FCC SAR Test Report

APPLICANT	:	TCL Communication Ltd.
EQUIPMENT	:	Tablet PC
BRAND NAME	:	ALCATEL ONETOUCH
MODEL NAME	:	9006W
MARKETING NAME	:	ONETOUCH PIXI 2 (7)
FCC ID	:	2ACCJB014
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 had been in 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

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Revision History

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FA542101	Rev. 01	Initial issue of report	May. 11, 2015

1. Statement of Compliance

The maximum results of Specific Absorption Rate (SAR) found during testing for **TCL Communication Ltd., Tablet PC, 9006W** are as follows.

Equipment Class	Frequency Band	Highest SAR Summary	
		Body 1g SAR (W/kg)	Simultaneous Transmission 1g SAR (W/kg)
PCB	GSM850	0.22	1.49
	GSM1900	1.11	
	WCDMA Band V	0.25	
	WCDMA Band IV	1.03	
	WCDMA Band II	1.40	
	LTE Band 12	0.32	
	LTE Band 4	1.01	
	LTE Band 2	**1.44**	
DTS	WLAN 2.4GHz Band	1.39	1.44
Date of Testing:		2015/5/5~ 2015/5/9	

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 District, Taoyuan City, Taiwan (R.O.C.) TEL: +886-3-327-3456 FAX: +886-3-328-4978

Applicant	
Company Name	TCL Communication Ltd.
Address	5F, C building, No. 232, Liang Jing Road ZhangJiang High-Tech Park, Pudong Area Shanghai, P.R. China. 201203

Manufacturer	
Company Name	TCL Communication Ltd.
Address	5F, C building, No. 232, Liang Jing Road ZhangJiang High-Tech Park, Pudong Area Shanghai, P.R. China. 201203

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 802.11 Wi-Fi SAR v02
- FCC KDB 616217 D04 SAR for laptop and tablets v01r01
- FCC KDB 941225 D01 3G SAR Procedures v03
- FCC KDB 941225 D05 SAR for LTE Devices v02r03

4. Equipment Under Test (EUT)

4.1 General Information

Product Feature & Specification	
Equipment Name	Tablet PC
Brand Name	ALCATEL ONETOUCH
Model Name	9006W
Marketing Name	ONETOUCH PIXI 2 (7)
FCC ID	2ACCJB014
IMEI Code	014399000023051
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 LTE Band 12: 699.7 MHz ~ 715.3 MHz LTE Band 4: 1710.7 MHz ~ 1754.3 MHz LTE Band 2: 1850.7 MHz ~ 1909.3 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 5.8GHz Band: 5745 MHz ~ 5825 MHz Bluetooth: 2402 MHz ~ 2480 MHz
Mode	· GSM/GPRS/EGPRS · RMC/AMR 12.2Kbps · HSDPA · HSUPA · DC-HSDPA · LTE: QPSK, 16QAM · 802.11a/b/g/n HT20/HT40 · Bluetooth v3.0+EDR, Bluetooth v4.1-LE
HW Version	V03
SW Version	B2E
GSM / (E)GPRS Transfer mode	Class B – EUT cannot support Packet Switched and Circuit Switched Network simultaneously but can automatically switch between Packet and Circuit Switched Network.
EUT Stage	Production Unit
Remark: 1. This device supported VoIP in EGPRS, WCDMA, LTE (e.g. 3rd party VoIP).	

4.2 Maximum Tune-up Limit

Mode / Band	Burst Average Power (dBm)			
	GSM 850		GSM 1900	
Output Power Status	Full Power Mode	Reduce Power Mode	Full Power Mode	Reduce Power Mode
GPRS (GMSK, 1 Tx slot)	34.50	24.50	31.00	20.00
GPRS (GMSK, 2 Tx slots)	31.00	22.50	29.00	18.00
GPRS (GMSK, 3 Tx slots)	29.00	20.50	26.00	16.00
GPRS (GMSK, 4 Tx slots)	27.00	19.00	25.00	14.50
EDGE (8PSK, 1 Tx slot)	27.00	19.00	26.00	16.00
EDGE (8PSK, 2 Tx slots)	27.00	17.50	26.00	15.00
EDGE (8PSK, 3 Tx slot)	26.00	16.50	24.00	15.00
EDGE (8PSK, 4 Tx slots)	25.00	16.00	24.00	14.00

Mode / Band	Average Power (dBm)					
	WCDMA Band V		WCDMA Band II		WCDMA Band IV	
Output Power Status	Full Power Mode	Reduce Power Mode	Full Power Mode	Reduce Power Mode	Full Power Mode	Reduce Power Mode
RMC 12.2Kbps	24.50	16.50	24.50	13.50	24.50	13.50
HSDPA Subtest-1	23.50	14.50	23.50	13.50	23.50	13.50
DC-HSDPA Subtest-1	23.50	14.50	23.50	13.50	23.50	13.50
HSUPA Subtest-5	23.50	14.50	23.50	13.50	23.50	13.50

LTE Band 12						
Modulation	BW (MHz)	RB size	Full Power Mode		Reduce Power Mode	
			MPR	Average Power (dBm)	MPR	Average Power (dBm)
QPSK	10	≤ 12	0	24.50	0	15.50
QPSK	10	> 12	1	23.50	0	15.50
16QAM	10	≤ 12	1	23.50	0	15.50
16QAM	10	> 12	2	22.50	0	15.50
QPSK	5	≤ 8	0	24.50	0	15.50
QPSK	5	> 8	1	23.50	0	15.50
16QAM	5	≤ 8	1	23.50	0	15.50
16QAM	5	> 8	2	22.50	0	15.50
QPSK	3	≤ 4	0	24.50	0	15.50
QPSK	3	> 4	1	23.50	0	15.50
16QAM	3	≤ 4	1	23.50	0	15.50
16QAM	3	> 4	2	22.50	0	15.50
QPSK	1.4	≤ 5	0	24.50	0	15.50
QPSK	1.4	> 5	1	23.50	0	15.50
16QAM	1.4	≤ 5	1	23.50	0	15.50
16QAM	1.4	> 5	2	22.50	0	15.50

LTE Band 4						
Modulation	BW (MHz)	RB size	Full Power Mode		Reduce Power Mode	
			MPR	Average Power (dBm)	MPR	Average Power (dBm)
QPSK	20	≤ 18	0	24.50	0	13.50
QPSK	20	> 18	1	23.50	0	13.50
16QAM	20	≤ 18	1	23.50	0	13.50
16QAM	20	> 18	2	22.50	0	13.50
QPSK	15	≤ 16	0	24.50	0	13.50
QPSK	15	> 16	1	23.50	0	13.50
16QAM	15	≤ 16	1	23.50	0	13.50
16QAM	15	> 16	2	22.50	0	13.50
QPSK	10	≤ 12	0	24.50	0	13.50
QPSK	10	> 12	1	23.50	0	13.50
16QAM	10	≤ 12	1	23.50	0	13.50
16QAM	10	> 12	2	22.50	0	13.50
QPSK	5	≤ 8	0	24.50	0	13.50
QPSK	5	> 8	1	23.50	0	13.50
16QAM	5	≤ 8	1	23.50	0	13.50
16QAM	5	> 8	2	22.50	0	13.50
QPSK	3	≤ 4	0	24.50	0	13.50
QPSK	3	> 4	1	23.50	0	13.50
16QAM	3	≤ 4	1	23.50	0	13.50
16QAM	3	> 4	2	22.50	0	13.50
QPSK	1.4	≤ 5	0	24.50	0	13.50
QPSK	1.4	> 5	1	23.50	0	13.50
16QAM	1.4	≤ 5	1	23.50	0	13.50
16QAM	1.4	> 5	2	22.50	0	13.50

LTE Band 2						
Modulation	BW (MHz)	RB size	Full Power Mode		Reduce Power Mode	
			MPR	Average Power (dBm)	MPR	Average Power (dBm)
QPSK	20	≤ 18	0	24.50	0	13.50
QPSK	20	> 18	1	23.50	0	13.50
16QAM	20	≤ 18	1	23.50	0	13.50
16QAM	20	> 18	2	22.50	0	13.50
QPSK	15	≤ 16	0	24.50	0	13.50
QPSK	15	> 16	1	23.50	0	13.50
16QAM	15	≤ 16	1	23.50	0	13.50
16QAM	15	> 16	2	22.50	0	13.50
QPSK	10	≤ 12	0	24.50	0	13.50
QPSK	10	> 12	1	23.50	0	13.50
16QAM	10	≤ 12	1	23.50	0	13.50
16QAM	10	> 12	2	22.50	0	13.50
QPSK	5	≤ 8	0	24.50	0	13.50
QPSK	5	> 8	1	23.50	0	13.50
16QAM	5	≤ 8	1	23.50	0	13.50
16QAM	5	> 8	2	22.50	0	13.50
QPSK	3	≤ 4	0	24.50	0	13.50
QPSK	3	> 4	1	23.50	0	13.50
16QAM	3	≤ 4	1	23.50	0	13.50
16QAM	3	> 4	2	22.50	0	13.50
QPSK	1.4	≤ 5	0	24.50	0	13.50
QPSK	1.4	> 5	1	23.50	0	13.50
16QAM	1.4	≤ 5	1	23.50	0	13.50
16QAM	1.4	> 5	2	22.50	0	13.50

Mode		Average Power (dBm)
2.4GHz	802.11b	12.90
	802.11g	12.50
	802.11n-HT20	12.50
5GHz	802.11a	8.00
	802.11n-HT20	8.00
	802.11n-HT40	8.00
Bluetooth v3.0-EDR		7.0
Bluetooth v4.1-LE		3.0

4.3 General LTE SAR Test and Reporting Considerations

Summarized necessary items addressed in KDB 941225 D05 v02r03	
FCC ID	2ACCJB014
Equipment Name	Tablet PC
Operating Frequency Range of each LTE transmission band	LTE Band 12: 699.7 MHz ~ 715.3 MHz LTE Band 4: 1710.7 MHz ~ 1754.3 MHz LTE Band 2: 1850.7 MHz ~ 1909.3 MHz
Channel Bandwidth	LTE Band 12: 1.4MHz, 3MHz, 5MHz, 10MHz LTE Band 04: 1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz, 20MHz LTE Band 02: 1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz, 20MHz
UE Category	Cat4
uplink modulations used	QPSK, and 16QAM
LTE Voice / Data requirements	1. Data only
LTE MPR permanently built-in by design	Table 6.2.3-1: Maximum Power Reduction (MPR) for Power Class 3

Modulation	Channel bandwidth / Transmission bandwidth (RB)						MPR (dB)
	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz	
QPSK	> 5	> 4	> 8	> 12	> 16	> 18	≤ 1
16 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	≤ 1
16 QAM	> 5	> 4	> 8	> 12	> 16	> 18	≤ 2

LTE A-MPR	In the base station simulator configuration, Network Setting value is set to NS_01 to disable A-MPR during SAR testing and the LTE SAR tests was transmitting on all TTI frames (Maximum TTI)
Spectrum plots for RB configuration	A properly configured base station simulator was used for the SAR and power measurement; therefore, spectrum plots for each RB allocation and offset configuration are not included in the SAR report.
Power reduction applied to satisfy SAR compliance	Yes, proximity sensor.

Transmission (H, M, L) channel numbers and frequencies in each LTE band

LTE Band 12

	Bandwidth 1.4 MHz		Bandwidth 3 MHz		Bandwidth 5 MHz		Bandwidth 10 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	23017	699.7	23025	700.5	23035	701.5	23060	704
M	23095	707.5	23095	707.5	23095	707.5	23095	707.5
H	23173	715.3	23165	714.5	23155	713.5	23130	711

LTE Band 4

	Bandwidth 1.4 MHz		Bandwidth 3 MHz		Bandwidth 5 MHz		Bandwidth 10 MHz		Bandwidth 15 MHz		Bandwidth 20 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	19957	1710.7	19965	1711.5	19975	1712.5	20000	1715	20025	1717.5	20050	1720
M	20175	1732.5	20175	1732.5	20175	1732.5	20175	1732.5	20175	1732.5	20175	1732.5
H	20393	1754.3	20385	1753.5	20375	1752.5	20350	1750	20325	1747.5	20300	1745

LTE Band 2

	Bandwidth 1.4 MHz		Bandwidth 3 MHz		Bandwidth 5 MHz		Bandwidth 10 MHz		Bandwidth 15 MHz		Bandwidth 20 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	18607	1850.7	18615	1851.5	18625	1852.5	18650	1855	18675	1857.5	18700	1860
M	18900	1880	18900	1880	18900	1880	18900	1880	18900	1880	18900	1880
H	19193	1909.3	19185	1908.5	19175	1907.5	19150	1905	19125	1902.5	19100	1900

5. Proximity Sensor Triggering Test

Proximity sensor power reduction

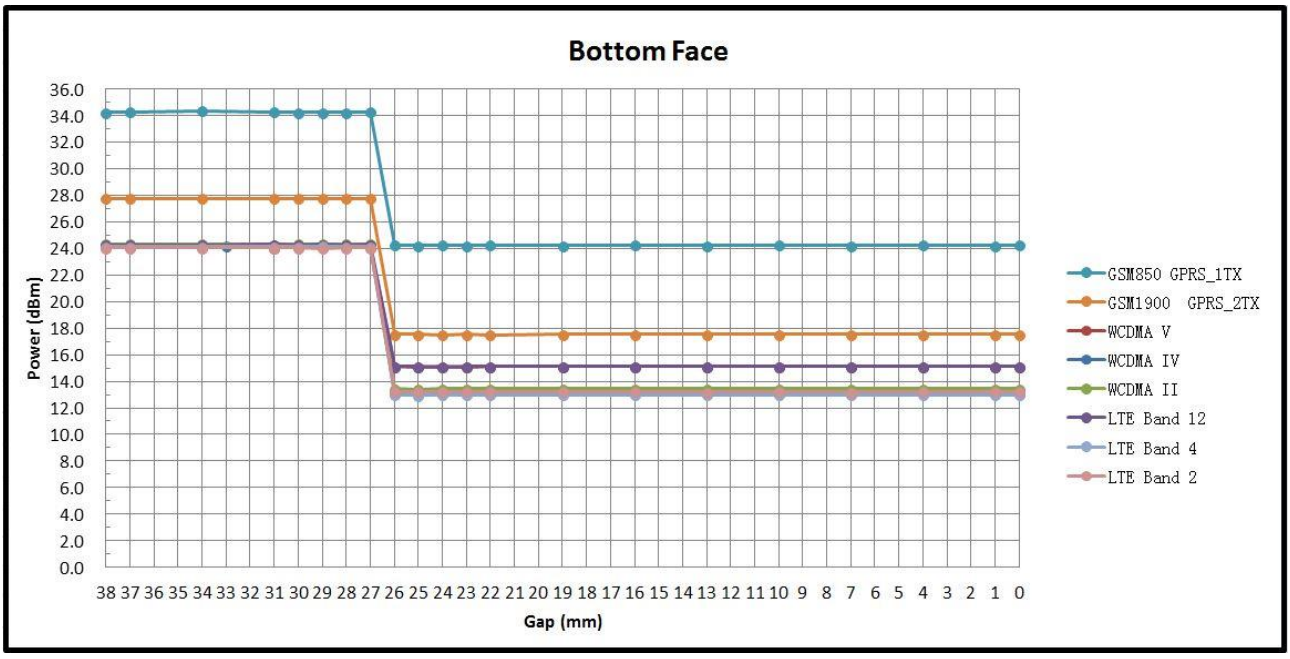
Exposure Position / wireless mode	Bottom Face(1)	Edge 1(1)	Curved surface of Edge 1(1)	Edge 2	Edge 3	Edge 4
GSM850 GPRS (GMSK 1 Tx slot) - CS1	10.0	10.0	10.0	0 dB	0 dB	0 dB
GSM850 GPRS (GMSK 2 Tx slot) - CS1	8.5	8.5	8.5			
GSM850 GPRS (GMSK 3 Tx slot) - CS1	8.5	8.5	8.5			
GSM850 GPRS (GMSK 4 Tx slot) - CS1	8.0	8.0	8.0			
GSM850 EDGE (8PSK 1 Tx slot) - MCS5	8.0	8.0	8.0			
GSM850 EDGE (8PSK 2 Tx slot) - MCS5	9.5	9.5	9.5			
GSM850 EDGE (8PSK 3 Tx slot) - MCS5	9.5	9.5	9.5			
GSM850 EDGE (8PSK 4 Tx slot) - MCS5	9.0	9.0	9.0			
GSM1900 GPRS (GMSK 1 Tx slot) - CS1	11.0	11.0	11.0			
GSM1900 GPRS (GMSK 2 Tx slot) - CS1	11.0	11.0	11.0			
GSM1900 GPRS (GMSK 3 Tx slot) - CS1	10.0	10.0	10.0			
GSM1900 GPRS (GMSK 4 Tx slot) - CS1	10.5	10.5	10.5			
GSM1900 EDGE (8PSK 1 Tx slot) - MCS5	10.0	10.0	10.0			
GSM1900 EDGE (8PSK 2 Tx slot) - MCS5	11.0	11.0	11.0			
GSM1900 EDGE (8PSK 3 Tx slot) - MCS5	9.0	9.0	9.0			
GSM1900 EDGE (8PSK 4 Tx slot) - MCS5	10.0	10.0	10.0			
WCDMA Band V	8.0	8.0	8.0			
WCDMA Band II	11.0	11.0	11.0			
WCDMA Band IV	11.0	11.0	11.0			
LTE Band 12	9.0	9.0	9.0			
LTE Band 4	11.0	11.0	11.0			
LTE Band 2	11.0	11.0	11.0			

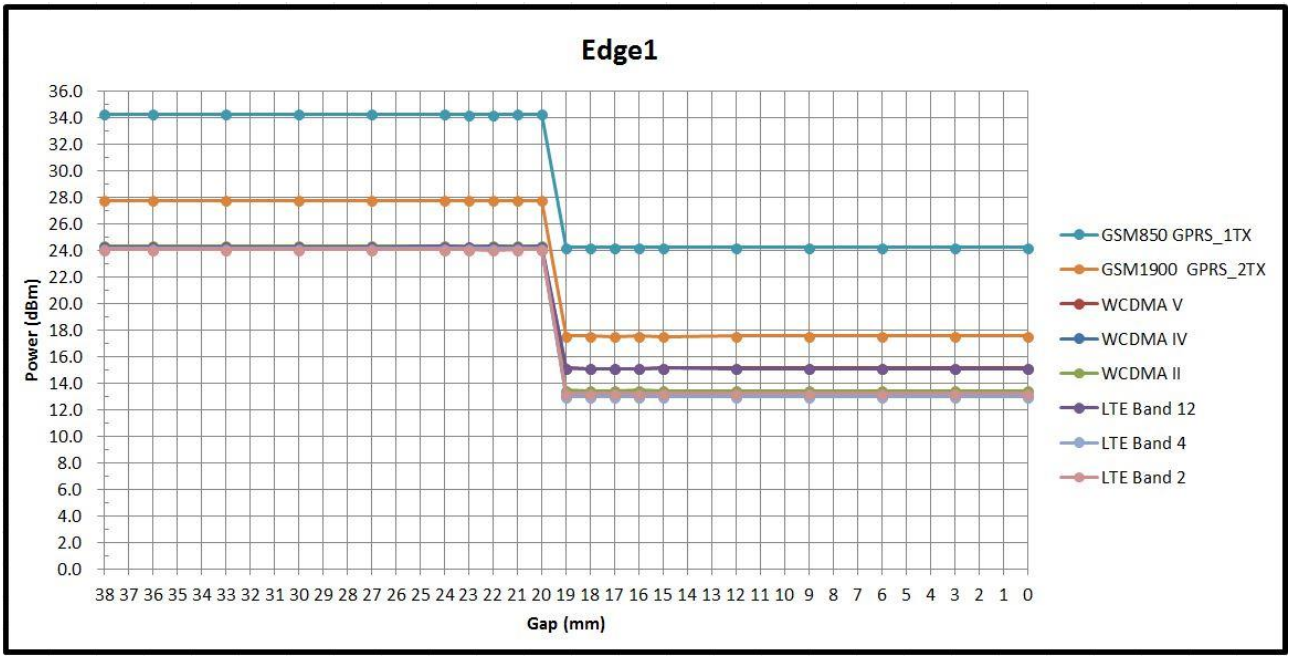
Remark:

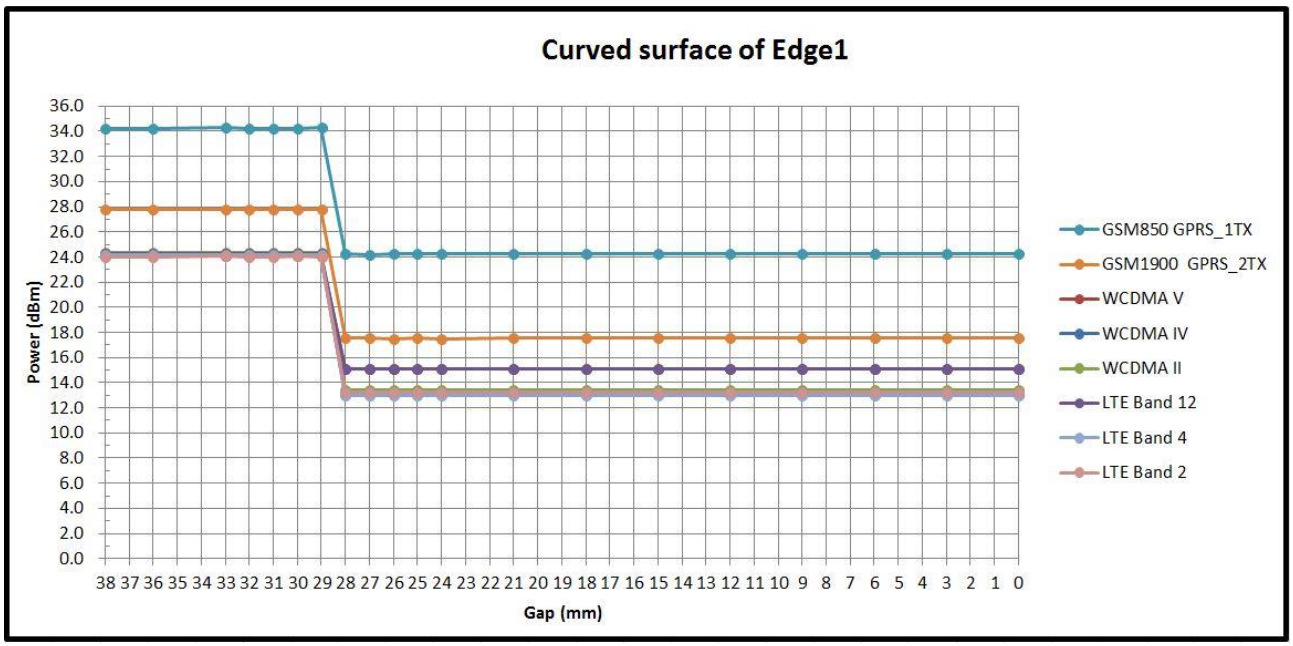
1. (1): Reduced maximum limit applied by activation of proximity sensor.
2. Power reduction is not applicable for WLAN and Bluetooth.
3. Tests were performed in accordance with KDB 616217 D04 section 6.1, 6.2, 6.3, 6.4 and 6.5 and compliant results are shown and described in exhibit “P-Sensor operational description
4. For verification of compliance of power reduction scheme, additional SAR testing with EUT transmitting at full RF power at a conservative trigger distance was performed:
   - Bottom Face: 15 mm
   - Edge1: 15 mm
   - Curved surface of dge1: 15 mm

Power Measurement during Sensor Trigger distance testing

Band/Mode	Ch #	Measured power reduction (dBm)		Reduction Levels
		w/o power back-off	w/ power back-off	(dB)
GSM850	189	34.27	24.23	10.04
GSM1900	661	30.67	19.38	11.29
WCDMA Band V	4182	24.03	15.02	9.01
WCDMA Band IV	1413	24.01	13.10	10.91
WCDMA Band II	9400	24.13	13.39	10.74
LTE Band 12	23095	24.28	15.11	9.17
LTE Band 4	20175	24.15	12.97	11.18
LTE Band 2	18900	24.04	13.22	10.82




Edge1
Power (dBm)
Gap (mm)
GSM850 GPRS_1TX
GSM1900 GPRS_2TX
WCDMA V
WCDMA IV
WCDMA II
LTE Band 12
LTE Band 4
LTE Band 2


Curved surface of Edge1
Power (dBm)
Gap (mm)
GSM850 GPRS_1TX
GSM1900 GPRS_2TX
WCDMA V
WCDMA IV
WCDMA II
LTE Band 12
LTE Band 4
LTE Band 2

6. RF Exposure Limits

6.1 Uncontrolled Environment

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

6.2 Controlled Environment

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

Limits for Occupational/Controlled Exposure (W/kg)

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

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

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

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.

7. Specific Absorption Rate (SAR)

7.1 Introduction

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

7.2 SAR Definition

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

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

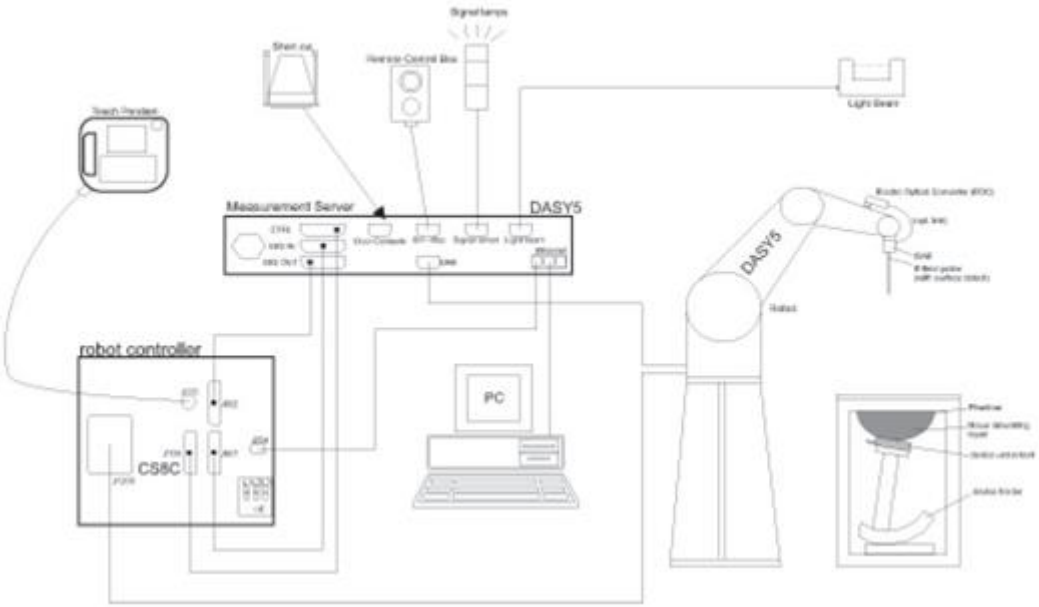
SAR is expressed in units of Watts per kilogram (W/kg)

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

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

8. System Description and Setup

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



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

9. Measurement Procedures

The measurement procedures are as follows:

<Conducted power measurement>

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

<SAR measurement>

(a) Use base station simulator to configure EUT WWAN transmission in radiated connection, and engineering software to configure EUT WLAN/BT continuously transmission, at maximum RF power, in the highest power channel.
(b) Place the EUT in the positions as Appendix 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 form the measurement grid to the high-resolution grid
(e) Extrapolation of the entire 3-D field distribution to the phantom surface over the distance from sensor to surface
(f) Calculation of the averaged SAR within masses of 1g and 10g

9.2 Power Reference Measurement

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

9.3 Area Scan

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

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

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

9.4 Zoom Scan

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

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

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

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

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

9.5 Volume Scan Procedures

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

9.6 Power Drift Monitoring

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

10. Test Equipment List

Manufacturer	Name of Equipment	Type/Model	Serial Number	Calibration	
				Last Cal.	Due Date
SPEAG	750MHz System Validation Kit	D750V3	1099	Nov. 19, 2014	Nov. 18, 2015
SPEAG	835MHz System Validation Kit	D835V2	499	Mar. 20, 2015	Mar. 19, 2016
SPEAG	1750MHz System Validation Kit	D1750V2	1068	Nov. 14, 2014	Nov. 13, 2015
SPEAG	1900MHz System Validation Kit	D1900V2	5d041	Mar. 24, 2015	Mar. 23, 2016
SPEAG	2450MHz System Validation Kit	D2450V2	924	Nov. 19, 2014	Nov. 18, 2015
SPEAG	Data Acquisition Electronics	DAE3	577	Oct. 06, 2014	Oct. 05, 2015
SPEAG	Dosimetric E-Field Probe	EX3DV4	3931	Sep. 25, 2014	Sep. 24, 2015
Wisewind	Thermometer	ETP-101	TM560	Oct. 21, 2014	Oct. 20, 2015
Anritsu	Radio Communication Analyzer	MT8820C	6201074414	Feb. 06, 2015	Feb. 05, 2016
Agilent	Wireless Communication Test Set	E5515C	MY50266977	May. 27, 2014	May. 26, 2015
SPEAG	Device Holder	N/A	N/A	N/A	N/A
Agilent	Signal Generator	N5181A	MY50145381	Dec. 11, 2014	Dec. 10, 2015
Agilent	ENA Network Analyzer	E5071C	MY46316648	Feb. 11, 2015	Feb. 10, 2016
SPEAG	Dielectric Probe Kit	DAK-3.5	1138	Nov. 18, 2014	Nov. 17, 2015
Anritsu	Power Meter	ML2495A	1349001	Dec. 03, 2014	Dec. 02, 2015
Anritsu	Power Sensor	MA2411B	1306099	Dec. 03, 2014	Dec. 02, 2015
R&S	Spectrum Analyzer	FSP 7	101131	Jul. 10, 2014	Jul. 09, 2015
Agilent	Dual Directional Coupler	778D	50422	Note 1	
Woken	Attenuator 1	WK0602-XX	N/A	Note 1	
PE	Attenuator 2	PE7005-10	N/A	Note 1	
PE	Attenuator 3	PE7005- 3	N/A	Note 1	
AR	Power Amplifier	5S1G4M2	0328767	Note 1	
Mini-Circuits	Power Amplifier	ZVE-3W	162601250	Note 1	

General Note:

1. Prior to system verification and validation, the path loss from the signal generator to the system check source and the power meter, which includes the amplifier, cable, attenuator and directional coupler, was measured by the network analyzer. The reading of the power meter was offset by the path loss difference between the path to the power meter and the path to the system check source to monitor the actual power level fed to the system check source.

11. System Verification

11.1 Tissue Verification

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

Frequency (MHz)	Water (%)	Sugar (%)	Cellulose (%)	Salt (%)	Preventol (%)	DGBE (%)	Conductivity (σ)	Permittivity (εr)
For Head								
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
750	MSL	22.5	0.961	53.914	0.96	55.50	0.10	-2.86	±5	2015/5/6
835	MSL	22.5	0.996	55.380	0.97	55.20	2.68	0.33	±5	2015/5/6
1750	MSL	22.4	1.459	52.753	1.49	53.40	-2.08	-1.21	±5	2015/5/5
1750	MSL	22.4	1.473	52.385	1.49	53.40	-1.14	-1.90	±5	2015/5/7
1900	MSL	22.4	1.541	53.910	1.52	53.30	1.38	1.14	±5	2015/5/5
1900	MSL	22.3	1.569	51.584	1.52	53.30	3.22	-3.22	±5	2015/5/8
2450	MSL	22.2	2.026	52.618	1.95	52.70	3.90	-0.16	±5	2015/5/9

11.2 System Performance Check Results

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

Date	Frequency (MHz)	Tissue Type	Input Power (mW)	Dipole S/N	Probe S/N	DAE S/N	Measured 1g SAR (W/kg)	Targeted 1g SAR (W/kg)	Normalized 1g SAR (W/kg)	Deviation (%)
2015/5/6	750	MSL	250	D750V3-1099	EX3DV4 - SN3931	DAE3 Sn577	2.00	8.56	8.00	-6.54
2015/5/6	835	MSL	250	D835V2-499	EX3DV4 - SN3931	DAE3 Sn577	2.51	9.30	10.04	7.96
2015/5/5	1750	MSL	250	D1750V2-1068	EX3DV4 - SN3931	DAE3 Sn577	8.90	38.00	35.60	-6.32
2015/5/7	1750	MSL	250	D1750V2-1068	EX3DV4 - SN3931	DAE3 Sn577	8.84	38.00	35.36	-6.95
2015/5/5	1900	MSL	250	D1900V2-5d041	EX3DV4 - SN3931	DAE3 Sn577	9.45	39.80	37.80	-5.03
2015/5/8	1900	MSL	250	D1900V2-5d041	EX3DV4 - SN3931	DAE3 Sn577	10.10	39.80	40.40	1.51
2015/5/9	2450	MSL	250	D2450V2-924	EX3DV4 - SN3931	DAE3 Sn577	13.70	51.40	54.80	6.61

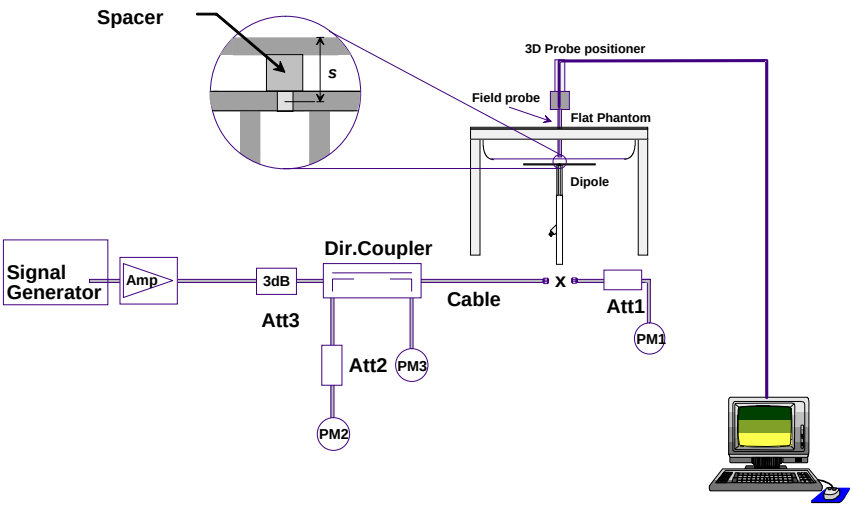


Fig 8.3.1 System Performance Check Setup

Fig 8.3.2 Setup Photo

12. RF Exposure Positions

12.1 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 D01v05r02 can be applied to determine SAR test exclusion for adjacent edge configurations. The closest distance from the antenna to an adjacent tablet edge is used to determine if SAR testing is required for the adjacent edges, with the adjacent edge positioned against the phantom and the edge containing the antenna positioned perpendicular to the phantom.

13. Conducted RF Output Power (Unit: dBm)

<GSM Conducted Power>

General Note:

1. Per KDB 447498 D01v05r02, the maximum output power channel is used for SAR testing and for further SAR test reduction.
2. Per KDB 941225 D01v03, for Body SAR test reduction for GPRS and EDGE modes is determined by the source-based time-averaged output power including tune-up tolerance, for modes with the same specified maximum output power and tolerance, the higher number time-slot configuration should be tested, therefore, for GSM850 the GPRS 1Tx slot modes was selected when EUT operating without power back-off, the GPRS 2Tx slots modes was selected when EUT operating with power back-off, according to the highest source-based time-averaged output power, and for GSM1900 the GPRS 2Tx slot modes was selected when EUT operating without power back-off, the GPRS 2Tx slots modes was selected when EUT operating with power back-off, according to the highest source-based time-averaged output power.

