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Sony Mobile Communications (China) Co., Ltd.
Test Laboratory
Test Report

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TARC-PY7-PM0817-SAR-FCC-01	1	2015-03-16	Initial creation of test report
TARC-PY7-PM0817-SAR-FCC-02	2	2015-04-14	Updated report per 17240 - TCB Comments
TARC-PY7-PM0817-SAR-FCC-03	3	2016-01-28	Update test results of LTE B41
TARC-PY7-PM0817-SAR-FCC-04	4	2016-02-11	Updated the latest probe sn3843 and dipole sn1088 calibration certificate

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1 SUMMARY

The Sony Mobile Communications (China) Co., Ltd. Test Laboratory has performed measurements of the maximum potential exposure to the user of the portable cellular phone covered by this test report. The Specific Absorption Rate (SAR) of this product was measured. The portable cellular phone was tested in accordance with IEEE 1528:2003. The SAR values measured for the portable cellular phone are below the maximum recommended levels of 1.6 W/kg in a 1 g average set in IEEE Std C95-1:1992.

For IEEE (1g), the final stand-alone SAR readings for this phone are given in the table below. These measurements were performed using a DASY52™ system manufactured by SPEAG, of Zurich Switzerland.

1.1 Highest Standalone Reported SAR

Exposure configuration	Band	Highest reported 1g SAR (w/kg)	Equipment class	Highest reported 1g SAR (w/kg)
Head (Separation distance 0mm)	GSM 850	0.361	PCE	0.666
	GSM 1900	0.254		
	WCDMA 850	0.281		
	WCDMA 1900	0.497		
	LTE band 7	0.666		
	LTE band 41	0.364		
	WLAN 2.4GHz	0.857	DTS	0.857
	WLAN 5GHz	0.697	NII/DTS	0.697
	Bluetooth	0.138	DTS	0.138

Exposure configuration	Band	Highest reported 1g SAR (w/kg)	Equipment class	Highest reported 1g SAR (w/kg)
Hotspot (Separation distance 10mm)	GSM 850	0.34	PCE	1.047
	GSM 1900	0.641		
	WCDMA 850	0.329		
	WCDMA 1900	0.351		
	LTE band 7	0.832		
	LTE band 41	1.047		
	WLAN 2.4GHz	0.25	DTS	0.25
	WLAN 5GHz	NA	NII	NA
	Bluetooth	NP	DTS	NP

Exposure configuration	Band	Highest reported 1g SAR (w/kg)	Equipment class	Highest reported 1g SAR (w/kg)
Body worn (Separation distance 15mm)	GSM 850	0.424	PCE	1.047
	GSM 1900	0.338		
	WCDMA 850	0.299		
	WCDMA 1900	0.682		
	LTE band 7	0.542		
	LTE band 41	1.047		
	WLAN 2.4GHz	0.25	DTS	0.25
	WLAN 5GHz	0.143	NII	0.143
	Bluetooth	NP	DTS	NP

1.2 Statement of Compliance

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 and FCC rule §2.1093.

For body worn 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 data and 15mm for speech between this device and the body of the user. Use of other accessories may not ensure compliance with FCC RF exposure guidelines.

1.3 EUT Information

1.3.1 Basic Information

Description	Smartphone handset
FCC ID	PY7PM-0817
IC ID	N/A
Operating Mode(s)	GSM/UMTS/LTE/ 2.4G/5G Wlan/BT
GPRS/ EGPRS Class	33
DTM Multislot Class	11
WCDMA UE Category	6
RF Exposure Limits	General Population / Uncontrolled

Band	Modulation	Maximum Output Power Setting (dBm)	Duty Cycle	Transmitting Frequency Range(s)
GSM 850	GMSK	33.6	1:8	824.2 – 848.8 MHz
GSM 1900	GMSK	30.7	1:8	1850.2 – 1910 MHz
WCDMA 850	QPSK	24	1:1	826.4 – 846.6 MHz
WCDMA 1900	QPSK	25.5	1:1	1852.4 – 1907.6 MHz
LTE Band 7	QPSK	23.5	1:1	2502.5 – 2567.5 MHz
LTE Band 41	QPSK	24	1:1.58	2498.5 – 2687.5 MHz
Wlan 2.4G	OFDM	19	1:1	2412 – 2462 MHz
Wlan 5G	OFDM	18	1:1	5180 – 5825 MHz
Bluetooth	GFSK	11	1:1	2402– 2480 MHz

1.3.2 Internal Identification of EUT

Received Date	IMEI	FCC-ID	HW	SW	Test Case
2014-07-10	CB5A1ZTFMM	PY7PB-0808	A	23.0.F.1.16	GSM/WCDMA/LTE
2014-07-10	CB5A1ZTFUG	PY7PB-0808	A	23.0.F.1.16	GSM/WCDMA/LTE
2014-07-10	CB5A1ZTFNY	PY7PB-0808	A	23.0.F.1.16	GSM/WCDMA/LTE
2014-07-10	004402452817921	PY7PB-0808	A	23.0.F.1.16	GSM/WCDMA/LTE
2014-07-10	CB5A1ZTFZH	PY7PB-0808	A	0.27.1.17	Wlan
2014-07-10	004402452519964	PY7PB-0808	A	0.27.1.17	Wlan
2014-07-10	CB5A1ZTFVM	PY7PB-0808	A	23.0.F.1.16	Cellular Conducted power
2014-07-10	CB5A1ZTFRF	PY7PB-0808	A	0.27.1.17	Wlan Conducted power
2014-07-10	CB5A1ZTFTL	PY7PB-0808	A	0.27.1.17	BT Conducted power
2015-02-09	CB5A21CLJ0	PY7PB-0817	A	KK-MR1-SHINANO2-DSDS-150114-0317	GSM/WCDMA/LTE
2015-02-09	CB5A215KSJ	PY7PB-0817	A	KK-MR1-SHINANO2-DSDS-150114-0317	GSM/WCDMA/LTE
2015-02-09	CB5A21CLQU	PY7PB-0817	A	KK-MR1-SHINANO2-DSDS-150114-0317	GSM/WCDMA/LTE
2015-02-09	CB5A218QUK	PY7PB-0817	A	KK-MR1-SHINANO2-DSDS-150114-0317	GSM/WCDMA/LTE Conductive power
2015-02-09	CB5A215BL3	PY7PB-0817	A	S_atp_leo_cmcc_0_31_11_18_7	Wlan
2015-02-09	CB5A21C8SY	PY7PB-0817	A	S_atp_leo_cmcc_0_31_11_18_7	Wlan Conductive power

1.3.3 Identification of Ancillary Equipment

No.	Description	SN
1	Integrated Battery	N/A
2	Headset	N/A

1.3.4 Reference Standard and Criteria

Reference	Version	Test Standard Description
IEEE 1528	2003-04	Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques
RSS-102 Issue 4	2010-03	Radio Frequency Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands)
Canada's Safety Code No. 6	99-EHD-237	Limits of Human Exposure to Radiofrequency Electromagnetic Fields in the Frequency Range from 3 kHz to 300 GHz
IEEE Std. C95-3	2002	IEEE Recommended Practice for the Measurement of Potentially Hazardous Electromagnetic Fields – RF and Microwave
IEEE Std. C95-1	1992	IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz.
KDB 865664D01	v01r03	SAR measurement 100 MHz to 6 GHz
KDB 865664D02	v01r01	RF Exposure Reporting
KDB 447498D01	v05r02	General RF Exposure Guidance
KDB 648474D04	v01r02	SAR Evaluation Considerations for Wireless Handsets
KDB 248227D01	v01r02	SAR Measurement Procedures for 802.11 a/b/g Transmitters
KDB 941225D01	v03	3G SAR Procedures
KDB 941225D05	v02r03	SAR Evaluation Considerations for LTE Devices
KDB 941225D06	v02	Hotspot SAR

1.3.5 RF Exposure Limits

Human Exposure	Uncontrolled Environment General Population (W/Kg)	Controlled Environment Occupational (W/Kg)
Spatial Peak SAR (Head and Body)	**1.6**	8.00
Spatial Average SAR (Whole Body)	0.08	0.40
Spatial Peak SAR (Hands/Feet/Ankle/Wrist)	4.00	20.00

Note that the limit applied in this test report is shown in bold letters

1.3.6 Test Basic Information

Testing Engineers	Yao, JuMing / Zhou, ZhiLi
Testing Start Date	2015-2-10/2015-12-30
Testing End Date	2015-3-13/2015-12-31
Ambient Temperature	18~25℃
Relative Humidity	30~70%

2 SPECIFIC ABSORPTION RATE (SAR)

2.1 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.

2.2 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, δ T is the temperature rise and δ t is the exposure duration, or related to the electrical field in the tissue by

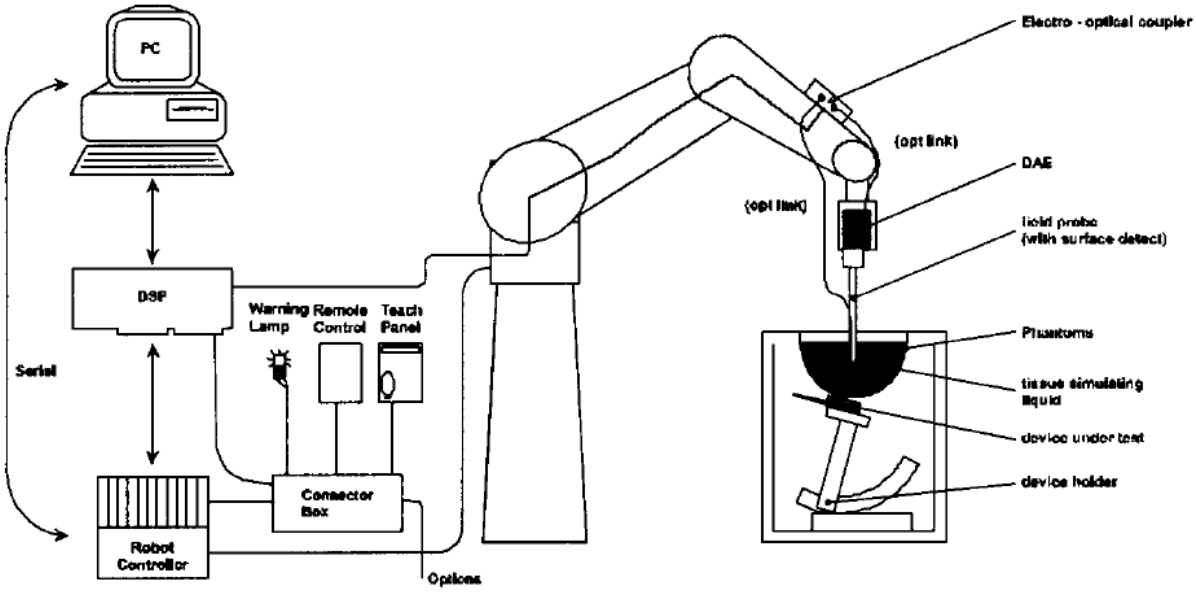
$$SAR = \frac{\sigma |E|^2}{\rho}$$

Where: δ 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.

3 TEST SET UP AND PROCESS

3.1 SAR System set-up

3.1.1 System Description



• The DASY 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 DASY measurement server.

• The DASY 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 or Windows 7.

• DASY 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 check dipoles allowing to validate the proper functioning of the system.

3.1.2 Probe Description

EX3DV4 E-Field Probe

Construction	Symmetrical design with triangular core Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)
Frequency	10 MHz to > 6 GHz Linearity: ± 0.2 dB (30 MHz to 6 GHz)
Directivity	± 0.3 dB in TSL (rotation around probe axis) ± 0.5 dB in TSL (rotation normal to probe axis)
Dynamic Range	10 µW/g to > 100 mW/g Linearity: ± 0.2 dB (noise: typically < 1 µW/g)
Dimensions	Overall length: 337 mm (Tip: 20 mm) Tip diameter: 2.5 mm (Body: 12 mm) Typical distance from probe tip to dipole centers: 1 mm
Application	High precision dosimetric measurements in any exposure scenario (e.g., very strong gradient fields); the only probe that enables compliance testing for frequencies up to 6 GHz with precision of better 30%.

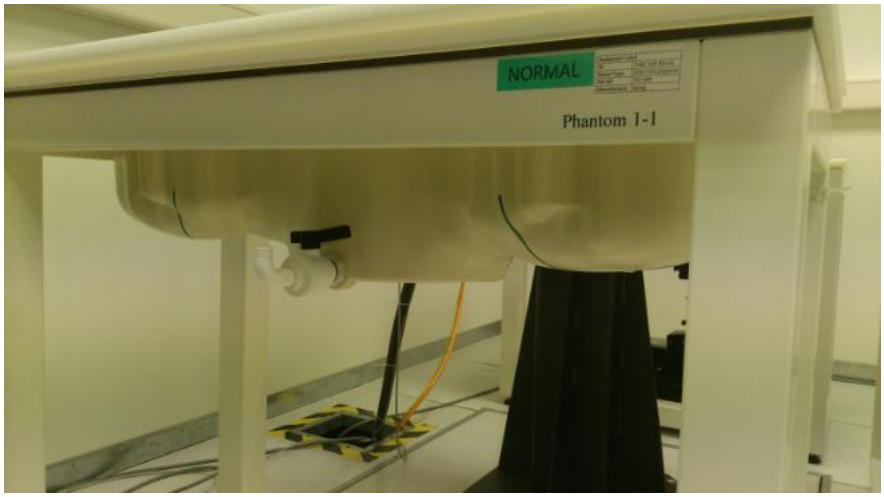
ES3DV3 E-Field Probe

Construction	Symmetrical design with triangular core Interleaved sensors Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)	
Frequency	10 MHz to 4 GHz; Linearity: ± 0.2 dB (30 MHz to 4 GHz)	
Directivity	± 0.2 dB in TSL (rotation around probe axis) ± 0.3 dB in TSL (rotation normal to probe axis)	
Dynamic Range	5 µW/g to > 100 mW/g; Linearity: ± 0.2 dB	
Dimensions	Overall length: 337 mm (Tip: 20 mm) Tip diameter: 3.9 mm (Body: 12 mm) Distance from probe tip to dipole centers: 2.0 mm	
Application	General dosimetry up to 4 GHz Dosimetry in strong gradient fields Compliance tests of mobile phones	

3.1.3 Phantom Description

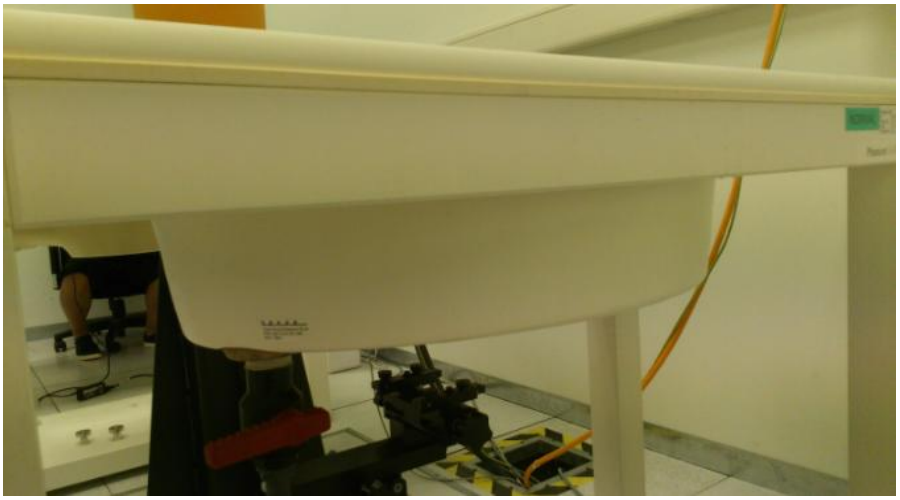
The used SAM and ELI Phantom meet the requirements specified in IEEE 1528 and EN 62209-1 for Specific Absorption Rate (SAR) measurements.

SAM phantom enables the dosimetric evaluation of left and right hand phone usage as well as body mounted usage at the flat phantom region. A cover prevents evaporation of the liquid. Reference markings on the phantom allow the complete setup of all predefined phantom positions and measurement grids by teaching three points with the robot.



