UltraTech
Group of Labs

31040/SIT

C-1376

Canada
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NVLAP
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SL2-IN-E-1119R

entela

3000 Bristol Circle,
Oakville, Ontario,
Canada L6H 6G4

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Website: www.ultratech-labs.com
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June 24, 2003

TIMCO ENGINEERING INC.
P.O. Box 370
849 N.W. State Road 45
Newberry, Florida

Subject: **Type Acceptance Application under FCC CFR 47, Parts 2 and 90 (Subpart R) - Private Land Mobile Radio Services Operating in the frequency band 764-776 MHz.**

Applicant: **Futurecom Systems Group Inc.**
Product: **Vehicular Repeater**
Model: **Mobexcom 700**
FCC ID: **LO6-MBX700**

Dear Sir/Madam,

As appointed agent for **Futurecom Systems Group Inc.**, we would like to submit the application for certification of the above product. Please review all necessary files uploaded to TIMCO Upload Web Site.

If you have any queries, please do not hesitate to contact us by our TOLL FREE number:

OUR TELEPHONE NO.: 1-877-765-4173

Yours truly,

Tri Minh Luu, P. Eng.,
V.P., Engineering

TML/DH

Encl.

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Email: vic@ultratech-labs.com

June 24, 2003

Futurecom Systems Group Inc.
3277 Langstaff Road
Concord, Ontario
Canada, L4K 5P8

Attn.: **Mr. Tony Bombera**

Subject: **Certification Testing in accordance with FCC CFR 47, Parts 2 and 90 (Subpart R) - Private Land Mobile Radio Services Operating in the frequency band 764-776 MHz.**

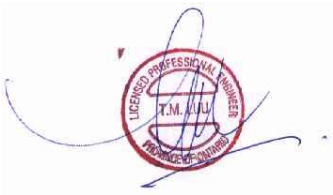
Product: **Vehicular Repeater**
Model: **Mobexcom 700**
FCC ID: **LO6-MBX700**

Dear Mr. Bombera,

The product sample has been tested in accordance with **FCC CFR 47, Parts 2 and 90 (Subpart R) - Private Land Mobile Radio Services Operating in the frequency band 764-776 MHz,** and the results and observation were recorded in the engineering report, Our File No.: FSG-034FCC90R

Enclosed you will find copy of the engineering report. If you have any queries, please do not hesitate to contact us.

Yours truly,



Tri Minh Luu, P.Eng
Vice President - Engineering

Encl.

ENGINEERING TEST REPORT

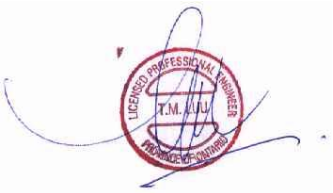
Vehicular Repeater
Model No.: Mobexcom 700
FCC ID: LO6-MBX700

Applicant: **Futurecom Systems Group Inc.**
3277 Langstaff Road
Concord, Ontario
Canada, L4K 5P8

Tested in Accordance With

Federal Communications Commission (FCC)
CFR 47, PARTS 2 and 90 (Subpart R)

UltraTech's File No.: FSG-034FCC90R

This Test report is Issued under the Authority of Tri M. Luu, Professional Engineer, Vice President of Engineering UltraTech Group of Labs Date: June 24, 2003	
Report Prepared by: Tri Luu, P.Eng. Issued Date: June 24, 2003	Tested by: Test Dates: June 21-24, 2003

- *The results in this Test Report apply only to the sample(s) tested, and the sample tested is randomly selected.*
- *This report must not be used by the client to claim product endorsement by NVLAP or any agency of the US Government.*

UltraTech

3000 Bristol Circle, Oakville, Ontario, Canada, L6H 6G4
Tel.: (905) 829-1570 Fax.: (905) 829-8050
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31040/SIT	C-1376	46390-2049	200093-0	SL2-IN-E-1119R	00-034		

TABLE OF CONTENTS

EXHIBIT 1. SUBMITTAL CHECK LIST

Annex No.	Exhibit Type	Description of Contents	Quality Check (OK)
--	Test Report	• Exhibit 1: Submittal check lists • Exhibit 2: Introduction • Exhibit 3: Performance Assessment • Exhibit 4: EUT Operation and Configuration during Tests • Exhibit 5: Summary of test Results • Exhibit 6: Measurement Data • Exhibit 7: Measurement Uncertainty • Exhibit 8: Measurement Methods	
1	Test Setup Photos	Photos # 1 to 2	OK
2	External Photos of EUT	Photos # 1 to 2	OK
3	Internal Photos of EUT	Photos of 1 to 22	OK
4	Cover Letters	• Letter from the Applicant to appoint Ultratech to act as an agent • Letter from the Applicant to request for Confidentiality Filing	OK
5	Attestation Statements	• Manufacturer's Declaration for Equipment Specifications, Installation (if it is professionally installed) and Production Quality Production Assurance.	N/A
6	ID Label/Location Info	ID Label Location of ID Label	OK
7	Block Diagrams	Block diagrams # 1 of 1	OK
8	Schematic Diagrams	Schematic diagrams # 1 of 1	OK
9	Parts List/Tune Up Info		OK
10	Operational Description		OK
11	RF Exposure Info		OK
12	Users Manual		OK

EXHIBIT 2. INTRODUCTION

2.1. SCOPE

Reference:	FCC Parts 2 and 90 (Subpart R)
Title:	Telecommunication - Code of Federal Regulations, CFR 47, Parts 2 & 90
Purpose of Test:	To obtain FCC Certification Authorization for Radio operating in the frequency band 764-776 MHz.
Test Procedures:	Both conducted and radiated emissions measurements were conducted in accordance with American National Standards Institute ANSI C63.4 - 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.

2.2. RELATED SUBMITAL(S)/GRANT(S)

None

2.3. NORMATIVE REFERENCES

Publication	Year	Title
FCC CFR Parts 0-19, 80-End	2002	Code of Federal Regulations – Telecommunication
ANSI C63.4	1992	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
CISPR 22 & EN 55022	1997 1998	Limits and Methods of Measurements of Radio Disturbance Characteristics of Information Technology Equipment
CISPR 16-1		Specification for Radio Disturbance and Immunity measuring apparatus and methods

EXHIBIT 3. PERFORMANCE ASSESSMENT

3.1. CLIENT INFORMATION

APPLICANT	
Name:	Futurecom Systems Group Inc.
Address:	3277 Langstaff Road Concord, Ontario Canada, L4K 5P8
Contact Person:	Mr. Tony Bombera Phone #: 905-660-5548 (25) Fax #: 905-660-1380 Email Address: tonyb@futurecom.com

MANUFACTURER	
Name:	Futurecom Systems Group Inc.
Address:	3277 Langstaff Road Concord, Ontario Canada, L4K 5P8
Contact Person:	Mr. Tony Bombera Phone #: 905-660-5548 (25) Fax #: 905-660-1380 Email Address: tonyb@futurecom.com

3.2. EQUIPMENT UNDER TEST (EUT) INFORMATION

The following information (with the exception of the Date of Receipt) has been supplied by the applicant.

