Prüfbericht-Nr.: *Test Report No.:*	50055364 004	**Auftrags-Nr.:** *Order No.:*	164069058 — Seite 1 von 29 *Page 1 of 29*
Kunden-Referenz-Nr.: *Client Reference No.:*	N/A	**Auftragsdatum:** *Order date:*	14.07.2016
Auftraggeber: *Client:*	ContextMedia LLC 330 N. Wabash Ave STE 2500, Chicago, Illinois United States		
Prüfgegenstand: *Test item:*	Wallboard 32" Tablet		
Bezeichnung / Typ-Nr.: *Identification / Type No.:*	P-WAL-106-YIT-01, P-WAL-106-YIT-02, P-WAL-106-YIT-03 (ContextMedia Health)		
Auftrags-Inhalt: *Order content:*	FCC/IC Certification		
Prüfgrundlage: *Test specification:*	CFR Title 47 Part 2 Subpart J Section 2.1093 ANSI/IEEE C95.1-1992 IEEE 1528-2003 KDB 447498 D01 v06 RSS-102 Issue 5 March 2015		
Wareneingangsdatum: *Date of receipt:*	25.07.2016		
Prüfmuster-Nr.: *Test sample No.:*	A000395273-002		
Prüfzeitraum: *Testing period:*	05.08.2016 - 08.08.2016		
Ort der Prüfung: *Place of testing:*	Shenzhen EMTEK Co., Ltd.		
Prüflaboratorium: *Testing laboratory:*	TÜV Rheinland (Shenzhen) Co., Ltd.		
Prüfergebnis*: *Test result*:*	Pass		

geprüft von / *tested by:*

Datum *Date*	**Name / Stellung** *Name / Position*	**Unterschrift** *Signature*
18.09.2016	Andy Yan/Project Manager	

kontrolliert von / *reviewed by:*

Datum *Date*	**Name / Stellung** *Name / Position*	**Unterschrift** *Signature*
18.09.2016	Owen Tian/Technical Certifier	

Sonstiges / *Other:* FCC ID: 2AI6X-PWALYIT
IC: 21722-PWALYIT

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 = mangelhaft
	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 specification(s)		*F(ail) = failed a.m. test specification(s)*	*N/A = not applicable*	*N/T = not tested*

STATEMENT OF COMPLIANCE

TEST ITEM	SPECIFICATION	RESULT
Specific Absorption Rate - Wi-Fi 802.11 b/g/n - 2.4GHz Band	Exposure Rules 47 C.F.R 2.1093; KDB 447498 D01 General RF Exposure Guidance v06; KDB 248227 D01 802 11 Wi-Fi SAR v02r02; KDB 865664 D01 SAR Measurement 100 MHz to 6GHz v01r04; KDB 865664 D02 RF Exposure Reporting v01r02; KDB 616217 D04 SAR for laptop and tablets v01r02; FCC Inquiry Tracking Number 351814	PASS
Specific Absorption Rate - Wi-Fi 802.11 a/n/ac - 5GHz Band U-NII-1		PASS
Specific Absorption Rate - Wi-Fi 802.11 a/n/ac - 5GHz Band U-NII-3		PASS
Specific Absorption Rate - Bluetooth BDR/EDR/LE		PASS

This device complies with Specific Absorption Rate (SAR) for general population/uncontrolled exposure limits (4W/kg) specified in CFR Title 47 Part 2 Subpart J Section 2.1093 and ANSI/IEEE C95.1-1992 for extremity SAR.

This device has been testd in accordance with the measurement methods and procedure specified in Published RF exposure KDB procedures

Refer to the maximum results of Specific Absorption Rate (SAR) durning testing as below.

FREQUENCY BAND	EXPOSURE POSITION	EQUIPMENT CLASS	HIGHEST REPORTED EXTREMITY 10G SAR VALUE (W/KG)
802.11 b/g/n - 2.4GHz Band	Body	DTS	0.146
802.11 a/n/ac - 5GHz Band U-NII-1	Body	NII	0.691
802.11 a/n/ac - 5GHz Band U-NII-3	Body		0.807

Contents

1. GENERAL REMARKS 5
1.1 COMPLEMENTARY MATERIALS 5
2. TEST SITES 5
2.1 TEST FACILITIES 5
2.2 LIST OF TEST AND MEASUREMENT INSTRUMENTS 6
3. GENERAL PRODUCT INFORMATION 7
3.1 PRODUCT FUNCTION AND INTENDED USE 7
3.2 RATINGS AND SYSTEM DETAILS 7
3.3 INDEPENDENT OPERATION MODES 11
3.4 SUBMITTED DOCUMENTS 11
4. SAR MEASUREMENTS SYSTEM CONFIGURATION 12
4.1 SAR MEASUREMENTS SET-UP 12
4.2 DASY5 E-FIELD PROBE SYSTEM 13
4.3 E-FILED PROBE CALIBRATION 14
4.4 OTHER TEST EQUIPMENT 14
4.4.1 Data Acquisition Electronics (DAE) 14
4.4.2 Robot 15
4.4.3 Measurement Server 16
4.4.4 Device Holder for Phantom 16
4.4.5 Phantom 17
4.5 SCANNING PROCEDURE 18
4.6 DATA STORAGE AND EVALUATION 19
4.6.1 Data Storage 19
4.6.2 Data Evaluation by SEMCAD 19
5. TEST SET-UP AND OPERATION MODES 21
5.1 PRINCIPLE OF CONFIGURATION SELECTION 21
5.2 TISSUE SIMULATING LIQUID INGREDIENTS 21
5.3 SPECIFIC ABSORPTION RATE (SAR) SYSTEM CHECK 22
5.4 EXPOSURE POSITIONS CONSIDERATION 23
5.5 TEST OPERATION AND TEST SOFTWARE 24
5.6 SPECIAL ACCESSORIES AND AUXILIARY EQUIPMENT 24
6. TEST RESULTS 25
6.1 HUAMAN EXPOSURE TO RADIOFREQUENCY ELECTROMAGNETIC FIELDS 25
6.2 MEASUREMENT UNCERTAINTY 26
6.2.1 Measurement uncertainty evaluation 26

7. PHOTOGRAPHS OF THE TEST SET-UP 27

8. LIST OF TABLES 29

9. LIST OF PHOTOGRAPHS 29

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
Appendix B: Calibration Certificate

2. Test Sites

2.1 Test Facilities

Shenzhen EMTEK Co., Ltd.

Bldg 69, Majialong Industry Zone, Nanshan District,
Shenzhen, Guangdong, P.R. China

The tests at the test site 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

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
Signal Generator	Agilent	N5181A	MY50145187	2016-05-28	1year
RF Power Meter. Dual Channel	BOONTON	4232A	10539	2016-05-28	1year
Power Sensor	BOONTON	51011EMC	34236/34238	2016-05-28	1year
Wideband Radio Communication Tester	R&S	CMW500	1201.0002K50-140822zk	2016-05-28	1year
Signal Analyzer	Agilent	N9010A	My53470879	2016-05-28	1year
Network Analyzer	Agilent	E5071C	MY46316645	2016-05-28	1year
E-Field Probe	SPEAG	EX3DV4	3970	2015-08-26	1year
DAE	SPEAG	DAE4	1341	2015-08-25	1year
Validation Kit 2450MHz	SPEAG	D2450V2	927	2014-01-13	3years
Validation Kit 5GHz	SPEAG	D5GHzV2	1169	2014-01-07	3years
Dual Directional Coupler	Agilent	EE393	TW5451008	2016-05-28	1year
10dB Attenuator	Mini-Circuits	15542	3 1344	2016-05-28	1year
10dB Attenuator	Mini-Circuits	15542	3 1415	2016-05-28	1year
30dB Attenuator	Mini-Circuits	15542	3 1420	2016-05-28	1year
Power Amplifier	MILMEGA	80RF1000-175	1059345	2016-05-28	1 Year
Power Amplifier	MILMEGA	AS0102-55	1018770	2016-05-28	1 Year
Power Amplifier	MILMEGA	AS1860-50	1059346	2016-05-28	1 Year
Power Meter	Agilent	N1918A	MY54180006	2016-05-28	1 Year
ELI V5.0	SPEAG	QD 0VA 022 AA	1231	N/A	N/A
Device Holder	SPEAG	N/A	N/A	N/A	N/A
SAR Test System	SPEAG	DASY52 SAR TX60XL	F13/5R4XA1/A/01	2016-05-15	1 Year

3. General Product Information

3.1 Product Function and Intended Use

The EUT is a Wallboard 32" Tablet which supports Bluetooth (dual mode) and Wi-Fi 802.11 a/b/g/n/ac wireless technology.
For details refer to the User Manual and Circuit Diagram.

3.2 Ratings and System Details

Table 2: Technical Specification of Wi-Fi

Technical Specification	Value
Kind of Equipment	Wallboard 32" Tablet
Type Designation	P-WAL-106-YIT-01, P-WAL-106-YIT-02, P-WAL-106-YIT-03
FCC ID	2AI6X-PWALYIT
IC	21722-PWALYIT
HVIN	P-WAL-106-YIT-01, P-WAL-106-YIT-02, P-WAL-106-YIT-03
Operating Frequency band	2400-2483.5MHz, 5150-5250MHz, 5725-5850MHz
Extreme Temperature Range	0~+40℃
Operation Voltage	DC 12 V from AC/DC Adapter
Antenna Gain (dBi)	2.52 dBi for 2.4GHz band and 1.98dBi for 5GHz Band
Hardware version	VER1.0
Software version	Android 4.4.4

Table 3: Technical Specification of 2.4GHz, 802.11b/g/n

Item	Description			
	IEEE 802.11b	IEEE 802.11g	IEEE 802.11n (HT20)	IEEE 802.11n (HT40)
Operating Frequency band (MHz)	2412 ~ 2462	2412 ~ 2462	2412 ~ 2462	2422 ~ 2452
Channel Number	11	11	11	7
Modulation	DSSS (DBPSK, DQPSK), CCK)	OFDM (DBPSK, DQPSK)	OFDM (BPSK, QPSK, 16-QAM, 64-QAM)	OFDM (BPSK, QPSK, 16-QAM, 64-QAM)
Data Rate (Mbps)	1, 2, 5, 11	6, 9, 12, 18, 24, 36, 48, 54	MCS0 ~ MCS7	MCS0 ~ MCS7
Maximum tune-up conducted average output power (dBm)	14.0	14.0	14.0	14.0
Maximum tested output power (dBm)	13.95	13.85	13.79	13.64

Table 4: List of WLAN Channel of 802.11b/g/n

802.11b		802.11g		802.11n HT20		802.11n HT40	
Channel Number	Frequency (MHz)	Channel Number	Frequency (MHz)	Channel Number	Frequency (MHz)	Channel Number	Frequency (MHz)
1	2412	1	2412	1	2412	3	2422
2	2417	2	2417	2	2417	4	2427
3	2422	3	2422	3	2422	5	2432
4	2427	4	2427	4	2427	6	2437
5	2432	5	2432	5	2432	7	2442
6	2437	6	2437	6	2437	8	2447
7	2442	7	2442	7	2442	9	2452
8	2447	8	2447	8	2447		
9	2452	9	2452	9	2452		
10	2457	10	2457	10	2457		
11	2462	11	2462	11	2462		

Table 5: Technical Specification of 5GHz, 802.11a/n

Operating mode(s) / WiFi	IEEE 802.11a	IEEE 802.11n HT20	IEEE 802.11n HT40
Test modulation	OFDM (BPSK, QPSK, 16-QAM, 64-QAM)	OFDM (BPSK, QPSK, 16-QAM, 64-QAM)	OFDM (BPSK, QPSK, 16-QAM, 64-QAM)
Transmit Frequency Range (MHz)	5180 - 5240 5845 - 5825	5180 - 5240 5845 - 5825	5180 - 5240 5845 - 5825
Channel Number	9	9	4
Data Rate (Mbps)	6, 9, 12, 18, 24, 36, 48, 54	MCS0 ~ MCS7	MCS0 ~ MCS7
Maximum tune-up conducted average output power (dBm	16.5	16.5	14.5
Maximum tested output power (dBm)	16.43	16.45	14.12

Table 6: Technical Specification of 5GHz, 802.11ac

Operating mode(s) / WiFi	IEEE 802.11ac VHT20	IEEE 802.11ac VHT40	IEEE 802.11ac VHT80
Test modulation	OFDM (BPSK, QPSK, 16-QAM, 64-QAM, 256-QAM)	OFDM (BPSK, QPSK, 16-QAM, 64-QAM, 256-QAM)	OFDM (BPSK, QPSK, 16-QAM, 64-QAM, 256-QAM)
Transmit Frequency Range (MHz)	5180 - 5240 5845 - 5825	5180 - 5240 5845 - 5825	5180 - 5240 5845 - 5825
Channel Number	9	4	2
Data Rate (Mbps)	MCS0 ~ MCS8	MCS0 ~ MCS9	MCS0 ~ MCS9
Maximum tune-up conducted average output power (dBm)	16.5	14.5	14.0
Maximum tested output power (dBm)	16.5	14.17	13.51

Table 7: List of WLAN Channel of 5GHz 802.11a/n

802.11a		802.11n HT20		802.11n HT40	
Channel Number	Frequency (MHz)	Channel Number	Frequency (MHz)	Channel Number	Frequency (MHz)
36	5180	36	5180	38	5190
40	5200	40	5200	46	5230
44	5220	44	5220	151	5755
48	5240	48	5240	159	5795
149	5745	149	5745		
153	5765	153	5765		
157	5785	157	5785		
161	5805	161	5805		
165	5825	165	5825		

Table 8: List of WLAN Channel of 5GHz 802.11ac

802.11ac VHT20		802.11ac VHT40		802.11ac VHT80	
Channel Number	Frequency (MHz)	Channel Number	Frequency (MHz)	Channel Number	Frequency (MHz)
36	5180	38	5190	42	5210
40	5200	46	5230	155	5775
44	5220	151	5755		
48	5240	159	5795		
149	5745				
153	5765				
157	5785				
161	5805				
165	5825				

Table 9: Technical Specification of Bluetooth (BDR & EDR mode)

Technical Specification	**Value**
Operating Frequency band (MHz)	2400 – 2483.5
Channel separation	1MHz
Extreme Temperature Range	0~+40℃
Modulation	GFSK, 8DPSK, π/4DQPSK
Bluetooth version	4.0, Dual Mode
Antenna Gain (dBi)	2.52
Maximum tune-up conducted average output power (dBm)	2
Maximum tested output power (dBm)	1.87

Table 10: RF channel and frequency of Bluetooth (BDR & EDR mode)

