FCC SAR Test Report

APPLICANT	:	VeriFone, Inc.
EQUIPMENT	:	Point of Sale Terminal
BRAND NAME	:	Verifone or VERIFONE or verifone
MODEL NAME	:	VM100
FCC ID	:	B32VM100
STANDARD	:	FCC 47 CFR Part 2 (2.1093)

We, Sporton International Inc. (Kunshan), would like to declare that the tested sample has been evaluated in accordance with the test procedures given in 47 CFR Part 2.1093 and FCC KDB 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. (Kunshan), the test report shall not be reproduced except in full.

Si Zhang

Approved by: Si Zhang

ACCREDITED
Cert #5145.02

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People's Republic of China

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Revision History

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FA530703	Rev. 01	Initial issue of report	Apr. 29, 2025

1. Statement of Compliance

The maximum results of Specific Absorption Rate (SAR) found during testing for **VeriFone, Inc., Point of Sale Terminal, VM100,** are as follows.

Highest 1g SAR Summary				
Equipment Class	Frequency Band		Body-worn (Separation 5mm) 1g SAR (W/kg)	Highest Simultaneous Transmission 1g SAR (W/kg)
Licensed	WCDMA	Band II	1.11	1.58
		Band IV	1.14	
		Band V	1.18	
	LTE	LTE Band 7	1.18	
		LTE Band 12/17	1.11	
		LTE Band 13	**1.19**	
		LTE Band 14	1.16	
		LTE Band 25/2	1.17	
		LTE Band 26/5	1.14	
		LTE Band 66/4	1.18	
		LTE Band 71	0.96	
		LTE Band 41	1.13	
DTS	WLAN	2.4GHz WLAN	0.44	1.52
NII		5GHz WLAN	1.13	1.58
DSS	Bluetooth	2.4GHz Bluetooth	0.24	1.43

Highest 10g SAR Summary				
Equipment Class	Frequency Band		Extremity SAR (W/kg) (Separation 0mm)	Highest Simultaneous Transmission 10g SAR (W/kg)
Licensed	WCDMA	Band II	1.32	1.91
		Band IV	0.92	
		Band V	0.58	
	LTE	LTE Band 7	0.53	
		LTE Band 12/17	1.19	
		LTE Band 13	0.99	
		LTE Band 14	0.88	
		LTE Band 25/2	**1.42**	
		LTE Band 26/5	0.59	
		LTE Band 66/4	0.89	
		LTE Band 71	1.20	
		LTE Band 41	0.41	
DTS	WLAN	2.4GHz WLAN	0.85	1.91
NII		5GHz WLAN	0.85	1.76
DSS	Bluetooth	2.4GHz Bluetooth	0.38	1.78
Date of Testing:			2025/3/25 ~ 2025/4/7	

Remark: This device supports LTE B2 / B4 / B5 / B17 and B25 / B66 / B26 / B12. Since the supported frequency span for LTE B2 / B4 / B5 / B17 falls completely within the supports frequency span for LTE B25 / B66 / B26 / B12, both LTE bands have the same target power, and both LTE bands share the same transmission path; therefore, SAR was only assessed for LTE B25 / B66 / B26 / B12.

Declaration of Conformity:
The test results with all measurement uncertainty excluded are 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.

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, 4.0 W/kg for 10g 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.

2. Administration Data

Sporton International Inc. (Kunshan) is accredited to ISO/IEC 17025:2017 by American Association for Laboratory Accreditation with Certificate Number 5145.02.

Testing Laboratory			
Test Firm	Sporton International Inc. (Kunshan)		
Test Site Location	No. 1098, Pengxi North Road, Kunshan Economic Development Zone Jiangsu Province 215300 People's Republic of China TEL : +86-512-57900158		
Test Site No.	Sporton Site No.	FCC Designation No.	FCC Test Firm Registration No.
	SAR01-KS	CN1257	314309

Applicant	
Company Name	VeriFone, Inc.
Address	1400 West Stanford Ranch Road Suite 150 Rocklin CA 95765 USA

Manufacturer	
Company Name	VeriFone, Inc.
Address	1400 West Stanford Ranch Road Suite 150 Rocklin CA 95765 USA

3. 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 D01 3G SAR Procedures v03r01
- FCC KDB 941225 D05 SAR for LTE Devices v02r05

4. Equipment Under Test (EUT) Information

4.1 General Information

Product Feature & Specification	
Equipment Name	Point of Sale Terminal
Brand Name	Verifone or VERIFONE or verifone
Model Name	VM100
FCC ID	B32VM100
S/N	713-009-588
Wireless Technology and Frequency Range	WCDMA Band II: 1850 MHz ~ 1910 MHz WCDMA Band IV: 1710 MHz ~ 1755 MHz WCDMA Band V: 824 MHz ~ 849 MHz LTE Band 2: 1850 MHz ~ 1910 MHz LTE Band 4: 1710 MHz ~ 1755 MHz LTE Band 5: 824 MHz ~ 849 MHz LTE Band 7: 2500 MHz ~ 2570 MHz LTE Band 12: 699 MHz ~ 716 MHz LTE Band 13: 777 MHz ~ 787 MHz LTE Band 14: 788 MHz ~ 798 MHz LTE Band 17: 704 MHz ~ 716 MHz LTE Band 25: 1850 MHz ~ 1915 MHz LTE Band 26: 814 MHz ~ 849 MHz LTE Band 41: 2496 MHz ~ 2690 MHz LTE Band 66: 1710 MHz ~ 1780 MHz LTE Band 71: 663 MHz ~ 698 MHz WLAN 2.4GHz Band: 2412 MHz ~ 2462 MHz WLAN 5.2GHz Band: 5180 MHz ~ 5240 MHz WLAN 5.3GHz Band: 5260 MHz ~ 5320 MHz WLAN 5.5GHz Band: 5500 MHz ~ 5720 MHz WLAN 5.8GHz Band: 5745 MHz ~ 5825 MHz Bluetooth: 2402 MHz ~ 2480 MHz NFC : 13.56 MHz
Mode	RMC 12.2Kbps HSDPA HSUPA LTE: QPSK, 16QAM, 64QAM WLAN 2.4GHz 802.11b/g/n HT20/HT40 WLAN 5GHz 802.11a/n HT20/HT40 WLAN 5GHz 802.11ac VHT20/VHT40/VHT80 Bluetooth BR/EDR/LE NFC: ASK
EUT Stage	Identical Prototype

Remark:
1. This device does not support voice function.
2. This device has no hotspot function.
3. For dual SIM card mobile has two SIM slots and supports dual SIM dual standby. The WWAN radio transmission will be enabled by either one SIM at a time (single active).
4. For WLAN when transmit simultaneously with WWAN/BT, the device WLAN power will be reduced power at body-worn and extremity conditions.
5. NFC SAR will be submitted separately.

4.2 General LTE SAR Test and Reporting Considerations

Summarized necessary items addressed in KDB 941225 D05 v02r05	
FCC ID	B32VM100
Equipment Name	Point of Sale Terminal
Operating Frequency Range of each LTE transmission band	LTE Band 2: 1850 MHz ~ 1910 MHz LTE Band 4: 1710 MHz ~ 1755 MHz LTE Band 5: 824 MHz ~ 849 MHz LTE Band 7: 2500 MHz ~ 2570 MHz LTE Band 12: 699 MHz ~ 716 MHz LTE Band 13: 777 MHz ~ 787 MHz LTE Band 14: 788 MHz ~ 798 MHz LTE Band 17: 704 MHz ~ 716 MHz LTE Band 25: 1850 MHz ~ 1915 MHz LTE Band 26: 814 MHz ~ 849 MHz LTE Band 41: 2496 MHz ~ 2690 MHz LTE Band 66: 1710 MHz ~ 1780 MHz LTE Band 71: 663 MHz ~ 698 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 5:1.4MHz, 3MHz, 5MHz, 10MHz LTE Band 7: 5MHz, 10MHz, 15MHz, 20MHz LTE Band 12:1.4MHz, 3MHz, 5MHz, 10MHz LTE Band 13: 5MHz, 10MHz LTE Band 14: 5MHz, 10MHz LTE Band 17: 5MHz, 10MHz LTE Band 25:1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz, 20MHz LTE Band 26:1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz LTE Band 41: 5MHz, 10MHz, 15MHz, 20MHz LTE Band 66:1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz, 20MHz LTE Band 71: 5MHz, 10MHz, 15MHz, 20MHz
Uplink Modulations used	QPSK / 16QAM / 64QAM
LTE Voice / Data requirements	Data only
LTE Release Version	R10
CA Support	Not Supported
LTE MPR permanently built-in by design	**Table 6.2.3-1: Maximum Power Reduction (MPR) for Power Class 1, 2 and 3**

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

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

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

LTE Band 2

	Bandwidth 1.4 MHz		Bandwidth 3 MHz		Bandwidth 5 MHz		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 5

	Bandwidth 1.4 MHz		Bandwidth 3 MHz		Bandwidth 5 MHz		Bandwidth 10 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	20407	824.7	20415	825.5	20425	826.5	20450	829
M	20525	836.5	20525	836.5	20525	836.5	20525	836.5
H	20643	848.3	20635	847.5	20625	846.5	20600	844

LTE Band 7

	Bandwidth 5 MHz		Bandwidth 10 MHz		Bandwidth 15 MHz		Bandwidth 20 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	20775	2502.5	20800	2505	20825	2507.5	20850	2510
M	21100	2535	21100	2535	21100	2535	21100	2535
H	21425	2567.5	21400	2565	21375	2562.5	21350	2560

LTE Band 12

	Bandwidth 1.4 MHz		Bandwidth 3 MHz		Bandwidth 5 MHz		Bandwidth 10 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
M	23095	707.5	23095	707.5	23095	707.5	23095	707.5
H	23173	715.3	23165	714.5	23155	713.5	23130	711

LTE Band 13

	Bandwidth 5 MHz		Bandwidth 10 MHz	
	Channel #	Freq.(MHz)	Channel #	Freq.(MHz)
L	23205	779.5	23230	782
M	23230	782		
H	23255	784.5		

LTE Band 14

	Bandwidth 5 MHz		Bandwidth 10 MHz	
	Channel #	Channel #	Channel #	Freq.(MHz)
L	23305	790.5	23330	793
M	23330	793		
H	23355	795.5		

LTE Band 17

	Bandwidth 5 MHz		Bandwidth 10 MHz	
	Channel #	Freq.(MHz)	Channel #	Freq. (MHz)
L	23755	706.5	23780	709
M	23790	710	23790	710
H	23825	713.5	23800	711

LTE Band 25

	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	26047	1850.7	26055	1851.5	26065	1852.5	26090	1855	26115	1857.5	26140	1860
M	26340	1880	26340	1880	26340	1880	26340	1880	26340	1880	26340	1880
H	26683	1914.3	26675	1913.5	26665	1912.5	26640	1910	26615	1907.5	26590	1905

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

LTE Band 41								
	Bandwidth 5 MHz		Bandwidth 10 MHz		Bandwidth 15 MHz		Bandwidth 20 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	39675	2498.5	39700	2501	39725	2503.5	39750	2506
LM	40148	2545.8	40160	2547	40173	2548.3	40185	2549.5
M	40620	2593	40620	2593	40620	2593	40620	2593
HM	41093	2640.3	41080	2639	41068	2637.8	41055	2636.5
H	41565	2687.5	41540	2685	41515	2682.5	41490	2680

LTE Band 66												
	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	131979	1710.7	131987	1711.5	131997	1712.5	132022	1715	132047	1717.5	132072	1720
M	132322	1745	132322	1745	132322	1745	132322	1745	132322	1745	132322	1745
H	132665	1779.3	132657	1778.5	132647	1777.5	132622	1775	132597	1772.5	132572	1770

LTE Band 71								
	Bandwidth 5 MHz		Bandwidth 10 MHz		Bandwidth 15 MHz		Bandwidth 20 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	133147	665.5	133172	668	133197	670.5	133222	673
M	133247	675.5	133272	678	133297	680.5	133322	683
H	133447	695.5	133422	693	133397	690.5	133372	688

