MOTOROLA

ACCREDITED
Certificate Number: 1449-01

FCC ID: AZ489FT3810
DECLARATION OF COMPLIANCE SAR ASSESSMENT Part 1 of 2

CGISS EME Test Laboratory
8000 West Sunrise Blvd
Fort Lauderdale, FL. 33322

Date of Report: February 15, 2005
Report Revision: Rev. A
Report ID: FCC rpt_AlphaL VHF_Rev A_050215 SR1795

Responsible Engineer:	Jim Fortier (Elect. Principle Staff Eng.)
Date/s Tested:	12/8/04 -12/10/04
Manufacturer/Location:	Motorola
Sector/Group/Div.:	CGISS/GTDG
Date submitted for test:	11/19/04
DUT Description:	Portable, PTT, Alpha L VHF 5W 150-174Mhz, 16ch, Black
Test TX mode(s):	CW
Max. Power output:	5.5 Watts
Nominal Power:	5.0 Watts
Tx Frequency Bands:	150-174 MHz
Signaling type:	FM
Model(s) Tested:	PMUD2085A
Model(s) Certified:	PMUD2085A
Serial Number(s):	027YEU0007, 027YEU0006
Classification:	Occupational/Controlled
Rule Part(s):	90.210

Approved Accessories:

Antenna(s):
PMAD4051 (Alpha L antenna 150-174MHZ ¼ wave, 14cm, -3dBi)
Battery(ies):
PMNN4071A (NiMH battery)
Body worn accessory:
RLN5644A (Spring Belt clip); PMLN4691A (Standard Belt clip)
Audio Accessories:
PMMN4008A (RSM); PMLN4442A (Earbud w/ in-line mic & PTT/VOX switch); PMLN4443A (Ear receiver w/ in-line mic & PTT/VOX switch; PMLN4444A (Earphone Boom mic w/ in-line mic & PTT/VOX switch); PMLN4445A (Ultra lightweight headset w/ in-line PTT/VOX switch)

Max. Calc. 1-g/10-g Avg. SAR: 1.85/1.38 W/kg (Head/Face); 2.21/1.43 W/kg (Body)

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 2.0 of this report. This report shall not be reproduced without written approval from an officially designated representative of the Motorola EME Laboratory.

This reporting format is consistent with the test report guidelines of the TIA TSB-150 December 2004
The results and statements contained in this report pertain only to the device(s) evaluated.

Signature on file

Ken Enger CGISS EME Lab Senior Resource Manager, Laboratory Director,

2/16/05
Approval Date:

Certification Date: 12/17/04

Certification No.: L1041246

Part 1 of 2

Part 2 of 2

Appendices

REVISION HISTORY

Date	Revision	Comments
12/17/04	O	Release of Prototype results
2/15/05	A	Corrected additional accessory model number stated in band edge and 2.5cm assessment sections of table 1 pg 10.

1.0 Introduction and Overview

This report details the utilization, test setup, test equipment, and test results of the Specific Absorption Rate (S.A.R.) measurements performed at the CGISS EME Test Lab for model number PMUD2085A, FCC ID: AZ489FT3810.

The test results presented herein clearly demonstrate compliance with FCC Occupational/Controlled RF Exposure limits of **8.0 mW/g** per the requirements of 47 CFR 2.1093(d).

2.0 Reference Standards and Guidelines

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

- 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 Electronic Engineers (IEEE) C95. 1-1992
- Institute of Electrical and Electronic Engineers (IEEE) C95.1-1999 Edition
- International Commission on Non-Ionizing Radiation Protection (ICNIRP) 1998
- Ministry of Health (Canada) Safety Code 6. Limits of Human Exposure to Terminal frequency Electromagnetic Fields in the Frequency Range from 3 kHz to 300 GHz, 1999
- Australian Communications Authority Radiocommunications (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 9KHz and 300 GHz." and “Attachment to resolution # 303 from July 2, 2002”
- Health Canada, “Limits of Human Exposure to Radiofrequency Electromagnetic Fields in the Frequency Range from 3 kHz to 300 GHz”, Safety Code 6.
- Industry Canada, “Evaluation Procedure for Mobile and Portable Radio Transmitters with respect to Health Canada’s Safety Code 6 for Exposure of Humans to Radio Frequency Fields”, Radio Standards Specification RSS-102 Issue 1 (Provisional): September 1999.

