

TEST REPORT



Certification # 1367-01

Laboratory ID

PRODUCT SAFETY ENGINEERING, INC.
12955 Bellamy Brothers Boulevard
Dade City, Florida 33525 USA
PH (352) 588-2209 FX (352) 588-2544

Submitter ID

XM Radio
7777 Glades Road
Boca Raton, FL 33434

Report Issue Date: 21 MAR 05
Sample S/N: E6V490RE
Sample Receipt Date: February 25, 200

Test Report Number: 05F145B
Model Designation: TAO
Product Description: Satellite Radio
Receiver

Sample Test Date: see data sheets

Marketing Approval _____

Description of non-standard test method or test practice: *None*

Estimated Measurement Uncertainty: *Not Applicable*

Special limitations of use: *None*

Traceability: *reference standards of measurement have been calibrated by a competent body using standards traceable to the NIST.*

According to testing performed at Product Safety Engineering, Inc., the above-mentioned unit is in compliance with the electromagnetic compatibility requirements defined in regulations indicated on page (3) of the test report. The test results contained herein relate only to the model(s) identified above. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical characteristics.

As the responsible EMC Project Engineer, I hereby declare that the equipment tested as specified above conforms to the requirements indicated on page (3) of the test report.

Signature *David Foerstner* Name David Foerstner

Title Engineering Group Leader Date 22 MAR 05

Reviewed by: *John E. Hale* Date 21 MAR 05
Approved Signatory

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Test Report Number 05F145B

Product Safety Engineering, Inc 12955 Bellamy Brothers Blvd. Dade City, FL 33525
Tel (352) 588-2209 Fax (352) 588-2544

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	Conducted emissions	10/150 kHz - 30 MHz
	Radiated emissions	10 kHz - 30 MHz
	Radiated emissions	30 MHz - 1000 MHz
	Interference power	30 MHz - 300 MHz
	Equivalent Radiated emissions	1 GHz - 18 GHz
	Antenna Disturbance Voltage	30 MHz - 1,000 MHz
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EMISSIONS TEST REGULATIONS :

The emissions tests were performed according to following regulations:

☐ - EN 61000-6-3:2001

☐ - EN 61000-6-4:2001

☐ - EN 55011 : 1998 / A1:1999

☐ - Group 1

☐ - Group 2

☐ - Class A

☐ - Class B

☐ - EN 55013 : 1990 / A12:1994 / A13:1996 / A14:1999

☐ - EN 55014 -1: 2001

☐ - Household appliances and similar

☐ - Portable tools

☐ - Semiconductor devices

☐ - EN 55022 : 1998

☐ - Class A

☐ - Class B

☐ -AS/NZS 3548:1995

☐ - Class A

☐ - Class B

☐ - ICES-003

☐ - Class A

☐ - Class B

☐ - CNS 13438

☐ - Class A

☐ - Class B

☐ - VCCI : 1999

☐ - Class A

☐ - Class B

■ - FCC Part 15

☐ - Class A

☐ - Class B

■ - Certification

☐ - Verification

☐ - Declaration of Conformity

☐ - FCC Part 18

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Environmental conditions during testing:

	LAB	OATS
Temperature: *	_____	: _____
Relative Humidity: **	_____	: _____

* The ambient temperature during the testing was within the range of (50° - 104° F) unless indicted above.

** The humidity levels during the testing was within the range of (10% - 90%) relative humidity unless indicated above.

Power supply system : 110 Volts 60 Hz SINGLE phase

Also internal 3.6 VDC battery at & external 12 VDC

Sign Explanations:

- ☐ - not applicable
- ☒ - applicable

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Emissions Test Conditions: CONDUCTED EMISSIONS (Interference Voltage)

The *CONDUCTED EMISSIONS (INTERFERENCE VOLTAGE)* measurements were performed at the following test location:

☐ - Test not applicable

- ☐ - Darby Test Site (Open Area Test Site)
☒ - Darby Laboratory

Test equipment used :

Model Number	Manufacturer	Description	Serial Number
■ - 8028-50	Solar	50 Ω LISN	829012, 829022
☐ - 3825/2	Solar	50 Ω LISN	924840
■ - EMC-30	Electro-Metrics	EMI Receiver	191
☐ - 8566B	Hewlett-Packard	Spectrum Analyzer	2421A00526
☐ - 85650A	Hewlett-Packard	Quasi-Peak Adapter	2043A00209
☐ - 85662A	Hewlett Packard	Analyzer Display	2403A07352
☐ - 8028-50	Solar	50 Ω LISN	903725, 903726
☐ - FCC-TLISN-T4	Fisher Custom Com.	Telecom ISN	20072

Emissions Test Conditions: RADIATED EMISSIONS (Magnetic Field)

The *RADIATED EMISSIONS (MAGNETIC FIELD)* measurements were performed at the following test location:

- ☐ - Darby Test Site (Open Area Test Site)
☐ -
☐ -

at a test distance of :

- ☐ - 3 meters
☐ - 30 meters

☒ - Test not applicable

Test equipment used :

