FCC SAR Test Report

APPLICANT	:	Samsung Electronics Co., Ltd.
EQUIPMENT	:	Phonblet
BRAND NAME	:	SAMSUNG
MODEL NAME	:	SM-T2519
FCC ID	:	A3LSMT2519
STANDARD	:	FCC 47 CFR Part 2 (2.1093) ANSI/IEEE C95.1-1992 IEEE 1528-2003

We, SPORTON INTERNATIONAL (SHENZHEN) INC., would like to declare that the tested sample has been evaluated in accordance with the procedures and shown the compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL (SHENZHEN) INC., the test report shall not be reproduced except in full.

Reviewed by: Eric Huang / Deputy Manager

Approved by: Jones Tsai / Manager

Testing Laboratory
2353

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Revision History

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FA441601	Rev. 01	Initial issue of report	May 26, 2014

1. Statement of Compliance

The maximum results of Specific Absorption Rate (SAR) found during testing for **Samsung Electronics Co., Ltd., Phonblet, SM-T2519** are as follows.

Equipment Class	Frequency Band	Operating Mode	Highest SAR Summary		
			Head 1g SAR (W/kg)	Body 1g SAR (W/kg)	Simultaneous Transmission SAR (W/kg)
PCB	GSM1900 Main Antenna	Voice/Data	0.13	0.78	1.53
	GSM1900 Second Antenna	Voice/Data	<0.10	0.76	
	WCDMA Band V	Voice/Data	0.10	0.67	
	WCDMA Band II	Voice/Data	0.18	0.95	
DTS	WLAN 2.4GHz Band	Data	0.43	0.56	1.51
	WLAN 5.8GHz Band	Data	0.48	0.55	
NII	WLAN 5.2GHz Band	Data	0.62	0.44	1.53
	WLAN 5.3GHz Band	Data	0.83	0.69	
	WLAN 5.5GHz Band	Data	0.91	1.00	
DSS	Bluetooth	Data			1.33
Date of Testing			Apr. 25, 2014 ~ May 10, 2014		

This device is in compliance with Specific Absorption Rate (SAR) for general population/uncontrolled exposure limits (1.6 W/kg) specified in FCC 47 CFR part 2 (2.1093) and ANSI/IEEE C95.1-1992, and had been tested in accordance with the measurement methods and procedures specified in IEEE 1528-2003.

2. Administration Data

Testing Laboratory	
Test Site	SPORTON INTERNATIONAL (SHENZHEN) INC.
Test Site Location	No. 101, Complex Building C, Guanlong Village, Xili Town, Nanshan District, Shenzhen, Guangdong, P.R.C. TEL: +86-755-8637-9589 FAX: +86-755-8637-9595

Applicant	
Company Name	Samsung Electronics Co., Ltd.
Address	416 Maetan-3dong, Yeongtong-gu, Suwon-City, Gyeonggi-do, 443-742, Korea

Manufacturer	
Company Name	Samsung Electronics Co., Ltd.
Address	416 Maetan-3dong, Yeongtong-gu, Suwon-City, Gyeonggi-do, 443-742, Korea

3. Guidance Standard

The Specific Absorption Rate (SAR) testing specification, method, and procedure for this device is in accordance with the following standards:

- FCC 47 CFR Part 2 (2.1093)
- ANSI/IEEE C95.1-1992
- IEEE 1528-2003
- FCC KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz v01r03
- FCC KDB 865664 D02 SAR Reporting v01r01
- FCC KDB 447498 D01 General RF Exposure Guidance v05r02
- FCC KDB 248227 D01 SAR meas for 802 11abg v01r02
- FCC KDB 616217 D04 SAR for laptop and tablets v01r01
- FCC KDB 648474 D04 SAR Evaluation Considerations for Wireless Handsets v01r02
- FCC KDB 941225 D01 SAR test for 3G devices v02
- FCC KDB 941225 D02 HSPA and 1x Advanced v02r02
- FCC KDB 941225 D03 SAR Test Reduction GSM GPRS EDGE v01

4. Equipment Under Test (EUT)

4.1 General Information

Product Feature & Specification	
Equipment Name	Phonblet
Brand Name	SAMSUNG
Model Name	SM-T2519
FCC ID	A3LSMT2519
IMEI Code	SIM1: 353561060012204 SIM2: 353562060012202
Wireless Technology and Frequency Range	GSM1900: 1850.2 MHz ~ 1909.8 MHz WCDMA Band V: 826.4 MHz ~ 846.6 MHz WCDMA Band II: 1852.4 MHz ~ 1907.6 MHz WLAN 2.4GHz Band: 2412 MHz ~ 2462 MHz WLAN 5.2GHz Band: 5180 MHz ~ 5240 MHz WLAN 5.3GHz Band: 5260 MHz ~ 5320 MHz WLAN 5.5GHz Band: 5500 MHz ~ 5700 MHz WLAN 5.8GHz Band: 5745 MHz ~ 5825 MHz Bluetooth: 2402 MHz ~ 2480 MHz NFC : 13.56 MHz
Mode	• GSM/GPRS/EGPRS • RMC/AMR 12.2Kbps • HSDPA • HSUPA • HSPA+ (16QAM Downlink Only) • WLAN 2.4GHz 802.11b/g/n HT20 • WLAN 5GHz 802.11a/n HT20/HT40 • Bluetooth v3.0+EDR, Bluetooth v4.0 LE • NFC:ASK
HW Version	T2519.02
SW Version	T2519KEUANC2
GSM / (E)GPRS Transfer mode	Class B – EUT cannot support Packet Switched and Circuit Switched Network simultaneously but can automatically switch between Packet and Circuit Switched Network.
EUT Stage	Pre-Production

Remark:

1. This device supports next to the ear voice mode operations and smart phones are incorporating tablet operating characteristics. This new generation of devices has been referred to by industry as “phablets”.
2. WLAN operation in 5600 MHz ~ 5650 MHz is notched and 802.11n-HT40 is not supported in 2.4GHz WLAN.
3. This device 2.4GHz WLAN supports hotspot operation, and 2.4GHz / 5.8GHz WLAN supports WiFi Direct (GC/GO), and 5.2GHz / 5.3GHz / 5.5GHz supports WiFi Direct (GC only).
4. This device supported VoIP in GPRS, EGPRS and WCDMA (e.g. 3rd party VoIP).
5. This device supports GRPS/EGPRS mode up to multi-slot class10 and does not support DTM operation.
6. This supports dual SIM dual active, the SIM1 for the main antenna supports 1900, UMTS Band 2 / 5, the SIM2 for the second antenna supports GSM1900 only, the WWAN radio cannot simultaneous transmission at the same time.

4.2 Maximum Tune-up Limit

Mode	Burst Average Power (dBm)			
	GSM1900 Main Antenna		GSM1900 Second Antenna	
Output Power Status	Full power mode	Reduced power mode	Full power mode	Reduced power mode
GSM (GMSK, 1 Tx slot)	30.6	23.0	30.7	23.0
GPRS (GMSK, 1 Tx slot)	30.6	23.0	30.7	23.0
GPRS (GMSK, 2 Tx slots)	28.0	20.0	27.0	20.0
EDGE (8PSK, 1 Tx slot)	27.0	20.0	26.6	20.0
EDGE (8PSK, 2 Tx slots)	25.0	20.0	26.5	20.0

Mode	Average Power (dBm)			
	WCDMA Band V		WCDMA Band II	
Output Power Status	Full power mode	Reduced power mode	Full power mode	Reduced power mode
RMC/AMR 12.2Kbps	22.0	13.0	22.0	12.5
HSDPA	22.0	12.0	22.0	11.5
HSUPA	22.0	12.0	22.0	11.5

Mode			Maximum Average Power (dBm)
2.4GHz	802.11b	CH01	15.5
		CH06	13.0
		CH11	15.5

Mode			Maximum Average Power (dBm)
2.4GHz	802.11g		11.0
	802.11n-HT20		10.0
5GHz	802.11a	5.2GHz	13.0
		5.3GHz	13.0
		5.5GHz	13.0
		5.8GHz	13.0
	802.11n-HT20	5.2GHz	11.5
		5.3GHz	11.5
		5.5GHz	11.5
		5.8GHz	11.5
	802.11n-HT40	5.2GHz	10.0
		5.3GHz	10.0
		5.5GHz	10.0
		5.8GHz	10.0
Bluetooth v3.0+EDR			9.5
Bluetooth v4.0 LE			1.5

5. Additional Test Positions due to Proximity Sensor

FCC KDB 616217 D04 Section 6 was used as guideline for selecting SAR test distance for this device at these additional exposure conditions. Since the proximity sensor activation distance for the bottom face of the device is 12mm, a conservative distance 11mm was tested for SAR on the bottom face at maximum power. Since the proximity sensor activation distance for the edge 3 of the device is 7mm ,a conservative distance 6mm was tested for SAR on the edge 3 at maximum power. Sensor triggering distance summary data is included in Appendix F.

6. RF Exposure Limits

6.1 Uncontrolled Environment

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

6.2 Controlled Environment

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

Limits for Occupational/Controlled Exposure (W/kg)

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

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

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

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

7. Specific Absorption Rate (SAR)

7.1 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.

7.2 SAR Definition

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

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

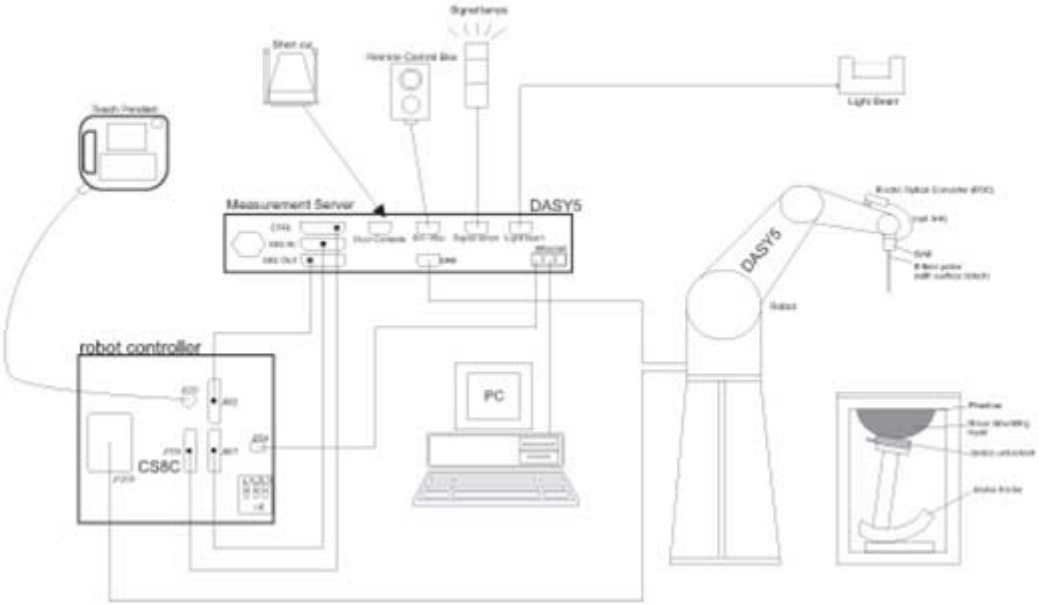
SAR is expressed in units of Watts per kilogram (W/kg)

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

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

8. System Description and Setup

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



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

9. Measurement Procedures

The measurement procedures are as follows:

<Conducted power measurement>

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

<SAR measurement>

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

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

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

9.1 Spatial Peak SAR Evaluation

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

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

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

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

9.2 Power Reference Measurement

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

9.3 Area Scan

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

Area scan parameters extracted from FCC KDB 865664 D01v01r03 SAR measurement 100 MHz to 6 GHz.

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

9.4 Zoom Scan

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

Zoom scan parameters extracted from FCC KDB 865664 D01v01r03 SAR measurement 100 MHz to 6 GHz.