Maximum Average RF Power (Proximity Sensor Inactive)

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)	33.89	34.27	34.22	34.50	24.89	25.27	25.22	25.50
GPRS (GMSK, 2 Tx slots)	30.62	30.67	30.73	31.00	24.62	24.67	24.73	25.00
GPRS (GMSK, 3 Tx slots)	28.54	28.55	28.62	29.00	24.28	24.29	24.36	24.74
GPRS (GMSK, 4 Tx slots)	26.78	26.78	26.85	27.00	23.78	23.78	23.85	24.00
EDGE (8PSK, 1 Tx slot)	26.70	26.69	26.77	27.00	17.70	17.69	17.77	18.00
EDGE (8PSK, 2 Tx slots)	26.13	26.14	26.19	27.00	20.13	20.14	20.19	21.00
EDGE (8PSK, 3 Tx slots)	25.06	25.05	25.11	26.00	20.80	20.79	20.85	21.74
EDGE (8PSK, 4 Tx slots)	23.99	23.98	24.05	25.00	20.99	20.98	21.05	22.00

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)	30.68	30.67	30.88	31.00	21.68	21.67	21.88	22.00
GPRS (GMSK, 2 Tx slots)	27.65	27.52	27.77	29.00	21.65	21.52	21.77	23.00
GPRS (GMSK, 3 Tx slots)	25.25	25.38	25.30	26.00	20.99	21.12	21.04	21.74
GPRS (GMSK, 4 Tx slots)	23.77	23.64	23.81	25.00	20.77	20.64	20.81	22.00
EDGE (8PSK, 1 Tx slot)	25.55	25.57	25.67	26.00	16.55	16.57	16.67	17.00
EDGE (8PSK, 2 Tx slots)	24.91	24.88	24.94	26.00	18.91	18.88	18.94	20.00
EDGE (8PSK, 3 Tx slots)	23.77	23.74	23.81	24.00	19.51	19.48	19.55	19.74
EDGE (8PSK, 4 Tx slots)	22.70	22.64	22.71	24.00	19.70	19.64	19.71	21.00

Reduced Average RF Power (Proximity Sensor active)

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)	24.14	24.23	24.22	24.50	15.14	15.23	15.22	15.50
GPRS (GMSK, 2 Tx slots)	22.35	22.40	22.37	22.50	16.35	16.40	16.37	16.50
GPRS (GMSK, 3 Tx slots)	20.36	20.45	20.38	20.50	16.10	16.19	16.12	16.24
GPRS (GMSK, 4 Tx slots)	18.71	18.88	18.75	19.00	15.71	15.88	15.75	16.00
EDGE (8PSK, 1 Tx slot)	18.48	18.54	18.51	19.00	9.48	9.54	9.51	10.00
EDGE (8PSK, 2 Tx slots)	17.37	17.49	17.40	17.50	11.37	11.49	11.40	11.50
EDGE (8PSK, 3 Tx slots)	16.32	16.46	16.44	16.50	12.06	12.20	12.18	12.24
EDGE (8PSK, 4 Tx slots)	15.48	15.57	15.49	16.00	12.48	12.57	12.49	13.00

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)	19.44	19.38	19.49	20.00	10.44	10.38	10.49	11.00
GPRS (GMSK, 2 Tx slots)	17.38	17.27	17.54	18.00	11.38	11.27	11.54	12.00
GPRS (GMSK, 3 Tx slots)	15.39	15.36	15.48	16.00	11.13	11.10	11.22	11.74
GPRS (GMSK, 4 Tx slots)	14.26	14.17	14.33	14.50	11.26	11.17	11.33	11.50
EDGE (8PSK, 1 Tx slot)	15.53	15.50	15.62	16.00	6.53	6.50	6.62	7.00
EDGE (8PSK, 2 Tx slots)	14.58	14.57	14.66	15.00	8.58	8.57	8.66	9.00
EDGE (8PSK, 3 Tx slots)	14.05	14.01	14.11	15.00	9.79	9.75	9.85	10.74
EDGE (8PSK, 4 Tx slots)	13.26	13.20	13.32	14.00	10.26	10.20	10.32	11.00

<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.
3. For HSPA+ devices supporting 16 QAM in the uplink, power measurements procedure is according to the configurations in Table C.11.1.4 of 3GPP TS 34.121-1.
4. For DC-HSDPA, the device was configured according to the H-Set 12, Fixed Reference Channel (FRC) configuration in Table C.8.1.12 of 3GPP TS 34.121-1, with the primary and the secondary serving HS-DSCH Cell enabled during the power measurement.

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

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: β_c/β_d=2/15
      b). Subtest 2: β_c/β_d=12/15
      c). Subtest 3: β_c/β_d=15/8
      d). Subtest 4: β_c/β_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.		

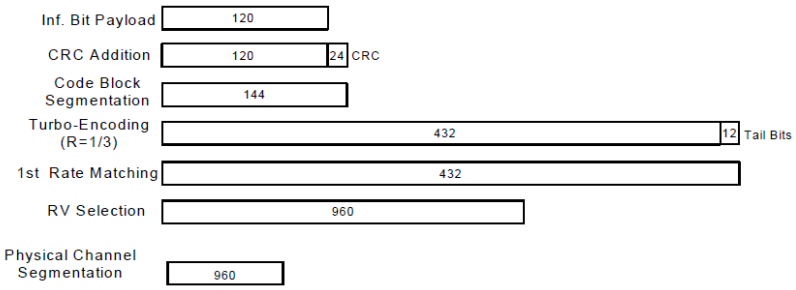


Figure C.8.19: Coding rate for Fixed reference Channel H-Set 12 (QPSK)

Setup Configuration

<WCDMA Conducted Power>

General Note:

1. Per KDB 941225 D01v03, SAR for Body exposure is measured using a 12.2 kbps RMC with TPC bits configured to all "1's".
2. Per KDB 941225 D01v03, RMC 12.2kbps setting is used to evaluate SAR. If the maximum output power and tune-up tolerance specified for production units in HSDPA / HSUPA / DC-HSDPA is ≤ ¼ dB higher than RMC 12.2Kbps or when the highest reported SAR of the RMC12.2Kbps is scaled by the ratio of specified maximum output power and tune-up tolerance of HSDPA / HSUPA / DC-HSDPA to RMC12.2Kbps and the adjusted SAR is ≤ 1.2 W/kg, SAR measurement is not required for HSDPA / HSUPA / DC-HSDPA.

Maximum Average RF Power (Proximity Sensor Inactive)

Band			WCDMA V			WCDMA II			WCDMA IV		
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	RMC 12.2Kbps	24.10	24.03	24.08	24.07	24.13	24.39	24.15	24.01	24.34
0	3GPP Rel 6	HSDPA Subtest-1	23.09	22.95	23.01	23.19	23.29	23.39	23.48	23.17	23.47
0	3GPP Rel 6	HSDPA Subtest-2	23.05	22.98	23.00	23.21	23.30	23.34	23.49	23.19	23.50
0.5	3GPP Rel 6	HSDPA Subtest-3	22.64	22.53	22.63	22.69	22.79	22.90	22.50	22.55	22.98
0.5	3GPP Rel 6	HSDPA Subtest-4	22.63	22.55	22.62	22.70	22.81	22.91	22.51	22.57	22.99
0	3GPP Rel 8	DC-HSDPA Subtest-1	23.07	22.90	23.00	23.17	23.24	23.35	23.45	23.15	23.47
0	3GPP Rel 8	DC-HSDPA Subtest-2	23.01	22.93	23.00	23.20	23.27	23.32	23.48	23.18	23.48
0.5	3GPP Rel 8	DC-HSDPA Subtest-3	22.65	22.52	22.61	22.62	22.78	22.88	22.43	22.53	22.95
0.5	3GPP Rel 8	DC-HSDPA Subtest-4	22.63	22.50	22.64	22.65	22.80	22.88	22.50	22.57	22.99
0	3GPP Rel 6	HSUPA Subtest-1	23.09	21.98	22.19	22.46	22.74	22.08	23.46	23.14	23.50
2	3GPP Rel 6	HSUPA Subtest-2	20.85	21.08	20.68	21.76	21.46	21.04	21.90	21.82	21.86
1	3GPP Rel 6	HSUPA Subtest-3	21.18	21.63	21.33	21.37	21.18	21.31	21.52	21.54	21.94
2	3GPP Rel 6	HSUPA Subtest-4	21.11	21.62	21.03	22.15	21.76	21.29	22.48	22.12	22.45
0	3GPP Rel 6	HSUPA Subtest-5	22.13	22.65	22.12	22.09	22.42	22.00	23.48	23.14	23.43

Reduced Average RF Power (Proximity Sensor active)

Band			WCDMA V			WCDMA II			WCDMA IV		
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	RMC 12.2Kbps	15.11	15.02	15.10	13.38	13.39	13.45	13.09	13.10	13.11
0	3GPP Rel 6	HSDPA Subtest-1	13.95	13.90	13.92	12.20	12.24	12.39	12.33	12.34	12.39
0	3GPP Rel 6	HSDPA Subtest-2	14.15	14.09	14.11	12.25	12.30	12.39	12.33	12.37	12.45
0.5	3GPP Rel 6	HSDPA Subtest-3	13.67	13.56	13.60	11.77	11.79	11.89	11.80	11.81	11.89
0.5	3GPP Rel 6	HSDPA Subtest-4	13.50	13.40	13.45	11.79	11.80	11.99	11.79	11.82	11.89
0	3GPP Rel 8	DC-HSDPA Subtest-1	13.90	13.85	13.87	12.15	12.19	12.34	12.28	12.29	12.34
0	3GPP Rel 8	DC-HSDPA Subtest-2	14.10	14.04	14.06	12.20	12.25	12.34	12.28	12.32	12.40
0.5	3GPP Rel 8	DC-HSDPA Subtest-3	13.62	13.51	13.55	11.72	11.74	11.84	11.75	11.76	11.84
0.5	3GPP Rel 8	DC-HSDPA Subtest-4	13.45	13.35	13.40	11.74	11.75	11.94	11.74	11.77	11.84
0	3GPP Rel 6	HSUPA Subtest-1	13.58	13.49	13.51	11.52	11.41	11.10	11.15	11.33	11.39
2	3GPP Rel 6	HSUPA Subtest-2	13.03	13.18	12.65	10.84	10.44	10.11	10.39	10.29	10.43
1	3GPP Rel 6	HSUPA Subtest-3	13.37	13.50	13.39	10.43	10.23	10.21	10.56	10.46	10.60
2	3GPP Rel 6	HSUPA Subtest-4	13.33	13.31	13.17	11.20	10.82	10.26	11.11	11.05	11.26
0	3GPP Rel 6	HSUPA Subtest-5	14.25	14.34	14.22	11.08	11.32	10.91	12.10	12.05	12.41

<LTE Conducted Power>

General Note:

1. Anritsu MT8820C base station simulator was used to setup the connection with EUT; the frequency band, channel bandwidth, RB allocation configuration, modulation type are set in the base station simulator to configure EUT transmitting at maximum power and at different configurations which are requested to be reported to FCC, for conducted power measurement and SAR testing.
2. Per KDB 941225 D05v02r03, when a properly configured base station simulator is used for the SAR and power measurements, spectrum plots for each RB allocation and offset configuration is not required.
3. Per KDB 941225 D05v02r03, start with the largest channel bandwidth and measure SAR for QPSK with 1 RB allocation, using the RB offset and required test channel combination with the highest maximum output power for RB offsets at the upper edge, middle and lower edge of each required test channel.
4. Per KDB 941225 D05v02r03, 50% RB allocation for QPSK SAR testing follows 1RB QPSK allocation procedure.
5. Per KDB 941225 D05v02r03, For QPSK with 100% RB allocation, SAR is not required when the highest maximum output power for 100 % RB allocation is less than the highest maximum output power in 50% and 1 RB allocations and the highest reported SAR for 1 RB and 50% RB allocation are ≤ 0.8 W/kg. Otherwise, SAR is measured for the highest output power channel; and if the reported SAR is > 1.45 W/kg, the remaining required test channels must also be tested.
6. Per KDB 941225 D05v02r03, 16QAM output power for each RB allocation configuration is > not ½ dB higher than the same configuration in QPSK and the reported SAR for the QPSK configuration is ≤ 1.45 W/kg; Per KDB 941225 D05v02r03, 16QAM SAR testing is not required.
7. Per KDB 941225 D05v02r03, Smaller bandwidth output power for each RB allocation configuration is > not ½ dB higher than the same configuration in the largest supported bandwidth, and the reported SAR for the largest supported bandwidth is ≤ 1.45 W/kg; Per KDB 941225 D05v02r03, smaller bandwidth SAR testing is not required.

Maximum Average RF Power (Proximity Sensor Inactive)

<LTE Band 12>

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)	MPR (dB)
Channel				23060	23095	23130		
Frequency (MHz)				704	707.5	711		
10	QPSK	1	0	24.06	24.28	24.15	24.5	0
10	QPSK	1	24	24.04	24.10	24.13		
10	QPSK	1	49	24.04	23.87	24.15		
10	QPSK	25	0	23.00	23.01	22.97	23.5	1
10	QPSK	25	12	22.99	22.88	22.92		
10	QPSK	25	24	22.91	23.00	22.88		
10	QPSK	50	0	22.93	22.95	22.91		
10	16QAM	1	0	22.77	23.06	23.01	23.5	1
10	16QAM	1	24	22.99	23.40	23.15		
10	16QAM	1	49	23.44	23.20	23.42		
10	16QAM	25	0	21.80	21.92	21.96	22.5	2
10	16QAM	25	12	21.96	21.96	21.97		
10	16QAM	25	24	22.07	21.99	21.97		
10	16QAM	50	0	22.00	22.03	21.99		
Channel				23035	23095	23155	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				701.5	707.5	713.5		
5	QPSK	1	0	24.06	24.03	24.00	24.5	0
5	QPSK	1	12	23.98	24.02	24.04		
5	QPSK	1	24	24.05	23.81	23.88		
5	QPSK	12	0	22.83	22.84	22.86	23.5	1
5	QPSK	12	6	22.90	23.00	22.89		
5	QPSK	12	11	22.83	22.92	22.92		
5	QPSK	25	0	22.79	22.90	22.90		
5	16QAM	1	0	22.96	23.25	22.80	23.5	1
5	16QAM	1	12	23.47	23.11	23.48		
5	16QAM	1	24	23.47	22.87	23.42		
5	16QAM	12	0	21.86	21.90	21.89	22.5	2
5	16QAM	12	6	21.82	22.02	21.90		
5	16QAM	12	11	21.78	21.92	21.82		
5	16QAM	25	0	22.16	22.09	21.89		
Channel				23025	23095	23165	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				700.5	707.5	714.5		
3	QPSK	1	0	24.04	24.12	23.81	24.5	0
3	QPSK	1	7	24.01	24.11	24.05		
3	QPSK	1	14	23.72	23.76	23.93		
3	QPSK	8	0	22.96	22.91	22.86	23.5	1
3	QPSK	8	4	22.91	23.02	22.99		
3	QPSK	8	7	22.93	22.98	22.99		
3	QPSK	15	0	22.83	22.98	22.83		
3	16QAM	1	0	23.10	23.24	22.80	23.5	1
3	16QAM	1	7	23.46	23.25	23.19		
3	16QAM	1	14	23.48	23.29	23.02		
3	16QAM	8	0	22.09	21.82	21.80	22.5	2
3	16QAM	8	4	21.99	22.14	21.81		
3	16QAM	8	7	21.99	22.20	21.84		
3	16QAM	15	0	22.11	22.17	21.75		

Channel				23017	23095	23173	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				699.7	707.5	715.3		
1.4	QPSK	1	0	24.18	24.27	23.61	24.5	0
1.4	QPSK	1	2	23.99	23.80	23.74		
1.4	QPSK	1	5	23.87	23.92	23.83		
1.4	QPSK	3	0	23.99	24.02	23.98		
1.4	QPSK	3	1	24.11	24.26	24.12		
1.4	QPSK	3	2	24.17	24.18	24.23		
1.4	QPSK	6	0	22.86	23.01	22.95	23.5	1
1.4	16QAM	1	0	22.49	22.62	22.54	23.5	1
1.4	16QAM	1	2	22.58	22.58	22.62		
1.4	16QAM	1	5	22.51	22.72	22.53		
1.4	16QAM	3	0	22.48	22.66	22.56		
1.4	16QAM	3	1	22.48	22.62	23.01		
1.4	16QAM	3	2	22.70	22.82	23.11		
1.4	16QAM	6	0	21.50	21.66	22.04	22.5	2

<LTE Band 4>

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)	MPR (dB)
Channel				20050	20175	20300		
Frequency (MHz)				1720	1732.5	1745		
20	QPSK	1	0	23.86	24.15	23.96	24.5	0
20	QPSK	1	49	23.79	24.14	23.85		
20	QPSK	1	99	23.70	23.78	23.70		
20	QPSK	50	0	22.72	22.85	22.84	23.5	1
20	QPSK	50	24	22.62	22.60	22.65		
20	QPSK	50	49	22.60	22.61	22.64		
20	QPSK	100	0	22.67	22.68	22.62		
20	16QAM	1	0	23.12	22.61	22.66	23.5	1
20	16QAM	1	49	22.80	22.48	22.50		
20	16QAM	1	99	22.78	22.49	22.41		
20	16QAM	50	0	21.68	21.66	21.67	22.5	2
20	16QAM	50	24	21.53	21.64	21.62		
20	16QAM	50	49	21.52	21.47	21.58		
20	16QAM	100	0	21.70	21.67	21.56		
Channel				20025	20175	20325	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1717.5	1732.5	1747.5		
15	QPSK	1	0	23.95	23.87	23.74	24.5	0
15	QPSK	1	37	23.69	23.74	23.73		
15	QPSK	1	74	23.62	23.56	23.52		
15	QPSK	36	0	22.64	22.73	22.74	23.5	1
15	QPSK	36	18	22.60	22.66	22.73		
15	QPSK	36	37	22.57	22.56	22.67		
15	QPSK	75	0	22.65	22.64	22.76		
15	16QAM	1	0	23.13	23.06	23.45	23.5	1
15	16QAM	1	37	22.87	22.81	23.49		
15	16QAM	1	74	22.82	22.77	23.37		
15	16QAM	36	0	21.56	21.49	21.64	22.5	2
15	16QAM	36	18	21.46	21.50	21.57		
15	16QAM	36	37	21.45	21.42	21.56		
15	16QAM	75	0	21.66	21.66	21.82		
Channel				20000	20175	20350	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1715	1732.5	1750		
10	QPSK	1	0	23.80	24.04	24.03	24.5	0
10	QPSK	1	24	23.55	23.89	23.95		
10	QPSK	1	49	23.56	23.71	23.78		
10	QPSK	25	0	22.64	22.75	22.75	23.5	1
10	QPSK	25	12	22.65	22.67	22.79		
10	QPSK	25	24	22.56	22.58	22.64		
10	QPSK	50	0	22.60	22.72	22.71		
10	16QAM	1	0	23.44	22.54	23.10	23.5	1
10	16QAM	1	24	23.42	22.78	23.19		
10	16QAM	1	49	23.19	22.84	22.95		
10	16QAM	25	0	21.67	21.67	21.62	22.5	2
10	16QAM	25	12	21.69	21.60	21.61		
10	16QAM	25	24	21.68	21.58	21.66		
10	16QAM	50	0	21.59	21.78	21.74		

Channel				19975	20175	20375	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1712.5	1732.5	1752.5		
5	QPSK	1	0	23.41	23.74	23.64	24.5	0
5	QPSK	1	12	23.40	23.56	23.63		
5	QPSK	1	24	23.40	23.59	23.40		
5	QPSK	12	0	22.57	22.63	22.74	23.5	1
5	QPSK	12	6	22.55	22.68	22.83		
5	QPSK	12	11	22.52	22.63	22.69		
5	QPSK	25	0	22.52	22.63	22.69		
5	16QAM	1	0	22.83	22.80	22.86	23.5	1
5	16QAM	1	12	22.90	22.84	22.92		
5	16QAM	1	24	22.27	22.80	22.78		
5	16QAM	12	0	21.61	21.49	21.55	22.5	2
5	16QAM	12	6	21.58	21.47	21.56		
5	16QAM	12	11	21.65	21.53	21.53		
5	16QAM	25	0	21.74	21.51	21.64		
Channel				19965	20175	20385	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1711.5	1732.5	1753.5		
3	QPSK	1	0	23.72	23.65	23.89	24.5	0
3	QPSK	1	7	23.46	23.64	23.68		
3	QPSK	1	14	23.37	23.51	23.55		
3	QPSK	8	0	22.63	22.69	22.69	23.5	1
3	QPSK	8	4	22.61	22.62	22.59		
3	QPSK	8	7	22.56	22.64	22.65		
3	QPSK	15	0	22.53	22.63	22.61		
3	16QAM	1	0	22.82	22.80	22.97	23.5	1
3	16QAM	1	7	22.81	22.83	22.82		
3	16QAM	1	14	22.73	22.79	22.81		
3	16QAM	8	0	21.63	21.60	21.59	22.5	2
3	16QAM	8	4	21.44	21.52	21.41		
3	16QAM	8	7	21.55	21.63	21.52		
3	16QAM	15	0	21.55	21.28	21.27		
Channel				19957	20175	20393	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1710.7	1732.5	1754.3		
1.4	QPSK	1	0	23.83	23.84	23.74	24.5	0
1.4	QPSK	1	2	23.82	23.83	23.61		
1.4	QPSK	1	5	23.69	23.54	23.53		
1.4	QPSK	3	0	23.79	23.70	23.56		
1.4	QPSK	3	1	23.73	23.56	23.68		
1.4	QPSK	3	2	23.81	23.56	23.73		
1.4	QPSK	6	0	22.53	22.59	22.60	23.5	1
1.4	16QAM	1	0	22.99	22.78	23.02	23.5	1
1.4	16QAM	1	2	22.96	23.05	22.89		
1.4	16QAM	1	5	23.04	22.79	22.50		
1.4	16QAM	3	0	22.51	22.62	22.38		
1.4	16QAM	3	1	22.73	22.65	22.73		
1.4	16QAM	3	2	22.56	22.72	22.49		
1.4	16QAM	6	0	21.34	21.72	22.01	22.5	2

<LTE Band 2>

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)	MPR (dB)
Channel				18700	18900	19100		
Frequency (MHz)				1860	1880	1900		
20	QPSK	1	0	24.01	24.04	23.88	24.5	0
20	QPSK	1	49	23.96	23.73	23.67		
20	QPSK	1	99	23.80	23.71	23.71		
20	QPSK	50	0	22.87	22.88	22.83	23.5	1
20	QPSK	50	24	22.79	22.80	22.79		
20	QPSK	50	49	22.76	22.67	22.82		
20	QPSK	100	0	22.79	22.87	22.84		
20	16QAM	1	0	23.13	23.24	23.21	23.5	1
20	16QAM	1	49	23.02	23.24	23.10		
20	16QAM	1	99	22.92	23.03	23.04		
20	16QAM	50	0	21.77	21.97	21.90	22.5	2
20	16QAM	50	24	21.73	21.84	21.83		
20	16QAM	50	49	21.75	21.80	21.87		
20	16QAM	100	0	21.93	21.83	21.88		
Channel				18675	18900	19125	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1857.5	1880	1902.5		
15	QPSK	1	0	24.00	23.91	24.02	24.5	0
15	QPSK	1	37	23.99	23.84	23.79		
15	QPSK	1	74	23.89	23.72	23.80		
15	QPSK	36	0	22.78	22.85	22.81	23.5	1
15	QPSK	36	18	22.76	22.78	22.81		
15	QPSK	36	37	22.71	22.65	22.80		
15	QPSK	75	0	22.74	22.89	22.77		
15	16QAM	1	0	23.12	23.41	23.18	23.5	1
15	16QAM	1	37	22.97	23.46	23.00		
15	16QAM	1	74	23.01	23.27	23.03		
15	16QAM	36	0	21.80	21.98	21.83	22.5	2
15	16QAM	36	18	21.79	21.92	21.80		
15	16QAM	36	37	21.74	21.88	21.76		
15	16QAM	75	0	21.77	21.92	21.87		
Channel				18650	18900	19150	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1855	1880	1905		
10	QPSK	1	0	24.02	23.77	23.99	24.5	0
10	QPSK	1	24	24.01	23.65	23.88		
10	QPSK	1	49	23.68	23.70	23.98		
10	QPSK	25	0	22.66	22.88	22.88	23.5	1
10	QPSK	25	12	22.69	22.86	22.83		
10	QPSK	25	24	22.69	22.84	22.78		
10	QPSK	50	0	22.72	22.81	22.78		
10	16QAM	1	0	23.44	23.23	23.22	23.5	1
10	16QAM	1	24	23.49	23.26	23.22		
10	16QAM	1	49	23.19	23.05	23.11		
10	16QAM	25	0	21.89	21.91	21.93	22.5	2
10	16QAM	25	12	21.80	21.89	21.85		
10	16QAM	25	24	21.83	21.97	21.84		
10	16QAM	50	0	21.72	21.95	21.84		

Channel				18625	18900	19175	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1852.5	1880	1907.5		
5	QPSK	1	0	23.98	23.98	23.93	24.5	0
5	QPSK	1	12	23.91	23.89	23.92		
5	QPSK	1	24	23.60	23.55	23.87		
5	QPSK	12	0	22.65	22.79	22.81	23.5	1
5	QPSK	12	6	22.65	22.86	22.81		
5	QPSK	12	11	22.66	22.81	22.83		
5	QPSK	25	0	22.62	22.81	22.76		
5	16QAM	1	0	23.45	23.46	23.45	23.5	1
5	16QAM	1	12	23.44	23.43	23.22		
5	16QAM	1	24	23.06	23.42	22.44		
5	16QAM	12	0	21.67	22.12	21.68	22.5	2
5	16QAM	12	6	21.68	22.20	21.60		
5	16QAM	12	11	21.78	22.14	21.74		
5	16QAM	25	0	21.87	21.74	21.83		
Channel				18615	18900	19185	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1851.5	1880	1908.5		
3	QPSK	1	0	23.83	23.82	23.74	24.5	0
3	QPSK	1	7	23.81	23.81	23.73		
3	QPSK	1	14	23.55	23.70	23.73		
3	QPSK	8	0	22.78	22.85	22.99	23.5	1
3	QPSK	8	4	22.68	22.90	22.82		
3	QPSK	8	7	22.72	22.82	22.82		
3	QPSK	15	0	22.67	22.81	22.78		
3	16QAM	1	0	22.99	23.14	22.63	23.5	1
3	16QAM	1	7	22.68	22.65	23.07		
3	16QAM	1	14	22.71	23.06	22.77		
3	16QAM	8	0	21.93	21.95	21.73	22.5	2
3	16QAM	8	4	21.79	21.96	21.96		
3	16QAM	8	7	21.92	22.00	21.96		
3	16QAM	15	0	21.87	21.89	21.98		
Channel				18607	18900	19193	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1850.7	1880	1909.3		
1.4	QPSK	1	0	23.94	23.93	23.87	24.5	0
1.4	QPSK	1	2	23.93	23.82	23.83		
1.4	QPSK	1	5	23.79	23.78	23.73		
1.4	QPSK	3	0	23.72	23.87	23.76		
1.4	QPSK	3	1	23.70	23.81	23.85		
1.4	QPSK	3	2	23.72	23.92	23.86		
1.4	QPSK	6	0	22.77	22.87	22.95	23.5	1
1.4	16QAM	1	0	22.80	22.58	23.46	23.5	1
1.4	16QAM	1	2	22.86	22.88	23.25		
1.4	16QAM	1	5	22.89	23.49	23.17		
1.4	16QAM	3	0	22.78	22.84	22.74		
1.4	16QAM	3	1	22.84	22.83	22.77		
1.4	16QAM	3	2	22.85	22.97	22.62		
1.4	16QAM	6	0	21.38	21.87	21.57	22.5	2

Reduced Average RF Power (Proximity Sensor active)

<LTE Band 12>

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)	MPR (dB)
Channel				23060	23095	23130		
Frequency (MHz)				704	707.5	711		
10	QPSK	1	0	15.02	15.11	15.00	15.5	0
10	QPSK	1	24	14.70	15.04	14.99		
10	QPSK	1	49	14.65	14.87	14.98		
10	QPSK	25	0	14.74	14.84	14.79	15.5	0
10	QPSK	25	12	14.73	14.68	14.70		
10	QPSK	25	24	14.68	14.77	14.70		
10	QPSK	50	0	14.73	14.79	14.76		
10	16QAM	1	0	14.95	14.86	14.91	15.5	0
10	16QAM	1	24	14.87	14.75	14.90		
10	16QAM	1	49	14.79	14.58	14.85		
10	16QAM	25	0	14.77	14.57	14.66	15.5	0
10	16QAM	25	12	14.72	14.67	14.69		
10	16QAM	25	24	14.63	14.67	14.56		
10	16QAM	50	0	14.74	14.67	14.73		
Channel				23035	23095	23155	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				701.5	707.5	713.5		
5	QPSK	1	0	14.97	15.03	14.97	15.5	0
5	QPSK	1	12	14.63	14.98	14.89		
5	QPSK	1	24	14.55	14.85	14.95		
5	QPSK	12	0	14.64	14.81	14.77	15.5	0
5	QPSK	12	6	14.70	14.65	14.64		
5	QPSK	12	11	14.61	14.75	14.68		
5	QPSK	25	0	14.63	14.75	14.66		
5	16QAM	1	0	14.95	14.85	14.84	15.5	0
5	16QAM	1	12	14.83	14.74	14.90		
5	16QAM	1	24	14.77	14.57	14.76		
5	16QAM	12	0	14.77	14.54	14.66	15.5	0
5	16QAM	12	6	14.64	14.59	14.65		
5	16QAM	12	11	14.56	14.60	14.49		
5	16QAM	25	0	14.74	14.64	14.70		
Channel				23025	23095	23165	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				700.5	707.5	714.5		
3	QPSK	1	0	14.89	14.93	14.93	15.5	0
3	QPSK	1	7	14.54	14.90	14.83		
3	QPSK	1	14	14.50	14.85	14.88		
3	QPSK	8	0	14.64	14.72	14.77	15.5	0
3	QPSK	8	4	14.68	14.61	14.54		
3	QPSK	8	7	14.54	14.67	14.64		
3	QPSK	15	0	14.60	14.69	14.65		
3	16QAM	1	0	14.88	14.76	14.78	15.5	0
3	16QAM	1	7	14.78	14.65	14.81		
3	16QAM	1	14	14.72	14.48	14.68		
3	16QAM	8	0	14.77	14.45	14.56	15.5	0
3	16QAM	8	4	14.55	14.54	14.57		
3	16QAM	8	7	14.51	14.54	14.44		
3	16QAM	15	0	14.70	14.57	14.68		

Channel				23017	23095	23173	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				699.7	707.5	715.3		
1.4	QPSK	1	0	14.85	14.89	14.85	15.5	0
1.4	QPSK	1	2	14.53	14.84	14.80		
1.4	QPSK	1	5	14.45	14.81	14.82		
1.4	QPSK	3	0	14.63	14.71	14.77		
1.4	QPSK	3	1	14.63	14.61	14.46		
1.4	QPSK	3	2	14.49	14.62	14.63		
1.4	QPSK	6	0	14.56	14.61	14.63	15.5	0
1.4	16QAM	1	0	14.81	14.69	14.74	15.5	0
1.4	16QAM	1	2	14.74	14.60	14.72		
1.4	16QAM	1	5	14.71	14.43	14.66		
1.4	16QAM	3	0	14.70	14.41	14.54		
1.4	16QAM	3	1	14.55	14.52	14.51		
1.4	16QAM	3	2	14.45	14.52	14.41		
1.4	16QAM	6	0	14.64	14.53	14.66	15.5	0

<LTE Band 4>

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)	MPR (dB)
Channel				20050	20175	20300		
Frequency (MHz)				1720	1732.5	1745		
20	QPSK	1	0	12.69	12.97	12.75	13.5	0
20	QPSK	1	49	12.58	12.45	12.58		
20	QPSK	1	99	12.32	12.46	12.24		
20	QPSK	50	0	12.49	12.84	12.71	13.5	0
20	QPSK	50	24	12.48	12.51	12.53		
20	QPSK	50	49	12.35	12.47	12.52		
20	QPSK	100	0	12.48	12.76	12.57		
20	16QAM	1	0	12.67	12.68	12.73	13.5	0
20	16QAM	1	49	12.53	12.79	12.69		
20	16QAM	1	99	12.27	12.57	12.51		
20	16QAM	50	0	12.25	12.71	12.66	13.5	0
20	16QAM	50	24	12.23	12.56	12.58		
20	16QAM	50	49	12.11	12.50	12.49		
20	16QAM	100	0	12.31	12.57	12.54		
Channel				20025	20175	20325	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1717.5	1732.5	1747.5		
15	QPSK	1	0	12.44	12.72	12.73	13.5	0
15	QPSK	1	37	12.30	12.20	12.51		
15	QPSK	1	74	12.22	12.27	12.07		
15	QPSK	36	0	12.32	12.72	12.56	13.5	0
15	QPSK	36	18	12.24	12.21	12.35		
15	QPSK	36	37	12.23	12.33	12.50		
15	QPSK	75	0	12.31	12.63	12.53		
15	16QAM	1	0	12.39	12.46	12.57	13.5	0
15	16QAM	1	37	12.33	12.59	12.46		
15	16QAM	1	74	12.09	12.40	12.21		
15	16QAM	36	0	12.10	12.45	12.40	13.5	0
15	16QAM	36	18	12.08	12.36	12.33		
15	16QAM	36	37	11.98	12.26	12.36		
15	16QAM	75	0	12.09	12.42	12.39		
Channel				20000	20175	20350	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1715	1732.5	1750		
10	QPSK	1	0	12.49	12.73	12.66	13.5	0
10	QPSK	1	24	12.45	12.30	12.49		
10	QPSK	1	49	12.22	12.28	12.21		
10	QPSK	25	0	12.20	12.64	12.54	13.5	0
10	QPSK	25	12	12.20	12.37	12.45		
10	QPSK	25	24	12.17	12.29	12.52		
10	QPSK	50	0	12.19	12.58	12.56		
10	16QAM	1	0	12.48	12.41	12.50	13.5	0
10	16QAM	1	24	12.39	12.49	12.53		
10	16QAM	1	49	12.05	12.26	12.38		
10	16QAM	25	0	11.96	12.49	12.39	13.5	0
10	16QAM	25	12	11.96	12.40	12.48		
10	16QAM	25	24	11.83	12.15	12.21		
10	16QAM	50	0	12.08	12.31	12.27		

Channel				19975	20175	20375	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1712.5	1732.5	1752.5		
5	QPSK	1	0	12.51	12.83	12.65	13.5	0
5	QPSK	1	12	12.46	12.29	12.55		
5	QPSK	1	24	12.11	12.17	12.24		
5	QPSK	12	0	12.19	12.59	12.61	13.5	0
5	QPSK	12	6	12.33	12.28	12.40		
5	QPSK	12	11	12.22	12.24	12.33		
5	QPSK	25	0	12.35	12.47	12.55		
5	16QAM	1	0	12.46	12.45	12.60	13.5	0
5	16QAM	1	12	12.33	12.54	12.57		
5	16QAM	1	24	12.04	12.42	12.29		
5	16QAM	12	0	11.98	12.38	12.51	13.5	0
5	16QAM	12	6	12.01	12.21	12.45		
5	16QAM	12	11	11.89	12.21	12.39		
5	16QAM	25	0	12.14	12.29	12.26		
Channel				19965	20175	20385	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1711.5	1732.5	1753.5		
3	QPSK	1	0	12.55	12.84	12.64	13.5	0
3	QPSK	1	7	12.37	12.22	12.51		
3	QPSK	1	14	12.20	12.21	12.14		
3	QPSK	8	0	12.34	12.56	12.54	13.5	0
3	QPSK	8	4	12.20	12.23	12.46		
3	QPSK	8	7	12.18	12.36	12.37		
3	QPSK	15	0	12.22	12.62	12.41		
3	16QAM	1	0	12.43	12.43	12.48	13.5	0
3	16QAM	1	7	12.27	12.53	12.48		
3	16QAM	1	14	12.02	12.36	12.22		
3	16QAM	8	0	11.95	12.44	12.36	13.5	0
3	16QAM	8	4	12.05	12.38	12.46		
3	16QAM	8	7	11.92	12.30	12.35		
3	16QAM	15	0	12.10	12.41	12.28		
Channel				19957	20175	20393	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1710.7	1732.5	1754.3		
1.4	QPSK	1	0	12.59	12.87	12.69	13.5	0
1.4	QPSK	1	2	12.36	12.20	12.57		
1.4	QPSK	1	5	12.20	12.19	12.20		
1.4	QPSK	3	0	12.27	12.63	12.61		
1.4	QPSK	3	1	12.20	12.25	12.39		
1.4	QPSK	3	2	12.15	12.20	12.34		
1.4	QPSK	6	0	12.37	12.53	12.44	13.5	0
1.4	16QAM	1	0	12.52	12.45	12.60	13.5	0
1.4	16QAM	1	2	12.36	12.60	12.58		
1.4	16QAM	1	5	12.12	12.42	12.38		
1.4	16QAM	3	0	11.98	12.36	12.54		
1.4	16QAM	3	1	12.04	12.32	12.36		
1.4	16QAM	3	2	11.94	12.21	12.33		
1.4	16QAM	6	0	12.06	12.31	12.25	13.5	0

