Testing Laboratory 1190

FCC SAR TEST REPORT

FCC ID	**:**	**AK8-PM1300BV**
Brand Name	**:**	**Sony**
Applicant	**:**	**Sony Corporation** **1-7-1 Konan, Minato-ku, Tokyo, 108-0075, Japan**
Standard	**:**	**FCC 47 CFR Part 2 (2.1093)** **ANSI/IEEE C95.1-1992** **IEEE 1528-2013**

The product was received on Mar 06, 2020 and testing was started from Apr. 14, 2020 and completed on Jul. 02, 2020. We, SPORTON INTERNATIONAL INC., would like to declare that the tested sample has been evaluated in accordance with the test procedures and has been in compliance with the applicable technical standards.

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

Approved by: Cona Huang / Deputy Manager

SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory

No. 52, Huaya 1st Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.)

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History of this test report

Report No.	Version	Description	Issued Date
FA010618-04	01	Initial issue of report	Oct. 06, 2020
FA010618-04	02	Update section 9.2, 10 and appendix D	Oct. 09, 2020

1. Statement of Compliance

Applicant Name	Sony Corporation	
EUT Description	Communication Device	
Brand Name	Sony	
FCC ID	AK8-PM1300BV	
HW Version	A	
RF Exposure Conditions	**Equipment Class**	
	Licensed	
Body (1g SAR W/kg)	0.62	
Highest Simultaneous Transmission (1g SAR W/kg)	0.95	
Date Tested	2020/04/13 ~ 2020/7/2	
Test Result	Pass	
Remark: 1. The user may use a lanyard on the product, according to KDB 447498 D01 section4.2.2)c), tested for SAR compliance using a conservative minimum test separation distance at 5 mm.		

Sporton Lab is accredited to ISO 17025 by Taiwan Accreditation Foundation (TAF code: 1190). The ISED Assigned Code is 4086B.This device is in compliance with Specific Absorption Rate (SAR) for general population/uncontrolled exposure limits (1.6 W/kg) specified in FCC 47 CFR part 2 (2.1093) and ANSI/IEEE C95.1-1992, and had been tested in accordance with the measurement methods and procedures specified in IEEE 1528-2013 and FCC KDB publications.

Reviewed by: Jason Wang
Report Producer: Daisy Peng

2. Guidance Applied

The Specific Absorption Rate (SAR) testing specification, method, and procedure for this device is in accordance with the following standards:

- 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 248227 D01 802.11 Wi-Fi SAR v02r02
- FCC KDB 941225 D05 SAR for LTE Devices v02r05

3. Equipment Under Test (EUT) Information

3.1 General Information

Wireless Technologies	Frequency	Operating Mode
LTE (FDD)	Band 4 Band 26	· QPSK · 16QAM
Bluetooth	2.4GHz	· BR / EDR / LE

3.2 Device Serial Number

Band	SN
WWAN	824773115B2

Note: Several samples were used with identical hardware to support SAR testing. The manufacturer has confirmed that the device tested gave the same physical, mechanical and thermal characteristics and are within operational tolerances expected for production units.

3.3 General LTE SAR Test and Reporting Considerations

<table>
<tr><th colspan="2">Summarized necessary items addressed in KDB 941225 D05 v02r05</th></tr>
<tr><td>FCC ID</td><td>AK8-PM1300BV</td></tr>
<tr><td>Equipment Name</td><td>Tracker</td></tr>
<tr><td>Operating Frequency Range of each LTE transmission band</td><td>LTE Band 4: 1710 MHz ~ 1755 MHz
LTE Band 26: 814 MHz ~ 849 MHz</td></tr>
<tr><td>Channel Bandwidth</td><td>LTE Band 04:1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz, 20MHz
LTE Band 26:1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz</td></tr>
<tr><td>uplink modulations used</td><td>QPSK / 16QAM</td></tr>
<tr><td>LTE Voice / Data requirements</td><td>Data only</td></tr>
<tr><td>LTE MPR permanently built-in by design</td><td>
Table 6.2.3E-1: Maximum Power Reduction (MPR) for category M1 UE for Power Class 3
<table>
<tr><th rowspan="2">Modulation</th><th colspan="6">Channel bandwidth / Transmission bandwidth (N_{RB})</th><th rowspan="2">MPR (dB)</th></tr>
<tr><th>1.4 MHz</th><th>3.0 MHz</th><th>5 MHz</th><th>10 MHz</th><th>15 MHz</th><th>20 MHz</th></tr>
<tr><td>QPSK</td><td>>2</td><td>>2</td><td>>1</td><td>>4</td><td>-</td><td>-</td><td>≤ 1</td></tr>
<tr><td>QPSK</td><td>>5</td><td>>5</td><td>-</td><td>-</td><td>-</td><td>-</td><td>≤ 2</td></tr>
<tr><td>16 QAM</td><td>≤ 2</td><td>≤ 2</td><td>>1</td><td>>3</td><td>-</td><td>-</td><td>≤ 1</td></tr>
<tr><td>16QAM</td><td>>2</td><td>>2</td><td>>3</td><td>>5</td><td>-</td><td>-</td><td>≤ 2</td></tr>
<tr><td colspan="8">NOTE: MPR only applicable for $N_{RB} \geq 1$</td></tr>
</table>
</td></tr>
<tr><td>LTE A-MPR</td><td>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)</td></tr>
<tr><td>Spectrum plots for RB configuration</td><td>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.</td></tr>
</table>

