Prüfbericht-Nr.: *Test Report No.:*	**50049186 004**	**Auftrags-Nr.:** *Order No.:*	164062055	**Seite 1 von 23** *Page 1 of 23*
Kunden-Referenz-Nr.: *Client Reference No.:*	466337	**Auftragsdatum:** *Order date.:*	28.04.2016	
Auftraggeber: *Client:*	**Lightcomm Technology Co., Ltd.** RM 1808 18/F, FO TAN INDUSTRIAL CENTRE, NOS. 26-28 AU PUI WAN STREET, FO TAN SHATIN NEW TERRITORIES HONG KONG			
Prüfgegenstand: *Test item:*	7 Inch Quad Core Tablet			
Bezeichnung / Typ-Nr.: *Identification / Type No.:*	MID721-RB, DL721-RB, DL721-** (** means different color) (DIGILAND)			
Auftrags-Inhalt: *Order content:*	FCC approval			
Prüfgrundlage: *Test specification:*	CFR Title 47 Part 2 Subpart J Section 2.1093 ANSI/IEEE C95.1-1992		KDB 865664 D01 v01r04 KDB 447498 D01 v06 KDB 248227 D01 v02r02 KDB 941225 D07 v01r02	

Wareneingangsdatum: *Date of receipt:*	01.06.2016
Prüfmuster-Nr.: *Test sample No.:*	A000368549-007
Prüfzeitraum: *Testing period:*	12.06.2016 - 12.06.2016
Ort der Prüfung: *Place of testing:*	Emtek (Shenzhen) Co., Ltd.
Prüflaboratorium: *Testing laboratory:*	TÜV Rheinland (Shenzhen) Co., Ltd.
Prüfergebnis*: *Test result*:*	Pass

Refer to photo documents

geprüft von / *tested by:*			**kontrolliert von** / *reviewed by:*		
07.07.2016	Andy Yan / Project Manager		07.07.2016	Sam Lin / Technical Certifier	
Datum *Date*	**Name/Stellung** *Name/Position*	**Unterschrift** *Signature*	**Datum** *Date*	**Name/Stellung** *Name/Position*	**Unterschrift** *Signature*

Sonstiges / *Other:*

FCC ID: XMF-MID721RB

Zustand des Prüfgegenstandes bei Anlieferung: Prüfmuster vollständig und unbeschädigt
Condition of the test item at delivery: *Test item complete and undamaged:*

* Legende:	1 = sehr gut	2 = gut	3 = befriedigend	4 = ausreichend	5 = mangelhalt
	P(ass) = entspricht o.g. Prüfgrundlage(n)		F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	N/A = nicht anwendbar	N/T = nicht getestet
Legend:	1 = very good	2 = good	3 = satisfactory	4 = sufficient	5 = poor
	P(ass) = passed a.m. test specifications(s)		F(ail) = failed a.m. test specifications(s)	N/A = not applicable	N/T = not tested

TÜV Rheinland LGA Products GmbH · Tillystrasse 2 · D-90431 Nürnberg · Tel.: +49 911 655 5225 · Fax +49 911 655 5226
Mail: service@de.tuv.com · Web: www.tuv.com

STATEMENT OF COMPLIANCE

TEST ITEM	SPECIFICATION	RESULT
Specific Absorption Rate – Wi-Fi 802.11 b/g/n - 2.4GHz Band	*Refer to Specification as below*	PASS

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

☒**KDB 865664 D01** SAR measurement 100 MHz to 6 GHz v01r04: SAR Measurement Requirements for 100 MHz to 6 GHz

☒**KDB 447498 D01** General RF Exposure Guidance v06: RF Exposure Procedures and Equipment Authorization Policies For Mobile and Portable Table Device

☒**KDB 248227 D01** 802.11 Wi-Fi SAR v02r02: SAR Guidance for IEEE 802.11 (Wi-Fi) Transmitters

☒**KDB 941225 D07** 941225 D07 UMPC Mini Tablet v01r02

This device complies with Specific Absorption Rate (SAR) for general population/uncontrolled exposure limits (1.6W/kg) specified in CFR Title 47 Part 2 Subpart J Section 2.1093 and ANSI/IEEE C95.1-1992.

The maximum results of Specific Absorption Rate (SAR) durning testing as below.

FREQUENCY BAND	EXPOSURE POSITION	EQUIPMENT CLASS	HIGHEST REPORTED SAR VALUE (W/KG)
802.11 b/g/n - 2.4GHz Band	Body	DTS	0.972

Contents

1 General Remarks

1.1 Complementary Materials

All attachments are integral parts of this test report. This applies especially to the following appendix:

Appendix A: System Performance Check and Test Plots of SAR Measurement

Appendix B: Calibration Certificate

2 Test Sites

2.1 Test Facilities

EMTEK (Shenzhen) Co., Ltd.
Bldg. 69, Majialong Industry Zone, Nanshan District, Shenzhen Guangdong, China

The tests at the test sites have been conducted under the supervision of a TÜV engineer.

2.2 List of Test and Measurement Instruments

Table 1: List of Test and Measurement Equipment

EMTEK (Shenzhen) Co., Ltd.

Equipment	Manufacturer	Model No.	Serial No.	Cal. Until
SAR Test System	SPEAG	DASY52 SAR TX60XL	F13/5R4XA1/A/01	15.05.2017
Wideband Radio Communication Tester	R&S	CMW500	1201.0002K50-140822zk	28.05.2017
Power Meter	BOONTON	4232A	10539	28.05.2017
Power Sensor	BOONTON	51011EMC	34236/34238	28.05.2017
Signal Generator	Agilent	N5181A	MY50145187	28.05.2017
Validation Kit 2450MHz	SPEAG	D2450V2	927	13.01.2017
10dB Attenuator	Mini-Circuits	15542	31344	28.05.2017
10dB Attenuator	Mini-Circuits	15542	31415	28.05.2017
13	30dB Attenuator	Mini-Circuits	15542	28.05.2017
Dual Directional Coupler	Agilent	EE393	TW5451008	28.05.2017
DAE	SPEAG	DAE4	1418	23.06.2016
E-Field Probe	SPEAG	EX3DV4	3970	10.07.2016
Network Analyzer	Agilent	E5071C	MY46316645	28.05.2017
Signal Analyzer	Agilent	N9010A	My53470879	28.05.2017
Power Amplifier	MILMEGA	80RF1000-175	1059345	28.05.2017
Power Amplifier	MILMEGA	AS0102-55	1018770	28.05.2017
Power Amplifier	MILMEGA	AS1860-50	1059346	28.05.2017
Power Meter	Agilent	N1918A	MY54180006	28.05.2017
ELI V5.0	SPEAG	QD 0VA 022 AA	1231	N/A
Device Holder	SPEAG	N/A	N/A	N/A

3 General Product Information

3.1 Product Function and Intended Use

The EUTs are tablet with Wi-Fi and Bluetooth function.

Refer to User Manual and Circuit Diagram for further details.

