

FCC SAR Test Report

APPLICANT : BLU Products, Inc.
EQUIPMENT : Mobile Phone
BRAND NAME : BLU
MODEL NAME : VIVO XL4
FCC ID : YHLBLUVIVOXL4
STANDARD : FCC 47 CFR Part 2 (2.1093)
ANSI/IEEE C95.1-1992
IEEE 1528-2013

We, SPORTON INTERNATIONAL (Shenzhen) INC., would like to declare that the tested sample has been evaluated in accordance with the procedures and had 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 (Shenzhen) INC., the test report shall not be reproduced except in full.



Approved by: Mark Qu / Manager



Sporton International (Shenzhen) Inc.

**1/F, 2/F, Bldg 5, Shiling Industrial Zone, Xinwei Village, Xili, Nanshan, Shenzhen City,
Guangdong Province 518055, China**



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Revision History

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FA883001	Rev. 01	Initial issue of report	Sep. 28, 2018



1. Statement of Compliance

The maximum results of Specific Absorption Rate (SAR) found during testing for **BLU Products, Inc., Mobile Phone, VIVO XL4**, are as follows.

Equipment Class	Frequency Band		Highest SAR Summary			Highest Simultaneous Transmission 1g SAR (W/kg)
			Head (Separation 0mm)	Body-worn (Separation 10mm)	Hotspot (Separation 10mm)	
			1g SAR (W/kg)			
Licensed	GSM	GSM850	0.32	0.34	0.37	1.18
		GSM1900	0.12	0.84	0.84	
	WCDMA	WCDMA V	0.25	0.29	0.32	
		WCDMA IV	0.16	1.03	1.03	
		WCDMA II	0.10	0.72	0.72	
	LTE	Band 12/17	0.08	0.13	0.17	
		Band 13	0.19	0.22	0.22	
		Band 5	0.27	0.26	0.30	
		Band 4	0.17	0.64	0.64	
		Band 66	0.19	0.71	0.72	
		Band 2	0.12	0.78	0.78	
		Band 7	0.73	0.83	0.83	
DTS	WLAN	2.4GHz WLAN	0.66	0.12	0.12	1.15
DSS	2.4GHz Band	Bluetooth	<0.10			1.18
Date of Testing:			2018/8/20 ~ 2018/9/23			
Remark : This device supports both LTE B12 and B17. Since the supported frequency span for LTE B17 falls completely within the supports frequency span for LTE 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 B12.						

This device is in compliance with Specific Absorption Rate (SAR) for general population/uncontrolled exposure limits (1.6 W/kg) specified in FCC 47 CFR part 2 (2.1093) and ANSI/IEEE C95.1-1992, and had been tested in accordance with the measurement methods and procedures specified in IEEE 1528-2013 and FCC KDB publications.



2. Administration Data

Testing Laboratory	
Test Site	Sporton International (Shenzhen) Inc.
Test Site Location	1/F, 2/F, Bldg 5, Shiling Industrial Zone, Xinwei Village, Xili, Nanshan Shenzhen City Guangdong Province 518055 China TEL: +86-755-8637-9589 FAX: +86-755-8637-9595

Applicant	
Company Name	BLU Products, Inc.
Address	10814 NW 33rd St # 100 Doral, FL 33172, USA

Manufacturer	
Company Name	BLU Products, Inc.
Address	10814 NW 33rd St # 100 Doral, FL 33172, 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 648474 D04 SAR Evaluation Considerations for Wireless Handsets v01r03
- 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
- FCC KDB 941225 D05A Rel.10 LTE SAR Test Guidance v01r02
- FCC KDB 941225 D06 Hotspot Mode SAR v02r01



4. Equipment Under Test (EUT) Information

4.1 General Information

Product Feature & Specification	
Equipment Name	Mobile Phone
Brand Name	BLU
Model Name	VIVO XL4
FCC ID	YHLBLUVIVOXL4
IMEI Code	SIM1: 354147042319286 SIM2: 354147042369281
Wireless Technology and Frequency Range	GSM850: 824.2 MHz ~ 848.8 MHz GSM1900: 1850.2 MHz ~ 1909.8 MHz WCDMA Band II: 1852.4 MHz ~ 1907.6 MHz WCDMA Band IV: 1712.4 MHz ~ 1752.6 MHz WCDMA Band V: 826.4 MHz ~ 846.6 MHz LTE Band 2: 1850.7 MHz ~ 1909.3 MHz LTE Band 4: 1710.7 MHz ~ 1754.3 MHz LTE Band 5: 824.7 MHz ~ 848.3 MHz LTE Band 7: 2502.5 MHz ~ 2567.5 MHz LTE Band 12: 699.7 MHz ~ 715.3 MHz LTE Band 13: 779.5 MHz ~ 784.5 MHz LTE Band 17: 706.5 MHz ~ 713.5 MHz LTE Band 66 : 1710.7 MHz ~ 1779.3 MHz WLAN 2.4GHz Band: 2412 MHz ~ 2462 MHz Bluetooth: 2402 MHz ~ 2480 MHz
Mode	GSM/GPRS/EGPRS RMC/AMR 12.2Kbps HSDPA HSUPA DC-HSDPA HSPA+ LTE: QPSK, 16QAM, 64QAM WLAN 2.4GHz : 802.11b/g/n HT20/HT40 Bluetooth BR/EDR/LE
HW Version	Vivo XL4_Mainboard_P4
SW Version	Vivo XL4_2403
GSM / (E)GPRS Transfer mode	Class B – EUT cannot support Packet Switched and Circuit Switched Network simultaneously but can automatically switch between Packet and Circuit Switched Network.
EUT Stage	Identical Prototype
Remark:	
<ol style="list-style-type: none"> This device WLAN 2.4GHz supports Hotspot operation. This device supported VoIP in GPRS, EGPRS, WCDMA, LTE (e.g. 3rd party VoIP) and VOLTE. This device does not support DTM operation and support GRPS/EGRPS mode up to multi-slot class 12. 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). After pre-scan two SIM cards power, we found test result of the SIM1 was the worse, so we chose SIM1 slot to perform all tests. This device has two WWAN antennas. WWAN antenna 1 is located at the right side of bottom Side of the device, WWAN antenna 2 is located at the left Side of bottom side of the device which can refer to antenna location chapter. WWAN antenna 1 frequency bands include LTE B7, and WWAN antenna 2 frequency bands include GSM850 / 1900, WCDMA Band II / IV/ V and LTE B2 / B4 / B5 / B12 / B13 / B17 / B66. They can't transmit simultaneously. 	



4.2 General LTE SAR Test and Reporting Considerations

Summarized necessary items addressed in KDB 941225 D05 v02r05																																																															
FCC ID	YHLBLUVIVOXL4																																																														
Equipment Name	Mobile Phone																																																														
Operating Frequency Range of each LTE transmission band	LTE Band 2: 1850.7 MHz ~ 1909.3 MHz LTE Band 4: 1710.7 MHz ~ 1754.3 MHz LTE Band 5: 824.7 MHz ~ 848.3 MHz LTE Band 7: 2502.5 MHz ~ 2567.5 MHz LTE Band 12: 699.7 MHz ~ 715.3 MHz LTE Band 13: 779.5 MHz ~ 784.5 MHz LTE Band 17: 706.5 MHz ~ 713.5 MHz LTE Band 66 : 1710.7 MHz ~ 1779.3 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 17: 5MHz, 10MHz LTE Band 66: 1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz, 20MHz																																																														
uplink modulations used	QPSK / 16QAM / 64QAM																																																														
LTE Voice / Data requirements	Voice and Data																																																														
LTE Release Version	R10, Cat7																																																														
CA Support	Yes, Downlink only																																																														
LTE MPR permanently built-in by design	<p>Table 6.2.3-1: Maximum Power Reduction (MPR) for Power Class 1, 2 and 3</p> <table border="1"> <thead> <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> </thead> <tbody> <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" style="text-align: center;">≥ 1</td> <td>≤ 5</td> </tr> </tbody> </table>	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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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.																																																														
LTE Carrier Aggregation Combinations	Intra-Band possible combinations and the detail power verification please referred to section 12.																																																														
LTE Carrier Aggregation Additional Information	This device does not support full CA features on 3GPP Release 10. It supports a maximum of 2 carriers in the downlink only. All uplink communications are identical to the Release 8 Specifications. Uplink communications are done on the PCC. Due to carrier capability, only the combinations listed above are supported. The following LTE Release features are not supported: Relay, HetNet, Enhanced MIMO, eICI, WiFi Offloading, MDH, eMBMA, Cross-Carrier Scheduling, Enhanced SC-FDMA.																																																														



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		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	20407	824.7	20415	825.5	20425	826.5	20450	829	20450	829	20450	829	
M	20525	836.5	20525	836.5	20525	836.5	20525	836.5	20525	836.5	20525	836.5	
H	20643	848.3	20635	847.5	20625	846.5	20600	844	20600	844	20600	844	
LTE Band 7													
	Bandwidth 5 MHz		Bandwidth 10 MHz		Bandwidth 15 MHz		Bandwidth 20 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	20850	2510	20850	2510	
M	21100	2535	21100	2535	21100	2535	21100	2535	21100	2535	21100	2535	
H	21425	2567.5	21400	2565	21375	2562.5	21350	2560	21350	2560	21350	2560	
LTE Band 12													
	Bandwidth 1.4 MHz		Bandwidth 3 MHz		Bandwidth 5 MHz		Bandwidth 10 MHz		Bandwidth 15 MHz		Bandwidth 20 MHz		
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	
L	23017	699.7	23025	700.5	23035	701.5	23060	704	23060	704	23060	704	
M	23095	707.5	23095	707.5	23095	707.5	23095	707.5	23095	707.5	23095	707.5	
H	23173	715.3	23165	714.5	23155	713.5	23130	711	23130	711	23130	711	
LTE Band 13													
	Bandwidth 5 MHz				Bandwidth 10 MHz				Bandwidth 15 MHz				Bandwidth 20 MHz
	Channel #		Freq.(MHz)		Channel #		Freq.(MHz)		Channel #		Freq.(MHz)		Channel #
L	23205		779.5		23230		782		23255		784.5		23230
M	23230		782		23230		782		23255		784.5		23230
H	23255		784.5		23230		782		23255		784.5		23230
LTE Band 17													
	Bandwidth 5 MHz				Bandwidth 10 MHz				Bandwidth 15 MHz				Bandwidth 20 MHz
	Channel #		Freq.(MHz)		Channel #		Freq.(MHz)		Channel #		Freq.(MHz)		Channel #
L	23755		706.5		23780		709		23790		710		23790
M	23790		710		23790		710		23790		710		23790
H	23825		713.5		23800		711		23800		711		23800
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	

5. RF Exposure Limits

5.1 Uncontrolled Environment

Uncontrolled Environments are defined as locations where there is the exposure of individuals who have no knowledge or control of their exposure. The general population/uncontrolled exposure limits are applicable to situations in which the general public may be exposed or in which persons who are exposed as a consequence of their employment may not be made fully aware of the potential for exposure or cannot exercise control over their exposure. Members of the general public would come under this category when exposure is not employment-related; for example, in the case of a wireless transmitter that exposes persons in its vicinity.

5.2 Controlled Environment

Controlled Environments are defined as locations where there is exposure that may be incurred by persons who are aware of the potential for exposure, (i.e. as a result of employment or occupation). In general, occupational/controlled exposure limits are applicable to situations in which persons are exposed as a consequence of their employment, who have been made fully aware of the potential for exposure and can exercise control over their exposure. The exposure category is also applicable when the exposure is of a transient nature due to incidental passage through a location where the exposure levels may be higher than the general population/uncontrolled limits, but the exposed person is fully aware of the potential for exposure and can exercise control over his or her exposure by leaving the area or by some other appropriate means.

Limits for Occupational/Controlled Exposure (W/kg)

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

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

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

1. Whole-Body SAR is averaged over the entire body, partial-body SAR is averaged over any 1gram of tissue defined as a tissue volume in the shape of a cube. SAR for hands, wrists, feet and ankles is averaged over any 10 grams of tissue defined as a tissue volume in the shape of a cube.

6. Specific Absorption Rate (SAR)

6.1 Introduction

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

6.2 SAR Definition

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

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

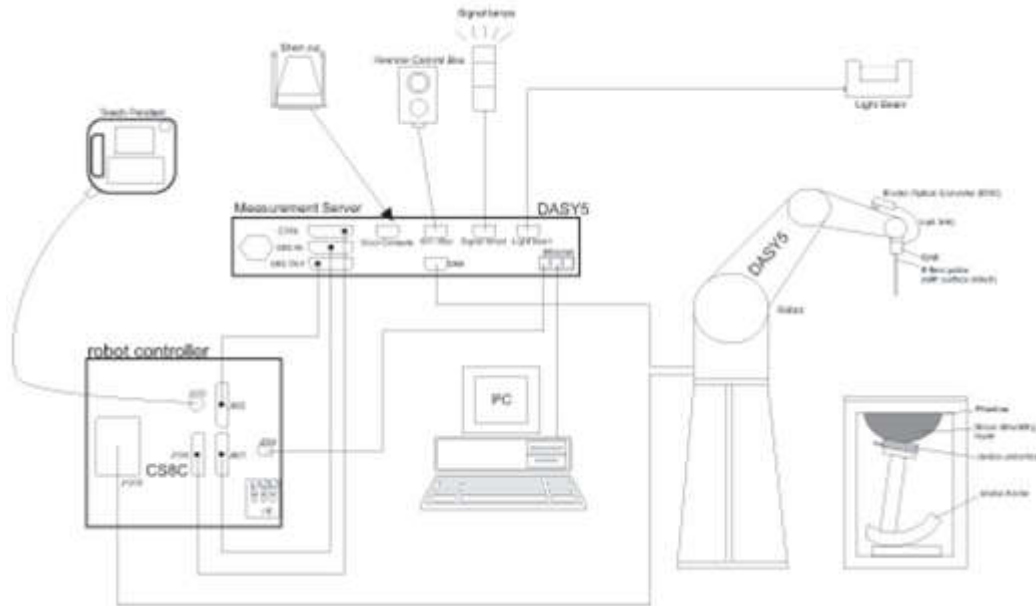
SAR is expressed in units of Watts per kilogram (W/kg)

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

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

7. System Description and Setup

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




- 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	10 MHz – >6 GHz Linearity: ±0.2 dB (30 MHz – 6 GHz)	
Directivity	±0.3 dB in TSL (rotation around probe axis) ±0.5 dB in TSL (rotation normal to probe axis)	
Dynamic Range	10 µW/g – >100 mW/g Linearity: ±0.2 dB (noise: typically <1 µW/g)	
Dimensions	Overall length: 337 mm (tip: 20 mm) Tip diameter: 2.5 mm (body: 12 mm) Typical distance from probe tip to dipole centers: 1 mm	

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.



Fig 5.1 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 in the frequency range of 30 MHz to 6 GHz. ELI4 is fully compatible with standard and all known tissue simulating liquids.

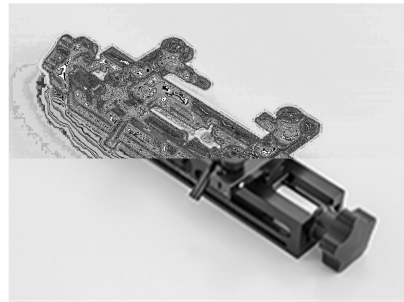
7.4 Device Holder

<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° ± 1°	20° ± 1°
Maximum area scan spatial resolution: $\Delta x_{Area}, \Delta y_{Area}$	≤ 2 GHz: ≤ 15 mm 2 – 3 GHz: ≤ 12 mm	3 – 4 GHz: ≤ 12 mm 4 – 6 GHz: ≤ 10 mm
	When the x or y dimension of the test device, in the measurement plane orientation, is smaller than the above, the measurement resolution must be ≤ the corresponding x or y dimension of the test device with at least one measurement point on the test device.	

8.4 Zoom Scan

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

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

		≤ 3 GHz	> 3 GHz	
Maximum zoom scan spatial resolution: $\Delta x_{Zoom}, \Delta y_{Zoom}$		≤ 2 GHz: ≤ 8 mm 2 – 3 GHz: ≤ 5 mm*	3 – 4 GHz: ≤ 5 mm* 4 – 6 GHz: ≤ 4 mm*	
Maximum zoom scan spatial resolution, normal to phantom surface	uniform grid: $\Delta z_{Zoom}(n)$	≤ 5 mm	3 – 4 GHz: ≤ 4 mm 4 – 5 GHz: ≤ 3 mm 5 – 6 GHz: ≤ 2 mm	
	graded grid	$\Delta z_{Zoom}(1)$: between 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
		$\Delta z_{Zoom}(n>1)$: between subsequent points	$\leq 1.5 \cdot \Delta z_{Zoom}(n-1)$	
Minimum zoom scan volume	x, y, z	≥ 30 mm	3 – 4 GHz: ≥ 28 mm 4 – 5 GHz: ≥ 25 mm 5 – 6 GHz: ≥ 22 mm	
Note: δ is the penetration depth of a plane-wave at normal incidence to the tissue medium; see draft standard IEEE P1528-2011 for details. * When zoom scan is required and the <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 for assess overlapping SAR distributions for antennas transmitting in different frequency bands. It is equivalent to an oversized zoom scan used in standalone measurements. The measurement volume will be used to enclose all the simultaneous transmitting antennas. For antennas transmitting simultaneously in different frequency bands, the volume scan is measured separately in each frequency band. In order to sum correctly to compute the 1g aggregate SAR, the EUT remain in the same test position for all measurements and all volume scan use the same spatial resolution and grid spacing. When all volume scan were completed, the software, SEMCAD postprocessor can combine and subsequently superpose these measurement data to calculating the multiband SAR.

8.6 Power Drift Monitoring

All SAR testing is under the EUT install full charged battery and transmit maximum output power. In DASy measurement software, the power reference measurement and power drift measurement procedures are used for monitoring the power drift of EUT during SAR test. Both these procedures measure the field at a specified reference position before and after the SAR testing. The software will calculate the field difference in dB. If the power drifts more than 5%, the SAR will be retested.



9. Test Equipment List

Manufacturer	Name of Equipment	Type/Model	Serial Number	Calibration	
				Last Cal.	Due Date
SPEAG	750MHz System Validation Kit	D750V3	1099	Dec. 04, 2017	Dec. 03, 2018
SPEAG	835MHz System Validation Kit	D835V2	4d162	Dec. 05, 2017	Dec. 04, 2018
SPEAG	1750MHz System Validation Kit	D1750V2	1137	Jul. 30, 2018	Jul. 29, 2019
SPEAG	1900MHz System Validation Kit	D1900V2	5d182	Dec. 06, 2017	Dec. 05, 2018
SPEAG	2450MHz System Validation Kit	D2450V2	924	Mar. 22, 2018	Mar. 21, 2019
SPEAG	2600MHz System Validation Kit	D2600V2	1070	Dec. 07, 2017	Dec. 06, 2018
SPEAG	Data Acquisition Electronics	DAE4	1303	Dec. 19, 2017	Dec. 18, 2018
SPEAG	Dosimetric E-Field Probe	EX3DV4	3958	Jan. 11, 2018	Jan. 10, 2019
SPEAG	SAM Twin Phantom	SAM V5.0	1795	NCR	NCR
SPEAG	Phone Positioner	N/A	N/A	NCR	NCR
Anritsu	Radio communication analyzer	MT8820C	6201300653	Jul. 18, 2018	Jul. 17, 2019
Agilent	Wireless Communication Test Set	E5515C	MY50267224	Sep. 12, 2017	Sep. 11, 2018
Agilent	Network Analyzer	E5071C	MY46523671	Oct. 18, 2017	Oct. 17, 2018
Speag	Dielectric Assessment KIT	DAK-3.5	1071	Nov. 28, 2017	Nov. 27, 2018
Agilent	Signal Generator	N5181A	MY50145381	Dec. 26, 2017	Dec. 25, 2018
Anritsu	Power Sensor	MA2411B	1306099	Jul. 30, 2018	Jul. 29, 2019
Anritsu	Power Meter	ML2495A	1349001	Jul. 26, 2018	Jul. 25, 2019
R&S	CBT BLUETOOTH TESTER	CBT	100963	Dec. 26, 2017	Dec. 25, 2018
R&S	Spectrum Analyzer	FSP7	100818	Jul. 18, 2018	Jul. 17, 2019
LKM electronic	Hygrometer	DTM3000	3241	Aug. 10, 2018	Aug. 09, 2019
Anymetre	Thermo-Hygrometer	JR593	2015030904	Apr. 19, 2018	Apr. 18, 2019
Anymetre	Thermo-Hygrometer	JR593	2015030903	Jan. 01, 2018	Dec. 31, 2018
Anymetre	Thermo-Hygrometer	JR593	2015102801	Jan. 01, 2018	Dec. 31, 2018
ARRA	Power Divider	A3200-2	N/A	Note 1	
PASTERNAK	Dual Directional Coupler	PE2214-10	N/A	Note 1	
Agilent	Dual Directional Coupler	778D	50422	Note 1	
MCL	Attenuation1	BW-S10W5	N/A	Note 1	
Weinschel	Attenuation2	3M-20	N/A	Note 1	
Zhongjilianhe	Attenuation3	MVE2214-03	N/A	Note 1	
mini-circuits	Amplifier	ZHL-42W+	QA1341002	Note 1	
mini-circuits	Amplifier	ZVE-3W-83+	599201528	Note 1	

General Note:

1. Prior to system verification and validation, the path loss from the signal generator to the system check source and the power meter, which includes the amplifier, cable, attenuator and directional coupler, was measured by the network analyzer. The reading of the power meter was offset by the path loss difference between the path to the power meter and the path to the system check source to monitor the actual power level fed to the system check source.

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 head SAR testing, the liquid height from the ear reference point (ERP) of the phantom to the liquid top surface is larger than 15 cm, which is shown in Fig. 10.1. For body SAR testing, the liquid height from the center of the flat phantom to the liquid top surface is larger than 15 cm, which is shown in Fig. 10.2.

