FCC SAR Test Report

APPLICANT	: Lenovo (Shanghai) Electronics Technology Co., Ltd.
EQUIPMENT	: Portable Tablet Computer
BRAND NAME	: Lenovo
MODEL NAME	: Lenovo YT3–X50M
FCC ID	: O57YT3X50M
STANDARD	: FCC 47 CFR Part 2 (2.1093) ANSI/IEEE C95.1-1992 IEEE 1528-2013

We, SPORTON INTERNATIONAL (XI'AN) 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 (XI'AN) INC., the test report shall not be reproduced except in full.

Reviewed by: Eric Huang / Deputy Manager

Approved by: Jones Tsai / Manager

Testing Laboratory 2804

SPORTON INTERNATIONAL (XI'AN) INC.
1F, Building A3, No. 39 Chuangye Rd., Xi'an Hi-tech Zone, Shanxi Province, P. R. China

Table of Contents

1. Statement of Compliance 4
2. Administration Data 5
3. Guidance Standard 5
4. Equipment Under Test (EUT) 6
4.1 General Information 6
4.2 Component List 7
4.3 Maximum Tune-up Limit 8
4.4 General LTE SAR Test and Reporting Considerations 12
5. Proximity Sensor Triggering Test 14
6. RF Exposure Limits 20
6.1 Uncontrolled Environment 20
6.2 Controlled Environment 20
7. Specific Absorption Rate (SAR) 21
7.1 Introduction 21
7.2 SAR Definition 21
8. System Description and Setup 22
9. Measurement Procedures 23
9.1 Spatial Peak SAR Evaluation 23
9.2 Power Reference Measurement 24
9.3 Area Scan 24
9.4 Zoom Scan 25
9.5 Volume Scan Procedures 25
9.6 Power Drift Monitoring 25
10. Test Equipment List 26
11. System Verification 27
11.1 Tissue Verification 27
11.2 System Performance Check Results 28
12. RF Exposure Positions 29
12.1 SAR Testing for Tablet 29
13. Conducted RF Output Power (Unit: dBm) 30
14. Antenna Location 58
15. SAR Test Results 62
15.1 Body SAR 64
15.2 Repeated SAR Measurement 70
16. Simultaneous Transmission Analysis 71
16.1 Tablet Body Exposure Conditions 72
17. Uncertainty Assessment 78
18. References 80
Appendix A. Plots of System Performance Check
Appendix B. Plots of High SAR Measurement
Appendix C. DASY Calibration Certificate
Appendix D. Test Setup Photos

Revision History

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FA570302	Rev. 01	Initial issue of report	Sep. 10, 2015

1. Statement of Compliance

The maximum results of Specific Absorption Rate (SAR) found during testing for **Lenovo (Shanghai) Electronics Technology Co., Ltd., Portable Tablet Computer, Lenovo YT3–X50M** are as follows.

Equipment Class	Frequency Band	Highest SAR Summary	Highest Simultaneous Transmission 1g SAR (W/kg)
		Body 1g SAR (W/kg)	
PCB	GSM850	1.17	1.52
	GSM1900	1.22	
	WCDMA Band V	**1.32**	
	WCDMA Band IV	1.26	
	WCDMA Band II	1.22	
	LTE Band 5	1.27	
	LTE Band 4	1.11	
	LTE Band 7	1.28	
	LTE Band 38	1.26	
DTS	WLAN 2.4GHz Band	0.33	1.52
DSS	Bluetooth	<0.10	1.35
Date of Testing:		Aug. 24, 2015 ~ Aug. 29, 2015	

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 1528-2013 and FCC KDB publications.

2. Administration Data

Testing Laboratory	
Test Site	SPORTON INTERNATIONAL (XI'AN) INC.
Test Site Location	1F, Building A3, No. 39 Chuangye Rd., Xi'an Hi-tech Zone, Shanxi Province, P. R. China TEL: +86-029-8860-8767 FAX: +86-029-8860-8791

Applicant	
Company Name	Lenovo (Shanghai) Electronics Technology Co., Ltd.
Address	No. 68 Building, 199 Fenju Road, Wai Gao Qiao FTZ , Shanghai , China

Manufacturer	
Company Name	Lenovo PC HK Limited
Address	23/F, Lincoln House, Taikoo Place 979 King's Road, Quarry Bay, Hong Kong

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 1528-2013
- FCC KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz v01r04
- 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 v02r01
- 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	Portable Tablet Computer
Brand Name	Lenovo
Model Name	Lenovo YT3–X50M
FCC ID	O57YT3X50M
IMEI Code	867152020025350
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 5: 824.7 MHz ~ 848.3 MHz LTE Band 4: 1710.7 MHz ~ 1754.3 MHz LTE Band 7: 2502.5 MHz ~ 2567.5 MHz LTE Band 38: 2572.5 MHz ~ 2617.5 MHz WLAN 2.4GHz Band: 2412 MHz ~ 2462 MHz Bluetooth: 2402 MHz ~ 2480 MHz
Mode	· GSM/GPRS/EGPRS · RMC/AMR 12.2Kbps · HSDPA · HSUPA · DC-HSDPA · HSPA+ (Downlink Only) · LTE: QPSK, 16QAM · 802.11b/g/n HT20 · Bluetooth v3.0+EDR, Bluetooth v4.0 LE
HW Version	LLAM510
SW Version	LLA3I16 B01
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	Identical Prototype

Remark:
1. 802.11n-HT40 is not supported in 2.4GHz WLAN.
2. This device 2.4GHz WLAN supports Hotspot operation.
3. This device has voice function, but only limited to speakerphone mode.
4. This device supports GRPS/EGPRS mode up to multi-slot class33.
5. This device does not support DTM operation.

4.2 Component List

Note: There are two types of EUT, the details refer the following table. According to the difference, we evaluate is not affect SAR test, so only choose sample 1 to perform SAR test.

Component	Sample 1	Sample 2
CPU	Qualcomm (MSM8909 2AA)	Qualcomm (MSM8909 2AA)
Flash	Samsung (KMQ4Z0013M)	Hynix (H9TQ17ABJTMC)
LCD	AUO (B101EAN02.4)	BOE (TV101WXM-NL0)
Camera	O-FILM (L8865A80 8MP)	O-FILM (L8865A80 8MP)
Motor	HOCHAR (F102730-20Y)	DMEGC (DM-B1003-3H)
Battery	lenovo (Sunwoda) (L15D3K32)	lenovo(Scud) (L15D3K32)

4.3 Maximum Tune-up Limit

Mode	Burst average power(dBm)			
	GSM 850		GSM 1900	
	Full power mode	Reduced power mode	Full power mode	Reduced power mode
GSM (GMSK, 1 Tx slot)	33.50	28.50	30.50	25.00
GPRS (GMSK, 1 Tx slot)	33.50	28.50	30.50	25.00
GPRS (GMSK, 2 Tx slots)	31.50	26.50	29.00	22.00
GPRS (GMSK, 3 Tx slots)	30.00	25.00	27.50	21.00
GPRS (GMSK, 4 Tx slots)	28.00	23.50	26.00	19.00
EDGE (8PSK, 1 Tx slot)	27.00	27.00	26.00	24.50
EDGE (8PSK, 2 Tx slots)	26.50	26.50	26.00	21.50
EDGE (8PSK, 3 Tx slots)	24.50	24.50	24.00	20.50
EDGE (8PSK, 4 Tx slots)	23.00	23.00	23.00	19.00

Mode	Average power (dBm)					
	WCDMA Band V		WCDMA Band II		WCDMA Band IV	
	Full power mode	Reduced power mode	Full power mode	Reduced power mode	Full power mode	Reduced power mode
AMR 12.2Kbps	23.50	21.50	23.50	16.50	23.50	18.50
RMC 12.2Kbps	23.50	21.50	23.50	16.50	23.50	18.50
HSDPA Subtest-1	22.50	20.50	22.50	16.50	22.50	18.00
HSDPA Subtest-2	22.50	20.50	22.50	16.50	22.50	18.00
HSDPA Subtest-3	22.00	20.00	22.00	16.00	22.00	17.50
HSDPA Subtest-4	22.00	20.00	22.00	16.00	22.00	17.50
DC-HSDPA Subtest-1	22.50	20.50	22.50	16.50	22.50	18.00
DC-HSDPA Subtest-2	22.50	20.50	22.50	16.50	22.50	18.00
DC-HSDPA Subtest-3	22.00	20.00	22.00	16.00	22.00	17.50
DC-HSDPA Subtest-4	22.00	20.00	22.00	16.00	22.00	17.50
HSUPA Subtest-1	22.00	20.00	22.00	15.50	22.00	17.50
HSUPA Subtest-2	22.00	20.00	22.00	15.50	22.00	17.50
HSUPA Subtest-3	22.00	20.00	22.00	15.50	22.00	17.50
HSUPA Subtest-4	22.00	20.00	22.00	15.50	22.00	17.50
HSUPA Subtest-5	22.00	20.00	22.00	15.50	22.00	17.50

LTE Band 5					
Average Power (dBm)					
Modulation	BW (MHz)	RB size	MPR	Full power mode	Reduced power mode
QPSK	10	≤ 12	0	23.50	21.00
QPSK	10	> 12	0-1	22.50	21.00
16QAM	10	≤ 12	0-1	22.50	21.00
16QAM	10	> 12	0-2	21.50	21.00
QPSK	5	≤ 8	0	23.50	21.00
QPSK	5	> 8	0-1	22.50	21.00
16QAM	5	≤ 8	0-1	22.50	21.00
16QAM	5	> 8	0-2	21.50	21.00
QPSK	3	≤ 4	0	23.50	21.00
QPSK	3	> 4	0-1	22.50	21.00
16QAM	3	≤ 4	0-1	22.50	21.00
16QAM	3	> 4	0-2	21.50	21.00
QPSK	1.4	≤ 5	0	23.50	21.00
QPSK	1.4	> 5	0-1	22.50	21.00
16QAM	1.4	≤ 5	0-1	22.50	21.00
16QAM	1.4	> 5	0-2	21.50	21.00

LTE Band 4					
Average Power (dBm)					
Modulation	BW (MHz)	RB size	MPR	Full power mode	Reduced power mode
QPSK	20	≤ 18	0	23.00	18.00
QPSK	20	> 18	0-1	22.00	18.00
16QAM	20	≤ 18	0-1	22.00	18.00
16QAM	20	> 18	0-2	21.00	18.00
QPSK	15	≤ 16	0	23.00	18.00
QPSK	15	> 16	0-1	22.00	18.00
16QAM	15	≤ 16	0-1	22.00	18.00
16QAM	15	> 16	0-2	21.00	18.00
QPSK	10	≤ 12	0	23.00	18.00
QPSK	10	> 12	0-1	22.00	18.00
16QAM	10	≤ 12	0-1	22.00	18.00
16QAM	10	> 12	0-2	21.00	18.00
QPSK	5	≤ 8	0	23.00	18.00
QPSK	5	> 8	0-1	22.00	18.00
16QAM	5	≤ 8	0-1	22.00	18.00
16QAM	5	> 8	0-2	21.00	18.00
QPSK	3	≤ 4	0	23.00	18.00
QPSK	3	> 4	0-1	22.00	18.00
16QAM	3	≤ 4	0-1	22.00	18.00
16QAM	3	> 4	0-2	21.00	18.00
QPSK	1.4	≤ 5	0	23.00	18.00
QPSK	1.4	> 5	0-1	22.00	18.00
16QAM	1.4	≤ 5	0-1	22.00	18.00
16QAM	1.4	> 5	0-2	21.00	18.00

LTE Band 7					
Average Power (dBm)					
Modulation	BW (MHz)	RB size	MPR	Full power mode	Reduced power mode
QPSK	20	≤ 18	0	24.00	16.50
QPSK	20	> 18	0-1	23.00	16.50
16QAM	20	≤ 18	0-1	23.00	16.50
16QAM	20	> 18	0-2	22.00	16.50
QPSK	15	≤ 16	0	24.00	16.50
QPSK	15	> 16	0-1	23.00	16.50
16QAM	15	≤ 16	0-1	23.00	16.50
16QAM	15	> 16	0-2	22.00	16.50
QPSK	10	≤ 12	0	24.00	16.50
QPSK	10	> 12	0-1	23.00	16.50
16QAM	10	≤ 12	0-1	23.00	16.50
16QAM	10	> 12	0-2	22.00	16.50
QPSK	5	≤ 8	0	24.00	16.50
QPSK	5	> 8	0-1	23.00	16.50
16QAM	5	≤ 8	0-1	23.00	16.50
16QAM	5	> 8	0-2	22.00	16.50

LTE Band 38					
Average Power (dBm)					
Modulation	BW (MHz)	RB size	MPR	Full power mode	Reduced power mode
QPSK	20	≤ 18	0	24.00	20.50
QPSK	20	> 18	0-1	23.00	20.50
16QAM	20	≤ 18	0-1	23.00	20.50
16QAM	20	> 18	0-2	22.00	20.50
QPSK	15	≤ 16	0	24.00	20.50
QPSK	15	> 16	0-1	23.00	20.50
16QAM	15	≤ 16	0-1	23.00	20.50
16QAM	15	> 16	0-2	22.00	20.50
QPSK	10	≤ 12	0	24.00	20.50
QPSK	10	> 12	0-1	23.00	20.50
16QAM	10	≤ 12	0-1	23.00	20.50
16QAM	10	> 12	0-2	22.00	20.50
QPSK	5	≤ 8	0	24.00	20.50
QPSK	5	> 8	0-1	23.00	20.50
16QAM	5	≤ 8	0-1	23.00	20.50
16QAM	5	> 8	0-2	22.00	20.50

Mode		Average Power (dBm)
2.4GHz	802.11b	16.00
	802.11g	13.00
	802.11n-HT20	12.00
Bluetooth v3.0+EDR		10.00
Bluetooth v4.0 LE		0

4.4 General LTE SAR Test and Reporting Considerations

Summarized necessary items addressed in KDB 941225 D05 v02r03	
FCC ID	O57YT3X50M
Equipment Name	Portable Tablet Computer
Operating Frequency Range of each LTE transmission band	LTE Band 5: 824.7 MHz ~ 848.3 MHz LTE Band 4: 1710.7 MHz ~ 1754.3 MHz LTE Band 7: 2502.5 MHz ~ 2567.5 MHz LTE Band 38: 2572.5 MHz ~ 2617.5 MHz
Channel Bandwidth	LTE Band 5:1.4MHz, 3MHz, 5MHz, 10MHz LTE Band 4:1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz, 20MHz LTE Band 7: 5MHz, 10MHz, 15MHz, 20MHz LTE Band 38: 5MHz, 10MHz, 15MHz, 20MHz
uplink modulations used	QPSK, and 16QAM
LTE Voice / Data requirements	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)
LTE Release	R10,Cat 4
CA Support	NO
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 5								
	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	20407	824.7	20415	825.5	20425	826.5	20450	829
M	20525	836.5	20525	836.5	20525	836.5	20525	836.5
H	20643	848.3	20635	847.5	20625	846.5	20600	844

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

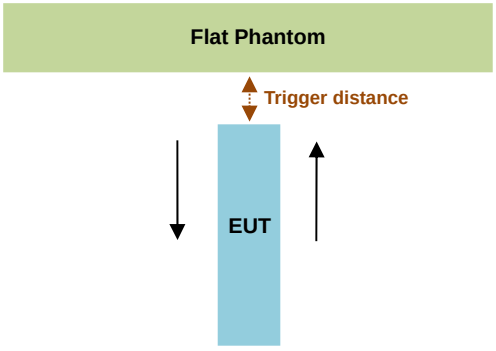
LTE Band 7								
	Bandwidth 5 MHz		Bandwidth 10 MHz		Bandwidth 15 MHz		Bandwidth 20 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	20775	2502.5	20800	2505	20825	2507.5	20850	2510
M	21100	2535	21100	2535	21100	2535	21100	2535
H	21425	2567.5	21400	2565	21375	2562.5	21350	2560

LTE Band 38								
	Bandwidth 5 MHz		Bandwidth 10 MHz		Bandwidth 15 MHz		Bandwidth 20 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	37775	2572.5	37800	2575	37825	2577.5	37850	2580
M	38000	2595	38000	2595	38000	2595	38000	2595
H	38225	2617.5	38200	2615	38175	2612.5	38150	2610

5. Proximity Sensor Triggering Test

<Proximity Sensor Triggering Distance (KDB 616217 D04 section 6.2)>:

Proximity sensor triggering distance testing was performed according to the procedures outlined in KDB 616217 D04 section 6.2, and EUT moving further away from the flat phantom and EUT moving toward the flat phantom were both assessed. The details are illustrated in the exhibit “P-Sensor operational description”, and the shortest triggering distances were reported and used for SAR assessment.
In the preliminary triggering distance testing, the tissue-equivalent medium for different frequency bands were used for verification; no other frequency bands tissue-equivalent medium was found to result in shortest triggering distance than that for 1900MHz, and the tissue-equivalent medium for 1900MHz was used for formal proximity sensor triggering testing.



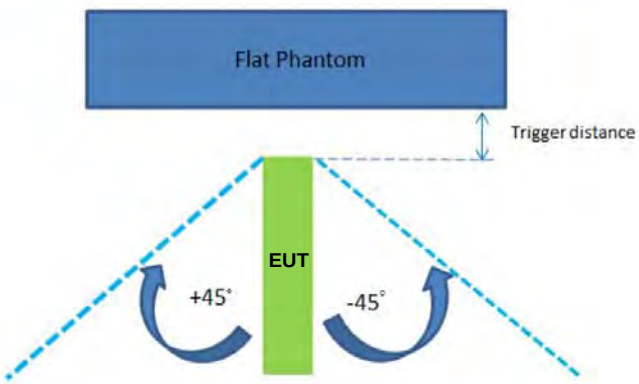
Proximity Sensor Trigger Distance (mm)			
Position	Bottom Face	Edge 1	Edge 2
Minimum	17	14	7

<Proximity Sensor Triggering Coverage (KDB 616217 D04 section 6.3)>:

If a sensor is spatially offset from the antenna(s), it is necessary to verify sensor triggering for conditions where the antenna is next to the user but the sensor is laterally further away to ensure sensor coverage is sufficient for reducing the power to maintain compliance. For p-sensor coverage testing, the device is moved and “along the direction of maximum antenna and sensor offset”.

<Tablet Tilt angle influences to proximity sensor triggering (KDB 616217 D04 section 6.4)>:

The influence of table tilt angles to proximity sensor triggering was determined by positioning each tablet edge that contains a transmitting antenna, perpendicular to the flat phantom, at 14 mm separation.
Rotating the tablet around the edge next to the phantom in ≤ 10° increments until the tablet is ± 45° from the vertical position at 0°, and the maximum output power remains in the reduced mode.



The Sensor Trigger Distance (mm)	
Position	Edge 1
Minimum	14

Proximity sensor power reduction

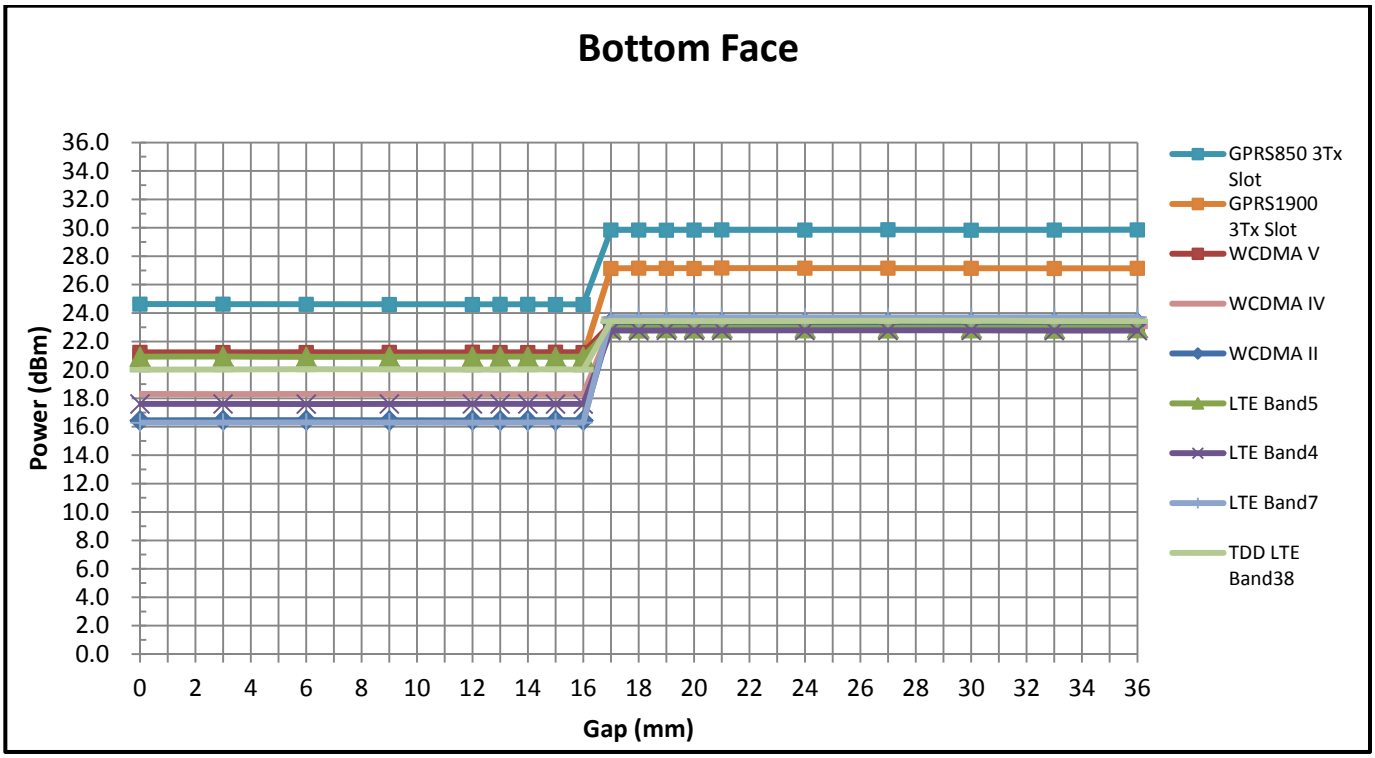
Exposure Position / wireless mode	Bottom Face(1)	Edge 1(1)	Edge 2(1)	Edge 3	Edge 4
GSM (GMSK, 1 Tx slot)	5 dB	5 dB	5 dB	0 dB	0 dB
GSM850 GPRS (GMSK 1 Tx slot) - CS1	5 dB	5 dB	5 dB	0 dB	0 dB
GSM850 GPRS (GMSK 2 Tx slot) - CS1	5 dB	5 dB	5 dB	0 dB	0 dB
GSM850 GPRS (GMSK 3 Tx slot) - CS1	5 dB	5 dB	5 dB	0 dB	0 dB
GSM850 GPRS (GMSK 4 Tx slot) - CS1	4.5 dB	4.5 dB	4.5 dB	0 dB	0 dB
GSM850 EDGE (8PSK 1 Tx slot) - MCS5	0 dB	0 dB	0 dB	0 dB	0 dB
GSM850 EDGE (8PSK 2 Tx slot) - MCS5	0 dB	0 dB	0 dB	0 dB	0 dB
GSM850 EDGE (8PSK 3 Tx slot) - MCS5	0 dB	0 dB	0 dB	0 dB	0 dB
GSM850 EDGE (8PSK 4 Tx slot) - MCS5	0 dB	0 dB	0 dB	0 dB	0 dB
GSM (GMSK, 1 Tx slot)	5.5 dB	5.5 dB	5.5 dB	0 dB	0 dB
GSM1900 GPRS (GMSK 1 Tx slot) - CS1	5.5 dB	5.5 dB	5.5 dB	0 dB	0 dB
GSM1900 GPRS (GMSK 2 Tx slot) - CS1	7.0 dB	7.0 dB	7.0 dB	0 dB	0 dB
GSM1900 GPRS (GMSK 3 Tx slot) - CS1	6.5 dB	6.5 dB	6.5 dB	0 dB	0 dB
GSM1900 GPRS (GMSK 4 Tx slot) - CS1	7.0 dB	7.0 dB	7.0 dB	0 dB	0 dB
GSM1900 EDGE (8PSK 1 Tx slot) - MCS5	1.5 dB	1.5 dB	1.5 dB	0 dB	0 dB
GSM1900 EDGE (8PSK 2 Tx slot) - MCS5	4.5 dB	4.5 dB	4.5 dB	0 dB	0 dB
GSM1900 EDGE (8PSK 3 Tx slot) - MCS5	3.5 dB	3.5 dB	3.5 dB	0 dB	0 dB
GSM1900 EDGE (8PSK 4 Tx slot) - MCS5	4.0 dB	4.0 dB	4.0 dB	0 dB	0 dB
WCDMA Band V	2.0 dB	2.0 dB	2.0 dB	0 dB	0 dB
WCDMA Band II	7.0 dB	7.0 dB	7.0 dB	0 dB	0 dB
WCDMA Band IV	5.0 dB	5.0 dB	5.0 dB	0 dB	0 dB
LTE Band 5	2.5 dB	2.5 dB	2.5 dB	0 dB	0 dB
LTE Band 4	5.0 dB	5.0 dB	5.0 dB	0 dB	0 dB
LTE Band 7	7.5 dB	7.5 dB	7.5 dB	0 dB	0 dB
LTE Band 38	3.5 dB	3.5 dB	3.5 dB	0 dB	0 dB

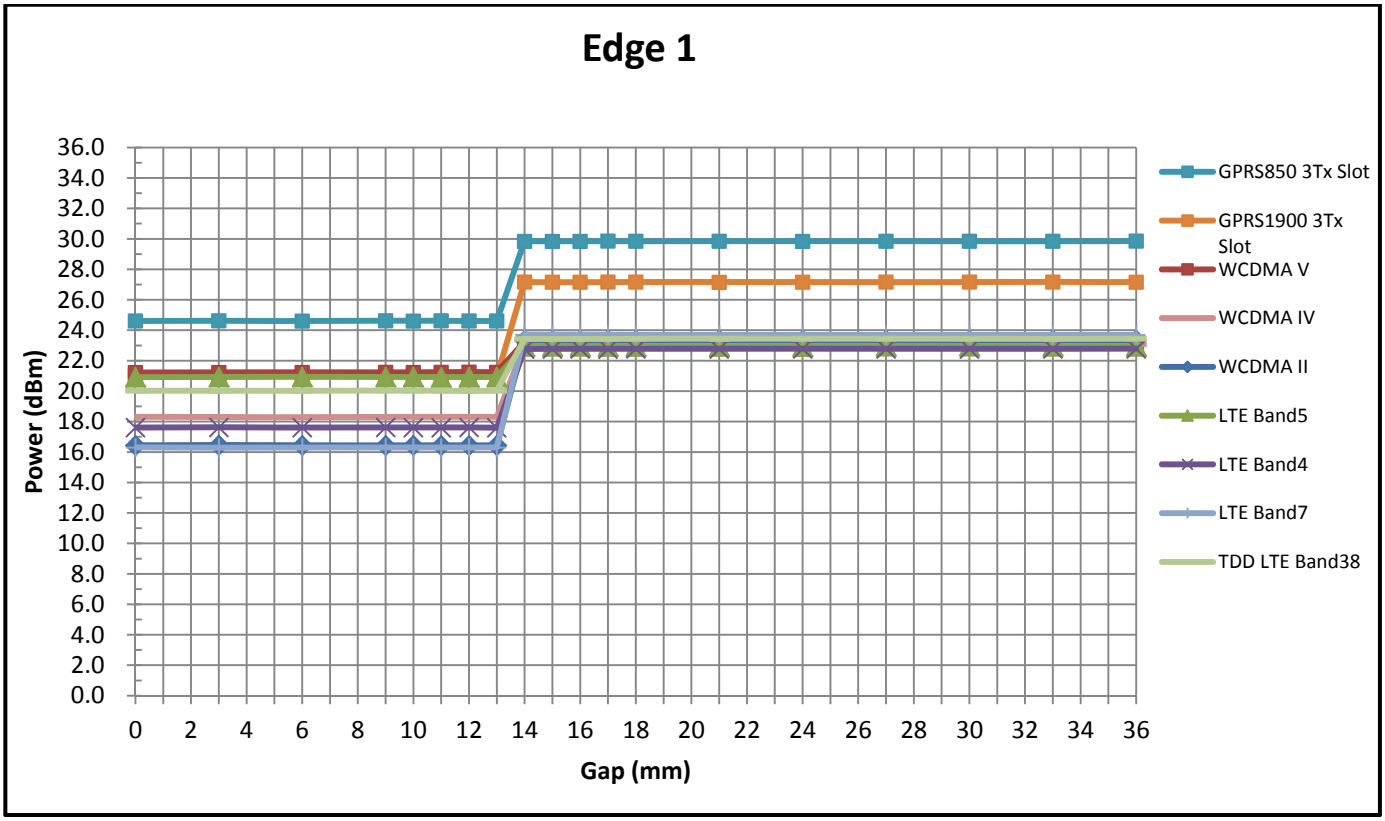
Remark:

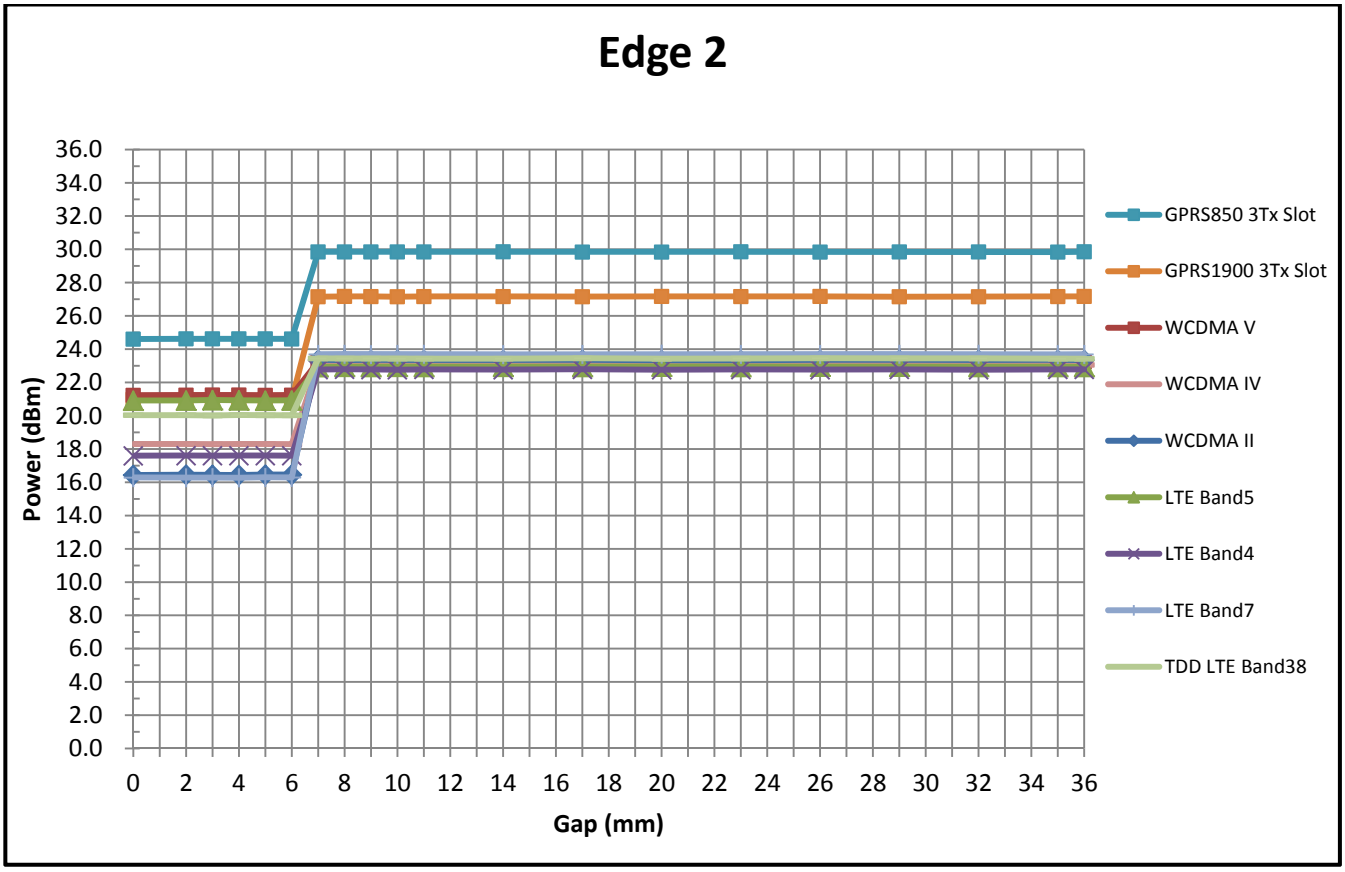
1. (1): Reduced maximum limit applied by activation of proximity sensor.
2. Power reduction is not applicable for WLAN and Bluetooth.
3. Tests were performed in accordance with KDB 616217 D04 section 6.1, 6.2, 6.3, 6.4 and 6.5 and compliant results are shown and described in exhibit “P-Sensor operational 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: 10 mm
   - Edge1: 10 mm
   - Edge 2: 5 mm
5. For edge 2 proximity sensor active, LTE Band 7 reduced power with 0mm, others band at 0mm full power can be tested pass, conservatively evaluated, so no need evaluated at full power with 5mm distance.

