MOTOROLA SOLUTIONS

ACCREDITED
TESTING CERT # 2518.01

DECLARATION OF COMPLIANCE SAR ASSESSMENT Part 1 of 2

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Date of Report: 08/03/2011
Report Revision: O
Report ID: SR9214_15_16 SAR rpt_APX6000 U2 _Rev.O_110803

Responsible Engineer:	Kim Uong (Principal Staff Eng.)
Report Author:	Kim Uong (Principal Staff Eng.)
Date/s Tested:	6/24/2011-7/25/2011
Manufacturer/Location:	Motorola, Reynosa/Schaumburg
Sector/Group/Div.:	G&PS
Date submitted for test:	6/17/2011
DUT Description:	APX6000, 450-520MHz, 1-5.6W, 6.25kHz/12.5 kHz /25 kHz , Basic Top Display and Dual Display Models. Capable of digital and analog FM transmission. Also capable of TDMA transmission. This radio is also equipped with Bluetooth.
Test TX mode(s):	CW (PTT)
Max. Power output:	5.6 Watts (UHF R2), 10 mWatts (Bluetooth)
Nominal Power:	5.0 Watts (UHF R2), 10 mWatts (Bluetooth)
Tx Frequency Bands:	450 – 520 MHz (UHF R2) , 2402-2480 MHz (Bluetooth)
Signaling type:	FM, TDMA (UHF R2), and FHSS (Bluetooth)
Model(s) Tested:	H98SDH9PW7AN(NUE1022), H98SDD9PW5AN(NUE1017), H98SDH9PW7AN(NUE1021)
Model(s) Certified:	H98SDH9PW7AN (NUE1022)
Serial Number(s):	CAI110MCXH, CAI110MCWF, CAI110MCVW
Classification:	Occupational/Controlled
FCC ID:	AZ489FT4903; Rule part 90 (450 - 512 MHz)
IC:	109U-89FT4903

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

The test results clearly demonstrate compliance with FCC Occupational/Controlled RF Exposure limits of 8 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 10 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 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.

p.p. Deanna Zakharia
EMS EME Lab Senior Resource Manager,
Laboratory Director

Approval Date: 8/3/2011

Certification Date:

Certification No.:

Part 1 of 2

Part 1 of 2 (continued)

APPENDICES

Part 2 of 2

APPENDICES

Report Revision History

Date	Revision	Comments
8/3/2011	O	Initial release

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 Solution EME Test Laboratory for model numbers H98SDH9PW7AN (NUE1022), H98SDD9PW5AN (NUE1017) and H98SDH9PW7AN (NUE1021).

2.0 Abbreviations / Definitions

CNR: Calibration Not Required
CQPSK**:** Compatible Quadrature Phase-Shift Keying
CW: Continues Wave
DUT: Device Under Test
EME: Electromagnetic Energy
FM: Frequency Modulation/Factory Mutual
GPS: Global Positioning System
NA: Not Applicable
PTT: Push to Talk
PSM: Public Safety Microphone
RSM: Remote Speaker Microphone
TDMA: Time Division Multiple Access
SAR: Specific Absorption Rate

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 sub-part J:1999
- 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 H. 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 KDB 450824 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.

6.0 Description of Device Under Test (DUT)

This device operates using digital and analog frequency modulation (FM) as well as TDMA signaling incorporating traditional simplex two-way radio transmission protocol.

Time Division Multiple Access (TDMA) is used to allocate portions of the RF signal by dividing time into two slots. Time allocation enables each unit to transmit its voice information without interference from other transmitting units. Transmission from a unit or base station is accommodated during two time-slot lengths of 30 milliseconds with frame length of 60 milliseconds. C4FM CQPSK modulation is used and includes 12.5kHz channel spacing. The TDMA technique requires sophisticated algorithms and a digital signal processor (DSP) to perform voice compressions/decompressions and RF modulation/demodulation. The maximum duty cycle for TDMA is 2:1 and is controlled by software. The FM signal is continuous. However, because of hand shaking or Push-To-Talk (PTT) between users and/or base stations a conservative 50% duty cycle is applied. The TDMA mode was not tested because its duty cycle is inherently 50% and would include an additional 50% duty cycle for PTT. This device also incorporates a Class 1 Bluetooth device which is a Frequency Hopping Spread Spectrum (FHSS) technology. The Bluetooth radio modem is used to wireless link audio accessories. The maximum actual transmission duty cycle is imposed by the Bluetooth standard. Bluetooth v1.1, 1.2, 2.0, and 2.1 packet types of varying duty cycles: 1-slot, 3-slot and 5-slot packets. The maximum duty cycle for Bluetooth is 76.1%.

The models represented under this filing utilize removable antennas and are capable of transmitting in the 450 - 520 MHz (UHF R2) band and fixed internal antenna for the 2402 – 2480MHz (Bluetooth) band. The nominal output power is 1-5 Watts (450-520 MHz) and 10 mWatts (Bluetooth) with maximum output powers of 5.6 Watts (450-520 MHz) and 10 mWatts (Bluetooth) respectively as defined by upper limit of the production line final test station. The intended operating positions are "at the face" with the DUT at least 1 inch from the mouth, and "at the body" by means of the offered body worn accessories. Body worn audio and PTT operation is accomplished by means of optional remote accessories that are connected to the radio. This device supports operation with a wireless BT PTT audio accessory.

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

All offered antennas were tested. The table below lists the antennas and their descriptions.

Table 2

Antenna Models	Description	*Tested
PMAE4065A	UHF/GPS/PSM whip; 380-520, 1575 MHz; ¼ wave; 0.15dBi gain	Yes
FAF5260A	UHF/GPS Stubby; 450-520, 1575 MHz; ¼ wave; 1.15dBi gain	Yes
84009370001	Internal speaker/mic/flex Bluetooth 2402-2481 MHz; 1/4 wave; 2.15 dBi gain	No

*Refer to Exhibit 7B for antenna separation distances**.**

7.2 Batteries

All batteries were evaluated during the test plan generation. Batteries that had the same chemistry, cell size, physical size and shape and do not decrease the separation distance were removed from the test plan. These batteries are identified in the table below. Refer to Exhibit 7B section for photos of batteries, height and thickness for the batteries.

Table 3

Battery Models	Description	*Tested	Comments
NNTN7033A	FM Impres Li Ion 4100 mAh	Yes	
NNTN7034A	Impres Li Ion 4200 mAh	Yes	
NNTN7035A	FM Impres NiMH 2000mAh Ruggedized	No	Similar to NNTN7036A
NNTN7036A	FM Impres NiMH 2000mAh	Yes	
NNTN7037A	Impres NiMH 2100mAh	Yes	
NNTN7573A	Impres NiMH 2100 mAh Ruggedized	No	Similar to NNTN7037A
NNTN7038A	Hi Cap Impres Li Ion 2900mAh	Yes	
NNTN8092A	FM Impress Li Ion 2300mAh Ruggedized	Yes	
PMNN4403A	Impres LiIon Slim 2150mAh	Yes	

*Refer to Exhibit 7B for antenna separation distances**.**

7.3 Body worn accessories

All body worn accessories were evaluated during the test plan generation. Accessories were grouped by metallic content, separation distances and similarities. All accessories that contain unique metallic content were tested. Accessories that do not contain unique metallic content were evaluated to determine which would offer the closest separation distance. Refer to Exhibit 7B sections 1.0 and 2.0 for photos of the body worn test configurations and section 6.3 for individual photos of the body worn accessories with the DUT.

Table 4

Body worn Models	Description	*Tested	Comments
4205823V01	1 1/2 inch belt clip for PSM	Yes	Tested with PSM PMMN4059B, PMMN4060B, and PMMN4061B
HLN6875A	3 in. Belt Clip -Plastic	Yes	Top Display model only.
NTN5243A	Carry Strap	Yes	Tested w/ carry cases PMLN5657A, PMLN5658A, PMLN5659A and PMLN5660A
NTN9179A	Swivel D-clip and belt loop	Yes	
PMLN5657A	Leather case w/ swivel belt loop for batteries PMNN4403A, NNTN7038A and NNTN8092A.	Yes	.
PMLN5659A	Leather case w/ swivel Belt Loop for batteries NNTN7033A and NNTN7034A.	Yes	
PMLN5658A	Leather case w/ fixed Belt Loop for batteries PMNN4403A, NNTN7038A and NNTN8092A.	Yes	
PMLN5660A	Leather case w/ fixed Belt Loop for batteries NNTN7033A and NNTN7034A.	Yes	
PMLN5709A	Universal Carry Holder w/ belt clip	Yes	For Dual Display model only

*Refer to Exhibit 7B for antenna separation distances.

7.4 Audio accessories

All audio accessories were tested. The table below lists the audio accessories and their descriptions.

Table 5

Audio Acc. Models	Description	Tested	Comments
Public Safety Microphones			
PMMN4059B	Public Safety Mic 18 inch IP55, 3.5mm jackTX/RX (w/ 4205823V08 beltclip)	Yes	Tested w/ antenna PMAE4065A
PMMN4060B	Public Safety Mic 24 inch IP55, 3.5mm jackTX/RX (w/ 4205823V08 beltclip)		
PMMN4061B	Public Safety Mic 30 inch IP55, 3.5mm jack TX/RX (w/ 4205823V08 beltclip)		
Receiver only Audio accessories			
BDN6664A	Earpiece with standard earpiece BEIGE Tilt / Man Down Switch	No	Testing is not required per KDB 643646
BDN6665A	Earpiece w/ XL Earphone		
BDN6666A	Earpiece w/ Volume Control		
BDN6719A	Earpad, w/3.5 MM threaded plug		
BDN6726A	Earpiece with standard earpiece Black		
BDN6727A	Earpiece with extra loud earphone Black		
BDN6728A	Earpiece with volume control Black		
BDN6781A	Earbud, single, receive only, Black		
RLN5878A	Core 1 wire - Black		
RLN5879A	Core 1 wire - Beige		
Secondary Audio accessories			
RMN5116A	Temple Transducer Headset	Yes	Tested w/ DRSM kit # HMN4104B
RLN6424A	RX only Secondary Audio accessory for DRSM	No	
AARLN4885B	3.5mm RX only earbud for RSM short coiled cable	No	
RLN4941A	3.5mm RX only earpiece w/ translucent tube - Short coiled cable	No	
WADN4190B	3.5mm ear receiver w/ coil cable	No	
PMLN4620A	RX only earpiece	No	

