L.S. Compliance, Inc.
W66 N220 Commerce Court
Cedarburg, WI 53012
262-375-4400

COMPLIANCE TESTING OF:

PSM 200 wireless system
P2T TransMixer

PREPARED FOR:

Shure Incorporated
222 Hartrey Avenue
Evanston, IL 60202

TEST REPORT NUMBER:

301423

DATE(S) OF TESTING:

March, 2002

I. Table of Contents

L.S. Compliance, Inc.

1. L. S. Compliance In Review

L. S. Compliance, Inc. is located in Cedarburg, Wisconsin – United States.

We may be contacted by:

Mail: L. S. Compliance, Inc.
W66 N220 Commerce Court
Cedarburg, Wisconsin 53012

Phone: 262-375-4400
Fax: 262-375-4248
E-mail: eng@lsr.com

As an EMC Testing Laboratory, our Accreditation and Assessments are recognized through the following:

A2LA – American Association for Laboratory Accreditation
Accreditation based on ISO/IEC 17025 : 1999
with Electrical (EMC) Scope of Accreditation
A2LA Certificate Number: **1255.01**

U. S. Conformity Assessment Body (CAB) Validation
Validated by the European Commission as a U. S. Conformity Assessment Body operating under the U. S. /EU, Mutual Recognition Agreement (MRA) operating under the European Union EMC Directive 89/336/EEC, Article 10.2.
Date of Validation: **January 16, 2001**

Federal Communications Commission (FCC) – USA
Listing of 3 Meter Semi-Anechoic Chamber based on 47CFR 2.948
FCC Registration Number: **90756**

Listing of 3 and 10 meter OATS based on 47CFR 2.948
FCC Registration Number: **90757**

Industry Canada
On-file, 3 Meter Semi-Anechoic Chamber based on 47CRF 2.948
File Number: **IC 3088**

On-file 3 and 10 Meter OATS based on RSS-210
File Number: **IC 3088-A**

2. A2LA Certificate of Accreditation

THE AMERICAN
ASSOCIATION
FOR LABORATORY
ACCREDITATION

ACCREDITED LABORATORY

A2LA has accredited

L.S. COMPLIANCE, INC.
Cedarburg, WI

for technical competence in the field of

Electrical (EMC) Testing

The accreditation covers the specific tests and types of tests listed on the agreed scope of accreditation. This laboratory meets the requirements of ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration Laboratories" and any additional program requirements in the identified field of testing. Testing and calibration laboratories that comply with this International Standard also operate in accordance with ISO 9001 or ISO 9002.

Presented this 26th day of June, 2001.

SEAL

President
For the Accreditation Council
Certificate Number 1255.01
Valid to January 31, 2003

For tests or types of tests to which this accreditation applies, please refer to the laboratory's Electrical (EMC) Scope of Accreditation

3. A2LA Scope of Accreditation

American Association for Laboratory Accreditation

SCOPE OF ACCREDITATION TO ISO/IEC 17025-1999

L.S. COMPLIANCE, INC.
W66 N220 Commerce Court
Cedarburg, WI 53012
James Blaha Phone: 262 375 4400

ELECTRICAL (EMC)

Valid to: January 31, 2003 Certificate Number: 1255-01

In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory to perform the following tests:

Test	Test Method(s)
Conducted Emissions Continuous/Discontinuous	Code of Federal Regulations (CFR) 47, FCC Method Parts 15 and 18 using ANSI C63.4; EN: 55011, 55022, 55081-1, 55081-2; CISPR: 11, 22; CNS 13438
Radiated Emissions	Code of Federal Regulations (CFR) 47, FCC Method Parts 15 and 18 using ANSI C63.4; EN: 55011, 55022, 55081-1, 55081-2; CISPR: 11,22; CNS 13438
Conducted Immunity Fast Transients/Burst	IEC: 1000-4-4, 801-4; EN: 61000-4-4, 50082-1, 50082-2
Surge	IEC: 1000-4-5, 801-5; ENV 50142; EN: 61000-4-5, 50082-1, 50082-2
RF Fields	IEC: 1000-4-6, 801-6; ENV 50141; EN: 61000-4-6, 50082-1, 50082-2
Voltage Dips/Interruptions	IEC 1000-4-11; EN: 61000-4-11, 50082-1, 50082-2
Radiated Immunity RF Fields	IEC: 801-3, 1000-4-3; ENV 50140; EN: 61000-4-3, 50082-1, 50082-2
RF Fields (50 Hz)	IEC 1000-4-8; EN 61000-4-8
RF Fields (Pulse Mode)	EN: 50082-1, 50082-2; ENV 50204
Electrostatic Discharge (ESD)	IEC: 1000-4-2, 801-2; BSEN 60801-2; EN: 61000-4-2, 50082-1, 50082-2

(A2LA Cert. No. 1255.01) 06/26/01 Page 1 of 1

5301 Buckeystown Pike, Suite 350 • Frederick, MD 21704-8373 • Phone: 301-644-3248 • Fax: 301-662 2974

4. Validation Letter – U.S. Competent Body for EMC Directive 89/336/EEC

NIST CENTENNIAL 1901-2001

UNITED STATES DEPARTMENT OF COMMERCE
National Institute of Standards and Technology
Gaithersburg, Maryland 20899-

January 16, 2001

Mr. James J. Blaha
L.S. Compliance Inc.
W66 N220 Commerce Court
Cedarburg, WI 53012-2636

Dear Mr. Blaha:

I am pleased to inform you that the European Commission has validated your organization's nomination as a U.S. Conformity Assessment Body (CAB) for the following checked (✓) sectoral annex(es) of the U.S.-EU Mutual Recognition Agreement (MRA).

(✓) Electromagnetic Compatibility-Council Directive 89/336/EEC, Article 10(2)
( ) Telecommunication Equipment-Council Directive 98/13/EC, Annex III
( ) Telecommunication Equipment-Council Directive 98/13/EC, Annex III and IV
Identification Number:
( ) Telecommunication Equipment-Council Directive 98/13/EC, Annex V
Identification Number:

This validation is only for the location noted in the address block, unless otherwise indicated below.

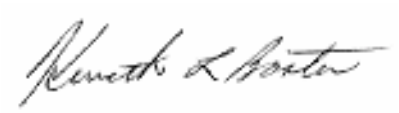
(✓) Only the facility noted in the address block above has been approved.
( ) Additional EMC facilities:
( ) Additional R&TTE facilities:

Please note that an organization's validations for various sectors of the MRA are listed on our web site at http://ts.nist.gov/mra. You may now participate in the conformity assessment activities for the operational period of the MRA as described in the relevant sectoral annex or annexes of the U.S.-EU MRA document.

NIST will continue to work with you throughout the operational period. All CABs validated for the operational phase of the Agreement must sign and return the enclosed CAB declaration form, which states that each CAB is responsible for notifying NIST of any relevant changes such as accreditation status, liability insurance, and key staff involved with projects under the MRA. Please be sure that you fully understand the terms under which you are obligated to operate as a condition of designation as a CAB. As a designating authority, NIST is responsible for monitoring CAB performance to ensure continued competence under the terms of the MRA.

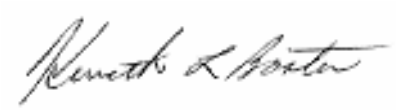
NIST

5. Signature Page



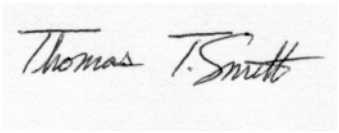
Prepared By: **April 8, 2002**

Kenneth L. Boston, EMC Lab Manager **Date**



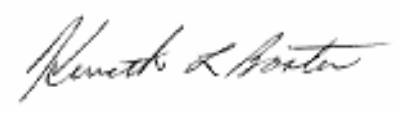
Tested By: **April 8, 2002**

Kenneth L. Boston, EMC Lab Manager **Date**



Tested By: **April 8, 2002**

Thomas Smith, EMC Engineer **Date**



Approved By: **April 8, 2002**

Kenneth L. Boston, EMC Lab Manager **Date**
PE#31926 Licensed Professional Engineer
Registered in the State of Wisconsin, United States

1.1 SUMMARY OF TEST REPORT

MANUFACTURER:	Shure Incorporated
MODEL:	PSM200; P2T
SERIAL:	preproduction; H2, FCC, Q3
DESCRIPTION:	Low Power Auxiliary Transmitter
FREQUENCY RANGE:	TRANSMITTER; 518-608; 614-784 MHz

The Shure PSM200 wireless transmitter was found to **meet** the General emission specification of Title 47 CFR FCC, Part 74, for a low power auxiliary transmitter. The emission tests were performed with the product operating in the UHF television frequency range of 518-608 MHz and 614-784 MHz, which is shared by Part 74.800 (subpart H) licensed wireless microphone systems.

1.2 INTRODUCTION

During March of 2002, a suite of various Emissions tests were performed on a three sample models of the Shure PSM 200 system; P2T low power transmitter. Most of the tests were performed with the samples transmitting using the integral antenna. Certain samples were configured to allow a direct connection to be made to the TX output with a coaxial cable, to allow testing in an environmental chamber, and directly connected to an analyzer. These tests were performed using the test procedures outlined in ANSI C63.4-1992 for intentional radiators, as called for in section 2.1033 for a type accepted device, and in accordance with the limits set forth in FCC Part 74.861. These tests were performed by Kenneth L. Boston, PE and Thomas Smith of L. S. Compliance, Inc.

