



FCC SAR Compliance Test Report

Project Name: LTE 2D USB Rotator
Model : E397Bu-501
FCC ID : QISE397BU-501
Report No. : SYBH(Z-SAR)007122011-2

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DATE	2011-12-07	2011-12-07	2011-12-07

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Reliability Laboratory of Huawei Technologies Co., Ltd.

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※ ※ Modified History ※ ※

REV.	DESCRIPTION	ISSUED DATE	REMARK
Rev. 1.0	Initial Test Report Release	2011-12-07	Luchaogan

1 General Information

1.1 Statement of Compliance

The maximum results of Specific Absorption Rate (SAR) found during testing for HUAWEI E397Bu-501 are as below Table 1.

Band	Position	Test Mode	Measured MAX SAR _{1g} (W/kg)	MAX Conducted Power (dBm)	Tune-up Power (dBm)	Extrapolated Result (W/kg)
GSM 850	Rear side 5mm	EGPRS 1TS	1.080	32.37	33.00	1.249
GSM 1900	Rear side 5mm	GPRS 1TS	0.645	28.91	30.00	0.829
WCDMA 850	Rear side 5mm	RMC	0.940	22.27	23.00	1.112
WCDMA 1900	Front side 5mm	RMC	0.884	22.28	23.00	1.043
LTE Band XVII	Rear side 5mm	QPSK	0.557	22.01	23.00	0.700
	Front side 5mm	16QAM	0.491	20.83	22.00	0.643
LTE Band IV	Front side 5mm	QPSK	0.988	22.31	23.00	1.158
	Front side 5mm	16QAM	0.829	21.82	22.00	0.864

Table 1: Summary of test result

The device is in compliance with Specific Absorption Rate (SAR) for general population/uncontrolled exposure limits of 1.6 W/Kg as averaged over any 1 g tissue according to the FCC rule §2.1093, the ANSI/IEEE C 95.1:1999, the NCRP Report Number 86 for uncontrolled environment, according to the Health Canada's Safety Code 6 and the Industry Canada Radio Standards Specification RSS-102 for General Population/Uncontrolled exposure, and had been tested in accordance with the measurement methods and procedures specified in IEEE 1528-2003 and FCC OET Bulletin 65 Supplement.

1.2 RF exposure limits

Human Exposure	Uncontrolled Environment General Population	Controlled Environment Occupational
Spatial Peak SAR* (Brain)	1.60 mW/g	8.00 mW/g
Spatial Average SAR** (Whole Body)	0.08 mW/g	0.40 mW/g
Spatial Peak SAR*** (Hands/Feet/Ankle/Wrist)	4.00 mW/g	20.00 mW/g

Table 2: RF exposure limits

The limit applied in this test report is shown in **bold** letters

Notes:

* The Spatial Peak value of the SAR averaged over any 1 gram of tissue (defined as a tissue volume in the shape of a cube) and over the appropriate averaging time

** The Spatial Average value of the SAR averaged over the whole body.

*** The Spatial Peak value of the SAR averaged over any 10 grams of tissue (defined as a tissue volume in the shape of a cube) and over the appropriate averaging time.

Uncontrolled Environments are defined as locations where there is the exposure of individuals who have no knowledge or control of their exposure.

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).

1.3 EUT Description

Device Information:			
DUT Name:	LTE 2D USB Rotator		
Type Identification:	E397Bu-501		
FCC ID :	QISE397BU-501		
S/N No:	E3R01A11A2900014 [SAR1]		
IMEI No:	862342010000233		
Device Type :	portable device		
Exposure Category:	uncontrolled environment / general population		
Hardware Version :	CD2E397UM		
Software Version :	11.433.03.20.000		
Antenna Type :	internal antenna		
Tested with host laptop:	Lenovo ThinkPad T61 Lenovo ThinkPad X301		
Device Operating Configurations:			
Supporting Mode(s)	GSM 850/1900,WCDMA 850/1900,LTE Band IV/XVII,		
Test Modulation	GMSK, QPSK, 16QAM		
Device Class	B		
Operating Frequency Range(s)	Band	Tx (MHz)	Rx (MHz)
	GSM 850	824 - 849	869 - 894
	GSM 1900	1850-1910	1930-1990
	WCDMA 850	824 - 849	869 - 894
	WCDMA 1900	1850-1910	1930-1990
	LTE Band IV	1710-1755	2110-2155
	LTE Band XVII	704-716	734-746
GPRS Multislot Class (12)	Max Number of Timeslots in Uplink:	4	
	Max Number of Timeslots in Downlink:	4	
	Max Total Timeslot:	5	
EGPRS Multislot Class (12)	Max Number of Timeslots in Uplink:	4	
	Max Number of Timeslots in Downlink:	4	
	Max Total Timeslot:	5	
HSDPA UE Category	24		
HSUPA UE Category	6		
Power Class :	4, Tested with power level 5 (GSM 850)		
	1, Tested with power level 0 (GSM 1900)		
	3. Tested with power control all 1 bits (WCDMA II)		
	3, Tested with power control all 1 bits (WCDMA V)		
	3, tested with power control all Max.(LTE Band IV)		
	3, tested with power control all Max.(LTE Band XVII)		
Test Channels (low-mid-high) :	128-190-251(GSM 850)		
	512-661-810(GSM 1900)		
	4132-4182-4233(WCDMA 850)		
	9262-9400-9538(WCDMA 1900)		
	19957-20175-20393(LTE Band IV BW=1.4MHz)		
	19965-20175-20385(LTE Band IV BW=3MHz)		
	19975-20175-20375(LTE Band IV BW=5MHz)		
	20000-20175-20350(LTE Band IV BW=10MHz)		
	20050-20175-20300(LTE Band IV BW=20MHz)		
	23755-23790-23825(LTE Band XVII BW=5MHz)		
23780-23790-23800(LTE Band XVII BW=10MHz)			

Table 3: Device information and operating configuration

1.3.1 General Description

E397Bu-501 LTE/DC-HSPA+/HSPA+/WCDMA/EDGE/GPRS/GSM dual mode 9 bands 2D USB Rotator is subscriber equipment in the LTE/UMTS/GSM system. E397Bu-501 implement such functions as RF signal receiving/transmitting, LTE/DC-HSPA+/HSPA+/WCDMA and EDGE/GPRS/GSM protocol processing, data service etc. Externally it provides USB interface (to connect to the notebook etc.), USIM card interface and Micro SD card interface.

Note:

1.The antennas used in the EUT are listed as below table:

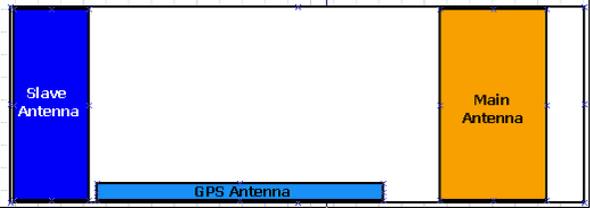
Antenna Type	Function	Antenna Location
Main antenna	One transmitter path for GSM/WCDMA/LTE Transmit and receive signal from base station	
Slave antenna	Only receive signal from base station	
GPS antenna	Only receive GPS signal from satellite.	

Table 4: Antenna Type

1.3.2 LTE information Summary

Items	Device Operating Configurations for LTE	Remark
1	Frequency Range of each LTE transmission band	Refer to table 3
2	Channel Bandwidths	Band IV (1.4MHz,3MHz,5MHz,10MHz) Band XVII (5 MHz,10MHz)
3	H,M,L channel numbers and frequencies	Refer to table 3
4a	UE Category	3
4b	Modulations Supported in UL	QPSK, 16QAM
5	Description of LTE Tx and Ant. Implementation	Refer to table 4
6	LTE Voice available	No
7	LTE MPR Permanently implement per 3GPP TS36.101 section 6.2.3~6.2.5?(manufacturer attestation to be provided)	Yes
8	Conducted power table provided for 1RB(Low and high offset),50%RB(centered),100%RB	Yes
9~10	Non-LTE operating Modes and Band	Refer to table 3
11	Simultaneous Tx Conditions	No
12	Power Reduction used for SAR Compliance	No
13~15	Supporting descriptions for power reduction	No

Table 5: LTE information Summary per FCC KDB 941225 D05

1.4 Test specification(s)

IEEE Std C95.1 – 1999	IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz – 300 GHz.
IEEE 1528-2003	Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques
OET Bulletin No. 65, Supplement C– 2001	Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields---Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions
Canada’s Safety Code 6	Limits of Human Exposure to Radiofrequency Electromagnetic Fields in the Frequency Range from 3 kHz to 300 GHz (99-EHD-237)
RSS-102	Radio Frequency Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands (Issue 4 of March 2010)
KDB941225 D01	SAR test for 3G devices v02 ,Published on Nov 13 2009
KDB941225 D05	SAR for LTE Devices v01, Published on Dec 15 2010
KDB447489 D02	SAR Procedures for Dongle Xmtr v02, Published on Nov 16 2009
Lab PBA	Tracking number: 230023

1.5 Testing laboratory

Test Site	Reliability Laboratory of Huawei Technologies Co., Ltd.
Test Location	Section K3,Bantian, Longgang District, Shenzhen, P.R.China
Telephone	+86-755-28785513
Fax	+86-755-36834474
State of accreditation	The Test laboratory (area of testing) is accredited according to ISO/IEC 17025. CNAS Registration number: L0310

1.6 Applicant and Manufacturer

Company Name	HUAWEI TECHNOLOGIES CO., LTD
Address	Huawei Base, Bantian, Longgang District, Shenzhen, P.R.China

1.7 Application details

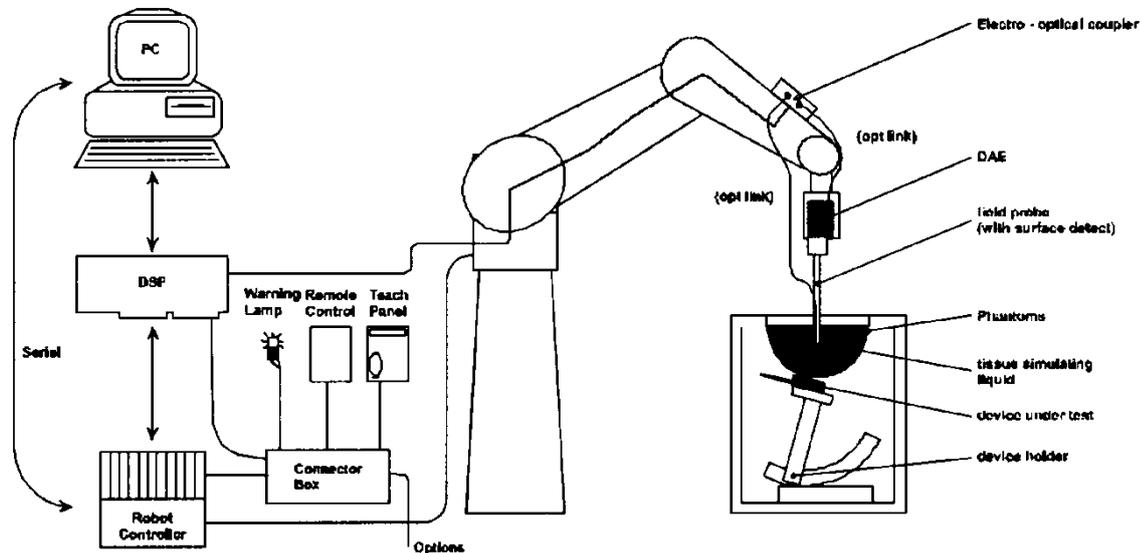
Start Date of test	2011-11-22
End Date of test	2011-11-28

1.8 Ambient Condition

Ambient temperature	20°C – 24°C
Relative Humidity	30% – 70%

2 SAR Measurement System

2.1 SAR Measurement Set-up



The DASY5 system for performing compliance tests consists of the following items:

- A standard high precision 6-axis robot (Stäubli RX family) with controller and software. An arm extension for accommodating the data acquisition electronics (DAE).
- A dosimetric probe, i.e. an isotropic E-field probe optimized and calibrated for usage in tissue simulating liquid. The probe is equipped with an optical surface detector system.
- A data acquisition electronic (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.
- A unit to operate the optical surface detector which is connected to the EOC.
- The Electro-Optical Coupler (EOC) performs the conversion from the optical into a digital electric signal of the DAE. The EOC is connected to the DASY5 measurement server.
- The DASY5 measurement server, which performs all real-time data evaluation for field measurements and surface detection, controls robot movements and handles safety operation. A computer operating Windows XP.
- DASY5 software and SEMCAD data evaluation software.
- Remote control with teach panel and additional circuitry for robot safety such as warning lamps, etc.
- The generic twin phantom enabling the testing of left-hand and right-hand usage.
- The device holder for handheld mobile phones.
- Tissue simulating liquid mixed according to the given recipes.
- System validation dipoles allowing to validate the proper functioning of the system.

2.2 Test environment

The DASY4 measurement system is placed at the head end of a room with dimensions: 5 x 2.5 x 3 m³, the SAM phantom is placed in a distance of 75 cm from the side walls and 1.1m from the rear wall. Above the test system a 1.5 x 1.5 m² array of pyramid absorbers is installed to reduce reflections from the ceiling.

Picture 1 of the photo documentation shows a complete view of the test environment.

The system allows the measurement of SAR values larger than 0.005 mW/g.

2.3 Data Acquisition Electronics description

The data acquisition electronics (DAE) consist of a highly sensitive electrometer-grade preamplifier with auto-zeroing, a channel and gain-switching multiplexer, a fast 16 bit AD-converte and a command decoder with a 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 mechanical probe mounting device includes two different sensor systems for frontal and sideways probe contacts. They are used for mechanical surface detection and probe collision detection.

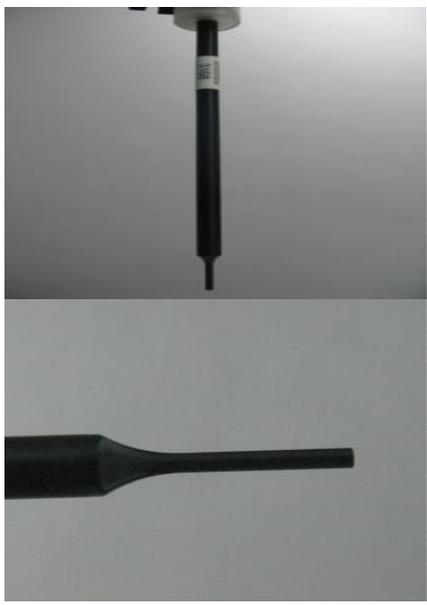
DAE4

Input Impedance	200MOhm	
The Inputs	symmetrical and floating	
Common mode rejection	above 80 dB	

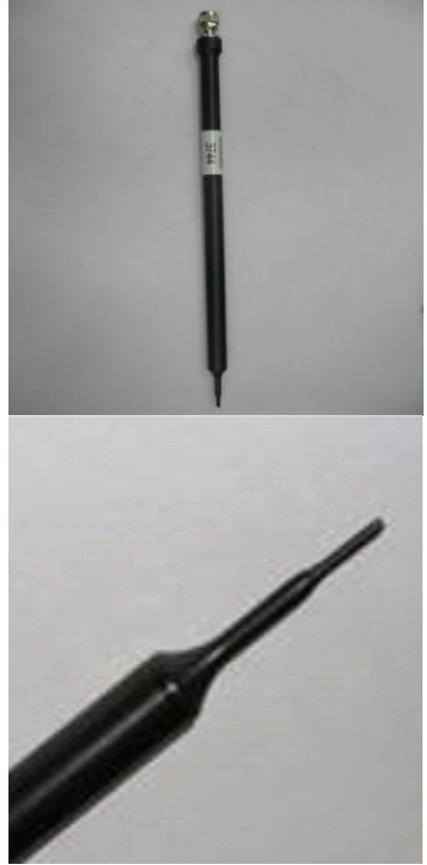
2.4 Probe description

These probes are specially designed and calibrated for use in liquids with high permittivities. They should not be used in air, since the spherical isotropy in air is poor (± 2 dB). The dosimetric probes have special calibrations in various liquids at different frequencies.

Isotropic E-Field Probe ES3DV3 for Dosimetric Measurements

Construction	Symmetrical design with triangular core Interleaved sensors Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)	
Calibration	ISO/IEC 17025 calibration service available.	
Frequency	10 MHz to 4 GHz; Linearity: ± 0.2 dB (30 MHz to 4 GHz)	
Directivity	± 0.2 dB in HSL (rotation around probe axis) ± 0.3 dB in tissue material (rotation normal to probe axis)	
Dynamic range	5 μ W/g to > 100 mW/g; Linearity: ± 0.2 dB	
Dimensions	Overall length: 330 mm (Tip: 20 mm) Tip diameter: 3.9 mm (Body: 12 mm) Distance from probe tip to dipole centers: 2.0 mm	
Application	General dosimetry up to 4 GHz Dosimetry in strong gradient fields Compliance tests of mobile phones	

Isotropic E-Field Probe EX3DV4 for Dosimetric Measurements

Construction	Symmetrical design with triangular core Built-in optical fiber for surface detection system Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., glycolether)	
Calibration	In air from 10 MHz to 2.5 GHz In head tissue simulating liquid (HSL) at 900 (800-1000) MHz and 1.8 GHz (1700-1910 MHz) (accuracy $\pm 11\%$; $k=2$) Calibration for other liquids and frequencies upon request	
Frequency	10 MHz to 3 GHz (dosimetry); Linearity: ± 0.2 dB (30 MHz to 3 GHz)	
Directivity	± 0.2 dB in HSL (rotation around probe axis) ± 0.4 dB in HSL (rotation normal to probe axis)	
Dynamic range	5 μ W/g to > 100 mW/g; Linearity: ± 0.2 dB	
Optical Surface Detection	± 0.2 mm repeatability in air and clear liquids over diffuse reflecting surfaces (EX3DV4 only)	
Dimensions	Overall length: 337 mm Tip length: 9 mm Body diameter: 10 mm Tip diameter: 2.5 mm Distance from probe tip to dipole centers: 1.0 mm	
Application	General dosimetry up to 3 GHz Compliance tests of mobile phones Fast automatic scanning in arbitrary phantoms (EX3DV4)	

2.5 Phantom description

SAM Twin Phantom

Shell Thickness	2mm +/- 0.2 mm; The ear region: 6mm	
Filling Volume	Approximately 30 liters	
Dimensions	Length:1000mm; Width:500mm; Height: adjustable feet	
Measurement Areas	Left hand Right hand Flat phantom	

The bottom plate contains three pairs 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 cover the phantom during off-periods to prevent water evaporation and changes in the liquid parameters. Free space scans of devices on top of this phantom cover are possible. Three reference marks are provided on the phantom counter. These reference marks are used to teach the absolute phantom position relative to the robot.

