MOTOROLA SOLUTIONS

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TESTING CERT # 2518.01

DECLARATION OF COMPLIANCE SAR ASSESSMENT Part 1 of 2

Motorola Solutions Inc.
EME Test Laboratory
8000 West Sunrise Blvd
Fort Lauderdale, FL. 33322

Date of Report:	**7/10/2012**
Report Revision:	**B**
Report ID:	**SR9935 EWP 3200 Rev C 120710**

Responsible Engineer:	Stephen Whalen (Principal Staff Engineer)
Report Author:	Pei Loo Tey (EME Engineer); Deanna Zakharia
Date/s Tested:	2/07/2012-2/18/2012
Manufacturer/Location:	Motorola Solutions, Israel
Sector/Group/Div.:	MSI
Date submitted for test:	11/08/2011
DUT Description:	VoWLAN (Semi-Rugged) is a VoIP phone based on WLAN a/b/g/n. It also includes a Bluetooth transceiver and a camera.
Test TX mode(s):	802.11 a/b 25%; BlueTooth 34%
Max. Power output:	10mW for BT; 79.3mW for WLAN 802.11b; 70.8mW for WLAN 802.11g/n @ channels 2-10; 31.62mW for WLAN 802.11g/n @ channels 1 & 11; 79.3mW (6Mbps) for WLAN 802.11a/n Middle and Upper Bands, 39.8mW (6Mbps) for WLAN 802.11a/n Lower Band
Nominal Power:	BT:5mW; WLAN:802.11a/n: Lower Band 28.2mW (6Mbps) , Middle and Upper Bands 56.2mW (6 Mbps); WLAN 802.11b: 63mW (11Mbps), WLAN 802.11g/n 17.8mW (54 Mbps)
Tx Frequency Bands:	BT:2402-2480MHz; WLAN b/g/n:2412-2462MHz, WLAN a/n. 5180MHz, 5200MHz; 5220MHz, 5240MHz; 5260MHz, 5280MHz, 5300MHz, 5320MHz; 5500MHz, 5520MHz, 5540MHz, 5560MHz, 5580MHz, 5600MHz, 5620MHz, 5640MHz, 5660MHz, 5680MHz, 5700MHz, 5745MHz, 5765MHz, 5785MHz, 5805MHz; 5825MHz
Signaling type:	GMSK Modulation, FHSS (Bluetooth); DSSS (802.11 a/b/g/n), OFDM
Model(s) Tested:	EWP3200
Model(s) Certified:	EWP3200
Serial Number(s):	847SMN0038
Classification:	General Population/Uncontrolled Environment
FCC ID:	AZ489FT7051; Rule part 15
IC ID:	109U-89FT7051

* Refer to section 15 of part 1 for highest SAR summary results.

The test results clearly demonstrate compliance with FCC General Population/Uncontrolled RF Exposure limits of 1.6 W/kg averaged over 1 gram per the requirements of 47 CFR 2.1093(d). The 10 grams result is not applicable to FCC filing.
The test results clearly demonstrate compliance with ICNIRP (1998) Guidelines for limiting exposure in time-varying electric, magnetic, and electromagnetic fields (up to 300 GHz), Health Physics 74, 494-522 RF Exposure limits of 2.0 W/kg averaged over 10grams of contiguous tissue.

Based on the information and the testing results provided herein, the undersigned certifies that when used as stated in the operating instructions supplied, said product complies with the national and international reference standards and guidelines listed in section 3.0 of this report. This report shall not be reproduced without written approval from an officially designated representative of the Motorola Solutions Inc EME Laboratory.
I attest to the accuracy of the data and assume full responsibility for the completeness of these measurements. This reporting format is consistent with the suggested guidelines of the TIA TSB-150 December 2004. The results and statements contained in this report pertain only to the device(s) evaluated.

Deanna M Zakharia

Deanna Zakharia
EMS EME Lab Senior Resource Manager,
Laboratory Director
Approval Date: 7/10/2012

Certification Date: 6/28/2012

Certification No.: L1120608P

Part 1 of 2

APPENDICES

Part 2 of 2

APPENDICES (continued)

Report Revision History

Date	Revision	Comments
4/3/2012	O	Initial release
6/13/2012	A	Revise report per TCB correspondence
6/28/2012	B	Revise report per TCB correspondence
7/10/2012	C	Revise report per TCB correspondence

1.0 Introduction

This report details the utilization, test setup, test equipment, and test results of the Specific Absorption Rate (SAR) measurements performed at the Motorola Solutions Inc. EME Test Laboratory for model number EWP3200.

2.0 Abbreviations / Definitions

BT: Bluetooth
CNR: Calibration Not Required
CPU: Computer Processing Unit
DC: Duty Cycle
DUT: Device Under Test
DSSS: Direct Sequence Spread Spectrum
EME: Electromagnetic Energy
FHSS: Frequency Hopping Spread Spectrum
NA: Not Applicable
OFDM: Orthogonal Frequency Division Multiplexing
PTT: Push to Talk
QPSK**:** Quadrature Phase-Shift Keying
RF: Radio Frequency
SAR: Specific Absorption Rate
UNII: Unlicensed National Information Infrastructure
VoIP: Voice Over Internet Protocal
VoWLAN: Voice Over WLAN
WLAN: Wireless Local-Area Network

Audio accessories: These accessories allow communication while the DUT is worn on the body.
Body worn accessories: These accessories allow the DUT to be worn on the body of the user.
Maximum Power: Defined as the upper limit of the production line final test station.

3.0 Referenced Standards and Guidelines

This product is designed to comply with the following applicable national and international standards and guidelines.

- IEC62209-1*(2005) Procedure to determine the specific absorption rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)
- United States Federal Communications Commission, Code of Federal Regulations; Rule Part 47CFR § 2.1093(d) sub-part J:2011
- Federal Communications Commission, “Evaluating Compliance with FCC Guidelines for Human Exposure to Radio frequency Electromagnetic Fields”, OET Bulletin 65, Supplement C (Edition 01-01), FCC, Washington, D.C.: June 2001.

- IEEE 1528*(2003), Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques
- American National Standards Institute (ANSI) / Institute of Electrical and Electronics Engineers (IEEE) C95. 1-1992
- Institute of Electrical and Electronics Engineers (IEEE) C95.1-2005
- International Commission on Non-Ionizing Radiation Protection (ICNIRP) 1998
- Ministry of Health (Canada) Safety Code 6 (2009), Limits of Human Exposure to Radio frequency Electromagnetic Fields in the Frequency Range from 3 kHz to 300 GHz
- Australian Communications Authority Radio communications (Electromagnetic Radiation - Human Exposure) Standard (2003)
- ANATEL, Brazil Regulatory Authority, Resolution No. 303 of July 2, 2002 "Regulation of the limitation of exposure to electrical, magnetic, and electromagnetic fields in the radio frequency range between 9 kHz and 300 GHz." and “Attachment to resolution # 303 from July 2, 2002”
- IEC62209-2 Edition 1.0 2010-03, Human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices – Human models, instrumentation, and procedures – Part 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).

* The IEC62209-1 and IEEE 1528 are applicable for hand-held devices used in close proximity to the ear only.

4.0 SAR Limits

TABLE 1

EXPOSURE LIMITS	SAR (W/kg)	
	(General Population / Uncontrolled Exposure Environment)	(Occupational / Controlled Exposure Environment)
Spatial Average - ANSI - (averaged over the whole body)	0.08	0.4
Spatial Peak - ANSI - (averaged over any 1-g of tissue)	1.6	8.0
Spatial Peak – ICNIRP/ANSI - (hands/wrists/feet/ankles averaged over 10-g)	4.0	20.0
Spatial Peak - ICNIRP - (Head and Trunk 10-g)	2.0	10.0

5.0 SAR Result Scaling Methodology

The calculated 1-gram and 10-gram averaged SAR results indicated as "Max Calc. 1g-SAR" and "Max Calc.10g-SAR" in the data tables is determined by scaling the measured SAR to account for power leveling variations and power slump. A table and graph of output power versus time is provided in APPENDIX G. For this device the "Max Calc. 1g-SAR" and "Max Calc.10g-SAR" are scaled using the following formula:

$$Max\_Calc = SAR\_meas \cdot 10^{\frac{-Drift}{10}} \cdot \frac{P\_\max}{P\_\text{int}} \cdot DC$$

P_max = Maximum Power (W)
P_int = Initial Power (W)
Drift = DASY drift results (dB)
SAR_meas = Measured 1-g or 10-g Avg. SAR (W/kg)
DC = Transmission mode duty cycle in % where applicable
50% duty cycle is applied for PTT operation

Note: for conservative results, the following are applied:
If P_int > P_max, then P_max/P_int = 1.
Drift = 1 for positive drift

Additional SAR scaling was applied using the methodologies outlined in FCC KDB450824 using tissue sensitivity values. SAR was scaled for conditions where the tissue permittivity was measured above the nominal target and for tissue conductivity that was measured below the nominal target. These scaling conditions only allow for positive SAR scaling. Negative or reduced SAR scaling is not permitted.

6.0 Description of Device Under Test (DUT)

This device is a VoIP phone based on WLANa/b/g/n (VoWLAN) for phone, dispatch and data application. WLAN supports the following bands; 802.11b/g/n (2.4 GHz ISM band) Direct Sequence Spread Spectrum (DSSS) and 802.11a/n (5 GHz UNII bands) Orthogonal Frequency Division Multiplexing (OFDM).

The maximum duty cycle for WLANa/b/g/n is 50% which is maintained within the VoWLAN device's CPU processing limitations.

Bluetooth: Frequency Hopping Spread Spectrum (FHSS) GFSK (1Mbps) maximum duty cycle is 95%. The Bluetooth is used for any application in which data/voice is exchanged with an external Bluetooth device.

This device will be marketed to and used by the general population. This device may be used while held against the head in voice mode, in front of the face in PTT mode, and against the body in phone, PTT or Data modes.

This device is capable of operating in the BT 2400-2483.5MHz; 802.11a/n 5.15-5.25GHz; 802.11a/n 5.25-5.35GHz; 802.11a/n 5.47-5.725GHz; 802.11a/n 5.725-5.825GHz; 802.11b/g/n 2.400-2.483.5GHz bands.

The rated conducted power is BT 5mW; 802.11a/n (5.15-5.25GHz) 28.2mW; 802.11a/n (5.25-5.35GHz) 56.2mW; 802.11a/n (5.47-5.725GHz) 56.2mW; 802.11a/n (5.725-5.825 GHz) 56.2mW; 802.11b (2.400-2.4835GHz) 63mW; 802.11g/n (2.400-2.4835GHz) 17.8mW.

The maximum conducted output power is BT 10mW; 802.11a/n (5.15-5.25 GHz) 39.8mW; 802.11a/n (5.25-5.35 GHz) 79.3mW; 802.11a/n (5.47-5.725 GHz) 79.3mW; 802.11a/n (5.725-5.825 GHz) 79.3mW; 802.11b (2.400-2.4835 GHz) 79.3mW; 802.11g/n (2.400-2.4835 GHz) 70.8mW @ channels 2-10; 802.11g/n (2.400-2.4835 GHz) 31.62mW @ channels 1 & 11 as defined by the upper limit of the production line final test station.

Note that 802.11g/n has a lower power level than 802.11b and therefore 802.11g/n was not tested.

7.0 Optional Accessories and Test Criteria

This device is offered with optional accessories. All accessories were individually evaluated during the test plan creation to determine if testing was required. The following sections identify the test criteria and details for each accessory category.

7.1 Antennas

There is one internal dual-band antenna offered for this product. The table below lists its description by band.

TABLE 2

Antenna Models	Description	*Tested
0789971V87	Dual-Band Planar Inverted-F Antenna [PIFA] (2412-2484 MHz), 1/4 wave, 2.4 – 3.2 dBi	Yes
0789971V87	Dual-Band Planar Inverted-F Antenna [PIFA] (5180 - 5805 MHz), 1/4 wave, 1.9 – 2.4 dBi	Yes

*Refer to Exhibit 7B for antenna separation distances.

7.2 Batteries

There is one battery offered for this product. The table below lists the battery description.

TABLE 3

Battery Models	Description	*Tested	Comments
SNN5793A	Li Ion 3.7V 1750 mAh – BK10 EWP1x00, EWP2x00 and EWP3x00	Yes	Tested with battery cover FHN7740A.

7.3 Body worn Accessories

All body worn accessories were considered. The table below lists the body worn accessories, and body worn accessory descriptions.

TABLE 4

<table>
<tr><th>Body worn Models</th><th>Description</th><th>*Tested</th><th>Comments</th></tr>
<tr><td>EWPACCUC001</td><td>Carry Case for EWP2x00 and EWP3x00</td><td>Yes</td><td></td></tr>
<tr><td>SYN2680A</td><td>Plastic holster with clip, EWP3x00, EWP2x00 TEAM-BUN-XX-2x00</td><td>Yes</td><td></td></tr>
<tr><td>SYN2678A</td><td>Cord Lanyard for EWP1x00, EWP2x00 and EWP3x00</td><td rowspan="2">No</td><td rowspan="2">Lanyard is used only to secure the device to the garment while being carried by the offered body worn accessories.</td></tr>
<tr><td>EWPACCLY002</td><td>Cord Lanyard</td></tr>
</table>

*Refer to Exhibit 7B for antenna separation distances.

7.4 Audio Accessories

All audio accessories were considered. The table below lists the offered audio accessories and their descriptions. Exhibit 7B illustrates photos of the tested audio accessories.

TABLE 5

Audio Acc. Models	Description	Tested	Comments
RMN5130A	Mono over the ear headset W/MIC & PTT-2.5mm	Yes	
SJYN0264C	Mono in the ear headset w/MIC & PTT	Yes	
RCH50 (A9132697=25-156511-01)	Rugged Cabled Headset and headset adapter cable	Yes	
SKN6371C	Data Cable	Yes	

8.0 Description of Test System

8.1 Descriptions of Robotics/Probes/Readout Electronics

The laboratory utilizes a Dosimetric Assessment System (DASY5™) SAR measurement system Version 52.6.2.424 manufactured by Schmid & Partner Engineering AG (SPEAG™), of Zurich Switzerland. The test system consists of a Stäubli RX90L robot, DAE4 and ES3DV3 & EX3DV4 E-field probes. The DASY5™ system is operated per the instructions in the DASY5™ Users Manual. The complete manual is available directly from SPEAG™. All measurement equipment used to assess EME SAR compliance was calibrated according to ISO/IEC 17025 A2LA guidelines. Section 9.0 presents additional test equipment information. Appendices B and C present the applicable calibration certificates. The E-field probe first scans a coarse grid over a large area inside the phantom in order to locate the interpolated maximum SAR distribution. After the coarse scan measurement, the probe is automatically moved to a position at the interpolated maximum. The subsequent scan can directly use this position as reference for the cube evaluations.

8.2 Description of Phantom(s)

8.2.1 Dual Flat Phantom

TABLE 6

Phantom ID	Material Parameters	Phantom Dimensions (mm)	Material Thickness (mm)	Support structure material	Loss Tangent (wood)
Dual flat 1002	200MHz -6GHz; Er = 5 Loss Tangent = <0.05	414x390	2mm +/- 0.2mm	Wood	< 0.05

8.2.2 SAM Phantom

TABLE 7

Phantom ID	Material Parameters	Material Thickness (mm)	Support structure material	Loss Tangent (wood)
SAMTP1209	300MHz -6GHz; Er = 5 Loss Tangent = <0.05	2mm +/- 0.2mm	Wood	< 0.05
SAMTP1234	300MHz -6GHz; Er = <5, Loss Tangent = <0.05	2mm +/- 0.2mm	Wood	< 0.05

8.2.3 Elliptical Phantom

Not Applicable

8.3 Description of Simulated Tissue

The simulated tissue used is compliant to that specified in FCC Supplement C (Edition 01-01) to OET Bulletin 65 (Edition 97-01) and IEEE Std 1528 - 2003 "Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques". The simulated tissue used is also compliant to that specified in IEC62209-1 (2005) and adopted by CENELEC as EN62209-1 (2006).

The sugar based simulate tissue is produced by placing the correct measured amount of De-ionized water into a large container. Each of the dried ingredients are weighed and added to the water carefully to avoid clumping. If the solution has a high sugar concentration the water is pre-heated to aid in dissolving the ingredients. For Diacetin and similar type simulates, sugar and HEC ingredients are not needed. The solution is mixed thoroughly, covered, and allowed to sit overnight prior to use.

The simulated tissue mixture was mixed based on the Simulated Tissue Composition indicated in table 8 below for 2.450 & 5.0 GHz. During the daily testing of this product, the applicable mixture was used to measure the Di-electric parameters at each of the tested frequencies to verify that the Di-electric parameters were within the tolerance of the tissue specifications.