1.3 PURPOSE

The above mentioned tests were performed in order to determine the compliance of the test sample with limits contained in various provisions of Title 47 CFR, including:

2.1046	2.1051	2.1057
2.1047	2.1053	74.861 (subpart H)
2.1049	2.1055	

All radiated emissions tests were performed to measure the emissions in the frequency bands described by the above sections, and to determine whether said emissions are below the limits established by the above sections. These tests were performed in accordance with the procedure described in the American National Standard for methods of measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz (ANSI C63.4-1992). Another document used as reference for the EMI receiver specification was the International Special Committee on Radio Interference (CISPR) number 16-1 (1993).

1.4 RADIATED EMISSIONS TEST SETUP (47 CFR 2.1053)

The test samples were operated within the 3 meter Semi-Anechoic, FCC listed chamber located at L.S. Compliance in Cedarburg, WI. The samples were placed on an 80cm high wooden table, which was centered on the flush-mounted 2m diameter metal turntable. The samples were operated on a standard, wall-pack DC power supply, and with 4 XLR audio cables connected. The test samples were configured to run in a continuous un-modulated transmit mode, using the integral short quarter wave antenna attached to the antenna port, during the Radiated measurements. The test sample was set to operate on one of several channels within the 74.802 frequency assignment: three representative channels within the 518-608 MHz segment, and three channels within the 614-784 MHz segment. Channels available were determined by the channel plans presently programmed into 3 pre-production transmitters. These samples were designated: H2 (518 to 554 MHz), FCC (607.5 and 614.5 MHz) and Q3 (748 to 784 MHz).

1.5 RADIATED EMISSION TEST PROCEDURE

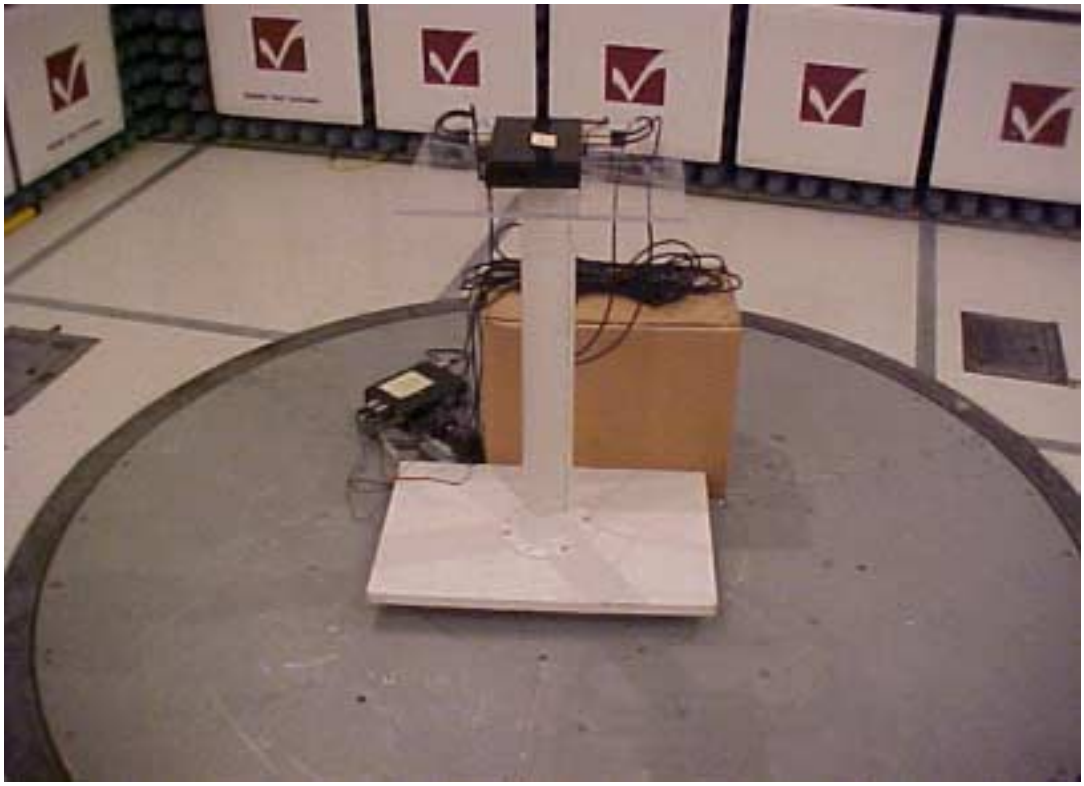
The fundamental and spurious (harmonic) emissions of the transmitter were tested for compliance to Title 47 CFR, FCC Part 74.861(e) limits for a low power auxilliary station. For the calculations used to determine the limits applicable for the test sample, refer to page 11. These limits are expressed in decibels below carrier level. (-dBc) The samples were tested from the lowest frequency generated by the transmitter (without going below 9 kHz) to the 10th harmonic of the fundamental frequency generated by the device. The samples were placed on a nonconductive (plexiglas) pedestal in the 3 Meter chamber and the antenna mast was placed such that the antenna was 3m from the test object. A biconical antenna was used to measure emissions from 30 to 200 MHz, a log periodic was used to measure emissions from 200 to 1000 MHz, and a double ridged waveguide horn was used to measure emissions above 1 GHz. The test object was programmed to operate in continuous transmit, while generating a carrier on the appropriate channel, and the resultant signals were maximized by rotating the turntable 360 degrees, and by raising and lowering the antenna between 1 and 4 meters. Measurements from a frequency of 4 GHz and up were performed at a 1 meter separation, and at a fixed antenna height of 1 meter., for some of the samples. The microwave Spectrum Analyzer was located right next to the antenna; in order to keep cable losses very low.

No significant emissions were found aside from the transmitter fundamental and some low order harmonics. Other emissions that were seen were much lower than 20 dB below the specified limits. In addition, the fundamental emission of several of the test channels tested was measured via the substitution method. (EIA/TIA 603, section 2.2.12)

1.6 TEST EQUIPMENT UTILIZED FOR THE RADIATED EMISSIONS TEST

A list of the test equipment and antennas used for the tests can be found on page 31, which includes the calibration information as well as the equipment description. All equipment is calibrated and used according to the user manuals supplied by the manufacturer. All antenna calibrations were performed at a N.I.S.T traceable site, and the resultant correction factors were entered into the Hewlett Packard 8546A EMI receiver software database. The connecting cables used were also measured for loss using a calibrated signal generator and the HP 8546A EMI receiver. The resulting loss factors were entered into the HP 8546A database. This allowed for automatic changes in the antenna correction factor, as well as cable loss or other corrections, to be added to the EMI receiver display while taking measurements. Thus, the resulting data taken from the HP 8546A is an actual reading and can be entered into the database as a corrected meter reading. The HP 8546A EMI receiver was operated with a bandwidth of 120 kHz when receiving signals below 1 GHz, and with a bandwidth of 1 MHz when receiving signals above 1 GHz, in accordance with CISPR 16, while performing the Part 15 measurements. Other IF and Video bandwidths, such as 30 kHz, were used where appropriate and allowable. A Hewlett Packard E4407B microwave Spectrum Analyzer, connected to the Horn Antenna with a very short section of RG-214 cable was used for measurement of frequencies above 4 GHz, at a distance of 1 meter.

PHOTOS TAKEN DURING TESTING



View of one of the PSM200 samples, while performing Radiated Emission Testing

FIELD STRENGTH OF SPURIOUS/HARMONIC FREQUENCIES:

In accordance with section 74.861:
All out of band spurious emissions must be below the mean power of the carrier by at least:

43 + 10 log(carrier power)

which for a .01 watt rating on one of the the test samples is: (maximum power filed for: 03 watt)

43 + 10 log(01)
43 – 20 = 23 dBc

-23.0dBc from 10 dBm = -13. dBm

FIELD STRENGTH OF PART 74 LIMIT: AT R = 3 METERS DSTANCE

FROM THE STANDARD REFERENCE FORMULA FOR POWER TRANSMITTED VERSUS ELECTRIC FIELD:

$Pt = (R^{**}) \times |E|^{**} / 30$

Then to convert to dB:

$Pt = 20\log|E| + 20\log(R) - 10\log(30)$

Insert additional terms to convert watts to milli-watts (in dB) and volts to micro-volts (in dBuV):

$Pt = 20\log|Euv| - 20\log(1{,}000{,}000) + 10\log(1000) + 20\log(3) - 10\log(30)$

$Pt = 20\log|Euv| - 120 + 30 + 9.54 - 14.77$

$Pt = 20\log|Euv| - 95.23$

OR; $20\log|Euv| = Pt \text{ (in dBm)} + 95.23$

$|E|$ (in dBuV) = -13 dBm + 95.23 = 82.23 dBuV/m , at 3 meters

$|E|$ (in dBuV) = +10 dBm + 95.23 = 105.23 dBuV/m , at 3 meters

Actual effective radiated power (ERP) is determined from the substitution method, with values recorded above being determined from the generator setting found to create the same field strength as the signal measured from the EUT. This setting is adjusted slightly for the short cable loss, and the balun loss of the substitution dipole, and is 0.5 dB in this case. Calculated ERPs will tend to be 4 to 6 dB higher than the actual reading due to the contribution of the reflected emission path, which adds a voltage value to the emission via the direct path from EUT to the sense antenna.