2.1 SAR Limits

EXPOSURE LIMITS	SAR (W/kg)	
	(General Population / Uncontrolled Exposure Environment)	(Occupational / Controlled Exposure Environment)
Spatial Average (averaged over the whole body)	0.08	**0.4**
Spatial Peak (averaged over any 1-g of tissue)	1.60	**8.0**
Spatial Peak (hands/wrists/feet/ankles averaged over 10-g)	4.0	**20.0**
Localized SAR (Head and Trunk 10-g)	2.0	**10.0**

3.0 Description of Device Under Test (DUT)

FCC ID: AZ489FT3810 is a VHF portable two-way radio that operates using frequency modulation (FM) incorporating traditional simplex transmission protocol. This radio is intended to be assessed using CW transmission via its' inherent test mode signaling capability. The radio has a removable antenna and does not have a keypad or a display and is capable of transmitting in the 150-174MHz band. The nominal output power is 5.0 watts with a maximum output power of 5.5 watts as defined by the upper limit of the production line final test station. The intended operating positions are "at the face" with the DUT 1 to 2 inches 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 connect to the radio. This device will be marketed to and used by employees solely for occupational operations, such as public safety agencies, e.g. police, fire and emergency medical. User training is the responsibility of these agencies, which can be expected to employ the usage instructions, safety information and operational cautions set forth in the user's manual, instructional sessions or other means. Motorola also makes available to its customers training classes on the proper use of two-way radios and wireless data devices.

FCC ID: AZ489FT3810 is offered with the options and accessories listed on the coversheet of this report:

Test Output Power

A table of the characteristic power slump versus time is provided in Appendix F.

4.0 Description of Test System

4.1 Descriptions of Robotics/probes/Readout Electronics

The laboratory utilizes a Dosimetric Assessment System (DASY3™) S.A.R. measurement system Version 3.1d manufactured by Schmid & Partner Engineering AG (SPEAG™), of Zurich Switzerland. The test system consists of a Stäubli RX90L robot with ET3DV6 and EX3DV3 E-Field probes. Please reference the SPEAG user manual and application notes for detailed probe, robot, and S.A.R. computational procedures. Section 5.0 presents relevant 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 S.A.R. 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.

4.2 Description of Phantom(s)

4.2.1 Flat Phantom

A rectangular shaped box made of high density polyethylene (HDPE) material. The phantom is mounted on a wooden supporting structure that has a loss tangent of < 0.05. The structure has a 68.58 cm x 25.4 cm opening at its center to allow positioning the DUT to the phantom's surface.

The flat phantom dimensions used for S.A.R. performance assessment are L = 80cm, W = 60cm, H = 20cm, Surface Thickness = 0.2cm.

4.2.2 SAM Phantom

N/A

4.3 Description of Equivalent tissues

Type 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 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 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. The solution is mixed thoroughly, covered, and allowed to sit overnight prior to use.

4.3.2 Simulated Tissue Composition

% of listed ingredients	300MHz		162MHz	
	Head	Body	Head	Body
Sugar	56.0	47.1	55.4	49.7
DGBE (Glycol)	NA	NA	NA	NA
Diacetin	NA	NA	NA	NA
De ionized -Water	37.5	49.48	38.35	46.2
Salt	5.4	2.32	5.15	2.8
HEC	1	1	1	1
Bact.	0.1	0.1	0.1	0.1

Reference section 6.1 for target parameters

5.0 Additional Test Equipment

Equipment Type	Model Number	Serial Number	Calibration Due Date
Coupler (NARDA)	3020A	40295	7/18/2006
Sensor (HP/Agilent)	8482B	3318A06774	3/1/2005
Sensor (HP/Agilent)	8481H	2703A14631	9/29/2005
Power meter (HP/Agilent)	437B	3125U16028	9/29/05
Power meter (HP/Agilent)	437B	3737U26425	11/1/05
Sig Gen (HP/Agilent)	E4421B	US39270649	1/27/05
AMP (Amplifier Research)	1W1000	16625	CNR (Cal Not Req.)
Network Analyzer (HP/Agilent)	8753D	3410A06417	6-Jan-05
Dielectric Probe Kit (HP/Agilent)	85070C	US99360076	CNR
Speag Dipole	D300V2	1001	5/22/05
Spectrum Analyzer (HP)	8561E	SPHPAP18	CNR
Power Amplifier	10WD1000	AMAHG016	CNR