3.2 Ratings and System Details

Table 2: Technical Specification of EUT

Technical Specification	Value
Product Name	7 Inch Quad Core Tablet
Model Number	MID721-RB, DL721-RB, DL721-**(** means different color)
FCC ID	XMF-MID721RB
Operating Voltage	DC 3.7V 2700mAh via internal rechargeable Li-Poly battery DC 5.0V 1.5A via AC/DC adapter for charging
Adapter	Model: TEKA006-0501500UKU Input: AC 100-240V ~ 50/60Hz 0.3A Max. Output: DC 5.0V ~ 1.5A
Hardware Version	EM-SK8170-MB-v1.1
Software Version	3.14.0+ dzr@dzr-OptiPlex- 9020 #85 Mon Jun 27 18:04:24 CST 2016

Table 3: Technical Specification of Bluetooth

Technical Specification	Value	
Operating Frequency	2402-2480 MHz	
Extreme Temperature Range	0°C ~ +40°C	
Operation Voltage	DC 3.7V via Internal rechargeable lithium battery	
	DC 5.0V 1.5A via AC/DC adapter for charging	
Modulation	BDR mode	GFSK
	EDR mode	π/4DQPSK, 8DPSK
	Low Energy mode	GFSK
Number of Channel	BDR & EDR mode:79 channels;	Low Energy mode:40 channels
Channel Spacing	BDR & EDR mode: 1MHz;	Low Energy mode: 2MHz;
Bluetooth Version	Bluetooth 4.0 (dual mode)	
Antenna Type and Gain	PIFA, 1.14 dBi	

Table 4: Technical Specification of Wi-Fi

Technical Specification	Value
Operating Frequency	802.11b/g/n(HT20): 2412 MHz to 2462 MHz
Extreme Temperature Range	0°C ~ +40°C
Operation Voltage	DC 3.7V via Internal rechargeable lithium battery DC 5.0V 1.5A via AC/DC adapter for charging
Modulation	802.11b: DSSS(DQPSK/ DBPSK/ CCK) 802.11g: OFDM(BPSK/QPSK/16QAM/64QAM) 802.11n: OFDM(BPSK/QPSK/16QAM/64QAM)
Data Rate	802.11b :1/2/5.5/11 Mbps 802.11g :6/9/12/18/24/36/48/54 Mbps 802.11n(HT20): MCS0 ~ MCS7 Mbps
Number of Channel	802.11b/g/n(HT20): 11 Channels
Channel Spacing	5 MHz
Antenna Type and Gain	PIFA, 1.14 dBi

Table 5: RF Channel and Frequency of Bluetooth

RF Channel	Frequency (MHz)	RF Channel	Frequency (MHz)	RF Channel	Frequency (MHz)	RF Channel	Frequency (MHz)
00	2402.00	20	2422.00	40	2442.00	60	2462.00
01	2403.00	21	2423.00	41	2443.00	61	2463.00
02	2404.00	22	2424.00	42	2444.00	62	2464.00
03	2405.00	23	2425.00	43	2445.00	63	2465.00
04	2406.00	24	2426.00	44	2446.00	64	2466.00
05	2407.00	25	2427.00	45	2447.00	65	2467.00
06	2408.00	26	2428.00	46	2448.00	66	2468.00
07	2409.00	27	2429.00	47	2449.00	67	2469.00
08	2410.00	28	2430.00	48	2450.00	68	2470.00
09	2411.00	29	2431.00	49	2451.00	69	2471.00
10	2412.00	30	2432.00	50	2452.00	70	2472.00
11	2413.00	31	2433.00	51	2453.00	71	2473.00
12	2414.00	32	2434.00	52	2454.00	72	2474.00
13	2415.00	33	2435.00	53	2455.00	73	2475.00
14	2416.00	34	2436.00	54	2456.00	74	2476.00
15	2417.00	35	2437.00	55	2457.00	75	2477.00
16	2418.00	36	2438.00	56	2458.00	76	2478.00
17	2419.00	37	2439.00	57	2459.00	77	2479.00
18	2420.00	38	2440.00	58	2460.00	78	2480.00
19	2421.00	39	2441.00	59	2461.00	/	/

Table 6: RF Channel and Frequency of Bluetooth Low Energy

RF Channel	Frequency (MHz)	RF Channel	Frequency (MHz)	RF Channel	Frequency (MHz)	RF Channel	Frequency (MHz)
00	2402.00	10	2422.00	20	2442.00	30	2462.00
01	2404.00	11	2424.00	21	2444.00	31	2464.00
02	2406.00	12	2426.00	22	2446.00	32	2466.00
03	2408.00	13	2428.00	23	2448.00	33	2468.00
04	2410.00	14	2430.00	24	2450.00	34	2470.00
05	2412.00	15	2432.00	25	2452.00	35	2472.00
06	2414.00	16	2434.00	26	2454.00	36	2474.00
07	2416.00	17	2436.00	27	2456.00	37	2476.00
08	2418.00	18	2438.00	28	2458.00	38	2478.00
09	2420.00	19	2440.00	29	2460.00	39	2480.00

Table 7: RF Channel and Frequency of Wi-Fi

RF Channel	Frequency (MHz)	RF Channel	Frequency (MHz)
01	2412	07	2442
02	2417	08	2447
03	2422	09	2452
04	2427	10	2457
05	2432	11	2462
06	2437	/	/

3.3 Independent Operation Modes

The basic operation modes are:

A. On, Bluetooth transmitting mode
   1. Bluetooth BDR & EDR
      a. Channel 00
      b. Channel 39
      c. Channel 78
   2. Bluetooth Low Energy
      a. Channel 00
      b. Channel 19
      c. Channel 39

B. On, Wi-Fi transmitting mode
   1. 802.11b/g/n(HT20)
      a. Channel 01
      b. Channel 06
      c. Channel 11

C. Off

3.4 Noise Generating and Noise Suppressing Parts

Refer to Circuit Diagram for further details.

3.5 Submitted Documents

- Application Form
- Bill of Material
- Block Diagram
- Circuit Diagram
- FCC Label and Location
- Operation Description
- Photo Document
- User Manual

4 Test Set-up and Operation Modes

4.1 Principle of Configuration Selection

The EUT is commanded to operate at maximum transmitting power.

The EUT shall use its internal transmitter. The antenna, battery and accessories shall be those specified by the manufacturer. The EUT battery must be fully charged and checked periodically during the test to ascertain uniform power output.

Table 8: Configuration of EUT

Operation mode	Frequency Range (MHz)	Modulation	Default Test Channel			Power Control Level
			Low	Mid	High	
Bluetooth (BDR & EDR)	2402-2480	FHSS	CH00	CH39	CH78	Test software was used to configure the EUT to transmit at maximum output power
Bluetooth (Low Energy)	2402-2480	GFSK	CH00	CH19	CH39	
802.11b/g/n(HT20)	2412-2462	DSSS, OFDM	CH01	CH06	CH11	

5 Tissue Simulating Liquid Ingredients

The liquid is consisted of Water, Salt, Glycol, Sugar, Preventol and Cellulose. The liquid has previously been proven to be suited for worst-case. The following table shows the detail solution.

Table 9: Composition of Tissue Simulating Liquid

Ingredients (% by weight)	Frequency (MHz)									
	450		835		915		1900		2450	
Tissue Type	Head	Body	Head	Body	Head	Body	Head	Body	Head	Body
Water	38.56	51.16	41.45	52.4	41.05	56.0	54.9	40.4	62.7	73.2
Salt (NaCl)	3.95	1.49	1.45	1.4	1.35	0.76	0.18	0.5	0.5	0.04
Sugar	56.32	46.78	56.0	45.0	56.5	41.76	0.0	58.0	0.0	0.0
HEC	0.98	0.52	1.0	1.0	1.0	1.21	0.0	1.0	0.0	0.0
Bactericide	0.19	0.05	0.1	0.1	0.1	0.27	0.0	0.1	0.0	0.0
Triton X-100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	36.8	0.0
DGBE	0.0	0.0	0.0	0.0	0.0	0.0	44.92	0.0	0.0	26.7
Dielectric Constant	43.42	58.0	42.54	56.1	42.0	56.8	39.9	54.0	39.8	52.5
Conductivity (S/m)	0.85	0.83	0.91	0.95	1.0	1.07	1.42	1.45	1.88	1.78