RADIATED EMISSIONS IN THE 3 METER FCC LISTED CHAMBER

Date of Test:	March 1,5,27, 2002	Manufacturer:	Shure Incorporated
Location:	L. S. Compliance, Inc.	Model No.:	PSM200; P2T
	W66 N220 Commerce Court		
	Cedarburg, WI 53012		
Specifications:	1 and 3 meters	Serial No.:	H2, FCC, Q3
Equipment:	HP 8546A EMI Receiver, HP E4407 analyzer	Configuration:	Continuous transmit
	EMCO 3110B biconical	Detector(s) Used:	Peak
	EMCO 3146A Log Periodic		
	EMCO 3115 Waveguide Horn		

Transmit channel (channel #, frequency: MHz)	Frequency (MHz)	Height (meters)	Azimuth (degrees)	Polarity.	Peak (dBuV/m)	Limit (dBuV/m)	Margin (dB)
H2 #1; 518.75	1038.0	1.1	200	V	50.5	82.2	31.7
H2 #1; 518.75	2594.0	1.2	115	V	50.4	82.2	31.8
H2 #1; 518.75	3112.0	1.0	160	V	54.6	82.2	27.6
H2 #1; 518.75	3112.0	1.0	35	H	58.0	82.2	24.2
H2 #8; 553.25	1106.0	1.0	255	V	45.0	82.2	37.2
H2 #8; 553.25	2766.0	1.2	105	V	53.0	82.2	29.2
H2 #8; 553.25	3319.5	1.15	105	V	61.4	82.2	20.8
FCC #4; 607.5	3037.5	1.1	35	H	47.0	82.2	35.2
FCC #5; 614.5	3072.5	1.1	40	H	46.9	82.2	35.3
Q3 #1; 749.1	1498.0	1.15	60	V	52.0	82.2	30.2
Q3 #1; 749.1	2996.0	1.1	40	H	54.3	82.2	27.9
Q3 #8; 781.9	1564.0	1.1	50	V	49.6	82.2	32.6
Q3 #8; 781.9	3128.0	1.0	45	H	51.2	82.2	31.0

All other spurious signals were seen to be at least 35 dB below the FCC part 74.861 limits.

L.S. Compliance, Inc.

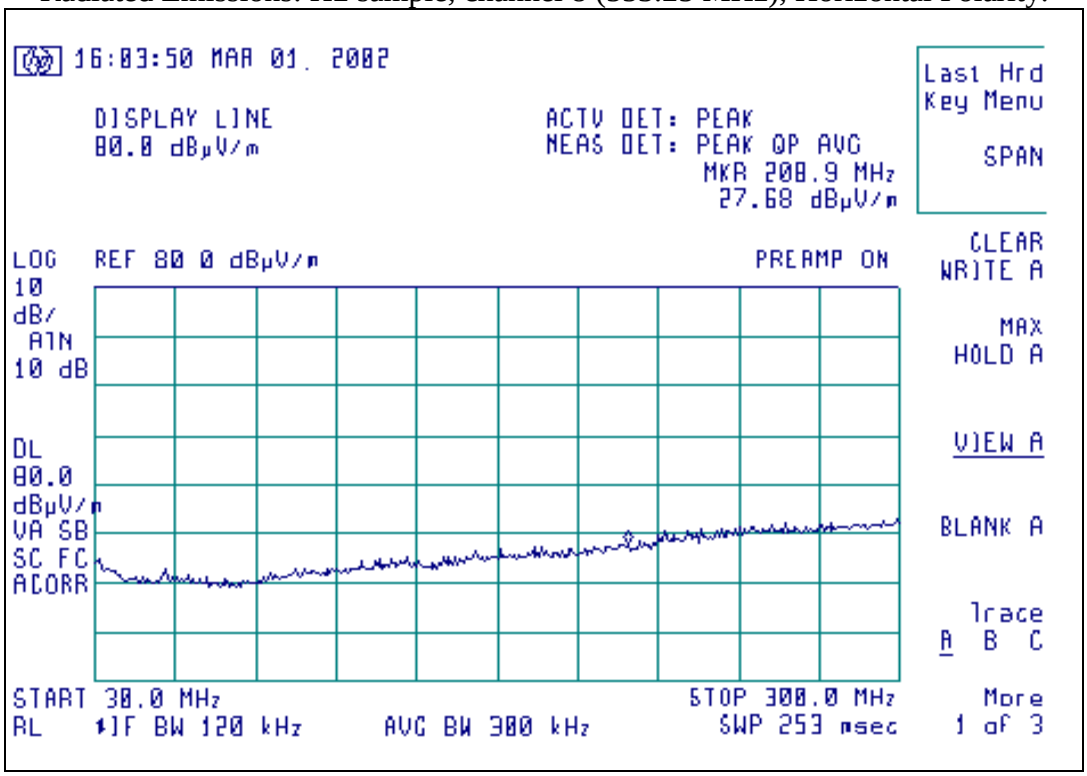
ERP MEASUREMENTS IN THE 3 METER FCC LISTED CHAMBER

Date of Test:	16 March, 2002	Manufacturer:	Shure Incorporated
Location:	L. S. Compliance, Inc.	Model No.:	PSM-200; H2;Q3
	W66 N220 Commerce Court		(maximum power sought is 15 dBm)
	Cedarburg, WI 53012		
Specifications:	EIA/TIA 603-1	Serial No.:	preproduction
Equipment:	HP 8546A EMI Receiver	Configuration:	Unmodulated transmit
	EMCO 3110B biconical	Detector(s) Used:	Peak
	EMCO 3146A Log Periodic		
	EMCO 3121c Dipole Set		
	EMCO 3115 Waveguide Horn		
	Marconi 2024 signal generator		

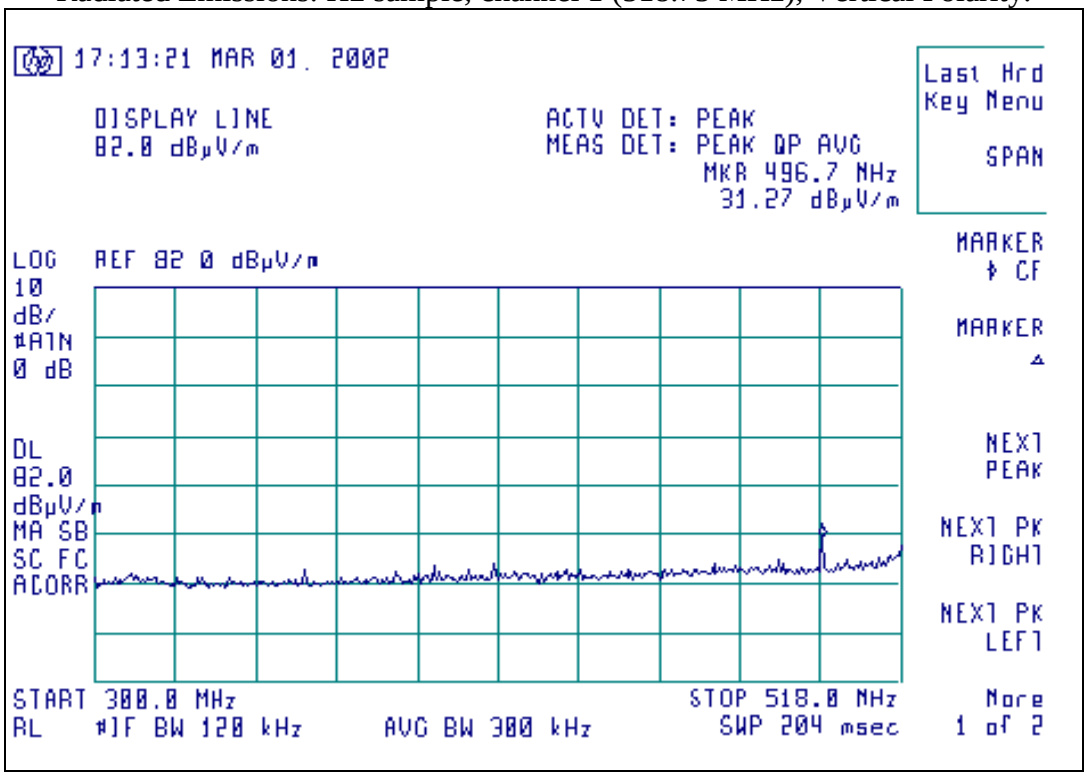
FREQ (MHz)	Channel	ELEV. (meters)	AZIMU (degrees)	POL. (H/V)	EMI reading (dBuV/m)	Calculated ERP (dBm)	Actual ERP (dBm)	Target ERP (dBm)
518.73	1	1.0	100	V	107.0	11.8	6.9	15.0
518.73	1	1.7	170	H	110.6	15.4	9.5	15.0
553.23	8	1.0	125	V	108.0	12.8	9.2	15.0
553.23	8	1.55	335	H	113.3	18.1	12.9	15.0

FREQ (MHz)	Channel	ELEV. (meters)	AZIMU (degrees)	POL. (H/V)	EMI reading (dBuV/m)	Calculated ERP (dBm)	Actual ERP (dBm)	Target ERP (dBm)
749.09	1	1.73	252	V	110.7	15.5	11.0	13.0
749.09	1	1.20	196	H	112.2	17.0	10.7	13.0
781.88	8	1.47	264	V	108.6	13.4	9.5	13.0
781.88	8	1.07	292	H	114.1	18.9	12.5	13.0

