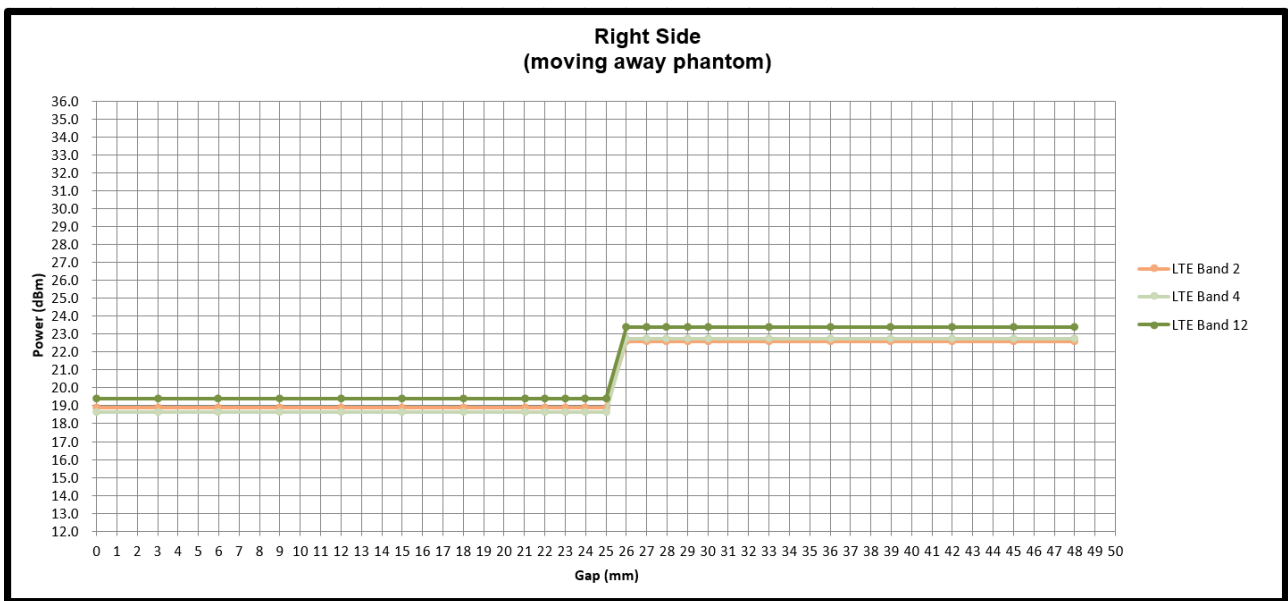
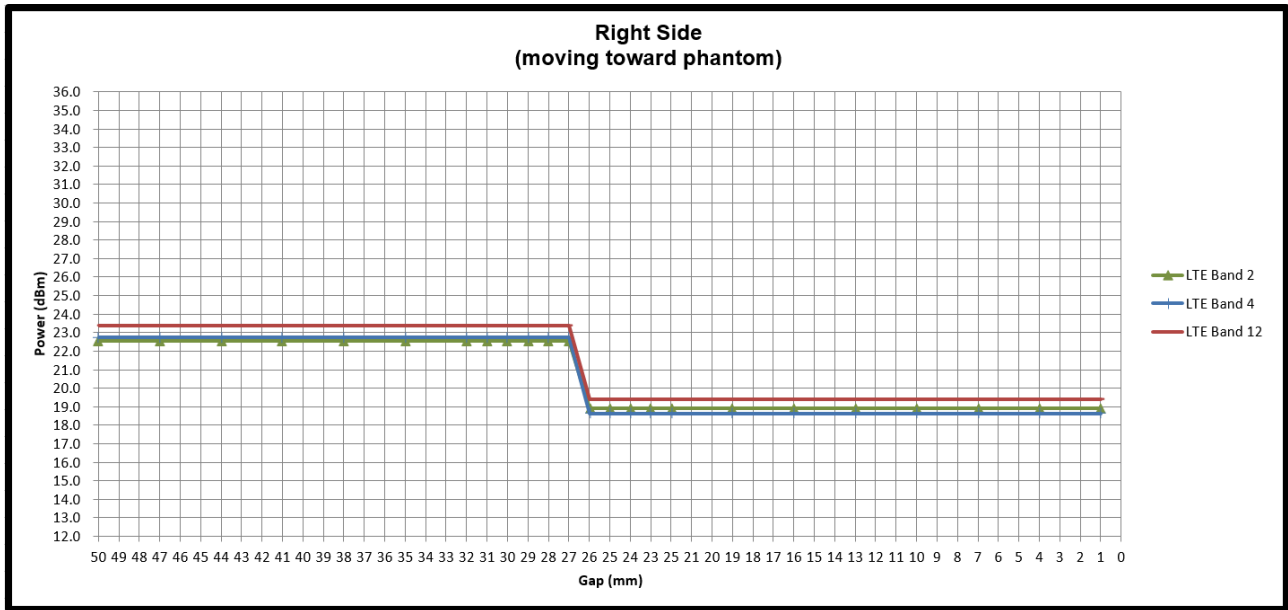
Exposure Position / wireless mode	Front / Back / Top Side / Left Side / Right Side
LTE Band 2	4.5 dB
LTE Band 4	4.5 dB
LTE Band 12	4.0 dB