Brand Name:	Futurecom Systems Group Inc.
Product Name:	Vehicular Repeater
Model Name or Number:	Mobexcom 700
Serial Number:	Preproduction
Type of Equipment:	Non-broadcast Radio Communication Equipment
External Power Supply:	None
Transmitting/Receiving Antenna Type:	Non-integral
Operational Decsription:	The Futurecom MOBEXCOM® Vehicular Repeater is designed to interface to a range of mobile radios and control heads. It permits expanded operation of portable radios. The Vehicular Repeater system consists of e.g. a MCS2000 mobile radio, MOBEXCOM® Vehicular Repeater unit, a mobile radio Control Head and a RF multiplexer. The Control Head communicates with the Vehicular Repeater and the mobile using a serial data protocol

3.3. EUT'S TECHNICAL SPECIFICATIONS

TRANSMITTER	
Equipment Type:	Mobile
Intended Operating Environment:	[x] Commercial [x] Light Industry & Heavy Industry
Power Supply Requirement:	13.6 Vdc
RF Output Power Rating:	0.035 to 12.0 Watts
Operating Frequency Range:	764-776 MHz
RF Output Impedance:	50 Ohms
Channel Spacing:	12.5 kHz & 25.0 kHz
Occupied Bandwidth (99%):	▪ 9.3 kHz (or 12.5 Khz channel Spacing ▪ 13.9 kHz for 25 kHz channel spacing
Emission Designation*:	▪ 7K30F1D for 12.5 kHz channel spacing ▪ 14K8F1D for 25 kHz channel spacing ▪ 11K0F3E for 12.5 kHz channel spacing ▪ 16K0F3E for 25 kHz channel spacing
Digital Oscillator Frequencies:	32.768 kHz, 16 MHz, 29.4912 MHz, 93.6 MHz and 96 MHz
Radio Oscillator Frequencies:	LO1: Rx Freq - 109.65 MHz (Rx), LO2: 109.2 MHz & LO3: Tx Freq + 110.51875 MHz
Antenna Connector Type:	TNC

* For an average case of commercial telephony, the Necessary Bandwidth is calculated as follows:

1. For FM Voice Modulation:

   Channel Spacing = 12.5 KHz, D = 2.5 KHz max., K = 1, M = 3 KHz
   B_n = 2M + 2DK = 2(3) + 2(2.5)(1) = **11 KHz**
   emission designation: 11K0F3E

   Channel Spacing = 25 KHz, D = 5 KHz max., K = 1, M = 3 KHz
   B_n = 2M + 2DK = 2(3) + 2(5)(1) = **16 KHz**
   emission designation: 11K0F3E

2. For FM Digital Modulation:

   Channel Spacing = 12.5 KHz, D = 2.5 KHz max., K = 1, M = Data Rate in kb/s / Level of FM,
   Level of FM = 4
   M = 9.6/2 kb/s
   B_n = 2M + 2DK = 2(9.6/4) + 2(2.5)(1) = **7.3 KHz**
   emission designation: 7K30F1D

   Channel Spacing = 25 KHz, D = 5 KHz max., K = 1, M = Data Rate in kb/s / Level of FM,
   Level of FM = 4
   M = 9.6/2 kb/s
   B_n = 2M + 2DK = 2(9.6/4) + 2(5)(1) = **14.8 KHz**
   emission designation: 7K30F1D

3.4. LIST OF EUT'S PORTS

Port Number	EUT's Port Description	Number of Identical Ports	Connector Type	Cable Type (Shielded/Non-shielded)
1	DC Input Port	1	Jack	Non-shielded
2	RF IN/OUT Port	1	TNC	Shielded
3	RS-232 Port	1	DB9	Shielded
4	Control Head Ports	2	DB25	Shielded

3.5. ANCILLARY EQUIPMENT

The EUT was tested while connected to the following representative configuration of ancillary equipment necessary to exercise the ports during tests:

Ancillary Equipment # 1	
Description:	Laptop Computer
Brand name:	IBM
Model Name or Number:	2625
Serial Number:	78-WWM48
Cable Length & Type:	6 feet shielded cable
Connected to EUT's Port:	RS-232

Ancillary Equipment # 2	
Description:	9600 b/s Data Sigbal Generator
Brand name:	General Electric
Model Name or Number:	9600 Data Signal Generator
Serial Number:	9614517
Cable Length & Type:	6 feet shielded cable
Connected to EUT's Port:	Control head

3.6. TEST ARRANGEMENT

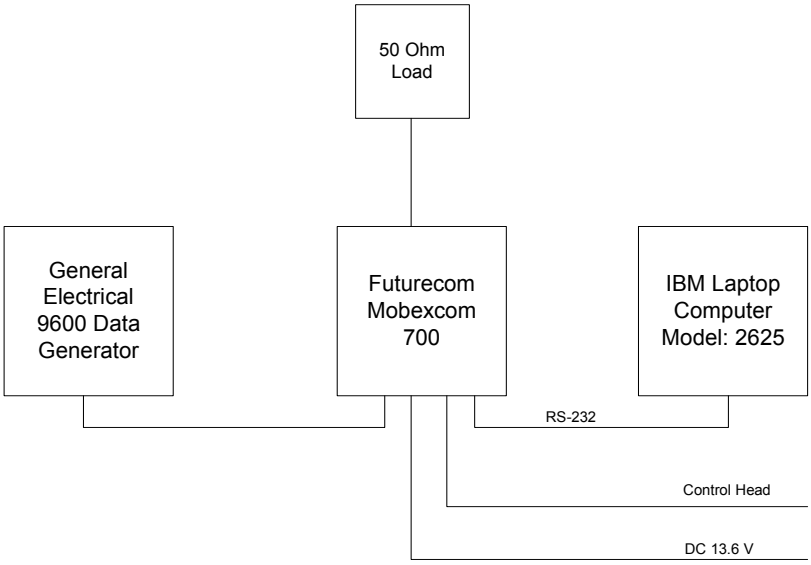


EXHIBIT 4. EUT OPERATING CONDITIONS AND CONFIGURATIONS DURING TESTS

4.1. CLIMATE TEST CONDITIONS

The climate conditions of the test environment are as follows:

Temperature:	21°C
Humidity:	51%
Pressure:	102 kPa
Power input source:	13.6 Vdc

4.2. OPERATIONAL TEST CONDITIONS & ARRANGEMENT FOR TEST SIGNALS

Operating Modes:	The transmitter was operated in a continuous transmission mode with the carrier modulated as specified in the Test Data.
Special Test Software:	Operating software provided by Futurecom for selecting operating channel frequency and power
Special Hardware Used:	N/A
Transmitter Test Antenna:	The EUT is tested with the transmitter antenna port terminated to a 50 Ohms RF Load.