Table 5 **(continued)**

Audio Acc. Models	Description	Tested	Comments
	Other Audio accessories		
BDN6783A	Headset/Earpiece Audio accessory Adapter	Yes	Tested w/ adaptor BDN6731A, BDN6732A and BDN6780A
BDN6731A	Earpiece, Mic and PTT combined with extra loud earpiece black	Yes	Tested w/ adaptor BDN6783A
BDN6732A	Earpiece, Mic and PTT separate with extra loud earpiece black		
BDN6780A	Earbud Single w/ Mic & PTT		
BDN6667A	Earpiece, Mic & PTT Combo	No	Similar to BDN6731A
BDN6669A	Earpiece, Mic and PTT combined with extra loud earpiece beige		
BDN6729A	Earpiece, Mic and PTT combined black		
BDN6668A	Earpiece, Mic & PTT Separate	No	Similar to BDN6732A
BDN6670A	Earpiece, Mic and PTT separate with extra loud earpiece beige		
BDN6730A	Earpiece, Mic and PTT separate Black		
HMN4104B	IMPRES Display Submersible RSM w/jack & Ch. Selector	Yes	
HMN4101B	Display RSM w/o Display and w/o Channel Knob	No	Similar to HMN4104B
HMN4103B	Display RSM w/o Channel Knob		
NNTN7869A	Surveillance/Keyloader accessory Adapter	Yes	Tested w/ ZMN6031A, ZMN6032A
ZMN6031A	Speaker Mic 3 piece	Yes	Tested w/ NNTN7869A
ZMN6039A	Speaker Mic 3 piece XL	No	Similar to ZMN6031A
ZMN6032A	Speaker Mic 2 piece	Yes	Tested w/ NNTN7869A
ZMN6038A	SPKR MIC 2 PIECE XL	No	Similar to ZMN6032A
PMLN5101A	Impress Temple Transducer	Yes	
PMLN5111A	Plus 3 wire - Black- one programmable button	Yes	
PMLN5112A	Plus 3 wire - Beige-one programmable button	No	Similar to PMLN5111A, differ color
PMLN5275C	Core H/D Headset	Yes	
PMMN4024A	Core RSM	Yes	
PMMN4065A	Standard Large IP57 RSM	Yes	
PMMN4062A	Large Plus Noise cancelling RSM IP55 3.5MM jack RX only	Yes	
PMMN4025A	Smart RSM	No	Similar to PMMN4062A
PMMN4069A	APX Basic Smart RSM, IP55		
RLN5882A	Plus 2 wire /w translucent tube - Black One programmable button	Yes	
RLN5880A	Plus 2 wire - Black-one programmable button	No	Similar to RLN5882A
RLN5881A	Plus 2 wire - Beige-one programmable button		
RLN5883A	Plus 2 wire /w translucent tube - Beige one programmable button		
RMN5058A	Core L/W Headset	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 E-field probe. 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

Not Applicable

8.2.2 SAM Phantom

Not Applicable

8.2.3 Elliptical Flat Phantom

Table 6

Phantom ID (s)	Material Parameters	Phantom Dimensions LxWxD (mm)	Material Thickness (mm)	Support Structure Material	Loss Tangent (wood)
OVAL1016 OVAL1090	300MHz -6GHz; Er = 4+/- 1, Loss Tangent = ≤0.05	600x400x190	2mm +/- 0.2mm	Wood	< 0.05

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.

Simulated Tissue Composition (by mass)

Table 7

% of listed ingredients	450MHz	
	Head	Body
Sugar	56.0	46.5
Diacetin	0	0
De ionized -Water	39.1	50.53
Salt	3.8	1.87
HEC	1.0	1.0
Bact.	0.1	0.1

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 8

Equipment Type	Model Number	Serial Number	Calibration Date	Calibration Due Date
Power Meter (Agilent)	E4418B	GB40206480	11/29/2010	9/29/2011
Power Sensor (HP)	8481B	3318A10984	4/2/2011	4/2/2012
Power Meter (Agilent)	E4419B	MY50000505	9/2/2010	9/2/2011
E-Series Avg. Power Sensor (Agilent)	E9301B	MY50280001	8/3/2010	8/3/2011
E-Series Avg. Power Sensor (Agilent)	E9301B	MY50290001	8/3/2010	8/3/2011
Bi-Directional Coupler (NARDA)	3020A	40296	2/5/2010	2/5/2012
Signal Generator (Agilent)	E4438C	MY42082269	2/18/2010	2/18/2012
AMP (Amplifier Research)	1W1000	16625	CNR	CNR
Temperature Recording Equipment				
Dickson Temperature Recorder	TM125	1195889	3/9/2011	3/9/2012
Omega Digital Thermometer with J Type TC Probe	HH200A	20857	9/20/2010	9/20/2011
Omega Digital Thermometer with J Type TC Probe	HH202A	18800	11/17/2010	11/17/2011
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
Tissue Station				
Agilent PNA-L Network Analyzer	N5230A	MY45001092	6/9/2011	6/9/2012
Dielectric Probe Kit (HP)	85070C	US99360076	CNR	CNR
Dipole				
Speag Dipole	D450V3	1077	1/11/2011	1/11/2013

10.0 SAR Measurement System Verification

The SAR measurements were conducted with probe model/serial number ES3DV3/SN3163. 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 +/- 5% of target parameters at the center of the transmit band. This measurement is done using the applicable equipment indicated in section 9.0. The table 9 summarizes the measured tissue parameters used for the SAR assessment.

Table 9

Frequency (MHz)	Tissue Type	Conductivity Target & Range (S/m)	Dielectric Constant Target & Range	Conductivity Meas. (S/m)	Dielectric Constant Meas.	Tested Date
450	IEEE/IEC Head	0.87 (0.83-0.91)	43.5 (41.3-45.7)	0.85	43.9	6/26/2011
				0.85	43.9	7/14/2011
516	IEEE/IEC Head	0.88 (0.84-0.92)	43.2 (41.0-45.4)	0.91	43.3	6/29/2011
				0.90	43.0	7/6/2011
520	IEEE/IEC Head	0.88 (0.84-0.92)	43.1 (40.9-45.3)	0.91	43.2	6/29/2011
				0.91	42.9	7/6/2011
450	FCC Body	0.94 (0.89-0.99)	56.7 (53.9-59.5)	0.90	54.9	6/24/2011
				0.91	55.6	6/25/2011
				0.91	55.4	6/26/2011
				0.90	56.7	6/28/2011
				0.90	56.5	6/29/2011
				0.90	56.3	7/7/2011
				0.90	55.8	7/8/2011
				0.91	56.0	7/14/2011
				0.91	56.1	7/16/2011
				0.91	56.0	7/18/2011
				0.90	55.7	7/19/2011
				0.90	55.7	7/25/2011
466	FCC Body	0.94 (0.89-0.99)	56.6 (53.8-59.4)	0.92	56.4	6/28/2011
				0.92	56.2	6/29/2011
				0.91	56.0	7/7/2011
				0.92	55.8	7/16/2011
481	FCC Body	0.94 (0.89-0.99)	56.6 (53.8-59.4)	0.93	56.1	6/28/2011
				0.93	56.0	6/29/2011
				0.92	55.7	7/7/2011
				0.94	55.5	7/16/2011
497	FCC Body	0.94 (0.89-0.99)	56.5 (53.7-59.3)	0.95	55.9	6/28/2011
				0.94	55.4	7/7/2011
512	FCC Body	0.94 (0.89-0.99)	56.5 (53.7-59.3)	0.96	55.4	6/29/2011
516	FCC Body	0.95 (0.90-1.00)	56.4 (53.6-59.2)	0.96	55.4	6/29/2011
				0.97	54.8	7/18/2011
520	FCC Body	0.95 (0.90-1.00)	56.4 (53.6-59.2)	0.97	55.3	6/29/2011
				0.97	54.8	7/18/2011

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 10

Probe Serial #	Tissue Type	Probe Cal Date	Dipole Kit / Serial #	Reference SAR @ 1W (W/kg)	System Check Test Results when normalized to 1W (W/kg)	Tested Date
3163	FCC Body	4/13/2011	SPEAG D450V3 /1077	4.68 +/- 10%	4.44	6/24/2011
					4.44	6/25/2011
					4.44	6/26/2011
					4.44	6/28/2011
					4.44	6/29/2011
					4.44	7/6/2011
					4.44	7/7/2011
					4.40	7/8/2011
					4.44	7/14/2011
					4.48	7/16/2011
					4.48	7/18/2011
					4.44	7/19/2011
					4.52	7/25/2011

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 11

	Target	Measured
Ambient Temperature	18 - 25 ˚C	Range: 20.8 -22.8˚C Avg. 22.1˚C
Relative Humidity	30 - 70 %	Range: 49.6 – 65.3% Avg. 55.8%
Tissue Temperature	NA	Range: 21.1-22.1˚C Avg. 21.7˚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 5x5x7 zoom scan. Elliptical flat phantoms filled with applicable simulated tissue were used for body and face testing.

12.2 DUT Configuration(s)

The DUT is a portable device operational at the body and face as described in section 6.0 while using the applicable accessories listed in section 7.0. All accessories listed in section 7.0 of this report were considered when implementing the guidelines specified in KDB 643646 D01.

12.3 DUT Positioning Procedures

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

12.3.1 Face

The DUT was positioned with its’ front and back side separated 2.5cm from the phantom. Note that this product has two microphones, one on the front and one on the back of the DUT and therefore both sides were assessed. The offered PSMs were also tested with 2.5cm separation from the phantom.

12.3.2 Body

The DUT was positioned in the intended use configuration against the phantom with the offered body worn and audio accessories where applicable.

The PSM was positioned in the intended use configuration against the phantom with the offered body worn accessory.

12.3.3 Head

Not applicable

12.4 DUT Test Channels

The following equations were used to determine the number of test channels for the DUT. The number of test channels was determined by using the following IEEE 1528 equation. The use of this equation produces the same or more test channels compared to the FCC KDB 447498 number of test channels formula.

Equation #1 – Equation from KDB 447498.

$$N_c = Roundup\{[100 * (f_{high} - f_{low}) / f_c]^{0.5} * (f_c / 100)^{0.2}\}$$

Equation #2 – Equation from IEEE 1528.

$$N_c = 2 * roundup[10 * (f_{high} - f_{low}) / f_c] + 1$$

Where
N_c = Number of channels
F_{high} = Upper channel
F_{low} = Lower channel
F_c = Center channel

12.5 DUT Test Plan

All modes of operation identified in section 6.0 were considered during the development of the test plan. The mode which presented the highest duty cycle was chosen for SAR assessment.

All accessories listed in section 7.0 of this report were evaluated and only those identified for testing were used to develop the SAR test plan for this product.

Tests for frequency range within FCC Part 90 (450-512 MHz) were performed per FCC KDB 643646 D01 SAR Test for PTT Radios v01r01 (Publication Date: 04/04/2011). The highest test configuration found for each of the test positions (Face, Body, and Body w/ PSM) were used to assess the frequency range outside FCC Part 90 for each of the antennas where applicable.