<For LTE Overlap Bands Description>

1) LTE Bands BW

Band	1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz
LTE Band 4	Yes	Yes	Yes	Yes	Yes	Yes
LTE Band 66	Yes	Yes	Yes	Yes	Yes	Yes
LTE Band 12	Yes	Yes	Yes	Yes		
LTE Band 17			Yes	Yes		
LTE Band 5	Yes	Yes	Yes	Yes		
LTE Band 26	Yes	Yes	Yes	Yes	Yes	
LTE Band 25	Yes	Yes	Yes	Yes	Yes	Yes
LTE Band 2	Yes	Yes	Yes	Yes	Yes	Yes

2) LTE Bands tune up:

Band	Antenna	Default Tune-up Limit
LTE Band 25(2)	Ant 0	22.5
LTE Band 66(4)	Ant 0	22
LTE Band 26(5)	Ant 0	23.5
LTE Band 12(17)	Ant 0	24.5

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

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:

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

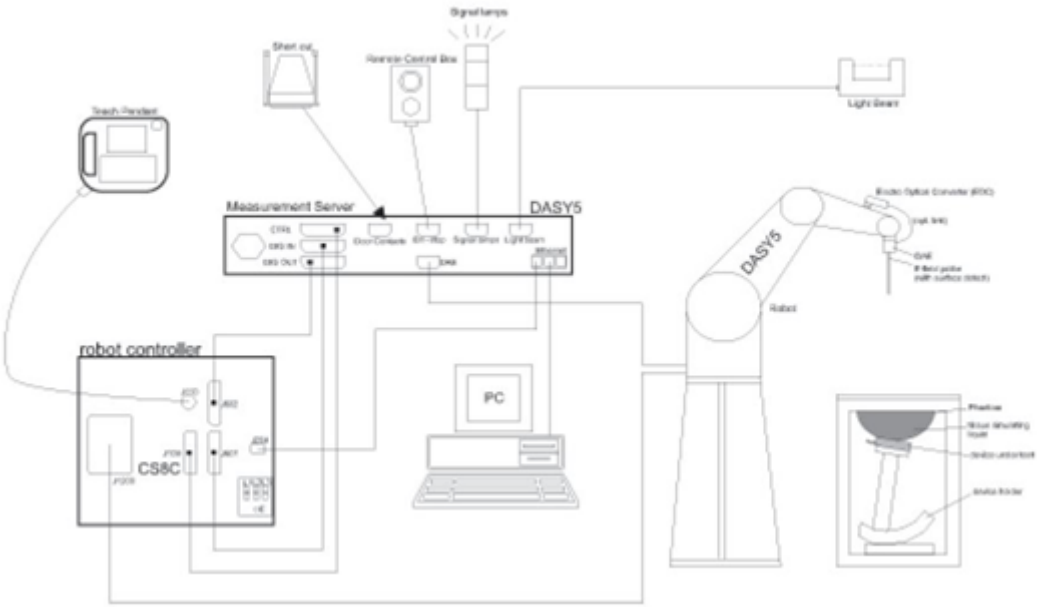
SAR is expressed in units of Watts per kilogram (W/kg)

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

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

7. 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.

7.1 E-Field Probe

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

<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	4 MHz – 10 GHz Linearity: ±0.2 dB (30 MHz – 10 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

7.2 Data Acquisition Electronics (DAE)

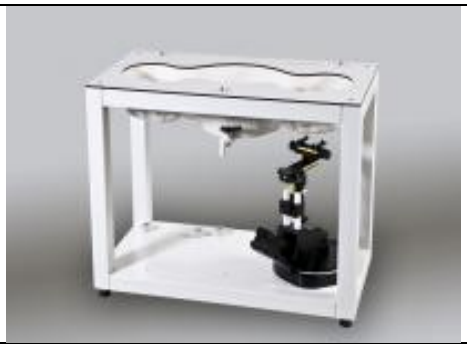
The data acquisition electronics (DAE) consists of a highly sensitive electrometer-grade preamplifier with auto-zeroing, a channel and gain-switching multiplexer, a fast 16 bit AD-converter and a command decoder and control logic unit. Transmission to the measurement server is accomplished through an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

The input impedance of the DAE is 200 MOhm; the inputs are symmetrical and floating. Common mode rejection is above 80 dB.

Photo of DAE

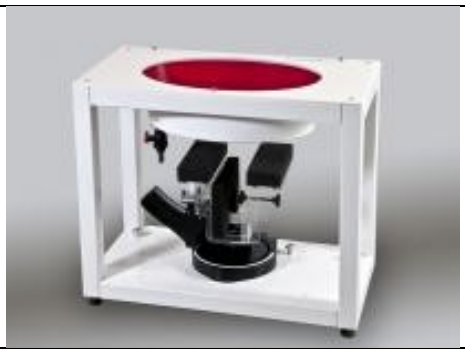
7.3 Phantom

<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 or for evaluating transmitters operating at low frequencies. ELI is fully compatible with standard and all known tissue simulating liquids.

7.4 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:

<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

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 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

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 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.	

8.4 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.

8.5 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.

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	1099	2024/12/13	2025/12/12
SPEAG	835MHz System Validation Kit	D835V2	4d162	2024/12/13	2025/12/12
SPEAG	1750MHz System Validation Kit	D1750V2	1137	2024/10/15	2025/10/14
SPEAG	1900MHz System Validation Kit	D1900V2	5d118	2022/3/30	2025/3/28
SPEAG	2450MHz System Validation Kit	D2450V2	1095	2024/2/8	2026/2/6
SPEAG	2600MHz System Validation Kit	D2600V2	1112	2023/12/18	2025/12/16
SPEAG	5000MHz System Validation Kit	D5GHzV2	1113	2022/9/23	2025/9/21
SPEAG	Data Acquisition Electronics	DAE4	1650	2024/11/25	2025/11/24
SPEAG	Data Acquisition Electronics	DAE4	690	2024/10/8	2025/10/7
SPEAG	Dosimetric E-Field Probe	EX3DV4	7764	2024/9/2	2025/9/1
SPEAG	Dosimetric E-Field Probe	EX3DV4	3857	2025/2/19	2026/2/18
SPEAG	SAM Twin Phantom	SAM Twin	TP-1754	NCR	NCR
SPEAG	SAM Twin Phantom	SAM Twin	TP-1697	NCR	NCR
CHIGO	Thermo-Hygrometer	HTC-1	1929539	2024/5/15	2025/5/14
CHIGO	Thermo-Hygrometer	HTC-1	1929537	2024/5/15	2025/5/14
SPEAG	Phone Positioner	N/A	N/A	NCR	NCR
Anritsu	Radio Communication Analyzer	MT8821C	6262306175	2024/7/4	2025/7/3
Agilent	ENA Series Network Analyzer	E5071C	MY46112129	2024/7/4	2025/7/3
SPEAG	Dielectric Probe Kit	DAK-3.5	1144	2024/8/20	2025/8/19
Anritsu	Vector Signal Generator	MG3710A	6201682672	2025/1/3	2026/1/2
Rohde & Schwarz	Power Meter	NRVD	102081	2024/7/4	2025/7/3
Rohde & Schwarz	Power Sensor	NRV-Z5	100538	2024/7/4	2025/7/3
Rohde & Schwarz	Power Sensor	NRV-Z5	100539	2024/7/4	2025/7/3
R&S	BLUETOOTH TESTER	CBT	101246	2024/7/4	2025/7/3
Rohde & Schwarz	Spectrum Analyzer	FSV7	101631	2024/10/11	2025/10/10
TES	DIGITAC THERMOMETER	TYPE-K	220305411	2025/1/2	2026/1/1
BONN	POWER AMPLIFIER	BLMA 0830-3	087193A	Note 1	
BONN	POWER AMPLIFIER	BLMA 2060-2	087193B	Note 1	
Agilent	Dual Directional Coupler	778D	20500	Note 1	
Agilent	Dual Directional Coupler	11691D	MY48151020	Note 1	
ARRA	Power Divider	A3200-2	N/A	Note 1	
MCL	Attenuation1	BW-S10W5+	N/A	Note 1	
MCL	Attenuation2	BW-S10W5+	N/A	Note 1	
MCL	Attenuation3	BW-S10W5+	N/A	Note 1	

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 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 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. 10.1.

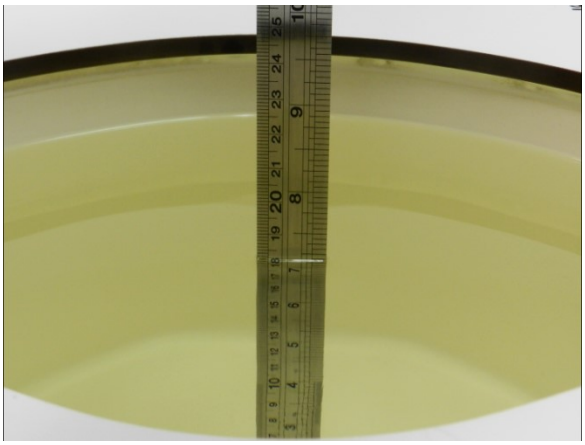


Fig 10.1 Photo of Liquid Height for Body SAR

10.2 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)
For Head								
750	41.1	57.0	0.2	1.4	0.2	0	0.89	41.9
835	40.3	57.9	0.2	1.4	0.2	0	0.90	41.5
1800, 1900, 2000	55.2	0	0	0.3	0	44.5	1.40	40.0
2450	55.0	0	0	0	0	45.0	1.80	39.2
2600	54.8	0	0	0.1	0	45.1	1.96	39.0

Simulating Liquid for 5GHz, Manufactured by SPEAG

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

<Tissue Dielectric Parameter Check Results>

Frequency (MHz)	Tissue Type	Liquid Temp. (℃)	Conductivity (σ)	Permittivity (ε_r)	Conductivity Target (σ)	Permittivity Target (ε_r)	Delta (σ) (%)	Delta (ε_r) (%)	Limit (%)	Date
750	Head	22.8	0.889	42.282	0.89	41.90	-0.11	0.91	±5	2025/3/25
835	Head	22.8	0.928	42.060	0.90	41.50	3.11	1.35	±5	2025/3/26
1750	Head	22.6	1.401	40.508	1.37	40.10	2.26	1.02	±5	2025/3/27
1900	Head	22.8	1.422	38.963	1.40	40.00	1.57	-2.59	±5	2025/3/27
2600	Head	22.7	2.008	40.561	1.96	39.00	2.45	4.00	±5	2025/3/31
2450	Head	22.8	1.831	37.489	1.80	39.20	1.72	-4.36	±5	2025/4/1
5250	Head	22.7	4.640	36.528	4.71	35.90	-1.49	1.75	±5	2025/4/3
5600	Head	22.6	4.989	35.907	5.07	35.50	-1.60	1.15	±5	2025/4/5
5750	Head	22.7	5.215	35.594	5.22	35.40	-0.10	0.55	±5	2025/4/7

10.3 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)	Tissue Type	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 (%)	Measured 10g SAR (W/kg)	Targeted 10g SAR (W/kg)	Normalized 10g SAR (W/kg)	Deviation (%)
2025/3/25	750	Head	50	1099	7764	1650	0.438	8.28	8.76	5.80	0.281	5.37	5.62	4.66
2025/3/26	835	Head	50	4d162	7764	1650	0.484	9.08	9.68	6.61	0.310	5.85	6.2	5.98
2025/3/27	1750	Head	50	1137	7764	1650	1.890	36.80	37.8	2.72	1.010	19.60	20.2	3.06
2025/3/27	1900	Head	50	5d118	7764	1650	1.810	39.30	36.2	-7.89	0.956	20.40	19.12	-6.27
2025/3/31	2600	Head	50	1112	7764	1650	2.750	55.10	55	-0.18	1.270	24.80	25.4	2.42
2025/4/1	2450	Head	50	1095	3857	690	2.570	52.60	51.4	-2.28	1.230	24.70	24.6	-0.40
2025/4/3	5250	Head	50	1113	3857	690	3.760	81.50	75.2	-7.73	1.120	23.30	22.4	-3.86
2025/4/5	5600	Head	50	1113	3857	690	4.080	82.60	81.6	-1.21	1.170	23.70	23.4	-1.27
2025/4/7	5750	Head	50	1113	3857	690	3.790	80.80	75.8	-6.19	1.140	23.00	22.8	-0.87