RF Channel	Frequency (MHz)	RF Channel	Frequency (MHz)	RF Channel	Frequency (MHz)	RF Channel	Frequency (MHz)
0	2402.00	21	2423.00	42	2444.00	63	2465.00
1	2403.00	22	2424.00	43	2445.00	64	2466.00
2	2404.00	23	2425.00	44	2446.00	65	2467.00
3	2405.00	24	2426.00	45	2447.00	66	2468.00
4	2406.00	25	2427.00	46	2448.00	67	2469.00
5	2407.00	26	2428.00	47	2449.00	68	2470.00
6	2408.00	27	2429.00	48	2450.00	69	2471.00
7	2409.00	28	2430.00	49	2451.00	70	2472.00
8	2410.00	29	2431.00	50	2452.00	71	2473.00
9	2411.00	30	2432.00	51	2453.00	72	2474.00
10	2412.00	31	2433.00	52	2454.00	73	2475.00
11	2413.00	32	2434.00	53	2455.00	74	2476.00
12	2414.00	33	2435.00	54	2456.00	75	2477.00
13	2415.00	34	2436.00	55	2457.00	76	2478.00
14	2416.00	35	2437.00	56	2458.00	77	2479.00
15	2417.00	36	2438.00	57	2459.00	78	2480.00
16	2418.00	37	2439.00	58	2460.00		
17	2419.00	38	2440.00	59	2461.00		
18	2420.00	39	2441.00	60	2462.00		
19	2421.00	40	2442.00	61	2463.00		
20	2422.00	41	2443.00	62	2464.00		

Table 11: Technical Specification of Bluetooth (Low Energy mode)

Technical Specification	**Value**
Operating Frequency band	2400 – 2483.5MHz
Channel separation	2MHz
Extreme Temperature Range	0~+40℃
Modulation	GFSK
Bluetooth version	4.0, Dual Mode
Antenna Gain (dBi)	2.52
Maximum tune-up conducted average output power (dBm)	4
Maximum tested output power (dBm)	3.92

Table 12: RF channel and frequency of Bluetooth (Low Energy mode)

RF Channel	Frequency (MHz)	RF Channel	Frequency (MHz)	RF Channel	Frequency (MHz)	RF Channel	Frequency (MHz)
0	2402.00	11	2424.00	22	2446.00	33	2468.00
1	2404.00	12	2426.00	23	2448.00	34	2470.00
2	2406.00	13	2428.00	24	2450.00	35	2472.00
3	2408.00	14	2430.00	25	2452.00	36	2474.00
4	2410.00	15	2432.00	26	2454.00	37	2476.00
5	2412.00	16	2434.00	27	2456.00	38	2478.00
6	2414.00	17	2436.00	28	2458.00	39	2480.00
7	2416.00	18	2438.00	29	2460.00		
8	2418.00	19	2440.00	30	2462.00		
9	2420.00	20	2442.00	31	2464.00		
10	2422.00	21	2444.00	32	2466.00		

3.3 Independent Operation Modes

The basic operation modes are:

A. On, transmitting
   1. 802.11b
   2. 802.11g
   3. 802.11n (HT20)
   4. 802.11n (HT40)
   5. 802.11a
   6. 802.11ac (VHT20)
   7. 802.11ac (VHT40)
   8. 802.11ac (VHT80)
   9. Bluetooth BDR
   10. Bluetooth EDR
   11. Bluetooth Low Energy

B. Off

3.4 Submitted Documents

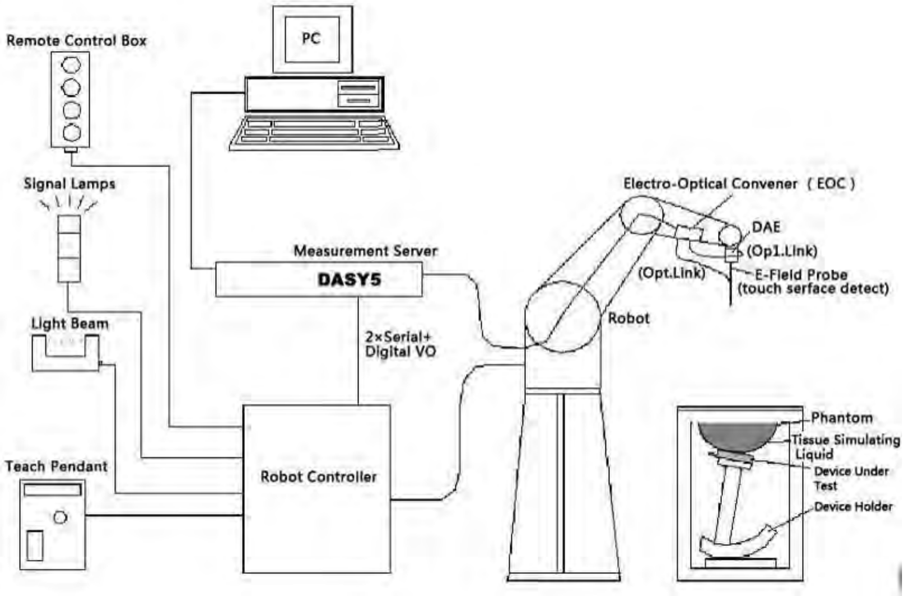
- Application Form
- Block Diagram
- Schematics
- Technical Description
- FCC/IC Label and Location Info
- Photo Document
- User Manual

4. SAR Measurements System Configuration

4.1 SAR Measurements Set-up

The DASY5 system for performing compliance tests consists of the following items:

- A standard high precision 6-axis robot (Stäubli TX=RX family) 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 and the DASY5 software.
- Remote control and teach pendant as well as additional circuitry for robot safety such as warning lamps, etc.
- The generic twin phantom enabling the testing of left-hand and right-hand usage.
- The device holder for handheld mobile phones.
- Tissue simulating liquid mixed according to the given recipes.
- System validation dipoles allowing to validate the proper functioning of the system.



Picture 1 SAR Lab Test Measurement Set-up

4.2 DASY5 E-Field Probe System

The SAR measurements were conducted with the dosimetric probe designed in the classical triangular configuration and optimized for dosimetric evaluation. The probe is constructed using the thick film technique; with printed resistive lines on ceramic substrates. The probe is equipped with an optical multifiber line ending at the front of the probe tip. It is connected to the EOC box on the robot arm and provides an automatic detection of the phantom surface. Half of the fibers are connected to a pulsed infrared transmitter, the other half to a synchronized receiver. As the probe approaches the surface, the reflection from the surface produces a coupling from the transmitting to the receiving fibers. This reflection increases first during the approach, reaches maximum and then decreases. If the probe is flatly touching the surface, the coupling is zero. The distance of the coupling maximum to the surface is independent of the surface reflectivity and largely independent of the surface to probe angle. The DASY5 software reads the reflection turning a software approach and looks for the maximum using 2nd ord curve fitting. The approach is stopped at reaching the maximum.

Probe Specifications:

Model:	EX3DV4
Frequency Range:	10MHz - 6.0GHz (EX3DV4)
Calibration:	In head and body simulating tissue at Frequencies from 835 up to 5800MHz
Linearity:	± 0.2 dB (30 MHz to 6 GHz) for EX3DV4
Dynamic Range:	10 mW/kg - 100W/kg
Probe Length:	330 mm
Probe Tip Length:	20 mm
Body Diameter:	12 mm
Tip Diameter:	2.5 mm
Tip-Center:	1 mm
Application:	SAR Dosimetry Testing Compliance tests of mobile phones Dosimetry in strong gradient fields

Picture 2 E-field Probe

4.3 E-Filed Probe Calibration

Each E-Probe/Probe Amplifier combination has unique calibration parameters. A TEM cell calibration procedure is conducted to determine the proper amplifier settings to enter in the probe parameters. The amplifier settings are determined for a given frequency by subjecting the probe to a known E-field density (1 mW/cm^2) using an RF Signal generator, TEM cell, and RF Power Meter. The free space E-field from amplified probe outputs is determined in a test chamber. This calibration can be performed in a TEM cell if the frequency is below 1 GHz and inn a waveguide or other methodologies above 1 GHz for free space. For the free space calibration, the probe is placed in the volumetric center of the cavity and at the proper orientation with the field. The probe is then rotated 360 degrees until the three channels show the maximum reading. The power density readings equates to 1 mw/ cm^2.
E-field temperature correlation calibration is performed in a flat phantom filled with the appropriate simulated brain tissue. The E-field in the medium correlates with the temperature rise in the dielectric medium. For temperature correlation calibration a RF transparent thermistor-based temperature probe is used in conjunction with the E-field probe.

$$SAR = C\frac{\Delta T}{\Delta t}$$

Where:
Δt = Exposure time (30 seconds),
C = Heat capacity of tissue (brain or muscle),
ΔT = Temperature increase due to RF exposure.

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

Where:
σ = Simulated tissue conductivity,
ρ = Tissue density (kg/m^3).

4.4 Other Test Equipment

4.4.1 Data Acquisition Electronics (DAE)

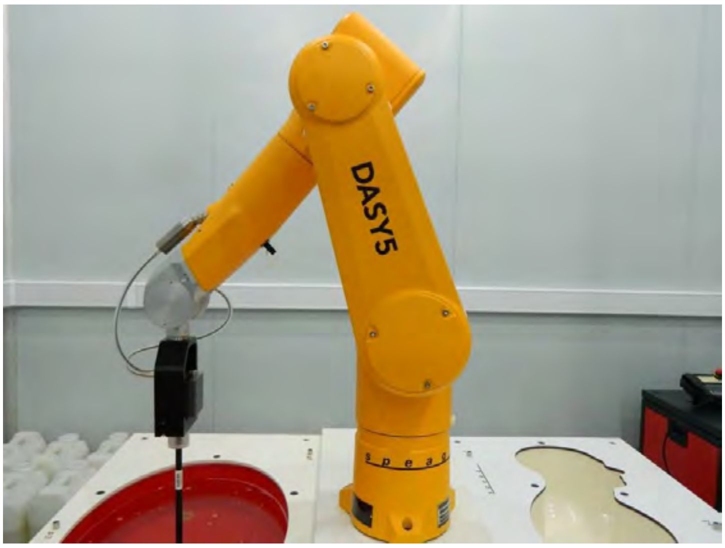
The data acquisition electronics consist of a highly sensitive electrometer-grade preamplifier with auto-zeroing, a channel and gain-switching multiplexer, a fast 16 bit AD-converter and a command decoder with a control logic unit. Transmission to the measurement server is accomplished through an optical downlink for data and status information, as well as an optical uplink for commands and the clock.
The mechanical probe mounting device includes two different sensor systems for frontal and sideways probe contacts. They are used for mechanical surface detection and probe collision detection.
The input impedance of the DAE is 200 MOhm; the inputs are symmetrical and floating. Common mode rejection is above 80 dB.

Picture 3 DAE

4.4.2 Robot

The SPEAG DASY system uses the high precision robots (DASY5: TX60XL) type from Stäubli SA (France). For the 6-axis controller system, the robot controller version from Stäubli is used. The Stäubli robot series have many features that are important for our application:

High precision (repeatability 0.02mm)
High reliability (industrial design)
Low maintenance costs (virtually maintenance free due to direct drive gears; no belt drives)
Jerk-free straight movements (brushless synchron motors; no stepper motors)
Low ELF interference (motor control fields shielded via the closed metallic construction shields)



Picture 4 DASY 5

4.4.3 Measurement Server

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

Picture 4 Server for DASY 5

The measurement server performs all real-time data evaluation of field measurements and surface detection, controls robot movements and handles safety operation. The PC operating system cannot interfere with these time critical processes. All connections are supervised by a watchdog, and disconnection of any of the cables to the measurement server will automatically disarm the robot and disable all program-controlled robot movements. Furthermore, the measurement server is equipped with an expansion port which is reserved for future applications. Please note that this expansion port does not have a standardized pinout, and therefore only devices provided by SPEAG can be connected. Devices from any other supplier could seriously damage the measurement server.

4.4.4 Device Holder for Phantom

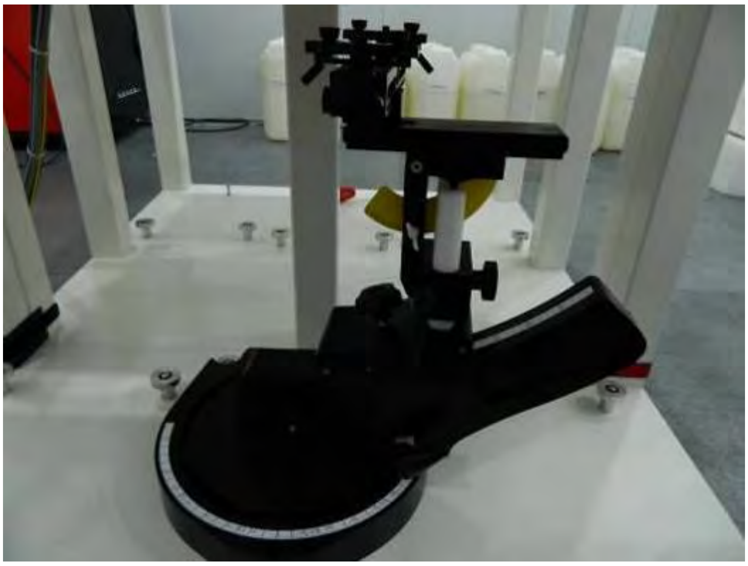
The SAR in the phantom is approximately inversely proportional to the square of the distance between the source and the liquid surface. For a source at 5mm distance, a positioning uncertainty of ±0.5mm would produce a SAR uncertainty of ±20%. Accurate device positioning is therefore crucial for accurate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

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

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

<Laptop Extension Kit>

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

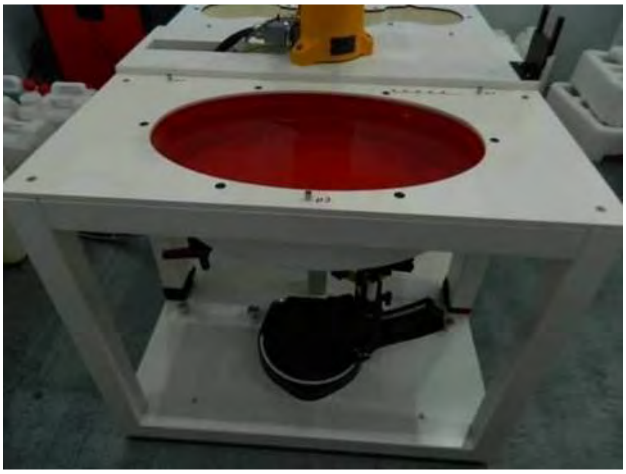


Picture 5 Device Holder

4.4.5 Phantom

Phantom for compliance testing of handheld and body-mounted wireless devices in the frequency range of 30 MHz to 6 GHz. ELI is fully compatible with the IEC 62209-2 standard and all known tissue simulating liquids. ELI has been optimized regarding its performance and can be integrated into our standard phantom tables. A cover prevents evaporation of the liquid. Reference markings on the phantom allow installation of the complete setup, including all predefined phantom positions and measurement grids, by teaching three points. The phantom is compatible with all SPEAG dosimetric probes and dipoles.

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



Picture 8 ELI4 Phantom

4.5 Scanning Procedure

The DASY5 installation includes predefined files with recommended procedures for measurements and validation. They are read-only document files and destined as fully defined but unmeasured masks. All test positions (head or body-worn) are tested with the same configuration of test steps differing only in the grid definition for the different test positions.

The “reference” and “drift” measurements are located at the beginning and end of the batch process. They measure the field drift at one single point in the liquid over the complete procedure. The indicated drift is mainly the variation of the DUT’s output power and should vary max. ± 5 %.