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.

Bluetooth testing is not required due to Bluetooth max power is 10mW which is less than 60/f-GHz per FCC correspondent EA778949/EA670193, and less than 12mW (KDB 648474; Pref for 2.45GHz).

Note that test results that are outside the relevant FCC frequency allocations are presented herein in blue font.

13.0 DUT Test Data

13.1 Assessments at the Face (CW mode)

The highest capacity battery NNTN7034A was selected as default battery to assess at the Face (refer to section 7.2 for the battery's description). The conducted power measurement for all test channels within part 90 frequency range (450-512MHz) using the battery NNTN7034A is indicated in the table 12. The channel with highest conducted power was identified as default channel per KDB 643646 D01 SAR Test for PTT Radios v01r01. SAR plots of the highest results per table (bolded) are presented in appendices E-G.

Table 12

Test Freq (MHz)	Power (W)
450.00	5.70
465.50	5.66
481.00	5.64
496.50	5.62
512.00	5.58

13.1.1 Assessment at the Face (DUT front) with the offered antennas and batteries

Testing antennas with the default battery per KDB 643646 D01 SAR Test for PTT Radios v01r01 – Head SAR Test Consideration. Refer to table 12 for highest power channel.

Table 13

Antenna	Battery	Carry Accessory	Cable Accessory	Test Freq (MHz)	Init Pwr (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#
FAF5260A (450-520 MHz)	NNTN7034A	None	None	450.00	5.54	-0.260	6.37	4.81	**3.42**	2.58	HvH-Face-110626-08
				465.50							
				481.00							
				496.50							
				512.00							
PMAE4065A (380-520 MHz)	NNTN7034A	None	None	450.00	5.57	0.018	2.95	2.23	1.48	1.12	HvH-Face-110626-09
				465.50							
				481.00							
				496.50							
				512.00							

Testing antennas with additional batteries per KDB 643646 D01 SAR Test for PTT Radios v01r01 – Head SAR Test Consideration.

Table 14

Antenna	Battery	Carry Accessory	Cable Accessory	Test Freq (MHz)	Init Pwr (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#
FAF5260A (450-520 MHz)	NNTN7033A	None	None	450.00	5.55	-0.640	4.88	3.66	2.85	2.14	HvH-Face-110626-10
	NNTN7036A				5.54	-0.200	5.67	4.31	3.00	2.28	HvH-Face-110626-11
	NNTN7037A				5.58	-0.150	5.66	4.29	2.94	2.23	HvH-Face-110626-12
	NNTN7038A				5.59	-0.820	6.26	4.69	3.79	2.84	HvH-Face-110626-13
	NNTN8092A				5.56	-0.900	5.32	3.97	3.30	2.46	HvH-Face-110626-14
	PMNN4403A				5.37	-0.900	7.49	5.55	**4.80**	3.56	HvH-Face-110714-04

13.1.2 Assessment at the Face (DUT back) with the offered antennas and batteries

Testing antennas with the default battery per KDB 643646 D01 SAR Test for PTT Radios v01r01 – Head SAR Test Consideration. Refer to table 12 for highest power channel.

Table 15

Antenna	Battery	Carry Accessory	Cable Accessory	Test Freq (MHz)	Init Pwr (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#
FAF5260A (450-520 MHz)	NNTN7034A	None	None	450.00	5.56	-0.760	7.15	5.35	**4.29**	3.21	CM-Face-110626-16
				465.50	5.54	-0.120	6.27	4.70	3.26	2.44	CM-Face-110626-17
				481.00	5.50	-0.070	5.09	3.81	2.63	1.97	CM-Face-110626-18
				496.50							
				512.00							
PMAE4065A (380-520 MHz)	NNTN7034A	None	None	450.00	5.55	-0.066	3.86	2.90	1.98	1.49	CM-Face-110626-19
				465.50							
				481.00							
				496.50							
				512.00							

Testing antennas with additional batteries per KDB 643646 D01 SAR Test for PTT Radios v01r01 – Head SAR Test Consideration.

Table 16

Antenna	Battery	Carry Accessory	Cable Accessory	Test Freq (MHz)	Init Pwr (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#
FAF5260A (450-520 MHz)	NNTN7033A	None	None	450.00	5.50	-0.620	5.84	4.39	3.43	2.58	CM-Face-110626-20
	NNTN7036A				5.50	-0.170	5.52	4.14	2.92	2.19	CM-Face-110626-21
	NNTN7037A				5.52	-0.130	5.56	4.18	2.91	2.18	CM-Face-110626-22
	NNTN7038A				5.57	-0.720	6.87	5.12	**4.08**	3.04	CM-Face-110626-23
	NNTN8092A				5.51	-0.770	5.92	4.42	3.59	2.68	CM-Face-110626-24
	PMNN4403A				5.59	-0.820	6.23	4.65	3.77	2.81	CM-Face-110626-25

13.2 Assessments at the Body with body worn accessories (CW mode)

The battery PMNN4403A was selected as default battery to assess at the Body since it is the thinnest battery (refers to exhibit 7B for the dimension of the batteries). The conducted power measurement for all test channels within part 90 frequency range (450-512MHz) using the battery PMMN4403A is indicated in the table 15. The channel with highest conducted power was identified as default channel per KDB 643646 D01 SAR Test for PTT Radios v01r01. SAR plots of the highest results per table (bolded) are presented in appendices E-G.

Table 17

Test Freq (MHz)	Power (W)
450.00	5.68
465.50	5.64
481.00	5.62
496.50	5.60
512.00	5.57

13.2.1 Assessment at the Body with body worn PMLN5709A

Testing antennas with the default battery and body worn accessory PMLN5709A per KDB 643646 D01 SAR Test for PTT Radios v01r01 – Body SAR Test Considerations for body worn accessories. Refer to table 17 for highest output power channel.

Table 18

Antenna	Battery	Carry Accessory	Cable Accessory	Test Freq (MHz)	Init Pwr (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#
FAF5260A (450-520 MHz)	PMNN4403A	PMLN5709A	PMLN5275C	450.00	5.56	-0.360	7.89	5.74	**4.32**	3.14	CM-Ab-110707-12
				465.50	5.58	-0.310	6.34	4.65	3.42	2.51	CM-Ab-110707-13
				481.00	5.58	-0.180	5.02	3.74	2.63	1.96	CM-Ab-110707-14
				496.50							
				512.00							
PMAE4065A (380-520 MHz)	PMNN4403A	PMLN5709A	PMLN5275C	450.00	5.56	-0.160	4.29	3.11	2.24	1.63	CM-Ab-110707-15
				465.50							
				481.00							
				496.50							
				512.00							

Testing antennas and body worn accessory PMLN5709A with additional batteries per KDB 643646 D01 SAR Test for PTT Radios v01r01 – Body SAR Test Considerations for body worn accessories.

Table 19

Antenna	Battery	Carry Accessory	Cable Accessory	Test Freq (MHz)	Init Pwr (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#
FAF5260A (450-520 MHz)	NNTN7034A	PMLN5709A	PMLN5275C	450.00	5.56	-0.230	7.81	5.81	4.15	3.09	HvH-Ab-110708-03
	NNTN7033A				5.56	-0.330	7.26	5.28	3.94	2.87	HvH-Ab-110708-04
	NNTN7036A				5.53	-0.190	6.93	5.16	3.67	2.73	HvH-Ab-110708-05
	NNTN7037A				5.60	-0.360	6.76	5.04	3.67	2.74	HvH-Ab-110708-06
	NNTN7038A				5.60	-0.390	8.23	5.97	**4.50**	3.27	HvH-Ab-110708-07
	NNTN8092A				5.52	-0.610	7.68	5.60	4.48	3.27	HvH-Ab-110708-08

13.2.2 Assessment at the Body with body worn HLN6875A

Testing antennas with the default battery and body worn HLN6875A accessory per KDB 643646 D01 SAR Test for PTT Radios v01r01 – Body SAR Test Considerations for body worn accessories. Refer to table 17 for highest output power channel.

Table 20

Antenna	Battery	Carry Accessory	Cable Accessory	Test Freq (MHz)	Init Pwr (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#
FAF5260A (450-520 MHz)	PMNN4403A	HLN6875A Belt Clip	PMLN5275C	450.00	5.56	-0.300	5.11	2.89	**2.76**	1.56	HvH-Ab-110624-02
				465.50							
				481.00							
				496.50							
				512.00							
PMAE4065 (380-520 MHz)	PMNN4403A	HLN6875A Belt Clip	PMLN5275C	450.00	5.52	-0.028	3.45	2.55	1.76	1.30	HvH-Ab-110624-03
				465.50							
				481.00							
				496.50							
				512.00							

Testing antennas and body worn accessory HLN6875A with additional batteries per KDB 643646 D01 SAR Test for PTT Radios v01r01 – Body SAR Test Considerations for body worn accessories.

Table 21

Antenna	Battery	Carry Accessory	Cable Accessory	Test Freq (MHz)	Init Pwr (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#
FAF5260A (450-520 MHz)	NNTN7034A	HLN6875A Belt Clip	PMLN5275C	450.00	5.52	-0.350	6.94	5.14	3.82	2.83	HvH-Ab-110624-04
	NNTN7033A				5.58	-0.440	6.11	4.53	3.39	2.52	HvH-Ab-110624-05
	NNTN7036A				5.53	-0.240	6.29	4.66	3.37	2.49	HvH-Ab-110624-08
	NNTN7037A				5.56	-0.260	6.45	4.75	3.45	2.54	HvH-Ab-110624-09
	NNTN7038A				5.55	-0.160	7.24	5.36	3.79	2.81	HvH-Ab-110624-10
	NNTN8092A				5.45	-0.430	7.69	5.68	**4.36**	3.22	CM-Ab-110624-11

13.2.3 Assessment at the Body with body worn NTN9179A

Testing antennas with the default battery and body worn accessory NTN9179A per KDB 643646 D01 SAR Test for PTT Radios v01r01 – Body SAR Test Considerations for body worn accessories. Refer to table 17 for highest output power channel.

Table 22

Antenna	Battery	Carry Accessory	Cable Accessory	Test Freq (MHz)	Init Pwr (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#
FAF5260A (450-520 MHz)	PMNN4403A	NTN9179A	PMLN5275C	450.00	5.52	-0.120	4.69	3.51	**2.45**	1.83	CM-Ab-110624-12
				465.50							
				481.00							
				496.50							
				512.00							
PMAE4065A (380-520 MHz)	PMNN4403A	NTN9179A	PMLN5275C	450.00	5.50	0.095	2.22	1.66	1.13	0.85	CM-Ab-110624-13
				465.50							
				481.00							
				496.50							
				512.00							

Testing antennas and body worn accessory NTN9179A with additional batteries per KDB 643646 D01 SAR Test for PTT Radios v01r01 – Body SAR Test Considerations for body worn accessories.

