



FCC SAR TEST REPORT

FCC ID : ZMOL850GL
Equipment : LTE module
Brand Name : Fibocom
Model Name : L850-GL
Applicant : Fibocom Wireless Inc.
5/F, Tower A, Technology Building II, 1057#
Nanhai Blvd, Shenzhen, 518067 China.
Standard : FCC 47 CFR Part 2 (2.1093)

The product was installed into Notebook Computer (Brand Name HP, Model Name: HSN-I39C) during test.

The product was received on Jul. 21, 2020 and testing was started from Aug. 10, 2020 and completed on Aug. 13, 2020. We, SPORTON INTERNATIONAL INC., would like to declare that the tested sample provide by manufacturer and the test data has been evaluated in accordance with the test procedures given in 47 CFR Part 2.1093 and FCC KDB and has been pass the FCC requirement.

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



Approved by: Cona Huang / Deputy Manager

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History of this test report

Report No.	Version	Description	Issued Date
FA071625-08	01	Initial issue of report	Sep. 10, 2020

1. Statement of Compliance

The maximum results of Specific Absorption Rate (SAR) found during testing for **Fibocom Wireless Inc., LTE module, L850-GL**, are as follows.

Equipment Class	Frequency Band		Highest SAR Summary	Highest Simultaneous Transmission 1g SAR (W/kg)
			Body (Separation 0mm)	
			1g SAR (W/kg)	
Licensed	WCDMA	WCDMA II	0.08	1.03
		WCDMA IV	0.04	
		WCDMA V	0.02	
	LTE	LTE Band 2	0.05	
		LTE Band 7	0.01	
		LTE Band 12 / 17	0.02	
		LTE Band 13	0.03	
		LTE Band 5 / 26	0.02	
		LTE Band 30	0.00	
		LTE Band 38 / 41	0.01	
		LTE Band 4 / 66	0.06	
Date of Testing:		2020/8/10 ~ 2020/8/13		

Sporton Lab is accredited to ISO 17025 by Taiwan Accreditation Foundation (TAF code: 1190) and the FCC designation No. TW1190 under the FCC 2.948(e) by Mutual Recognition Agreement (MRA) in FCC test. This device is in compliance with Specific Absorption Rate (SAR) for general population/uncontrolled exposure limits (1.6 W/kg) specified in FCC 47 CFR part 2 (2.1093) and ANSI/IEEE C95.1-1992, and had been tested in accordance with the measurement methods and procedures specified in IEEE 1528-2013 and FCC KDB publications.

Reviewed by: Jason Wang
Report Producer: Daisy Peng

2. Guidance Applied

The Specific Absorption Rate (SAR) testing specification, method, and procedure for this device is in accordance with the following standards, if the KDB standards were not list within TAF approval, because it is include in the FCC KDB 447498.

- FCC 47 CFR Part 2 (2.1093)
- ANSI/IEEE C95.1-1992
- IEEE 1528-2013
- FCC KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz v01r04
- FCC KDB 865664 D02 SAR Reporting v01r02
- FCC KDB 447498 D01 General RF Exposure Guidance v06
- FCC KDB 248227 D01 802.11 Wi-Fi SAR v02r02
- FCC KDB 616217 D04 SAR for laptop and tablets v01r02
- 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

3. Equipment Under Test (EUT) Information

3.1 General Information

Product Feature & Specification	
Equipment Name	LTE module
Brand Name	Fibocom
Model Name	L850-GL
FCC ID	ZMOL850GL
Wireless Technology and Frequency Range	WCDMA Band II: 1850 MHz ~ 1910 MHz WCDMA Band IV: 1710 MHz ~ 1755 MHz WCDMA Band V: 824 MHz ~ 849 MHz LTE Band 2: 1850 MHz ~ 1910 MHz LTE Band 4: 1710 MHz ~ 1755 MHz LTE Band 5: 824 MHz ~ 849 MHz LTE Band 7: 2500 MHz ~ 2570 MHz LTE Band 12: 699 MHz ~ 716 MHz LTE Band 13: 777 MHz ~ 787 MHz LTE Band 17: 704 MHz ~ 716 MHz LTE Band 26: 814 MHz ~ 849 MHz LTE Band 30: 2305 MHz ~ 2315 MHz LTE Band 38: 2570 MHz ~ 2620 MHz LTE Band 41: 2496 MHz ~ 2690 MHz LTE Band 66: 1710 MHz ~ 1780 MHz
Mode	RMC 12.2Kbps HSDPA HSUPA DC-HSDPA LTE: QPSK, 16QAM
EUT Stage	Production Unit

WWAN Antenna Information									
Vendor	Hong-Bo								
Antenna	PIFA								
Part Number	6036B0278901 (260-27452) Tx1/Rx1								
Frequency	B5/B26 uplink 824-849 MHz	B2 downlink+uplink 1850-1910MHz	B12/B17 uplink 704-716MHz	B13 down link 746-756MHz	B13 uplink 777-787MHz	B4/B66 uplink 1710-1755MHz	B7 uplink 2500-2570MHz	B38/B41 uplink+downlink 2570-2620MHz	B30 uplink+downlink 2300-2400MHz
Gain (dBi)	1.04	-0.42	0.66	0.29	0.64	0.54	-1.15	-1.64	2.01

WWAN Antenna Information									
Vendor	Hong-Bo								
Antenna	PIFA								
Part Number	6036B0279701 (260-27453) Tx2/Rx2								
Frequency	B5/B26 downlink 869-894MHz	B2 downlink 1930-1990MHz	B12/B17 downlink 734-746MHz	B13 downlink 746-756MHz	B4/B66 Downlink 2110-2155MHz	B7 downlink 2620-2690MHz	B38/B41 uplink+downlink 2570-2620MHz	B30 uplink+downlink 2300-2400MHz	
Gain (dBi)	-3.09	-0.59	-1.42	0.11	1.21	-1.47	-1.19	1.01	

Host Information	
Brand Name	HP
Model Name	HSN-I39C
Integrated WLAN Module	Brand Name: Intel Model Name: AX200NGW
Wireless Technology and Frequency Range	WLAN 2.4GHz Band: 2400 MHz ~ 2483.5 MHz WLAN 5.2GHz Band: 5150 MHz ~ 5250 MHz WLAN 5.3GHz Band: 5250 MHz ~ 5350 MHz WLAN 5.6GHz Band: 5470 MHz ~ 5725 MHz WLAN 5.8GHz Band: 5725 MHz ~ 5825 MHz Bluetooth: 2400 MHz ~ 2483.5 MHz
Mode	WLAN: 802.11a/b/g/n/ac/ax HT20/HT40/VHT20/VHT40/VHT80/VHT160/HE20/HE40/HE80/HE160 Bluetooth BR/EDR/LE/HS
Remark: 1. The Intel AX200NGW WLAN/BT module is also integrated in this host, the 2.4GHz/5 GHz WLAN and Bluetooth SAR results are referenced from the report of FCC ID: B94-AX200NGWP (SAR Report No. FA071625-02), and these SAR results are also used to perform simultaneous transmission analysis.	



3.2 General LTE SAR Test and Reporting Considerations

Summarized necessary items addressed in KDB 941225 D05 v02r05									
FCC ID		ZMOL850GL							
Equipment Name		LTE module							
Operating Frequency Range of each LTE transmission band		LTE Band 2: 1850 MHz ~ 1910 MHz LTE Band 4: 1710 MHz ~ 1755 MHz LTE Band 5: 824 MHz ~ 849 MHz LTE Band 7: 2500 MHz ~ 2570 MHz LTE Band 12: 699 MHz ~ 716 MHz LTE Band 13: 777 MHz ~ 787 MHz LTE Band 17: 704 MHz ~ 716 MHz LTE Band 26: 814 MHz ~ 849 MHz LTE Band 30: 2305 MHz ~ 2315 MHz LTE Band 38: 2570 MHz ~ 2620 MHz LTE Band 41: 2496 MHz ~ 2690 MHz LTE Band 66: 1710 MHz ~ 1780 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 12:1.4MHz, 3MHz, 5MHz, 10MHz LTE Band 13: 5MHz, 10MHz LTE Band 17: 5MHz, 10MHz LTE Band 26:1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz LTE Band 30: 5MHz, 10MHz LTE Band 38: 5MHz, 10MHz, 15MHz, 20MHz LTE Band 41: 5MHz, 10MHz, 15MHz, 20MHz LTE Band 66:1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz, 20MHz							
uplink modulations used		QPSK / 16QAM							
LTE Voice / Data requirements		Data only							
LTE MPR permanently built-in by design		Table 6.2.3-1: Maximum Power Reduction (MPR) for Power Class 1, 2 and 3							
		Modulation	Channel bandwidth / Transmission bandwidth (N _{RB})					MPR (dB)	
			1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz		20 MHz
		QPSK	> 5	> 4	> 8	> 12	> 16	> 18	≤ 1
		16 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	≤ 1
		16 QAM	> 5	> 4	> 8	> 12	> 16	> 18	≤ 2
		64 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	≤ 2
		64 QAM	> 5	> 4	> 8	> 12	> 16	> 18	≤ 3
		256 QAM	≥ 1					≤ 5	
LTE A-MPR		In the base station simulator configuration, Network Setting value is set to NS_01 to disable A-MPR during SAR testing and the LTE SAR tests was transmitting on all TTI frames (Maximum TTI)							
Spectrum plots for RB configuration		A properly configured base station simulator was used for the SAR and power measurement; therefore, spectrum plots for each RB allocation and offset configuration are not included in the SAR report.							
LTE Carrier Aggregation Combinations		Inter-Band and Intra-Band possible combinations and the detail power measurement please referred to section 10.							
LTE Carrier Aggregation Additional Information		This device supports maximum of 3 carriers in the downlink. Additional 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)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)		
L	20407	824.7	20415	825.5	20425	826.5	20450	829						
M	20525	836.5	20525	836.5	20525	836.5	20525	836.5						
H	20643	848.3	20635	847.5	20625	846.5	20600	844						
LTE Band 7														
	Bandwidth 5 MHz		Bandwidth 10 MHz		Bandwidth 15 MHz		Bandwidth 20 MHz							
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)		
L	20775	2502.5	20800	2505	20825	2507.5	20850	2510						
M	21100	2535	21100	2535	21100	2535	21100	2535						
H	21425	2567.5	21400	2565	21375	2562.5	21350	2560						
LTE Band 12														
	Bandwidth 1.4 MHz		Bandwidth 3 MHz		Bandwidth 5 MHz		Bandwidth 10 MHz							
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)		
L	23017	699.7	23025	700.5	23035	701.5	23060	704						
M	23095	707.5	23095	707.5	23095	707.5	23095	707.5						
H	23173	715.3	23165	714.5	23155	713.5	23130	711						
LTE Band 13														
	Bandwidth 5 MHz				Bandwidth 10 MHz									
	Channel #		Freq.(MHz)		Channel #		Freq.(MHz)							
L	23205		779.5		23230		782							
M	23230		782											
H	23255		784.5											
LTE Band 17														
	Bandwidth 5 MHz				Bandwidth 10 MHz									
	Channel #		Freq.(MHz)		Channel #		Freq. (MHz)							
L	23755		706.5		23780		709							
M	23790		710		23790		710							
H	23825		713.5		23800		711							
LTE Band 26														
	Bandwidth 1.4 MHz		Bandwidth 3 MHz		Bandwidth 5 MHz		Bandwidth 10 MHz		Bandwidth 15 MHz					
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)		
L	26697	814.7	26705	815.5	26715	816.5	26740	819	26765	821.5				
M	26865	831.5	26865	831.5	26865	831.5	26865	831.5	26865	831.5				
H	27033	848.3	27025	847.5	27015	846.5	26990	844	26965	841.5				
LTE Band 30														
	Bandwidth 5 MHz				Bandwidth 10 MHz									
	Channel #		Freq.(MHz)		Channel #		Freq.(MHz)							
L	27685		2307.5		27710		2310							
M	27710		2310											
H	27735		2312.5											

LTE Band 38												
	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	37775	2572.5	37800	2575	37825	2577.5	37850	2580				
M	38000	2595	38000	2595	38000	2595	38000	2595				
H	38225	2617.5	38200	2615	38175	2612.5	38150	2610				
LTE Band 41												
	Bandwidth 5 MHz		Bandwidth 10 MHz		Bandwidth 15 MHz		Bandwidth 20 MHz					
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)				
L	39675	2498.5	39700	2501	39725	2503.5	39750	2506				
L M	40148	2545.8	40160	2547	40173	2548.3	40185	2549.5				
M	40620	2593	40620	2593	40620	2593	40620	2593				
H M	41093	2640.3	41080	2639	41068	2637.8	41055	2636.5				
H	41565	2687.5	41540	2685	41515	2682.5	41490	2680				
LTE Band 66												
	Bandwidth 1.4 MHz		Bandwidth 3 MHz		Bandwidth 5 MHz		Bandwidth 10 MHz		Bandwidth 15 MHz		Bandwidth 20 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	131979	1710.7	131987	1711.5	131997	1712.5	132022	1715	132047	1717.5	132072	1720
M	132322	1745	132322	1745	132322	1745	132322	1745	132322	1745	132322	1745
H	132665	1779.3	132657	1778.5	132647	1777.5	132622	1775	132597	1772.5	132572	1770

4. RF Exposure Limits

4.1 Uncontrolled Environment

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

4.2 Controlled Environment

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

Limits for Occupational/Controlled Exposure (W/kg)

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

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

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

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

5. Specific Absorption Rate (SAR)

5.1 Introduction

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

5.2 SAR Definition

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

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

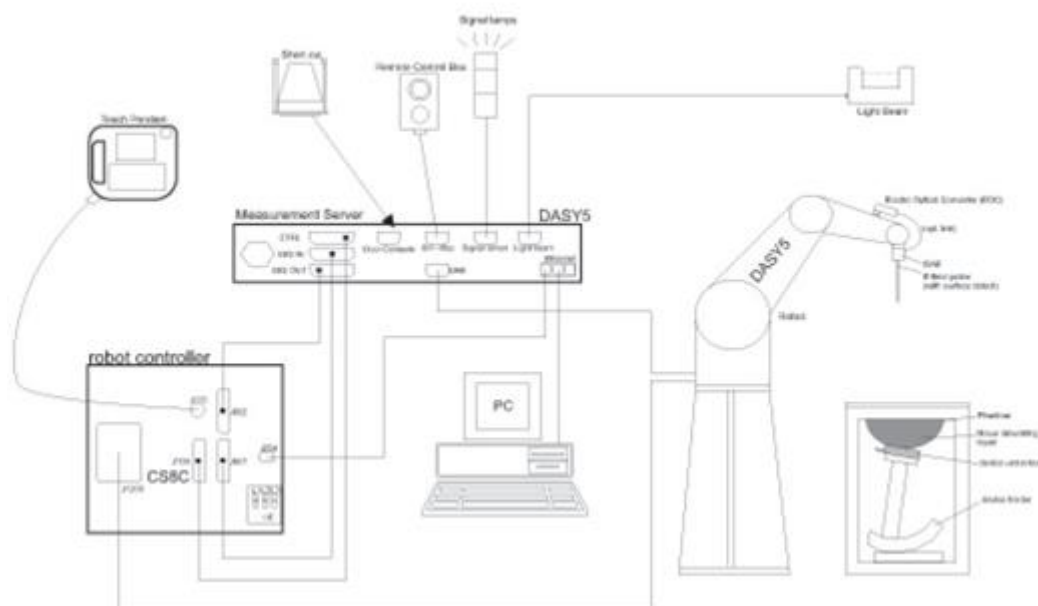
SAR is expressed in units of Watts per kilogram (W/kg)

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

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

6. System Description and Setup

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



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

6.1 Test Side Location

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

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

6.2 E-Field Probe

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

<ES3DV3 Probe>

Construction	Symmetric design with triangular core Interleaved sensors Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)	
Frequency	10 MHz – 4 GHz; Linearity: ± 0.2 dB (30 MHz – 4 GHz)	
Directivity	± 0.2 dB in TSL (rotation around probe axis) ± 0.3 dB in TSL (rotation normal to probe axis)	
Dynamic Range	5 μ W/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 μ W/g – >100 mW/g Linearity: ± 0.2 dB (noise: typically <1 μ W/g)	
Dimensions	Overall length: 337 mm (tip: 20 mm) Tip diameter: 2.5 mm (body: 12 mm) Typical distance from probe tip to dipole centers: 1 mm	

6.3 Data Acquisition Electronics (DAE)

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

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



Fig 5.1 Photo of DAE

6.4 Phantom

<SAM Twin Phantom>

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

The bottom plate contains three pair of bolts for locking the device holder. The device holder positions are adjusted to the standard measurement positions in the three sections. A white cover is provided to tap the phantom during off-periods to prevent water evaporation and changes in the liquid parameters. On the phantom top, three reference markers are provided to identify the phantom position with respect to the robot.