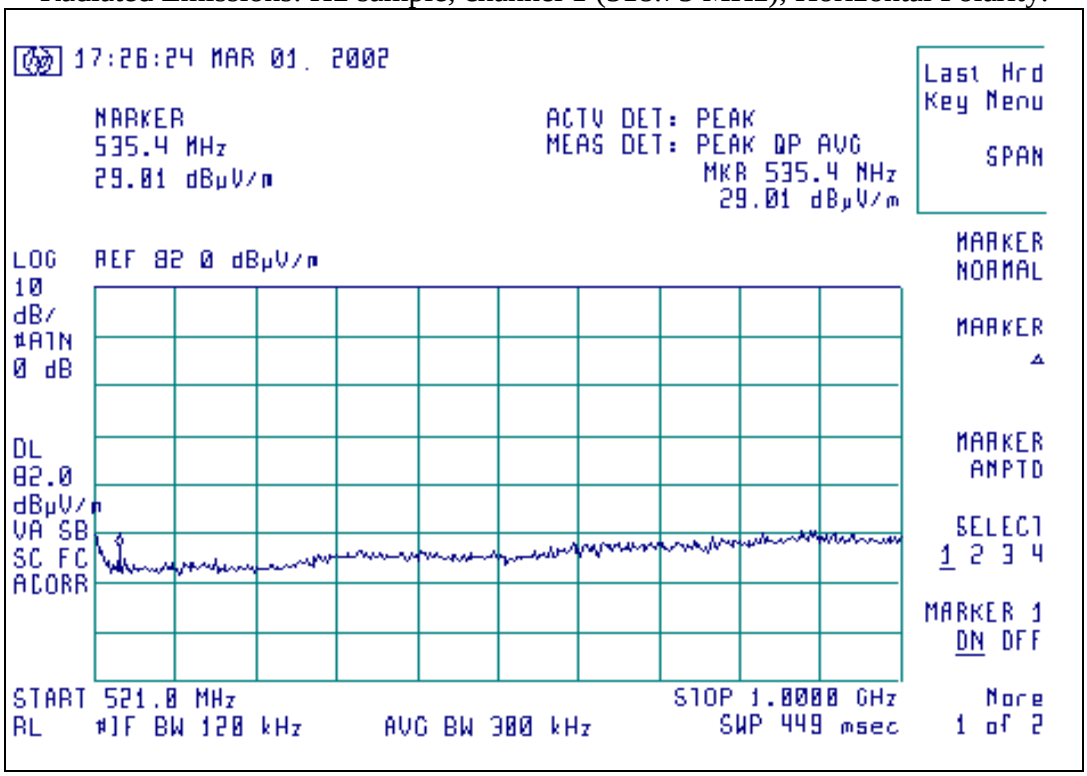
Radiated Emissions: H2 sample, channel 8 (553.25 MHz), Horizontal Polarity.



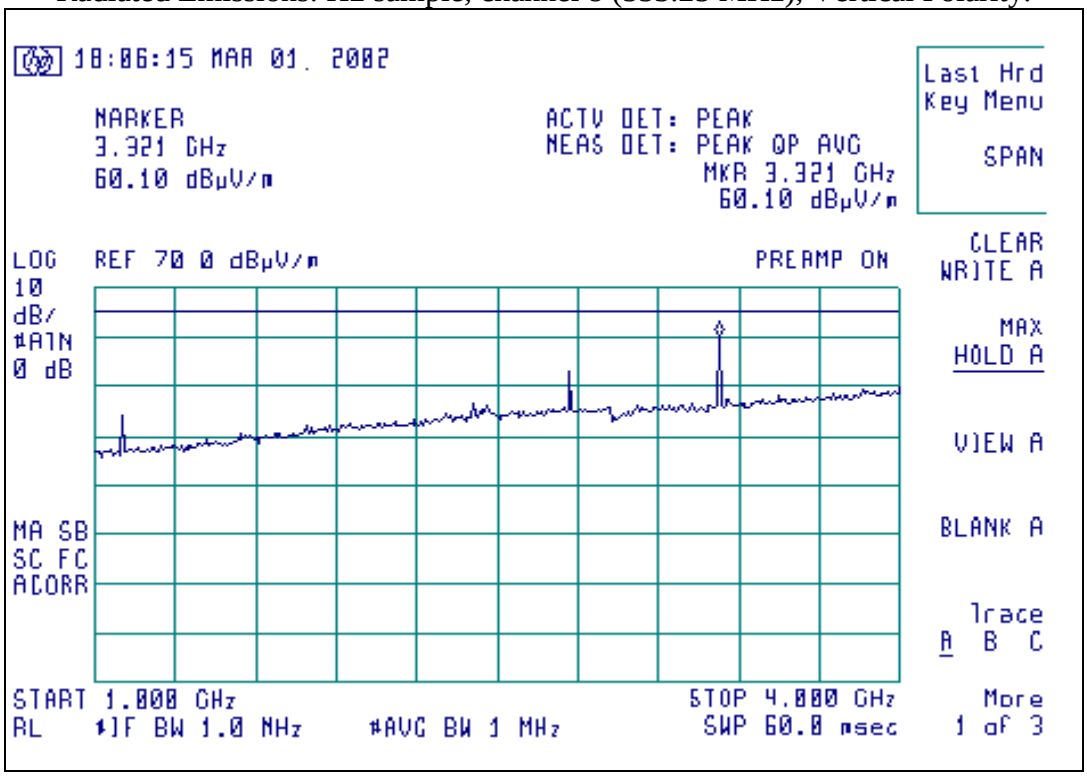
Radiated Emissions: H2 sample, channel 1 (518.75 MHz), Vertical Polarity.



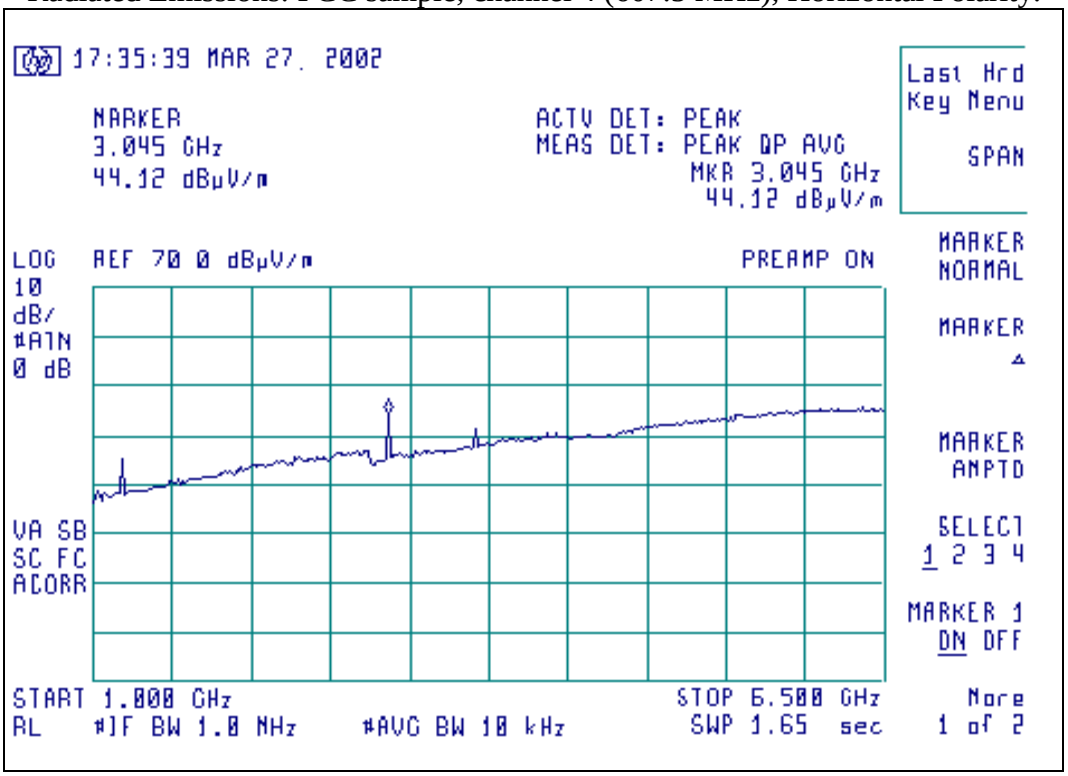
Radiated Emissions: H2 sample, channel 1 (518.75 MHz), Horizontal Polarity.



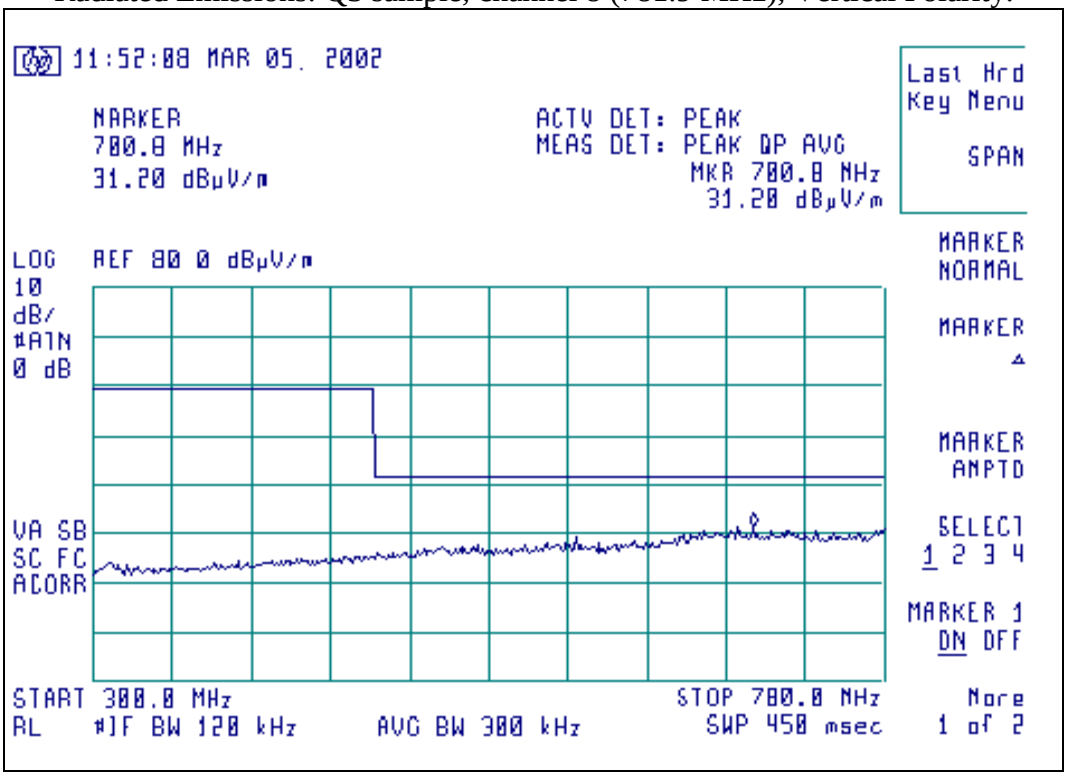
Radiated Emissions: H2 sample, channel 8 (553.25 MHz), Vertical Polarity.



