Engineering and Testing for EMC and Safety Compliance

RF Exposure Assessment for Controlled and Uncontrolled Environments Maximum Permissible Exposure Testing for M/A-COM, Inc. Model: M7200 Series FCC ID: BV8M7200

M/A-COM, Inc.
221 Jefferson Ridge Parkway
Lynchburg, VA 24501 USA
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September 14, 2005

Report Prepared By:
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Report Number: 2005131-004 Rev 0.02

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Engineering and Testing for EMC and Safety Compliance

CONFORMANCE STATEMENT

Standard(s) to which conformity is declared

STANDARDS AND OTHER APPLICABLE DOCUMENTS	ENVIRONMENTAL PHENOMENA
• FCC OET Bulletin 65 • FCC 47 CFR, Paragraphs 1.1310 and 2.1091 • TCB Training Material	Maximum Permissible Exposure (MPE) for Controlled and Uncontrolled Environment

Device for which conformity is declared

Manufacturer's Name	M/A-COM, Inc.
Manufacturer's Address	221 Jefferson Ridge Parkway Lynchburg, VA 24501 USA
Trade Name	Opensky Mobile Radio
Device Classification	Licensed Non-Broadcast Transceiver
Device Type	Mobile 760 - 870 MHz Radio Transceiver with Vehicle Rooftop Antenna
Model Number	M7200 Series
Serial Number	A40041001004
FCC ID	BV8M7200
TX Frequency Ranges	764 – 776, 794 – 806, 806 – 824, 851 – 869 MHz
RF Max Power Rating	15 Watts
TX Duty Cycle	100%
Antenna(s) to be used with the device	Rooftop mount antennas, models MAXRAD model (B)MUF7603, antenna gain 3 dBd (5.15 dBi) MAXRAD model (B)Max76035, antenna gain 3 dBd (5.15 dBi) MAXRAD model MLPV700, antenna gain 1.85 dBd (4 dBi)
Antenna mount to be used with the device	Magnetic mount with a GPS receiving antenna and a preamplifier, through the roof mount
Year of Manufacture	2005

We, the undersigned, hereby declare that the equipment specified above conforms to the MPE limits for controlled and uncontrolled environments required by the above identified standards at the distance referenced as the safe distance in the attached test report. No modifications were made during testing to the equipment in order to comply with the requirements of the standards.

Test Personnel:

Galina Yushina		September 12, 2005
Test Engineer	Signature	Date

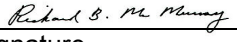
Richard B. McMurray, P.E.		September 12, 2005
Supervising Engineer	Signature	Date

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TABLE OF CONTENTS

1 MPE MEASUREMENTS AND FCC REGULATIONS

This test report presents the results of Maximum Permissible Exposure (MPE)[1] testing performed on the M/A-Com, Inc. Model M7200 Series. The tests were performed in accordance with the following parts of FCC Rules and Regulations:

- FCC OET Bulletin 65: "Evaluating Compliance with FCC-Specified Guidelines for Human Exposure to Radio Frequency Radiation",
- Subpart I of Part 1 of 47 CFR FCC Rules and Regulations: "Procedures Implementing the National Environmental Policy Act of 1969",
- Subpart J of Part 2 of 47 CFR: "Equipment Authorization Procedures",
- 47 CFR paragraph 1.1310: "Radiofrequency radiation exposure limits",
- 47 CFR paragraph 2.1091: "Radiofrequency radiation exposure evaluation: mobile and unlicensed devices", and TCB training material.

2 IDENTIFICATION OF THE EUT[2]

The EUT is a system comprising of a 764 - 869 MHz transceiver, an RF antenna mounted on the antenna base and connected to the EUT via an RF cable, and a control unit. General information about the EUT is shown below.

Manufacturer's Name	M/A-COM, Inc.
Manufacturer's Address	221 Jefferson Ridge Parkway Lynchburg, VA 24501 USA
Model Number	M7200 Series
FCC ID	BV8M7200
Use of Product	Voice and Data Communication
Device Classification	Non-Broadcast Mobile Transceiver
Device Type	Transceiver with a vehicle rooftop antenna
Types of Modulation	FM and Digital
TX Frequency Ranges	764 – 776, 794 – 806, 806 – 824, 851 – 869 MHz
RF Power Rating	15 W
Duty Cycle	100%
External Input	Digital data
Antenna(s) Type(s) and Gain(s)	MAXRAD model (B)MUF7603, antenna gain 3 dBd (5.15 dBi) MAXRAD model (B)Max76035, antenna gain 3 dBd (5.15 dBi) MAXRAD model MLPV700, antenna gain 1.85 dBd (4 dBi)
Antenna Base Types	Magnetic mount with a GPS receiving antenna and a preamplifier, through the roof mount
Year of Manufacture	2005

[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.
[2] Equipment Under Test would be referenced hereafter as EUT

M7200 Series Model Information

The M7200 Series consists of two models:

- M7250 - Trunk-Mount Full-Duplex Mobile Radio with CH-103 or CH-103PA Control Head
- M7270 - Trunk-Mount Full-Duplex Mobile Radio with CH-721 Control Head

The M7250 version of the product was tested. The only difference in product types is the user control head only.

M7200 Series Antenna Elements and Mounts

A total number of 4 antenna mount types and 3 antenna element types form the following antenna combinations. An additional antenna assembly is a magnetic mount GPS receiving antenna only (as this is just a receiving antenna, it was not a subject of the MPE investigation). We selected a subset of the mount types to serve as representative cases for the MPE investigation (that is, the magnetic mount with GPS and the through the roof mount with GPS). We investigated the three antenna element types with the magnetic mount with GPS, and the two elements that rely on the automobile as a ground plane for investigation with the through the roof mount. All combinations are shown below for completion.

