FCC SAR Test Report

APPLICANT	**:**	**VeriFone, Inc.**
EQUIPMENT	**:**	**Point of Sale Terminal**
BRAND NAME	**:**	**VeriFone**
MODEL NAME	**:**	**VX690 3G-BT-WiFi**
FCC ID	**:**	**B32VX6903GBTWIFI**
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

Testing Laboratory
1190

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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Revision History

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FA441115	Rev. 01	Initial issue of report	May 13, 2014

1. Statement of Compliance

The maximum results of Specific Absorption Rate (SAR) found during testing for **VeriFone, Inc., Point of Sale Terminal, VX690 3G-BT-WiFi**, are as follows.

Equipment Class	Frequency Band	Highest SAR Summary	
		Body 1g SAR (W/kg)	Simultaneous Transmission 1g SAR (W/kg)
PCB	GSM850	0.70	1.51
	GSM1900	0.53	
	WCDMA Band V	**1.03**	
	WCDMA Band II	0.89	
DTS	WLAN 2.4GHz Band	0.55	1.51
	WLAN 5.8GHz Band	0.99	
NII	WLAN 5.2GHz Band	0.35	1.41
	WLAN 5.3GHz Band	0.37	
	WLAN 5.5GHz Band	0.72	
Date of Testing:		04/20/2014 ~ 04/23/2014	

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

2. Administration Data

Testing Laboratory	
Test Site	SPORTON INTERNATIONAL INC.
Test Site Location	No. 52, Hwa Ya 1st 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

Applicant	
Company Name	VeriFone, Inc.
Address	1400 West Stanford Ranch Road Suite 200 Rocklin CA 95765 USA

Manufacturer	
Company Name	Inventec Appliances (Pudong) Co., Ltd.
Address	No. 789 Pu Xing Road, Shanghai, PRC

3. Guidance Standard

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

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

4. Equipment Under Test (EUT)

4.1 General Information

Product Feature & Specification	
Equipment Name	Point of Sale Terminal
Brand Name	VeriFone
Model Name	VX690 3G-BT-WiFi
FCC ID	B32VX6903GBTWIFI
IMEI Code	013954000008865 for WWAN SAR Testing 013954000008790 for WLAN SAR Testing
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 II: 1852.4 MHz ~ 1907.6 MHz WLAN 2.4GHz Band: 2412 MHz ~ 2462 MHz WLAN 5.2GHz Band: 5180 MHz ~ 5240 MHz WLAN 5.3GHz Band: 5260 MHz ~ 5320 MHz WLAN 5.5GHz Band: 5500 MHz ~ 5700 MHz WLAN 5.8GHz Band: 5745 MHz ~ 5825 MHz Bluetooth: 2402 MHz ~ 2480 MHz NFC : 13.56 MHz
Mode	• GPRS/EGPRS • RMC 12.2Kbps • HSDPA • HSUPA • 802.11a/b/g/n HT20 • Bluetooth v2.1+EDR，Bluetooth v4.0-LE • NFC:ASK
HW Version	DVT 1
SW Version	Ver. Apr 17 2014
EUT Stage	Identical Prototype

4.2 Maximum Tune-up Limit

Mode	Burst Average power(dBm)	
	GSM 850	GSM 1900
GPRS/EDGE (GMSK, 1 Tx slot)	32.5	30.0
GPRS/EDGE (GMSK, 2 Tx slots)	29.5	27.5
GPRS/EDGE (GMSK, 3 Tx slots)	27.5	24.5
GPRS/EDGE (GMSK, 4 Tx slots)	26.0	23.5
EDGE (8PSK, 1 Tx slot)	27.0	26.5
EDGE (8PSK, 2 Tx slots)	24.0	23.0
EDGE (8PSK, 3 Tx slots)	22.0	21.5
EDGE (8PSK, 4 Tx slots)	21.0	20.0

Mode	Average Power (dBm)	
	WCDMA Band V	WCDMA Band II
RMC 12.2K	24.0	24.0
HSDPA Subtest-1	24.0	24.0
HSUPA Subtest-5	24.0	24.0

Band / Frequency (MHz)	IEEE 802.11 Average Power (dBm)		
	11b	11g	HT20
2.4GHz Band	14.5	12.5	12.5

Band / Frequency (MHz)	IEEE 802.11 Average Power (dBm)	
	11a	HT20
5.2GHz Band	9.0	9.0
5.3GHz Band	9.0	9.0
5.5GHz Band	9.0	9.0
5.8GHz Band	10.0	10.0

Mode		Average Power (dBm)
Bluetooth v2.1+EDR	1Mbps	8.0
	2Mbps	6.0
	3Mbps	6.0
Bluetooth v4.0+LE		8.0

5. RF Exposure Limits

5.1 Uncontrolled Environment

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

5.2 Controlled Environment

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

Limits for Occupational/Controlled Exposure (W/kg)

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

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

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

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

6. Specific Absorption Rate (SAR)

6.1 Introduction

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

6.2 SAR Definition

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

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

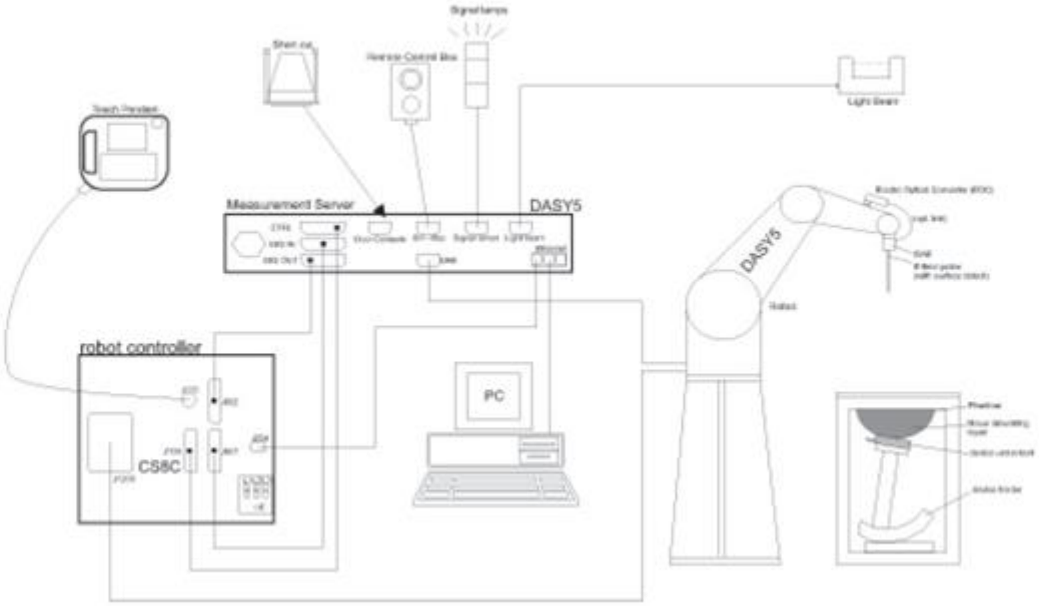
SAR is expressed in units of Watts per kilogram (W/kg)

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

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

7. System Description and Setup

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



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

8. 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

8.1 Spatial Peak SAR Evaluation

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

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

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

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

8.2 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.

