

FCC SAR Test Report

APPLICANT : VeriFone, Inc.
EQUIPMENT : Point of Sale Terminal
BRAND NAME : Verifone or VERIFONE or verifone
MODEL NAME : VM110, VM111
FCC ID : B32VM110
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.



Approved by: Si Zhang

Sporton International Inc. (Kunshan)

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People's Republic of China



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Revision History

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FA590905	Rev. 01	Initial issue of report	Nov. 07, 2025

1. Statement of Compliance

The maximum results of Specific Absorption Rate (SAR) found during testing for **VeriFone, Inc., Point of Sale Terminal, VM110, VM111**, are as follows.

Frequency Band		Highest SAR Summary		Highest Body-Worn Simultaneous Transmission 1g SAR SAR (W/kg)	Highest Extremity Simultaneous Transmission 10g SAR SAR (W/kg)
		Body-Worn (Separation 5mm)	Extremity (Separation 0mm)		
		1g SAR (W/kg)	10g SAR (W/kg)		
WCDMA	WCDMA II	1.03	1.18	1.58	2.03
	WCDMA IV	1.07	1.01		
	WCDMA V	0.94	0.59		
LTE	LTE Band 7	1.19	0.59		
	LTE Band 12/17	0.77	0.90		
	LTE Band 13	0.89	0.76		
	LTE Band 14	0.90	0.77		
	LTE Band 25/2	1.12	1.21		
	LTE Band 26/5	1.00	0.69		
	LTE Band 41	1.10	0.34		
	LTE Band 66/4	1.07	0.92		
	LTE Band 71	0.74	0.97		
WLAN	2.4GHz WLAN	0.45	0.76	1.58	1.95
	5GHz WLAN	1.08	0.84	1.21	2.03
Bluetooth	Bluetooth	0.14	0.23	1.33	1.42
Date of Testing:		2025/09/23 ~ 2025/09/29			

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 support's 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.
	SAR03-KS, SAR07-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	VM110, VM111
FCC ID	B32VM110
S/N	713-018-958, 713-018-919
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. There are two samples, Sample 1 (VM110) is P-SIM + E-SIM sample, and Sample 2 (VM111) is dual P-SIM sample. According to the difference, sample 1 was chosen to perform full SAR testing. 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	B32VM110																																																																												
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><tr><th colspan="8">Table 6.2.3-1: Maximum Power Reduction (MPR) for Power Class 1, 2 and 3</th></tr><tr><th rowspan="2">Modulation</th><th colspan="6">Channel bandwidth / Transmission bandwidth (N_{RB})</th><th rowspan="2">MPR (dB)</th></tr><tr><th>1.4 MHz</th><th>3.0 MHz</th><th>5 MHz</th><th>10 MHz</th><th>15 MHz</th><th>20 MHz</th></tr><tr><td>QPSK</td><td>> 5</td><td>> 4</td><td>> 8</td><td>> 12</td><td>> 16</td><td>> 18</td><td>≤ 1</td></tr><tr><td>16 QAM</td><td>≤ 5</td><td>≤ 4</td><td>≤ 8</td><td>≤ 12</td><td>≤ 16</td><td>≤ 18</td><td>≤ 1</td></tr><tr><td>16 QAM</td><td>> 5</td><td>> 4</td><td>> 8</td><td>> 12</td><td>> 16</td><td>> 18</td><td>≤ 2</td></tr><tr><td>64 QAM</td><td>≤ 5</td><td>≤ 4</td><td>≤ 8</td><td>≤ 12</td><td>≤ 16</td><td>≤ 18</td><td>≤ 2</td></tr><tr><td>64 QAM</td><td>> 5</td><td>> 4</td><td>> 8</td><td>> 12</td><td>> 16</td><td>> 18</td><td>≤ 3</td></tr><tr><td>256 QAM</td><td colspan="6">≥ 1</td><td>≤ 5</td></tr></table>							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
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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)	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)	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)	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 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 2	Yes	Yes	Yes	Yes	Yes	Yes
LTE Band 25	Yes	Yes	Yes	Yes	Yes	Yes
LTE Band 4	Yes	Yes	Yes	Yes	Yes	Yes
LTE Band 66	Yes	Yes	Yes	Yes	Yes	Yes

2) LTE Bands tune up:

Band	Antenna	Full Power Tune-up Limit
LTE Band 12	Ant 0	24
LTE Band 17	Ant 0	24
LTE Band 5	Ant 0	24
LTE Band 26	Ant 0	24
LTE Band 2	Ant 0	23
LTE Band 25	Ant 0	23
LTE Band 4	Ant 0	22
LTE Band 66	Ant 0	22

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:

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

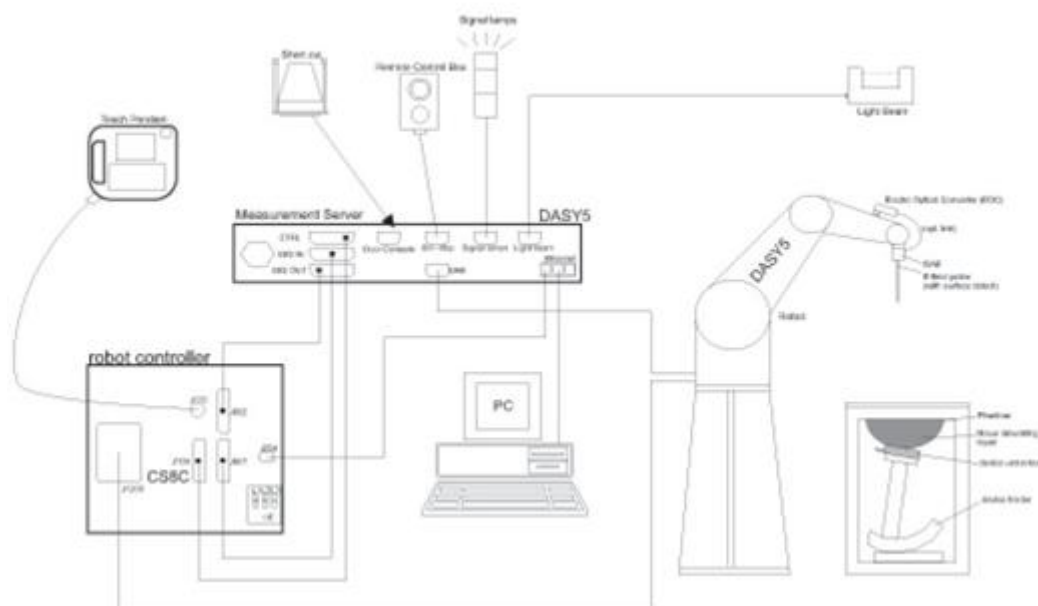
SAR is expressed in units of Watts per kilogram (W/kg)

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

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

7. System Description and Setup

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



- 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 μ W/g – >100 mW/g Linearity: ± 0.2 dB (noise: typically <1 μ W/g)	
Dimensions	Overall length: 337 mm (tip: 20 mm) Tip diameter: 2.5 mm (body: 12 mm) Typical distance from probe tip to dipole centers: 1 mm	

7.2 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 from the measurement grid to the high-resolution grid
- (e) Extrapolation of the entire 3-D field distribution to the phantom surface over the distance from sensor to surface
- (f) Calculation of the averaged SAR within masses of 1g and 10g

8.2 Power Reference Measurement

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

8.3 Area Scan

The area scan is used as a fast scan in two dimensions to find the area of high field values, before doing a fine measurement around the hot spot. The sophisticated interpolation routines implemented in DASY software can find the maximum found in the scanned area, within a range of the global maximum. The range (in 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	$\frac{1}{2} \cdot \delta \cdot \ln(2) \pm 0.5$ mm
Maximum probe angle from probe axis to phantom surface normal at the measurement location	$30^\circ \pm 1^\circ$	$20^\circ \pm 1^\circ$
Maximum area scan spatial resolution: Δx_{Area} , Δy_{Area}	≤ 2 GHz: ≤ 15 mm 2 – 3 GHz: ≤ 12 mm	3 – 4 GHz: ≤ 12 mm 4 – 6 GHz: ≤ 10 mm
	When the x or y dimension of the test device, in the measurement plane orientation, is smaller than the above, the measurement resolution must be $\leq$ the corresponding x or y dimension of the test device with at least one measurement point on the test device.	

8.4 Zoom Scan

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

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

			≤ 3 GHz	> 3 GHz
Maximum zoom scan spatial resolution: $\Delta x_{\text{Zoom}}, \Delta y_{\text{Zoom}}$			≤ 2 GHz: ≤ 8 mm 2 – 3 GHz: ≤ 5 mm*	3 – 4 GHz: ≤ 5 mm* 4 – 6 GHz: ≤ 4 mm*
Maximum zoom scan spatial resolution, normal to phantom surface	uniform grid: $\Delta z_{\text{Zoom}}(n)$		≤ 5 mm	3 – 4 GHz: ≤ 4 mm 4 – 5 GHz: ≤ 3 mm 5 – 6 GHz: ≤ 2 mm
	graded grid	$\Delta z_{\text{Zoom}}(1)$: between 1 st two points closest to phantom surface	≤ 4 mm	3 – 4 GHz: ≤ 3 mm 4 – 5 GHz: ≤ 2.5 mm 5 – 6 GHz: ≤ 2 mm
		$\Delta z_{\text{Zoom}}(n>1)$: between subsequent points	$\leq 1.5 \cdot \Delta z_{\text{Zoom}}(n-1)$	
Minimum zoom scan volume	x, y, z		≥ 30 mm	3 – 4 GHz: ≥ 28 mm 4 – 5 GHz: ≥ 25 mm 5 – 6 GHz: ≥ 22 mm
Note: δ is the penetration depth of a plane-wave at normal incidence to the tissue medium; see draft standard IEEE P1528-2011 for details.				
* When zoom scan is required and the <i>reported</i> SAR from the <i>area scan based 1-g SAR estimation</i> procedures of KDB 447498 is ≤ 1.4 W/kg, ≤ 8 mm, ≤ 7 mm and ≤ 5 mm zoom scan resolution may be applied, respectively, for 2 GHz to 3 GHz, 3 GHz to 4 GHz and 4 GHz to 6 GHz.				

