FCC SAR Test Report

APPLICANT	:	Motorola Mobility, LLC
EQUIPMENT	:	Mobile Cellular Phone
BRAND NAME	:	Motorola
MODEL NAME	:	4237
FCC ID	:	IHDT56VB1
STANDARD	:	FCC 47 CFR Part 2 (2.1093) ANSI/IEEE C95.1-1992 IEEE 1528-2013

We, SPORTON INTERNATIONAL 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 INC., the test report shall not be reproduced except in full.

Reviewed by: Eric Huang / Deputy Manager

Approved by: Jones Tsai / Manager

Testing Laboratory
1190

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Revision History

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FA640145-06	Rev. 01	Variant report to add WPC accessory and include verification of worst case found in the original report FCC ID: IHDT56VB1, (Sporton Report No. FA631828) performed testing.	Jun. 01, 2016

1. Statement of Compliance

The maximum results of Specific Absorption Rate (SAR) found during testing for Motorola Mobility, LLC, Mobile Cellular Phone, 4237 are as follows.

Equipment Class	Frequency Band		Highest 1g SAR Summary			
			Head (Separation 0mm)	Body-worn (Separation 10mm)	Hotspot (Separation 10mm)	Product Specific (Separation 0mm)
			1g SAR (W/kg)			10g SAR (W/kg)
Licensed	GSM	GSM850	0.230	0.477	0.477	
		GSM1900	0.265	0.304	0.304	
	WCDMA	WCDMA II	0.497	0.982	1.074	3.134
		WCDMA V	0.305	0.497	0.497	
	CDMA	CDMA2000 BC0	0.291	1.081	0.615	
		CDMA2000 BC1	0.519	0.484	0.971	3.364
	LTE	LTE Band 2	0.367	0.657	1.129	
		LTE Band 4	0.411	0.880	0.895	
		LTE Band 5	0.412	0.652	0.321	
		LTE Band 7	0.371	0.474	0.474	
		LTE Band 13	0.234	0.964	0.964	
DTS	WLAN	2.4GHz WLAN	0.753	0.248	0.248	
NII		5GHz WLAN	0.793	0.442	0.158	1.974
DSS	2.4GHz Band	Bluetooth		0.007		
Date of Testing:			2016/05/23 ~ 2016/05/27			

This device is in compliance with Specific Absorption Rate (SAR) for general population/uncontrolled exposure limits (1.6 W/kg for Partial-Body, 4.0 W/kg for Product Specific) 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 INC.
Test Site Location	No.52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan District, Taoyuan City, Taiwan (R.O.C.) TEL: +886-3-327-3456 FAX: +886-3-328-4978

Applicant	
Company Name	Motorola Mobility, LLC
Address	222 W Merchandise Mart Plaza, Suite 1800, Chicago, IL 60654, United States

Manufacturer	
Company Name	Motorola Mobility, LLC
Address	222 W Merchandise Mart Plaza, Suite 1800, Chicago, IL 60654, United States

3. Guidance Standard

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 D03 Wireless Chargers Battery Cover v01r04
- 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 Cellular Phone
Brand Name	Motorola
Model Name	4237
FCC ID	IHDT56VB1
IMEI Code	354107070048827
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 V: 826.4 MHz ~ 846.6 MHz CDMA2000 BC0: 824.7 MHz ~ 848.31 MHz CDMA 2000 BC1: 1851.25 MHz ~ 1908.75 MHz LTE Band 2: 1850 MHz ~ 1910 MHz LTE Band 4: 1710 MHz ~ 1755 MHz LTE Band 5: 824 MHz ~ 849 MHz LTE Band 7: 2500 MHz ~ 2570 MHz LTE Band 13: 777 MHz ~ 787 MHz WLAN 2.4GHz Band: 2412 MHz ~ 2462 MHz WLAN 5.2GHz Band: 5180 MHz ~ 5240 MHz WLAN 5.3GHz Band: 5260 MHz ~ 5320 MHz WLAN 5.5GHz Band: 5500 MHz ~ 5720 MHz WLAN 5.8GHz Band: 5745 MHz ~ 5825 MHz Bluetooth: 2402 MHz ~ 2480 MHz NFC: 13.56 MHz
Mode	· GSM/GPRS/EGPRS · RMC/AMR 12.2Kbps · HSDPA · HSUPA · DC-HSDPA · CDMA2000 : 1xRTT/1xEv-Do(Rev.0)/1xEv-Do(Rev.A) · LTE: QPSK, 16QAM · 802.11a/b/g/n/ac HT20/HT40/VHT20/VHT40/VHT80 · Bluetooth with EDR / LE · NFC:ASK
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 : 1. In this report, add WPC accessory and include verification of worst case found in the original report FCC ID: IHDT56VB1, (Sporton Report No. FA631828) performed testing.	

4.2 General LTE SAR Test and Reporting Considerations

Summarized necessary items addressed in KDB 941225 D05 v02r05	
FCC ID	IHDT56VB1
Equipment Name	Mobile Cellular Phone
Operating Frequency Range of each LTE transmission band	LTE Band 02: 1850 MHz ~ 1910 MHz LTE Band 04: 1710 MHz ~ 1755 MHz LTE Band 05: 824 MHz ~ 849 MHz LTE Band 07: 2500 MHz ~ 2570 MHz LTE Band 13: 777 MHz ~ 787 MHz
Channel Bandwidth	LTE Band 02:1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz, 20MHz LTE Band 04:1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz, 20MHz LTE Band 05:1.4MHz, 3MHz, 5MHz, 10MHz LTE Band 07: 5MHz, 10MHz, 15MHz, 20MHz LTE Band 13: 5MHz, 10MHz
uplink modulations used	QPSK, and 16QAM
LTE Voice / Data requirements	Voice and Data
LTE MPR permanently built-in by design	**Table 6.2.3-1: Maximum Power Reduction (MPR) for Power Class 3** Modulation | Channel bandwidth / Transmission bandwidth (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
LTE A-MPR	In the base station simulator configuration, Network Setting value is set to NS_01 to disable A-MPR during SAR testing and the LTE SAR tests was transmitting on all TTI frames (Maximum TTI)
Spectrum plots for RB configuration	A properly configured base station simulator was used for the SAR and power measurement; therefore, spectrum plots for each RB allocation and offset configuration are not included in the SAR report.
Power reduction applied to satisfy SAR compliance	Yes, when operating in hotspot mode that LTE B4 / B5 / B13 power reduction applied to satisfy SAR compliance.
LTE Carrier Aggregation Combinations	Inter-Band and Intra-Band possible combinations and the detail power verification please referred to page57.
LTE Carrier Aggregation Additional Information	This device supports a maximum of 3 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	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	20407	824.7	20415	825.5	20425	826.5	20450	829
M	20525	836.5	20525	836.5	20525	836.5	20525	836.5
H	20643	848.3	20635	847.5	20625	846.5	20600	844

LTE Band 7								
	Bandwidth 5 MHz		Bandwidth 10 MHz		Bandwidth 15 MHz		Bandwidth 20 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	20775	2502.5	20800	2505	20825	2507.5	20850	2510
M	21100	2535	21100	2535	21100	2535	21100	2535
H	21425	2567.5	21400	2565	21375	2562.5	21350	2560

LTE Band 13				
	Bandwidth 5 MHz		Bandwidth 10 MHz	
	Channel #	Freq.(MHz)	Channel #	Freq.(MHz)
L	23205	779.5	23230	782
M	23230	782		
H	23255	784.5		

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:

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

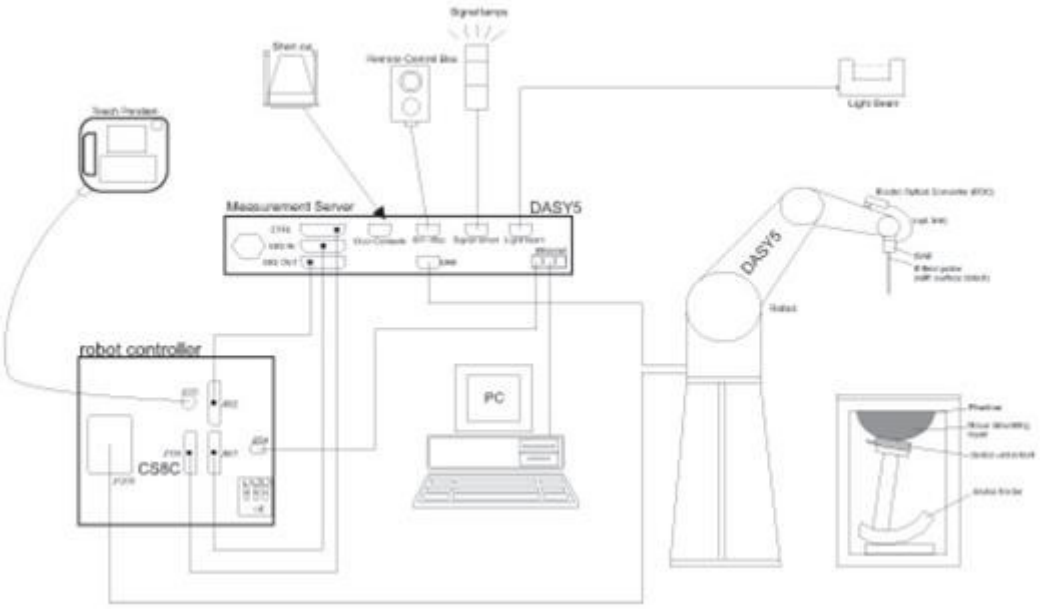
SAR is expressed in units of Watts per kilogram (W/kg)

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

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

7. System Description and Setup

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



- A standard high precision 6-axis robot with controller, teach pendant and software. An arm extension for accommodating the data acquisition electronics (DAE).
- An isotropic Field probe optimized and calibrated for the targeted measurement.
- A data acquisition electronics (DAE) which performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.
- The Electro-optical converter (EOC) performs the conversion from optical to electrical signals for the digital communication to the DAE. To use optical surface detection, a special version of the EOC is required. The EOC signal is transmitted to the measurement server.
- The function of the measurement server is to perform the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
- The Light Beam used is for probe alignment. This improves the (absolute) accuracy of the probe positioning.
- A computer running WinXP or Win7 and the DASY5 software.
- Remote control and teach pendant as well as additional circuitry for robot safety such as warning lamps, etc.
- The phantom, the device holder and other accessories according to the targeted measurement.

7.1 E-Field Probe

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

<ES3DV3 Probe>

Construction	Symmetric design with triangular core Interleaved sensors Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)
Frequency	10 MHz – 4 GHz; Linearity: ±0.2 dB (30 MHz – 4 GHz)
Directivity	±0.2 dB in TSL (rotation around probe axis) ±0.3 dB in TSL (rotation normal to probe axis)
Dynamic Range	5 µW/g – >100 mW/g; Linearity: ±0.2 dB
Dimensions	Overall length: 337 mm (tip: 20 mm) Tip diameter: 3.9 mm (body: 12 mm) Distance from probe tip to dipole centers: 3.0 mm

<EX3DV4 Probe>

Construction	Symmetric design with triangular core Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)
Frequency	10 MHz – >6 GHz Linearity: ±0.2 dB (30 MHz – 6 GHz)
Directivity	±0.3 dB in TSL (rotation around probe axis) ±0.5 dB in TSL (rotation normal to probe axis)
Dynamic Range	10 µW/g – >100 mW/g Linearity: ±0.2 dB (noise: typically <1 µW/g)
Dimensions	Overall length: 337 mm (tip: 20 mm) Tip diameter: 2.5 mm (body: 12 mm) Typical distance from probe tip to dipole centers: 1 mm

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.

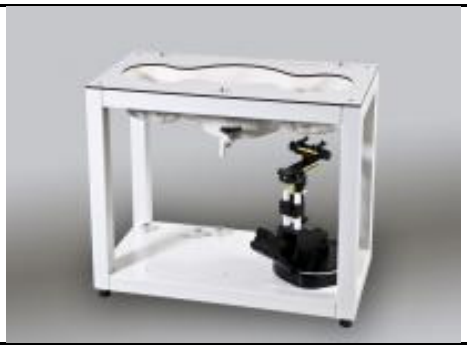
The input impedance of the DAE is 200 MOhm; the inputs are symmetrical and floating. Common mode rejection is above 80 dB.

Fig 5.1 Photo of DAE

7.3 Phantom

<SAM Twin Phantom>

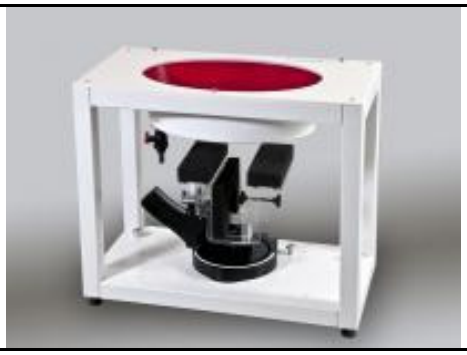
Shell Thickness	2 ± 0.2 mm; Center ear point: 6 ± 0.2 mm
Filling Volume	Approx. 25 liters
Dimensions	Length: 1000 mm; Width: 500 mm; Height: adjustable feet
Measurement Areas	Left Hand, Right Hand, Flat Phantom



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 Exhibit 7C_SAR Setup Photo demonstrates.
(c) Set scan area, grid size and other setting on the DASY software.
(d) Measure SAR results for the highest power channel on each testing position.
(e) Find out the largest SAR result on these testing positions of each band
(f) Measure SAR results for other channels in worst SAR testing position if the reported SAR of highest power channel is larger than 0.8 W/kg

According to the test standard, the recommended procedure for assessing the peak spatial-average SAR value consists of the following steps:

(a) Power reference measurement
(b) Area scan
(c) Zoom scan
(d) Power drift measurement

8.1 Spatial Peak SAR Evaluation

The procedure for spatial peak SAR evaluation has been implemented according to the test standard. It can be conducted for 1g and 10g, as well as for user-specific masses. The DASY software includes all numerical procedures necessary to evaluate the spatial peak SAR value.

The base for the evaluation is a "cube" measurement. The measured volume must include the 1g and 10g cubes with the highest averaged SAR values. For that purpose, the center of the measured volume is aligned to the interpolated peak SAR value of a previously performed area scan.

The entire evaluation of the spatial peak values is performed within the post-processing engine (SEMCAD). The system always gives the maximum values for the 1g and 10g cubes. The algorithm to find the cube with highest averaged SAR is divided into the following stages:

(a) Extraction of the measured data (grid and values) from the Zoom Scan
(b) Calculation of the SAR value at every measurement point based on all stored data (A/D values and measurement parameters)
(c) Generation of a high-resolution mesh within the measured volume
(d) Interpolation of all measured values form the measurement grid to the high-resolution grid
(e) Extrapolation of the entire 3-D field distribution to the phantom surface over the distance from sensor to surface
(f) Calculation of the averaged SAR within masses of 1g and 10g

8.2 Power Reference Measurement

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

8.3 Area Scan

The area scan is used as a fast scan in two dimensions to find the area of high field values, before doing a fine measurement around the hot spot. The sophisticated interpolation routines implemented in DASY software can find the maximum found in the scanned area, within a range of the global maximum. The range (in dB0 is specified in the standards for compliance testing. For example, a 2 dB range is required in IEEE standard 1528 and IEC 62209 standards, whereby 3 dB is a requirement when compliance is assessed in accordance with the ARIB standard (Japan), if only one zoom scan follows the area scan, then only the absolute maximum will be taken as reference. For cases where multiple maximums are detected, the number of zoom scans has to be increased accordingly.

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

	≤ 3 GHz	> 3 GHz
Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface	5 ± 1 mm	½·δ·ln(2) ± 0.5 mm
Maximum probe angle from probe axis to phantom surface normal at the measurement location	30° ± 1°	20° ± 1°
Maximum area scan spatial resolution: Δx_{Area}, Δy_{Area}	≤ 2 GHz: ≤ 15 mm 2 – 3 GHz: ≤ 12 mm	3 – 4 GHz: ≤ 12 mm 4 – 6 GHz: ≤ 10 mm
	When the x or y dimension of the test device, in the measurement plane orientation, is smaller than the above, the measurement resolution must be ≤ the corresponding x or y dimension of the test device with at least one measurement point on the test device.	

8.4 Zoom Scan

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

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

			≤ 3 GHz	> 3 GHz
Maximum zoom scan spatial resolution: Δx_{Zoom}, Δy_{Zoom}			≤ 2 GHz: ≤ 8 mm 2 – 3 GHz: ≤ 5 mm*	3 – 4 GHz: ≤ 5 mm* 4 – 6 GHz: ≤ 4 mm*
Maximum zoom scan spatial resolution, normal to phantom surface	uniform grid: $\Delta z_{Zoom}(n)$		≤ 5 mm	3 – 4 GHz: ≤ 4 mm 4 – 5 GHz: ≤ 3 mm 5 – 6 GHz: ≤ 2 mm
	graded grid	$\Delta z_{Zoom}(1)$: between 1st two points closest to phantom surface	≤ 4 mm	3 – 4 GHz: ≤ 3 mm 4 – 5 GHz: ≤ 2.5 mm 5 – 6 GHz: ≤ 2 mm
		$\Delta z_{Zoom}(n>1)$: between subsequent points	≤ 1.5·$\Delta z_{Zoom}(n-1)$	
Minimum zoom scan volume	x, y, z		≥ 30 mm	3 – 4 GHz: ≥ 28 mm 4 – 5 GHz: ≥ 25 mm 5 – 6 GHz: ≥ 22 mm

Note: δ is the penetration depth of a plane-wave at normal incidence to the tissue medium; see draft standard IEEE P1528-2011 for details.

* When zoom scan is required and the *reported* SAR from the *area scan based 1-g SAR estimation* procedures of KDB 447498 is ≤ 1.4 W/kg, ≤ 8 mm, ≤ 7 mm and ≤ 5 mm zoom scan resolution may be applied, respectively, for 2 GHz to 3 GHz, 3 GHz to 4 GHz and 4 GHz to 6 GHz.

8.5 Volume Scan Procedures

The volume scan is used for assess overlapping SAR distributions for antennas transmitting in different frequency bands. It is equivalent to an oversized zoom scan used in standalone measurements. The measurement volume will be used to enclose all the simultaneous transmitting antennas. For antennas transmitting simultaneously in different frequency bands, the volume scan is measured separately in each frequency band. In order to sum correctly to compute the 1g aggregate SAR, the EUT remain in the same test position for all measurements and all volume scan use the same spatial resolution and grid spacing. When all volume scan were completed, the software, SEMCAD postprocessor can combine and subsequently superpose these measurement data to calculating the multiband SAR.

8.6 Power Drift Monitoring

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

9. Test Equipment List

Manufacturer	Name of Equipment	Type/Model	Serial Number	Calibration	
				Last Cal.	Due Date
SPEAG	750MHz System Validation Kit	D750V3	1078	Jun. 23, 2015	Jun. 22, 2016
SPEAG	835MHz System Validation Kit	D835V2	499	Mar. 21, 2016	Mar. 20, 2017
SPEAG	1750MHz System Validation Kit	D1750V2	1068	Nov. 23, 2015	Nov. 22, 2016
SPEAG	1900MHz System Validation Kit	D1900V2	5d041	Oct. 22, 2015	Oct. 21, 2016
SPEAG	2450MHz System Validation Kit	D2450V2	736	Aug. 20, 2015	Aug. 19, 2016
SPEAG	2600MHz System Validation Kit	D2600V2	1008	Aug. 19, 2015	Aug. 18, 2016
SPEAG	5GHz System Validation Kit	D5GHzV2	1006	Oct. 06, 2015	Oct. 05, 2016
SPEAG	Data Acquisition Electronics	DAE4	916	Dec. 16, 2015	Dec. 15, 2016
SPEAG	Data Acquisition Electronics	DAE4	1399	Nov. 23, 2015	Nov. 22, 2016
SPEAG	Dosimetric E-Field Probe	EX3DV4	7346	Sep. 02, 2015	Sep. 01, 2016
SPEAG	Dosimetric E-Field Probe	ES3DV3	3270	Sep. 28, 2015	Sep. 27, 2016
Wisewind	Thermometer	HTC-1	TM225	Oct. 16, 2015	Oct. 15, 2016
H.M.IRIS	Thermometer	TH-08	TM356	Oct. 16, 2015	Oct. 15, 2016
Anritsu	Radio Communication Analyzer	MT8820C	6201341950	Dec. 18, 2015	Dec. 17, 2016
Agilent	Wireless Communication Test Set	E5515C	MY50266977	May. 17, 2016	May. 16, 2017
SPEAG	Device Holder	N/A	N/A	N/A	N/A
R&S	Signal Generator	MG3710A	6201502524	Dec. 18, 2015	Dec. 17, 2016
Agilent	ENA Network Analyzer	E5071C	MY46316648	Jan. 12, 2016	Jan. 11, 2017
SPEAG	Dielectric Probe Kit	DAK-3.5	1126	Jul. 21, 2015	Jul. 20, 2016
LINE SEIKI	Digital Thermometer	LKMelectronic	DTM3000SPEZIAL	Jul. 17, 2015	Jul. 16, 2016
Anritsu	Power Meter	ML2495A	1419002	May. 10, 2016	May. 09, 2017
Anritsu	Power Sensor	MA2411B	1339124	May. 10, 2016	May. 09, 2017
Agilent	Spectrum Analyzer	E4408B	MY44211028	Aug. 24, 2015	Aug. 23, 2016
ATM	Dual Directional Coupler	C122H-10	P610410z-02	Note 1	
Woken	Attenuator 1	WK0602-XX	N/A	Note 1	
PE	Attenuator 2	PE7005-10	N/A	Note 1	
PE	Attenuator 3	PE7005- 3	N/A	Note 1	
AR	Power Amplifier	5S1G4M2	0328767	Note 1	
Mini-Circuits	Power Amplifier	ZVE-3W	162601250	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 Verification

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

Frequency (MHz)	Water (%)	Sugar (%)	Cellulose (%)	Salt (%)	Preventol (%)	DGBE (%)	Conductivity (σ)	Permittivity (εr)
For Head								
750	41.1	57.0	0.2	1.4	0.2	0	0.89	41.9
835	40.3	57.9	0.2	1.4	0.2	0	0.90	41.5
900	40.3	57.9	0.2	1.4	0.2	0	0.97	41.5
1800, 1900, 2000	55.2	0	0	0.3	0	44.5	1.40	40.0
2450	55.0	0	0	0	0	45.0	1.80	39.2
2600	54.8	0	0	0.1	0	45.1	1.96	39.0
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
900	50.8	48.2	0	0.9	0.1	0	1.05	55.0
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

Simulating Liquid for 5GHz, Manufactured by SPEAG

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

<Tissue Dielectric Parameter Check Results>

Frequency (MHz)	Tissue Type	Liquid Temp. (℃)	Conductivity (σ)	Permittivity (ε_r)	Conductivity Target (σ)	Permittivity Target (ε_r)	Delta (σ) (%)	Delta (ε_r) (%)	Limit (%)	Date
750	HSL	22.5	0.900	41.911	0.89	41.90	1.12	0.03	±5	2016/5/23
750	MSL	22.4	0.961	54.966	0.96	55.50	0.10	-0.96	±5	2016/5/24
750	MSL	22.5	0.962	55.000	0.96	55.50	0.21	-0.90	±5	2016/5/27
835	HSL	22.5	0.904	41.413	0.90	41.50	0.44	-0.21	±5	2016/5/23
835	HSL	22.5	0.880	42.900	0.90	41.50	-2.22	3.37	±5	2016/5/27
835	MSL	22.4	0.979	56.640	0.97	55.20	0.93	2.61	±5	2016/5/24
835	MSL	22.5	0.978	56.700	0.97	55.20	0.82	2.72	±5	2016/5/27
1750	HSL	22.7	1.382	38.901	1.37	40.10	0.88	-2.99	±5	2016/5/23
1750	MSL	22.3	1.480	55.230	1.49	53.40	-0.67	3.43	±5	2016/5/24
1900	HSL	22.7	1.431	38.653	1.40	40.00	2.21	-3.37	±5	2016/5/23
1900	MSL	22.3	1.580	52.579	1.52	53.30	3.95	-1.35	±5	2016/5/24
2450	HSL	22.2	1.841	38.816	1.80	39.20	2.28	-0.98	±5	2016/5/26
2450	MSL	22.2	1.975	53.476	1.95	52.70	1.28	1.47	±5	2016/5/25
2600	HSL	22.6	1.922	39.447	1.96	39.00	-1.94	1.15	±5	2016/5/24
2600	MSL	22.3	2.182	52.973	2.16	52.50	1.02	0.90	±5	2016/5/25
5200	MSL	22.4	5.330	46.800	5.30	49.00	0.57	-4.49	±5	2016/5/26
5300	HSL	22.5	4.540	36.300	4.76	35.90	-4.62	1.11	±5	2016/5/27
5300	MSL	22.4	5.460	46.700	5.42	48.90	0.74	-4.50	±5	2016/5/26
5600	HSL	22.5	4.830	35.800	5.07	35.50	-4.73	0.85	±5	2016/5/27
5600	MSL	22.4	5.850	46.200	5.77	48.50	1.39	-4.74	±5	2016/5/26
5800	HSL	22.5	5.020	35.600	5.27	35.30	-4.74	0.85	±5	2016/5/27
5800	MSL	22.4	6.100	45.900	6.00	48.20	1.67	-4.77	±5	2016/5/26

<Tissue Dielectric Parameter Check for Low / Middle / High Frequencies>

General Note:

The tissue measure results for low / middle / high frequencies list below, the results were used in the Dasy SAR system to perform interpolation to determine the dielectric parameters on the SAR test device. The SAR test plots may slightly difference between the tables below due to the digit rounding in the software calculated.