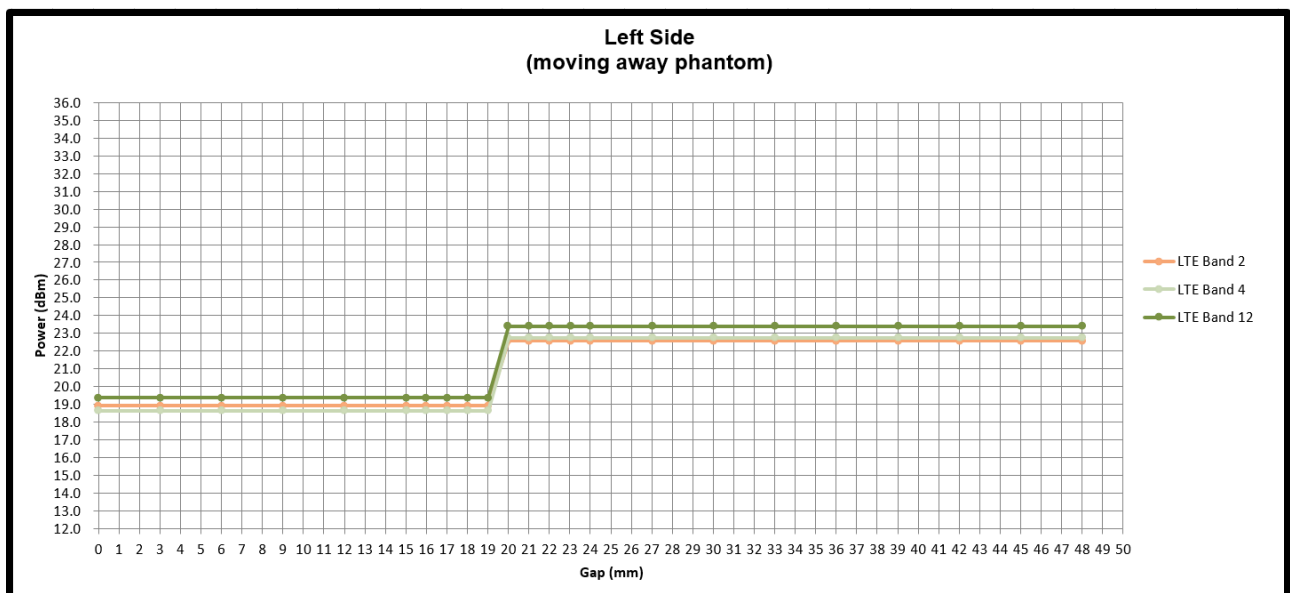
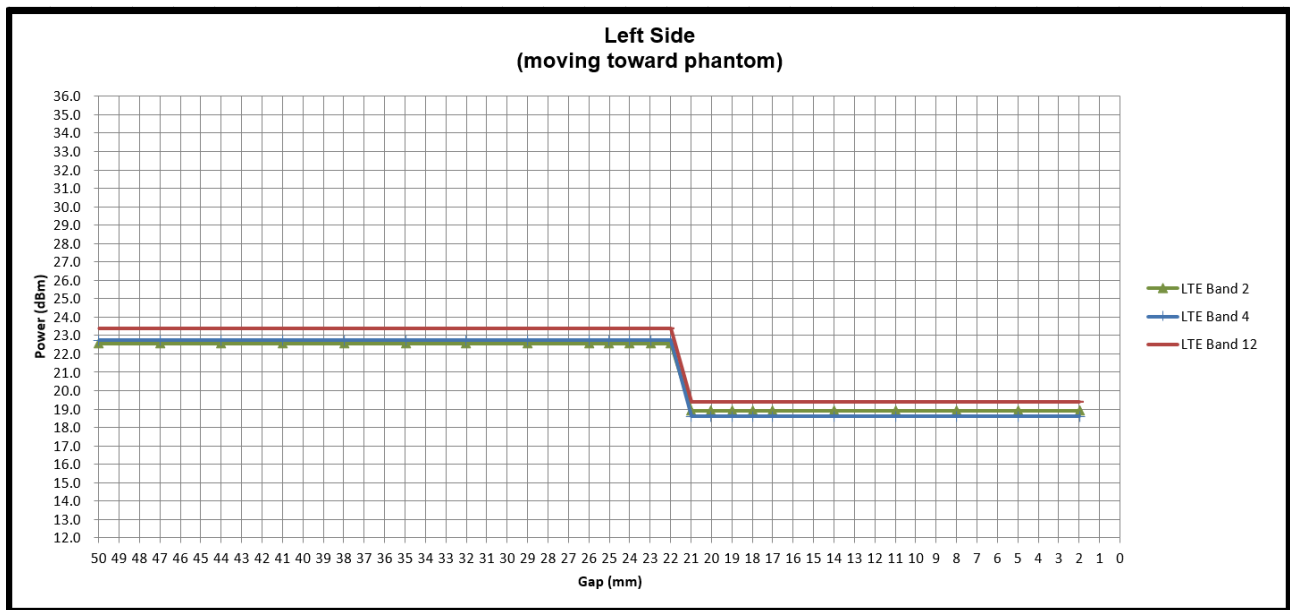
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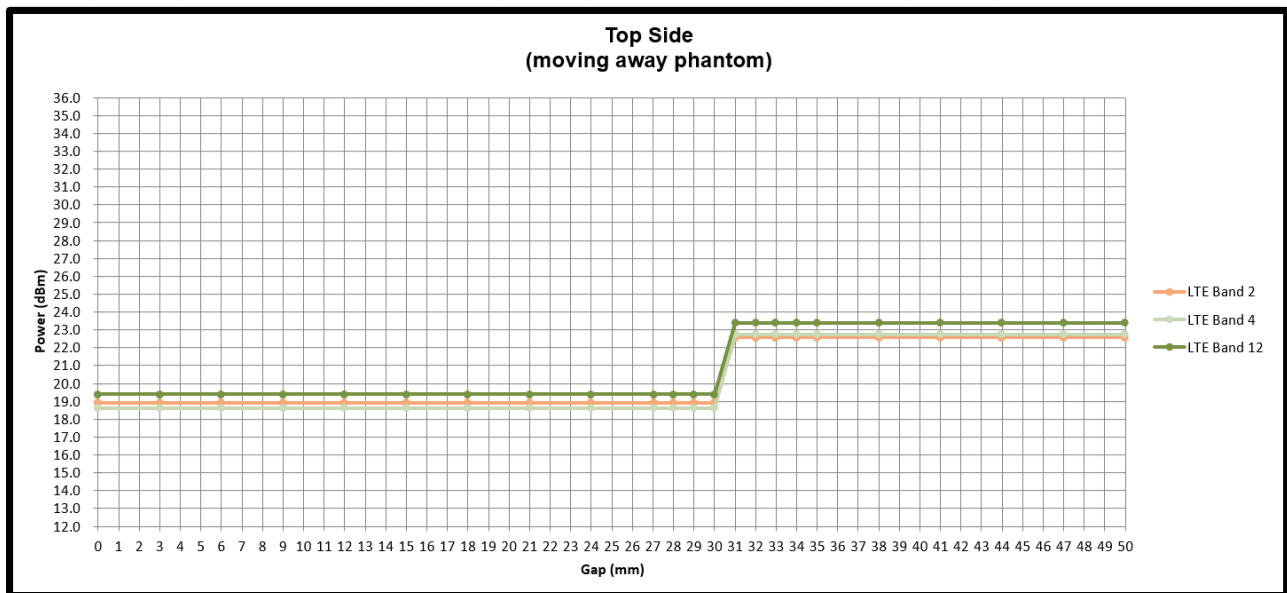
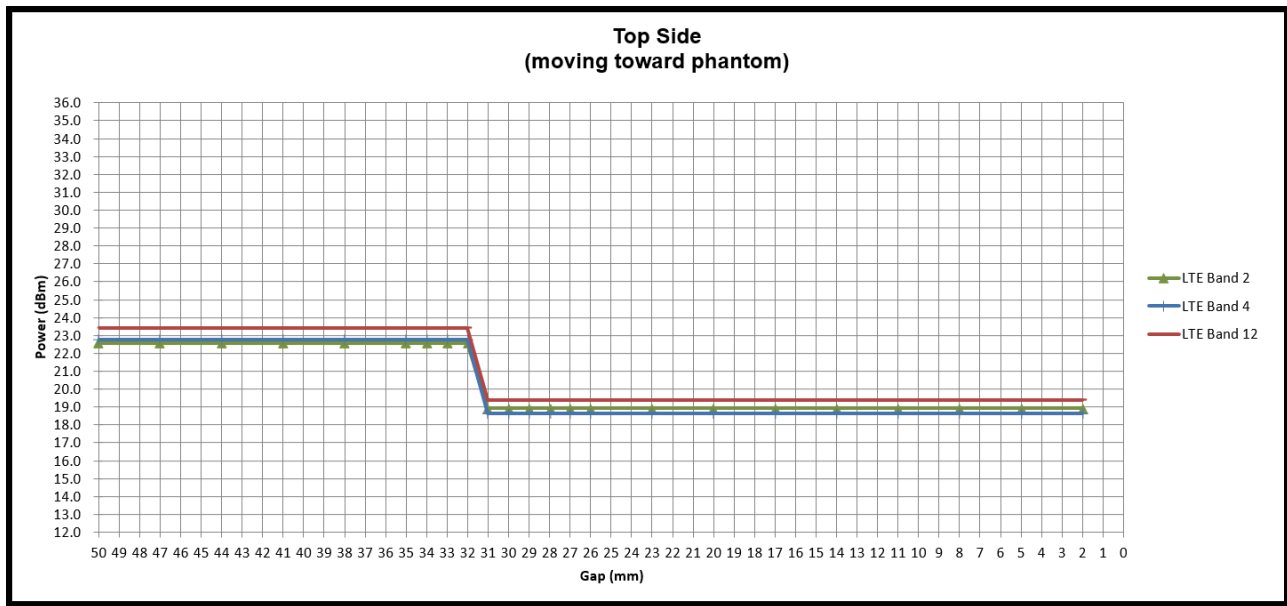
1. Reduced maximum limit applied by activation of proximity sensor.
2. Tests were performed in accordance with KDB 616217 D04 section 6.1, 6.2, 6.3, 6.4 and 6.5 and compliant results are shown as below.
3. For verification of compliance of power reduction scheme, additional SAR testing with EUT transmitting at full RF power at a conservative trigger distance was performed:
 - Front: [26 mm](#)
 - Back: [23 mm](#)
 - Left Side: [18 mm](#)
 - Right Side: [24 mm](#)
 - Top Side: [29 mm](#)

Power Measurement during Sensor Trigger distance testing










5. RF Exposure Limits

5.1 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.

5.2 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.

6. Specific Absorption Rate (SAR)

6.1 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.

6.2 SAR Definition

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

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

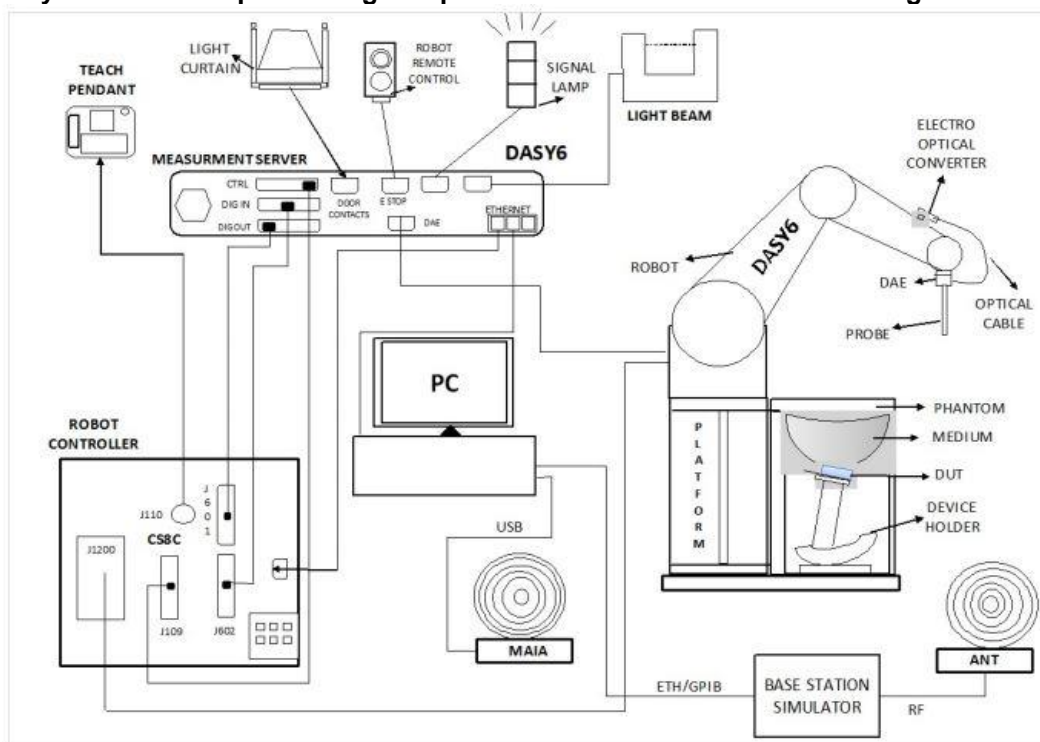
SAR is expressed in units of Watts per kilogram (W/kg)

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

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

7. 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.

