TESTING
NVLAP LAB CODE 600118-0

SAR TEST REPORT

No. I22Z60412-SEM14

For

HMD Global Oy

Smart Phone

Model Name: TA-1448

with

Hardware Version: v1.0

Software Version: 04US_1_150

FCC ID: 2AJOTTA-1448

Issued Date: 2022-5-31

Note:

The test results in this test report relate only to the devices specified in this report. This report shall not be reproduced except in full without the written approval of CTTL.

Test Laboratory:

CTTL, Telecommunication Technology Labs, CAICT

No. 51, Xueyuan Road, Haidian District, Beijing, P. R. China 100191.

Tel:+86(0)10-62304633-2512, Fax:+86(0)10-62304633-2504

Email: cttl_terminals@caict.ac.cn, website: www.caict.ac.cn

REPORT HISTORY

Report Number	Revision	Issue Date	Description
I22Z60412-SEM014	Rev.0	2022-5-24	Initial creation of test report
I22Z60412-SEM014	Rev.0	2022-5-31	Values above 0.8 w/kg have been repeated and judgement on page 110.

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1 Test Laboratory

1.1 Testing Location

Company Name:	CTTL(Shouxiang)
Address:	No. 51 Shouxiang Science Building, Xueyuan Road, Haidian District, Beijing, P. R. China100191

1.2 Testing Environment

Temperature:	18°C~25°C,
Relative humidity:	30%~ 70%
Ground system resistance:	< 0.5 Ω
Ambient noise & Reflection:	< 0.012 W/kg

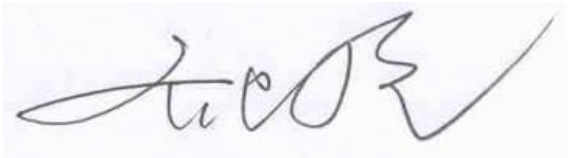
1.3 Project Data

Project Leader:	Qi Dianyuan
Test Engineer:	Lin Xiaojun
Testing Start Date:	May 5, 2022
Testing End Date:	May 20, 2022

1.4 Signature

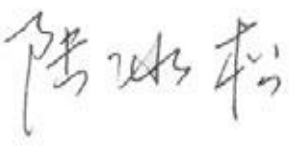
Lin Xiaojun

(Prepared this test report)



Qi Dianyuan

(Reviewed this test report)



Lu Bingsong

Deputy Director of the laboratory

(Approved this test report)

2 Statement of Compliance

The maximum results of Specific Absorption Rate (SAR) found during testing for HMD Global Oy Smart Phone TA-1448 are as follows:

Table 2.1: Highest Reported SAR -Standalone(1g)

Mode		Antenna	Highest Reported SAR (1g)	
			Head SAR	Body-worn SAR
GSM	GSM 850	0	0.32	0.71
	PCS 1900	2	0.34	0.40
WCDMA	UMTS FDD 2	2	0.96	0.58
	UMTS FDD 4	2	0.71	0.39
	UMTS FDD 5	0	0.42	0.62
LTE	LTE Band 2	0	0.13	0.18
	LTE Band 7	7	0.61	1.09
	LTE Band 12	0	0.10	0.51
	LTE Band 13	0	0.13	0.45
	LTE Band 25	2	0.77	0.54
	LTE Band 26	0	0.16	0.35
	LTE Band 41 PC3	4	0.38	0.54
	LTE Band 41 PC2	4	0.31	0.45
	LTE Band 66	2	0.48	0.39
	LTE Band 66	0	0.25	0.22
	LTE Band 71	0	0.11	0.55
NR SA/NSA	N25	2	0.67	0.37
	N41	4	0.73	0.23
	N66	2	0.48	0.27
	N77 3450M-3550M	5	0.61	0.60
	N77 3700M-3980M	5	1.05	0.88
	N71	0	0.23	0.47
WLAN 2.4 GHz		9	0.20	0.25
WLAN 5 GHz		9	0.17	0.44
BT		9	<0.01	<0.01

The SAR values found for the Mobile Phone are below the maximum recommended levels of 1.6 W/kg as averaged over any 1g tissue according to the ANSI C95.1-1992.

For body operation, this device has been tested and meets FCC RF exposure guidelines when used with any accessory that contains no metal and which provides a minimum separation distance of 10 mm for body worn between this device and the body of the user. Use of other accessories may not ensure compliance with FCC RF exposure guidelines.

The EUT battery must be fully charged and checked periodically during the test to ascertain uniform power output.

The measurement together with the test system set-up is described in annex C. A detailed description of the equipment under test can be found in chapter 4 of this test report. **The highest reported SAR for Head, Body Worn are 1.05W/kg, 1.09W/kg.**

Table 2.2: Highest Reported SAR -Simultaneous transmission

reported SAR 1g (W/kg)					
Body	WWAN		WIFI5G	BT	WWAN+WiFi2.4G +BT
	LTE Band66 ANT0	N71			
Right Edge 10mm	0.22	0.47	0.44	<0.01	1.13

According to the above tables, the highest sum of reported SAR values is **1.13 W/kg (1g)**. The detail for simultaneous transmission consideration is described in chapter 13.

3 Client Information

3.1 Applicant Information

Company Name:	HMD Global Oy
Address/Post:	Bertel Jungin aukio 9 02600 Espoo Finland
Contact Person:	/
E-mail:	/
Telephone:	/
Fax:	/

3.2 Manufacturer Information

Company Name:	HMD Global Oy
Address/Post:	Bertel Jungin aukio 9 02600 Espoo Finland
Contact Person:	/
E-mail:	/
Telephone:	/
Fax:	/

4 Equipment Under Test (EUT) and Ancillary Equipment (AE)

4.1 About EUT

Description:	Smart Phone
Model name:	TA-1448
Tested mode(s):	GSM8501900, WCDMA1900/1700/850, LTE Band 2/7/12/13/25/26/40/41/66/71 n25/n41/n66/n71/n77, BT, Wi-Fi (2.4G/5G),
Tested Tx Frequency:	824 – 849 MHz (GSM 850)
	1850 – 1910 MHz (GSM 1900)
	824–849 MHz (WCDMA 850 Band V)
	1710 – 1755 MHz (WCDMA 1700 Band IV)
	1850–1910 MHz (WCDMA1900 Band II)
	1850 – 1910 MHz(LTE Band 2)
	2500 – 2570 MHz(LTE Band 7)
	699 – 716 MHz (LTE Band 12)
	777 –787 MHz (LTE Band 13)
	1850.7 – 1914.3 MHz (LTE Band 25)
	814 – 849 MHz (LTE Band 26)
	2496 – 2690 MHz (LTE Band 41)
	1710 – 1780 MHz (LTE Band 66)
	665.5 – 695.5 MHz (LTE Band 71)
	1852.5 – 1912.5 MHz (NR n25)
	2506.02 – 2679.99 MHz (NR n41)
	2570 – 2620 MHz (NR n66)
	665.5 – 695.5 MHz (NR n71)
	3450 – 3550 MHz (NR n77L)
	3700 – 3980 MHz (NR n77H)
	2402 – 2480 MHz (Bluetooth)
	2412 – 2462 MHz (Wi-Fi 2.4G)
	5150-5825 MHz (Wi-Fi 5G)
GPRS/EGPRS Multislot Class:	12
GPRS capability Class:	B
Antenna type:	Integrated antenna
Hotspot mode:	Support
Note: 1. The n77 frequency is divided into two parts. The first part of the frequency range is 3700-3900MHz, represented by n77H, and the second part of the frequency range is 3450-3550 MHz, represented by n77L. 2. For 5G NR test, using FTM (Factory Test Mode) to perform SAR with default 100% transmission.	

4.2 Internal Identification of EUT used during the test

EUT ID*	IMEI/SN	HW	SW Version
EUT1	357713910027686	v1.0	04US_1_150
EUT2	357713910027603	v1.0	04US_1_150
EUT3	357713910053278	v1.0	04US_1_150
EUT4	357713910027736	v1.0	04US_1_150
EUT5	357713910027819	v1.0	04US_1_150
EUT6	357713910006557	v1.0	04US_1_150
EUT7	357713910006532	v1.0	04US_1_150
EUT8	357713910006326	v1.0	04US_1_150
EUT9	357713910006383	v1.0	04US_1_150

*EUT ID: is used to identify the test sample in the lab internally.

Note: It is performed to test SAR with the EUT1-5 and conducted power with the EUT6-9.

4.3 Internal Identification of AE used during the test

AE ID*	Description	Model	SN	Manufacturer
AE1	Battery	HQ610	/	Ningde Amperex Technology Limited
AE2	Battery	HQ610	/	GUANGDONG FENGHUA NEW ENERGY CO., LTD
AE3	Headset	JWEP239-H17H	/	JUWEI ELECTRONICS CO.,LTD

*AE ID: is used to identify the test sample in the lab internally.

5 TEST METHODOLOGY

5.1 Applicable Limit Regulations

ANSI C95.1–1992:IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz.

It specifies the maximum exposure limit of **1.6 W/kg** as averaged over any 1 gram of tissue for portable devices being used within 20 cm of the user in the uncontrolled environment.

5.2 Applicable Measurement Standards

IEEE 1528–2013: Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques.

KDB447498 D01: General RF Exposure Guidance v06: Mobile and Portable Devices RF Exposure Procedures and Equipment Authorization Policies.

KDB648474 D04 Handset SAR v01r03: SAR Evaluation Considerations for Wireless Handsets.

KDB941225 D01 SAR test for 3G devices v03r01: SAR Measurement Procedures for 3G Devices

KDB941225 D05 SAR for LTE Devices v02r05: SAR Evaluation Considerations for LTE Devices

KDB941225 D06 Hotspot Mode SAR v02r01: SAR Evaluation Procedures for Portable Devices with Wireless Router Capabilities

KDB248227 D01 802.11 Wi-Fi SAR v02r02: SAR GUIDANCE FOR IEEE 802.11 (Wi-Fi) TRANSMITTERS

KDB865664 D01SAR measurement 100 MHz to 6 GHz v01r04: SAR Measurement Requirements for 100 MHz to 6 GHz.

KDB865664 D02RF Exposure Reporting v01r02: RF Exposure Compliance Reporting and Documentation Considerations

6 Specific Absorption Rate (SAR)

6.1 Introduction

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

6.2 SAR Definition

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

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

SAR is expressed in units of Watts per kilogram (W/kg)
SAR measurement can be either related to the temperature elevation in tissue by

$$SAR = c\left(\frac{\delta T}{\delta t}\right)$$

Where: C is the specific head capacity, δT is the temperature rise and δt is the exposure duration, or related to the electrical field in the tissue by

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

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

However for evaluating SAR of low power transmitter, electrical field measurement is typically applied.

7 Tissue Simulating Liquids

The temperature of the tissue-equivalent medium used during measurement must also be within 18 °C to 25 °C and within ± 2 °C of the temperature when the tissue parameters are characterized. The dielectric parameters must be measured before the tissue-equivalent medium is used in a series of SAR measurements. The parameters should be re-measured after each 3 – 4 days of use; or earlier if the dielectric parameters can become out of tolerance; for example, when the parameters are marginal at the beginning of the measurement series.

The dielectric constant (εr) and conductivity (σ) of typical tissue-equivalent media recipes are expected to be within ± 5% of the required target values; but for SAR measurement systems that have implemented the SAR error compensation algorithms documented in IEEE Std 1528-2013, to automatically compensate the measured SAR results for deviations between the measured and required tissue dielectric parameters, the tolerance for εr and σ may be relaxed to ± 10%. This is limited to frequencies ≤ 3 GHz.

7.1 Targets for tissue simulating liquid

Table 7.1: Targets for tissue simulating liquid

Frequency(MHz)	Liquid Type	Conductivity(σ)	±10% Range	Permittivity(ε)	± 10% Range
750	Head	0.89	0.80～0.98	41.94	37.75～46.13
835	Head	0.90	0.81～0.99	41.5	37.35～45.65
1750	Head	1.40	1.26～1.54	40.0	36～44
1900	Head	1.40	1.26～1.54	40.0	36～44
2450	Head	1.80	1.62～1.98	39.2	35.28～43.12
2600	Head	1.96	1.76～2.16	39.01	35.11～42.91

Table 7.2: Targets for tissue simulating liquid

Frequency(MHz)	Liquid Type	Conductivity(σ)	± 5% Range	Permittivity(ε)	± 5% Range
3700	Head	3.12	2.96～3.28	37.70	35.82～39.59
3900	Head	3.32	3.15～3.49	37.47	35.6～39.34
5250	Head	4.71	4.47～4.95	35.93	34.13～37.73
5600	Head	5.07	4.82～5.32	35.53	33.8～37.3
5750	Head	5.22	4.96～5.48	35.36	33.59～37.13

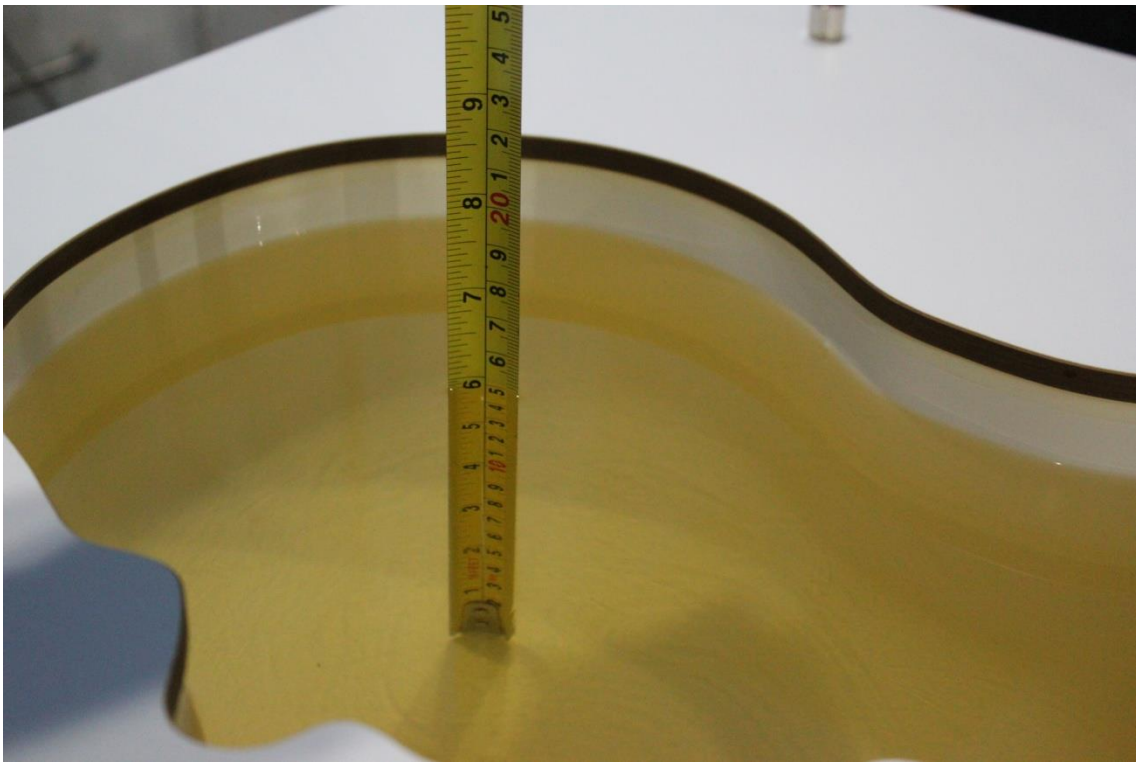
7.2 Dielectric Performance

Table 7.3: Dielectric Performance of Tissue Simulating Liquid

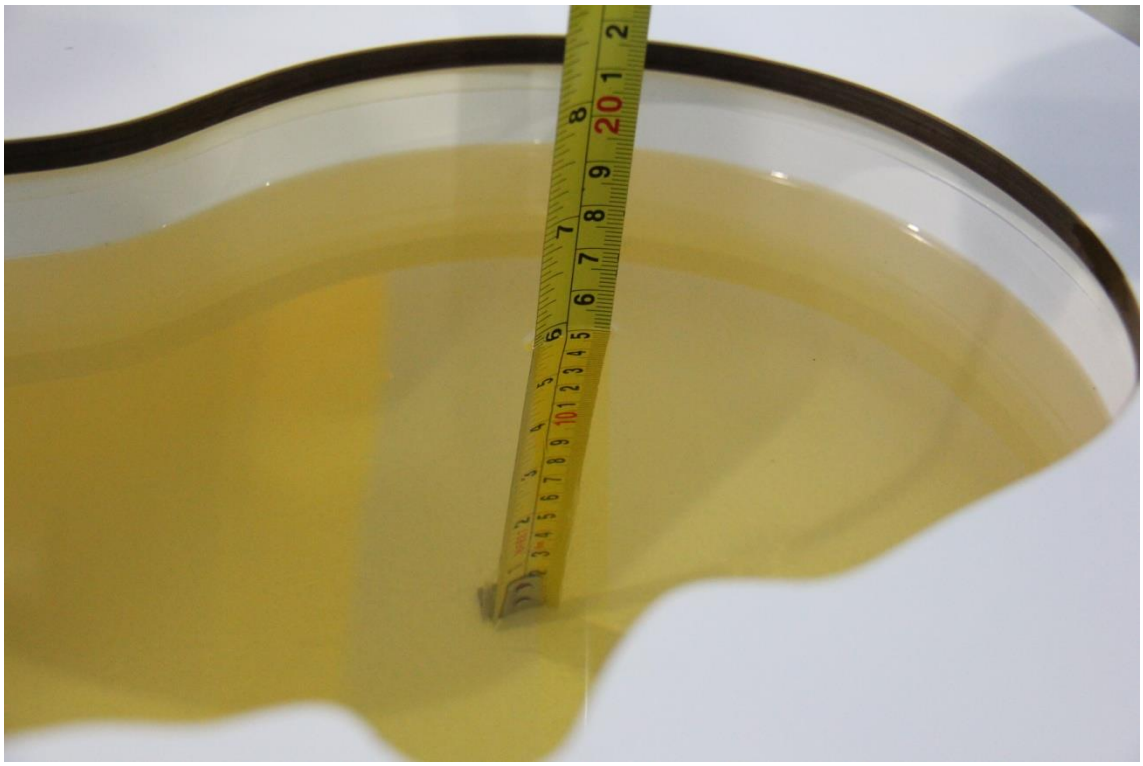
Measurement Date yyyy/mm/dd	Frequency	Type	Permittivity ε	Drift (%)	Conductivity σ (S/m)	Drift (%)
2022/5/5	750 MHz	Head	42.07	0.31	0.897	0.79
2022/5/6	750 MHz	Head	41.89	-0.12	0.874	-1.80
2022/5/7	835 MHz	Head	40.84	-1.59	0.903	0.33
2022/5/8	835 MHz	Head	40.8	-1.69	0.889	-1.22
2022/5/9	1750 MHz	Head	40.1	0.05	1.38	0.73
2022/5/10	1750 MHz	Head	39.45	-1.57	1.37	0.00

