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Electromagnetic Compatibility (EMC) and Electrical Safety Test Report for Network Telecommunications Equipment For

American Microsystems, AMERICAN MICROSYSTEMS' M6200

FCC PART 15, SUB-PART B, CLASS B and FCC part 15.249

Prepared For: American Microsystems

Prepared By: National Technical Systems
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This is to certify that the following report is true and correct to the best of my knowledge.

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EMI Operations Manager
FCC, CE, Telecommunication

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TABLE OF CONTENTS

1.0 GENERAL INFORMATION

1.1 Product Description

American Microsystems' M6200 is the host receiver for the companion M6000 wireless barcode decoder. This system provides a means of wireless transmission of barcode data and then of receiving this data from the M6200 host as simulated keyboard keystrokes ("wedge") to an IBM compatible PC. The intended uses for this product include point-of-sale and inventory applications in a business or industrial environment. The M6200 consists an Atmel ATMega103 microcontroller operating at 4 MHz, a voltage regulator for RF power, an interface for connecting an undecoded barcode reading device (e.g. laser, wand, or CCD), an IBM PC compatible keyboard wedge interface, and finally of an RF Monolithics TR1000 radio frequency transceiver with a printed circuit board (PCB) based antenna.

1.2 Instrument Calibration

All test instrumentation requiring calibration will be calibrated in accordance with ANSI Standard NCSL Z540-1. There will be a current calibration sticker attached to the item and traceability documentation will be provided at the customer's request.

1.2.1 Accuracy of Measurement

The expected accuracy of measurement shall be:

Frequency Accuracy: ± 2%
Amplitude Accuracy: ± 2 dB
Distance: ± 5%
Amplitude, Measurement System (includes measurement receivers, transducers, cables, etc): ± 3 dB
Time (waveforms): ± 5%

1.3 Ambient Tests

In the event that an out-of-tolerance interference condition arises, ambient measurements shall be made in the frequency range where out-of-tolerance condition is present. Ambient measurements shall be made with power applied to all equipment, with the exception of the system under test. This level shall be at least 6 dB below the specification limits of FCC Part 15.

1.4 Failure Reporting

In the event of a test item failure or a test anomaly, the following procedure will be followed:

1. The testing will be stopped.
2. The American Microsystems Program Manager or his designate will immediately be notified.
3. A Notice of Deviation (NOD) will be prepared.
4. The test item will be retained in the setup or in storage, as applicable, pending disposition from American Microsystems.
5. Testing will be resumed only on instructions (written, if practicable) of American Microsystems to the project engineer or test engineer.

1.5 Threshold of Susceptibility

When susceptibility indications are noted in test sample operation, the threshold level shall be determined where the susceptible condition is no longer present. The threshold level shall be determined as follows:

1. When a susceptibility condition is detected, reduce the signal level until the test sample recovers.
2. Gradually increase the signal level until the susceptibility condition reoccurs. The resulting level is the threshold of susceptibility, and that level shall be recorded.

1.6 Test Program Deviation

Unless otherwise directed by the responsible test witness, the tests described in the table summary page of this document may be performed in any sequence.

In the event that test plan deviations are required during the normal qualification test program, they shall be made only upon approval of the cognizant representative and that approval shall be noted in the test log with a complete description and justification for such deviations.

1.7 Inspection

All tests described herein may have been witnessed by the authorized representative(s) of American Microsystems. All testing will be performed by qualified test engineers/personnel.

1.8 Disposition of Test Items

The test sample was returned to American Microsystems upon completion of the test program.

1.9 Test Facility

Measurements for this report were taken at **National Technical Systems, EMC Test Facility**, 1701 East Plano Parkway Suit 150, Plano Texas, USA. At the time of testing, the EMC facility had the following accreditations, registrations, etc.:

- Compliance with the requirements of ISO/IEC Guide 25: 1990 (E).
- Compliance with the requirements of ISO 9000: 1997 (E).
- Compliance with the requirements NVLAP, VCCI, BSMI.
- Compliance with the radiated and AC line conducted test site criteria in ANSI C63.4-1992 as required by the Federal Communications Commission (FCC).

The EMC chamber has been qualified as one having performance characteristics suitable for testing to the requirements of IEC 1000-4-3;95, and the Open Area Test Site (OATS) has been qualified as one having performance characteristics suitable for testing as per CISPR, Part 16, and ANSI C63.4-1992.

