MOTOROLA

TESTING CERT # 2518.01

DECLARATION OF COMPLIANCE: MPE ASSESSMENT Part 1 of 2

Enterprise Mobility Solutions
EME Test Laboratory
8000 West Sunrise Blvd
Fort Lauderdale, FL. 33322

Date of Report: July 7, 2010
Report Revision: O
Report ID: SR8254_MPE rpt_APX7500_UHFR1_ and VHF Mobile_Rev O_100707

Responsible Engineer:	Stephen C. Whalen (Principal Staff EME Test Engineer)
Date/s Tested:	5/27/2010, 6/2/2010,6/3/2010, 6/22/2010, 6/25/2010 &7/1/2010 8/20/09-8/21/09
Manufacturer/Location:	Motorola Penang
Date submitted for test:	6/15/2010
DUT Description:	Mackinaw Mobile UHFR1 (40W) & VHF (50W)
Test TX mode(s):	CW
Max. Power output:	UHF 48 Watts & VHF 60Watts
TX Frequency Bands:	UHF 380-470MHz & VHF 136-174MHz
Signaling type:	Analog, APCO 25, and TDMA 1:2 (F2)
Model(s) Tested	M30QSS9PW1AN, M30KSS9PW1AN
Model(s) Certified:	M30TSS9PW1AN
Serial Number(s):	123ABC4567 (M30QSS9PW1AN) QM0KW063 (M30KSS9PW1AN)
Classification:	Occupational/Controlled Environment

DUT Photo (Refer to Exhibit 7B)

Regulatory Identifications:
FCC ID AZ492FT4895 – Part 22 & 90 (406.1-470 MHz & 150.8-173.4 MHz), MPE results outside of Part 90 are not applicable for FCC compliance demonstration.
IC ID 109U-92FT4895

Approved Accessories:
Antenna(s):

Antennas for UHFR1 band	Antennas for VHF band
HAE6012A (Vehicular Roof Mount, 380-433 MHz, 1/4 Wave, 2.15dBi) HAE6011A (Vehicular Mount, 380-433 MHz, 5/8 Wave, 7.15dBi) HAE4003A (Vehicular Roof Mount, 450-470 MHz, 1/4 Wave, 2.15dBi) HAE4011A (Vehicular Mount, 450-470 MHz, 1/2 Wave, 5.65dBi) RAE4014ARB (Vehicular Mount, 445-470 MHz, 5/8 Wave, 7.15dBi)	HAD4006A (Vehicular Thru-Hole Mount 136 - 144 MHz, 1/4 Wave, 2.15dBi) HAD4007A (Vehicular Thru-Hole Mount 144-150.8 MHz, 1/4 Wave, 2.15dBi) HAD4008A (Vehicular Thru-Hole Mount 150.8-162 MHz, 1/4 Wave, 2.15dBi) HAD4009A (Vehicular Thru-Hole Mount 162 - 174 MHz, 1/4 Wave, 2.15dBi) RAD4010ARB (Vehicular Thru-Hole Mount Tunable 136 - 174 MHz, 1/2 Wave, 5.15dBi) HAD4016A (Vehicular Thru-Hole Mount 136 - 162 MHz, 1/4 Wave, 2.15dBi) HAD4017A (Vehicular Thru-Hole Mount 146 - 174 MHz, 1/4 Wave, 2.15dBi) HAD4021A (Vehicular Thru-Hole Mount 136 - 174 MHz, 1/4 Wave, 2.15dBi)

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 4.0 of this report. This report shall not be reproduced without written approval from an officially designated representative of the Motorola 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-159 April 2006
The results and statements contained in this report pertain only to the device(s) evaluated herein.

Signature on file
Deanna Zakharia EMS EME Lab Senior Resource Manager, Laboratory Director,

Approval Date:7/9/2010

Certification Date:

Certification No.:

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Part 1 of 2: MPE Assessment for 380-470MHz band
Part 2 of 2: MPE Assessment for the 136-174MHz band

Part 1 of 2

REVISION HISTORY

Date	Revision	Comments
7/7/2010	O	Initial release

1.0 Product and System Description

Model M30QSS9PW1AN is a mobile transceiver that utilizes analog, APCO 25 & F2 digital two-way radio communications. The analog modulation scheme uses Frequency Modulation (FM). APCO 25 & F2 digital modes use C4FM of CQPSK family of modulation (Compatible 4-Level Frequency Modulation of Compatible Quadrature Phase Shift Keying). F2 is a TDMA 1:2 protocol that allocates portions of the RF signal by dividing time into two slots (2 slots TDMA). Transmission from a unit or base station is accommodated in time-slot lengths of 30 milliseconds and frame lengths of 60 milliseconds. This product supports voice in analog mode, and both voice and data modes in digital mode.

The maximum duty cycle for TDMA is 1:2 (50%) 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.

The intended use of the radio is PTT while the device is properly installed in a vehicle with an external antenna mounted at the center of the roof or trunk.

This device will be marketed to and used by employees solely for work-related 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.

Accordingly this product is classified as Occupational/Controlled Exposure. However, in accordance with FCC requirements, the passengers inside the vehicle and the bystanders external to the vehicle are evaluated to the General Population/Uncontrolled Exposure Limits.

(Note that “Bystanders” as used herein mean people other than operator)

2.0 Abbreviations / Definitions

APCO: Association of Public-Safety Communications Officials
C4FM: Compatible 4-Level Frequency Modulation
CNR: Calibration Not Required
CQPSK: Compatible Quadrature Phase Shift Keying
CW: Continues Wave
DUT: Device Under Test
F2: 2 slot Time Division Multiple Access
FM: Frequency Modulation
NA: Not Applicable
PTT: Push to Talk
TDMA: Time Division Multiple Access
MPE: Maximum Permissible Exposure
EME: Electromagnetic Energy

3.0 Additional Options and Accessories

NA

4.0 Measurement and Limit Standards

Measurements were performed according to the recommended guidelines in ICNIRP, IEEE/ANSI C95.3-2002 and compared to FCC Limits Per 47 CFR 2.1091 (d) for General Population/ Uncontrolled RF Exposure.

For test frequencies ranging from 380 - 470 MHz the MPE (Maximum Permissible Exposure) limits to electromagnetic energy in equivalent plane wave free-space power density are 0.20 – 0.23mW/cm^2 (ICNIRP) and 0.25 – 0.31mW/cm^2 (FCC) for General Population, and 1.0 – 1.17mW/cm^2 (ICNIRP) and 1.27 – 1.57mW/cm^2 (FCC) for Occupational.

