



MOTOROLA



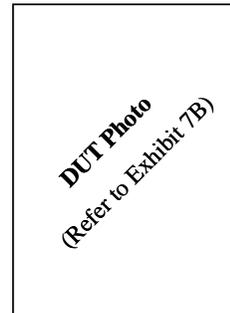
TESTING CERT # 2518.01

**FCC ID: AZ492FT4887
DECLARATION OF COMPLIANCE MPE ASSESSMENT Part 1 of 2**

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

Date of Report: October 22, 2009
Report Revision: Rev. B
Report ID: FCC SAR rpt_SR6835_PMUE3257A RPX Repeater_Rev. B_091022

Responsible Engineer: Kim Uong (Principal Staff EME Eng.)
Date/s Tested: 5/1/09; 10/2/09
Manufacturer/Location: Motorola, China
Date submitted for test: 10/20/08
DUT Description: RPU4160 RPX Repeater, UHF 450-470, Removable Antenna, 4.0Watts
AC/DC Power supply,(2.0 Watts AA Li-Ion) Color Black
Test TX mode(s): CW
Max. Power output: 4.20 W, 100% Duty Cycle
TX Frequency Bands: 450.000MHz - 455.000MHz
Signaling type: FM
Model(s) Tested: PMUE3257A
Model(s) Certified: PMUE3257A
Serial Number(s): 186TKC0019
Classification: Occupational/Controlled Environment
Rule Part(s): 90



Approved Accessories:

Antenna(s):
HKAE4000A Dipole, 450MHz-470MHz, 1.4dBi gain
HKKN4022A 1/2 wave Whip (monopole), 438MHz-470MHz, 2.4dBi gain, Mag Mount & 12' RF CBL Kit

Batteries:

AA Alkaline battery; 6080384X65 (RLN6351A) 1100MAh Standard Li-Ion battery; 6080384X63 (RLN6305A) 2200MAh High capacity battery; 6080384Y10 (RLN6308A) Ultra High Capacity battery.

Others:

HKHN4003A (NNTN7569A) Alkaline Battery frame; HKHN4004A (NNTN7571A) Li-Ion Battery frame; HKNN4010A Ultra high capacity Li-Ion Battery kit; HKNN4011A High capacity Li-Ion Battery kit.

Final RF Exposure Results:

	Vehicle	Desk Top/Wall mount
Passengers/Operator	0.08 mW/cm ²	0.16 mW/cm ²
Bystander	0.06 mW/cm ²	

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 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

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

Approval Date: 10/22/09

Certification Date: 10/22/09

Certification No.: L1091025

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REVISION HISTORY

Date	Revision	Comments
08/03/09	O	Original release
8/25/09	A	To add the suffix for the battery 6080384Y10 (RLN6308A) and modify the 2 nd paragraph of section 1.0.
10/22/09	B	To change the report's name from RF exposure to MPE assessment; include the actual MPE measurement for desktop, wall mount and vehicle mount applications; add section 2.0 Abbreviations / Definitions.

1.0 Product and System Description

FCC ID: AZ492FT4887, RPX Series™ Repeater model PMUE3257A is ideal as a range extender that can help reach other users in areas that are normally not covered by a 2-way radio's range. This repeater is very useful to help resolve the common problem of "dead spots" that are created when there are terrain obstructions. The RPX Series™ operates in the 450-470 MHz band (transmit only at 450-455MHz), with a rated conducted power of 4W (with power supply) and 2W (with AA Li-Ion battery). The maximum conducted output power is 4.2 Watts. The RPX Series™ is designed to be completely compatible with the RDX UHF 2-Way Radio Series.

This device will be marketed to and used by employees solely for work-related operations. 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 bystanders are evaluated to the General Population/Uncontrolled Exposure Limits.

(Note that "By-standers" as used herein mean people other than operator)

2.0 Abbreviations / Definitions

CNR: Calibration Not Required
CW: Continues Wave
DUT: Device Under Test
FM: Frequency Modulation
NA: Not Applicable
MPE: Maximum Permissible Exposure
EME: Electromagnetic Energy

3.0 Additional Options and Accessories

FCC ID: AZ492FT4887 is offered with the options and accessories listed on the coversheet.