2.0 GENERAL TEST METHODOLOGY

2.1 Emissions

Required emissions testing is performed in accordance with the respective measurement procedures listed on page 1. Specifics such as test locations will be listed in the appropriate data sections of this report.

Conducted measurements are made with power supplied to the AMERICAN MICROSYSTEMS' M6200 through a 50Ω/50µh Line Impedance Stabilization Network (LISN); support equipment not part of the AMERICAN MICROSYSTEMS' M6200 will be powered through a similar but separate LISN. Typically, each of the AMERICAN MICROSYSTEMS' M6200's input power leads will be scanned first with a peak detector. The highest peak amplitudes relative to the appropriate limits will be identified and remeasured using a quasipeak detector. At least six of all peaks closest to the respective limits will be recorded in this report. The conducted emissions test was performed using NTS' automatic EMI test equipment. This equipment utilized HP EMI measurement software running on an HP computer that interfaced directly with HPIB (IEEE) compatible instruments with graphical displays presented on the spectrum analyzer's CRT, with hard copies of the data generated by a plotter. The program automatically selects the range of test frequencies or band, and sets the specification line limits to be used during the test. This equipment/software allows for real-time data reduction and prints tabulated data on peak value or quasi-peak value measurements.

Radiated measurements are made at an open area test site (OATS) with an antenna to AMERICAN MICROSYSTEMS' M6200 distance of 3m or 10m, as appropriate. The actual test distance will be listed in the respective test data sections. The applicable frequency spectrum is searched with a calibrated antenna system for RF emissions approaching the appropriate limits. "Maximization" of each suspect frequency is accomplished by a combination of a 360° azimuth search and varying the antenna to ground plane height from 1m to 4m, in both the vertical and horizontal polarizations. Final data was collected in the worst case configurations of the AMERICAN MICROSYSTEMS' M6200 with the highest emission levels. The six highest emission readings and the corresponding frequencies are listed in Appendix A. If necessary, radiated emissions over 1 GHz are maximized after first "aiming" the horn antennas using the "bore sight" method.

Other emissions tests will be performed in accordance with the appropriate measurement procedures listed in this report.

2.1.1 Radiated Emissions Field Strength Calculations

FS = RA + AF + CF - AG where: FS = field strength CF = cable attenuation factor
RA = receiver amplitude AG = amplifier gain

The receiver used for radiated emissions measurements performed the field strength calculations automatically. The program has resident AF and CF figures for individual antennas and cables.

2.2 Order of Testing

Testing normally proceeds from the least volatile to the most. As an example for "global" requirements the sequence typically would begin with conducted emissions, then radiated prescans in the semi-anechoic chamber, then OATS radiated emissions measurements. The actual order may vary due to tests conducted, scheduling and facility availability.

2.3 Special Test Justification

None

3.0 TEST CONFIGURATION

3.1 Selection of AMERICAN MICROSYSTEMS' M6200 Configuration and Modes of Operation

As per measurement procedures, **the worst-case test configuration and mode of operation was used for all testing**. Unless otherwise noted elsewhere in this report, this selection will apply to all testing. The selection process was based on previous investigative testing of the AMERICAN MICROSYSTEMS' M6200 system.
Worst case operating mode is described as "Operate." Other modes used will be listed in the respective data measurement sections when appropriate. Operating modes considered were all those available to the operator, including Standby.

3.2 Equipment Modifications

None

4.0 TEST INSTRUMENTATION

Instrument	Mfr.	Model	NTS Control No.	Cal Due
CONDUCTED EMISSIONS				
Quasi Peak Detector	HP	85650A	E1001P	4/21/01
HP Spectrum Analyzer	HP	8567A	E1002P	4/21/01
LISN	Solar Electronic	9331-50-TS-200-N	E1053P	5/31/01
LISN	Solar Electronic	8028-50-24-BNC	E1054P	7/8/01
RADIATED EMISSIONS				
HP Spectrum Analyzer	HP	8566B	E1005P	2/18/01
Quasi Peak Detector	HP	85650A	E1004P	7/25/01
HP Pre-Amp	HP	1040	E1008P	8/29/01
Biconilog Antenna	ETS	94455-SP	SN: 0003-1500	3/14/01
Antenna	EST	3115	E3115P	11/07/01
HP Pre-Amp	HP	1040	E1008P	8/29/01
HP -Pream	HP	8449B	E1009F	02/25/01

5.0 EMISSIONS

The test procedures of Paragraph 2.1 were followed for these measurements. Conducted measurements were made in shielded enclosures. Radiated final measurements were made at the OATS facility described in Paragraph 2.0. All readings are quasi-peak unless otherwise stated and are listed in order of ascending delta. The original test data is contained in Master Job Folder A 0579, located at the National Technical Systems EMC Facility. Mode of operation is that listed under Paragraph 3.1, unless otherwise stated.