6.0 SAR Measurement System Verification

The S.A.R. measurements were conducted with probe model/serial number ET3DV6/SN1383. The system performance check was conducted daily and within 24 hours prior to testing. DASY output files of the system performance test results and the probe/dipole calibration certificates are included in appendices B and C respectively. The table below summarizes the system performance check results normalized to 1W.
Dipole validation scans at the head from SPEAG are provided in APPENDIX D. The CGISS EME lab validated the dipole to the applicable IEEE 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 CGISS EME system performance validation are provided herein.

6.1 Equivalent Tissue Test Results

Simulated tissue prepared for S.A.R. measurements is measured daily and within 24 hours prior to actual S.A.R. 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 Agilent (HP) probe kit model 85070C and a HP8753D Network Analyzer.

Actual versus Target tissue parameters (12/89/04 – 12/10/04)

FCC Body				
Frequency (MHz)	**Di-electric Constant Target**	**Di-electric Constant Meas. (Range)**	**Conductivity Target S/m**	**Conductivity Meas. (Range) S/m**
300	58.2	56.4-56.7	0.92	0.88-0.88
162	61.6	59.7-60.2	0.81	0.78-0.78

IEEE Head				
Frequency (MHz)	**Di-electric Constant Target**	**Di-electric Constant Meas. (Range)**	**Conductivity Target S/m**	**Conductivity Meas. (Range) S/m**
300	45.3	46.9-46.9	0.87	0.88-0.88
162	51.7	52.1-52.1	0.77	0.77-0.77

6.2 System Check Test Results

Probe Serial #	Tissue Type	Probe Cal Date	Dipole Kit / Serial #	System Perf. Result when normalized to 1W (mW/g)	Reference S.A.R @ 1W (mW/g)	Test Date(s)
1383	FCC Body	2/25/04	SPEAG D300V2 /1001	2.77 +/- 0.00	2.76 +/- 10%	12/9/04
1383	IEEE Head	2/25/04	SPEAG D300V2 /1001	2.91 +/- 0.03	2.89 +/- 10%	12/8/04 & 12/10/04

Note: see APPENDIX D for an explanation of the reference S.A.R. targets stated above.

The DASY3™ system is operated per the instructions in the DASY3™ Users Manual. The complete manual is available directly from SPEAG™. All measurement equipment used to assess EME S.A.R. compliance was calibrated according to 17025 A2LA guidelines.

7.0 DUT Test Strategy and Methodology

7.1 DUT Configuration

PTT operation using Frequency Modulation (FM) in CW transmission mode
The DUT's PTT switch is engaged and the radio is placed in the reported test positions presented in Appendix G.

7.1 Test Plan

All options and accessories listed on the cover page of this report were considered in order to develop the S.A.R. test plan for this product. S.A.R. measurements were performed using a flat phantom with the applicable simulated tissue to assess performance at the body and face using the relevant transmission modes.
Note that a coarse-to-cube approximation methodology was utilized to determine the worst-case S.A.R. performance configuration for each applicable body location. The test configurations that produced the highest S.A.R. results for each body position using the coarse-to-cube approximation methodology were assessed using the full DASY3™ coarse and 5x5x7 cube scans.

Assessments at the Body [Page 11 of 12; Table 1]

The DUT was assessed at the center frequency of the band, in CW mode, against the phantom using the offered antenna and battery along with audio accessory model PMMN4008A and each of the offered body worn accessories.
The DUT was assessed at the center frequency of the band, in CW mode, against the phantom using the worst case test configuration from above with each of the other offered audio accessories.
The DUT was assessed at the transmission band edges, in CW mode, against the phantom using the worst case test configuration above.

Assessments at the body (@ 2.5cm) [Page 11 of 12; Table 1]

The DUT was assessed with its' front, back, and antenna (back towards phantom) separated 2.5cm from the phantom without the body worn accessory, in CW mode using the worst case test configuration from above.

Assessments at the face [Page 12 of 12; Table 2]

The DUT was assessed across the transmission band, in CW mode, using the offered battery and antenna.