ELI4 Phantom

Shell Thickness	2mm +/- 0.2 mm	
Filling Volume	Approximately 30 liters	
Dimensions	Length:1000mm; Width:500mm; Height: adjustable feet	
Measurement Areas	Flat phantom	

The ELI4 phantom is intended for compliance testing of handheld and body-mounted wireless devices in the frequency range of 30MHz to 6GHz. ELI4 is fully compatible with the latest draft of the standard IEC 62209-2 and all known tissue simulating liquids.

2.6 Device holder description

The DASY5 device holder has two scales for device rotation (with respect to the body axis) and the device inclination (with respect to the line between the ear openings). The plane between the ear openings and the mouth tip has a rotation angle of 65°. 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. This device holder is used for standard mobile phones or PDA's only. If necessary an additional support of polystyrene material is used.



Larger DUT's (e.g. notebooks) cannot be tested using this device holder. Instead a support of bigger polystyrene cubes and thin polystyrene plates is used to position the DUT in all relevant positions to find and measure spots with maximum SAR values.

Therefore those devices are normally only tested at the flat part of the SAM.

2.7 Test Equipment List

This table gives a complete overview of the SAR measurement equipment
 Devices used during the test described are marked

	Manufacturer	Device	Type	Serial number	Date of last calibration)*
<input checked="" type="checkbox"/>	SPEAG	Dosimetric E-Field Probe	ES3DV3	3168	2011-09-27
<input checked="" type="checkbox"/>	SPEAG	Dosimetric E-Field Probe	ES3DV3	3168	2011-10-26
<input checked="" type="checkbox"/>	SPEAG	750 MHz Validation Dipole	D750V3	1044	2011-09-16
<input checked="" type="checkbox"/>	SPEAG	835 MHz Validation Dipole	D835V2	4d092	2011-06-22
<input checked="" type="checkbox"/>	SPEAG	1800 MHz Validation Dipole	D1800V2	2d184	2011-03-08
<input checked="" type="checkbox"/>	SPEAG	1900 MHz Validation Dipole	D1900V2	5d143	2011-09-26
<input checked="" type="checkbox"/>	SPEAG	Data acquisition electronics	DAE4	1291	2011-10-10
<input type="checkbox"/>	SPEAG	Data acquisition electronics	DAE4	852	2010-12-24
<input checked="" type="checkbox"/>	SPEAG	Software	DASY 5	N/A	N/A
<input type="checkbox"/>	SPEAG	Twin Phantom	SAM1	TP-1475	N/A
<input type="checkbox"/>	SPEAG	Twin Phantom	SAM2	TP-1474	N/A
<input checked="" type="checkbox"/>	SPEAG	Twin Phantom	SAM3	TP-1597	N/A
<input checked="" type="checkbox"/>	SPEAG	Twin Phantom	SAM4	TP-1620	N/A
<input type="checkbox"/>	SPEAG	Flat Phantom	ELI 4.0	TP-1038	N/A
<input type="checkbox"/>	SPEAG	Flat Phantom	ELI 4.0	TP-1111	N/A
<input checked="" type="checkbox"/>	R & S	WideBand Radio Communication Tester	CMW 500	112936	2011-08-17
<input checked="" type="checkbox"/>	R & S	Universal Radio Communication Tester	CMU 200	113989	2011-06-02
<input checked="" type="checkbox"/>	Agilent)*	Network Analyser	E5071B	MY42404956	2011-02-22
<input checked="" type="checkbox"/>	Agilent	Dielectric Probe Kit	85070E	2484	N/A
<input checked="" type="checkbox"/>	Agilent	Signal Generator	N5181A	MY47420989	2011-02-22
<input checked="" type="checkbox"/>	MINI-CIRCUITS	Amplifier	ZHL-42W	QA0746001	N/A
<input checked="" type="checkbox"/>	Agilent	Power Meter	E4417A	MY45101339	2011-02-22
<input checked="" type="checkbox"/>	Agilent	Power Meter Sensor	E9321A	MY44420359	2011-02-22

Note: The calibration interval of validation dipoles is 3 years.

1) Per KDB 450824 D02 requirements for dipole calibration, Reliability Laboratory of Huawei SAR lab has adopted three years calibration interval. But each measured dipole is expected to evaluate with the following criteria at least on annual interval.

- a) There is no physical damage on the dipole;
- b) System validation with specific dipole is within 10% of calibrated value;
- c) Return-loss is within 10% of calibrated measurement;
- d) Impedance is within 5Ω from the previous measurement.

2) Network analyzer probe calibration against air, distilled water and a shorting block performed before measuring liquid parameters.

3 SAR Measurement Procedure

3.1 Scanning procedure

The DASY5 installation includes predefined files with recommended procedures for measurements and validation. They are read-only document files and destined as fully defined but unmeasured masks. All test positions (head or body-worn) are tested with the same configuration of test steps differing only in the grid definition for the different test positions.

- The „reference“ and „drift“ measurements are located at the beginning and end of the batch process. They measure the field drift at one single point in the liquid over the complete procedure. The indicated drift is mainly the variation of the DUT's output power and should vary max. +/- 5 %.
- The „surface check“ measurement tests the optical surface detection system of the DASY5 system by repeatedly detecting the surface with the optical and mechanical surface detector and comparing the results. The output gives the detecting heights of both systems, the difference between the two systems and the standard deviation of the detection repeatability. Air bubbles or refraction in the liquid due to separation of the sugar-water mixture gives poor repeatability (above $\pm 0.1\text{mm}$). To prevent wrong results tests are only executed when the liquid is free of air bubbles. The difference between the optical surface detection and the actual surface depends on the probe and is specified with each probe. (It does not depend on the surface reflectivity or the probe angle to the surface within $\pm 30^\circ$.)
- The „area scan“ measures the SAR above the DUT or verification dipole on a parallel plane to the surface. It is used to locate the approximate location of the peak SAR with 2D spline interpolation. The robot performs a stepped movement along one grid axis while the local electrical field strength is measured by the probe. The probe is touching the surface of the SAM during acquisition of measurement values. The standard scan uses large grid spacing for faster measurement. Standard grid spacing for head measurements is 15 mm in x- and y- dimension. If a finer resolution is needed, the grid spacing can be reduced. Grid spacing and orientation have no influence on the SAR result. For special applications where the standard scan method does not find the peak SAR within the grid, e.g. mobile phones with flip cover, the grid can be adapted in orientation. Results of this coarse scan are shown in Appendix B.
- A „7x7x7 zoom scan“ measures the field in a volume around the 2D peak SAR value acquired in the previous „coarse“ scan. This is a fine 7x7 grid where the robot additionally moves the probe in 7 steps along the z-axis away from the bottom of the Phantom. Grid spacing for the cube measurement is 5 mm in x and y-direction and 5 mm in z-direction. DASY5 is also able to perform repeated zoom scans if more than 1 peak is found during area scan. In this document, the evaluated peak 1g and 10g averaged SAR values are shown in the 2D-graphics in Appendix B. Test results relevant for the specified standard (see chapter 1.4.) are shown in table form in chapter 7.2.
- A Z-axis scan measures the total SAR value at the x-and y-position of the maximum SAR value found during the cube 7x7x7 scan. The probe is moved away in z-direction from the bottom of the SAM phantom in 2mm steps. This measurement shows the continuity of the liquid and can - depending in the field strength – also show the liquid depth. A z-axis scan of the measurement with maximum SAR value is shown in Appendix B.

3.2 Spatial Peak SAR Evaluation

The spatial peak SAR - value for 1 and 10 g is evaluated after the Cube measurements have been done. The basis of the evaluation are the SAR values measured at the points of the fine cube grid consisting of 7 x 7 x 7 points. The algorithm that finds the maximal averaged volume is separated into three different stages.

- The data between the dipole center of the probe and the surface of the phantom are extrapolated. This data cannot be measured since the center of the dipole is 2.7 mm away from the tip of the probe and the distance between the surface and the lowest measuring point is about 1 mm (see probe calibration sheet). The extrapolated data from a cube measurement can be visualized by selecting 'Graph Evaluated'.
- The maximum interpolated value is searched with a straight-forward algorithm. Around this maximum the SAR - values averaged over the spatial volumes (1g or 10 g) are computed using the 3d-spline interpolation algorithm. If the volume cannot be evaluated (i.e., if a part of the grid was cut off by the boundary of the measurement area) the evaluation will be started on the corners of the bottom plane of the cube.
- All neighboring volumes are evaluated until no neighboring volume with a higher average value is found.

Extrapolation

The extrapolation is based on a least square algorithm [W. Gander, Computermathematik, p.168-180]. Through the points in the first 3 cm along the z-axis, polynomials of order four are calculated. These polynomials are then used to evaluate the points between the surface and the probe tip. The points, calculated from the surface, have a distance of 1 mm from each other.

Interpolation

The interpolation of the points is done with a 3d-Spline. The 3d-Spline is composed of three one-dimensional splines with the "Not a knot"-condition [W. Gander, Computermathematik, p.141-150] (x, y and z -direction) [Numerical Recipes in C, Second Edition, p.123ff].

Volume Averaging

At First the size of the cube is calculated. Then the volume is integrated with the trapezoidal algorithm. 8000 points (20x20x20) are interpolated to calculate the average.

Advanced Extrapolation

DASY5 uses the advanced extrapolation option which is able to compensate boundary effects on E-field probes.

3.3 Data Storage and Evaluation

Data Storage

The DASY5 software stores the acquired data from the data acquisition electronics as raw data (in microvolt readings from the probe sensors), together with all necessary software parameters for the data evaluation (probe calibration data, liquid parameters and device frequency and modulation data) in measurement files with the extension ".DA4". The software evaluates the desired unit and format for output each time the data is visualized or exported. This allows verification of the complete software setup even after the measurement and allows correction of incorrect parameter settings. For example, if a measurement has been performed with a wrong crest factor parameter in the device setup, the parameter can be corrected afterwards and the data can be re-evaluated.

The measured data can be visualized or exported in different units or formats, depending on the selected probe type ([V/m], [A/m], [°C], [mW/g], [mW/cm²], [dBrel], etc.). Some of these units are not available in certain situations or show meaningless results, e.g., a SAR output in a lossless media will always be zero. Raw data can also be exported to perform the evaluation with other software packages.

Data Evaluation by SEMCAD

The SEMCAD software automatically executes the following procedures to calculate the field units from the microvolt readings at the probe connector. The parameters used in the evaluation are stored in the configuration modules of the software:

Probe parameters:	- Sensitivity	Norm _i , a ₀ , a ₁ , a ₂
	- Conversion factor	ConvF _i
	- Diode compression point	Dcpi
Device parameters:	- Frequency	f
	- Crest factor	cf
Media parameters:	- Conductivity	σ
	- Density	ρ

These parameters must be set correctly in the software. They can be found in the component documents or they can be imported into the software from the configuration files issued for the DASY5 components. In the direct measuring mode of the multimeter option, the parameters of the actual system setup are used. In the scan visualization and export modes, the parameters stored in the corresponding document files are used.

The first step of the evaluation is a linearization of the filtered input signal to account for the compression characteristics of the detector diode. The compensation depends on the input signal, the diode type and the DC-transmission factor from the diode to the evaluation electronics.

If the exciting field is pulsed, the crest factor of the signal must be known to correctly compensate for peak power. The formula for each channel can be given as:

$$V_i = U_i + U_i^2 \cdot cf/dcp_i$$

with	V _i	= compensated signal of channel i	(i = x, y, z)
	U _i	= input signal of channel i	(i = x, y, z)
	cf	= crest factor of exciting field (DASY parameter)	
	dcp _i	= diode compression point	(DASY parameter)

From the compensated input signals the primary field data for each channel can be evaluated:

E-field probes:
$$E_i = (V_i / Norm_i \cdot ConvF)^{1/2}$$

H-field probes:
$$H_i = (V_i)^{1/2} \cdot (a_{i0} + a_{i1}f + a_{i2}f^2)/f$$

- with V_i = compensated signal of channel i (i = x, y, z)
 $Norm_i$ = sensor sensitivity of channel i (i = x, y, z)
[mV/(V/m)²] for E-field Probes
ConvF = sensitivity enhancement in solution
 a_{ij} = sensor sensitivity factors for H-field probes
f = carrier frequency [GHz]
 E_i = electric field strength of channel i in V/m
 H_i = magnetic field strength of channel i in A/m

The RSS value of the field components gives the total field strength (Hermitian magnitude):

$$E_{tot} = (E_x^2 + E_y^2 + E_z^2)^{1/2}$$

The primary field data are used to calculate the derived field units.

$$SAR = (E_{tot}^2 \cdot \sigma) / (\rho \cdot 1000)$$

- with SAR = local specific absorption rate in mW/g
 E_{tot} = total field strength in V/m
 σ = conductivity in [mho/m] or [Siemens/m]
 ρ = equivalent tissue density in g/cm³

Note that the density is normally set to 1 (or 1.06), to account for actual brain density rather than the density of the simulation liquid. The power flow density is calculated assuming the excitation field to be a free space field.

$$P_{pwe} = E_{tot}^2 / 3770 \quad \text{or} \quad P_{pwe} = H_{tot}^2 \cdot 37.7$$

- with P_{pwe} = equivalent power density of a plane wave in mW/cm²
 E_{tot} = total electric field strength in V/m
 H_{tot} = total magnetic field strength in A/m

4 System Verification Procedure

4.1 Tissue Verification

The simulating liquids should be checked at the beginning of a series of SAR measurements to determine if the dielectric parameters are within the tolerances of the specified target values. The measured conductivity and relative permittivity should be within $\pm 5\%$ of the target values.

The following materials are used for producing the tissue-equivalent materials.

Ingredients (% of weight)	Body Tissue					
	750	835	900	1800	1900	2450
Frequency Band (MHz)						
Water	50.3	52.4	56.0	69.91	69.91	73.2
Salt (NaCl)	1.6	1.40	0.76	0.13	0.13	0.04
Sugar	47	45.0	41.76	0.0	0.0	0.0
HEC	0.0	1.0	1.21	0.0	0.0	0.0
Bactericide	0.0	0.1	0.27	0.0	0.0	0.0
Cellulose	1.0	0.0	0.0	0.0	0.0	0.0
DGBE	0.0	0.0	0.0	29.96	29.96	26.7
Preventol	0.1	0.0	0.0	0.0	0.0	0.0

Table 6: Tissue Dielectric Properties

Salt: 99+% Pure Sodium Chloride; Sugar: 98+% Pure Sucrose; Water: De-ionized, 16M Ω + resistivity
 HEC: Hydroxyethyl Cellulose; DGBE: 99+% Di(ethylene glycol) butyl ether, [2-(2-butoxyethoxy)ethanol]
 Triton X-100(ultra pure): Polyethylene glycol mono [4-(1,1,3,3-tetramethylbutyl)phenyl]ether

Used Target Frequency	Target Tissue		Measured Tissue		Liquid Temp.	Test Date
	ϵ_r (+/-5%)	σ (S/m) (+/-5%)	ϵ_r	σ (S/m)		
709MHz Body	55.69 (52.91~58.47)	0.96 (0.912~1.008)	55.18	0.915	21.4°C	2011-11-25
710MHz Body	55.69 (52.91~58.47)	0.96 (0.912~1.008)	55.18	0.921		
711MHz Body	55.68 (52.90~58.46)	0.96 (0.912~1.008)	55.05	0.926		
750MHz Body	55.53 (52.75~58.31)	0.96 (0.912~1.008)	54.67	0.955		
709MHz Body	55.69 (52.91~58.47)	0.96 (0.912~1.008)	55.23	0.920	21.4°C	2011-11-26
710MHz Body	55.69 (52.91~58.47)	0.96 (0.912~1.008)	54.96	0.921		
711MHz Body	55.68 (52.90~58.46)	0.96 (0.912~1.008)	54.97	0.929		
750MHz Body	55.53 (52.75~58.31)	0.96 (0.912~1.008)	54.65	0.962		
824MHz Body	55.2 (52.44~57.96)	0.97 (0.92~1.02)	53.61	0.994	21.4°C	2011-11-22
837MHz Body	55.2 (52.44~57.96)	0.97 (0.92~1.02)	53.53	1.015		
849MHz Body	55.2 (52.44~57.96)	0.99 (0.94~1.04)	53.67	1.019		
835MHz Body	55.2 (52.44~57.96)	0.97 (0.92~1.02)	53.46	1.011		
826MHz Body	55.2 (52.44~57.96)	0.97 (0.92~1.02)	53.71	1.010	21.4°C	2011-11-23

836MHz Body	55.2 (52.44~57.96)	0.97 (0.92~1.02)	53.53	1.015		
847MHz Body	55.2 (52.44~57.96)	0.99 (0.94~1.04)	53.31	1.032		
835MHz Body	55.2 (52.44~57.96)	0.97 (0.92~1.02)	53.46	1.011		
1720MHz Body	53.5 (50.83~56.18)	1.47 (1.40~1.54)	52.03	1.526	21.4°C	2011-11-28
1732MHz Body	53.5 (50.83~56.18)	1.47 (1.40~1.54)	51.96	1.539		
1745MHz Body	53.4 (50.73~56.07)	1.49 (1.42~1.56)	51.91	1.544		
1800MHz Body	53.3 (50.64~55.97)	1.52 (1.44~1.60)	51.73	1.591		
1850MHz Body	53.3 (50.64~55.97)	1.52 (1.44~1.60)	52.09	1.539	21.4°C	2011-11-24
1852MHz Body	53.3 (50.64~55.97)	1.52 (1.44~1.60)	52.08	1.541		
1880MHz Body	53.3 (50.64~55.97)	1.52 (1.44~1.60)	51.99	1..569		
1907MHz Body	53.3 (50.64~55.97)	1.52 (1.44~1.60)	51.91	1.594		
1910MHz Body	53.3 (50.64~55.97)	1.52 (1.44~1.60)	51.90	1.596		
1900MHz Body	53.3 (50.64~55.97)	1.52 (1.44~1.60)	51.93	1.586		
ϵ_r = Relative permittivity, σ = Conductivity						

Table 7: Measured Tissue Parameter

The dielectric parameters of the tissue-equivalent liquid should be measured under similar ambient conditions and within 2 °C of the conditions expected during the SAR evaluation to satisfy protocol requirements.