Material	Vinylester, glass fiber reinforced (VE-GF)
Liquid Compatibility	Compatible with all SPEAG tissue simulating liquids (incl. DGBE type)
Shell Thickness	2 ±0.2 mm (6 ±0.2 mm at ear point)
Dimensions (incl. Wooden Support)	Length: 1000 mm Width: 500 mm Height: adjustable feet
Filling Volume	approx. 25 liters
Wooden Support	SPEAG standard phantom table

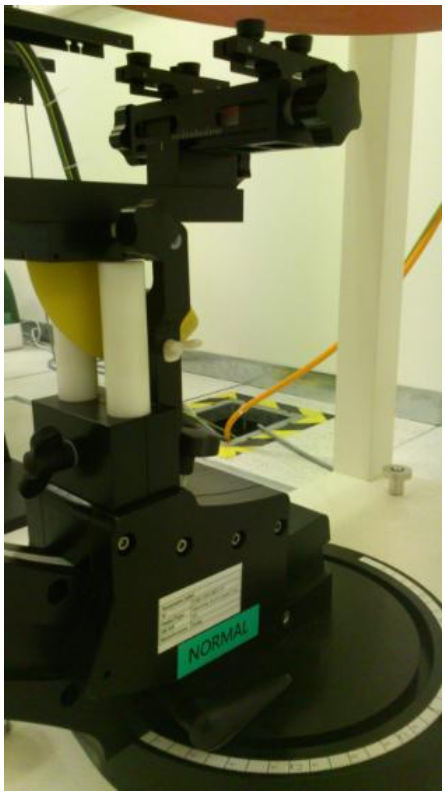
ELI phantom is fully compatible with the EN 62209-2 standard and all known tissue simulating liquids. ELI has been optimized regarding its performance and can be integrated into our standard phantom tables. A cover prevents evaporation of the liquid. Reference markings on the phantom allow installation of the complete setup, including all predefined phantom positions and measurement grids, by teaching three points. The phantom is compatible with all SPEAG dosimetric probes and dipoles.



Material	Vinylester, glass fiber reinforced (VE-GF)
Liquid Compatibility	Compatible with all SPEAG tissue simulating liquids (incl. DGBE type)
Shell Thickness	2.0 ±0.2 mm (bottom plate)
Dimensions	Major axis: 600 mm Minor axis: 400 mm
Filling Volume	approx. 30 liters
Wooden Support	SPEAG standard phantom table

3.1.4 Device Holder Description

The DASY 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.



3.1.5 Scanning Procedure

• The DASY installation includes predefined files with recommended procedures for measurements and system check. They are read-only document files and destined as fully defined but unmeasured masks. All test positions 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 DASY 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 ±0.1mm). 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 ±30 °.)

• 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 C.

• A “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 / 4 mm in x and y-direction and 5 mm / 2 mm in z-direction. DASY 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 annex 2. Test results relevant for the specified standard.

3.1.6 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 or 3 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 neighbouring volumes are evaluated until no neighbouring 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

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

3.2 Electrical Parameters of the Tissue Simulating Liquid

Prior to conducting SAR measurements, the relative permittivity, ε_r, and the conductivity, σ, of the tissue simulating liquids were measured with a HP85070 Dielectric Probe Kit.

These values, along with the temperature of the simulated tissue are shown in the table below. The recommended limits for permittivity and conductivity are also shown. A mass density of $\rho = 1\ ^{g}/_{cm^3}$ was entered into the system in all the cases. It can be seen that the measured parameters are within tolerance of the recommended limits specified in IEEE 1528.

Freq. (MHz)	Target head tissue		Measurement head tissue				Temp. ℃	Measurement date
	Permittivity	Conductivity (S/m)	Permittivity	Dev. %	Conductivity (S/m)	Dev. %		
835	41.5	0.90	41.41	-0.2	0.8	-2.2	22.3	2014-07-10
835	41.5	0.90	42	1.2	0.87	-3.3	22.5	2014-07-16
835	41.5	0.90	42.61	2.7	0.92	2.2	22.5	2014-07-22
835	41.5	0.90	43.12	3.9	0.9	0.0	22.3	2014-07-30
1750	40.08	1.37	40.05	0.1	1.41	0.4	22	2014-07-17
1750	40.08	1.37	39.69	-0.8	1.42	1.8	22.1	2014-07-18
1750	40.08	1.37	39.96	-0.1	1.43	2.1	22.1	2014-07-20
1900	40	1.4	38.98	-2.6	1.44	2.9	22.7	2014-07-10
1900	40	1.4	38.8	-3.0	1.41	0.7	22.5	2014-07-15
1900	40	1.4	38.9	-2.8	1.42	1.4	22.1	2014-07-17
1900	40	1.4	39.27	-1.8	1.39	-1.0	22.3	2014-07-22
2450	39.2	1.8	39.27	0.2	1.87	3.9	23	2014-07-26
2450	39.2	1.8	39.53	0.8	1.88	4.4	23	2014-07-28
5200	36	4.66	35.76	-0.7	4.8	3.0	23.3	2014-07-24
5300	35.9	4.76	35.57	-0.9	4.68	-1.8	23.3	2014-07-24
5500	35.6	4.96	35.57	-0.1	4.9	-1.2	23.3	2014-07-24
5600	35.5	5.07	35	-1.4	5.26	3.7	23.3	2014-07-24
5800	35.3	5.27	34.7	-1.7	5.48	4.0	23.3	2014-07-24
835	41.5	0.90	41.24	-0.6	0.86	-4	22.7	2015-02-10
1900	40	1.4	38.19	-4.5	1.41	0.86	22.8	2015-02-10
2450	39.2	1.8	40.05	2.2	1.76	-2.2	22.5	2015-03-12
2600	39	1.96	39.42	1	2.05	4.6	22.5	2015-02-15
2600	39	1.96	37.31	-4.3	2.04	4.1	22.8	2015-12-30
5300	35.9	4.76	34.36	-4.3	4.82	1.3	22.9	2015-03-05

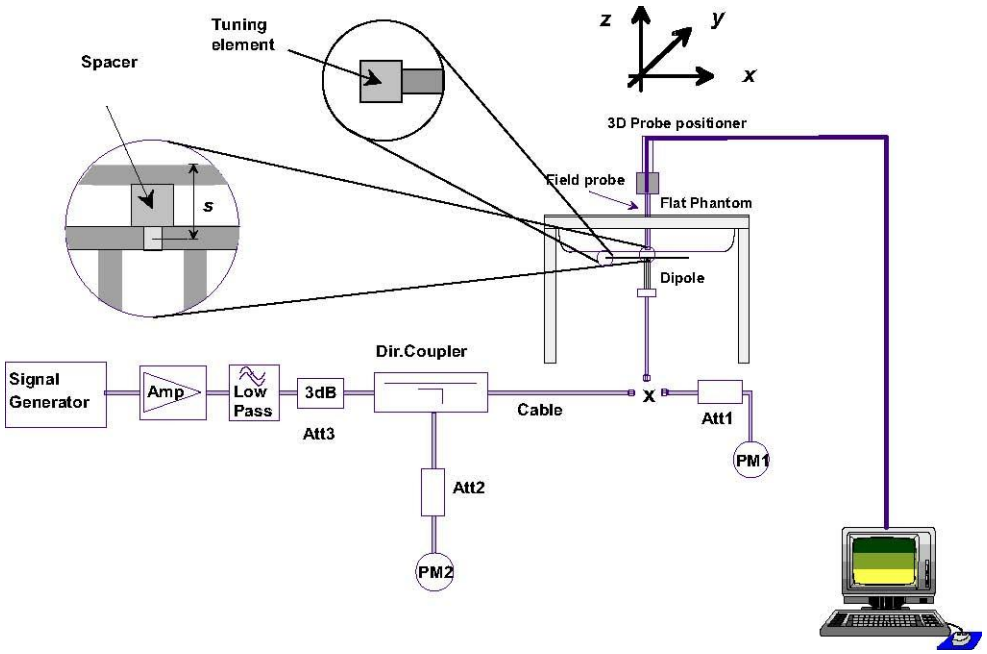
Freq. (MHz)	Target body tissue		Measurement body tissue				Temp. ℃	Measurement date
	Permittivity	Conductivity (S/m)	Permittivity	Dev. %	Conductivity (S/m)	Dev. %		
835	55.2	0.97	55.79	-4.4	0.97	0.0	22.2	2014-07-11
835	55.2	0.97	53	-4.0	0.96	-1.0	22.1	2014-07-16
835	55.2	0.97	53.54	-3.0	0.98	1.0	22	2014-07-20
835	55.2	0.97	53.85	-2.4	0.99	2.4	22.2	2014-07-23
1750	53.44	1.49	54.58	2.4	1.49	0.0	22.5	2014-07-21
1750	53.44	1.49	54.51	2.3	1.49	0.0	22.4	2014-07-24
1900	53.3	1.52	51	-4.3	1.49	-2.0	22.7	2014-07-11
1900	53.3	1.52	50.93	-4.4	1.52	0.2	22.5	2014-07-19
1900	53.3	1.52	51.25	-3.8	1.49	-2.0	22.5	2014-07-21
1900	53.3	1.52	51.5	-3.4	1.55	1.8	22.4	2014-07-23
2450	52.7	1.95	50.1	-4.9	2	2.6	23	2014-07-14
5200	49	5.3	50.1	2.2	5.36	1.1	23.1	2014-07-27
5500	48.6	5.65	49.4	1.6	5.8	2.7	23.1	2014-07-27
5800	48.2	6	48.54	0.7	6.22	3.7	23.1	2014-07-27
5200	49	5.3	47.24	-3.6	5.5	3.8	23.1	2014-07-28
5500	48.6	5.65	46.61	-4.1	5.89	4.2	23.1	2014-07-28
5800	48.2	6	46.05	-4.5	6.3	5.0	23.1	2014-07-28
835	55.2	0.97	52.92	-4.1	0.98	1.0	22.6	2015-02-10
1900	53.3	1.52	51.61	-3.2	1.56	2.6	22.6	2015-02-10
2450	52.7	1.95	50.72	-3.8	1.88	-3.6	22.8	2015-03-12
2600	52.5	2.16	50.21	-4.4	2.08	-3.7	22.7	2015-02-15
2600	52.5	2.16	50.59	-3.6	2.24	3.7	22.5	2015-12-30
5300	48.9	5.42	49.94	2.1	5.52	1.8	23	2015-02-25

All of the stimulating liquid used in this test report are supplied and manufactured by SPEAG.
The list of ingredients and the percent composition are indicated in the table below.

Ingredients (% of weight)	Frequency (MHz)											
	835		900		1800		1900		2450		5000	
Tissue Type	Head	Body	Head	Body	Head	Body	Head	Body	Head	Body	Head	Body
Water	41.45	52.4	40.92	56.0	52.64	69.91	54.9	69.91	62.7	73.2	64-78	64-78
Salt (NaCl)	1.45	1.4	1.48	0.76	0.36	0.13	0.18	0.13	0.5	0.04	2-3	2-3
Sugar	56.0	45.0	56.5	41.76	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
HEC	1.0	1.0	1.0	1.21	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bactericide	0.1	0.1	0.1	0.27	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Triton X-100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	36.8	0.0	0.0	0.0
DGBE	0.0	0.0	0.0	0.0	47.0	29.96	44.92	29.96	0.0	26.7	0.0	0.0
Emulsifiers	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9-15	9-15
Mineral Oil	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11-18	11-18

3.3 System Accuracy Verifications

The system check is performed for verifying the accuracy of the complete measurement system and performance of the software. The system check 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. A forward power of 250mW was applied to the dipoles. To adjust this power a power meter is used. The power sensor is connected to the cable before the system check 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.



System check results have to be equal or near the values determined during dipole calibration with the relevant liquids and test system. It is seen that the system is operating within its specification, as the results are within acceptable tolerance of the reference values. The following tables show system check results for all frequency bands and tissue liquids used during the tests (see Appendix B).

The simulated tissue depth was verified to be 15.0 cm ± 0.5 cm. (see Appendix A).

System Accuracy Verification Measurements for Head

Frequency (MHz)	Target value (W/Kg)		Measured value (W/Kg)		Dev. (%)		Measurement date
	1g	10g	1g	10g	1g	10g	
835	9.43	6.14	9.04	5.92	-4.14	-3.58	2014-07-10
835	9.43	6.14	9.48	6.2	0.53	0.98	2014-07-22
835	9.43	6.14	8.96	5.88	-4.98	-4.23	2014-07-30
1800	39	20.4	36.32	19.32	-6.87	-5.29	2014-07-17
1800	39	20.4	36	19.04	-7.69	-6.67	2014-07-18
1800	39	20.4	36.36	19.36	-6.77	-5.1	2014-07-20
1900	40.7	21.2	39.04	20.08	-4.08	-5.28	2014-07-10
1900	40.7	21.2	38.4	19.76	-5.65	-6.79	2014-07-15
1900	40.7	21.2	38.52	19.6	-5.36	-7.55	2014-07-17
1900	40.7	21.2	40	19.96	-1.72	-1.92	2014-07-22
1900	40.7	21.2	36.96	19.28	-9.19	-9.06	2014-07-31
2450	51.6	24.1	52	23.96	0.78	-0.58	2014-07-28
2450	51.6	24.1	52.4	24.44	1.55	1.41	2014-07-31
5200	77.3	22.1	74.8	21.44	-3.23	-2.99	2014-07-25
5500	84.1	23.9	76.4	21.52	-9.16	-9.96	2014-07-25
5800	77.9	22.2	75.2	21.32	-3.47	-3.96	2014-07-25
835	9.43	6.14	9.12	5.96	-3.29	-2.93	2015-02-10
1900	40.7	21.2	43.2	22.36	6.14	5.47	2015-02-10
2450	51.6	24.1	48.4	22.00	-6.2	-8.71	2015-03-12
2600	57.1	25.4	60.8	26.6	6.48	4.72	2015-02-15
2600	57.1	25.9	58.4	25.44	2.28	-1.78	2015-12-30
5300	85.1	24.3	88.6	24	4.11	-1.23	2015-03-05

System Accuracy Verification Measurements for Body

Frequency (MHz)	Target value (W/Kg)		Measured value (W/Kg)		Dev. (%)		Measurement date
	1g	10g	1g	10g	1g	10g	
835	9.3	6.11	9.82	6.52	6.67	6.71	2014-07-20
835	9.3	6.11	9.88	6.52	6.24	6.71	2014-07-23
1800	36.9	19.5	36.56	19.76	-0.92	1.33	2014-07-21
1800	36.9	19.5	36.84	19.84	-0.16	1.74	2014-07-24
1900	40.4	21.3	37.28	19.48	-7.72	-8.54	2014-07-11
1900	40.4	21.3	37.84	19.72	-6.34	-7.42	2014-07-18
1900	40.4	21.3	38.88	20.2	-3.76	-5.16	2014-07-21
1900	40.4	21.3	41.6	21.76	2.97	2.16	2014-07-23
2450	51.1	23.8	50	22.64	-2.15	-4.87	2014-07-14
5200	73.6	20.5	66.8	18.8	-9.24	-8.29	2014-07-28
5500	79.7	22.1	73.6	20.36	-7.65	-7.87	2014-07-28
5800	74.5	20.5	68	18.96	-8.72	-7.51	2014-07-28
835	9.3	6.11	9.48	6.24	1.94	2.13	2015-02-10
1900	40.4	21.3	43.2	22.36	6.93	4.98	2015-02-10
2450	51.1	23.8	52.8	24.64	3.33	3.53	2015-03-12
2600	56.9	25.3	55.6	24.96	-2.28	-1.34	2015-02-15
2600	57.2	25.8	60.4	26.64	5.59	3.26	2015-12-30
5300	78.5	22	84.4	23.2	7.52	5.45	2015-02-25

4 POWER MEASUREMENT

4.1 Power Reduction for SAR

This device utilize power reduction scheme under mobile hotspot conditions for SAR compliance in some bands, therefore conducted power were measured both in "hotspot off mode" and "hotspot on mode" for these bands at the RF port.