M/A-COM P/N	M/A-COM Model	Components	Supplier – P/N	Description
AN-025167-001	MAMV-AN3J	MAX603S; BM		3 dBd vertical with hole mount base, no GPS
AN-025167-002	MAMV-AN3K	MUF7603; BM		3 dBd elevated feed (vertical dipole) hole mount base, no GPS.
AN-025167-004	MAMV-AN3V	MAX603S; GPSPSM GPS+		3 dBd vertical with hole mount base including GPS receiving antenna.
AN-025167-005		MUF7603; GPSPSM GPS+		3 dBd elevated feed (vertical dipole) with hole mount base including GPS receiving antenna.
AN-025167-006		MAX603S; xxxxxx		3 dBd vertical with mag mount, no GPS.
AN-025167-007		MAX603S; CPSPMM		3 dBd vertical with mag mount including GPS receiving antenna.
AN-025167-008		MUF7603; xxxxxxx		3 dBd elevated feed (vertical dipole) with mag mount, no

				GPS.
AN-025167-009		MUF7603; CPSPMM		3 dBd elevated feed (vertical dipole) with mag mount including GPS receiving antenna.
AN-025167-010		MLPV700; BM		1.85 dBd low profile vertical (canister) hole mount, no GPS.
AN-025167-011		MLPV700; GPSPSM GPS+		1.85 dBd low profile vertical (canister) with hole mount base including GPS receiving antenna.
	MAMV-AN3L			GPS receiving antenna only; mag mount.
		MLPV700; CPSPMM		1.85 dBd low profile vertical (canister) mag mount with GPS receiving antenna.

PCTel has purchased MaxRad antenna company. Antenna elements and bases are MaxRad P/N's as shown in components column. Supplier P/N is PCTel number for packaged component parts for creating a M/A-COM antenna assembly.

Antenna bases are either hole mount or magnetic mount. Of these two types they either have, or do not have a receiving GPS antenna. This gives 4 mounting base configurations.

Mounts with GPS receiving antennas, have a 27 dB (typical) preamp included, DC powered through the transmission line.

3 MODIFICATIONS

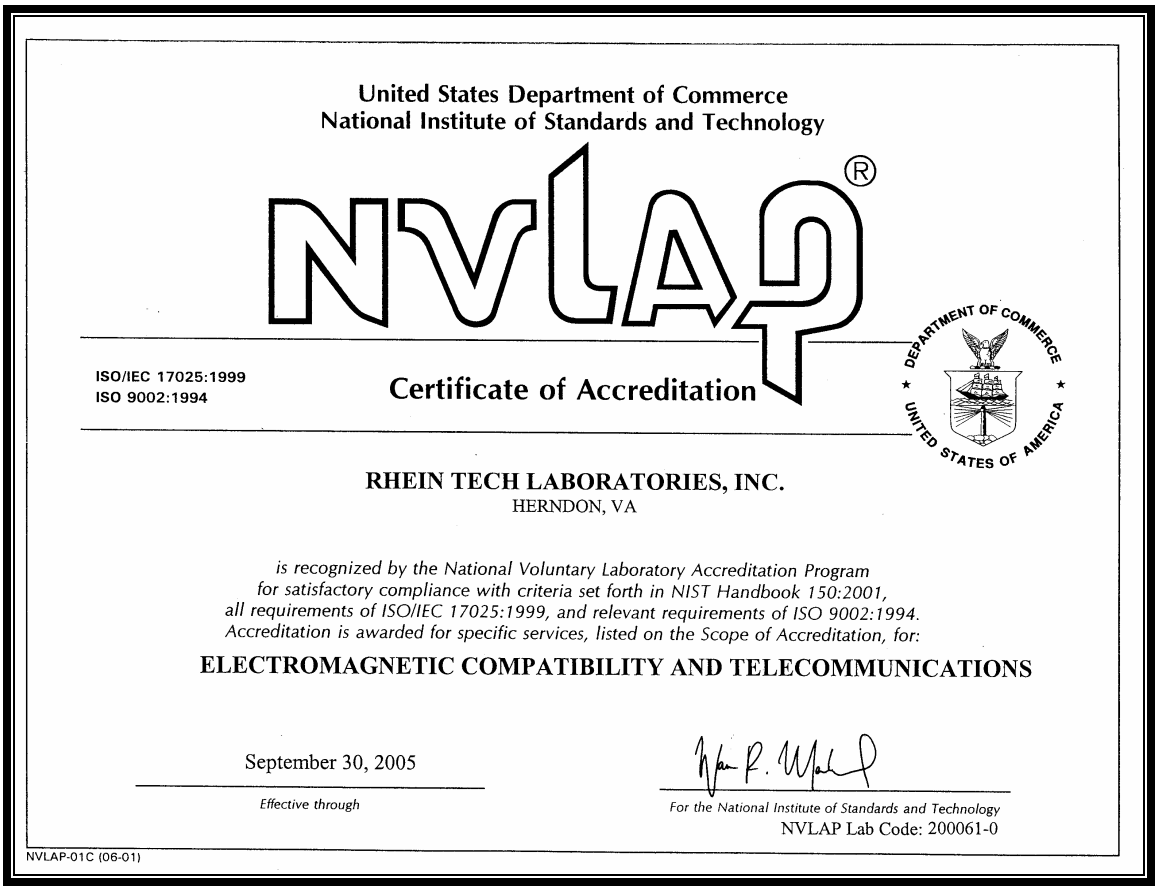
No modifications were made to the EUT during testing.

4 TEST LABORATORY

Tests were performed by test personnel of Rhein Tech Laboratories, Inc. (RTL), which is accredited by national and international regulatory bodies against ISO IEC 17025: “General Requirements for Competence of Testing and Calibration Laboratories”. Figures 4.1 through 4.3 of this test report present copies of the RTL NVLAP certificate and the applicable part of the scope of RTL accreditation.

The RTL test facility is located at 360 Herndon Parkway, Suite 1400, Herndon, Virginia, 20170, USA. The FCC and other regulatory bodies approved using this facility for conducting tests and measurements on a contractual basis.

