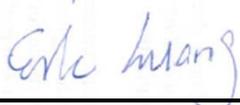


FCC SAR Test Report

APPLICANT : ASUSTeK COMPUTER INC.
EQUIPMENT : ASUS Tablet
BRAND NAME : ASUS
MODEL NAME : K00E
FCC ID : MSQK00E
STANDARD : FCC 47 CFR Part 2 (2.1093)
ANSI/IEEE C95.1-1992
IEEE 1528-2003

We, SPORTON INTERNATIONAL 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 INC., the test report shall not be reproduced except in full.



Reviewed by: Eric Huang / Deputy Manager



Approved by: Jones Tsai / Manager



SPORTON INTERNATIONAL INC.

No. 52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C.



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1. Statement of Compliance

The maximum results of Specific Absorption Rate (SAR) found during testing for **ASUSTeK COMPUTER INC. ASUS Tablet, ASUS** are as follows.

<Highest SAR Summary>

Exposure Position	Frequency Band	Reported 1g-SAR (W/kg)	Equipment Class	Highest Reported 1g-SAR (W/kg)
Head	GSM850	0.11	PCE	0.38
	GSM1900	0.16		
	WCDMA Band V	0.11		
	WCDMA Band IV	0.22		
	WCDMA Band II	0.38		
	WLAN 5.2GHz Band	0.82	NII	1.05
	WLAN 5.3GHz Band	1.05		
	WLAN 5.5GHz Band	0.83		
	WLAN 5.8GHz Band	0.53	DTS	0.92
	WLAN 2.4GHz Band	0.92		
Body	GPRS850	0.56	PCE	1.19
	GPRS1900	1.11		
	WCDMA Band V	0.57		
	WCDMA Band IV	1.12		
	WCDMA Band II	1.19		
	WLAN 5.2GHz Band	0.95	NII	1.18
	WLAN 5.3GHz Band	1.18		
	WLAN 5.5GHz Band	1.07		
	WLAN 5.8GHz Band	0.39	DTS	0.83
	WLAN 2.4GHz Band	0.83		

<Highest Simultaneous transmission SAR>

Frequency Band	Equipment Class	Exposure Position	Highest Reported Simultaneous Transmission 1g-SAR (W/kg)
WCDMA IV	PCE	Body	1.50
2.4GHz Bluetooth	DSS		

Frequency Band	Equipment Class	Exposure Position	Highest Reported Simultaneous Transmission 1g-SAR (W/kg)
WCDMA IV	PCE	Body	1.55
2.4GHz Bluetooth	DTS		

Frequency Band	Equipment Class	Exposure Position	Highest Reported Simultaneous Transmission 1g-SAR (W/kg)
WCDMA II	PCE	Head	1.28
WLAN 5.3GHz Band	NII		

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

2.1 Testing Laboratory

Test Site	SPORTON INTERNATIONAL INC.
Test Site Location	No. 52, Hwa Ya 1 st Rd., Hwa Ya Technology Park, Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C. TEL: +886-3-327-3456 FAX: +886-3-328-4978

2.2 Applicant

Company Name	ASUSTeK COMPUTER INC.
Address	4F, No. 150, LI-TE RD., PEITOU, TAIPEI, TAIWAN

2.3 Manufacturer

Company Name	WISTRON INFOCOMM(KUNSHAN) CO LTD
Address	168# First Avenue, Kunshan Integrated Free Trade Zone, Kunshan, Jiangsu, China

2.4 Application Details

Date of Start during the Test	Aug. 14, 2013
Date of End during the Test	Sep. 13, 2013



3. General Information

3.1 Description of Equipment Under Test (EUT)

Product Feature & Specification	
EUT	ASUS Tablet
Brand Name	ASUS
Model Name	K00E
FCC ID	MSQK00E
S / N	D70KCT073373
Wireless Technology and Frequency Range	GSM850: 824.2 MHz ~ 848.8 MHz GSM1900: 1850.2 MHz ~ 1909.8 MHz WCDMA Band V: 826.4 MHz ~ 846.6 MHz WCDMA Band IV: 1712.4 MHz ~ 1752.6 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
Mode	<ul style="list-style-type: none">• GSM/GPRS/EGPRS• RMC/AMR 12.2Kbps Rel 99• HSDPA Rel 7, Cat14• HSUPA Rel 6, Cat6• DC-HSDPA Rel 8 Cat24• 802.11a/b/g/n HT20/HT40• Bluetooth v3.0+EDR
Antenna Type	WWAN: PCB Antenna WLAN: PIFA Antenna Bluetooth: PIFA Antenna
Transfer Mode Category	Class B – EUT cannot support Packet Switched and Circuit Switched Network simultaneously but can automatically switch between Packet and Circuit Switched Network.
EUT Stage	Production Unit
Remark:	<ol style="list-style-type: none">1. The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.2. WLAN5GHz operation in 5600 MHz ~ 5650 MHz is notched.



3.2 Maximum RF output power among production units

Mode / Band	Average power (dBm)			
	GSM 850		GSM 1900	
Output Power Status	Full Power mode	Reduced power mode	Full Power mode	Reduced power mode
GSM (GMSK, 1 Tx slot)	32.5	29	29.5	26
GPRS/EDGE (GMSK, 1 Tx slot)	32.5	29	29.5	26
GPRS/EDGE (GMSK, 2 Tx slots)	30.5	27.5	27.5	23
EDGE (8PSK, 1 Tx slot)	26.5	23.5	26	23
EDGE (8PSK, 2 Tx slots)	26.5	23.5	26	23

Mode / Band	Average power (dBm)					
	WCDMA Band V		WCDMA Band IV		WCDMA Band II	
Output Power Status	Full Power mode	Reduced power mode	Full Power mode	Reduced power mode	Full Power mode	Reduced power mode
AMR 12.2K	24	21	24	18	24	17.5
RMC 12.2K	24	21	24	18	24	17.5
HSDPA Subtest-1	24	21	24	18	24	17.5
DC-HSDPA Subtest-1	24	21	24	18	24	17.5
HSUPA Subtest-5	24	21	24	18	24	17.5

Mode	Average Power (dBm)		
	1Mbps	2Mbps	3Mbps
	(GFSK)	($\pi/4$ -DQPSK)	(8-DPSK)
2.4 GHz Bluetooth	9.5	8	8

Band / Channel	IEEE 802.11 Average Power (dBm)			
	11b	11g	HT20	HT40
WLAN 2.4GHz Band	CH 1	13.5	13	12
	CH 3			12
	CH 6	14	13	12
	CH 9			12
	CH 11	14	13	12



Band / Channel		IEEE 802.11 Average Power (dBm)		
		11a	HT20	HT40
WLAN 5.2GHz Band	Ch 36	9	9	
	Ch 38			9
	Ch 40	9	9	
	Ch 44	9	9	
	Ch 46			9
	Ch 48	9	9	
WLAN 5.3GHz Band	Ch 52	9	9	
	Ch 54			9.5
	Ch 56	9	9	
	Ch 60	9	9	
	Ch 62			9.5
	Ch 64	9.5	9.5	
WLAN 5.5GHz Band	Ch 100	11	11	
	Ch 102			11
	Ch 104	11	11	
	Ch 108	11	11	
	Ch 110			11
	Ch 112	11	11	
	Ch 116	11	11	
	Ch 132	10.5	10.5	
	Ch 134			11
	Ch 136	10.5	10.5	
Ch 140	10.5	10.5		
WLAN 5.8GHz Band	Ch 149	10.5	10.5	
	Ch 151			10.5
	Ch 153	10.5	10.5	
	Ch 157	10.5	10.5	
	Ch 159			10.5
	Ch 161	10.5	10.5	
	Ch 165	10.5	10.5	



3.3 Applied 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 v01r01
- FCC KDB 648474 D04 v01r01
- FCC KDB 447498 D01 v05r01
- FCC KDB 248227 D01 v01r02
- FCC KDB 941225 D01 v02
- FCC KDB 941225 D02 v02r02
- FCC KDB 941225 D03 v01
- FCC KDB 616217 D04 v01r01

3.4 Device Category and SAR Limits

This device belongs to portable device category because its radiating structure is allowed to be used within 20 centimeters of the body of the user. Limit for General Population/Uncontrolled exposure should be applied for this device, it is 1.6 W/kg as averaged over any 1 gram of tissue.

3.5 Test Conditions

3.5.1 Ambient Condition

Ambient Temperature	20 to 24 °C
Humidity	< 60 %

3.5.2 Test Configuration

For WWAN SAR testing, the device was controlled by using a base station emulator. Communication between the device and the emulator was established by air link. The distance between the EUT and the antenna of the emulator is larger than 50 cm and the output power radiated from the emulator antenna is at least 30 dB smaller than the output power of EUT.

During WLAN SAR testing EUT is configured with the WLAN continuous TX tool, and the transmission duty factor was monitored on the spectrum analyzer with zero-span setting

Duty factor observed as below:

802.11b, 1Mbps: 96.79%

802.11a, 6Mbps: 82.35%

For WLAN SAR testing, WLAN engineering testing software installed on the EUT can provide continuous transmitting RF signal.

Target Power reduction applied for each wireless mode and orientation

Exposure Position / wireless mode	Bottom Face ⁽¹⁾	Edge 1	Edge 2 ⁽¹⁾	Edge 3 ⁽¹⁾	Edge 4
GSM850 GPRS (GMSK 1 Tx slot) - CS1	3.50 dB	0 dB	3.50 dB	3.50 dB	0 dB
GSM850 GPRS (GMSK 2 Tx slot) - CS1	3.00 dB	0 dB	3.00 dB	3.00 dB	0 dB
GSM850 EDGE (8PSK 1 Tx slot) - MCS5	3.00 dB	0 dB	3.00 dB	3.00 dB	0 dB
GSM850 EDGE (8PSK 2 Tx slot) - MCS5	3.00 dB	0 dB	3.00 dB	3.00 dB	0 dB
GSM1900 GPRS (GMSK 1 Tx slot) - CS1	3.50 dB	0 dB	3.50 dB	3.50 dB	0 dB
GSM1900 GPRS (GMSK 2 Tx slot) - CS1	4.50 dB	0 dB	4.50 dB	4.50 dB	0 dB
GSM1900 EDGE (8PSK 1 Tx slot) - MCS5	3.00 dB	0 dB	3.00 dB	3.00 dB	0 dB
GSM1900 EDGE (8PSK 2 Tx slot) - MCS5	3.00 dB	0 dB	3.00 dB	3.00 dB	0 dB
WCDMA Band V	3.00 dB	0 dB	3.00 dB	3.00 dB	0 dB
WCDMA Band II	6.50 dB	0 dB	6.50 dB	6.50 dB	0 dB
WCDMA Band IV	6.00 dB	0 dB	6.00 dB	6.00 dB	0 dB

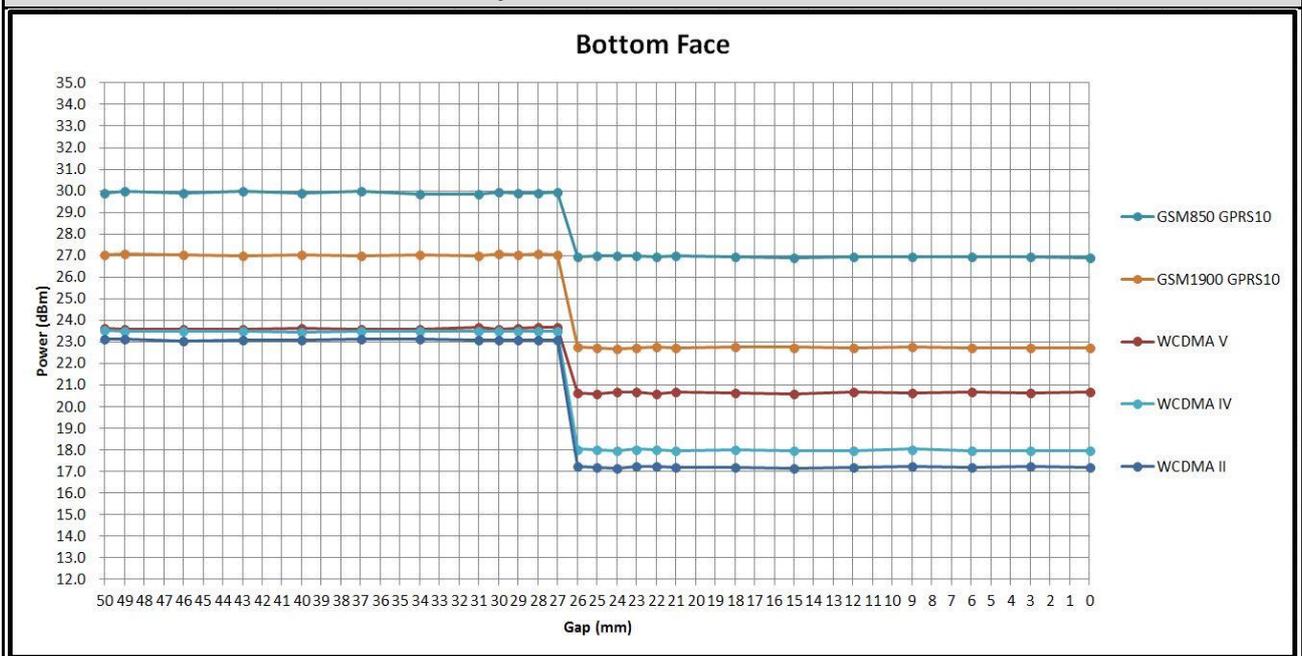
Remark:

- ⁽¹⁾: Reduced maximum limit applied by activation of proximity sensor.
- Power reduction is not applicable for WLAN and Bluetooth.