The “surface check” measurement tests the optical surface detection system of the DASY5 system by repeatedly detecting the surface with the optical and mechanical surface detector and comparing the results. The output gives the detecting heights of both systems, the difference between the two systems and the standard deviation of the detection repeatability. Air bubbles or refraction in the liquid due to separation of the sugar-water mixture gives poor repeatability (above ± 0.1mm). To prevent wrong results tests are only executed when the liquid is free of air bubbles. The difference between the optical surface detection and the actual surface depends on the probe and is specified with each probe. (It does not depend on the surface reflectivity or the probe angle to the surface within ± 30°.)

Area Scan

The Area Scan is used as a fast scan in two dimensions to find the area of high field values before running a detailed measurement around the hot spot. Before starting the area scan a grid spacing is set according to FCC KDB Publication 865664. During scan the distance of the probe to the phantom remains unchanged. After finishing area scan, the field maxima within a range of 2 dB will be ascertained.

Zoom Scan

After the maximum interpolated values were calculated between the points in the cube, the SAR was averaged over the spatial volume (1g or 10g) using a 3D-Spline interpolation algorithm. The 3D-spline is composed of three one-dimensional splines with the “Not a knot” condition (in x, y, and z directions). The volume was then integrated with the trapezoidal algorithm.

Spatial Peak Detection

The procedure for spatial peak SAR evaluation has been implemented and can determine values of masses of 1g and 10g, as well as for user-specific masses. The DASY5 system allows evaluations that combine measured data and robot positions, such as:

- maximum search
- extrapolation
- boundary correction
- peak search for averaged SAR

During a maximum search, global and local maxima searches are automatically performed in 2-D after each Area Scan measurement with at least 6 measurement points. It is based on the evaluation of the local SAR gradient calculated by the Quadratic Shepard’s method. The algorithm will find the global maximum and all local maxima within -2 dB of the global maxima for all SAR distributions.

Extrapolation routines are used to obtain SAR values between the lowest measurement points and the inner phantom surface. The extrapolation distance is determined by the surface detection distance and the probe sensor offset. Several measurements at different distances are necessary for the extrapolation. Extrapolation routines require at least 10 measurement points in 3-D space.

They are used in the Zoom Scan to obtain SAR values between the lowest measurement points and the inner phantom surface. The routine uses the modified Quadratic Shepard’s method for extrapolation.

A Z-axis scan measures the total SAR value at the x-and y-position of the maximum SAR value found during the cube scan. The probe is moved away in z-direction from the bottom of the SAM phantom in 5mm steps.

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

4.6 Data Storage and Evaluation

4.6.1 Data Storage

The DASY5 software stores the acquired data from the data acquisition electronics as raw data (in microvolt readings from the probe sensors), together with all necessary software parameters for the data evaluation (probe calibration data, liquid parameters and device frequency and modulation data) in measurement files with the extension ".DAE4". The software evaluates the desired unit and format for output each time the data is visualized or exported. This allows verification of the complete software setup even after the measurement and allows correction of incorrect parameter settings. For example, if a measurement has been performed with a wrong crest factor parameter in the device set up, the parameter can be corrected afterwards and the data can be re-evaluated. The measured data can be visualized or exported in different units or formats, depending on the selected probe type ([V/m], [A/m], [°C], [mW/g], [mW/cm²], [dBrel], etc.). Some of these units are not available in certain situations or show meaningless results, e.g., a SAR output in a loss less media will always be zero. Raw data can also be exported to perform the evaluation with other software packages.

4.6.2 Data Evaluation by SEMCAD

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

Probe parameters: - Sensitivity $Norm_i$, a_{i0}, a_{i1}, a_{i2}

- Conversion factor $ConvF_i$

- Diode compression point Dcp_i

Device parameters: - Frequency f

- Crest factor cf

Media parameters: - Conductivity
- Density

These parameters must be set correctly in the software. They can be found in the component documents or they can be imported into the software from the configuration files issued for the DASY5 components. In the direct measuring mode of the multimeter option, the parameters of the actual system setup are used. In the scan visualization and export modes, the parameters stored in the corresponding document files are used.

The first step of the evaluation is a linearization of the filtered input signal to account for the compression characteristics of the detector diode. The compensation depends on the input signal, the diode type and the DC-transmission factor from the diode to the evaluation electronics.

If the exciting field is pulsed, the crest factor of the signal must be known to correctly compensate for peak power. The formula for each channel can be given as:

$$\mathbf{V_i = U_i + U_i^2 \cdot c\,f / dcp_i}$$

With $\mathbf{V_i}$ = compensated signal of channel i (i = x, y, z)

$\mathbf{U_i}$ = input signal of channel i (i = x, y, z)

cf = crest factor of exciting field (DASY parameter)

$\mathbf{dcp_i}$ = diode compression point (DASY parameter)

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

evaluated:

E-field probes: $\mathbf{E_i = (V_i / Norm_i \cdot ConvF)^{1/2}}$

H-field probes: $\mathbf{H_i = (V_i)^{1/2} \cdot (a_{i0} + a_{i1}\, f + a_{i2} f^2) / f}$

With $\mathbf{V_i}$ = compensated signal of channel i (i = x, y, z)

$\mathbf{Norm_i}$ = sensor sensitivity of channel i (i = x, y, z)

[mV/(V/m)2] for E-field Probes

ConvF = sensitivity enhancement in solution

$\mathbf{a_{ij}}$ **=** sensor sensitivity factors for H-field probes

f = carrier frequency [GHz]

$\mathbf{E_i}$ = electric field strength of channel i in V/m

$\mathbf{H_i}$ = magnetic field strength of channel i in A/m

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

$$\mathbf{E_{tot} = (E_x^2 + E_Y^2 + E_z^2)^{1/2}}$$

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

$$\mathbf{SAR = (E_{tot})\ 2 \cdot \sigma / (\rho \cdot 1000)}$$

with **SAR** = local specific absorption rate in mW/g

$\mathbf{E_{tot}}$ = total field strength in V/m

= conductivity in [mho/m] or [Siemens/m]

= equivalent tissue density in g/cm^3

Note that the density is normally set to 1 (or 1.06), to account for actual brain density rather than the density of the simulation liquid. The power flow density is calculated assuming the excitation field to be a free space field.

$\mathbf{P_{pwe} = E_{tot}^2 / 3770}$ **or** $\mathbf{P_{pwe} = H_{tot}^2 \cdot 37.7}$

with $\mathbf{P_{pwe}}$ = equivalent power density of a plane wave in mW/cm^2

$\mathbf{E_{tot}}$ = total electric field strength in V/m; $\mathbf{H_{tot}}$ = total magnetic field strength in A/m

5. Test Set-up and Operation Modes

5.1 Principle of Configuration Selection

The EUT is commanded to operate at maximum transmitting power. The EUT shall use its internal transmitter. The antenna and accessories shall be those specified by the manufacturer. The EUT battery must be fully powered and checked periodically during the test to ascertain uniform power output.

Table 13: Configuration of EUT

Operation mode	Frequency Range (MHz)	Modulation	Default Test Channel			Power Control Level
			Low	Middle	High	
802.11b/g/n(HT20)	2412-2462	DSSS, OFDM	CH1	CH6	CH11	Test software was used to configure the EUT to transmit at maximum output power
802.11a/n(HT20)/ac(VHT20) (Band U-NII-1)	5180-5240	OFDM	CH36	CH40	CH48	
802.11a/n(HT20)/ac(VHT20) (Band U-NII-3)	5745-5825	OFDM	CH149	CH157	CH165	
802.11n(HT40)/ac(VHT40) (Band U-NII-1)	5180-5240	OFDM	CH38	---	CH46	
802.11n(HT40)/ac(VHT40) (Band U-NII-3)	5745-5825	OFDM	CH151	---	CH159	
802.11ac(VHT80) (Band U-NII-1)	5180-5240	OFDM	---	CH42	---	
802.11ac(VHT80) (Band U-NII-3)	5745-5825	OFDM	---	CH155	---	
Bluetooth (BDR & EDR)	2402-2480	FHSS	CH0	CH39	CH78	
Bluetooth (Low Energy)	2402-2480	GFSK	CH0	CH19	CH39	

5.2 Tissue Simulating Liquid Ingredients

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

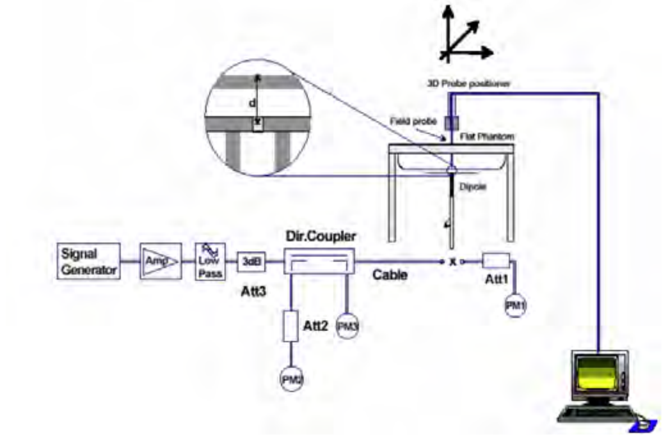
Table 14: Composition of Tissue Simulating Liquid

MIXTURE%(Weight)	FREQUENCY (Body) 2450MHz
Water	73.2
Glycol	26.7
Salt	0.1
Dielectric Parameters Target Value	f=2450MHz ε=52.70 σ=1.95

MIXTURE%(Weight)	FREQUENCY (Body) 5GHz
Water	75.68
DGBE	4.42
Triton X-100	19.47
Salt	0.43
Dielectric Parameters Target Value	f=5200MHz ε=49.00 σ=5.30 f=5300MHz ε=48.90 σ=5.42 f=5500MHz ε=48.60 σ=5.65 f=5600MHz ε=48.50 σ=5.77 f=5800MHz ε=48.20 σ=6.00

5.3 Specific Absorption Rate (SAR) System Check

The manufacturer calibrates the probes annually. Dielectric parameters of the tissue simulants were measured every day using the dielectric probe kit and the network analyzer. A system check measurement was made following the determination of the dielectric parameters of the simulant, using the dipole validation kit. A power level of 250 mW 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 Appendix A. System check results have to be equal or near the values determined during dipole calibration with the relevant liquids and test system (±10 %). System check is performed regularly on all frequency bands where tests are performed with the DASY5 system.



Picture 9 System Check Set-up

Table 15: System Check Results of Tissue Simulating Liquid

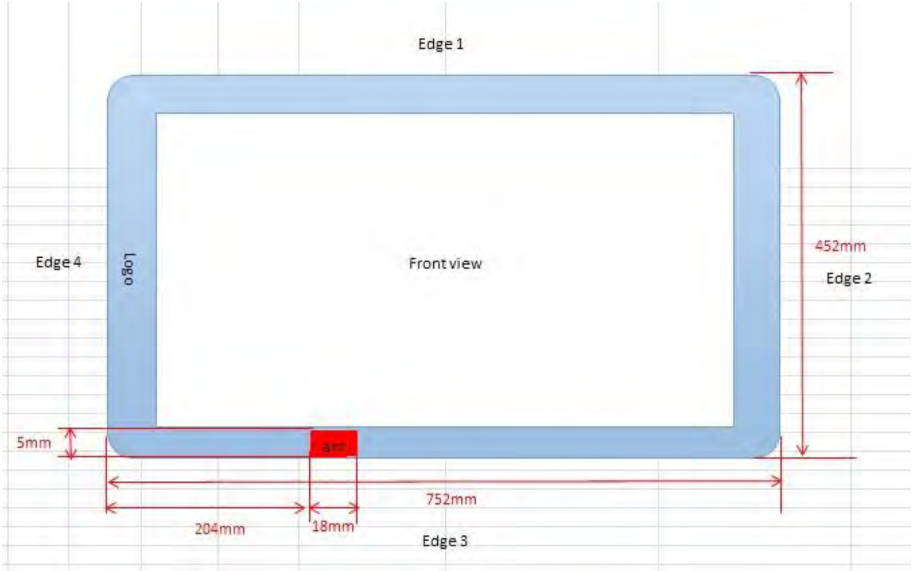
Frequency (MHz)	Tissue Type	Liquid Temp. (℃)	Conductivity (σ)	Permittivity (ε_r)	Conductivity Target (σ)	Permittivity Target (ε_r)	Delta (σ) (%)	Delta (ε_r) (%)	Limit (%)	Date
2450	Body	22.6	2.026	52.063	1.95	52.70	3.90	-1.21	±5	2016-08-05
5200	Body	22.7	5.208	50.972	5.30	49.00	-1.74	4.02	±5	2016-08-08
5800	Body	22.7	6.185	49.782	6.00	48.20	3.08	3.28	±5	2016-08-08

(Liquid depth: 15cm)

Table 16: System Validation

Frequency (MHz)	Tissue Type	Input Power (mW)	Dipole S/N	Probe S/N	DAE S/N	Measured 1g SAR (W/kg)	Targeted 1g SAR (W/kg)	Normalized 1g SAR (W/kg)	Deviation (%)	Date
2450	Body	250	927	3873	1341	12.60	50.40	50.4	0.00	2016-08-05
5200	Body	100	1169	3970	1418	7.48	73.80	74.8	1.36	2016-08-08
5800	Body	100	1169	3970	1418	7.35	74.30	73.5	-1.08	2016-08-08

5.4 Exposure Positions Consideration



Front Screen and Top Edge were tested with small area near the antenna according to FCC inquiry with Tracking Number 351814

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

SAR is not required for 2.4GHz 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.

5.6 Special Accessories and Auxiliary Equipment

None.

6. Test Results

6.1 Huaman Exposure to Radiofrequency Electromagnetic Fields

RESULT: **Passed**

Date of testing	:	2016-08-05 to 2016-08-08
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 KDB 865664 D01 v01r04 KDB 616217 D04 v01r02
Limits	:	4W/kg for Extremity

Note: Wi-Fi antenna and Bluetooth cannot transmitter simultaneously.

According to the position of antenna and dimension of product, the test was carried out on front face /edge Top per FCC Inquiry with Tracking Number 351814.

The reported SAR of all initial test configurations is ≤ 1.2 W/kg. Adjusted SAR according to the ratio of the specified maximum output power of subsequent test configuration to initial test configuration will result in lower SAR; therefore, subsequent test configuration SAR is not required for this example.