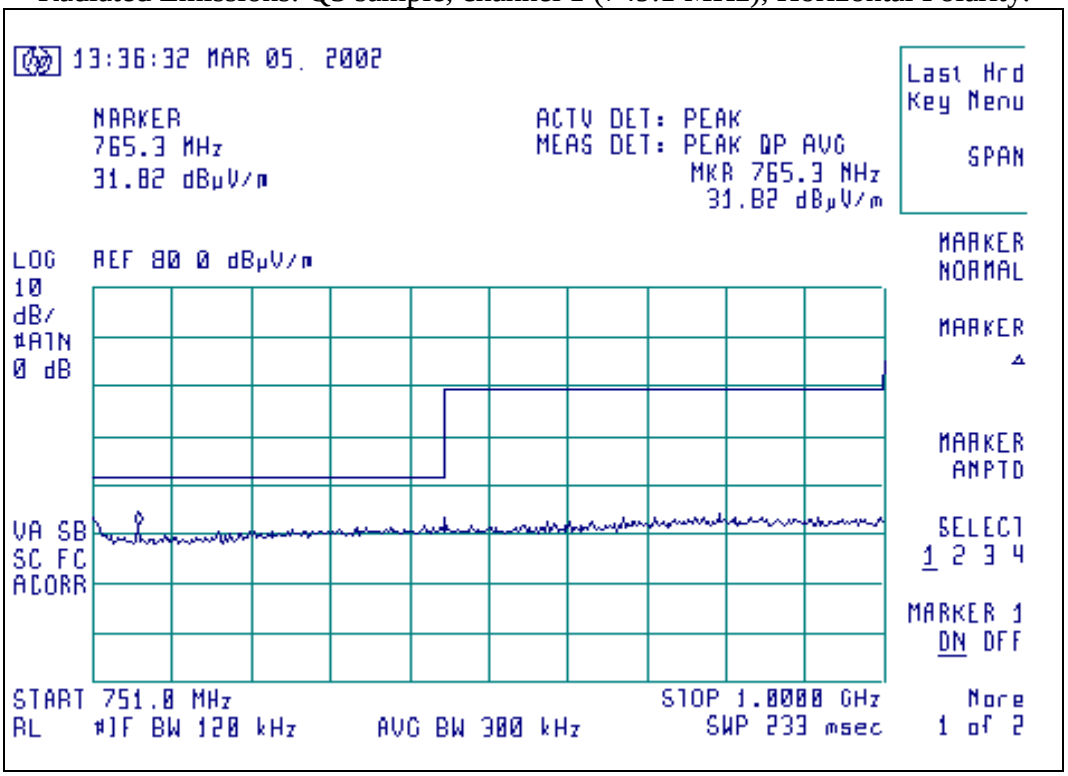
Radiated Emissions: FCC sample, channel 4 (607.5 MHz), Horizontal Polarity.



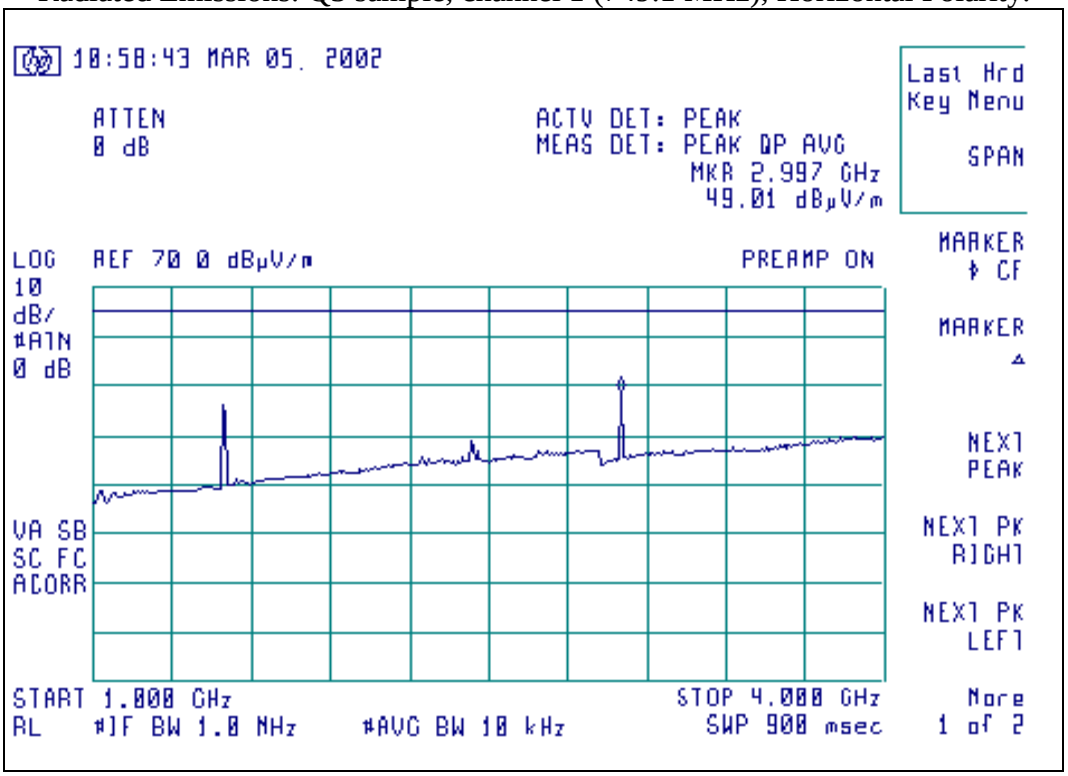
Radiated Emissions: Q3 sample, channel 8 (781.9 MHz), Vertical Polarity.



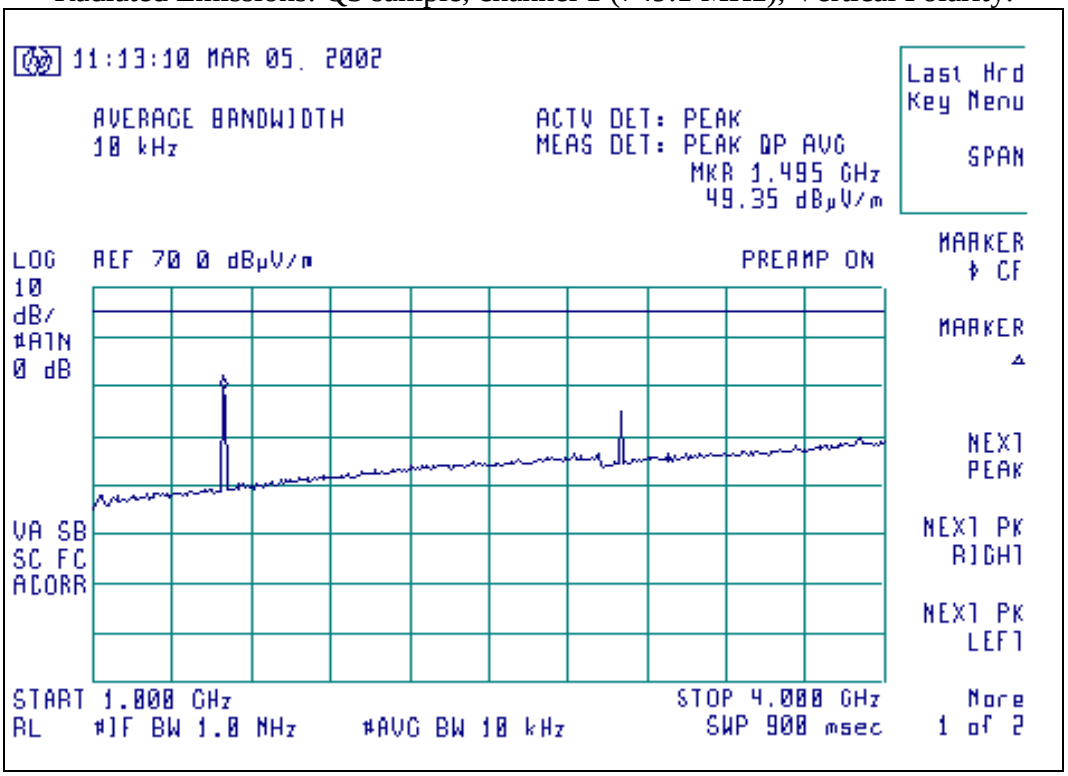
Radiated Emissions: Q3 sample, channel 1 (749.1 MHz), Horizontal Polarity.



Radiated Emissions: Q3 sample, channel 1 (749.1 MHz), Horizontal Polarity.



Radiated Emissions: Q3 sample, channel 1 (749.1 MHz), Vertical Polarity.