4.2 Nominal and Maximum Output Power Specifications

This device operates using the following maximum and nominal output power specifications. SAR values were scaled to the maximum allowed power to determine compliance per KDB 447498 D01.

4.2.1 Hotspot Mode Disabled

4.2.1.1 GSM

GSM Speech

		GSM	
		Target [dBm]	Tolerance +-[dB]
GSM850	low	32.6	-1~+1
	mid	32.6	-1~+1
	high	32.6	-1~+1
GSM1900	low	30.0	-0.7~+0.7
	mid	30.0	-0.7~+0.7
	high	30.0	-0.7~+0.7

GRRS tolerance

		GPRS							
		TX Slot 1		TX Slot 2		TX Slot 3		TX Slot 4	
		Target [dBm]	Tolerance +-[dB]	Target [dBm]	Tolerance +-[dB]	Target [dBm]	Tolerance +-[dB]	Target [dBm]	Tolerance +-[dB]
GSM850	low	32.6	-1~+1	31.0	-1.5~+0.8	29.0	-1.5~+0.8	28.0	-1.5~+0.8
	mid	32.6	-1~+1	31.0	-1.5~+0.8	29.0	-1.5~+0.8	28.0	-1.5~+0.8
	high	32.6	-1~+1	31.0	-1.5~+0.8	29.0	-1.5~+0.8	28.0	-1.5~+0.8
GSM1900	low	30.0	-0.7~+0.7	28.0	-1.5~+0.6	27.0	-1.5~+0.6	26.0	-1.5~+0.6
	mid	30.0	-0.7~+0.7	28.0	-1.5~+0.6	27.0	-1.5~+0.6	26.0	-1.5~+0.6
	high	30.0	-0.7~+0.7	28.0	-1.5~+0.6	27.0	-1.5~+0.6	26.0	-1.5~+0.6

EGPRS tolerance

		EGPRS 8PSK Modulation (MCS 5-9)							
		TX Slot 1		TX Slot 2		TX Slot 3		TX Slot 4	
		Target [dBm]	Tolerance +-[dB]	Target [dBm]	Tolerance +-[dB]	Target [dBm]	Tolerance +-[dB]	Target [dBm]	Tolerance +-[dB]
GSM850	low	27.0	-1.5~+1.0	25.5	-1.5~+1.0	24.5	-1.5~+1.0	22.5	-1.5~+1.0
	mid	27.0	-1.5~+1.0	25.5	-1.5~+1.0	24.5	-1.5~+1.0	22.5	-1.5~+1.0
	high	27.0	-1.5~+1.0	25.5	-1.5~+1.0	24.5	-1.5~+1.0	22.5	-1.5~+1.0
GSM1900	low	26.0	-1.5~+1.0	24.5	-1.5~+1.0	23.5	-1.5~+1.0	22.5	-1.5~+1.0
	mid	26.0	-1.5~+1.0	24.5	-1.5~+1.0	23.5	-1.5~+1.0	22.5	-1.5~+1.0
	high	26.0	-1.5~+1.0	24.5	-1.5~+1.0	23.5	-1.5~+1.0	22.5	-1.5~+1.0

4.2.1.2 WCDMA

WCDMA tolerance

		CS		HSDPA(CS)		HSDPA(1/2/3/4)		HSUPA(1/5)		HSUPA(2/3/4)	
		Target [dBm]	Tolerance +- [dB]	Target [dBm]	Tolerance +- [dB]	Target [dBm]	Tolerance +- [dB]	Target [dBm]	Tolerance +- [dB]	Target [dBm]	Tolerance +- [dB]
WCDMA 1900	low	24.0	-1.5~+1.5	24.0	-1.5~+1.5	23.0	-1.5~+1.5	24.0	-1.5~+1.5	23.0	-1.5~+1.5
	mid	24.0	-1.5~+1.5	24.0	-1.5~+1.5	23.0	-1.5~+1.5	24.0	-1.5~+1.5	23.0	-1.5~+1.5
	high	24.0	-1.5~+1.5	24.0	-1.5~+1.5	23.0	-1.5~+1.5	24.0	-1.5~+1.5	23.0	-1.5~+1.5
WCDMA 850	low	23.0	-1.5~+1.0	23.0	-1.5~+1.0	22.0	-1.5~+1.0	23.0	-1.5~+1.0	22.0	-1.5~+1.0
	mid	23.0	-1.5~+1.0	23.0	-1.5~+1.0	22.0	-1.5~+1.0	23.0	-1.5~+1.0	22.0	-1.5~+1.0
	high	23.0	-1.5~+1.0	23.0	-1.5~+1.0	22.0	-1.5~+1.0	23.0	-1.5~+1.0	22.0	-1.5~+1.0

4.2.1.3 LTE

LTE tolerance

		Target [dBm]	Tolerance +- [dB]
LTE B7	low	22.5	-1.0~+1.0
	mid	22.5	-1.0~+1.0
	high	22.5	-1.0~+1.0
LTE B41	low	23	-1.0~+1.0
	mid	23	-1.0~+1.0
	high	23	-1.0~+1.0

LTE MPR will follow up 3GPP setting as below:

Modulation	**Channel bandwidth / Transmission bandwidth (N_{RB})**						**MPR (dB)**
	1.4 MHz	**3.0 MHz**	**5 MHz**	**10 MHz**	**15 MHz**	**20 MHz**	
QPSK	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	≤0
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

4.2.1.4 WLAN and BT

WLAN tolerance

Band	Data Rates(Mbps)		Target (dBm)	Tolerance(dBm)
2.4G	11b	1	17	-2~+2
		2	17	--2~+2
		5.5	17	-2~+2
		11	17	-2~+2
	11g	6	17	-2~+2
		9	17	-2~+2
		12	17	-2~+2
		18	17	-2~+2
		24	16	-2~+2
		36	16	-2~+2
		48	16	-2~+2
		54	16	-2~+2
	11n	MCS0~MCS4	14	-2~+2
		MCS5,MCS6	14	-2~+2
		MCS7	14	-2~+2
5G	11a	6	16	-2~+2
		9	16	-2~+2
		12	16	-2~+2
		18	16	-2~+2
		24	15	-2~+2
		36	15	-2~+2
		48	15	-2~+2
		54	15	-2~+2
5G	11n/ac_20MHz	MCS0~MCS4	14	-2~+2
		MCS5,MCS6	14	-2~+2
		MCS7	14	-2~+2
	11ac_20MHz	MCS8	14	-2~+2
	11n/ac_40MHz	MCS0~MCS4	13	-2~+2
		MCS5,MCS6	13	-2~+2
		MCS7	13	-2~+2
	11ac_40MHz	MCS8,MCS9	13	-2~+2
	11ac_80MHz	MCS0~MCS4	12	-2~+2
		MCS5,MCS6	12	-2~+2
		MCS7	12	-2~+2
		MCS8,MCS9	12	-2~+2

Bluetooth tolerance

	Manufacturing Max Power [dBm]		
	BR	EDR	BL E
Low	8	6	2.4
Mid	11	8	2.4
High	8	5	2.4

4.2.2 Hotspot Mode Enabled

4.2.2.1 GSM

GSM Speech

		GSM	
		Target [dBm]	Tolerance +-[dB]
GSM850	low	24.5	-1~+1
	mid	24.5	-1~+1
	high	24.5	-1~+1
GSM1900	low	23.0	-1.5~+1
	mid	23.0	-1.5~+1
	high	23.0	-1.5~+1

GRRS tolerance

		GPRS							
		TX Slot 1		TX Slot 2		TX Slot 3		TX Slot 4	
		Target [dBm]	Tolerance +-[dB]	Target [dBm]	Tolerance +-[dB]	Target [dBm]	Tolerance +-[dB]	Target [dBm]	Tolerance +-[dB]
GSM850	low	24.5	-1~+1	24.5	-1.5~+1	24.5	-1.5~+1	24.5	-1.5~+1
	mid	24.5	-1~+1	24.5	-1.5~+1	24.5	-1.5~+1	24.5	-1.5~+1
	high	24.5	-1~+1	24.5	-1.5~+1	24.5	-1.5~+1	24.5	-1.5~+1
GSM1900	low	23.0	-1.5~+1	23.0	-1.5~+1	23.0	-1.5~+1	23.0	-1.5~+1
	mid	23.0	-1.5~+1	23.0	-1.5~+1	23.0	-1.5~+1	23.0	-1.5~+1
	high	23.0	-1.5~+1	23.0	-1.5~+1	23.0	-1.5~+1	23.0	-1.5~+1

EGPRS tolerance

		EGPRS 8PSK Modulation (MCS 5-9)							
		TX Slot 1		TX Slot 2		TX Slot 3		TX Slot 4	
		Target [dBm]	Tolerance +-[dB]	Target [dBm]	Tolerance +-[dB]	Target [dBm]	Tolerance +-[dB]	Target [dBm]	Tolerance +-[dB]
GSM850	low	24.5	-1~+1	24.5	-1.5~+1	24.5	-1.5~+1	22.5	-1.5~+1
	mid	24.5	-1~+1	24.5	-1.5~+1	24.5	-1.5~+1	22.5	-1.5~+1
	high	24.5	-1~+1	24.5	-1.5~+1	24.5	-1.5~+1	22.5	-1.5~+1
GSM1900	low	23.0	-1.5~+1	23.0	-1.5~+1	23.0	-1.5~+1	22.5	-1.5~+1
	mid	23.0	-1.5~+1	23.0	-1.5~+1	23.0	-1.5~+1	22.5	-1.5~+1
	high	23.0	-1.5~+1	23.0	-1.5~+1	23.0	-1.5~+1	22.5	-1.5~+1

4.2.2.2 WCDMA

WCDMA tolerance

		CS		HSDPA(CS)		HSDPA(1/2/3/4)		HSUPA(1/5)		HSUPA(2/3/4)	
		Target [dBm]	Tolerance +- [dB]	Target [dBm]	Tolerance +- [dB]	Target [dBm]	Tolerance +- [dB]	Target [dBm]	Tolerance +- [dB]	Target [dBm]	Tolerance +- [dB]
WCDMA 1900	low	17.0	-1.5~+1.5	17.0	-1.5~+1.5	16.0	-1.5~+1.5	17.0	-1.5~+1.5	16.0	-1.5~+1.5
	mid	17.0	-1.5~+1.5	17.0	-1.5~+1.5	16.0	-1.5~+1.5	17.0	-1.5~+1.5	16.0	-1.5~+1.5
	high	17.0	-1.5~+1.5	17.0	-1.5~+1.5	16.0	-1.5~+1.5	17.0	-1.5~+1.5	16.0	-1.5~+1.5
WCDMA 850	low	21.0	-1.5~+1.0	21.0	-1.5~+1.0	20.0	-1.5~+1.0	21.0	-1.5~+1.0	20.0	-1.5~+1.0
	mid	21.0	-1.5~+1.0	21.0	-1.5~+1.0	20.0	-1.5~+1.0	21.0	-1.5~+1.0	20.0	-1.5~+1.0
	high	21.0	-1.5~+1.0	21.0	-1.5~+1.0	20.0	-1.5~+1.0	21.0	-1.5~+1.0	20.0	-1.5~+1.0

4.2.2.3 LTE

LTE tolerance

		Target [dBm]	Tolerance +- [dB]
LTE B7	low	21	-1.0~+1.0
	mid	21	-1.0~+1.0
	high	21	-1.0~+1.0
LTE B41	low	23	-1.0~+1.0
	mid	23	-1.0~+1.0
	high	23	-1.0~+1.0

LTE MPR will follow up 3GPP setting as below:

Modulation	Channel bandwidth / Transmission bandwidth (N_{RB})						MPR (dB)
	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz	
QPSK	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	0
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

4.3 Conducted Power Results

4.3.1 GSM

Technical Description

The phone under test contains a GSM transmitter that supports voice (circuit-switched) capability, and data (packet switched) capabilities over GPRS/EDGE (GMSK) or EDGE (8PSK).

Exposure Conditions and Test Exclusions

Mode	Type	Head Adjacent	Body Worn Accessory	WiFi Hotspot
GSM (GMSK 1 slot)	Voice	Tested	Tested	NA
GPRS/EDGE (GMSK Multi-slots)	Data	Tested	Tested	Tested
EDGE (8PSK Multi-slots)	Data	Excluded	Excluded	Excluded

4.3.1.1 Hotspot Mode Disabled

GSM850	Conducted Power (dBm)		
	Channel 251(848.8MHz)	Channel 190(836.6MHz)	Channel 128(824.2MHz)
	32.53	32.54	32.55
GSM1900	Conducted Power (dBm)		
	Channel 810(1909.8MHz)	Channel 661(1880MHz)	Channel 512(1850.2MHz)
	30.33	30.38	30.24

GPRS POWER LEVELS

GSM850 GPRS (GMSK)	Measured Power(dBm)			Calculation	Averaged Power(dBm)		
	251	190	128		251	190	128
1TX Slot	32.42	32.40	32.38	-9.03dBm	23.39	23.37	23.35
2TX Slots	31.17	31.16	31.22	-6.02dBm	25.15	25.14	25.2
3TX Slots	29.29	29.15	29.20	-4.26dBm	25.03	24.89	24.94
4TX Slots	28.40	28.33	28.59	-3.01dBm	**25.39**	**25.32**	**25.58**
GSM1900 GPRS (GMSK)	Measured Power(dBm)			Calculation	Averaged Power(dBm)		
	810	661	512		810	661	512
1TX Slot	30.30	30.36	30.22	-9.03dBm	21.27	21.33	21.19
2TX Slots	28.53	28.57	28.55	-6.02dBm	22.51	22.55	22.53
3TX Slots	27.38	27.37	27.39	-4.26dBm	23.12	23.11	23.13
4TX Slots	26.45	26.50	26.41	-3.01dBm	**23.44**	**23.49**	**23.4**

EGPRS POWER LEVELS

GSM850 EGPRS (8PSK)	Measured Power(dBm)			Calculation	Averaged Power(dBm)		
	251	190	128		251	190	128
1TX Slot	27.66	27.59	27.60	-9.03dBm	18.63	18.56	18.57
2TX Slots	25.99	25.91	25.96	-6.02dBm	19.97	19.89	19.94
3TX Slots	25.15	25.09	25.12	-4.26dBm	20.89	20.83	20.86
4TX Slots	23.20	23.18	23.25	-3.01dBm	20.19	20.17	20.24
GSM1900 EGPRS (8PSK)	Measured Power(dBm)			Calculation	Averaged Power(dBm)		
	810	661	512		810	661	512
1TX Slot	26.20	26.16	26.09	-9.03dBm	17.17	17.13	17.06
2TX Slots	25.09	25.07	25.02	-6.02dBm	19.07	19.05	19
3TX Slots	24.00	23.98	23.93	-4.26dBm	19.74	19.72	19.67
4TX Slots	23.25	23.16	23.11	-3.01dBm	20.24	20.15	20.1

GSM DTM POWER LEVELS

Band: 850

Channel / frequency	Modulation	Slotted avg. power	Time base avg. Power(calculated)
128 / 824.2	GMSK + 1 GMSK	31.42	25.42
190 / 836.6	GMSK + 1 GMSK	31.25	25.25
251 / 848.8	GMSK + 1 GMSK	31.17	25.17
128 / 824.2	GMSK + 2 GMSK	29.79	25.6
190 / 836.6	GMSK + 2 GMSK	29.58	**25.38**
251 / 848.8	GMSK + 2 GMSK	29.55	25.3
128 / 824.2	GMSK + 1 8PSK	26.28	20.28
190 / 836.6	GMSK + 1 8PSK	26.1	20.1
251 / 848.8	GMSK + 1 8PSK	25.99	19.99
128 / 824.2	GMSK + 2 8PSK	25.31	21.1
190 / 836.6	GMSK + 2 8PSK	25.02	20.8
251 / 848.8	GMSK + 2 8PSK	25.01	20.75

Band:1900

Channel / frequency	Modulation	Slotted avg. power	Time base avg. Power(calculated)
610 / 1850.2	GMSK + 1 GMSK	28.58	22.58
661 / 1880.0	GMSK + 1 GMSK	28.6	22.6
810 / 1909.8	GMSK + 1 GMSK	28.62	22.62