Table 23

Antenna	Battery	Carry Accessory	Cable Accessory	Test Freq (MHz)	Init Pwr (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#
FAF5260A (450-520 MHz)	NNTN7034A	NTN9179A	PMLN5275C	450.00	5.55	-0.170	4.78	3.57	2.51	1.87	CM-Ab-110624-14
	NNTN7033A				5.50	-0.220	4.24	3.18	2.27	1.70	CM-Ab-110624-15
	NNTN7036A				5.44	-0.330	5.24	2.84	2.91	1.58	CM-Ab-110624-16
	NNTN7037A				5.54	-0.260	6.44	3.38	**3.46**	1.81	CM-Ab-110624-17
	NNTN7038A				5.53	-0.140	4.18	3.12	2.19	1.63	CM-Ab-110624-18
	NNTN8092A				5.50	-0.800	4.65	3.49	2.85	2.14	HvH-Ab-110625-02

13.2.4 Assessment at the Body with body worn PMLN5658A

Testing antennas with the default battery and body worn accessory PMLN5658A per KDB 643646 D01 SAR Test for PTT Radios v01r01 – Body SAR Test Considerations for body worn accessories. Refer to table 17 for highest output power channel.

Table 24

Antenna	Battery	Carry Accessory	Cable Accessory	Test Freq (MHz)	Init Pwr (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#
FAF5260A (450-520 MHz)	PMNN4403A	PMLN5658A	PMLN5275C	450.00	5.55	-0.140	4.58	3.42	**2.39**	1.78	HvH-Ab-110625-03
				465.50							
				481.00							
				496.50							
				512.00							
PMAE4065 (380-520 MHz)	PMNN4403A	PMLN5658A	PMLN5275C	450.00	5.56	-0.012	2.43	1.82	1.23	0.92	HvH-Ab-110625-04
				465.50							
				481.00							
				496.50							
				512.00							

Testing antennas and body worn accessory PMLN5658A with additional batteries per KDB 643646 D01 SAR Test for PTT Radios v01r01 – Body SAR Test Considerations for body worn accessories.

Table 25

Antenna	Battery	Carry Accessory	Cable Accessory	Test Freq (MHz)	Init Pwr (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#
FAF5260A (450-520 MHz)	NNTN7038A	PMLN5658A	PMLN5275C	450.00	5.58	-0.110	5.70	4.26	2.93	2.19	HvH-Ab-110625-05
	NNTN8092A			450.00	5.56	-0.260	5.77	4.32	**3.09**	2.31	HvH-Ab-110625-06

13.2.5 Assessment at the Body with body worn PMLN5657A

Testing antennas with the default battery and body worn accessory PMLN5657A per KDB 643646 D01 SAR Test for PTT Radios v01r01 – Body SAR Test Considerations for body worn accessories. Refer to table 17 for highest output power channel.

Table 26

Antenna	Battery	Carry Accessory	Cable Accessory	Test Freq (MHz)	Init Pwr (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#
FAF5260A (450-520 MHz)	PMNN4403 A	PMLN5657A	PMLN5275C	450.00	5.57	-0.170	3.06	2.32	**1.60**	1.21	HvH-Ab-110625-07
				465.50							
				481.00							
				496.50							
				512.00							
PMAE4065 (380-520 MHz)	PMNN4403 A	PMLN5657A	PMLN5275C	450.00	5.55	0.120	1.31	0.996	0.66	0.50	HvH-Ab-110625-08
				465.50							
				481.00							
				496.50							
				512.00							

Testing antennas and body worn accessory PMLN5657A with additional batteries per KDB 643646 D01 SAR Test for PTT Radios v01r01 – Body SAR Test Considerations for body worn accessories.

Table 27

Antenna	Battery	Carry Accessory	Cable Accessory	Test Freq (MHz)	Init Pwr (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#
FAF5260A (450-520 MHz)	NNTN7038A	PMLN5657A	PMLN5275C	450.00	5.57	-0.092	2.45	1.86	1.26	0.96	HvH-Ab-110625-09
	NNTN8092A				5.56	-0.160	2.45	1.86	**1.28**	0.97	HvH-Ab-110625-10

13.2.6 Assessment at the Body with body worn PMLN5660A

Testing antennas with the default battery and body worn accessory PMLN5660A per KDB 643646 D01 SAR Test for PTT Radios v01r01 – Body SAR Test Considerations for body worn accessories. Refer to table 17 for highest output power channel.

Table 28

Antenna	Battery	Carry Accessory	Cable Accessory	Test Freq (MHz)	Init Pwr (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#
FAF5260A (450-520 MHz)	NNTN7034A	PMLN5660A	PMLN5275C	450.00	5.57	-0.170	5.97	4.46	**3.12**	2.33	HvH-Ab-110625-14
				465.50							
				481.00							
				496.50							
				512.00							
PMAE4065A (380-520 MHz)	NNTN7034A	PMLN5660A	PMLN5275C	450.00	5.51	-0.099	2.82	2.12	1.47	1.10	CM-Ab-110625-15
				465.50							
				481.00							
				496.50							
				512.00							

Testing antennas and body worn accessory PMLN5660A with additional battery per KDB 643646 D01 SAR Test for PTT Radios v01r01 – Body SAR Test Considerations for body worn accessories.

Table 29

Antenna	Battery	Carry Accessory	Cable Accessory	Test Freq (MHz)	Init Pwr (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#
FAF5260A (450-520 MHz)	NNTN7033A	PMLN5660A	PMLN5275C	450.00	5.55	-0.200	4.81	3.59	**2.54**	1.90	CM-Ab-110625-16

13.2.7 Assessment at the Body with body worn PMLN5659A

Testing antennas with the default battery and body worn accessory PMLN5659A per KDB 643646 D01 SAR Test for PTT Radios v01r01 – Body SAR Test Considerations for body worn accessories. Refer to table 17 for highest output power channel.

Table 30

Antenna	Battery	Carry Accessory	Cable Accessory	Test Freq (MHz)	Init Pwr (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#
FAF5260A (450-520 MHz)	NNTN7034A	PMLN5659A	PMLN5275C	450.00	5.53	-0.075	2.93	2.23	**1.51**	1.15	CM-Ab-110625-17
				465.50							
				481.00							
				496.50							
				512.00							
PMAE4065A (380-520 MHz)	NNTN7034A	PMLN5659A	PMLN5275C	450.00	5.57	0.086	1.45	1.10	0.73	0.55	CM-Ab-110625-18
				465.50							
				481.00							
				496.50							
				512.00							

Testing antennas and body worn accessory PMLN5659A with additional battery per KDB 643646 D01 SAR Test for PTT Radios v01r01 – Body SAR Test Considerations for body worn accessories.

Table 31

Antenna	Battery	Carry Accessory	Cable Accessory	Test Freq (MHz)	Init Pwr (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#
FAF5260A (450-520 MHz)	NNTN7033A	PMLN5659A	PMLN5275C	450.00	5.55	-0.270	2.35	1.78	**1.26**	0.96	CM-Ab-110625-20

13.2.8 Assessment at the Body with carry strap NTN5243A and body worn PMLN5658A

Testing antennas with the default battery, carry strap NTN5243A and body worn PMLN5658A per KDB 643646 D01 SAR Test for PTT Radios v01r01 – Body SAR Test Considerations for body worn Accessories. Refer to table 17 for highest output power channel.

Table 32

Antenna	Battery	Carry Accessory	Cable Accessory	Test Freq (MHz)	Init Pwr (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#
FAF5260A (450-520 MHz)	PMNN4403A	NTN5243A PMLN5658A	PMLN5275C	450.00	5.60	-0.430	4.72	3.54	**2.61**	1.95	HvH-Ab-110716-02
				465.50							
				481.00							
				496.50							
				512.00							
PMAE4065A (380-520 MHz)	PMNN4403A	NTN5243A PMLN5658A	PMLN5275C	450.00	5.60	-0.010	2.74	2.06	1.37	1.03	HvH-Ab-110716-03
				465.50							
				481.00							
				496.50							
				512.00							

Testing antennas, carry strap NTN5243A and body worn accessory PMLN5658A with additional batteries per KDB 643646 D01 SAR Test for PTT Radios v01r01 – Body SAR Test Considerations for body worn accessories.

Table 33

Antenna	Battery	Carry Accessory	Cable Accessory	Test Freq (MHz)	Init Pwr (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#
FAF5260A (450-520 MHz)	NNTN7038A	NTN5243A PMLN5658A	PMLN5275C	450.00	5.60	-0.140	4.48	3.34	2.31	1.72	HvH-Ab-110716-04
	NNTN8092A				5.60	-0.210	4.61	3.44	**2.42**	1.81	HvH-Ab-110716-05

13.2.9 Assessment at the Body with carry strap NTN5243A and body worn PMLN5657A

Testing antennas with the default battery, carry strap NTN5243A and body worn PMLN5657A per KDB 643646 D01 SAR Test for PTT Radios v01r01 – Body SAR Test Considerations for body worn accessories. Refer to table 17 for highest output power channel.

Table 34

Antenna	Battery	Carry Accessory	Cable Accessory	Test Freq (MHz)	Init Pwr (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#
FAF5260A (450-520 MHz)	PMNN4403A	NTN5243A PMLN5657A (w/o loop)	PMLN5275C	450.00	5.60	-0.460	6.88	4.75	**3.82**	2.64	HvH-Ab-110716-06
				465.50							
				481.00	5.59	-0.071	5.51	3.90	2.81	1.99	HvH-Ab-110716-07
				496.50							
				512.00							
PMAE4065A (380-520 MHz)	PMNN4403A	NTN5243A PMLN5657A (w/o loop)	PMLN5275C	450.00	5.60	0.027	4.29	2.98	2.15	1.49	HvH-Ab-110716-08
				465.50							
				481.00							
				496.50							
				512.00							

Testing antennas, carry strap NTN5243A and body worn accessory PMLN5657A with additional batteries per KDB 643646 D01 SAR Test for PTT Radios v01r01 – Body SAR Test Considerations for body worn accessories.

Table 35

enna	Battery	Carry Accessory	Cable Accessory	Test Freq (MHz)	Init Pwr (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#
FAF5260A (450-520 MHz)	NNTN7038A	NTN5243A PMLN5657A (w/o loop)	PMLN5275C	450.00	5.60	-0.250	7.19	5.01	3.81	2.65	HvH-Ab-110716-09
	NNTN8092A				5.58	-0.800	7.09	5.00	**4.28**	3.02	HvH-Ab-110716-10

13.2.10 Assessment at the Body with carry strap NTN5243A and body worn PMLN5660A

Testing antennas with the default battery, carry strap NTN5243A and body worn PMLN5660A per KDB 643646 D01 SAR Test for PTT Radios v01r01 – Body SAR Test Considerations for body worn accessories. Refer to table 17 for highest output power channel.