Model Number	Manufacturer	Description	Serial Number
☐ - 96005	Eaton	Log Periodic Antenna	1099
☐ - BIA-25	Electro-Metrics	Biconical Antenna	4283
☐ - 8566B	Hewlett-Packard	Spectrum Analyzer	2421A00526
☐ - 85662A	Hewlett-Packard	Analyzer Display	2403A07352
☐ - 85650A	Hewlett-Packard	Quasi-Peak Adapter	2043A00209
☐ - ALR-30M	Electro-Metrics	Loop Antenna	824
☐ - 8447D	Hewlett Packard	Preamplifier	2944A06832
☐ - EMC-30	Electro-Metrics	EMI Receiver	191
☐ - ALA-130/A	Antenna Research	Loop Antenna	106

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Emissions Test Conditions: RADIATED EMISSIONS (Electric Field)

The *RADIATED EMISSIONS (ELECTRIC FIELD)* measurements, in the frequency range of 30 MHz-1000 MHz, were tested in a horizontal and vertical polarization at the following test location :

☐ - Test not applicable

- - Darby Site (Open Area Test Site)
- ☐ - Darby Lab
- ☐ -

at a test distance of :

- - 3 meters
- ☐ - 10 meters
- ☐ - 30 meters

Test equipment used :

	Model Number	Manufacturer	Description	Serial Number
■ -	LPA30	eElectro-Metrics	Log Periodic Antenna	2280
■ -	BIA-30	Electro-Metrics	Biconical Antenna	3852
■ -	8566B	Hewlett-Packard	Spectrum Analyzer	2421A00526
■ -	85662A	Hewlett-Packard	Analyzer Display	2403A07352
■ -	85650A	Hewlett-Packard	Quasi-Peak Adapter	2043A00209
■ -	8447D	Hewlett-Packard	Preamplifier (26dB)	2944A06832
☐ -	EMC-30	Electro-Metrics	EMI Receiver	191
☐ -	8568B	Hewlett Packard	Spectrum Analyzer	2407A03213
☐ -	85650A	Hewlett Packard	Quasi-Peak Adapter	2043A00358
☐ -	85662A	Hewlett Packard	Analyzer Display	2340A05806
☐ -	96005	Eaton	Log Periodic	1099
☐ -	BIA 25	Electro-Metrics	Biconical Antenna	4283

Emissions Test Conditions): INTERFERENCE POWER

The *INTERFERENCE POWER* measurements were performed by using the absorbing clamp on the mains and interface cables in the frequency range 30 MHz - 300 MHz at the following test location :

■ - Test not applicable

- ☐ - Darby Lab
- ☐ -

Test equipment used :

	Model Number	Manufacturer	Description	Serial Number
☐ -	MDS-21	Rhode&Schwarz	Absorbing Clamp	8608447020
☐ -	8566B	Hewlett-Packard	Spectrum Analyzer	2421A00526
☐ -	85662A	Hewlett-Packard	Analyzer Display	2403A07352
☐ -	85650A	Hewlett-Packard	Quasi-Peak Adapter	2043A00209
☐ -	8447D	Hewlett-Packard	Amplifier (26 dB)	2944A06832
☐ -	EMC-30	Electro-Metrics	EMI Receiver	191

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The *EQUIVALENT RADIATED EMISSIONS* measurements in the frequency range 1.0 GHz - 1.08 GHz were performed in a horizontal and vertical polarization at the following test location :

■ - Darby Test Site (Open Area Test Site)

- ☐ -
- ☐ -
- ☐ -

at a test distance of:

- ☐ - 1 meters
- - 3 meters
- ☐ - 10 meters

☐ - Test not applicable

Test equipment used :

	Model Number	Manufacturer	Description	Serial Number
■ -	8566B	Hewlett-Packard	Spectrum Analyzer	2421A00526
■ -	85662A	Hewlett-Packard	Analyzer Display	2403A07352
■ -	85650A	Hewlett-Packard	Quasi-Peak Adapter	2043A00209
■ -	8449B	Hewlett-Packard	Preamplifier	3008A00320
■ -	3115	Electro-Mechanics	Double Ridge Guide Horn	3810

The *ANTENNA TERMINAL DISTURBANCE VOLTAGE* in the frequency range 30 MHz - 1,000 MHz were performed.