8.3 Area Scan

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

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

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

8.4 Zoom Scan

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

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

<table>
<tr><th colspan="3"></th><th>$\leq$ 3 GHz</th><th>$>$ 3 GHz</th></tr>
<tr><td colspan="3">Maximum zoom scan spatial resolution: Δx_{Zoom}, Δy_{Zoom}</td><td>$\leq$ 2 GHz: $\leq$ 8 mm
2 – 3 GHz: $\leq$ 5 mm*</td><td>3 – 4 GHz: $\leq$ 5 mm*
4 – 6 GHz: $\leq$ 4 mm*</td></tr>
<tr><td rowspan="3">Maximum zoom scan spatial resolution, normal to phantom surface</td><td colspan="2">uniform grid: $\Delta z_{Zoom}(n)$</td><td>$\leq$ 5 mm</td><td>3 – 4 GHz: $\leq$ 4 mm
4 – 5 GHz: $\leq$ 3 mm
5 – 6 GHz: $\leq$ 2 mm</td></tr>
<tr><td rowspan="2">graded grid</td><td>$\Delta z_{Zoom}(1)$: between 1st two points closest to phantom surface</td><td>$\leq$ 4 mm</td><td>3 – 4 GHz: $\leq$ 3 mm
4 – 5 GHz: $\leq$ 2.5 mm
5 – 6 GHz: $\leq$ 2 mm</td></tr>
<tr><td>$\Delta z_{Zoom}(n>1)$: between subsequent points</td><td colspan="2">$\leq 1.5 \cdot \Delta z_{Zoom}(n-1)$</td></tr>
<tr><td>Minimum zoom scan volume</td><td colspan="2">x, y, z</td><td>$\geq$ 30 mm</td><td>3 – 4 GHz: $\geq$ 28 mm
4 – 5 GHz: $\geq$ 25 mm
5 – 6 GHz: $\geq$ 22 mm</td></tr>
<tr><td colspan="5">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 <u>reported</u> SAR from the area scan based 1-g SAR estimation procedures of KDB 447498 is $\leq$ 1.4 W/kg, $\leq$ 8 mm, $\leq$ 7 mm and $\leq$ 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.</td></tr>
</table>

8.5 Volume Scan Procedures

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

8.6 Power Drift Monitoring

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

9. Test Equipment List

Manufacturer	Name of Equipment	Type/Model	Serial Number	Calibration	
				Last Cal.	Due Date
SPEAG	835MHz System Validation Kit	D835V2	4d162	Nov. 11, 2013	Nov. 10, 2014
SPEAG	1900MHz System Validation Kit	D1900V2	5d182	Nov. 12, 2013	Nov. 11, 2014
SPEAG	2450MHz System Validation Kit	D2450V2	736	Aug. 23, 2013	Aug. 22, 2014
SPEAG	5GHz System Validation Kit	D5GHzV2	1006	Sep. 23, 2013	Sep. 22, 2014
SPEAG	Data Acquisition Electronics	DAE4	1388	Oct. 30, 2013	Oct. 29, 2014
SPEAG	Dosimetric E-Field Probe	EX3DV4	3697	Oct. 15, 2013	Oct. 14, 2014
Agilent	Wireless Communication Test Set	E5515C	MY48360820	Jan. 10, 2014	Jan. 09, 2015
SPEAG	Device Holder	N/A	N/A	NCR	NCR
Agilent	Signal Generator	E4438C	MY49070755	Oct. 08, 2013	Oct. 07, 2014
SPEAG	Dielectric Probe Kit	DAK-3.5	1126	Jul. 23, 2013	Jul. 22, 2014
Agilent	ENA Network Analyzer	E5071C	MY46316648	Feb. 07, 2014	Feb. 06, 2015
Anritsu	Power Meter	ML2495A	1349001	Dec. 04, 2013	Dec. 03, 2014
Anritsu	Power Sensor	MA2411B	1306099	Dec. 03, 2013	Dec. 02, 2014
R&S	Spectrum Analyzer	FSP 7	101131	Jul. 09, 2013	Jul. 08, 2014
Agilent	Dual Directional Coupler	778D	50422	*CBT	
Woken	Attenuator	WK0602-XX	N/A	*CBT	
PE	Attenuator	PE7005-10	N/A	*CBT	
PE	Attenuator	PE7005- 3	N/A	*CBT	
AR	Power Amplifier	5S1G4M2	0328767	*CBT	
Mini-Circuits	Power Amplifier	ZVE-3W	162601250	*CBT	
Mini-Circuits	Power Amplifier	ZHL-42W+	13440021344	*CBT	

General Note:

1. The calibration certificate of DASY can be referred to appendix C of this report.
2. *CBT (Calibrated Before Testing). Prior to testing, the measurement paths containing an amplifier, coupler and attenuator were connected to a calibrated source (i.e. a signal generator) to determine the losses of the measurement path. The power meter offset was then adjusted to compensate for the measurement system losses. This level offset is stored within the power meter before measurements are made. The calibrated reading is then taken directly from the power meter after compensation of the losses for all final power measurement.