2022/5/11	1900 MHz	Head	39.44	-1.40	1.397	-0.21
2022/5/12	1900 MHz	Head	39.61	-0.98	1.387	-0.93
2022/5/13	2600 MHz	Head	39.73	1.85	1.971	0.56
2022/5/14	2600 MHz	Head	39	-0.03	1.999	1.99
2022/5/15	2450 MHz	Head	39.32	0.31	1.815	0.83
2022/5/16	5250 MHz	Head	35.89	-0.11	4.626	-1.78
2022/5/17	5600 MHz	Head	34.97	-1.58	5.085	0.30
2022/5/18	5750 MHz	Head	34.77	-1.67	5.154	-1.26
2022/5/18	750 MHz	Head	42.07	0.31	0.897	0.79
2022/5/19	1750 MHz	Head	40.03	-0.12	1.346	-1.75
2022/5/20	1900 MHz	Head	39.36	-1.60	1.404	0.29
2022/5/21	2600 MHz	Head	38.36	-1.67	1.935	-1.28
2022/5/22	3500 MHz	Head	37.72	0.05	3.142	0.71
2022/5/23	3900 MHz	Head	36.88	-1.57	3.321	0.03
2022/5/19	1750 MHz	Head	40.21	0.32	1.381	0.80
2022/5/20	1900 MHz	Head	39.95	-0.12	1.375	-1.79

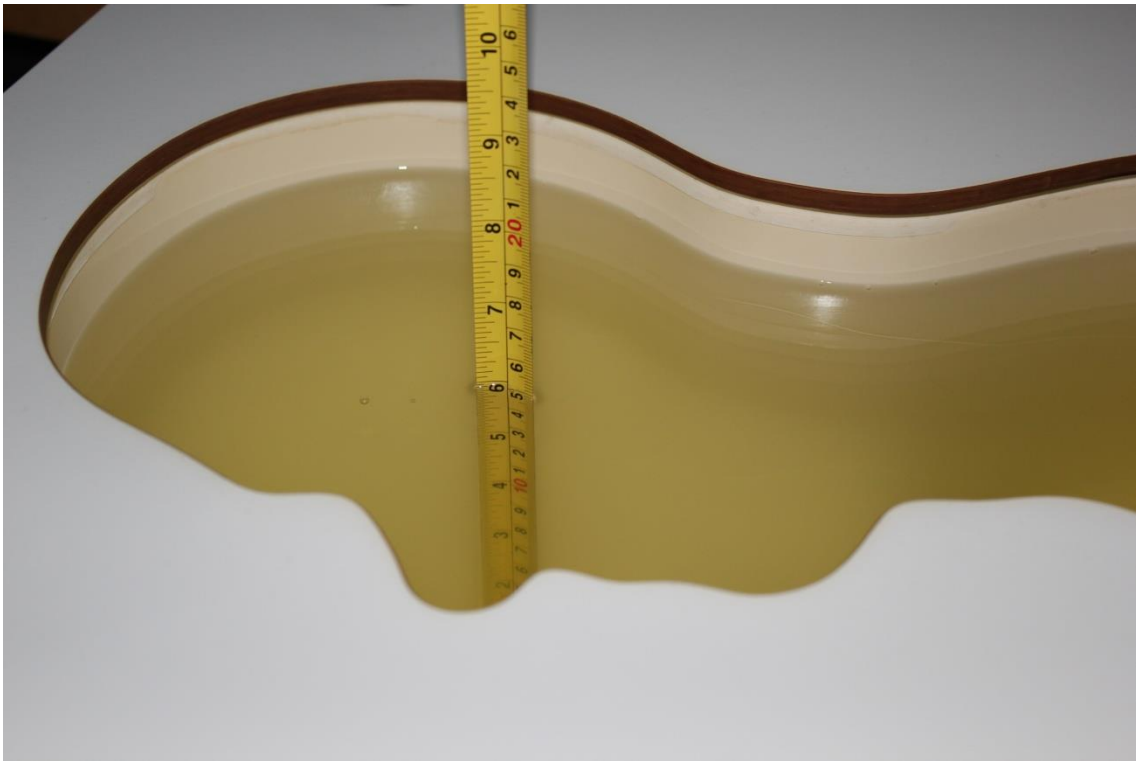
Note: The liquid temperature is (22.0 -23.0)°C



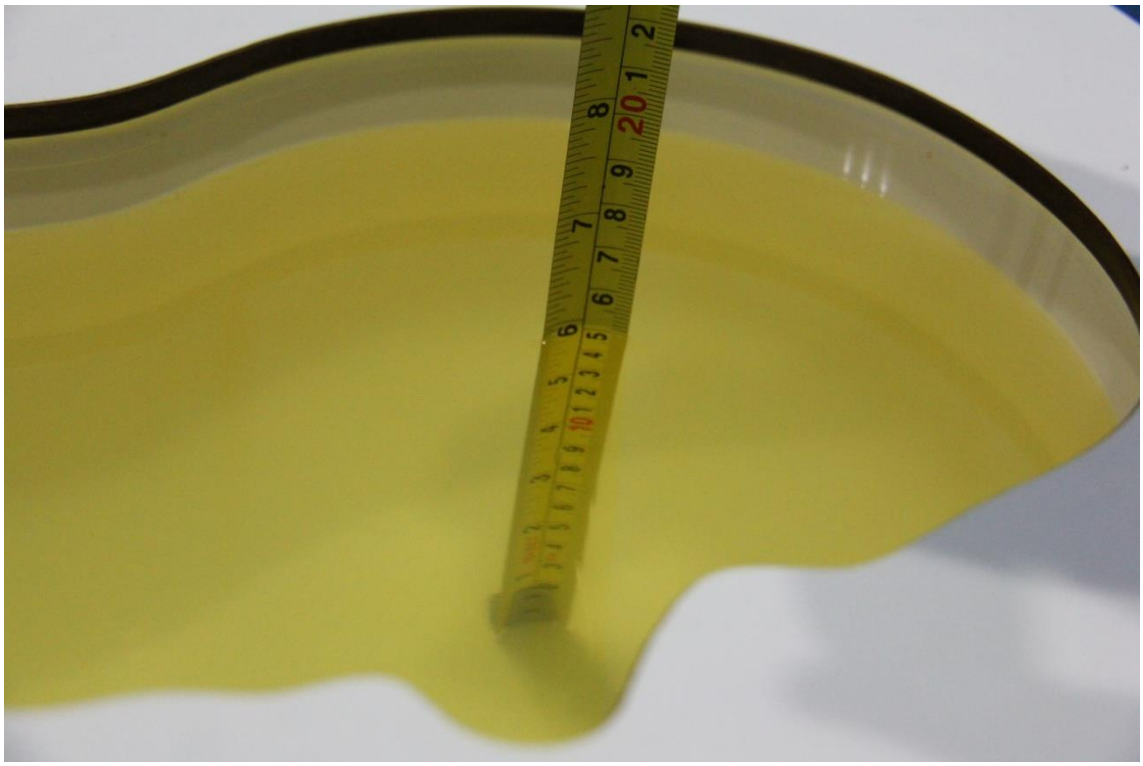
Picture 7-1 Liquid depth in the Head Phantom (750MHz)



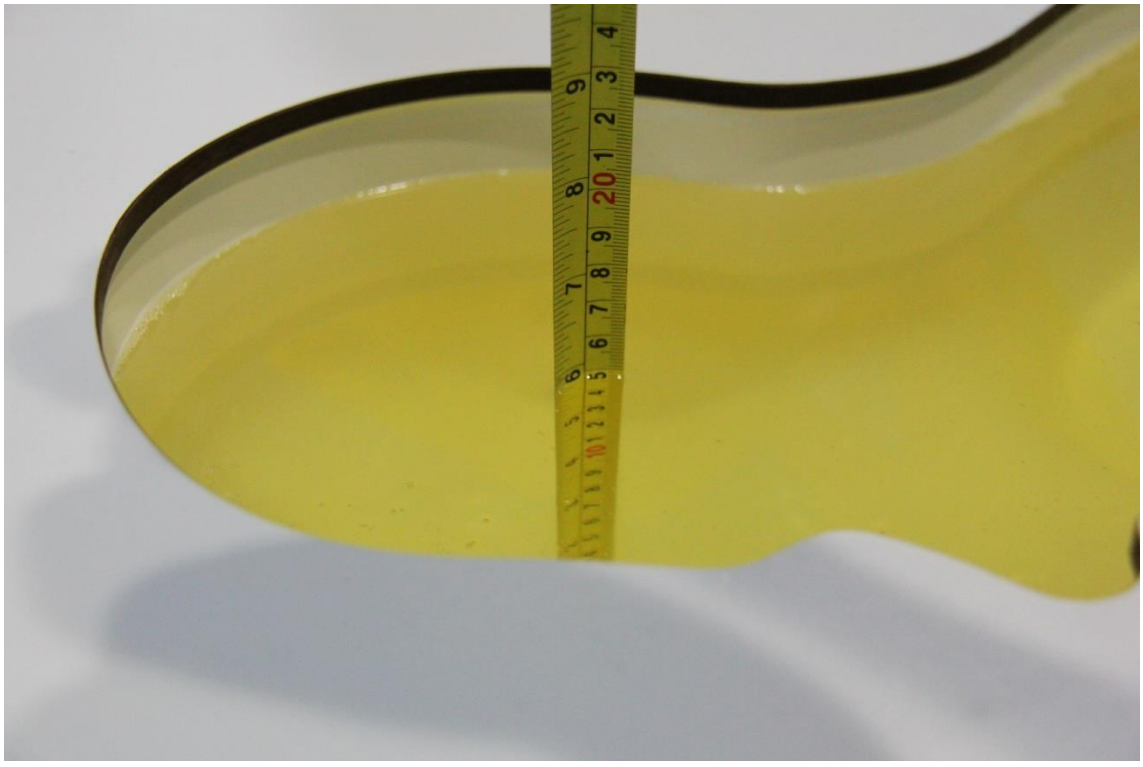
Picture 7-2 Liquid depth in the Head Phantom (835 MHz)



Picture 7-3 Liquid depth in the Head Phantom (1750 MHz)



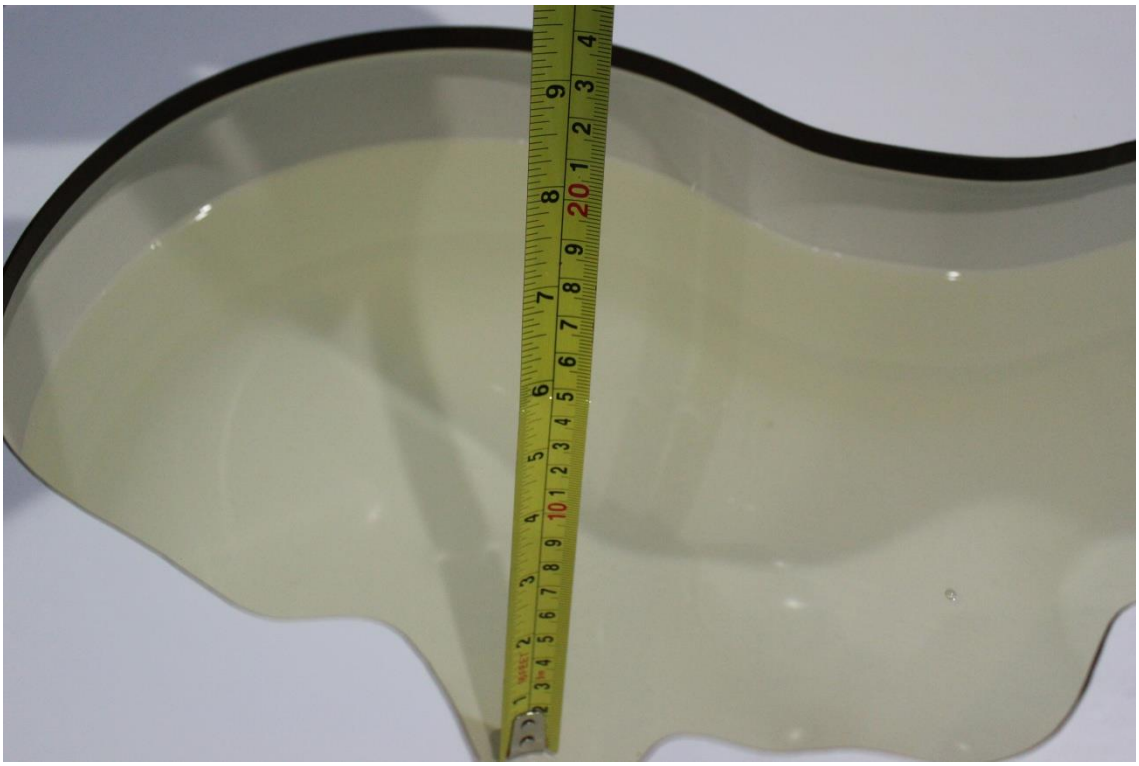
Picture 7-4 Liquid depth in the Head Phantom (1900 MHz)



Picture 7-5 Liquid depth in the Head Phantom (2450MHz)

Picture 7-6 Liquid depth in the Head Phantom (2600 MHz)

Picture 7-7 Liquid depth in the Head Phantom (3500-3900 MHz)

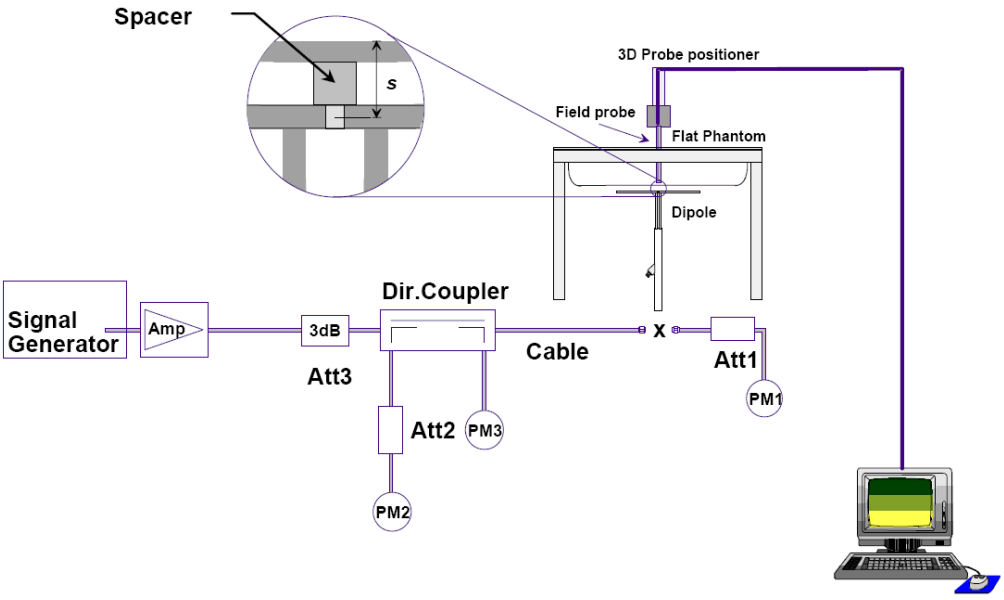


Picture 7-8 Liquid depth in the Head Phantom (5GHz)

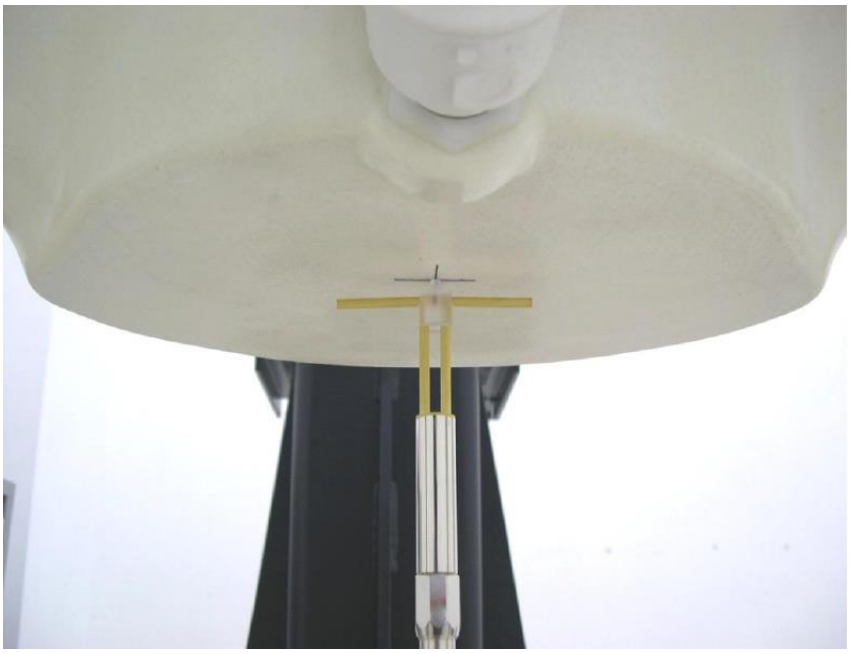
8 System verification

8.1 System Setup

In the simplified setup for system evaluation, the DUT is replaced by a calibrated dipole and the power source is replaced by a continuous wave that comes from a signal generator. The calibrated dipole must be placed beneath the flat phantom section of the SAM twin phantom with the correct distance holder. The distance holder should touch the phantom surface with a light pressure at the reference marking and be oriented parallel to the long side of the phantom. The equipment setup is shown below:



Picture 8.1 System Setup for System Evaluation



Picture 8.2 Photo of Dipole Setup

8.2 System Verification

SAR system verification is required to confirm measurement accuracy, according to the tissue dielectric media, probe calibration points and other system operating parameters required for measuring the SAR of a test device. The system verification must be performed for each frequency band and within the valid range of each probe calibration point required for testing the device.