1.7 Conducted Emission (direct RF connection)Test:

For the Part 2.1046, 2.1047, 2.1049 and 2.1055 tests, the Antenna port of the modified sample was directly coupled to the input of the test and monitoring eqipment through a special coupling cable and a 10 dB passive attenuator. The transceiver sample was set to transmit continuously in either the unmodulated or modulated mode. Scans were then performed at the various frequencies tested, while observing the fundamental signal level, plus modulation characteristics and frequency stability. The output of the sample, with the attenuator was measured using a Hewlett Packard 8591 EM spectrum analyzer to verify modulation bandwidth and frequency stability. The output of the transmitter sample was connected to an HP 8920 Communication analyzer to perform the frequency response and limiting response tests of the sample.

Details of each of these tests follow.

Views of the PSM200 P2T during Conducted Emission testing

Part 2.1049 Occupied bandwidth using 74.861(e)(6) Emission Mask for F3E Transmitter.

a) Test Requirement:

(1) On any frequency from the center of the authorized bandwidth f_o to 100 kHz removed from f_o: Zero dBc down from the mean power of the fundamental.

(2) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 100 kHz, but less than 200 kHz; 25 dBc down.

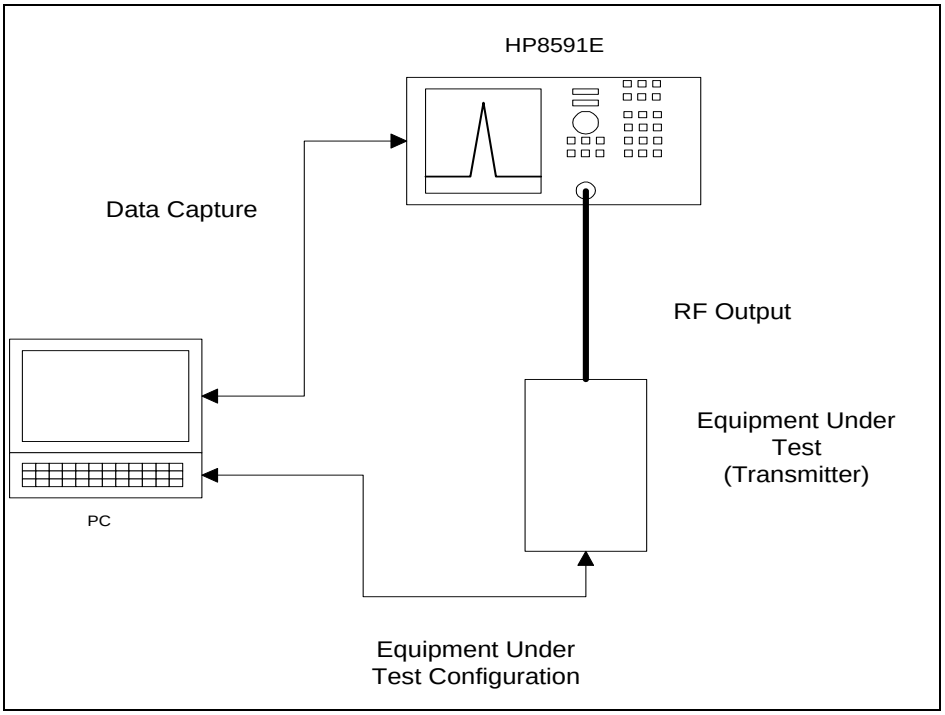
(3) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 200 kHz, but less than 500 kHz; 35 dBc down.

(4) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 500 kHz, 43 +10 log (Pout; W)

The test condition is presented in Tabular form below.

74.861 (e)	Absolute Frequency Offset Range: $\lvert f_m \rvert$	Attenuation relative to Carrier power P.
(1)	0 to 100 kHz	0 dB
(2)	100 to 200 kHz	25 dB
(3)	200 to 500 kHz	35 dB
(4)	> 500 kHz	-13 dBm

b) Test Configuration



c) Test Conditions: Stimulus

Input nominal audio signal at 2.5 kHz: (-40 dBu).

Set level to 50% rated deviation. (100 % is +/- 35 kHz., 50% is 17.5 kHz)

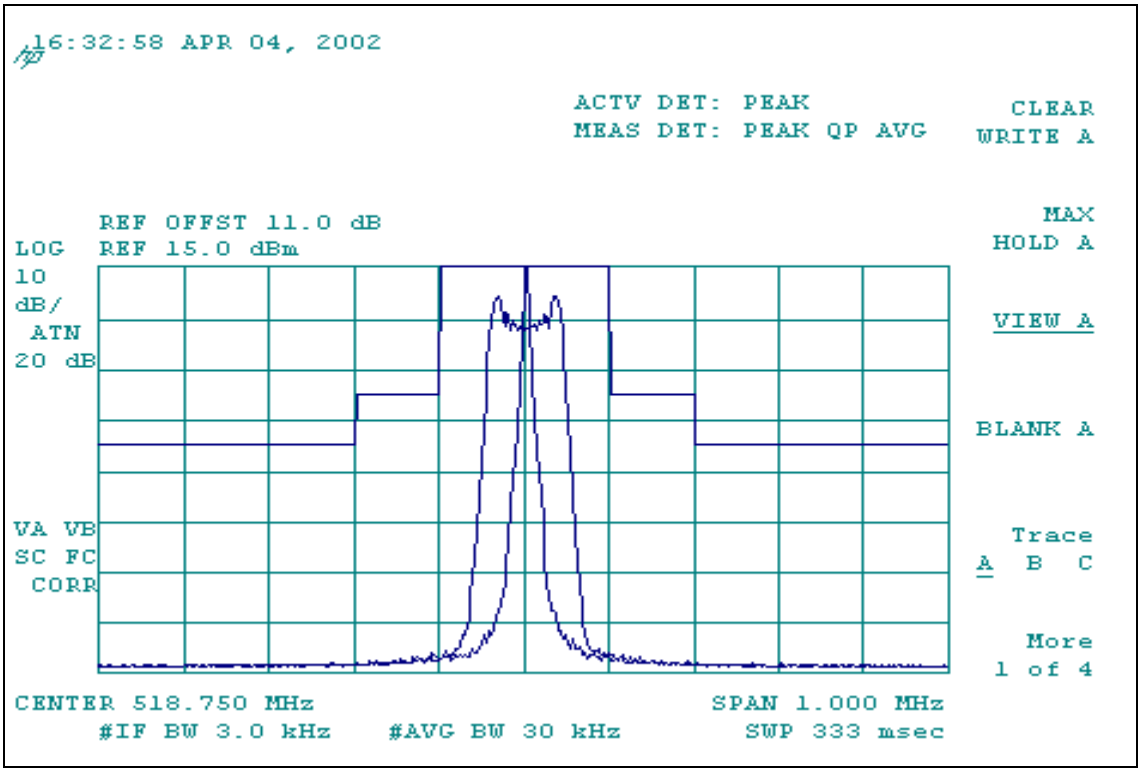
This level typically occurs at about -36 dBu (slight variation from unit to unit)

Increase Level 16 dB: to -20 dBu

Measure Spectrum Mask per 74.861

Test Indications Part 2. 1049 Occupied Bandwidth

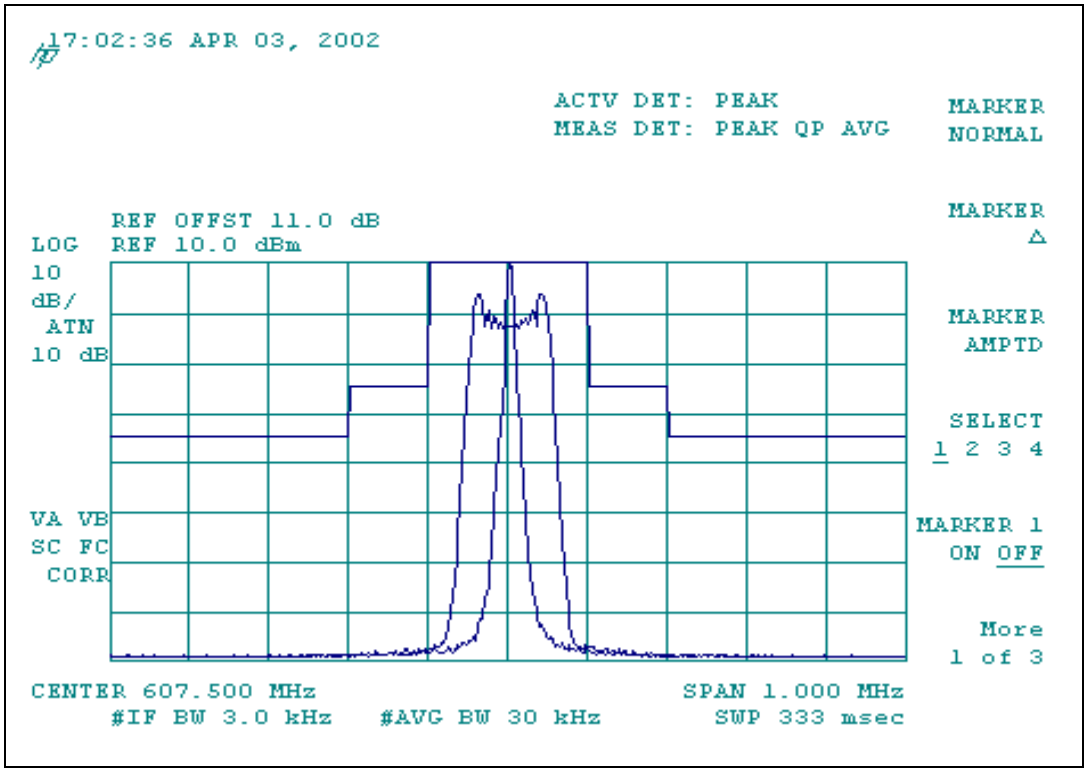
1. Deviation Set as indicated in Stimulus Test Conditions.
2. Reference level set with unmodulated carrier
3. Measurement Indication under these conditions:
   (a) Span =1000 kHz
   (b) Resolution Bandwidth = 3000 Hz.
   (c) Video Bandwidth = 30 kHz.
   (d) Peak Hold for > 10 Sweeps