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

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

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

9.5 Volume Scan Procedures

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

9.6 Power Drift Monitoring

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

10. Test Equipment List

Manufacturer	Name of Equipment	Type/Model	Serial Number	Calibration	
				Last Cal.	Due Date
SPEAG	835MHz System Validation Kit	D835V2	4d091	Nov. 18, 2011	Nov. 17, 2014
SPEAG	1900MHz System Validation Kit	D1900V2	5d118	Nov. 21, 2011	Nov. 20, 2014
SPEAG	2450MHz System Validation Kit	D2450V2	908	Mar. 26, 2013	Mar. 25, 2015
SPEAG	5000MHz System Validation Kit	D5GHzV2	1128	Jul. 24, 2013	Jul. 23, 2014
SPEAG	Data Acquisition Electronics	DAE4	910	Dec. 17, 2013	Dec. 16, 2014
SPEAG	Dosimetric E-Field Probe	EX3DV4	3819	Nov. 27, 2013	Nov. 26, 2014
SPEAG	SAM Twin Phantom	QD 000 P40 CD	TP-1670	NCR	NCR
SPEAG	SAM Twin Phantom	QD 000 P40 CD	TP-1671	NCR	NCR
SPEAG	ELI4 Phantom	QD OVA 002 AA	1149	NCR	NCR
SPEAG	Phone Positioner	N/A	N/A	NCR	NCR
Agilent	Wireless Communication Test Set	E5515C	MY50267224	Oct. 10, 2013	Oct. 09, 2014
R&S	Signal Generator	SMB 100A	175779	Mar. 03, 2014	Mar. 02, 2015
R&S	Network Analyzer	ZVB8	100106	Nov. 07, 2013	Nov. 06, 2014
Speag	Dielectric Assessment Kit	DAK-3.5	1032	NCR	NCR
Anritsu	Power Meter	ML2495A	1218010	Mar. 03, 2014	Mar. 02, 2015
Anritsu	Power Sensor	MA2411B	1207253	Mar. 03, 2014	Mar. 02, 2015
ARRA	Power Divider	A3200-2	N/A	NA	NA
R&S	Spectrum Analyzer	FSP7	101230	Jun. 13, 2013	Jun. 12, 2014
Agilent	Dual Directional Coupler	778D	50422	Note 2	
Woken	Attenuator	WK0602-XX	N/A	Note 2	
PE	Attenuator	PE7005-10	N/A	Note 2	
PE	Attenuator	PE7005- 3	N/A	Note 2	
AR	Power Amplifier	5S1G4M2	0328767	Note 2	
Mini-Circuits	Power Amplifier	ZVE-3W	162601250	Note 2	
Mini-Circuits	Power Amplifier	ZHL-42W+	13440021344	Note 2	

General Note:

1. The calibration certificate of DASY can be referred to appendix C of this report.
2. Prior to system verification and validation, the path loss from the signal generator to the system check source and the power meter, which includes the amplifier, cable, attenuator and directional coupler were measured by the network analyzer. The reading of the power meter was compensated by the path loss between the signal generator and the power meter, and offset by the path loss difference between the path to the power meter and the path to the system check source to monitor the actual power level fed to the system check source.
3. Referring to KDB 865664 D01v01r03, the dipole calibration interval can be extended to 3 years with justification. The dipoles are also not physically damaged, or repaired during the interval.
4. The justification data of dipole D835V2, SN: 4d091, D1900V2, SN: 5d118 and D2450V2, SN: 908 can be found in appendix C. The return loss is < -20dB, within 20% of prior calibration, the impedance is within 5 ohm of prior calibration.

11. System Verification

11.1 Tissue Verification

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

Frequency (MHz)	Water (%)	Sugar (%)	Cellulose (%)	Salt (%)	Preventol (%)	DGBE (%)	Conductivity (σ)	Permittivity (εr)
For Head								
835	40.3	57.9	0.2	1.4	0.2	0	0.90	41.5
1800, 1900, 2000	55.2	0	0	0.3	0	44.5	1.40	40.0
2450	55.0	0	0	0	0	45.0	1.80	39.2
For Body								
835	50.8	48.2	0	0.9	0.1	0	0.97	55.2
1800, 1900, 2000	70.2	0	0	0.4	0	29.4	1.52	53.3
2450	68.6	0	0	0	0	31.4	1.95	52.7

Simulating Liquid for 5GHz, Manufactured by SPEAG

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

<Tissue Dielectric Parameter Check Results>

Frequency (MHz)	Tissue Type	Liquid Temp. (℃)	Conductivity (σ)	Permittivity (ε_r)	Conductivity Target (σ)	Permittivity Target (ε_r)	Delta (σ) (%)	Delta (ε_r) (%)	Limit (%)	Date
835	Head	22.6	0.900	42.153	0.90	41.50	0.00	1.57	±5	May 04, 2014
1900	Head	22.6	1.449	39.097	1.40	40.00	3.50	-2.26	±5	May 04, 2014
2450	Head	22.6	1.821	37.950	1.80	39.20	1.17	-3.19	±5	Apr. 25, 2014
5200	Head	22.7	4.696	37.048	4.66	36.00	0.77	2.91	±5	May 10, 2014
5300	Head	22.8	4.819	36.839	4.76	35.90	1.24	2.70	±5	May 10, 2014
5600	Head	22.7	5.199	36.179	5.07	35.50	2.75	1.83	±5	May 10, 2014
5800	Head	22.8	5.432	35.732	5.27	35.30	3.07	1.22	±5	May 10, 2014
835	Body	22.8	0.972	53.975	0.97	55.20	0.21	-2.22	±5	May 01, 2014
1900	Body	22.7	1.542	53.532	1.52	53.30	1.45	0.44	±5	Apr. 30, 2014
2450	Body	22.8	2.001	52.089	1.95	52.70	2.62	-1.16	±5	Apr. 25, 2014
5200	Body	22.6	5.137	48.164	5.30	49.00	-3.08	-1.71	±5	May 10, 2014
5300	Body	22.7	5.251	47.988	5.42	48.90	-3.12	-1.82	±5	May 10, 2014
5600	Body	22.6	5.644	47.452	5.77	48.50	-2.18	-2.10	±5	May 10, 2014
5800	Body	22.7	5.868	46.994	6.00	48.20	-2.20	-2.50	±5	May 10, 2014

11.2 System Performance Check Results

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

Date	Frequency (MHz)	Tissue Type	Input Power (mW)	Dipole S/N	Probe S/N	DAE S/N	Measured SAR (W/kg)	Targeted SAR (W/kg)	Normalized SAR (W/kg)	Deviation (%)
May 04, 2014	835	Head	250	4d091	3819	910	2.17	9.40	8.68	-7.66
May 04, 2014	1900	Head	250	5d118	3819	910	9.62	40.30	38.48	-4.52
Apr. 25, 2014	2450	Head	250	908	3819	910	13.30	54.00	53.2	-1.48
May 10, 2014	5200	Head	100	1128	3819	910	7.38	78.20	73.8	-5.63
May 10, 2014	5300	Head	100	1128	3819	910	7.86	80.60	78.6	-2.48
May 10, 2014	5600	Head	100	1128	3819	910	7.71	80.50	77.1	-4.22
May 10, 2014	5800	Head	100	1128	3819	910	7.51	77.20	75.1	-2.72
May 01, 2014	835	Body	250	4d091	3819	910	2.18	9.42	8.72	-7.43
Apr. 30, 2014	1900	Body	250	5d118	3819	910	10.60	41.80	42.4	1.44
Apr. 25, 2014	2450	Body	250	908	3819	910	13.40	50.40	53.6	6.35
May 10, 2014	5200	Body	100	1128	3819	910	7.24	73.40	72.4	-1.36
May 10, 2014	5300	Body	100	1128	3819	910	7.87	74.30	78.7	5.92
May 10, 2014	5600	Body	100	1128	3819	910	7.84	77.80	78.4	0.77
May 10, 2014	5800	Body	100	1128	3819	910	7.41	72.20	74.1	2.63

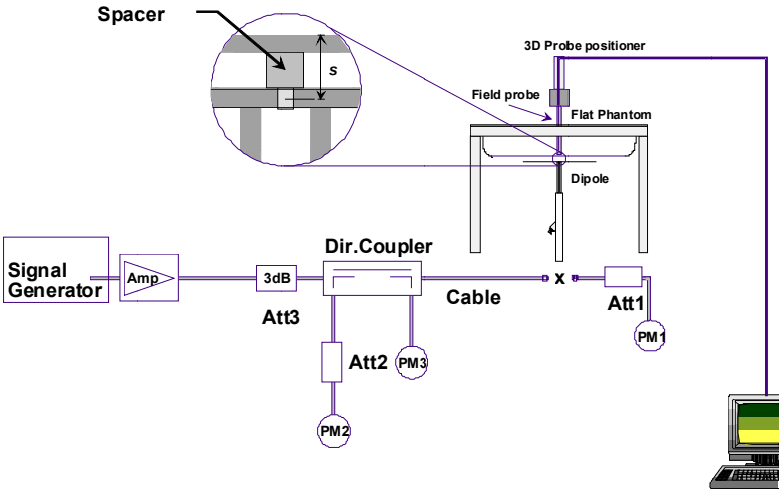


Fig 8.3.1 System Performance Check Setup

Fig 8.3.2 Setup Photo

12. RF Exposure Positions

12.1 Ear and handset reference point

Figure 9.1.1 shows the front, back, and side views of the SAM phantom. The center-of-mouth reference point is labeled "M," the left ear reference point (ERP) is marked "LE," and the right ERP is marked "RE." Each ERP is 15 mm along the B-M (back-mouth) line behind the entrance-to-ear-canal (EEC) point, as shown in Figure 9.1.2 The Reference Plane is defined as passing through the two ear reference points and point M. The line N-F (neck-front), also called the reference pivoting line, is normal to the Reference Plane and perpendicular to both a line passing through RE and LE and the B-M line (see Figure 9.1.3). Both N-F and B-M lines should be marked on the exterior of the phantom shell to facilitate handset positioning. Posterior to the N-F line the ear shape is a flat surface with 6 mm thickness at each ERP, and forward of the N-F line the ear is truncated, as illustrated in Figure 9.1.2. The ear truncation is introduced to preclude the ear lobe from interfering with handset tilt, which could lead to unstable positioning at the cheek.

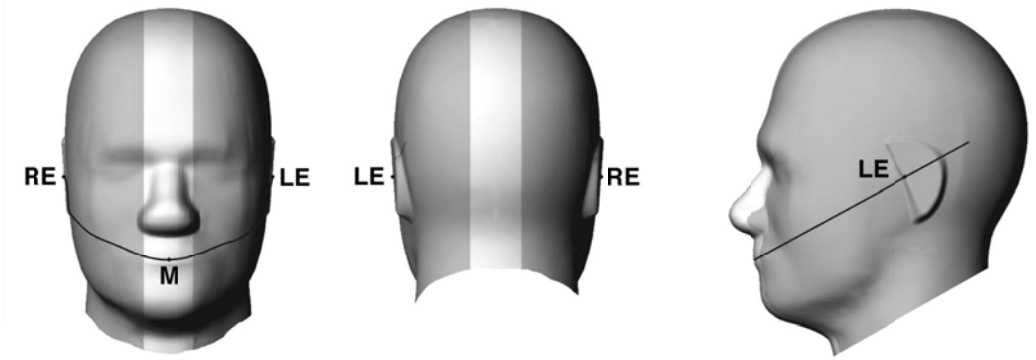


Fig 9.1.1 Front, back, and side views of SAM twin phantom

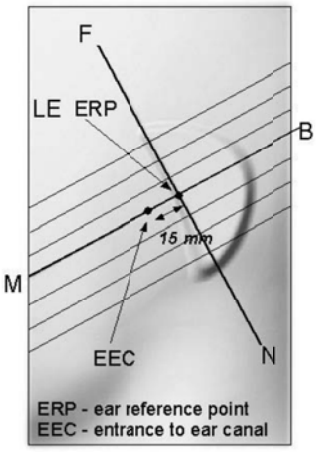


Fig 9.1.2 Close-up side view of phantom showing the ear region.

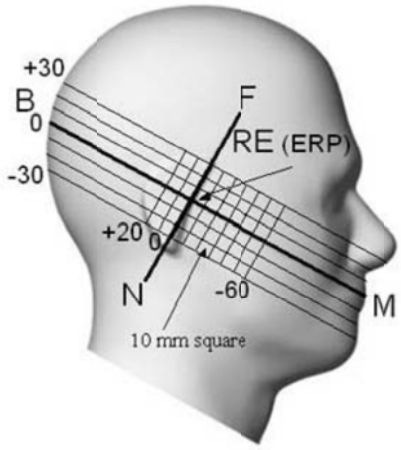


Fig 9.1.3 Side view of the phantom showing relevant markings and seven cross-sectional plane locations

12.2 Definition of the cheek position

1. Ready the handset for talk operation, if necessary. For example, for handsets with a cover piece (flip cover), open the cover. If the handset can transmit with the cover closed, both configurations must be tested.
2. Define two imaginary lines on the handset—the vertical centerline and the horizontal line. The vertical centerline passes through two points on the front side of the handset—the midpoint of the width wt of the handset at the level of the acoustic output (point A in Figure 9.2.1 and Figure 9.2.2), and the midpoint of the width wb of the bottom of the handset (point B). The horizontal line is perpendicular to the vertical centerline and passes through the center of the acoustic output (see Figure 9.2.1). The two lines intersect at point A. Note that for many handsets, point A coincides with the center of the acoustic output; however, the acoustic output may be located elsewhere on the horizontal line. Also note that the vertical centerline is not necessarily parallel to the front face of the handset (see Figure 9.2.2), especially for clamshell handsets, handsets with flip covers, and other irregularly-shaped handsets.
3. Position the handset close to the surface of the phantom such that point A is on the (virtual) extension of the line passing through points RE and LE on the phantom (see Figure 9.2.3), such that the plane defined by the vertical centerline and the horizontal line of the handset is approximately parallel to the sagittal plane of the phantom.
4. Translate the handset towards the phantom along the line passing through RE and LE until handset point A touches the pinna at the ERP.
5. While maintaining the handset in this plane, rotate it around the LE-RE line until the vertical centerline is in the plane normal to the plane containing B-M and N-F lines, i.e., the Reference Plane.
6. Rotate the handset around the vertical centerline until the handset (horizontal line) is parallel to the N-F line.
7. While maintaining the vertical centerline in the Reference Plane, keeping point A on the line passing through RE and LE, and maintaining the handset contact with the pinna, rotate the handset about the N-F line until any point on the handset is in contact with a phantom point below the pinna on the cheek. See Figure 9.2.3. The actual rotation angles should be documented in the test report.