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

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 26

	Bandwidth 1.4 MHz		Bandwidth 3 MHz		Bandwidth 5 MHz		Bandwidth 10 MHz		Bandwidth 15 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	26697	814.7	26705	815.5	26715	816.5	26740	819	26765	821.5
M	26865	831.5	26865	831.5	26865	831.5	26865	831.5	26865	831.5
H	27033	848.3	27025	847.5	27015	846.5	26990	844	26965	841.5

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:

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

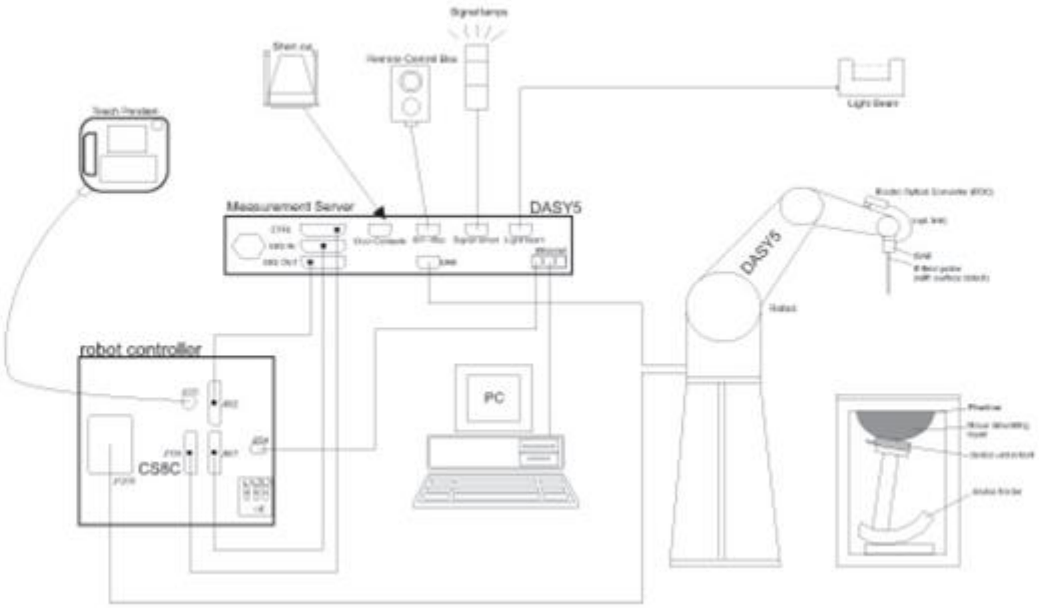
SAR is expressed in units of Watts per kilogram (W/kg)

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

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:



- 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 WinXP or Win7 and the DASY5 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 Side Location

Sporton Lab and below test site location are accredited to ISO 17025 by Taiwan Accreditation Foundation (TAF code: 1190 and 0007) and the FCC designation No. TW1190 and TW0007 under the FCC 2.948(e) by Mutual Recognition Agreement (MRA) in FCC test.