- ☐ - Darby Test Site (Open Area Test Site)
- ☐ - Laboratory
- ☐ -
- ☐ -

■ - Test not applicable

	Model Number	Manufacturer	Description	Serial Number
☐ -	2F9-3C4-3C5	Wavecom	UHF PAL TV Modulator	185879
☐ -	2F1-3C4-3C5	Wavecom	VHF PAL TV Modulator	157728
☐ -	A-8000	IFR	Spectrum Analyzer	1306
☐ -	8648B	Hewlett-Packard	Signal Generator	3623A01433
☐ -	8648B	Hewlett-Packard	Signal Generator	3623A01477
☐ -	LMV-182A	Leader	RMS Milli-Voltmeter	8010091
☐ -	3202	Krhon-Hite	Active filter	5899
☐ -	FMT115	Leaming	FM Modulator	NONE
☐ -	371	UDT	Optical power meter	06657
☐ -	TSG95	Tektronix	PAL video / Audio generator	B028883
☐ -				

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Equipment Under Test (EUT) Test Operation Mode - Emission tests :

The device under test was operated under the following conditions during emissions testing:

- ☐ - Standby
- ☐ - Test program (H - Pattern)
- ☐ - Test program (color bar)
- ☐ - Test program (customer specific)
- ☐ - Practice operation
- ☒ - Normal Operating Mode
- ☐ -

Configuration of the device under test:

- ☒ - See System Under Test Information in Appendix B

Rationale for EUT setup / configuration:

ANSI C63.4

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Emission Test Results:

Conducted emissions 150 kHz - 30 MHz

The requirements are ☒ - MET ☐ - NOT MET
Minimum limit margin 8.7 dB at 0.154 MHz
Remarks:

Radiated emissions (magnetic field) 10 kHz - 30 MHz

The requirements are ☐ - MET ☐ - NOT MET
Minimum limit margin dB at MHz
Remarks:

Radiated emissions (electric field) 30 MHz - 1000 MHz

The requirements are ☒ - MET ☐ - NOT MET
Minimum limit margin 0.2 dB at 107.5 MHz
Remarks: Measured with the Mobile Docking configuration

Interference Power at the mains and interface cables 30 MHz - 300 MHz

The requirements are ☐ - MET ☐ - NOT MET
Minimum limit margin dB at MHz
Remarks:

Radiated emissions 1 GHz - 1.08 GHz

The requirements are ☒ - MET ☐ - NOT MET
Minimum limit margin >20 dB at all GHz
Remarks:

Antenna Terminal Disturbance Voltage 30 MHz - 1,000 MHz

The requirements are ☐ - MET ☐ - NOT MET
Minimum limit margin dB at MHz
Remarks:

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GENERAL REMARKS:

The EUT's were tested in (3) orthogonal planes.

Measurements were made up to the tenth harmonic of the highest frequency transmitted.

There are (3) separate configurations that were tested.

- (1) Home installation uses home style antenna and internal antenna and home style cradle
- (2) Mobile installation uses vehicle style antenna & internal antenna and vehicle style cradle
- (3) Battery operated installation using internal antenna and no cradle

The EUT only transmits on 88.1, 88.3, 88.5, 88.7, 88.9, 106.7, 106.9, 107.1, 107.3, 107.5, 107.7 & 107.9 MHz.

We test all (3) configurations at both 88.7 & 107.5 MHz.

The line out port was never cabled during testing because it shuts off the transmitter.

SUMMARY:

The requirements according to the technical regulations are

■ - met

□ - **not** met.

The device under test does

■ - fulfill the general approval requirements mentioned on page 3.

□ - **not** fulfill the general approval requirements mentioned on page 3.

Testing Start Date February 25, 2005

Testing End Date: March 02, 2005

- PRODUCT SAFETY ENGINEERING INC -

Test Report Number 05F145B

Product Safety Engineering, Inc 12955 Bellamy Brothers Blvd. Dade City, FL 33525
Tel (352) 588-2209 Fax (352) 588-2544

APPENDIX

A

Test Equipment Calibration Information & Test Data Sheets

TEST EQUIPMENT CALIBRATION INFORMATION

Manufacturer	Model	Description	Serial Number	Cal Due
Hewlett Packard	8566B	Spectrum Analyzer	2421A00526	08/12/05
Hewlett Packard	85662A	Display	2403A07352	08/12/05
Hewlett Packard	85650A	Quasi-Peak Adapter	2043A00209	08/12/05
Hewlett Packard	8447D	Preamplifier 0.1 - 1,000 MHz	2944A06832	12/13/05
Hewlett Packard	8568B	Spectrum Analyzer	2407A03213	08/12/05
Hewlett Packard	85662A	Display	2340A05806	08/12/05
Hewlett Packard	85650A	Quasi-Peak Adapter	2043A00358	08/12/05
Hewlett Packard	8447D	Preamplifier 0.1 - 1,000 MHz	2944A06901	08/12/05
Hewlett Packard	8447D	Preamplifier 0.1 - 1,000 MHz	1937A03247	08/12/05
Hewlett Packard	8449B	Preamplifier 1 - 26.5 GHz	3008A00320	12/13/05
Hewlett Packard	8648B	Signal Generator	3443U00312	05/04/05
Hewlett Packard	8672A	Signal Generator	2211A02426	12/13/05
Eaton	96005	Log Periodic Antenna	1099	02/05/05
Electro-Metrics	LPA 30	Log Periodic Antenna	2280	01/11/06
Electro-Metrics	BIA 30	Biconical Antenna	3852	01/11/06
Electro-Metrics	BIA 25	Biconical Antenna	4283	02/04/05
Electro-Mechanics	3115	Double Ridge Guide Ant.	3810	11/25/05
Electro-Metrics	ALR30M	Magnetic Loop Antenna	824	01/10/06
Solar	8012	LISN	924840	12/24/04
Solar	8028	LISN	829012/809022	12/15/05
Solar	8028	LISN	903725/903726	12/15/05
Schwartzbeck	MDS-21	Absorbing Clamp	02581	12/09/05
Leader	LFG1310	Function Generator	8060233	05/04/05
Electro-Metrics	EMC-30	EMI Receiver	191	05/04/05
Antenna Research	ALA-130/A	Loop Antenna	106	05/03/05
Radio Shack	63-867	Temp/Hygrometer	N/A	05/04/05
Radio Shack	63-867A	Temp/Hygrometer	N/A	05/04/05

