MOTOROLA SOLUTIONS

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TESTING CERT # 2518.05

DECLARATION OF COMPLIANCE SAR ASSESSMENT Part 1 of 2

Enterprise Mobility Solutions
EME Test Laboratory
Motorola Solutions Malaysia Sdn Bhd (455657-H)
Customer Solution Center
Plot 2, Bayan Lepas Technoplex Industrial Park,
Mukim 12 SWD 11900 Bayan Lepas Penang, Malaysia.

Date of Report:	**01/04/2012**
Report Revision:	**O**
Report ID:	**SAR rpt_PMUF1473B_Rev.O _120104_SR9992**

Responsible Engineer:	Veeramani Veerapan (Sr. EME Engineer)
Report Author:	Veeramani Veerapan (Sr. EME Engineer)
Date/s Tested:	11/21/2011 –12/8/2011
Manufacturer/Location:	Motorola, Penang
Sector/Group/Div.:	EMS
Date submitted for test:	11/14/2011
DUT Description:	806-870 MHz & 896-941 MHz, 12.5kHz/25kHz, 2W, 160CH, FKP & Display with GPS (Capable of analog FM transmission and digital TDMA transmission.)
Test TX mode(s):	CW (PTT)
Max. Power output:	2.65 Watts
Nominal Power:	2.20 Watts
Tx Frequency Bands:	TMO: 806-825 MHz, DMO: 851-870 MHz (800 band) & TMO: 896-902 MHz, DMO: 935-941 MHz (900 band)
Signaling type:	FM and TDMA
Model(s) Tested:	PMUF1473B
Model(s) Certified:	PMUF1473B
Serial Number(s):	N4RPRD1O, N4RPRD1P
Classification:	Occupational/Controlled
FCC ID:	ABZ99FT5013; Rule part 90 (806-824, 851-869, 896-901 & 935-940 MHz)
IC:	109AB-99FT5013 (806-821, 821-824, 851-866, 866-869, 896-901 & 935-940 MHz)

* 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 Inc, 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.

Digitally signed by Zakharia Deanna-EDC015
DN: cn=Zakharia Deanna-EDC015
Date: 2012.01.19 15:17:31 -05'00'

Deanna Zakharia
EMS EME Lab Senior Resource Manager,
Laboratory Director

Approval Date: 1/19/2012

Certification Date: 1/19/2012

Certification No.: L1120111P

Part 1 of 2

APPENDICES

Part 2 of 2

Report Revision History

Date	Revision	Comments
01/04/2012	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 EMS EME Test Laboratory for model number PMUF1473B.

2.0 Abbreviations / Definitions

CNR: Calibration Not Required
CW: Continuous Wave
DUT: Device Under Test
FM: Frequency Modulation
NA: Not Applicable
PTT: Push to Talk
4FSK: 4 Level Frequency Shift Keying
TDMA: Time Division Multiple Access
SAR: Specific Absorption Rate
RSM: Remote Speaker Microphone
DSP: Digital Signal Processor
GPS: Global Positioning Satellite

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 (1999), 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. 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.

6.0 Description of Device Under Test (DUT):

This product contains transmit and receive circuitry for both analog and digital two way radio communications as well as receive circuitry for Global Positioning Satellite (GPS) signals. The technology details for modes of operation employing transmitters are described below. The modulation scheme used for analog two-way radio communications is narrowband Frequency Modulation (FM). FM is a modulation technique that transmits voice information by altering a radio frequency (RF) signal. The instantaneous frequency of the RF signal is in direct proportion to changes in the amplitude of the voice signal. The rate of change of the RF signal carries the voice frequency information and the deviation of the RF signal carries the voice amplitude information. When the signal is received the change in frequency is converted back into the original voice signal. The FM modulation technique in this product uses sophisticated algorithms and a digital signal processor (DSP) to perform RF modulation/demodulation. The modulation scheme used for digital two-way radio communications is 4 Level Frequency Shift Keying (4FSK) and Time Division Multiple Access (TDMA). 4FSK is a modulation technique that transmits information by altering the frequency of the radio frequency (RF) signal. Data is converted into complex symbols, which alter the RF signal and transmit the information. When the signal is received, the change in frequency is converted back into symbols and then into the original data. The system can accommodate 2-voice channels in a standard 12.5 kHz channel as used in two-way radio. Time Division Multiple Access (TDMA) is used to allocate portions of the RF signal by dividing time into two slots. Time allocation enables independent units to transmit voice information without interference from each other. Transmission from a unit or base station is accommodated in time-slot lengths of 30 milliseconds and frame lengths of 60 milliseconds. The 4FSK TDMA modulation technique requires sophisticated algorithms and a digital signal processor (DSP) to perform voice compressions/decompressions and RF modulation/demodulation.

The model represented under this filing utilizes removable antenna and is capable of transmitting in the 806-825 MHz, 851-870 MHz, 896-902 MHz and 935-941 MHz bands. The nominal output power and maximum output power for each of the applicable bands are indicated in table 2 below. The max power is 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.

TABLE 2

Frequency Band	Nominal Output Power	Maximum Output Power
806-825, 851-870, 896-902, 935-941 MHz	2.2 W	2.65 W

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 Battery:

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

TABLE 3

Battery Models	Description	*Tested	Comments
NNTN8287A	MOTOTRBO CSA 157 IMPRES Li-Ion, 1750 mAh	Yes	Height = 140mm

*Refer to Exhibit 7B for antenna separation distances.

7.2 Antenna:

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

TABLE 4

Antenna Models	Description	*Tested
PMAF4005A	CSA 800/900+GPS Helical Antenna 806-941MHz, 1/2 wave; 0dBi	Yes

*Refer to Exhibit 7B for antenna separation distances.

7.3 Body worn Accessories:

All additional body worn accessories were tested. The table below lists the body worn accessories and their descriptions.

TABLE 5

Body worn Models	Description	*Tested	Comments
PMLN5606A	Display Hard Leather 3 inch swivel Belt Loop	Yes	
PMLN5607A	Display Soft Leather 3 inch swivel Belt Loop	Yes	
PMLN5134A	ATEX/CSA Belt Clip 2.5 inch Belt Width	Yes	
PMLN5610A	2.5 inch swivel belt loop to be used with PMLN5606A and PMLN5607A	Yes	Tested with carry cases PMLN5606A and PMLN5607A
PMLN5611A	3.0 inch replacement swivel belt loop	No	Replacement kit

*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. Based on KDB publication 643646 provisions only the default audio accessory PMLN5275C highlighted in green required testing for this product due to the low SAR results produced. Audio accessories highlighted in yellow are unique accessories that were not tested based on the allowed test exclusion provisions. Audio accessories with similar construction are noted as such in the relevant comment fields.
Exhibit 7B illustrates photos of the tested audio accessories.

TABLE 6

Audio Acc. Models	Description	Selected for Test	Tested	Comments
PMLN5275C	Behind the Head Heavy Duty Headset	Yes	Yes	Default audio accessory applicable for offered battery, body worn and antenna.
PMMN4067A	IMPRES ATEX CSA Remote Speaker Microphone	Yes	No	Per KDB provisions test not required.
PMMN4050A	IMPRES Noise Canceling RSM with audio jack	Yes	No	Intended for test with RLN4941A. Per KDB provisions test not required.
RLN4941A	RX-only earpiece with translucent tube	Yes	No	Intended for test with PMMN4050A. Per KDB provisions test not required.