TABLE 8: Simulated Tissue Composition (by mass)

% of listed ingredients	2450MHz		5GHz(1)	
	Head	Body	Head	Body
Sugar	NA	NA	NA	NA
Diacetin	NA	30	NA	NA
De ionized -Water	51.0	NA	NA	NA
Salt	48.8	70	NA	NA
HEC	0.1	NA	NA	NA
Bact.	0.1	NA	NA	NA

Note: 1) SPEAG provides Motorola proprietary simulant ingredients for the 5GHz band.
2) Reference section 10.1 for target parameters

9.0 Additional Test Equipment

The table below lists additional test equipment used during the SAR assessment.

TABLE 9

Equipment Type	Model Number	Serial Number	Calibration Date	Calibration Due Date
Power Meter (Agilent)	E4419B	MY45103725	4/6/2011	4/6/2012
P-Series Power Meter (Agilent)	N1911A	GB45100276	11/9/2011	11/30/2012
E-Series Avg. Power Sensor (Agilent)	E9301B	MY50280001	8/8/2011	8/8/2012
E-Series Avg. Power Sensor (Agilent)	E9301B	MY50290001	8/8/2011	8/8/2012
Wideband Power Sensor (Agilent)	N1921A	MY45240599	11/9/2011	11/30/2012
Bi-Directional Coupler (NARDA)	3024	61150	11/14/2011	11/14/2013
Bi-Directional Coupler (NARDA)	3022	77115	3/3/2010	3/3/2012
Signal Generator (Agilent)	E4438C	MY42082269	1/24/2012	1/24/2014
Signal Generator (Agilent)	E4428C	MY47381119	6/24/2011	6/24/2013
Dickson Temperature Recorder	TM125	1195889	3/9/2011	3/9/2012
Omega Digital Thermometer with J Type TC Probe	HH200A	20857	10/28/2011	10/28/2012
Omega Digital Thermometer with J Type TC Probe	HH202A	18801	5/18/2011	5/18/2012
Omega Digital Thermometer with J Type TC Probe	HH202A	18812	5/3/2011	5/3/2012
Agilent PNA-L Network Analyzer	N5230A	MY45001092	6/9/2011	6/9/2012
Dielectric Probe Kit (HP)*	85070C	US99360076	CNR	CNR
Speag Dipole	D5GHzV2	1017	9/20/2011	9/20/2013
Speag Dipole	D2450V2	704	11/25/2010	11/25/2012

Note: * Calibration is not required by the OEM. The dielectric probe kit is used in conjunction with a calibrated network analyzer. The dielectric probe kit is calibrated for short, open and load using the calibrated network analyzer. A saline solution is routinely measured as an additional check point.

10.0 SAR Measurement System Verification

The SAR measurements were conducted with probe model/serial number ES3DV3/3291 and EX3DV4/3735. The system performance check was conducted daily and within 24 hours prior to testing. DASY output files of the probe/dipole calibration certificates and system performance test results are included in appendices B, C, D respectively.

Dipole validation scans using head tissue equivalent medium are provided in APPENDIX D. The EMS EME lab validated the dipole to the applicable IEEE 1528-2003 system performance targets. Within the same day system validation was performed using FCC body tissue parameters to generate the system performance target values for body at the applicable frequency. The results of the EMS EME system performance validation are provided herein.

10.1 Equivalent Tissue Test Results

Simulated tissue prepared for SAR measurements is measured daily and within 24 hours prior to actual SAR testing to verify that the tissue is within +/- 10% (2.4GHz and 5GHz) of target parameters for each tested channel. This measurement is done using the applicable equipment indicated in section 9.0.
The table below summarizes the measured tissue parameters used for the SAR assessment.

TABLE 10

Frequency (MHz)	Tissue Type	Conductivity Target (S/m)	Dielectric Constant Target	Conductivity Meas. (S/m)	Dielectric Constant Meas.	Tested Date
Simulated Tissue Measurements for 5GHz testing						
5200	FCC Body	5.30 (4.77 - 5.83)	49.0 (46.6 - 51.5)	4.93	48.9	2/7/12
				4.93	49.0	2/13/12
5240	FCC Body	5.35 (4.81 - 5.88)	49.0 (46.5 - 51.4)	5.03	49.1	2/13/12
5260	FCC Body	5.37 (4.84 - 5.91)	48.9 (46.5 - 51.4)	4.99	48.9	2/12/12
				5.05	49.2	2/13/12
5320	FCC Body	5.44 (4.90 - 5.99)	48.9 (46.4 - 51.3)	5.08	48.9	2/13/12
5500	FCC Body	5.65 (5.09 - 6.22)	48.6 (46.2 - 51.0)	5.66	48.3	2/8/12
				5.41	48.7	2/13/12
				5.38	46.8	2/14/12
5600	FCC Body	5.77 (5.19 - 6.34)	48.5 (46.1 - 50.9)	5.55	48.4	2/13/12
				5.51	46.6	2/14/12
5620	FCC Body	5.79 (5.21 - 6.37)	48.4 (46.0 - 50.9)	5.54	46.6	2/14/12
5660	FCC Body	5.84 (5.25 - 6.42)	48.4 (46.0 - 50.8)	5.60	46.5	2/14/12
5745	FCC Body	5.94 (5.34 - 6.53)	48.3 (45.9 - 50.7)	5.71	46.6	2/16/12
5785	FCC Body	5.98 (5.38 - 6.58)	48.2 (45.8 - 50.6)	5.77	48.0	2/13/12
				5.60	47.6	2/15/12
				5.77	46.5	2/16/12
5800	FCC Body	6.00 (5.40 - 6.60)	48.2 (45.8 - 50.6)	5.80	47.9	2/13/12
				5.62	47.6	2/15/12
				5.79	46.5	2/16/12
5805	FCC Body	6.01 (5.41 - 6.61)	48.2 (45.8 - 50.6)	5.80	46.5	2/16/12

TABLE 10 (continued)

Frequency (MHz)	Tissue Type	Conductivity Target (S/m)	Dielectric Constant Target	Conductivity Meas. (S/m)	Dielectric Constant Meas.	Tested Date
Simulated Tissue Measurements for 5GHz testing						
5200	IEEE Head	4.66 (4.19 – 5.13)	36.0 (34.2 – 37.8)	4.90	33.9	2/8/12
				4.94	34.3	2/9/12
				4.77	33.9	2/11/12
				4.75	33.9	2/12/12
				4.79	33.8	2/15/12
5240	IEEE Head	4.70 (4.23 – 5.17)	36.0 (34.2 – 37.8)	4.95	33.8	2/8/12
				4.99	34.3	2/9/12
				4.82	33.8	2/11/12
5260	IEEE Head	4.72 (4.25 – 5.19)	35.9 (34.1 – 37.7)	4.92	33.6	2/7/12
				5.02	34.2	2/9/12
				4.85	33.8	2/11/12
5320	IEEE Head	4.78 (4.30 – 5.26)	35.9 (34.1 – 37.7)	5.04	33.6	2/8/12
				5.09	34.1	2/9/12
				4.92	33.7	2/11/12
5500	IEEE Head	4.97 (4.47 – 5.46)	35.7 (33.9 – 37.4)	5.40	32.8	2/8/12
				5.31	33.7	2/9/12
				5.14	33.8	2/10/12
				5.12	33.3	2/11/12
				4.75	33.9	2/12/12
5600	IEEE Head	5.07 (4.56 – 5.58)	35.5 (33.7 – 37.3)	5.35	33.0	2/8/12
				5.43	33.5	2/9/12
				5.25	33.5	2/10/12
				5.26	33.1	2/11/12
5620	IEEE Head	5.09 (4.58 – 5.60)	35.5 (33.7 – 37.3)	5.46	33.5	2/9/12
				5.28	33.5	2/10/12
				5.25	33.2	2/12/12
5660	IEEE Head	5.13 (4.62 – 5.64)	35.5 (33.7 – 37.3)	5.51	33.4	2/9/12
				5.33	33.4	2/10/12
				5.29	33.1	2/12/12
5745	IEEE Head	5.22 (4.69 – 5.74)	35.5 (33.7 – 37.3)	5.62	33.2	2/9/12
				5.44	33.3	2/10/12
				5.40	32.9	2/12/12
5785	IEEE Head	5.26 (4.73 – 5.78)	35.5 (33.7 – 37.3)	5.67	33.1	2/9/12
				5.49	33.2	2/10/12
				5.45	32.8	2/12/12
5800	IEEE Head	5.27 (4.74 – 5.80)	35.5 (33.7 – 37.3)	5.69	33.1	2/9/12
				5.50	33.2	2/10/12
				5.47	32.8	2/12/12
5805	IEEE Head	5.28 (4.75 – 5.80)	35.5 (33.7 – 37.3)	5.69	33.1	2/9/12
				5.51	33.2	2/10/12
				5.48	32.8	2/12/12

TABLE 10 (continued)

Frequency (MHz)	Tissue Type	Conductivity Target (S/m)	Dielectric Constant Target	Conductivity Meas. (S/m)	Dielectric Constant Meas.	Tested Date
Simulated Tissue Measurements for 2.5GHz testing						
2417	FCC Body	1.92 (1.82 – 2.02)	52.7 (50.1 – 55.4)	1.96	47.9	2/18/12
2437	FCC Body	1.94 (1.84 – 2.03)	52.7 (50.1 – 55.4)	1.94	48.2	2/17/12
				1.99	47.9	2/18/12
2450	FCC Body	1.95 (1.85 – 2.05)	52.7 (50.1 – 55.3)	2.01	47.8	2/18/12
2457	FCC Body	1.96 (1.86 – 2.06)	52.7 (50.1 – 55.3)	2.02	47.8	2/18/12
2417	IEEE /IEC Head	1.77 (1.68 – 1.86)	39.3 (37.3 – 41.2)	1.84	39.7	2/16/12
				1.83	39.4	2/17/12
2437	IEEE /IEC Head	1.79 (1.70 – 1.88)	39.2 (37.3 – 41.2)	1.86	39.6	2/16/12
				1.85	39.3	2/17/12
2450	IEEE /IEC Head	1.80 (1.71 – 1.89)	39.2 (37.2 – 41.2)	1.88	39.6	2/16/12
				1.87	39.2	2/17/12
2457	IEEE /IEC Head	1.81 (1.72 – 1.90)	39.2 (37.2 – 41.1)	1.89	3.95	2/16/12
				1.88	39.2	2/17/12

10.2 System Check Test Results

System performance checks were conducted each day during the SAR assessment. The results are normalized to 1W. APPENDIX D explains how the targets were set and includes DASY plots for each day during the SAR assessment. The table below summarizes the daily system check results used for the SAR assessment.

TABLE 11

Probe Serial #	Tissue Type	Dipole Kit / Serial #	Reference SAR @ 1W (W/kg)	System Check Test Results when normalized to 1W (W/kg)	Reported SAR values for System Check at 1g (W/kg)	Tested Date
System Check result for 5GHz						
3735	5200 FCC Body	D5GHzV2 / 1017	80.00 +/- 10%	78.67	1.18	2/7/12
				83.33	1.25	2/13/12
	5500 FCC Body	D5GHzV2 / 1017	86.00 +/- 10%	90.67	1.36	2/8/12
				89.33	1.34	2/13/12
				88.67	1.33	2/14/12
	5800 FCC Body	D5GHzV2 / 1017	76.10 +/- 10%	77.33	1.16	2/13/12
				78.00	1.17	2/15/12
				79.33	1.19	2/16/12
	5200 IEEE /IEC Head	D5GHzV2 / 1017	81.33 +/- 10%	86.67	1.30	2/8/12
				84.00	1.26	2/9/12
				86.67	1.30	2/11/12
				88.00	1.32	2/12/12
				86.67	1.30	2/15/12
	5500 IEEE /IEC Head	D5GHzV2 / 1017	88.00 +/- 10%	94.00	1.41	2/9/12
				91.33	1.37	2/10/12
				91.33	1.37	2/11/12
				94.67	1.42	2/12/12
	5800 IEEE /IEC Head	D5GHzV2 / 1017	82.40 +/- 10%	88.67	1.33	2/9/12
				86.00	1.29	2/10/12
				88.67	1.33	2/12/12
System Check result for 2.5GHz						
3291	2450 FCC Body	D2450V2 / 704	52.78+/- 10%	51.00	1.53	2/18/12
	2450 IEEE /IEC Head	D2450V2 / 704	55.33+/- 10%	59.00	1.77	2/16/12
				53.67	1.61	2/17/12

Note: See APPENDIX D for an explanation of the reference SAR targets stated above.

11.0 Environmental Test Conditions

The EME Laboratory's ambient environment is well controlled resulting in very stable simulated tissue temperature and therefore stable dielectric properties. Simulated tissue temperature is measured prior to each scan to insure it is within +/ - 2^{o}C of the temperature at which the dielectric properties were determined. The liquid depth within the phantom used for measurements was at least 15cm. Additional precautions are routinely taken to ensure the stability of the simulated tissue such as covering the phantoms when scans are not actively in process in order to minimize evaporation. The lab environment is continuously monitored. The table below presents the range and average environmental conditions during the SAR tests reported herein:

TABLE 12

	Target	Measured
Ambient Temperature	18 - 25 ˚C	Range: 21.2 – 22.5˚C Avg. 21.9 ˚C
Relative Humidity	30 - 70 %	Range: 33.7 – 59.0 % Avg. 50.4%
Tissue Temperature	NA	Range: 19.9 – 22.5˚C Avg. 20.9˚C

The EME Lab RF environment uses a Spectrum Analyzer to monitor for extraneous large signal RF contaminants that could possibly affect the test results. If such unwanted signals are discovered the SAR scans are repeated.

12.0 DUT Test Methodology

12.1 Measurements

SAR measurements were performed using the DASY system described in section 8.0 using coarse and zoom scans. Dual flat and SAM phantoms were filled with applicable simulated tissue, which were used for body, head and face testing.

12.2 DUT Configuration(s)

The DUT is a portable device with BT (FHSS) and 802.11a/b/g (DSSS, OFDM) transmission signaling operational at the body, head, and face using the offered accessories. The device is placed in the test positions presented in Appendix I.

12.3 DUT Positioning Procedures

The positioning of the device for each body location is described below and illustrated in APPENDIX H.

12.3.1 Body

The DUT was positioned in normal use configuration against the phantom with the offered body worn accessory as well as with and without the offered audio accessories as applicable.

12.3.2 Head

The DUT was placed against the right and left heads of the SAM phantom in the cheek touch and tilt positions.

12.3.3 **Face**

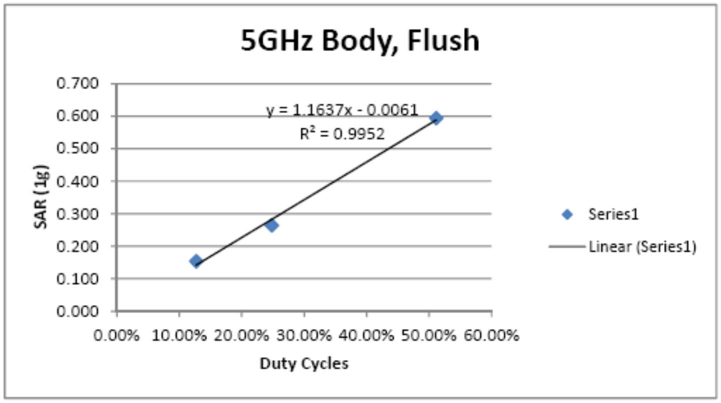
The DUT was positioned with its' front side separated 2.5cm from the phantom.

12.4 SAR Linearity Test

This device is unable to operate at 100% duty factor of its maximum duty cycle (50%) for the duration of a SAR test due to thermal restriction. Therefore, SAR linearity was verified for the highest 5GHz band frequency channel (5.6GHz) at the body using 25%, 50% and 100% of the intended maximum duty cycle (i.e. 12.7%, 24.8% and 51.1%). The table and chart below illustrates SAR linearity results.

Note – in order to achieve SAR data above the system noise level the DUT was positioned in a non-user configuration. SAR results are for SAR linearity purpose only.

Duty cycle	SAR
0.127	0.154
0.2479	0.265
0.5113	0.595



12.5 DUT Test Plan

Test channels were selected per the requirement of OET/KDB 248227 D01 "SAR Measurement Procedures for 802.11a/b/g transmitters (revised May 2007)". All modes of operation identified in section 6.0 were considered during the development of the test plan.

In some cases the initial power listed herein may exceed the reported maximum power due to software step size tuning limitations. However, the initial powers measured are not greater than the allowed 5% of the reported maximum power.