8.5 Volume Scan Procedures

The volume scan is used to assess overlapping SAR distributions for antennas transmitting in different frequency bands. It is equivalent to an oversized zoom scan used in standalone measurements. The measurement volume will be used to enclose all the simultaneous transmitting antennas. For antennas transmitting simultaneously in different frequency bands, the volume scan is measured separately in each frequency band. In order to sum correctly to compute the 1g aggregate SAR, the EUT 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	Last Cal.	Due Date
SPEAG	750MHz System Validation Kit	D750V3	1087	Mar. 12, 2025	Mar. 11, 2026
SPEAG	835MHz System Validation Kit	D835V2	4d162	Dec. 13, 2024	Dec. 12, 2025
SPEAG	1750MHz System Validation Kit	D1750V2	1137	Oct. 15, 2024	Oct. 14, 2025
SPEAG	1900MHz System Validation Kit	D1900V2	5d170	Mar. 13, 2025	Mar. 12, 2026
SPEAG	2450MHz System Validation Kit ^(2)	D2450V2	1095	Feb. 08, 2024	Feb. 06, 2026
SPEAG	2600MHz System Validation Kit ^(2)	D2600V2	1112	Dec. 18, 2023	Dec. 16, 2025
SPEAG	5000MHz System Validation Kit	D5GHzV2	1113	Sep. 17, 2025	Sep. 16, 2026
SPEAG	Data Acquisition Electronics	DAE4	1691	Jun. 04, 2025	Jun. 03, 2026
SPEAG	Dosimetric E-Field Probe	EX3DV4	3857	Feb. 19, 2025	Feb. 18, 2026
SPEAG	SAM Twin Phantom	SAM Twin	TP-1697	NCR	NCR
Beichuang	Thermo-Hygrometer	HTC-1	1959629	May. 27, 2025	May. 26, 2026
SPEAG	Phone Positioner	N/A	N/A	None	None
Anritsu	Radio Communication Analyzer	MT8820C	6201563900	Jul. 02, 2025	Jul. 01, 2026
Agilent	ENA Series Network Analyzer	E5071C	MY46112129	Jul. 02, 2025	Jul. 01, 2026
SPEAG	Dielectric Probe Kit	DAK-3.5	1071	Feb. 24, 2025	Feb. 23, 2026
Anritsu	Vector Signal Generator	MG3710A	6201682672	Jan. 03, 2025	Jan. 02, 2026
BONN	POWER AMPLIFIER	BLMA 0830-3	087193A	NCR	NCR
BONN	POWER AMPLIFIER	BLMA 2060-2	087193B	NCR	NCR
Agilent	Dual Directional Coupler	778D	20500	Jul. 02, 2025	Jul. 01, 2026
Agilent	Dual Directional Coupler	11691D	MY48151020	Jul. 02, 2025	Jul. 01, 2026
Rohde & Schwarz	Power Meter	NRVD	102081	Jul. 02, 2025	Jul. 01, 2026
Rohde & Schwarz	Power Sensor	NRV-Z5	100538	Jul. 02, 2025	Jul. 01, 2026
Rohde & Schwarz	Power Sensor	NRV-Z5	100539	Jul. 02, 2025	Jul. 01, 2026
ARRA	Power Divider	A3200-2	N/A	NCR	NCR
MCL	Attenuation1	BW-S10W5+	N/A	NCR	NCR
R&S	BLUETOOTH TESTER	CBT	101246	Jul. 03, 2025	Jul. 02, 2026
Rohde & Schwarz	Spectrum Analyzer	FSV7	101631	Oct. 11, 2024	Oct. 10, 2025
TES	DIGITAC THERMOMETER	TYPE-K	220305411	Jan. 02, 2025	Jan. 01, 2026
BONN Elektronik	Power Amplifier	BSA 0125-150	076577A	Jan. 06, 2025	Jan. 05, 2026

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 (ϵ_r)
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)	Liquid Temp (°C)	Conductivity (σ)	Permittivity (ϵ_r)	Conductivity Target (σ)	Permittivity Target (ϵ_r)	Delta (σ) (%)	Delta (ϵ_r) (%)	Limit (%)	Date
750	22.8	0.883	42.841	0.89	41.9	-0.79	2.25	±5.0	2025-09-23
750	22.8	0.891	42.824	0.89	41.9	0.11	2.21	±5.0	2025-09-25
835	22.7	0.919	42.571	0.9	41.5	2.11	2.58	±5.0	2025-09-23
835	22.8	0.916	42.397	0.9	41.5	1.78	2.16	±5.0	2025-09-26
1750	22.7	1.393	40.338	1.37	40.1	1.68	0.59	±5.0	2025-09-24
1750	22.7	1.374	40.676	1.37	40.1	0.29	1.44	±5.0	2025-09-26
1900	22.9	1.44	39.088	1.4	40.0	2.86	-2.28	±5.0	2025-09-24
1900	22.8	1.451	39.071	1.4	40.0	3.64	-2.32	±5.0	2025-09-27
2450	22.7	1.769	39.295	1.8	39.2	-1.72	0.24	±5.0	2025-09-28
2600	22.8	1.903	38.827	1.96	39.0	-2.91	-0.44	±5.0	2025-09-25
2600	22.7	1.913	38.831	1.96	39.0	-2.40	-0.43	±5.0	2025-09-27
5250	22.8	4.734	36.378	4.71	35.95	0.51	1.19	±5.0	2025-09-28
5600	22.8	4.982	36.056	5.07	35.5	-1.74	1.57	±5.0	2025-09-29
5800	22.7	5.305	35.764	5.27	35.3	0.66	1.31	±5.0	2025-09-29

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)	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 (%)
2025-09-23	750	50.00	D750V3 - 1087	EX3DV4 - SN3857	DAE4 Sn1691	0.432	8.680	8.640	-0.46	0.290	5.610	5.800	3.39
2025-09-25	750	50.00	D750V3 - 1087	EX3DV4 - SN3857	DAE4 Sn1691	0.437	8.680	8.740	0.69	0.293	5.610	5.860	4.46
2025-09-23	835	50.00	D835V2 - 4d162	EX3DV4 - SN3857	DAE4 Sn1691	0.478	9.080	9.560	5.29	0.318	5.850	6.360	8.72
2025-09-26	835	50.00	D835V2 - 4d162	EX3DV4 - SN3857	DAE4 Sn1691	0.475	9.080	9.500	4.63	0.317	5.850	6.340	8.38
2025-09-24	1750	50.00	D1750V2 - 1137	EX3DV4 - SN3857	DAE4 Sn1691	1.730	36.800	34.600	-5.98	0.922	19.600	18.440	-5.92
2025-09-26	1750	50.00	D1750V2 - 1137	EX3DV4 - SN3857	DAE4 Sn1691	1.690	36.800	33.800	-8.15	0.905	19.600	18.100	-7.65
2025-09-24	1900	50.00	D1900V2 - 5d170	EX3DV4 - SN3857	DAE4 Sn1691	1.850	39.100	37.000	-5.37	0.982	20.600	19.640	-4.66
2025-09-27	1900	50.00	D1900V2 - 5d170	EX3DV4 - SN3857	DAE4 Sn1691	1.870	39.100	37.400	-4.35	0.991	20.600	19.820	-3.79
2025-09-28	2450	50.00	D2450V2 - 1095	EX3DV4 - SN3857	DAE4 Sn1691	2.630	52.600	52.600	-0.00	1.220	24.700	24.400	-1.21
2025-09-25	2600	50.00	D2600V2 - 1112	EX3DV4 - SN3857	DAE4 Sn1691	2.570	55.100	51.400	-6.72	1.170	24.800	23.400	-5.65
2025-09-27	2600	50.00	D2600V2 - 1112	EX3DV4 - SN3857	DAE4 Sn1691	2.590	55.100	51.800	-5.99	1.170	24.800	23.400	-5.65
2025-09-28	5250	50.00	D5GHZV2 - 1113	EX3DV4 - SN3857	DAE4 Sn1691	4.050	78.100	81.000	3.71	1.150	22.400	23.000	2.68
2025-09-29	5600	50.00	D5GHZV2 - 1113	EX3DV4 - SN3857	DAE4 Sn1691	4.330	80.000	86.600	8.25	1.230	23.000	24.600	6.96
2025-09-29	5800	50.00	D5GHZV2 - 1113	EX3DV4 - SN3857	DAE4 Sn1691	4.040	77.900	80.800	3.72	1.160	22.300	23.200	4.04

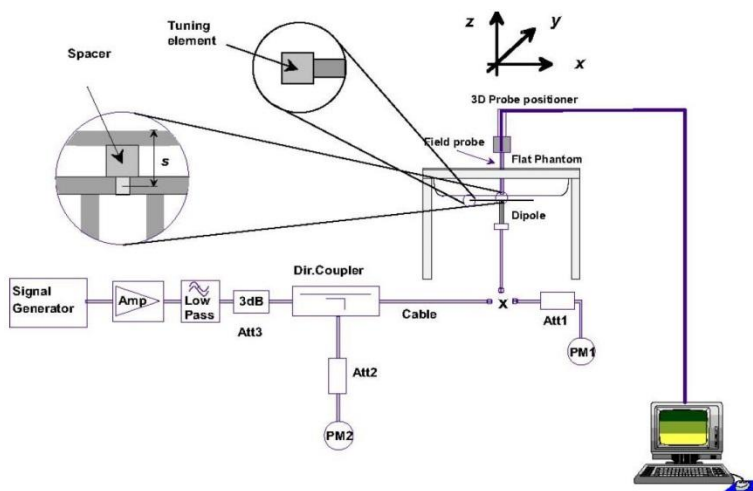


Fig 10.3.1 System Performance Check Setup



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 Back 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} (Note 1, 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 $\Delta_{CQI} = 30/15$ with $\beta_{hs} = 30/15 * \beta_c$.

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 $\Delta_{NACK} = 30/15$ with $\beta_{hs} = 30/15 * \beta_c$, and $\Delta_{CQI} = 24/15$ with $\beta_{hs} = 24/15 * \beta_c$.

Note 3: CM = 1 for $\beta_c/\beta_d = 12/15$, $\beta_{hs}/\beta_c = 24/15$. For all other combinations of DPDCCH, 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 $\beta_c = 11/15$ and $\beta_d = 15/15$.

Setup Configuration

HSUPA Setup Configuration:

- The EUT was connected to Base Station Agilent E5515C referred to the Setup Configuration.
- The RF path losses were compensated into the measurements.
- A call was established between EUT and Base Station with following setting * :
 - Call Configs = 5.2B, 5.9B, 5.10B, and 5.13.2B with QPSK
 - 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
 - Set Cell Power = -86 dBm
 - Set Channel Type = 12.2k + HSPA
 - Set UE Target Power
 - Power Ctrl Mode= Alternating bits
 - Set and observe the E-TFCI
 - Confirm that E-TFCI is equal to the target E-TFCI of 75 for sub-test 1, and other subtest's E-TFCI
- 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	209/25	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	$\beta_{ed1}: 47/15$ $\beta_{ed2}: 47/15$	4	2	2.0	1.0	15	92
4	2/15	15/15	64	2/15	4/15	2/15	56/75	4	1	3.0	2.0	17	71
5	15/15	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 $\Delta_{CQI} = 30/15$ with $\beta_{hs} = 30/15 * \beta_c$. For sub-test 5, Δ_{ACK} , Δ_{NACK} and $\Delta_{CQI} = 5/15$ with $\beta_{hs} = 5/15 * \beta_c$.

Note 2: CM = 1 for $\beta_d/\beta_c = 12/15$, $\beta_{hs}/\beta_c = 24/15$. For all other combinations of DPDCCH, DPCCH, HS-DPCCH, E-DPDCCH 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 $\beta_c = 10/15$ and $\beta_d = 15/15$.