8.0 Description of Test System:

8.1 Descriptions of Robotics/Probes/Readout Electronics:

The laboratory utilizes a Dosimetric Assessment System (DASY4™) SAR measurement system Version 4.7 build 80 manufactured by Schmid & Partner Engineering AG (SPEAG™), of Zurich Switzerland. The test system consists of a Stäubli RX90L robot, DAE3, and ES3DV3 E-field probe. The DASY4™ system is operated per the instructions in the DASY4™ 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 7

Phantom ID (s)	Material Parameters	Phantom Dimensions LxWxD (mm)	Material Thickness (mm)	Support Structure Material	Loss Tangent (wood)
ELI4 1103 ELI4 1028	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.

The simulated tissue mixture was mixed based on the Simulated Tissue Composition indicated in Table 8 below for 900 MHz. During the daily testing of this product, the applicable mixture was used to measure the Di-electric parameters at 806, 814, 821, 823, 824, 825, 851, 859, 866, 868, 869, 870, 896, 900, 902, 938, 941 MHz frequencies to verify that the Di-electric parameters were within the tolerance of the tissue specifications.

Simulated Tissue Composition (by mass)

TABLE 8

% of listed ingredients	900MHz	
	Head	Body
Sugar	56.5	44.9
Diacetin	0	0
De ionized -Water	40.95	53.06
Salt	1.45	0.94
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 9

Equipment Type	Model Number	Serial Number	Calibration Date	Calibration Due Date
Power Meter	E4419B	MY40330364	5/20/2011	5/20/2012
Power Sensor	8482B	3318A07546	5/19/2011	5/19/2012
Power Sensor	8482B	3318A07392	5/19/2011	5/19/2012
Power Meter	E4418B	MY45100739	6/9/2011	6/9/2012
Power Sensor	8481B	MY41091243	6/10/2011	6/10/2012
Signal Generator	E4438C	MY45091014	10/11/2010	10/11/2012
Thermometer	HH806AU	80307	10/6/2011	10/6/2012
Therm. Probe	80PK-22	8765	10/7/2011	10/7/2012
Dickson Temp & RH Data Logger	TM320	06153216	6/1/2011	6/1/2012
Amplifier	10W1000C	312858	CNR	CNR
NARDA Bi-Directional Coupler	3020A	41931	8/11/2011	8/11/2012
Tissue Station				
Network Analyzer (HP)	E5071B	MY42403218	6/20/2011	6/20/2012
Dielectric Probe Kit (HP)	85070E	MY44300183	CNR	CNR
Dipole				
Speag Dipole	D900V2	1d025	4/14/2011	4/14/2013
Cables				
CABLE N-type to SMA	TM8-N2S1-60	6072702 001	CNR	CNR
CABLE N-type to N-type	TM8-NKNK-36	6072701 001	CNR	CNR
CABLE N-type to N-type	TM8-NKNK-36	6072701 002	CNR	CNR

* Equipment used for test dates prior to equipment cal due date.

10.0 SAR Measurement System Verification:

The SAR measurements were conducted with probe model/serial number ES3DV3/SN3122. 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 below summarizes the measured tissue parameters used for the SAR assessment. Frequencies in blue are outside FCC Part 90.

TABLE 10

Frequency (MHz)	Tissue Type	Conductivity Target & Range (S/m)	Dielectric Constant Target & Range	Conductivity Meas. (S/m)	Dielectric Constant Meas.	Tested Date
806	FCC Body	0.97 (0.92 -1.02)	55.3 (52.54– 58.07)	0.94	53.5	11/21/11
				0.94	53.8	11/22/11
	IEEE / IEC Head	0.90 (0.86-0.95)	41.7 (39.62-43.79)	0.88	41.0	11/23/11
814	FCC Body	0.97 (0.92 -1.02)	55.3 (52.54– 58.07)	0.95	53.7	11/24/11
	IEEE/ IEC Head	0.90 (0.86-0.95)	41.6 (39.52-43.68)	0.89	40.9	11/23/11
821	FCC Body	0.97 (0.92 -1.02)	55.3 (52.54– 58.07)	0.96	53.7	11/24/11
				0.95	53.5	12/8/11
	IEEE/ IEC Head	0.90 (0.86-0.95)	41.6 (39.52-43.68)	0.89	40.8	11/23/11
				0.89	40.8	12/8/11
823	FCC Body	0.97 (0.92 -1.02)	55.2 (52.44-57.96)	0.96	53.6	11/24/11
	IEEE/ IEC Head	0.90 (0.86-0.95)	41.6 (39.52-43.68)	0.90	40.8	11/23/11
824	FCC Body	0.97 (0.92 -1.02)	55.24 (52.48-58.00)	0.96	53.6	11/24/11
	IEEE/ IEC Head	0.90 (0.86-0.95)	41.56 (39.48-43.64)	0.90	40.8	11/23/11
825	FCC Body	0.97 (0.92 -1.02)	55.24 (52.48-58.00)	0.96	53.6	11/24/11
	IEEE / IEC Head	0.90 (0.86-0.95)	41.55 (39.48-43.63)	0.90	40.8	11/23/11

TABLE 10 (Continued)

Frequency (MHz)	Tissue Type	Conductivity Target & Range (S/m)	Dielectric Constant Target & Range	Conductivity Meas. (S/m)	Dielectric Constant Meas.	Tested Date
851	FCC Body	0.99 (0.94-1.04)	55.15 (52.39-57.91)	0.99	53.3	11/22/11
	IEEE/ IEC Head	0.92 (0.87-0.97)	41.50 (39.43-43.58)	0.92	40.4	11/23/11
859	FCC Body	1.00 (0.95-1.05)	55.13 (52.37-57.89)	1.00	53.2	11/24/11
	IEEE/ IEC Head	0.93 (0.88-0.98)	41.50 (39.43-43.58)	0.93	40.3	11/23/11
866	FCC Body	1.01 (0.96-1.06)	55.1 (52.35-57.86)	1.00	53.2	11/24/11
				1.00	53.1	12/08/11
	IEEE/ IEC Head	0.93 (0.88-0.98)	41.50 (39.43-43.58)	0.94	40.4	11/24/11
				0.93	40.3	12/08/11
868	FCC Body	1.01 (0.96-1.06)	55.1 (52.35-57.86)	1.01	53.1	11/24/11
	IEEE/ IEC Head	0.94 (0.89-0.99)	41.50 (39.43-43.58)	0.94	40.4	11/24/11
869	FCC Body	1.01 (0.96-1.06)	55.1 (52.35-57.86)	1.01	53.1	11/24/11
	IEEE/ IEC Head	0.94 (0.89-0.99)	41.50 (39.43-43.58)	0.94	40.4	11/24/11
870	FCC Body	1.01 (0.96-1.06)	55.1 (52.35-57.86)	1.01	53.1	11/24/11
	IEEE/ IEC Head	0.94 (0.89-0.99)	41.50 (39.43-43.58)	0.94	40.2	11/23/11
896	FCC Body	1.05 (1.00-1.10)	55.0 (52.25-57.75)	1.03	52.9	11/22/11
	IEEE/ IEC Head	0.97 (0.92-1.02)	41.50 (39.43-43.58)	0.96	39.9	11/23/11
900	FCC Body	1.05 (1.00-1.10)	55.0 (52.25-57.75)	1.03	52.5	11/21/11
				1.04	52.9	11/22/11
				1.04	52.8	11/23/11
	IEEE/ IEC Head	0.97 (0.92-1.02)	41.50 (39.43-43.58)	0.97	40.1	11/24/11
				0.96	39.9	12/8/11
902	FCC Body	1.05 (1.00-1.10)	55.0 (52.25-57.75)	1.04	52.8	11/24/11
	IEEE/ IEC Head	0.97 (0.92-1.02)	41.50 (39.43-43.58)	0.97	39.8	11/23/11
938	FCC Body	1.07 (1.02-1.12)	54.9 (52.16-57.65)	1.08	52.5	11/22/11
				1.08	52.4	11/23/11
				1.08	52.5	11/24/11
	IEEE/ IEC Head	0.99 (0.94-1.04)	41.4 (39.33-43.47)	1.01	39.4	11/23/11
941	FCC Body	1.07 (1.02-1.12)	54.9 (52.16-57.65)	1.09	52.4	11/24/11
	IEEE/ IEC Head	0.99 (0.94-1.04)	41.4 (39.33-43.47)	1.01	39.4	11/23/11