TABLE 13

Mode	Band	Data rate (Mbps)	Channel	Frequency (MHz)	Maximum Conducted Power (W)	Measured Conducted Power (W)	Delta** (%)	Default test channel	Higher adjacent channel
802.11a	5.18 - 5.32 GHz	6	36	5180	0.0398	0.0398	0.03%	√	
		6	40	5200	0.0398	0.0407	2.36%		√*
		6	44	5220	0.0398	0.0398	0.03%		
		6	48	5240	0.0398	0.0407	2.36%	√*	
		6	52	5260	0.0793	0.0759	-4.34%	√*	
		6	56	5280	0.0793	0.0759	-4.34%		
		6	60	5300	0.0793	0.0741	-6.52%		
		6	64	5320	0.0793	0.0759	-4.34%	√*	
	5.5 - 5.7GHz	6	100	5500	0.0793	0.0776	-2.11%		√*
		6	104	5520	0.0793	0.0759	-4.34%	√	
		6	108	5540	0.0793	0.0759	-4.34%		
		6	112	5560	0.0793	0.0759	-4.34%		
		6	116	5580	0.0793	0.0759	-4.34%	√	
		6	120	5600	0.0793	0.0794	0.17%		√*
		6	124	5620	0.0793	0.0813	2.50%	√*	
		6	128	5640	0.0793	0.0794	0.17%		
		6	132	5660	0.0793	0.0794	0.17%		√*
		6	136	5680	0.0793	0.0776	-2.11%	√	
		6	140	5700	0.0793	0.0794	0.17%		
	5.745 - 5.825GHz	6	149	5745	0.0793	0.0776	-2.11%	√*	
		6	153	5765	0.0793	0.0776	-2.11%		
		6	157	5785	0.0793	0.0776	-2.11%	√*	
		6	161	5805	0.0793	0.0759	-4.34%		√*
		6	165	5825	0.0793	0.0724	-8.65%	√	

Mode	Band	Data rate (Mbps)	Test Channel	Frequency (MHz)	Maximum Conducted Power (W)	Measured Conducted Power (W)	Delta** (%)	Comment
802.11n	5.18 - 5.32 GHz	MCSO	36	5180	0.0398	0.0388	n/a	Testing not required and therefore power was not retuned to be within +/- 5% of maximum
		MCSO	40	5200	0.0398	0.0351	n/a	
		MCSO	44	5240	0.0398	0.0364	n/a	
		MCSO	48	5260	0.0793	0.0662	n/a	
		MCSO	52	5300	0.0793	0.0748	n/a	
		MCSO	56	5320	0.0793	0.0693	n/a	
	5.5 - 5.7GHz	MCSO	100	5500	0.0793	0.0716	n/a	
		MCSO	112	5560	0.0793	0.0772	n/a	
		MCSO	140	5700	0.0793	0.0703	n/a	

Note * - Channel was selected during the development of the test plan.
Note ** - Delta is calculated by:
(Measured conducted power – Maximum conducted power)/ Maximum conducted power

TABLE 13 (continued)

Mode	Band	Data rate (Mbps)	Test Channel	Frequency (MHz)	Maximum Conducted Power (W)	Measured Conducted Power (W)	Delta** (%)	Default test channel
802.11b	2.412 - 2.462 GHz	1	1	2412	0.0793	0.0832	4.68%	√
		1		2417	0.0793	0.0832	4.89%	√*
		1		2422	0.0793	0.0794	0.17%	
		1		2427	0.0793	0.0794	0.17%	
		1		2432	0.0793	0.0724	-8.65%	
		1	6	2437	0.0793	0.0832	4.89%	√*
		1		2442	0.0793	0.0741	-6.52%	
		1		2447	0.0793	0.0708	-10.73%	
		1		2452	0.0793	0.0759	-4.34%	
		1		2457	0.0793	0.0724	-8.65%	√*
		1	11	2462	0.0793	0.0741	-7.02%	√
Mode	**Band**	**Data rate (Mbps)**	**Test Channel**	**Frequency (MHz)**	**Maximum Conducted Power (W)**	**Measured Conducted Power (W)**	**Delta** (%)**	**Comment**
802.11g/n	2.412 - 2.462 GHz	6	Ch 1	2412	0.03162	0.0347	9.65%	Testing not required because of lower power levels.
		6	Ch 2	2417	0.0708	0.0692	-2.28%	
		6	Ch 3	2422	0.0708	0.0692	-2.28%	
		6	Ch 4	2427	0.0708	0.0724	2.33%	
		6	Ch 5	2432	0.0708	0.0724	2.33%	
		6	Ch 6	2437	0.0708	0.0708	0.00%	
		6	Ch 7	2442	0.0708	0.0724	2.33%	
		6	Ch 8	2447	0.0708	0.0661	-6.67%	
		6	Ch 9	2452	0.0708	0.0676	-4.50%	
		6	Ch 10	2457	0.0708	0.0692	-2.28%	
		6	Ch 11	2462	0.03162	0.0295	-6.67%	

Note * - Channel was selected during the development of the test plan.
Note ** - Delta is calculated by:
(Measured conducted power – Maximum conducted power)/ Maximum conducted power

13.0 DUT Test Data

13.1 Assessments at 802.11a (5.18 – 5.32GHz) Test Data

13.1.1 Assessments at the Body

Assessment of the optional carry cases; The DUT was tested with the optional carry cases, at mid channel using offered battery SNN5793A, without any data or audio attachments. The DUT was tested in each of 2 intended orientations within body worn kit EWPACCUC 001, the orientations are: 1) front of DUT facing phantom with audio port facing up 2) back of DUT facing phantom with audio port facing up.

Assessment of the offered audio and data accessories; The DUT was tested with the optional audio and data cables using the highest SAR configuration from above.

Assessment across the remaining selected test frequencies; The DUT was tested across the remaining selected tests frequencies with the body worn kit EWPACCUC001 (back of DUT facing phantom) without any data or audio cable attachment. This was the highest configuration observed at the body for this band.

Table 14 presents the data of the body assessment. SAR plot of the highest result from the table below (bolded) was presented in Appendix F Section 1.0 – 802.11a (5.18 – 5.32GHz) Assessment at the Body.

TABLE 14

Antenna Pos.	Battery	Test position	Carry Case	Cable Accessory	Freq (MHz)	Initial Power (W)	SAR Drift (dB)	Meas. 1g-SAR (mW/g)	Meas. 10g-SAR (mW/g)	Max Calc. 1g-SAR (mW/g)	Max Calc. 10g-SAR (mW/g)	Run Number
Assessments at the Body (VoWLAN 802.11a) 5.18 - 5.32GHz band												
Assessment at the body – optional carry cases												
Internal 0789971V87	SNN5793A	Against Phantom	Holder w/clip SYN2680A	None	5260	0.0759	-0.850	0.031	0.013	0.08	0.03	CM-Ab-120212-11
			Case w/clip EWPACCUC001, back facing phantom			0.0759	-0.500	0.062	0.025	**0.14**	**0.06**	CM-Ab-120212-12
			Case w/clip EWPACCUC001, front facing phantom			0.0759	-0.840	0.036	0.015	0.09	0.04	CM-Ab-120212-13
Assessment at the body – optional audio and data cables search using worst case from above												
Internal 0789971V87	SNN5793A	Against Phantom	Case w/clip EWPACCUC001, back facing phantom	Headset RMN5130A	5260	0.0759	-0.850	0.052	0.022	0.13	0.06	CM-Ab-120212-14
				Headset SJYN0264C	5260	0.0759	-0.780	0.048	0.021	0.12	0.05	CM-Ab-120212-16
				Headset & adapter RCH50 (A9132697=25-156511-01)	5260	0.0759	-0.330	0.058	0.024	0.13	0.05	JsT-Ab-120213-04
				Data cable SKN6371C	5260	0.0759	-0.840	0.028	0.012	0.07	0.03	JsT-Ab-120213-05
Assessment at the body – freq. search using worst case position from above												
Internal 0789971V87	SNN5793A	Against Phantom	Case w/clip EWPACCUC001, back facing phantom	None	5200	0.0407	-0.350	0.023	0.009	0.05	0.02	JsT-Ab-120213-11
					5240	0.0407	-0.950	0.022	0.008	0.06	0.02	JsT-Ab-120213-10
					5320	0.0759	-0.520	0.044	0.020	0.10	0.05	CM-Ab-120213-12

13.1.2 Assessments at the Head

Assessment of the right ear test positions and applicable frequencies; The DUT was tested at the right ear in both the cheek touch and 15° tilt positions using the offered battery kit SNN5793A at the center frequency of the band. The highest configuration from the position search above was used to test all other applicable frequencies in the band.

Assessment of the left ear test positions and applicable frequencies; The DUT was tested at the left ear in both the cheek touch and 15° tilt positions using the offered battery kit SNN5793A at the center frequency of the band. The highest configuration from the position search above was used to test all other applicable frequencies in the band.

Table 15 presents the data of the head assessment. SAR plots of the highest result from head for each test position were bolded and presented in Appendix F Section 2.0 - 802.11a (5.18 – 5.32GHz) Assessment at the Head – Tilt and Touch positions.

13.1.3 Assessments at the Face

Assessment of the applicable frequencies; The DUT was tested using the offered battery kit SNN5793A at the applicable frequencies of the band.

Table 15 presents the data of the face assessment. SAR plot of the highest result from face assessments was bolded and presented in Appendix F Section 3.0 - 802.11a (5.18 – 5.32GHz) Assessment at the Face.

TABLE 15

Assessments at the Head (VoWLAN 802.11a) 5.18 – 5.32GHz band												
Antenna Pos.	**Battery**	**Test position**	**Carry Case**	**Cable Accessory**	**Freq (MHz)**	**Initial Power (W)**	**SAR Drift (dB)**	**Meas. 1g-SAR (mW/g)**	**Meas. 10g-SAR (mW/g)**	**Max Calc. 1g-SAR (mW/g)**	**Max Calc. 10g-SAR (mW/g)**	**Run Number**
Assessment at the right ear – touch/tilt												
Internal 0789971V87	SNN5793A	Cheek touch	None	None	5260	0.0759	-0.450	0.239	0.087	0.55	0.20	CM-Rear-120207-16
		Cheek tilt			5260	0.0759	-0.940	0.282	0.104	**0.73**	**0.27**	CM-Rear-120207-17
Assessment at the right ear – freq. search using worst case position from above												
Internal 0789971V87	SNN5793A	Cheek tilt	None	None	5200	0.0407	-0.690	0.102	0.040	0.24	0.09	JsT-Rear-120208-08
					5240	0.0407	-1.230	0.117	0.044	0.31	0.12	CM-Rear-120208-09
					5320	0.0759	-0.670	0.279	0.103	0.68	0.25	CM-Rear-120208-10
Assessment at the left ear – touch/tilt												
Internal 0789971V87	SNN5793A	Cheek touch	None	None	5260	0.0759	-0.350	0.229	0.093	0.52	0.21	CM-Lear-120209-12
		Cheek tilt			5260	0.0759	-0.580	0.217	0.089	0.52	0.21	CM-Lear-120209-13
Assessment at the left ear – freq. search using worst case position from above												
Internal 0789971V87	SNN5793A	Cheek touch	None	None	5200	0.0407	-0.790	0.100	0.040	0.24	0.10	CM-Lear-120209-14
					5240	0.0407	-0.410	0.116	0.051	0.25	0.11	CM-Lear-120209-16
					5320	0.0759	-0.460	0.247	0.102	**0.57**	**0.24**	CM-Lear-120209-18
Assessment at the face – 2.5cm												
Internal 0789971V87	SNN5793A	Front 2.5cm	None	None	5200	0.0407	-0.540	0.011	0.004	0.01	0.00	JsT-Face-120215-04
					5240	0.0407	-0.610	0.014	0.006	0.02	0.01	CM-Face-120211-14
					5260	0.0759	-0.940	0.028	0.012	**0.04**	**0.02**	CM-Face-120211-15
					5320	0.0759	-0.870	0.023	0.010	0.03	0.01	CM-Face-120211-16

13.2 Assessments at 802.11a (5.5 – 5.7GHz) Test Data

13.2.1 Assessments at the Body

Assessment of the optional carry cases; The DUT was tested with the optional carry cases, at mid channel using offered battery SNN5793A, without any data or audio attachments. The DUT was tested in each of 2 intended orientations within body worn kit EWPACCUC 001, the orientations are: 1) front of DUT facing phantom with audio port facing up 2) back of DUT facing phantom with audio port facing up.

Assessment of the offered audio and data accessories; The DUT was tested with the optional audio and data cables using the highest SAR configuration from above.

Assessment across the remaining selected test frequencies; The DUT was tested across the remaining selected tests frequencies with the body worn kit EWPACCUC001 (back of DUT facing phantom) and audio cable SJYN0264C. This was the highest configuration observed at the body for this band.

Table 16 presents the data of the body assessment. SAR plot of the highest result from the table below (bolded) was presented in Appendix F Section 4.0 - 802.11a (5.5 – 5.7GHz) Assessment at the Body.

TABLE 16

Assessments at the Body (VoWLAN 802.11a) 5.5 - 5.7GHz band												
Antenna Pos.	**Battery**	**Test position**	**Carry Case**	**Cable Accessory**	**Freq (MHz)**	**Initial Power (W)**	**SAR Drift (dB)**	**Meas. 1g-SAR (mW/g)**	**Meas. 10g-SAR (mW/g)**	**Max Calc. 1g-SAR (mW/g)**	**Max Calc. 10g-SAR (mW/g)**	**Run Number**
Assessment at the body – optional carry cases												
Internal 0789971V87	SNN5793A	Against Phantom	Holder w/clip SYN2680A	None	5600*	0.0794	-1.010	0.020	0.006	0.05	0.02	CM-Ab-120213-14
			Case w/clip EWPACCUC001, back facing phantom			0.0794	-0.990	0.043	0.018	0.11	0.05	CM-Ab-120213-18
			Case w/clip EWPACCUC001, front facing phantom			0.0794	-0.320	0.048	0.020	0.10	0.04	JsT-Ab-120214-04
Assessment at the body – optional audio and data cable search using worst case from above												
Internal 0789971V87	SNN5793A	Against Phantom	Case w/clip EWPACCUC001, back facing phantom	Headset RMN5130A	5600*	0.0794	-0.660	0.058	0.024	0.14	0.06	JsT-Ab-120214-05
				Headset SJYN0264C		0.0794	-0.940	0.062	0.026	**0.15**	**0.06**	JsT-Ab-120214-09
				Headset & adapter RCH50 (A9132697=25-156511-01)		0.0794	-0.570	0.060	0.025	0.14	0.06	JsT-Ab-120214-08
				Data cable SKN6371C		0.0794	-0.770	0.046	0.011	0.11	0.03	JsT-Ab-120214-10

Note * - Even though this channel is not applicable per KDB443999 it could be applicable for other countries

TABLE 16 (continued)

Assessments at the Body (VoWLAN 802.11a) 5.5 - 5.7GHz band												
Antenna Pos.	**Battery**	**Test position**	**Carry Case**	**Cable Accessory**	**Freq (MHz)**	**Initial Power (W)**	**SAR Drift (dB)**	**Meas. 1g-SAR (mW/g)**	**Meas. 10g-SAR (mW/g)**	**Max Calc. 1g-SAR (mW/g)**	**Max Calc. 10g-SAR (mW/g)**	**Run Number**
Assessment at the body – freq. search using worst case position from above												
Internal 0789971V87	SNN5793A	Against Phantom	Case w/clip EWPACCUC001, back facing phantom	Headset SJYN0264C	5500	0.0776	-0.580	0.036	0.014	0.09	0.03	CM-Ab-120214-11
					5620*	0.0813	-0.930	0.055	0.022	0.14	0.05	CM-Ab-120214-12
					5660	0.0794	-0.280	0.060	0.025	0.13	0.05	CM-Ab-120214-15

Note * - Even though this channel is not applicable per KDB443999 it could be applicable for other countries

13.2.2 Assessments at the Head

Assessment of the right ear test positions and applicable frequencies; The DUT was tested at the right ear in both the cheek touch and 15° tilt positions using the offered battery kit SNN5793A at the center frequency of the band. The highest configuration from the position search above was used to test all other applicable frequencies in the band.

Assessment of the left ear test positions and applicable frequencies; The DUT was tested at the left ear in both the cheek touch and 15° tilt positions using the offered battery kit SNN5793A at the center frequency of the band. The highest configuration from the position search above was used to test all other applicable frequencies in the band.

Table 17 presents the data of the head assessment. SAR plots of the highest result from head assessments for each test position were bolded and presented in Appendix F Section 5.0 - 802.11a (5.5 – 5.7GHz) Assessment at the Head – Tilt and Touch positions.

13.2.3 Assessments at the Face

Assessment of the applicable frequencies; The DUT was tested using the offered battery kit SNN5793A at the applicable frequencies of the band.

Table 17 presents the data of the face assessment. SAR plot of the highest result from face assessments was bolded and presented in Appendix F Section 6.0 - 802.11a (5.5 – 5.7GHz) Assessment at the Face.