610 / 1850.2	GMSK + 2 GMSK	27.51	23.25
661 / 1880.0	GMSK + 2 GMSK	27.42	**23.2**
810 / 1909.8	GMSK + 2 GMSK	27.5	23.25
610 / 1850.2	GMSK + 1 8PSK	25.35	19.35
661 / 1880.0	GMSK + 1 8PSK	25.36	19.36
810 / 1909.8	GMSK + 1 8PSK	25.4	19.6
610 / 1850.2	GMSK + 2 8PSK	24.24	20.01
661 / 1880.0	GMSK + 2 8PSK	24.35	20.1
810 / 1909.8	GMSK + 2 8PSK	24.38	20.08

4.3.1.2 Hotspot Mode Enabled

GPRS POWER LEVELS

GSM850 GPRS (GMSK)	Measured Power(dBm)			Calculation	Averaged Power(dBm)		
	251	190	128		251	190	128
1TX Slot	24.36	24.35	24.41	-9.03dBm	15.33	15.32	15.38
2TX Slots	24.28	24.23	24.24	-6.02dBm	18.26	18.21	18.22
3TX Slots	24.13	24.11	24.15	-4.26dBm	19.87	19.85	19.89
4TX Slots	24.19	23.99	24.00	-3.01dBm	21.18	20.98	20.99
GSM1900 GPRS (GMSK)	Measured Power(dBm)			Calculation	Averaged Power(dBm)		
	810	661	512		810	661	512
1TX Slot	23.09	23.09	22.96	-9.03dBm	14.06	14.06	13.93
2TX Slots	22.99	23.00	22.89	-6.02dBm	16.97	16.98	16.87
3TX Slots	22.87	22.86	22.83	-4.26dBm	18.61	18.6	18.57
4TX Slots	22.81	22.80	22.74	-3.01dBm	19.8	19.79	19.73

EGPRS POWER LEVELS

GSM850 EGPRS (8PSK)	Measured Power(dBm)			Calculation	Averaged Power(dBm)		
	251	190	128		251	190	128
1TX Slot	24.05	24.02	24.06	-9.03dBm	15.02	14.99	15.03
2TX Slots	23.97	23.95	24.00	-6.02dBm	17.95	17.93	17.98
3TX Slots	23.84	23.72	23.75	-4.26dBm	19.58	19.46	19.49
4TX Slots	23.11	23.10	23.17	-3.01dBm	20.1	20.09	20.16
GSM1900 EGPRS (8PSK)	Measured Power(dBm)			Calculation	Averaged Power(dBm)		
	810	661	512		810	661	512
1TX Slot	22.69	22.66	22.62	-9.03dBm	13.66	13.63	13.59
2TX Slots	22.62	22.57	22.55	-6.02dBm	16.6	16.55	16.53
3TX Slots	22.50	22.49	22.42	-4.26dBm	18.24	18.23	18.16
4TX Slots	22.47	22.45	22.39	-3.01dBm	19.46	19.44	19.38

*

Burst Average Power was measured using a power meter set to the appropriate profile to capture average power in the transmitting timeslot(s). Source-Based Time-Averaged Power, being related to the Burst Average Power by a fixed factor dependent on the number of time slots active in the frame, was calculated as follows (in dB), where x is the number of time slots active:

$$P_{Source} = P_{Burst} - 10 * \log\left(\frac{x}{8.3}\right)$$

So the scale factor for uplink time slots to calculate Source-Based Time-Averaged Power:
1 Tx slot = 9.03 dB
2 Tx slots = 6.02 dB
3 Tx slots = 4.26 dB
4 Tx slots = 3.01 dB

Justification of SAR measurements in GSM mode
SAR measurements were performed in GPRS mode with 1 active timeslots because highest time based averaged output power was calculated for that configuration. For comparison an additional delta measurement was performed with 1 timeslot in speech mode. In EDGE mode no delta measurement was performed.

4.3.2 WCDMA

Technical Description
The phone under test contains a WCDMA transmitter designed per 3GPP TS 25.101, that supports both voice and data capabilities.

Exposure Conditions and Test Exclusions

Mode	Type	Head Adjacent	Body Worn Accessory	WiFi Hotspot
RMC	Voice/Data	Tested	Tested	Tested
AMR	Voice/Data	Excluded	Excluded	Excluded
HSDPA (Rel 5) Modes	Data	Excluded	Excluded	Excluded
HSPA (Rel 6) Modes	Data	Excluded	Excluded	Excluded
DC-HSDPA (Rel 8) Modes	Data	Excluded	Excluded	Excluded

Notes:

AMR, HSDPA, HSPA, DC-HSDPA were excluded from testing per FCC KDB 941225 D01, as the measured output power in these modes is not more than ¼ dB higher than that measured in RMC.

Device Test Setup

For WCDMA modes, the test sample was operated using transmission to a base station simulator. The base station simulator was set up for the proper channel and transmit mode of operation on the phone's uplink. The transmitter power level and transmit power control were set to "All 1's" for RMC and AMR modes in WCDMA or HSDPA, or inner loop power control procedures were applied to maintain maximum output power while HSUPA was active.

a). HSDPA

HSDPA adds the HS-DPCCH in uplink as a control channel for high speed data transfer in downlink.

In HSDPA mode 4 sub-tests are defined by 3GPP 34.121 according to the following table:

Sub-test	β_c	β_d	β_d *(SF)*	β_c/β_d	β_{HS} *(Note1, Note 2)*	**CM (dB)** *(Note 3)*	**MPR (dB)** *(Note 3)*
1	2/15	15/15	64	2/15	4/15	0.0	0.0
2	12/15 *(Note 4)*	15/15 *(Note 4)*	64	12/15 *(Note 4)*	24/15	1.0	0.0
3	15/15	8/15	64	15/8	30/15	1.5	0.5
4	15/15	4/15	64	15/4	30/15	1.5	0.5

Note 1: Δ_{ACK}, Δ_{NACK} and Δ_{CQI} = 30/15 with β_{hs} = 30/15 * β_c.

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

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

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

The βc and βd gain factors for DPCCH and DPDCH were set according to the values in the above table, βhs for HS-DPCCH is set automatically to the correct value when ΔACK, ΔNACK, ΔCQI = 8. The variation of the βc /βd ratio causes a power reduction at sub-tests 2 - 4.

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

Settings of required H-Set 1 QPSK acc. to 3GPP 34.121

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

b). HSUPA
In HSUPA mode additional code channels (E-DPCCH, E-DPDCHn) are added for data transfer in uplink at higher bit rates.
5 sub-tests are defined by 3GPP 34.121 according to the following table :

Sub-test	β_c	β_d	β_d *(SF)*	β_c/β_d	β_{HS} *(Note1)*	β_{ec}	β_{ed} *(Note 4) (Note 5)*	β_{ed} *(SF)*	β_{ed} *(Codes)*	CM *(dB) (Note 2)*	MPR *(dB) (Note 2) (Note 6)*	*AG Index (Note 5)*	*E-TFCI*
1	11/15 *(Note 3)*	15/15 *(Note 3)*	64	11/15 *(Note 3)*	22/15	209/225	1309/225	4	1	1.0	0.0	20	75
2	6/15	15/15	64	6/15	12/15	12/15	94/75	4	1	3.0	2.0	12	67
3	15/15	9/15	64	15/9	30/15	30/15	β_{ed}1: 47/15 β_{ed}2: 47/15	4 4	2	2.0	1.0	15	92
4	2/15	15/15	64	2/15	4/15	2/15	56/75	4	1	3.0	2.0	17	71
5	15/15	0	-	-	5/15	5/15	47/15	4	1	1.0	0.0	12	67

Note 1: For sub-test 1 to 4, Δ_{ACK}, Δ_{NACK} and Δ_{CQI} = 30/15 with β_{hs} = 30/15 * β_c. For sub-test 5, Δ_{ACK}, Δ_{NACK} and Δ_{CQI} = 5/15 with β_{hs} = 5/15 * β_c.
Note 2: CM = 1 for β_c/β_d =12/15, β_{hs}/β_c=24/15. For all other combinations of DPDCH, DPCCH, HS- DPCCH, E-DPDCH and E-DPCCH the MPR is based on the relative CM difference.
Note 3: For subtest 1 the β_c/β_d ratio of 11/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signalled gain factors for the reference TFC (TF1, TF1) to β_c = 10/15 and β_d = 15/15.
Note 4: In case of testing by UE using E-DPDCH Physical Layer category 1, Sub-test 3 is omitted according to TS25.306 Table 5.1g.
Note 5: β_{ed} can not be set directly; it is set by Absolute Grant Value.
Note 6: For subtests 2, 3 and 4, UE may perform E-DPDCH power scaling at max power which could results in slightly smaller MPR values.

To achieve the settings above some additional procedures were defined by 3GPP 34.121. Those have been included in an application note for the CMU200 and were exactly followed :

- Test mode connection (BS signal tab) :
RMC 12.2 kbit/s + HSPA 34.108 with loop mode 1
- HS-DSCH settings (BS signal tab):
- FRC with H-set 1 QPSK
- ACK-NACK repetition factor = 3
- CQI feedback cycle = 4ms
- CQI repetition factor = 2
- HSUPA-specific signalling settings (UE signal tab) :
- E-TFCI table index = 0
- E-DCH minimum set E-TFCI = 9

- Puncturing limit non-max = 0.84
- max. number of channelisation codes = 2x SF4
- Initial Serving Grant Value = Off
- HSDPA and HSUPA Gain factors (UE signal tab)

Sub-test	β_c	β_d	Δ_{ACK}, Δ_{NACK}, Δ_{CQI}	ΔE–**DPCCH)***
1	10	15	8	6
2	6	15	8	8
3	15	9	8	8
4	2	15	8	5
5	14	15	8	7

)* : β_{ec} and β_{ed} ratios (relative to β_c and β_d) are set by ΔE–DPCCH

- HSUPA Reference E-TFCIs (UE signal tab > HSUPA gain factors) :

Sub-test	**1, 2, 4, 5**				
Number of E-TFCIs	5				
Reference E-TFCI	11	67	71	75	81
Reference E-TFCI power offset	4	18	23	26	27

Sub-test	**3**	
Number of E-TFCIs	2	
Reference E-TFCI	11	92
Reference E-TFCI power offset	4	18

- HSUPA-specific generator parameters (BS Signal tab > HSUPA > E-AGCH > AG Pattern)

Sub-test	***Absolute Grant Value (AG Index)***
1	20
2	12
3	15
4	17
5	21

- Power Level settings (BS Signal tab > Node B-settings):
- Level reference : Output Channel Power (lor)
- Output Channel Power (lor) : -86 dBm
- Downlink Physical Channel Settings (BS signal tab)
- P-CPICH : -10 dB
- S-CPICH : Off
- P-SCH : -15 dB
- S-SCH : -15 dB
- P-CCPCH : -12 dB
- S-CCPCH : -12 dB
- PICH : -15 dB
- AICH : -12 dB
- DPDCH : -10 dB
- HS-SCCH : -8 dB
- HS-PDSCH : -3 dB
- E-AGCH : -20 dB
- E-RGCH/E-HICH - 20 dB

- E-RGCH Active : Off

The settings above were stored once for each sub-test and recalled before the measurement.

HSUPA test procedure :

To reach maximum output power in HSUPA mode the following procedures were followed:

3 different TPC patterns were defined :

Set 1 : Closed loop with target power 10 dBm

Set 2 : Single Pattern+Alternating with binary pattern '11111' for 1 dB steps 'up'

Set 3 : Single Pattern+Alternating with binary pattern '00000' for 1 dB steps 'down'

After recalling a certain HSUPA sub-test the HSUPA E-AGCH graph with E-TFCI event counter is displayed. After starting with the closed loop command the power is increased in 1 dB steps by activating pattern set 2 until the UE decreases the transmitted E-TFCI.

At this point set 3 is activated once to reduce the output power to the value at which the original E-TFCI, which is required for the sub-test, appears again.

For conducted power measurements the same steps are repeated in the power menu to read out the corresponding maximum RMS output power with the target E-TFCI.

For SAR measurements it is useful to switch to Code Domain Power vs. Time display.

Here the CMU200 shows relative power values (max. and min.) of each code channel which should roughly correspond to the numerators of the gain factors e.g. :

Sub-test	β_c	β_d	β_{hs}	β_{ec}	β_{ed}
5	15	15	30	24	134

By this way a surveillance of signaling conditions is possible to make sure that HSUPA code channels are active during the complete SAR measurement.

c) DC-HSDPA (3GPP Release 8)

Dual Cell – HSDPA has been signalized using the following settings for connection setup:

Parameter During Connection Setup	Value
P-CPICH_Ec/Ior	-10 dB
P-CCPCH	-12
SCH_Ec/Ior	-12
PICH_Ec/Ior	-15
HS-PDSCH	off
HS-SCCH_1	off
DPCH_Ec/Ior	-5
OCNS_Ec/Ior	-3.1

Downlink Physical Channels according to 3GPP 34.121 Table E.5.0

The fixed reference channel has been set to H-set 12 according to 3GPP TS 34.121 Table C.8.1.12:

Parameter	Unit	Value
Nominal Average Inf. Bit Rate	kbit/s	60
Inter-TTI Distance	TTI's	1
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 Process	SML's	3200
Coding Rate		0.15
Number of Physical Channel Codecs	Codecs	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.		

H-Set 12 QPSK configuration

Power measurements were executed per FCC KDB 941225 D01:

4.3.2.1 Hotspot Mode Disabled

Sets\Modes		WCDMA	HSUPA					DC-HSDPA			
Band	Channel	RMC	1	2	3	4	5	1	2	3	4
WCDMA1900	9262	24.21	22.65	23.28	23.32	22.24	22.75	23.2	23.1	22.8	22.8
	9400	24.28	22.84	23.44	23.5	22.53	23.02	23.5	23.5	23	23
	9538	24.38	22.54	23.05	23.17	22.17	22.69	23.5	23.3	22.9	22.7
WCDMA850	4132	23.21	22.04	21.47	21.23	21.83	22.46	22.5	22.5	22	22
	4183	23.21	22.43	20.96	20.69	21.22	22.35	22.3	22.4	21.9	21.9
	4233	23.12	21.65	21.11	21.42	21.36	22.38	22.4	22.4	21.9	21.9

4.3.2.2 Hotspot Mode Enabled

Sets\Modes		WCDMA	HSUPA					DC-HSDPA			
Band	Channel	RMC	1	2	3	4	5	1	2	3	4
WCDMA1900	9262	17.10	15.73	16.16	16.25	15.2	15.58	16.1	16.2	15.9	15.9
	9400	17.35	15.9	16.35	16.45	15.4	15.85	16.6	16.7	15.9	16
	9538	17.29	16.05	16.25	16.26	15.48	15.97	16.6	16.4	16	15.8
WCDMA850	4132	20.98	20.34	20.8	20.71	19.96	20.25	20.1	20.1	19.9	19.9
	4183	21.04	20.24	20.75	20.75	19.91	20.22	20	20.1	19.8	19.8
	4233	21.32	20.48	20.93	20.96	19.95	20.37	20.1	20	19.9	19.9

4.3.3 LTE

Technical Description

Per KDB 941225 D05, for TDD systems, SAR must be tested using a fixed periodic duty factor according to the highest transmission duty factor implemented for the device and supported by the defined 3GPP LTE TDD configuration.

TDD LTE was tested using UL-DL configuration 0 with 6 UL subframes and 2 S subframes using extended cyclic prefix only and special subframe configuration 6. SAR tests were performed at maximum output power. The duty factor for special subframe configuration 6 using extended cyclic prefix is 0.633.