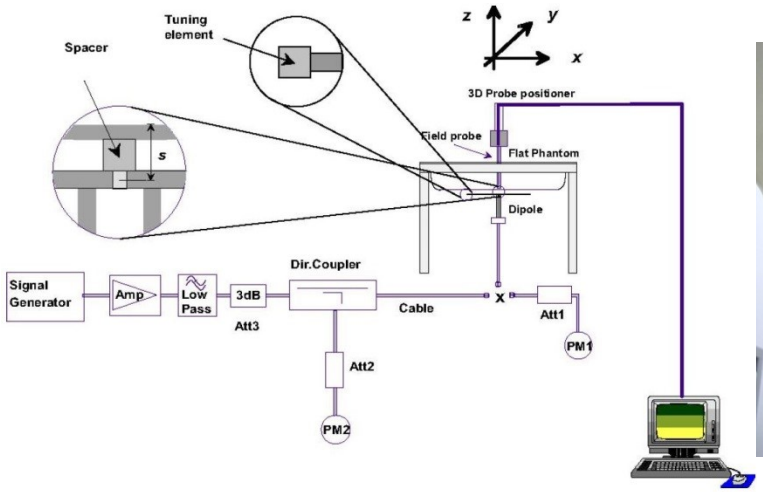


Fig 10.3.1 System Performance Check Setup

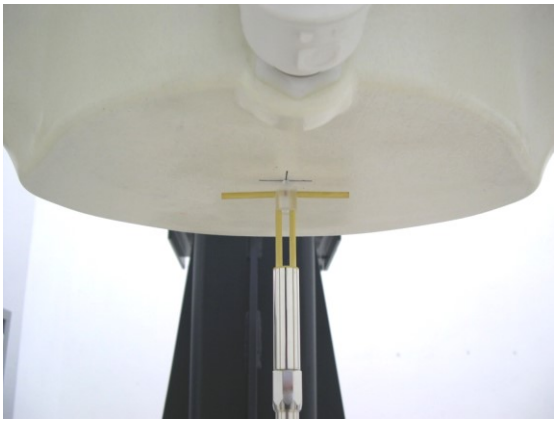


Fig 10.3.2 Setup Photo

11. RF Exposure Positions

11.1 Body-worn SAR Testing for Device

(a) To position the device parallel to the phantom surface with Front and Bottom surfaces of the device.

(b) To adjust the device parallel to the flat phantom.

(c) To adjust the distance between the device surface and the flat phantom to 5 mm.

11.2 Extremity SAR Testing for Device

(b) To position the device parallel to the phantom surface with all surfaces of the device.

(b) To adjust the device parallel to the flat phantom.

(c) To adjust the distance between the device surface and the flat phantom to 0 mm.

Please refer to Appendix D for the test setup photos.

12. Conducted RF Output Power (Unit: dBm)

The detailed conducted power table can refer to Appendix E.

<WCDMA Conducted Power>

1. The following tests were conducted according to the test requirements outlines in 3GPP TS 34.121 specification.
2. The procedures in KDB 941225 D01v03r01 are applied for 3GPP Rel. 6 HSPA to configure the device in the required sub-test mode(s) to determine SAR test exclusion.

A summary of these settings are illustrated below:

HSDPA Setup Configuration:

a. The EUT was connected to Base Station Agilent E5515C referred to the Setup Configuration.
b. The RF path losses were compensated into the measurements.
c. A call was established between EUT and Base Station with following setting:
   i. Set Gain Factors (β_c and β_d) and parameters were set according to each
   ii. Specific sub-test in the following table, C10.1.4, quoted from the TS 34.121
   iii. Set RMC 12.2Kbps + HSDPA mode.
   iv. Set Cell Power = -86 dBm
   v. Set HS-DSCH Configuration Type to FRC (H-set 1, QPSK)
   vi. Select HSDPA Uplink Parameters
   vii. Set Delta ACK, Delta NACK and Delta CQI = 8
   viii. Set Ack-Nack Repetition Factor to 3
   ix. Set CQI Feedback Cycle (k) to 4 ms
   x. Set CQI Repetition Factor to 2
   xi. Power Ctrl Mode = All Up bits
d. The transmitted maximum output power was recorded.

Table C.10.1.4: β values for transmitter characteristics tests with HS-DPCCH

Sub-test	β_c	β_d	β_d (SF)	β_c/β_d	β_{HS} (Note1, Note 2)	CM (dB) (Note 3)	MPR (dB) (Note 3)
1	2/15	15/15	64	2/15	4/15	0.0	0.0
2	12/15 (Note 4)	15/15 (Note 4)	64	12/15 (Note 4)	24/15	1.0	0.0
3	15/15	8/15	64	15/8	30/15	1.5	0.5
4	15/15	4/15	64	15/4	30/15	1.5	0.5

Note 1: Δ_{ACK}, Δ_{NACK} and Δ_{CQI} = 30/15 with β_{hs} = 30/15 * β_c.

Note 2: For the HS-DPCCH power mask requirement test in clause 5.2C, 5.7A, and the Error Vector Magnitude (EVM) with HS-DPCCH test in clause 5.13.1A, and HSDPA EVM with phase discontinuity in clause 5.13.1AA, Δ_{ACK} and Δ_{NACK} = 30/15 with β_{hs} = 30/15 * β_c, and Δ_{CQI} = 24/15 with β_{hs} = 24/15 * β_c.

Note 3: CM = 1 for β_c/β_d =12/15, β_{hs}/β_c=24/15. For all other combinations of DPDCH, DPCCH and HS-DPCCH the MPR is based on the relative CM difference. This is applicable for only UEs that support HSDPA in release 6 and later releases.

Note 4: For subtest 2 the β_c/β_d ratio of 12/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signalled gain factors for the reference TFC (TF1, TF1) to β_c = 11/15 and β_d = 15/15.

Setup Configuration

HSUPA Setup Configuration:

a. The EUT was connected to Base Station Agilent E5515C referred to the Setup Configuration.
b. The RF path losses were compensated into the measurements.
c. A call was established between EUT and Base Station with following setting * :
   i. Call Configs = 5.2B, 5.9B, 5.10B, and 5.13.2B with QPSK
   ii. Set the Gain Factors (β_c and β_d) and parameters (AG Index) were set according to each specific sub-test in the following table, C11.1.3, quoted from the TS 34.121
   iii. Set Cell Power = -86 dBm
   iv. Set Channel Type = 12.2k + HSPA
   v. Set UE Target Power
   vi. Power Ctrl Mode= Alternating bits
   vii. Set and observe the E-TFCI
   viii. Confirm that E-TFCI is equal to the target E-TFCI of 75 for sub-test 1, and other subtest's E-TFCI
d. The transmitted maximum output power was recorded.

Table C.11.1.3: β values for transmitter characteristics tests with HS-DPCCH and E-DCH

Sub-test	β_c	β_d	β_d (SF)	β_c/β_d	β_{HS} (Note1)	β_{ec}	β_{ed} (Note 4) (Note 5)	β_{ed} (SF)	β_{ed} (Codes)	CM (dB) (Note 2)	MPR (dB) (Note 2) (Note 6)	AG Index (Note 5)	E-TFCI
1	11/15 (Note 3)	15/15 (Note 3)	64	11/15 (Note 3)	22/15	209/225	1309/225	4	1	1.0	0.0	20	75
2	6/15	15/15	64	6/15	12/15	12/15	94/75	4	1	3.0	2.0	12	67
3	15/15	9/15	64	15/9	30/15	30/15	$\beta_{ed}1$: 47/15 $\beta_{ed}2$: 47/15	4 4	2	2.0	1.0	15	92
4	2/15	15/15	64	2/15	4/15	2/15	56/75	4	1	3.0	2.0	17	71
5	15/15	0	-	-	5/15	5/15	47/15	4	1	1.0	0.0	12	67

Note 1: For sub-test 1 to 4, Δ_{ACK}, Δ_{NACK} and Δ_{CQI} = 30/15 with β_{hs} = 30/15 * β_c . For sub-test 5, Δ_{ACK}, Δ_{NACK} and Δ_{CQI} = 5/15 with β_{hs} = 5/15 * β_c .

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

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

Note 4: In case of testing by UE using E-DPDCH Physical Layer category 1, Sub-test 3 is omitted according to TS25.306 Table 5.1g.

Note 5: β_{ed} can not be set directly; it is set by Absolute Grant Value.

Note 6: For subtests 2, 3 and 4, UE may perform E-DPDCH power scaling at max power which could results in slightly smaller MPR values.

Setup Configuration

<WCDMA Conducted Power>

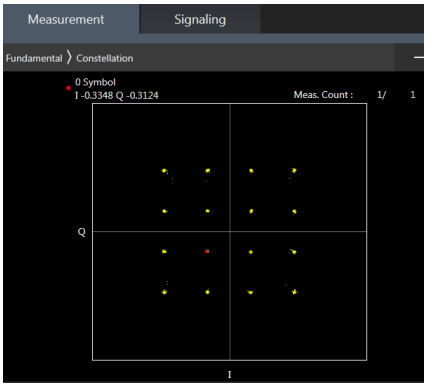
General Note:

1. Per KDB 941225 D01v03r01, for SAR testing is measured using a 12.2 kbps RMC with TPC bits configured to all "1's".
2. Per KDB 941225 D01v03r01, RMC 12.2kbps setting is used to evaluate SAR. The maximum output power and tune-up tolerance specified for production units in HSDPA / HSUPA is ≤ ¼ dB higher than RMC 12.2Kbps or when the highest reported SAR of the RMC12.2Kbps is scaled by the ratio of specified maximum output power and tune-up tolerance of HSDPA / HSUPA to RMC12.2Kbps and the adjusted SAR is ≤ 1.2 W/kg, SAR measurement is not required for HSDPA / HSUPA, and according to the following RF output power, the output power results of the secondary modes (HSDPA / HSUPA) are less than ¼ dB higher than the primary modes; therefore, SAR measurement is not required for HSDPA / HSUPA.

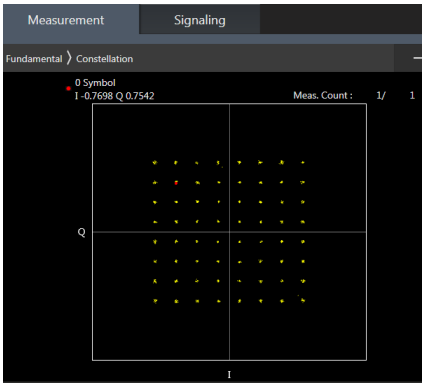
<LTE Conducted Power>

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/64QAM 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 / B5 / B12 / B17 / B26/ B71 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.
9. LTE B2 /B4 /B5 / B17 SAR test was covered by B25 / B66 / B26 / B12; according to April 2015 TCB workshop, SAR test for overlapping LTE bands can be reduced if
   a. the maximum output power, including tolerance, for the smaller band is ≤ the larger band to qualify for the SAR test exclusion
   b. the channel bandwidth and other operating parameters for the smaller band are fully supported by the larger band
10. According to May 2017 TCB workshop, for 16QAM and 64QAM should be verified by checking the signal constellation with a call box to avoid incorrect maximum power levels due to MPR and other requirements associated with signal modulation, and the following figure is taken from the "Fundamental Measurement >> Modulation Analysis >> constellation" mode of the device connect to the MT8821C base station, therefore, the device 64QAM and 16QAM signal modulation are correct.



16QAM



64QAM

<TDD LTE SAR Measurement>

TDD LTE configuration setup for SAR measurement

SAR was tested with a fixed periodic duty factor according to the highest transmission duty factor implemented for the device and supported by 3GPP.

a. 3GPP TS 36.211 section 4.2 for Type 2 Frame Structure and Table 4.2-2 for uplink-downlink configurations
b. "special subframe S" contains both uplink and downlink transmissions, it has been taken into consideration to determine the transmission duty factor according to the worst case uplink and downlink cyclic prefix requirements for UpPTS
c. Establishing connections with base station simulators ensure a consistent means for testing SAR and recommended for evaluating SAR. The Anritsu MT8820C (firmware: #22.52#004) was used for LTE output power measurements and SAR testing.