5.0 Measurement System Uncertainty Levels

Uncertainty Budget for Near Field Probe Measurements

	Tol. (± %)	**Prob. Dist.**	**Divisor**	**u_i (±%)**	**v_i**
Measurement System					
Probe Calibration	6.0	N	1.00	6.0	∞
Survey Meter Calibration	3.0	N	1.00	3.0	∞
Hemispherical Isotropy	8.0	R	1.73	4.6	∞
Linearity	5.0	R	1.73	2.9	∞
Pulse Response	1.0	R	1.73	0.6	∞
RF Ambient Noise	3.0	R	1.73	1.7	∞
RF Reflections	8.0	R	1.73	4.6	∞
Probe Positioning	10.0	R	1.73	5.8	∞
Test sample Related					
Antenna Positioning	3.0	N	1.00	3.0	∞
Power drift	5.0	R	1.73	2.9	∞
Combined Standard Uncertainty		RSS		12.2	∞
Expanded Uncertainty (95% CONFIDENCE LEVEL)		*k*=2		24	

6.0 Method of Measurement

6.1 EME measurements made with trunk mounted antenna(s)

(Refer to APPENDIX A for antenna location and test distances)

6.1.1 External/Bystander vehicle EME measurement
(Antenna mounted at trunk center)

MPE measurements for bystander conditions are determined by taking the average of (10) measurements in a 2m vertical line for each of the (3) test locations indicated in appendix A with 20cm increments at the test distance of 90cm from the antenna under test. The measurement probe is positioned orthogonal to antenna (typically parallel to ground with a vertically mounted antenna) and aimed directly at the antenna's axis. These measurements are representative of persons other than the operator standing next to the vehicle.

Each of the offered antennas mounted at the center of the trunk were assessed at the rear of the vehicle while maintaining a twenty (20) centimeter separation distance between the probe sensor and vehicle body. The worst case antenna was then tested at a 45º radial at the corner of the trunk, and 90º radial at the side of the trunk.

For the current test vehicle, the antenna to probe sensor separation distance is 90cm (directly behind vehicle), 104 cm (45 degree radial) and 110.5 cm (90 degree radial).

Note: The distance from the trunk-mounted antenna to the edge of the vehicle is 42cm and the distance from the edge of the vehicle's trunk to the Survey Probe Sensor is 48cm.

6.1.2 Internal/Passenger vehicle EME measurement
(Antenna mounted at trunk center)

MPE measurements for passenger conditions are determined by taking the average of the (3) measurements (Head, Chest, and Lower Trunk) inside the vehicle for both the front and back seats. The measurement probe is positioned orthogonal to antenna (typically parallel to ground with a vertically mounted antenna), and aimed directly at the antenna's axis while the antenna is at 85cm from the back of the backseat passenger's head. These measurements are representative of operator and passengers sitting in the front and back seat of the vehicle.

6.2 EME measurements made with roof mounted antenna(s)
(Refer to APPENDIX A for antenna location and test distances)

6.2.1 External/Bystander vehicle EME measurement
(Antenna mounted at roof center)

MPE measurements for bystander conditions are determined by taking the average of (10) measurements in a 2m vertical line for the test location indicated in APPENDIX A with 20cm increments at the test distance of 90cm from the antenna under test. The measurement probe is positioned orthogonal to antenna (typically parallel to ground with a vertically mounted antenna) and aimed directly at the antenna's axis. These measurements are representative of persons other than the operator standing next to the vehicle.

Note: Actual test distance was approximately 117cm from antenna to probe element (97cm from antenna to edge of car door; 20cm vertical test line to car door); this is the closest distance that can be achieved to an antenna mounted to the center of the vehicle used for MPE compliance assessment.

6.2.2 Internal/Passenger vehicle EME measurement

(Antenna mounted at roof center)

MPE measurements for passenger conditions are determined by taking the average of the (3) measurements (Head, Chest, and Lower Trunk) inside the vehicle for both the front and back seats. The measurement probe is positioned orthogonal to antenna (typically parallel to ground with a vertically mounted antenna) and aimed directly at the antenna's axis. These measurements are representative of operator and passengers sitting in the front and back seat of the vehicle.

7.0 Test Site

The test site is the Motorola open area test site located at 8000 W. Sunrise Blvd., Plantation, FL. 33322.

8.0 Measurement System/Equipment

Equipment Type	Model #	SN	Calibration Date
Automobile	2003 Ford Crown Victoria, 4-Door	NA	NA
Survey Meter / Probe – E-Field (Electric Field)	ETS Model HI-2200 / ETS Model E100	00086316 / 00109011	10/22/09

ETS equipments measured for E-field is in mW/cm2 for E-field.

9.0 DUT Output Power

Power density measurements were performed with the test frequencies and associated power levels presented in the table below.

Test Frequencies (MHz)	Measured Initial Power (W)
380.0125	47.5
406.5	47.8
432.9875	47.0
445.0125	47.3
450.0125	46.6
457.5	47.0
460.0125	47.1
469.9875	46.6

10.0 Test Set-Up Description

All antennas listed on the cover page of this report were considered in order to develop the test plan for this product.

a) The ¼ wave 2.15dBi gain antennas (HAE6012A & HAE4003A), ½ wave 5.65dBi gain antenna (HAE4011A) and 5/8 wave 7.15dBi gain antennas (HAE6011A & RAE4014ARB) were assessed while mounted at the center of the roof of the test vehicle.

b) The ½ wave 5.65dBi gain antenna (HAE4011A) and 5/8 wave 7.15dBi gain antennas (HAE6011A & RAE4014ARB) were assessed while mounted at the center of the trunk of the test vehicle.

Assessments were performed with DUT (Device Under Test) installed on a test vehicle, while engine was at idle, at the specified distances and test locations indicated in section 6.0 and APPENDIX A.

11.0 Test Results Summary

The tables below summarized the MPE measurement results for each test configuration: antenna (model and description), antenna gain, TX frequency, maximum output power, initial power, E/H field measurements, probe frequency cal factor, test positions (BS-Bystander, PB-Passenger Back, PF-Passenger Front), average over body results, calculated power density results, max calculated power density results, % of the applicable specification limit, and applicable ICNIRP/IEEE/FCC specification limits.

MPE results for this mobile radio are based on 50% duty cycle which is in accordance with the User Manual instructions.

Below is an explanation of how the MPE results are calculated.

External to vehicle (Bystander) -10 measurements are averaged over the body (*body_avg*).
Internal to vehicle (Passengers) - 3 measurements are averaged over the body (*body_avg*).
The Average over Body test methodology is consistent with IEEE/ANSI C95.3-2002 guidelines.

