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Safety Certification - EMI - Telecom Environmental Simulation

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August 4, 2010

Harris Corporation
221 Jefferson Ridge Parkway
Lynchburg, VA 24501

Dear Bruno Yurman,

Enclosed is the EMC Wireless test report for MPE measurements of the Harris Corporation, M5300 900 MHz Mobile Radio as evaluated to the requirements of Title 47 of the CFR, Ch. 1 (10-1-06 ed.), Part 1, Subpart I, Title 47 of the CFR, Ch. 1 (10-1-06 ed.), Part 2, Subpart J, and RSS-102, Issue 2, November 2005.

Thank you for using the services of MET Laboratories, Inc. If you have any questions regarding these results or if MET can be of further service to you, please feel free to contact me.

Sincerely yours,
MET LABORATORIES, INC.

Jennifer Warnell
Documentation Department

Reference: (\Harris Corporation\EMC29312-MPE Rev. 1)

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RF Maximum Permissible Exposure (MPE) Report For Controlled and Uncontrolled Environments

for the

Harris Corporation
M5300 900 MHz Mobile Radio

Tested under
the FCC Certification Rules
contained in
Title 47 of the CFR, Part 1 Subpart I & Part 2 Subpart J
&
RSS-102, Issue 2, November 2005

MET Report: EMC29312-MPE Rev. 1

August 4, 2010

Prepared For:

Harris Corporation
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Lynchburg, VA 24501

Prepared By:
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RSS-102, Issue 2, November 2005



Len Knight, Project Engineer
Electromagnetic Compatibility Lab



Jennifer Warnell
Documentation Department

Engineering Statement: The measurements shown in this report were made in accordance with the procedures indicated, and the emissions from this equipment were found to be within the limits applicable. I assume full responsibility for the accuracy and completeness of these measurements, and for the qualifications of all persons taking them. It is further stated that upon the basis of the measurements made, the equipment tested is capable of operation in accordance with the requirements of the FCC Rules Parts 1 and 2, and Industry Canada standards RSS-102, Issue 2, November 2005 under normal use and maintenance.



Shawn McMillen,
Wireless Manager, Electromagnetic Compatibility Lab

Report Status Sheet

Revision	Report Date	Reason for Revision
Ø	July 28, 2010	Initial Issue.
1	August 4, 2010	Editorial corrections.

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List of Terms and Abbreviations

AC	Alternating Current
ACF	Antenna Correction Factor
Cal	Calibration
<i>d</i>	Measurement Distance
dB	Decibels
dB_μA	Decibels above one microamp
dB_μV	Decibels above one microvolt
dB_μA/m	Decibels above one microamp per meter
dB_μV/m	Decibels above one microvolt per meter
DC	Direct Current
E	Electric Field
DSL	Digital Subscriber Line
ESD	Electrostatic Discharge
EUT	Equipment Under Test
<i>f</i>	Frequency
FCC	Federal Communications Commission
GRP	Ground Reference Plane
H	Magnetic Field
HCP	Horizontal Coupling Plane
Hz	Hertz
IEC	International Electrotechnical Commission
kHz	kilohertz
kPa	kilopascal
kV	kilovolt
LISN	Line Impedance Stabilization Network
MHz	Megahertz
μH	microhenry
μF	microfarad
μs	microseconds
NEBS	Network Equipment-Building System
PRF	Pulse Repetition Frequency
RF	Radio Frequency
RMS	Root-Mean-Square
TWT	Traveling Wave Tube
V/m	Volts per meter
VCP	Vertical Coupling Plane

I. Executive Summary

A. Purpose of Test

An MPE evaluation was performed to determine compliance of the Harris Corporation M5300 900 MHz Mobile Radio, with the requirements of Part 1 and 2. All references are to the most current version of Title 47 of the Code of Federal Regulations in effect. In accordance with §2.1033, the following data is presented in support of the Certification of the M5300 900 MHz Mobile Radio. Harris Corporation should retain a copy of this document which should be kept on file for at least two years after the manufacturing of the M5300 900 MHz Mobile Radio, has been **permanently** discontinued.

