Certificate Number: 1449-02

MOTOROLA

ACCREDITED

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

EME Compliance Test Report

Date of Report:	May 5, 2003
Report Revision(s):	Rev. O
Device Manufacturer:	Motorola
Device Description:	3.5-15W Motorcycle Transceiver 764-870MHz
Classification:	Occupational/Controlled Exposure
FCC ID:	AZ492FT5823
Device Model:	M20URS9PW1AN(w/ W15AG and W15AH)

Test Period:	5/1/03
Test Engineer:	Jim Fortier (Principle Staff Engineer)
Author:	Michael Sailsman (Global EME Regulatory Affairs Liaison)

Note: 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 all applicable national and international reference standards and guidelines.

Signature on File — 5/5/03

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Date Approved

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REVISION HISTORY

Date	Revision	Comments
5/5/03	O	Initial release Prototype results

1.0 Product Description

FCC ID: AZ492FT5823, model M20URS9PW1AN is a mobile motorcycle transceiver that utilizes continuous carrier frequency modulation (FM). The modulation could be conventional analog voice, trunked analog voice, tone PL or C4FM digital. The control channel data rates are 3600 and 9600 baud on the C4FM envelope carrier. This does not represent packet or duty cycle modulation configuration. The intended use of the radio is Push-To-Talk (PTT) while the device is properly installed in a motorcycle enclosure with an external antenna.
This device will be marketed to and used by employees solely for work-related operations, such as public safety agencies, e.g. police. User training is the responsibility of these agencies, who can be expected to employ the usage instructions, safety information and operational cautions set forth in the user's manual, instructional sessions or other means. Motorola also makes available to its customers training classes on the proper use of two-way radios and wireless data devices. This device is classified as Occupational/Controlled Exposure. However, in accordance with FCC requirements, the bystanders are evaluated to the General Population/Uncontrolled Exposure Limits. The transmit frequency band is 764-870 MHz. The rated power of the device is 3.5 to 15 watts with a maximum conducted power output of 18 watts.

2.0 Applicable Options and Accessories

Antenna

HAF4015A 764-870 MHz ¼ wave 3dBi antenna; 15in
HAF4018A 764-870 MHz ¼ wave 3.0dBi gain antenna; 1.8in

3.0 Measurement Standards

By-stander measurements were performed according to FCC Limits Per 47 CFR 2.1091 (b) for General Population/Uncontrolled RF Exposure.
For frequencies ranging from 764-870 MHz the MPE (Maximum Permissible Exposure) limit to electromagnetic energy in equivalent plane wave free-space power density is 0.51-0.58 mW/cm^2.
Operator measurements were performed according to FCC Limits Per 47 CFR 2.1091 (b) for Occupational/Controlled RF Exposure.
For frequencies ranging from 764-870 MHz the MPE (Maximum Permissible Exposure) limit to electromagnetic energy in equivalent plane wave free-space power density is 2.55-2.90 mW/cm^2.

4.0 Data Collection Consideration

Power density testing was performed with DUT installed on a Kawasaki 1000 motorcycle. The battery used to power the DUT measured 14.0 volts.

5.0 Measurement System Uncertainty Levels

The information below presents an estimate of the possible errors that are associated with the measurement system.

Description	**Error**
NARDA Survey Meter	**± 3%**
Repeatability Accuracy	**± 7%**

6.0 Method of Measurement

6.1 EME measurements made on motorcycle-mounted antennas
(for reference, see Antenna Location Layout drawings in Appendix A)

6.1.1 Bystander EME assessment

With the survey meter and probe, take ten (10) measurements, at the standard test distance of 30 cm to the antenna, from the back of the vehicle in a vertical line and then average the results. These measurements are taken and recorded at every twenty (20) centimeters over a range starting at twenty (20) centimeters above ground and ending at 2.0 meters; this would be representative of a person standing next to the motorcycle when the device is transmitting.

6.1.2 Operator EME measurement

While rotating survey meter probe through 180 degrees to ensure that the highest level is found, take the following (3) measurements at the standard test distance of

30cm towards the operators' seat area: scan the lower third of the antenna for a peak reading, scan the middle third of the antenna for a peak reading, and scan the top third (up to 2 meters from ground) for a peak reading. Average the (3) results.

7.0 Test Site

The test site area is the Motorola Commercial Government Industrial Solution Sector (CGISS) world wide electromagnetic exposure (EME) open area test site located at 8000 W. Sunrise Blvd., Plantation, FL. 33322.