Table 8.1: System Verification of Head

Calibration Date	Frequency	Target value (W/kg)		Measured value (W/kg)		Deviation	
		10 g Average	1 g Average	10 g Average	1 g Average	10 g Average	1 g Average
2022/5/5	750 MHz	5.53	8.47	5.6	8.44	1.27%	-0.35%
2022/5/6	750 MHz	5.53	8.47	5.48	8.52	-0.90%	0.59%
2022/5/7	835 MHz	6.25	9.60	6.24	9.48	-0.16%	-1.25%
2022/5/8	835 MHz	6.25	9.60	6.36	9.64	1.76%	0.42%
2022/5/9	1750 MHz	19.1	36.5	18.92	36	-0.94%	-1.37%
2022/5/10	1750 MHz	19.1	36.5	19.2	35.76	0.52%	-2.03%
2022/5/11	1900 MHz	20.6	39.6	20.96	39.76	1.75%	0.40%
2022/5/12	1900 MHz	20.6	39.6	20.68	39.12	0.39%	-1.21%
2022/5/13	2600 MHz	25.3	57.0	25.32	57.12	0.08%	0.21%
2022/5/14	2600 MHz	25.3	57.0	25.68	56.96	1.50%	-0.07%
2022/5/15	2450 MHz	24.5	52.5	24.88	52.24	1.55%	-0.50%
2022/5/16	5250 MHz	22.9	80.5	22.7	81.1	-0.96%	0.77%
2022/5/17	5600 MHz	23.6	83.3	23.5	82.2	-0.34%	-1.37%
2022/5/18	5750 MHz	22.7	80.4	23.1	80.6	1.67%	0.25%
2022/5/18	750 MHz	5.53	8.47	5.6	8.44	1.27%	-0.35%
2022/5/19	1750 MHz	19.1	36.5	18.92	36.8	-0.94%	0.82%
2022/5/20	1900 MHz	20.6	39.6	20.52	39.08	-0.39%	-1.31%
2022/5/21	2600 MHz	25.3	57.0	25.72	57.12	1.66%	0.21%
2022/5/22	3500 MHz	25.2	67.3	25.0	66.4	-0.95%	-1.40%
2022/5/23	3900 MHz	24.1	69.3	24.2	67.9	0.58%	-1.99%
2022/5/19	1750 MHz	19.1	36.5	19.4	36.32	1.57%	-0.49%
2022/5/20	1900 MHz	20.6	39.6	20.4	39.92	-0.97%	0.81%

9 General Measurement Procedure

9.1 *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.

9.2 *Area Scan*

The area scan is used as a fast scan in two dimensions to find the area of high field values, before doing a fine measurement around the hot spot. The sophisticated interpolation routines implemented in DASY software can find the maximum found in the scanned area, within a range of the global maximum. The range (in dB0 is specified in the standards for compliance testing. For example, a 2 dB range is required in IEEE standard 1528 and IEC 62209 standards, whereby 3 dB is a requirement when compliance is assessed in accordance with the ARIB standard (Japan), if only one zoom scan follows the area scan, then only the absolute maximum will be taken as reference. For cases where multiple maximums are detected, the number of zoom scans has to be increased accordingly.
Area scan parameters extracted from FCC KDB 865664 D01v01r04 SAR measurement 100 MHz to 6 GHz.

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

9.3 *Zoom Scan*

Zoom Scans are used to assess the peak spatial SAR values within a cubic averaging volume containing 1 g and 10g 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 g and 10 g and displays these values next to the job’s label.

Zoom Scan Parameters extracted from KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz

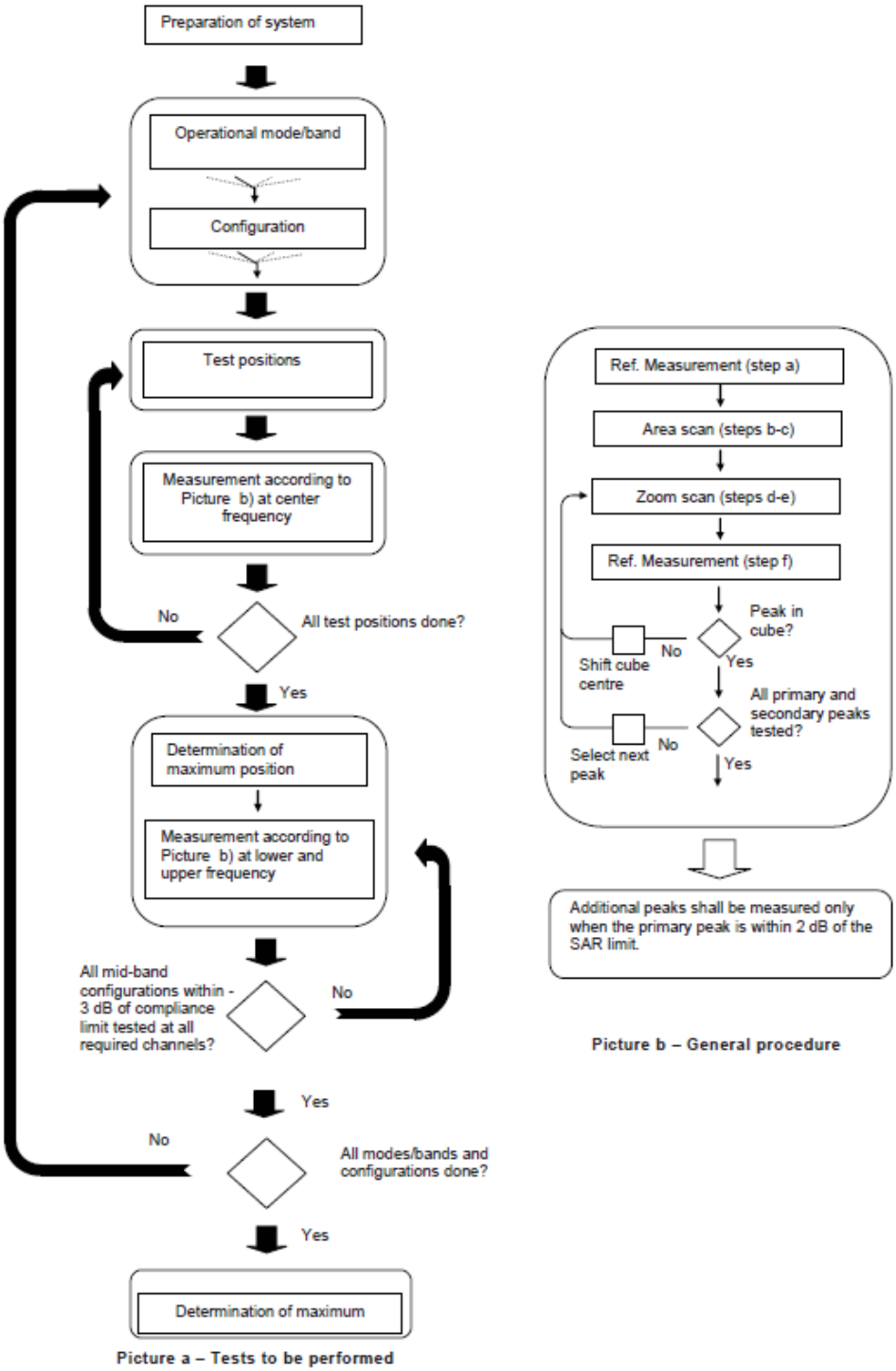
Maximum zoom scan spatial resolution: Δx_{Zoom}, Δy_{Zoom}			≤ 2 GHz: ≤ 8 mm 2 – 3 GHz: ≤ 5 mm*	3 – 4 GHz: ≤ 5 mm* 4 – 6 GHz: ≤ 4 mm*
Maximum zoom scan spatial resolution, normal to phantom surface	uniform grid: $\Delta z_{Zoom}(n)$		≤ 5 mm	3 – 4 GHz: ≤ 4 mm 4 – 5 GHz: ≤ 3 mm 5 – 6 GHz: ≤ 2 mm
	graded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

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

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

9.4 *Power drift measurement*

The Power Drift Measurement measures the field at the same location as the most recent power reference measurement within the same procedure, and with the same settings. The Power Drift Measurement gives the field difference in dB from the reading conducted within the last Power Reference Measurement. This allows a user to monitor the power drift of the device under test within a batch process. The measurement procedure is the same as 10.1.



Picture a – Tests to be performed

Picture b – General procedure

Picture 9.1Block diagram of the tests to be performed

9.5 *Area Scan Based 1-g SAR*

9.5-1 Requirement of KDB

According to the KDB447498 D01 v06, when the implementation is based the specific polynomial fit algorithm as presented at the 29th Bioelectromagnetics Society meeting (2007) and the estimated 1-gSAR is ≤ 1.2 W/kg, a zoom scan measurement is not required provided it is also not needed for any other purpose; for example, if the peak SAR location required for simultaneous transmission SAR test exclusion can be determined accurately by the SAR system or manually to discriminate between distinctive peaks and scattered noisy SAR distributions from area scans.

There must not be any warning or alert messages due to various measurement concerns identified by the SAR system; for example, noise in measurements, peaks too close to scan boundary, peaks are too sharp, spatial resolution and uncertainty issues etc. The SAR system verification must also demonstrate that the area scan estimated 1-g SAR is within 3% of the zoom scan 1-g SAR (See Annex B). When all the SAR results for each exposure condition in a frequency band and wireless mode are based on estimated 1-g SAR, the 1-g SAR for the highest SAR configuration must be determined by a zoom scan.

9.5-2 Fast SAR Algorithms

The approach is based on the area scan measurement applying a frequency dependent attenuation parameter. This attenuation parameter was empirically determined by analyzing a large number of phones. The MOTOROLA FAST SAR was developed and validated by the MOTOROLA Research Group in Ft. Lauderdale.

In the initial study, an approximation algorithm based on Linear fit was developed. The accuracy of the algorithm has been demonstrated across a broad frequency range (136-2450 MHz)and for both 1- and 10-g averaged SAR using a sample of 264 SAR measurements from 55wireless handsets. For the sample size studied, the root-mean-squared errors of the algorithm mare 1.2% and 5.8% for 1- and 10-g averaged SAR, respectively. The paper describing the algorithm in detail is expected to be published in August 2004 within the Special Issue of Transactions on MTT.

In the second step, the same research group optimized the fitting algorithm to an Polynomial fit whereby the frequency validity was extended to cover the range 30-6000MHz. Details of this study can be found in the BEMS 2007 Proceedings.

Both algorithms are implemented in DASY software.

10 Measurement Procedure for different technologies

10.1 GSM/GPRS Measurement Procedures for SAR

GSM / GPRS / EDGE modes is determined by the source-based time-averaged output power including tune-up tolerance. The mode with highest specified time-averaged output power should be tested for SAR compliance in the applicable exposure conditions. For modes with the same specified maximum output power and tolerance, the higher number time-slot configuration should be tested. Other configurations of GSM / GPRS / EDGE are considered as secondary modes. The 3G SAR test reduction procedure is applied, when the maximum output power and tune-up tolerance specified for production units in a secondary mode is ≤ ¼ dB higher than the primary mode, SAR measurement is not required for the secondary mode.

10.2 WCDMA Measurement Procedures for SAR

The following procedures are applicable to WCDMA handsets operating under 3GPP Release99, Release 5 and Release 6. The default test configuration is to measure SAR with an established radio link between the DUT and a communication test set using a 12.2kbps RMC (reference measurement channel) configured in Test Loop Mode 1. SAR is selectively confirmed for other physical channel configurations (DPCCH & $DPDCH_n$), HSDPA and HSPA (HSUPA/HSDPA) modes according to output power, exposure conditions and device operating capabilities. Both uplink and downlink should be configured with the same RMC or AMR, when required. SAR for Release 5 HSDPA and Release 6 HSPA are measured using the applicable FRC (fixed reference channel) and E-DCH reference channel configurations. Maximum output power is verified according to applicable versions of 3GPP TS 34.121 and SAR must be measured according to these maximum output conditions. When Maximum Power Reduction (MPR) is not implemented according to Cubic Metric (CM) requirements for Release 6 HSPA, the following procedures do not apply.

For Release 5 HSDPA Data Devices:

Sub-test	β_c	β_d	β_d （SF）	β_c/β_d	β_{hs}	CM/dB
1	2/15	15/15	64	2/15	4/15	0.0
2	12/15	15/15	64	12/15	24/25	1.0
3	15/15	8/15	64	15/8	30/15	1.5
4	15/15	4/15	64	15/4	30/15	1.5

For Release 6 HSPA Data Devices

Sub-test	β_c	β_d	β_d （SF）	β_c/β_d	β_{hs}	β_{ec}	β_{ed}	β_{ed} （SF）	β_{ed} （codes）	CM (dB)	MPR (dB)	AG Index	E-TFCI
1	11/15	15/15	64	11/15	22/15	209/225	1039/225	4	1	1.5	1.5	20	75
2	6/15	15/15	64	6/15	12/15	12/15	12/15	4	1	1.5	1.5	12	67
3	15/15	9/15	64	15/9	30/15	30/15	β_{ed1}:47/15	4	2	1.5	1.5	15	92

							β_{ed2}:47/15						
4	2/15	15/15	64	2/15	4/15	4/15	56/75	4	1	1.5	1.5	17	71
5	15/15	15/15	64	15/15	24/15	30/15	134/15	4	1	1.5	1.5	21	81

Rel.7 Release 7 HSPA+ Data Devices

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

Sub-test	β_c (Note3)	β_d	β_{HS} (Note1)	β_{ec}	β_{ed} (2xSF2) (Note 4)	β_{ed} (2xSF4) (Note 4)	CM (dB) (Note 2)	MPR (dB) (Note 2)	AG Index (Note 4)	E-TFCI (Note 5)	E-TFCI (boost)
1	1	0	30/15	30/15	β_{ed}1: 30/15 β_{ed}2: 30/15	β_{ed}3: 24/15 β_{ed}4: 24/15	3.5	2.5	14	105	105

Note 1: Δ_{ACK}, Δ_{NACK} and Δ_{CQI} = 30/15 with β_{hs} = 30/15 * β_c.
Note 2: CM = 3.5 and the MPR is based on the relative CM difference, MPR = MAX(CM-1,0).
Note 3: DPDCH is not configured, therefore the β_c is set to 1 and β_d = 0 by default.
Note 4: β_{ed} can not be set directly; it is set by Absolute Grant Value.
Note 5: All the sub-tests require the UE to transmit 2SF2+2SF4 16QAM EDCH and they apply for UE using E-DPDCH category 7. E-DCH TTI is set to 2ms TTI and E-DCH table index = 2. To support these E-DCH configurations DPDCH is not allocated. The UE is signalled to use the extrapolation algorithm.

Rel.8 DC-HSDPA (Cat 24)

SAR test exclusion for Rel.8 DC-HSDPA must satisfy the SAR test exclusion requirements of Rel.5 HSDPA. SAR test exclusion for DC-HSDPA devices is determined by power measurements according to the H-Set 12, Fixed Reference Channel (FRC) configuration in Table C.8.1.12 of 3GPP TS 34.121-1. A primary and a secondary serving HS-DSCH Cell are required to perform the power measurement and for the results to qualify for SAR test exclusion.

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.

10.3 LTE Measurement Procedures for SAR

SAR tests for LTE are performed with a base station simulator, Rohde & Rchwarz CMW500 or . Anritsu MT8821C Closed loop power control was used so the UE transmits with maximum output power during SAR testing.

It is performed for conducted power and SAR based on the KDB941225 D05.