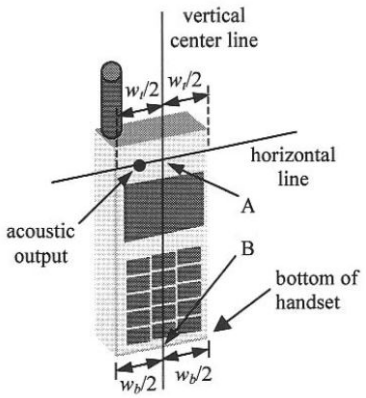


Fig 9.2.1 Handset vertical and horizontal reference lines—"fixed case

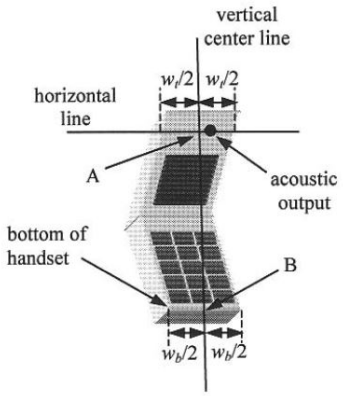


Fig 9.2.2 Handset vertical and horizontal reference lines—"clam-shell case"

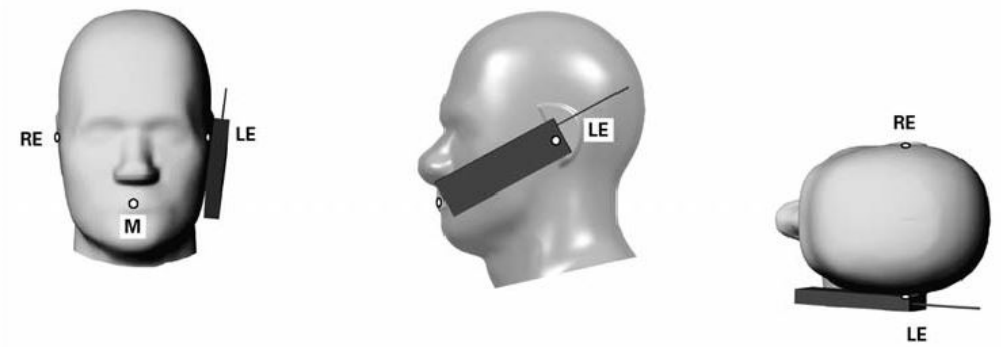


Fig 9.2.3 cheek or touch position. The reference points for the right ear (RE), left ear (LE), and mouth (M), which establish the Reference Plane for handset positioning, are indicated.

12.3 Definition of the tilt position

1. Ready the handset for talk operation, if necessary. For example, for handsets with a cover piece (flip cover), open the cover. If the handset can transmit with the cover closed, both configurations must be tested.
2. While maintaining the orientation of the handset, move the handset away from the pinna along the line passing through RE and LE far enough to allow a rotation of the handset away from the cheek by 15°.
3. Rotate the handset around the horizontal line by 15°.
4. While maintaining the orientation of the handset, move the handset towards the phantom on the line passing through RE and LE until any part of the handset touches the ear. The tilt position is obtained when the contact point is on the pinna. See Figure 9.3.1. If contact occurs at any location other than the pinna, e.g., the antenna at the back of the phantom head, the angle of the handset should be reduced. In this case, the tilt position is obtained if any point on the handset is in contact with the pinna and a second point

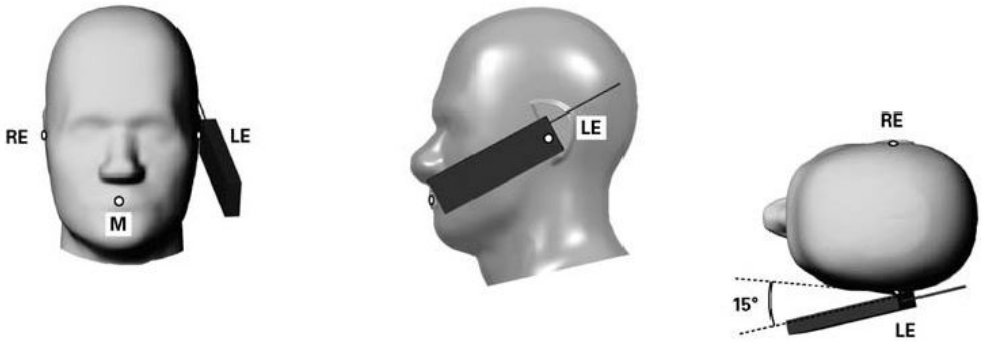


Fig 9.3.1 Tilt position. The reference points for the right ear (RE), left ear (LE), and mouth (M), which define the Reference Plane for handset positioning, are indicated.

12.4 SAR Testing for Body

This device can be used also in full sized tablet exposure conditions, due to its size. Per FCC KDB 616217, the back surface and edges of the tablet should be tested for SAR compliance with the tablet touching the phantom. The SAR exclusion threshold in KDB 447498 D01v05r02 can be applied to determine SAR test exclusion for adjacent edge configurations. The closest distance from the antenna to an adjacent tablet edge is used to determine if SAR testing is required for the adjacent edges, with the adjacent edge positioned against the phantom and the edge containing the antenna positioned perpendicular to the phantom.

13. Conducted RF Output Power (Unit: dBm)

<GSM Conducted Power>

(Main Antenna)

General Note:

1. Per KDB 447498 D01v05r02, the maximum output power channel is used for SAR testing and for further SAR test reduction.
2. According to October 2013TCB workshop, For GSM / GPRS / EGPRS, the number of time slots to test for SAR should correspond to the highest source-based time-averaged maximum output power configuration, considering the possibility of e.g. 3rd party VoIP operation for head SAR testing, the EUT was set in GPRS (2Tx slots) for GSM1900 band due to its highest frame-average power.
3. For body SAR testing was following KDB 941225 D03v01, the GPRS 2Tx slots mode was selected when EUT operating without power back-off, the GPRS 2Tx slots mode was selected when EUT operating with power back-off, according to the highest frame-average power.

Maximum Average RF Power (Proximity Sensor Inactive)

Band GSM1900	Burst Average Power (dBm)			Tune-up Limit (dBm)	Frame-Average Power (dBm)			Tune-up Limit (dBm)
Tx Channel	512	661	810		512	661	810	
Frequency (MHz)	1850.2	1880	1909.8		1850.2	1880	1909.8	
GSM (GMSK, 1 Tx slot)	**30.53**	30.29	30.37	30.6	21.53	21.29	21.37	21.6
GPRS (GMSK, 1 Tx slot) – CS1	30.46	30.27	30.28	30.6	21.46	21.27	21.28	21.6
GPRS (GMSK, 2 Tx slots) – CS1	27.97	27.78	27.76	28.0	21.97	21.78	21.76	22.0
EDGE (8PSK, 1 Tx slot) – MCS5	26.38	26.14	26.14	27.0	17.38	17.14	17.14	18.0
EDGE (8PSK, 2 Tx slots) – MCS5	24.75	24.53	24.51	25.0	18.75	18.53	18.51	19.0

Remark: The frame-averaged power is linearly scaled the maximum burst averaged power over 8 time slots.
The calculated method are shown as below:
Frame-averaged power = Maximum burst averaged power (1 Tx Slot) - 9 dB
Frame-averaged power = Maximum burst averaged power (2 Tx Slots) - 6 dB

Reduced Average RF Power (Proximity Sensor active)

Band GSM1900	Burst Average Power (dBm)			Tune-up Limit (dBm)	Frame-Average Power (dBm)			Tune-up Limit (dBm)
Tx Channel	512	661	810		512	661	810	
Frequency (MHz)	1850.2	1880	1909.8		1850.2	1880	1909.8	
GSM (GMSK, 1 Tx slot)	**22.68**	22.47	22.42	23.0	13.68	13.47	13.42	14.0
GPRS (GMSK, 1 Tx slot) – CS1	22.66	22.41	22.31	23.0	13.66	13.41	13.31	14.0
GPRS (GMSK, 2 Tx slots) – CS1	19.61	19.37	19.44	20.0	13.61	13.37	13.44	14.0
EDGE (8PSK, 1 Tx slot) – MCS5	19.63	19.40	19.44	20.0	10.63	10.40	10.44	11.0
EDGE (8PSK, 2 Tx slots) – MCS5	19.60	19.34	19.31	20.0	13.60	13.34	13.31	14.0

Remark: The frame-averaged power is linearly scaled the maximum burst averaged power over 8 time slots.
The calculated method are shown as below:
Frame-averaged power = Maximum burst averaged power (1 Tx Slot) - 9 dB
Frame-averaged power = Maximum burst averaged power (2 Tx Slots) - 6 dB

(Second Antenna)

General Note:

1. Per KDB 447498 D01v05r02, the maximum output power channel is used for SAR testing and for further SAR test reduction.
2. According to October 2013TCB Workshop, For GSM / GPRS / EGPRS, the number of time slots to test for SAR should correspond to the highest source-based time-averaged maximum output power configuration, considering the possibility of e.g. 3rd party VoIP operation for head SAR testing, the EUT was set in GSM Voice for GSM1900 band due to its highest frame-average power.
3. For Body SAR testing was following KDB 941225 D03v01, the GPRS 1Tx slots mode was selected when EUT operating without power back-off, the GPRS 2Tx slots mode was selected when EUT operating with power back-off, according to the highest frame-average power.

Maximum Average RF Power (Proximity Sensor Inactive)

Band GSM1900	Burst Average Power (dBm)			Tune-up Limit (dBm)	Frame-Average Power (dBm)			Tune-up Limit (dBm)
Tx Channel	512	661	810		512	661	810	
Frequency (MHz)	1850.2	1880	1909.8		1850.2	1880	1909.8	
GSM (GMSK, 1 Tx slot)	**30.61**	30.39	30.37	30.7	21.61	21.39	21.37	21.7
GPRS (GMSK, 1 Tx slot) – CS1	30.56	30.37	30.36	30.7	21.56	21.37	21.36	21.7
GPRS (GMSK, 2 Tx slots) – CS1	26.82	26.52	26.59	27.0	20.82	20.52	20.59	21.0
EDGE (8PSK, 1 Tx slot) – MCS5	26.47	26.21	26.12	26.6	17.47	17.21	17.12	17.6
EDGE (8PSK, 2 Tx slots) – MCS5	26.34	26.09	26.01	26.5	20.34	20.09	20.01	20.5

Remark: The frame-averaged power is linearly scaled the maximum burst averaged power over 8 time slots.
The calculated method are shown as below:
Frame-averaged power = Maximum burst averaged power (1 Tx Slot) - 9 dB
Frame-averaged power = Maximum burst averaged power (2 Tx Slots) - 6 dB

Reduced Average RF Power (Proximity Sensor active)

Band GSM1900	Burst Average Power (dBm)			Tune-up Limit (dBm)	Frame-Average Power (dBm)			Tune-up Limit (dBm)
Tx Channel	512	661	810		512	661	810	
Frequency (MHz)	1850.2	1880	1909.8		1850.2	1880	1909.8	
GSM (GMSK, 1 Tx slot)	**22.27**	21.91	21.87	23.0	13.27	12.91	12.87	14.0
GPRS (GMSK, 1 Tx slot) – CS1	22.26	21.90	21.86	23.0	13.26	12.90	12.86	14.0
GPRS (GMSK, 2 Tx slots) – CS1	19.29	18.98	19.01	20.0	13.29	12.98	13.01	14.0
EDGE (8PSK, 1 Tx slot) – MCS5	19.28	19.04	19.03	20.0	10.28	10.04	10.03	11.0
EDGE (8PSK, 2 Tx slots) – MCS5	19.21	18.96	18.95	20.0	13.21	12.96	12.95	14.0

Remark: The frame-averaged power is linearly scaled the maximum burst averaged power over 8 time slots.
The calculated method are shown as below:
Frame-averaged power = Maximum burst averaged power (1 Tx Slot) - 9 dB
Frame-averaged power = Maximum burst averaged power (2 Tx Slots) - 6 dB

<WCDMA Conducted Power>

1. The following tests were conducted according to the test requirements outlines in 3GPP TS 34.121 specification.
2. The procedures in KDB 941225 D01 are applied for 3GPP Rel. 6 HSPA to configure the device in the required sub-test mode(s) to determine SAR test exclusion.

A summary of these settings are illustrated below:

HSDPA Setup Configuration:

a. The EUT was connected to Base Station Agilent E5515C referred to the Setup Configuration.
b. The RF path losses were compensated into the measurements.
c. A call was established between EUT and Base Station with following setting:
   i. Set Gain Factors (β_c and β_d) and parameters were set according to each
   ii. Specific sub-test in the following table, C10.1.4, quoted from the TS 34.121
   iii. Set RMC 12.2Kbps + HSDPA mode.
   iv. Set Cell Power = -86 dBm
   v. Set HS-DSCH Configuration Type to FRC (H-set 1, QPSK)
   vi. Select HSDPA Uplink Parameters
   vii. Set Delta ACK, Delta NACK and Delta CQI = 8
   viii. Set Ack-Nack Repetition Factor to 3
   ix. Set CQI Feedback Cycle (k) to 4 ms
   x. Set CQI Repetition Factor to 2
   xi. Power Ctrl Mode = All Up bits
d. The transmitted maximum output power was recorded.

Table C.10.1.4: β values for transmitter characteristics tests with HS-DPCCH

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

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

Setup Configuration

HSUPA Setup Configuration:

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

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

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

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

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

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

Note 4: For subtest 5 the β_c/β_d ratio of 15/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signalled gain factors for the reference TFC (TF1, TF1) to β_c = 14/15 and β_d = 15/15.