B. MPE Measurements and Applicable Regulations

This test report presents the results of Maximum Permissible Exposure (MPE)¹ measurements performed on the Harris Corporation M5300 900 MHz Mobile Radio, operating in the frequency ranges 896-901 MHz and 935-940 MHz. The tests were performed in accordance with TCB training material and the following parts of the FCC Rules and Regulations and Industry Canada Radio Standard Specification:

- IEEE Std. C95.1: 2005: “IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz – 300 GHz”
- IEEE Std. C95.3: 2002: “IEEE Recommended Practice for Measurements and Computations of Radio Frequency Electromagnetic Fields with Respect to Human Exposure to Such Fields, 100 kHz – 300 GHz”
- FCC OET Bulletin 65, Edition 97-01: “Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields”
- FCC Supplement C to OET Bulletin 65, Edition 01-01: “Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emission.”
- Subpart I, Part 1 of 47 CFR FCC Rules and Regulations, Edition 10-1-06: “Procedures Implementing the National Environmental Policy Act of 1969.” Specifically, Paragraph 1.1310: “Radiofrequency Radiation Exposure Limits”
- Subpart J, Part 2 of 47 CFR FCC Rules and Regulations, Edition 10-1-06: “Equipment Authorization Procedures.” Specifically, Paragraph 2.1091: “Radiofrequency Radiation Exposure Evaluation: Mobile Devices”
- RSS-102, Issue 2, November 2005: “Spectrum Management and Telecommunications Radio Standards Specification. Radiofrequency Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands.)”

¹ By definition, maximum permissible exposure (MPE) is rms or peak electric (or magnetic) field strength, or the plane-wave equivalent power densities associated with these fields to which a person may be exposed without harmful effect and with an acceptable safety factor.

II. Equipment Configuration

A. Overview

MET Laboratories, Inc. was contracted by Harris Corporation to perform testing on the M5300 900 MHz Mobile Radio, under Harris Corporation's purchase order number 1075005.

This document describes the test setups, test methods, required test equipment, and the test limit criteria used to perform compliance testing of the Harris Corporation, M5300 900 MHz Mobile Radio.

The results obtained relate only to the item(s) tested.

Model(s) Tested:	M5300 900 MHz Mobile Radio	
EUT Specifications:	Primary Power: 13.8 V Vehicular Battery Voltage	
	FCC ID: OWDTR-0049-E IC: 3636B-0049	
	Type of Modulations:	Analog CW FM, C4FM, 4-Level GFSK
	EUT Frequency Ranges:	896 MHz to 940 MHz
Analysis:	The results obtained relate only to the item(s) tested.	
Environmental Test Conditions:	Temperature: 15-35° C	
	Relative Humidity: 30-60%	
	Barometric Pressure: 860-1060 mbar	
Evaluated by:	Len Knight	
Report Date(s):	August 4, 2010	

Table 1. EUT Summary Table

B. Test Site

All testing was performed at MET Laboratories, Inc., 914 W. Patapsco Ave., Baltimore, MD 21230. All equipment used in making physical determinations is accurate and bears recent traceability to the National Institute of Standards and Technology.

Radiated Emissions measurements were performed in a 3 meter anechoic chamber.

C. Description of Test Sample

The Harris Corporation M5300 900 MHz Mobile Radio, Equipment Under Test (EUT), is as follows:

FCC ID: OWDTR-0049-E

IC: 3636B-0049

M5300 900 MHz mobile radio

New antenna parts are -

AN-225005-001

Astron NMO9000

The coax cable is changed from RG-58 to RF-195, with a corresponding length change from 17 feet to 6 feet.

For the purposes of testing, the radio submitted was programmed to transmit and receive continuous analog voice continuous-wave FM modulation.