Note 4: In case of testing by UE using E-DPDCCH 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-DPDCCH power scaling at max power which could results in slightly smaller MPR values.

Setup Configuration

<WCDMA Conducted Power>

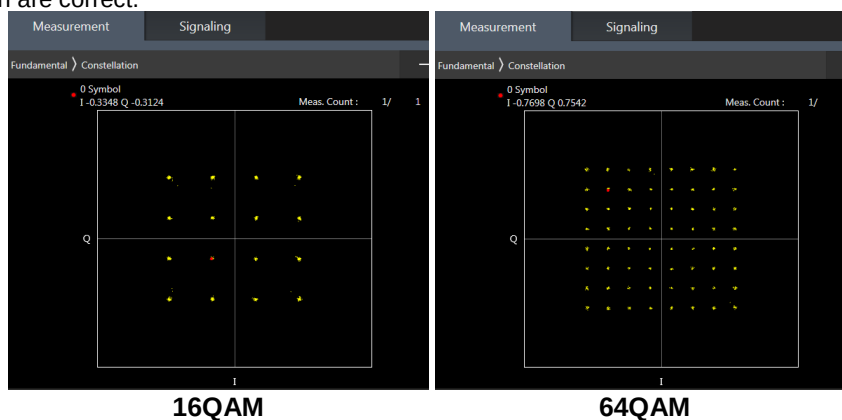
General Note:

- Per KDB 941225 D01v03r01, for SAR testing is measured using a 12.2 kbps RMC with TPC bits configured to all "1's".
- 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 $\leq 1/4$ 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 $1/4$ 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 $\frac{1}{2}$ dB higher than the same configuration in QPSK and the reported SAR for the QPSK configuration is ≤ 1.45 W/kg; Per KDB 941225 D05v02r05, 16QAM/64QAM SAR testing is not required.
7. Per KDB 941225 D05v02r05, smaller bandwidth output power for each RB allocation configuration is $>$ not $\frac{1}{2}$ dB higher than the same configuration in the largest supported bandwidth, and the reported SAR for the largest supported bandwidth is ≤ 1.45 W/kg; Per KDB 941225 D05v02r05, smaller bandwidth SAR testing is not required.
8. For LTE B4 / 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 $\leq$ 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.



<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.

- 3GPP TS 36.211 section 4.2 for Type 2 Frame Structure and Table 4.2-2 for uplink-downlink configurations
- “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
- 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.

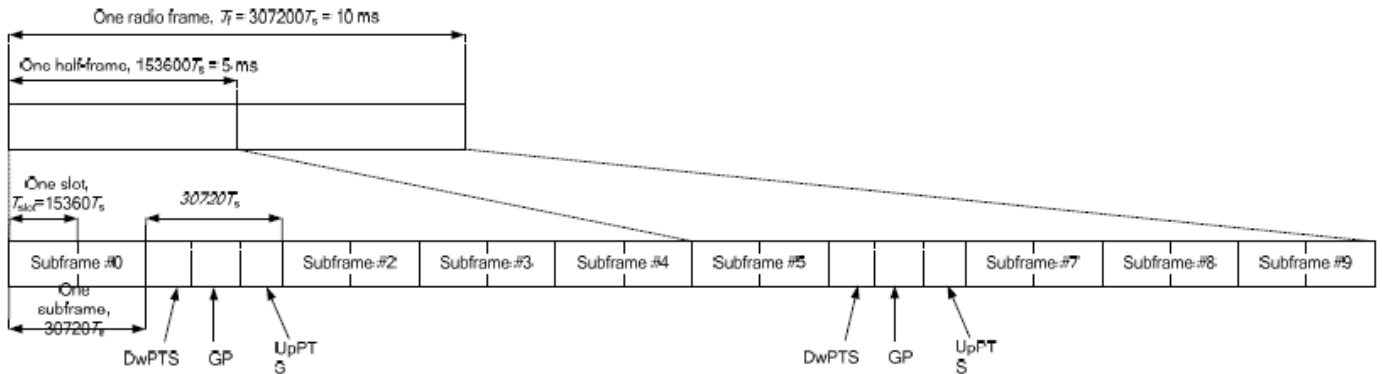


Figure 4.2-1: Frame structure type 2 (for 5 ms switch-point periodicity).

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	$26336 \cdot T_s$	$4384 \cdot T_s$	$5120 \cdot T_s$	$7680 \cdot T_s$	$4384 \cdot T_s$	$5120 \cdot T_s$
5	$6592 \cdot T_s$			$20480 \cdot T_s$		
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

- Uplink-downlink configuration: 0. In a half-frame consisted of 5 subframes, uplink operation is in 3 uplink subframes and 1 special subframe.
- special subframe configuration: 5-9 for normal cyclic prefix in downlink, 4-7 for extended cyclic prefix in downlink
- for special subframe with extended cyclic prefix in uplink, the total uplink duty factor in one half-frame is: $(3+0.167)/5 = 63.3\%$
- for special subframe with normal cyclic prefix in uplink, the total uplink duty factor in one half-frame is: $(3+0.143)/5 = 62.9\%$
- 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.

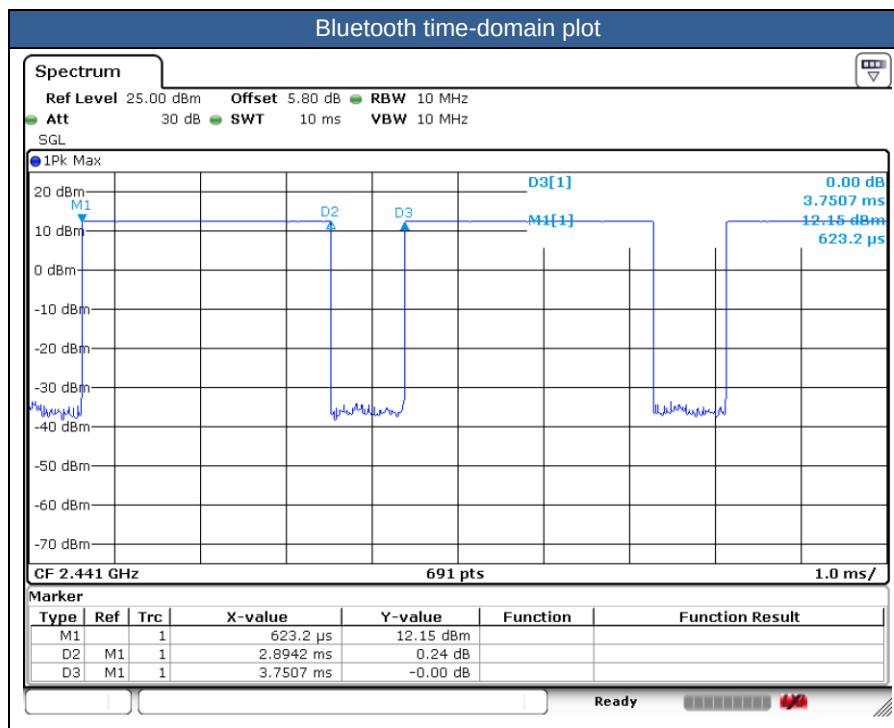
<WLAN Conducted Power>**General Note:**

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 77.16% 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.





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 ≥ 0.8 W/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.

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 $\leq \frac{1}{4}$ 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 $\frac{1}{4}$ 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 $\frac{1}{2}$ dB higher than the same configuration in QPSK and the reported SAR for the QPSK configuration is ≤ 1.45 W/kg; Per KDB 941225 D05v02r05, 16QAM/64QAM SAR testing is not required.
5. Per KDB 941225 D05v02r05, smaller bandwidth output power for each RB allocation configuration is $>$ not $\frac{1}{2}$ dB higher than the same configuration in the largest supported bandwidth, and the reported SAR for the largest supported bandwidth is ≤ 1.45 W/kg; Per KDB 941225 D05v02r05, smaller bandwidth SAR testing is not required.
6. For LTE B4 / 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 $\leq$ 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

【WCDMA SAR】

Plot No	Band	Mode	Test Position	Gap (mm)	Antenna	Power State	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-Up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
01	WCDMA II	RMC 12.2Kbps	Front	5mm	Ant 0	Full Power	9400	1880	22.15	22.50	1.084	-0.03	0.141	0.153
	WCDMA II	RMC 12.2Kbps	Back	5mm	Ant 0	Full Power	9400	1880	22.15	22.50	1.084	-0.01	0.953	1.033
	WCDMA II	RMC 12.2Kbps	Back	5mm	Ant 0	Full Power	9262	1852.4	22.13	22.50	1.089	-0.14	0.891	0.970
	WCDMA II	RMC 12.2Kbps	Back	5mm	Ant 0	Full Power	9538	1907.6	22.10	22.50	1.096	-0.06	0.912	0.999
	WCDMA IV	RMC 12.2Kbps	Front	5mm	Ant 0	Full Power	1413	1732.6	21.74	22.00	1.062	0.04	0.151	0.161
	WCDMA IV	RMC 12.2Kbps	Back	5mm	Ant 0	Full Power	1413	1732.6	21.74	22.00	1.062	0.01	0.984	1.045
02	WCDMA IV	RMC 12.2Kbps	Back	5mm	Ant 0	Full Power	1312	1712.4	21.71	22.00	1.069	0.03	0.999	1.068
	WCDMA IV	RMC 12.2Kbps	Back	5mm	Ant 0	Full Power	1513	1752.6	21.66	22.00	1.081	0.11	0.938	1.013
	WCDMA V	RMC 12.2Kbps	Front	5mm	Ant 0	Full Power	4182	836.4	23.87	24.00	1.03	0.09	0.488	0.503
03	WCDMA V	RMC 12.2Kbps	Back	5mm	Ant 0	Full Power	4182	836.4	23.87	24.00	1.03	0.13	0.908	0.935
	WCDMA V	RMC 12.2Kbps	Back	5mm	Ant 0	Full Power	4132	826.4	23.82	24.00	1.042	0.02	0.852	0.888
	WCDMA V	RMC 12.2Kbps	Back	5mm	Ant 0	Full Power	4233	846.6	23.81	24.00	1.045	0.03	0.813	0.850