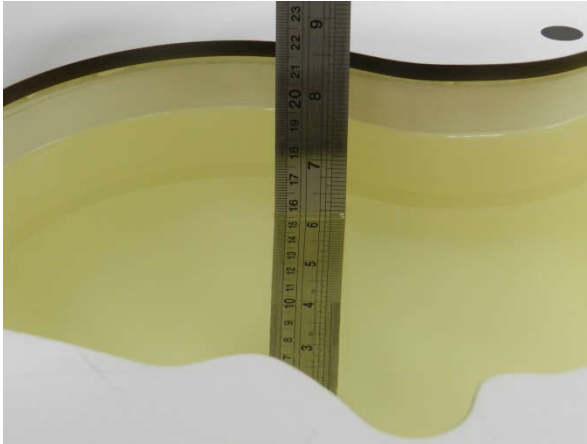


Fig 10.1 Photo of Liquid Height for Head SAR

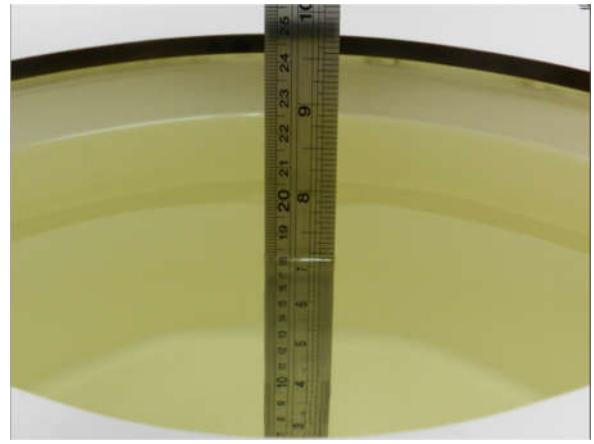


Fig 10.2 Photo of Liquid Height for Body SAR

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
For Body								
750	51.7	47.2	0	0.9	0.1	0	0.96	55.5
835	50.8	48.2	0	0.9	0.1	0	0.97	55.2
1800, 1900, 2000	70.2	0	0	0.4	0	29.4	1.52	53.3
2450	68.6	0	0	0	0	31.4	1.95	52.7
2600	68.1	0	0	0.1	0	31.8	2.16	52.5

<Tissue Dielectric Parameter Check Results>

Frequency (MHz)	Tissue Type	Liquid Temp. (°C)	Conductivity (σ)	Permittivity (ϵ_r)	Conductivity Target (σ)	Permittivity Target (ϵ_r)	Delta (σ) (%)	Delta (ϵ_r) (%)	Limit (%)	Date
750	Head	22.8	0.881	40.783	0.89	41.90	-1.01	-2.67	±5	2018/9/21
835	Head	22.6	0.916	41.029	0.90	41.50	1.78	-1.13	±5	2018/9/21
1750	Head	22.5	1.378	41.340	1.37	40.10	0.58	3.09	±5	2018/9/21
1900	Head	22.8	1.417	40.994	1.40	40.00	1.21	2.49	±5	2018/9/21
2450	Head	22.5	1.857	37.670	1.80	39.20	3.17	-3.90	±5	2018/9/18
2600	Head	22.7	2.053	38.335	1.96	39.00	4.74	-1.71	±5	2018/8/20
750	Body	22.7	0.970	54.646	0.96	55.50	1.04	-1.54	±5	2018/9/23
835	Body	22.6	0.998	54.379	0.97	55.20	2.89	-1.49	±5	2018/9/23
1750	Body	22.5	1.527	52.035	1.49	53.40	2.48	-2.56	±5	2018/9/21
1900	Body	22.6	1.535	54.579	1.52	53.30	0.99	2.40	±5	2018/9/22
2450	Body	22.4	1.977	51.617	1.95	52.70	1.38	-2.06	±5	2018/9/19
2600	Body	22.8	2.165	53.823	2.16	52.50	0.23	2.52	±5	2018/9/23

10.3 System Performance Check Results

Comparing to the original SAR value provided by SPEAG, the verification data should be within its specification of 10 %. Below table shows the target SAR and measured SAR after normalized to 1W input power. The table below indicates the system performance check can meet the variation criterion and the plots can be referred to Appendix A of this report.

Date	Frequency (MHz)	Tissue Type	Input Power (mW)	Dipole S/N	Probe S/N	DAE S/N	Measured 1g SAR (W/kg)	Targeted 1g SAR (W/kg)	Normalized 1g SAR (W/kg)	Deviation (%)
2018/9/21	750	Head	250	1099	3958	1303	2.16	8.33	8.64	3.72
2018/9/21	835	Head	250	4d162	3958	1303	2.44	9.56	9.76	2.09
2018/9/21	1750	Head	250	1137	3958	1303	8.77	36.50	35.08	-3.89
2018/9/21	1900	Head	250	5d182	3958	1303	9.62	40.10	38.48	-4.04
2018/9/18	2450	Head	250	924	3958	1303	12.20	51.80	48.8	-5.79
2018/8/20	2600	Head	250	1070	3958	1303	14.70	58.20	58.8	1.03
2018/9/23	750	Body	250	1099	3958	1303	2.20	8.64	8.8	1.85
2018/9/23	835	Body	250	4d162	3958	1303	2.46	9.56	9.84	2.93
2018/9/21	1750	Body	250	1137	3958	1303	9.27	37.00	37.08	0.22
2018/9/22	1900	Body	250	5d182	3958	1303	9.89	40.40	39.56	-2.08
2018/9/19	2450	Body	250	924	3958	1303	12.80	50.70	51.2	0.99
2018/9/23	2600	Body	250	1070	3958	1303	14.00	55.20	56	1.45

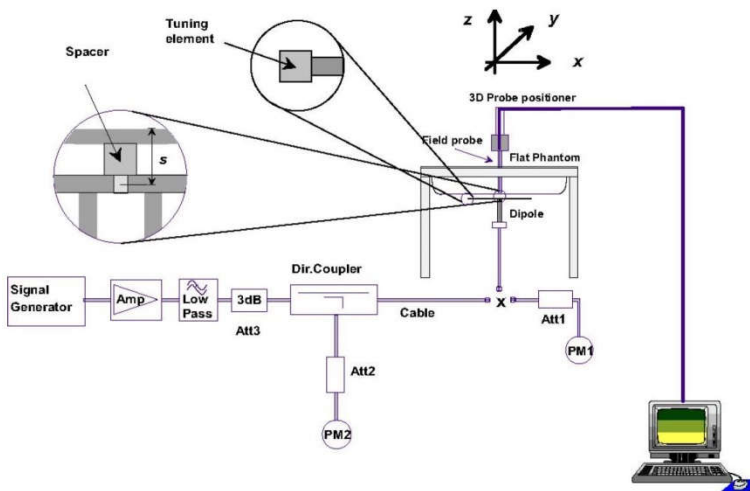


Fig 8.3.1 System Performance Check Setup



Fig 8.3.2 Setup Photo

11. RF Exposure Positions

11.1 Ear and handset reference point

Figure 9.1.1 shows the front, back, and side views of the SAM phantom. The center-of-mouth reference point is labeled “M,” the left ear reference point (ERP) is marked “LE,” and the right ERP is marked “RE.” Each ERP is 15 mm along the B-M (back-mouth) line behind the entrance-to-ear-canal (EEC) point, as shown in Figure 9.1.2 The Reference Plane is defined as passing through the two ear reference points and point M. The line N-F (neck-front), also called the reference pivoting line, is normal to the Reference Plane and perpendicular to both a line passing through RE and LE and the B-M line (see Figure 9.1.3). Both N-F and B-M lines should be marked on the exterior of the phantom shell to facilitate handset positioning. Posterior to the N-F line the ear shape is a flat surface with 6 mm thickness at each ERP, and forward of the N-F line the ear is truncated, as illustrated in Figure 9.1.2. The ear truncation is introduced to preclude the ear lobe from interfering with handset tilt, which could lead to unstable positioning at the cheek.

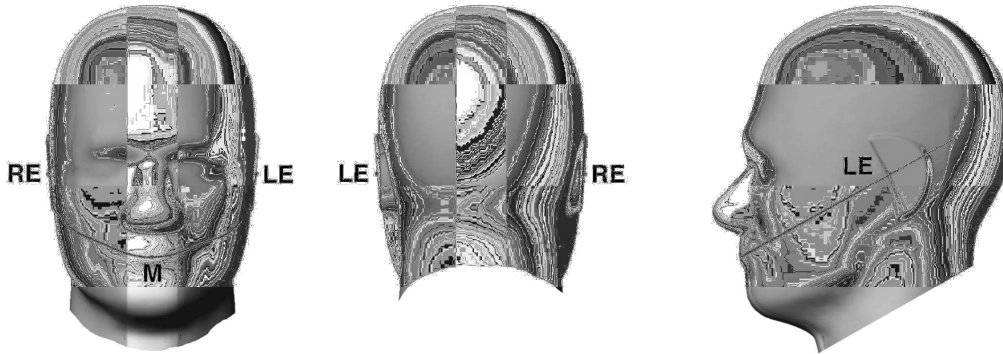


Fig 9.1.1 Front, back, and side views of SAM twin phantom

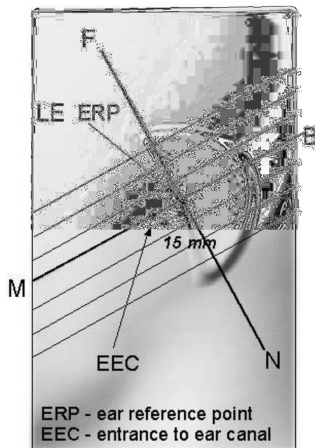


Fig 9.1.2 Close-up side view of phantom showing the ear region.

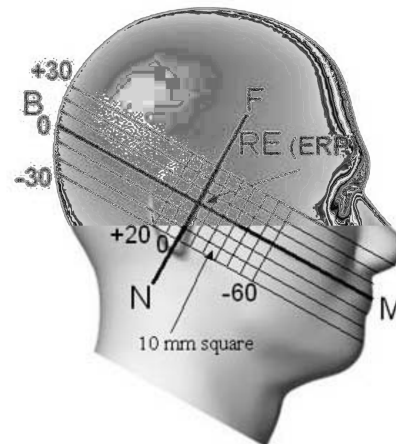


Fig 9.1.3 Side view of the phantom showing relevant markings and seven cross-sectional plane locations

11.2 Definition of the cheek position

1. Ready the handset for talk operation, if necessary. For example, for handsets with a cover piece (flip cover), open the cover. If the handset can transmit with the cover closed, both configurations must be tested.
2. Define two imaginary lines on the handset—the vertical centerline and the horizontal line. The vertical centerline passes through two points on the front side of the handset—the midpoint of the width w_t of the handset at the level of the acoustic output (point A in Figure 9.2.1 and Figure 9.2.2), and the midpoint of the width w_b of the bottom of the handset (point B). The horizontal line is perpendicular to the vertical centerline and passes through the center of the acoustic output (see Figure 9.2.1). The two lines intersect at point A. Note that for many handsets, point A coincides with the center of the acoustic output; however, the acoustic output may be located elsewhere on the horizontal line. Also note that the vertical centerline is not necessarily parallel to the front face of the handset (see Figure 9.2.2), especially for clamshell handsets, handsets with flip covers, and other irregularly-shaped handsets.
3. Position the handset close to the surface of the phantom such that point A is on the (virtual) extension of the line passing through points RE and LE on the phantom (see Figure 9.2.3), such that the plane defined by the vertical centerline and the horizontal line of the handset is approximately parallel to the sagittal plane of the phantom.
4. Translate the handset towards the phantom along the line passing through RE and LE until handset point A touches the pinna at the ERP.
5. While maintaining the handset in this plane, rotate it around the LE-RE line until the vertical centerline is in the plane normal to the plane containing B-M and N-F lines, i.e., the Reference Plane.
6. Rotate the handset around the vertical centerline until the handset (horizontal line) is parallel to the N-F line.
7. While maintaining the vertical centerline in the Reference Plane, keeping point A on the line passing through RE and LE, and maintaining the handset contact with the pinna, rotate the handset about the N-F line until any point on the handset is in contact with a phantom point below the pinna on the cheek. See Figure 9.2.3. The actual rotation angles should be documented in the test report.

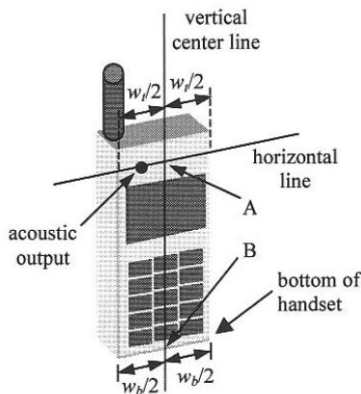


Fig 9.2.1 Handset vertical and horizontal reference lines—"fixed case"

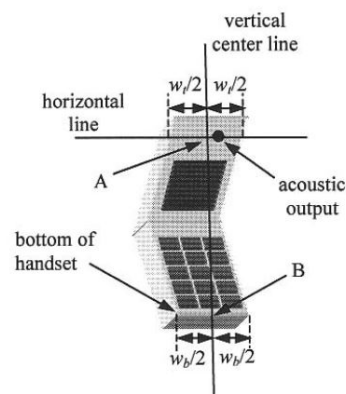


Fig 9.2.2 Handset vertical and horizontal reference lines—"clam-shell case"

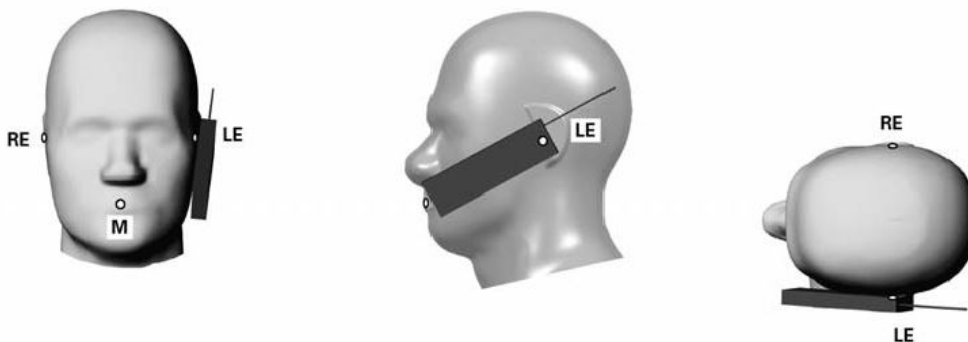


Fig 9.2.3 cheek or touch position. The reference points for the right ear (RE), left ear (LE), and mouth (M), which establish the Reference Plane for handset positioning, are indicated.

11.3 Definition of the tilt position

1. Ready the handset for talk operation, if necessary. For example, for handsets with a cover piece (flip cover), open the cover. If the handset can transmit with the cover closed, both configurations must be tested.
2. While maintaining the orientation of the handset, move the handset away from the pinna along the line passing through RE and LE far enough to allow a rotation of the handset away from the cheek by 15°.
3. Rotate the handset around the horizontal line by 15°.
4. While maintaining the orientation of the handset, move the handset towards the phantom on the line passing through RE and LE until any part of the handset touches the ear. The tilt position is obtained when the contact point is on the pinna. See Figure 9.3.1. If contact occurs at any location other than the pinna, e.g., the antenna at the back of the phantom head, the angle of the handset should be reduced. In this case, the tilt position is obtained if any point on the handset is in contact with the pinna and a second point

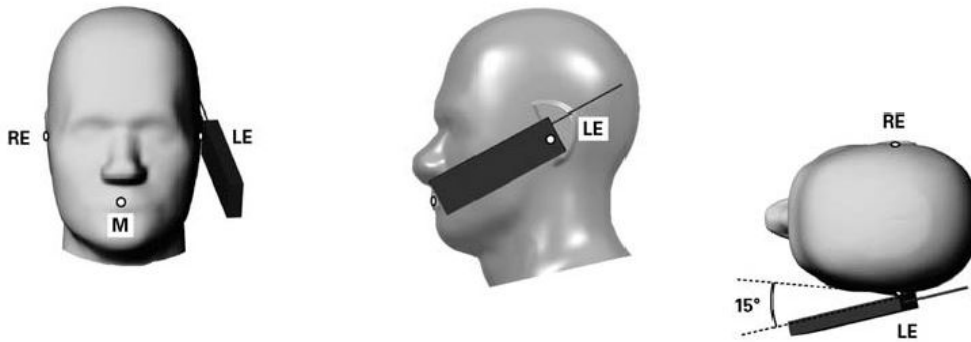


Fig 9.3.1 Tilt position. The reference points for the right ear (RE), left ear (LE), and mouth (M), which define the Reference Plane for handset positioning, are indicated.

11.4 Body Worn Accessory

Body-worn operating configurations are tested with the belt-clips and holsters attached to the device and positioned against a flat phantom in a normal use configuration (see Figure 9.4). Per KDB648474 D04v01r03, body-worn accessory exposure is typically related to voice mode operations when handsets are carried in body-worn accessories. The body-worn accessory procedures in FCC KDB 447498 D01v06 should be used to test for body-worn accessory SAR compliance, without a headset connected to it. This enables the test results for such configuration to be compatible with that required for hotspot mode when the body-worn accessory test separation distance is greater than or equal to that required for hotspot mode, when applicable. When the reported SAR for body-worn accessory, measured without a headset connected to the handset is > 1.2 W/kg, the highest reported SAR configuration for that wireless mode and frequency band should be repeated for that body-worn accessory with a headset attached to the handset.

Accessories for body-worn operation configurations are divided into two categories: those that do not contain metallic components and those that do contain metallic components. When multiple accessories that do not contain metallic components are supplied with the device, the device is tested with only the accessory that dictates the closest spacing to the body. Then multiple accessories that contain metallic components are test with the device with each accessory. If multiple accessories share an identical metallic component (i.e. the same metallic belt-chip used with different holsters with no other metallic components) only the accessory that dictates the closest spacing to the body is tested.

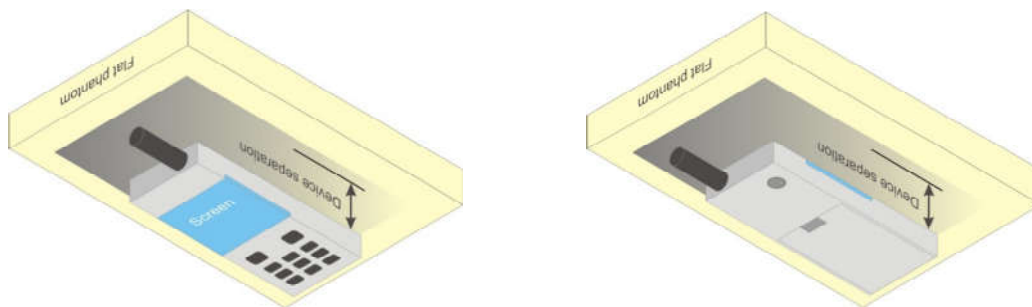


Fig 9.4 Body Worn Position

11.5 Wireless Router

Some battery-operated handsets have the capability to transmit and receive user through simultaneous transmission of WIFI simultaneously with a separate licensed transmitter. The FCC has provided guidance in FCC KDB Publication 941225 D06 v02r01 where SAR test considerations for handsets (L x W ≥ 9 cm x 5 cm) are based on a composite test separation distance of 10mm from the front, back and edges of the device containing transmitting antennas within 2.5cm of their edges, determined from general mixed use conditions for this type of devices. Since the hotspot SAR results may overlap with the body-worn accessory SAR requirements, the more conservative configurations can be considered, thus excluding some body-worn accessory SAR tests.

When the user enables the personal wireless router functions for the handset, actual operations include simultaneous transmission of both the WIFI transmitter and another licensed transmitter. Both transmitters often do not transmit at the same transmitting frequency and thus cannot be evaluated for SAR under actual use conditions due to the limitations of the SAR assessment probes. Therefore, SAR must be evaluated for each frequency transmission and mode separately and spatially summed with the WIFI transmitter according to FCC KDB Publication 447498 D01v06 publication procedures. The "Portable Hotspot" feature on the handset was NOT activated during SAR assessments, to ensure the SAR measurements were evaluated for a single transmission frequency RF signal at a time.



12. Conducted RF Output Power (Unit: dBm)

<GSM Conducted Power>

General Note:

1. Per KDB 447498 D01v06, the maximum output power channel is used for SAR testing and for further SAR test reduction.
2. Per KDB 941225 D01v03r01, for SAR test reduction for GSM / GPRS / EDGE modes is determined by the source-based time-averaged output power including tune-up tolerance. The mode with highest specified time-averaged output power should be tested for SAR compliance in the applicable exposure conditions. For modes with the same specified maximum output power and tolerance, the higher number time-slot configuration should be tested. Therefore, the GPRS (4Tx slots) for GSM850/GSM1900 is considered as the primary mode.
3. Other configurations of GSM / GPRS / EDGE are considered as secondary modes. The 3G SAR test reduction procedure is applied, when the maximum output power and tune-up tolerance specified for production units in a secondary mode is $\leq \frac{1}{4}$ dB higher than the primary mode, SAR measurement is not required for the secondary mode

GSM850 Tx Channel	Burst Average Power (dBm)			Tune-up Limit (dBm)	Frame-Average Power (dBm)			Tune-up Limit (dBm)	
	128	189	251		128	189	251		
Frequency (MHz)	824.2	836.4	848.8		824.2	836.4	848.8		
GSM 1 Tx slot	32.46	32.47	32.41	33.00	23.46	23.47	23.41	24.00	
GPRS 1 Tx slot	32.44	32.44	32.37	33.00	23.44	23.44	23.37	24.00	
GPRS 2 Tx slots	31.64	31.71	31.63	32.00	25.64	25.71	25.63	26.00	
GPRS 3 Tx slots	29.84	29.94	29.87	30.00	25.58	25.68	25.61	25.74	
GPRS 4 Tx slots	28.73	28.81	28.85	29.00	25.73	25.81	25.85	26.00	
EDGE 1 Tx slot	27.28	27.22	27.41	28.00	18.28	18.22	18.41	19.00	
EDGE 2 Tx slots	26.01	26.08	26.09	27.00	20.01	20.08	20.09	21.00	
EDGE 3 Tx slots	22.71	22.79	22.88	24.00	18.45	18.53	18.62	19.74	
EDGE 4 Tx slots	21.31	21.24	21.34	22.00	18.31	18.24	18.34	19.00	
GSM1900		Burst Average Power (dBm)			Tune-up Limit (dBm)	Frame-Average Power (dBm)			Tune-up Limit (dBm)
Tx Channel		512	661	810		512	661	810	
Frequency (MHz)		1850.2	1880	1909.8		1850.2	1880	1909.8	
GSM 1 Tx slot		29.81	29.83	29.84	30.50	20.81	20.83	20.84	21.50
GPRS 1 Tx slot		29.79	29.80	29.81	30.50	20.79	20.80	20.81	21.50
GPRS 2 Tx slots		28.74	29.09	29.09	29.50	22.74	23.09	23.09	23.50
GPRS 3 Tx slots		27.01	27.34	27.37	27.50	22.75	23.08	23.11	23.24
GPRS 4 Tx slots		26.01	26.29	26.32	26.50	23.01	23.29	23.32	23.50
EDGE 1 Tx slot		26.18	26.14	26.19	26.50	17.18	17.14	17.19	17.50
EDGE 2 Tx slots		25.14	25.01	25.07	25.50	19.14	19.01	19.07	19.50
EDGE 3 Tx slots		23.11	22.84	22.98	23.50	18.85	18.58	18.72	19.24
EDGE 4 Tx slots		21.95	21.81	21.85	22.50	18.95	18.81	18.85	19.50

Remark: The frame-averaged power is linearly scaled the maximum burst averaged power over 8 time slots.

The calculated method are shown as below:

- Frame-averaged power = Maximum burst averaged power (1 Tx Slot) - 9 dB
- Frame-averaged power = Maximum burst averaged power (2 Tx Slots) - 6 dB
- Frame-averaged power = Maximum burst averaged power (3 Tx Slots) - 4.26 dB
- Frame-averaged power = Maximum burst averaged power (4 Tx Slots) - 3 dB

<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.
3. For HSPA+ devices supporting 16 QAM in the uplink, power measurements procedure is according to the configurations in Table C.11.1.4 of 3GPP TS 34.121-1.
4. For DC-HSDPA, the device was configured according to the H-Set 12, Fixed Reference Channel (FRC) configuration in Table C.8.1.12 of 3GPP TS 34.121-1, with the primary and the secondary serving HS-DSCH Cell enabled during the power measurement.

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 DPCCH, DPDCCH 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:

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

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

Sub-test	β_c	β_d	β_d (SF)	β_c/β_d	β_{HS} (Note1)	β_{ec}	β_{ed} (Note 4) (Note 5)	β_{ed} (SF)	β_{ed} (Codes)	CM (dB) (Note 2)	MPR (dB) (Note 2) (Note 6)	AG Index (Note 5)	E-TFCl
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 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 $\beta_{tx} = 30/15 * \beta_c$. For sub-test 5, Δ_{ACK} , Δ_{NACK} and $\Delta_{CQI} = 5/15$ with $\beta_{tx} = 5/15 * \beta_c$.