Repeated SAR and other next highest channels are exempted to conduct with all the initial reported SAR ≤ 0.8 W/kg

Table 17: Initial test configurations Test result of SAR Values

Band	Mode	Test Position	Gap (cm)	Ch.	Freq. (MHz)	configure	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)	Date
WLAN2.4G	802.11b	Front Face	0	11	2462	1Mbps	13.95	14.00	1.012	100	1.000	0.1	0.115	0.116	2016-08-05
WLAN2.4G	802.11b	Edge 3	0	11	2462	1Mbps	13.95	14.00	1.012	100	1.000	-0.04	0.144	0.146	2016-08-05
									1.000		1.000			0.000	
WLAN5G Band 1	802.11a	Front Face	0	48	5240	6Mbps	16.41	16.50	1.021	97.32	1.028	-0.02	0.343	0.360	2016-08-08
WLAN5G Band 1	802.11a	Edge 3	0	48	5240	6Mbps	16.41	16.50	1.021	97.32	1.028	-0.02	0.658	0.691	2016-08-08
									1.000		1.000			0.000	
WLAN5G Band 4	802.11a	Front Face	0	149	5745	6Mbps	16.43	16.50	1.016	97.32	1.028	-0.06	0.407	0.425	2016-08-08
WLAN5G Band 4	802.11a	Edge 3	0	149	5745	6Mbps	16.43	16.50	1.016	97.32	1.028	0.07	0.692	0.723	2016-08-08
WLAN5G Band 4	802.11a	Edge 3	0	165	5825	6Mbps	16.06	16.50	1.107	97.32	1.028	0.07	0.709	0.807	2016-08-08

Refer to attached Appendix B for details of test results.

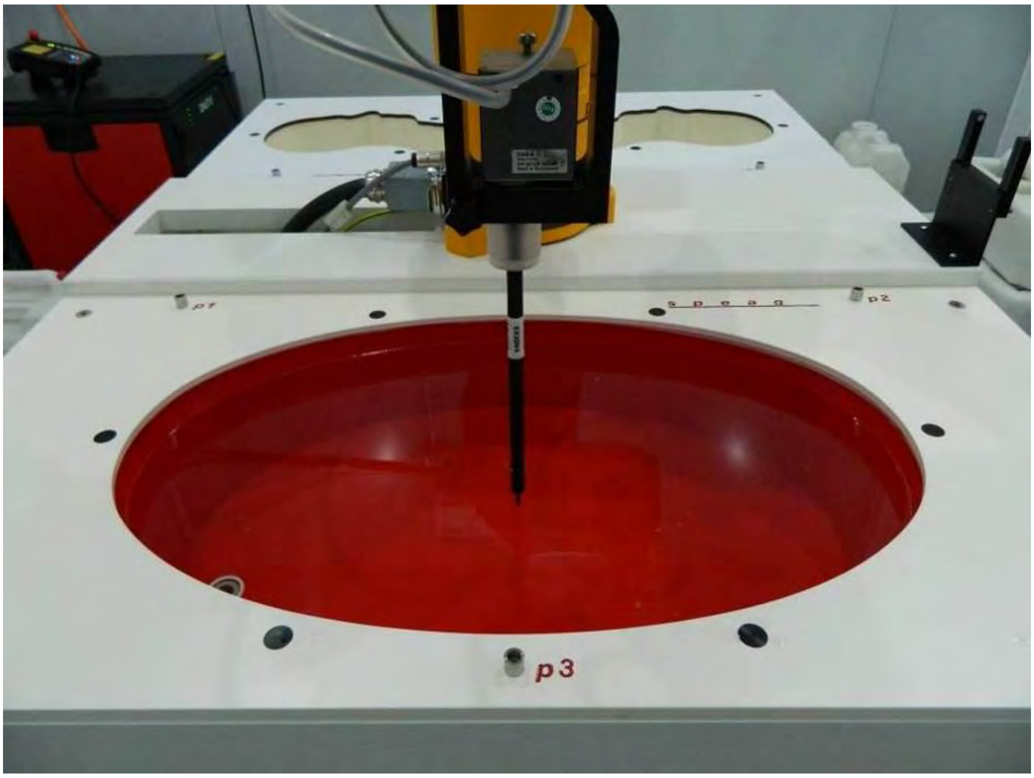
6.2 Measurement Uncertainty

6.2.1 Measurement uncertainty evaluation

The measured SAR were <1.5 W/kg for all frequency bands, therefore per KDB Publication 865664 D01, the extensive SAR measurement uncertainty analysis described in IEEE Std 1528-2013 is not required in SAR reports.

7. Photographs of the Test Set-Up

Photograph 1: Test Layout



Photograph 2: Set-up for Front Face

Photograph 3: Set-up for Edge 3

8. List of Tables

Table 1: List of Test and Measurement Equipment 6
Table 2: Technical Specification of Wi-Fi 7
Table 3: Technical Specification of 2.4GHz, 802.11b/g/n 7
Table 4: List of WLAN Channel of 802.11b/g/n 8
Table 5: Technical Specification of 5GHz, 802.11a/n 8
Table 6: Technical Specification of 5GHz, 802.11ac 8
Table 7: List of WLAN Channel of 5GHz 802.11a/n 9
Table 8: List of WLAN Channel of 5GHz 802.11ac 9
Table 9: Technical Specification of Bluetooth (BDR & EDR mode) 9
Table 10: RF channel and frequency of Bluetooth (BDR & EDR mode) 10
Table 11: Technical Specification of Bluetooth (Low Energy mode) 10
Table 12: RF channel and frequency of Bluetooth (Low Energy mode) 11
Table 13: Configuration of EUT 21
Table 14: Composition of Tissue Simulating Liquid 21
Table 15: System Check Results of Tissue Simulating Liquid 22
Table 16: System Validation 22
Table 17: Initial test configurations Test result of SAR Values 25

9. List of Photographs

Photograph 1: Test Layout 27
Photograph 2: Set-up for Front Face 27
Photograph 3: Set-up for Edge 3 28

Appendix A

System Performance Check

Test Laboratory: EMTEK (Shenzhen) Co.,Ltd. Date/Time: 05.08.2016

SystemPerformanceCheck-D2450V2-MSL-160805

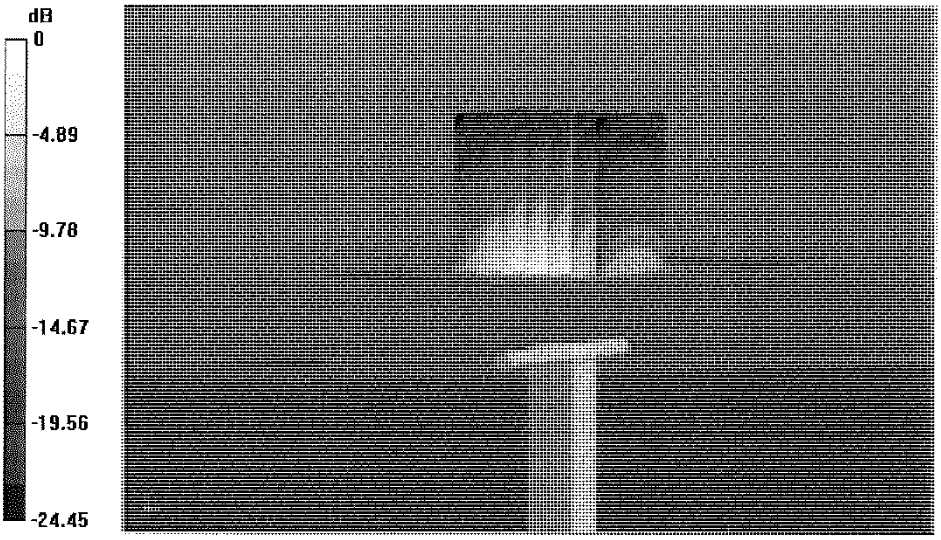
Communication System: UID 0, CW (0); Frequency: 2450 MHz;Duty Cycle: 1:1
Medium: MSL_2450_160805
Medium parameters used: f = 2450 MHz; σ = 2.026 S/m; ε_r = 52.063; ρ = 1000 kg/m^3
Ambient Temperature: 23.3 ℃; Liquid Temperature: 22.6 ℃

DASY Configuration:

- Probe: EX3DV4 - SN3873; ConvF(7.30, 7.30, 7.30); Calibrated: 26.08.2015;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1341; Calibrated: 25.08.2015
- 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) = 18.6 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 = 94.496 V/m; Power Drift = 0.07 dB
Peak SAR (extrapolated) = 25.7 W/kg
SAR(1 g) = 12.6 W/kg; SAR(10 g) = 5.39 W/kg
Maximum value of SAR (measured) = 18.8 W/kg



0 dB = 18.8 W/kg = 12.74 dBW/kg

Test Laboratory: EMTEK (Shenzhen) Co.,Ltd. Date/Time: 08.08.2016

SystemPerformanceCheck-D5GHzV2-5200MHz-MSL-160808

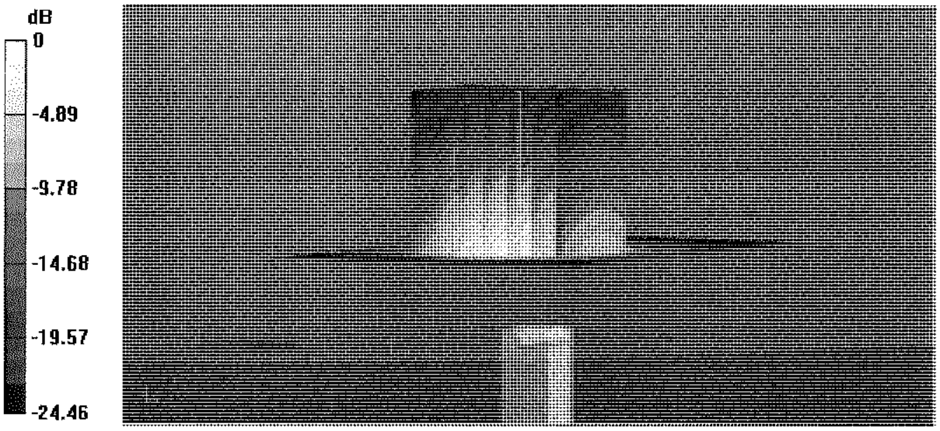
Communication System: UID 0, CW (0); Frequency: 5200 MHz;Duty Cycle: 1:1
Medium: MSL_5G_160808
Medium parameters used: f = 5200 MHz; σ = 5.208 S/m; ε_r = 50.972; ρ = 1000 kg/m^3
Ambient Temperature: 23.5 ℃; Liquid Temperature: 22.7 ℃

DASY Configuration:

- Probe: EX3DV4 - SN3873; ConvF(4.40, 4.40, 4.40); Calibrated: 26.08.2015;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1341; Calibrated: 25.08.2015
- 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 5200MHz/d=10mm, Pin=100mW, dist=1.4mm (EX-Probe)/Area Scan (91x91x1): Interpolated grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 17.6 W/kg

System Performanee Check at Frequency at 5200MHz/d=10mm, Pin=100mW, dist=1.4mm (EX-Probe)/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 96.402 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 31.4 W/kg
SAR(1 g) = 7.48 W/kg; SAR(10 g) = 2.13 W/kg
Maximum value of SAR (measured) = 17.7 W/kg



0 dB = 17.7 W/kg = 12.48 dBW/kg

Test Laboratory: EMTEK (Shenzhen) Co.,Ltd. Date/Time: 08.08.2016

SystemPerformanceCheck-D5GHzV2-5800MHz-MSL-160808

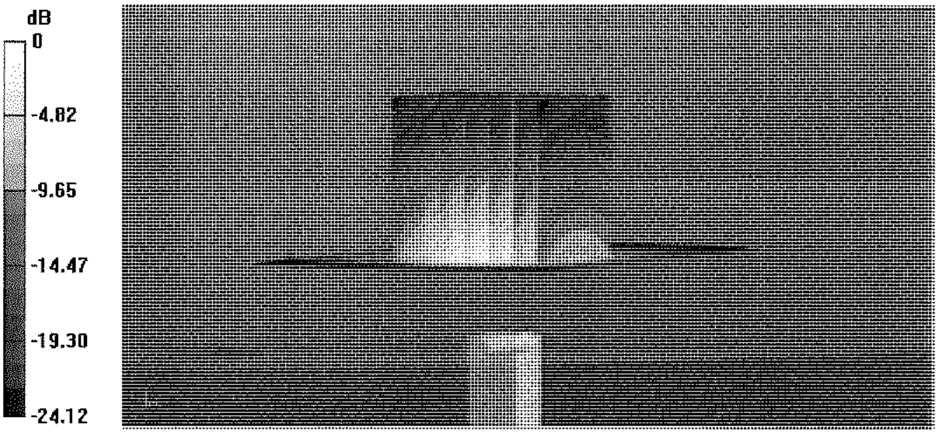
Communication System: UID 0, CW (0); Frequency: 5800 MHz;Duty Cycle: 1:1
Medium: MSL_5G_160808
Medium parameters used: f = 5800 MHz; σ = 6.185 S/m; ε_r = 49.782; ρ = 1000 kg/m^3
Ambient Temperature: 23.5 ℃; Liquid Temperature: 22.7 ℃

DASY Configuration:

- Probe: EX3DV4 - SN3873; ConvF(4.02, 4.02, 4.02); Calibrated: 26.08.2015;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1341; Calibrated: 25.08.2015
- 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 5800MHz/d=10mm, Pin=100mW, dist=1.4mm (EX-Probe)/Area Scan (91x91x1): Interpolated grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 16.1 W/kg

System Performance Check at Frequency at 5800MHz/d=10mm, Pin=100mW, dist=1.4mm (EX-Probe)/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 57.214 V/m; Power Drift = 0.09 dB
Peak SAR (extrapolated) = 30.2 W/kg
SAR(1 g) = 7.35 W/kg; SAR(10 g) = 2.09 W/kg
Maximum value of SAR (measured) = 16.2 W/kg



0 dB = 16.2 W/kg = 12.10 dBW/kg

Appendix A

Test Plots of SAR Measurement

Test Laboratory: EMTEK (Shenzhen) Co.,Ltd. Date/Time: 05.08.2016

01-WLAN2.4GHz-802.11b 1Mbps-Front Face-0cm-Ch11

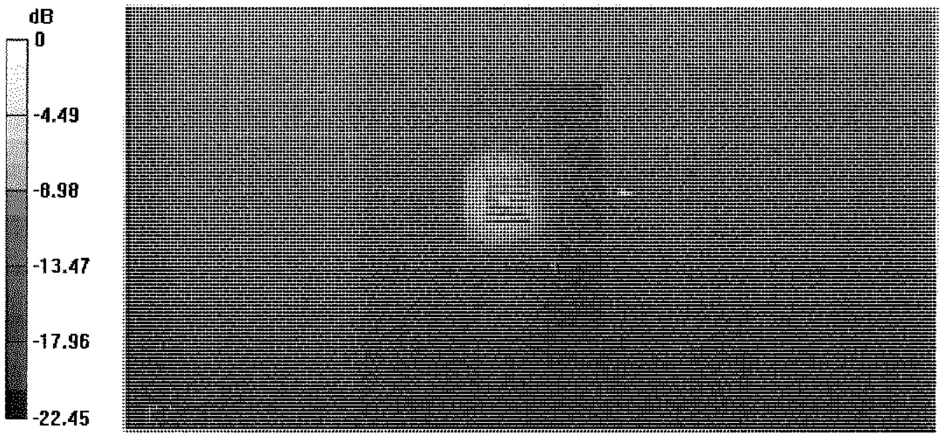
Communication System: UID 0, WIFI (0); Frequency: 2462 MHz;Duty Cycle: 1:1
Medium: MSL_2450_160805
Medium parameters used: f = 2462 MHz; σ = 2.046 S/m; ε_r = 52.782; ρ = 1000 kg/m^3
Ambient Temperature: 23.3 ℃; Liquid Temperature: 22.6 ℃