Therefore;

$$Pwr\_density\_calc = body\_avg * (probe\_frequency\_cal\_factor)^2 * duty\_cycle$$

$$Pwr\_density\_\max\_calc = pwr\_density\_calc * \frac{\max\_output\_power}{initial\_output\_power}$$

Note1; For initial output power> max_output_power; max_output_power / initial output power = 1
Note2: The probe frequency cal factors used for MPE evaluation of this product are based on the worse case.
Note 3: The calibration certificate's frequency cal factors were determined by measuring V/m for E-field probe and A/m for H-field probe. The results presented herein are power density (mW/cm^2) and therefore the cal factors were squared as indicated in the formula above.
Note 4: The H-field measurements were done in A/m. Therefore the calculated power density results were converted to mW/cm2 using the formula: $mW/cm^2 = (A/m)^2 * 37.699$.

Table 1: E-field - MPE assessment data with antennas mounted on the Roof

Ant. Model/ Desc.	Ant. Gain (dBi)	Tx Freq (MHz)	Max Pwr (W)	Initial Pwr (W)	E/H Field	Probe Cal. Factor	Test Pos.	Avg. over Body (mW/ cm2)	Calc. P.D. (mW/ cm2)	Max Calc. P.D. (mW/ cm2)	% of ICNIRP Spec Limit	ICNIRP Spec Limit (mW/ cm2)	FCC Spec Limit (mW/ cm2)
HAE6012A													
HAE6012A, 1/4 wave (380-433MHz)	2.15	380.0125	48	47.5	E	0.94	BS	0.101	0.047	0.05	24	0.20	0.25
HAE6012A, 1/4 wave (380-433MHz)	2.15	380.0125	48	47.5	E	0.94	PB	0.097	0.045	0.05	23	0.20	0.25
HAE6012A, 1/4 wave (380-433MHz)	2.15	380.0125	48	47.5	E	0.94	PF	0.060	0.028	0.03	14	0.20	0.25
HAE6012A, 1/4 wave (380-433MHz)	2.15	406.5	48	47.8	E	0.94	BS	0.109	0.051	0.05	25	0.20	0.27
HAE6012A, 1/4 wave (380-433MHz)	2.15	406.5	48	47.8	E	0.94	PB	0.247	0.116	0.12	57	0.20	0.27
HAE6012A, 1/4 wave (380-433MHz)	2.15	406.5	48	47.8	E	0.94	PF	0.067	0.031	0.03	15	0.20	0.27
HAE6012A, 1/4 wave (380-433MHz)	2.15	432.9875	48	47	E	0.95	BS	0.095	0.045	0.05	21	0.22	0.29
HAE6012A, 1/4 wave (380-433MHz)	2.15	432.9875	48	47	E	0.95	PB	0.047	0.022	0.02	10	0.22	0.29
HAE6012A, 1/4 wave (380-433MHz)	2.15	432.9875	48	47	E	0.95	PF	0.020	0.010	0.01	4	0.22	0.29

Table 1 (cont): E field - MPE assessment data with antenna mounted on the roof

Ant. Model/ Desc.	Ant. Gain (dBi)	Tx Freq (MHz)	Max Pwr (W)	Initial Pwr (W)	E/H Field	Probe Cal. Factor	Test Pos.	Avg. over Body (mW/ cm2)	Calc. P.D. (mW/ cm2)	Max Calc. P.D. (mW/ cm2)	% of ICNIRP Spec Limit	ICNIRP Spec Limit (mW/ cm2)	FCC Spec Limit (mW/ cm2)
HAE4003A													
HAE4003A, 1/4 wave (450-470MHz)	2.15	450.0125	48	46.6	E	0.96	BS	0.126	0.060	0.06	28	0.23	0.30
HAE4003A, 1/4 wave (450-470MHz)	2.15	450.0125	48	46.6	E	0.96	PB	0.083	0.040	0.04	18	0.23	0.30
HAE4003A, 1/4 wave (450-470MHz)	2.15	450.0125	48	46.6	E	0.96	PF	0.050	0.024	0.02	11	0.23	0.30
HAE4003A, 1/4 wave (450-470MHz)	2.15	460.0125	48	47.8	E	0.96	BS	0.122	0.059	0.06	26	0.23	0.31
HAE4003A, 1/4 wave (450-470MHz)	2.15	460.0125	48	47.8	E	0.96	PB	0.047	0.022	0.02	10	0.23	0.31
HAE4003A, 1/4 wave (450-470MHz)	2.15	460.0125	48	47.8	E	0.96	PF	0.063	0.030	0.03	13	0.23	0.31
HAE4003A, 1/4 wave (450-470MHz)	2.15	469.9875	48	46.6	E	0.97	BS	0.112	0.054	0.06	24	0.23	0.31
HAE4003A, 1/4 wave (450-470MHz)	2.15	469.9875	48	46.6	E	0.97	PB	0.043	0.021	0.02	9	0.23	0.31
HAE4003A, 1/4 wave (450-470MHz)	2.15	469.9875	48	46.6	E	0.97	PF	0.043	0.021	0.02	9	0.23	0.31

Table 1 (cont): E field - MPE assessment data with antenna mounted on the roof

Ant. Model/ Desc.	Ant. Gain (dBi)	Tx Freq (MHz)	Max Pwr (W)	Initial Pwr (W)	E/H Field	Probe Cal. Factor	Test Pos.	Avg. over Body (mW/ cm2)	Calc. P.D. (mW/ cm2)	Max Calc. P.D. (mW/ cm2)	% of ICNIRP Spec Limit	ICNIRP Spec Limit (mW/ cm2)	FCC Spec Limit (mW/ cm2)
HAE6011A													
HAE6011A, 5/8 wave (380-433MHz)	7.15	380.0125	48	47.5	E	0.94	BS	0.073	0.034	0.03	17	0.20	0.25
HAE6011A, 5/8 wave (380-433MHz)	7.15	380.0125	48	47.5	E	0.94	PB	0.003	0.002	0.00	1	0.20	0.25
HAE6011A, 5/8 wave (380-433MHz)	7.15	380.0125	48	47.5	E	0.94	PF	0.007	0.003	0.00	2	0.20	0.25
HAE6011A, 5/8 wave (380-433MHz)	7.15	406.5	48	47.8	E	0.94	BS	0.069	0.032	0.03	16	0.20	0.27
HAE6011A, 5/8 wave (380-433MHz)	7.15	406.5	48	47.8	E	0.94	PB	0.033	0.016	0.02	8	0.20	0.27
HAE6011A, 5/8 wave (380-433MHz)	7.15	406.5	48	47.8	E	0.94	PF	0.000	0.000	0.00	0	0.20	0.27
HAE6011A, 5/8 wave (380-433MHz)	7.15	432.9875	48	47	E	0.95	BS	0.020	0.010	0.01	4	0.22	0.29
HAE6011A, 5/8 wave (380-433MHz)	7.15	432.9875	48	47	E	0.95	PB	0.000	0.000	0.00	0	0.22	0.29
HAE6011A, 5/8 wave (380-433MHz)	7.15	432.9875	48	47	E	0.95	PF	0.000	0.000	0.00	0	0.22	0.29