XM Radio TAO Home Dock			
Frequency	Level	Limit	Delta to Limit
88.7	45.6	48.0	-2.4
107.5	47.1	48.0	-0.9
177.4	30.7	43.5	-12.8
266.2	16.4	46.0	-29.6
354.8	26.9	46.0	-19.1
443.5	28.3	46.0	-17.7
532.2	24.5	46.0	-21.5
620.9	21.3	46.0	-24.7
709.6	25.1	46.0	-20.9
798.3	23.1	46.0	-22.9
887.0	24.0	46.0	-22.0
215.0	15.2	43.5	-28.3
322.5	16.5	46.0	-29.5
430.0	19.2	46.0	-26.8
537.5	19.8	46.0	-26.2
645.0	20.1	46.0	-25.9
752.5	25.4	46.0	-20.6
860.0	21.2	46.0	-24.8
967.5	21.3	54.0	-32.7
1075.0	22.1	54.0	-31.9

XM Radio TAO Mobile Dock			
Frequency	Level	Limit	Delta to Limit
88.7	45.8	48.0	-2.2
107.5	47.8	48.0	-0.2
177.4	31.2	43.5	-12.3
266.2	17.3	46.0	-28.7
354.8	27.2	46.0	-18.8
443.5	27.3	46.0	-18.7
532.2	26.4	46.0	-19.6
620.9	22.3	46.0	-23.7
709.6	24.6	46.0	-21.4
798.3	24.5	46.0	-21.5
887.0	24.1	46.0	-21.9
215.0	16.3	43.5	-27.2
322.5	16.4	46.0	-29.6
430.0	19.8	46.0	-26.2
537.5	19.8	46.0	-26.2
645.0	21.0	46.0	-25.0
752.5	24.9	46.0	-21.1
860.0	21.5	46.0	-24.5
967.5	21.6	54.0	-32.4
1075.0	21.9	54.0	-32.1

XM Radio TAO Portable			
Frequency	Level	Limit	Delta to Limit
88.7	29.5	48.0	-18.5
107.5	31.5	48.0	-16.5
177.4	28.3	43.5	-15.2
266.2	17.5	46.0	-28.5
354.8	27.1	46.0	-18.9
443.5	26.9	46.0	-19.1
532.2	26.5	46.0	-19.5
620.9	22.4	46.0	-23.6
709.6	24.5	46.0	-21.5
798.3	24.3	46.0	-21.7
887.0	24.2	46.0	-21.8
215.0	16.5	43.5	-27.0
322.5	17.3	46.0	-28.7
430.0	19.5	46.0	-26.5
537.5	19.7	46.0	-26.3
645.0	21.2	46.0	-24.8
752.5	24.8	46.0	-21.2
860.0	21.4	46.0	-24.6
967.5	21.9	54.0	-32.1
1075.0	22.1	54.0	-31.9