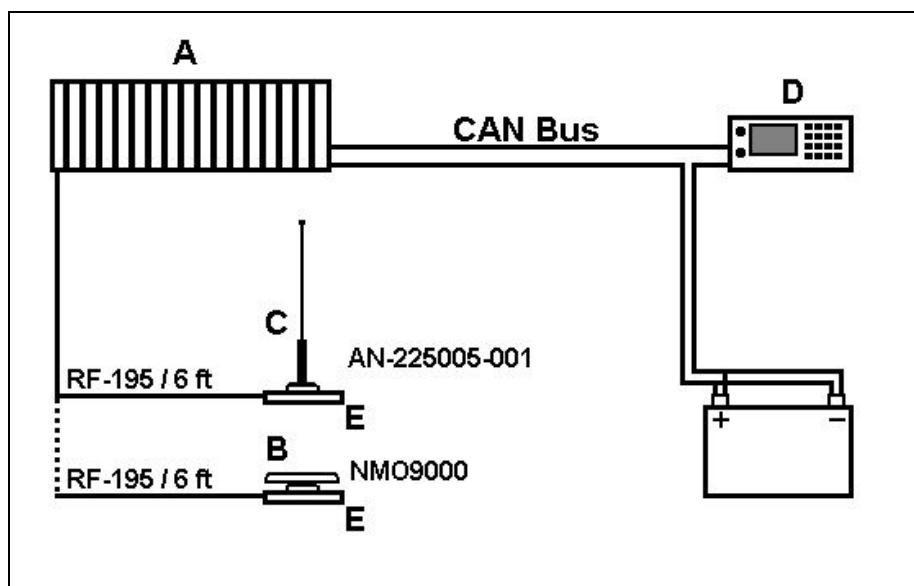


Figure 1. Block Diagram of Test Configuration

D. Equipment Configuration

The EUT was set up as outlined in Figure 1, Block Diagram of Test Setup.

Ref. ID	Name / Description	Manufacturer	Model Number	Serial Number
A	M5300 900 MHz mobile radio	Harris	RU144750-181	A4011D183034
B	Astron NMO9000 antenna	Astron	NMO9000	N/A
C	5.15 dBi Antenna	PC Tel	AN-225005-001	N/A
D	CH-721 Control Unit	Harris	CU23218-0002	98000619
E	Magnetic Antenna Mount	Harris	AN-125001-008	N/A

Table 2. Equipment Configuration

E. Mode of Operation

The mobile radio was pre-programmed with six Tx/Rx frequency pairs.

The mobile radio can transmit using the mobile microphone on each of the respective Tx frequencies. The Tx power on each of the six frequencies was 30 watts (continuous analog CW modulation).

F. Modifications

- a) **Modifications to EUT**
No modifications were made to the EUT.
- b) **Modifications to Test Standard**
No modifications were made to the test standard.

G. Disposition of EUT

The test sample including all support equipment submitted to the Electro-Magnetic Compatibility Lab for testing was returned to Harris Corporation upon completion of testing.

III. MPE Limits

A. Limits for Maximum Permissible Exposure (MPE)

Requirements: FCC Guidelines for evaluating exposure to RF Emissions, from the FCC OET Bulletin 65, Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields.

Frequency Range, MHz	Power Density (S), mW/cm ²	Averaging Time, min
300-1500	f/1500	30

Note that "f" in the column for power density is the frequency in MHz

Table 3. Limits for General Population/Uncontrolled Exposure

Frequency Range, MHz	Power Density (S), mW/cm ²	Averaging Time, min
300-1500	f/300	6

Note that "f" in the column for power density is the frequency in MHz

Table 4. Limits for Occupational/Controlled Exposure

Procedures: Prior to radiated testing, the radio was connected to a power meter in order to see if any channel was significantly stronger than the next. For the purposes of testing, the lowest channel was used.

Frequency (MHz)	Power (dBm)
896.0125	45.27
898.5000	45.27
900.9875	45.27
935.0125	45.11
937.5000	45.14
939.9875	45.14

The MPE limits for the EUT at 896.0125 MHz are shown in Table 5.