Salt: 99+% Pure Sodium Chloride Sugar: 98+% Pure Sucrose
Water: De-ionized, 16 MΩ+ resistivity HEC: Hydroxyethyl Cellulose
DGBE: 99+% Di(ethylene glycol) butyl ether, [2-(2-butoxyethoxy)ethanol]
Triton X-100 (ultra pure): Polyethylene glycol mono [4-(1,1, 3, 3-tetramethylbutyl)phenyl]ether

5.1 Specific Absorption Rate (SAR) System Check

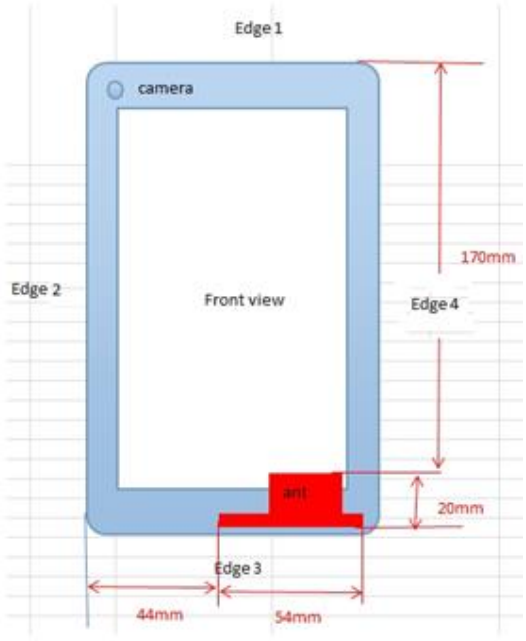
Dielectric parameters of the tissue simulating liquid were verified prior to the SAR evaluation using the dielectric proble kit and the network analyzer.

A system check measurement was made following the determination of the dielectric parameters of the tissue simulating liquid, using the dipole validation kit. A power level of 250 mW for 2.4GHz band was supplied to the dipole antenna, which was placed under the flat section of the twin SAM phantom. The system check results (dielectric parameters and SAR values) are given in the following table.

Table 10: System Check Results of for Body of Tissue Simulating Liquid

Frequency (MHz)	Description	SAR(W/kg)		Dielectric Parameters		Temp ℃
		1g	10g	ε_r	σ(s/m)	
2450	Recommended value ±10% window	12.8 11.52 - 14.08	5.86 5.27 - 6.45	52.7	1.95	---
	Measurement value (2016-06-12)	12.4	5.76	52.83	2.01	20.6

5.2 Exposure Positions Consideration



Distance of the Antenna to the EUT surface/edge						
	Edge 1	**Edge 2**	**Edge 3**	**Edge 4**	**Bottom Face**	**Front Face**
Distance	170mm	44mm	≤5mm	≤5mm	≤5mm	≤5mm

Positions for SAR test						
	Edge 1	**Edge 2**	**Edge 3**	**Edge 4**	**Bottom Face**	**Front Face**
Exemption Limit (mW)	1259.6	84.1	9.6	9.6	9.6	9.6
802.11b	N/A	N/A	Yes	Yes	Yes	Yes

Note: SAR testing exemption according to KDB 447498 D01 Clause 4.3.1 with the following fomula.

1) For 100 MHz to 6 GHz and t*est separation distances* ≤ 50 mm, the 1-g *SAR test exclusion thresholds* are determined by the following:
[(*max. power of channel, including tune-up tolerance, mW*) / (*min. test separation distance, mm*)] · [√f(GHz)] ≤ 3.0 for 1-g SAR,
*where f(GHz) is the RF channel transmit frequency in GHz
*When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion.

2) For 100 MHz to 6 GHz and *test separation distances* > 50 mm, the 1-g *SAR test exclusion thresholds* are determined by the following
{[Power allowed at *numeric threshold* for 50 mm in step a)] + [(test separation distance – 50 mm)·10]} mW, for > 1500 MHz and ≤ 6 GHz

5.3 Phantom Description

The used SAM Phantom meets the requirements specified in FCC KDB 865664 for Specific Absorption Rate (SAR) measurements.

The SAM Twin Phantom ELI is constructed of a fiberglass shell integrated in a table. The shape of the shell is based on data from an anatomical study designed to Represent the 90th percentile of the population. The phantom enables the dissymmetric evaluation of SAR for both left and right handed handset usage, as well as body-worn usage using the flat phantom region. Reference markings on the Phantom allow the complete setup of all predefined phantom positions and measurement grids by manually teaching three points in the robot.

Material	Vinylester, glass fiber reinforced (VE-GF)
Liquid compatibility	Compatible with all SPEAG tissue simulating liquids (incl. DGBE type)
Shell thickness	2.0 ± 0.2 mm (bottom plate)
Dimensions	Major axis: 650 mm, Minor axis: 400 mm
Filling volume	approx. 30 liters
Wooden support	SPEAG standard phantom table

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

On the phantom top, three reference markers are provided to identify the phantom position with respect to the robot.

5.4 Scanning Procedure

The DASY5 installation includes predefined files with recommended procedures for measurements and validation. All test positions (body-worn) are tested with the same configuration of test steps differing only in the grid definition for the different test positions.

The “area scan” measures the SAR above the DUT or verification dipole on a parallel plane to the surface. It is used to locate the approximate location of the peak SAR with 2D spline interpolation. The robot performs a stepped movement along one grid axis while the local electrical field strenth is measured by the probe. The probe is touching the surface of the SAM during acquisition of measurement values. The standard scan uses large grid spacing for faster measurement. Standard grid spacing for head measurements is 15 mm in x- and y- dimension. If a finer resolution is needed, the grid spacing can be reduced. Grid spacing and orientation have no influence on the SAR result. For special applications where the standard scan method does not find the peak SAR within the grid, e.g. mobile phones with flip cover, the grid can be adapted in orientation.

A “7x7x7 zoom scan” measures the field in a volume around the 2D peak SAR value acquired in the previous “coarse” scan. This is a fine 7x7 grid where the robot additionally moves the probe in 7 steps along the z-axis away from the bottom of the Phantom. Grid spacing for the cube measurement is 5 mm in x and y-direction and 5 mm in z-direction. DASY5 is also able to perform repeated zoom scans if more than 1 peak is found during area scan.

Area and Zoom Scan Resolutions per FCC KDB Publication 865664 D01

Frequency	Maximum Area Scan Resolution (mm) (Δxarea, Δyarea)	Maximum Zoom Scan Resolution (mm) (Δxzoom, Δyzoom)	Maximum Zoom Scan Spatial Resolution (mm) Δzzoom(n)	Minimum Zoom Scan Volume (mm) (x,y,z)
≤2 GHz	≤15	≤8	≤5	≥ 30
2-3 GHz	≤12	≤5	≤5	≥30
3-4 GHz	≤12	≤5	≤4	≥28
4-5 GHz	≤10	≤4	≤3	≥25
5-6 GHz	≤10	≤4	≤2	≥22

5.5 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. 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:

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

Extrapolation

The extrapolation is based on a least square algorithm. Through the points in the first 3 cm along the z-axis, polynomials of order four are calculated. These polynomials are then used to evaluate the points between the surface and the probe tip. The points, calculated from the surface, have a distance of 1 mm from each other.

Interpolation

The interpolation of the points is done with a 3d-Spline. The 3d-Spline is composed of three one-dimensional splines with the "Not a knot"-condition (x, y and z -direction).

5.6 Test Operation and Test Software

Test operation refers to test setup in chapter 5.

A communication link is set up with the test mode software for WiFi mode test. During the test, at the each test frequency channel, the EUT is operated at the RF continuous emission mode.

802.11 b/g/n operating modes are tested independently according to the service requirements in each frquency band.802.11b/g/n modes are tested on channel 1, 6, 11. However, if output power reduction is necessary for channels 1 and/or 11 to meet restricted band requirements the highest output channel closest to each of these channels must be tested instead.