DASY Configuration:

- Probe: EX3DV4 - SN3873; ConvF(7.30, 7.30, 7.30); Calibrated: 26.08.2015;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1341; Calibrated: 25.08.2015
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1231
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

Configuration/Ch11/Area Scan (161x81x1): Interpolated grid: dx=12mm, dy=12mm
Maximum value of SAR (interpolated) = 0.174 W/kg

Configuration/Ch11/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 5.318 V/m; Power Drift = 0.10 dB
Peak SAR (extrapolated) = 0.241 W/kg
SAR(1 g) = 0.115 W/kg; SAR(10 g) = 0.054 W/kg
Maximum value of SAR (measured) = 0.175 W/kg



0 dB = 0.175 W/kg = -7.57 dBW/kg

Test Laboratory: EMTEK (Shenzhen) Co.,Ltd. Date/Time: 05.08.2016

02-WLAN2.4GHz-802.11b 1Mbps-Edge 3-0cm-Ch11

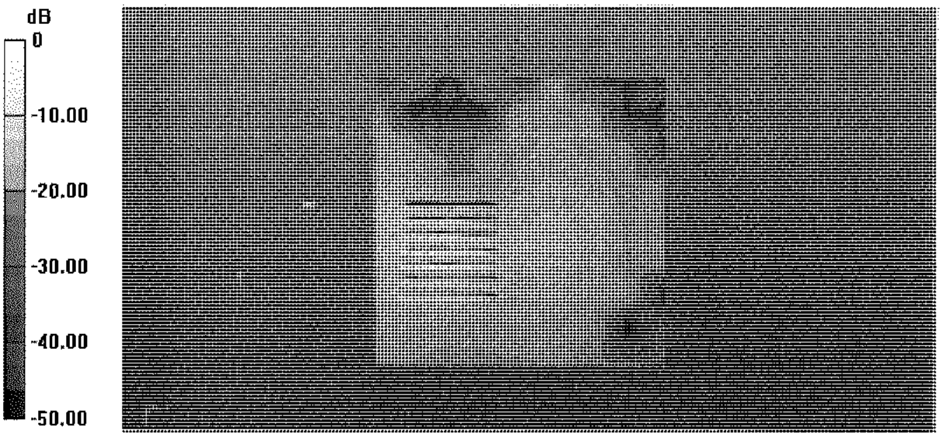
Communication System: UID 0, WIFI (0); Frequency: 2462 MHz;Duty Cycle: 1:1
Medium: MSL_2450_160805
Medium parameters used: f = 2462 MHz; σ = 2.046 S/m; ε_r = 52.782; ρ = 1000 kg/m^3
Ambient Temperature: 23.3 ℃; Liquid Temperature: 22.6 ℃

DASY Configuration:

- Probe: EX3DV4 - SN3873; ConvF(7.30, 7.30, 7.30); Calibrated: 26.08.2015;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1341; Calibrated: 25.08.2015
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1231
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

Configuration/Ch11/Area Scan (81x81x1): Interpolated grid: dx=12mm, dy=12mm
Maximum value of SAR (interpolated) = 0.230 W/kg

Configuration/Ch11/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 5.884 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 0.348 W/kg
SAR(1 g) = 0.144 W/kg; SAR(10 g) = 0.053 W/kg
Maximum value of SAR (measured) = 0.232 W/kg



0 dB = 0.232 W/kg = -6.35 dBW/kg

Test Laboratory: EMTEK (Shenzhen) Co.,Ltd. Date/Time: 08.08.2016

03-WLAN5GHz Band 1-802.11a 6Mbps-Front Face-0cm-Ch48

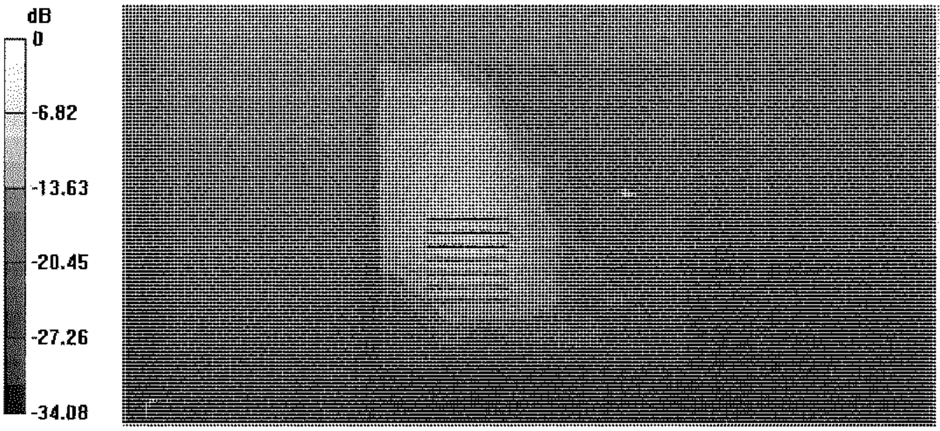
Communication System: UID 0, WIFI (0); Frequency: 5240 MHz;Duty Cycle: 1:1.028
Medium: MSL_5G_160808
Medium parameters used: f = 5240 MHz; σ = 5.271 S/m; ε_r = 50.934; ρ = 1000 kg/m^3
Ambient Temperature: 23.5 ℃; Liquid Temperature: 22.7 ℃

DASY Configuration:

- Probe: EX3DV4 - SN3873; ConvF(4.40, 4.40, 4.40); Calibrated: 26.08.2015;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1341; Calibrated: 25.08.2015
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1231
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

Configuration/Ch48/Area Scan (91x91x1): Interpolated grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.682 W/kg

Configuration/Ch48/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 3.264 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 1.80 W/kg
SAR(1 g) = 0.343 W/kg; SAR(10 g) = 0.098 W/kg
Maximum value of SAR (measured) = 0.920 W/kg



0 dB = 0.920 W/kg = -0.36 dBW/kg

Test Laboratory: EMTEK (Shenzhen) Co.,Ltd. Date/Time: 08.08.2016

04-WLAN5GHz Band 1-802.11a 6Mbps-Edge 3-0cm-Ch48

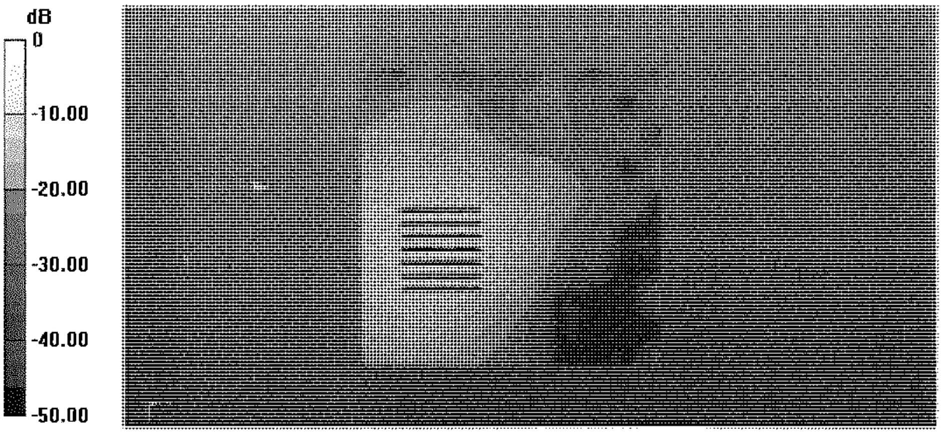
Communication System: UID 0, WIFI (0); Frequency: 5240 MHz;Duty Cycle: 1:1.028
Medium: MSL_5G_160808
Medium parameters used: f = 5240 MHz; σ = 5.271 S/m; ε_r = 50.934; ρ = 1000 kg/m^3
Ambient Temperature: 23.5 ℃; Liquid Temperature: 22.7 ℃

DASY Configuration:

- Probe: EX3DV4 - SN3873; ConvF(4.40, 4.40, 4.40); Calibrated: 26.08.2015;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1341; Calibrated: 25.08.2015
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1231
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

Configuration/Ch48/Area Scan (91x91x1): Interpolated grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 1.32 W/kg

Configuration/Ch48/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 1.813 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 3.81 W/kg
SAR(1 g) = 0.658 W/kg; SAR(10 g) = 0.223 W/kg
Maximum value of SAR (measured) = 1.79 W/kg



0 dB = 1.79 W/kg = 2.53 dBW/kg

Test Laboratory: EMTEK (Shenzhen) Co.,Ltd. Date/Time: 08.08.2016

05-WLAN5GHz Band 4-802.11a 6Mbps-Front Face-0cm-Ch149

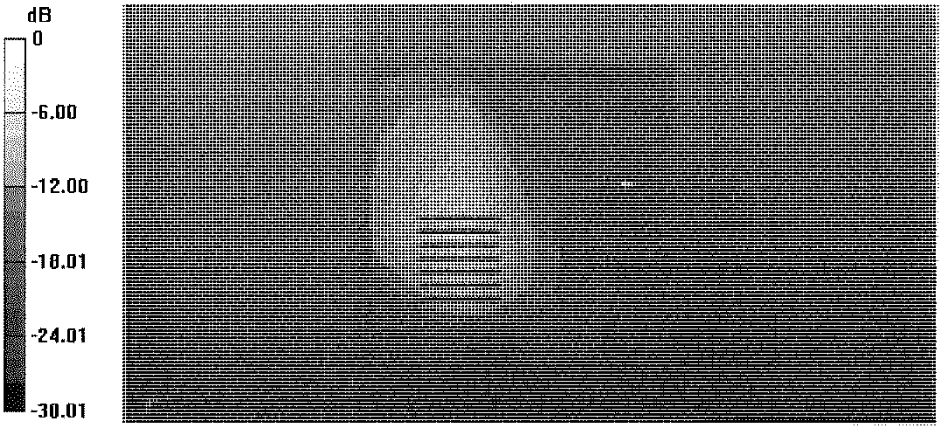
Communication System: UID 0, WIFI (0); Frequency: 5745 MHz;Duty Cycle: 1:1.028
Medium: MSL_5G_160808
Medium parameters used: f = 5745 MHz; σ = 6.105 S/m; ε_r = 49.947; ρ = 1000 kg/m^3
Ambient Temperature: 23.5 ℃; Liquid Temperature: 22.7 ℃

DASY Configuration:

- Probe: EX3DV4 - SN3873; ConvF(4.02, 4.02, 4.02); Calibrated: 26.08.2015;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1341; Calibrated: 25.08.2015
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1231
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

Configuration/Ch149/Area Scan (91x91x1): Interpolated grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 1.04 W/kg

Configuration/Ch149/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 4.005 V/m; Power Drift = -0.06 dB
Peak SAR (extrapolated) = 1.97 W/kg
SAR(1 g) = 0.407 W/kg; SAR(10 g) = 0.106 W/kg
Maximum value of SAR (measured) = 1.06 W/kg



0 dB = 1.06 W/kg = 0.25 dBW/kg

Test Laboratory: EMTEK (Shenzhen) Co.,Ltd. Date/Time: 08.08.2016

06-WLAN5GHz Band 4-802.11a 6Mbps-Edge 3-0cm-Ch149

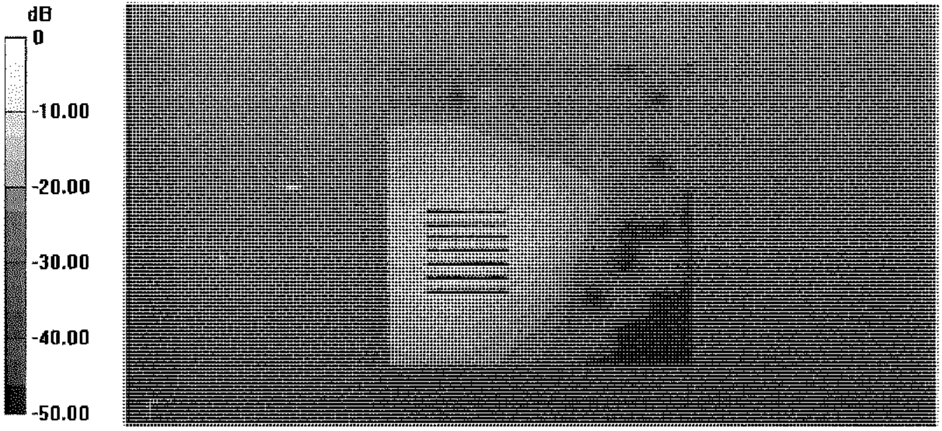
Communication System: UID 0, WIFI (0); Frequency: 5745 MHz;Duty Cycle: 1:1.028
Medium: MSL_5G_160808
Medium parameters used: f = 5745 MHz; σ = 6.105 S/m; ε_r = 49.947; ρ = 1000 kg/m^3
Ambient Temperature: 23.5 ℃; Liquid Temperature: 22.7 ℃

DASY Configuration:

- Probe: EX3DV4 - SN3873; ConvF(4.02, 4.02, 4.02); Calibrated: 26.08.2015;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1341; Calibrated: 25.08.2015
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1231
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

Configuration/Ch149/Area Scan (91x91x1): Interpolated grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 2.06 W/kg

Configuration/Ch149/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 1.818 V/m; Power Drift = 0.07 dB
Peak SAR (extrapolated) = 4.04 W/kg
SAR(1 g) = 0.692 W/kg; SAR(10 g) = 0.242 W/kg
Maximum value of SAR (measured) = 2.03 W/kg



0 dB = 2.03 W/kg = 3.07 dBW/kg

Test Laboratory: EMTEK (Shenzhen) Co.,Ltd. Date/Time: 08.08.2016

07-WLAN5GHz Band 4-802.11a 6Mbps-Edge 3-0cm-Ch165

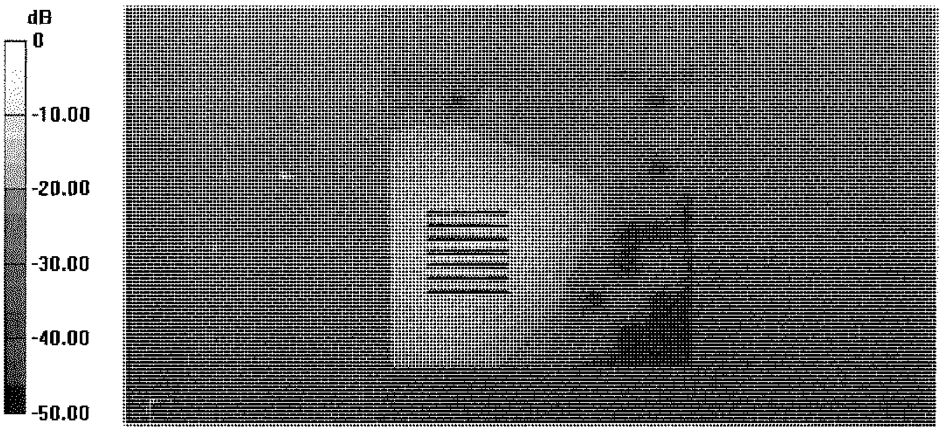
Communication System: UID 0, WIFI (0); Frequency: 5825 MHz;Duty Cycle: 1:1.028
Medium: MSL_5G_160808
Medium parameters used: f = 5825 MHz; σ = 6.228 S/m; ε_r = 49.742; ρ = 1000 kg/m^3
Ambient Temperature: 23.5 ℃; Liquid Temperature: 22.7 ℃