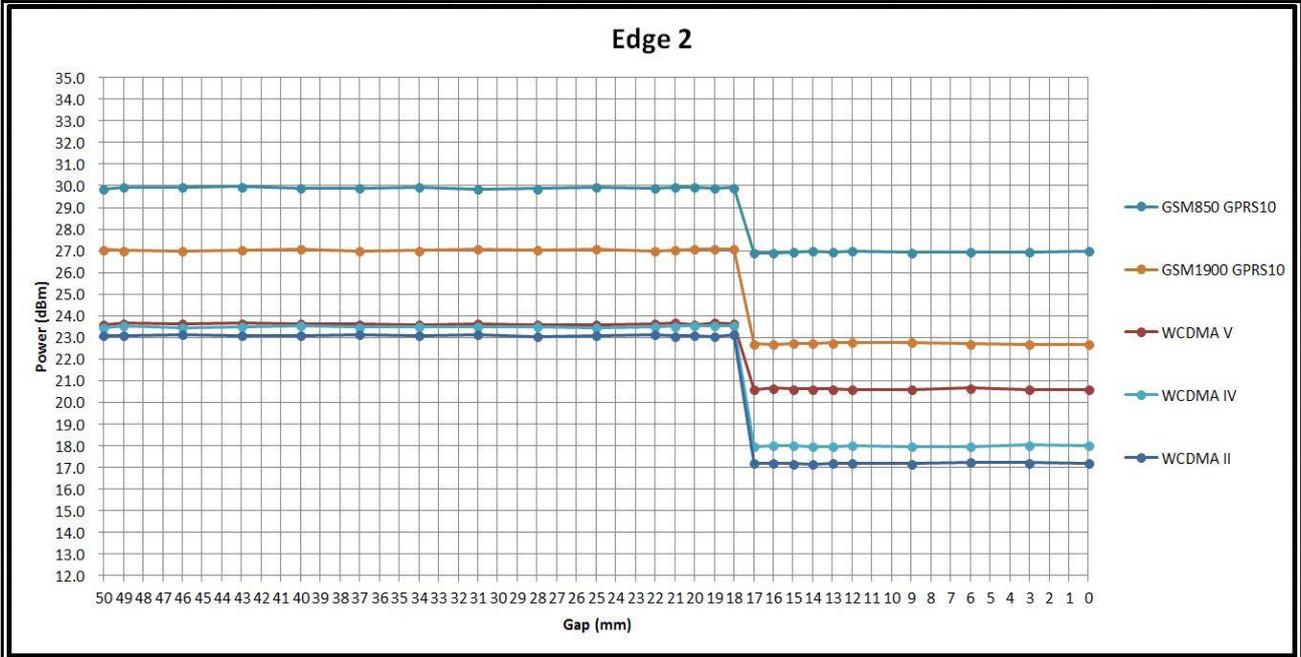
Measurement on EUT:

Band/Mode	Ch #	Measured power reduction (dBm)		Reduction Levels (dB)
		w/o power back-off	w/ power back-off	
GSM850 GPRS (GMSK 1 Tx slot) - CS1	189	29.90	26.93	2.97
GSM1900 GPRS (GMSK 2 Tx slot) - CS1	661	27.03	22.72	4.31
WCDMA Band V (RMC 12.2Kbps)	4182	23.62	20.63	2.99
WCDMA Band II (RMC 12.2Kbps)	9400	23.08	17.18	5.90
WCDMA Band IV (RMC 12.2Kbps)	1413	23.49	17.98	5.51

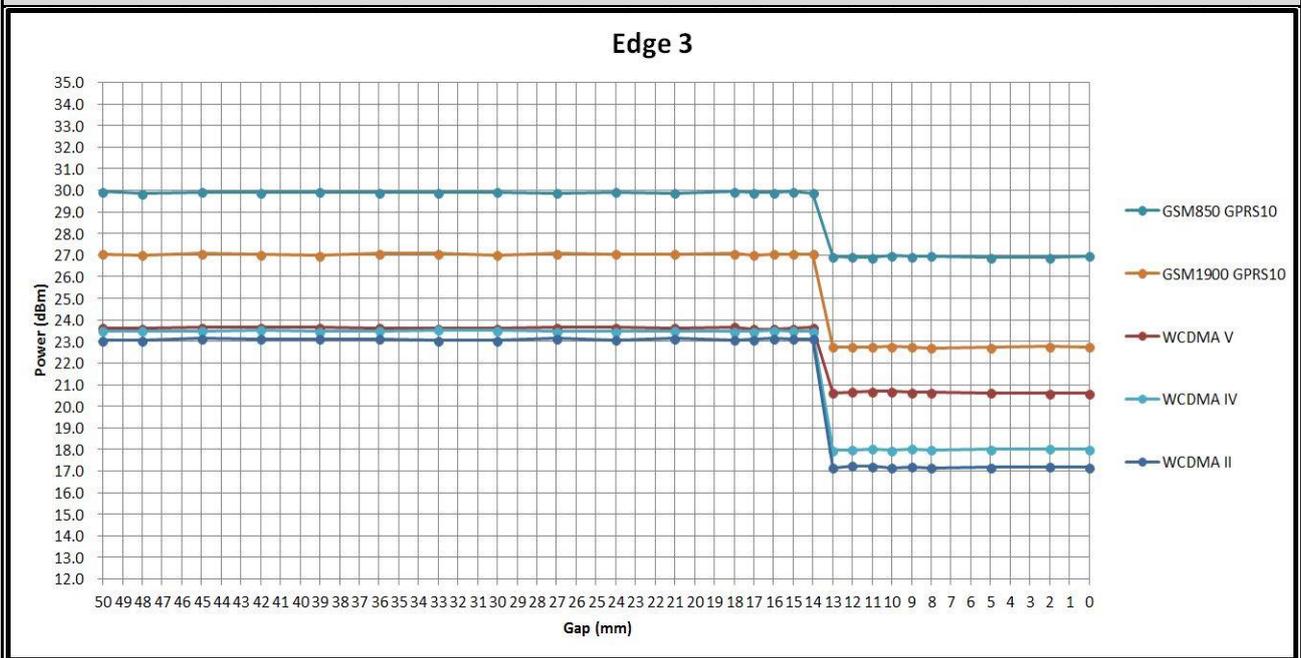
Proximity Sensor for Bottom Face detection



Proximity Sensor for Edge2 detection



Proximity Sensor for Edge 3 detection



4. Specific Absorption Rate (SAR)

4.1 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.

4.2 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:

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

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

SAR measurement can be either related to the temperature elevation in tissue by

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

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

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

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

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

5. SAR Measurement System

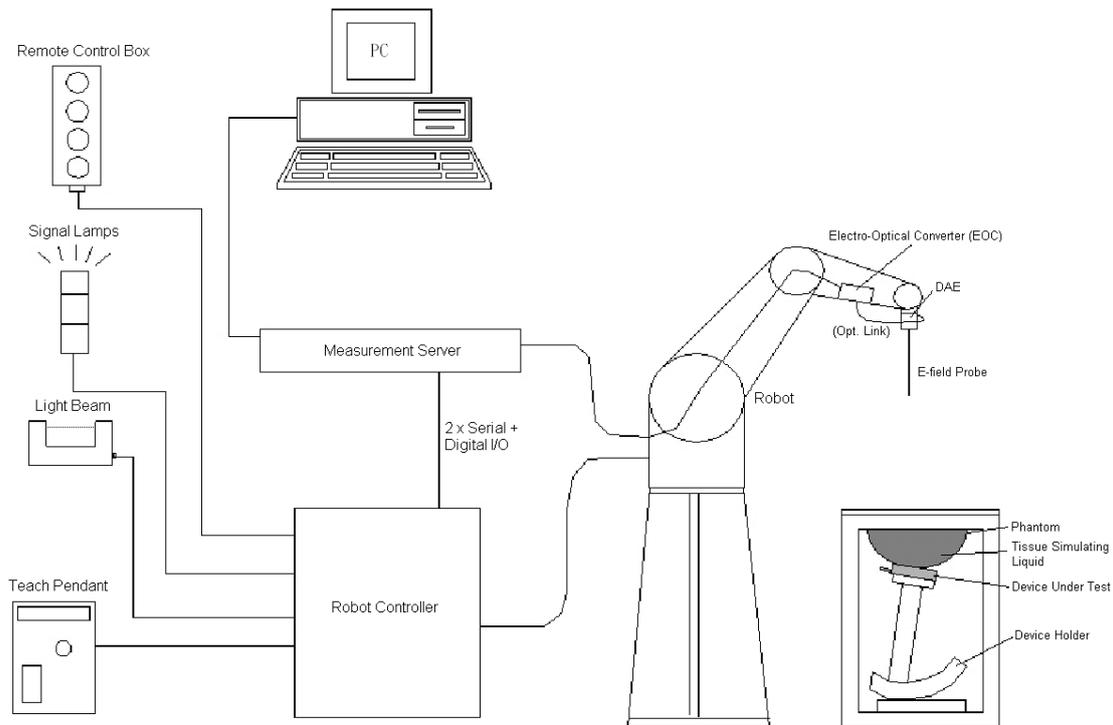


Fig 5.1 SPEAG DASY System Configurations

The DASY system for performance compliance tests is illustrated above graphically. This system consists of the following items:

- A standard high precision 6-axis robot with controller, a teach pendant and software
- A data acquisition electronic (DAE) attached to the robot arm extension
- A dosimetric probe equipped with an optical surface detector system
- The electro-optical converter (EOC) performs the conversion between optical and electrical signals
- A measurement server performs the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
- A probe alignment unit which improves the accuracy of the probe positioning
- A computer operating Windows XP
- DASY software
- Remote control with teach pendant and additional circuitry for robot safety such as warning lamps, etc.
- The SAM twin phantom
- A device holder
- Tissue simulating liquid
- Dipole for evaluating the proper functioning of the system

Component details are described in in the following sub-sections.

5.1 E-Field Probe

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

5.1.1 E-Field Probe Specification

<ET3DV6 Probe >

Construction	Symmetrical design with triangular core Built-in optical fiber for surface detection system. Built-in shielding against static charges. PEEK enclosure material (resistant to organic solvents, e.g., DGBE)
Frequency	10 MHz to 3 GHz; Linearity: ± 0.2 dB
Directivity	± 0.2 dB in HSL (rotation around probe axis) ± 0.4 dB in HSL (rotation normal to probe axis)
Dynamic Range	5 μ W/g to 100 mW/g; Linearity: ± 0.2 dB
Dimensions	Overall length: 330 mm (Tip: 16 mm) Tip diameter: 6.8 mm (Body: 12 mm) Distance from probe tip to dipole centers: 2.7 mm



Fig 5.2 Photo of ET3DV6

<ES3DV3 Probe >

Construction	Symmetrical design with triangular core Built-in optical fiber for surface detection system. Built-in shielding against static charges. PEEK enclosure material (resistant to organic solvents, e.g., DGBE)
Frequency	10 MHz to 3 GHz; Linearity: ± 0.2 dB
Directivity	± 0.2 dB in HSL (rotation around probe axis) ± 0.4 dB in HSL (rotation normal to probe axis)
Dynamic Range	5 μ W/g to 100 mW/g; Linearity: ± 0.2 dB
Dimensions	Overall length: 337 mm (Tip: 10 mm) Tip diameter: 4 mm (Body: 10 mm) Distance from probe tip to dipole centers: 3 mm



Fig 5.3 Photo of ES3DV3

<EX3DV4 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
Directivity	± 0.3 dB in HSL (rotation around probe axis) ± 0.5 dB in tissue material (rotation normal to probe axis)
Dynamic Range	10 μ W/g to 100 mW/g; Linearity: ± 0.2 dB (noise: typically < 1 μ W/g)
Dimensions	Overall length: 330 mm (Tip: 20 mm) Tip diameter: 2.5 mm (Body: 12 mm) Typical distance from probe tip to dipole centers: 1 mm

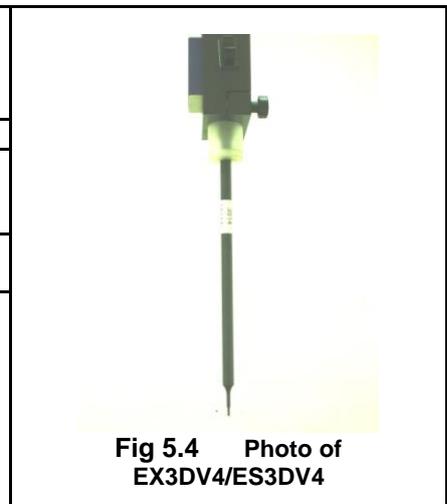


Fig 5.4 Photo of EX3DV4/ES3DV4

5.1.2 E-Field Probe Calibration

Each probe needs to be calibrated according to a dosimetric assessment procedure with accuracy better than $\pm 10\%$. The spherical isotropy shall be evaluated and within ± 0.25 dB. The sensitivity parameters (NormX, NormY, and NormZ), the diode compression parameter (DCP) and the conversion factor (ConvF) of the probe are tested. The calibration data can be referred to appendix C of this report.

5.2 Data Acquisition Electronics (DAE)

The data acquisition electronics (DAE) consists of a highly sensitive electrometer-grade preamplifier with auto-zeroing, a channel and gain-switching multiplexer, a fast 16 bit AD-converter and a command decoder and control logic unit. Transmission to the measurement server is accomplished through an optical downlink for data and status information as well as an optical uplink for commands and the clock. The input impedance of the DAE is 200 MOhm; the inputs are symmetrical and floating. Common mode rejection is above 80 dB.



Fig 5.5 Photo of DAE

5.3 Robot

The SPEAG DASY system uses the high precision robots (DASY4: RX90BL; DASY5: TX90XL) type from Stäubli SA (France). For the 6-axis controller system, the robot controller version (DASY4: CS7MB; DASY5: CS8c) from Stäubli is used. The Stäubli robot series have many features that are important for our application:

- High precision (repeatability ± 0.035 mm)
- High reliability (industrial design)
- Jerk-free straight movements
- Low ELF interference (the closed metallic construction shields against motor control fields)



Fig 5.6 Photo of DASY4



Fig 5.7 Photo of DASY5

5.4 Measurement Server

The measurement server is based on a PC/104 CPU board with CPU (DASY4: 166 MHz, Intel Pentium; DASY5: 400 MHz, Intel Celeron), chipdisk (DASY4: 32 MB; DASY5: 128 MB), RAM (DASY4: 64 MB, DASY5: 128 MB). The necessary circuits for communication with the DAE electronic box, as well as the 16 bit AD converter system for optical detection and digital I/O interface are contained on the DASY I/O board, which is directly connected to the PC/104 bus of the CPU board.

The measurement server performs all the real-time data evaluation for field measurements and surface detection, controls robot movements and handles safety operations.



Fig 5.8 Photo of Server for DASY4



Fig 5.9 Photo of Server for DASY5

5.5 Phantom

<SAM Twin Phantom>

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



Fig 5.10 Photo of SAM Phantom

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

<ELI4 Phantom>

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



Fig 5.11 Photo of ELI4 Phantom

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

5.6 Device Holder

<Device Holder for SAM Twin Phantom>

The SAR in the phantom is approximately inversely proportional to the square of the distance between the source and the liquid surface. For a source at 5 mm distance, a positioning uncertainty of ± 0.5 mm would produce a SAR uncertainty of ± 20 %. Accurate device positioning is therefore crucial for accurate and repeatable measurements. The positions in which the devices must be measured are defined by the standards.

The DASY device holder is designed to cope with different positions given in the standard. It has two scales for the device rotation (with respect to the body axis) and the device inclination (with respect to the line between the ear reference points). The rotation center for both scales is the ear reference point (ERP). Thus the device needs no repositioning when changing the angles.

The DASY device holder is constructed of low-loss POM material having the following dielectric parameters: relative permittivity $\epsilon = 3$ and loss tangent $\delta = 0.02$. The amount of dielectric material has been reduced in the closest vicinity of the device, since measurements have suggested that the influence of the clamp on the test results could thus be lowered.



Fig 5.12 Device Holder

<Laptop Extension Kit>

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

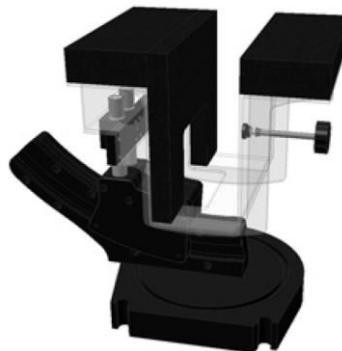


Fig 5.13 Laptop Extension Kit



5.7 Data Storage and Evaluation

5.7.1 Data Storage

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

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

5.7.2 Data Evaluation

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

Probe parameters :	- Sensitivity	Norm _i , a _{i0} , a _{i1} , a _{i2}
	- Conversion factor	ConvF _i
	- Diode compression point	dcp _i
Device parameters :	- Frequency	f
	- Crest factor	cf
Media parameters :	- Conductivity	σ
	- Density	ρ

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

The first step of the evaluation is a linearization of the filtered input signal to account for the compression characteristics of the detector diode. The compensation depends on the input signal, the diode type and the DC-transmission factor from the diode to the evaluation electronics. If the exciting field is pulsed, the crest factor of the signal must be known to correctly compensate for peak power.



The formula for each channel can be given as :

$$V_i = U_i + U_i^2 \cdot \frac{cf}{dcp_i}$$

- with V_i = compensated signal of channel i, (i = x, y, z)
- U_i = input signal of channel i, (i = x, y, z)
- cf = crest factor of exciting field (DASY parameter)
- dcp_i = diode compression point (DASY parameter)

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

$$\text{E-field Probes : } E_i = \sqrt{\frac{V_i}{\text{Norm}_i \cdot \text{ConvF}}}$$

$$\text{H-field Probes : } H_i = \sqrt{V_i \cdot \frac{a_{i0} + a_{i1}f + a_{i2}f^2}{f}}$$

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

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

$$E_{\text{tot}} = \sqrt{E_x^2 + E_y^2 + E_z^2}$$

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

$$\text{SAR} = E_{\text{tot}}^2 \cdot \frac{\sigma}{\rho \cdot 1000}$$

- with SAR = local specific absorption rate in mW/g
- E_{tot} = total field strength in V/m
- σ = conductivity in [mho/m] or [Siemens/m]
- ρ = equivalent tissue density in g/cm^3

Note that the density is set to 1, to account for actual head tissue density rather than the density of the tissue simulating liquid.