SAR is not required for 802.11g/n when
a) KDB Publication 447498 D01 SAR test exclusion applies to the OFDM configuration.
b) 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.

Each channel should be tested at the lowest data rate, and repeated SAR measurement is required only when the measured SAR is ≥ 0.8 W/kg.

When the reported SAR is > 0.8 W/kg, SAR is required for that exposure configuration using the next highest measured output power channel. When any reported SAR is > 1.2 W/kg, SAR is required for the third channel; i.e., all channels require testing.

5.7 Special Accessories and Auxiliary Equipment

None.

6 Test Results

6.1 Huaman Exposure to Radiofrequency Electromagnetic Fields

RESULT: **Pass**

Test Specification

Test standard	:	CFR Title 47 Part 2 Subpart J Section 2.1093
		ANSI/IEEE C95.1-1992
FCC KDB Publication	:	KDB 447498 D01 v06
		KDB 248227 D01 v02r02
		941225 D07 v01r02
		865664 D01 v01r04
		865664 D02 v01r02
Limits	:	1.6W/kg

Test Setup

Date of testing	:	12.06.2016
Operation mode	:	A, B
Ambient temperature	:	21.0℃
Relative humidity	:	56%
Atmospheric pressure	:	101kPa

Table 11: Conducted Power of Bluetooth (BDR & EDR)

Bluetooth	Conducted Power (dBm)		
	CH00 / 2402	CH39 / 2441	CH78 / 2480
Basic Date Rate	2.38	2.65	2.70
Enhanced Data Rate	2.40	2.57	2.86
Rated Average Power	3.0		

Table 12: Conducted Power of Bluetooth (Low Energy)

Bluetooth	Conducted Power (dBm)		
	CH00 / 2402	CH13 / 2440	CH39 / 2480
Low Energy	-4.36	-4.51	-5.02
Rated Average Power	-4.0		

Table 13: Conducted Power of 802.11b/g/n (HT20)

802.11b/g/n (HT20)	Conducted Power (dBm)					
	CH1 / 2412		CH6 / 2437		CH11 / 2462	
	Rated Average Power	Measured Average Power	Rated Average Power	Measured Average Power	Rated Average Power	Measured Average Power
802.11b (1Mbps)	18.5	17.13	18.5	**18.02**	18.5	17.50
802.11b (5.5Mbps)		17.32		18.01		17.64
802.11b (11Mbps)		17.36		18.01		17.74
802.11g (6Mbps)	15.0	14.03	15.0	13.68	15.0	14.06
802.11g (24Mbps)		14.05		13.63		14.28
802.11g (54Mbps)		14.35		14.21		14.25
802.11n (HT20)(MSC0)	15.0	13.96	15.0	13.70	15.0	13.97
802.11n (HT20)(MSC4)		13.12		13.75		13.86
802.11n (HT20)(MSC7)		13.42		13.59		14.03

Note:

According to KDB 447498 D01, the 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances ≤ 50mm 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.

The maximum output power of Bluetooth is 3.0 (2.0mW), and the minimum separation distance is 5mm, hence the exclusion thresholds is 0.63 < 3.0, therefore the SAR testing is not required for Bluetooth function.

Table 14: Test Result of SAR Values

WiFi-802.11b original SAR Value

Mode	Test Position	Gap (mm)	Channel/ Frequency (MHz)	Max. Allowed Power (dBm)	Conducted Power (dBm)	Drift ±0.21dB	Limit SAR1g : 1.6W/kg			
						Drift(dB)	Measured SAR1g (W/kg)	Scaling Factor	Reported SAR1g (W/kg)	Figure No.
DSSS	Front Face	0	CH06/2437	18.5	18.02	-0.01	0.629	1.117	0.703	1
	Bottom Face		CH06/2437		18.02	0.02	0.717	1.117	0.801	2
	Edge 3		CH06/2437		18.02	-0.03	0.803	1.117	0.897	3
	Edge 4		CH06/2437		18.02	-0.05	0.045	1.117	0.050	5
	Bottom Face		CH01/2412		17.13	-0.04	0.709	1.371	**0.972**	6
	Bottom Face		CH11/2462		17.50	-0.04	0.767	1.259	0.966	7
	Edge 3		CH01/2412		17.13	-0.04	0.578	1.371	0.792	8
	Edge 3		CH11/2462		17.50	-0.02	0.603	1.259	0.759	9

Note:
1. The value with blue color is the maximum SAR Value of each test band.
2 When the reported SAR of the highest measured maximum output power channel for the exposure configuration is ≤ 0.8 W/kg, no further SAR testing is required for 802.11b DSSS in that exposure configuration.

2. When the reported SAR is > 0.8 W/kg, SAR is required for that exposure configuration using the next highest measured output power channel. When any reported SAR is > 1.2 W/kg, SAR is required for the third channel; i.e., all channels require testing.

WiFi-802.11b Repeated SAR Values

Mode	Test Position	Gap (mm)	Channel/ Frequency (MHz)	Max. Allowed Power (dBm)	Conducted Power (dBm)	Drift ±0.21dB	Limit SAR1g : 1.6W/kg			
						Drift(dB)	Measured SAR1g (W/kg)	Scaling Factor	Reported SAR1g (W/kg)	Figure No.
DSSS	Edge 3	0	CH06/2437	18.5	18.02	-0.03	0.794	1.117	0.887	4

Note:
1) Repeated measurement is not required when the original highest measured SAR is < 0.80 W/kg;
2) When the original highest measured SAR is ⩾ 0.80 W/kg, repeat that measurement once.
3) Perform a second repeated measurement only if the ratio of largest to smallest SAR for the original and first repeated measurements is > 1.20 or when the original or repeated measurement is ⩾ 1.45 W/kg (~ 10% from the 1-g SAR limit).
4) Perform a third repeated measurement only if the original, first or second repeated measurement is ⩾ 1.5 W/kg and the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20.

802.11g/n SAR Test Exclusion Requirements

Mode	Channel/ Frequency (MHz)	802.11b Max. Allowed Power (dBm)	802.11g/n Max. Allowed Power (dBm)	Limit SAR1g : 1.6W/kg			
				Reported SAR1g (W/kg)	Scaling Factor	Adjusted SAR1g (W/kg)	Figure No.
OFDM	CH06/2437	18.5	15.0	0.972	0.447	0.434	N/A

Note: SAR is not required for the 2.4 GHz OFDM conditions if 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.

Refer to attached Appendix B for details of test results.

6.2 Measurement Uncertainty

6.2.1 Measurement Uncertainty Evaluation

The measured SAR were <1.5 W/kg for all frequency bands, therefore per KDB Publication 865664 D01v01r04, the extensive SAR measurement uncertainty analysis described in IEEE Std 1528-2013 is not required in SAR reports.