Transmitter Test Signals	
Frequency Band(s): ▪ 764-776 MHz band:	Near lowest, near middle & near highest frequencies in each frequency band that the transmitter covers: ▪ 764, 770 and 776 MHz
Transmitter Wanted Output Test Signals: ▪ RF Power Output (measured maximum output power): ▪ Normal Test Modulation ▪ Modulating signal source:	 ▪ 0.035 to 12.0 Watts ▪ FM Data & Voice ▪ external

EXHIBIT 5. SUMMARY OF TEST RESULTS

5.1. LOCATION OF TESTS

All of the measurements described in this report were performed at Ultratech Group of Labs located in the city of Oakville, Province of Ontario, Canada.

- AC Powerline Conducted Emissions were performed in UltraTech's shielded room, 16'(L) by 12'(W) by 12'(H).

- Radiated Emissions were performed at the Ultratech's 3 Meter Open Field Test Site (OFTS) situated in the Town of Oakville, province of Ontario.

  The above sites have been calibrated in accordance with ANSI C63.4, and found to be in compliance with the requirements of Sec. 2.948 of the FCC Rules. The descriptions and site measurement data of the Oakville Open Field Test Site has been filed with FCC office (FCC File No.: 31040/SIT 1300B3) and Industry Canada office (Industry Canada File No.: IC2049). Last Date of Site Calibration: Aug. 10, 2002.

5.2. APPLICABILITY & SUMMARY OF EMISSION TEST RESULTS

FCC PARAGRAPH.	TEST REQUIREMENTS	APPLICABILITY (YES/NO)
90.541 & 2.1046	RF Power Output	Yes
1.1307, 1.1310, 2.1091 & 2.1093	RF Exposure Limit	Yes
90.539 & 2.1055	Frequency Stability	Yes
2.1047(a)	Audio Frequency Response	Yes
2.1047(b)	Modulation Limiting	Yes
90.543 & 2.1049	99% OBW & Adjacent Channel Coupled Power	Yes
90.543(c), 2.1057 & 2.1051	Emission Limits - Spurious Emissions at Antenna Terminal	Yes
90.543(c), 2.1057 & 2.1053	Emission Limits - Field Strength of Spurious Emissions	Yes
Vehicular Repeater, **Model No.: Mobexcom 700**, by **Futurecom Systems Group Inc.** has also been tested and found to comply with **FCC Part 15, Subpart B - Radio Receivers and Class A Digital Devices**. The engineering test report has been documented and kept in file and it is available anytime upon FCC request.		

5.3. MODIFICATIONS INCORPORATED IN THE EUT FOR COMPLIANCE PURPOSES

None

5.4. DEVIATION OF STANDARD TEST PROCEDURES

None

EXHIBIT 6. MEASUREMENTS, EXAMINATIONS & TEST DATA FOR EMC EMISSIONS

6.1. TEST PROCEDURES

This section contains test results only. Details of test methods and procedures can be found in Exhibit 8 of this report

6.2. MEASUREMENT UNCERTAINTIES

The measurement uncertainties stated were calculated in accordance with requirements of UKAS Document NIS 81 with a confidence level of 95%. Please refer to Exhibit 7 for Measurement Uncertainties.

6.3. MEASUREMENT EQUIPMENT USED:

The measurement equipment used complied with the requirements of the Standards referenced in the Methods & Procedures ANSI C63.4:1992 and CISPR 16-1.

6.4. ESSENTIAL/PRIMARY FUNCTIONS AS DECLARED BY THE MANUFACTURER:

The essential function of the EUT is to correctly communicate data to and from radios over RF link.

6.5. RF POWER OUTPUT @ FCC 2.1046 & 90.541

6.5.1. Limits

***Sec. 90.541 Transmitting power limits**:- The transmitting power of base, mobile, portable and control stations operating in the 764-776 MHz and 794-806 MHz frequency band must not exceed the maximum limits in this section, and must also comply with any applicable effective radiated power limits in Sec. 90.545.*

(a) The transmitting power of base transmitters must not exceed the limits given in paragraphs (a), (b) and (c) of Sec. 90.635.
(b) The transmitter output power of mobile and control transmitters must not exceed 30 Watts.
(c) The transmitter output power of portable (hand-held) transmitters must not exceed 3 Watts.
(d) Transmitters operating on the narrowband low power channels listed in Secs. 90.531(b)(3), 90.531(b)(4), must not exceed 2 watts (ERP).

6.5.2. Method of Measurements

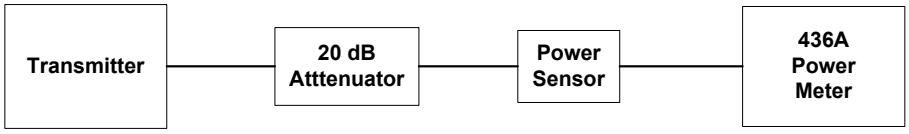
Refer to Exhibit 8, § 8.1 (Conducted) and 8.2 (Radiated) of this report for measurement details

6.5.3. Test Equipment List

Test Instruments	Manufacturer	Model No.	Serial No.	Frequency Range
Spectrum Analyzer/ EMI Receiver	Hewlett Packard	HP 8546A	…	9 kHz to 5.6 GHz with built-in 30 dB Gain Pre-selector, QP, Average & Peak Detectors.
Attenuator(s)	Bird	…	…	DC – 22 GHz
Spectrum Analyzer/ EMI Receiver	Advantest	R3271	15050203	100 Hz – 26.5 GHz
Attenuator(s)	Weinschel Corp	24-20-34	BJ2357	DC – 8.5 GHz
Dipole Antenna	EMCO	3121C	8907-440	30 MHz – 1 GHz
Dipole Antenna	EMCO	3121C	8907-434	30 MHz – 1 GHz
Power Meter	Hewlett Packard	436A	1725A02249	10 kHz – 50 GHz, sensor dependent
Power Sensor	Hewlett Packard	8481A	2702A68983	10 MHz – 18 GHz
Synthesize Sweeper	Hewlett Packard	83752B	3610A00457	0.01 – 20 GHz