SAR is evaluated separately according to the following procedures for the different test positions in each exposure condition – head, body, body-worn accessories and other use conditions. The procedures in the following subsections are applied separately to test each LTE frequency band.

1) QPSK with 1 RB allocation

   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 among RB offsets at the upper edge, middle and lower edge of each required test channel. When the reported SAR is ≤ 0.8 W/kg, testing of the remaining RB offset configurations and required test channels is not required for 1 RB allocation; otherwise, SAR is required for the remaining required test channels and only for the RB offset configuration with the highest output power for that channel. When the reported SAR of a required test channel is > 1.45 W/kg, SAR is required for all three RB offset configurations for that required test channel.

2) QPSK with 50% RB allocation

   The procedures required for 1 RB allocation in 1) are applied to measure the SAR for QPSK with 50% RB allocation.

3) QPSK with 100% RB allocation

   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 in 1) and 2) 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.

TDD test:

TDD testing is performed using guidance from FCC KDB 941225 D05 v02r05 and the SAR test guidance provided in April 2013 TCB works hop notes. TDD is tested at the highest duty factor using UL-DL configuration 0 with special subframe configuration 6 and applying the FDD LTE procedures in KDB 941225 D05 v02r05. SAR testing is performed using the extended cyclic prefix listed in 3GPP TS 36.211.

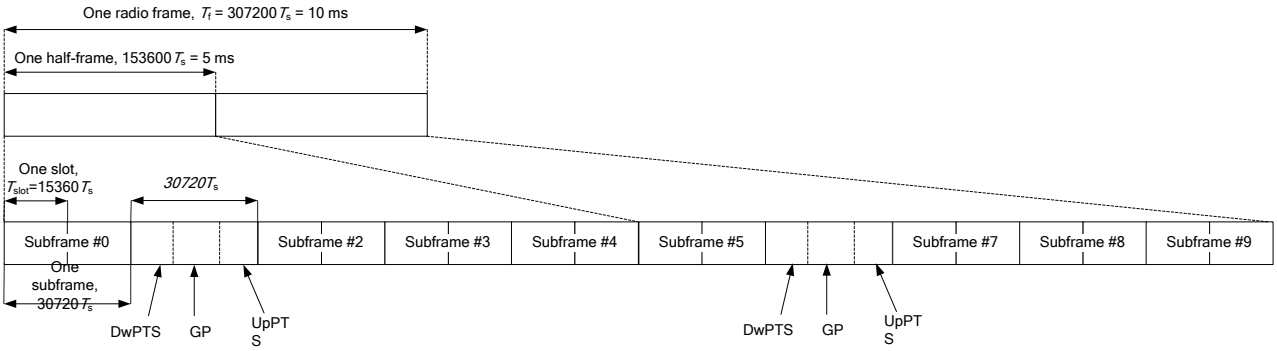


Figure 10.2: Frame structure type 2 (for 5 ms switch-point periodicity)

Table 10.1: Configuration of special subframe (lengths of DwPTS/GP/UpPTS)

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

Table 10.2: 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

Duty factor is calculated by:

Duty factor = uplink frame*6+UpPTS*2/one frame length

= (30720.T_s * 6+5120. T_s*2)/307200.T_s

= 0.633

According to the KDB 447498 D01, SAR should be evaluated at more than 3 frequencies for devices supporting transmit bands wider than 100MHz. Oct.2014 FCC-TCB conference notes (Dec. 2014 rev.) specifies the 5 test channels to use for 3GPP band 38/41 SAR evaluation.

10.4 Bluetooth & Wi-Fi Measurement Procedures for SAR

Normal network operating configurations are not suitable for measuring the SAR of 802.11 transmitters in general. Unpredictable fluctuations in network traffic and antenna diversity conditions can introduce undesirable variations in SAR results. The SAR for these devices should be measured using chipset based test mode software to ensure that the results are consistent and reliable.

Chipset based test mode software is hardware dependent and generally varies among manufacturers. The device operating parameters established in a test mode for SAR measurements must be identical to those programmed in production units, including output power levels, amplifier gain settings and other RF performance tuning parameters. The test frequencies should correspond to actual channel frequencies defined for domestic use. SAR for devices with switched diversity should be measured with only one antenna transmitting at a time during each SAR measurement, according to a fixed modulation and data rate. The same data pattern should be used for all measurements.

10.5 SAR Measurement for ENDC

1. Test LTE SAR with single uplink at maximum power following LTE SAR test procedure.
2. Test conducted power of 5G NR sub-carrier under EN-DC at maximum power (FDD and TDD)[1] and change the different parameters to find the worst-case configuration, see detail procedure as attached.

[1] For TDD band (n41), PC2 mode is only tested, because the duty cycle of both PC2 and PC3 are the same and PC2 has higher power than PC3.

3. Test SAR in worst case configuration for 5G NR in single uplink (test mode).
4. If the single uplink 1g SAR values for 5G NR and LTE are both less than 0.8W/kg and the algebraic summation of the 1g SAR values are less than 1.45W/kg, no additional measurements need to be performed.

11 Conducted Output Power

Antenna	Receiver ON (Head scenario)	Receiver OFF/ Sensor On (Body scenario)	Receiver OFF/ Sensor Off (Body scenario)
Standalone	Low Power	Low Power	Normal Power

11.1 GSM Measurement result

GSM850(Normal Power)

GSM 850 Speech（GMSK）	Measured timeslot-averaged output power (dBm)			Tune up	calculation	Source-based time-averaged output power (dBm)		
	251	**190**	**128**			**251**	**190**	**128**
1Txslot	32.73	32.96	32.83	33.50	/	/	/	/
GSM 850 GPRS（GMSK）	Measured timeslot-averaged output power (dBm)			Tune up	calculation	Source-based time-averaged output power (dBm)		
	251	**190**	**128**			**251**	**190**	**128**
1Txslot	32.91	32.91	32.93	33.50	-9.03	23.88	23.88	23.90
2Txslots	**31.20**	**31.14**	**31.04**	**32.00**	**-6.02**	**25.18**	**25.12**	**25.02**
3Txslots	29.07	29.06	28.99	30.00	-4.26	24.81	24.80	24.73
4Txslots	27.05	27.04	27.08	28.00	-3.01	24.04	24.03	24.07
GSM 850 EGPRS (GMSK)	Measured timeslot-averaged output power (dBm)					Source-based time-averaged output power (dBm)		
	251	**190**	**128**			**251**	**190**	**128**
1Txslot	32.86	32.88	32.86	33.50	-9.03	23.83	23.85	23.83
2Txslots	**31.13**	**31.09**	**30.98**	**32.00**	**-6.02**	**25.11**	**25.07**	**24.96**
3Txslots	29.00	29.01	28.93	30.00	-4.26	24.74	24.75	24.67
4Txslots	26.97	26.98	27.02	28.00	-3.01	23.96	23.97	24.01
GSM 850 EGPRS(8PSK)	Measured timeslot-averaged output power (dBm)					Source-based time-averaged output power (dBm)		
	251	**190**	**128**			**251**	**190**	**128**
1Txslot	26.84	26.88	26.90	28.00	-9.03	17.81	17.85	17.87
2Txslots	24.83	25.10	24.86	26.00	-6.02	18.81	19.08	18.84
3Txslots	23.73	22.82	23.58	24.00	-4.26	19.47	18.56	19.32
4Txslots	21.00	20.99	21.01	22.00	-3.01	17.99	17.98	18.00
GSM 1900 Speech（GMSK）	Measured timeslot-averaged output power (dBm)			Tune up	calculation	Source-based time-averaged output power (dBm)		
	810	**661**	**512**			**810**	**661**	**512**
1Txslot	29.72	29.75	29.49	30.50	/	/	/	/
GSM 1900 GPRS（GMSK）	Measured timeslot-averaged output power (dBm)			Tune up	calculation	Source-based time-averaged output power (dBm)		
	810	**661**	**512**			**810**	**661**	**512**
1Txslot	29.83	29.98	29.67	30.50	-9.03	20.80	20.95	20.64
2Txslots	**28.05**	**28.00**	**27.89**	**29.00**	**-6.02**	**22.03**	**21.98**	**21.87**
3Txslots	25.89	25.95	25.96	27.00	-4.26	21.63	21.69	21.70
4Txslots	24.13	24.14	24.11	25.00	-3.01	21.12	21.13	21.10
GSM 1900 EGPRS (GMSK)	Measured timeslot-averaged output power (dBm)					Source-based time-averaged output power (dBm)		
	810	**661**	**512**			**810**	**661**	**512**
1Txslot	29.96	29.84	29.60	30.50	-9.03	20.93	20.81	20.57

2Txslots	**28.02**	**27.86**	**27.81**	**29.00**	**-6.02**	**22.00**	**21.84**	**21.79**
3Txslots	26.00	25.82	25.87	27.00	-4.26	21.74	21.56	21.61
4Txslots	23.98	23.99	24.01	25.00	-3.01	20.97	20.98	21.00
GSM 1900 EGPRS(8PSK)	Measured timeslot-averaged output power (dBm)					Source-based time-averaged output power (dBm)		
	810	**661**	**512**			**810**	**661**	**512**
1Txslot	26.10	26.16	26.12	27.00	-9.03	17.07	17.13	17.09
2Txslots	24.22	23.73	24.08	25.00	-6.02	18.20	17.71	18.06
3Txslots	21.77	21.73	21.65	23.00	-4.26	17.51	17.47	17.39
4Txslots	19.73	19.86	19.48	21.00	-3.01	16.72	16.85	16.47

GSM1900(Low Power)

GSM 1900 Speech（GMSK）	Measured timeslot-averaged output power (dBm)			Tune up	calculation	Source-based time-averaged output power (dBm)		
	810	**661**	**512**			**810**	**661**	**512**
1Txslot	21.91	21.89	21.87	22.50	/	/	/	/
GSM 1900 GPRS（GMSK）	Measured timeslot-averaged output power (dBm)			Tune up	calculation	Source-based time-averaged output power (dBm)		
	810	**661**	**512**			**810**	**661**	**512**
1Txslot	**21.92**	**21.92**	**21.91**	**22.50**	**-9.03**	**12.89**	**12.89**	**12.88**
2Txslots	18.01	17.97	17.91	18.50	-6.02	11.99	11.95	11.89
3Txslots	16.52	16.47	16.45	17.00	-4.26	12.26	12.21	12.19
4Txslots	15.05	14.95	15.06	15.50	-3.01	12.04	11.94	12.05
GSM 1900 EGPRS (GMSK)	Measured timeslot-averaged output power (dBm)					Source-based time-averaged output power (dBm)		
	810	**661**	**512**			**810**	**661**	**512**
1Txslot	**21.85**	**21.81**	**21.77**	**22.50**	**-9.03**	**12.82**	**12.78**	**12.74**
2Txslots	17.96	17.87	17.80	18.50	-6.02	11.94	11.85	11.78
3Txslots	16.48	16.39	16.38	17.00	-4.26	12.22	12.13	12.12
4Txslots	15.01	14.87	14.98	15.50	-3.01	12.00	11.86	11.97
GSM 1900 EGPRS(8PSK)	Measured timeslot-averaged output power (dBm)					Source-based time-averaged output power (dBm)		
	810	**661**	**512**			**810**	**661**	**512**
1Txslot	18.73	18.66	18.66	19.50	-9.03	9.70	9.63	9.63
2Txslots	15.42	15.45	15.26	16.50	-6.02	9.40	9.43	9.24
3Txslots	14.54	14.33	14.24	15.50	-4.26	10.28	10.07	9.98
4Txslots	13.91	13.86	13.83	14.50	-3.01	10.90	10.85	10.82

11.2 WCDMA Measurement result

WCDMA1900(Normal Power)

Item	band	FDDII result			
	ARFCN	9538 (1907.6MHz)	9400 (1880MHz)	9262 (1852.4MHz)	Tune up
WCDMA	\	24.15	24.22	24.29	25.00
HSUPA	1	23.71	23.76	23.75	24.00
	2	21.71	21.75	21.67	22.00
	3	22.7	22.72	22.66	23.00
	4	21.73	21.77	21.67	22.00
	5	23.69	23.71	23.73	24.00
DC-HSDPA	1	22.86	22.89	22.83	24.00
	2	22.83	22.87	22.86	24.00
	3	21.93	22.01	21.99	23.50
	4	22.35	22.41	22.38	23.50

WCDMA1900(Low Power)

Item	band	FDDII result			
	ARFCN	9538 (1907.6MHz)	9400 (1880MHz)	9262 (1852.4MHz)	Tune up
WCDMA	\	16.22	16.26	16.21	17.00
HSUPA	1	14.21	14.39	14.22	16.00
	2	12.21	12.34	12.27	14.00
	3	13.32	13.37	13.27	15.00
	4	12.43	12.31	12.34	14.00
	5	14.3	14.32	14.27	16.00
HSPA+		14.33	14.40	14.37	16.00
DC-HSDPA	1	14.35	14.39	14.34	16.00
	2	14.37	14.40	14.44	15.50
	3	13.89	13.87	13.83	15.50
	4	16.22	16.26	16.21	17.00

WCDMA1700(Normal Power)

Item	band	FDDIV result			
	ARFCN	1513 (1752.6MHz)	1412 (1732.4MHz)	1312 (1712.4MHz)	Tune up
WCDMA	\	24.06	24.02	24.12	25.00
HSUPA	1	23.86	23.82	23.77	24.00
	2	21.81	21.86	21.84	22.00
	3	22.87	22.83	22.85	23.00
	4	21.76	21.88	21.80	22.00
	5	23.76	23.82	23.78	24.00
DC-HSDPA	1	22.88	22.97	22.83	24.00
	2	22.85	22.86	22.87	24.00
	3	21.97	22.42	22.46	23.50
	4	22.38	22.46	22.39	23.50

WCDMA1700(Low Power)

Item	band	FDDIV result			
	ARFCN	1513 (1752.6MHz)	1412 (1732.4MHz)	1312 (1712.4MHz)	Tune up
WCDMA	\	16.09	16.15	16.04	17.00
HSUPA	1	14.37	14.38	14.39	16.00
	2	12.45	12.42	12.41	14.00
	3	13.35	13.34	13.37	15.00
	4	12.4	12.43	12.45	14.00
	5	14.35	14.48	14.44	16.00
DC-HSDPA	1	14.37	14.43	14.39	16.00
	2	14.39	14.41	14.46	16.00
	3	14.39	14.42	14.45	15.50
	4	13.96	13.85	13.90	15.50

WCDMA850

Item	band	FDDV result			
	ARFCN	4233 (846.6MHz)	4183 (836.6MHz)	4132 (826.4MHz)	Tune up
WCDMA	\	24.46	24.58	24.57	25.00
HSUPA	1	23.53	23.56	23.51	24.00
	2	21.55	21.51	21.46	22.00
	3	22.6	22.61	22.52	23.00
	4	21.54	21.57	21.46	22.00
	5	23.56	23.57	23.46	24.00
DC-HSDPA	1	23.28	23.22	23.18	24.00
	2	23.24	23.21	23.18	24.00
	3	22.81	22.73	22.70	23.50
	4	22.78	22.66	22.71	23.50

11.3 LTE Measurement result

Table 11.3-1: Maximum Power Reduction (MPR) for LTE-Normal Power

Modulation	Channel bandwidth / Transmission bandwidth configuration [RB]						MPR (dB)
	1.4 MHz	3 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

Table 11.3-2: Maximum Power Reduction (MPR) for LTE- Low Power

Modulation	Channel bandwidth / Transmission bandwidth configuration [RB]						MPR (dB)
	1.4 MHz	3 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

Table 11.3-3: The tune up for LTE

Mode/Band	Normal Power	Low Power
FDD Band 2 ANT0	25	25
FDD Band 7	24	15
FDD Band 12	25	25
FDD Band 13	25	25
FDD Band 25	22	17
FDD Band 26	25	25
TDD Band 41(PC3)	25	15
TDD Band 41(PC2)	27.5	17.5
FDD Band 66 ANT2	25	17
FDD Band 66 ANT0	25	25
FDD Band 71	25	25

LTE Band2(Normal Power)

Band 2					
Bandwidth (MHz)	RB allocation RB offset	Frequency (MHz)	Actual output power (dBm)		
			QPSK	16QAM	64QAM
1.4MHz	1RB-High	1909.3	24.15	23.54	23.56
		1880	24.31	23.67	23.43
		1850.7	24.28	23.69	23.42
	1RB-Middle	1909.3	24.39	23.66	23.63
		1880	24.55	23.58	23.62
		1850.7	24.61	23.63	23.68
	1RB-Low	1909.3	24.30	23.83	23.64
		1880	24.34	23.67	23.76
		1850.7	24.41	23.68	23.49
	3RB-High	1909.3	24.35	23.39	23.57
		1880	24.35	23.41	23.53
		1850.7	24.39	23.45	23.50
	3RB-Middle	1909.3	24.49	23.25	23.43
		1880	24.39	23.54	23.50
		1850.7	24.42	23.33	23.57
	3RB-Low	1909.3	24.38	23.25	23.60
		1880	24.39	23.49	23.50
		1850.7	24.42	23.46	23.54
	6RB	1909.3	23.49	22.57	22.43
		1880	23.44	22.52	22.44
		1850.7	23.44	22.44	22.51
3MHz	1RB-High	1908.5	24.31	23.72	23.59
		1880	24.34	23.76	23.54
		1851.5	24.38	23.64	23.73
	1RB-Middle	1908.5	24.34	23.93	23.41
		1880	24.46	23.76	23.52
		1851.5	24.41	23.76	23.62
	1RB-Low	1908.5	24.56	23.95	23.62
		1880	24.53	23.91	23.67
		1851.5	24.57	23.92	23.68
	8RB-High	1908.5	23.52	22.41	22.60
		1880	23.48	22.43	22.50
		1851.5	23.50	22.51	22.57
	8RB-Middle	1908.5	23.51	22.62	22.53
		1880	23.59	22.64	22.61
		1851.5	23.48	22.56	22.44
	8RB-Low	1908.5	23.61	22.64	22.61
		1880	23.61	22.65	22.67
		1851.5	23.54	22.68	22.64
	15RB	1908.5	23.45	22.56	22.54
		1880	23.57	22.62	22.56
		1851.5	23.48	22.53	22.53
5MHz	1RB-High	1907.5	24.31	23.82	23.59
		1880	24.36	23.69	23.53
		1852.5	24.39	23.67	23.65
	1RB-Middle	1907.5	24.37	23.85	23.36
		1880	24.39	23.48	23.62
		1852.5	24.41	23.81	23.68