10. System Verification

10.1 Tissue Verification

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

Frequency (MHz)	Water (%)	Sugar (%)	Cellulose (%)	Salt (%)	Preventol (%)	DGBE (%)	Conductivity (σ)	Permittivity (εr)
For Head								
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
2600	54.8	0	0	0.1	0	45.1	1.96	39.0
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
2600	68.1	0	0	0.1	0	31.8	2.16	52.5

Simulating Liquid for 5GHz, Manufactured by SPEAG

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

<Tissue Dielectric Parameter Check Results>

Frequency (MHz)	Tissue Type	Liquid Temp. (℃)	Conductivity (σ)	Permittivity (ε_r)	Conductivity Target (σ)	Permittivity Target (ε_r)	Delta (σ) (%)	Delta (ε_r) (%)	Limit (%)	Date
835	Body	22.4	0.983	54.935	0.97	55.20	1.34	-0.48	±5	2014/4/21
1900	Body	22.5	1.535	52.615	1.52	53.30	0.99	-1.29	±5	2014/4/20
2450	Body	22.6	1.994	51.825	1.95	52.70	2.26	-1.66	±5	2014/4/22
5200	Body	22.6	5.344	48.305	5.30	49.00	0.83	-1.42	±5	2014/4/23
5300	Body	22.6	5.476	48.127	5.42	48.88	1.03	-1.54	±5	2014/4/23
5600	Body	22.6	5.853	47.594	5.77	48.47	1.44	-1.81	±5	2014/4/23
5800	Body	22.6	6.121	47.298	6.00	48.20	2.02	-1.87	±5	2014/4/23

10.2 System Performance Check Results

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

Date	Frequency (MHz)	Tissue Type	Input Power (mW)	Dipole S/N	Probe S/N	DAE S/N	Measured SAR (W/kg)	Targeted SAR (W/kg)	Normalized SAR (W/kg)	Deviation (%)
2014/4/21	835	Body	250	D835V2-4d162	3697	1388	2.36	9.28	9.44	1.72
2014/4/20	1900	Body	250	D1900V2-5d182	3697	1388	10.00	39.50	40.00	1.27
2014/4/22	2450	Body	250	D2450V2-736	3697	1388	13.00	51.30	52.00	1.36
2014/4/23	5200	Body	100	D5GHzV2-1006	3697	1388	7.25	71.50	72.50	1.40
2014/4/23	5300	Body	100	D5GHzV2-1006	3697	1388	7.66	75.20	76.60	1.86
2014/4/23	5600	Body	100	D5GHzV2-1006	3697	1388	7.65	77.80	76.50	-1.67
2014/4/23	5800	Body	100	D5GHzV2-1006	3697	1388	6.99	72.30	69.90	-3.32

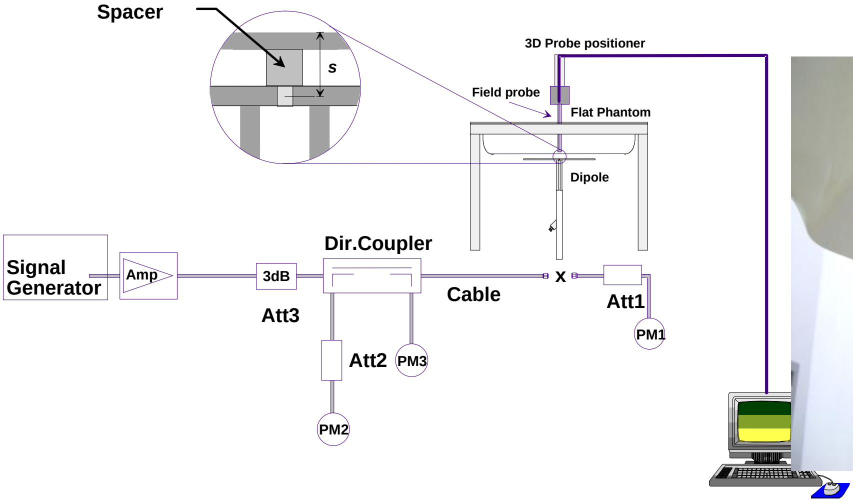


Fig 8.3.1 System Performance Check Setup

Fig 8.3.2 Setup Photo

11. RF Exposure Positions

11.1 Body Position

(a) To position the device parallel to the phantom surface with either keypad up or down.

(b) To adjust the device parallel to the flat phantom.

(c) To adjust the distance between the device surface and the flat phantom to 0 cm.

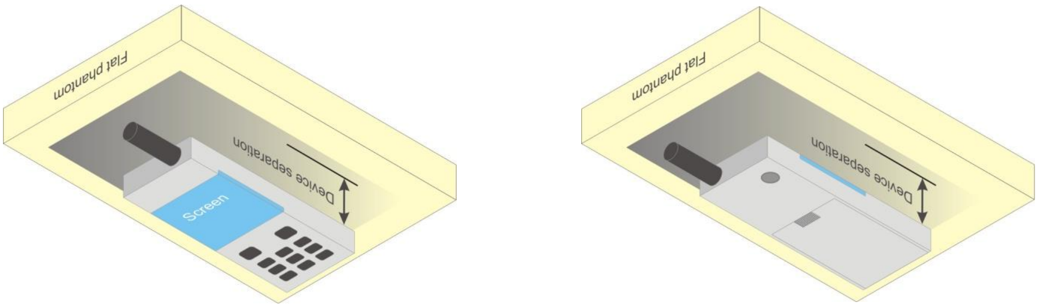


Fig 9.4 Body Position

<DUT Setup Photos>

Please refer to Appendix D for the test setup photos.

12. Conducted RF Output Power (Unit: dBm)

<GSM Conducted Power>

General Note:

1. Per KDB 447498 D01v05r02, the maximum output power channel is used for SAR testing and for further SAR test reduction.
2. For Body SAR testing, GPRS / EDGE should be evaluated, therefore the EUT was set in GPRS 1 Tx slot for GSM850 and GPRS 2 Tx slots GSM1900 band due to its highest frame-average power.