Table 1 (cont): E field - MPE assessment data with antenna mounted on the roof

Ant. Model/ Desc.	Ant. Gain (dBi)	Tx Freq (MHz)	Max Pwr (W)	Initial Pwr (W)	E/H Field	Probe Cal. Factor	Test Pos.	Avg. over Body (mW/ cm2)	Calc. P.D. (mW/ cm2)	Max Calc. P.D. (mW/ cm2)	% of ICNIRP Spec Limit	ICNIRP Spec Limit (mW/ cm2)	FCC Spec Limit (mW/ cm2)
HAE4011A													
HAE4011A, 1/2 wave (450-470MHz)	5.65	450.0125	48	46.6	E	0.96	BS	0.107	0.051	0.05	24	0.23	0.30
HAE4011A, 1/2 wave (450-470MHz)	5.65	450.0125	48	46.6	E	0.96	PB	0.010	0.005	0.00	2	0.23	0.30
HAE4011A, 1/2 wave (450-470MHz)	5.65	450.0125	48	46.6	E	0.96	PF	0.010	0.005	0.00	2	0.23	0.30
HAE4011A, 1/2 wave (450-470MHz)	5.65	460.0125	48	47.1	E	0.96	BS	0.086	0.041	0.04	18	0.23	0.31
HAE4011A, 1/2 wave (450-470MHz)	5.65	460.0125	48	47.1	E	0.96	PB	0.003	0.002	0.00	1	0.23	0.31
HAE4011A, 1/2 wave (450-470MHz)	5.65	460.0125	48	47.1	E	0.96	PF	0.010	0.005	0.00	2	0.23	0.31
HAE4011A, 1/2 wave (450-470MHz)	5.65	469.9875	48	46.6	E	0.97	BS	0.059	0.029	0.03	13	0.23	0.31
HAE4011A, 1/2 wave (450-470MHz)	5.65	469.9875	48	46.6	E	0.97	PB	0.003	0.002	0.00	1	0.23	0.31
HAE4011A, 1/2 wave (450-470MHz)	5.65	469.9875	48	46.6	E	0.97	PF	0.000	0.000	0.00	0	0.23	0.31

Table 1 (cont): E field - MPE assessment data with antenna mounted on the roof

Ant. Model/ Desc.	Ant. Gain (dBi)	Tx Freq (MHz)	Max Pwr (W)	Initial Pwr (W)	E/H Field	Probe Cal. Factor	Test Pos.	Avg. over Body (mW/ cm2)	Calc. P.D. (mW/ cm2)	Max Calc. P.D. (mW/ cm2)	% of ICNIRP Spec Limit	ICNIRP Spec Limit (mW/ cm2)	FCC Spec Limit (mW/ cm2)
RAE4014ARB													
RAE4014ARB, 5/8 wave (445-470MHz)	7.15	445.0125	48	47.3	E	0.96	BS	0.057	0.027	0.03	12	0.22	0.30
RAE4014ARB, 5/8 wave (445-470MHz)	7.15	445.0125	48	47.3	E	0.96	PB	0.003	0.002	0.00	1	0.22	0.30
RAE4014ARB, 5/8 wave (445-470MHz)	7.15	445.0125	48	47.3	E	0.96	PF	0.000	0.000	0.00	0	0.22	0.30
RAE4014ARB, 5/8 wave (445-470MHz)	7.15	457.5	48	47	E	0.96	BS	0.034	0.016	0.02	7	0.23	0.31
RAE4014ARB, 5/8 wave (445-470MHz)	7.15	457.5	48	47	E	0.96	PB	0.000	0.000	0.00	0	0.23	0.31
RAE4014ARB, 5/8 wave (445-470MHz)	7.15	457.5	48	47	E	0.96	PF	0.000	0.000	0.00	0	0.23	0.31
RAE4014ARB, 5/8 wave (445-470MHz)	7.15	469.9875	48	46.6	E	0.97	BS	0.006	0.003	0.00	1	0.23	0.31
RAE4014ARB, 5/8 wave (445-470MHz)	7.15	469.9875	48	46.6	E	0.97	PB	0.000	0.000	0.00	0	0.23	0.31
RAE4014ARB, 5/8 wave (445-470MHz)	7.15	469.9875	48	46.6	E	0.97	PF	0.000	0.000	0.00	0	0.23	0.31

Table 2: E field - MPE assessment data with antenna mounted on the trunk

Ant. Model/ Desc.	Ant. Gain (dBi)	Tx Freq (MHz)	Max Pwr (W)	Initial Pwr (W)	E/H Field	Probe Cal. Factor	Test Pos.	Avg. over Body (mW/ cm2)	Calc. P.D. (mW/ cm2)	Max Calc. P.D. (mW/ cm2)	% of ICNIRP Spec Limit	ICNIRP Spec Limit (mW/ cm2)	FCC Spec Limit (mW/ cm2)
HAE6011A													
HAE6011A, 5/8 wave (380-433MHz)	7.15	380.0125	48	47.5	E	0.94	BS	0.169	0.079	0.08	40	0.20	0.25
HAE6011A, 5/8 wave (380-433MHz)	7.15	380.0125	48	47.5	E	0.94	PB	0.303	0.143	0.14	72	0.20	0.25
HAE6011A, 5/8 wave (380-433MHz)	7.15	380.0125	48	47.5	E	0.94	PF	0.063	0.030	0.03	15	0.20	0.25
HAE6011A, 5/8 wave (380-433MHz)	7.15	406.5	48	47.8	E	0.94	BS	0.137	0.064	0.06	32	0.20	0.27
HAE6011A, 5/8 wave (380-433MHz)	7.15	406.5	48	47.8	E	0.94	PB	0.360	0.169	0.17	84	0.20	0.27
HAE6011A, 5/8 wave (380-433MHz)	7.15	406.5	48	47.8	E	0.94	PF	0.057	0.027	0.03	13	0.20	0.27
HAE6011A, 5/8 wave (380-433MHz)	7.15	432.9875	48	47	E	0.95	BS	0.050	0.024	0.02	11	0.22	0.29
HAE6011A, 5/8 wave (380-433MHz)	7.15	432.9875	48	47	E	0.95	PB	0.030	0.014	0.01	7	0.22	0.29
HAE6011A, 5/8 wave (380-433MHz)	7.15	432.9875	48	47	E	0.95	PF	0.007	0.003	0.00	1	0.22	0.29