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 GPRS (GMSK 3 Tx slot)	189	29.70	24.44	5.26
GSM1900 GPRS (GMSK 3 Tx slot)	661	27.14	20.96	6.18
WCDMA Band V (RMC 12.2Kbps)	4182	23.22	21.22	2.00
WCDMA Band IV (RMC 12.2Kbps)	1413	23.05	18.28	4.77
WCDMA Band II (RMC 12.2Kbps)	9400	23.23	16.38	6.85
LTE Band 5 1RB 24 offset	20525	22.81	20.62	2.19
LTE Band 4 1RB 0 offset	20175	22.76	17.59	5.17
LTE Band 7 1RB 0offset	21100	23.41	15.82	7.59
LTE Band 38 1RB 0offset	18900	22.84	19.78	3.06


Bottom Face
Power (dBm)
36.0
34.0
32.0
30.0
28.0
26.0
24.0
22.0
20.0
18.0
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36
Gap (mm)
GPRS850 3Tx Slot
GPRS1900 3Tx Slot
WCDMA V
WCDMA IV
WCDMA II
LTE Band5
LTE Band4
LTE Band7
TDD LTE Band38


Edge 1
Power (dBm)
36.0
34.0
32.0
30.0
28.0
26.0
24.0
22.0
20.0
18.0
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36
Gap (mm)
GPRS850 3Tx Slot
GPRS1900 3Tx Slot
WCDMA V
WCDMA IV
WCDMA II
LTE Band5
LTE Band4
LTE Band7
TDD LTE Band38


Edge 2
Power (dBm)
36.0
34.0
32.0
30.0
28.0
26.0
24.0
22.0
20.0
18.0
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36
Gap (mm)
GPRS850 3Tx Slot
GPRS1900 3Tx Slot
WCDMA V
WCDMA IV
WCDMA II
LTE Band5
LTE Band4
LTE Band7
TDD LTE Band38

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:

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

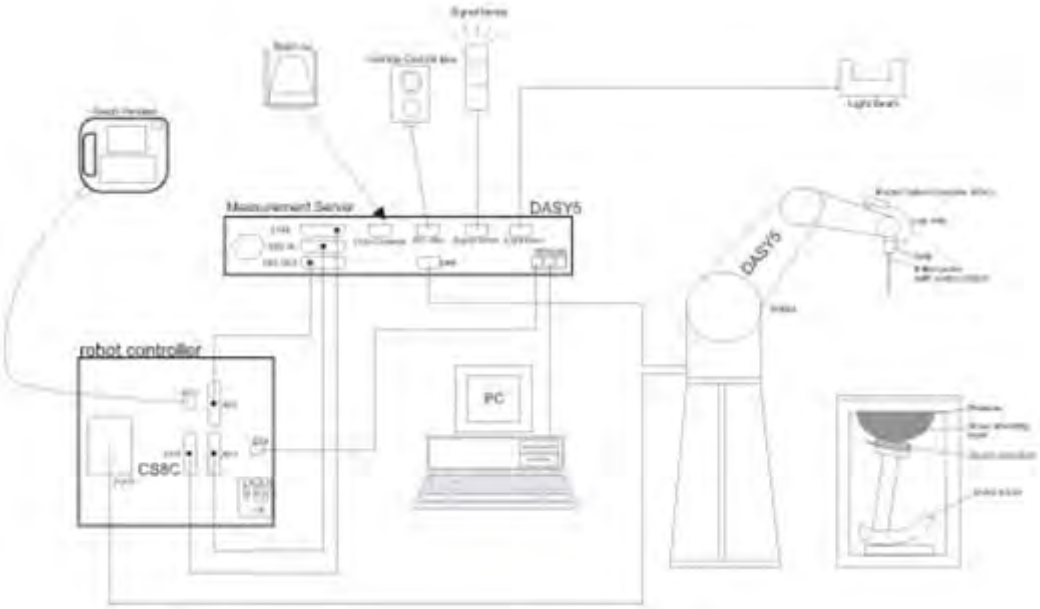
SAR is expressed in units of Watts per kilogram (W/kg)

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

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 D01v01r04 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 D01v01r04 SAR measurement 100 MHz to 6 GHz.

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

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

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

9.5 Volume Scan Procedures

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

9.6 Power Drift Monitoring

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

10. Test Equipment List

Manufacturer	Name of Equipment	Type/Model	Serial Number	Calibration	
				Last Cal.	Due Date
SPEAG	835MHz System Validation Kit	D835V2	4d091	Nov. 21, 2014	Nov. 20, 2015
SPEAG	1750MHz System Validation Kit	D1750V2	1069	Nov. 21, 2014	Nov. 20, 2015
SPEAG	1900MHz System Validation Kit	D1900V2	5d118	Nov. 21, 2014	Nov. 20, 2015
SPEAG	2450MHz System Validation Kit	D2450V2	840	Nov. 19, 2014	Nov. 18, 2015
SPEAG	2600MHz System Validation Kit	D2600V2	1061	Nov. 19, 2014	Nov. 18, 2015
SPEAG	Data Acquisition Electronics	DAE4	679	Apr. 13, 2015	Apr. 12, 2016
SPEAG	Data Acquisition Electronics	DAE4	1210	May 21, 2015	May 20, 2016
SPEAG	Dosimetric E-Field Probe	EX3DV4	3911	Oct. 02, 2014	Oct. 01, 2015
SPEAG	Dosimetric E-Field Probe	EX3DV4	3857	May 28, 2015	May 27, 2016
SPEAG	Phone Positioner	N/A	N/A	NCR	NCR
Agilent	Wireless Communication Test Set	E5515C	MY52102600	Dec. 09, 2014	Dec. 08, 2015
Anritus	Radio communication analyzer	MT8820C	6201091028	Dec. 09, 2014	Dec. 08, 2015
Agilent	ENA Series Network Analyzer	E5071C	MY46317418	Dec. 09, 2014	Dec. 08, 2015
Agilent	Dielectric Probe Kit	85070E	MY44300751	NCR	NCR
R&S	Signal Generator	SMBV100A	258305	Jan. 23, 2015	Jan. 22, 2016
Agilent	Dielectric Probe Kit	85070E	MY44300751	NCR	NCR
Anritsu	Power Senor	MA2411B	0917070	Jan. 23, 2015	Jan. 22, 2016
Anritsu	Power Meter	ML2495A	1005002	Jan. 23, 2015	Jan. 22, 2016
Anritsu	Power Sensor	MA2411B	1207253	Jan. 28, 2015	Jan. 27, 2016
Anritsu	Power Meter	ML2495A	1218010	Jan. 28, 2015	Jan. 27, 2016
R&S	CBT BLUETOOTH TESTER	CBT	100783	Aug. 10, 2015	Aug. 09, 2016
SPEAG	ELI5 Phantom	QD OVA 002 AA	TP-1201	NCR	NCR
SPEAG	ELI4 Phantom	QD OVA 001 BB	TP-1079	NCR	NCR
R&S	Spectrum Analyzer	FSP7	101045	Dec. 09, 2014	Dec. 08, 2015
Agilent	Dual Directional Coupler	778D	50422	Note1	
Woken	Attenuator 1	WK0602-XX	N/A	Note1	
PE	Attenuator 2	PE7005-10	N/A	Note1	
PE	Attenuator 3	PE7005- 3	N/A	Note1	
AR	Power Amplifier	5S1G4M2	0328767	Note1	
Mini-Circuits	Power Amplifier	ZVE-3W	162601250	Note1	
Mini-Circuits	Power Amplifier	ZHL-42W+	13440021344	Note1	

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 Body								
835	50.8	48.2	0	0.9	0.1	0	0.97	55.2
1800, 1900, 2000	70.2	0	0	0.4	0	29.4	1.52	53.3
2450	68.6	0	0	0	0	31.4	1.95	52.7
2600	68.1	0	0	0.1	0	31.8	2.16	52.5

<Tissue Dielectric Parameter Check Results>

Frequency (MHz)	Tissue Type	Liquid Temp. (℃)	Conductivity (σ)	Permittivity (ε_r)	Conductivity Target (σ)	Permittivity Target (ε_r)	Delta (σ) (%)	Delta (ε_r) (%)	Limit (%)	Date
835	Body	22.4	1.000	54.086	0.97	55.20	3.09	-2.02	±5	Aug. 29, 2015
1750	Body	22.6	1.477	53.510	1.49	53.40	-0.87	0.21	±5	Aug. 28, 2015
1900	Body	22.2	1.542	55.338	1.52	53.30	1.45	3.82	±5	Aug. 27, 2015
2450	Body	22.5	1.949	53.894	1.95	52.70	-0.05	2.27	±5	Aug. 24, 2015
2450	Body	22.8	1.931	51.252	1.95	52.70	-0.97	-2.75	±5	Aug. 26, 2015
2600	Body	22.5	2.189	51.328	2.16	52.50	1.34	-2.23	±5	Aug. 24, 2015

11.2 System Performance Check Results

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

Date	Frequency (MHz)	Tissue Type	Input Power (mW)	Dipole S/N	Probe S/N	DAE S/N	Measured SAR (W/kg)	Targeted SAR (W/kg)	Normalized SAR (W/kg)	Deviation (%)
Aug. 29, 2015	835	Body	250	4d091	3911	679	2.40	9.60	9.6	0.00
Aug. 28, 2015	1750	Body	250	1069	3911	679	8.81	38.10	35.24	-7.51
Aug. 27, 2015	1900	Body	250	5d118	3911	679	10.20	40.00	40.8	2.00
Aug. 24, 2015	2450	Body	250	840	3911	679	13.40	51.00	53.6	5.10
Aug. 26, 2015	2450	Body	250	840	3857	1210	12.00	51.00	48	-5.88
Aug. 24, 2015	2600	Body	250	1061	3911	679	14.30	54.90	57.2	4.19

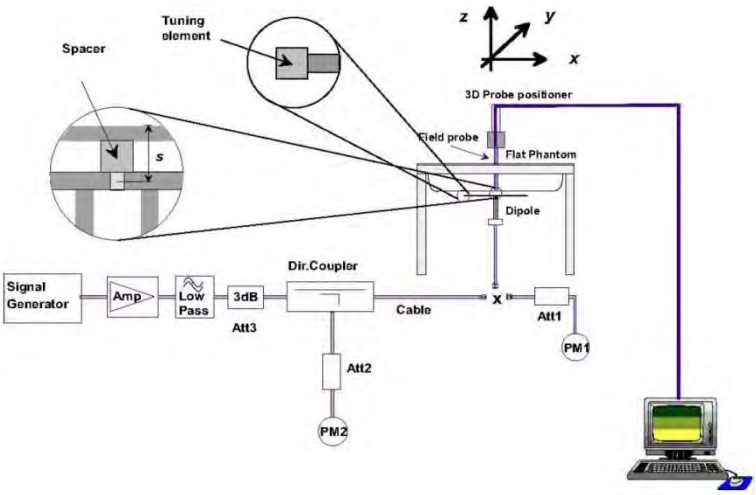


Fig 8.3.1 System Performance Check Setup

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>

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, the GPRS 3Tx slots modes was selected when EUT operating without power back-off, the GPRS 3Tx 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	
GSM (GMSK, 1 Tx slot)	33.15	33.25	**33.36**	33.50	24.15	24.25	24.36	24.50
GPRS (GMSK, 1 Tx slot) – CS1	33.11	33.22	33.35	33.50	24.11	24.22	24.35	24.50
GPRS (GMSK, 2 Tx slots) – CS1	31.33	31.41	31.12	31.50	25.33	25.41	25.12	25.50
GPRS (GMSK, 3 Tx slots) – CS1	29.59	29.70	29.83	30.00	25.33	25.44	25.57	**25.74**
GPRS (GMSK, 4 Tx slots) – CS1	27.20	27.24	27.38	28.00	24.20	24.24	24.38	25.00
EDGE (8PSK, 1 Tx slot) – MCS5	26.42	26.52	26.66	27.00	17.42	17.52	17.66	18.00
EDGE (8PSK, 2 Tx slots) – MCS5	25.77	25.87	26.00	26.50	19.77	19.87	20.00	20.50
EDGE (8PSK, 3 Tx slots) – MCS5	23.63	23.75	23.94	24.50	19.37	19.49	19.68	20.24
EDGE (8PSK, 4 Tx slots) – MCS5	22.43	22.51	22.68	23.00	19.43	19.51	19.68	20.00
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	
GSM (GMSK, 1 Tx slot)	30.20	**30.25**	30.01	30.50	21.20	21.25	21.01	21.50
GPRS (GMSK, 1 Tx slot) – CS1	30.18	30.22	29.99	30.50	21.18	21.22	20.99	21.50
GPRS (GMSK, 2 Tx slots) – CS1	28.60	28.74	28.40	29.00	22.60	22.74	22.40	23.00
GPRS (GMSK, 3 Tx slots) – CS1	27.08	27.14	27.18	27.50	22.82	22.88	22.92	**23.24**
GPRS (GMSK, 4 Tx slots) – CS1	25.65	25.72	25.75	26.00	22.65	22.72	22.75	23.00
EDGE (8PSK, 1 Tx slot) – MCS5	25.56	25.61	25.64	26.00	16.56	16.61	16.64	17.00
EDGE (8PSK, 2 Tx slots) – MCS5	25.45	25.51	25.54	26.00	19.45	19.51	19.54	20.00
EDGE (8PSK, 3 Tx slots) – MCS5	23.32	23.39	23.40	24.00	19.06	19.13	19.14	19.74
EDGE (8PSK, 4 Tx slots) – MCS5	22.21	22.29	22.33	23.00	19.21	19.29	19.33	20.00

Remark: The frame-averaged power is linearly scaled the maximum burst averaged power over 8 time slots.
The calculated method are shown as below:
Frame-averaged power = Maximum burst averaged power (1 Tx Slot) - 9 dB
Frame-averaged power = Maximum burst averaged power (2 Tx Slots) - 6 dB
Frame-averaged power = Maximum burst averaged power (3 Tx Slots) - 4.26 dB
Frame-averaged power = Maximum burst averaged power (4 Tx Slots) - 3 dB

Reduced 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	
GSM (GMSK, 1 Tx slot)	27.85	27.81	**27.99**	28.50	18.85	18.81	18.99	19.50
GPRS (GMSK, 1 Tx slot) – CS1	27.82	27.78	27.94	28.50	18.82	18.78	18.94	19.50
GPRS (GMSK, 2 Tx slots) – CS1	25.65	25.68	25.83	26.50	19.65	19.68	19.83	20.50
GPRS (GMSK, 3 Tx slots) – CS1	24.41	24.44	24.60	25.00	20.15	20.18	20.34	**20.74**
GPRS (GMSK, 4 Tx slots) – CS1	22.84	22.88	23.02	23.50	19.84	19.88	20.02	20.50
EDGE (8PSK, 1 Tx slot) – MCS5	26.42	26.52	26.66	27.00	17.42	17.52	17.66	18.00
EDGE (8PSK, 2 Tx slots) – MCS5	25.77	25.87	26.00	26.50	19.77	19.87	20.00	20.50
EDGE (8PSK, 3 Tx slots) – MCS5	23.63	23.75	23.94	24.50	19.37	19.49	19.68	20.24
EDGE (8PSK, 4 Tx slots) – MCS5	22.43	22.51	22.68	23.00	19.43	19.51	19.68	20.00
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	
GSM (GMSK, 1 Tx slot)	24.48	**24.55**	24.54	25.00	15.48	15.55	15.54	16.00
GPRS (GMSK, 1 Tx slot) – CS1	24.47	24.54	24.53	25.00	15.47	15.54	15.53	16.00
GPRS (GMSK, 2 Tx slots) – CS1	21.48	21.51	21.58	22.00	15.48	15.51	15.58	16.00
GPRS (GMSK, 3 Tx slots) – CS1	20.95	20.96	20.98	21.00	16.69	16.70	16.72	**16.74**
GPRS (GMSK, 4 Tx slots) – CS1	18.67	18.66	18.70	19.00	15.67	15.66	15.70	16.00
EDGE (8PSK, 1 Tx slot) – MCS5	24.15	24.13	24.13	24.50	15.15	15.13	15.13	15.50
EDGE (8PSK, 2 Tx slots) – MCS5	21.06	21.04	21.06	21.50	15.06	15.04	15.06	15.50
EDGE (8PSK, 3 Tx slots) – MCS5	20.44	20.46	20.48	20.50	16.18	16.20	16.22	16.24
EDGE (8PSK, 4 Tx slots) – MCS5	18.35	18.37	18.38	19.00	15.35	15.37	15.38	16.00

Remark: The frame-averaged power is linearly scaled the maximum burst averaged power over 8 time slots.
The calculated method are shown as below:
Frame-averaged power = Maximum burst averaged power (1 Tx Slot) - 9 dB
Frame-averaged power = Maximum burst averaged power (2 Tx Slots) - 6 dB
Frame-averaged power = Maximum burst averaged power (3 Tx Slots) - 4.26 dB
Frame-averaged power = Maximum burst averaged power (4 Tx Slots) - 3 dB

<WCDMA Conducted Power>

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 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.		

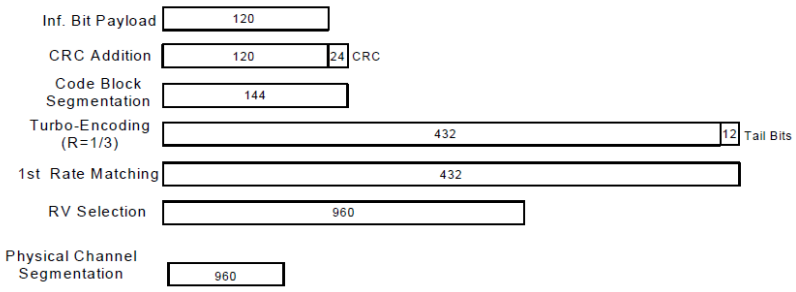


Figure C.8.19: Coding rate for Fixed reference Channel H-Set 12 (QPSK)

Setup Configuration

<WCDMA Conducted Power>

General Note:

1. Per KDB 941225 D01v03, SAR for Head / Hotspot / Body-worn 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 Band V			WCDMA Band II			WCDMA Band 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	AMR 12.2Kbps	23.11	23.20	23.18	23.30	23.22	23.24	23.00	23.03	22.98
	3GPP Rel 99	RMC 12.2Kbps	23.13	**23.22**	23.20	**23.33**	23.23	23.25	23.02	**23.05**	23.00
0	3GPP Rel 6	HSDPA Subtest-1	22.14	22.23	22.21	22.20	22.11	22.12	22.10	22.11	22.05
0	3GPP Rel 6	HSDPA Subtest-2	22.10	22.16	22.15	22.40	22.32	22.33	22.11	22.14	22.07
0.5	3GPP Rel 6	HSDPA Subtest-3	21.52	21.59	21.56	21.93	21.81	21.82	21.55	21.57	21.50
0.5	3GPP Rel 6	HSDPA Subtest-4	21.51	21.57	21.55	21.90	21.80	21.81	21.54	21.56	21.49
0	3GPP Rel 8	DC-HSDPA Subtest-1	22.12	22.18	22.19	22.21	22.13	22.11	22.09	22.13	22.06
0	3GPP Rel 8	DC-HSDPA Subtest-2	22.11	22.15	22.16	22.22	22.28	22.19	22.10	22.11	22.04
0.5	3GPP Rel 8	DC-HSDPA Subtest-3	21.53	21.58	21.51	21.87	21.88	21.82	21.53	21.51	21.48
0.5	3GPP Rel 8	DC-HSDPA Subtest-4	21.51	21.56	21.52	21.86	21.73	21.81	21.51	21.53	21.39
0	3GPP Rel 6	HSUPA Subtest-1	21.18	21.21	21.20	21.38	21.29	21.30	21.40	21.41	21.35
2	3GPP Rel 6	HSUPA Subtest-2	21.13	21.18	21.16	20.89	20.81	20.82	21.02	21.04	21.00
1	3GPP Rel 6	HSUPA Subtest-3	20.55	20.60	20.58	20.92	20.84	20.83	20.65	20.69	20.60
2	3GPP Rel 6	HSUPA Subtest-4	21.52	21.57	21.55	21.38	21.26	21.30	21.28	21.30	21.20
0	3GPP Rel 6	HSUPA Subtest-5	21.00	21.04	21.01	21.24	21.11	21.12	21.36	21.38	21.30

Reduced Average RF Power (Proximity Sensor active)

Band			WCDMA Band V			WCDMA Band II			WCDMA Band 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	AMR 12.2Kbps	21.07	21.21	21.18	16.42	16.37	16.24	18.23	18.27	18.21
	3GPP Rel 99	RMC 12.2Kbps	21.08	**21.22**	21.20	**16.43**	16.38	16.24	18.24	**18.28**	18.23
0	3GPP Rel 6	HSDPA Subtest-1	20.01	20.07	20.05	15.56	15.51	15.42	17.44	17.45	17.40
0	3GPP Rel 6	HSDPA Subtest-2	20.02	20.12	20.08	15.65	15.63	15.53	17.42	17.43	17.39
0.5	3GPP Rel 6	HSDPA Subtest-3	19.51	19.60	19.58	15.51	15.39	15.31	16.90	16.92	16.85
0.5	3GPP Rel 6	HSDPA Subtest-4	19.62	19.71	19.70	15.46	15.38	15.28	16.85	16.90	16.82
0	3GPP Rel 8	DC-HSDPA Subtest-1	20.00	20.05	20.03	15.53	15.51	15.43	17.38	17.41	17.39
0	3GPP Rel 8	DC-HSDPA Subtest-2	20.01	20.08	20.06	15.55	15.58	15.41	17.39	17.28	17.25
0.5	3GPP Rel 8	DC-HSDPA Subtest-3	19.53	19.58	19.62	14.98	14.91	14.83	16.85	16.87	16.83
0.5	3GPP Rel 8	DC-HSDPA Subtest-4	19.60	19.71	19.68	14.96	14.90	14.81	16.81	16.79	16.75
0	3GPP Rel 6	HSUPA Subtest-1	19.31	19.40	19.38	15.21	15.09	15.01	16.40	16.42	16.34
2	3GPP Rel 6	HSUPA Subtest-2	19.32	19.44	19.40	14.28	14.18	14.12	16.35	16.39	16.30
1	3GPP Rel 6	HSUPA Subtest-3	18.74	18.84	18.82	13.99	13.97	13.91	16.25	16.29	16.20
2	3GPP Rel 6	HSUPA Subtest-4	19.32	19.45	19.40	14.80	14.78	14.76	16.81	16.88	16.80
0	3GPP Rel 6	HSUPA Subtest-5	19.30	19.40	19.36	14.75	14.68	14.62	16.82	16.85	16.79

<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 5>

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				20450	20525	20600		
Frequency (MHz)				829	836.5	844		
10	QPSK	1	0	22.49	22.80	22.65	23.50	0
10	QPSK	1	24	22.70	22.81	**22.93**		
10	QPSK	1	49	22.35	22.48	22.52		
10	QPSK	25	0	21.71	21.88	21.86	22.50	0-1
10	QPSK	25	12	21.79	21.89	21.92		
10	QPSK	25	24	21.85	21.75	21.79		
10	QPSK	50	0	21.90	21.77	21.99		
10	16QAM	1	0	21.98	22.45	21.85	22.50	0-1
10	16QAM	1	24	22.10	22.46	22.14		
10	16QAM	1	49	21.55	21.42	22.00		
10	16QAM	25	0	20.98	21.14	20.89	21.50	0-2
10	16QAM	25	12	20.82	20.92	21.24		
10	16QAM	25	24	20.88	20.99	20.95		
10	16QAM	50	0	20.80	20.73	20.99		
Channel				20425	20525	20625	Tune up Limit (dBm)	MPR (dB)
Frequency (MHz)				826.5	836.5	846.5		
5	QPSK	1	0	22.76	22.68	22.75	23.50	0
5	QPSK	1	12	22.74	22.78	22.88		
5	QPSK	1	24	22.55	22.41	22.35		
5	QPSK	12	0	21.82	21.85	21.73	22.50	0-1
5	QPSK	12	6	21.79	21.85	21.82		
5	QPSK	12	11	21.82	21.77	21.86		
5	QPSK	25	0	21.84	21.81	21.78		
5	16QAM	1	0	22.11	22.07	22.11	22.50	0-1
5	16QAM	1	12	22.03	21.97	22.04		
5	16QAM	1	24	22.01	21.94	21.92		
5	16QAM	12	0	20.62	20.70	20.75	21.50	0-2
5	16QAM	12	6	20.81	20.90	20.75		
5	16QAM	12	11	20.86	20.68	20.77		
5	16QAM	25	0	20.98	20.86	20.65		
Channel				20415	20525	20635	Tune up Limit (dBm)	MPR (dB)
Frequency (MHz)				825.5	836.5	847.5		
3	QPSK	1	0	22.60	22.80	22.52	23.50	0
3	QPSK	1	7	22.71	22.78	22.91		
3	QPSK	1	14	22.60	22.69	22.34		
3	QPSK	8	0	21.85	21.80	21.88	22.50	0-1
3	QPSK	8	4	21.86	21.87	21.80		
3	QPSK	8	7	21.81	21.81	21.80		
3	QPSK	15	0	21.79	21.82	21.79		
3	16QAM	1	0	22.06	22.25	22.18	22.50	0-1
3	16QAM	1	7	22.05	22.04	22.19		
3	16QAM	1	14	22.10	22.16	22.12		
3	16QAM	8	0	20.94	20.87	20.83	21.50	0-2
3	16QAM	8	4	21.05	20.94	20.78		
3	16QAM	8	7	20.99	20.73	20.77		
3	16QAM	15	0	20.92	20.95	20.65		

Channel				20407	20525	20643	Tune up Limit (dBm)	Target MPR (dB)
Frequency (MHz)				824.7	836.5	848.3		
1.4	QPSK	1	0	22.50	22.64	22.40	23.50	0
1.4	QPSK	1	2	22.65	22.56	22.49		
1.4	QPSK	1	5	22.53	22.49	22.39		
1.4	QPSK	3	0	22.54	22.66	22.48		
1.4	QPSK	3	1	22.50	22.55	22.50		
1.4	QPSK	3	2	22.52	22.52	22.49		
1.4	QPSK	6	0	21.81	21.73	21.69	22.50	0-1
1.4	16QAM	1	0	22.32	22.12	21.87	22.50	0-1
1.4	16QAM	1	2	22.40	22.14	21.61		
1.4	16QAM	1	5	22.10	22.05	22.09		
1.4	16QAM	3	0	22.06	22.00	22.15		
1.4	16QAM	3	1	22.00	22.09	22.16		
1.4	16QAM	3	2	22.04	22.02	22.05		
1.4	16QAM	6	0	20.55	20.63	20.72	21.50	0-2

<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	22.72	**22.76**	22.60	23.00	0
20	QPSK	1	49	22.41	22.60	22.43		
20	QPSK	1	99	22.27	22.26	22.09		
20	QPSK	50	0	21.56	21.61	21.57	22.00	0-1
20	QPSK	50	24	21.44	21.54	21.45		
20	QPSK	50	49	21.41	21.44	21.23		
20	QPSK	100	0	21.49	21.53	21.44		
20	16QAM	1	0	21.99	21.95	21.87	22.00	0-1
20	16QAM	1	49	21.81	21.90	21.29		
20	16QAM	1	99	21.75	21.67	21.12		
20	16QAM	50	0	20.60	20.63	20.57	21.00	0-2
20	16QAM	50	24	20.48	20.56	20.32		
20	16QAM	50	49	20.32	20.46	20.17		
20	16QAM	100	0	20.52	20.54	20.29		
Channel				20025	20175	20325	Tune up Limit (dBm)	MPR (dB)
Frequency (MHz)				1717.5	1732.5	1747.5		
15	QPSK	1	0	22.65	22.75	22.65	23.00	0
15	QPSK	1	37	22.39	22.74	22.44		
15	QPSK	1	74	22.35	22.44	22.38		
15	QPSK	36	0	21.53	21.61	21.58	22.00	0-1
15	QPSK	36	18	21.42	21.57	21.34		
15	QPSK	36	37	21.36	21.32	21.34		
15	QPSK	75	0	21.50	21.46	21.42		
15	16QAM	1	0	21.89	21.75	21.95	22.00	0-1
15	16QAM	1	37	21.39	21.63	21.36		
15	16QAM	1	74	21.83	21.67	21.31		
15	16QAM	36	0	20.56	20.66	20.53	21.00	0-2
15	16QAM	36	18	20.44	20.51	20.41		
15	16QAM	36	37	20.26	20.39	20.22		
15	16QAM	75	0	20.54	20.49	20.48		
Channel				20000	20175	20350	Tune up Limit (dBm)	MPR (dB)
Frequency (MHz)				1715	1732.5	1750		
10	QPSK	1	0	22.52	22.58	22.45	23.00	0
10	QPSK	1	24	22.60	22.68	22.51		
10	QPSK	1	49	22.31	22.34	22.30		
10	QPSK	25	0	21.47	21.47	21.33	22.00	0-1
10	QPSK	25	12	21.40	21.50	21.27		
10	QPSK	25	24	21.36	21.34	21.37		
10	QPSK	50	0	21.46	21.49	21.33		
10	16QAM	1	0	21.62	21.80	21.37	22.00	0-1
10	16QAM	1	24	21.55	21.79	21.46		
10	16QAM	1	49	21.43	21.57	21.08		
10	16QAM	25	0	20.33	20.69	20.38	21.00	0-2
10	16QAM	25	12	20.42	20.74	20.45		
10	16QAM	25	24	20.40	20.57	20.51		
10	16QAM	50	0	20.31	20.47	20.38		

Channel				19975	20175	20375	Tune up Limit (dBm)	MPR (dB)
Frequency (MHz)				1712.5	1732.5	1752.5		
5	QPSK	1	0	22.62	22.63	22.58	23.00	0
5	QPSK	1	12	22.53	22.50	22.57		
5	QPSK	1	24	22.37	22.55	22.29		
5	QPSK	12	0	21.41	21.45	21.46	22.00	0-1
5	QPSK	12	6	21.36	21.35	21.36		
5	QPSK	12	11	21.31	21.34	21.30		
5	QPSK	25	0	21.32	21.41	21.42		
5	16QAM	1	0	21.82	21.73	21.69	22.00	0-1
5	16QAM	1	12	21.66	21.70	21.59		
5	16QAM	1	24	21.66	21.71	21.57		
5	16QAM	12	0	20.37	20.39	20.38	21.00	0-2
5	16QAM	12	6	20.33	20.40	20.43		
5	16QAM	12	11	20.26	20.30	20.28		
5	16QAM	25	0	20.37	20.56	20.46		
Channel				19965	20175	20385	Tune up Limit (dBm)	MPR (dB)
Frequency (MHz)				1711.5	1732.5	1753.5		
3	QPSK	1	0	22.52	22.57	22.32	23.00	0
3	QPSK	1	7	22.57	22.75	22.45		
3	QPSK	1	14	22.44	22.59	22.39		
3	QPSK	8	0	21.56	21.54	21.37	22.00	0-1
3	QPSK	8	4	21.50	21.59	21.48		
3	QPSK	8	7	21.42	21.52	21.42		
3	QPSK	15	0	21.37	21.48	21.38		
3	16QAM	1	0	21.73	21.90	21.69	22.00	0-1
3	16QAM	1	7	21.69	21.88	21.57		
3	16QAM	1	14	21.76	21.78	21.61		
3	16QAM	8	0	20.40	20.61	20.36	21.00	0-2
3	16QAM	8	4	20.53	20.62	20.37		
3	16QAM	8	7	20.66	20.72	20.42		
3	16QAM	15	0	20.40	20.68	20.26		
Channel				19957	20175	20393	Tune up Limit (dBm)	MPR (dB)
Frequency (MHz)				1710.7	1732.5	1754.3		
1.4	QPSK	1	0	22.48	22.49	22.32	23.00	0
1.4	QPSK	1	2	22.69	22.63	22.39		
1.4	QPSK	1	5	22.33	22.43	22.29		
1.4	QPSK	3	0	22.42	22.47	22.33		
1.4	QPSK	3	1	22.64	22.60	22.45		
1.4	QPSK	3	2	22.57	22.53	22.43		
1.4	QPSK	6	0	21.49	21.48	21.47	22.00	0-1
1.4	16QAM	1	0	21.81	21.66	21.62	22.00	0-1
1.4	16QAM	1	2	21.69	21.64	21.60		
1.4	16QAM	1	5	21.48	21.88	21.45		
1.4	16QAM	3	0	21.62	21.59	21.40		
1.4	16QAM	3	1	21.61	21.68	21.50		
1.4	16QAM	3	2	21.70	21.85	21.23		
1.4	16QAM	6	0	20.28	20.20	20.34	21.00	0-2