6.5.4. Test Arrangement

- Power at RF Power Output Terminals



6.5.5. Test Data

Transmitter Channel Output	Fundamental Frequency (MHz)	Measured (Average) Power (Watts)	Power Rating for Mobile (Watts)
RF Output Power Setting: Minimum			
Lowest	764	0.028	30.0
Middle	770	0.032	30.0
Highest	776	0.035	30.0
RF Output Power Setting: Maximum			
Lowest	764	10.6	30.0
Middle	770	11.9	30.0
Highest	776	12.0	30.0

Note: Same RF output power levels were measured for both FC Data and FM Voice modulations

6.6. RF EXPOSURE REQUIRMENTS @ 1.1310 & 2.1091

6.6.1. Limits

- **FCC 1.1310:-** The criteria listed in the following table shall be used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation as specified in 1.1307(b).

LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm^2)	Average Time (minutes)
(A) Limits for Occupational/Control Exposures				
300-1500	...	...	F/300	6
(B) Limits for General Population/Uncontrolled Exposure				
300-1500	...	...	F/1500	6

F = Frequency in MHz

6.6.2. Method of Measurements

Refer to FCC @ 1.1310, 2.1091 and Public Notice DA 00-705 (March 30, 2000)

- In order to demonstrate compliance with MPE requirements (see Section 2.1091), the following information is typically needed:

(1) Calculation that estimates the minimum separation distance (20 cm or more) between an antenna and persons required to satisfy power density limits defined for free space.
(2) Antenna installation and device operating instructions for installers (professional/unskilled users), and the parties responsible for ensuring compliance with the RF exposure requirement
(3) Any caution statements and/or warning labels that are necessary in order to comply with the exposure limits
(4) Any other RF exposure related issues that may affect MPE compliance

Calculation Method of RF Safety Distance:

$S = PG/4\Pi r^2 = EIRP/4\Pi r^2$

Where: P: power input to the antenna in mW
EIRP: Equivalent (effective) isotropic radiated power.
S: power density mW/cm^2
G: numeric gain of antenna relative to isotropic radiator
r: distance to centre of radiation in cm

FCC radio frequency exposure limits may be exceeded at distances closer than r cm from the antenna of this device

$r = \sqrt{PG/4\Pi S}$

FCC radio frequency exposure limits may not be exceeded at distances closer than r cm from the antenna of this device

- For portable transmitters (see Section 2.1093), or devices designed to operate next to a person's body, compliance is determined with respect to the SAR limit (define in the body tissues) for near-field exposure conditions. If the maximum average output power, operating condition configurations and exposure conditions are comparable to those of existing cellular and PCS phones., an SAR evaluation may be required in order to determine if such a device complies with SAR limit. When SAR evaluation data is not available, and the additional supporting information cannot assure compliance, the Commission may request that an SAR evaluation be performed, as provided for in Section 1.1307(d)

6.6.3. Test Data

Antenna Gain Limit specified by Manufacturer: 0 dBd or 2.15 dBi

Lowest Frequency (MHz)	Highest Measured RF Conducted (dBm)	Calculated EIRP (dBm)	Exposure Condition	Laboratory's Recommended Minimum RF Safety Distance r (cm)
764	40.8	43.0	Occupational	25.0
764	40.8	43.0	Bystanders	55.9

Note 1: **RF EXPOSURE DISTANCE LIMITS:** $r = (PG/4\Pi S)^{1/2} = (EIRP/4\Pi S)^{1/2}$

*** **Occupational/Control Exposures S = F/300 = 764/300 = 2.55 mW/cm^2**
*** **For bystanders S = F/1500 = 764/1500 = 0.509 mW/cm^2**

Evaluation of RF Exposure Compliance Requirements	
RF Exposure Requirements	**Compliance with FCC Rules**
Minimum calculated separation distance between antenna and persons required: 55.9 cm	Manufacturer' instruction for separation distance between antenna and persons required: 56 cm. Please refer to page # 3 of the Users/ Manual and FCC RF Exposure folder
Antenna installation and device operating instructions for installers (professional/unskilled users), and the parties responsible for ensuring compliance with the RF exposure requirement	Please refer to page # 3 of the Users/ Manual and FCC RF Exposure folder
Caution statements and/or warning labels that are necessary in order to comply with the exposure limits	N/A
Any other RF exposure related issues that may affect MPE compliance	N/A

Remarks: The Mobexcom repeater is for Occupational Use only. The repeater is used by government public safety agencies, such as police, fire, ambulance etc. It is typically installed in trucks, vans and cars, with the antenna located in the centre of a grounded roof. The smallest of these vehicles would be a mid size passenger car. We have measured width of several cars and found it to be around 130cm. It means that a person standing beside the car is at least 65cm from the antenna. 65cm is larger than the minimum recommended MPE distance of 56cm. Thus the FCC MPE requirements are met even when the Mobexcom Repeater is installed in a passenger car.

6.7. FREQUENCY STABILITY @ FCC 2.1055 & 90.539

6.7.1. Limits

Sec. 90.539 Frequency Stability:- *Transmitters designed to operate in 764-776 MHz and 794-806 MHz frequency band must meet the frequency stability requirements in this section.*

(a) Mobile, portable and control transmitters must normally useautomatic frequency control (AFC) to lock on to the base station signal.
(b) The frequency stability of base transmitters operating in the narrowband segment must be 100 parts per billion or better.
(c) The frequency stability of mobile, portable, and control transmitters operating in the narrowband segment must be 400 parts perbillion or better when AFC is locked to the base station. When AFC is not locked to the base station, the frequency stability must be at least 1.0 ppm for 6.25 kHz, 1.5 ppm for 12.5 kHz (2 channel aggregate), and 2.5 ppm for 25 kHz (4 channel aggregate).
(d) The frequency stability of base transmitters operating in the wideband segment must be 1 part per million or better.
(e) The frequency stability of mobile, portable and control transmitters operating in the wideband segment must be 1.25 parts per million or better when AFC is locked to a base station, and 5 parts per million or better when AFC is not locked.