CH	Frequency (MHz)	Liquid Type	Conductivity (σ)	Permittivity (ε_r)	Conductivity Target (σ)	Permittivity Target (ε_r)	Delta (σ) (%)	Delta (ε_r) (%)	Limit (%)	Date
128	824.2	Head	0.89	41.55	0.90	41.55	-0.65	-0.12	±5	2016/5/23
189	836.4	Head	0.91	41.39	0.90	41.50	0.58	-0.26	±5	2016/5/23
251	848.8	Head	0.92	41.24	0.91	41.50	0.64	-0.63	±5	2016/5/23
4132	826.4	Head	0.90	41.52	0.90	41.54	-0.44	0.06	±5	2016/5/23
4182	836.4	Head	0.91	41.39	0.90	41.50	0.58	-0.26	±5	2016/5/23
4233	846.6	Head	0.91	41.27	0.91	41.50	0.42	-0.56	±5	2016/5/23
20450	829	Head	0.90	41.49	0.90	41.53	-0.19	-0.02	±5	2016/5/23
20525	836.5	Head	0.91	41.39	0.90	41.50	0.58	-0.26	±5	2016/5/23
20600	844	Head	0.91	41.30	0.91	41.50	0.17	-0.49	±5	2016/5/23
1013	824.7	Head	0.89	41.54	0.90	41.55	-0.60	0.10	±5	2016/5/23
384	836.52	Head	0.91	41.39	0.90	41.50	0.59	-0.26	±5	2016/5/23
777	848.31	Head	0.92	41.25	0.91	41.50	0.59	-0.61	±5	2016/5/23
23230	782	Head	0.92	42.70	0.89	42.15	3.37	1.42	±5	2016/5/23
512	1850.2	Head	1.38	38.90	1.40	40.00	-1.39	-2.75	±5	2016/5/23
661	1880	Head	1.41	38.76	1.40	40.00	0.71	-3.09	±5	2016/5/23
810	1909.8	Head	1.44	38.60	1.40	40.00	2.90	-3.50	±5	2016/5/23
9262	1852.4	Head	1.38	38.89	1.40	40.00	-1.22	-2.77	±5	2016/5/23
9400	1880	Head	1.41	38.76	1.40	40.00	0.71	-3.09	±5	2016/5/23
9538	1907.6	Head	1.44	38.61	1.40	40.00	2.75	-3.47	±5	2016/5/23
25	1851.25	Head	1.38	38.90	1.40	40.00	-1.30	-2.76	±5	2016/5/23
600	1880	Head	1.41	38.76	1.40	40.00	0.71	-3.09	±5	2016/5/23
1175	1908.75	Head	1.44	38.61	1.40	40.00	2.83	-3.48	±5	2016/5/23
18700	1860	Head	1.39	38.87	1.40	40.00	-0.66	-2.84	±5	2016/5/23
18900	1880	Head	1.41	38.76	1.40	40.00	0.71	-3.09	±5	2016/5/23
19100	1900	Head	1.43	38.65	1.40	40.00	2.19	-3.37	±5	2016/5/23
20050	1720	Head	1.35	39.03	1.36	40.15	-0.46	-2.66	±5	2016/5/23
20175	1732.5	Head	1.37	38.97	1.36	40.13	0.39	-2.81	±5	2016/5/23
20300	1745	Head	1.38	38.92	1.37	40.11	0.54	-2.95	±5	2016/5/23
20850	2510	Head	1.81	39.76	1.86	39.12	-2.88	1.69	±5	2016/5/24
21100	2535	Head	1.84	39.68	1.89	39.09	-2.80	1.49	±5	2016/5/24
21350	2560	Head	1.87	39.59	1.92	39.05	-2.67	1.26	±5	2016/5/24
128	824.2	Body	0.97	56.74	0.97	55.24	-0.06	2.80	±5	2016/5/24
189	836.4	Body	0.98	56.63	0.97	55.20	1.08	2.58	±5	2016/5/24
251	848.8	Body	0.99	56.51	0.99	55.16	0.19	2.38	±5	2016/5/24
4132	826.4	Body	0.97	56.73	0.97	55.23	0.11	2.76	±5	2016/5/24
4182	836.4	Body	0.98	56.63	0.97	55.20	1.08	2.58	±5	2016/5/24
4233	846.6	Body	0.99	56.53	0.98	55.16	0.98	2.41	±5	2016/5/24
1013	824.7	Body	0.97	56.74	0.97	55.24	-0.03	2.79	±5	2016/5/24
384	836.52	Body	0.98	56.62	0.97	55.20	1.09	2.58	±5	2016/5/24
777	848.31	Body	0.99	56.52	0.99	55.16	0.14	2.39	±5	2016/5/24

Table of Low/Middle/High Channel for Liquid Validation

CH	Frequency (MHz)	Liquid Type	Conductivity (σ)	Permittivity (εr)	Conductivity Target (σ)	Permittivity Target (εr)	Delta (σ) (%)	Delta (εr) (%)	Limit (%)	Date
20450	829	Body	0.97	56.70	0.97	55.22	0.37	2.71	±5	2016/5/24
20525	836.5	Body	0.98	56.62	0.97	55.20	1.09	2.58	±5	2016/5/24
20600	844	Body	0.99	56.55	0.98	55.17	0.77	2.45	±5	2016/5/24
23230	782	Body	0.99	54.63	0.96	55.68	3.21	-1.92	±5	2016/5/24
20050	1720	Body	1.45	55.29	1.47	53.46	-1.44	3.35	±5	2016/5/24
20175	1732.5	Body	1.46	55.27	1.48	53.43	-1.19	3.50	±5	2016/5/24
20300	1745	Body	1.47	55.25	1.49	53.41	-1.06	3.46	±5	2016/5/24
512	1850.2	Body	1.52	52.77	1.52	53.30	0.28	-0.99	±5	2016/5/24
661	1880	Body	1.56	52.67	1.52	53.30	2.40	-1.18	±5	2016/5/24
810	1909.8	Body	1.59	52.54	1.52	53.30	4.74	-1.42	±5	2016/5/24
9262	1852.4	Body	1.53	52.77	1.52	53.30	0.44	-1.00	±5	2016/5/24
9400	1880	Body	1.56	52.67	1.52	53.30	2.40	-1.18	±5	2016/5/24
9538	1907.6	Body	1.59	52.55	1.52	53.30	4.55	-1.40	±5	2016/5/24
25	1851.25	Body	1.53	52.77	1.52	53.30	0.36	-1.00	±5	2016/5/24
600	1880	Body	1.56	52.67	1.52	53.30	2.40	-1.18	±5	2016/5/24
1175	1908.75	Body	1.59	52.55	1.52	53.30	4.65	-1.41	±5	2016/5/24
18700	1860	Body	1.54	52.75	1.52	53.30	1.01	-1.03	±5	2016/5/24
18900	1880	Body	1.56	52.67	1.52	53.30	2.40	-1.18	±5	2016/5/24
19100	1900	Body	1.58	52.58	1.52	53.30	3.91	-1.35	±5	2016/5/24
20850	2510	Body	2.05	53.28	2.03	52.62	1.20	1.30	±5	2016/5/25
21100	2535	Body	2.09	53.19	2.07	52.59	0.98	1.12	±5	2016/5/25
21350	2560	Body	2.12	53.10	2.10	52.55	1.18	0.95	±5	2016/5/25
1	2412	Body	1.92	53.61	1.91	52.75	0.73	1.54	±5	2016/5/25
3	2422	Body	1.94	53.58	1.92	52.74	0.92	1.66	±5	2016/5/25
6	2437	Body	1.96	53.52	1.94	52.72	0.90	1.56	±5	2016/5/25
9	2452	Body	1.98	53.47	1.95	52.70	1.41	1.46	±5	2016/5/25
11	2462	Body	1.99	53.44	1.97	52.68	1.07	1.39	±5	2016/5/25
0	2402	Body	1.91	53.66	1.90	52.76	0.56	1.63	±5	2016/5/25
39	2441	Body	1.96	53.51	1.94	52.71	1.15	1.53	±5	2016/5/25
78	2480	Body	2.02	53.37	1.95	52.70	3.41	1.28	±5	2016/5/25
1	2412	Head	1.798	38.99	1.766	39.27	1.60	-0.80	±5	2016/5/26
3	2422	Head	1.810	38.94	1.775	39.25	1.67	-0.67	±5	2016/5/26
6	2437	Head	1.827	38.88	1.788	39.22	2.08	-0.83	±5	2016/5/26
9	2452	Head	1.844	38.81	1.802	39.20	2.42	-1.00	±5	2016/5/26
11	2462	Head	1.856	38.76	1.813	39.18	2.53	-1.11	±5	2016/5/26
36	5180	Body	5.31	46.82	5.28	49.03	0.63	-4.45	±5	2016/5/26
38	5190	Body	5.32	46.81	5.29	49.01	0.64	-4.47	±5	2016/5/26
40	5200	Body	5.33	46.80	5.30	49.00	0.62	-4.50	±5	2016/5/26
42	5210	Body	5.35	46.77	5.31	48.99	0.67	-4.54	±5	2016/5/26
44	5220	Body	5.36	46.75	5.32	48.98	0.74	-4.58	±5	2016/5/26
46	5230	Body	5.37	46.73	5.33	48.97	0.83	-4.62	±5	2016/5/26
48	5240	Body	5.39	46.73	5.35	48.96	0.70	-4.63	±5	2016/5/26
52	5260	Body	5.41	46.69	5.37	48.94	0.69	-4.51	±5	2016/5/26

Table of Low/Middle/High Channel for Liquid Validation

CH	Frequency (MHz)	Liquid Type	Conductivity (σ)	Permittivity (εr)	Conductivity Target (σ)	Permittivity Target (εr)	Delta (σ) (%)	Delta (εr) (%)	Limit (%)	Date
54	5270	Body	5.42	46.67	5.38	48.93	0.79	-4.55	±5	2016/5/26
56	5280	Body	5.44	46.66	5.39	48.92	0.90	-4.57	±5	2016/5/26
58	5290	Body	5.45	46.66	5.40	48.91	0.94	-4.59	±5	2016/5/26
60	5300	Body	5.46	46.65	5.42	48.90	0.78	-4.60	±5	2016/5/26
62	5310	Body	5.47	46.63	5.43	48.79	0.77	-4.45	±5	2016/5/26
64	5320	Body	5.49	46.61	5.44	48.67	0.83	-4.29	±5	2016/5/26
100	5500	Body	5.71	46.33	5.65	48.60	1.13	-4.66	±5	2016/5/26
102	5510	Body	5.73	46.33	5.66	48.59	1.16	-4.67	±5	2016/5/26
104	5520	Body	5.74	46.32	5.67	48.58	1.17	-4.70	±5	2016/5/26
106	5530	Body	5.75	46.30	5.68	48.57	1.23	-4.73	±5	2016/5/26
108	5540	Body	5.76	46.28	5.70	48.56	1.09	-4.77	±5	2016/5/26
110	5550	Body	5.78	46.26	5.71	48.55	1.18	-4.82	±5	2016/5/26
112	5560	Body	5.79	46.25	5.72	48.54	1.23	-4.64	±5	2016/5/26
116	5580	Body	5.81	46.20	5.74	48.52	1.27	-4.74	±5	2016/5/26
120	5600	Body	5.85	46.18	5.77	48.50	1.32	-4.79	±5	2016/5/26
122	5610	Body	5.86	46.17	5.78	48.49	1.38	-4.80	±5	2016/5/26
124	5620	Body	5.87	46.16	5.79	48.47	1.40	-4.82	±5	2016/5/26
126	5630	Body	5.88	46.15	5.80	48.46	1.43	-4.84	±5	2016/5/26
128	5640	Body	5.90	46.14	5.81	48.44	1.47	-4.68	±5	2016/5/26
132	5660	Body	5.92	46.10	5.84	48.41	1.40	-4.76	±5	2016/5/26
134	5670	Body	5.93	46.09	5.85	48.40	1.39	-4.78	±5	2016/5/26
136	5680	Body	5.94	46.07	5.86	48.38	1.38	-4.82	±5	2016/5/26
138	5690	Body	5.96	46.04	5.87	48.37	1.47	-4.88	±5	2016/5/26
140	5700	Body	5.97	46.02	5.88	48.35	1.61	-4.92	±5	2016/5/26
142	5710	Body	5.99	46.01	5.89	48.34	1.69	-4.74	±5	2016/5/26
144	5720	Body	6.00	46.01	5.91	48.32	1.58	-4.74	±5	2016/5/26
149	5745	Body	6.03	45.99	5.94	48.28	1.57	-4.79	±5	2016/5/26
151	5755	Body	6.05	45.97	5.95	48.27	1.60	-4.82	±5	2016/5/26
153	5765	Body	6.06	45.96	5.96	48.25	1.65	-4.85	±5	2016/5/26
155	5775	Body	6.07	45.95	5.97	48.24	1.64	-4.68	±5	2016/5/26
157	5785	Body	6.08	45.92	5.98	48.22	1.60	-4.72	±5	2016/5/26
159	5795	Body	6.09	45.89	5.99	48.21	1.67	-4.80	±5	2016/5/26
161	5805	Body	6.11	45.87	6.00	48.20	1.80	-4.83	±5	2016/5/26
165	5825	Body	6.14	45.86	6.00	48.20	2.26	-4.86	±5	2016/5/26
52	5260	Head	4.50	36.31	4.72	35.94	-4.65	1.15	±5	2016/5/27
54	5270	Head	4.51	36.29	4.73	35.93	-4.60	1.09	±5	2016/5/27
56	5280	Head	4.52	36.28	4.74	35.92	-4.54	1.05	±5	2016/5/27
58	5290	Head	4.53	36.27	4.75	35.91	-4.54	1.03	±5	2016/5/27
60	5300	Head	4.54	36.26	4.76	35.90	-4.58	1.00	±5	2016/5/27
62	5310	Head	4.55	36.24	4.77	35.89	-4.61	0.95	±5	2016/5/27
64	5320	Head	4.56	36.22	4.78	35.87	-4.58	0.90	±5	2016/5/27

Table of Low/Middle/High Channel for Liquid Validation

CH	Frequency (MHz)	Liquid Type	Conductivity (σ)	Permittivity (εr)	Conductivity Target (σ)	Permittivity Target (εr)	Delta (σ) (%)	Delta (εr) (%)	Limit (%)	Date
100	5500	Head	4.73	35.98	4.97	35.63	-4.88	1.07	±5	2016/5/27
102	5510	Head	4.74	35.97	4.98	35.62	-4.91	1.04	±5	2016/5/27
104	5520	Head	4.74	35.95	4.99	35.61	-4.92	0.99	±5	2016/5/27
106	5530	Head	4.76	35.94	5.00	35.59	-4.89	0.94	±5	2016/5/27
108	5540	Head	4.77	35.92	5.01	35.58	-4.85	0.90	±5	2016/5/27
110	5550	Head	4.78	35.91	5.02	35.57	-4.79	0.86	±5	2016/5/27
112	5560	Head	4.79	35.91	5.03	35.55	-4.77	0.86	±5	2016/5/27
116	5580	Head	4.80	35.87	5.05	35.53	-4.91	1.04	±5	2016/5/27
120	5600	Head	4.83	35.84	5.07	35.50	-4.78	0.95	±5	2016/5/27
122	5610	Head	4.84	35.83	5.08	35.49	-4.78	0.92	±5	2016/5/27
124	5620	Head	4.85	35.82	5.09	35.48	-4.79	0.89	±5	2016/5/27
126	5630	Head	4.86	35.80	5.10	35.47	-4.80	0.85	±5	2016/5/27
128	5640	Head	4.87	35.79	5.11	35.46	-4.75	0.81	±5	2016/5/27
132	5660	Head	4.89	35.76	5.13	35.44	-4.66	1.03	±5	2016/5/27
134	5670	Head	4.90	35.76	5.14	35.43	-4.72	1.02	±5	2016/5/27
136	5680	Head	4.90	35.75	5.15	35.42	-4.82	0.99	±5	2016/5/27
138	5690	Head	4.91	35.72	5.16	35.41	-4.79	0.90	±5	2016/5/27
140	5700	Head	4.93	35.70	5.17	35.40	-4.71	0.86	±5	2016/5/27
142	5710	Head	4.94	35.69	5.18	35.39	-4.69	0.83	±5	2016/5/27
144	5720	Head	4.95	35.68	5.19	35.38	-4.69	0.80	±5	2016/5/27
149	5745	Head	4.97	35.65	5.22	35.36	-4.76	0.71	±5	2016/5/27
151	5755	Head	4.98	35.64	5.23	35.35	-4.72	0.96	±5	2016/5/27
153	5765	Head	5.00	35.63	5.24	35.34	-4.67	0.94	±5	2016/5/27
155	5775	Head	5.00	35.63	5.25	35.33	-4.73	0.94	±5	2016/5/27
157	5785	Head	5.01	35.62	5.26	35.32	-4.81	0.90	±5	2016/5/27
159	5795	Head	5.02	35.59	5.27	35.31	-4.81	0.83	±5	2016/5/27
161	5805	Head	5.03	35.57	5.28	35.30	-4.73	0.78	±5	2016/5/27
165	5825	Head	5.05	35.56	5.30	35.28	-4.71	0.73	±5	2016/5/27

Table of Low/Middle/High Channel for Liquid Validation

10.2 System Performance Check Results

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

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 (%)
2016/5/23	750	HSL	250	D750V3-1078	ES3DV3 - SN3270	DAE4 Sn1399	2.14	8.09	8.56	5.81
2016/5/24	750	MSL	250	D750V3-1078	ES3DV3 - SN3270	DAE4 Sn1399	2.16	8.59	8.64	0.58
2016/5/27	750	MSL	250	D750V3-1078	EX3DV4 - SN7346	DAE4 Sn916	2.18	8.59	8.72	1.51
2016/5/23	835	HSL	250	D835V2-499	ES3DV3 - SN3270	DAE4 Sn1399	2.34	9.14	9.36	2.41
2016/5/27	835	HSL	250	D835V2-499	EX3DV4 - SN7346	DAE4 Sn916	2.40	9.14	9.6	5.03
2016/5/24	835	MSL	250	D835V2-499	ES3DV3 - SN3270	DAE4 Sn1399	2.27	9.52	9.08	-4.62
2016/5/27	835	MSL	250	D835V2-499	EX3DV4 - SN7346	DAE4 Sn916	2.55	9.52	10.2	7.14
2016/5/23	1750	HSL	250	D1750V2-1068	ES3DV3 - SN3270	DAE4 Sn1399	8.50	36.80	34	-7.61
2016/5/24	1750	MSL	250	D1750V2-1068	ES3DV3 - SN3270	DAE4 Sn1399	8.99	35.70	35.96	0.73
2016/5/23	1900	HSL	250	D1900V2-5d041	ES3DV3 - SN3270	DAE4 Sn1399	10.50	39.80	42	5.53
2016/5/24	1900	MSL	250	D1900V2-5d041	ES3DV3 - SN3270	DAE4 Sn1399	10.40	40.00	41.6	4.00
2016/5/26	2450	HSL	250	D2450V2-736	ES3DV3 - SN3270	DAE4 Sn1399	13.60	53.40	54.4	1.87
2016/5/25	2450	MSL	250	D2450V2-736	ES3DV3 - SN3270	DAE4 Sn1399	13.20	51.90	52.8	1.73
2016/5/24	2600	HSL	250	D2600V2-1008	ES3DV3 - SN3270	DAE4 Sn1399	14.20	56.30	56.8	0.89
2016/5/25	2600	MSL	250	D2600V2-1008	ES3DV3 - SN3270	DAE4 Sn1399	13.30	55.80	53.2	-4.66
2016/5/26	5200	MSL	100	D5GHzV2-1006-5200	EX3DV4 - SN7346	DAE4 Sn916	7.31	75.60	73.1	-3.31
2016/5/27	5300	HSL	100	D5GHzV2-1006-5300	EX3DV4 - SN7346	DAE4 Sn916	8.06	84.50	80.6	-4.62
2016/5/26	5300	MSL	100	D5GHzV2-1006-5300	EX3DV4 - SN7346	DAE4 Sn916	7.46	79.50	74.6	-6.16
2016/5/27	5600	HSL	100	D5GHzV2-1006-5600	EX3DV4 - SN7346	DAE4 Sn916	8.92	84.80	89.2	5.19
2016/5/26	5600	MSL	100	D5GHzV2-1006-5600	EX3DV4 - SN7346	DAE4 Sn916	8.39	82.30	83.9	1.94
2016/5/27	5800	HSL	100	D5GHzV2-1006-5800	EX3DV4 - SN7346	DAE4 Sn916	8.03	82.00	80.3	-2.07
2016/5/26	5800	MSL	100	D5GHzV2-1006-5800	EX3DV4 - SN7346	DAE4 Sn916	8.52	79.00	85.2	7.85

Date	Frequency (MHz)	Tissue Type	Input Power (mW)	Dipole S/N	Probe S/N	DAE S/N	Measured 10g SAR (W/kg)	Targeted 10g SAR (W/kg)	Normalized 10g SAR (W/kg)	Deviation (%)
2016/5/24	1900	MSL	250	D1900V2-5d041	ES3DV3 - SN3270	DAE4 Sn1399	5.50	21.20	22	3.77
2016/5/26	5300	MSL	100	D5GHzV2-1006-5300	EX3DV4 - SN7346	DAE4 Sn916	2.08	22.40	20.8	-7.14
2016/5/26	5600	MSL	100	D5GHzV2-1006-5600	EX3DV4 - SN7346	DAE4 Sn916	2.23	23.00	22.3	-3.04

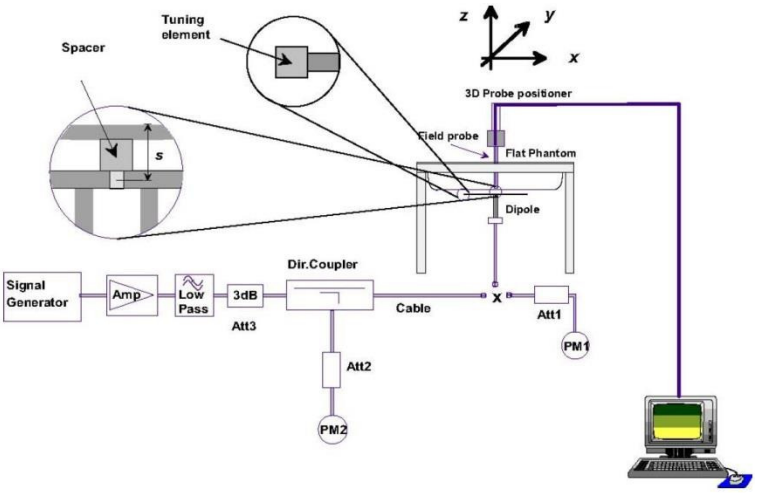


Fig 8.3.1 System Performance Check Setup

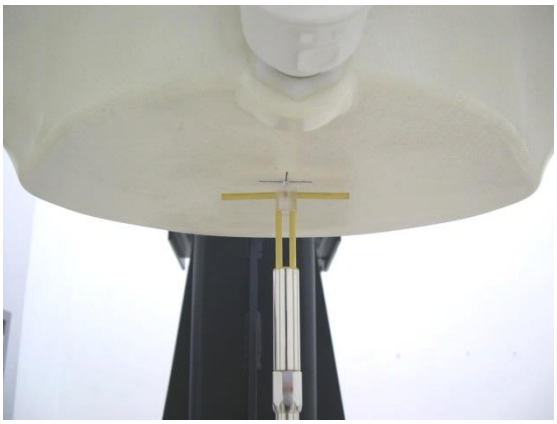


Fig 8.3.2 Setup Photo

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.