<LTE Band 7>

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				20850	21100	21350		
Frequency (MHz)				2510	2535	2560		
20	QPSK	1	0	**23.68**	23.41	23.23	24.00	0
20	QPSK	1	49	23.58	23.36	23.18		
20	QPSK	1	99	23.24	23.08	22.89		
20	QPSK	50	0	22.70	22.61	22.28	23.00	0-1
20	QPSK	50	24	22.50	22.50	22.23		
20	QPSK	50	49	22.45	22.37	22.00		
20	QPSK	100	0	22.53	22.54	22.18		
20	16QAM	1	0	22.94	22.79	22.64	23.00	0-1
20	16QAM	1	49	22.82	22.68	22.44		
20	16QAM	1	99	22.12	22.20	21.91		
20	16QAM	50	0	21.68	21.70	21.31	22.00	0-2
20	16QAM	50	24	21.70	21.61	21.25		
20	16QAM	50	49	21.23	21.38	20.97		
20	16QAM	100	0	21.49	21.54	21.21		
Channel				20825	21100	21375	Tune up Limit (dBm)	MPR (dB)
Frequency (MHz)				2507.5	2535	2562.5		
15	QPSK	1	0	23.61	23.63	23.29	24.00	0
15	QPSK	1	37	23.55	23.44	23.11		
15	QPSK	1	74	23.36	23.45	23.02		
15	QPSK	36	0	22.60	22.63	22.34	23.00	0-1
15	QPSK	36	18	22.54	22.46	22.16		
15	QPSK	36	37	22.55	22.52	22.08		
15	QPSK	75	0	22.54	22.58	22.19		
15	16QAM	1	0	22.92	22.95	22.76	23.00	0-1
15	16QAM	1	37	22.75	22.74	22.33		
15	16QAM	1	74	22.67	22.65	21.88		
15	16QAM	36	0	21.76	21.49	21.29	22.00	0-2
15	16QAM	36	18	21.65	21.48	21.22		
15	16QAM	36	37	21.66	21.52	21.16		
15	16QAM	75	0	21.46	21.51	21.16		

Channel				20800	21100	21400	Tune up Limit (dBm)	MPR (dB)
Frequency (MHz)				2505	2535	2565		
10	QPSK	1	0	23.52	23.64	23.24	24.00	0
10	QPSK	1	24	23.65	23.57	23.32		
10	QPSK	1	49	23.55	23.34	23.02		
10	QPSK	25	0	22.66	22.55	22.18	23.00	0-1
10	QPSK	25	12	22.60	22.47	22.07		
10	QPSK	25	24	22.61	22.52	21.97		
10	QPSK	50	0	22.58	22.57	22.04		
10	16QAM	1	0	22.86	22.90	22.46	23.00	0-1
10	16QAM	1	24	22.86	22.77	22.54		
10	16QAM	1	49	22.91	22.78	22.18		
10	16QAM	25	0	21.76	21.59	21.43	22.00	0-2
10	16QAM	25	12	21.71	21.51	21.39		
10	16QAM	25	24	21.64	21.50	21.22		
10	16QAM	50	0	21.69	21.43	21.11		
Channel				20775	21100	21425	Tune up Limit (dBm)	MPR (dB)
Frequency (MHz)				2502.5	2535	2567.5		
5	QPSK	1	0	23.62	23.49	23.09	24.00	0
5	QPSK	1	12	23.66	23.51	23.15		
5	QPSK	1	24	23.49	23.48	22.93		
5	QPSK	12	0	22.49	22.54	22.17	23.00	0-1
5	QPSK	12	6	22.57	22.49	21.98		
5	QPSK	12	11	22.61	22.49	21.98		
5	QPSK	25	0	22.57	22.49	21.92		
5	16QAM	1	0	22.72	22.67	22.58	23.00	0-1
5	16QAM	1	12	22.82	22.25	21.85		
5	16QAM	1	24	22.84	22.60	22.10		
5	16QAM	12	0	21.55	21.51	21.17	22.00	0-2
5	16QAM	12	6	21.58	21.47	21.02		
5	16QAM	12	11	21.54	21.45	20.89		
5	16QAM	25	0	21.48	21.61	21.02		

Reduced Average RF Power (Proximity Sensor active)

<LTE Band 5>

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				20450	20525	20600		
Frequency (MHz)				829	836.5	844		
10	QPSK	1	0	20.61	20.63	20.52	21.00	0
10	QPSK	1	24	20.75	20.62	**20.91**		
10	QPSK	1	49	20.50	20.38	20.59		
10	QPSK	25	0	20.66	20.70	20.66	21.00	0-1
10	QPSK	25	12	20.71	20.69	20.72		
10	QPSK	25	24	20.65	20.52	20.67		
10	QPSK	50	0	20.72	20.61	20.64		
10	16QAM	1	0	20.73	20.65	20.83	21.00	0-1
10	16QAM	1	24	20.70	20.66	20.84		
10	16QAM	1	49	20.70	20.67	20.38		
10	16QAM	25	0	20.70	20.63	20.84	21.00	0-2
10	16QAM	25	12	20.63	20.64	20.90		
10	16QAM	25	24	20.66	20.68	20.81		
10	16QAM	50	0	20.64	20.69	20.58		
Channel				20425	20525	20625	Tune up Limit (dBm)	MPR (dB)
Frequency (MHz)				826.5	836.5	846.5		
5	QPSK	1	0	20.58	20.63	20.72	21.00	0
5	QPSK	1	12	20.72	20.70	20.87		
5	QPSK	1	24	20.35	20.55	20.58		
5	QPSK	12	0	20.48	20.64	20.51	21.00	0-1
5	QPSK	12	6	20.55	20.54	20.55		
5	QPSK	12	11	20.54	20.51	20.59		
5	QPSK	25	0	20.59	20.60	20.50		
5	16QAM	1	0	20.71	20.66	20.80	21.00	0-1
5	16QAM	1	12	20.70	20.69	20.83		
5	16QAM	1	24	20.62	20.61	20.76		
5	16QAM	12	0	20.43	20.57	20.49	21.00	0-2
5	16QAM	12	6	20.52	20.57	20.48		
5	16QAM	12	11	20.64	20.43	20.54		
5	16QAM	25	0	20.35	20.61	20.64		
Channel				20415	20525	20635	Tune up Limit (dBm)	MPR (dB)
Frequency (MHz)				825.5	836.5	847.5		
3	QPSK	1	0	20.49	20.86	20.63	21.00	0
3	QPSK	1	7	20.66	20.60	20.57		
3	QPSK	1	14	20.69	20.55	20.43		
3	QPSK	8	0	20.50	20.64	20.56	21.00	0-1
3	QPSK	8	4	20.59	20.52	20.53		
3	QPSK	8	7	20.52	20.47	20.53		
3	QPSK	15	0	20.53	20.67	20.51		
3	16QAM	1	0	20.65	20.75	20.59	21.00	0-1
3	16QAM	1	7	20.61	20.74	20.58		
3	16QAM	1	14	20.63	20.83	20.61		
3	16QAM	8	0	20.59	20.79	20.56	21.00	0-2
3	16QAM	8	4	20.68	20.67	20.50		
3	16QAM	8	7	20.64	20.65	20.50		
3	16QAM	15	0	20.60	20.64	20.35		

Channel				20407	20525	20643	Tune up Limit (dBm)	Target MPR (dB)
Frequency (MHz)				824.7	836.5	848.3		
1.4	QPSK	1	0	20.51	20.43	20.66	21.00	0
1.4	QPSK	1	2	20.75	20.65	20.85		
1.4	QPSK	1	5	20.48	20.46	20.37		
1.4	QPSK	3	0	20.47	20.58	20.55		
1.4	QPSK	3	1	20.57	20.55	20.56		
1.4	QPSK	3	2	20.53	20.50	20.54		
1.4	QPSK	6	0	20.52	20.60	20.53	21.00	0-1
1.4	16QAM	1	0	20.70	20.59	20.83	21.00	0-1
1.4	16QAM	1	2	20.74	20.63	20.76		
1.4	16QAM	1	5	20.72	20.58	20.65		
1.4	16QAM	3	0	20.72	20.54	20.78		
1.4	16QAM	3	1	20.70	20.60	20.72		
1.4	16QAM	3	2	20.71	20.57	20.74		
1.4	16QAM	6	0	20.51	20.44	20.40	21.00	0-2

<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	17.16	**17.59**	17.26	18.00	0
20	QPSK	1	49	17.13	17.53	17.07		
20	QPSK	1	99	17.11	16.89	17.06		
20	QPSK	50	0	17.24	17.37	17.23	18.00	0-1
20	QPSK	50	24	17.14	17.23	17.10		
20	QPSK	50	49	17.10	17.11	17.12		
20	QPSK	100	0	17.12	17.29	17.11		
20	16QAM	1	0	17.20	17.52	17.21	18.00	0-1
20	16QAM	1	49	17.01	17.50	17.08		
20	16QAM	1	99	17.21	17.29	17.01		
20	16QAM	50	0	17.23	17.36	17.17	18.00	0-2
20	16QAM	50	24	17.04	17.24	17.08		
20	16QAM	50	49	17.01	17.30	17.14		
20	16QAM	100	0	17.20	17.28	17.01		
Channel				20025	20175	20325	Tune up Limit (dBm)	MPR (dB)
Frequency (MHz)				1717.5	1732.5	1747.5		
15	QPSK	1	0	17.53	17.27	17.35	18.00	0
15	QPSK	1	37	17.05	17.18	17.26		
15	QPSK	1	74	17.04	17.10	17.24		
15	QPSK	36	0	17.15	17.38	17.22	18.00	0-1
15	QPSK	36	18	17.04	17.24	17.09		
15	QPSK	36	37	16.94	17.17	17.07		
15	QPSK	75	0	17.15	17.18	17.25		
15	16QAM	1	0	17.50	17.30	17.30	18.00	0-1
15	16QAM	1	37	17.31	17.25	17.34		
15	16QAM	1	74	17.26	17.28	17.32		
15	16QAM	36	0	17.08	17.37	17.15	18.00	0-2
15	16QAM	36	18	17.06	17.33	17.09		
15	16QAM	36	37	17.05	17.19	17.07		
15	16QAM	75	0	17.14	17.19	17.25		
Channel				20000	20175	20350	Tune up Limit (dBm)	MPR (dB)
Frequency (MHz)				1715	1732.5	1750		
10	QPSK	1	0	17.14	17.22	17.10	18.00	0
10	QPSK	1	24	17.11	17.53	17.09		
10	QPSK	1	49	16.99	17.15	17.13		
10	QPSK	25	0	17.16	17.37	17.22	18.00	0-1
10	QPSK	25	12	17.17	17.30	17.22		
10	QPSK	25	24	17.05	17.24	17.30		
10	QPSK	50	0	17.14	17.29	17.25		
10	16QAM	1	0	17.15	17.48	17.24	18.00	0-1
10	16QAM	1	24	17.12	17.50	17.29		
10	16QAM	1	49	17.16	17.15	17.23		
10	16QAM	25	0	17.15	17.37	17.21	18.00	0-2
10	16QAM	25	12	17.15	17.31	17.22		
10	16QAM	25	24	17.06	17.15	17.25		
10	16QAM	50	0	17.06	17.20	17.25		

Channel				19975	20175	20375	Tune up Limit (dBm)	MPR (dB)
Frequency (MHz)				1712.5	1732.5	1752.5		
5	QPSK	1	0	17.19	17.24	17.27	18.00	0
5	QPSK	1	12	17.16	17.28	17.51		
5	QPSK	1	24	17.11	17.14	17.19		
5	QPSK	12	0	17.00	17.17	17.21	18.00	0-1
5	QPSK	12	6	16.97	17.17	17.22		
5	QPSK	12	11	17.00	17.18	17.19		
5	QPSK	25	0	17.02	17.23	17.26		
5	16QAM	1	0	17.11	17.23	17.40	18.00	0-1
5	16QAM	1	12	17.18	17.15	17.38		
5	16QAM	1	24	17.13	17.19	17.38		
5	16QAM	12	0	16.94	17.18	17.21	18.00	0-2
5	16QAM	12	6	16.89	17.18	17.22		
5	16QAM	12	11	17.02	17.08	17.31		
5	16QAM	25	0	16.97	17.20	17.27		
Channel				19965	20175	20385	Tune up Limit (dBm)	MPR (dB)
Frequency (MHz)				1711.5	1732.5	1753.5		
3	QPSK	1	0	17.03	17.35	17.23	18.00	0
3	QPSK	1	7	17.20	17.57	17.34		
3	QPSK	1	14	17.01	17.09	17.34		
3	QPSK	8	0	17.18	17.24	17.30	18.00	0-1
3	QPSK	8	4	17.02	17.29	17.35		
3	QPSK	8	7	17.04	17.22	17.32		
3	QPSK	15	0	17.02	17.18	17.25		
3	16QAM	1	0	17.17	17.51	17.30	18.00	0-1
3	16QAM	1	7	17.11	17.45	17.31		
3	16QAM	1	14	17.12	17.50	17.33		
3	16QAM	8	0	16.96	17.30	17.16	18.00	0-2
3	16QAM	8	4	16.81	17.36	17.11		
3	16QAM	8	7	16.83	17.38	17.34		
3	16QAM	15	0	16.97	17.39	17.30		
Channel				19957	20175	20393	Tune up Limit (dBm)	MPR (dB)
Frequency (MHz)				1710.7	1732.5	1754.3		
1.4	QPSK	1	0	17.15	17.18	17.35	18.00	0
1.4	QPSK	1	2	17.07	17.24	17.33		
1.4	QPSK	1	5	17.09	17.14	17.33		
1.4	QPSK	3	0	17.21	17.19	17.28		
1.4	QPSK	3	1	17.15	17.34	17.52		
1.4	QPSK	3	2	17.18	17.36	17.39		
1.4	QPSK	6	0	17.15	17.31	17.37	18.00	0-1
1.4	16QAM	1	0	17.20	17.27	17.28	18.00	0-1
1.4	16QAM	1	2	17.13	17.24	17.48		
1.4	16QAM	1	5	17.19	17.29	17.36		
1.4	16QAM	3	0	17.18	17.25	17.36		
1.4	16QAM	3	1	17.19	17.29	17.47		
1.4	16QAM	3	2	17.12	17.34	17.50		
1.4	16QAM	6	0	16.96	17.13	17.23	18.00	0-2

<LTE Band 7>

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				20850	21100	21350		
Frequency (MHz)				2510	2535	2560		
20	QPSK	1	0	**16.27**	15.82	15.70	16.50	0
20	QPSK	1	49	16.17	15.82	15.75		
20	QPSK	1	99	15.71	15.48	15.30		
20	QPSK	50	0	16.20	15.98	15.64	16.50	0-1
20	QPSK	50	24	16.03	15.81	15.59		
20	QPSK	50	49	15.91	15.71	15.58		
20	QPSK	100	0	16.11	15.85	15.52		
20	16QAM	1	0	16.21	15.95	15.69	16.50	0-1
20	16QAM	1	49	16.18	15.96	15.65		
20	16QAM	1	99	16.16	15.84	15.21		
20	16QAM	50	0	16.12	15.97	15.68	16.50	0-2
20	16QAM	50	24	16.03	15.80	15.71		
20	16QAM	50	49	15.82	15.69	15.69		
20	16QAM	100	0	16.01	15.91	15.54		
Channel				20825	21100	21375	Tune up Limit (dBm)	MPR (dB)
Frequency (MHz)				2507.5	2535	2562.5		
15	QPSK	1	0	16.12	15.94	15.71	16.50	0
15	QPSK	1	37	15.99	15.86	15.53		
15	QPSK	1	74	15.88	15.76	15.40		
15	QPSK	36	0	16.20	15.90	15.65	16.50	0-1
15	QPSK	36	18	16.08	15.74	15.53		
15	QPSK	36	37	16.06	15.79	15.45		
15	QPSK	75	0	16.07	15.85	15.55		
15	16QAM	1	0	16.18	15.90	15.70	16.50	0-1
15	16QAM	1	37	15.81	15.89	15.69		
15	16QAM	1	74	15.79	15.89	15.49		
15	16QAM	36	0	15.99	15.87	15.63	16.50	0-2
15	16QAM	36	18	16.09	15.82	15.63		
15	16QAM	36	37	16.07	15.87	15.46		
15	16QAM	75	0	15.98	15.73	15.45		

Channel				20800	21100	21400	Tune up Limit (dBm)	MPR (dB)
Frequency (MHz)				2505	2535	2565		
10	QPSK	1	0	16.05	15.88	15.61	16.50	0
10	QPSK	1	24	16.24	15.90	15.59		
10	QPSK	1	49	16.02	15.65	15.22		
10	QPSK	25	0	16.12	15.85	15.55	16.50	0-1
10	QPSK	25	12	16.10	15.83	15.42		
10	QPSK	25	24	16.09	15.75	15.29		
10	QPSK	50	0	16.10	15.79	15.48		
10	16QAM	1	0	16.21	15.85	15.60	16.50	0-1
10	16QAM	1	24	16.15	15.86	15.59		
10	16QAM	1	49	16.20	15.88	15.21		
10	16QAM	25	0	16.03	15.84	15.51	16.50	0-2
10	16QAM	25	12	16.13	15.86	15.51		
10	16QAM	25	24	16.03	15.82	15.58		
10	16QAM	50	0	15.93	15.86	15.58		
Channel				20775	21100	21425	Tune up Limit (dBm)	MPR (dB)
Frequency (MHz)				2502.5	2535	2567.5		
5	QPSK	1	0	15.96	16.04	15.38	16.50	0
5	QPSK	1	12	16.23	15.85	15.85		
5	QPSK	1	24	16.04	15.77	15.29		
5	QPSK	12	0	15.92	15.75	15.38	16.50	0-1
5	QPSK	12	6	16.03	15.75	15.29		
5	QPSK	12	11	16.06	15.71	15.33		
5	QPSK	25	0	16.03	15.69	15.35		
5	16QAM	1	0	16.14	16.01	15.80	16.50	0-1
5	16QAM	1	12	16.13	16.03	15.52		
5	16QAM	1	24	16.10	16.02	15.31		
5	16QAM	12	0	15.95	15.69	15.30	16.50	0-2
5	16QAM	12	6	15.86	15.72	15.24		
5	16QAM	12	11	15.98	15.60	15.16		
5	16QAM	25	0	15.94	15.62	15.34		

<TDD LTE SAR Measurement>

TDD LTE configuration setup for SAR measurement

SAR was tested with a fixed periodic duty factor according to the highest transmission duty factor implemented for the device and supported by 3GPP.

a. 3GPP TS 36.211 section 4.2 for Type 2 Frame Structure and Table 4.2-2 for uplink-downlink configurations
b. "special subframe S" contains both uplink and downlink transmissions, it has been taken into consideration to determine the transmission duty factor according to the worst case uplink and downlink cyclic prefix requirements for UpPTS
c. Establishing connections with base station simulators ensure a consistent means for testing SAR and recommended for evaluating SAR. The Anritsu MT8820C (firmware: #22.52#004) was used for LTE output power measurements and SAR testing.

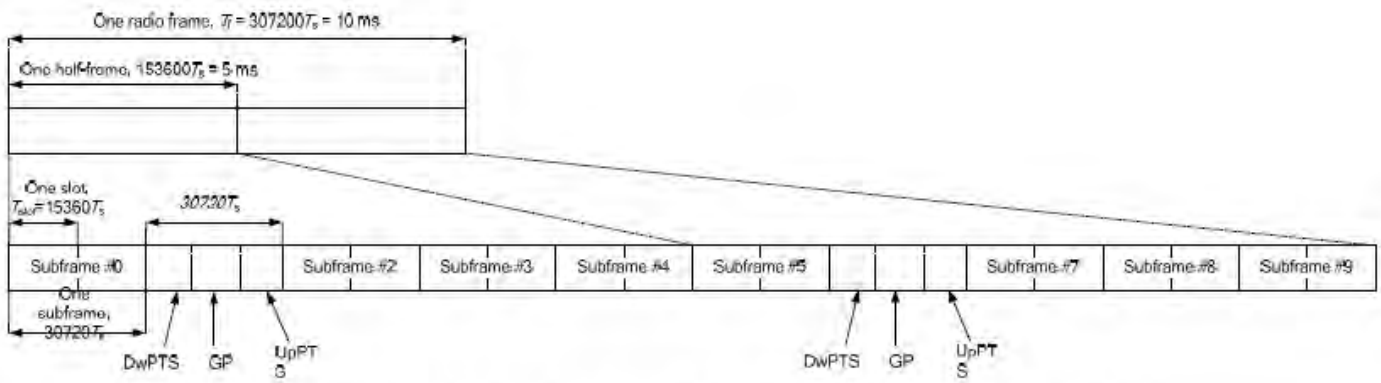


Figure 4.2-1: Frame structure type 2 (for 5 ms switch-point periodicity).

Table 4.2-2: Uplink-downlink configurations.

Uplink-downlink configuration	Downlink-to-Uplink Switch-point periodicity	Subframe number									
		0	1	2	3	4	5	6	7	8	9
0	5 ms	D	S	U	U	U	D	S	U	U	U
1	5 ms	D	S	U	U	D	D	S	U	U	D
2	5 ms	D	S	U	D	D	D	S	U	D	D
3	10 ms	D	S	U	U	U	D	D	D	D	D
4	10 ms	D	S	U	U	D	D	D	D	D	D
5	10 ms	D	S	U	D	D	D	D	D	D	D
6	5 ms	D	S	U	U	U	D	S	U	U	D

Table 4.2-1: Configuration of special subframe (lengths of DwPTS/GP/UpPTS).

Special subframe configuration	Normal cyclic prefix in downlink			Extended cyclic prefix in downlink		
	DwPTS	UpPTS		DwPTS	UpPTS	
		Normal cyclic prefix in uplink	Extended cyclic prefix in uplink		Normal cyclic prefix in uplink	Extended cyclic prefix in uplink
0	$6592 \cdot T_s$	$2192 \cdot T_s$	$2560 \cdot T_s$	$7680 \cdot T_s$	$2192 \cdot T_s$	$2560 \cdot T_s$
1	$19760 \cdot T_s$			$20480 \cdot T_s$		
2	$21952 \cdot T_s$			$23040 \cdot T_s$		
3	$24144 \cdot T_s$			$25600 \cdot T_s$		
4	$26336 \cdot T_s$			$7680 \cdot T_s$	$4384 \cdot T_s$	$5120 \cdot T_s$
5	$6592 \cdot T_s$	$4384 \cdot T_s$	$5120 \cdot T_s$	$20480 \cdot T_s$		
6	$19760 \cdot T_s$			$23040 \cdot T_s$		
7	$21952 \cdot T_s$			$12800 \cdot T_s$		
8	$24144 \cdot T_s$			-	-	-
9	$13168 \cdot T_s$			-	-	-

Special subframe (30720·T_s): Normal cyclic prefix in downlink (UpPTS)			
	Special subframe configuration	**Normal cyclic prefix in uplink**	**Extended cyclic prefix in uplink**
Uplink duty factor in one special subframe	**0~4**	7.13%	8.33%
	5~9	14.3%	16.7%

Special subframe(30720·T_s): Extended cyclic prefix in downlink (UpPTS)			
	Special subframe configuration	**Normal cyclic prefix in uplink**	**Extended cyclic prefix in uplink**
Uplink duty factor in one special subframe	**0~3**	7.13%	8.33%
	4~7	14.3%	16.7%

The highest duty factor is resulted from:

i. Uplink-downlink configuration: 0. In a half-frame consisted of 5 subfames, uplink operation is in 3 uplink subframes and 1 special subframe.

ii. special subframe configuration: 5-9 for normal cyclic prefix in downlink, 4-7 for extended cyclic prefix in downlink

iii. for special subframe with extended cyclic prefix in uplink, the total uplink duty factor in one half-frame is: (3+0.167)/5 = 63.3%

iv. for special subframe with normal cyclic prefix in uplink, the total uplink duty factor in one half-frame is: (3+0.143)/5 = 62.9%

v. For TDD LTE SAR measurement, the duty cycle 1:1.59 (62.9 %) was used perform testing and considering the theoretical duty cycle of 63.3% for extended cyclic prefix in the uplink, and the theoretical duty cycle of 62.9% for normal cyclic prefix in uplink, a scaling factor of extended cyclic prefix 63.3%/62.9% = 1.006 is applied to scale-up the measured SAR result. The scaled TDD LTE SAR = measured SAR (W/kg)* Tune-up Scaling Factor* scaling factor for extended cyclic prefix.

Maximum Average RF Power (Proximity Sensor Inactive)

<LTE Band 38>

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				37850	38000	38150		
Frequency (MHz)				2580	2595	2610		
20	QPSK	1	0	**23.42**	22.84	22.68	24.00	0
20	QPSK	1	49	23.09	22.54	22.63		
20	QPSK	1	99	22.80	22.45	22.34		
20	QPSK	50	0	22.43	21.66	21.79	23.00	0-1
20	QPSK	50	24	22.23	21.64	21.78		
20	QPSK	50	49	22.01	21.54	21.72		
20	QPSK	100	0	22.23	21.62	21.53		
20	16QAM	1	0	22.36	22.05	21.85	23.00	0-1
20	16QAM	1	49	22.02	21.74	21.51		
20	16QAM	1	99	21.72	21.55	21.28		
20	16QAM	50	0	21.21	20.69	20.68	22.00	0-2
20	16QAM	50	24	21.20	20.77	20.50		
20	16QAM	50	49	20.81	20.55	20.44		
20	16QAM	100	0	20.94	20.59	20.68		
Channel				37825	38000	38175	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				2577.5	2595	2612.5		
15	QPSK	1	0	22.97	22.66	22.61	24.00	0
15	QPSK	1	37	22.73	22.33	22.49		
15	QPSK	1	74	22.94	22.59	22.57		
15	QPSK	36	0	22.17	21.78	21.56	23.00	0-1
15	QPSK	36	18	22.21	21.66	21.85		
15	QPSK	36	37	22.05	21.59	21.45		
15	QPSK	75	0	22.03	21.63	21.78		
15	16QAM	1	0	21.96	22.10	21.80	23.00	0-1
15	16QAM	1	37	22.10	21.73	21.62		
15	16QAM	1	74	21.86	21.79	21.49		
15	16QAM	36	0	21.34	20.63	20.55	22.00	0-2
15	16QAM	36	18	21.05	20.59	20.52		
15	16QAM	36	37	21.06	20.60	20.58		
15	16QAM	75	0	21.07	20.59	20.55		

Channel				37800	38000	38200	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				2575	2595	2615		
10	QPSK	1	0	23.22	22.61	22.80	24.00	0
10	QPSK	1	24	22.91	22.75	22.68		
10	QPSK	1	49	23.32	22.53	22.36		
10	QPSK	25	0	22.11	21.65	21.57	23.00	0-1
10	QPSK	25	12	22.08	21.71	21.73		
10	QPSK	25	24	21.99	21.67	21.69		
10	QPSK	50	0	22.31	21.63	21.77		
10	16QAM	1	0	21.97	21.63	21.77	23.00	0-1
10	16QAM	1	24	22.03	21.65	21.70		
10	16QAM	1	49	22.08	21.59	21.54		
10	16QAM	25	0	21.35	20.51	20.68	22.00	0-2
10	16QAM	25	12	21.28	20.57	20.87		
10	16QAM	25	24	21.39	20.54	20.82		
10	16QAM	50	0	21.19	20.57	20.48		
Channel				37775	38000	38225	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				2572.5	2595	2617.5		
5	QPSK	1	0	23.14	22.62	22.53	24.00	0
5	QPSK	1	12	23.40	22.69	22.78		
5	QPSK	1	24	23.01	22.67	22.30		
5	QPSK	12	0	22.08	21.67	21.47	23.00	0-1
5	QPSK	12	6	22.11	21.66	21.45		
5	QPSK	12	11	22.00	21.67	21.39		
5	QPSK	25	0	22.04	21.64	21.40		
5	16QAM	1	0	22.31	22.17	21.69	23.00	0-1
5	16QAM	1	12	22.10	21.74	21.75		
5	16QAM	1	24	22.07	21.67	21.49		
5	16QAM	12	0	21.26	20.67	20.30	22.00	0-2
5	16QAM	12	6	21.16	20.64	20.56		
5	16QAM	12	11	21.00	20.65	20.50		
5	16QAM	25	0	21.27	20.76	20.66		

Reduced Average RF Power (Proximity Sensor active)

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				37850	38000	38150		
Frequency (MHz)				2580	2595	2610		
20	QPSK	1	0	**20.01**	19.78	19.65	20.50	0
20	QPSK	1	49	19.84	19.49	19.38		
20	QPSK	1	99	19.40	19.38	19.27		
20	QPSK	50	0	19.89	19.68	19.64	20.50	0-1
20	QPSK	50	24	19.83	19.53	19.57		
20	QPSK	50	49	19.63	19.53	19.55		
20	QPSK	100	0	19.76	19.57	19.64		
20	16QAM	1	0	19.96	19.69	19.60	20.50	0-1
20	16QAM	1	49	19.96	19.68	19.59		
20	16QAM	1	99	19.56	19.48	19.39		
20	16QAM	50	0	19.98	19.75	19.59	20.50	0-2
20	16QAM	50	24	19.83	19.51	19.58		
20	16QAM	50	49	19.79	19.51	19.55		
20	16QAM	100	0	19.77	19.55	19.58		
Channel				37825	38000	38175	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				2577.5	2595	2612.5		
15	QPSK	1	0	20.01	19.67	19.61	20.50	0
15	QPSK	1	37	19.73	19.54	19.47		
15	QPSK	1	74	19.71	19.49	19.35		
15	QPSK	36	0	19.92	19.49	19.56	20.50	0-1
15	QPSK	36	18	19.82	19.50	19.56		
15	QPSK	36	37	19.84	19.53	19.56		
15	QPSK	75	0	19.83	19.55	19.60		
15	16QAM	1	0	20.00	19.62	19.54	20.50	0-1
15	16QAM	1	37	19.74	19.50	19.43		
15	16QAM	1	74	19.78	19.60	19.47		
15	16QAM	36	0	19.99	19.62	19.60	20.50	0-2
15	16QAM	36	18	19.83	19.60	19.59		
15	16QAM	36	37	19.89	19.63	19.58		
15	16QAM	75	0	19.77	19.49	19.59		

Channel				37800	38000	38200	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				2575	2595	2615		
10	QPSK	1	0	20.00	19.42	19.41	20.50	0
10	QPSK	1	24	19.76	19.59	19.61		
10	QPSK	1	49	19.66	19.44	19.35		
10	QPSK	25	0	19.88	19.52	19.58	20.50	0-1
10	QPSK	25	12	19.75	19.49	19.56		
10	QPSK	25	24	19.82	19.58	19.60		
10	QPSK	50	0	19.85	19.50	19.60		
10	16QAM	1	0	19.90	19.53	19.50	20.50	0-1
10	16QAM	1	24	19.81	19.58	19.55		
10	16QAM	1	49	19.86	19.56	19.47		
10	16QAM	25	0	19.88	19.42	19.60	20.50	0-2
10	16QAM	25	12	19.98	19.54	19.58		
10	16QAM	25	24	19.78	19.50	19.53		
10	16QAM	50	0	19.91	19.41	19.54		
Channel				37775	38000	38225	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				2572.5	2595	2617.5		
5	QPSK	1	0	19.78	19.31	19.48	20.50	0
5	QPSK	1	12	19.74	19.73	19.55		
5	QPSK	1	24	19.62	19.32	19.31		
5	QPSK	12	0	19.82	19.39	19.43	20.50	0-1
5	QPSK	12	6	19.93	19.54	19.58		
5	QPSK	12	11	19.76	19.55	19.45		
5	QPSK	25	0	19.80	19.35	19.47		
5	16QAM	1	0	19.81	19.49	19.56	20.50	0-1
5	16QAM	1	12	19.85	19.49	19.56		
5	16QAM	1	24	19.80	19.58	19.33		
5	16QAM	12	0	19.81	19.50	19.42	20.50	0-2
5	16QAM	12	6	19.82	19.51	19.57		
5	16QAM	12	11	19.89	19.52	19.55		
5	16QAM	25	0	19.80	19.67	19.53		

<WLAN Conducted Power>

General Note:

1. Per KDB 248227 D01v02r01, 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)	Tune-Up Limit	Duty Cycle %
2.4GHz WLAN Antenna A	802.11b	CH 1	2412	1Mbps	**15.92**	16.00	97.42
		CH 6	2437		15.47	16.00	
		CH 11	2462		15.25	16.00	
	802.11g	CH 1	2412	6Mbps	12.61	13.00	87.67
		CH 6	2437		12.46	13.00	
		CH 11	2462		12.33	13.00	
	802.11n-HT20	CH 1	2412	MCS0	11.57	12.00	86.01
		CH 6	2437		11.43	12.00	
		CH 11	2462		11.36	12.00	

<2.4GHz Bluetooth>

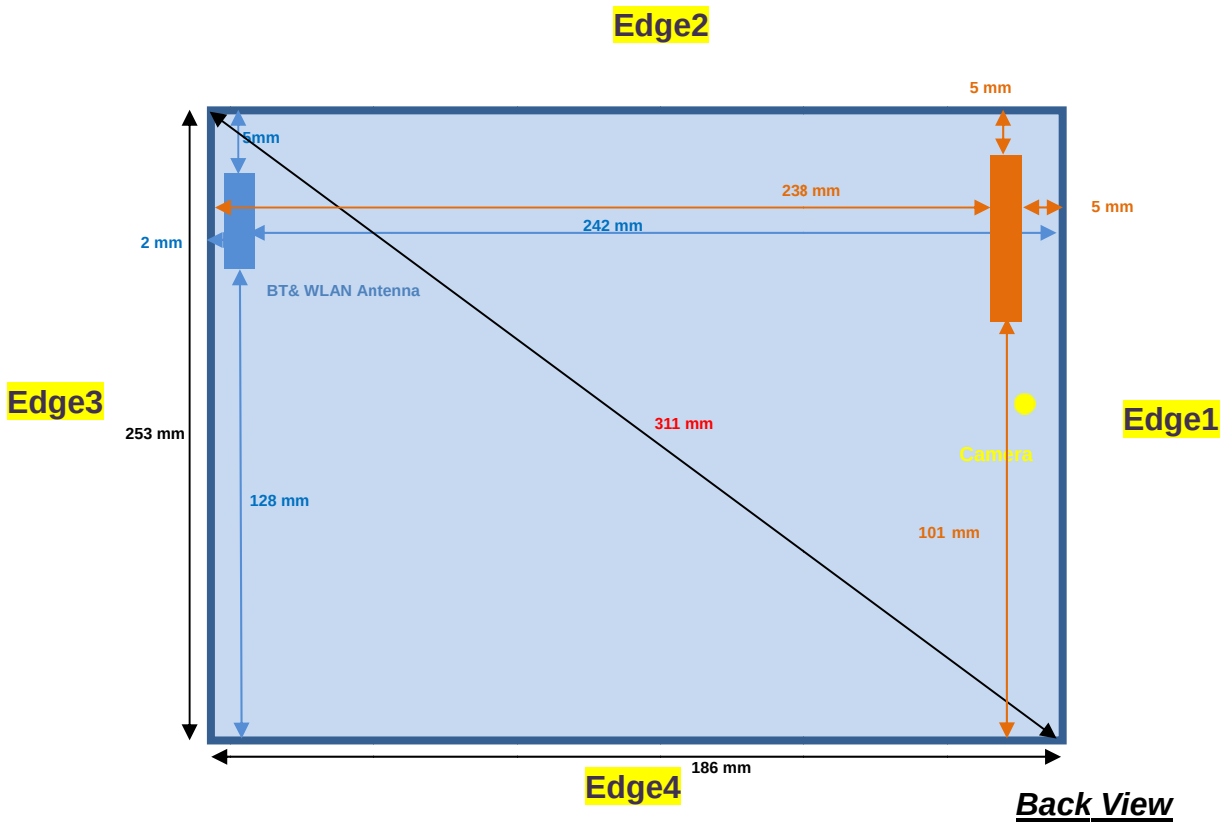
General Note:

1. For 2.4GHz Bluetooth SAR testing was selected 1Mbps, due to its highest average power.
2. The duty factor is selected theoretical 83.3% perform Bluetooth SAR testing.