PRODUCT SAFETY ENGINEERING
REF 97.0 dBμV ATTN 0 dB

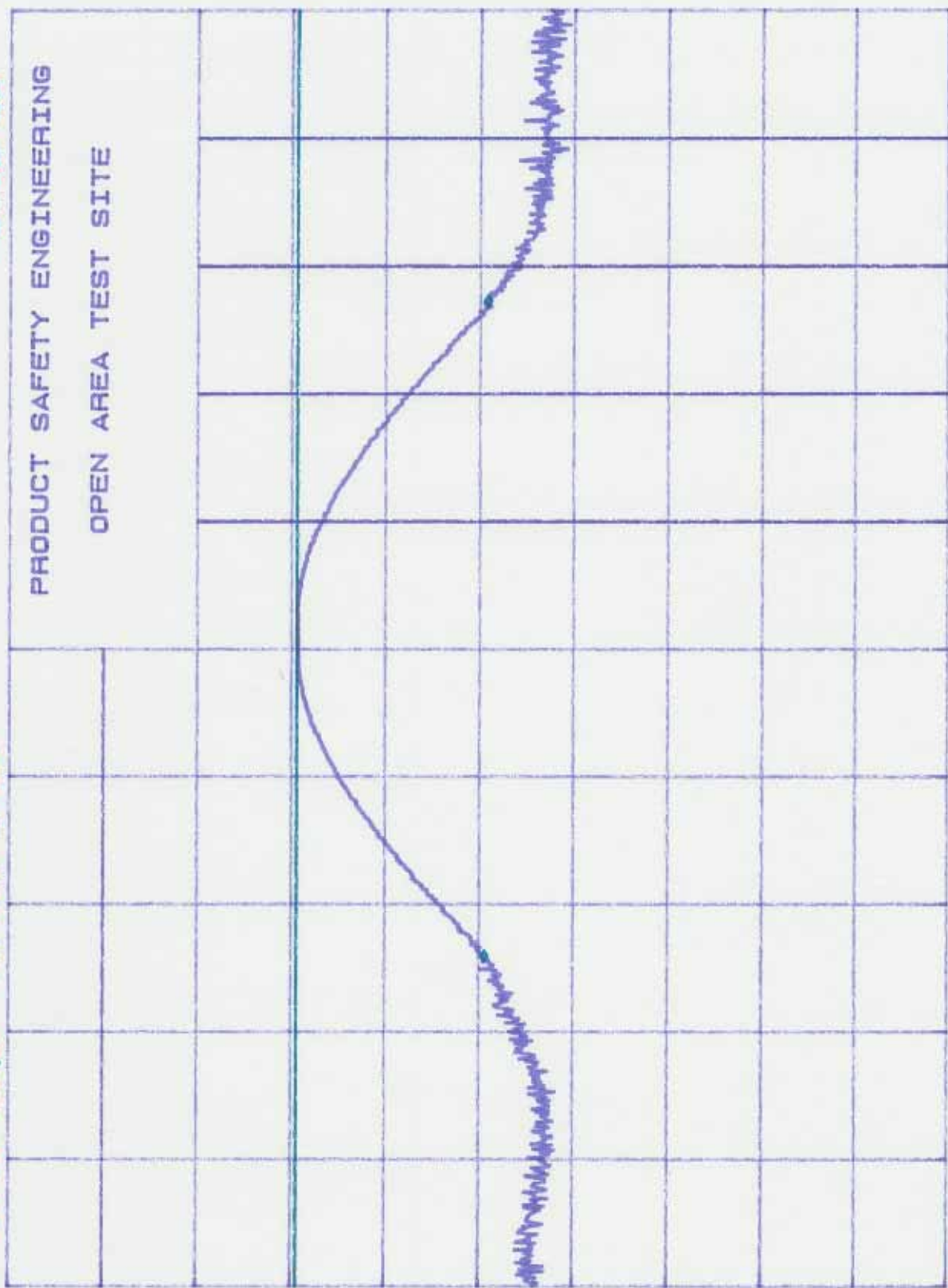
MKR Δ 102.8 KHZ
-0.30 dB

h_p

10 dB/

POS PK

DL
66.3
dBμV



PRODUCT SAFETY ENGINEERING

MKR Δ 144.0 KHZ
-0.90 dB

HP

REF 97.0 dB μ V ATTN 0 dB

10 dB/

POS PK

PRODUCT SAFETY ENGINEERING

OPEN AREA TEST SITE

MARKER Δ

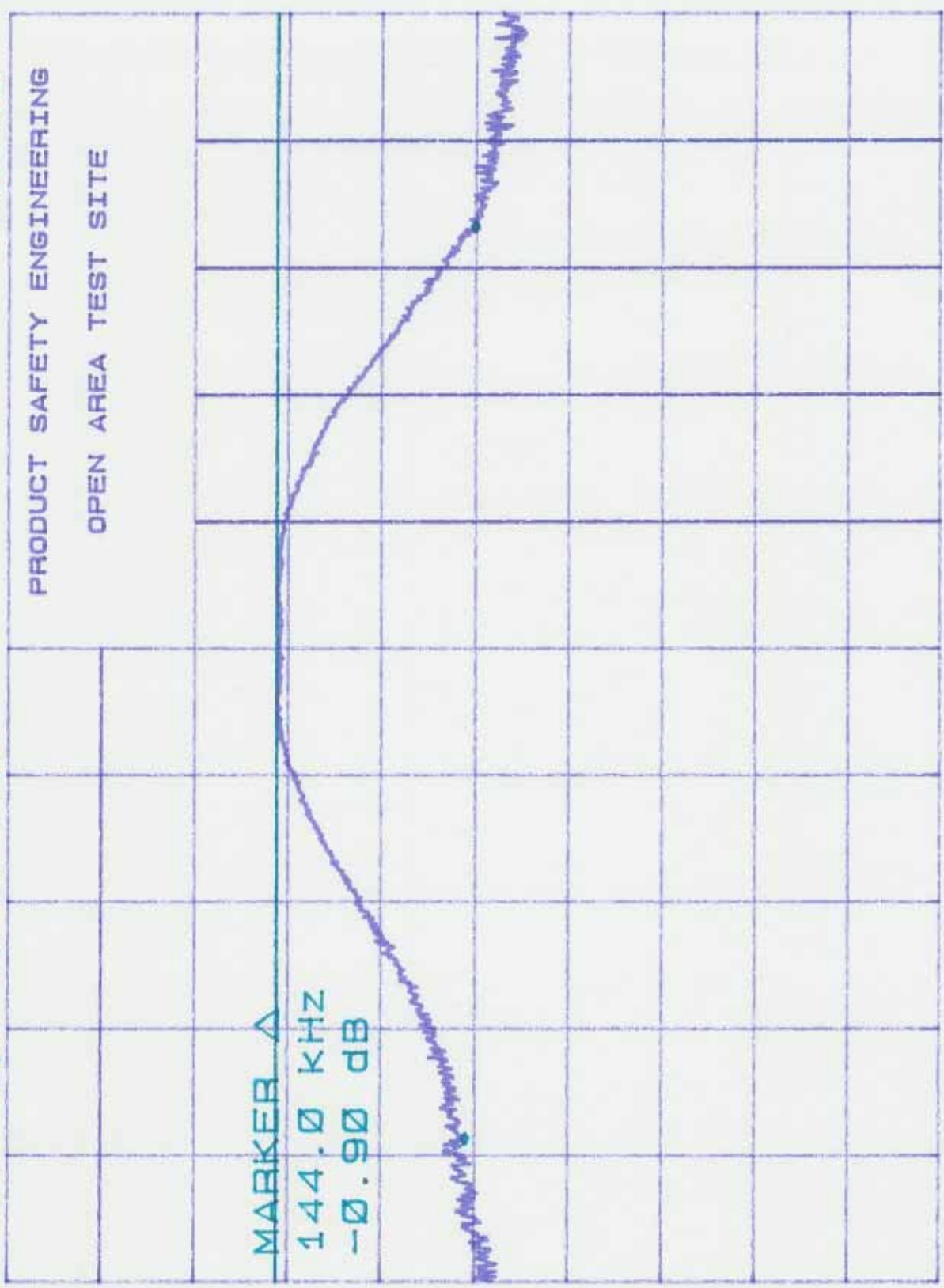