Frequency, MHz	MPE Limit for Occupational/Controlled Environment, mW/cm ²	MPE Limit for General Population/Uncontrolled Environment, mW/cm ²
896.0125	2.99	0.597

Table 5. MPE Limits for the Frequency Transmitted by the EUT

B. Calculating MPE Distance from Antenna

From the OET 65, Equations for Predicting RF Fields:

$$S = \frac{PG}{4\pi R^2}$$

Rearranging the equation for distance:

$$R = \sqrt{\frac{PG}{4\pi S}}$$

Where G is a numerical antenna gain, P is the maximum power input to the antenna and S is the MPE limit for a power density, respectively.

Cable loss was taken into account when calculating for distance.

NMO900	AN-225005-001
P = 28.84 W	P = 28.84 W
G = 2	G = 3.273
S = 0.597/2.99	S = 0.597/2.99

The R calculations, including the power reduction for cable loss are shown in Table 6.

Cable Type/Loss, dB	Antenna Model	R for Occupational/Controlled Environment, cm	R for Population/Uncontrolled Environment, cm
RF-195/0.67	NMO9000	39.2	87.7
RF-195/0.67	AN-225005-001	50.12	112.17

Table 6. Calculated MPE Distance for Different Environments

Test Procedures:

1. The test setup was as described in the EUT Configuration section of this test report. The EUT, the control head, and power supply were separated from the transmitting antenna by as much distance as the cabling would allow.
2. The antenna under test was mounted to a 20x20cm ground plane and placed on an 80cm test table.
3. The EUT was set to transmit continuously at the selected frequency and modulation at maximum RF power. The distance between the field intensity probe and the EUT's antenna was equal to the calculated distance R applicable either for controlled or uncontrolled environments.
4. Field intensity measurements were taken at different heights of the probe from the ground (0.1 to 2 meters) in 10cm increments, while rotating versus azimuth (from 0° to 360°).
5. Each maximized peak field intensity measurement was recorded.
6. Average values of power density were calculated for the imaginary whole human body (0.1–2.0 m), for the lower part of the body (0.1–0.9 m) and for the upper part of the body (1.0–2.0 m). The results of calculations are shown in the following tables.

Test Results: The EUT was compliant with this requirement.

Test Engineer: Len Knight

Test Date: 06/23/10 – 06/24/10

General Population / Uncontrolled Environment at 112.17 AN-225005-001			
	Raw	Corrected V/m	PD mW/cm2
10	18.45	15.129	0.060713
20	22.7	18.614	0.091905
30	24.2	19.844	0.104452
40	23.9	19.598	0.101878
50	25.3	20.746	0.114164
60	31.33	25.6906	0.175068
70	28.66	23.5012	0.1465
80	28.4	23.288	0.143854
90	30.4	24.928	0.164829
100	31.8	26.076	0.18036
110	30.97	25.3954	0.171068
120	30.44	24.9608	0.165263
130	28.42	23.3044	0.144057
140	25.48	20.8936	0.115794
150	21.17	17.3594	0.079933
160	21.3	17.466	0.080918
170	20.57	16.8674	0.075467
180	15.5	12.71	0.04285
190	10	8.2	0.017836
200	7.61	6.2402	0.010329

General Population / Uncontrolled Environment 112.17 cm	5.15 dBi AN-225005-001
Part of the Body/Averaging Points	Averaged Power Density
Whole Body (0.1 m to 2.0 m)	0.11
Lower Body (0.1 m to 0.9 m)	0.12
Upper Body (1.0 m to 2.0 m)	0.10