8 Lists of Tables

9 List of Photographs

Appendix A

System Performance Check

Test Laboratory: EMTEK (Shenzhen) Co.,Ltd. Date/Time: 12.06.2016

SystemPerformanceCheck-D2450V2-MSL-160611

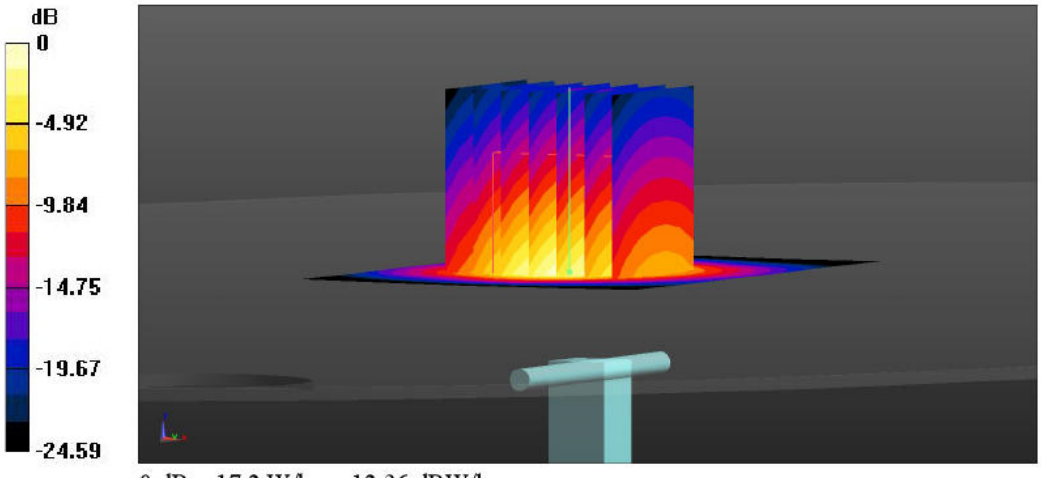
Communication System: UID 0, CW (0); Frequency: 2450 MHz;Duty Cycle: 1:1
Medium: MSL_2450_160612
Medium parameters used: f = 2450 MHz; σ = 2.005 S/m; ε_r = 52.826; ρ = 1000 kg/m^3
Ambient Temperature: 23.3 ℃; Liquid Temperature: 22.6 ℃

DASY Configuration:

- Probe: EX3DV4 - SN3970; ConvF(7.66, 7.66, 7.66); Calibrated: 10.07.2015;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1418; Calibrated: 23.06.2015
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1231
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

System Performance Check at Frequency at 2450MHz/d=10mm, Pin=250mW, dist=2.0mm (EX-Probe)/Area Scan (41x61x1): Interpolated grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 17.2 W/kg

System Performance Check at Frequency at 2450MHz/d=10mm, Pin=250mW, dist=2.0mm (EX-Probe)/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 99.505 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 26.3 W/kg
SAR(1 g) = 12.4 W/kg; SAR(10 g) = 5.76 W/kg
Maximum value of SAR (measured) = 17.2 W/kg



0 dB = 17.2 W/kg = 12.36 dBW/kg

Appendix A

Test Plots of SAR Measurement

Test Laboratory: EMTEK (Shenzhen) Co.,Ltd. Date/Time: 12.06.2016

03-WLAN2.4G-802.11b-1Mbps-Edge3-0cm-Ch6

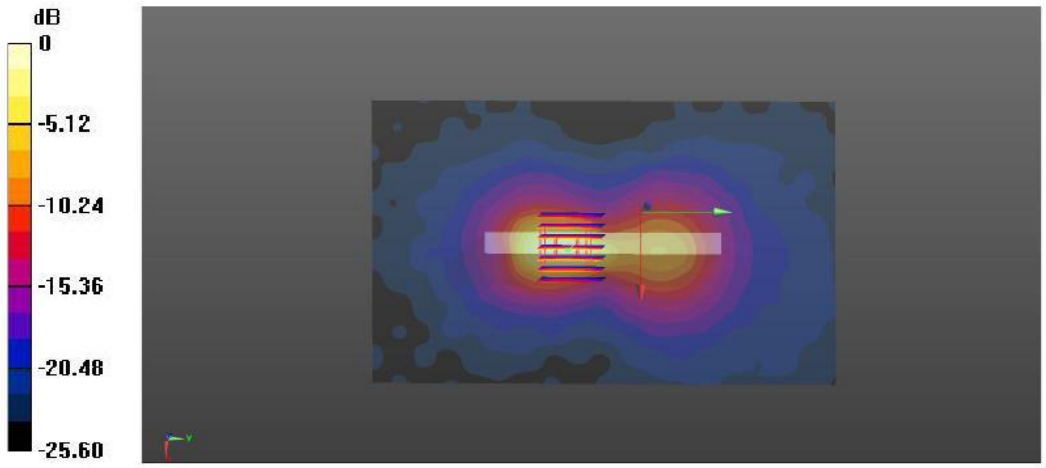
Communication System: UID 0, WIFI (0); Frequency: 2437 MHz;Duty Cycle: 1:1
Medium: MSL_2450_160612
Medium parameters used: f = 2437 MHz; σ = 1.986 S/m; ε_r = 52.871; ρ = 1000 kg/m^3
Ambient Temperature: 23.3 ℃; Liquid Temperature: 22.6 ℃

DASY Configuration:

- Probe: EX3DV4 - SN3970; ConvF(7.66, 7.66, 7.66); Calibrated: 10.07.2015;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1418; Calibrated: 23.06.2015
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1231
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

Configuration/Ch6/Area Scan (111x181x1): Interpolated grid: dx=12mm, dy=12mm
Maximum value of SAR (interpolated) = 1.41 W/kg

Configuration/Ch6/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 12.719 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 1.91 W/kg
SAR(1 g) = 0.803 W/kg; SAR(10 g) = 0.333 W/kg
Maximum value of SAR (measured) = 1.34 W/kg



0 dB = 1.34 W/kg = 1.27 dBW/kg

Test Laboratory: EMTEK (Shenzhen) Co.,Ltd. Date/Time: 12.06.2016

09-WLAN2.4G-802.11b-1Mbps-Edge3-0cm-Ch6-repeat

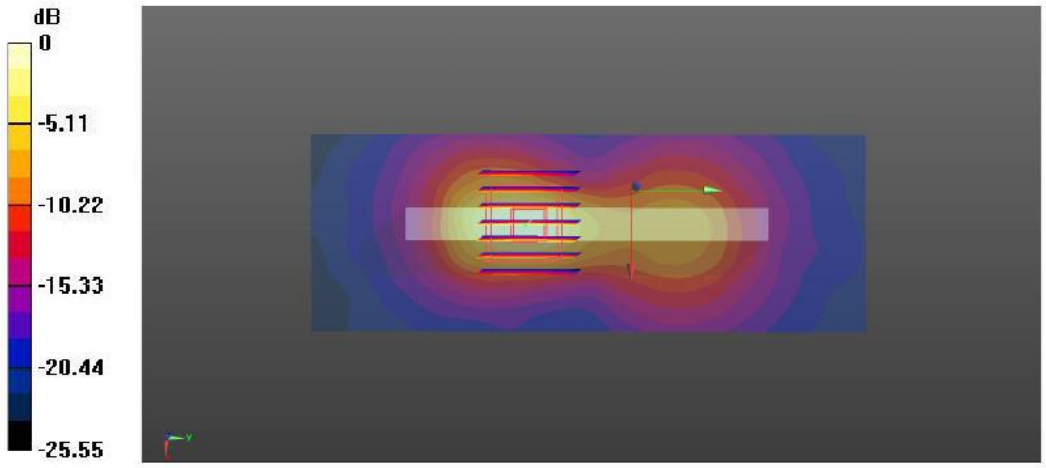
Communication System: UID 0, WIFI (0); Frequency: 2437 MHz;Duty Cycle: 1:1
Medium: MSL_2450_160612
Medium parameters used: f = 2437 MHz; σ = 1.986 S/m; ε_r = 52.871; ρ = 1000 kg/m^3
Ambient Temperature: 23.3 ℃; Liquid Temperature: 22.6 ℃

DASY Configuration:

- Probe: EX3DV4 - SN3970; ConvF(7.66, 7.66, 7.66); Calibrated: 10.07.2015;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1418; Calibrated: 23.06.2015
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1231
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

Configuration/Ch6/Area Scan (51x141x1): Interpolated grid: dx=12mm, dy=12mm
Maximum value of SAR (interpolated) = 1.39 W/kg