<ELI Phantom>

Shell Thickness	2 ± 0.2 mm (sagging: <1%)	
Filling Volume	Approx. 30 liters	
Dimensions	Major ellipse axis: 600 mm Minor axis: 400 mm	

The ELI phantom is intended for compliance testing of handheld and body-mounted wireless devices in the frequency range of 30 MHz to 6 GHz. ELI4 is fully compatible with standard and all known tissue simulating liquids.

6.5 Device Holder

<Mounting Device for Hand-Held Transmitter>

In combination with the Twin SAM V5.0/V5.0c or ELI phantoms, the Mounting Device for Hand-Held Transmitters enables rotation of the mounted transmitter device to specified spherical coordinates. At the heads, the rotation axis is at the ear opening. Transmitter devices can be easily and accurately positioned according to IEC 62209-1, IEEE 1528, FCC, or other specifications. The device holder can be locked for positioning at different phantom sections (left head, right head, flat). And upgrade kit to Mounting Device to enable easy mounting of wider devices like big smart-phones, e-books, small tablets, etc. It holds devices with width up to 140 mm.



Mounting Device for Hand-Held Transmitters



Mounting Device Adaptor for Wide-Phones

<Mounting Device for Laptops and other Body-Worn Transmitters>

The extension is lightweight and made of POM, acrylic glass and foam. It fits easily on the upper part of the mounting device in place of the phone positioned. The extension is fully compatible with the SAM Twin and ELI phantoms.



Mounting Device for Laptops

7. Measurement Procedures

The measurement procedures are as follows:

<Conducted power measurement>

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

<SAR measurement>

- (a) Use base station simulator to configure EUT WWAN transmission in radiated connection, and engineering software to configure EUT WLAN/BT continuously transmission, at maximum RF power, in the highest power channel.
- (b) Place the EUT in the positions as Appendix D demonstrates.
- (c) Set scan area, grid size and other setting on the DASY software.
- (d) Measure SAR results for the highest power channel on each testing position.
- (e) Find out the largest SAR result on these testing positions of each band
- (f) Measure SAR results for other channels in worst SAR testing position if the reported SAR of highest power channel is larger than 0.8 W/kg

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

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

7.1 Spatial Peak SAR Evaluation

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

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

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

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

7.2 Power Reference Measurement

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

7.3 Area Scan

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

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

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

7.4 Zoom Scan

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

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

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



7.5 Volume Scan Procedures

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

7.6 Power Drift Monitoring

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

8. Test Equipment List

Manufacturer	Name of Equipment	Type/Model	Serial Number	Calibration	
				Last Cal.	Due Date
SPEAG	750MHz System Validation Kit ⁽²⁾	D750V3	1107	Mar. 08, 2019	Mar. 06, 2021
SPEAG	835MHz System Validation Kit	D835V2	4d167	Nov. 25, 2019	Nov. 24, 2020
SPEAG	1750MHz System Validation Kit ⁽²⁾	D1750V2	1112	Mar. 07, 2019	Mar. 05, 2021
SPEAG	1900MHz System Validation Kit ⁽²⁾	D1900V2	5d041	Sep. 11, 2018	Sep. 09, 2020
SPEAG	2300MHz System Validation Kit ⁽²⁾	D2300V2	1006	Jan. 28, 2019	Jan. 26, 2021
SPEAG	2600MHz System Validation Kit ⁽²⁾	D2600V2	1008	Aug. 31, 2018	Aug. 29, 2020
SPEAG	Data Acquisition Electronics	DAE3	577	Sep. 17, 2019	Sep. 16, 2020
SPEAG	Data Acquisition Electronics	DAE4	1311	Aug. 27, 2019	Aug. 26, 2020
SPEAG	Data Acquisition Electronics	DAE4	1399	Feb. 18, 2020	Feb. 17, 2021
SPEAG	Dosimetric E-Field Probe	ES3DV3	3270	Sep. 25, 2019	Sep. 24, 2020
SPEAG	Dosimetric E-Field Probe	EX3DV4	3931	Sep. 26, 2019	Sep. 25, 2020
SPEAG	Dosimetric E-Field Probe	EX3DV4	7590	Apr. 14, 2020	Apr. 13, 2021
RCPTWN	Thermometer	HTC-1	TM685-1	Nov. 12, 2019	Nov. 11, 2020
RCPTWN	Thermometer	HTC-1	TM560-2	Nov. 12, 2019	Nov. 11, 2020
Anritsu	Radio Communication Analyzer	MT8821C	6201341950	Oct. 31, 2019	Oct. 30, 2020
Agilent	Wireless Communication Test Set	E5515C	MY50267236	Mar. 18, 2020	Mar. 17, 2021
SPEAG	Device Holder	N/A	N/A	N/A	N/A
Anritsu	Signal Generator	MG3710A	6201502524	Nov. 20, 2019	Nov. 19, 2020
Agilent	ENA Network Analyzer	E5071C	MY46104758	Sep. 06, 2019	Sep. 05, 2020
SPEAG	Dielectric Probe Kit	DAK-3.5	1126	Sep. 18, 2019	Sep. 17, 2020
LINE SEIKI	Digital Thermometer	DTM3000-spezial	2942	Nov. 18, 2019	Nov. 17, 2020
Anritsu	Power Meter	ML2495A	932001	Oct. 03, 2019	Oct. 02, 2020
Anritsu	Power Sensor	MA2411B	846202	Oct. 03, 2019	Oct. 02, 2020
Anritsu	Power Meter	ML2495A	1218006	Oct. 14, 2019	Oct. 13, 2020
Anritsu	Power Sensor	MA2411B	1207363	Oct. 14, 2019	Oct. 13, 2020
Agilent	Spectrum Analyzer	E4408B	MY44211028	Aug. 27, 2019	Aug. 26, 2020
Anritsu	Spectrum Analyzer	N9010A	MY53470118	Mar. 12, 2020	Mar. 11, 2021
Mini-Circuits	Power Amplifier	ZVE-8G+	6418	Oct. 16, 2019	Oct. 15, 2020
Mini-Circuits	Power Amplifier	ZHL-42W+	715701915	May. 07, 2020	May. 06, 2021
ATM	Dual Directional Coupler	C122H-10	P610410z-02	Note 1	
Woken	Attenuator 1	WK0602-XX	N/A	Note 1	
PE	Attenuator 2	PE7005-10	N/A	Note 1	
PE	Attenuator 3	PE7005-3	N/A	Note 1	

General Note:

1. Prior to system verification and validation, the path loss from the signal generator to the system check source and the power meter, which includes the amplifier, cable, attenuator and directional coupler, was measured by the network analyzer. The reading of the power meter was offset by the path loss difference between the path to the power meter and the path to the system check source to monitor the actual power level fed to the system check source.
2. The dipole calibration interval can be extended to 3 years with justification according to KDB 865664 D01. The dipoles are also not physically damaged, or repaired during the interval. The justification data in appendix C can be found which the return loss is < -20dB, within 20% of prior calibration, the impedance is within 5 ohm of prior calibration for each dipole.

9. System Verification

9.1 Tissue Simulating Liquids

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

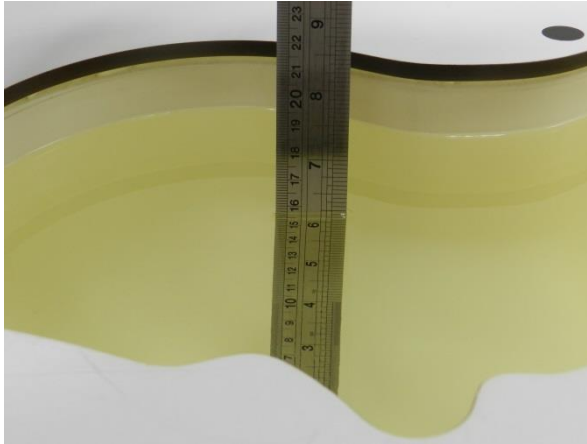


Fig 10.1 Photo of Liquid Height for Head SAR

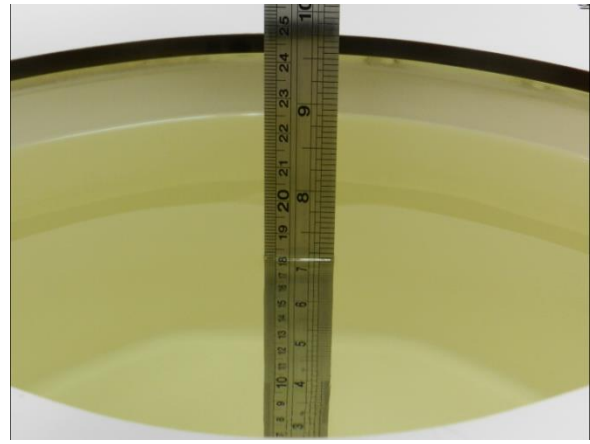


Fig 10.2 Photo of Liquid Height for Body SAR

9.2 Tissue Verification

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

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

Simulating Liquid for 5GHz, Manufactured by SPEAG

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

<Tissue Dielectric Parameter Check Results>

Frequency (MHz)	Liquid Temp. (°C)	Conductivity (σ)	Permittivity (ϵ_r)	Conductivity Target (σ)	Permittivity Target (ϵ_r)	Delta (σ) (%)	Delta (ϵ_r) (%)	Limit (%)	Date
750	22.2	0.901	40.799	0.89	41.90	1.24	-2.63	±5	2020/8/10
750	22.6	0.894	41.420	0.89	41.90	0.45	-1.15	±5	2020/8/11
835	22.2	0.911	43.339	0.90	41.50	1.22	4.43	±5	2020/8/10
835	22.2	0.904	41.357	0.90	41.50	0.44	-0.34	±5	2020/8/10
835	22.6	0.922	41.333	0.90	41.50	2.44	-0.40	±5	2020/8/11
835	22.3	0.922	41.320	0.90	41.50	2.44	-0.43	±5	2020/8/13
1750	22.2	1.361	41.632	1.37	40.10	-0.66	3.82	±5	2020/8/10
1750	22.2	1.353	39.076	1.37	40.10	-1.24	-2.55	±5	2020/8/10
1750	22.6	1.370	41.311	1.37	40.10	0.00	3.02	±5	2020/8/11
1900	22.2	1.432	38.495	1.40	40.00	2.29	-3.76	±5	2020/8/10
1900	22.2	1.421	40.853	1.40	40.00	1.50	2.13	±5	2020/8/10
1900	22.6	1.431	39.390	1.40	40.00	2.21	-1.53	±5	2020/8/11
2300	22.4	1.664	39.234	1.67	39.50	-0.36	-0.67	±5	2020/8/11
2300	22.6	1.648	40.006	1.67	39.50	-1.32	1.28	±5	2020/8/11
2600	22.4	1.893	38.865	1.96	39.00	-3.42	-0.35	±5	2020/8/10
2600	22.4	1.980	38.109	1.96	39.00	1.02	-2.28	±5	2020/8/11
2600	22.6	1.987	38.808	1.96	39.00	1.38	-0.49	±5	2020/8/11
2600	22.3	1.989	37.761	1.96	39.00	1.48	-3.18	±5	2020/8/12

9.3 System Performance Check Results

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

Date	Frequency (MHz)	Input Power (mW)	Dipole S/N	Probe S/N	DAE S/N	Measured 1g SAR (W/kg)	Targeted 1g SAR (W/kg)	Normalized 1g SAR (W/kg)	Deviation (%)
2020/8/10	750	250	D750V3-1107	EX3DV4 - SN3931	DAE4 Sn1311	2.03	8.32	8.12	-2.40
2020/8/11	750	250	D750V3-1107	ES3DV3 - SN3270	DAE4 Sn1399	2.06	8.32	8.24	-0.96
2020/8/10	835	250	D835V2-4d167	EX3DV4 - SN3931	DAE4 Sn1311	2.40	9.55	9.6	0.52
2020/8/10	835	250	D835V2-4d167	EX3DV4 - SN7590	DAE3 Sn577	2.21	9.55	8.84	-7.43
2020/8/11	835	250	D835V2-4d167	ES3DV3 - SN3270	DAE4 Sn1399	2.36	9.55	9.44	-1.15
2020/8/13	835	250	D835V2-4d167	EX3DV4 - SN7590	DAE3 Sn577	2.49	9.55	9.96	4.29
2020/8/10	1750	250	D1750V2-1112	EX3DV4 - SN3931	DAE4 Sn1311	9.34	36.70	37.36	1.80
2020/8/10	1750	250	D1750V2-1112	EX3DV4 - SN7590	DAE3 Sn577	9.67	36.70	38.68	5.40
2020/8/11	1750	250	D1750V2-1112	ES3DV3 - SN3270	DAE4 Sn1399	9.40	36.70	37.6	2.45
2020/8/10	1900	250	D1900V2-5d041	EX3DV4 - SN3931	DAE4 Sn1311	10.20	40.20	40.8	1.49
2020/8/10	1900	250	D1900V2-5d041	EX3DV4 - SN7590	DAE3 Sn577	10.70	40.20	42.8	6.47
2020/8/11	1900	250	D1900V2-5d041	ES3DV3 - SN3270	DAE4 Sn1399	10.30	40.20	41.2	2.49
2020/8/11	2300	250	D2300V2-1006	EX3DV4 - SN3931	DAE4 Sn1311	11.40	48.70	45.6	-6.37
2020/8/11	2300	250	D2300V2-1006	EX3DV4 - SN7590	DAE3 Sn577	12.40	48.70	49.6	1.85
2020/8/10	2600	250	D2600V2-1008	EX3DV4 - SN7590	DAE3 Sn577	14.30	56.40	57.2	1.42
2020/8/11	2600	250	D2600V2-1008	EX3DV4 - SN3931	DAE4 Sn1311	14.50	56.40	58	2.84
2020/8/11	2600	250	D2600V2-1008	ES3DV3 - SN3270	DAE4 Sn1399	14.00	56.40	56	-0.71
2020/8/12	2600	250	D2600V2-1008	EX3DV4 - SN7590	DAE3 Sn577	15.00	56.40	60	6.38

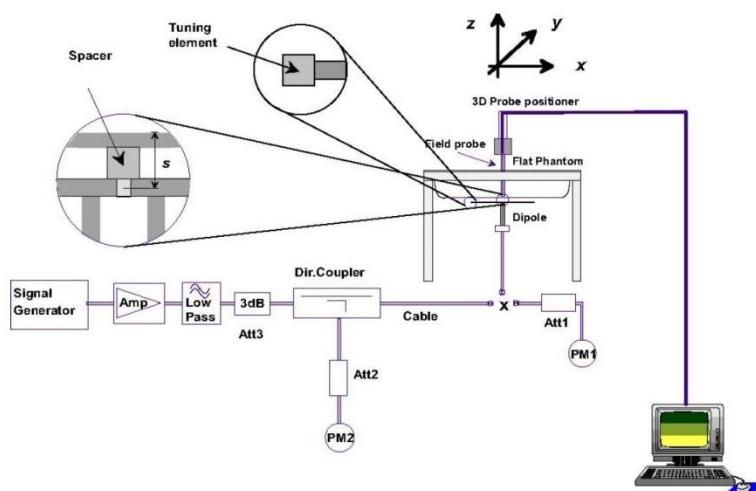


Fig 8.3.1 System Performance Check Setup



Fig 8.3.2 Setup Photo

10. UMTS/LTE Output Power (Unit: dBm)

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

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

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

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

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

Setup Configuration

HSUPA Setup Configuration:

- a. The EUT was connected to Base Station Agilent E5515C referred to the Setup Configuration.
- b. The RF path losses were compensated into the measurements.
- c. A call was established between EUT and Base Station with following setting * :
 - i. Call Configs = 5.2B, 5.9B, 5.10B, and 5.13.2B with QPSK
 - ii. Set the Gain Factors (β_c and β_d) and parameters (AG Index) were set according to each specific sub-test in the following table, C11.1.3, quoted from the TS 34.121
 - iii. Set Cell Power = -86 dBm
 - iv. Set Channel Type = 12.2k + HSPA
 - v. Set UE Target Power
 - vi. Power Ctrl Mode= Alternating bits
 - vii. Set and observe the E-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} (Note 1)	β_{ec}	β_{ed} (Note 4) (Note 5)	β_{ed} (SF)	β_{ed} (Codes)	CM (dB) (Note 2)	MPR (dB) (Note 2) (Note 6)	AG Index (Note 5)	E-TFCI
1	11/15 (Note 3)	15/15 (Note 3)	64	11/15 (Note 3)	22/15	209/25	1309/225	4	1	1.0	0.0	20	75
2	6/15	15/15	64	6/15	12/15	12/15	94/75	4	1	3.0	2.0	12	67
3	15/15	9/15	64	15/9	30/15	30/15	β_{ed1} : 47/15 β_{ed2} : 47/15	4	2	2.0	1.0	15	92
4	2/15	15/15	64	2/15	4/15	2/15	56/75	4	1	3.0	2.0	17	71
5	15/15	0	-	-	5/15	5/15	47/15	4	1	1.0	0.0	12	67

Note 1: For sub-test 1 to 4, Δ_{ACK} , Δ_{NACK} and $\Delta_{CQI} = 30/15$ with $\beta_{hs} = 30/15 * \beta_c$. For sub-test 5, Δ_{ACK} , Δ_{NACK} and $\Delta_{CQI} = 5/15$ with $\beta_{hs} = 5/15 * \beta_c$.