FIGURE 4.1: RTL NVLAP ACCREDITATION CERTIFICATE 2004-2005



United States Department of Commerce
National Institute of Standards and Technology

NVLAP®

ISO/IEC 17025:1999
ISO 9002:1994

Certificate of Accreditation

DEPARTMENT OF COMMERCE ★ UNITED STATES OF AMERICA ★

RHEIN TECH LABORATORIES, INC.
HERNDON, VA

is recognized by the National Voluntary Laboratory Accreditation Program for satisfactory compliance with criteria set forth in NIST Handbook 150:2001, all requirements of ISO/IEC 17025:1999, and relevant requirements of ISO 9002:1994. Accreditation is awarded for specific services, listed on the Scope of Accreditation, for:

ELECTROMAGNETIC COMPATIBILITY AND TELECOMMUNICATIONS

September 30, 2005
Effective through

For the National Institute of Standards and Technology
NVLAP Lab Code: 200061-0

NVLAP-01C (06-01)

FIGURE 4.2: NVLAP SCOPE OF ACCREDITATION

National Institute of Standards and Technology — NVLAP® — National Voluntary Laboratory Accreditation Program

ISO/IEC 17025:1999
ISO 9002:1994

Scope of Accreditation

Page: 2 of 15

ELECTROMAGNETIC COMPATIBILITY AND TELECOMMUNICATIONS — **NVLAP LAB CODE 200061-0**

RHEIN TECH LABORATORIES, INC.

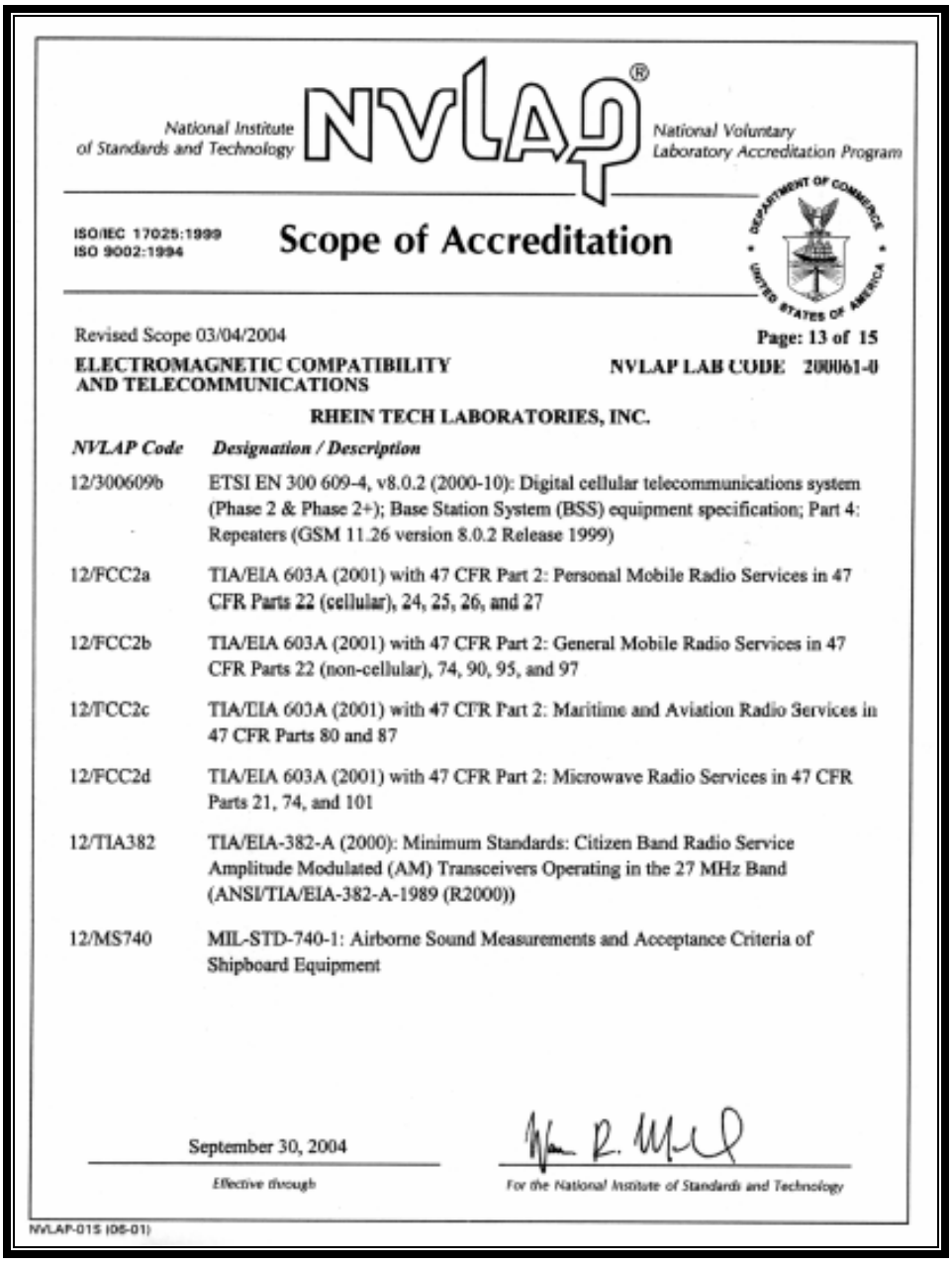
NVLAP Code	*Designation / Description*
12/EM03	IEC 61000-3-3(1995); EN 61000-3-3(1995); AS/NZS 2279.3(1995): EMC - Part 3: Limits - Section 3. Limitation of voltage fluctuations and flicker in low-voltage supply systems for equipment with rated current up to 16A
12/F18	FCC OST/MP-5 (1986): FCC Methods of Measurement of Radio Noise Emissions for ISM Equipment (cited in FCC Method 47 CFR Part 18 - Industrial, Scientific, and Medical Equipment)
12/FCC15b	ANSI C63.4 (2001) with FCC Method 47 CFR Part 15, Subpart B: Unintentional Radiators
12/FCC15c	ANSI C63.4 (2001) with FCC Method 47 CFR Part 15, Subpart C: Intentional Radiators
12/FCC15d	ANSI C63.4(2001) with FCC Method 47 CFR Part 15, Subpart D: Unlicensed Personal Communications Service Devices
12/FCC15f	ANSI C63.4 (2001) with FCC Method 47 CFR Part 15, Subpart F: Ultra-Wideband Operation
12/T51	AS/NZS CISPR 22 (2002) and AS/NZS 3548 (1997): Electromagnetic Interference - Limits and Methods of Measurement of Information Technology Equipment