Note 5: In case of testing by UE using E-DPDCH Physical Layer category 1, Sub-test 3 is omitted according to TS25.306 Table 5.1g.

Note 6: β_{ed} can not be set directly, it is set by Absolute Grant Value.

Setup Configuration

<WCDMA Conducted Power>

(Main Antenna)

General Note:

1. SAR testing in AMR configuration is not required when the maximum average output of each RF channel for AMR 12.2Kbps is less than 0.25dB higher than that measured in RMC 12.2Kbps
2. Per KDB 941225 D02v02r02, RMC 12.2kbps setting is used to evaluate SAR. If HSDPA/HSUPA output power is < 0.25dB higher than RMC, or reported SAR with RMC 12.2kbps setting is ≤ 1.2W/kg, HSDPA/HSUPA SAR evaluation can be excluded.

Maximum Average RF Power (Proximity Sensor Inactive)

Band			WCDMA Band V				WCDMA Band II			
Tx Channel			4132	4182	4233	Tune-up Limit (dBm)	9262	9400	9538	Tune-up Limit (dBm)
Frequency (MHz)			826.4	836.4	846.6		1852.4	1880	1907.6	
MPR (dB)	3GPP Rel 99	AMR 12.2Kbps	21.82	21.88	21.90	22.0	21.81	21.46	21.76	22.0
	3GPP Rel 99	RMC 12.2Kbps	21.84	21.89	**21.92**		**21.82**	21.48	21.79	
0	3GPP Rel 6	HSDPA Subtest-1	20.49	20.46	20.50	22.0	20.23	20.26	20.37	22.0
0	3GPP Rel 6	HSDPA Subtest-2	20.05	20.21	20.21		20.04	20.05	20.30	
0.5	3GPP Rel 6	HSDPA Subtest-3	20.16	20.12	19.97		20.01	20.16	20.24	
0.5	3GPP Rel 6	HSDPA Subtest-4	20.06	20.11	20.04		20.10	20.20	20.26	
0	3GPP Rel 6	HSUPA Subtest-1	20.41	20.45	20.56	22.0	20.40	20.21	20.46	22.0
2	3GPP Rel 6	HSUPA Subtest-2	19.82	19.95	19.87		19.98	19.85	19.87	
1	3GPP Rel 6	HSUPA Subtest-3	20.52	20.82	20.58		20.72	20.65	20.72	
2	3GPP Rel 6	HSUPA Subtest-4	19.85	19.76	19.78		19.82	19.67	19.77	
0	3GPP Rel 6	HSUPA Subtest-5	20.76	21.12	20.86		20.76	20.68	20.75	

Reduced Average RF Power (Proximity Sensor active)

Band			WCDMA Band V				WCDMA Band II			
Tx Channel			4132	4182	4233	Tune-up Limit (dBm)	9262	9400	9538	Tune-up Limit (dBm)
Frequency (MHz)			826.4	836.4	846.6		1852.4	1880	1907.6	
MPR (dB)	3GPP Rel 99	AMR 12.2Kbps	12.61	12.62	12.11	13.0	11.41	11.36	11.87	12.5
	3GPP Rel 99	RMC 12.2Kbps	12.62	**12.63**	12.13		11.43	11.37	**11.88**	
0	3GPP Rel 6	HSDPA Subtest-1	10.83	10.93	10.70	12.0	9.78	9.65	10.12	11.5
0	3GPP Rel 6	HSDPA Subtest-2	10.80	10.99	10.85		9.59	9.53	9.99	
0.5	3GPP Rel 6	HSDPA Subtest-3	11.09	10.89	10.76		9.38	9.57	9.92	
0.5	3GPP Rel 6	HSDPA Subtest-4	10.80	10.88	10.75		9.37	9.56	9.83	
0	3GPP Rel 6	HSUPA Subtest-1	11.44	11.48	11.46	12.0	10.29	10.19	10.65	11.5
2	3GPP Rel 6	HSUPA Subtest-2	9.26	9.66	9.57		8.46	8.35	8.85	
1	3GPP Rel 6	HSUPA Subtest-3	11.07	11.45	10.31		9.34	9.23	9.31	
2	3GPP Rel 6	HSUPA Subtest-4	8.55	8.96	8.76		8.77	8.78	9.29	
0	3GPP Rel 6	HSUPA Subtest-5	11.33	11.56	11.45		9.48	9.40	10.10	

<WLAN Conducted Power>

General Note:

1. For 2.4GHz WLAN SAR testing, highest average RF output power channel for the lowest data rate for 802.11b were selected for SAR evaluation. 802.11g/n HT20 were not investigated since the average output powers over all channels and data rates were not more than 0.25 dB higher than the tested channel in the lowest data rate of 802.11b mode.
2. For 5 GHz WLAN SAR testing, highest average RF output power channel for the lowest data rate for 802.11a were selected for SAR evaluation. 802.11n HT20/HT40 modes were not investigated since the average output powers over all channels and data rates were not more than 0.25 dB higher than the tested channel in the lowest data rate of 802.11a mode.

<2.4GHz WLAN>

802.11b Average Power (dBm)						Tune up Limit (dBm)
Channel	Frequency (MHz)	Data Rate (bps)				
		1M bps	2M bps	5.5M bps	11M bps	
CH 01	2412	13.71	13.64	13.69	13.67	15.5
CH 06	2437	12.64	12.59	12.62	12.61	13.0
CH 11	2462	**15.14**	15.12	15.11	15.12	15.5

802.11g Average Power (dBm)										Tune up Limit (dBm)
Channel	Frequency (MHz)	Data Rate (bps)								
		6M bps	9M bps	12M bps	18M bps	24M bps	36M bps	48M bps	54M bps	
CH 01	2412	10.08	10.06	10.06	10.04	10.07	10.05	10.03	10.04	11.0
CH 06	2437	9.08	9.03	9.01	8.99	9.05	8.99	9.01	9.00	11.0
CH 11	2462	**10.94**	10.88	10.89	10.84	10.91	10.88	10.84	10.88	11.0

802.11n-HT20 Average Power (dBm)										Tune up Limit (dBm)
Channel	Frequency (MHz)	MCS Index								
		MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7	
CH 01	2412	9.30	8.74	8.71	8.76	8.72	8.66	8.69	8.76	10.0
CH 06	2437	8.08	7.61	7.58	7.57	7.55	7.50	7.56	7.57	10.0
CH 11	2462	**9.91**	9.41	9.38	9.41	9.36	9.36	9.35	9.39	10.0

<5GHz WLAN>

Mode	Channel	Frequency (MHz)	Average Power (dBm)								Tune up Limit (dBm)
			Data Rate								
			6Mbps	9Mbps	12Mbps	18Mbps	24Mbps	36Mbps	48Mbps	54Mbps	
802.11a	CH 36	5180	**12.15**	12.13	11.87	11.76	11.68	11.80	11.84	11.94	13.0
	CH 40	5200	11.30	11.26	11.27	11.21	11.21	11.26	11.24	11.26	
	CH 44	5220	12.13	12.10	11.80	11.73	11.63	11.70	11.80	11.84	
	CH 48	5240	11.71	11.67	11.40	11.27	11.22	11.30	11.36	11.44	
	CH 52	5260	12.15	12.07	11.83	11.70	11.66	11.77	11.83	11.91	13.0
	CH 56	5280	11.36	11.34	11.32	11.27	11.27	11.33	11.31	11.30	
	CH 60	5300	**12.24**	12.17	11.90	11.81	11.71	11.85	11.85	11.99	
	CH 64	5320	11.89	11.84	11.55	11.46	11.39	11.50	11.49	11.66	
	CH 100	5500	10.78	10.70	10.45	10.33	10.27	10.41	10.41	10.48	13.0
	CH 104	5520	10.73	10.68	10.71	10.67	10.67	10.69	10.70	10.64	
	CH 108	5540	11.54	11.51	11.49	11.49	11.52	11.48	11.52	11.50	
	CH 112	5560	**11.58**	11.54	11.55	11.52	11.56	11.55	11.53	11.56	
	CH 116	5580	10.18	10.07	9.87	9.70	9.66	9.81	9.84	9.91	
	CH 136	5680	9.08	9.03	9.06	9.02	9.03	9.02	9.04	9.02	
	CH 140	5700	11.15	11.04	10.81	10.74	10.64	10.74	10.80	10.93	
	CH 149	5745	11.40	11.37	11.37	11.38	11.34	11.44	11.37	11.34	13.0
	CH 153	5765	11.58	11.55	11.52	11.56	11.55	11.53	11.56	11.52	
	CH 157	5785	**12.66**	12.60	12.54	12.59	12.58	12.64	12.59	12.57	
	CH 161	5805	11.76	11.74	11.70	11.70	11.72	11.73	11.67	11.71	
	CH 165	5825	12.04	11.99	11.97	11.93	11.95	11.99	11.98	11.93	

Mode	Channel	Frequency (MHz)	Average Power (dBm) MCS Index								Tune up Limit (dBm)
			MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7	
802.11n HT20	CH 36	5180	10.19	10.11	10.16	10.15	10.12	10.13	10.15	10.17	11.5
	CH 40	5200	10.22	10.19	10.17	10.16	10.20	10.18	10.13	10.19	
	CH 44	5220	**10.58**	10.47	10.46	10.45	10.47	10.46	10.50	10.48	
	CH 48	5240	10.07	9.95	9.95	9.94	9.97	9.96	9.97	9.96	
	CH 52	5260	10.19	10.09	10.10	10.09	10.08	10.10	10.06	10.12	11.5
	CH 56	5280	10.36	10.32	10.33	10.27	10.31	10.34	10.30	10.32	
	CH 60	5300	**10.76**	10.63	10.68	10.70	10.63	10.68	10.68	10.65	
	CH 64	5320	10.19	10.08	10.10	10.13	10.09	10.08	10.13	10.11	
	CH 100	5500	8.96	8.82	8.89	8.86	8.85	8.84	8.90	8.91	11.5
	CH 104	5520	8.92	8.87	8.86	8.86	8.86	8.90	8.89	8.91	
	CH 108	5540	9.00	8.97	8.91	8.91	8.96	8.94	8.96	8.92	
	CH 112	5560	9.21	9.17	9.12	9.12	9.18	9.16	9.15	9.12	
	CH 116	5580	8.81	8.71	8.72	8.72	8.68	8.71	8.71	8.75	
	CH 136	5680	8.29	8.27	8.23	8.24	8.23	8.25	8.23	8.25	
	CH 140	5700	**10.34**	10.24	10.28	10.27	10.21	10.24	10.27	10.28	
	CH 149	5745	9.89	9.79	9.83	9.84	9.80	9.79	9.82	9.82	11.5
	CH 153	5765	9.65	9.62	9.62	9.59	9.61	9.62	9.61	9.56	
	CH 157	5785	**11.30**	11.16	11.23	11.18	11.18	11.22	11.22	11.25	
	CH 161	5805	9.72	9.68	9.66	9.67	9.66	9.68	9.70	9.66	
	CH 165	5825	10.32	10.19	10.23	10.19	10.22	10.21	10.25	10.25	

Mode	Channel	Frequency (MHz)	Average Power (dBm) MCS Index								Tune up Limit (dBm)
			MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7	
802.11n HT40	CH 38	5190	9.27	9.22	9.20	9.11	9.07	9.24	9.21	9.22	10.0
	CH 46	5230	**9.29**	9.22	9.19	9.08	9.07	9.20	9.19	9.18	
	CH 54	5270	9.33	9.22	9.22	9.11	9.11	9.27	9.26	9.25	10.0
	CH 62	5310	**9.60**	9.50	9.47	9.40	9.34	9.53	9.46	9.51	
	CH 102	5510	7.99	7.91	7.86	7.79	7.76	7.92	7.84	7.92	10.0
	CH 110	5550	**8.79**	8.68	8.67	8.57	8.55	8.74	8.67	8.65	
	CH 134	5670	8.01	7.87	7.91	7.76	7.76	7.96	7.92	7.90	
	CH 151	5755	8.94	8.87	8.81	8.73	8.68	8.91	8.82	8.85	10.0
	CH 159	5795	**9.42**	9.35	9.32	9.23	9.16	9.38	9.33	9.33	

14. Bluetooth Exclusions Applied

Mode Band	Average power(dBm)	
	Bluetooth v3.0+EDR	Bluetooth v4.0 LE
2.4GHz Bluetooth	9.5	1.5

Note:
Per KDB 447498 D01v05r02, the 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at *test separation distances* ≤ 50 mm are determined by:

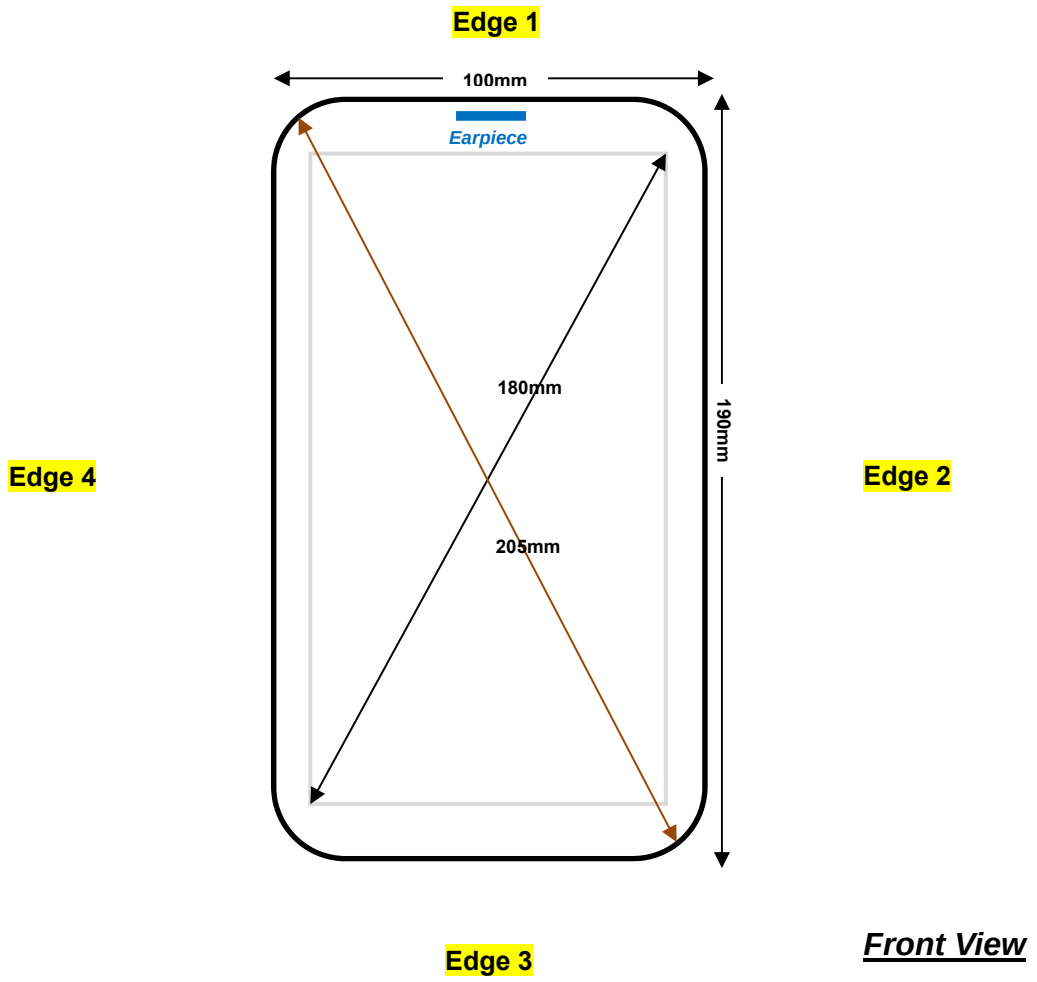
[(*max. power of channel, including tune-up tolerance, mW*)/(*min. test separation distance, mm*)] ·[$\sqrt{f(GHz)}$] ≤ 3.0 for 1-g SAR and ≤ 7.5 for 10-g extremity SAR

- 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

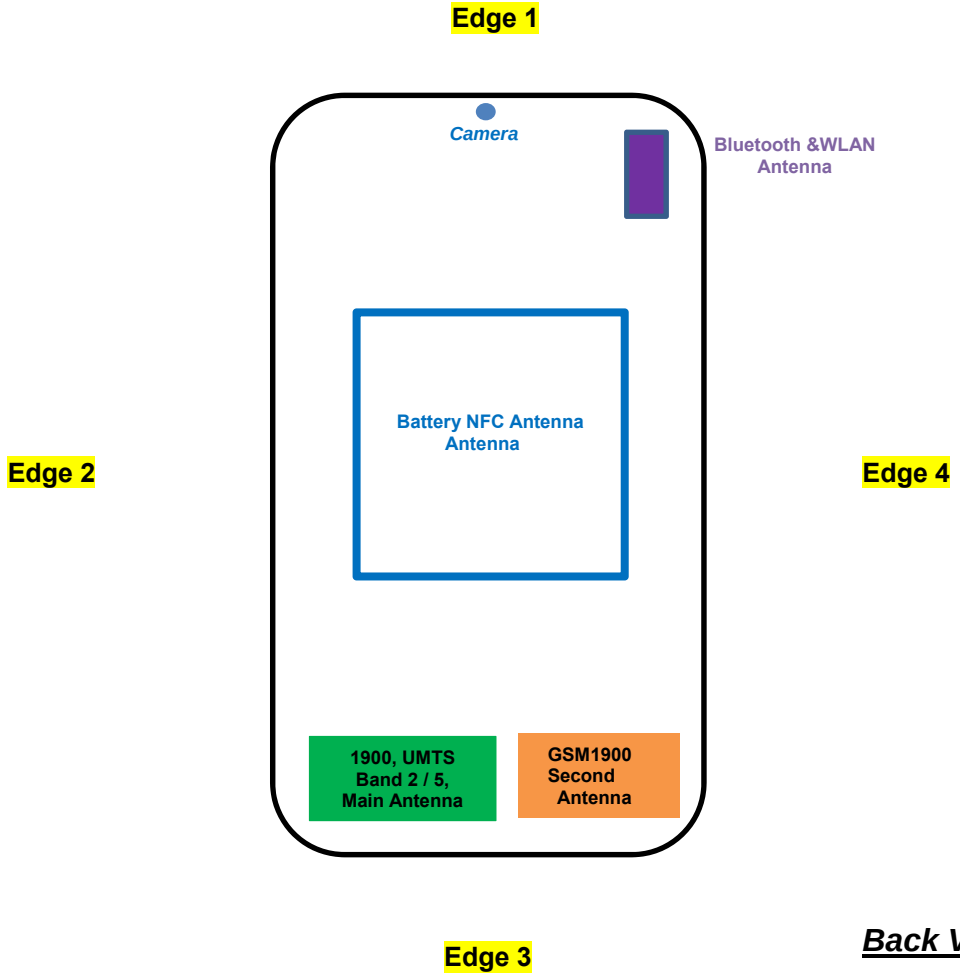
Bluetooth Max Power (dBm)	Separation Distance (mm)	Frequency (GHz)	Exclusion Thresholds
9.5	0	2.48	2.83

Note:
Per KDB 447498 D01v05r02, when the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion. The test exclusion threshold is 2.83 which is <= 3, SAR testing is not required.

15. Antenna Location



Front View



Back View

Distance of the Antenna to the EUT surface/edge					
Antennas	Bottom Side	Edge 1	Edge 2	Edge 3	Edge 4
WWAN Main	0mm	178mm	2mm	2mm	73mm
WWAN Second	0mm	178mm	68mm	2mm	2mm
Bluetooth & WLAN	0mm	2mm	87mm	174mm	8mm

General Note:

1. Above the table, when the distance is < 50 mm exclusion threshold is "Ratio", when the distance is > 50 mm exclusion threshold is "mW".
2. Maximum power is the source-based time-average power and represents the maximum RF output power among production units
3. Per KDB 447498 D01v05r02, for larger devices, the test separation distance of adjacent edge configuration is determined by the closest separation between the antenna and the user.
4. Per KDB 447498 D01v05r02, standalone SAR test exclusion threshold is applied; If the test separation distance is < 5mm, 5mm is used to determine SAR exclusion threshold.
5. Per KDB 447498 D01v05r02, the 1-g and 10-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*)] ·[$\sqrt{f(GHz)}$] ≤ 3.0 for 1-g SAR and ≤ 7.5 for 10-g extremity SAR
   - 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
   - For < 50 mm distance, we just calculate mW of the exclusion threshold value (3.0) to do compare. This formula is [3.0] / [$\sqrt{f(GHz)}$] ·[(*min. test separation distance, mm*)] = exclusion threshold of mW.
6. Per KDB 447498 D01v05r02, at 100 MHz to 6 GHz and for *test separation distances* > 50 mm, the SAR test exclusion threshold is determined according to the following
   a) [Threshold at 50 mm in step 1) + (test separation distance - 50 mm)·(f(MHz)/150)] mW, at 100 MHz to 1500 MHz
   b) [Threshold at 50 mm in step 1) + (test separation distance - 50 mm)·10] mW at > 1500 MHz and ≤ 6 GHz.

SAR test exclusion table distance is ≤ 50mm

Exposure Position	Wireless Interface	WCDMA Band V	WCDMA Band II	GPRS1900 Main 2 Tx slots	GPRS1900 Second 1 Tx slot	WLAN 2.4GHz 802.11b	WLAN 5.2GHz 802.11a	WLAN 5.3GHz 802.11a	WLAN 5.5GHz 802.11a	WLAN 5.8GHz 802.11a
	Calculated Frequency (MHz)	846.6	1907.6	1909.8	1909.8	2462	5240	5320	5700	5825
	Tune-up Maximum power (dBm)	22.0	22.0	22.0	21.7	15.5	13.0	13.0	13.0	13.0
Bottom Face	Antenna to user (mm)	0			0	0				
	SAR exclusion threshold	29	44	44	41	11	9	9	10	10
	SAR testing required?	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Edge 1	Antenna to user (mm)					2				
	SAR exclusion threshold					11	9	9	10	10
	SAR testing required?					**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Edge 2	Antenna to user (mm)	2								
	SAR exclusion threshold	29	44	44						
	SAR testing required?	**Yes**	**Yes**	**Yes**						
Edge 3	Antenna to user (mm)	2			2					
	SAR exclusion threshold	29	44	44	41					
	SAR testing required?	**Yes**	**Yes**	**Yes**	**Yes**					
Edge 4	Antenna to user (mm)				2	8				
	SAR exclusion threshold				41	7	6	6	6	6
	SAR testing required?				**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**

SAR test exclusion table distance is > 50mm

Exposure Position	Wireless Interface	WCDMA Band V	WCDMA Band II	GPRS1900 Main 2 Tx slots	GPRS1900 Second 1 Tx slot	WLAN 2.4GHz 802.11b	WLAN 5.2GHz 802.11a	WLAN 5.3GHz 802.11a	WLAN 5.5GHz 802.11a	WLAN 5.8GHz 802.11a
	Calculated Frequency (MHz)	846.6	1907.6	1909.8	1909.8	2462	5240	5320	5700	5825
	Tune-up Maximum power (dBm)	22.0	22.0	22.0	21.7	15.5	13.0	13.0	13.0	13.0
	Tune-up Maximum rated power (mW)	158	158	158	148	35	20	20	20	20
Edge 1	Antenna to user (mm)	178			178					
	SAR exclusion threshold (mW)	885	1389	1389	1389					
	SAR testing required?	No	No	No	No					
Edge 2	Antenna to user (mm)				68	87				
	SAR exclusion threshold (mW)				1389	466	436	435	433	432
	SAR testing required?				No	No	No	No	No	No
Edge 3	Antenna to user (mm)					174				
	SAR exclusion threshold (mW)					1336	1306	1305	1303	1302
	SAR testing required?					No	No	No	No	No
Edge 4	Antenna to user (mm)	73								
	SAR exclusion threshold (mW)	293	339	339						
	SAR testing required?	No	No	No						

16. SAR Test Results

General Note:

1. Per KDB 447498 D01v05r02, the reported SAR is the measured SAR value adjusted for maximum tune-up tolerance.
   a. Tune-up scaling Factor = tune-up limit power (mW) / EUT RF power (mW), where tune-up limit is the maximum rated power among all production units.
   b. Reported SAR(W/kg)= Measured SAR(W/kg)*Tune-up Scaling Factor
2. Per KDB 447498 D01v05r02, for each exposure position, testing of other required channels within the operating mode of a frequency band is not required when the *reported* 1-g or 10-g SAR for the mid-band or highest output power channel is:
   - ≤ 0.8 W/kg or 2.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≤ 100 MHz
   - ≤ 0.6 W/kg or 1.5 W/kg, for 1-g or 10-g respectively, when the transmission band is between 100 MHz and 200 MHz
   - ≤ 0.4 W/kg or 1.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≥ 200 MHz
3. Per KDB 941225 D02v02r02, RMC 12.2kbps setting is used to evaluate SAR. If HSDPA/HSUPA output power is < 0.25dB higher than RMC, or reported SAR with RMC 12.2kbps setting is ≤ 1.2W/kg, HSDPA/HSUPA SAR evaluation can be excluded.
4. This device 2.4GHz WLAN supports hotspot operation, and 2.4GHz / 5.8GHz WLAN supports WiFi Direct (Group Client / Group Owner), and 5.2GHz / 5.3GHz / 5.5GHz supports WiFi Direct (Group Client only).
5. For the exposure positions that proximity sensor power reduction is applied for SAR compliance, additional SAR testing with EUT transmitting full power in normal mode was performed; 1.1cm for bottom face, 0.6cm for edge3.
6. For the bottom-face and edge3 that proximity sensor power reduction is applied for SAR compliance, additional SAR testing at “sensor trigger distance – 1mm” with EUT transmitting full power in normal mode was performed.
7. Additional WLAN SAR with 1.1cm for bottom face testing was performed for simultaneous transmission analysis.

