MOTOROLA

ACCREDITED

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

MPE Compliance Test Report

Date of Report:	August 29,2003
Report Revision(s):	Rev. O
Manufacturer:	Motorola
Product Description:	10-15W Motorcycle Transceiver 380-470MHz
Classification:	Occupational/Controlled Exposure
FCC ID:	AZ492FT4862
Device Model:	M20QSS9PW1AN

Test Period:	8/1/03 & 8/22/03
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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 — 9/02/03

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Date Approved

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REVISION HISTORY

Date	Revision	Comments
08/29/03	O	Initial release Prototype results

1.0 Product Description

FCC ID AZ492FT4862, model M20QSS9PW1AN is a mobile motorcycle transceiver that utilizes continuous carrier frequency modulation (FM). The modulation could be conventional analog voice, trunked analog voice or C4FM digital modulation. Control channel data rates are 3600 and 9600 baud on the C4FM constant envelope carrier. 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, fire and emergency medical. 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 by-stander external to the motorcycle is evaluated to the General Population/Uncontrolled Exposure Limits while the operator is evaluated to the Occupational/Controlled Exposure Limits. The transmit frequency band is 380-470MHz. The rated power of the device is 10-15 watts with a maximum conducted power output of 18 watts.

2.0 Offered Options and Accessories (see Appendix B for photos of antennas)

Antenna	**Description**
HAE6014A	380-433MHz, ¼ Wave, 16cm, 2.15dBi
RAE4024A	450-470MHz, ¼ Wave, 16cm, 2.15dBi

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 380-470MHz the MPE (Maximum Permissible Exposure) limit to electromagnetic energy in equivalent plane wave free-space power density is 0.25-0.31 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 380-470 MHz the MPE (Maximum Permissible

Exposure) limit to electromagnetic energy in equivalent plane wave free-space power density is 1.3-1.6mW/cm^2.

4.0 Data Collection Consideration

Power density testing was performed with DUT (Device Under Test) 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 By-stander 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 assessment

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 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) Survey Meter – NARDA Model 8718 (S/N 01108); Calibration date: 04/14/03

c) E-Field (Electric Field) Probe – NARDA Model 8722B (SN13001) (300 kHz – 40 Ghz); Calibration date: 05/06/03

9.0 Test Unit Description

Power density measurements were performed on a 10-15 watt mobile motorcycle radio; model number M20QSS9PW1AN serial number X19890011. The frequency band of the mobile was 380-470MHz; the test frequencies were 380.0125, 425.0125, 460.0125 and 469.9875MHz. The HAE6014A and RAE4024A mobile 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)

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 result represents the highest MPE results observed.

Note:
Raw MPE Data; Test Frequencies and measured Po:
380.0125MHz (Po=17.6W), 425.0125MHz (Po=17.9W), 460.0125MHz (Po=17.8W), 469.9875MHz (Po=17.9W)
Meter reads in % of controlled limit; controlled limit = 0.25-0.31mW/cm^2 for 380-470 MHz
(Cal factors presented herein are automatically accounted for in the meter used for assessments)
General Population MPE limits = 0.25-0.31mW/cm^2
Occupational Population in MPE limits = 1.3-1.6mW/cm^2
Operator Power Density (Pwr. Den. (cal.)) = (Avg.[over ant.]/1.5[2/3 body ht.])/2
Max cal Operator Power Density (Pwr. Den. (cal.)) = (Pmax/Pintial)*(Avg.[over ant.]/1.5[2/3 body ht.])/2
By-standard Power Density (Pwr. Den. (cal)) = Avg.[over body]/2
Max cal By-standard Power Density (Pwr. Den. (cal)) = (Pmax/Pintial)*(Avg.[over body]/2)

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

Table 1

Motorcycle Operator MPE Assessment @ 380.0125MHz									
Assessment condition	**Antenna**	**Gain (dBi)**	**Meas. Distance (cm)**	**E/H field**	**Calibration factor**	**Average over Antenna (mW/cm^2)**	**Initial Power (W)**	**Pwr. Density cal (mW/cm^2)**	**Pwr. Density max cal (mW/cm^2)**
Operator	HAE6014A	2.15	30	E	0.98	1.048	17.6	0.35	**0.36**
Measurement Grid									
Test position	**Height (cm)**	**% of Control Limit**							
1	Bottom 1/3	114.6							
2	Middle 1/3	71.6							
3	Top 1/3	61.9							