4.0 Measurement and Limit Standards

Measurements were performed according to the recommended guidelines in 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 450-455MHz the MPE (Maximum Permissible Exposure) limit to electromagnetic energy in equivalent plane wave free-space power density is $0.30 - 0.30 \text{ mW/cm}^2$ and calculated using the formula $f/1500$.

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 MPE assessment for the roof mounted antenna(s) (Refer to APPENDIX A for antenna location and test distances)

6.1.1 External/Bystander vehicle MPE assessment (Antenna mounted at roof center)

MPE measurements for by-stander 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 20cm from the antenna under test. These measurements are representative of persons other than the operator standing next to the vehicle.

The offered antenna HKKN4022A mounted at the roof was assessed at the side of the vehicle while maintaining a twenty (20) centimeter separation distance between the probe sensor and vehicle body.

Note: Actual test distance was 65cm (45cm 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 vehicle used for MPE compliance assessment.

6.1.2 Internal/Passenger vehicle MPE assessment

(Antenna mounted at roof center)

Measurements were performed inside of the vehicle, at both front and back seating areas and at the center of the transmit band, for the head, chest and lower trunk and record the highest level in each location so as to have a total of three measured points as indicated below that will be averaged.

- a) Head area
- b) Chest area
- c) Lower Trunk area

6.2 MPE assessment for trunk mounted antenna(s)

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

6.2.1 External/Bystander vehicle MPE assessment

(Antenna mounted at trunk center)

MPE measurements for by-stander 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 20cm from the antenna under test. These measurements are representative of persons other than the operator standing next to the vehicle.

The offered antenna HKKN4022A mounted at the trunk was assessed at the rear of the vehicle while maintaining a twenty (20) centimeter separation distance between the probe sensor and vehicle body. This antenna was then tested at a 45° radial at the corner of the trunk, and 90° radial at the side of the trunk.

For the current test vehicle, the antenna to probe sensor separation distance is 35cm (directly behind vehicle, 20 cm), 97 cm (45 degree radial) and 109 cm (90 degree radial).

Note: Actual test distance from the trunk-mounted antenna to the probe sensor was 35cm (15cm from antenna to edge of vehicle body; 20cm vertical test line to vehicle body); this is the closest distance that can be achieved to an antenna mounted to the vehicle used for MPE compliance assessment. The radial distance measured at 45° from corner of trunk to vertical test line is 97cm. The radial distance measured at 90° from the side of the trunk is 109cm.

6.2.2 Internal/Passenger vehicle MPE assessment

(Antenna mounted at trunk center)

Measurements were performed inside of the vehicle, at both front and back seating areas and at the center of the transmit band, for the head, chest and lower trunk and record the highest level in each location so as to have a total of three measured points as indicated below that will be averaged.

- a) Head area
- b) Chest area
- c) Lower Trunk area

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 Due Date
Vehicle	2003 Ford Crown Victoria, 4-Door		
Survey Meter / Probe – E-Field (Electric Field)	ETS Model HI-2200 / ETS Model E100	00086316 / 00109011	3/24/2009

9.0 DUT output power

Power density measurements were performed on device model PMUE3257A with serial number 186TKC0019. The HKKN4022A mobile antenna listed in the cover page of this report was used to assess MPE compliance.

The tested frequency and associated power output are presented below.

Test frequencies and measured Po (W):

Frequency (MHz)	Po (W)
452.5	4.19

10.0 Test Set-Up Description

The ½ wave 2.4dBi gain mobile antenna model HKKN4022A was assessed while mounted at the roof and the trunk of the test vehicle. (Refer to APPENDIX A for antenna location and test distances).

Assessments were made internal and external to the test vehicle at the specified distances and test locations indicated in sections 6.0, 11.0, and the APPENDIX A.

11.0 Test Results Summary

The table 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, OP-Operator), average over body results, calculated power density results, max calculated power density results, % of the applicable specification limit, and applicable FCC specification limits.

MPE results for this device, while the antenna is mounted on the vehicle, are based on 100% 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/cm²) and therefore the cal factors were squared as indicated in the formula above.