September 30, 2005
Effective through

For the National Institute of Standards and Technology

NVLAP-01S (06-01)

FIGURE 4.3: NVLAP SCOPE OF ACCREDITATION



National Institute of Standards and Technology — NVLAP® — National Voluntary Laboratory Accreditation Program

ISO/IEC 17025:1999
ISO 9002:1994

Scope of Accreditation

Revised Scope 03/04/2004

Page: 13 of 15

ELECTROMAGNETIC COMPATIBILITY AND TELECOMMUNICATIONS

NVLAP LAB CODE 200061-0

RHEIN TECH LABORATORIES, INC.

NVLAP Code	*Designation / Description*
12/300609b	ETSI EN 300 609-4, v8.0.2 (2000-10): Digital cellular telecommunications system (Phase 2 & Phase 2+); Base Station System (BSS) equipment specification; Part 4: Repeaters (GSM 11.26 version 8.0.2 Release 1999)
12/FCC2a	TIA/EIA 603A (2001) with 47 CFR Part 2: Personal Mobile Radio Services in 47 CFR Parts 22 (cellular), 24, 25, 26, and 27
12/FCC2b	TIA/EIA 603A (2001) with 47 CFR Part 2: General Mobile Radio Services in 47 CFR Parts 22 (non-cellular), 74, 90, 95, and 97
12/FCC2c	TIA/EIA 603A (2001) with 47 CFR Part 2: Maritime and Aviation Radio Services in 47 CFR Parts 80 and 87
12/FCC2d	TIA/EIA 603A (2001) with 47 CFR Part 2: Microwave Radio Services in 47 CFR Parts 21, 74, and 101
12/TIA382	TIA/EIA-382-A (2000): Minimum Standards: Citizen Band Radio Service Amplitude Modulated (AM) Transceivers Operating in the 27 MHz Band (ANSI/TIA/EIA-382-A-1989 (R2000))
12/MS740	MIL-STD-740-1: Airborne Sound Measurements and Acceptance Criteria of Shipboard Equipment

September 30, 2004
Effective through

For the National Institute of Standards and Technology

NVLAP-01S (05-01)

5 TURNAROUND TIME

The EUT was ready for MPE investigation on 08/29/05. Investigation began on 08/30/05 and was finished on 09/12/05.

6 TEST EQUIPMENT, ACCESSORIES AND TEST SET UP

Test equipment used for the measurements is shown in Table 6.1.

TABLE 6.1: LIST OF TEST EQUIPMENT

RTL Barcode	Manufacturer	Model	Equipment Type	Serial Number	Calibration Due Date
901182	Wandel & Goltermann	TYPE-8	E- Field Probe (10 kHz to 3 GHz)	AH-0021	01/06/07
901183	Wandel & Goltermann	EMR 200[3]	Radiation Meter	AE-0024	01/06/07
901109	SPER Scientific	800041	Digital Higro Thermometer	NA	11/09/05
901366	Control Company	PTB210 Class A	Barometer	W2940009	07/02/2006

RTL did not use any accessories with the EUT, except for an EUT power supply and a PC loaded with the M/A-Com provided software to operate and control the system. Table 6.2 shows detailed information about the M/A-Com provided parts of the tested system.

TABLE 6.2: M/A-COM PARTS

Part	Manufacturer	Model	PN/SN or comment	FCC ID	RTL Bar Code
Transceiver	M/A-Com, Inc.	M7250	MAHROS0050/A40041001004	BV8M7200	16802
Power Supply	M/A-Com, Inc.	SEC212	N/A	N/A	16804
Control Head	M/A-Com, Inc.	CH103	A4000A16FF8A	N/A	16809
Antenna	Maxrad	(B)MUF7603	N/A	N/A	16812
Antenna	Maxrad	(B)Max76035	N/A	N/A	16813
Antenna	Maxrad	MLPV700	N/A	N/A	16814
Antenna Base 2	M/A-Com, Inc.		Through the roof mount	N/A	16833
Antenna Base 1	M/A-Com, Inc.		Magnetic mount	N/A	

[3] Per the Operating Manual for the EMR 200 radiation meter, the device, with the type 8 probe, measures electromagnetic power in the range of 0.00027 - 170 mW/cm^2. The recommended environment is the following: Ambient temperature: (23 ± 3) °C; ambient relative humidity: 25% - 75%.

TEST SETUP

To avoid influence of ambient radiation, RTL conducted MPE measurements in a semi-anechoic room.

- The EUT's antenna[4] was solidly connected to the mount[5] placed (or solidly connected) in the center of the 60x60 cm^2 metal plane simulating the actual installation environment on the car roof. The metal plane was placed on the 80 cm tall wood table located on the 10 cm tall 360° rotating wooden platform.
- The EUT (without the antenna), its power supply and control unit were located on the wooden platform; the EUT was connected to the antenna by 4.5 m RF cable.
- The test probe was solidly connected to the radiation meter attached to the plastic mast in front of the EUT's antenna.
- The PC was located outside the anechoic room.