General Population / Uncontrolled Environment at 87.7 NMO9000			
	Raw	Corrected V/m	PD mW/cm²
10	20.3	16.646	0.073498
20	22.2	18.204	0.087901
30	23.56	19.3192	0.099
40	25.38	20.8116	0.114887
50	22.28	18.2696	0.088535
60	23.03	18.8846	0.094596
70	24.55	20.131	0.107495
80	24.01	19.6882	0.102818
90	23.46	19.2372	0.098162
100	22.06	18.0892	0.086796
110	23.13	18.9666	0.09542
120	23.51	19.2782	0.098581
130	24.66	20.2212	0.108461
140	25.37	20.8034	0.114796
150	25.23	20.6886	0.113533
160	24.98	20.4836	0.111294
170	23.85	19.557	0.101453
180	20.54	16.8428	0.075247
190	19.35	15.867	0.06678
200	16.81	13.7842	0.050399

General Population / Uncontrolled Environment 87.7 cm	3.0 dBi NMO9000
Part of the Body/Averaging Points	Averaged Power Density
Whole Body (0.1 m to 2.0 m)	0.09
Lower Body (0.1 m to 0.9 m)	0.10
Upper Body (1.0 m to 2.0 m)	0.09

Occupational / Controlled Environment at 50.12 AN-225005-001			
	Raw	Corrected V/m	PD mW/cm²
10	17.82	14.6124	0.056637
20	19.56	16.0392	0.068238
30	22.76	18.6632	0.092391
40	23.45	19.229	0.098078
50	24.11	19.7702	0.103677
60	24.24	19.8768	0.104798
70	36.73	30.1186	0.240618
80	45.67	37.4494	0.372005
90	57.05	46.781	0.580494
100	71.7	58.794	0.916906
110	76.62	62.8284	1.047058
120	66.22	54.3004	0.782104
130	48.11	39.4502	0.412817
140	27.81	22.8042	0.137939
150	10.43	8.5526	0.019402
160	5.31	4.3542	0.005029
170	9.54	7.8228	0.016232
180	13.44	11.0208	0.032217
190	14.45	11.849	0.037241
200	15.37	12.6034	0.042134

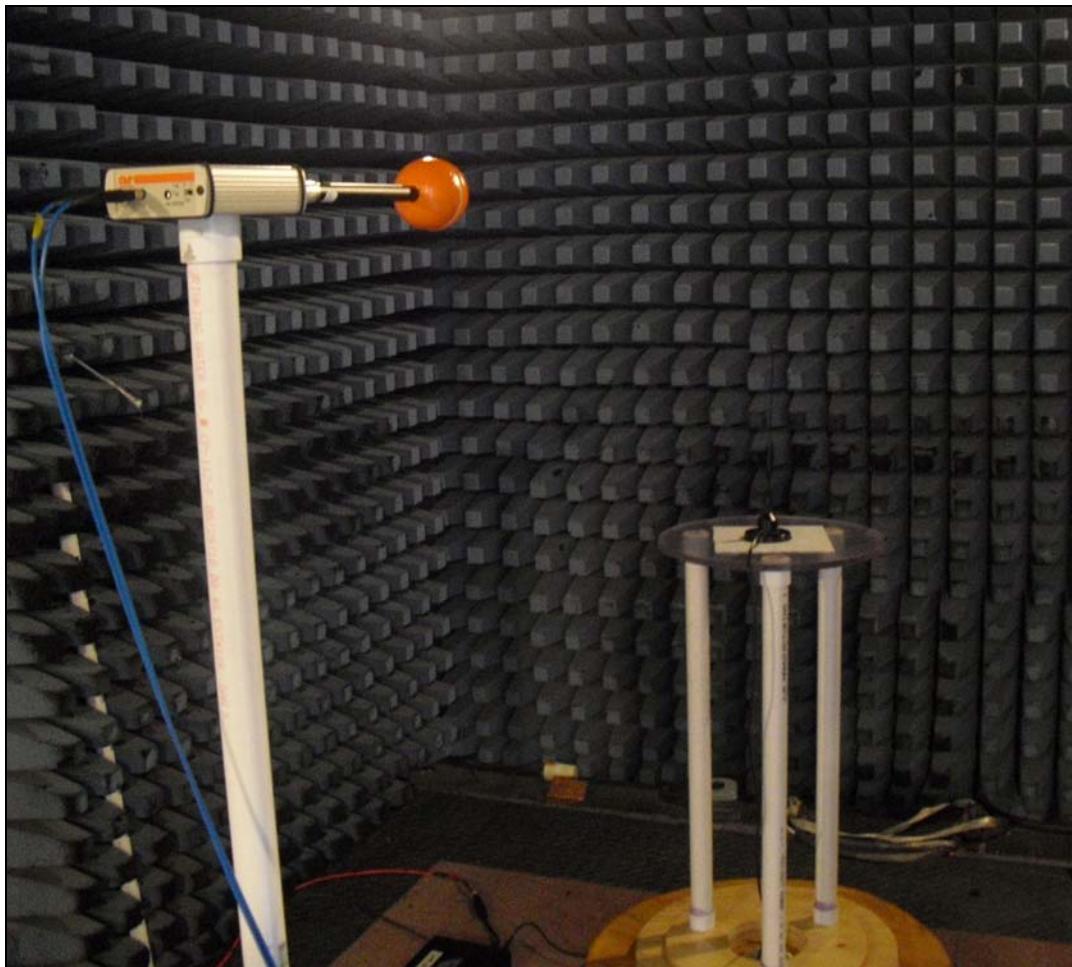
Occupational / Controlled Environment 50.12 cm	5.15 dBi AN-225005-001
Part of the Body/Averaging Points	Averaged Power Density
Whole Body (0.1 m to 2.0 m)	0.26
Lower Body (0.1 m to 0.9 m)	0.19
Upper Body (1.0 m to 2.0 m)	0.31