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

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

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

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

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

Setup Configuration

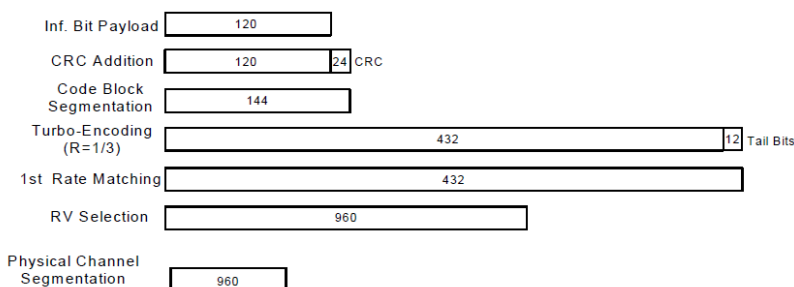
DC-HSDPA 3GPP release 8 Setup Configuration:

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

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

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

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


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

<WCDMA Conducted Power>
General Note:

1. Per KDB 941225 D01v03r01, for SAR testing is measured using a 12.2 kbps RMC with TPC bits configured to all "1's".
2. Per KDB 941225 D01v03r01, RMC 12.2kbps setting is used to evaluate SAR. The maximum output power and tune-up tolerance specified for production units in HSDPA / HSUPA / DC-HSDPA is $\leq \frac{1}{4}$ dB higher than RMC 12.2Kbps or when the highest reported SAR of the RMC12.2Kbps is scaled by the ratio of specified maximum output power and tune-up tolerance of HSDPA / HSUPA / DC-HSDPA to RMC12.2Kbps and the adjusted SAR is ≤ 1.2 W/kg, SAR measurement is not required for HSDPA / HSUPA / DC-HSDPA, and according to the following RF output power, the output power results of the secondary modes (HSUPA, HSDPA, DC-HSDPA) are less than $\frac{1}{4}$ dB higher than the primary modes; therefore, SAR measurement is not required for HSDPA / HSUPA / DC-HSDPA.

Band		WCDMA II			Tune-up Limit (dBm)	WCDMA IV			Tune-up Limit (dBm)	WCDMA V			Tune-up Limit (dBm)
TX Channel		9262	9400	9538		1312	1413	1513		4132	4182	4233	
Rx Channel		9662	9800	9938		1537	1638	1738		4357	4407	4458	
Frequency (MHz)		1852.4	1880	1907.6		1712.4	1732.6	1752.6		826.4	836.4	846.6	
3GPP Rel 99	RMC 12.2Kbps	24.32	24.43	24.47	24.50	24.30	24.37	24.45	24.50	24.28	24.43	24.47	24.50
3GPP Rel 6	HSDPA Subtest-1	24.30	24.34	24.43	24.50	24.22	24.33	24.41	24.50	24.25	24.31	24.34	24.50
3GPP Rel 6	HSDPA Subtest-2	24.24	24.33	24.37	24.50	24.19	24.23	24.31	24.50	24.15	24.26	24.31	24.50
3GPP Rel 6	HSDPA Subtest-3	23.75	23.84	23.95	24.00	23.72	23.82	23.92	24.00	23.66	23.82	23.88	24.00
3GPP Rel 6	HSDPA Subtest-4	23.66	23.79	23.90	24.00	23.62	23.78	23.90	24.00	23.65	23.73	23.87	24.00
3GPP Rel 8	DC-HSDPA Subtest-1	24.22	24.30	24.36	24.50	24.15	24.26	24.30	24.50	24.22	24.22	24.26	24.50
3GPP Rel 8	DC-HSDPA Subtest-2	24.17	24.29	24.30	24.50	24.12	24.26	24.23	24.50	24.08	24.23	24.23	24.50
3GPP Rel 8	DC-HSDPA Subtest-3	23.69	23.79	23.88	24.00	23.61	23.72	23.78	24.00	23.66	23.77	23.84	24.00
3GPP Rel 8	DC-HSDPA Subtest-4	23.66	23.75	23.80	24.00	23.57	23.67	23.77	24.00	23.63	23.69	23.70	24.00
3GPP Rel 6	HSUPA Subtest-1	24.15	24.21	24.30	24.50	24.14	24.15	24.22	24.50	24.10	24.15	24.26	24.50
3GPP Rel 6	HSUPA Subtest-2	22.30	22.26	22.43	22.50	22.30	22.20	22.33	22.50	22.21	22.26	22.39	22.50
3GPP Rel 6	HSUPA Subtest-3	23.16	23.27	23.44	23.50	23.07	23.23	23.42	23.50	23.15	23.17	23.34	23.50
3GPP Rel 6	HSUPA Subtest-4	22.27	22.32	22.39	22.50	22.19	22.31	22.39	22.50	22.27	22.29	22.29	22.50
3GPP Rel 6	HSUPA Subtest-5	24.19	24.24	24.29	24.50	24.11	24.20	24.27	24.50	24.12	24.24	24.19	24.50

<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 $\frac{1}{2}$ dB higher than the same configuration in QPSK and the reported SAR for the QPSK configuration is ≤ 1.45 W/kg; Per KDB 941225 D05v02r05, 16QAM SAR testing is not required.
7. Per KDB 941225 D05v02r05, Smaller bandwidth output power for each RB allocation configuration is $>$ not $\frac{1}{2}$ dB higher than the same configuration in the largest supported bandwidth, and the reported SAR for the largest supported bandwidth is ≤ 1.45 W/kg; Per KDB 941225 D05v02r05, smaller bandwidth SAR testing is not required.
8. For LTE B4/B5/B12/B17/B26/B38 the maximum bandwidth does not support three non-overlapping channels, per KDB 941225 D05v02r05, when a device supports overlapping channel assignment in a channel bandwidth configuration, the middle channel of the group of overlapping channels should be selected for testing.
9. LTE band 4/5/17/38 SAR test was covered by Band 66/26/12/41; according to April 2015 TCB workshop, SAR test for overlapping LTE bands can be reduced if
 - a. the maximum output power, including tolerance, for the smaller band is $\leq$ the larger band to qualify for the SAR test exclusion
 - b. the channel bandwidth and other operating parameters for the smaller band are fully supported by the larger band



<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	23.67	23.86	23.95	24	0
20	QPSK	1	49	23.52	23.80	23.93		
20	QPSK	1	99	23.60	23.76	23.92		
20	QPSK	50	0	22.48	22.74	22.84	23	1
20	QPSK	50	24	22.42	22.77	22.91		
20	QPSK	50	50	22.44	22.73	22.86		
20	QPSK	100	0	22.50	22.89	22.99		
20	16QAM	1	0	22.86	22.91	22.93	23	1
20	16QAM	1	49	22.56	22.75	22.88		
20	16QAM	1	99	22.75	22.83	22.96		
20	16QAM	50	0	21.47	21.85	21.85	22	2
20	16QAM	50	24	21.49	21.87	21.93		
20	16QAM	50	50	21.52	21.83	21.86		
20	16QAM	100	0	21.59	21.97	21.96		
Channel				18675	18900	19125	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1857.5	1880	1902.5		
15	QPSK	1	0	23.50	23.60	23.82	24	0
15	QPSK	1	37	23.41	23.73	23.73		
15	QPSK	1	74	23.43	23.61	23.74		
15	QPSK	36	0	22.31	22.64	22.66	23	1
15	QPSK	36	20	22.30	22.63	22.76		
15	QPSK	36	39	22.32	22.59	22.74		
15	QPSK	75	0	22.37	22.79	22.82		
15	16QAM	1	0	22.72	22.81	22.78	23	1
15	16QAM	1	37	22.39	22.65	22.75		
15	16QAM	1	74	22.60	22.72	22.82		
15	16QAM	36	0	21.37	21.74	21.66	22	2
15	16QAM	36	20	21.38	21.69	21.81		
15	16QAM	36	39	21.38	21.73	21.73		
15	16QAM	75	0	21.44	21.83	21.83		
Channel				18650	18900	19150	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1855	1880	1905		
10	QPSK	1	0	23.30	23.47	23.67	24	0
10	QPSK	1	25	23.22	23.61	23.63		
10	QPSK	1	49	23.27	23.46	23.55		
10	QPSK	25	0	22.19	22.54	22.54	23	1
10	QPSK	25	12	22.20	22.53	22.65		
10	QPSK	25	25	22.21	22.43	22.62		
10	QPSK	50	0	22.26	22.67	22.64		
10	16QAM	1	0	22.61	22.66	22.68	23	1
10	16QAM	1	25	22.28	22.49	22.60		
10	16QAM	1	49	22.49	22.52	22.70		
10	16QAM	25	0	21.24	21.62	21.54	22	2
10	16QAM	25	12	21.27	21.55	21.66		
10	16QAM	25	25	21.20	21.60	21.57		
10	16QAM	50	0	21.34	21.67	21.63		
Channel				18625	18900	19175	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1852.5	1880	1907.5		
5	QPSK	1	0	23.12	23.30	23.55	24	0
5	QPSK	1	12	23.05	23.42	23.53		
5	QPSK	1	24	23.12	23.35	23.35		

5	QPSK	12	0	22.09	22.34	22.43	23	1
5	QPSK	12	7	22.09	22.35	22.46		
5	QPSK	12	13	22.11	22.32	22.48		
5	QPSK	25	0	22.12	22.54	22.49		
5	16QAM	1	0	22.43	22.46	22.48	23	1
5	16QAM	1	12	22.12	22.29	22.48		
5	16QAM	1	24	22.31	22.38	22.55		
5	16QAM	12	0	21.10	21.50	21.42	22	2
5	16QAM	12	7	21.08	21.40	21.53		
5	16QAM	12	13	21.06	21.50	21.45		
5	16QAM	25	0	21.22	21.51	21.53		
Channel				18615	18900	19185	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1851.5	1880	1908.5		
3	QPSK	1	0	22.97	23.12	23.36	24	0
3	QPSK	1	8	22.96	23.29	23.41		
3	QPSK	1	14	23.00	23.22	23.20		
3	QPSK	8	0	21.99	22.17	22.23	23	1
3	QPSK	8	4	21.91	22.20	22.32		
3	QPSK	8	7	21.96	22.22	22.33		
3	QPSK	15	0	21.93	22.36	22.38		
3	16QAM	1	0	22.32	22.30	22.28	23	1
3	16QAM	1	8	22.01	22.10	22.37		
3	16QAM	1	14	22.12	22.28	22.41		
3	16QAM	8	0	20.90	21.35	21.30	22	2
3	16QAM	8	4	20.95	21.22	21.39		
3	16QAM	8	7	20.89	21.35	21.34		
3	16QAM	15	0	21.05	21.32	21.35		
Channel				18607	18900	19193	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1850.7	1880	1909.3		
1.4	QPSK	1	0	22.86	22.85	23.10	24	0
1.4	QPSK	1	3	22.75	23.06	23.18		
1.4	QPSK	1	5	22.92	23.06	23.21		
1.4	QPSK	3	0	22.77	22.77	23.03		
1.4	QPSK	3	1	22.72	23.06	23.16		
1.4	QPSK	3	3	22.88	22.99	23.12		
1.4	QPSK	6	0	21.74	21.97	21.95	23	1
1.4	16QAM	1	0	21.92	22.00	22.12	23	1
1.4	16QAM	1	3	21.90	21.89	22.10		
1.4	16QAM	1	5	21.89	22.06	22.33		
1.4	16QAM	3	0	22.08	22.10	22.21		
1.4	16QAM	3	1	21.81	22.22	22.31		
1.4	16QAM	3	3	21.96	22.18	22.23		
1.4	16QAM	6	0	21.03	21.18	21.30	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	24	0
Frequency (MHz)				1720	1732.5	1745		
20	QPSK	1	0	23.98	23.93	23.73		
20	QPSK	1	49	23.75	23.65	23.58	23	1
20	QPSK	1	99	23.68	23.59	23.57		
20	QPSK	50	0	22.90	22.66	22.62		
20	QPSK	50	24	22.95	22.59	22.53	23	1
20	QPSK	50	50	22.80	22.54	22.51		
20	QPSK	100	0	23.00	22.70	22.70		
20	16QAM	1	0	22.85	22.96	22.92	23	1
20	16QAM	1	49	22.97	22.95	22.74		
20	16QAM	1	99	22.85	22.79	22.75		
20	16QAM	50	0	21.94	21.76	21.72	22	2
20	16QAM	50	24	21.98	21.69	21.63		
20	16QAM	50	50	21.84	21.63	21.50		
20	16QAM	100	0	21.88	21.79	21.70		
Channel				20025	20175	20325	24	0
Frequency (MHz)				1717.5	1732.5	1747.5		
15	QPSK	1	0	23.60	23.76	23.54		
15	QPSK	1	37	23.84	23.45	23.39	23	1
15	QPSK	1	74	23.54	23.39	23.46		
15	QPSK	36	0	22.70	22.50	22.47		
15	QPSK	36	20	22.81	22.47	22.33	23	1
15	QPSK	36	39	22.64	22.37	22.32		
15	QPSK	75	0	22.90	22.53	22.56		
15	16QAM	1	0	22.65	22.98	22.78	23	1
15	16QAM	1	37	22.90	22.82	22.60		
15	16QAM	1	74	22.70	22.62	22.57		
15	16QAM	36	0	21.80	21.61	21.55	22	2
15	16QAM	36	20	21.80	21.59	21.46		
15	16QAM	36	39	21.65	21.48	21.33		
15	16QAM	75	0	21.84	21.65	21.52		
Channel				20000	20175	20350	24	0
Frequency (MHz)				1715	1732.5	1750		
10	QPSK	1	0	23.45	23.62	23.36		
10	QPSK	1	25	23.68	23.29	23.28	23	1
10	QPSK	1	49	23.42	23.27	23.31		
10	QPSK	25	0	22.54	22.30	22.37		
10	QPSK	25	12	22.64	22.37	22.18	23	1
10	QPSK	25	25	22.54	22.22	22.19		
10	QPSK	50	0	22.70	22.40	22.38		
10	16QAM	1	0	22.47	22.80	22.60	23	1
10	16QAM	1	25	22.78	22.66	22.44		
10	16QAM	1	49	22.51	22.48	22.45		
10	16QAM	25	0	21.70	21.46	21.40	22	2
10	16QAM	25	12	21.66	21.40	21.30		
10	16QAM	25	25	21.47	21.37	21.22		
10	16QAM	50	0	21.71	21.52	21.36		
Channel				19975	20175	20375	24	0
Frequency (MHz)				1712.5	1732.5	1752.5		
5	QPSK	1	0	23.30	23.43	23.25		
5	QPSK	1	12	23.57	23.17	23.08	24	0
5	QPSK	1	24	23.24	23.12	23.12		