Shortened scan assessment at the body [APPENDIX E Part 2 of 2]

A "shortened" scan was performed using the test configuration that produced the highest S.A.R. results overall at the body. Note that the shortened scan is obtained by first running a coarse scan to find the peak area and then, using a newly charged battery, perform a cube scan only. The shortened scan represents the cube scan performance results.

7.2 Device Positioning Procedures

Reference Appendix G for photos of the DUT tested positions.

7.2.1 Body

The DUT was positioned such that the applicable carry case accessories were centered against the body phantom as close as possible according to a normal use position. The DUT back housing and front housing was positioned with 2.5cm separation distance from the flat phantom. Attached accessories are allowed to hang straight down from the radio.

7.2.2 Head

NA

7.2.3 Face

The DUT was positioned at the center of the flat phantom with a 2.5cm separation distance from the front housing.

8.0 Environmental Test Conditions

The EME Laboratory 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 15cm +/- 0.5cm. 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 S.A.R. tests reported herein:

	Target	Measured
Ambient Temperature	20 - 25 ˚C	Range: 20.6-22.8˚C Avg. 21.3˚C
Relative Humidity	30 - 70 %	Range: 47.4-56.2% Avg. 52.2%
Tissue Temperature	NA	Range: 20.1-20.3˚C Avg. 20.2 ˚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 S.A.R scans are repeated. However, the lab environment is sufficiently protected such that no S.A.R. impacting interference has been experienced to date.

9.0 Test Results Summary

All S.A.R. results obtained by the tests described in Section 7.1 are listed below. As noted in section 7.1, a coarse-to-cube approximation methodology, was utilized to ascertain the worst-case test configuration for each body location. The worst case test configurations observed for each body location were then assessed using the full DASY3™ coarse and 7x7x7 cube methodology, and they are presented as bolded results. The associated S.A.R. plots are provided in APPENDIX E.

Appendix E also presents shortened S.A.R. cube scans to assess the validity of the calculated results presented herein. Note: The results of the shortened cube scans presented in Appendix E demonstrate that the scaling methodology used to determine the calculated S.A.R. results presented herein are valid.

Table1

DUT assessment at the body; CW mode												
Run Number/ SN	**Antenna**	**Freq. (MHz)**	**Battery**	**Test position**	**Carry Case**	**Additional attachments**	**Initial Power (W)**	**S.A.R. Drift (dB)**	**Meas. 1g-S.A.R. (mW/g)**	**Meas. 10g-S.A.R. (mW/g)**	**Max Calc. 1g-S.A.R. (mW/g)**	**Max Calc. 10g-S.A.R. (mW/g)**
Assessment of body worn accessories												
CM-Ab-R3-041208-09/027YEU0007	PMAD4051A	162.025	PMNN4071A	Against phantom	PMLN4691A	PMMN4008A	5.66	-0.290	0.987	0.738	0.53	0.39
CM-Ab-R3-041208-10/027YEU0007	PMAD4051A	162.025	PMNN4071A	Against phantom	RLN5644A	PMMN4008A	5.58	-0.360	1.590	1.168	0.86	0.63
Assessment of audio accessories												
CM-Ab-R3-041208-11/027YEU0007	PMAD4051A	162.025	PMNN4071A	Against phantom	RLN5644A	PMLN4445A	5.67	-0.280	2.690	1.937	1.43	1.03
CM-Ab-R3-041208-12/027YEU0007	PMAD4051A	162.025	PMNN4071A	Against phantom	RLN5644A	PMLN4442A	5.60	-0.370	2.594	1.849	1.41	1.01
CM-Ab-R3-041208-13/027YEU0007	PMAD4051A	162.025	PMNN4071A	Against phantom	RLN5644A	PMLN4443A	5.65	-0.420	2.019	1.462	1.11	0.81
*CM-Ab-R3-041209-02/027YEU0007	PMAD4051A	162.025	PMNN4071A	Against phantom	RLN5644A	PMLN4444A	5.64	-0.580	3.837	2.743	2.19	1.57
Assessment of Band edges												
CM-Ab-R3-041209-03/027YEU0007	PMAD4051A	150.025	PMNN4071A	Against phantom	RLN5644A	PMLN4444A	5.55	-0.200	3.798	2.712	1.99	1.42
CM-Ab-R3-041209-04/027YEU0007	PMAD4051A	173.975	PMNN4071A	Against phantom	RLN5644A	PMLN4444A	4.84	-0.220	0.487	0.354	0.29	0.21
Assessment at 2.5cm												
CM-Ab-R3-041209-08/027YEU0007	PMAD4051A	162.025	PMNN4071A	DUT back w/ ant. 2.5cm	None	PMLN4444A	5.51	-0.330	3.966	2.977	2.14	1.61
CM-Ab-R3-041209-09/027YEU0007	PMAD4051A	162.025	PMNN4071A	DUT back 2.5cm	None	PMLN4444A	5.55	0.130	1.267	0.956	0.63	0.48
CM-Ab-R3-041209-10/027YEU0007	PMAD4051A	162.025	PMNN4071A	DUT front 2.5cm	None	PMLN4444A	5.54	0.160	1.227	0.923	0.61	0.46
***Assessment with the worst case test configuration at the body using the full DASY coarse and 5x5x7 cube scan measurements.**												
CM-Ab-R3-041209-06/027YEU0007	PMAD4051A	162.025	PMNN4071A	Against phantom	RLN5644A	PMLN4444A	5.65	-0.310	4.110	2.660	**2.21**	1.43