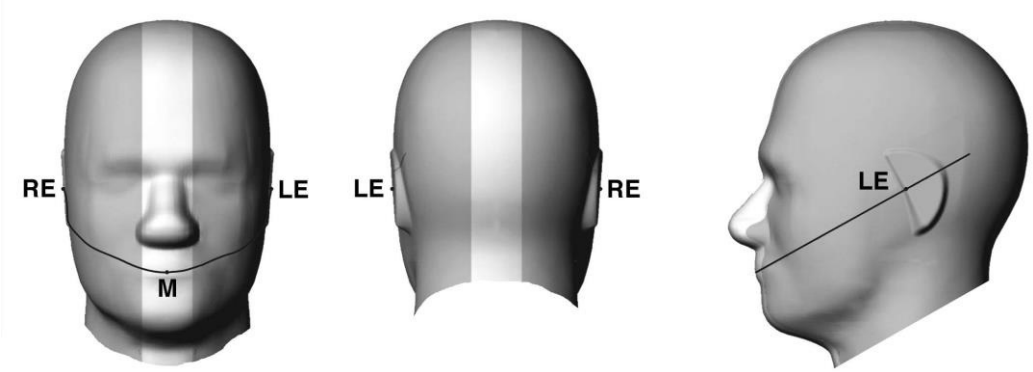


Fig 9.1.1 Front, back, and side views of SAM twin phantom

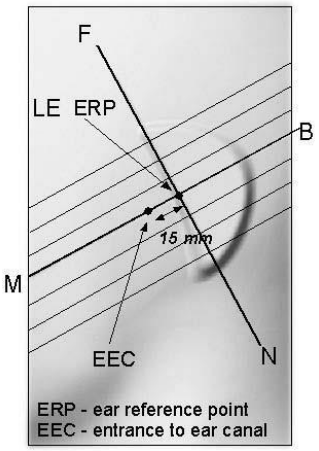


Fig 9.1.2 Close-up side view of phantom showing the ear region.

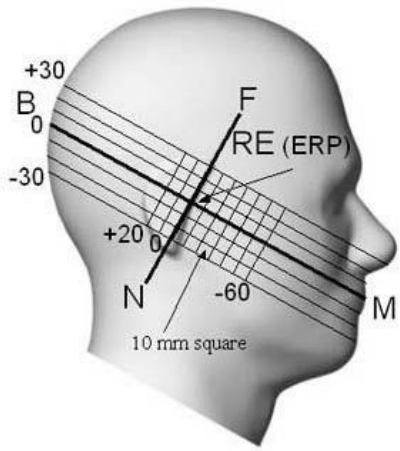


Fig 9.1.3 Side view of the phantom showing relevant markings and seven cross-sectional plane locations

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 wt 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 wb 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.

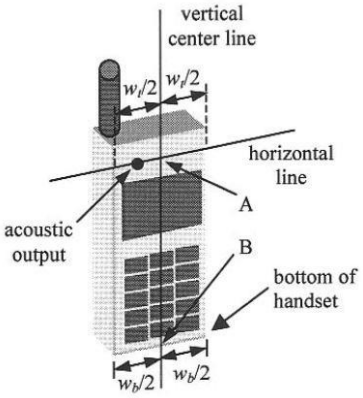


Fig 9.2.1 Handset vertical and horizontal reference lines—"fixed case

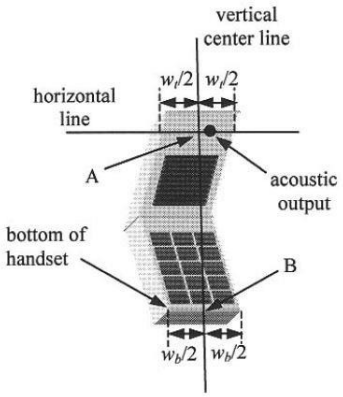


Fig 9.2.2 Handset vertical and horizontal reference lines—"clam-shell case"

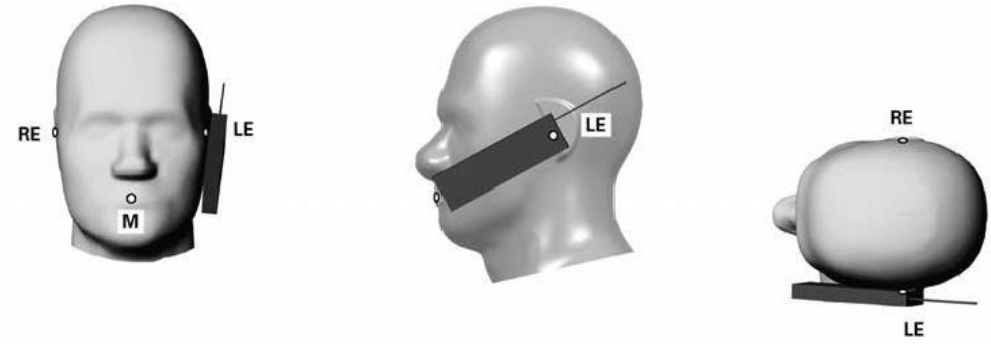


Fig 9.2.3 cheek or touch position. The reference points for the right ear (RE), left ear (LE), and mouth (M), which establish the Reference Plane for handset positioning, are indicated.

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

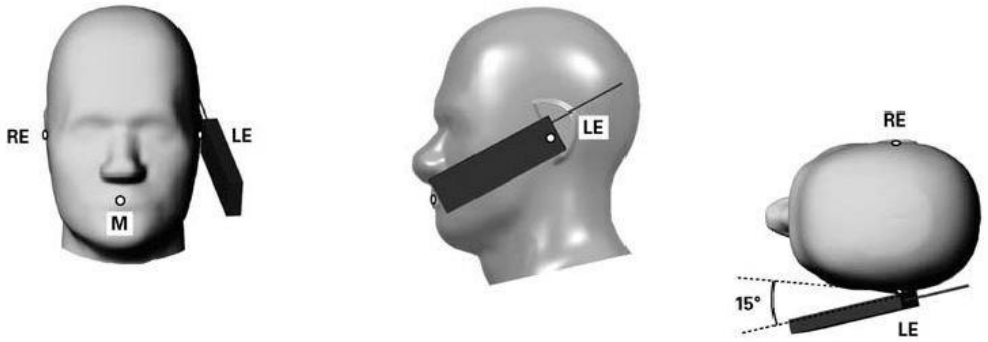


Fig 9.3.1 Tilt position. The reference points for the right ear (RE), left ear (LE), and mouth (M), which define the Reference Plane for handset positioning, are indicated.

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 handset 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 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.

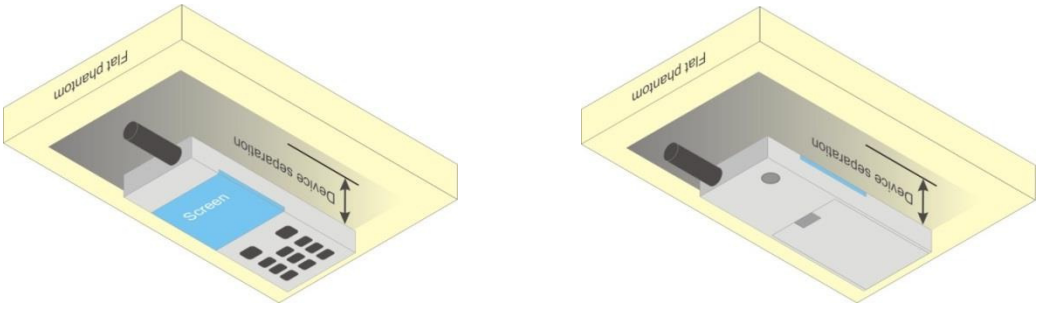


Fig 9.4 Body Worn Position

11.5 Product Specific device

For smart phones with a display diagonal dimension > 15.0 cm or an overall diagonal dimension > 16.0 cm that provide similar mobile web access and multimedia support found in mini-tablets or UMPC mini-tablets that support voice calls next to the ear, According to KDB648474 D04v01r03, the following phablet procedures should be applied to evaluate SAR compliance for each applicable wireless modes and frequency band. Devices marketed as phablets, regardless of form factors and operating characteristics must be tested as a phablet to determine SAR compliance

1. The normally required head and body-worn accessory SAR test procedures for handsets, including hotspot mode, must be applied.

2. The UMPC mini-tablet procedures must also be applied to test the SAR of all surfaces and edges with an antenna located at ≤ 25 mm from that surface or edge, in direct contact with a flat phantom, for 10-g extremity SAR according to the body-equivalent tissue dielectric parameters in KDB 865664 to address interactive hand use exposure conditions.6 The UMPC mini-tablet 1-g SAR at 5 mm is not required. When hotspot mode applies, 10-g extremity SAR is required only for the surfaces and edges with hotspot mode 1-g reported SAR > 1.2 W/kg.

11.6 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 form 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 ≤ ¼ dB higher than the primary mode, SAR measurement is not required for the secondary mode

<Default Power Mode>

GSM850	Burst Average Power (dBm)			Tune-up Limit (dBm)	Frame-Average Power (dBm)			Tune-up Limit (dBm)
TX Channel	128	189	251		128	189	251	
Frequency (MHz)	824.2	836.4	848.8		824.2	836.4	848.8	
GSM 1 Tx slot	33.48	33.14	33.10	33.50	24.48	24.14	24.10	24.50
GPRS 1 Tx slot	33.49	33.13	33.11	33.50	24.49	24.13	24.11	24.50
GPRS 2 Tx slots	29.43	29.45	29.07	30.50	23.43	23.45	23.07	24.50
GPRS 3 Tx slots	27.32	27.31	27.13	28.75	23.06	23.05	22.87	24.49
GPRS 4 Tx slots	25.78	25.78	25.57	27.50	22.78	22.78	22.57	24.50
EDGE 1 Tx slot	26.53	26.55	26.51	28.50	17.53	17.55	17.51	19.50
EDGE 2 Tx slots	26.38	26.42	26.24	28.50	20.38	20.42	20.24	22.50
EDGE 3 Tx slots	25.88	25.95	25.81	26.75	21.62	21.69	21.55	22.49
EDGE 4 Tx slots	24.53	24.58	24.49	25.50	21.53	21.58	21.49	22.50

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	29.71	29.87	30.16	30.50	20.71	20.87	21.16	21.50
GPRS 1 Tx slot	29.71	29.88	30.18	30.50	20.71	20.88	21.18	21.50
GPRS 2 Tx slots	26.36	26.36	26.82	27.50	20.36	20.36	20.82	21.50
GPRS 3 Tx slots	24.39	24.44	24.69	25.75	20.13	20.18	20.43	21.49
GPRS 4 Tx slots	23.72	23.66	23.90	24.50	20.72	20.66	20.90	21.50
EDGE 1 Tx slot	25.24	25.29	25.60	27.50	16.24	16.29	16.60	18.50
EDGE 2 Tx slots	25.03	25.06	25.50	27.50	19.03	19.06	19.50	21.50
EDGE 3 Tx slots	24.61	24.64	25.04	25.75	20.35	20.38	20.78	21.49
EDGE 4 Tx slots	23.24	23.29	23.72	24.50	20.24	20.29	20.72	21.50

<Near-body and Hotspot Mode>

GSM850	Burst Average Power (dBm)			Tune-up Limit (dBm)	Frame-Average Power (dBm)			Tune-up Limit (dBm)
TX Channel	128	189	251		128	189	251	
Frequency (MHz)	824.2	836.4	848.8		824.2	836.4	848.8	
GSM 1 Tx slot	29.71	29.74	29.63	31.00	20.71	20.74	20.63	22.00
GPRS 1 Tx slot	29.70	29.72	29.59	31.00	20.70	20.72	20.59	22.00
GPRS 2 Tx slots	26.34	26.38	26.26	28.00	20.34	20.38	20.26	22.00
GPRS 3 Tx slots	24.41	24.45	24.30	26.25	20.15	20.19	20.04	21.99
GPRS 4 Tx slots	23.01	23.02	23.00	25.00	20.01	20.02	20.00	22.00
EDGE 1 Tx slot	26.22	26.32	26.06	28.00	17.22	17.32	17.06	19.00
EDGE 2 Tx slots	26.06	26.13	26.00	28.00	20.06	20.13	20.00	22.00
EDGE 3 Tx slots	24.74	24.80	24.60	26.25	20.48	20.54	20.34	21.99
EDGE 4 Tx slots	23.33	23.45	23.24	25.00	20.33	20.45	20.24	22.00

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	29.71	29.87	30.16	30.50	20.71	20.87	21.16	21.50
GPRS 1 Tx slot	29.71	29.88	30.18	30.50	20.71	20.88	21.18	21.50
GPRS 2 Tx slots	26.36	26.36	26.82	27.50	20.36	20.36	20.82	21.50
GPRS 3 Tx slots	24.39	24.44	24.69	25.75	20.13	20.18	20.43	21.49
GPRS 4 Tx slots	23.72	23.66	23.90	24.50	20.72	20.66	20.90	21.50
EDGE 1 Tx slot	25.24	25.29	25.60	27.50	16.24	16.29	16.60	18.50
EDGE 2 Tx slots	25.03	25.06	25.50	27.50	19.03	19.06	19.50	21.50
EDGE 3 Tx slots	24.61	24.64	25.04	25.75	20.35	20.38	20.78	21.49
EDGE 4 Tx slots	23.24	23.29	23.72	24.50	20.24	20.29	20.72	21.50

<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 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} *(Note1, Note 2)*	**CM** (dB) *(Note 3)*	**MPR** (dB) *(Note 3)*
1	2/15	15/15	64	2/15	4/15	0.0	0.0
2	12/15 *(Note 4)*	15/15 *(Note 4)*	64	12/15 *(Note 4)*	24/15	1.0	0.0
3	15/15	8/15	64	15/8	30/15	1.5	0.5
4	15/15	4/15	64	15/4	30/15	1.5	0.5

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

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

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

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

Setup Configuration

HSUPA Setup Configuration:

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

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

Sub-test	β_c	β_d	β_d (SF)	β_c/β_d	β_{HS} (Note1)	β_{ec}	β_{ed} (Note 5) (Note 6)	β_{ed} (SF)	β_{ed} (Codes)	CM (dB) (Note 2)	MPR (dB) (Note 2)	AG Index (Note 6)	E-TFCI
1	11/15 (Note 3)	15/15 (Note 3)	64	11/15 (Note 3)	22/15	209/225	1309/225	4	1	1.0	0.0	20	75
2	6/15	15/15	64	6/15	12/15	12/15	94/75	4	1	3.0	2.0	12	67
3	15/15	9/15	64	15/9	30/15	30/15	β_{ed}1: 47/15 β_{ed}2: 47/15	4 4	2	2.0	1.0	15	92
4	2/15	15/15	64	2/15	4/15	2/15	56/75	4	1	3.0	2.0	17	71
5	15/15 (Note 4)	15/15 (Note 4)	64	15/15 (Note 4)	30/15	24/15	134/15	4	1	1.0	0.0	21	81

Note 1: Δ_{ACK}, Δ_{NACK} and Δ_{CQI} = 30/15 with β_{hs} = 30/15 * β_c.
Note 2: CM = 1 for β_c/β_d =12/15, β_{hs}/β_c=24/15. For all other combinations of DPDCH, DPCCH, HS- DPCCH, E-DPDCH and E-DPCCH the MPR is based on the relative CM difference.
Note 3: For subtest 1 the β_c/β_d ratio of 11/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signalled gain factors for the reference TFC (TF1, TF1) to β_c = 10/15 and β_d = 15/15.
Note 4: For subtest 5 the β_c/β_d ratio of 15/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signalled gain factors for the reference TFC (TF1, TF1) to β_c = 14/15 and β_d = 15/15.
Note 5: 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 6: β_{ed} can not be set directly, it is set by Absolute Grant Value.

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: β_c/β_d=2/15
      b). Subtest 2: β_c/β_d=12/15
      c). Subtest 3: β_c/β_d=15/8
      d). Subtest 4: β_c/β_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	Proces ses	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.		

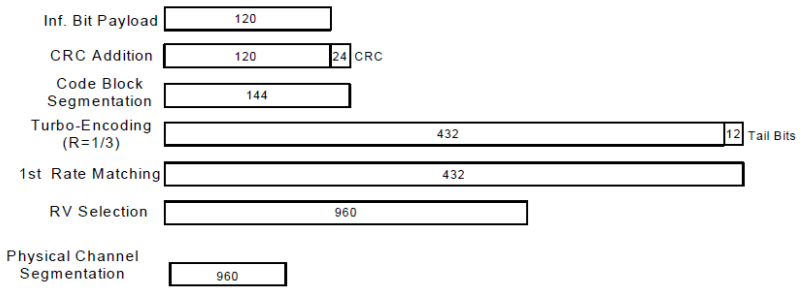


Figure C.8.19: Coding rate for Fixed reference Channel H-Set 12 (QPSK)

Setup Configuration

<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. If the maximum output power and tune-up tolerance specified for production units in HSDPA / HSUPA / DC-HSDPA 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 to RMC12.2Kbps and the adjusted SAR is ≤ 1.2 W/kg, SAR measurement is not required for HSDPA / HSUPA / DC-HSDPA.

<Default Power Mode>

Band		WCDMA II			Tune-up Limit (dBm)	WCDMA V			Tune-up Limit (dBm)
TX Channel		9262	9400	9538		4132	4182	4233	
Rx Channel		9662	9800	9938		4357	4407	4458	
Frequency (MHz)		1852.4	1880	1907.6		826.4	836.4	846.6	
3GPP Rel 99	AMR 12.2Kbps	22.96	22.92	23.08	24.00	23.04	22.95	22.92	24.00
3GPP Rel 99	RMC 12.2Kbps	22.97	22.93	23.13	24.00	23.05	22.96	22.93	24.00
3GPP Rel 6	HSDPA Subtest-1	21.94	21.90	22.09	23.00	22.04	21.91	21.93	23.00
3GPP Rel 6	HSDPA Subtest-2	21.92	21.88	22.10	23.00	22.03	21.91	21.92	23.00
3GPP Rel 6	HSDPA Subtest-3	21.44	21.41	21.62	22.50	21.55	21.43	21.44	22.50
3GPP Rel 6	HSDPA Subtest-4	21.43	21.42	21.61	22.50	21.54	21.43	21.43	22.50
3GPP Rel 8	DC-HSDPA Subtest-1	21.94	21.92	22.11	23.00	22.03	21.90	21.92	23.00
3GPP Rel 8	DC-HSDPA Subtest-2	21.93	21.92	21.12	23.00	22.03	21.90	21.91	23.00
3GPP Rel 8	DC-HSDPA Subtest-3	21.42	21.42	21.62	22.50	21.54	21.42	21.43	22.50
3GPP Rel 8	DC-HSDPA Subtest-4	21.45	21.42	21.61	22.50	21.53	21.41	21.40	22.50
3GPP Rel 6	HSUPA Subtest-1	21.91	21.90	22.04	23.00	22.05	21.90	21.89	23.00
3GPP Rel 6	HSUPA Subtest-2	19.95	19.92	20.11	21.00	20.03	19.92	19.90	21.00
3GPP Rel 6	HSUPA Subtest-3	20.90	20.85	21.06	22.00	21.00	20.90	20.85	22.00
3GPP Rel 6	HSUPA Subtest-4	19.74	19.93	20.13	21.00	20.00	19.92	19.89	21.00
3GPP Rel 6	HSUPA Subtest-5	21.85	21.79	22.07	23.00	22.02	22.02	21.82	23.00

<Near-body and Hotspot Mode>

Band		WCDMA II			Tune-up Limit (dBm)	WCDMA V			Tune-up Limit (dBm)
TX Channel		9262	9400	9538		4132	4182	4233	
Rx Channel		9662	9800	9938		4357	4407	4458	
Frequency (MHz)		1852.4	1880	1907.6		826.4	836.4	846.6	
3GPP Rel 99	AMR 12.2Kbps	21.83	21.70	21.98	23.00	19.33	19.25	19.31	20.50
3GPP Rel 99	RMC 12.2Kbps	21.84	21.71	22.00	23.00	19.35	19.27	19.32	20.50
3GPP Rel 6	HSDPA Subtest-1	20.84	20.68	20.94	22.00	18.27	18.22	18.22	19.50
3GPP Rel 6	HSDPA Subtest-2	20.86	20.70	20.95	22.00	18.30	18.21	18.20	19.50
3GPP Rel 6	HSDPA Subtest-3	20.40	20.22	20.48	21.50	17.81	17.74	17.75	19.00
3GPP Rel 6	HSDPA Subtest-4	20.36	20.20	20.47	21.50	17.80	17.74	17.73	19.00
3GPP Rel 8	DC-HSDPA Subtest-1	20.80	20.66	20.90	22.00	18.25	18.20	18.21	19.50
3GPP Rel 8	DC-HSDPA Subtest-2	20.82	20.77	20.92	22.00	18.29	18.20	18.20	19.50
3GPP Rel 8	DC-HSDPA Subtest-3	20.37	20.21	20.44	21.50	17.78	17.73	17.74	19.00
3GPP Rel 8	DC-HSDPA Subtest-4	20.32	20.20	20.41	21.50	17.75	17.70	17.72	19.00
3GPP Rel 6	HSUPA Subtest-1	20.47	20.43	20.62	22.00	17.82	17.72	17.76	19.50
3GPP Rel 6	HSUPA Subtest-2	18.87	18.80	18.98	20.00	16.32	16.24	16.28	17.50
3GPP Rel 6	HSUPA Subtest-3	19.65	19.61	19.77	21.00	17.25	17.18	17.22	18.50
3GPP Rel 6	HSUPA Subtest-4	18.75	18.70	18.79	20.00	16.33	16.27	16.29	17.50
3GPP Rel 6	HSUPA Subtest-5	20.80	20.72	20.90	22.00	18.20	18.17	18.14	19.50

<CDMA Conducted Power>

General Note:

1. Per KDB 941225 D01v03r01, SAR for head exposure is measured in RC3 with the handset configured to transmit at full rate in SO55.
2. Per KDB 941225 D01v03r01, in Hotspot mode EUT is treated as data device and SAR is tested with Ev-Do Rev 0 (RTAP 153.6kbps) as the primary mode.
3. Per KDB 941225 D01v03r01, for Body-worn accessory SAR is measured in RC3 with the handset configured in TDSO/SO32 to transmit at full rate on FCH only with all other code channels disabled. The body-worn accessory procedures in KDB Publication 447498 are applied. The 3G SAR test reduction procedure is applied to the multiple code channel configuration (FCH+SCH), with FCH only as the primary mode.