Table 2 (cont): E field - MPE assessment data with antenna mounted on the trunk

Ant. Model/ Desc.	Ant. Gain (dBi)	Tx Freq (MHz)	Max Pwr (W)	Initial Pwr (W)	E/H Field	Probe Cal. Factor	Test Pos.	Avg. over Body (mW/ cm2)	Calc. P.D. (mW/ cm2)	Max Calc. P.D. (mW/ cm2)	% of ICNIRP Spec Limit	ICNIRP Spec Limit (mW/ cm2)	FCC Spec Limit (mW/ cm2)
HAE4011A													
HAE4011A, 1/2 wave (450-470MHz)	5.65	450.0125	48	46.6	E	0.96	BS	0.161	0.077	0.08	35	0.23	0.30
HAE4011A, 1/2 wave (450-470MHz)	5.65	450.0125	48	46.6	E	0.96	PB	0.383	0.184	0.19	84	0.23	0.30
HAE4011A, 1/2 wave (450-470MHz)	5.65	450.0125	48	46.6	E	0.96	PF	0.090	0.043	0.04	20	0.23	0.30
HAE4011A, 1/2 wave (450-470MHz)	5.65	460.0125	48	47.1	E	0.96	BS	0.162	0.078	0.08	34	0.23	0.31
HAE4011A, 1/2 wave (450-470MHz)	5.65	460.0125	48	47.1	E	0.96	PB	0.327	0.157	0.16	69	0.23	0.31
HAE4011A, 1/2 wave (450-470MHz)	5.65	460.0125	48	47.1	E	0.96	PF	0.087	0.042	0.04	18	0.23	0.31
HAE4011A, 1/2 wave (450-470MHz)	5.65	469.9875	48	46.6	E	0.97	BS	0.105	0.051	0.05	22	0.23	0.31
HAE4011A, 1/2 wave (450-470MHz)	5.65	469.9875	48	46.6	E	0.97	PB	0.163	0.079	0.08	35	0.23	0.31
HAE4011A, 1/2 wave (450-470MHz)	5.65	469.9875	48	46.6	E	0.97	PF	0.053	0.026	0.03	11	0.23	0.31

Table 2 (cont): E field - MPE assessment data with antenna mounted on the trunk

Ant. Model/ Desc.	Ant. Gain (dBi)	Tx Freq (MHz)	Max Pwr (W)	Initial Pwr (W)	E/H Field	Probe Cal. Factor	Test Pos.	Avg. over Body (mW/ cm2)	Calc. P.D. (mW/ cm2)	Max Calc. P.D. (mW/ cm2)	% of ICNIRP Spec Limit	ICNIRP Spec Limit (mW/ cm2)	FCC Spec Limit (mW/ cm2)
RAE4014ARB													
RAE4014ARB, 5/8 wave (445-470MHz)	7.15	445.0125	48	47.3	E	0.96	BS	0.112	0.054	0.05	25	0.22	0.30
RAE4014ARB, 5/8 wave (445-470MHz)	7.15	445.0125	48	47.3	E	0.96	PB	0.117	0.056	0.06	26	0.22	0.30
RAE4014ARB, 5/8 wave (445-470MHz)	7.15	445.0125	48	47.3	E	0.96	PF	0.020	0.010	0.01	4	0.22	0.30
RAE4014ARB, 5/8 wave (445-470MHz)	7.15	457.5	48	47	E	0.96	BS	0.093	0.045	0.05	20	0.23	0.31
RAE4014ARB, 5/8 wave (445-470MHz)	7.15	457.5	48	47	E	0.96	PB	0.033	0.016	0.02	7	0.23	0.31
RAE4014ARB, 5/8 wave (445-470MHz)	7.15	457.5	48	47	E	0.96	PF	0.010	0.005	0.00	2	0.23	0.31
RAE4014ARB, 5/8 wave (445-470MHz)	7.15	469.9875	48	46.6	E	0.97	BS	0.041	0.020	0.02	9	0.23	0.31
RAE4014ARB, 5/8 wave (445-470MHz)	7.15	469.9875	48	46.6	E	0.97	PB	0.000	0.000	0.00	0	0.23	0.31
RAE4014ARB, 5/8 wave (445-470MHz)	7.15	469.9875	48	46.6	E	0.97	PF	0.000	0.000	0.00	0	0.23	0.31
---------- 45 Degree ---------													
HAE6011A, 5/8 wave (380-433MHz)	7.15	380.0125	48	47.5	E	0.94	BS	0.168	0.079	0.08	40	0.20	0.25
---------- 90 Degree ----------													
HAE6011A, 5/8 wave (380-433MHz)	7.15	380.0125	48	47.5	E	0.94	BS	0.141	0.066	0.07	33	0.20	0.25

12.0 Conclusion

The assessments for this device were performed with an output power range as indicated in section 8.0 The maximum allowable output power is equal to the upper limit of the final test factory transmit power specification of 48W for frequency range of 380 - 470MHz. The highest power density results for the mobile device scaled to the maximum allowable power output is 0.19mW/cm^2 for internal/passenger to the vehicle, and 0.08mW/cm^2 for external/bystander to the vehicle.

These MPE results demonstrate compliance to the ICNIRP/IEEE/FCC Occupational/Controlled Exposure limit.

These MPE results also demonstrate compliance to the FCC General Population/Uncontrolled limits as required by FCC rules for passengers and bystanders.

RF Exposure Results (380-470MHz)

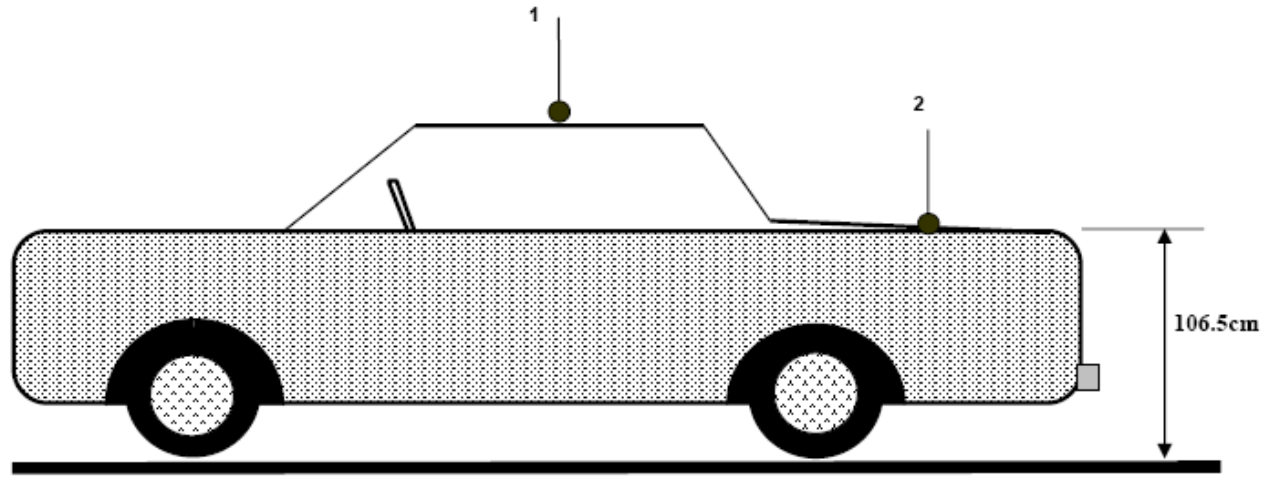
	UHFR1 Band
Passenger - Max Calculated Power Density	0.19 mW/cm²
Bystander - Max Calculated Power Density	0.08 mW/cm²