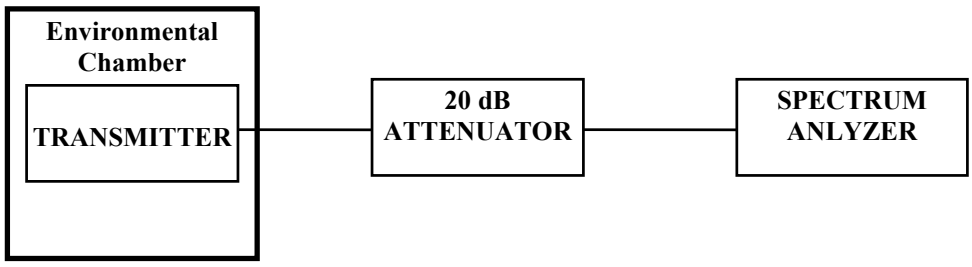
6.7.2. Method of Measurements

Refer to Exhibit 8, § 8.3 of this report for measurement details

6.7.3. Test Equipment List

Test Instruments	Manufacturer	Model No.	Serial No.	Frequency Range
EMI Receiver/ EMI Receiver	Hewlett Packard	HP 8593EM	3412A00103	9 kHz – 26.5 GHz
Attenuator(s)	Bird	..	…	DC – 22 GHz
Temperature & Humidity Chamber	Tenney	T5	9723B	-40^{o} to +60 ^{o} C range

6.7.4. Test Arrangement



6.7.5. Test Data

Product Name: **Model No.:**	**Vehicular Repeater** **Mobexcom 700**
Center Frequency:	764 MHz
Full Power Level:	10.6 watts
Frequency Tolerance Limit:	*The AFC is not locked to the base station, the frequency stability must be at least 1.5 ppm for 12.5 kHz*
Max. Frequency Tolerance Measured:	-1.4 ppm
Input Voltage Rating:	13.6 Vdc

CENTER FREQUENCY & RF POWER OUTPUT VARIATION			
Ambient Temperature (^{o}C)	**Supply Voltage (Nominal) 13.6 Volts**	**Supply Voltage (85% of Nominal) 11.6 Volts**	**Supply Voltage (115% of Nominal) 15.6 Volts**
	Hz	**Hz**	**Hz**
-30	-1057	N/A	N/A
-20	-189	N/A	N/A
-10	+3	N/A	N/A
0	+55	N/A	N/A
+10	+43	N/A	N/A
+20	0	+7	+6
+30	+70	N/A	N/A
+40	-60	N/A	N/A
+50	-104	N/A	N/A

6.8. AUDIO FREQUENCY RESPONSE @ FCC 2.1047(A)

6.8.1. Limits @ FCC 2.1047(a)

Recommended audio filter attenuation characteristics are give below:

RF Band	Audio band	Minimum Attenuation Rel. to 1 kHz Attenuation
406.1 – 960 MHz	3 –20 kHz 20 – 30 kHz	60 $\log_{10}$(f/3) dB where f is in kHz 50dB

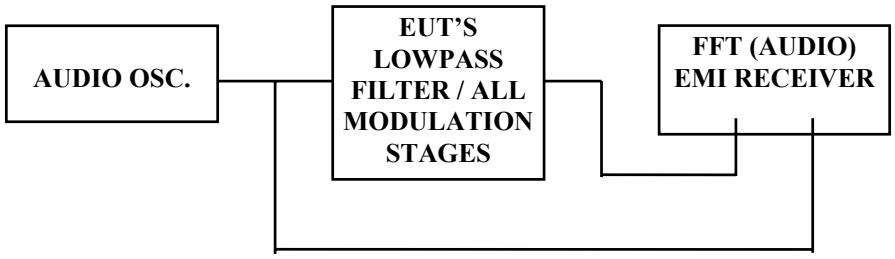
6.8.2. Method of Measurements

The rated audio input signal was applied to the input of the audio lowpass filter (or of all modulation stages) using an audio oscillator, this input signal level and its corresponding output signal were then measured and recorded using the FFT (Audio) EMI Receiver. Tests were repeated at different audio signal frequencies from 0 to
50 kHz.

6.8.3. Test Equipment List

Test Instruments	Manufacturer	Model No.	Serial No.	Frequency Range
FFT (audio) EMI Receiver	Advantest	R9211E	…	10 mHz – 100 kHz, 1 MHz Input Impedance
Audio Oscillator	Hewlett Packard	HP 204C	0989A08798	DC to 1.2 MHz