<Default Power Mode>

Band	CDMA2000 BC0			Tune-up Limit (dBm)	CDMA2000 BC1			Tune-up Limit (dBm)
TX Channel	1013	384	777		25	600	1175	
Frequency (MHz)	824.7	836.52	848.31		1851.25	1880	1908.75	
RC1 SO55	23.80	23.73	23.55	25.00	24.10	24.09	24.19	25.00
RC3 SO55	23.76	23.74	23.54	25.00	24.05	24.07	24.12	25.00
RC3 SO32(F+SCH)	23.77	23.71	23.57	25.00	24.07	24.17	24.12	25.00
RC3 SO32(+SCH)	23.79	23.75	23.58	25.00	24.02	24.08	24.13	25.00
RTAP 153.6Kbps	24.06	23.99	23.69	25.00	24.35	24.31	24.37	25.00
RETAP 4096Bits	23.84	23.92	23.52	25.00	24.28	24.30	24.48	25.00

<Near-body and Hotspot Mode>

Band	CDMA2000 BC0			Tune-up Limit (dBm)	CDMA2000 BC1			Tune-up Limit (dBm)
TX Channel	1013	384	777		25	600	1175	
Frequency (MHz)	824.7	836.52	848.31		1851.25	1880	1908.75	
RC1 SO55	21.30	21.23	21.03	22.50	22.63	22.52	22.58	23.50
RC3 SO55	21.33	21.32	21.13	22.50	22.62	22.61	22.68	23.50
RC3 SO32(F+SCH)	21.34	21.31	21.11	22.50	22.61	22.60	22.67	23.50
RC3 SO32(+SCH)	21.32	21.31	21.10	22.50	22.62	22.63	22.69	23.50
RTAP 153.6Kbps	21.35	21.24	21.03	22.50	22.64	22.63	22.72	23.50
RETAP 4096Bits	21.29	21.31	21.09	22.50	22.62	22.63	22.70	23.50

<LTE Conducted Power>

General Note:

1. Anritsu MT8820C base station simulator was used to setup the connection with EUT; the frequency band, channel bandwidth, RB allocation configuration, modulation type are set in the base station simulator to configure EUT transmitting at maximum power and at different configurations which are requested to be reported to FCC, for conducted power measurement and SAR testing.
2. Per KDB 941225 D05v02r05, when a properly configured base station simulator is used for the SAR and power measurements, spectrum plots for each RB allocation and offset configuration is not required.
3. Per KDB 941225 D05v02r05, start with the largest channel bandwidth and measure SAR for QPSK with 1 RB allocation, using the RB offset and required test channel combination with the highest maximum output power for RB offsets at the upper edge, middle and lower edge of each required test channel.
4. Per KDB 941225 D05v02r05, 50% RB allocation for QPSK SAR testing follows 1RB QPSK allocation procedure.
5. Per KDB 941225 D05v02r05, For QPSK with 100% RB allocation, SAR is not required when the highest maximum output power for 100 % RB allocation is less than the highest maximum output power in 50% and 1 RB allocations and the highest reported SAR for 1 RB and 50% RB allocation are ≤ 0.8 W/kg. Otherwise, SAR is measured for the highest output power channel; and if the reported SAR is > 1.45 W/kg, the remaining required test channels must also be tested.
6. Per KDB 941225 D05v02r05, 16QAM output power for each RB allocation configuration is > not ½ dB higher than the same configuration in QPSK and the reported SAR for the QPSK configuration is ≤ 1.45 W/kg; Per KDB 941225 D05v02r05, 16QAM SAR testing is not required.
7. Per KDB 941225 D05v02r05, Smaller bandwidth output power for each RB allocation configuration is > not ½ dB higher than the same configuration in the largest supported bandwidth, and the reported SAR for the largest supported bandwidth is ≤ 1.45 W/kg; Per KDB 941225 D05v02r05, smaller bandwidth SAR testing is not required.
8. For LTE B5 / B4 the maximum bandwidth does not support three non-overlapping channels, per KDB 941225 D05v02r05, when a device supports overlapping channel assignment in a channel bandwidth configuration, the middle channel of the group of overlapping channels should be selected for testing.

<Default Power Mode>

<LTE Band 2>

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)	MPR (dB)
Channel				18700	18900	19100		
Frequency (MHz)				1860	1880	1900		
20	QPSK	1	0	23.01	23.09	23.01	24	0
20	QPSK	1	49	22.83	22.77	22.76		
20	QPSK	1	99	22.98	22.99	22.93		
20	QPSK	50	0	22.09	22.10	22.01	23	1
20	QPSK	50	24	22.01	21.90	21.91		
20	QPSK	50	50	22.01	21.95	21.86		
20	QPSK	100	0	22.07	21.92	21.95		
20	16QAM	1	0	22.49	22.50	22.47	23	1
20	16QAM	1	49	22.15	22.02	22.06		
20	16QAM	1	99	22.35	22.31	22.23		
20	16QAM	50	0	21.10	20.97	20.87	22	2
20	16QAM	50	24	20.98	20.88	20.90		
20	16QAM	50	50	20.99	20.94	21.00		
20	16QAM	100	0	21.02	20.90	20.94		
Channel				18675	18900	19125	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1857.5	1880	1902.5		
15	QPSK	1	0	23.16	23.01	22.94	24	0
15	QPSK	1	37	22.85	22.72	22.85		
15	QPSK	1	74	23.05	22.94	23.11		
15	QPSK	36	0	22.05	21.96	22.00	23	1
15	QPSK	36	20	21.99	21.89	21.99		
15	QPSK	36	39	22.05	21.90	22.05		
15	QPSK	75	0	22.05	21.93	22.03		
15	16QAM	1	0	22.43	22.34	22.35	23	1
15	16QAM	1	37	22.12	22.01	22.09		
15	16QAM	1	74	22.38	22.34	22.42		
15	16QAM	36	0	21.01	20.93	20.98	22	2
15	16QAM	36	20	20.97	20.87	20.99		
15	16QAM	36	39	21.01	20.87	21.02		
15	16QAM	75	0	20.99	20.92	21.00		
Channel				18650	18900	19150	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1855	1880	1905		
10	QPSK	1	0	23.12	23.08	23.10	24	0
10	QPSK	1	25	22.91	22.80	22.97		
10	QPSK	1	49	23.00	23.02	23.11		
10	QPSK	25	0	22.15	21.96	22.12	23	1
10	QPSK	25	12	22.00	21.88	22.07		
10	QPSK	25	25	21.92	21.82	22.07		
10	QPSK	50	0	22.04	21.93	22.11		
10	16QAM	1	0	22.79	22.61	22.74	23	1
10	16QAM	1	25	22.12	21.99	22.19		
10	16QAM	1	49	22.40	22.40	22.55		
10	16QAM	25	0	21.11	20.93	21.10	22	2
10	16QAM	25	12	20.98	20.84	21.03		
10	16QAM	25	25	20.94	20.79	21.06		
10	16QAM	50	0	21.03	20.89	21.08		

Channel				18625	18900	19175	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1852.5	1880	1907.5		
5	QPSK	1	0	23.04	22.93	23.10	24	0
5	QPSK	1	12	22.94	22.83	22.99		
5	QPSK	1	24	22.91	22.83	23.02		
5	QPSK	12	0	22.15	22.01	22.08	23	1
5	QPSK	12	7	22.15	22.03	22.13		
5	QPSK	12	13	22.15	22.00	22.24		
5	QPSK	25	0	21.93	21.79	21.99	23	1
5	16QAM	1	0	22.51	22.29	22.53	23	1
5	16QAM	1	12	22.45	22.27	22.45		
5	16QAM	1	24	22.24	22.23	22.41		
5	16QAM	12	0	21.13	21.02	21.15	22	2
5	16QAM	12	7	21.11	21.02	21.08		
5	16QAM	12	13	21.09	21.05	21.15		
5	16QAM	25	0	20.93	20.80	20.98	22	2
Channel				18615	18900	19185	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1851.5	1880	1908.5		
3	QPSK	1	0	22.94	22.89	23.10	24	0
3	QPSK	1	8	23.07	23.01	23.08		
3	QPSK	1	14	22.86	22.76	22.93		
3	QPSK	8	0	22.09	22.05	22.18	23	1
3	QPSK	8	4	22.15	22.07	22.19		
3	QPSK	8	7	22.08	22.02	22.15		
3	QPSK	15	0	21.91	21.77	21.95	23	1
3	16QAM	1	0	22.04	22.00	22.16	23	1
3	16QAM	1	8	22.38	22.07	22.36		
3	16QAM	1	14	22.42	22.11	22.45		
3	16QAM	8	0	21.03	21.05	21.05	22	2
3	16QAM	8	4	21.10	21.03	21.15		
3	16QAM	8	7	21.00	21.03	21.08		
3	16QAM	15	0	20.91	20.81	20.98	22	2
Channel				18607	18900	19193	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1850.7	1880	1909.3		
1.4	QPSK	1	0	22.78	22.73	22.87	24	0
1.4	QPSK	1	3	22.75	22.69	22.90		
1.4	QPSK	1	5	22.76	22.70	22.88		
1.4	QPSK	3	0	22.90	22.78	22.97		
1.4	QPSK	3	1	22.94	22.89	23.08		
1.4	QPSK	3	3	22.95	22.89	23.09		
1.4	QPSK	6	0	22.07	22.02	22.10	23	1
1.4	16QAM	1	0	22.02	22.00	22.15	23	1
1.4	16QAM	1	3	22.07	22.03	22.18		
1.4	16QAM	1	5	22.01	21.93	22.09		
1.4	16QAM	3	0	21.92	21.79	21.99		
1.4	16QAM	3	1	22.08	21.93	22.06		
1.4	16QAM	3	3	22.10	21.93	22.09		
1.4	16QAM	6	0	21.05	21.01	21.08	22	2

<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	22.37	22.49	22.55	24	0
20	QPSK	1	49	22.32	22.34	22.51		
20	QPSK	1	99	22.34	22.39	22.45		
20	QPSK	50	0	21.49	21.46	21.61	23	1
20	QPSK	50	24	21.61	21.65	21.66		
20	QPSK	50	50	21.46	21.53	21.45		
20	QPSK	100	0	21.51	21.49	21.58		
20	16QAM	1	0	21.78	21.88	21.92	23	1
20	16QAM	1	49	21.55	21.60	21.73		
20	16QAM	1	99	21.61	21.63	21.64		
20	16QAM	50	0	20.59	20.39	20.47	22	2
20	16QAM	50	24	20.65	20.64	20.58		
20	16QAM	50	50	20.50	20.52	20.44		
20	16QAM	100	0	20.51	20.59	20.46		
Channel				20025	20175	20325	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1717.5	1732.5	1747.5		
15	QPSK	1	0	22.56	22.56	22.73	24	0
15	QPSK	1	37	22.38	22.42	22.48		
15	QPSK	1	74	22.30	22.36	22.32		
15	QPSK	36	0	21.57	21.51	21.60	23	1
15	QPSK	36	20	21.56	21.60	21.61		
15	QPSK	36	39	21.54	21.44	21.54		
15	QPSK	75	0	21.54	21.56	21.60		
15	16QAM	1	0	21.72	21.77	21.79	23	1
15	16QAM	1	37	21.56	21.67	21.69		
15	16QAM	1	74	21.62	21.60	21.67		
15	16QAM	36	0	20.50	20.46	20.55	22	2
15	16QAM	36	20	20.58	20.62	20.68		
15	16QAM	36	39	20.53	20.41	20.51		
15	16QAM	75	0	20.57	20.56	20.52		
Channel				20000	20175	20350	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1715	1732.5	1750		
10	QPSK	1	0	22.29	22.33	22.46	24	0
10	QPSK	1	25	22.56	22.58	22.71		
10	QPSK	1	49	22.87	22.89	22.99		
10	QPSK	25	0	21.60	21.64	21.69	23	1
10	QPSK	25	12	21.60	21.65	21.73		
10	QPSK	25	25	21.63	21.74	21.77		
10	QPSK	50	0	21.64	21.72	21.78		
10	16QAM	1	0	22.09	22.23	22.33	23	1
10	16QAM	1	25	21.76	21.84	21.88		
10	16QAM	1	49	22.24	22.33	22.35		
10	16QAM	25	0	20.59	20.59	20.67	22	2
10	16QAM	25	12	20.58	20.69	20.71		
10	16QAM	25	25	20.61	20.73	20.75		
10	16QAM	50	0	20.64	20.72	20.75		

Channel				19975	20175	20375	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1712.5	1732.5	1752.5		
5	QPSK	1	0	22.19	22.14	22.33	24	0
5	QPSK	1	12	22.52	22.60	22.70		
5	QPSK	1	24	22.62	22.68	22.73		
5	QPSK	12	0	21.63	21.67	21.71	23	1
5	QPSK	12	7	21.62	21.62	21.70		
5	QPSK	12	13	21.57	21.62	21.67		
5	QPSK	25	0	21.58	21.64	21.66	23	1
5	16QAM	1	0	22.12	22.11	22.14	23	1
5	16QAM	1	12	21.91	21.97	22.08		
5	16QAM	1	24	21.05	21.15	21.18		
5	16QAM	12	0	20.65	20.59	20.74	22	2
5	16QAM	12	7	20.63	20.67	20.70		
5	16QAM	12	13	20.60	20.64	20.68		
5	16QAM	25	0	20.59	20.65	20.70	22	2
Channel				19965	20175	20385	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1711.5	1732.5	1753.5		
3	QPSK	1	0	22.55	22.60	22.61	24	0
3	QPSK	1	8	22.61	22.67	22.84		
3	QPSK	1	14	22.54	22.84	22.86		
3	QPSK	8	0	21.54	21.56	21.65	23	0
3	QPSK	8	4	21.63	21.26	21.78		
3	QPSK	8	7	21.60	21.59	21.64		
3	QPSK	15	0	21.50	21.64	21.64	23	1
3	16QAM	1	0	21.45	21.98	21.83	23	1
3	16QAM	1	8	22.02	21.62	22.02		
3	16QAM	1	14	21.57	21.28	22.21		
3	16QAM	8	0	20.61	20.60	20.73	22	2
3	16QAM	8	4	20.73	20.43	20.90		
3	16QAM	8	7	20.57	20.67	20.69		
3	16QAM	15	0	20.52	20.65	20.68	22	2
Channel				19957	20175	20393	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1710.7	1732.5	1754.3		
1.4	QPSK	1	0	22.63	22.51	22.68	24	0
1.4	QPSK	1	3	22.71	22.77	22.83		
1.4	QPSK	1	5	22.48	22.53	22.58		
1.4	QPSK	3	0	22.58	22.58	22.64		
1.4	QPSK	3	1	22.64	22.54	22.75		
1.4	QPSK	3	3	22.67	22.58	22.78		
1.4	QPSK	6	0	21.41	21.54	21.60	23	1
1.4	16QAM	1	0	21.77	21.73	21.82	23	1
1.4	16QAM	1	3	21.84	21.89	21.95		
1.4	16QAM	1	5	21.68	21.77	21.76		
1.4	16QAM	3	0	21.58	21.61	21.65		
1.4	16QAM	3	1	21.61	21.60	21.75		
1.4	16QAM	3	3	21.55	21.55	21.78		
1.4	16QAM	6	0	20.52	20.63	20.68	22	2

<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	22.99	22.86	22.89	24	0
10	QPSK	1	25	22.83	22.63	22.71		
10	QPSK	1	49	22.75	22.64	22.47		
10	QPSK	25	0	21.92	21.77	21.89	23	1
10	QPSK	25	12	21.78	21.73	21.87		
10	QPSK	25	25	21.71	21.70	21.85		
10	QPSK	50	0	21.82	21.77	21.74		
10	16QAM	1	0	22.15	22.07	22.11	23	1
10	16QAM	1	25	21.89	22.02	21.93		
10	16QAM	1	49	21.92	22.11	21.77		
10	16QAM	25	0	20.64	20.81	20.82	22	2
10	16QAM	25	12	20.71	20.84	20.77		
10	16QAM	25	25	20.71	20.85	20.65		
10	16QAM	50	0	20.69	20.68	20.72		
Channel				20425	20525	20625	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				826.5	836.5	846.5		
5	QPSK	1	0	22.84	22.82	22.77	24	0
5	QPSK	1	12	22.80	22.79	22.53		
5	QPSK	1	24	22.73	22.67	22.57		
5	QPSK	12	0	21.78	21.79	21.72	23	1
5	QPSK	12	7	21.81	21.83	21.70		
5	QPSK	12	13	21.79	21.87	21.60		
5	QPSK	25	0	21.77	21.80	21.67	23	1
5	16QAM	1	0	22.27	22.26	22.17	23	1
5	16QAM	1	12	22.25	22.21	22.11		
5	16QAM	1	24	21.73	22.19	21.21		
5	16QAM	12	0	20.75	20.79	20.79	22	2
5	16QAM	12	7	20.76	20.91	20.76		
5	16QAM	12	13	20.76	20.88	20.65		
5	16QAM	25	0	20.74	20.78	20.73	22	2
Channel				20415	20525	20635	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				825.5	836.5	847.5		
3	QPSK	1	0	22.81	22.78	22.69	24	0
3	QPSK	1	8	22.67	22.75	22.48		
3	QPSK	1	14	22.69	22.71	22.45		
3	QPSK	8	0	21.78	21.76	21.55	23	1
3	QPSK	8	4	21.72	21.72	21.08		
3	QPSK	8	7	21.70	21.79	21.51		
3	QPSK	15	0	21.70	21.79	21.52	23	1
3	16QAM	1	0	22.19	22.05	22.09	23	1
3	16QAM	1	8	22.10	21.92	21.37		
3	16QAM	1	14	22.05	22.05	21.34		
3	16QAM	8	0	20.82	20.77	20.56	22	2
3	16QAM	8	4	20.86	20.67	20.15		
3	16QAM	8	7	20.71	20.77	20.47		
3	16QAM	15	0	20.72	20.83	20.57	22	2

Channel				20407	20525	20643	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				824.7	836.5	848.3		
1.4	QPSK	1	0	22.89	22.77	22.63	24	0
1.4	QPSK	1	3	22.87	22.73	22.51		
1.4	QPSK	1	5	22.74	22.74	22.44		
1.4	QPSK	3	0	22.84	22.74	22.52	23	1
1.4	QPSK	3	1	22.77	22.72	22.59		
1.4	QPSK	3	3	22.77	22.84	22.54		
1.4	QPSK	6	0	21.75	21.84	21.54		
1.4	16QAM	1	0	22.09	22.10	21.77	23	1
1.4	16QAM	1	3	22.22	22.21	21.67		
1.4	16QAM	1	5	22.05	22.06	21.75		
1.4	16QAM	3	0	21.86	21.81	21.55	22	2
1.4	16QAM	3	1	21.85	21.74	21.53		
1.4	16QAM	3	3	21.93	21.74	21.48		
1.4	16QAM	6	0	20.79	20.83	20.47		

<LTE Band 7>

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.
Channel				20850	21100	21350		
Frequency (MHz)				2510	2535	2560		
20	QPSK	1	0	22.84	22.58	22.67	24	0
20	QPSK	1	49	22.58	22.48	22.57		
20	QPSK	1	99	23.01	22.78	22.92		
20	QPSK	50	0	21.63	21.61	21.65	23	1
20	QPSK	50	24	21.57	21.64	21.78		
20	QPSK	50	50	21.86	21.68	21.79		
20	QPSK	100	0	21.61	21.75	21.87		
20	16QAM	1	0	21.96	22.05	22.01	23	1
20	16QAM	1	49	21.75	21.77	21.89		
20	16QAM	1	99	22.02	22.12	22.25		
20	16QAM	50	0	20.60	20.59	20.65	22	2
20	16QAM	50	24	20.56	20.62	20.79		
20	16QAM	50	50	20.66	20.53	20.87		
20	16QAM	100	0	20.58	20.60	20.84		
Channel				20825	21100	21375	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				2507.5	2535	2562.5		
15	QPSK	1	0	22.03	22.01	22.02	24	0
15	QPSK	1	37	22.60	22.50	22.65		
15	QPSK	1	74	22.83	22.74	22.88		
15	QPSK	36	0	21.65	21.69	21.76	23	1
15	QPSK	36	20	21.71	21.64	21.73		
15	QPSK	36	39	21.74	21.66	21.85		
15	QPSK	75	0	21.73	21.72	21.77		
15	16QAM	1	0	22.05	22.01	22.06	23	1
15	16QAM	1	37	21.89	21.79	21.88		
15	16QAM	1	74	22.17	22.10	22.34		
15	16QAM	36	0	20.61	20.64	20.67	22	2
15	16QAM	36	20	20.70	20.61	20.69		
15	16QAM	36	39	20.68	20.59	20.81		
15	16QAM	75	0	20.70	20.64	20.73		
Channel				20800	21100	21400	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				2505	2535	2565		
10	QPSK	1	0	22.32	22.38	22.41	24	0
10	QPSK	1	25	22.60	22.38	22.62		
10	QPSK	1	49	22.74	22.38	22.80		
10	QPSK	25	0	21.71	21.76	21.79	23	1
10	QPSK	25	12	21.69	21.64	21.71		
10	QPSK	25	25	21.74	21.68	21.84		
10	QPSK	50	0	21.79	21.75	21.78		
10	16QAM	1	0	22.45	22.38	22.45	23	1
10	16QAM	1	25	21.83	21.78	21.87		
10	16QAM	1	49	22.38	22.32	22.56		
10	16QAM	25	0	20.57	20.71	20.77	22	2
10	16QAM	25	12	20.59	20.61	20.72		
10	16QAM	25	25	20.70	20.64	20.85		
10	16QAM	50	0	20.76	20.69	20.81		

Channel				20775	21100	21425	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				2502.5	2535	2567.5		
5	QPSK	1	0	22.73	22.77	22.79	24	0
5	QPSK	1	12	22.52	22.54	22.67		
5	QPSK	1	24	22.33	22.57	22.21		
5	QPSK	12	0	21.59	21.57	21.69	23	1
5	QPSK	12	7	21.57	21.57	21.70		
5	QPSK	12	13	21.53	21.53	21.70		
5	QPSK	25	0	21.56	21.53	21.66	23	1
5	16QAM	1	0	22.02	21.88	22.24	23	1
5	16QAM	1	12	22.00	21.88	22.09		
5	16QAM	1	24	21.81	21.04	21.59		
5	16QAM	12	0	20.61	20.57	20.71	22	2
5	16QAM	12	7	20.56	20.53	20.72		
5	16QAM	12	13	20.53	20.50	20.70		
5	16QAM	25	0	20.58	20.53	20.69	22	2