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5	QPSK	12	0	22.36	22.14	22.21	23	1
5	QPSK	12	7	22.47	22.24	22.05		
5	QPSK	12	13	22.39	22.06	21.97		
5	QPSK	25	0	22.54	22.25	22.19		
5	16QAM	1	0	22.29	22.67	22.50	23	1
5	16QAM	1	12	22.59	22.55	22.33		
5	16QAM	1	24	22.35	22.36	22.31		
5	16QAM	12	0	21.51	21.27	21.27	22	2
5	16QAM	12	7	21.50	21.25	21.13		
5	16QAM	12	13	21.30	21.19	21.11		
5	16QAM	25	0	21.52	21.36	21.20		
Channel				19965	20175	20385	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1711.5	1732.5	1753.5		
3	QPSK	1	0	23.20	23.29	23.12	24	0
3	QPSK	1	8	23.38	23.04	22.93		
3	QPSK	1	14	23.13	23.02	22.96		
3	QPSK	8	0	22.23	21.99	22.01	23	1
3	QPSK	8	4	22.34	22.10	21.85		
3	QPSK	8	7	22.27	21.89	21.84		
3	QPSK	15	0	22.43	22.07	22.07		
3	16QAM	1	0	22.10	22.55	22.36	23	1
3	16QAM	1	8	22.41	22.41	22.14		
3	16QAM	1	14	22.20	22.17	22.17		
3	16QAM	8	0	21.31	21.12	21.08	22	2
3	16QAM	8	4	21.36	21.05	20.96		
3	16QAM	8	7	21.18	21.06	20.99		
3	16QAM	15	0	21.38	21.22	21.09		
Channel				19957	20175	20393	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1710.7	1732.5	1754.3		
1.4	QPSK	1	0	23.09	23.15	22.95	24	0
1.4	QPSK	1	3	23.19	22.84	22.78		
1.4	QPSK	1	5	23.02	22.87	22.80		
1.4	QPSK	3	0	22.99	23.12	22.93		
1.4	QPSK	3	1	23.19	22.81	22.70		
1.4	QPSK	3	3	22.97	22.81	22.73		
1.4	QPSK	6	0	22.23	21.96	21.93	23	1
1.4	16QAM	1	0	21.92	22.37	22.21	23	1
1.4	16QAM	1	3	22.25	22.25	21.97		
1.4	16QAM	1	5	22.01	22.00	21.98		
1.4	16QAM	3	0	21.84	22.33	22.19		
1.4	16QAM	3	1	22.16	22.21	21.94		
1.4	16QAM	3	3	21.94	21.96	21.92		
1.4	16QAM	6	0	21.20	21.06	20.91	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	24	0
Frequency (MHz)				829	836.5	844		
10	QPSK	1	0	22.87	23.03	23.17		
10	QPSK	1	25	22.93	23.04	23.15	23	1
10	QPSK	1	49	23.00	23.12	23.07		
10	QPSK	25	0	21.92	22.07	22.22		
10	QPSK	25	12	21.98	22.06	22.19	23	1
10	QPSK	25	25	22.02	22.16	22.10		
10	QPSK	50	0	22.01	22.07	22.28		
10	16QAM	1	0	22.14	22.27	22.38	23	1
10	16QAM	1	25	22.14	22.31	22.34		
10	16QAM	1	49	22.24	22.34	22.32		
10	16QAM	25	0	20.97	21.15	21.28	22	2
10	16QAM	25	12	21.03	21.14	21.26		
10	16QAM	25	25	21.12	21.24	21.14		
10	16QAM	50	0	21.11	21.14	21.39	24	0
Channel				20425	20525	20625		
Frequency (MHz)				826.5	836.5	846.5		
5	QPSK	1	0	22.77	22.92	22.99	24	0
5	QPSK	1	12	22.82	22.93	22.95		
5	QPSK	1	24	22.81	22.92	22.92		
5	QPSK	12	0	21.78	21.93	22.04	23	1
5	QPSK	12	7	21.86	21.92	22.08		
5	QPSK	12	13	21.85	22.00	21.90		
5	QPSK	25	0	21.84	21.95	22.14	23	1
5	16QAM	1	0	22.01	22.16	22.25		
5	16QAM	1	12	21.98	22.21	22.21		
5	16QAM	1	24	22.13	22.23	22.16	22	2
5	16QAM	12	0	20.81	20.95	21.16		
5	16QAM	12	7	20.84	21.03	21.13		
5	16QAM	12	13	20.92	21.14	21.03	24	0
5	16QAM	25	0	20.98	21.04	21.23		
Channel				20415	20525	20635		
Frequency (MHz)				825.5	836.5	847.5		
3	QPSK	1	0	22.60	22.82	22.89	24	0
3	QPSK	1	8	22.67	22.78	22.77		
3	QPSK	1	14	22.69	22.82	22.74		
3	QPSK	8	0	21.67	21.75	21.89	23	1
3	QPSK	8	4	21.71	21.76	21.91		
3	QPSK	8	7	21.73	21.83	21.73		
3	QPSK	15	0	21.72	21.80	22.02	23	1
3	16QAM	1	0	21.90	22.03	22.05		
3	16QAM	1	8	21.88	22.10	22.02		
3	16QAM	1	14	22.01	22.06	21.97	22	2
3	16QAM	8	0	20.63	20.79	21.01		
3	16QAM	8	4	20.69	20.87	20.99		
3	16QAM	8	7	20.77	21.01	20.83	24	0
3	16QAM	15	0	20.81	20.91	21.05		
Channel				20407	20525	20643		
Frequency (MHz)				824.7	836.5	848.3		
1.4	QPSK	1	0	22.46	22.67	22.69	24	0
1.4	QPSK	1	3	22.47	22.58	22.63		
1.4	QPSK	1	5	22.53	22.70	22.61		



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1.4	QPSK	3	0	22.36	22.57	22.60		
1.4	QPSK	3	1	22.43	22.57	22.56		
1.4	QPSK	3	3	22.53	22.64	22.58		
1.4	QPSK	6	0	21.55	21.61	21.82	23	1
1.4	16QAM	1	0	21.72	21.91	21.94	23	1
1.4	16QAM	1	3	21.75	21.95	21.82		
1.4	16QAM	1	5	21.85	21.92	21.86		
1.4	16QAM	3	0	21.70	21.81	21.85		
1.4	16QAM	3	1	21.72	21.90	21.81		
1.4	16QAM	3	3	21.80	21.87	21.81		
1.4	16QAM	6	0	20.67	20.74	20.94	22	2

<LTE Band 7>

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)	MPR (dB)
Channel				20850	21100	21350	24	0
Frequency (MHz)				2510	2535	2560		
20	QPSK	1	0	23.98	23.96	23.93		
20	QPSK	1	49	23.92	23.96	23.93	23	1
20	QPSK	1	99	23.91	23.92	23.93		
20	QPSK	50	0	22.86	22.73	22.55		
20	QPSK	50	24	22.88	22.73	22.59	23	1
20	QPSK	50	50	22.81	22.70	22.74		
20	QPSK	100	0	22.96	22.84	22.72		
20	16QAM	1	0	22.86	22.99	22.76	23	1
20	16QAM	1	49	22.91	22.88	22.70		
20	16QAM	1	99	22.96	22.83	22.87		
20	16QAM	50	0	21.68	21.80	21.62	22	2
20	16QAM	50	24	21.85	21.75	21.70		
20	16QAM	50	50	21.69	21.66	21.78		
20	16QAM	100	0	21.99	21.93	21.79	24	0
Channel				20825	21100	21375		
Frequency (MHz)				2507.5	2535	2562.5		
15	QPSK	1	0	23.88	23.79	23.79	24	0
15	QPSK	1	37	23.74	23.86	23.82		
15	QPSK	1	74	23.86	23.82	23.77		
15	QPSK	36	0	22.73	22.61	22.43	23	1
15	QPSK	36	20	22.73	22.56	22.43		
15	QPSK	36	39	22.64	22.55	22.63		
15	QPSK	75	0	22.81	22.72	22.53	23	1
15	16QAM	1	0	22.67	22.83	22.65		
15	16QAM	1	37	22.76	22.74	22.51		
15	16QAM	1	74	22.84	22.64	22.72	22	2
15	16QAM	36	0	21.58	21.69	21.43		
15	16QAM	36	20	21.65	21.59	21.56		
15	16QAM	36	39	21.52	21.48	21.68	24	0
15	16QAM	75	0	21.85	21.79	21.65		
Channel				20800	21100	21400		
Frequency (MHz)				2505	2535	2565		
10	QPSK	1	0	23.78	23.59	23.65	24	0
10	QPSK	1	25	23.63	23.71	23.64		
10	QPSK	1	49	23.75	23.66	23.63		
10	QPSK	25	0	22.54	22.44	22.25	23	1
10	QPSK	25	12	22.58	22.45	22.29		
10	QPSK	25	25	22.52	22.40	22.48		
10	QPSK	50	0	22.69	22.53	22.33	23	1
10	16QAM	1	0	22.47	22.71	22.53		
10	16QAM	1	25	22.63	22.64	22.38		
10	16QAM	1	49	22.64	22.49	22.62	22	2
10	16QAM	25	0	21.43	21.50	21.29		
10	16QAM	25	12	21.53	21.47	21.41		
10	16QAM	25	25	21.32	21.30	21.48	24	0
10	16QAM	50	0	21.69	21.63	21.49		
Channel				20775	21100	21425		
Frequency (MHz)				2502.5	2535	2567.5		
5	QPSK	1	0	23.63	23.41	23.49	24	0
5	QPSK	1	12	23.45	23.54	23.46		
5	QPSK	1	24	23.58	23.53	23.48		



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5	QPSK	12	0	22.38	22.26	22.15	23	1
5	QPSK	12	7	22.46	22.25	22.19		
5	QPSK	12	13	22.34	22.30	22.30		
5	QPSK	25	0	22.59	22.43	22.15		
5	16QAM	1	0	22.32	22.54	22.33	23	1
5	16QAM	1	12	22.53	22.47	22.22		
5	16QAM	1	24	22.46	22.30	22.47		
5	16QAM	12	0	21.32	21.39	21.15	22	2
5	16QAM	12	7	21.34	21.32	21.22		
5	16QAM	12	13	21.21	21.16	21.28		
5	16QAM	25	0	21.55	21.52	21.32		

<LTE Band 12>

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)	MPR (dB)
Channel				23060	23095	23130	24	0
Frequency (MHz)				704	707.5	711		
10	QPSK	1	0	23.05	23.24	22.97		
10	QPSK	1	25	23.06	23.02	23.08	23	1
10	QPSK	1	49	23.11	23.12	23.08		
10	QPSK	25	0	22.28	22.17	22.00		
10	QPSK	25	12	22.14	22.10	22.12	23	1
10	QPSK	25	25	22.20	22.15	22.14		
10	QPSK	50	0	22.15	22.16	22.28		
10	16QAM	1	0	22.41	22.43	22.19	23	1
10	16QAM	1	25	22.44	22.23	22.34		
10	16QAM	1	49	22.44	22.45	22.36		
10	16QAM	25	0	21.40	21.11	21.11	22	2
10	16QAM	25	12	21.28	21.14	21.22		
10	16QAM	25	25	21.29	21.21	21.25		
10	16QAM	50	0	21.22	21.21	21.37	24	0
Channel				23035	23095	23155		
Frequency (MHz)				701.5	707.5	713.5		
5	QPSK	1	0	22.92	23.01	22.84	24	0
5	QPSK	1	12	22.92	22.91	22.94		
5	QPSK	1	24	22.99	23.07	22.91		
5	QPSK	12	0	22.14	21.93	21.84	23	1
5	QPSK	12	7	21.99	22.00	21.94		
5	QPSK	12	13	22.08	22.07	22.02		
5	QPSK	25	0	22.03	22.00	22.14	23	1
5	16QAM	1	0	22.30	22.30	22.07		
5	16QAM	1	12	22.31	22.05	22.21		
5	16QAM	1	24	22.26	22.28	22.24	22	2
5	16QAM	12	0	21.25	20.99	20.95		
5	16QAM	12	7	21.15	21.01	21.09		
5	16QAM	12	13	21.16	21.05	21.10	24	0
5	16QAM	25	0	21.04	21.02	21.25		
Channel				23025	23095	23165		
Frequency (MHz)				700.5	707.5	714.5		
3	QPSK	1	0	22.78	22.89	22.67	24	0
3	QPSK	1	8	22.82	22.78	22.79		
3	QPSK	1	14	22.79	22.93	22.77		
3	QPSK	8	0	21.95	21.77	21.70	23	1
3	QPSK	8	4	21.88	21.87	21.74		
3	QPSK	8	7	21.97	21.93	21.86		
3	QPSK	15	0	21.93	21.84	21.95	23	1
3	16QAM	1	0	22.11	22.16	21.97		
3	16QAM	1	8	22.15	21.94	22.10		
3	16QAM	1	14	22.14	22.13	22.09	22	2
3	16QAM	8	0	21.10	20.87	20.78		
3	16QAM	8	4	21.02	20.84	20.99		
3	16QAM	8	7	21.04	20.91	20.96	24	0
3	16QAM	15	0	20.84	20.85	21.06		
Channel				23017	23095	23173		
Frequency (MHz)				699.7	707.5	715.3		
1.4	QPSK	1	0	22.61	22.73	22.52	24	0
1.4	QPSK	1	3	22.64	22.67	22.61		
1.4	QPSK	1	5	22.67	22.69	22.59		



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1.4	QPSK	3	0	22.54	22.69	22.44		
1.4	QPSK	3	1	22.57	22.61	22.57		
1.4	QPSK	3	3	22.62	22.61	22.49		
1.4	QPSK	6	0	21.74	21.74	21.82	23	1
1.4	16QAM	1	0	21.99	21.97	21.80	23	1
1.4	16QAM	1	3	21.96	21.84	21.91		
1.4	16QAM	1	5	21.92	21.93	21.97		
1.4	16QAM	3	0	21.97	21.97	21.80		
1.4	16QAM	3	1	21.94	21.79	21.89		
1.4	16QAM	3	3	21.94	21.85	21.88		
1.4	16QAM	6	0	20.71	20.69	20.81	22	2

<LTE Band 13>

E-UTRA Band 20								
BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)	MPR (dB)
Channel				23230				
Frequency (MHz)				782				
10	QPSK	1	0		23.13		24	0
10	QPSK	1	25		23.07			
10	QPSK	1	49		23.11			
10	QPSK	25	0		22.06		23	1
10	QPSK	25	12		22.06			
10	QPSK	25	25		22.17			
10	QPSK	50	0		22.27		23	1
10	16QAM	1	0		22.34			
10	16QAM	1	25		22.28			
10	16QAM	1	49		22.45		22	2
10	16QAM	25	0		21.08			
10	16QAM	25	12		21.11			
10	16QAM	25	25		21.23		22	2
10	16QAM	50	0		21.33			
Channel				23205	23230	23255	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				779.5	782	784.5		
5	QPSK	1	0	22.88	22.99	22.84	24	0
5	QPSK	1	12	22.88	22.90	22.92		
5	QPSK	1	24	22.91	23.06	22.97		
5	QPSK	12	0	22.11	21.93	21.80	23	1
5	QPSK	12	7	21.97	21.97	22.02		
5	QPSK	12	13	22.08	22.04	22.01		
5	QPSK	25	0	22.00	21.98	22.11	23	1
5	16QAM	1	0	22.28	22.26	22.04		
5	16QAM	1	12	22.26	22.03	22.22		
5	16QAM	1	24	22.33	22.27	22.25	22	2
5	16QAM	12	0	21.28	20.91	20.96		
5	16QAM	12	7	21.16	20.97	21.12		
5	16QAM	12	13	21.10	21.02	21.14	22	2
5	16QAM	25	0	21.05	21.05	21.26		

<LTE Band 17>

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)	MPR (dB)
Channel				23780	23790	23800	24	0
Frequency (MHz)				709	710	711		
10	QPSK	1	0	23.21	23.12	23.01		
10	QPSK	1	25	23.02	23.09	23.12	23	1
10	QPSK	1	49	23.20	23.18	23.09		
10	QPSK	25	0	22.07	22.00	21.99		
10	QPSK	25	12	22.06	22.05	22.10	23	1
10	QPSK	25	25	22.26	22.21	22.12		
10	QPSK	50	0	22.22	22.22	22.26		
10	16QAM	1	0	22.28	22.17	22.21	23	1
10	16QAM	1	25	22.32	22.27	22.34		
10	16QAM	1	49	22.51	22.39	22.37		
10	16QAM	25	0	21.15	21.13	21.10	22	2
10	16QAM	25	12	21.14	21.18	21.21		
10	16QAM	25	25	21.35	21.30	21.24		
10	16QAM	50	0	21.31	21.32	21.33	24	0
Channel				23755	23790	23825		
Frequency (MHz)				706.5	710	713.5		
5	QPSK	1	0	22.79	22.79	22.90	24	0
5	QPSK	1	12	22.85	22.98	23.00		
5	QPSK	1	24	23.09	23.00	22.98		
5	QPSK	12	0	21.93	21.90	21.88	23	1
5	QPSK	12	7	21.91	21.89	21.94		
5	QPSK	12	13	22.15	22.11	22.00		
5	QPSK	25	0	22.02	22.11	22.15	23	1
5	16QAM	1	0	22.17	21.98	22.10		
5	16QAM	1	12	22.20	22.14	22.17		
5	16QAM	1	24	22.37	22.19	22.22	22	2
5	16QAM	12	0	21.02	21.01	20.90		
5	16QAM	12	7	20.98	20.99	21.01		
5	16QAM	12	13	21.15	21.18	21.10	22	2
5	16QAM	25	0	21.15	21.22	21.21		