Table 1

Ant. Model/ Desc.	Ant. Gain (dBi)	Tx Freq (MHz)	Max Pwr (W)	Initial Pwr (W)	E/H Field	Probe Freq. Cal Factor	Test Pos.	Avg. over Body (mW/cm ²)	Calc. (mW/cm ²)	Max Calc. (mW/cm ²)	% of Spec Limit	FCC Spec Limit (mW/cm ²)
Antenna HKKN4022A mounted on the Roof												
HKKN4022A (Whip 438-470MHz)	2.4	452.51	4.20	4.19	E	1.02	BS	0.030	0.031	0.031	10	0.30
HKKN4022A (Whip 438-470MHz)	2.4	452.51	4.20	4.19	E	1.02	PS	0.007	0.007	0.007	2	0.30
Antenna HKKN4022A mounted on the Trunk												
HKKN4022A (Whip 438-470MHz)	2.4	452.51	4.20	4.19	E	1.02	BS	0.060	0.061	0.06	20	0.30
HKKN4022A (Whip 438-470MHz)	2.4	452.51	4.20	4.19	E	1.02	PS	0.073	0.075	0.08	25	0.30
-----45 Degree-----												
HKKN4022A (Whip 438-470MHz)	2.4	452.51	4.2	4.19	E	1.02	BS	0.021	0.021	0.021	7	0.30
-----90 Degree-----												
HKKN4022A (Whip 438-470MHz)	2.4	452.51	4.2	4.19	E	1.02	BS	0.014	0.014	0.014	5	0.30

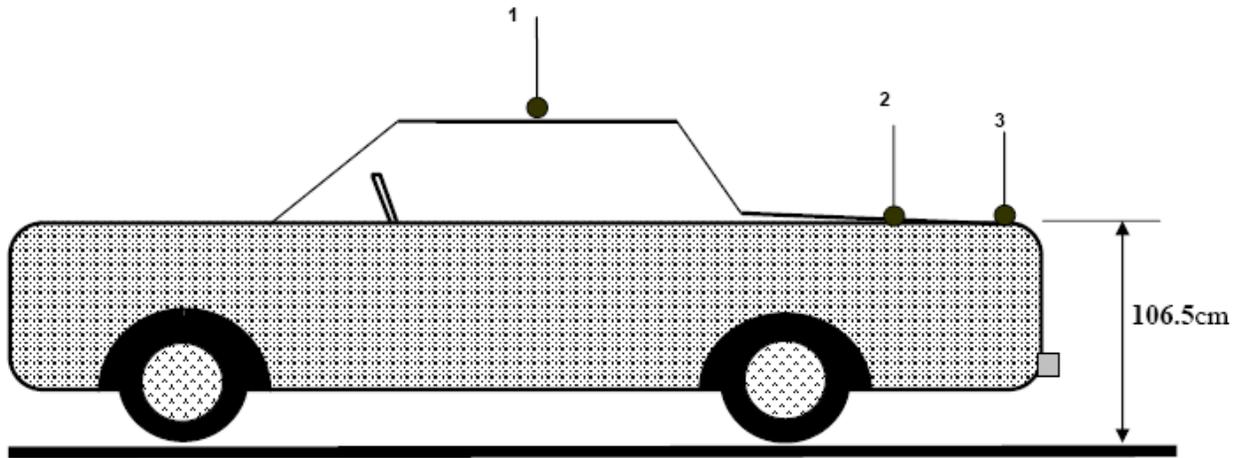
12.0 Conclusion

The MPE assessments were performed with an output power of 4.19W. The maximum RF power allowable will be equal to the upper limit of the final test factory transmit power specification of 4.20W. The highest power density result scaled to the maximum allowable power output is 0.06 mW/cm² for bystander test position, 0.08 mW/cm² for passenger test position.