6.8.4. Test Arrangement



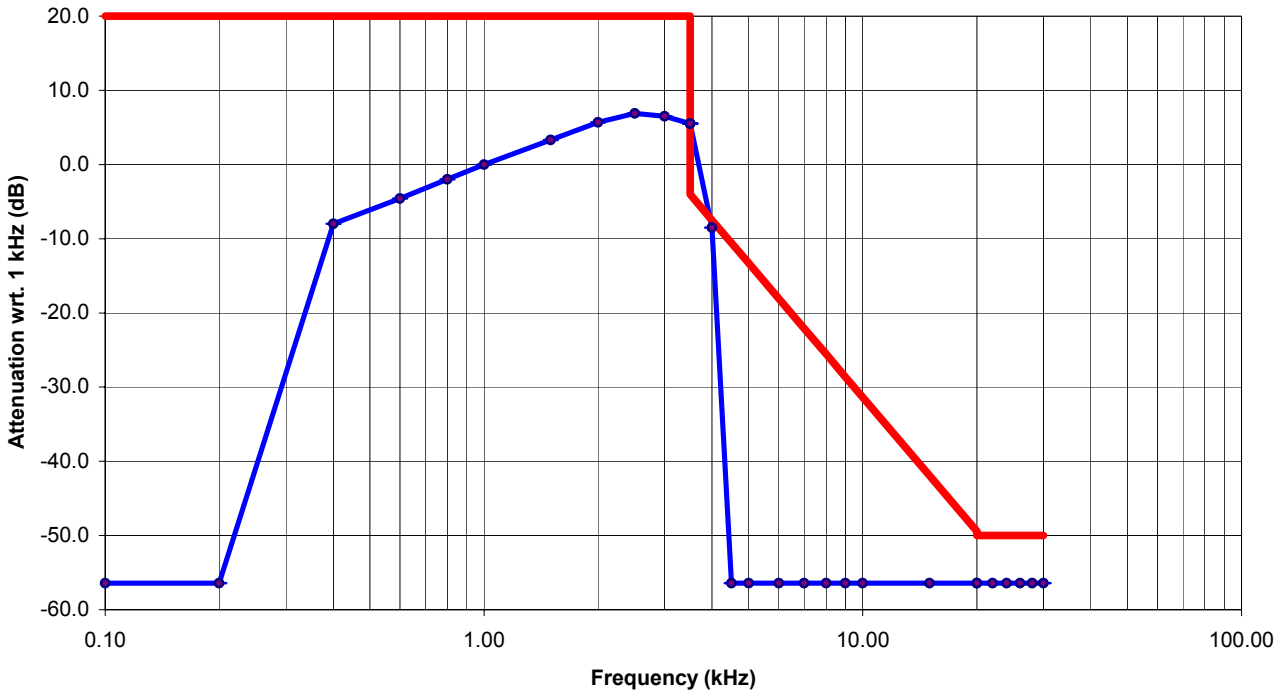
6.8.5. Test Data

*6.8.5.1. 12.5 kHz Channel Spacing, F3E, Frequency of All Modulation States**

Note: Because of the difficulty of measuring the Frequency Response of the internal lowpass filter, the Frequency Response of All Modulation States are performed to show the roll-off at 3 kHz in comparison with FCC Limit for audio lowpass filter.

FREQUENCY (kHz)	AUDIO IN (dBV)	AUDIO OUT (dBV)	ATTEN. (OUT - IN) (dB)	ATTEN. wrt. 1 kHz (dB)	FCC LIMIT (dB)	PASS/ FAIL
0.10	-25.1	-60.0	-34.9	-56.4	--	PASS
0.20	-25.1	-60.0	-34.9	-56.4	--	PASS
0.40	-25.1	-11.6	13.5	-8.0	--	PASS
0.60	-25.1	-8.2	16.9	-4.6	--	PASS
0.80	-25.1	-5.6	19.5	-2.0	--	PASS
1.00	-25.1	-3.6	21.5	0.0	--	PASS
1.50	-25.1	-0.3	24.8	3.3	--	PASS
2.00	-25.1	2.1	27.2	5.7	--	PASS
2.50	-25.1	3.3	28.4	6.9	--	PASS
3.00	-25.1	2.9	28.0	6.5	--	PASS
3.50	-25.1	1.9	27.0	5.5	-4.0	PASS
4.00	-25.1	-12.1	13.0	-8.5	-7.5	PASS
4.50	-25.1	-60.0	-34.9	-56.4	-10.6	PASS
5.00	-25.1	-60.0	-34.9	-56.4	-13.3	PASS
6.00	-25.1	-60.0	-34.9	-56.4	-18.1	PASS
7.00	-25.1	-60.0	-34.9	-56.4	-22.1	PASS
8.00	-25.1	-60.0	-34.9	-56.4	-25.6	PASS
9.00	-25.1	-60.0	-34.9	-56.4	-28.6	PASS
10.00	-25.1	-60.0	-34.9	-56.4	-31.4	PASS
15.00	-25.1	-60.0	-34.9	-56.4	-41.9	PASS
20.00	-25.1	-60.0	-34.9	-56.4	-49.4	PASS
22.00	-25.1	-60.0	-34.9	-56.4	-50.0	PASS
24.00	-25.1	-60.0	-34.9	-56.4	-50.0	PASS
26.00	-25.1	-60.0	-34.9	-56.4	-50.0	PASS
28.00	-25.1	-60.0	-34.9	-56.4	-50.0	PASS
30.00	-25.1	-60.0	-34.9	-56.4	-50.0	PASS

AUDIO FREQUENCY REPSONSE
Vehicular Repeater, Model Mobexcom 700
12.5 kHz Channel Spacing

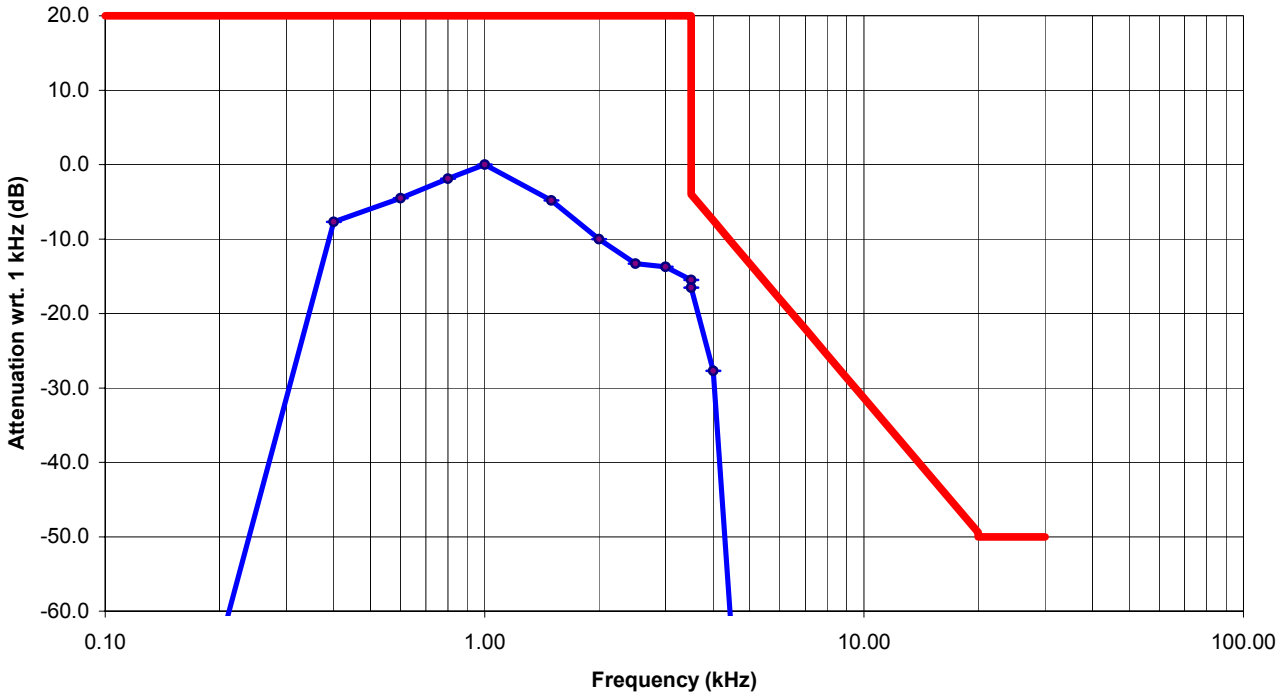


*6.8.5.2. 25 kHz Channel Spacing, F3E, Frequency of All Modulation States**

Note: Because of the difficulty of measuring the Frequency Response of the internal lowpass filter, the Frequency Response of All Modulation States are performed to show the roll-off at 3 kHz in comparison with FCC Limit for audio lowpass filter.