Test Side	SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory			
Test Site Location	TW1190 No. 52, Huaya 1st Rd., Guishan Dist., Taoyuan City 333, CHINESE TAIPEI		TW0007 No. 58, Aly. 75, Ln. 564, Wehnua 3rd, Rd., Guishan Dist., Taoyuan City, CHINESE TAIPEI	
Test Site No.	SAR01-HY	SAR03-HY	SAR08-HY	SAR09-HY
	SAR04-HY	SAR05-HY	SAR11-HY	SAR12-HY
	SAR06-HY	SAR10-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)

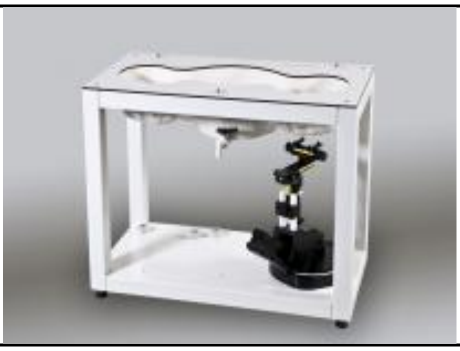
The data acquisition electronics (DAE) consists of a highly sensitive electrometer-grade preamplifier with auto-zeroing, a channel and gain-switching multiplexer, a fast 16 bit AD-converter and a command decoder and control logic unit. Transmission to the measurement server is accomplished through an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

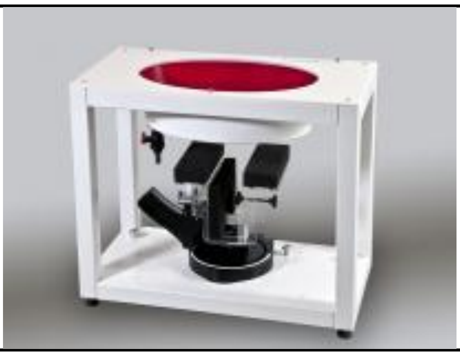
6.4 Phantom

<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:

<Conducted power measurement>

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

<SAR measurement>

(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	835MHz System Validation Kit	D835V2	4d167	Nov. 25, 2019	Nov. 24, 2020
SPEAG	1750MHz System Validation Kit(2)	D1750V2	1112	Mar. 07, 2019	Mar. 05, 2021
SPEAG	Data Acquisition Electronics	DAE4	916	Dec. 17, 2019	Dec. 16, 2020
SPEAG	Dosimetric E-Field Probe	ES3DV3	3184	Sep. 25, 2019	Sep. 24, 2020
RCPTWN	Thermometer	HTC-1	TM685-1	Nov. 12, 2019	Nov. 11, 2020
Anritsu	Radio Communication Analyzer	MT8821C	6201341950	Oct. 31, 2019	Oct. 30, 2020
SPEAG	Device Holder	N/A	N/A	N/A	N/A
Anritsu	Signal Generator	MG3710A	6201502524	Nov. 20, 2019	Nov. 19, 2020
Agilent	ENA Network Analyzer	E5071C	MY46104758	Sep. 06, 2019	Sep. 05, 2020
SPEAG	Dielectric Probe Kit	DAK-3.5	1126	Sep. 18, 2019	Sep. 17, 2020
LINE SEIKI	Digital Thermometer	DTM3000-spezial	2942	Nov. 18, 2019	Nov. 17, 2020
Anritsu	Power Meter	ML2495A	1036004	Aug. 08, 2019	Aug. 07, 2020
Anritsu	Power Sensor	MA2411B	1027253	Aug. 08, 2019	Aug. 07, 2020
Anritsu	Power Meter	ML2495A	1218006	Oct. 14, 2019	Oct. 13, 2020
Anritsu	Power Sensor	MA2411B	1207363	Oct. 14, 2019	Oct. 13, 2020
Agilent	Spectrum Analyzer	E4408B	MY44211028	Aug. 27, 2019	Aug. 26, 2020
Mini-Circuits	Power Amplifier	ZVE-8G+	6382	Aug. 12, 2019	Aug. 11, 2020
Mini-Circuits	Power Amplifier	ZHL-42W+	321501827	Aug. 12, 2019	Aug. 11, 2020
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.

9. System Verification

9.1 Tissue Simulating Liquids

For the measurement of the field distribution inside the SAM phantom with DASY, the phantom must be filled with around 25 liters of homogeneous body tissue simulating liquid. For head SAR testing, the liquid height from the ear reference point (ERP) of the phantom to the liquid top surface is larger than 15 cm, which is shown in Fig. 10.1. For body SAR testing, the liquid height from the center of the flat phantom to the liquid top surface is larger than 15 cm, which is shown in Fig. 10.2.