<LTE Band 26>

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				26765	26865	26965	24	0
Frequency (MHz)				821.5	831.5	841.5		
15	QPSK	1	0	22.81	22.98	23.13		
15	QPSK	1	37	22.63	22.88	23.01	23	1
15	QPSK	1	74	22.63	22.85	22.99		
15	QPSK	36	0	21.73	21.89	22.11		
15	QPSK	36	20	21.72	21.97	22.21	23	1
15	QPSK	36	39	21.87	21.95	22.15		
15	QPSK	75	0	21.96	22.07	22.39		
15	16QAM	1	0	21.89	22.05	22.33	23	1
15	16QAM	1	37	21.90	22.17	22.39		
15	16QAM	1	74	22.08	22.26	22.26		
15	16QAM	36	0	20.80	20.93	21.18	22	2
15	16QAM	36	20	20.82	21.03	21.28		
15	16QAM	36	39	20.94	21.07	21.18		
15	16QAM	75	0	21.16	21.17	21.45	24	0
Channel				26740	26865	26990		
Frequency (MHz)				819	831.5	844		
10	QPSK	1	0	22.53	22.64	22.86	24	0
10	QPSK	1	25	22.51	22.74	22.99		
10	QPSK	1	49	22.65	22.87	22.80		
10	QPSK	25	0	21.56	21.76	22.01	23	1
10	QPSK	25	12	21.57	21.77	22.02		
10	QPSK	25	25	21.77	21.88	22.04		
10	QPSK	50	0	21.84	21.95	22.20	23	1
10	16QAM	1	0	21.78	21.95	22.17		
10	16QAM	1	25	21.77	22.03	22.24		
10	16QAM	1	49	21.88	22.15	22.16	22	2
10	16QAM	25	0	20.63	20.80	21.03		
10	16QAM	25	12	20.69	20.90	21.13		
10	16QAM	25	25	20.81	20.89	21.03	24	0
10	16QAM	50	0	21.05	21.07	21.25		
Channel				26715	26865	27015		
Frequency (MHz)				816.5	831.5	846.5	24	0
5	QPSK	1	0	22.43	22.52	22.75		
5	QPSK	1	12	22.38	22.60	22.87	23	1
5	QPSK	1	24	22.46	22.73	22.61		
5	QPSK	12	0	21.45	21.60	21.84		
5	QPSK	12	7	21.47	21.63	21.84	23	1
5	QPSK	12	13	21.62	21.72	21.90		
5	QPSK	25	0	21.69	21.80	22.01		
5	16QAM	1	0	21.62	21.82	22.06	23	1
5	16QAM	1	12	21.64	21.84	22.12		
5	16QAM	1	24	21.75	22.01	21.96		
5	16QAM	12	0	20.53	20.62	20.84	22	2
5	16QAM	12	7	20.53	20.73	21.02		
5	16QAM	12	13	20.64	20.70	20.85		
5	16QAM	25	0	20.86	20.87	21.06	24	0
Channel				26705	26865	27025		
Frequency (MHz)				815.5	831.5	847.5		
3	QPSK	1	0	22.30	22.35	22.55	24	0
3	QPSK	1	8	22.22	22.41	22.71		
3	QPSK	1	14	22.30	22.61	22.43		



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3	QPSK	8	0	21.33	21.48	21.73	23	1
3	QPSK	8	4	21.36	21.48	21.68		
3	QPSK	8	7	21.43	21.57	21.78		
3	QPSK	15	0	21.55	21.62	21.90		
3	16QAM	1	0	21.51	21.65	21.96	23	1
3	16QAM	1	8	21.51	21.64	21.97		
3	16QAM	1	14	21.62	21.83	21.76		
3	16QAM	8	0	20.35	20.43	20.67	22	2
3	16QAM	8	4	20.39	20.56	20.83		
3	16QAM	8	7	20.45	20.60	20.72		
3	16QAM	15	0	20.73	20.76	20.96		
Channel				26697	26865	27033	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				814.7	831.5	848.3		
1.4	QPSK	1	0	22.13	22.18	22.35	24	0
1.4	QPSK	1	3	22.03	22.26	22.52		
1.4	QPSK	1	5	22.14	22.48	22.30		
1.4	QPSK	3	0	22.03	22.17	22.30		
1.4	QPSK	3	1	22.17	22.24	22.47		
1.4	QPSK	3	3	22.07	22.48	22.25		
1.4	QPSK	6	0	21.35	21.44	21.77	23	1
1.4	16QAM	1	0	21.36	21.53	21.76	23	1
1.4	16QAM	1	3	21.33	21.54	21.80		
1.4	16QAM	1	5	21.46	21.67	21.61		
1.4	16QAM	3	0	21.29	21.43	21.66		
1.4	16QAM	3	1	21.33	21.45	21.76		
1.4	16QAM	3	3	21.45	21.66	21.61		
1.4	16QAM	6	0	20.60	20.63	20.80	22	2

<LTE Band 30>

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				27710				
Frequency (MHz)				2310				
10	QPSK	1	0		23.70		24	0
10	QPSK	1	25		23.37			
10	QPSK	1	49		23.35			
10	QPSK	25	0		22.47		23	1
10	QPSK	25	12		22.41			
10	QPSK	25	25		22.41			
10	QPSK	50	0		22.36		23	1
10	16QAM	1	0		22.64			
10	16QAM	1	25		22.57			
10	16QAM	1	49		22.64		22	2
10	16QAM	25	0		21.48			
10	16QAM	25	12		21.43			
10	16QAM	25	25		21.45		22	2
10	16QAM	50	0		21.43			
Channel				27685	27710	27735	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				2307.5	2310	2312.5		
5	QPSK	1	0	23.21	23.28	23.55	24	0
5	QPSK	1	12	23.32	23.40	23.52		
5	QPSK	1	24	23.34	23.49	23.59		
5	QPSK	12	0	22.33	22.43	22.68	23	1
5	QPSK	12	7	22.34	22.52	22.80		
5	QPSK	12	13	22.47	22.52	22.74		
5	QPSK	25	0	22.37	22.57	22.86	23	1
5	16QAM	1	0	22.49	22.61	22.83		
5	16QAM	1	12	22.47	22.74	22.97		
5	16QAM	1	24	22.59	22.76	22.86	22	2
5	16QAM	12	0	21.37	21.44	21.69		
5	16QAM	12	7	21.35	21.62	21.83		
5	16QAM	12	13	21.46	21.63	21.78	22	2
5	16QAM	25	0	21.69	21.72	22.00		

<LTE Band 66>

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)	MPR (dB)
Channel				132072	132322	132572	24	0
Frequency (MHz)				1720	1745	1770		
20	QPSK	1	0	23.82	23.72	23.70		
20	QPSK	1	49	23.61	23.59	23.48	23	1
20	QPSK	1	99	23.63	23.65	23.50		
20	QPSK	50	0	22.90	22.75	22.65		
20	QPSK	50	24	22.84	22.66	22.70	23	1
20	QPSK	50	50	22.82	22.57	22.42		
20	QPSK	100	0	22.98	22.79	22.59		
20	16QAM	1	0	22.96	22.99	22.96	23	1
20	16QAM	1	49	22.98	22.87	22.58		
20	16QAM	1	99	22.95	22.91	22.77		
20	16QAM	50	0	21.86	21.76	21.47	22	2
20	16QAM	50	24	21.88	21.65	21.42		
20	16QAM	50	50	21.78	21.48	21.41		
20	16QAM	100	0	21.86	21.78	21.56	24	0
Channel				132047	132322	132597		
Frequency (MHz)				1717.5	1745	1772.5		
15	QPSK	1	0	23.62	23.59	23.51	24	0
15	QPSK	1	37	23.78	23.44	23.32		
15	QPSK	1	74	23.47	23.55	23.35		
15	QPSK	36	0	22.71	22.62	22.33	23	1
15	QPSK	36	20	22.76	22.50	22.45		
15	QPSK	36	39	22.62	22.34	22.34		
15	QPSK	75	0	22.86	22.61	22.47	23	1
15	16QAM	1	0	22.88	22.93	22.83		
15	16QAM	1	37	22.81	22.70	22.57		
15	16QAM	1	74	22.75	22.75	22.59	22	2
15	16QAM	36	0	21.66	21.58	21.37		
15	16QAM	36	20	21.80	21.49	21.35		
15	16QAM	36	39	21.67	21.35	21.33	24	0
15	16QAM	75	0	21.76	21.60	21.43		
Channel				132022	132322	132622		
Frequency (MHz)				1715	1745	1775		
10	QPSK	1	0	23.50	23.48	23.39	24	0
10	QPSK	1	25	23.64	23.26	23.19		
10	QPSK	1	49	23.29	23.39	23.18		
10	QPSK	25	0	22.55	22.42	22.20	23	1
10	QPSK	25	12	22.66	22.32	22.26		
10	QPSK	25	25	22.45	22.17	22.24		
10	QPSK	50	0	22.67	22.47	22.31	23	1
10	16QAM	1	0	22.78	22.82	22.66		
10	16QAM	1	25	22.62	22.52	22.45		
10	16QAM	1	49	22.62	22.55	22.39	22	2
10	16QAM	25	0	21.54	21.41	21.22		
10	16QAM	25	12	21.60	21.29	21.21		
10	16QAM	25	25	21.53	21.19	21.16	24	0
10	16QAM	50	0	21.65	21.45	21.32		
Channel				131997	132322	132647		
Frequency (MHz)				1712.5	1745	1777.5		
5	QPSK	1	0	23.39	23.35	23.26	24	0
5	QPSK	1	12	23.49	23.08	23.09		
5	QPSK	1	24	23.12	23.29	23.07		



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5	QPSK	12	0	22.41	22.24	22.10	23	1
5	QPSK	12	7	22.46	22.15	22.08		
5	QPSK	12	13	22.31	22.02	22.06		
5	QPSK	25	0	22.49	22.29	22.14		
5	16QAM	1	0	22.67	22.63	22.56	23	1
5	16QAM	1	12	22.51	22.33	22.25		
5	16QAM	1	24	22.42	22.44	22.20		
5	16QAM	12	0	21.39	21.24	21.02	22	2
5	16QAM	12	7	21.41	21.17	21.06		
5	16QAM	12	13	21.42	21.03	21.02		
5	16QAM	25	0	21.52	21.31	21.22		
Channel				131987	132322	132657	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1711.5	1745	1778.5		
3	QPSK	1	0	23.29	23.16	23.06	24	0
3	QPSK	1	8	23.32	22.96	22.98		
3	QPSK	1	14	22.92	23.09	22.92		
3	QPSK	8	0	22.23	22.10	21.94	23	1
3	QPSK	8	4	22.32	21.98	21.92		
3	QPSK	8	7	22.18	21.83	21.95		
3	QPSK	15	0	22.35	22.13	22.00		
3	16QAM	1	0	22.52	22.45	22.46	23	1
3	16QAM	1	8	22.33	22.22	22.13		
3	16QAM	1	14	22.27	22.31	22.06		
3	16QAM	8	0	21.19	21.04	20.88	22	2
3	16QAM	8	4	21.22	20.97	20.91		
3	16QAM	8	7	21.22	20.85	20.82		
3	16QAM	15	0	21.40	21.17	21.02		
Channel				131979	132322	132665	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1710.7	1745	1779.3		
1.4	QPSK	1	0	23.15	22.98	22.89	24	0
1.4	QPSK	1	3	23.14	22.84	22.78		
1.4	QPSK	1	5	22.82	22.97	22.82		
1.4	QPSK	3	0	22.05	22.03	22.01		
1.4	QPSK	3	1	22.12	22.07	22.03		
1.4	QPSK	3	3	22.06	22.01	22.03		
1.4	QPSK	6	0	22.18	21.93	21.87	23	1
1.4	16QAM	1	0	22.36	22.31	22.30	23	1
1.4	16QAM	1	3	22.21	22.04	22.01		
1.4	16QAM	1	5	22.15	22.18	21.86		
1.4	16QAM	3	0	21.03	21.06	21.00		
1.4	16QAM	3	1	21.06	21.03	21.01		
1.4	16QAM	3	3	21.08	21.06	21.03		
1.4	16QAM	6	0	21.29	21.00	20.91	22	2

<TDD LTE SAR Measurement>

TDD LTE configuration setup for SAR measurement

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

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

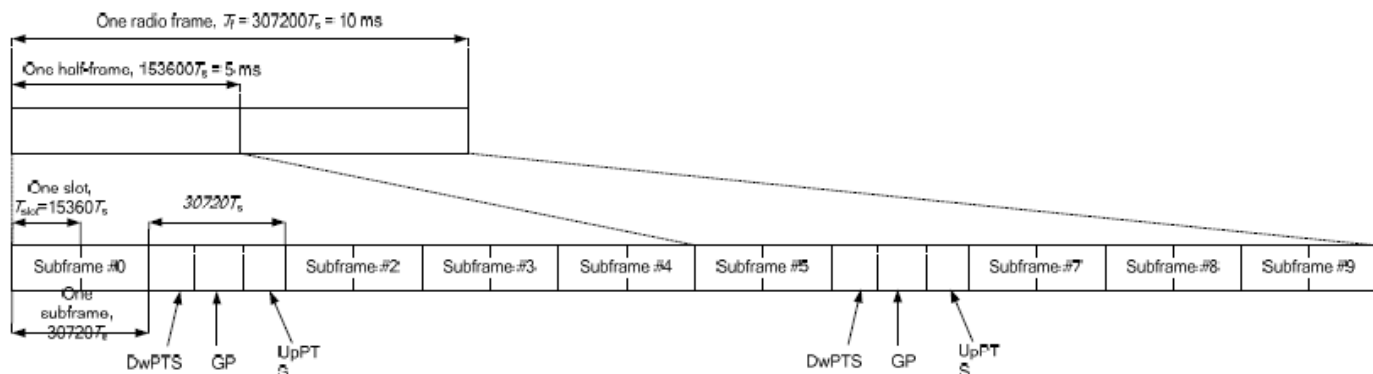


Figure 4.2-1: Frame structure type 2 (for 5 ms switch-point periodicity).

Table 4.2-2: Uplink-downlink configurations.

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

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

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

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

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

The highest duty factor is resulted from:

- Uplink-downlink configuration: 0. In a half-frame consisted of 5 subframes, uplink operation is in 3 uplink subframes and 1 special subframe.
- special subframe configuration: 5-9 for normal cyclic prefix in downlink, 4-7 for extended cyclic prefix in downlink
- for special subframe with extended cyclic prefix in uplink, the total uplink duty factor in one half-frame is:
 $(3+0.167)/5 = 63.3\%$
- for special subframe with normal cyclic prefix in uplink, the total uplink duty factor in one half-frame is:
 $(3+0.143)/5 = 62.9\%$
- For TDD LTE SAR measurement, the duty cycle 1:1.59 (62.9 %) was used perform testing and considering the theoretical duty cycle of 63.3% for extended cyclic prefix in the uplink, and the theoretical duty cycle of 62.9% for normal cyclic prefix in uplink, a scaling factor of extended cyclic prefix $63.3\%/62.9\% = 1.006$ is applied to scale-up the measured SAR result. The scaled TDD LTE SAR = measured SAR (W/kg)* Tune-up Scaling Factor* scaling factor for extended cyclic prefix.