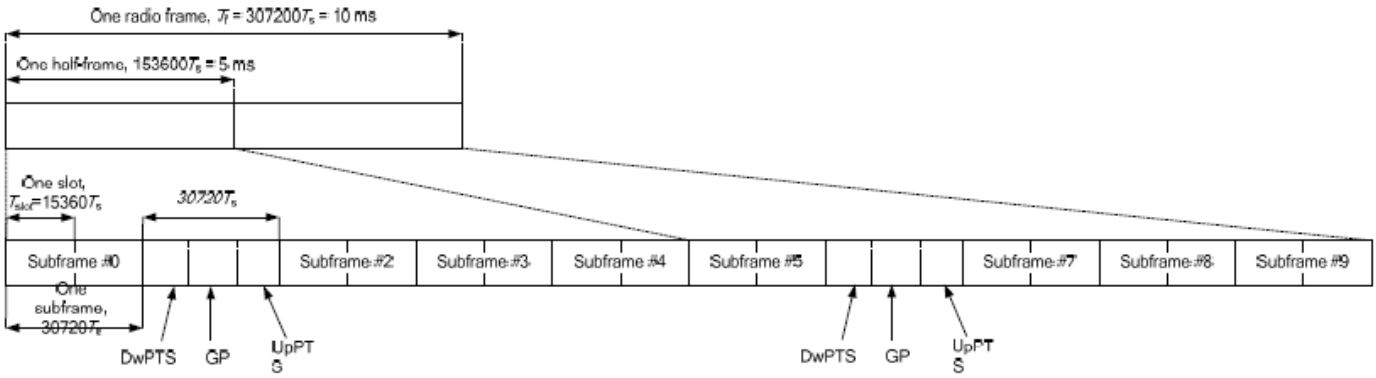


Figure 4.2-1: Frame structure type 2 (for 5 ms switch-point periodicity).

Table 4.2-2: Uplink-downlink configurations.

Uplink-downlink configuration	Downlink-to-Uplink Switch-point periodicity	Subframe number									
		0	1	2	3	4	5	6	7	8	9
0	5 ms	D	S	U	U	U	D	S	U	U	U
1	5 ms	D	S	U	U	D	D	S	U	U	D
2	5 ms	D	S	U	D	D	D	S	U	D	D
3	10 ms	D	S	U	U	U	D	D	D	D	D
4	10 ms	D	S	U	U	D	D	D	D	D	D
5	10 ms	D	S	U	D	D	D	D	D	D	D
6	5 ms	D	S	U	U	U	D	S	U	U	D

Table 4.2-1: Configuration of special subframe (lengths of DwPTS/GP/UpPTS).

Special subframe configuration	Normal cyclic prefix in downlink			Extended cyclic prefix in downlink		
	DwPTS	UpPTS		DwPTS	UpPTS	
		Normal cyclic prefix in uplink	Extended cyclic prefix in uplink		Normal cyclic prefix in uplink	Extended cyclic prefix in uplink
0	$6592 \cdot T_s$	$2192 \cdot T_s$	$2560 \cdot T_s$	$7680 \cdot T_s$	$2192 \cdot T_s$	$2560 \cdot T_s$
1	$19760 \cdot T_s$			$20480 \cdot T_s$		
2	$21952 \cdot T_s$			$23040 \cdot T_s$		
3	$24144 \cdot T_s$			$25600 \cdot T_s$		
4	$26336 \cdot T_s$			$7680 \cdot T_s$	$4384 \cdot T_s$	$5120 \cdot T_s$
5	$6592 \cdot T_s$	$4384 \cdot T_s$	$5120 \cdot T_s$	$20480 \cdot T_s$		
6	$19760 \cdot T_s$			$23040 \cdot T_s$		
7	$21952 \cdot T_s$			$12800 \cdot T_s$		
8	$24144 \cdot T_s$			-	-	-
9	$13168 \cdot T_s$			-	-	-

Special subframe (30720·T_s): Normal cyclic prefix in downlink (UpPTS)			
	Special subframe configuration	**Normal cyclic prefix in uplink**	**Extended cyclic prefix in uplink**
Uplink duty factor in one special subframe	**0~4**	7.13%	8.33%
	5~9	14.3%	16.7%

Special subframe(30720·T_s): Extended cyclic prefix in downlink (UpPTS)			
	Special subframe configuration	**Normal cyclic prefix in uplink**	**Extended cyclic prefix in uplink**
Uplink duty factor in one special subframe	**0~3**	7.13%	8.33%
	4~7	14.3%	16.7%

The highest duty factor is resulted from:

For LTE TDD Power class 3

i. Uplink-downlink configuration: 0. In a half-frame consisted of 5 subfames, uplink operation is in 3 uplink subframes and 1 special subframe.

ii. special subframe configuration: 5-9 for normal cyclic prefix in downlink, 4-7 for extended cyclic prefix in downlink

iii. for special subframe with extended cyclic prefix in uplink, the total uplink duty factor in one half-frame is: (3+0.167)/5 = 63.3%

iv. for special subframe with normal cyclic prefix in uplink, the total uplink duty factor in one half-frame is: (3+0.143)/5 = 62.9%

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

<WLAN Conducted Power>

General Note:

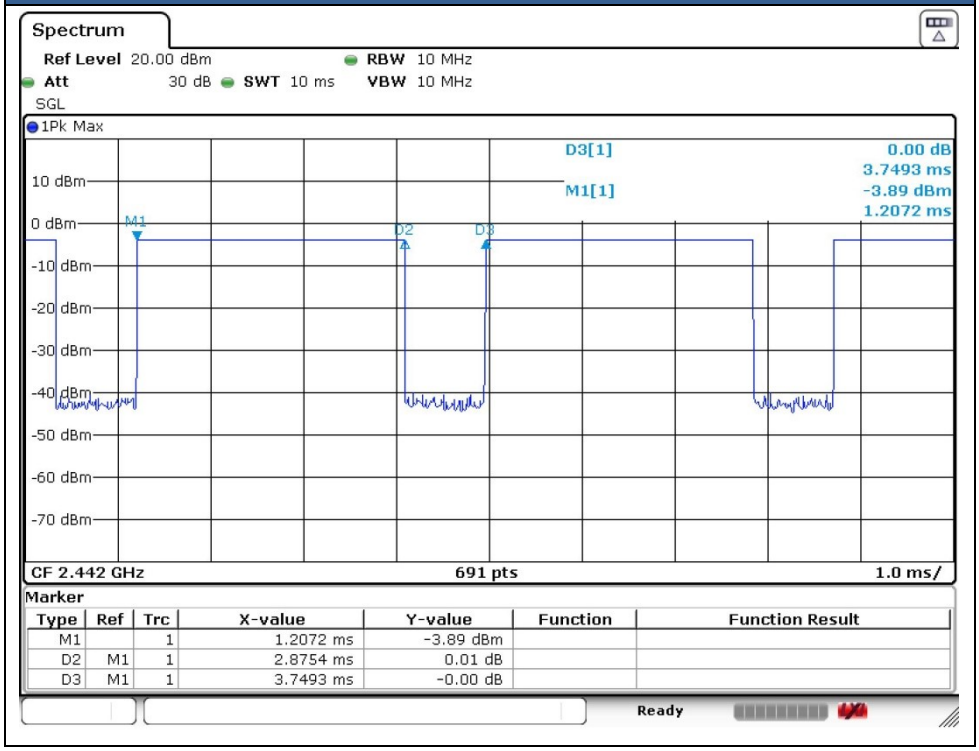
1. The maximum output power specified for production units are determined for all applicable 802.11 transmission modes in each standalone and aggregated frequency band. Maximum output power is measured for the highest maximum output power configuration(s) in each frequency band according to the default power measurement procedures. For “Not required”, SAR Test reduction was applied from KDB 248227 guidance, Sec. 2.1, b), 1) when the same maximum power is specified for multiple transmission modes in a frequency band, the largest channel bandwidth, lowest order modulation, lowest data rate and lowest order 802.11a/g/n/ac mode is used for SAR measurement, on the highest measured output power channel in the initial test configuration. Additional output power measurements were not necessary.
2. Per KDB 248227 D01v02r02, SAR test reduction is determined according to 802.11 transmission mode configurations and certain exposure conditions with multiple test positions. In the 2.4 GHz band, separate SAR procedures are applied to DSSS and OFDM configurations to simplify DSSS test requirements. For OFDM, in both 2.4 and 5 GHz bands, an initial test configuration must be determined for each standalone and aggregated frequency band, according to the transmission mode configuration with the highest maximum output power specified for production units to perform SAR measurements. If the same highest maximum output power applies to different combinations of channel bandwidths, modulations and data rates, additional procedures are applied to determine which test configurations require SAR measurement. When applicable, an initial test position may be applied to reduce the number of SAR measurements required for next to the ear, UMPC mini-tablet or hotspot mode configurations with multiple test positions.
3. For 2.4 GHz 802.11b DSSS, either the initial test position procedure for multiple exposure test positions or the DSSS procedure for fixed exposure position is applied; these are mutually exclusive. For 2.4 GHz and 5 GHz OFDM configurations, the initial test configuration is applied to measure SAR using either the initial test position procedure for multiple exposure test position configurations or the initial test configuration procedures for fixed exposure test conditions. Based on the reported SAR of the measured configurations and maximum output power of the transmission mode configurations that are not included in the initial test configuration, the subsequent test configuration and initial test position procedures are applied to determine if SAR measurements are required for the remaining OFDM transmission configurations. In general, the number of test channels that require SAR measurement is minimized based on maximum output power measured for the test sample(s).
4. For OFDM transmission configurations in the 2.4 GHz and 5 GHz bands, When the same maximum power is specified for multiple transmission modes in a frequency band, the largest channel bandwidth, lowest order modulation, lowest data rate and lowest order 802.11a/g/n/ac mode is used for SAR measurement, on the highest measured output power channel for each frequency band.
5. DSSS and OFDM configurations are considered separately according to the required SAR procedures. SAR is measured in the initial test position using the 802.11 transmission mode configuration required by the DSSS procedure or initial test configuration and subsequent test configuration(s) according to the OFDM procedures.18 The initial test position procedure is described in the following:
   a. When the reported SAR of the initial test position is ≤ 0.4 W/kg, further SAR measurement is not required for the other test positions in that exposure configuration and 802.11 transmission mode combinations within the frequency band or aggregated band.
   b. When the reported SAR of the test position is > 0.4 W/kg, SAR is repeated for the 802.11 transmission mode configuration tested in the initial test position to measure the subsequent next closet/smallest test separation distance and maximum coupling test position on the highest maximum output power channel, until the report SAR is ≤ 0.8 W/kg or all required test position are tested.
   c. For all positions/configurations, when the reported SAR is > 0.8 W/kg, SAR is measured for these test positions/configurations on the subsequent next highest measured output power channel(s) until the reported SAR is ≤ 1.2 W/kg or all required channels are tested.

<2.4GHz Bluetooth>

General Note:

1. For 2.4GHz Bluetooth SAR testing was selected 1Mbps, due to its highest average power.
2. The Bluetooth duty cycle are 76.69% as following figure, Bluetooth SAR scaling need further consideration and the theoretical duty cycle is 83.3%, therefore the actual duty cycle will be scaled up to the theoretical value of Bluetooth reported SAR calculation.

Bluetooth time-domain plot



13. Antenna Location

The detailed antenna location information can refer to SAR Test Setup Photos.