4.3.3.1 Hotspot Mode Disabled

Conducted power measurements LTE Band 7

BW	Frequency	RB config	QPSK	16-QAM
5MHz	2502.5	1RB_Low	23.01	21.86
		1RB_Middle	22.89	21.8
		1RB_High	22.86	21.71
		12RB_Low	21.87	20.88
		12RB_Middle	21.88	20.89
		12RB_High	21.79	20.82
		25RB	21.75	20.78
	2535	1RB_Low	22.88	22.1
		1RB_Middle	22.91	22.13
		1RB_High	22.91	22.11
		12RB_Low	21.92	20.84
		12RB_Middle	21.84	20.76
		12RB_High	21.86	20.8
		25RB	21.89	20.81
	2567.5	1RB_Low	22.25	21.15
		1RB_Middle	22.28	21.16
		1RB_High	22.33	21.25
		12RB_Low	21.39	20.37
		12RB_Middle	21.38	20.4
		12RB_High	21.41	20.42
		25RB	21.41	20.46
10MHz	2505	1RB_Low	22.79	21.7
		1RB_Middle	22.66	21.51
		1RB_High	22.56	21.41
		25RB_Low	21.75	20.82
		25RB_Middle	21.75	20.81

		25RB_High	21.64	20.72
		50RB	21.84	20.85
	2535	1RB_Low	22.79	22.05
		1RB_Middle	22.81	22
		1RB_High	22.76	21.94
		25RB_Low	21.91	20.89
		25RB_Middle	21.88	20.84
		25RB_High	21.85	20.77
		50RB	21.91	20.83
	2565	1RB_Low	22.29	21.23
		1RB_Middle	22.23	21.14
		1RB_High	22.32	21.23
		25RB_Low	21.4	20.42
		25RB_Middle	21.41	20.47
		25RB_High	21.43	20.48
		50RB	21.41	20.41
15MHz	2507.5	1RB_Low	22.86	21.66
		1RB_Middle	22.6	21.4
		1RB_High	22.64	21.47
		36RB_Low	21.84	20.78
		36RB_Middle	21.67	20.71
		36RB_High	21.67	20.73
		75RB	21.85	20.86
	2535	1RB_Low	22.8	22.03
		1RB_Middle	22.78	22
		1RB_High	22.71	21.88
		36RB_Low	21.95	20.87
		36RB_Middle	21.93	20.89
		36RB_High	21.87	20.78
		75RB	21.88	20.9
	2562.5	1RB_Low	22.39	21.68
		1RB_Middle	22.37	21.73
		1RB_High	22.38	21.74
		36RB_Low	21.47	20.35
		36RB_Middle	21.51	20.43
		36RB_High	21.43	20.37
		75RB	21.35	20.39
20MHz	2510	1RB_Low	22.85	21.93
		1RB_Middle	22.58	21.64
		1RB_High	22.68	21.77
		50RB_Low	21.76	20.84
		50RB_Middle	21.63	20.71

		50RB_High	21.64	20.77
		100RB	21.66	20.78
	2535	1RB_Low	22.81	21.9
		1RB_Middle	22.87	21.86
		1RB_High	22.57	21.58
		50RB_Low	21.89	20.89
		50RB_Middle	21.86	20.84
		50RB_High	21.79	20.77
		100RB	21.89	20.82
	2560	1RB_Low	22.33	21.39
		1RB_Middle	22.35	21.48
		1RB_High	22.41	21.48
		50RB_Low	21.4	20.35
		50RB_Middle	21.43	20.35
		50RB_High	21.35	20.35
		100RB	21.28	20.33

Conducted power measurements LTE Band 41

BW	Frequency	RB config	QPSK	16-QAM
5MHz	2498.5	1RB_Low	23.12	22.14
		1RB_Middle	23.07	22.09
		1RB_High	23.01	22.11
		12RB_Low	22.10	21.05
		12RB_Middle	22.09	21.00
		12RB_High	22.08	21.00
		25RB	22.13	21.03
	2545.75	1RB_Low	23.06	22.17
		1RB_Middle	23.08	22.10
		1RB_High	23.02	22.13
		12RB_Low	22.08	21.03
		12RB_Middle	22.06	21.05
		12RB_High	22.07	21.03
		25RB	22.10	21.02
	2593.0	1RB_Low	22.69	21.40
		1RB_Middle	22.69	21.32
		1RB_High	22.67	21.33
		12RB_Low	21.80	20.87
		12RB_Middle	21.82	20.83
		12RB_High	21.83	20.81

		25RB	21.83	20.83
	2640.25	1RB_Low	22.82	21.52
		1RB_Middle	22.82	21.43
		1RB_High	22.78	21.45
		12RB_Low	21.91	21.06
		12RB_Middle	21.88	21.01
		12RB_High	21.89	21.01
		25RB	21.89	21.00
	2687.5	1RB_Low	22.65	22.27
		1RB_Middle	22.58	22.19
		1RB_High	22.66	22.23
		12RB_Low	21.85	21.04
		12RB_Middle	21.78	21.00
		12RB_High	21.84	21.02
		25RB	21.83	20.78
10MHz	2501	1RB_Low	23.04	22.39
		1RB_Middle	22.96	22.31
		1RB_High	22.92	22.26
		25RB_Low	22.06	21.08
		25RB_Middle	22.07	21.09
		25RB_High	22.07	21.00
		50RB	22.07	20.98
	2547	1RB_Low	23.19	21.88
		1RB_Middle	23.18	21.94
		1RB_High	23.13	21.93
		25RB_Low	22.05	21.01
		25RB_Middle	22.12	21.00
		25RB_High	22.10	20.98
		50RB	22.10	21.11
	2593	1RB_Low	22.87	21.70
		1RB_Middle	22.88	21.63
		1RB_High	22.83	21.67
		25RB_Low	21.72	20.71
		25RB_Middle	21.72	20.64
		25RB_High	21.74	20.64
		50RB	21.71	20.74
	2639	1RB_Low	22.87	22.45
		1RB_Middle	22.78	22.38
		1RB_High	22.76	22.35
		25RB_Low	21.97	20.91
		25RB_Middle	21.99	20.91

		25RB_High	21.96	20.92
		50RB	21.92	21.05
	2685	1RB_Low	22.50	22.31
		1RB_Middle	22.50	22.31
		1RB_High	22.55	22.27
		25RB_Low	21.81	20.86
		25RB_Middle	21.82	20.83
		25RB_High	21.81	20.82
		50RB	21.80	20.97
15MHz	2503.5	1RB_Low	22.97	22.47
		1RB_Middle	22.92	21.94
		1RB_High	22.82	21.83
		36RB_Low	22.04	21.00
		36RB_Middle	22.03	20.90
		36RB_High	21.95	20.92
		75RB	22.05	21.07
	2548.25	1RB_Low	23.11	21.93
		1RB_Middle	23.13	21.94
		1RB_High	23.20	21.94
		36RB_Low	22.16	21.13
		36RB_Middle	22.14	21.11
		36RB_High	22.09	21.09
		75RB	22.13	21.13
	2593	1RB_Low	22.71	21.94
		1RB_Middle	22.85	21.99
		1RB_High	22.82	21.98
		36RB_Low	21.65	20.61
		36RB_Middle	21.78	20.71
		36RB_High	21.76	20.70
		75RB	21.74	20.78
	2637.75	1RB_Low	22.94	21.93
		1RB_Middle	22.80	21.83
		1RB_High	22.83	21.82
		36RB_Low	22.05	20.92
		36RB_Middle	22.04	20.91
		36RB_High	21.93	20.83
		75RB	22.01	21.00
	2682.5	1RB_Low	22.60	21.71
		1RB_Middle	22.61	21.70
		1RB_High	22.51	21.60
		36RB_Low	21.77	20.85
		36RB_Middle	21.85	20.93

		36RB_High	21.79	20.87
		75RB	21.82	20.96
20MHz	2506	1RB_Low	22.97	22.09
		1RB_Middle	22.85	21.96
		1RB_High	22.76	21.88
		50RB_Low	22.07	21.05
		50RB_Middle	21.98	20.89
		50RB_High	21.92	20.88
		100RB	22.02	20.91
	2549.5	1RB_Low	23.04	21.55
		1RB_Middle	23.05	21.52
		1RB_High	23.02	21.51
		50RB_Low	22.09	21.09
		50RB_Middle	22.16	21.10
		50RB_High	22.10	21.12
		100RB	22.16	21.05
	2593	1RB_Low	22.57	21.07
		1RB_Middle	22.69	21.12
		1RB_High	22.65	21.11
		50RB_Low	21.74	20.63
		50RB_Middle	21.80	20.68
		50RB_High	21.76	20.71
		100RB	21.76	20.60
	2636.5	1RB_Low	22.71	21.06
		1RB_Middle	22.63	21.16
		1RB_High	22.47	20.69
		50RB_Low	21.74	20.76
		50RB_Middle	21.56	20.96
		50RB_High	21.78	20.26
		100RB	21.52	20.66
	2680	1RB_Low	22.81	22.32
		1RB_Middle	22.78	22.32
		1RB_High	22.80	22.35
		50RB_Low	21.82	20.90
		50RB_Middle	21.79	20.80
		50RB_High	21.87	20.86
		100RB	21.88	20.87

4.3.3.2 Hotspot Mode Enabled

Conducted power measurements LTE Band 7

BW	Frequency	RB config	QPSK	16-QAM
5MHz	2502.5	1RB_Low	21.05	20.86
		1RB_Middle	20.98	20.84
		1RB_High	21.05	20.91
		12RB_Low	20.99	20.98
		12RB_Middle	21.04	21.02
		12RB_High	21.04	21.04
		25RB	21.05	21.1
	2535	1RB_Low	20.94	20.6
		1RB_Middle	21	20.59
		1RB_High	20.97	20.64
		12RB_Low	20.96	20.92
		12RB_Middle	20.95	20.91
		12RB_High	20.93	21.06
		25RB	20.93	20.98
	2567.5	1RB_Low	20.81	20.98
		1RB_Middle	20.76	21
		1RB_High	20.86	21.05
		12RB_Low	20.89	21
		12RB_Middle	20.92	21.04
		12RB_High	20.89	20.85
		25RB	20.93	20.9
10MHz	2505	1RB_Low	20.9	21.07
		1RB_Middle	20.92	21.12
		1RB_High	20.87	21
		25RB_Low	21.09	20.97
		25RB_Middle	21.03	20.99
		25RB_High	20.93	20.92
		50RB	20.96	20.91
	2535	1RB_Low	21.01	20.97
		1RB_Middle	20.99	20.94
		1RB_High	20.9	20.88
		25RB_Low	20.95	20.89
		25RB_Middle	20.92	20.91
		25RB_High	20.87	20.8
		50RB	20.96	20.9
	2565	1RB_Low	20.89	21.17
		1RB_Middle	20.75	20.98
		1RB_High	20.75	21

		25RB_Low	20.89	20.83
		25RB_Middle	20.83	20.82
		25RB_High	20.88	20.8
		50RB	20.97	20.85
15MHz	2507.5	1RB_Low	20.92	21.05
		1RB_Middle	20.84	21.04
		1RB_High	20.81	20.98
		36RB_Low	21.06	21
		36RB_Middle	20.92	20.89
		36RB_High	20.89	20.82
		75RB	20.93	20.85
	2535	1RB_Low	20.93	20.91
		1RB_Middle	20.93	20.91
		1RB_High	20.86	20.85
		36RB_Low	20.87	20.87
		36RB_Middle	20.94	20.9
		36RB_High	20.84	20.78
		75RB	20.96	20.93
	2562.5	1RB_Low	20.74	20.96
		1RB_Middle	20.93	21.09
		1RB_High	20.81	21.02
		36RB_Low	20.85	20.84
		36RB_Middle	20.92	20.83
		36RB_High	20.91	20.8
		75RB	20.91	20.86
20MHz	2510	1RB_Low	21.04	20.82
		1RB_Middle	20.94	20.78
		1RB_High	20.91	20.68
		50RB_Low	20.94	20.88
		50RB_Middle	20.83	20.86
		50RB_High	20.78	20.72
		100RB	20.86	20.77
	2535	1RB_Low	20.81	20.66
		1RB_Middle	20.76	20.67
		1RB_High	20.68	20.58
		50RB_Low	20.91	20.89
		50RB_Middle	20.87	20.87
		50RB_High	20.83	20.81
		100RB	20.86	20.85
	2560	1RB_Low	20.87	20.87
		1RB_Middle	21.03	21.05
		1RB_High	20.93	20.98

		50RB_Low	20.8	20.82
		50RB_Middle	20.87	20.79
		50RB_High	20.86	20.88
		100RB	20.83	20.79

4.3.4 WLAN

Technical Description
The phone under test contains a Wi-Fi 802.11b/g/n/a/ac transmitter capable of data transmission in the 2.45 GHz and 5 GHz band.

Exposure Conditions and Test Exclusions

Mode	Type	Head Adjacent	Body Worn Accessory	WiFi Hotspot
802.11b/g/n	Data	Tested	Tested	Tested
802.11a/ac	Data	Tested	Tested	NA

Notes:
(1) Per FCC KDB 248227 D01 and the April 2010 FCC/TCB Meeting Notes, the highest average output power channel for the lowest data rate for 802.11b or 802.11a was selected for SAR evaluation. Other 802.11 modes (including 802.11g, 802.11n) were not investigated when the average output powers over all channels and data rates were not more than ¼ dB higher than the tested channel in the lowest data rate of the 802.11b or 802.11a mode. The bolded data rates and channels in the following conducted power tables were used for SAR testing. For cases where alternate channels, higher data rates, or 802.11 modes resulted in output power more than ¼ dB higher than the tested configuration, additional SAR tests were conducted.

Device Test Setup
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.

In order to testing the conducted power of WLAN, the DUT is controlled to transmit WLAN TX as maximum power by the terminal software installed on the PC. The procedure how to control is presented as blew:
1. Connect DUT and PC via the USB cable and check the port is opened.
2. Input the command "WLPU" to power on WLAN.
3. Input the command "WTFD" to firmware download.
4. Input the WBTX command to start transmit (i.e., WBTX=1,0,1,1500,25,0,12).
5. Input the command "WIDL" to stop transmit.
6. Input the command "WLPD" to power off WLAN.