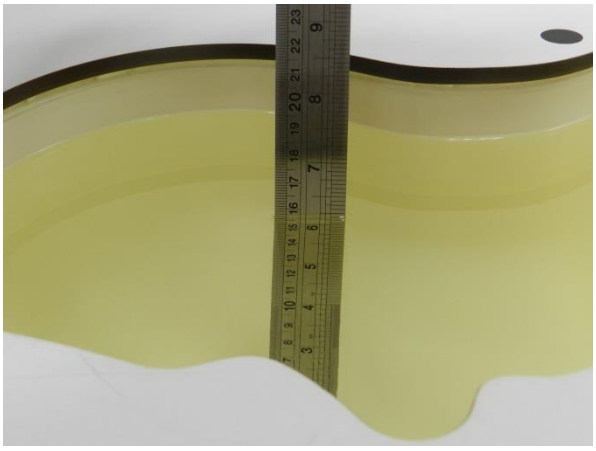


Fig 10.1Photo of Liquid Height for Head SAR

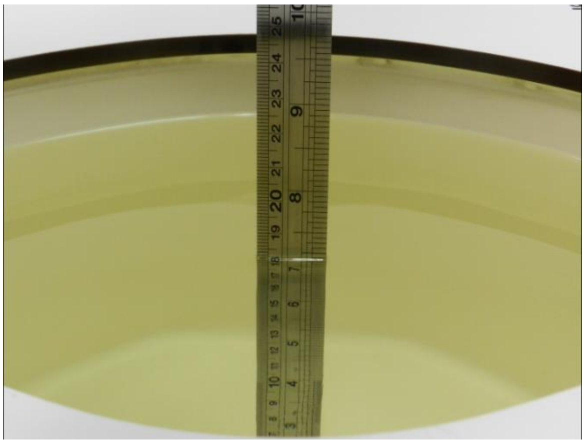


Fig 10.2 Photo of Liquid Height for Body SAR

9.2 Tissue Verification

The following tissue formulations are provided for reference only as some of the parameters have not been thoroughly verified. The composition of ingredients may be modified accordingly to achieve the desired target tissue parameters required for routine SAR evaluation.

Frequency (MHz)	Water (%)	Sugar (%)	Cellulose (%)	Salt (%)	Preventol (%)	DGBE (%)	Conductivity (σ)	Permittivity (εr)
750	41.1	57.0	0.2	1.4	0.2	0	0.89	41.9
835	40.3	57.9	0.2	1.4	0.2	0	0.90	41.5
900	40.3	57.9	0.2	1.4	0.2	0	0.97	41.5
1800, 1900, 2000	55.2	0	0	0.3	0	44.5	1.40	40.0
2450	55.0	0	0	0	0	45.0	1.80	39.2
2600	54.8	0	0	0.1	0	45.1	1.96	39.0

Simulating Liquid for 5GHz, Manufactured by SPEAG

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

<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
835	22.9	0.933	42.510	0.90	41.50	3.67	2.43	±5	2020/7/2
1750	22.3	1.381	41.532	1.37	40.10	0.80	3.57	±5	2020/4/14

9.3 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.

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 (%)
2020/7/2	835	250	D835V2-4d167	ES3DV3 - SN3184	DAE4 Sn916	2.29	9.55	9.16	-4.08
2020/4/14	1750	250	D1750V2-1112	ES3DV3 - SN3184	DAE4 Sn916	8.88	36.70	35.52	-3.22

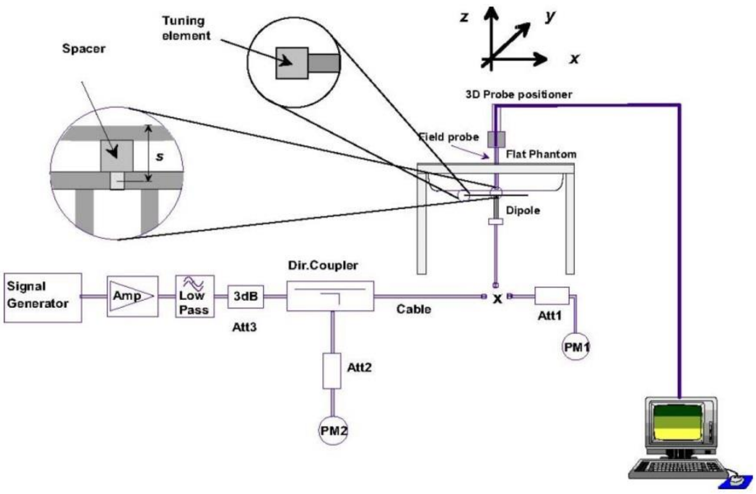


Fig 8.3.1 System Performance Check Setup

Fig 8.3.2 Setup Photo

10. 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 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. For LTE B4 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.