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 SAR testing of WLAN signal with non-100% duty cycle, the measured SAR is scaled-up by the duty cycle scaling factor which is equal to "1/(duty cycle)"
   c. For SAR testing of Bluetooth signal with 83.3% theoretical duty cycle, the measured SAR is scaled-up by the duty cycle scaling factor which is equal to "1/(duty cycle) *83.3%".
   d. For WWAN: Reported SAR(W/kg)= Measured SAR(W/kg)*Tune-up Scaling Factor
   e. For WLAN/Bluetooth: Reported SAR(W/kg)= Measured SAR(W/kg)* Duty Cycle scaling factor * Tune-up scaling factor
   f. For TDD LTE SAR measurement, the duty cycle 1:1.59 (62.9 %) was used perform testing and considering the theoretical duty cycle of 63.3% for extended cyclic prefix in the uplink, and the theoretical duty cycle of 62.9% for normal cyclic prefix in uplink, a scaling factor of extended cyclic prefix 63.3%/62.9% = 1.006 is applied to scale-up the measured SAR result. The Reported TDD LTE SAR (W/kg) = measured SAR (W/kg)* Tune-up Scaling Factor* scaling factor for extended cyclic prefix.
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.
4. For 10-g extremity SAR testing, only performed within a transmitting antenna located within 25mm from that surface or edge.
5. While 1-g SAR thresholds are specified in the procedures for SAR test reduction and exclusion, these thresholds should be multiplied by 2.5 when 10-g extremity SAR is considered.
6. This device has no voice function and has no hotspot function.

WCDMA Note:

1. Per KDB 941225 D01v03r01, for SAR testing is measured using a 12.2 kbps RMC with TPC bits configured to all “1’s”.
2. Per KDB 941225 D01v03r01, RMC 12.2kbps setting is used to evaluate SAR. The maximum output power and tune-up tolerance specified for production units in HSDPA / HSUPA is ≤ ¼ dB higher than RMC 12.2Kbps or when the highest reported SAR of the RMC12.2Kbps is scaled by the ratio of specified maximum output power and tune-up tolerance of HSDPA / HSUPA to RMC12.2Kbps and the adjusted SAR is ≤ 1.2 W/kg, SAR measurement is not required for HSDPA / HSUPA, and according to the following RF output power, the output power results of the secondary modes (HSDPA / HSUPA) are less than ¼ dB higher than the primary modes; therefore, SAR measurement is not required for HSDPA / HSUPA.

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/64QAM 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 / B5 / B12 / B17 / B26 /B71 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.
7. LTE B2 /B4 /B5 / B17 SAR test was covered by B25 / B66 / B26 / B12; according to April 2015 TCB workshop, SAR test for overlapping LTE bands can be reduced if
   a. the maximum output power, including tolerance, for the smaller band is ≤ the larger band to qualify for the SAR test exclusion
   b. the channel bandwidth and other operating parameters for the smaller band are fully supported by the larger band

WLAN/Bluetooth Note:

1. Per KDB 248227 D01v02r02, for 2.4GHz 802.11g/n SAR testing is not required when the highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power and the adjusted SAR is ≤ 1.2 W/kg.
2. Per KDB 248227 D01v02r02, U-NII-1 SAR testing is not required when the U-NII-2A band highest reported SAR for a test configuration is ≤ 1.2 W/kg, SAR is not required for U-NII-1 band.
3. When the reported SAR of the test position is > 0.4 W/kg, SAR is repeated for the 802.11 transmission mode configuration tested in the initial test position to measure the subsequent next closet/smallest test separation distance and maximum coupling test position on the highest maximum output power channel, until the report SAR is ≤ 0.8 W/kg or all required test position are tested.
4. For all positions / configurations, when the reported SAR is > 0.8 W/kg, SAR is measured for these test positions / configurations on the subsequent next highest measured output power channel(s) until the reported SAR is ≤ 1.2 W/kg or all required channels are tested.
5. During SAR testing the WLAN transmission was verified using a spectrum analyzer.

14.1 Body Worn Accessory SAR

Plot No.	Band	BW (MHz)	Modulation	RB Size	RB offset	Mode	Test Position	Gap (mm)	Power Reduction	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
750MHz																			
	LTE Band 71	20M	QPSK	1	0	-	Front	5mm	Full Power	133322	683	23.64	24.50	1.219	-	-	0.08	0.179	0.218
	LTE Band 71	20M	QPSK	50	0	-	Front	5mm	Full Power	133322	683	22.72	23.50	1.197	-	-	0.01	0.142	0.170
01	LTE Band 71	20M	QPSK	1	0	-	Back	5mm	Full Power	133322	683	23.64	24.50	1.219	-	-	0.05	0.785	**0.957**
	LTE Band 71	20M	QPSK	50	0	-	Back	5mm	Full Power	133322	683	22.72	23.50	1.197	-	-	0.03	0.619	0.741
	LTE Band 71	20M	QPSK	100	0	-	Back	5mm	Full Power	133322	683	22.61	23.50	1.227	-	-	-0.08	0.603	0.740
	LTE Band 12	10M	QPSK	1	0	-	Front	5mm	Full Power	23095	707.5	23.47	24.50	1.268	-	-	-0.08	0.193	0.245
	LTE Band 12	10M	QPSK	25	0	-	Front	5mm	Full Power	23095	707.5	22.75	23.50	1.189	-	-	0.1	0.163	0.194
02	LTE Band 12	10M	QPSK	1	0	-	Back	5mm	Full Power	23095	707.5	23.47	24.50	1.268	-	-	0.16	0.874	**1.108**
	LTE Band 12	10M	QPSK	25	0	-	Back	5mm	Full Power	23095	707.5	22.75	23.50	1.189	-	-	-0.18	0.809	0.961
	LTE Band 12	10M	QPSK	50	0	-	Back	5mm	Full Power	23095	707.5	22.68	23.50	1.208	-	-	0.1	0.813	0.982
	LTE Band 13	10M	QPSK	1	0	-	Front	5mm	Full Power	23230	782	23.65	24.50	1.216	-	-	0.12	0.521	0.634
	LTE Band 13	10M	QPSK	25	0	-	Front	5mm	Full Power	23230	782	22.74	23.50	1.191	-	-	0.08	0.428	0.510
03	LTE Band 13	10M	QPSK	1	0	-	Back	5mm	Full Power	23230	782	23.65	24.50	1.216	-	-	0.06	0.980	**1.192**
	LTE Band 13	10M	QPSK	25	0	-	Back	5mm	Full Power	23230	782	22.74	23.50	1.191	-	-	-0.17	0.783	0.933
	LTE Band 13	10M	QPSK	50	0	-	Back	5mm	Full Power	23230	782	22.76	23.50	1.186	-	-	-0.03	0.799	0.947
	LTE Band 14	10M	QPSK	1	0	-	Front	5mm	Full Power	23330	793	22.92	24.00	1.282	-	-	0.06	0.469	0.601
	LTE Band 14	10M	QPSK	25	0	-	Front	5mm	Full Power	23330	793	22.02	23.00	1.253	-	-	0.02	0.384	0.481
04	LTE Band 14	10M	QPSK	1	0	-	Back	5mm	Full Power	23330	793	22.92	24.00	1.282	-	-	0.07	0.907	**1.163**
	LTE Band 14	10M	QPSK	25	0	-	Back	5mm	Full Power	23330	793	22.02	23.00	1.253	-	-	-0.14	0.719	0.901
	LTE Band 14	10M	QPSK	50	0	-	Back	5mm	Full Power	23330	793	21.93	23.00	1.279	-	-	-0.19	0.704	0.901
835MHz																			
	WCDMA V	-	-	-	-	RMC 12.2Kbps	Front	5mm	Full Power	4182	836.4	22.10	23.50	1.380	-	-	0.07	0.479	0.661
	WCDMA V	-	-	-	-	RMC 12.2Kbps	Back	5mm	Full Power	4182	836.4	22.10	23.50	1.380	-	-	-0.02	0.725	1.001
05	WCDMA V	-	-	-	-	RMC 12.2Kbps	Back	5mm	Full Power	4132	826.4	21.96	23.50	1.426	-	-	0.01	0.830	**1.183**
	WCDMA V	-	-	-	-	RMC 12.2Kbps	Back	5mm	Full Power	4233	846.6	22.02	23.50	1.406	-	-	-0.05	0.717	1.008
	LTE Band 26	15M	QPSK	1	0	-	Front	5mm	Full Power	26865	831.5	22.47	23.50	1.268	-	-	-0.11	0.538	0.682
	LTE Band 26	15M	QPSK	36	0	-	Front	5mm	Full Power	26865	831.5	21.35	22.50	1.303	-	-	-0.06	0.424	0.553
06	LTE Band 26	15M	QPSK	1	0	-	Back	5mm	Full Power	26865	831.5	22.47	23.50	1.268	-	-	-0.02	0.901	**1.142**
	LTE Band 26	15M	QPSK	36	0	-	Back	5mm	Full Power	26865	831.5	21.35	22.50	1.303	-	-	-0.15	0.657	0.856
	LTE Band 26	15M	QPSK	75	0	-	Back	5mm	Full Power	26865	831.5	21.37	22.50	1.297	-	-	0.03	0.640	0.830
1750MHz																			
	WCDMA IV	-	-	-	-	RMC 12.2Kbps	Front	5mm	Full Power	1413	1732.6	20.14	21.50	1.368	-	-	-0.16	0.135	0.185
	WCDMA IV	-	-	-	-	RMC 12.2Kbps	Back	5mm	Full Power	1413	1732.6	20.14	21.50	1.368	-	-	-0.18	0.749	1.024
07	WCDMA IV	-	-	-	-	RMC 12.2Kbps	Back	5mm	Full Power	1312	1712.4	20.05	21.50	1.396	-	-	-0.03	0.818	**1.142**
	WCDMA IV	-	-	-	-	RMC 12.2Kbps	Back	5mm	Full Power	1513	1752.6	20.04	21.50	1.400	-	-	-0.07	0.795	1.113
	LTE Band 66	20M	QPSK	1	0	-	Front	5mm	Full Power	132322	1745	21.05	22.00	1.245	-	-	0.11	0.154	0.192
	LTE Band 66	20M	QPSK	50	0	-	Front	5mm	Full Power	132322	1745	19.99	21.00	1.262	-	-	-0.08	0.129	0.163
	LTE Band 66	20M	QPSK	1	0	-	Back	5mm	Full Power	132322	1745	21.05	22.00	1.245	-	-	-0.1	0.927	1.154
08	LTE Band 66	20M	QPSK	1	0	-	Back	5mm	Full Power	132072	1720	21.00	22.00	1.259	-	-	-0.06	0.935	**1.177**
	LTE Band 66	20M	QPSK	1	0	-	Back	5mm	Full Power	132572	1770	20.92	22.00	1.282	-	-	-0.01	0.915	1.173
	LTE Band 66	20M	QPSK	50	0	-	Back	5mm	Full Power	132322	1745	19.99	21.00	1.262	-	-	-0.09	0.744	0.939
	LTE Band 66	20M	QPSK	50	0	-	Back	5mm	Full Power	132072	1720	19.94	21.00	1.276	-	-	-0.06	0.920	1.174
	LTE Band 66	20M	QPSK	50	0	-	Back	5mm	Full Power	132572	1770	19.91	21.00	1.285	-	-	-0.17	0.707	0.909
	LTE Band 66	20M	QPSK	100	0	-	Back	5mm	Full Power	132322	1745	19.87	21.00	1.297	-	-	-0.01	0.725	0.940
1900MHz																			
	WCDMA II	-	-	-	-	RMC 12.2Kbps	Front	5mm	Full Power	9400	1880	21.12	22.50	1.374	-	-	-0.11	0.180	0.247
09	WCDMA II	-	-	-	-	RMC 12.2Kbps	Back	5mm	Full Power	9400	1880	21.12	22.50	1.374	-	-	-0.08	0.808	**1.110**
	WCDMA II	-	-	-	-	RMC 12.2Kbps	Back	5mm	Full Power	9262	1852.4	21.10	22.50	1.380	-	-	0.14	0.757	1.045
	WCDMA II	-	-	-	-	RMC 12.2Kbps	Back	5mm	Full Power	9538	1907.6	21.08	22.50	1.387	-	-	0.03	0.800	1.109
	LTE Band 25	20M	QPSK	1	0	-	Front	5mm	Full Power	26340	1880	21.14	22.50	1.368	-	-	0.1	0.174	0.238