RF Exposure Results for FCC Part 90 (406.1-470 MHz)

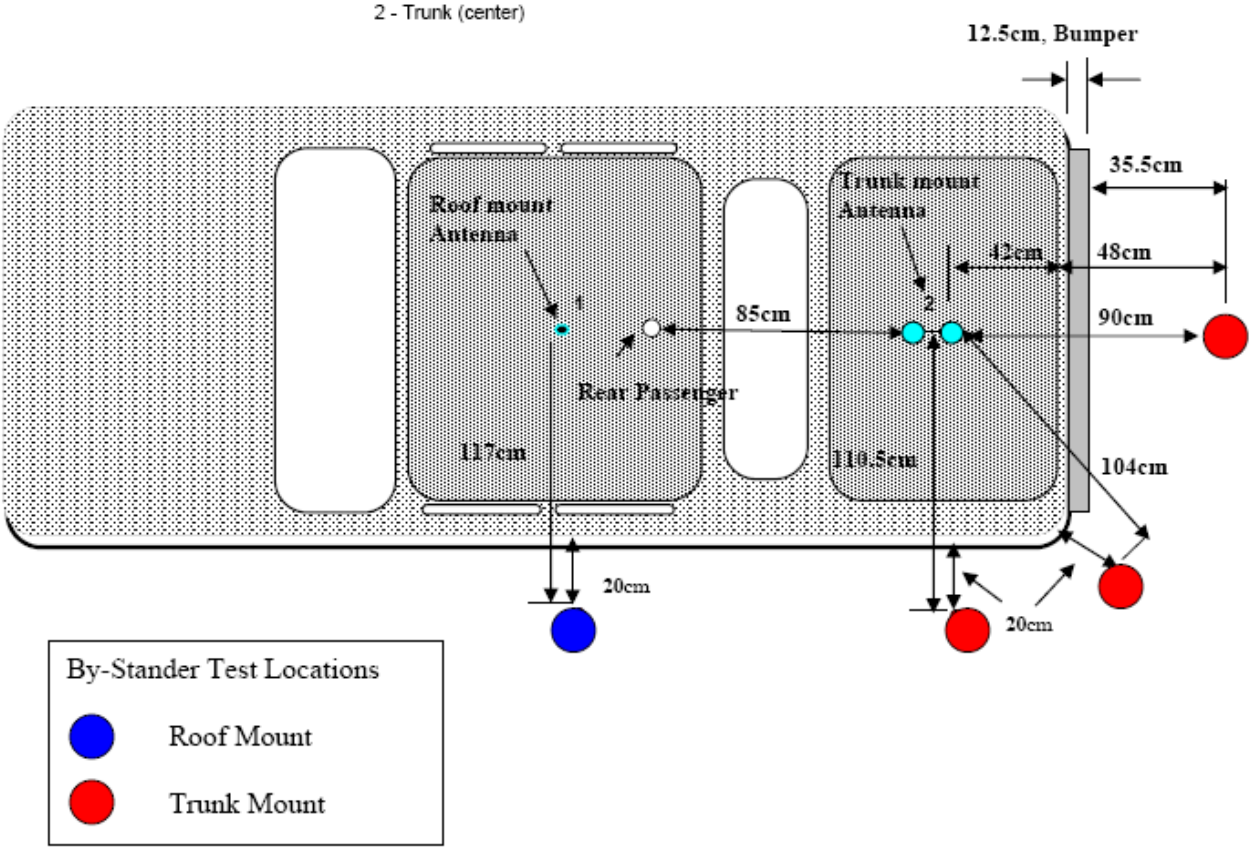
	UHFR1 Band
Passenger - Max Calculated Power Density	0.19 mW/cm²
Bystander - Max Calculated Power Density	0.08 mW/cm²

APPENDIX A
Illustration of Antenna Locations and Test Distances

Antenna Location Drawing with Test Locations Identified



1 - Roof (center)
2 - Trunk (center)



APPENDIX B
Meter/Probe Calibration Certificates

ACCREDITED
Lab ID:1207.01-Calibration

Cert I.D.: 75742

ETS-LINDGREN™
An ESCO Technologies Company
1301 Arrow Point Drive
Cedar Park, Texas 78613
(512) 531-6498

ETS-LINDGREN
An ESCO Technologies Company
Track# S000017735 Ltd Cal ☐
By MR Date 22-Oct-09
Next Cal Due _____
www.ets-lindgren.com

Certificate of Calibration Conformance

The instrument identifed below has been individually calibrated in compliance with the following standard(s):

IEEE 1309 - 2005, Institute of Electrical and Electronics Engineers, Standard for Calibration of Electromagnetic Field Sensors and Probes, Excluding Antennas from 9 kHz to 40 GHz

Environment: Laboratory MTE is maintained in a temperature controlled environment with ambient conditions from 18 to 28 C, relative humidity less than 90%. The instrument under test has been calibrated in a suitable environment using an EMCO TEM Cell 5101C, GTEM! 5305 and an RF Shielded EMC Chamber which is conducive to maintaining accurate and reliable measurement quality.

Manufacturer:	ETS-Lindgren	**Operating Range:**	100kHz - 5GHz
Model Number:	E100	**Instrument Type:**	Isotropic Probe > 1 GHz
Serial Number/ ID:	*00109011*	**Date Code:**	
Tracking Number:	**S000017735**	**Alternate ID:**	
Date Completed:	22-Oct-09	**Customer:**	MOTOROLA INC. (FL)
Test Type:	Standard Field, Field Strength		

Calibration Uncertainty: Std Field Method 10kHz - 18000 MHz, +/-0.7 dB, 26.5GHz - 40GHz,+/- 0.95 dB
k=2, (95% Confidence Level)

Test Remarks: Special calibration - Additional field levels added.