Note: 1) KDB 450824 was ensured to be applied for probe calibration frequencies greater than or equal to 50MHz of the EUT frequencies.

2)The above measured tissue parameters were used in the DASY software to perform interpolation via the DASY software to determine actual dielectric parameters at the test frequencies. The SAR test plots may slightly differ from the table above since the DASY rounds to three significant digits.

3) For LTE measurements in band IV and for 1800 MHz system verification the same TSL and 1750 MHz SAR probe calibration point have been used.

4.2 System Check

The system check is performed for verifying the accuracy of the complete measurement system and performance of the software. The system validation is performed with tissue equivalent material according to IEEE P1528 (described above). The following table shows validation results for all frequency bands and tissue liquids used during the tests (Graphic Plot(s) see Appendix A).

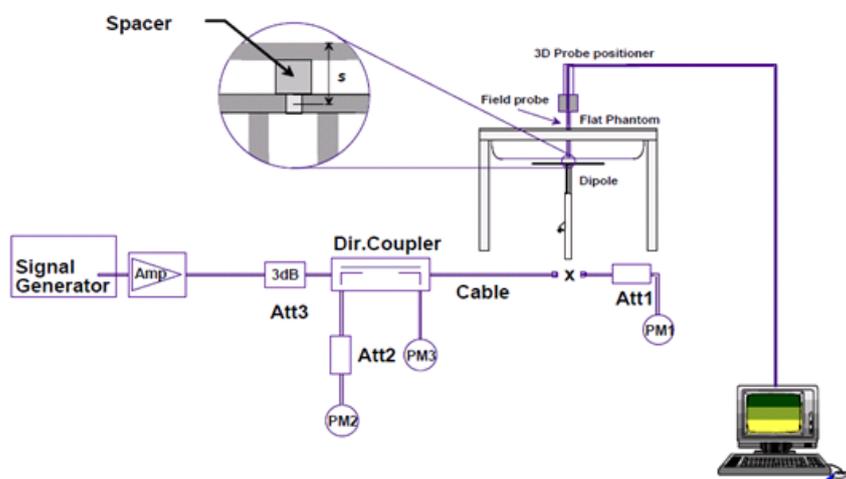
System Check	Target SAR (1W) (+/-10%)		Measured SAR (Normalized to 1W)		Liquid Temp.	Test Date
	1-g (mW/g)	10-g (mW/g)	1-g (mW/g)	10-g (mW/g)		
D750V2 Body	8.80 (7.92~9.68)	5.84 (5.26~6.42)	8.68	5.80	21.4°C	2011-11-25
D750V2 Body	8.80 (7.92~9.68)	5.84 (5.26~6.42)	8.68	5.76	21.4°C	2011-11-26
D835V2 Body	9.65 (8.69~10.61)	6.38 (5.74~7.02)	10.32	6.72	21.4°C	2011-11-22
D835V2 Body	9.65 (8.69~10.61)	6.38 (5.74~7.02)	9.96	6.52	21.4°C	2011-11-23
D1800V2 Body	38.8 (34.92~42.68)	20.4 (18.36~22.44)	40.80	20.96	21.4°C	2011-11-28
D1900V2 Body	41.4 (37.26~45.54)	21.8 (19.62~23.98)	39.80	19.84	21.4°C	2011-11-24

Table 8: System Check Results

4.3 Validation Procedure

The validation is performed by using a validation dipole which is positioned parallel to the planar part of the SAM phantom at the reference point. The distance of the dipole to the SAM phantom is determined by a plexiglass spacer. The dipole is connected to the signal source consisting of signal generator and amplifier via a directional coupler, N-connector cable and adaption to SMA. It is fed with a power of 250 mW. To adjust this power a power meter is used. The power sensor is connected to the cable before the validation to measure the power at this point and do adjustments at the signal generator. At the outputs of the directional coupler both return loss as well as forward power are controlled during the validation to make sure that emitted power at the dipole is kept constant. This can also be checked by the power drift measurement after the test (result on plot).

Validation results have to be equal or near the values determined during dipole calibration (target SAR in table above) with the relevant liquids and test system.



5 Measurement Uncertainty Evaluation

5.1 Measurement uncertainty evaluation for SAR test

The overall combined measurement uncertainty of the measurement system is $\pm 10.9\%$ ($K=1$).
The expanded uncertainty ($k=2$) is assessed to be $\pm 21.9\%$

This measurement uncertainty budget is suggested by IEEE P1528 and determined by Schmid & Partner Engineering AG. The breakdown of the individual uncertainties is as follows:

Error Sources	Uncertainty Value	Probability Distribution	Divisor	c_i 1g	c_i 10g	Standard Uncertainty 1g	Standard Uncertainty 10g	v_i^2 or v_{eff}
Measurement System								
Probe calibration	$\pm 6.0\%$	Normal	1	1	1	$\pm 6.0\%$	$\pm 6.0\%$	∞
Axial isotropy	$\pm 4.7\%$	Rectangular	$\sqrt{3}$	0.7	0.7	$\pm 1.9\%$	$\pm 1.9\%$	∞
Hemispherical isotropy	$\pm 9.6\%$	Rectangular	$\sqrt{3}$	0.7	0.7	$\pm 3.9\%$	$\pm 3.9\%$	∞
Spatial resolution	$\pm 0.0\%$	Rectangular	$\sqrt{3}$	1	1	$\pm 0.0\%$	$\pm 0.0\%$	∞
Boundary effects	$\pm 1.0\%$	Rectangular	$\sqrt{3}$	1	1	$\pm 0.6\%$	$\pm 0.6\%$	∞
Probe linearity	$\pm 4.7\%$	Rectangular	$\sqrt{3}$	1	1	$\pm 2.7\%$	$\pm 2.7\%$	∞
System detection limits	$\pm 1.0\%$	Rectangular	$\sqrt{3}$	1	1	$\pm 0.6\%$	$\pm 0.6\%$	∞
Readout electronics	$\pm 0.3\%$	Normal	1	1	1	$\pm 0.3\%$	$\pm 0.3\%$	∞
Response time	$\pm 0.8\%$	Rectangular	$\sqrt{3}$	1	1	$\pm 0.5\%$	$\pm 0.5\%$	∞
Integration time	$\pm 2.6\%$	Rectangular	$\sqrt{3}$	1	1	$\pm 1.5\%$	$\pm 1.5\%$	∞
RF ambient conditions	$\pm 3.0\%$	Rectangular	$\sqrt{3}$	1	1	$\pm 1.7\%$	$\pm 1.7\%$	∞
Probe positioner	$\pm 0.4\%$	Rectangular	$\sqrt{3}$	1	1	$\pm 0.2\%$	$\pm 0.2\%$	∞
Probe positioning	$\pm 2.9\%$	Rectangular	$\sqrt{3}$	1	1	$\pm 1.7\%$	$\pm 1.7\%$	∞
Max. SAR evaluation	$\pm 1.0\%$	Rectangular	$\sqrt{3}$	1	1	$\pm 0.6\%$	$\pm 0.6\%$	∞
Test Sample Related								
Device positioning	$\pm 2.9\%$	Normal	1	1	1	$\pm 2.9\%$	$\pm 2.9\%$	145
Device holder uncertainty	$\pm 3.6\%$	Normal	1	1	1	$\pm 3.6\%$	$\pm 3.6\%$	5
Power drift	$\pm 5.0\%$	Rectangular	$\sqrt{3}$	1	1	$\pm 2.9\%$	$\pm 2.9\%$	∞
Phantom and Set-up								
Phantom uncertainty	$\pm 4.0\%$	Rectangular	$\sqrt{3}$	1	1	$\pm 2.3\%$	$\pm 2.3\%$	∞
Liquid conductivity (target)	$\pm 5.0\%$	Rectangular	$\sqrt{3}$	0.64	0.43	$\pm 1.8\%$	$\pm 1.2\%$	∞
Liquid conductivity (meas.)	$\pm 2.5\%$	Normal	1	0.64	0.43	$\pm 1.6\%$	$\pm 1.1\%$	∞
Liquid permittivity (target)	$\pm 5.0\%$	Rectangular	$\sqrt{3}$	0.6	0.49	$\pm 1.7\%$	$\pm 1.4\%$	∞
Liquid permittivity (meas.)	$\pm 2.5\%$	Normal	1	0.6	0.49	$\pm 1.5\%$	$\pm 1.2\%$	∞
Combined Uncertainty						$\pm 10.9\%$	$\pm 10.7\%$	387
Expanded Std. Uncertainty						$\pm 21.9\%$	$\pm 21.4\%$	

Table 9: Measurement uncertainties

5.2 Measurement uncertainty evaluation for system validation

The overall combined measurement uncertainty of the measurement system is $\pm 9.5\%$ ($K=1$).

The expanded uncertainty ($k=2$) is assessed to be $\pm 18.9\%$

This measurement uncertainty budget is suggested by IEEE P1528 and determined by Schmid & Partner Engineering AG. The breakdown of the individual uncertainties is as follows:

Error Sources	Uncertainty Value	Probability Distribution	Divisor	c_i 1g	c_i 10g	Standard Uncertainty 1g	Standard Uncertainty 10g	v_i^2 or v_{eff}
Measurement System								
Probe calibration	$\pm 6.0\%$	Normal	1	1	1	$\pm 6.0\%$	$\pm 6.0\%$	∞
Axial isotropy	$\pm 4.7\%$	Rectangular	$\sqrt{3}$	1	1	$\pm 2.7\%$	$\pm 2.7\%$	∞
Hemispherical isotropy	$\pm 9.6\%$	Rectangular	$\sqrt{3}$	0.7	0.7	$\pm 0.0\%$	$\pm 0.0\%$	∞
Boundary effects	$\pm 1.0\%$	Rectangular	$\sqrt{3}$	1	1	$\pm 0.6\%$	$\pm 0.6\%$	∞
Probe linearity	$\pm 4.7\%$	Rectangular	$\sqrt{3}$	1	1	$\pm 2.7\%$	$\pm 2.7\%$	∞
System detection limits	$\pm 1.0\%$	Rectangular	$\sqrt{3}$	1	1	$\pm 0.6\%$	$\pm 0.6\%$	∞
Readout electronics	$\pm 0.3\%$	Normal	1	1	1	$\pm 0.3\%$	$\pm 0.3\%$	∞
Response time	$\pm 0.0\%$	Rectangular	$\sqrt{3}$	1	1	$\pm 0.0\%$	$\pm 0.0\%$	∞
Integration time	$\pm 0.0\%$	Rectangular	$\sqrt{3}$	1	1	$\pm 0.0\%$	$\pm 0.0\%$	∞
RF ambient conditions	$\pm 1.0\%$	Rectangular	$\sqrt{3}$	1	1	$\pm 0.6\%$	$\pm 0.6\%$	∞
Probe positioner	$\pm 0.4\%$	Rectangular	$\sqrt{3}$	1	1	$\pm 0.2\%$	$\pm 0.2\%$	∞
Probe positioning	$\pm 2.9\%$	Rectangular	$\sqrt{3}$	1	1	$\pm 1.7\%$	$\pm 1.7\%$	∞
Max. SAR evaluation	$\pm 1.0\%$	Rectangular	$\sqrt{3}$	1	1	$\pm 0.6\%$	$\pm 0.6\%$	∞
Dipole								
Deviation of experimental dipole	$\pm 5.5\%$	Rectangular	$\sqrt{3}$	1	1	$\pm 3.2\%$	$\pm 3.2\%$	∞
Dipole axis to liquid distance	$\pm 2.0\%$	Rectangular	1	1	1	$\pm 1.2\%$	$\pm 1.2\%$	∞
Power drift	$\pm 4.7\%$	Rectangular	$\sqrt{3}$	1	1	$\pm 2.7\%$	$\pm 2.7\%$	∞
Phantom and Set-up								
Phantom uncertainty	$\pm 4.0\%$	Rectangular	$\sqrt{3}$	1	1	$\pm 2.3\%$	$\pm 2.3\%$	∞
Liquid conductivity (target)	$\pm 5.0\%$	Rectangular	$\sqrt{3}$	0.64	0.43	$\pm 1.8\%$	$\pm 1.2\%$	∞
Liquid conductivity (meas.)	$\pm 2.5\%$	Normal	1	0.64	0.43	$\pm 1.6\%$	$\pm 1.1\%$	∞
Liquid permittivity (target)	$\pm 5.0\%$	Rectangular	$\sqrt{3}$	0.6	0.49	$\pm 1.7\%$	$\pm 1.4\%$	∞
Liquid permittivity (meas.)	$\pm 2.5\%$	Normal	1	0.6	0.49	$\pm 1.5\%$	$\pm 1.2\%$	∞
Combined Uncertainty						$\pm 9.5\%$	$\pm 9.2\%$	
Expanded Std. Uncertainty						$\pm 18.9\%$	$\pm 18.4\%$	

Table 10: Measurement uncertainties

6 SAR Test Configuration

6.1 GSM Test Configurations

SAR tests for GSM 850 and GSM 1900, a communication link is set up with a base station by air link. Using CMU200 the power lever is set to “5”and “0” in SAR of GSM 850 and GSM 1900. The tests in the band of GSM 850 and GSM 1900 are performed in the mode of GPRS/EGPRS function. Since the GPRS class is 12 for this EUT, it has at most 4 timeslots in uplink and at most 4 timeslots in downlink, the maximum total timeslot is 5. The EGPRS class is 12 for this EUT, it has at most 4 timeslots in uplink, and at most 4 timeslots in downlink, the maximum total timeslot is 5.

When SAR tests for EGPRS mode is necessary, GMSK modulation should be used to minimize SAR measurement error due to higher peak-to-average power (PAR) ratios inherent in 8-PSK.

According to specification 3GPP TS 51.010, the maximum power of the GSM can do the power reduction for the multi-slot.

The allowed power reduction in the multi-slot configuration is as following:

Number of timeslots in uplink assignment		Reduction of maximum output power, (dB)		
Band	Time Slots	GPRS (GMSK)	EGPRS (GMSK)	EGPRS (8PSK)
GSM850	1 TX slot	0	0	0
	2 TX slots	2.5	2.5	2
	3 TX slots	3.5	3.5	4
	4 TX slots	5	5	6
GSM1900	1 TX slot	0	0	0
	2 TX slots	2.5	2.5	2
	3 TX slots	3.5	3.5	4
	4 TX slots	5	5	6

Table 11: The allowed power reduction in the multi-slot configuration of GSM

6.2 WCDMA Test Configuration

1) RMC

As the SAR body tests for WCDMA Band II and WCDMA Band V, we established the radio link through call processing. The maximum output power were verified on high, middle and low channels for each test band according to 3GPP TS 34.121 with the following configuration:

- 1) 12.2kbps RMC, 64,144,384 kbps RMC with TPC set to ‘all 1’.
- 2) Test loop Mode 1.

For the output power, the configurations for the DPCCH and DPDCH₁ are as followed (EUT do not support the DPDCH_{2-n})

	Channel Bit Rate (kbps)	Channel Symbol Rate (ksps)	Spreading Factor	Spreading Code Number	Bits/Slot
DPCCH	15	15	256	0	10
DPDCH ₁	15	15	256	64	10
	30	30	128	32	20
	60	60	64	16	40
	120	120	32	8	80
	240	240	16	4	160

	480	480	8	2	320
	960	960	4	1	640
DPDCH _n	960	960	4	1, 2, 3	640

SAR for body exposure configurations is measured using the 12.2 kbps RMC with the TPC bits configured to all “1s”. SAR for other spreading codes and multiple DPDCH_n, when supported by the EUT, are not required when the maximum average outputs of each RF channel, for each spreading code and DPDCH_n configuration, are less than ¼ dB higher than those measured in 12.2 kbps RMC.

2) HSDPA

SAR for body exposure configurations is measured according to the “Body SAR Measurements” procedures of 3G device. In addition, body SAR is also measured for HSDPA when the maximum average outputs of each RF channel with HSDPA active is at ¼ dB higher than that measured without HSDPA using 12.2kbps RMC or the maximum SAR 12.2kbps RMC is above 75% of the SAR limit. Body SAR for HSDPA is measured using an FRC with H-Set 1 in Sub-test 1 and a 12.2kbps RMC configured in Test Loop Mode 1, using the highest body SAR configuration in 12.2 kbps RMC without HSDPA.