5.1 Radiated Emissions

5.1.1 Radiated Emissions Test Setup

Top View of Equipment Under Test

Radiated Emissions (Open Area Test Site), Front of AMERICAN MICROSYSTEMS' M6200

5.1.2 Radiated Measurement Data

Date of measurement: 11/18/00. Test Personnel: Scott Oates, EMC Technician
Radiated Emissions (FCC Class B prorate to 10m distance from antenna)

Emissions Freq. (MHZ)	Ant. Pol (H/V)	Emission Level (QP) (dBuV)	Site Factor (dB/m)	Emission Level (dBuV/m)	Limit DBuV/m)	Azi.	Hgt	Margin
62.492	H	34.4	-14.1	20.3	29.5	0	3	-9.2
62.551	V	33.6	-14.9	18.7	29.5	0	1	-10.8
165.44	H	34.6	-10.1	24.5	33	90	3	-8.5
166.054	V	35.3	-10.4	24.9	33	180	1	-8.1
257.29	V	26.4	-6.8	19.6	35.5	0	1	-15.9
257.718	H	33.6	-6.4	27.2	35.5	270	3	-8.3
398.857	V	25.8	-3	22.8	35.5	200	1	-12.7
500	H	23.3	-1.4	21.9	35.5	0	3	-13.6
500	V	23.7	-1	22.7	35.5	0	1	-12.8
916.353	V	23.4	4.3	27.7	35.5	0	1	-7.8
916.393	H	23.3	3.5	26.8	35.5	0	3	-8.7
998.413	H	24.1	3.6	27.7	43.5	0	3	-15.8
999.99	V	23.5	4.5	28	43.5	0	1	-15.5

5.13 Radiated Measurement CFR 47 FCC part 15.249 Subpart C

Mode of Operation during emissions test:

Mode of operations during emissions test: The diagnostic mode of the M6200 was set to continuously transmit random data. Note that this mode represents the worst case where data transmissions can last for periods greater than 100mS. This diagnostic mode was added specifically to simplify FCC Subpart C compliance testing.

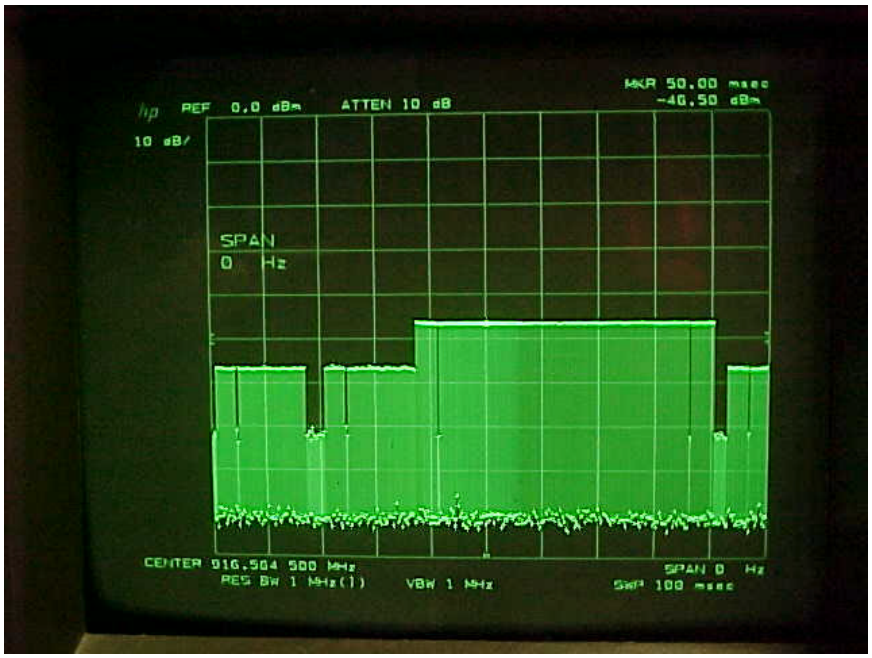
This transmission method employs Manchester data encoding with an On/Off Keying (OOK) modulation method at the frequency 916.5 MHz. Due to the nature of this method, the duty cycle of the transmission waveform is by definition 50%, corresponding to a peak correction factor of -6 dB. The frequency tolerance of the transmitter is +- 200 KHz. The nominal power output of the transmitter is 0.25 mW.