Table 2

Motorcycle by-stander MPE Assessment @ 380.0125MHz									
Antenna Location	**Antenna**	**Gain (dBi)**	**Meas. Distance (cm)**	**E/H Field**	**Calibration Factor**	**Average over Body (mW/cm^2)**	**Initial Power (W)**	**Pwr. Density cal (mW/cm^2)**	**Pwr. Density max cal (mW/cm^2)**
By-Stander	HAE6014A	2.15	30	E	0.98	0.462	17.6	0.23	**0.24**
Measurement grid									
Test Position	**Height (cm)**	**% of Control Limit**		**Test position**	**Height (cm)**	**% of Control Limit**			
1	20	9.1		6	120	103.0			
2	40	12.3		7	140	48.3			
3	60	24.5		8	160	21.8			
4	80	59.2		9	180	8.7			
5	100	74.1		10	200	3.9			

Table 3

Motorcycle Operator MPE Assessment @ 425.0125MHz									
Assessment condition	**Antenna**	**Gain (dBi)**	**Meas. Distance (cm)**	**E/H field**	**Calibration factor**	**Average over Antenna (mW/cm^2)**	**Initial Power (W)**	**Pwr. Density cal (mW/cm^2)**	**Pwr. Density max cal (mW/cm^2)**
Operator	HAE6014A	2.15	30	E	0.96	1.026	17.9	0.34	0.34
Measurement Grid									
Test position	**Height (cm)**	**% of Control Limit**							
1	Bottom 1/3	80.1							
2	Middle 1/3	71.5							
3	Top 1/3	65.7							

Table 4

Motorcycle by-stander MPE Assessment @ 425.0125MHz									
Antenna Location	**Antenna**	**Gain (dBi)**	**Meas. Distance (cm)**	**E/H Field**	**Calibration Factor**	**Average over Body (mW/cm^2)**	**Initial Power (W)**	**Pwr. Density cal (mW/cm^2)**	**Pwr. Density max cal (mW/cm^2)**
By-Stander	HAE6014A	2.15	30	E	0.96	0.412	17.9	0.21	0.21
Measurement grid									
Test Position	**Height (cm)**	**% of Control Limit**		**Test position**	**Height (cm)**	**% of Control Limit**			
1	20	4.2		6	120	87.5			
2	40	8.7		7	140	36.5			
3	60	14.3		8	160	8.4			
4	80	27.5		9	180	4.8			
5	100	96.4		10	200	2.2			

Table 5

Motorcycle Operator MPE Assessment @ 460.0125MHz									
Assessment condition	**Antenna**	**Gain (dBi)**	**Meas. Distance (cm)**	**E/H field**	**Calibration factor**	**Average over Antenna (mW/cm^2)**	**Initial Power (W)**	**Pwr. Density cal (mW/cm^2)**	**Pwr. Density max cal (mW/cm^2)**
Operator	RAE4024A	2.15	30	E	0.94	0.951	17.8	0.32	0.32
Measurement Grid									
Test position	**Height (cm)**	**% of Control Limit**							
1	Bottom 1/3	62.2							
2	Middle 1/3	62.7							
3	Top 1/3	61.1							

Table 6

Motorcycle by-stander MPE Assessment @ 460.0125MHz									
Antenna Location	**Antenna**	**Gain (dBi)**	**Meas. Distance (cm)**	**E/H Field**	**Calibration Factor**	**Average over Body (mW/cm^2)**	**Initial Power (W)**	**Pwr. Density cal (mW/cm^2)**	**Pwr. Density max cal (mW/cm^2)**
By-Stander	RAE4024A	2.15	30	E	0.94	0.369	17.8	0.18	0.19
Measurement grid									
Test Position	**Height (cm)**	**% of Control Limit**		**Test position**	**Height (cm)**	**% of Control Limit**			
1	20	8.0		6	120	63.3			
2	40	5.7		7	140	20.1			
3	60	14.7		8	160	6.6			
4	80	35.3		9	180	2.1			
5	100	84.1		10	200	1.0			

Table 7

Motorcycle Operator MPE Assessment @ 469.9875MHz									
Assessment condition	**Antenna**	**Gain (dBi)**	**Meas. Distance (cm)**	**E/H field**	**Calibration factor**	**Average over Antenna (mW/cm^2)**	**Initial Power (W)**	**Pwr. Density cal (mW/cm^2)**	**Pwr. Density max cal (mW/cm^2)**
Operator	RAE4024A	2.15	30	E	0.94	0.800	17.9	0.27	0.27
Measurement Grid									
Test position	**Height (cm)**	**% of Control Limit**							
1	Bottom 1/3	48.7							
2	Middle 1/3	49.2							
3	Top 1/3	55.3							