TABLE 17

Antenna Pos.	Battery	Test position	Carry Case	Cable Accessory	Freq (MHz)	Initial Power (W)	SAR Drift (dB)	Meas. 1g-SAR (mW/g)	Meas. 10g-SAR (mW/g)	Max Calc. 1g-SAR (mW/g)	Max Calc. 10g-SAR (mW/g)	Run Number
Assessments at the Head (VoWLAN 802.11a) 5.5 – 5.7 GHz band												
Assessment at the right ear – touch/tilt												
Internal 0789971V87	SNN5793A	Cheek touch	None	None	5600*	0.0794	-0.630	0.299	0.106	**0.69**	**0.25**	CM-Rear-120208-11
		Cheek tilt			5600*	0.0794	-0.250	0.348	0.127	0.74	0.27	JsT-Rear-120209-09
Assessment at the right ear – freq. search using worst case position from above												
Internal 0789971V87	SNN5793A	Cheek tilt	None	None	5500	0.0776	-1.120	0.266	0.095	0.70	0.25	CM-Rear-120208-14
					5620*	0.0813	-0.380	0.352	0.127	0.77	0.28	JsT-Rear-120209-11
					5660	0.0794	-0.240	0.370	0.129	**0.78**	**0.27**	JsT-Rear-120209-10
Assessment at the left ear – touch/tilt												
Internal 0789971V87	SNN5793A	Cheek touch	None	None	5600*	0.0794	-0.420	0.265	0.110	0.58	0.24	JsT-Lear-120210-05
		Cheek tilt			5600*	0.0794	-0.490	0.287	0.118	0.64	0.26	JsT-Lear-120210-07
Assessment at the left ear – freq. search using worst case position from above												
Internal 0789971V87	SNN5793A	Cheek tilt	None	None	5500	0.0776	-0.190	0.271	0.114	0.58	0.24	JsT-Lear-120210-08
					5620*	0.0813	-1.000	0.298	0.121	0.75	0.30	JsT-Lear-120210-09
					5660	0.0794	-0.420	0.288	0.119	0.63	0.26	JsT-Lear-120210-11
Assessment at the face – 2.5cm												
Internal 0789971V87	SNN5793A	Front 2.5cm	None	None	5500	0.0776	0.500	0.026	0.011	0.03	0.01	CM-Face-120211-18
					5600*	0.0794	-0.200	0.033	0.013	0.03	0.01	CM-Face-120211-19
					5620*	0.0813	-0.530	0.032	0.015	0.04	0.02	JsT-Face-120212-04
					5660	0.0794	-0.460	0.036	0.015	**0.04**	**0.02**	JsT-Face-120212-05

Note * - Even though this channel is not applicable per KDB443999 it could be applicable for other countries

13.3 Assessments at 802.11a (5.745 – 5.825GHz) Test Data

13.3.1 Assessments at the Body

Assessment of the optional carry cases; The DUT was tested with the optional carry cases, at mid channel using offered battery SNN5793A, without any data or audio attachments. The DUT was tested in each of 2 intended orientations within body worn kit EWPACCUC 001, the orientations are: 1) front of DUT facing phantom with audio port facing up 2) back of DUT facing phantom with audio port facing up.

Assessment of the offered audio and data accessories; The DUT was tested with the optional audio and data cables using the highest SAR configuration from above.

Assessment across the remaining selected test frequencies; The DUT was tested across the remaining selected tests frequencies with the body worn kit SYN2680A and data cable SKN6371C. This was the highest configuration observed at the body for this band.

Table 18 presents the data of the body assessment. SAR plot of the highest result from the table below (bolded) was presented in Appendix F Section 7.0 – 802.11a (5.745 – 5.825GHz) Assessment at the Body.

TABLE 18

Antenna Pos.	Battery	Test position	Carry Case	Cable Accessory	Freq (MHz)	Initial Power (W)	SAR Drift (dB)	Meas. 1g-SAR (mW/g)	Meas. 10g-SAR (mW/g)	Max Calc. 1g-SAR (mW/g)	Max Calc. 10g-SAR (mW/g)	Run Number
Assessments at the Body (VoWLAN 802.11a) 5.745 - 5.825GHz band												
Assessment at the body – optional carry cases												
Internal 0789971V87	SNN5793A	Against Phantom	Holder w/clip SYN2680A	None	5785	0.0776	-0.910	0.048	0.019	0.12	0.05	CM-Ab-120213-16
			Case w/clip EWPACCUC001, back facing phantom			0.0776	-0.880	0.043	0.018	0.11	0.05	CM-Ab-120215-11
			Case w/clip EWPACCUC001, front facing phantom			0.0776	0.066	0.039	0.015	0.08	0.03	CM-Ab-120215-14
Assessment at the body – optional audio and data cable search using worst case from above												
Internal 0789971V87	SNN5793A	Against Phantom	Holder w/clip SYN2680A	Headset RMN5130A	5785	0.0776	-0.099	0.042	0.017	0.09	0.04	CM-Ab-120215-16
				Headset SJYN0264C		0.0776	-0.410	0.050	0.021	0.11	0.05	JsT-Ab-120216-03
				Headset & adapter RCH50 (A9132697=25-156511-01)		0.0776	-0.890	0.042	0.017	0.10	0.04	JsT-Ab-120216-05
				Data cable SKN6371C		0.0776	-0.550	0.052	0.021	**0.12**	**0.05**	JsT-Ab-120216-06
Assessment at the body – freq. search using worst case position from above												
Internal 0789971V87	SNN5793A	Against Phantom	Holder w/clip SYN2680A	Data cable SKN6371C	5745	0.0776	-0.810	0.045	0.019	0.11	0.05	JsT-Ab-120216-07
					5805	0.0759	-0.540	0.047	0.020	0.11	0.05	JsT-Ab-120216-08

13.3.2 Assessments at the Head

Assessment of the right ear test positions and applicable frequencies; The DUT was tested at the right ear in both the cheek touch and 15° tilt positions using the offered battery kit SNN5793A at the center frequency of the band. The highest configuration from the position search above was used to test all other applicable frequencies in the band.

Assessment of the left ear test positions and applicable frequencies; The DUT was tested at the left ear in both the cheek touch and 15° tilt positions using the offered battery kit SNN5793A at the center frequency of the band. The highest configuration from the position search above was used to test all other applicable frequencies in the band.

Table 19 presents the data of the head assessments. SAR plots of the highest result from head assessments for each test position were bolded and presented in Appendix F Section 8.0 – 802.11a (5.745 – 5.825GHz) Assessment at the Head – Tilt and Touch positions.

13.3.3 Assessments at the Face

Assessment of the applicable frequencies; The DUT was tested using the offered battery kit SNN5793A at the applicable frequencies of the band.

Table 18 presents the data of the face assessments. SAR plots of the highest result from face assessments was bolded and presented in Appendix F Section 9.0 – 802.11a (5.745 – 5.825GHz) Assessment at the Face.

TABLE 19

Assessments at the Head (VoWLAN 802.11a) 5.745 – 5.825GHz band												
Antenna Pos.	**Battery**	**Test position**	**Carry Case**	**Cable Accessory**	**Freq (MHz)**	**Initial Power (W)**	**SAR Drift (dB)**	**Meas. 1g-SAR (mW/g)**	**Meas. 10g-SAR (mW/g)**	**Max Calc. 1g-SAR (mW/g)**	**Max Calc. 10g-SAR (mW/g)**	**Run Number**
Assessment at the right ear – touch/tilt												
Internal 0789971V87	SNN5793A	Cheek touch	None	None	5785	0.0776	-0.180	0.302	0.106	**0.64**	**0.23**	JsT-Rear-120209-05
		Cheek tilt			5785	0.0776	-0.800	0.320	0.112	0.79	0.28	JsT-Rear-120209-06
Assessment at the right ear – freq. search using worst case position from above												
Internal 0789971V87	SNN5793A	Cheek tilt	None	None	5745	0.0776	-0.740	0.327	0.116	0.79	0.28	JsT-Rear-120209-07
					5805	0.0759	-0.950	0.314	0.112	**0.82**	**0.29**	JsT-Rear-120209-08
Assessment at the left ear – touch/tilt												
Internal 0789971V87	SNN5793A	Cheek touch	None	None	5785	0.0776	-0.490	0.268	0.103	0.61	0.24	CM-Lear-120210-13
		Cheek tilt			5785	0.0776	0.530	0.288	0.114	0.59	0.23	CM-Lear-120210-14
Assessment at the left ear – freq. search using worst case position from above												
Internal 0789971V87	SNN5793A	Cheek touch	None	None	5745	0.0776	1.120	0.244	0.092	0.50	0.19	CM-Lear-120210-15
					5805	0.0759	0.140	0.297	0.113	0.62	0.24	CM-Lear-120210-16
Assessment at the face – 2.5cm												
Internal 0789971V87	SNN5793A	Front 2.5cm	None	None	5745	0.0776	-0.580	0.043	0.018	**0.05**	**0.02**	JsT-Face-120212-06
					5785	0.0776	-0.640	0.030	0.012	0.04	0.01	JsT-Face-120212-07
					5805	0.0759	-0.740	0.036	0.015	0.04	0.02	JsT-Face-120212-08

13.4 Assessments at 802.11b (2.412 – 2.462MHz) Test Data

13.4.1 Assessments at the Body

Assessment of the optional carry cases; The DUT was tested with the optional carry cases, at mid channel using offered battery SNN5793A, without any data or audio attachments. The DUT was tested in each of 2 intended orientations within body worn kit EWPACCUC 001, the orientations are: 1) front of DUT facing phantom with audio port facing up 2) back of DUT facing phantom with audio port facing up.

Assessment of the offered audio and data accessories; The DUT was tested with the optional audio and data cables using the highest SAR configuration from above.

Assessment across the band edges; The DUT was tested across the band edges with the body worn kit EWPACCUC001 (back of DUT facing phantom) and audio cable SJYN0264C. This was the highest configuration observed at the body for this band.

Table 20 presents the data of the body assessment. SAR plot of the highest result from the table below (bolded) was presented in Appendix F Section 10.0 – 802.11b (2.412 – 2.462GHz) Assessment at the Body.

TABLE 20

Assessments at the Body (VoWLAN 802.11b) 2.412-2.462GHz band												
Antenna Pos.	**Battery**	**Test position**	**Carry Case**	**Cable Accessory**	**Freq (MHz)**	**Initial Power (W)**	**SAR Drift (dB)**	**Meas. 1g-SAR (mW/g)**	**Meas. 10g-SAR (mW/g)**	**Max Calc. 1g-SAR (mW/g)**	**Max Calc. 10g-SAR (mW/g)**	**Run Number**
Assessment at the body – optional carry cases												
Internal 0789971V87	SNN5793A	Against Phantom	Holder w/clip SYN2680A	None	2437	0.0832	0.240	0.017	0.009	0.03	0.02	CM-Ab-120217-22
			Case w/clip EWPACCUC001, back facing phantom			0.0832	-0.320	0.048	0.028	0.10	0.06	CM-Ab-120217-23
			Case w/clip EWPACCUC001, front facing phantom			0.0832	-0.490	0.014	0.008	0.03	0.02	CM-Ab-120217-24
Assessment at the body – optional audio and data cable search using worst case from above												
Internal 0789971V87	SNN5793A	Against Phantom	Case w/clip EWPACCUC001, back facing phantom	Headset RMN5130A	2437	0.0832	0.280	0.053	0.032	0.11	0.06	JsT-Ab-120218-02
				Headset SJYN0264C	2437	0.0832	-0.790	0.053	0.031	**0.13**	**0.08**	JsT-Ab-120218-03
				Headset & adapter RCH50 (A9132697=25-156511-01)	2437	0.0832	-0.120	0.053	0.032	0.11	0.07	JsT-Ab-120218-04
				Data cable SKN6371C	2437	0.0832	-0.180	0.047	0.028	0.10	0.06	JsT-Ab-120218-05

TABLE 20(continued)

Antenna Pos.	Battery	Test position	Carry Case	Cable Accessory	Freq (MHz)	Initial Power (W)	SAR Drift (dB)	Meas. 1g-SAR (mW/g)	Meas. 10g-SAR (mW/g)	Max Calc. 1g-SAR (mW/g)	Max Calc. 10g-SAR (mW/g)	Run Number
Assessments at the Body (VoWLAN 802.11b) 2.412-2.462GHz band												
Assessment at the body – freq. search using worst case position from above												
Internal 0789971V87	SNN5793A	Against Phantom	Case w/clip EWPACCUC001, back facing phantom	Headset SJYN0264C	2417	0.0832	-0.460	0.044	0.026	0.10	0.06	JsT-Ab-120218-06
					2457	0.0724	-0.400	0.047	0.027	0.11	0.07	JsT-Ab-120218-07

13.4.2 Assessments at the Head

Assessment of the right ear test positions and applicable frequencies; The DUT was tested at the right ear in both the cheek touch and 15° tilt positions using the offered battery kit SNN5793A at the center frequency of the band. The highest configuration from the position search above was used to test all other applicable frequencies in the band.

Assessment of the left ear test positions and applicable frequencies; The DUT was tested at the left ear in both the cheek touch and 15° tilt positions using the offered battery kit SNN5793A at the center frequency of the band. The highest configuration from the position search above was used to test all other applicable frequencies in the band.

Table 21 presented the data of the head assessments. SAR plots of the highest result from head assessments for each test position were bolded and presented in Appendix F Section 11.0 – 802.11b (2.412 – 2.462GHz) Assessment at the Head – Tilt and Touch positions.

13.4.3 Assessments at the Face

Assessment of the applicable frequencies; The DUT was tested using the offered battery kit SNN5793A at the applicable frequencies of the band.

Table 21 presents the data of the face assessments. SAR plot of the highest result from face assessments was bolded and presented in Appendix F Section 12.0 – 802.11b (2.412 – 2.462GHz) Assessment at the Face.

TABLE 21

Antenna Pos.	Battery	Test position	Carry Case	Cable Accessory	Freq (MHz)	Initial Power (W)	SAR Drift (dB)	Meas. 1g-SAR (mW/g)	Meas. 10g-SAR (mW/g)	Max Calc. 1g-SAR (mW/g)	Max Calc. 10g-SAR (mW/g)	Run Number
Assessments at the Head (VoWLAN 802.11b) 2.412-2.462GHz band												
Assessment at the right ear – touch/tilt												
Internal 0789971V87	SNN5793A	Cheek touch	None	None	2437	0.0832	-0.093	0.092	0.046	**0.19**	**0.10**	CM-Rear-120216-12
		Cheek tilt			2437	0.0832	-0.240	0.064	0.033	**0.14**	**0.07**	CM-Rear-120216-13
Assessment at the right ear – freq. search using worst case position from above												
Internal 0789971V87	SNN5793A	Cheek touch	None	None	2417	0.0832	-0.290	0.079	0.040	0.17	0.09	CM-Rear-120216-14
					2457	0.0724	-0.097	0.074	0.037	0.17	0.08	CM-Rear-120216-15
Assessment at the left ear – touch/tilt												
Internal 0789971V87	SNN5793A	Cheek touch	None	None	2437	0.0832	-0.170	0.054	0.031	0.11	0.06	CM-Lear-120217-18
		Cheek tilt			2437	0.0832	-0.280	0.053	0.029	0.11	0.06	CM-Lear-120217-19
Assessment at the left ear – freq. search using worst case position from above												
Internal 0789971V87	SNN5793A	Cheek tilt	None	None	2417	0.0832	-0.340	0.046	0.025	0.10	0.06	CM-Lear-120217-20
					2457	0.0724	-0.280	0.051	0.028	0.12	0.07	CM-Lear-120217-21
Assessment at the face – 2.5cm												
Internal 0789971V87	SNN5793A	Front 2.5cm	None	None	2417	0.0832	-0.360	0.008	0.004	0.01	0.00	JsT-Face-120217-15
					2437	0.0832	1.000	0.008	0.005	**0.01**	**0.01**	JsT-Face-120217-16
					2457	0.0724	0.230	0.008	0.004	0.01	0.00	CM-Face-120217-17

13.5 Shorten Scan Assessment

Short scan assessment A "shortened" scan was performed to validate the SAR drift of the full DASY5™ coarse and zoom scans. Note that the shortened scan represents the zoom scan performance result; this is obtained by first running a coarse scan to find the peak area and then, using a newly charged battery, a zoom scan only was performed. The results of the shortened cube scan presented in APPENDIX E demonstrate that the scaling methodology used to determine the calculated SAR results presented herein are valid. The SAR result from the table below is provided in APPENDIX E.

TABLE 22

Antenna Pos.	Battery	Test position	Carry Case	Cable Accessory	Freq (MHz)	Initial Power (W)	SAR Drift (dB)	Meas. 1g-SAR (mW/g)	Meas. 10g-SAR (mW/g)	Max Calc. 1g-SAR (mW/g)	Max Calc. 10g-SAR (mW/g)	Run Number
Internal 0789971V87	SNN5793A	Cheek tilt	None	None	5805	0.0759	-0.950	0.314	0.112	0.82	0.29	Full Scan JsT-Rear-120209-08
Internal 0789971V87	SNN5793A	Cheek tilt	None	None	5805	0.0759	-0.420	0.334	0.109	0.77	0.25	Shorten Scan JsT-Rear-120215-06

14.0 Simultaneous Transmission Exclusion

FCC part 15 subpart C source-based time-averaged conducted output power for BT is less than 60 / f-GHz. Therefore, simultaneous transmission SAR results are not reported herein.

15.0 Conclusion

The highest Operational Maximum Calculated 1-gram and 10-gram average SAR values found for this filing: Model EWP3200 are in the table below.