Band GSM850	Burst Average Power (dBm)			Tune-up Limit (dBm)	Frame-Average Power (dBm)			Tune-up Limit (dBm)
TX Channel	128	189	251		128	189	251	
Frequency (MHz)	824.2	836.4	848.8		824.2	836.4	848.8	
GPRS (GMSK, 1 Tx slot)	32.11	32.09	31.99	32.50	23.11	23.09	22.99	23.50
GPRS (GMSK, 2 Tx slots)	29.10	28.86	28.81	29.50	23.10	22.86	22.81	23.50
GPRS (GMSK, 3 Tx slots)	27.20	27.11	27.07	27.50	22.94	22.85	22.81	23.24
GPRS (GMSK, 4 Tx slots)	25.70	25.67	25.65	26.00	22.70	22.67	22.65	23.00
EDGE (8PSK, 1 Tx slot)	26.50	26.45	26.43	27.00	17.50	17.45	17.43	18.00
EDGE (8PSK, 2 Tx slots)	23.63	23.60	23.58	24.00	17.63	17.60	17.58	18.00
EDGE (8PSK, 3 Tx slots)	21.96	21.89	21.86	22.00	17.70	17.63	17.60	17.74
EDGE (8PSK, 4 Tx slots)	20.87	20.81	20.80	21.00	17.87	17.81	17.80	18.00

Band GSM1900	Burst Average Power (dBm)			Tune-up Limit (dBm)	Frame-Average Power (dBm)			Tune-up Limit (dBm)
TX Channel	512	661	810		512	661	810	
Frequency (MHz)	1850.2	1880	1909.8		1850.2	1880	1909.8	
GPRS (GMSK, 1 Tx slot)	29.32	29.51	29.84	30.00	20.32	20.51	20.84	21.00
GPRS (GMSK, 2 Tx slots)	26.30	26.34	26.40	27.50	20.30	20.34	20.40	21.50
GPRS (GMSK, 3 Tx slots)	24.30	24.36	24.39	24.50	20.04	20.10	20.13	20.24
GPRS (GMSK, 4 Tx slots)	23.01	23.05	23.14	23.50	20.01	20.05	20.14	20.50
EDGE (8PSK, 1 Tx slot)	25.82	25.98	26.04	26.50	16.82	16.98	17.04	17.50
EDGE (8PSK, 2 Tx slots)	22.70	22.84	22.89	23.00	16.70	16.84	16.89	17.00
EDGE (8PSK, 3 Tx slots)	20.97	21.03	21.07	21.50	16.71	16.77	16.81	17.24
EDGE (8PSK, 4 Tx slots)	19.76	19.82	19.86	20.00	16.76	16.82	16.86	17.00

<WCDMA Conducted Power>

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

A summary of these settings are illustrated below:

HSDPA Setup Configuration:

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

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

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

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

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

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

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

Setup Configuration

HSUPA Setup Configuration:

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

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

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

Note 1: Δ_{ACK}, Δ_{NACK} and Δ_{CQI} = 30/15 with β_{hs} = 30/15 * β_c .
Note 2: CM = 1 for β_c/β_d =12/15, β_{hs}/β_c=24/15. For all other combinations of DPDCH, DPCCH, HS- DPCCH, E-DPDCH and E-DPCCH the MPR is based on the relative CM difference.
Note 3: For subtest 1 the β_c/β_d ratio of 11/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signalled gain factors for the reference TFC (TF1, TF1) to β_c = 10/15 and β_d = 15/15.
Note 4: For subtest 5 the β_c/β_d ratio of 15/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signalled gain factors for the reference TFC (TF1, TF1) to β_c = 14/15 and β_d = 15/15.
Note 5: In case of testing by UE using E-DPDCH Physical Layer category 1, Sub-test 3 is omitted according to TS25.306 Table 5.1g.
Note 6: β_{ed} can not be set directly, it is set by Absolute Grant Value.

Setup Configuration

<WCDMA Conducted Power>

General Note:

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

Band			WCDMA V			WCDMA II		
TX Channel			4132	4182	4233	9262	9400	9538
Rx Channel			4357	4407	4458	9662	9800	9938
Frequency (MHz)			826.4	836.4	846.6	1852.4	1880	1907.6
MPR (dB)	3GPP Rel 99	RMC 12.2Kbps	23.32	23.44	23.37	23.33	23.48	23.37
0	3GPP Rel 6	HSDPA Subtest-1	23.19	23.34	23.24	23.21	23.34	23.28
0	3GPP Rel 6	HSDPA Subtest-2	23.16	23.28	23.23	23.15	23.28	23.21
0.5	3GPP Rel 6	HSDPA Subtest-3	22.58	22.69	22.62	22.49	22.61	22.53
0.5	3GPP Rel 6	HSDPA Subtest-4	22.57	22.65	22.62	22.47	22.56	22.50
0	3GPP Rel 6	HSUPA Subtest-1	22.99	23.18	23.10	22.72	22.82	22.79
2	3GPP Rel 6	HSUPA Subtest-2	22.82	23.01	22.98	22.40	22.45	22.44
1	3GPP Rel 6	HSUPA Subtest-3	22.28	22.41	22.34	22.18	22.30	22.21
2	3GPP Rel 6	HSUPA Subtest-4	23.10	23.31	23.18	22.89	23.04	22.95
0	3GPP Rel 6	HSUPA Subtest-5	23.15	23.29	23.21	23.13	23.25	23.17

<WLAN Conducted Power>

General Note:

1. For IEEE802.11b/g SAR testing, highest average RF output power channel for the lowest data rate for 802.11b were selected for SAR evaluation. 802.11g were not investigated since the average output powers over all channels and data rates were not more than 0.25 dB higher than the tested channel in the lowest data rate of 802.11b mode.
2. For IEEE802.11n, SAR testing can be conducted on channel with the highest output power when taking into consideration tune-up tolerance for same test configuration that was identified during SAR evaluations for IEEE802.11a/b/g (as applicable) provided bandwidth and test position are the same.

<2.4GHz WLAN>

WLAN 2.4GHz 802.11b Average Power (dBm)					
Power vs. Channel			Power vs. Data Rate		
Channel	Frequency (MHz)	Data Rate 1Mbps	2Mbps	5.5Mbps	11Mbps
CH 1	2412	14.12	14.28	14.32	14.28
CH 6	2437	14.15			
CH 11	2462	14.34			

WLAN 2.4GHz 802.11g Average Power (dBm)									
Power vs. Channel			Power vs. Data Rate						
Channel	Frequency (MHz)	Data Rate 6Mbps	9Mbps	12Mbps	18Mbps	24Mbps	36Mbps	48Mbps	54Mbps
CH 1	2412	12.05	12.18	12.20	12.21	12.17	12.14	12.15	12.09
CH 6	2437	12.14							
CH 11	2462	12.22							

WLAN 2.4GHz 802.11n-HT20 Average Power (dBm)									
Power vs. Channel			Power vs. MCS Index						
Channel	Frequency (MHz)	MCS Index MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7
CH 1	2412	11.42	11.61	11.62	11.62	11.60	11.57	11.53	11.56
CH 6	2437	11.63							
CH 11	2462	11.62							