16.1 Head SAR

<GSM SAR>

Plot No.	Band	Mode	Test Position	Ch.	Freq. (MHz)	Antenna	Power Back-off	Average Power (dBm)	Tune-Up Limit (dBm)	Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
#01	GSM1900	GPRS(2 Tx slots)	Right Cheek	512	1850.2	Main	Off	27.97	28	1.007	0.08	0.133	**0.134**
	GSM1900	GPRS(2 Tx slots)	Right Tilted	512	1850.2	Main	Off	27.97	28	1.007	0.09	0.070	0.070
	GSM1900	GPRS(2 Tx slots)	Left Cheek	512	1850.2	Main	Off	27.97	28	1.007	0.05	0.087	0.088
	GSM1900	GPRS(2 Tx slots)	Left Tilted	512	1850.2	Main	Off	27.97	28	1.007	0.05	0.051	0.051
#02	GSM1900	GSM Voice	Right Cheek	512	1850.2	Second	Off	30.61	30.7	1.021	0.09	0.045	**0.046**
	GSM1900	GSM Voice	Right Tilted	512	1850.2	Second	Off	30.61	30.7	1.021	0.04	0.044	0.045
	GSM1900	GSM Voice	Left Cheek	512	1850.2	Second	Off	30.61	30.7	1.021	0.05	0.043	0.044
	GSM1900	GSM Voice	Left Tilted	512	1850.2	Second	Off	30.61	30.7	1.021	0.05	0.04	0.041

<WCDMA SAR>

Plot No.	Band	Mode	Test Position	Ch.	Freq. (MHz)	Antenna	Power Back-off	Average Power (dBm)	Tune-Up Limit (dBm)	Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	WCDMA Band V	RMC 12.2K	Right Cheek	4233	846.6	Main	Off	21.92	22	1.019	0.08	0.074	0.075
	WCDMA Band V	RMC 12.2K	Right Tilted	4233	846.6	Main	Off	21.92	22	1.019	0.08	0.057	0.058
#03	WCDMA Band V	RMC 12.2K	Left Cheek	4233	846.6	Main	Off	21.92	22	1.019	0.09	0.097	**0.099**
	WCDMA Band V	RMC 12.2K	Left Tilted	4233	846.6	Main	Off	21.92	22	1.019	0.01	0.047	0.048
#04	WCDMA Band II	RMC 12.2K	Right Cheek	9262	1852.4	Main	Off	21.82	22	1.042	0.01	0.170	**0.177**
	WCDMA Band II	RMC 12.2K	Right Tilted	9262	1852.4	Main	Off	21.82	22	1.042	0.07	0.089	0.093
	WCDMA Band II	RMC 12.2K	Left Cheek	9262	1852.4	Main	Off	21.82	22	1.042	0.06	0.117	0.122
	WCDMA Band II	RMC 12.2K	Left Tilted	9262	1852.4	Main	Off	21.82	22	1.042	0.07	0.073	0.076

<DTS WLAN SAR>

Plot No.	Band	Mode	Test Position	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
#05	WLAN 2.4GHz	802.11b 1Mbps	Right Cheek	11	2462	15.14	15.5	1.086	0.01	0.394	**0.428**
	WLAN 2.4GHz	802.11b 1Mbps	Right Tilted	11	2462	15.14	15.5	1.086	0.01	0.234	0.254
	WLAN 2.4GHz	802.11b 1Mbps	Left Cheek	11	2462	15.14	15.5	1.086	0.09	0.110	0.119
	WLAN 2.4GHz	802.11b 1Mbps	Left Tilted	11	2462	15.14	15.5	1.086	-0.01	0.098	0.106
#06	WLAN 5.8GHz	802.11a 6Mbps	Right Cheek	157	5785	12.66	13	1.082	-0.02	0.447	**0.484**
	WLAN 5.8GHz	802.11a 6Mbps	Right Tilted	157	5785	12.66	13	1.082	0.01	0.124	0.134
	WLAN 5.8GHz	802.11a 6Mbps	Left Cheek	157	5785	12.66	13	1.082	0.01	0.083	0.090
	WLAN 5.8GHz	802.11a 6Mbps	Left Tilted	157	5785	12.66	13	1.082	0.08	0.080	0.087

<NII WLAN SAR>

Plot No.	Band	Mode	Test Position	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
#07	WLAN 5.2GHz	802.11a 6Mbps	Right Cheek	36	5180	12.15	13	1.217	0.05	0.510	**0.620**
	WLAN 5.2GHz	802.11a 6Mbps	Right Tilted	36	5180	12.15	13	1.217	-0.02	0.124	0.151
	WLAN 5.2GHz	802.11a 6Mbps	Left Cheek	36	5180	12.15	13	1.217	0.05	0.110	0.134
	WLAN 5.2GHz	802.11a 6Mbps	Left Tilted	36	5180	12.15	13	1.217	0.07	0.057	0.069
#08	WLAN 5.3GHz	802.11a 6Mbps	Right Cheek	60	5300	12.24	13	1.192	0.01	0.699	**0.833**
	WLAN 5.3GHz	802.11a 6Mbps	Right Tilted	60	5300	12.24	13	1.192	0.04	0.166	0.198
	WLAN 5.3GHz	802.11a 6Mbps	Left Cheek	60	5300	12.24	13	1.192	0.03	0.091	0.108
	WLAN 5.3GHz	802.11a 6Mbps	Left Tilted	60	5300	12.24	13	1.192	0.1	0.084	0.100
	WLAN 5.3GHz	802.11a 6Mbps	Right Cheek	52	5260	12.15	13	1.217	0.05	0.534	0.650
#09	WLAN 5.5GHz	802.11a 6Mbps	Right Cheek	112	5560	11.58	13	1.387	0.01	0.654	**0.907**
	WLAN 5.5GHz	802.11a 6Mbps	Right Tilted	112	5560	11.58	13	1.387	0.08	0.167	0.232
	WLAN 5.5GHz	802.11a 6Mbps	Left Cheek	112	5560	11.58	13	1.387	0.02	0.117	0.162
	WLAN 5.5GHz	802.11a 6Mbps	Left Tilted	112	5560	11.58	13	1.387	0.08	0.115	0.159
	WLAN 5.5GHz	802.11a 6Mbps	Right Cheek	108	5540	11.54	13	1.400	-0.1	0.515	0.721
	WLAN 5.5GHz	802.11a 6Mbps	Right Cheek	140	5700	11.15	13	1.532	-0.07	0.385	0.590

16.2 Body SAR

<GSM SAR>

Plot No.	Band	Mode	Test Position	Gap (cm)	Ch.	Freq. (MHz)	Antenna	Power Back-off	Average Power (dBm)	Tune-Up Limit (dBm)	Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	GSM1900	GPRS(2 Tx slots)	Bottom Face	0	512	1850.2	Main	On	19.61	20	1.094	-0.09	0.552	0.604
#10	GSM1900	GPRS(2 Tx slots)	Edge 2	0	512	1850.2	Main	Off	27.97	28	1.007	0.05	0.779	**0.784**
	GSM1900	GPRS(2 Tx slots)	Edge 3	0	512	1850.2	Main	On	19.61	20	1.094	-0.07	0.142	0.155
	GSM1900	GPRS(2 Tx slots)	Bottom Face	1.1	512	1850.2	Main	Off	27.97	28	1.007	0.01	0.346	0.348
	GSM1900	GPRS(2 Tx slots)	Edge 3	0.6	512	1850.2	Main	Off	27.97	28	1.007	-0.03	0.313	0.315
	GSM1900	GPRS(2 Tx slots)	Bottom Face	0	512	1850.2	Second	On	19.29	20	1.178	-0.05	0.448	0.528
	GSM1900	GPRS(2 Tx slots)	Edge 3	0	512	1850.2	Second	On	19.29	20	1.178	-0.09	0.441	0.519
	GSM1900	GPRS(1 Tx slots)	Edge 4	0	512	1850.2	Second	Off	30.56	30.7	1.033	-0.03	0.057	0.059
	GSM1900	GPRS(1 Tx slots)	Bottom Face	1.1	512	1850.2	Second	Off	30.56	30.7	1.033	-0.06	0.176	0.182
#11	GSM1900	GPRS(1 Tx slots)	Edge 3	0.6	512	1850.2	Second	Off	30.56	30.7	1.033	0.07	0.731	**0.755**

<WCDMA SAR>

Plot No.	Band	Mode	Test Position	Gap (cm)	Ch.	Freq. (MHz)	Antenna	Power Back-off	Average Power (dBm)	Tune-Up Limit (dBm)	Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	WCDMA Band V	RMC 12.2K	Bottom Face	0	4182	836.4	Main	On	12.63	13	1.089	-0.02	0.166	0.181
	WCDMA Band V	RMC 12.2K	Edge 2	0	4233	846.6	Main	Off	21.92	22	1.019	0.06	0.461	0.470
	WCDMA Band V	RMC 12.2K	Edge 3	0	4182	836.4	Main	On	12.63	13	1.089	-0.05	0.194	0.211
#12	WCDMA Band V	RMC 12.2K	Bottom Face	1.1	4233	846.6	Main	Off	21.92	22	1.019	0.09	0.659	**0.671**
	WCDMA Band V	RMC 12.2K	Edge 3	0.6	4233	846.6	Main	Off	21.92	22	1.019	0.04	0.572	0.583
#13	WCDMA Band II	RMC 12.2K	Bottom Face	0	9538	1907.6	Main	On	11.88	12.5	1.153	-0.06	0.824	**0.950**
	WCDMA Band II	RMC 12.2K	Edge 2	0	9262	1852.4	Main	Off	21.82	22	1.042	0.09	0.885	0.922
	WCDMA Band II	RMC 12.2K	Edge 3	0	9538	1907.6	Main	On	11.88	12.5	1.153	-0.01	0.163	0.188
	WCDMA Band II	RMC 12.2K	Bottom Face	1.1	9262	1852.4	Main	Off	21.82	22	1.042	-0.06	0.460	0.479
	WCDMA Band II	RMC 12.2K	Edge 3	0.6	9262	1852.4	Main	Off	21.82	22	1.042	0.08	0.374	0.390
	WCDMA Band II	RMC 12.2K	Bottom Face	0	9262	1852.4	Main	On	11.43	12.5	1.279	-0.09	0.534	0.683
	WCDMA Band II	RMC 12.2K	Bottom Face	0	9400	1880	Main	On	11.37	12.5	1.297	-0.05	0.523	0.678
	WCDMA Band II	RMC 12.2K	Edge 2	0	9400	1880	Main	Off	21.48	22	1.127	0.08	0.803	0.905
	WCDMA Band II	RMC 12.2K	Edge 2	0	9538	1907.6	Main	Off	21.79	22	1.050	0.01	0.816	0.856

<DTS WLAN SAR>

Plot No.	Band	Mode	Test Position	Gap (cm)	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
#14	WLAN 2.4GHz	802.11b 1Mbps	Bottom Face	0	11	2462	15.14	15.5	1.086	-0.07	0.513	**0.557**
	WLAN 2.4GHz	802.11b 1Mbps	Edge 1	0	11	2462	15.14	15.5	1.086	-0.04	0.288	0.313
	WLAN 2.4GHz	802.11b 1Mbps	Edge 4	0	11	2462	15.14	15.5	1.086	-0.08	0.380	0.413
	WLAN 2.4GHz	802.11b 1Mbps	Bottom Face	1.1	11	2462	15.14	15.5	1.086	-0.07	0.034	0.037
#15	WLAN 5.8GHz	802.11a 6Mbps	Bottom Face	0	157	5785	12.66	13	1.082	0.08	0.505	**0.546**
	WLAN 5.8GHz	802.11a 6Mbps	Edge 1	0	157	5785	12.66	13	1.082	0.02	0.136	0.147
	WLAN 5.8GHz	802.11a 6Mbps	Edge 4	0	157	5785	12.66	13	1.082	-0.05	0.196	0.212
	WLAN 5.8GHz	802.11a 6Mbps	Bottom Face	1.1	157	5785	12.66	13	1.082	0.11	0.066	0.071

<UNII WLAN SAR>

Plot No.	Band	Mode	Test Position	Gap (cm)	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
#16	WLAN 5.2GHz	802.11a 6Mbps	Bottom Face	0	36	5180	12.15	13	1.217	-0.08	0.359	**0.437**
	WLAN 5.2GHz	802.11a 6Mbps	Edge 1	0	36	5180	12.15	13	1.217	-0.05	0.088	0.107
	WLAN 5.2GHz	802.11a 6Mbps	Edge 4	0	36	5180	12.15	13	1.217	0.06	0.180	0.219
	WLAN 5.2GHz	802.11a 6Mbps	Bottom Face	1.1	36	5180	12.15	13	1.217	0.04	0.046	0.056
#17	WLAN 5.3GHz	802.11a 6Mbps	Bottom Face	0	60	5300	12.24	13	1.192	-0.05	0.582	**0.694**
	WLAN 5.3GHz	802.11a 6Mbps	Edge 1	0	60	5300	12.24	13	1.192	-0.07	0.116	0.138
	WLAN 5.3GHz	802.11a 6Mbps	Edge 4	0	60	5300	12.24	13	1.192	-0.09	0.228	0.272
	WLAN 5.3GHz	802.11a 6Mbps	Bottom Face	1.1	60	5300	12.24	13	1.192	0.08	0.068	0.081
#18	WLAN 5.5GHz	802.11a 6Mbps	Bottom Face	0	112	5560	11.58	13	1.387	-0.05	0.722	**1.001**
	WLAN 5.5GHz	802.11a 6Mbps	Edge 1	0	112	5560	11.58	13	1.387	-0.01	0.132	0.183
	WLAN 5.5GHz	802.11a 6Mbps	Edge 4	0	112	5560	11.58	13	1.387	-0.02	0.267	0.370
	WLAN 5.5GHz	802.11a 6Mbps	Bottom Face	1.1	112	5560	11.58	13	1.387	0.09	0.079	0.110
	WLAN 5.5GHz	802.11a 6Mbps	Bottom Face	0	108	5540	11.54	13	1.400	0.05	0.648	0.907
	WLAN 5.5GHz	802.11a 6Mbps	Bottom Face	0	140	5700	11.15	13	1.532	0.08	0.549	0.841

16.3 Repeated SAR Measurement

No.	Band	Mode	Test Position	Gap (cm)	Ch.	Freq. (MHz)	Antenna	Power Back-off	Average Power (dBm)	Tune-Up Limit (dBm)	Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Ratio	Reported 1g SAR (W/kg)
1st	WCDMA Band II	RMC 12.2K	Edge 2	0	9262	1852.4	Main	Off	21.82	22	1.042	0.09	0.885	1	0.922
2nd	WCDMA Band II	RMC 12.2K	Edge 2	0	9262	1852.4	Main	Off	21.82	22	1.042	0.09	0.860	1.029	0.896

General Note:

1. Per KDB 865664 D01v01r03, for each frequency band, repeated SAR measurement is required only when the measured SAR is ≥0.8W/kg
2. Per KDB 865664 D01v01r03, if the ratio among the repeated measurement is ≤ 1.2 and the measured SAR <1.45W/kg, only one repeated measurement is required.
3. The ratio is the difference in percentage between original and repeated *measured SAR*.
4. All measurement SAR result is scaled-up to account for tune-up tolerance and is compliant.