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 #	Probe Cal Date	Tissue Type	Dipole Kit / Serial #	Reference SAR @ 1W (W/kg)	System Check Test Results when normalized to 1W (W/kg)	Tested Date
3122	4/14/2011	FCC Body	SPEAG D900V2 / 1d025	10.90+/- 10%	11.17	11/21/11
					11.10	11/22/11
					11.06	11/23/11
		IEEE/ IEC Head	SPEAG D900V2 / 1d025	10.24+/- 10%	10.60	11/24/11
					10.54	12/08/11

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: 21.4-22.8˚C Avg. 22.1˚C
Relative Humidity	30 - 70 %	Range: 44.9-53.9% Avg. 49.4%
Tissue Temperature	NA	Range: 20.2-21.7˚C Avg. 20.7˚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 Body:

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

12.3.2 Head:

Not applicable.

12.3.3 Face:

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

12.4 DUT Test Channels:

The number of test channels was determined by the following equation.

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

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

12.5 DUT Test Plan:

The guidelines and requirements outlined in "SAR Test Reduction Considerations for Occupational PTT Radios" FCC KDB 643646 D01 dated 4/4/11 for head (face) and body were used to assess compliance of this device. All modes of operation identified in section 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.

Note that test results that are outside the relevant FCC frequency allocations are presented herein in blue font. Tests outside Part 90 allocation were performed using the highest configuration for both body and face.

13.0 DUT Test Data

13.1 Assessment at the Body (806-824 MHz band):

The default battery NNTN8287A was used to assess at the Body since it is the only battery offered for this product (refer to Exhibit 7B for the dimension of the battery). The conducted power measurement for all test channels within Part 90 frequency range (806-824 MHz) using the battery NNTN8287A is indicated in Table 13. The channel with the highest conducted power will be identified as the default channel per KDB 643646 D01 SAR Test for PTT Radios v01r01. Highest SAR results from each table are bolded. SAR plots of the highest results are presented in Appendix E-G.

TABLE 13

Test Freq (MHz)	Power (W)
806.0125	2.72
815.5	2.71
824	2.70

13.2 Assessment at the Body with Body-worn accessories:

Assessment of offered body worn accessories with the battery and antenna per KDB 643646 D01 SAR Test for PTT Radios v01r01 – Body SAR Test Considerations for Body-worn Accessories. Refer to Table 13 for the highest output power channel.

TABLE 14

Assessments at the Body (CW mode)											
Antenna	Battery	Carry Accessory	Additional attachments	Test Freq. (MHz)	Initial Power (W)	SAR Drift (dB)	Meas. 1g-SAR (W/kg)	Meas. 10g-SAR (W/kg)	Max Calc. 1g-SAR (W/kg)	Max Calc. 10g-SAR (W/kg)	Run#
PMAF4005A	NNTN8287A	PMLN5606A	PMLN5275C	806.0125	2.70	-0.215	0.085	0.0659	0.04	0.03	Lee-AB-111121-02
				815.5000							
				824.0000							
PMAF4005A	NNTN8287A	PMLN5607A	PMLN5275C	806.0125	2.71	-0.222	0.1011	0.078	0.05	0.04	Lee-AB-111121-03
				815.5000							
				824.0000							
PMAF4005A	NNTN8287A	PMLN5134A	PMLN5275C	806.0125	2.70	-0.193	0.605	0.453	**0.32**	**0.24**	Lee-AB-111121-04
				815.5000							
				824.0000							
PMAF4005A	NNTN8287A	PMLN5606A w/ PMLN5610A	PMLN5275C	806.0125	2.69	-0.128	0.0904	0.0693	0.05	0.04	Lee-AB-111121-05
				815.5000							
				824.0000							
PMAF4005A	NNTN8287A	PMLN5607A w/ PMLN5610A	PMLN5275C	806.0125	2.72	-0.188	0.0994	0.0764	0.05	0.04	Lee-AB-111121-06
				815.5000							
				824.0000							

13.3 Assessment at the Face (806-824 MHz band):

The conducted power measurement for all test channels within Part 90 frequency range (806-824 MHz) using battery NNTN8287A is listed in Table 13. The channel with the highest conducted power was used as the default channel per KDB 643646 D01 SAR Test for PTT Radios v01r01. SAR plots of the highest results per table (bolded) are presented in Appendix E-G.

TABLE 15

Assessments at the Face (CW mode)											
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#**
PMAF4005A	NNTN8287A	None	None	806.0125	2.71	-0.093	0.816	0.597	**0.42**	**0.30**	PS-FACE-111123-03
				815.5000							
				824.0000							

13.4 Assessment at the Body (851-869 MHz band):

The default battery NNTN8287A was used to assess at the Body since it is the only battery offered for this product (refer to Exhibit 7B for the dimension of the battery). The conducted power measurement for all test channels within Part 90 frequency range (851-869 MHz) using the battery NNTN8287A is indicated in Table 16. The channel with highest conducted power will be identified as the default channel per KDB 643646 D01 SAR Test for PTT Radios v01r01. Highest SAR results from each table are bolded. SAR plots of the highest results are presented in Appendix E-G.

TABLE 16

Test Freq (MHz)	Power (W)
851.0125	2.71
860.5	2.69
869	2.69

13.5 Assessment at the Body with Body-worn accessories:

Assessment of offered body worn accessories with the battery and antenna per KDB 643646 D01 SAR Test for PTT Radios v01r01 – Body SAR Test Considerations for Body-worn Accessories. Refer to Table 16 for the highest output power channel.