Configuration/Ch6/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 12.749 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 1.91 W/kg
SAR(1 g) = 0.794 W/kg; SAR(10 g) = 0.329 W/kg
Maximum value of SAR (measured) = 1.32 W/kg



0 dB = 1.32 W/kg = 1.21 dBW/kg

Test Laboratory: EMTEK (Shenzhen) Co.,Ltd. Date/Time: 12.06.2016

04-WLAN2.4G-802.11b-1Mbps-Edge4-0cm-Ch6

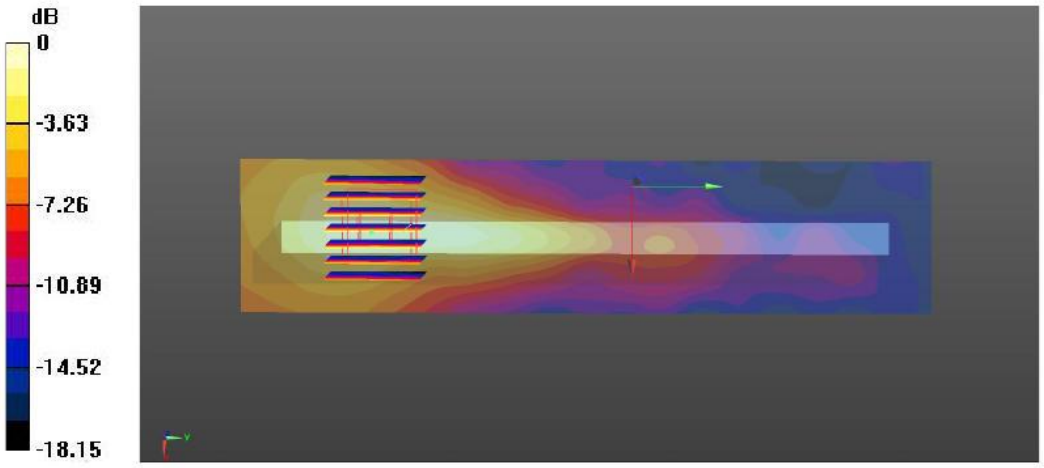
Communication System: UID 0, WIFI (0); Frequency: 2437 MHz;Duty Cycle: 1:1
Medium: MSL_2450_160612
Medium parameters used: f = 2437 MHz; σ = 1.986 S/m; ε_r = 52.871; ρ = 1000 kg/m^3
Ambient Temperature: 23.3 ℃; Liquid Temperature: 22.6 ℃

DASY Configuration:

- Probe: EX3DV4 - SN3970; ConvF(7.66, 7.66, 7.66); Calibrated: 10.07.2015;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1418; Calibrated: 23.06.2015
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1231
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

Configuration/Ch6/Area Scan (41x181x1): Interpolated grid: dx=12mm, dy=12mm
Maximum value of SAR (interpolated) = 0.0729 W/kg

Configuration/Ch6/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 3.286 V/m; Power Drift = -0.05 dB
Peak SAR (extrapolated) = 0.0990 W/kg
SAR(1 g) = 0.045 W/kg; SAR(10 g) = 0.022 W/kg
Maximum value of SAR (measured) = 0.0708 W/kg



0 dB = 0.0708 W/kg = -11.50 dBW/kg

Test Laboratory: EMTEK (Shenzhen) Co.,Ltd. Date/Time: 12.06.2016

05-WLAN2.4G-802.11b-1Mbps-Bottom Face-0cm-Ch1

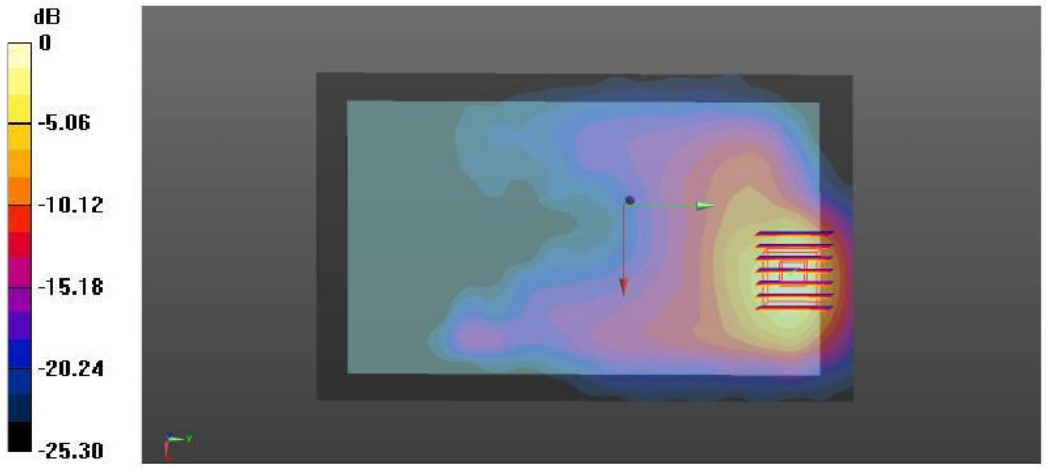
Communication System: UID 0, WIFI (0); Frequency: 2412 MHz;Duty Cycle: 1:1
Medium: MSL_2450_160612
Medium parameters used: f = 2412 MHz; σ = 1.951 S/m; ε_r = 52.915; ρ = 1000 kg/m^3
Ambient Temperature: 23.3 ℃; Liquid Temperature: 22.6 ℃

DASY Configuration:

- Probe: EX3DV4 - SN3970; ConvF(7.66, 7.66, 7.66); Calibrated: 10.07.2015;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1418; Calibrated: 23.06.2015
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1231
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

Configuration/Ch1/Area Scan (111x181x1): Interpolated grid: dx=12mm, dy=12mm
Maximum value of SAR (interpolated) = 1.09 W/kg

Configuration/Ch1/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 2.453 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 1.55 W/kg
SAR(1 g) = 0.709 W/kg; SAR(10 g) = 0.317 W/kg
Maximum value of SAR (measured) = 1.13 W/kg



0 dB = 1.13 W/kg = 0.53 dBW/kg

Test Laboratory: EMTEK (Shenzhen) Co.,Ltd. Date/Time: 12.06.2016

06-WLAN2.4G-802.11b-1Mbps-Bottom Face-0cm-Ch11

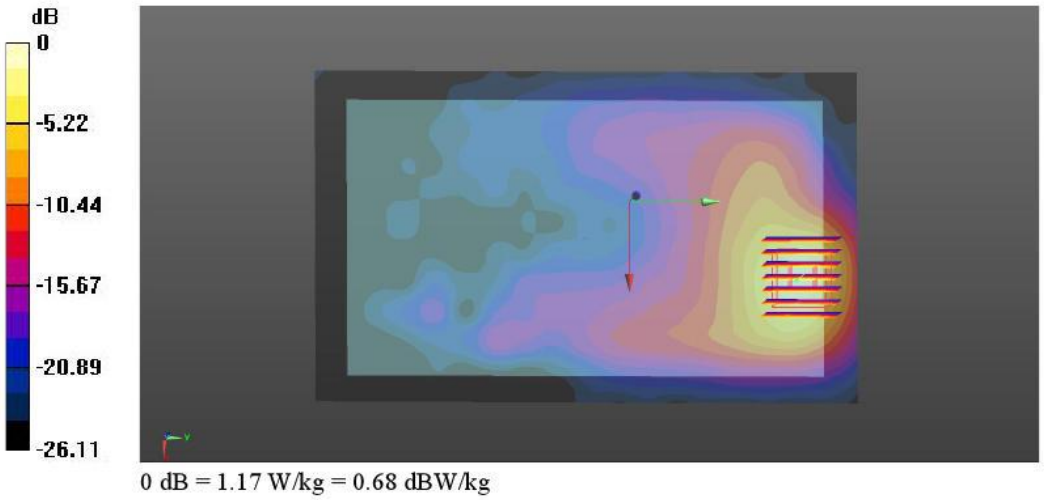
Communication System: UID 0, WIFI (0); Frequency: 2462 MHz;Duty Cycle: 1:1
Medium: MSL_2450_160612
Medium parameters used: f = 2462 MHz; σ = 2.023 S/m; ε_r = 52.782; ρ = 1000 kg/m^3
Ambient Temperature: 23.3 ℃; Liquid Temperature: 22.6 ℃