Test Condition: H2, channel 1, 518.75

Test Limit: Indicated Mask (see sub-section (a)

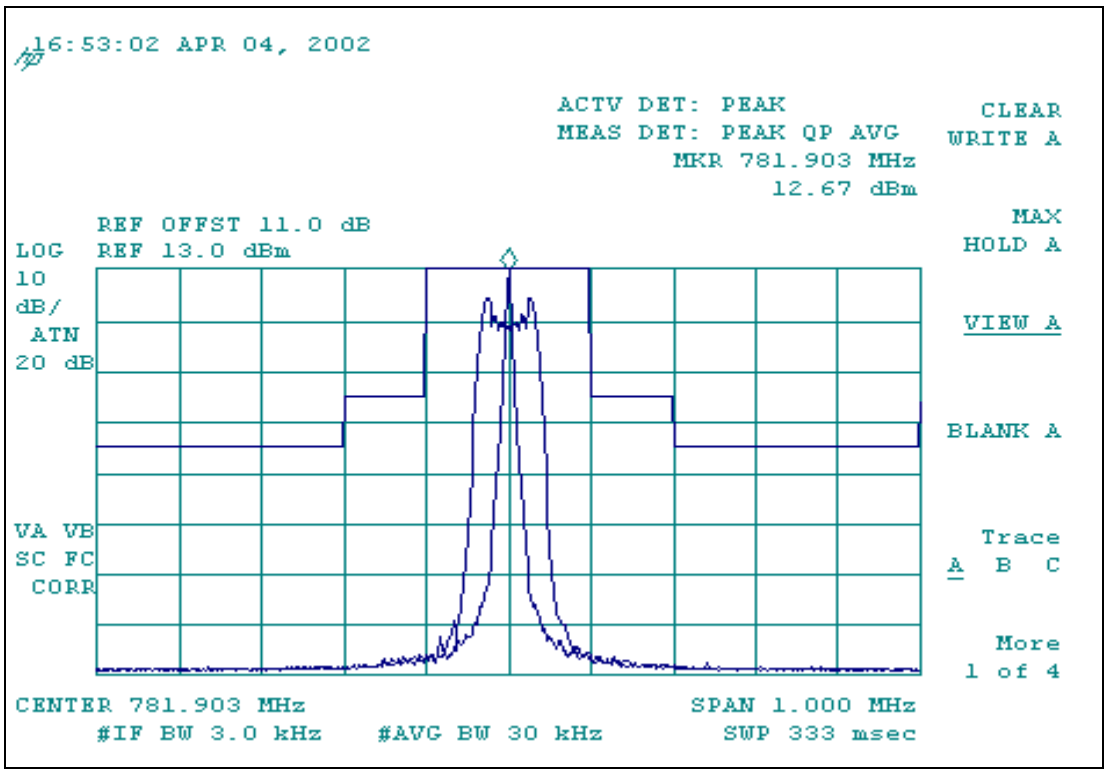
Test Outcome: Spectrum falls below Indicated Mask → PASS



Test Condition: FCC unit, channel 4, 607.5 MHz

Test Limit: Indicated Mask (see sub-section (a)

Test Outcome: Spectrum falls below Indicated Mask → PASS



Test Condition: Q3 unit, channel 8, 781.9 MHz

Test Limit: Indicated Mask (see sub-section (a)

Test Outcome: Spectrum falls below Indicated Mask → PASS

Part 2.1055 and 74.861 (e)(4) (a) Frequency Stability

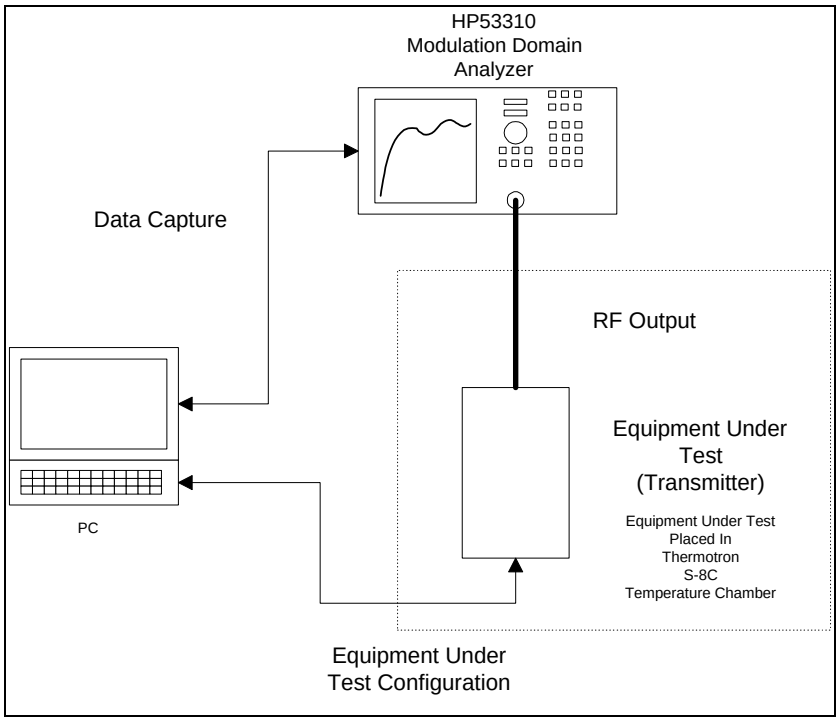
d) Test Requirement

Low power auxiliary transmitters must have an absolute frequency stability of >005% when operating with a 200 kHz bandwidth.

Test in accordance to conditions called out in Part 2.1055: Frequency stability must be measured from ***–30 to 50 degrees centigrade for (b) steps of 10 degrees*** allowing for thermal equilibrium.

e) Test Configuration

During this test, the HP8920 was substituted for the HP53310 Mod domain analyzer shown in the configuration drawing; the PC consists of a Dell laptop and an Audio Precision analyzer which is a PC based audio distortion analyzer/generator.



CONDUCTED EMISSIONS DIRECTLY INTO THE H.P. EMI SYSTEM

Date of Test:	March 14, 15, 2002	Manufacturer:	Shure Incorporated
Location:	L. S. Compliance, Inc.	Model No.:	PSM200; P2T
	W66 N220 Commerce Court		
	Cedarburg, WI 53012		
Specifications:	47 CFR, 2.1055	Serial No.:	H2, Q3
Equipment:	HP 8591EM EMI analyzer	Configuration:	Unmodulated transmit
	HP-E4407B Spectrum Analyzer	Detector(s) Used:	peak

During the tests of the Frequency error (2.1055) and power output drift, the transmitter was tested at normal test conditions, and extreme test conditions. To this purpose the transmitter was placed inside a Thermotron S-8C environmental chamber. AC power was fed in via a power cable, and the RF output was routed outside the chamber, and connected through a 10 dB pad to the HP 8591 EM analyzer. The transmitter was powered on in continuous unmodulated transmit, and the signal was monitored during the test, whereby the temperature was varied from -30 degrees to +50 degrees Centigrade. At each temperature plateau, the device was allowed to reach thermal equilibrium before the power and frequency was measured. Equipment set-up seen in the figure on page 27, with the additional detail that the TX module is placed within the thermal chamber, and the AC power supply is located externally and is controlled by a 10 amp variac, A picture of the setup can be found on page 20. The test sample was found to **meet** the limits given in 74.861

	Center freq. (MHz)	Nominal (MHz)	**Delta (kHz)**	Power (dBm)	Nom. Pwr (dBm)	**Delta (dB)**
25deg/97.7vac	518.7499	518.750	0.1	14.5	15.0	0.5
25deg/132.2vac	518.7499	518.750	0.1	14.5	15.0	0.5
-30deg/115vac	518.7454	518.750	4.6	13.9	15.0	1.1
-20deg/115vac	518.7486	518.750	1.4	14.2	15.0	0.8
-10deg/115vac	518.7504	518.750	0.4	14.1	15.0	0.9
0deg/115vac	518.7514	518.750	1.4	14.3	15.0	0.7
10deg/115/vac	518.7514	518.750	1.4	14.4	15.0	0.6
20deg/115vac	518.7509	518.750	0.9	14.4	15.0	0.6
30deg/115vac	518.7499	518.750	0.1	14.5	15.0	0.5
40deg/115vac	518.7496	518.750	0.4	14.3	15.0	0.7
50deg/115vac	518.7489	518.750	1.1	14.4	15.0	0.6

	Center freq. (MHz)	Nominal (MHz)	**Delta (KHz)**	Power (dBm)	Nom. Pwr (dBm)	**Delta (dB)**
-30deg/230vac	781.8968	781.900	3.2	11.5	13.0	1.5
-20deg/230vac	781.901	781.900	1.0	11.3	13.0	1.7
-10deg/230vac	781.902	781.900	2.0	11.7	13.0	1.3
0deg/230vac	781.9023	781.900	2.3	11.7	13.0	1.3
10deg/230/vac	781.9015	781.900	1.5	11.7	13.0	1.3
20deg/230vac	781.901	781.900	1.0	11.3	13.0	1.7
30deg/230vac	781.9013	781.900	1.3	11.5	13.0	1.5
40deg/230vac	781.8993	781.900	0.7	11.5	13.0	1.5
50deg/230vac	781.8988	781.900	1.2	11.5	13.0	1.5

The voltage stability test was not repeated for the other samples due to the evidence obtained during the test of the H2 unit. Similarily, the FCC unit was not tested for temperature stability due to positive results on the H2 and Q3 sample.