<LTE Band 38>

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				37850	38000	38150		
Frequency (MHz)				2580	2595	2610		
20	QPSK	1	0	23.99	24.00	23.98	24	0
20	QPSK	1	49	23.95	23.88	23.85		
20	QPSK	1	99	23.87	23.85	23.86		
20	QPSK	50	0	22.92	22.94	22.90	23	1
20	QPSK	50	24	22.88	22.86	22.85		
20	QPSK	50	50	22.86	22.84	22.83		
20	QPSK	100	0	22.90	22.93	22.87	23	1
20	16QAM	1	0	22.95	23.00	22.97		
20	16QAM	1	49	22.94	22.98	22.97		
20	16QAM	1	99	23.00	22.96	22.96	22	2
20	16QAM	50	0	21.96	22.00	21.99		
20	16QAM	50	24	21.95	21.96	21.93		
20	16QAM	50	50	22.00	21.93	21.92	22	2
20	16QAM	100	0	21.95	21.91	21.87		
Channel				37825	38000	38175	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				2577.5	2595	2612.5		
15	QPSK	1	0	23.94	23.92	23.91	24	0
15	QPSK	1	37	23.86	23.81	23.78		
15	QPSK	1	74	23.87	23.82	23.78		
15	QPSK	36	0	22.92	22.92	22.85	23	1
15	QPSK	36	20	22.88	22.85	22.80		
15	QPSK	36	39	22.77	22.75	22.81		
15	QPSK	75	0	22.84	22.81	22.81	23	1
15	16QAM	1	0	22.92	22.95	22.92		
15	16QAM	1	37	22.87	22.94	22.97		
15	16QAM	1	74	22.99	22.88	22.95	22	2
15	16QAM	36	0	21.95	21.99	21.92		
15	16QAM	36	20	21.92	21.96	21.83		
15	16QAM	36	39	21.98	21.87	21.91	22	2
15	16QAM	75	0	21.95	21.86	21.81		
Channel				37800	38000	38200	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				2575	2595	2615		
10	QPSK	1	0	23.89	23.91	23.93	24	0
10	QPSK	1	25	23.87	23.85	23.84		
10	QPSK	1	49	23.87	23.82	23.80		
10	QPSK	25	0	22.91	22.91	22.89	23	1
10	QPSK	25	12	22.86	22.76	22.78		
10	QPSK	25	25	22.85	22.83	22.75		
10	QPSK	50	0	22.88	22.86	22.81	23	1
10	16QAM	1	0	22.90	22.94	22.87		
10	16QAM	1	25	22.93	22.90	22.90		
10	16QAM	1	49	22.95	22.96	22.89	22	2
10	16QAM	25	0	21.86	21.90	21.98		
10	16QAM	25	12	21.92	21.96	21.89		
10	16QAM	25	25	21.91	21.92	21.87	22	2
10	16QAM	50	0	21.93	21.86	21.85		
Channel				37775	38000	38225	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				2572.5	2595	2617.5		
5	QPSK	1	0	23.94	23.95	23.96	24	0
5	QPSK	1	12	23.85	23.79	23.85		
5	QPSK	1	24	23.80	23.79	23.79		

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5	QPSK	12	0	22.87	22.92	22.83	23	1
5	QPSK	12	7	22.84	22.81	22.75		
5	QPSK	12	13	22.84	22.82	22.75		
5	QPSK	25	0	22.80	22.89	22.86		
5	16QAM	1	0	22.88	22.98	22.95	23	1
5	16QAM	1	12	22.85	22.98	22.96		
5	16QAM	1	24	22.99	22.93	22.93		
5	16QAM	12	0	21.92	21.90	21.93	22	2
5	16QAM	12	7	21.93	21.96	21.87		
5	16QAM	12	13	21.96	21.88	21.84		
5	16QAM	25	0	21.94	21.91	21.83		

<LTE Band 41>

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Low Middle Ch. / Freq.	Power Middle Ch. / Freq.	Power High Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)	MPR (dB)
Channel				39750	40185	40620	41055	41490	24	0
Frequency (MHz)				2506	2549.5	2593	2636.5	2680		
20	QPSK	1	0	23.86	23.91	23.99	23.98	23.94		
20	QPSK	1	49	23.85	23.89	23.95	23.97	23.89	24	0
20	QPSK	1	99	23.79	23.90	23.84	23.96	23.85		
20	QPSK	50	0	22.54	22.84	22.86	22.65	22.67		
20	QPSK	50	24	22.46	22.73	22.66	22.59	22.65	23	1
20	QPSK	50	50	22.51	22.75	22.58	22.61	22.63		
20	QPSK	100	0	22.58	22.76	22.79	22.62	22.71		
20	16QAM	1	0	22.39	22.69	22.70	22.68	22.69	23	1
20	16QAM	1	49	22.50	22.67	22.69	22.67	22.68		
20	16QAM	1	99	22.63	22.66	22.59	22.65	22.70		
20	16QAM	50	0	21.57	21.84	21.89	21.62	21.75	22	2
20	16QAM	50	24	21.58	21.90	21.81	21.70	21.74		
20	16QAM	50	50	21.61	21.91	21.72	21.73	21.76		
20	16QAM	100	0	21.57	21.83	21.75	21.64	21.74		
Channel				39725	40173	40620	41068	41515	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				2503.5	2548.3	2593	2637.8	2682.5		
15	QPSK	1	0	23.71	23.91	23.91	23.88	23.87		
15	QPSK	1	37	23.83	23.82	23.78	23.82	23.84	24	0
15	QPSK	1	74	23.63	23.82	23.81	23.88	23.76		
15	QPSK	36	0	22.49	22.77	22.81	22.49	22.65		
15	QPSK	36	20	22.32	22.65	22.49	22.47	22.65	23	1
15	QPSK	36	39	22.39	22.59	22.46	22.57	22.56		
15	QPSK	75	0	22.56	22.68	22.61	22.61	22.53		
15	16QAM	1	0	22.28	22.58	22.62	22.66	22.50	23	1
15	16QAM	1	37	22.45	22.50	22.53	22.55	22.66		
15	16QAM	1	74	22.48	22.49	22.58	22.49	22.70		
15	16QAM	36	0	21.47	21.83	21.76	21.48	21.63	22	2
15	16QAM	36	20	21.50	21.86	21.61	21.69	21.68		
15	16QAM	36	39	21.41	21.82	21.61	21.53	21.76		
15	16QAM	75	0	21.39	21.74	21.74	21.55	21.72		
Channel				39700	40160	40620	41080	41540	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				2501	2547	2593	2639	2685		
10	QPSK	1	0	23.83	23.77	23.84	23.87	23.78		
10	QPSK	1	25	23.73	23.75	23.81	23.92	23.89	24	0
10	QPSK	1	49	23.77	23.89	23.75	23.76	23.80		
10	QPSK	25	0	22.47	22.78	22.68	22.64	22.56		
10	QPSK	25	12	22.44	22.56	22.46	22.42	22.54	23	1
10	QPSK	25	25	22.36	22.68	22.38	22.50	22.63		
10	QPSK	50	0	22.51	22.62	22.65	22.60	22.60		
10	16QAM	1	0	22.20	22.64	22.70	22.60	22.66	23	1
10	16QAM	1	25	22.35	22.65	22.55	22.67	22.59		
10	16QAM	1	49	22.58	22.50	22.56	22.63	22.50		
10	16QAM	25	0	21.42	21.72	21.73	21.46	21.56	22	2
10	16QAM	25	12	21.50	21.78	21.78	21.55	21.73		
10	16QAM	25	25	21.56	21.84	21.62	21.63	21.70		
10	16QAM	50	0	21.37	21.76	21.65	21.59	21.61		
Channel				39675	40148	40620	41093	41565	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				2498.5	2545.8	2593	2640.30	2687.5		
5	QPSK	1	0	23.66	23.89	23.79	23.81	23.94		



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5	QPSK	1	12	23.69	23.84	23.77	23.90	23.74		
5	QPSK	1	24	23.63	23.78	23.73	23.82	23.77		
5	QPSK	12	0	22.43	22.70	22.86	22.47	22.55	23	1
5	QPSK	12	7	22.37	22.57	22.49	22.59	22.48		
5	QPSK	12	13	22.46	22.62	22.58	22.61	22.47		
5	QPSK	25	0	22.52	22.66	22.62	22.54	22.63		
5	16QAM	1	0	22.37	22.49	22.70	22.56	22.55	23	1
5	16QAM	1	12	22.36	22.64	22.50	22.49	22.51		
5	16QAM	1	24	22.50	22.46	22.44	22.57	22.54		
5	16QAM	12	0	21.46	21.73	21.81	21.51	21.61	22	2
5	16QAM	12	7	21.56	21.70	21.68	21.57	21.66		
5	16QAM	12	13	21.46	21.81	21.62	21.59	21.69		
5	16QAM	25	0	21.38	21.72	21.63	21.58	21.71		

<LTE Carrier Aggregation combinations>
General Note:

1. This device supports Carrier Aggregation on downlink only for inter and intra band, Uplink CA is not supported. For the device supports combination bands and configurations are according to 3GPP.
2. In applying the existing power measurement procedure of KDB 941225 D05A for DL CA SAR test exclusion, only the subset with the largest number of combinations of the frequency band and CCs in each row need consideration, and that configurations require power measurement should be highlighted in the below table.

2CC Downlink Carrier Aggregation				3CC Downlink Carrier Aggregation			
Number	Combination	Restriction	Covered by Measurement Superset	Number	Combination	Restriction	Covered by Measurement Superset
1	CA_2A-4A		3CC-49	44	CA_2A-2A-5A		3CC-49
2	CA_2A-5A		3CC-49	45	CA_2A-2A-13A		3CC-50
3	CA_2A-12A		3CC-53	46	CA_2A_66B		3CC-52
4	CA_2A-13A		3CC-45	47	CA_2A_66C		3CC-52
5	CA_2A-17A			48	CA_2C-5A		3CC-49
6	CA_2A-29A		3CC-55	49	CA_2A-4A-5A		
7	CA_2A-30A		3CC-55	50	CA_2A-4A-13A		
8	CA_2A-66A		3CC-46	51	CA_2A-5A-30A		
9	CA_4A-2A		3CC-58	52	CA_2A-5A-66A		
10	CA_4A_5A		3CC-56	53	CA_2A-12A-30A		
11	CA_4A_12A		3CC-61	54	CA_2A_13A_66A		
12	CA_4A_13A		3CC-57	55	CA_2A_29A_30A		
13	CA_4A_17A			56	CA_4A_4A_5A		3CC-49
14	CA_4A_29A		3CC-62	57	CA_4A_4A_13A		3CC-50
15	CA_4A_30A		3CC-62	58	CA_4A-2A-5A		3CC-49
16	CA_5A_2A		3CC-63	59	CA_4A-2A-13A		3CC-50
17	CA_5A_4A		3CC-64	60	CA_4A_5A_30A		
18	CA_5A_7A			61	CA_4A_12A_30A		
19	CA_5A_30A		3CC-69	62	CA_4A_29A_30A		
20	CA_5A_66A		3CC-67	63	CA_5A-2A-2A		3CC-49
21	CA_7A_5A		2CC-18	64	CA_5A_4A_4A		3CC-49
22	CA_12A-2A		3CC-71	65	CA_5A_66A_66A		3CC-52
23	CA_12A_4A		3CC-72	66	CA_5A_66B		3CC-52
24	CA_12A_30A		3CC-72	67	CA_5A_66C		3CC-52
25	CA_13A-2A		3CC-73	68	CA_5A-2A-4A		3CC-49
26	CA_13A_4A		3CC-74	69	CA_5A-2A-30A		3CC-51
27	CA_13A_66A		3CC-76	70	CA_5A_4A_30A		3CC-60
28	CA_17A-2A		2CC-5	71	CA_12A-2A-30A		3CC-53
29	CA_17A_4A		2CC-13	72	CA_12A_4A_30A		3CC-61
30	CA_30A-2A		3CC-55	73	CA_13A-2A-2A		3CC-50
31	CA_30A_4A		3CC-62	74	CA_13A_4A_4A		3CC-59
32	CA_30A_5A		3CC-69	75	CA_13A_66A_66A		3CC-54
33	CA_30A_12A		3CC-83	76	CA_13A_66B		3CC-54
34	CA_30A_29A		3CC-82	77	CA_13A_66C		3CC-54
35	CA_66A-2A		3CC-87	78	CA_13A-2A-4A		3CC-50
36	CA_66A_5A		3CC-88	79	CA_13A_2A_66A		3CC-54
37	CA_66A_13A		3CC-89	80	CA_30A-2A-5A		3CC-51
38	CA_2C			81	CA_30A-2A-12A		3CC-61
39	CA_2A_2A			82	CA_30A_2A_29A		3CC-55
40	CA_4A_4A			83	CA_30A_4A_12A		3CC-61
41	CA_7B			84	CA_30A_4A_29A		3CC-62
42	CA_7C			85	CA_66A_66A_5A		3CC-66
43	CA_7A_7A			86	CA_66A_66A_13A		3CC-76
95	CA_41C			87	CA_66B_2A		3CC-52
96	CA_41A_41A			88	CA_66B_5A		3CC-52
				89	CA_66B_13A		3CC-54
				90	CA_66C_2A		3CC-52
				91	CA_66C_5A		3CC-52
				92	CA_66C_13A		3CC-54
				93	CA_66A_2A_13A		3CC-54
				94	CA_66D		

<Power verification when LTE Carrier Aggregation Active>
General Note:

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

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

<Two Carrier power verification>

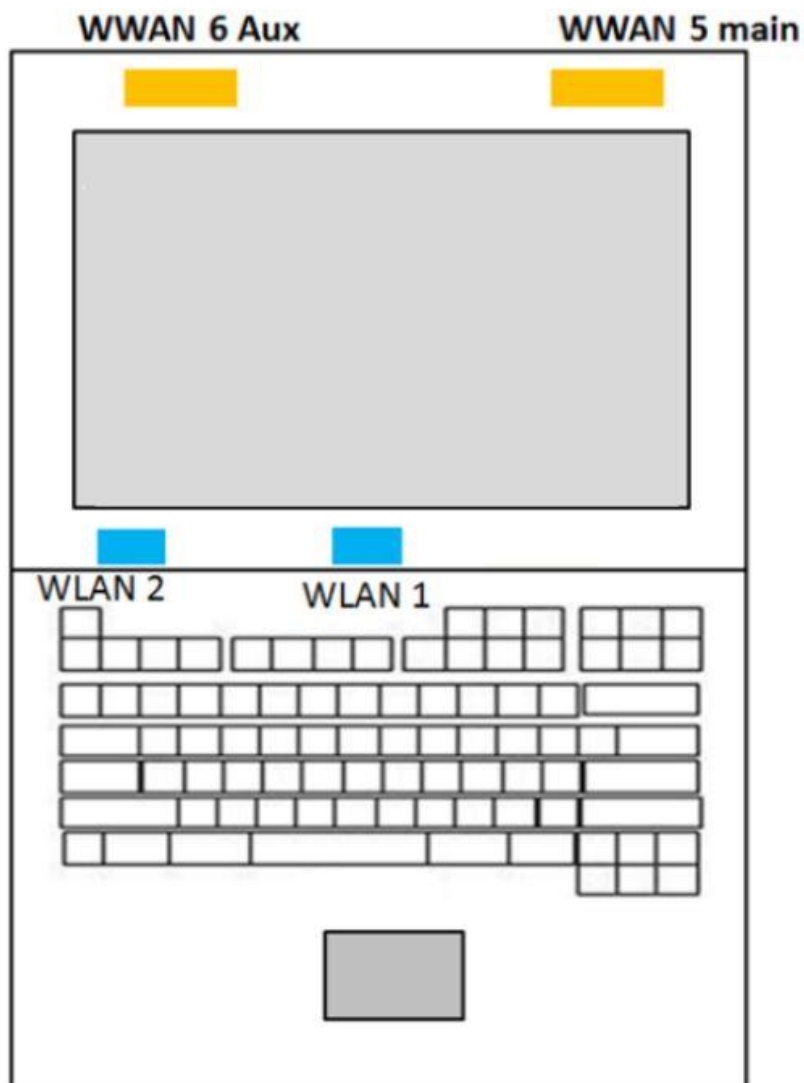
Configure		CA Configuration (BCS)	PCC						SCC				Power		
			LTE Band	BW (MHz)	UL Freq. (MHz)	UL Channel	Mod.	UL# RB	UL RB Offset	LTE Band	BW (MHz)	DL Freq. (MHz)	DL Channel	With CA Tx.Power (dBm)	W/O CA Tx.Power (dBm)
Inter-Band		2A-17A	2	10	1905	19150	QPSK	1	0	17	10	740	5790	23.56	23.67
		4A-17A	4	10	1715	20000	QPSK	1	25	17	10	740	5790	23.48	23.68
		5A-7A	5	10	844	20600	QPSK	1	0	7	20	2655	3100	23.15	23.17
Intra-Band	Non-Contiguous	2A-2A	2	20	1900	19100	QPSK	1	0	2	5	1932.5	625	23.95	23.95
		4A-4A	4	20	1720	20050	QPSK	1	0	4	5	2152.5	2375	23.83	23.98
		7A-7A	7	20	2510	20850	QPSK	1	0	7	5	2687.5	3425	23.89	23.98
		41A-41A	41	20	2593	40620	QPSK	1	0	41	5	2687.5	41565	23.94	23.99
	Contiguous	2C	2	20	1900	19100	QPSK	1	0	2	20	1960.2	902	23.51	23.67
		7B	7	15	2507.5	20825	QPSK	1	0	7	5	2636.8	2918	23.85	23.88
		7C	7	20	2510	20850	QPSK	1	0	7	20	2649.8	3048	23.95	23.98
		41C	41	20	2593	40620	QPSK	1	0	41	20	2573.5	40422	23.84	23.99