<5GHz WLAN>

<table>
<tr><th colspan="10">WLAN 5GHz 802.11a Average Power (dBm)</th></tr>
<tr><th colspan="3">Power vs. Channel</th><th colspan="7">Power vs. Data Rate</th></tr>
<tr><th rowspan="2">Channel</th><th rowspan="2">Frequency (MHz)</th><th>Data Rate</th><th rowspan="2">9Mbps</th><th rowspan="2">12Mbps</th><th rowspan="2">18Mbps</th><th rowspan="2">24Mbps</th><th rowspan="2">36Mbps</th><th rowspan="2">48Mbps</th><th rowspan="2">54Mbps</th></tr>
<tr><th>6Mbps</th></tr>
<tr><td>CH 36</td><td>5180</td><td>8.81</td><td rowspan="4">8.80</td><td rowspan="4">8.81</td><td rowspan="4">8.81</td><td rowspan="4">8.79</td><td rowspan="4">8.72</td><td rowspan="4">8.72</td><td rowspan="4">8.83</td></tr>
<tr><td>CH 40</td><td>5200</td><td>8.75</td></tr>
<tr><td>CH 44</td><td>5220</td><td>8.67</td></tr>
<tr><td>CH 48</td><td>5240</td><td>8.61</td></tr>
<tr><td>CH 52</td><td>5260</td><td>8.66</td><td rowspan="4">8.57</td><td rowspan="4">8.37</td><td rowspan="4">8.34</td><td rowspan="4">8.37</td><td rowspan="4">8.43</td><td rowspan="4">8.47</td><td rowspan="4">8.34</td></tr>
<tr><td>CH 56</td><td>5280</td><td>8.23</td></tr>
<tr><td>CH 60</td><td>5300</td><td>8.36</td></tr>
<tr><td>CH 64</td><td>5320</td><td>7.81</td></tr>
<tr><td>CH 100</td><td>5500</td><td>8.12</td><td rowspan="8">8.06</td><td rowspan="8">8.03</td><td rowspan="8">8.00</td><td rowspan="8">7.97</td><td rowspan="8">8.03</td><td rowspan="8">7.87</td><td rowspan="8">7.92</td></tr>
<tr><td>CH 104</td><td>5520</td><td>8.01</td></tr>
<tr><td>CH 108</td><td>5540</td><td>8.05</td></tr>
<tr><td>CH 112</td><td>5560</td><td>7.95</td></tr>
<tr><td>CH 116</td><td>5580</td><td>8.03</td></tr>
<tr><td>CH 132</td><td>5660</td><td>7.80</td></tr>
<tr><td>CH 136</td><td>5680</td><td>7.93</td></tr>
<tr><td>CH 140</td><td>5700</td><td>7.51</td></tr>
<tr><td>CH 149</td><td>5745</td><td>8.73</td><td rowspan="5">9.08</td><td rowspan="5">9.01</td><td rowspan="5">9.12</td><td rowspan="5">9.10</td><td rowspan="5">9.01</td><td rowspan="5">9.11</td><td rowspan="5">9.10</td></tr>
<tr><td>CH 153</td><td>5765</td><td>8.65</td></tr>
<tr><td>CH 157</td><td>5785</td><td>8.70</td></tr>
<tr><td>CH 161</td><td>5805</td><td>8.81</td></tr>
<tr><td>CH 165</td><td>5825</td><td>9.13</td></tr>
</table>

WLAN 5GHz 802.11n-HT20 Average Power (dBm)									
Power vs. Channel			Power vs. MCS Index						
Channel	Frequency (MHz)	Data Rate 6Mbps	9Mbps	12Mbps	18Mbps	24Mbps	36Mbps	48Mbps	54Mbps
CH 36	5180	8.83	8.70	8.73	8.64	8.54	8.80	8.75	8.70
CH 40	5200	8.65							
CH 44	5220	8.80							
CH 48	5240	8.53							
CH 52	5260	8.37	8.33	8.18	8.16	8.23	8.30	8.32	8.29
CH 56	5280	8.26							
CH 60	5300	8.29							
CH 64	5320	7.83							
CH 100	5500	8.14	8.04	7.97	7.93	7.89	7.88	7.81	7.86
CH 104	5520	8.00							
CH 108	5540	7.93							
CH 112	5560	7.85							
CH 116	5580	7.97							
CH 132	5660	7.70							
CH 136	5680	7.98							
CH 140	5700	7.53							
CH 149	5745	9.41	9.58	9.61	9.55	9.61	9.55	9.62	9.63
CH 153	5765	9.31							
CH 157	5785	9.23							
CH 161	5805	9.21							
CH 165	5825	9.64							

13. Bluetooth Exclusions Applied

Mode Band	Average power(dBm)	
	Bluetooth v2.1+EDR	Bluetooth v4.0+LE
2.4GHz Bluetooth	8	8

Note:

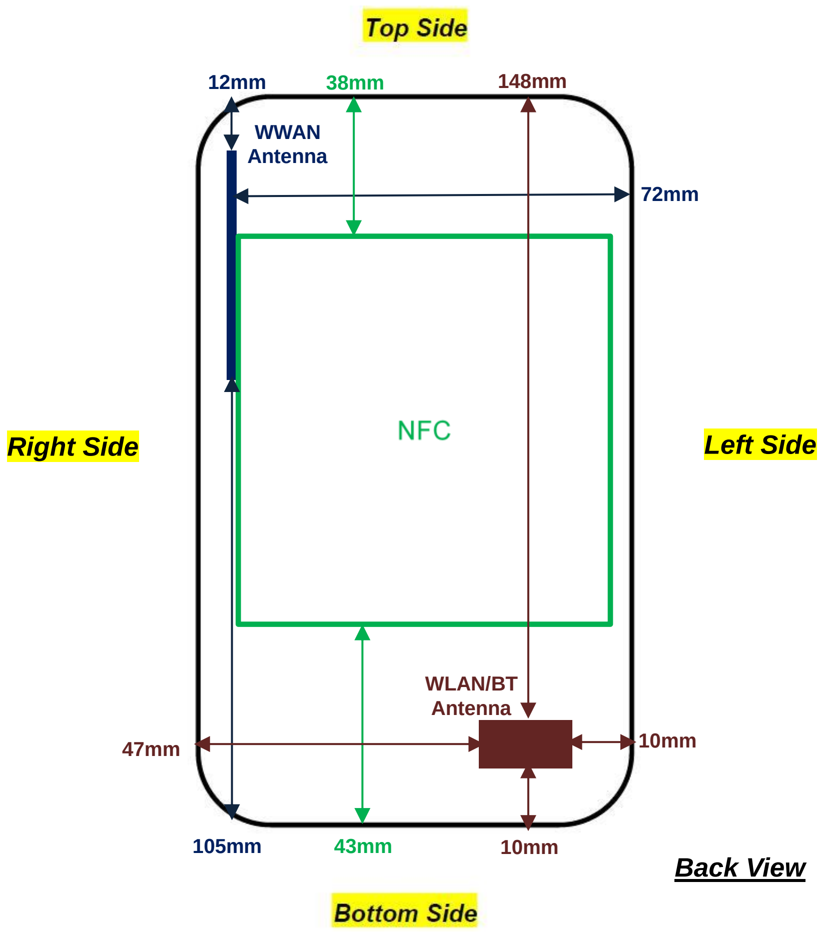
1. Per KDB 447498 D01v05r02, the 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at *test separation distances* ≤ 50 mm are determined by:
   [(*max. power of channel, including tune-up tolerance, mW*)/(*min. test separation distance, mm*)] ·[$\sqrt{f(GHz)}$] ≤ 3.0 for 1-g SAR and ≤ 7.5 for 10-g extremity SAR
   - f(GHz) is the RF channel transmit frequency in GHz
   - Power and distance are rounded to the nearest mW and mm before calculation
   - The result is rounded to one decimal place for comparison

Bluetooth Max Power (dBm)	Separation Distance (mm)	Frequency (GHz)	exclusion thresholds
8	5	2.48	1.89

Note:

Per KDB 447498 D01v05r02, when the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion. The test exclusion threshold is 1.89 which is <= 3, SAR testing is not required.

14. Antenna Location



15. SAR Test Results

General Note:

1. Per KDB 447498 D01v05r02, the reported SAR is the measured SAR value adjusted for maximum tune-up tolerance.
   a. Tune-up scaling Factor = tune-up limit power (mW) / EUT RF power (mW), where tune-up limit is the maximum rated power among all production units.
   b. 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 D01v05r02, for each exposure position, testing of other required channels within the operating mode of a frequency band is not required when the *reported* 1-g or 10-g SAR for the mid-band or highest output power channel is:
   - ≤ 0.8 W/kg or 2.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≤ 100 MHz
   - ≤ 0.6 W/kg or 1.5 W/kg, for 1-g or 10-g respectively, when the transmission band is between 100 MHz and 200 MHz
   - ≤ 0.4 W/kg or 1.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≥ 200 MHz
3. When the WLAN transmission was verified using a spectrum analyzer.

15.1 Body SAR

<GSM SAR>

Plot No.	Band	Mode	Test Position	Gap (cm)	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	GSM850	GPRS (1 Tx slot)	Front	0cm	128	824.2	32.11	32.50	1.094	-0.05	0.397	0.434
	GSM850	GPRS (1 Tx slot)	Back	0cm	128	824.2	32.11	32.50	1.094	-0.04	0.456	0.499
	GSM850	GPRS (1 Tx slot)	Back	0cm	189	836.4	32.09	32.50	1.099	-0.02	0.508	0.558
01	GSM850	GPRS (1 Tx slot)	Back	0cm	251	848.8	31.99	32.50	1.125	0.01	0.621	**0.698**
02	GSM1900	GPRS (2 Tx slots)	Front	0cm	810	1909.8	26.40	27.50	1.288	-0.08	0.413	**0.532**
	GSM1900	GPRS (2 Tx slots)	Front	0cm	512	1850.2	26.30	27.50	1.318	-0.01	0.306	0.403
	GSM1900	GPRS (2 Tx slots)	Front	0cm	661	1880	26.34	27.50	1.306	-0.01	0.366	0.478
	GSM1900	GPRS (2 Tx slots)	Back	0cm	810	1909.8	26.40	27.50	1.288	0	0.291	0.375

<WCDMA SAR>

Plot No.	Band	Mode	Test Position	Gap (cm)	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	WCDMA V	RMC 12.2Kbps	Front	0cm	4182	836.4	23.44	24.00	1.138	0.07	0.597	0.679
	WCDMA V	RMC 12.2Kbps	Back	0cm	4182	836.4	23.44	24.00	1.138	0.03	0.759	0.863
	WCDMA V	RMC 12.2Kbps	Back	0cm	4132	826.4	23.32	24.00	1.169	-0.05	0.635	0.743
03	WCDMA V	RMC 12.2Kbps	Back	0cm	4233	846.6	23.37	24.00	1.156	-0.18	0.890	**1.029**
	WCDMA II	RMC 12.2Kbps	Front	0cm	9400	1880	23.48	24.00	1.127	-0.08	0.755	0.851
	WCDMA II	RMC 12.2Kbps	Front	0cm	9262	1852.4	23.33	24.00	1.167	-0.05	0.672	0.784
04	WCDMA II	RMC 12.2Kbps	Front	0cm	9538	1907.6	23.37	24.00	1.156	0.05	0.772	**0.893**
	WCDMA II	RMC 12.2Kbps	Back	0cm	9400	1880	23.48	24.00	1.127	-0.14	0.457	0.515