5.8 Test Equipment List

Manufacturer	Name of Equipment	Type/Model	Serial Number	Calibration	
				Last Cal.	Due Date
SPEAG	835MHz System Validation Kit	D835V2	499	Mar. 18, 2013	Mar. 17, 2014
SPEAG	1750MHz System Validation Kit	D1750V2	1068	Jun. 20, 2012	Jun. 19, 2014
SPEAG	1900MHz System Validation Kit	D1900V2	5d041	Mar. 20, 2013	Mar. 19, 2014
SPEAG	2450MHz System Validation Kit	D2450V2	869	Jun. 11, 2013	Jun. 10, 2014
SPEAG	5GHz System Validation Kit	D5GHzV2	1128	Jul. 24, 2013	Jul. 23, 2014
SPEAG	Data Acquisition Electronics	DAE4	914	Jan. 16, 2013	Jan. 15, 2014
SPEAG	Data Acquisition Electronics	DAE3	577	May. 08, 2013	May. 07, 2014
SPEAG	Data Acquisition Electronics	DAE4	778	Aug. 27, 2012	Aug. 26, 2013
SPEAG	Data Acquisition Electronics	DAE3	495	May. 08, 2013	May. 07, 2014
SPEAG	Data Acquisition Electronics	DAE4	1279	Jan. 28, 2013	Jan. 27, 2014
SPEAG	Data Acquisition Electronics	DAE4	1338	May. 28, 2013	May. 27, 2014
SPEAG	Dosimetric E-Field Probe	ET3DV6R	1788	Oct. 23, 2012	Oct. 22, 2013
SPEAG	Dosimetric E-Field Probe	EX3DV4	3697	Sep. 28, 2012	Sep. 27, 2013
SPEAG	Dosimetric E-Field Probe	EX3DV4	3792	Jun. 04, 2013	Jun. 03, 2014
SPEAG	Dosimetric E-Field Probe	EX3DV4	3925	Jun. 12, 2013	Jun. 11, 2014
SPEAG	Dosimetric E-Field Probe	ES3DV3	3270	Sep. 28, 2012	Sep. 27, 2013
SPEAG	Dosimetric E-Field Probe	EX3DV4	3801	Jun. 20, 2013	Jun. 19, 2014
Wisewind	Thermometer	ETP-101	TM560	Nov. 13, 2012	Nov. 12, 2013
Wisewind	Thermometer	ETP-101	TM685	Nov. 13, 2012	Nov. 12, 2013
Wisewind	Thermometer	HTC-1	TM642	Nov. 13, 2012	Nov. 12, 2013
Wisewind	Thermometer	HTC-1	TM281	Nov. 13, 2012	Nov. 12, 2013
H.M.IRIS	Thermometer	TH-08	TM658	Nov. 13, 2012	Nov. 12, 2013
Agilent	Wireless Communication Test Set	E5515C	MY50266977	May. 06, 2013	May. 05, 2015
R&S	Radio communication Tester	CMW500	116160	Jan. 09, 2013	Jan. 08, 2014
SPEAG	Device Holder	N/A	N/A	NCR	NCR
Agilent	ESG Vector Series Signal Generator	E4438C	MY49070755	Oct. 02, 2012	Oct. 01, 2013
SPEAG	Dielectric Probe Kit	DAK-3.5	1126	Jul. 23, 2013	Jul. 22, 2014
Agilent	ENA Network Analyzer	E5071C	MY46316648	Feb. 07, 2013	Feb. 06, 2014
Anritsu	Power Meter	ML2495A	1218006	Oct. 22, 2012	Oct. 21, 2013
Anritsu	Power Sensor	MA2411B	1207363	Oct. 24, 2012	Oct. 23, 2013
Agilent	Dual Directional Coupler	778D	50422	Note 4	
Woken	Attenuator 1	WK0602-XX	N/A	Note 4	
PE	Attenuator 2	PE7005-10	N/A	Note 4	
PE	Attenuator 3	PE7005- 3	N/A	Note 4	
AR	Power Amplifier	5S1G4M2	328767	Note 5	
R&S	Spectrum Analyzer	FSP 7	101131	Jul. 09, 2013	Jul. 08, 2014

Table 5.1 Test Equipment List

Note:

1. The calibration certificate of DASY can be referred to appendix C of this report.
2. Referring to KDB 865664 D01v01r01, the dipole calibration interval can be extended to 3 years with justification. The dipoles are also not physically damaged, or repaired during the interval.
3. The justification data of dipole D1750V2, SN: 1068 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.
4. The Insertion Loss calibration of Dual Directional Coupler and Attenuator were characterized via the network analyzer and compensated during system check.
5. In system check we need to monitor the level on the power meter, and adjust the power amplifier level to have precise power level to the dipole; the measured SAR will be normalized to 1W input power according to the ratio of 1W to the input power to the dipole. For system check, the calibration of the power amplifier is deemed not critically required for correct measurement; the power meter is critical and we do have calibration for it
6. Attenuator 1 insertion loss is calibrated by the network Analyzer, which the calibration is valid, before system check.

6. Tissue Simulating Liquids

For the measurement of the field distribution inside the SAM phantom with DASY, the phantom must be filled with around 25 liters of homogeneous body tissue simulating liquid. For head SAR testing, the liquid height from the ear reference point (ERP) of the phantom to the liquid top surface is larger than 15 cm, which is shown in Fig. 6.1. For body SAR testing, the liquid height from the center of the flat phantom to the liquid top surface is larger than 15 cm, which is shown in Fig. 6.2.

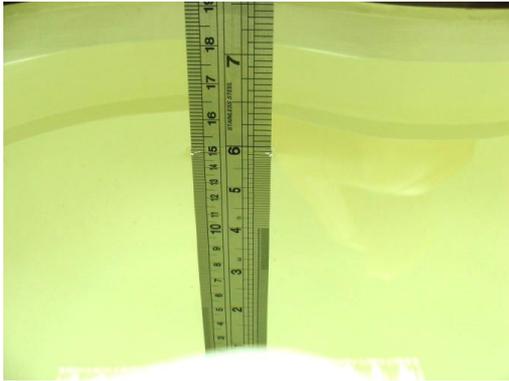


Fig 6.1 Photo of Liquid Height for Head SAR



Fig 6.2 Photo of Liquid Height for Body SAR

The following table gives the recipes for tissue simulating liquid.

Frequency (MHz)	Water (%)	Sugar (%)	Cellulose (%)	Salt (%)	Preventol (%)	DGBE (%)	Conductivity (σ)	Permittivity (ϵ_r)
For Head								
750	41.1	57.0	0.2	1.4	0.2	0	0.89	41.9
835	40.3	57.9	0.2	1.4	0.2	0	0.90	41.5
900	40.3	57.9	0.2	1.4	0.2	0	0.97	41.5
1800, 1900, 2000	55.2	0	0	0.3	0	44.5	1.40	40.0
2450	55.0	0	0	0	0	45.0	1.80	39.2
For Body								
750	51.7	47.2	0	0.9	0.1	0	0.96	55.5
835	50.8	48.2	0	0.9	0.1	0	0.97	55.2
900	50.8	48.2	0	0.9	0.1	0	1.05	55.0
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

Table 6.1 Recipes of Tissue Simulating Liquid

Simulating Liquid for 5G, Manufactured by SPEAG

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



The dielectric parameters of the liquids were verified prior to the SAR evaluation using an SPEAG DAK-3.5 Dielectric Probe Kit and an Agilent Network Analyzer.

The following table shows the measuring results for simulating liquid.

Frequency (MHz)	Tissue Type	Liquid Temp. (°C)	Conductivity (σ)	Permittivity (ε _r)	Conductivity Target (σ)	Permittivity Target (ε _r)	Delta (σ) (%)	Delta (ε _r) (%)	Limit (%)	Date
835	Head	22.4	0.904	41.129	0.90	41.50	0.44	-0.89	±5	2013/9/8
835	Body	22.3	0.953	52.720	0.97	55.20	-1.75	-4.49	±5	2013/9/11
835	Body	22.1	0.962	54.600	0.97	55.20	-0.82	-1.09	±5	2013/9/16
1750	Head	22.3	1.383	38.267	1.40	40.00	-1.21	-4.33	±5	2013/9/7
1750	Body	22.4	1.530	51.900	1.52	53.30	0.66	-2.63	±5	2013/9/13
1750	Body	22.4	1.530	51.900	1.52	53.30	0.66	-2.63	±5	2013/9/13
1900	Head	22.6	1.432	39.344	1.40	40.00	2.29	-1.64	±5	2013/9/7
1900	Body	22.4	1.550	51.900	1.52	53.30	1.97	-2.63	±5	2013/9/12
1900	Body	22.4	1.545	51.942	1.52	53.30	1.64	-2.55	±5	2013/9/12
1900	Body	22.4	1.530	52.500	1.52	53.30	0.66	-1.50	±5	2013/9/13
2450	Head	22.5	1.851	39.252	1.80	39.20	2.83	0.13	±5	2013/8/14
2450	Body	22.4	2.021	53.832	1.95	52.70	3.64	2.15	±5	2013/8/14
5200	Head	22.6	4.811	35.440	4.66	36.00	3.24	-1.56	±5	2013/8/15
5200	Body	22.5	5.318	47.507	5.30	49.00	0.34	-3.05	±5	2013/8/18
5300	Head	22.6	4.920	35.310	4.76	35.87	3.36	-1.56	±5	2013/8/15
5300	Body	22.5	5.457	47.242	5.42	48.88	0.68	-3.35	±5	2013/8/18
5600	Head	22.3	5.199	34.711	5.06	35.53	2.75	-2.31	±5	2013/8/16
5600	Head	22.2	5.233	34.724	5.06	35.53	3.42	-2.27	±5	2013/8/17
5600	Body	22.5	5.857	46.718	5.77	48.47	1.51	-3.61	±5	2013/8/18
5800	Head	22.2	5.423	34.346	5.27	35.30	2.90	-2.70	±5	2013/8/17
5800	Body	22.7	5.956	46.473	6.00	48.20	-0.73	-3.58	±5	2013/8/18

Table 6.2 Measuring Results for Simulating Liquid

7. System Verification Procedures

Each DASY system is equipped with one or more system validation kits. These units, together with the predefined measurement procedures within the DASY software, enable the user to conduct the system performance check and system validation. System validation kit includes a dipole, tripod holder to fix it underneath the flat phantom and a corresponding distance holder.

7.1 Purpose of System Performance check

The system performance check verifies that the system operates within its specifications. System and operator errors can be detected and corrected. It is recommended that the system performance check be performed prior to any usage of the system in order to guarantee reproducible results. The system performance check uses normal SAR measurements in a simplified setup with a well characterized source. This setup was selected to give a high sensitivity to all parameters that might fail or vary over time. The system check does not intend to replace the calibration of the components, but indicates situations where the system uncertainty is exceeded due to drift or failure.

7.2 System Setup

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

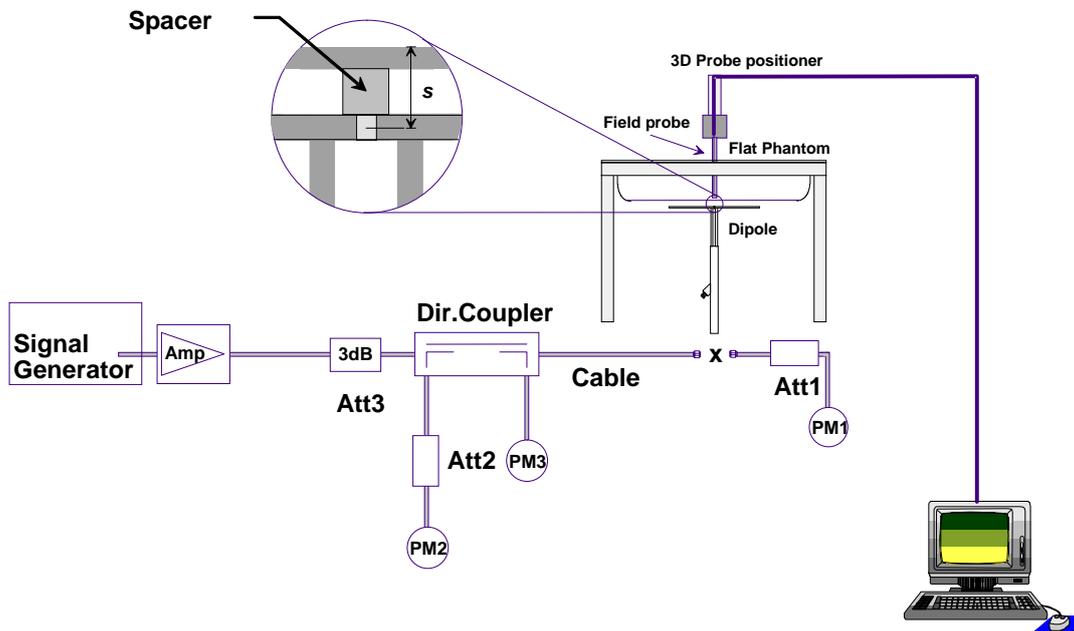


Fig 7.1 System Setup for System Evaluation

1. Signal Generator
2. Amplifier
3. Directional Coupler
4. Power Meter
5. Calibrated Dipole



Fig 7.2 Photo of Dipole Setup

7.3 SAR System Verification Results

Comparing to the original SAR value provided by SPEAG, the verification data should be within its specification of 10 %. Table 7.1 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 (%)
2013/9/8	835	Head	250	499	1788	577	2.47	9.57	9.88	3.24
2013/9/11	835	Body	250	499	3925	495	2.38	9.63	9.52	-1.14
2013/9/16	835	Body	250	499	1788	577	2.55	9.63	10.20	5.92
2013/9/7	1750	Head	250	1068	3792	1338	9.56	36.10	38.24	5.93
2013/9/13	1750	Body	250	1068	1788	577	9.23	36.80	36.92	0.33
2013/9/13	1750	Body	250	1068	3801	778	9.66	36.80	38.64	5.00
2013/9/7	1900	Head	250	5d041	3792	1338	9.52	40.60	38.08	-6.21
2013/9/12	1900	Body	250	5d041	3801	778	11.00	40.80	44.00	7.84
2013/9/12	1900	Body	250	5d041	3270	914	10.20	40.80	40.80	0.00
2013/9/13	1900	Body	250	5d041	1788	577	9.52	40.80	38.08	-6.67
2013/8/14	2450	Head	250	869	3270	778	13.70	53.80	54.80	1.86
2013/8/14	2450	Body	250	869	3270	778	13.30	51.50	53.20	3.30
2013/8/15	5200	Head	100	1128	3792	1338	7.86	78.20	78.60	0.51
2013/8/18	5200	Body	100	1128	3792	1338	7.21	73.40	72.10	-1.77
2013/8/15	5300	Head	100	1128	3792	1338	8.25	80.60	82.50	2.36
2013/8/18	5300	Body	100	1128	3792	1338	7.47	74.30	74.70	0.54
2013/8/16	5600	Head	100	1128	3697	1279	7.98	80.50	79.80	-0.87
2013/8/17	5600	Head	100	1128	3792	1338	8.16	80.50	81.60	1.37
2013/8/18	5600	Body	100	1128	3792	1338	8.12	77.80	81.20	4.37
2013/8/17	5800	Head	100	1128	3792	1338	7.75	77.20	77.50	0.39
2013/8/18	5800	Body	100	1128	3792	1338	7.16	72.20	71.60	-0.83

Table 7.1 Target and Measurement SAR after Normalized

8. EUT Testing Position

8.1 Define two imaginary lines on the handset

- The vertical centerline passes through two points on the front side of the handset - the midpoint of the width w_t of the handset at the level of the acoustic output, and the midpoint of the width w_b of the bottom of the handset.
- The horizontal line is perpendicular to the vertical centerline and passes through the center of the acoustic output. The horizontal line is also tangential to the face of the handset at point A.
- 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, especially for clamshell handsets, handsets with flip covers, and other irregularly shaped handsets.