Calibration Traceability: All Measuring and Test Equipment (M/TE) identified below are traceable to the National Institute for Standards and Technology (NIST). Calibration Laboratory and Quality System controls are compliant with ISO/IEC 17025-2005.

Standards and Equipment Used:
Make / Model / Name / S/N / Recall Date

Rohde & Schwarz	857.8008.0	Power Meter NRVD	828110/019	10-Feb-10
Hewlett Packard	437B	HP Power Meter	3110A03972	09-Jan-10
Fluke	6060B	RF Signal Generator	5690204	11-Jun-10
Marconi	2022	Signal Generator	119019/077	25-Sep-10
Rohde & Schwarz	857.8008.0	Power Meter NRVD	100451	18-Nov-09
Hewlett Packard	83620B	Signal Generator	3722A00541	25-Sep-10

Condition of Instrument Upon Receipt:
In Tolerance to Internal Quality Standards

On Release:
In Tolerance to Internal Quality Standards

Calibration Completed By
Maynard Reich, Calibration Technician

Attested and Issued on 22-Oct-09
Justin Terr, Calibration Supervisor

This document provides traceability of measurements to recognized national standards using controlled processes at the ETS-Lindgren Calibration Laboratory. Uncertainties listed are derived from the methods described by NIST Tech Note 1297. This certificate and report may not be reproduced, except in full, without the written approval of ETS-Lindgren Calibration Laboratory in accordance with ISO/IEC 17025-2005. QAF 1127 (06/07)

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Frequency Response Calibration Factors
Model E100 Serial Number 00109011
Date of Calibration 21 Oct 2009

Frequency	Applied	Probe Reading			Correction Factor			
(MHz)	V/m	X	Y	Z	X	Y	Z	Avg
1.00	7.64	7.02	7.79	6.94	1.14	1.04	0.98	1.05
1.00	19.82	16.71	17.11	16.74	1.18	1.16	1.18	1.18
1.00	71.15	57.93	59.53	58.16	1.23	1.19	1.22	1.22
1.00	125.11	100.56	104.03	102.13	1.24	1.20	1.23	1.22
15.00	7.95	8.17	8.28	8.18	0.98	0.96	0.97	0.97
15.00	19.94	19.63	19.98	19.65	1.02	1.00	1.01	1.01
15.00	70.00	67.78	68.81	67.94	1.03	1.02	1.03	1.03
15.00	124.61	120.61	122.69	121.30	1.03	1.02	1.03	1.03
30.00	7.95	8.49	8.59	8.45	0.93	0.93	0.94	0.93
30.00	19.81	19.99	20.29	20.08	1.00	0.97	0.98	0.98
30.00	69.87	69.71	70.67	70.11	1.00	0.99	1.00	1.00
30.00	124.31	124.11	125.93	125.11	1.00	0.99	0.99	0.99
75.00	8.06	8.62	8.75	8.77	0.94	0.93	0.91	0.92
75.00	19.92	20.32	20.71	20.76	0.97	0.96	0.96	0.97
75.00	69.19	71.16	72.25	72.19	0.97	0.96	0.96	0.96
75.00	123.17	126.65	128.70	128.37	0.97	0.96	0.96	0.96
100.00	7.99	8.30	8.54	8.58	0.96	0.95	0.92	0.94
100.00	19.72	20.02	20.31	20.50	0.98	0.97	0.96	0.97
100.00	70.01	70.85	71.90	72.15	0.99	0.97	0.97	0.98
100.00	126.58	128.59	130.29	130.10	0.98	0.97	0.97	0.98
150.00	8.05	8.13	8.26	8.36	0.99	0.98	0.95	0.98
150.00	19.93	20.03	20.39	20.66	0.99	0.98	0.96	0.98
150.00	69.87	70.30	71.46	71.94	0.99	0.98	0.97	0.98
150.00	124.91	126.00	127.53	128.17	0.99	0.98	0.97	0.98
200.00	8.07	8.50	8.67	8.69	0.95	0.94	0.92	0.94
200.00	19.86	20.80	21.21	21.58	0.96	0.94	0.92	0.94
200.00	69.73	73.51	74.90	75.46	0.95	0.93	0.92	0.93
200.00	125.11	132.11	134.58	134.95	0.95	0.93	0.93	0.93
250.00	8.00	8.33	8.42	8.60	0.96	0.95	0.93	0.95
250.00	20.02	20.72	21.00	21.43	0.97	0.95	0.93	0.95
250.00	70.08	72.35	73.13	74.05	0.97	0.96	0.95	0.96
250.00	123.93	128.09	129.47	130.20	0.97	0.96	0.95	0.96
300.00	8.02	8.27	8.40	8.57	0.97	0.95	0.94	0.95
300.00	19.96	20.48	20.79	21.31	0.98	0.96	0.94	0.96
300.00	69.80	71.54	72.40	73.40	0.98	0.96	0.95	0.96
300.00	125.31	129.68	131.16	131.92	0.97	0.96	0.95	0.96
400.00	7.97	8.30	8.34	8.56	0.97	0.95	0.93	0.95
400.00	20.00	20.54	20.92	21.48	0.97	0.96	0.93	0.95
400.00	70.16	71.90	72.88	73.99	0.98	0.96	0.95	0.96
400.00	126.35	129.28	131.06	132.12	0.98	0.96	0.96	0.97
500.00	7.99	8.01	8.18	8.39	1.00	0.98	0.95	0.97
500.00	20.01	20.00	20.41	20.98	1.00	0.98	0.95	0.98
500.00	69.97	69.80	71.05	72.15	1.00	0.98	0.97	0.99
500.00	124.82	125.16	127.11	128.22	1.00	0.98	0.97	0.98
600.00	8.05	8.00	8.13	8.36	1.01	0.99	0.96	0.99
600.00	19.91	19.62	19.99	20.62	1.01	1.00	0.97	0.99
600.00	70.04	68.89	69.92	71.17	1.02	1.00	0.98	1.00
600.00	126.51	124.61	126.45	127.20	1.02	1.00	0.99	1.00

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Frequency Response Calibration Factors
Model E100 Serial Number 00109011
Date of Calibration 21 Oct 2009