DASY Configuration:

- Probe: EX3DV4 - SN3970; ConvF(7.66, 7.66, 7.66); Calibrated: 10.07.2015;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1418; Calibrated: 23.06.2015
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1231
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

Configuration/Ch11/Area Scan (111x181x1): Interpolated grid: dx=12mm, dy=12mm
Maximum value of SAR (interpolated) = 1.14 W/kg

Configuration/Ch11/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 1.563 V/m; Power Drift = -0.05 dB
Peak SAR (extrapolated) = 1.72 W/kg
SAR(1 g) = 0.767 W/kg; SAR(10 g) = 0.342 W/kg
Maximum value of SAR (measured) = 1.17 W/kg



0 dB = 1.17 W/kg = 0.68 dBW/kg

Test Laboratory: EMTEK (Shenzhen) Co.,Ltd. Date/Time: 12.06.2016

07-WLAN2.4G-802.11b-1Mbps-Edge3-0cm-Ch1

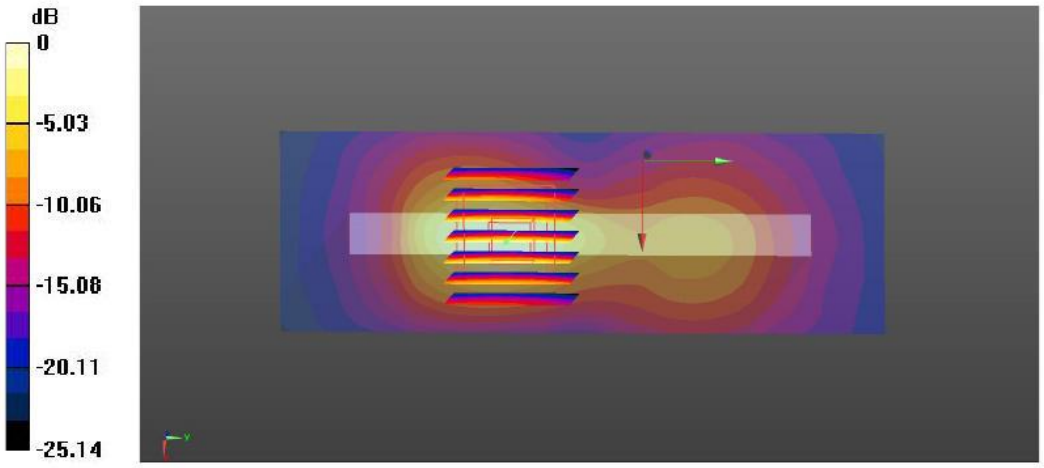
Communication System: UID 0, WIFI (0); Frequency: 2412 MHz;Duty Cycle: 1:1
Medium: MSL_2450_160612
Medium parameters used: f = 2412 MHz; σ = 1.951 S/m; ε_r = 52.915; ρ = 1000 kg/m^3
Ambient Temperature: 23.3 ℃; Liquid Temperature: 22.6 ℃

DASY Configuration:

- Probe: EX3DV4 - SN3970; ConvF(7.66, 7.66, 7.66); Calibrated: 10.07.2015;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1418; Calibrated: 23.06.2015
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1231
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

Configuration/Ch1/Area Scan (41x121x1): Interpolated grid: dx=12mm, dy=12mm
Maximum value of SAR (interpolated) = 1.02 W/kg

Configuration/Ch1/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 10.877 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 1.37 W/kg
SAR(1 g) = 0.578 W/kg; SAR(10 g) = 0.241 W/kg
Maximum value of SAR (measured) = 0.952 W/kg



0 dB = 0.952 W/kg = -0.21 dBW/kg

Test Laboratory: EMTEK (Shenzhen) Co.,Ltd. Date/Time: 12.06.2016

08-WLAN2.4G-802.11b-1Mbps-Edge3-0cm-Ch11

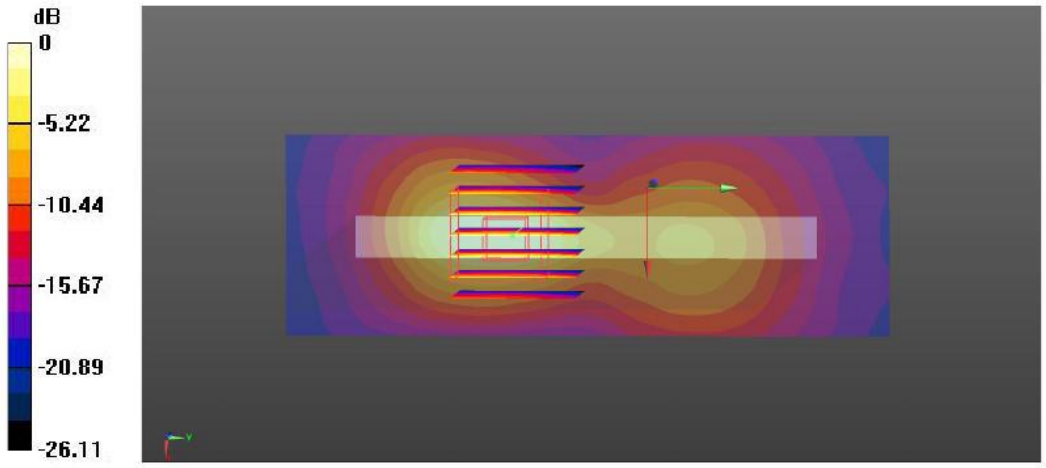
Communication System: UID 0, WIFI (0); Frequency: 2462 MHz;Duty Cycle: 1:1
Medium: MSL_2450_160612
Medium parameters used: f = 2462 MHz; σ = 2.023 S/m; ε_r = 52.782; ρ = 1000 kg/m^3
Ambient Temperature: 23.3 ℃; Liquid Temperature: 22.6 ℃

DASY Configuration:

- Probe: EX3DV4 - SN3970; ConvF(7.66, 7.66, 7.66); Calibrated: 10.07.2015;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1418; Calibrated: 23.06.2015
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1231
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

Configuration/Ch11/Area Scan (41x121x1): Interpolated grid: dx=12mm, dy=12mm
Maximum value of SAR (interpolated) = 1.08 W/kg

Configuration/Ch11/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 10.063 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 1.46 W/kg
SAR(1 g) = 0.603 W/kg; SAR(10 g) = 0.247 W/kg
Maximum value of SAR (measured) = 1.01 W/kg