TABLE 17

Assessments at the Body (CW mode)												
Antenna	**Battery**	**Carry Accessory**	**Additional attachments**	**Test Freq. (MHz)**	**Initial Power (W)**	**SAR Drift (dB)**	**Meas. 1g-SAR (W/kg)**	**Meas. 10g-SAR (W/kg)**	**Max Calc. 1g-SAR (W/kg)**	**Max Calc. 10g-SAR (W/kg)**	**Run#**
PMAF4005A	NNTN8287A	PMLN5606A	PMLN5275C	851.0125	2.70	-0.424	0.127	0.0949	0.07	0.05	PS-AB-111122-03
				860.5000							
				869.0000							
PMAF4005A	NNTN8287A	PMLN5607A	PMLN5275C	851.0125	2.72	-0.418	0.119	0.0891	0.07	0.05	PS-AB-111122-04
				860.5000							
				869.0000							
PMAF4005A	NNTN8287A	PMLN5134A	PMLN5275C	851.0125	2.71	-0.399	0.644	0.4790	**0.35**	**0.26**	PS-AB-111122-05
				860.5000							
				869.0000							
PMAF4005A	NNTN8287A	PMLN5606A w/ PMLN5610A	PMLN5275C	851.0125	2.72	-0.416	0.142	0.1060	0.08	0.06	PS-AB-111122-06
				860.5000							
				869.0000							
PMAF4005A	NNTN8287A	PMLN5607A w/ PMLN5610A	PMLN5275C	851.0125	2.70	-0.391	0.151	0.1130	0.08	0.06	PS-AB-111122-07
				860.5000							
				869.0000							

13.6 Assessment at the Face (851-869 MHz band):

The conducted power measurement for all test channels within Part 90 frequency range (851-869 MHz) using battery NNTN8287A is listed in Table 16. The channel with the highest conducted power was used as the default channel per KDB 643646 D01 SAR Test for PTT Radios v01r01.

TABLE 18

Assessments at the Face (CW mode)											
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#**
PMAF4005A	NNTN8287A	None	None	851.0125	2.74	-0.344	1.030	0.748	**0.56**	**0.40**	PS-FACE-111123-04
				860.5000							
				869.0000							

13.7 Assessment at the Body (896-901 MHz band):

The default battery NNTN8287A was used to assess at the Body since it is the only battery offered for this product (refer to Exhibit 7B for the dimension of the battery). The conducted power measurement for all test channels within Part 90 frequency range (896-901 MHz) using the battery NNTN8287A is indicated in Table 19. The channel with highest conducted power will be identified as the default channel per KDB 643646 D01 SAR Test for PTT Radios v01r01. Highest SAR results from each table are bolded. SAR plots of the highest results are presented in Appendix E-G.

TABLE 19

Test Freq (MHz)	Power (W)
896	2.71
899	2.70
901	2.69

13.8 Assessment at the Body with Body- worn accessories:

Assessment of offered body worn accessories with the battery and antenna per KDB 643646 D01 SAR Test for PTT Radios v01r01 – Body SAR Test Considerations for Body-worn Accessories. Refer to Table 16 for the highest output power channel.

TABLE 20

Assessments at the Body (CW mode)											
Antenna	Battery	Carry Accessory	Additional attachments	Test Freq. (MHz)	Initial Power (W)	SAR Drift (dB)	Meas. 1g-SAR (W/kg)	Meas. 10g-SAR (W/kg)	Max Calc. 1g-SAR (W/kg)	Max Calc. 10g-SAR (W/kg)	Run#
PMAF4005A	NNTN8287A	PMLN5606A	PMLN5275C	896.0000	2.74	-0.516	0.691	0.506	0.39	0.28	PS-AB-111122-08
				899.0000							
				901.0000							
PMAF4005A	NNTN8287A	PMLN5607A	PMLN5275C	896.0000	2.74	-0.523	0.640	0.470	0.36	0.27	Lee-AB-111122-09
				899.0000							
				901.0000							
PMAF4005A	NNTN8287A	PMLN5134A	PMLN5275C	896.0000	2.75	-0.612	2.179	1.568	**1.25**	**0.90**	Lee-AB-111122-10
				899.0000							
				901.0000							
PMAF4005A	NNTN8287A	PMLN5606A w/ PMLN5610A	PMLN5275C	896.0000	2.73	-0.549	0.705	0.517	0.40	0.29	CcC-AB-111122-11
				899.0000							
				901.0000							
PMAF4005A	NNTN8287A	PMLN5607A w/ PMLN5610A	PMLN5275C	896.0000	2.75	-0.525	0.700	0.512	0.39	0.29	CcC-AB-111122-12
				899.0000							
				901.0000							

13.9 Assessment at the Face (896-901 MHz band):

The conducted power measurement for all test channels within Part 90 frequency range (896-901 MHz) using battery NNTN8287A is listed in Table 19. The channel with the highest conducted power was used as the default channel per KDB 643646 D01 SAR Test for PTT Radios v01r01.

TABLE 21

Assessments at the Face (CW mode)											
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#**
PMAF4005A	NNTN8287A	None	None	896.0000	2.74	-0.256	1.284	0.921	**0.68**	**0.49**	PS-FACE-111123-05
				899.0000							
				901.0000							

13.10 Assessment at the Body (935-940 MHz band):

The default battery NNTN8287A was used to assess at the Body since it is the only battery offered for this product (refer to Exhibit 7B for the dimension of the battery). The conducted power measurement for all test channels within part 90 frequency range (935-940 MHz) using the battery NNTN8287A is indicated in Table 22. The channel with highest conducted power will be identified as the default channel per KDB 643646 D01 SAR Test for PTT Radios v01r01. Highest SAR results from each table are bolded. SAR plots of the highest results are presented in Appendix E-G.

TABLE 22

Test Freq (MHz)	Power (W)
935	2.68
938	2.69
940	2.67

13.11 Assessment at the Body with Body- worn accessories:

Assessment of offered body worn accessories with the battery and antenna per KDB 643646 D01 SAR Test for PTT Radios v01r01 – Body SAR Test Considerations for Body-worn Accessories. Refer to Table 22 for the highest output power channel.

TABLE 23

Antenna	Battery	Carry Accessory	Additional attachments	Test Freq. (MHz)	Initial Power (W)	SAR Drift (dB)	Meas. 1g-SAR (W/kg)	Meas. 10g-SAR (W/kg)	Max Calc. 1g-SAR (W/kg)	Max Calc. 10g-SAR (W/kg)	Run#
Assessments at the Body (CW mode)											
PMAF4005A	NNTN8287A	PMLN5606A	PMLN5275C	935.0000							
				938.0000	2.73	-0.812	1.130	0.822	0.68	0.50	CcC-AB-111122-13
				940.0000							
PMAF4005A	NNTN8287A	PMLN5607A	PMLN5275C	935.0000							
				938.0000	2.74	-0.837	1.150	0.837	0.70	0.51	CcC-AB-111122-14
				940.0000							
PMAF4005A	NNTN8287A	PMLN5134A	PMLN5275C	935.0000							
				938.0000	2.76	-0.804	2.180	1.570	**1.31**	**0.94**	CcC-AB-111122-16
				940.0000							
PMAF4005A	NNTN8287A	PMLN5606A w/ PMLN5610A	PMLN5275C	935.0000							
				938.0000	2.74	-0.959	1.120	0.815	0.70	0.51	CcC-AB-111122-17
				940.0000							
PMAF4005A	NNTN8287A	PMLN5607A w/ PMLN5610A	PMLN5275C	935.0000							
				938.0000	2.75	-0.880	1.210	0.879	0.74	0.54	PS-AB-111123-02
				940.0000							

13.12 Assessment at the Face (935-940 MHz band):

The conducted power measurement for all test channels within Part 90 frequency range (935-940 MHz) using battery NNTN8287A is listed in Table 22. The channel with the highest conducted power was used as the default channel per KDB 643646 D01 SAR Test for PTT Radios v01r01.