144.0 KHZ

-0.90 dB

DL

68.1

dB μ V



CENTER 107.900 MHz
RES BW 30 KHZ

VBW 30 KHZ

SPAN 200 KHZ
SWP 100 msec

A1

Product Safety Engineering

XM RADIO

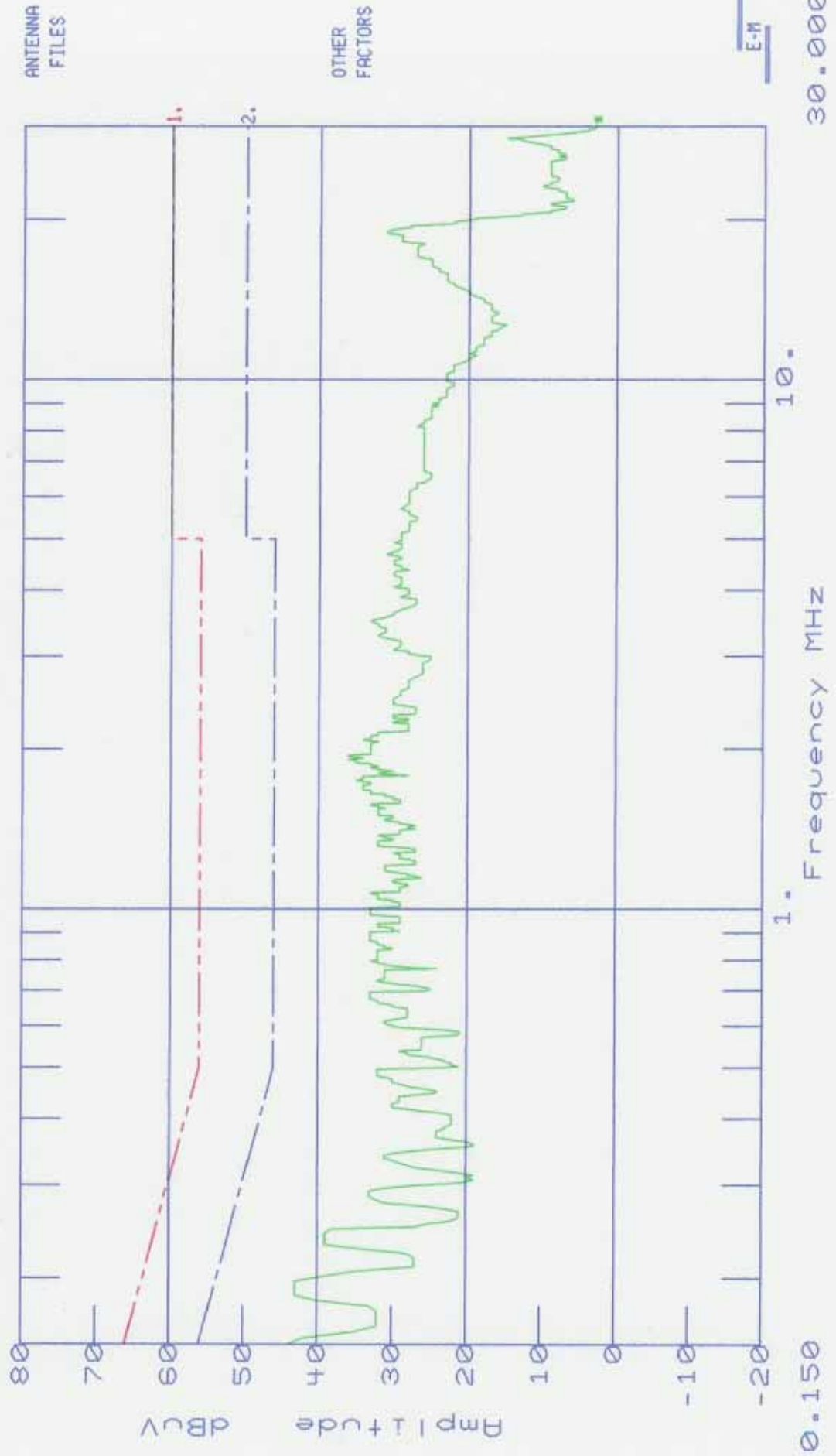
Date : 03/02/05
 Technician : JACK GARNER
 Test Method : EN55022 CLASS B
 Equipment : XM260 TAO
 Mode of Op. : NORMAL
 Serial No. : EGV490RE