<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	22.32			24	0
10	QPSK	1	25	22.25				
10	QPSK	1	49	22.29				
10	QPSK	25	0	21.56			23	1
10	QPSK	25	12	21.55				
10	QPSK	25	25	21.50				
10	QPSK	50	0	21.58				
10	16QAM	1	0	22.20			23	1
10	16QAM	1	25	21.66				
10	16QAM	1	49	22.05				
10	16QAM	25	0	20.53			22	2
10	16QAM	25	12	20.52				
10	16QAM	25	25	20.57				
10	16QAM	50	0	20.00				
Channel				23205	23230	23255	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				779.5	782	784.5		
5	QPSK	1	0	22.55	22.53	22.50	24	0
5	QPSK	1	12	22.44	22.38	22.54		
5	QPSK	1	24	22.37	22.54	22.53		
5	QPSK	12	0	21.56	21.55	21.55	23	1
5	QPSK	12	7	21.50	21.46	21.64		
5	QPSK	12	13	21.41	21.47	21.50		
5	QPSK	25	0	21.49	21.48	21.48		
5	16QAM	1	0	21.90	22.06	21.98	23	1
5	16QAM	1	12	21.70	22.01	22.04		
5	16QAM	1	24	22.00	22.05	22.15		
5	16QAM	12	0	20.55	20.39	20.41	22	2
5	16QAM	12	7	20.51	20.38	20.50		
5	16QAM	12	13	20.37	20.26	20.57		
5	16QAM	25	0	20.47	20.35	20.42		

<Near-body and Hotspot Mode>

<LTE Band 2>

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)	MPR (dB)
Channel				18700	18900	19100		
Frequency (MHz)				1860	1880	1900		
20	QPSK	1	0	23.01	23.09	23.01	24	0
20	QPSK	1	49	22.83	22.77	22.76		
20	QPSK	1	99	22.98	22.99	22.93		
20	QPSK	50	0	22.09	22.10	22.01	23	1
20	QPSK	50	24	22.01	21.90	21.91		
20	QPSK	50	50	22.01	21.95	21.86		
20	QPSK	100	0	22.07	21.92	21.95		
20	16QAM	1	0	22.49	22.50	22.47	23	1
20	16QAM	1	49	22.15	22.02	22.06		
20	16QAM	1	99	22.35	22.31	22.23		
20	16QAM	50	0	21.10	20.97	20.87	22	2
20	16QAM	50	24	20.98	20.88	20.90		
20	16QAM	50	50	20.99	20.94	21.00		
20	16QAM	100	0	21.02	20.90	20.94		
Channel				18675	18900	19125	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1857.5	1880	1902.5		
15	QPSK	1	0	23.16	23.01	22.94	24	0
15	QPSK	1	37	22.85	22.72	22.85		
15	QPSK	1	74	23.05	22.94	23.11		
15	QPSK	36	0	22.05	21.96	22.00	23	1
15	QPSK	36	20	21.99	21.89	21.99		
15	QPSK	36	39	22.05	21.90	22.05		
15	QPSK	75	0	22.05	21.93	22.03		
15	16QAM	1	0	22.43	22.34	22.35	23	1
15	16QAM	1	37	22.12	22.01	22.09		
15	16QAM	1	74	22.38	22.34	22.42		
15	16QAM	36	0	21.01	20.93	20.98	22	2
15	16QAM	36	20	20.97	20.87	20.99		
15	16QAM	36	39	21.01	20.87	21.02		
15	16QAM	75	0	20.99	20.92	21.00		
Channel				18650	18900	19150	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1855	1880	1905		
10	QPSK	1	0	23.12	23.08	23.10	24	0
10	QPSK	1	25	22.91	22.80	22.97		
10	QPSK	1	49	23.00	23.02	23.11		
10	QPSK	25	0	22.15	21.96	22.12	23	1
10	QPSK	25	12	22.00	21.88	22.07		
10	QPSK	25	25	21.92	21.82	22.07		
10	QPSK	50	0	22.04	21.93	22.11		
10	16QAM	1	0	22.79	22.61	22.74	23	1
10	16QAM	1	25	22.12	21.99	22.19		
10	16QAM	1	49	22.40	22.40	22.55		
10	16QAM	25	0	21.11	20.93	21.10	22	2
10	16QAM	25	12	20.98	20.84	21.03		
10	16QAM	25	25	20.94	20.79	21.06		
10	16QAM	50	0	21.03	20.89	21.08		

Channel				18625	18900	19175	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1852.5	1880	1907.5		
5	QPSK	1	0	23.04	22.93	23.10	24	0
5	QPSK	1	12	22.94	22.83	22.99		
5	QPSK	1	24	22.91	22.83	23.02		
5	QPSK	12	0	22.15	22.01	22.08	23	1
5	QPSK	12	7	22.15	22.03	22.13		
5	QPSK	12	13	22.15	22.00	22.24		
5	QPSK	25	0	21.93	21.79	21.99	23	1
5	16QAM	1	0	22.51	22.29	22.53	23	1
5	16QAM	1	12	22.45	22.27	22.45		
5	16QAM	1	24	22.24	22.23	22.41		
5	16QAM	12	0	21.13	21.02	21.15	22	2
5	16QAM	12	7	21.11	21.02	21.08		
5	16QAM	12	13	21.09	21.05	21.15		
5	16QAM	25	0	20.93	20.80	20.98	22	2
Channel				18615	18900	19185	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1851.5	1880	1908.5		
3	QPSK	1	0	22.94	22.89	23.10	24	0
3	QPSK	1	8	23.07	23.01	23.08		
3	QPSK	1	14	22.86	22.76	22.93		
3	QPSK	8	0	22.09	22.05	22.18	23	1
3	QPSK	8	4	22.15	22.07	22.19		
3	QPSK	8	7	22.08	22.02	22.15		
3	QPSK	15	0	21.91	21.77	21.95	23	1
3	16QAM	1	0	22.04	22.00	22.16	23	1
3	16QAM	1	8	22.38	22.07	22.36		
3	16QAM	1	14	22.42	22.11	22.45		
3	16QAM	8	0	21.03	21.05	21.05	22	2
3	16QAM	8	4	21.10	21.03	21.15		
3	16QAM	8	7	21.00	21.03	21.08		
3	16QAM	15	0	20.91	20.81	20.98	22	2
Channel				18607	18900	19193	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1850.7	1880	1909.3		
1.4	QPSK	1	0	22.78	22.73	22.87	24	0
1.4	QPSK	1	3	22.75	22.69	22.90		
1.4	QPSK	1	5	22.76	22.70	22.88		
1.4	QPSK	3	0	22.90	22.78	22.97		
1.4	QPSK	3	1	22.94	22.89	23.08		
1.4	QPSK	3	3	22.95	22.89	23.09		
1.4	QPSK	6	0	22.07	22.02	22.10	23	1
1.4	16QAM	1	0	22.02	22.00	22.15	23	1
1.4	16QAM	1	3	22.07	22.03	22.18		
1.4	16QAM	1	5	22.01	21.93	22.09		
1.4	16QAM	3	0	21.92	21.79	21.99		
1.4	16QAM	3	1	22.08	21.93	22.06		
1.4	16QAM	3	3	22.10	21.93	22.09		
1.4	16QAM	6	0	21.05	21.01	21.08	22	2

<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	22.00	22.08	22.14	23	0
20	QPSK	1	49	21.49	21.58	21.73		
20	QPSK	1	99	21.84	21.93	21.90		
20	QPSK	50	0	22.04	21.95	21.99	23	0
20	QPSK	50	24	22.13	22.09	22.15		
20	QPSK	50	50	21.95	22.04	21.94		
20	QPSK	100	0	21.96	21.99	22.07		
20	16QAM	1	0	22.01	22.11	22.22	23	0
20	16QAM	1	49	22.27	22.37	22.46		
20	16QAM	1	99	22.08	22.20	22.13		
20	16QAM	50	0	21.03	20.92	20.95	22	1
20	16QAM	50	24	21.13	21.13	21.07		
20	16QAM	50	50	20.97	21.02	20.95		
20	16QAM	100	0	20.98	21.05	20.95		
Channel				20025	20175	20325	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1717.5	1732.5	1747.5		
15	QPSK	1	0	21.41	21.58	21.63	23	0
15	QPSK	1	37	21.74	21.94	22.04		
15	QPSK	1	74	21.77	21.81	21.83		
15	QPSK	36	0	22.03	22.00	22.14	23	0
15	QPSK	36	20	22.42	22.00	22.17		
15	QPSK	36	39	22.03	21.96	22.05		
15	QPSK	75	0	22.06	22.05	22.04		
15	16QAM	1	0	21.97	22.13	22.26	23	0
15	16QAM	1	37	22.14	22.22	22.25		
15	16QAM	1	74	22.06	22.14	22.11		
15	16QAM	36	0	20.95	20.99	21.06	22	1
15	16QAM	36	20	21.38	20.90	21.28		
15	16QAM	36	39	20.99	20.91	20.99		
15	16QAM	75	0	21.04	21.03	21.04		
Channel				20000	20175	20350	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1715	1732.5	1750		
10	QPSK	1	0	22.00	22.12	22.17	23	0
10	QPSK	1	25	22.02	22.10	22.21		
10	QPSK	1	49	22.38	22.42	22.48		
10	QPSK	25	0	22.08	22.12	22.20	23	0
10	QPSK	25	12	22.07	22.16	22.25		
10	QPSK	25	25	22.10	22.23	22.27		
10	QPSK	50	0	22.12	22.24	22.26		
10	16QAM	1	0	22.63	22.77	22.85	23	0
10	16QAM	1	25	22.26	22.37	22.38		
10	16QAM	1	49	22.72	22.81	22.90		
10	16QAM	25	0	21.05	21.12	21.17	22	1
10	16QAM	25	12	21.06	21.19	21.21		
10	16QAM	25	25	21.09	21.22	21.24		
10	16QAM	50	0	21.11	21.20	21.24		

Channel				19975	20175	20375	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1712.5	1732.5	1752.5		
5	QPSK	1	0	21.97	21.94	22.10	23	0
5	QPSK	1	12	21.97	22.14	22.18		
5	QPSK	1	24	22.06	22.17	22.23		
5	QPSK	12	0	21.92	21.99	21.92	23	0
5	QPSK	12	7	21.99	21.96	21.92		
5	QPSK	12	13	21.93	21.90	21.96		
5	QPSK	25	0	21.98	21.92	21.97	23	0
5	16QAM	1	0	22.67	22.59	22.68	23	0
5	16QAM	1	12	22.42	22.43	22.56		
5	16QAM	1	24	22.53	22.61	22.66		
5	16QAM	12	0	21.15	21.13	21.25	22	1
5	16QAM	12	7	21.10	21.15	21.21		
5	16QAM	12	13	21.06	21.12	21.17		
5	16QAM	25	0	21.08	21.16	21.19	22	1
Channel				19965	20175	20385	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1711.5	1732.5	1753.5		
3	QPSK	1	0	21.95	21.68	21.86	23	0
3	QPSK	1	8	22.09	22.34	22.42		
3	QPSK	1	14	22.12	22.10	22.11		
3	QPSK	8	0	22.03	22.09	22.18	23	0
3	QPSK	8	4	21.98	21.95	22.34		
3	QPSK	8	7	21.99	22.09	22.16		
3	QPSK	15	0	21.94	22.08	22.16	23	0
3	16QAM	1	0	21.87	22.44	22.27	23	0
3	16QAM	1	8	22.35	22.23	22.68		
3	16QAM	1	14	22.10	21.92	22.55		
3	16QAM	8	0	21.07	21.17	21.22	22	1
3	16QAM	8	4	21.02	21.04	21.36		
3	16QAM	8	7	21.04	21.18	21.20		
3	16QAM	15	0	20.95	21.14	21.18	22	1
Channel				19957	20175	20393	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1710.7	1732.5	1754.3		
1.4	QPSK	1	0	21.66	21.69	21.79	23	0
1.4	QPSK	1	3	22.15	22.26	22.35		
1.4	QPSK	1	5	21.96	22.02	22.06		
1.4	QPSK	3	0	21.99	22.08	22.15		
1.4	QPSK	3	1	21.82	22.26	22.19		
1.4	QPSK	3	3	21.72	21.91	22.23		
1.4	QPSK	6	0	21.90	22.03	22.09	23	0
1.4	16QAM	1	0	22.23	22.23	22.37	23	0
1.4	16QAM	1	3	22.34	22.18	22.43		
1.4	16QAM	1	5	22.17	22.25	22.28		
1.4	16QAM	3	0	22.04	22.10	22.16		
1.4	16QAM	3	1	22.10	21.88	22.31		
1.4	16QAM	3	3	22.12	21.86	22.34		
1.4	16QAM	6	0	20.98	21.11	21.18	22	1

<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	18.56	18.66	18.57	20	0
10	QPSK	1	25	18.38	18.65	18.38		
10	QPSK	1	49	18.44	18.42	18.19		
10	QPSK	25	0	18.47	18.69	18.54	20	0
10	QPSK	25	12	18.45	18.58	18.46		
10	QPSK	25	25	18.38	18.60	18.36		
10	QPSK	50	0	18.46	18.55	18.45		
10	16QAM	1	0	18.84	18.87	18.87	20	0
10	16QAM	1	25	18.59	18.88	18.62		
10	16QAM	1	49	18.78	18.79	18.56		
10	16QAM	25	0	18.32	18.53	18.49	20	0
10	16QAM	25	12	18.41	18.66	18.43		
10	16QAM	25	25	18.45	18.54	18.33		
10	16QAM	50	0	18.39	18.50	18.41		
Channel				20425	20525	20625	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				826.5	836.5	846.5		
5	QPSK	1	0	18.76	18.83	18.64	20	0
5	QPSK	1	12	18.50	18.62	18.46		
5	QPSK	1	24	18.44	18.62	18.37		
5	QPSK	12	0	18.49	18.58	18.48	20	0
5	QPSK	12	7	18.53	18.62	18.49		
5	QPSK	12	13	18.52	18.54	18.47		
5	QPSK	25	0	18.47	18.59	18.41	20	0
5	16QAM	1	0	19.13	18.90	18.90	20	0
5	16QAM	1	12	19.02	19.08	18.84		
5	16QAM	1	24	18.80	18.86	18.56		
5	16QAM	12	0	18.52	18.59	18.49	20	0
5	16QAM	12	7	18.55	18.66	18.46		
5	16QAM	12	13	18.54	18.57	18.47		
5	16QAM	25	0	18.51	18.60	18.44	20	0
Channel				20415	20525	20635	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				825.5	836.5	847.5		
3	QPSK	1	0	18.76	18.80	18.61	20	0
3	QPSK	1	8	18.82	18.41	18.03		
3	QPSK	1	14	18.46	18.49	18.34		
3	QPSK	8	0	18.53	18.55	18.40	20	0
3	QPSK	8	4	18.56	18.47	18.05		
3	QPSK	8	7	18.45	18.48	18.35		
3	QPSK	15	0	18.44	18.58	18.36	20	0
3	16QAM	1	0	18.79	18.71	18.78	20	0
3	16QAM	1	8	19.04	18.71	18.18		
3	16QAM	1	14	18.84	18.79	18.59		
3	16QAM	8	0	18.59	18.58	18.44	20	0
3	16QAM	8	4	18.54	18.53	18.06		
3	16QAM	8	7	18.49	18.49	18.39		
3	16QAM	15	0	18.49	18.61	18.44	20	0

Channel				20407	20525	20643	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				824.7	836.5	848.3		
1.4	QPSK	1	0	18.62	18.66	18.43	20	0
1.4	QPSK	1	3	18.75	18.76	18.36		
1.4	QPSK	1	5	18.51	18.51	18.29		
1.4	QPSK	3	0	18.60	18.56	18.39	20	0
1.4	QPSK	3	1	18.67	18.50	18.37		
1.4	QPSK	3	3	18.78	18.62	18.32		
1.4	QPSK	6	0	18.48	18.52	18.28		
1.4	16QAM	1	0	18.80	18.76	18.64	20	0
1.4	16QAM	1	3	18.89	18.68	18.62		
1.4	16QAM	1	5	18.80	18.82	18.57		
1.4	16QAM	3	0	18.60	18.60	18.39	20	0
1.4	16QAM	3	1	18.73	18.50	18.40		
1.4	16QAM	3	3	18.84	18.51	18.33		
1.4	16QAM	6	0	18.57	18.59	18.36		

<LTE Band 7>

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.
Channel				20850	21100	21350		
Frequency (MHz)				2510	2535	2560		
20	QPSK	1	0	22.84	22.58	22.67	24	0
20	QPSK	1	49	22.58	22.48	22.57		
20	QPSK	1	99	23.01	22.78	22.92		
20	QPSK	50	0	21.63	21.61	21.65	23	1
20	QPSK	50	24	21.57	21.64	21.78		
20	QPSK	50	50	21.86	21.68	21.79		
20	QPSK	100	0	21.61	21.75	21.87		
20	16QAM	1	0	21.96	22.05	22.01	23	1
20	16QAM	1	49	21.75	21.77	21.89		
20	16QAM	1	99	22.02	22.12	22.25		
20	16QAM	50	0	20.60	20.59	20.65	22	2
20	16QAM	50	24	20.56	20.62	20.79		
20	16QAM	50	50	20.66	20.53	20.87		
20	16QAM	100	0	20.58	20.60	20.84		
Channel				20825	21100	21375	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				2507.5	2535	2562.5		
15	QPSK	1	0	22.03	22.01	22.02	24	0
15	QPSK	1	37	22.60	22.50	22.65		
15	QPSK	1	74	22.83	22.74	22.88		
15	QPSK	36	0	21.65	21.69	21.76	23	1
15	QPSK	36	20	21.71	21.64	21.73		
15	QPSK	36	39	21.74	21.66	21.85		
15	QPSK	75	0	21.73	21.72	21.77		
15	16QAM	1	0	22.05	22.01	22.06	23	1
15	16QAM	1	37	21.89	21.79	21.88		
15	16QAM	1	74	22.17	22.10	22.34		
15	16QAM	36	0	20.61	20.64	20.67	22	2
15	16QAM	36	20	20.70	20.61	20.69		
15	16QAM	36	39	20.68	20.59	20.81		
15	16QAM	75	0	20.70	20.64	20.73		
Channel				20800	21100	21400	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				2505	2535	2565		
10	QPSK	1	0	22.32	22.38	22.41	24	0
10	QPSK	1	25	22.60	22.38	22.62		
10	QPSK	1	49	22.74	22.38	22.80		
10	QPSK	25	0	21.71	21.76	21.79	23	1
10	QPSK	25	12	21.69	21.64	21.71		
10	QPSK	25	25	21.74	21.68	21.84		
10	QPSK	50	0	21.79	21.75	21.78		
10	16QAM	1	0	22.45	22.38	22.45	23	1
10	16QAM	1	25	21.83	21.78	21.87		
10	16QAM	1	49	22.38	22.32	22.56		
10	16QAM	25	0	20.57	20.71	20.77	22	2
10	16QAM	25	12	20.59	20.61	20.72		
10	16QAM	25	25	20.70	20.64	20.85		
10	16QAM	50	0	20.76	20.69	20.81		

Channel				20775	21100	21425	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				2502.5	2535	2567.5		
5	QPSK	1	0	22.73	22.77	22.79	24	0
5	QPSK	1	12	22.52	22.54	22.67		
5	QPSK	1	24	22.33	22.57	22.21		
5	QPSK	12	0	21.59	21.57	21.69	23	1
5	QPSK	12	7	21.57	21.57	21.70		
5	QPSK	12	13	21.53	21.53	21.70		
5	QPSK	25	0	21.56	21.53	21.66	23	1
5	16QAM	1	0	22.02	21.88	22.24	23	1
5	16QAM	1	12	22.00	21.88	22.09		
5	16QAM	1	24	21.81	21.04	21.59		
5	16QAM	12	0	20.61	20.57	20.71	22	2
5	16QAM	12	7	20.56	20.53	20.72		
5	16QAM	12	13	20.53	20.50	20.70		
5	16QAM	25	0	20.58	20.53	20.69	22	2

<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		18.21		20	0
10	QPSK	1	25		18.20			
10	QPSK	1	49		18.00			
10	QPSK	25	0		18.58		20	0
10	QPSK	25	12		18.39			
10	QPSK	25	25		18.32			
10	QPSK	50	0		18.48			
10	16QAM	1	0		18.50		20	0
10	16QAM	1	25		18.38			
10	16QAM	1	49		18.27			
10	16QAM	25	0		18.29		20	0
10	16QAM	25	12		18.31			
10	16QAM	25	25		18.63			
10	16QAM	50	0		18.50			
Channel				23205	23230	23255	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				779.5	782	784.5		
5	QPSK	1	0	18.34	18.30	18.29	20	0
5	QPSK	1	12	18.20	18.08	18.23		
5	QPSK	1	24	18.11	18.21	18.23		
5	QPSK	12	0	18.31	18.29	18.27	20	0
5	QPSK	12	7	18.25	18.21	18.37		
5	QPSK	12	13	18.14	18.18	18.24		
5	QPSK	25	0	18.23	18.22	18.29		
5	16QAM	1	0	18.35	18.50	18.51	20	0
5	16QAM	1	12	18.29	18.12	18.26		
5	16QAM	1	24	18.31	18.37	18.20		
5	16QAM	12	0	18.36	18.28	18.27	20	0
5	16QAM	12	7	18.27	18.16	18.41		
5	16QAM	12	13	18.15	18.16	18.30		
5	16QAM	25	0	18.26	18.26	18.29		

<LTE Rel. 10 Carrier Aggregation>

General Note:

1. This device supports LTE Rel.11 Cat9 and Aggregation on downlink only for inter and intra band, Uplink CA in not supported. For the device supports bands and bandwidths and configurations are provided as follow table was according to 3GPP.
2. All permutations exist. No restrictions on Pcell & Scell combinations.
3. Only supported intra-band non-contiguous CA, intra-band contiguous CA is not supported.

E-UTRA CA Configuration	E-UTRA Bands	5 MHz	10 MHz	15 MHz	20 MHz	Maximum aggregated bandwidth [MHz]	Bandwidth combination set
CA_2A-2A	2	Yes	Yes	Yes	Yes	40	0
CA_4A-4A	4	Yes	Yes	Yes	Yes	40	0
CA_2A-2A-5A	2	Yes	Yes	Yes	Yes	50	0
	5	Yes	Yes				
CA_2A-2A-13A	2	Yes	Yes	Yes	Yes	50	0
	13		Yes				
CA_2A-4A	2	Yes	Yes	Yes	Yes	40	2
	4	Yes	Yes	Yes	Yes		
CA_2A-5A	2	Yes	Yes	Yes	Yes	30	0
	5	Yes	Yes				
CA_2A-13A	2	Yes	Yes	Yes	Yes	30	0
	13		Yes				
CA_4A-4A-5A	4	Yes	Yes	Yes	Yes	50	0
	5	Yes	Yes				
CA_4A-4A-13A	4	Yes	Yes	Yes	Yes	50	0
	13		Yes				
CA_4A-5A	4	Yes	Yes	Yes	Yes	30	1
	5	Yes	Yes				
CA_4A-13A	4	Yes	Yes	Yes	Yes	30	0
	13		Yes				
CA_2A-4A-5A	2	Yes	Yes	Yes	Yes	50	0
	4	Yes	Yes	Yes	Yes		
	5	Yes	Yes				
CA_2A-4A-13A	2	Yes	Yes	Yes	Yes	50	0
	4	Yes	Yes	Yes	Yes		
	13		Yes				

<LTE Carrier Aggregation Conducted Power>

General Note:

1. According to KDB941225 D05A LTE Rel.10 KDB Inquiry Sheet v01r02 LTE CA conducted power requirement will base on below procedure for conducted power verification.
2. 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.
3. 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.
4. For inter-band CA, the SCC selected highest bandwidth and near the middle of its transmission band.