Frequency	Applied	Probe Reading			Correction Factor			
(MHz)	V/m	X	Y	Z	X	Y	Z	Avg
700.00	8.00	7.97	8.10	8.33	1.00	0.99	0.96	0.98
700.00	19.96	19.73	20.08	20.70	1.01	0.99	0.96	0.99
700.00	70.92	70.15	71.10	72.40	1.01	1.00	0.98	1.00
700.00	126.17	124.81	126.29	127.81	1.01	1.00	0.99	1.00
800.00	8.03	7.80	7.94	8.18	1.03	1.01	0.98	1.01
800.00	20.00	19.25	19.67	20.30	1.04	1.02	0.99	1.01
800.00	70.11	67.44	68.66	69.87	1.04	1.02	1.01	1.02
800.00	124.80	120.51	122.51	123.68	1.04	1.02	1.01	1.02
900.00	8.00	7.62	7.82	8.04	1.05	1.02	1.00	1.02
900.00	20.12	19.05	19.57	20.18	1.06	1.03	1.00	1.03
900.00	69.94	66.19	67.78	68.96	1.06	1.03	1.01	1.03
900.00	124.54	118.24	120.95	121.59	1.05	1.03	1.02	1.04
1000.00	7.99	8.48	8.65	9.01	0.94	0.92	0.89	0.92
1000.00	19.88	21.08	21.49	22.22	0.94	0.92	0.89	0.92
1000.00	70.09	74.27	75.51	76.80	0.94	0.93	0.91	0.93
1000.00	126.71	134.43	136.66	137.97	0.94	0.93	0.92	0.93
2000.00	20.27	19.59	20.78	20.88	1.03	0.98	0.97	0.99
2450.00	19.89	18.55	19.38	19.12	1.07	1.03	1.04	1.05
3000.00	20.20	19.52	20.35	21.43	1.03	0.99	0.94	0.99
3500.00	19.95	20.73	22.23	21.00	0.96	0.90	0.95	0.94
4000.00	20.49	21.32	21.67	21.70	0.96	0.95	0.94	0.95
5000.00	20.26	16.24	17.62	17.17	1.25	1.15	1.18	1.19
5500.00	19.77	15.77	16.06	14.83	1.25	1.23	1.33	1.27
6000.00	19.99	14.67	16.77	16.40	1.36	1.19	1.22	1.26

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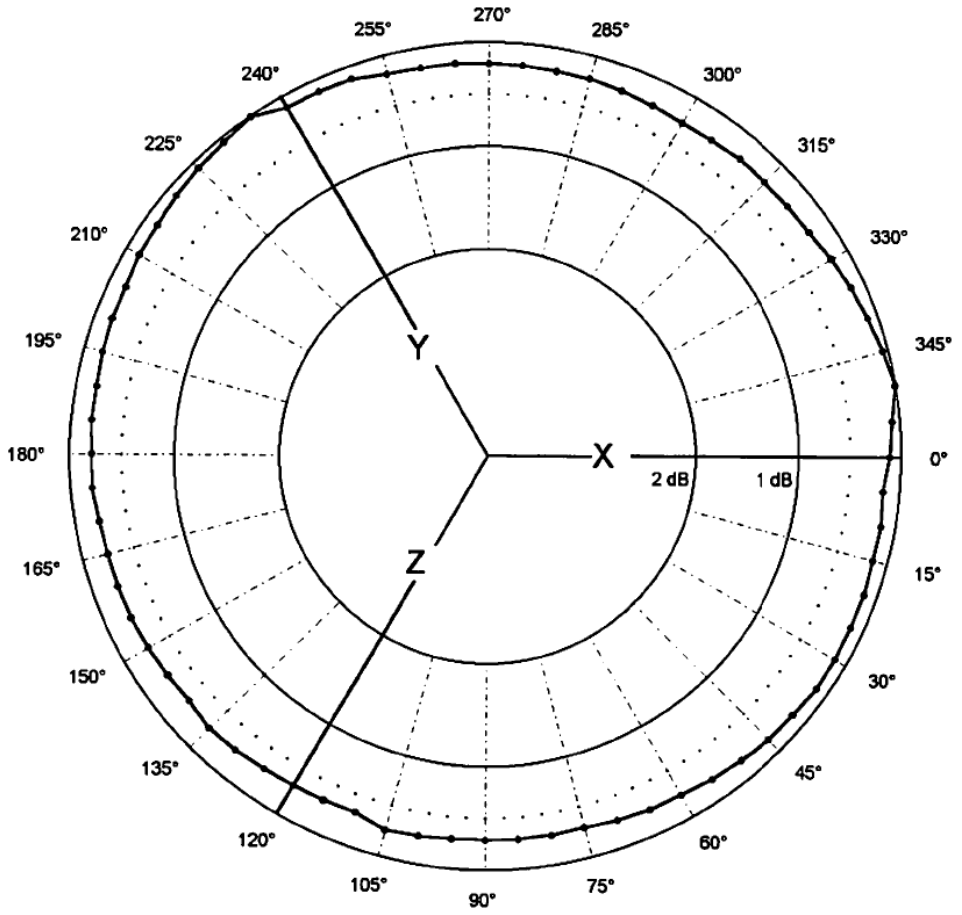
An ESCO Technologies Company

PROBE ROTATIONAL RESPONSE

Model	E100
S/N	00109011
Date	22-Oct-2009
Time	07:40:55
Variation	0.39 dB



- Isotropic response measured in a 20 V/m field at 400 MHz

Page 4 of 4

Service Test Report
QAF 1126, 06/07
Report ID: 75744

ETS-LINDGREN
An ESCO Technologies Company
1301 Arrow Point Drive
Cedar Park, Texas 78613
(512) 531-6498

ETS-LINDGREN
An ESCO Technologies Company
Tracking # S000017735
Equipment Check
Attested by JT Date: 22-Oct-09
www.ets-lindgren.com

Certificate of Test Conformance

Page 1 of 1

Reference: S 000017735

Customer: MOTOROLA INC. (FL)

The instrument listed below has been tested and verified to Internal Quality Standards. Test data is Not Applicable. Equipment used during instrument testing is controlled by laboratory compliance with ISO/IEC 17025-2005 using ETS-Lindgren Quality Management System internal procedures.

Manufacturer	ETS-Lindgren
Instrument Type	RF Survey Meter
Model	HI-2200
Serial Number/ID	00086316

Status In
Other
Date Completed
22-Oct-09
Status Out
Compliant with Internal Quality Standards

Remarks
Secured mounting screw on LCD to remove lines - Functional Test Performed.

I would like to take this opportunity to express our appreciation for using ETS-Lindgren for your EMI test equipment services and I am looking forward to continued business with your organization. Please feel free to contact our offices at (512) 531-6400, if you have any questions regarding this report.

Sincerely,

Justin Tarr
Calibration Supervisor

Date Attested: 22-Oct-09

APPENDIX C
DUT Photos
(Refer to Exhibit 7B)