7.1 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	
	SAR06-HY	SAR10-HY	SAR13-HY	SAR14-HY	


7.2 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 μ W/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 μ W/g – >100 mW/g Linearity: ± 0.2 dB (noise: typically <1 μ W/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	

7.3 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

7.4 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.

7.5 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

8. 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

8.1 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 from 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

8.2 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.

8.3 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 dB) 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	$\frac{1}{2} \cdot \delta \cdot \ln(2) \pm 0.5$ mm
Maximum probe angle from probe axis to phantom surface normal at the measurement location	$30^\circ \pm 1^\circ$	$20^\circ \pm 1^\circ$
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 \leq the corresponding x or y dimension of the test device with at least one measurement point on the test device.	

8.4 Zoom Scan

Zoom scans are used to 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 whose 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: $\Delta x_{\text{Zoom}}, \Delta y_{\text{Zoom}}$			≤ 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: $\Delta z_{\text{Zoom}}(n)$		≤ 5 mm	3 – 4 GHz: ≤ 4 mm 4 – 5 GHz: ≤ 3 mm 5 – 6 GHz: ≤ 2 mm
	graded grid	$\Delta z_{\text{Zoom}}(1)$: between 1 st two points closest to phantom surface	≤ 4 mm	3 – 4 GHz: ≤ 3 mm 4 – 5 GHz: ≤ 2.5 mm 5 – 6 GHz: ≤ 2 mm
		$\Delta z_{\text{Zoom}}(n>1)$: between subsequent points	$\leq 1.5 \cdot \Delta z_{\text{Zoom}}(n-1)$	
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 <i>reported</i> SAR from the <i>area scan based 1-g SAR estimation</i> 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.				

8.5 Volume Scan Procedures

The volume scan is used to 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 remains in the same test position for all measurements and all volume scans use the same spatial resolution and grid spacing. When all volume scans were completed, the software, SEMCAD postprocessor can combine and subsequently superpose these measurement data to calculating the multiband SAR.

8.6 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.

9. Test Equipment List

Manufacturer	Name of Equipment	Type/Model	Serial Number	Calibration	
				Last Cal.	Due Date
SPEAG	750MHz System Validation Kit	D750V3	1117	Mar. 24, 2022	Mar. 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	1399	Feb. 28, 2022	Feb. 27, 2023
SPEAG	Data Acquisition Electronics	DAE4	1647	Jan. 19, 2022	Jan. 18, 2023
SPEAG	Dosimetric E-Field Probe	EX3DV4	3728	Mar. 02, 2022	Mar. 01, 2023
SPEAG	Dosimetric E-Field Probe	EX3DV4	7700	Jan. 11, 2022	Jan. 10, 2023
RCPTWN	Thermometer	HTC-1	TM685-1	Jun. 27, 2022	Jun. 26, 2023
RCPTWN	Thermometer	HTC-1	TM560-2	Mar. 15, 2022	Mar. 14, 2023
Anritsu	Radio Communication Analyzer	MT8821C	6201341950	Oct. 21, 2021	Oct. 20, 2022
SPEAG	Device Holder	N/A	N/A	N/A	N/A
Anritsu	Signal Generator	MG3710A	6201502524	Oct. 24, 2021	Oct. 23, 2022
Keysight	ENA Network Analyzer	E5071C	MY46104758	Sep. 19, 2021	Sep. 18, 2022
SPEAG	Dielectric Probe Kit	DAK-3.5	1126	Sep. 24, 2021	Sep. 23, 2022
LINE SEIKI	Digital Thermometer	DTM3000-spezial	2942	Oct. 26, 2021	Oct. 25, 2022
Anritsu	Power Meter	ML2495A	1804003	Oct. 09, 2021	Oct. 08, 2022
Anritsu	Power Meter	ML2496A	2119003	Jun. 22, 2022	Jun. 21, 2023
Anritsu	Power Sensor	MA2411B	1726150	Oct. 09, 2021	Oct. 08, 2022
Anritsu	Power Sensor	MA2411B	1911334	Jun. 22, 2022	Jun. 21, 2023
Anritsu	Spectrum Analyzer	MS2830A	6201396378	Jul. 21, 2022	Jul. 20, 2023
Anritsu	Spectrum Analyzer	N9010A	MY53470118	Jan. 12, 2022	Jan. 11, 2023
Mini-Circuits	Power Amplifier	ZVE-8G+	6418	Oct. 12, 2021	Oct. 11, 2022
Mini-Circuits	Power Amplifier	ZHL-42W+	715701915	May. 12, 2022	May. 11, 2023
ATM	Dual Directional Coupler	C122H-10	P610410z-02	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.

10. System Verification

10.1 Tissue Verification

The tissue dielectric parameters of tissue-equivalent media used for SAR measurements must be characterized within a temperature range of 18°C to 25°C, 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°C to 25°C and within $\pm 2^\circ\text{C}$ 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. (°C)	Conductivity (σ)	Permittivity (ϵ_r)	Conductivity Target (σ)	Permittivity Target (ϵ_r)	Delta (σ) (%)	Delta (ϵ_r) (%)	Limit (%)	Date
750	22.5	0.885	42.10	0.89	41.90	-0.56	0.48	± 5	2022/9/8
1750	22.5	1.36	41.00	1.37	40.10	-0.73	2.24	± 5	2022/9/8
1900	22.5	1.44	39.40	1.40	40.00	2.86	-1.50	± 5	2022/9/8

10.2 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 (%)
SAR13	2022/9/8	750	50	D750V3-1117	EX3DV4 - SN3728	DAE4 Sn1647	0.388	8.520	7.76	-8.92
SAR13	2022/9/8	1750	50	D1750V2-1112	EX3DV4 - SN3728	DAE4 Sn1647	1.700	36.900	34	-7.86
SAR14	2022/9/8	1900	50	D1900V2-5d185	EX3DV4 - SN7700	DAE4 Sn1399	1.840	39.000	36.8	-5.64

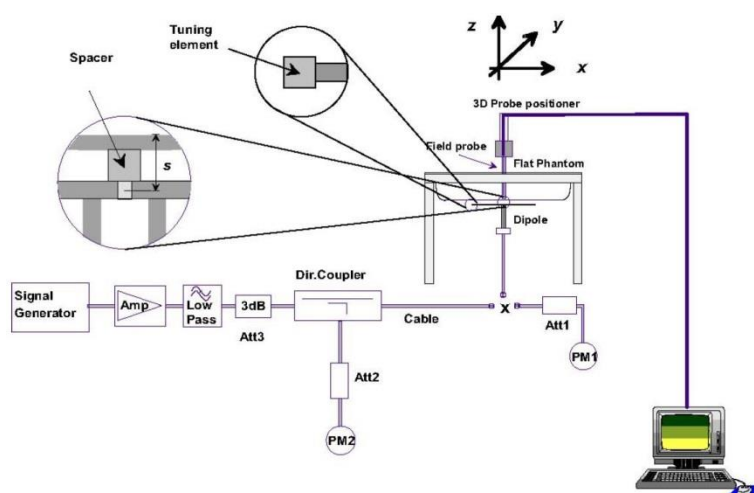


Fig 8.3.1 System Performance Check Setup







Fig 8.3.2 Setup Photo

11. RF Exposure Positions

11.1 SAR Testing for USB Dongle

Test all USB orientations [see figure below: (A) Horizontal-Up, (B) Horizontal-Down, (C) Vertical-Front, and (D) Vertical-Back] with a device-to-phantom separation distance of 5 mm or less, according to KDB Publication 447498 D02 requirements. These test orientations are intended for the exposure conditions found in typical laptop/notebook/netbook or tablet computers with either horizontal or vertical USB connector configurations at various locations in the keyboard section of the computer. Current generation portable host computers should be used to establish the required SAR measurement separation distance. The same test separation distance must be used to test all frequency bands and modes in each USB orientation. The typical Horizontal-Up USB connection (A), found in the majority of host computers, must be tested using an appropriate host computer. A host computer with either Vertical-Front (C) or Vertical Back (D) USB connection should be used to test one of the vertical USB orientations. If a suitable host computer is not available for testing the Horizontal-Down (B) or the remaining Vertical USB orientation, a high quality USB cable, 12 inches or less, may be used for testing these other orientations. It must be documented that the USB cable does not influence the radiating characteristics and output power of the transmitter.