Note 2: CM = 1 for $\beta_c/\beta_d = 12/15$, $\beta_{tx}/\beta_c = 24/15$. For all other combinations of DPDCH, DPCCH, HS-DPCCH, E-DPDCH and E-DPCCH the MPR is based on the relative CM difference.

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

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

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

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

Setup Configuration

DC-HSDPA 3GPP release 8 Setup Configuration:

- a. The EUT was connected to Base Station Agilent E5515C referred to the Setup Configuration below
- 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 RMC 12.2Kbps + HSDPA mode.
 - ii. Set Cell Power = -25 dBm
 - iii. Set HS-DSCH Configuration Type to FRC (H-set 12, QPSK)
 - iv. Select HSDPA Uplink Parameters
 - v. Set Gain Factors (β_c and β_d) and parameters were set according to each Specific sub-test in the following table, C10.1.4, quoted from the TS 34.121
 - a). Subtest 1: $\beta_c/\beta_d=2/15$
 - b). Subtest 2: $\beta_c/\beta_d=12/15$
 - c). Subtest 3: $\beta_c/\beta_d=15/8$
 - d). Subtest 4: $\beta_c/\beta_d=15/4$
 - vi. Set Delta ACK, Delta NACK and Delta CQI = 8
 - vii. Set Ack-Nack Repetition Factor to 3
 - viii. Set CQI Feedback Cycle (k) to 4 ms
 - ix. Set CQI Repetition Factor to 2
 - x. Power Ctrl Mode = All Up bits
- d. The transmitted maximum output power was recorded.

The following tests were conducted according to the test requirements outlines in 3GPP TS 34.121 specification. A summary of these settings are illustrated below:

C.8.1.12 Fixed Reference Channel Definition H-Set 12

Table C.8.1.12: Fixed Reference Channel H-Set 12

Parameter	Unit	Value
Nominal Avg. Inf. Bit Rate	kbps	60
Inter-TTI Distance	TTI's	1
Number of HARQ Processes	Processes	6
Information Bit Payload (N_{INF})	Bits	120
Number Code Blocks	Blocks	1
Binary Channel Bits Per TTI	Bits	960
Total Available SML's in UE	SML's	19200
Number of SML's per HARQ Proc.	SML's	3200
Coding Rate		0.15
Number of Physical Channel Codes	Codes	1
Modulation		QPSK
Note 1: The RMC is intended to be used for DC-HSDPA mode and both cells shall transmit with identical parameters as listed in the table. Note 2: Maximum number of transmission is limited to 1, i.e., retransmission is not allowed. The redundancy and constellation version 0 shall be used.		

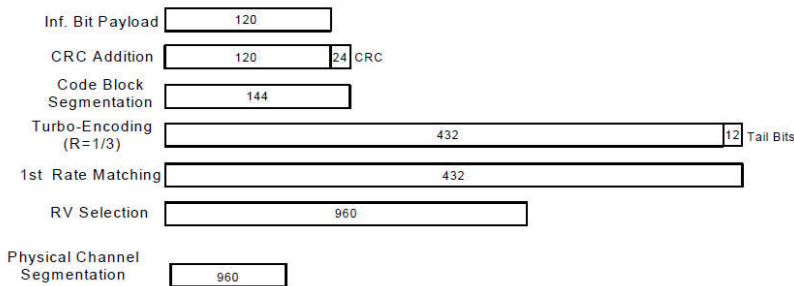


Figure C.8.19: Coding rate for Fixed reference Channel H-Set 12 (QPSK)

Setup Configuration

HSPA+ 3GPP release 7 (uplink category 7) 16QAM, Setup Configuration:

- a. The EUT was connected to Base Station Agilent E5515C referred to the Setup Configuration.
- b. The RF path losses were compensated into the measurements.
- c. A call was established between EUT and Base Station with following setting * :
 - i. Call Configs = 5.2E:HSPA+:UL with 16QAM
 - ii. Set the Gain Factors (β_c and β_d) and parameters (AG Index) were set according to each specific sub-test in the following table, C11.1.4, quoted from the TS 34.121-1 s5.2E
 - iii. Set Channel Parm
 - iv. Set Cell Power = -86 dBm
 - v. Set Channel Type = HSPA
 - vi. Set UE Target Power =21 dBm
 - vii. Power Ctrl Mode= All Up Bits
 - viii. Set Manual Uplink DPCH Bc/Bd = Manual
 - ix. Set Manual Uplink DPCH Bc and Bd=15,15(for 34.121-1 v8.10.0 table C11.1.4 sub-test 1)
 - x. Set HSPA Conn DL Channel Levels
 - xi. Set HS-SCCH Configs
 - xii. Set RB Test Mode Setup
 - xiii. Set Common HSUPA Parameters
 - xiv. Set Serving Grant
 - xv. Confirm that E-TFCI is equal to the target E-TFCI of 105 for sub-test 1, and other subtest's E-TFCI
- d. The transmitted maximum output power was recorded.

Table C.11.1.4: β values for transmitter characteristics tests with HS-DPCCH and E-DCH with 16QAM

Sub-test	β_c (Note3)	β_d	β_{HS} (Note 1)	β_{ec}	β_{ed} (2xSF2) (Note 4)	β_{ed} (2xSF4) (Note 4)	CM (dB) (Note 2)	MPR (dB) (Note 2)	AG Index (Note 4)	E-TFCI (Note 5)	E-TFCI (boost)
1	1	0	30/15	30/15	β_{ed1} : 30/15 β_{ed2} : 30/15	β_{ed3} : 24/15 β_{ed4} : 24/15	3.5	2.5	14	105	105

Note 1: $\Delta_{ACK}, \Delta_{NACK}$ and $\Delta_{CQI} = 30/15$ with $\beta_{fs} = 30/15 * \beta_c$.

Note 2: CM = 3.5 and the MPR is based on the relative CM difference, MPR = MAX(CM-1,0).

Note 3: DPDCH is not configured, therefore the β_c is set to 1 and $\beta_d = 0$ by default.

Note 4: β_{ed} can not be set directly; it is set by Absolute Grant Value.

Note 5: All the sub-tests require the UE to transmit 2SF2+2SF4 16QAM EDCH and they apply for UE using E-DPDCH category 7. E-DCH TTI is set to 2ms TTI and E-DCH table index = 2. To support these E-DCH configurations DPDCH is not allocated. The UE is signaled to use the extrapolation algorithm.

Setup Configuration



<WCDMA Conducted Power>

General Note:

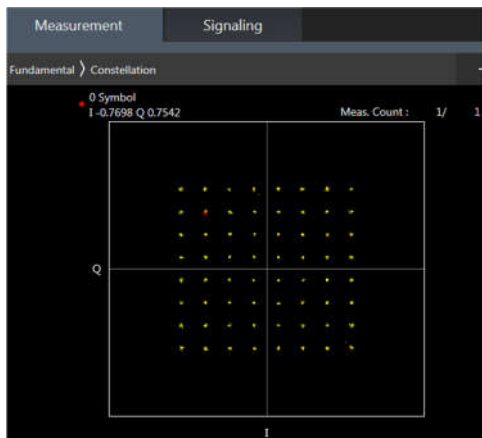
1. Per KDB 941225 D01v03r01, for SAR testing is measured using a 12.2 kbps RMC with TPC bits configured to all "1's".
2. Per KDB 941225 D01v03r01, RMC 12.2kbps setting is used to evaluate SAR. The maximum output power and tune-up tolerance specified for production units in HSDPA / HSUPA / DC-HSDPA/HSPA+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

Band		WCDMA Band II			Tune-up Limit (dBm)	WCDMA Band IV			Tune-up Limit (dBm)	WCDMA Band V			Tune-up Limit (dBm)
Tx Channel		9262	9400	9538		1312	1413	1513		4132	4182	4233	
Rx Channel		9662	9800	9938		1537	1638	1738		4357	4407	4458	
Frequency (MHz)		1852.4	1880	1907.6	1712.4	1732.6	1752.6	826.4	836.4	846.6			
3GPP Rel 99	AMR 12.2Kbps	22.68	22.82	22.96	23.50	24.22	24.25	24.17	24.50	23.38	23.30	23.21	23.50
3GPP Rel 99	RMC 12.2Kbps	22.71	22.84	22.99	23.50	24.23	24.28	24.19	24.50	23.41	23.32	23.23	23.50
3GPP Rel 6	HSDPA Subtest-1	21.63	21.78	21.94	22.50	23.26	23.43	23.26	23.50	22.18	22.09	22.04	22.50
3GPP Rel 6	HSDPA Subtest-2	21.56	21.76	21.85	22.50	23.18	23.28	23.23	23.50	22.09	22.02	21.94	22.50
3GPP Rel 6	HSDPA Subtest-3	21.01	21.30	21.32	22.00	22.74	22.83	22.70	23.00	21.64	21.46	21.44	22.00
3GPP Rel 6	HSDPA Subtest-4	21.02	21.23	21.33	22.00	22.67	22.80	22.71	23.00	21.63	21.49	21.47	22.00
3GPP Rel 8	DC-HSDPA Subtest-1	22.29	22.32	22.28	22.50	23.42	23.44	23.34	23.50	22.15	22.03	22.02	22.50
3GPP Rel 8	DC-HSDPA Subtest-2	22.27	22.31	22.27	22.50	23.43	23.43	23.29	23.50	22.11	22.01	21.98	22.50
3GPP Rel 8	DC-HSDPA Subtest-3	21.76	21.81	21.77	22.00	22.84	22.95	22.89	23.00	21.59	21.48	21.46	22.00
3GPP Rel 8	DC-HSDPA Subtest-4	21.74	21.79	21.76	22.00	22.81	22.92	22.86	23.00	21.52	21.44	21.47	22.00
3GPP Rel 6	HSUPA Subtest-1	19.67	19.79	19.99	21.50	21.29	21.46	21.28	22.50	20.25	20.12	20.16	21.50
3GPP Rel 6	HSUPA Subtest-2	19.59	19.79	19.91	20.50	21.30	21.43	21.25	21.50	20.24	20.16	20.16	20.50
3GPP Rel 6	HSUPA Subtest-3	20.64	20.77	20.94	21.50	22.31	22.42	22.28	22.50	21.24	21.06	21.10	21.50
3GPP Rel 6	HSUPA Subtest-4	19.19	19.30	19.47	20.50	20.76	20.98	20.78	21.50	19.73	19.66	19.67	20.50
3GPP Rel 6	HSUPA Subtest-5	20.50	20.70	20.90	22.50	22.30	22.30	22.20	23.50	21.10	21.10	21.00	22.50
3GPP Rel 7	HSPA+ (16QAM) Subtest-1	19.21	19.34	19.31	20.00	20.24	20.37	20.21	21.00	19.29	19.25	19.26	20.00

<LTE Conducted Power>

General Note:

1. Anritsu MT8820C base station simulator was used to setup the connection with EUT; the frequency band, channel bandwidth, RB allocation configuration, modulation type are set in the base station simulator to configure EUT transmitting at maximum power and at different configurations which are requested to be reported to FCC, for conducted power measurement and SAR testing.
2. Per KDB 941225 D05v02r05, when a properly configured base station simulator is used for the SAR and power measurements, spectrum plots for each RB allocation and offset configuration is not required.
3. Per KDB 941225 D05v02r05, start with the largest channel bandwidth and measure SAR for QPSK with 1 RB allocation, using the RB offset and required test channel combination with the highest maximum output power for RB offsets at the upper edge, middle and lower edge of each required test channel.
4. Per KDB 941225 D05v02r05, 50% RB allocation for QPSK SAR testing follows 1RB QPSK allocation procedure.
5. Per KDB 941225 D05v02r05, For QPSK with 100% RB allocation, SAR is not required when the highest maximum output power for 100 % RB allocation is less than the highest maximum output power in 50% and 1 RB allocations and the highest reported SAR for 1 RB and 50% RB allocation are ≤ 0.8 W/kg. Otherwise, SAR is measured for the highest output power channel; and if the reported SAR is > 1.45 W/kg, the remaining required test channels must also be tested.
6. Per KDB 941225 D05v02r05, 16QAM output power for each RB allocation configuration is $>$ not $\frac{1}{2}$ dB higher than the same configuration in QPSK and the reported SAR for the QPSK configuration is ≤ 1.45 W/kg; Per KDB 941225 D05v02r05, 16QAM SAR testing is not required.
7. Per KDB 941225 D05v02r05, Smaller bandwidth output power for each RB allocation configuration is $>$ not $\frac{1}{2}$ dB higher than the same configuration in the largest supported bandwidth, and the reported SAR for the largest supported bandwidth is ≤ 1.45 W/kg; Per KDB 941225 D05v02r05, smaller bandwidth SAR testing is not required.
8. For LTE B4 / B5 / B12 / B17 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 B17 SAR test was covered by 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 2017 TCB workshop, for 64QAM and 16QAM 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.



64QAM



16QAM



<LTE Band 2>

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)	MPR (dB)
Channel				18700	18900	19100		
Frequency (MHz)				1860	1880	1900		
20	QPSK	1	0	22.83	22.77	22.94	23.5	0
20	QPSK	1	49	22.88	23.01	23.19		
20	QPSK	1	99	22.81	22.83	22.96		
20	QPSK	50	0	21.88	21.97	22.12	22.5	1
20	QPSK	50	24	21.90	22.00	22.15		
20	QPSK	50	50	21.88	22.00	22.13		
20	16QAM	1	0	21.94	22.03	22.20	22.5	1
20	16QAM	1	49	22.20	22.29	22.39		
20	16QAM	1	99	21.91	22.07	22.18		
20	16QAM	50	0	20.85	21.00	21.14	21.5	2
20	16QAM	50	24	20.88	21.04	21.17		
20	16QAM	50	50	20.86	21.02	21.14		
20	16QAM	100	0	20.83	21.01	21.12	21.5	2
20	64QAM	1	0	20.86	20.97	21.08		
20	64QAM	1	49	21.07	21.16	21.25		
20	64QAM	1	99	20.84	20.99	21.14	20.5	3
20	64QAM	50	0	19.80	19.96	20.07		
20	64QAM	50	24	19.81	19.99	20.06		
20	64QAM	50	50	19.80	19.95	20.08	20.5	3
20	64QAM	100	0	19.83	19.96	20.06		



Channel				18675	18900	19125	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1857.5	1880	1902.5		
15	QPSK	1	0	22.97	22.84	23.00	23.5	0
15	QPSK	1	37	22.89	23.13	23.17		
15	QPSK	1	74	22.84	22.88	23.04		
15	QPSK	36	0	21.87	21.97	22.13	22.5	1
15	QPSK	36	20	21.86	22.00	22.18		
15	QPSK	36	39	21.86	22.00	22.16		
15	QPSK	75	0	21.87	21.97	22.15	22.5	1
15	16QAM	1	0	21.99	22.07	22.26		
15	16QAM	1	37	22.25	22.31	22.45		
15	16QAM	1	74	21.98	22.13	22.24	21.5	2
15	16QAM	36	0	20.80	20.98	21.13		
15	16QAM	36	20	20.82	21.02	21.20		
15	16QAM	36	39	20.83	21.01	21.16	21.5	2
15	16QAM	75	0	20.83	20.99	21.16		
15	64QAM	1	0	20.92	20.86	20.93		
15	64QAM	1	37	21.02	21.07	21.10	21.5	2
15	64QAM	1	74	20.77	20.76	20.94		
15	64QAM	36	0	19.75	19.80	19.83		
15	64QAM	36	20	19.79	19.76	19.91	20.5	3
15	64QAM	36	39	19.73	19.71	19.83		
15	64QAM	75	0	19.73	19.76	19.82		
Channel				18650	18900	19150	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1855	1880	1905		
10	QPSK	1	0	22.88	22.89	23.08	23.5	0
10	QPSK	1	25	22.85	23.05	23.14		
10	QPSK	1	49	22.87	22.91	23.11		
10	QPSK	25	0	21.86	22.00	22.20	22.5	1
10	QPSK	25	12	21.85	22.00	22.21		
10	QPSK	25	25	21.88	22.03	22.16		
10	QPSK	50	0	21.89	22.02	22.20	22.5	1
10	16QAM	1	0	21.98	22.12	22.31		
10	16QAM	1	25	22.12	22.29	22.43		
10	16QAM	1	49	22.00	22.13	22.29	21.5	2
10	16QAM	25	0	20.86	21.03	21.21		
10	16QAM	25	12	20.82	21.04	21.24		
10	16QAM	25	25	20.85	21.05	21.18	21.5	2
10	16QAM	50	0	20.86	21.04	21.19		
10	64QAM	1	0	20.96	20.92	20.97		
10	64QAM	1	25	21.09	21.03	21.09	21.5	2
10	64QAM	1	49	20.83	20.87	21.05		
10	64QAM	25	0	19.81	19.82	19.96		
10	64QAM	25	12	19.79	19.78	19.89	20.5	3
10	64QAM	25	25	19.81	19.75	19.84		
10	64QAM	50	0	19.82	19.79	19.90		



Channel				18625	18900	19175	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1852.5	1880	1907.5		
5	QPSK	1	0	22.79	22.83	23.02	23.5	0
5	QPSK	1	12	22.91	23.15	23.10		
5	QPSK	1	24	22.70	22.81	23.02		
5	QPSK	12	0	21.79	21.98	22.19	22.5	1
5	QPSK	12	7	21.85	22.04	22.25		
5	QPSK	12	13	21.77	22.00	22.15		
5	QPSK	25	0	21.81	22.00	22.18	22.5	1
5	16QAM	1	0	21.96	22.06	22.22		
5	16QAM	1	12	22.24	22.34	22.37		
5	16QAM	1	24	21.99	22.04	22.23	21.5	2
5	16QAM	12	0	20.76	20.98	21.08		
5	16QAM	12	7	20.79	21.04	21.06		
5	16QAM	12	13	20.74	21.00	21.07	21.5	2
5	16QAM	25	0	20.77	21.04	21.18		
5	64QAM	1	0	20.88	20.85	20.88		
5	64QAM	1	12	21.16	21.07	21.18	21.5	2
5	64QAM	1	24	20.87	20.83	20.98		
5	64QAM	12	0	19.81	19.81	19.92		
5	64QAM	12	7	19.86	19.83	19.95	20.5	3
5	64QAM	12	13	19.84	19.78	19.88		
5	64QAM	25	0	19.78	19.78	19.89		
Channel				18615	18900	19185	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1851.5	1880	1908.5		
3	QPSK	1	0	22.68	22.92	23.15	23.5	0
3	QPSK	1	8	22.71	22.94	23.17		
3	QPSK	1	14	22.68	22.94	23.14		
3	QPSK	8	0	21.78	21.97	22.18	22.5	1
3	QPSK	8	4	21.81	21.99	22.22		
3	QPSK	8	7	21.78	21.98	22.18		
3	QPSK	15	0	21.77	21.97	22.21	22.5	1
3	16QAM	1	0	22.02	22.18	22.35		
3	16QAM	1	8	22.05	22.16	22.37		
3	16QAM	1	14	22.01	22.17	22.34	21.5	2
3	16QAM	8	0	20.83	21.06	21.26		
3	16QAM	8	4	20.85	21.07	21.31		
3	16QAM	8	7	20.81	21.09	21.08	21.5	2
3	16QAM	15	0	20.76	21.05	21.08		
3	64QAM	1	0	20.96	20.92	21.00		
3	64QAM	1	8	20.93	20.91	21.08	21.5	2
3	64QAM	1	14	20.96	20.90	21.09		
3	64QAM	8	0	19.82	19.79	19.95		
3	64QAM	8	4	19.85	19.82	19.98	20.5	3
3	64QAM	8	7	19.81	19.77	19.97		
3	64QAM	15	0	19.76	19.73	19.91		



Channel				18607	18900	19193	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1850.7	1880	1909.3		
1.4	QPSK	1	0	22.71	22.94	23.15	23.5	0
1.4	QPSK	1	3	22.86	23.10	23.10		
1.4	QPSK	1	5	22.71	22.92	23.15		
1.4	QPSK	3	0	22.81	23.06	23.18		
1.4	QPSK	3	1	22.88	23.13	23.15		
1.4	QPSK	3	3	22.82	23.06	23.15		
1.4	QPSK	6	0	21.88	22.05	22.31	22.5	1
1.4	16QAM	1	0	22.00	22.15	22.35	22.5	1
1.4	16QAM	1	3	22.16	22.29	22.48		
1.4	16QAM	1	5	21.98	22.16	22.34		
1.4	16QAM	3	0	21.84	22.05	22.21		
1.4	16QAM	3	1	21.92	22.11	22.28		
1.4	16QAM	3	3	21.87	22.01	22.22		
1.4	16QAM	6	0	20.92	21.18	21.38	21.5	2
1.4	64QAM	1	0	21.01	21.03	21.05	21.5	2
1.4	64QAM	1	3	21.17	21.09	21.17		
1.4	64QAM	1	5	21.07	20.98	21.09		
1.4	64QAM	3	0	21.06	21.02	21.09		
1.4	64QAM	3	1	21.13	21.07	21.19		
1.4	64QAM	3	3	21.07	21.02	21.11		
1.4	64QAM	6	0	19.96	19.91	20.05	20.5	3



<LTE Band 4>

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)	MPR (dB)
Channel				20050	20175	20300		
Frequency (MHz)				1720	1732.5	1745		
20	QPSK	1	0	22.31	22.28	22.28	23	0
20	QPSK	1	49	22.44	22.46	22.45		
20	QPSK	1	99	22.11	22.08	22.08		
20	QPSK	50	0	21.41	21.46	21.45	22	1
20	QPSK	50	24	21.50	21.51	21.47		
20	QPSK	50	50	21.40	21.40	21.44		
20	QPSK	100	0	21.41	21.47	21.46	22	1
20	16QAM	1	0	21.59	21.66	21.65		
20	16QAM	1	49	21.79	21.84	21.77		
20	16QAM	1	99	21.46	21.47	21.42	21	2
20	16QAM	50	0	20.40	20.51	20.48		
20	16QAM	50	24	20.48	20.46	20.47		
20	16QAM	50	50	20.40	20.39	20.43	21	2
20	16QAM	100	0	20.38	20.43	20.45		
20	64QAM	1	0	20.55	20.51	20.50		
20	64QAM	1	49	20.75	20.67	20.68	21	2
20	64QAM	1	99	20.40	20.32	20.32		
20	64QAM	50	0	19.40	19.49	19.48		
20	64QAM	50	24	19.49	19.47	19.47	20	3
20	64QAM	50	50	19.41	19.39	19.44		
20	64QAM	100	0	19.41	19.41	19.45		