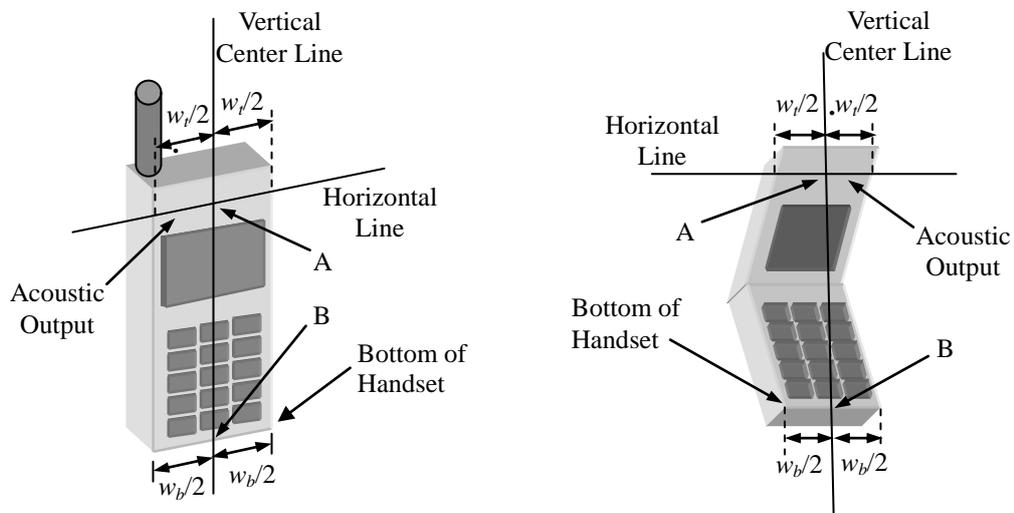


Fig 8.1 Illustration for Handset Vertical and Horizontal Reference Lines

8.2 Cheek Position

- To position the device with the vertical center line of the body of the device and the horizontal line crossing the center piece in a plane parallel to the sagittal plane of the phantom. While maintaining the device in this plane, align the vertical center line with the reference plane containing the three ear and mouth reference point (M: Mouth, RE: Right Ear, and LE: Left Ear) and align the center of the ear piece with the line RE-LE.
- To move the device towards the phantom with the ear piece aligned with the line LE-RE until the phone touched the ear. While maintaining the device in the reference plane and maintaining the phone contact with the ear, move the bottom of the phone until any point on the front side is in contact with the cheek of the phantom or until contact with the ear is lost (see Fig. 8.2).

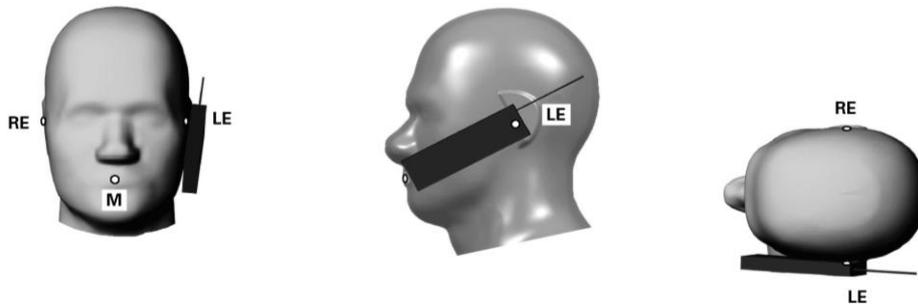


Fig 8.2 Illustration for Cheek Position

8.3 Tilted Position

- (a) To position the device in the “cheek” position described above.
- (b) While maintaining the device the reference plane described above and pivoting against the ear, moves it outward away from the mouth by an angle of 15 degrees or until contact with the ear is lost (see Fig. 8.3).

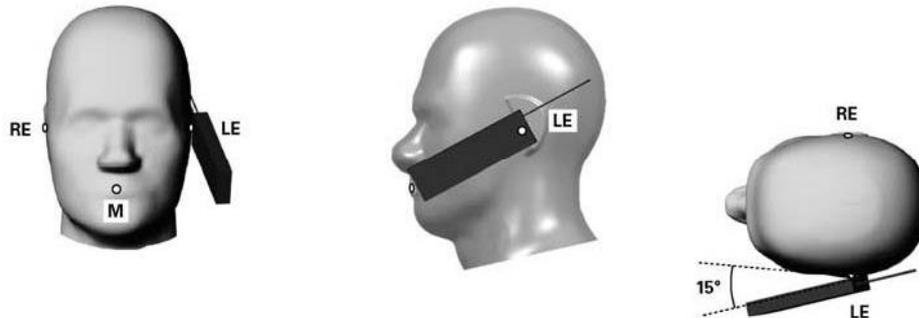


Fig 8.3 Illustration for Tilted Position

8.4 SAR Testing for Tablet

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 D01v05r01 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.

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 D demonstrates.
- (c) Set scan area, grid size and other setting on the DASY software.
- (d) Measure SAR results for the highest power channel on each testing position.
- (e) Find out the largest SAR result on these testing positions of each band
- (f) Measure SAR results for other channels in worst SAR testing position if the reported SAR of highest power channel is larger than 0.8 W/kg

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

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

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 from the measurement grid to the high-resolution grid
- (e) Extrapolation of the entire 3-D field distribution to the phantom surface over the distance from sensor to surface
- (f) Calculation of the averaged SAR within masses of 1g and 10g

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 & Zoom Scan Procedures

First Area Scan is used to locate the approximate location(s) of the local peak SAR value(s). The measurement grid within an Area Scan is defined by the grid extent, grid step size and grid offset. Next, in order to determine the EM field distribution in a three-dimensional spatial extension, Zoom Scan is required. The Zoom Scan is performed around the highest E-field value to determine the averaged SAR-distribution over 10 g. Area scan and zoom scan resolution setting follows KDB 865664 D01v01r01 quoted below.

When the 1-g SAR of the highest peak is within 2 dB of the SAR limit, additional zoom scans are required for other peaks within 2 dB of the highest peak that have not been included in any zoom scan to ensure there is no increase in SAR.

		≤ 3 GHz	> 3 GHz
Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface		5 ± 1 mm	$\frac{1}{2} \cdot \delta \cdot \ln(2) \pm 0.5$ mm
Maximum probe angle from probe axis to phantom surface normal at the measurement location		30° ± 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.	
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 1 st two points closest to phantom surface	≤ 4 mm 3 – 4 GHz: ≤ 3 mm 4 – 5 GHz: ≤ 2.5 mm 5 – 6 GHz: ≤ 2 mm
		$\Delta z_{Zoom}(n>1)$: between subsequent points	≤ 1.5 · $\Delta z_{Zoom}(n-1)$
Minimum zoom scan volume	x, y, z	≥ 30 mm	3 – 4 GHz: ≥ 28 mm 4 – 5 GHz: ≥ 25 mm 5 – 6 GHz: ≥ 22 mm
Note: δ is the penetration depth of a plane-wave at normal incidence to the tissue medium; see draft standard IEEE P1528-2011 for details. * When zoom scan is required and the <i>reported</i> SAR from the area scan based 1-g SAR estimation procedures of KDB 447498 is ≤ 1.4 W/kg, ≤ 8 mm, ≤ 7 mm and ≤ 5 mm zoom scan resolution may be applied, respectively, for 2 GHz to 3 GHz, 3 GHz to 4 GHz and 4 GHz to 6 GHz.			



9.4 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.

9.5 SAR Averaged Methods

In DASYS, the interpolation and extrapolation are both based on the modified Quadratic Shepard's method. The interpolation scheme combines a least-square fitted function method and a weighted average method which are the two basic types of computational interpolation and approximation.

Extrapolation routines are used to obtain SAR values between the lowest measurement points and the inner phantom surface. The extrapolation distance is determined by the surface detection distance and the probe sensor offset. The uncertainty increases with the extrapolation distance. To keep the uncertainty within 1% for the 1 g and 10 g cubes, the extrapolation distance should not be larger than 5 mm.

9.6 Power Drift Monitoring

All SAR testing is under the EUT install full charged battery and transmit maximum output power. In DASYS 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. Conducted RF Output Power (Unit: dBm)

<GSM Conducted Power>

Note:

1. Per KDB 447498 D01v05r01, the maximum output power channel is used for SAR testing and for further SAR test reduction.
2. For Head SAR testing, the EUT was set in GSM Voice full power mode for GSM850/GSM1900.
3. Following KDB 941225 D03v01, for Body SAR testing, the EUT operating without power back-off was set in GPRS (2 Tx slots) and the EUT operating with power back-off was set in GPRS (2 Tx slots) due to its highest frame-average power.

Full Power Mode (Proximity Sensor Inactive)

Band GSM850 TX Channel	Burst Average Power (dBm)			Tune-up Limit (dBm)	Frame-Average Power (dBm)			Tune-up Limit (dBm)
	128	189	251		128	189	251	
Frequency (MHz)	824.2	836.4	848.8		824.2	836.4	848.8	
GSM (GMSK, 1 Tx slot)	31.94	31.90	31.90	32.50	22.94	22.90	22.90	23.50
GPRS (GMSK, 1 Tx slot) – CS1	31.95	31.91	31.91	32.50	22.95	22.91	22.91	23.50
GPRS (GMSK, 2 Tx slots) – CS1	29.92	29.90	29.91	30.50	23.92	23.90	23.91	24.50
EDGE (GMSK, 1 Tx slot) – MCS1	31.90	31.88	31.88	32.50	22.90	22.88	22.88	23.50
EDGE (GMSK, 2 Tx slots) – MCS1	29.85	29.89	29.87	30.50	23.85	23.89	23.87	24.50
EDGE (8PSK, 1 Tx slot) – MCS5	26.10	26.06	26.00	26.50	17.10	17.06	17.00	17.50
EDGE (8PSK, 2 Tx slots) – MCS5	26.10	26.06	25.98	26.50	20.10	20.06	19.98	20.50

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
- Frame-averaged power = Maximum burst averaged power (3 Tx Slots) - 4.26 dB
- Frame-averaged power = Maximum burst averaged power (4 Tx Slots) - 3 dB

Reduced Power Mode (Proximity Sensor active)

Band GSM850 TX Channel	Burst Average Power (dBm)			Tune-up Limit (dBm)	Frame-Average Power (dBm)			Tune-up Limit (dBm)
	128	189	251		128	189	251	
Frequency (MHz)	824.2	836.4	848.8		824.2	836.4	848.8	
GSM (GMSK, 1 Tx slot)	28.80	28.78	28.79	29.00	19.80	19.78	19.79	20.00
GPRS (GMSK, 1 Tx slot) – CS1	28.82	28.79	28.81	29.00	19.82	19.79	19.81	20.00
GPRS (GMSK, 2 Tx slots) – CS1	26.95	26.93	26.94	27.50	20.95	20.93	20.94	21.50
EDGE (GMSK, 1 Tx slot) – MCS1	28.81	28.78	28.80	29.00	19.81	19.78	19.80	20.00
EDGE (GMSK, 2 Tx slots) – MCS1	26.94	26.91	26.93	27.50	20.94	20.91	20.93	21.50
EDGE (8PSK, 1 Tx slot) – MCS5	22.98	22.97	22.92	23.50	13.98	13.97	13.92	14.50
EDGE (8PSK, 2 Tx slots) – MCS5	22.98	22.96	22.88	23.50	16.98	16.96	16.88	17.50

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
- Frame-averaged power = Maximum burst averaged power (3 Tx Slots) - 4.26 dB
- Frame-averaged power = Maximum burst averaged power (4 Tx Slots) - 3 dB



Full Power Mode (Proximity Sensor Inactive)

Band GSM1900 TX Channel	Burst Average Power (dBm)			Tune-up Limit (dBm)	Frame-Average Power (dBm)			Tune-up Limit (dBm)
	512	661	810		512	661	810	
Frequency (MHz)	1850.2	1880	1909.8		1850.2	1880	1909.8	
GSM (GMSK, 1 Tx slot)	29.28	29.37	29.38	29.50	20.28	20.37	20.38	20.50
GPRS (GMSK, 1 Tx slot) – CS1	29.30	29.38	29.39	29.50	20.30	20.38	20.39	20.50
GPRS (GMSK, 2 Tx slots) – CS1	26.97	27.03	27.04	27.50	20.97	21.03	21.04	21.50
EDGE (GMSK, 1 Tx slot) – MCS1	29.26	29.35	29.36	29.50	20.26	20.35	20.36	20.50
EDGE (GMSK, 2 Tx slots) – MCS1	26.94	26.99	27.01	27.50	20.94	20.99	21.01	21.50
EDGE (8PSK, 1 Tx slot) – MCS5	25.43	25.45	25.50	26.00	16.43	16.45	16.50	17.00
EDGE (8PSK, 2 Tx slots) – MCS5	25.45	25.46	25.51	26.00	19.45	19.46	19.51	20.00

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
- Frame-averaged power = Maximum burst averaged power (3 Tx Slots) - 4.26 dB
- Frame-averaged power = Maximum burst averaged power (4 Tx Slots) - 3 dB

Reduced Power Mode (Proximity Sensor active)

Band GSM1900 TX Channel	Burst Average Power (dBm)			Tune-up Limit (dBm)	Frame-Average Power (dBm)			Tune-up Limit (dBm)
	512	661	810		512	661	810	
Frequency (MHz)	1850.2	1880	1909.8		1850.2	1880	1909.8	
GSM (GMSK, 1 Tx slot)	24.72	24.76	24.82	26.00	15.72	15.76	15.82	17.00
GPRS (GMSK, 1 Tx slot) – CS1	24.72	24.75	24.81	26.00	15.72	15.75	15.81	17.00
GPRS (GMSK, 2 Tx slots) – CS1	22.70	22.72	22.83	23.00	16.70	16.72	16.83	17.00
EDGE (GMSK, 1 Tx slot) – MCS1	24.70	24.75	24.79	26.00	15.70	15.75	15.79	17.00
EDGE (GMSK, 2 Tx slots) – MCS1	22.74	22.76	22.80	23.00	16.74	16.76	16.80	17.00
EDGE (8PSK, 1 Tx slot) – MCS5	21.15	21.14	21.18	23.00	12.15	12.14	12.18	14.00
EDGE (8PSK, 2 Tx slots) – MCS5	21.11	21.07	21.15	23.00	15.11	15.07	15.15	17.00

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
- Frame-averaged power = Maximum burst averaged power (3 Tx Slots) - 4.26 dB
- Frame-averaged power = Maximum burst averaged power (4 Tx Slots) - 3 dB

<WCDMA Conducted Power>

The following tests were conducted according to the test requirements outlines in 3GPP TS 34.121 specification.

A summary of these settings are illustrated below:

HSDPA Setup Configuration:

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

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

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

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

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

Note 3: CM = 1 for $\beta_c/\beta_d = 12/15, \beta_{HS}/\beta_c = 24/15$. For all other combinations of 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 $\beta_c = 11/15$ and $\beta_d = 15/15$.

Setup Configuration

HSUPA Setup Configuration:

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

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

Sub-test	β_c	β_d	β_d (SF)	β_c/β_d	β_{HS} (Note 1)	β_{ec}	β_{ed} (Note 5) (Note 6)	β_{ed} (SF)	β_{ed} (Codes)	CM (dB) (Note 2)	MPR (dB) (Note 2)	AG Index (Note 6)	E-TFCl
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	$\beta_{ed1}: 47/15$ $\beta_{ed2}: 47/15$	4	2	2.0	1.0	15	92
4	2/15	15/15	64	2/15	4/15	2/15	56/75	4	1	3.0	2.0	17	71
5	15/15 (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: $\Delta_{ACK}, \Delta_{NACK}$ and $\Delta_{CQI} = 30/15$ with $\beta_{hs} = 30/15 * \beta_c$.