The average conducted power for Wi-Fi is as following:

802.11b(dBm)				
Channel\data rate	1Mbps	2Mbps	5.5Mbps	11Mbps
1(2412MHz)	17.38			
6(2437MHz)	18.31	18.22	18.23	18.06
11(2462MHz)	17.85			

802.11g(dBm)								
Channel\data rate	6Mbps	9Mbps	12Mbps	18Mbps	24Mbps	36Mbps	48Mbps	54Mbps
1(2412MHz)	17.13							
6(2437MHz)	17.84	17.79	17.78	17.66	16.63	16.38	16.23	16.19
11(2462MHz)	17.55							

802.11n(dBm)-20MHz								
Channel\data rate	MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7
1(2412MHz)	15.00							
6(2437MHz)	15.69	15.56	15.44	15.43	15.36	15.24	15.15	15.05
11(2462MHz)	15.43							

802.11a(dBm)								
Channel\data rate	6Mbps	9Mbps	12Mbps	18Mbps	24Mbps	36Mbps	48Mbps	54Mbps
36(5180 MHz)	16.21							
40(5200 MHz)	16.27							
44(5220 MHz)	16.40							
48(5240 MHz)	16.73	16.52	16.57	16.43	15.66	15.28	15.23	15.17
52(5260 MHz)	16.76							
56(5280 MHz)	16.90	16.80	16.75	16.59	15.81	15.46	15.39	15.29
60(5300 MHz)	16.84							
64(5320 MHz)	16.81							
100(5500 MHz)	16.12							
104(5520 MHz)	16.28							
108(5540 MHz)	16.53							
112(5560 MHz)	16.56	16.49	16.43	16.32	15.31	15.19	15.11	15.00
116(5580 MHz)	16.52							
120(5600 MHz)	16.30							

124(5620 MHz)	16.04							
128(5640 MHz)	16.03							
132(5660 MHz)	16.07							
136(5680 MHz)	16.19							
140(5700 MHz)	16.24							
149(5745 MHz)	16.22							
153(5765 MHz)	16.33							
157(5785 MHz)	16.44							
161(5805 MHz)	16.45							
165(5825 MHz)	16.52	16.46	16.43	16.37	15.40	15.18	15.10	15.00
802.11n(dBm)-20MHz								
Channel\data rate	MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7
36(5180 MHz)	15.27							
40(5200 MHz)	15.30							
44(5220 MHz)	15.48							
48(5240 MHz)	15.69	15.49	15.28	15.27	15.27	15.07	15.13	15.02
52(5260 MHz)	15.79							
56(5280 MHz)	15.86							
60(5300 MHz)	15.92	15.72	15.47	15.47	15.57	15.41	15.27	15.22
64(5320 MHz)	15.73							
100(5500 MHz)	15.00							
104(5520 MHz)	15.33							
108(5540 MHz)	15.28							
112(5560 MHz)	15.58	15.44	15.35	15.54	15.50	14.97	14.74	14.71
116(5580 MHz)	15.33							
120(5600 MHz)	15.33							
124(5620 MHz)	15.02							
128(5640 MHz)	15.04							
132(5660 MHz)	15.03							
136(5680 MHz)	15.31							
140(5700 MHz)	15.20							
149(5745 MHz)	15.15							
153(5765 MHz)	15.25							
157(5785 MHz)	15.29							
161(5805 MHz)	15.40							
165(5825 MHz)	15.46	15.30	15.22	15.40	15.24	14.89	14.83	14.73
802.11n(dBm)-40MHz								
Channel\data rate	MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7
38(5190 MHz)	13.92							
46(5230 MHz)	14.11	14.07	13.79	13.66	13.35	13.25	13.11	13.07
54(5270 MHz)	15.02							
62(5310 MHz)	15.15	14.91	14.63	14.49	14.12	13.90	13.85	13.68
102(5510 MHz)	14.28							
110(5550 MHz)	14.44							
118(5590 MHz)	14.53	14.20	13.99	14.03	13.72	13.48	13.37	13.00

126(5630 MHz)	14.12								
134(5670 MHz)	14.24								
151(5755 MHz)	14.40								
159(5795 MHz)	14.59	14.36	14.07	13.99	13.71	13.55	13.38	13.34	

802.11ac(dBm)-80MHz										
Channel\data rate	MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7	MCS8	MCS9
42(5210 MHz)	13.11	12.70	12.68	12.36	12.57	12.42	12.32	11.84	11.61	11.64
58(5290 MHz)	13.39	13.05	12.80	12.94	12.47	12.17	12.22	12.22	11.89	11.99
106(5530 MHz)	13.19									
122(5610 MHz)	13.21	12.76	12.43	12.67	12.26	12.15	11.99	11.84	11.80	11.68
155(5775 MHz)	13.13	12.84	12.53	12.65	12.42	12.13	12.02	11.94	11.88	11.78

802.11ac(dBm)									
Channel\data rate	MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7	MCS8
36(5180 MHz)	15.24								
40(5200 MHz)	15.40								
44(5220 MHz)	15.55								
48(5240 MHz)	15.80	15.58	15.48	15.64	15.32	15.26	15.14	14.98	14.86
52(5260 MHz)	15.83								
56(5280 MHz)	15.83								
60(5300 MHz)	15.98	15.78	15.69	15.70	15.68	15.44	15.31	15.28	15.24
64(5320 MHz)	15.92								
100(5500 MHz)	14.94								
104(5520 MHz)	15.34								
108(5540 MHz)	15.31								
112(5560 MHz)	15.41								
116(5580 MHz)	15.35								
120(5600 MHz)	15.39	15.21	15.02	15.28	15.10	14.90	14.88	14.78	14.53
124(5620 MHz)	15.03								
128(5640 MHz)	15.05								
132(5660 MHz)	15.12								
136(5680 MHz)	15.30								
140(5700 MHz)	15.20								
149(5745 MHz)	15.20								
153(5765 MHz)	15.24								
157(5785 MHz)	15.26								
161(5805 MHz)	15.55	15.40	15.24	15.31	15.04	15.05	14.86	14.79	14.64
165(5825 MHz)	15.42								

802.11ac(dBm)-40MHz										
Channel\data rate	MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7	MCS8	MCS9
38(5190 MHz)	13.96									
46(5230 MHz)	14.17	14.15	13.88	13.81	13.57	13.31	13.21	13.16	12.94	12.72
54(5270 MHz)	15.08	14.72	14.44	14.67	14.21	14.02	13.93	13.82	13.72	13.47
62(5310 MHz)	15.06									

102(5510 MHz)	14.31									
110(5550 MHz)	14.46									
118(5590 MHz)	14.57	14.27	14.06	14.05	13.81	13.58	13.51	13.38	12.97	12.86
126(5630 MHz)	14.08									
134(5670 MHz)	14.25									
151(5755 MHz)	14.38									
159(5795 MHz)	14.56	14.18	14.01	14.12	13.80	13.68	13.54	13.51	13.04	13.21

4.3.5 BT

Condition	GFSK			EDR2M-4_DQPSK			EDR3M-8DPSK		
	Low	Mid	High	Low	Mid	High	Low	Mid	High
Maximum Transmit Power(dBm)									
Hopping OFF_NTNV	6.62	9.45	7.53	3.78	5.89	4.25	3.78	5.88	4.24
Hopping OFF_HTHV	6.57	9.36	7.43	3.72	5.81	4.14	3.72	5.80	4.13
Hopping OFF_HTLV	6.52	9.35	7.42	3.78	5.84	4.18	3.78	5.85	4.18
Hopping OFF_LTHV	6.60	9.40	7.48	3.77	5.84	4.19	3.77	5.84	4.19
Hopping OFF_LTLV	6.58	9.34	7.42	3.74	5.79	4.13	3.75	5.80	4.13

5 SAR MEASUREMENTS

5.1 Mobile Hotspot SAR Measurement Positions

Mobile hotspot SAR measurement positions						
Mode	**Front**	**Rear**	**Left edge**	**Right edge**	**Top edge**	**Bottom edge**
GSM 850	Yes	Yes	Yes	Yes	No	Yes
GSM 1900	Yes	Yes	Yes	Yes	No	Yes
WCDMA 850	Yes	Yes	Yes	Yes	No	Yes
WCDMA 1900	Yes	Yes	Yes	Yes	No	Yes
LTE B7	Yes	Yes	Yes	Yes	No	Yes
LTE B41	Yes	Yes	Yes	Yes	No	Yes
Wlan	Yes	Yes	No	Yes	Yes	No

The edges with less than 2.5 cm distance to the TX antennas need to be tested for hotspot SAR.

5.2 Results Overview

The device was put into operation by using a base station simulator. Communication between the device and the call tester was established by air link. The device output power was set to maximum power level for all tests. A fully charged battery was used for every test sequence.

Per the KDB inquiry, FCC allows data leveraging across FCC IDs as long as the test data is representative of the FCC ID it is to be applied to. Therefore the test lab made spot-check on the worst case of each test position on each band. Highlighted numbers are the test results for the new product (FCC ID: PY7-PM0817).

5.2.1 Head Adjacent Test Results

Test results head SAR GSM 850

Place-ment	Position	Channel Number	Test setup	Link Config	Crest Factor	Liquid Temp (°C)	Meas. Avg. power [dBm]	Max. Output power [dBm]	Measured SAR 1g (W/kg)	Calculated SAR 1g (W/kg)
Cheek	Right	190	Speech	DTM	3,1125 (3TX)	22.0	29.58	29.80	0.338	0.356
Tilt	Right	190	Speech	DTM	3,1125 (3TX)	22.0	29.58	29.80	0.142	0.149
Cheek	Left	190	Speech	DTM	3,1125 (3TX)	22.0	29.58	29.80	0.343	**0.361**
Cheek	Left	190	Speech	DTM	3,1125 (3TX)	22.0	29.58	29.80	0.31	**0.326**

Tilt	Left	190	Speech	DTM	3,1125 (3TX)	22.0	29.58	29.80	0.143	0.150

Test results head SAR GSM 1900

Place-ment	Position	Channel Number	Test setup	Link Config	Crest Factor	Liquid Temp (°C)	Meas. Avg. power [dBm]	Max. Output power [dBm]	Measured SAR 1g (W/kg)	Calculated SAR 1g (W/kg)
Cheek	Left	661	DTM	1TX CS + 2TX PS	3,1125 (3TX)	22.5	27.42	27.60	0.204	**0.213**
Cheek	Left	661	DTM	1TX CS + 2TX PS	3,1125 (3TX)	22.5	27.42	27.60	0.244	**0.254**
Tilt	Left	661	DTM	1TX CS + 2TX PS	3,1125 (3TX)	22.5	27.42	27.60	0.138	0.144
Cheek	Right	661	DTM	1TX CS + 2TX PS	3,1125 (3TX)	22.5	27.42	27.60	0.189	0.197
Tilt	Right	661	DTM	1TX CS + 2TX PS	3,1125 (3TX)	22.5	27.42	27.60	0.069	0.072

Test results head SAR WCDMA 1900

Place-ment	Position	Channel Number	Test setup	Link Config	Crest Factor	Liquid Temp (°C)	Meas. Avg. power [dBm]	Max. Output power [dBm]	Measured SAR 1g (W/kg)	Calculated SAR 1g (W/kg)
Cheek	Right	9400	Data_RMC	RMC 12.2Kps	1	22.0	24.28	25.50	0.266	0.352
Tilt	Right	9400	Data_RMC	RMC 12.2Kps	1	22.0	24.28	25.50	0.098	0.130
Cheek	Left	9400	Data_RMC	RMC 12.2Kps	1	22.0	24.28	25.50	0.357	0.473
Tilt	Left	9400	Data_RMC	RMC 12.2Kps	1	22.0	24.28	25.50	0.166	0.220
Cheek	Left	9262	Data_RMC	RMC 12.2Kps	1	22.0	24.21	25.50	0.369	**0.497**
Cheek	Left	9262	Data_RMC	RMC 12.2Kps	1	22.0	24.21	25.50	0.352	**0.474**
Cheek	Left	9538	Data_RMC	RMC 12.2Kps	1	22.0	24.38	25.50	0.352	0.456

Test results head SAR WCDMA 850

Place-ment	Position	Channel Number	Test setup	Link Config	Crest Factor	Liquid Temp (°C)	Meas. Avg. power [dBm]	Max. Output power [dBm]	Measured SAR 1g (W/kg)	Calculated SAR 1g (W/kg)
Cheek	Right	4183	Data_RMC	RMC 12.2Kps	1	21.8	23.21	24.00	0.233	0.279
Tilt	Right	4183	Data_RMC	RMC 12.2Kps	1	21.8	23.21	24.00	0.092	0.110
Cheek	Left	4183	Data_RMC	RMC 12.2Kps	1	21.8	23.21	24.00	0.234	**0.281**
Cheek	Left	4183	Data_RMC	RMC 12.2Kps	1	21.8	23.21	24.00	0.197	**0.236**
Tilt	Left	4183	Data_RMC	RMC 12.2Kps	1	21.8	23.21	24.00	0.092	0.111

Test results head SAR LTE Band 7

Place-ment	Position	Channel Number	Link Config	Crest Factor	Liquid Temp (°C)	Meas. Avg. power [dBm]	Max. Output power [dBm]	Measured SAR 1g (W/kg)	Calculated SAR 1g (W/kg)
Cheek	Left	21100	QP20/1 RB Mid	1	22.5	22.87	23.5	0.439	0.508
Tilt	Left	21100	QP20/1 RB Mid	1	22.5	22.87	23.5	0.055	0.064
Cheek	Left	21100	QP 20 / 50%RB Low	1	22.5	21.89	22.5	0.361	0.415
Tilt	Left	21100	QP 20 / 50%RB Low	1	22.5	21.89	22.5	0.0453	0.052
Cheek	Right	21100	QP20/1 RB Mid	1	22.5	22.87	23.5	0.199	0.230
Tilt	Right	21100	QP20/1 RB Mid	1	22.5	22.87	23.5	0.0934	0.108
Cheek	Right	21100	QP 20 / 50%RB Low	1	22.5	21.89	22.5	0.154	0.177
Tilt	Right	21100	QP 20 / 50%RB Low	1	22.5	21.89	22.5	0.076	0.087
Cheek	Left	20850	QP 20 / 1RB Low	1	22.5	22.85	23.5	0.466	0.541
Cheek	Left	21350	QP 20 / 1RB High	1	22.5	22.41	23.5	0.518	**0.666**

Test results head SAR LTE Band 41

Place-ment	Position	Channel Number	Link Config	Crest Factor	Liquid Temp (°C)	Meas. Avg. power [dBm]	Max. Output power [dBm]	Measured SAR 1g (W/kg)	Calculated SAR 1g (W/kg)
Cheek	Left	40185	QP20/1 RB Mid	1	22.3	23.05	24.00	0.218	0.271
Tilt	Left	40185	QP20/1 RB Mid	1	22.3	23.05	24.00	0.031	0.039
Cheek	Left	40185	QP20/50% RB Mid	1	22.3	22.16	23.00	0.176	0.214
Tilt	Left	40185	QP20/50% RB Mid	1	22.3	22.16	23.00	0.015	0.018
Cheek	Right	40185	QP20/1 RB Mid	1	22.3	23.05	24.00	0.159	0.198
Tilt	Right	40185	QP20/1 RB Mid	1	22.3	23.05	24.00	0.054	0.067
Cheek	Right	40185	QP20/50% RB Mid	1	22.3	22.16	23.00	0.126	0.153
Tilt	Right	40185	QP20/50% RB Mid	1	22.3	22.16	23.00	0.045	0.054
Cheek	Left	39750	QP20/1 RB Low	1	22.3	22.97	24.00	0.287	**0.364**
Cheek	Left	40620	QP20/1 RB Mid	1	22.3	22.69	24.00	0.154	0.208
Cheek	Left	41055	QP20/1 RB Low	1	22.3	22.71	24.00	0.087	0.117
Cheek	Left	41490	QP20/1 RB Low	1	22.3	22.81	24.00	0.068	0.089

Test results head SAR Wi-Fi 802.11b

Place-ment	Position	Channel Number	Link Config	Crest Factor	Liquid Temp (°C)	Meas. Avg. power [dBm]	Max. Output power [dBm]	Measured SAR 1g (W/kg)	Calculated SAR 1g (W/kg)
Cheek	Left	6	1 Mbps	1	22.2	18.31	19.00	0.580	0.680
Tilt	Left	6	1 Mbps	1	22.2	18.31	19.00	0.225	0.264
Cheek	Right	6	1 Mbps	1	22.2	18.31	19.00	0.129	0.151
Tilt	Right	6	1 Mbps	1	22.2	18.31	19.00	0.062	0.073
Cheek	Left	1	1 Mbps	1	22.2	17.38	19.00	0.483	0.701
Cheek	Left	11	1 Mbps	1	22.2	17.85	19.00	0.658	**0.857**

Test results head SAR Wi-Fi 802.11a

Place-ment	Position	Channel Number	Test setup	Link Config	Crest Factor	Liquid Temp (°C)	Meas. Avg. power [dBm]	Max. Output power [dBm]	Measured SAR 1g (W/kg)	Calculated SAR 1g (W/kg)
Cheek	Left	48	IEEE802.11a	6 Mbps	1	22.5	16.73	18.00	0.391	0.524
Tilt	Left	48	IEEE802.11a	6 Mbps	1	22.5	16.73	18.00	0.212	0.284
Cheek	Left	56	IEEE802.11a	6 Mbps	1	22.5	16.90	18.00	0.541	**0.697**
Cheek	Left	56	IEEE802.11a	6 Mbps	1	22.5	16.90	18.00	0.518	**0.667**
Tilt	Left	56	IEEE802.11a	6 Mbps	1	22.5	16.90	18.00	0.194	0.250
Cheek	Left	112	IEEE802.11a	6 Mbps	1	22.5	16.56	18.00	0.330	0.460
Tilt	Left	112	IEEE802.11a	6 Mbps	1	22.5	16.56	18.00	0.115	0.160
Cheek	Left	165	IEEE802.11a	6 Mbps	1	22.5	16.52	18.00	0.434	0.610
Tilt	Left	165	IEEE802.11a	6 Mbps	1	22.5	16.52	18.00	0.137	0.193
Cheek	Right	48	IEEE802.11a	6 Mbps	1	22.5	16.73	18.00	0.204	0.273
Tilt	Right	48	IEEE802.11a	6 Mbps	1	22.5	16.73	18.00	0.030	0.040
Cheek	Right	56	IEEE802.11a	6 Mbps	1	22.5	16.90	18.00	0.232	0.299
Tilt	Right	56	IEEE802.11a	6 Mbps	1	22.5	16.90	18.00	0.078	0.101
Cheek	Right	112	IEEE802.11a	6 Mbps	1	22.5	16.56	18.00	0.152	0.212
Tilt	Right	112	IEEE802.11a	6 Mbps	1	22.5	16.56	18.00	0.029	0.041
Cheek	Right	165	IEEE802.11a	6 Mbps	1	22.5	16.52	18.00	0.112	0.157
Tilt	Right	165	IEEE802.11a	6 Mbps	1	22.5	16.52	18.00	0.025	0.035

Test results head SAR Bluetooth

Place-ment	Position	Frequency Band	Channel Number	Link Config	Liquid Temp (°C)	Meas. Avg. power [dBm]	Max. Output power [dBm]	Measured SAR 1g (W/kg)	Calculated SAR 1g (W/kg)
Cheek	Right	Bluetooth	39	1 Mbps	22.0	9.45	11.00	0.024	0.034
Tilt	Right	Bluetooth	39	1 Mbps	22.0	9.45	11.00	0.009	0.013
Cheek	Left	Bluetooth	39	1 Mbps	22.0	9.45	11.00	0.097	**0.138**
Tilt	Left	Bluetooth	39	1 Mbps	22.0	9.45	11.00	0.029	0.041

5.2.2 Body Worn Test Results

There are no body-worn accessories available for this phone at the time of testing thus the device was tested per the FCC KDB publication guidelines for devices that do not have body-worn accessories.