Time : 09:32:44.73
 Test Equip. : EMC-30
 Test Number : 1
 Sensor Loc. : LINE
 Sensor Pol. :
 Ext. Atten. : 0 dB

Comment : 120 VAC / 60 HZ

EMC-30 SETTINGS
 Detector QuasiPeak
 Bandwidth CISPR
 Dump/Dwell IN/A
 RF Atten. 10 dB
 IF Atten. 10 dB

SPECS
 1) CISPR 22 Quasi Peak
 2) CISPR 22 AVG
 3)
 4)



TEST TITLE:XM RADIO	PAGE 1
DATA FILE :XM_L.D30	Freq.(MHz)
Amplitude Units : dBuV	Threshold -10 dB
	0.1500

Freq(MHz)	Amp	C22BQP.S30 vs Spec(dB)	C22BAVG.S30 vs Spec(dB)
1.9134	36.0		-10.000 *
1.9167	36.0		-10.000 *
1.9403	36.0		-10.000 *
1.9471	36.0		-10.000 *
1.9505	36.0		-10.000 *

Product Safety Engineering

XM RADIO

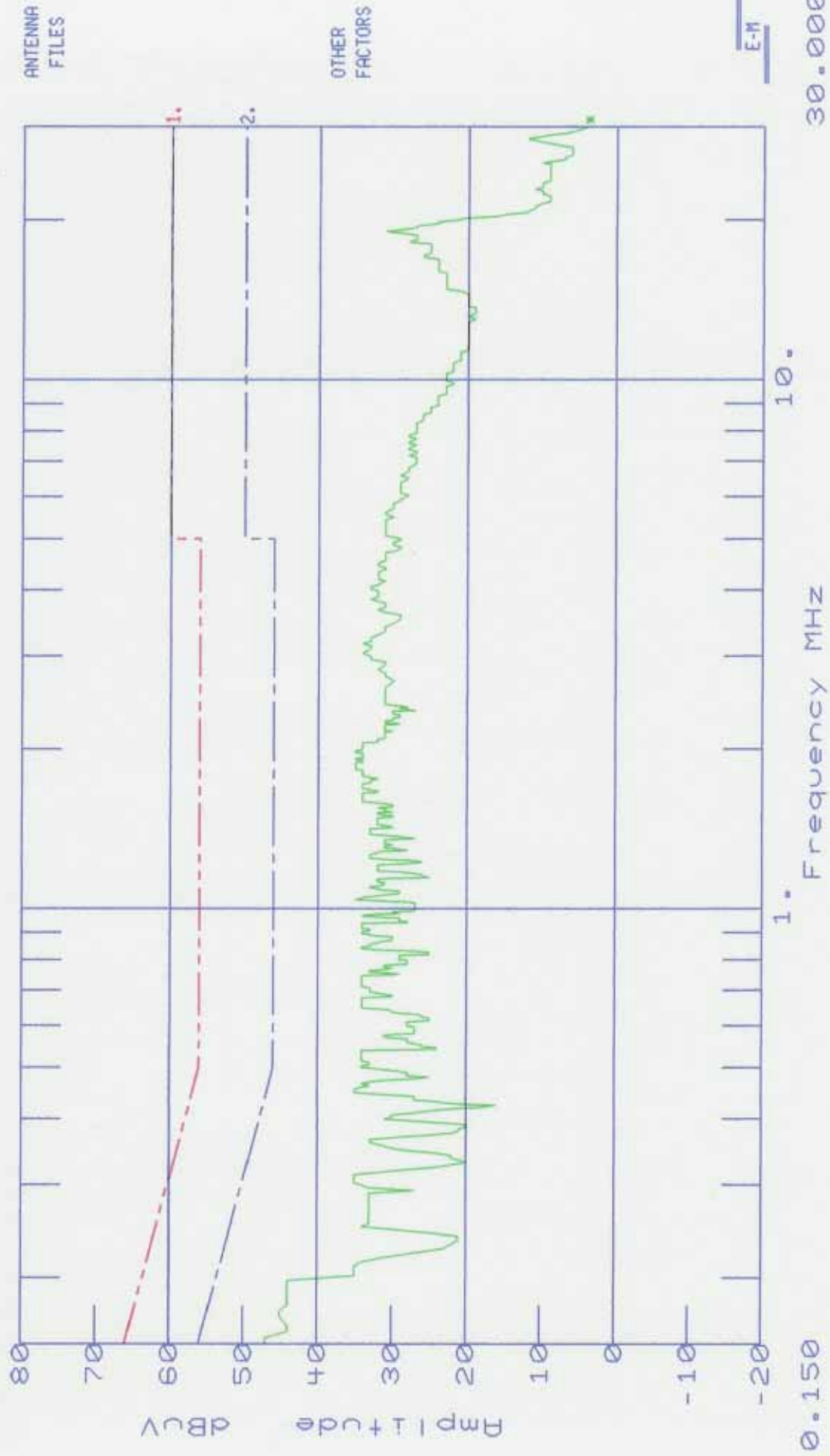
Date : 03/02/05
 Technician : JACK GARNER
 Test Method : EN55022 CLASS B
 Equipment : XM260 TAO
 Mode of Op. : NORMAL
 Serial No. : EGV490RE