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

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

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

Note 5: 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

DC-HSDPA 3GPP release 8 Setup Configuration:

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

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

C.8.1.12 Fixed Reference Channel Definition H-Set 12

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

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

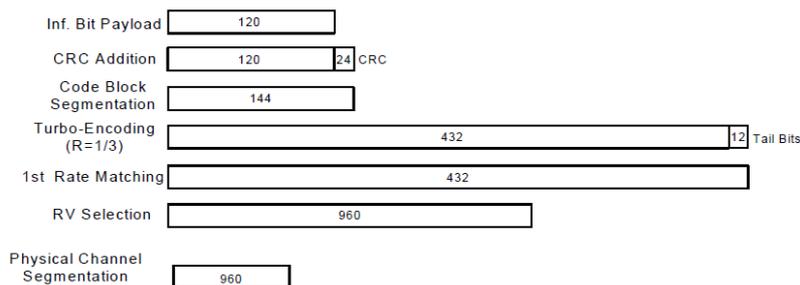


Figure C.8.19: Coding rate for Fixed reference Channel H-Set 12 (QPSK)

Setup Configuration



<WCDMA Conducted Power>

Note:

- Per KDB 941225 D02v02r02, RMC 12.2kbps setting is used to evaluate SAR. If HSDPA/HSUPA/DC-HSDPA output power is < 0.25dB higher than RMC12.2Kbps, or reported SAR with RMC 12.2kbps setting is ≤ 1.2W/kg, HSDPA/HSUPA/DC-HSDPA SAR evaluation can be excluded.

Full Power Mode (Proximity Sensor Inactive)

Band			WCDMA V			Tune-up Limit (dBm)	WCDMA II			Tune-up Limit (dBm)	WCDMA IV			Tune-up Limit (dBm)
TX Channel			4132	4182	4233		9262	9400	9538		1312	1413	1513	
Rx Channel			4357	4407	4458	9662	9800	9938	1537	1638	1738			
Frequency (MHz)			826.4	836.4	846.6	1852.4	1880	1907.6	1712.4	1732.6	1752.6			
MPR (dB)	3GPP Rel 99	AMR 12.2Kbps	23.59	23.60	23.69	24.00	23.24	23.10	23.26	24.00	23.19	23.48	23.51	24.00
	3GPP Rel 99	RMC 12.2Kbps	23.60	23.62	23.72	24.00	23.23	23.08	23.03	24.00	23.21	23.49	23.53	24.00
0	3GPP Rel 6	HSDPA Subtest-1	23.58	23.61	23.71	24.00	23.17	23.11	23.10	24.00	23.18	23.48	23.50	24.00
0	3GPP Rel 6	HSDPA Subtest-2	23.57	23.59	23.71	24.00	22.65	22.61	22.54	24.00	23.19	23.48	23.51	24.00
0.5	3GPP Rel 6	HSDPA Subtest-3	22.68	22.58	22.62	23.50	22.62	22.54	22.52	23.50	22.24	22.45	22.46	23.50
0.5	3GPP Rel 6	HSDPA Subtest-4	22.56	22.45	22.55	23.50	22.79	22.69	22.63	23.50	22.12	22.31	22.35	23.50
0	3GPP Rel 8	DC-HSDPA Subtest-1	23.57	23.62	23.71	24.00	23.05	22.99	22.98	24.00	23.18	23.47	23.48	24.00
0	3GPP Rel 8	DC-HSDPA Subtest-2	23.58	23.62	23.70	24.00	22.53	22.49	22.42	24.00	23.20	23.48	23.49	24.00
0.5	3GPP Rel 8	DC-HSDPA Subtest-3	23.07	23.09	23.24	23.50	22.50	22.42	22.40	23.50	22.75	22.97	23.02	23.50
0.5	3GPP Rel 8	DC-HSDPA Subtest-4	23.09	23.12	23.26	23.50	22.67	22.57	22.51	23.50	22.76	22.97	23.04	23.50
0	3GPP Rel 6	HSUPA Subtest-1	22.65	22.68	22.71	24.00	22.88	22.77	22.64	24.00	22.26	22.51	22.53	24.00
2	3GPP Rel 6	HSUPA Subtest-2	20.83	20.85	20.90	22.00	21.36	21.22	21.18	22.00	20.47	20.71	20.72	22.00
1	3GPP Rel 6	HSUPA Subtest-3	21.88	21.91	21.95	23.00	21.84	21.66	21.58	23.00	21.52	21.70	21.73	23.00
2	3GPP Rel 6	HSUPA Subtest-4	21.14	21.15	21.18	22.00	21.11	21.07	21.01	22.00	20.78	20.96	21.00	22.00
0	3GPP Rel 6	HSUPA Subtest-5	23.06	23.07	23.19	24.00	22.70	22.74	22.78	24.00	22.63	23.00	23.03	24.00

Reduced Power Mode (Proximity Sensor active)

Band			WCDMA V			Tune-up Limit (dBm)	WCDMA II			Tune-up Limit (dBm)	WCDMA IV			Tune-up Limit (dBm)
TX Channel			4132	4182	4233		9262	9400	9538		1312	1413	1513	
Rx Channel			4357	4407	4458	9662	9800	9938	1537	1638	1738			
Frequency (MHz)			826.4	836.4	846.6	1852.4	1880	1907.6	1712.4	1732.6	1752.6			
MPR (dB)	3GPP Rel 99	AMR 12.2Kbps	20.51	20.60	20.66	21.00	17.13	17.11	17.21	17.50	17.78	17.96	17.92	18.00
	3GPP Rel 99	RMC 12.2Kbps	20.52	20.63	20.68	21.00	17.14	17.18	17.26	17.50	17.71	17.98	17.93	18.00
0	3GPP Rel 6	HSDPA Subtest-1	20.49	20.59	20.63	21.00	17.12	17.18	17.18	17.50	17.67	17.94	17.88	18.00
0	3GPP Rel 6	HSDPA Subtest-2	20.44	20.50	20.65	21.00	17.13	17.17	17.20	17.50	17.67	17.95	17.96	18.00
0.5	3GPP Rel 6	HSDPA Subtest-3	20.45	20.50	20.64	21.00	17.12	17.20	17.19	17.50	17.62	17.92	17.94	18.00
0.5	3GPP Rel 6	HSDPA Subtest-4	20.44	20.52	20.62	21.00	17.10	17.17	17.16	17.50	17.64	17.93	17.95	18.00
0	3GPP Rel 8	DC-HSDPA Subtest-1	20.48	20.56	20.63	21.00	17.11	17.16	17.18	17.50	17.65	17.93	17.86	18.00
0	3GPP Rel 8	DC-HSDPA Subtest-2	20.42	20.49	20.64	21.00	17.11	17.16	17.18	17.50	17.66	17.93	17.95	18.00
0.5	3GPP Rel 8	DC-HSDPA Subtest-3	20.43	20.49	20.64	21.00	17.12	17.18	17.18	17.50	17.62	17.90	17.92	18.00
0.5	3GPP Rel 8	DC-HSDPA Subtest-4	20.43	20.50	20.60	21.00	17.10	17.15	17.16	17.50	17.64	17.92	17.94	18.00
0	3GPP Rel 6	HSUPA Subtest-1	19.77	19.82	19.90	21.00	16.50	16.56	16.51	17.50	16.97	17.21	17.27	18.00
2	3GPP Rel 6	HSUPA Subtest-2	20.11	20.12	20.15	21.00	16.34	16.37	16.41	17.50	17.23	17.47	17.53	18.00
1	3GPP Rel 6	HSUPA Subtest-3	19.72	19.74	19.77	20.00	16.37	16.46	16.39	16.50	16.89	16.92	16.94	17.00
2	3GPP Rel 6	HSUPA Subtest-4	19.88	19.91	19.93	20.00	16.34	16.44	16.36	16.50	16.63	16.46	16.56	17.00
0	3GPP Rel 6	HSUPA Subtest-5	20.43	20.48	20.54	21.00	17.09	17.14	17.14	17.50	17.61	17.89	17.94	18.00



<WLAN 2.4GHz Conducted Power>

WLAN 2.4GHz 802.11b Average Power (dBm)							Tune up Limit (dBm)
Power vs. Channel			Power vs. Data Rate				
Channel	Frequency (MHz)	Data Rate 1Mbps	Channel	2Mbps	5.5Mbps	11Mbps	
CH 1	2412	13.17	CH 11	13.61	13.62	13.65	13.5
CH 6	2437	13.58					14.0
CH 11	2462	13.66					14.0

WLAN 2.4GHz 802.11g Average Power (dBm)											Tune up Limit (dBm)
Power vs. Channel			Power vs. Data Rate								
Channel	Frequency (MHz)	Data Rate 6Mbps	Channel	9Mbps	12Mbps	18Mbps	24Mbps	36Mbps	48Mbps	54Mbps	
CH 1	2412	11.79	CH 11	12.03	12.10	11.86	11.99	12.11	12.15	12.09	13.0
CH 6	2437	11.88									13.0
CH 11	2462	12.17									13.0

WLAN 2.4GHz 802.11n-HT20 Average Power (dBm)											Tune up Limit (dBm)
Power vs. Channel			Power vs. MCS Index								
Channel	Frequency (MHz)	MCS Index MCS0	Channel	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7	
CH 1	2412	10.64	CH 11	11.00	10.97	10.97	11.05	11.02	10.97	10.96	12.0
CH 6	2437	10.71									12.0
CH 11	2462	11.06									12.0

WLAN 2.4GHz 802.11n-HT40 Average Power (dBm)											Tune up Limit (dBm)
Power vs. Channel			Power vs. MCS Index								
Channel	Frequency (MHz)	MCS Index MCS0	Channel	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7	
CH 3	2422	11.21	CH 9	11.51	11.52	11.46	11.41	11.62	11.53	11.50	12.0
CH 6	2437	11.34									12.0
CH 9	2452	11.56									12.0

Note:

1. Per KDB 248227 D01 v01r02, choose the highest output power channel to test SAR and determine further SAR exclusion
2. For each frequency band, testing at higher data rates and higher order modulations is not required when the maximum average output power for each of these configurations is less than 1/4dB higher than those measured at the lowest data rate
3. Apply the test exclusion rule in KDB 248227 D01 v01r02 11g, 11n-HT20 and HT40 output power is less than 1/4dB higher than 11b mode, thus the SAR can be excluded.



<Bluetooth Conducted Power>

Bluetooth average power (dBm)			
Mode	GFSK	$\pi/4$ -DQPSK	8-DPSK
Measured Power	9.13	6.36	6.32
Tune Up Limit	9.5	8	8

Note:

1. Per KDB 447498 D01v05r01, 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:

$[(\text{max. power of channel, including tune-up tolerance, mW}) / (\text{min. test separation distance, mm})] \cdot [\sqrt{f(\text{GHz})}] \leq 3.0$ 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)	Test Distance (mm)	Frequency (GHz)	exclusion thresholds
9.5	9.00	5	2.83

2. Per KDB 447498 D01v05r01 exclusion thresholds is $2.83 < 3$, RF exposure evaluation is not required.



<WLAN 5GHz Conducted Power>

WLAN 5GHz 802.11a Average Power (dBm)											Tune up Limit (dBm)
Power vs. Channel			Power vs. Data Rate								
Channel	Frequency (MHz)	Data Rate 6Mbps	Channel	9Mbps	12Mbps	18Mbps	24Mbps	36Mbps	48Mbps	54Mbps	
CH 36	5180	8.28	CH 44	8.36	8.43	8.44	8.47	8.49	8.51	8.43	9.0
CH 40	5200	8.49									9.0
CH 44	5220	8.52									9.0
CH 48	5240	8.35									9.0
CH 52	5260	8.41	CH 64	9.06	8.91	8.99	9.06	9.05	8.94	8.85	9.0
CH 56	5280	8.82									9.0
CH 60	5300	8.88									9.0
CH 64	5320	9.09									9.5
CH 100	5500	10.75	CH 100	10.74	10.70	10.74	10.69	10.74	10.73	10.74	11.0
CH 104	5520	10.63									11.0
CH 108	5540	10.58									11.0
CH 112	5560	10.65									11.0
CH 116	5580	10.60									11.0
CH 132	5660	10.38									10.5
CH 136	5680	10.30									10.5
CH 140	5700	10.33									10.5
CH 149	5745	10.25	CH 149	10.24	10.20	10.22	10.23	10.23	10.24	10.21	10.5
CH 153	5765	9.12									10.5
CH 157	5785	10.20									10.5
CH 161	5805	9.11									10.5
CH 165	5825	9.98									10.5

WLAN 5GHz 802.11n-HT20 Average Power (dBm)											Tune up Limit (dBm)
Power vs. Channel			Power vs. MCS Index								
Channel	Frequency (MHz)	MCS Index MCS0	Channel	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7	
CH 36	5180	8.14	CH 44	8.43	8.41	8.37	8.42	8.43	8.34	8.41	9.0
CH 40	5200	8.51									9.0
CH 44	5220	8.53									9.0
CH 48	5240	8.39									9.0
CH 52	5260	8.44	CH 64	8.96	8.94	8.91	8.83	8.86	8.89	8.95	9.0
CH 56	5280	8.81									9.0
CH 60	5300	8.91									9.0
CH 64	5320	8.99									9.5
CH 100	5500	10.64	CH 100	10.58	10.62	10.56	10.60	10.53	10.52	10.62	11.0
CH 104	5520	10.57									11.0
CH 108	5540	10.56									11.0
CH 112	5560	10.54									11.0
CH 116	5580	10.58									11.0
CH 132	5660	10.45									10.5
CH 136	5680	10.31									10.5
CH 140	5700	10.23									10.5
CH 149	5745	10.11	CH 149	10.01	10.05	9.96	10.07	10.01	9.97	10.10	10.5
CH 153	5765	9.93									10.5
CH 157	5785	9.82									10.5
CH 161	5805	9.92									10.5
CH 165	5825	9.92									10.5