【LTE SAR】

Plot No	Band	BW	Modulation	RB Size	RB Offset	Test Position	Gap (mm)	Antenna	Power State	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)
	LTE Band 7	20M	QPSK	1	0	Front	5mm	Ant 0	Full Power	21100	2535	16.29	17.00	1.178			0.08	0.070	0.082
	LTE Band 7	20M	QPSK	50	0	Front	5mm	Ant 0	Full Power	21100	2535	16.23	17.00	1.194			-0.13	0.055	0.066
	LTE Band 7	20M	QPSK	1	0	Back	5mm	Ant 0	Full Power	21100	2535	16.29	17.00	1.178			-0.17	0.964	1.135
	LTE Band 7	20M	QPSK	1	0	Back	5mm	Ant 0	Full Power	20850	2510	16.21	17.00	1.199			0.14	0.879	1.054
	LTE Band 7	20M	QPSK	1	0	Back	5mm	Ant 0	Full Power	21350	2560	16.28	17.00	1.18			0.03	1.010	1.192
	LTE Band 7	20M	QPSK	50	0	Back	5mm	Ant 0	Full Power	21100	2535	16.23	17.00	1.194			0.05	0.756	0.903
	LTE Band 7	20M	QPSK	50	0	Back	5mm	Ant 0	Full Power	20850	2510	16.01	17.00	1.256			-0.12	0.716	0.899
	LTE Band 7	20M	QPSK	50	0	Back	5mm	Ant 0	Full Power	21350	2560	16.16	17.00	1.213			-0.10	0.852	1.034
	LTE Band 7	20M	QPSK	100	0	Back	5mm	Ant 0	Full Power	21100	2535	16.20	17.00	1.202			-0.07	0.754	0.906
	LTE Band 12	10M	QPSK	1	0	Front	5mm	Ant 0	Full Power	23095	707.5	23.25	24.00	1.189			-0.18	0.090	0.107
	LTE Band 12	10M	QPSK	25	0	Front	5mm	Ant 0	Full Power	23095	707.5	22.35	23.00	1.161			-0.08	0.071	0.083
	LTE Band 12	10M	QPSK	1	0	Back	5mm	Ant 0	Full Power	23095	707.5	23.25	24.00	1.189			-0.08	0.644	0.766
05	LTE Band 12	10M	QPSK	25	0	Back	5mm	Ant 0	Full Power	23095	707.5	22.35	23.00	1.161			-0.07	0.464	0.538
	LTE Band 13	10M	QPSK	1	0	Front	5mm	Ant 0	Full Power	23230	782	23.26	24.00	1.186			0.14	0.328	0.389
	LTE Band 13	10M	QPSK	25	0	Front	5mm	Ant 0	Full Power	23230	782	22.41	23.00	1.146			0.11	0.251	0.288
06	LTE Band 13	10M	QPSK	1	0	Back	5mm	Ant 0	Full Power	23230	782	23.26	24.00	1.186			-0.06	0.748	0.887
	LTE Band 13	10M	QPSK	25	0	Back	5mm	Ant 0	Full Power	23230	782	22.41	23.00	1.146			0.11	0.571	0.655
	LTE Band 13	10M	QPSK	50	0	Back	5mm	Ant 0	Full Power	23230	782	22.29	23.00	1.178			-0.10	0.575	0.678
	LTE Band 14	10M	QPSK	1	0	Front	5mm	Ant 0	Full Power	23330	793	23.19	24.00	1.205			0.17	0.327	0.393
	LTE Band 14	10M	QPSK	25	0	Front	5mm	Ant 0	Full Power	23330	793	22.11	23.00	1.227			-0.07	0.258	0.317
	LTE Band 14	10M	QPSK	1	0	Back	5mm	Ant 0	Full Power	23330	793	23.19	24.00	1.205			0.01	0.745	0.898
07	LTE Band 14	10M	QPSK	25	0	Back	5mm	Ant 0	Full Power	23330	793	22.11	23.00	1.227			0.00	0.573	0.703
	LTE Band 14	10M	QPSK	50	0	Back	5mm	Ant 0	Full Power	23330	793	22.06	23.00	1.242			0.11	0.579	0.719
	LTE Band 25	20M	QPSK	1	0	Front	5mm	Ant 0	Full Power	26340	1880	22.36	23.00	1.159			-0.15	0.130	0.151
	LTE Band 25	20M	QPSK	50	0	Front	5mm	Ant 0	Full Power	26340	1880	22.33	23.00	1.167			0.10	0.109	0.127
	LTE Band 25	20M	QPSK	1	0	Back	5mm	Ant 0	Full Power	26340	1880	22.36	23.00	1.159			0.13	0.970	1.124
08	LTE Band 25	20M	QPSK	1	0	Back	5mm	Ant 0	Full Power	26140	1860	22.22	23.00	1.197			-0.04	0.925	1.107
	LTE Band 25	20M	QPSK	1	0	Back	5mm	Ant 0	Full Power	26590	1905	22.31	23.00	1.172			0.09	0.942	1.104
	LTE Band 25	20M	QPSK	50	0	Back	5mm	Ant 0	Full Power	26340	1880	22.33	23.00	1.167			0.06	0.721	0.842
	LTE Band 25	20M	QPSK	50	0	Back	5mm	Ant 0	Full Power	26140	1860	22.30	23.00	1.175			0.06	0.712	0.836
	LTE Band 25	20M	QPSK	50	0	Back	5mm	Ant 0	Full Power	26590	1905	22.28	23.00	1.18			-0.05	0.715	0.844
	LTE Band 25	20M	QPSK	100	0	Back	5mm	Ant 0	Full Power	26340	1880	22.21	23.00	1.199			0.06	0.903	1.083
	LTE Band 26	15M	QPSK	1	0	Front	5mm	Ant 0	Full Power	26865	831.5	23.22	24.00	1.197			-0.08	0.439	0.526
	LTE Band 26	15M	QPSK	36	0	Front	5mm	Ant 0	Full Power	26865	831.5	22.35	23.00	1.161			-0.02	0.360	0.418
	LTE Band 26	15M	QPSK	1	0	Back	5mm	Ant 0	Full Power	26865	831.5	23.22	24.00	1.197			0.16	0.832	0.996
09	LTE Band 26	15M	QPSK	36	0	Back	5mm	Ant 0	Full Power	26865	831.5	22.35	23.00	1.161			-0.05	0.590	0.685
	LTE Band 26	15M	QPSK	75	0	Back	5mm	Ant 0	Full Power	26865	831.5	22.19	23.00	1.205			-0.08	0.602	0.725
	LTE Band 66	20M	QPSK	1	0	Front	5mm	Ant 0	Full Power	132322	1745	21.49	22.00	1.125			-0.03	0.129	0.145
	LTE Band 66	20M	QPSK	50	0	Front	5mm	Ant 0	Full Power	132322	1745	21.41	22.00	1.146			-0.19	0.097	0.111
	LTE Band 66	20M	QPSK	1	0	Back	5mm	Ant 0	Full Power	132322	1745	21.49	22.00	1.125			0.11	0.816	0.918
10	LTE Band 66	20M	QPSK	1	0	Back	5mm	Ant 0	Full Power	132072	1720	21.41	22.00	1.146			0.02	0.931	1.067
	LTE Band 66	20M	QPSK	1	0	Back	5mm	Ant 0	Full Power	132572	1770	21.37	22.00	1.156			0.15	0.897	1.037
	LTE Band 66	20M	QPSK	50	0	Back	5mm	Ant 0	Full Power	132322	1745	21.41	22.00	1.146			0.01	0.624	0.715
	LTE Band 66	20M	QPSK	100	0	Back	5mm	Ant 0	Full Power	132322	1745	21.30	22.00	1.175			-0.06	0.629	0.739
	LTE Band 71	20M	QPSK	1	0	Front	5mm	Ant 0	Full Power	133297	680.5	23.35	24.00	1.161			0.04	0.098	0.113
11	LTE Band 71	20M	QPSK	50	0	Front	5mm	Ant 0	Full Power	133297	680.5	22.30	23.00	1.175			0.14	0.080	0.093
	LTE Band 71	20M	QPSK	1	0	Back	5mm	Ant 0	Full Power	133297	680.5	23.35	24.00	1.161			0.03	0.638	0.741
	LTE Band 71	20M	QPSK	50	0	Back	5mm	Ant 0	Full Power	133297	680.5	22.30	23.00	1.175			0.13	0.451	0.530
	LTE Band 41	20M	QPSK	1	0	Front	5mm	Ant 0	Full Power	40620	2593	15.33	16.00	1.167	62.9	1.006	-0.11	0.031	0.036
	LTE Band 41	20M	QPSK	50	0	Front	5mm	Ant 0	Full Power	40620	2593	15.28	16.00	1.18	62.9	1.006	0.16	0.025	0.029



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	LTE Band 41	20M	QPSK	1	0	Back	5mm	Ant 0	Full Power	40620	2593	15.33	16.00	1.167	62.9	1.006	0.15	0.634	0.745
	LTE Band 41	20M	QPSK	1	0	Back	5mm	Ant 0	Full Power	39750	2506	15.19	16.00	1.205	62.9	1.006	-0.18	0.529	0.641
	LTE Band 41	20M	QPSK	1	0	Back	5mm	Ant 0	Full Power	40185	2549.5	15.24	16.00	1.191	62.9	1.006	0.03	0.619	0.742
	LTE Band 41	20M	QPSK	1	0	Back	5mm	Ant 0	Full Power	41055	2636.5	15.26	16.00	1.186	62.9	1.006	-0.17	0.806	0.961
12	LTE Band 41	20M	QPSK	1	0	Back	5mm	Ant 0	Full Power	41490	2680	15.21	16.00	1.199	62.9	1.006	0.19	0.913	1.101
	LTE Band 41	20M	QPSK	50	0	Back	5mm	Ant 0	Full Power	40620	2593	15.28	16.00	1.18	62.9	1.006	0.01	0.897	1.065
	LTE Band 41	20M	QPSK	50	0	Back	5mm	Ant 0	Full Power	39750	2506	15.21	16.00	1.199	62.9	1.006	0.04	0.795	0.959
	LTE Band 41	20M	QPSK	50	0	Back	5mm	Ant 0	Full Power	40185	2549.5	15.25	16.00	1.189	62.9	1.006	-0.05	0.680	0.813
	LTE Band 41	20M	QPSK	50	0	Back	5mm	Ant 0	Full Power	41055	2636.5	15.18	16.00	1.208	62.9	1.006	0.11	0.785	0.954
	LTE Band 41	20M	QPSK	50	0	Back	5mm	Ant 0	Full Power	41490	2680	15.20	16.00	1.202	62.9	1.006	0.12	0.697	0.842
	LTE Band 41	20M	QPSK	100	0	Back	5mm	Ant 0	Full Power	40620	2593	15.06	16.00	1.242	62.9	1.006	0.08	0.701	0.876