	LTE Band 25	20M	QPSK	50	0	-	Front	5mm	Full Power	26340	1880	20.13	21.50	1.371	-	-	0.16	0.133	0.182
	LTE Band 25	20M	QPSK	1	0	-	Back	5mm	Full Power	26340	1880	21.14	22.50	1.368	-	-	-0.06	0.829	1.134
	LTE Band 25	20M	QPSK	1	0	-	Back	5mm	Full Power	26140	1860	21.01	22.50	1.409	-	-	0.02	0.605	0.853
10	LTE Band 25	20M	QPSK	1	0	-	Back	5mm	Full Power	26590	1905	21.05	22.50	1.396	-	-	-0.07	0.838	**1.170**
	LTE Band 25	20M	QPSK	50	0	-	Back	5mm	Full Power	26340	1880	20.13	21.50	1.371	-	-	-0.16	0.686	0.940
	LTE Band 25	20M	QPSK	50	0	-	Back	5mm	Full Power	26140	1860	20.04	21.50	1.400	-	-	0.05	0.587	0.822
	LTE Band 25	20M	QPSK	50	0	-	Back	5mm	Full Power	26590	1905	20.04	21.50	1.400	-	-	-0.03	0.693	0.970
	LTE Band 25	20M	QPSK	100	0	-	Back	5mm	Full Power	26340	1880	20.19	21.50	1.352	-	-	0.17	0.821	1.110
2600MHz																			
	LTE Band 7	20M	QPSK	1	0	-	Front	5mm	Full Power	21100	2535	15.68	17.00	1.355	-	-	-0.15	0.081	0.110
	LTE Band 7	20M	QPSK	50	0	-	Front	5mm	Full Power	21100	2535	14.72	16.00	1.343	-	-	0.16	0.069	0.093
	LTE Band 7	20M	QPSK	1	0	-	Back	5mm	Full Power	21100	2535	15.68	17.00	1.355	-	-	0.05	0.753	1.020
	LTE Band 7	20M	QPSK	1	0	-	Back	5mm	Full Power	20850	2510	15.50	17.00	1.413	-	-	-0.06	0.623	0.880
11	LTE Band 7	20M	QPSK	1	0	-	Back	5mm	Full Power	21350	2560	15.57	17.00	1.390	-	-	0.09	0.850	**1.181**
	LTE Band 7	20M	QPSK	50	0	-	Back	5mm	Full Power	21100	2535	14.72	16.00	1.343	-	-	-0.13	0.633	0.850
	LTE Band 7	20M	QPSK	50	0	-	Back	5mm	Full Power	20850	2510	14.66	16.00	1.361	-	-	-0.01	0.519	0.707
	LTE Band 7	20M	QPSK	50	0	-	Back	5mm	Full Power	21350	2560	14.63	16.00	1.371	-	-	-0.11	0.701	0.961
	LTE Band 7	20M	QPSK	100	0	-	Back	5mm	Full Power	21100	2535	14.71	16.00	1.346	-	-	0.19	0.636	0.856
	LTE Band 41	20M	QPSK	1	0	-	Front	5mm	Full Power	41490	2680	14.75	16.00	1.334	62.9	1.006	-0.14	0.028	0.038
	LTE Band 41	20M	QPSK	50	0	-	Front	5mm	Full Power	41490	2680	13.75	15.00	1.334	62.9	1.006	-0.18	0.028	0.038
12	LTE Band 41	20M	QPSK	1	0	-	Back	5mm	Full Power	41490	2680	14.75	16.00	1.334	62.9	1.006	0.09	0.839	**1.126**
	LTE Band 41	20M	QPSK	1	0	-	Back	5mm	Full Power	39750	2506	14.38	16.00	1.452	62.9	1.006	0.02	0.284	0.415
	LTE Band 41	20M	QPSK	1	0	-	Back	5mm	Full Power	40185	2549.5	14.52	16.00	1.406	62.9	1.006	0.16	0.426	0.603
	LTE Band 41	20M	QPSK	1	0	-	Back	5mm	Full Power	40620	2593	14.60	16.00	1.380	62.9	1.006	0.01	0.555	0.771
	LTE Band 41	20M	QPSK	1	0	-	Back	5mm	Full Power	41055	2636.5	14.67	16.00	1.358	62.9	1.006	-0.04	0.717	0.980
	LTE Band 41	20M	QPSK	50	0	-	Back	5mm	Full Power	41490	2680	13.75	15.00	1.334	62.9	1.006	0.13	0.695	0.932
	LTE Band 41	20M	QPSK	50	0	-	Back	5mm	Full Power	39750	2506	13.65	15.00	1.365	62.9	1.006	0.07	0.253	0.347
	LTE Band 41	20M	QPSK	50	0	-	Back	5mm	Full Power	40185	2549.5	13.70	15.00	1.349	62.9	1.006	0.08	0.356	0.483
	LTE Band 41	20M	QPSK	50	0	-	Back	5mm	Full Power	40620	2593	13.64	15.00	1.368	62.9	1.006	0.19	0.481	0.662
	LTE Band 41	20M	QPSK	50	0	-	Back	5mm	Full Power	41055	2636.5	13.68	15.00	1.355	62.9	1.006	-0.06	0.621	0.847
	LTE Band 41	20M	QPSK	100	0	-	Back	5mm	Full Power	41490	2680	13.65	15.00	1.365	62.9	1.006	-0.03	0.704	0.966

Plot No.	Band	Mode	Test Position	Gap (mm)	Power Reduction	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
2450MHz															
	WLAN2.4GHz	802.11b 1Mbps	Front	5mm	Full Power	1	2412	16.76	18.50	1.493	98.95	1.011	0.15	0.065	0.098
13	WLAN2.4GHz	802.11b 1Mbps	Back	5mm	Full Power	1	2412	16.76	18.50	1.493	98.95	1.011	-0.13	0.290	**0.438**
	WLAN2.4GHz	802.11b 1Mbps	Back	5mm	Simultaneous	1	2412	16.42	18.00	1.439	98.95	1.011	-0.09	0.223	0.324
	Bluetooth	1Mbps	Front	5mm	Full Power	39	2441	12.32	14.00	1.471	76.69	1.086	-0.09	0.037	0.059
14	Bluetooth	1Mbps	Back	5mm	Full Power	39	2441	12.32	14.00	1.471	76.69	1.086	-0.08	0.151	**0.241**
5000MHz															
	WLAN5.3GHz	802.11n-HT40 MCS0	Front	5mm	Full Power	54	5270	10.72	12.50	1.505	96.3	1.038	0.01	0.018	0.028
15	WLAN5.3GHz	802.11n-HT40 MCS0	Back	5mm	Full Power	54	5270	10.72	12.50	1.505	96.3	1.038	0.01	0.652	**1.019**
	WLAN5.3GHz	802.11n-HT40 MCS0	Back	5mm	Full Power	62	5310	10.60	12.00	1.379	96.3	1.038	-0.08	0.633	0.906
	WLAN5.3GHz	802.11ac-VHT80 MCS0	Back	5mm	Simultaneous	58	5290	5.99	7.50	1.416	92.44	1.082	-0.05	0.213	0.326
	WLAN5.5GHz	802.11n-HT40 MCS0	Front	5mm	Full Power	110	5550	15.62	17.50	1.540	96.3	1.038	0.16	0.030	0.048
16	WLAN5.5GHz	802.11n-HT40 MCS0	Back	5mm	Full Power	110	5550	15.62	17.50	1.540	96.3	1.038	0.01	0.640	**1.023**
	WLAN5.5GHz	802.11n-HT40 MCS0	Back	5mm	Full Power	102	5510	13.53	15.00	1.402	96.3	1.038	0.05	0.362	0.527
	WLAN5.5GHz	802.11n-HT40 MCS0	Back	5mm	Full Power	126	5630	15.34	17.00	1.466	96.3	1.038	-0.03	0.573	0.872
	WLAN5.5GHz	802.11n-HT40 MCS0	Back	5mm	Full Power	134	5670	15.31	17.00	1.474	96.3	1.038	-0.15	0.589	0.901
	WLAN5.5GHz	802.11n-HT40 MCS0	Back	5mm	Full Power	142	5710	14.95	16.50	1.428	96.3	1.038	0.02	0.588	0.871
	WLAN5.5GHz	802.11n-HT40 MCS0	Back	5mm	Simultaneous	110	5550	11.25	13.00	1.496	96.3	1.038	0.01	0.250	0.388
	WLAN5.8GHz	802.11n-HT40 MCS0	Front	5mm	Full Power	151	5755	14.92	16.50	1.438	96.3	1.038	0.08	0.042	0.063
	WLAN5.8GHz	802.11n-HT40 MCS0	Back	5mm	Full Power	151	5755	14.92	16.50	1.438	96.3	1.038	0.01	0.662	0.988
17	WLAN5.8GHz	802.11n-HT40 MCS0	Back	5mm	Full Power	159	5795	14.77	16.50	1.488	96.3	1.038	0.09	0.733	**1.132**
	WLAN5.8GHz	802.11n-HT40 MCS0	Back	5mm	Simultaneous	151	5755	9.97	11.50	1.422	96.3	1.038	0.03	0.239	0.353