			
Configuration 1 (Horizontal Up)	Configuration 2 (Horizontal Down)	Configuration 3 (Vertical Front)	Configuration 4 (Vertical Back)

12. LTE Output Power (Unit: dBm)

<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 $\frac{1}{2}$ 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 $\frac{1}{2}$ 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. For LTE B4/B12 the maximum bandwidth does not support three non-overlapping channels, per KDB 941225 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.

**Default Power Mode****<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				18700	18900	19100	
Frequency (MHz)				1860	1880	1900	
20	QPSK	1	0	22.58	22.57	22.32	24
20	QPSK	1	49	22.30	22.20	22.16	
20	QPSK	1	99	22.45	22.24	22.44	
20	QPSK	50	0	21.53	21.52	21.50	23
20	QPSK	50	24	21.52	21.50	21.51	
20	QPSK	50	50	21.46	21.50	21.41	
20	QPSK	100	0	21.50	21.38	21.44	
20	16QAM	1	0	21.65	21.19	21.15	23
20	16QAM	1	49	21.21	21.30	21.62	
20	16QAM	1	99	21.07	21.22	21.79	
20	16QAM	50	0	20.55	20.55	20.49	22
20	16QAM	50	24	20.65	20.52	20.54	
20	16QAM	50	50	20.42	20.51	20.38	
20	16QAM	100	0	20.59	20.38	20.52	
Channel				18675	18900	19125	Tune-up limit (dBm)
Frequency (MHz)				1857.5	1880	1902.5	
15	QPSK	1	0	22.58	22.47	22.31	24
15	QPSK	1	37	22.27	22.12	22.16	
15	QPSK	1	74	22.36	22.20	22.41	
15	QPSK	36	0	21.52	21.49	21.46	23
15	QPSK	36	20	21.48	21.46	21.41	
15	QPSK	36	39	21.39	21.50	21.41	
15	QPSK	75	0	21.47	21.37	21.45	
15	16QAM	1	0	21.55	21.16	21.05	23
15	16QAM	1	37	21.19	21.26	21.62	
15	16QAM	1	74	21.02	21.14	21.79	
15	16QAM	36	0	20.53	20.54	20.44	22
15	16QAM	36	20	20.61	20.50	20.50	
15	16QAM	36	39	20.42	20.42	20.32	
15	16QAM	75	0	20.57	20.35	20.42	
Channel				18650	18900	19150	Tune-up limit (dBm)
Frequency (MHz)				1855	1880	1905	
10	QPSK	1	0	22.48	22.52	22.23	24
10	QPSK	1	25	22.23	22.13	22.16	
10	QPSK	1	49	22.45	22.20	22.36	
10	QPSK	25	0	21.47	21.49	21.45	23
10	QPSK	25	12	21.46	21.43	21.45	
10	QPSK	25	25	21.43	21.42	21.35	
10	QPSK	50	0	21.46	21.36	21.51	
10	16QAM	1	0	21.55	21.15	21.12	23
10	16QAM	1	25	21.19	21.27	21.62	
10	16QAM	1	49	21.01	21.15	21.78	
10	16QAM	25	0	20.47	20.49	20.39	22
10	16QAM	25	12	20.59	20.42	20.54	
10	16QAM	25	25	20.34	20.50	20.28	
10	16QAM	50	0	20.55	20.36	20.49	
Channel				18625	18900	19175	Tune-up limit (dBm)
Frequency (MHz)				1852.5	1880	1907.5	
5	QPSK	1	0	22.53	22.57	22.24	24
5	QPSK	1	12	22.21	22.13	22.10	



FCC SAR TEST REPORT

Report No. : FA261635

5	QPSK	1	24	22.44	22.20	22.37	23
5	QPSK	12	0	21.51	21.49	21.45	
5	QPSK	12	7	21.43	21.50	21.43	
5	QPSK	12	13	21.37	21.50	21.41	
5	QPSK	25	0	21.41	21.38	21.52	
5	16QAM	1	0	21.57	21.16	21.08	23
5	16QAM	1	12	21.16	21.20	21.58	
5	16QAM	1	24	21.08	21.17	21.69	
5	16QAM	12	0	20.53	20.49	20.47	22
5	16QAM	12	7	20.64	20.45	20.47	
5	16QAM	12	13	20.35	20.42	20.38	
5	16QAM	25	0	20.49	20.33	20.43	
Channel				18615	18900	19185	Tune-up limit (dBm)
Frequency (MHz)				1851.5	1880	1908.5	
3	QPSK	1	0	22.49	22.48	22.23	24
3	QPSK	1	8	22.29	22.15	22.06	
3	QPSK	1	14	22.43	22.24	22.40	
3	QPSK	8	0	21.49	21.48	21.53	23
3	QPSK	8	4	21.47	21.48	21.42	
3	QPSK	8	7	21.45	21.48	21.38	
3	QPSK	15	0	21.42	21.28	21.44	
3	16QAM	1	0	21.63	21.18	21.12	23
3	16QAM	1	8	21.11	21.24	21.61	
3	16QAM	1	14	21.03	21.17	21.75	
3	16QAM	8	0	20.52	20.47	20.49	22
3	16QAM	8	4	20.58	20.44	20.49	
3	16QAM	8	7	20.36	20.50	20.36	
3	16QAM	15	0	20.49	20.33	20.48	
Channel				18607	18900	19193	Tune-up limit (dBm)
Frequency (MHz)				1850.7	1880	1909.3	
1.4	QPSK	1	0	22.39	22.48	22.22	24
1.4	QPSK	1	3	22.15	22.09	22.10	
1.4	QPSK	1	5	22.43	22.15	22.26	
1.4	QPSK	3	0	22.48	22.42	22.18	
1.4	QPSK	3	1	22.21	22.09	22.11	
1.4	QPSK	3	3	22.37	22.10	22.28	
1.4	QPSK	6	0	21.46	21.40	21.39	23
1.4	16QAM	1	0	21.45	21.38	21.43	23
1.4	16QAM	1	3	21.43	21.32	21.26	
1.4	16QAM	1	5	21.46	21.26	21.48	
1.4	16QAM	3	0	21.53	21.14	21.02	
1.4	16QAM	3	1	21.17	21.27	21.60	
1.4	16QAM	3	3	21.12	21.06	21.70	
1.4	16QAM	6	0	20.46	20.45	20.34	22

**<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				20050	20175	20300	
Frequency (MHz)				1720	1732.5	1745	
20	QPSK	1	0	22.74	22.75	22.71	
20	QPSK	1	49	22.42	22.59	22.40	24
20	QPSK	1	99	22.23	22.54	22.50	
20	QPSK	50	0	21.39	21.43	21.39	
20	QPSK	50	24	21.30	21.36	21.37	23
20	QPSK	50	50	21.34	21.41	21.38	
20	QPSK	100	0	21.55	21.57	21.51	
20	16QAM	1	0	21.51	21.69	21.13	23
20	16QAM	1	49	21.35	21.51	21.60	
20	16QAM	1	99	21.58	21.10	21.12	
20	16QAM	50	0	20.85	20.51	20.64	22
20	16QAM	50	24	20.69	20.60	20.68	
20	16QAM	50	50	20.57	20.65	20.56	
20	16QAM	100	0	20.72	20.66	20.53	
Channel				20025	20175	20325	Tune-up limit (dBm)
Frequency (MHz)				1717.5	1732.5	1747.5	
15	QPSK	1	0	22.70	22.70	22.61	
15	QPSK	1	37	22.40	22.51	22.33	24
15	QPSK	1	74	22.22	22.46	22.40	
15	QPSK	36	0	21.75	21.43	21.62	23
15	QPSK	36	20	21.56	21.37	21.53	
15	QPSK	36	39	21.36	21.51	21.45	
15	QPSK	75	0	21.72	21.54	21.49	
15	16QAM	1	0	21.47	21.65	21.13	23
15	16QAM	1	37	21.27	21.41	21.56	
15	16QAM	1	74	21.56	21.04	21.09	
15	16QAM	36	0	20.76	20.49	20.55	22
15	16QAM	36	20	20.63	20.55	20.64	
15	16QAM	36	39	20.48	20.65	20.53	
15	16QAM	75	0	20.64	20.59	20.52	
Channel				20000	20175	20350	Tune-up limit (dBm)
Frequency (MHz)				1715	1732.5	1750	
10	QPSK	1	0	22.74	22.69	22.67	
10	QPSK	1	25	22.34	22.54	22.37	24
10	QPSK	1	49	22.22	22.53	22.46	
10	QPSK	25	0	21.76	21.33	21.62	23
10	QPSK	25	12	21.59	21.41	21.50	
10	QPSK	25	25	21.35	21.52	21.46	
10	QPSK	50	0	21.70	21.49	21.47	
10	16QAM	1	0	21.51	21.61	21.10	23
10	16QAM	1	25	21.29	21.45	21.59	
10	16QAM	1	49	21.56	21.03	21.12	
10	16QAM	25	0	20.85	20.47	20.57	22
10	16QAM	25	12	20.59	20.59	20.66	
10	16QAM	25	25	20.48	20.56	20.52	
10	16QAM	50	0	20.67	20.62	20.44	
Channel				19975	20175	20375	Tune-up limit (dBm)
Frequency (MHz)				1712.5	1732.5	1752.5	
5	QPSK	1	0	22.65	22.70	22.61	
5	QPSK	1	12	22.37	22.52	22.30	24