HSDPA should be configured according to UE category of a test device. The number of HS-DSCH/ HS-PDSCHs, HAPRQ processes, minimum inter-TTI interval, transport block sizes and RV coding sequence are defined by the H-set. To maintain a consistent test configuration and stable transmission condition, QPSK is used in the H-set for SAR testing. HS-DPCCH should be configured with a CQI feedback cycle of 4ms with a CQI repetition factor of 2 to maintain a constant rate of active CQI slots. The β_c and β_d gain factors for DPCCH and DPDCH were set according to the values in the below table, β_{hs} for HS-DPCCH is set automatically to the correct value when $\Delta ACK, \Delta NACK, \Delta CQI = 8$. The variation of the β_c / β_d ratio causes a power reduction at sub-tests 2 - 4.

Sub-test	β_c	β_d	β_d (SF)	β_c / β_d	β_{hs} (1)	CM(dB)(2)	MPR (dB)
1	2/15	15/15	64	2/15	4/15	0.0	0
2	12/15(3)	15/15(3)	64	12/15(3)	24/15	1.0	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: $\Delta ACK, \Delta NACK$ and $\Delta CQI = 8$. $A_{hs} = \beta_{hs} / \beta_c = 30/15$. $\beta_{hs} = 30/15 * \beta_c$
 Note 2 : CM = 1 for $\beta_c / \beta_d = 12/15, \beta_{hs} / \beta_c = 24/15$
 Note 3 : 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 $\beta_d = 15/15$

Table 12: Sub-tests for UMTS Release 5 HSDPA

The measurements were performed with a Fixed Reference Channel (FRC) and H-Set 1 QPSK.

Parameter	Value
Nominal average inf. bit rate	534 kbit/s
Inter-TTI Distance	3 TTI's
Number of HARQ Processes	2 Processes
Information Bit Payload	3202 Bits
MAC-d PDU size	336 Bits
Number Code Blocks	1 Block
Binary Channel Bits Per TTI	4800 Bits
Total Available SMLs in UE	19200 SMLs
Number of SMLs per HARQ Process	9600 SMLs
Coding Rate	0.67
Number of Physical Channel Codes	5

Table 13: settings of required H-Set 1 QPSK acc. to 3GPP 34.121

HS-DSCH Category	Maximum HS-DSCH Codes Received	Minimum Inter-TTI Interval	Maximum HS-DSCH Transport Block Bits/HS-DSCH TTI	Total Soft Channel Bits
1	5	3	7298	19200
2	5	3	7298	28800
3	5	2	7298	28800
4	5	2	7298	38400
5	5	1	7298	57600
6	5	1	7298	67200
7	10	1	14411	115200
8	10	1	14411	134400
9	15	1	25251	172800
10	15	1	27952	172800
11	5	2	3630	14400
12	5	1	3630	28800
13	15	1	34800	259200
14	15	1	42196	259200
15	15	1	23370	345600
16	15	1	27952	345600

Table 14: HSDPA UE category

3) HSUPA

Body SAR is also measured for HSDPA when the maximum average outputs of each RF channel with HSDPA active is at ¼ dB higher than that measured without HSDPA using 12.2kbps RMC or the maximum SAR 12.2kbps RMC is above 75% of the SAR limit. Body SAR for HSPA is measured with E-DCH Sub-test 5, using H-set 1 and QPSK for FRC and 12.2kbps RMC configured in Test Loop Mode 1 with power control algorithm 2, according to the highest body SAR configuration in 12.2 kbps RMC without HSPA.

Due to inner loop power control requirements in HSDPA, a commercial communication test set should be used for the output power and SAR tests. The 12.2 kbps RMC, FRC H-set 1 and E-DCH configurations for HSDPA should be configured according to the β values indicated below as well as other applicable procedures described in the 'WCDMA Handset' and 'Release 5 HSDPA Data Device' sections of 3G device.

Sub-test	β_c	β_d	β_d (SF)	β_c/β_d	$\beta_{ns}^{(1)}$	β_{ec}	β_{ed}	β_{ec} (SF)	β_{ed} (code)	CM ⁽²⁾ (dB)	MPR (dB)	AG ⁽⁴⁾ Index	E-TFCI
1	11/15 ⁽³⁾	15/15 ⁽³⁾	64	11/15 ⁽³⁾	22/15	209/225	1039/225	4	1	1.0	0.0	20	75
2	6/15	15/15	64	6/15	12/15	12/15	94/75	4	1	3.0	2.0	12	67
3	15/15	9/15	64	15/9	30/15	30/15	$\beta_{ed1}:47/15$ $\beta_{ed2}:47/15$	4	2	2.0	1.0	15	92
4	2/15	15/15	64	2/15	4/15	2/15	56/75	4	1	3.0	2.0	17	71
5	15/15 ⁽⁴⁾	15/15 ⁽⁴⁾	64	15/15 ⁽⁴⁾	30/15	24/15	134/15	4	1	1.0	0.0	21	81

Note 1: $\Delta ACK, \Delta NACK$ and $\Delta CQI = 8$. $A_{hs} = \beta_{hs}/\beta_c = 30/15$. $\beta_{hs} = 30/15 * \beta_c$
 Note 2: CM = 1 for $\beta_c/\beta_d = 12/15, \beta_{hs}/\beta_c = 24/15$. For all other combinations of DPDCH, DPCCCH, HS-DPCCCH, E-DPDCH and E-DPCCCH 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: For subtest 5 the β_c/β_d ratio of 15/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signalled gain factors for the reference TFC (TF1,TF1) to $\beta_c = 14/15$ and $\beta_d = 15/15$
 Note 5: Testing UE using E-DPDCH Physical Layer category 1 Sub-test 3 is not required according to TS 25.306 Table 5.1g
 Note 6: β_{sd} can not be set directly; it is set by Absolute Grant Value.

Table 15: Subtests for HSUPA.

UE E-DCH Category	Maximum E-DCH Codes Transmitted	Number of HARQ Processes	E-DCH TTI(ms)	Minimum Spreading Factor	Maximum E-DCH Transport Block Bits	Max Rate (Mbps)
1	1	4	10	4	7110	0.7296
2	2	8	2	4	2798	1.4592
	2	4	10	4	14484	
3	2	4	10	4	14484	1.4592
4	2	8	2	2	5772	2.9185
	2	4	10	2	20000	2.00
5	2	4	10	2	20000	2.00
6 (No DPDCH)	4	8	10	2SF2&2SF	11484	5.76
	4	4	2	4	20000	2.00
7 (No DPDCH)	4	8	2	2SF2&2SF	22996	?
	4	4	10	4	20000	?

NOTE: When 4 codes are transmitted in parallel, two codes shall be transmitted with SF2 and two with SF4. UE categories 1 to 6 support QPSK only. UE category 7 supports QPSK.(TS25.306-7.3.0)

Table 16: HSUPA UE category

6.3 LTE Test Configurations

SAR for body exposure configurations is measured according to the “Body SAR Measurements” Procedures of KDB941225 D05 SAR for LTE.

- 1) The procedures shall be applied independently to the device and exposure configurations required for body, USB dongle orientations and antenna diversity conditions etc. applying the test positions in KDB 447498 for USB dongles.
- 2) When MPR is implemented permanently within the UE, regardless of network requirements, only those RB configurations allowed (see 3GPP standards) for the channel bandwidth and modulation combinations may be tested with MPR. Configurations with RB allocations below the required RB thresholds must be tested without MPR. A-MPR must always be disabled.

LTE Band IV MPR as follows:

Modulation	Channel bandwidth / Transmission bandwidth configuration [RB]					MPR
	1.4	3	5	10	20	
	MHz	MHz	MHz	MHz	MHz	
QPSK	1	1	1	1	1	0
QPSK	≤ 5	≤ 4	≤ 8	≤ 12	≤ 18	0
QPSK	> 5	> 4	> 8	> 12	>18	1
16 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤18	1
16 QAM	> 5	> 4	> 8	> 12	>18	2

LTE Band XVII MPR as belows:

Modulation	Channel bandwidth / Transmission bandwidth configuration [RB]		MPR
	5	10	
	MHz	MHz	
QPSK	1	1	0
QPSK	≤ 8	≤ 12	0
QPSK	> 8	> 12	1
16 QAM	≤ 8	≤ 12	1
16 QAM	> 8	> 12	2

3) For each LTE frequency band, detail reduce test information is referred to section 7.2.5 to 7.2.6 and final test summary is as belows:

LTE Band IV

Bandwidth	Modulation Type	RB Size and Allocation	Test Channel	SAR Test
20MHz	QPSK	50% Centered	High Channel	No Test*
			Middle Channel	Tested*
			Low Channel	No Test*
		1RB Lower edge	High Channel	Tested
			Middle Channel	No Test
			Low Channel	No Test
		1RB Upper edge	High Channel	No Test
			Middle Channel	No Test
			Low Channel	Tested
	16QAM	50% Centered	High Channel	No Test
			Middle Channel	Tested
			Low Channel	No Test
		1RB Lower edge	High Channel	No Test
			Middle Channel	Tested
			Low Channel	No Test
1RB Upper edge	High Channel	No Test		
	Middle Channel	No Test		
	Low Channel	Tested		

*Please check SAR test result table of middle channel is <0.8W/kg, other channels are not required.

LTE Band XVII

Bandwidth	Modulation Type	RB Size and Allocation	Test Channel	SAR Test
10MHz	QPSK	50% Centered	High Channel	No Test*
			Middle Channel	Tested*
			Low Channel	No Test*
		1RB Lower edge	High Channel	No Test
			Middle Channel	Tested
			Low Channel	No Test
		1RB Upper edge	High Channel	No Test
			Middle Channel	Tested
			Low Channel	No Test
	16QAM	50% Centered	High Channel	No Test
			Middle Channel	Tested
			Low Channel	No Test
		1RB Lower edge	High Channel	Tested
			Middle Channel	No Test
			Low Channel	No Test
1RB Upper edge	High Channel	No Test		
	Middle Channel	Tested		
	Low Channel	No Test		

*Please check SAR test result table of middle channel is <0.8W/kg, other channels are not required.

7 SAR Measurement Results

7.1 Conducted power measurements

For the measurements a Rohde & Schwarz Radio Communication Tester CMU 200 and CMW500 were used.

The output power was measured using an integrated RF connector and attached RF cable.

SAR drift measured at same position in liquid before and after each SAR test as below 7.2 chapter.

7.1.1 Conducted power measurements GSM850 MHz

GSM850		Conducted Power (dBm)			Division Factors	Average Power (dBm)		
		128CH	190CH	251CH		128CH	190CH	251CH
GPRS (GMSK)	1 Tx Slot	32.27	32.26	32.17	-9	23.27	23.26	23.17
	2 Tx Slot	29.84	29.79	29.72	-6	23.84	23.79	23.72
	3 Tx Slot	28.72	28.61	28.32	-4.25	24.47	24.36	24.07
	4 Tx Slot	27.29	27.33	27.31	-3	24.29	24.33	24.31
EDGE (GMSK)	1 Tx Slot	32.37	32.38	32.30	-9	23.37	23.38	23.30
	2 Tx Slot	30.14	30.04	30.24	-6	24.14	24.04	24.24
	3 Tx Slot	28.77	28.70	28.66	-4.25	24.52	24.45	24.41
	4 Tx Slot	27.31	27.15	27.32	-3	24.31	24.15	24.32
EDGE (8PSK)	1 Tx Slot	26.62	26.59	26.60	-9	17.62	17.59	17.60
	2 Tx Slot	24.08	24.03	24.00	-6	18.08	18.03	18.00
	3 Tx Slot	22.40	22.34	22.30	-4.25	18.15	18.09	18.05
	4 Tx Slot	20.09	20.08	20.01	-3	17.09	17.08	17.01

Table 17: Test results conducted power measurement GSM850 MHz

7.1.2 Conducted power measurements GSM 1900 MHz

GSM1900		Conducted Power (dBm)			Division Factors	Average Power (dBm)		
		512CH	661CH	810CH		512CH	661CH	810CH
GPRS (GMSK)	1 Tx Slot	29.58	28.91	29.41	-9	20.58	19.91	20.41
	2 Tx Slot	27.13	27.21	27.19	-6	21.13	21.21	21.19
	3 Tx Slot	25.83	25.89	25.90	-4.25	21.58	21.64	21.65
	4 Tx Slot	23.96	24.00	24.47	-3	20.96	21.00	21.47
EDGE (GMSK)	1 Tx Slot	29.52	28.89	29.44	-9	20.52	19.89	20.44
	2 Tx Slot	27.15	27.28	27.22	-6	21.15	21.28	21.22
	3 Tx Slot	25.81	25.85	25.92	-4.25	21.56	21.60	21.67
	4 Tx Slot	23.93	23.99	24.42	-3	20.93	20.99	21.42
EDGE (8PSK)	1 Tx Slot	25.22	25.64	25.60	-9	16.22	16.64	16.60
	2 Tx Slot	23.36	23.31	23.26	-6	17.36	17.31	17.26
	3 Tx Slot	21.30	21.32	21.26	-4.25	17.05	17.07	17.01
	4 Tx Slot	19.40	19.34	19.37	-3	16.4	16.34	16.37

Table 18: Test results conducted power measurement GSM 1900 MHz

7.1.3 Conducted power measurements WCDMA 850 MHz

UMTS850 (Band V)		Conducted Power (dBm)		
		4132CH	4182CH	4233CH
WCDMA	12.2kbps RMC	22.27	22.28	22.30
	64kbps RMC	22.21	22.28	22.22
	144kbps RMC	22.15	22.29	22.16
	384kbps RMC	22.15	22.27	22.23
HSDPA	Subtest 1	22.29	22.34	22.29
	Subtest 2	22.26	22.32	22.30
	Subtest 3	21.51	21.62	21.57
	Subtest 4	21.42	21.68	21.51
HSUPA	Subtest 1	21.61	21.43	21.52
	Subtest 2	20.30	20.62	20.35
	Subtest 3	20.93	20.76	20.87
	Subtest 4	20.28	20.55	20.40
	Subtest 5	21.61	21.96	21.56

Table 19: Test results conducted power measurement WCDMA 850 MHz

Note:

Per941225 D01 SAR is not required for HSDPA because the maximum average output of each RF channel with HSDPA active is less than 1/4 dBm higher than that measured without HSDPA using 12.2 kbps RMC and the maximum SAR for 12.2 kbps RMC is <75% of the SAR limit.

7.1.4 Conducted power measurements WCDMA 1900 MHz

UMTS1900 (Band II)		Conducted Power (dBm)		
		9262CH	9400CH	9538CH
WCDMA	12.2kbps RMC	22.28	22.20	21.99
	64kbps RMC	22.27	22.05	22.03
	144kbps RMC	22.32	22.09	22.02
	384kbps RMC	22.28	22.17	22.16
HSDPA	Subtest 1	22.46	22.31	22.17
	Subtest 2	22.31	22.38	22.41
	Subtest 3	21.64	21.33	21.89
	Subtest 4	21.62	21.28	21.89
HSUPA	Subtest 1	21.95	21.15	20.91
	Subtest 2	20.69	20.29	20.52
	Subtest 3	20.87	20.60	20.97
	Subtest 4	20.41	20.64	19.69
	Subtest 5	22.07	21.29	21.47

Table 20: Test results conducted power measurement WCDMA 1900 MHz

Note:

Per941225 D01 SAR is not required for HSDPA because the maximum average output of each RF channel with HSDPA active is less than 1/4 dBm higher than that measured without HSDPA using 12.2 kbps RMC and the maximum SAR for 12.2 kbps RMC is <75% of the SAR limit.