<WLAN SAR>

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)
	WLAN2.4GHz	802.11b 1Mbps	Front	0cm	11	2462	14.34	14.50	1.038	100	1.000	-0.06	0.097	0.101
05	WLAN2.4GHz	802.11b 1Mbps	Back	0cm	11	2462	14.34	14.50	1.038	100	1.000	-0.01	0.526	0.546
	WLAN2.4GHz	802.11b 1Mbps	Back	0cm	1	2412	14.12	14.50	1.091	100	1.000	0.02	0.381	0.416
	WLAN2.4GHz	802.11b 1Mbps	Back	0cm	6	2437	14.15	14.50	1.084	100	1.000	0.02	0.445	0.482
	WLAN2.4GHz	802.11n-HT20 MCS0	Back	0cm	6	2437	11.63	12.50	1.221	97.67	1.024	0.04	0.245	0.306
	WLAN5GHz	802.11a 6Mbps	Front	0cm	165	5825	9.13	10.00	1.223	97.81	1.022	0	< 0.001	< 0.001
	WLAN5GHz	802.11a 6Mbps	Back	0cm	165	5825	9.13	10.00	1.223	97.81	1.022	0.01	0.793	0.991
	WLAN5GHz	802.11a 6Mbps	Back	0cm	149	5745	8.73	10.00	1.341	97.81	1.022	-0.06	0.637	0.873
	WLAN5GHz	802.11a 6Mbps	Back	0cm	157	5785	8.70	10.00	1.350	97.81	1.022	0.04	0.718	0.991
	WLAN5GHz	802.11n-HT20 MCS0	Back	0cm	165	5825	9.64	10.00	1.088	97.38	1.027	-0.13	0.888	0.992
	WLAN5GHz	802.11n-HT20 MCS0	Back	0cm	149	5745	9.41	10.00	1.147	97.38	1.027	-0.05	0.728	0.857
06	WLAN5GHz	802.11n-HT20 MCS0	Back	0cm	157	5785	9.23	10.00	1.195	97.38	1.027	-0.04	0.810	0.994

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)
	WLAN5GHz	802.11a 6Mbps	Front	0cm	36	5180	8.81	9.00	1.046	97.81	1.022	0	< 0.001	< 0.001
	WLAN5GHz	802.11a 6Mbps	Back	0cm	36	5180	8.81	9.00	1.046	97.81	1.022	-0.04	0.316	0.338
07	WLAN5GHz	802.11n-HT20 MCS0	Back	0cm	36	5180	8.83	9.00	1.041	97.38	1.027	0.12	0.328	0.351
	WLAN5GHz	802.11n-HT20 MCS0	Back	0cm	44	5220	8.80	9.00	1.048	97.38	1.027	-0.13	0.300	0.323
	WLAN5GHz	802.11a 6Mbps	Front	0cm	52	5260	8.66	9.00	1.082	97.81	1.022	0	< 0.001	< 0.001
	WLAN5GHz	802.11a 6Mbps	Back	0cm	52	5260	8.66	9.00	1.082	97.81	1.022	-0.06	0.302	0.334
08	WLAN5GHz	802.11a 6Mbps	Back	0cm	60	5300	8.36	9.00	1.160	97.81	1.022	0	0.313	0.371
	WLAN5GHz	802.11n-HT20 MCS0	Back	0cm	52	5260	8.37	9.00	1.157	97.38	1.027	-0.12	0.289	0.344
	WLAN5GHz	802.11a 6Mbps	Front	0cm	100	5500	8.12	9.00	1.226	97.81	1.022	-0.19	0.012	0.015
	WLAN5GHz	802.11a 6Mbps	Back	0cm	100	5500	8.12	9.00	1.226	97.81	1.022	-0.14	0.310	0.388
	WLAN5GHz	802.11a 6Mbps	Back	0cm	116	5580	8.03	9.00	1.251	97.81	1.022	0.13	0.369	0.472
09	WLAN5GHz	802.11a 6Mbps	Back	0cm	136	5680	7.93	9.00	1.279	97.81	1.022	-0.04	0.547	0.715
	WLAN5GHz	802.11n-HT20 MCS0	Back	0cm	100	5500	8.14	9.00	1.220	97.38	1.027	0.13	0.293	0.367

15.2 Repeated SAR Measurement

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)	Ratio	Reported 1g SAR (W/kg)
1st	WCDMA V	RMC 12.2Kbps	Back	0cm	4233	846.6	23.37	24.00	1.156	-	1.000	-0.18	0.890	-	1.029
2nd	WCDMA V	RMC 12.2Kbps	Back	0cm	4233	846.6	23.37	24.00	1.156	-	1.000	-0.01	0.791	1.13	0.914
1st	WLAN5GHz	802.11n-HT20 MCS0	Back	0cm	165	5825	9.64	10.00	1.088	97.38	1.027	-0.13	0.888	-	0.992
2nd	WLAN5GHz	802.11n-HT20 MCS0	Back	0cm	165	5825	9.64	10.00	1.088	97.38	1.027	0.04	0.884	1.01	0.987

General Note:

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

16. Simultaneous Transmission Analysis

NO.	Simultaneous Transmission Configurations	Point of Sale Terminal	Note
		Body	
1.	GPRS/EDGE(Data) + WLAN2.4GHz(data)	Yes	
2.	WCDMA(Data) + WLAN2.4GHz(data)	Yes	
3.	GPRS/EDGE(Data) + Bluetooth(data)	Yes	
4.	WCDMA(Data) + Bluetooth(data)	Yes	
5.	GPRS/EDGE(data) + WLAN5GHz(data)	Yes	
6.	WCDMA(data) + WLAN5GHz(data)	Yes	

General Note:

1. WLAN and Bluetooth share the same antenna, and cannot transmit simultaneously.
2. EUT will choose either WLAN 2.4GHz or WLAN 5GHz according to the network signal condition; therefore, 2.4GHz WLAN and 5GHz WLAN will not operate simultaneously at any moment.
3. The Scaled SAR summation is calculated based on the same configuration and test position.
4. Per KDB 447498 D01v05r02, simultaneous transmission SAR is compliant if,
   i) Scalar SAR summation < 1.6W/kg.
   ii) SPLSR = (SAR1 + SAR2)^1.5 / (min. separation distance, mm), and the peak separation distance is determined from the square root of [(x1-x2)2 + (y1-y2)2 + (z1-z2)2], where (x1, y1, z1) and (x2, y2, z2) are the coordinates of the extrapolated peak SAR locations in the zoom scan.
   iii) If SPLSR ≤ 0.04, simultaneously transmission SAR measurement is not necessary.
   iv) Simultaneously transmission SAR measurement, and the reported multi-band SAR < 1.6W/kg.
   v) The SPLSR calculated results please refer to section 16.2.
5. For simultaneous transmission analysis, Bluetooth SAR is estimated per KDB 447498 D01v05r02 based on the formula below.
   i) (*max. power of channel, including tune-up tolerance, mW*)/(*min. test separation distance, mm*)]·[$\sqrt{f(GHz)}/x$] W/kg for *test separation distances* ≤ 50 mm; where x = 7.5 for 1-g SAR, and x = 18.75 for 10-g SAR.
   ii) When the minimum separation distance is < 5mm, the distance is used 5mm to determine SAR test exclusion.
   iii) 0.4 W/kg for 1-g SAR and 1.0 W/kg for 10-g SAR, when the *test separation distances* is > 50 mm.
   iv) Bluetooth estimated SAR is conservatively determined by 5mm separation, for all applicable exposure positions.