<LTE Band 4>

BW [MHz]	Modulation	RB Size	RB Offset	Index			Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)	MPR (dB)
Channel				L	M	H	20050	20175	20300		
Frequency (MHz)							1720	1732.5	1745		
20	QPSK	1	0	0	8	15	23.53	23.48	23.30	25.00	0.00
20	QPSK	1	5	0	8	15	23.52	23.47	23.31		
20	QPSK	3	0	0	8	15	23.57	23.50	23.37		
20	QPSK	3	3	0	8	15	23.38	23.34	23.18		
20	QPSK	6	0	0	8	15	23.43	23.32	23.19		
20	16QAM	1	0	0	8	15	23.77	23.67	23.53		
20	16QAM	1	5	0	8	15	23.74	23.64	23.55		
20	16QAM	3	0	0	8	15	23.67	23.57	23.44		
20	16QAM	3	3	0	8	15	23.63	23.55	23.41		
20	16QAM	6	0	0	8	15	23.49	23.62	23.38		
Channel				L	M	H	20025	20175	20325	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)							1717.5	1732.5	1747.5		
15	QPSK	1	0	0	6	11	23.50	23.46	23.30	25.00	0.00
15	QPSK	1	5	0	6	11	23.53	23.43	23.30		
15	QPSK	3	0	0	6	11	23.56	23.51	23.37		
15	QPSK	3	3	0	6	11	23.40	23.29	23.19		
15	QPSK	6	0	0	6	11	23.38	23.36	23.16		
15	16QAM	1	0	0	6	11	23.74	23.66	23.50		
15	16QAM	1	5	0	6	11	23.71	23.64	23.48		
15	16QAM	3	0	0	6	11	23.64	23.60	23.39		
15	16QAM	3	3	0	6	11	23.61	23.55	23.38		
15	16QAM	6	0	0	6	11	23.73	23.50	23.56		
Channel				L	M	H	20000	20175	20350	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)							1715	1732.5	1750		
10	QPSK	1	0	0	4	7	23.55	23.48	23.38	25.00	0.00
10	QPSK	1	5	0	4	7	23.52	23.46	23.34		
10	QPSK	3	0	0	4	7	23.58	23.49	23.41	25.00	0.00
10	QPSK	3	3	0	4	7	23.40	23.34	23.21		
10	QPSK	6	0	0	4	7	22.39	22.30	22.21	24.00	1.00
10	16QAM	1	0	0	4	7	23.78	23.75	23.54	25.00	0.00
10	16QAM	1	5	0	4	7	23.74	23.65	23.54		
10	16QAM	3	0	0	4	7	23.67	23.58	23.45	25.00	0.00
10	16QAM	3	3	0	4	7	23.65	23.56	23.40		
10	16QAM	6	0	0	4	7	21.51	21.64	21.47	23.00	2.00
Channel				L	M	H	19975	20175	20375	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)							1712.5	1732.5	1752.5		
5	QPSK	1	0	0	2	3	23.45	23.48	23.35	25.00	0.00
5	QPSK	1	5	0	2	3	23.53	23.47	23.31		
5	QPSK	3	0	0	2	3	22.58	22.52	22.33	24.00	1.00
5	QPSK	3	3	0	2	3	22.36	22.30	22.17		
5	QPSK	6	0	0	2	3	22.43	22.35	22.24	24.00	1.00
5	16QAM	1	0	0	2	3	23.77	23.73	23.66	25.00	0.00
5	16QAM	1	5	0	2	3	23.76	23.64	23.57		
5	16QAM	3	0	0	2	3	22.69	22.59	22.48	24.00	1.00
5	16QAM	3	3	0	2	3	22.67	22.60	22.49		
5	16QAM	6	0	0	2	3	21.49	21.66	21.31	23.00	2.00