<Three Carrier power verification>

Configure		CA Configuration (BCS)	PCC						SCC				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	LTE Band	BW (MHz)	DL Freq. (MHz)	DL Channel	With CA Tx.Power (dBm)	W/O CA Tx.Power (dBm)
Inter-Band		2C-5A	2	20	1900	19100	QPSK	1	0	2	20	1960.2	902	5	10	881.5	2525	23.65	23.67
		2A-66C	2	20	1900	19100	QPSK	1	0	66	20	2155	66886	66	20	2174.8	67084	23.48	23.67
		5A-66C	5	10	844	20600	QPSK	1	0	66	20	2155	66886	66	20	2174.8	67084	23.09	23.17
		13A-66C	13	10	782	23230	QPSK	1	0	66	20	2155	66886	66	20	2174.8	67084	23.12	23.13
Inter-Band		2A-4A-5A	2	20	1900	19100	QPSK	1	0	4	20	2132.5	2175	5	10	881.5	2525	23.52	23.67
		2A-4A-13A	2	20	1900	19100	QPSK	1	0	4	20	2132.5	2175	13	10	751	5230	23.50	23.67
		2A-5A-30A	2	20	1900	19100	QPSK	1	0	5	10	881.5	2525	30	10	2355	9820	23.65	23.67
		2A-5A-66A	2	20	1900	19100	QPSK	1	0	5	10	881.5	2525	66	20	2155	66886	23.63	23.67
		2A-12A-30A	2	20	1900	19100	QPSK	1	0	12	10	737.5	5095	30	10	2355	9820	23.67	23.67
		2A-13A-66A	2	20	1900	19100	QPSK	1	0	12	10	737.5	5095	66	20	2155	66886	23.47	23.67
		2A-29A-30A	2	20	1900	19100	QPSK	1	0	29	10	722.5	9715	30	10	2355	9820	23.50	23.67
		4A-5A-30A	4	20	1720	20050	QPSK	1	0	5	10	881.5	2525	30	10	2355	9820	23.88	23.98
		4A-12A-30A	4	20	1720	20050	QPSK	1	0	12	10	737.5	5095	30	10	2355	9820	23.80	23.98
Intra-Band	Contiguous	66D	66	20	1720	132072	QPSK	1	0	66	20	2139.8	66734	66	20	2159.6	66932	23.80	23.82

11. Antenna Location



12. SAR Test Results

General Note:

1. Per KDB 447498 D01v06, the reported SAR is the measured SAR value adjusted for maximum tune-up tolerance.
 - a. Tune-up scaling Factor = tune-up limit power (mW) / EUT RF power (mW), where tune-up limit is the maximum rated power among all production units.
 - b. For SAR testing of WLAN signal with non-100% duty cycle, the measured SAR is scaled-up by the duty cycle scaling factor which is equal to "1/(duty cycle)"
 - c. For WWAN: Reported SAR(W/kg)= Measured SAR(W/kg)*Tune-up Scaling Factor
 - d. For TDD LTE SAR measurement, the duty cycle 1:1.59 (62.9 %) was used for performance testing and considering the theoretical duty cycle of 63.3% for extended cyclic prefix in the uplink, and the theoretical duty cycle of 62.9% for normal cyclic prefix in uplink, a scaling factor of extended cyclic prefix $63.3\%/62.9\% = 1.006$ is applied to scale-up the measured SAR result. The Reported TDD LTE SAR = measured SAR (W/kg)* Tune-up Scaling Factor* scaling factor for extended cyclic prefix.
2. Per KDB 447498 D01v06, for each exposure position, testing of other required channels within the operating mode of a frequency band is not required when the reported 1-g or 10-g SAR for the mid-band or highest output power channel is:
 - ≤ 0.8 W/kg or 2.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≤ 100 MHz
 - ≤ 0.6 W/kg or 1.5 W/kg, for 1-g or 10-g respectively, when the transmission band is between 100 MHz and 200 MHz
 - ≤ 0.4 W/kg or 1.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≥ 200 MHz
3. Per KDB 865664 D01v01r04, for each frequency band, repeated SAR measurement is required only when the measured SAR is ≥ 0.8 W/kg.

UMTS Note:

1. Per KDB 941225 D01v03r01, for SAR testing is measured using a 12.2 kbps RMC with TPC bits configured to all "1's".
2. Per KDB 941225 D01v03r01, RMC 12.2kbps setting is used to evaluate SAR. The maximum output power and tune-up tolerance specified for production units in HSDPA / HSUPA / DC-HSDPA is $\leq \frac{1}{4}$ dB higher than RMC 12.2Kbps or when the highest reported SAR of the RMC12.2Kbps is scaled by the ratio of specified maximum output power and tune-up tolerance of HSDPA / HSUPA / DC-HSDPA to RMC12.2Kbps and the adjusted SAR is ≤ 1.2 W/kg, SAR measurement is not required for HSDPA / HSUPA / DC-HSDPA, and according to the following RF output power, the output power results of the secondary modes (HSUPA, HSDPA, DC-HSDPA) are less than $\frac{1}{4}$ dB higher than the primary modes; therefore, SAR measurement is not required for HSDPA / HSUPA / DC-HSDPA.

LTE Note:

1. Per KDB 941225 D05v02r05, start with the largest channel bandwidth and measure SAR for QPSK with 1 RB allocation, using the RB offset and required test channel combination with the highest maximum output power for RB offsets at the upper edge, middle and lower edge of each required test channel.
2. Per KDB 941225 D05v02r05, 50% RB allocation for QPSK SAR testing follows 1RB QPSK allocation procedure.
3. Per KDB 941225 D05v02r05, For QPSK with 100% RB allocation, SAR is not required when the highest maximum output power for 100 % RB allocation is less than the highest maximum output power in 50% and 1 RB allocations and the highest reported SAR for 1 RB and 50% RB allocation are ≤ 0.8 W/kg. Otherwise, SAR is measured for the highest output power channel; and if the reported SAR is > 1.45 W/kg, the remaining required test channels must also be tested.
4. Per KDB 941225 D05v02r05, 16QAM output power for each RB allocation configuration is $> \text{not } \frac{1}{2}$ dB higher than the same configuration in QPSK and the reported SAR for the QPSK configuration is ≤ 1.45 W/kg; Per KDB 941225 D05v02r05, 16QAM SAR testing is not required.
5. Per KDB 941225 D05v02r05, Smaller bandwidth output power for each RB allocation configuration is $> \text{not } \frac{1}{2}$ dB higher than the same configuration in the largest supported bandwidth, and the reported SAR for the largest supported bandwidth is ≤ 1.45 W/kg; Per KDB 941225 D05v02r05, smaller bandwidth SAR testing is not required.
6. For LTE B4/B5/B12/B17/B26/B38 the maximum bandwidth does not support three non-overlapping channels, per KDB 941225 D05v02r05, when a device supports overlapping channel assignment in a channel bandwidth configuration, the middle channel of the group of overlapping channels should be selected for testing.
7. LTE band 4/5/17/38 SAR test was covered by Band 66/26/12/41; according to TCB workshop, SAR test for overlapping LTE bands can be reduced if
 - a. The maximum output power, including tolerance, for the smaller band is $\leq$ the larger band to qualify for the SAR test exclusion.
 - b. The channel bandwidth and other operating parameters for the smaller band are fully supported by the larger band.

12.1 Body 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 1g SAR (W/kg)	Reported 1g SAR (W/kg)
01	WCDMA II	RMC 12.2Kbps	Bottom of Laptop	0mm	9538	1907.6	24.47	24.50	1.007	0.18	0.074	0.075
02	WCDMA IV	RMC 12.2Kbps	Bottom of Laptop	0mm	1513	1752.6	24.45	24.50	1.012	-0.04	0.043	0.043
03	WCDMA V	RMC 12.2Kbps	Bottom of Laptop	0mm	4233	846.6	24.47	24.50	1.007	0	0.022	0.022

<FDD 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)
04	LTE Band 2	20M	QPSK	1	0	Bottom of Laptop	0mm	19100	1900	23.95	24.00	1.012	0.06	0.051	0.052
	LTE Band 2	20M	QPSK	50	24	Bottom of Laptop	0mm	19100	1900	22.91	23.00	1.021	0.03	0.038	0.039
05	LTE Band 7	20M	QPSK	1	0	Bottom of Laptop	0mm	20850	2510	23.98	24.00	1.005	-0.1	0.005	0.005
	LTE Band 7	20M	QPSK	50	24	Bottom of Laptop	0mm	20850	2510	22.88	23.00	1.028	0.14	0.004	0.005
06	LTE Band 12	10M	QPSK	1	0	Bottom of Laptop	0mm	23095	707.5	23.24	24.00	1.191	-0.14	0.015	0.018
	LTE Band 12	10M	QPSK	25	0	Bottom of Laptop	0mm	23095	707.5	22.17	23.00	1.211	0.09	0.007	0.008
07	LTE Band 13	10M	QPSK	1	0	Bottom of Laptop	0mm	23230	782	23.13	24.00	1.222	-0.03	0.021	0.026
	LTE Band 13	10M	QPSK	25	25	Bottom of Laptop	0mm	23230	782	22.17	23.00	1.211	0.02	0.015	0.018
08	LTE Band 26	15M	QPSK	1	0	Bottom of Laptop	0mm	26865	831.5	22.98	24.00	1.265	-0.03	0.014	0.018
	LTE Band 26	15M	QPSK	36	20	Bottom of Laptop	0mm	26865	831.5	21.97	23.00	1.268	-0.13	0.005	0.006
09	LTE Band 30	10M	QPSK	1	0	Bottom of Laptop	0mm	27710	2310	23.70	24.00	1.072	0.14	0.001	0.001
	LTE Band 30	10M	QPSK	25	0	Bottom of Laptop	0mm	27710	2310	22.47	23.00	1.130	-0.06	0.001	0.001
10	LTE Band 66	20M	QPSK	1	0	Bottom of Laptop	0mm	132072	1720	23.82	24.00	1.042	-0.11	0.061	0.064
	LTE Band 66	20M	QPSK	50	0	Bottom of Laptop	0mm	132072	1720	22.90	23.00	1.023	-0.11	0.048	0.049

<TDD 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	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
11	LTE Band 41	20M	QPSK	1	0	Bottom of Laptop	0mm	40620	2593	23.99	24.00	1.002	62.9	1.006	-0.06	0.005	0.005
	LTE Band 41	20M	QPSK	50	0	Bottom of Laptop	0mm	40620	2593	22.86	23.00	1.033	62.9	1.006	0.08	0.003	0.003

13. Simultaneous Transmission Analysis

NO.	Simultaneous Transmission Configurations	Body
1.	WWAN + 2.4GHz WLAN ANT 1 + 2.4GHz WLAN ANT 2	Yes
2.	WWAN + 2.4GHz WLAN ANT 2+ Bluetooth ANT 1	Yes
3.	WWAN + 5.GHz WLAN ANT 1 + 5GHz WLAN ANT 2 + Bluetooth ANT 1	Yes

General Note:

1. For 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. WLAN and Bluetooth share the same antenna, and cannot transmit simultaneously.
3. All licensed modes share the same antenna 1 part and cannot transmit simultaneously
4. The Scaled SAR summation is calculated based on the same configuration and test position.
5. Per KDB 447498 D01v06, simultaneous transmission SAR is compliant if,
 - i) Scalar SAR summation < 1.6W/kg.
 - ii) $SPLSR = (SAR1 + SAR2)^{1.5} / (\text{min. separation distance, mm})$, and the peak separation distance is determined from the square root of $[(x1-x2)^2 + (y1-y2)^2 + (z1-z2)^2]$, where (x1, y1, z1) and (x2, y2, z2) are the coordinates of the extrapolated peak SAR locations in the zoom scan.
 - iii) If $SPLSR \leq 0.04$, simultaneously transmission SAR measurement is not necessary.
 - iv) Simultaneously transmission SAR measurement, and the reported multi-band SAR < 1.6W/kg.
 - v) The SPLSR calculated results please refer to section 13.3.



13.1 Body Exposure Conditions

WWAN Band	Exposure Position	0	1	2	3	4	5	0+1+2 Summed 1g SAR (W/kg)	0+2+5 Summed 1g SAR (W/kg)	0+3+4+5 Summed 1g SAR (W/kg)	SPLSR	Case No
		WWAN	2.4GHz WLAN Ant 1	2.4GHz WLAN Ant 2	5GHz WLAN Ant 1	5GHz WLAN Ant 2	Bluetooth Ant 1					
		1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)					
WCDMA II	Bottom of Laptop at 0mm	0.075	0.253	0.701	0.960	0.935	0.002	1.029	0.778	1.972	0.02	Case 1
WCDMA IV	Bottom of Laptop at 0mm	0.043	0.253	0.701	0.960	0.935	0.002	0.997	0.746	1.940	0.02	Case 2
WCDMA V	Bottom of Laptop at 0mm	0.022	0.253	0.701	0.960	0.935	0.002	0.976	0.725	1.919	0.02	Case 3
LTE Band 2	Bottom of Laptop at 0mm	0.052	0.253	0.701	0.960	0.935	0.002	1.006	0.755	1.949	0.02	Case 4
LTE Band 7	Bottom of Laptop at 0mm	0.005	0.253	0.701	0.960	0.935	0.002	0.959	0.708	1.902	0.02	Case 5
LTE Band 12	Bottom of Laptop at 0mm	0.018	0.253	0.701	0.960	0.935	0.002	0.972	0.721	1.915	0.02	Case 6
LTE Band 13	Bottom of Laptop at 0mm	0.026	0.253	0.701	0.960	0.935	0.002	0.980	0.729	1.923	0.02	Case 7
LTE Band 26	Bottom of Laptop at 0mm	0.018	0.253	0.701	0.960	0.935	0.002	0.972	0.721	1.915	0.02	Case 8
LTE Band 30	Bottom of Laptop at 0mm	0.001	0.253	0.701	0.960	0.935	0.002	0.955	0.704	1.898	0.02	Case 9
LTE Band 41	Bottom of Laptop at 0mm	0.005	0.253	0.701	0.960	0.935	0.002	0.959	0.708	1.902	0.02	Case 10
LTE Band 66	Bottom of Laptop at 0mm	0.064	0.253	0.701	0.960	0.935	0.002	1.018	0.767	1.961	0.02	Case 11

13.2 SPLSR Evaluation and Analysis

General Note:

1. $SPLSR = (SAR_1 + SAR_2)^{1.5} / (\text{min. separation distance, mm})$. If $SPLSR \leq 0.04$, simultaneously transmission SAR measurement is not necessary
2. The detail hotspot point for each transmitter in each exposure condition are showing as below figure and the minimum 3D distance for each sum combination is used for SPLSR analysis.