14.2 Extremity SAR

Plot No.	Band	BW (MHz)	Modulation	RB Size	RB offset	Mode	Test Position	Gap (mm)	Power Reduction	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 10g SAR (W/kg)	Reported 10g SAR (W/kg)
750MHz																			
	LTE Band 71	20M	QPSK	1	0	-	Front	0mm	Full Power	133322	683	23.64	24.50	1.219	-	-	-0.18	0.273	0.333
	LTE Band 71	20M	QPSK	50	0	-	Front	0mm	Full Power	133322	683	22.72	23.50	1.197	-	-	0.02	0.230	0.275
18	LTE Band 71	20M	QPSK	1	0	-	Back	0mm	Full Power	133322	683	23.64	24.50	1.219	-	-	0.1	0.985	**1.201**
	LTE Band 71	20M	QPSK	50	0	-	Back	0mm	Full Power	133322	683	22.72	23.50	1.197	-	-	0.16	0.737	0.882
	LTE Band 71	20M	QPSK	1	0	-	Right Side	0mm	Full Power	133322	683	23.64	24.50	1.219	-	-	-0.03	0.345	0.421
	LTE Band 71	20M	QPSK	50	0	-	Right Side	0mm	Full Power	133322	683	22.72	23.50	1.197	-	-	0.07	0.320	0.383
	LTE Band 71	20M	QPSK	1	0	-	Top Side	0mm	Full Power	133322	683	23.64	24.50	1.219	-	-	0	0.085	0.104
	LTE Band 71	20M	QPSK	50	0	-	Top Side	0mm	Full Power	133322	683	22.72	23.50	1.197	-	-	0.01	0.095	0.114
	LTE Band 12	10M	QPSK	1	0	-	Front	0mm	Full Power	23095	707.5	23.47	24.50	1.268	-	-	-0.01	0.340	0.431
	LTE Band 12	10M	QPSK	25	0	-	Front	0mm	Full Power	23095	707.5	22.75	23.50	1.189	-	-	-0.06	0.301	0.358
19	LTE Band 12	10M	QPSK	1	0	-	Back	0mm	Full Power	23095	707.5	23.47	24.50	1.268	-	-	-0.08	0.939	**1.190**
	LTE Band 12	10M	QPSK	25	0	-	Back	0mm	Full Power	23095	707.5	22.75	23.50	1.189	-	-	-0.04	0.762	0.906
	LTE Band 12	10M	QPSK	1	0	-	Right Side	0mm	Full Power	23095	707.5	23.47	24.50	1.268	-	-	-0.09	0.356	0.451
	LTE Band 12	10M	QPSK	25	0	-	Right Side	0mm	Full Power	23095	707.5	22.75	23.50	1.189	-	-	-0.17	0.342	0.406
	LTE Band 12	10M	QPSK	1	0	-	Top Side	0mm	Full Power	23095	707.5	23.47	24.50	1.268	-	-	-0.1	0.154	0.195
	LTE Band 12	10M	QPSK	25	0	-	Top Side	0mm	Full Power	23095	707.5	22.75	23.50	1.189	-	-	0.18	0.137	0.163
	LTE Band 13	10M	QPSK	1	0	-	Front	0mm	Full Power	23230	782	23.65	24.50	1.216	-	-	-0.17	0.471	0.573
	LTE Band 13	10M	QPSK	25	0	-	Front	0mm	Full Power	23230	782	22.74	23.50	1.191	-	-	-0.04	0.405	0.482
20	LTE Band 13	10M	QPSK	1	0	-	Back	0mm	Full Power	23230	782	23.65	24.50	1.216	-	-	-0.08	0.815	**0.991**
	LTE Band 13	10M	QPSK	25	0	-	Back	0mm	Full Power	23230	782	22.74	23.50	1.191	-	-	-0.05	0.662	0.789
	LTE Band 13	10M	QPSK	1	0	-	Right Side	0mm	Full Power	23230	782	23.65	24.50	1.216	-	-	0	0.551	0.670
	LTE Band 13	10M	QPSK	25	0	-	Right Side	0mm	Full Power	23230	782	22.74	23.50	1.191	-	-	-0.13	0.471	0.561
	LTE Band 13	10M	QPSK	1	0	-	Top Side	0mm	Full Power	23230	782	23.65	24.50	1.216	-	-	-0.01	0.115	0.140
	LTE Band 13	10M	QPSK	25	0	-	Top Side	0mm	Full Power	23230	782	22.74	23.50	1.191	-	-	-0.09	0.083	0.099
	LTE Band 14	10M	QPSK	1	0	-	Front	0mm	Full Power	23330	793	22.92	24.00	1.282	-	-	0.04	0.405	0.519
	LTE Band 14	10M	QPSK	25	0	-	Front	0mm	Full Power	23330	793	22.02	23.00	1.253	-	-	0.13	0.319	0.400
21	LTE Band 14	10M	QPSK	1	0	-	Back	0mm	Full Power	23330	793	22.92	24.00	1.282	-	-	0.16	0.685	**0.878**
	LTE Band 14	10M	QPSK	25	0	-	Back	0mm	Full Power	23330	793	22.02	23.00	1.253	-	-	-0.18	0.524	0.657
	LTE Band 14	10M	QPSK	1	0	-	Right Side	0mm	Full Power	23330	793	22.92	24.00	1.282	-	-	-0.11	0.438	0.562
	LTE Band 14	10M	QPSK	25	0	-	Right Side	0mm	Full Power	23330	793	22.02	23.00	1.253	-	-	-0.16	0.337	0.422
	LTE Band 14	10M	QPSK	1	0	-	Top Side	0mm	Full Power	23330	793	22.92	24.00	1.282	-	-	-0.15	0.155	0.199
	LTE Band 14	10M	QPSK	25	0	-	Top Side	0mm	Full Power	23330	793	22.02	23.00	1.253	-	-	-0.06	0.123	0.154
835MHz																			
22	WCDMA V	-	-	-	-	RMC 12.2Kbps	Front	0mm	Full Power	4182	836.4	22.10	23.50	1.380	-	-	0.04	0.419	**0.578**
	WCDMA V	-	-	-	-	RMC 12.2Kbps	Back	0mm	Full Power	4182	836.4	22.10	23.50	1.380	-	-	0.12	0.373	0.515
	WCDMA V	-	-	-	-	RMC 12.2Kbps	Right Side	0mm	Full Power	4182	836.4	22.10	23.50	1.380	-	-	-0.16	0.406	0.560
	WCDMA V	-	-	-	-	RMC 12.2Kbps	Top Side	0mm	Full Power	4182	836.4	22.10	23.50	1.380	-	-	-0.12	0.364	0.502
23	LTE Band 26	15M	QPSK	1	0	-	Front	0mm	Full Power	26865	831.5	22.47	23.50	1.268	-	-	-0.05	0.463	**0.587**
	LTE Band 26	15M	QPSK	36	0	-	Front	0mm	Full Power	26865	831.5	21.35	22.50	1.303	-	-	0.08	0.375	0.489
	LTE Band 26	15M	QPSK	1	0	-	Back	0mm	Full Power	26865	831.5	22.47	23.50	1.268	-	-	0.16	0.400	0.507
	LTE Band 26	15M	QPSK	36	0	-	Back	0mm	Full Power	26865	831.5	21.35	22.50	1.303	-	-	0.01	0.319	0.416
	LTE Band 26	15M	QPSK	1	0	-	Right Side	0mm	Full Power	26865	831.5	22.47	23.50	1.268	-	-	-0.16	0.420	0.532
	LTE Band 26	15M	QPSK	36	0	-	Right Side	0mm	Full Power	26865	831.5	21.35	22.50	1.303	-	-	0.1	0.346	0.451
	LTE Band 26	15M	QPSK	1	0	-	Top Side	0mm	Full Power	26865	831.5	22.47	23.50	1.268	-	-	-0.04	0.117	0.148
	LTE Band 26	15M	QPSK	36	0	-	Top Side	0mm	Full Power	26865	831.5	21.35	22.50	1.303	-	-	-0.01	0.095	0.124
1750MHz																			
	WCDMA IV	-	-	-	-	RMC 12.2Kbps	Front	0mm	Full Power	1413	1732.6	20.14	21.50	1.368	-	-	-0.02	0.150	0.205
	WCDMA IV	-	-	-	-	RMC 12.2Kbps	Back	0mm	Full Power	1413	1732.6	20.14	21.50	1.368	-	-	-0.09	0.621	0.849
24	WCDMA IV	-	-	-	-	RMC 12.2Kbps	Back	0mm	Full Power	1312	1712.4	20.05	21.50	1.396	-	-	-0.03	0.657	**0.917**
	WCDMA IV	-	-	-	-	RMC 12.2Kbps	Back	0mm	Full Power	1513	1752.6	20.04	21.50	1.400	-	-	0.14	0.645	0.903

	WCDMA IV	-	-	-	-	RMC 12.2Kbps	Right Side	0mm	Full Power	1413	1732.6	20.14	21.50	1.368	-	-	0.1	0.488	0.667
	WCDMA IV	-	-	-	-	RMC 12.2Kbps	Top Side	0mm	Full Power	1413	1732.6	20.14	21.50	1.368	-	-	-0.09	0.106	0.145
	WCDMA IV	-	-	-	-	RMC 12.2Kbps	Right Side	0mm	Full Power	1312	1712.4	20.05	21.50	1.396	-	-	0.07	0.492	0.687
	WCDMA IV	-	-	-	-	RMC 12.2Kbps	Right Side	0mm	Full Power	1513	1752.6	20.04	21.50	1.400	-	-	-0.09	0.504	0.705
	LTE Band 66	20M	QPSK	1	0	-	Front	0mm	Full Power	132322	1745	21.05	22.00	1.245	-	-	0.07	0.155	0.193
	LTE Band 66	20M	QPSK	50	0	-	Front	0mm	Full Power	132322	1745	19.99	21.00	1.262	-	-	-0.12	0.124	0.156
25	LTE Band 66	20M	QPSK	1	0	-	Back	0mm	Full Power	132322	1745	21.05	22.00	1.245	-	-	0.06	0.715	**0.890**
	LTE Band 66	20M	QPSK	50	0	-	Back	0mm	Full Power	132322	1745	19.99	21.00	1.262	-	-	-0.03	0.570	0.719
	LTE Band 66	20M	QPSK	1	0	-	Right Side	0mm	Full Power	132322	1745	21.05	22.00	1.245	-	-	0.02	0.549	0.683
	LTE Band 66	20M	QPSK	50	0	-	Right Side	0mm	Full Power	132322	1745	19.99	21.00	1.262	-	-	0.12	0.456	0.575
	LTE Band 66	20M	QPSK	1	0	-	Top Side	0mm	Full Power	132322	1745	21.05	22.00	1.245	-	-	0.02	0.222	0.276
	LTE Band 66	20M	QPSK	50	0	-	Top Side	0mm	Full Power	132322	1745	19.99	21.00	1.262	-	-	-0.03	0.145	0.183
1900MHz																			
	WCDMA II	-	-	-	-	RMC 12.2Kbps	Front	0mm	Full Power	9400	1880	21.12	22.50	1.374	-	-	0	0.207	0.284
	WCDMA II	-	-	-	-	RMC 12.2Kbps	Back	0mm	Full Power	9400	1880	21.12	22.50	1.374	-	-	-0.1	0.816	1.121
	WCDMA II	-	-	-	-	RMC 12.2Kbps	Back	0mm	Full Power	9262	1852.4	21.10	22.50	1.380	-	-	0.05	0.665	0.918
	WCDMA II	-	-	-	-	RMC 12.2Kbps	Back	0mm	Full Power	9538	1907.6	21.08	22.50	1.387	-	-	0	0.699	0.969
	WCDMA II	-	-	-	-	RMC 12.2Kbps	Right Side	0mm	Full Power	9400	1880	21.12	22.50	1.374	-	-	0.07	0.883	1.213
	WCDMA II	-	-	-	-	RMC 12.2Kbps	Top Side	0mm	Full Power	9400	1880	21.12	22.50	1.374	-	-	0.15	0.181	0.249
	WCDMA II	-	-	-	-	RMC 12.2Kbps	Right Side	0mm	Full Power	9262	1852.4	21.10	22.50	1.380	-	-	-0.05	0.849	1.172
26	WCDMA II	-	-	-	-	RMC 12.2Kbps	Right Side	0mm	Full Power	9538	1907.6	21.08	22.50	1.387	-	-	-0.08	0.950	**1.317**
	LTE Band 25	20M	QPSK	1	0	-	Front	0mm	Full Power	26340	1880	21.14	22.50	1.368	-	-	-0.08	0.228	0.312
	LTE Band 25	20M	QPSK	50	0	-	Front	0mm	Full Power	26340	1880	20.13	21.50	1.371	-	-	-0.08	0.188	0.258
	LTE Band 25	20M	QPSK	1	0	-	Back	0mm	Full Power	26340	1880	21.14	22.50	1.368	-	-	-0.13	1.000	1.368
	LTE Band 25	20M	QPSK	50	0	-	Back	0mm	Full Power	26340	1880	20.13	21.50	1.371	-	-	0.01	0.784	1.075
27	LTE Band 25	20M	QPSK	1	0	-	Right Side	0mm	Full Power	26340	1880	21.14	22.50	1.368	-	-	0.06	1.040	**1.422**
	LTE Band 25	20M	QPSK	50	0	-	Right Side	0mm	Full Power	26340	1880	20.13	21.50	1.371	-	-	-0.11	0.844	1.157
	LTE Band 25	20M	QPSK	1	0	-	Top Side	0mm	Full Power	26340	1880	21.14	22.50	1.368	-	-	0.03	0.353	0.483
	LTE Band 25	20M	QPSK	50	0	-	Top Side	0mm	Full Power	26340	1880	20.13	21.50	1.371	-	-	-0.05	0.267	0.366
2600MHz																			
	LTE Band 7	20M	QPSK	1	0	-	Front	0mm	Full Power	21100	2535	15.68	17.00	1.355	-	-	0.14	0.069	0.094
	LTE Band 7	20M	QPSK	50	0	-	Front	0mm	Full Power	21100	2535	14.72	16.00	1.343	-	-	-0.01	0.058	0.078
	LTE Band 7	20M	QPSK	1	0	-	Back	0mm	Full Power	21100	2535	15.68	17.00	1.355	-	-	-0.12	0.272	0.369
	LTE Band 7	20M	QPSK	50	0	-	Back	0mm	Full Power	21100	2535	14.72	16.00	1.343	-	-	0.04	0.223	0.299
28	LTE Band 7	20M	QPSK	1	0	-	Right Side	0mm	Full Power	21100	2535	15.68	17.00	1.355	-	-	0.07	0.394	**0.534**
	LTE Band 7	20M	QPSK	50	0	-	Right Side	0mm	Full Power	21100	2535	14.72	16.00	1.343	-	-	-0.16	0.298	0.400
	LTE Band 7	20M	QPSK	1	0	-	Top Side	0mm	Full Power	21100	2535	15.68	17.00	1.355	-	-	-0.01	0.062	0.084
	LTE Band 7	20M	QPSK	50	0	-	Top Side	0mm	Full Power	21100	2535	14.72	16.00	1.343	-	-	-0.14	0.036	0.048
	LTE Band 41	20M	QPSK	1	0	-	Front	0mm	Full Power	41490	2680	14.75	16.00	1.334	62.9	1.006	-0.15	0.019	0.025
	LTE Band 41	20M	QPSK	50	0	-	Front	0mm	Full Power	41490	2680	13.75	15.00	1.334	62.9	1.006	-0.12	0.015	0.020
	LTE Band 41	20M	QPSK	1	0	-	Back	0mm	Full Power	41490	2680	14.75	16.00	1.334	62.9	1.006	-0.17	0.192	0.258
	LTE Band 41	20M	QPSK	50	0	-	Back	0mm	Full Power	41490	2680	13.75	15.00	1.334	62.9	1.006	0.08	0.158	0.212
29	LTE Band 41	20M	QPSK	1	0	-	Right Side	0mm	Full Power	41490	2680	14.75	16.00	1.334	62.9	1.006	0.05	0.306	**0.411**
	LTE Band 41	20M	QPSK	50	0	-	Right Side	0mm	Full Power	41490	2680	13.75	15.00	1.334	62.9	1.006	0.1	0.243	0.326
	LTE Band 41	20M	QPSK	1	0	-	Top Side	0mm	Full Power	41490	2680	14.75	16.00	1.334	62.9	1.006	-0.18	0.010	0.013
	LTE Band 41	20M	QPSK	50	0	-	Top Side	0mm	Full Power	41490	2680	13.75	15.00	1.334	62.9	1.006	-0.03	0.005	0.007