	1RB-Low	1907.5	24.44	23.70	23.63
		1880	24.49	23.82	23.61
		1852.5	24.44	23.74	23.69
	12RB-High	1907.5	23.43	22.53	22.45
		1880	23.46	22.24	22.42
		1852.5	23.42	22.47	22.51
	12RB-Middle	1907.5	23.64	22.57	22.59
		1880	23.56	22.64	22.44
		1852.5	23.69	22.66	22.63
	12RB-Low	1907.5	23.55	22.65	22.65
		1880	23.62	22.55	22.61
		1852.5	23.63	22.58	22.46
	25RB	1907.5	23.51	22.58	22.61
		1880	23.45	22.46	22.45
		1852.5	23.53	22.58	22.58
10MHz	1RB-High	1905	24.57	23.63	23.51
		1880	24.44	23.69	23.58
		1855	24.47	23.78	23.42
	1RB-Middle	1905	24.36	23.77	23.59
		1880	24.42	23.67	23.59
		1855	24.43	23.69	23.74
	1RB-Low	1905	24.38	24.00	23.71
		1880	24.38	23.93	23.61
		1855	24.47	23.96	23.62
	25RB-High	1905	23.51	22.63	22.55
		1880	23.34	22.50	22.48
		1855	23.54	22.58	22.59
	25RB-Middle	1905	23.53	22.62	22.59
		1880	23.52	22.60	22.60
		1855	23.64	22.68	22.69
	25RB-Low	1905	23.57	22.64	22.55
		1880	23.57	22.53	22.70
		1855	23.50	22.63	22.53
	50RB	1905	23.60	22.68	22.67
		1880	23.43	22.50	22.49
		1855	23.56	22.62	22.62
15MHz	1RB-High	1902.5	24.19	23.68	23.55
		1880	24.29	23.62	23.53
		1857.5	24.27	23.61	23.56
	1RB-Middle	1902.5	24.22	23.76	23.49
		1880	24.32	23.65	23.62
		1857.5	24.32	23.74	23.53
	1RB-Low	1902.5	24.23	23.55	23.59
		1880	24.28	23.69	23.66
		1857.5	24.30	23.70	23.47
	36RB-High	1902.5	23.51	22.39	22.50
		1880	23.37	22.35	22.44
		1857.5	23.37	22.47	22.41
	36RB-Middle	1902.5	23.42	22.43	22.52
		1880	23.40	22.34	22.43
		1857.5	23.47	22.50	22.47
	36RB-Low	1902.5	23.46	22.42	22.38
		1880	23.52	22.49	22.39
		1857.5	23.50	22.43	22.42
	75RB	1902.5	23.43	22.52	22.53

		1880	23.48	22.34	22.36
		1857.5	23.47	22.41	22.32
20MHz	1RB-High	1900	24.19	23.56	23.49
		1880	24.19	23.69	23.51
		1860	24.25	23.63	23.51
	1RB-Middle	1900	24.22	23.56	23.5
		1880	24.26	23.53	23.47
		1860	24.26	23.70	23.5
	1RB-Low	1900	24.28	23.60	23.5
		1880	24.29	23.62	23.56
		1860	24.50	23.65	23.54
	50RB-High	1900	23.47	22.48	22.49
		1880	23.32	22.39	22.44
		1860	23.42	22.38	22.37
	50RB-Middle	1900	23.42	22.43	22.44
		1880	23.31	22.37	22.44
		1860	23.43	22.42	22.37
	50RB-Low	1900	23.46	22.49	22.38
		1880	23.46	22.43	22.47
		1860	23.48	22.48	22.46
	100RB	1900	23.45	22.35	22.45
		1880	23.41	22.34	22.31
		1860	23.41	22.39	22.47

LTE Band7(Normal Power)

Band 7					
Bandwidth (MHz)	RB allocation RB offset	Frequency (MHz)	Actual output power (dBm)		
			QPSK	16QAM	64QAM
5MHz	1RB-High	2567.5	23.11	22.41	21.28
		2535	23.11	22.47	21.33
		2502.5	23.20	22.61	21.34
	1RB-Middle	2567.5	23.19	22.55	21.35
		2535	23.09	22.80	21.43
		2502.5	23.21	22.83	21.06
	1RB-Low	2567.5	23.04	22.51	21.19
		2535	23.14	22.44	21.31
		2502.5	23.05	22.54	21.23
	12RB-High	2567.5	22.29	21.22	20.39
		2535	22.25	21.32	20.28
		2502.5	22.34	21.41	20.49
	12RB-Middle	2567.5	22.26	21.34	20.34
		2535	22.27	21.28	20.27
		2502.5	22.35	21.41	20.38
	12RB-Low	2567.5	22.18	21.31	20.33
		2535	22.17	21.26	20.16
		2502.5	22.23	21.36	20.29
	25RB	2567.5	22.19	21.30	20.30
		2535	22.16	21.20	20.28
		2502.5	22.30	21.35	20.40
10MHz	1RB-High	2565	23.09	22.78	21.52
		2535	23.19	22.66	21.34
		2505	23.14	22.53	21.40
	1RB-Middle	2565	23.11	22.37	21.24
		2535	23.01	22.30	21.30

		2505	23.08	22.42	21.34
	1RB-Low	2565	23.03	22.70	21.23
		2535	22.99	22.51	21.38
		2505	23.16	22.75	21.43
	25RB-High	2565	22.18	21.35	20.36
		2535	22.22	21.26	20.27
		2505	22.33	21.42	20.42
	25RB-Middle	2565	22.23	21.26	20.24
		2535	22.25	21.30	20.31
		2505	22.35	21.41	20.42
	25RB-Low	2565	22.14	21.31	20.20
		2535	22.17	21.25	20.23
		2505	22.32	21.42	20.33
	50RB	2565	22.13	21.22	20.22
		2535	22.22	21.28	20.18
		2505	22.28	21.33	20.36
15MHz	1RB-High	2562.5	22.84	22.22	21.46
		2535	22.78	22.22	21.20
		2507.5	22.87	22.24	21.37
	1RB-Middle	2562.5	22.83	22.21	21.36
		2535	22.92	22.28	21.18
		2507.5	22.97	22.36	21.26
	1RB-Low	2562.5	22.86	22.18	21.33
		2535	22.87	22.27	21.15
		2507.5	22.89	22.35	21.42
	36RB-High	2562.5	22.11	21.12	20.14
		2535	22.09	21.12	20.09
		2507.5	22.13	21.18	20.17
	36RB-Middle	2562.5	22.06	21.11	20.09
		2535	22.04	21.14	20.20
		2507.5	22.19	21.28	20.21
	36RB-Low	2562.5	22.00	21.02	20.03
		2535	22.01	21.06	20.04
		2507.5	22.18	21.15	20.27
	75RB	2562.5	22.02	21.15	20.17
		2535	22.08	21.14	20.09
		2507.5	22.17	21.27	20.24
20MHz	1RB-High	2560	23.07	22.50	21.27
		2535	23.04	22.28	21.23
		2510	23.04	22.44	21.32
	1RB-Middle	2560	23.09	22.44	21.33
		2535	23.05	22.33	21.13
		2510	22.97	22.39	21.18
	1RB-Low	2560	23.05	22.43	21.33
		2535	23.03	22.30	21.28
		2510	22.97	22.35	21.25
	50RB-High	2560	22.24	21.34	20.29
		2535	22.22	21.16	20.14
		2510	22.17	21.23	20.21
	50RB-Middle	2560	22.20	21.18	20.26
		2535	22.18	21.22	20.19
		2510	22.19	21.25	20.23
	50RB-Low	2560	22.23	21.19	20.20
		2535	22.14	21.12	20.05
		2510	22.19	21.19	20.25

	100RB	2560	22.21	21.20	20.15
		2535	22.16	21.12	20.16
		2510	22.23	21.20	20.20

LTE Band7(Normal Power)

Band 7					
Bandwidth (MHz)	RB allocation RB offset	Frequency (MHz)	Actual output power (dBm) QPSK	16QAM	64QAM
5MHz	1RB-High	2567.5	14.36	13.79	13.71
		2535	14.51	13.72	13.54
		2502.5	14.46	13.80	13.54
	1RB-Middle	2567.5	14.30	13.63	13.90
		2535	14.29	13.63	13.16
		2502.5	14.32	13.65	13.51
	1RB-Low	2567.5	14.45	13.67	13.76
		2535	14.42	13.55	13.47
		2502.5	14.42	13.78	13.61
	12RB-High	2567.5	13.43	12.32	12.43
		2535	13.44	12.46	12.44
		2502.5	13.50	12.62	12.57
	12RB-Middle	2567.5	13.55	12.43	12.45
		2535	13.48	12.48	12.44
		2502.5	13.48	12.48	12.47
	12RB-Low	2567.5	13.44	12.41	12.42
		2535	13.26	12.28	12.24
		2502.5	13.45	12.47	12.39
	25RB	2567.5	13.48	12.37	12.49
		2535	13.41	12.40	12.40
		2502.5	13.43	12.51	12.43
10MHz	1RB-High	2565	14.45	13.68	13.85
		2535	14.37	13.94	13.59
		2505	14.41	13.66	13.30
	1RB-Middle	2565	14.38	13.50	13.61
		2535	14.44	13.73	13.61
		2505	14.42	13.83	13.63
	1RB-Low	2565	14.48	13.66	13.55
		2535	14.30	13.73	13.45
		2505	14.48	13.64	13.63
	25RB-High	2565	13.53	12.51	12.50
		2535	13.43	12.42	12.41
		2505	13.50	12.47	12.48
	25RB-Middle	2565	13.48	12.47	12.45
		2535	13.45	12.43	12.43
		2505	13.53	12.54	12.52
	25RB-Low	2565	13.42	12.52	12.44
		2535	13.39	12.38	12.37
		2505	13.54	12.52	12.54
	50RB	2565	13.47	12.45	12.33
		2535	13.45	12.44	12.42
		2505	13.47	12.56	12.34
15MHz	1RB-High	2562.5	14.15	13.31	13.38
		2535	14.05	13.39	13.25
		2507.5	14.19	13.46	13.40
	1RB-Middle	2562.5	14.19	13.57	13.26

		2535	14.13	13.39	13.20
		2507.5	14.10	13.47	13.34
	1RB-Low	2562.5	14.09	13.44	13.28
		2535	14.10	13.38	13.27
		2507.5	14.10	13.43	13.20
	36RB-High	2562.5	13.31	12.30	12.30
		2535	13.30	12.25	12.31
		2507.5	13.31	12.28	12.40
	36RB-Middle	2562.5	13.29	12.32	12.30
		2535	13.27	12.32	12.25
		2507.5	13.33	12.44	12.31
	36RB-Low	2562.5	13.30	12.31	12.31
		2535	13.28	12.23	12.23
		2507.5	13.30	12.26	12.28
	75RB	2562.5	13.33	12.19	12.27
		2535	13.29	12.25	12.28
		2507.5	13.40	12.37	12.28
20MHz	1RB-High	2560	14.28	13.47	13.37
		2535	14.10	13.45	13.32
		2510	14.20	13.36	13.31
	1RB-Middle	2560	14.21	13.49	13.23
		2535	14.12	13.42	13.33
		2510	14.16	13.41	13.23
	1RB-Low	2560	14.16	13.38	13.31
		2535	14.16	13.48	13.29
		2510	14.24	13.29	13.30
	50RB-High	2560	13.38	12.39	12.31
		2535	13.32	12.32	12.30
		2510	13.30	12.30	12.30
	50RB-Middle	2560	13.36	12.37	12.35
		2535	13.32	12.33	12.30
		2510	13.34	12.32	12.32
	50RB-Low	2560	13.39	12.29	12.28
		2535	13.29	12.30	12.27
		2510	13.33	12.42	12.33
	100RB	2560	13.29	12.37	12.27
		2535	13.36	12.34	12.23
		2510	13.42	12.32	12.30

LTE Band12(Normal Power)

Band 12					
Bandwidth (MHz)	RB allocation RB offset	Frequency (MHz)	Actual output power (dBm)		
			QPSK	16QAM	64QAM
1.4MHz	1RB-High	715.3	23.93	22.91	22.04
		707.5	24.01	23.31	22.33
		699.7	23.99	23.23	22.48
	1RB-Middle	715.3	24.04	23.08	22.06
		707.5	24.25	23.38	22.38
		699.7	24.25	23.35	22.53
	1RB-Low	715.3	23.87	23.50	22.36
		707.5	24.10	23.26	22.29
		699.7	24.08	23.30	22.48
	3RB-High	715.3	23.84	22.80	21.85
		707.5	24.13	23.17	22.28

		699.7	24.02	23.18	22.23
	3RB-Middle	715.3	24.00	23.07	22.08
		707.5	24.17	23.30	22.27
		699.7	24.15	23.29	22.22
	3RB-Low	715.3	24.08	23.15	22.17
		707.5	24.12	23.24	22.27
		699.7	24.20	23.20	22.32
	6RB	715.3	23.13	22.21	21.13
		707.5	23.19	22.28	21.13
		699.7	23.22	22.30	21.31
3MHz	1RB-High	714.5	23.77	22.96	22.03
		707.5	24.08	23.47	22.33
		700.5	24.06	23.33	22.32
	1RB-Middle	714.5	24.12	23.44	22.34
		707.5	24.10	23.53	22.32
		700.5	24.12	23.38	22.33
	1RB-Low	714.5	24.03	23.48	22.27
		707.5	24.13	23.54	22.42
		700.5	24.26	23.62	22.48
	8RB-High	714.5	23.11	22.28	21.27
		707.5	23.27	22.37	21.32
		700.5	23.27	22.28	21.34
	8RB-Middle	714.5	23.20	22.37	21.18
		707.5	23.24	22.32	21.22
		700.5	23.38	22.38	21.28
	8RB-Low	714.5	23.17	22.28	21.22
		707.5	23.21	22.38	21.44
		700.5	23.34	22.43	21.51
	15RB	714.5	23.06	22.22	21.22
		707.5	23.18	22.39	21.22
		700.5	23.28	22.25	21.34
5MHz	1RB-High	713.5	23.65	22.99	22.09
		707.5	24.14	23.47	22.32
		701.5	24.12	23.54	22.24
	1RB-Middle	713.5	24.13	23.92	22.35
		707.5	24.33	23.25	22.47
		701.5	24.21	23.64	22.11
	1RB-Low	713.5	24.16	23.62	22.34
		707.5	24.23	23.66	22.26
		701.5	24.12	23.43	22.33
	12RB-High	713.5	23.13	22.20	21.36
		707.5	23.21	22.31	21.24
		701.5	23.24	22.23	21.35
	12RB-Middle	713.5	23.13	22.30	21.31
		707.5	23.30	22.33	21.29
		701.5	23.28	22.42	21.33
	12RB-Low	713.5	23.18	22.28	21.26
		707.5	23.23	22.39	21.33
		701.5	23.32	22.44	21.31
	25RB	713.5	23.06	22.25	21.16
		707.5	23.22	22.22	21.26
		701.5	23.30	22.33	21.29
10MHz	1RB-High	711	23.97	23.56	22.11
		707.5	24.14	23.64	22.30
		704	24.26	23.57	22.44

	1RB-Middle	711	24.23	23.48	22.46
		707.5	24.30	23.56	22.46
		704	24.27	23.39	22.58
	1RB-Low	711	24.46	23.78	22.62
		707.5	24.24	23.73	22.56
		704	24.30	23.72	22.48
	25RB-High	711	23.26	22.38	21.34
		707.5	23.29	22.32	21.40
		704	23.30	22.24	21.39
	25RB-Middle	711	23.30	22.33	21.37
		707.5	23.35	22.35	21.25
		704	23.34	22.48	21.43
	25RB-Low	711	23.37	22.42	21.40
		707.5	23.31	22.27	21.40
		704	23.36	22.40	21.44
	50RB	711	23.31	22.27	21.33
		707.5	23.32	22.29	21.30
		704	23.34	22.45	21.45

LTE Band13(Normal Power)