	Band	Position	SAR (W/kg)	Gap (mm)	SAR peak location (mm)			3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
					X	Y	Z				
Case 1	WCDMA II	Bottom of Laptop	0.075	0	105.4	111.1	2.04	85.1	1.04	0.01	Not required
	WLAN5GHz_Ant 1		0.96	0	105.2	26	0.9				
	WCDMA II	Bottom of Laptop	0.075	0	105.4	111.1	2.04	220.0	1.01	0.00	Not required
	WLAN5GHz_Ant 2		0.935	0	0.81	-82.4	0.81				
	WCDMA II	Bottom of Laptop	0.075	0	105.4	111.1	2.04	125.8	0.08	0.00	Not required
	Bluetooth_Ant 1		0.002	0	137	-8	27.5				
	WLAN5GHz_Ant 1	Bottom of Laptop	0.96	0	105.2	26	0.9	150.5	1.90	0.02	Not required
	WLAN5GHz_Ant 2		0.935	0	0.81	-82.4	0.81				
	WLAN5GHz_Ant 1	Bottom of Laptop	0.96	0	105.2	26	0.9	53.6	0.96	0.02	Not required
	Bluetooth_Ant 1		0.002	0	137	-8	27.5				
	WLAN5GHz_Ant 2	Bottom of Laptop	0.935	0	0.81	-82.4	0.81	157.5	0.94	0.01	Not required
	Bluetooth_Ant 1		0.002	0	137	-8	27.5				

	Band	Position	SAR (W/kg)	Gap (mm)	SAR peak location (mm)			3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
					X	Y	Z				
Case 2	WCDMA IV	Bottom of Laptop	0.043	0	98	92.9	1.87	67.3	1.00	0.01	Not required
	WLAN5GHz_Ant 1		0.96	0	105.2	26	0.9				
	WCDMA IV	Bottom of Laptop	0.043	0	98	92.9	1.87	200.4	0.98	0.00	Not required
	WLAN5GHz_Ant 2		0.935	0	0.81	-82.4	0.81				
	WCDMA IV	Bottom of Laptop	0.043	0	98	92.9	1.87	111.2	0.05	0.00	Not required
	Bluetooth_Ant 1		0.002	0	137	-8	27.5				
	WLAN5GHz_Ant 1	Bottom of Laptop	0.96	0	105.2	26	0.9	150.5	1.90	0.02	Not required
	WLAN5GHz_Ant 2		0.935	0	0.81	-82.4	0.81				
	WLAN5GHz_Ant 1	Bottom of Laptop	0.96	0	105.2	26	0.9	53.6	0.96	0.02	Not required
	Bluetooth_Ant 1		0.002	0	137	-8	27.5				
	WLAN5GHz_Ant 2	Bottom of Laptop	0.935	0	0.81	-82.4	0.81	157.5	0.94	0.01	Not required
	Bluetooth_Ant 1		0.002	0	137	-8	27.5				

	Band	Position	SAR (W/kg)	Gap (mm)	SAR peak location (cm)			3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
					X	Y	Z				
Case 3	WCDMA V	Bottom of Laptop	0.022	0	110	106.4	2.05	80.6	0.98	0.01	Not required
	WLAN5GHz_Ant 1		0.96	0	105.2	26	0.9				
	WCDMA V	Bottom of Laptop	0.022	0	110	106.4	2.05	218.1	0.96	0.00	Not required
	WLAN5GHz_Ant 2		0.935	0	0.81	-82.4	0.81				
	WCDMA V	Bottom of Laptop	0.022	0	110	106.4	2.05	120.3	0.02	0.00	Not required
	Bluetooth_Ant 1		0.002	0	137	-8	27.5				
	WLAN5GHz_Ant 1	Bottom of Laptop	0.96	0	105.2	26	0.9	150.5	1.90	0.02	Not required
	WLAN5GHz_Ant 2		0.935	0	0.81	-82.4	0.81				
	WLAN5GHz_Ant 1	Bottom of Laptop	0.96	0	105.2	26	0.9	53.6	0.96	0.02	Not required
	Bluetooth_Ant 1		0.002	0	137	-8	27.5				
	WLAN5GHz_Ant 2	Bottom of Laptop	0.935	0	0.81	-82.4	0.81	157.5	0.94	0.01	Not required
	Bluetooth_Ant 1		0.002	0	137	-8	27.5				

	Band	Position	SAR (W/kg)	Gap (mm)	SAR peak location (mm)			3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
					X	Y	Z				
Case 4	LTE Band 2	Bottom of Laptop	0.052	0	105.5	110.9	1.9	84.9	1.01	0.01	Not required
	WLAN5GHz_Ant 1		0.96	0	105.2	26	0.9				
	LTE Band 2	Bottom of Laptop	0.052	0	105.5	110.9	1.9	219.8	0.99	0.00	Not required
	WLAN5GHz_Ant 2		0.935	0	0.81	-82.4	0.81				
	LTE Band 2	Bottom of Laptop	0.052	0	105.5	110.9	1.9	125.6	0.05	0.00	Not required
	Bluetooth_Ant 1		0.002	0	137	-8	27.5				
	WLAN5GHz_Ant 1	Bottom of Laptop	0.96	0	105.2	26	0.9	150.5	1.90	0.02	Not required
	WLAN5GHz_Ant 2		0.935	0	0.81	-82.4	0.81				
	WLAN5GHz_Ant 1	Bottom of Laptop	0.96	0	105.2	26	0.9	53.6	0.96	0.02	Not required
	Bluetooth_Ant 1		0.002	0	137	-8	27.5				
	WLAN5GHz_Ant 2	Bottom of Laptop	0.935	0	0.81	-82.4	0.81	157.5	0.94	0.01	Not required
	Bluetooth_Ant 1		0.002	0	137	-8	27.5				

	Band	Position	SAR (W/kg)	Gap (mm)	SAR peak location (mm)			3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
					X	Y	Z				
Case 5	LTE Band 7	Bottom of Laptop	0.005	0	95.8	103.8	0.93	78.4	0.97	0.01	Not required
	WLAN5GHz_Ant 1		0.96	0	105.2	26	0.9				
	LTE Band 7	Bottom of Laptop	0.005	0	95.8	103.8	0.93	209.0	0.94	0.00	Not required
	WLAN5GHz_Ant 2		0.935	0	0.81	-82.4	0.81				
	LTE Band 7	Bottom of Laptop	0.005	0	95.8	103.8	0.93	122.1	0.01	0.00	Not required
	Bluetooth_Ant 1		0.002	0	137	-8	27.5				
	WLAN5GHz_Ant 1	Bottom of Laptop	0.96	0	105.2	26	0.9	150.5	1.90	0.02	Not required
	WLAN5GHz_Ant 2		0.935	0	0.81	-82.4	0.81				
	WLAN5GHz_Ant 1	Bottom of Laptop	0.96	0	105.2	26	0.9	53.6	0.96	0.02	Not required
	Bluetooth_Ant 1		0.002	0	137	-8	27.5				
	WLAN5GHz_Ant 2	Bottom of Laptop	0.935	0	0.81	-82.4	0.81	157.5	0.94	0.01	Not required
	Bluetooth_Ant 1		0.002	0	137	-8	27.5				

	Band	Position	SAR (W/kg)	Gap (mm)	SAR peak location (cm)			3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
					X	Y	Z				
Case 6	LTE Band 12	Bottom of Laptop	0.018	0	109.8	111.1	1.98	85.2	0.98	0.01	Not required
	WLAN5GHz_Ant 1		0.96	0	105.2	26	0.9				
	LTE Band 12	Bottom of Laptop	0.018	0	109.8	111.1	1.98	222.1	0.95	0.00	Not required
	WLAN5GHz_Ant 2		0.935	0	0.81	-82.4	0.81				
	LTE Band 12	Bottom of Laptop	0.018	0	109.8	111.1	1.98	124.8	0.02	0.00	Not required
	Bluetooth_Ant 1		0.002	0	137	-8	27.5				
	WLAN5GHz_Ant 1	Bottom of Laptop	0.96	0	105.2	26	0.9	150.5	1.90	0.02	Not required
	WLAN5GHz_Ant 2		0.935	0	0.81	-82.4	0.81				
	WLAN5GHz_Ant 1	Bottom of Laptop	0.96	0	105.2	26	0.9	53.6	0.96	0.02	Not required
	Bluetooth_Ant 1		0.002	0	137	-8	27.5				
	WLAN5GHz_Ant 2	Bottom of Laptop	0.935	0	0.81	-82.4	0.81	157.5	0.94	0.01	Not required
	Bluetooth_Ant 1		0.002	0	137	-8	27.5				

	Band	Position	SAR (W/kg)	Gap (mm)	SAR peak location (mm)			3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
					X	Y	Z				
Case 7	LTE Band 13	Bottom of Laptop	0.026	0	110	106.4	2.05	80.6	0.99	0.01	Not required
	WLAN5GHz_Ant 1		0.96	0	105.2	26	0.9				
	LTE Band 13	Bottom of Laptop	0.026	0	110	106.4	2.05	218.1	0.96	0.00	Not required
	WLAN5GHz_Ant 2		0.935	0	0.81	-82.4	0.81				
	LTE Band 13	Bottom of Laptop	0.026	0	110	106.4	2.05	120.3	0.03	0.00	Not required
	Bluetooth_Ant 1		0.002	0	137	-8	27.5				
	WLAN5GHz_Ant 1	Bottom of Laptop	0.96	0	105.2	26	0.9	150.5	1.90	0.02	Not required
	WLAN5GHz_Ant 2		0.935	0	0.81	-82.4	0.81				
	WLAN5GHz_Ant 1	Bottom of Laptop	0.96	0	105.2	26	0.9	53.6	0.96	0.02	Not required
	Bluetooth_Ant 1		0.002	0	137	-8	27.5				
	WLAN5GHz_Ant 2	Bottom of Laptop	0.935	0	0.81	-82.4	0.81	157.5	0.94	0.01	Not required
	Bluetooth_Ant 1		0.002	0	137	-8	27.5				

	Band	Position	SAR (W/kg)	Gap (mm)	SAR peak location (mm)			3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
					X	Y	Z				
Case 8	LTE Band 26	Bottom of Laptop	0.018	0	90.1	116.7	0.81	91.9	0.98	0.01	Not required
	WLAN5GHz_Ant 1		0.96	0	105.2	26	0.9				
	LTE Band 26	Bottom of Laptop	0.018	0	90.1	116.7	0.81	218.2	0.95	0.00	Not required
	WLAN5GHz_Ant 2		0.935	0	0.81	-82.4	0.81				
	LTE Band 26	Bottom of Laptop	0.018	0	90.1	116.7	0.81	135.9	0.02	0.00	Not required
	Bluetooth_Ant 1		0.002	0	137	-8	27.5				
	WLAN5GHz_Ant 1	Bottom of Laptop	0.96	0	105.2	26	0.9	150.5	1.90	0.02	Not required
	WLAN5GHz_Ant 2		0.935	0	0.81	-82.4	0.81				
	WLAN5GHz_Ant 1	Bottom of Laptop	0.96	0	105.2	26	0.9	53.6	0.96	0.02	Not required
	Bluetooth_Ant 1		0.002	0	137	-8	27.5				
	WLAN5GHz_Ant 2	Bottom of Laptop	0.935	0	0.81	-82.4	0.81	157.5	0.94	0.01	Not required
	Bluetooth_Ant 1		0.002	0	137	-8	27.5				

	Band	Position	SAR (W/kg)	Gap (mm)	SAR peak location (mm)			3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
					X	Y	Z				
Case 9	LTE Band 30	Bottom of Laptop	0.001	0	95.8	118.8	1.04	93.3	0.96	0.01	Not required
	WLAN5GHz_Ant 1		0.96	0	105.2	26	0.9				
	LTE Band 30	Bottom of Laptop	0.001	0	95.8	118.8	1.04	222.5	0.94	0.00	Not required
	WLAN5GHz_Ant 2		0.935	0	0.81	-82.4	0.81				
	LTE Band 30	Bottom of Laptop	0.001	0	95.8	118.8	1.04	135.9	0.00	0.00	Not required
	Bluetooth_Ant 1		0.002	0	137	-8	27.5				
	WLAN5GHz_Ant 1	Bottom of Laptop	0.96	0	105.2	26	0.9	150.5	1.90	0.02	Not required
	WLAN5GHz_Ant 2		0.935	0	0.81	-82.4	0.81				
	WLAN5GHz_Ant 1	Bottom of Laptop	0.96	0	105.2	26	0.9	53.6	0.96	0.02	Not required
	Bluetooth_Ant 1		0.002	0	137	-8	27.5				
	WLAN5GHz_Ant 2	Bottom of Laptop	0.935	0	0.81	-82.4	0.81	157.5	0.94	0.01	Not required
	Bluetooth_Ant 1		0.002	0	137	-8	27.5				

	Band	Position	SAR (W/kg)	Gap (mm)	SAR peak location (mm)			3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
					X	Y	Z				
Case 10	LTE Band 41	Bottom of Laptop	0.005	0	105.6	99.4	1.2	73.4	0.97	0.01	Not required
	WLAN5GHz_Ant 1		0.96	0	105.2	26	0.9				
	LTE Band 41	Bottom of Laptop	0.005	0	105.6	99.4	1.2	209.8	0.94	0.00	Not required
	WLAN5GHz_Ant 2		0.935	0	0.81	-82.4	0.81				
	LTE Band 41	Bottom of Laptop	0.005	0	105.6	99.4	1.2	114.9	0.01	0.00	Not required
	Bluetooth_Ant 1		0.002	0	137	-8	27.5				
	WLAN5GHz_Ant 1	Bottom of Laptop	0.96	0	105.2	26	0.9	150.5	1.90	0.02	Not required
	WLAN5GHz_Ant 2		0.935	0	0.81	-82.4	0.81				
	WLAN5GHz_Ant 1	Bottom of Laptop	0.96	0	105.2	26	0.9	53.6	0.96	0.02	Not required
	Bluetooth_Ant 1		0.002	0	137	-8	27.5				
	WLAN5GHz_Ant 2	Bottom of Laptop	0.935	0	0.81	-82.4	0.81	157.5	0.94	0.01	Not required
	Bluetooth_Ant 1		0.002	0	137	-8	27.5				

	Band	Position	SAR (W/kg)	Gap (mm)	SAR peak location (cm)			3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
					X	Y	Z				
Case 11	LTE Band 66	Bottom of Laptop	0.064	0	107.2	109.9	1.09	83.9	1.02	0.01	Not required
	WLAN5GHz_Ant 1		0.96	0	105.2	26	0.9				
	LTE Band 66	Bottom of Laptop	0.064	0	107.2	109.9	1.09	219.8	1.00	0.00	Not required
	WLAN5GHz_Ant 2		0.935	0	0.81	-82.4	0.81				
	LTE Band 66	Bottom of Laptop	0.064	0	107.2	109.9	1.09	124.4	0.07	0.00	Not required
	Bluetooth_Ant 1		0.002	0	137	-8	27.5				
	WLAN5GHz_Ant 1	Bottom of Laptop	0.96	0	105.2	26	0.9	150.5	1.90	0.02	Not required
	WLAN5GHz_Ant 2		0.935	0	0.81	-82.4	0.81				
	WLAN5GHz_Ant 1	Bottom of Laptop	0.96	0	105.2	26	0.9	53.6	0.96	0.02	Not required
	Bluetooth_Ant 1		0.002	0	137	-8	27.5				
	WLAN5GHz_Ant 2	Bottom of Laptop	0.935	0	0.81	-82.4	0.81	157.5	0.94	0.01	Not required
	Bluetooth_Ant 1		0.002	0	137	-8	27.5				

Test Engineer : Jack Yang

14. Uncertainty Assessment

Per KDB 865664 D01 SAR measurement 100MHz to 6GHz, when the highest measured 1-g SAR within a frequency band is < 1.5 W/kg and the measured 10-g SAR within a frequency band is < 3.75 W/kg. The expanded SAR measurement uncertainty must be $\leq 30\%$, for a confidence interval of $k = 2$. If these conditions are met, extensive SAR measurement uncertainty analysis described in IEEE Std 1528-2013 is not required in SAR reports submitted for equipment approval. For this device, the highest measured 1-g SAR is less 1.5W/kg. Therefore, the measurement uncertainty table is not required in this report.

Declaration of Conformity:

The test results with all measurement uncertainty excluded is presented in accordance with the regulation limits or requirements declared by manufacturers.

Comments and Explanations:

The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.

15. References

- [1] FCC 47 CFR Part 2 "Frequency Allocations and Radio Treaty Matters; General Rules and Regulations"
- [2] ANSI/IEEE Std. C95.1-1992, "IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz", September 1992
- [3] IEEE Std. 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", Sep 2013
- [4] SPEAG DASY System Handbook
- [5] FCC KDB 248227 D01 v02r02, "SAR Guidance for IEEE 802.11 (WiFi) Transmitters", Oct 2015.
- [6] FCC KDB 447498 D01 v06, "Mobile and Portable Device RF Exposure Procedures and Equipment Authorization Policies", Oct 2015
- [7] FCC KDB 941225 D01 v03r01, "3G SAR MEAUREMENT PROCEDURES", Oct 2015
- [8] FCC KDB 941225 D05 v02r05, "SAR Evaluation Considerations for LTE Devices", Dec 2015
- [9] FCC KDB 941225 D05A v01r02, "Rel. 10 LTE SAR Test Guidance and KDB Inquiries", Oct 2015
- [10] FCC KDB 616217 D04 v01r02, "SAR Evaluation Considerations for Laptop, Notebook, Netbook and Tablet Computers", Oct 2015
- [11] FCC KDB 865664 D01 v01r04, "SAR Measurement Requirements for 100 MHz to 6 GHz", Aug 2015.
- [12] FCC KDB 865664 D02 v01r02, "RF Exposure Compliance Reporting and Documentation Considerations" Oct 2015.