7.1.5 Conducted power measurements LTE FDD Band IV (1700 MHz) Low Channel

LTE AWS Band	Uplink Channel Number	BW [MHz]	RB Size	RB Offset	Mod	Conducted Power (dBm)
Low Channel	19957	1.4	1	0	QPSK	21.99
			1	5	QPSK	22.01
			3	2	QPSK	21.99
			6	0	QPSK	20.96
			1	0	16-QAM	21.17
			1	5	16-QAM	21.08
			3	2	16-QAM	21.15
			6	0	16-QAM	20.29
	19965	3	1	0	QPSK	22.14
			1	14	QPSK	22.11
			8	4	QPSK	21.14
			15	0	QPSK	21.08
			1	0	16-QAM	21.19
			1	14	16-QAM	21.21
			8	4	16-QAM	20.31
			15	0	16-QAM	20.16
	19975	5	1	0	QPSK	22.26
			1	24	QPSK	22.11
			12	6	QPSK	21.12
			25	0	QPSK	21.15
			1	0	16-QAM	21.34
			1	24	16-QAM	21.19
			12	6	16-QAM	20.07
			25	0	16-QAM	20.32
	20000	10	1	0	QPSK	22.18
			1	49	QPSK	22.27
			25	13	QPSK	21.11
			50	0	QPSK	21.24
			1	0	16-QAM	21.15
			1	49	16-QAM	21.29
			25	13	16-QAM	20.23
			50	0	16-QAM	20.33
20050	20	1	0	QPSK	22.17	
		1	99	QPSK	22.31	
		50	25	QPSK	21.28	
		100	0	QPSK	21.34	
		1	0	16-QAM	21.69	
		1	99	16-QAM	21.85	
		50	25	16-QAM	20.12	
		100	0	16-QAM	20.31	

Table 21: Test results conducted power measurement LTE Band IV Low Channel

7.1.6 Conducted power measurements LTE FDD Band IV (1700 MHz) Mid Channel

LTE AWS Band	Uplink Channel Number	BW [MHz]	RB Size	RB Offset	Mod	Conducted Power (dBm)
Mid Channel	20175	1.4	1	0	QPSK	22.19
			1	5	QPSK	22.22
			3	2	QPSK	22.14
			6	0	QPSK	21.18
			1	0	16-QAM	20.88
			1	5	16-QAM	20.85
			3	2	16-QAM	21.21
			6	0	16-QAM	20.38
		3	1	0	QPSK	22.26
			1	14	QPSK	22.22
			8	4	QPSK	21.21
			15	0	QPSK	21.23
			1	0	16-QAM	21.34
			1	14	16-QAM	21.35
			8	4	16-QAM	20.47
			15	0	16-QAM	20.31
		5	1	0	QPSK	22.38
			1	24	QPSK	22.40
			12	6	QPSK	21.22
			25	0	QPSK	21.24
			1	0	16-QAM	21.48
			1	24	16-QAM	21.43
			12	6	16-QAM	20.25
			25	0	16-QAM	20.68
		10	1	0	QPSK	22.33
			1	49	QPSK	22.22
			25	13	QPSK	21.26
			50	0	QPSK	21.31
			1	0	16-QAM	21.36
			1	49	16-QAM	21.27
			25	13	16-QAM	20.39
			50	0	16-QAM	20.48
		20	1	0	QPSK	22.12
			1	99	QPSK	22.23
			50	25	QPSK	21.31
			100	0	QPSK	21.77
			1	0	16-QAM	21.82
			1	99	16-QAM	21.76
			50	25	16-QAM	20.28
			100	0	16-QAM	20.40

Table 22: Test results conducted power measurement LTE Band IV Mid Channel

7.1.7 Conducted power measurements LTE FDD Band IV (1700 MHz) High Channel

LTE AWS Band	Uplink Channel Number	BW [MHz]	RB Size	RB Offset	Mod	Conducted Power (dBm)
High Channel	20393	1.4	1	0	QPSK	22.16
			1	5	QPSK	22.12
			3	2	QPSK	22.08
			6	0	QPSK	21.12
			1	0	16-QAM	20.85
			1	5	16-QAM	20.78
			3	2	16-QAM	21.28
			6	0	16-QAM	20.36
	20385	3	1	0	QPSK	22.31
			1	14	QPSK	22.24
			8	4	QPSK	21.23
			15	0	QPSK	21.19
			1	0	16-QAM	21.33
			1	14	16-QAM	21.39
			8	4	16-QAM	20.47
			15	0	16-QAM	20.35
	20375	5	1	0	QPSK	22.31
			1	24	QPSK	22.41
			12	6	QPSK	21.23
			25	0	QPSK	21.33
			1	0	16-QAM	21.43
			1	24	16-QAM	21.34
			12	6	16-QAM	20.23
			25	0	16-QAM	20.67
	20350	10	1	0	QPSK	22.28
			1	49	QPSK	22.29
			25	13	QPSK	21.14
			50	0	QPSK	21.33
			1	0	16-QAM	21.28
			1	49	16-QAM	21.32
			25	13	16-QAM	20.25
			50	0	16-QAM	20.31
	20300	20	1	0	QPSK	22.23
			1	99	QPSK	22.24
			50	25	QPSK	21.23
			100	0	QPSK	21.24
			1	0	16-QAM	21.44
			1	99	16-QAM	21.52
			50	25	16-QAM	20.28
			100	0	16-QAM	20.26

Table 23: Test results conducted power measurement LTE Band IV High Channel

7.1.8 Conducted power measurements LTE FDD Band XVII (750 MHz) Low Channel

LTE band XVII	Uplink Channel Number	BW [MHz]	RB Size	RB Offset	Mod	Maximum Average Power [dBm]
Low Channel	23755	5	1	0	QPSK	22.35
			1	24	QPSK	22.27
			12	6	QPSK	21.03
			25	0	QPSK	20.90
			1	0	16-QAM	21.34
			1	24	16-QAM	21.36
			12	6	16-QAM	19.86
			25	0	16-QAM	20.21
	23780	10	1	0	QPSK	22.03
			1	49	QPSK	21.98
			25	13	QPSK	21.13
			50	0	QPSK	21.07
			1	0	16-QAM	20.73
			1	49	16-QAM	20.62
			25	13	16-QAM	20.15
			50	0	16-QAM	20.18

Table 24: Test results conducted power measurement LTE Band XVII Low Channel

7.1.9 Conducted power measurements LTE FDD Band XVII (750 MHz) Mid Channel

LTE band XVII	Uplink Channel Number	BW [MHz]	RB Size	RB Offset	Mod	Maximum Average Power [dBm]
Middle Channel	23790	5	1	0	QPSK	22.31
			1	24	QPSK	22.02
			12	6	QPSK	21.12
			25	0	QPSK	21.03
			1	0	16-QAM	20.87
			1	24	16-QAM	20.84
			12	6	16-QAM	19.94
			25	0	16-QAM	20.32
	23790	10	1	0	QPSK	22.24
			1	49	QPSK	22.01
			25	13	QPSK	20.96
			50	0	QPSK	20.92
			1	0	16-QAM	20.82
			1	49	16-QAM	20.67
			25	13	16-QAM	20.01
			50	0	16-QAM	20.08

Table 25: Test results conducted power measurement LTE Band XVII Middle Channel

7.1.10 Conducted power measurements LTE FDD Band XVII (750 MHz) High Channel

LTE band XVII	Uplink Channel Number	BW [MHz]	RB Size	RB Offset	Mod	Maximum Average Power [dBm]
High Channel	23825	5	1	0	QPSK	22.13
			1	24	QPSK	21.59
			12	6	QPSK	20.93
			25	0	QPSK	20.98
			1	0	16-QAM	21.32
			1	24	16-QAM	20.72
			12	6	16-QAM	19.88
			25	0	16-QAM	20.29
	23800	10	1	0	QPSK	22.12
			1	49	QPSK	21.72
			25	13	QPSK	20.92
			50	0	QPSK	20.84
			1	0	16-QAM	20.83
			1	49	16-QAM	20.44
			25	13	16-QAM	20.03
			50	0	16-QAM	20.01

Table 26: Test results conducted power measurement LTE Band XVII High Channel

7.2 SAR measurement Result

Connection to the EUT is established via air interface with CMU200, and the EUT is set to maximum output power by CMU200. The antenna connected to the output of the base station simulator shall be placed at least 50 cm away from the EUT. The signal transmitted by the simulator to the antenna feeding point shall be lower than the output power level of the EUT by at least 30 dB.

The EUT is tested using a CMW500 communications tester as controller unit to set test channels and EUT transmits with maximum output power for LTE.

The measurements were performed in combination with two host laptops (Lenovo ThinkPad X301 and Lenovo ThinkPad T61). Lenovo ThinkPad T61 laptop has horizontal and vertical USB slot, Lenovo ThinkPad X301 Laptop has horizontal USB slot.

7.2.1 SAR measurement Result of GSM 1900

Test Position with 5mm	Test channel /Frequency	Test Mode	SAR Value (W/kg)		Power Drift (dB)	Limit (W/kg)	Liquid Temp.
			1-g	10-g			
Front Side	661/1880	GPRS 1TS	0.594	0.342	0.060	1.6	21.4°C
Front Side	661/1880	GPRS 2TS	0.509	0.295	-0.080	1.6	21.4°C
Front Side	661/1880	GPRS 3TS	0.577	0.328	-0.050	1.6	21.4°C
Front Side	661/1880	GPRS 4TS	0.580	0.329	-0.060	1.6	21.4°C
Rear Side	661/1880	GPRS 1TS	0.645	0.368	-0.110	1.6	21.4°C
Left Side	661/1880	GPRS 1TS	0.481	0.234	0.010	1.6	21.4°C
Right Side	661/1880	GPRS 1TS	0.538	0.275	0.080	1.6	21.4°C
Rear Side	661/1880	EDGE 1TS	0.583	0.332	0.020	1.6	21.4°C
Rear Side	661/1880	EDGE 2TS	0.502	0.288	-0.040	1.6	21.4°C
Rear Side	661/1880	EDGE 3TS	0.461	0.264	-0.180	1.6	21.4°C
Rear Side	661/1880	EDGE 4TS	0.486	0.279	-0.170	1.6	21.4°C

Table 27: Test results body SAR GSM 1900

7.2.2 SAR measurement Result of GSM 850

Test Position with 5mm	Test channel /Frequency	Test Mode	SAR Value (W/kg)		Power Drift (dB)	Limit (W/kg)	Liquid Temp.
			1-g	10-g			
Front Side	190/836.6	GPRS 1TS	0.780	0.517	0.050	1.6	21.4°C
Front Side	190/836.6	GPRS 2TS	0.671	0.449	0.080	1.6	21.4°C
Front Side	190/836.6	GPRS 3TS	0.567	0.376	0.060	1.6	21.4°C
Front Side	190/836.6	GPRS 4TS	0.662	0.431	0.010	1.6	21.4°C
Rear Side	190/836.6	GPRS 1TS	0.979	0.622	-0.110	1.6	21.4°C
Left Side	190/836.6	GPRS 1TS	0.629	0.405	-0.080	1.6	21.4°C
Right Side	190/836.6	GPRS 1TS	0.173	0.117	0.150	1.6	21.4°C
Rear Side	251/848.8	GPRS 1TS	0.882	0.574	0.010	1.6	21.4°C
Rear Side	128/824.2	GPRS 1TS	0.960	0.612	0.080	1.6	21.4°C
Rear Side	190/836.6	EDGE 1TS	1.000	0.625	0.003	1.6	21.4°C
Rear Side	190/836.6	EDGE 2TS	0.960	0.606	0.140	1.6	21.4°C
Rear Side	190/836.6	EDGE 3TS	0.842	0.533	0.130	1.6	21.4°C
Rear Side	190/836.6	EDGE 4TS	0.941	0.594	-0.170	1.6	21.4°C
Rear Side	251/848.8	EDGE 1TS	0.870	0.564	0.180	1.6	21.4°C
Rear Side	128/824.2	EDGE 1TS	1.080	0.679	-0.060	1.6	21.4°C
Rear Side	251/848.8	EDGE 2TS	0.855	0.545	-0.003	1.6	21.4°C
Rear Side	128/824.2	EDGE 2TS	1.060	0.665	0.110	1.6	21.4°C
Rear Side	251/848.8	EDGE 3TS	0.729	0.468	-0.120	1.6	21.4°C
Rear Side	128/824.2	EDGE 3TS	1.020	0.638	0.110	1.6	21.4°C
Rear Side	251/848.8	EDGE 4TS	0.858	0.559	-0.120	1.6	21.4°C
Rear Side	128/824.2	EDGE 4TS	1.020	0.645	0.190	1.6	21.4°C

Table 28: Test results body SAR GSM 850

7.2.3 SAR measurement Result of WCDMA 850

Test Position with 5mm	Test channel /Frequency	Test Mode	SAR Value (W/kg)		Power Drift (dB)	Limit (W/kg)	Liquid Temp.
			1-g	10-g			
Front Side	4182/836.4	RMC	0.843	0.492	-0.050	1.6	21.4°C
Rear Side	4182/836.4	RMC	0.888	0.559	-0.140	1.6	21.4°C
Left Side	4182/836.4	RMC	0.186	0.130	0.060	1.6	21.4°C
Right Side	4182/836.4	RMC	0.569	0.362	0.170	1.6	21.4°C
Front Side	4233/846.6	RMC	0.776	0.455	-0.010	1.6	21.4°C
Front Side	4132/826.4	RMC	0.864	0.507	-0.060	1.6	21.4°C
Rear Side	4233/846.6	RMC	0.832	0.520	0.100	1.6	21.4°C
Rear Side	4132/826.4	RMC	0.940	0.590	0.140	1.6	21.4°C

Table 29: Test results body SAR WCDMA 850

7.2.4 SAR measurement Result of WCDMA 1900

Test Position with 5mm	Test channel /Frequency	Test Mode	SAR Value (W/kg)		Power Drift (dB)	Limit (W/kg)	Liquid Temp.
			1-g	10-g			
Front Side	9400/1880	RMC	0.834	0.476	-0.090	1.6	21.4°C
Rear Side	9400/1880	RMC	0.761	0.439	0.180	1.6	21.4°C
Left Side	9400/1880	RMC	0.647	0.338	-0.100	1.6	21.4°C
Right Side	9400/1880	RMC	0.566	0.276	0.110	1.6	21.4°C
Front Side	9538/1907.6	RMC	0.879	0.506	-0.020	1.6	21.4°C
Front Side	9262/1852.4	RMC	0.884	0.503	0.060	1.6	21.4°C

Table 30: Test results body SAR WCDMA 1900

Note:

- 1) The maximum SAR value are marks in **bold**.
- 2) The SAR test shall be performed at the high, middle and low frequency channels of each operating mode. If the SAR measured at mid-band channel for each test configuration is at least 3.0 dB lower than the SAR limit (< 0.8 W/kg), testing at the high and low channels is optional.
- 3) Tests in body position were performed with 5 mm air gap between DUT and SAM.

7.2.5 SAR measurement Result of LTE Band IV

Bandwidth: 20MHz / Modulation: QPSK

Test Position with 5mm	Test channel /Frequency	LTE Configuration	SAR Value (W/kg)		Power Drift (dB)	Limit (W/kg)	Liquid Temp.
			1-g	10-g			
20M/QPSK							
Front Side	20175/1732.5	50%RB/#25	0.749	0.439	0.180	1.6	21.4°C
Rear Side	20175/1732.5		0.710	0.424	0.150	1.6	21.4°C
Left Side	20175/1732.5		0.751	0.442	0.090	1.6	21.4°C
Right Side	20175/1732.5		0.383	0.201	0.110	1.6	21.4°C
20M/QPSK							
Front Side	20300/1745	1RB/#0	0.907	0.528	0.190	1.6	21.4°C
Rear Side	20300/1745		0.833	0.499	-0.070	1.6	21.4°C
Left Side	20300/1745		0.913	0.543	0.140	1.6	21.4°C
Right Side	20300/1745		0.504	0.268	0.060	1.6	21.4°C
20M/QPSK							
Front Side	20050/1720	1RB/#99	0.988	0.576	0.090	1.6	21.4°C
Rear Side	20050/1720		0.726	0.430	0.180	1.6	21.4°C
Left Side	20050/1720		0.935	0.557	0.120	1.6	21.4°C
Right Side	20050/1720		0.494	0.265	0.180	1.6	21.4°C

Table 31: Test results body SAR LTE Band IV QPSK

Bandwidth: 20MHz / Modulation: 16QAM

Test Position with 5mm	Test channel /Frequency	LTE Configuration	SAR Value (W/kg)		Power Drift (dB)	Limit (W/kg)	Liquid Temp.
			1-g	10-g			
20M/16QAM							
Front Side	20175/1732.5	50%RB/#25	0.629	0.367	0.002	1.6	21.4°C
Rear Side	20175/1732.5		0.561	0.335	-0.110	1.6	21.4°C
Left Side	20175/1732.5		0.621	0.375	0.070	1.6	21.4°C
Right Side	20175/1732.5		0.332	0.180	0.150	1.6	21.4°C
20M/16QAM							
Front Side	20175/1732.5	1RB/#0	0.829	0.477	0.120	1.6	21.4°C
Rear Side	20175/1732.5		0.723	0.430	0.180	1.6	21.4°C
Left Side	20175/1732.5		0.784	0.469	0.170	1.6	21.4°C
Right Side	20175/1732.5		0.403	0.217	0.190	1.6	21.4°C
20M/16QAM							
Front Side	20050/1720	1RB/#99	0.800	0.472	0.130	1.6	21.4°C
Rear Side	20050/1720		0.729	0.434	0.010	1.6	21.4°C
Left Side	20050/1720		0.807	0.483	0.130	1.6	21.4°C
Right Side	20050/1720		0.411	0.220	0.070	1.6	21.4°C

Table 32: Test results body SAR LTE Band IV 16QAM

Note:

- 1) The maximum SAR value are marks in **bold**.
- 2) A-MPR was disabled by Radio Communication Tester;
- 3) Per Lab PBA Tracking Number 230023:
If the SAR level for the horizontal position is < 1.2 W/Kg,testing at the additional position is optional.
- 4) Tests in body position were performed with 5 mm air gap between DUT and SAM.

7.2.6 SAR measurement Result of LTE Band XVII

Bandwidth: 10MHz / Modulation: QPSK

Test Position with 5mm	Test channel /Frequency	LTE Configuration	SAR Value (W/kg)		Power Drift (dB)	Limit (W/kg)	Liquid Temp.
			1-g	10-g			
10M/QPSK							
Front side	23790/710	50%RB/#13	0.471	0.315	0.020	1.6	21.4°C
Rear side	23790/710		0.510	0.331	-0.080	1.6	21.4°C
Left side	23790/710		0.343	0.229	-0.160	1.6	21.4°C
Right side	23790/710		0.105	0.074	-0.100	1.6	21.4°C
10M/QPSK							
Front side	23790/710	1RB/#0	0.554	0.364	0.060	1.6	21.4°C
Rear side	23790/710		0.545	0.356	0.190	1.6	21.4°C
Left side	23790/710		0.360	0.240	0.190	1.6	21.4°C
Right side	23790/710		0.112	0.080	0.190	1.6	21.4°C
10M/QPSK							
Front side	23790/710	1RB/#49	0.527	0.364	-0.010	1.6	21.4°C
Rear side	23790/710		0.557	0.366	0.080	1.6	21.4°C
Left side	23790/710		0.392	0.261	0.020	1.6	21.4°C
Right side	23790/710		0.116	0.083	0.050	1.6	21.4°C

Table 33: Test results body SAR LTE Band XVII QPSK

Bandwidth: 10MHz / Modulation: 16QAM

Test Position with 5mm	Test channel /Frequency	LTE Configuration	SAR Value (W/kg)		Power Drift (dB)	Limit (W/kg)	Liquid Temp.
			1-g	10-g			
10M/16QAM							
Front side	23790/710	50%RB/#13	0.386	0.254	0.020	1.6	21.4°C
Rear side	23790/710		0.428	0.278	-0.005	1.6	21.4°C
Left side	23790/710		0.266	0.176	-0.050	1.6	21.4°C
Right side	23790/710		0.082	0.059	-0.070	1.6	21.4°C
10M/16QAM							
Front side	23800/711	1RB/#0	0.491	0.338	-0.006	1.6	21.4°C
Rear side	23800/711		0.461	0.298	0.150	1.6	21.4°C
Left side	23800/711		0.318	0.212	0.040	1.6	21.4°C
Right side	23800/711		0.107	0.077	0.008	1.6	21.4°C
10M/16QAM							
Front side	23790/710	1RB/#49	0.406	0.277	0.070	1.6	21.4°C
Rear side	23790/710		0.431	0.282	0.100	1.6	21.4°C
Left side	23790/710		0.316	0.211	0.003	1.6	21.4°C
Right side	23790/710		0.099	0.070	0.120	1.6	21.4°C

Table 34: Test results body SAR LTE Band XVII 16QAM

Note:

- 1) The maximum SAR value are marks in **bold**.
- 2) A-MPR was disabled by Radio Communication Tester;
- 3) Per Lab PBA Tracking Number 230023:
If the SAR level for the horizontal position is < 1.2 W/Kg, testing at the additional position is optional.
- 4) Tests in body position were performed with 5 mm air gap between DUT and SAM.
- 5) Per KDB941225 D05, LTE band test reduce is as below the following:

First step:

Refer to Item 3A): Begin by measuring SAR on the high, middle and low (H, M, L) channels² using the largest channel bandwidth, in QPSK with 50% RB allocation⁴ centered within the channel bandwidth.