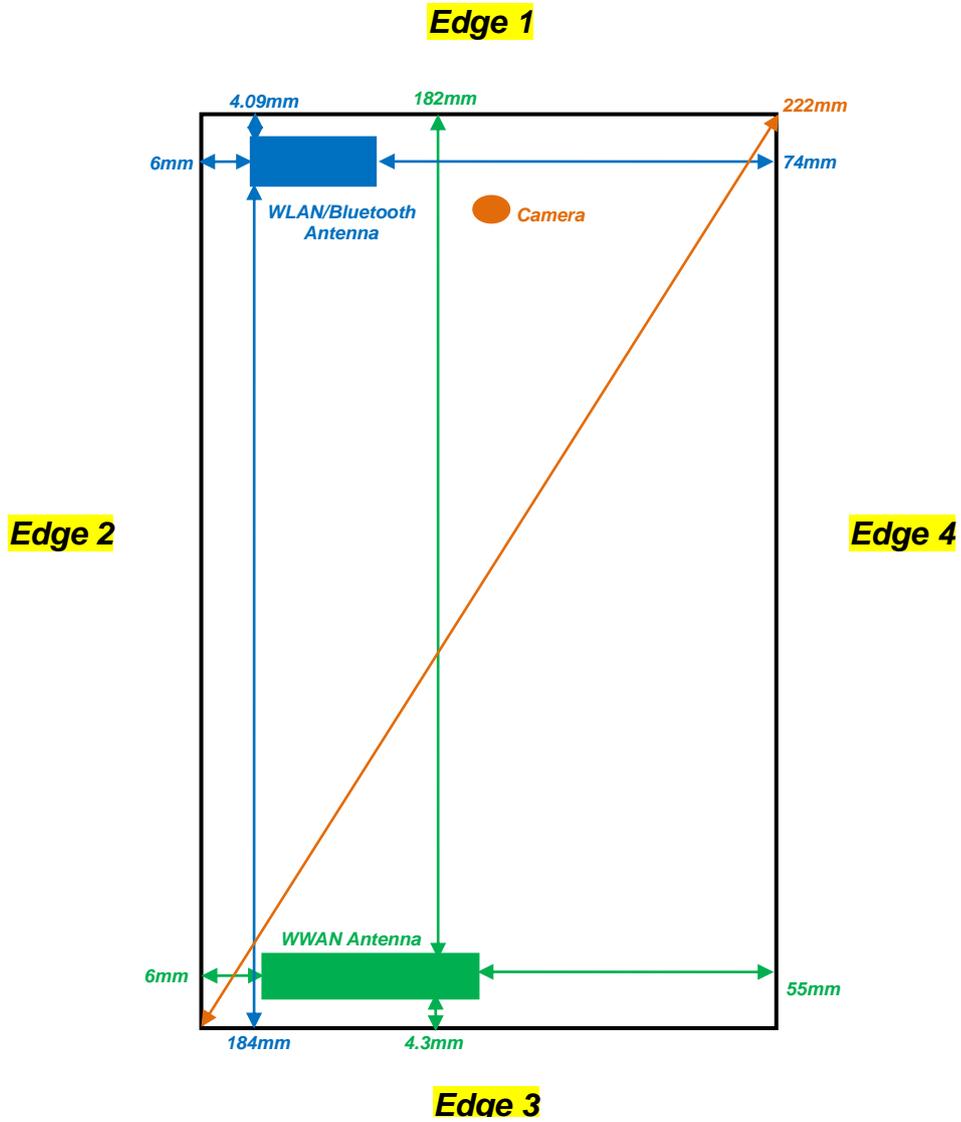


WLAN 5GHz 802.11n-HT40 Average Power (dBm)											Tune up Limit (dBm)
Power vs. Channel			Power vs. MCS Index								
Channel	Frequency (MHz)	MCS Index MCS0	Channel	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7	
CH 38	5190	8.71	CH 38	8.66	8.56	8.61	8.61	8.56	8.65	8.54	9.0
CH 46	5230	8.69									9.0
CH 54	5270	9.06	CH 62	9.09	9.17	9.18	9.01	9.11	9.17	9.11	9.5
CH 62	5310	9.19									9.5
CH 102	5510	10.91	CH 102	10.89	10.89	10.85	10.73	10.86	10.82	10.79	11.0
CH 110	5550	10.90									11.0
CH 134	5670	10.65									11.0
CH 151	5755	10.45	CH 151	10.41	10.34	10.41	10.48	10.40	10.42	10.39	10.5
CH 159	5795	10.30									10.5

Note:

1. Per KDB 248227 D01 v01r02, choose the highest output power channel to test SAR and determine further SAR exclusion
2. For each frequency band, testing at higher data rates and higher order modulations is not required when the maximum average output power for each of these configurations is less than 1/4dB higher than those measured at the lowest data rate.
3. Apply the test exclusion rule in KDB 248227 D01 v01r02, 11n-HT20 and HT40 output power is less than 1/4dB higher than 802.11a mode, thus the SAR can be excluded.

11. Antenna Location





<SAR test exclusion table>

Exposure Position	Wireless Interface	WWAN					WLAN	
		GPRS850 Class 10	GPRS1900 Class 10	WCDMA Band V	WCDMA Band IV	WCDMA Band II	802.11b	802.11a
	Maximum power	24.5	21.5	24	24	24	17	11
	Maximum rated power(mW)	281.84	141.25	251.19	251.19	251.19	50.12	12.59
Bottom Face	Antenna to user (mm)	5					5	
	SAR exclusion threshold	51.91	39.03	46.21	66.46	69.38	15.73	6.08
	SAR testing required?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Edge 1	Antenna to user (mm)	182					5	
	SAR exclusion threshold	909.13	1428.56	907.56	1433.39	1428.62	15.73	6.08
	SAR testing required?	No	No	No	No	No	Yes	Yes
Edge 2	Antenna to user (mm)	6					6	
	SAR exclusion threshold	43.26	32.53	38.51	55.38	57.81	13.11	5.06
	SAR testing required?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Edge 3	Antenna to user (mm)	5					184	
	SAR exclusion threshold	51.91	39.03	46.21	66.46	69.38	1435.6	1402.15
	SAR testing required?	Yes	Yes	Yes	Yes	Yes	No	No
Edge 4	Antenna to user (mm)	55					74	
	SAR exclusion threshold	191.16	158.56	191.28	163.39	158.62	335.6	302.15
	SAR testing required?	Yes	No	Yes	Yes	Yes	No	No

Note:

- Maximum power is the source-based time-average power and represents the maximum RF output power among production units
- Per KDB 447498 D01v05r01, for larger devices, the test separation distance of adjacent edge configuration is determined by the closest separation between the antenna and the user.
- Per KDB 447498 D01v05r01, standalone SAR test exclusion threshold is applied; If the distance of the antenna to the user is < 5mm, 5mm is used to determine SAR exclusion threshold
- Per KDB 447498 D01v05r01, 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:

$$[(max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)] \cdot [\sqrt{f(GHz)}] \leq 3.0$$
 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 $[3.0] / [\sqrt{f(GHz)}] \cdot [(min. test separation distance, mm)] =$ exclusion threshold of mW.
- Per KDB 447498 D01v05r01, at 100 MHz to 6 GHz and for *test separation distances* > 50 mm, the SAR test exclusion threshold is determined according to the following
 - [Threshold at 50 mm in step 1) + (test separation distance - 50 mm)·(f(MHz)/150)] mW, at 100 MHz to 1500 MHz
 - [Threshold at 50 mm in step 1) + (test separation distance - 50 mm)·10] mW at > 1500 MHz and ≤ 6 GHz

12. SAR Test Results

Note:

1. Per KDB 447498 D01v05r01, the reported SAR is the measured SAR value adjusted for maximum tune-up tolerance.
 - a. Tune-up scaling Factor = tune-up limit power (mW) / EUT RF power (mW), where tune-up limit is the maximum rated power among all production units.
 - b. For SAR testing of WLAN signal with non-100% duty cycle, the measured SAR is scaled-up by the duty cycle scaling factor which is equal to "1/(duty cycle)"
 - c. For WWAN: Reported SAR(W/kg)= Measured SAR(W/kg)*Tune-up Scaling Factor
 - d. For WLAN: Reported SAR(W/kg)= Measured SAR(W/kg)* Duty Cycle scaling factor * Tune-up scaling factor
2. Per KDB 447498 D01v05r01, 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. Considering the curvature transition from bottom face to the edge, SAR testing at the curvature was performed. The SAR test setup is included in test setup photo exhibit, and the details of the curvature are included in operation description exhibit.
4. For the exposure positions that proximity sensor power reduction is applied for SAR compliance, additional SAR testing with EUT transmitting full power mode was performed; 0.9cm for bottom face, 0.5cm for edge2, 0.8cm for edge3
5. Per KDB 616217 D04v01r01, the additional separation introduced by the contour against a flat phantom is < 5 mm and reported SAR is < 1.2 W/kg, a curved or contoured back surface or edge SAR is not required, more detail information please refer to the setup photo.
6. Per KDB 941225 D02v02r02, RMC 12.2kbps setting is used to evaluate SAR. If HSDPA/HSUPA/DC-HSDPA output power is < 0.25dB higher than RMC12.2Kbps, or reported SAR with RMC 12.2kbps setting is ≤ 1.2W/kg, HSDPA/HSUPA/DC-HSDPA SAR evaluation can be excluded.

12.1 Head SAR

<GSM 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)
	GSM850	GSM Voice	Right Cheek	128	824.2	31.94	32.5	1.138	0.01	0.081	0.092
	GSM850	GSM Voice	Right Tilted	128	824.2	31.94	32.5	1.138	0.08	0.070	0.080
01	GSM850	GSM Voice	Left Cheek	128	824.2	31.94	32.5	1.138	0.02	0.093	0.106
	GSM850	GSM Voice	Left Tilted	128	824.2	31.94	32.5	1.138	0	0.064	0.073
02	GSM1900	GSM Voice	Right Cheek	810	1909.8	29.38	29.5	1.028	0.09	0.152	0.156
	GSM1900	GSM Voice	Right Tilted	810	1909.8	29.38	29.5	1.028	0.01	0.057	0.059
	GSM1900	GSM Voice	Left Cheek	810	1909.8	29.38	29.5	1.028	-0.08	0.090	0.093
	GSM1900	GSM Voice	Left Tilted	810	1909.8	29.38	29.5	1.028	0.15	0.072	0.074



<WCDMA 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)
	WCDMA V	RMC 12.2Kbps	Right Cheek	4233	846.6	23.72	24.0	1.067	0.06	0.087	0.093
	WCDMA V	RMC 12.2Kbps	Right Tilted	4233	846.6	23.72	24.0	1.067	-0.01	0.076	0.081
03	WCDMA V	RMC 12.2Kbps	Left Cheek	4233	846.6	23.72	24.0	1.067	-0.03	0.105	0.112
	WCDMA V	RMC 12.2Kbps	Left Tilted	4233	846.6	23.72	24.0	1.067	-0.01	0.077	0.082
04	WCDMA IV	RMC 12.2Kbps	Right Cheek	1513	1752.6	23.53	24.0	1.114	0.03	0.195	0.217
	WCDMA IV	RMC 12.2Kbps	Right Tilted	1513	1752.6	23.53	24.0	1.114	0.01	0.077	0.086
	WCDMA IV	RMC 12.2Kbps	Left Cheek	1513	1752.6	23.53	24.0	1.114	-0.08	0.084	0.094
	WCDMA IV	RMC 12.2Kbps	Left Tilted	1513	1752.6	23.53	24.0	1.114	0.15	0.068	0.076
05	WCDMA II	RMC 12.2Kbps	Right Cheek	9538	1907.6	23.03	24.0	1.250	0.09	0.306	0.383
	WCDMA II	RMC 12.2Kbps	Right Tilted	9538	1907.6	23.03	24.0	1.250	0.03	0.126	0.158
	WCDMA II	RMC 12.2Kbps	Left Cheek	9538	1907.6	23.03	24.0	1.250	0.03	0.187	0.234
	WCDMA II	RMC 12.2Kbps	Left Tilted	9538	1907.6	23.03	24.0	1.250	0.07	0.157	0.196

<WLAN SAR-DTS>

Plot No.	Band	Mode	Test Position	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	WLAN2.4GMHz	802.11b 1Mbps	Right Cheek	11	2462	13.66	14.0	1.081	96.79	1.033	0.13	0.426	0.476
	WLAN2.4GMHz	802.11b 1Mbps	Right Tilted	11	2462	13.66	14.0	1.081	96.79	1.033	0.13	0.264	0.295
06	WLAN2.4GMHz	802.11b 1Mbps	Left Cheek	11	2462	13.66	14.0	1.081	96.79	1.033	0	0.824	0.920
	WLAN2.4GMHz	802.11b 1Mbps	Left Cheek	1	2412	13.17	13.5	1.079	96.79	1.033	-0.01	0.594	0.662
	WLAN2.4GMHz	802.11b 1Mbps	Left Cheek	6	2437	13.58	14.0	1.101	96.79	1.033	0.07	0.675	0.768
	WLAN2.4GMHz	802.11b 1Mbps	Left Tilted	11	2462	13.66	14.0	1.081	96.79	1.033	0.06	0.377	0.421
	WLAN5GMHz	802.11a 6Mbps	Right Cheek	149	5745	10.25	10.5	1.058	82.35	1.214	-0.03	0.234	0.301
	WLAN5GMHz	802.11a 6Mbps	Right Tilted	149	5745	10.25	10.5	1.058	82.35	1.214	-0.01	0.231	0.297
07	WLAN5GMHz	802.11a 6Mbps	Left Cheek	149	5745	10.25	10.5	1.058	82.35	1.214	0.1	0.412	0.529
	WLAN5GMHz	802.11a 6Mbps	Left Tilted	149	5745	10.25	10.5	1.058	82.35	1.214	0.08	0.287	0.369



<WLAN SAR-NII>

Plot No.	Band	Mode	Test Position	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	WLAN5GMHz	802.11a 6Mbps	Right Cheek	44	5220	8.52	9.0	1.117	82.35	1.214	0.04	0.447	0.606
	WLAN5GMHz	802.11a 6Mbps	Right Tilted	44	5220	8.52	9.0	1.117	82.35	1.214	0.02	0.410	0.556
08	WLAN5GMHz	802.11a 6Mbps	Left Cheek	44	5220	8.52	9.0	1.117	82.35	1.214	0.08	0.606	0.822
	WLAN5GMHz	802.11a 6Mbps	Left Tilted	44	5220	8.52	9.0	1.117	82.35	1.214	0.18	0.460	0.624
	WLAN5GMHz	802.11a 6Mbps	Left Cheek	40	5200	8.49	9.0	1.125	82.35	1.214	0.14	0.570	0.778
	WLAN5GMHz	802.11a 6Mbps	Right Cheek	64	5320	9.09	9.5	1.099	82.35	1.214	0.05	0.503	0.671
	WLAN5GMHz	802.11a 6Mbps	Right Tilted	64	5320	9.09	9.5	1.099	82.35	1.214	0.05	0.453	0.604
09	WLAN5GMHz	802.11a 6Mbps	Left Cheek	64	5320	9.09	9.5	1.099	82.35	1.214	0.07	0.784	1.046
	WLAN5GMHz	802.11a 6Mbps	Left Cheek	56	5280	8.82	9.0	1.042	82.35	1.214	0.11	0.692	0.876
	WLAN5GMHz	802.11a 6Mbps	Left Tilted	64	5320	9.09	9.5	1.099	82.35	1.214	0.1	0.580	0.774
	WLAN5GMHz	802.11a 6Mbps	Right Cheek	100	5500	10.75	11.0	1.059	82.35	1.214	-0.14	0.382	0.491
	WLAN5GMHz	802.11a 6Mbps	Right Cheek	112	5560	10.65	11.0	1.084	82.35	1.214	-0.18	0.392	0.516
	WLAN5GMHz	802.11a 6Mbps	Right Cheek	132	5660	10.38	10.5	1.028	82.35	1.214	-0.13	0.334	0.417
	WLAN5GMHz	802.11a 6Mbps	Right Tilted	100	5500	10.75	11.0	1.059	82.35	1.214	-0.04	0.373	0.480
	WLAN5GMHz	802.11a 6Mbps	Right Tilted	112	5560	10.65	11.0	1.084	82.35	1.214	-0.04	0.373	0.491
	WLAN5GMHz	802.11a 6Mbps	Right Tilted	132	5660	10.38	10.5	1.028	82.35	1.214	-0.12	0.317	0.396
	WLAN5GMHz	802.11a 6Mbps	Left Cheek	100	5500	10.75	11.0	1.059	82.35	1.214	-0.16	0.611	0.786
10	WLAN5GMHz	802.11a 6Mbps	Left Cheek	112	5560	10.65	11.0	1.084	82.35	1.214	0.09	0.630	0.829
	WLAN5GMHz	802.11a 6Mbps	Left Cheek	132	5660	10.38	10.5	1.028	82.35	1.214	0.17	0.516	0.644
	WLAN5GMHz	802.11a 6Mbps	Left Tilted	100	5500	10.75	11.0	1.059	82.35	1.214	0.11	0.482	0.620
	WLAN5GMHz	802.11a 6Mbps	Left Tilted	112	5560	10.65	11.0	1.084	82.35	1.214	0.1	0.473	0.622
	WLAN5GMHz	802.11a 6Mbps	Left Tilted	132	5660	10.38	10.5	1.028	82.35	1.214	0.17	0.389	0.485