Table 8

Motorcycle by-stander MPE Assessment @ 469.9875MHz									
Antenna Location	**Antenna**	**Gain (dBi)**	**Meas. Distance (cm)**	**E/H Field**	**Calibration Factor**	**Average over Body (mW/cm^2)**	**Initial Power (W)**	**Pwr. Density cal (mW/cm^2)**	**Pwr. Density max cal (mW/cm^2)**
By-Stander	RAE4024A	2.15	30	E	0.94	0.300	17.9	0.15	0.15
Measurement grid									
Test Position	**Height (cm)**	**% of Control Limit**		**Test position**	**Height (cm)**	**% of Control Limit**			
1	20	4.1		6	120	54.3			
2	40	3.7		7	140	21.5			
3	60	10.9		8	160	7.1			
4	80	22.1		9	180	2.5			
5	100	64.5		10	200	1.1			

12.0 Conclusion

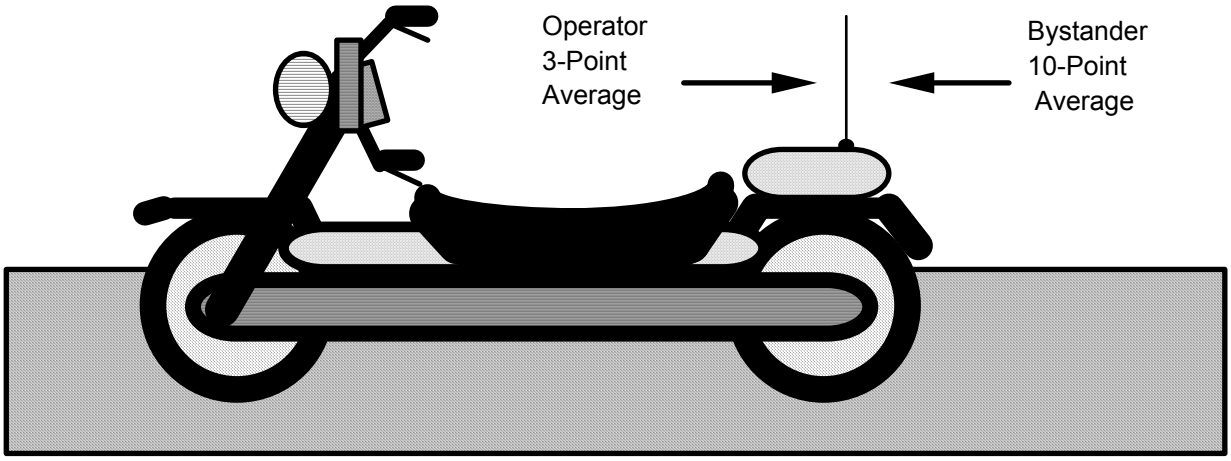
Depending on the test frequency, compliance assessments were performed with an output power range of 17.6-17.9W. The maximum RF power allowable will be equal to the upper limit of the final test factory transmit power specification of 18W. The highest power density result scaled to the maximum allowable power output is 0.24 mW/cm^2 for by-stander test position and 0.36 mW/cm^2 for operator test position

The measurement results clearly demonstrate compliance with the FCC Limits for the frequency band of 380-470MHz Per 47 CFR 2.1091 (d) for General Population/Uncontrolled(0.25-0.31 mW/cm^2) RF Exposure.

The measurement results clearly demonstrate compliance with the FCC Limits for the frequency band of 380-470MHz Per 47 CFR 2.1091 (d) for Occupational Population/Controlled(1.3-1.6 mW/cm^2) RF Exposure.

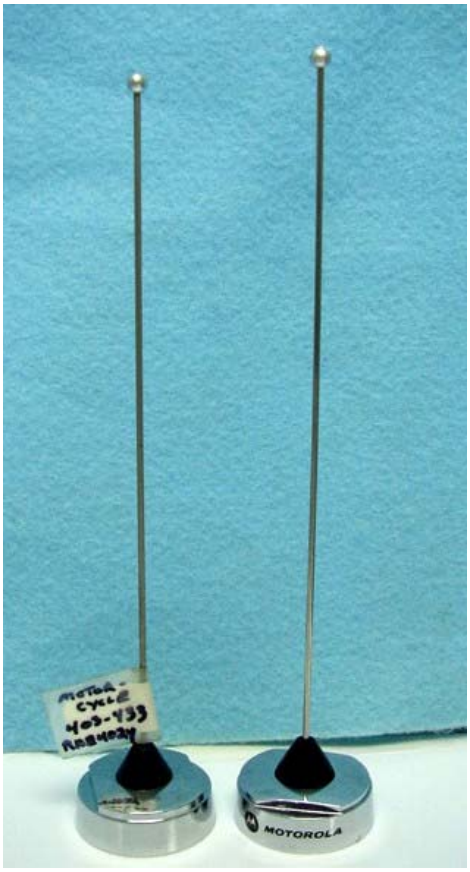
APPENDIX A

ANTENNA LOCATION DRAWING



APPENDIX B

Antenna photos



Antenna kit numbers, from left to right; RAE4024A and HAE6014A