And Foot note 2: When the maximum output power variation across H, M and L channels is $\leq \frac{1}{2}$ dB, start with the middle channel; otherwise, start with the highest output power channel. When the measured 1-g SAR for the middle or highest output power channel is ≤ 0.8 W/kg, testing of the remaining two channels in that device and exposure configuration is not necessary. Also see footnote 1.

LTE Band IV	Uplink Channel Number	BW [MHz]	RB Size	RB Offset	Mod	Max Conducted Power (dBm)	Max Difference
Low Channel	20050	20	1	99	QPSK	22.31	0.08
Mid Channel	20175	20	1	99	QPSK	22.23	
High Channel	20300	20	1	0	QPSK	22.24	

➔ Band IV Middle channel, 20MHz BW, 50%/#25, QPSK has been selected.

LTE Band XVII	Uplink Channel Number	BW [MHz]	RB Size	RB Offset	Mod	Max Conducted Power (dBm)	Max Difference
Low Channel	23780	10	1	0	QPSK	22.03	0.21
Mid Channel	23790	10	1	0	QPSK	22.24	
High Channel	23800	10	1	0	QPSK	22.12	

➔ Band XVII Middle channel, 10MHz BW, 50%/#13, QPSK has been selected.

Second step:

Refer to Item 3B) : Measure SAR in QPSK with 1 RB allocated at the high end of the channel edge using the highest SAR channel measured in A); and then repeat the measurement at the low end of the channel edge.⁶

And Foot note 6: If the maximum average conducted output power for a 1 RB allocation is > ½ dB higher than the 50% RB allocation, instead of using the highest SAR channel measured for QPSK and 50% RB allocation, measure SAR on the highest output power channel for the 1 RB allocation

the maximum average conducted output power should be compared with 1RB/50% RB allocation of the same channel as below the following:

LTE Band IV	Uplink Channel Number	BW [MHz]	RB Size	RB Offset	Mod	Max Conducted Power (dBm)	Difference
Low Channel	20050	20	1	99	QPSK	22.31	1.03
		20	50	25	QPSK	21.28	
Mid Channel	20175	20	1	99	QPSK	22.23	0.92
		20	50	25	QPSK	21.31	
High Channel	20300	20	1	99	QPSK	22.24	1.01
		20	50	25	QPSK	21.23	

➔ Band IV Low channel, 20 MHz BW, 1RB/#99, QPSK has been selected.

LTE Band XVII	Uplink Channel Number	BW [MHz]	RB Size	RB Offset	Mod	Max Conducted Power (dBm)	Difference
Low Channel	23780	10	1	49	QPSK	21.98	0.85
		10	25	13	QPSK	21.13	
Mid Channel	23790	10	1	49	QPSK	22.01	1.05
		10	25	13	QPSK	20.96	
High Channel	23800	10	1	49	QPSK	21.72	0.8
		10	25	13	QPSK	20.92	

➔ Band XVII Mid channel, 10 MHz BW, 1RB/#49, QPSK has been selected.

LTE Band IV	Uplink Channel Number	BW [MHz]	RB Size	RB Offset	Mod	Max Conducted Power (dBm)	Difference
Low Channel	20050	20	1	0	QPSK	22.17	0.89
		20	50	25	QPSK	21.28	
Mid Channel	20175	20	1	0	QPSK	22.12	0.89
		20	50	25	QPSK	21.31	
High Channel	20300	20	1	0	QPSK	22.23	1.00
		20	50	25	QPSK	21.23	

➔ Band IV High channel, 20 MHz BW, 1RB/#0, QPSK has been selected.

LTE Band XVII	Uplink Channel Number	BW [MHz]	RB Size	RB Offset	Mod	Max Conducted Power (dBm)	Difference
Low Channel	23780	10	1	0	QPSK	22.03	0.90
		10	25	13	QPSK	21.13	
Mid Channel	23790	10	1	0	QPSK	22.24	1.28
		10	25	13	QPSK	20.96	
High Channel	23800	10	1	0	QPSK	22.12	1.20
		10	25	13	QPSK	20.92	

➔ Band XVII Mid channel, 10 MHz BW, 1RB/#0, QPSK has been selected.

For measured SAR in QPSK with 1 RB is < 1.45 W/kg-> Test 1RB configuration on other channels is not required.

Third step:

Refer to Item 4A): For the largest channel bandwidth in each LTE frequency band⁷: Measure SAR in 16QAM with 50% RB allocation using the highest SAR channel measured in 3) A).⁸

And Foot note 7: If the maximum average conducted output power for 16QAM is more than ¼ dB higher than QPSK, apply the procedures for QPSK in 3) to test 16QAM.

And Foot note 8: If the maximum average conducted output power for 16QAM with 50% RB allocation is > ½ dB higher than QPSK with 50% RB allocation, instead of using the highest SAR channel measured in QPSK measure SAR on the highest output power channel for 16QAM with 50% RB allocation.

LTE Band IV	Uplink Channel Number	BW [MHz]	RB Size	RB Offset	Mod	Max Conducted Power (dBm)	Difference
Low Channel	20050	20	1	99	QPSK	22.31	-0.46
		20	1	99	16QAM	21.85	
Mid Channel	20175	20	1	99	QPSK	22.23	-0.41
		20	1	0	16QAM	21.82	
High Channel	20300	20	1	99	QPSK	22.24	-0.72
		20	1	99	16QAM	21.52	

➔ Band IV QPSK 50#RB High SAR channel has been selected for Test 20 MHz BW , 16QAM.

LTE Band IV	Uplink Channel Number	BW [MHz]	RB Size	RB Offset	Mod	Max Conducted Power (dBm)	Difference
Low Channel	20050	20	50	25	QPSK	21.28	-1.16
		20	50	25	16QAM	20.12	
Mid Channel	20175	20	50	25	QPSK	21.31	-1.03
		20	50	25	16QAM	20.28	
High Channel	20300	20	50	25	QPSK	21.23	-0.95
		20	50	25	16QAM	20.28	

➔ Band IV QPSK 50#RB High SAR channel has been selected for Test 20 MHz BW, 50%RB/#25, 16QAM.

LTE Band XVII	Uplink Channel Number	BW [MHz]	RB Size	RB Offset	Mod	Max Conducted Power (dBm)	Difference
Low Channel	23780	10	1	0	QPSK	22.03	-1.30
		10	1	0	16QAM	20.73	
Mid Channel	23790	10	1	0	QPSK	22.24	-1.42
		10	1	0	16QAM	20.82	
High Channel	23800	10	1	0	QPSK	22.12	-1.30
		10	1	0	16QAM	20.82	

➔ Band XVII QPSK 50#RB High SAR channel has been selected for Test 10 MHz BW, 16QAM.

LTE Band XVII	Uplink Channel Number	BW [MHz]	RB Size	RB Offset	Mod	Max Conducted Power (dBm)	Difference
Low Channel	23780	10	25	13	QPSK	21.13	-0.98
		10	25	13	16QAM	20.15	
Mid Channel	23790	10	25	13	QPSK	20.96	-0.95
		10	25	13	16QAM	20.01	
High Channel	23800	10	25	13	QPSK	20.92	-0.89
		10	25	13	16QAM	20.03	

➔ Band XVII QPSK 50#RB High SAR channel has been selected for Test 10 MHz BW, 50%RB/#13, 16QAM.

Refer to Item 4B): Measure SAR in 16QAM with 1 RB allocated at the high end of the channel edge using the SAR channel measured in A); and then repeat the measurement at the low end of the channel edge.⁹

And Foot note 9: If the maximum average conducted output power for a 1 RB allocation is > ½ dB higher than the 50% RB allocation, instead of using the highest SAR channel measured for 16QAM and 50% RB measure SAR on the highest output power channel for the 1 RB allocation.

the maximum average conducted output power should be compared with 1RB/50% RB allocation of the same channel as below the following:

LTE Band IV	Uplink Channel Number	BW [MHz]	RB Size	RB Offset	Mod	Max Conducted Power (dBm)	Difference
Low Channel	20050	20	1	0	16QAM	21.69	1.57
		20	50	25	16QAM	20.12	
Mid Channel	20175	20	1	0	16QAM	21.82	1.54
		20	50	25	16QAM	20.28	
High Channel	20300	20	1	0	16QAM	21.44	1.16
		20	50	25	16QAM	20.28	

➔ Band IV Mid channel, 20 MHz BW, 1RB/#0, 16QAM has been selected

LTE Band IV	Uplink Channel Number	BW [MHz]	RB Size	RB Offset	Mod	Max Conducted Power (dBm)	Difference
Low Channel	20050	20	1	99	16QAM	21.85	1.73
		20	50	25	16QAM	20.12	
Mid Channel	20175	20	1	99	16QAM	21.76	1.48
		20	50	25	16QAM	20.28	
High Channel	20300	20	1	99	16QAM	21.52	1.24
		20	50	25	16QAM	20.28	

➔ Band IV Low channel, 20 MHz BW, 1RB/#99, 16QAM has been selected.

LTE Band XVII	Uplink Channel Number	BW [MHz]	RB Size	RB Offset	Mod	Max Conducted Power (dBm)	Difference
Low Channel	23780	10	1	0	16QAM	20.73	0.58
		10	25	13	16QAM	20.15	
Mid Channel	23790	10	1	0	16QAM	20.82	0.81
		10	25	13	16QAM	20.01	
High Channel	23800	10	1	0	16QAM	20.83	0.80
		10	25	13	16QAM	20.03	

➔ Band XVII High channel, 10 MHz BW, 1RB/#0, 16QAM has been selected

LTE Band XVII	Uplink Channel Number	BW [MHz]	RB Size	RB Offset	Mod	Max Conducted Power (dBm)	Difference
Low Channel	23780	10	1	49	16QAM	20.62	0.47
		10	25	13	16QAM	20.15	
Mid Channel	23790	10	1	49	16QAM	20.67	0.66
		10	25	13	16QAM	20.01	
High Channel	23800	10	1	49	16QAM	20.44	0.41
		10	25	13	16QAM	20.03	

➔ Band XVII Middle channel, 10 MHz BW, 1RB/#49, 16QAM has been selected.

Measured SAR in 16QAM with 1 RB is < 1.45 W/kg-> Test 16QAM on other channels is not required.

Fourth step:

Refer to Item 5B): For the other channel bandwidths used by the device within a LTE frequency band:

- a) Max average conducted power of 10MHz/ 5MHz/3MHz/1.4MHz BW is within ½ dB, higher or lower of 20MHz Band IV:

Bandwidth(MHz)	20	10 MHz	5 MHz	3 MHz	1.4 MHz
Max Power	22.31	22.33	22.40	22.31	22.22
Difference	--	0.02	0.07	0.00	-0.09

And SAR of QPSK with 50% RB (20MHz) is < 1.45 W/kg. Therefore, the smaller channel bandwidth SAR is not requires tested.

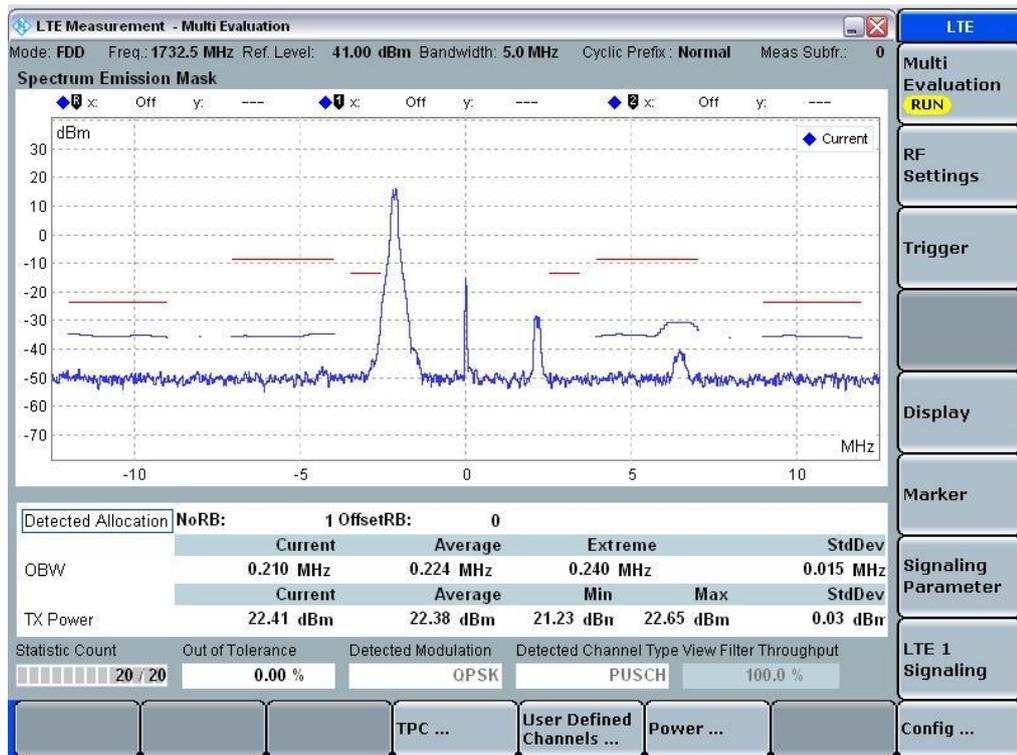
- b) Max average conducted power of 5MHz BW is within ½ dB, higher of 10MHz Band XVII:

Bandwidth(MHz)	10 MHz	5 MHz
Max Power	22.24	22.35
Difference	--	0.11

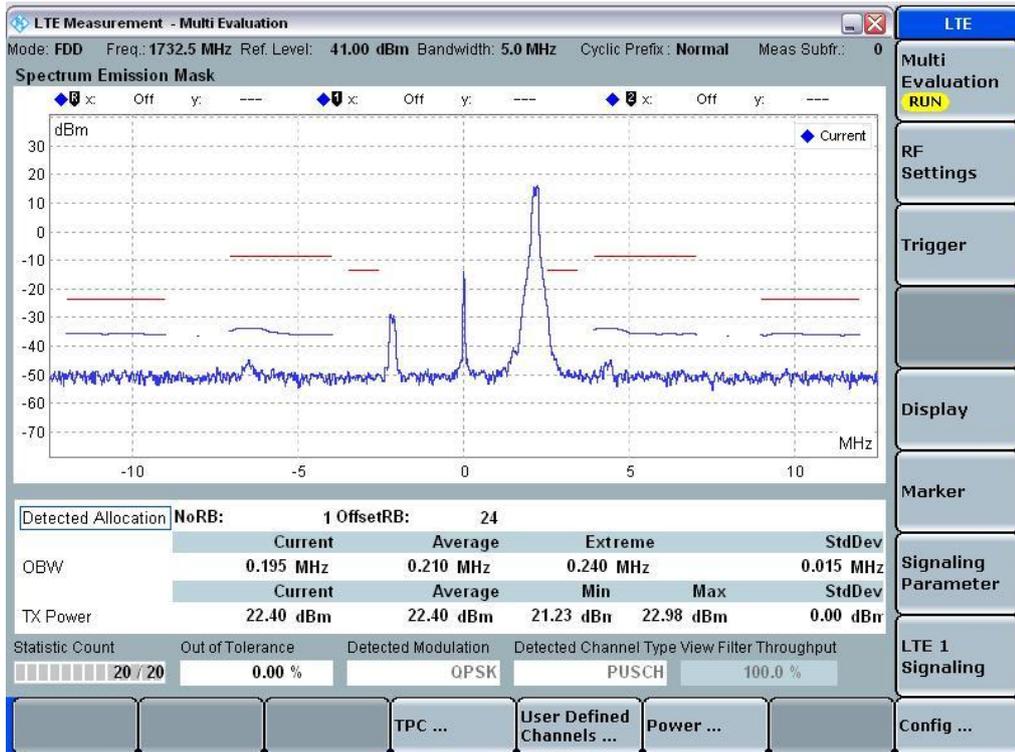
And SAR of QPSK with 50% RB (10MHz) is < 1.45 W/kg. Therefore, the smaller channel bandwidth SAR is not requires tested.