12.2 Body SAR

<GSM SAR>

Plot No.	Band	Mode	Test Position	Gap (cm)	Ch.	Freq. (MHz)	Power Back-off	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	GSM850	GPRS (2 Tx slots)	Bottom Face	0.9cm	128	824.2	OFF	29.92	30.5	1.143	0.013	0.174	0.199
	GSM850	GPRS (2 Tx slots)	Edge 2	0.5cm	128	824.2	OFF	29.92	30.5	1.143	-0.011	0.083	0.095
	GSM850	GPRS (2 Tx slots)	Edge 3	0.8cm	128	824.2	OFF	29.92	30.5	1.143	-0.068	0.207	0.237
	GSM850	GPRS (2 Tx slots)	Edge 4	0cm	128	824.2	OFF	29.92	30.5	1.143	0.06	0.097	0.111
	GSM850	GPRS (2 Tx slots)	Bottom Face	0cm	128	824.2	ON	26.95	27.5	1.135	0.04	0.472	0.536
	GSM850	GPRS (2 Tx slots)	Edge 2	0cm	128	824.2	ON	26.95	27.5	1.135	0.08	0.096	0.109
11	GSM850	GPRS (2 Tx slots)	Edge 3	0cm	128	824.2	ON	26.95	27.5	1.135	0.04	0.489	0.555
	GSM1900	GPRS (2 Tx slots)	Bottom Face	0.9cm	810	1909.8	OFF	27.04	27.5	1.112	-0.021	0.471	0.524
	GSM1900	GPRS (2 Tx slots)	Edge 2	0.5cm	810	1909.8	OFF	27.04	27.5	1.112	-0.067	0.273	0.304
	GSM1900	GPRS (2 Tx slots)	Edge 3	0.8cm	810	1909.8	OFF	27.04	27.5	1.112	-0.024	0.302	0.336
12	GSM1900	GPRS (2 Tx slots)	Bottom Face	0cm	810	1909.8	ON	22.83	23.0	1.040	0.071	1.070	1.113
	GSM1900	GPRS (2 Tx slots)	Bottom Face	0cm	810	1909.8	ON	22.83	23.0	1.040	-0.151	0.952	0.990
	GSM1900	GPRS (2 Tx slots)	Bottom Face	0cm	512	1850.2	ON	22.70	23.0	1.072	0.092	0.674	0.722
	GSM1900	GPRS (2 Tx slots)	Bottom Face	0cm	661	1880	ON	22.72	23.0	1.067	0.125	0.788	0.840
	GSM1900	GPRS (2 Tx slots)	Edge 2	0cm	810	1909.8	ON	22.83	23.0	1.040	0.157	0.305	0.317
	GSM1900	GPRS (2 Tx slots)	Edge 3	0cm	810	1909.8	ON	22.83	23.0	1.040	-0.097	0.506	0.526



<WCDMA SAR>

Plot No.	Band	Mode	Test Position	Gap (cm)	Ch.	Freq. (MHz)	Power Back-off	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	WCDMA V	RMC 12.2Kbps	Bottom Face	0.9cm	4233	846.6	OFF	23.72	24.0	1.067	0.036	0.214	0.228
	WCDMA V	RMC12.2Kbps	Edge 2	0.5cm	4233	846.6	OFF	23.72	24.0	1.067	-0.043	0.092	0.098
	WCDMA V	RMC12.2Kbps	Edge 3	0.8cm	4233	846.6	OFF	23.72	24.0	1.067	-0.043	0.225	0.240
	WCDMA V	RMC12.2Kbps	Edge 4	0cm	4233	846.6	OFF	23.72	24.0	1.067	-0.02	0.111	0.118
	WCDMA V	RMC 12.2Kbps	Bottom Face	0cm	4233	846.6	ON	20.68	21.0	1.076	0.06	0.526	0.566
	WCDMA V	RMC12.2Kbps	Edge 2	0cm	4233	846.6	ON	20.68	21.0	1.076	-0.04	0.128	0.138
13	WCDMA V	RMC12.2Kbps	Edge 3	0cm	4233	846.6	ON	20.68	21.0	1.076	0	0.527	0.567
	WCDMA IV	RMC 12.2Kbps	Bottom Face	0.9cm	1513	1752.6	OFF	23.53	24.0	1.114	0.108	0.644	0.718
	WCDMA IV	RMC 12.2Kbps	Edge 2	0.5cm	1513	1752.6	OFF	23.53	24.0	1.114	-0.02	0.416	0.464
	WCDMA IV	RMC 12.2Kbps	Edge 3	0.8cm	1513	1752.6	OFF	23.53	24.0	1.114	-0.057	0.202	0.225
	WCDMA IV	RMC 12.2Kbps	Edge 4	0cm	1513	1752.6	OFF	23.53	24.0	1.114	0.007	0.030	0.033
	WCDMA IV	RMC 12.2Kbps	Bottom Face	0cm	1413	1732.6	ON	17.98	18.0	1.005	0.17	1.030	1.035
14	WCDMA IV	RMC 12.2Kbps	Bottom Face	0cm	1312	1712.4	ON	17.71	18.0	1.069	0.166	1.050	1.123
	WCDMA IV	RMC 12.2Kbps	Bottom Face	0cm	1513	1752.6	ON	17.93	18.0	1.016	0.173	1.060	1.077
	WCDMA IV	RMC 12.2Kbps	Edge 2	0cm	1413	1732.6	ON	17.98	18.0	1.005	-0.152	0.292	0.293
	WCDMA IV	RMC 12.2Kbps	Edge 3	0cm	1413	1732.6	ON	17.98	18.0	1.005	0.154	0.319	0.320
15	WCDMA II	RMC 12.2Kbps	Bottom Face	0.9cm	9538	1907.6	OFF	23.24	24.0	1.191	-0.03	1.000	1.191
	WCDMA II	RMC 12.2Kbps	Bottom Face	0.9cm	9262	1852.4	OFF	23.24	24.0	1.191	0.002	0.899	1.071
	WCDMA II	RMC 12.2Kbps	Bottom Face	0.9cm	9400	1880	OFF	23.24	24.0	1.191	0.001	0.924	1.101
	WCDMA II	RMC 12.2Kbps	Edge 2	0.5cm	9538	1907.6	OFF	23.24	24.0	1.191	0.048	0.084	0.100
	WCDMA II	RMC 12.2Kbps	Edge 3	0.8cm	9538	1907.6	OFF	23.24	24.0	1.191	0.031	0.535	0.637
	WCDMA II	RMC 12.2Kbps	Edge 4	0cm	9538	1907.6	OFF	23.24	24.0	1.191	-0.011	0.031	0.037
	WCDMA II	RMC 12.2Kbps	Bottom Face	0cm	9538	1907.6	ON	17.26	17.5	1.057	-0.052	0.991	1.047
	WCDMA II	RMC 12.2Kbps	Bottom Face	0cm	9262	1852.4	ON	17.14	17.5	1.086	-0.015	0.763	0.829
	WCDMA II	RMC 12.2Kbps	Bottom Face	0cm	9400	1880	ON	17.18	17.5	1.076	-0.06	0.870	0.937
	WCDMA II	RMC 12.2Kbps	Edge 2	0cm	9538	1907.6	ON	17.26	17.5	1.057	0.044	0.343	0.362
	WCDMA II	RMC 12.2Kbps	Edge 3	0cm	9538	1907.6	ON	17.26	17.5	1.057	0.025	0.570	0.602

<WLAN SAR-DTS>

Plot No.	Band	Mode	Test Position	Gap (cm)	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
16	WLAN2.4GMHz	802.11b 1Mbps	Bottom Face	0cm	11	2462	13.66	14.0	1.081	96.79	1.033	0.01	0.746	0.833
	WLAN2.4GMHz	802.11b 1Mbps	Bottom Face	0cm	1	2412	13.17	13.5	1.079	96.79	1.033	0	0.604	0.673
	WLAN2.4GMHz	802.11b 1Mbps	Bottom Face	0cm	6	2437	13.58	14.0	1.101	96.79	1.033	0.07	0.679	0.772
	WLAN2.4GMHz	802.11b 1Mbps	Edge 1	0cm	11	2462	13.66	14.0	1.081	96.79	1.033	0.01	0.481	0.537
	WLAN2.4GMHz	802.11b 1Mbps	Edge 2	0cm	11	2462	13.66	14.0	1.081	96.79	1.033	0.17	0.159	0.178
	WLAN5GMHz	802.11a 6Mbps	Bottom Face	0cm	149	5745	10.25	10.5	1.058	82.35	1.214	0.13	0.085	0.109
17	WLAN5GMHz	802.11a 6Mbps	Edge 1	0cm	149	5745	10.25	10.5	1.058	82.35	1.214	-0.02	0.300	0.385
	WLAN5GMHz	802.11a 6Mbps	Edge 2	0cm	149	5745	10.25	10.5	1.058	82.35	1.214	0.09	0.028	0.036



<WLAN SAR-NII>

Plot No.	Band	Mode	Test Position	Gap (cm)	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	WLAN5GMHz	802.11a 6Mbps	Bottom Face	0cm	44	5220	8.52	9.0	1.117	82.35	1.214	0	0.245	0.332
	WLAN5GMHz	802.11a 6Mbps	Edge 1	0cm	44	5220	8.52	9.0	1.117	82.35	1.214	0.07	0.700	0.949
18	WLAN5GMHz	802.11a 6Mbps	Edge 1	0cm	40	5200	8.49	9.0	1.125	82.35	1.214	0.13	0.696	0.950
	WLAN5GMHz	802.11a 6Mbps	Edge 2	0cm	44	5220	8.52	9.0	1.117	82.35	1.214	-0.09	0.036	0.049
	WLAN5GMHz	802.11a 6Mbps	Bottom Face	0cm	64	5320	9.09	9.5	1.099	82.35	1.214	-0.04	0.245	0.327
19	WLAN5GMHz	802.11a 6Mbps	Edge 1	0cm	64	5320	9.09	9.5	1.099	82.35	1.214	0.19	0.883	1.178
	WLAN5GMHz	802.11a 6Mbps	Edge 1	0cm	56	5280	8.82	9.0	1.042	82.35	1.214	0.13	0.824	1.043
	WLAN5GMHz	802.11a 6Mbps	Edge 2	0cm	64	5320	9.09	9.5	1.099	82.35	1.214	-0.12	0.040	0.053
	WLAN5GMHz	802.11a 6Mbps	Bottom Face	0cm	100	5500	10.75	11.0	1.059	82.35	1.214	-0.08	0.199	0.256
20	WLAN5GMHz	802.11a 6Mbps	Edge 1	0cm	100	5500	10.75	11.0	1.059	82.35	1.214	0.07	0.833	1.071
	WLAN5GMHz	802.11a 6Mbps	Edge 1	0cm	112	5560	10.65	11.0	1.084	82.35	1.214	0.07	0.778	1.024
	WLAN5GMHz	802.11a 6Mbps	Edge 1	0cm	132	5660	10.38	10.5	1.028	82.35	1.214	0.02	0.576	0.719
	WLAN5GMHz	802.11a 6Mbps	Edge 2	0cm	100	5500	10.75	11.0	1.059	82.35	1.214	-0.04	0.046	0.059

12.3 Repeated SAR Measurement

NO.	Band	Mode	Test Position	Gap (cm)	Ch.	Freq. (MHz)	Power Back-off	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Ratio	Reported 1g SAR (W/kg)
1st	GSM1900	GPRS (2 Tx slots)	Bottom Face	0cm	810	1909.8	ON	22.83	23	1.040	-	1.000	0.071	1.070	-	1.113
2nd	GSM1900	GPRS (2 Tx slots)	Bottom Face	0cm	810	1909.8	ON	22.83	23	1.040	-	1.000	-0.151	0.952	1.12	0.990
1st	WCDMA IV	RMC 12.2Kbps	Bottom Face	0cm	1513	1752.6	ON	17.93	18	1.016	-	1.000	0.173	1.060	-	1.077
2nd	WCDMA IV	RMC 12.2Kbps	Bottom Face	0cm	1513	1752.6	ON	17.93	18	1.016	-	1.000	0.166	1.050	1.01	1.067
1st	WLAN2.4GMHz	802.11b 1Mbps	Left Cheek	-	11	2462	-	13.66	14	1.081	96.79	1.033	0	0.824	-	0.920
2nd	WLAN2.4GMHz	802.11b 1Mbps	Left Cheek	-	11	2462	-	13.66	14	1.081	96.79	1.033	0.09	0.784	1.05	0.875
1st	WLAN5GMHz	802.11a 6Mbps	Edge 1	0cm	64	5320	-	9.09	9.5	1.099	82.35	1.214	0.19	0.883	-	1.178
2nd	WLAN5GMHz	802.11a 6Mbps	Edge 1	0cm	64	5320	-	9.09	9.5	1.099	82.35	1.214	-0.04	0.873	1.01	1.165

Note:

- Per KDB 865664 D01v01r01, for each frequency band, repeated SAR measurement is required only when the measured SAR is $\geq 0.8W/kg$
- Per KDB 865664 D01v01r01, if the ratio among the repeated measurement is ≤ 1.2 and the measured SAR $< 1.45W/kg$, only one repeated measurement is required.
- The ratio is the largest SAR to the smallest SAR among original and repeated measurement.
- All measurement SAR result is scaled-up to account for tune-up tolerance and is compliant.

13. Simultaneous Transmission Analysis

NO.	Simultaneous Transmission Configurations	Tablet		Note
		Head	Body	
1.	GSM(Voice) + WLAN2.4GHz(data)	Yes		
2.	WCDMA(Voice) + WLAN2.4GHz(data)	Yes		
3.	GSM(Voice) + Bluetooth(data)	Yes		
4.	WCDMA((Voice) + Bluetooth(data)	Yes		
5.	GSM(Voice) + WLAN5GHz(data)	Yes		
6.	WCDMA((Voice) + WLAN5GHz(data)	Yes		
7.	GPRS/EDGE(Data) + WLAN2.4GHz(data)	Yes ⁽¹⁾	Yes	2.4GHz Hotspot
8.	WCDMA(Data) + WLAN2.4GHz(data)	Yes	Yes	2.4GHz Hotspot
9.	GPRS/EDGE(Data) + Bluetooth(data)	Yes ⁽¹⁾	Yes	Bluetooth Tethering
10.	WCDMA(Data) + Bluetooth(data)	Yes	Yes	Bluetooth Tethering
11.	GPRS/EDGE(data) + WLAN5GHz(data)			
12.	WCDMA(data) + WLAN5GHz(data)			

Note:

- Considering the possibility of 3rd party VoIP app installation by end users and the device does not have limitation to operate VoIP in EGPRS wireless interface; considering the data rate of EGPRS to support VOIP quality and realistic operation, SAR testing was not performed evaluation VOIP operation in EGPRS mode.
- For simultaneous transmission analysis, WLAN SAR tested at 0mm separation is worse and the test data is used for conservative SAR summation.
- WLAN and Bluetooth share the same antenna, and cannot transmit simultaneously.
- EUT will choose either WLAN 2.4GHz or WLAN 5GHz according to the network signal condition; therefore, they will not transmit simultaneously.
- The Scaled SAR summation is calculated based on the same configuration and test position.
- Per KDB 447498 D01v05r01, simultaneous transmission SAR is compliant if,
 - Scalar SAR summation < 1.6W/kg.
 - $SPLSR = (SAR_1 + SAR_2)^{1.5} / (min. \text{ separation distance, mm})$, 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
If $SPLSR \leq 0.04$, simultaneously transmission SAR measurement is not necessary
 - Simultaneously transmission SAR measurement, and the reported multi-band SAR < 1.6W/kg
- For simultaneous transmission analysis, Bluetooth SAR is estimated per KDB 447498 D01v05r01 based on the formula below.
 - $(max. \text{ power of channel, including tune-up tolerance, mW}) / (min. \text{ test separation distance, mm}) \cdot [\sqrt{f(\text{GHz})} / x] \text{ W/kg}$ for test separation distances $\leq 50 \text{ mm}$; where $x = 7.5$ for 1-g SAR, and $x = 18.75$ for 10-g SAR.
 - When the minimum test separation distance is < 5mm, the distance is used 5mm to determine SAR test exclusion.
 - 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.