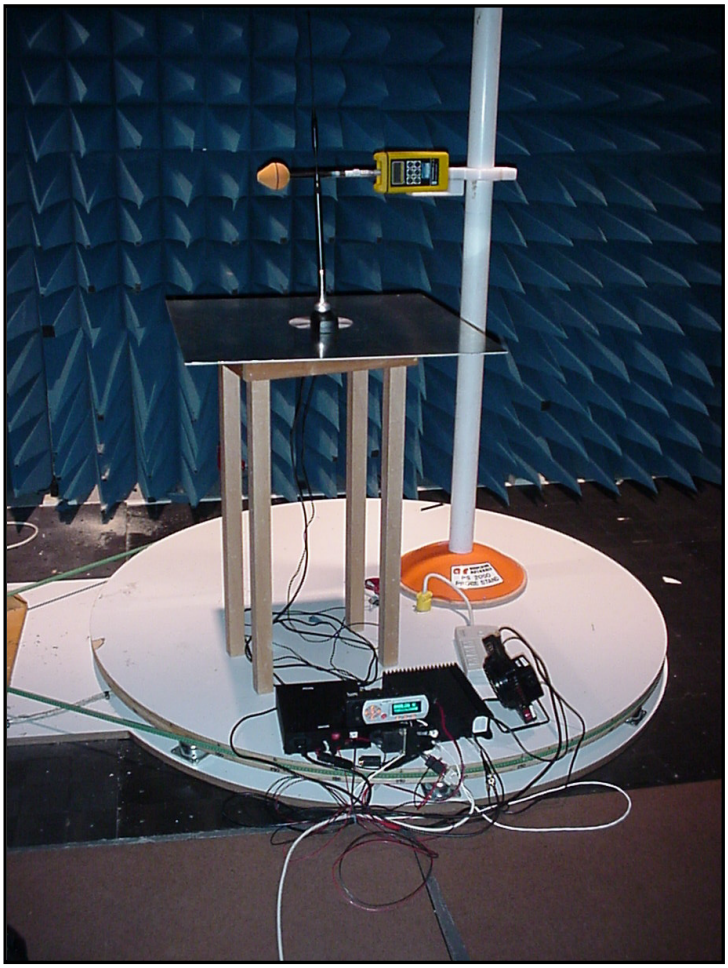
During the MPE measurements, the EUT was set to transmit at maximum RF power and 100% duty cycle

The typical test set up with antenna base 2 (See Table 6.2 for identification of the antenna bases) is shown in Photograph 6.1; when antenna base 1 was used, the RF cable did not go down through the hole in the metal plane, but was routed on the surface of the metal plane.
Photograph 6.2 demonstrates the tested antenna.

[4] Any of the antennas used with the EUT during the measurements.

[5] RTL conducted the tests using two antenna mounts in sequence with different antennas. One of the mounts was a magnetic mount, which contained a GPS receiving antenna and a preamplifier. Its internal devices receive power through the GPS coax connected to the transceiver whenever the M7200 Series is powered. Another mount has no magnet and no GPS antenna with a preamplifier; unlike the first mount, it requires a hole in the vehicle roof sheet metal to be properly set on the car roof.

PHOTOGRAPH 6.1: TEST SET UP FOR MPE MEASUREMENTS FOR CONTROLLED ENVIRONMENT.



PHOTOGRAPH 6.2: TESTED ANTENNAS

Note to Photograph 6.2:
The following antennas are shown on the photograph from the left to the right:
(B)MUF7603, (B)Max76035, MLPV700 (the shortest one)

7 MPE LIMITS

The FCC limits for MPE are based on the recommended MPE guidelines published by the National Council on Radiation Protection and Measurements in "Biological Effects and Exposure Criteria for Radiofrequency Electromagnetic Fields". The recommended electro-magnetic fields and power limits in the radio frequency range in uncontrolled and controlled environments are shown below.

TABLE 7.1: FCC/IC LIMITS FOR MPE IN GENERAL POPULATION / UNCONTROLLED ENVIRONMENT

Frequency Range, MHz	Electric Field Strength (E), V/m	Magnetic Field Strength (H), A/m	Power Density (S), mW/cm^2	Averaging Time, min
0.3-3.0	614	1.63	(100)	30
3.0-30	824/f	2.19/f	$(180/f^2)$	30
30-300	27.5	0.073	0.2	30
300-1500	-	-	f/1500	30
1500-100,000	-	-	1.0	30

TABLE 7.2: FCC/IC LIMITS FOR MPE IN CONTROLLED ENVIRONMENT

Frequency Range, MHz	Electric Field Strength (E), V/m	Magnetic Field Strength (H), A/m	Power Density (S), mW/cm^2	Averaging Time, min
0.3-3.0	614	1.63	(100)	6
3.0-30	1842/f	4.89/f	$(900/f^2)$	6
30-300	61.4	0.163	1.0	6
300-1500	-	-	f/300	6
1500-100,000	-	-	5	6

For a device transmitting in the frequency range of 764-869 MHz, the MPE limits for power density in controlled and uncontrolled environments are shown in Table 7.3.

TABLE 7.3: MPE LIMITS FOR THE EUT

Frequency, MHz	MPE Limit for Controlled Environment, mW/cm^2	MPE Limit for Uncontrolled Environment, mW/cm^2
764	2.5467	0.5093
806	2.6867	0.5373
824	2.7467	0.5493
869	2.8967	0.5793

8 STANDARD TEST CONDITIONS AND ENGINEERING PRACTICES

Except as noted herein, the following conditions and procedures were fulfilled during the testing:

ANSI C63.4 requires the ambient temperature and relative humidity to be within the ranges of 10°C to 40°C and 10% to 90%, respectively. With respect to the narrower ranges recommended for the power meter (see Section 6), ambient conditions shall be in line with the power meter ranges. Actual values of ambient temperature and relative humidity were measured and shown in Section 10 of this test report.

The MPE measurements presented in Section 10, unless otherwise noted, show the highest measured level.