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#
Assessments at the Face (CW mode)											
PMAF4005A	NNTN8287A	None	None	935.0000							
				938.0000	2.76	-0.593	1.780	1.280	**1.02**	**0.73**	PS-FACE-111123-06
				940.0000							

13.13 Assessment of Outside FCC Part 90 at body:

Assessment using highest SAR configuration from Part 90 assessment above (Run# CcC-AB-111122-16; Table 23) across the offered antenna.

TABLE 25

Assessments at the Body (CW mode)											
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#
806-825 MHz											
PMAF4005A	NNTN8287A	PMLN5134A	PMLN5275C	825.0000	2.72	-0.315	0.784	0.587	0.42	0.32	PS-AB-111124-05
851-870 MHz											
PMAF4005A	NNTN8287A	PMLN5134A	PMLN5275C	870.0000	2.72	-0.375	1.032	0.757	0.56	0.41	PS-AB-111124-06
896-902 MHz											
PMAF4005A	NNTN8287A	PMLN5134A	PMLN5275C	902.0000	2.75	-0.491	2.265	1.646	1.27	0.92	PS-AB-111124-07
935-941 MHz											
PMAF4005A	NNTN8287A	PMLN5134A	PMLN5275C	941.0000	2.81	-0.926	1.740	1.250	1.08	0.77	PS-AB-111124-08

13.14 Assessment of Outside FCC Part 90 at the face:

Assessment using highest SAR configuration from Part 90 assessment above (Run# PS-FACE-111123-06; Table 24) across the offered antenna.

TABLE 26

Assessments at the Face (CW mode)											
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#
806-825 MHz											
PMAF4005A	NNTN8287A	None	None	825.0000	2.71	-0.278	1.130	0.826	0.60	0.44	CcC-FACE-111123-07
851-870 MHz											
PMAF4005A	NNTN8287A	None	None	870.0000	2.70	-0.255	1.020	0.740	0.54	0.39	CcC-FACE-111123-08
896-902 MHz											
PMAF4005A	NNTN8287A	None	None	902.0000	2.73	-0.364	1.261	0.900	0.69	0.49	CcC-FACE-111123-09
935-941 MHz											
PMAF4005A	NNTN8287A	None	None	941.0000	2.75	-0.637	1.760	1.260	1.02	0.73	CcC-FACE-111123-10

13.15 Assessment of Industry Canada freq range:

Additional tests have been performed for Canada frequencies. Assessment using the overall highest SAR configuration from both body and face assessments. Highest SAR results from each table are bolded. SAR plots of the highest results are presented in Appendix E-G.

TABLE 27

Assessments at the Body (CW mode)											
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#
806-821 MHz band											
PMAF4005A	NNTN8287A	PMLN5134A	PMLN5275C	806.0125	2.70	-0.193	0.605	0.453	0.32	0.24	Lee-AB-111121-04
PMAF4005A	NNTN8287A	PMLN5134A	PMLN5275C	813.5000	2.73	-0.412	0.644	0.482	0.35	0.26	CcC-AB-111124-09
PMAF4005A	NNTN8287A	PMLN5134A	PMLN5275C	820.9875	2.73	-0.308	0.730	0.545	**0.39**	**0.29**	CcC-AB-111124-10
821-824 MHz band											
PMAF4005A	NNTN8287A	PMLN5134A	PMLN5275C	821.0000	2.77	-0.293	0.769	0.574	**0.41**	**0.31**	PS-AB-111208-04
PMAF4005A	NNTN8287A	PMLN5134A	PMLN5275C	822.5125	2.70	-0.327	0.715	0.534	0.39	0.29	CcC-AB-111124-11
PMAF4005A	NNTN8287A	PMLN5134A	PMLN5275C	824.0000	2.70	-0.346	0.726	0.543	0.39	0.29	CcC-AB-111124-12
851-866 MHz band											
PMAF4005A	NNTN8287A	PMLN5134A	PMLN5275C	851.0125	2.71	-0.399	0.644	0.4790	0.35	0.26	PS-AB-111122-05
PMAF4005A	NNTN8287A	PMLN5134A	PMLN5275C	858.5000	2.73	-0.385	0.736	0.537	0.40	0.29	CcC-AB-111124-13
PMAF4005A	NNTN8287A	PMLN5134A	PMLN5275C	865.9875	2.71	-0.144	1.015	0.743	**0.52**	**0.38**	CcC-AB-111124-14
866-869 MHz band											
PMAF4005A	NNTN8287A	PMLN5134A	PMLN5275C	866.0000	2.71	-0.483	1.015	0.737	0.57	0.41	PS-AB-111208-05
PMAF4005A	NNTN8287A	PMLN5134A	PMLN5275C	867.5125	2.69	-0.390	1.100	0.809	**0.60**	**0.44**	CcC-AB-111124-15
PMAF4005A	NNTN8287A	PMLN5134A	PMLN5275C	869.0000	2.72	-0.342	0.995	0.729	0.54	0.39	CcC-AB-111124-16

TABLE 28

Assessments at the Face (CW mode)											
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#
806-821 MHz band											
PMAF4005A	NNTN8287A	None	None	806.0125	2.70	-0.0606	0.841	0.615	0.43	0.31	CcC-FACE-111123-11
PMAF4005A	NNTN8287A	None	None	813.5000	2.72	-0.0946	0.900	0.662	0.46	0.34	CcC-FACE-111123-12
PMAF4005A	NNTN8287A	None	None	820.9875	2.75	-0.143	1.127	0.823	**0.58**	**0.43**	CcC-FACE-111123-13
821-824 MHz band											
PMAF4005A	NNTN8287A	None	None	821.0000	2.74	-0.178	1.086	0.792	0.57	0.41	PS-FACE-111208-02
PMAF4005A	NNTN8287A	None	None	822.5125	2.71	-0.249	1.170	0.858	0.62	0.45	CcC-FACE-111123-14
PMAF4005A	NNTN8287A	None	None	824.0000	2.70	-0.317	1.160	0.848	**0.62**	**0.46**	CcC-FACE-111123-15
851-866 MHz band											
PMAF4005A	NNTN8287A	None	None	851.0125	2.73	-0.372	1.040	0.756	**0.57**	**0.41**	CcC-FACE-111123-16
PMAF4005A	NNTN8287A	None	None	858.5000	2.72	-0.282	1.040	0.757	0.55	0.40	CcC-FACE-111123-17
PMAF4005A	NNTN8287A	None	None	865.9875	2.68	-0.231	1.060	0.770	0.56	0.41	PS-FACE-111124-02
866-869 MHz band											
PMAF4005A	NNTN8287A	None	None	866.0000	2.75	-0.232	1.032	0.746	0.54	0.39	PS-FACE-111208-03
PMAF4005A	NNTN8287A	None	None	867.5125	2.71	-0.298	1.040	0.754	0.56	0.40	PS-FACE-111124-03
PMAF4005A	NNTN8287A	None	None	869.0000	2.73	-0.281	1.070	0.771	**0.57**	**0.41**	PS-FACE-111124-04

13.16 Assessment of other audio accessories at the body :

Assessment per KDB 643646 D01 Body SAR Test Considerations for Audio Accessories without Built-in Antenna; Sec 1, A. when overall < 4.0 W/kg, SAR tests for that audio accessory is not necessary. This was applicable to all remaining accessories.