DASY Configuration:

- Probe: EX3DV4 - SN3873; ConvF(4.02, 4.02, 4.02); Calibrated: 26.08.2015;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1341; Calibrated: 25.08.2015
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1231
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

Configuration/Ch165/Area Scan (91x91x1): Interpolated grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 2.08 W/kg

Configuration/Ch165/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 1.822 V/m; Power Drift = 0.07 dB
Peak SAR (extrapolated) = 4.05 W/kg
SAR(1 g) = 0.709 W/kg; SAR(10 g) = 0.251 W/kg
Maximum value of SAR (measured) = 2.17 W/kg



0 dB = 2.17 W/kg = 3.36 dBW/kg

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 **MRT-CERT (Auden)**

Certificate No: **D5GHzV2-1169_Jan14**

CALIBRATION CERTIFICATE

Object	D5GHzV2 - SN: 1169
Calibration procedure(s)	QA CAL-22.v2 Calibration procedure for dipole validation kits between 3-6 GHz
Calibration date:	January 07, 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 EX3DV4	SN: 3503	30-Dec-13 (No. EX3-3503_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:	Jeton Kastrati	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: January 8, 2014

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**
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

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) IEC 62209-2, "Evaluation of Human Exposure to Radio Frequency Fields from Handheld and Body-Mounted Wireless Communication Devices in the Frequency Range of 30 MHz to 6 GHz: Human models, Instrumentation, and Procedures"; Part 2: "Procedure to determine the Specific Absorption Rate (SAR) for including accessories and multiple transmitters", March 2010
b) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"
c) 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

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 V5.0	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy = 4.0 mm, dz = 1.4 mm	Graded Ratio = 1.4 (Z direction)
Frequency	5200 MHz ± 1 MHz 5300 MHz ± 1 MHz 5500 MHz ± 1 MHz 5600 MHz ± 1 MHz 5800 MHz ± 1 MHz	

Head TSL parameters at 5200 MHz

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	36.0	4.66 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	35.5 ± 6 %	4.43 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5200 MHz

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.00 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**79.7 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.30 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**22.9 W/kg ± 19.5 % (k=2)**

Head TSL parameters at 5300 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.9	4.76 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	35.3 ± 6 %	4.54 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5300 MHz

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.34 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**83.0 W / kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.40 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**23.8 W/kg ± 19.5 % (k=2)**

Head TSL parameters at 5500 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.6	4.96 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	35.1 ± 6 %	4.75 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5500 MHz

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.50 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**84.6 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.43 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**24.2 W/kg ± 19.5 % (k=2)**

Head TSL parameters at 5600 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.5	5.07 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	35.0 ± 6 %	4.84 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5600 MHz

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.54 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**85.0 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.43 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**24.2 W/kg ± 19.5 % (k=2)**

Head TSL parameters at 5800 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.3	5.27 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	34.7 ± 6 %	5.05 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5800 MHz

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.13 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**80.9 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.32 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**23.1 W/kg ± 19.5 % (k=2)**

Body TSL parameters at 5200 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	49.0	5.30 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	47.2 ± 6 %	5.38 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5200 MHz

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.43 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**73.8 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.08 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**20.6 W/kg ± 19.5 % (k=2)**

Body TSL parameters at 5300 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.9	5.42 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	47.0 ± 6 %	5.52 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5300 MHz

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.58 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**75.2 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.12 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**21.0 W/kg ± 19.5 % (k=2)**

Body TSL parameters at 5500 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.6	5.65 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	46.7 ± 6 %	5.80 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5500 MHz

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.98 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**79.2 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.22 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**22.0 W/kg ± 19.5 % (k=2)**

Body TSL parameters at 5600 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.5	5.77 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	46.6 ± 6 %	5.92 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5600 MHz

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	8.03 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**79.7 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.23 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**22.1 W/kg ± 19.5 % (k=2)**

Body TSL parameters at 5800 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.2	6.00 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	46.2 ± 6 %	6.20 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5800 MHz

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.48 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**74.3 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.07 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**20.5 W/kg ± 19.5 % (k=2)**

Appendix

Antenna Parameters with Head TSL at 5200 MHz

Impedance, transformed to feed point	49.7 Ω - 8.2 jΩ
Return Loss	- 21.7 dB

Antenna Parameters with Head TSL at 5300 MHz

Impedance, transformed to feed point	49.5 Ω - 5.8 jΩ
Return Loss	- 24.7 dB

Antenna Parameters with Head TSL at 5500 MHz

Impedance, transformed to feed point	52.7 Ω - 3.3 jΩ
Return Loss	- 27.6 dB

Antenna Parameters with Head TSL at 5600 MHz

Impedance, transformed to feed point	54.7 Ω - 2.7 jΩ
Return Loss	- 25.8 dB

Antenna Parameters with Head TSL at 5800 MHz

Impedance, transformed to feed point	55.7 Ω - 4.4 jΩ
Return Loss	- 23.4 dB

Antenna Parameters with Body TSL at 5200 MHz

Impedance, transformed to feed point	49.6 Ω - 7.5 jΩ
Return Loss	- 22.5 dB

Antenna Parameters with Body TSL at 5300 MHz

Impedance, transformed to feed point	49.7 Ω - 4.7 jΩ
Return Loss	- 26.5 dB

Antenna Parameters with Body TSL at 5500 MHz

Impedance, transformed to feed point	53.2 Ω - 2.2 jΩ
Return Loss	- 28.5 dB

Antenna Parameters with Body TSL at 5600 MHz

Impedance, transformed to feed point	55.2 Ω - 1.6 jΩ
Return Loss	- 25.8 dB

Antenna Parameters with Body TSL at 5800 MHz

Impedance, transformed to feed point	55.9 Ω - 2.9 jΩ
Return Loss	- 24.1 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.207 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	December 09, 2013

DASY5 Validation Report for Head TSL

Date: 07.01.2014

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 5GHz; Type: D5GHzV2; Serial: D5GHzV2 - SN: 1169

Communication System: UID 0 - CW; Frequency: 5200 MHz, Frequency: 5300 MHz, Frequency: 5500 MHz, Frequency: 5600 MHz, Frequency: 5800 MHz
Medium parameters used: f = 5200 MHz; σ = 4.43 S/m; ε_r = 35.5; ρ = 1000 kg/m^3 , Medium parameters used: f = 5300 MHz; σ = 4.54 S/m; ε_r = 35.3; ρ = 1000 kg/m^3 , Medium parameters used: f = 5500 MHz; σ = 4.75 S/m; ε_r = 35.1; ρ = 1000 kg/m^3 , Medium parameters used: f = 5600 MHz; σ = 4.84 S/m; ε_r = 35; ρ = 1000 kg/m^3 , Medium parameters used: f = 5800 MHz; σ = 5.05 S/m; ε_r = 34.7; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(5.52, 5.52, 5.52); Calibrated: 30.12.2013, ConvF(5.2, 5.2, 5.2); Calibrated: 30.12.2013, ConvF(5.01, 5.01, 5.01); Calibrated: 30.12.2013, ConvF(4.86, 4.86, 4.86); Calibrated: 30.12.2013, ConvF(4.91, 4.91, 4.91); Calibrated: 30.12.2013;
- Sensor-Surface: 1.4mm (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)

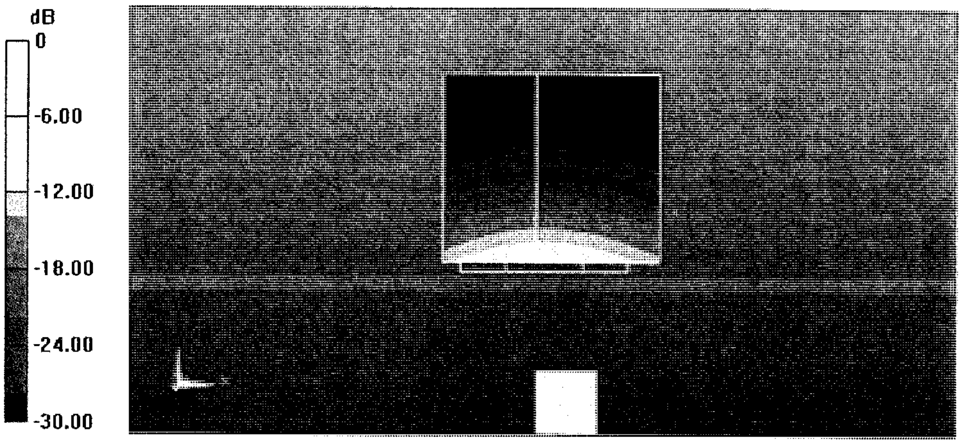
Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5200 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 63.584 V/m; Power Drift = 0.05 dB
Peak SAR (extrapolated) = 28.9 W/kg
SAR(1 g) = 8 W/kg; SAR(10 g) = 2.3 W/kg
Maximum value of SAR (measured) = 18.6 W/kg

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5300 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 64.034 V/m; Power Drift = 0.06 dB
Peak SAR (extrapolated) = 31.5 W/kg
SAR(1 g) = 8.34 W/kg; SAR(10 g) = 2.4 W/kg
Maximum value of SAR (measured) = 19.5 W/kg

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5500 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 63.164 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 33.6 W/kg
SAR(1 g) = 8.5 W/kg; SAR(10 g) = 2.43 W/kg
Maximum value of SAR (measured) = 20.5 W/kg

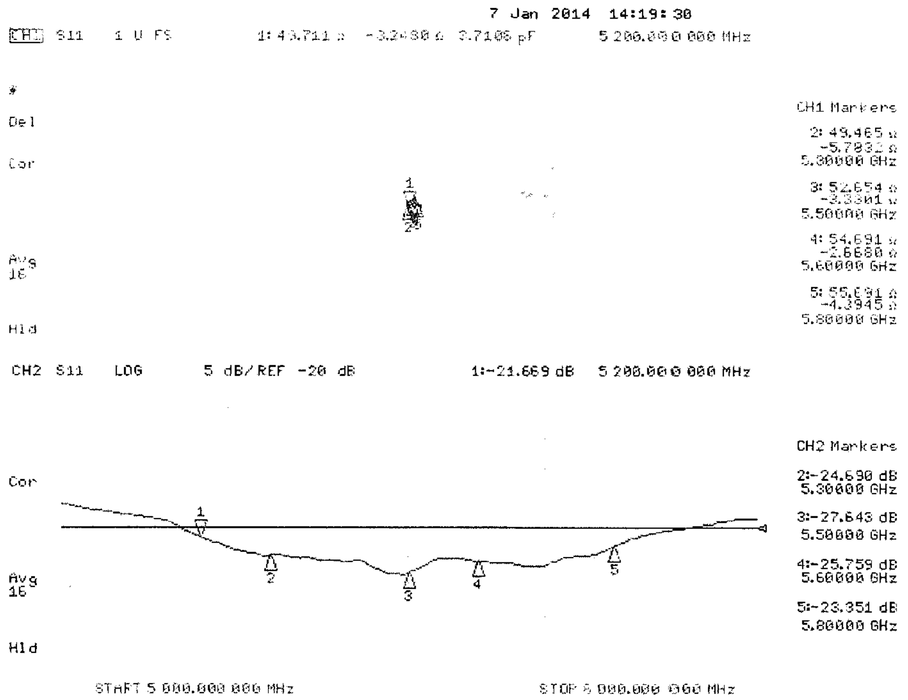
Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5600 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 63.543 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 33.9 W/kg
SAR(1 g) = 8.54 W/kg; SAR(10 g) = 2.43 W/kg
Maximum value of SAR (measured) = 20.6 W/kg

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5800 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 60.517 V/m; Power Drift = 0.07 dB
Peak SAR (extrapolated) = 33.6 W/kg
SAR(1 g) = 8.13 W/kg; SAR(10 g) = 2.32 W/kg
Maximum value of SAR (measured) = 19.9 W/kg



0 dB = 19.9 W/kg = 12.99 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 07.01.2014

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 5GHz; Type: D5GHzV2; Serial: D5GHzV2 - SN: 1169

Communication System: UID 0 - CW; Frequency: 5200 MHz, Frequency: 5300 MHz, Frequency: 5600 MHz, Frequency: 5500 MHz, Frequency: 5800 MHz
Medium parameters used: f = 5200 MHz; σ = 5.38 S/m; ε_r = 47.2; ρ = 1000 kg/m^3 , Medium parameters used: f = 5300 MHz; σ = 5.52 S/m; ε_r = 47; ρ = 1000 kg/m^3 , Medium parameters used: f = 5600 MHz; σ = 5.92 S/m; ε_r = 46.6; ρ = 1000 kg/m^3 , Medium parameters used: f = 5500 MHz; σ = 5.8 S/m; ε_r = 46.7; ρ = 1000 kg/m^3 , Medium parameters used: f = 5800 MHz; σ = 6.2 S/m; ε_r = 46.2; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(5.01, 5.01, 5.01); Calibrated: 30.12.2013, ConvF(4.76, 4.76, 4.76); Calibrated: 30.12.2013, ConvF(4.3, 4.3, 4.3); Calibrated: 30.12.2013, ConvF(4.52, 4.52, 4.52); Calibrated: 30.12.2013, ConvF(4.47, 4.47, 4.47); Calibrated: 30.12.2013;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

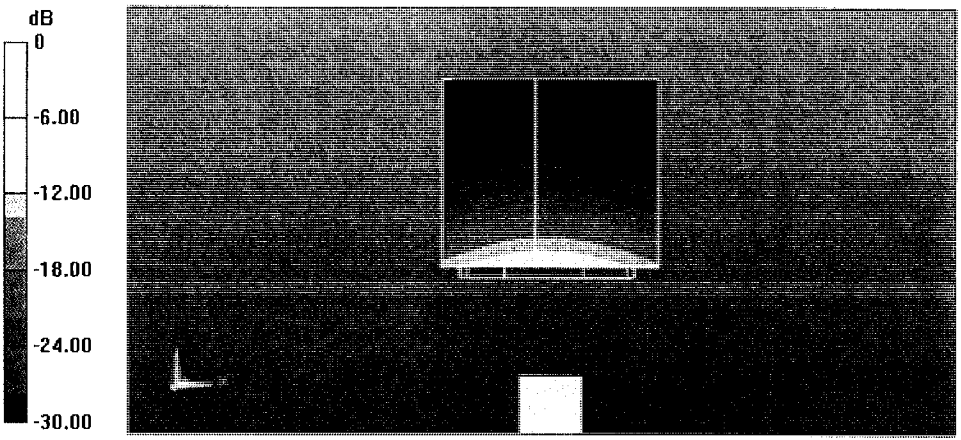
Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5200 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 58.646 V/m; Power Drift = -0.05 dB
Peak SAR (extrapolated) = 29.4 W/kg
SAR(1 g) = 7.43 W/kg; SAR(10 g) = 2.08 W/kg
Maximum value of SAR (measured) = 17.5 W/kg