【WLAN 2.4GHz_5GHz SAR】

Plot No	Band	Mode	Test Position	Gap (mm)	Antenna	Power State	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)
	WLAN2.4GHz	802.11b 1Mbps	Front	5mm	Ant 1	Full Power	11	2462	17.13	18.50	1.371	100.0	1.0	-0.08	0.057	0.079
13	WLAN2.4GHz	802.11b 1Mbps	Back	5mm	Ant 1	Full Power	11	2462	17.13	18.50	1.371	100.0	1.0	-0.01	0.331	0.454
	WLAN5GHz	802.11n-HT40 MCS0	Front	5mm	Ant 1	Full Power	46	5230	14.30	16.00	1.479	96.27	1.039	0.07	0.001	0.001
14	WLAN5GHz	802.11n-HT40 MCS0	Back	5mm	Ant 1	Full Power	46	5230	14.30	16.00	1.479	96.27	1.039	0.09	0.675	1.037
	WLAN5GHz	802.11n-HT40 MCS0	Back	5mm	Ant 1	Full Power	38	5190	12.65	14.00	1.365	96.27	1.039	-0.13	0.494	0.701
	WLAN5GHz	802.11n-HT40 MCS0	Front	5mm	Ant 1	Full Power	54	5270	14.83	16.00	1.309	96.27	1.039	0.18	0.001	0.001
15	WLAN5GHz	802.11n-HT40 MCS0	Back	5mm	Ant 1	Full Power	54	5270	14.83	16.00	1.309	96.27	1.039	-0.09	0.768	1.045
	WLAN5GHz	802.11n-HT40 MCS0	Back	5mm	Ant 1	Full Power	62	5310	13.16	14.50	1.361	96.27	1.039	0.08	0.716	1.012
	WLAN5GHz	802.11n-HT40 MCS0	Front	5mm	Ant 1	Full Power	134	5670	14.35	16.00	1.462	96.27	1.039	-0.10	0.001	0.002
16	WLAN5GHz	802.11n-HT40 MCS0	Back	5mm	Ant 1	Full Power	134	5670	14.35	16.00	1.462	96.27	1.039	-0.09	0.688	1.045
	WLAN5GHz	802.11n-HT40 MCS0	Back	5mm	Ant 1	Full Power	102	5510	13.85	15.50	1.462	96.27	1.039	-0.12	0.481	0.730
	WLAN5GHz	802.11n-HT40 MCS0	Back	5mm	Ant 1	Full Power	110	5550	13.78	15.50	1.486	96.27	1.039	0.15	0.337	0.520
	WLAN5GHz	802.11n-HT40 MCS0	Back	5mm	Ant 1	Full Power	126	5630	13.95	15.50	1.429	96.27	1.039	-0.18	0.481	0.714
	WLAN5GHz	802.11n-HT40 MCS0	Back	5mm	Ant 1	Full Power	142	5710	14.20	15.50	1.349	96.27	1.039	0.09	0.416	0.583
	WLAN5GHz	802.11n-HT40 MCS0	Front	5mm	Ant 1	Full Power	151	5755	14.72	16.00	1.343	96.27	1.039	0.14	0.049	0.069
17	WLAN5GHz	802.11n-HT40 MCS0	Back	5mm	Ant 1	Full Power	151	5755	14.72	16.00	1.343	96.27	1.039	-0.09	0.774	1.080
	WLAN5GHz	802.11n-HT40 MCS0	Back	5mm	Ant 1	Full Power	159	5795	14.41	16.00	1.442	96.27	1.039	0.07	0.675	1.011

【Bluetooth SAR】

Plot No	Band	Mode	Test Position	Gap (mm)	Antenna	Power State	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)
	Bluetooth	1Mbps	Front	5mm	Ant 1	Full Power	39	2441	12.73	14.00	1.34	77.16	1.08	0.19	0.001	0.001
18	Bluetooth	1Mbps	Back	5mm	Ant 1	Full Power	39	2441	12.73	14.00	1.34	77.16	1.08	0.06	0.096	0.138



14.2 Extremity SAR

【WCDMA SAR】

Plot No	Band	Mode	Test Position	Gap (mm)	Antenna	Power State	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-Up Scaling Factor	Power Drift (dB)	Measured 10g SAR (W/kg)	Reported 10g SAR (W/kg)
19	WCDMA II	RMC 12.2Kbps	Front	0mm	Ant 0	Full Power	9400	1880	22.15	22.50	1.084	0.05	0.219	0.237
	WCDMA II	RMC 12.2Kbps	Back	0mm	Ant 0	Full Power	9400	1880	22.15	22.50	1.084	-0.04	1.050	1.138
	WCDMA II	RMC 12.2Kbps	Right Side	0mm	Ant 0	Full Power	9400	1880	22.15	22.50	1.084	0.02	1.090	1.182
	WCDMA II	RMC 12.2Kbps	Top Side	0mm	Ant 0	Full Power	9400	1880	22.15	22.50	1.084	0.09	0.255	0.277
20	WCDMA IV	RMC 12.2Kbps	Front	0mm	Ant 0	Full Power	1413	1732.6	21.74	22.00	1.062	-0.15	0.242	0.257
	WCDMA IV	RMC 12.2Kbps	Back	0mm	Ant 0	Full Power	1413	1732.6	21.74	22.00	1.062	0.06	0.947	1.006
	WCDMA IV	RMC 12.2Kbps	Right Side	0mm	Ant 0	Full Power	1413	1732.6	21.74	22.00	1.062	0.04	0.739	0.785
	WCDMA IV	RMC 12.2Kbps	Top Side	0mm	Ant 0	Full Power	1413	1732.6	21.74	22.00	1.062	-0.16	0.191	0.203
21	WCDMA V	RMC 12.2Kbps	Front	0mm	Ant 0	Full Power	4182	836.4	23.87	24.00	1.03	0.09	0.568	0.585
	WCDMA V	RMC 12.2Kbps	Back	0mm	Ant 0	Full Power	4182	836.4	23.87	24.00	1.03	0.14	0.433	0.446
	WCDMA V	RMC 12.2Kbps	Right Side	0mm	Ant 0	Full Power	4182	836.4	23.87	24.00	1.03	0.18	0.482	0.496
	WCDMA V	RMC 12.2Kbps	Top Side	0mm	Ant 0	Full Power	4182	836.4	23.87	24.00	1.03	0.06	0.450	0.464

【LTE SAR】

Plot No	Band	BW	Modulation	RB Size	RB Offset	Test Position	Gap (mm)	Antenna	Power State	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)
	LTE Band 7	20M	QPSK	1	0	Front	0mm	Ant 0	Full Power	21100	2535	16.29	17.00	1.178			-0.16	0.073	0.086
	LTE Band 7	20M	QPSK	50	0	Front	0mm	Ant 0	Full Power	21100	2535	16.23	17.00	1.194			-0.19	0.056	0.067
	LTE Band 7	20M	QPSK	1	0	Back	0mm	Ant 0	Full Power	21100	2535	16.29	17.00	1.178			-0.14	0.344	0.405
	LTE Band 7	20M	QPSK	50	0	Back	0mm	Ant 0	Full Power	21100	2535	16.23	17.00	1.194			0.00	0.257	0.307
22	LTE Band 7	20M	QPSK	1	0	Right Side	0mm	Ant 0	Full Power	21100	2535	16.29	17.00	1.178			-0.08	0.497	0.585
	LTE Band 7	20M	QPSK	50	0	Right Side	0mm	Ant 0	Full Power	21100	2535	16.23	17.00	1.194			-0.10	0.391	0.467
	LTE Band 7	20M	QPSK	1	0	Top Side	0mm	Ant 0	Full Power	21100	2535	16.29	17.00	1.178			0.15	0.067	0.079
	LTE Band 7	20M	QPSK	50	0	Top Side	0mm	Ant 0	Full Power	21100	2535	16.23	17.00	1.194			-0.14	0.048	0.057
	LTE Band 12	10M	QPSK	1	0	Front	0mm	Ant 0	Full Power	23095	707.5	23.25	24.00	1.189			-0.01	0.317	0.377
	LTE Band 12	10M	QPSK	25	0	Front	0mm	Ant 0	Full Power	23095	707.5	22.35	23.00	1.161			0.06	0.250	0.290
	LTE Band 12	10M	QPSK	1	0	Back	0mm	Ant 0	Full Power	23095	707.5	23.25	24.00	1.189			-0.02	0.759	0.902
	LTE Band 12	10M	QPSK	25	0	Back	0mm	Ant 0	Full Power	23095	707.5	22.35	23.00	1.161			-0.18	0.598	0.694
23	LTE Band 12	10M	QPSK	1	0	Right Side	0mm	Ant 0	Full Power	23095	707.5	23.25	24.00	1.189			0.04	0.287	0.341
	LTE Band 12	10M	QPSK	25	0	Right Side	0mm	Ant 0	Full Power	23095	707.5	22.35	23.00	1.161			-0.13	0.225	0.261
	LTE Band 12	10M	QPSK	1	0	Top Side	0mm	Ant 0	Full Power	23095	707.5	23.25	24.00	1.189			0.10	0.108	0.129
	LTE Band 12	10M	QPSK	25	0	Top Side	0mm	Ant 0	Full Power	23095	707.5	22.35	23.00	1.161			-0.09	0.089	0.103
	LTE Band 13	10M	QPSK	1	0	Front	0mm	Ant 0	Full Power	23230	782	23.26	24.00	1.186			-0.16	0.493	0.584
	LTE Band 13	10M	QPSK	25	0	Front	0mm	Ant 0	Full Power	23230	782	22.41	23.00	1.146			-0.18	0.362	0.415
	LTE Band 13	10M	QPSK	1	0	Back	0mm	Ant 0	Full Power	23230	782	23.26	24.00	1.186			-0.14	0.637	0.755
	LTE Band 13	10M	QPSK	25	0	Back	0mm	Ant 0	Full Power	23230	782	22.41	23.00	1.146			-0.12	0.533	0.611
24	LTE Band 13	10M	QPSK	1	0	Right Side	0mm	Ant 0	Full Power	23230	782	23.26	24.00	1.186			-0.10	0.570	0.676
	LTE Band 13	10M	QPSK	25	0	Right Side	0mm	Ant 0	Full Power	23230	782	22.41	23.00	1.146			-0.13	0.432	0.495
	LTE Band 13	10M	QPSK	1	0	Top Side	0mm	Ant 0	Full Power	23230	782	23.26	24.00	1.186			0.16	0.280	0.332
	LTE Band 13	10M	QPSK	25	0	Top Side	0mm	Ant 0	Full Power	23230	782	22.41	23.00	1.146			-0.09	0.207	0.238
	LTE Band 14	10M	QPSK	1	0	Front	0mm	Ant 0	Full Power	23330	793	23.19	24.00	1.205			-0.02	0.391	0.471
	LTE Band 14	10M	QPSK	25	0	Front	0mm	Ant 0	Full Power	23330	793	22.11	23.00	1.227			-0.05	0.322	0.395
	LTE Band 14	10M	QPSK	1	0	Back	0mm	Ant 0	Full Power	23330	793	23.19	24.00	1.205			-0.08	0.639	0.770
	LTE Band 14	10M	QPSK	25	0	Back	0mm	Ant 0	Full Power	23330	793	22.11	23.00	1.227			0.06	0.505	0.620
25	LTE Band 14	10M	QPSK	1	0	Right Side	0mm	Ant 0	Full Power	23330	793	23.19	24.00	1.205			-0.03	0.501	0.603
	LTE Band 14	10M	QPSK	25	0	Right Side	0mm	Ant 0	Full Power	23330	793	22.11	23.00	1.227			-0.02	0.385	0.473
	LTE Band 14	10M	QPSK	1	0	Top Side	0mm	Ant 0	Full Power	23330	793	23.19	24.00	1.205			-0.13	0.323	0.389
	LTE Band 14	10M	QPSK	25	0	Top Side	0mm	Ant 0	Full Power	23330	793	22.11	23.00	1.227			0.16	0.248	0.304
	LTE Band 25	20M	QPSK	1	0	Front	0mm	Ant 0	Full Power	26340	1880	22.36	23.00	1.159			-0.16	0.192	0.223
	LTE Band 25	20M	QPSK	50	0	Front	0mm	Ant 0	Full Power	26340	1880	22.33	23.00	1.167			-0.19	0.156	0.183
	LTE Band 25	20M	QPSK	1	0	Back	0mm	Ant 0	Full Power	26340	1880	22.36	23.00	1.159			0.08	0.948	1.099
	LTE Band 25	20M	QPSK	50	0	Back	0mm	Ant 0	Full Power	26340	1880	22.33	23.00	1.167			0.11	0.742	0.866
26	LTE Band 25	20M	QPSK	1	0	Right Side	0mm	Ant 0	Full Power	26340	1880	22.36	23.00	1.159			0.08	1.040	1.205
	LTE Band 25	20M	QPSK	50	0	Right Side	0mm	Ant 0	Full Power	26340	1880	22.33	23.00	1.167			0.08	0.876	1.022
	LTE Band 25	20M	QPSK	1	0	Top Side	0mm	Ant 0	Full Power	26340	1880	22.36	23.00	1.159			-0.01	0.239	0.277
	LTE Band 25	20M	QPSK	50	0	Top Side	0mm	Ant 0	Full Power	26340	1880	22.33	23.00	1.167			0.12	0.194	0.226
27	LTE Band 26	15M	QPSK	1	0	Front	0mm	Ant 0	Full Power	26865	831.5	23.22	24.00	1.197			0.07	0.576	0.689
	LTE Band 26	15M	QPSK	36	0	Front	0mm	Ant 0	Full Power	26865	831.5	22.35	23.00	1.161			0.18	0.513	0.596
	LTE Band 26	15M	QPSK	1	0	Back	0mm	Ant 0	Full Power	26865	831.5	23.22	24.00	1.197			-0.01	0.476	0.569
	LTE Band 26	15M	QPSK	36	0	Back	0mm	Ant 0	Full Power	26865	831.5	22.35	23.00	1.161			-0.12	0.380	0.441
	LTE Band 26	15M	QPSK	1	0	Right Side	0mm	Ant 0	Full Power	26865	831.5	23.22	24.00	1.197			-0.09	0.561	0.671
	LTE Band 26	15M	QPSK	36	0	Right Side	0mm	Ant 0	Full Power	26865	831.5	22.35	23.00	1.161			0.14	0.432	0.502
	LTE Band 26	15M	QPSK	1	0	Top Side	0mm	Ant 0	Full Power	26865	831.5	23.22	24.00	1.197			0.14	0.551	0.659
	LTE Band 26	15M	QPSK	36	0	Top Side	0mm	Ant 0	Full Power	26865	831.5	22.35	23.00	1.161			-0.08	0.434	0.504
	LTE Band 66	20M	QPSK	1	0	Front	0mm	Ant 0	Full Power	132322	1745	21.49	22.00	1.125			-0.01	0.204	0.230
	LTE Band 66	20M	QPSK	50	0	Front	0mm	Ant 0	Full Power	132322	1745	21.41	22.00	1.146			-0.05	0.168	0.193