Mode	Channel	Frequency (MHz)	Average power (dBm)		
			1Mbps	2Mbps	3Mbps
v3.0 with EDR	CH 00	2402	8.39	7.30	7.28
	CH 39	2441	**9.17**	7.98	7.99
	CH 78	2480	6.91	5.79	5.78

Mode	Channel	Frequency (MHz)	Average power (dBm)
			GFSK
v4.0 with LE	CH 00	2402	-1.04
	CH 19	2440	**-0.14**
	CH 39	2480	-2.60

14. Antenna Location



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
7. For the bottom-face that proximity sensor power reduction is applied for SAR compliance, additional SAR testing at “sensor trigger distance – 1mm” with EUT transmitting full power in normal mode was performed.

SAR test exclusion table distance is ≤ 50mm

	Wireless Interface	GPRS 850 Class 8	GPRS 1900 Class 10	WCDMA Band V	WCDMA Band IV	WCDMA Band II	LTE Band 5	LTE Band 4	LTE Band 7	LTE Band 38	BT	802.11b
Exposure Position	Calculated Frequency	848MHz	1909MHz	846MHz	1750MHz	1907MHz	848MHz	1754MHz	2570MHz	2620MHz	2480MHz	2462MHz
	Maximum power (dBm)	25.74	23.24	23.5	23.5	23.5	23.5	23.0	24	24	10	16
	Maximum rated power(mW)	375.0	211.0	224.0	224.0	224.0	224.0	200.0	251.0	251.0	10.0	40.0
Bottom Face	Separation distance(mm)	5.0									5.0	5.0
	exclusion threshold	69.1	58.3	41.2	59.3	61.9	41.3	53.0	80.5	82.3	3.2	12.6
	Testing required?	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Edge 1	Separation distance(mm)	5.0										
	exclusion threshold	69.1	58.3	41.2	59.3	61.9	41.3	53.0	80.5	82.3		
	Testing required?	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**		
Edge 2	Separation distance(mm)	5.0									5.0	5.0
	exclusion threshold	69.1	58.3	41.2	59.3	61.9	41.3	53.0	80.5	82.3	3.2	12.6
	Testing required?	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Edge 3	Separation distance(mm)										5.0	5.0
	exclusion threshold										3.2	12.6
	Testing required?										**Yes**	**Yes**

SAR test exclusion table distance is > 50mm

Exposure Position	Wireless Interface	GPRS 850 Class 8	GPRS 1900 Class 10	WCDMA Band V	WCDMA Band IV	WCDMA Band II	LTE Band 5	LTE Band 4	LTE Band 7	LTE Band 38	BT	802.11b
	Calculated Frequency	848MHz	1909MHz	846MHz	1750MHz	1907MHz	848MHz	1754MHz	2570MHz	2620MHz	2480MHz	2462MHz
	Maximum power (dBm)	25.74	23.24	23.5	23.5	23.5	23.5	23.0	24	24	10	16
	Maximum rated power(mW)	375.0	211.0	224.0	224.0	224.0	224.0	200.0	251.0	251.0	10.0	40.0
Edge 1	Separation distance(mm)										242.0	242.0
	exclusion threshold										2015.0	2016.0
	Testing required?										No	No
Edge 3	Separation distance(mm)	238.0										
	exclusion threshold	1226.0	1989.0	1223.0	1993.0	1989.0	1226.0	1993.0	1974.0	1971.0		
	Testing required?	No	No	No	No	No	No	No	No	No		
Edge 4	Separation distance(mm)	101.0									128.0	128.0
	exclusion threshold	451.0	619.0	451.0	623.0	619.0	451.0	623.0	604.0	601.0	875.0	876.0
	Testing required?	No	No	No	No	No	No	No	No	No	No	No

15. SAR Test Results

General Note:

1. Per KDB 447498 D01v05r02, the reported SAR is the measured SAR value adjusted for maximum tune-up tolerance.
   d. 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.
   e. 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)"
   f. For WWAN: Reported SAR(W/kg)= Measured SAR(W/kg)*Tune-up Scaling Factor
   g. For WLAN: Reported SAR(W/kg)= Measured SAR(W/kg)* Duty Cycle scaling factor * Tune-up scaling factor
2. Per KDB 447498 D01v05r02, for each exposure position, testing of other required channels within the operating mode of a frequency band is not required when the *reported* 1-g or 10-g SAR for the mid-band or highest output power channel is:
   - ≤ 0.8 W/kg or 2.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≤ 100 MHz
   - ≤ 0.6 W/kg or 1.5 W/kg, for 1-g or 10-g respectively, when the transmission band is between 100 MHz and 200 MHz
   - ≤ 0.4 W/kg or 1.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≥ 200 MHz
3. Curved region diagram of the device according to the test setup photo (exterior radius dimension), X=2.2mm, Y=4.33mm, Z=1.11mm for WWAN; X=2.0mm, Y=4.33mm, Z=0.92mm for WLAN, they are all complied with X>Z, Y>Z, Per KDB 616217 D04v01r01, curved SAR are necessary, more detail information which can be referred to setup photo.
4. For edge 2 proximity sensor active, LTE Band 7 reduced power with 0mm, others band at 0mm full power can be tested pass, conservatively evaluated, so no need evaluated at full power with 5mm distance.

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, the GPRS 3Tx slots modes was selected when EUT operating without power back-off, the GPRS 3Tx 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 Head / Hotspot / Body-worn 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 D01v02r01, for 2.4GHz 802.11g/n SAR testing is not 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.
2. 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.
3. 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.
4. During SAR testing the WLAN transmission was verified using a spectrum analyzer.

15.1 Body SAR

<GSM SAR>

Plot No.	Band	Mode	Test Position	Gap (mm)	Sensor	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 (GMSK 3 Tx slots)	Bottom Face	0	on	251	848.8	24.60	25.00	1.096	0.02	1.060	1.162
	GSM850	GPRS (GMSK 3 Tx slots)	Edge 1	0	on	251	848.8	24.60	25.00	1.096	-0.03	0.450	0.493
	GSM850	GPRS (GMSK 3 Tx slots)	Edge 2	0	off	251	848.8	29.83	30.00	1.040	-0.09	0.460	0.478
	GSM850	GPRS (GMSK 3 Tx slots)	Bottom Face	1	off	251	848.8	29.83	30.00	1.040	0.12	0.897	0.933
	GSM850	GPRS (GMSK 3 Tx slots)	Edge 1	1	off	251	848.8	29.83	30.00	1.040	-0.08	0.440	0.458
	GSM850	GPRS (GMSK 3 Tx slots)	Bottom Face Edge 1_35 Degree	0	on	251	848.8	24.60	25.00	1.096	0.01	0.856	0.939
	GSM850	GPRS (GMSK 3 Tx slots)	Bottom Face Edge 1_35 Degree	1	off	251	848.8	29.83	30.00	1.040	0.17	0.940	0.978
	GSM850	GPRS (GMSK 3 Tx slots)	Bottom Face	0	on	128	824.4	24.41	25.00	1.146	0.06	0.967	1.108
01	GSM850	GPRS (GMSK 3 Tx slots)	Bottom Face	0	on	189	836.4	24.44	25.00	1.138	0.03	1.030	**1.172**
	GSM850	GPRS (GMSK 3 Tx slots)	Bottom Face	1	off	128	824.4	29.59	30.00	1.099	0.04	0.861	0.946
	GSM850	GPRS (GMSK 3 Tx slots)	Bottom Face	1	off	189	836.4	29.70	30.00	1.072	0.03	0.883	0.946
	GSM850	GPRS (GMSK 3 Tx slots)	Bottom Face Edge 1_35 Degree	0	on	128	824.4	24.41	25.00	1.146	0.08	0.752	0.861
	GSM850	GPRS (GMSK 3 Tx slots)	Bottom Face Edge 1_35 Degree	0	on	189	836.4	24.44	25.00	1.138	0.03	0.804	0.915
	GSM850	GPRS (GMSK 3 Tx slots)	Bottom Face Edge 1_35 Degree	1	off	128	824.2	29.59	30.00	1.099	0.09	0.735	0.808
	GSM850	GPRS (GMSK 3 Tx slots)	Bottom Face Edge 1_35 Degree	1	off	189	836.4	29.70	30.00	1.072	0.08	0.882	0.945
	GSM1900	GPRS (GMSK 3 Tx slots)	Bottom Face	0	on	810	1909.8	20.98	21.00	1.005	0.01	0.904	0.908
	GSM1900	GPRS (GMSK 3 Tx slots)	Edge 1	0	on	810	1909.8	20.98	21.00	1.005	-0.01	0.822	0.826
	GSM1900	GPRS (GMSK 3 Tx slots)	Edge 2	0	off	810	1909.8	27.18	27.50	1.076	0.09	0.155	0.167
	GSM1900	GPRS (GMSK 3 Tx slots)	Bottom Face	1	off	810	1909.8	27.18	27.50	1.076	0.09	0.814	0.876
	GSM1900	GPRS (GMSK 3 Tx slots)	Edge 1	1	off	810	1909.8	27.18	27.50	1.076	-0.04	0.926	0.997
	GSM1900	GPRS (GMSK 3 Tx slots)	Bottom Face Edge 1_35 Degree	0	on	810	1909.8	20.98	21.00	1.005	0.09	0.618	0.621
02	GSM1900	GPRS (GMSK 3 Tx slots)	Bottom Face Edge 1_35 Degree	1	off	810	1909.8	27.18	27.50	1.076	0.05	1.130	**1.216**
	GSM1900	GPRS (GMSK 3 Tx slots)	Bottom Face	0	on	512	1850.2	20.95	21.00	1.012	0.01	0.768	0.777
	GSM1900	GPRS (GMSK 3 Tx slots)	Bottom Face	0	on	661	1880	20.96	21.00	1.009	0.01	0.863	0.871
	GSM1900	GPRS (GMSK 3 Tx slots)	Edge 1	0	on	512	1850.2	20.95	21.00	1.012	-0.05	0.502	0.508
	GSM1900	GPRS (GMSK 3 Tx slots)	Edge 1	0	on	661	1880	20.96	21.00	1.009	-0.06	0.636	0.642
	GSM1900	GPRS (GMSK 3 Tx slots)	Bottom Face	1	off	512	1850.2	27.08	27.50	1.102	0.09	0.582	0.641
	GSM1900	GPRS (GMSK 3 Tx slots)	Bottom Face	1	off	661	1880	27.14	27.50	1.086	0.09	0.685	0.744
	GSM1900	GPRS (GMSK 3 Tx slots)	Edge 1	1	off	512	1850.2	27.08	27.50	1.102	-0.11	0.499	0.550
	GSM1900	GPRS (GMSK 3 Tx slots)	Edge 1	1	off	661	1880	27.14	27.50	1.086	-0.08	0.683	0.742
	GSM1900	GPRS (GMSK 3 Tx slots)	Bottom Face Edge 1_35 Degree	1	off	512	1850.2	27.08	27.50	1.102	0.07	0.735	0.810
	GSM1900	GPRS (GMSK 3 Tx slots)	Bottom Face Edge 1_35 Degree	1	off	661	1880	27.14	27.50	1.086	0.15	0.923	1.003

<WCDMA SAR>

Plot No.	Band	Mode	Test Position	Gap (mm)	Sensor	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 Band V	RMC 12.2Kbps	Bottom Face	0	on	4182	836.4	21.22	21.50	1.067	0.06	1.150	1.227
	WCDMA Band V	RMC 12.2Kbps	Edge 1	0	on	4182	836.4	21.22	21.50	1.067	-0.03	0.559	0.596
	WCDMA Band V	RMC 12.2Kbps	Edge 2	0	off	4182	836.4	23.22	23.50	1.067	-0.01	0.216	0.230
	WCDMA Band V	RMC 12.2Kbps	Bottom Face	1	off	4182	836.4	23.22	23.50	1.067	0.06	0.491	0.524
	WCDMA Band V	RMC 12.2Kbps	Edge 1	1	off	4182	836.4	23.22	23.50	1.067	-0.12	0.245	0.261
	WCDMA Band V	RMC 12.2Kbps	Bottom Face Edge 1_35 Degree	0	on	4182	836.4	21.22	21.50	1.067	0.08	1.220	1.301
	WCDMA Band V	RMC 12.2Kbps	Bottom Face Edge 1_35 Degree	1	off	4182	836.4	23.22	23.50	1.067	0.06	0.499	0.532
	WCDMA Band V	RMC 12.2Kbps	Bottom Face	0	on	4132	826.4	21.08	21.50	1.102	0.01	1.090	1.201
	WCDMA Band V	RMC 12.2Kbps	Bottom Face	0	on	4233	846.6	21.20	21.50	1.072	0.11	1.190	1.275
	WCDMA Band V	RMC 12.2Kbps	Bottom Face Edge 1_35 Degree	0	on	4132	826.4	21.08	21.50	1.102	0.07	1.150	1.267
03	WCDMA Band V	RMC 12.2Kbps	Bottom Face Edge 1_35 Degree	0	on	4233	846.6	21.20	21.50	1.072	0.03	1.230	**1.318**
	WCDMA Band IV	RMC 12.2Kbps	Bottom Face	0	on	1413	1732.6	18.28	18.50	1.052	0.09	1.130	1.189
	WCDMA Band IV	RMC 12.2Kbps	Edge 1	0	on	1413	1732.6	18.28	18.50	1.052	-0.04	0.269	0.283
	WCDMA Band IV	RMC 12.2Kbps	Edge 2	0	off	1413	1732.6	23.05	23.50	1.109	-0.05	0.358	0.397
	WCDMA Band IV	RMC 12.2Kbps	Bottom Face	1	off	1413	1732.6	23.05	23.50	1.109	0.03	0.626	0.694
	WCDMA Band IV	RMC 12.2Kbps	Edge 1	1	off	1413	1732.6	23.05	23.50	1.109	-0.14	0.252	0.280
	WCDMA Band IV	RMC 12.2Kbps	Bottom Face Edge 1_35 Degree	0	on	1413	1732.6	18.28	18.50	1.052	0.09	0.888	0.934
	WCDMA Band IV	RMC 12.2Kbps	Bottom Face Edge 1_35 Degree	1	off	1413	1732.6	23.05	23.50	1.109	0.03	0.643	0.713
04	WCDMA Band IV	RMC 12.2Kbps	Bottom Face	0	on	1312	1712.4	18.24	18.50	1.062	0.09	1.190	**1.263**
	WCDMA Band IV	RMC 12.2Kbps	Bottom Face	0	on	1513	1752.6	18.23	18.50	1.064	0.09	1.170	1.245
	WCDMA Band IV	RMC 12.2Kbps	Bottom Face Edge 1_35 Degree	0	on	1312	1712.4	18.24	18.50	1.062	0.02	0.770	0.818
	WCDMA Band IV	RMC 12.2Kbps	Bottom Face Edge 1_35 Degree	0	on	1513	1752.6	18.23	18.50	1.064	0.05	1.010	1.075
	WCDMA Band II	RMC 12.2Kbps	Bottom Face	0	on	9262	1852.4	16.43	16.50	1.016	0.01	0.737	0.749
	WCDMA Band II	RMC 12.2Kbps	Edge 1	0	on	9262	1852.4	16.43	16.50	1.016	-0.03	0.591	0.601
	WCDMA Band II	RMC 12.2Kbps	Edge 2	0	off	9262	1852.4	23.33	23.50	1.040	-0.04	0.176	0.183
	WCDMA Band II	RMC 12.2Kbps	Bottom Face	1	off	9262	1852.4	23.33	23.50	1.040	0.09	0.846	0.880
	WCDMA Band II	RMC 12.2Kbps	Edge 1	1	off	9262	1852.4	23.33	23.50	1.040	-0.02	0.555	0.577
	WCDMA Band II	RMC 12.2Kbps	Bottom Face Edge 1_35 Degree	0	on	9262	1852.4	16.43	16.50	1.016	0.04	0.511	0.519
	WCDMA Band II	RMC 12.2Kbps	Bottom Face Edge 1_35 Degree	1	off	9262	1852.4	23.33	23.50	1.040	0.07	0.839	0.872
	WCDMA Band II	RMC 12.2Kbps	Bottom Face	1	off	9400	1880	23.23	23.50	1.064	0.09	0.945	1.006
	WCDMA Band II	RMC 12.2Kbps	Bottom Face	1	off	9538	1907.6	23.25	23.50	1.059	0.09	1.120	1.186
	WCDMA Band II	RMC 12.2Kbps	Bottom Face Edge 1_35 Degree	1	off	9400	1880	23.23	23.50	1.064	0.08	0.982	1.045
05	WCDMA Band II	RMC 12.2Kbps	Bottom Face Edge 1_35 Degree	1	off	9538	1907.6	23.25	23.50	1.059	0.02	1.150	**1.218**

<LTE SAR>

Plot No.	Band	BW (MHz)	Modulation	RB Size	RB offset	Test Position	Gap (mm)	Sensor	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)
06	LTE Band 5	10M	QPSK	1	24	Bottom Face	0	on	20600	844	20.91	21.00	1.021	0.09	1.240	**1.266**
	LTE Band 5	10M	QPSK	1	24	Edge 1	0	on	20600	844	20.91	21.00	1.021	-0.05	0.515	0.526
	LTE Band 5	10M	QPSK	1	24	Edge 2	0	off	20600	844	22.93	23.50	1.140	-0.06	0.213	0.243
	LTE Band 5	10M	QPSK	1	24	Bottom Face	1	off	20600	844	22.93	23.50	1.140	0.14	0.576	0.657
	LTE Band 5	10M	QPSK	1	24	Edge 1	1	off	20600	844	22.93	23.50	1.140	-0.14	0.194	0.221
	LTE Band 5	10M	QPSK	1	24	Bottom Face Edge 1_35 Degree	0	on	20600	844	20.91	21.00	1.021	0.05	1.030	1.052
	LTE Band 5	10M	QPSK	1	24	Bottom Face Edge 1_35 Degree	1	off	20600	844	22.93	23.50	1.140	0.15	0.453	0.517
	LTE Band 5	10M	QPSK	1	24	Bottom Face	0	on	20450	829	20.75	21.00	1.059	0.01	1.150	1.218
	LTE Band 5	10M	QPSK	1	24	Bottom Face	0	on	20525	836.5	20.62	21.00	1.091	0.06	1.090	1.190
	LTE Band 5	10M	QPSK	1	24	Bottom Face Edge 1_35 Degree	0	on	20450	829	20.75	21.00	1.059	0.02	0.979	1.037
	LTE Band 5	10M	QPSK	1	24	Bottom Face Edge 1_35 Degree	0	on	20525	836.5	20.62	21.00	1.091	0.02	0.946	1.033
	LTE Band 5	10M	QPSK	25	12	Bottom Face	0	on	20600	844	20.72	21.00	1.067	0.02	1.160	1.237
	LTE Band 5	10M	QPSK	25	12	Edge 1	0	on	20600	844	20.72	21.00	1.067	-0.04	0.529	0.564
	LTE Band 5	10M	QPSK	25	12	Edge 2	0	off	20600	844	21.92	22.50	1.143	-0.01	0.169	0.193
	LTE Band 5	10M	QPSK	25	12	Bottom Face	1	off	20600	844	21.92	22.50	1.143	0.01	0.460	0.526
	LTE Band 5	10M	QPSK	25	12	Edge 1	1	off	20600	844	21.92	22.00	1.019	-0.05	0.203	0.207
	LTE Band 5	10M	QPSK	25	12	Bottom Face Edge 1_35 Degree	0	on	20600	844	20.72	21.00	1.067	0.18	0.961	1.025
	LTE Band 5	10M	QPSK	25	12	Bottom Face Edge 1_35 Degree	1	off	20600	844	21.92	22.50	1.143	0.05	0.391	0.447
	LTE Band 5	10M	QPSK	25	12	Bottom Face	0	on	20450	829	20.71	21.00	1.069	0.06	1.080	1.155
	LTE Band 5	10M	QPSK	25	12	Bottom Face	0	on	20525	836.5	20.69	21.00	1.074	0.15	1.130	1.214
	LTE Band 5	10M	QPSK	25	12	Bottom Face Edge 1_35 Degree	0	on	20450	829	20.71	21.00	1.069	0.09	0.911	0.974
	LTE Band 5	10M	QPSK	25	12	Bottom Face Edge 1_35 Degree	0	on	20525	836.5	20.69	21.00	1.074	0.02	0.916	0.984
	LTE Band 5	10M	QPSK	50	0	Bottom Face	0	on	20450	829	20.72	21.00	1.067	0.08	1.090	1.163
	LTE Band 5	10M	QPSK	50	0	Bottom Face Edge 1_35 Degree	0	on	20450	829	20.72	21.00	1.067	0.01	0.911	0.972
	LTE Band 4	20M	QPSK	1	0	Bottom Face	0	on	20175	1732.5	17.59	18.00	1.099	0.09	0.885	0.973
	LTE Band 4	20M	QPSK	1	0	Edge 1	0	on	20175	1732.5	17.59	18.00	1.099	-0.17	0.200	0.220
	LTE Band 4	20M	QPSK	1	0	Edge 2	0	off	20175	1732.5	22.76	23.00	1.057	-0.07	0.307	0.324
	LTE Band 4	20M	QPSK	1	0	Bottom Face	1	off	20175	1732.5	22.76	23.00	1.057	0.15	0.403	0.426
	LTE Band 4	20M	QPSK	1	0	Edge 1	1	off	20175	1732.5	22.76	23.00	1.057	-0.07	0.177	0.187
	LTE Band 4	20M	QPSK	1	0	Bottom Face Edge 1_35 Degree	0	on	20175	1732.5	17.59	18.00	1.099	0.09	0.639	0.702
	LTE Band 4	20M	QPSK	1	0	Bottom Face Edge 1_35 Degree	1	off	20175	1732.5	22.76	23.00	1.057	0.08	0.552	0.583
07	LTE Band 4	20M	QPSK	1	0	Bottom Face	0	on	20050	1720	17.16	18.00	1.213	0.03	0.914	**1.109**
	LTE Band 4	20M	QPSK	1	0	Bottom Face	0	on	20300	1745	17.26	18.00	1.186	0.02	0.837	0.992
	LTE Band 4	20M	QPSK	50	0	Bottom Face	0	on	20175	1732.5	17.37	18.00	1.156	0.06	0.868	1.004
	LTE Band 4	20M	QPSK	50	0	Edge 1	0	on	20175	1732.5	17.37	18.00	1.156	-0.09	0.200	0.231
	LTE Band 4	20M	QPSK	50	0	Edge 2	0	off	20175	1732.5	21.61	22.00	1.094	-0.11	0.243	0.266
	LTE Band 4	20M	QPSK	50	0	Bottom Face	1	off	20175	1732.5	21.61	22.00	1.094	0.05	0.322	0.352
	LTE Band 4	20M	QPSK	50	0	Edge 1	1	off	20175	1732.5	21.61	22.00	1.094	-0.06	0.145	0.159
	LTE Band 4	20M	QPSK	50	0	Bottom Face Edge 1_35 Degree	0	on	20175	1732.5	17.37	18.00	1.156	0.08	0.652	0.754
	LTE Band 4	20M	QPSK	50	0	Bottom Face Edge 1_35 Degree	1	off	20175	1732.5	21.61	22.00	1.094	0.09	0.461	0.504
	LTE Band 4	20M	QPSK	50	0	Bottom Face	0	on	20050	1720	17.24	18.00	1.191	0.05	0.930	1.108
	LTE Band 4	20M	QPSK	50	0	Bottom Face	0	on	20300	1745	17.23	18.00	1.194	0.04	0.877	1.047
	LTE Band 4	20M	QPSK	100	0	Bottom Face	0	on	20175	1732.5	17.29	18.00	1.178	0.05	0.859	1.012

Plot No.	Band	BW (MHz)	Modulation	RB Size	RB offset	Test Position	Gap (mm)	Sensor	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 7	20M	QPSK	1	0	Bottom Face	0	on	20850	2510	16.27	16.50	1.054	0.03	0.831	0.876
	LTE Band 7	20M	QPSK	1	0	Edge 1	0	on	20850	2510	16.27	16.50	1.054	-0.17	0.714	0.753
	LTE Band 7	20M	QPSK	1	0	Edge 2	0	on	20850	2510	16.27	16.50	1.054	-0.03	0.279	0.294
	LTE Band 7	20M	QPSK	1	0	Bottom Face	1	off	20850	2510	23.68	24.00	1.076	0.03	1.120	1.206
	LTE Band 7	20M	QPSK	1	0	Edge 1	1	off	20850	2510	23.68	24.00	1.076	0.15	1.050	1.130
	LTE Band 7	20M	QPSK	1	0	Edge 2	0.5	off	20850	2510	23.68	24.00	1.076	-0.04	0.734	0.790
	LTE Band 7	20M	QPSK	1	0	Bottom Face Edge 1_35 Degree	0	on	20850	2510	16.27	16.50	1.054	0.04	1.050	1.107
	LTE Band 7	20M	QPSK	1	0	Bottom Face Edge 1_35 Degree	1	off	20850	2510	23.68	24.00	1.076	0.07	0.889	0.957
	LTE Band 7	20M	QPSK	1	0	Bottom Face	0	on	21100	2535	15.82	16.50	1.169	0.08	0.783	0.916
	LTE Band 7	20M	QPSK	1	0	Bottom Face	0	on	21350	2560	15.70	16.50	1.202	0.01	0.712	0.856
	LTE Band 7	20M	QPSK	1	0	Bottom Face	1	off	21100	2535	23.41	24.00	1.146	0.09	1.070	1.226
	LTE Band 7	20M	QPSK	1	0	Bottom Face	1	off	21350	2560	23.23	24.00	1.194	0.01	0.939	1.121
	LTE Band 7	20M	QPSK	1	0	Edge 1	1	off	21100	2535	23.41	24.00	1.146	0.07	0.737	0.844
	LTE Band 7	20M	QPSK	1	0	Edge 1	1	off	21350	2560	23.23	24.00	1.194	0.19	0.628	0.750
08	LTE Band 7	20M	QPSK	1	0	Bottom Face Edge 1_35 Degree	0	on	21100	2535	15.82	16.50	1.169	0.06	1.090	**1.275**
	LTE Band 7	20M	QPSK	1	0	Bottom Face Edge 1_35 Degree	0	on	21350	2560	15.70	16.50	1.202	0.17	1.020	1.226
	LTE Band 7	20M	QPSK	1	0	Bottom Face Edge 1_35 Degree	1	off	21100	2535	23.41	24.00	1.146	0.06	0.881	1.009
	LTE Band 7	20M	QPSK	1	0	Bottom Face Edge 1_35 Degree	1	off	21350	2560	23.23	24.00	1.194	0.02	0.665	0.794
	LTE Band 7	20M	QPSK	50	0	Bottom Face	0	on	20850	2510	16.20	16.50	1.072	0.02	0.835	0.895
	LTE Band 7	20M	QPSK	50	0	Edge 1	0	on	20850	2510	16.20	16.50	1.072	-0.07	0.651	0.698
	LTE Band 7	20M	QPSK	50	0	Edge 2	0	on	20850	2510	16.20	16.50	1.072	-0.01	0.279	0.299
	LTE Band 7	20M	QPSK	50	0	Bottom Face	1	off	20850	2510	22.70	23.00	1.072	0.03	0.962	1.031
	LTE Band 7	20M	QPSK	50	0	Edge 1	1	off	20850	2510	22.70	23.00	1.072	0.03	0.800	0.857
	LTE Band 7	20M	QPSK	50	0	Edge 2	0.5	off	20850	2510	22.70	23.00	1.072	-0.04	0.649	0.695
	LTE Band 7	20M	QPSK	50	0	Bottom Face Edge 1_35 Degree	0	on	20850	2510	16.20	16.50	1.072	0.09	1.080	1.157
	LTE Band 7	20M	QPSK	50	0	Bottom Face Edge 1_35 Degree	1	off	20850	2510	22.70	23.00	1.072	0.08	0.864	0.926
	LTE Band 7	20M	QPSK	50	0	Bottom Face	0	on	21100	2535	15.98	16.50	1.127	0.03	0.797	0.898
	LTE Band 7	20M	QPSK	50	0	Bottom Face	0	on	21350	2560	15.64	16.50	1.219	0.02	0.720	0.878
	LTE Band 7	20M	QPSK	50	0	Bottom Face	1	off	21100	2535	22.61	23.00	1.094	0.03	0.875	0.957
	LTE Band 7	20M	QPSK	50	0	Bottom Face	1	off	21350	2560	22.28	23.00	1.180	0.06	0.808	0.954
	LTE Band 7	20M	QPSK	50	0	Edge 1	1	off	21100	2535	22.61	23.00	1.094	0.05	0.573	0.627
	LTE Band 7	20M	QPSK	50	0	Edge 1	1	off	21350	2560	22.28	23.00	1.180	0.06	0.506	0.597
	LTE Band 7	20M	QPSK	50	0	Bottom Face Edge 1_35 Degree	0	on	21100	2535	15.98	16.50	1.127	0.09	1.080	1.217
	LTE Band 7	20M	QPSK	50	0	Bottom Face Edge 1_35 Degree	0	on	21350	2560	15.64	16.50	1.219	0.09	1.040	1.268
	LTE Band 7	20M	QPSK	50	0	Bottom Face Edge 1_35 Degree	1	off	21100	2535	22.61	23.00	1.094	0.03	0.596	0.652
	LTE Band 7	20M	QPSK	50	0	Bottom Face Edge 1_35 Degree	1	off	21350	2560	22.28	23.00	1.180	0.02	0.487	0.575
	LTE Band 7	20M	QPSK	100	0	Bottom Face	0	on	20850	2510	16.11	16.50	1.094	0.03	0.808	0.884
	LTE Band 7	20M	QPSK	100	0	Bottom Face	1	off	21100	2535	22.54	23.00	1.112	0.04	0.848	0.943
	LTE Band 7	20M	QPSK	100	0	Edge 1	1	off	21100	2535	22.54	23.00	1.112	-0.18	0.725	0.806
	LTE Band 7	20M	QPSK	100	0	Bottom Face Edge 1_35 Degree	0	on	20850	2510	16.11	16.50	1.094	0.07	1.060	1.160
	LTE Band 7	20M	QPSK	100	0	Bottom Face Edge 1_35 Degree	1	off	21100	2535	22.54	23.00	1.112	0.08	0.541	0.601