TABLE 23

Frequency (MHz)	Max Calc at Body (mW/g)		Max Calc at Face (mW/g)		Max Calc at Head (mW/g)	
	1g-SAR	10g-SAR	1g-SAR	10g-SAR	1g-SAR	10g-SAR
802.11b 2.412-2.462 GHz	0.13	0.08	0.01	0.01	0.19	0.10
802.11a 5.18- 5.32 GHz 5.5 – 5.7 GHz 5.745 – 5.825 GHz	0.15	0.07	0.05	0.02	0.82	0.29

Note – All results are scaled to maximum output power.

The test results clearly demonstrate compliance with FCC General Population/Uncontrolled RF Exposure limits of **1.6** W/kg averaged over 1 gram per the requirements of 47 CFR 2.1093(d). The 10 grams result is not applicable to FCC filing.

APPENDIX A
Measurement Uncertainty

The Measurement Uncertainty tables indicated in this APPENDIX are applicable to the DUT test frequencies ranging from 800MHz to 3GHz and 3GHz to 5GHz; for Dipole test frequencies ranging from 800MHz to 3GHz and 3GHZ to 5GHz. Therefore, the highest tolerances for the probes calibration uncertainty are indicated.

Table 1: Uncertainty Budget for Device Under Test: 800 – 3000 MHz

a	*b*	*c*	*d*	*e = f(d,k)*	*f*	*g*	*h = c x f / e*	*i = c x g / e*	*k*
Uncertainty Component	**IEEE 1528 section**	**Tol. (± %)**	**Prob Dist**	**Div.**	c_i **(1 g)**	c_i **(10 g)**	**1 g** u_i **(±%)**	**10 g** u_i **(±%)**	v_i
Measurement System									
Probe Calibration	E.2.1	5.9	N	1.00	1	1	5.9	5.9	∞
Axial Isotropy	E.2.2	4.7	R	1.73	0.707	0.707	1.9	1.9	∞
Hemispherical Isotropy	E.2.2	9.6	R	1.73	0.707	0.707	3.9	3.9	∞
Boundary Effect	E.2.3	1.0	R	1.73	1	1	0.6	0.6	∞
Linearity	E.2.4	4.7	R	1.73	1	1	2.7	2.7	∞
System Detection Limits	E.2.5	1.0	R	1.73	1	1	0.6	0.6	∞
Readout Electronics	E.2.6	0.3	N	1.00	1	1	0.3	0.3	∞
Response Time	E.2.7	1.1	R	1.73	1	1	0.6	0.6	∞
Integration Time	E.2.8	1.1	R	1.73	1	1	0.6	0.6	∞
RF Ambient Conditions - Noise	E.6.1	3.0	R	1.73	1	1	1.7	1.7	∞
RF Ambient Conditions - Reflections	E.6.1	0.0	R	1.73	1	1	0.0	0.0	∞
Probe Positioner Mech. Tolerance	E.6.2	0.4	R	1.73	1	1	0.2	0.2	∞
Probe Positioning w.r.t Phantom	E.6.3	1.4	R	1.73	1	1	0.8	0.8	∞
Max. SAR Evaluation (ext., int., avg.)	E.5	3.4	R	1.73	1	1	2.0	2.0	∞
Test sample Related									
Test Sample Positioning	E.4.2	3.2	N	1.00	1	1	3.2	3.2	29
Device Holder Uncertainty	E.4.1	4.0	N	1.00	1	1	4.0	4.0	8
SAR drift	6.6.2	5.0	R	1.73	1	1	2.9	2.9	∞
Phantom and Tissue Parameters									
Phantom Uncertainty	E.3.1	4.0	R	1.73	1	1	2.3	2.3	∞
Liquid Conductivity (target)	E.3.2	5.0	R	1.73	0.64	0.43	1.8	1.2	∞
Liquid Conductivity (measurement)	E.3.3	3.3	N	1.00	0.64	0.43	2.1	1.4	∞
Liquid Permittivity (target)	E.3.2	5.0	R	1.73	0.6	0.49	1.7	1.4	∞
Liquid Permittivity (measurement)	E.3.3	1.9	N	1.00	0.6	0.49	1.1	0.9	∞
Combined Standard Uncertainty			RSS				11	11	411
Expanded Uncertainty (95% CONFIDENCE LEVEL)			*k*=2				22	22	

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Table 2: Uncertainty Budget for Device Under Test: 3 – 6 GHz

a	*b*	*c*	*d*	*e = f(d,k)*	*f*	*g*	*h = c x f / e*	*i = c x g / e*	*k*
Uncertainty Component	**IEEE 1528 section**	**Tol. (± %)**	**Prob Dist**	**Div.**	**c_i (1 g)**	**c_i (10 g)**	**1 g u_i (±%)**	**10 g u_i (±%)**	**v_i**
Measurement System									
Probe Calibration	E.2.1	8.3	N	1.00	1	1	8.3	8.3	∞
Axial Isotropy	E.2.2	4.7	R	1.73	0.707	0.707	1.9	1.9	∞
Hemispherical Isotropy	E.2.2	9.6	R	1.73	0.707	0.707	3.9	3.9	∞
Boundary Effect	E.2.3	2.0	R	1.73	1	1	1.2	1.2	∞
Linearity	E.2.4	4.7	R	1.73	1	1	2.7	2.7	∞
System Detection Limits	E.2.5	1.0	R	1.73	1	1	0.6	0.6	∞
Readout Electronics	E.2.6	0.3	N	1.00	1	1	0.3	0.3	∞
Response Time	E.2.7	1.1	R	1.73	1	1	0.6	0.6	∞
Integration Time	E.2.8	1.1	R	1.73	1	1	0.6	0.6	∞
RF Ambient Conditions - Noise	E.6.1	3.0	R	1.73	1	1	1.7	1.7	∞
RF Ambient Conditions - Reflections	E.6.1	0.0	R	1.73	1	1	0.0	0.0	∞
Probe Positioner Mech. Tolerance	E.6.2	1.0	R	1.73	1	1	0.6	0.6	∞
Probe Positioning w.r.t Phantom	E.6.3	4.0	R	1.73	1	1	2.3	2.3	∞
Max. SAR Evaluation (ext., int., avg.)	E.5	2.1	R	1.73	1	1	1.2	1.2	∞
Test sample Related									
Test Sample Positioning	E.4.2	3.2	N	1.00	1	1	3.2	3.2	29
Device Holder Uncertainty	E.4.1	4.0	N	1.00	1	1	4.0	4.0	8
SAR drift	6.6.2	5.0	R	1.73	1	1	2.9	2.9	∞
Phantom and Tissue Parameters									
Phantom Uncertainty	E.3.1	4.0	R	1.73	1	1	2.3	2.3	∞
Dielectric Parameter Correction	--	1.4	N	1.00	1	0.79	1.4	1.1	∞
Liquid Conductivity (measurement)	E.3.3	3.3	N	1.00	0.64	0.43	2.1	1.4	∞
Liquid Permittivity (measurement)	E.3.3	1.9	N	1.00	0.6	0.49	1.1	0.9	∞
Combined Standard Uncertainty			RSS				12	12	663
Expanded Uncertainty (95% CONFIDENCE LEVEL)			*k*=2				25	25	

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Table 3: Uncertainty Budget for System Validation: 800 – 3000 MHz

a	*b*	*c*	*d*	*e* = *f(d,k)*	*f*	*g*	*h* = *c* x *f* / *e*	*i* = *c* x *g* / *e*	*k*
Uncertainty Component	**IEEE 1528 section**	**Tol. (± %)**	**Prob. Dist.**	**Div.**	c_i (1 g)	c_i (10 g)	**1 g** u_i (±%)	**10 g** u_i (±%)	v_i
Measurement System									
Probe Calibration	E.2.1	5.9	N	1.00	1	1	5.9	5.9	∞
Axial Isotropy	E.2.2	4.7	R	1.73	1	1	2.7	2.7	∞
Spherical Isotropy	E.2.2	9.6	R	1.73	0	0	0.0	0.0	∞
Boundary Effect	E.2.3	1.0	R	1.73	1	1	0.6	0.6	∞
Linearity	E.2.4	4.7	R	1.73	1	1	2.7	2.7	∞
System Detection Limits	E.2.5	1.0	R	1.73	1	1	0.6	0.6	∞
Readout Electronics	E.2.6	0.3	N	1.00	1	1	0.3	0.3	∞
Response Time	E.2.7	1.1	R	1.73	1	1	0.6	0.6	∞
Integration Time	E.2.8	0.0	R	1.73	1	1	0.0	0.0	∞
RF Ambient Conditions - Noise	E.6.1	3.0	R	1.73	1	1	1.7	1.7	∞
RF Ambient Conditions - Reflections	E.6.1	0.0	R	1.73	1	1	0.0	0.0	∞
Probe Positioner Mechanical Tolerance	E.6.2	0.4	R	1.73	1	1	0.2	0.2	∞
Probe Positioning w.r.t. Phantom	E.6.3	1.4	R	1.73	1	1	0.8	0.8	∞
Max. SAR Evaluation (ext., int., avg.)	E.5	3.4	R	1.73	1	1	2.0	2.0	∞
Dipole									
Dipole Axis to Liquid Distance	8, E.4.2	2.0	R	1.73	1	1	1.2	1.2	∞
Input Power and SAR Drift Measurement	8, 6.6.2	5.0	R	1.73	1	1	2.9	2.9	∞
Phantom and Tissue Parameters									
Phantom Uncertainty	E.3.1	4.0	R	1.73	1	1	2.3	2.3	∞
Liquid Conductivity (target)	E.3.2	5.0	R	1.73	0.64	0.43	1.8	1.2	∞
Liquid Conductivity (measurement)	E.3.3	3.3	R	1.73	0.64	0.43	1.2	0.8	∞
Liquid Permittivity (target)	E.3.2	5.0	R	1.73	0.6	0.49	1.7	1.4	∞
Liquid Permittivity (measurement)	E.3.3	1.9	R	1.73	0.6	0.49	0.6	0.5	∞
Combined Standard Uncertainty			RSS				9	9	99999
Expanded Uncertainty (95% CONFIDENCE LEVEL)			*k*=2				18	17	

FCD-0558 Uncertainty Budget Rev8.0

Table 4: Uncertainty Budget for System Validation: 3 – 6 GHz

a	*b*	*c*	*d*	*e = f(d,k)*	*f*	*g*	*h = c x f / e*	*i = c x g / e*	*k*
Uncertainty Component	**IEEE 1528 section**	**Tol. (± %)**	**Prob. Dist.**	**Div.**	c_i **(1 g)**	c_i **(10 g)**	**1 g** u_i **(±%)**	**10 g** u_i **(±%)**	v_i
Measurement System									
Probe Calibration	E.2.1	8.3	N	1.00	1	1	8.3	8.3	∞
Axial Isotropy	E.2.2	4.7	R	1.73	1	1	2.7	2.7	∞
Spherical Isotropy	E.2.2	9.6	R	1.73	0	0	0.0	0.0	∞
Boundary Effect	E.2.3	2.0	R	1.73	1	1	1.2	1.2	∞
Linearity	E.2.4	4.7	R	1.73	1	1	2.7	2.7	∞
System Detection Limits	E.2.5	1.0	R	1.73	1	1	0.6	0.6	∞
Readout Electronics	E.2.6	0.3	N	1.00	1	1	0.3	0.3	∞
Response Time	E.2.7	1.1	R	1.73	1	1	0.6	0.6	∞
Integration Time	E.2.8	0.0	R	1.73	1	1	0.0	0.0	∞
RF Ambient Conditions - Noise	E.6.1	3.0	R	1.73	1	1	1.7	1.7	∞
RF Ambient Conditions - Reflections	E.6.1	0.0	R	1.73	1	1	0.0	0.0	∞
Probe Positioner Mechanical Tolerance	E.6.2	1.0	R	1.73	1	1	0.6	0.6	∞
Probe Positioning w.r.t. Phantom	E.6.3	4.0	R	1.73	1	1	2.3	2.3	∞
Max. SAR Evaluation (ext., int., avg.)	E.5	2.1	R	1.73	1	1	1.2	1.2	∞
Dipole									
Dipole Axis to Liquid Distance	8, E.4.2	2.0	R	1.73	1	1	1.2	1.2	∞
Input Power and SAR Drift Measurement	8, 6.6.2	5.0	R	1.73	1	1	2.9	2.9	∞
Phantom and Tissue Parameters									
Phantom Uncertainty	E.3.1	4.0	R	1.73	1	1	2.3	2.3	∞
Dielectric Parameter Correction	--	1.4	N	1.00	1	0.79	1.4	1.1	∞
Liquid Conductivity (measurement)	E.3.3	3.3	R	1.73	0.64	0.43	1.2	0.8	∞
Liquid Permittivity (measurement)	E.3.3	1.9	R	1.73	0.6	0.49	0.6	0.5	∞
Combined Standard Uncertainty			RSS				11	11	99999
Expanded Uncertainty (95% CONFIDENCE LEVEL)			*k*=2				21	21	

FCD-0558 Uncertainty Budget Rev8.0

Notes for Tables 1, 2, 3 and 4.
a) Column headings *a*-*k* are given for reference.
b) Tol. - tolerance in influence quantity.
c) Prob. Dist. – Probability distribution
d) N, R - normal, rectangular probability distributions
e) Div. - divisor used to translate tolerance into normally distributed standard uncertainty
f) *ci* - sensitivity coefficient that should be applied to convert the variability of the uncertainty component into a variability of SAR.
g) *ui* – SAR uncertainty
h) *vi* - degrees of freedom for standard uncertainty and effective degrees of freedom for the expanded uncertainty

APPENDIX B
Probe Calibration Certificates

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**

Client **Motorola EME**

Certificate No: **ES3-3291_Jul11**

CALIBRATION CERTIFICATE

Object: ES3DV3 - SN:3291

Calibration procedure(s): QA CAL-01.v8, QA CAL-12.v7, QA CAL-14.v3, QA CAL-23.v4, QA CAL-25.v4
Calibration procedure for dosimetric E-field probes

Calibration date: July 22, 2011

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	31-Mar-11 (No. 217-01372)	Apr-12
Power sensor E4412A	MY41498087	31-Mar-11 (No. 217-01372)	Apr-12
Reference 3 dB Attenuator	SN: S5054 (3c)	29-Mar-11 (No. 217-01369)	Apr-12
Reference 20 dB Attenuator	SN: S5086 (20b)	29-Mar-11 (No. 217-01367)	Apr-12
Reference 30 dB Attenuator	SN: S5129 (30b)	29-Mar-11 (No. 217-01370)	Apr-12
Reference Probe ES3DV2	SN: 3013	29-Dec-10 (No. ES3-3013_Dec10)	Dec-11
DAE4	SN: 654	3-May-11 (No. DAE4-654_May11)	May-12
Secondary Standards	ID	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Oct-09)	In house check: Oct-11
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-10)	In house check: Oct-11

	Name	Function	Signature
Calibrated by:	Katja Pokovic	Technical Manager	
Approved by:	Niels Kuster	Quality Manager	

Issued: July 25, 2011

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

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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
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	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

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005

Methods Applied and Interpretation of Parameters:

- *NORMx,y,z:* Assessed for E-field polarization ϑ = 0 (f ≤ 900 MHz in TEM-cell; f > 1800 MHz: R22 waveguide). NORMx,y,z are only intermediate values, i.e., the uncertainties of NORMx,y,z does not affect the E^2-field uncertainty inside TSL (see below *ConvF*).
- *NORM(f)x,y,z = NORMx,y,z * frequency_response* (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of *ConvF*.
- *DCPx,y,z:* DCP are numerical linearization parameters assessed based on the data of power sweep with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- *PAR:* PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics
- *Ax,y,z; Bx,y,z; Cx,y,z, VRx,y,z: A, B, C* 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.

Probe ES3DV3

SN:3291

Manufactured: July 6, 2010
Calibrated: July 22, 2011

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

DASY/EASY - Parameters of Probe: ES3DV3 - SN:3291

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(V/m)^2$)[A]	0.87	1.39	0.83	± 10.1 %
DCP (mV)[B]	104.0	101.6	101.6	

Modulation Calibration Parameters

UID	Communication System Name	PAR		A dB	B dB	C dB	VR mV	Unc[E] (k=2)
10000	CW	0.00	X	0.00	0.00	1.00	122.4	±2.5 %
			Y	0.00	0.00	1.00	122.0	
			Z	0.00	0.00	1.00	123.0	

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

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

DASY/EASY - Parameters of Probe: ES3DV3 - SN:3291

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	Depth (mm)	Unct. (k=2)
300	45.3	0.87	7.48	7.48	7.48	0.24	1.01	± 13.4 %
450	43.5	0.87	6.94	6.94	6.94	0.16	1.79	± 13.4 %
750	41.9	0.89	6.58	6.58	6.58	1.00	1.00	± 12.0 %
900	41.5	0.97	6.24	6.24	6.24	1.00	1.00	± 12.0 %
1810	40.0	1.40	5.23	5.23	5.23	0.95	1.13	± 12.0 %
1950	40.0	1.40	5.08	5.08	5.08	1.00	1.06	± 12.0 %
2300	39.5	1.67	4.88	4.88	4.88	0.87	1.14	± 12.0 %
2450	39.2	1.80	4.56	4.56	4.56	0.94	1.09	± 12.0 %
2600	39.0	1.96	4.47	4.47	4.47	0.84	1.19	± 12.0 %
3500	37.9	2.91	4.35	4.35	4.35	0.99	1.24	± 13.1 %
3700	37.7	3.12	3.91	3.91	3.91	0.99	1.30	± 13.1 %

[C] Frequency validity 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.
[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.