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28	LTE Band 66	20M	QPSK	1	0	Back	0mm	Ant 0	Full Power	132322	1745	21.49	22.00	1.125			0.05	0.813	0.915
	LTE Band 66	20M	QPSK	50	0	Back	0mm	Ant 0	Full Power	132322	1745	21.41	22.00	1.146			-0.10	0.626	0.718
	LTE Band 66	20M	QPSK	1	0	Right Side	0mm	Ant 0	Full Power	132322	1745	21.49	22.00	1.125			0.14	0.742	0.835
	LTE Band 66	20M	QPSK	50	0	Right Side	0mm	Ant 0	Full Power	132322	1745	21.41	22.00	1.146			0.03	0.532	0.610
	LTE Band 66	20M	QPSK	1	0	Top Side	0mm	Ant 0	Full Power	132322	1745	21.49	22.00	1.125			0.07	0.177	0.199
	LTE Band 66	20M	QPSK	50	0	Top Side	0mm	Ant 0	Full Power	132322	1745	21.41	22.00	1.146			0.14	0.150	0.172
	LTE Band 71	20M	QPSK	1	0	Front	0mm	Ant 0	Full Power	133297	680.5	23.35	24.00	1.161			-0.18	0.300	0.348
	LTE Band 71	20M	QPSK	50	0	Front	0mm	Ant 0	Full Power	133297	680.5	22.30	23.00	1.175			-0.12	0.248	0.292
29	LTE Band 71	20M	QPSK	1	0	Back	0mm	Ant 0	Full Power	133297	680.5	23.35	24.00	1.161			0.05	0.836	0.971
	LTE Band 71	20M	QPSK	50	0	Back	0mm	Ant 0	Full Power	133297	680.5	22.30	23.00	1.175			-0.02	0.659	0.774
	LTE Band 71	20M	QPSK	1	0	Right Side	0mm	Ant 0	Full Power	133297	680.5	23.35	24.00	1.161			0.11	0.344	0.400
	LTE Band 71	20M	QPSK	50	0	Right Side	0mm	Ant 0	Full Power	133297	680.5	22.30	23.00	1.175			-0.14	0.258	0.304
	LTE Band 71	20M	QPSK	1	0	Top Side	0mm	Ant 0	Full Power	133297	680.5	23.35	24.00	1.161			0.03	0.106	0.123
	LTE Band 71	20M	QPSK	50	0	Top Side	0mm	Ant 0	Full Power	133297	680.5	22.30	23.00	1.175			0.14	0.090	0.106
	LTE Band 41	20M	QPSK	1	0	Front	0mm	Ant 0	Full Power	40620	2593	15.33	16.00	1.167	62.9	1.006	-0.09	0.031	0.036
	LTE Band 41	20M	QPSK	50	0	Front	0mm	Ant 0	Full Power	40620	2593	15.28	16.00	1.18	62.9	1.006	-0.16	0.026	0.031
	LTE Band 41	20M	QPSK	1	0	Back	0mm	Ant 0	Full Power	40620	2593	15.33	16.00	1.167	62.9	1.006	-0.14	0.219	0.257
	LTE Band 41	20M	QPSK	50	0	Back	0mm	Ant 0	Full Power	40620	2593	15.28	16.00	1.18	62.9	1.006	-0.01	0.168	0.199
30	LTE Band 41	20M	QPSK	1	0	Right Side	0mm	Ant 0	Full Power	40620	2593	15.33	16.00	1.167	62.9	1.006	0.04	0.287	0.337
	LTE Band 41	20M	QPSK	50	0	Right Side	0mm	Ant 0	Full Power	40620	2593	15.28	16.00	1.18	62.9	1.006	0.18	0.223	0.265
	LTE Band 41	20M	QPSK	1	0	Top Side	0mm	Ant 0	Full Power	40620	2593	15.33	16.00	1.167	62.9	1.006	-0.07	0.027	0.031
	LTE Band 41	20M	QPSK	50	0	Top Side	0mm	Ant 0	Full Power	40620	2593	15.28	16.00	1.18	62.9	1.006	0.01	0.021	0.025

【WLAN 2.4GHz_5GHz SAR】

Plot No	Band	Mode	Test Position	Gap (mm)	Antenna	Power State	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)
	WLAN2.4GHz	802.11b 1Mbps	Front	0mm	Ant 1	Full Power	11	2462	17.13	18.50	1.371	100.0	1.0	-0.06	0.051	0.070
31	WLAN2.4GHz	802.11b 1Mbps	Back	0mm	Ant 1	Full Power	11	2462	17.13	18.50	1.371	100.0	1.0	0.01	0.556	0.762
	WLAN2.4GHz	802.11b 1Mbps	Left Side	0mm	Ant 1	Full Power	11	2462	17.13	18.50	1.371	100.0	1.0	-0.05	0.213	0.292
	WLAN2.4GHz	802.11b 1Mbps	Top Side	0mm	Ant 1	Full Power	11	2462	17.13	18.50	1.371	100.0	1.0	-0.13	0.001	0.001
	WLAN5GHz	802.11n-HT40 MCS0	Front	0mm	Ant 1	Full Power	46	5230	14.30	16.00	1.479	96.27	1.039	0.10	0.015	0.023
32	WLAN5GHz	802.11n-HT40 MCS0	Back	0mm	Ant 1	Full Power	46	5230	14.30	16.00	1.479	96.27	1.039	-0.09	0.509	0.782
	WLAN5GHz	802.11n-HT40 MCS0	Left Side	0mm	Ant 1	Full Power	46	5230	14.30	16.00	1.479	96.27	1.039	0.02	0.108	0.165
	WLAN5GHz	802.11n-HT40 MCS0	Top Side	0mm	Ant 1	Full Power	46	5230	14.30	16.00	1.479	96.27	1.039	0.11	0.048	0.074
	WLAN5GHz	802.11n-HT40 MCS0	Front	0mm	Ant 1	Full Power	54	5270	14.83	16.00	1.309	96.27	1.039	-0.02	0.016	0.022
33	WLAN5GHz	802.11n-HT40 MCS0	Back	0mm	Ant 1	Full Power	54	5270	14.83	16.00	1.309	96.27	1.039	0.00	0.563	0.766
	WLAN5GHz	802.11n-HT40 MCS0	Left Side	0mm	Ant 1	Full Power	54	5270	14.83	16.00	1.309	96.27	1.039	0.18	0.111	0.152
	WLAN5GHz	802.11n-HT40 MCS0	Top Side	0mm	Ant 1	Full Power	54	5270	14.83	16.00	1.309	96.27	1.039	-0.17	0.055	0.074
	WLAN5GHz	802.11n-HT40 MCS0	Front	0mm	Ant 1	Full Power	134	5670	14.35	16.00	1.462	96.27	1.039	-0.12	0.024	0.037
34	WLAN5GHz	802.11n-HT40 MCS0	Back	0mm	Ant 1	Full Power	134	5670	14.35	16.00	1.462	96.27	1.039	-0.09	0.515	0.782
	WLAN5GHz	802.11n-HT40 MCS0	Left Side	0mm	Ant 1	Full Power	134	5670	14.35	16.00	1.462	96.27	1.039	-0.03	0.063	0.095
	WLAN5GHz	802.11n-HT40 MCS0	Top Side	0mm	Ant 1	Full Power	134	5670	14.35	16.00	1.462	96.27	1.039	0.05	0.079	0.120
	WLAN5GHz	802.11n-HT40 MCS0	Front	0mm	Ant 1	Full Power	151	5755	14.72	16.00	1.343	96.27	1.039	-0.15	0.035	0.049
35	WLAN5GHz	802.11n-HT40 MCS0	Back	0mm	Ant 1	Full Power	151	5755	14.72	16.00	1.343	96.27	1.039	-0.09	0.604	0.843
	WLAN5GHz	802.11n-HT40 MCS0	Left Side	0mm	Ant 1	Full Power	151	5755	14.72	16.00	1.343	96.27	1.039	-0.16	0.081	0.113
	WLAN5GHz	802.11n-HT40 MCS0	Top Side	0mm	Ant 1	Full Power	151	5755	14.72	16.00	1.343	96.27	1.039	-0.16	0.093	0.130