Band 13					
Bandwidth (MHz)	RB allocation	Frequency (MHz)	Actual output power (dBm)		
	RB offset (Start RB)		QPSK	16QAM	64QAM
5 MHz	1RB-High	784.5	24.13	23.37	22.74
		782	24.18	23.76	22.66
		779.5	24.17	23.67	22.61
	1RB-Middle	784.5	24.54	23.90	22.96
		782	24.47	23.48	22.65
		779.5	24.45	23.20	22.70
	1RB-Low	784.5	24.26	23.68	22.73
		782	24.14	23.79	22.86
		779.5	23.92	23.37	22.63
	12RB-High	784.5	23.38	22.54	21.84
		782	23.40	22.58	21.92
		779.5	23.42	22.54	21.95
	12RB-Middle	784.5	23.41	22.59	21.77
		782	23.44	22.54	21.83
		779.5	23.48	22.49	21.92
	12RB-Low	784.5	23.35	22.43	21.80
		782	23.39	22.42	21.90
		779.5	23.32	22.55	21.91
	25RB	784.5	23.36	22.44	21.73
		782	23.37	22.51	21.74
		779.5	23.39	22.57	21.83
10 MHz	1RB-High	782	24.27	23.57	22.52
	1RB-Middle	782	24.37	23.65	22.98
	1RB-Low	782	24.21	23.94	22.28
	25RB-High	782	23.45	22.45	21.46
	25RB-Middle	782	23.48	22.47	21.49
	25RB-Low	782	23.43	22.47	21.53
	50RB	782	23.48	22.40	21.51

LTE Band25(Normal Power)

Band 25

Bandwidth (MHz)	RB allocation	Frequency (MHz)	QPSK	16QAM	64QAM
	RB offset (Start RB)		Actual output power (dBm)	Actual output power (dBm)	Actual output power (dBm)
1.4 MHz	1RB High (5)	1914.3	24.12	23.48	22.57
		1882.5	24.24	23.58	22.76
		1850.7	23.58	23.04	22.31
	1RB Middle (3)	1914.3	24.16	23.47	22.67
		1882.5	24.32	23.70	22.95
		1850.7	23.60	23.02	22.32
	1RB Low (0)	1914.3	23.95	23.46	22.58
		1882.5	24.27	23.50	22.75
		1850.7	23.54	22.96	22.19
	3RB High (3)	1914.3	24.13	23.37	22.69
		1882.5	24.33	23.44	22.83
		1850.7	23.58	22.81	22.17
	3RB Middle (1)	1914.3	24.31	23.35	22.73
		1882.5	24.37	23.29	22.77
		1850.7	23.59	22.86	22.19
	3RB Low (0)	1914.3	24.18	23.38	22.64
		1882.5	24.34	23.46	22.78
		1850.7	23.54	22.78	22.15
	6RB (0)	1914.3	23.28	22.42	21.54
		1882.5	23.45	22.52	21.64
		1850.7	22.78	22.05	21.32
3 MHz	1RB High (14)	1913.5	24.30	23.71	22.57
		1882.5	24.38	23.76	22.81
		1851.5	23.82	23.30	22.50
	1RB Middle (7)	1913.5	24.35	23.56	22.77
		1882.5	24.50	23.76	22.86
		1851.5	23.65	23.10	22.33
	1RB Low (0)	1913.5	24.14	23.68	22.71
		1882.5	24.39	23.90	22.82
		1851.5	23.69	23.11	22.34
	8RB High (7)	1913.5	23.38	22.41	21.80
		1882.5	23.50	22.57	21.95
		1851.5	22.96	22.21	21.46
	8RB Middle (4)	1913.5	23.44	22.50	21.73
		1882.5	23.50	22.65	21.90
		1851.5	22.94	22.20	21.49
	8RB Low (0)	1913.5	23.41	22.39	21.78
		1882.5	23.43	22.52	21.86
		1851.5	22.89	22.16	21.37
	15RB (0)	1913.5	23.41	22.50	21.78
		1882.5	23.49	22.56	21.86
		1851.5	22.94	22.14	21.44
5 MHz	1RB High (24)	1912.5	24.28	23.52	22.62
		1882.5	24.41	23.66	22.86
		1852.5	23.96	23.45	22.54

	1RB Middle (12)	1912.5	24.29	23.17	22.80
		1882.5	24.54	23.79	22.81
		1852.5	23.71	23.05	22.46
	1RB Low (0)	1912.5	24.23	23.57	22.65
		1882.5	24.30	23.85	22.79
		1852.5	23.73	23.22	22.43
	12RB High (13)	1912.5	23.41	22.57	21.74
		1882.5	23.55	22.65	21.91
		1852.5	23.07	22.28	21.59
	12RB Middle (6)	1912.5	23.37	22.54	21.86
		1882.5	23.48	22.50	21.79
		1852.5	23.01	22.22	21.49
	12RB Low (0)	1912.5	23.46	22.41	21.88
		1882.5	23.48	22.53	21.81
		1852.5	22.96	22.16	21.48
	25RB (0)	1912.5	23.37	22.49	21.81
		1882.5	23.45	22.52	21.77
		1852.5	23.03	22.22	21.54
10 MHz	1RB High (49)	1910	24.23	23.85	22.76
		1882.5	24.37	24.01	22.98
		1855	24.32	23.86	22.99
	1RB Middle (24)	1910	24.22	23.54	22.73
		1882.5	24.37	23.74	22.85
		1855	23.82	23.23	22.40
	1RB Low (0)	1910	24.30	23.83	22.89
		1882.5	24.35	23.93	22.82
		1855	23.86	23.32	22.52
	25RB High (25)	1910	23.42	22.48	21.81
		1882.5	23.59	22.62	21.97
		1855	23.50	22.58	21.81
	25RB Middle (12)	1910	23.42	22.50	21.72
		1882.5	23.52	22.61	21.81
		1855	23.18	22.35	21.65
	25RB Low (0)	1910	23.40	22.37	21.73
		1882.5	23.50	22.59	21.90
		1855	23.10	22.27	21.58
	50RB (0)	1910	23.41	22.47	21.77
		1882.5	23.45	22.62	21.76
		1855	23.26	22.45	21.74
15 MHz	1RB High (74)	1907.5	24.11	23.37	22.41
		1882.5	24.19	23.64	22.46
		1857.5	24.09	23.59	22.44
	1RB Middle (37)	1907.5	24.06	23.63	22.48
		1882.5	24.13	23.56	22.68
		1857.5	24.02	23.40	21.71
	1RB Low (0)	1907.5	24.09	23.80	22.42
		1882.5	24.18	23.70	22.39
		1857.5	23.80	23.17	21.42

	36RB High (38)	1907.5	23.36	22.43	21.52
		1882.5	23.47	22.49	21.56
		1857.5	23.46	22.43	21.54
	36RB Middle (19)	1907.5	23.41	22.49	21.58
		1882.5	23.39	22.43	21.61
		1857.5	23.40	22.46	21.40
	36RB Low (0)	1907.5	23.33	22.45	21.45
		1882.5	23.38	22.44	21.50
		1857.5	23.12	22.26	20.56
	75RB (0)	1907.5	23.39	22.40	21.51
		1882.5	23.41	22.46	21.52
		1857.5	23.37	22.44	21.44
20 MHz	1RB High (99)	1905	24.17	23.70	22.24
		1882.5	24.27	23.65	22.67
		1860	24.25	23.91	22.42
	1RB Middle (50)	1905	24.31	23.64	22.65
		1882.5	24.18	23.65	22.67
		1860	24.20	23.72	22.75
	1RB Low (0)	1905	24.27	23.78	22.48
		1882.5	24.24	23.76	22.46
		1860	24.30	23.91	22.28
	50RB High (50)	1905	23.41	22.54	21.47
		1882.5	23.49	22.49	21.54
		1860	23.45	22.42	21.46
	50RB Middle (25)	1905	23.49	22.47	21.58
		1882.5	23.40	22.48	21.43
		1860	23.51	22.48	21.53
	50RB Low (0)	1905	23.46	22.40	21.54
		1882.5	23.36	22.43	21.45
		1860	23.48	22.55	21.53
	100RB (0)	1905	23.36	22.47	21.51
		1882.5	23.37	22.41	21.43
		1860	23.51	22.50	21.50

LTE Band25(Low Power)

Band 25					
Bandwidth (MHz)	RB allocation	Frequency (MHz)	QPSK	16QAM	64QAM
	RB offset (Start RB)		Actual output power (dBm)	Actual output power (dBm)	Actual output power (dBm)
1.4 MHz	1RB High (5)	1914.3	16.21	15.37	14.89
		1882.5	16.24	15.51	15.00
		1850.7	16.23	15.51	14.67
	1RB Middle (3)	1914.3	16.16	15.56	14.77
		1882.5	16.40	15.53	14.89
		1850.7	16.38	15.61	14.82
	1RB Low (0)	1914.3	16.07	15.39	14.67
		1882.5	16.18	15.48	14.80
		1850.7	16.16	15.58	14.92

	3RB High (3)	1914.3	16.17	15.09	14.54
		1882.5	16.22	15.29	14.65
		1850.7	16.23	15.24	14.65
	3RB Middle (1)	1914.3	16.21	15.21	14.60
		1882.5	16.21	14.93	14.57
		1850.7	16.28	14.86	14.48
	3RB Low (0)	1914.3	16.13	15.29	14.56
		1882.5	16.17	15.36	14.54
		1850.7	16.22	15.48	14.64
	6RB (0)	1914.3	15.29	14.29	13.59
		1882.5	15.28	14.46	13.68
		1850.7	15.42	14.39	13.65
3 MHz	1RB High (14)	1913.5	16.16	15.45	14.92
		1882.5	16.38	15.53	14.78
		1851.5	16.39	15.58	14.79
	1RB Middle (7)	1913.5	16.16	15.40	14.62
		1882.5	16.14	15.54	14.65
		1851.5	16.23	15.55	14.92
	1RB Low (0)	1913.5	16.32	15.61	14.86
		1882.5	16.23	15.40	14.88
		1851.5	16.39	15.66	14.85
	8RB High (7)	1913.5	15.41	14.46	13.81
		1882.5	15.44	14.37	13.84
		1851.5	15.51	14.50	13.79
	8RB Middle (4)	1913.5	15.37	14.50	13.55
		1882.5	15.46	14.50	13.78
		1851.5	15.40	14.53	13.76
	8RB Low (0)	1913.5	15.37	14.42	13.69
		1882.5	15.38	14.46	13.71
		1851.5	15.43	14.50	13.78
	15RB (0)	1913.5	15.44	14.58	13.66
		1882.5	15.45	14.45	13.74
		1851.5	15.49	14.50	13.87
5 MHz	1RB High (24)	1912.5	16.29	15.60	14.74
		1882.5	16.23	15.57	15.24
		1852.5	16.38	15.62	14.81
	1RB Middle (12)	1912.5	16.16	15.58	14.49
		1882.5	16.15	15.71	14.50
		1852.5	16.23	15.60	14.97
	1RB Low (0)	1912.5	16.21	15.57	14.78
		1882.5	16.37	15.65	14.96
		1852.5	16.40	15.68	14.88
	12RB High (13)	1912.5	15.36	14.32	13.67
		1882.5	15.47	14.52	13.63
		1852.5	15.47	14.47	13.75
	12RB Middle (6)	1912.5	15.42	14.42	13.69
		1882.5	15.40	14.40	13.71
		1852.5	15.47	14.47	13.74

	12RB Low (0)	1912.5	15.44	14.46	13.64
		1882.5	15.42	14.21	13.79
		1852.5	15.42	14.53	13.75
	25RB (0)	1912.5	15.40	14.45	13.69
		1882.5	15.46	14.57	13.75
		1852.5	15.50	14.48	13.79
10 MHz	1RB High (49)	1910	16.27	15.57	14.92
		1882.5	16.27	15.42	14.62
		1855	16.27	15.51	14.80
	1RB Middle (24)	1910	16.16	15.39	14.73
		1882.5	16.21	15.63	14.84
		1855	16.23	15.73	14.86
	1RB Low (0)	1910	16.34	15.47	14.69
		1882.5	16.25	15.50	14.74
		1855	16.35	15.65	14.66
	25RB High (25)	1910	15.48	14.48	13.76
		1882.5	15.42	14.55	13.73
		1855	15.47	14.47	13.77
	25RB Middle (12)	1910	15.45	14.41	13.72
		1882.5	15.43	14.49	13.78
		1855	15.53	14.54	13.72
	25RB Low (0)	1910	15.34	14.43	13.69
		1882.5	15.30	14.41	13.70
		1855	15.58	14.58	13.88
	50RB (0)	1910	15.43	14.45	13.62
		1882.5	15.51	14.51	13.78
		1855	15.53	14.55	13.75
15 MHz	1RB High (74)	1907.5	16.12	15.42	14.50
		1882.5	16.18	15.45	14.60
		1857.5	16.10	15.28	14.52
	1RB Middle (37)	1907.5	16.12	15.55	14.47
		1882.5	16.12	15.54	14.55
		1857.5	16.13	15.49	14.54
	1RB Low (0)	1907.5	16.12	15.44	14.58
		1882.5	16.17	15.53	14.56
		1857.5	16.20	15.40	14.63
	36RB High (38)	1907.5	15.39	14.38	13.67
		1882.5	15.39	14.35	13.73
		1857.5	15.36	14.35	13.71
	36RB Middle (19)	1907.5	15.31	14.39	13.56
		1882.5	15.35	14.42	13.58
		1857.5	15.39	14.38	13.67
	36RB Low (0)	1907.5	15.33	14.30	13.58
		1882.5	15.31	14.38	13.64
		1857.5	15.44	14.41	13.61
	75RB (0)	1907.5	15.32	14.37	13.56
		1882.5	15.38	14.42	13.66
		1857.5	15.40	14.43	13.67

20 MHz	1RB High (99)	1905	16.03	15.31	14.46
		1882.5	15.96	15.27	14.48
		1860	16.03	15.36	14.43
	1RB Middle (50)	1905	16.03	15.33	14.57
		1882.5	16.04	15.28	14.49
		1860	15.98	15.26	14.53
	1RB Low (0)	1905	16.48	15.33	14.47
		1882.5	16.04	15.48	14.42
		1860	16.00	15.46	14.56
	50RB High (50)	1905	15.26	14.29	13.66
		1882.5	15.28	14.30	13.6
		1860	15.33	14.35	13.6
	50RB Middle (25)	1905	15.22	14.30	13.55
		1882.5	15.35	14.27	13.58
		1860	15.34	14.34	13.61
	50RB Low (0)	1905	15.21	14.28	13.57
		1882.5	15.25	14.23	13.55
		1860	15.31	14.33	13.61
	100RB (0)	1905	15.29	14.30	13.52
		1882.5	15.30	14.27	13.6
		1860	15.25	14.23	13.54

LTE Band26

Band 26					
Bandwidth (MHz)	RB allocation RB offset (Start RB)	Frequency (MHz)	QPSK Actual output power (dBm)	16QAM Actual output power (dBm)	64QAM Actual output power (dBm)
1.4 MHz	1RB High (5)	848.3	23.24	22.53	22.57
		831.5	23.40	22.69	22.62
		814.7	23.36	22.63	22.59
	1RB Middle (3)	848.3	23.33	22.64	22.66
		831.5	23.31	22.75	22.57
		814.7	23.55	22.76	22.64
	1RB Low (0)	848.3	23.23	22.40	22.47
		831.5	23.29	22.61	22.61
		814.7	23.33	22.59	22.65
	3RB High (3)	848.3	23.35	22.36	22.33
		831.5	23.37	22.41	22.47
		814.7	23.43	22.56	22.64
	3RB Middle (1)	848.3	23.26	22.33	22.46
		831.5	23.43	22.53	22.48
		814.7	23.51	22.51	22.54
	3RB Low (0)	848.3	23.25	22.28	22.46
		831.5	23.36	22.45	22.49
		814.7	23.45	22.62	22.62
	6RB (0)	848.3	22.29	21.47	21.25
		831.5	22.41	21.52	21.27
		814.7	22.44	21.63	21.50

3 MHz	1RB High (14)	847.5	23.33	22.61	21.56
		831.5	23.48	22.75	21.63
		815.5	23.46	22.72	22.49
	1RB Middle (7)	847.5	23.29	22.91	21.53
		831.5	23.35	23.02	21.54
		815.5	23.45	22.42	22.51
	1RB Low (0)	847.5	23.44	22.77	21.62
		831.5	23.39	22.79	21.47
		815.5	23.47	22.54	22.47
	8RB High (7)	847.5	22.44	21.58	20.48
		831.5	22.47	21.42	20.58
		815.5	22.46	21.51	20.60
	8RB Middle (4)	847.5	22.46	21.52	20.59
		831.5	22.48	21.65	20.64
		815.5	22.53	21.49	20.68
	8RB Low (0)	847.5	22.44	21.53	20.49
		831.5	22.40	21.45	20.59
		815.5	22.32	21.53	20.67
	15RB (0)	847.5	22.50	21.57	20.55
		831.5	22.49	21.49	20.44
		815.5	22.40	21.50	20.41
5 MHz	1RB High (24)	846.5	23.45	22.64	22.42
		831.5	23.45	22.84	22.64
		816.5	23.45	22.76	22.74
	1RB Middle (12)	846.5	23.39	22.80	22.57
		831.5	23.41	22.82	22.61
		816.5	23.40	23.25	22.69
	1RB Low (0)	846.5	23.39	22.80	22.58
		831.5	23.51	22.78	22.64
		816.5	23.58	22.86	22.58
	12RB High (13)	846.5	22.44	21.56	21.53
		831.5	22.52	21.60	21.53
		816.5	22.52	21.55	21.62
	12RB Middle (6)	846.5	22.44	21.55	21.56
		831.5	22.49	21.55	21.53
		816.5	22.62	21.59	21.60
	12RB Low (0)	846.5	22.52	21.56	21.48
		831.5	22.45	21.50	21.51
		816.5	22.60	21.65	21.64
	25RB (0)	846.5	22.47	21.54	21.54
		831.5	22.47	21.54	21.53
		816.5	22.61	21.53	21.54
10 MHz	1RB High (49)	844	23.38	22.80	21.39
		831.5	23.38	22.71	21.70
		820	23.36	22.89	21.62
	1RB Middle (24)	844	23.37	22.57	21.72
		831.5	23.37	22.58	21.55
		820	23.38	22.68	21.70