Bluetooth Max Power	Exposure Position	Head	Bottom Face	Bottom Face	Edge 2	Edge 2
	Antenna to User	<5 mm	9 mm	<5 mm	11 mm	6 mm
9.5 dBm	Estimated SAR (W/kg)	0.374 W/kg	0.208 W/kg	0.374 W/kg	0.17 W/kg	0.312 W/kg



13.1 Head Exposure Conditions

<WWAN + 2.4GHz WLAN>

Position	WWAN			WLAN		Summed SAR (W/kg)
	WWAN Band	Plot No	SAR (W/kg)	Plot No	SAR (W/kg)	
Right Cheek	GSM850	134	0.092	34	0.476	0.57
	GSM1900	110	0.156	34	0.476	0.63
	WCDMA V	128	0.093	34	0.476	0.57
	WCDMA IV	120	0.217	34	0.476	0.69
	WCDMAII	116	0.341	34	0.476	0.82
Right Tilted	GSM850	135	0.080	35	0.295	0.38
	GSM1900	111	0.059	35	0.295	0.35
	WCDMA V	129	0.081	35	0.295	0.38
	WCDMA IV	121	0.086	35	0.295	0.38
	WCDMAII	117	0.140	35	0.295	0.44
Left Cheek	GSM850	136	0.106	30	0.920	1.03
	GSM1900	112	0.093	30	0.920	1.01
	WCDMA V	130	0.112	30	0.920	1.03
	WCDMA IV	122	0.094	30	0.920	1.01
	WCDMAII	118	0.208	30	0.920	1.13
Left Tilted	GSM850	137	0.073	33	0.421	0.49
	GSM1900	113	0.074	33	0.421	0.50
	WCDMA V	131	0.082	33	0.421	0.50
	WCDMA IV	123	0.076	33	0.421	0.50
	WCDMAII	119	0.175	33	0.421	0.60

<WWAN + Bluetooth>

Position	WWAN			Bluetooth	Summed SAR (W/kg)
	WWAN Band	Plot No	SAR (W/kg)	Estimated SAR (W/kg)	
Right Cheek	GSM850	134	0.092	0.374	0.47
	GSM1900	110	0.156	0.374	0.53
	WCDMA V	128	0.093	0.374	0.47
	WCDMA IV	120	0.217	0.374	0.59
	WCDMAII	116	0.341	0.374	0.72
Right Tilted	GSM850	135	0.080	0.374	0.45
	GSM1900	111	0.059	0.374	0.43
	WCDMA V	129	0.081	0.374	0.46
	WCDMA IV	121	0.086	0.374	0.46
	WCDMAII	117	0.140	0.374	0.51
Left Cheek	GSM850	136	0.106	0.374	0.48
	GSM1900	112	0.093	0.374	0.47
	WCDMA V	130	0.112	0.374	0.49
	WCDMA IV	122	0.094	0.374	0.47
	WCDMAII	118	0.208	0.374	0.58
Left Tilted	GSM850	137	0.073	0.374	0.45
	GSM1900	113	0.074	0.374	0.45
	WCDMA V	131	0.082	0.374	0.46
	WCDMA IV	123	0.076	0.374	0.45
	WCDMAII	119	0.175	0.374	0.55



<WWAN + WLAN5.2GHz Band>

Position	WWAN			WLAN		Summed SAR (W/kg)
	WWAN Band	Plot No	SAR (W/kg)	Plot No	SAR (W/kg)	
Right Cheek	GSM850	134	0.092	46	0.606	0.70
	GSM1900	110	0.156	46	0.606	0.76
	WCDMA V	128	0.093	46	0.606	0.70
	WCDMA IV	120	0.217	46	0.606	0.82
	WCDMAII	116	0.341	46	0.606	0.95
Right Tilted	GSM850	135	0.080	47	0.556	0.64
	GSM1900	111	0.059	47	0.556	0.62
	WCDMA V	129	0.081	47	0.556	0.64
	WCDMA IV	121	0.086	47	0.556	0.64
	WCDMAII	117	0.140	47	0.556	0.70
Left Cheek	GSM850	136	0.106	48	0.822	0.93
	GSM1900	112	0.093	48	0.822	0.92
	WCDMA V	130	0.112	48	0.822	0.93
	WCDMA IV	122	0.094	48	0.822	0.92
	WCDMAII	118	0.208	48	0.822	1.03
Left Tilted	GSM850	137	0.073	49	0.624	0.70
	GSM1900	113	0.074	49	0.624	0.70
	WCDMA V	131	0.082	49	0.624	0.71
	WCDMA IV	0	0.076	49	0.624	0.70
	WCDMAII	119	0.175	49	0.624	0.80

<WWAN + WLAN5.3GHz Band>

Position	WWAN			WLAN		Summed SAR (W/kg)
	WWAN Band	Plot No	SAR (W/kg)	Plot No	SAR (W/kg)	
Right Cheek	GSM850	134	0.092	51	0.671	0.76
	GSM1900	110	0.156	51	0.671	0.83
	WCDMA V	128	0.093	51	0.671	0.76
	WCDMA IV	120	0.217	51	0.671	0.89
	WCDMAII	116	0.341	51	0.671	1.01
Right Tilted	GSM850	135	0.080	52	0.604	0.68
	GSM1900	111	0.059	52	0.604	0.66
	WCDMA V	129	0.081	52	0.604	0.69
	WCDMA IV	121	0.086	52	0.604	0.69
	WCDMAII	117	0.140	52	0.604	0.74
Left Cheek	GSM850	136	0.106	53	1.046	1.15
	GSM1900	112	0.093	53	1.046	1.14
	WCDMA V	130	0.112	53	1.046	1.16
	WCDMA IV	122	0.094	53	1.046	1.14
	WCDMAII	118	0.208	53	1.046	1.25
Left Tilted	GSM850	137	0.073	54	0.774	0.85
	GSM1900	113	0.074	54	0.774	0.85
	WCDMA V	131	0.082	54	0.774	0.86
	WCDMA IV	0	0.076	54	0.774	0.85
	WCDMAII	119	0.175	54	0.774	0.95



<WWAN + WLAN5.5GHz Band>

Position	WWAN			WLAN		Summed SAR (W/kg)
	WWAN Band	Plot No	SAR (W/kg)	Plot No	SAR (W/kg)	
Right Cheek	GSM850	134	0.092	59	0.516	0.61
	GSM1900	110	0.156	59	0.516	0.67
	WCDMA V	128	0.093	59	0.516	0.61
	WCDMA IV	120	0.217	59	0.516	0.73
	WCDMAII	116	0.341	59	0.516	0.86
Right Tilted	GSM850	135	0.080	63	0.491	0.57
	GSM1900	111	0.059	63	0.491	0.55
	WCDMA V	129	0.081	63	0.491	0.57
	WCDMA IV	121	0.086	63	0.491	0.58
	WCDMAII	117	0.140	63	0.491	0.63
Left Cheek	GSM850	136	0.106	67	0.829	0.94
	GSM1900	112	0.093	67	0.829	0.92
	WCDMA V	130	0.112	67	0.829	0.94
	WCDMA IV	122	0.094	67	0.829	0.92
	WCDMAII	118	0.208	67	0.829	1.04
Left Tilted	GSM850	137	0.073	71	0.622	0.70
	GSM1900	113	0.074	71	0.622	0.70
	WCDMA V	131	0.082	71	0.622	0.70
	WCDMA IV	1:1	0.076	71	0.622	0.70
	WCDMAII	119	0.175	71	0.622	0.80

<WWAN + WLAN5.8GHz Band>

Position	WWAN			WLAN		Summed SAR (W/kg)
	WWAN Band	Plot No	SAR (W/kg)	Plot No	SAR (W/kg)	
Right Cheek	GSM850	134	0.092	74	0.301	0.39
	GSM1900	110	0.156	74	0.301	0.46
	WCDMA V	128	0.093	74	0.301	0.39
	WCDMA IV	120	0.217	74	0.301	0.52
	WCDMAII	116	0.341	74	0.301	0.64
Right Tilted	GSM850	135	0.080	75	0.297	0.38
	GSM1900	111	0.059	75	0.297	0.36
	WCDMA V	129	0.081	75	0.297	0.38
	WCDMA IV	121	0.086	75	0.297	0.38
	WCDMAII	117	0.140	75	0.297	0.44
Left Cheek	GSM850	136	0.106	76	0.529	0.64
	GSM1900	112	0.093	76	0.529	0.62
	WCDMA V	130	0.112	76	0.529	0.64
	WCDMA IV	122	0.094	76	0.529	0.62
	WCDMAII	118	0.208	76	0.529	0.74
Left Tilted	GSM850	137	0.073	77	0.369	0.44
	GSM1900	113	0.074	77	0.369	0.44
	WCDMA V	131	0.082	77	0.369	0.45
	WCDMA IV	0	0.076	77	0.369	0.45
	WCDMAII	119	0.175	77	0.369	0.54



13.2 Body Exposure Conditions

<WWAN + WLAN2.4GHz Band>

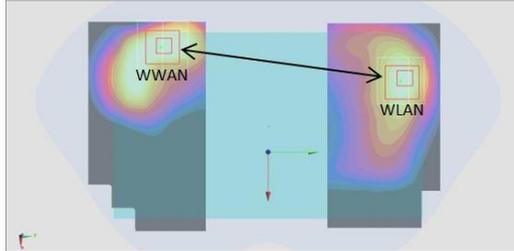
Position	WWAN			WLAN		Summed SAR (W/kg)	SPLSR	Case No
	WWAN Band	Plot No	SAR (W/kg)	Plot No	SAR (W/kg)			
Bottom Face At 0.9 cm	GSM850	192	0.199	37	0.833	1.03		
	GSM1900	171	0.524	37	0.833	1.36		
	WCDMA V	197	0.228	37	0.833	1.06		
	WCDMA IV	184	0.718	37	0.833	1.55		
	WCDMA II	154	1.191	37	0.833	2.02	0.02	4
Edge2 At 0.5 cm	GSM850	193	0.095	41	0.178	0.27		
	GSM1900	177	0.304	41	0.178	0.48		
	WCDMA V	198	0.098	41	0.178	0.28		
	WCDMA IV	185	0.464	41	0.178	0.64		
	WCDMA II	155	0.100	41	0.178	0.28		
Bottom Face At 0cm	GSM850	147	0.536	37	0.833	1.37		
	GSM1900	165	1.113	37	0.833	1.95	0.02	1
	WCDMA V	146	0.566	37	0.833	1.40		
	WCDMA IV	167	1.123	37	0.833	1.96	0.02	2
	WCDMA II	172	1.047	37	0.833	1.88	0.02	3
Edge2 At 0cm	GSM850	148	0.109	41	0.178	0.29		
	GSM1900	181	0.317	41	0.178	0.50		
	WCDMA V	151	0.138	41	0.178	0.32		
	WCDMA IV	191	0.293	41	0.178	0.47		
	WCDMA II	175	0.362	41	0.178	0.54		

<WWAN + Bluetooth>

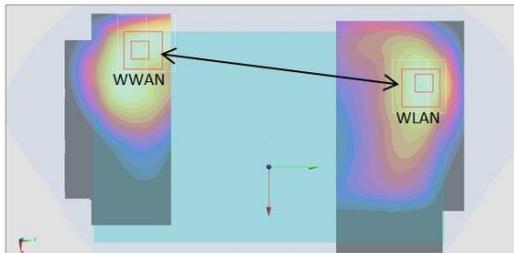
Position	WWAN			Bluetooth	Summed SAR (W/kg)
	WWAN Band	Plot No	SAR (W/kg)	Estimated SAR (W/kg)	
Bottom Face At 0.9 cm	GSM850	192	0.199	0.208	0.41
	GSM1900	171	0.524	0.208	0.73
	WCDMA V	197	0.228	0.208	0.44
	WCDMA IV	184	0.718	0.208	0.93
	WCDMA II	154	1.191	0.208	1.40
Edge2 At 0.5 cm	GSM850	193	0.095	0.170	0.27
	GSM1900	177	0.304	0.170	0.47
	WCDMA V	198	0.098	0.170	0.27
	WCDMA IV	185	0.464	0.170	0.63
	WCDMA II	155	0.100	0.170	0.27
Bottom Face At 0cm	GSM850	147	0.536	0.374	0.91
	GSM1900	165	1.113	0.374	1.49
	WCDMA V	146	0.566	0.374	0.94
	WCDMA IV	167	1.123	0.374	1.50
	WCDMA II	172	1.047	0.374	1.42
Edge2 At 0cm	GSM850	148	0.109	0.312	0.42
	GSM1900	181	0.317	0.312	0.63
	WCDMA V	151	0.138	0.312	0.45
	WCDMA IV	191	0.293	0.312	0.61
	WCDMA II	175	0.362	0.312	0.67

13.3 SPLSR Evaluation and Analysis

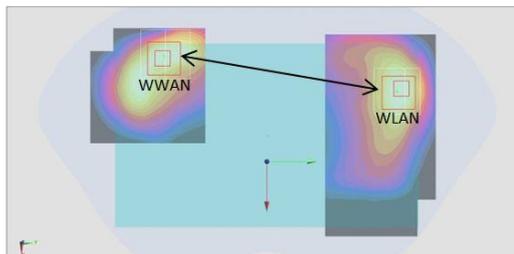
Case 1	Band	Position	SAR (W/kg)	Gap (cm)	SAR peak location (m)			3D distance (mm)	Pair SAR sum (W/kg)	SPLSR	Simultaneous SAR
Plot No					X	Y	Z				
#165	GSM1900	Bottom Face	1.113	0	-0.0685	-0.0675	-0.207	158.3	1.95	0.02	Not required
#37	WLAN2.4GHz		0.833	0	-0.0508	0.0898	-0.203				



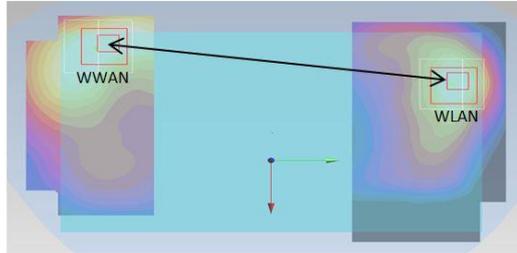
Case 2	Band	Position	SAR (W/kg)	Gap (cm)	SAR peak location (m)			3D distance (mm)	Pair SAR sum (W/kg)	SPLSR	Simultaneous SAR
Plot No					X	Y	Z				
#167	WCDMA IV	Bottom Face	1.123	0	-0.0701	-0.069	-0.207	160.0	1.96	0.02	Not required
#37	WLAN2.4GHz		0.833	0	-0.0508	0.0898	-0.203				



Case 3	Band	Position	SAR (W/kg)	Gap (cm)	SAR peak location (m)			3D distance (mm)	Pair SAR sum (W/kg)	SPLSR	Simultaneous SAR
Plot No					X	Y	Z				
#172	WCDMA II	Bottom Face	1.047	0	-0.07	-0.066	-0.202	157.0	1.88	0.02	Not required
#37	WLAN2.4GHz		0.833	0	-0.0508	0.0898	-0.203				



Case 4	Band	Position	SAR (W/kg)	Gap (cm)	SAR peak location (m)			3D distance (mm)	Pair SAR sum (W/kg)	SPLSR	Simultaneous SAR
Plot No					X	Y	Z				
#154	WCDMA II	Bottom Face	1.191	0.9	-0.0685	-0.081	-0.204	171.7	2.02	0.02	Not required
#37	WLAN2.4GHz		0.833	0	-0.0508	0.0898	-0.203				



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14. Uncertainty Assessment

The component of uncertainty may generally be categorized according to the methods used to evaluate them. The evaluation of uncertainty by the statistical analysis of a series of observations is termed a Type A evaluation of uncertainty. The evaluation of uncertainty by means other than the statistical analysis of a series of observations 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 14.1

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 14.1. 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 14.2. 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 14.3. Uncertainty Budget for frequency range 3 GHz to 6 GHz



15. References

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- [12] FCC KDB 865664 D01 v01r01, "SAR Measurement Requirements for 100 MHz to 6 GHz", May 2013.