<Default power mode for two CA power verification>

Configure		PCC							SCC							Power	
		LTE Band	BW (MHz)	UL Freq. (MHz)	UL Channel	Modulation	UL# RB	UL RB Offset	LTE Band	BW (MHz)	DL Freq. (MHz)	DL Channel	Modulation	DL# RB	DL RB Offset	LTE Rel 11 Tx.Power (dBm)	LTE Rel 8 Tx.Power (dBm)
Inter-Band		Band 2	15M	1857.5	18675	QPSK	1	0	Band 4	20M	2132.5	2175	QPSK	1	0	23.15	23.16
		Band 4	10M	1750	20350	QPSK	1	49	Band 2	20M	1960	900	QPSK	1	99	22.95	22.99
		Band 2	15M	1857.5	18675	QPSK	1	0	Band 5	10M	881.5	2525	QPSK	1	0	23.00	23.05
		Band 5	10M	829	20450	QPSK	1	0	Band 2	20M	1960	900	QPSK	1	0	22.95	22.99
		Band 2	15M	1857.5	18675	QPSK	1	0	Band 13	10M	751	5230	QPSK	1	0	21.95	21.99
		Band 13	10M	782	23230	QPSK	1	0	Band 2	20M	1960	900	QPSK	1	0	22.30	22.32
		Band 4	10M	1750	20350	QPSK	1	49	Band 5	10M	881.5	2525	QPSK	1	49	22.30	22.33
		Band 5	10M	829	20450	QPSK	1	0	Band 4	20M	2132.5	2175	QPSK	1	0	22.95	22.99
		Band 4	10M	1750	20350	QPSK	1	49	Band 13	10M	751	5230	QPSK	1	49	22.32	22.35
		Band 13	10M	782	23230	QPSK	1	0	Band 4	20M	2132.5	2175	QPSK	1	0	22.30	22.32
Intra-Band	Non Contiguous	Band 2	15M	1857.5	18675	QPSK	1	0	Band 2	5M	1987.5	1175	QPSK	1	0	23.11	23.16
		Band 4	10M	1750	20350	QPSK	1	49	Band 4	5M	2112.5	1975	QPSK	1	24	22.94	22.99

<Near-body and Hotspot mode for two CA power verification>

Configure		PCC							SCC							Power	
		LTE Band	BW (MHz)	UL Freq. (MHz)	UL Channel	Modulation	UL# RB	UL RB Offset	LTE Band	BW (MHz)	DL Freq. (MHz)	DL Channel	Modulation	DL# RB	DL RB Offset	LTE Rel 11 Tx.Power (dBm)	LTE Rel 8 Tx.Power (dBm)
Inter-Band		Band 4	10M	1750	20350	16QAM	1	49	Band 2	20M	1960	900	16QAM	1	99	22.81	22.90
		Band 5	5M	826.5	20425	16QAM	1	0	Band 2	20M	1960	900	16QAM	1	0	19.10	19.13
		Band 13	10M	782	23230	QPSK	25	0	Band 2	20M	1960	900	QPSK	50	0	18.55	18.58
		Band 4	10M	1750	20350	16QAM	1	49	Band 5	10M	881.5	2525	16QAM	1	49	22.84	22.90
		Band 5	5M	826.5	20425	16QAM	1	0	Band 4	20M	2132.5	2175	16QAM	1	0	19.12	19.13
		Band 4	10M	1750	20350	16QAM	1	49	Band 13	10M	751	5230	16QAM	1	49	22.83	22.90
		Band 13	10M	782	23230	QPSK	25	0	Band 4	20M	2132.5	2175	QPSK	50	0	18.51	18.58
Intra-Band	Non Contiguous	Band 2	15M	1857.5	18675	QPSK	1	0	Band 2	5M	1987.5	1175	QPSK	1	0	23.11	23.16

<Default power mode for three CA power verification>

Configure		PCC							SCC1							SCC2							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	Mod.	DL# RB	DL RB Offset	LTE Band	BW (MHz)	DL Freq. (MHz)	DL Channel	Mod.	DL# RB	DL RB Offset	LTE Rel 10 Tx.Power (dBm)	LTE Rel 8 Tx.Power (dBm)
Inter-Band		Band 2	15M	1857.5	18675	QPSK	1	0	Band 4	20M	2132.5	2175	QPSK	1	0	Band 5	10M	881.5	2525	QPSK	1	0	23.14	23.16
		Band 4	10M	1750	20350	QPSK	1	49	Band 2	20M	1960	900	QPSK	1	99	Band 5	10M	881.5	2525	QPSK	1	49	22.96	22.99
		Band 5	10M	829	20450	QPSK	1	0	Band 4	20M	2132.5	2175	QPSK	1	0	Band 2	20M	1960	900	QPSK	1	0	22.93	22.99
		Band 2	15M	1857.5	18675	QPSK	1	0	Band 4	20M	2132.5	2175	QPSK	1	0	Band 13	10M	751	5230	QPSK	1	0	23.10	23.16
		Band 4	10M	1750	20350	QPSK	1	49	Band 2	20M	1960	900	QPSK	1	99	Band 13	10M	751	5230	QPSK	1	49	22.96	22.99
		Band 13	10M	782	23230	QPSK	1	0	Band 4	20M	2132.5	2175	QPSK	1	0	Band 2	20M	1960	900	QPSK	1	0	22.29	22.32
Intra-Band	Non-Contiguous	Band 2	15M	1857.5	18675	QPSK	1	0	Band 2	5M	1987.5	1175	QPSK	1	0	Band 5	10M	881.5	2525	QPSK	1	0	23.11	23.16
		Band 5	10M	829	20450	QPSK	1	0	Band 2	20M	1960	900	QPSK	1	0	Band 2	5M	1987.5	1175	QPSK	1	0	22.94	22.99
		Band 2	15M	1857.5	18675	QPSK	1	0	Band 2	5M	1987.5	1175	QPSK	1	0	Band 13	10M	751	5230	QPSK	1	0	23.12	23.16
		Band 13	10M	782	23230	QPSK	1	0	Band 2	20M	1960	900	QPSK	1	0	Band 2	5M	1987.5	1175	QPSK	1	0	22.30	22.32
		Band 4	10M	1750	20350	QPSK	1	49	Band 4	5M	2112.5	1975	QPSK	1	24	Band 5	10M	881.5	2525	QPSK	1	49	22.94	22.99
		Band 5	10M	829	20450	QPSK	1	0	Band 4	20M	2132.5	2175	QPSK	1	0	Band 4	5M	2112.5	1975	QPSK	1	0	22.95	22.99
		Band 4	10M	1750	20350	QPSK	1	49	Band 4	5M	2112.5	1975	QPSK	1	24	Band 13	10M	751	5230	QPSK	1	49	22.96	22.99
		Band 13	10M	782	23230	QPSK	1	0	Band 4	20M	2132.5	2175	QPSK	1	0	Band 4	5M	2112.5	1975	QPSK	1	0	22.27	22.32

<Near-body and Hotspot mode for three CA power verification>

Configure		PCC							SCC1							SCC2							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	Mod.	DL# RB	DL RB Offset	LTE Band	BW (MHz)	DL Freq. (MHz)	DL Channel	Mod.	DL# RB	DL RB Offset	LTE Rel 10 Tx.Power (dBm)	LTE Rel 8 Tx.Power (dBm)
Inter-Band		Band 4	10M	1750	20350	16QAM	1	49	Band 2	20M	1960	900	16QAM	1	99	Band 5	10M	881.5	2525	16QAM	1	49	22.86	22.90
		Band 5	5M	826.5	20425	16QAM	1	0	Band 4	20M	2132.5	2175	16QAM	1	0	Band 2	20M	1960	900	16QAM	1	0	19.12	19.13
		Band 4	10M	1750	20350	16QAM	1	49	Band 2	20M	1960	900	16QAM	1	99	Band 13	10M	751	5230	16QAM	1	49	22.65	22.90
		Band 13	10M	782	23230	QPSK	25	0	Band 4	20M	2132.5	2175	QPSK	50	0	Band 2	20M	1960	900	QPSK	50	0	18.53	18.58
Intra-Band	Non-Contiguous	Band 5	5M	826.5	20425	16QAM	1	0	Band 2	20M	1960	900	16QAM	1	0	Band 2	5M	1987.5	1175	16QAM	1	0	19.09	19.13
		Band 13	10M	782	23230	QPSK	25	0	Band 2	20M	1960	900	QPSK	50	0	Band 2	5M	1987.5	1175	QPSK	12	0	18.54	18.58
		Band 4	10M	1750	20350	16QAM	1	49	Band 4	5M	2112.5	1975	16QAM	1	24	Band 5	10M	881.5	2525	16QAM	1	49	22.67	22.90
		Band 5	5M	826.5	20425	16QAM	1	0	Band 4	20M	2132.5	2175	16QAM	1	0	Band 4	5M	2112.5	1975	16QAM	1	0	19.11	19.13
		Band 4	10M	1750	20350	16QAM	1	49	Band 4	5M	2112.5	1975	16QAM	1	24	Band 13	10M	751	5230	16QAM	1	49	22.65	22.90
		Band 13	10M	782	23230	QPSK	25	0	Band 4	20M	2132.5	2175	QPSK	50	0	Band 4	5M	2112.5	1975	QPSK	12	0	18.53	18.58

<WLAN Conducted Power>

General Note:

1. For WLAN SAR testing was performed on single antenna RF power in SISO mode is larger or equal to the single antenna RF power in MIMO mode, and for RF exposure assessment of MIMO mode simultaneous transmission exclusion analysis was performed with SAR test results of each antenna in SISO mode.
2. Per KDB 248227 D01v02r02, the simultaneous SAR provisions in KDB publication 447498 should be applied to determine simultaneous transmission SAR test exclusion for WiFi MIMO. If the sum of 1g single transmission chain SAR measurements is < 1.6W/kg and SAR peak to location ratio < 0.04, no additional SAR measurements for MIMO.
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.

<Default Power Mode>

<2.4GHz WLAN ANT 1>

	Mode	Channel	Frequency (MHz)	Data Rate	Average power (dBm)	Tune-Up Limit	Duty Cycle %
2.4GHz WLAN ANT 1	802.11b	CH 1	2412	1Mbps	17.30	19.00	99.04
		CH 6	2437		18.48	20.00	
		CH 11	2462		18.91	20.00	
	802.11g	CH 1	2412	6Mbps	16.54	18.50	94.50
		CH 6	2437		17.30	19.00	
		CH 11	2462		16.18	17.50	
	802.11n-HT20	CH 1	2412	MCS0	16.35	18.00	95.04
		CH 6	2437		16.81	18.50	
		CH 11	2462		15.51	17.50	
	802.11ac-VHT20	CH 1	2412	MCS0	16.44	18.00	94.18
		CH 6	2437		16.75	18.50	
		CH 11	2462		14.97	16.50	

<2.4GHz WLAN ANT 2>

	Mode	Channel	Frequency (MHz)	Data Rate	Average power (dBm)	Tune-Up Limit	Duty Cycle %
2.4GHz WLAN ANT 2	802.11b	CH 1	2412	1Mbps	14.35	15.00	99.05
		CH 6	2437		14.88	16.00	
		CH 11	2462		14.96	16.00	
	802.11g	CH 1	2412	6Mbps	13.41	14.50	94.50
		CH 6	2437		13.73	15.00	
		CH 11	2462		12.47	13.50	
	802.11n-HT20	CH 1	2412	MCS0	13.19	14.00	95.05
		CH 6	2437		13.58	14.50	
		CH 11	2462		11.82	13.50	
	802.11ac-VHT20	CH 1	2412	MCS0	13.17	14.00	94.12
		CH 6	2437		13.59	14.50	
		CH 11	2462		11.28	13.00	

<2.4GHz WLAN ANT 1+2>

	Mode	Channel	Frequency (MHz)	Data Rate	Average power (dBm)	Tune-Up Limit	Duty Cycle %
2.4GHz WLAN ANT 1+2	802.11b	CH 1	2412	1Mbps	18.43	20.00	99.04
		CH 6	2437		19.41	21.00	
		CH 11	2462		19.80	21.00	
	802.11g	CH 1	2412	6Mbps	17.48	19.00	94.50
		CH 6	2437		18.18	20.00	
		CH 11	2462		16.92	18.50	
	802.11n-HT20	CH 1	2412	MCS0	17.37	19.00	93.14
		CH 6	2437		17.77	19.50	
		CH 11	2462		16.35	18.00	
	802.11ac-VHT20	CH 1	2412	MCS0	17.41	18.30	94.18
		CH 6	2437		17.77	19.50	
		CH 11	2462		15.87	17.50	

<5GHz WLAN ANT1>

	Mode	Channel	Frequency (MHz)	Data Rate	Average power (dBm)	Tune-Up Limit	Duty Cycle %
5.2GHz WLAN ANT 1	802.11a	CH 36	5180	6Mbps	16.30	18.00	94.95
		CH 40	5200		16.24	18.00	
		CH 44	5220		16.23	18.00	
		CH 48	5240		16.26	18.00	
	802.11n-HT20	CH 36	5180	MCS0	16.17	18.00	95.07
		CH 40	5200		16.02	18.00	
		CH 44	5220		15.98	17.50	
		CH 48	5240		16.09	17.50	
	802.11n-HT40	CH 38	5190	MCS0	13.78	15.50	90.48
		CH 46	5230		14.25	16.00	
	802.11ac-VHT20	CH 36	5180	MCS0	16.21	18.00	95.10
		CH 40	5200		16.12	18.00	
		CH 44	5220		16.07	18.00	
		CH 48	5240		16.18	18.00	
	802.11ac-VHT40	CH 38	5190	MCS0	13.59	15.00	89.62
		CH 46	5230		14.56	16.00	
	802.11ac-VHT80	CH 42	5210	MCS0	13.42	14.50	86.10

	Mode	Channel	Frequency (MHz)	Data Rate	Average power (dBm)	Tune-Up Limit	Duty Cycle %
5.3GHz WLAN ANT 1	802.11a	CH 52	5260	6Mbps	16.40	18.00	94.95
		CH 56	5280		16.28	18.00	
		CH 60	5300		16.07	18.00	
		CH 64	5320		16.04	18.00	
	802.11n-HT20	CH 52	5260	MCS0	16.20	18.00	95.07
		CH 56	5280		16.10	18.00	
		CH 60	5300		16.00	18.00	
		CH 64	5320		15.86	17.50	
	802.11n-HT40	CH 54	5270	MCS0	14.51	16.00	90.48
		CH 62	5310		13.82	15.50	
	802.11ac-VHT20	CH 52	5260	MCS0	16.14	18.00	95.10
		CH 56	5280		16.06	18.00	
		CH 60	5300		16.03	18.00	
		CH 64	5320		15.98	17.50	
	802.11ac-VHT40	CH 54	5270	MCS0	14.60	16.00	89.62
		CH 62	5310		13.93	15.50	
	802.11ac-VHT80	CH 58	5290	MCS0	12.53	13.00	86.10

	Mode	Channel	Frequency (MHz)	Data Rate	Average power (dBm)	Tune-Up Limit	Duty Cycle %
5.5GHz WLAN ANT 1	802.11a	CH 100	5500	6Mbps	16.70	18.00	94.95
		CH 116	5580		16.67	18.00	
		CH 124	5620		16.56	18.00	
		CH 132	5660		16.23	17.00	
		CH 140	5700		15.68	17.00	
		CH 144	5720		15.13	16.50	
	802.11n-HT20	CH 100	5500	MCS0	16.54	18.00	95.07
		CH 116	5580		16.50	18.00	
		CH 124	5620		16.23	18.00	
		CH 132	5660		16.13	18.00	
		CH 140	5700		15.77	17.50	
		CH 144	5720		14.64	16.50	
	802.11n-HT40	CH 102	5510	MCS0	13.79	15.00	90.48
		CH 110	5550		14.34	16.00	
		CH 126	5630		14.42	16.00	
		CH 134	5670		14.60	16.00	
		CH 142	5710		12.79	14.50	
	802.11ac-VHT20	CH 100	5500	MCS0	16.51	18.00	95.10
		CH 116	5580		16.46	18.00	
		CH 124	5620		16.23	18.00	
		CH 132	5660		16.05	18.00	
		CH 140	5700		15.68	17.50	
		CH 144	5720		14.71	16.00	
	802.11ac-VHT40	CH 102	5510	MCS0	14.06	15.00	89.62
		CH 110	5550		14.39	16.00	
		CH 126	5630		14.42	16.00	
		CH 134	5670		14.60	16.00	
		CH 142	5710		12.82	14.50	
	802.11ac-VHT80	CH 106	5530	MCS0	8.54	10.50	86.10
		CH 122	5610		14.76	16.00	
		CH 138	5690		13.62	15.50	

	Mode	Channel	Frequency (MHz)	Data Rate	Average power (dBm)	Tune-Up Limit	Duty Cycle %
5.8GHz WLAN ANT 1	802.11a	CH 149	5745	6Mbps	16.37	18.00	94.95
		CH 157	5785		15.85	17.50	
		CH 165	5825		15.96	17.50	
	802.11n-HT20	CH 149	5745	MCS0	16.13	18.00	95.07
		CH 157	5785		15.90	17.50	
		CH 165	5825		15.72	17.50	
	802.11n-HT40	CH 151	5755	MCS0	14.94	16.00	90.48
		CH 159	5795		14.45	16.00	
	802.11ac-VHT20	CH 149	5745	MCS0	16.17	18.00	95.10
		CH 157	5785		15.81	17.50	
		CH 165	5825		15.78	17.50	
	802.11ac-VHT40	CH 151	5755	MCS0	14.67	16.00	89.62
		CH 159	5795		14.57	16.00	
	802.11ac-VHT80	CH 155	5775	MCS0	13.93	15.50	86.10

<5GHz WLAN ANT2>

	Mode	Channel	Frequency (MHz)	Data Rate	Average power (dBm)	Tune-Up Limit	Duty Cycle %
5.2GHz WLAN ANT 2	802.11a	CH 36	5180	6Mbps	15.79	17.50	95.41
		CH 40	5200		15.63	17.50	
		CH 44	5220		15.69	17.50	
		CH 48	5240		15.76	17.50	
	802.11n-HT20	CH 36	5180	MCS0	15.52	17.50	94.52
		CH 40	5200		15.44	17.50	
		CH 44	5220		15.40	17.00	
		CH 48	5240		15.46	17.00	
	802.11n-HT40	CH 38	5190	MCS0	13.43	15.00	89.62
		CH 46	5230		14.00	16.00	
	802.11ac-VHT20	CH 36	5180	MCS0	15.74	17.50	95.10
		CH 40	5200		15.68	18.00	
		CH 44	5220		15.72	17.50	
		CH 48	5240		15.69	17.50	
	802.11ac-VHT40	CH 38	5190	MCS0	13.03	15.00	90.05
		CH 46	5230		13.97	15.50	
	802.11ac-VHT80	CH 42	5210	MCS0	12.62	14.50	85.71

	Mode	Channel	Frequency (MHz)	Data Rate	Average power (dBm)	Tune-Up Limit	Duty Cycle %
5.3GHz WLAN ANT 2	802.11a	CH 52	5260	6Mbps	15.76	17.50	95.41
		CH 56	5280		15.63	17.50	
		CH 60	5300		15.54	17.50	
		CH 64	5320		15.43	17.00	
	802.11n-HT20	CH 52	5260	MCS0	15.56	17.50	94.52
		CH 56	5280		15.49	17.50	
		CH 60	5300		15.45	17.00	
		CH 64	5320		15.42	17.00	
	802.11n-HT40	CH 54	5270	MCS0	13.89	15.50	89.36
		CH 62	5310		13.20	15.00	
	802.11ac-VHT20	CH 52	5260	MCS0	15.71	17.50	95.10
		CH 56	5280		15.63	17.50	
		CH 60	5300		15.56	17.50	
		CH 64	5320		15.39	17.00	
	802.11ac-VHT40	CH 54	5270	MCS0	13.90	15.50	90.05
		CH 62	5310		13.31	15.00	
	802.11ac-VHT80	CH 58	5290	MCS0	11.70	13.50	85.71

	Mode	Channel	Frequency (MHz)	Data Rate	Average power (dBm)	Tune-Up Limit	Duty Cycle %
5.5GHz WLAN ANT 2	802.11a	CH 100	5500	6Mbps	16.10	18.00	95.41
		CH 116	5580		16.08	18.00	
		CH 124	5620		15.98	18.00	
		CH 132	5660		15.73	17.00	
		CH 140	5700		15.66	17.50	
		CH 144	5720		14.63	16.50	
	802.11n-HT20	CH 100	5500	MCS0	16.23	18.00	94.52
		CH 116	5580		16.19	18.00	
		CH 124	5620		16.01	18.00	
		CH 132	5660		15.95	18.00	
		CH 140	5700		15.72	17.00	
		CH 144	5720		14.55	16.00	
	802.11n-HT40	CH 102	5510	MCS0	13.26	15.00	89.62
		CH 110	5550		14.32	16.00	
		CH 126	5630		14.25	16.00	
		CH 134	5670		14.19	16.00	
		CH 142	5710		12.60	14.00	
	802.11ac-VHT20	CH 100	5500	MCS0	16.15	18.00	95.10
		CH 116	5580		16.12	18.00	
		CH 124	5620		16.02	18.00	
		CH 132	5660		15.91	17.50	
		CH 140	5700		15.70	17.50	
		CH 144	5720		14.35	16.00	
	802.11ac-VHT40	CH 102	5510	MCS0	13.42	15.00	90.05
		CH 110	5550		14.22	16.00	
		CH 126	5630		14.15	16.00	
		CH 134	5670		14.23	16.00	
		CH 142	5710		12.77	14.50	
	802.11ac-VHT80	CH 106	5530	MCS0	8.48	10.00	85.71
		CH 122	5610		14.41	16.00	
		CH 138	5690		13.37	15.00	

	Mode	Channel	Frequency (MHz)	Data Rate	Average power (dBm)	Tune-Up Limit	Duty Cycle %
5.8GHz WLAN ANT 2	802.11a	CH 149	5745	6Mbps	16.22	18.00	95.41
		CH 157	5785		15.81	17.50	
		CH 165	5825		15.89	17.50	
	802.11n-HT20	CH 149	5745	MCS0	16.02	17.50	94.52
		CH 157	5785		15.88	17.00	
		CH 165	5825		15.55	17.00	
	802.11n-HT40	CH 151	5755	MCS0	14.44	16.00	89.62
		CH 159	5795		14.08	15.50	
	802.11ac-VHT20	CH 149	5745	MCS0	15.63	17.50	95.10
		CH 157	5785		15.74	17.50	
		CH 165	5825		15.55	17.00	
	802.11ac-VHT40	CH 151	5755	MCS0	14.43	16.00	90.05
		CH 159	5795		14.12	16.00	
	802.11ac-VHT80	CH 155	5775	MCS0	13.81	15.50	85.71

<5GHz WLAN ANT1+2>

	Mode	Channel	Frequency (MHz)	Data Rate	Average power (dBm)	Tune-Up Limit	Duty Cycle %
5.2GHz WLAN ANT 1+2	802.11a	CH 36	5180	6Mbps	18.27	20.00	94.95
		CH 40	5200		18.18	20.00	
		CH 44	5220		18.21	20.00	
		CH 48	5240		18.18	20.00	
	802.11n-HT20	CH 36	5180	MCS0	18.07	20.00	94.94
		CH 40	5200		18.02	20.00	
		CH 44	5220		18.00	20.00	
		CH 48	5240		18.02	20.00	
	802.11n-HT40	CH 38	5190	MCS0	16.05	18.00	89.62
		CH 46	5230		16.57	18.50	
	802.11ac-VHT20	CH 36	5180	MCS0	18.23	20.00	94.63
		CH 40	5200		18.14	20.00	
		CH 44	5220		18.16	20.00	
		CH 48	5240		18.16	20.00	
	802.11ac-VHT40	CH 38	5190	MCS0	15.67	17.50	90.48
		CH 46	5230		16.55	18.50	
	802.11ac-VHT80	CH 42	5210	MCS0	15.55	17.50	85.63