FREQUENCY (kHz)	AUDIO IN (dBV)	AUDIO OUT (dBV)	ATTEN. (OUT - IN) (dB)	ATTEN. wrt. 1 kHz (dB)	FCC LIMIT (dB)	PASS/ FAIL
0.10	-22.5	-60.0	-37.5	-64.8	--	PASS
0.20	-22.5	-60.0	-37.5	-64.8	--	PASS
0.40	-22.5	-2.9	19.6	-7.7	--	PASS
0.60	-22.5	0.3	22.8	-4.5	--	PASS
0.80	-22.5	2.9	25.4	-1.9	--	PASS
1.00	-22.5	4.8	27.3	0.0	--	PASS
1.50	-22.5	0.0	22.5	-4.8	--	PASS
2.00	-22.5	-5.2	17.3	-10.0	--	PASS
2.50	-22.5	-8.5	14.0	-13.3	--	PASS
3.00	-22.5	-8.9	13.6	-13.7	--	PASS
3.50	-22.5	-11.7	10.8	-16.5	-4.0	PASS
4.00	-22.5	-22.9	-0.4	-27.7	-7.5	PASS
4.50	-22.5	-60.0	-37.5	-64.8	-10.6	PASS
5.00	-22.5	-60.0	-37.5	-64.8	-13.3	PASS
6.00	-22.5	-60.0	-37.5	-64.8	-18.1	PASS
7.00	-22.5	-60.0	-37.5	-64.8	-22.1	PASS
8.00	-22.5	-60.0	-37.5	-64.8	-25.6	PASS
9.00	-22.5	-60.0	-37.5	-64.8	-28.6	PASS
10.00	-22.5	-60.0	-37.5	-64.8	-31.4	PASS
15.00	-22.5	-60.0	-37.5	-64.8	-41.9	PASS
20.00	-22.5	-60.0	-37.5	-64.8	-49.4	PASS
22.00	-22.5	-60.0	-37.5	-64.8	-50.0	PASS
24.00	-22.5	-60.0	-37.5	-64.8	-50.0	PASS
26.00	-22.5	-60.0	-37.5	-64.8	-50.0	PASS
28.00	-22.5	-60.0	-37.5	-64.8	-50.0	PASS
30.00	-22.5	-60.0	-37.5	-64.8	-50.0	PASS

AUDIO FREQUENCY REPSONSE
Vehicular Repeater, Model Mobexcom 700
25 kHz Channel Spacing



6.9. MODULATION LIMITING @ FCC 2.1047(B)

6.9.1. Limits @ FCC 2.1047(b)

Recommended frequency deviation characteristics are give below:

- 2.5 kHz for 12.5 kHz Channel Spacing
- 5 kHz for 25 kHz Channel Spacing System

6.9.2. Method of Measurements

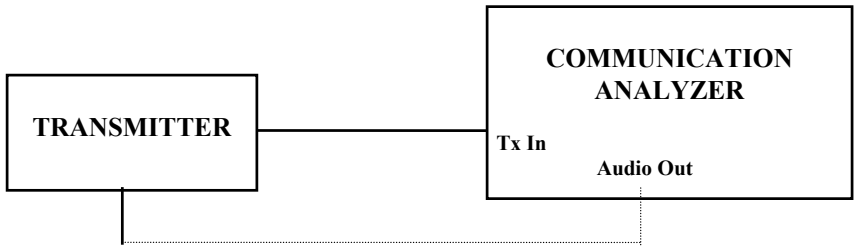
For Audio Transmitter:- The carrier frequency deviation was measured with the tone input signal level varied from 0 Vp to audio input rating level plus 16 dB at frequencies 0.1, 0.5, 1.0, 3.0 and 5.0 kHz. The maximum deviation was recorded at each test condition.

For Data Transmitter with Maximum Frequency Deviation set by Factory:- The EUT was set at maximum frequency deviation, and its peak frequency deviation was then measured using EUT's internal random data source.

6.9.3. Test Equipment List

Test Instruments	Manufacturer	Model No.	Serial No.	Frequency Range
Communication Analyzer	Rohde & Schawrz	SMF02	879988/057	400 kHz - 1000 MHz including AF & RF Signal Generators, SINAD, DISTORTION, DEVIATION meters and etc

6.9.4. Test Arrangement



6.9.5. Test Data

6.9.5.1. Data Modulation Limiting: FM modulation with random data and Modulation Limiter set at a Maximum Frequency Deviation (Factory Setting).

Channel Spacing	Data Baud Rate (b/s)	Maximum Peak Deviation set by factory (kHz)	Maximum Limit (kHz)
12.5 kHz	9600	2.5 kHz	2.5 kHz
25 kHz	9600	5.0 kHz	5 kHz

6.9.5.2. Voice Modulation Limiting – 12.5 kHz Channel Spacing:

MODULATING SIGNAL LEVEL	PEAK FREQUENCY DEVIATION (kHz) at the following modulating frequency:					MAXIMUM LIMIT
(mVrms)	0.1 kHz	0.5 kHz	1.0 kHz	3.0 kHz	5.0 kHz	(kHz)
20	0.8	0.8	1.0	1.7	0.8	2.5
40	0.8	0.9	1.2	2.5	0.8	2.5
60	0.8	1.1	1.6	2.5	0.8	2.5
80	0.8	1.2	1.9	2.5	0.8	2.5
100	0.8	1.4	2.2	2.5	0.8	2.5
120	0.8	1.6	2.5	2.5	0.8	2.5
140	0.8	1.7	2.5	2.5	0.8	2.5
160	0.8	1.9	2.5	2.5	0.8	2.5
180	0.8	2.0	2.5	2.5	0.8	2.5
200	0.8	2.2	2.5	2.5	0.8	2.5
250	0.8	2.5	2.5	2.5	0.8	2.5
300	0.8	2.5	2.5	2.5	0.8	2.5
350	0.8	2.5	2.5	2.5	0.8	2.5
400	0.8	2.5	2.5	2.5	0.8	2.5
450	0.8	2.5	2.5	2.5	0.8	2.5
500	0.8	2.5	2.5	2.5	0.8	2.5

Voice Signal Input Level = STD MOD Level + 16 dB = 34.8 dBmVrms + 16 = **50.8 dBmVrms**