9 MEASUREMENT PROCEDURE

1. The test setup was organized as described in Section 6 of this test report. The transceiver, the EUT power supply, and the control unit were kept at a distance from the transmitting antenna and a power density meter in order to minimize interference with the measurements.
2. The polarization of the EUT's antenna was vertical, which is its position in actual use.
3. Prior to making any measurements, we calibrated the measuring system in accordance with the EMR-200 Operating Manual and evaluated the "safe" distance for different antennas and different environments by calculation.
4. Evaluation of the safe distance was based on the equation $R_{safe} = \sqrt{(P_{max} \times G \times \eta / 4\pi S)}$, where G is the numerical value for the antenna gain, P_{max} and S are the maximum power delivered to an antenna and the MPE limit for the power density, respectively; η is the duty cycle (in percentage) divided by 100.
5. During the preliminary measurements, the distance between the field probe and the EUT's antenna was set to the evaluated R_{safe}.
6. The EUT was set to transmit maximum RF power.
7. Power density MPE measurements were taken at different heights of the probe from the ground (0.2 to 2 meters) while rotating the EUT from 0 to 360° at each position of the probe.
8. The azimuth between the probe and the antenna position corresponding to the highest MPE level was chosen as the "worst case" position for the final measurements.
9. The distance between the test probe and the tested antenna was adjusted to the real safe distance, R_{real}, such that the "worst case" position corresponding to the highest power density was slightly less than the test limit. The correction factor for the power density meter/probe at the transmitting frequency was taken into account when this adjustment was made. We conducted final power density measurements at different positions (heights) of the probe from the ground. These measurement results are shown in Section 10.
10. Average values of power density were calculated for the whole body (0.2 – 2.0 m), lower body (0.2 – 0.9 m) and upper body (1.0 – 2.0 m). These calculations are also shown in Section 10.

Two important issues were taken into account during evaluation of R_{safe}:

- The first issue considered was the influence of the length of the RF cable (Belden RG58) connecting the EUT to the antenna mount and the quality of connection of the antenna to the base (mount). A significant cable length (4.5 m) lowered the RF power delivered from the EUT to the antenna due to cable insertion loss. If the connection of the antenna to its mount is not 100%

perfect, this connection may add additional loss to the RF power delivered to the tested antenna and correspondingly to the power transmitted by the antenna. Both factors influence the value of $R_{real.}$ Since the RF cable was connected to the antenna mount permanently, cable insertion loss was not possible to measure. Therefore, evaluation of the loss was based on the specification from the cable manufacturer and experience-based information from the EUT manufacturer. We estimated that at the EUT transmitting frequencies cable loss could vary from 1.5 dB to 2.5 dB.

- The second issue considered was the choice of the transmitting frequency during the investigation. RTL test report number 2005131-002 showed that the highest RF power of 14.79 W was delivered to the antenna port at the highest transmitting frequency of 869 MHz, and the lowest power of 13.94 W was delivered to the antenna port at the lowest frequency of 764 MHz. On the other hand, the MPE test limit is more stringent at 764 MHz. Both factors influenced the value of $R_{real.}$ To make the appropriate choice of the transmitting frequency for the test, we calculated safe distances for controlled and uncontrolled environments for four frequencies covering the entire frequency range of the EUT. Calculation was based on the MPE limits at different frequencies and the real values of RF power delivered to the antenna port. It was reasonable to suggest that for the test we shall set the EUT to transmit at the frequency which gave the largest safe distance.

Evaluated values of R_{safe} for antennas with G_N = 3.27 (G_I = 5.15 dBi) and G_N=1.78 (G_I= 4 dBi) are shown in Tables 9.1 and 9.2 for controlled and uncontrolled environments. Three different columns in the tables with the headers R_{s1}, $R_{s2,}$ and R_{s3} show the calculated safe distances in three different cases: R_{s1} corresponds to the situation when full RF power is delivered to the tested antenna. R_{s2} reflects the loss of 2 dB due to the cable and the quality of a connection. R_{s3} safe distance was calculated in the suggestion that 3 dB of the transmitting power is lost in the path of the RF cable and the antenna connector. The column "Power" shows the measured conducted RF power per the test report 2005131-002.

TABLE 9.1: EVALUATED SAFE DISTANCE FOR CONTROLLED ENVIRONMENT

Frequency, MHz	Power, watts	Evaluation for the antenna with G_N =3.27			Evaluation for the antenna with G_N =1.78		
		R_{s1}, cm	R_{s2}, cm	$R_{s3,}$ cm	R_{s1}, cm	R_{s2}, cm	$R_{s3,}$ cm
764.00	13.9	37.7	29.9	26.7	27.8	22.1	19.7
806.00	14.3	37.2	29.6	26.3	27.4	21.8	19.4
824.00	14.1	36.5	29.0	25.8	26.9	21.4	19.1
869.00	14.7	36.4	28.9	25.8	26.8	21.3	19.0

TABLE 9.2: EVALUATED SAFE DISTANCE FOR UNCONTROLLED ENVIRONMENT

Frequency, MHz	Power, watts	Evaluation for the antenna with G_N =3.27			Evaluation for the antenna with G_N =1.78		
		R_{s1}, cm	R_{s2}, cm	$R_{s3,}$ cm	R_{s1}, cm	R_{s2}, cm	$R_{s3,}$ cm
764.00	13.9	84.3	67.0	59.7	62.2	49.4	44.0
806.00	14.3	83.2	66.0	58.9	61.4	48.8	43.5
824.00	14.1	81.6	64.8	57.8	60.2	47.8	42.6
869.00	14.7	81.3	64.6	57.6	60.0	47.7	42.5

The evaluation above shows that we should choose the frequency 764 MHz for the MPE measurements.

10 TEST RESULTS

The MPE measurements were conducted 08/30/05 - 09/10/05 by Galina Yushina.

Ambient conditions during MPE investigation:

- Temperature varied from 23 to 26°C.
- Relative humidity varied from 30 to 33%
- Atmospheric pressure varied from 755 to 765 mmHg.

The MPE measurement procedure was in line with the description of Section 9. However, regardless of the theoretical evaluations of the R_{safe} shown in Tables 9.1 and 9.2, preliminary MPE measurements demonstrated that it was necessary to choose the transmitting frequency on the case-by-case basis since MPE levels were significantly dependent on the combination of frequency, antenna, and antenna base. The highest values of the "safe distance" corresponded to the following transmitting frequencies of the EUT:

a. 764 MHz - for MLPV700 antenna and antenna mount 1
b. 806 MHz – for (B)Max76035 antenna and antenna mount 1
c. 869 MHz – for MLPV700 and (B)Max76035 mounted on antenna mount 2, and for (B)MUF7603 and antenna base 1.