17. Simultaneous Transmission Analysis

NO.	Simultaneous Transmission Configurations	Head	Body
1.	Main GSM 1900 voice + 2.4GHz WLAN	Yes	
2.	Main GSM 1900 voice + Bluetooth	Yes	
3.	Main GSM 1900 voice + 5GHz WLAN	Yes	
4.	Main GPRS 1900 data + 2.4GHz WLAN	Yes	Yes
5.	Main GPRS 1900 data + Bluetooth	Yes	Yes
6.	Main GPRS 1900 data + 5GHz WLAN	Yes	Yes
7.	Second GSM 1900 voice + 2.4GHz WLAN	Yes	
8.	Second GSM 1900 voice + Bluetooth	Yes	
9.	Second GSM 1900 voice + 5GHz WLAN	Yes	
10.	Second GPRS 1900 data + 2.4GHz WLAN	Yes	Yes
11.	Second GPRS 1900 data + Bluetooth	Yes	Yes
12.	Second GPRS 1900 data + 5GHz WLAN	Yes	Yes
13.	UMTS 850 / 1900 voice + 2.4GHz WLAN	Yes	
14.	UMTS 850 / 1900 voice + Bluetooth	Yes	
15.	UMTS 850 / 1900 voice + 5GHz WLAN	Yes	
16.	UMTS 850 / 1900 data + 2.4GHz WLAN	Yes	Yes
17.	UMTS 850 / 1900 data + Bluetooth	Yes	Yes
18.	UMTS 850 / 1900 data + 5GHz WLAN	Yes	Yes

General Note:

1. This device supported VoIP in GPRS, EGPRS and WCDMA (e.g. 3rd party VoIP).
2. This device 2.4GHz WLAN supports hotspot operation, and 2.4GHz / 5.8GHz WLAN supports WiFi Direct (Group Client / Group Owner), and 5.2GHz / 5.3GHz / 5.5GHz supports WiFi Direct (Group Client only).
3. This supports dual SIM dual active, the SIM1 for the main antenna supports 1900, UMTS Band 2 / 5, the SIM2 for the second antenna supports GSM1900 only, the WWAN radio cannot simultaneous transmission at the same time.
4. EUT will choose either WLAN 2.4GHz or WLAN 5GHz according to the network signal condition; therefore, 2.4GHz WLAN and 5GHz WLAN will not operate simultaneously at any moment.
5. The reported SAR summation is calculated based on the same configuration and test position.
6. Per KDB 447498 D01v05r02, simultaneous transmission SAR is compliant if,
   i) Scalar SAR summation < 1.6W/kg.
   ii) SPLSR = $(SAR_1 + SAR_2)^{1.5}$ / (*min. separation distance, mm*), and the peak separation distance is determined from the square root of $[(x_1-x_2)^2 + (y_1-y_2)^2 + (z_1-z_2)^2]$, where (x_1, y_1, z_1) and (x_2, y_2, z_2) are the coordinates of the extrapolated peak SAR locations in the zoom scan.
   iii) If SPLSR ≤ 0.04, simultaneously transmission SAR measurement is not necessary.
   iv) Simultaneously transmission SAR measurement, and the reported multi-band SAR < 1.6W/kg.

7. For simultaneous transmission analysis, Bluetooth SAR is estimated per KDB 447498 D01v05r02 based on the formula below.
   i) (*max. power of channel, including tune-up tolerance, mW*)/(*min. test separation distance, mm*)]·[$\sqrt{f(GHz)/x}$] W/kg for *test separation distances* ≤ 50 mm; where *x* = 7.5 for 1-g SAR, and *x* = 18.75 for 10-g SAR.
   ii) When the minimum separation distance is < 5mm, the distance is used 5mm to determine SAR test exclusion.
   iii) 0.4 W/kg for 1-g SAR and 1.0 W/kg for 10-g SAR, when the *test separation distances* is > 50 mm.
   iv) Bluetooth estimated SAR is conservatively determined by 5mm separation, for all applicable exposure positions.

Bluetooth Max Power	Exposure Position	All Positions
9.5 dBm	Estimated SAR (W/kg)	0.378 W/kg

17.1 Head Exposure Conditions

<WWAN + WLAN DTS>

WWAN Band		Exposure Position	WWAN SAR (W/kg)	WLAN DTS SAR (W/kg)	Summed SAR (W/kg)	SPLSR	Case No
GSM	Main GSM1900	Right Cheek	0.134	0.484	0.62		
		Right Tilted	0.070	0.254	0.32		
		Left Cheek	0.088	0.119	0.21		
		Left Tilted	0.051	0.106	0.16		
	Second GSM1900	Right Cheek	0.046	0.484	0.53		
		Right Tilted	0.045	0.254	0.30		
		Left Cheek	0.044	0.119	0.16		
		Left Tilted	0.041	0.106	0.15		
WCMDA	Band V	Right Cheek	0.075	0.484	0.56		
		Right Tilted	0.058	0.254	0.31		
		Left Cheek	0.099	0.119	0.22		
		Left Tilted	0.048	0.106	0.15		
	Band II	Right Cheek	0.177	0.484	0.66		
		Right Tilted	0.093	0.254	0.35		
		Left Cheek	0.122	0.119	0.24		
		Left Tilted	0.076	0.106	0.18		

<WWAN + WLAN NII>

WWAN Band		Exposure Position	WWAN SAR (W/kg)	WLAN NII SAR (W/kg)	Summed SAR (W/kg)	SPLSR	Case No
GSM	Main GSM1900	Right Cheek	0.134	0.907	1.04		
		Right Tilted	0.070	0.232	0.30		
		Left Cheek	0.088	0.162	0.25		
		Left Tilted	0.051	0.159	0.21		
	Second GSM1900	Right Cheek	0.046	0.907	0.95		
		Right Tilted	0.045	0.232	0.28		
		Left Cheek	0.044	0.162	0.21		
		Left Tilted	0.041	0.159	0.20		
WCMDA	Band V	Right Cheek	0.075	0.907	0.98		
		Right Tilted	0.058	0.232	0.29		
		Left Cheek	0.099	0.162	0.26		
		Left Tilted	0.048	0.159	0.21		
	Band II	Right Cheek	0.177	0.907	1.08		
		Right Tilted	0.093	0.232	0.33		
		Left Cheek	0.122	0.162	0.28		
		Left Tilted	0.076	0.159	0.24		

<WWAN + Bluetooth DSS>

WWAN Band		Exposure Position	WWAN SAR (W/kg)	Bluetooth DSS SAR (W/kg)	Summed SAR (W/kg)	SPLSR	Case No
GSM	Main GSM1900	Right Cheek	0.134	0.378	0.51		
		Right Tilted	0.070	0.378	0.45		
		Left Cheek	0.088	0.378	0.47		
		Left Tilted	0.051	0.378	0.43		
	Second GSM1900	Right Cheek	0.046	0.378	0.42		
		Right Tilted	0.045	0.378	0.42		
		Left Cheek	0.044	0.378	0.42		
		Left Tilted	0.041	0.378	0.42		
WCMDA	Band V	Right Cheek	0.075	0.378	0.45		
		Right Tilted	0.058	0.378	0.44		
		Left Cheek	0.099	0.378	0.48		
		Left Tilted	0.048	0.378	0.43		
	Band II	Right Cheek	0.177	0.378	0.56		
		Right Tilted	0.093	0.378	0.47		
		Left Cheek	0.122	0.378	0.50		
		Left Tilted	0.076	0.378	0.45		

17.2 Body Exposure Conditions

<WWAN + WLAN DTS>

WWAN Band		Exposure Position	WWAN SAR (W/kg)	WLAN DTS SAR (W/kg)	Summed SAR (W/kg)	SPLSR	Case No
GSM	Main GSM1900	Bottom Face at 1.1 cm	0.348	0.071	0.42		
		Edge3 at 0.6 cm	0.315		0.32		
		Bottom Face at 0cm	0.604	0.557	1.16		
		Edge1 at 0cm		0.313	0.31		
		Edge2 at 0cm	0.784		0.78		
		Edge3 at 0cm	0.155		0.16		
		Edge4 at 0cm		0.413	0.41		
	Second GSM1900	Bottom Face at 1.1 cm	0.182	0.071	0.25		
		Edge3 at 0.6 cm	0.755		0.76		
		Bottom Face at 0cm	0.528	0.557	1.09		
		Edge1 at 0cm		0.313	0.31		
		Edge3 at 0cm	0.519		0.52		
		Edge4 at 0cm	0.059	0.413	0.47		
WCMDA	Band V	Bottom Face at 1.1 cm	0.671	0.071	0.74		
		Edge3 at 0.6 cm	0.583		0.58		
		Bottom Face at 0cm	0.181	0.557	0.74		
		Edge1 at 0cm		0.313	0.31		
		Edge2 at 0cm	0.470		0.47		
		Edge3 at 0cm	0.211		0.21		
		Edge4 at 0cm		0.413	0.41		
	Band II	Bottom Face at 1.1 cm	0.479	0.071	0.55		
		Edge3 at 0.6 cm	0.390		0.39		
		Bottom Face at 0cm	0.950	0.557	**1.51**		
		Edge1 at 0cm		0.313	0.31		
		Edge2 at 0cm	0.922		0.92		
		Edge3 at 0cm	0.188		0.19		
		Edge4 at 0cm		0.413	0.41		

<WWAN + WLAN NII>

WWAN Band		Exposure Position	WWAN SAR (W/kg)	WLAN NII SAR (W/kg)	Summed SAR (W/kg)	SPLSR	Case No
GSM	Main GSM1900	Bottom Face at 1.1 cm	0.348	0.110	0.46		
		Edge3 at 0.6 cm	0.315		0.32		
		Bottom Face at 0cm	0.604	1.001	**1.61**	**0.01**	**#1**
		Edge1 at 0cm		0.183	0.18		
		Edge2 at 0cm	0.784		0.78		
		Edge3 at 0cm	0.155		0.16		
		Edge4 at 0cm		0.370	0.37		
GSM	Second GSM1900	Bottom Face at 1.1 cm	0.182	0.110	0.29		
		Edge3 at 0.6 cm	0.755		0.76		
		Bottom Face at 0cm	0.528	1.001	**1.53**		
		Edge1 at 0cm		0.183	0.18		
		Edge3 at 0cm	0.519		0.52		
		Edge4 at 0cm	0.059	0.370	0.43		
WCMDA	Band V	Bottom Face at 1.1 cm	0.671	0.110	0.78		
		Edge3 at 0.6 cm	0.583		0.58		
		Bottom Face at 0cm	0.181	1.001	1.18		
		Edge1 at 0cm		0.183	0.18		
		Edge2 at 0cm	0.470		0.47		
		Edge3 at 0cm	0.211		0.21		
		Edge4 at 0cm		0.370	0.37		
	Band II	Bottom Face at 1.1 cm	0.479	0.110	0.59		
		Edge3 at 0.6 cm	0.390		0.39		
		Bottom Face at 0cm	0.950	1.001	**1.95**	**0.02**	**#2**
		Edge1 at 0cm		0.183	0.18		
		Edge2 at 0cm	0.922		0.92		
		Edge3 at 0cm	0.188		0.19		
		Edge4 at 0cm		0.370	0.37		