<LTE Band 2>

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)	MPR (dB)
Channel				18700	18900	19100		
Frequency (MHz)				1860	1880	1900		
20	QPSK	1	0	13.19	13.22	13.20	13.5	0
20	QPSK	1	49	13.01	12.95	13.00		
20	QPSK	1	99	12.75	12.80	12.83		
20	QPSK	50	0	12.85	12.86	12.83	13.5	0
20	QPSK	50	24	12.65	12.75	12.76		
20	QPSK	50	49	12.61	12.62	12.75		
20	QPSK	100	0	12.78	12.79	12.75		
20	16QAM	1	0	12.95	12.72	12.70	13.5	0
20	16QAM	1	49	12.91	12.58	12.56		
20	16QAM	1	99	12.85	13.00	12.53		
20	16QAM	50	0	12.72	12.68	12.64	13.5	0
20	16QAM	50	24	12.60	12.64	12.59		
20	16QAM	50	49	12.56	12.80	12.68		
20	16QAM	100	0	12.69	12.77	12.65		
Channel				18675	18900	19125	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1857.5	1880	1902.5		
15	QPSK	1	0	13.01	13.01	13.04	13.5	0
15	QPSK	1	37	12.99	12.85	12.92		
15	QPSK	1	74	12.73	12.74	12.74		
15	QPSK	36	0	12.75	12.81	12.79	13.5	0
15	QPSK	36	18	12.60	12.68	12.73		
15	QPSK	36	37	12.56	12.53	12.65		
15	QPSK	75	0	12.57	12.76	12.67		
15	16QAM	1	0	12.86	12.70	12.68	13.5	0
15	16QAM	1	37	12.85	12.52	12.49		
15	16QAM	1	74	12.78	12.35	12.45		
15	16QAM	36	0	12.66	12.58	12.62	13.5	0
15	16QAM	36	18	12.54	12.58	12.55		
15	16QAM	36	37	12.51	12.50	12.62		
15	16QAM	75	0	12.64	12.42	12.64		
Channel				18650	18900	19150	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1855	1880	1905		
10	QPSK	1	0	12.91	12.92	12.98	13.5	0
10	QPSK	1	24	12.93	12.81	12.86		
10	QPSK	1	49	12.71	12.69	12.66		
10	QPSK	25	0	12.70	12.76	12.71	13.5	0
10	QPSK	25	12	12.55	12.61	12.63		
10	QPSK	25	24	12.51	12.51	12.59		
10	QPSK	50	0	12.48	12.76	12.60		
10	16QAM	1	0	12.84	12.62	12.62	13.5	0
10	16QAM	1	24	12.82	12.48	12.49		
10	16QAM	1	49	12.68	12.34	12.38		
10	16QAM	25	0	12.59	12.53	12.58	13.5	0
10	16QAM	25	12	12.52	12.49	12.52		
10	16QAM	25	24	12.47	12.48	12.57		
10	16QAM	50	0	12.57	12.36	12.61		

Channel				18625	18900	19175	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1852.5	1880	1907.5		
5	QPSK	1	0	12.91	12.84	12.96	13.5	0
5	QPSK	1	12	12.84	12.71	12.82		
5	QPSK	1	24	12.65	12.61	12.63		
5	QPSK	12	0	12.68	12.69	12.69	13.5	0
5	QPSK	12	6	12.48	12.60	12.59		
5	QPSK	12	11	12.49	12.45	12.52		
5	QPSK	25	0	12.41	12.74	12.53		
5	16QAM	1	0	12.77	12.59	12.52	13.5	0
5	16QAM	1	12	12.77	12.44	12.43		
5	16QAM	1	24	12.66	12.24	12.37		
5	16QAM	12	0	12.51	12.50	12.51	13.5	0
5	16QAM	12	6	12.50	12.41	12.50		
5	16QAM	12	11	12.40	12.40	12.56		
5	16QAM	25	0	12.50	12.36	12.56		
Channel				18615	18900	19185	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1851.5	1880	1908.5		
3	QPSK	1	0	12.89	12.80	12.89	13.5	0
3	QPSK	1	7	12.79	12.62	12.80		
3	QPSK	1	14	12.61	12.52	12.59		
3	QPSK	8	0	12.58	12.60	12.64	13.5	0
3	QPSK	8	4	12.47	12.58	12.56		
3	QPSK	8	7	12.46	12.42	12.43		
3	QPSK	15	0	12.38	12.67	12.50		
3	16QAM	1	0	12.75	12.53	12.49	13.5	0
3	16QAM	1	7	12.67	12.39	12.37		
3	16QAM	1	14	12.60	12.21	12.37		
3	16QAM	8	0	12.49	12.40	12.45	13.5	0
3	16QAM	8	4	12.45	12.35	12.41		
3	16QAM	8	7	12.38	12.40	12.52		
3	16QAM	15	0	12.42	12.31	12.50		
Channel				18607	18900	19193	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1850.7	1880	1909.3		
1.4	QPSK	1	0	12.88	12.79	12.82	13.5	0
1.4	QPSK	1	2	12.74	12.55	12.71		
1.4	QPSK	1	5	12.57	12.43	12.52		
1.4	QPSK	3	0	12.58	12.53	12.62		
1.4	QPSK	3	1	12.39	12.58	12.50		
1.4	QPSK	3	2	12.37	12.41	12.38		
1.4	QPSK	6	0	12.38	12.66	12.41	13.5	0
1.4	16QAM	1	0	12.70	12.50	12.40	13.5	0
1.4	16QAM	1	2	12.60	12.32	12.32		
1.4	16QAM	1	5	12.59	12.20	12.29		
1.4	16QAM	3	0	12.39	12.37	12.35		
1.4	16QAM	3	1	12.44	12.32	12.32		
1.4	16QAM	3	2	12.30	12.38	12.49		
1.4	16QAM	6	0	12.37	12.29	12.50	13.5	0

<WLAN Conducted Power>

General Note:

1. Per KDB 248227 D01v02, SAR test reduction is determined according to 802.11 transmission mode configurations and certain exposure conditions with multiple test positions. In the 2.4 GHz band, separate SAR procedures are applied to DSSS and OFDM configurations to simplify DSSS test requirements. For OFDM, in both 2.4 and 5 GHz bands, an initial test configuration must be determined for each standalone and aggregated frequency band, according to the transmission mode configuration with the highest maximum output power specified for production units to perform SAR measurements. If the same highest maximum output power applies to different combinations of channel bandwidths, modulations and data rates, additional procedures are applied to determine which test configurations require SAR measurement. When applicable, an initial test position may be applied to reduce the number of SAR measurements required for next to the ear, UMPC mini-tablet or hotspot mode configurations with multiple test positions.
2. For 2.4 GHz 802.11b DSSS, either the initial test position procedure for multiple exposure test positions or the DSSS procedure for fixed exposure position is applied; these are mutually exclusive. For 2.4 GHz and 5 GHz OFDM configurations, the initial test configuration is applied to measure SAR using either the initial test position procedure for multiple exposure test position configurations or the initial test configuration procedures for fixed exposure test conditions. Based on the reported SAR of the measured configurations and maximum output power of the transmission mode configurations that are not included in the initial test configuration, the subsequent test configuration and initial test position procedures are applied to determine if SAR measurements are required for the remaining OFDM transmission configurations. In general, the number of test channels that require SAR measurement is minimized based on maximum output power measured for the test sample(s).
3. For OFDM transmission configurations in the 2.4 GHz and 5 GHz bands, When the same maximum power is specified for multiple transmission modes in a frequency band, the largest channel bandwidth, lowest order modulation, lowest data rate and lowest order 802.11a/g/n/ac mode is used for SAR measurement, on the highest measured output power channel for each frequency band.
4. DSSS and OFDM configurations are considered separately according to the required SAR procedures. SAR is measured in the initial test position using the 802.11 transmission mode configuration required by the DSSS procedure or initial test configuration and subsequent test configuration(s) according to the OFDM procedures.18 The initial test position procedure is described in the following:
   a. When the reported SAR of the initial test position is ≤ 0.4 W/kg, further SAR measurement is not required for the other test positions in that exposure configuration and 802.11 transmission mode combinations within the frequency band or aggregated band.
   b. When the reported SAR of the test position is > 0.4 W/kg, SAR is repeated for the 802.11 transmission mode configuration tested in the initial test position to measure the subsequent next closet/smallest test separation distance and maximum coupling test position on the highest maximum output power channel, until the report SAR is ≤ 0.8 W/kg or all required test position are tested.
   c. For all positions/configurations, when the reported SAR is > 0.8 W/kg, SAR is measured for these test positions/configurations on the subsequent next highest measured output power channel(s) until the reported SAR is ≤ 1.2 W/kg or all required channels are tested.

<2.4GHz WLAN>

	Mode	Channel	Frequency (MHz)	Data Rate	Average power (dBm)	Duty Cycle %
2.4GHz WLAN Antenna A	802.11b	CH 1	2412	1Mbps	11.57	97.79
		CH 6	2437		11.64	
		CH 11	2462		12.52	
	802.11g	CH 1	2412	6Mbps	10.84	86.97
		CH 6	2437		11.08	
		CH 11	2462		11.79	
	802.11n-HT20	CH 1	2412	MCS0	10.76	86.42
		CH 6	2437		11.06	
		CH 11	2462		11.71	

14. RF Exposure Exclusions Applied

<Bluetooth Maximum Power>

Mode Band	Average power(dBm)	
	Bluetooth v3.0-EDR	Bluetooth v4.1-LE
2.4GHz Bluetooth	7.0	3.0

<5GHz WLAN Maximum Power>

Mode		Average Power (dBm)
5GHz	802.11a	8.00
	802.11n-HT20	8.00
	802.11n-HT40	8.00

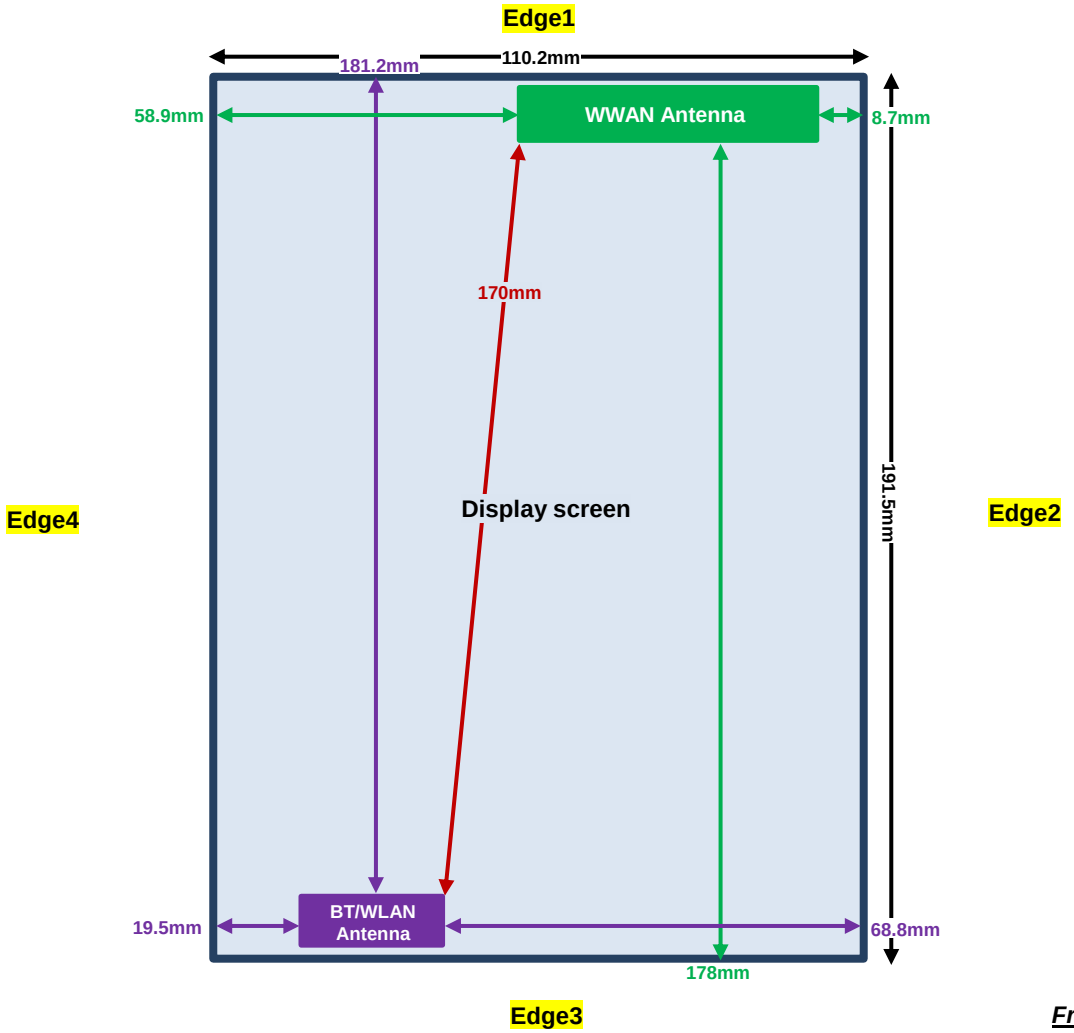
<Exclusion Applied>

General 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*)] ·[√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
2. 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 both are <= 3, SAR testing is not required.

Function	Max Power (dBm)	Distance (mm)	Frequency (GHz)	exclusion threshold	Limit
Bluetooth	7.0	5	2.480	1.57	3.0
5GHz WLAN	8.0	5	5.825	2.9	3.0

15. Antenna Location



Front View

<SAR test exclusion table>

General Note:

1. The below table, when the distance is < 50 mm exclusion threshold is "Ratio", when the distance is > 50 mm exclusion threshold is "mW"
2. Maximum power is the source-based time-average power and represents the maximum RF output power among production units
3. Per KDB 447498 D01v05r02, for larger devices, the test separation distance of adjacent edge configuration is determined by the closest separation between the antenna and the user.
4. Per KDB 447498 D01v05r02, standalone SAR test exclusion threshold is applied; If the test separation distance is < 5mm, 5mm is used to determine SAR exclusion threshold.
5. Per KDB 447498 D01v05r02, the 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at *test separation distances* ≤ 50 mm are determined by:
   [(*max. power of channel, including tune-up tolerance, mW*)/(*min. test separation distance, mm*)] ·[√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
6. Per KDB 447498 D01v05r02, at 100 MHz to 6 GHz and for *test separation distances* > 50 mm, the SAR test exclusion threshold is determined according to the following
   a) [Threshold at 50 mm in step 1) + (test separation distance - 50 mm)·(f(MHz)/150)] mW, at 100 MHz to 1500 MHz
   b) [Threshold at 50 mm in step 1) + (test separation distance - 50 mm)·10] mW at > 1500 MHz and ≤ 6 GHz

Exposure Position	Wireless Interface	GPRS 850 Class 8	GPRS 1900 Class 10	WCDMA Band V	WCDMA Band IV	WCDMA Band II	LTE Band 12	LTE Band 4	LTE Band 2	802.11b
	Calculated Frequency	848MHz	1909MHz	846MHz	1750MHz	1907MHz	715MHz	1754MHz	1909MHz	2462MHz
	Maximum power (dBm)	25.5	23	24.50	24.5	24.5	24.5	24.5	24.5	12.9
	Maximum rated power(mW)	355.0	200.0	282.0	282.0	282.0	282.0	282.0	282.0	19.0
Bottom Face	Separation distance(mm)	5.0								5.0
	exclusion threshold	65.4	55.3	51.9	74.6	77.9	47.7	74.7	77.9	6.0
	Testing required?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Edge 1	Separation distance(mm)	5.0								181.2
	exclusion threshold	65.4	55.3	51.9	74.6	77.9	47.7	74.7	77.9	1408.0
	Testing required?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
Edge 2	Separation distance(mm)	8.7								68.8
	exclusion threshold	37.6	31.8	29.8	42.9	44.8	27.4	42.9	44.8	283.0
	Testing required?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
Edge 3	Separation distance(mm)	178.0								5.0
	exclusion threshold	886.0	1388.0	885.0	1393.0	1388.0	787.0	1393.0	1388.0	6.0
	Testing required?	No	No	No	No	No	No	No	No	Yes
Edge 4	Separation distance(mm)	58.9								19.5
	exclusion threshold	213.0	197.0	213.0	202.0	197.0	220.0	202.0	197.0	1.5
	Testing required?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No

16. SAR Test Results

General Note:

1. Per KDB 447498 D01v05r02, the reported SAR is the measured SAR value adjusted for maximum tune-up tolerance.
   a. Tune-up scaling Factor = tune-up limit power (mW) / EUT RF power (mW), where tune-up limit is the maximum rated power among all production units.
   b. 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

Tablet Note:

1. For the exposure positions that proximity sensor power reduction is applied for SAR compliance, additional SAR testing with EUT transmitting full power in normal mode was performed; 15mm for bottom face, 15mm for edge1, 15mm for curved surface of edge1.
2. When the minimum distance between antenna and device edge along the curve is less than bottom face and surface edge, the curved SAR is necessary, more detail information which can be referred to setup photo.
3. For SAR testing of the curved region of the device, the device was placed directly against the phantom at the point where the distance between the antenna and device exterior is a minimum.

GSM Note:

1. Per KDB 941225 D01v03, for Body SAR test reduction for GPRS and EDGE modes is determined by the source-based time-averaged output power including tune-up tolerance, for modes with the same specified maximum output power and tolerance, the higher number time-slot configuration should be tested, therefore, for GSM850 the GPRS 1Tx slot modes was selected when EUT operating without power back-off, the GPRS 2Tx slots modes was selected when EUT operating with power back-off, according to the highest source-based time-averaged output power, and for GSM1900 the GPRS 2Tx slot modes was selected when EUT operating without power back-off, the GPRS 2Tx slots modes was selected when EUT operating with power back-off, according to the highest source-based time-averaged output power.

UMTS Note:

1. Per KDB 941225 D01v03, SAR for Body exposure is measured using a 12.2 kbps RMC with TPC bits configured to all “1’s”.
2. Per KDB 941225 D01v03, RMC 12.2kbps setting is used to evaluate SAR. If the maximum output power and tune-up tolerance specified for production units in HSDPA / HSUPA / DC-HSDPA is ≤ ¼ dB higher than RMC 12.2Kbps or when the highest reported SAR of the RMC12.2Kbps is scaled by the ratio of specified maximum output power and tune-up tolerance of HSDPA / HSUPA / DC-HSDPA to RMC12.2Kbps and the adjusted SAR is ≤ 1.2 W/kg, SAR measurement is not required for HSDPA / HSUPA / DC-HSDPA.

LTE Note:

1. Per KDB 941225 D05v02r03, start with the largest channel bandwidth and measure SAR for QPSK with 1 RB allocation, using the RB offset and required test channel combination with the highest maximum output power for RB offsets at the upper edge, middle and lower edge of each required test channel.
2. Per KDB 941225 D05v02r03, 50% RB allocation for QPSK SAR testing follows 1RB QPSK allocation procedure.
3. Per KDB 941225 D05v02r03, For QPSK with 100% RB allocation, SAR is not required when the highest maximum output power for 100 % RB allocation is less than the highest maximum output power in 50% and 1 RB allocations and the highest reported SAR for 1 RB and 50% RB allocation are ≤ 0.8 W/kg. Otherwise, SAR is measured for the highest output power channel; and if the reported SAR is > 1.45 W/kg, the remaining required test channels must also be tested.
4. Per KDB 941225 D05v02r03, 16QAM output power for each RB allocation configuration is > not ½ dB higher than the same configuration in QPSK and the reported SAR for the QPSK configuration is ≤ 1.45 W/kg; Per KDB 941225 D05v02r03, 16QAM SAR testing is not required.
5. Per KDB 941225 D05v02r03, Smaller bandwidth output power for each RB allocation configuration is > not ½ dB higher than the same configuration in the largest supported bandwidth, and the reported SAR for the largest supported bandwidth is ≤ 1.45 W/kg; Per KDB 941225 D05v02r03, smaller bandwidth SAR testing is not required.

WLAN Note:

1. Per KDB 248227 D01v02, for all positions/configurations tested using the initial test position and subsequent test positions, when the reported SAR is > 0.8 W/kg, SAR is measured for these test positions/configurations on the subsequent next highest measured output power channel(s) until the reported SAR is ≤ 1.2 W/kg or all required channels are tested.
2. Per KDB 248227 D01v02, for 802.11g/n SAR testing is required. When the highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power and the adjusted SAR is > 1.2 W/kg.
3. Per KDB 248227 D01v02, for OFDM transmission configurations in the 2.4 GHz bands, When the same maximum power is specified for multiple transmission modes in a frequency band, the largest channel bandwidth, lowest order modulation, lowest data rate and lowest order 802.11g/n mode is used for SAR measurement, on the highest measured output power channel for each frequency band.

16.1 Body SAR

<GSM SAR>

Plot No.	Band	Mode	Test Position	Gap (mm)	Power Reduction	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 (2 Tx slots)	Bottom Face	0mm	ON	189	836.4	22.40	22.50	1.023	-0.01	0.154	0.158
	GSM850	GPRS (2 Tx slots)	Edge 1	0mm	ON	189	836.4	22.40	22.50	1.023	-0.01	0.147	0.150
	GSM850	GPRS (2 Tx slots)	Curved surface of Edge 1	0mm	ON	189	836.4	22.40	22.50	1.023	-0.12	0.143	0.146
	GSM850	GPRS (1 Tx slots)	Bottom Face	15mm	OFF	189	836.4	34.27	34.50	1.054	-0.05	0.154	0.162
	GSM850	GPRS (1 Tx slots)	Edge 1	15mm	OFF	189	836.4	34.27	34.50	1.054	-0.05	0.101	0.106
01	GSM850	GPRS (1 Tx slots)	Edge 2	0mm	OFF	189	836.4	34.27	34.50	1.054	-0.07	0.206	0.217
	GSM850	GPRS (1 Tx slots)	Edge 4	0mm	OFF	189	836.4	34.27	34.50	1.054	0.01	0.095	0.100
	GSM850	GPRS (1 Tx slots)	Curved surface of Edge 1	15mm	OFF	189	836.4	34.27	34.50	1.054	-0.05	0.131	0.138
	GSM1900	GPRS (2 Tx slots)	Bottom Face	0mm	ON	810	1909.8	17.54	18.00	1.112	-0.07	0.623	0.693
	GSM1900	GPRS (2 Tx slots)	Edge 1	0mm	ON	810	1909.8	17.54	18.00	1.112	0.02	0.560	0.623
02	GSM1900	GPRS (2 Tx slots)	Curved surface of Edge 1	0mm	ON	810	1909.8	17.54	18.00	1.112	-0.08	0.996	1.107
	GSM1900	GPRS (2 Tx slots)	Curved surface of Edge 1	0mm	ON	512	1850.2	17.38	18.00	1.153	-0.06	0.847	0.977
	GSM1900	GPRS (2 Tx slots)	Curved surface of Edge 1	0mm	ON	661	1880	17.27	18.00	1.183	-0.08	0.914	1.081
	GSM1900	GPRS (2 Tx slots)	Bottom Face	15mm	OFF	810	1909.8	27.77	29.00	1.327	0.03	0.249	0.331
	GSM1900	GPRS (2 Tx slots)	Edge 1	15mm	OFF	810	1909.8	27.77	29.00	1.327	0.02	0.348	0.462
	GSM1900	GPRS (2 Tx slots)	Edge 2	0mm	OFF	810	1909.8	27.77	29.00	1.327	-0.03	0.183	0.243
	GSM1900	GPRS (2 Tx slots)	Edge 4	0mm	OFF	810	1909.8	27.77	29.00	1.327	0.15	0.029	0.038
	GSM1900	GPRS (2 Tx slots)	Curved surface of Edge 1	15mm	OFF	810	1909.8	27.77	29.00	1.327	-0.06	0.517	0.686

<WCDMA SAR>

Plot No.	Band	Mode	Test Position	Gap (mm)	Power Reduction	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	Bottom Face	0mm	ON	4132	826.4	15.11	16.50	1.377	-0.09	0.111	0.153
	WCDMA V	RMC 12.2Kbps	Edge 1	0mm	ON	4132	826.4	15.11	16.50	1.377	-0.03	0.117	0.161
	WCDMA V	RMC 12.2Kbps	Curved surface of Edge 1	0mm	ON	4132	826.4	15.11	16.50	1.377	-0.05	0.134	0.185
	WCDMA V	RMC 12.2Kbps	Bottom Face	15mm	OFF	4132	826.4	24.10	24.50	1.096	0.01	0.137	0.150
	WCDMA V	RMC 12.2Kbps	Edge 1	15mm	OFF	4132	826.4	24.10	24.50	1.096	-0.08	0.125	0.137
03	WCDMA V	RMC 12.2Kbps	Edge 2	0mm	OFF	4132	826.4	24.10	24.50	1.096	0.02	0.228	0.250
	WCDMA V	RMC 12.2Kbps	Edge 4	0mm	OFF	4132	826.4	24.10	24.50	1.096	-0.04	0.112	0.123
	WCDMA V	RMC 12.2Kbps	Curved surface of Edge 1	15mm	OFF	4132	826.4	24.10	24.50	1.096	-0.01	0.156	0.171
	WCDMA IV	RMC 12.2Kbps	Bottom Face	0mm	ON	1513	1752.6	13.11	13.50	1.094	-0.02	0.558	0.610
	WCDMA IV	RMC 12.2Kbps	Edge 1	0mm	ON	1513	1752.6	13.11	13.50	1.094	-0.06	0.576	0.630
	WCDMA IV	RMC 12.2Kbps	Curved surface of Edge 1	0mm	ON	1513	1752.6	13.11	13.50	1.094	-0.04	0.754	0.825
	WCDMA IV	RMC 12.2Kbps	Curved surface of Edge 1	0mm	ON	1312	1712.4	13.09	13.50	1.099	-0.04	0.646	0.710
04	WCDMA IV	RMC 12.2Kbps	Curved surface of Edge 1	0mm	ON	1413	1732.6	13.10	13.50	1.096	-0.07	0.938	1.028
	WCDMA IV	RMC 12.2Kbps	Bottom Face	15mm	OFF	1513	1752.6	24.34	24.50	1.038	-0.04	0.572	0.593
	WCDMA IV	RMC 12.2Kbps	Edge 1	15mm	OFF	1513	1752.6	24.34	24.50	1.038	-0.03	0.535	0.555
	WCDMA IV	RMC 12.2Kbps	Edge 2	0mm	OFF	1513	1752.6	24.34	24.50	1.038	-0.03	0.430	0.446
	WCDMA IV	RMC 12.2Kbps	Edge 4	0mm	OFF	1513	1752.6	24.34	24.50	1.038	0.01	0.379	0.393
	WCDMA IV	RMC 12.2Kbps	Curved surface of Edge 1	15mm	OFF	1513	1752.6	24.34	24.50	1.038	-0.09	0.943	0.978
	WCDMA IV	RMC 12.2Kbps	Curved surface of Edge 1	15mm	OFF	1312	1712.4	24.15	24.50	1.084	0	0.806	0.874
	WCDMA IV	RMC 12.2Kbps	Curved surface of Edge 1	15mm	OFF	1413	1732.6	24.01	24.50	1.119	-0.04	0.851	0.953
	WCDMA II	RMC 12.2Kbps	Bottom Face	0mm	ON	9538	1907.6	13.45	13.50	1.012	-0.07	0.737	0.746
	WCDMA II	RMC 12.2Kbps	Edge 1	0mm	ON	9538	1907.6	13.45	13.50	1.012	-0.04	0.840	0.850
	WCDMA II	RMC 12.2Kbps	Edge 1	0mm	ON	9262	1852.4	13.38	13.50	1.028	-0.02	0.604	0.621
	WCDMA II	RMC 12.2Kbps	Edge 1	0mm	ON	9400	1880	13.39	13.50	1.026	0	0.732	0.751
05	WCDMA II	RMC 12.2Kbps	Curved surface of Edge 1	0mm	ON	9538	1907.6	13.45	13.50	1.012	-0.05	1.380	1.396
	WCDMA II	RMC 12.2Kbps	Curved surface of Edge 1	0mm	ON	9262	1852.4	13.38	13.50	1.028	-0.06	0.963	0.990
	WCDMA II	RMC 12.2Kbps	Curved surface of Edge 1	0mm	ON	9400	1880	13.39	13.50	1.026	-0.04	1.200	1.231
	WCDMA II	RMC 12.2Kbps	Bottom Face	15mm	OFF	9538	1907.6	24.39	24.50	1.026	-0.03	0.451	0.463
	WCDMA II	RMC 12.2Kbps	Edge 1	15mm	OFF	9538	1907.6	24.39	24.50	1.026	0	0.640	0.656
	WCDMA II	RMC 12.2Kbps	Edge 2	0mm	OFF	9538	1907.6	24.39	24.50	1.026	-0.04	0.374	0.384
	WCDMA II	RMC 12.2Kbps	Edge 4	0mm	OFF	9538	1907.6	24.39	24.50	1.026	-0.06	0.067	0.069
	WCDMA II	RMC 12.2Kbps	Curved surface of Edge 1	15mm	OFF	9538	1907.6	24.39	24.50	1.026	-0.05	0.875	0.897
	WCDMA II	RMC 12.2Kbps	Curved surface of Edge 1	15mm	OFF	9262	1852.4	24.07	24.50	1.104	-0.1	0.618	0.682
	WCDMA II	RMC 12.2Kbps	Curved surface of Edge 1	15mm	OFF	9400	1880	24.13	24.50	1.089	-0.01	0.681	0.742

<LTE SAR>

Plot No.	Band	BW (MHz)	Modulation	RB Size	RB offset	Test Position	Gap (mm)	Power Reduction	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)
	LTE Band 12	10M	QPSK	1RB	0offset	Bottom Face	0mm	ON	23095	707.5	15.11	15.50	1.094	0.11	0.210	0.230
	LTE Band 12	10M	QPSK	25RB	0offset	Bottom Face	0mm	ON	23095	707.5	14.84	15.50	1.164	-0.01	0.217	0.253
	LTE Band 12	10M	QPSK	1RB	0offset	Edge 1	0mm	ON	23095	707.5	15.11	15.50	1.094	-0.1	0.168	0.184
	LTE Band 12	10M	QPSK	25RB	0offset	Edge 1	0mm	ON	23095	707.5	14.84	15.50	1.164	-0.11	0.166	0.193
	LTE Band 12	10M	QPSK	1RB	0offset	Curved surface of Edge 1	0mm	ON	23095	707.5	15.11	15.50	1.094	-0.13	0.175	0.191
	LTE Band 12	10M	QPSK	25RB	0offset	Curved surface of Edge 1	0mm	ON	23095	707.5	14.84	15.50	1.164	-0.08	0.176	0.205
	LTE Band 12	10M	QPSK	1RB	0offset	Bottom Face	15mm	OFF	23095	707.5	24.28	24.50	1.052	-0.1	0.253	0.266
	LTE Band 12	10M	QPSK	25RB	0offset	Bottom Face	15mm	OFF	23095	707.5	23.01	23.50	1.119	-0.04	0.209	0.234
	LTE Band 12	10M	QPSK	1RB	0offset	Edge 1	15mm	OFF	23095	707.5	24.28	24.50	1.052	0.02	0.157	0.165
	LTE Band 12	10M	QPSK	25RB	0offset	Edge 1	15mm	OFF	23095	707.5	23.01	23.50	1.119	-0.03	0.131	0.147
06	LTE Band 12	10M	QPSK	1RB	0offset	Edge 2	0mm	OFF	23095	707.5	24.28	24.50	1.052	0.08	0.300	0.316
	LTE Band 12	10M	QPSK	25RB	0offset	Edge 2	0mm	OFF	23095	707.5	23.01	23.50	1.119	-0.03	0.251	0.281
	LTE Band 12	10M	QPSK	1RB	0offset	Edge 4	0mm	OFF	23095	707.5	24.28	24.50	1.052	0.17	0.239	0.251
	LTE Band 12	10M	QPSK	25RB	0offset	Edge 4	0mm	OFF	23095	707.5	23.01	23.50	1.119	0	0.197	0.221
	LTE Band 12	10M	QPSK	1RB	0offset	Curved surface of Edge 1	15mm	OFF	23095	707.5	24.28	24.50	1.052	-0.04	0.253	0.266
	LTE Band 12	10M	QPSK	25RB	0offset	Curved surface of Edge 1	15mm	OFF	23095	707.5	23.01	23.50	1.119	-0.07	0.236	0.264
	LTE Band 4	20M	QPSK	1RB	0offset	Bottom Face	0mm	ON	20175	1732.5	12.97	13.50	1.130	-0.04	0.534	0.603
	LTE Band 4	20M	QPSK	50RB	0offset	Bottom Face	0mm	ON	20175	1732.5	12.84	13.50	1.164	-0.07	0.636	0.740
	LTE Band 4	20M	QPSK	1RB	0offset	Edge 1	0mm	ON	20175	1732.5	12.97	13.50	1.130	-0.05	0.360	0.407
	LTE Band 4	20M	QPSK	50RB	0offset	Edge 1	0mm	ON	20175	1732.5	12.84	13.50	1.164	-0.04	0.381	0.444
	LTE Band 4	20M	QPSK	1RB	0offset	Curved surface of Edge 1	0mm	ON	20175	1732.5	12.97	13.50	1.130	-0.07	0.775	0.876
	LTE Band 4	20M	QPSK	1RB	0offset	Curved surface of Edge 1	0mm	ON	20050	1720	12.69	13.50	1.205	-0.16	0.699	0.842
07	LTE Band 4	20M	QPSK	1RB	0offset	Curved surface of Edge 1	0mm	ON	20300	1745	12.75	13.50	1.189	-0.06	0.852	1.013
	LTE Band 4	20M	QPSK	50RB	0offset	Curved surface of Edge 1	0mm	ON	20175	1732.5	12.84	13.50	1.164	-0.05	0.754	0.878
	LTE Band 4	20M	QPSK	50RB	0offset	Curved surface of Edge 1	0mm	ON	20050	1720	12.49	13.50	1.262	-0.17	0.724	0.914
	LTE Band 4	20M	QPSK	50RB	0offset	Curved surface of Edge 1	0mm	ON	20300	1745	12.71	13.50	1.199	-0.11	0.814	0.976
	LTE Band 4	20M	QPSK	100RB	0offset	Curved surface of Edge 1	0mm	ON	20175	1732.5	12.76	13.50	1.186	-0.04	0.792	0.939
	LTE Band 4	20M	QPSK	1RB	0offset	Bottom Face	15mm	OFF	20175	1732.5	24.15	24.50	1.084	0.01	0.543	0.589
	LTE Band 4	20M	QPSK	50RB	0offset	Bottom Face	15mm	OFF	20175	1732.5	22.85	23.50	1.161	0.09	0.420	0.488
	LTE Band 4	20M	QPSK	1RB	0offset	Edge 1	15mm	OFF	20175	1732.5	24.15	24.50	1.084	-0.03	0.519	0.563
	LTE Band 4	20M	QPSK	50RB	0offset	Edge 1	15mm	OFF	20175	1732.5	22.85	23.50	1.161	-0.05	0.405	0.470
	LTE Band 4	20M	QPSK	1RB	0offset	Edge 2	0mm	OFF	20175	1732.5	24.15	24.50	1.084	0.11	0.339	0.367
	LTE Band 4	20M	QPSK	50RB	0offset	Edge 2	0mm	OFF	20175	1732.5	22.85	23.50	1.161	0	0.279	0.324
	LTE Band 4	20M	QPSK	1RB	0offset	Edge 4	0mm	OFF	20175	1732.5	24.15	24.50	1.084	0.04	0.401	0.435
	LTE Band 4	20M	QPSK	50RB	0offset	Edge 4	0mm	OFF	20175	1732.5	22.85	23.50	1.161	0.03	0.304	0.353
	LTE Band 4	20M	QPSK	1RB	0offset	Curved surface of Edge 1	15mm	OFF	20175	1732.5	24.15	24.50	1.084	0.06	0.813	0.881
	LTE Band 4	20M	QPSK	1RB	0offset	Curved surface of Edge 1	15mm	OFF	20050	1720	23.86	24.50	1.159	-0.07	0.743	0.861
	LTE Band 4	20M	QPSK	1RB	0offset	Curved surface of Edge 1	15mm	OFF	20300	1745	23.96	24.50	1.132	0.01	0.852	0.965
	LTE Band 4	20M	QPSK	50RB	0offset	Curved surface of Edge 1	15mm	OFF	20175	1732.5	22.85	23.50	1.161	-0.01	0.651	0.756
	LTE Band 4	20M	QPSK	100RB	0offset	Curved surface of Edge 1	15mm	OFF	20175	1732.5	22.68	23.50	1.208	-0.05	0.626	0.756