FCC SAR TEST REPORT

Report No. : FA261635

5	QPSK	1	24	22.18	22.45	22.45	23
5	QPSK	12	0	21.77	21.39	21.62	
5	QPSK	12	7	21.53	21.38	21.51	
5	QPSK	12	13	21.38	21.55	21.39	
5	QPSK	25	0	21.71	21.48	21.49	
5	16QAM	1	0	21.47	21.69	21.04	23
5	16QAM	1	12	21.28	21.49	21.51	
5	16QAM	1	24	21.52	21.04	21.05	
5	16QAM	12	0	20.82	20.47	20.56	22
5	16QAM	12	7	20.65	20.51	20.63	
5	16QAM	12	13	20.55	20.57	20.51	
5	16QAM	25	0	20.72	20.57	20.43	
Channel				19965	20175	20385	Tune-up limit (dBm)
Frequency (MHz)				1711.5	1732.5	1753.5	
3	QPSK	1	0	22.67	22.72	22.69	24
3	QPSK	1	8	22.36	22.52	22.35	
3	QPSK	1	14	22.16	22.45	22.43	
3	QPSK	8	0	21.76	21.37	21.59	23
3	QPSK	8	4	21.55	21.43	21.54	
3	QPSK	8	7	21.41	21.51	21.44	
3	QPSK	15	0	21.67	21.51	21.50	
3	16QAM	1	0	21.41	21.63	21.03	23
3	16QAM	1	8	21.26	21.45	21.57	
3	16QAM	1	14	21.57	21.00	21.09	
3	16QAM	8	0	20.81	20.41	20.56	22
3	16QAM	8	4	20.66	20.51	20.64	
3	16QAM	8	7	20.52	20.61	20.47	
3	16QAM	15	0	20.67	20.59	20.51	
Channel				19957	20175	20393	Tune-up limit (dBm)
Frequency (MHz)				1710.7	1732.5	1754.3	
1.4	QPSK	1	0	22.62	22.69	22.57	24
1.4	QPSK	1	3	22.35	22.51	22.32	
1.4	QPSK	1	5	22.21	22.38	22.32	
1.4	QPSK	3	0	22.66	22.70	22.54	
1.4	QPSK	3	1	22.36	22.46	22.33	
1.4	QPSK	3	3	22.18	22.46	22.32	
1.4	QPSK	6	0	21.68	21.42	21.59	23
1.4	16QAM	1	0	21.49	21.27	21.51	23
1.4	16QAM	1	3	21.34	21.44	21.38	
1.4	16QAM	1	5	21.64	21.53	21.48	
1.4	16QAM	3	0	21.41	21.60	21.13	
1.4	16QAM	3	1	21.25	21.39	21.52	
1.4	16QAM	3	3	21.56	21.08	21.09	
1.4	16QAM	6	0	20.75	20.48	20.48	22

<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				23060	23095	23130	
Frequency (MHz)				704	707.5	711	
10	QPSK	1	0	23.28	23.39	23.24	24
10	QPSK	1	25	22.40	22.49	22.66	
10	QPSK	1	49	23.25	23.37	23.00	
10	QPSK	25	0	22.20	22.30	22.39	23
10	QPSK	25	12	22.25	22.31	22.34	
10	QPSK	25	25	22.52	22.35	22.44	
10	QPSK	50	0	22.30	22.34	22.39	23
10	16QAM	1	0	21.88	22.10	21.98	
10	16QAM	1	25	22.14	22.47	22.69	
10	16QAM	1	49	22.48	21.67	22.09	22
10	16QAM	25	0	21.19	21.35	21.32	
10	16QAM	25	12	21.18	21.38	21.39	
10	16QAM	25	25	21.46	21.46	21.34	22
10	16QAM	25	25	21.46	21.46	21.34	
10	16QAM	50	0	21.32	21.38	21.31	
Channel				23035	23095	23155	Tune-up limit (dBm)
Frequency (MHz)				701.5	707.5	713.5	
5	QPSK	1	0	23.24	23.33	23.23	24
5	QPSK	1	12	22.30	22.45	22.59	
5	QPSK	1	24	23.22	23.31	22.95	
5	QPSK	12	0	22.13	22.26	22.30	23
5	QPSK	12	7	22.18	22.35	22.25	
5	QPSK	12	13	22.47	22.27	22.39	
5	QPSK	25	0	22.30	22.30	22.39	23
5	16QAM	1	0	21.87	22.04	21.97	
5	16QAM	1	12	22.08	22.43	22.64	
5	16QAM	1	24	22.43	21.65	22.04	22
5	16QAM	12	0	21.10	21.28	21.22	
5	16QAM	12	7	21.16	21.37	21.35	
5	16QAM	12	13	21.45	21.37	21.31	22
5	16QAM	12	13	21.45	21.37	21.31	
5	16QAM	25	0	21.27	21.34	21.25	
Channel				23025	23095	23165	Tune-up limit (dBm)
Frequency (MHz)				700.5	707.5	714.5	
3	QPSK	1	0	23.18	23.35	23.21	24
3	QPSK	1	8	22.32	22.40	22.57	
3	QPSK	1	14	23.15	23.27	22.96	
3	QPSK	8	0	22.18	22.22	22.32	23
3	QPSK	8	4	22.21	22.31	22.24	
3	QPSK	8	7	22.42	22.28	22.41	
3	QPSK	15	0	22.28	22.27	22.35	23
3	16QAM	1	0	21.88	22.08	21.88	
3	16QAM	1	8	22.05	22.42	22.62	
3	16QAM	1	14	22.42	21.58	22.05	22
3	16QAM	8	0	21.09	21.35	21.28	
3	16QAM	8	4	21.11	21.29	21.31	
3	16QAM	8	7	21.36	21.45	21.32	22
3	16QAM	8	7	21.36	21.45	21.32	
3	16QAM	15	0	21.27	21.29	21.27	
Channel				23017	23095	23173	Tune-up limit (dBm)
Frequency (MHz)				699.7	707.5	715.3	
1.4	QPSK	1	0	23.21	23.30	23.20	24
1.4	QPSK	1	3	22.27	22.41	22.54	



FCC SAR TEST REPORT

Report No. : FA261635

1.4	QPSK	1	5	23.13	23.21	22.95	
1.4	QPSK	3	0	23.22	23.23	23.22	
1.4	QPSK	3	1	22.30	22.41	22.51	
1.4	QPSK	3	3	23.22	23.31	22.87	
1.4	QPSK	6	0	22.08	22.16	22.29	23
1.4	16QAM	1	0	22.08	22.28	22.18	23
1.4	16QAM	1	3	22.46	22.19	22.35	
1.4	16QAM	1	5	22.27	22.21	22.34	
1.4	16QAM	3	0	21.77	22.03	21.88	
1.4	16QAM	3	1	22.08	22.41	22.55	
1.4	16QAM	3	3	22.39	21.55	22.02	22
1.4	16QAM	6	0	21.02	21.20	21.19	