Occupational / Controlled Environment at 39.2 NMO9000			
	Raw	Corrected V/m	PD mW/cm ²
10	22.62	18.5484	0.091258
20	25.66	21.0412	0.117436
30	27.65	22.673	0.136357
40	31.17	25.5594	0.173285
50	33.28	27.2896	0.197539
60	36.43	29.8726	0.236704
70	39.4	32.308	0.276872
80	40.37	33.1034	0.290672
90	47.78	39.1796	0.407173
100	50.04	41.0328	0.446602
110	50.33	41.2706	0.451794
120	46.2	37.884	0.380689
130	40.37	33.1034	0.290672
140	35.73	29.2986	0.227694
150	31.57	25.8874	0.177761
160	27.3	22.386	0.132927
170	23.71	19.4422	0.100265
180	21.07	17.2774	0.07918
190	17.59	14.4238	0.055185
200	15.64	12.8248	0.043627

Occupational / Controlled Environment 39.2 cm	3.0 dBi NMO9000
Part of the Body/Averaging Points	Averaged Power Density
Whole Body (0.1 m to 2.0 m)	0.22
Lower Body (0.1 m to 0.9 m)	0.21
Upper Body (1.0 m to 2.0 m)	0.22



Photograph 1. Test Setup - NMO9000



Photograph 2. Test Setup - AN-225005-001

IV. Test Equipment

Test Equipment

Calibrated test equipment utilized during testing was maintained in a current state of calibration per the requirements of ANSI/NCSL Z540-1-1994 and ANSI/ISO/IEC 17025:2000.

MET Asset #	Equipment	Manufacturer	Model	Last Cal Date	Cal Due Date
1T4353	POWER METER	HEWLETT PACKARD	E4416A	04/13/2010	04/13/2011
1T4477	POWER SENSOR	AGILENT	E9304A	12/14/2009	12/14/2010
1T4148	SHIELD ROOM #2 SEMI-ANECHOIC	RANTEC	20	SEE NOTE	
1T4566	FIELD PROBE, 27 MHZ - 60 GHZ	AMPLIFIER RESEARCH	FP7060	12/21/2009	12/21/2010

Table 7. Test Equipment List

Note: Functionally tested equipment is verified using calibrated instrumentation at the time of testing.

End of Report