Test Result for FCC 15.249

a) The field strength was measured at 3 meters distance between Equipment under test and measurement antenna.

b) Radiated outside specific frequency band were met FCC part 15 subpart B class B and Spurious frequency per FCC part 15 subpart C requirement.

c) The maximum Radiated emission was scan from 30 Mhz to 9.2Ghz.



Test requirement Field Strength of Emissions from Intentional Radiator

EUT name: American Microsystems M6200.
Reference to FCC part 15 subpart C, 15.249.
The fundamental frequency tuned at 916.58.

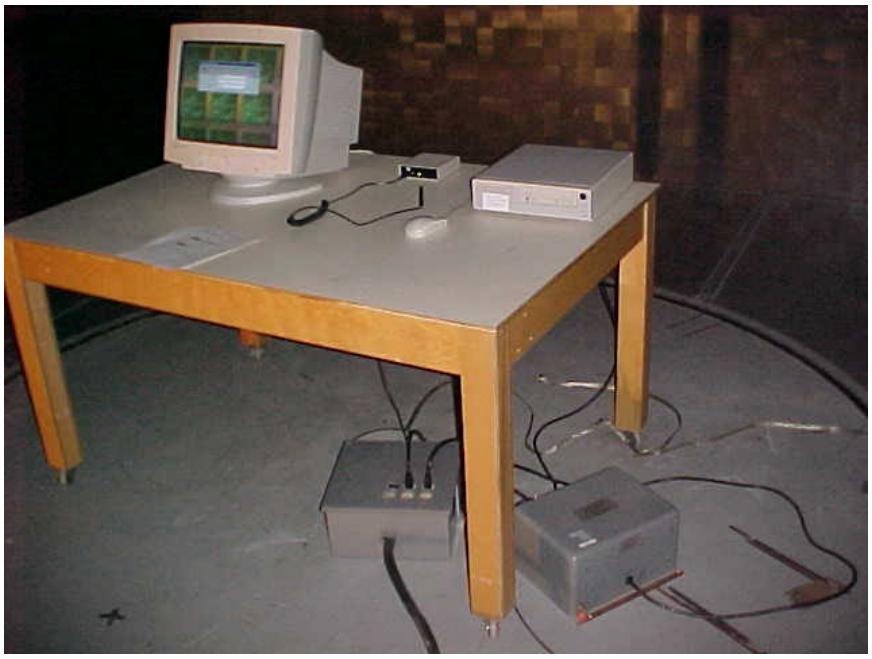
Duty Cycle: 50 % (due to modulation method per manufacture information)

The table lists the fundamental and harmonic emissions frequencies. The site correction factor includes: cable loss, antenna factor, and pre-amplifier. All measurements were taken with 1 MHz RBW and 1 MHz VBW. All readings are peak with the specific bandwidth. The duty-cycle correction factor is not required, as all peak measurements are below the FCC limits.

Ferq (Mhz)	Vert/hori	SA Reading (DBuV)	Correction Factor (dB)	Field Strength DbuV/m	Field Strength uV/m	FCC Limit 3m (uV/m)
916.585	V	46.6	22.9	69.5	2,985.38	50,000.00
916.585	H	53.6	22.9	76.5	6,683.44	50,000.00
1833.17	V	41.4	-6	35.4	58.88	500
1833.17	H	41.4	-6	35.4	58.88	500
2749	V	29.8	-3.2	26.6	21.38	500
2749	H	33.4	-3.2	30.2	32.36	500
3666	V	28.7	-1.1	27.6	23.99	500
3666	H	32.1	-1.1	31	35.48	500
4582	V	No signal	N/A	N/A	N/A	500
4582	H	No signal	N/A	N/A	N/A	500
5499	V	No signal	N/A	N/A	N/A	500
5499	H	No signal	N/A	N/A	N/A	500
6416	V	No signal	N/A	N/A	N/A	500
6416	H	No signal	N/A	N/A	N/A	500
7332	V	No signal	N/A	N/A	N/A	500
7332	H	No signal	N/A	N/A	N/A	500
8249	V	No signal	N/A	N/A	N/A	500
8249	H	No signal	N/A	N/A	N/A	500
9165	V	No signal	N/A	N/A	N/A	500
9165	H	No signal	N/A	N/A	N/A	500