13.17 Shorten Scan Assessment

Short scan assessment: A "shortened" scan was performed to validate the SAR drift of the full DASY4™ 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. Both SAR results from the table below are provided in APPENDIX E.

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#
Full scan											
PMAF4005A	NNTN8287A	PMLN5134A	PMLN5275 C	938.0000	2.74	-0.542	2.430	1.740	1.38	0.99	CcC-AB-111124-17
Shorten scan											
PMAF4005A	NNTN8287A	PMLN5134A	PMLN5275 C	938.0000	2.72	-0.217	2.460	1.760	1.29	0.93	CcC-AB-111124-18

14.0 Simultaneous Transmission Exclusion:

NA.

15.0 Conclusion:

The highest Operational Maximum Calculated 1-gram and 10-gram average SAR values found for this filing: Model PMUF1473B :

Results for FCC Part 90 (806-824, 851-869, 896-901 & 935-940 MHz)

TABLE 30

Frequency Range (MHz)	Max Calc at Body (W/kg)		Max Calc at Face (W/kg)	
	1g-SAR	10g-SAR	1g-SAR	10g-SAR
806-824	0.32	0.24	0.42	0.30
851-869	0.35	0.26	0.56	0.40
896-901	1.25	0.90	0.68	0.49
935-940	1.38	0.99	1.02	0.73

Results for Industry Canada (806-821, 821-824, 851-866, 866-869, 896-901 & 935-940 MHz)

TABLE 31

Frequency Range (MHz)	Max Calc at Body (W/kg)		Max Calc at Face (W/kg)	
	1g-SAR	10g-SAR	1g-SAR	10g-SAR
806-821	0.39	0.29	0.58	0.43
821-824	0.39	0.29	0.62	0.46
851-866	0.52	0.38	0.57	0.41
866-869	0.60	0.44	0.57	0.41
896-901	1.25	0.90	0.68	0.49
935-940	1.38	0.99	1.02	0.73

Results for entire band (806-825, 851-870, 896-902 & 935-941 MHz)

TABLE 32

Frequency Range (MHz)	Max Calc at Body (W/kg)		Max Calc at Face (W/kg)	
	1g-SAR	10g-SAR	1g-SAR	10g-SAR
806-825	0.42	0.32	0.62	0.46
851-870	0.60	0.44	0.57	0.41
896-902	1.27	0.92	0.69	0.49
935-941	1.38	0.99	1.02	0.73

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.

APPENDIX A
Measurement Uncertainty

The Measurement Uncertainty tables indicated in this APPENDIX are applicable to the DUT ranging from 800 MHz to 3 GHz and for Dipole test frequencies ranging from 800 MHz to 3 GHz. Therefore, the highest tolerance for the probe calibration uncertainty is indicated.

TABLE 1

Uncertainty Budget for Device Under Test, for 800 MHz to 3 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	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	

FCD-0558 Uncertainty Budget Rev.8

TABLE 2
Uncertainty Budget for System Validation (dipole & flat phantom) for 800 MHz to 3 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	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 Rev.8

Notes for Tables 1 and 2
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 MY (Precision)**

Certificate No: **ES3-3122_Apr11**

CALIBRATION CERTIFICATE

Object: ES3DV3 - SN:3122

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 14, 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 14, 2011

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

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

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

Accreditation No.: **SCS 108**

Glossary:

TSL	tissue simulating liquid
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:3122

Manufactured: July 11, 2006
Calibrated: April 14, 2011

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

DASY/EASY - Parameters of Probe: ES3DV3 - SN:3122

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(V/m)^2$)[A]	1.36	1.24	1.44	± 10.1 %
DCP (mV)[B]	100.4	101.6	100.8	

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	116.7	±1.9 %
			Y	0.00	0.00	1.00	113.1	
			Z	0.00	0.00	1.00	127.1	

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:3122

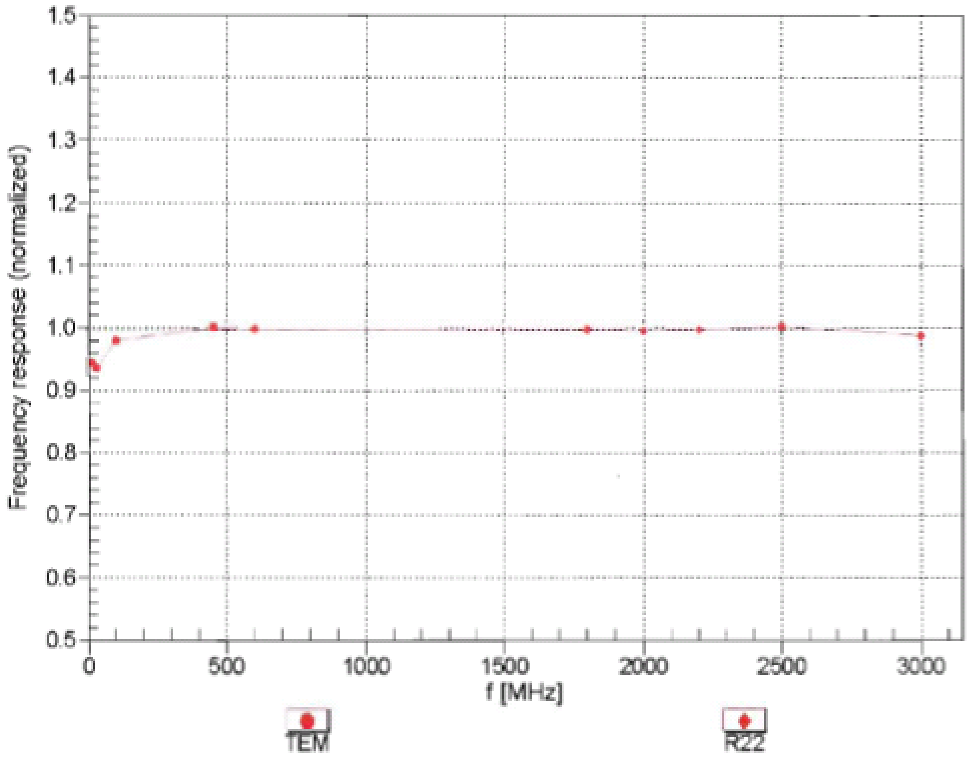
Calibration Parameter Determined in Head Tissue Simulating Media

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	6.79	6.79	6.79	0.25	1.05	± 13.4 %
450	43.5	0.87	6.43	6.43	6.43	0.15	1.74	± 13.4 %
750	41.9	0.89	6.24	6.24	6.24	0.99	1.12	± 12.0 %
900	41.5	0.97	5.94	5.94	5.94	0.99	1.11	± 12.0 %
1810	40.0	1.40	5.07	5.07	5.07	0.86	1.20	± 12.0 %
2300	39.5	1.67	4.71	4.71	4.71	0.74	1.33	± 12.0 %
2450	39.2	1.80	4.41	4.41	4.41	0.73	1.34	± 12.0 %
2600	39.0	1.96	4.28	4.28	4.28	0.72	1.38	± 12.0 %
3500	37.9	2.91	4.07	4.07	4.07	0.85	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.