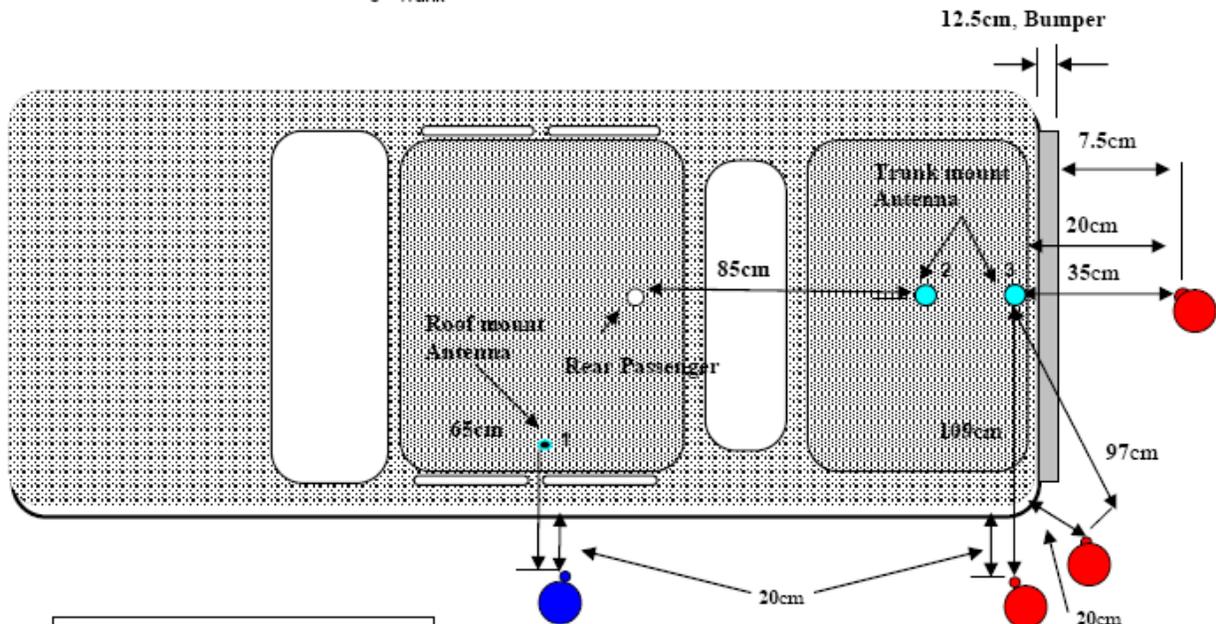
The measurement results for the vehicle clearly demonstrate compliance with the FCC Limits for the frequency band of 450-455 MHz Per 47 CFR 2.1091 (d) for General Population/Uncontrolled RF Exposure limit.

APPENDIX A
Illustration of Antenna Locations and Test Distances

Antenna Location Drawing with Test Locations Identified



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



By-Stander Test Locations

-  Roof Mount
-  Trunk Mount

APPENDIX B
Meter/Probe Calibration Certificates



Cert I.D.: 72393

Certificate of Calibration Conformance
Page 1 of 4

The instrument identified 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: S000015751 Alternate ID:
Date Completed: 24-Mar-09 Customer: AGILENT/MOTOROLA (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: As received, connector on E100 serial number 00084254 was damaged. Replaced E100 with serial number 00109011. E100 was calibrated with HI-2200 00086316.

Calibration Traceability: All Measuring and Test Equipment (MTE) 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:

Table with 6 columns: Make / Model / Name / S/N / Recall Date, Condition of Instrument Upon Receipt, and On Release. Rows include Boonton, Hewlett Packard, Fluke, Marconi, Rohde & Schwarz, and Hewlett Packard.

Richard C. Goodlow
Calibration Completed By
Richard C. Goodlow, Calibration Technician

Justin Tarr
Attested and Issued on 24-Mar-09
Justin Tarr, 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)



Frequency Response Calibration Factors
Model E100 Serial Number 00109011
Date of Calibration 20 Mar 2009