	1RB Low (0)	844	23.49	22.95	21.56
		831.5	23.44	22.85	21.77
		820	23.42	23.10	21.54
	25RB High (25)	844	22.54	21.58	20.57
		831.5	22.53	21.46	20.51
		820	22.57	21.59	20.54
	25RB Middle (12)	844	22.55	21.50	20.55
		831.5	22.40	21.50	20.50
		820	22.59	21.64	20.59
	25RB Low (0)	844	22.45	21.53	20.59
		831.5	22.54	21.53	20.53
		820	22.56	21.55	20.59
	50RB (0)	844	22.51	21.45	20.54
		831.5	22.44	21.48	20.48
		820	22.54	21.62	20.66
15 MHz	1RB High (74)	841.5	23.12	22.53	21.29
		831.5	23.24	22.54	21.41
		822.5	23.26	22.59	21.48
	1RB Middle (37)	841.5	23.20	22.59	21.44
		831.5	23.14	22.55	21.40
		822.5	23.31	22.69	21.51
	1RB Low (0)	841.5	23.34	22.74	21.47
		831.5	23.34	22.71	21.47
		822.5	23.36	22.92	21.58
	36RB High (38)	841.5	22.36	21.40	20.37
		831.5	22.39	21.41	20.44
		822.5	22.34	21.39	20.41
	36RB Middle (19)	841.5	22.29	21.33	20.36
		831.5	22.31	21.30	20.34
		822.5	22.37	21.34	20.44
	36RB Low (0)	841.5	22.39	21.26	20.32
		831.5	22.33	21.34	20.38
		822.5	22.40	21.34	20.45
	75RB (0)	841.5	22.34	21.43	20.42
		831.5	22.33	21.35	20.35
		822.5	22.41	21.38	20.48

LTE Band41PC3(Normal Power)

Band 41					
Bandwidth (MHz)	RB allocation RB offset	Frequency (MHz)	Actual output power (dBm)		
			QPSK	16QAM	64QAM
5MHz	1RB-High	2687.5	24.02	23.23	22.63
		2640.3	24.04	23.27	22.56
		2593	23.84	23.04	22.33
		2545.8	23.86	23.14	22.35
		2498.5	23.68	22.91	22.24
	1RB-Middle	2687.5	24.22	23.17	22.55
		2640.3	24.19	23.22	22.33
		2593	23.88	23.00	22.30

		2545.8	23.85	23.03	22.13
		2498.5	23.69	22.85	22.02
	1RB-Low	2687.5	24.03	23.25	22.57
		2640.3	24.02	23.17	22.59
		2593	23.79	22.99	22.37
		2545.8	23.81	22.97	22.37
		2498.5	23.68	22.84	22.18
	12RB-High	2687.5	23.14	22.20	21.70
		2640.3	23.15	22.20	21.70
		2593	22.98	22.01	21.53
		2545.8	22.93	22.02	21.52
		2498.5	22.79	21.90	21.38
	12RB-Middle	2687.5	23.18	22.20	21.72
		2640.3	23.09	22.12	21.68
		2593	23.00	22.04	21.54
		2545.8	23.00	22.05	21.59
		2498.5	22.79	21.93	21.43
	12RB-Low	2687.5	23.16	22.16	21.74
		2640.3	23.08	22.16	21.64
		2593	22.95	22.01	21.54
		2545.8	22.96	22.01	21.54
		2498.5	22.74	21.83	21.40
	25RB	2687.5	23.09	22.24	21.69
		2640.3	23.05	22.13	21.62
		2593	22.99	22.02	21.54
		2545.8	22.98	22.09	21.52
		2498.5	22.80	21.89	21.36
10MHz	1RB-High	2685	23.94	23.09	22.51
		2639	23.92	23.14	22.45
		2593	23.77	22.97	22.30
		2547	23.75	22.93	22.26
		2501	23.70	22.85	22.17
	1RB-Middle	2685	24.01	23.18	22.52
		2639	23.96	23.17	22.48
		2593	23.79	23.00	22.26
		2547	23.78	22.93	22.27
		2501	23.68	22.81	22.17
	1RB-Low	2685	24.08	23.25	22.61
		2639	24.05	23.26	22.61
		2593	23.85	23.03	22.38
		2547	23.86	23.06	22.38
		2501	23.66	22.87	22.14
	25RB-High	2685	23.15	22.28	21.74
		2639	23.13	22.22	21.70
		2593	22.96	22.09	21.54
		2547	22.95	22.04	21.52
		2501	22.80	21.89	21.35
	25RB-Middle	2685	23.11	22.27	21.66
		2639	23.11	22.20	21.66
		2593	23.02	22.15	21.56
		2547	22.98	22.10	21.52
		2501	22.82	21.92	21.36
	25RB-Low	2685	23.06	22.20	21.66
		2639	23.09	22.22	21.65
		2593	22.93	22.07	21.51

		2547	22.96	22.09	21.54
		2501	22.80	21.87	21.32
	50RB	2685	23.13	22.27	21.70
		2639	23.08	22.21	21.64
		2593	22.99	22.13	21.53
		2547	22.99	22.13	21.55
		2501	22.83	21.97	21.37
15MHz	1RB-High	2682.5	23.86	23.03	22.37
		2637.8	23.71	23.06	22.30
		2593	23.72	22.87	22.18
		2548.3	23.68	22.86	22.12
		2503.5	23.62	22.81	22.03
	1RB-Middle	2682.5	23.88	23.08	22.40
		2637.8	23.85	23.00	22.30
		2593	23.63	22.86	22.18
		2548.3	23.65	22.85	22.11
		2503.5	23.52	22.73	22.01
	1RB-Low	2682.5	23.95	23.18	22.48
		2637.8	23.92	23.15	22.42
		2593	23.75	22.97	22.24
		2548.3	23.74	22.95	22.23
		2503.5	23.43	22.66	21.88
	36RB-High	2682.5	23.05	22.09	21.60
		2637.8	22.96	22.10	21.58
		2593	22.86	21.97	21.44
		2548.3	22.84	21.88	21.42
		2503.5	22.72	21.79	21.31
	36RB-Middle	2682.5	23.07	22.09	21.61
		2637.8	23.05	22.08	21.63
		2593	22.87	21.96	21.47
		2548.3	22.85	21.93	21.44
		2503.5	22.67	21.77	21.27
	36RB-Low	2682.5	23.03	22.07	21.60
		2637.8	22.99	22.07	21.58
		2593	22.87	21.95	21.48
		2548.3	22.90	21.95	21.49
		2503.5	22.61	21.71	21.25
	75RB	2682.5	22.94	22.07	21.59
		2637.8	23.05	22.16	21.65
		2593	22.88	21.98	21.47
		2548.3	22.88	21.98	21.48
		2503.5	22.68	21.85	21.33
20MHz	1RB-High	2680	24.20	23.39	22.53
		2636.5	24.35	23.48	22.62
		2593	24.34	23.49	22.67
		2549.5	24.15	23.30	22.49
		2506	24.20	23.37	22.48
	1RB-Middle	2680	24.25	23.39	22.55
		2636.5	24.38	23.54	22.69
		2593	24.31	23.37	22.59
		2549.5	24.23	23.34	22.54
		2506	24.06	23.21	22.39
	1RB-Low	2680	24.38	23.58	22.73
		2636.5	24.54	23.73	22.93
		2593	24.38	23.57	22.74

		2549.5	24.28	23.41	22.64
		2506	23.96	23.09	22.32
	50RB-High	2680	23.35	22.41	21.83
		2636.5	23.47	22.51	21.94
		2593	23.43	22.52	21.95
		2549.5	23.34	22.37	21.79
		2506	23.31	22.34	21.77
	50RB-Middle	2680	23.36	22.38	21.85
		2636.5	23.46	22.51	21.94
		2593	23.45	22.50	21.91
		2549.5	23.36	22.41	21.86
		2506	23.23	22.22	21.74
	50RB-Low	2680	23.38	22.41	21.90
		2636.5	23.54	22.57	21.80
		2593	23.38	22.45	21.87
		2549.5	23.39	22.42	21.87
		2506	23.16	22.18	21.68
	100RB	2680	23.36	22.40	21.99
		2636.5	23.44	22.51	21.91
		2593	23.47	22.47	21.84
		2549.5	23.40	22.42	21.97
		2506	23.23	22.25	21.79

LTE Band41PC3(Low Power)

Band 41					
Bandwidth (MHz)	RB allocation RB offset	Frequency (MHz)	Actual output power (dBm)		
			QPSK	16QAM	64QAM
5MHz	1RB-High	2687.5	14.44	13.57	12.69
		2640.3	14.56	13.66	12.93
		2593	14.44	13.59	12.79
		2545.8	14.44	13.57	12.88
		2498.5	14.13	13.39	12.50
	1RB-Middle	2687.5	14.49	13.62	12.58
		2640.3	14.56	13.62	12.78
		2593	14.49	13.54	12.72
		2545.8	14.46	13.58	12.67
		2498.5	14.41	13.26	12.49
	1RB-Low	2687.5	14.41	13.53	12.75
		2640.3	14.47	13.62	12.85
		2593	14.39	13.52	12.80
		2545.8	14.40	13.56	12.68
		2498.5	14.14	13.31	12.52
	12RB-High	2687.5	13.45	12.42	11.96
		2640.3	13.55	12.57	12.06
		2593	13.51	12.47	11.95
		2545.8	13.48	12.46	11.91
		2498.5	13.25	12.25	11.70
	12RB-Middle	2687.5	13.50	12.47	11.97
		2640.3	13.53	12.53	12.08
		2593	13.49	12.50	11.92
		2545.8	13.50	12.48	11.95
		2498.5	13.23	12.23	11.73
	12RB-Low	2687.5	13.55	12.47	11.96
		2640.3	13.57	12.54	12.01

		2593	13.49	12.43	11.96
		2545.8	13.51	12.48	12.00
		2498.5	13.28	12.24	11.74
	25RB	2687.5	13.48	12.46	11.87
		2640.3	13.52	12.51	11.94
		2593	13.50	12.49	11.91
		2545.8	13.46	12.48	11.97
		2498.5	13.25	12.19	11.66
10MHz	1RB-High	2685	14.45	13.50	12.65
		2639	14.43	13.61	12.77
		2593	14.38	13.58	12.74
		2547	14.35	13.54	12.72
		2501	14.20	13.37	12.59
	1RB-Middle	2685	14.40	13.56	12.75
		2639	14.47	13.64	12.86
		2593	14.42	13.54	12.80
		2547	14.32	13.53	12.71
		2501	14.03	13.29	12.61
	1RB-Low	2685	14.47	13.65	12.82
		2639	14.62	13.74	12.98
		2593	14.45	13.61	12.83
		2547	14.43	13.66	12.83
		2501	14.14	13.35	12.51
	25RB-High	2685	13.50	12.56	11.96
		2639	13.61	12.67	12.10
		2593	13.52	12.54	11.97
		2547	13.52	12.47	11.99
		2501	13.30	12.28	11.77
	25RB-Middle	2685	13.50	12.48	11.94
		2639	13.60	12.56	12.05
		2593	13.54	12.51	11.97
		2547	13.53	12.54	12.01
		2501	13.29	12.28	11.74
	25RB-Low	2685	13.43	12.49	11.85
		2639	13.57	12.63	12.07
		2593	13.44	12.47	11.90
		2547	13.49	12.54	11.98
		2501	13.22	12.29	11.75
	50RB	2685	13.44	12.44	11.92
		2639	13.50	12.59	12.00
		2593	13.52	12.55	11.96
		2547	13.48	12.54	11.97
		2501	13.32	12.32	11.70
15MHz	1RB-High	2682.5	14.20	13.32	12.38
		2637.8	14.27	13.42	12.58
		2593	14.28	13.43	12.54
		2548.3	14.24	13.38	12.47
		2503.5	14.11	13.19	12.28
	1RB-Middle	2682.5	14.25	13.33	12.44
		2637.8	14.37	13.45	12.61
		2593	14.18	13.30	12.42
		2548.3	14.23	13.31	12.44
		2503.5	13.97	13.10	12.25
	1RB-Low	2682.5	14.42	13.49	12.56
		2637.8	14.51	13.65	12.81

		2593	14.35	13.47	12.59
		2548.3	14.30	13.48	12.58
		2503.5	13.98	13.09	12.19
	36RB-High	2682.5	13.31	12.33	11.83
		2637.8	13.45	12.38	11.90
		2593	13.33	12.32	11.87
		2548.3	13.35	12.30	11.85
		2503.5	13.13	12.09	11.63
	36RB-Middle	2682.5	13.36	12.35	11.85
		2637.8	13.42	12.44	11.97
		2593	13.34	12.32	11.80
		2548.3	13.37	12.30	11.83
		2503.5	13.13	12.09	11.59
	36RB-Low	2682.5	13.37	12.29	11.82
		2637.8	13.45	12.42	11.94
		2593	13.32	12.31	11.78
		2548.3	13.39	12.38	11.87
		2503.5	13.04	12.07	11.59
	75RB	2682.5	13.30	12.36	11.81
		2637.8	13.47	12.49	12.00
		2593	13.37	12.38	11.89
		2548.3	13.39	12.37	11.89
		2503.5	13.14	12.11	11.64
20MHz	1RB-High	2680	14.59	13.63	12.68
		2636.5	14.65	13.72	12.77
		2593	14.47	13.55	12.62
		2549.5	14.34	13.44	12.51
		2506	14.22	13.36	12.35
	1RB-Middle	2680	14.60	13.66	12.74
		2636.5	14.71	13.73	12.85
		2593	14.43	13.47	12.56
		2549.5	14.36	13.49	12.52
		2506	14.13	13.22	12.36
	1RB-Low	2680	14.78	13.84	12.88
		2636.5	14.86	13.94	13.01
		2593	14.54	13.62	12.68
		2549.5	14.46	13.52	12.55
		2506	14.00	13.14	12.14
	50RB-High	2680	13.75	12.66	12.06
		2636.5	13.75	12.73	12.13
		2593	13.54	12.51	11.91
		2549.5	13.52	12.50	11.9
		2506	13.32	12.34	11.77
	50RB-Middle	2680	13.71	12.66	12.08
		2636.5	13.85	12.81	12.2
		2593	13.58	12.51	11.95
		2549.5	13.55	12.53	11.94
		2506	13.28	12.26	11.72
	50RB-Low	2680	13.77	12.71	12.11
		2636.5	13.82	12.75	12.17
		2593	13.53	12.43	11.9
		2549.5	13.56	12.56	11.94
		2506	13.28	12.24	11.65
	100RB	2680	13.65	12.61	12.15
		2636.5	13.83	12.80	12.23

		2593	13.59	12.49	12
		2549.5	13.52	12.51	12.02
		2506	13.27	12.29	11.72

LTE Band41PC2(Normal Power)

Band 41					
Bandwidth (MHz)	RB allocation RB offset	Frequency (MHz)	Actual output power (dBm) QPSK	16QAM	64QAM
5MHz	1RB-High	2687.5	26.28	25.30	24.64
		2640.3	26.63	25.64	24.95
		2593	26.44	25.58	24.86
		2545.8	26.43	25.52	24.91
		2498.5	26.34	25.54	24.91
	1RB-Middle	2687.5	26.26	25.47	24.77
		2640.3	26.50	25.61	24.90
		2593	26.54	25.37	24.90
		2545.8	26.56	25.45	24.90
		2498.5	26.39	25.32	24.73
	1RB-Low	2687.5	26.59	25.58	24.90
		2640.3	26.56	25.67	24.81
		2593	26.36	25.53	24.75
		2545.8	26.39	25.60	24.97
		2498.5	26.29	25.44	24.88
	12RB-High	2687.5	25.35	24.44	23.79
		2640.3	25.65	24.57	24.02
		2593	25.43	24.38	23.77
		2545.8	25.46	24.55	23.83
		2498.5	25.38	24.30	23.64
	12RB-Middle	2687.5	25.51	24.62	23.97
		2640.3	25.59	24.71	23.94
		2593	25.41	24.55	23.83
		2545.8	25.48	24.49	23.84
		2498.5	25.34	24.33	23.65
	12RB-Low	2687.5	25.67	24.73	24.04
		2640.3	25.57	24.66	23.94
		2593	25.47	24.48	23.76
		2545.8	25.46	24.39	23.82
		2498.5	25.35	24.27	23.69
	25RB	2687.5	25.48	24.64	23.92
		2640.3	25.56	24.60	23.83
		2593	25.40	24.49	23.75
		2545.8	25.47	24.50	23.76
		2498.5	25.33	24.39	23.62
10MHz	1RB-High	2685	26.39	25.44	24.70
		2639	26.49	25.81	24.91
		2593	26.27	25.60	24.83
		2547	26.27	25.61	24.84
		2501	26.31	25.57	24.84
	1RB-Middle	2685	26.60	25.84	24.95
		2639	26.48	25.80	24.91
		2593	26.39	25.61	24.89
		2547	26.34	25.62	24.90
		2501	26.27	25.50	24.82
	1RB-Low	2685	26.69	26.00	24.95