DASY/EASY - Parameters of Probe: ES3DV3- SN:3291

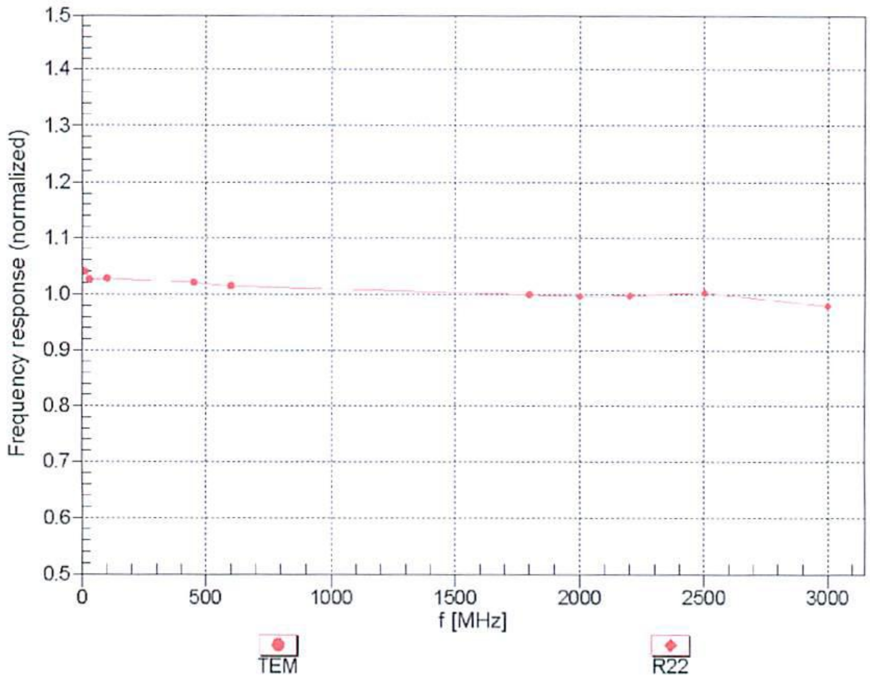
Calibration Parameter Determined in Body Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
300	58.2	0.92	7.62	7.62	7.62	0.22	1.67	± 13.4 %
450	56.7	0.94	7.46	7.46	7.46	0.08	1.30	± 13.4 %
750	55.5	0.96	6.47	6.47	6.47	1.00	1.14	± 12.0 %
900	55.0	1.05	6.28	6.28	6.28	1.00	1.00	± 12.0 %
1810	53.3	1.52	5.07	5.07	5.07	1.00	1.18	± 12.0 %
1950	53.3	1.52	4.97	4.97	4.97	0.94	1.20	± 12.0 %
2300	52.9	1.81	4.56	4.56	4.56	1.00	1.09	± 12.0 %
2450	52.7	1.95	4.30	4.30	4.30	1.00	1.08	± 12.0 %
2600	52.5	2.16	4.21	4.21	4.21	0.90	1.21	± 12.0 %
3500	51.3	3.31	3.63	3.63	3.63	0.65	1.70	± 13.1 %
3700	51.0	3.55	3.58	3.58	3.58	0.60	1.87	± 13.1 %

[C] Frequency validity 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.
[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.

Frequency Response of E-Field

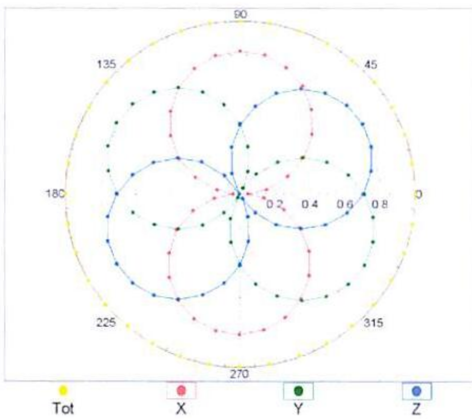
(TEM-Cell:ifi110 EXX, Waveguide: R22)



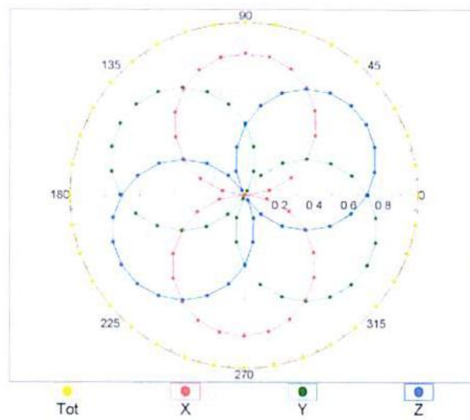
Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

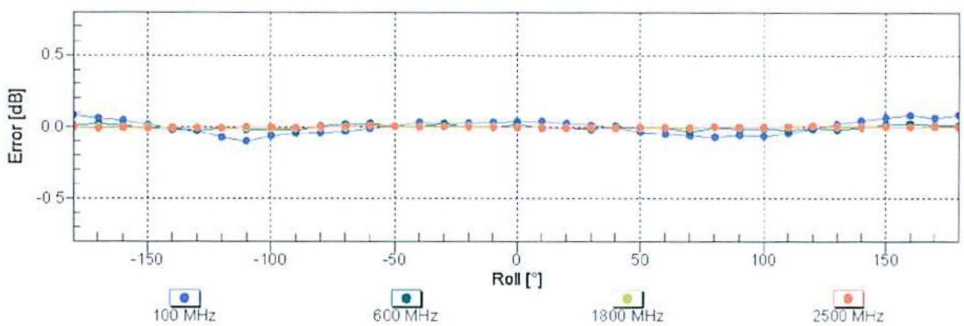
Receiving Pattern (ϕ), ϑ = 0°

f=600 MHz,TEM



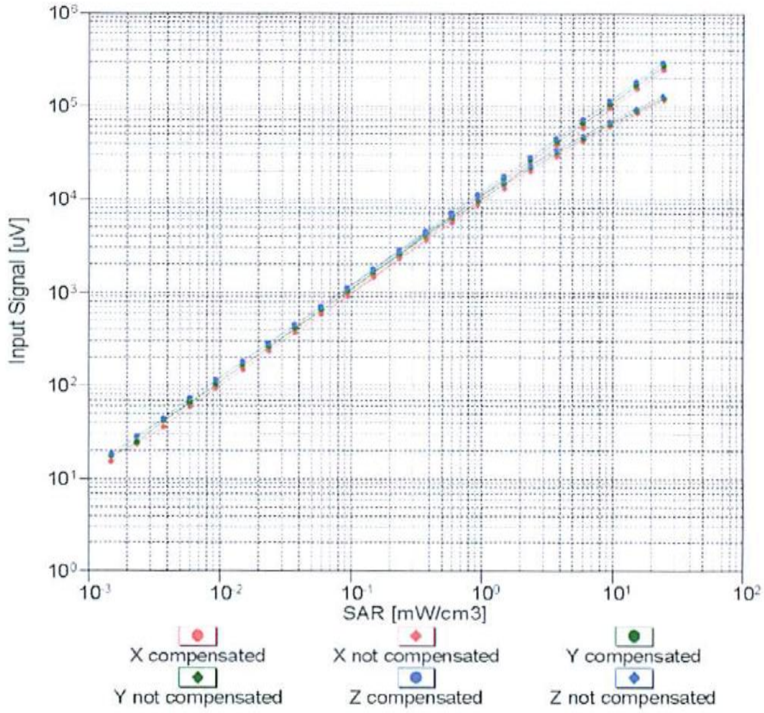
f=1800 MHz,R22

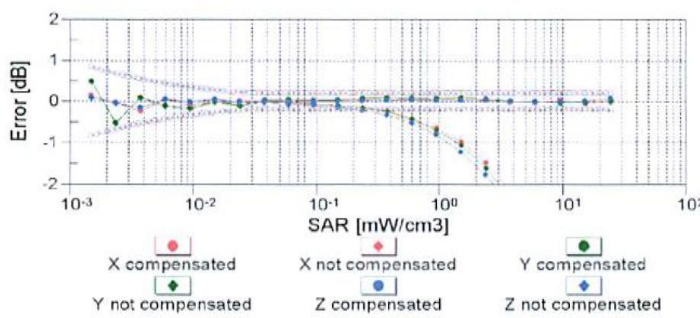




Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

Dynamic Range f(SAR_{head})
(TEM cell , f = 900 MHz)

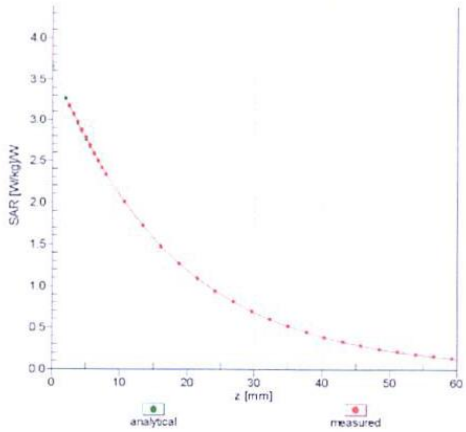




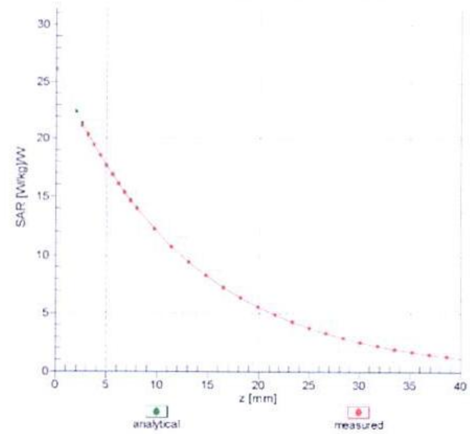
Uncertainty of Linearity Assessment: ± 0.6% (k=2)

Conversion Factor Assessment

f = 900 MHz,WGLS R9 (H_convF)

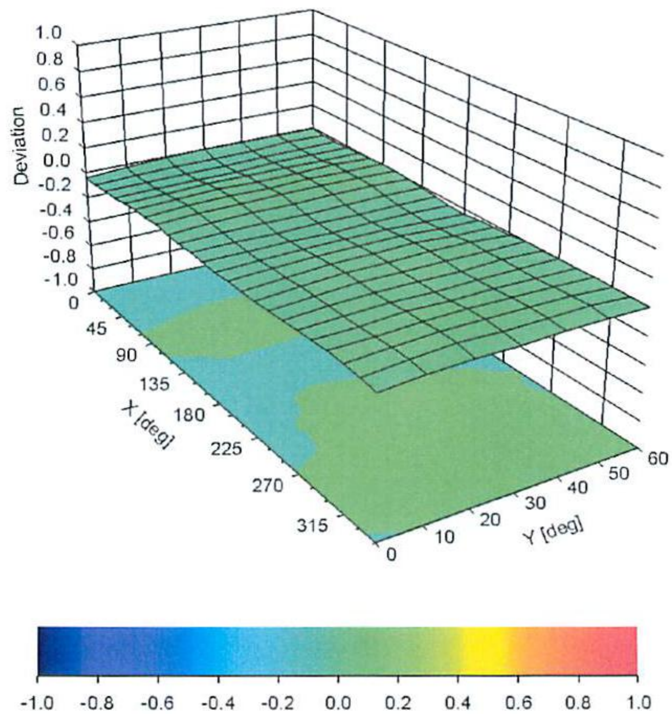


f = 1810 MHz,WGLS R22 (H_convF)



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: ES3DV3 - SN:3291

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	Not applicable
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	10 mm
Tip Diameter	4 mm
Probe Tip to Sensor X Calibration Point	2 mm
Probe Tip to Sensor Y Calibration Point	2 mm
Probe Tip to Sensor Z Calibration Point	2 mm
Recommended Measurement Distance from Surface	3 mm

Schmid & Partner Engineering AG

s p e a g

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

Additional Conversion Factors

for Dosimetric E-Field Probe

Type:	**ES3DV3**
Serial Number:	**3291**
Place of Assessment:	**Zurich**
Date of Assessment:	**July 26, 2011**
Probe Calibration Date:	**July 22, 2011**

Schmid & Partner Engineering AG hereby certifies that conversion factor(s) of this probe have been evaluated on the date indicated above. The assessment was performed using the FDTD numerical code SEMCAD of Schmid & Partner Engineering AG. Since the evaluation is coupled with measured conversion factors, it has to be recalculated yearly, i.e., following the re-calibration schedule of the probe. The uncertainty of the numerical assessment is based on the extrapolation from measured value at 900 MHz or at 1810 MHz.

Assessed by:

Schmid & Partner Engineering AG

s p e a g

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

Dosimetric E-Field Probe ES3DV3 SN:3291

Conversion factor (± standard deviation)

150 ± 50 MHz	*ConvF*	**8.5 ± 10%**	**ε_r = 52.3** **σ = 0.76 mho/m** (head tissue)
250 ± 50 MHz	*ConvF*	**7.9 ± 10%**	**ε_r = 47.6** **σ = 0.83 mho/m** (head tissue)
150 ± 50 MHz	*ConvF*	**8.2 ± 10%**	**ε_r = 61.9** **σ = 0.80 mho/m** (body tissue)
250 ± 50 MHz	*ConvF*	**7.8 ± 10%**	**ε_r = 59.4** **σ = 0.88 mho/m** (body tissue)

Important Note:

For numerically assessed probe conversion factors, parameters Alpha and Delta in the DASY software must have the following entries: Alpha = 0 and Delta = 1.

Please see also DASY Manual.

Calibration Laboratory of
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Accreditation No.: **SCS 108**

Client **Motorola EME**

Certificate No: **EX3-3735_Sep11**

CALIBRATION CERTIFICATE

Object: EX3DV4 - SN:3735

Calibration procedure(s): QA CAL-01.v8, QA CAL-14.v3, QA CAL-23.v4, QA CAL-25.v4
Calibration procedure for dosimetric E-field probes

Calibration date: September 26, 2011

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	31-Mar-11 (No. 217-01372)	Apr-12
Power sensor E4412A	MY41498087	31-Mar-11 (No. 217-01372)	Apr-12
Reference 3 dB Attenuator	SN: S5054 (3c)	29-Mar-11 (No. 217-01369)	Apr-12
Reference 20 dB Attenuator	SN: S5086 (20b)	29-Mar-11 (No. 217-01367)	Apr-12
Reference 30 dB Attenuator	SN: S5129 (30b)	29-Mar-11 (No. 217-01370)	Apr-12
Reference Probe ES3DV2	SN: 3013	29-Dec-10 (No. ES3-3013_Dec10)	Dec-11
DAE4	SN: 654	3-May-11 (No. DAE4-654_May11)	May-12
Secondary Standards	ID	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Oct-09)	In house check: Oct-11
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-10)	In house check: Oct-11

	Name	Function	Signature
Calibrated by:	Katja Pokovic	Technical Manager	
Approved by:	Niels Kuster	Quality Manager	

Issued: September 27, 2011

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

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

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Accreditation No.: SCS 108

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	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

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005

Methods Applied and Interpretation of Parameters:

- *NORMx,y,z:* Assessed for E-field polarization ϑ = 0 (f ≤ 900 MHz in TEM-cell; f > 1800 MHz: R22 waveguide). NORMx,y,z are only intermediate values, i.e., the uncertainties of NORMx,y,z does not affect the E^2-field uncertainty inside TSL (see below *ConvF*).
- *NORM(f)x,y,z = NORMx,y,z * frequency_response* (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of *ConvF*.
- *DCPx,y,z:* DCP are numerical linearization parameters assessed based on the data of power sweep with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- *PAR:* PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics
- *Ax,y,z; Bx,y,z; Cx,y,z, VRx,y,z: A, B, C* 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.

Probe EX3DV4

SN:3735

Manufactured: February 15, 2010
Calibrated: September 26, 2011

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

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3735

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(V/m)^2$)[A]	0.52	0.46	0.43	± 10.1 %
DCP (mV)[B]	100.9	99.3	101.2	

Modulation Calibration Parameters

UID	Communication System Name	PAR		A dB	B dB	C dB	VR mV	Unc[E] (k=2)
10000	CW	0.00	X	0.00	0.00	1.00	116.1	±2.7 %
			Y	0.00	0.00	1.00	110.6	
			Z	0.00	0.00	1.00	106.5	

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

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3735

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	Depth (mm)	Unct. (k=2)
4950	36.3	4.40	5.34	5.34	5.34	0.30	1.80	± 13.1 %
5200	36.0	4.66	5.15	5.15	5.15	0.35	1.80	± 13.1 %
5300	35.9	4.76	4.80	4.80	4.80	0.40	1.80	± 13.1 %
5500	35.6	4.96	4.38	4.38	4.38	0.50	1.80	± 13.1 %
5600	35.5	5.07	4.08	4.08	4.08	0.55	1.80	± 13.1 %
5800	35.3	5.27	4.16	4.16	4.16	0.55	1.80	± 13.1 %

[C] Frequency validity 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.