Plot No.	Band	BW (MHz)	Modulation	RB Size	RB offset	Test Position	Gap (mm)	Sensor	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)
	LTE Band 38	20M	QPSK	1	0	Bottom Face	0	on	37850	2580	20.01	20.50	1.119	62.9	1.006	0.03	0.831	0.936
	LTE Band 38	20M	QPSK	1	0	Edge 1	0	on	37850	2580	20.01	20.50	1.119	62.9	1.006	-0.07	0.700	0.788
	LTE Band 38	20M	QPSK	1	0	Edge 2	0	off	37850	2580	23.42	24.00	1.143	62.9	1.006	-0.07	0.705	0.811
	LTE Band 38	20M	QPSK	1	0	Bottom Face	1	off	37850	2580	23.42	24.00	1.143	62.9	1.006	0.05	0.570	0.655
	LTE Band 38	20M	QPSK	1	0	Edge 1	1	off	37850	2580	23.42	24.00	1.143	62.9	1.006	-0.07	0.267	0.307
	LTE Band 38	20M	QPSK	1	0	Bottom Face Edge 1_35 Degree	0	on	37850	2580	20.01	20.50	1.119	62.9	1.006	0.04	1.120	1.261
	LTE Band 38	20M	QPSK	1	0	Bottom Face Edge 1_35 Degree	1	off	37850	2580	23.42	24.00	1.143	62.9	1.006	-0.05	0.502	0.577
	LTE Band 38	20M	QPSK	1	0	Bottom Face	0	on	38000	2595	19.78	20.50	1.180	62.9	1.006	0.09	0.764	0.907
	LTE Band 38	20M	QPSK	1	0	Bottom Face	0	on	38150	2610	19.65	20.50	1.216	62.9	1.006	0.04	0.722	0.883
	LTE Band 38	20M	QPSK	1	0	Edge 2	0	off	38000	2595	22.84	24.00	1.306	62.9	1.006	-0.07	0.659	0.866
	LTE Band 38	20M	QPSK	1	0	Edge 2	0	off	38150	2610	22.68	24.00	1.355	62.9	1.006	-0.02	0.642	0.875
	LTE Band 38	20M	QPSK	1	0	Bottom Face Edge 1_35 Degree	0	on	38000	2595	19.78	20.50	1.180	62.9	1.006	0.14	1.000	1.187
	LTE Band 38	20M	QPSK	1	0	Bottom Face Edge 1_35 Degree	0	on	38150	2610	19.65	20.50	1.216	62.9	1.006	0.05	0.954	1.167
	LTE Band 38	20M	QPSK	50	0	Bottom Face	0	on	37850	2580	19.89	20.50	1.151	62.9	1.006	0.06	0.819	0.948
	LTE Band 38	20M	QPSK	50	0	Edge 1	0	on	37850	2580	19.89	20.50	1.151	62.9	1.006	0.09	0.739	0.856
	LTE Band 38	20M	QPSK	50	0	Edge 2	0	off	37850	2580	22.43	23.00	1.140	62.9	1.006	-0.02	0.523	0.600
	LTE Band 38	20M	QPSK	50	0	Bottom Face	1	off	37850	2580	22.43	23.00	1.140	62.9	1.006	0.09	0.422	0.484
	LTE Band 38	20M	QPSK	50	0	Edge 1	1	off	37850	2580	22.43	23.00	1.140	62.9	1.006	0.05	0.199	0.228
09	LTE Band 38	20M	QPSK	50	0	Bottom Face Edge 1_35 Degree	0	on	37850	2580	19.89	20.50	1.151	62.9	1.006	0.13	1.090	**1.262**
	LTE Band 38	20M	QPSK	50	0	Bottom Face Edge 1_35 Degree	1	off	37850	2580	22.43	23.00	1.140	62.9	1.006	0.05	0.357	0.410
	LTE Band 38	20M	QPSK	50	0	Bottom Face	0	on	38000	2595	19.68	20.50	1.208	62.9	1.006	0.05	0.739	0.898
	LTE Band 38	20M	QPSK	50	0	Bottom Face	0	on	38150	2610	19.64	20.50	1.219	62.9	1.006	0.09	0.738	0.905
	LTE Band 38	20M	QPSK	50	0	Edge 1	0	on	38000	2595	19.68	20.50	1.208	62.9	1.006	-0.1	0.642	0.780
	LTE Band 38	20M	QPSK	50	0	Edge 1	0	on	38150	2610	19.64	20.50	1.219	62.9	1.006	-0.06	0.591	0.725
	LTE Band 38	20M	QPSK	50	0	Bottom Face Edge 1_35 Degree	0	on	38000	2595	19.68	20.50	1.208	62.9	1.006	0.07	0.972	1.181
	LTE Band 38	20M	QPSK	50	0	Bottom Face Edge 1_35 Degree	0	on	38150	2610	19.64	20.50	1.219	62.9	1.006	0.07	0.939	1.151
	LTE Band 38	20M	QPSK	100	0	Bottom Face	0	on	37850	2580	19.76	20.50	1.186	62.9	1.006	0.09	0.771	0.920
	LTE Band 38	20M	QPSK	100	0	Edge 1	0	on	37850	2580	19.76	20.50	1.186	62.9	1.006	0.09	0.678	0.809
	LTE Band 38	20M	QPSK	100	0	Edge 2	0	off	37850	2580	22.23	23.00	1.194	62.9	1.006	-0.04	0.519	0.623
	LTE Band 38	20M	QPSK	100	0	Bottom Face Edge 1_35 Degree	0	on	37850	2580	19.76	20.50	1.186	62.9	1.006	0.02	1.030	1.229

<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	Area Scan Max SAR (W/kg)	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	WLAN2.4GHz	802.11b 1Mbps	Bottom Face	0	1	2412	15.92	16.00	1.019	97.42	1.026	0.551	0.01	0.236	0.247
	WLAN2.4GHz	802.11b 1Mbps	Edge 2	0	1	2412	15.92	16.00	1.019	97.42	1.026	0.0804			
	WLAN2.4GHz	802.11b 1Mbps	Edge 3	0	1	2412	15.92	16.00	1.019	97.42	1.026	0.244			
10	WLAN2.4GHz	802.11b 1Mbps	Bottom Face Edge 3_40 Degree	0	1	2412	15.92	16.00	1.019	97.42	1.026	0.656	0.01	0.318	**0.332**

<Bluetooth SAR>

Plot No.	Band	Mode	Test Position	Gap (mm)	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)
	Bluetooth	DH5	Bottom Face	0	39	2441	9.17	10.00	1.211	-0.03	0.057	0.069
	Bluetooth	DH5	Edge 2	0	39	2441	9.17	10.00	1.211	-0.05	0.015	0.018
	Bluetooth	DH5	Edge 3	0	39	2441	9.17	10.00	1.211	-0.07	0.037	0.045
11	Bluetooth	DH5	Bottom Face Edge 3_40 Degree	0	39	2441	9.17	10.00	1.211	0.03	0.062	**0.075**

15.2 Repeated SAR Measurement

No.	Band	BW (MHz)	Mode	RB Size	RB offset	Test Position	Gap (mm)	Sensor	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Ratio	Reported 1g SAR (W/kg)
1st	WCDMA Band IV	-	RMC 12.2Kbps	-	-	Bottom Face	0	on	1312	1712.4	18.24	18.50	1.062	0.09	1.190	1	1.263
2nd	WCDMA Band IV	-	RMC 12.2Kbps	-	-	Bottom Face	0	on	1312	1712.4	18.24	18.50	1.062	0.09	1.110	1.072	1.178
1st	WCDMA Band II	-	RMC 12.2Kbps	-	-	Bottom Face Edge 1_35 Degree	1	off	9538	1907.6	23.25	23.50	1.059	0.02	1.150	1	1.218
2nd	WCDMA Band II	-	RMC 12.2Kbps	-	-	Bottom Face Edge 1_35 Degree	1	off	9538	1907.6	23.25	23.50	1.059	0.01	1.140	1.008	1.208
1st	LTE Band 5	10M	QPSK	1	24	Bottom Face	0	on	20600	844	20.91	21.00	1.021	0.09	1.240	1	1.266
2nd	LTE Band 5	10M	QPSK	1	24	Bottom Face	0	on	20600	844	20.91	21.00	1.021	0.09	1.180	1.051	1.205
1st	LTE Band 7	20M	QPSK	1	0	Bottom Face	1	off	20850	2510	23.68	24.00	1.076	0.03	1.120	1	1.206
2nd	LTE Band 7	20M	QPSK	1	0	Bottom Face	1	off	20850	2510	23.68	24.00	1.076	0.01	1.070	1.047	1.152

General Note:

1. Per KDB 865664 D01v01r04, for each frequency band, repeated SAR measurement is required only when the measured SAR is ≥0.8W/kg.
2. Per KDB 865664 D01v01r04, if the ratio among the repeated measurement is ≤ 1.2 and the measured SAR <1.45W/kg, only one repeated measurement is required.
3. The ratio is the difference in percentage between original and repeated *measured SAR*.
4. All measurement SAR result is scaled-up to account for tune-up tolerance and is compliant.

16. Simultaneous Transmission Analysis

NO.	Simultaneous Transmission Configurations	Tablet Body	Note
1.	GPRS/EDGE(Data) + WLAN2.4GHz(data)	Yes	2.4GHz Hotspot
2.	WCDMA(Data) + WLAN2.4GHz(data)	Yes	2.4GHz Hotspot
3.	LTE(Data) + WLAN2.4GHz(data)	Yes	2.4GHz 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

General Note:

1. EUT will choose each GSM, WCDMA and LTE according to the network signal condition; therefore, they will not operate simultaneously at any moment.
2. WLAN and Bluetooth share the same antenna, and cannot transmit simultaneously
3. The reported SAR summation is calculated based on the same configuration and test position.
4. Per KDB 447498 D01v05r02, simultaneous transmission SAR is compliant if,
   i) Scalar SAR summation < 1.6W/kg.
   ii) SPLSR = $(SAR_1 + SAR_2)^{1.5}$ / (*min. separation distance, mm*), and the peak separation distance is determined from the square root of $[(x_1-x_2)^2 + (y_1-y_2)^2 + (z_1-z_2)^2]$, where (x_1, y_1, z_1) and (x_2, y_2, z_2) are the coordinates of the extrapolated peak SAR locations in the zoom scan.
   iii) If SPLSR ≤ 0.04, simultaneously transmission SAR measurement is not necessary.
   iv) Simultaneously transmission SAR measurement, and the reported multi-band SAR < 1.6W/kg.

16.1 Tablet Body Exposure Conditions

<WWAN + WLAN>

WWAN Band		Exposure Position	WWAN PCB Max. WWAN SAR (W/kg)	WLAN DTS Max. WLAN SAR (W/kg)	Summed SAR (W/kg)	SPLSR	Case No
GSM	GSM850	Bottom Face at 0 cm	1.172	0.247	1.42		
		Edge1 at 0 cm	0.493		0.49		
		Edge2 at 0cm	0.478	0.332	0.81		
		Edge3 at 0cm		0.332	0.33		
		Bottom Face at 1cm	0.946	0.247	1.19		
		Edge1 at 1cm	0.458	0.332	0.79		
		Bottom Face Edge 1 35 Degree at 0 cm	0.939		0.94		
		Bottom Face Edge 1 35 Degree at 1 cm	0.978		0.98		
		Bottom Face Edge 3 40 Degree at 1 cm		0.332	0.33		
	GSM1900	Bottom Face at 0 cm	0.908	0.247	1.16		
		Edge1 at 0 cm	0.826		0.83		
		Edge2 at 0cm	0.167	0.332	0.50		
		Edge3 at 0cm		0.332	0.33		
		Bottom Face at 1cm	0.876	0.247	1.12		
		Edge1 at 1cm	0.997	0.332	1.33		
		Bottom Face Edge 1 35 Degree at 0 cm	0.621		0.62		
		Bottom Face Edge 1 35 Degree at 1 cm	1.216		1.22		
		Bottom Face Edge 3_40 Degree at 0 cm		0.332	0.33		

WWAN Band		Exposure Position	WWAN PCB Max. WWAN SAR (W/kg)	WLAN DTS Max. WLAN SAR (W/kg)	Summed SAR (W/kg)	SPLSR	Case No
WCDMA	Band V	Bottom Face at 0 cm	1.275	0.247	**1.52**		
		Edge1 at 0 cm	0.596		0.60		
		Edge2 at 0cm	0.230	0.332	0.56		
		Edge3 at 0cm		0.332	0.33		
		Bottom Face at 1cm	0.524	0.247	0.77		
		Edge1 at 1cm	0.261	0.332	0.59		
		Bottom Face Edge 1 35 Degree at 0 cm	1.318		1.32		
		Bottom Face Edge 1 35 Degree at 1 cm	0.532		0.53		
		Bottom Face Edge 3_40 Degree at 0 cm		0.332	0.33		
	Band IV	Bottom Face at 0 cm	1.263	0.247	1.51		
		Edge1 at 0 cm	0.283		0.28		
		Edge2 at 0cm	0.397	0.332	0.73		
		Edge3 at 0cm		0.332	0.33		
		Bottom Face at 1cm	0.694	0.247	0.94		
		Edge1 at 1cm	0.28	0.332	0.61		
		Bottom Face Edge 1 35 Degree at 0 cm	1.075		1.08		
		Bottom Face Edge 1 35 Degree at 1 cm	0.713		0.71		
		Bottom Face Edge 3_40 Degree at 0 cm		0.332	0.33		
	WCDMA II	Bottom Face at 0 cm	0.749	0.247	1.00		
		Edge1 at 0 cm	0.601		0.60		
		Edge2 at 0cm	0.183	0.332	0.52		
		Edge3 at 0cm		0.332	0.33		
		Bottom Face at 1cm	1.186	0.247	1.43		
		Edge1 at 1cm	0.577	0.332	0.91		
		Bottom Face Edge 1 35 Degree at 0 cm	0.519		0.52		
		Bottom Face Edge 1 35 Degree at 1 cm	1.218		1.22		
		Bottom Face Edge 3_40 Degree at 0 cm		0.332	0.33		

WWAN Band		Exposure Position	WWAN PCB Max. WWAN SAR (W/kg)	WLAN DTS Max. WLAN SAR (W/kg)	Summed SAR (W/kg)	SPLSR	Case No
LTE	Band 5	Bottom Face at 0 cm	1.266	0.247	1.51		
		Edge1 at 0 cm	0.564		0.56		
		Edge2 at 0cm	0.243	0.332	0.58		
		Edge3 at 0cm		0.332	0.33		
		Bottom Face at 1cm	0.657	0.247	0.90		
		Edge1 at 1cm	0.221	0.332	0.55		
		Bottom Face Edge 1 35 Degree at 0 cm	1.052		1.05		
		Bottom Face Edge 1 35 Degree at 1 cm	0.517		0.52		
		Bottom Face Edge 3_40 Degree at 0 cm		0.332	0.33		
	Band 4	Bottom Face at 0 cm	1.109	0.247	1.36		
		Edge1 at 0 cm	0.231		0.23		
		Edge2 at 0cm	0.324	0.332	0.66		
		Edge3 at 0cm		0.332	0.33		
		Bottom Face at 1cm	0.426	0.247	0.67		
		Edge1 at 1cm	0.187	0.332	0.52		
		Bottom Face Edge 1 35 Degree at 0 cm	0.754		0.75		
		Bottom Face Edge 1 35 Degree at 1 cm	0.583		0.58		
		Bottom Face Edge 3_40 Degree at 0 cm		0.332	0.33		
	Band 7	Bottom Face at 0 cm	0.916	0.247	1.16		
		Edge1 at 0 cm	0.753		0.75		
		Edge2 at 0cm	0.299	0.332	0.63		
		Edge3 at 0cm		0.332	0.33		
		Bottom Face at 1cm	1.226	0.247	1.47		
		Edge1 at 1cm	1.130	0.332	1.46		
		Edge2 at 0.5cm	0.79	0.332	1.12		
		Bottom Face Edge 1 35 Degree at 0 cm	1.275		1.28		
		Bottom Face Edge 1 35 Degree at 1 cm	1.009		1.01		
		Bottom Face Edge 3_40 Degree at 0 cm		0.332	0.33		
	Band 38	Bottom Face at 0 cm	0.948	0.247	1.20		
		Edge1 at 0 cm	0.856		0.86		
		Edge2 at 0cm	0.875	0.332	1.21		
		Edge3 at 0cm		0.332	0.33		
		Bottom Face at 1cm	0.655	0.247	0.90		
		Edge1 at 1cm	0.307	0.332	0.64		
		Bottom Face Edge 1 35 Degree at 0 cm	1.262		1.26		
		Bottom Face Edge 1 35 Degree at 1 cm	0.577		0.58		
		Bottom Face Edge 3_40 Degree at 0 cm		0.332	0.33		

<WWAN + Bluetooth >

WWAN Band		Exposure Position	WWAN PCB Max. WWAN SAR (W/kg)	Bluetooth DSS Bluetooth SAR (W/kg)	Summed SAR (W/kg)	SPLSR	Case No
GSM	GSM850	Bottom Face at 0 cm	1.172	0.075	1.25		
		Edge1 at 0 cm	0.493		0.49		
		Edge2 at 0cm	0.478	0.075	0.55		
		Edge3 at 0cm		0.075	0.08		
		Bottom Face at 1cm	0.946	0.075	1.02		
		Edge1 at 1cm	0.458	0.075	0.53		
		Bottom Face Edge 1 35 Degree at 0 cm	0.939		0.94		
		Bottom Face Edge 1 35 Degree at 1 cm	0.978		0.98		
		Bottom Face Edge 1 40 Degree at 1 cm		0.075	0.08		
	GSM1900	Bottom Face at 0 cm	0.908	0.075	0.98		
		Edge1 at 0 cm	0.826		0.83		
		Edge2 at 0cm	0.167	0.075	0.24		
		Edge3 at 0cm		0.075	0.08		
		Bottom Face at 1cm	0.876	0.075	0.95		
		Edge1 at 1cm	0.997	0.075	1.07		
		Bottom Face Edge 1 35 Degree at 0 cm	0.621		0.62		
		Bottom Face Edge 1 35 Degree at 1 cm	1.216		1.22		
		Bottom Face Edge 3_40 Degree at 0 cm		0.075	0.08		

WWAN Band		Exposure Position	WWAN PCB Max. WWAN SAR (W/kg)	Bluetooth DSS Bluetooth SAR (W/kg)	Summed SAR (W/kg)	SPLSR	Case No
WCDMA	Band V	Bottom Face at 0 cm	1.275	0.075	**1.35**		
		Edge1 at 0 cm	0.596		0.60		
		Edge2 at 0cm	0.230	0.075	0.31		
		Edge3 at 0cm		0.075	0.08		
		Bottom Face at 1cm	0.524	0.075	0.60		
		Edge1 at 1cm	0.261	0.075	0.34		
		Bottom Face Edge 1 35 Degree at 0 cm	1.318		1.32		
		Bottom Face Edge 1 35 Degree at 1 cm	0.532		0.53		
		Bottom Face Edge 3_40 Degree at 0 cm		0.075	0.08		
	Band IV	Bottom Face at 0 cm	1.263	0.075	1.34		
		Edge1 at 0 cm	0.283		0.28		
		Edge2 at 0cm	0.397	0.075	0.47		
		Edge3 at 0cm		0.075	0.08		
		Bottom Face at 1cm	0.694	0.075	0.77		
		Edge1 at 1cm	0.28	0.075	0.36		
		Bottom Face Edge 1 35 Degree at 0 cm	1.075		1.08		
		Bottom Face Edge 1 35 Degree at 1 cm	0.713		0.71		
		Bottom Face Edge 3_40 Degree at 0 cm		0.075	0.08		
	Band II	Bottom Face at 0 cm	0.749	0.075	0.82		
		Edge1 at 0 cm	0.601		0.60		
		Edge2 at 0cm	0.183	0.075	0.26		
		Edge3 at 0cm		0.075	0.08		
		Bottom Face at 1cm	1.186	0.075	1.26		
		Edge1 at 1cm	0.577	0.075	0.65		
		Bottom Face Edge 1 35 Degree at 0 cm	0.519		0.52		
		Bottom Face Edge 1 35 Degree at 1 cm	1.218		1.22		
		Bottom Face Edge 3_40 Degree at 0 cm		0.075	0.08		

WWAN Band	Exposure Position	WWAN PCB	Bluetooth DSS	Summed SAR (W/kg)	SPLSR	Case No
		Max. WWAN SAR (W/kg)	Estimated SAR (W/kg)			
Band 5	Bottom Face at 0 cm	1.266	0.075	1.34		
	Edge1 at 0 cm	0.564		0.56		
	Edge2 at 0cm	0.243	0.075	0.32		
	Edge3 at 0cm		0.075	0.08		
	Bottom Face at 1cm	0.657	0.075	0.73		
	Edge1 at 1cm	0.221	0.075	0.30		
	Bottom Face Edge 1 35 Degree at 0 cm	1.052		1.05		
	Bottom Face Edge 1 35 Degree at 1 cm	0.517		0.52		
	Bottom Face Edge 3_40 Degree at 0 cm		0.075	0.08		
Band 4	Bottom Face at 0 cm	1.109	0.075	1.18		
	Edge1 at 0 cm	0.231		0.23		
	Edge2 at 0cm	0.324	0.075	0.40		
	Edge3 at 0cm		0.075	0.08		
	Bottom Face at 1cm	0.426	0.075	0.50		
	Edge1 at 1cm	0.187	0.075	0.26		
	Bottom Face Edge 1 35 Degree at 0 cm	0.754		0.75		
	Bottom Face Edge 1 35 Degree at 1 cm	0.583		0.58		
	Bottom Face Edge 3_40 Degree at 0 cm		0.075	0.08		
Band 7	Bottom Face at 0 cm	0.916	0.075	0.99		
	Edge1 at 0 cm	0.753		0.75		
	Edge2 at 0cm	0.299	0.075	0.37		
	Edge3 at 0cm		0.075	0.08		
	Bottom Face at 1cm	1.226	0.075	1.30		
	Edge1 at 1cm	1.130	0.075	1.21		
	Edge2 at 0.5cm	0.79	0.075	0.87		
	Bottom Face Edge 1 35 Degree at 0 cm	1.275		1.28		
	Bottom Face Edge 1 35 Degree at 1 cm	1.009		1.01		
	Bottom Face Edge 3_40 Degree at 0 cm		0.075	0.08		
Band 38	Bottom Face at 0 cm	0.948	0.075	1.02		
	Edge1 at 0 cm	0.856		0.86		
	Edge2 at 0cm	0.875	0.075	0.95		
	Edge3 at 0cm		0.075	0.08		
	Bottom Face at 1cm	0.655	0.075	0.73		
	Edge1 at 1cm	0.307	0.075	0.38		
	Bottom Face Edge 1 35 Degree at 0 cm	1.262		1.26		
	Bottom Face Edge 1 35 Degree at 1 cm	0.577		0.58		
	Bottom Face Edge 3_40 Degree at 0 cm		0.075	0.08		

Test Engineer： Kat Yin

17. Uncertainty Assessment

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

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

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

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

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

(b) κ is the coverage factor

Table 17.1. Standard Uncertainty for Assumed Distribution

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

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

Error Description	Uncertainty Value (±%)	Probability	Divisor	(Ci) 1g	(Ci) 10g	Standard Uncertainty (1g) (±%)	Standard Uncertainty (10g) (±%)
Measurement System							
Probe Calibration	6.0	N	1	1	1	6.0	6.0
Axial Isotropy	4.7	R	1.732	0.7	0.7	1.9	1.9
Hemispherical Isotropy	9.6	R	1.732	0.7	0.7	3.9	3.9
Boundary Effects	1.0	R	1.732	1	1	0.6	0.6
Linearity	4.7	R	1.732	1	1	2.7	2.7
System Detection Limits	1.0	R	1.732	1	1	0.6	0.6
Modulation Response	3.2	R	1.732	1	1	1.8	1.8
Readout Electronics	0.3	N	1	1	1	0.3	0.3
Response Time	0.0	R	1.732	1	1	0.0	0.0
Integration Time	2.6	R	1.732	1	1	1.5	1.5
RF Ambient Noise	3.0	R	1.732	1	1	1.7	1.7
RF Ambient Reflections	3.0	R	1.732	1	1	1.7	1.7
Probe Positioner	0.4	R	1.732	1	1	0.2	0.2
Probe Positioning	2.9	R	1.732	1	1	1.7	1.7
Max. SAR Eval.	2.0	R	1.732	1	1	1.2	1.2
Test Sample Related							
Device Positioning	3.0	N	1	1	1	3.0	3.0
Device Holder	3.6	N	1	1	1	3.6	3.6
Power Drift	5.0	R	1.732	1	1	2.9	2.9
Power Scaling	0.0	R	1.732	1	1	0.0	0.0
Phantom and Setup							
Phantom Uncertainty	6.1	R	1.732	1	1	3.5	3.5
SAR correction	0.0	R	1.732	1	0.84	0.0	0.0
Liquid Conductivity Repeatability	0.2	N	1	0.78	0.71	0.1	0.1
Liquid Conductivity (target)	5.0	R	1.732	0.78	0.71	2.3	2.0
Liquid Conductivity (mea.)	2.5	R	1.732	0.78	0.71	1.1	1.0
Temp. unc. - Conductivity	3.4	R	1.732	0.78	0.71	1.5	1.4
Liquid Permittivity Repeatability	0.15	N	1	0.23	0.26	0.0	0.0
Liquid Permittivity (target)	5.0	R	1.732	0.23	0.26	0.7	0.8
Liquid Permittivity (mea.)	2.5	R	1.732	0.23	0.26	0.3	0.4
Temp. unc. - Permittivity	0.83	R	1.732	0.23	0.26	0.1	0.1
Combined Std. Uncertainty						11.4%	11.4%
Coverage Factor for 95 %						K=2	K=2
Expanded STD Uncertainty						22.9%	22.7%

Table 17.2. Uncertainty Budget for frequency range 300 MHz to 3 GHz

18. References

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

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

[3] IEEE Std. 1528-2013, “IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques”, Sep 2013

[4] SPEAG DASY System Handbook

[5] FCC KDB 248227 D01 v02r01, “SAR Guidance for IEEE 802.11 (WiFi) Transmitters”, Jun 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 v01r04, "SAR Measurement Requirements for 100 MHz to 6 GHz", Aug 2015.

[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.

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2015/8/29

System Check_Body_835MHz_150829

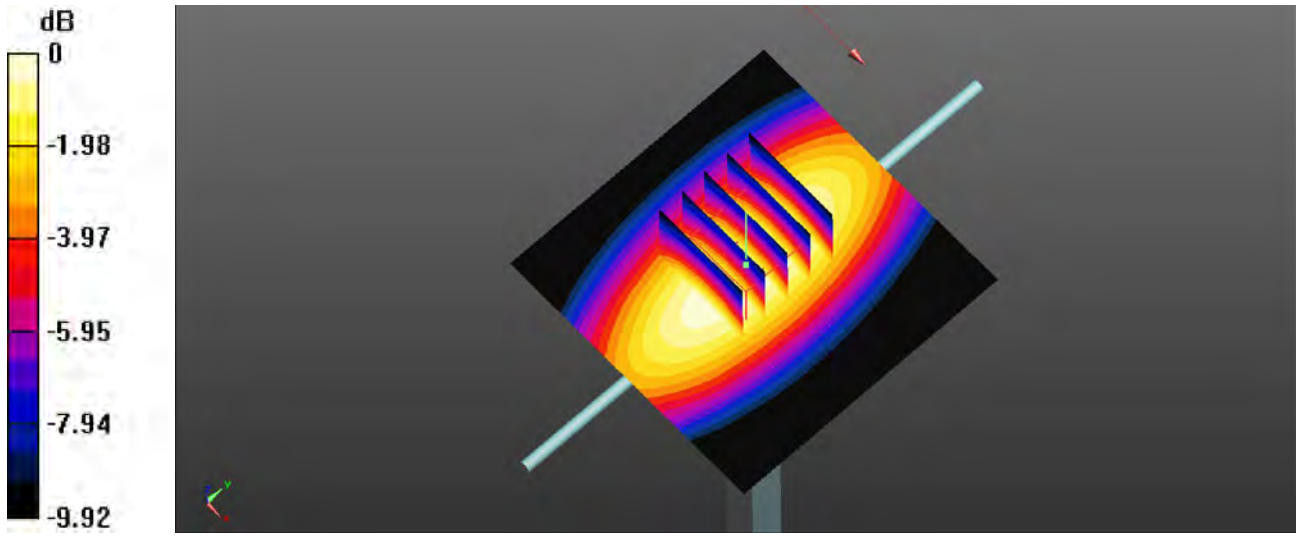
DUT: D835V2-SN:4d091

Communication System: UID 0, CW; Frequency: 835 MHz;Duty Cycle: 1:1
Medium: MSL_835_150829 Medium parameters used: f = 835 MHz; σ = 1 S/m; ε_r = 54.086; ρ = 1000 kg/m^3
Ambient Temperature：23.5 ℃; Liquid Temperature ：22.4 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3911; ConvF(9.66, 9.66, 9.66); Calibrated: 2014/10/2;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn679; Calibrated: 2015/4/13
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1201
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Pin=250mW/Area Scan (61x61x1): Interpolated grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 2.61 W/kg

Pin=250mW/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 50.60 V/m; Power Drift = -0.06 dB
Peak SAR (extrapolated) = 3.50 W/kg
SAR(1 g) = 2.4 W/kg; SAR(10 g) = 1.6 W/kg
Maximum value of SAR (measured) = 2.57 W/kg



0 dB = 2.57 W/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2015/8/28

System Check_Body_1750MHz_150828

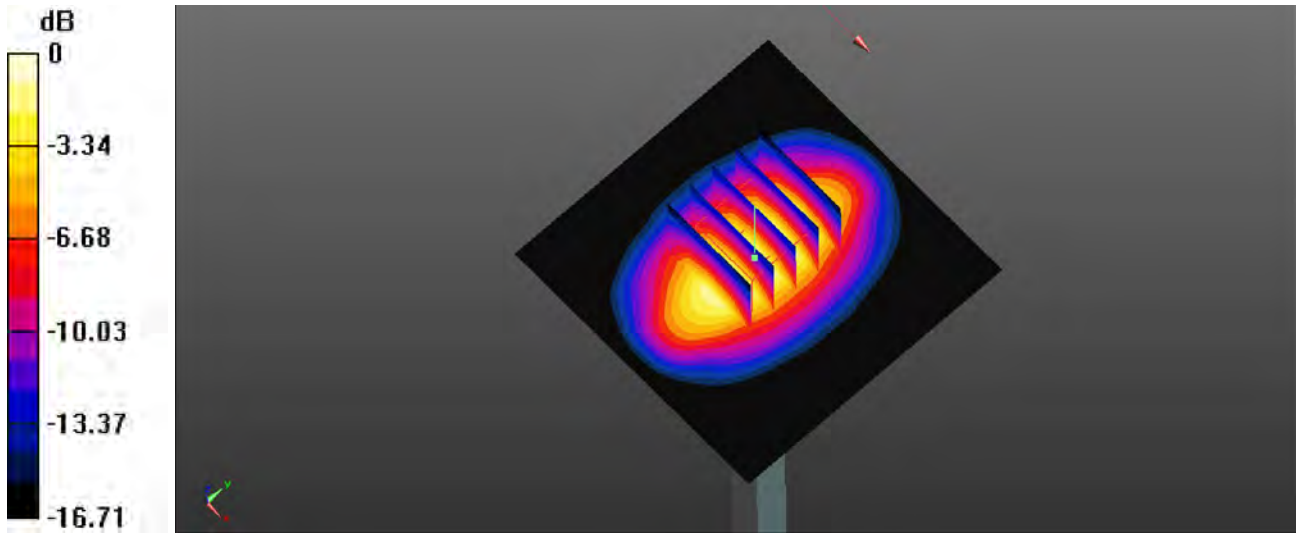
DUT: D1750V2-SN:1069

Communication System: UID 0, CW; Frequency: 1750 MHz;Duty Cycle: 1:1
Medium: MSL_1750_150828 Medium parameters used: f = 1750 MHz; σ = 1.477 S/m; ε_r = 53.51; ρ = 1000 kg/m^3
Ambient Temperature：23.4 ℃; Liquid Temperature ：22.6 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3911; ConvF(7.93, 7.93, 7.93); Calibrated: 2014/10/2;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn679; Calibrated: 2015/4/13
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1201
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Pin=250mW/Area Scan (61x61x1): Interpolated grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 11.9 W/kg

Pin=250mW/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 90.49 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 14.7 W/kg
SAR(1 g) = 8.81 W/kg; SAR(10 g) = 4.49 W/kg
Maximum value of SAR (measured) = 11.8 W/kg