Plot No.	Band	BW (MHz)	Modulation	RB Size	RB offset	Test Position	Gap (mm)	Power Reduction	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)
	LTE Band 2	20M	QPSK	1RB	0offset	Bottom Face	0mm	ON	18900	1880	13.22	13.50	1.067	-0.06	0.894	0.954
	LTE Band 2	20M	QPSK	1RB	0offset	Bottom Face	0mm	ON	18700	1860	13.19	13.50	1.074	-0.03	0.887	0.953
	LTE Band 2	20M	QPSK	1RB	0offset	Bottom Face	0mm	ON	19100	1900	13.20	13.50	1.072	-0.05	0.872	0.934
	LTE Band 2	20M	QPSK	50RB	0offset	Bottom Face	0mm	ON	18900	1880	12.86	13.50	1.159	-0.05	0.897	1.039
	LTE Band 2	20M	QPSK	50RB	0offset	Bottom Face	0mm	ON	18700	1860	12.85	13.50	1.161	-0.05	0.856	0.994
	LTE Band 2	20M	QPSK	50RB	0offset	Bottom Face	0mm	ON	19100	1900	12.83	13.50	1.167	0.02	0.864	1.008
	LTE Band 2	20M	QPSK	100RB	0offset	Bottom Face	0mm	ON	18900	1880	12.79	13.50	1.178	-0.03	0.875	1.030
	LTE Band 2	20M	QPSK	1RB	0offset	Edge 1	0mm	ON	18900	1880	13.22	13.50	1.067	-0.08	0.725	0.773
	LTE Band 2	20M	QPSK	50RB	0offset	Edge 1	0mm	ON	18900	1880	12.86	13.50	1.159	-0.06	0.720	0.834
	LTE Band 2	20M	QPSK	50RB	0offset	Edge 1	0mm	ON	18700	1860	12.85	13.50	1.161	-0.03	0.669	0.777
	LTE Band 2	20M	QPSK	50RB	0offset	Edge 1	0mm	ON	19100	1900	12.83	13.50	1.167	-0.02	0.767	0.895
	LTE Band 2	20M	QPSK	100RB	0offset	Edge 1	0mm	ON	18900	1880	12.79	13.50	1.178	-0.04	0.722	0.850
	LTE Band 2	20M	QPSK	1RB	0offset	Curved surface of Edge 1	0mm	ON	18900	1880	13.22	13.50	1.067	-0.15	1.180	1.259
	LTE Band 2	20M	QPSK	1RB	0offset	Curved surface of Edge 1	0mm	ON	18700	1860	13.19	13.50	1.074	-0.05	1.120	1.203
	LTE Band 2	20M	QPSK	1RB	0offset	Curved surface of Edge 1	0mm	ON	19100	1900	13.20	13.50	1.072	-0.07	1.260	1.350
	LTE Band 2	20M	QPSK	50RB	0offset	Curved surface of Edge 1	0mm	ON	18900	1880	12.86	13.50	1.159	-0.08	1.170	1.356
	LTE Band 2	20M	QPSK	50RB	0offset	Curved surface of Edge 1	0mm	ON	18700	1860	12.85	13.50	1.161	-0.01	1.090	1.266
08	LTE Band 2	20M	QPSK	50RB	0offset	Curved surface of Edge 1	0mm	ON	19100	1900	12.83	13.50	1.167	-0.02	1.230	1.435
	LTE Band 2	20M	QPSK	100RB	0offset	Curved surface of Edge 1	0mm	ON	18900	1880	12.79	13.50	1.178	-0.06	1.190	1.401
	LTE Band 2	20M	QPSK	1RB	0offset	Bottom Face	15mm	OFF	18900	1880	24.04	24.50	1.112	0.08	0.490	0.545
	LTE Band 2	20M	QPSK	50RB	0offset	Bottom Face	15mm	OFF	18900	1880	22.88	23.50	1.153	0.02	0.374	0.431
	LTE Band 2	20M	QPSK	1RB	0offset	Edge 1	15mm	OFF	18900	1880	24.04	24.50	1.112	0.11	0.550	0.611
	LTE Band 2	20M	QPSK	50RB	0offset	Edge 1	15mm	OFF	18900	1880	22.88	23.50	1.153	-0.01	0.440	0.508
	LTE Band 2	20M	QPSK	1RB	0offset	Edge 2	0mm	OFF	18900	1880	24.04	24.50	1.112	-0.02	0.391	0.435
	LTE Band 2	20M	QPSK	50RB	0offset	Edge 2	0mm	OFF	18900	1880	22.88	23.50	1.153	-0.01	0.298	0.344
	LTE Band 2	20M	QPSK	1RB	0offset	Edge 4	0mm	OFF	18900	1880	24.04	24.50	1.112	0.07	0.063	0.070
	LTE Band 2	20M	QPSK	50RB	0offset	Edge 4	0mm	OFF	18900	1880	22.88	23.50	1.153	0.02	0.044	0.051
	LTE Band 2	20M	QPSK	1RB	0offset	Curved surface of Edge 1	15mm	OFF	18900	1880	24.04	24.50	1.112	-0.02	0.821	0.913
	LTE Band 2	20M	QPSK	1RB	0offset	Curved surface of Edge 1	15mm	OFF	18700	1860	24.01	24.50	1.119	0	0.815	0.912
	LTE Band 2	20M	QPSK	1RB	0offset	Curved surface of Edge 1	15mm	OFF	19100	1900	23.88	24.50	1.153	-0.06	0.870	1.004
	LTE Band 2	20M	QPSK	50RB	0offset	Curved surface of Edge 1	15mm	OFF	18900	1880	22.88	23.50	1.153	0	0.691	0.797
	LTE Band 2	20M	QPSK	100RB	0offset	Curved surface of Edge 1	15mm	OFF	18900	1880	22.87	23.50	1.156	-0.16	0.661	0.764

<WLAN SAR>

Plot No.	Band	Mode	Test Position	Gap (mm)	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	Bottom Face	0mm	11	2462	12.52	12.90	1.091	97.79	1.023	-0.1	1.010	1.128
	WLAN2.4GHz	802.11b 1Mbps	Bottom Face	0mm	6	2437	11.64	12.90	1.337	97.79	1.023	-0.15	0.852	1.165
	WLAN2.4GHz	802.11b 1Mbps	Bottom Face	0mm	1	2412	11.57	12.90	1.358	97.79	1.023	0.06	0.841	1.169
	WLAN2.4GHz	802.11b 1Mbps	Edge 3	0mm	11	2462	12.52	12.90	1.091	97.79	1.023	-0.1	0.697	0.778
	WLAN2.4GHz	802.11b 1Mbps	Curved surface of Edge 3	0mm	11	2462	12.52	12.90	1.091	97.79	1.023	-0.08	1.100	1.228
	WLAN2.4GHz	802.11b 1Mbps	Curved surface of Edge 3	0mm	6	2437	11.64	12.90	1.337	97.79	1.023	-0.01	1.010	1.381
09	WLAN2.4GHz	802.11b 1Mbps	Curved surface of Edge 3	0mm	1	2412	11.57	12.90	1.358	97.79	1.023	-0.09	1.000	1.390
	WLAN2.4GHz	802.11g 6Mbps	Bottom Face	0mm	11	2462	11.79	12.50	1.178	86.97	1.150	-0.01	0.816	1.105
	WLAN2.4GHz	802.11g 6Mbps	Bottom Face	0mm	6	2437	11.08	12.50	1.387	86.97	1.150	-0.14	0.726	1.158
	WLAN2.4GHz	802.11g 6Mbps	Bottom Face	0mm	1	2412	10.84	12.50	1.466	86.97	1.150	-0.02	0.688	1.160
	WLAN2.4GHz	802.11g 6Mbps	Edge 3	0mm	11	2462	11.79	12.50	1.178	86.97	1.150	0.02	0.541	0.733
	WLAN2.4GHz	802.11g 6Mbps	Curved surface of Edge 3	0mm	11	2462	11.79	12.50	1.178	86.97	1.150	-0.05	0.924	1.251
	WLAN2.4GHz	802.11g 6Mbps	Curved surface of Edge 3	0mm	6	2437	11.08	12.50	1.387	86.97	1.150	-0.12	0.806	1.285
	WLAN2.4GHz	802.11g 6Mbps	Curved surface of Edge 3	0mm	1	2412	10.84	12.50	1.466	86.97	1.150	-0.1	0.817	1.377

16.2 Repeated SAR Measurement

No.	Band	Mode	Test Position	Gap (mm)	Power Reduction	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 IV	RMC 12.2Kbps	Curved surface of Edge 1	15mm	OFF	1513	1752.6	24.34	24.50	1.038	-	-	-0.09	0.943	-	0.978
2nd	WCDMA IV	RMC 12.2Kbps	Curved surface of Edge 1	15mm	OFF	1513	1752.6	24.34	24.50	1.038	-	-	-0.04	0.867	1.09	0.900
1st	WCDMA II	RMC 12.2Kbps	Curved surface of Edge 1	0mm	ON	9538	1907.6	13.45	13.50	1.012	-	-	-0.05	1.380	-	1.396
2nd	WCDMA II	RMC 12.2Kbps	Curved surface of Edge 1	0mm	ON	9538	1907.6	13.45	13.50	1.012	-		-0.01	1.360	1.01	1.376
1st	WLAN2.4GHz	802.11b 1Mbps	Curved surface of Edge 3	0mm	-	11	2462	12.52	12.90	1.091	97.79	1.023	-0.08	1.100	-	1.228
2nd	WLAN2.4GHz	802.11b 1Mbps	Curved surface of Edge 3	0cm	-	11	2462	12.52	12.90	1.091	97.79	1.023	-0.19	1.060	1.04	1.184

General Note:

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

17. Simultaneous Transmission Analysis

NO.	Simultaneous Transmission Configurations	Tablet Body	Note
1.	GPRS/EDGE(Data) + WLAN2.4GHz(data)	Yes	Hotspot
2.	WCDMA(Data) + WLAN2.4GHz(data)	Yes	Hotspot
3.	LTE(Data) + WLAN2.4GHz(data)	Yes	Hotspot
4.	GPRS/EDGE(Data) + Bluetooth(data)	Yes	Bluetooth Tethering
5.	WCDMA(Data) + Bluetooth(data)	Yes	Bluetooth Tethering
6.	LTE(Data) + Bluetooth(data)	Yes	Bluetooth Tethering
7.	GPRS/EDGE(data) + WLAN5.2GHz / 5.8GHz(data)	Yes	Hotspot
8.	WCDMA(data) + WLAN5.2GHz / 5.8GHz(data)	Yes	Hotspot
9.	LTE(data) + WLAN5.2GHz / 5.8GHz(data)	Yes	Hotspot

General Note:

1. This device 2.4GHz / 5.2GHz / 5.8GHz WLAN supports Hotspot operation, and 5.3GHz WLAN supports WiFi Direct (Group Client).
2. For simultaneous transmission analysis for exposure position of edge 15mm and bottom face15mm, WLAN SAR tested at 0mm separation is worse and the test data is used for conservative SAR summation.
3. WLAN and Bluetooth share the same antenna, and cannot transmit simultaneously.
4. EUT will choose either WLAN 2.4GHz or WLAN 5GHz according to the network signal condition; therefore, 2.4GHz WLAN and 5GHz WLAN will not operate simultaneously at any moment.
5. The Scaled SAR summation is calculated based on the same configuration and test position.
6. Per KDB 447498 D01v05r02, simultaneous transmission SAR is compliant if,
   i) Scalar SAR summation < 1.6W/kg.
   ii) SPLSR = (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 17.2.
7. For simultaneous transmission analysis, Bluetooth SAR is estimated per KDB 447498 D01v05r02 based on the formula below.
   i) (*max. power of channel, including tune-up tolerance, mW*)/(*min. test separation distance, mm*)]·[√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.

Function	Max Power	Estimated 1g SAR W/kg
Bluetooth	7.0	0.210 W/kg
5GHz WLAN	8.0	0.386 W/kg

17.1 Body Exposure Conditions

WWAN Band		Exposure Position	1 WWAN 1g SAR (W/kg)	2 2.4GHz WLAN 1g SAR (W/kg)	1+2 Summed 1g SAR (W/kg)	SPLSR	Case No
GSM	GSM850	Bottom Face at 0mm	0.158	1.165	**1.32**		
		Edge 1 at 0mm	0.150		**0.15**		
		Curved surface of Edge 1 at 0mm	0.146		**0.15**		
		Bottom Face at 15mm	0.162		**0.16**		
		Edge 1 at 15mm	0.106		**0.11**		
		Edge 2 at 0mm	0.217		**0.22**		
		Edge 3 at 0mm		0.778	**0.78**		
		Edge 4 at 0mm	0.100		**0.10**		
		Curved surface of Edge 1 at 15mm	0.138		**0.14**		
		Curved surface of Edge 3 at 0mm		1.390	**1.39**		
	GSM1900	Bottom Face at 0mm	0.693	1.165	**1.86**	0.01	Case 1
		Edge 1 at 0mm	0.623		**0.62**		
		Curved surface of Edge 1 at 0mm	1.107		**1.11**		
		Bottom Face at 15mm	0.331		**0.33**		
		Edge 1 at 15mm	0.462		**0.46**		
		Edge 2 at 0mm	0.243		**0.24**		
		Edge 3 at 0mm		0.778	**0.78**		
		Edge 4 at 0mm	0.038		**0.04**		
		Curved surface of Edge 1 at 15mm	0.686		**0.69**		
		Curved surface of Edge 3 at 0mm		1.390	**1.39**		
WCDMA	WCDMA V	Bottom Face at 0mm	0.153	1.165	**1.32**		
		Edge 1 at 0mm	0.161		**0.16**		
		Curved surface of Edge 1 at 0mm	0.185		**0.19**		
		Bottom Face at 15mm	0.150		**0.15**		
		Edge 1 at 15mm	0.137		**0.14**		
		Edge 2 at 0mm	0.250		**0.25**		
		Edge 3 at 0mm		0.778	**0.78**		
		Edge 4 at 0mm	0.123		**0.12**		
		Curved surface of Edge 1 at 15mm	0.171		**0.17**		
		Curved surface of Edge 3 at 0mm		1.390	**1.39**		
	WCDMA IV	Bottom Face at 0mm	0.610	1.165	**1.78**	0.01	Case 2
		Edge 1 at 0mm	0.630		**0.63**		
		Curved surface of Edge 1 at 0mm	1.028		**1.03**		
		Bottom Face at 15mm	0.593		**0.59**		
		Edge 1 at 15mm	0.555		**0.56**		
		Edge 2 at 0mm	0.446		**0.45**		
		Edge 3 at 0mm		0.778	**0.78**		
		Edge 4 at 0mm	0.393		**0.39**		
		Curved surface of Edge 1 at 15mm	0.978		**0.98**		
		Curved surface of Edge 3 at 0mm		1.390	**1.39**		
	WCDMA II	Bottom Face at 0mm	0.746	1.165	**1.91**	0.01	Case 3
		Edge 1 at 0mm	0.850		**0.85**		
		Curved surface of Edge 1 at 0mm	1.396		**1.40**		
		Bottom Face at 15mm	0.463		**0.46**		
		Edge 1 at 15mm	0.656		**0.66**		
		Edge 2 at 0mm	0.384		**0.38**		
		Edge 3 at 0mm		0.778	**0.78**		
		Edge 4 at 0mm	0.069		**0.07**		
		Curved surface of Edge 1 at 15mm	0.897		**0.90**		
		Curved surface of Edge 3 at 0mm		1.390	**1.39**		

WWAN Band		Exposure Position	1 WWAN 1g SAR (W/kg)	2 2.4GHz WLAN 1g SAR (W/kg)	1+2 Summed 1g SAR (W/kg)	SPLSR	Case No
		Edge 1 at 0mm	0.193		**0.19**		
		Curved surface of Edge 1 at 0mm	0.205		**0.21**		
		Bottom Face at 15mm	0.266		**0.27**		
		Edge 1 at 15mm	0.165		**0.17**		
		Edge 2 at 0mm	0.316		**0.32**		
		Edge 3 at 0mm		0.778	**0.78**		
		Edge 4 at 0mm	0.251		**0.25**		
		Curved surface of Edge 1 at 15mm	0.266		**0.27**		
		Curved surface of Edge 3 at 0mm		1.390	**1.39**		
	LTE Band 4	Bottom Face at 0mm	0.740	1.165	**1.91**	0.01	Case 4
		Edge 1 at 0mm	0.444		**0.44**		
		Curved surface of Edge 1 at 0mm	1.013		**1.01**		
		Bottom Face at 15mm	0.589		**0.59**		
		Edge 1 at 15mm	0.563		**0.56**		
		Edge 2 at 0mm	0.367		**0.37**		
		Edge 3 at 0mm		0.778	**0.78**		
		Edge 4 at 0mm	0.435		**0.44**		
		Curved surface of Edge 1 at 15mm	0.965		**0.97**		
		Curved surface of Edge 3 at 0mm		1.390	**1.39**		
	LTE Band 2	Bottom Face at 0mm	1.039	1.165	**2.20**	0.02	Case 5
		Edge 1 at 0mm	0.895		**0.90**		
		Curved surface of Edge 1 at 0mm	1.435		**1.44**		
		Bottom Face at 15mm	0.545		**0.55**		
		Edge 1 at 15mm	0.611		**0.61**		
		Edge 2 at 0mm	0.435		**0.44**		
		Edge 3 at 0mm		0.778	**0.78**		
		Edge 4 at 0mm	0.070		**0.07**		
		Curved surface of Edge 1 at 15mm	1.004		**1.00**		
		Curved surface of Edge 3 at 0mm		1.390	**1.39**		

WWAN Band		Exposure Position	1 WWAN 1g SAR (W/kg)	3 2.4GHz Bluetooth Estimated 1g SAR (W/kg)	1+3 Summed 1g SAR (W/kg)	SPLSR	Case No
GSM	GSM850	Bottom Face at 0mm	0.158	0.210	**0.37**		
		Edge 1 at 0mm	0.150	0.210	**0.36**		
		Curved surface of Edge 1 at 0mm	0.146	0.210	**0.36**		
		Bottom Face at 15mm	0.162	0.210	**0.37**		
		Edge 1 at 15mm	0.106	0.210	**0.32**		
		Edge 2 at 0mm	0.217	0.210	**0.43**		
		Edge 4 at 0mm	0.100	0.210	**0.31**		
		Curved surface of Edge 1 at 15mm	0.138	0.210	**0.35**		
	GSM1900	Bottom Face at 0mm	0.693	0.210	**0.90**		
		Edge 1 at 0mm	0.623	0.210	**0.83**		
		Curved surface of Edge 1 at 0mm	1.107	0.210	**1.32**		
		Bottom Face at 15mm	0.331	0.210	**0.54**		
		Edge 1 at 15mm	0.462	0.210	**0.67**		
		Edge 2 at 0mm	0.243	0.210	**0.45**		
		Edge 4 at 0mm	0.038	0.210	**0.25**		
		Curved surface of Edge 1 at 15mm	0.686	0.210	**0.90**		
WCDMA	WCDMA V	Bottom Face at 0mm	0.153	0.210	**0.36**		
		Edge 1 at 0mm	0.161	0.210	**0.37**		
		Curved surface of Edge 1 at 0mm	0.185	0.210	**0.40**		
		Bottom Face at 15mm	0.150	0.210	**0.36**		
		Edge 1 at 15mm	0.137	0.210	**0.35**		
		Edge 2 at 0mm	0.250	0.210	**0.46**		
		Edge 4 at 0mm	0.123	0.210	**0.33**		
		Curved surface of Edge 1 at 15mm	0.171	0.210	**0.38**		
	WCDMA IV	Bottom Face at 0mm	0.610	0.210	**0.82**		
		Edge 1 at 0mm	0.630	0.210	**0.84**		
		Curved surface of Edge 1 at 0mm	1.028	0.210	**1.24**		
		Bottom Face at 15mm	0.593	0.210	**0.80**		
		Edge 1 at 15mm	0.555	0.210	**0.77**		
		Edge 2 at 0mm	0.446	0.210	**0.66**		
		Edge 4 at 0mm	0.393	0.210	**0.60**		
		Curved surface of Edge 1 at 15mm	0.978	0.210	**1.19**		
	WCDMA II	Bottom Face at 0mm	0.746	0.210	**0.96**		
		Edge 1 at 0mm	0.850	0.210	**1.06**		
		Curved surface of Edge 1 at 0mm	1.396	0.210	**1.61**	0.01	Case 6
		Bottom Face at 15mm	0.463	0.210	**0.67**		
		Edge 1 at 15mm	0.656	0.210	**0.87**		
		Edge 2 at 0mm	0.384	0.210	**0.59**		
		Edge 4 at 0mm	0.069	0.210	**0.28**		
		Curved surface of Edge 1 at 15mm	0.897	0.210	**1.11**		

WWAN Band		Exposure Position	1	3	1+3 Summed 1g SAR (W/kg)	SPLSR	Case No
			WWAN	2.4GHz Bluetooth			
			1g SAR (W/kg)	Estimated 1g SAR (W/kg)			
LTE	LTE Band 12	Bottom Face at 0mm	0.253	0.210	**0.46**		
		Edge 1 at 0mm	0.193	0.210	**0.40**		
		Curved surface of Edge 1 at 0mm	0.205	0.210	**0.42**		
		Bottom Face at 15mm	0.266	0.210	**0.48**		
		Edge 1 at 15mm	0.165	0.210	**0.38**		
		Edge 2 at 0mm	0.316	0.210	**0.53**		
		Edge 4 at 0mm	0.251	0.210	**0.46**		
		Curved surface of Edge 1 at 15mm	0.266	0.210	**0.48**		
	LTE Band 4	Bottom Face at 0mm	0.740	0.210	**0.95**		
		Edge 1 at 0mm	0.444	0.210	**0.65**		
		Curved surface of Edge 1 at 0mm	1.013	0.210	**1.22**		
		Bottom Face at 15mm	0.589	0.210	**0.80**		
		Edge 1 at 15mm	0.563	0.210	**0.77**		
		Edge 2 at 0mm	0.367	0.210	**0.58**		
		Edge 4 at 0mm	0.435	0.210	**0.65**		
		Curved surface of Edge 1 at 15mm	0.965	0.210	**1.18**		
	LTE Band 2	Bottom Face at 0mm	1.039	0.210	**1.25**		
		Edge 1 at 0mm	0.895	0.210	**1.11**		
		Curved surface of Edge 1 at 0mm	1.435	0.210	**1.65**	0.01	Case 7
		Bottom Face at 15mm	0.545	0.210	**0.76**		
		Edge 1 at 15mm	0.611	0.210	**0.82**		
		Edge 2 at 0mm	0.435	0.210	**0.65**		
		Edge 4 at 0mm	0.070	0.210	**0.28**		
		Curved surface of Edge 1 at 15mm	1.004	0.210	**1.21**		

WWAN Band		Exposure Position	1 WWAN 1g SAR (W/kg)	4 5GHz WLAN Estimated 1g SAR (W/kg)	1+4 Summed 1g SAR (W/kg)	SPLSR	Case No
GSM	GSM850	Bottom Face at 0mm	0.158	0.386	**0.54**		
		Edge 1 at 0mm	0.150	0.386	**0.54**		
		Curved surface of Edge 1 at 0mm	0.146	0.386	**0.53**		
		Bottom Face at 15mm	0.162	0.386	**0.55**		
		Edge 1 at 15mm	0.106	0.386	**0.49**		
		Edge 2 at 0mm	0.217	0.386	**0.60**		
		Edge 4 at 0mm	0.100	0.386	**0.49**		
		Curved surface of Edge 1 at 15mm	0.138	0.386	**0.52**		
	GSM1900	Bottom Face at 0mm	0.693	0.386	**1.08**		
		Edge 1 at 0mm	0.623	0.386	**1.01**		
		Curved surface of Edge 1 at 0mm	1.107	0.386	**1.49**		
		Bottom Face at 15mm	0.331	0.386	**0.72**		
		Edge 1 at 15mm	0.462	0.386	**0.85**		
		Edge 2 at 0mm	0.243	0.386	**0.63**		
		Edge 4 at 0mm	0.038	0.386	**0.42**		
		Curved surface of Edge 1 at 15mm	0.686	0.386	**1.07**		
WCDMA	WCDMA V	Bottom Face at 0mm	0.153	0.386	**0.54**		
		Edge 1 at 0mm	0.161	0.386	**0.55**		
		Curved surface of Edge 1 at 0mm	0.185	0.386	**0.57**		
		Bottom Face at 15mm	0.150	0.386	**0.54**		
		Edge 1 at 15mm	0.137	0.386	**0.52**		
		Edge 2 at 0mm	0.250	0.386	**0.64**		
		Edge 4 at 0mm	0.123	0.386	**0.51**		
		Curved surface of Edge 1 at 15mm	0.171	0.386	**0.56**		
	WCDMA IV	Bottom Face at 0mm	0.610	0.386	**1.00**		
		Edge 1 at 0mm	0.630	0.386	**1.02**		
		Curved surface of Edge 1 at 0mm	1.028	0.386	**1.41**		
		Bottom Face at 15mm	0.593	0.386	**0.98**		
		Edge 1 at 15mm	0.555	0.386	**0.94**		
		Edge 2 at 0mm	0.446	0.386	**0.83**		
		Edge 4 at 0mm	0.393	0.386	**0.78**		
		Curved surface of Edge 1 at 15mm	0.978	0.386	**1.36**		
	WCDMA II	Bottom Face at 0mm	0.746	0.386	**1.13**		
		Edge 1 at 0mm	0.850	0.386	**1.24**		
		Curved surface of Edge 1 at 0mm	1.396	0.386	**1.78**	0.01	Case 8
		Bottom Face at 15mm	0.463	0.386	**0.85**		
		Edge 1 at 15mm	0.656	0.386	**1.04**		
		Edge 2 at 0mm	0.384	0.386	**0.77**		
		Edge 4 at 0mm	0.069	0.386	**0.46**		
		Curved surface of Edge 1 at 15mm	0.897	0.386	**1.28**		

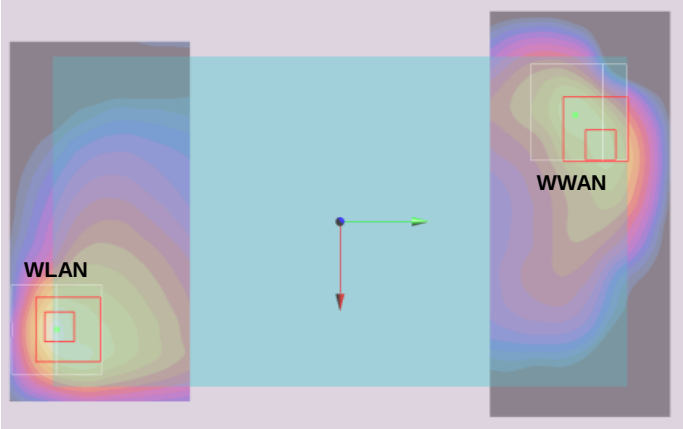
WWAN Band		Exposure Position	1 WWAN 1g SAR (W/kg)	4 5GHz WLAN Estimated 1g SAR (W/kg)	1+4 Summed 1g SAR (W/kg)	SPLSR	Case No
LTE	LTE Band 12	Bottom Face at 0mm	0.253	0.386	**0.64**		
		Edge 1 at 0mm	0.193	0.386	**0.58**		
		Curved surface of Edge 1 at 0mm	0.205	0.386	**0.59**		
		Bottom Face at 15mm	0.266	0.386	**0.65**		
		Edge 1 at 15mm	0.165	0.386	**0.55**		
		Edge 2 at 0mm	0.316	0.386	**0.70**		
		Edge 4 at 0mm	0.251	0.386	**0.64**		
		Curved surface of Edge 1 at 15mm	0.266	0.386	**0.65**		
	LTE Band 4	Bottom Face at 0mm	0.740	0.386	**1.13**		
		Edge 1 at 0mm	0.444	0.386	**0.83**		
		Curved surface of Edge 1 at 0mm	1.013	0.386	**1.40**		
		Bottom Face at 15mm	0.589	0.386	**0.98**		
		Edge 1 at 15mm	0.563	0.386	**0.95**		
		Edge 2 at 0mm	0.367	0.386	**0.75**		
		Edge 4 at 0mm	0.435	0.386	**0.82**		
		Curved surface of Edge 1 at 15mm	0.965	0.386	**1.35**		
	LTE Band 2	Bottom Face at 0mm	1.039	0.386	**1.43**		
		Edge 1 at 0mm	0.895	0.386	**1.28**		
		Curved surface of Edge 1 at 0mm	1.435	0.386	**1.82**	0.01	Case 9
		Bottom Face at 15mm	0.545	0.386	**0.93**		
		Edge 1 at 15mm	0.611	0.386	**1.00**		
		Edge 2 at 0mm	0.435	0.386	**0.82**		
		Edge 4 at 0mm	0.070	0.386	**0.46**		
		Curved surface of Edge 1 at 15mm	1.004	0.386	**1.39**		

17.2 SPLSR Evaluation and Analysis

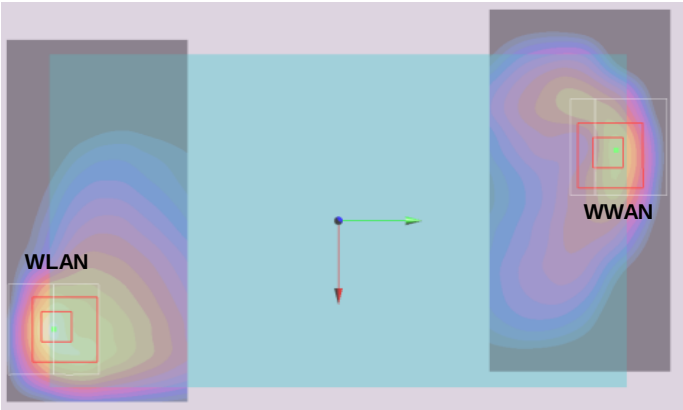
General Note:

1. According to section15, the minimum distances between each antenna pair was used for conservative SPLSR calculation. This is justified to compare the SAR peak separation in SPLSR analysis case 1 ~ 5 with SPLSR analysis case 6 ~ 9.
2. SPLSR = $(SAR_1 + SAR_2)^{1.5}$ / (*min. separation distance, mm*). If SPLSR ≤ 0.04, simultaneously transmission SAR measurement is not necessary

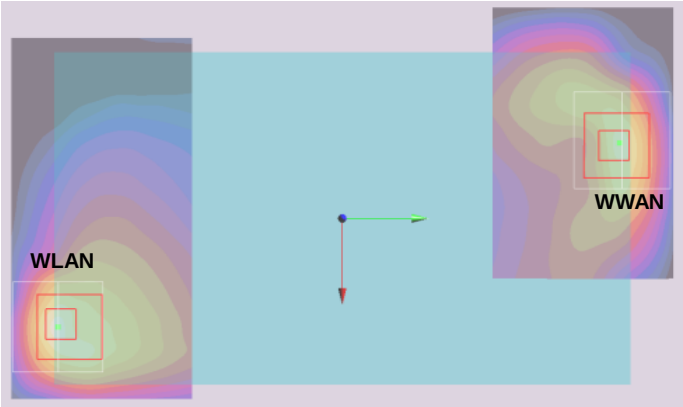
Case 1	Band	Position	SAR (W/kg)	Gap (cm)	SAR peak location (m) X	Y	Z	3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
	GSM1900	Bottom Face	0.693	0mm	-0.0204	0.0875	-0.177	190.4	1.86	0.01	Not required
	2.4GHz WLAN		1.165	0mm	0.036	-0.0944	-0.177				



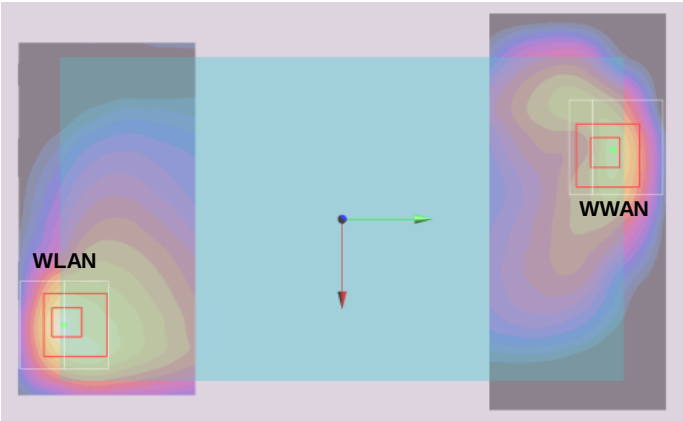
Case 2	Band	Position	SAR (W/kg)	Gap (cm)	SAR peak location (m) X	Y	Z	3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
	WCDMA IV	Bottom Face	0.610	0mm	-0.0244	0.085	-0.177	189.3	1.78	0.01	Not required
	2.4GHz WLAN		1.165	0mm	0.036	-0.0944	-0.177				



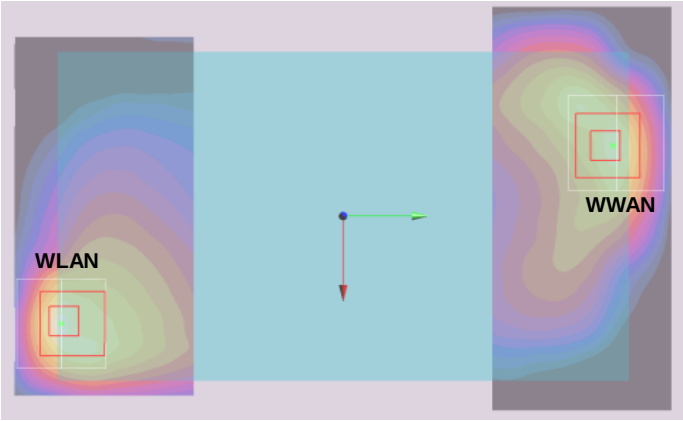
Case 3	Band	Position	SAR (W/kg)	Gap (cm)	SAR peak location (m) X	Y	Z	3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
	WCDMA II	Bottom Face	0.746	0mm	-0.026	0.093	-0.178	197.4	1.91	0.01	Not required
	2.4GHz WLAN		1.165	0mm	0.036	-0.0944	-0.177				



Case 4	Band	Position	SAR (W/kg)	Gap (cm)	SAR peak location (m) X	Y	Z	3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
	LTE Band 4	Bottom Face	0.740	0mm	-0.0245	0.085	-0.177	189.3	1.91	0.01	Not required
	2.4GHz WLAN		1.165	0mm	0.036	-0.0944	-0.177				



Case 5	Band	Position	SAR (W/kg)	Gap (cm)	SAR peak location (m) X	Y	Z	3D distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
	LTE Band 2	Bottom Face	1.039	0mm	-0.0245	0.0915	-0.177	195.5	2.20	0.02	Not required
	2.4GHz WLAN		1.165	0mm	0.036	-0.0944	-0.177				



Case 6	Band	Position	SAR (W/kg)	Gap (cm)	Minimum Distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
	WCDMA II	Curved surface of Edge 1	1.396	0mm	170.0	1.61	0.01	Not required
	Bluetooth		0.210	0mm				

Case 7	Band	Position	SAR (W/kg)	Gap (cm)	Minimum Distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
	LTE Band 2	Curved surface of Edge 1	1.435	0mm	170.0	1.65	0.01	Not required
	Bluetooth		0.210	0mm				

Case 8	Band	Position	SAR (W/kg)	Gap (cm)	Minimum Distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
	WCDMA II	Curved surface of Edge 1	1.396	0mm	170.0	1.78	0.01	Not required
	5GHz WLAN		0.386	0mm				

Case 9	Band	Position	SAR (W/kg)	Gap (cm)	Minimum Distance (mm)	Summed SAR (W/kg)	SPLSR Results	Simultaneous SAR
	LTE Band 2	Curved surface of Edge 1	1.435	0mm	170.0	1.82	0.01	Not required
	5GHz WLAN		0.386	0mm				

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18. Uncertainty Assessment

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

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

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

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

(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 16.1. 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 16.2. Uncertainty Budget for frequency range 300 MHz to 3 GHz

19. References

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

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

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

[4] SPEAG DASY System Handbook

[5] FCC KDB 248227 D01 v2, “SAR Guidance for IEEE 802.11 (WiFi) Transmitters”, Mar 2015.

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

[7] FCC KDB 941225 D01 v03, “3G SAR MEAUREMENT PROCEDURES”, Oct 2014

[8] FCC KDB 941225 D05 v02r03, “SAR Evaluation Considerations for LTE Devices”, Dec 2013

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

[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.

Appendix A. Plots of System Performance Check

The plots are shown as follows.