[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.

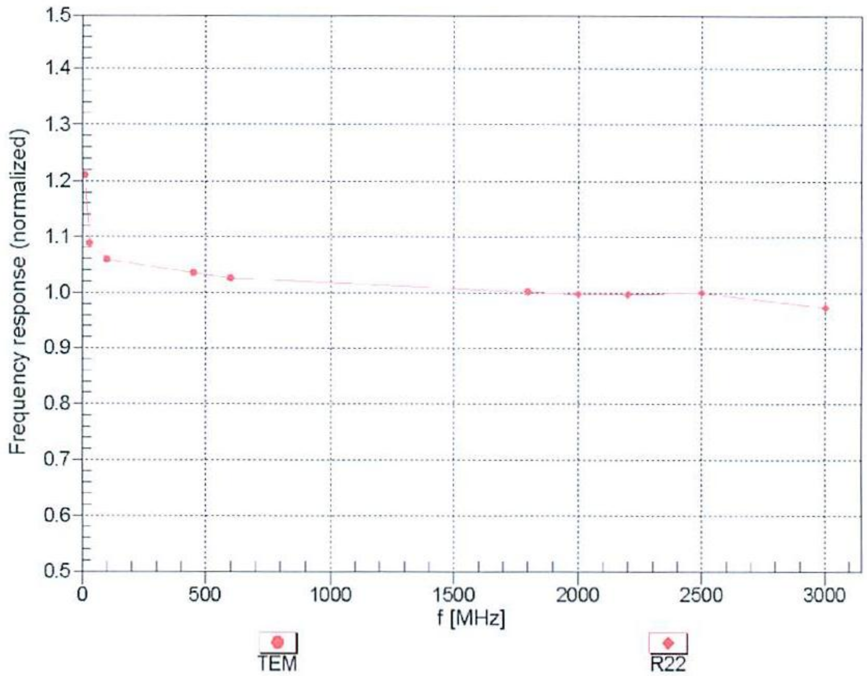
DASY/EASY - Parameters of Probe: EX3DV4 - SN:3735

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	Depth (mm)	Unct. (k=2)
4950	49.4	5.01	4.34	4.34	4.34	0.50	1.95	± 13.1 %
5200	49.0	5.30	4.10	4.10	4.10	0.60	1.95	± 13.1 %
5300	48.9	5.42	3.80	3.80	3.80	0.60	1.95	± 13.1 %
5500	48.6	5.65	3.53	3.53	3.53	0.65	1.95	± 13.1 %
5600	48.5	5.77	3.35	3.35	3.35	0.65	1.95	± 13.1 %
5800	48.2	6.00	3.59	3.59	3.59	0.65	1.95	± 13.1 %

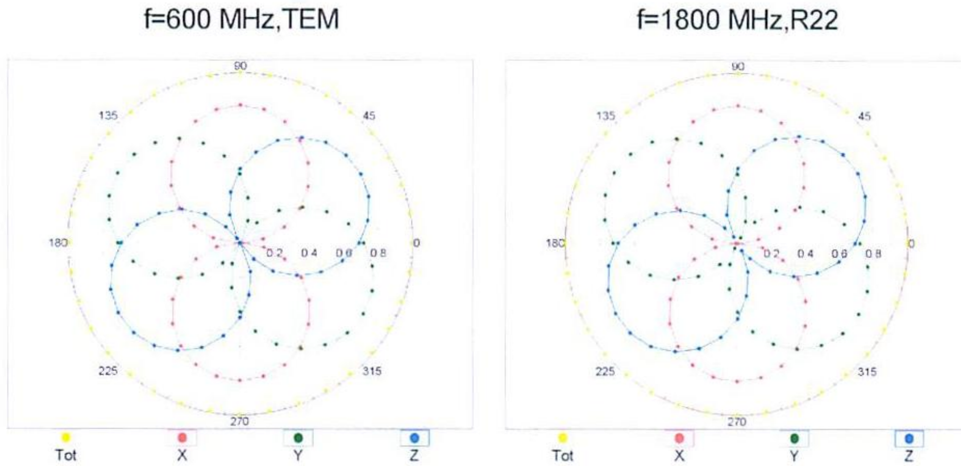
[C] Frequency validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.
[F] At frequencies below 3 GHz, the validity of 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.

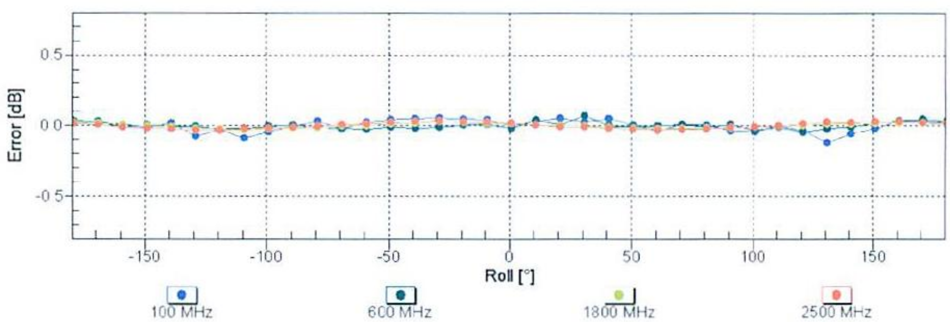
Frequency Response of E-Field
(TEM-Cell:ifi110 EXX, Waveguide: R22)



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

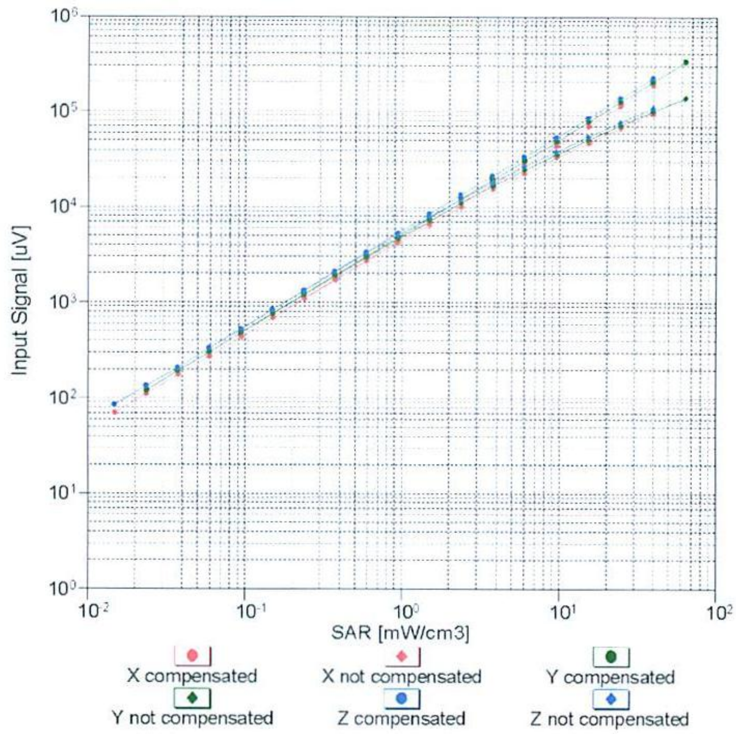
Receiving Pattern (ϕ), ϑ = 0°

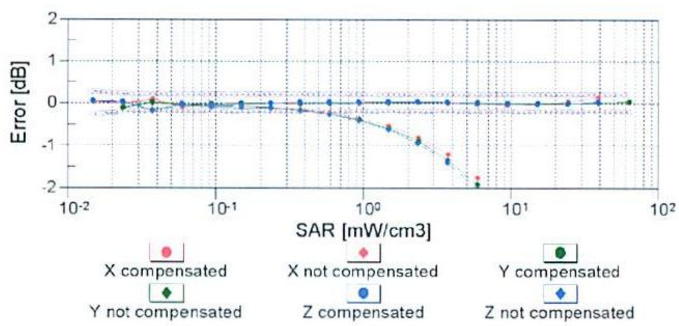




Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

Dynamic Range f(SAR_{head})
(TEM cell , f = 900 MHz)

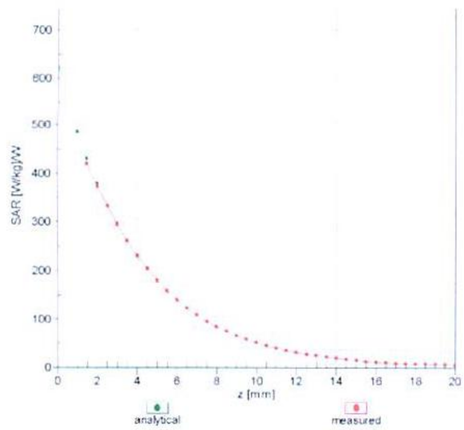




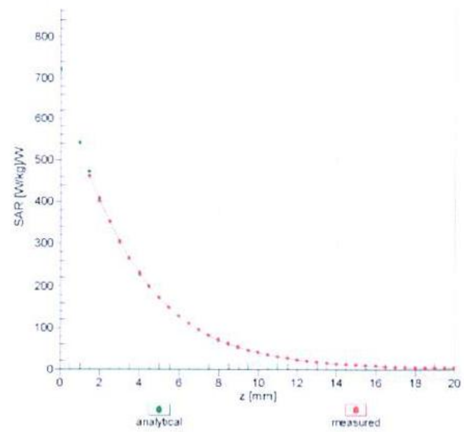
Uncertainty of Linearity Assessment: ± 0.6% (k=2)

Conversion Factor Assessment

f = 5200 MHz,WGLS R58 (H_convF)-SCS

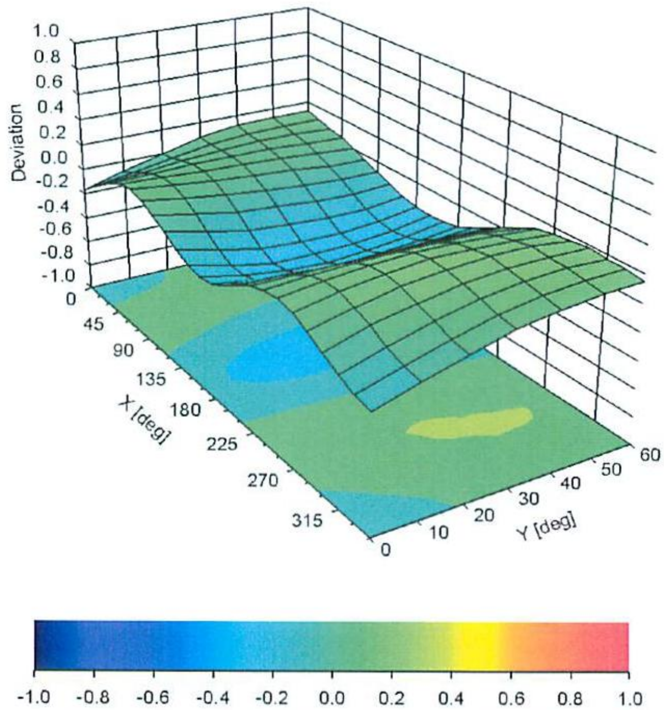


f = 5800 MHz,WGLS R58 (H_convF)-SCS



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:3735

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	Not applicable
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	2 mm

APPENDIX C
Dipole Calibration Certificates

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

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S Servizio svizzero di taratura
S Swiss Calibration Service

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

Accreditation No.: SCS 108

Client **Motorola EME**

Certificate No: D2450V2-704_Nov10

CALIBRATION CERTIFICATE

Object	D2450V2 - SN: 704
Calibration procedure(s)	QA CAL-05.v7 Calibration procedure for dipole validation kits
Calibration date:	November 25, 2010

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	06-Oct-10 (No. 217-01266)	Oct-11
Power sensor HP 8481A	US37292783	06-Oct-10 (No. 217-01266)	Oct-11
Reference 20 dB Attenuator	SN: 5086 (20g)	30-Mar-10 (No. 217-01158)	Mar-11
Type-N mismatch combination	SN: 5047.2 / 06327	30-Mar-10 (No. 217-01162)	Mar-11
Reference Probe ES3DV3	SN: 3205	30-Apr-10 (No. ES3-3205_Apr10)	Apr-11
DAE4	SN: 601	10-Jun-10 (No. DAE4-601_Jun10)	Jun-11
Secondary Standards	**ID #**	**Check Date (in house)**	**Scheduled Check**
Power sensor HP 8481A	MY41092317	18-Oct-02 (in house check Oct-09)	In house check: Oct-11
RF generator R&S SMT-06	100005	4-Aug-99 (in house check Oct-09)	In house check: Oct-11
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-10)	In house check: Oct-11

	Name	Function	Signature
Calibrated by:	Dimce Iliev	Laboratory Technician	D. Iliev
Approved by:	Katja Pokovic	Technical Manager	

Issued: November 25, 2010

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

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 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
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) Federal Communications Commission Office of Engineering & Technology (FCC OET), "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields; Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions", Supplement C (Edition 01-01) to Bulletin 65

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.

Measurement Conditions

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

DASY Version	DASY5	V52.2
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom V5.0	
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	38.8 ± 6 %	1.72 mho/m ± 6 %
Head TSL temperature during test	(21.5 ± 0.2) °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	13.1 mW / g
SAR normalized	normalized to 1W	52.4 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**53.4 mW /g ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	6.15 mW / g
SAR normalized	normalized to 1W	24.6 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**24.7 mW /g ± 16.5 % (k=2)**

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	55.2 Ω + 0.4 jΩ
Return Loss	- 26.2 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.152 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.
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	March 22, 2001

DASY5 Validation Report for Head TSL

Date/Time: 25.11.2010 14:18:31

Test Laboratory: SPEAG, Zurich, Switzerland

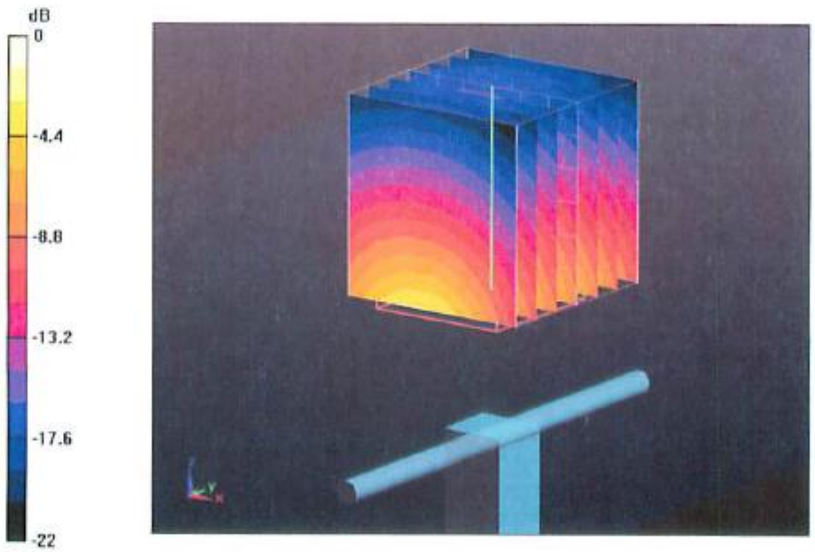
DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:704

Communication System: CW; Frequency: 2450 MHz; Duty Cycle: 1:1
Medium: HSL U12 BB
Medium parameters used: f = 2450 MHz; σ = 1.72 mho/m; ε_r = 38.8; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.53, 4.53, 4.53); Calibrated: 30.04.2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 10.06.2010
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- Measurement SW: DASY52, V52.2 Build 0, Version 52.2.0 (163)
- Postprocessing SW: SEMCAD X, V14.2 Build 2, Version 14.2.2 (1685)