0 dB = 1.01 W/kg = 0.04 dBW/kg

Test Laboratory: EMTEK (Shenzhen) Co.,Ltd. Date/Time: 12.06.2016

01-WLAN2.4G-802.11b-1Mbps-Front Face-0cm-Ch6

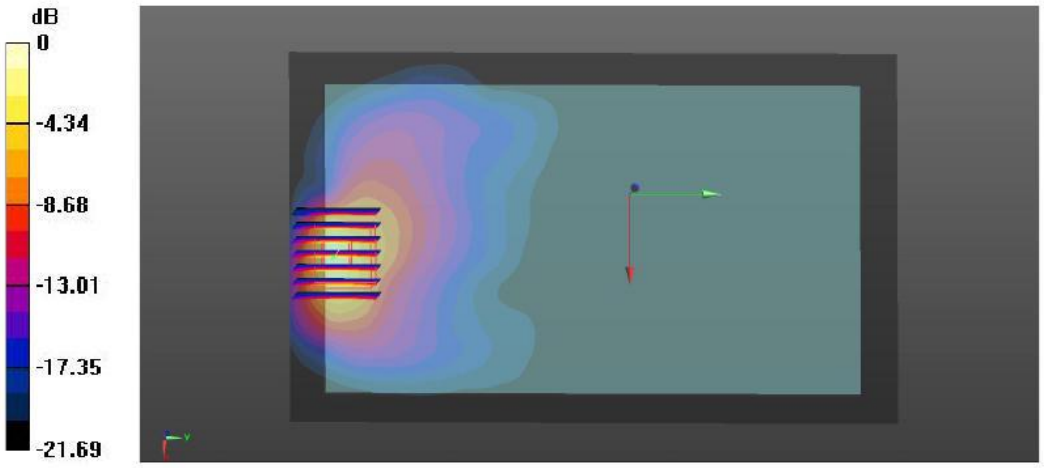
Communication System: UID 0, WIFI (0); Frequency: 2437 MHz;Duty Cycle: 1:1
Medium: MSL_2450_160612
Medium parameters used: f = 2437 MHz; σ = 1.986 S/m; ε_r = 52.871; ρ = 1000 kg/m^3
Ambient Temperature: 23.3 ℃; Liquid Temperature: 22.6 ℃

DASY Configuration:

- Probe: EX3DV4 - SN3970; ConvF(7.66, 7.66, 7.66); Calibrated: 10.07.2015;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1418; Calibrated: 23.06.2015
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1231
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

Configuration/Ch6/Area Scan (111x181x1): Interpolated grid: dx=12mm, dy=12mm
Maximum value of SAR (interpolated) = 0.88 W/kg

Configuration/Ch6/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 3.434 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 1.41 W/kg
SAR(1 g) = 0.629 W/kg; SAR(10 g) = 0.315 W/kg
Maximum value of SAR (measured) = 0.85 W/kg



0 dB = 0.850 W/kg = -0.71 dBW/kg

Test Laboratory: EMTEK (Shenzhen) Co.,Ltd. Date/Time: 12.06.2016

02-WLAN2.4G-802.11b-1Mbps-Bottom Face-0cm-Ch6

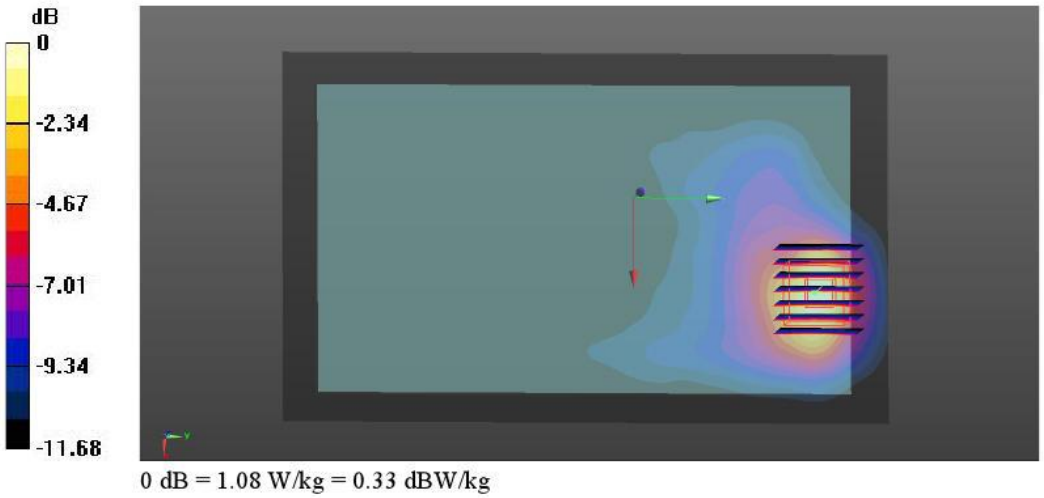
Communication System: UID 0, WIFI (0); Frequency: 2437 MHz;Duty Cycle: 1:1
Medium: MSL_2450_160612
Medium parameters used: f = 2437 MHz; σ = 1.986 S/m; ε_r = 52.871; ρ = 1000 kg/m^3
Ambient Temperature: 23.3 ℃; Liquid Temperature: 22.6 ℃

DASY Configuration:

- Probe: EX3DV4 - SN3970; ConvF(7.66, 7.66, 7.66); Calibrated: 10.07.2015;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1418; Calibrated: 23.06.2015
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1231
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

Configuration/Ch6/Area Scan (111x181x1): Interpolated grid: dx=12mm, dy=12mm
Maximum value of SAR (interpolated) = 1.17 W/kg

Configuration/Ch6/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 5.661 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 1.52 W/kg
SAR(1 g) = 0.717 W/kg; SAR(10 g) = 0.356 W/kg
Maximum value of SAR (measured) = 1.08 W/kg



0 dB = 1.08 W/kg = 0.33 dBW/kg

Appendix B

Calibration Certificate

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

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S 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 **EMTEK (Auden)**

Certificate No: D2450V2-927_Jan14

CALIBRATION CERTIFICATE

Object	D2450V2 - SN: 927
Calibration procedure(s)	QA CAL-05.v9 Calibration procedure for dipole validation kits above 700 MHz
Calibration date:	January 13, 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	09-Oct-13 (No. 217-01827)	Oct-14
Power sensor HP 8481A	US37292783	09-Oct-13 (No. 217-01827)	Oct-14
Power sensor HP 8481A	MY41092317	09-Oct-13 (No. 217-01828)	Oct-14
Reference 20 dB Attenuator	SN: 5058 (20k)	04-Apr-13 (No. 217-01736)	Apr-14
Type-N mismatch combination	SN: 5047.3 / 06327	04-Apr-13 (No. 217-01739)	Apr-14
Reference Probe ES3DV3	SN: 3205	30-Dec-13 (No. ES3-3205_Dec13)	Dec-14
DAE4	SN: 601	25-Apr-13 (No. DAE4-601_Apr13)	Apr-14

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-13)	In house check: Oct-14

	Name	Function	Signature
Calibrated by:	Israe El-Naouq	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: January 13, 2014

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

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Accreditation No.: SCS 108

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	V52.8.7
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	39.3 ± 6 %	1.83 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	13.4 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**53.2 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	6.22 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**24.8 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	52.7	1.95 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	51.8 ± 6 %	2.00 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	12.8 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**50.4 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.89 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**23.3 W/kg ± 16.5 % (k=2)**

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	55.2 Ω + 2.9 jΩ
Return Loss	- 24.9 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	51.4 Ω + 4.7 jΩ
Return Loss	- 26.3 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.158 ns

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

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

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	September 26, 2013

DASY5 Validation Report for Head TSL

Date: 13.01.2014

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 927

Communication System: UID 0 - CW; Frequency: 2450 MHz
Medium parameters used: f = 2450 MHz; σ = 1.83 S/m; ε_r = 39.3; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

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: 25.04.2013
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

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 = 100.3 V/m; Power Drift = 0.06 dB
Peak SAR (extrapolated) = 27.9 W/kg
SAR(1 g) = 13.4 W/kg; SAR(10 g) = 6.22 W/kg
Maximum value of SAR (measured) = 17.1 W/kg

0 dB = 17.1 W/kg = 12.33 dBW/kg