Reduced Power Mode
<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				18700	18900	19100	
Frequency (MHz)				1860	1880	1900	
20	QPSK	1	0	18.92	18.81	18.50	19.5
20	QPSK	1	49	18.40	18.29	18.36	
20	QPSK	1	99	18.50	18.35	18.37	
20	QPSK	50	0	18.66	18.54	18.55	19.5
20	QPSK	50	24	18.63	18.50	18.46	
20	QPSK	50	50	18.55	18.53	18.44	
20	QPSK	100	0	18.56	18.45	18.54	
20	16QAM	1	0	18.72	18.46	18.64	19.5
20	16QAM	1	49	18.05	18.36	18.67	
20	16QAM	1	99	18.16	18.17	18.42	
20	16QAM	50	0	18.75	18.67	18.50	19.5
20	16QAM	50	24	18.69	18.57	18.51	
20	16QAM	50	50	18.62	18.61	18.62	
20	16QAM	100	0	18.62	18.54	18.59	
Channel				18675	18900	19125	Tune-up limit (dBm)
Frequency (MHz)				1857.5	1880	1902.5	
15	QPSK	1	0	18.86	18.74	18.47	19.5
15	QPSK	1	37	18.37	18.23	18.32	
15	QPSK	1	74	18.50	18.27	18.30	
15	QPSK	36	0	18.61	18.48	18.51	19.5
15	QPSK	36	20	18.56	18.51	18.47	
15	QPSK	36	39	18.53	18.48	18.37	
15	QPSK	75	0	18.53	18.38	18.52	
15	16QAM	1	0	18.62	18.44	18.57	19.5
15	16QAM	1	37	17.97	18.34	18.65	
15	16QAM	1	74	18.11	18.08	18.40	
15	16QAM	36	0	18.70	18.65	18.40	19.5
15	16QAM	36	20	18.65	18.54	18.51	
15	16QAM	36	39	18.61	18.54	18.56	
15	16QAM	75	0	18.58	18.49	18.56	
Channel				18650	18900	19150	Tune-up limit (dBm)
Frequency (MHz)				1855	1880	1905	
10	QPSK	1	0	18.91	18.73	18.50	19.5
10	QPSK	1	25	18.38	18.22	18.26	
10	QPSK	1	49	18.42	18.27	18.28	
10	QPSK	25	0	18.58	18.52	18.50	19.5
10	QPSK	25	12	18.60	18.52	18.46	
10	QPSK	25	25	18.45	18.50	18.42	
10	QPSK	50	0	18.55	18.36	18.44	
10	16QAM	1	0	18.68	18.46	18.56	19.5
10	16QAM	1	25	18.02	18.36	18.66	
10	16QAM	1	49	18.12	18.16	18.39	
10	16QAM	25	0	18.74	18.65	18.41	19.5
10	16QAM	25	12	18.59	18.50	18.45	
10	16QAM	25	25	18.56	18.56	18.58	
10	16QAM	50	0	18.60	18.52	18.59	
Channel				18625	18900	19175	Tune-up limit (dBm)
Frequency (MHz)				1852.5	1880	1907.5	
5	QPSK	1	0	18.87	18.79	18.42	19.5
5	QPSK	1	12	18.39	18.24	18.27	

5	QPSK	1	24	18.44	18.25	18.28	
5	QPSK	12	0	18.61	18.52	18.53	19.5
5	QPSK	12	7	18.55	18.56	18.52	
5	QPSK	12	13	18.48	18.51	18.43	
5	QPSK	25	0	18.46	18.43	18.52	
5	16QAM	1	0	18.62	18.46	18.55	19.5
5	16QAM	1	12	18.00	18.30	18.65	
5	16QAM	1	24	18.10	18.14	18.37	
5	16QAM	12	0	18.69	18.63	18.40	19.5
5	16QAM	12	7	18.64	18.51	18.44	
5	16QAM	12	13	18.52	18.51	18.59	
5	16QAM	25	0	18.57	18.53	18.55	
Channel				18615	18900	19185	Tune-up limit (dBm)
Frequency (MHz)				1851.5	1880	1908.5	
3	QPSK	1	0	18.83	18.75	18.47	19.5
3	QPSK	1	8	18.37	18.24	18.34	
3	QPSK	1	14	18.40	18.34	18.37	
3	QPSK	8	0	18.63	18.45	18.52	19.5
3	QPSK	8	4	18.61	18.60	18.55	
3	QPSK	8	7	18.54	18.43	18.37	
3	QPSK	15	0	18.56	18.40	18.44	
3	16QAM	1	0	18.68	18.37	18.59	19.5
3	16QAM	1	8	17.96	18.32	18.59	
3	16QAM	1	14	18.09	18.13	18.36	
3	16QAM	8	0	18.70	18.61	18.44	19.5
3	16QAM	8	4	18.64	18.47	18.50	
3	16QAM	8	7	18.61	18.57	18.57	
3	16QAM	15	0	18.55	18.54	18.51	
Channel				18607	18900	19193	Tune-up limit (dBm)
Frequency (MHz)				1850.7	1880	1909.3	
1.4	QPSK	1	0	18.90	18.78	18.45	19.5
1.4	QPSK	1	3	18.38	18.22	18.34	
1.4	QPSK	1	5	18.50	18.35	18.32	
1.4	QPSK	3	0	18.57	18.44	18.45	
1.4	QPSK	3	1	18.63	18.57	18.56	
1.4	QPSK	3	3	18.51	18.51	18.44	
1.4	QPSK	6	0	18.53	18.35	18.44	19.5
1.4	16QAM	1	0	18.64	18.42	18.64	19.5
1.4	16QAM	1	3	17.95	18.30	18.61	
1.4	16QAM	1	5	18.08	18.09	18.35	
1.4	16QAM	3	0	18.75	18.62	18.42	
1.4	16QAM	3	1	18.59	18.54	18.50	
1.4	16QAM	3	3	18.53	18.52	18.55	
1.4	16QAM	6	0	18.57	18.45	18.53	19.5

<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				20050	20175	20300	
Frequency (MHz)				1720	1732.5	1745	
20	QPSK	1	0	18.56	18.63	18.62	19.5
20	QPSK	1	49	18.35	18.62	18.61	
20	QPSK	1	99	18.04	18.50	18.44	
20	QPSK	50	0	18.31	18.33	18.29	19.5
20	QPSK	50	24	18.28	18.32	18.25	
20	QPSK	50	50	18.30	18.31	18.29	
20	QPSK	100	0	18.42	18.47	18.46	19.5
20	16QAM	1	0	18.39	18.35	18.60	
20	16QAM	1	49	18.61	18.02	18.52	
20	16QAM	1	99	17.84	18.47	17.83	19.5
20	16QAM	50	0	18.62	18.36	18.53	
20	16QAM	50	24	18.43	18.47	18.46	
20	16QAM	50	50	18.36	18.58	18.43	19.5
20	16QAM	100	0	18.39	18.56	18.47	
Channel				20025	20175	20325	Tune-up limit (dBm)
Frequency (MHz)				1717.5	1732.5	1747.5	
15	QPSK	1	0	18.48	18.54	18.59	19.5
15	QPSK	1	37	18.31	18.53	18.56	
15	QPSK	1	74	17.96	18.46	18.41	
15	QPSK	36	0	18.55	18.24	18.57	19.5
15	QPSK	36	20	18.45	18.42	18.39	
15	QPSK	36	39	18.24	18.42	18.37	
15	QPSK	75	0	18.55	18.38	18.53	19.5
15	16QAM	1	0	18.39	18.30	18.50	
15	16QAM	1	37	18.53	17.96	18.43	
15	16QAM	1	74	17.78	18.37	17.74	19.5
15	16QAM	36	0	18.61	18.29	18.49	
15	16QAM	36	20	18.40	18.39	18.37	
15	16QAM	36	39	18.30	18.51	18.39	19.5
15	16QAM	75	0	18.36	18.52	18.39	
Channel				20000	20175	20350	Tune-up limit (dBm)
Frequency (MHz)				1715	1732.5	1750	
10	QPSK	1	0	18.49	18.56	18.53	19.5
10	QPSK	1	25	18.33	18.54	18.58	
10	QPSK	1	49	18.00	18.48	18.35	
10	QPSK	25	0	18.53	18.28	18.54	19.5
10	QPSK	25	12	18.47	18.42	18.38	
10	QPSK	25	25	18.27	18.47	18.39	
10	QPSK	50	0	18.49	18.43	18.56	19.5
10	16QAM	1	0	18.38	18.28	18.59	
10	16QAM	1	25	18.57	17.94	18.44	
10	16QAM	1	49	17.82	18.41	17.74	19.5
10	16QAM	25	0	18.54	18.30	18.43	
10	16QAM	25	12	18.41	18.38	18.39	
10	16QAM	25	25	18.31	18.48	18.34	19.5
10	16QAM	50	0	18.35	18.47	18.45	
Channel				19975	20175	20375	Tune-up limit (dBm)
Frequency (MHz)				1712.5	1732.5	1752.5	
5	QPSK	1	0	18.55	18.57	18.56	19.5
5	QPSK	1	12	18.34	18.62	18.57	