0 dB = 11.8 W/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2015/8/27

System Check_Body_1900MHz_150827

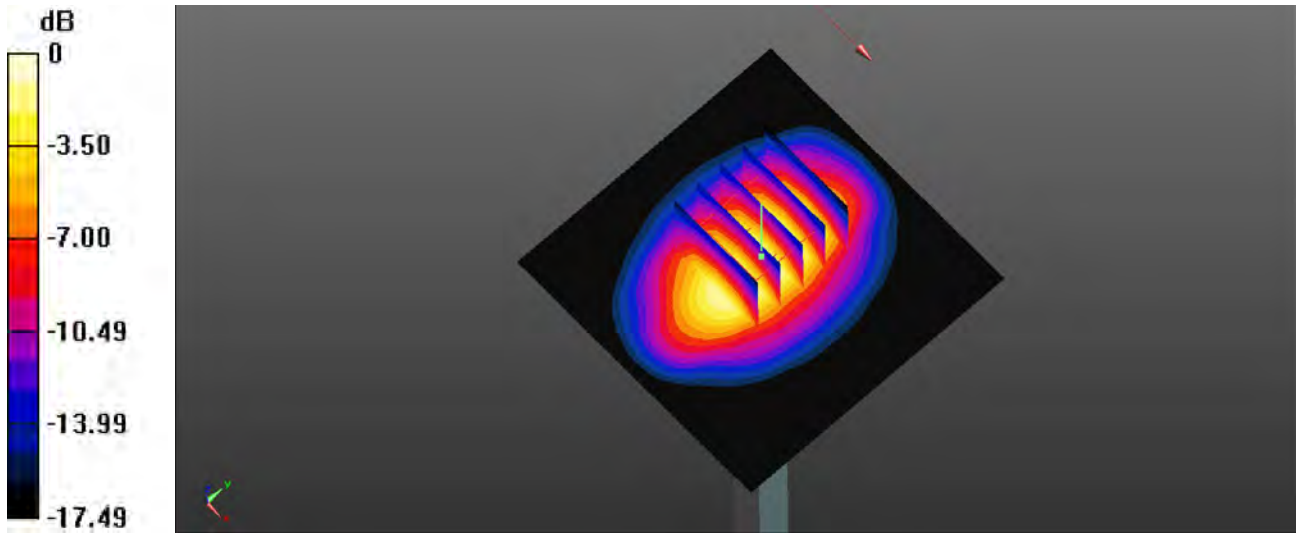
DUT: D1900V2-SN:5d118

Communication System: UID 0, CW; Frequency: 1900 MHz;Duty Cycle: 1:1
Medium: MSL_1900_150827 Medium parameters used: f = 1900 MHz; σ = 1.542 S/m; ε_r = 55.338; ρ = 1000 kg/m^3
Ambient Temperature：23.3 ℃; Liquid Temperature ：22.2 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3911; ConvF(7.57, 7.57, 7.57); Calibrated: 2014/10/2;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn679; Calibrated: 2015/4/13
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1201
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Pin=250mW/Area Scan (61x61x1): Interpolated grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 14.3 W/kg

Pin=250mW/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 83.88 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 18.0 W/kg
SAR(1 g) = 10.2 W/kg; SAR(10 g) = 5.36 W/kg
Maximum value of SAR (measured) = 14.2 W/kg



0 dB = 14.2 W/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2015/8/24

System Check_Body_2450MHz_150824

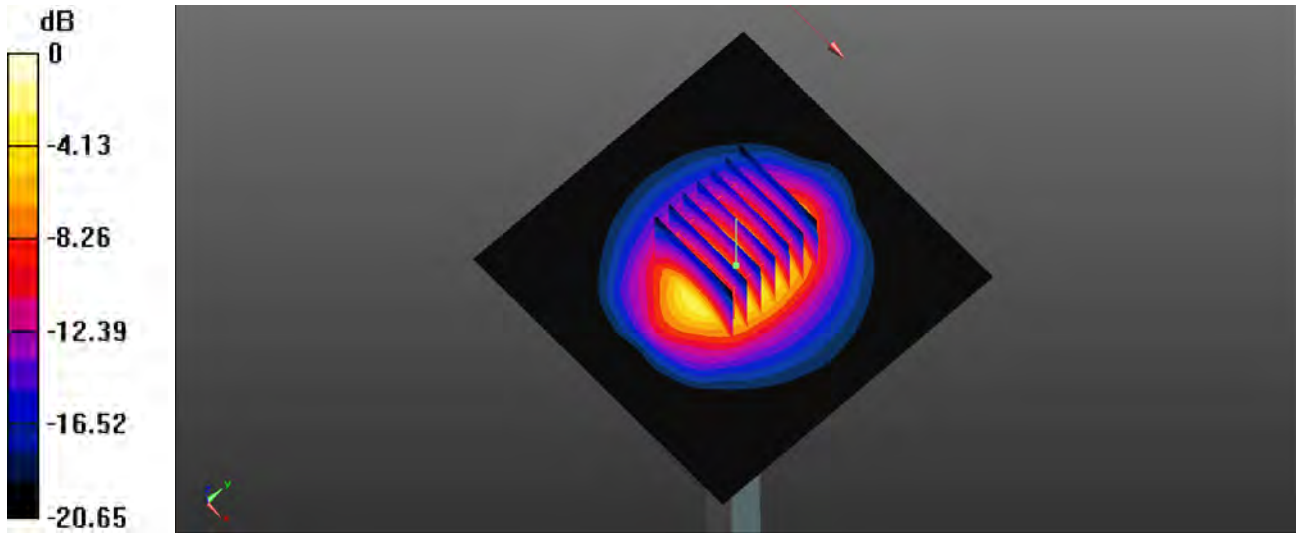
DUT:D2450V2-SN:840

Communication System: UID 0, CW; Frequency: 2450 MHz;Duty Cycle: 1:1
Medium: MSL_2450_150824 Medium parameters used: f = 2450 MHz; σ = 1.949 S/m; ε_r = 53.894; ρ = 1000 kg/m^3
Ambient Temperature：23.5 ℃; Liquid Temperature ：22.5 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3911; ConvF(7.18, 7.18, 7.18); Calibrated: 2014/10/2;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn679; Calibrated: 2015/4/13
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1201
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Pin=250mW/Area Scan (81x81x1): Interpolated grid: dx=12mm, dy=12mm
Maximum value of SAR (interpolated) = 20.1 W/kg

Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 89.16 V/m; Power Drift = -0.15 dB
Peak SAR (extrapolated) = 27.0 W/kg
SAR(1 g) = 13.4 W/kg; SAR(10 g) = 6.31 W/kg
Maximum value of SAR (measured) = 20.4 W/kg



0 dB = 20.4 W/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2015.08.26

System Check_Body_2450MHz_150826

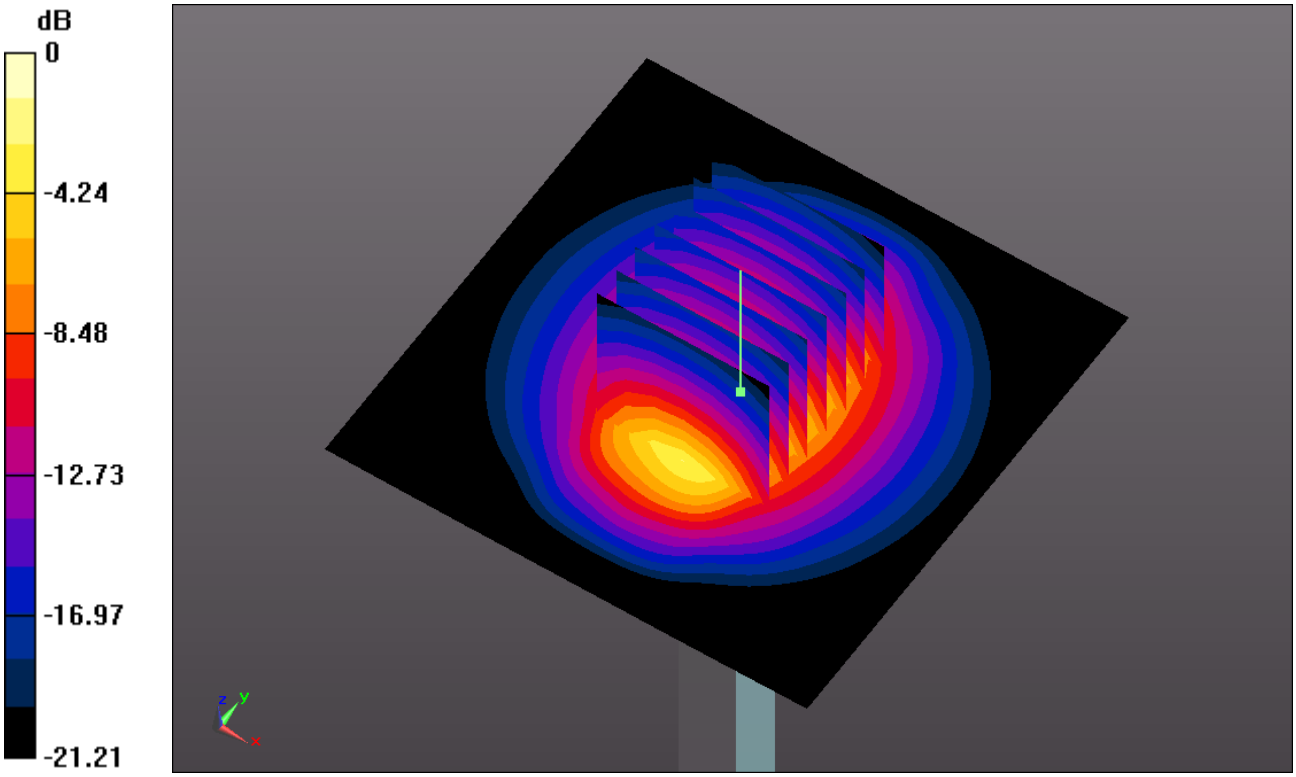
DUT: D2450V2 - SN:840

Communication System: CW; Frequency: 2450 MHz;Duty Cycle: 1:1
Medium: MSL_2450_150826 Medium parameters used: f = 2450 MHz; σ = 1.931 mho/m; ε_r = 51.252; ρ = 1000 kg/m^3
Ambient Temperature：23.6 ℃； Liquid Temperature：22.8 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3857; ConvF(7.29, 7.29, 7.29); Calibrated: 2015.05.28
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1210; Calibrated: 2015.05.21
- Phantom: SAM3; Type: SAM; Serial: TP-1079
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.4.5 (3634)

Pin=250mW/Area Scan (71x71x1): Measurement grid: dx=12mm, dy=12mm
Maximum value of SAR (interpolated) = 18.373 mW/g

Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 83.988 V/m; Power Drift = -0.19 dB
Peak SAR (extrapolated) = 24.112 W/kg
SAR(1 g) = 12 mW/g; SAR(10 g) = 5.63 mW/g
Maximum value of SAR (measured) = 18.198 mW/g



0 dB = 18.200mW/g

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2015/8/24

System Check_Body_2600MHz_150824

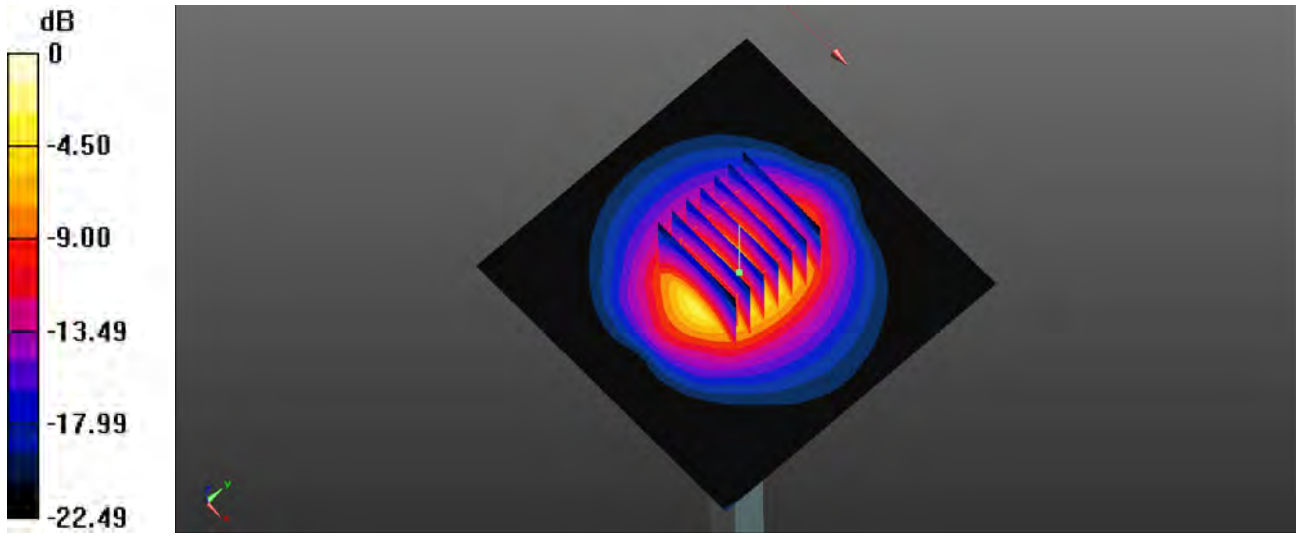
DUT: D2600V2-SN:1061

Communication System: UID 0, CW; Frequency: 2600 MHz;Duty Cycle: 1:1
Medium: MSL_2600_150824 Medium parameters used: f = 2600 MHz; σ = 2.189 S/m; ε_r = 51.328; ρ = 1000 kg/m^3
Ambient Temperature：23.5 ℃; Liquid Temperature ：22.5 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3911; ConvF(7.03, 7.03, 7.03); Calibrated: 2014/10/2;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn679; Calibrated: 2015/4/13
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1201
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Pin=250mW/Area Scan (81x81x1): Interpolated grid: dx=12mm, dy=12mm
Maximum value of SAR (interpolated) = 21.9 W/kg

Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 86.51 V/m; Power Drift = -0.13 dB
Peak SAR (extrapolated) = 30.3 W/kg
SAR(1 g) = 14.3 W/kg; SAR(10 g) = 6.4 W/kg
Maximum value of SAR (measured) = 22.3 W/kg



0 dB = 22.3 W/kg

Appendix B. Plots of High SAR Measurement

The plots are shown as follows.

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2015/8/29

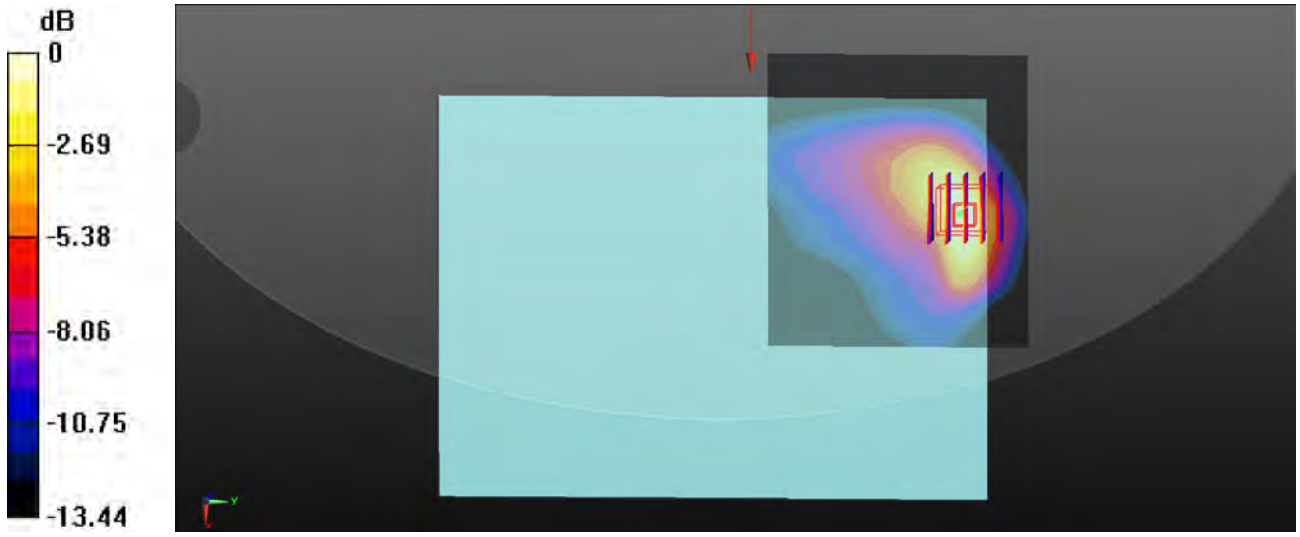
#01 GSM850_GPRS (GMSK 3 Tx slots)_Bottom Face_0cm_Ch189_Sensor on

Communication System: UID 0, GPRS/EDGE (GMSK 3 Tx slot) (0); Frequency: 836.4 MHz;Duty Cycle: 1:2.77
Medium: MSL_835_150823 Medium parameters used: f = 836.4 MHz; σ = 1.002 S/m; ε_r = 54.072; ρ = 1000 kg/m^3
Ambient Temperature：23.5 ℃; Liquid Temperature ：22.4 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3911; ConvF(9.66, 9.66, 9.66); Calibrated: 2014/10/2;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn679; Calibrated: 2015/4/13
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1201
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Ch189/Area Scan (91x81x1): Interpolated grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 1.47 W/kg

Ch189/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 0.8850 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 1.80 W/kg
SAR(1 g) = 1.03 W/kg; SAR(10 g) = 0.600 W/kg
Maximum value of SAR (measured) = 1.44 W/kg



0 dB = 1.44 W/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2015/8/27

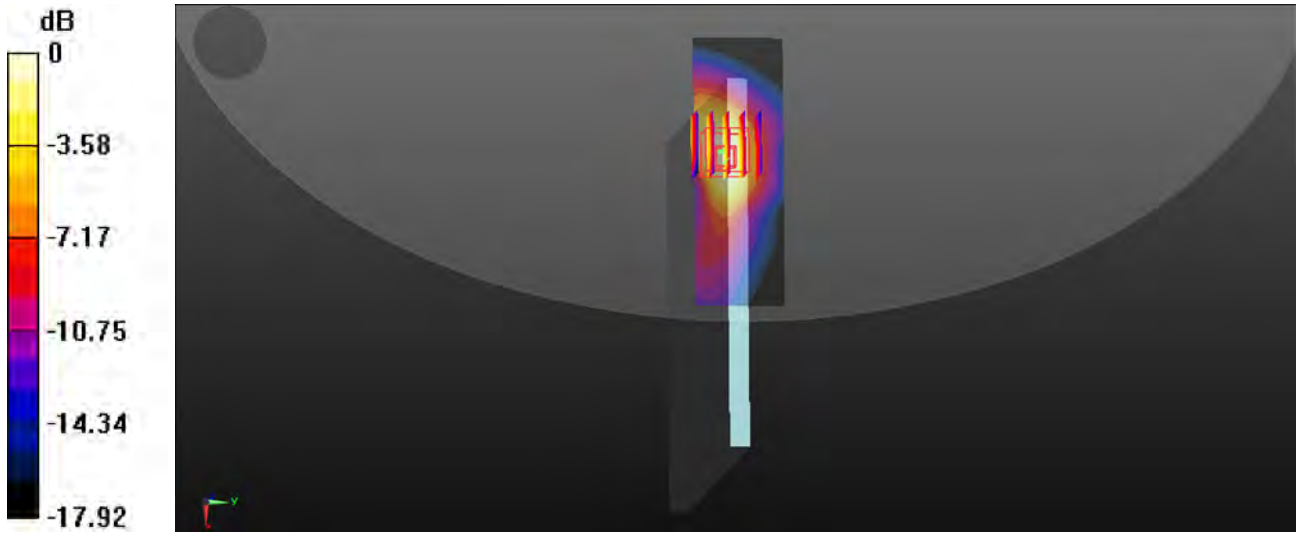
#02 GSM1900_GPRS (GMSK 3 Tx slots)_Bottom Face Edge 1 35 Degree_1.0cm_Ch810_Sensor off

Communication System: UID 0, GPRS/EDGE (GMSK 3 Tx slot) (0); Frequency: 1909.8 MHz;Duty Cycle: 1:2.77
Medium: MSL_1900_150827 Medium parameters used: f = 1909.8 MHz; σ = 1.554 S/m; ε_r = 55.263; ρ = 1000 kg/m^3
Ambient Temperature：23.3 ℃; Liquid Temperature ：22.2 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3911; ConvF(7.57, 7.57, 7.57); Calibrated: 2014/10/2;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn679; Calibrated: 2015/4/13
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1201
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Ch810/Area Scan (91x31x1): Interpolated grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 1.55 W/kg

Ch810/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 0.7520 V/m; Power Drift = 0.05 dB
Peak SAR (extrapolated) = 1.74 W/kg
SAR(1 g) = 1.13 W/kg; SAR(10 g) = 0.637 W/kg
Maximum value of SAR (measured) = 1.45 W/kg



0 dB = 1.45 W/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2015/8/29

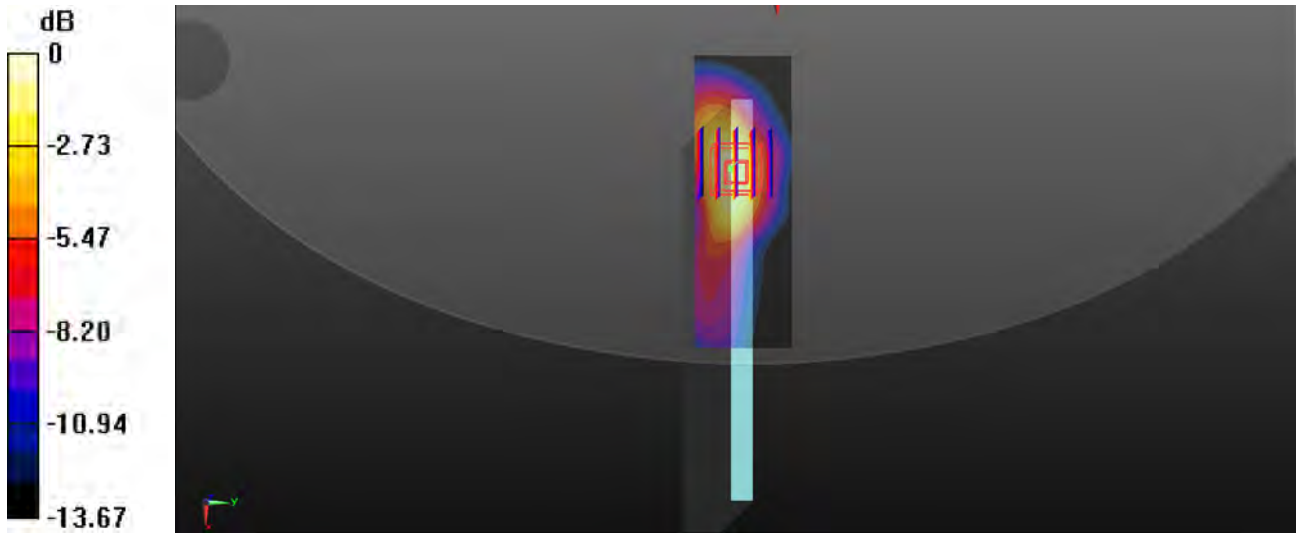
#03 WCDMA Band V_RMC 12.2Kbps_Bottom Face Edge 1 35 Degree_0cm_Ch4233_Sensor on

Communication System: UID 0, WCDMA (0); Frequency: 846.6 MHz;Duty Cycle: 1:1
Medium: MSL_835_150829 Medium parameters used: f = 846.6 MHz; σ = 1.015 S/m; ε_r = 53.97; ρ = 1000 kg/m^3
Ambient Temperature：23.5 ℃; Liquid Temperature ：22.4 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3911; ConvF(9.66, 9.66, 9.66); Calibrated: 2014/10/2;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn679; Calibrated: 2015/4/13
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1201
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Ch4233/Area Scan (91x31x1): Interpolated grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 1.57 W/kg

Ch4233/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 2.485 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 2.19 W/kg
SAR(1 g) = 1.23 W/kg; SAR(10 g) = 0.670 W/kg
Maximum value of SAR (measured) = 1.75 W/kg



0 dB = 1.75 W/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2015/8/28

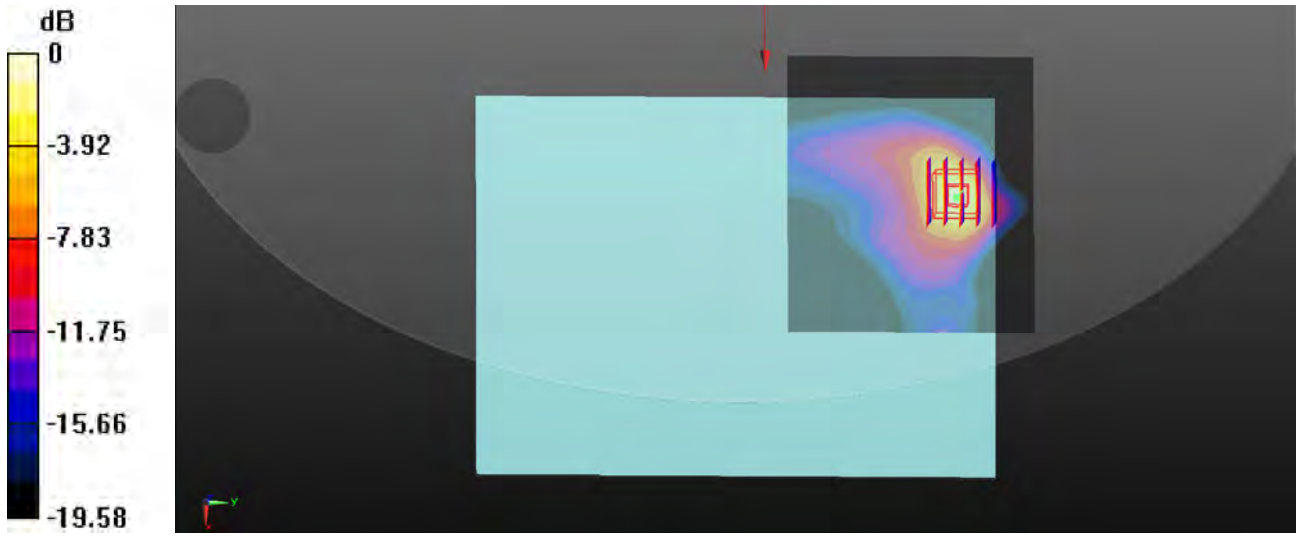
#04 WCDMA Band IV_RMC 12.2Kbps_Bottom Face_0cm_Ch1312_Sensor on

Communication System: UID 0, WCDMA (0); Frequency: 1712.4 MHz;Duty Cycle: 1:1
Medium: MSL_1750_150828 Medium parameters used: f = 1712.4 MHz; σ = 1.44 S/m; ε_r = 53.657; ρ = 1000 kg/m^3
Ambient Temperature：23.4 ℃; Liquid Temperature ：22.6 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3911; ConvF(7.93, 7.93, 7.93); Calibrated: 2014/10/2;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn679; Calibrated: 2015/4/13
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1201
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Ch1312/Area Scan (91x81x1): Interpolated grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 1.64 W/kg

Ch1312/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 0 V/m; Power Drift = 0.09 dB
Peak SAR (extrapolated) = 2.51 W/kg
SAR(1 g) = 1.19 W/kg; SAR(10 g) = 0.556 W/kg
Maximum value of SAR (measured) = 1.96 W/kg



0 dB = 1.96 W/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2015/8/27

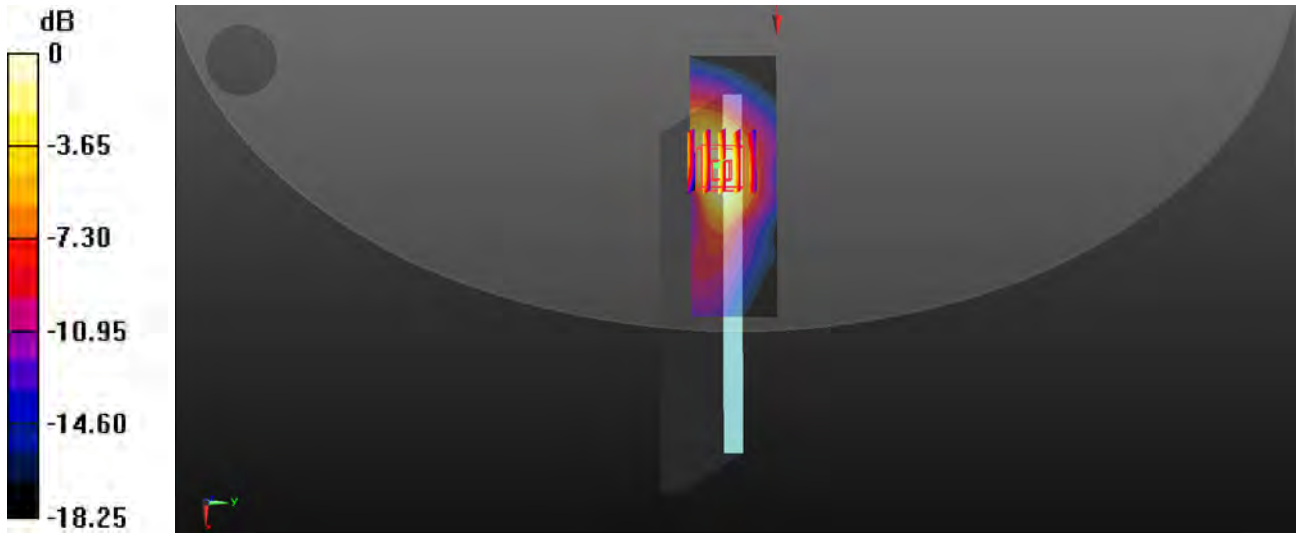
#05 WCDMA Band II_RMC 12.2Kbps_Bottom Face Edge 1 35 Degree_1.0cm_Ch9538_Sensor off

Communication System: UID 0, WCDMA (0); Frequency: 1907.6 MHz;Duty Cycle: 1:1
Medium: MSL_1900_150827 Medium parameters used: f = 1907.6 MHz; σ = 1.552 S/m; ε_r = 55.278; ρ = 1000 kg/m^3
Ambient Temperature：23.3 ℃; Liquid Temperature ：22.2 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3911; ConvF(7.57, 7.57, 7.57); Calibrated: 2014/10/2;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn679; Calibrated: 2015/4/13
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1201
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Ch9538/Area Scan (91x31x1): Interpolated grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 1.69 W/kg

Ch9538/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 0.9260 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 1.91 W/kg
SAR(1 g) = 1.15 W/kg; SAR(10 g) = 0.709 W/kg
Maximum value of SAR (measured) = 1.58 W/kg



0 dB = 1.58 W/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2015/8/29

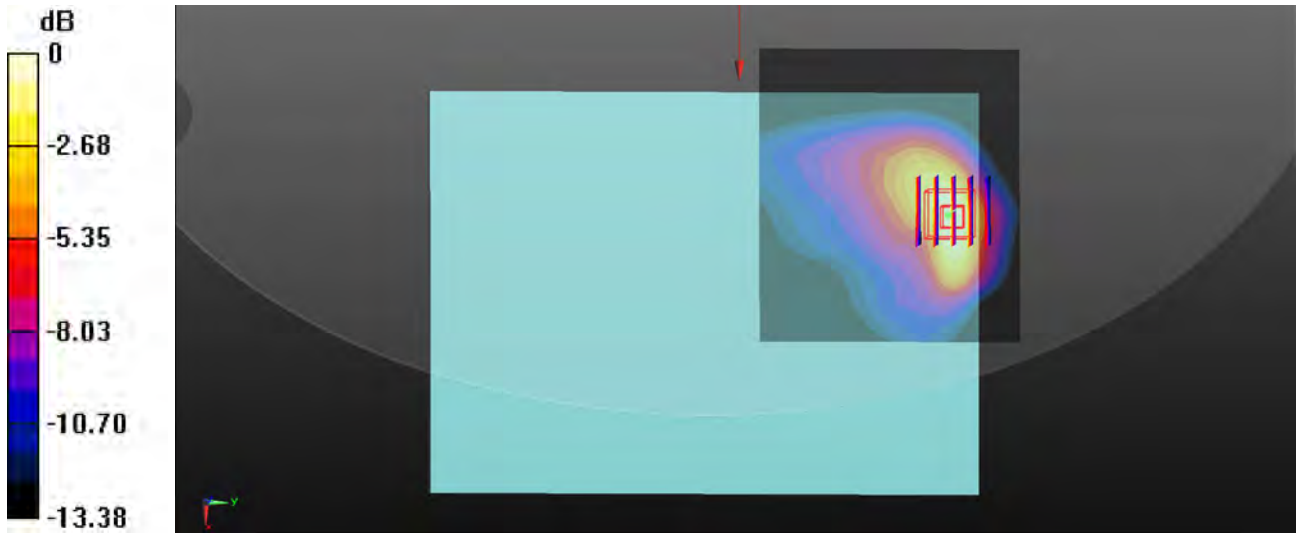
#06 LTE Band 5_QPSK_10M(1,24)_Bottom Face_0cm_Ch20600_Sensor on

Communication System: UID 0, FDD-LTE (0); Frequency: 844 MHz;Duty Cycle: 1:1
Medium: MSL_835_150829 Medium parameters used: f = 844 MHz; σ = 1.012 S/m; ε_r = 53.995; ρ = 1000 kg/m^3
Ambient Temperature：23.5 ℃; Liquid Temperature ：22.4 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3911; ConvF(9.66, 9.66, 9.66); Calibrated: 2014/10/2;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn679; Calibrated: 2015/4/13
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1201
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Ch20600/Area Scan (91x81x1): Interpolated grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 1.80 W/kg