Table 36

Antenna	Battery	Carry Accessory	Cable Accessory	Test Freq (MHz)	Init Pwr (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#
FAF5260A (450-520 MHz)	NNTN7034A	NTN5243A PMLN5660A	PMLN5275C	450.00	5.60	-0.190	5.67	4.24	**2.96**	2.21	HvH-Ab-110716-11
				465.50							
				481.00							
				496.50							
				512.00							
PMAE4065A (380-520 MHz)	NNTN7034A	NTN5243A PMLN5660A	PMLN5275C	450.00	5.60	-0.034	2.99	2.24	1.51	1.13	HvH-Ab-110716-12
				465.50							
				481.00							
				496.50							
				512.00							

Testing antennas, carry strap NTN5243A and body worn accessory PMLN5660A with additional battery per KDB 643646 D01 SAR Test for PTT Radios v01r01 – Body SAR Test Considerations for body worn accessories.

Table 37

Antenna	Battery	Carry Accessory	Cable Accessory	Test Freq (MHz)	Init Pwr (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#
FAF5260A (450-520 MHz)	NNTN7033A	NTN5243A PMLN5660A	PMLN5275C	450.00	5.60	-0.530	4.82	3.61	**2.72**	2.04	HvH-Ab-110716-13

13.2.11 Assessment at the Body with carry strap NTN5243A and body worn PMLN5659A

Testing antennas with the default battery, carry strap NTN5243A and body worn PMLN5659A per KDB 643646 D01 SAR Test for PTT Radios v01r01 – Body SAR Test Considerations for body worn accessories. Refer to table 17 for highest output power channel.

Table 38

Antenna	Battery	Carry Accessory	Cable Accessory	Test Freq (MHz)	Init Pwr (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#
FAF5260A (450-520 MHz)	NNTN7034A	NTN5243A PMLN5659A (w/o loop)	PMLN5275C	450.00	5.60	-0.370	8.10	5.61	**4.41**	3.05	HvH-Ab-110716-14
				465.50	5.60	-0.110	7.38	5.01	3.78	2.57	HvH-Ab-110716-15
				481.00	5.60	-0.140	6.72	4.41	3.47	2.28	HvH-Ab-110716-16
				496.50							
				512.00							
PMAE4065A (380-520 MHz)	NNTN7034A	NTN5243A PMLN5659A (w/o loop)	PMLN5275C	450.00	5.60	-0.036	4.85	3.33	2.45	1.68	HvH-Ab-110716-17
				465.50							
				481.00							
				496.50							
				512.00							

Testing antennas, carry strap NTN5243A and body worn accessory PMLN5659A with additional battery per KDB 643646 D01 SAR Test for PTT Radios v01r01 – Body SAR Test Considerations for body worn accessories.

Table 39

Antenna	Battery	Carry Accessory	Cable Accessory	Test Freq (MHz)	Init Pwr (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#
FAF5260A (450-520 MHz)	NNTN7033A	NTN5243A PMLN5659A (w/o loop)	PMLN5275C	450.00	5.60	0.160	7.43	4.95	**3.72**	2.48	HvH-Ab-110716-18

13.3 Assessments at the Body with additional audio accessories (CW Mode)

Testing additional audio accessories per KDB 643646 D01 SAR Test for PTT Radios v01r01 – Body SAR Test Considerations for audio accessories without Integral antenna. SAR plots of the highest results per table (bolded) are presented in appendices E-G.

Table 40

Antenna	Battery	Carry Accessory	Cable Accessory	Test Freq (MHz)	Init Pwr (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#
FAF5260A (450-520 MHz)	NNTN7034A	NTN5243A PMLN5659A (w/o loop)	HMN4104B	450.00	5.60	-0.480	8.94	6.18	4.99	3.45	HvH-Ab-110718-03
			PMLN5101A		5.60	-0.800	7.54	5.25	4.53	3.16	HvH-Ab-110718-04
			PMLN5111A		5.60	-0.440	9.11	6.32	5.04	3.50	HvH-Ab-110718-05
			PMMN4062A		5.60	-0.430	8.98	6.23	4.96	3.44	HvH-Ab-110718-06
			PMMN4065A		5.60	-0.470	8.13	5.64	4.53	3.14	HvH-Ab-110718-07
			RLN5882A		5.57	-0.460	8.25	5.74	4.61	3.21	HvH-Ab-110718-08
			RMN5058A		5.60	-0.660	8.83	6.12	**5.14**	3.56	HvH-Ab-110718-09
			RMN5116A/HMN4104B		5.60	-0.400	8.95	6.22	4.91	3.41	HvH-Ab-110718-10
			PMMN4024A		5.60	-0.480	8.29	5.76	4.63	3.22	HvH-Ab-110718-11
			NNTN7869A ZMN6031A		5.60	-0.230	7.90	5.46	4.16	2.88	HvH-Ab-110718-12
			NNTN7869A ZMN6032A		5.60	-0.540	6.58	4.57	3.73	2.59	CM-Ab-110718-13
			BDN6783A BDN6731A		5.59	-0.450	8.55	5.88	4.75	3.27	CM-Ab-110718-14
			BDN6783A BDN6732A		5.60	-0.460	8.02	5.54	4.46	3.08	CM-Ab-110718-15
			BDN6783A BDN6780A		5.60	-0.450	8.39	5.79	4.65	3.21	CM-Ab-110718-16
			None		5.39	-0.270	7.74	5.38	4.28	2.97	HvH-Ab-110719-06

13.4 Assessments at the Body with Public Safety Microphones (CW Mode)

The highest capacity battery NNTN7034A was selected as default battery to assess at the Body with PSM (refer to section 7.2 for the battery's description). The conducted power measurement for all test channels within part 90 frequency range (450-512MHz) using the battery NNTN7034A is indicated in the table 41. The channel with highest conducted power was identified as default channel per KDB 643646 D01 SAR Test for PTT Radios v01r01. SAR plots of the highest results per table (bolded) are presented in appendices E-G.

Table 41

Test Freq (MHz)	Power (W)
450.00	5.70
465.50	5.66
481.00	5.64
496.50	5.62
512.00	5.58

Testing PSM accessories PMMN4059B, PMMN4060B, and PMMN4061B per KDB 643646 D01 SAR Test for PTT Radios v01r01 (4/4/2011) – Body SAR Test Considerations for audio accessories with Integral antenna. Refer to table 41 for highest output power channel.

Table 42

Antenna	Battery	Carry Accessory	Cable Accessory	Test Freq (MHz)	Init Pwr (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#
PMAE4065A (380-520 MHz)	NNTN7034A	4205823V08	PMMN4059B	450.00	5.57	-0.220	9.30	6.64	4.92	3.51	CM-Ab-110628-02
				465.50	5.57	-0.160	8.01	5.57	4.18	2.91	CM-Ab-110628-03
				481.00	5.54	-0.032	6.13	4.33	3.12	2.20	CM-Ab-110628-04
				496.50							
				512.00							
			PMMN4060B	450.00	5.56	-0.210	8.05	5.24	4.25	2.77	CM-Ab-110628-05
				465.50	5.57	-0.490	7.86	5.40	4.42	3.04	CM-Ab-110628-06
				481.00	5.51	-0.720	8.54	5.82	5.12	3.49	CM-Ab-110628-08
				496.50	5.51	-0.240	10.40	7.45	**5.59**	4.00	CM-Ab-110628-09
				512.00	5.56	-0.011	6.64	4.73	3.35	2.39	HvH-Ab-110629-02
			PMMN4061B	450.00	5.59	-0.140	8.36	5.83	4.32	3.02	HvH-Ab-110629-03
				465.50	5.59	-0.096	7.35	5.24	3.76	2.68	HvH-Ab-110629-04
				481.00	5.58	-0.500	6.17	4.36	3.47	2.45	HvH-Ab-110629-05
				496.50							
				512.00							

13.5 Assessments for Frequency range outside FCC Part 90 (CW Mode)

(Data within this section is not applicable for FCC filing)

13.5.1 Assessment at the Face for other frequencies outside part 90

Test each of the offered antennas (if applicable) at the same test configuration indicated overall highest SAR results from tables 13 to 16 above for assessment at the Face.

Table 43

Antenna	Battery	Carry Accessory	Cable Accessory	Test Freq (MHz)	Init Pwr (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#
FAF5260A (450-520 MHz)	PMNN4403A	None	None	516.00	5.53	-0.160	3.62	2.70	**1.90**	1.42	CM-Face-110629-12
				520.00	5.55	-0.034	3.58	2.68	1.82	1.36	CM-Face-110629-14
PMAE4065A (380-520 MHz)	PMNN4403A	None	None	516.00	5.58	-0.039	2.76	2.07	1.40	1.05	CM-Face-110706-17
				520.00	5.57	0.039	2.78	2.08	1.40	1.05	CM-Face-110706-19

13.5.2 Assessment at the Body for other frequencies outside part 90:

DUT w/ body worn and audio accessories: test each of the offered antennas (if applicable) at the same test configuration indicated overall highest SAR results from tables 18 to 40 for assessment at the Body-DUT with body worn accessories.

Table 44

Antenna	Battery	Carry Accessory	Cable Accessory	Test Freq (MHz)	Init Pwr (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#
FAF5260A (450-520 MHz)	NNTN7034A	NTN5243A/ PMLN5659A w/o loop	RMN5058A	516.00	5.57	-0.051	6.38	3.88	3.25	1.97	CM-Ab-110718-18
				520.00	5.56	-0.190	7.12	4.12	**3.75**	2.17	CM-Ab-110718-19
PMAE4065A (380-520 MHz)	NNTN7034A	NTN5243A/ PMLN5659A w/o loop	RMN5058A	516.00	5.58	-0.120	6.34	3.75	3.27	1.93	CM-Ab-110718-21
				520.00	5.58	-0.021	6.50	3.78	3.28	1.91	CM-Ab-110718-22

DUT w/ Public Safety Microphones (PSMs): **t**est the offered antennas at the same test configuration indicated overall highest SAR results from table 42 for assessment at the Body for PSM accessories.

Table 45

Antenna	Battery	Carry Accessory	Cable Accessory	Test Freq (MHz)	Init Pwr (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#
PMAE4065A (380-520 MHz)	NNTN7034A	4205823V08	PMMN4060B	516.00	5.58	-0.012	5.77	4.12	**2.90**	2.07	HvH-Ab-110629-06
				520.00	5.58	-0.011	5.14	3.67	2.59	1.85	HvH-Ab-110629-07

13.6 Shorten scan assessment (CW Mode)

A "shortened" scan was performed to validate the SAR drift of the full DASY5™ coarse and 5x5x7 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 5x5x7 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 both SAR results from the table below are provided in APPENDIX E.
The highest SAR result from the table below (bolded) is included in APPENDIX F and G Section 32.0.