Channel				20025	20175	20325	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1717.5	1732.5	1747.5		
15	QPSK	1	0	22.36	22.34	22.30	23	0
15	QPSK	1	37	22.43	22.43	22.41		
15	QPSK	1	74	22.22	22.22	22.17		
15	QPSK	36	0	21.50	21.49	21.45	22	1
15	QPSK	36	20	21.54	21.51	21.48		
15	QPSK	36	39	21.46	21.46	21.45		
15	QPSK	75	0	21.48	21.45	21.43	22	1
15	16QAM	1	0	21.66	21.68	21.66		
15	16QAM	1	37	21.88	21.86	21.85		
15	16QAM	1	74	21.55	21.58	21.52	21	2
15	16QAM	36	0	20.44	20.47	20.42		
15	16QAM	36	20	20.48	20.46	20.46		
15	16QAM	36	39	20.43	20.41	20.42	21	2
15	16QAM	75	0	20.45	20.41	20.42		
15	64QAM	1	0	20.60	20.56	20.54		
15	64QAM	1	37	20.76	20.77	20.76	21	2
15	64QAM	1	74	20.47	20.43	20.38		
15	64QAM	36	0	19.46	19.49	19.45		
15	64QAM	36	20	19.49	19.49	19.48	20	3
15	64QAM	36	39	19.46	19.43	19.44		
15	64QAM	75	0	19.42	19.42	19.41		
Channel				20000	20175	20350	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1715	1732.5	1750		
10	QPSK	1	0	22.43	22.36	22.32	23	0
10	QPSK	1	25	22.41	22.43	22.45		
10	QPSK	1	49	22.33	22.32	22.27		
10	QPSK	25	0	21.51	21.52	21.50	22	1
10	QPSK	25	12	21.55	21.47	21.51		
10	QPSK	25	25	21.56	21.46	21.45		
10	QPSK	50	0	21.54	21.49	21.50	22	1
10	16QAM	1	0	21.69	21.71	21.70		
10	16QAM	1	25	21.86	21.79	21.80		
10	16QAM	1	49	21.64	21.63	21.59	21	2
10	16QAM	25	0	20.49	20.52	20.50		
10	16QAM	25	12	20.52	20.47	20.48		
10	16QAM	25	25	20.55	20.48	20.44	21	2
10	16QAM	50	0	20.54	20.49	20.48		
10	64QAM	1	0	20.67	20.60	20.61		
10	64QAM	1	25	20.76	20.70	20.70	21	2
10	64QAM	1	49	20.56	20.53	20.52		
10	64QAM	25	0	19.48	19.53	19.51		
10	64QAM	25	12	19.52	19.49	19.52	20	3
10	64QAM	25	25	19.57	19.46	19.46		
10	64QAM	50	0	19.53	19.48	19.48		



Channel				19975	20175	20375	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1712.5	1732.5	1752.5		
5	QPSK	1	0	22.34	22.26	22.25	23	0
5	QPSK	1	12	22.40	22.43	22.43		
5	QPSK	1	24	22.29	22.26	22.22		
5	QPSK	12	0	21.47	21.43	21.43	22	1
5	QPSK	12	7	21.54	21.48	21.46		
5	QPSK	12	13	21.52	21.43	21.41		
5	QPSK	25	0	21.47	21.43	21.41	22	1
5	16QAM	1	0	21.63	21.61	21.62		
5	16QAM	1	12	21.89	21.88	21.88		
5	16QAM	1	24	21.61	21.61	21.58	21	2
5	16QAM	12	0	20.44	20.42	20.43		
5	16QAM	12	7	20.55	20.49	20.45		
5	16QAM	12	13	20.50	20.42	20.40	21	2
5	16QAM	25	0	20.50	20.42	20.42		
5	64QAM	1	0	20.56	20.52	20.50		
5	64QAM	1	12	20.83	20.79	20.77	21	2
5	64QAM	1	24	20.51	20.48	20.46		
5	64QAM	12	0	19.47	19.47	19.45		
5	64QAM	12	7	19.54	19.51	19.52	20	3
5	64QAM	12	13	19.52	19.46	19.45		
5	64QAM	25	0	19.49	19.41	19.44		
Channel				19965	20175	20385	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1711.5	1732.5	1753.5		
3	QPSK	1	0	22.42	22.37	22.35	23	0
3	QPSK	1	8	22.41	22.36	22.34		
3	QPSK	1	14	22.39	22.33	22.30		
3	QPSK	8	0	21.50	21.45	21.44	22	1
3	QPSK	8	4	21.56	21.47	21.46		
3	QPSK	8	7	21.50	21.41	21.43		
3	QPSK	15	0	21.51	21.42	21.42	22	1
3	16QAM	1	0	21.72	21.67	21.70		
3	16QAM	1	8	21.71	21.70	21.66		
3	16QAM	1	14	21.71	21.63	21.65	21	2
3	16QAM	8	0	20.55	20.49	20.49		
3	16QAM	8	4	20.58	20.51	20.52		
3	16QAM	8	7	20.57	20.46	20.46	21	2
3	16QAM	15	0	20.50	20.44	20.43		
3	64QAM	1	0	20.62	20.58	20.61		
3	64QAM	1	8	20.65	20.58	20.58	21	2
3	64QAM	1	14	20.63	20.60	20.60		
3	64QAM	8	0	19.54	19.48	19.49		
3	64QAM	8	4	19.58	19.54	19.53	20	3
3	64QAM	8	7	19.55	19.45	19.45		
3	64QAM	15	0	19.49	19.41	19.43		



Channel				19957	20175	20393	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1710.7	1732.5	1754.3		
1.4	QPSK	1	0	22.37	22.31	22.32	23	0
1.4	QPSK	1	3	22.41	22.45	22.39		
1.4	QPSK	1	5	22.38	22.32	22.31		
1.4	QPSK	3	0	22.41	22.42	22.39		
1.4	QPSK	3	1	22.42	22.44	22.44		
1.4	QPSK	3	3	22.43	22.43	22.39		
1.4	QPSK	6	0	21.53	21.46	21.47	22	1
1.4	16QAM	1	0	21.68	21.66	21.63	22	1
1.4	16QAM	1	3	21.80	21.76	21.77		
1.4	16QAM	1	5	21.68	21.69	21.66		
1.4	16QAM	3	0	21.53	21.47	21.41		
1.4	16QAM	3	1	21.54	21.55	21.51		
1.4	16QAM	3	3	21.49	21.46	21.44		
1.4	16QAM	6	0	20.60	20.55	20.54	21	2
1.4	64QAM	1	0	20.63	20.57	20.54	21	2
1.4	64QAM	1	3	20.73	20.67	20.68		
1.4	64QAM	1	5	20.60	20.54	20.56		
1.4	64QAM	3	0	20.66	20.60	20.57		
1.4	64QAM	3	1	20.68	20.66	20.65		
1.4	64QAM	3	3	20.66	20.57	20.59		
1.4	64QAM	6	0	19.53	19.50	19.47	20	3



<LTE Band 5>

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)	MPR (dB)
Channel				20450	20525	20600		
Frequency (MHz)				829	836.5	844		
10	QPSK	1	0	22.59	22.57	22.53	23	0
10	QPSK	1	25	22.69	22.79	22.63		
10	QPSK	1	49	22.53	22.52	22.50		
10	QPSK	25	0	21.82	21.83	21.79	22	1
10	QPSK	25	12	21.74	21.66	21.70		
10	QPSK	25	25	21.75	21.65	21.66		
10	16QAM	1	0	21.85	21.80	21.77	22	1
10	16QAM	1	25	21.96	21.83	21.89		
10	16QAM	1	49	21.76	21.79	21.74		
10	16QAM	25	0	20.81	20.60	20.79	21	2
10	16QAM	25	12	20.73	20.63	20.69		
10	16QAM	25	25	20.74	20.63	20.66		
10	16QAM	50	0	20.79	20.61	20.74	21	2
10	64QAM	1	0	20.82	20.79	20.80		
10	64QAM	1	25	20.97	20.83	20.91		
10	64QAM	1	49	20.76	20.78	20.72	20	3
10	64QAM	25	0	19.85	19.64	19.84		
10	64QAM	25	12	19.77	19.70	19.74		
10	64QAM	25	25	19.79	19.67	19.69	20	3
10	64QAM	50	0	19.83	19.66	19.78		



Channel				20425	20525	20625	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				826.5	836.5	846.5		
5	QPSK	1	0	22.52	22.45	22.46	23	0
5	QPSK	1	12	22.78	22.72	22.75		
5	QPSK	1	24	22.52	22.41	22.42		
5	QPSK	12	0	21.71	21.59	21.65	22	1
5	QPSK	12	7	21.77	21.65	21.68		
5	QPSK	12	13	21.72	21.64	21.66		
5	QPSK	25	0	21.74	21.62	21.68	22	1
5	16QAM	1	0	21.78	21.66	21.76		
5	16QAM	1	12	21.88	21.86	21.95		
5	16QAM	1	24	21.81	21.65	21.65	21	2
5	16QAM	12	0	20.71	20.55	20.64		
5	16QAM	12	7	20.75	20.61	20.68		
5	16QAM	12	13	20.70	20.60	20.64	21	2
5	16QAM	25	0	20.73	20.59	20.66		
5	64QAM	1	0	20.76	20.69	20.75		
5	64QAM	1	12	20.94	20.87	20.96	21	2
5	64QAM	1	24	20.80	20.64	20.67		
5	64QAM	12	0	19.77	19.66	19.72		
5	64QAM	12	7	19.85	19.69	19.74	20	3
5	64QAM	12	13	19.75	19.67	19.69		
5	64QAM	25	0	19.76	19.65	19.71		
Channel				20415	20525	20635	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				825.5	836.5	847.5		
3	QPSK	1	0	22.62	22.53	22.57	23	0
3	QPSK	1	8	22.77	22.70	22.69		
3	QPSK	1	14	22.62	22.52	22.49		
3	QPSK	8	0	21.67	21.59	21.61	22	1
3	QPSK	8	4	21.73	21.63	21.65		
3	QPSK	8	7	21.68	21.59	21.61		
3	QPSK	15	0	21.67	21.63	21.62	22	1
3	16QAM	1	0	21.83	21.76	21.83		
3	16QAM	1	8	21.95	21.87	21.89		
3	16QAM	1	14	21.90	21.74	21.72	21	2
3	16QAM	8	0	20.73	20.63	20.68		
3	16QAM	8	4	20.77	20.65	20.68		
3	16QAM	8	7	20.76	20.62	20.65	21	2
3	16QAM	15	0	20.69	20.61	20.63		
3	64QAM	1	0	20.82	20.72	20.84		
3	64QAM	1	8	20.90	20.75	20.79	21	2
3	64QAM	1	14	20.88	20.73	20.75		
3	64QAM	8	0	19.78	19.67	19.72		
3	64QAM	8	4	19.82	19.69	19.74	20	3
3	64QAM	8	7	19.79	19.66	19.72		
3	64QAM	15	0	19.72	19.64	19.66		



Channel				20407	20525	20643	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				824.7	836.5	848.3		
1.4	QPSK	1	0	22.58	22.49	22.48	23	0
1.4	QPSK	1	3	22.73	22.61	22.61		
1.4	QPSK	1	5	22.61	22.50	22.44		
1.4	QPSK	3	0	22.68	22.59	22.60		
1.4	QPSK	3	1	22.74	22.65	22.67		
1.4	QPSK	3	3	22.73	22.63	22.60		
1.4	QPSK	6	0	21.73	21.65	21.65	22	1
1.4	16QAM	1	0	21.83	21.69	21.74	22	1
1.4	16QAM	1	3	21.95	21.82	21.82		
1.4	16QAM	1	5	21.88	21.69	21.69		
1.4	16QAM	3	0	21.66	21.53	21.59		
1.4	16QAM	3	1	21.70	21.60	21.63		
1.4	16QAM	3	3	21.72	21.55	21.59		
1.4	16QAM	6	0	20.80	20.70	20.71	21	2
1.4	64QAM	1	0	20.79	20.68	20.74	21	2
1.4	64QAM	1	3	20.90	20.77	20.79		
1.4	64QAM	1	5	20.87	20.66	20.66		
1.4	64QAM	3	0	20.85	20.76	20.76		
1.4	64QAM	3	1	20.88	20.80	20.80		
1.4	64QAM	3	3	20.85	20.73	20.74		
1.4	64QAM	6	0	19.78	19.67	19.67	20	3



<LTE Band 7>

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)	MPR (dB)
Channel				20850	21100	21350		
Frequency (MHz)				2510	2535	2560		
20	QPSK	1	0	22.67	22.78	22.72	23.5	0
20	QPSK	1	49	22.86	23.12	22.91		
20	QPSK	1	99	22.70	22.83	22.77		
20	QPSK	50	0	22.06	21.99	22.01	22.5	1
20	QPSK	50	24	22.10	22.16	22.05		
20	QPSK	50	50	22.09	21.99	21.83		
20	QPSK	100	0	21.96	21.97	21.94	22.5	1
20	16QAM	1	0	21.78	21.78	22.07		
20	16QAM	1	49	21.99	22.02	22.19		
20	16QAM	1	99	21.79	21.88	22.12	21.5	2
20	16QAM	50	0	20.94	20.91	20.91		
20	16QAM	50	24	20.91	21.07	20.87		
20	16QAM	50	50	20.95	20.96	20.76	21.5	2
20	16QAM	100	0	20.92	20.92	20.83		
20	64QAM	1	0	20.92	20.89	20.93		
20	64QAM	1	49	21.15	21.21	21.06	21.5	2
20	64QAM	1	99	20.84	21.02	20.87		
20	64QAM	50	0	19.92	19.95	19.91		
20	64QAM	50	24	20.01	20.03	19.95	20.5	3
20	64QAM	50	50	19.97	19.95	19.80		
20	64QAM	100	0	19.96	19.94	19.87		



Channel				20825	21100	21375	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				2507.5	2535	2562.5		
15	QPSK	1	0	22.76	22.76	22.85	23.5	0
15	QPSK	1	37	23.06	23.04	23.08		
15	QPSK	1	74	22.73	22.92	22.88		
15	QPSK	36	0	21.88	21.92	21.90	22.5	1
15	QPSK	36	20	21.94	22.01	21.87		
15	QPSK	36	39	21.86	22.01	21.79		
15	QPSK	75	0	21.92	21.92	21.76	22.5	1
15	16QAM	1	0	22.09	21.98	21.87		
15	16QAM	1	37	22.24	22.33	22.16		
15	16QAM	1	74	21.96	22.08	22.03	21.5	2
15	16QAM	36	0	20.86	20.83	20.73		
15	16QAM	36	20	20.88	20.94	20.76		
15	16QAM	36	39	20.89	20.95	20.65	21.5	2
15	16QAM	75	0	20.84	20.92	20.79		
15	64QAM	1	0	20.96	20.92	20.89		
15	64QAM	1	37	21.15	21.22	21.08	21.5	2
15	64QAM	1	74	20.89	21.09	20.95		
15	64QAM	36	0	19.92	19.99	19.91		
15	64QAM	36	20	19.96	20.01	19.92	20.5	3
15	64QAM	36	39	19.96	20.00	19.82		
15	64QAM	75	0	19.95	19.98	19.87		
Channel				20800	21100	21400	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				2505	2535	2565		
10	QPSK	1	0	22.60	22.83	22.86	23.5	0
10	QPSK	1	25	22.84	23.02	22.92		
10	QPSK	1	49	22.78	22.90	22.87		
10	QPSK	25	0	21.99	22.15	22.11	22.5	1
10	QPSK	25	12	21.99	22.14	22.08		
10	QPSK	25	25	22.03	22.13	21.94		
10	QPSK	50	0	21.90	22.07	21.90	22.5	1
10	16QAM	1	0	21.96	22.30	22.09		
10	16QAM	1	25	22.40	22.46	22.20		
10	16QAM	1	49	22.21	22.40	22.19	21.5	2
10	16QAM	25	0	21.05	21.13	20.94		
10	16QAM	25	12	20.98	21.10	20.93		
10	16QAM	25	25	21.03	21.10	20.83	21.5	2
10	16QAM	50	0	20.98	21.08	20.83		
10	64QAM	1	0	20.93	21.00	20.87		
10	64QAM	1	25	21.07	21.17	20.98	21.5	2
10	64QAM	1	49	20.90	21.09	20.98		
10	64QAM	25	0	19.95	20.04	19.96		
10	64QAM	25	12	19.95	20.03	19.96	20.5	3
10	64QAM	25	25	19.97	20.02	19.85		
10	64QAM	50	0	19.96	20.05	19.92		



Channel				20775	21100	21425	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				2502.5	2535	2567.5		
5	QPSK	1	0	22.65	22.76	22.66	23.5	0
5	QPSK	1	12	22.94	23.05	22.94		
5	QPSK	1	24	22.65	22.79	22.75		
5	QPSK	12	0	21.84	21.96	21.84	22.5	1
5	QPSK	12	7	21.90	22.03	21.90		
5	QPSK	12	13	21.87	22.01	21.86		
5	QPSK	25	0	21.85	21.98	21.88		
5	16QAM	1	0	21.87	21.96	21.79	22.5	1
5	16QAM	1	12	22.13	22.25	22.17		
5	16QAM	1	24	21.90	22.02	21.91		
5	16QAM	12	0	20.80	20.91	20.80	21.5	2
5	16QAM	12	7	20.86	20.98	20.85		
5	16QAM	12	13	20.85	20.96	20.80		
5	16QAM	25	0	20.82	20.95	20.79		
5	64QAM	1	0	20.85	20.94	20.77	21.5	2
5	64QAM	1	12	21.09	21.27	21.14		
5	64QAM	1	24	20.86	20.97	20.88		
5	64QAM	12	0	19.84	19.94	19.89	20.5	3
5	64QAM	12	7	19.92	20.01	19.92		
5	64QAM	12	13	19.86	19.95	19.83		
5	64QAM	25	0	19.83	19.95	19.85		

<LTE Band 12>

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)	MPR (dB)
Channel				23060	23095	23130		
Frequency (MHz)				704	707.5	711		
10	QPSK	1	0	21.94	21.93	21.91	22.5	0
10	QPSK	1	25	22.10	22.27	22.17		
10	QPSK	1	49	22.06	22.09	22.07		
10	QPSK	25	0	20.91	21.35	21.08	21.5	1
10	QPSK	25	12	21.07	21.13	21.14		
10	QPSK	25	25	21.09	21.36	21.27		
10	16QAM	1	0	21.14	21.15	21.01	21.5	1
10	16QAM	1	25	21.18	21.23	21.34		
10	16QAM	1	49	21.20	21.29	21.12		
10	16QAM	25	0	19.94	20.33	20.10	20.5	2
10	16QAM	25	12	20.08	20.14	20.18		
10	16QAM	25	25	19.96	20.35	20.25		
10	16QAM	50	0	19.97	20.36	20.24	20.5	2
10	64QAM	1	0	20.16	20.11	20.09		
10	64QAM	1	25	20.24	20.33	20.36		
10	64QAM	1	49	20.26	20.26	20.14	19.5	3
10	64QAM	25	0	18.99	19.41	19.17		
10	64QAM	25	12	19.16	19.21	19.22		
10	64QAM	25	25	19.01	19.45	19.37	19.5	3
10	64QAM	50	0	19.01	19.41	19.31		



Channel				23035	23095	23155	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				701.5	707.5	713.5		
5	QPSK	1	0	21.86	21.83	21.84	22.5	0
5	QPSK	1	12	22.18	22.19	22.17		
5	QPSK	1	24	21.88	21.89	21.90		
5	QPSK	12	0	20.87	21.12	20.88	21.5	1
5	QPSK	12	7	21.06	21.08	21.06		
5	QPSK	12	13	21.07	21.09	21.04		
5	QPSK	25	0	20.94	21.09	20.94	21.5	1
5	16QAM	1	0	21.06	20.92	21.05		
5	16QAM	1	12	21.34	21.30	21.29		
5	16QAM	1	24	21.01	21.10	20.96	20.5	2
5	16QAM	12	0	19.89	20.11	19.85		
5	16QAM	12	7	20.10	20.08	20.03		
5	16QAM	12	13	20.08	20.09	19.98	20.5	2
5	16QAM	25	0	19.97	20.10	19.92		
5	64QAM	1	0	20.13	20.03	20.14		
5	64QAM	1	12	20.42	20.40	20.35	20.5	2
5	64QAM	1	24	20.08	20.16	20.01		
5	64QAM	12	0	18.97	19.25	19.03		
5	64QAM	12	7	19.21	19.26	19.25	19.5	3
5	64QAM	12	13	19.16	19.18	19.09		
5	64QAM	25	0	19.06	19.19	19.10		
Channel				23025	23095	23165	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				700.5	707.5	714.5		
3	QPSK	1	0	22.06	22.03	22.04	22.5	0
3	QPSK	1	8	22.21	22.23	22.26		
3	QPSK	1	14	22.07	22.08	22.09		
3	QPSK	8	0	21.04	21.11	21.11	21.5	1
3	QPSK	8	4	21.16	21.16	21.15		
3	QPSK	8	7	21.12	21.12	21.07		
3	QPSK	15	0	21.11	21.16	21.14	21.5	1
3	16QAM	1	0	21.25	21.09	21.22		
3	16QAM	1	8	21.38	21.31	21.29		
3	16QAM	1	14	21.26	21.24	21.10	20.5	2
3	16QAM	8	0	20.13	20.17	20.13		
3	16QAM	8	4	20.24	20.23	20.14		
3	16QAM	8	7	20.21	20.20	20.08	20.5	2
3	16QAM	15	0	20.16	20.19	20.09		
3	64QAM	1	0	20.22	20.15	20.17		
3	64QAM	1	8	20.27	20.27	20.19	20.5	2
3	64QAM	1	14	20.26	20.26	20.11		
3	64QAM	8	0	19.11	19.17	19.19		
3	64QAM	8	4	19.23	19.23	19.24	19.5	3
3	64QAM	8	7	19.23	19.21	19.17		
3	64QAM	15	0	19.18	19.18	19.15		



Channel				23017	23095	23173	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				699.7	707.5	715.3		
1.4	QPSK	1	0	21.97	21.97	21.98	22.5	0
1.4	QPSK	1	3	22.08	22.13	22.14		
1.4	QPSK	1	5	21.95	22.00	22.00		
1.4	QPSK	3	0	22.06	22.07	22.10		
1.4	QPSK	3	1	22.11	22.12	22.15		
1.4	QPSK	3	3	22.07	22.15	22.15		
1.4	QPSK	6	0	21.07	21.10	21.12	21.5	1
1.4	16QAM	1	0	21.16	21.09	21.04	21.5	1
1.4	16QAM	1	3	21.27	21.24	21.18		
1.4	16QAM	1	5	21.15	21.14	21.05		
1.4	16QAM	3	0	20.99	20.95	20.94		
1.4	16QAM	3	1	21.04	21.01	20.99		
1.4	16QAM	3	3	21.02	21.00	20.96		
1.4	16QAM	6	0	20.18	20.19	20.10	20.5	2
1.4	64QAM	1	0	20.17	20.12	20.05	20.5	2
1.4	64QAM	1	3	20.26	20.25	20.11		
1.4	64QAM	1	5	20.21	20.19	20.01		
1.4	64QAM	3	0	20.15	20.18	20.06		
1.4	64QAM	3	1	20.23	20.22	20.08		
1.4	64QAM	3	3	20.18	20.21	20.04		
1.4	64QAM	6	0	19.09	19.11	19.12	19.5	3



<LTE Band 13>

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)	MPR (dB)
Channel				23230				
Frequency (MHz)				782				
10	QPSK	1	0		23.67		24	0
10	QPSK	1	25		23.89			
10	QPSK	1	49		23.66			
10	QPSK	25	0		22.79		23	1
10	QPSK	25	12		22.84			
10	QPSK	25	25		22.95			
10	QPSK	50	0		22.89		23	1
10	16QAM	1	0		22.65			
10	16QAM	1	25		22.94			
10	16QAM	1	49		22.69		22	2
10	16QAM	25	0		21.74			
10	16QAM	25	12		21.81			
10	16QAM	25	25		21.92		22	2
10	16QAM	50	0		21.86			
10	64QAM	1	0		21.63			
10	64QAM	1	25		21.89		22	2
10	64QAM	1	49		21.71			
10	64QAM	25	0		20.73			
10	64QAM	25	12		20.81		21	3
10	64QAM	25	25		20.92			
10	64QAM	50	0		20.86			