Ch20600/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 1.317 V/m; Power Drift = 0.09 dB
Peak SAR (extrapolated) = 2.12 W/kg
SAR(1 g) = 1.24 W/kg; SAR(10 g) = 0.716 W/kg
Maximum value of SAR (measured) = 1.72 W/kg



0 dB = 1.72 W/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2015/8/28

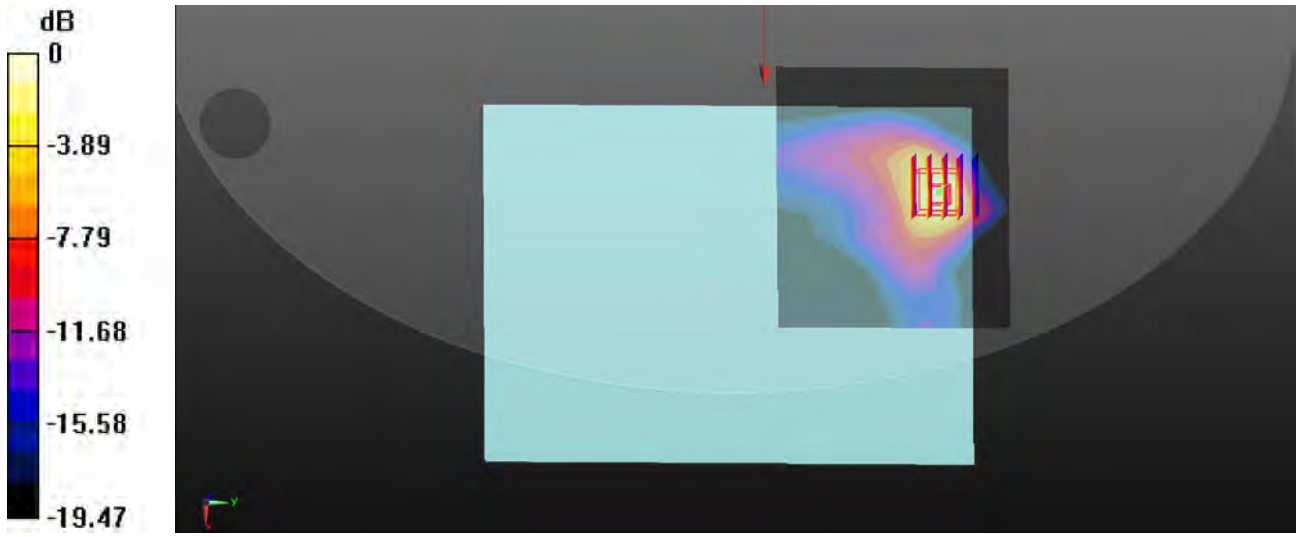
#07 LTE Band 4_QPSK_20M(1,0)_Bottom Face_0cm_Ch20050_Sensor on

Communication System: UID 0, FDD-LTE (0); Frequency: 1720 MHz;Duty Cycle: 1:1
Medium: MSL_1750_150828 Medium parameters used: f = 1720 MHz; σ = 1.447 S/m; ε_r = 53.618; ρ = 1000 kg/m^3
Ambient Temperature：23.4 ℃; Liquid Temperature ：22.6 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3911; ConvF(7.93, 7.93, 7.93); Calibrated: 2014/10/2;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn679; Calibrated: 2015/4/13
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1201
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Ch20050/Area Scan (91x81x1): Interpolated grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 1.28 W/kg

Ch20050/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 0.1540 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 1.84 W/kg
SAR(1 g) = 0.914 W/kg; SAR(10 g) = 0.438 W/kg
Maximum value of SAR (measured) = 1.38 W/kg



0 dB = 1.38 W/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2015/8/24

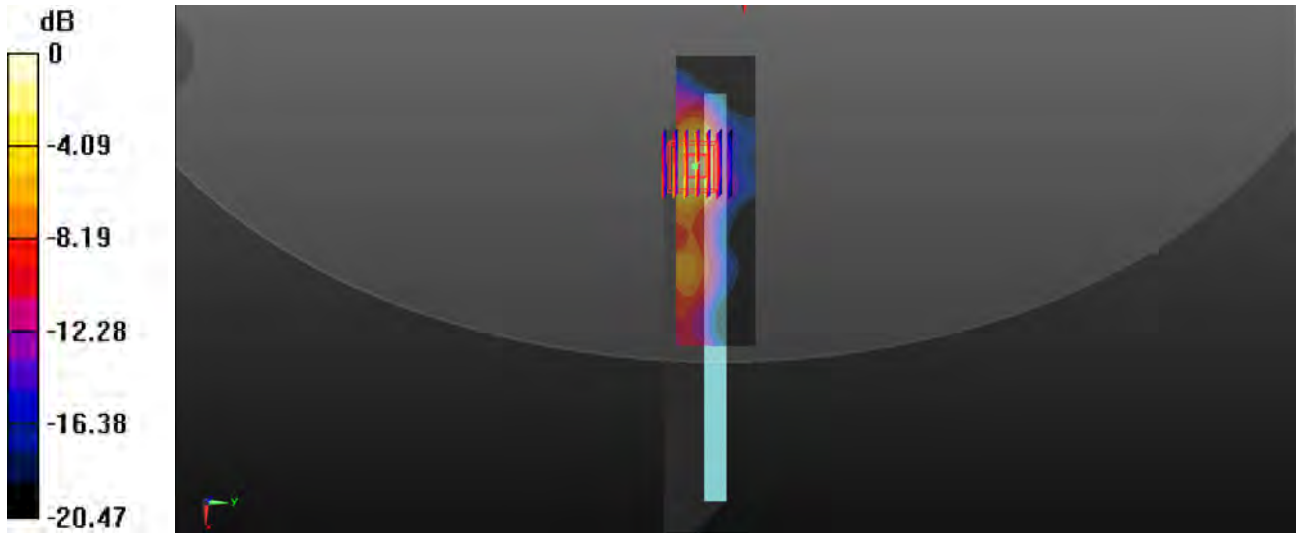
#08 LTE Band 7_QPSK_20M(1,0)_Bottom Face Edge 1 35 Degree_0cm_Ch21100_Sensor on

Communication System: UID 0, FDD-LTE (0); Frequency: 2535 MHz;Duty Cycle: 1:1
Medium: MSL_2600_150824 Medium parameters used: f = 2535 MHz; σ = 2.096 S/m; ε_r = 51.59; ρ = 1000 kg/m^3
Ambient Temperature：23.5 ℃; Liquid Temperature ：22.5 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3911; ConvF(7.03, 7.03, 7.03); Calibrated: 2014/10/2;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn679; Calibrated: 2015/4/13
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1201
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Ch21100/Area Scan (111x31x1): Interpolated grid: dx=12mm, dy=12mm
Maximum value of SAR (interpolated) = 1.66 W/kg

Ch21100/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 1.216 V/m; Power Drift = 0.06 dB
Peak SAR (extrapolated) = 2.24 W/kg
SAR(1 g) = 1.09 W/kg; SAR(10 g) = 0.476 W/kg
Maximum value of SAR (measured) = 1.75 W/kg



0 dB = 1.75 W/kg

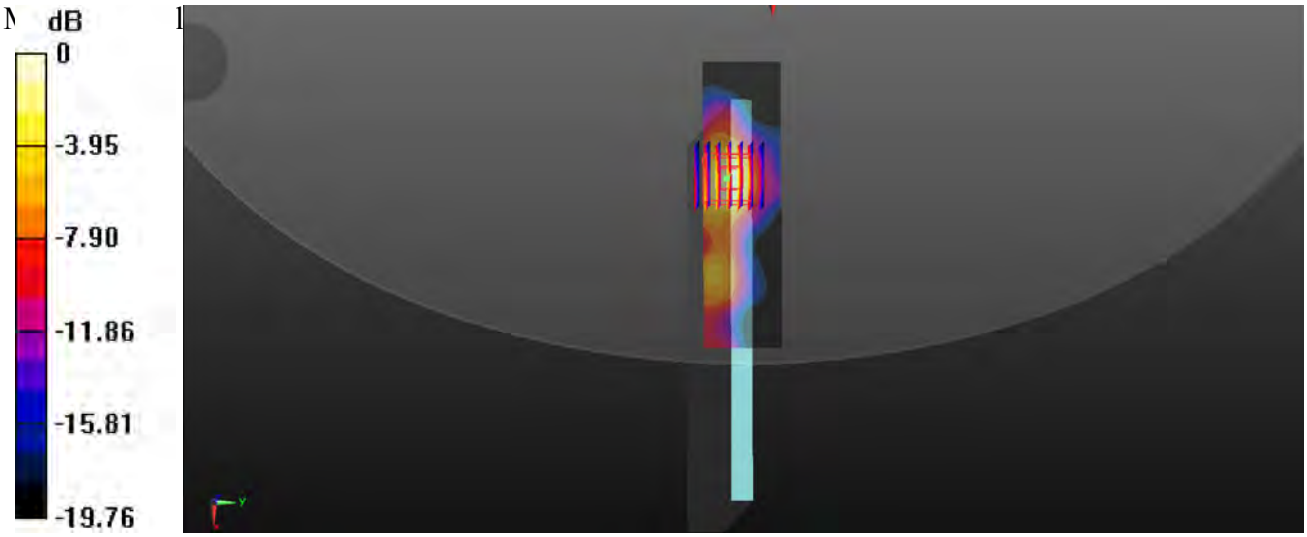
#09 LTE Band 38_QPSK_20M(50,0)_Bottom Face Edge 1 35 Degree_0cm_Ch37850_Sensor on

Communication System: UID 0, TDD-LTE (0); Frequency: 2580 MHz;Duty Cycle: 1:1.59
Medium: MSL_2600_150824 Medium parameters used: f = 2580 MHz; σ = 2.16 S/m; ε_r = 51.407; ρ = 1000 kg/m^3
Ambient Temperature：23.5 ℃; Liquid Temperature ：22.5 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3911; ConvF(7.03, 7.03, 7.03); Calibrated: 2014/10/2;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn679; Calibrated: 2015/4/13
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1201
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Ch37850/Area Scan (111x31x1): Interpolated grid: dx=12mm, dy=12mm
Maximum value of SAR (interpolated) = 1.82 W/kg

Ch37850/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 1.049 V/m; Power Drift = 0.13 dB
Peak SAR (extrapolated) = 2.22 W/kg
SAR(1 g) = 1.09 W/kg; SAR(10 g) = 0.475 W/kg



0 dB = 1.61 W/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2015/8/24

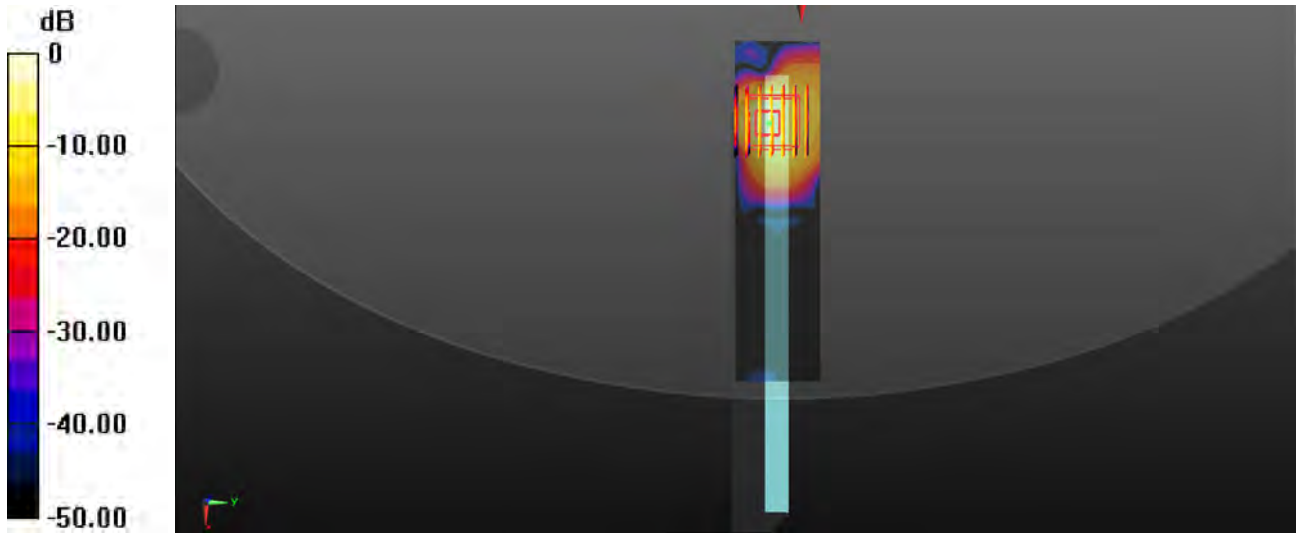
#10 WLAN2.4GHz_802.11b 1Mbps_Bottom Face Edge 3 40 Degree_0cm_Ch1

Communication System: UID 0, 802.11b (0); Frequency: 2412 MHz;Duty Cycle: 1:1.026
Medium: MSL_2450_150824 Medium parameters used: f = 2412 MHz; σ = 1.877 S/m; ε_r = 54.002; ρ = 1000 kg/m^3
Ambient Temperature：23.5 ℃; Liquid Temperature ：22.5 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3911; ConvF(7.18, 7.18, 7.18); Calibrated: 2014/10/2;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn679; Calibrated: 2015/4/13
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1201
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Ch1/Area Scan (121x31x1): Interpolated grid: dx=12mm, dy=12mm
Maximum value of SAR (interpolated) = 0.656 W/kg

Ch1/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 0 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 0.903 W/kg
SAR(1 g) = 0.318 W/kg; SAR(10 g) = 0.105 W/kg
Maximum value of SAR (measured) = 0.630 W/kg



0 dB = 0.630 W/kg

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab Date: 2015/8/26

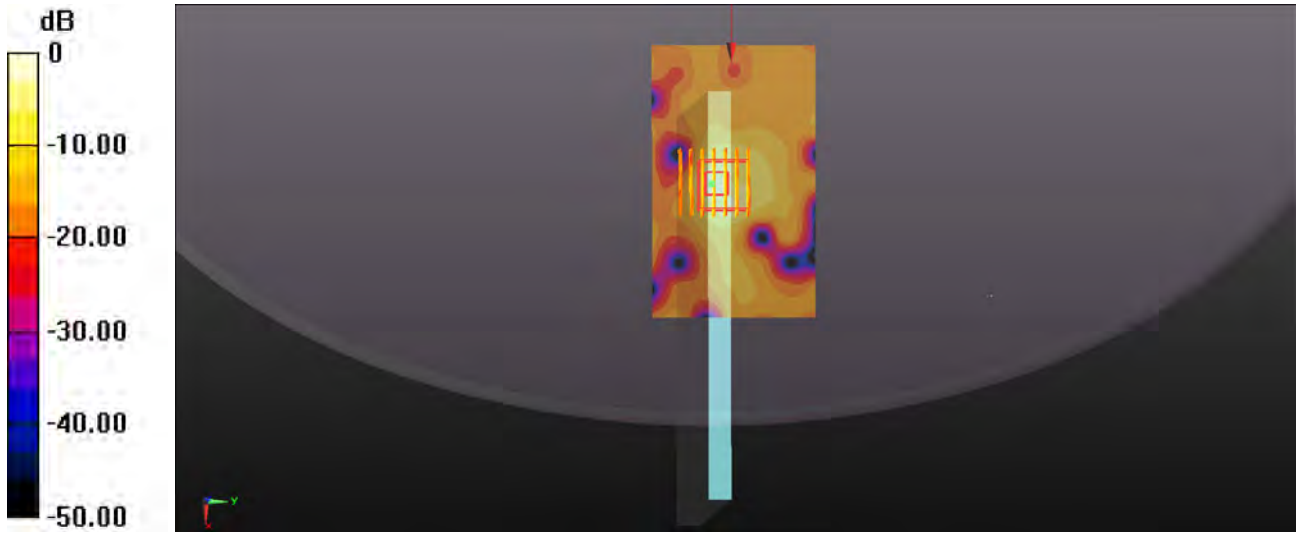
#11 Bluetooth_1Mbps_DH5_Bottom Face Curved surface of Edge3 Tited40 0cm_Ch39

Communication System: UID 0, Bluetooth (0); Frequency: 2441 MHz;Duty Cycle: 1:1.27
Medium: MSL_2450_150826 Medium parameters used: f = 2441 MHz; σ = 1.919 S/m; ε_r = 51.292; ρ = 1000 kg/m^3
Ambient Temperature：23.6 ℃; Liquid Temperature ：22.8 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3857; ConvF(7.29, 7.29, 7.29); Calibrated: 2015/5/28;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1210; Calibrated: 2015/5/21
- Phantom: SAM3; Type: SAM; Serial: TP-1079
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Ch39/Area Scan (101x61x1): Interpolated grid: dx=12mm, dy=12mm
Maximum value of SAR (interpolated) = 0.0858 W/kg

Ch39/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 1.091 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 0.222 W/kg
SAR(1 g) = 0.062 W/kg; SAR(10 g) = 0.019 W/kg
Maximum value of SAR (measured) = 0.114 W/kg



0 dB = 0.114 W/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-CN (Auden)**

Certificate No: D835V2-4d091_Nov14

CALIBRATION CERTIFICATE

Object	D835V2 - SN: 4d091
Calibration procedure(s)	QA CAL-05.v9 Calibration procedure for dipole validation kits above 700 MHz
Calibration date:	November 21, 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 21, 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	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	41.2 ± 6 %	0.91 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	2.30 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**9.11 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.50 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**5.95 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	54.5 ± 6 %	1.01 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	2.48 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**9.60 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	1.62 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**6.31 W/kg ± 16.5 % (k=2)**

Appendix (Additional assessments outside the scope of SCS108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	51.7 Ω - 1.8 jΩ
Return Loss	- 32.2 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	46.7 Ω - 4.2 jΩ
Return Loss	- 25.2 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.394 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 15, 2009

DASY5 Validation Report for Head TSL

Date: 19.11.2014

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 4d091

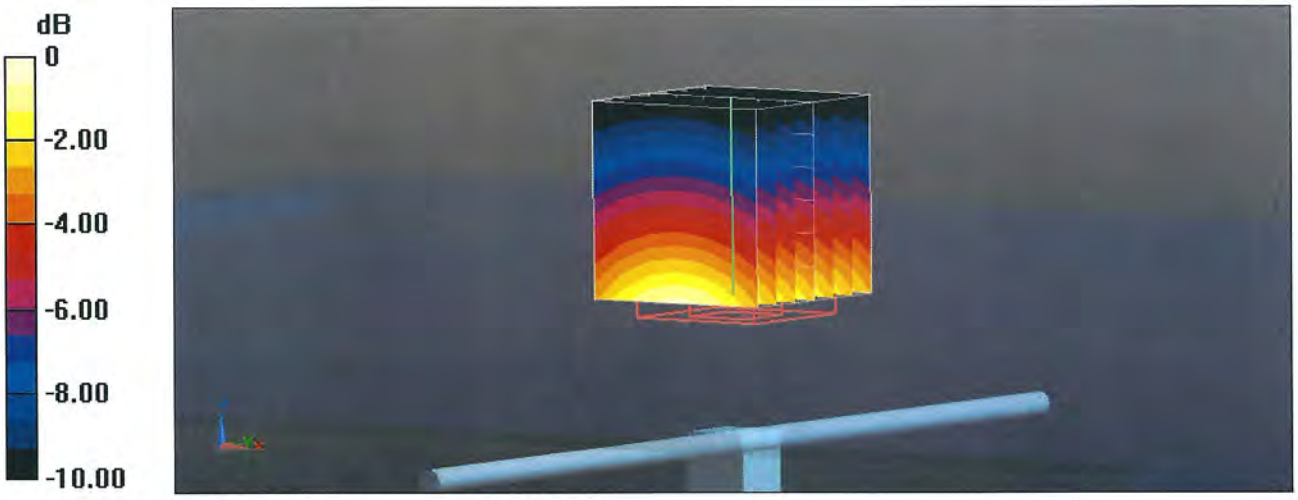
Communication System: UID 0 - CW; Frequency: 835 MHz
Medium parameters used: f = 835 MHz; σ = 0.91 S/m; ε_r = 41.2; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(6.22, 6.22, 6.22); 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)

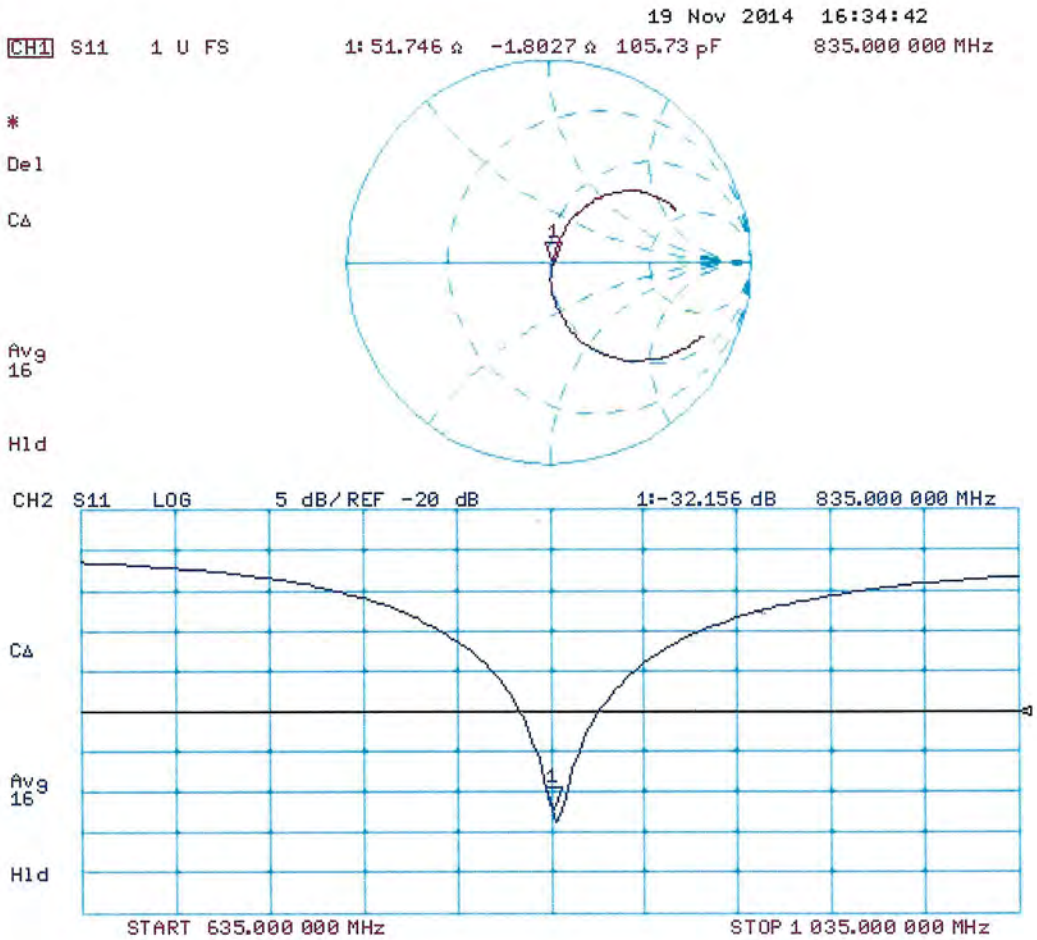
Dipole Calibration for Head Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 56.46 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 3.43 W/kg
SAR(1 g) = 2.3 W/kg; SAR(10 g) = 1.5 W/kg
Maximum value of SAR (measured) = 2.69 W/kg



0 dB = 2.69 W/kg = 4.30 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 21.11.2014

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 4d091

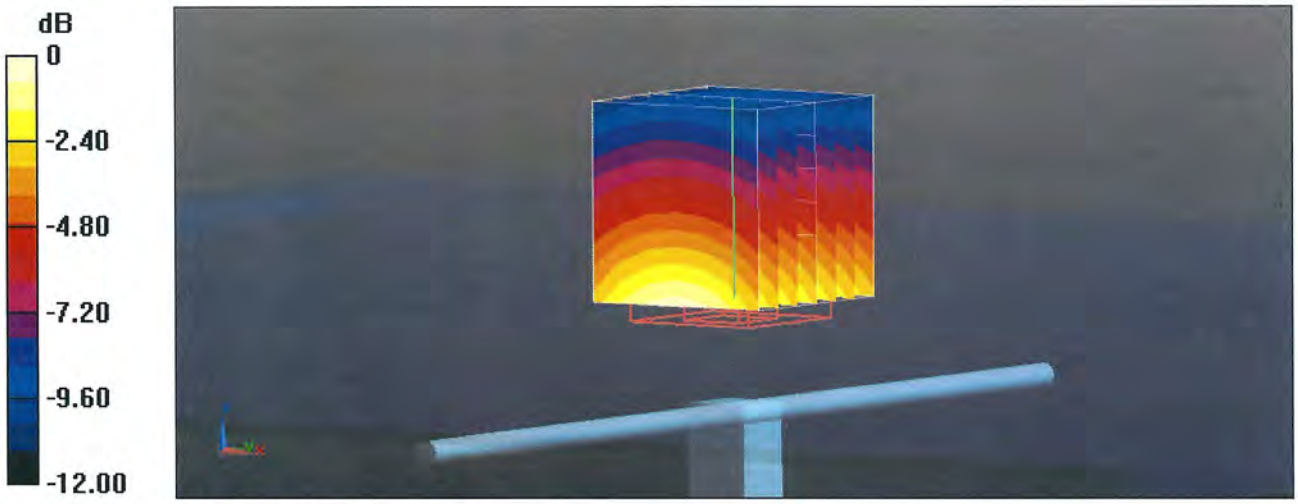
Communication System: UID 0 - CW; Frequency: 835 MHz
Medium parameters used: f = 835 MHz; σ = 1.01 S/m; ε_r = 54.5; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(6.09, 6.09, 6.09); 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)

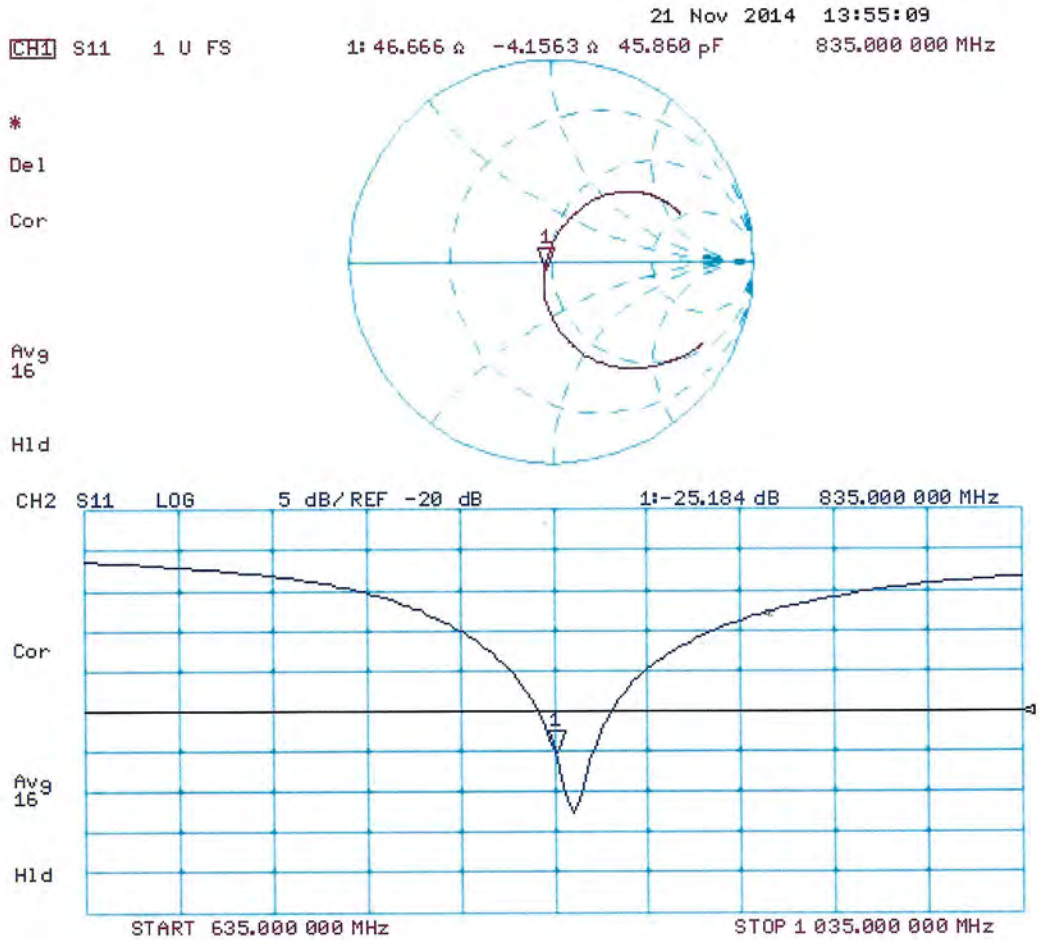
Dipole Calibration for Body Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 55.36 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 3.64 W/kg
SAR(1 g) = 2.48 W/kg; SAR(10 g) = 1.62 W/kg
Maximum value of SAR (measured) = 2.89 W/kg



0 dB = 2.89 W/kg = 4.61 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 108

Client **Sporton-CN (Auden)**

Certificate No: D1750V2-1069_Nov14

CALIBRATION CERTIFICATE

Object	D1750V2 - SN: 1069
Calibration procedure(s)	QA CAL-05.v9 Calibration procedure for dipole validation kits above 700 MHz
Calibration date:	November 21, 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 21, 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	9.36 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**37.1 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	4.97 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**19.8 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	9.62 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**38.1 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.16 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**20.5 W/kg ± 16.5 % (k=2)**

Appendix (Additional assessments outside the scope of SCS108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	51.4 Ω + 1.3 jΩ
Return Loss	- 34.6 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	46.8 Ω + 1.7 jΩ
Return Loss	- 28.6 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.217 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: 21.11.2014

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1750 MHz; Type: D1750V2; Serial: D1750V2 - SN: 1069

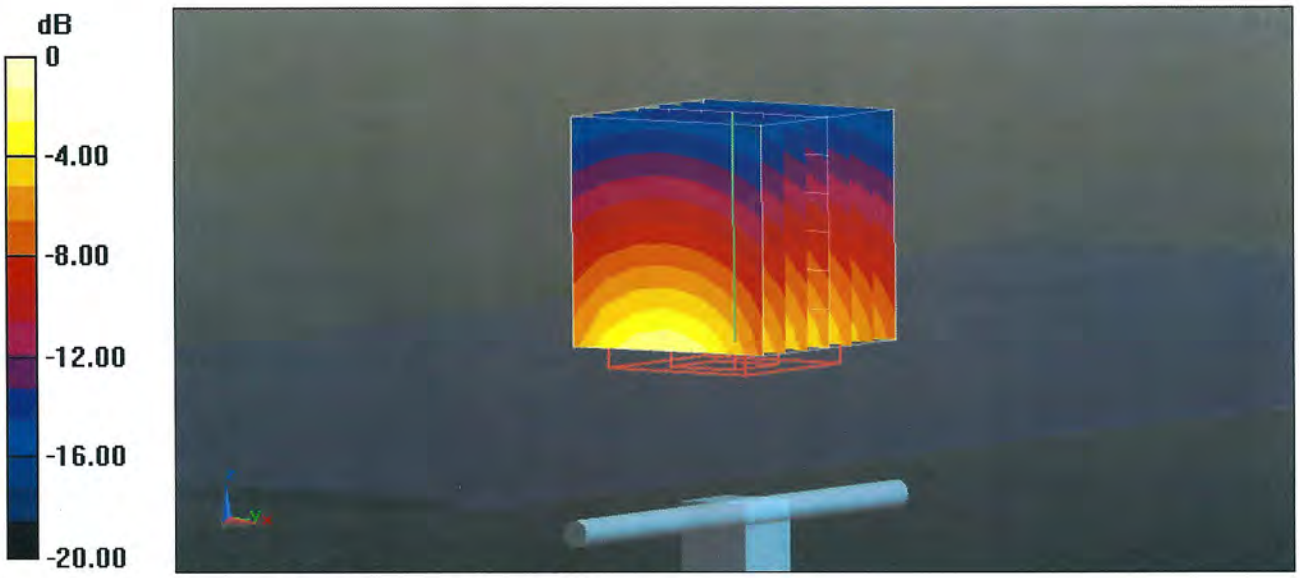
Communication System: UID 0 - CW; Frequency: 1750 MHz
Medium parameters used: f = 1750 MHz; σ = 1.38 S/m; ε_r = 39.4; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

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)