System Check_Body_750MHz_150506

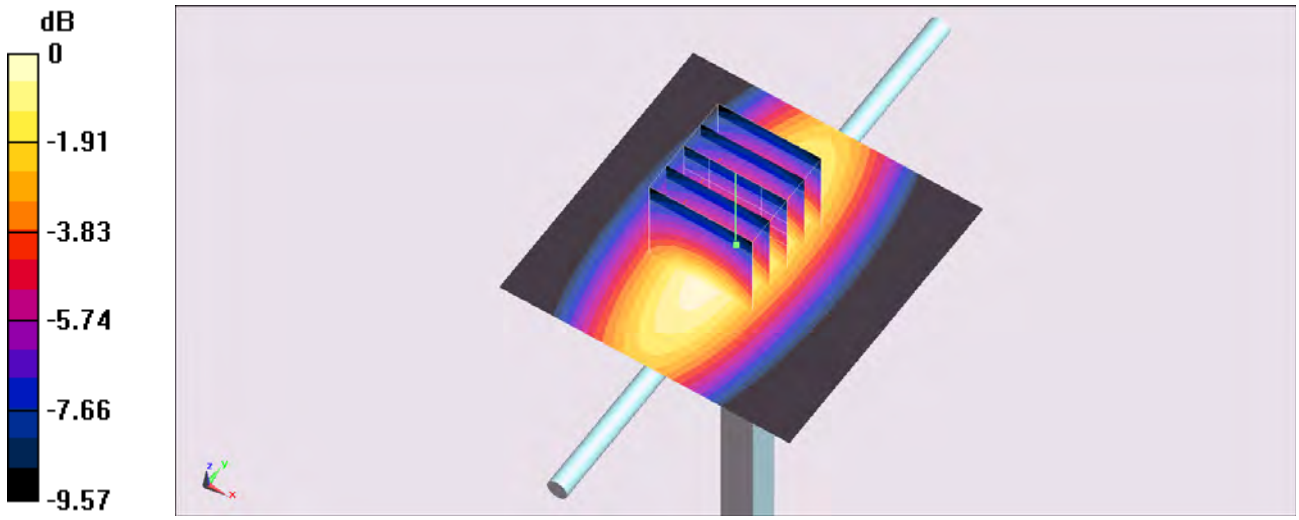
DUT: D750V3-1099

Communication System: CW ; Frequency: 750 MHz;Duty Cycle: 1:1
Medium: MSL_750_150506 Medium parameters used: f = 750 MHz; σ = 0.961 S/m; ε_r = 53.914; ρ = 1000 kg/m^3
Ambient Temperature：23.5 ℃； Liquid Temperature：22.5 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3931; ConvF(10.1, 10.1, 10.1); Calibrated: 2014/9/25;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn577; Calibrated: 2014/10/6
- Phantom: ELI 4.0_Front; Type: QDOVA001BB; Serial: 1026
- Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

Configuration/Pin=250mW/Area Scan (61x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 2.47 W/kg

Configuration/Pin=250mW/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 51.70 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 2.85 W/kg
SAR(1 g) = 2 W/kg; SAR(10 g) = 1.35 W/kg
Maximum value of SAR (measured) = 2.48 W/kg



0 dB = 2.48 W/kg = 3.94 dBW/kg

System Check_Body_835MHz_150506

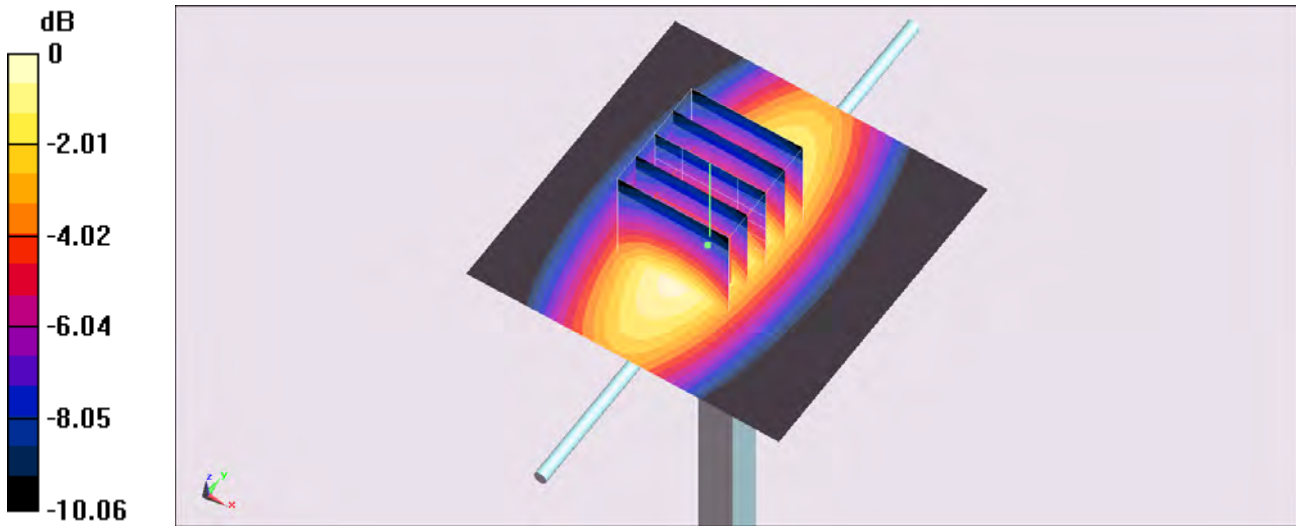
DUT: D835V2-499

Communication System: CW ; Frequency: 835 MHz;Duty Cycle: 1:1
Medium: MSL_850_150506 Medium parameters used: f = 835 MHz; σ = 0.996 S/m; ε_r = 55.38; ρ = 1000 kg/m^3
Ambient Temperature：23.5 ℃； Liquid Temperature：22.5 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3931; ConvF(10.13, 10.13, 10.13); Calibrated: 2014/9/25;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn577; Calibrated: 2014/10/6
- Phantom: ELI 4.0_Front; Type: QDOVA001BB; Serial: 1026
- Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

Configuration/Pin=250mW/Area Scan (61x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 3.12 W/kg

Configuration/Pin=250mW/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 57.07 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 3.64 W/kg
SAR(1 g) = 2.51 W/kg; SAR(10 g) = 1.67 W/kg
Maximum value of SAR (measured) = 3.13 W/kg



0 dB = 3.13 W/kg = 4.96 dBW/kg

System Check_Body_1750MHz_150505

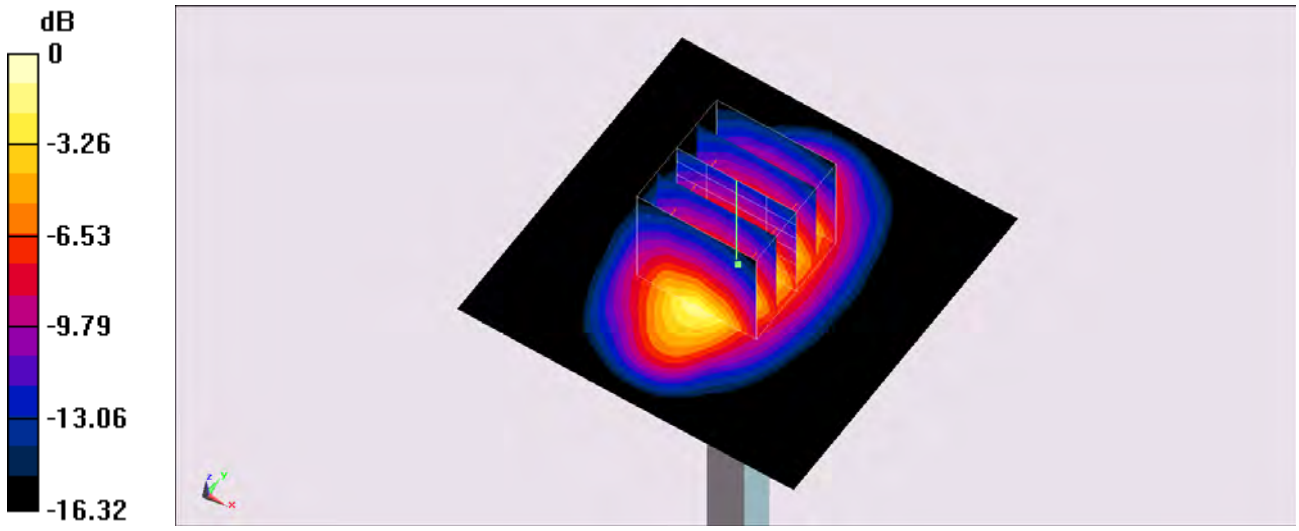
DUT: D1750V2-1068

Communication System: CW ; Frequency: 1750 MHz;Duty Cycle: 1:1
Medium: MSL_1750_150505 Medium parameters used: f = 1750 MHz; σ = 1.459 S/m; ε_r = 52.753; ρ = 1000 kg/m^3
Ambient Temperature：23.4 ℃； Liquid Temperature：22.4 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3931; ConvF(8.26, 8.26, 8.26); Calibrated: 2014/9/25;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn577; Calibrated: 2014/10/6
- Phantom: ELI 4.0_Front; Type: QDOVA001BB; Serial: 1026
- Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

Configuration/Pin=250mW/Area Scan (61x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 13.4 W/kg

Configuration/Pin=250mW/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 100.2 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 15.5 W/kg
SAR(1 g) = 8.9 W/kg; SAR(10 g) = 4.78 W/kg
Maximum value of SAR (measured) = 13.4 W/kg



0 dB = 13.4 W/kg = 11.27 dBW/kg

System Check_Body_1750MHz_150507

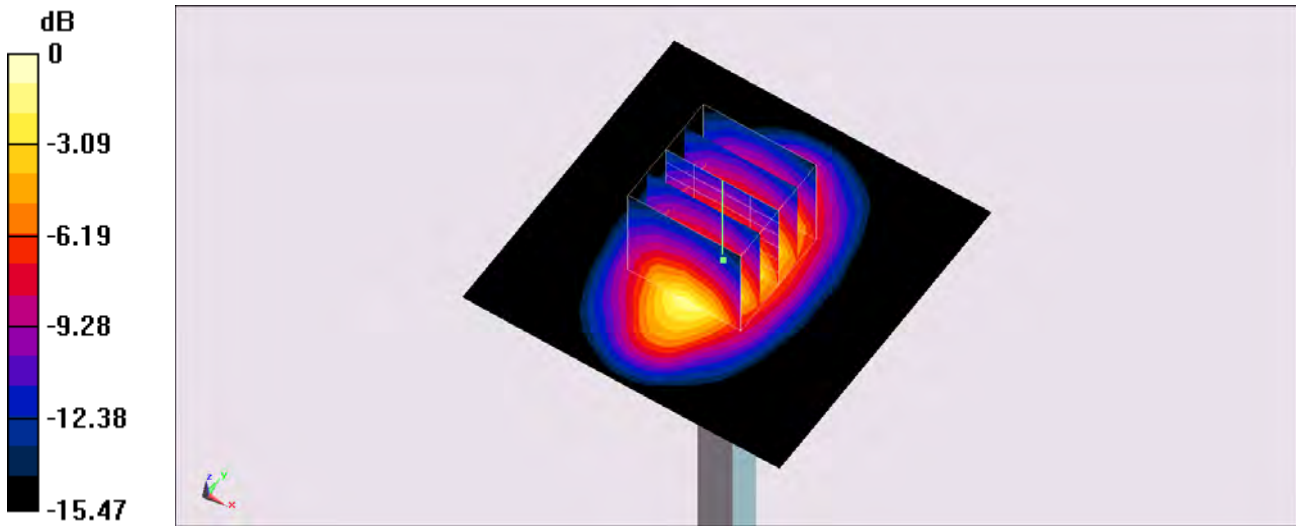
DUT: D1750V2-1068

Communication System: CW; Frequency: 1750 MHz;Duty Cycle: 1:1
Medium: MSL_1750_150507 Medium parameters used: f = 1750 MHz; σ = 1.473 S/m; ε_r = 52.385; ρ = 1000 kg/m^3
Ambient Temperature：23.4 ℃； Liquid Temperature：22.4 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3931; ConvF(8.26, 8.26, 8.26); Calibrated: 2014/9/25;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn577; Calibrated: 2014/10/6
- Phantom: ELI 4.0_Front; Type: QDOVA001BB; Serial: 1026
- Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

Configuration/Pin=250mW/Area Scan (61x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 12.0 W/kg

Configuration/Pin=250mW/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 91.42 V/m; Power Drift = -0.15 dB
Peak SAR (extrapolated) = 14.2 W/kg
SAR(1 g) = 8.84 W/kg; SAR(10 g) = 4.91 W/kg
Maximum value of SAR (measured) = 11.8 W/kg



0 dB = 11.8 W/kg = 10.72 dBW/kg

System Check_Body_1900MHz_150505

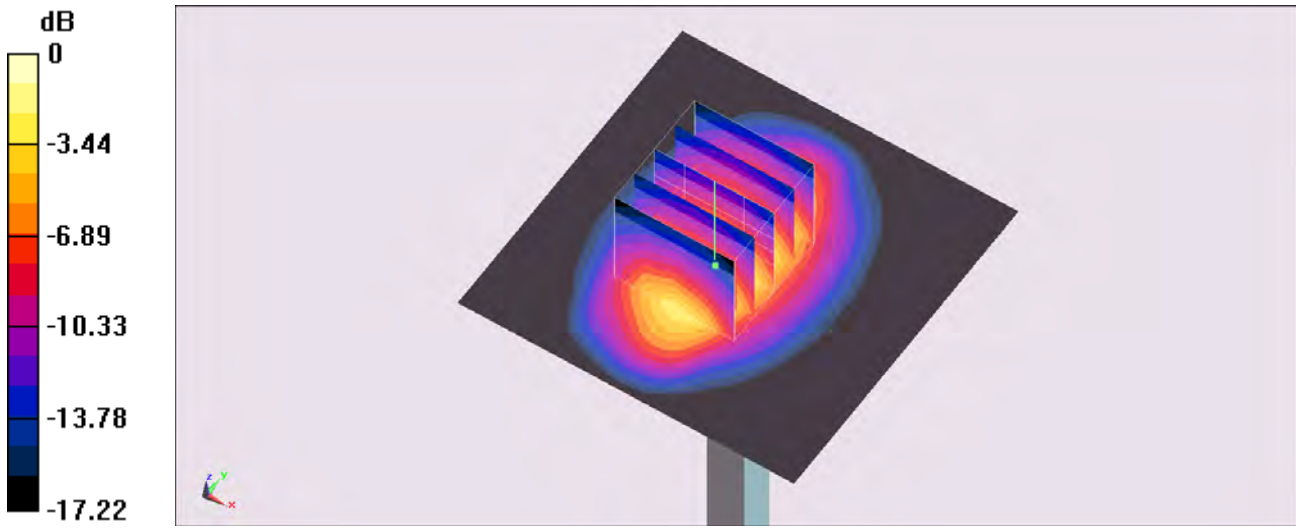
DUT: D1900V2-5d041

Communication System: CW ; Frequency: 1900 MHz;Duty Cycle: 1:1
Medium: MSL_1900_150505 Medium parameters used: f = 1900 MHz; σ = 1.541 S/m; ε_r = 53.91; ρ = 1000 kg/m^3
Ambient Temperature：23.4 ℃； Liquid Temperature：22.4 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3931; ConvF(7.8, 7.8, 7.8); Calibrated: 2014/9/25;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn577; Calibrated: 2014/10/6
- Phantom: ELI 4.0_Front; Type: QDOVA001BB; Serial: 1026
- Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

Configuration/Pin=250mW/Area Scan (61x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 13.3 W/kg

Configuration/Pin=250mW/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 91.48 V/m; Power Drift = -0.12 dB
Peak SAR (extrapolated) = 15.9 W/kg
SAR(1 g) = 9.45 W/kg; SAR(10 g) = 5.03 W/kg
Maximum value of SAR (measured) = 12.8 W/kg



0 dB = 12.8 W/kg = 11.07 dBW/kg

System Check_Body_1900MHz_150508

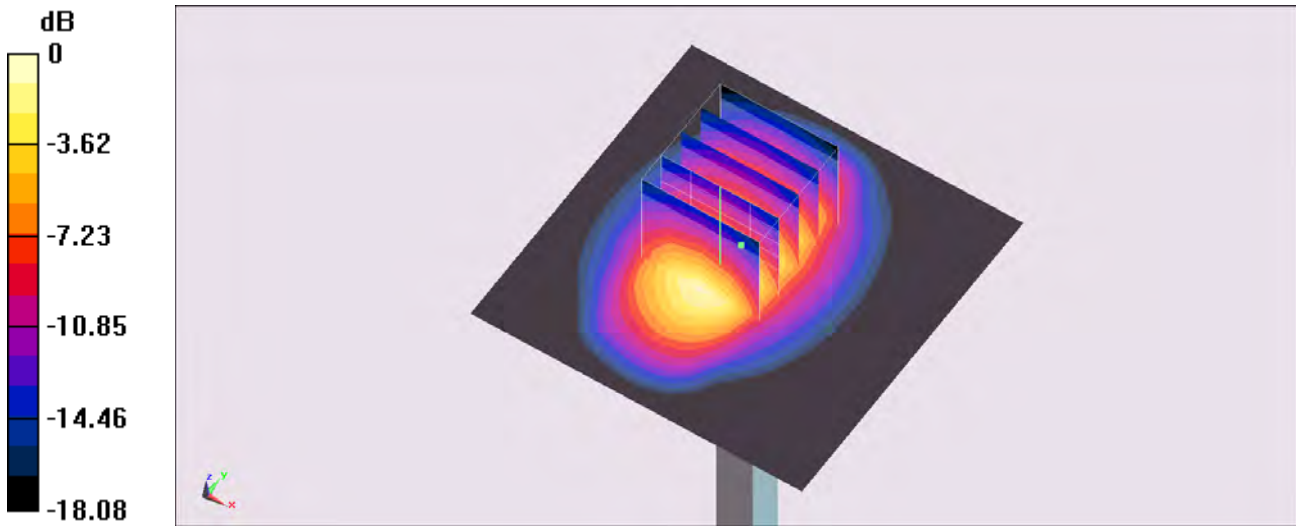
DUT: D1900V2-5d041

Communication System: CW ; Frequency: 1900 MHz;Duty Cycle: 1:1
Medium: MSL_1900_150508 Medium parameters used: f = 1900 MHz; σ = 1.569 S/m; ε_r = 51.584; ρ = 1000 kg/m^3
Ambient Temperature：23.3 ℃； Liquid Temperature：22.3 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3931; ConvF(7.8, 7.8, 7.8); Calibrated: 2014/9/25;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn577; Calibrated: 2014/10/6
- Phantom: ELI 4.0_Front; Type: QDOVA001BB; Serial: 1026
- Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

Configuration/Pin=250mW/Area Scan (61x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 14.1 W/kg

Configuration/Pin=250mW/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 86.72 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 17.3 W/kg
SAR(1 g) = 10.1 W/kg; SAR(10 g) = 5.29 W/kg
Maximum value of SAR (measured) = 13.9 W/kg



0 dB = 13.9 W/kg = 11.43 dBW/kg

System Check_Body_2450MHz_150509

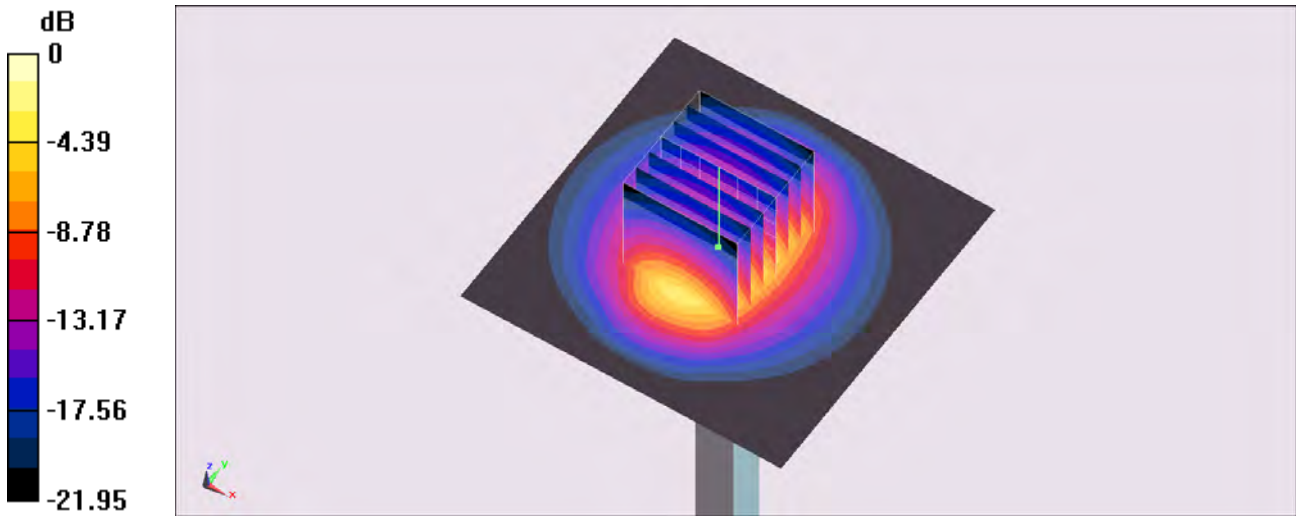
DUT: D2450V2-924

Communication System: CW; Frequency: 2450 MHz;Duty Cycle: 1:1
Medium: MSL_2450_150509 Medium parameters used: f = 2450 MHz; σ = 2.026 S/m; ε_r = 52.618; ρ = 1000 kg/m^3
Ambient Temperature：23.2 ℃； Liquid Temperature：22.2 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3931; ConvF(7.36, 7.36, 7.36); Calibrated: 2014/9/25;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn577; Calibrated: 2014/10/6
- Phantom: ELI 4.0_Front; Type: QDOVA001BB; Serial: 1026
- Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

Configuration/Pin=250mW/Area Scan (71x71x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 20.9 W/kg

Configuration/Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 98.77 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 29.3 W/kg
SAR(1 g) = 13.7 W/kg; SAR(10 g) = 6.25 W/kg
Maximum value of SAR (measured) = 21.2 W/kg



0 dB = 21.2 W/kg = 13.26 dBW/kg

Appendix B. Plots of SAR Measurement

The plots are shown as follows.

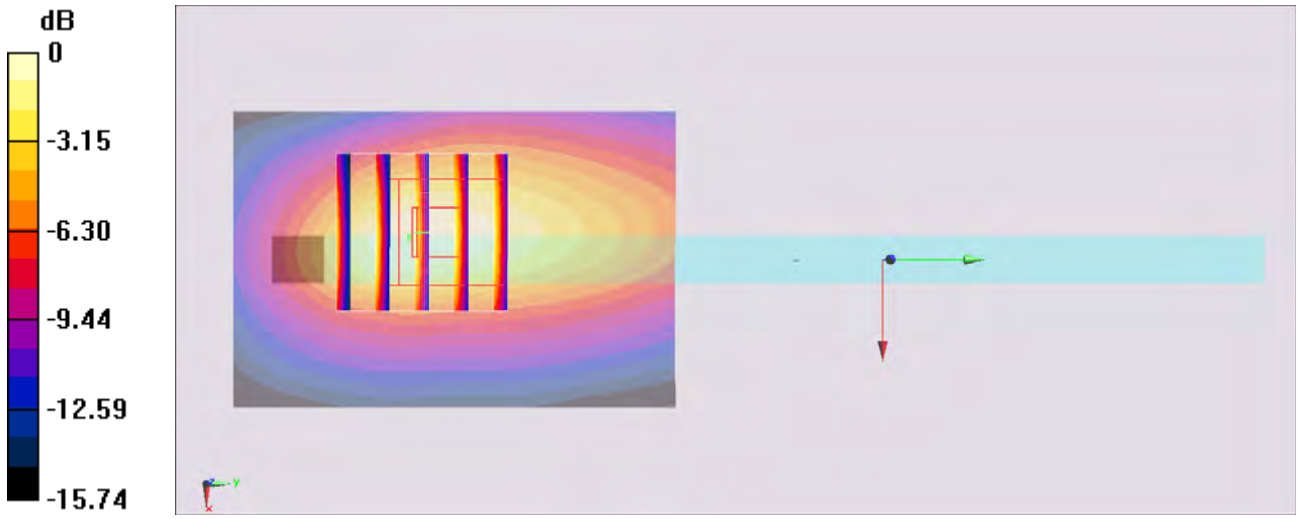
#01_GSM850_GPRS (1 Tx slots)_Edge 2_0mm_Ch189

Communication System: GSM850 ; Frequency: 836.4 MHz;Duty Cycle: 1:8.3
Medium: MSL_850_150506 Medium parameters used : f = 836.4 MHz; σ = 0.998 S/m; ε_r = 55.382; ρ = 1000 kg/m^3
Ambient Temperature：23.5 ℃； Liquid Temperature：22.5 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3931; ConvF(10.13, 10.13, 10.13); Calibrated: 2014/9/25;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn577; Calibrated: 2014/10/6
- Phantom: ELI 4.0_Front; Type: QDOVA001BB; Serial: 1026
- Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

Configuration/Ch189/Area Scan (41x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 0.326 W/kg

Configuration/Ch189/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 18.55 V/m; Power Drift = -0.07 dB
Peak SAR (extrapolated) = 0.382 W/kg
SAR(1 g) = 0.206 W/kg; SAR(10 g) = 0.119 W/kg
Maximum value of SAR (measured) = 0.305 W/kg



0 dB = 0.305 W/kg = -5.16 dBW/kg

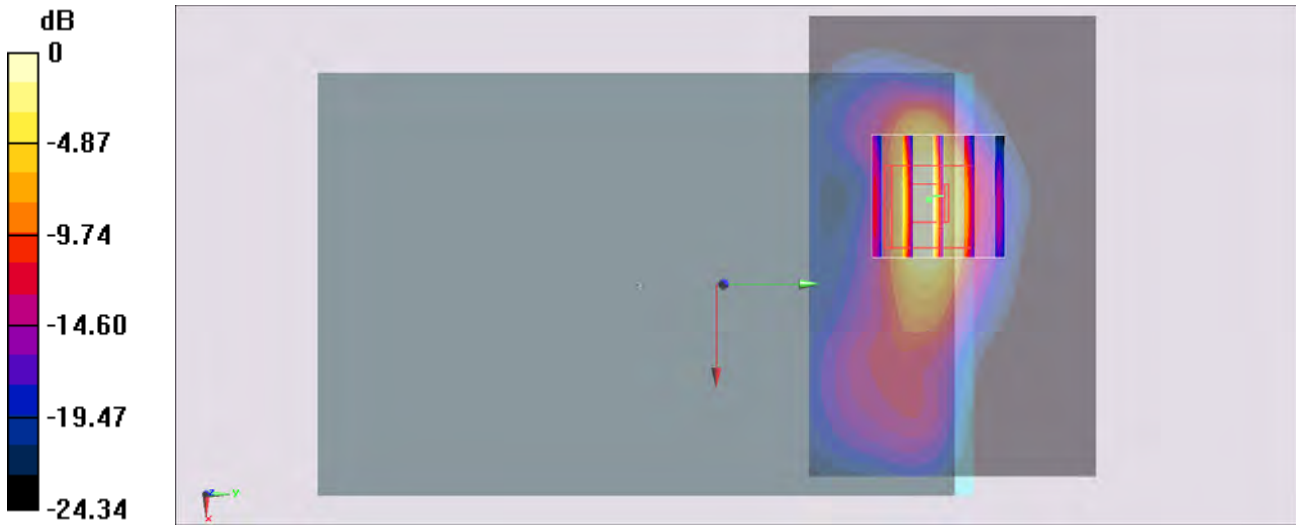
#02_GSM1900_GPRS (2 Tx slots)_Curved surface of Edge 1_0mm_Ch810

Communication System: PCS; Frequency: 1909.8 MHz;Duty Cycle: 1:4.15
Medium: MSL_1900_150508 Medium parameters used: f = 1910 MHz; σ = 1.581 S/m; ε_r = 51.566; ρ = 1000 kg/m^3
Ambient Temperature：23.3 ℃； Liquid Temperature：22.3 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3931; ConvF(7.8, 7.8, 7.8); Calibrated: 2014/9/25;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn577; Calibrated: 2014/10/6
- Phantom: ELI 4.0_Front; Type: QDOVA001BB; Serial: 1026
- Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

Configuration/Ch810/Area Scan (81x51x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 1.90 W/kg

Configuration/Ch810/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 34.42 V/m; Power Drift = -0.08 dB
Peak SAR (extrapolated) = 2.14 W/kg
SAR(1 g) = 0.996 W/kg; SAR(10 g) = 0.412 W/kg
Maximum value of SAR (measured) = 1.54 W/kg



0 dB = 1.54 W/kg = 1.88 dBW/kg

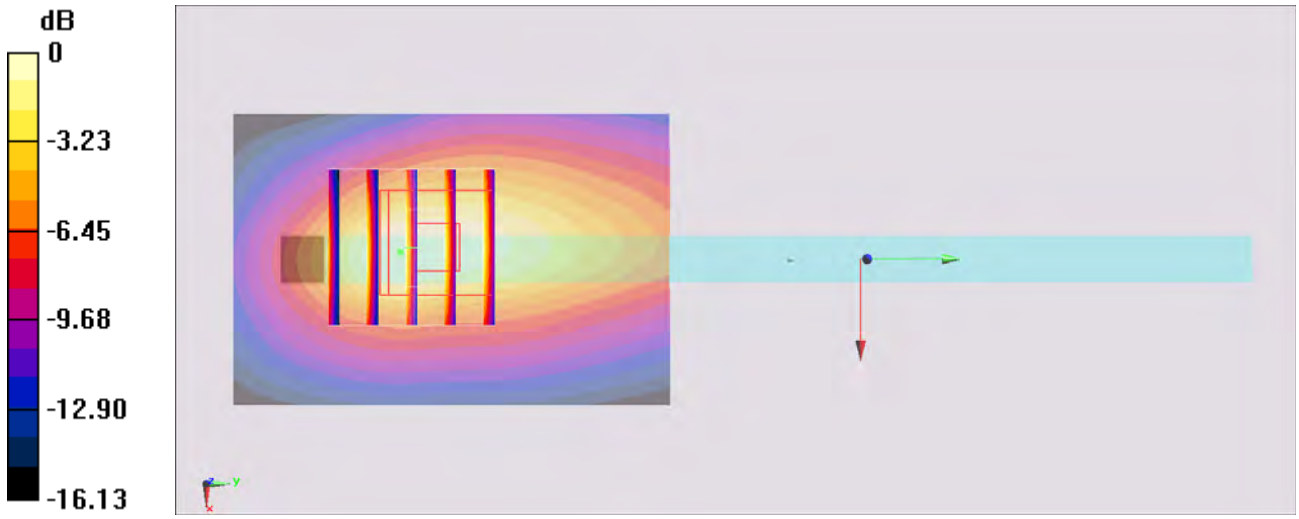
#03_WCDMA V_RMC 12.2Kbps_Edge 2_0mm_Ch4132

Communication System: WCDMA ; Frequency: 826.4 MHz;Duty Cycle: 1:1
Medium: MSL_850_150506 Medium parameters used : f = 826.4 MHz; σ = 0.988 S/m; ε_r = 55.443; ρ = 1000 kg/m^3
Ambient Temperature：23.5 ℃； Liquid Temperature：22.5 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3931; ConvF(10.13, 10.13, 10.13); Calibrated: 2014/9/25;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn577; Calibrated: 2014/10/6
- Phantom: ELI 4.0_Front; Type: QDOVA001BB; Serial: 1026
- Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

Configuration/Ch4132/Area Scan (41x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 0.393 W/kg

Configuration/Ch4132/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 19.80 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 0.407 W/kg
SAR(1 g) = 0.228 W/kg; SAR(10 g) = 0.130 W/kg
Maximum value of SAR (measured) = 0.341 W/kg



0 dB = 0.341 W/kg = -4.67 dBW/kg

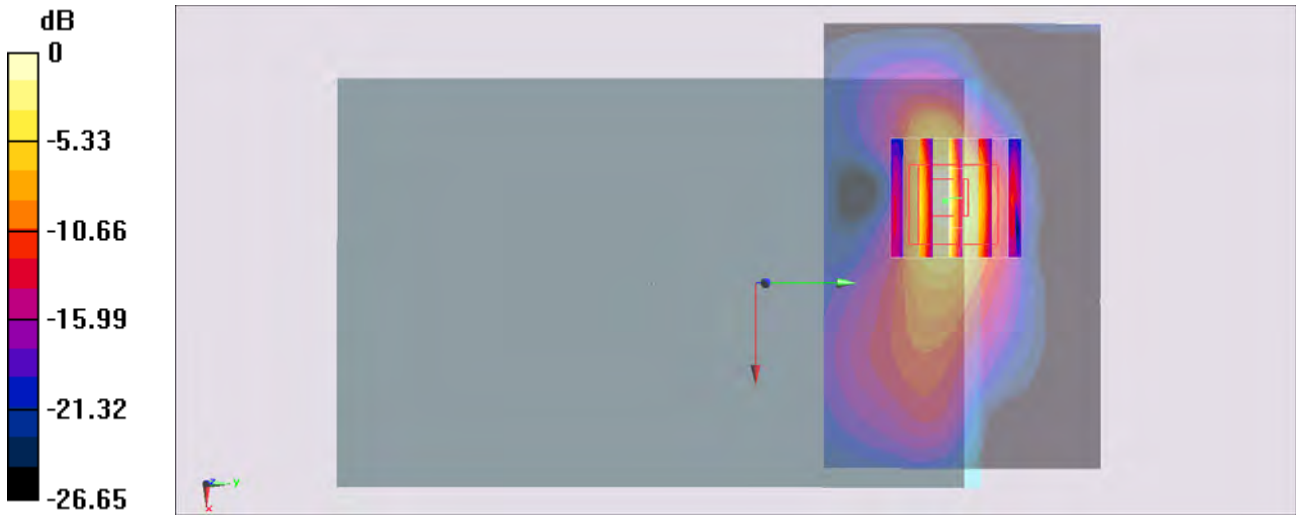
#04_WCDMA IV_RMC 12.2Kbps_Curved surface of Edge 1_0mm_Ch1413

Communication System: WCDMA ; Frequency: 1732.6 MHz;Duty Cycle: 1:1
Medium: MSL_1750_150507 Medium parameters used: f = 1733 MHz; σ = 1.458 S/m; ε_r = 52.44; ρ = 1000 kg/m^3
Ambient Temperature：23.4 ℃； Liquid Temperature：22.4 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3931; ConvF(8.26, 8.26, 8.26); Calibrated: 2014/9/25;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn577; Calibrated: 2014/10/6
- Phantom: ELI 4.0_Front; Type: QDOVA001BB; Serial: 1026
- Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

Configuration/Ch1413/Area Scan (81x51x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 1.69 W/kg

Configuration/Ch1413/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 36.87 V/m; Power Drift = -0.07 dB
Peak SAR (extrapolated) = 2.04 W/kg
SAR(1 g) = 0.938 W/kg; SAR(10 g) = 0.396 W/kg
Maximum value of SAR (measured) = 1.70 W/kg



0 dB = 1.70 W/kg = 2.30 dBW/kg

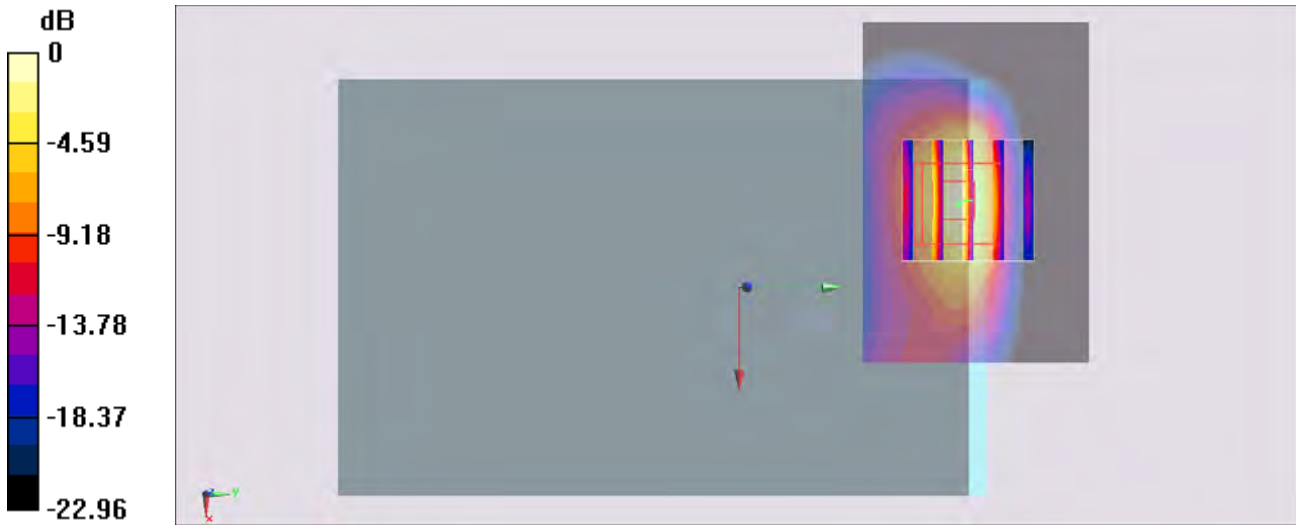
#05_WCDMA II_RMC 12.2Kbps_Curved surface of Edge 1_0mm_Ch9538