Channel				L	M	H	19965	20175	20385	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)							1711.5	1732.5	1753.5		
3	QPSK	1	0	0	0	1	23.40	23.49	23.27	25.00	0.00
3	QPSK	1	5	0	0	1	23.51	23.47	23.29		
3	QPSK	3	0	0	0	1	22.58	22.54	22.40	24.00	1.00
3	QPSK	3	3	0	0	1	22.40	22.35	22.17		
3	QPSK	6	0	0	0	1	21.48	21.42	21.27	23.00	2.00
3	16QAM	1	0	0	0	1	22.46	22.44	22.25	24.00	1.00
3	16QAM	1	5	0	0	1	22.41	22.36	22.21		
3	16QAM	3	0	0	0	1	21.72	21.66	21.49	23.00	2.00
3	16QAM	3	3	0	0	1	21.68	21.62	21.44		
3	16QAM	6	0	0	0	1	21.71	21.65	21.49	23.00	2.00
Channel				L	M	H	19957	20175	20393	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)							1710.7	1732.5	1754.3		
1.4	QPSK	1	0	0	0	0	23.68	23.50	23.47	25.00	0.00
1.4	QPSK	1	5	0	0	0	23.62	23.58	23.44		
1.4	QPSK	3	0	0	0	0	22.61	22.53	22.41	24.00	1.00
1.4	QPSK	3	3	0	0	0	22.39	22.36	22.19		
1.4	QPSK	6	0	0	0	0	21.56	21.52	21.34	23.00	2.00
1.4	16QAM	1	0	0	0	0	22.66	22.60	22.46	24.00	1.00
1.4	16QAM	1	5	0	0	0	22.61	22.57	22.42		
1.4	16QAM	3	0	0	0	0	21.79	21.70	21.56	23.00	2.00
1.4	16QAM	3	3	0	0	0	21.81	21.75	21.62		
1.4	16QAM	6	0	0	0	0	21.67	21.56	21.46	23.00	2.00

<LTE Band 26>

BW [MHz]	Modulation	RB Size	RB Offset	Index			Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)	MPR (dB)
Channel				L	M	H	26765	26865	26965		
Frequency (MHz)							821.5	831.5	841.5		
15	QPSK	1	0	0	6	11	23.43	23.52	23.35	25.00	0.00
15	QPSK	1	5	0	6	11	23.41	23.48	23.34		
15	QPSK	3	0	0	6	11	23.60	23.54	23.60		
15	QPSK	3	3	0	6	11	23.30	23.33	23.24		
15	QPSK	6	0	0	6	11	23.41	23.43	23.35		
15	16QAM	1	0	0	6	11	23.68	23.75	23.61		
15	16QAM	1	5	0	6	11	23.59	23.73	23.53		
15	16QAM	3	0	0	6	11	23.73	23.73	23.72		
15	16QAM	3	3	0	6	11	23.66	23.67	23.66		
15	16QAM	6	0	0	6	11	23.57	23.49	23.54		
Channel				L	M	H	26740	26865	26990	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)							819	831.5	844		
10	QPSK	1	0	0	4	7	23.48	23.42	23.41	25.00	0.00
10	QPSK	1	5	0	4	7	23.47	23.39	23.36		
10	QPSK	3	0	0	4	7	23.62	23.52	23.47	25.00	0.00
10	QPSK	3	3	0	4	7	23.42	23.31	23.33		
10	QPSK	6	0	0	4	7	22.42	22.34	22.30	24.00	1.00
10	16QAM	1	0	0	4	7	23.75	23.71	23.74	25.00	0.00
10	16QAM	1	5	0	4	7	23.70	23.61	23.61		
10	16QAM	3	0	0	4	7	23.75	23.68	23.63	25.00	0.00
10	16QAM	3	3	0	4	7	23.71	23.65	23.59		
10	16QAM	6	0	0	4	7	21.64	21.55	21.45	23.00	2.00
Channel				L	M	H	26715	26865	27015	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)							816.5	831.5	846.5		
5	QPSK	1	0	0	2	3	23.42	23.40	23.43	25.00	0.00
5	QPSK	1	5	0	2	3	23.45	23.38	23.36		
5	QPSK	3	0	0	2	3	23.13	23.15	23.15	24.00	1.00
5	QPSK	3	3	0	2	3	23.18	23.13	23.13		
5	QPSK	6	0	0	2	3	22.37	22.33	22.37	24.00	1.00
5	16QAM	1	0	0	2	3	23.77	23.63	23.76	25.00	0.00
5	16QAM	1	5	0	2	3	23.65	23.56	23.58		
5	16QAM	3	0	0	2	3	23.19	23.11	23.16	24.00	1.00
5	16QAM	3	3	0	2	3	23.17	23.12	23.06		
5	16QAM	6	0	0	2	3	21.73	21.66	21.65	23.00	2.00
Channel				L	M	H	26705	26865	27025	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)							815.5	831.5	847.5		
3	QPSK	1	0	0	0	1	23.38	23.37	23.35	25.00	0.00
3	QPSK	1	5	0	0	1	23.42	23.35	23.29		
3	QPSK	3	0	0	0	1	23.52	23.46	23.45	25.00	0.00
3	QPSK	3	3	0	0	1	23.35	23.23	23.26		
3	QPSK	6	0	0	0	1	22.33	22.27	22.26	23.00	2.00
3	16QAM	1	0	0	0	1	23.75	23.68	23.70	24.00	1.00
3	16QAM	1	5	0	0	1	23.66	23.58	23.59		
3	16QAM	3	0	0	0	1	23.72	23.66	23.54	24.00	1.00
3	16QAM	3	3	0	0	1	23.69	23.65	23.53		
3	16QAM	6	0	0	0	1	21.60	21.54	21.41	23.00	2.00