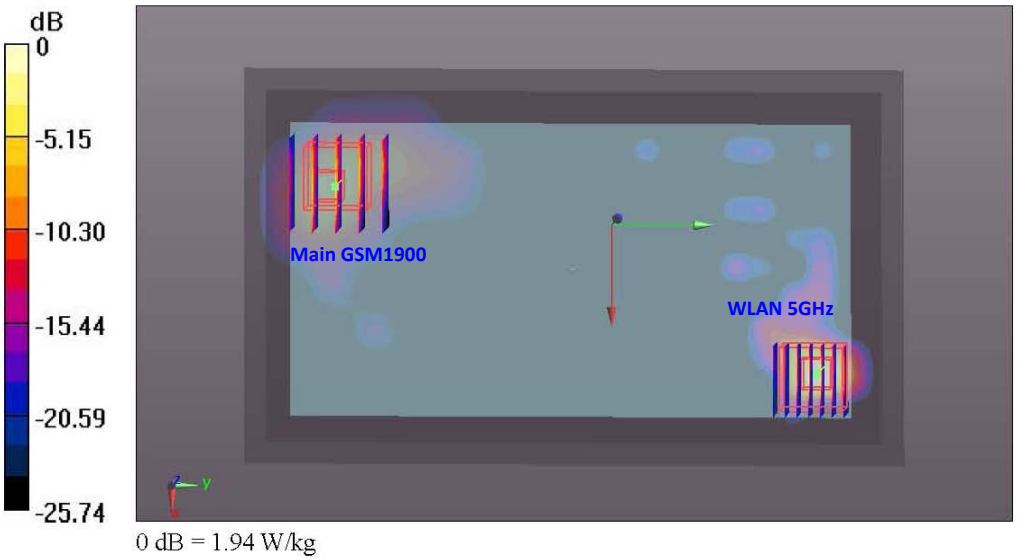
<WWAN + Bluetooth DSS>

WWAN Band		Exposure Position	WWAN SAR (W/kg)	Bluetooth DSS SAR (W/kg)	Summed SAR (W/kg)	SPLSR	Case No
GSM	Main GSM1900	Bottom Face at 1.1 cm	0.348	0.378	0.73		
		Edge3 at 0.6 cm	0.315	0.378	0.69		
		Bottom Face at 0cm	0.604	0.378	0.98		
		Edge2 at 0cm	0.784	0.378	1.16		
		Edge3 at 0cm	0.155	0.378	0.53		
GSM	Second GSM1900	Bottom Face at 1.1 cm	0.182	0.378	0.56		
		Edge3 at 0.6 cm	0.755	0.378	1.13		
		Bottom Face at 0cm	0.528	0.378	0.91		
		Edge3 at 0cm	0.519	0.378	0.90		
		Edge4 at 0cm	0.059	0.378	0.44		
WCMDA	Band V	Bottom Face at 1.1 cm	0.671	0.378	1.05		
		Edge3 at 0.6 cm	0.583	0.378	0.96		
		Bottom Face at 0cm	0.181	0.378	0.56		
		Edge2 at 0cm	0.470	0.378	0.85		
		Edge3 at 0cm	0.211	0.378	0.59		
	Band II	Bottom Face at 1.1 cm	0.479	0.378	0.86		
		Edge3 at 0.6 cm	0.390	0.378	0.77		
		Bottom Face at 0cm	0.950	0.378	**1.33**		
		Edge2 at 0cm	0.922	0.378	1.30		
		Edge3 at 0cm	0.188	0.378	0.57		

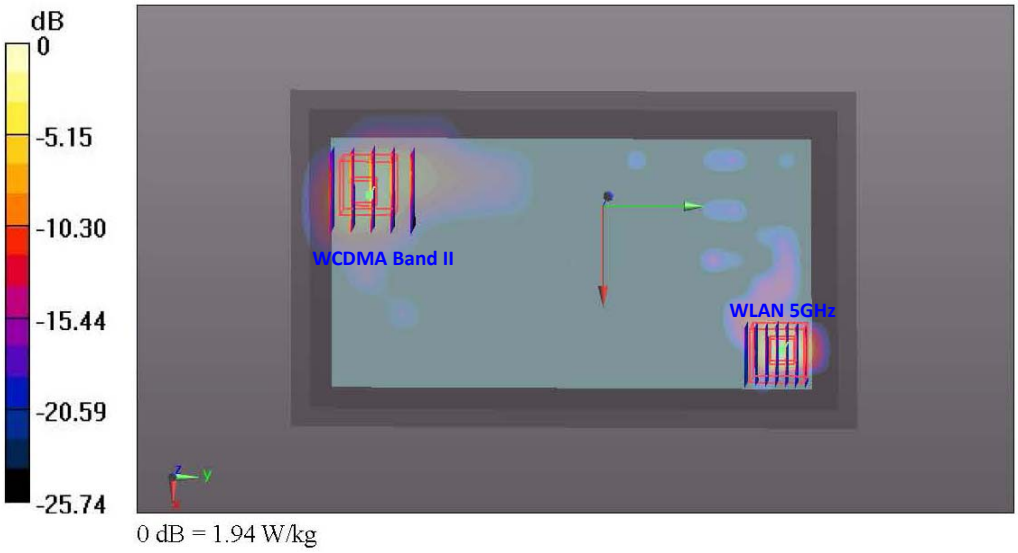
17.3 SPLSR Evaluation and Analysis

General Note:
SPLSR = $(SAR_1 + SAR_2)^{1.5}$ / (*min. separation distance, mm*). If SPLSR ≤ 0.04, simultaneously transmission SAR measurement is not necessary

Case No #1 Position	Band	SAR (W/kg)	Gap (cm)	SAR peak location (m)			3D distance (mm)	Pair SAR sum (W/kg)	SPLSR	Simultaneous SAR
				X	Y	Z				
Bottom Face at 0cm	Main GSM1900	0.604	0	-0.027	-0.081	-0.182	176.3	1.61	0.01	Not required
	WLAN 5GHz	1.001	0	0.035	0.084	-0.182				



Case No #2 Position	Band	SAR (W/kg)	Gap (cm)	SAR peak location (m)			3D distance (mm)	Pair SAR sum (W/kg)	SPLSR	Simultaneous SAR
				X	Y	Z				
Bottom Face at 0cm	WCDM Band II	0.95	0	-0.0255	-0.081	-0.181	175.7	1.95	0.02	Not required
	WLAN 5GHz	1.001	0	0.035	0.084	-0.182				



Test Engineer : Luke Lu

18. Uncertainty Assessment

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

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

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

Uncertainty Distributions	Normal	Rectangular	Triangular	U-Shape
Multi-plying Factor[(a)]	1/k[(b)]	1/√3	1/√6	1/√2

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

(b) κ is the coverage factor

Table 18.1. Standard Uncertainty for Assumed Distribution

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

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

Error Description	Uncertainty Value (±%)	Probability Distribution	Divisor	Ci (1g)	Ci (10g)	Standard Uncertainty (1g)	Standard Uncertainty (10g)
Measurement System							
Probe Calibration	6.0	Normal	1	1	1	± 6.0 %	± 6.0 %
Axial Isotropy	4.7	Rectangular	√3	0.7	0.7	± 1.9 %	± 1.9 %
Hemispherical Isotropy	9.6	Rectangular	√3	0.7	0.7	± 3.9 %	± 3.9 %
Boundary Effects	1.0	Rectangular	√3	1	1	± 0.6 %	± 0.6 %
Linearity	4.7	Rectangular	√3	1	1	± 2.7 %	± 2.7 %
System Detection Limits	1.0	Rectangular	√3	1	1	± 0.6 %	± 0.6 %
Readout Electronics	0.3	Normal	1	1	1	± 0.3 %	± 0.3 %
Response Time	0.8	Rectangular	√3	1	1	± 0.5 %	± 0.5 %
Integration Time	2.6	Rectangular	√3	1	1	± 1.5 %	± 1.5 %
RF Ambient Noise	3.0	Rectangular	√3	1	1	± 1.7 %	± 1.7 %
RF Ambient Reflections	3.0	Rectangular	√3	1	1	± 1.7 %	± 1.7 %
Probe Positioner	0.4	Rectangular	√3	1	1	± 0.2 %	± 0.2 %
Probe Positioning	2.9	Rectangular	√3	1	1	± 1.7 %	± 1.7 %
Max. SAR Eval.	1.0	Rectangular	√3	1	1	± 0.6 %	± 0.6 %
Test Sample Related							
Device Positioning	2.9	Normal	1	1	1	± 2.9 %	± 2.9 %
Device Holder	3.6	Normal	1	1	1	± 3.6 %	± 3.6 %
Power Drift	5.0	Rectangular	√3	1	1	± 2.9 %	± 2.9 %
Phantom and Setup							
Phantom Uncertainty	4.0	Rectangular	√3	1	1	± 2.3 %	± 2.3 %
Liquid Conductivity (Target)	5.0	Rectangular	√3	0.64	0.43	± 1.8 %	± 1.2 %
Liquid Conductivity (Meas.)	2.5	Normal	1	0.64	0.43	± 1.6 %	± 1.1 %
Liquid Permittivity (Target)	5.0	Rectangular	√3	0.6	0.49	± 1.7 %	± 1.4 %
Liquid Permittivity (Meas.)	2.5	Normal	1	0.6	0.49	± 1.5 %	± 1.2 %
Combined Standard Uncertainty						± 11.0 %	± 10.8 %
Coverage Factor for 95 %						K=2	
Expanded Uncertainty						**± 22.0 %**	**± 21.5 %**

Table 18.2. Uncertainty Budget for frequency range 300 MHz to 3 GHz

Error Description	Uncertainty Value (±%)	Probability Distribution	Divisor	Ci (1g)	Ci (10g)	Standard Uncertainty (1g)	Standard Uncertainty (10g)
Measurement System							
Probe Calibration	6.55	Normal	1	1	1	± 6.55 %	± 6.55 %
Axial Isotropy	4.7	Rectangular	√3	0.7	0.7	± 1.9 %	± 1.9 %
Hemispherical Isotropy	9.6	Rectangular	√3	0.7	0.7	± 3.9 %	± 3.9 %
Boundary Effects	2.0	Rectangular	√3	1	1	± 1.2 %	± 1.2 %
Linearity	4.7	Rectangular	√3	1	1	± 2.7 %	± 2.7 %
System Detection Limits	1.0	Rectangular	√3	1	1	± 0.6 %	± 0.6 %
Readout Electronics	0.3	Normal	1	1	1	± 0.3 %	± 0.3 %
Response Time	0.8	Rectangular	√3	1	1	± 0.5 %	± 0.5 %
Integration Time	2.6	Rectangular	√3	1	1	± 1.5 %	± 1.5 %
RF Ambient Noise	3.0	Rectangular	√3	1	1	± 1.7 %	± 1.7 %
RF Ambient Reflections	3.0	Rectangular	√3	1	1	± 1.7 %	± 1.7 %
Probe Positioner	0.8	Rectangular	√3	1	1	± 0.5 %	± 0.5 %
Probe Positioning	9.9	Rectangular	√3	1	1	± 5.7 %	± 5.7 %
Max. SAR Eval.	4.0	Rectangular	√3	1	1	± 2.3 %	± 2.3 %
Test Sample Related							
Device Positioning	2.9	Normal	1	1	1	± 2.9 %	± 2.9 %
Device Holder	3.6	Normal	1	1	1	± 3.6 %	± 3.6 %
Power Drift	5.0	Rectangular	√3	1	1	± 2.9 %	± 2.9 %
Phantom and Setup							
Phantom Uncertainty	4.0	Rectangular	√3	1	1	± 2.3 %	± 2.3 %
Liquid Conductivity (Target)	5.0	Rectangular	√3	0.64	0.43	± 1.8 %	± 1.2 %
Liquid Conductivity (Meas.)	2.5	Normal	1	0.64	0.43	± 1.6 %	± 1.1 %
Liquid Permittivity (Target)	5.0	Rectangular	√3	0.6	0.49	± 1.7 %	± 1.4 %
Liquid Permittivity (Meas.)	2.5	Normal	1	0.6	0.49	± 1.5 %	± 1.2 %
Combined Standard Uncertainty						± 12.8 %	± 12.6 %
Coverage Factor for 95 %						K=2	
Expanded Uncertainty						**± 25.6 %**	**± 25.2 %**

Table 18.3. Uncertainty Budget for frequency range 3 GHz to 6 GHz

19. References

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

[2] ANSI/IEEE Std. C95.1-1992, “IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz”, September 1992

[3] IEEE Std. 1528-2003, “Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques”, December 2003

[4] SPEAG DASY System Handbook

[5] FCC KDB 865664 D01 v01r03 "SAR Measurement Requirements for 100 MHz to 6 GHz", Feb 2014

[6] FCC KDB 865664 D02 v01r01, “RF Exposure Compliance Reporting and Documentation Considerations”, May 2013

[7] FCC KDB 447498 D01 v05r02 General RF Exposure Guidance “Mobile and Portable Device RF Exposure Procedures and Equipment Authorization Policies”, Feb 2014

[8] FCC KDB 248227 D01 v01r02, “SAR Measurement Procedures for 802.11 a/b/g Transmitters”, May 2007

[9] FCC KDB 616217 D04 v01r01, “SAR Evaluation Considerations for Laptop, Notebook, Netbook and Tablet Computers”, May 2013

[10] FCC KDB 648474 D04 v01r02, “SAR Evaluation Considerations for Wireless Handsets”, Dec 2013.

[11] FCC KDB 941225 D01 v02, “SAR Measurement Procedures for 3G Devices – CDMA 2000 / Ev-Do / WCDMA / HSDPA / HSPA”, October 2007

[12] FCC KDB 941225 D02 v02r02, “SAR Guidance for HSPA, HSPA+, DC-HSDPA and 1x-Advanced”, May 2013.

[13] FCC KDB 941225 D03 v01, “Recommended SAR Test Reduction Procedures for GSM / GPRS / EDGE”, December 2008

Appendix A. Plots of System Performance Check

The plots are shown as follows.

Appendix B. Plots of High SAR Measurement

The plots are shown as follows.

Appendix C. DASY Calibration Certificate

The DASY calibration certificates are shown as follows.