7.3 LTE specrum plots

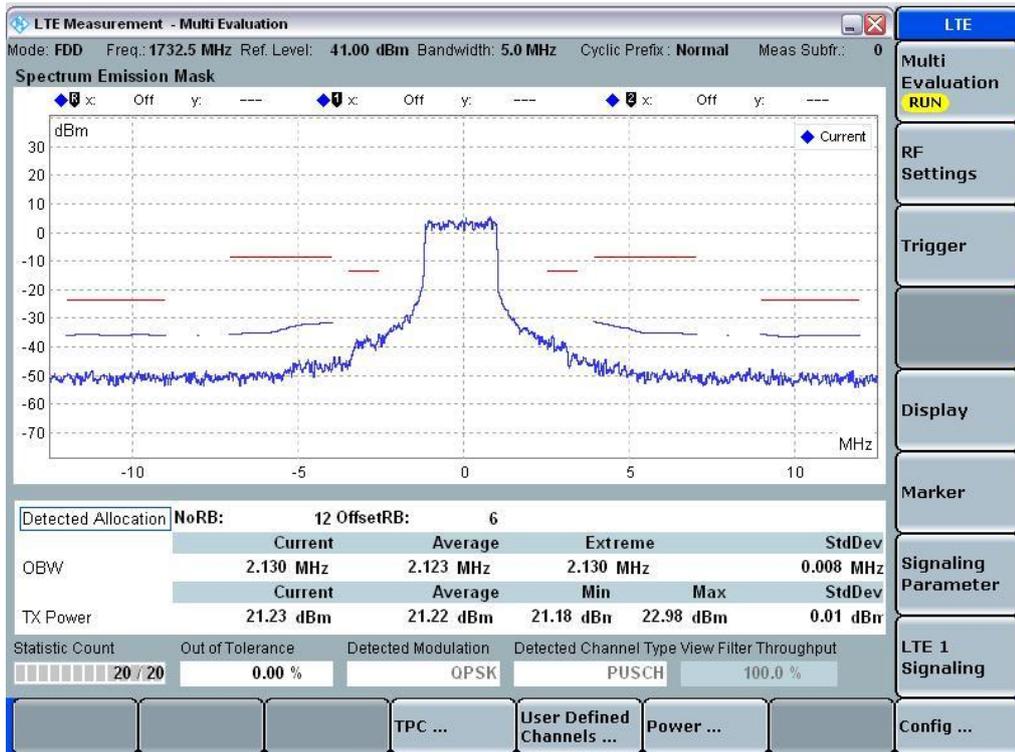
The following spectrum plots show the tested RB allocations at the LTE maximum output power conditions.



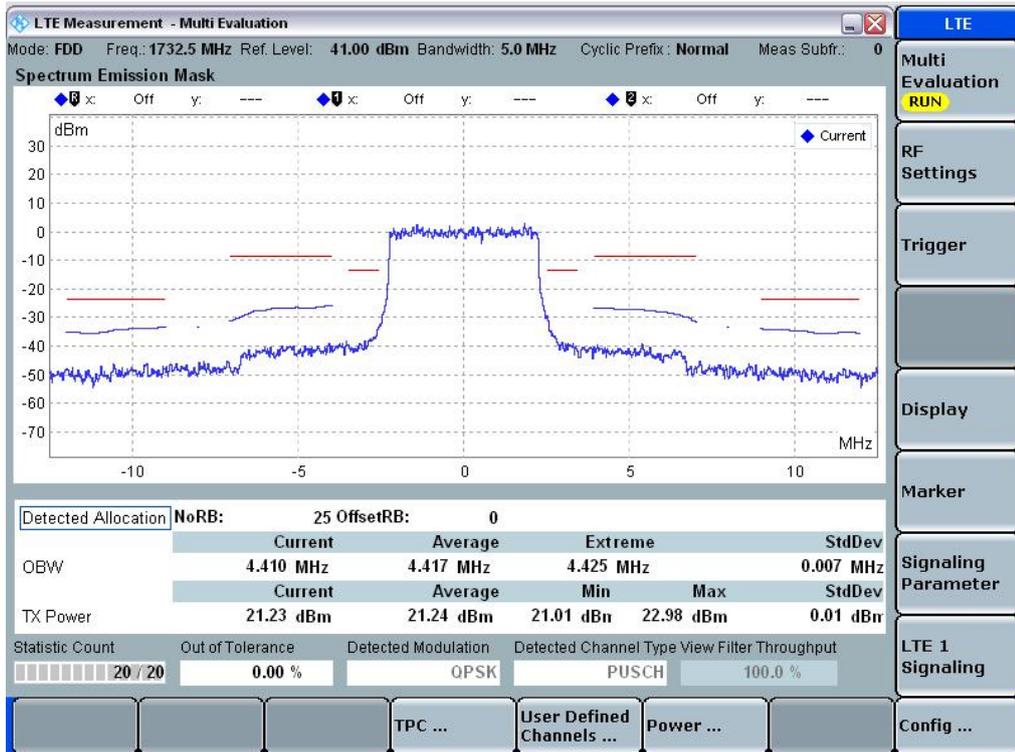
LTE Band IV,5MHz BW ,QPSK,1RB,Offset 0



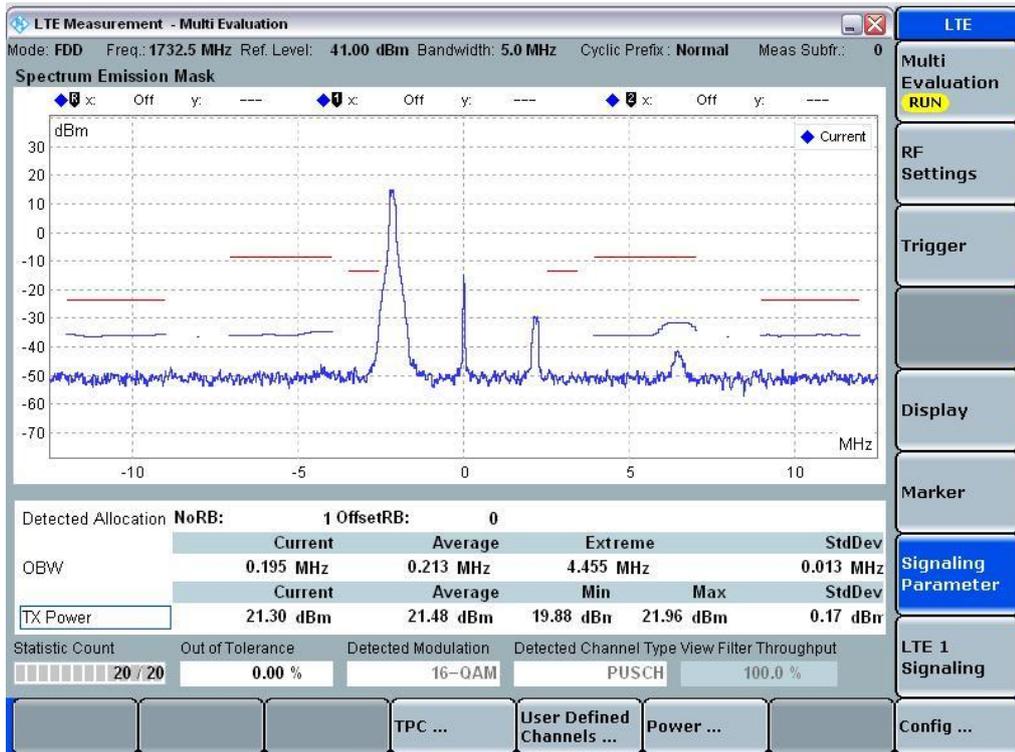
LTE Band IV, 5MHz BW, QPSK, 1RB, Offset 24



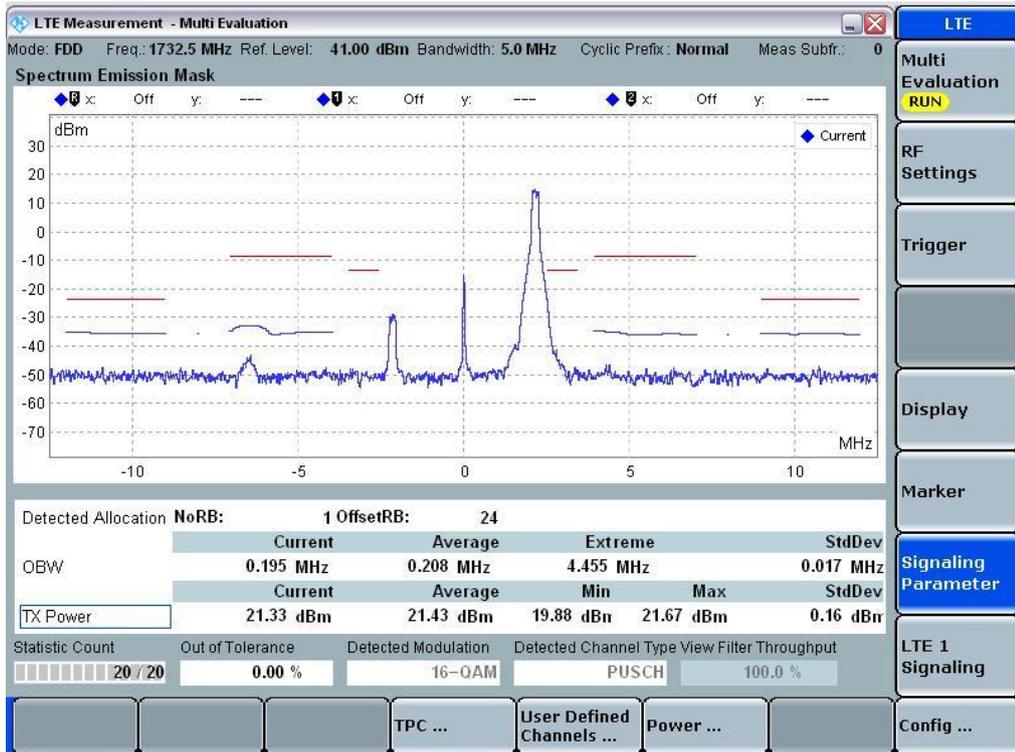
LTE Band IV, 5MHz BW, QPSK, 12RB, Offset 6



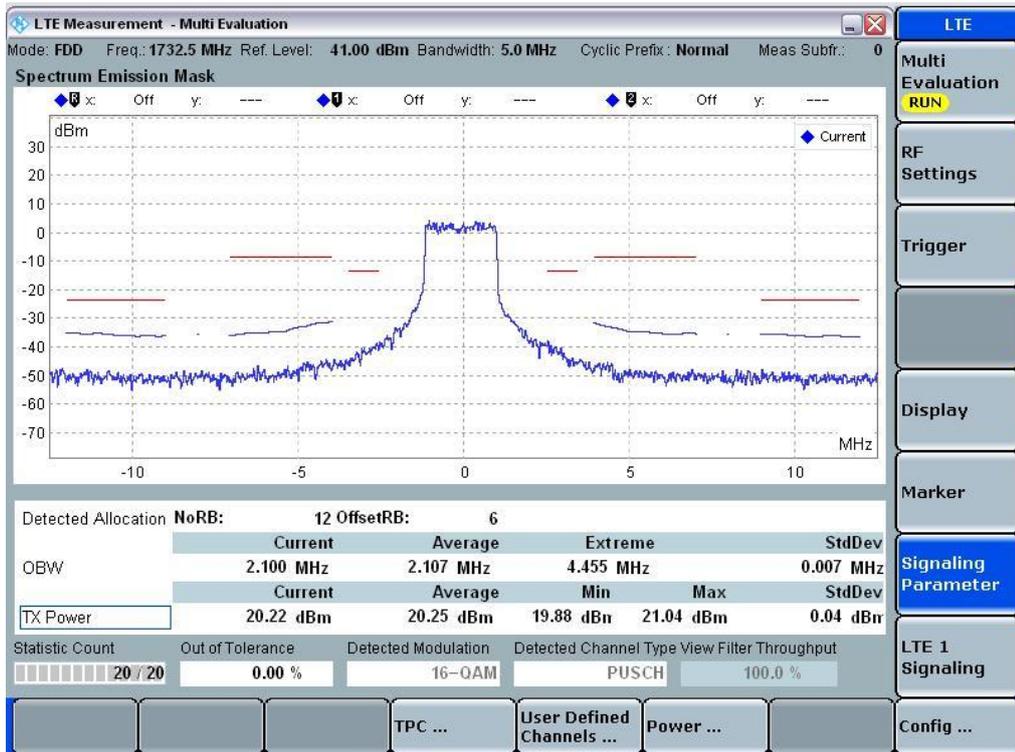
LTE Band IV, 5MHz BW, QPSK, 25RB, Offset 0



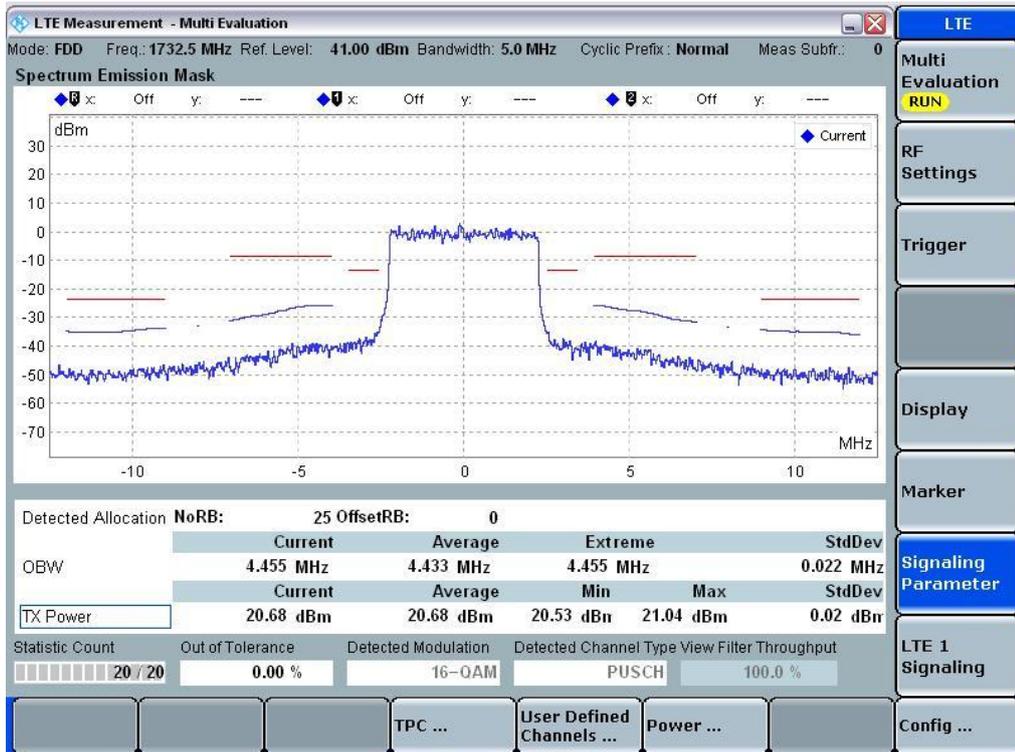
LTE Band IV, 5MHz BW, 16-QAM, 1RB, Offset 0



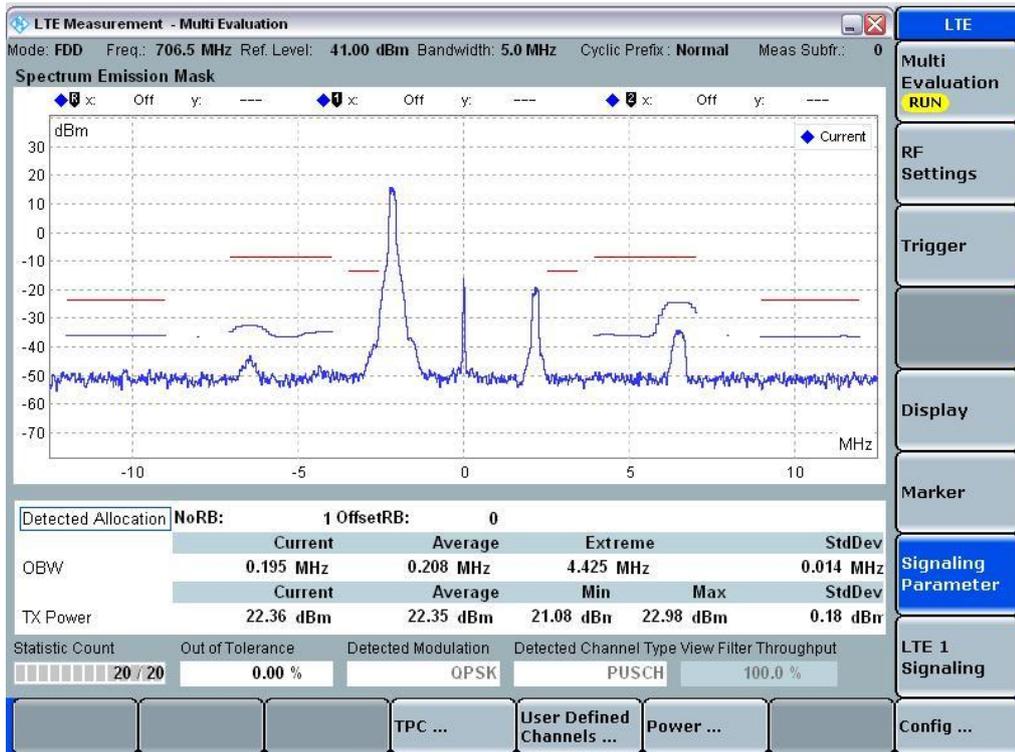
LTE Band IV, 5MHz BW, 16-QAM, 1RB, Offset 24