Channel				L	M	H	26697	26865	27033	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)							814.7	831.5	848.3		
1.4	QPSK	1	0	0	0	0	23.43	23.32	23.34	25.00	0.00
1.4	QPSK	1	5	0	0	0	23.39	23.32	23.31		
1.4	QPSK	3	0	0	0	0	23.55	23.50	23.39	25.00	0.00
1.4	QPSK	3	3	0	0	0	23.34	23.27	23.30		
1.4	QPSK	6	0	0	0	0	22.42	22.33	22.23	23.00	2.00
1.4	16QAM	1	0	0	0	0	23.71	23.71	23.64	24.00	1.00
1.4	16QAM	1	5	0	0	0	23.66	23.54	23.55		
1.4	16QAM	3	0	0	0	0	23.75	23.67	23.58	24.00	1.00
1.4	16QAM	3	3	0	0	0	23.69	23.59	23.54		
1.4	16QAM	6	0	0	0	0	21.64	21.48	21.37	23.00	2.00

11. Bluetooth Exclusions Applied

Mode Band	Max Average power(dBm)		
	BR	EDR	LE
2.4GHz Bluetooth	9.0	7.0	6.0

Note:

1. Per KDB 447498 D01v06, the 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at *test separation distances* ≤ 50 mm are determined by:
   [(*max. power of channel, including tune-up tolerance, mW*)/(*min. test separation distance, mm*)] ·[√f(GHz)] ≤ 3.0 for 1-g SAR and ≤ 7.5 for 10-g extremity SAR
   - f(GHz) is the RF channel transmit frequency in GHz
   - Power and distance are rounded to the nearest mW and mm before calculation
   - The result is rounded to one decimal place for comparison

Bluetooth Max Power (dBm)	Separation Distance (mm)	Frequency (GHz)	exclusion thresholds
9	< 5	2.48	2.50

Note:

Per KDB 447498 D01v06, when the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion. The test exclusion threshold is 2.50 which is <= 3, SAR testing is not required.

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 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.

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. For LTE B4 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.