	Mode	Channel	Frequency (MHz)	Data Rate	Average power (dBm)	Tune-Up Limit	Duty Cycle %
5.3GHz WLAN ANT 1+2	802.11a	CH 52	5260	6Mbps	18.37	20.00	94.95
		CH 56	5280		18.21	20.00	
		CH 60	5300		18.06	20.00	
		CH 64	5320		18.05	20.00	
	802.11n-HT20	CH 52	5260	MCS0	18.03	19.50	94.94
		CH 56	5280		17.92	19.50	
		CH 60	5300		17.85	19.50	
		CH 64	5320		17.85	19.50	
	802.11n-HT40	CH 54	5270	MCS0	16.60	18.50	89.62
		CH 62	5310		15.95	17.50	
	802.11ac-VHT20	CH 52	5260	MCS0	18.08	19.50	94.63
		CH 56	5280		17.95	19.50	
		CH 60	5300		17.87	19.50	
		CH 64	5320		17.79	19.50	
	802.11ac-VHT40	CH 54	5270	MCS0	16.53	18.50	90.48
		CH 62	5310		15.85	17.50	
	802.11ac-VHT80	CH 58	5290	MCS0	14.67	16.50	85.63

	Mode	Channel	Frequency (MHz)	Data Rate	Average power (dBm)	Tune-Up Limit	Duty Cycle %
5.5GHz WLAN ANT 1+2	802.11a	CH 100	5500	6Mbps	18.60	20.00	94.95
		CH 116	5580		18.56	20.00	
		CH 124	5620		18.26	20.00	
		CH 132	5660		18.18	20.00	
		CH 140	5700		17.90	19.50	
		CH 144	5720		16.84	19.00	
	802.11n-HT20	CH 100	5500	MCS0	18.02	19.50	94.94
		CH 116	5580		17.97	19.50	
		CH 124	5620		17.86	19.50	
		CH 132	5660		17.62	19.50	
		CH 140	5700		17.60	19.50	
		CH 144	5720		16.79	19.00	
	802.11n-HT40	CH 102	5510	MCS0	16.11	18.00	89.62
		CH 110	5550		16.70	18.50	
		CH 126	5630		16.55	18.50	
		CH 134	5670		16.51	18.50	
		CH 142	5710		15.09	17.00	
	802.11ac-VHT20	CH 100	5500	MCS0	18.52	20.00	94.63
		CH 116	5580		18.47	20.00	
		CH 124	5620		18.23	20.00	
		CH 132	5660		17.95	20.00	
		CH 140	5700		17.48	19.00	
		CH 144	5720		16.35	18.50	
	802.11ac-VHT40	CH 102	5510	MCS0	16.03	17.50	90.48
		CH 110	5550		16.56	18.50	
		CH 126	5630		16.43	18.50	
		CH 134	5670		16.57	18.50	
		CH 142	5710		15.03	16.00	
	802.11ac-VHT80	CH 106	5530	MCS0	11.51	13.00	85.63
		CH 122	5610		16.89	18.50	
		CH 138	5690		15.72	17.00	

	Mode	Channel	Frequency (MHz)	Data Rate	Average power (dBm)	Tune-Up Limit	Duty Cycle %
5.8GHz WLAN ANT 1+2	802.11a	CH 149	5745	MCS0	18.62	19.50	94.95
		CH 157	5785		18.03	19.50	
		CH 165	5825		17.88	19.50	
	802.11n-HT20	CH 149	5745	MCS0	18.39	19.50	94.94
		CH 157	5785		18.02	19.50	
		CH 165	5825		17.92	19.50	
	802.11n-HT40	CH 151	5755	MCS0	16.98	18.50	89.62
		CH 159	5795		16.66	18.50	
	802.11ac-VHT20	CH 149	5745	MCS0	18.37	19.50	94.63
		CH 157	5785		18.08	19.50	
		CH 165	5825		17.95	19.50	
	802.11ac-VHT40	CH 151	5755	MCS0	17.09	18.50	90.48
		CH 159	5795		16.60	18.50	
	802.11ac-VHT80	CH 155	5775	MCS0	16.31	18.00	85.63

<At-Head Power Mode>

<2.4GHz WLAN ANT 1>

	Mode	Channel	Frequency (MHz)	Data Rate	Average power (dBm)	Tune-Up Limit	Duty Cycle %
2.4GHz WLAN ANT 1	802.11b	CH 1	2412	1Mbps	15.83	16.50	99.04
		CH 6	2437		16.06	16.50	
		CH 11	2462		16.35	16.50	
	802.11g	CH 1	2412	6Mbps	15.16	16.00	94.50
		CH 6	2437		15.13	16.00	
		CH 11	2462		15.66	16.00	
	802.11n-HT20	CH 1	2412	MCS0	14.85	16.00	95.04
		CH 6	2437		14.86	16.00	
		CH 11	2462		15.51	16.00	
	802.11ac-VHT20	CH 1	2412	MCS0	14.88	16.00	94.18
		CH 6	2437		14.87	16.00	
		CH 11	2462		14.97	16.00	

<2.4GHz WLAN ANT 2>

	Mode	Channel	Frequency (MHz)	Data Rate	Average power (dBm)	Tune-Up Limit	Duty Cycle %
2.4GHz WLAN ANT 2	802.11b	CH 1	2412	1Mbps	12.96	13.00	99.05
		CH 6	2437		12.73	13.00	
		CH 11	2462		12.71	13.00	
	802.11g	CH 1	2412	6Mbps	11.98	13.00	94.50
		CH 6	2437		11.96	13.00	
		CH 11	2462		12.10	13.00	
	802.11n-HT20	CH 1	2412	MCS0	11.78	13.00	95.05
		CH 6	2437		11.77	13.00	
		CH 11	2462		11.82	13.00	
	802.11ac-VHT20	CH 1	2412	MCS0	11.79	13.00	94.12
		CH 6	2437		11.78	13.00	
		CH 11	2462		11.28	13.00	

<2.4GHz WLAN ANT 1+2>

	Mode	Channel	Frequency (MHz)	Data Rate	Average power (dBm)	Tune-Up Limit	Duty Cycle %
2.4GHz WLAN ANT 1+2	802.11b	CH 1	2412	1Mbps	16.86	18.10	99.04
		CH 6	2437		17.05	18.10	
		CH 11	2462		17.22	18.10	
	802.11g	CH 1	2412	6Mbps	16.03	17.10	94.50
		CH 6	2437		16.15	17.80	
		CH 11	2462		16.61	17.80	
	802.11n-HT20	CH 1	2412	MCS0	16.04	17.10	93.14
		CH 6	2437		16.03	17.80	
		CH 11	2462		16.35	17.80	
	802.11ac-VHT20	CH 1	2412	MCS0	15.89	17.10	94.18
		CH 6	2437		15.99	17.80	
		CH 11	2462		15.87	17.80	

<5GHz WLAN ANT1>

	Mode	Channel	Frequency (MHz)	Data Rate	Average power (dBm)	Tune-Up Limit	Duty Cycle %
5.2GHz WLAN ANT 1	802.11a	CH 36	5180	6Mbps	11.34	12.00	94.95
		CH 40	5200		11.20	12.00	
		CH 44	5220		11.18	12.00	
		CH 48	5240		11.15	12.00	
	802.11n-HT20	CH 36	5180	MCS0	11.30	12.00	95.07
		CH 40	5200		11.12	12.00	
		CH 44	5220		10.96	12.00	
		CH 48	5240		11.07	12.00	
	802.11n-HT40	CH 38	5190	MCS0	10.74	12.00	90.48
		CH 46	5230		10.64	12.00	
	802.11ac-VHT20	CH 36	5180	MCS0	11.21	12.00	95.10
		CH 40	5200		11.17	12.00	
		CH 44	5220		11.13	12.00	
		CH 48	5240		11.07	12.00	
	802.11ac-VHT40	CH 38	5190	MCS0	10.83	12.00	89.62
		CH 46	5230		10.89	12.00	
	802.11ac-VHT80	CH 42	5210	MCS0	10.79	12.00	86.10

	Mode	Channel	Frequency (MHz)	Data Rate	Average power (dBm)	Tune-Up Limit	Duty Cycle %
5.3GHz WLAN ANT 1	802.11a	CH 52	5260	6Mbps	11.43	12.00	94.95
		CH 56	5280		11.21	12.00	
		CH 60	5300		10.94	12.00	
		CH 64	5320		9.34	10.00	
	802.11n-HT20	CH 52	5260	MCS0	11.04	12.00	95.07
		CH 56	5280		10.88	12.00	
		CH 60	5300		10.79	12.00	
		CH 64	5320		9.14	10.00	
	802.11n-HT40	CH 54	5270	MCS0	11.08	12.00	90.48
		CH 62	5310		10.68	12.00	
	802.11ac-VHT20	CH 52	5260	MCS0	11.27	12.00	95.10
		CH 56	5280		11.20	12.00	
		CH 60	5300		10.65	12.00	
		CH 64	5320		8.99	10.00	
	802.11ac-VHT40	CH 54	5270	MCS0	11.15	12.00	89.62
		CH 62	5310		10.50	12.00	
	802.11ac-VHT80	CH 58	5290	MCS0	10.86	12.00	86.10

	Mode	Channel	Frequency (MHz)	Data Rate	Average power (dBm)	Tune-Up Limit	Duty Cycle %
5.5GHz WLAN ANT 1	802.11a	CH 100	5500	6Mbps	10.19	12.00	94.95
		CH 116	5580		10.66	12.00	
		CH 124	5620		10.02	12.00	
		CH 132	5660		10.16	12.00	
		CH 140	5700		10.04	12.00	
		CH 144	5720		10.02	12.00	
	802.11n-HT20	CH 100	5500	MCS0	10.03	12.00	95.07
		CH 116	5580		10.47	12.00	
		CH 124	5620		10.07	12.00	
		CH 132	5660		10.02	12.00	
		CH 140	5700		10.04	12.00	
		CH 144	5720		10.03	12.00	
	802.11n-HT40	CH 102	5510	MCS0	10.01	12.00	90.48
		CH 110	5550		10.01	12.00	
		CH 126	5630		10.09	12.00	
		CH 134	5670		10.02	12.00	
		CH 142	5710		10.00	12.00	
	802.11ac-VHT20	CH 100	5500	MCS0	10.01	12.00	95.10
		CH 116	5580		10.50	12.00	
		CH 124	5620		10.02	12.00	
		CH 132	5660		10.09	12.00	
		CH 140	5700		10.08	12.00	
		CH 144	5720		10.05	12.00	
	802.11ac-VHT40	CH 102	5510	MCS0	10.02	12.00	89.62
		CH 110	5550		10.06	12.00	
		CH 126	5630		10.04	12.00	
		CH 134	5670		10.11	12.00	
		CH 142	5710		10.05	12.00	
	802.11ac-VHT80	CH 106	5530	MCS0	8.54	9.50	86.10
		CH 122	5610		10.19	12.00	
		CH 138	5690		10.06	12.00	

	Mode	Channel	Frequency (MHz)	Data Rate	Average power (dBm)	Tune-Up Limit	Duty Cycle %
5.8GHz WLAN ANT 1	802.11a	CH 149	5745	6Mbps	10.48	12.00	94.95
		CH 157	5785		10.46	12.00	
		CH 165	5825		10.57	12.00	
	802.11n-HT20	CH 149	5745	MCS0	10.30	12.00	95.07
		CH 157	5785		10.36	12.00	
		CH 165	5825		10.26	12.00	
	802.11n-HT40	CH 151	5755	MCS0	10.15	12.00	90.48
		CH 159	5795		10.24	12.00	
	802.11ac-VHT20	CH 149	5745	MCS0	10.34	12.00	95.10
		CH 157	5785		10.19	12.00	
		CH 165	5825		10.13	12.00	
	802.11ac-VHT40	CH 151	5755	MCS0	10.26	12.00	89.62
		CH 159	5795		10.45	12.00	
	802.11ac-VHT80	CH 155	5775	MCS0	10.76	12.00	86.10

<5GHz WLAN ANT2>

	Mode	Channel	Frequency (MHz)	Data Rate	Average power (dBm)	Tune-Up Limit	Duty Cycle %
5.2GHz WLAN ANT 2	802.11a	CH 36	5180	6Mbps	10.31	12.00	95.41
		CH 40	5200		10.08	12.00	
		CH 44	5220		10.00	12.00	
		CH 48	5240		10.15	12.00	
	802.11n-HT20	CH 36	5180	MCS0	10.30	12.00	94.52
		CH 40	5200		10.01	12.00	
		CH 44	5220		10.01	12.00	
		CH 48	5240		10.13	12.00	
	802.11n-HT40	CH 38	5190	MCS0	10.34	12.00	89.62
		CH 46	5230		10.25	12.00	
	802.11ac-VHT20	CH 36	5180	MCS0	10.24	12.00	95.10
		CH 40	5200		10.02	12.00	
		CH 44	5220		10.00	12.00	
		CH 48	5240		10.05	12.00	
	802.11ac-VHT40	CH 38	5190	MCS0	10.39	12.00	90.05
		CH 46	5230		10.30	12.00	
	802.11ac-VHT80	CH 42	5210	MCS0	10.00	12.00	85.71

	Mode	Channel	Frequency (MHz)	Data Rate	Average power (dBm)	Tune-Up Limit	Duty Cycle %
5.3GHz WLAN ANT 2	802.11a	CH 52	5260	6Mbps	10.09	12.00	95.41
		CH 56	5280		10.02	12.00	
		CH 60	5300		10.15	12.00	
		CH 64	5320		10.00	12.00	
	802.11n-HT20	CH 52	5260	MCS0	10.16	12.00	94.52
		CH 56	5280		10.06	12.00	
		CH 60	5300		10.09	12.00	
		CH 64	5320		10.00	12.00	
	802.11n-HT40	CH 54	5270	MCS0	10.06	12.00	89.36
		CH 62	5310		10.00	12.00	
	802.11ac-VHT20	CH 52	5260	MCS0	10.03	12.00	95.10
		CH 56	5280		10.08	12.00	
		CH 60	5300		10.00	12.00	
		CH 64	5320		10.00	12.00	
	802.11ac-VHT40	CH 54	5270	MCS0	10.04	12.00	90.05
		CH 62	5310		10.00	12.00	
	802.11ac-VHT80	CH 58	5290	MCS0	10.23	12.00	85.71

	Mode	Channel	Frequency (MHz)	Data Rate	Average power (dBm)	Tune-Up Limit	Duty Cycle %
5.5GHz WLAN ANT 2	802.11a	CH 100	5500	6Mbps	10.05	12.00	95.41
		CH 116	5580		10.16	12.00	
		CH 124	5620		10.00	12.00	
		CH 132	5660		10.03	12.00	
		CH 140	5700		10.17	12.00	
		CH 144	5720		10.11	12.00	
	802.11n-HT20	CH 100	5500	MCS0	10.05	12.00	94.52
		CH 116	5580		10.16	12.00	
		CH 124	5620		10.00	12.00	
		CH 132	5660		10.08	12.00	
		CH 140	5700		10.37	12.00	
		CH 144	5720		10.28	12.00	
	802.11n-HT40	CH 102	5510	MCS0	10.13	12.00	89.62
		CH 110	5550		10.26	12.00	
		CH 126	5630		10.11	12.00	
		CH 134	5670		10.02	12.00	
		CH 142	5710		10.01	12.00	
	802.11ac-VHT20	CH 100	5500	MCS0	10.03	12.00	95.10
		CH 116	5580		10.01	12.00	
		CH 124	5620		10.00	12.00	
		CH 132	5660		10.03	12.00	
		CH 140	5700		10.01	12.00	
		CH 144	5720		10.06	12.00	
	802.11ac-VHT40	CH 102	5510	MCS0	10.00	12.00	90.05
		CH 110	5550		10.37	12.00	
		CH 126	5630		10.22	12.00	
		CH 134	5670		10.04	12.00	
		CH 142	5710		10.16	12.00	
	802.11ac-VHT80	CH 106	5530	MCS0	8.48	10.00	85.71
		CH 122	5610		10.05	12.00	
		CH 138	5690		10.01	12.00	

	Mode	Channel	Frequency (MHz)	Data Rate	Average power (dBm)	Tune-Up Limit	Duty Cycle %
5.8GHz WLAN ANT 2	802.11a	CH 149	5745	6Mbps	10.41	12.00	95.41
		CH 157	5785		10.15	12.00	
		CH 165	5825		10.00	12.00	
	802.11n-HT20	CH 149	5745	MCS0	10.46	12.00	94.52
		CH 157	5785		10.12	12.00	
		CH 165	5825		10.06	12.00	
	802.11n-HT40	CH 151	5755	MCS0	10.13	12.00	89.62
		CH 159	5795		10.03	12.00	
	802.11ac-VHT20	CH 149	5745	MCS0	10.30	12.00	95.10
		CH 157	5785		10.15	12.00	
		CH 165	5825		10.00	12.00	
	802.11ac-VHT40	CH 151	5755	MCS0	10.53	12.00	90.05
		CH 159	5795		10.10	12.00	
	802.11ac-VHT80	CH 155	5775	MCS0	10.61	12.00	85.71

<5GHz WLAN ANT1+2>

	Mode	Channel	Frequency (MHz)	Data Rate	Average power (dBm)	Tune-Up Limit	Duty Cycle %
5.2GHz WLAN ANT 1+2	802.11a	CH 36	5180	6Mbps	13.12	15.00	94.95
		CH 40	5200		13.05	15.00	
		CH 44	5220		13.05	15.00	
		CH 48	5240		13.27	15.00	
	802.11n-HT20	CH 36	5180	MCS0	13.13	15.00	94.94
		CH 40	5200		13.16	15.00	
		CH 44	5220		13.06	15.00	
		CH 48	5240		13.19	15.00	
	802.11n-HT40	CH 38	5190	MCS0	13.18	15.00	89.62
		CH 46	5230		13.08	15.00	
	802.11ac-VHT20	CH 36	5180	MCS0	13.10	15.00	94.63
		CH 40	5200		13.18	15.00	
		CH 44	5220		13.04	15.00	
		CH 48	5240		13.00	15.00	
	802.11ac-VHT40	CH 38	5190	MCS0	13.35	15.00	90.48
		CH 46	5230		13.15	15.00	
	802.11ac-VHT80	CH 42	5210	MCS0	13.07	15.00	85.63

	Mode	Channel	Frequency (MHz)	Data Rate	Average power (dBm)	Tune-Up Limit	Duty Cycle %
5.3GHz WLAN ANT 1+2	802.11a	CH 52	5260	6Mbps	13.16	15.00	94.95
		CH 56	5280		13.05	15.00	
		CH 60	5300		13.04	15.00	
		CH 64	5320		13.01	14.10	
	802.11n-HT20	CH 52	5260	MCS0	13.11	15.00	94.94
		CH 56	5280		13.18	15.00	
		CH 60	5300		13.10	15.00	
		CH 64	5320		13.00	14.10	
	802.11n-HT40	CH 54	5270	MCS0	13.10	15.00	89.62
		CH 62	5310		13.06	15.00	
	802.11ac-VHT20	CH 52	5260	MCS0	13.08	15.00	94.63
		CH 56	5280		13.19	15.00	
		CH 60	5300		13.00	15.00	
		CH 64	5320		13.01	14.10	
	802.11ac-VHT40	CH 54	5270	MCS0	13.09	15.00	90.48
		CH 62	5310		13.02	15.00	
	802.11ac-VHT80	CH 58	5290	MCS0	13.11	15.00	85.63

	Mode	Channel	Frequency (MHz)	Data Rate	Average power (dBm)	Tune-Up Limit	Duty Cycle %
5.5GHz WLAN ANT 1+2	802.11a	CH 100	5500	6Mbps	13.78	15.00	94.95
		CH 116	5580		13.98	15.00	
		CH 124	5620		13.68	15.00	
		CH 132	5660		13.54	15.00	
		CH 140	5700		13.40	15.00	
		CH 144	5720		13.32	15.00	
	802.11n-HT20	CH 100	5500	MCS0	13.59	15.00	94.94
		CH 116	5580		13.76	15.00	
		CH 124	5620		13.11	15.00	
		CH 132	5660		13.09	15.00	
		CH 140	5700		13.11	15.00	
		CH 144	5720		13.05	15.00	
	802.11n-HT40	CH 102	5510	MCS0	13.52	15.00	89.62
		CH 110	5550		13.23	15.00	
		CH 126	5630		13.18	15.00	
		CH 134	5670		13.14	15.00	
		CH 142	5710		13.05	15.00	
	802.11ac-VHT20	CH 100	5500	MCS0	13.59	15.00	94.63
		CH 116	5580		13.69	15.00	
		CH 124	5620		13.08	15.00	
		CH 132	5660		13.06	15.00	
		CH 140	5700		13.06	15.00	
		CH 144	5720		13.01	15.00	
	802.11ac-VHT40	CH 102	5510	MCS0	13.47	15.00	90.48
		CH 110	5550		13.02	15.00	
		CH 126	5630		13.06	15.00	
		CH 134	5670		13.13	15.00	
		CH 142	5710		13.02	15.00	
	802.11ac-VHT80	CH 106	5530	MCS0	11.51	12.80	85.63
		CH 122	5610		13.33	15.00	
		CH 138	5690		13.24	15.00	

	Mode	Channel	Frequency (MHz)	Data Rate	Average power (dBm)	Tune-Up Limit	Duty Cycle %
5.8GHz WLAN ANT 1+2	802.11a	CH 149	5745	MCS0	13.66	15.00	94.95
		CH 157	5785		13.14	15.00	
		CH 165	5825		13.08	15.00	
	802.11n-HT20	CH 149	5745	MCS0	13.30	15.00	94.94
		CH 157	5785		13.05	15.00	
		CH 165	5825		13.00	15.00	
	802.11n-HT40	CH 151	5755	MCS0	13.19	15.00	89.62
		CH 159	5795		13.08	15.00	
	802.11ac-VHT20	CH 149	5745	MCS0	13.47	15.00	94.63
		CH 157	5785		13.08	15.00	
		CH 165	5825		13.01	15.00	
	802.11ac-VHT40	CH 151	5755	MCS0	13.22	15.00	90.48
		CH 159	5795		13.00	15.00	
	802.11ac-VHT80	CH 155	5775	MCS0	13.33	15.00	85.63

<Bluetooth Power>

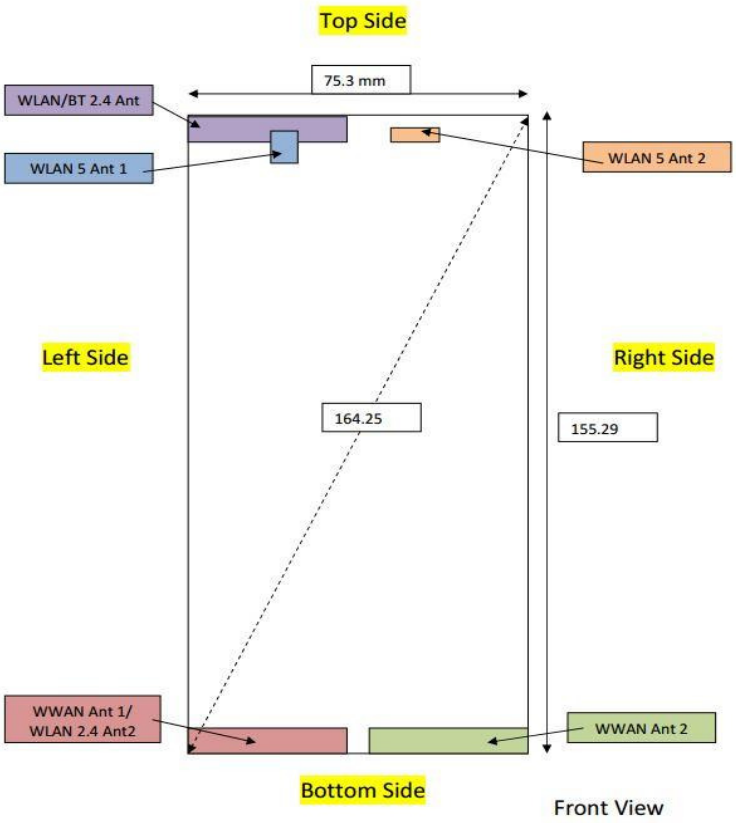
General Note:

1. For 2.4GHz Bluetooth SAR testing was selected 1Mbps, due to its highest average power.
2. The duty factor is selected theoretical 83.3% perform Bluetooth SAR testing.