Communication System: WCDMA ; Frequency: 1907.6 MHz;Duty Cycle: 1:1
Medium: MSL_1900_150505 Medium parameters used: f = 1908 MHz; σ = 1.55 S/m; ε_r = 53.86; ρ = 1000 kg/m^3
Ambient Temperature：23.4 ℃； Liquid Temperature：22.4 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3931; ConvF(7.8, 7.8, 7.8); Calibrated: 2014/9/25;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn577; Calibrated: 2014/10/6
- Phantom: ELI 4.0_Front; Type: QDOVA001BB; Serial: 1026
- Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

Configuration/Ch9538/Area Scan (61x41x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 1.82 W/kg

Configuration/Ch9538/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 40.45 V/m; Power Drift = -0.05 dB
Peak SAR (extrapolated) = 2.97 W/kg
SAR(1 g) = 1.38 W/kg; SAR(10 g) = 0.572 W/kg
Maximum value of SAR (measured) = 2.09 W/kg



0 dB = 2.09 W/kg = 3.20 dBW/kg

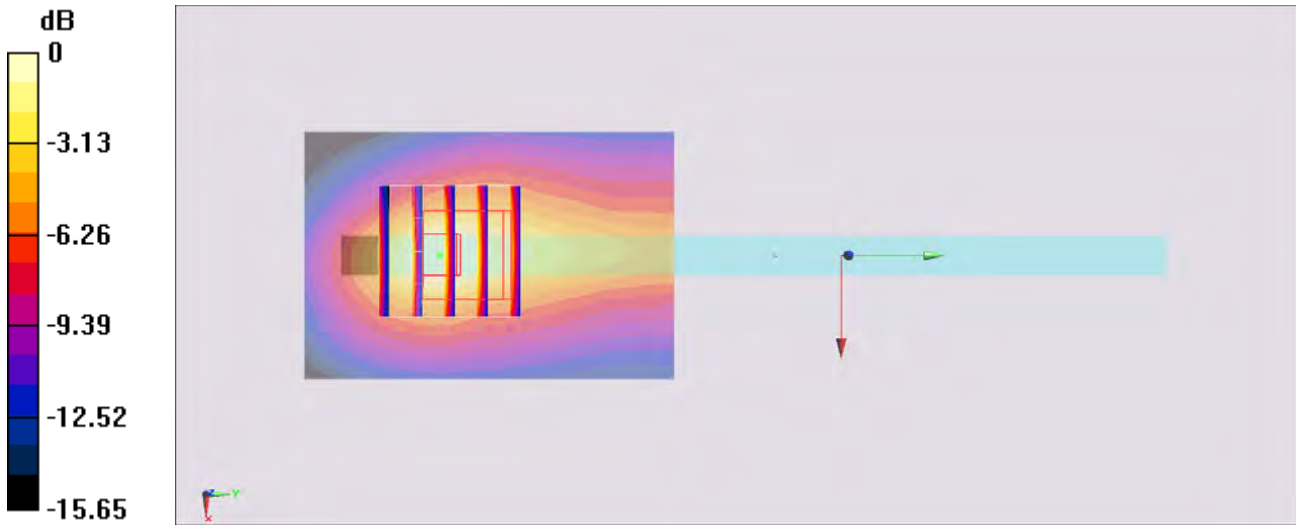
#06_LTE Band 12_10M_QPSK_1RB_0offset_Edge 2_0mm_Ch23095

Communication System: LTE; Frequency: 707.5 MHz;Duty Cycle: 1:1
Medium: MSL_750_150506 Medium parameters used: f = 707.5 MHz; σ = 0.931 S/m; ε_r = 54.88; ρ = 1000 kg/m^3
Ambient Temperature：23.5 ℃； Liquid Temperature：22.5 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3931; ConvF(10.1, 10.1, 10.1); Calibrated: 2014/9/25;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn577; Calibrated: 2014/10/6
- Phantom: ELI 4.0_Front; Type: QDOVA001BB; Serial: 1026
- Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

Configuration/Ch23095/Area Scan (41x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 0.588 W/kg

Configuration/Ch23095/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 24.00 V/m; Power Drift = 0.08 dB
Peak SAR (extrapolated) = 0.658 W/kg
SAR(1 g) = 0.300 W/kg; SAR(10 g) = 0.168 W/kg
Maximum value of SAR (measured) = 0.501 W/kg



0 dB = 0.501 W/kg = -3.00 dBW/kg

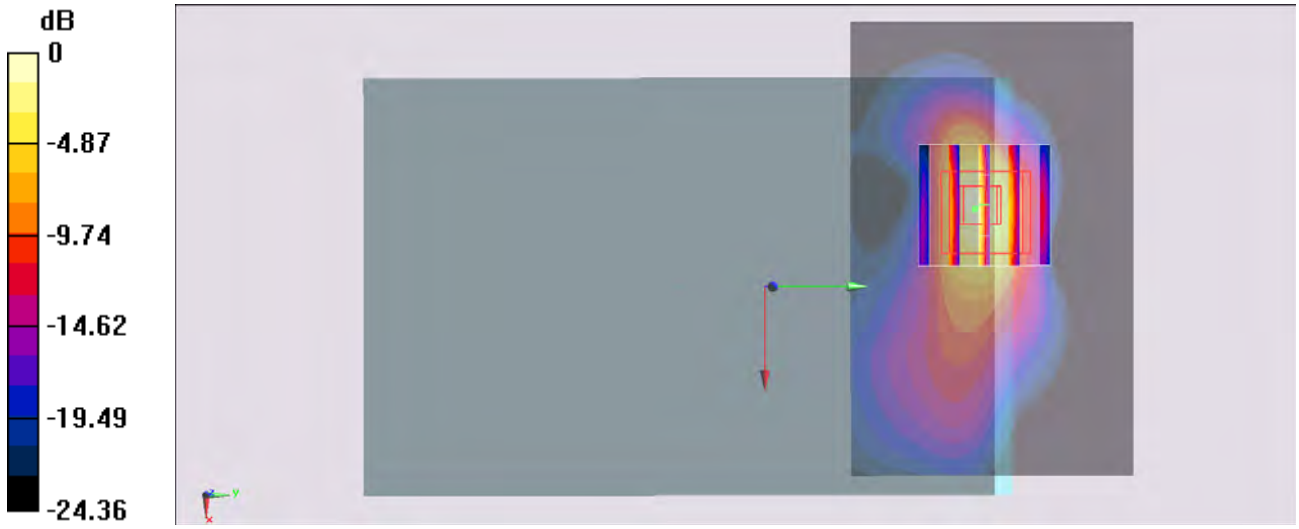
#07_LTE Band 4_20M_QPSK_1RB_0offset_Curved surface of Edge 1_0mm_Ch20300

Communication System: LTE ; Frequency: 1745 MHz;Duty Cycle: 1:1
Medium: MSL_1750_150507 Medium parameters used: f = 1745 MHz; σ = 1.468 S/m; ε_r = 52.402; ρ = 1000 kg/m^3
Ambient Temperature：23.4 ℃; Liquid Temperature：22.4 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3931; ConvF(8.26, 8.26, 8.26); Calibrated: 2014/9/25;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn577; Calibrated: 2014/10/6
- Phantom: ELI 4.0_Front; Type: QDOVA001BB; Serial: 1026
- Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

Configuration/Ch20300/Area Scan (81x51x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 1.38 W/kg

Configuration/Ch20300/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 34.45 V/m; Power Drift = -0.06 dB
Peak SAR (extrapolated) = 1.98 W/kg
SAR(1 g) = 0.852 W/kg; SAR(10 g) = 0.354 W/kg
Maximum value of SAR (measured) = 1.67 W/kg



0 dB = 1.67 W/kg = 2.23 dBW/kg

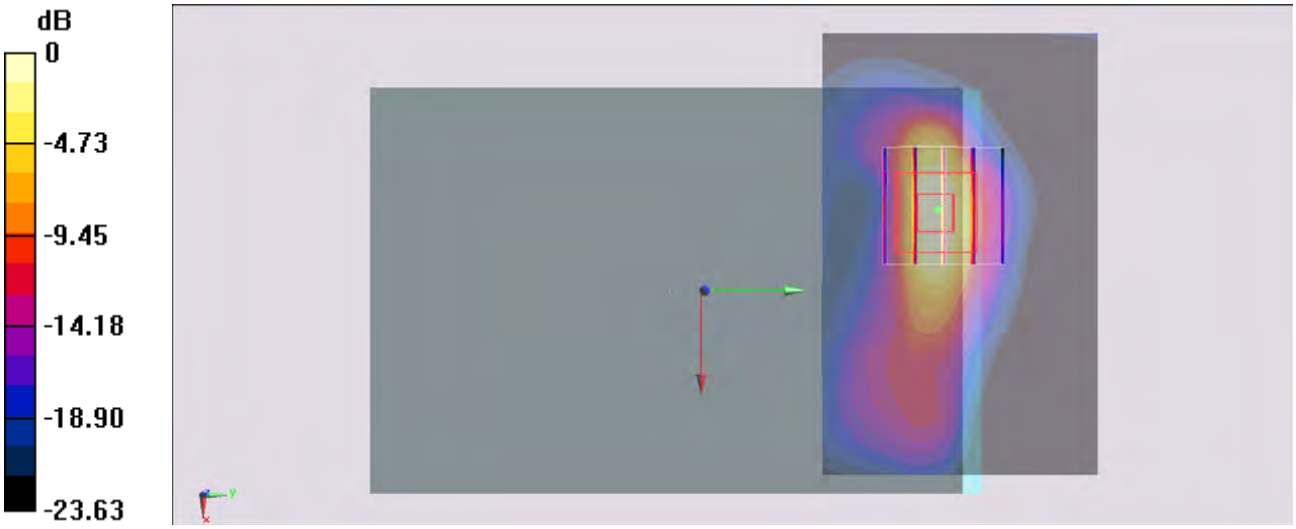
#08_LTE Band 2_20M_QPSK_50RB_0offset_Curved surface of Edge 1_0mm_Ch19100

Communication System: LTE; Frequency: 1900 MHz;Duty Cycle: 1:1
Medium: MSL_1900_150508 Medium parameters used: f = 1900 MHz; σ = 1.569 S/m; ε_r = 51.584; ρ = 1000 kg/m^3
Ambient Temperature：23.3 ℃; Liquid Temperature：22.3 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3931; ConvF(7.8, 7.8, 7.8); Calibrated: 2014/9/25;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn577; Calibrated: 2014/10/6
- Phantom: ELI 4.0_Front; Type: QDOVA001BB; Serial: 1026
- Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

Configuration/Ch19100/Area Scan (81x51x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 2.44 W/kg

Configuration/Ch19100/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 39.60 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 2.71 W/kg
SAR(1 g) = 1.23 W/kg; SAR(10 g) = 0.506 W/kg
Maximum value of SAR (measured) = 1.95 W/kg



0 dB = 1.95 W/kg = 2.90 dBW/kg

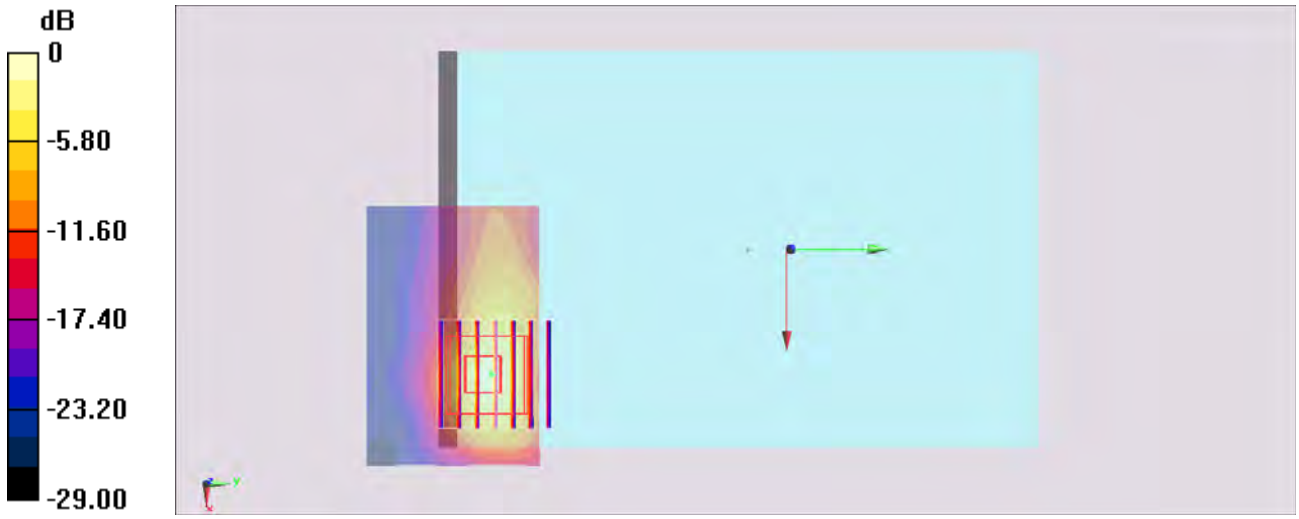
#09_WLAN2.4GHz_802.11b 1Mbps_Curved surface of Edge 3_0mm_Ch1

Communication System: 802.11b; Frequency: 2412 MHz;Duty Cycle: 1:1.023
Medium: MSL_2450_150509 Medium parameters used: f = 2412 MHz; σ = 1.972 S/m; ε_r = 52.788; ρ = 1000 kg/m^3
Ambient Temperature：23.2 ℃； Liquid Temperature：22.2 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3931; ConvF(7.36, 7.36, 7.36); Calibrated: 2014/9/25;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn577; Calibrated: 2014/10/6
- Phantom: ELI 4.0_Front; Type: QDOVA001BB; Serial: 1026
- Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

Configuration/Ch1/Area Scan (61x41x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 1.55 W/kg

Configuration/Ch1/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 31.62 V/m; Power Drift = -0.09 dB
Peak SAR (extrapolated) = 2.77 W/kg
SAR(1 g) = 1 W/kg; SAR(10 g) = 0.342 W/kg
Maximum value of SAR (measured) = 1.81 W/kg



0 dB = 1.81 W/kg = 2.58 dBW/kg

Appendix C. DASY Calibration Certificate

The DASY calibration certificates are shown as follows.

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
Servizio svizzero di taratura
S Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)
The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: SCS 108

Client **Sporton-TW (Auden)**

Certificate No: D750V3-1099_Nov14

CALIBRATION CERTIFICATE

Object	D750V3 - SN: 1099
Calibration procedure(s)	QA CAL-05.v9 Calibration procedure for dipole validation kits above 700 MHz
Calibration date:	November 19, 2014

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	07-Oct-14 (No. 217-02020)	Oct-15
Power sensor HP 8481A	US37292783	07-Oct-14 (No. 217-02020)	Oct-15
Power sensor HP 8481A	MY41092317	07-Oct-14 (No. 217-02021)	Oct-15
Reference 20 dB Attenuator	SN: 5058 (20k)	03-Apr-14 (No. 217-01918)	Apr-15
Type-N mismatch combination	SN: 5047.2 / 06327	03-Apr-14 (No. 217-01921)	Apr-15
Reference Probe ES3DV3	SN: 3205	30-Dec-13 (No. ES3-3205_Dec13)	Dec-14
DAE4	SN: 601	18-Aug-14 (No. DAE4-601_Aug14)	Aug-15

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-13)	In house check: Oct-16
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-14)	In house check: Oct-15

	Name	Function	Signature
Calibrated by:	Michael Weber	Laboratory Technician	M. Weber
Approved by:	Katja Pokovic	Technical Manager	

Issued: November 20, 2014

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.

Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORM x,y,z
N/A	not applicable or not measured

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
c) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

d) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- *Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- *Antenna Parameters with TSL:* The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- *Feed Point Impedance and Return Loss:* These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- *Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- *SAR measured:* SAR measured at the stated antenna input power.
- *SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- *SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY5	V52.8.8
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	750 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	41.9	0.89 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	41.4 ± 6 %	0.89 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.02 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**8.06 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.33 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**5.31 W/kg ± 16.5 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Body TSL parameters	22.0 °C	55.5	0.96 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	54.7 ± 6 %	0.98 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	2.18 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**8.56 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	1.44 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**5.68 W/kg ± 16.5 % (k=2)**

Appendix (Additional assessments outside the scope of SCS108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	55.2 Ω + 0.1 jΩ
Return Loss	- 26.2 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	49.7 Ω - 2.2 jΩ
Return Loss	- 33.0 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.034 ns

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	July 05, 2013

DASY5 Validation Report for Head TSL

Date: 19.11.2014

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 750 MHz; Type: D750V3; Serial: D750V3 - SN: 1099

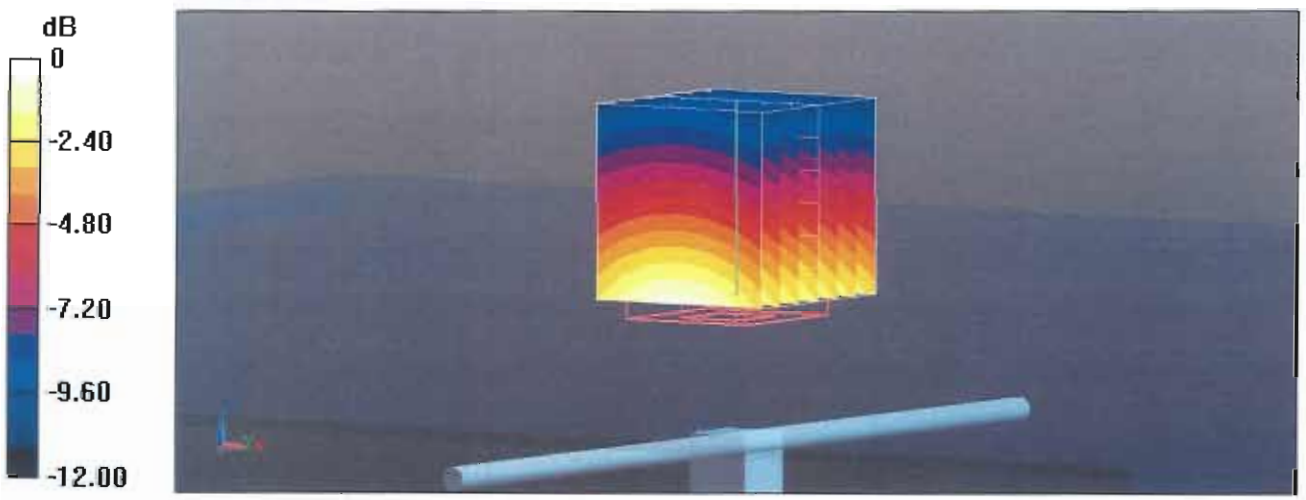
Communication System: UID 0 - CW; Frequency: 750 MHz
Medium parameters used: f = 750 MHz; σ = 0.89 S/m; ε_r = 41.4; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(6.37, 6.37, 6.37); Calibrated: 30.12.2013;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 18.08.2014
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

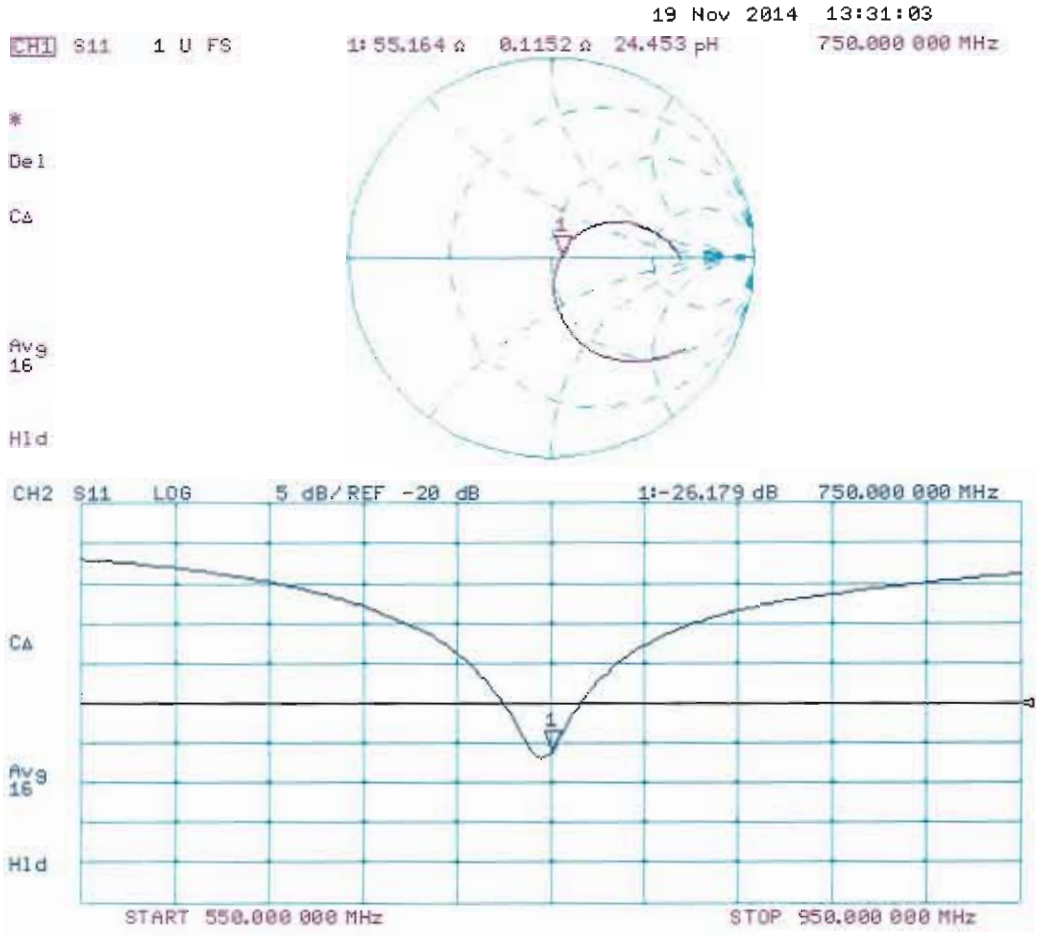
Dipole Calibration for Head Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 53.19 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 3.00 W/kg
SAR(1 g) = 2.02 W/kg; SAR(10 g) = 1.33 W/kg
Maximum value of SAR (measured) = 2.36 W/kg



0 dB = 2.36 W/kg = 3.73 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 18.11.2014

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 750 MHz; Type: D750V3; Serial: D750V3 - SN: 1099

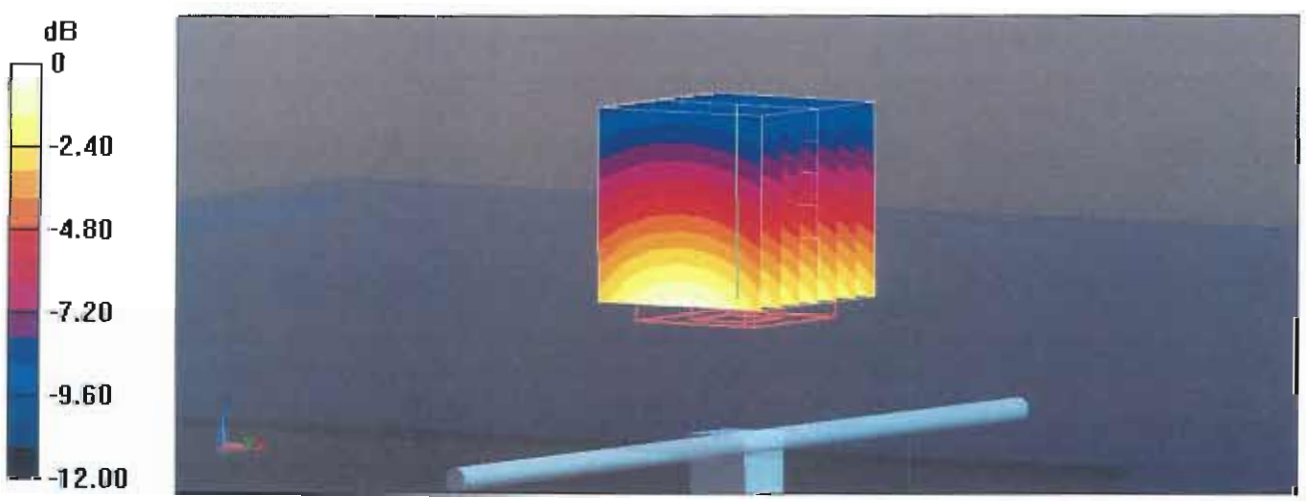
Communication System: UID 0 - CW; Frequency: 750 MHz
Medium parameters used: f = 750 MHz; σ = 0.98 S/m; ε_r = 54.7; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(6.13, 6.13, 6.13); Calibrated: 30.12.2013;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 18.08.2014
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

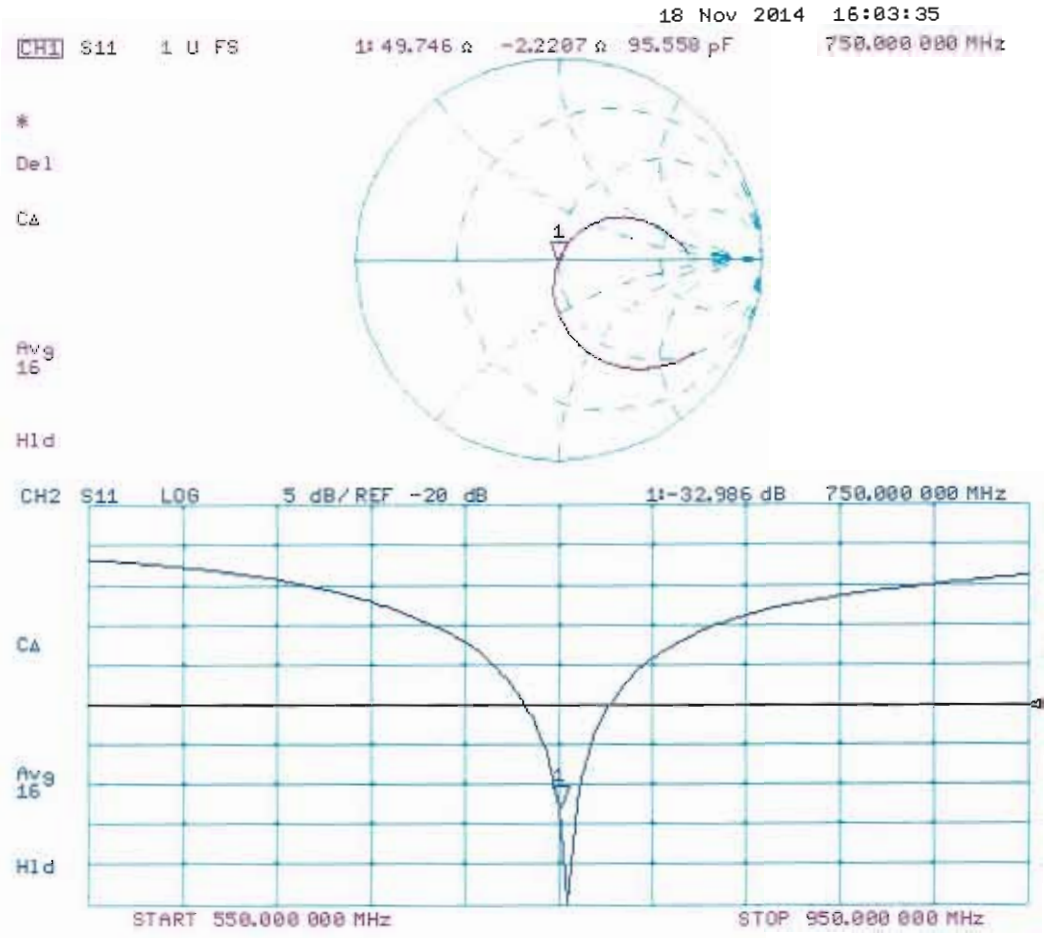
Dipole Calibration for Body Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 52.95 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 3.16 W/kg
SAR(1 g) = 2.18 W/kg; SAR(10 g) = 1.44 W/kg
Maximum value of SAR (measured) = 2.55 W/kg



0 dB = 2.55 W/kg = 4.07 dBW/kg

Impedance Measurement Plot for Body TSL



Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
Servizio svizzero di taratura
S Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)
The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: SCS 0108

Client **Sporton-TW (Auden)**

Certificate No: D835V2-499_Mar15

CALIBRATION CERTIFICATE

Object	D835V2 - SN:499
Calibration procedure(s)	QA CAL-05.v9 Calibration procedure for dipole validation kits above 700 MHz
Calibration date:	March 20, 2015

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	07-Oct-14 (No. 217-02020)	Oct-15
Power sensor HP 8481A	US37292783	07-Oct-14 (No. 217-02020)	Oct-15
Power sensor HP 8481A	MY41092317	07-Oct-14 (No. 217-02021)	Oct-15
Reference 20 dB Attenuator	SN: 5058 (20k)	03-Apr-14 (No. 217-01918)	Apr-15
Type-N mismatch combination	SN: 5047.2 / 06327	03-Apr-14 (No. 217-01921)	Apr-15
Reference Probe ES3DV3	SN: 3205	30-Dec-14 (No. ES3-3205_Dec14)	Dec-15
DAE4	SN: 601	18-Aug-14 (No. DAE4-601_Aug14)	Aug-15

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-13)	In house check: Oct-16
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-14)	In house check: Oct-15

	Name	Function	Signature
Calibrated by:	Israe Elnaouq	Laboratory Technician	Israe Elnaouq
Approved by:	Katja Pokovic	Technical Manager	

Issued: March 20, 2015

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.

Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORM x,y,z
N/A	not applicable or not measured

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
c) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

d) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- *Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- *Antenna Parameters with TSL:* The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- *Feed Point Impedance and Return Loss:* These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- *Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- *SAR measured:* SAR measured at the stated antenna input power.
- *SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- *SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY5	V52.8.8
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	835 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	41.5	0.90 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	40.6 ± 6 %	0.92 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.35 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**9.20 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.53 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**6.02 W/kg ± 16.5 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Body TSL parameters	22.0 °C	55.2	0.97 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	54.6 ± 6 %	1.02 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	2.42 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**9.30 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	1.58 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**6.12 W/kg ± 16.5 % (k=2)**

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	51.3 Ω - 3.2 jΩ
Return Loss	- 29.4 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	47.6 Ω - 5.2 jΩ
Return Loss	- 24.7 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.390 ns

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	July 10, 2003

DASY5 Validation Report for Head TSL

Date: 19.03.2015

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:499

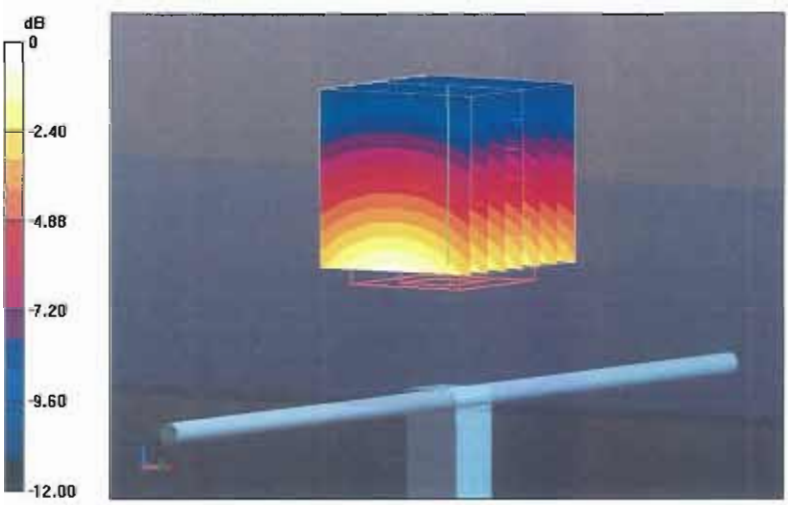
Communication System: UID 0 - CW; Frequency: 835 MHz
Medium parameters used: f = 835 MHz; σ = 0.92 S/m; ε_r = 40.6; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(6.2, 6.2, 6.2); Calibrated: 30.12.2014;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 18.08.2014
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

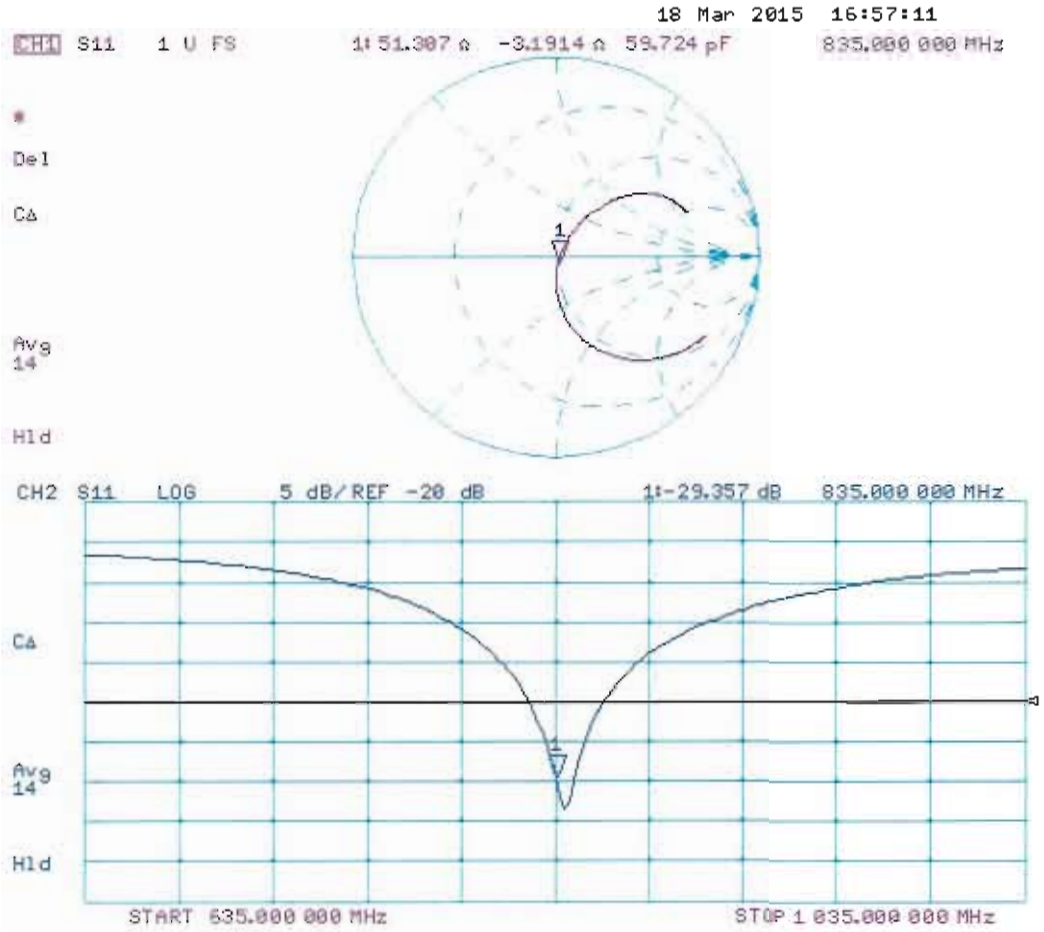
Dipole Calibration for Head Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 56.43 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 3.52 W/kg
SAR(1 g) = 2.35 W/kg; SAR(10 g) = 1.53 W/kg
Maximum value of SAR (measured) = 2.75 W/kg



0 dB = 2.75 W/kg = 4.39 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 20.03.2015