Frequency (MHz)	Applied V/m	Probe Reading			Correction Factor			Avg
		X	Y	Z	X	Y	Z	
0.10	8.02	4.78	4.28	4.47	1.67	1.88	1.79	1.78
0.10	19.99	12.12	10.91	11.27	1.65	1.83	1.77	1.75
0.10	70.17	43.44	39.21	40.35	1.62	1.79	1.74	1.71
0.10	124.71	76.85	69.53	71.44	1.62	1.79	1.75	1.72
0.50	8.02	5.97	6.27	6.32	1.34	1.28	1.27	1.30
0.50	19.90	14.88	15.65	15.82	1.34	1.27	1.26	1.29
0.50	70.11	52.39	55.13	55.64	1.34	1.27	1.26	1.29
0.50	124.78	92.94	97.72	98.59	1.34	1.28	1.27	1.30
1.00	7.95	6.60	6.75	6.68	1.21	1.18	1.19	1.19
1.00	19.96	16.62	17.04	16.97	1.20	1.17	1.18	1.18
1.00	70.30	58.63	60.09	59.53	1.20	1.17	1.18	1.18
1.00	125.11	104.13	106.65	105.70	1.20	1.17	1.18	1.19
10.00	7.95	7.71	7.77	7.68	1.03	1.03	1.04	1.03
10.00	20.00	19.52	19.68	19.44	1.02	1.02	1.03	1.02
10.00	70.19	68.29	68.76	67.96	1.03	1.02	1.03	1.03
10.00	124.24	118.92	121.34	120.10	1.04	1.02	1.03	1.03
20.00	7.99	8.12	8.17	8.09	0.98	0.98	0.99	0.98
20.00	19.95	20.40	20.50	20.24	0.98	0.97	0.99	0.98
20.00	70.00	71.15	71.58	70.65	0.98	0.98	0.99	0.98
20.00	125.79	125.66	127.92	126.53	1.00	0.98	0.99	0.99
50.00	7.96	8.07	8.11	8.03	0.99	0.98	0.99	0.99
50.00	19.99	20.43	20.53	20.30	0.98	0.97	0.98	0.98
50.00	70.01	71.21	71.50	70.66	0.98	0.98	0.99	0.98
50.00	125.30	125.39	127.61	126.53	1.00	0.98	0.99	0.99
100.00	7.99	8.21	8.26	8.05	0.98	0.97	0.99	0.98
100.00	19.96	20.47	20.58	20.28	0.97	0.97	0.98	0.98
100.00	69.62	70.94	71.34	70.34	0.98	0.98	0.99	0.98
100.00	124.32	123.99	126.55	124.91	1.00	0.98	1.00	0.99
200.00	8.00	8.52	8.63	8.43	0.94	0.93	0.95	0.94
200.00	20.07	21.52	21.77	21.22	0.93	0.92	0.95	0.93
200.00	69.86	74.99	75.83	73.91	0.93	0.92	0.95	0.93
200.00	124.26	131.82	134.80	131.56	0.94	0.92	0.94	0.94
300.00	8.00	8.01	8.03	7.99	1.00	1.00	1.00	1.00
300.00	19.93	20.09	20.16	19.97	0.99	0.99	1.00	0.99
300.00	69.76	70.50	70.72	70.12	0.99	0.99	0.99	0.99
300.00	125.19	128.11	130.13	129.27	0.98	0.96	0.97	0.97
400.00	8.02	8.09	8.12	8.05	0.99	0.99	1.00	0.99
400.00	19.92	20.08	20.17	19.94	0.99	0.99	1.00	0.99
400.00	70.51	70.95	71.27	70.57	0.99	0.99	1.00	0.99
400.00	124.34	122.86	124.97	123.91	1.01	1.00	1.00	1.00
500.00	8.01	7.89	7.97	7.81	1.02	1.00	1.03	1.02
500.00	19.98	19.68	19.86	19.43	1.02	1.01	1.03	1.02
500.00	69.79	69.47	70.18	68.71	1.01	0.99	1.02	1.00
500.00	124.13	120.91	123.60	121.44	1.03	1.00	1.02	1.02
600.00	7.96	7.62	7.67	7.60	1.04	1.04	1.05	1.04
600.00	20.01	19.20	19.34	19.12	1.04	1.03	1.05	1.04
600.00	69.89	67.70	68.11	67.36	1.03	1.03	1.04	1.03
600.00	125.21	118.86	121.32	120.42	1.05	1.03	1.04	1.04