5	QPSK	1	24	18.02	18.40	18.43	
5	QPSK	12	0	18.55	18.28	18.54	19.5
5	QPSK	12	7	18.41	18.34	18.43	
5	QPSK	12	13	18.20	18.45	18.33	
5	QPSK	25	0	18.51	18.37	18.55	
5	16QAM	1	0	18.29	18.25	18.53	19.5
5	16QAM	1	12	18.53	17.94	18.45	
5	16QAM	1	24	17.83	18.40	17.81	
5	16QAM	12	0	18.54	18.34	18.45	19.5
5	16QAM	12	7	18.40	18.45	18.39	
5	16QAM	12	13	18.27	18.56	18.40	
5	16QAM	25	0	18.34	18.51	18.44	
Channel				19965	20175	20385	Tune-up limit (dBm)
Frequency (MHz)				1711.5	1732.5	1753.5	
3	QPSK	1	0	18.50	18.56	18.58	19.5
3	QPSK	1	8	18.26	18.53	18.55	
3	QPSK	1	14	18.00	18.40	18.35	
3	QPSK	8	0	18.57	18.30	18.51	19.5
3	QPSK	8	4	18.48	18.42	18.44	
3	QPSK	8	7	18.28	18.43	18.36	
3	QPSK	15	0	18.56	18.45	18.55	
3	16QAM	1	0	18.35	18.27	18.60	19.5
3	16QAM	1	8	18.58	17.92	18.43	
3	16QAM	1	14	17.84	18.42	17.74	
3	16QAM	8	0	18.61	18.32	18.51	19.5
3	16QAM	8	4	18.38	18.43	18.38	
3	16QAM	8	7	18.36	18.48	18.42	
3	16QAM	15	0	18.31	18.55	18.42	
Channel				19957	20175	20393	Tune-up limit (dBm)
Frequency (MHz)				1710.7	1732.5	1754.3	
1.4	QPSK	1	0	18.50	18.58	18.60	19.5
1.4	QPSK	1	3	18.33	18.60	18.61	
1.4	QPSK	1	5	17.96	18.48	18.43	
1.4	QPSK	3	0	18.60	18.25	18.52	
1.4	QPSK	3	1	18.47	18.39	18.41	
1.4	QPSK	3	3	18.29	18.49	18.36	
1.4	QPSK	6	0	18.56	18.44	18.49	19.5
1.4	16QAM	1	0	18.30	18.30	18.51	19.5
1.4	16QAM	1	3	18.59	18.00	18.45	
1.4	16QAM	1	5	17.80	18.40	17.80	
1.4	16QAM	3	0	18.62	18.32	18.44	
1.4	16QAM	3	1	18.43	18.40	18.45	
1.4	16QAM	3	3	18.32	18.52	18.39	
1.4	16QAM	6	0	18.34	18.46	18.39	19.5

<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				23060	23095	23130	
Frequency (MHz)				704	707.5	711	
10	QPSK	1	0	19.21	19.40	19.32	20
10	QPSK	1	25	18.79	18.90	19.14	
10	QPSK	1	49	19.25	19.25	19.02	
10	QPSK	25	0	19.16	19.34	19.36	20
10	QPSK	25	12	19.17	19.30	19.32	
10	QPSK	25	25	19.33	19.37	19.37	
10	QPSK	50	0	19.29	19.36	19.32	20
10	16QAM	1	0	19.34	18.53	18.99	
10	16QAM	1	25	18.98	19.24	19.30	
10	16QAM	1	49	18.91	19.33	19.21	20
10	16QAM	25	0	19.12	19.29	19.38	
10	16QAM	25	12	19.08	19.29	19.34	
10	16QAM	25	25	19.34	19.37	19.35	
10	16QAM	50	0	19.33	19.33	19.38	
Channel				23035	23095	23155	Tune-up limit (dBm)
Frequency (MHz)				701.5	707.5	713.5	
5	QPSK	1	0	19.14	19.37	19.25	20
5	QPSK	1	12	18.77	18.83	19.05	
5	QPSK	1	24	19.25	19.17	18.95	
5	QPSK	12	0	19.09	19.26	19.30	20
5	QPSK	12	7	19.11	19.25	19.25	
5	QPSK	12	13	19.31	19.32	19.33	
5	QPSK	25	0	19.23	19.34	19.22	20
5	16QAM	1	0	19.34	18.48	18.99	
5	16QAM	1	12	18.93	19.20	19.29	
5	16QAM	1	24	18.91	19.24	19.12	20
5	16QAM	12	0	19.11	19.23	19.33	
5	16QAM	12	7	19.02	19.22	19.29	
5	16QAM	12	13	19.32	19.36	19.26	
5	16QAM	25	0	19.31	19.24	19.33	
Channel				23025	23095	23165	Tune-up limit (dBm)
Frequency (MHz)				700.5	707.5	714.5	
3	QPSK	1	0	19.12	19.33	19.22	20
3	QPSK	1	8	18.78	18.90	19.12	
3	QPSK	1	14	19.21	19.20	19.01	
3	QPSK	8	0	19.09	19.34	19.26	20
3	QPSK	8	4	19.17	19.21	19.29	
3	QPSK	8	7	19.29	19.36	19.37	
3	QPSK	15	0	19.20	19.26	19.26	20
3	16QAM	1	0	19.33	18.46	18.92	
3	16QAM	1	8	18.92	19.23	19.25	
3	16QAM	1	14	18.89	19.24	19.18	20
3	16QAM	8	0	19.09	19.28	19.32	
3	16QAM	8	4	19.00	19.27	19.27	
3	16QAM	8	7	19.26	19.35	19.35	
3	16QAM	15	0	19.28	19.31	19.29	
Channel				23017	23095	23173	Tune-up limit (dBm)
Frequency (MHz)				699.7	707.5	715.3	
1.4	QPSK	1	0	19.19	19.39	19.29	20
1.4	QPSK	1	3	18.76	18.88	19.07	

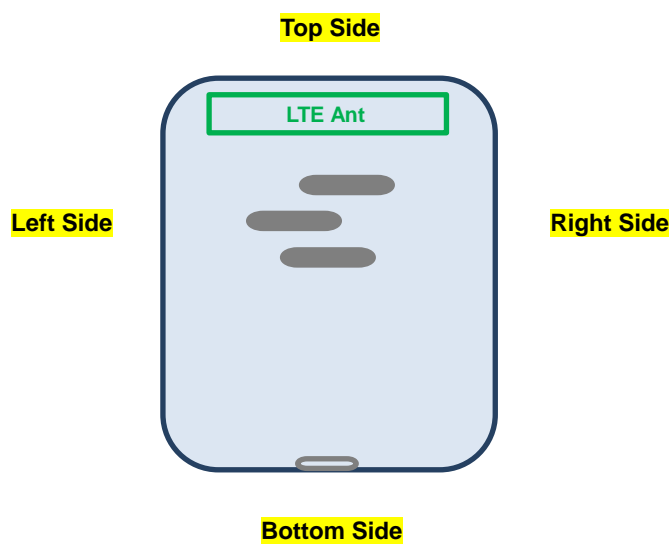


FCC SAR TEST REPORT

Report No. : FA261635

1.4	QPSK	1	5	19.16	19.22	18.98	
1.4	QPSK	3	0	19.11	19.31	19.33	
1.4	QPSK	3	1	19.11	19.25	19.30	
1.4	QPSK	3	3	19.23	19.33	19.36	
1.4	QPSK	6	0	19.29	19.29	19.23	20
1.4	16QAM	1	0	19.24	18.49	18.91	20
1.4	16QAM	1	3	18.97	19.14	19.20	
1.4	16QAM	1	5	18.90	19.32	19.15	
1.4	16QAM	3	0	19.06	19.28	19.30	
1.4	16QAM	3	1	19.07	19.28	19.24	
1.4	16QAM	3	3	19.32	19.29	19.25	
1.4	16QAM	6	0	19.29	19.24	19.38	20

13. Antenna Location



Front View



14. 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 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 ≥ 0.8 W/kg.

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 $\frac{1}{2}$ 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 $\frac{1}{2}$ 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. For LTE B4/B12 the maximum bandwidth does not support three non-overlapping channels, per KDB 941225 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.