Table 46

Antenna	Battery	Carry Accessory	Cable Accessory	Test Freq (MHz)	Init Pwr (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#
FAF5260A (450-520 MHz)	NNTN7034A	NTN5243A PMLN5659A (w/o loop)	RMN5058A	450.00	5.60	-0.660	8.83	6.12	**5.14**	3.56	HvH-Ab-110718-09 (Full scan)
			RMN5058A		5.60	-0.140	8.08	5.60	4.17	2.89	HvH-Ab-110725-02 (Shorten scan)

14.0 Simultaneous Transmission Exclusion

Bluetooth testing not required due to Bluetooth power is 10mW which is less than 60/f-GHz per FCC correspondent EA778949/EA670193, and less than 12mW (KDB 648474; Pref for 2.45GHz).

15.0 Conclusion

Based on the test guidelines from KDB 643646, the highest Operational Maximum Calculated 1-gram and 10-gram average SAR values found for this filing:

Table 47
RF Exposure Results for FCC Part 90

Frequency Range (MHz)	Max Calc at Body (W/kg)		Max Calc at Face (W/kg)	
	1g-SAR	10g-SAR	1g-SAR	10g-SAR
450-512	5.59	4.00	4.80	3.56

Table 48
RF Exposure Results for entire frequency range

Frequency Range (MHz)	Max Calc at Body (W/kg)		Max Calc at Face (W/kg)	
	1g-SAR	10g-SAR	1g-SAR	10g-SAR
450-520	5.59	4.00	4.80	3.56

The test results clearly demonstrate compliance with FCC Occupational/Controlled RF Exposure limits of **8 W/kg** per the requirements of 47 CFR 2.1093(d).

The test results clearly demonstrate compliance with standards listed in section 3.0 for Occupational/Controlled RF Exposure limits of 8.0 W/kg for 1gram average SAR or 10W/kg for 10-gram average SAR.

APPENDIX A
Measurement Uncertainty

The Measurement Uncertainty tables indicated in this APPENDIX are applicable to the DUT ranging from 100MHz to 800MHz and for Dipole test frequency ranging from 300MHz to 800MHz. Therefore, the highest tolerance for the probe calibration uncertainty is indicated.

Table A1:

Uncertainty Budget for Device Under Test, for 100 MHz to 800 MHz

a	*b*	*c*	*d*	*e = f(d,k)*	*f*	*g*	*h = c x f / e*	*i = c x g / e*
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 (±%)**
Measurement System								
Probe Calibration	E.2.1	10.0	N	1.00	1	1	10.0	10.0
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
Device Holder Uncertainty	E.4.1	4.0	N	1.00	1	1	4.0	4.0
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				14	13
Expanded Uncertainty (95% CONFIDENCE LEVEL)			k=2				27	27

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Table A2:

Uncertainty Budget for System Validation (dipole & flat phantom) for 300 MHz to 800 MHz

a	*b*	*c*	*d*	*e = f(d,k)*	*f*	*g*	*h = c x f / e*	*i = c x g / e*
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 (±%)**
Measurement System								
Probe Calibration	E.2.1	9.0	N	1.00	1	1	9.0	9.0
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				11	11
Expanded Uncertainty (95% CONFIDENCE LEVEL)			*k* =2				22	22

FCD-0558 Uncertainty Budget Rev.8

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: **ES3-3163_Apr11**

CALIBRATION CERTIFICATE

Object	ES3DV3 - SN:3163
Calibration procedure(s)	QA CAL-01.v7, QA CAL-12.v6, QA CAL-14.v3, QA CAL-23.v4, QA CAL-25.v3 Calibration procedure for dosimetric E-field probes
Calibration date:	April 13, 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	MY41495277	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	23-Apr-10 (No. DAE4-654_Apr10)	Apr-11
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: April 13, 2011

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

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* are numerical linearization parameters in dB assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media.
- *VR:* VR is the validity range of the calibration related to the average diode voltage or DAE voltage in mV.
- *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:3163

Manufactured: October 8, 2007
Calibrated: April 13, 2011

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

DASY/EASY - Parameters of Probe: ES3DV3 - SN:3163

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(V/m)^2$)[A]	1.34	1.14	1.06	± 10.1 %
DCP (mV)[B]	100.6	102.9	102.3	

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	112.6	±2.7 %
			Y	0.00	0.00	1.00	105.3	
			Z	0.00	0.00	1.00	98.4	

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:3163

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	6.88	6.88	6.88	0.25	1.08	± 13.4 %
450	43.5	0.87	6.53	6.53	6.53	0.17	1.84	± 13.4 %
750	41.9	0.89	6.39	6.39	6.39	0.99	1.10	± 12.0 %
900	41.5	0.97	6.04	6.04	6.04	0.99	1.08	± 12.0 %
1810	40.0	1.40	5.05	5.05	5.05	0.89	1.16	± 12.0 %
1950	40.0	1.40	4.88	4.88	4.88	0.87	1.17	± 12.0 %
2300	39.5	1.67	4.70	4.70	4.70	0.77	1.25	± 12.0 %
2450	39.2	1.80	4.44	4.44	4.44	0.77	1.25	± 12.0 %
2600	39.0	1.96	4.29	4.29	4.29	0.75	1.29	± 12.0 %
3500	37.9	2.91	4.06	4.06	4.06	0.99	1.26	± 13.1 %
3700	37.7	3.12	3.63	3.63	3.63	0.99	1.29	± 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:3163

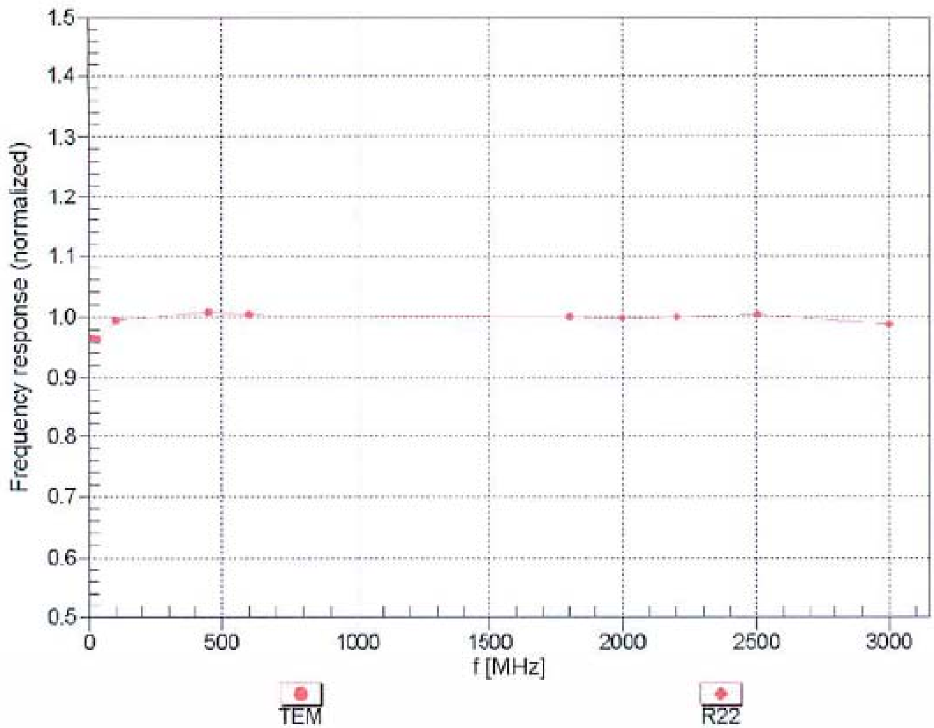
Calibration Parameter Determined in Body Tissue Simulating Media

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	6.83	6.83	6.83	0.22	1.69	± 13.4 %
450	56.7	0.94	7.01	7.01	7.01	0.09	1.00	± 13.4 %
750	55.5	0.96	6.13	6.13	6.13	0.99	1.14	± 12.0 %
900	55.0	1.05	5.99	5.99	5.99	0.99	1.14	± 12.0 %
1810	53.3	1.52	4.87	4.87	4.87	0.87	1.30	± 12.0 %
1950	53.3	1.52	4.81	4.81	4.81	0.77	1.37	± 12.0 %
2300	52.9	1.81	4.38	4.38	4.38	0.90	1.15	± 12.0 %
2450	52.7	1.95	4.20	4.20	4.20	0.99	1.05	± 12.0 %
2600	52.5	2.16	4.07	4.07	4.07	0.99	1.06	± 12.0 %
3500	51.3	3.31	3.47	3.47	3.47	0.99	1.37	± 13.1 %
3700	51.0	3.55	3.42	3.42	3.42	0.99	1.41	± 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.

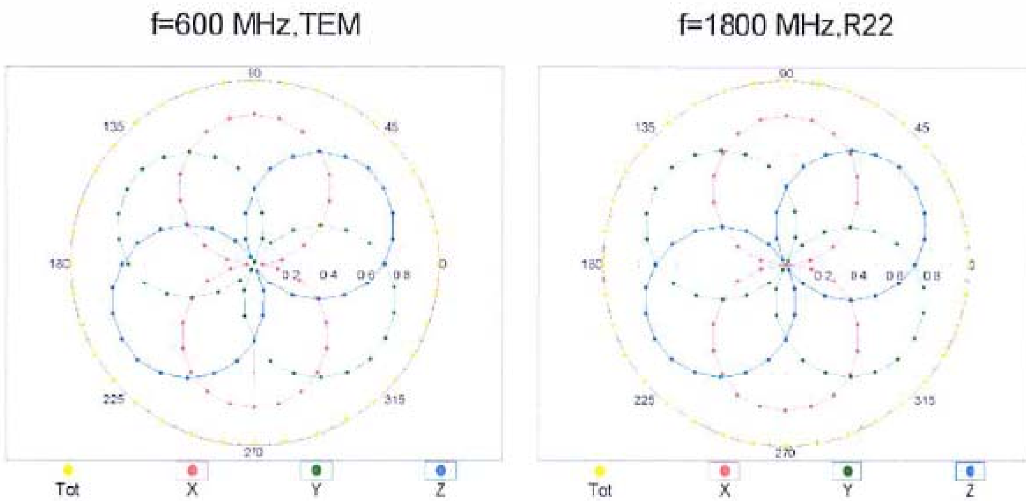
[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF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