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5300 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 58.747 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 30.6 W/kg
SAR(1 g) = 7.58 W/kg; SAR(10 g) = 2.12 W/kg
Maximum value of SAR (measured) = 17.9 W/kg

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5600 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 58.868 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 35.7 W/kg
SAR(1 g) = 8.03 W/kg; SAR(10 g) = 2.23 W/kg
Maximum value of SAR (measured) = 19.8 W/kg

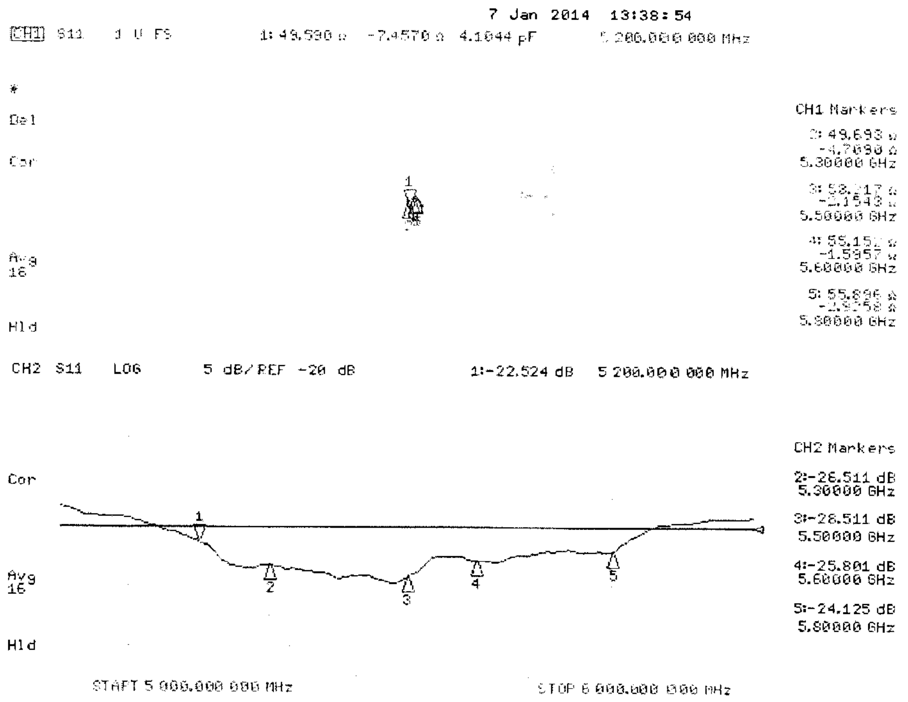
Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5500 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 59.036 V/m; Power Drift = -0.00 dB
Peak SAR (extrapolated) = 34.4 W/kg
SAR(1 g) = 7.98 W/kg; SAR(10 g) = 2.22 W/kg
Maximum value of SAR (measured) = 19.3 W/kg

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5800 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 55.673 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 35.0 W/kg
SAR(1 g) = 7.48 W/kg; SAR(10 g) = 2.07 W/kg
Maximum value of SAR (measured) = 18.7 W/kg



0 dB = 18.7 W/kg = 12.72 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 MRT-CERT (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	Israe Elnaouq
Approved by:	Katja Pokovic	Technical Manager	

Issued: January 13, 2014

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

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

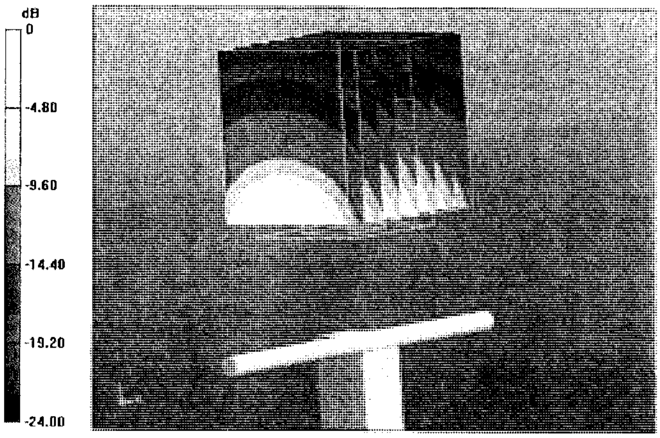
DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 927

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)

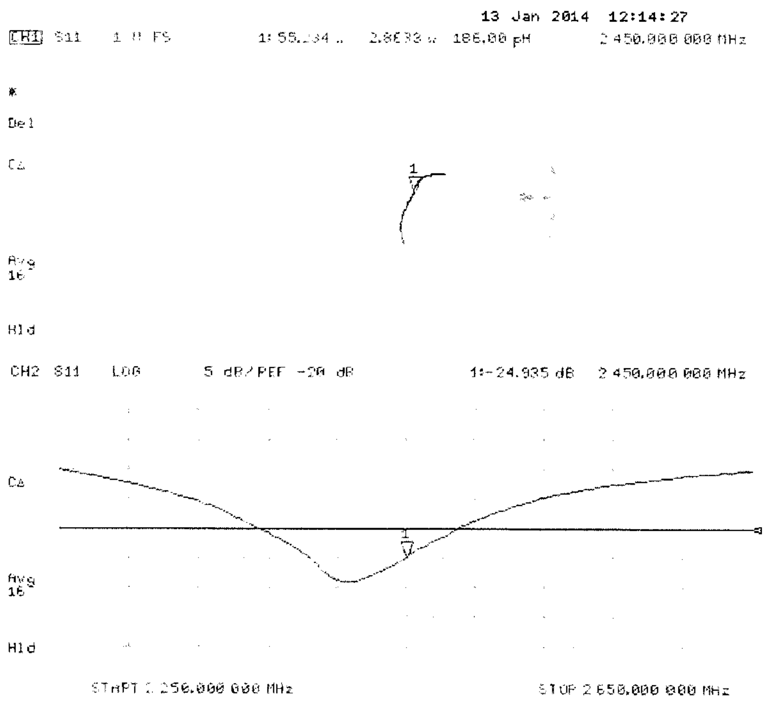
Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 100.3 V/m; Power Drift = 0.06 dB
Peak SAR (extrapolated) = 27.9 W/kg
SAR(1 g) = 13.4 W/kg; SAR(10 g) = 6.22 W/kg
Maximum value of SAR (measured) = 17.1 W/kg



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

Produkte
Products

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 13.01.2014

Test Laboratory: SPEAG, Zurich, Switzerland

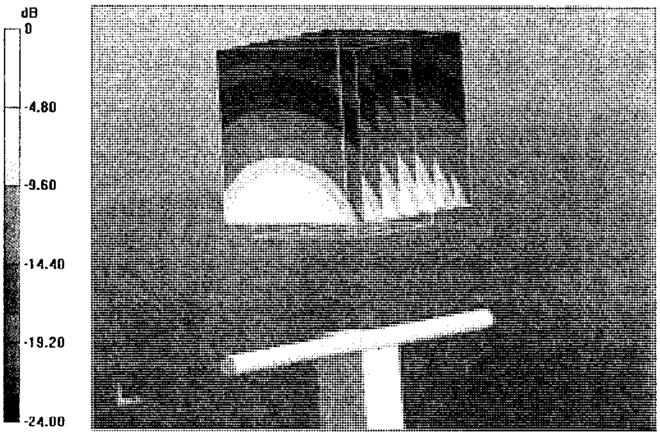
DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 927

Communication System: UID 0 - CW; Frequency: 2450 MHz
Medium parameters used: f = 2450 MHz; σ = 2 S/m; ε_r = 51.8; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

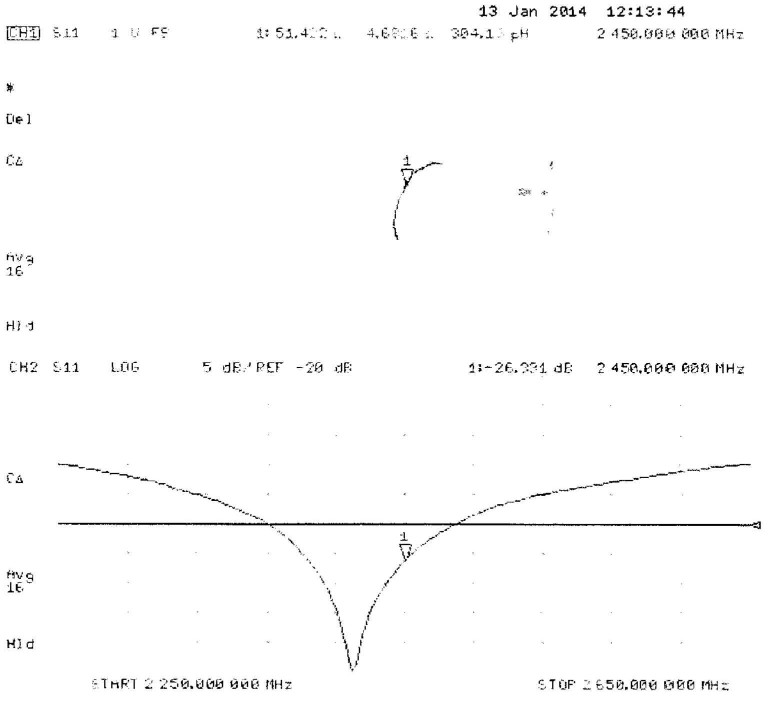
- Probe: ES3DV3 - SN3205; ConvF(4.35, 4.35, 4.35); Calibrated: 30.12.2013;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

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 = 94.560 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 26.7 W/kg
SAR(1 g) = 12.8 W/kg; SAR(10 g) = 5.89 W/kg
Maximum value of SAR (measured) = 16.8 W/kg



0 dB = 16.8 W/kg = 12.25 dBW/kg

Impedance Measurement Plot for Body TSL



Schmid & Partner Engineering AG
speag
Zeughausstrasse 43, 8004 Zurich, Switzerland
Phone +41 44 245 9700, Fax +41 44 245 9779
info@speag.com, http://www.speag.com

1341

IMPORTANT NOTICE

USAGE OF THE DAE 4

The DAE unit is a delicate, high precision instrument and requires careful treatment by the user. There are no serviceable parts inside the DAE. Special attention shall be given to the following points:

Battery Exchange: The battery cover of the DAE4 unit is closed using a screw, over tightening the screw may cause the threads inside the DAE to wear out.

Shipping of the DAE: Before shipping the DAE to SPEAG for calibration, remove the batteries and pack the DAE in an antistatic bag. This antistatic bag shall then be packed into a larger box or container which protects the DAE from impacts during transportation. The package shall be marked to indicate that a fragile instrument is inside.

E-Stop Failures: Touch detection may be malfunctioning due to broken magnets in the E-stop. Rough handling of the E-stop may lead to damage of these magnets. Touch and collision errors are often caused by dust and dirt accumulated in the E-stop. To prevent E-stop failure, the customer shall always mount the probe to the DAE carefully and keep the DAE unit in a non-dusty environment if not used for measurements.

Repair: Minor repairs are performed at no extra cost during the annual calibration. However, SPEAG reserves the right to charge for any repair especially if rough unprofessional handling caused the defect.

DASY Configuration Files: Since the exact values of the DAE input resistances, as measured during the calibration procedure of a DAE unit, are not used by the DASY software, a nominal value of 200 MOhm is given in the corresponding configuration file.

Important Note:
Warranty and calibration is void if the DAE unit is disassembled partly or fully by the Customer.

Important Note:
Never attempt to grease or oil the E-stop assembly. Cleaning and readjusting of the E-stop assembly is allowed by certified SPEAG personnel only and is part of the annual calibration procedure.

Important Note:
To prevent damage of the DAE probe connector pins, use great care when installing the probe to the DAE. Carefully connect the probe with the connector notch oriented in the mating position. Avoid any rotational movement of the probe body versus the DAE while turning the locking nut of the connector. The same care shall be used when disconnecting the probe from the DAE.

Schmid & Partner Engineering

Produkte
Products

TÜVRheinland®

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
Swiss Calibration Service

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

Accreditation No.: **SCS 0108**

Client **BV ADT - CN (Auden)**

Certificate No: **DAE4-1341_Aug15**

CALIBRATION CERTIFICATE

Object	DAE4 - SD 000 D04 BM - SN: 1341
Calibration procedure(s)	QA CAL-06.v29 Calibration procedure for the data acquisition electronics (DAE)
Calibration date:	August 25, 2015

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Keithley Multimeter Type 2001	SN: 0810278	03-Oct-14 (No:15573)	Oct-15
Secondary Standards	**ID #**	**Check Date (in house)**	**Scheduled Check**
Auto DAE Calibration Unit	SE UWS 053 AA 1001	06-Jan-15 (in house check)	In house check: Jan-16
Calibrator Box V2.1	SE UMS 006 AA 1002	06-Jan-15 (in house check)	In house check: Jan-16

	Name	Function	Signature
Calibrated by:	Eric Hainfeld	Technician	
Approved by:	Fin Bomholt	Deputy Technical Manager	i.V.