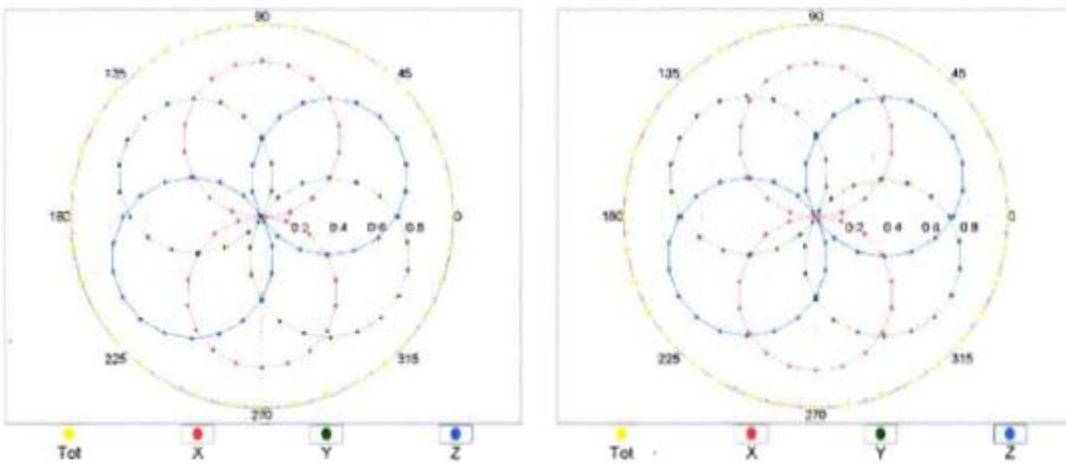
Frequency Response of E-Field

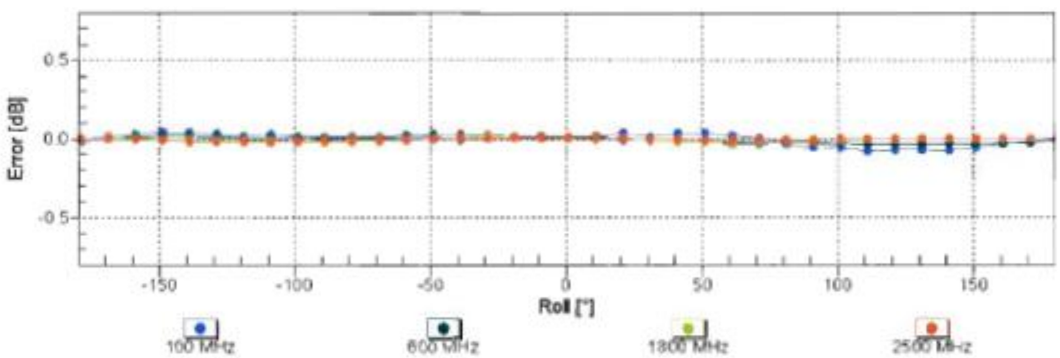
(TEM-Cell:ifi110 EXX, Waveguide: R22)



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

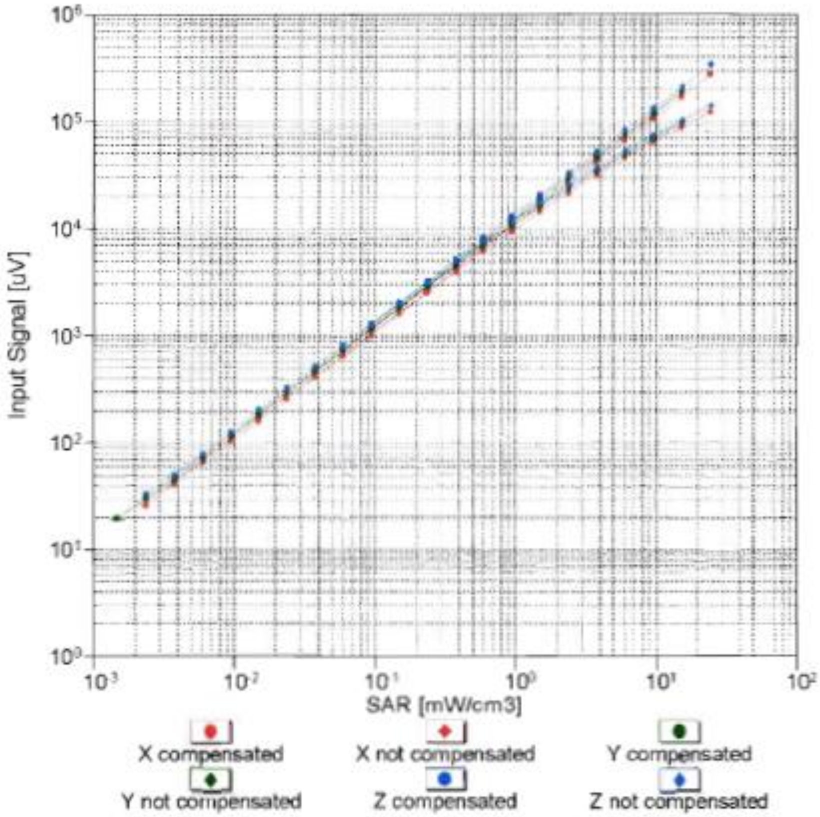
Receiving Pattern (ϕ), $\vartheta = 0°$

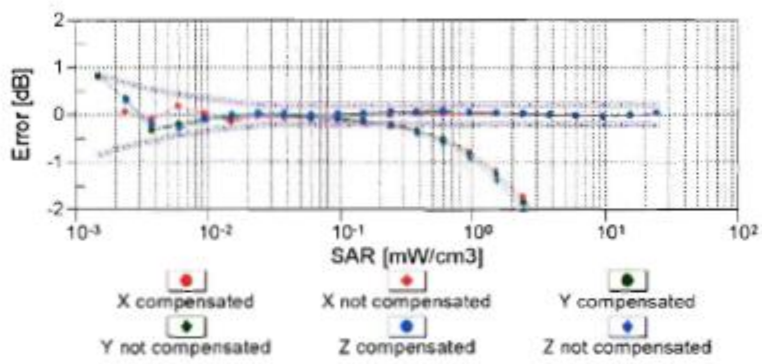




Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

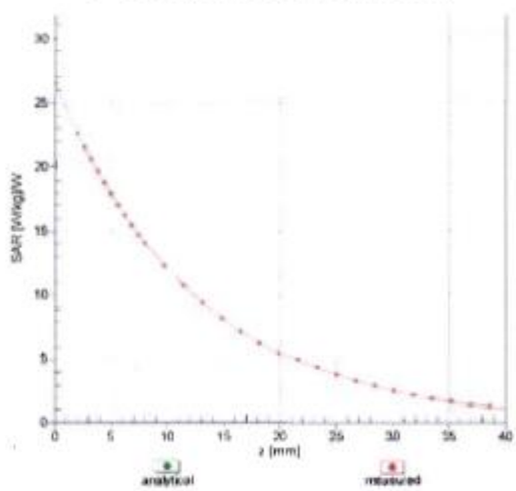
Dynamic Range f(SAR_{head})
(TEM cell , f = 900 MHz)