8.0 Measurement System/Equipment

The minimum equipment required will mainly consist of a test vehicle, radio frequency radiation test set consisting of an Electromagnetic Radiation Survey Meter, E-Field Test Probe, and typical antenna configurations.
Below are the test equipment used to assess compliance:

a) Vehicle: Kawasaki 1000 motorcycle

b) E-Field Survey Meter - NARDA Model 8718 (S/N 01108); Calibration date: 4/14/03

c) E-Field (Electric Field) Probe - NARDA Model 8722B (S/N 12023) (300 kHz - 40 Ghz);

Calibration date: 11/6/02

d) Antennas - (3.0dBi gain)

9.0 Test Unit Description

Power density measurements were performed on a 3.5-15 watt mobile motorcycle radio; model number M20URS9PW1AN serial number CAM0305572. The frequency band of the mobile is 764-870 MHz with functional operation within the 764-776, 794-806, 806-825, 851-870 MHz sub bands. The test frequencies evaluated were 764.0875, 794.0875, 823.9875, 868.9875 MHz. The 3.0dBi gain antennas listed in section 2.0 were used to assess MPE compliance.

10.0 Test Set-Up Description

Following are the standard mobile antenna test configurations used for this product.
(for reference, see Antenna Location Layout drawings in Appendix)

a) 3dBi antenna model HAF4015A, HAF4018A mounted on the motorcycle.

11.0 Test Results

Measurements were taken with the antenna located as illustrated in Appendix A. Below is the raw MPE data for all measured grid points. Results are based on a 50% duty cycle with the radio operating in accordance with the User Manual instructions. The bolded power density results represents the highest MPE results observed.

Raw MPE Data; Test Frequencies and measured Po:
764.0875 MHz (Po=18.3W), 794.0875 MHz (Po=18.8W), 823.9875 MHz (Po=18.9W), 868.9875MHz (Po=18.8W)
Meter reads in % of controlled limit; controlled limit = 2.55-2.90 mW/cm^2 for 300-1500 MHz
(Cal factors presented herein are automatically accounted for in the meter used for assessments)
General Population MPE limits = 0.51-0.58 mW/cm^2 (Test Frequency/1500)
Operator Power Density (Pwr. Den. (cal.)) = (Avg[over ant.]/1.5[2/3 body ht.])/2
By-stander Power Density (Pwr. Den. (cal.)) = Avg. [over body]/2

Note: The average over the body test methodology is consistent with IEEE/ANSI C95.1-1999 guidelines

Table 1

Motorcycle MPE Assessment @ 764.0875 MHz						
Assessment condition	**Antenna /gain**	**Meas. Distance (cm)**	**E/H Field**	**Calibration Factor**	**Average over Antenna (mW/cm^2)**	**Pwr. Density (mW/cm^2)**
Operator	HAF4018A/3dB	30	E	0.97	2.55	0.85
Measurement Grid						
Test position	**Height (cm)**	**% of control limit**				
1	Bottom 1/3	100				
2	Middle 1/3	100				
3	Top 1/3	100				

Table 2

Motorcycle MPE Assessment @ 764.0875MHz						
Assessment condition	**Antenna /gain**	**Meas. Distance (cm)**	**E/H Field**	**Calibration Factor**	**Average over Body (mW/cm^2)**	**Pwr. Density (mW/cm^2)**
By-stander	HAF4018A/3dB	30	E	0.97	0.528	0.26
Measurement grid						
Test position	**Height (cm)**	**% of control limit**	**Test position**	**Height (cm)**	**% of control limit**	
1	20	2.0	6	120	47.0	
2	40	5.0	7	140	13.0	
3	60	11.0	8	160	6.0	
4	80	39.0	9	180	6.0	
5	100	76.0	10	200	2.5	

Table 3

Motorcycle MPE Assessment @ 794.0875 MHz						
Assessment condition	**Antenna /gain**	**Meas. Distance (cm)**	**E/H Field**	**Calibration Factor**	**Average over Antenna (mW/cm^2)**	**Pwr. Density (mW/cm^2)**
Operator	HAF4018A/3dB	30	E	0.97	2.25	0.75
Measurement Grid						
Test position	**Height (cm)**	**% of control limit**				
1	Bottom 1/3	85				
2	Middle 1/3	85				
3	Top 1/3	85				