		2639	26.65	25.97	24.85
		2593	26.42	25.67	24.96
		2547	26.43	25.79	24.97
		2501	26.18	25.58	24.78
	25RB-High	2685	25.66	24.76	24.01
		2639	25.61	24.68	23.95
		2593	25.47	24.50	23.75
		2547	25.46	24.54	23.81
		2501	25.37	24.44	23.69
	25RB-Middle	2685	25.64	24.72	23.98
		2639	25.59	24.68	23.94
		2593	25.45	24.53	23.79
		2547	25.43	24.57	23.84
		2501	25.36	24.43	23.67
	25RB-Low	2685	25.61	24.70	23.93
		2639	25.56	24.67	23.90
		2593	25.42	24.48	23.75
		2547	25.45	24.55	23.82
		2501	25.26	24.38	23.63
	50RB	2685	25.64	24.71	23.95
		2639	25.58	24.65	23.88
		2593	25.46	24.55	23.78
		2547	25.49	24.56	23.80
		2501	25.35	24.47	23.65
15MHz	1RB-High	2682.5	25.89	25.02	23.24
		2637.8	26.30	25.14	24.39
		2593	26.41	24.78	24.00
		2548.3	26.13	25.54	24.81
		2503.5	26.10	25.49	24.78
	1RB-Middle	2682.5	26.31	25.83	24.85
		2637.8	26.40	25.77	24.81
		2593	26.06	25.54	24.86
		2548.3	26.11	25.55	24.82
		2503.5	26.01	25.41	24.69
	1RB-Low	2682.5	26.46	25.45	24.69
		2637.8	25.67	25.00	24.18
		2593	26.20	24.99	24.21
		2548.3	26.22	25.66	24.93
		2503.5	25.96	25.38	24.67
	36RB-High	2682.5	25.57	24.60	23.88
		2637.8	25.50	24.54	23.86
		2593	25.33	24.38	23.70
		2548.3	25.32	24.38	23.66
		2503.5	25.28	24.27	23.61
	36RB-Middle	2682.5	25.63	24.64	23.92
		2637.8	25.57	24.56	23.87
		2593	25.34	24.33	23.68
		2548.3	25.36	24.38	23.68
		2503.5	25.23	24.27	23.56
	36RB-Low	2682.5	25.53	24.58	23.87
		2637.8	25.55	24.56	23.87
		2593	25.35	24.37	23.72
		2548.3	25.37	24.39	23.75
		2503.5	25.17	24.23	23.53
	75RB	2682.5	25.50	24.55	23.87

		2637.8	25.55	24.63	23.91
		2593	25.32	24.38	23.70
		2548.3	25.34	24.40	23.72
		2503.5	25.25	24.30	23.58
20MHz	1RB-High	2680	26.32	25.75	24.48
		2636.5	26.41	25.76	24.52
		2593	26.40	25.80	24.61
		2549.5	26.31	25.66	24.48
		2506	26.34	25.73	24.47
	1RB-Middle	2680	26.35	25.71	24.50
		2636.5	26.42	25.79	24.53
		2593	26.35	25.70	24.52
		2549.5	26.36	25.70	24.47
		2506	26.24	25.58	24.30
	1RB-Low	2680	26.52	25.89	24.60
		2636.5	26.59	26.02	24.70
		2593	26.47	25.84	24.59
		2549.5	26.43	25.80	24.53
		2506	26.14	25.53	24.27
	50RB-High	2680	25.55	24.63	23.61
		2636.5	25.62	24.68	23.68
		2593	25.58	24.65	23.72
		2549.5	25.60	24.66	23.67
		2506	25.55	24.60	23.61
	50RB-Middle	2680	25.52	24.55	23.62
		2636.5	25.61	24.69	23.68
		2593	25.63	24.70	23.71
		2549.5	25.64	24.72	23.67
		2506	25.53	24.54	23.60
	50RB-Low	2680	25.56	24.59	23.61
		2636.5	25.69	24.73	23.75
		2593	25.63	24.67	23.64
		2549.5	25.63	24.69	23.70
		2506	25.46	24.49	23.48
	100RB	2680	25.54	24.63	23.57
		2636.5	25.59	24.68	23.68
		2593	25.63	24.71	23.71
		2549.5	25.60	24.64	23.65
		2506	25.55	24.54	23.58

LTE Band41PC2(Low Power)

Band 41					
Bandwidth (MHz)	RB allocation RB offset	Frequency (MHz)	Actual output power (dBm)		
			QPSK	16QAM	64QAM
5MHz	1RB-High	2687.5	16.81	15.66	14.87
		2640.3	16.98	15.80	14.96
		2593	16.87	15.68	14.92
		2545.8	16.95	15.74	15.04
		2498.5	16.75	15.49	14.72
	1RB-Middle	2687.5	16.78	15.56	14.78
		2640.3	16.91	15.78	15.00
		2593	16.98	15.64	14.80
		2545.8	16.84	15.66	14.89
		2498.5	16.69	15.42	14.69

	1RB-Low	2687.5	16.81	15.68	14.85
		2640.3	16.96	15.80	15.00
		2593	16.90	15.68	14.94
		2545.8	16.87	15.75	14.98
		2498.5	16.67	15.45	14.71
	12RB-High	2687.5	15.91	14.35	13.87
		2640.3	16.02	14.50	13.91
		2593	16.02	14.53	13.86
		2545.8	16.01	14.46	13.94
		2498.5	15.79	14.33	13.68
	12RB-Middle	2687.5	15.93	14.41	13.79
		2640.3	16.02	14.60	13.93
		2593	16.00	14.51	13.97
		2545.8	16.04	14.54	13.96
		2498.5	15.78	14.31	13.70
	12RB-Low	2687.5	15.98	14.40	13.82
		2640.3	16.03	14.56	13.96
		2593	15.96	14.54	13.95
		2545.8	16.01	14.56	13.94
		2498.5	15.74	14.31	13.66
	25RB	2687.5	15.85	14.47	13.76
		2640.3	15.99	14.53	13.86
		2593	15.97	14.53	13.88
		2545.8	15.98	14.54	13.86
		2498.5	15.76	14.32	13.64
10MHz	1RB-High	2685	16.84	15.56	14.82
		2639	16.87	15.68	14.97
		2593	16.80	15.72	14.93
		2547	16.90	15.74	14.92
		2501	16.72	15.61	14.83
	1RB-Middle	2685	16.90	15.57	14.91
		2639	17.03	15.67	15.04
		2593	16.98	15.60	14.97
		2547	16.97	15.68	14.97
		2501	16.74	15.44	14.75
	1RB-Low	2685	16.97	15.64	15.00
		2639	17.11	15.85	15.13
		2593	17.03	15.75	15.06
		2547	17.03	15.83	15.02
		2501	16.76	15.44	14.76
	25RB-High	2685	15.96	14.48	13.81
		2639	16.06	14.61	13.96
		2593	16.04	14.52	13.89
		2547	16.05	14.56	13.88
		2501	15.84	14.37	13.70
	25RB-Middle	2685	15.87	14.42	13.76
		2639	16.06	14.56	13.92
		2593	16.00	14.53	13.86
		2547	16.04	14.58	13.94
		2501	15.81	14.33	13.67
	25RB-Low	2685	15.90	14.39	13.74
		2639	16.03	14.56	13.89
		2593	15.99	14.51	13.89
		2547	16.04	14.57	13.86
		2501	15.81	14.28	13.65

	50RB	2685	15.91	14.36	13.72
		2639	16.01	14.63	13.91
		2593	16.03	14.51	13.91
		2547	16.06	14.62	13.88
		2501	15.82	14.28	13.64
15MHz	1RB-High	2682.5	16.66	15.45	14.64
		2637.8	16.82	15.61	14.75
		2593	16.76	15.57	14.78
		2548.3	16.77	15.58	14.81
		2503.5	16.61	15.36	14.59
	1RB-Middle	2682.5	16.65	15.39	14.60
		2637.8	16.78	15.58	14.82
		2593	16.66	15.52	14.69
		2548.3	16.74	15.56	14.74
		2503.5	16.51	15.26	14.54
	1RB-Low	2682.5	16.74	15.58	14.80
		2637.8	16.98	15.82	14.98
		2593	16.82	15.63	14.83
		2548.3	16.81	15.61	14.83
		2503.5	16.47	15.29	14.48
	36RB-High	2682.5	15.77	14.27	13.68
		2637.8	15.92	14.38	13.81
		2593	15.86	14.34	13.75
		2548.3	15.89	14.34	13.78
		2503.5	15.68	14.18	13.58
	36RB-Middle	2682.5	15.73	14.22	13.60
		2637.8	15.97	14.45	13.86
		2593	15.84	14.35	13.75
		2548.3	15.91	14.36	13.76
		2503.5	15.67	14.15	13.55
	36RB-Low	2682.5	15.78	14.27	13.66
		2637.8	15.98	14.44	13.87
		2593	15.94	14.39	13.78
		2548.3	15.92	14.42	13.82
		2503.5	15.63	14.11	13.52
	75RB	2682.5	15.79	14.27	13.65
		2637.8	15.97	14.48	13.93
		2593	15.91	14.43	13.81
		2548.3	15.89	14.42	13.84
		2503.5	15.65	14.21	13.59
20MHz	1RB-High	2680	16.71	16.03	14.72
		2636.5	16.83	16.14	14.89
		2593	16.76	16.09	14.77
		2549.5	16.70	15.95	14.68
		2506	16.54	15.93	14.62
	1RB-Middle	2680	16.73	16.04	14.73
		2636.5	16.86	16.17	14.89
		2593	16.65	15.97	14.69
		2549.5	16.67	15.98	14.71
		2506	16.44	15.75	14.46
	1RB-Low	2680	16.86	16.24	14.94
		2636.5	17.08	16.36	15.13
		2593	16.85	16.12	14.86
		2549.5	16.72	16.04	14.72
		2506	16.38	15.72	14.45

	50RB-High	2680	15.88	14.90	13.75
		2636.5	16.02	15.00	13.86
		2593	15.84	14.86	13.74
		2549.5	15.87	14.89	13.72
		2506	15.66	14.72	13.6
	50RB-Middle	2680	15.95	14.99	13.79
		2636.5	16.10	15.09	13.95
		2593	15.85	14.92	13.72
		2549.5	15.90	14.91	13.74
		2506	15.67	14.71	13.55
	50RB-Low	2680	15.85	14.91	13.77
		2636.5	16.01	15.06	13.95
		2593	15.87	14.89	13.74
		2549.5	15.90	14.93	13.8
		2506	15.61	14.66	13.5
	100RB	2680	15.85	14.88	13.87
		2636.5	16.04	15.10	14.01
		2593	15.86	14.91	13.78
		2549.5	15.88	14.91	13.84
		2506	15.65	14.72	13.62

LTE Band66(Normal Power) ANT2

Band 66					
Bandwidth (MHz)	RB allocation RB offset	Frequency (MHz)	Actual output power (dBm)		
			QPSK	16QAM	64QAM
1.4MHz	1RB-High	1779.3	23.00	22.22	22.21
		1745	23.02	22.37	22.30
		1710.7	23.05	22.36	22.41
	1RB-Middle	1779.3	23.11	22.30	22.38
		1745	23.01	22.45	22.26
		1710.7	23.15	22.58	22.46
	1RB-Low	1779.3	23.04	22.23	22.16
		1745	23.05	22.39	22.33
		1710.7	23.02	22.39	22.34
	3RB-High	1779.3	23.03	22.20	22.34
		1745	23.16	22.20	22.24
		1710.7	23.15	22.21	22.29
	3RB-Middle	1779.3	23.04	22.19	22.19
		1745	23.33	22.01	22.18
		1710.7	23.19	22.07	22.10
	3RB-Low	1779.3	23.09	22.29	22.21
		1745	23.13	22.31	22.21
		1710.7	23.12	22.17	22.29
	6RB	1779.3	22.11	21.38	21.24
		1745	22.20	21.36	21.15
		1710.7	22.22	21.16	21.24
3MHz	1RB-High	1778.5	23.13	22.54	22.21
		1745	23.18	22.52	22.35
		1711.5	23.29	22.64	22.35
	1RB-Middle	1778.5	23.05	22.75	22.18
		1745	23.11	22.86	22.13
		1711.5	23.08	22.61	22.40
	1RB-Low	1778.5	23.14	22.45	22.34
		1745	23.20	22.44	22.39

		1711.5	23.16	22.54	22.39
	8RB-High	1778.5	22.25	21.36	21.38
		1745	22.29	21.25	21.44
		1711.5	22.30	21.40	21.43
	8RB-Middle	1778.5	22.31	21.33	21.23
		1745	22.31	21.41	21.36
		1711.5	22.39	21.43	21.37
	8RB-Low	1778.5	22.22	21.36	21.36
		1745	22.21	21.37	21.31
		1711.5	22.27	21.37	21.41
	15RB	1778.5	22.28	21.31	21.29
		1745	22.26	21.18	21.27
		1711.5	22.31	21.38	21.35
5MHz	1RB-High	1777.5	23.11	22.51	22.17
		1745	23.12	22.58	21.33
		1712.5	23.11	22.57	21.41
	1RB-Middle	1777.5	23.11	22.54	22.21
		1745	23.15	22.14	21.37
		1712.5	23.22	22.54	21.49
	1RB-Low	1777.5	23.14	22.58	22.39
		1745	23.22	22.61	21.40
		1712.5	23.17	22.59	21.49
	12RB-High	1777.5	22.28	21.30	21.36
		1745	22.31	21.31	20.49
		1712.5	22.29	21.39	20.46
	12RB-Middle	1777.5	22.29	21.39	21.36
		1745	22.31	21.32	20.29
		1712.5	22.38	21.44	20.47
	12RB-Low	1777.5	22.22	21.18	21.31
		1745	22.29	21.39	20.32
		1712.5	22.31	21.38	20.43
	25RB	1777.5	22.23	21.36	21.33
		1745	22.21	21.32	20.37
		1712.5	22.31	21.36	20.45
10MHz	1RB-High	1775	23.07	22.67	22.39
		1745	23.13	22.72	22.27
		1715	23.09	22.52	22.36
	1RB-Middle	1775	23.13	22.48	22.37
		1745	23.06	22.44	22.45
		1715	23.12	22.39	22.40
	1RB-Low	1775	23.11	22.53	22.40
		1745	23.10	22.40	22.43
		1715	23.19	22.68	22.45
	25RB-High	1775	22.36	21.34	21.38
		1745	22.29	21.37	21.35
		1715	22.35	21.41	21.28
	25RB-Middle	1775	22.23	21.38	21.39
		1745	22.24	21.32	21.40
		1715	22.33	21.47	21.34
	25RB-Low	1775	22.18	21.34	21.33
		1745	22.29	21.30	21.36
		1715	22.30	21.43	21.49
	50RB	1775	22.24	21.39	21.18
		1745	22.26	21.27	21.23
		1715	22.34	21.45	21.33

15MHz	1RB-High	1772.5	23.05	22.41	22.48
		1745	23.04	22.35	22.41
		1717.5	23.02	22.39	22.29
	1RB-Middle	1772.5	23.07	22.50	22.28
		1745	23.11	22.41	22.46
		1717.5	23.04	22.39	22.40
	1RB-Low	1772.5	23.09	22.50	22.41
		1745	23.06	22.43	22.33
		1717.5	23.07	22.56	22.40
	36RB-High	1772.5	22.10	21.19	21.26
		1745	22.18	21.26	21.24
		1717.5	22.19	21.27	21.18
	36RB-Middle	1772.5	22.09	21.09	21.16
		1745	22.11	21.23	21.20
		1717.5	22.21	21.30	21.27
	36RB-Low	1772.5	22.12	21.13	21.13
		1745	22.14	21.11	21.17
		1717.5	22.22	21.28	21.25
	75RB	1772.5	22.06	21.13	21.25
		1745	22.21	21.13	21.20
		1717.5	22.25	21.24	21.22
20MHz	1RB-High	1770	23.19	22.31	22.26
		1745	23.09	22.39	22.25
		1720	23.07	22.44	21.12
	1RB-Middle	1770	23.09	22.32	22.16
		1745	23.07	22.40	22.24
		1720	23.00	22.30	21.03
	1RB-Low	1770	23.03	22.36	22.25
		1745	23.09	22.44	22.30
		1720	23.21	22.40	21.11
	50RB-High	1770	22.06	21.13	21.06
		1745	22.20	21.26	21.17
		1720	22.12	21.17	20.18
	50RB-Middle	1770	22.04	21.12	21.04
		1745	22.24	21.26	21.17
		1720	22.15	21.19	20.21
	50RB-Low	1770	22.08	21.12	21.06
		1745	22.18	21.22	21.15
		1720	22.15	21.19	20.19
	100RB	1770	22.08	21.08	21.14
		1745	22.23	21.24	20.27
		1720	22.16	21.17	20.22

LTE Band66(Low Power) ANT2

Band 66					
Bandwidth (MHz)	RB allocation RB offset	Frequency (MHz)	Actual output power (dBm)		
			QPSK	16QAM	64QAM
1.4MHz	1RB-High	1779.3	15.07	15.32	13.92
		1745	16.07	15.50	13.91
		1710.7	16.10	15.47	13.91
	1RB-Middle	1779.3	15.23	15.33	13.90
		1745	16.38	15.58	13.96
		1710.7	16.39	15.56	14.03
	1RB-Low	1779.3	15.21	15.37	13.91