5.2 Conducted Emissions

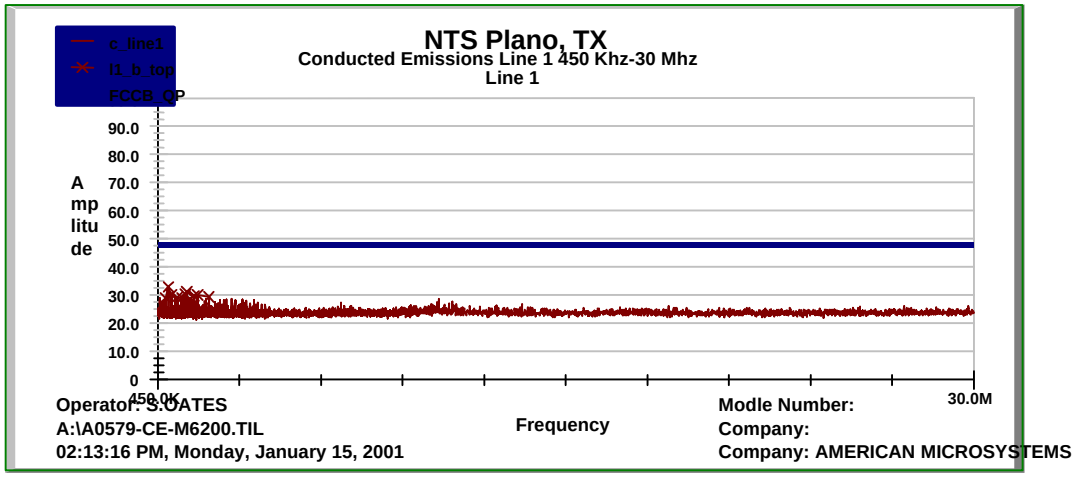
5.2.1 Conducted Emissions Test Setup

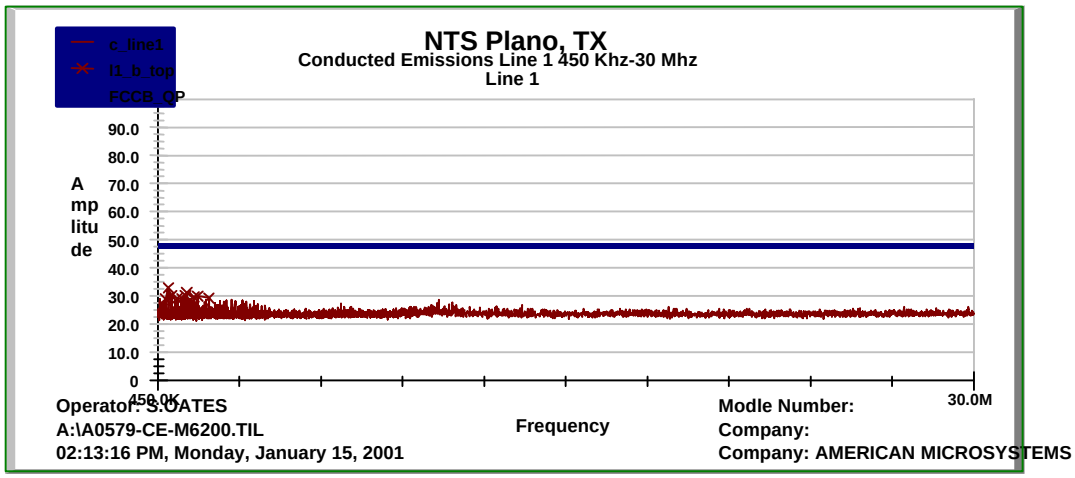


Conducted Test Setup

5.2.2 Conducted Measurement Data

Date of measurement: 01/15/01. Test Personnel: Oates Scott , EMC Personnel





Note:

- The worst case configuration was selected to perform the emissions test.
- The Equipment Under Test power from PC.
- The conducted emissions was tested from PC
- QP BW 9khz, RBW and VBW 100Khz and peak detection (max hold)