Issued: August 25, 2015

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

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

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

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

Accreditation No.: **SCS 0108**

Glossary

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

Methods Applied and Interpretation of Parameters

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

DC Voltage Measurement

A/D - Converter Resolution nominal

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

Low Range: 1LSB = 61nV , full range = -1.......+3mV

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

Calibration Factors	X	Y	Z
High Range	403.750 ± 0.02% (k=2)	403.984 ± 0.02% (k=2)	403.695 ± 0.02% (k=2)
Low Range	3.98648 ± 1.50% (k=2)	4.00128 ± 1.50% (k=2)	3.99767 ± 1.50% (k=2)

Connector Angle

Connector Angle to be used in DASY system	168.5 ° ± 1 °

Appendix (Additional assessments outside the scope of SCS0108)

1. DC Voltage Linearity

High Range		Reading (µV)	Difference (µV)	Error (%)
Channel X	+ Input	199996.78	-0.32	-0.00
Channel X	+ Input	20004.32	2.72	0.01
Channel X	- Input	-19999.36	1.12	-0.01
Channel Y	+ Input	199996.05	-0.88	-0.00
Channel Y	+ Input	20004.21	2.74	0.01
Channel Y	- Input	-20000.92	-0.38	0.00
Channel Z	+ Input	199996.11	-1.18	-0.00
Channel Z	+ Input	20000.24	-1.29	-0.01
Channel Z	- Input	-20001.93	-1.38	0.01

Low Range		Reading (µV)	Difference (µV)	Error (%)
Channel X	+ Input	2001.20	-0.19	-0.01
Channel X	+ Input	202.19	0.35	0.17
Channel X	- Input	-197.68	0.39	-0.20
Channel Y	+ Input	2001.41	0.15	0.01
Channel Y	+ Input	200.48	-1.23	-0.61
Channel Y	- Input	-199.37	-1.25	0.63
Channel Z	+ Input	2001.30	-0.03	-0.00
Channel Z	+ Input	200.84	-0.88	-0.44
Channel Z	- Input	-199.71	-1.51	0.76

2. Common mode sensitivity

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

	Common mode Input Voltage (mV)	High Range Average Reading (µV)	Low Range Average Reading (µV)
Channel X	200	11.36	10.62
	- 200	-9.82	-11.33
Channel Y	200	-6.16	-6.57
	- 200	3.88	3.83
Channel Z	200	-22.22	-22.16
	- 200	20.49	20.34

3. Channel separation

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

	Input Voltage (mV)	Channel X (µV)	Channel Y (µV)	Channel Z (µV)
Channel X	200	-	-4.48	-2.32
Channel Y	200	5.21	-	-1.81
Channel Z	200	9.82	2.20	-

4. AD-Converter Values with inputs shorted

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

	High Range (LSB)	Low Range (LSB)
Channel X	15976	16314
Channel Y	15918	17210
Channel Z	16256	16914

5. Input Offset Measurement

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

	Average (μV)	min. Offset (μV)	max. Offset (μV)	Std. Deviation (μV)
Channel X	1.14	0.22	2.05	0.42
Channel Y	-0.70	-1.88	0.32	0.44
Channel Z	-2.05	-2.92	-1.09	0.42

6. Input Offset Current

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

7. Input Resistance (Typical values for information)

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

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

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

9. Power Consumption (Typical values for information)

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

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
Swiss Calibration Service

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

Accreditation No.: **SCS 0108**

Client **BV ADT-CN (Auden)**

Certificate No: **EX3-3873_Aug15**

CALIBRATION CERTIFICATE

Object: EX3DV4 - SN:3873

Calibration procedure(s): QA CAL-01.v9, QA CAL-14.v4, QA CAL-23.v5, QA CAL-25.v6
Calibration procedure for dosimetric E-field probes

Calibration date: August 26, 2015

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID	Cal Date (Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	01-Apr-15 (No. 217-02128)	Mar-16
Power sensor E4412A	MY41498087	01-Apr-15 (No. 217-02128)	Mar-16
Reference 3 dB Attenuator	SN: S5054 (3c)	01-Apr-15 (No. 217-02129)	Mar-16
Reference 20 dB Attenuator	SN: S5277 (20x)	01-Apr-15 (No. 217-02132)	Mar-16
Reference 30 dB Attenuator	SN: S5129 (30b)	01-Apr-15 (No. 217-02133)	Mar-16
Reference Probe ES3DV2	SN: 3013	30-Dec-14 (No. ES3-3013_Dec14)	Dec-15
DAE4	SN: 660	14-Jan-15 (No. DAE4-660_Jan15)	Jan-16
Secondary Standards	ID	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Apr-13)	In house check: Apr-16
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-14)	In house check: Oct-15

	Name	Function	Signature
Calibrated by:	Claudio Leubler	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: August 27, 2015

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

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
Swiss Calibration Service

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

Accreditation No.: **SCS 0108**

Glossary:

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

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
c) IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
d) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Methods Applied and Interpretation of Parameters:

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

Probe EX3DV4

SN:3873

Manufactured: March 13, 2012
Calibrated: August 26, 2015

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

Produkte
Products

EX3DV4– SN:3873

August 26, 2015

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3873

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(V/m)^2$)[A]	0.37	0.46	0.48	± 10.1 %
DCP (mV)[B]	100.8	98.5	100.1	

Modulation Calibration Parameters

UID	Communication System Name		A dB	B dB$\sqrt{\mu V}$	C	D dB	VR mV	Unc[E] (k=2)
0	CW	X	0.0	0.0	1.0	0.00	158.3	±2.2 %
		Y	0.0	0.0	1.0		149.1	
		Z	0.0	0.0	1.0		152.5	

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

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

EX3DV4– SN:3873

August 26, 2015

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3873

Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha [G]	Depth [G] (mm)	Unc (k=2)
750	41.9	0.89	10.01	10.01	10.01	0.36	0.93	± 12.0 %
835	41.5	0.90	9.53	9.53	9.53	0.30	1.07	± 12.0 %
900	41.5	0.97	9.41	9.41	9.41	0.35	0.93	± 12.0 %
1750	40.1	1.37	8.21	8.21	8.21	0.36	0.80	± 12.0 %
1900	40.0	1.40	7.98	7.98	7.98	0.31	0.80	± 12.0 %
2300	39.5	1.67	7.63	7.63	7.63	0.37	0.80	± 12.0 %
2450	39.2	1.80	7.24	7.24	7.24	0.31	0.88	± 12.0 %
2600	39.0	1.96	7.05	7.05	7.05	0.35	0.80	± 12.0 %
5250	35.9	4.71	4.95	4.95	4.95	0.35	1.80	± 13.1 %
5600	35.5	5.07	4.66	4.66	4.66	0.40	1.80	± 13.1 %
5800	35.3	5.27	4.64	4.64	4.64	0.40	1.80	± 13.1 %

[C] Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Above 5 GHz frequency validity can be extended to ± 110 MHz.
[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.
[G] Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

EX3DV4– SN:3873

August 26, 2015

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3873

Calibration Parameter Determined in Body Tissue Simulating Media

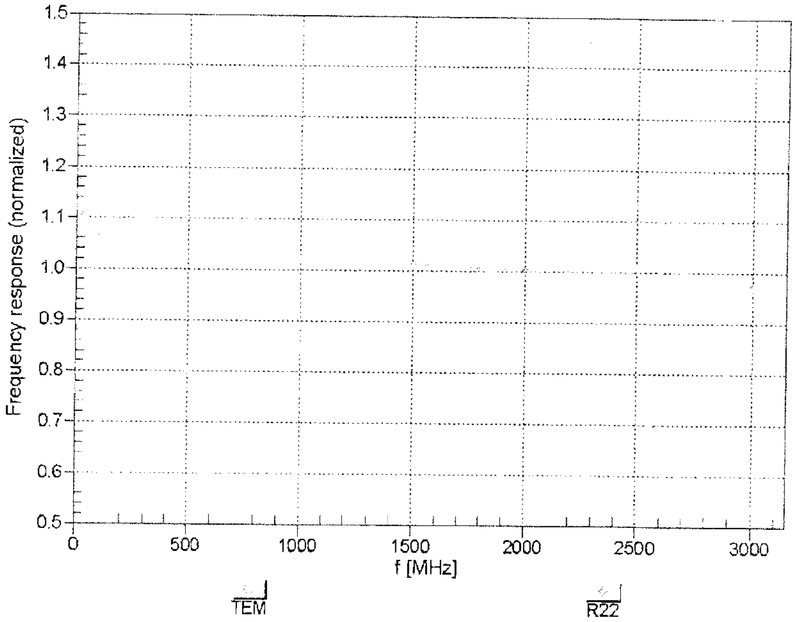
f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha [G]	Depth [G] (mm)	Unc (k=2)
750	55.5	0.96	9.77	9.77	9.77	0.46	0.80	± 12.0 %
835	55.2	0.97	9.72	9.72	9.72	0.50	0.81	± 12.0 %
900	55.0	1.05	9.41	9.41	9.41	0.42	0.86	± 12.0 %
1750	53.4	1.49	7.86	7.86	7.86	0.37	0.82	± 12.0 %
1900	53.3	1.52	7.62	7.62	7.62	0.41	0.80	± 12.0 %
2300	52.9	1.81	7.50	7.50	7.50	0.38	0.80	± 12.0 %
2450	52.7	1.95	7.30	7.30	7.30	0.31	0.80	± 12.0 %
2600	52.5	2.16	7.03	7.03	7.03	0.21	0.80	± 12.0 %
5250	48.9	5.36	4.40	4.40	4.40	0.40	1.90	± 13.1 %
5600	48.5	5.77	3.90	3.90	3.90	0.45	1.90	± 13.1 %
5800	48.2	6.00	4.02	4.02	4.02	0.50	1.90	± 13.1 %

[C] Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Above 5 GHz frequency validity can be extended to ± 110 MHz.
[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.
[G] Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

EX3DV4– SN:3873

August 26, 2015

Frequency Response of E-Field
(TEM-Cell:ifi110 EXX, Waveguide: R22)

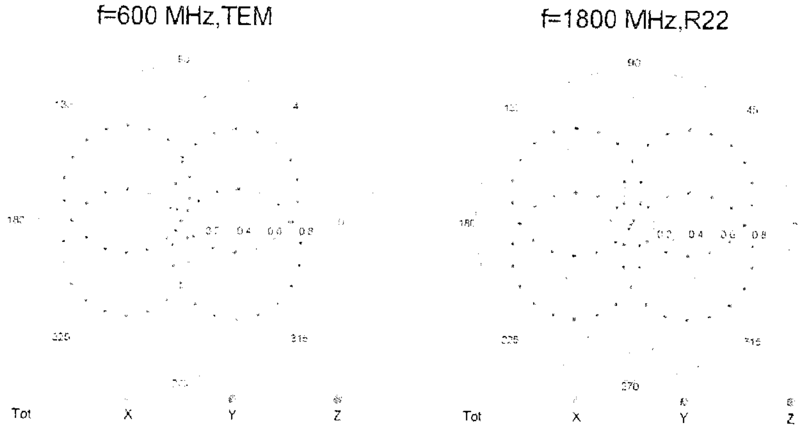


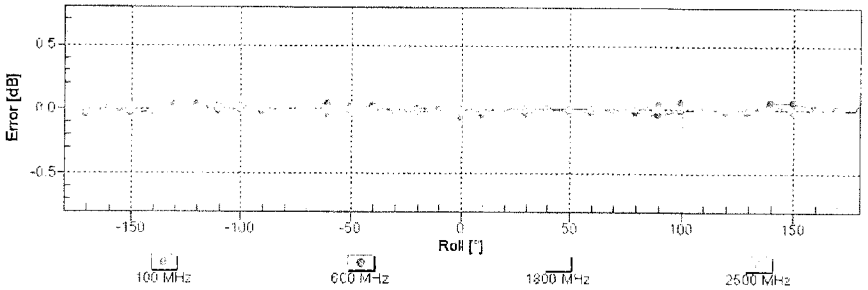
Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

EX3DV4– SN:3873

August 26, 2015

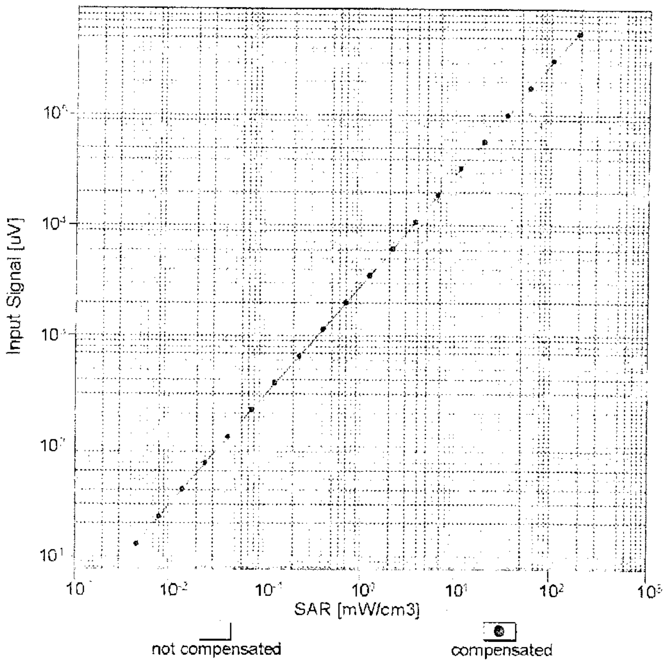
Receiving Pattern (ϕ), ϑ = 0°

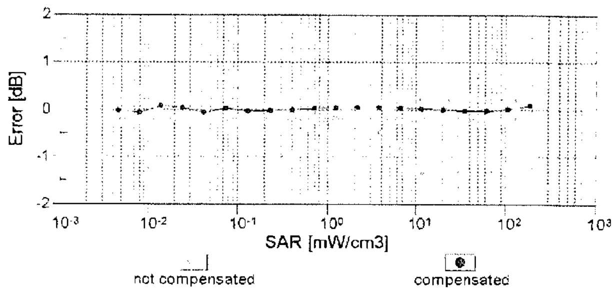




Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

Dynamic Range f(SAR_{head})
(TEM cell , f_{eval}= 1900 MHz)





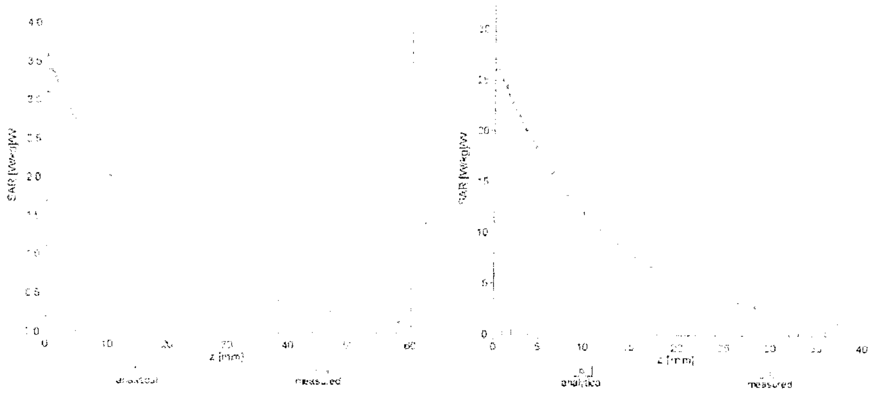
Uncertainty of Linearity Assessment: ± 0.6% (k=2)

Produkte
Products

Conversion Factor Assessment

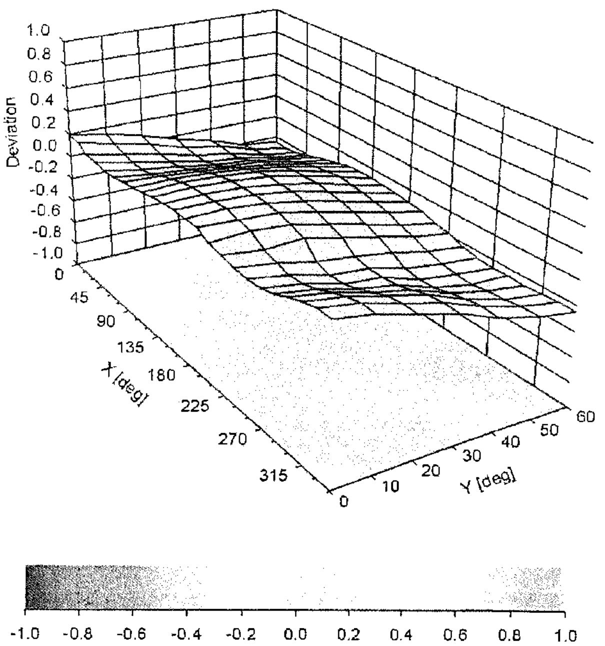
f = 900 MHz,WGLS R9 (H_convF)

f = 1750 MHz,WGLS R22 (H_convF)



Deviation from Isotropy in Liquid

Error (ϕ, ϑ), f = 900 MHz



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

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3873

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	19.6
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	9 mm
Tip Diameter	2.5 mm
Probe Tip to Sensor X Calibration Point	1 mm
Probe Tip to Sensor Y Calibration Point	1 mm
Probe Tip to Sensor Z Calibration Point	1 mm
Recommended Measurement Distance from Surface	1.4 mm