**14.1 Body SAR****<FDD LTE SAR>**

Plot No.	Band	BW (MHz)	Modulation	RB Size	RB offset	Test Position	Gap (mm)	Power Reduction	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
01	LTE Band 2	20M	QPSK	1	0	Front	5mm	ON	18700	1860	18.92	19.5	1.143	0.01	0.540	0.617
	LTE Band 2	20M	QPSK	50	0	Front	5mm	ON	18700	1860	18.66	19.5	1.213	0.09	0.526	0.638
	LTE Band 2	20M	QPSK	1	0	Back	5mm	ON	18700	1860	18.92	19.5	1.143	-0.02	0.787	0.899
	LTE Band 2	20M	QPSK	1	0	Back	5mm	ON	18900	1880	18.81	19.5	1.172	0.03	0.783	0.918
	LTE Band 2	20M	QPSK	1	0	Back	5mm	ON	19100	1900	18.5	19.5	1.259	0.13	0.695	0.875
	LTE Band 2	20M	QPSK	50	0	Back	5mm	ON	18700	1860	18.66	19.5	1.213	0.03	0.740	0.898
	LTE Band 2	20M	QPSK	50	0	Back	5mm	ON	18900	1880	18.54	19.5	1.247	0.11	0.731	0.912
	LTE Band 2	20M	QPSK	50	0	Back	5mm	ON	19100	1900	18.55	19.5	1.245	0.09	0.704	0.876
	LTE Band 2	20M	QPSK	100	0	Back	5mm	ON	18700	1860	18.56	19.5	1.242	-0.01	0.715	0.888
	LTE Band 2	20M	QPSK	1	0	Left Side	5mm	ON	18700	1860	18.92	19.5	1.143	0.09	0.573	0.655
	LTE Band 2	20M	QPSK	50	0	Left Side	5mm	ON	18700	1860	18.66	19.5	1.213	0.05	0.538	0.653
	LTE Band 2	20M	QPSK	1	0	Right Side	5mm	ON	18700	1860	18.92	19.5	1.143	0.06	0.547	0.625
	LTE Band 2	20M	QPSK	50	0	Right Side	5mm	ON	18700	1860	18.66	19.5	1.213	0.01	0.522	0.633
	LTE Band 2	20M	QPSK	1	0	Top Side	5mm	ON	18700	1860	18.92	19.5	1.143	-0.07	0.298	0.341
	LTE Band 2	20M	QPSK	50	0	Top Side	5mm	ON	18700	1860	18.66	19.5	1.213	0.04	0.269	0.326
	LTE Band 2	20M	QPSK	1	0	Front	26mm	OFF	18700	1860	22.58	24	1.387	0.11	0.278	0.386
	LTE Band 2	20M	QPSK	50	0	Front	26mm	OFF	18700	1860	21.53	23	1.403	0.05	0.265	0.372
	LTE Band 2	20M	QPSK	1	0	Back	23mm	OFF	18700	1860	22.58	24	1.387	0.13	0.299	0.415
	LTE Band 2	20M	QPSK	50	0	Back	23mm	OFF	18700	1860	21.53	23	1.403	-0.05	0.283	0.397
	LTE Band 2	20M	QPSK	1	0	Left Side	18mm	OFF	18700	1860	22.58	24	1.387	-0.05	0.127	0.176
	LTE Band 2	20M	QPSK	50	0	Left Side	18mm	OFF	18700	1860	21.53	23	1.403	0.05	0.123	0.173
	LTE Band 2	20M	QPSK	1	0	Right Side	24mm	OFF	18700	1860	22.58	24	1.387	0.03	0.192	0.266
	LTE Band 2	20M	QPSK	50	0	Right Side	24mm	OFF	18700	1860	21.53	23	1.403	-0.17	0.139	0.195
	LTE Band 2	20M	QPSK	1	0	Top Side	29mm	OFF	18700	1860	22.58	24	1.387	0.05	0.080	0.111
	LTE Band 2	20M	QPSK	50	0	Top Side	29mm	OFF	18700	1860	21.53	23	1.403	0.09	0.052	0.073
02	LTE Band 4	20M	QPSK	1	0	Front	5mm	ON	20175	1732.5	18.63	19.5	1.222	0.03	0.655	0.800
	LTE Band 4	20M	QPSK	50	0	Front	5mm	ON	20175	1732.5	18.33	19.5	1.309	-0.09	0.630	0.825
	LTE Band 4	20M	QPSK	1	0	Back	5mm	ON	20175	1732.5	18.63	19.5	1.222	-0.11	0.703	0.859
	LTE Band 4	20M	QPSK	50	0	Back	5mm	ON	20175	1732.5	18.33	19.5	1.309	0.01	0.634	0.830
	LTE Band 4	20M	QPSK	100	0	Back	5mm	ON	20175	1732.5	18.47	19.5	1.268	0.05	0.598	0.758
	LTE Band 4	20M	QPSK	1	0	Left Side	5mm	ON	20175	1732.5	18.63	19.5	1.222	-0.1	0.249	0.304
	LTE Band 4	20M	QPSK	50	0	Left Side	5mm	ON	20175	1732.5	18.33	19.5	1.309	0.08	0.232	0.304
	LTE Band 4	20M	QPSK	1	0	Right Side	5mm	ON	20175	1732.5	18.63	19.5	1.222	0	0.539	0.659
	LTE Band 4	20M	QPSK	50	0	Right Side	5mm	ON	20175	1732.5	18.33	19.5	1.309	0.06	0.514	0.673
	LTE Band 4	20M	QPSK	1	0	Top Side	5mm	ON	20175	1732.5	18.63	19.5	1.222	0.02	0.271	0.331
	LTE Band 4	20M	QPSK	50	0	Top Side	5mm	ON	20175	1732.5	18.33	19.5	1.309	0.01	0.250	0.327
	LTE Band 4	20M	QPSK	1	0	Front	26mm	OFF	20175	1732.5	22.75	24	1.334	0.01	0.227	0.303
	LTE Band 4	20M	QPSK	50	0	Front	26mm	OFF	20175	1732.5	21.43	23	1.435	0.07	0.207	0.297
	LTE Band 4	20M	QPSK	1	0	Back	23mm	OFF	20175	1732.5	22.75	24	1.334	0.05	0.207	0.276
	LTE Band 4	20M	QPSK	50	0	Back	23mm	OFF	20175	1732.5	21.43	23	1.435	-0.13	0.185	0.266
	LTE Band 4	20M	QPSK	1	0	Left Side	18mm	OFF	20175	1732.5	22.75	24	1.334	0.08	0.064	0.085
	LTE Band 4	20M	QPSK	50	0	Left Side	18mm	OFF	20175	1732.5	21.43	23	1.435	-0.06	0.050	0.072
	LTE Band 4	20M	QPSK	1	0	Right Side	24mm	OFF	20175	1732.5	22.75	24	1.334	0.07	0.133	0.177
	LTE Band 4	20M	QPSK	50	0	Right Side	24mm	OFF	20175	1732.5	21.43	23	1.435	0.08	0.116	0.167
	LTE Band 4	20M	QPSK	1	0	Top Side	29mm	OFF	20175	1732.5	22.75	24	1.334	-0.03	0.055	0.073
	LTE Band 4	20M	QPSK	50	0	Top Side	29mm	OFF	20175	1732.5	21.43	23	1.435	0.04	0.042	0.060



Plot No.	Band	BW (MHz)	Modulation	RB Size	RB offset	Test Position	Gap (mm)	Power Reduction	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
03	LTE Band 12	10M	QPSK	1	0	Front	5mm	ON	23095	707.5	19.4	20	1.148	-0.01	0.345	0.396
	LTE Band 12	10M	QPSK	25	25	Front	5mm	ON	23095	707.5	19.37	20	1.156	0.02	0.318	0.368
	LTE Band 12	10M	QPSK	1	0	Back	5mm	ON	23095	707.5	19.4	20	1.148	-0.03	0.304	0.349
	LTE Band 12	10M	QPSK	25	25	Back	5mm	ON	23095	707.5	19.37	20	1.156	0.01	0.272	0.314
	LTE Band 12	10M	QPSK	1	0	Left Side	5mm	ON	23095	707.5	19.4	20	1.148	0.05	0.137	0.157
	LTE Band 12	10M	QPSK	25	25	Left Side	5mm	ON	23095	707.5	19.37	20	1.156	-0.06	0.122	0.141
	LTE Band 12	10M	QPSK	1	0	Right Side	5mm	ON	23095	707.5	19.4	20	1.148	0.07	0.144	0.165
	LTE Band 12	10M	QPSK	25	25	Right Side	5mm	ON	23095	707.5	19.37	20	1.156	0.03	0.127	0.147
	LTE Band 12	10M	QPSK	1	0	Top Side	5mm	ON	23095	707.5	19.4	20	1.148	-0.07	0.167	0.192
	LTE Band 12	10M	QPSK	25	25	Top Side	5mm	ON	23095	707.5	19.37	20	1.156	0.03	0.142	0.164
	LTE Band 12	10M	QPSK	1	0	Front	26mm	OFF	23095	707.5	23.39	24	1.151	0.03	0.075	0.086
	LTE Band 12	10M	QPSK	25	25	Front	26mm	OFF	23095	707.5	22.35	23	1.161	0.05	0.051	0.059
	LTE Band 12	10M	QPSK	1	0	Back	23mm	OFF	23095	707.5	23.39	24	1.151	0.06	0.048	0.055
	LTE Band 12	10M	QPSK	25	25	Back	23mm	OFF	23095	707.5	22.35	23	1.161	0.04	0.038	0.044
	LTE Band 12	10M	QPSK	1	0	Left Side	18mm	OFF	23095	707.5	23.39	24	1.151	0.03	0.001	0.001
	LTE Band 12	10M	QPSK	25	25	Left Side	18mm	OFF	23095	707.5	22.35	23	1.161	0.08	0.001	0.001
	LTE Band 12	10M	QPSK	1	0	Right Side	24mm	OFF	23095	707.5	23.39	24	1.151	0.02	0.001	0.001
	LTE Band 12	10M	QPSK	25	25	Right Side	24mm	OFF	23095	707.5	22.35	23	1.161	0.08	0.009	0.010
	LTE Band 12	10M	QPSK	1	0	Top Side	29mm	OFF	23095	707.5	23.39	24	1.151	0.11	0.001	0.001
	LTE Band 12	10M	QPSK	25	25	Top Side	29mm	OFF	23095	707.5	22.35	23	1.161	0.08	0.001	0.001

Test Engineer : Henry Chou and Kevin Guo

15. 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 $\leq 30\%$, 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.

16. 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 447498 D02 v02r01, "SAR Measurement Procedures for USB Dongle Transmitters", Oct 2015.
- [7] FCC KDB 941225 D05 v02r05, "SAR Evaluation Considerations for LTE Devices", Dec 2015
- [8] FCC KDB 865664 D01 v01r04, "SAR Measurement Requirements for 100 MHz to 6 GHz", Aug 2015.
- [9] FCC KDB 865664 D02 v01r02, "RF Exposure Compliance Reporting and Documentation Considerations" Oct 2015.