It was noted that when antennas were mounted on the antenna base 1, MPE at the chosen frequency was 1.2-1.3 times higher than at 764 MHz; when antennas were mounted on the antenna base 2, MPE at the chosen frequency was up to 2.5 times higher than MPE at 764 MHz.

We also observed that MPE levels depended on the position of the RF cable in the cases when ground sensitive antennas ((B)Max76035 and MLPV700) were mounted on the antenna base 1. During the measurements, the cable was adjusted to maximize the MPE level.

A total 10 sets of measurements were made for controlled and uncontrolled environments representing measurements of all three antennas mounted on the antenna base 1 and measurements of two ground sensitive antennas mounted on the base 2. No measurements were made for the (B)MUF7603 antenna mounted on the base 2, since this antenna is not sensitive to grounding (per the manufacturer's specification sheet).

The test results are shown below. After each table with the set of measured MPE levels versus height, there is another table showing calculated average MPE value for the whole body, lower body, and upper body.

During MPE measurements for (B)MUF7603 antenna mounted on base 1, the EUT transmitted at 869 MHz. In a controlled environment, R_{real} was 26 cm; in an uncontrolled environment, R_{real} was 58 cm.

TABLE 10.1.0: MPE FOR (B)MUF7603 ANTENNA, CONTROLLED ENVIRONMENT, ANTENNA BASE 1

MPE, mW/cm^2, measured at the heights shown below																		
20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180	190	200
0.03	0.02	0.02	0.02	0.01	0.02	0.04	0.14	0.90	1.70	2.40	1.80	0.90	0.14	0.13	0.10	0.06	0.02	0.01.

TABLE 10.1.1: AVERAGED MPE, (B)MUF7603 ANTENNA, CONTROLLED ENVIRONMENT, ANTENNA MOUNT 1

Part of the body / averaging points	Averaged Power Density at the R_{real}, mW/cm^2
Whole body (0.2 m to 2.0 m)	**0.461**
Lower body (0.2 m to 0.9 m)	**0.038**
Upper body (1.0 m to 2.0 m)	**0.769**

TABLE 10.2.0: MPE FOR (B)MUF7603 ANTENNA, UNCONTROLLED ENVIRONMENT, ANTENNA MOUNT 1

MPE, mW/cm^2, measured at the heights shown below																		
20	**30**	**40**	**50**	**60**	**70**	**80**	**90**	**100**	**110**	**120**	**130**	**140**	**150**	**160**	**170**	**180**	**190**	**200**
0.01	0.02	0.02	0.02	0.02	0.04	0.09	0.12	0.16	0.20	0.43	0.59	0.53	0.51	0.37	0.21	0.09	0.05	0.04

TABLE 10.2.1: AVERAGED MPE, (B)MUF7603 ANTENNA, UNCONTROLLED ENVIRONMENT, ANTENNA MOUNT 1

Part of the body / averaging points	Averaged Power Density at the R_{real}, mW/cm^2
Whole body (0.2 m to 2.0 m)	**0.185**
Lower body (0.2 m to 0.9 m)	**0.042**
Upper body (1.0 m to 2.0 m)	**0.289**

During MPE measurements for (B)MAX76035 antenna mounted on base 1, the EUT transmitted at 806 MHz. In a controlled environment, R_{real} was 32 cm; in an uncontrolled environment, R_{real} was 70 cm.

TABLE 10.3.0: MPE FOR (B)MAX76035 ANTENNA, CONTROLLED ENVIRONMENT, ANTENNA BASE 1

MPE, mW/cm^2, measured at the heights shown below																		
20	**30**	**40**	**50**	**60**	**70**	**80**	**90**	**100**	**110**	**120**	**130**	**140**	**150**	**160**	**170**	**180**	**190**	**200**
0.03	0.02	0.02	0.03	0.05	0.10	0.20	0.30	2.60	1.70	1.00	0.60	0.20	0.15	0.10	0.04	0.03	0.02	0.01

TABLE 10.3.1: AVERAGED MPE, (B)MAX76035 ANTENNA, CONTROLLED ENVIRONMENT, BASE 1

Part of the body / averaging points	Averaged Power Density at the R_{real}, mW/cm^2
Whole body (0.2 m to 2.0 m)	**0.379**
Lower body (0.2 m to 0.9 m)	**0.094**
Upper body (1.0 m to 2.0 m)	**0.586**

TABLE 10.4.0: MPE FOR (B) MAX76035 ANTENNA, UNCONTROLLED ENVIRONMENT, ANTENNA BASE 1

MPE, mW/cm^2, measured at the heights shown below																		
20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180	190	200
0.07	0.06	0.07	0.06	0.12	0.12	0.10	0.15	0.30	0.45	0.56	0.57	0.43	0.28	0.20	0.15	0.14	0.10	0.08

TABLE 10.4.1: AVERAGED MPE, (B)MAX76035 ANTENNA, UNCONTROLLED ENVIRONMENT, BASE 1

Part of the body / averaging points	Averaged Power Density at the R_{real}, mW/cm^2
Whole body (0.2 m to 2.0 m)	**0.213**
Lower body (0.2 m to 0.9 m)	**0.094**
Upper body (1.0 m to 2.0 m)	**0.300**

During MPE measurements for MLPV700 antenna mounted on base 1 the EUT transmitted at 764 MHz. In a controlled environment, R_{real} was 27 cm; in an uncontrolled environment, R_{real} was 65 cm.