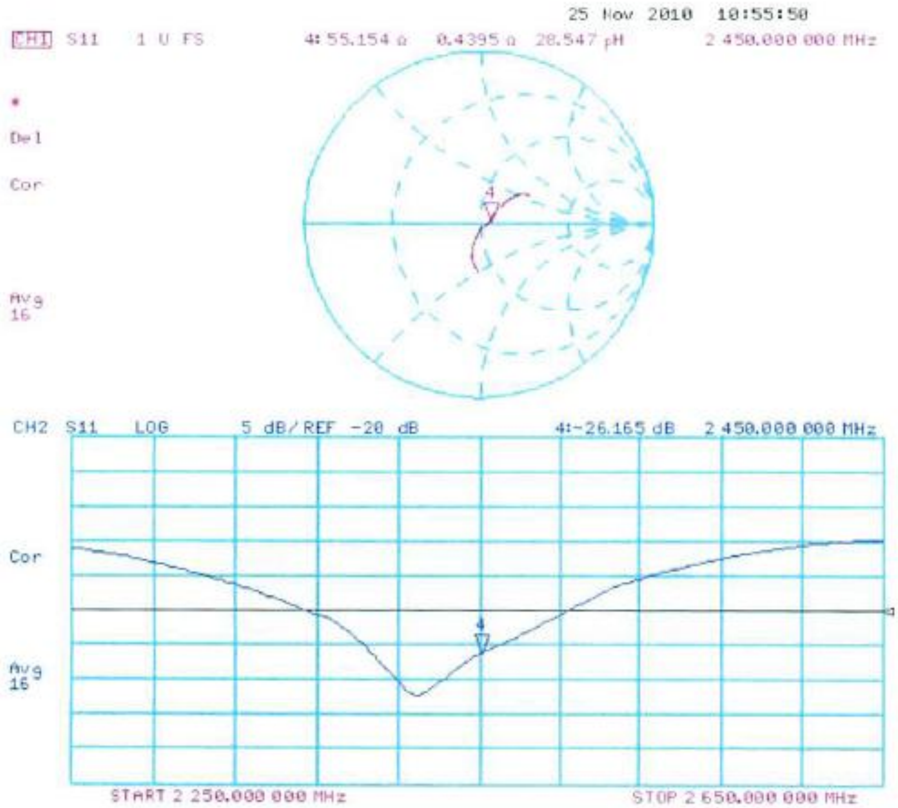
Pin=250 mW/d=10mm, dist=3.0mm (ES-Probe)/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 101.6 V/m; Power Drift = 0.037 dB
Peak SAR (extrapolated) = 26.8 W/kg
SAR(1 g) = 13.1 mW/g; SAR(10 g) = 6.15 mW/g
Maximum value of SAR (measured) = 16.5 mW/g



0 dB = 16.5mW/g

Certificate No: D2450V2-704_Nov10 Page 5 of 6

Impedance Measurement Plot for Head TSL



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Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)
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Accreditation No.: **SCS 108**

Client **Motorola EME**

Certificate No: **D5GHzV2-1017_Sep11**

CALIBRATION CERTIFICATE

Object	D5GHzV2 - SN: 1017
Calibration procedure(s)	QA CAL-22.v1 Calibration procedure for dipole validation kits between 3-6 GHz
Calibration date:	September 20, 2011

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	06-Oct-10 (No. 217-01266)	Oct-11
Power sensor HP 8481A	US37292783	06-Oct-10 (No. 217-01266)	Oct-11
Reference 20 dB Attenuator	SN: 5086 (20g)	29-Mar-11 (No. 217-01368)	Apr-12
Type-N mismatch combination	SN: 5047.2 / 06327	29-Mar-11 (No. 217-01371)	Apr-12
Reference Probe EX3DV4	SN: 3503	04-Mar-11 (No. EX3-3503_Mar11)	Mar-12
DAE4	SN: 601	04-Jul-11 (No. DAE4-601_Jul11)	Jul-12
Secondary Standards	**ID #**	**Check Date (in house)**	**Scheduled Check**
Power sensor HP 8481A	MY41092317	18-Oct-02 (in house check Oct-09)	In house check: Oct-11
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-09)	In house check: Oct-11
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-10)	In house check: Oct-11

	Name	Function	Signature
Calibrated by:	Dimce Iliev	Laboratory Technician	D. Iliev
Approved by:	Katja Pokovic	Technical Manager	

Issued: September 20, 2011

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

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S Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)
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Accreditation No.: **SCS 108**

Glossary:

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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 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
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) Federal Communications Commission Office of Engineering & Technology (FCC OET), "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields; Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions", Supplement C (Edition 01-01) to Bulletin 65

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.

Measurement Conditions

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

DASY Version	DASY5	V52.6.2
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 5500 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	34.8 ± 6 %	4.44 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	7.79 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**77.3 mW /g ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.22 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**21.9 mW /g ± 16.5 % (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	34.4 ± 6 %	4.73 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	8.40 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**83.2 mW / g ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.39 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**23.6 mW / g ± 16.5 % (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	33.9 ± 6 %	5.02 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	7.80 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**77.2 mW / g ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.21 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**21.8 mW / g ± 16.5 % (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	48.0 ± 6 %	5.49 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	7.61 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**75.8 mW / g ± 18.1 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.13 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**21.2 mW / g ± 17.6 % (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	47.4 ± 6 %	5.88 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	8.20 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**81.7 mW / g ± 18.1 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.27 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**22.6 mW / g ± 17.6 % (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	46.8 ± 6 %	6.29 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	7.69 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**76.6 mW / g ± 18.1 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.12 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**21.1 mW / g ± 17.6 % (k=2)**

Appendix

Antenna Parameters with Head TSL at 5200 MHz

Impedance, transformed to feed point	50.4 Ω - 7.6 jΩ
Return Loss	- 22.4 dB

Antenna Parameters with Head TSL at 5500 MHz

Impedance, transformed to feed point	55.7 Ω - 6.1 jΩ
Return Loss	- 22.1 dB

Antenna Parameters with Head TSL at 5800 MHz

Impedance, transformed to feed point	57.2 Ω - 6.2 jΩ
Return Loss	- 21.1 dB

Antenna Parameters with Body TSL at 5200 MHz

Impedance, transformed to feed point	50.3 Ω - 6.3 jΩ
Return Loss	- 24.1 dB

Antenna Parameters with Body TSL at 5500 MHz

Impedance, transformed to feed point	55.6 Ω - 4.0 jΩ
Return Loss	- 23.7 dB

Antenna Parameters with Body TSL at 5800 MHz

Impedance, transformed to feed point	59.0 Ω - 4.0 jΩ
Return Loss	- 20.9 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.234 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.
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	February 05, 2004

DASY5 Validation Report for Head TSL

Date: 20.09.2011

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 5GHz; Type: D5GHzV2; Serial: D5GHzV2 - SN: 1017

Communication System: CW; Frequency: 5200 MHz, Frequency: 5500 MHz, Frequency: 5800 MHz
Medium parameters used: f = 5200 MHz; $\sigma = 4.44$ mho/m; $\varepsilon_r = 34.8$; $\rho = 1000$ kg/m^3 , Medium parameters used: f = 5500 MHz; $\sigma = 4.73$ mho/m; $\varepsilon_r = 34.4$; $\rho = 1000$ kg/m^3 , Medium parameters used: f = 5800 MHz; $\sigma = 5.02$ mho/m; $\varepsilon_r = 33.9$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

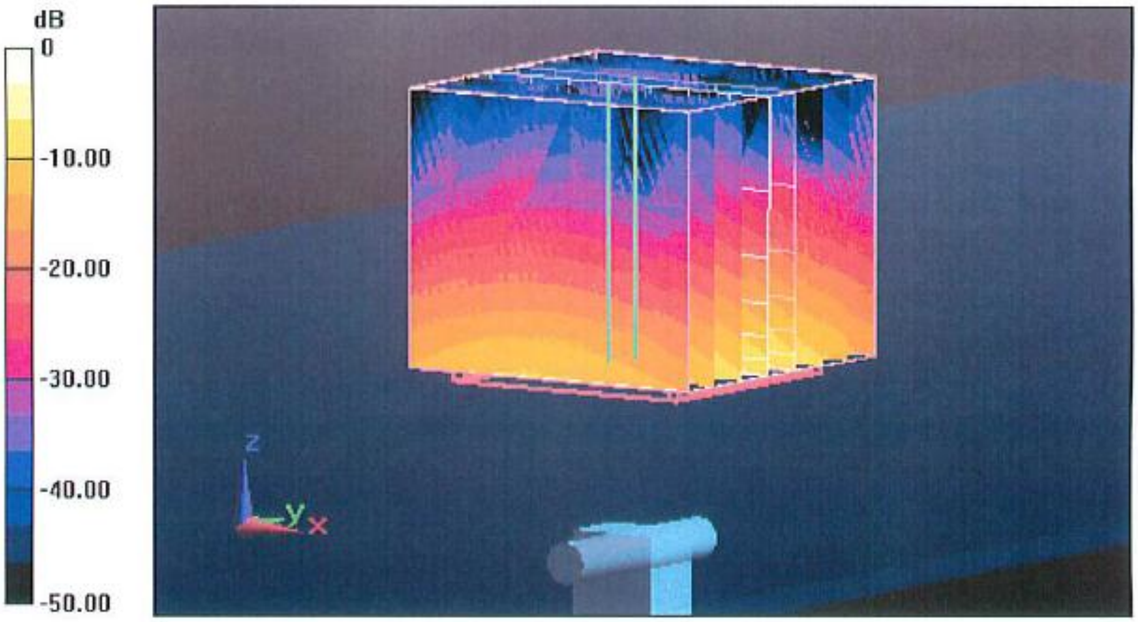
DASY52 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(5.41, 5.41, 5.41), ConvF(4.91, 4.91, 4.91), ConvF(4.81, 4.81, 4.81); Calibrated: 04.03.2011
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.07.2011
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.6.2(482); SEMCAD X 14.4.5(3634)

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 = 64.589 V/m; Power Drift = 0.06 dB
Peak SAR (extrapolated) = 28.998 W/kg
SAR(1 g) = 7.79 mW/g; SAR(10 g) = 2.22 mW/g
Maximum value of SAR (measured) = 17.776 mW/g

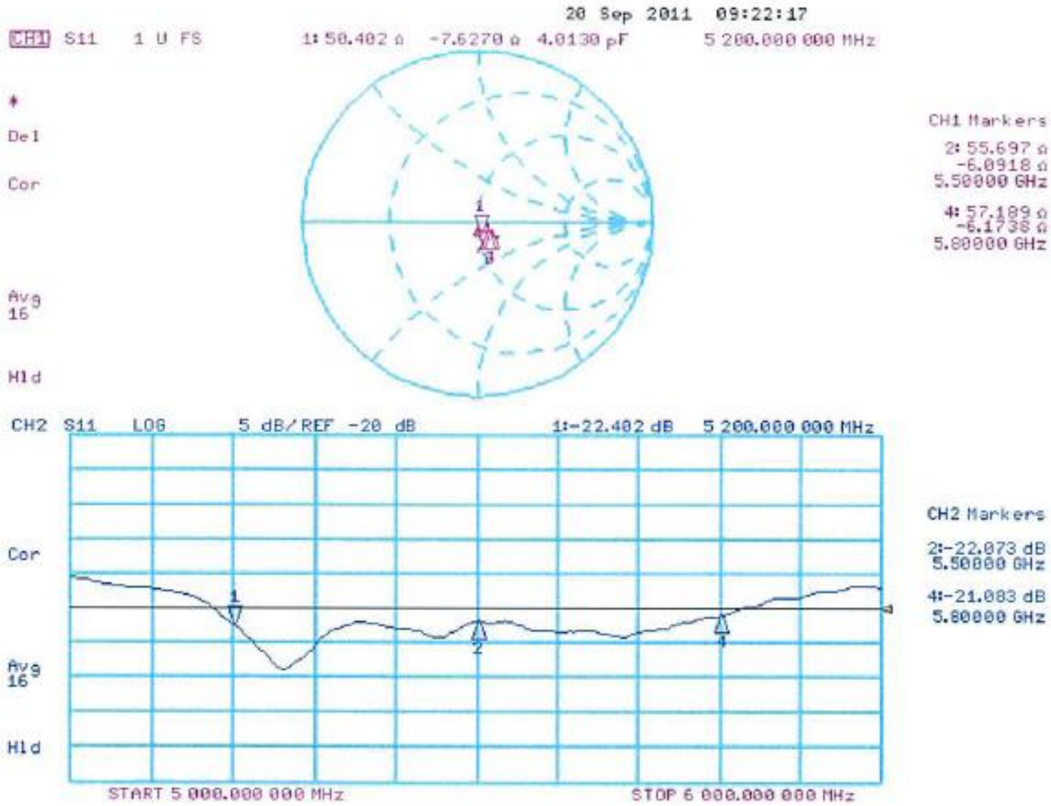
Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5500 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 65.361 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 33.287 W/kg
SAR(1 g) = 8.4 mW/g; SAR(10 g) = 2.39 mW/g
Maximum value of SAR (measured) = 19.730 mW/g

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 = 61.941 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 32.737 W/kg
SAR(1 g) = 7.8 mW/g; SAR(10 g) = 2.21 mW/g
Maximum value of SAR (measured) = 18.737 mW/g



0 dB = 18.740mW/g

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 19.09.2011

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 5GHz; Type: D5GHzV2; Serial: D5GHzV2 - SN: 1017

Communication System: CW; Frequency: 5200 MHz, Frequency: 5500 MHz, Frequency: 5800 MHz
Medium parameters used: f = 5200 MHz; σ = 5.49 mho/m; ε_r = 48; ρ = 1000 kg/m^3 , Medium parameters used: f = 5500 MHz; σ = 5.88 mho/m; ε_r = 47.4; ρ = 1000 kg/m^3 , Medium parameters used: f = 5800 MHz; σ = 6.29 mho/m; ε_r = 46.8; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

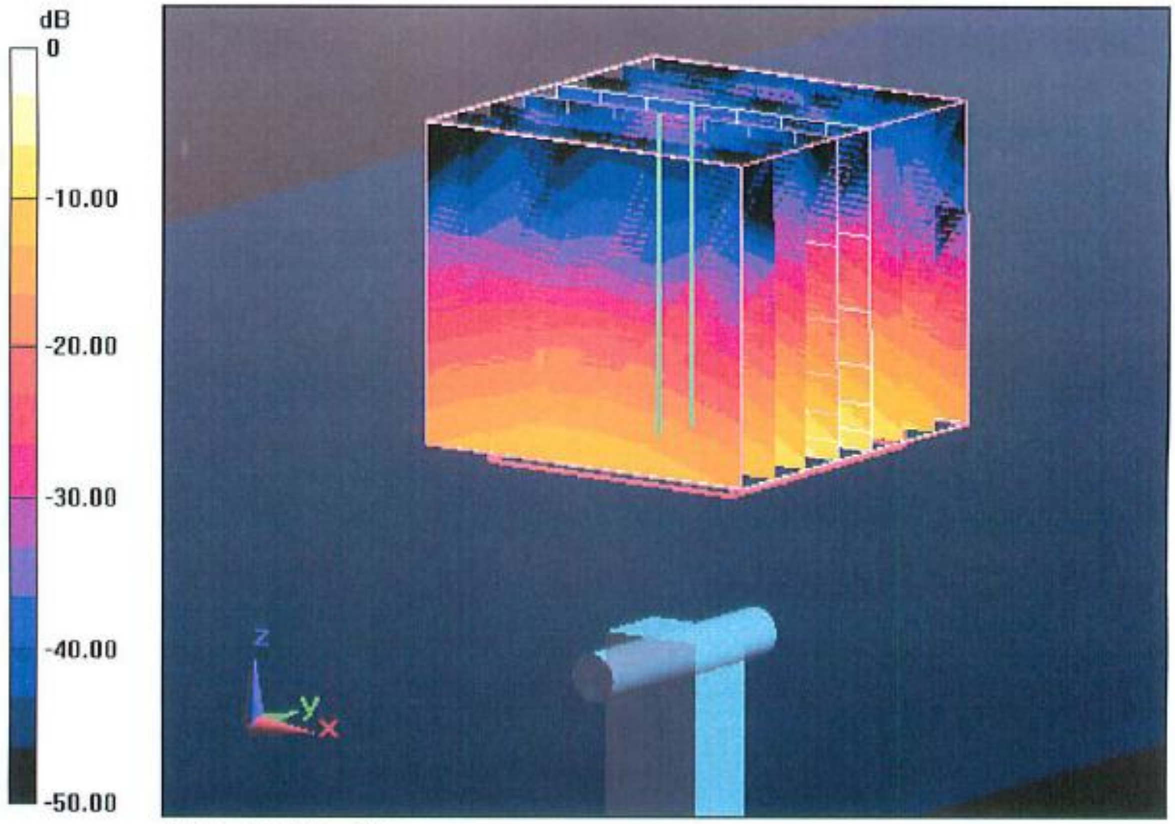
DASY52 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(4.91, 4.91, 4.91), ConvF(4.43, 4.43, 4.43), ConvF(4.38, 4.38, 4.38); Calibrated: 04.03.2011
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.07.2011
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.6.2(482); SEMCAD X 14.4.5(3634)

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 = 58.578 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 29.490 W/kg
SAR(1 g) = 7.61 mW/g; SAR(10 g) = 2.13 mW/g
Maximum value of SAR (measured) = 17.235 mW/g

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 = 59.471 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 34.752 W/kg
SAR(1 g) = 8.2 mW/g; SAR(10 g) = 2.27 mW/g
Maximum value of SAR (measured) = 19.268 mW/g

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 = 55.732 V/m; Power Drift = -0.0038 dB
Peak SAR (extrapolated) = 35.372 W/kg
SAR(1 g) = 7.69 mW/g; SAR(10 g) = 2.12 mW/g
Maximum value of SAR (measured) = 18.585 mW/g



0 dB = 18.590mW/g

Impedance Measurement Plot for Body TSL