【Bluetooth SAR】

Plot No	Band	Mode	Test Position	Gap (mm)	Antenna	Power State	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)
	Bluetooth	1Mbps	Front	0mm	Ant 1	Full Power	39	2441	12.73	14.00	1.34	77.16	1.08	0.17	0.001	0.002
36	Bluetooth	1Mbps	Back	0mm	Ant 1	Full Power	39	2441	12.73	14.00	1.34	77.16	1.08	0.01	0.161	0.233
	Bluetooth	1Mbps	Left Side	0mm	Ant 1	Full Power	39	2441	12.73	14.00	1.34	77.16	1.08	0.17	0.080	0.116
	Bluetooth	1Mbps	Top Side	0mm	Ant 1	Full Power	39	2441	12.73	14.00	1.34	77.16	1.08	0.16	0.001	0.002

14.3 Repeated SAR Measurement

【Repeat SAR 1g - FCC】

No.	Band	Mode	Test Position	Gap (mm)	Antenna	Power State	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)	Ratio
1st	WCDMA V	RMC 12.2Kbps	Back	5.0	Ant 0	Full Power	4182	836.4	23.87	24.00	1.03			0.13	0.908	0.935	-
2nd	WCDMA V	RMC 12.2Kbps	Back	5.0	Ant 0	Full Power	4182	836.4	23.87	24.00	1.03			0.03	0.901	0.928	1.01
1st	WCDMA IV	RMC 12.2Kbps	Back	5.0	Ant 0	Full Power	1312	1712.4	21.71	22.00	1.069			0.03	0.999	1.068	-
2nd	WCDMA IV	RMC 12.2Kbps	Back	5.0	Ant 0	Full Power	1312	1712.4	21.71	22.00	1.069			-0.05	0.983	1.051	1.02
1st	LTE Band 25	20M_QPSK_1_0	Back	5.0	Ant 0	Full Power	26340	1880	22.36	23.00	1.159			0.13	0.970	1.124	-
2nd	LTE Band 25	20M_QPSK_1_0	Back	5.0	Ant 0	Full Power	26340	1880	22.36	23.00	1.159			0.06	0.959	1.111	1.01
1st	LTE Band 7	20M_QPSK_1_0	Back	5.0	Ant 0	Full Power	21350	2560	16.28	17.00	1.18			0.03	1.010	1.192	-
2nd	LTE Band 7	20M_QPSK_1_0	Back	5.0	Ant 0	Full Power	21350	2560	16.28	17.00	1.18			0.01	0.994	1.173	1.02

General Note:

1. Per KDB 865664 D01v01r04, for each frequency band, repeated SAR measurement is required only when the measured SAR is ≥ 0.8 W/kg.
2. The ratio is the difference in percentage between original and repeated *measured SAR*.
3. 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) $SPLSR = (SAR1 + SAR2)^{1.5} / (\text{min. separation distance, mm})$, 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 $SPLSR \leq 0.04$ for 1g SAR and $SPLSR \leq 0.10$ 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.
 - v) The SPLSR calculated results please refer to section 15.3.
 - vi) The SPLSR hotspot combination procedure (Hybrid SPLSR) allows for the aggregate SAR distribution of a collocated antenna pair—either obtained from a small enlarged zoom scan or through the algebraic summation of SAR values. This approach may also be considered for simultaneous transmission analysis. A small enlarged zoom scan was performed in section 15.4 for those with SPLSR exceeding 0.04 for 1g SAR, and that SAR was used for Simultaneous transmission analysis.
9. The simultaneous transmission analysis was conducted in the following two steps:
 - i. Step1: If $SPLSR \leq 0.04$ for 1g SAR and $SPLSR \leq 0.10$ for 10g SAR, simultaneous transmission SAR measurement is not required. If $SPLSR > 0.04$ for 1g SAR and $SPLSR > 0.10$ for 10g SAR, proceed to Step 2;
 - ii. Step 2: If $SPLSR > 0.04$ for 1g SAR and $SPLSR > 0.10$ for 10g SAR, select the WWAN bands and WLAN Band to perform a small enlarged zoom scan and to ensure that the 1g scalar SAR summation is less than 1.6 W/kg and the 10g scalar SAR summation is less than 4.0 W/kg.

15.1 Body-Worn Exposure Conditions

WWAN1		Exposure Position	1	2	3	4	1+2 Summed 1g SAR (W/kg)	1+3 Summed 1g SAR (W/kg)	1+4 Summed 1g SAR (W/kg)	Note
			WWAN1	2.4GHz WLAN Ant 1	5GHz WLAN Ant 1	Bluetooth Ant 1				
			1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)				
WCDMA II	Ant 0	Front	0.153	0.079	0.069	0.001	0.23	0.22	0.15	
		Back	1.033	0.454	1.080	0.138	1.49	2.11	1.17	1
WCDMA IV	Ant 0	Front	0.161	0.079	0.069	0.001	0.24	0.23	0.16	
		Back	1.068	0.454	1.080	0.138	1.52	2.15	1.21	2
WCDMA V	Ant 0	Front	0.503	0.079	0.069	0.001	0.58	0.57	0.50	
		Back	0.935	0.454	1.080	0.138	1.39	2.02	1.07	3
LTE Band 7	Ant 0	Front	0.082	0.079	0.069	0.001	0.16	0.15	0.08	
		Back	1.192	0.454	1.080	0.138	1.65	2.27	1.33	4/5
LTE Band 12	Ant 0	Front	0.107	0.079	0.069	0.001	0.19	0.18	0.11	
		Back	0.766	0.454	1.080	0.138	1.22	1.85	0.90	6
LTE Band 13	Ant 0	Front	0.389	0.079	0.069	0.001	0.47	0.46	0.39	
		Back	0.887	0.454	1.080	0.138	1.34	1.97	1.03	7
LTE Band 14	Ant 0	Front	0.393	0.079	0.069	0.001	0.47	0.46	0.39	
		Back	0.898	0.454	1.080	0.138	1.35	1.98	1.04	8
LTE Band 25	Ant 0	Front	0.151	0.079	0.069	0.001	0.23	0.22	0.15	
		Back	1.124	0.454	1.080	0.138	1.58	2.20	1.26	9
LTE Band 26_FCC	Ant 0	Front	0.526	0.079	0.069	0.001	0.61	0.60	0.53	
		Back	0.996	0.454	1.080	0.138	1.45	2.08	1.13	10
LTE Band 66	Ant 0	Front	0.145	0.079	0.069	0.001	0.22	0.21	0.15	
		Back	1.067	0.454	1.080	0.138	1.52	2.15	1.21	11
LTE Band 71	Ant 0	Front	0.113	0.079	0.069	0.001	0.19	0.18	0.11	
		Back	0.741	0.454	1.080	0.138	1.20	1.82	0.88	12
LTE Band 41	Ant 0	Front	0.036	0.079	0.069	0.001	0.12	0.11	0.04	
		Back	1.101	0.454	1.080	0.138	1.56	2.18	1.24	13

15.2 Extremity Exposure Conditions

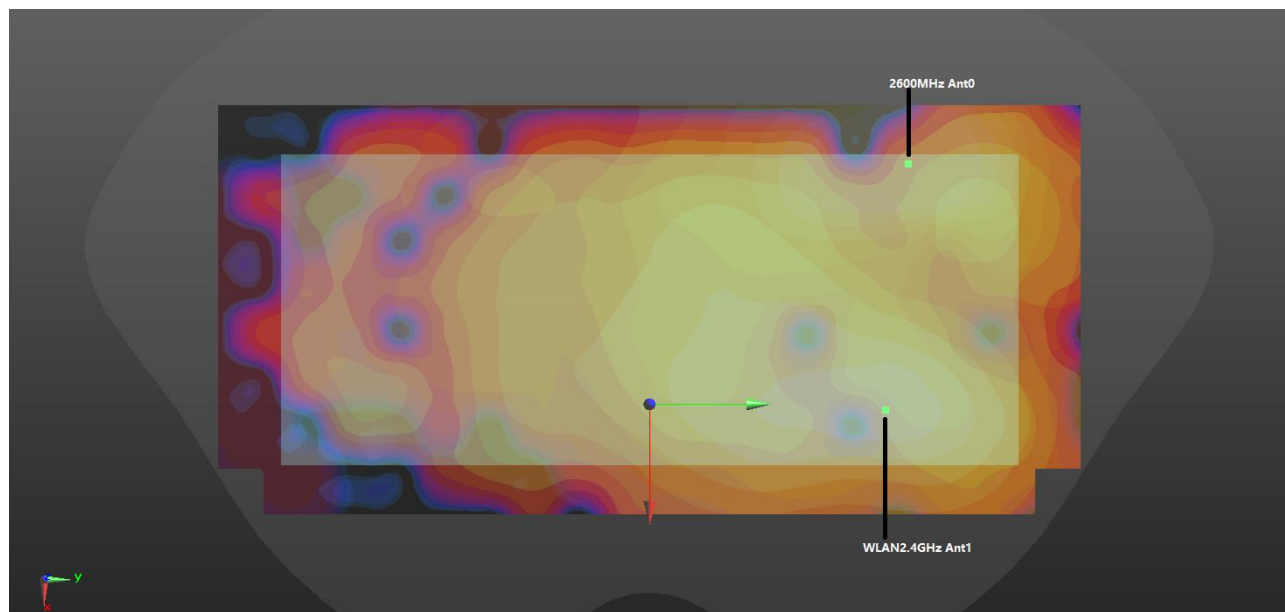
WWAN1		Exposure Position	1	2	3	4	5	1+2+5 Summed 10g SAR (W/kg)	1+3+5 Summed 10g SAR (W/kg)	1+4+5 Summed 10g SAR (W/kg)
			WWAN1	2.4GHz WLAN Ant 1	5GHz WLAN Ant 1	Bluetooth Ant 1	NFC			
			10g SAR (W/kg)	10g SAR (W/kg)	10g SAR (W/kg)	10g SAR (W/kg)	10g SAR (W/kg)			
All	Ant 0	Front	0.689	0.070	0.049	0.002	0.113	0.87	0.85	0.80
		Back	1.138	0.762	0.843	0.233	0.052	1.95	2.03	1.42
		Left Side		0.292	0.165	0.116	0.044	0.34	0.21	0.16
		Right Side	1.205				0.034	1.24	1.24	1.24
		Top Side	0.659	0.001	0.130	0.002	0.045	0.71	0.83	0.71
		Bottom Side					0.001	0.00	0.00	0.00

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

15.3 SPLSR Evaluation and Analysis

General Note:

1. When standalone SAR is measured for both antennas in the pair, the peak location separation distance is computed by the square root of $[(x_1-x_2)^2 + (y_1-y_2)^2 + (z_1-z_2)^2]$, where (x_1, y_1, z_1) and (x_2, y_2, z_2) are the coordinates in the area scans or extrapolated peak SAR locations in the zoom scans, as appropriate.
2. $SPLSR = (SAR_1 + SAR_2)1.5 / (\text{min. separation distance, mm})$. If $SPLSR \leq 0.04$ for 1g SAR, simultaneously transmission SAR measurement is not necessary.
3. The detail hotspot point for each transmitter in each exposure condition are showing as below figure and the minimum 3D distance for each sum combination is used for SPLSR analysis.
4. The small enlarged zoom scan was performed in section 15.4 for those with SPLSR exceeding 0.04 for 1g SAR.