TABLE 10.5.0: MPE FOR MLPV700 ANTENNA, CONTROLLED ENVIRONMENT, ANTENNA BASE 1

MPE, mW/cm^2, measured at the heights shown below																		
20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180	190	200
0.07	0.07	0.07	0.07	0.08	0.08	0.1	0.11	2.7	1.7	0.45	0.11	0.04	0.03	0.02	0.01	0.01	0.01	0.01

TABLE 10.5.1: AVERAGED MPE, MLPV700 ANTENNA, CONTROLLED ENVIRONMENT, BASE 1

Part of the body / averaging points	Averaged Power Density at the R_{real}, mW/cm^2
Whole body (0.2 m to 2.0 m)	**0.307**
Lower body (0.2 m to 0.9 m)	**0.081**
Upper body (1.0 m to 2.0 m)	**0.472**

TABLE 10.6.0: MPE FOR MLPV700 ANTENNA, UNCONTROLLED ENVIRONMENT, ANTENNA BASE 1

MPE, mW/cm^2, measured at the heights shown below																		
20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180	190	200
0.01	0.02	0.03	0.06	0.07	0.03	0.09	0.10	0.19	0.55	0.57	0.55	0.50	0.35	0.30	0.20	0.11	0.08	0.06

TABLE 10.6.1: AVERAGED MPE, MLPV700 ANTENNA, UNCONTROLLED ENVIRONMENT, BASE 1

Part of the body / averaging points	Averaged Power Density at the R_{real}, mW/cm^2
Whole body (0.2 m to 2.0 m)	**0.204**
Lower body (0.2 m to 0.9 m)	**0.012**
Upper body (1.0 m to 2.0 m)	**0.315**

During MPE measurements for (B)MAX76035 antenna mounted on base 2 the EUT transmitted at 869 MHz. In a controlled environment, R_{real} was 23 cm; in an uncontrolled environment, R_{real} was 60 cm.

TABLE 10.7.0: MPE FOR (B)MAX76035 ANTENNA, CONTROLLED ENVIRONMENT, ANTENNA BASE 2

MPE, mW/cm^2, measured at the heights shown below																		
20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180	190	200
0.05	0.14	0.16	0.09	0.13	0.06	0.03	0.09	2.40	1.50	0.30	0.12	0.09	0.05	0.02	0.02	0.02	0.01	0.01

TABLE 10.7.1: MPE AVERAGED OVER A BODY FOR (B)MAX76035, CONTROLLED ENVIRONMENT, BASE 2

Part of the body / averaging points	Averaged Power Density at the R_{real}, mW/cm^2
Whole body (0.2 m to 2.0 m)	**0.279**
Lower body (0.2 m to 0.9 m)	**0.094**
Upper body (1.0 m to 2.0 m)	**0.414**

TABLE 10.8.0: MPE FOR (B)MAX76035 ANTENNA, UNCONTROLLED ENVIRONMENT, ANTENNA BASE 2

MPE, mW/cm^2, measured at the heights shown below																		
20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180	190	200
0.13	0.18	0.11	0.10	0.08	0.13	0.09	0.17	0.43	0.58	0.50	0.33	0.14	0.05	0.04	0.05	0.03	0.02	0.02

TABLE 10.8.1: AVERAGED MPE, (B)MAX76035 ANTENNA, UNCONTROLLED ENVIRONMEN BASE 2

Part of the body / averaging points	Averaged Power Density at the R_{real}, mW/cm^2
Whole body (0.2 m to 2.0 m)	**0.167**
Lower body (0.2 m to 0.9 m)	**0.124**
Upper body (1.0 m to 2.0 m)	**0.199**

During MPE measurements for LPV700 antenna mounted on base 2 the EUT transmitted at 869 MHz. In a controlled environment, R_{real} was 18 cm; in an uncontrolled environment, R_{real} was 46 cm.

TABLE 10.9.0: MPE FOR MLPV700 ANTENNA, CONTROLLED ENVIRONMENT, ANTENNA BASE 2

MPE, mW/cm^2, measured at the heights shown below																		
20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180	190	200
0.95	0.55	0.30	0.44	0.12	0.22	0.09	0.28	2.40	0.93	0.13	0.08	0.03	0.01	0.01	0.01	0.01	0.01	0.01

TABLE 10.9.1: AVERAGED MPE, MLPV700 ANTENNA, CONTROLLED ENVIRONMENT, BASE 2

Part of the body / averaging points	Averaged Power Density at the R_{real}, mW/cm^2
Whole body (0.2 m to 2.0 m)	**0.346**
Lower body (0.2 m to 0.9 m)	**0.369**
Upper body (1.0 m to 2.0 m)	**0.330**

TABLE 10.10.0: MPE FOR MLPV700 ANTENNA UNCONTROLLED ENVIRONMENT, ANTENNA BASE 2

MPE, mW/cm^2, measured at the heights shown below																		
20	**30**	**40**	**50**	**60**	**70**	**80**	**90**	**100**	**110**	**120**	**130**	**140**	**150**	**160**	**170**	**180**	**190**	**200**
0.07	0.05	0.02	0.06	0.07	0.07	0.06	0.28	0.33	0.58	0.42	0.23	0.07	0.02	0.01	0.01	0.01	0.01	0.01

TABLE 10.10.1: AVERAGED MPE, MLVP700 ANTENNA, UNCONTOROLLED ENVIRONMENT, BASE 2

Part of the body / averaging points	**Averaged Power Density at the R_{real}, mW/cm^2**
Whole body (0.2 m to 2.0 m)	**0.126**
Lower body (0.2 m to 0.9 m)	**0.086**
Upper body (1.0 m to 2.0 m)	**0.155**

11 CONCLUSION

1. The MPE measurements for controlled and uncontrolled environments shown in this report were conducted per the applicable FCC Rules and Regulations and guidance, and determined the minimum safe distance between the EUT antennas and a user.

2. The User Manual shall have a statement regarding the safe distance.

3. A variety of antennas and antenna mounts are available for use with this device. To cover all possible settings, it is recommended to show a safe distance of 32 cm for controlled environments and 70 cm for uncontrolled environments.

4. As is shown in the tables of Section 10, the measured MPE are well below the maximum allowed limits.