Table 4

Motorcycle MPE Assessment @ 794.0875MHz						
Assessment condition	**Antenna /gain**	**Meas. Distance (cm)**	**E/H Field**	**Calibration Factor**	**Average over Body (mW/cm^2)**	**Pwr. Density (mW/cm^2)**
By-stander	HAF4018A/3dB	30	E	0.97	0.570	0.29
Measurement grid						
Test position	**Height (cm)**	**% of control limit**	**Test position**	**Height (cm)**	**% of control limit**	
1	20	1.5	6	120	49.0	
2	40	5.5	7	140	17.0	
3	60	17.0	8	160	8.0	
4	80	49.0	9	180	5.5	
5	100	60.0	10	200	3.0	

Table 5

Motorcycle MPE Assessment @ 823.9875 MHz						
Assessment condition	**Antenna /gain**	**Meas. Distance (cm)**	**E/H Field**	**Calibration Factor**	**Average over Antenna (mW/cm^2)**	**Pwr. Density (mW/cm^2)**
Operator	HAF4018A/3dB	30	E	0.95	2.65	**0.88**
Measurement Grid						
Test position	**Height (cm)**	**% of control limit**				
1	Bottom 1/3	98				
2	Middle 1/3	97				
3	Top 1/3	95				

Table 6

Motorcycle MPE Assessment @ 823.9875MHz						
Assessment condition	**Antenna /gain**	**Meas. Distance (cm)**	**E/H Field**	**Calibration Factor**	**Average over Body (mW/cm^2)**	**Pwr. Density (mW/cm^2)**
By-stander	HAF4018A/3dB	30	E	0.95	0.768	**0.38**
Measurement grid						
Test position	**Height (cm)**	**% of control limit**	**Test position**	**Height (cm)**	**% of control limit**	
1	20	1.0	6	120	50.0	
2	40	15.0	7	140	25.0	
3	60	41.0	8	160	10.0	
4	80	60.0	9	180	7.5	
5	100	66.0	10	200	4.5	

Table 7

Motorcycle MPE Assessment @ 868.9875 MHz						
Assessment condition	**Antenna /gain**	**Meas. Distance (cm)**	**E/H Field**	**Calibration Factor**	**Average over Antenna (mW/cm^2)**	**Pwr. Density (mW/cm^2)**
Operator	HAF4018A/3dB	30	E	0.93	1.33	0.44
Measurement Grid						
Test position	**Height (cm)**	**% of control limit**				
1	Bottom 1/3	42				
2	Middle 1/3	46				
3	Top 1/3	50				

Table 8

Motorcycle MPE Assessment @ 868.9875MHz						
Assessment condition	**Antenna /gain**	**Meas. Distance (cm)**	**E/H Field**	**Calibration Factor**	**Average over Body (mW/cm^2)**	**Pwr. Density (mW/cm^2)**
By-stander	HAF4018A/3dB	30	E	0.93	0.474	0.24
Measurement grid						
Test position	**Height (cm)**	**% of control limit**	**Test position**	**Height (cm)**	**% of control limit**	
1	20	1.0	6	120	43.0	
2	40	1.5	7	140	16.0	
3	60	9.0	8	160	11.0	
4	80	27.0	9	180	7.0	
5	100	43.0	10	200	5.0	

Table 9

Motorcycle MPE Assessment @ 764.0875 MHz						
Assessment condition	**Antenna /gain**	**Meas. Distance (cm)**	**E/H Field**	**Calibration Factor**	**Average over Antenna (mW/cm^2)**	**Pwr. Density (mW/cm^2)**
Operator	HAF4015A/3dB	30	E	0.97	1.66	0.55
Measurement Grid						
Test position	**Height (cm)**	**% of control limit**				
1	Bottom 1/3	90				
2	Middle 1/3	70				
3	Top 1/3	35				

Table 10

Motorcycle MPE Assessment @ 764.0875MHz						
Assessment condition	**Antenna /gain**	**Meas. Distance (cm)**	**E/H Field**	**Calibration Factor**	**Average over Body (mW/cm^2)**	**Pwr. Density (mW/cm^2)**
By-stander	HAF4015A/3dB	30	E	0.97	0.481	0.24
Measurement grid						
Test position	**Height (cm)**	**% of control limit**	**Test position**	**Height (cm)**	**% of control limit**	
1	20	0.5	6	120	80.0	
2	40	1.0	7	140	45.0	
3	60	2.5	8	160	6.0	
4	80	8.0	9	180	4.0	
5	100	40.0	10	200	2.0	