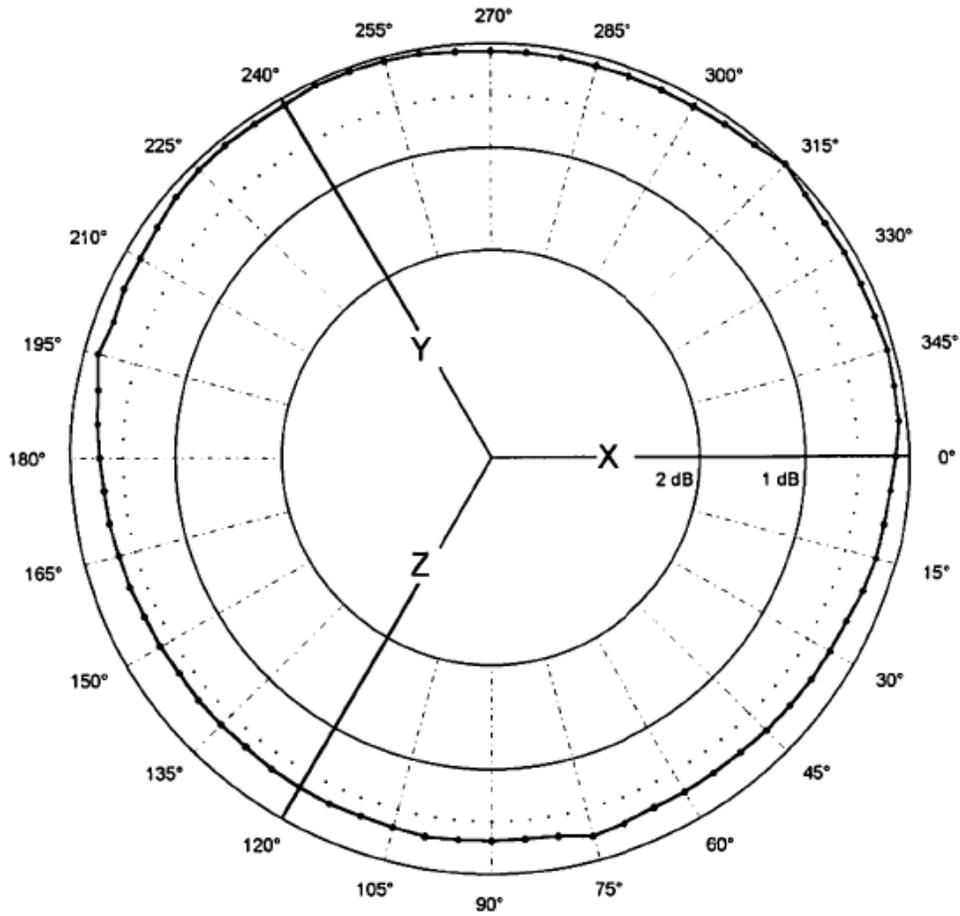
Frequency Response Calibration Factors
Model E100 Serial Number 00109011
Date of Calibration 20 Mar 2009

Frequency (MHz)	Applied V/m	Probe Reading			Correction Factor			Avg
		X	Y	Z	X	Y	Z	
700.00	8.02	7.61	7.61	7.58	1.05	1.05	1.06	1.06
700.00	19.86	18.81	18.84	18.74	1.06	1.05	1.06	1.06
700.00	69.57	66.13	66.34	66.07	1.05	1.05	1.05	1.05
700.00	125.54	116.65	118.85	118.60	1.08	1.06	1.06	1.06
800.00	7.96	7.28	7.33	7.20	1.09	1.09	1.10	1.09
800.00	20.01	18.34	18.49	18.16	1.09	1.08	1.10	1.09
800.00	70.15	64.42	65.03	63.98	1.09	1.08	1.10	1.09
800.00	125.10	113.81	114.85	113.08	1.10	1.09	1.11	1.10
900.00	8.00	7.85	7.97	7.71	1.02	1.01	1.04	1.02
900.00	20.03	19.54	19.86	19.30	1.02	1.01	1.04	1.02
900.00	70.11	68.36	69.40	67.39	1.03	1.01	1.04	1.03
900.00	124.41	118.52	122.01	118.78	1.05	1.02	1.05	1.04
1000.00	8.01	8.03	8.06	7.94	1.00	1.00	1.00	1.00
1000.00	19.97	19.77	19.89	19.96	1.01	1.00	1.01	1.00
1000.00	70.37	69.40	69.85	69.25	1.01	1.01	1.02	1.01
1000.00	125.24	120.38	122.75	122.05	1.04	1.02	1.03	1.03
2000.00	20.34	19.56	19.68	19.43	1.04	1.03	1.05	1.04
3000.00	20.34	19.23	19.79	19.28	1.06	1.03	1.05	1.05
4000.00	19.97	19.56	18.62	18.65	1.02	1.07	1.07	1.05
5000.00	20.24	14.56	15.37	14.20	1.39	1.32	1.43	1.38
6000.00	19.96	13.77	14.96	15.87	1.45	1.34	1.26	1.35



PROBE ROTATIONAL RESPONSE

Model E100
S/N 00109011
Date 24-Mar-2009
Time 14:39:28
Variation 0.38 dB



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

APPENDIX C
Photos of Assessed Antennas

(Refer to Exhibit 7B)