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:499

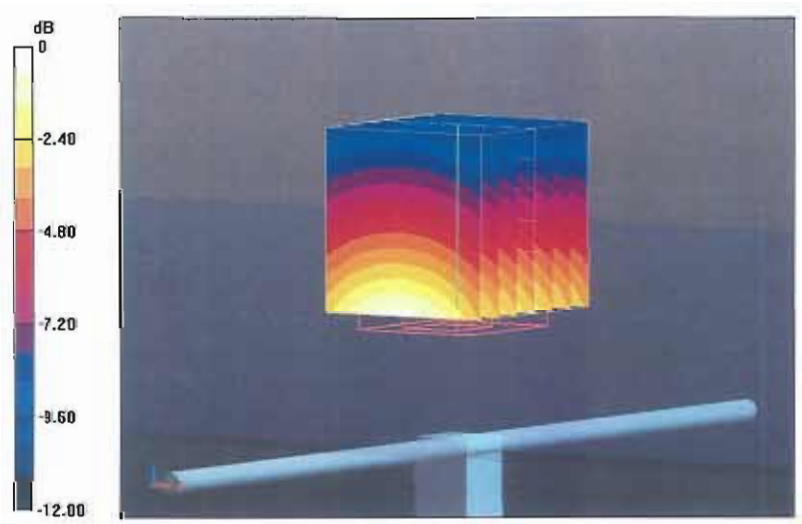
Communication System: UID 0 - CW; Frequency: 835 MHz
Medium parameters used: f = 835 MHz; σ = 1.02 S/m; ε_r = 54.6; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(6.17, 6.17, 6.17); Calibrated: 30.12.2014;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 18.08.2014
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

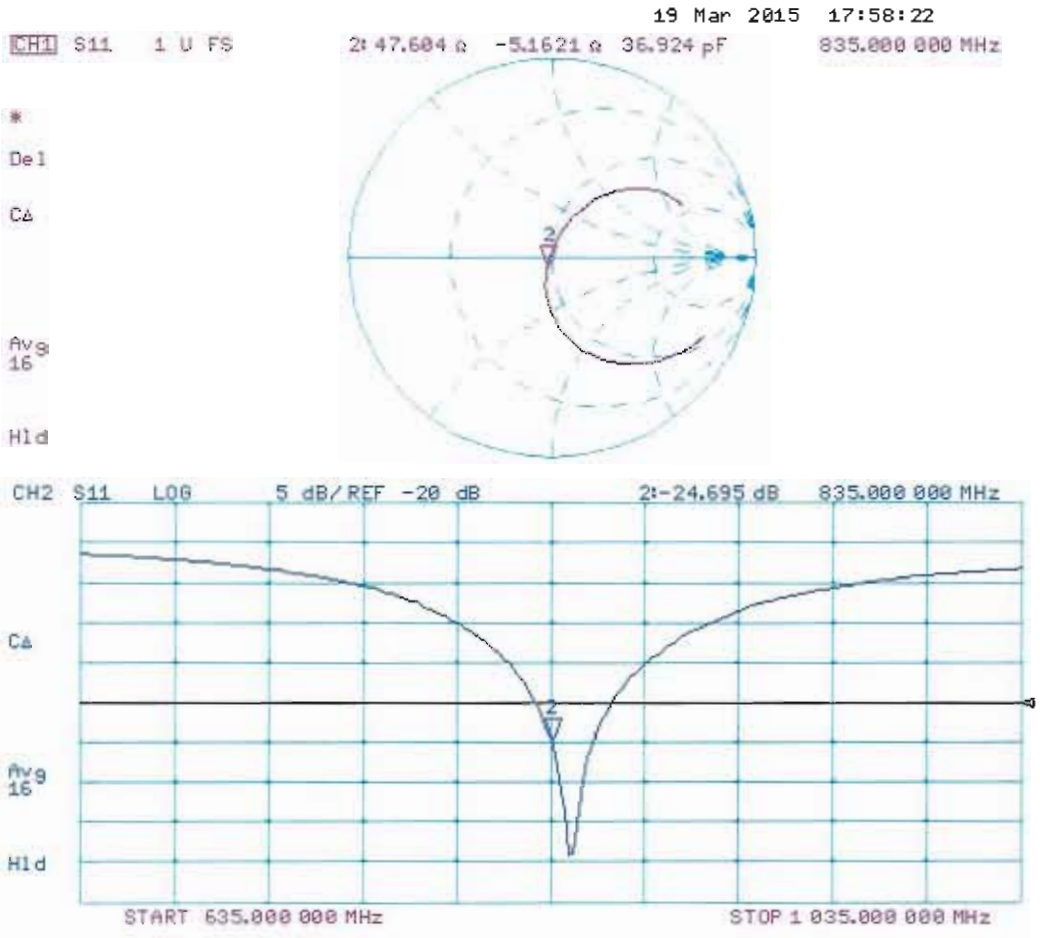
Dipole Calibration for Body Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 54.57 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 3.57 W/kg
SAR(1 g) = 2.42 W/kg; SAR(10 g) = 1.58 W/kg
Maximum value of SAR (measured) = 2.82 W/kg



0 dB = 2.82 W/kg = 4.50 dBW/kg

Impedance Measurement Plot for Body TSL



Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

S Schweizerischer Kalibrierdienst
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The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: SCS 108

Client **Sporton-TW (Auden)**

Certificate No: D1750V2-1068_Nov14

CALIBRATION CERTIFICATE

Object	D1750V2 - SN: 1068
Calibration procedure(s)	QA CAL-05.v9 Calibration procedure for dipole validation kits above 700 MHz
Calibration date:	November 14, 2014

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	07-Oct-14 (No. 217-02020)	Oct-15
Power sensor HP 8481A	US37292783	07-Oct-14 (No. 217-02020)	Oct-15
Power sensor HP 8481A	MY41092317	07-Oct-14 (No. 217-02021)	Oct-15
Reference 20 dB Attenuator	SN: 5058 (20k)	03-Apr-14 (No. 217-01918)	Apr-15
Type-N mismatch combination	SN: 5047.2 / 06327	03-Apr-14 (No. 217-01921)	Apr-15
Reference Probe ES3DV3	SN: 3205	30-Dec-13 (No. ES3-3205_Dec13)	Dec-14
DAE4	SN: 601	18-Aug-14 (No. DAE4-601_Aug14)	Aug-15

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-13)	In house check: Oct-16
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-14)	In house check: Oct-15

	Name	Function	Signature
Calibrated by:	Jeton Kastrati	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: November 14, 2014

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.

Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORM x,y,z
N/A	not applicable or not measured

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
c) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

d) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- *Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- *Antenna Parameters with TSL:* The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- *Feed Point Impedance and Return Loss:* These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- *Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- *SAR measured:* SAR measured at the stated antenna input power.
- *SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- *SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY5	V52.8.8
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	1750 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	40.1	1.37 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	39.4 ± 6 %	1.38 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	9.27 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**36.8 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	4.90 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**19.5 W/kg ± 16.5 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Body TSL parameters	22.0 °C	53.4	1.49 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	52.2 ± 6 %	1.50 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	9.59 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**38.0 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.14 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**20.4 W/kg ± 16.5 % (k=2)**

Appendix (Additional assessments outside the scope of SCS108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	49.8 Ω - 0.9 jΩ
Return Loss	- 41.0 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	45.7 Ω - 0.7 jΩ
Return Loss	- 26.9 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.221 ns

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	June 15, 2010

DASY5 Validation Report for Head TSL

Date: 14.11.2014

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1750 MHz; Type: D1750V2; Serial: D1750V2 - SN: 1068

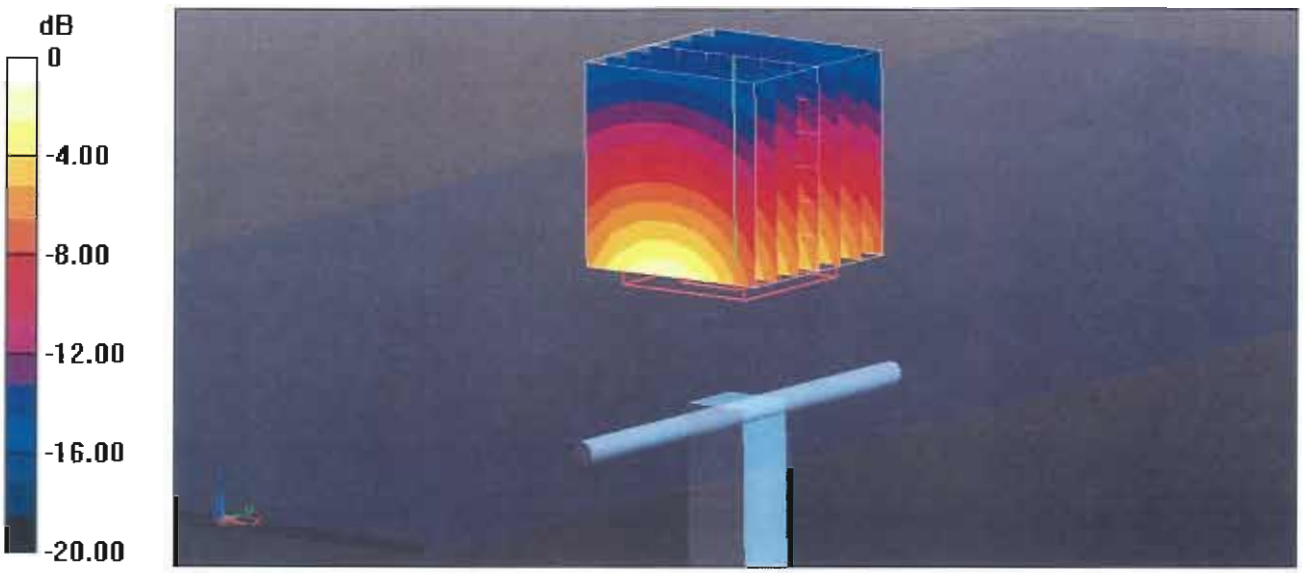
Communication System: UID 0 - CW; Frequency: 1750 MHz
Medium parameters used: f = 1750 MHz; σ = 1.38 S/m; ε_r = 39.4; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(5.23, 5.23, 5.23); Calibrated: 30.12.2013;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 18.08.2014
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

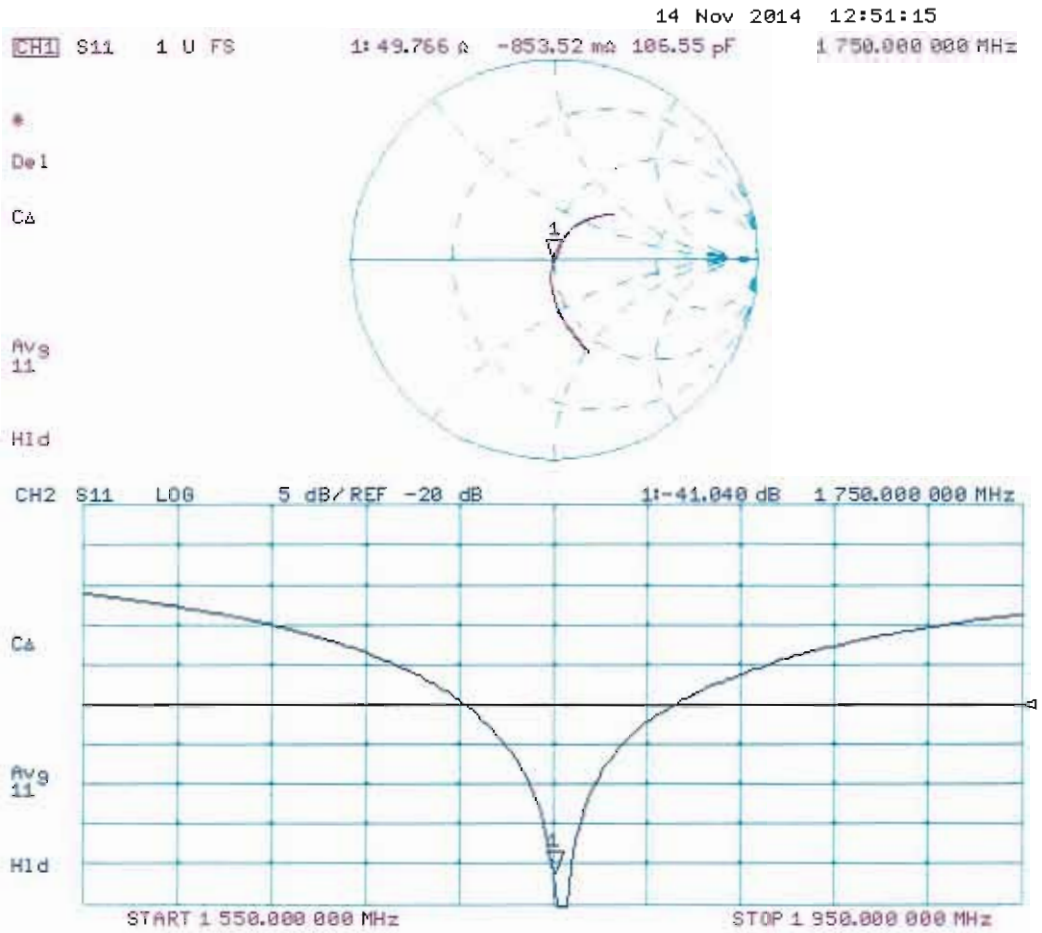
Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 95.05 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 16.8 W/kg
SAR(1 g) = 9.27 W/kg; SAR(10 g) = 4.9 W/kg
Maximum value of SAR (measured) = 11.7 W/kg



0 dB = 11.7 W/kg = 10.68 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 14.11.2014

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1750 MHz; Type: D1750V2; Serial: D1750V2 - SN: 1068

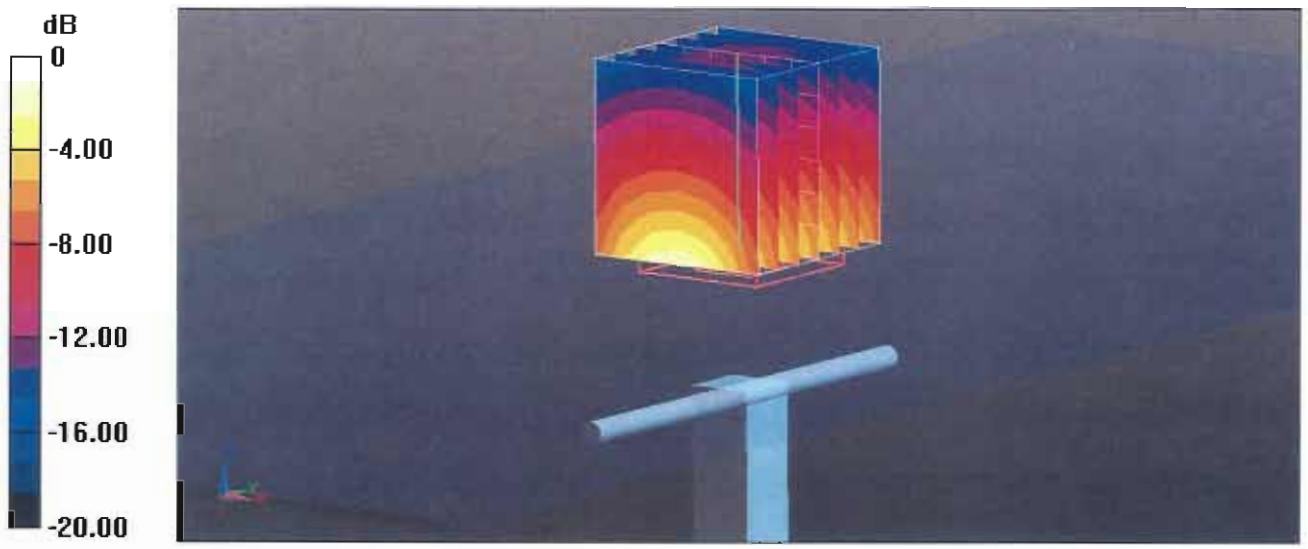
Communication System: UID 0 - CW; Frequency: 1750 MHz
Medium parameters used: f = 1750 MHz; σ = 1.5 S/m; ε_r = 52.2; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.89, 4.89, 4.89); Calibrated: 30.12.2013;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 18.08.2014
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

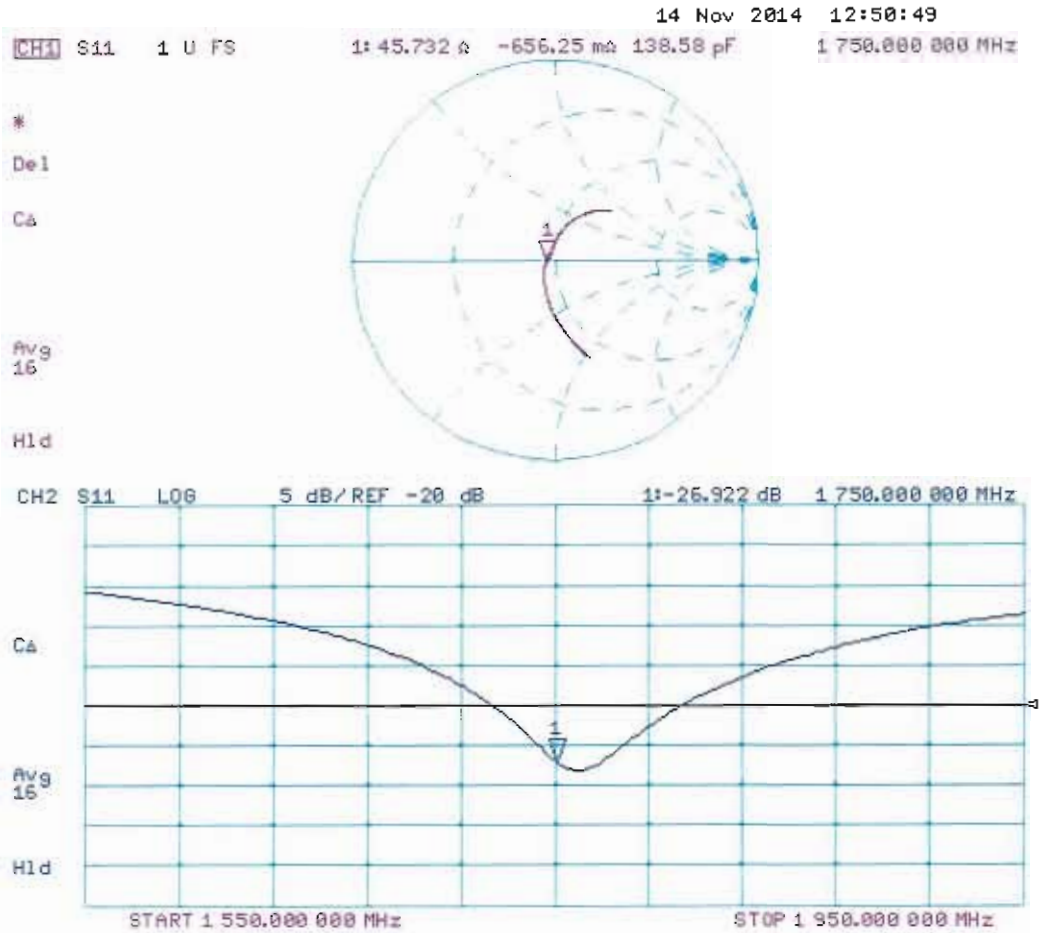
Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 93.73 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 16.6 W/kg
SAR(1 g) = 9.59 W/kg; SAR(10 g) = 5.14 W/kg
Maximum value of SAR (measured) = 12.1 W/kg



0 dB = 12.1 W/kg = 10.83 dBW/kg

Impedance Measurement Plot for Body TSL



Calibration Laboratory of
Schmid & Partner
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Zeughausstrasse 43, 8004 Zurich, Switzerland

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Accreditation No.: SCS 0108

Client **Sporton-TW (Auden)**

Certificate No: D1900V2-5d041_Mar15

CALIBRATION CERTIFICATE

Object	D1900V2 - SN:5d041
Calibration procedure(s)	QA CAL-05.v9 Calibration procedure for dipole validation kits above 700 MHz
Calibration date:	March 24, 2015

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	07-Oct-14 (No. 217-02020)	Oct-15
Power sensor HP 8481A	US37292783	07-Oct-14 (No. 217-02020)	Oct-15
Power sensor HP 8481A	MY41092317	07-Oct-14 (No. 217-02021)	Oct-15
Reference 20 dB Attenuator	SN: 5058 (20k)	03-Apr-14 (No. 217-01918)	Apr-15
Type-N mismatch combination	SN: 5047.2 / 06327	03-Apr-14 (No. 217-01921)	Apr-15
Reference Probe ES3DV3	SN: 3205	30-Dec-14 (No. ES3-3205_Dec14)	Dec-15
DAE4	SN: 601	18-Aug-14 (No. DAE4-601_Aug14)	Aug-15

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-13)	In house check: Oct-16
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-14)	In house check: Oct-15

	Name	Function	Signature
Calibrated by:	Leif Klysner	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: March 25, 2015

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.

Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORM x,y,z
N/A	not applicable or not measured

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
c) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

d) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- *Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- *Antenna Parameters with TSL:* The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- *Feed Point Impedance and Return Loss:* These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- *Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- *SAR measured:* SAR measured at the stated antenna input power.
- *SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- *SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY5	V52.8.8
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	1900 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	40.0	1.40 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	39.0 ± 6 %	1.38 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	9.98 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**40.0 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	5.22 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**20.9 W/kg ± 16.5 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Body TSL parameters	22.0 °C	53.3	1.52 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	52.8 ± 6 %	1.50 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	9.90 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**39.8 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.28 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**21.2 W/kg ± 16.5 % (k=2)**

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	53.2 Ω + 6.4 jΩ
Return Loss	- 23.3 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	48.7 Ω + 7.4 jΩ
Return Loss	- 22.4 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.201 ns

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	July 04, 2003

DASY5 Validation Report for Head TSL

Date: 24.03.2015

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:5d041

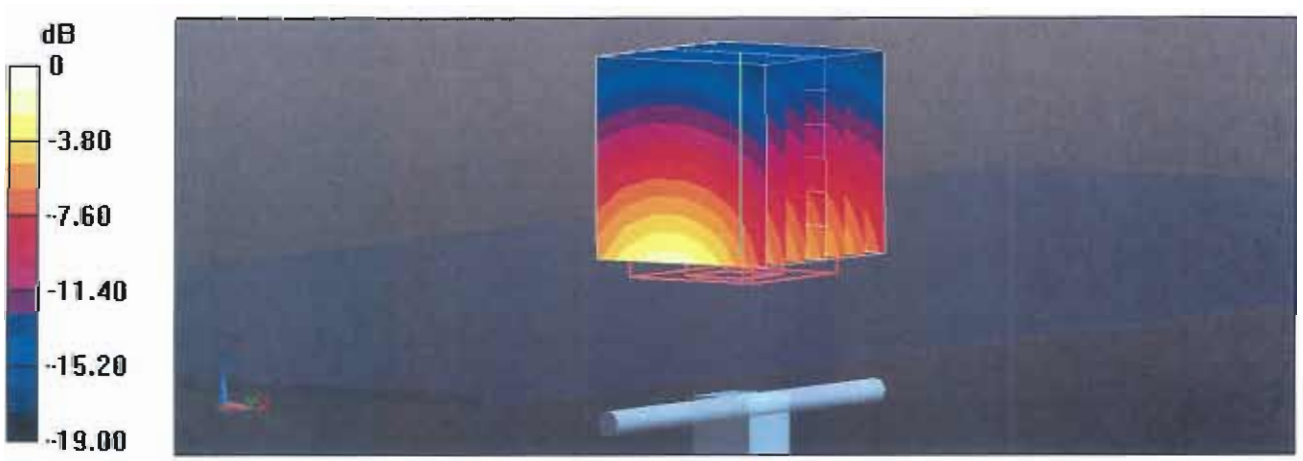
Communication System: UID 0 - CW; Frequency: 1900 MHz
Medium parameters used: f = 1900 MHz; σ = 1.38 S/m; ε_r = 39; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(5, 5, 5); Calibrated: 30.12.2014;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 18.08.2014
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

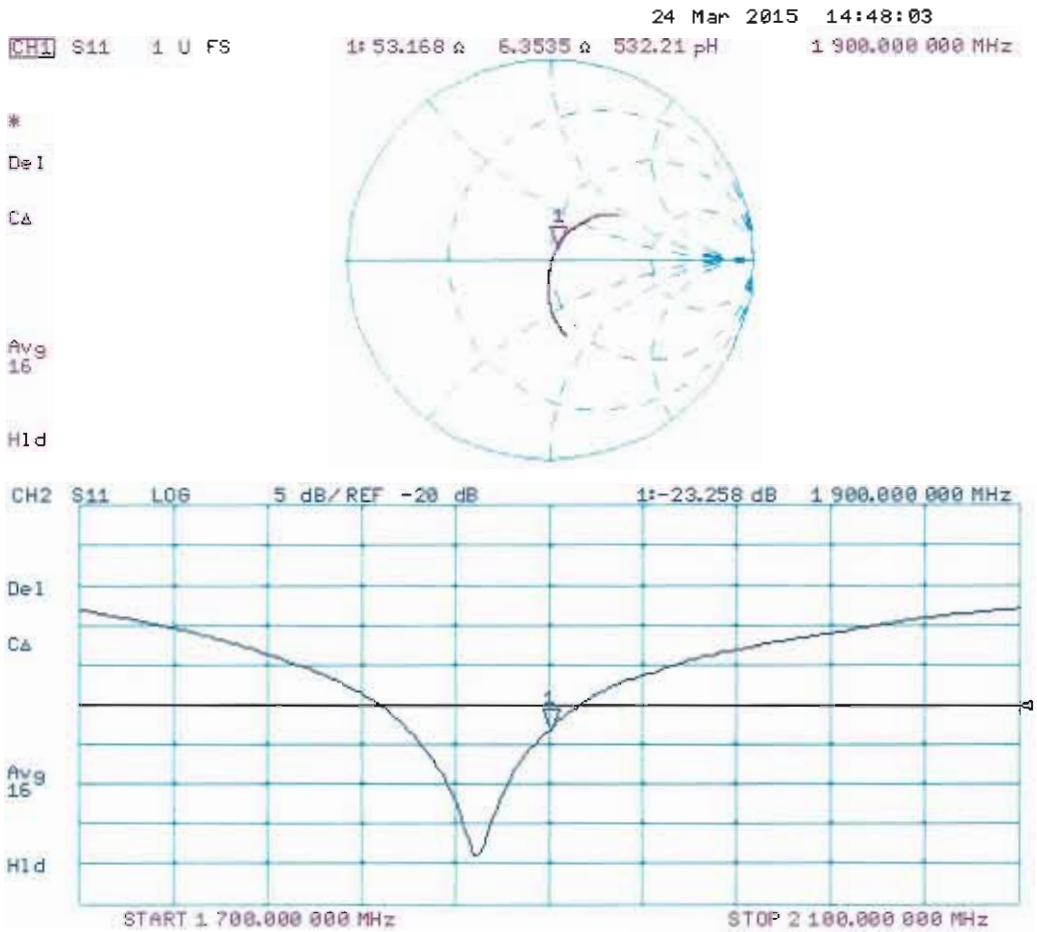
Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 97.15 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 18.4 W/kg
SAR(1 g) = 9.98 W/kg; SAR(10 g) = 5.22 W/kg
Maximum value of SAR (measured) = 12.3 W/kg



0 dB = 12.3 W/kg = 10.90 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 24.03.2015

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:5d041

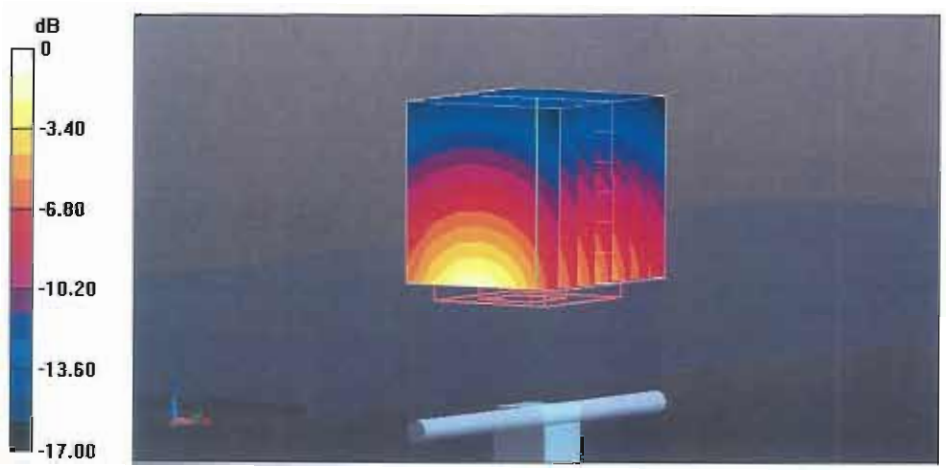
Communication System: UID 0 - CW; Frequency: 1900 MHz
Medium parameters used: f = 1900 MHz; σ = 1.5 S/m; ε_r = 52.8; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.65, 4.65, 4.65); Calibrated: 30.12.2014;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 18.08.2014
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

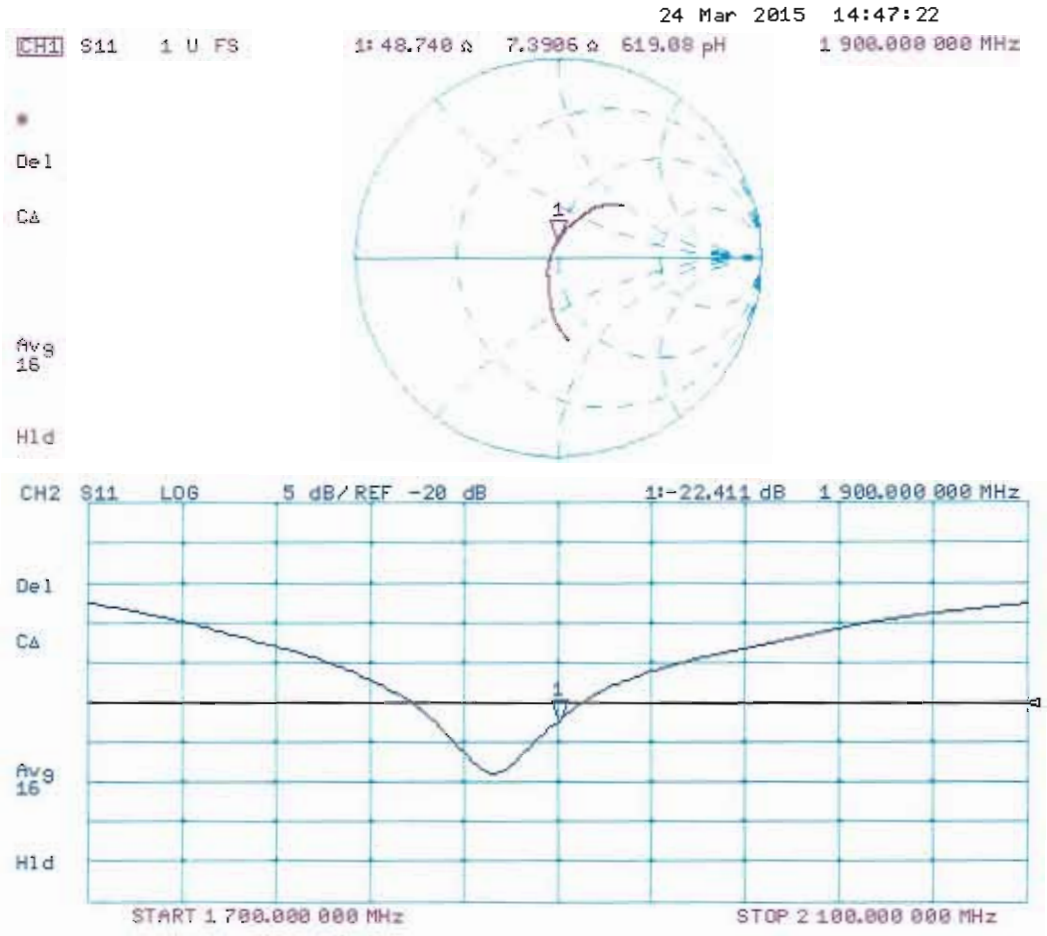
Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 95.15 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 16.8 W/kg
SAR(1 g) = 9.9 W/kg; SAR(10 g) = 5.28 W/kg
Maximum value of SAR (measured) = 12.3 W/kg



0 dB = 12.3 W/kg = 10.90 dBW/kg

Impedance Measurement Plot for Body TSL



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Accreditation No.: SCS 108

Client **Sporton-TW (Auden)**

Certificate No: D2450V2-924_Nov14

CALIBRATION CERTIFICATE

Object	D2450V2 - SN: 924
Calibration procedure(s)	QA CAL-05.v9 Calibration procedure for dipole validation kits above 700 MHz
Calibration date:	November 19, 2014

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	07-Oct-14 (No. 217-02020)	Oct-15
Power sensor HP 8481A	US37292783	07-Oct-14 (No. 217-02020)	Oct-15
Power sensor HP 8481A	MY41092317	07-Oct-14 (No. 217-02021)	Oct-15
Reference 20 dB Attenuator	SN: 5058 (20k)	03-Apr-14 (No. 217-01918)	Apr-15
Type-N mismatch combination	SN: 5047.2 / 06327	03-Apr-14 (No. 217-01921)	Apr-15
Reference Probe ES3DV3	SN: 3205	30-Dec-13 (No. ES3-3205_Dec13)	Dec-14
DAE4	SN: 601	18-Aug-14 (No. DAE4-601_Aug14)	Aug-15

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-13)	In house check: Oct-16
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-14)	In house check: Oct-15

	Name	Function	Signature
Calibrated by:	Michael Weber	Laboratory Technician	M.Weber
Approved by:	Katja Pokovic	Technical Manager	

Issued: November 20, 2014

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.

Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORM x,y,z
N/A	not applicable or not measured

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
c) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

d) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- *Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- *Antenna Parameters with TSL:* The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- *Feed Point Impedance and Return Loss:* These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- *Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- *SAR measured:* SAR measured at the stated antenna input power.
- *SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- *SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY5	V52.8.8
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	2450 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	39.2	1.80 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	39.0 ± 6 %	1.86 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	13.2 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**51.9 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	6.14 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**24.3 W/kg ± 16.5 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Body TSL parameters	22.0 °C	52.7	1.95 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	50.9 ± 6 %	2.03 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	13.2 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**51.4 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	6.05 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**23.8 W/kg ± 16.5 % (k=2)**

Appendix (Additional assessments outside the scope of SCS108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	54.8 Ω + 3.2 jΩ
Return Loss	- 25.3 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	50.3 Ω + 4.6 jΩ
Return Loss	- 26.8 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.153 ns

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	September 26, 2013

DASY5 Validation Report for Head TSL

Date: 18.11.2014

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 924

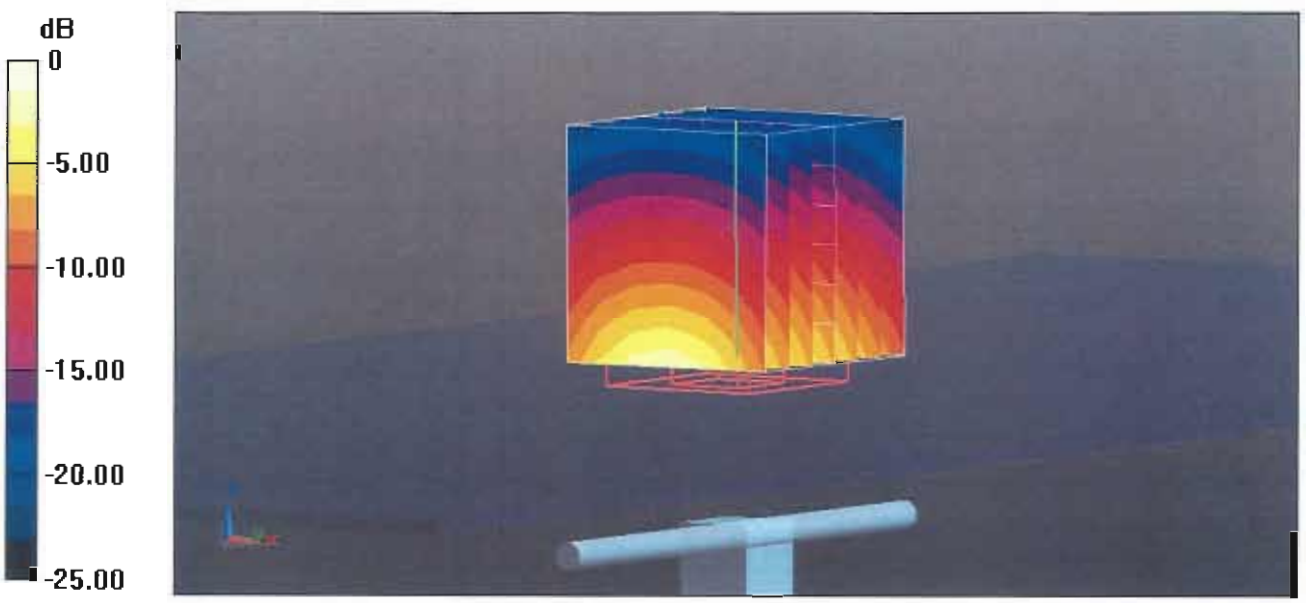
Communication System: UID 0 - CW; Frequency: 2450 MHz
Medium parameters used: f = 2450 MHz; σ = 1.86 S/m; ε_r = 39; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.53, 4.53, 4.53); Calibrated: 30.12.2013;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 18.08.2014
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

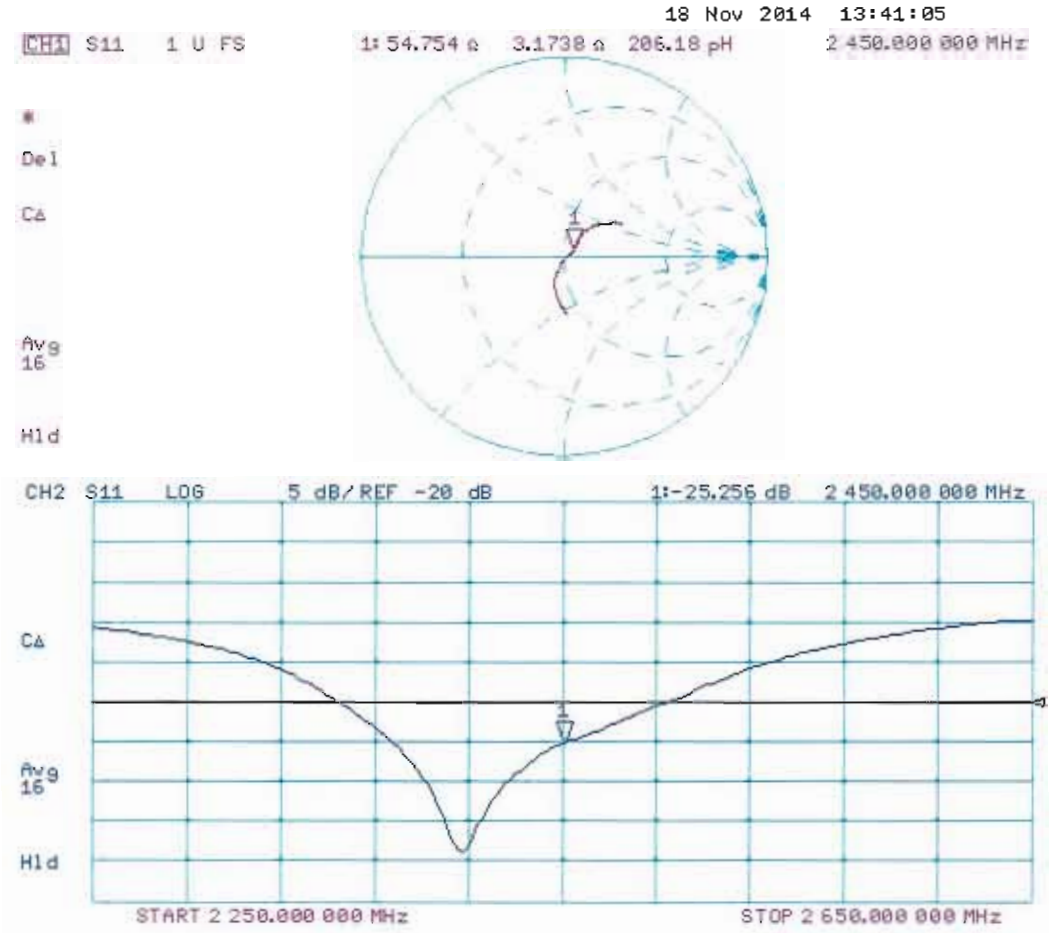
Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 100.6 V/m; Power Drift = -0.00 dB
Peak SAR (extrapolated) = 27.1 W/kg
SAR(1 g) = 13.2 W/kg; SAR(10 g) = 6.14 W/kg
Maximum value of SAR (measured) = 17.4 W/kg



0 dB = 17.4 W/kg = 12.41 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 19.11.2014

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 924

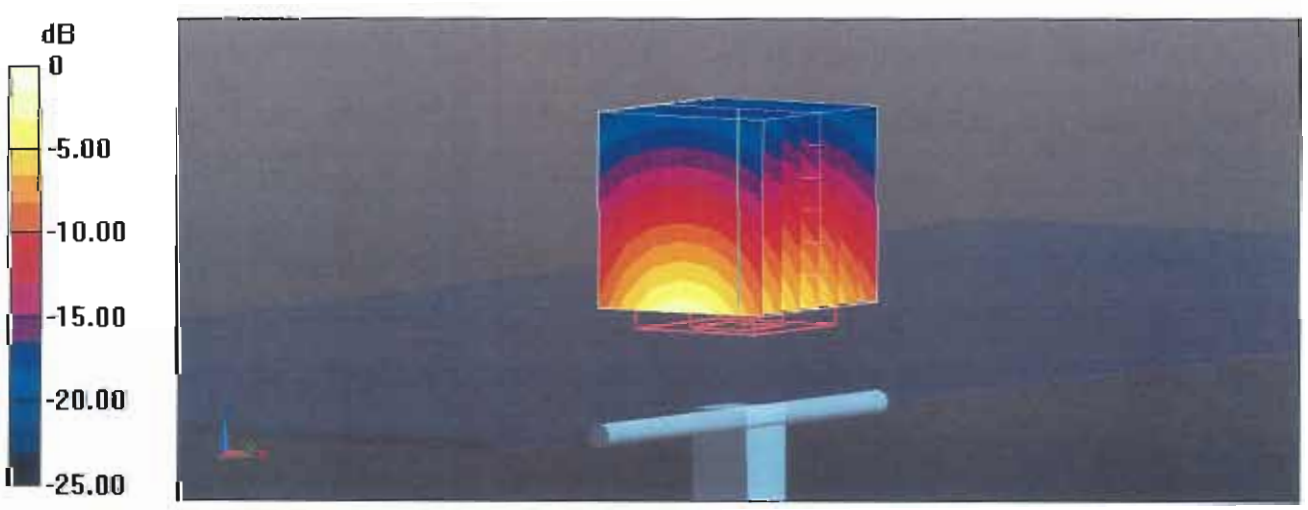
Communication System: UID 0 - CW; Frequency: 2450 MHz
Medium parameters used: f = 2450 MHz; σ = 2.03 S/m; ε_r = 50.9; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.35, 4.35, 4.35); Calibrated: 30.12.2013;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 18.08.2014
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

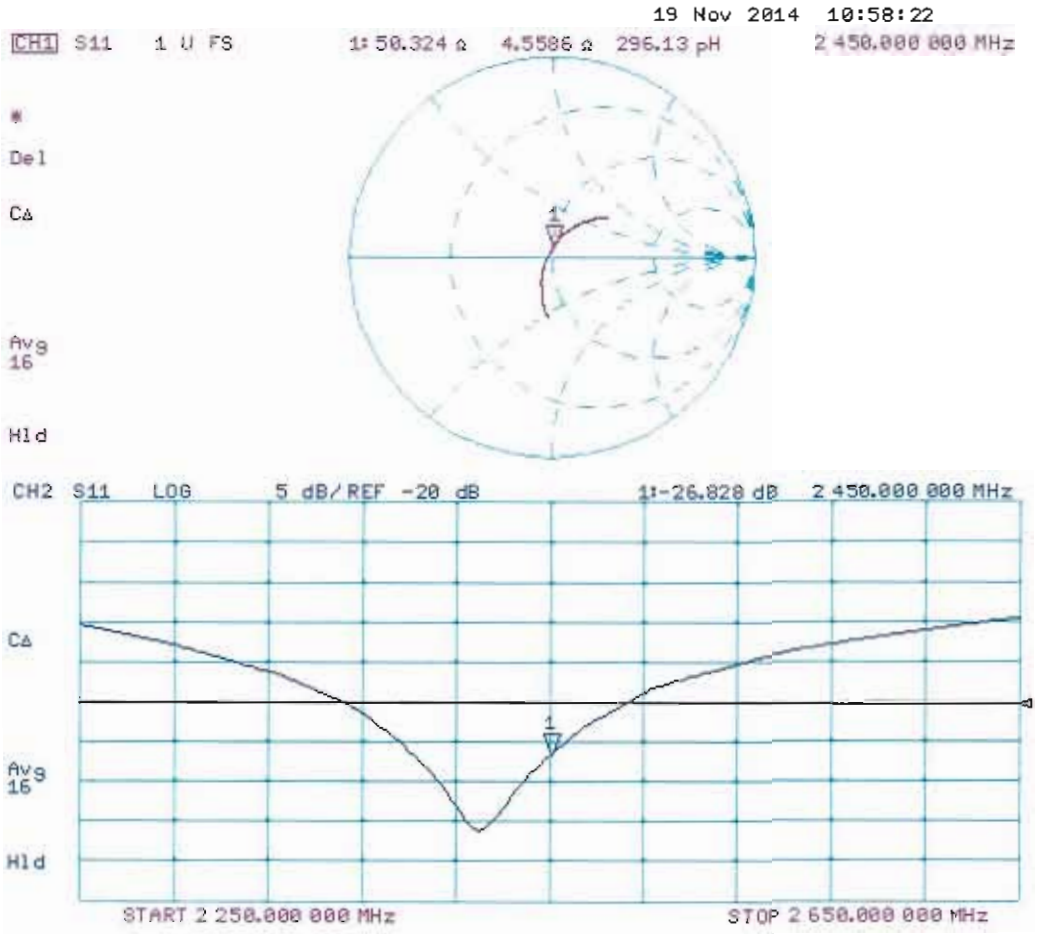
Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 95.44 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 27.9 W/kg
SAR(1 g) = 13.2 W/kg; SAR(10 g) = 6.05 W/kg
Maximum value of SAR (measured) = 17.4 W/kg



0 dB = 17.4 W/kg = 12.41 dBW/kg

Impedance Measurement Plot for Body TSL



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Accreditation No.: SCS 108

Client **Sporton-TW (Auden)**

Certificate No: DAE3-577_Oct14

CALIBRATION CERTIFICATE

Object	DAE3 - SD 000 D03 AA - SN: 577
Calibration procedure(s)	QA CAL-06.v28 Calibration procedure for the data acquisition electronics (DAE)
Calibration date:	October 06, 2014

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Keithley Multimeter Type 2001	SN: 0810278	03-Oct-14 (No:15573)	Oct-15

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Auto DAE Calibration Unit	SE UWS 053 AA 1001	07-Jan-14 (in house check)	In house check: Jan-15
Calibrator Box V2.1	SE UMS 006 AA 1002	07-Jan-14 (in house check)	In house check: Jan-15

	Name	Function	Signature
Calibrated by:	Dominique Steffen	Technician	
Approved by:	Fin Bomholt	Deputy Technical Manager	

Issued: October 6, 2014

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.

Glossary

DAE	data acquisition electronics
Connector angle	information used in DASY system to align probe sensor X to the robot coordinate system.

Methods Applied and Interpretation of Parameters

- *DC Voltage Measurement:* Calibration Factor assessed for use in DASY system by comparison with a calibrated instrument traceable to national standards. The figure given corresponds to the full scale range of the voltmeter in the respective range.
- *Connector angle*: The angle of the connector is assessed measuring the angle mechanically by a tool inserted. Uncertainty is not required.
- The following parameters as documented in the Appendix contain technical information as a result from the performance test and require no uncertainty.
  - *DC Voltage Measurement Linearity:* Verification of the Linearity at +10% and -10% of the nominal calibration voltage. Influence of offset voltage is included in this measurement.
  - *Common mode sensitivity:* Influence of a positive or negative common mode voltage on the differential measurement.
  - *Channel separation:* Influence of a voltage on the neighbor channels not subject to an input voltage.
  - *AD Converter Values with inputs shorted:* Values on the internal AD converter corresponding to zero input voltage
  - *Input Offset Measurement*: Output voltage and statistical results over a large number of zero voltage measurements.
  - *Input Offset Current:* Typical value for information; Maximum channel input offset current, not considering the input resistance.
  - *Input resistance:* Typical value for information: DAE input resistance at the connector, during internal auto-zeroing and during measurement.
  - *Low Battery Alarm Voltage:* Typical value for information. Below this voltage, a battery alarm signal is generated.
  - *Power consumption:* Typical value for information. Supply currents in various operating modes.

DC Voltage Measurement

A/D - Converter Resolution nominal

High Range:	1LSB =	6.1μV ,	full range =	-100...+300 mV
Low Range:	1LSB =	61nV ,	full range =	-1.....+3mV

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

Calibration Factors	X	Y	Z
High Range	403.482 ± 0.02% (k=2)	403.471 ± 0.02% (k=2)	403.779 ± 0.02% (k=2)
Low Range	3.91221 ± 1.50% (k=2)	3.94944 ± 1.50% (k=2)	3.96413 ± 1.50% (k=2)

Connector Angle

Connector Angle to be used in DASY system	190.0 ° ± 1 °

Appendix (Additional assessments outside the scope of SCS108)

1. DC Voltage Linearity

High Range		Reading (μV)	Difference (μV)	Error (%)
Channel X	+ Input	200032.88	-1.99	-0.00
Channel X	+ Input	20008.32	4.67	0.02
Channel X	- Input	-20001.95	3.91	-0.02
Channel Y	+ Input	200034.36	-0.48	-0.00
Channel Y	+ Input	20004.96	1.49	0.01
Channel Y	- Input	-20005.18	0.80	-0.00
Channel Z	+ Input	200033.48	-1.14	-0.00
Channel Z	+ Input	20005.14	1.72	0.01
Channel Z	- Input	-20006.62	-0.60	0.00

Low Range		Reading (μV)	Difference (μV)	Error (%)
Channel X	+ Input	2000.31	0.11	0.01
Channel X	+ Input	200.48	0.24	0.12
Channel X	- Input	-199.49	0.14	-0.07
Channel Y	+ Input	1999.98	-0.10	-0.01
Channel Y	+ Input	199.48	-0.67	-0.34
Channel Y	- Input	-200.14	-0.32	0.16
Channel Z	+ Input	1999.95	-0.08	-0.00
Channel Z	+ Input	199.09	-0.96	-0.48
Channel Z	- Input	-201.17	-1.27	0.64

2. Common mode sensitivity

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

	Common mode Input Voltage (mV)	High Range Average Reading (μV)	Low Range Average Reading (μV)
Channel X	200	-1.95	-3.98
	- 200	5.57	3.77
Channel Y	200	-13.96	-14.08
	- 200	13.30	13.19
Channel Z	200	2.29	2.64
	- 200	-5.81	-5.27

3. Channel separation

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

	Input Voltage (mV)	Channel X (μV)	Channel Y (μV)	Channel Z (μV)
Channel X	200	-	0.37	-3.20
Channel Y	200	9.80	-	0.72
Channel Z	200	6.30	6.84	-

4. AD-Converter Values with inputs shorted

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

	High Range (LSB)	Low Range (LSB)
Channel X	16130	15294
Channel Y	16097	15352
Channel Z	16126	12399

5. Input Offset Measurement

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec
Input 10MΩ

	Average (μV)	min. Offset (μV)	max. Offset (μV)	Std. Deviation (μV)
Channel X	0.41	-0.20	1.04	0.30
Channel Y	-0.55	-1.63	1.48	0.44
Channel Z	-0.30	-1.93	0.42	0.40

6. Input Offset Current

Nominal Input circuitry offset current on all channels: <25fA

7. Input Resistance (Typical values for information)

	Zeroing (kOhm)	Measuring (MOhm)
Channel X	200	200
Channel Y	200	200
Channel Z	200	200

8. Low Battery Alarm Voltage (Typical values for information)

Typical values	Alarm Level (VDC)
Supply (+ Vcc)	+7.9
Supply (- Vcc)	-7.6

9. Power Consumption (Typical values for information)

Typical values	Switched off (mA)	Stand by (mA)	Transmitting (mA)
Supply (+ Vcc)	+0.01	+6	+14
Supply (- Vcc)	–0.01	-8	-9

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Accreditation No.: SCS 108

Client **Sporton-TW (Auden)**

Certificate No: EX3-3931_Sep14

CALIBRATION CERTIFICATE

Object	EX3DV4 - SN:3931
Calibration procedure(s)	QA CAL-01.v9, QA CAL-23.v5, QA CAL-25.v6 Calibration procedure for dosimetric E-field probes
Calibration date:	September 25, 2014

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID	Cal Date (Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	03-Apr-14 (No. 217-01911)	Apr-15
Power sensor E4412A	MY41498087	03-Apr-14 (No. 217-01911)	Apr-15
Reference 3 dB Attenuator	SN: S5054 (3c)	03-Apr-14 (No. 217-01915)	Apr-15
Reference 20 dB Attenuator	SN: S5277 (20x)	03-Apr-14 (No. 217-01919)	Apr-15
Reference 30 dB Attenuator	SN: S5129 (30b)	03-Apr-14 (No. 217-01920)	Apr-15
Reference Probe ES3DV2	SN: 3013	30-Dec-13 (No. ES3-3013_Dec13)	Dec-14
DAE4	SN: 660	13-Dec-13 (No. DAE4-660_Dec13)	Dec-14
Secondary Standards	ID	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Apr-13)	In house check: Apr-16
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-13)	In house check: Oct-14

	Name	Function	Signature
Calibrated by:	Jeton Kastrati	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: September 25, 2014

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.

Glossary:

TSL	tissue simulating liquid
NORMx,y,z	sensitivity in free space
ConvF	sensitivity in TSL / NORMx,y,z
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A, B, C, D	modulation dependent linearization parameters
Polarization φ	φ rotation around probe axis
Polarization ϑ	ϑ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., ϑ = 0 is normal to probe axis
Connector Angle	information used in DASY system to align probe sensor X to the robot coordinate system

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005

Methods Applied and Interpretation of Parameters:

- *NORMx,y,z:* Assessed for E-field polarization ϑ = 0 (f ≤ 900 MHz in TEM-cell; f > 1800 MHz: R22 waveguide). NORMx,y,z are only intermediate values, i.e., the uncertainties of NORMx,y,z does not affect the E^2-field uncertainty inside TSL (see below *ConvF*).
- *NORM(f)x,y,z = NORMx,y,z * frequency_response* (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of *ConvF*.
- *DCPx,y,z:* DCP are numerical linearization parameters assessed based on the data of power sweep with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- *PAR:* PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics
- *Ax,y,z; Bx,y,z; Cx,y,z; Dx,y,z; VRx,y,z: A, B, C, D* are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. *VR* is the maximum calibration range expressed in RMS voltage across the diode.
- *ConvF and Boundary Effect Parameters:* Assessed in flat phantom using E-field (or Temperature Transfer Standard for f ≤ 800 MHz) and inside waveguide using analytical field distributions based on power measurements for f > 800 MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to *NORMx,y,z * ConvF* whereby the uncertainty corresponds to that given for *ConvF*. A frequency dependent *ConvF* is used in DASY version 4.4 and higher which allows extending the validity from ± 50 MHz to ± 100 MHz.
- *Spherical isotropy (3D deviation from isotropy)*: in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- *Sensor Offset*: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.
- *Connector Angle*: The angle is assessed using the information gained by determining the *NORMx* (no uncertainty required).

Probe EX3DV4

SN:3931

Manufactured: July 24, 2013
Calibrated: September 25, 2014

Calibrated for DASY/EASY Systems
(Note: non-compatible with DASY2 system!)

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3931

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(V/m)^2$)[A]	0.42	0.58	0.49	± 10.1 %
DCP (mV)[B]	99.9	96.9	99.9	

Modulation Calibration Parameters

UID	Communication System Name		A dB	B dB$\sqrt{\mu V}$	C	D dB	VR mV	Unc[E] (k=2)
0	CW	X	0.0	0.0	1.0	0.00	149.1	±3.8 %
		Y	0.0	0.0	1.0		132.9	
		Z	0.0	0.0	1.0		145.1	

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

[A] The uncertainties of NormX,Y,Z do not affect the E^2-field uncertainty inside TSL (see Pages 5 and 6).
[B] Numerical linearization parameter: uncertainty not required.
[E] Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3931

Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha [G]	Depth [G] (mm)	Unct. (k=2)
750	41.9	0.89	10.75	10.75	10.75	0.41	0.79	± 12.0 %
835	41.5	0.90	10.32	10.32	10.32	0.20	1.13	± 12.0 %
900	41.5	0.97	10.07	10.07	10.07	0.52	0.72	± 12.0 %
1450	40.5	1.20	8.74	8.74	8.74	0.20	1.48	± 12.0 %
1750	40.1	1.37	8.48	8.48	8.48	0.57	0.69	± 12.0 %
1900	40.0	1.40	8.17	8.17	8.17	0.31	0.96	± 12.0 %
2000	40.0	1.40	8.10	8.10	8.10	0.43	0.77	± 12.0 %
2450	39.2	1.80	7.29	7.29	7.29	0.33	0.88	± 12.0 %
2600	39.0	1.96	7.09	7.09	7.09	0.37	0.86	± 12.0 %

[C] Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Above 5 GHz frequency validity can be extended to ± 110 MHz.

[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

[G] Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3931

Calibration Parameter Determined in Body Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha [G]	Depth [G] (mm)	Unct. (k=2)
750	55.5	0.96	10.10	10.10	10.10	0.27	1.14	± 12.0 %
835	55.2	0.97	10.13	10.13	10.13	0.40	0.93	± 12.0 %
1450	54.0	1.30	8.72	8.72	8.72	0.24	1.22	± 12.0 %
1750	53.4	1.49	8.26	8.26	8.26	0.48	0.80	± 12.0 %
1900	53.3	1.52	7.80	7.80	7.80	0.38	0.89	± 12.0 %
2450	52.7	1.95	7.36	7.36	7.36	0.80	0.56	± 12.0 %
2600	52.5	2.16	7.20	7.20	7.20	0.76	0.58	± 12.0 %

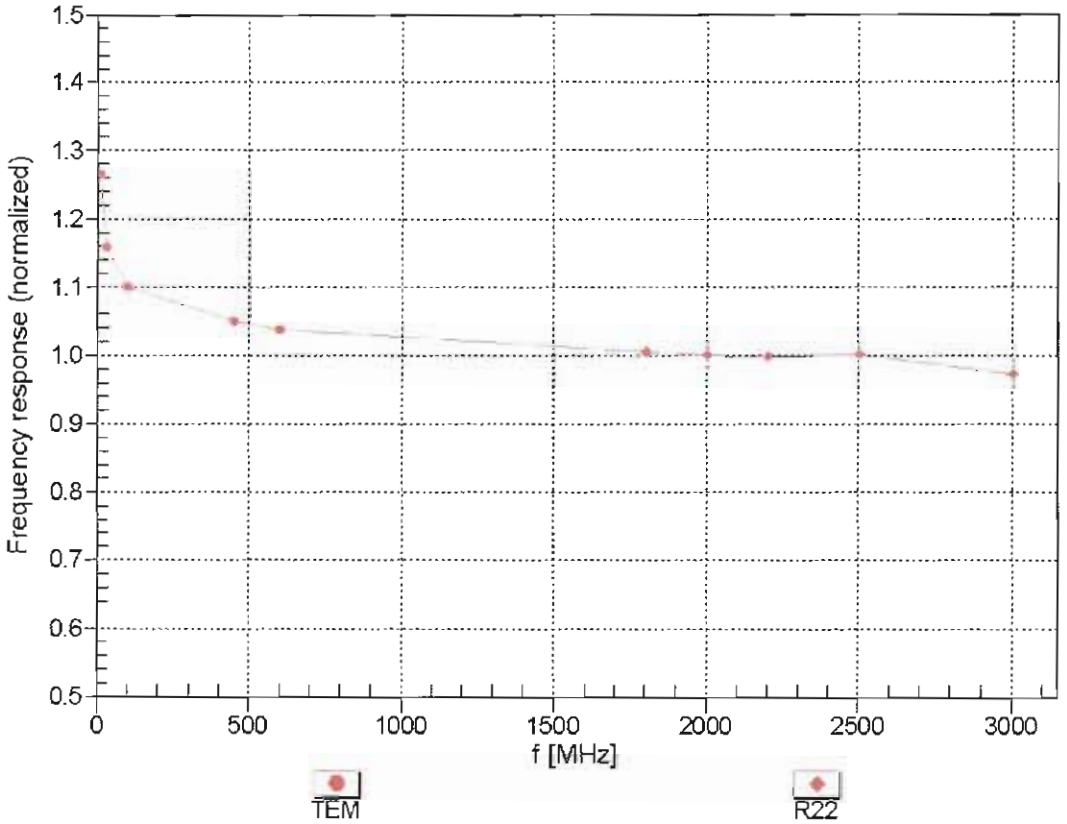
[C] Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Above 5 GHz frequency validity can be extended to ± 110 MHz.

[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

[G] Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

Frequency Response of E-Field

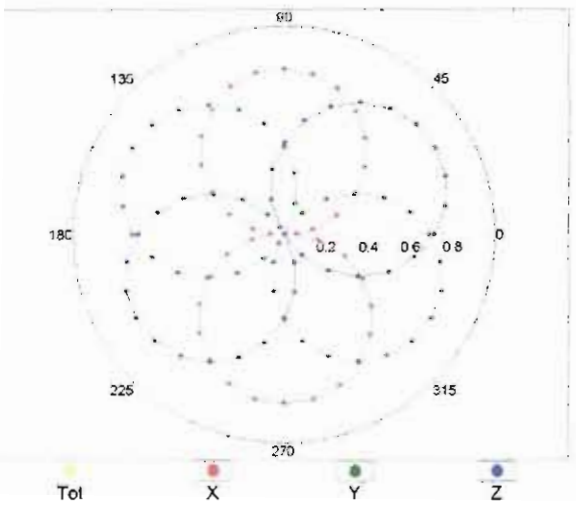
(TEM-Cell:ifi110 EXX, Waveguide: R22)



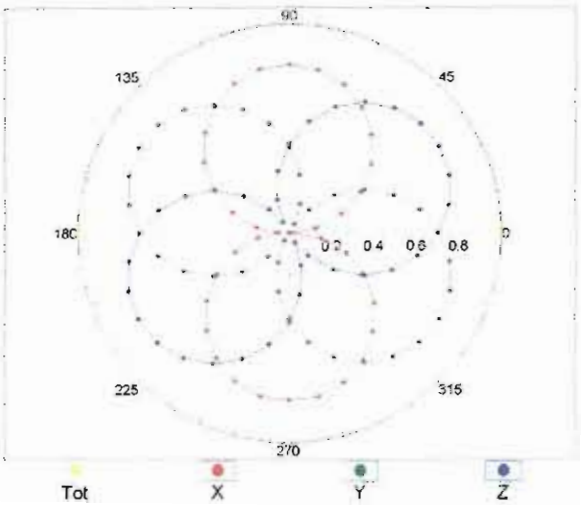
Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

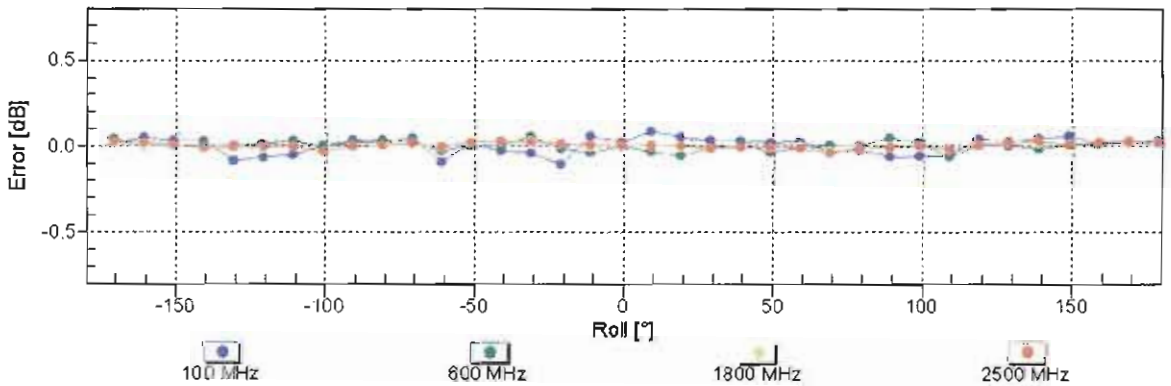
Receiving Pattern (ϕ), ϑ = 0°

f=600 MHz,TEM



f=1800 MHz,R22

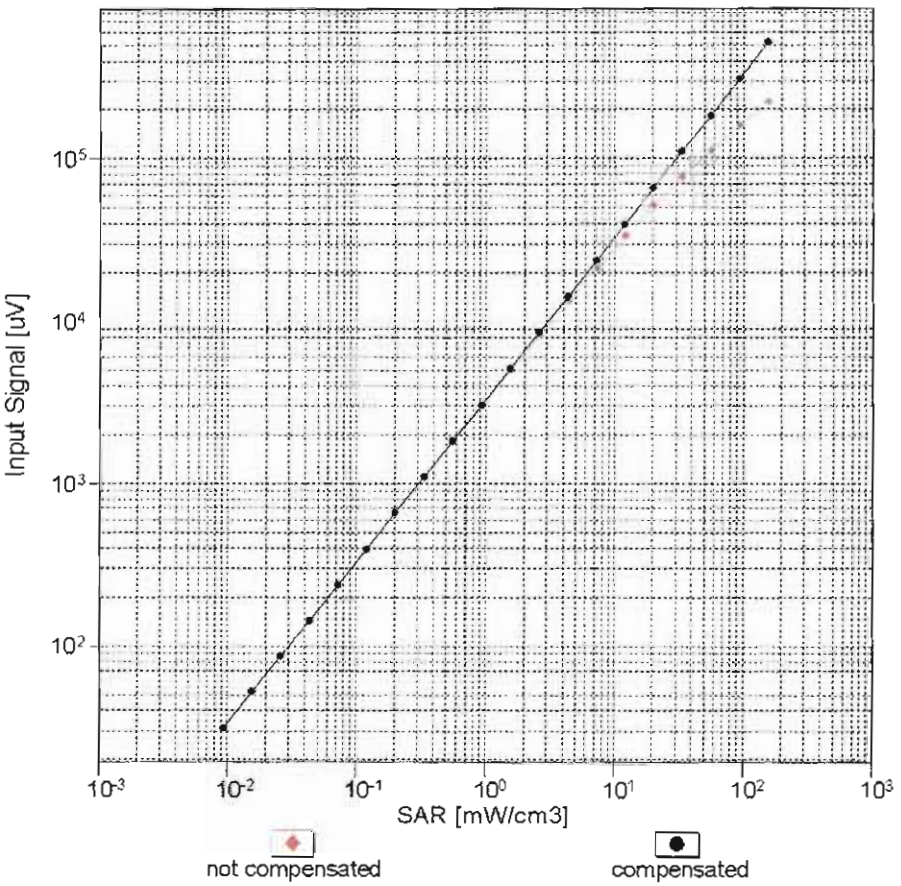


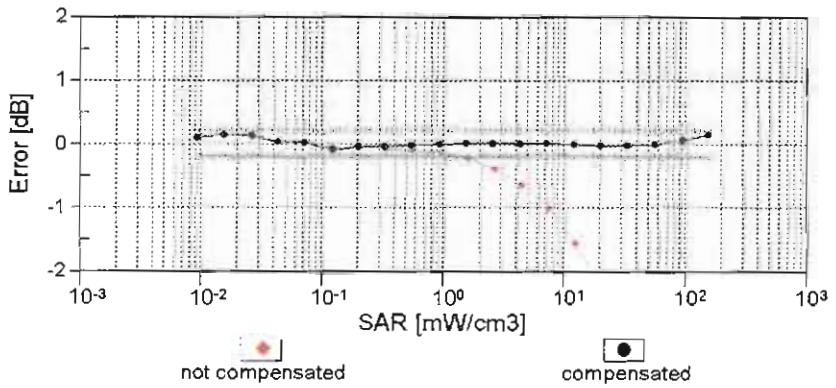


Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

Dynamic Range f(SAR_{head})

(TEM cell , f_{eval}= 1900 MHz)

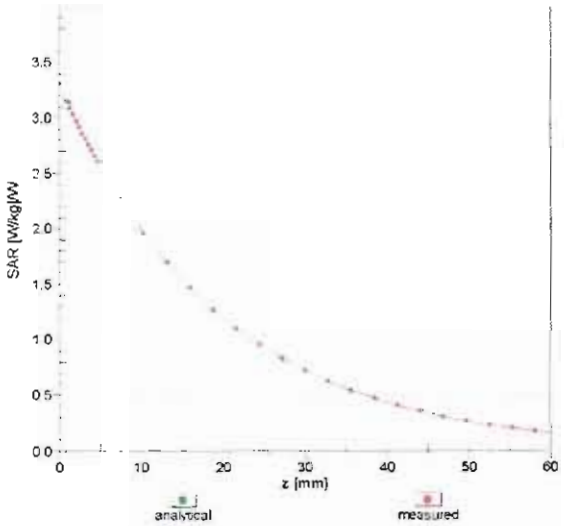




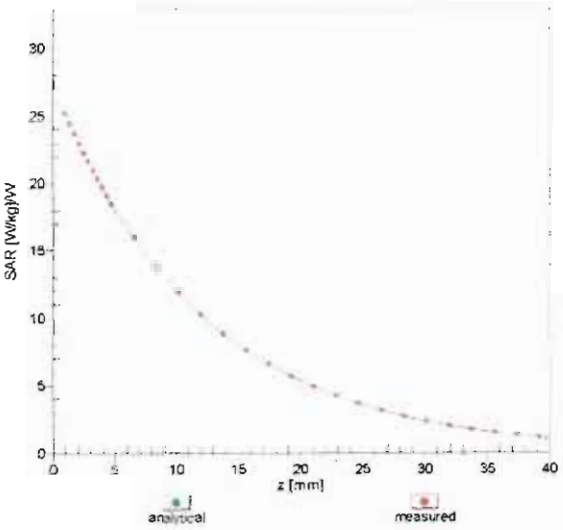
Uncertainty of Linearity Assessment: ± 0.6% (k=2)

Conversion Factor Assessment

f = 835 MHz,WGLS R9 (H_convF)

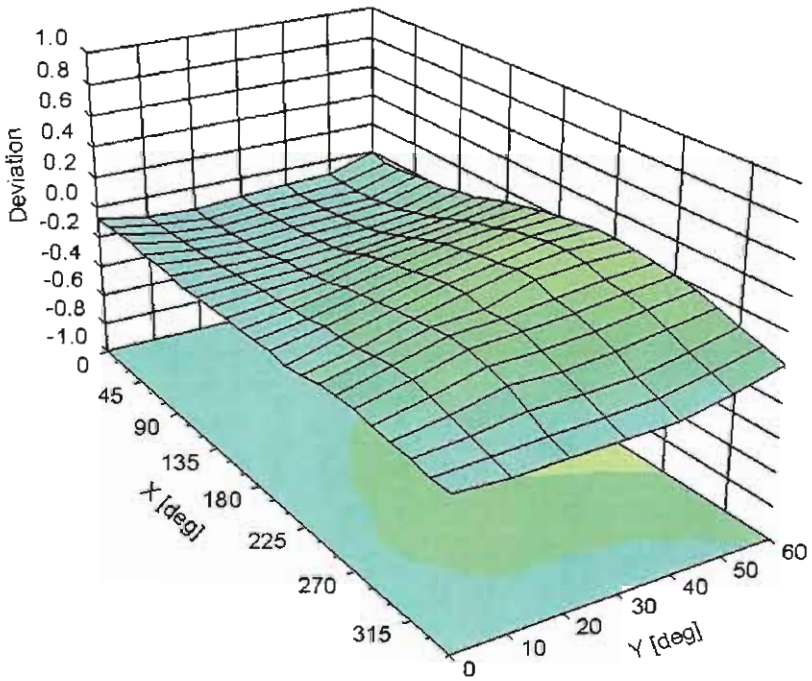


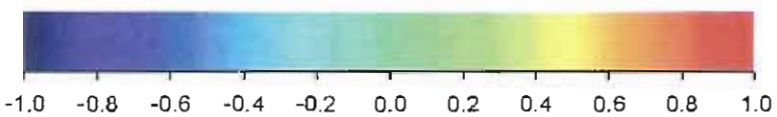
f = 1900 MHz,WGLS R22 (H_convF)



Deviation from Isotropy in Liquid

Error (ϕ, ϑ), f = 900 MHz





Uncertainty of Spherical Isotropy Assessment: ± 2.6% (k=2)

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3931

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	-11.5
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	9 mm
Tip Diameter	2.5 mm
Probe Tip to Sensor X Calibration Point	1 mm
Probe Tip to Sensor Y Calibration Point	1 mm
Probe Tip to Sensor Z Calibration Point	1 mm
Recommended Measurement Distance from Surface	1.4 mm