Body-worn WWAN+2.4GHz+BT Back 5mm

<Body-worn>

No.1	Position	SAR 1g SAR (W/kg)	Summed	Gap	SAR peak location (mm)			3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR	Volume Scan Case No.
Band					X	Y	Z					
WCDMA II_Ant0	Back	1.033	2.11	5mm	-32.9	81.6	-1.72	53.9	2.11	0.06	Required	1
WLAN5GHz_Ant1		1.080		5mm	20.4	73.8	-1.31					
No.2	Position	SAR 1g SAR (W/kg)	Summed	Gap	SAR peak location (mm)			3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR	Volume Scan Case No.
Band					X	Y	Z					
WCDMA IV_Ant0	Back	1.068	2.15	5mm	-37.4	74.1	-1.73	57.8	2.15	0.05	Required	2
WLAN5GHz_Ant1		1.080		5mm	20.4	73.8	-1.31					
No.3	Position	SAR 1g SAR (W/kg)	Summed	Gap	SAR peak location (mm)			3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR	Volume Scan Case No.
Band					X	Y	Z					
WCDMA V_Ant0	Back	0.935	2.02	5mm	-29.9	65	-1.78	51.1	2.02	0.06	Required	3
WLAN5GHz_Ant1		1.080		5mm	20.4	73.8	-1.31					
No.4	Position	SAR 1g SAR (W/kg)	Summed	Gap	SAR peak location (mm)			3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR	
Band					X	Y	Z					
LTE Band 7_Ant0	Back	1.192	1.65	5mm	-41.4	68.4	-1.73	66.8	1.65	0.03	Not required	
WLAN2.4GHz_Ant1		0.454		5mm	25.4	69.4	-1.4					
No.5	Position	SAR 1g SAR (W/kg)	Summed	Gap	SAR peak location (mm)			3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR	Volume Scan Case No.
Band					X	Y	Z					
LTE Band 7_Ant0	Back	1.192	2.27	5mm	-41.4	68.4	-1.73	62.0	2.27	0.06	Required	5



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WLAN5GHz_Ant1		1.080		5mm	20.4	73.8	-1.31					
No.6	Position	SAR 1g SAR (W/kg)	Summed	Gap	SAR peak location (mm)			3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR	Volume Scan Case No.
Band					X	Y	Z					
LTE Band 12	Back	0.766	1.85	5mm	-34.6	65.6	-1.71	55.6	1.85	0.05	Required	6
WLAN5GHz_Ant1		1.080		5mm	20.4	73.8	-1.31					
No.7	Position	SAR 1g SAR (W/kg)	Summed	Gap	SAR peak location (mm)			3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR	Volume Scan Case No.
Band					X	Y	Z					
LTE Band 13	Back	0.887	1.97	5mm	-33	62.4	-1.73	54.6	1.97	0.05	Required	7
WLAN5GHz_Ant1		1.080		5mm	20.4	73.8	-1.31					
No.8	Position	SAR 1g SAR (W/kg)	Summed	Gap	SAR peak location (mm)			3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR	Volume Scan Case No.
Band					X	Y	Z					
LTE Band 14	Back	0.898	1.98	5mm	-33	62.4	-1.74	54.6	1.98	0.05	Required	8
WLAN5GHz_Ant1		1.080		5mm	20.4	73.8	-1.31					
No.9	Position	SAR 1g SAR (W/kg)	Summed	Gap	SAR peak location (mm)			3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR	Volume Scan Case No.
Band					X	Y	Z					
LTE Band 25	Back	1.124	2.20	5mm	-31.2	74.8	-1.91	51.6	2.20	0.06	Required	9
WLAN5GHz_Ant1		1.080		5mm	20.4	73.8	-1.31					
No.10	Position	SAR 1g SAR (W/kg)	Summed	Gap	SAR peak location (mm)			3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR	Volume Scan Case No.
Band					X	Y	Z					
LTE Band 26	Back	0.996	2.08	5mm	-31.4	66.1	-1.82	52.4	2.08	0.06	Required	10
WLAN5GHz_Ant1		1.080		5mm	20.4	73.8	-1.31					
No.11	Position	SAR 1g SAR (W/kg)	Summed	Gap	SAR peak location (mm)			3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR	Volume Scan Case No.
Band					X	Y	Z					
LTE Band 66	Back	1.067	2.15	5mm	-37.4	70.8	-1.79	57.9	2.15	0.05	Required	11
WLAN5GHz_Ant1		1.080		5mm	20.4	73.8	-1.31					
No.12	Position	SAR 1g SAR (W/kg)	Summed	Gap	SAR peak location (mm)			3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR	Volume Scan Case No.
Band					X	Y	Z					
LTE Band 71	Back	0.741	1.82	5mm	-36.1	70.3	-1.73	56.6	1.82	0.04	Required	12
WLAN5GHz_Ant1		1.080		5mm	20.4	73.8	-1.31					
No.13	Position	SAR 1g SAR (W/kg)	Summed	Gap	SAR peak location (mm)			3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR	Volume Scan Case No.
Band					X	Y	Z					
LTE Band 41	Back	1.101	2.18	5mm	-39.4	67.6	-1.76	60.1	2.18	0.05	Required	13
WLAN5GHz_Ant1		1.080		5mm	20.4	73.8	-1.31					

15.4 Volume Scan Test procedure and SAR Results

General Note:

1. When simultaneous transmission SAR measurements are required in different frequency bands not covered by a single probe calibration point then separate tests for each frequency band are performed. The tests are performed using enlarged zoom scans which are processed, by means of superposition, using the DASY5 volume scan postprocessing procedures to determine the 1-g SAR for the aggregate SAR distribution.
2. The following test procedure is based on KDB 865664 D01:
 - a) Other than a larger measurement volume to enclose all antennas and radiating structures of the test device, the measurement requirements of an enlarged zoom scan are the same as those required by a normal zoom scan.
 - b) All simultaneous transmitting antennas and radiating structures must be included in the enlarged zoom scan measurement region projected onto the phantom.
 - c) Grid setting is used finer resolution in all different frequency bands.
 - d) Scan range is capturing enough wide for both SAR distribution.
 - e) Perform enlarged zoom scan (Volume scan) on the co-located antenna pair to determine 1g/10g aggregate SAR.
 - f) The SPLSR hotspot combination procedure (Hybrid SPLSR) allows for the aggregate SAR distribution of a collocated antenna pair—either obtained from a small enlarged zoom scan or through the algebraic summation of SAR values. This approach may also be considered for simultaneous transmission analysis.
3. To extract and process measurements within different frequency bands, the SEMCAD X Post-processor performs the combination and subsequent superposition of these measurement data via DASY5= Combined Multi-TX zoom scan SAR.
4. During multi-TX SAR combination, the SAR scaling factors were input into the SEMCAD X software to account for tune-up tolerance.
5. The detailed small enlarged zoom scan SAR Result Plot is in the appendix B.

Case No	Band	BW (MHz)	Modulation	RB Size	RB offset	Mode	Test Position	Gap (mm)	Antenna	Ch.	Freq. (MHz)	Reported 1g SAR (W/kg)	Summed 1g SAR (W/kg)	Multi-Band Combined 1g SAR (W/kg)
1	WCDMA II					RMC 12.2Kbps	Back	5mm	Ant 0	9400	1880	1.033	2.11	1.17
	WLAN5GHz					802.11n-HT40 MCS0	Back	5mm	Ant 1	151	5755	1.08		
2	WCDMA IV					RMC 12.2Kbps	Back	5mm	Ant 0	1312	1712.4	1.068	2.15	1.12
	WLAN5GHz					802.11n-HT40 MCS0	Back	5mm	Ant 1	151	5755	1.08		
3	WCDMA V					RMC 12.2Kbps	Back	5mm	Ant 0	4182	836.4	0.935	2.02	1.11
	WLAN5GHz					802.11n-HT40 MCS0	Back	5mm	Ant 1	151	5755	1.08		
5	LTE Band 7	20M	QPSK	1	0		Back	5mm	Ant 0	21350	2560	1.192	2.27	1.21
	WLAN5GHz					802.11n-HT40 MCS0	Back	5mm	Ant 1	151	5755	1.08		
6	LTE Band 12	10M	QPSK	1	0		Back	5mm	Ant 0	23095	707.5	0.766	1.85	1.09
	WLAN5GHz					802.11n-HT40 MCS0	Back	5mm	Ant 1	151	5755	1.08		
7	LTE Band 13	10M	QPSK	1	0		Back	5mm	Ant 0	23230	782	0.887	1.97	1.16
	WLAN5GHz					802.11n-HT40 MCS0	Back	5mm	Ant 1	151	5755	1.08		
8	LTE Band 14	10M	QPSK	1	0		Back	5mm	Ant 0	23330	793	0.898	1.98	1.19
	WLAN5GHz					802.11n-HT40 MCS0	Back	5mm	Ant 1	151	5755	1.08		
9	LTE Band 25	20M	QPSK	1	0		Back	5mm	Ant 0	26340	1880	1.124	2.20	1.16
	WLAN5GHz					802.11n-HT40 MCS0	Back	5mm	Ant 1	151	5755	1.08		
10	LTE Band 26	15M	QPSK	1	0		Back	5mm	Ant 0	26865	831.5	0.996	2.08	1.13
	WLAN5GHz					802.11n-HT40 MCS0	Back	5mm	Ant 1	151	5755	1.08		
11	LTE Band 66	20M	QPSK	1	0		Back	5mm	Ant 0	132072	1720	1.067	2.15	1.12
	WLAN5GHz					802.11n-HT40 MCS0	Back	5mm	Ant 1	151	5755	1.08		
12	LTE Band 71	20M	QPSK	1	0		Back	5mm	Ant 0	133297	680.5	0.741	1.82	1.13
	WLAN5GHz					802.11n-HT40 MCS0	Back	5mm	Ant 1	151	5755	1.08		
13	LTE Band 41	20M	QPSK	1	0		Back	5mm	Ant 0	41490	2680	1.101	2.18	1.19
	WLAN5GHz					802.11n-HT40 MCS0	Back	5mm	Ant 1	151	5755	1.08		

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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 $\leq 30\%$, for a confidence interval of $k = 2$. If these conditions are met, extensive SAR measurement uncertainty analysis described in IEEE Std 1528-2013 is not required in SAR reports submitted for equipment approval. For this device, the highest measured 1-g SAR is less 1.5W/kg 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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