Worst case Test Outcome: 4.6 kHz < 25.9 kHz (.005% of 518.75 MHz) → **PASS**

2.1047 Modulation Characteristics

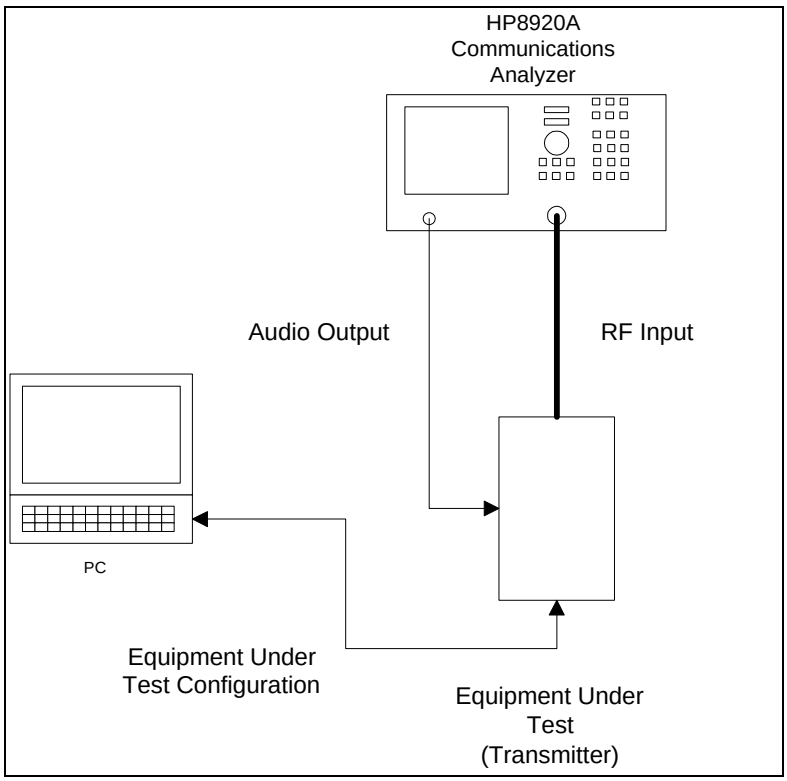
h) Test Requirement

(a) For a voice modulated transmitter a frequency response curve of the audio response through the entire transmit system, must be submitted.

(b) A curve of frequency deviation versus level must be made across the range of input audio frequencies.

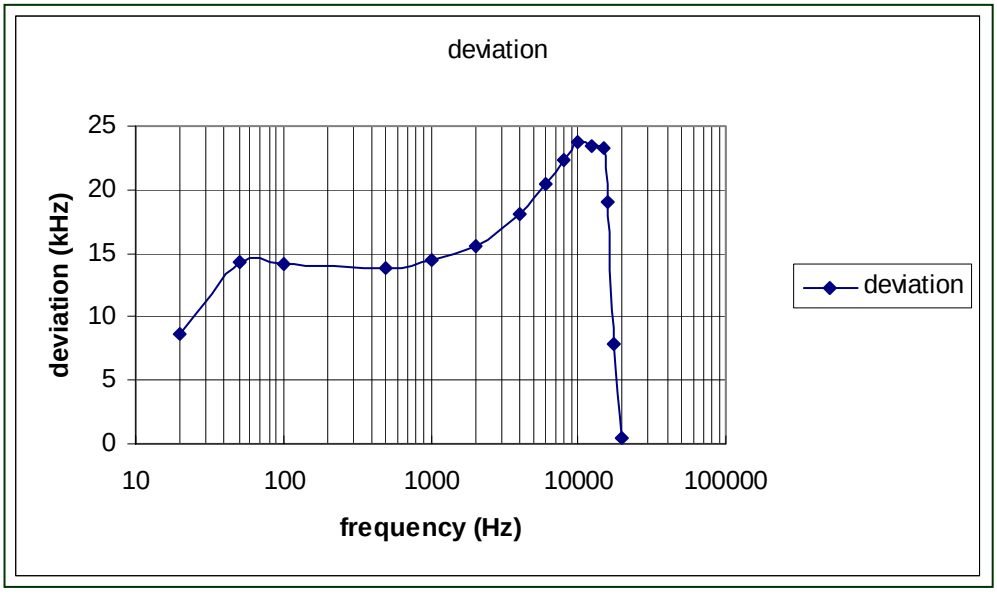
The test is configured such that the audio generator presents a source impedance of 600 Ohms to the audio circuitry.

i) Test Configuration (Deviation versus Level, and frequency response)



j) Test Conditions and Indications: Audio Response

frequency	deviation
20	8.7
50	14.3
100	14.1
500	13.9
1000	14.4
2000	15.5
4000	18.1
6000	20.4
8000	22.3
10000	23.7
12500	23.5
15000	23.2
16000	19
17500	7.8
20000	0.4



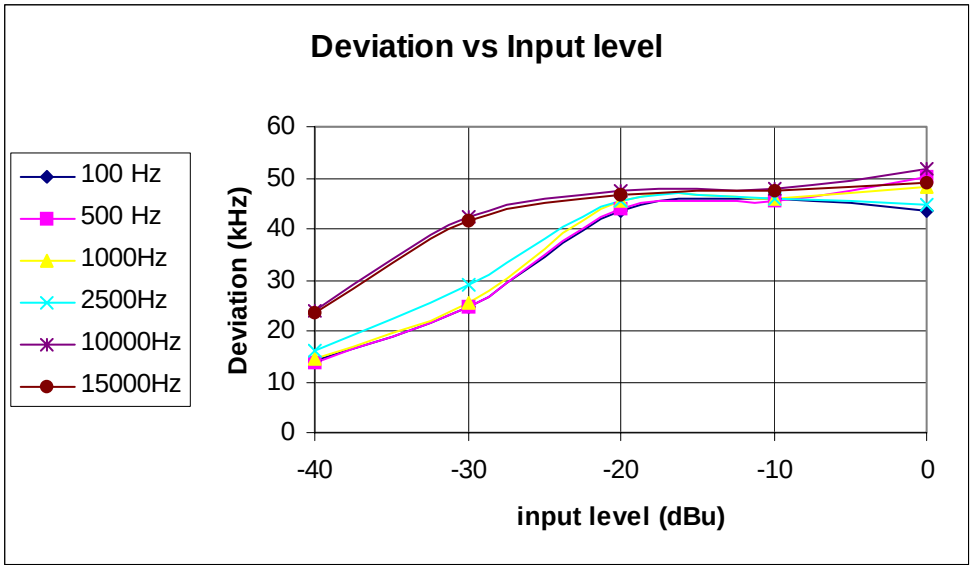
Frequency Response with -40 dBu input signal

k) Test Conditions and Indications: Peak Frequency Deviation versus Audio Level

Test Conditions:

100 to 15000 Hz input, over -40 to 0 dBu, normal operation:

Freq (Hz)		Input level	(dBu)		
	-40	-30	-20	-10	0
100	14	24.6	43.7	45.8	43.4
500	13.9	24.8	44	45.3	50.3
1000	14.4	25.6	45.3	45.8	48.1
2500	16.2	28.9	45.4	45.8	44.8
10000	23.8	42.4	47.5	47.9	51.7
15000	23.4	41.5	46.8	47.3	49.1



1.8 - Test Equipment

Asset #	Manufacturer	Model #	Serial #	Description	Calibration Information	
					Cal Date	Due Date
AA960004	EMCO	93146	9512-4276	Log-Periodic Antenna	02-28-01	02-28-02
AA960005	EMCO	3110B	9601-2280	Biconical Antenna	09-24-01	09-24-02
AA960007	EMCO	3115	99111-4198	Double Ridge Horn Antenna		8-1-00
EE960004	EMCO	2090	9607-1164	Mast/Ttable Controller	N/A	N/A
EE960013	HP	8546A	3617A00320	Receiver RF Section	10-31-01	10-31-02
EE960014	HP	85460A	3448A00296	Receiver Pre-Selector	10-31-01	10-31-02
N/a	Audio Precision	2022	22643	Audio distortion analyzer	9-6-01	9/6/02
CC000223	HP	8920B	US36492280	Communication analyzer	3-22-01	3-22-03
FF666020	HP	8591EM	3710A01194	Spectrum Analyzer	12-02-01	12-02-02
N/A	LSC	Cable	0011	3 meter ½" Heliax Cable	12-07-00	12-07-01
N/A	LSC	Cable	0038	1 meter RG 214 Cable	12-07-00	12-07-01
N/A	LSC	Cable	0050	10 meter RG 214 Cable	12-07-00	12-07-01
N/A	LSC	Attenuator		10 db Attenuator		N/A

Table of Expanded Uncertainty Values, (K=2) for Specified Measurements

Measurement Type	Particular Configuration	Uc Value in Appropriate Units
Radiated Emissions	3 Meter Chamber, Biconical Antenna	4.24 dB
Radiated Emissions	3 Meter Chamber, Log Periodic Antenna	4.80 dB
Radiated Emissions	10 Meter OATS, Biconical Antenna	4.18 dB
Radiated Emissions	10 Meter OATS, Log Periodic Antenna	3.92 dB
Conducted Emissions	Shielded Room/EMCO LISN	1.60 dB