Table 2

DUT assessment at the face; CW mode												
Run Number/ SN	**Antenna Position**	**Freq. (MHz)**	**Battery**	**Test position**	**Carry Case**	**Additional attachments**	**Initial Power (W)**	**S.A.R. Drift (dB)**	**Meas. 1g-S.A.R. (mW/g)**	**Meas. 10g-S.A.R. (mW/g)**	**Max Calc. 1g-S.A.R. (mW/g)**	**Max Calc. 10g-S.A.R. (mW/g)**
CM-Face-R3-041210-02/027YEU0007	PMAD4051A	150.025	PMNN4071A	DUT Front 2.5cm	None	None	5.67	0.070	0.229	0.172	0.11	0.09
CM-Face-R3-041210-03/027YEU0007	PMAD4051A	162.025	PMNN4071A	DUT Front 2.5cm	None	None	5.56	-0.520	2.682	2.014	1.51	1.14
*CM-Face-R3-041210-05/027YEU0006	PMAD4051A	162.025	PMNN4071A	DUT Front 2.5cm	None	None	6.18	-0.870	3.291	2.469	2.01	1.51
CM-Face-R3-041210-04/027YEU0007	PMAD4051A	173.975	PMNN4071A	DUT Front 2.5cm	None	None	4.83	-0.290	0.652	0.489	0.40	0.30
***Assessment with the worst case test configuration at the face using the full DASY coarse and 5x5x7 cube scan measurements.**												
CM-Face-R3-041210-06/027YEU0006	PMAD4051A	162.025	PMNN4071A	DUT Front 2.5cm	None	None	6.22	-0.990	2.950	2.200	**1.85**	1.38

9.1 Highest S.A.R. results calculation methodology

The calculated maximum 1-gram and 10-gram averaged S.A.R. results reported herein for the full DASY ™ coarse and 5x5x7 cube measurements are determined by scaling the measured S.A.R. to account for power leveling variations and power slump. For this device the Maximum Calculated 1-gram and 10-gram averaged peak S.A.R. is calculated using the following formula:

Max. Calc. 1-g/10-g Avg. SAR = ((S.A.R. meas. / (10^(Pdrift/10)))*(Pmax/Pint))* DC%
P_{max} = Maximum Power (W)
P_{int} = Initial Power (W)
Pdrift = DASY drift results (dB) - (for conservative results positive drifts are not accounted for)
SAR_{meas}. = Measured 1 gram averaged peak S.A.R. (mW/g)
DC % = Transmission mode duty cycle in % where applicable
50% duty cycle is applied for PTT operation.

10.0 Conclusion

The highest Operational Maximum Calculated 1-gram and 10-gram average S.A.R. values found for FCC ID: AZ489FT3810 model PMUD2085A.

At the Body: **1-g Avg. = 2.21mW/g; 10-g Avg. = 1.43mW/g**
At the Face: **1-g Avg. = 1.85mW/g; 10-g Avg. = 1.38mW/g**

These test results clearly demonstrate compliance with FCC Occupational/Controlled RF Exposure limits of **8.0 mW/g** per the requirements of 47 CFR 2.1093(d).