12.1 Body SAR

<LTE SAR>

Plot No.	Band	BW (MHz)	Modulation	RB Size	RB offset	Test Position	Gap (mm)	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 4	20M	QPSK	1	0	Front	5mm	20175	1732.5	23.48	25.00	1.419	0.01	0.150	0.213
	LTE Band 4	20M	QPSK	3	0	Front	5mm	20175	1732.5	23.50	25.00	1.413	-0.09	0.148	0.209
	LTE Band 4	20M	QPSK	1	0	Back	5mm	20175	1732.5	23.48	25.00	1.419	-0.17	0.088	0.125
	LTE Band 4	20M	QPSK	3	0	Back	5mm	20175	1732.5	23.50	25.00	1.413	-0.17	0.085	0.120
	LTE Band 4	20M	QPSK	1	0	Left Side	5mm	20175	1732.5	23.48	25.00	1.419	-0.1	0.149	0.211
	LTE Band 4	20M	QPSK	3	0	Left Side	5mm	20175	1732.5	23.50	25.00	1.413	-0.13	0.149	0.210
	LTE Band 4	20M	QPSK	1	0	Right Side	5mm	20175	1732.5	23.48	25.00	1.419	-0.03	0.022	0.031
	LTE Band 4	20M	QPSK	3	0	Right Side	5mm	20175	1732.5	23.50	25.00	1.413	-0.01	0.021	0.030
	LTE Band 4	20M	QPSK	1	0	Top Side	5mm	20175	1732.5	23.48	25.00	1.419	0.15	0.004	0.005
	LTE Band 4	20M	QPSK	3	0	Top Side	5mm	20175	1732.5	23.50	25.00	1.413	-0.06	0.003	0.005
	LTE Band 4	20M	QPSK	1	0	Bottom Side	5mm	20175	1732.5	23.48	25.00	1.419	0.16	0.051	0.072
	LTE Band 4	20M	QPSK	3	0	Bottom Side	5mm	20175	1732.5	23.50	25.00	1.413	0.06	0.050	0.071
	LTE Band 26	15M	QPSK	1	0	Front	5mm	26865	831.5	23.52	25.00	1.406	-0.09	0.156	0.219
	LTE Band 26	15M	QPSK	3	0	Front	5mm	26865	831.5	23.54	25.00	1.400	-0.08	0.152	0.213
	LTE Band 26	15M	QPSK	1	0	Back	5mm	26865	831.5	23.52	25.00	1.406	-0.19	0.440	0.619
02	LTE Band 26	15M	QPSK	3	0	Back	5mm	26865	831.5	23.54	25.00	1.400	0.03	0.444	0.621
	LTE Band 26	15M	QPSK	1	0	Left Side	5mm	26865	831.5	23.52	25.00	1.406	0.1	0.389	0.547
	LTE Band 26	15M	QPSK	3	0	Left Side	5mm	26865	831.5	23.54	25.00	1.400	-0.09	0.377	0.528
	LTE Band 26	15M	QPSK	1	0	Right Side	5mm	26865	831.5	23.52	25.00	1.406	-0.16	0.021	0.030
	LTE Band 26	15M	QPSK	3	0	Right Side	5mm	26865	831.5	23.54	25.00	1.400	0.03	0.021	0.029
	LTE Band 26	15M	QPSK	1	0	Top Side	5mm	26865	831.5	23.52	25.00	1.406	-0.09	0.011	0.015
	LTE Band 26	15M	QPSK	3	0	Top Side	5mm	26865	831.5	23.54	25.00	1.400	-0.05	0.010	0.014
	LTE Band 26	15M	QPSK	1	0	Bottom Side	5mm	26865	831.5	23.52	25.00	1.406	0.02	0.104	0.146
	LTE Band 26	15M	QPSK	3	0	Bottom Side	5mm	26865	831.5	23.54	25.00	1.400	0.09	0.101	0.141

13. Simultaneous Transmission Analysis

NO.	Simultaneous Transmission Configurations	Body
1.	WWAN + Bluetooth	Yes

General Note:

1. All licensed modes share the same antenna part and cannot transmit simultaneously
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.
4. For simultaneous transmission analysis, Bluetooth SAR is estimated per KDB 447498 D01v06 based on the formula below.
   i) (*max. power of channel, including tune-up tolerance, mW*)/(*min. test separation distance, mm*)]·[√f(GHz)/*x*] W/kg for *test separation distances* ≤ 50 mm; where *x* = 7.5 for 1-g SAR, and *x* = 18.75 for 10-g SAR.
   ii) When the minimum separation distance is < 5mm, the distance is used 5mm to determine SAR test exclusion.
   iii) 0.4 W/kg for 1-g SAR and 1.0 W/kg for 10-g SAR, when the *test separation distances* is > 50 mm.
   iv) Bluetooth estimated SAR is conservatively determined by 5mm separation, for all applicable exposure positions.

Bluetooth Max Power	Exposure Position	All Positions
9.0 dBm	Estimated SAR (W/kg)	0.333 W/kg

13.1 Body Exposure Conditions

WWAN Band		Exposure Position	1 WWAN 1g SAR (W/kg)	2 Bluetooth Ant 1 Estimated 1g SAR (W/kg)	**1+2 Summed 1g SAR (W/kg)**
LTE	LTE Band 4	Front	0.213	0.333	**0.546**
		Back	0.125	0.333	**0.458**
		Left side	0.211	0.333	**0.544**
		Right side	0.031	0.333	**0.364**
		Top side	0.005	0.333	**0.338**
		Bottom side	0.072	0.333	**0.405**
	LTE Band 26	Front	0.219	0.333	**0.552**
		Back	0.621	0.333	**0.954**
		Left side	0.547	0.333	**0.880**
		Right side	0.030	0.333	**0.363**
		Top side	0.015	0.333	**0.348**
		Bottom side	0.146	0.333	**0.479**

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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.

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 248227 D01 v02r02, “SAR Guidance for IEEE 802.11 (WiFi) Transmitters”, Oct 2015.

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