Plot No.	Band	Mode	Test Position	Gap (mm)	Power Reduction	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 10g SAR (W/kg)	Reported 10g SAR (W/kg)
2450MHz															
	WLAN2.4GHz	802.11b 1Mbps	Front	0mm	Full Power	1	2412	16.76	18.50	1.493	98.95	1.011	0.17	0.073	0.110
30	WLAN2.4GHz	802.11b 1Mbps	Back	0mm	Full Power	1	2412	16.76	18.50	1.493	98.95	1.011	-0.08	0.561	**0.847**
	WLAN2.4GHz	802.11b 1Mbps	Left Side	0mm	Full Power	1	2412	16.76	18.50	1.493	98.95	1.011	0.18	0.280	0.423
	WLAN2.4GHz	802.11b 1Mbps	Top Side	0mm	Full Power	1	2412	16.76	18.50	1.493	98.95	1.011	-0.04	0.032	0.048
	WLAN2.4GHz	802.11b 1Mbps	Back	0mm	Simultaneous	1	2412	16.42	18.00	1.439	98.95	1.011	0.08	0.346	0.503
	Bluetooth	1Mbps	Front	0mm	Full Power	39	2441	12.32	14.00	1.471	76.69	1.086	-0.04	0.034	0.054
31	Bluetooth	1Mbps	Back	0mm	Full Power	39	2441	12.32	14.00	1.471	76.69	1.086	0.06	0.235	**0.376**
	Bluetooth	1Mbps	Left Side	0mm	Full Power	39	2441	12.32	14.00	1.471	76.69	1.086	-0.09	0.112	0.179
	Bluetooth	1Mbps	Top Side	0mm	Full Power	39	2441	12.32	14.00	1.471	76.69	1.086	0.18	0.009	0.014
5000MHz															
	WLAN5.3GHz	802.11n-HT40 MCS0	Front	0mm	Full Power	54	5270	10.72	12.50	1.421	96.3	1.038	-0.15	0.008	0.012
32	WLAN5.3GHz	802.11n-HT40 MCS0	Back	0mm	Full Power	54	5270	10.72	12.50	1.421	96.3	1.038	0.02	0.537	**0.792**
	WLAN5.3GHz	802.11n-HT40 MCS0	Left Side	0mm	Full Power	54	5270	10.72	12.50	1.421	96.3	1.038	0.07	0.091	0.134
	WLAN5.3GHz	802.11n-HT40 MCS0	Top Side	0mm	Full Power	54	5270	10.72	12.50	1.421	96.3	1.038	-0.18	0.038	0.056
	WLAN5.3GHz	802.11ac-VHT80 MCS0	Back	0mm	Simultaneous	58	5290	5.99	7.50	1.535	92.44	1.082	0	0.206	0.342
	WLAN5.5GHz	802.11n-HT40 MCS0	Front	0mm	Full Power	110	5550	15.62	17.50	1.540	96.3	1.038	-0.15	0.010	0.016
33	WLAN5.5GHz	802.11n-HT40 MCS0	Back	0mm	Full Power	110	5550	15.62	17.50	1.540	96.3	1.038	0.03	0.532	**0.851**
	WLAN5.5GHz	802.11n-HT40 MCS0	Left Side	0mm	Full Power	110	5550	15.62	17.50	1.540	96.3	1.038	0.11	0.074	0.118
	WLAN5.5GHz	802.11n-HT40 MCS0	Top Side	0mm	Full Power	110	5550	15.62	17.50	1.540	96.3	1.038	-0.08	0.058	0.093
	WLAN5.5GHz	802.11n-HT40 MCS0	Back	0mm	Simultaneous	110	5550	11.25	13.00	1.496	96.3	1.038	0.01	0.232	0.360
	WLAN5.8GHz	802.11n-HT40 MCS0	Front	0mm	Full Power	151	5755	14.92	16.50	1.438	96.3	1.038	0.03	0.028	0.042
34	WLAN5.8GHz	802.11n-HT40 MCS0	Back	0mm	Full Power	151	5755	14.92	16.50	1.438	96.3	1.038	0	0.484	**0.722**
	WLAN5.8GHz	802.11n-HT40 MCS0	Left Side	0mm	Full Power	151	5755	14.92	16.50	1.438	96.3	1.038	-0.08	0.051	0.076
	WLAN5.8GHz	802.11n-HT40 MCS0	Top Side	0mm	Full Power	151	5755	14.92	16.50	1.438	96.3	1.038	-0.08	0.067	0.100
	WLAN5.8GHz	802.11n-HT40 MCS0	Back	0mm	Simultaneous	151	5755	9.97	11.50	1.422	96.3	1.038	0.02	0.173	0.255

14.3 Repeated SAR Measurement

<1g>

No.	Band	BW (MHz)	Modulation	RB Size	RB offset	Mode	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)	Ratio	Reported 1g SAR (W/kg)
1st	LTE Band 13	10M	QPSK	1	0	-	Back	5mm	Full Power	23230	782	23.65	24.50	1.216	0.06	0.980	1	1.192
2nd	LTE Band 13	10M	QPSK	1	0	-	Back	5mm	Full Power	23230	782	23.65	24.50	1.216	-0.02	0.953	1.028	1.159
1st	LTE Band 26	15M	QPSK	1	0	-	Back	5mm	Full Power	26865	831.5	22.47	23.50	1.268	-0.02	0.901	1	1.142
2nd	LTE Band 26	15M	QPSK	1	0	-	Back	5mm	Full Power	26865	831.5	22.47	23.50	1.268	0.06	0.886	1.017	1.123
1st	LTE Band 66	20M	QPSK	1	0	-	Back	5mm	Full Power	132072	1720	21.00	22.00	1.259	-0.06	0.935	1	1.177
2nd	LTE Band 66	20M	QPSK	1	0	-	Back	5mm	Full Power	132072	1720	21.00	22.00	1.259	0.04	0.907	1.031	1.142
1st	LTE Band 25	20M	QPSK	1	0	-	Back	5mm	Full Power	26590	1905	21.05	22.50	1.396	-0.07	0.838	1	1.170
2nd	LTE Band 25	20M	QPSK	1	0	-	Back	5mm	Full Power	26590	1905	21.05	22.50	1.396	-0.08	0.811	1.033	1.132
1st	LTE Band 7	20M	QPSK	1	0	-	Back	5mm	Full Power	21350	2560	15.57	17.00	1.390	0.09	0.850	1	1.181
2nd	LTE Band 7	20M	QPSK	1	0	-	Back	5mm	Full Power	21350	2560	15.57	17.00	1.390	0.02	0.806	1.055	1.120

General Note:

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

15. Simultaneous Transmission Analysis

No.	Simultaneous Transmission Configurations	Point of Sale Terminal	
		Body-worn	Extremity
1.	WWAN + WLAN2.4GHz	Yes	Yes
2.	WWAN + WLAN5GHz	Yes	Yes
3.	WWAN + Bluetooth	Yes	Yes
4.	WWAN + WLAN2.4GHz + NFC		Yes
5.	WWAN + WLAN5GHz+ NFC		Yes
6.	WWAN + Bluetooth+ NFC		Yes

General Note:

1. EUT will choose each WCDMA and LTE according to the network signal condition; therefore, they will not operate simultaneously at any moment.
2. EUT will choose either WLAN 2.4GHz or WLAN 5GHz according to the network signal condition; therefore, 2.4GHz WLAN and 5GHz WLAN will not operate simultaneously at any moment though they have independent antenna.
3. WLAN 2.4GHz and Bluetooth share the same antenna and they can't transmit simultaneously.
4. NFC can transmit simultaneously with other Radios in extremity exposure condition.
5. For standalone WWAN, always choose the highest SAR among the selected WWAN bands within the selected antenna for each exposure position to perform simultaneous transmission analysis with WLAN/BT. This is the worst co-located analysis and can represent each band.
6. All licensed modes share the same antenna part and cannot transmit simultaneously.
7. The reported SAR summation is calculated based on the same configuration and test position
8. Per KDB 447498 D01v06, simultaneous transmission SAR is compliant if,
   i) 1g Scalar SAR summation < 1.6W/kg and 10g Scalar SAR summation < 4.0W/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 for 1g SAR and SPLSR≤ 0.10 for 10g SAR, simultaneously transmission SAR measurement is not necessary.
   iv) Simultaneously transmission SAR measurement, and the reported multi-band 1g SAR < 1.6W/kg and 10g SAR < 4.0W/kg.

15.1 Body-Worn Exposure Conditions

WWAN Band	Exposure Position	1	2	3	4	1+2	1+3	1+4
		WWAN	WLAN2.4GHz	WLAN5GHz	Bluetooth	Summed	Summed	Summed
		1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)
WWAN All Bands	Front	0.682	0.098	0.063	0.059	0.78	0.75	0.74
	Back	1.192	0.324	0.388	0.241	**1.52**	**1.58**	**1.43**

15.2 Extremity Exposure Conditions

WWAN Band	Exposure Position	1	2	3	4	5	1+2+5	1+3+5	1+4+5
		WWAN	WLAN2.4GHz	WLAN5GHz	Bluetooth	NFC	Summed	Summed	Summed
		10g SAR (W/kg)	10g SAR (W/kg)	10g SAR (W/kg)	10g SAR (W/kg)	10g SAR (W/kg)	10g SAR (W/kg)	10g SAR (W/kg)	10g SAR (W/kg)
WWAN All Bands	Front	0.587	0.110	0.042	0.054	0.096	0.79	0.73	0.74
	Back	1.368	0.503	0.360	0.376	0.036	**1.91**	**1.76**	**1.78**
	Left side		0.423	0.134	0.179	0.029	0.45	0.16	0.21
	Right side	1.422				0.033	1.46	1.46	1.46
	Top side	0.502	0.048	0.100	0.014	0.033	0.58	0.64	0.55
	Bottom side					0.001	0.00	0.00	0.00

Note: NFC SAR value is from another NFC SAR report which is submitted separately.

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16. 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 and highest measured 10-g SAR is less 3.75W/kg. Therefore, the measurement uncertainty table is not required in this report.

17. 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 D01 v03r01, “3G SAR MEAUREMENT PROCEDURES”, Oct 2015

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

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

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

Appendixes

Please refer to separated files for the following appendixes

Appendix A. Plots of System Performance Check

Appendix B. Plots of High SAR Measurement

Appendix C. DASY Calibration Certificate

Appendix D. Test Setup Photos

Appendix E. Conducted RF Output Power Table

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