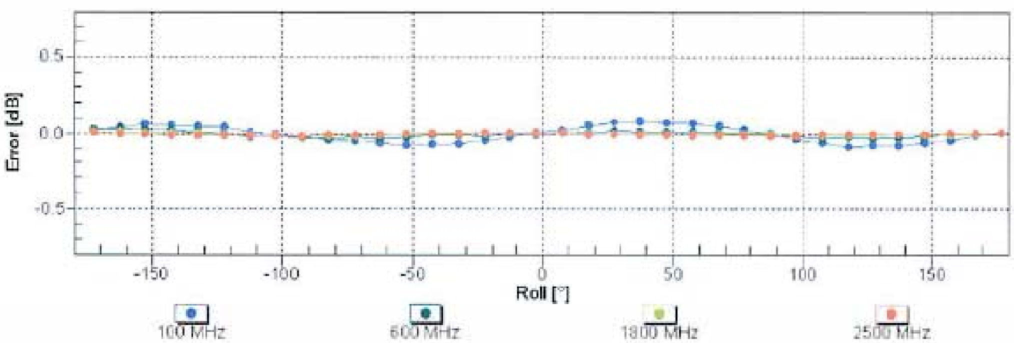
Frequency Response of E-Field
(TEM-Cell:ifi110 EXX, Waveguide: R22)



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

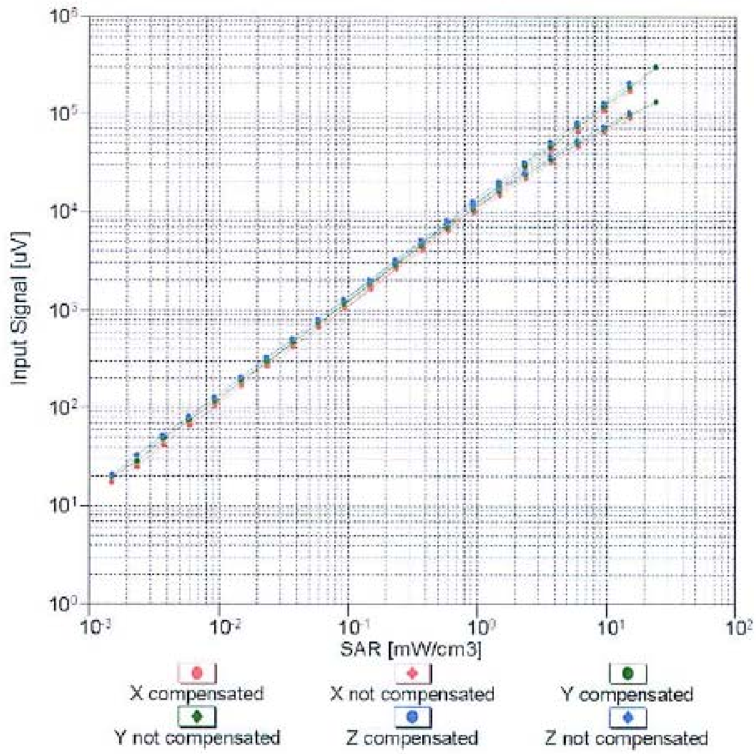
Receiving Pattern (φ), ϑ = 0°

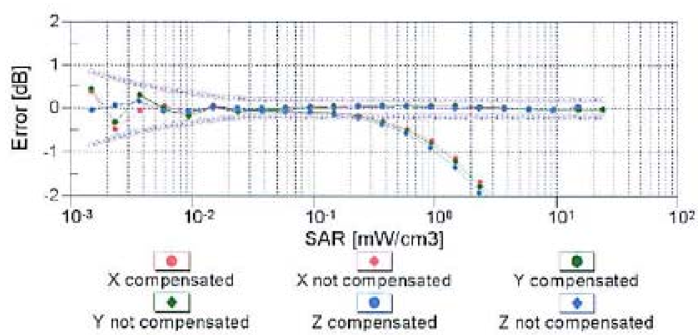




Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

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

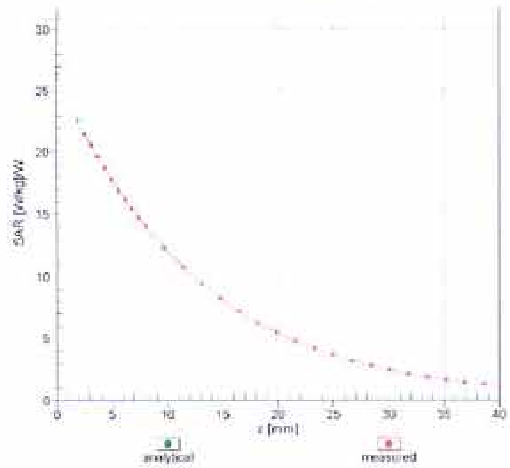




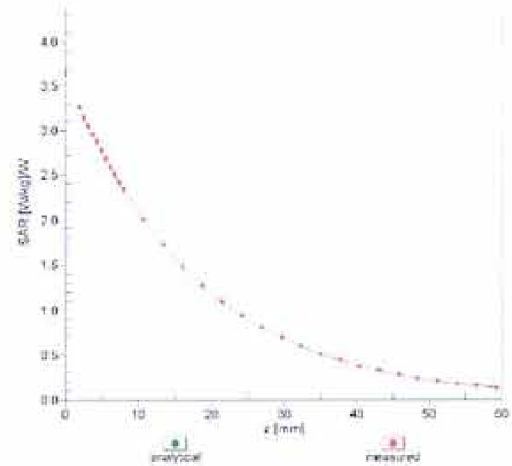
Uncertainty of Linearity Assessment: ± 0.6% (k=2)

Conversion Factor Assessment

f = 1810 MHz,WGLS R22 (H_convF)

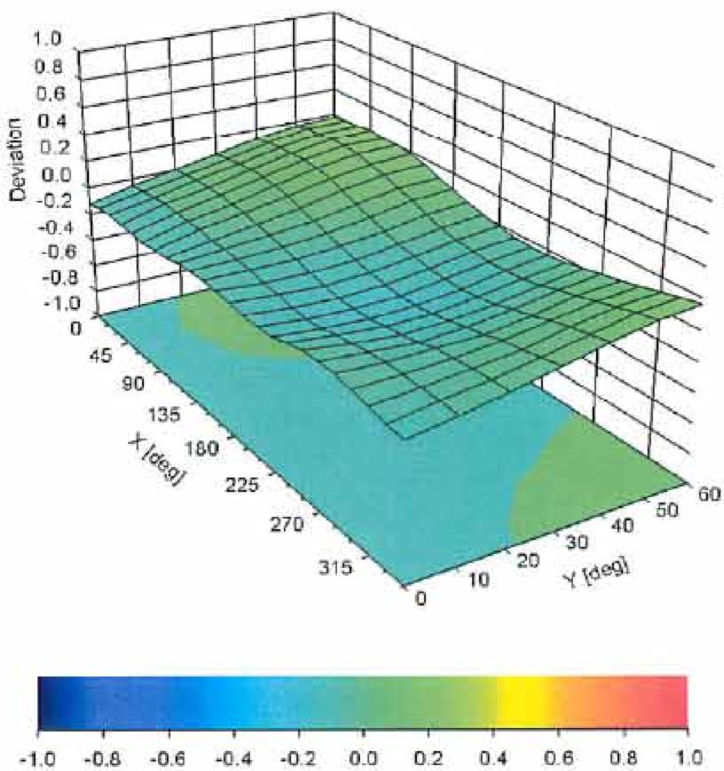


f = 900 MHz,WGLS R9 (H_convF)



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:3163

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

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info@speag.com, http://www.speag.com

Additional Conversion Factors

for Dosimetric E-Field Probe

Type:	**ES3DV3**
Serial Number:	**3163**
Place of Assessment:	**Zurich**
Date of Assessment:	**April 15, 2011**
Probe Calibration Date:	**April 13, 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

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Dosimetric E-Field Probe ES3DV3 SN:3163

Conversion factor (± standard deviation)

150 MHz	*ConvF*	**8.2 ± 10%**	**ε_r = 52.3** **σ = 0.76 mho/m** (head tissue)
250 MHz	*ConvF*	**7.7 ± 10%**	**ε_r = 47.6** **σ = 0.83 mho/m** (head tissue)
150 MHz	*ConvF*	**7.9 ± 10%**	**ε_r = 61.9** **σ = 0.80 mho/m** (body tissue)
250 MHz	*ConvF*	**7.5 ± 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.

APPENDIX C
Dipole Calibration Certificates

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

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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: **D450V3-1077_Jan11**

CALIBRATION CERTIFICATE

Object	D450V3 - SN: 1077
Calibration procedure(s)	QA CAL-15.v5 Calibration Procedure for dipole validation kits below 800 MHz
Calibration date:	January 11, 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 (Calibrated by, Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	1-Apr-10 (No. 217-01136)	Apr-11
Power sensor E4412A	MY41495277	1-Apr-10 (No. 217-01136)	Apr-11
Power sensor E4412A	MY41498087	1-Apr-10 (No. 217-01136)	Apr-11
Reference 3 dB Attenuator	SN: S5054 (3c)	30-Mar-10 (No. 217-01159)	Mar-11
Reference 20 dB Attenuator	SN: S5086 (20b)	30-Mar-10 (No. 217-01161)	Mar-11
Type-N mismatch combination	SN: 5047.3 / 06327	30-Mar-10 (No. 217-01162)	Mar-11
Reference Probe ET3DV6	SN: 1507	30-Apr-10 (No. ET3-1507_Apr10)	Apr-11
DAE4	SN: 654	23-Apr-10 (No. DAE4-654_Apr10)	Apr-11

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	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:	Jeton Kastrati	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: January 12, 2011

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

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
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S Swiss Calibration Service

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

Accreditation No.: **SCS 108**

Glossary:

TSL	tissue simulating liquid
ConF	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
Extrapolation	Advanced Extrapolation	
Phantom	ELI4 Flat Phantom	Shell thickness: 2 ± 0.2 mm
Distance Dipole Center - TSL	15 mm	with Spacer
Area Scan Resolution	dx, dy = 15 mm	
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	450 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	43.5	0.87 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	43.6 ± 6 %	0.83 mho/m ± 6 %
Head TSL temperature during test	(22.5 ± 0.2) °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	condition	
SAR measured	398 mW input power	1.82 mW / g
SAR normalized	normalized to 1W	4.57 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**4.73 mW / g ± 18.1 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	398 mW input power	1.21 mW / g
SAR normalized	normalized to 1W	3.04 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**3.13 mW / g ± 17.6 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	56.7	0.94 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	53.9 ± 6 %	0.90 mho/m ± 6 %
Body TSL temperature during test	(22.0 ± 0.2) °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	condition	
SAR measured	398 mW input power	1.74 mW / g
SAR normalized	normalized to 1W	4.37 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**4.47 mW / g ± 18.1 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	398 mW input power	1.16 mW / g
SAR normalized	normalized to 1W	2.91 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**2.98 mW / g ± 17.6 % (k=2)**