Time : 11:18:52.80
 Test Equip. : EMC-30
 Test Number : 1
 Sensor Loc. : NEUTRAL
 Sensor Pol. :
 Ext. Atten. : 0 dB

Comment : 120 VAC / 60 HZ

EMC-30 SETTINGS
 Detector QuasiPeak
 Bandwidth CISPR
 Dump/Dwell IN/A
 RF Atten. 10 dB
 IF Atten. 10 dB

SPECS
 1) CISPR 22 Quasi Peak
 2) CISPR 22 AVG
 3)
 4)



A10

TEST TITLE:XM RADIO	PAGE 1
DATA FILE :XM_N.D30	Freq.(MHz)
Amplitude Units : dBuV	0.1500 -
Threshold -10 dB	

Freq(MHz)	Amp	C22BQP.S30 vs Spec(dB)	C22BAVG.S30 vs Spec(dB)
0.1500	47.0		-9.000 *
0.1542	47.0		-8.771 *
0.1730	45.0		-9.815 *
0.1933	44.0		-9.894 *
0.1975	44.0		-9.715 *

APPENDIX

B

System Under Test Description

SYSTEM COMPONENTS

DEVICE TYPE: EUT, XM RADIO TAO
S/N: E6V490RE

DEVICE TYPE: EUT, XM RADIO TAO MOBILE DOCK

DEVICE TYPE: EUT, XM RADIO TAO HOME DOCK

DEVICE TYPE: EUT, XM RADIO TAO AC POWER SUPPLY, SMPS5V2A-XM

DEVICE TYPE: EUT, XM RADIO TAO MOBILE ANTENNA

DEVICE TYPE: EUT, XM RADIO TAO HOME ANTENNA

INTERFACE CABLES

DEVICE TYPE: HOME ANTENNA
SHIELD: COAX
LENGTH: 7 METERS
CONNECTOR TYPE: DEDICATED TO COAXIAL PLUG
PORT: ANTENNA IN ON TAO

DEVICE TYPE: MOBILE ANTENNA
SHIELD: COAX
LENGTH: 7 METERS
CONNECTOR TYPE: DEDICATED TO COAXIAL PLUG
PORT: ANTENNA IN ON TAO

AC LINE CORDS

DEVICE TYPE: POWER SUPPLY (AC SIDE)

SHIELD: NO

LENGTH: N/A

CONNECTOR TYPE: 2 PIN POLARIZED WALL PLUG

DEVICE TYPE: POWER SUPPLY (DC SIDE)

SHIELD: NO

LENGTH: 8 FEET

CONNECTOR TYPE: DEDICATED TO MINI COAXIAL PLUG TO EITHER DOCK

APPENDIX

C

Measurement Protocol

The test methodology followed during the collection of the data included within this technical report was ANSI C63.4:1992.

The EUT was powered with (120) VAC / (60) Hz during the collection of data included within.

The data is compared to the FCC Part 15 Class B limits.

The "EMI" instrumentation is capable of calculating the final emission level based on the following formula:

Level at the receiver (dB μ V) + Antenna Correction Factor (dB/M) + Cable Loss (dB) - Preamp Gain (dB) = Actual Level in dB μ V/M.

The sample calculation below is based on the actual test data collected:

Observed Level		36.4	dB μ V	
ACF	+	15.9	dB/M	
Cable Loss	+	4.9	dB	
Preamp Gain	-	<u>26.0</u>	dB	
Actual Level		31.2	dB μ V/M	@ 177.4 MHz

Please have a company official review this report and sign.