Mode	Channel	Frequency (MHz)	Average power (dBm)		
			1Mbps	2Mbps	3Mbps
EDR	CH 00	2402	7.19	3.99	3.97
	CH 39	2441	9.66	6.43	6.41
	CH 78	2480	7.69	4.47	4.48
Tune-up Limit			10	7	7

Mode	Channel	Frequency (MHz)	Average power (dBm)
			GFSK
LE	CH 00	2402	-1.39
	CH 19	2440	1.38
	CH 39	2480	-0.28
Tune-up Limit			2

13. Antenna Location



14. SAR Test Results

General Note:

1. Per KDB 447498 D01v06, the reported SAR is the measured SAR value adjusted for maximum tune-up tolerance.
   a. Tune-up scaling Factor = tune-up limit power (mW) / EUT RF power (mW), where tune-up limit is the maximum rated power among all production units.
   b. For SAR testing of WLAN signal with non-100% duty cycle, the measured SAR is scaled-up by the duty cycle scaling factor which is equal to "1/(duty cycle)"
   c. For WWAN/Bluetooth: Reported SAR(W/kg)= Measured SAR(W/kg)*Tune-up Scaling Factor
   d. For WLAN: 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 648474 D03v01r04, the highest SAR reported for each wireless technology (1xRTT, EVDO, WCDMA, GSM, Wi-Fi etc.), frequency band, operating mode (different modes/configurations within each wireless technology) and exposure condition (head, body-worn accessory, hotspot mode, etc.) must be repeated using the wireless charging battery cover.
4. Per KDB 648474 D03v01r04, for test cases where the measured SAR for a handset with normal battery cover is greater than 1.2 W/kg, these tests should be repeated with the wireless charging battery cover.

14.1 Head 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)
01	GSM850	GPRS (4 Tx slots)	Left Cheek	0mm	189	836.4	25.78	27.50	1.486	-0.01	0.155	0.230
02	GSM1900	GPRS (4 Tx slots)	Right Cheek	0mm	810	1909.8	23.90	24.50	1.148	0.03	0.231	0.265

<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)
03	WCDMA II	RMC 12.2Kbps	Right Cheek	0mm	9538	1907.6	23.13	24.00	1.222	0.1	0.407	0.497
04	WCDMA V	RMC 12.2Kbps	Left Cheek	0mm	4132	826.4	23.05	24.00	1.245	0.016	0.245	0.305

<CDMA 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)
05	CDMA BC0	1xRTT RC3 SO55	Left Cheek	0mm	1013	824.7	23.76	25.00	1.330	-0.02	0.219	0.291
06	CDMA BC1	1xRTT RC3 SO55	Right Cheek	0mm	1175	1908.75	24.12	25.00	1.225	0.13	0.424	0.519

<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)
07	LTE Band 2	20M	QPSK	1	0	Right Cheek	0mm	18900	1880	23.09	24.00	1.233	0.16	0.298	0.367
08	LTE Band 4	20M	QPSK	1	0	Left Cheek	0mm	20175	1732.5	22.49	24.00	1.416	-0.08	0.290	0.411
09	LTE Band 5	10M	QPSK	1	0	Left Cheek	0mm	20525	836.5	22.86	24.00	1.300	0.159	0.317	0.412
10	LTE Band 7	20M	QPSK	1	99	Left Cheek	0mm	20850	2510	23.01	24.00	1.256	0.12	0.295	0.371
11	LTE Band 13	10M	QPSK	1	0	Right Cheek	0mm	23230	782	22.32	24.00	1.472	0.05	0.159	0.234

<WLAN SAR>

Plot No.	Band	Mode	Test Position	Gap (mm)	Antenna	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)
12	WLAN2.4GHz	802.11b 1Mbps	Right Cheek	0mm	Ant 1	11	2462	16.35	16.50	1.035	99.04	1.010	-0.03	0.720	0.753
	WLAN2.4GHz	802.11b 1Mbps	Left Cheek	0mm	Ant 2	1	2412	12.96	13.00	1.009	99.05	1.010	0.1	0.004	0.005
13	WLAN5GHz	802.11ac-VHT80 MCS0	Right Cheek	0mm	Ant 1	58	5290	10.86	12.00	1.300	86.1	1.161	0.091	0.372	0.562
	WLAN5GHz	802.11ac-VHT80 MCS0	Left Cheek	0mm	Ant 2	58	5290	10.23	12.00	1.503	85.71	1.167	0.064	0.127	0.223
14	WLAN5GHz	802.11ac-VHT80 MCS0	Right Cheek	0mm	Ant 1	122	5610	10.19	12.00	1.517	86.1	1.161	0.061	0.450	0.793
	WLAN5GHz	802.11ac-VHT80 MCS0	Left Tilted	0mm	Ant 2	122	5610	10.05	12.00	1.567	85.71	1.167	0.05	0.109	0.199
15	WLAN5GHz	802.11ac-VHT80 MCS0	Right Cheek	0mm	Ant 1	155	5775	10.76	12.00	1.330	86.1	1.161	0.158	0.257	0.397
	WLAN5GHz	802.11ac-VHT80 MCS0	Left Tilted	0mm	Ant 2	155	5775	10.61	12.00	1.377	85.71	1.167	0.111	0.233	0.374

14.2 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)
16	GSM850	GPRS (4 Tx slots)	Back	10mm	251	848.8	23.00	25.00	1.585	-0.08	0.301	0.477
17	GSM1900	GPRS (4 Tx slots)	Back	10mm	810	1909.8	23.90	24.50	1.148	0.01	0.265	0.304

<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 II	RMC 12.2Kbps	Front	10mm	9538	1907.6	22.00	23.00	1.259	-0.08	0.780	0.982
	WCDMA II	RMC 12.2Kbps	Front	10mm	9262	1852.4	21.84	23.00	1.306	-0.01	0.807	1.054
18	WCDMA II	RMC 12.2Kbps	Front	10mm	9400	1880	21.71	23.00	1.346	-0.02	0.798	1.074
19	WCDMA V	RMC 12.2Kbps	Back	10mm	4233	846.6	19.32	20.50	1.312	-0.17	0.379	0.497

<CDMA 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)
20	CDMA BC0	RTAP 153.6Kbps	Back	10mm	384	836.52	21.24	22.50	1.337	-0.03	0.460	0.615
21	CDMA BC1	RTAP 153.6Kbps	Bottom Side	10mm	600	1880	22.63	23.50	1.222	-0.15	0.795	0.971
	CDMA BC1	RTAP 153.6Kbps	Bottom Side	10mm	25	1851.25	22.64	23.50	1.219	-0.1	0.780	0.951
	CDMA BC1	RTAP 153.6Kbps	Bottom Side	10mm	1175	1908.75	22.72	23.50	1.197	-0.01	0.792	0.948

<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)
22	LTE Band 2	20M	QPSK	1	0	Bottom Side	10mm	18700	1860	23.01	24.00	1.256	-0.15	0.899	1.129
	LTE Band 2	20M	QPSK	1	0	Bottom Side	10mm	18900	1880	23.09	24.00	1.233	0.1	0.893	1.101
	LTE Band 2	20M	QPSK	1	0	Bottom Side	10mm	19100	1900	23.01	24.00	1.256	-0.18	0.880	1.105
23	LTE Band 4	20M	QPSK	50	24	Bottom Side	10mm	20175	1732.5	22.09	23.00	1.233	-0.19	0.726	0.895
24	LTE Band 5	10M	QPSK	50	0	Back	10mm	20525	836.5	18.55	20.00	1.396	-0.02	0.230	0.321
25	LTE Band 7	20M	QPSK	1	99	Back	10mm	21350	2560	22.92	24.00	1.282	-0.11	0.370	0.474
26	LTE Band 13	10M	QPSK	50	0	Front	10mm	23230	782	18.48	20.00	1.419	0.048	0.679	0.964

<WLAN SAR>

Plot No.	Band	Mode	Test Position	Gap (mm)	Antenna	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)
27	WLAN2.4GHz	802.11b 1Mbps	Front	10mm	Ant 1	11	2462	18.91	20.00	1.285	99.04	1.010	0.16	0.191	0.248
	WLAN2.4GHz	802.11b 1Mbps	Back	10mm	Ant 2	11	2462	14.96	16.00	1.271	99.05	1.010	-0.08	0.024	0.031
28	WLAN5GHz	802.11a 6Mbps	Front	10mm	Ant 1	36	5180	16.30	18.00	1.479	94.95	1.053	-0.106	0.087	0.136
	WLAN5GHz	802.11a 6Mbps	Front	10mm	Ant 2	36	5180	15.79	17.50	1.483	95.41	1.048	-0.077	0.071	0.110
29	WLAN5GHz	802.11a 6Mbps	Front	10mm	Ant 1	149	5745	16.37	18.00	1.454	94.95	1.053	0.115	0.103	0.158
	WLAN5GHz	802.11a 6Mbps	Front	10mm	Ant 2	149	5745	16.22	18.00	1.505	95.41	1.048	0.046	0.029	0.046

14.3 Product Specific SAR

<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 10g SAR (W/kg)	Reported 10g SAR (W/kg)
30	WCDMA II	RMC 12.2Kbps	Bottom Side	0mm	9400	1880	22.93	24.00	1.279	-0.05	2.450	3.134
	WCDMA II	RMC 12.2Kbps	Bottom Side	0mm	9262	1852.4	22.97	24.00	1.268	-0.01	2.440	3.093
	WCDMA II	RMC 12.2Kbps	Bottom Side	0mm	9538	1907.6	23.13	24.00	1.222	-0.02	2.500	3.054

<CDMA 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 10g SAR (W/kg)	Reported 10g SAR (W/kg)
31	CDMA BC1	RTAP 153.6Kbps	Bottom Side	0mm	1175	1908.75	24.37	25.00	1.156	-0.11	2.910	3.364
	CDMA BC1	RTAP 153.6Kbps	Bottom Side	0mm	25	1851.25	24.35	25.00	1.161	-0.14	2.880	3.345
	CDMA BC1	RTAP 153.6Kbps	Bottom Side	0mm	600	1880	24.31	25.00	1.172	-0.1	2.850	3.341

<WLAN SAR>

Plot No.	Band	Mode	Test Position	Gap (mm)	Antenna	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 10g SAR (W/kg)	Reported 10g SAR (W/kg)
32	WLAN5GHz	802.11a 6Mbps	Front	0mm	Ant 1	52	5260	16.40	18.00	1.445	94.95	1.053	-0.109	0.717	1.091
	WLAN5GHz	802.11a 6Mbps	Front	0mm	Ant 2	52	5260	15.76	17.50	1.491	95.41	1.048	0.109	0.287	0.449
33	WLAN5GHz	802.11a 6Mbps	Front	0mm	Ant 1	100	5500	16.70	18.00	1.349	94.95	1.053	-0.103	1.390	1.974
	WLAN5GHz	802.11a 6Mbps	Front	0mm	Ant 2	100	5500	16.10	18.00	1.549	95.41	1.048	0.122	0.361	0.586

14.4 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)
34	GSM850	GPRS (4 Tx slots)	Back	10mm	251	848.8	23.00	25.00	1.585	-0.08	0.301	0.477
35	GSM1900	GPRS (4 Tx slots)	Back	10mm	810	1909.8	23.90	24.50	1.148	0.01	0.265	0.304

<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)
36	WCDMA II	RMC 12.2Kbps	Front	10mm	9538	1907.6	22.00	23.00	1.259	-0.08	0.780	0.982
	WCDMA II	RMC 12.2Kbps	Front	10mm	9262	1852.4	21.84	23.00	1.306	-0.01	0.707	0.923
	WCDMA II	RMC 12.2Kbps	Front	10mm	9400	1880	21.71	23.00	1.346	-0.02	0.698	0.939
37	WCDMA V	RMC 12.2Kbps	Back	10mm	4233	846.6	19.32	20.50	1.312	-0.17	0.379	0.497

<CDMA 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)
38	CDMA BC0	1xRTT RC3 SO32	Front	10mm	777	848.31	21.11	22.50	1.377	-0.12	0.785	1.081
	CDMA BC0	1xRTT RC3 SO32	Front	10mm	1013	824.7	21.34	22.50	1.306	-0.14	0.752	0.982
	CDMA BC0	1xRTT RC3 SO32	Front	10mm	384	836.52	21.31	22.50	1.315	-0.1	0.792	1.042
39	CDMA BC1	1xRTT RC3 SO32	Back	10mm	1175	1908.75	22.67	23.50	1.211	0.12	0.400	0.484

<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)
40	LTE Band 2	20M	QPSK	1	0	Back	10mm	18700	1860	23.01	24.00	1.256	0.09	0.523	0.657
41	LTE Band 4	20M	QPSK	1	0	Front	10mm	20175	1732.5	22.08	23.00	1.236	-0.09	0.712	0.880
42	LTE Band 5	10M	QPSK	50	0	Back	10mm	20525	836.5	18.55	20.00	1.396	0.012	0.467	0.652
43	LTE Band 7	20M	QPSK	1	99	Back	10mm	21350	2560	22.92	24.00	1.282	-0.11	0.370	0.474
44	LTE Band 13	10M	QPSK	50	0	Front	10mm	23230	782	18.48	20.00	1.419	0.048	0.679	0.964

<WLAN SAR>

Plot No.	Band	Mode	Test Position	Gap (mm)	Antenna	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)
45	WLAN2.4GHz	802.11b 1Mbps	Front	10mm	Ant 1	11	2462	18.91	20.00	1.285	99.04	1.010	0.16	0.191	0.248
	WLAN2.4GHz	802.11b 1Mbps	Back	10mm	Ant 2	11	2462	14.96	16.00	1.271	99.05	1.010	-0.08	0.024	0.031
46	WLAN5GHz	802.11a 6Mbps	Front	10mm	Ant 1	52	5260	16.40	18.00	1.444	94.95	1.053	-0.127	0.108	0.164
	WLAN5GHz	802.11a 6Mbps	Front	10mm	Ant 2	52	5260	15.76	17.50	1.491	95.41	1.048	0.16	0.038	0.059
47	WLAN5GHz	802.11a 6Mbps	Front	10mm	Ant 1	100	5500	16.70	18.00	1.349	94.5	1.058	-0.182	0.310	0.442
	WLAN5GHz	802.11a 6Mbps	Front	10mm	Ant 2	100	5500	16.10	18.00	1.549	95.41	1.048	-0.149	0.039	0.063
48	WLAN5GHz	802.11a 6Mbps	Front	10mm	Ant 1	149	5745	16.37	18.00	1.454	94.95	1.053	0.115	0.103	0.158
	WLAN5GHz	802.11a 6Mbps	Front	10mm	Ant 2	149	5745	16.22	18.00	1.505	95.41	1.048	0.046	0.029	0.046

<Bluetooth 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)
49	Bluetooth	1Mbps	Front	10mm	39	2441	9.66	10.00	1.081	0.03	0.006	0.007

Test Engineer : Frank Wu and Bevis Chang

15. Uncertainty Assessment

The component of uncertainly may generally be categorized according to the methods used to evaluate them. The evaluation of uncertainly by the statistical analysis of a series of observations is termed a Type An evaluation of uncertainty. The evaluation of uncertainty by means other than the statistical analysis of a series of observation is termed a Type B evaluation of uncertainty. Each component of uncertainty, however evaluated, is represented by an estimated standard deviation, termed standard uncertainty, which is determined by the positive square root of the estimated variance.

A Type A evaluation of standard uncertainty may be based on any valid statistical method for treating data. This includes calculating the standard deviation of the mean of a series of independent observations; using the method of least squares to fit a curve to the data in order to estimate the parameter of the curve and their standard deviations; or carrying out an analysis of variance in order to identify and quantify random effects in certain kinds of measurement.

A type B evaluation of standard uncertainty is typically based on scientific judgment using all of the relevant information available. These may include previous measurement data, experience, and knowledge of the behavior and properties of relevant materials and instruments, manufacture's specification, data provided in calibration reports and uncertainties assigned to reference data taken from handbooks. Broadly speaking, the uncertainty is either obtained from an outdoor source or obtained from an assumed distribution, such as the normal distribution, rectangular or triangular distributions indicated in table below.

Uncertainty Distributions	Normal	Rectangular	Triangular	U-Shape
Multi-plying Factor[a]	1/k[b]	$1/\sqrt{3}$	$1/\sqrt{6}$	$1/\sqrt{2}$

(a) standard uncertainty is determined as the product of the multiplying factor and the estimated range of variations in the measured quantity

(b) κ is the coverage factor

Table 15.1. Standard Uncertainty for Assumed Distribution

The combined standard uncertainty of the measurement result represents the estimated standard deviation of the result. It is obtained by combining the individual standard uncertainties of both Type A and Type B evaluation using the usual "root-sum-squares" (RSS) methods of combining standard deviations by taking the positive square root of the estimated variances.

Expanded uncertainty is a measure of uncertainty that defines an interval about the measurement result within which the measured value is confidently believed to lie. It is obtained by multiplying the combined standard uncertainty by a coverage factor. Typically, the coverage factor ranges from 2 to 3. Using a coverage factor allows the true value of a measured quantity to be specified with a defined probability within the specified uncertainty range. For purpose of this document, a coverage factor two is used, which corresponds to confidence interval of about 95 %. The DASY uncertainty Budget is shown in the following tables.

Error Description	Uncertainty Value (±%)	Probability	Divisor	(Ci) 1g	(Ci) 10g	Standard Uncertainty (1g) (±%)	Standard Uncertainty (10g) (±%)
Measurement System							
Probe Calibration	6.0	N	1	1	1	6.0	6.0
Axial Isotropy	4.7	R	1.732	0.7	0.7	1.9	1.9
Hemispherical Isotropy	9.6	R	1.732	0.7	0.7	3.9	3.9
Boundary Effects	1.0	R	1.732	1	1	0.6	0.6
Linearity	4.7	R	1.732	1	1	2.7	2.7
System Detection Limits	1.0	R	1.732	1	1	0.6	0.6
Modulation Response	3.2	R	1.732	1	1	1.8	1.8
Readout Electronics	0.3	N	1	1	1	0.3	0.3
Response Time	0.0	R	1.732	1	1	0.0	0.0
Integration Time	2.6	R	1.732	1	1	1.5	1.5
RF Ambient Noise	3.0	R	1.732	1	1	1.7	1.7
RF Ambient Reflections	3.0	R	1.732	1	1	1.7	1.7
Probe Positioner	0.4	R	1.732	1	1	0.2	0.2
Probe Positioning	2.9	R	1.732	1	1	1.7	1.7
Max. SAR Eval.	2.0	R	1.732	1	1	1.2	1.2
Test Sample Related							
Device Positioning	3.0	N	1	1	1	3.0	3.0
Device Holder	3.6	N	1	1	1	3.6	3.6
Power Drift	5.0	R	1.732	1	1	2.9	2.9
Power Scaling	0.0	R	1.732	1	1	0.0	0.0
Phantom and Setup							
Phantom Uncertainty	6.1	R	1.732	1	1	3.5	3.5
SAR correction	0.0	R	1.732	1	0.84	0.0	0.0
Liquid Conductivity Repeatability	0.2	N	1	0.78	0.71	0.1	0.1
Liquid Conductivity (target)	5.0	R	1.732	0.78	0.71	2.3	2.0
Liquid Conductivity (mea.)	2.5	R	1.732	0.78	0.71	1.1	1.0
Temp. unc. - Conductivity	3.4	R	1.732	0.78	0.71	1.5	1.4
Liquid Permittivity Repeatability	0.15	N	1	0.23	0.26	0.0	0.0
Liquid Permittivity (target)	5.0	R	1.732	0.23	0.26	0.7	0.8
Liquid Permittivity (mea.)	2.5	R	1.732	0.23	0.26	0.3	0.4
Temp. unc. - Permittivity	0.83	R	1.732	0.23	0.26	0.1	0.1
Combined Std. Uncertainty						11.4%	11.4%
Coverage Factor for 95 %						K=2	K=2
Expanded STD Uncertainty						22.9%	22.7%

Table 15.2. Uncertainty Budget for frequency range 300 MHz to 3 GHz

Error Description	Uncertainty Value (±%)	Probability	Divisor	(Ci) 1g	(Ci) 10g	Standard Uncertainty (1g) (±%)	Standard Uncertainty (10g) (±%)
Measurement System							
Probe Calibration	7.0	N	1	1	1	7.0	7.0
Axial Isotropy	4.7	R	1.732	0.7	0.7	1.9	1.9
Hemispherical Isotropy	9.6	R	1.732	0.7	0.7	3.9	3.9
Boundary Effects	2.0	R	1.732	1	1	1.2	1.2
Linearity	4.7	R	1.732	1	1	2.7	2.7
System Detection Limits	1.0	R	1.732	1	1	0.6	0.6
Modulation Response	3.2	R	1.732	1	1	1.8	1.8
Readout Electronics	0.3	N	1	1	1	0.3	0.3
Response Time	0.0	R	1.732	1	1	0.0	0.0
Integration Time	2.6	R	1.732	1	1	1.5	1.5
RF Ambient Noise	3.0	R	1.732	1	1	1.7	1.7
RF Ambient Reflections	3.0	R	1.732	1	1	1.7	1.7
Probe Positioner	0.4	R	1.732	1	1	0.2	0.2
Probe Positioning	6.7	R	1.732	1	1	3.9	3.9
Max. SAR Eval.	4.0	R	1.732	1	1	2.3	2.3
Test Sample Related							
Device Positioning	3.0	N	1	1	1	3.0	3.0
Device Holder	3.6	N	1	1	1	3.6	3.6
Power Drift	5.0	R	1.732	1	1	2.9	2.9
Power Scaling	0.0	R	1.732	1	1	0.0	0.0
Phantom and Setup							
Phantom Uncertainty	6.6	R	1.732	1	1	3.8	3.8
SAR correction	0.0	R	1.732	1	0.84	0.0	0.0
Liquid Conductivity Repeatability	0.2	N	1	0.78	0.71	0.1	0.1
Liquid Conductivity (target)	5.0	R	1.732	0.78	0.71	2.3	2.0
Liquid Conductivity (mea.)	2.5	R	1.732	0.78	0.71	1.1	1.0
Temp. unc. - Conductivity	3.4	R	1.732	0.78	0.71	1.5	1.4
Liquid Permittivity Repeatability	0.15	N	1	0.23	0.26	0.0	0.0
Liquid Permittivity (target)	5.0	R	1.732	0.23	0.26	0.7	0.8
Liquid Permittivity (mea.)	2.5	R	1.732	0.23	0.26	0.3	0.4
Temp. unc. - Permittivity	0.83	R	1.732	0.23	0.26	0.1	0.1
Combined Std. Uncertainty						12.8%	12.7%
Coverage Factor for 95 %						K=2	K=2
Expanded STD Uncertainty						25.5%	25.4%

Table 15.3. Uncertainty Budget for frequency range 3 GHz to 6 GHz

16. References

[1] FCC 47 CFR Part 2 “Frequency Allocations and Radio Treaty Matters; General Rules and Regulations”

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[11] FCC KDB 941225 D05A v01r02, “Rel. 10 LTE SAR Test Guidance and KDB Inquiries”, Oct 2015

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