Channel				23205	23230	23255	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				779.5	782	784.5		
5	QPSK	1	0	23.59	23.54	23.52	24	0
5	QPSK	1	12	23.85	23.86	23.84		
5	QPSK	1	24	23.57	23.56	23.54		
5	QPSK	12	0	22.54	22.79	22.63	23	1
5	QPSK	12	7	22.75	22.78	22.74		
5	QPSK	12	13	22.69	22.79	22.78		
5	QPSK	25	0	22.60	22.81	22.72	23	1
5	16QAM	1	0	22.56	22.55	22.67		
5	16QAM	1	12	22.84	22.96	22.90		
5	16QAM	1	24	22.72	22.67	22.55	22	2
5	16QAM	12	0	21.46	21.75	21.61		
5	16QAM	12	7	21.66	21.76	21.70		
5	16QAM	12	13	21.62	21.77	21.74	22	2
5	16QAM	25	0	21.55	21.79	21.70		
5	64QAM	1	0	21.58	21.55	21.68		
5	64QAM	1	12	21.80	21.92	21.91	22	2
5	64QAM	1	24	21.69	21.70	21.60		
5	64QAM	12	0	20.49	20.82	20.64		
5	64QAM	12	7	20.71	20.79	20.74	21	3
5	64QAM	12	13	20.61	20.80	20.74		
5	64QAM	25	0	20.56	20.82	20.72		



<LTE Band 17>

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)	MPR (dB)
Channel				23780	23790	23800		
Frequency (MHz)				709	710	711		
10	QPSK	1	0	21.93	21.96	21.98	22.5	0
10	QPSK	1	25	22.13	22.26	22.17		
10	QPSK	1	49	22.05	22.03	22.09		
10	QPSK	25	0	21.33	21.22	21.10	21.5	1
10	QPSK	25	12	21.17	21.18	21.16		
10	QPSK	25	25	21.47	21.48	21.27		
10	QPSK	50	0	21.41	21.46	21.22	21.5	1
10	16QAM	1	0	21.00	21.03	21.06		
10	16QAM	1	25	21.27	21.35	21.36		
10	16QAM	1	49	21.21	21.15	21.11	20.5	2
10	16QAM	25	0	20.33	20.22	20.12		
10	16QAM	25	12	20.17	20.20	20.19		
10	16QAM	25	25	20.49	20.45	20.24	20.5	2
10	16QAM	50	0	20.42	20.38	20.24		
10	64QAM	1	0	20.29	20.46	20.06		
10	64QAM	1	25	20.49	20.40	20.16	20.5	2
10	64QAM	1	49	20.31	20.16	20.16		
10	64QAM	25	0	19.37	19.45	19.17		
10	64QAM	25	12	19.45	19.48	19.05	19.5	3
10	64QAM	25	25	19.32	19.45	19.12		
10	64QAM	50	0	19.30	19.42	18.99		



Channel				23755	23790	23825	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				706.5	710	713.5		
5	QPSK	1	0	21.87	21.93	21.88	22.5	0
5	QPSK	1	12	22.20	22.22	22.18		
5	QPSK	1	24	21.94	21.95	21.95		
5	QPSK	12	0	21.19	21.04	20.88	21.5	1
5	QPSK	12	7	21.10	21.09	21.08		
5	QPSK	12	13	21.07	21.23	21.05		
5	QPSK	25	0	21.16	21.20	20.94		
5	16QAM	1	0	20.96	21.07	21.12	21.5	1
5	16QAM	1	12	21.29	21.35	21.35		
5	16QAM	1	24	21.09	21.15	21.01		
5	16QAM	12	0	20.16	20.05	19.90	20.5	2
5	16QAM	12	7	20.09	20.11	20.03		
5	16QAM	12	13	20.07	20.26	19.99		
5	16QAM	25	0	20.15	20.23	19.89		
5	64QAM	1	0	20.30	20.50	20.08	20.5	2
5	64QAM	1	12	20.44	20.40	20.14		
5	64QAM	1	24	20.31	20.31	20.11		
5	64QAM	12	0	19.36	19.48	19.09	19.5	3
5	64QAM	12	7	19.46	19.43	19.20		
5	64QAM	12	13	19.39	19.42	19.32		
5	64QAM	25	0	19.37	19.43	18.94		



<LTE Band 66>

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)	MPR (dB)
Channel				132072	132322	132572		
Frequency (MHz)				1720	1745	1770		
20	QPSK	1	0	22.32	22.28	22.24	23	0
20	QPSK	1	49	22.45	22.48	22.42		
20	QPSK	1	99	22.14	22.12	22.12		
20	QPSK	50	0	21.48	21.51	21.49	22	1
20	QPSK	50	24	21.42	21.50	21.48		
20	QPSK	50	50	21.38	21.42	21.28		
20	QPSK	100	0	21.38	21.45	21.44	22	1
20	16QAM	1	0	21.60	21.65	21.60		
20	16QAM	1	49	21.74	21.82	21.72		
20	16QAM	1	99	21.48	21.48	21.42	21	2
20	16QAM	50	0	20.36	20.48	20.58		
20	16QAM	50	24	20.47	20.47	20.47		
20	16QAM	50	50	20.38	20.40	20.24	21	2
20	16QAM	100	0	20.35	20.45	20.42		
20	64QAM	1	0	20.55	20.51	20.49		
20	64QAM	1	49	20.69	20.71	20.65	21	2
20	64QAM	1	99	20.45	20.34	20.33		
20	64QAM	50	0	19.40	19.51	19.55		
20	64QAM	50	24	19.47	19.48	19.48	20	3
20	64QAM	50	50	19.38	19.42	19.25		
20	64QAM	100	0	19.36	19.45	19.40		



Channel				132047	132322	132597	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1717.5	1745	1772.5		
15	QPSK	1	0	22.40	22.33	22.30	23	0
15	QPSK	1	37	22.39	22.38	22.40		
15	QPSK	1	74	22.22	22.21	22.19		
15	QPSK	36	0	21.50	21.50	21.55	22	1
15	QPSK	36	20	21.48	21.49	21.48		
15	QPSK	36	39	21.46	21.48	21.41		
15	QPSK	75	0	21.46	21.47	21.47	22	1
15	16QAM	1	0	21.66	21.68	21.61		
15	16QAM	1	37	21.85	21.87	21.82		
15	16QAM	1	74	21.53	21.55	21.49	21	2
15	16QAM	36	0	20.43	20.47	20.50		
15	16QAM	36	20	20.45	20.46	20.43		
15	16QAM	36	39	20.42	20.44	20.35	21	2
15	16QAM	75	0	20.42	20.44	20.43		
15	64QAM	1	0	20.63	20.55	20.54		
15	64QAM	1	37	20.72	20.80	20.75	21	2
15	64QAM	1	74	20.47	20.47	20.43		
15	64QAM	36	0	19.50	19.51	19.55		
15	64QAM	36	20	19.50	19.50	19.47	20	3
15	64QAM	36	39	19.47	19.46	19.39		
15	64QAM	75	0	19.43	19.46	19.45		
Channel				132022	132322	132622	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1715	1745	1775		
10	QPSK	1	0	22.43	22.35	22.30	23	0
10	QPSK	1	25	22.40	22.43	22.45		
10	QPSK	1	49	22.26	22.27	22.25		
10	QPSK	25	0	21.49	21.50	21.56	22	1
10	QPSK	25	12	21.55	21.51	21.51		
10	QPSK	25	25	21.52	21.46	21.42		
10	QPSK	50	0	21.54	21.49	21.50	22	1
10	16QAM	1	0	21.71	21.70	21.58		
10	16QAM	1	25	21.86	21.81	21.76		
10	16QAM	1	49	21.59	21.62	21.56	21	2
10	16QAM	25	0	20.48	20.50	20.55		
10	16QAM	25	12	20.53	20.51	20.50		
10	16QAM	25	25	20.53	20.48	20.39	21	2
10	16QAM	50	0	20.53	20.50	20.46		
10	64QAM	1	0	20.61	20.60	20.55		
10	64QAM	1	25	20.76	20.74	20.72	21	2
10	64QAM	1	49	20.51	20.53	20.49		
10	64QAM	25	0	19.48	19.51	19.55		
10	64QAM	25	12	19.53	19.51	19.49	20	3
10	64QAM	25	25	19.53	19.50	19.39		
10	64QAM	50	0	19.53	19.50	19.48		



Channel				131997	132322	132647	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1712.5	1745	1777.5		
5	QPSK	1	0	22.35	22.27	22.27	23	0
5	QPSK	1	12	22.41	22.41	22.40		
5	QPSK	1	24	22.27	22.21	22.21		
5	QPSK	12	0	21.48	21.45	21.48	22	1
5	QPSK	12	7	21.55	21.54	21.50		
5	QPSK	12	13	21.51	21.43	21.40		
5	QPSK	25	0	21.50	21.45	21.45		
5	16QAM	1	0	21.62	21.61	21.52	22	1
5	16QAM	1	12	21.87	21.84	21.77		
5	16QAM	1	24	21.58	21.55	21.47		
5	16QAM	12	0	20.44	20.46	20.44	21	2
5	16QAM	12	7	20.51	20.48	20.46		
5	16QAM	12	13	20.49	20.42	20.38		
5	16QAM	25	0	20.46	20.46	20.43		
5	64QAM	1	0	20.55	20.51	20.49	21	2
5	64QAM	1	12	20.79	20.80	20.78		
5	64QAM	1	24	20.52	20.50	20.42		
5	64QAM	12	0	19.48	19.47	19.51	20	3
5	64QAM	12	7	19.56	19.54	19.52		
5	64QAM	12	13	19.52	19.46	19.42		
5	64QAM	25	0	19.48	19.47	19.45		
Channel				131987	132322	132657	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1711.5	1745	1778.5		
3	QPSK	1	0	22.44	22.38	22.38	23	0
3	QPSK	1	8	22.45	22.39	22.35		
3	QPSK	1	14	22.38	22.35	22.32		
3	QPSK	8	0	21.52	21.46	21.43	22	1
3	QPSK	8	4	21.59	21.49	21.48		
3	QPSK	8	7	21.49	21.45	21.45		
3	QPSK	15	0	21.52	21.45	21.45		
3	16QAM	1	0	21.72	21.71	21.64	22	1
3	16QAM	1	8	21.71	21.69	21.63		
3	16QAM	1	14	21.66	21.67	21.63		
3	16QAM	8	0	20.59	20.52	20.49	21	2
3	16QAM	8	4	20.62	20.55	20.51		
3	16QAM	8	7	20.55	20.51	20.45		
3	16QAM	15	0	20.49	20.46	20.44		
3	64QAM	1	0	20.64	20.62	20.57	21	2
3	64QAM	1	8	20.67	20.65	20.56		
3	64QAM	1	14	20.61	20.62	20.56		
3	64QAM	8	0	19.58	19.51	19.51	20	3
3	64QAM	8	4	19.61	19.54	19.50		
3	64QAM	8	7	19.55	19.50	19.47		
3	64QAM	15	0	19.52	19.47	19.44		



Channel				131979	132322	132665	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1710.7	1745	1779.3		
1.4	QPSK	1	0	22.44	22.37	22.35	23	0
1.4	QPSK	1	3	22.42	22.42	22.41		
1.4	QPSK	1	5	22.42	22.35	22.35		
1.4	QPSK	3	0	22.41	22.45	22.47		
1.4	QPSK	3	1	22.41	22.42	22.40		
1.4	QPSK	3	3	22.36	22.46	22.46		
1.4	QPSK	6	0	21.63	21.52	21.54	22	1
1.4	16QAM	1	0	21.74	21.71	21.59	22	1
1.4	16QAM	1	3	21.84	21.83	21.76		
1.4	16QAM	1	5	21.70	21.69	21.65		
1.4	16QAM	3	0	21.55	21.53	21.46		
1.4	16QAM	3	1	21.62	21.57	21.53		
1.4	16QAM	3	3	21.55	21.50	21.46		
1.4	16QAM	6	0	20.68	20.61	20.59	21	2
1.4	64QAM	1	0	20.64	20.62	20.57	21	2
1.4	64QAM	1	3	20.79	20.74	20.73		
1.4	64QAM	1	5	20.65	20.61	20.59		
1.4	64QAM	3	0	20.73	20.69	20.63		
1.4	64QAM	3	1	20.76	20.74	20.67		
1.4	64QAM	3	3	20.71	20.65	20.65		
1.4	64QAM	6	0	19.61	19.54	19.51	20	3

<LTE Carrier Aggregation>

General Note:

This device supports Carrier Aggregation on downlink for intra band. For the device supports bands and bandwidths and configurations are provided as follow table was according to 3GPP.

<Intra-Band Carrier Combination>

E-UTRA CA configuration / Bandwidth combination set							
E-UTRA CA configuration	Uplink CA configurations	Component carriers in order of increasing carrier frequency				Maximum aggregated bandwidth [MHz]	Bandwidth combination set
		Channel bandwidths for carrier [MHz]	Channel bandwidths for carrier [MHz]	Channel bandwidths for carrier [MHz]	Channel bandwidths for carrier [MHz]		
CA_2C	-	5	20			40	0
		10	15, 20				
		15	10, 15, 20				
		20	5, 10, 15, 20				
CA_5B	-	5, 10	10			20	0
		10	5				
		3	5			8	1
		5	3				
CA_7C	-	15	15			40	0
		20	20				
		10	20			40	1
		15	15, 20				
		20	10, 15, 20			40	2
		15	10, 15				
20	15, 20						
CA_66C	-	5	20			40	0
		10	15, 20				
		15	10, 15, 20				
		20	5, 10, 15, 20				

E-UTRA CA configuration / Bandwidth combination set							
E-UTRA CA configuration	Uplink CA configurations	Component carriers in order of increasing carrier frequency				Maximum aggregated bandwidth [MHz]	Bandwidth combination set
		Channel bandwidths for carrier [MHz]	Channel bandwidths for carrier [MHz]	Channel bandwidths for carrier [MHz]	Channel bandwidths for carrier [MHz]		
CA_2A-2A	-	5, 10, 15, 20	5, 10, 15, 20			40	0
CA_5A-5A	-	5,10	5,10			20	0
CA_7A-7A	-	5	15			40	0
		10	10, 15				
		15	15, 20				
		20	20				
		5, 10, 15, 20	5, 10, 15, 20			40	1
		5, 10, 15, 20	5, 10			30	2
10, 15, 20	10, 15, 20			40	3		
CA_12A-12A	-	5	5			10	0
CA_66A-66A	-	5, 10, 15, 20	5, 10, 15, 20			40	0



<DL CA power measurement>

General Note:

- 1. This device supports Carrier Aggregation on downlink for intra band. For the device supports bands and bandwidths and configurations are provided as follow table was according to 3GPP.
- 2. In applying the existing power measurement procedures of KDB 941225 D05A for DL CA SAR test exclusion, only the subset with the largest number of combinations of frequency bands and CCs in each row need combination, and for this device that all the configurations were choose to power measurement.

Index	2CC	Restriction	Completely Covered by Measurement Superset
2CC #1	CA_2A-2A		No
2CC #2	CA_5A-5A		No
2CC #3	CA_7A-7A		No
2CC #4	CA_12A-12A		No
2CC #5	CA_66A-66A		No
2CC #6	CA_2C		No
2CC #7	CA_5B		No
2CC #8	CA_7C		No
2CC #9	CA_66C		No

LTE Carrier Aggregation Conducted Power (Downlink)

General Note:

- i. According to KDB941225 D05A v01r02, Uplink maximum output power measurement with downlink carrier aggregation active should be measured, using the highest output channel measured without downlink carrier aggregation, to confirm that uplink maximum output power with downlink carrier aggregation active remains within the specified tune-up tolerance limits and not more than ¼ dB higher than the maximum output measured without downlink carrier aggregation active.
- ii. Uplink maximum output power with downlink carrier aggregation active does not show more than ¼ dB higher than the maximum output power without downlink carrier aggregation active, therefore SAR evaluation with downlink carrier aggregation active can be excluded.
- iii. The device supports downlink carrier aggregation only. Uplink carrier aggregation is not supported. For power measurement were control and acknowledge data is sent on uplink channels that operate identical to specifications when downlink carrier aggregation is inactive.
- iv. Selected highest measured power when downlink carrier aggregation is inactive for conducted power comparison with downlink carrier aggregation is active, to confirm that when downlink carrier aggregation is active uplink maximum output power remains within the specified tune-up tolerance limits and not more than ¼ dB higher than the maximum output power measured when downlink carrier aggregation inactive.
- v. For non-contiguous intra-band CA, the SCC selected to provide maximum separation from the PCC and must remain fully within the downlink transmission band. For SCC DL RB size and offset will base on the PCC corresponding RB allocation.
- vi. For Intra-band, contiguous CA, the downlink channels selected to perform the uplink power measurement must satisfy 3GPP channel spacing (5.4.1A of 3GPP TS 36.521 or equivalent) and channel bandwidth (5.4.2A) requirements.

$$\text{Nominal channel spacing} = \left\lceil \frac{BW_{\text{Channel}(1)} + BW_{\text{Channel}(2)} - 0.1|BW_{\text{Channel}(1)} - BW_{\text{Channel}(2)}|}{0.6} \right\rceil 0.3 \text{ [MHz]}$$

<Two Carrier power verification>

Configure		CA List	PCC							SCC				Power	
			LTE Band	BW (MHz)	UL Freq. (MHz)	UL Channel	Mod.	UL # RB	UL RB Offset	LTE Band	BW (MHz)	DL Freq. (MHz)	DL Channel	With CA Tx. Power (dBm)	Without CA Tx. Power (dBm)
Intra-Band	Contiguous	CA_2C	Band 2	20M	1880	18900	QPSK	1	49	Band 2	20M	1979.8	1098	23.17	23.19
		CA_5B	Band 5	10M	836.5	20525	QPSK	1	25	Band 5	10M	891.4	2624	22.74	22.79
		CA_7C	Band 7	20M	2535	21100	QPSK	1	49	Band 7	20M	2674.8	3298	23.11	23.12
		CA_66C	Band 66	20M	1745	132322	QPSK	1	49	Band 66	20M	2174.8	67084	22.46	22.48
	Non-Contiguous	CA_2A-2A	Band 2	20M	1880	18900	QPSK	1	49	Band 2	5M	1987.5	1175	23.15	23.19
		CA_5A-5A	Band 5	10M	836.5	20525	QPSK	1	25	Band 5	5M	891.5	2625	23.71	22.79
		CA_7A-7A	Band 7	20M	2535	21100	QPSK	1	49	Band 7	5M	2687.5	3425	23.09	23.12
		CA_12A-12A	Band 12	10M	707.5	23095	QPSK	1	25	Band 12	5M	743.5	5155	22.14	22.27
		CA_66A-66A	Band 66	20M	1745	132322	QPSK	1	49	Band 66	5M	2197.5	67311	22.42	22.48



<WLAN Conducted Power>

General Note:

3. 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.
4. 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).
5. 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.
6. 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.



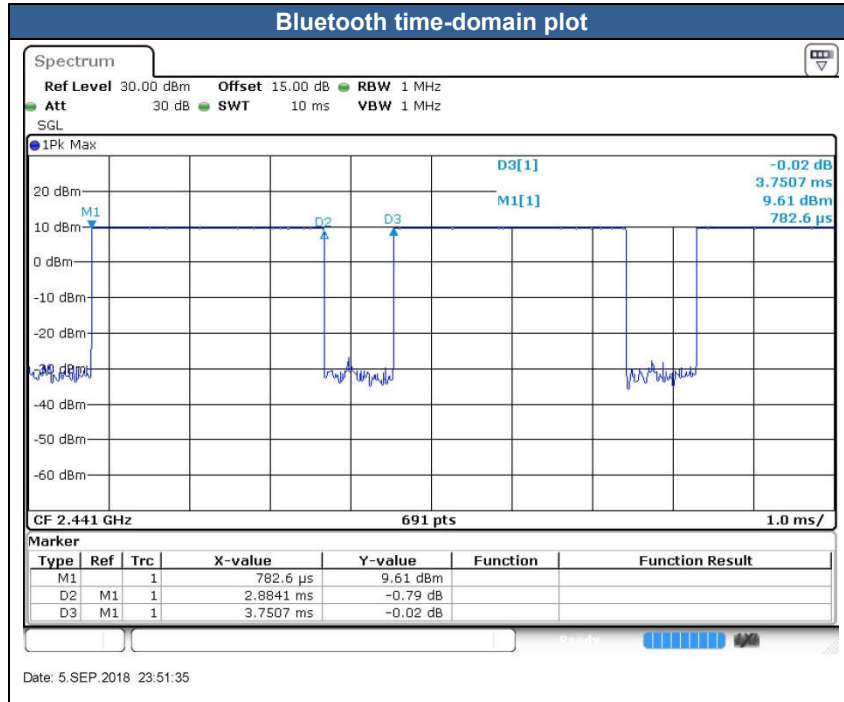
<2.4GHz WLAN ANT>

	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %
2.4GHz WLAN	802.11b 1Mbps	1	2412	14.18	15.00	99.31
		6	2437	17.12	17.50	
		11	2462	16.54	17.50	
	802.11g 6Mbps	1	2412	14.94	16.00	97.17
		6	2437	15.40	16.00	
		11	2462	15.46	16.00	
	802.11n-HT20 MCS0	1	2412	14.43	15.00	96.56
		6	2437	14.79	15.00	
		11	2462	14.83	15.00	
	802.11n-HT40 MCS0	3	2422	13.19	14.00	93.73
		6	2437	14.96	15.50	
		9	2452	13.60	14.00	

<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 is 76.89 % as following figure, according to 2016 Oct. TCB workshop for 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



Mode	Channel	Frequency (MHz)	Data Rate
			1Mbps
BR/EDR	CH 00	2402	7.88
	CH 39	2441	8.12
	CH 78	2480	8.12
Tune-up Limit			8.50

Mode	Channel	Frequency (MHz)	Average power (dBm)
			GFSK
LE	CH 00	2402	-2.06
	CH 19	2440	-1.06
	CH 39	2480	-2.12
Tune-up Limit			0.50

13. Bluetooth Exclusions Applied

Mode Band	Max Average power(dBm)	
	BR/EDR	LE
2.4GHz Bluetooth	8.50	0.50

Note:

Per KDB 447498 D01v06, the 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at *test separation distances* ≤ 50 mm are determined by:

$$[(\text{max. power of channel, including tune-up tolerance, mW}) / (\text{min. test separation distance, mm})] \cdot [\sqrt{f(\text{GHz})}] \leq 3.0 \text{ for 1-g SAR and } \leq 7.5 \text{ for 10-g extremity SAR}$$

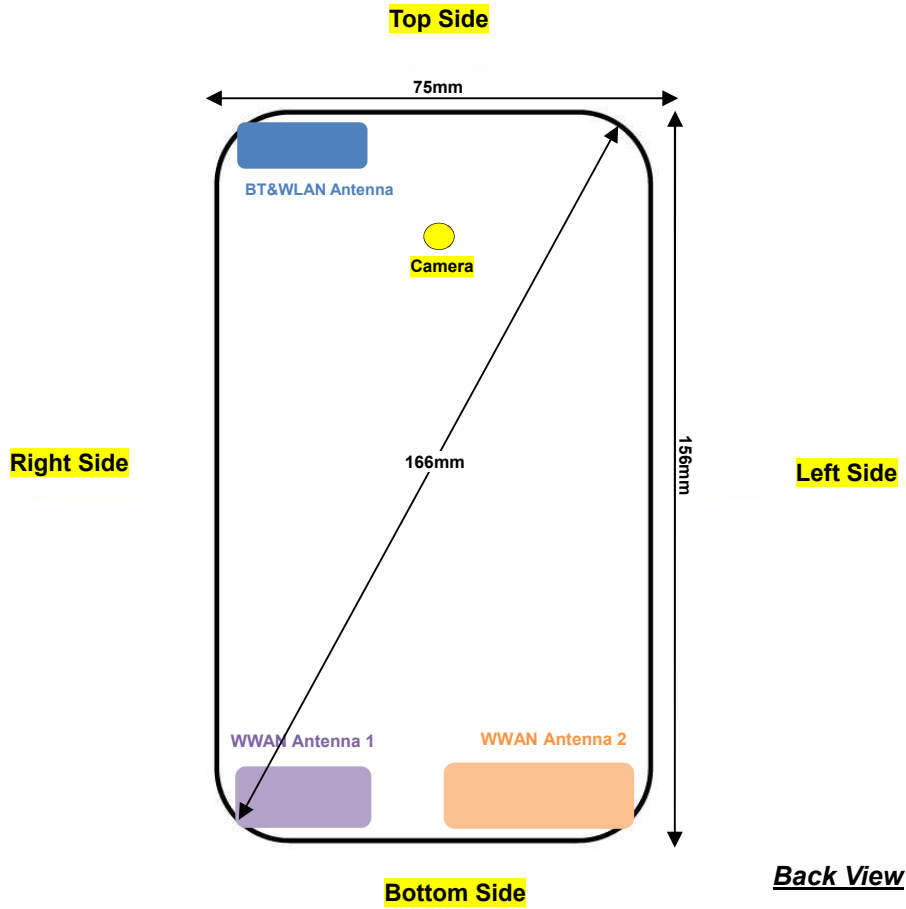
- f(GHz) is the RF channel transmit frequency in GHz
- Power and distance are rounded to the nearest mW and mm before calculation
- The result is rounded to one decimal place for comparison

Bluetooth Max Power (dBm)	Frequency (GHz)	Separation Distance (mm)	Exclusion Thresholds
8.50	2.48	10	1.1

Note:

Per KDB 447498 D01v06, a distance of 10 mm is applied to determine 1g SAR test exclusion. The test exclusion threshold is 1.1 which is ≤ 3, Hotspot SAR testing is not required.