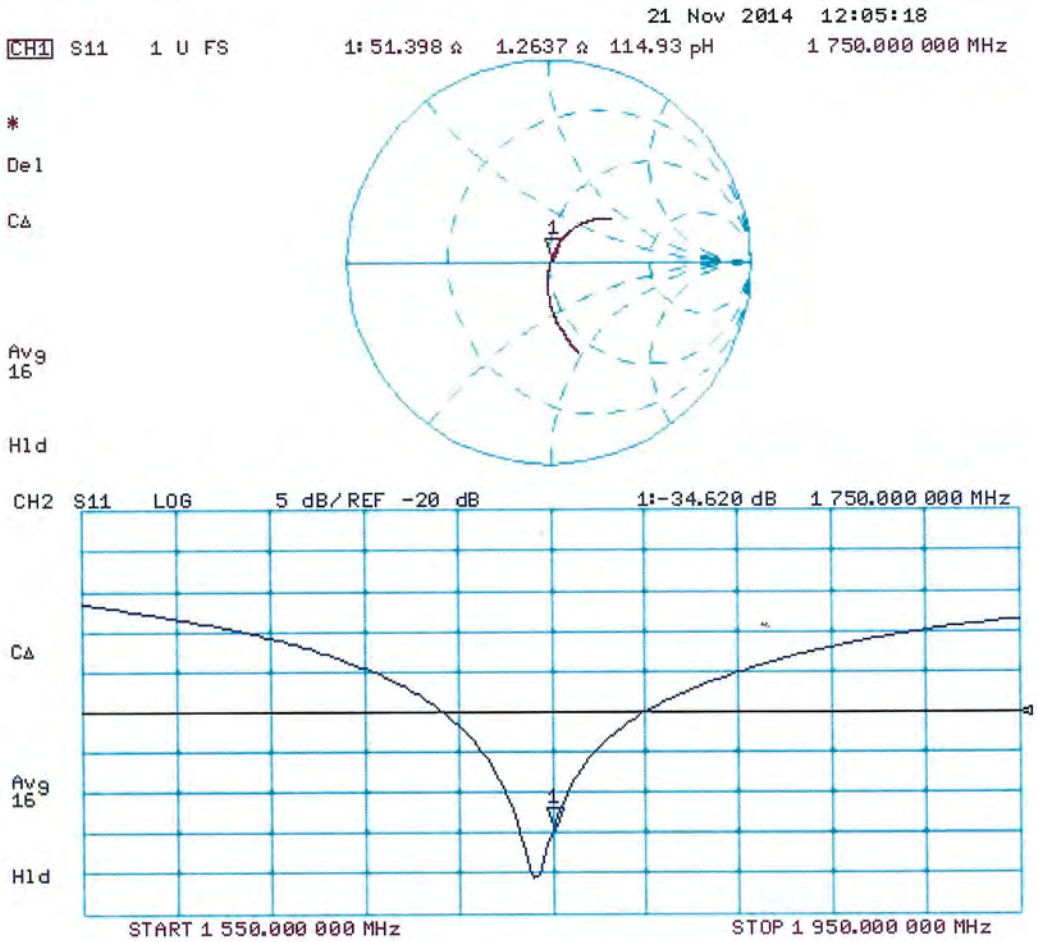
Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 95.69 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 16.8 W/kg
SAR(1 g) = 9.36 W/kg; SAR(10 g) = 4.97 W/kg
Maximum value of SAR (measured) = 11.8 W/kg



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

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 21.11.2014

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1750 MHz; Type: D1750V2; Serial: D1750V2 - SN: 1069

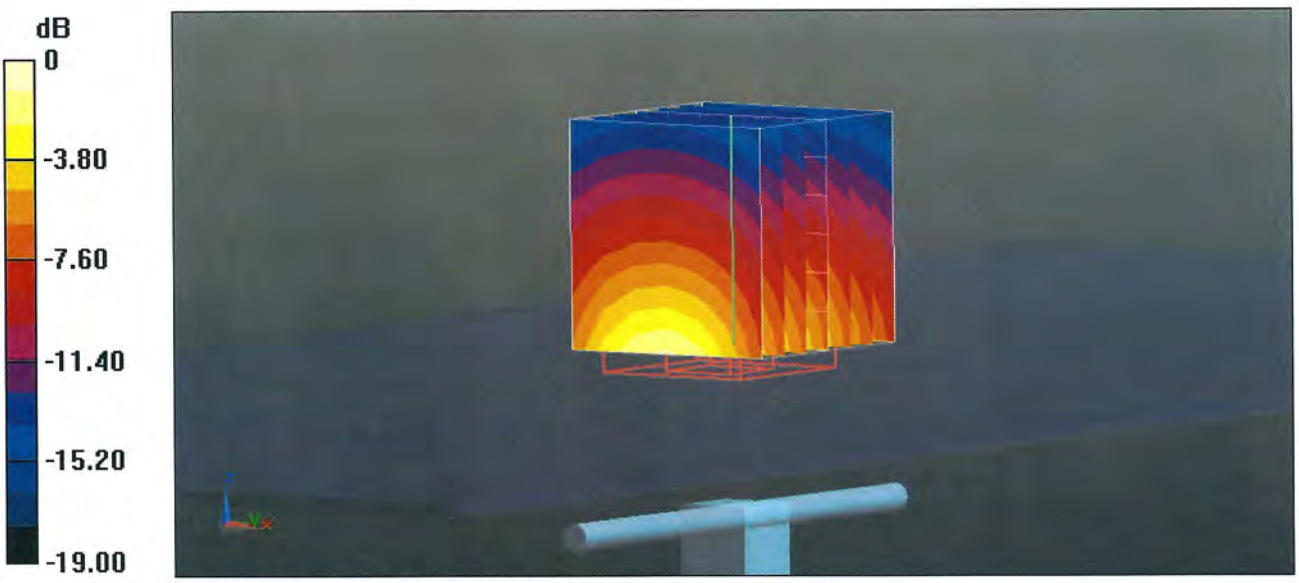
Communication System: UID 0 - CW; Frequency: 1750 MHz
Medium parameters used: f = 1750 MHz; σ = 1.5 S/m; ε_r = 52.2; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

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)

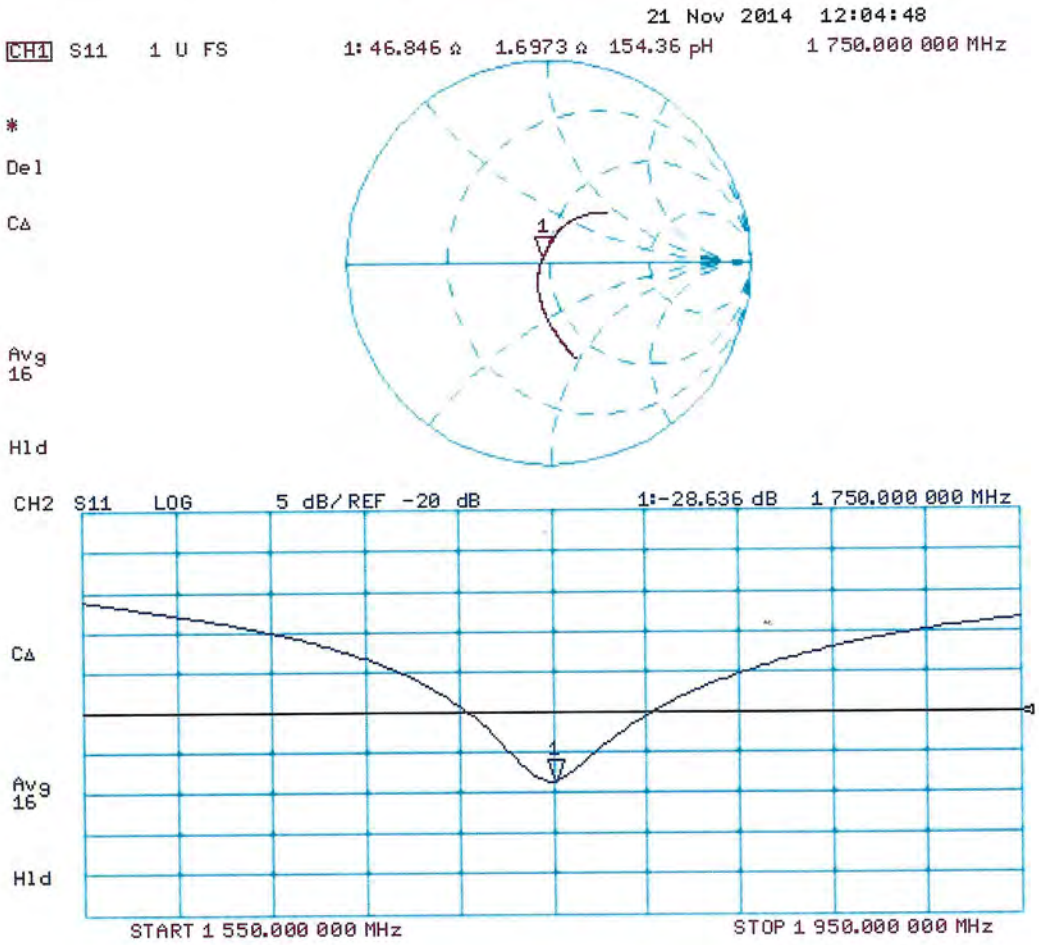
Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 93.56 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 16.6 W/kg
SAR(1 g) = 9.62 W/kg; SAR(10 g) = 5.16 W/kg
Maximum value of SAR (measured) = 12.0 W/kg



0 dB = 12.0 W/kg = 10.79 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 108

Client **Sporton-CN (Auden)**

Certificate No: D1900V2-5d118_Nov14

CALIBRATION CERTIFICATE

Object	D1900V2 - SN: 5d118
Calibration procedure(s)	QA CAL-05.v9 Calibration procedure for dipole validation kits above 700 MHz
Calibration date:	November 21, 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 21, 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	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	40.1 ± 6 %	1.39 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	9.97 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**40.1 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	5.24 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**21.0 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	53.3 ± 6 %	1.52 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	10.0 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**40.0 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.34 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**21.4 W/kg ± 16.5 % (k=2)**

Appendix (Additional assessments outside the scope of SCS108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	52.3 Ω + 6.8 jΩ
Return Loss	- 23.1 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	47.5 Ω + 7.1 jΩ
Return Loss	- 22.3 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	August 21, 2009

DASY5 Validation Report for Head TSL

Date: 21.11.2014

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN: 5d118

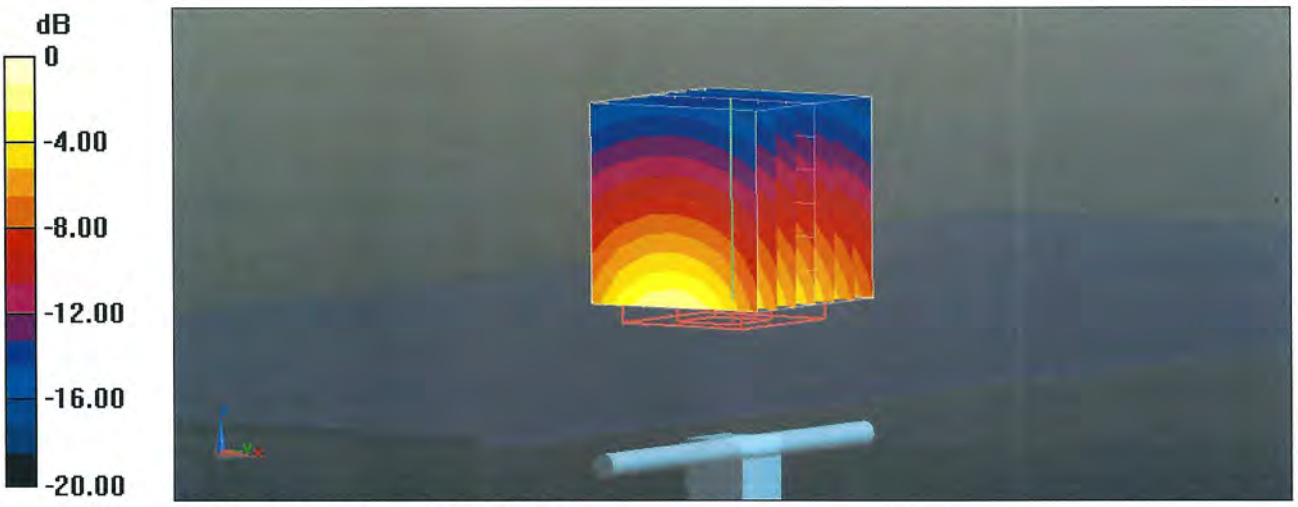
Communication System: UID 0 - CW; Frequency: 1900 MHz
Medium parameters used: f = 1900 MHz; σ = 1.39 S/m; ε_r = 40.1; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(5.06, 5.06, 5.06); 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)

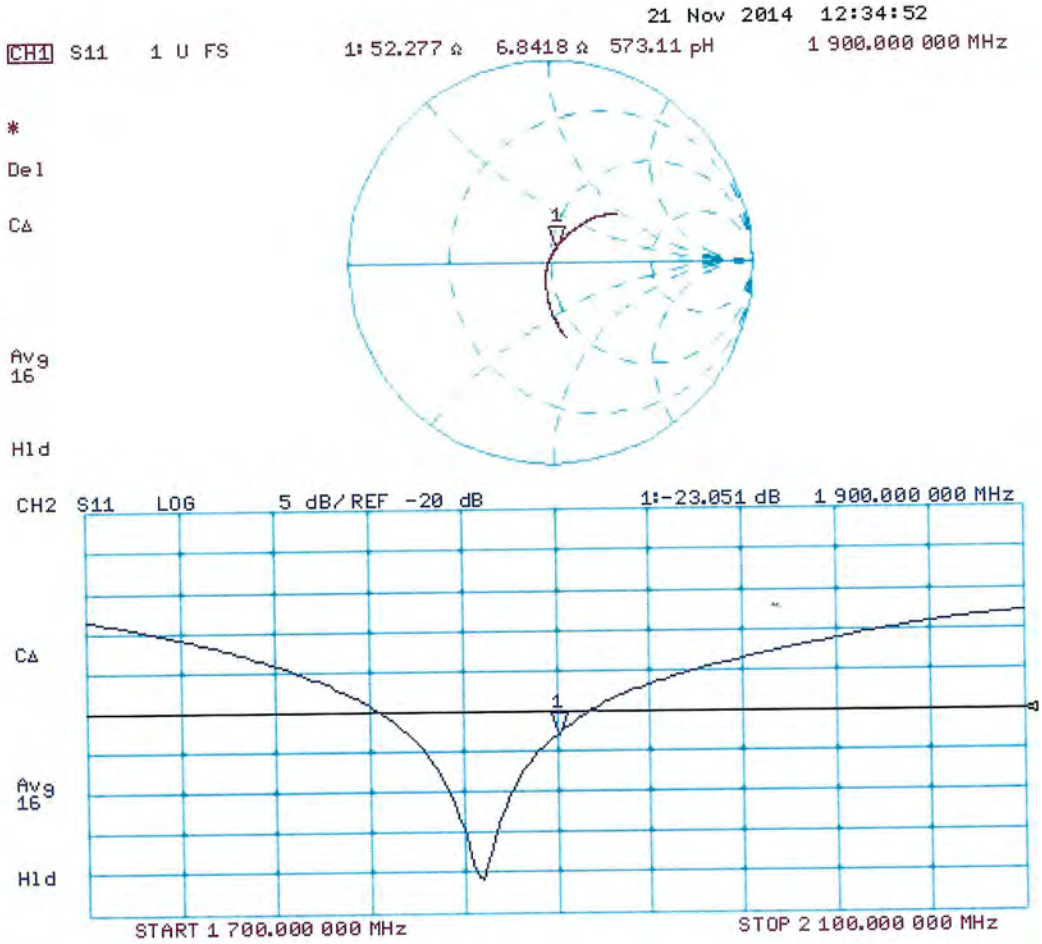
Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 98.04 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 18.2 W/kg
SAR(1 g) = 9.97 W/kg; SAR(10 g) = 5.24 W/kg
Maximum value of SAR (measured) = 12.6 W/kg



0 dB = 12.6 W/kg = 11.00 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 21.11.2014

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN: 5d118

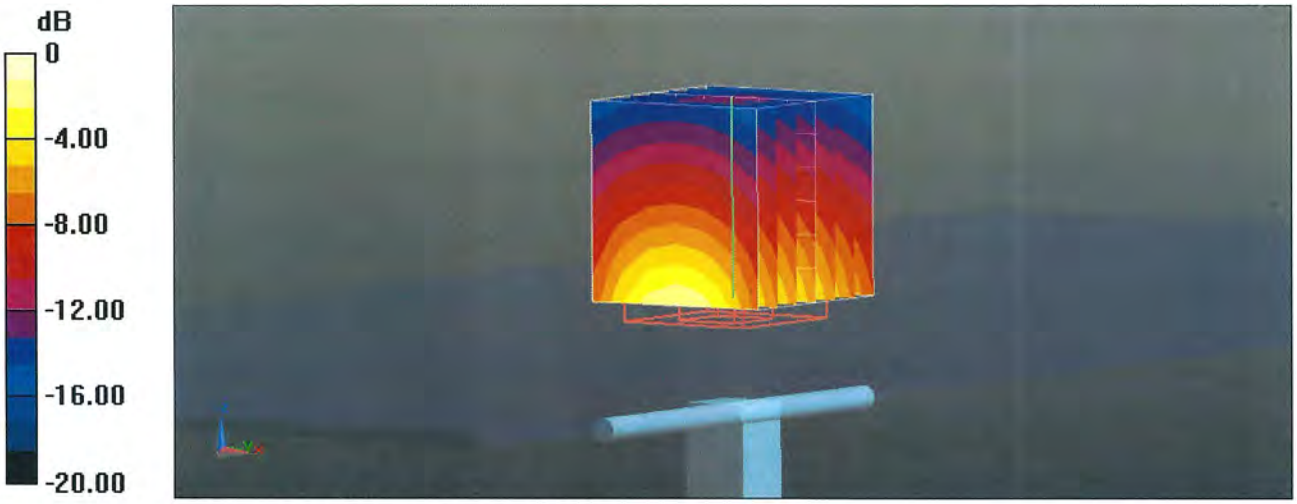
Communication System: UID 0 - CW; Frequency: 1900 MHz
Medium parameters used: f = 1900 MHz; σ = 1.52 S/m; ε_r = 53.3; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.76, 4.76, 4.76); 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)

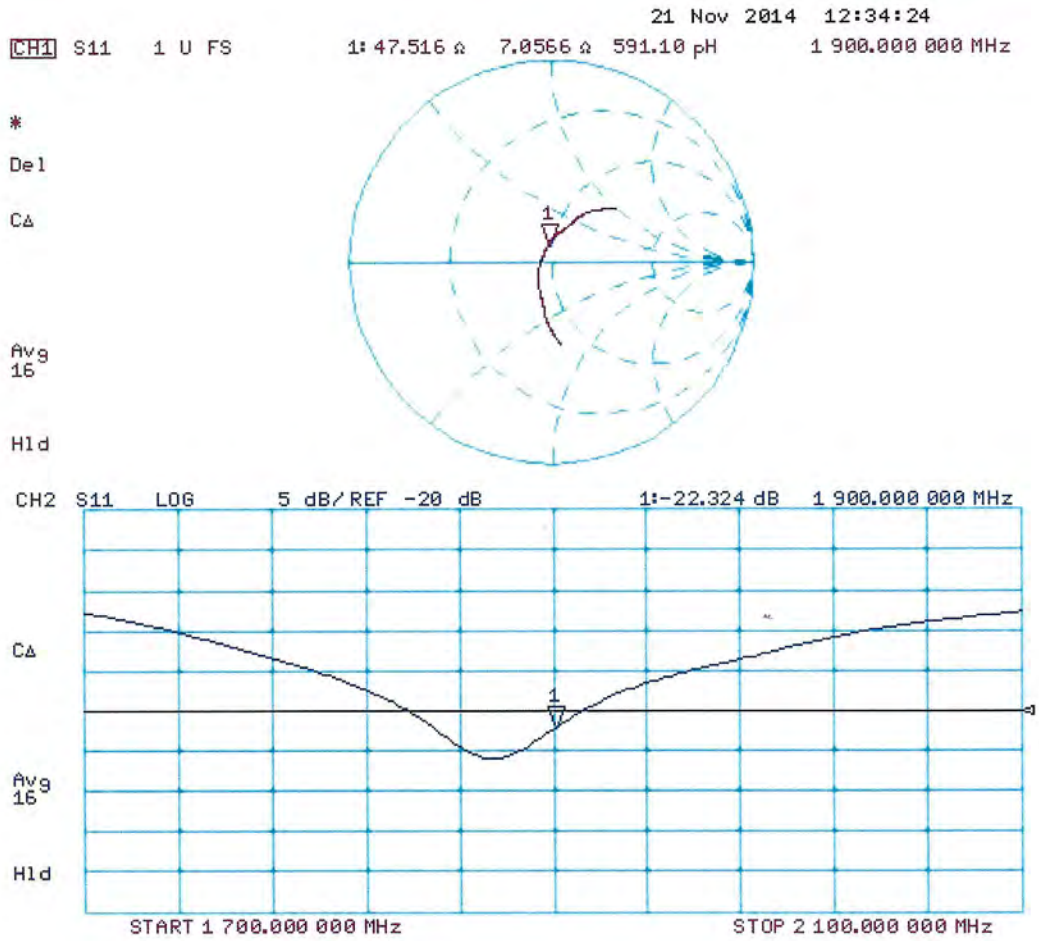
Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 95.09 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 17.5 W/kg
SAR(1 g) = 10 W/kg; SAR(10 g) = 5.34 W/kg
Maximum value of SAR (measured) = 12.7 W/kg



0 dB = 12.7 W/kg = 11.04 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 108

Client **Sporton-CN (Auden)**

Certificate No: D2450V2-840_Nov14

CALIBRATION CERTIFICATE

Object	D2450V2 - SN: 840
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:	Jeton Kastrati	Laboratory Technician	
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	13.3 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**52.3 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	6.21 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**24.6 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	13.1 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**51.0 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	6.00 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**23.6 W/kg ± 16.5 % (k=2)**

Appendix (Additional assessments outside the scope of SCS108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	54.7 Ω + 2.8 jΩ
Return Loss	- 25.6 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	50.9 Ω + 4.4 jΩ
Return Loss	- 27.0 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.162 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 20, 2009

DASY5 Validation Report for Head TSL

Date: 19.11.2014

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 840

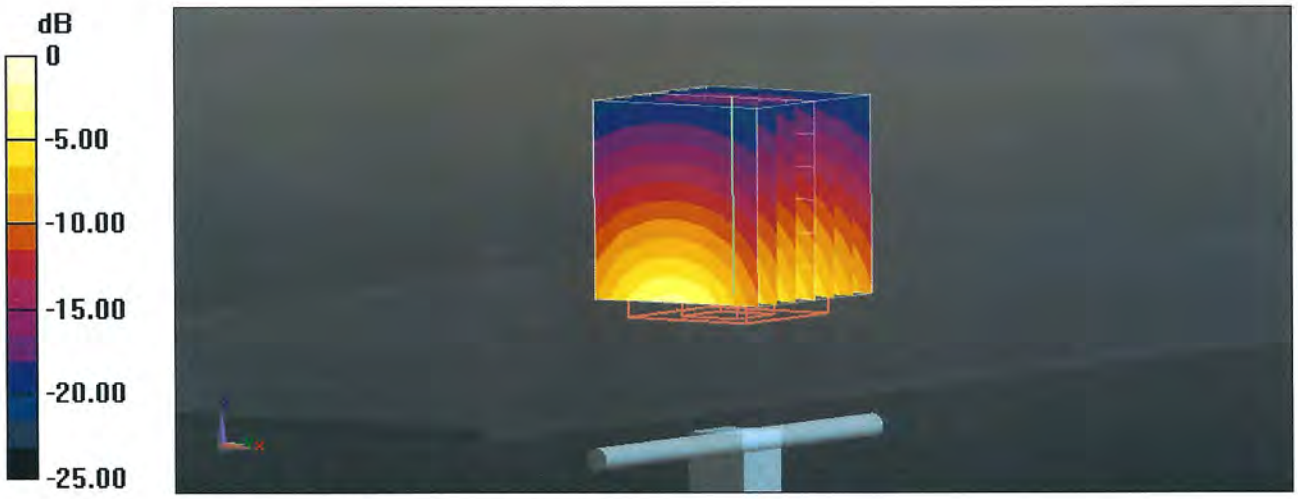
Communication System: UID 0 - CW; Frequency: 2450 MHz
Medium parameters used: f = 2450 MHz; σ = 1.86 S/m; ε_r = 39; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

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)

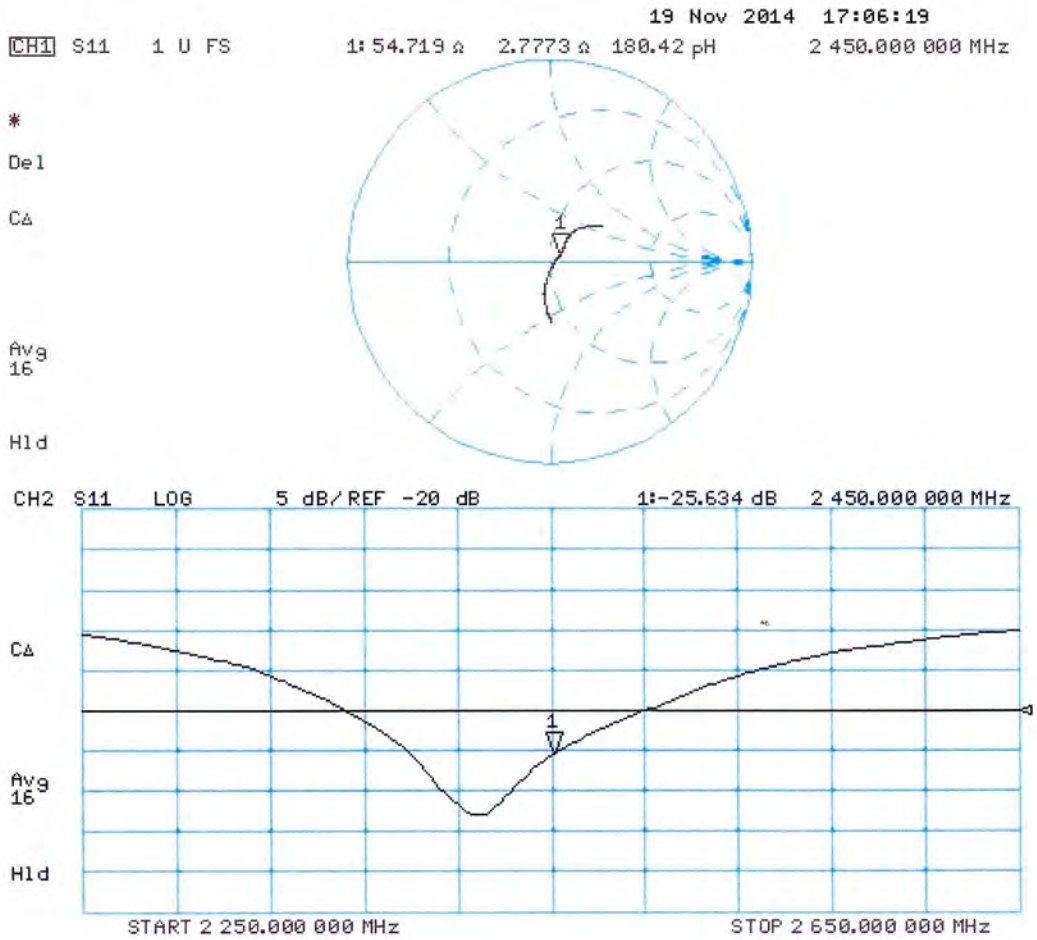
Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 100.9 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 27.3 W/kg
SAR(1 g) = 13.3 W/kg; SAR(10 g) = 6.21 W/kg
Maximum value of SAR (measured) = 17.5 W/kg



0 dB = 17.5 W/kg = 12.43 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: 840

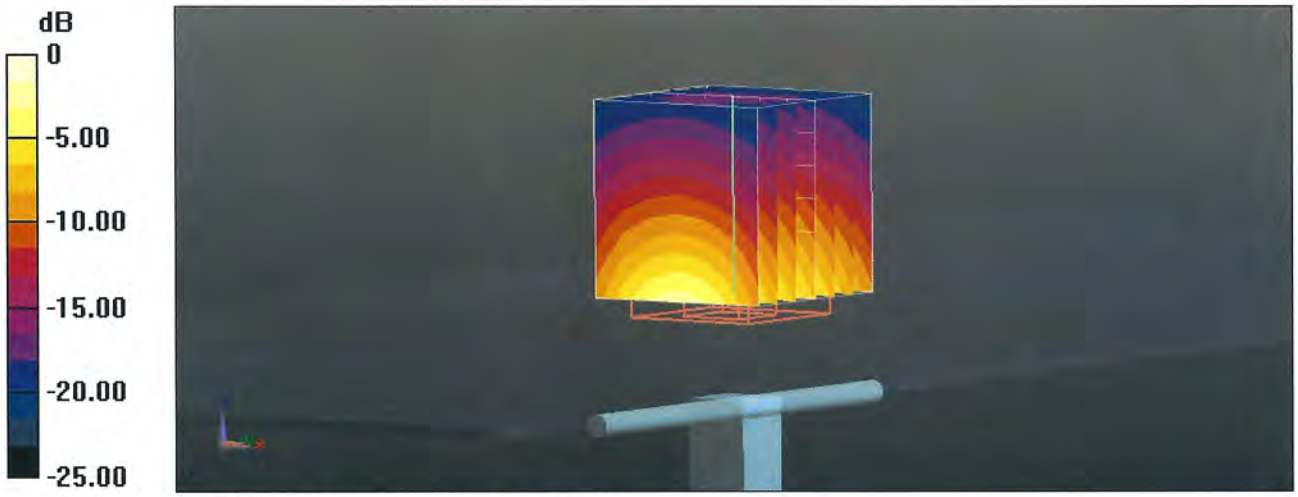
Communication System: UID 0 - CW; Frequency: 2450 MHz
Medium parameters used: f = 2450 MHz; σ = 2.03 S/m; ε_r = 50.9; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

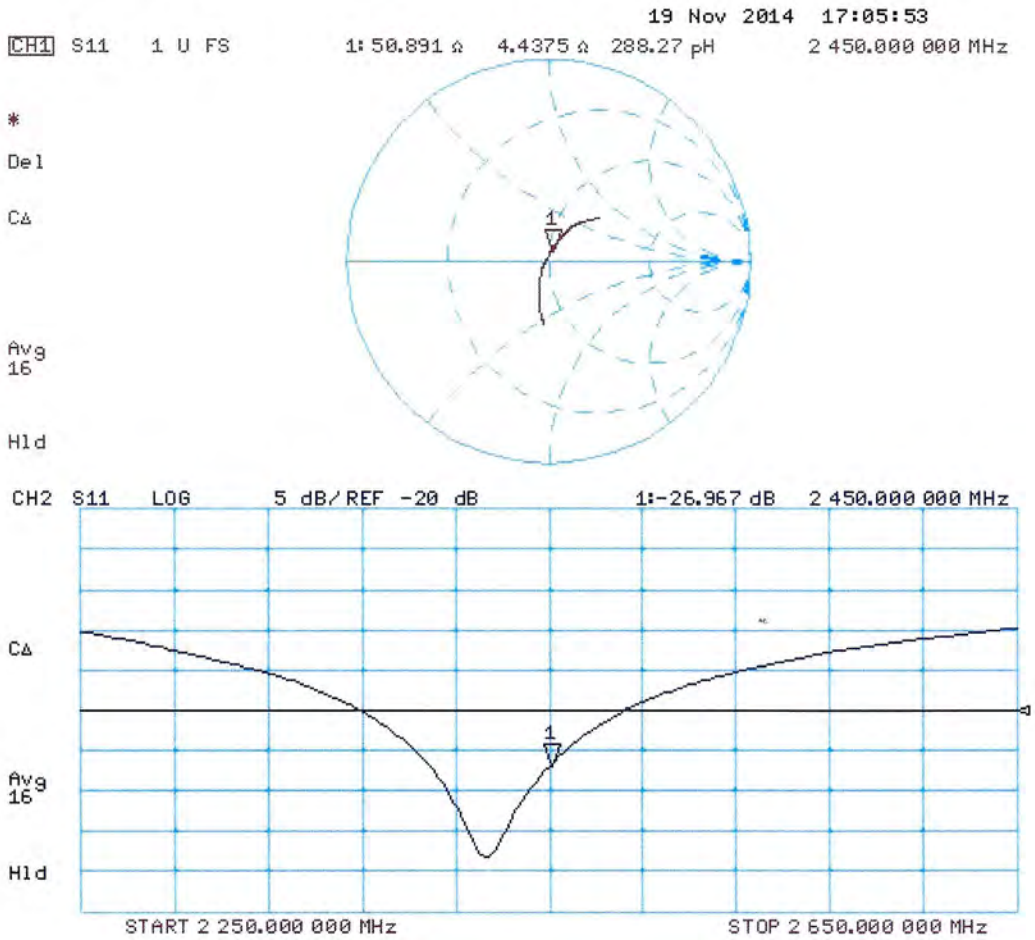
DASY52 Configuration:

- 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 = 95.80 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 27.6 W/kg
SAR(1 g) = 13.1 W/kg; SAR(10 g) = 6 W/kg
Maximum value of SAR (measured) = 17.3 W/kg



0 dB = 17.3 W/kg = 12.38 dBW/kg

Impedance Measurement Plot for Body TSL