A separation distance of 15 mm between the device and the flat phantom was used for testing body-worn SAR. The device was tested with the front and back of the device facing the phantom. Both sides of the device were tested for Body SAR for the purpose of including the SAR evaluation for body-worn accessories that support the device with the front side facing the user.

A separation distance of 10mm between the device and the flat phantom was used for testing Wi-Fi hotspot mode SAR. Detailed test configurations can be found in Section 5.1 in this test report.

Test results body SAR GSM 850

Place-ment	Position	HotSpot On/Off	Separ-ation	Channel Number	Test setup	Crest Factor	Liquid Temp (°C)	Meas. Avg. power [dBm]	Max. Output power [dBm]	Measured SAR 1g (W/kg)	Calculated SAR 1g (W/kg)
Body	Front	OFF	15mm	190	DTM	3,1125 (3TX)	22.0	29.58	29.80	0.379	0.399
Body	Back	OFF	15mm	190	DTM	3,1125 (3TX)	22.0	29.58	29.80	0.403	**0.424**
Body	Back	OFF	15mm	190	DTM	3,1125 (3TX)	22.0	29.58	29.80	0.37	**0.389**
Body	Front	ON	10mm	190	Data_GPRS	2,075 (4TX)	22.0	23.99	25.50	0.165	0.234
Body	Back	ON	10mm	190	Data_GPRS	2,075 (4TX)	22.0	23.99	25.50	0.182	0.258
Body	Left edge	ON	10mm	190	Data_GPRS	2,075 (4TX)	22.0	23.99	25.50	0.119	0.168
Body	Right edge	ON	10mm	190	Data_GPRS	2,075 (4TX)	22.0	23.99	25.50	0.240	0.340
Body	Bottom edge	ON	10mm	190	Data_GPRS	2,075 (4TX)	22.0	23.99	25.50	0.073	0.103

Test results body SAR GSM 1900

Position	HotSpot On/Off	Separ-ation	Channel Number	Link Config	Crest Factor	Liquid Temp (°C)	Meas. Avg. power [dBm]	Max. Output power [dBm]	Measured SAR 1g (W/kg)	Calculated SAR 1g (W/kg)
Back	ON	10mm	661	4TX	2,075 (4TX)	22.5	22.80	24.00	0.272	0.359
Front	ON	10mm	661	4TX	2,075 (4TX)	22.5	22.80	24.00	0.365	0.481
Left edge	ON	10mm	661	4TX	2,075 (4TX)	22.5	22.80	24.00	0.095	0.125
Right edge	ON	10mm	661	4TX	2,075 (4TX)	22.5	22.80	24.00	0.061	0.080
Bottom edge	ON	10mm	661	4TX	2,075 (4TX)	22.5	22.80	24.00	0.486	**0.641**
Bottom edge	ON	10mm	661	4TX	2,075 (4TX)	22.5	22.80	24.00	0.413	**0.544**
Back	OFF	15mm	661	1TX CS + 2TX PS	2,075 (4TX)	22.5	27.42	27.60	0.319	0.332
Front	OFF	15mm	661	1TX CS + 2TX PS	2,075 (4TX)	22.5	27.42	27.60	0.324	0.338

Test results body SAR WCDMA 850

Place-ment	Position	HotSpot On/Off	Separ-ation	Channel Number	Link Config	Crest Factor	Liquid Temp (°C)	Meas. Avg. power [dBm]	Max. Output power [dBm]	Measured SAR 1g (W/kg)	Calculated SAR 1g (W/kg)
Body	Front	OFF	15mm	4183	RMC 12.2Kps	1	21.9	23.21	24.00	0.246	0.295
Body	Back	OFF	15mm	4183	RMC 12.2Kps	1	21.9	23.21	24.00	0.249	0.299
Body	Front	ON	10mm	4183	RMC 12.2Kps	1	21.9	22.04	22.50	0.178	0.198
Body	Back	ON	10mm	4183	RMC 12.2Kps	1	21.9	22.04	22.50	0.212	0.236
Body	Left edge	ON	10mm	4183	RMC 12.2Kps	1	21.9	22.04	22.50	0.136	0.151
Body	Right edge	ON	10mm	4183	RMC 12.2Kps	1	21.9	22.04	22.50	0.296	**0.329**
Body	Right edge	ON	10mm	4183	RMC 12.2Kps	1	21.9	22.04	22.50	0.249	**0.277**
Body	Bottom edge	ON	10mm	4183	RMC 12.2Kps	1	21.9	22.04	22.50	0.0848	0.094

Test results body SAR WCDMA 1900

Place-ment	Position	HotSpot On/Off	Separ-ation	Channel Number	Link Config	Crest Factor	Liquid Temp (°C)	Meas. Avg. power [dBm]	Max. Output power [dBm]	Measured SAR 1g (W/kg)	Calculated SAR 1g (W/kg)
Body	Front	ON	10mm	9400	RMC 12.2Kps	1	22.0	17.35	18.50	0.269	0.351
Body	Back	ON	10mm	9400	RMC 12.2Kps	1	22.0	17.35	18.50	0.190	0.248
Body	Left edge	ON	10mm	9400	RMC 12.2Kps	1	22.0	17.35	18.50	0.022	0.029
Body	Right edge	ON	10mm	9400	RMC 12.2Kps	1	22.0	17.35	18.50	0.016	0.021
Body	Bottom edge	ON	10mm	9400	RMC 12.2Kps	1	22.0	17.35	18.50	0.241	0.314
Body	Front	OFF	15mm	9400	RMC 12.2Kps	1	22.0	17.35	18.50	0.478	**0.623**
Body	Front	OFF	15mm	9400	RMC 12.2Kps	1	22.0	17.35	18.50	0.523	0.682
Body	Back	OFF	15mm	9400	RMC 12.2Kps	1	22.0	17.35	18.50	0.463	0.603

Test results Body SAR LTE Band 7

Position	HotSpot On/Off	Separ-ation	Channel Number	Link Config	Crest Factor	Liquid Temp (°C)	Meas. Avg. power [dBm]	Max. Output power [dBm]	Measured SAR 1g (W/kg)	Calculated SAR 1g (W/kg)
Front	OFF	15mm	21100	QP 20 / 1RB Mid	1	22.4	22.87	23.50	0.421	0.487
Back	OFF	15mm	21100	QP 20 / 1RB Mid	1	22.4	22.87	23.50	0.469	**0.542**
Front	OFF	15mm	21100	QP 20 / 50%RB Low	1	22.4	21.89	22.50	0.336	0.387
Back	OFF	15mm	21100	QP 20 / 50%RB Low	1	22.4	21.89	22.50	0.365	0.420
Front	ON	10mm	20850	QP 20 / 1RB Low	1	22.4	21.04	22.00	0.596	0.743
Back	ON	10mm	20850	QP 20 / 1RB Low	1	22.4	21.04	22.00	0.667	**0.832**
Left edge	ON	10mm	20850	QP 20 / 1RB Low	1	22.4	21.04	22.00	0.278	0.347
Right edge	ON	10mm	20850	QP 20 / 1RB Low	1	22.4	21.04	22.00	0.072	0.089
Bottom edge	ON	10mm	20850	QP 20 / 1RB Low	1	22.4	21.04	22.00	0.474	0.591
Back	ON	10mm	21100	QP 20 / 1RB Low	1	22.4	20.81	22.00	0.540	0.710
Back	ON	10mm	21350	QP 20 / 1RB Low	1	22.4	20.87	22.00	0.570	0.739
Front	ON	10mm	20850	QP 20 / 50%RB Low	1	22.4	20.94	22.00	0.568	0.725
Back	ON	10mm	20850	QP 20 / 50%RB Low	1	22.4	20.94	22.00	0.649	0.828
Left edge	ON	10mm	20850	QP 20 / 50%RB Low	1	22.4	20.94	22.00	0.259	0.331
Right edge	ON	10mm	20850	QP 20 / 50%RB Low	1	22.4	20.94	22.00	0.065	0.083
Bottom edge	ON	10mm	20850	QP 20 / 50%RB Low	1	22.4	20.94	22.00	0.434	0.554

Test results Body SAR LTE Band 41

Position	HotSpot On/Off	Separ-ation	Channel Number	Link Config	Crest Factor	Liquid Temp (°C)	Meas. Avg. power [dBm]	Max. Output power [dBm]	Measured SAR 1g (W/kg)	Calculated SAR 1g (W/kg)
Front	OFF	10mm	40185	QP 20 / 1RB Mid	1	22.5	23.05	24.00	0.675	0.840
Back	OFF	10mm	40185	QP 20 / 1RB Mid	1	22.5	23.05	24.00	0.707	0.880
Left edge	OFF	10mm	40185	QP 20 / 1RB Mid	1	22.5	23.05	24.00	0.306	0.381
Right edge	OFF	10mm	40185	QP 20 / 1RB Mid	1	22.5	23.05	24.00	0.116	0.144
Bottom edge	OFF	10mm	40185	QP 20 / 1RB Mid	1	22.5	23.05	24.00	0.396	0.493
Back	OFF	10mm	39750	QP 20 / 1RB Low	1	22.5	22.97	24.00	0.632	0.801
Back	OFF	10mm	40620	QP 20 / 1RB Mid	1	22.5	22.69	24.00	0.774	**1.047**
Back	OFF	10mm	41490	QP 20 / 1RB Low	1	22.5	22.81	24.00	0.593	0.780
Back	OFF	10mm	41055	QP 20 / 1RB Low	1	22.5	22.71	24.00	0.747	1.005
Front	OFF	10mm	40185	QP 20 / 50%RB Mid	1	22.5	22.16	23.00	0.536	0.650
Back	OFF	10mm	40185	QP 20 / 50%RB Mid	1	22.5	22.16	23.00	0.574	0.696
Left edge	OFF	10mm	40185	QP 20 / 50%RB Mid	1	22.5	22.16	23.00	0.246	0.298
Right edge	OFF	10mm	40185	QP 20 / 50%RB Mid	1	22.5	22.16	23.00	0.094	0.115
Bottom edge	OFF	10mm	40185	QP 20 / 50%RB Mid	1	22.5	22.16	23.00	0.323	0.392

Test results Body SAR Wi-Fi 802.11b

Place-ment	Position	Separ-ation	Channel Number	Test setup	Link Config	Crest Factor	Liquid Temp (°C)	Meas. Avg. power [dBm]	Max. Output power [dBm]	Measured SAR 1g (W/kg)	Calculated SAR 1g (W/kg)
Body	Front	10mm	6	IEEE802.11b	1 Mbps	1	22.5	18.31	19.00	0.088	0.103
Body	Back	10mm	6	IEEE802.11b	1 Mbps	1	22.5	18.31	19.00	0.134	0.157
Body	Right edge	10mm	6	IEEE802.11b	1 Mbps	1	22.5	18.31	19.00	0.013	0.015
Body	Top edge	10mm	6	IEEE802.11b	1 Mbps	1	22.5	18.31	19.00	0.000	0.000
Body	Back	10mm	1	IEEE802.11b	1 Mbps	1	22.5	17.38	19.00	0.086	0.124
Body	Back	10mm	11	IEEE802.11b	1 Mbps	1	22.5	17.85	19.00	0.188	**0.245**
Body	Back	15mm	6	IEEE802.11b	1 Mbps	1	22.5	18.31	19.00	0.061	0.071
Body	Back	15mm	1	IEEE802.11b	1 Mbps	1	22.5	17.38	19.00	0.048	0.069
Body	Back	15mm	11	IEEE802.11b	1 Mbps	1	22.5	17.85	19.00	0.058	0.076

Position	Separ-ation	Channel Number	Link Config	Crest Factor	Liquid Temp (°C)	Meas. Avg. power [dBm]	Max. Output power [dBm]	Measured SAR 1g (W/kg)	Calculated SAR 1g (W/kg)
Front	10mm	6	1 Mbps	1	22.5	18.31	19.00	0.002	0.002
Back	10mm	6	1 Mbps	1	22.5	18.31	19.00	0.213	**0.250**
Right edge	10mm	6	1 Mbps	1	22.5	18.31	19.00	0.046	0.054
Top edge	10mm	6	1 Mbps	1	22.5	18.31	19.00	0.003	0.004
Back	10mm	1	1 Mbps	1	22.5	17.38	19.00	0.138	0.200
Back	10mm	11	1 Mbps	1	22.5	17.85	19.00	0.153	0.199

Test results Body SAR Wi-Fi 802.11a

Place-ment	Position	Separ-ation	Frequency Band	Channel Number	Link Config	Crest Factor	Liquid Temp (°C)	Meas. Avg. power [dBm]	Max. Output power [dBm]	Measured SAR 1g (W/kg)	Calculated SAR 1g (W/kg)
Body	Front	15mm	WLAN 5GHz	48	6 Mbps	1	22.5	16.73	18.00	0.000	0.000
Body	Back	15mm	WLAN 5GHz	48	6 Mbps	1	22.5	16.73	18.00	0.03	**0.04**
Body	Back	15mm	WLAN 5GHz	48	6 Mbps	1	22.5	16.73	18.00	0.107	**0.143**
Body	Front	15mm	WLAN 5GHz	56	6 Mbps	1	22.5	16.90	18.00	0.000	0.000
Body	Back	15mm	WLAN 5GHz	56	6 Mbps	1	22.5	16.90	18.00	0.003	0.003
Body	Front	15mm	WLAN 5GHz	112	6 Mbps	1	22.5	16.56	18.00	0.000	0.000
Body	Back	15mm	WLAN 5GHz	112	6 Mbps	1	22.5	16.56	18.00	0.013	0.019
Body	Front	15mm	WLAN 5GHz	165	6 Mbps	1	22.5	16.52	18.00	0.000	0.000
Body	Back	15mm	WLAN 5GHz	165	6 Mbps	1	22.5	16.52	18.00	0.003	0.004

5.2.3 SAR measurement variability

SAR measurement variability must be assessed for each frequency band, which is determined by the SAR probe calibration point and tissue-equivalent medium used for the device measurements.

When both head and body tissue-equivalent media are required for SAR measurements in a frequency band, the variability measurement procedures should be applied to the tissue medium with the highest measured SAR, using the highest measured SAR configuration for that tissue-equivalent medium.