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	57.6 Ω - 6.0 jΩ
Return Loss	- 20.9 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	55.6 Ω - 8.6 jΩ
Return Loss	- 20.3 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.350 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	June 24, 2010

DASY5 Validation Report for Head TSL

Date/Time: 11.01.2011 10:41:12

Test Laboratory: SPEAG, Zurich, Switzerland

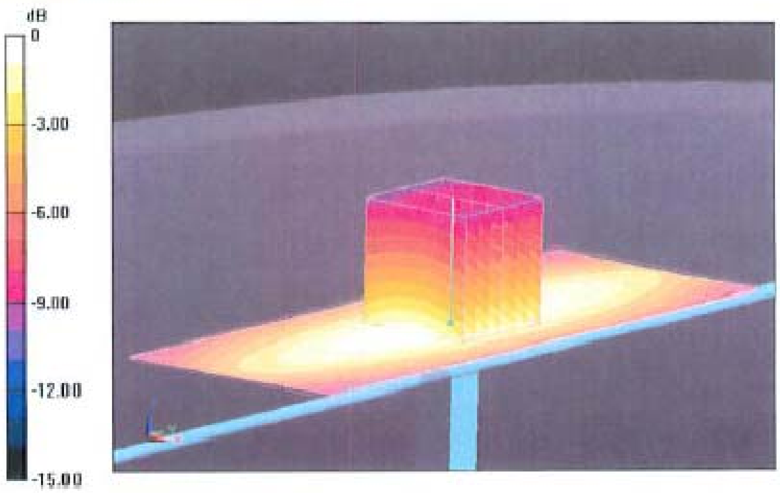
DUT: Dipole 450 MHz; Type: D450V3; Serial: D450V3 - SN:1077

Communication System: CW; Frequency: 450 MHz; Duty Cycle: 1:1
Medium: HSL450
Medium parameters used: f = 450 MHz; σ = 0.83 mho/m; ε_r = 43.6; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: ET3DV6 - SN1507; ConvF(6.62, 6.62, 6.62); Calibrated: 30.04.2010
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn654; Calibrated: 23.04.2010
- Phantom: ELI 4.0; Type: QDOVA001BA; Serial: 1002
- Measurement SW: DASY52, V52.6.1 Build (408)
- Postprocessing SW: SEMCAD X, V14.4.2 Build (2595)

Pin=398mW /d=15mm, /Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 50.139 V/m; Power Drift = -0.06 dB
Peak SAR (extrapolated) = 2.774 W/kg
SAR(1 g) = 1.82 mW/g; SAR(10 g) = 1.21 mW/g
Maximum value of SAR (measured) = 1.939 mW/g



0 dB = 1.940mW/g

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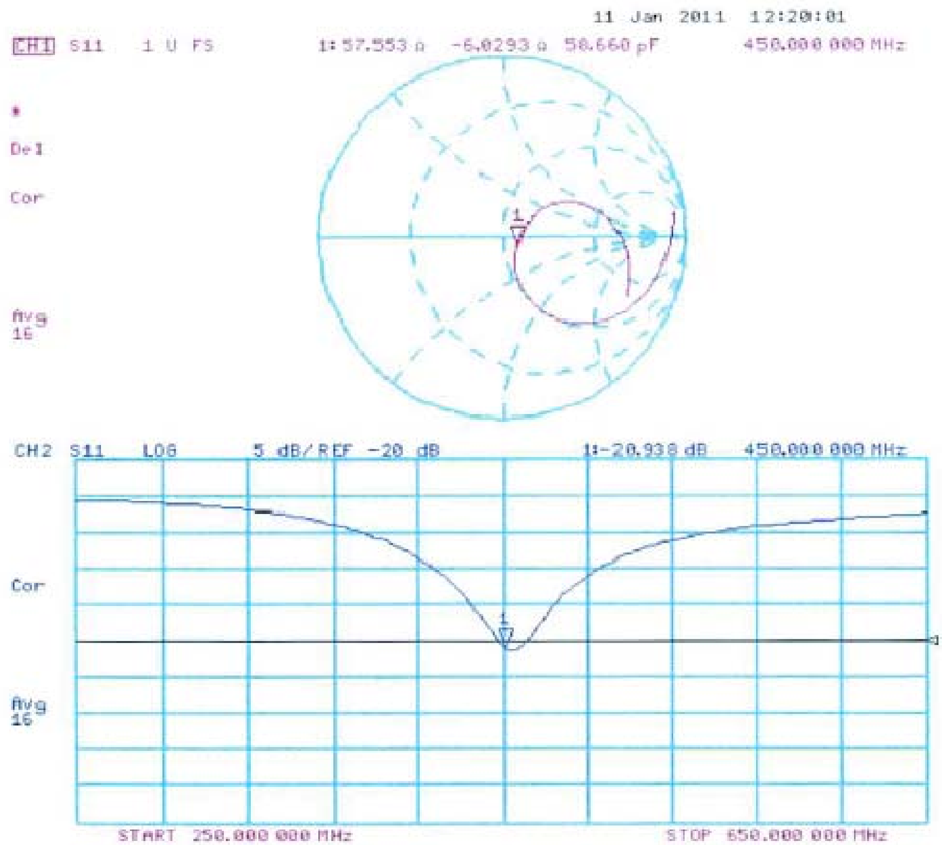
Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date/Time: 11.01.2011 13:17:57

Test Laboratory: SPEAG, Zurich, Switzerland

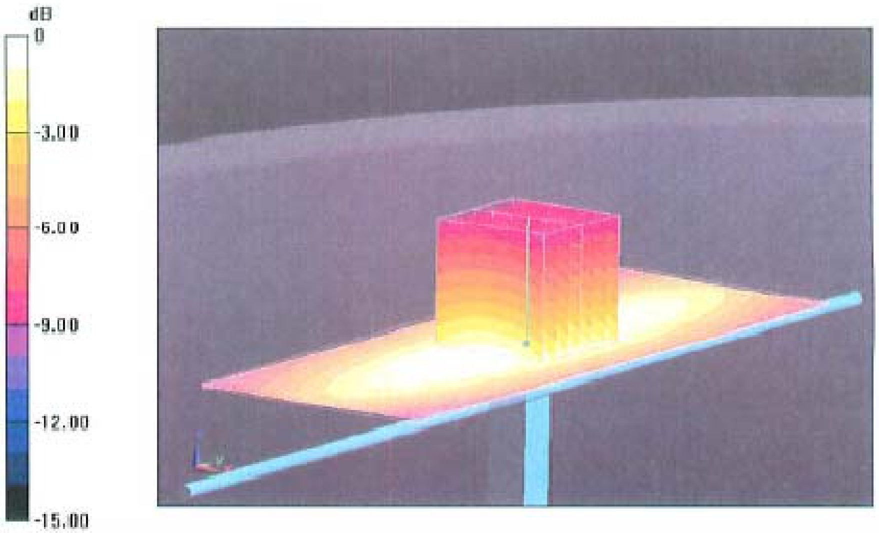
DUT: Dipole 450 MHz; Type: D450V3; Serial: D450V3 - SN:1077

Communication System: CW; Frequency: 450 MHz; Duty Cycle: 1:1
Medium: MSL450
Medium parameters used: f = 450 MHz; $\sigma = 0.9$ mho/m; $\varepsilon_r = 53.9$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

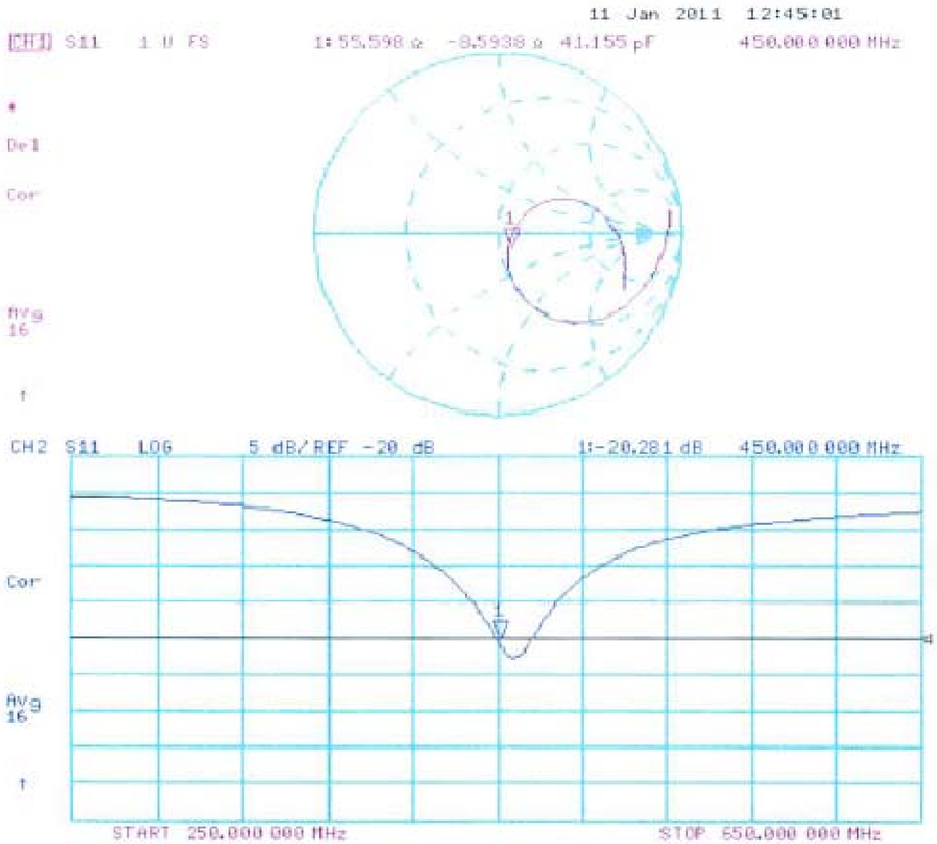
- Probe: ET3DV6 - SN1507; ConvF(7.2, 7.2, 7.2); Calibrated: 30.04.2010
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn654; Calibrated: 23.04.2010
- Phantom: ELI 4.0; Type: QDOVA001BA; Serial: 1002
- Measurement SW: DASY52, V52.6.1 Build (408)
- Postprocessing SW: SEMCAD X, V14.4.2 Build (2595)

Pin=398mW /d=15mm /Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 46.781 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 2.716 W/kg
SAR(1 g) = 1.74 mW/g; SAR(10 g) = 1.16 mW/g
Maximum value of SAR (measured) = 1.858 mW/g



0 dB = 1.860mW/g

Impedance Measurement Plot for Body TSL



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