14. Antenna Location



Antenna	Support Band
WWAN Antenna 1	LTE: B7
WWAN Antenna 2	GSM850/1900 WCDMA Band II / IV / V LTE: B2 / B4 / B5 / B12 / B13 / B17 / B66
Bluetooth & WLAN Antenna	Bluetooth, WLAN 2.4GHz



Distance of the Antenna to the EUT surface/edge						
Antennas	Back	Front	Top Side	Bottom Side	Right Side	Left Side
WWAN Antenna 1	≤ 25mm	≤ 25mm	>25mm	≤ 25mm	≤ 25mm	>25mm
WWAN Antenna 2	≤ 25mm	≤ 25mm	>25mm	≤ 25mm	>25mm	≤ 25mm
BT&WLAN Antenna	≤ 25mm	≤ 25mm	≤ 25mm	>25mm	≤ 25mm	>25mm

Positions for SAR tests; Hotspot mode						
Antennas	Back	Front	Top Side	Bottom Side	Right Side	Left Side
WWAN Antenna 1	Yes	Yes	No	Yes	Yes	No
WWAN Antenna 2	Yes	Yes	No	Yes	No	Yes
BT&WLAN Antenna	Yes	Yes	Yes	No	Yes	No

General Note:

- Referring to KDB 941225 D06 v02r01, when the overall device length and width are ≥ 9cm*5cm, the test distance is 10 mm. SAR must be measured for all sides and surfaces with a transmitting antenna located within 25mm from that surface or edge



15. SAR Test Results

General Note:

1. Per KDB 447498 D01v06, the reported SAR is the measured SAR value adjusted for maximum tune-up tolerance.
 - a. Tune-up scaling Factor = tune-up limit power (mW) / EUT RF power (mW), where tune-up limit is the maximum rated power among all production units.
 - b. For SAR testing of WLAN signal with non-100% duty cycle, the measured SAR is scaled-up by the duty cycle scaling factor which is equal to "1/(duty cycle)"
 - c. For WWAN: Reported SAR(W/kg)= Measured SAR(W/kg)*Tune-up Scaling Factor
 - d. For WLAN/Bluetooth: Reported SAR(W/kg)= Measured SAR(W/kg)* Duty Cycle scaling factor * Tune-up scaling factor
2. Per KDB 447498 D01v06, for each exposure position, testing of other required channels within the operating mode of a frequency band is not required when the *reported* 1-g or 10-g SAR for the mid-band or highest output power channel is:
 - ≤ 0.8 W/kg or 2.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≤ 100 MHz
 - ≤ 0.6 W/kg or 1.5 W/kg, for 1-g or 10-g respectively, when the transmission band is between 100 MHz and 200 MHz
 - ≤ 0.4 W/kg or 1.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≥ 200 MHz
3. Per KDB 865664 D01v01r04, for each frequency band, repeated SAR measurement is required only when the measured SAR is ≥ 0.8 W/kg.
4. Per KDB 648474 D04v01r03, when the reported SAR for a body-worn accessory measured without a headset connected to the handset is ≤ 1.2 W/kg, SAR testing with a headset connected to the handset is not required.
5. Per KDB648474 D04v01r03, for smart phones with a display diagonal dimension > 15 cm or an overall diagonal dimension > 16 cm, when hotspot mode applies, 10-g product specific SAR is required only for the surfaces and edges with hotspot mode 1-g reported SAR > 1.2 W/kg, in this report all the hotspot mode results are < 1.2 W/kg.

GSM Note:

1. Per KDB 941225 D01v03r01, for SAR test reduction for GSM / GPRS / EDGE modes is determined by the source-based time-averaged output power including tune-up tolerance. The mode with highest specified time-averaged output power should be tested for SAR compliance in the applicable exposure conditions. For modes with the same specified maximum output power and tolerance, the higher number time-slot configuration should be tested. Therefore, the GPRS (4Tx slots) for GSM850/ GSM1900 is considered as the primary mode.
2. Other configurations of GSM / GPRS / EDGE are considered as secondary modes. The 3G SAR test reduction procedure is applied, when the maximum output power and tune-up tolerance specified for production units in a secondary mode is $\leq \frac{1}{4}$ dB higher than the primary mode, SAR measurement is not required for the secondary mode.

UMTS 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 / DC-HSDPA / HSPA+ 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 / DC-HSDPA / HSPA+ to RMC12.2Kbps and the adjusted SAR is ≤ 1.2 W/kg, SAR measurement is not required for HSDPA / HSUPA / DC-HSDPA / HSPA+, and according to the following RF output power, the output power results of the secondary modes (HSUPA, HSDPA, DC-HSDPA, HSPA+) are less than $\frac{1}{4}$ dB higher than the primary modes; therefore, SAR measurement is not required for HSDPA / HSUPA / DC-HSDPA / HSPA+.

LTE Note:

1. Per KDB 941225 D05v02r05, start with the largest channel bandwidth and measure SAR for QPSK with 1 RB allocation, using the RB offset and required test channel combination with the highest maximum output power for RB offsets at the upper edge, middle and lower edge of each required test channel.
2. Per KDB 941225 D05v02r05, 50% RB allocation for QPSK SAR testing follows 1RB QPSK allocation procedure.
3. Per KDB 941225 D05v02r05, For QPSK with 100% RB allocation, SAR is not required when the highest maximum output power for 100 % RB allocation is less than the highest maximum output power in 50% and 1 RB allocations and the highest reported SAR for 1 RB and 50% RB allocation are ≤ 0.8 W/kg. Otherwise, SAR is measured for the highest output power channel; and if the reported SAR is > 1.45 W/kg, the remaining required test channels must also be tested.
4. Per KDB 941225 D05v02r05, 16QAM output power for each RB allocation configuration is $>$ not $\frac{1}{2}$ dB higher than the same configuration in QPSK and the reported SAR for the QPSK configuration is ≤ 1.45 W/kg; Per KDB 941225 D05v02r05, 16QAM SAR testing is not required.
5. Per KDB 941225 D05v02r05, Smaller bandwidth output power for each RB allocation configuration is $>$ not $\frac{1}{2}$ dB higher than the same configuration in the largest supported bandwidth, and the reported SAR for the largest supported bandwidth is ≤ 1.45 W/kg; Per KDB 941225 D05v02r05, smaller bandwidth SAR testing is not required.
6. For LTE B4 / B5 / B12 / B17 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 B17 SAR test was covered by B12; according to TCB workshop, SAR test for overlapping LTE bands can be reduced if
 - a. The maximum output power, including tolerance, for the smaller band is \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 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. 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.
3. 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.
4. During SAR testing the WLAN transmission was verified using a spectrum analyzer.



15.1 Head SAR

<GSM SAR>

Plot No.	Band	Mode	Test Position	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)
	GSM850	GPRS(4 Tx slots)	Right Cheek	251	848.8	28.85	29.00	1.035	0.05	0.196	0.203
	GSM850	GPRS(4 Tx slots)	Right Tilted	251	848.8	28.85	29.00	1.035	0.02	0.129	0.134
01	GSM850	GPRS(4 Tx slots)	Left Cheek	251	848.8	28.85	29.00	1.035	0.04	0.310	0.321
	GSM850	GPRS(4 Tx slots)	Left Tilted	251	848.8	28.85	29.00	1.035	0.03	0.152	0.157
	GSM1900	GPRS(4 Tx slots)	Right Cheek	810	1909.8	26.32	26.50	1.042	0.06	0.056	0.058
	GSM1900	GPRS(4 Tx slots)	Right Tilted	810	1909.8	26.32	26.50	1.042	0.03	0.050	0.052
02	GSM1900	GPRS(4 Tx slots)	Left Cheek	810	1909.8	26.32	26.50	1.042	0.06	0.116	0.121
	GSM1900	GPRS(4 Tx slots)	Left Tilted	810	1909.8	26.32	26.50	1.042	0.02	0.053	0.055

<WCDMA SAR>

Plot No.	Band	Mode	Test Position	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)
	WCDMA Band V	RMC 12.2Kbps	Right Cheek	4132	826.4	23.41	23.50	1.021	0.02	0.177	0.181
	WCDMA Band V	RMC 12.2Kbps	Right Tilted	4132	826.4	23.41	23.50	1.021	0.04	0.104	0.106
03	WCDMA Band V	RMC 12.2Kbps	Left Cheek	4132	826.4	23.41	23.50	1.021	0.07	0.247	0.252
	WCDMA Band V	RMC 12.2Kbps	Left Tilted	4132	826.4	23.41	23.50	1.021	0.01	0.125	0.128
	WCDMA Band IV	RMC 12.2Kbps	Right Cheek	1413	1732.6	24.28	24.50	1.052	0.05	0.135	0.142
	WCDMA Band IV	RMC 12.2Kbps	Right Tilted	1413	1732.6	24.28	24.50	1.052	0.02	0.095	0.100
04	WCDMA Band IV	RMC 12.2Kbps	Left Cheek	1413	1732.6	24.28	24.50	1.052	0.14	0.154	0.162
	WCDMA Band IV	RMC 12.2Kbps	Left Tilted	1413	1732.6	24.28	24.50	1.052	0.04	0.098	0.103
	WCDMA Band II	RMC 12.2Kbps	Right Cheek	9538	1907.6	22.99	23.50	1.125	0.06	0.062	0.070
	WCDMA Band II	RMC 12.2Kbps	Right Tilted	9538	1907.6	22.99	23.50	1.125	0.02	0.041	0.046
05	WCDMA Band II	RMC 12.2Kbps	Left Cheek	9538	1907.6	22.99	23.50	1.125	0.09	0.087	0.098
	WCDMA Band II	RMC 12.2Kbps	Left Tilted	9538	1907.6	22.99	23.50	1.125	0.07	0.042	0.047



<LTE SAR>

Plot No.	Band	BW (MHz)	Modulation	RB Size	RB Offset	Test Position	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)
	LTE Band 12	10M	QPSK	1	25	Right Cheek	23095	707.5	22.27	22.50	1.054	0.02	0.064	0.067
	LTE Band 12	10M	QPSK	1	25	Right Tilted	23095	707.5	22.27	22.50	1.054	0.04	0.021	0.022
06	LTE Band 12	10M	QPSK	1	25	Left Cheek	23095	707.5	22.27	22.50	1.054	0.08	0.074	0.078
	LTE Band 12	10M	QPSK	1	25	Left Tilted	23095	707.5	22.27	22.50	1.054	0.03	0.048	0.051
	LTE Band 12	10M	QPSK	25	25	Right Cheek	23095	707.5	21.36	21.50	1.033	0.05	0.061	0.063
	LTE Band 12	10M	QPSK	25	25	Right Tilted	23095	707.5	21.36	21.50	1.033	0.01	0.012	0.012
	LTE Band 12	10M	QPSK	25	25	Left Cheek	23095	707.5	21.36	21.50	1.033	0.06	0.068	0.070
	LTE Band 12	10M	QPSK	25	25	Left Tilted	23095	707.5	21.36	21.50	1.033	0.02	0.038	0.039
	LTE Band 13	10M	QPSK	1	25	Right Cheek	23230	782	23.89	24.00	1.026	0.02	0.115	0.118
	LTE Band 13	10M	QPSK	1	25	Right Tilted	23230	782	23.89	24.00	1.026	0.06	0.055	0.056
07	LTE Band 13	10M	QPSK	1	25	Left Cheek	23230	782	23.89	24.00	1.026	0.06	0.188	0.193
	LTE Band 13	10M	QPSK	1	25	Left Tilted	23230	782	23.89	24.00	1.026	0.05	0.077	0.079
	LTE Band 13	10M	QPSK	25	25	Right Cheek	23230	782	22.95	23.00	1.012	0.01	0.085	0.086
	LTE Band 13	10M	QPSK	25	25	Right Tilted	23230	782	22.95	23.00	1.012	-0.02	0.039	0.039
	LTE Band 13	10M	QPSK	25	25	Left Cheek	23230	782	22.95	23.00	1.012	0.03	0.159	0.161
	LTE Band 13	10M	QPSK	25	25	Left Tilted	23230	782	22.95	23.00	1.012	0.01	0.056	0.057
	LTE Band 5	10M	QPSK	1	25	Right Cheek	20525	836.5	22.79	23.00	1.050	0.03	0.144	0.151
	LTE Band 5	10M	QPSK	1	25	Right Tilted	20525	836.5	22.79	23.00	1.050	0.07	0.074	0.078
08	LTE Band 5	10M	QPSK	1	25	Left Cheek	20525	836.5	22.79	23.00	1.050	0.06	0.260	0.273
	LTE Band 5	10M	QPSK	1	25	Left Tilted	20525	836.5	22.79	23.00	1.050	0.05	0.097	0.102
	LTE Band 5	10M	QPSK	25	0	Right Cheek	20525	836.5	21.83	22.00	1.040	0.02	0.120	0.125
	LTE Band 5	10M	QPSK	25	0	Right Tilted	20525	836.5	21.83	22.00	1.040	0.1	0.061	0.063
	LTE Band 5	10M	QPSK	25	0	Left Cheek	20525	836.5	21.83	22.00	1.040	0.05	0.219	0.228
	LTE Band 5	10M	QPSK	25	0	Left Tilted	20525	836.5	21.83	22.00	1.040	0.01	0.083	0.086
	LTE Band 4	20M	QPSK	1	49	Right Cheek	20175	1732.5	22.46	23.00	1.132	0.05	0.114	0.129
	LTE Band 4	20M	QPSK	1	49	Right Tilted	20175	1732.5	22.46	23.00	1.132	0.06	0.065	0.074
09	LTE Band 4	20M	QPSK	1	49	Left Cheek	20175	1732.5	22.46	23.00	1.132	0.05	0.149	0.169
	LTE Band 4	20M	QPSK	1	49	Left Tilted	20175	1732.5	22.46	23.00	1.132	0.03	0.071	0.080
	LTE Band 4	20M	QPSK	50	24	Right Cheek	20175	1732.5	21.51	22.00	1.119	0.02	0.082	0.092
	LTE Band 4	20M	QPSK	50	24	Right Tilted	20175	1732.5	21.51	22.00	1.119	0.01	0.063	0.071
	LTE Band 4	20M	QPSK	50	24	Left Cheek	20175	1732.5	21.51	22.00	1.119	-0.05	0.121	0.135
	LTE Band 4	20M	QPSK	50	24	Left Tilted	20175	1732.5	21.51	22.00	1.119	0.06	0.058	0.065
	LTE Band 66	20M	QPSK	1	49	Right Cheek	132322	1745	22.48	23.00	1.127	0.02	0.081	0.091
	LTE Band 66	20M	QPSK	1	49	Right Tilted	132322	1745	22.48	23.00	1.127	0.06	0.071	0.080
10	LTE Band 66	20M	QPSK	1	49	Left Cheek	132322	1745	22.48	23.00	1.127	0.01	0.170	0.192
	LTE Band 66	20M	QPSK	1	49	Left Tilted	132322	1745	22.48	23.00	1.127	0.01	0.060	0.068
	LTE Band 66	20M	QPSK	50	0	Right Cheek	132322	1745	21.51	22.00	1.119	0.05	0.076	0.085
	LTE Band 66	20M	QPSK	50	0	Right Tilted	132322	1745	21.51	22.00	1.119	0.09	0.047	0.053
	LTE Band 66	20M	QPSK	50	0	Left Cheek	132322	1745	21.51	22.00	1.119	0.03	0.133	0.149
	LTE Band 66	20M	QPSK	50	0	Left Tilted	132322	1745	21.51	22.00	1.119	0.04	0.039	0.044
	LTE Band 2	20M	QPSK	1	49	Right Cheek	19100	1900	23.19	23.50	1.074	0.05	0.057	0.061
	LTE Band 2	20M	QPSK	1	49	Right Tilted	19100	1900	23.19	23.50	1.074	0.01	0.046	0.049
11	LTE Band 2	20M	QPSK	1	49	Left Cheek	19100	1900	23.19	23.50	1.074	0.01	0.107	0.115
	LTE Band 2	20M	QPSK	1	49	Left Tilted	19100	1900	23.19	23.50	1.074	0.02	0.047	0.050
	LTE Band 2	20M	QPSK	50	24	Right Cheek	19100	1900	22.15	22.50	1.084	0.05	0.044	0.048
	LTE Band 2	20M	QPSK	50	24	Right Tilted	19100	1900	22.15	22.50	1.084	0.05	0.031	0.034



	LTE Band 2	20M	QPSK	50	24	Left Cheek	19100	1900	22.15	22.50	1.084	0.01	0.082	0.089
	LTE Band 2	20M	QPSK	50	24	Left Tilted	19100	1900	22.15	22.50	1.084	0.07	0.039	0.042
12	LTE Band 7	20M	QPSK	1	49	Right Cheek	21100	2535	23.12	23.50	1.091	0.07	0.671	0.732
	LTE Band 7	20M	QPSK	1	49	Right Tilted	21100	2535	23.12	23.50	1.091	0.03	0.212	0.231
	LTE Band 7	20M	QPSK	1	49	Left Cheek	21100	2535	23.12	23.50	1.091	0.03	0.396	0.432
	LTE Band 7	20M	QPSK	1	49	Left Tilted	21100	2535	23.12	23.50	1.091	0.01	0.345	0.377
	LTE Band 7	20M	QPSK	50	24	Right Cheek	21100	2535	22.16	22.50	1.081	0.05	0.468	0.506
	LTE Band 7	20M	QPSK	50	24	Right Tilted	21100	2535	22.16	22.50	1.081	0.01	0.167	0.181
	LTE Band 7	20M	QPSK	50	24	Left Cheek	21100	2535	22.16	22.50	1.081	-0.05	0.277	0.300
	LTE Band 7	20M	QPSK	50	24	Left Tilted	21100	2535	22.16	22.50	1.081	0.04	0.294	0.318

<WLAN SAR>

Plot No.	Band	Mode	Test Position	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	Right Cheek	6	2437	17.12	17.50	1.091	99.31	1.007	-0.07	0.214	0.235
	WLAN2.4GHz	802.11b 1Mbps	Right Tilted	6	2437	17.12	17.50	1.091	99.31	1.007	0.01	0.199	0.219
13	WLAN2.4GHz	802.11b 1Mbps	Left Cheek	6	2437	17.12	17.50	1.091	99.31	1.007	-0.02	0.598	0.657
	WLAN2.4GHz	802.11b 1Mbps	Left Tilted	6	2437	17.12	17.50	1.091	99.31	1.007	-0.03	0.499	0.548

<Bluetooth SAR>

Plot No.	Band	Mode	Test Position	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)
14	Bluetooth	1Mbps	Left Cheek	78	2480	8.12	8.50	1.091	76.89	1.083	0.04	0.030	0.035
	Bluetooth	1Mbps	Left Cheek	0	2402	7.88	8.50	1.153	76.89	1.083	-0.02	0.026	0.033
	Bluetooth	1Mbps	Left Cheek	39	2441	8.12	8.50	1.091	76.89	1.083	-0.05	0.027	0.032

Note: Based on WLAN2.4GHz and Bluetooth share the same antenna, so Bluetooth RF exposure evaluation chose the worst position of WLAN 2.4GHz antenna to perform Bluetooth SAR test, and used this Bluetooth SAR value conservatively represent other position do co-located analysis with WWAN.