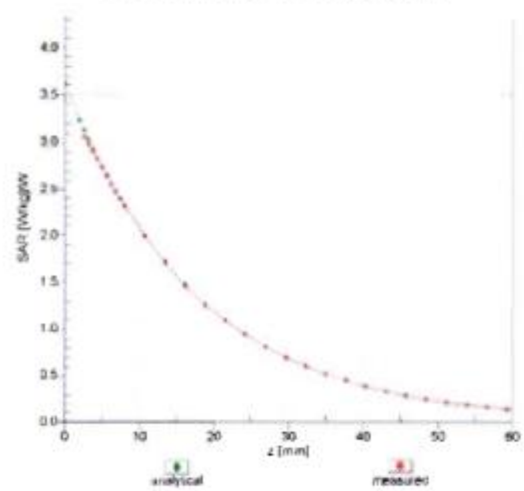




Uncertainty of Linearity Assessment: ± 0.6% (k=2)

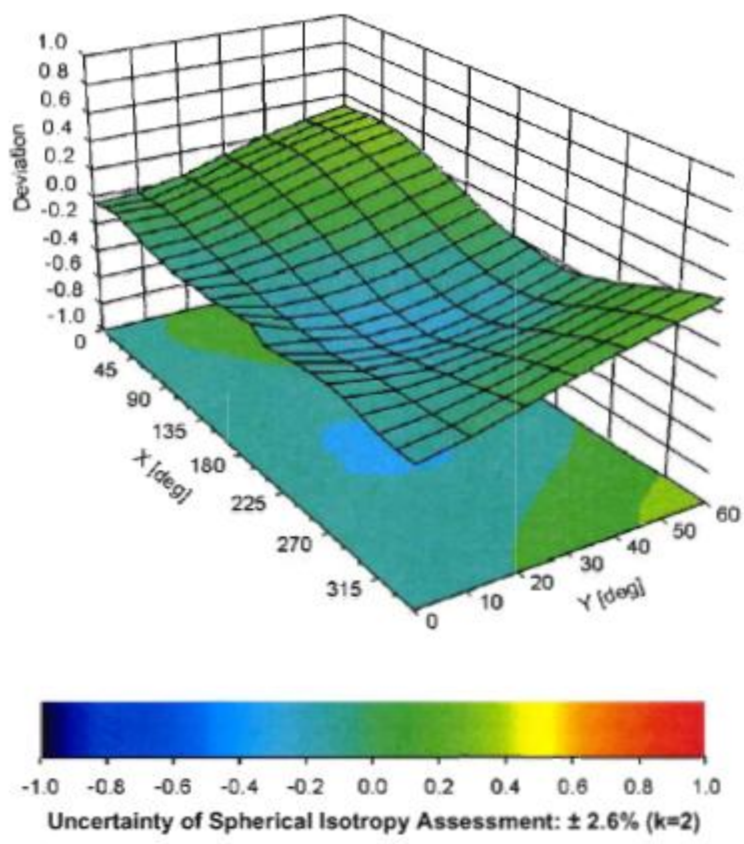
Conversion Factor Assessment





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:3122

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:	**3122**
Place of Assessment:	**Zurich**
Date of Assessment:	**April 18, 2011**
Probe Calibration Date:	**April 14, 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:3122

Conversion factor (± standard deviation)

150 MHz	*ConvF*	**8.1 ± 10%**	ε_r = 52.3 σ = 0.76 mho/m (head tissue)
250 MHz	*ConvF*	**7.5 ± 10%**	ε_r = 47.6 σ = 0.83 mho/m (head tissue)
150 MHz	*ConvF*	**7.8 ± 10%**	ε_r = 61.9 σ = 0.80 mho/m (body tissue)
250 MHz	*ConvF*	**7.4 ± 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

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 MY (Precision)**

Certificate No: **D900V2-1d025_Apr11**

CALIBRATION CERTIFICATE

Object: D900V2 - SN: 1d025

Calibration procedure(s): QA CAL-05.v8
Calibration procedure for dipole validation kits

Calibration date: April 14, 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 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:	Claudio Leubler	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: April 15, 2011

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

S Schweizerischer Kalibrierdienst
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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**

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	V52.6.2
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom V4.9	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	900 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.2 °C	41.5	0.97 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	39.9 ± 6 %	0.94 mho/m ± 6 %
Head TSL temperature during test	(22.0 ± 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	2.80 mW / g
SAR normalized	normalized to 1W	11.2 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**11.4 mW /g ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.80 mW / g
SAR normalized	normalized to 1W	7.20 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**7.28 mW /g ± 16.5 % (k=2)**

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	51.7 Ω - 6.6 jΩ
Return Loss	- 23.5 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.408 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 08, 2005

DASY5 Validation Report for Head TSL

Date/Time: 14.04.2011 15:55:06

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 900 MHz; Type: D900V2; Serial: D900V2 - SN:1d025

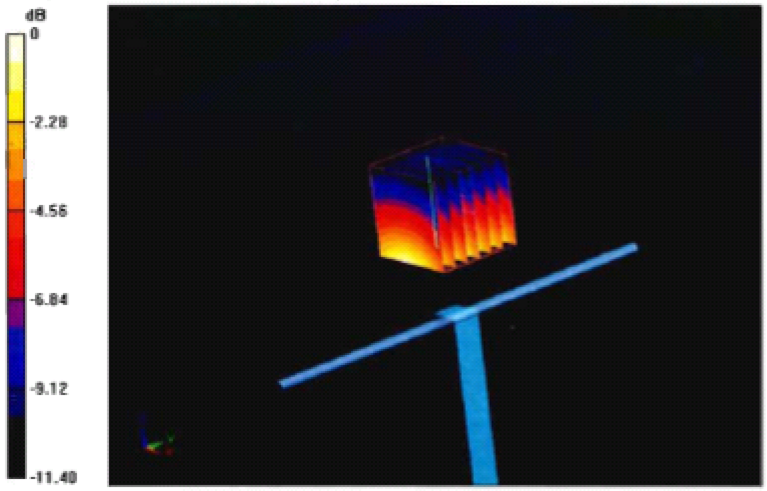
Communication System: CW; Frequency: 900 MHz; Duty Cycle: 1:1
Medium: HSL900
Medium parameters used: f = 900 MHz; σ = 0.94 mho/m; ε_r = 39.9; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(5.88, 5.88, 5.88); Calibrated: 30.04.2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 10.06.2010
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- Measurement SW: DASY52, V52.6.2 Build (424)
- Postprocessing SW: SEMCAD X, V14.4.4 Build (2829)

Head/d=15mm, Pin=250 mW/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 60.148 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 4.227 W/kg
SAR(1 g) = 2.8 mW/g; SAR(10 g) = 1.8 mW/g
Maximum value of SAR (measured) = 3.238 mW/g



0 dB = 3.240mW/g

Impedance Measurement Plot for Head TSL