Table 11

Motorcycle MPE Assessment @ 794.0875 MHz						
Assessment condition	**Antenna /gain**	**Meas. Distance (cm)**	**E/H Field**	**Calibration Factor**	**Average over Antenna (mW/cm^2)**	**Pwr. Density (mW/cm^2)**
Operator	HAF4015A/3dB	30	E	0.97	1.59	0.53
Measurement Grid						
Test position	**Height (cm)**	**% of control limit**				
1	Bottom 1/3	70				
2	Middle 1/3	70				
3	Top 1/3	40				

Table 12

Motorcycle MPE Assessment @ 794.0875MHz						
Assessment condition	**Antenna /gain**	**Meas. Distance (cm)**	**E/H Field**	**Calibration Factor**	**Average over Body (mW/cm^2)**	**Pwr. Density (mW/cm^2)**
By-stander	HAF4015A/3dB	30	E	0.97	0.388	0.19
Measurement grid						
Test position	**Height (cm)**	**% of control limit**	**Test position**	**Height (cm)**	**% of control limit**	
1	20	0.5	6	120	72.0	
2	40	1.0	7	140	35.0	
3	60	2.0	8	160	5.0	
4	80	7.0	9	180	2.0	
5	100	20.0	10	200	2.0	

Table 13

Motorcycle MPE Assessment @ 823.9875 MHz						
Assessment condition	**Antenna /gain**	**Meas. Distance (cm)**	**E/H Field**	**Calibration Factor**	**Average over Antenna (mW/cm^2)**	**Pwr. Density (mW/cm^2)**
Operator	HAF4015A/3dB	30	E	0.95	1.72	0.57
Measurement Grid						
Test position	**Height (cm)**	**% of control limit**				
1	Bottom 1/3	68				
2	Middle 1/3	80				
3	Top 1/3	40				

Table 14

Motorcycle MPE Assessment @ 823.9875MHz						
Assessment condition	**Antenna /gain**	**Meas. Distance (cm)**	**E/H Field**	**Calibration Factor**	**Average over Body (mW/cm^2)**	**Pwr. Density (mW/cm^2)**
By-stander	HAF4015A/3dB	30	E	0.95	0.425	0.21
Measurement grid						
Test position	**Height (cm)**	**% of control limit**	**Test position**	**Height (cm)**	**% of control limit**	
1	20	0.8	6	120	80.0	
2	40	1.0	7	140	42.0	
3	60	2.5	8	160	4.5	
4	80	4.0	9	180	3.0	
5	100	15.0	10	200	2.0	

Table 15

Motorcycle MPE Assessment @ 868.9875 MHz						
Assessment condition	**Antenna /gain**	**Meas. Distance (cm)**	**E/H Field**	**Calibration Factor**	**Average over Antenna (mW/cm^2)**	**Pwr. Density (mW/cm^2)**
Operator	HAF4015A/3dB	30	E	0.93	1.83	0.61
Measurement Grid						
Test position	**Height (cm)**	**% of control limit**				
1	Bottom 1/3	40				
2	Middle 1/3	105				
3	Top 1/3	45				

Table 16

Motorcycle MPE Assessment @ 868.9875MHz						
Assessment condition	**Antenna /gain**	**Meas. Distance (cm)**	**E/H Field**	**Calibration Factor**	**Average over Body (mW/cm^2)**	**Pwr. Density (mW/cm^2)**
By-stander	HAF4015A/3dB	30	E	0.93	0.348	0.17
Measurement grid						
Test position	**Height (cm)**	**% of control limit**	**Test position**	**Height (cm)**	**% of control limit**	
1	20	0.0	6	120	33.0	
2	40	0.0	7	140	18.0	
3	60	1.0	8	160	20.0	
4	80	2.0	9	180	20.0	
5	100	11.0	10	200	15.0	

12.0 Conclusion

Depending on the test frequency, compliance assessments were performed with an output power range of 18.3W to 18.9W. The maximum RF power allowable will be equal to the upper limit of the final test factory transmit power specification of 18.0W. The highest power density result scaled to the maximum allowable power output is 0.884 mW/cm^2 for operator test position and 0.384 mW/cm^2 for by-stander test position.

The measurement results clearly demonstrate compliance with the FCC Limits (test frequency / 1500 = 0.51-0.58 mW/cm^2 for the frequency band of 764-870 MHz) Per 47 CFR 2.1091 (d) for General Population/Uncontrolled RF Exposure.
The measurement results clearly demonstrate compliance with the FCC Limits (test frequency / 300 = 2.55-2.90 mW/cm^2 for the frequency band of 764-870 MHz) Per 47 CFR 2.1091 (d) for Occupational/Controlled RF Exposure.

APPENDIX A

ANTENNA LOCATION DRAWING