15.2 Hotspot SAR

<GSM SAR>

Plot No.	Band	Mode	Test Position	Gap (mm)	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	GSM850	GPRS(4 Tx slots)	Front	10	251	848.8	28.85	29.00	1.035	0.03	0.330	0.342
	GSM850	GPRS(4 Tx slots)	Back	10	251	848.8	28.85	29.00	1.035	0.05	0.282	0.292
	GSM850	GPRS(4 Tx slots)	Left Side	10	251	848.8	28.85	29.00	1.035	0.01	0.274	0.284
	GSM850	GPRS(4 Tx slots)	Right Side	10	251	848.8	28.85	29.00	1.035	0.02	0.153	0.158
15	GSM850	GPRS(4 Tx slots)	Bottom Side	10	251	848.8	28.85	29.00	1.035	0.02	0.358	0.371
	GSM1900	GPRS(4 Tx slots)	Front	10	810	1909.8	26.32	26.50	1.042	0.05	0.539	0.562
	GSM1900	GPRS(4 Tx slots)	Back	10	810	1909.8	26.32	26.50	1.042	0.02	0.805	0.839
	GSM1900	GPRS(4 Tx slots)	Left Side	10	810	1909.8	26.32	26.50	1.042	0.09	0.111	0.116
	GSM1900	GPRS(4 Tx slots)	Right Side	10	810	1909.8	26.32	26.50	1.042	0.04	0.050	0.052
	GSM1900	GPRS(4 Tx slots)	Bottom Side	10	810	1909.8	26.32	26.50	1.042	-0.05	0.736	0.767
	GSM1900	GPRS(4 Tx slots)	Back	10	512	1850.2	26.01	26.50	1.119	0.03	0.670	0.750
16	GSM1900	GPRS(4 Tx slots)	Back	10	661	1880	26.29	26.50	1.050	0.07	0.802	0.842

<WCDMA SAR>

Plot No.	Band	Mode	Test Position	Gap (mm)	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	WCDMA Band V	RMC 12.2Kbps	Front	10	4132	826.4	23.41	23.50	1.021	0.07	0.285	0.291
	WCDMA Band V	RMC 12.2Kbps	Back	10	4132	826.4	23.41	23.50	1.021	0.08	0.277	0.283
	WCDMA Band V	RMC 12.2Kbps	Left Side	10	4132	826.4	23.41	23.50	1.021	0.04	0.221	0.226
	WCDMA Band V	RMC 12.2Kbps	Right Side	10	4132	826.4	23.41	23.50	1.021	0.06	0.152	0.155
17	WCDMA Band V	RMC 12.2Kbps	Bottom Side	10	4132	826.4	23.41	23.50	1.021	0.02	0.317	0.324
	WCDMA Band IV	RMC 12.2Kbps	Front	10	1413	1732.6	24.28	24.50	1.052	0.05	0.788	0.829
	WCDMA Band IV	RMC 12.2Kbps	Back	10	1413	1732.6	24.28	24.50	1.052	0.04	0.830	0.873
	WCDMA Band IV	RMC 12.2Kbps	Left Side	10	1413	1732.6	24.28	24.50	1.052	-0.05	0.181	0.190
	WCDMA Band IV	RMC 12.2Kbps	Right Side	10	1413	1732.6	24.28	24.50	1.052	0.06	0.101	0.106
	WCDMA Band IV	RMC 12.2Kbps	Bottom Side	10	1413	1732.6	24.28	24.50	1.052	0.03	0.784	0.825
	WCDMA Band IV	RMC 12.2Kbps	Front	10	1312	1712.4	24.23	24.50	1.064	0.01	0.618	0.658
	WCDMA Band IV	RMC 12.2Kbps	Front	10	1513	1752.6	24.19	24.50	1.074	0.02	0.874	0.939
	WCDMA Band IV	RMC 12.2Kbps	Back	10	1312	1712.4	24.23	24.50	1.064	0.01	0.642	0.683
18	WCDMA Band IV	RMC 12.2Kbps	Back	10	1513	1752.6	24.19	24.50	1.074	0.01	0.955	1.026
	WCDMA Band IV	RMC 12.2Kbps	Bottom Side	10	1312	1712.4	24.23	24.50	1.064	0.02	0.603	0.642
	WCDMA Band IV	RMC 12.2Kbps	Bottom Side	10	1513	1752.6	24.19	24.50	1.074	0.09	0.934	1.003
	WCDMA Band II	RMC 12.2Kbps	Front	10	9538	1907.6	22.99	23.50	1.125	0.05	0.463	0.521
19	WCDMA Band II	RMC 12.2Kbps	Back	10	9538	1907.6	22.99	23.50	1.125	0.09	0.642	0.722
	WCDMA Band II	RMC 12.2Kbps	Left Side	10	9538	1907.6	22.99	23.50	1.125	0.06	0.098	0.110
	WCDMA Band II	RMC 12.2Kbps	Right Side	10	9538	1907.6	22.99	23.50	1.125	0.01	0.003	0.003
	WCDMA Band II	RMC 12.2Kbps	Bottom Side	10	9538	1907.6	22.99	23.50	1.125	0.04	0.537	0.604



<LTE SAR>

Plot No.	Band	BW (MHz)	Modulation	RB Size	RB offset	Test Position	Gap (mm)	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	LTE Band 12	10M	QPSK	1	25	Front	10	23095	707.5	22.27	22.50	1.054	0.07	0.113	0.119
	LTE Band 12	10M	QPSK	1	25	Back	10	23095	707.5	22.27	22.50	1.054	0.06	0.127	0.134
20	LTE Band 12	10M	QPSK	1	25	Left Side	10	23095	707.5	22.27	22.50	1.054	0.09	0.163	0.172
	LTE Band 12	10M	QPSK	1	25	Right Side	10	23095	707.5	22.27	22.50	1.054	0.02	0.100	0.105
	LTE Band 12	10M	QPSK	1	25	Bottom Side	10	23095	707.5	22.27	22.50	1.054	0.04	0.074	0.078
	LTE Band 12	10M	QPSK	25	25	Front	10	23095	707.5	21.36	21.50	1.033	-0.02	0.093	0.096
	LTE Band 12	10M	QPSK	25	25	Back	10	23095	707.5	21.36	21.50	1.033	0.05	0.116	0.120
	LTE Band 12	10M	QPSK	25	25	Left Side	10	23095	707.5	21.36	21.50	1.033	0.01	0.128	0.132
	LTE Band 12	10M	QPSK	25	25	Right Side	10	23095	707.5	21.36	21.50	1.033	0.05	0.080	0.083
	LTE Band 12	10M	QPSK	25	25	Bottom Side	10	23095	707.5	21.36	21.50	1.033	0.03	0.057	0.059
	LTE Band 13	10M	QPSK	1	25	Front	10	23230	782	23.89	24.00	1.026	0.05	0.203	0.208
21	LTE Band 13	10M	QPSK	1	25	Back	10	23230	782	23.89	24.00	1.026	0.09	0.213	0.218
	LTE Band 13	10M	QPSK	1	25	Left Side	10	23230	782	23.89	24.00	1.026	0.06	0.161	0.165
	LTE Band 13	10M	QPSK	1	25	Right Side	10	23230	782	23.89	24.00	1.026	0.01	0.114	0.117
	LTE Band 13	10M	QPSK	1	25	Bottom Side	10	23230	782	23.89	24.00	1.026	0.06	0.186	0.191
	LTE Band 13	10M	QPSK	25	25	Front	10	23230	782	22.95	23.00	1.012	0.04	0.114	0.115
	LTE Band 13	10M	QPSK	25	25	Back	10	23230	782	22.95	23.00	1.012	0.08	0.125	0.126
	LTE Band 13	10M	QPSK	25	25	Left Side	10	23230	782	22.95	23.00	1.012	0.02	0.120	0.121
	LTE Band 13	10M	QPSK	25	25	Right Side	10	23230	782	22.95	23.00	1.012	0.07	0.085	0.086
	LTE Band 13	10M	QPSK	25	25	Bottom Side	10	23230	782	22.95	23.00	1.012	0.01	0.117	0.118
	LTE Band 5	10M	QPSK	1	25	Front	10	20525	836.5	22.79	23.00	1.050	0.13	0.252	0.264
	LTE Band 5	10M	QPSK	1	25	Back	10	20525	836.5	22.79	23.00	1.050	0.09	0.243	0.255
	LTE Band 5	10M	QPSK	1	25	Left Side	10	20525	836.5	22.79	23.00	1.050	0.01	0.164	0.172
	LTE Band 5	10M	QPSK	1	25	Right Side	10	20525	836.5	22.79	23.00	1.050	0.08	0.115	0.121
22	LTE Band 5	10M	QPSK	1	25	Bottom Side	10	20525	836.5	22.79	23.00	1.050	0.01	0.281	0.295
	LTE Band 5	10M	QPSK	25	0	Front	10	20525	836.5	21.83	22.00	1.040	-0.08	0.171	0.178
	LTE Band 5	10M	QPSK	25	0	Back	10	20525	836.5	21.83	22.00	1.040	0.02	0.164	0.171
	LTE Band 5	10M	QPSK	25	0	Left Side	10	20525	836.5	21.83	22.00	1.040	0.01	0.140	0.146
	LTE Band 5	10M	QPSK	25	0	Right Side	10	20525	836.5	21.83	22.00	1.040	0.05	0.098	0.102
	LTE Band 5	10M	QPSK	25	0	Bottom Side	10	20525	836.5	21.83	22.00	1.040	-0.02	0.191	0.199
	LTE Band 4	20M	QPSK	1	49	Front	10	20175	1732.5	22.46	23.00	1.132	0.05	0.514	0.582
23	LTE Band 4	20M	QPSK	1	49	Back	10	20175	1732.5	22.46	23.00	1.132	-0.04	0.565	0.640
	LTE Band 4	20M	QPSK	1	49	Left Side	10	20175	1732.5	22.46	23.00	1.132	0.03	0.136	0.154
	LTE Band 4	20M	QPSK	1	49	Right Side	10	20175	1732.5	22.46	23.00	1.132	0.08	0.078	0.088
	LTE Band 4	20M	QPSK	1	49	Bottom Side	10	20175	1732.5	22.46	23.00	1.132	0.01	0.543	0.615
	LTE Band 4	20M	QPSK	50	24	Front	10	20175	1732.5	21.51	22.00	1.119	0.05	0.487	0.545
	LTE Band 4	20M	QPSK	50	24	Back	10	20175	1732.5	21.51	22.00	1.119	-0.01	0.479	0.536
	LTE Band 4	20M	QPSK	50	24	Left Side	10	20175	1732.5	21.51	22.00	1.119	-0.05	0.108	0.121
	LTE Band 4	20M	QPSK	50	24	Right Side	10	20175	1732.5	21.51	22.00	1.119	0.03	0.060	0.067
	LTE Band 4	20M	QPSK	50	24	Bottom Side	10	20175	1732.5	21.51	22.00	1.119	0.01	0.481	0.538



Plot No.	Band	BW (MHz)	Modulation	RB Size	RB offset	Test Position	Gap (mm)	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	LTE Band 66	20M	QPSK	1	49	Front	10	132322	1745	22.48	23.00	1.127	-0.02	0.576	0.649
	LTE Band 66	20M	QPSK	1	49	Back	10	132322	1745	22.48	23.00	1.127	0.07	0.629	0.709
	LTE Band 66	20M	QPSK	1	49	Left Side	10	132322	1745	22.48	23.00	1.127	0.04	0.137	0.154
	LTE Band 66	20M	QPSK	1	49	Right Side	10	132322	1745	22.48	23.00	1.127	0.05	0.089	0.100
24	LTE Band 66	20M	QPSK	1	49	Bottom Side	10	132322	1745	22.48	23.00	1.127	-0.04	0.642	0.724
	LTE Band 66	20M	QPSK	50	0	Front	10	132322	1745	21.51	22.00	1.119	0.05	0.503	0.563
	LTE Band 66	20M	QPSK	50	0	Back	10	132322	1745	21.51	22.00	1.119	0.01	0.485	0.543
	LTE Band 66	20M	QPSK	50	0	Left Side	10	132322	1745	21.51	22.00	1.119	-0.01	0.110	0.123
	LTE Band 66	20M	QPSK	50	0	Right Side	10	132322	1745	21.51	22.00	1.119	0.01	0.070	0.078
	LTE Band 66	20M	QPSK	50	0	Bottom Side	10	132322	1745	21.51	22.00	1.119	0.06	0.532	0.596
	LTE Band 2	20M	QPSK	1	49	Front	10	19100	1900	23.19	23.50	1.074	0.01	0.478	0.513
25	LTE Band 2	20M	QPSK	1	49	Back	10	19100	1900	23.19	23.50	1.074	0.05	0.729	0.783
	LTE Band 2	20M	QPSK	1	49	Left Side	10	19100	1900	23.19	23.50	1.074	0.02	0.110	0.118
	LTE Band 2	20M	QPSK	1	49	Right Side	10	19100	1900	23.19	23.50	1.074	0.05	0.044	0.047
	LTE Band 2	20M	QPSK	1	49	Bottom Side	10	19100	1900	23.19	23.50	1.074	0.06	0.598	0.642
	LTE Band 2	20M	QPSK	50	24	Front	10	19100	1900	22.15	22.50	1.084	0.04	0.407	0.441
	LTE Band 2	20M	QPSK	50	24	Back	10	19100	1900	22.15	22.50	1.084	0.08	0.512	0.555
	LTE Band 2	20M	QPSK	50	24	Left Side	10	19100	1900	22.15	22.50	1.084	0.03	0.089	0.096
	LTE Band 2	20M	QPSK	50	24	Right Side	10	19100	1900	22.15	22.50	1.084	0.01	0.023	0.025
	LTE Band 2	20M	QPSK	50	24	Bottom Side	10	19100	1900	22.15	22.50	1.084	0.07	0.517	0.560
	LTE Band 7	20M	QPSK	1	49	Front	10	21100	2535	23.12	23.50	1.091	0.04	0.730	0.797
	LTE Band 7	20M	QPSK	1	49	Back	10	21100	2535	23.12	23.50	1.091	-0.06	0.735	0.802
	LTE Band 7	20M	QPSK	1	49	Right Side	10	21100	2535	23.12	23.50	1.091	0.04	0.622	0.679
	LTE Band 7	20M	QPSK	1	49	Bottom Side	10	21100	2535	23.12	23.50	1.091	0.02	0.552	0.602
	LTE Band 7	20M	QPSK	1	49	Back	10	20850	2510	22.86	23.50	1.159	0.04	0.714	0.827
26	LTE Band 7	20M	QPSK	1	49	Back	10	21350	2560	22.91	23.50	1.146	-0.04	0.723	0.828
	LTE Band 7	20M	QPSK	50	24	Front	10	21100	2535	22.16	22.50	1.081	0.07	0.585	0.633
	LTE Band 7	20M	QPSK	50	24	Back	10	21100	2535	22.16	22.50	1.081	0.06	0.613	0.663
	LTE Band 7	20M	QPSK	50	24	Right Side	10	21100	2535	22.16	22.50	1.081	0.05	0.518	0.560
	LTE Band 7	20M	QPSK	50	24	Bottom Side	10	21100	2535	22.16	22.50	1.081	0.01	0.418	0.452
	LTE Band 7	20M	QPSK	100	0	Back	10	21100	2535	21.97	22.50	1.130	0.02	0.602	0.680

<WLAN SAR>

Plot No.	Band	Mode	Test Position	Gap (mm)	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	10	6	2437	17.12	17.50	1.091	99.31	1.007	0.02	0.110	0.121
27	WLAN2.4GHz	802.11b 1Mbps	Back	10	6	2437	17.12	17.50	1.091	99.31	1.007	0.14	0.112	0.123
	WLAN2.4GHz	802.11b 1Mbps	Right Side	10	6	2437	17.12	17.50	1.091	99.31	1.007	0.01	0.102	0.112
	WLAN2.4GHz	802.11b 1Mbps	Top Side	10	6	2437	17.12	17.50	1.091	99.31	1.007	0.04	0.075	0.082



15.3 Body Worn Accessory SAR

<GSM SAR>

Plot No.	Band	Mode	Test Position	Gap (mm)	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
28	GSM850	GPRS(4 Tx slots)	Front	10	251	848.8	28.85	29.00	1.035	0.03	0.330	0.342
	GSM850	GPRS(4 Tx slots)	Back	10	251	848.8	28.85	29.00	1.035	0.05	0.282	0.292
	GSM1900	GPRS(4 Tx slots)	Front	10	810	1909.8	26.32	26.50	1.042	0.05	0.539	0.562
	GSM1900	GPRS(4 Tx slots)	Back	10	810	1909.8	26.32	26.50	1.042	0.02	0.805	0.839
	GSM1900	GPRS(4 Tx slots)	Back	10	512	1850.2	26.01	26.50	1.119	0.03	0.670	0.750
29	GSM1900	GPRS(4 Tx slots)	Back	10	661	1880	26.29	26.50	1.050	0.07	0.802	0.842

<WCDMA SAR>

Plot No.	Band	Mode	Test Position	Gap (mm)	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
30	WCDMA Band V	RMC 12.2Kbps	Front	10	4132	826.4	23.41	23.50	1.021	0.07	0.285	0.291
	WCDMA Band V	RMC 12.2Kbps	Back	10	4132	826.4	23.41	23.50	1.021	0.08	0.277	0.283
	WCDMA Band IV	RMC 12.2Kbps	Front	10	1413	1732.6	24.28	24.50	1.052	0.05	0.788	0.829
	WCDMA Band IV	RMC 12.2Kbps	Back	10	1413	1732.6	24.28	24.50	1.052	0.04	0.830	0.873
	WCDMA Band IV	RMC 12.2Kbps	Front	10	1312	1712.4	24.23	24.50	1.064	0.01	0.618	0.658
	WCDMA Band IV	RMC 12.2Kbps	Front	10	1513	1752.6	24.19	24.50	1.074	0.02	0.874	0.939
	WCDMA Band IV	RMC 12.2Kbps	Back	10	1312	1712.4	24.23	24.50	1.064	0.01	0.642	0.683
31	WCDMA Band IV	RMC 12.2Kbps	Back	10	1513	1752.6	24.19	24.50	1.074	0.01	0.955	1.026
	WCDMA Band II	RMC 12.2Kbps	Front	10	9538	1907.6	22.99	23.50	1.125	0.05	0.463	0.521
32	WCDMA Band II	RMC 12.2Kbps	Back	10	9538	1907.6	22.99	23.50	1.125	0.09	0.642	0.722



<LTE SAR>

Plot No.	Band	BW (MHz)	Modulation	RB Size	RB offset	Test Position	Gap (mm)	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	LTE Band 12	10M	QPSK	1	25	Front	10	23095	707.5	22.27	22.50	1.054	0.07	0.113	0.119
33	LTE Band 12	10M	QPSK	1	25	Back	10	23095	707.5	22.27	22.50	1.054	0.06	0.127	0.134
	LTE Band 12	10M	QPSK	25	25	Front	10	23095	707.5	21.36	21.50	1.033	-0.02	0.093	0.096
	LTE Band 12	10M	QPSK	25	25	Back	10	23095	707.5	21.36	21.50	1.033	0.05	0.116	0.120
	LTE Band 13	10M	QPSK	1	25	Front	10	23230	782	23.89	24.00	1.026	0.05	0.203	0.208
34	LTE Band 13	10M	QPSK	1	25	Back	10	23230	782	23.89	24.00	1.026	0.09	0.213	0.218
	LTE Band 13	10M	QPSK	25	25	Front	10	23230	782	22.95	23.00	1.012	0.04	0.114	0.115
	LTE Band 13	10M	QPSK	25	25	Back	10	23230	782	22.95	23.00	1.012	0.08	0.125	0.126
35	LTE Band 5	10M	QPSK	1	25	Front	10	20525	836.5	22.79	23.00	1.050	0.13	0.252	0.264
	LTE Band 5	10M	QPSK	1	25	Back	10	20525	836.5	22.79	23.00	1.050	0.09	0.243	0.255
	LTE Band 5	10M	QPSK	25	0	Front	10	20525	836.5	21.83	22.00	1.040	-0.08	0.171	0.178
	LTE Band 5	10M	QPSK	25	0	Back	10	20525	836.5	21.83	22.00	1.040	0.02	0.164	0.171
	LTE Band 4	20M	QPSK	1	49	Front	10	20175	1732.5	22.46	23.00	1.132	0.05	0.514	0.582
36	LTE Band 4	20M	QPSK	1	49	Back	10	20175	1732.5	22.46	23.00	1.132	-0.04	0.565	0.640
	LTE Band 4	20M	QPSK	50	24	Front	10	20175	1732.5	21.51	22.00	1.119	0.05	0.487	0.545
	LTE Band 4	20M	QPSK	50	24	Back	10	20175	1732.5	21.51	22.00	1.119	-0.01	0.479	0.536
	LTE Band 66	20M	QPSK	1	49	Front	10	132322	1745	22.48	23.00	1.127	-0.02	0.576	0.649
37	LTE Band 66	20M	QPSK	1	49	Back	10	132322	1745	22.48	23.00	1.127	0.07	0.629	0.709
	LTE Band 66	20M	QPSK	50	0	Front	10	132322	1745	21.51	22.00	1.119	0.05	0.503	0.563
	LTE Band 66	20M	QPSK	50	0	Back	10	132322	1745	21.51	22.00	1.119	0.01	0.485	0.543
	LTE Band 2	20M	QPSK	1	49	Front	10	19100	1900	23.19	23.50	1.074	0.01	0.478	0.513
38	LTE Band 2	20M	QPSK	1	49	Back	10	19100	1900	23.19	23.50	1.074	0.05	0.729	0.783
	LTE Band 2	20M	QPSK	50	24	Front	10	19100	1900	22.15	22.50	1.084	0.04	0.407	0.441
	LTE Band 2	20M	QPSK	50	24	Back	10	19100	1900	22.15	22.50	1.084	0.08	0.512	0.555
	LTE Band 7	20M	QPSK	1	49	Front	10	21100	2535	23.12	23.50	1.091	0.04	0.730	0.797
	LTE Band 7	20M	QPSK	1	49	Back	10	21100	2535	23.12	23.50	1.091	-0.06	0.735	0.802
	LTE Band 7	20M	QPSK	1	49	Back	10	20850	2510	22.86	23.50	1.159	0.04	0.714	0.827
39	LTE Band 7	20M	QPSK	1	49	Back	10	21350	2560	22.91	23.50	1.146	-0.04	0.723	0.828
	LTE Band 7	20M	QPSK	50	24	Front	10	21100	2535	22.16	22.50	1.081	0.07	0.585	0.633
	LTE Band 7	20M	QPSK	50	24	Back	10	21100	2535	22.16	22.50	1.081	0.06	0.613	0.663
	LTE Band 7	20M	QPSK	100	0	Back	10	21100	2535	21.97	22.50	1.130	0.02	0.602	0.680

<WLAN SAR>

Plot No.	Band	Mode	Test Position	Gap (mm)	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	10	6	2437	17.12	17.50	1.091	99.31	1.007	0.02	0.110	0.121
40	WLAN2.4GHz	802.11b 1Mbps	Back	10	6	2437	17.12	17.50	1.091	99.31	1.007	0.14	0.112	0.123

15.4 Repeated SAR Measurement

No.	Band	Mode	Test Position	Gap (mm)	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Ratio	Reported 1g SAR (W/kg)
1st	GSM1900	GPRS(4 Tx slots)	Back	10	810	1909.8	26.32	26.50	1.042	0.02	0.805	1	0.839
2nd	GSM1900	GPRS(4 Tx slots)	Back	10	810	1909.8	26.32	26.50	1.042	0.04	0.791	1.018	0.824
1st	WCDMA Band IV	RMC 12.2Kbps	Back	10	1513	1752.6	24.19	24.50	1.074	0.01	0.955	1	1.026
2nd	WCDMA Band IV	RMC 12.2Kbps	Back	10	1513	1752.6	24.19	24.50	1.074	0.02	0.947	1.008	1.017

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

16. Simultaneous Transmission Analysis

NO.	Simultaneous Transmission Configurations	Mobile Phone		
		Head	Body-worn	Hotspot
1.	GSM Voice + WLAN2.4GHz	Yes	Yes	
2.	GPRS/EDGE + WLAN2.4GHz	Yes	Yes	Yes
3.	WCDMA + WLAN2.4GHz	Yes	Yes	Yes
4.	LTE + WLAN2.4GHz	Yes	Yes	Yes
5.	GSM Voice + Bluetooth	Yes	Yes	
6.	GPRS/EDGE + Bluetooth	Yes	Yes	Yes
7.	WCDMA+ Bluetooth	Yes	Yes	Yes
8.	LTE + Bluetooth	Yes	Yes	Yes

General Note:

1. This device supported VoIP in GPRS, EGPRS, WCDMA, LTE (e.g. 3rd party VoIP) and VOLTE.
2. This device WLAN 2.4GHz supports Hotspot operation and Bluetooth supports BT tethering function.
3. WLAN and Bluetooth share the same antenna, and cannot transmit simultaneously.
4. All licensed modes share the same antenna part and cannot transmit simultaneously.
5. EUT will choose each GSM, WCDMA and LTE according to the network signal condition; therefore, they will not operate simultaneously at any moment.
6. The reported SAR summation is calculated based on the same configuration and test position.
7. Per KDB 447498 D01v06, simultaneous transmission SAR is compliant if,
 - i) Scalar SAR summation < 1.6W/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 $SPLSR \leq 0.04$, simultaneously transmission SAR measurement is not necessary.
 - iv) Simultaneously transmission SAR measurement, and the reported multi-band SAR < 1.6W/kg.
8. For simultaneous transmission analysis, Bluetooth SAR is estimated per KDB 447498 D01v06 based on the formula below.
 - i) $(\text{max. power of channel, including tune-up tolerance, mW}) / (\text{min. test separation distance, mm}) \cdot [\sqrt{f(\text{GHz})/x}] \text{ W/kg}$ for test separation distances $\leq 50 \text{ mm}$; where $x = 7.5$ for 1-g SAR, and $x = 18.75$ for 10-g SAR.
 - ii) When the minimum separation distance is < 5mm, the distance is used 5mm to determine SAR test exclusion.
 - iii) 0.4 W/kg for 1-g SAR and 1.0 W/kg for 10-g SAR, when the test separation distances is > 50 mm.