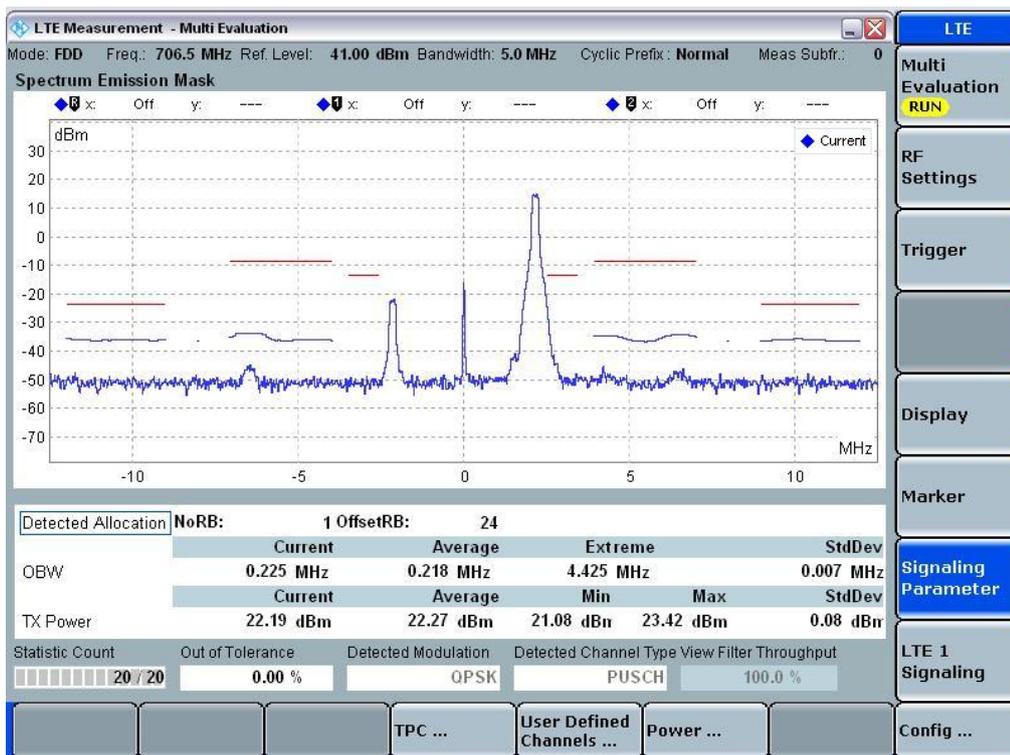
LTE Band IV, 5MHz BW, 16-QAM, 12RB, Offset 6



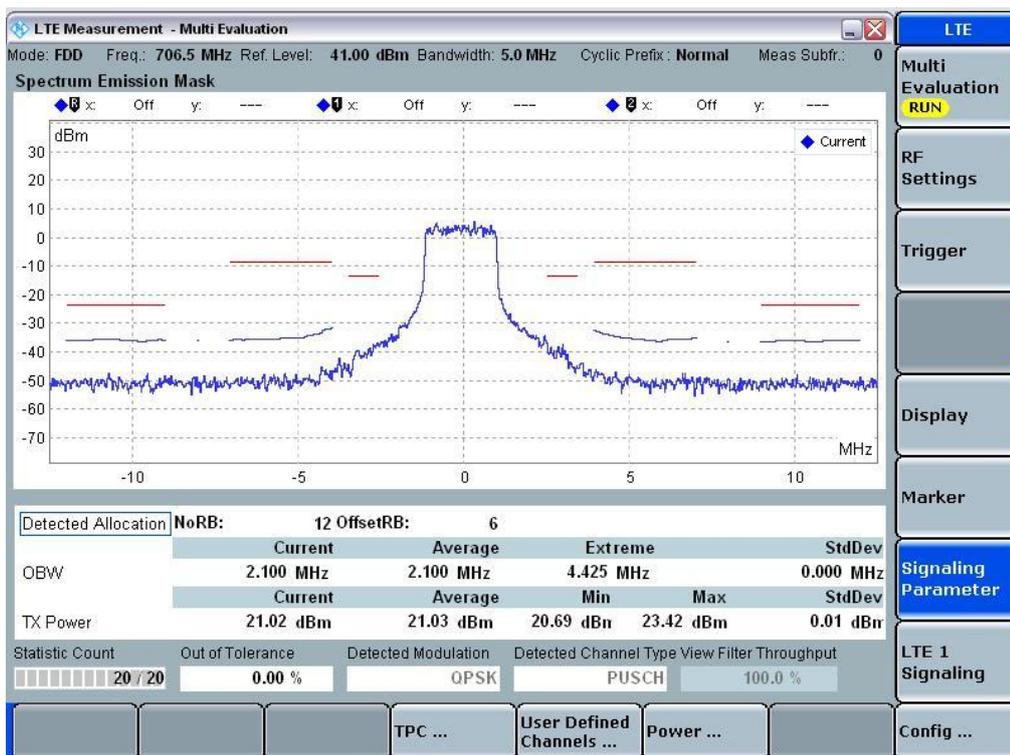
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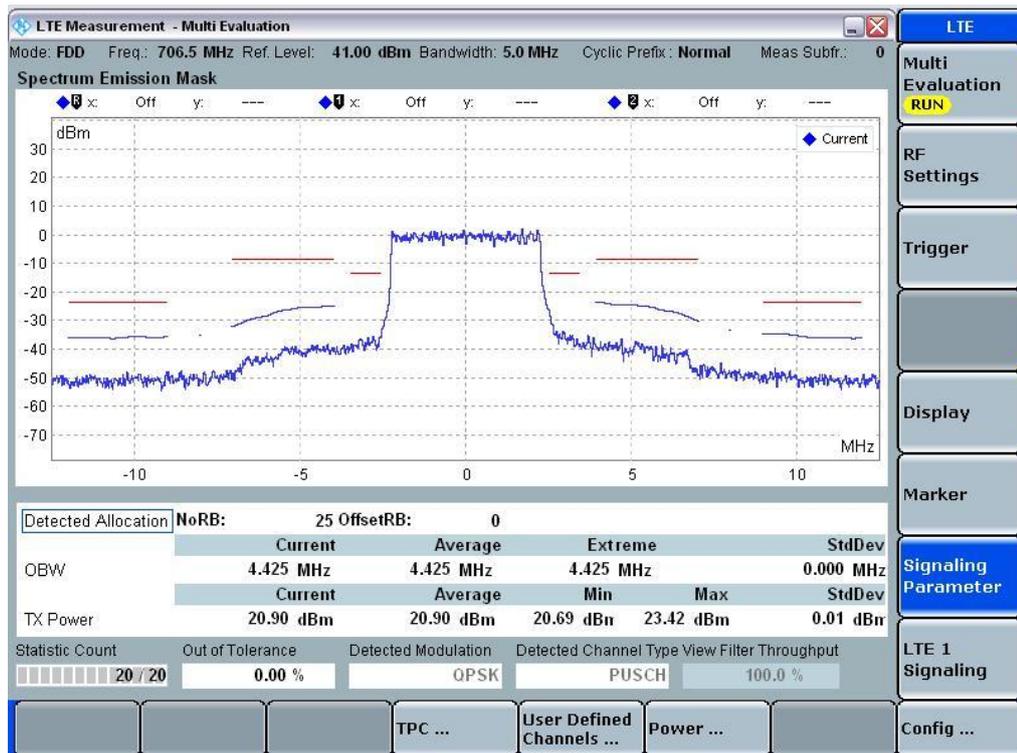
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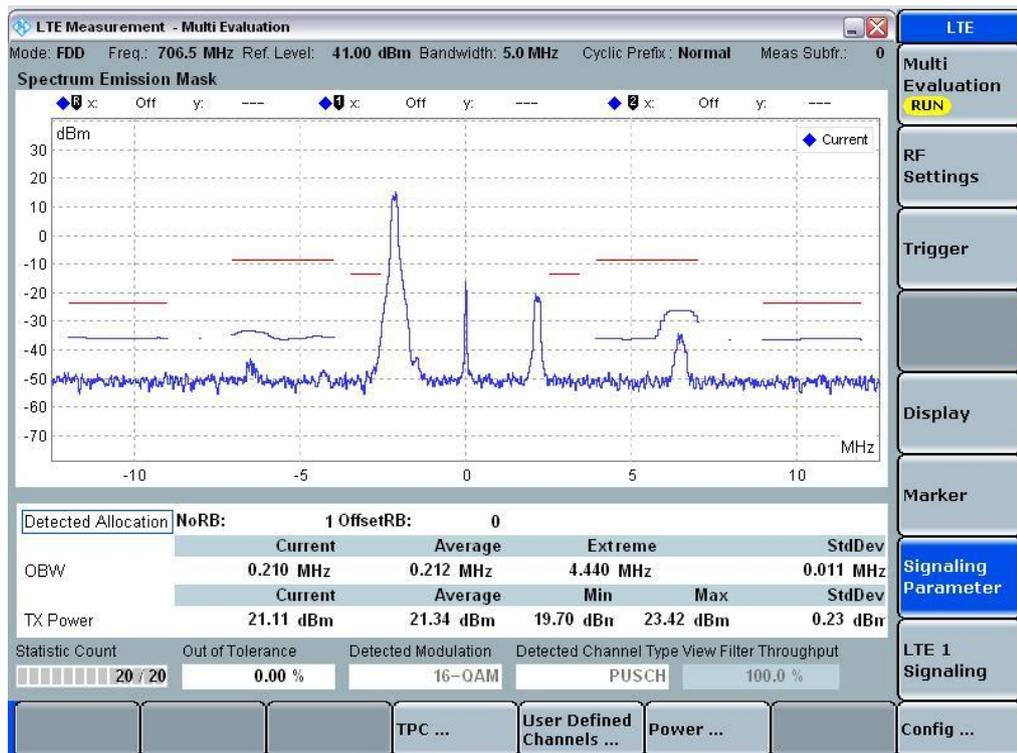
LTE Band XVII, 5MHz BW, QPSK, 1RB, Offset 24



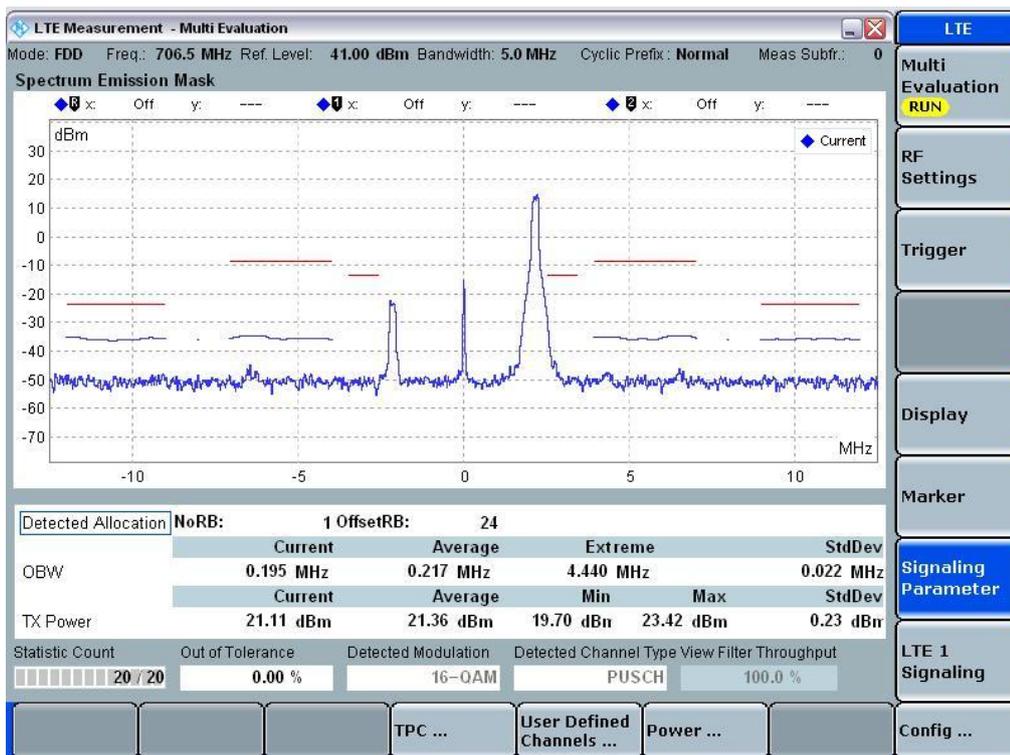
LTE Band XVII, 5MHz BW, QPSK, 12RB, Offset 6



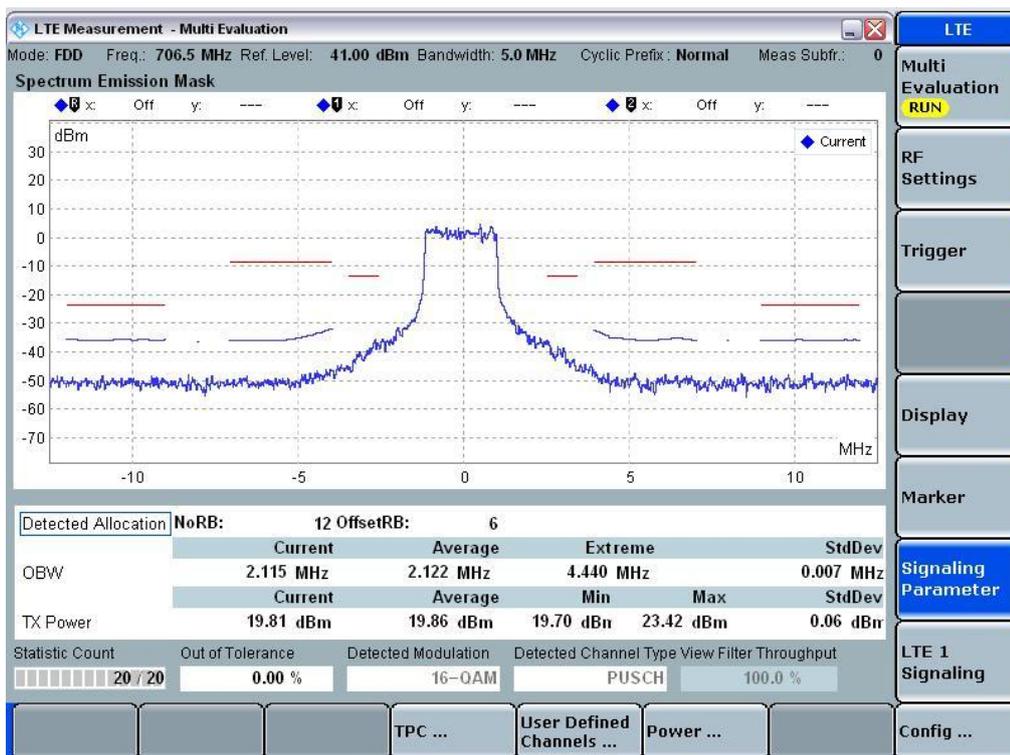
LTE Band XVII,5MHz BW,QPSK,25RB,Offset 0



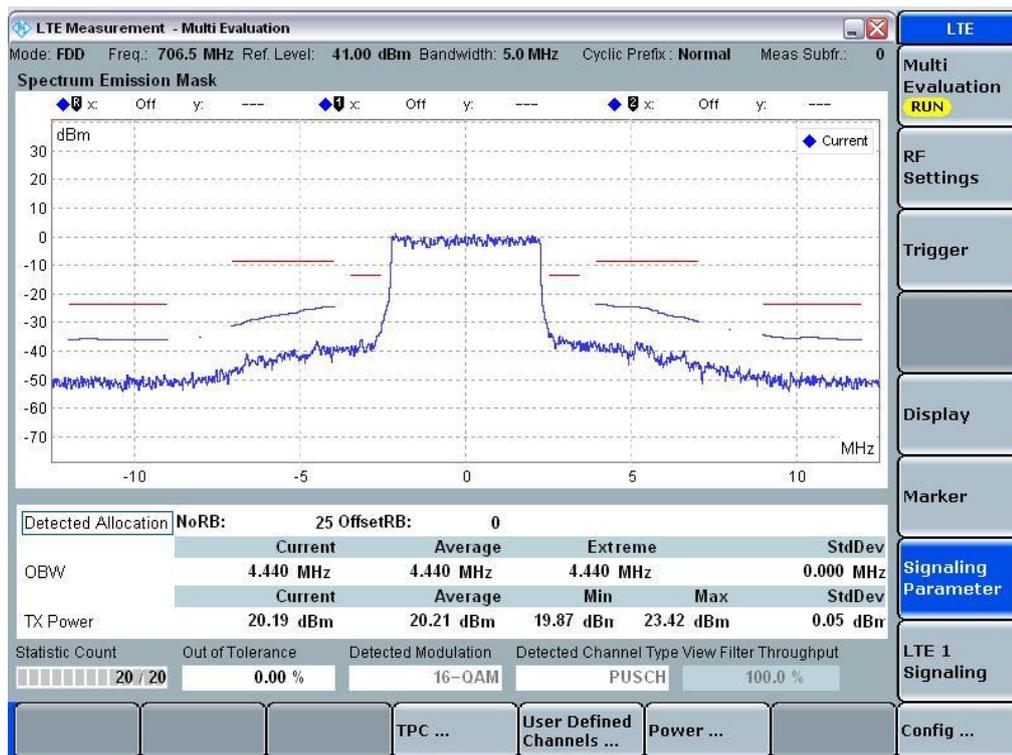
LTE Band XVII,5MHz BW,16-QAM,1RB,Offset 0



LTE Band XVII,5MHz BW ,16-QAM,1RB,Offset 24



LTE Band XVII,5MHz BW ,16-QAM,12RB,Offset 6



LTE Band XVII, 5MHz BW, 16-QAM, 25RB, Offset 0

7.4 simultaneous transmission SAR

GSM/WCDMA/LTE mode can not work at the same time. Only one mode can work at a time. No Simultaneous transmission mode is provided for the device. Therefore, simultaneous transmission SAR is not required.

Appendix A. System Check Plots**(Pls See Appendix A.)****Appendix B. SAR Measurement Plots****(Pls See Appendix B.)****Appendix C. Calibration Certificate****(Pls See Appendix C.)****Appendix D. Photo documentation****(Pls See Appendix D.)**