Bluetooth Max Power	Exposure Position	Body
8 dBm	Estimated SAR (W/kg)	0.252 W/kg

16.1 Body Exposure Conditions

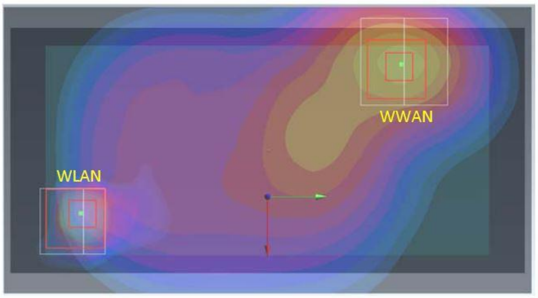
WWAN Band		Exposure Position	WWAN	2.4GHz / 5.8GHz WLAN		Summed SAR (W/kg)	SPLSR	Case No
			SAR (W/kg)	Band	SAR (W/kg)			
GSM	GSM850	Front	0.434	2.4GHz WLAN	0.101	**0.54**		
		Back	0.698	5.8GHz WLAN	0.994	**1.69**	0.02	Case 1
	GSM1900	Front	0.532	2.4GHz WLAN	0.101	**0.63**		
		Back	0.375	5.8GHz WLAN	0.994	**1.37**		
WCMDA	Band V	Front	0.679	2.4GHz WLAN	0.101	**0.78**		
		Back	1.029	5.8GHz WLAN	0.994	**2.02**	0.02	Case 2
	Band II	Front	0.893	2.4GHz WLAN	0.101	**0.99**		
		Back	0.515	5.8GHz WLAN	0.994	**1.51**		

WWAN Band		Exposure Position	WWAN	5.2GHz / 5.3GHz / 5.5GHz WLAN		Summed SAR (W/kg)	SPLSR	Case No
			SAR (W/kg)	Band	SAR (W/kg)			
GSM	GSM850	Front	0.434	5.5GHz WLAN	0.015	**0.45**		
		Back	0.698	5.5GHz WLAN	0.715	**1.41**		
	GSM1900	Front	0.532	5.5GHz WLAN	0.015	**0.55**		
		Back	0.375	5.5GHz WLAN	0.715	**1.09**		
WCMDA	Band V	Front	0.679	5.5GHz WLAN	0.015	**0.69**		
		Back	1.029	5.5GHz WLAN	0.715	**1.74**	0.02	Case 3
	Band II	Front	0.893	5.5GHz WLAN	0.015	**0.91**		
		Back	0.515	5.5GHz WLAN	0.715	**1.23**		

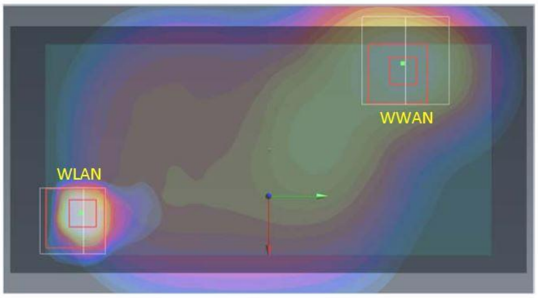
WWAN Band		Exposure Position	WWAN	2.4GHz Bluetooth	Summed SAR (W/kg)	SPLSR	Case No
			SAR (W/kg)	Estimated SAR (W/kg)			
GSM	GSM850	Front	0.434	0.252	**0.69**		
		Back	0.698	0.252	**0.95**		
	GSM1900	Front	0.532	0.252	**0.78**		
		Back	0.375	0.252	**0.63**		
WCMDA	Band V	Front	0.679	0.252	**0.93**		
		Back	1.029	0.252	**1.28**		
	Band II	Front	0.893	0.252	**1.15**		
		Back	0.515	0.252	**0.77**		

16.2 SPLSR Evaluation and Analysis

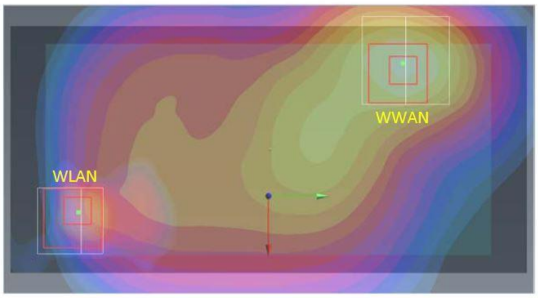
Case 1	Band	Position	SAR (W/kg)	Gap	SAR peak location (m)			3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
				(cm)	X	Y	Z				
	GSM850	Back	0.698	0	-0.0495	0.0505	-0.205	130.4	1.69	0.02	Not required
	5.8GHz WLAN		0.994	0	0.005	-0.068	-0.205				



Case 2	Band	Position	SAR (W/kg)	Gap	SAR peak location (m)			3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
				(cm)	X	Y	Z				
	WCDMA V	Back	1.029	0	-0.0495	0.0505	-0.205	130.4	2.02	0.02	Not required
	5.8GHz WLAN		0.994	0	0.005	-0.068	-0.205				



Case 3	Band	Position	SAR (W/kg)	Gap	SAR peak location (m)			3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
				(cm)	X	Y	Z				
	WCDMA V	Back	1.029	0	-0.0495	0.0505	-0.205	131.3	1.74	0.02	Not required
	5.5GHz WLAN		0.715	0	0.005	-0.069	-0.205				



Test Engineer： San Lin

17. Uncertainty Assessment

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

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

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

Uncertainty Distributions	Normal	Rectangular	Triangular	U-Shape
Multi-plying Factor[(a)]	1/k[(b)]	$1/\sqrt{3}$	$1/\sqrt{6}$	$1/\sqrt{2}$

(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 17.1. 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 17.2. 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 17.3. Uncertainty Budget for frequency range 3 GHz to 6 GHz

18. References

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

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

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

[4] SPEAG DASY System Handbook

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

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

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

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

[9] FCC KDB 941225 D04 v01, “Evaluating SAR for GSM/(E)GPRS Dual Transfer Mode”, January 2010

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

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