Bluetooth Max Power (dBm)	Exposure Position	Hotspot & Body worn
	Test separation	10 mm
8.5	Estimated 1g SAR (W/kg)	0.149

16.1 Head Exposure Conditions

WWAN Band		Exposure Position	1	2	3	1+2 Summed 1g SAR (W/kg)	1+3 Summed 1g SAR (W/kg)
			WWAN	2.4GHz WLAN	Bluetooth		
			1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)		
GSM	GSM850	Right Cheek	0.203	0.235	0.035	0.44	0.24
		Right Tilted	0.134	0.219	0.035	0.35	0.17
		Left Cheek	0.321	0.657	0.035	0.98	0.36
		Left Tilted	0.157	0.548	0.035	0.71	0.19
	GSM1900	Right Cheek	0.058	0.235	0.035	0.29	0.09
		Right Tilted	0.052	0.219	0.035	0.27	0.09
		Left Cheek	0.121	0.657	0.035	0.78	0.16
		Left Tilted	0.055	0.548	0.035	0.60	0.09
WCDMA	WCDMA V	Right Cheek	0.181	0.235	0.035	0.42	0.22
		Right Tilted	0.106	0.219	0.035	0.33	0.14
		Left Cheek	0.252	0.657	0.035	0.91	0.29
		Left Tilted	0.128	0.548	0.035	0.68	0.16
	WCDMA IV	Right Cheek	0.142	0.235	0.035	0.38	0.18
		Right Tilted	0.100	0.219	0.035	0.32	0.14
		Left Cheek	0.162	0.657	0.035	0.82	0.20
		Left Tilted	0.103	0.548	0.035	0.65	0.14
	WCDMA II	Right Cheek	0.070	0.235	0.035	0.31	0.11
		Right Tilted	0.046	0.219	0.035	0.27	0.08
		Left Cheek	0.098	0.657	0.035	0.76	0.13
		Left Tilted	0.047	0.548	0.035	0.60	0.08



WWAN Band		Exposure Position	1	2	3	1+2 Summed 1g SAR (W/kg)	1+3 Summed 1g SAR (W/kg)
			WWAN	2.4GHz WLAN	Bluetooth		
			1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)		
LTE	LTE Band 12	Right Cheek	0.067	0.235	0.035	0.30	0.10
		Right Tilted	0.022	0.219	0.035	0.24	0.06
		Left Cheek	0.078	0.657	0.035	0.74	0.11
		Left Tilted	0.051	0.548	0.035	0.60	0.09
	LTE Band 13	Right Cheek	0.118	0.235	0.035	0.35	0.15
		Right Tilted	0.056	0.219	0.035	0.28	0.09
		Left Cheek	0.193	0.657	0.035	0.85	0.23
		Left Tilted	0.079	0.548	0.035	0.63	0.11
	LTE Band 5	Right Cheek	0.151	0.235	0.035	0.39	0.19
		Right Tilted	0.078	0.219	0.035	0.30	0.11
		Left Cheek	0.273	0.657	0.035	0.93	0.31
		Left Tilted	0.102	0.548	0.035	0.65	0.14
	LTE Band 4	Right Cheek	0.129	0.235	0.035	0.36	0.16
		Right Tilted	0.074	0.219	0.035	0.29	0.11
		Left Cheek	0.169	0.657	0.035	0.83	0.20
		Left Tilted	0.080	0.548	0.035	0.63	0.12
	LTE Band 66	Right Cheek	0.091	0.235	0.035	0.33	0.13
		Right Tilted	0.080	0.219	0.035	0.30	0.12
		Left Cheek	0.192	0.657	0.035	0.85	0.23
		Left Tilted	0.068	0.548	0.035	0.62	0.10
	LTE Band 2	Right Cheek	0.061	0.235	0.035	0.30	0.10
		Right Tilted	0.049	0.219	0.035	0.27	0.08
		Left Cheek	0.115	0.657	0.035	0.77	0.15
		Left Tilted	0.050	0.548	0.035	0.60	0.09
	LTE Band 7	Right Cheek	0.732	0.235	0.035	0.97	0.77
		Right Tilted	0.231	0.219	0.035	0.45	0.27
		Left Cheek	0.432	0.657	0.035	1.09	0.47
		Left Tilted	0.377	0.548	0.035	0.93	0.41

16.2 Hotspot Exposure Conditions

WWAN Band		Exposure Position	1	2	3	1+2 Summed 1g SAR (W/kg)	1+3 Summed 1g SAR (W/kg)
			WWAN	2.4GHz WLAN	Bluetooth		
			1g SAR (W/kg)	1g SAR (W/kg)	Estimated 1g SAR (W/kg)		
GSM	GSM850	Front	0.342	0.121	0.149	0.46	0.49
		Back	0.292	0.123	0.149	0.42	0.44
		Left side	0.284			0.28	0.28
		Right side	0.158	0.112	0.149	0.27	0.31
		Top side		0.082	0.149	0.08	0.15
		Bottom side	0.371			0.37	0.37
	GSM1900	Front	0.562	0.121	0.149	0.68	0.71
		Back	0.842	0.123	0.149	0.97	0.99
		Left side	0.116			0.12	0.12
		Right side	0.052	0.112	0.149	0.16	0.20
		Top side		0.082	0.149	0.08	0.15
		Bottom side	0.767			0.77	0.77
WCDMA	WCDMA V	Front	0.291	0.121	0.149	0.41	0.44
		Back	0.283	0.123	0.149	0.41	0.43
		Left side	0.226			0.23	0.23
		Right side	0.155	0.112	0.149	0.27	0.30
		Top side		0.082	0.149	0.08	0.15
		Bottom side	0.324			0.32	0.32
	WCDMA IV	Front	0.939	0.121	0.149	1.06	1.09
		Back	1.026	0.123	0.149	1.15	1.18
		Left side	0.190			0.19	0.19
		Right side	0.106	0.112	0.149	0.22	0.26
		Top side		0.082	0.149	0.08	0.15
		Bottom side	1.003			1.00	1.00
	WCDMA II	Front	0.521	0.121	0.149	0.64	0.67
		Back	0.722	0.123	0.149	0.85	0.87
		Left side	0.110			0.11	0.11
		Right side	0.003	0.112	0.149	0.12	0.15
		Top side		0.082	0.149	0.08	0.15
		Bottom side	0.604			0.60	0.60



WWAN Band		Exposure Position	1	2	3	1+2 Summed 1g SAR (W/kg)	1+3 Summed 1g SAR (W/kg)
			WWAN	2.4GHz WLAN	Bluetooth		
			1g SAR (W/kg)	1g SAR (W/kg)	Estimated 1g SAR (W/kg)		
LTE	LTE Band 12	Front	0.119	0.121	0.149	0.24	0.27
		Back	0.134	0.123	0.149	0.26	0.28
		Left side	0.172			0.17	0.17
		Right side	0.105	0.112	0.149	0.22	0.25
		Top side		0.082	0.149	0.08	0.15
		Bottom side	0.078			0.08	0.08
	LTE Band 13	Front	0.208	0.121	0.149	0.33	0.36
		Back	0.218	0.123	0.149	0.34	0.37
		Left side	0.165			0.17	0.17
		Right side	0.117	0.112	0.149	0.23	0.27
		Top side		0.082	0.149	0.08	0.15
		Bottom side	0.191			0.19	0.19
	LTE Band 5	Front	0.264	0.121	0.149	0.39	0.41
		Back	0.255	0.123	0.149	0.38	0.40
		Left side	0.172			0.17	0.17
		Right side	0.121	0.112	0.149	0.23	0.27
		Top side		0.082	0.149	0.08	0.15
		Bottom side	0.295			0.30	0.30
	LTE Band 4	Front	0.582	0.121	0.149	0.70	0.73
		Back	0.640	0.123	0.149	0.76	0.79
		Left side	0.154			0.15	0.15
		Right side	0.088	0.112	0.149	0.20	0.24
		Top side		0.082	0.149	0.08	0.15
		Bottom side	0.615			0.62	0.62
	LTE Band 66	Front	0.649	0.121	0.149	0.77	0.80
		Back	0.709	0.123	0.149	0.83	0.86
		Left side	0.154			0.15	0.15
		Right side	0.100	0.112	0.149	0.21	0.25
		Top side		0.082	0.149	0.08	0.15
		Bottom side	0.724			0.72	0.72
	LTE Band 2	Front	0.513	0.121	0.149	0.63	0.66
		Back	0.783	0.123	0.149	0.91	0.93
		Left side	0.118			0.12	0.12
		Right side	0.047	0.112	0.149	0.16	0.20
		Top side		0.082	0.149	0.08	0.15
		Bottom side	0.642			0.64	0.64
	LTE Band 7	Front	0.797	0.121	0.149	0.92	0.95
		Back	0.828	0.123	0.149	0.95	0.98



		Right side	0.679	0.112	0.149	0.79	0.83
		Top side		0.082	0.149	0.08	0.15
		Bottom side	0.602			0.60	0.60

16.3 Body-Worn Accessory Exposure Conditions

WWAN Band		Exposure Position	1	2	3	1+2 Summed 1g SAR (W/kg)	1+3 Summed 1g SAR (W/kg)
			WWAN	2.4GHz WLAN	Bluetooth		
			1g SAR (W/kg)	1g SAR (W/kg)	Estimated 1g SAR (W/kg)		
GSM	GSM850	Front	0.342	0.121	0.149	0.46	0.49
		Back	0.292	0.123	0.149	0.42	0.44
	GSM1900	Front	0.562	0.121	0.149	0.68	0.71
		Back	0.842	0.123	0.149	0.97	0.99
WCDMA	WCDMA V	Front	0.291	0.121	0.149	0.41	0.44
		Back	0.283	0.123	0.149	0.41	0.43
	WCDMA IV	Front	0.939	0.121	0.149	1.06	1.09
		Back	1.026	0.123	0.149	1.15	1.18
	WCDMA II	Front	0.521	0.121	0.149	0.64	0.67
		Back	0.722	0.123	0.149	0.85	0.87
LTE	LTE Band 12	Front	0.119	0.121	0.149	0.24	0.27
		Back	0.134	0.123	0.149	0.26	0.28
	LTE Band 13	Front	0.208	0.121	0.149	0.33	0.36
		Back	0.218	0.123	0.149	0.34	0.37
	LTE Band 5	Front	0.264	0.121	0.149	0.39	0.41
		Back	0.255	0.123	0.149	0.38	0.40
	LTE Band 4	Front	0.582	0.121	0.149	0.70	0.73
		Back	0.640	0.123	0.149	0.76	0.79
	LTE Band 66	Front	0.649	0.121	0.149	0.77	0.80
		Back	0.709	0.123	0.149	0.83	0.86
	LTE Band 2	Front	0.513	0.121	0.149	0.63	0.66
		Back	0.783	0.123	0.149	0.91	0.93
	LTE Band 7	Front	0.797	0.121	0.149	0.92	0.95
		Back	0.828	0.123	0.149	0.95	0.98

Test Engineer : Long Liang



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



18. 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 648474 D04 v01r03, “SAR Evaluation Considerations for Wireless Handsets”, Oct 2015.
- [8] FCC KDB 941225 D01 v03r01, “3G SAR MEAUREMENT PROCEDURES”, Oct 2015
- [9] FCC KDB 941225 D05 v02r05, “SAR Evaluation Considerations for LTE Devices”, Dec 2015
- [10] FCC KDB 941225 D05A v01r02, “Rel. 10 LTE SAR Test Guidance and KDB Inquiries”, Oct 2015
- [11] FCC KDB 941225 D06 v02r01, "SAR Evaluation Procedures for Portable Devices with Wireless Router Capabilities", Oct 2015.
- [12] FCC KDB 865664 D01 v01r04, "SAR Measurement Requirements for 100 MHz to 6 GHz", Aug 2015.
- [13] FCC KDB 865664 D02 v01r02, “RF Exposure Compliance Reporting and Documentation Considerations” Oct 2015.



Appendix A. Plots of System Performance Check

The plots are shown as follows.

System Check_Head_750MHz_180921

DUT: D750V3-SN:1099

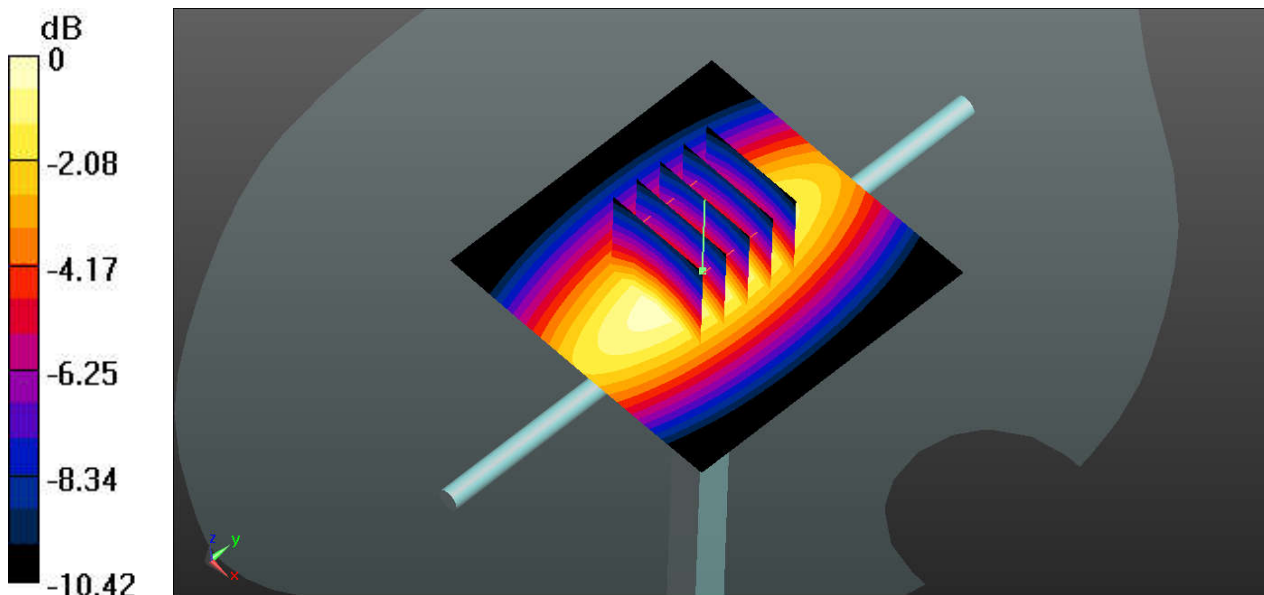
Communication System: UID 0, CW (0); Frequency: 750 MHz; Duty Cycle: 1:1
Medium: HSL_750_180921 Medium parameters used: $f = 750 \text{ MHz}$; $\sigma = 0.881 \text{ S/m}$; $\epsilon_r = 40.783$; $\rho = 1000 \text{ kg/m}^3$
Ambient Temperature : $23.5 \text{ }^\circ\text{C}$; Liquid Temperature : $22.8 \text{ }^\circ\text{C}$

DASY5 Configuration:

- Probe: EX3DV4 - SN3958; ConvF(10.59, 10.59, 10.59); Calibrated: 2018.01.11;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1303; Calibrated: 2017.12.19
- Phantom: SAM (Front) with CRP v5.0; Type: QD000P40CD; Serial: TP:1795
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Pin=250mW/Area Scan (61x61x1): Interpolated grid: $dx=15\text{mm}$, $dy=15\text{mm}$
Maximum value of SAR (interpolated) = 2.76 W/kg

Pin=250mW/Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$
Reference Value = 56.80 V/m ; Power Drift = -0.07 dB
Peak SAR (extrapolated) = 3.30 W/kg
SAR(1 g) = 2.16 W/kg ; SAR(10 g) = 1.42 W/kg
Maximum value of SAR (measured) = 2.76 W/kg



0 dB = 2.76 W/kg

System Check_Head_835MHz_180921

DUT: D835V2-SN:4d162

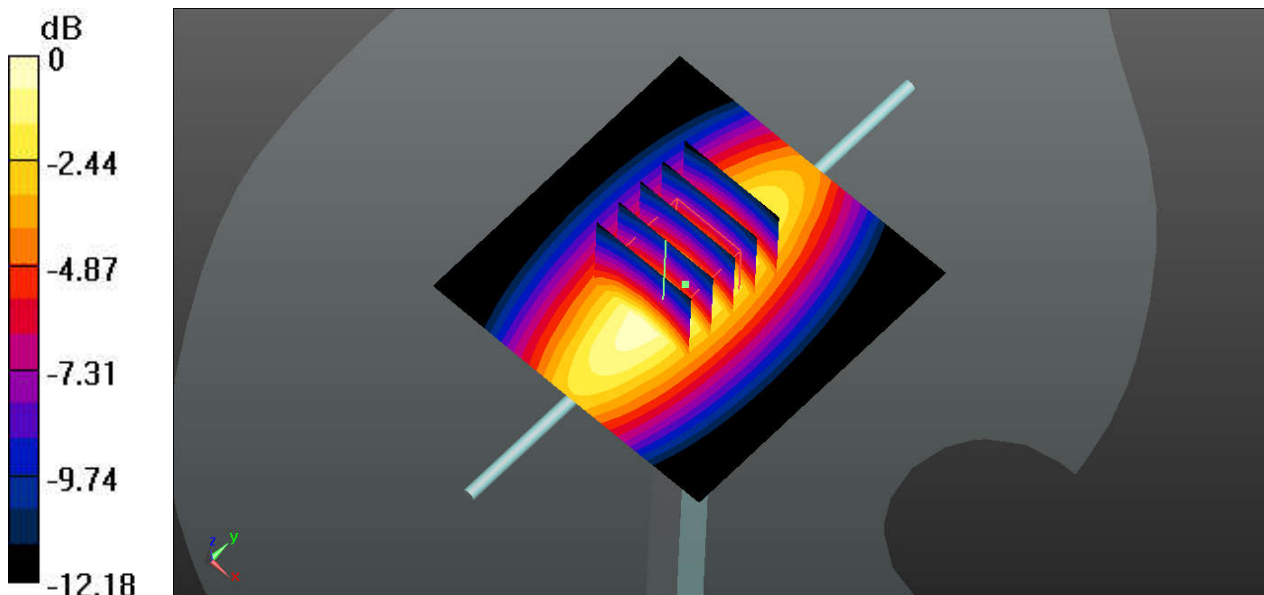
Communication System: UID 0, CW; Frequency: 835 MHz; Duty Cycle: 1:1
Medium: HSL_835_180921 Medium parameters used: $f = 835 \text{ MHz}$; $\sigma = 0.916 \text{ S/m}$; $\epsilon_r = 41.029$; $\rho = 1000 \text{ kg/m}^3$
Ambient Temperature : $23.5 \text{ }^\circ\text{C}$; Liquid Temperature : $22.6 \text{ }^\circ\text{C}$

DASY5 Configuration:

- Probe: EX3DV4 - SN3958; ConvF(10.31, 10.31, 10.31); Calibrated: 2018.01.11;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1303; Calibrated: 2017.12.19
- Phantom: SAM (Front) with CRP v5.0; Type: QD000P40CD; Serial: TP:1795
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Pin=250mW/Area Scan (61x61x1): Interpolated grid: $dx=15\text{mm}$, $dy=15\text{mm}$
Maximum value of SAR (interpolated) = 3.92 W/kg

Pin=250mW/Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$
Reference Value = 66.55 V/m ; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 4.47 W/kg
SAR(1 g) = 2.44 W/kg ; SAR(10 g) = 1.6 W/kg
Maximum value of SAR (measured) = 3.51 W/kg



0 dB = 3.51 W/kg

System Check_Head_1750MHz_180921

DUT: D1750V2-SN:1137

Communication System: UID 0, CW; Frequency: 1750 MHz; Duty Cycle: 1:1

Medium: HSL_1750_180921 Medium parameters used: $f = 1750$ MHz; $\sigma = 1.378$ S/m; $\epsilon_r = 41.34$; $\rho = 1000$ kg/m³

Ambient Temperature : 23.4 °C; Liquid Temperature : 22.5 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3958; ConvF(8.79, 8.79, 8.79); Calibrated: 2018.01.11;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1303; Calibrated: 2017.12.19
- Phantom: SAM (Front) with CRP v5.0; Type: QD000P40CD; Serial: TP:1795
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Pin=250mW/Area Scan (61x61x1): Interpolated grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 12.6 W/kg

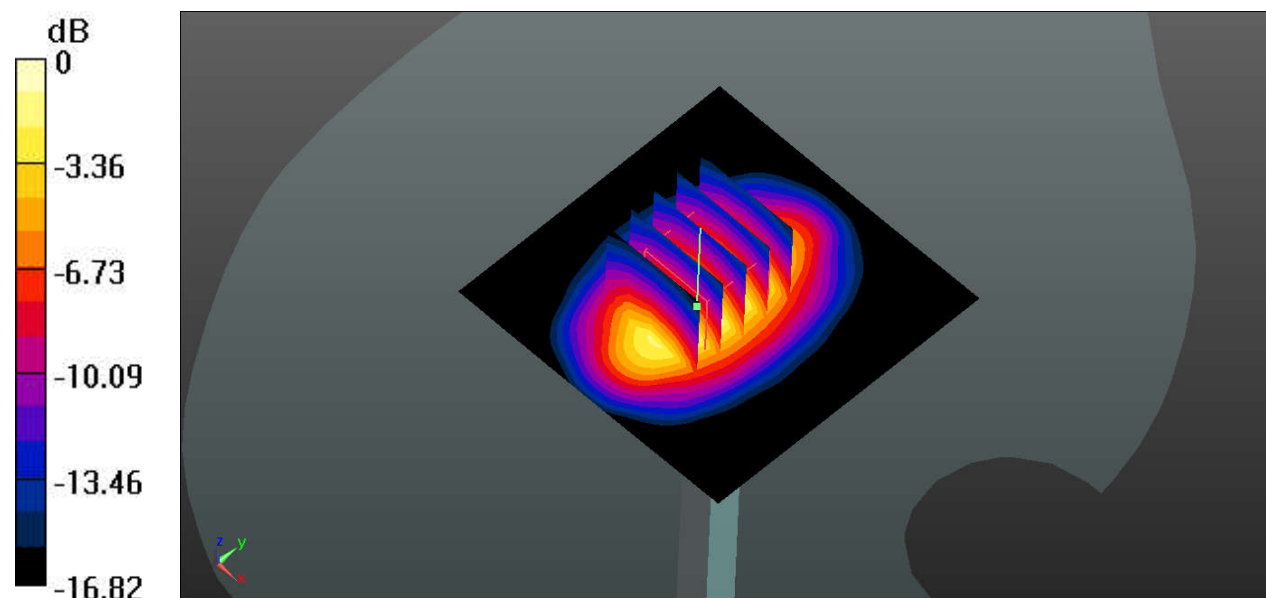
Pin=250mW/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 94.94 V/m; Power Drift = 0.07 dB

Peak SAR (extrapolated) = 15.5 W/kg

SAR(1 g) = 8.77 W/kg; SAR(10 g) = 4.71 W/kg

Maximum value of SAR (measured) = 12.3 W/kg



0 dB = 12.3 W/kg