The following procedures are applied to determine if repeated measurements are required.
1) Repeated measurement is not required when the original highest measured SAR is < 0.80 W/kg; steps 2) through 4) do not apply.
2) When the original highest measured SAR is ⩾ 0.80 W/kg, repeat that measurement once.
3) Perform a second repeated measurement only if the ratio of largest to smallest SAR for the original and first repeated measurements is > 1.20 or when the original or repeated measurement is ⩾ 1.45 W/kg (~ 10% from the 1-g SAR limit).
4) Perform a third repeated measurement only if the original, first or second repeated measurement is ⩾ 1.5 W/kg and the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20.

Per the measurement result from above, the reported SAR of this product are below 0.8W/Kg for all frequency bands, so no additional variability measurement was made.

Frequency band	Test configuration	Highest measurement result at worst case position (W/kg)	Second measurement result at worst case position (W/kg)	Ratio <1.2GSM

5.2.4 Standalone SAR Test Exclusion Considerations

Standalone 1-g head or body SAR evaluation by measurement or numerical simulation is not required when the corresponding SAR Exclusion Threshold condition, listed below, is satisfied.
The 1-g SAR test exclusion threshold for 100 MHz to 6 GHz at test separation distances ≤ 50 mm are determined by:

The 1-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances ≤ 50 mm are determined by:
[(max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)] ·
[√f(GHz)] ≤ 3.0 for 1-g SAR, where:

- f(GHz) is the RF channel transmit frequency in GHz
- Power and distance are rounded to the nearest mW and mm before calculation
- The result is rounded to one decimal place for comparison
- When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion

SAR Test Exclusion Thresholds for 100 MHz – 6 GHz and ≤ 50 mm

Approximate SAR Test Exclusion Power Thresholds at Selected Frequencies and Test Separation Distances are illustrated in the following Table.

MHz	5	10	15	20	25	mm
150	39	77	116	155	194	SAR Test Exclusion Threshold (mW)
300	27	55	82	110	137	
450	22	45	67	89	112	
835	16	33	49	66	82	
900	16	32	47	63	79	
1500	12	24	37	49	61	
1900	11	22	33	44	54	
2450	10	19	29	38	48	
3600	8	16	24	32	40	
5200	7	13	20	26	33	
5400	6	13	19	26	32	
5800	6	12	19	25	31	

Frequency Band	Freq. (MHz)	Max. declared Pavg(dBm)	Max. declared Pavg(mW)	Test Exclusion
WiFi 2450	2450	19	79.4	No
WiFi 5G	5180~5825	18	63.1	No
Bluetooth	2450	11	12.6	No

SAR test exclusion evaluation for Head position (min test separation distance=5mm)

Frequency Band	Freq. (MHz)	Max. declared Pavg(dBm)	Max. declared Pavg(mW)	Test Exclusion
WiFi 2450	2450	19	79.4	No
WiFi 5G	5180~5825	18	63.1	No
Bluetooth	2450	11	12.6	Yes

SAR test exclusion evaluation for Body position (min test separation distance=10mm)

5.2.5 Multiple Transmitter Information

Evaluations of the head, body simultaneous SAR summations for the worst-case SAR transmitter configurations are presented in the tables below.

Exposure Configuration	Frequency Band	Highest Reported SAR (W/kg) 1g	Equipment Class	Highest Reported SAR (W/kg) 1g	SPLSR
Head (Separation Distance 0 mm)	**LTE B7**	0.666	PCE	**1.523**	N/A
	WLAN 2.4 GHz	0.857	DTS		
	LTE B7	0.666	PCE	0.804	N/A
	Bluetooth	0.138	DSS		
Body-Worn (Separation Distance 15 mm)	**LTE B41**	1.047	PCE	1.297	N/A
	WLAN 2.4 GHz	0.25	DTS		N/A
	LTE B41	1.047	PCE	1.222	N/A
	Bluetooth*	0.175	DSS		N/A
Wi-Fi hotspot mode (Separation Distance 10mm)	**LTE B41**	1.047	PCE	1.297	N/A
	WLAN 2.4 GHz	0.25	DTS		N/A

For the transmitters requiring stand-alone SAR testing, the KDB guidelines direct that if the sum of the 1 g SAR measured for the simultaneously transmitting antennas is less than the SAR limit, SAR measurement for simultaneous transmission is not required.

*Where the estimated SAR for Bluetooth can be get from below table

Estimated SAR					
Frequency band	**Freq. (GHz)**	**Distance (mm)**	**Max. declared Pavg(dBm)**	**Max. declared Pavg(mW)**	**Estimated 1g (W/kg)**
Bluetooth Body	2.45	15	11	12.6	0.175

Calculated SARmax for Bluetooth 2450MHz

When standalone SAR test exclusion applies to an antenna that transmits simultaneously with other antennas, the standalone SAR must be estimated according to following to determine simultaneous transmission SAR test exclusion:

(max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)]·[√f(GHz)/x] W/kg for test separation distances ≤ 50 mm;
where x = 7.5 for 1-g SAR.

When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion

5.2.6 Extremity SAR Evaluation

The overall diagonal dimension of this phone is < 16.0cm and the screen diagonal is also <15.0cm, so the phone is not classified as a phablet. According to the KDB648474 D04, extremity SAR evaluation is not required for non-phablet product.

6 TEST EQUIPMENT UTILIZED

6.1 Dosimetric System

The Laboratory utilizes a Dosimetric Assessment System (DASY52™) manufactured by SPEAG, of Zurich Switzerland. All the SAR measurements are taken within a shielded enclosure.

The list of calibrated equipment used for the measurements is shown in the following table.

Instrument	Type	Manufacture	Serial Number	Cal Date	Cal Due Date
DAE	DAE4	SPEAG	853	2013-12-16	2014-12-15
DAE	DAE4	SPEAG	854	2013-12-16	2014-12-15
Probe	EX3DV4	SPEAG	3843	2014-02-21	2015-02-20
Probe	ES3DV3	SPEAG	3169	2013-12-19	2014-12-18
Probe	ES3DV3	SPEAG	3170	2013-12-19	2014-12-18
Dipole Validation Kit	D750V3	SPEAG	1055	2014-02-21	2015-02-20
Dipole Validation Kit	D835V2	SPEAG	4d061	2014-02-21	2015-02-20
Dipole Validation Kit	D900V2	SPEAG	1d065	2014-02-21	2015-02-20
Dipole Validation Kit	D1800V2	SPEAG	2d158	2012-01-12	2015-01-11
Dipole Validation Kit	D1900V2	SPEAG	5d093	2014-02-19	2015-02-18
Dipole Validation Kit	D2450V2	SPEAG	806	2014-02-18	2015-02-17
Dipole Validation Kit	D2600V2	SPEAG	1025	2013-01-31	2015-01-30
Dipole Validation Kit	D5GHzV2	SPEAG	1061	2013-12-19	2014-12-18
SAM Phantom	V4.0	SPEAG	TP-1488	-	-
SAM Phantom	V4.0	SPEAG	TP-1489	-	-
ELI4 Phantom	ELI4	SPEAG	1041	-	-
SAM Phantom	V4.0	SPEAG	TP-1696	-	-
SAM Phantom	V4.0	SPEAG	TP-1697	-	-
ELI4 Phantom	ELI4	SPEAG	1164	-	-

DAE	DAE4	SPEAG	1437	2014-7-8	2015-7-7
DAE	DAE4	SPEAG	853	2014-12-12	2015-12-11
DAE	DAE4	SPEAG	854	2014-12-15	2015-12-14
Probe	ES3DV3	SPEAG	3295	2014-3-14	2015-3-13
Probe	ES3DV3	SPEAG	3169	2014-12-16	2015-12-15
Probe	EX3DV4	SPEAG	3642	2014-12-12	2015-12-11
Probe	EX3DV4	SPEAG	7306	2014-7-16	2015-7-15
Dipole Validation Kit	D2600V2	SPEAG	1088	2014-8-11	2015-08-10
Dipole Validation Kit	D5GHzV2	SPEAG	1176	2014-7-8	2015-7-7

6.2 Additional Equipment

Instrument	Type	Manufacture	Serial Number	Cal Date	Cal Due Date
Signal generator	SML03	R&S	103818	2014-05-21	2015-05-20
Directional coupler	HP778D	Agilent	20500	2014-05-21	2015-05-20
Power meter	NRVD	R&S	102081	2014-05-21	2015-05-20
Power sensor	NRV-Z5	R&S	100538	2014-05-21	2015-05-20
Power sensor	NRV-Z5	R&S	100539	2014-05-21	2015-05-20
Network analyzer	E5071C	Agilent	MY46104758	2014-05-20	2015-05-19
Amplifier	0.3-3GHz	Bonn Elektronik	087193A	2014-05-20	2015-05-19
Amplifier	2-6GHz	Bonn Elektronik	087193B	2014-05-20	2015-05-19
Wireless Communication Test Set	CMU200	R&S	117336	2014-05-09	2015-05-08
Wireless Communication Test Set	CMW500	R&S	115793	2014-05-09	2015-05-08

6.3 Dosimetric System used for TDD Band41 results update

The Laboratory utilizes a Dosimetric Assessment System (DASY52™) manufactured by SPEAG, of Zurich Switzerland. All the SAR measurements are taken within a shielded enclosure.

The list of calibrated equipment used for the measurements is shown in the following table.

Instrument	Type	Manufacture	Serial Number	Cal Date	Cal Due Date
DAE	DAE4	SPEAG	1325	2015.02.12	2016-02-11
DAE	DAE4	SPEAG	1437	2015.07.23	2016.07.22
Probe	EX3DV4	SPEAG	3293	2015.07.20	2016.07.19
Probe	EX3DV4	SPEAG	3843	2015.03.13	2016.03.12
Dipole Validation Kit	D1900V2	SPEAG	5d092	2015.07.23	2016.07.22
Dipole Validation Kit	D2450V2	SPEAG	805	2015.07.21	2016.07.20
Dipole Validation Kit	D2600V2	SPEAG	1088	2015.07.21	2016.07.20
SAM Phantom	V4.0	SPEAG	TP-1839	-	-
MFP Phantom	V5.1	SPEAG	TP-1164	-	-
SAM Phantom	V4.0	SPEAG	TP-1696	-	-
SAM Phantom	V4.0	SPEAG	TP-1697	-	-

6.4 Additional Equipment used for TDD Band41 results update

Instrument	Type	Manufacture	Serial Number	Cal Date	Cal Due Date
Signal generator	SML03	R&S	103818	2015.06.02	2016.06.01
Signal generator	SMR20	R&S	102049	2015.06.02	2016.06.01
Directional coupler	HP778D	Agilent	20500	2015.06.02	2016.06.01
Directional coupler	11691D	Agilent	MY4815020	2015.06.03	2016.06.02
Power meter	NRVD	R&S	102081	2015.06.02	2016.06.01
Power sensor	NRV-Z5	R&S	100538	2015.06.02	2016.06.01
Power sensor	NRV-Z5	R&S	100539	2015.06.02	2016.06.01
Network analyzer	E5071C	Agilent	MY46104758	2015.06.02	2016.06.01
Amplifier	0.3-3GHz	Bonn Elektronik	087193A	2015.06.02	2016.06.01
Amplifier	2-6GHz	Bonn Elektronik	087193B	2015.06.02	2016.06.01
Wireless Communication Test Set	MT8820C	Anritsu	6201274349	2015.07.09	2016.07.08

7 MEASUREMENT UNCERTAINTY

According to IEEE 1528 and IEC 62209, Valid for frequency range 300MHz - 3GHz

Uncertainty Component	Unc. Value % (1g)	Unc. Value %(10g)	Probably Distribution	Div.	C 1g	C 10g	Std. Unc.% (1g)	Std. Unc.% (10g)
Measurement System								
Probe Calibration	6.0	6.0	N	1	1	1	6.0	6.0
Axial Isotropy	4.7	4.7	R	√3	0.71	0.71	1.9	1.9
Hemispherical Isotropy	9.6	9.6	R	√3	0.71	0.71	3.9	3.9
Boundary Effect	1.0	1.0	R	√3	1	1	0.6	0.6
Linearity	4.7	4.7	R	√3	1	1	2.7	2.7
System Detection Limits	1.0	1.0	R	√3	1	1	0.6	0.6
Readout Electronics	0.3	0.3	N	1	1	1	0.3	0.3
Response Time	0.0	0.0	R	√3	1	1	0.0	0.0
Integration Time	2.6	2.6	R	√3	1	1	1.5	1.5
RF Ambient Conditions - Noise	3.0	3.0	R	√3	1	1	1.7	1.7
RF Ambient Conditions - Reflections	3.0	3.0	R	√3	1	1	1.7	1.7
Probe Positioner Mech. Tolerance	0.4	0.4	R	√3	1	1	0.2	0.2
Probe Positioning w.r.t Phantom	2.9	2.9	R	√3	1	1	1.7	1.7
Post-processing	1.0	1.0	R	√3	1	1	0.6	0.6
Test Sample Related								
Test Sample Positioning	3.6	1.7	N	1	1	1	3.6	1.7
Device Holder Uncertainty	0.3	1.0	N	1	1	1	0.3	1.0
SAR drift	5.0	5.0	R	√3	1	1	2.9	2.9
Phantom and Tissue Parameters								
Phantom Uncertainty	4.0	4.0	R	√3	1	1	2.3	2.3
Liquid Conductivity (target)	5.0	5.0	R	√3	0.64	0.43	1.8	1.2
Liquid Conductivity (measurement)	2.8	2.8	N	1	0.64	0.43	1.8	1.2
Liquid Permittivity (target)	5.0	5.0	R	√3	0.6	0.49	1.7	1.4
Liquid Permittivity (measurement)	3.3	3.3	N	1	0.6	0.49	2.0	1.6
Combined Standard Uncertainty (%)							10.7	10.0
Expanded Uncertainty（95% CONFIDENCE LEVEL，k=2）							21.4	20.0

According to IEEE 1528 and IEC 62209, Valid for frequency range 3GHz - 6GHz

Uncertainty Component	Unc. Value % (1g)	Unc. Value %(10g)	Probably Distribution	Div.	C 1g	C 10g	Std. Unc.% (1g)	Std. Unc.% (10g)
Measurement System								
Probe Calibration	6.6	6.6	N	1	1	1	6.6	6.6
Axial Isotropy	4.7	4.7	R	√3	0.71	0.71	1.9	1.9
Hemispherical Isotropy	9.6	9.6	R	√3	0.71	0.71	3.9	3.9
Boundary Effect	2.0	2.0	R	√3	1	1	1.2	1.2
Linearity	4.7	4.7	R	√3	1	1	2.7	2.7
System Detection Limits	1.0	1.0	R	√3	1	1	0.6	0.6
Readout Electronics	0.3	0.3	N	1	1	1	0.3	0.3
Response Time	0.0	0.0	R	√3	1	1	0.0	0.0
Integration Time	2.6	2.6	R	√3	1	1	1.5	1.5
RF Ambient Conditions - Noise	3.0	3.0	R	√3	1	1	1.7	1.7
RF Ambient Conditions - Reflections	3.0	3.0	R	√3	1	1	1.7	1.7
Probe Positioner Mech. Tolerance	0.4	0.4	R	√3	1	1	0.2	0.2
Probe Positioning w.r.t Phantom	6.7	6.7	R	√3	1	1	3.9	3.9
Post-processing	4.0	4.0	R	√3	1	1	2.3	2.3
Test Sample Related								
Test Sample Positioning	2.9	0.6	N	1	1	1	2.9	0.6
Device Holder Uncertainty	0.3	1.0	N	1	1	1	0.3	1.0
SAR drift	5.0	5.0	R	√3	1	1	2.9	2.9
Phantom and Tissue Parameters								
Phantom Uncertainty	4.0	4.0	R	√3	1	1	2.3	2.3
Liquid Conductivity (target)	5.0	5.0	R	√3	0.64	0.43	1.8	1.2
Liquid Conductivity (measurement)	2.6	2.6	N	1	0.64	0.43	1.7	1.1
Liquid Permittivity (target)	10.0	10.0	R	√3	0.6	0.49	3.5	2.8
Liquid Permittivity (measurement)	2.1	2.1	N	1	0.6	0.49	1.3	1.0
Combined Standard Uncertainty (%)							11.9	11.3
Expanded Uncertainty（95% CONFIDENCE LEVEL，k=2）							23.8	22.5