MODULATING FREQUENCY (KHz)	PEAK FREQUENCY DEVIATION (KHz)	MAXIMUM LIMIT (KHz)
0.1	0.8	2.5
0.2	0.8	2.5
0.4	2.5	2.5
0.6	2.5	2.5
0.8	2.5	2.5
1.0	2.5	2.5
1.2	2.5	2.5
1.4	2.5	2.5
1.6	2.5	2.5
1.8	2.5	2.5
2.0	2.5	2.5
2.5	2.5	2.5
3.0	2.5	2.5
3.5	2.5	2.5
4.0	2.0	2.5
4.5	0.8	2.5
5.0	0.8	2.5
6.0	0.8	2.5
7.0	0.8	2.5
8.0	0.8	2.5
9.0	0.8	2.5
10.0	0.8	2.5

6.9.5.3. Voice Modulation Limiting – 25 kHz Channel Spacing:

MODULATING SIGNAL LEVEL	PEAK FREQUENCY DEVIATION (kHz) at the following modulating frequency:					MAXIMUM LIMIT
(mVrms)	0.1 kHz	0.5 kHz	1.0 kHz	3.0 kHz	5.0 kHz	(kHz)
20	0.8	0.9	1.4	3.2	0.8	5.0
40	0.8	1.2	2.1	4.0	0.8	5.0
60	0.8	1.5	2.6	4.8	0.8	5.0
80	0.8	1.9	3.2	4.8	0.8	5.0
100	0.8	2.2	3.9	4.8	0.8	5.0
120	0.8	2.5	4.8	4.8	0.8	5.0
140	0.8	2.9	4.9	4.8	0.8	5.0
160	0.8	3.2	4.9	4.8	0.8	5.0
180	0.8	3.8	4.9	4.8	0.8	5.0
200	0.8	4.1	4.9	4.8	0.8	5.0
250	0.8	4.7	4.9	4.8	0.8	5.0
300	0.8	4.9	4.9	4.8	0.8	5.0
350	0.8	4.9	4.9	4.8	0.8	5.0
400	0.8	4.9	4.9	4.8	0.8	5.0
450	0.8	4.9	4.9	4.8	0.8	5.0
500	0.8	4.9	4.9	4.8	0.8	5.0

Voice Signal Input Level = STD MOD Level + 16 dB = 37.5 dBmVrms + 16 = **53.5 dBmVrms**

MODULATING FREQUENCY (KHz)	PEAK FREQUENCY DEVIATION (KHz)	MAXIMUM LIMIT (KHz)
0.1	1.0	5.0
0.2	1.8	5.0
0.4	4.8	5.0
0.6	4.8	5.0
0.8	4.9	5.0
1.0	4.9	5.0
1.2	5.0	5.0
1.4	4.9	5.0
1.6	5.0	5.0
1.8	4.9	5.0
2.0	5.0	5.0
2.5	5.0	5.0
3.0	5.0	5.0
3.5	4.7	5.0
4.0	3.8	5.0
4.5	1.6	5.0
5.0	0.8	5.0
6.0	1.0	5.0
7.0	1.2	5.0
8.0	1.6	5.0
9.0	1.1	5.0
10.0	0.8	5.0

6.10. 99% OBW & ADJACENT CHANNEL COUPLED POWER (ACCP) @ FCC 2.1049, 90.208 & 90.543

6.10.1. Limits

Sec. 90.543 Emission limitations:- *Transmitters designed to operate in 764-776 MHz and 794-806 MHz frequency band must meet the emission limitations in this section.*

(a) The adjacent channel coupled power (ACCP) requirements for transmitters designed for various channel sizes are shown in the following tables. Mobile station requirements apply to

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Handheld, car mounted and control station units*. The tables specify a maximum value for the ACCP relative to maximum output power as a function of the displacement from the channel center frequency. In addition, the ACCP for a mobile station transmitter at the specified frequency displacement must not exceed the value shown in the tables. For transmitters that have power control, the latter ACCP requirement can be met at maximum power reduction. In the following charts, ``(s)'' means a swept measurement is to be used.*

- ***12.5 kHz Mobile Transmitter ACCP Requirements***

Offset from Center Frequency (kHz)	*Measurement Bandwidth (kHz)*	*Maximum ACCP Relative (dBc)*	*Maximum ACCP Absolute (dBm)*
9.375	*6.25*	*-40*	*(\1\)*
15.625	*6.25*	*-60*	*-45*
21.875	*6.25*	*-60*	*-45*
37.5	*25*	*-65*	*-50*
62.5	*25*	*-65*	*-50*
87.5	*25*	*-65*	*-50*
150	*100*	*-65*	*-50*
250	*100*	*-65*	*-50*
<ls-thn-eq>400 to receive band	*30(s)*	*-75*	*-55*
in the receive band	*30(s)*	*-100*	*-70*

\1\ Not specified.

- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*

- ***25 kHz Mobile Transmitter ACCP Requirements***

Offset from Center Frequency (kHz)	*Measurement Bandwidth (kHz)*	*Maximum ACCP Relative (dBc)*	*Maximum ACCP Absolute (dBm)*
15.625	*6.25*	*-40*	*(\1\)*
21.875	*6.25*	*-60*	*-45*
37.5	*25*	*-65*	*-50*
62.5	*25*	*-65*	*-50*
87.5	*25*	*-65*	*-50*
150	*100*	*-65*	*-50*
250	*100*	*-65*	*-50*
<ls-thn-eq> 400 to receive band	*30(s)*	*-75*	*-55*
in the receive band	*30(s)*	*-100*	*-70*

\1\ Not specified.

6.10.2. Method of Measurements

(b) ACCP measurement procedure. The following are procedures for making transmitter measurements. For time division multiple access (TDMA) systems, the measurements are to be made under TDMA operation only during time slots when the transmitter is on. All measurements must be made at the input to the transmitter's antenna. Measurement bandwidth used below implies an instrument that measures the power in many narrow bandwidths (e.g. 300 Hz) and integrates these powers across a larger band to determine power in the measurement bandwidth.

(1) Setting reference level. Using a spectrum analyzer capable of ACCP measurements, set the measurement bandwidth to the channel size. For example, for a 6.25 kHz transmitter, set the measurement bandwidth to 6.25 kHz; for a 150 kHz transmitter, set the measurement bandwidth to 150 kHz. Set the frequency offset of the measurement bandwidth to zero and adjust the center frequency of the spectrum analyzer to give the power level in the measurement bandwidth. Record this power level in dBm as the ``reference power level''.

(2) Measuring the power level at frequency offsets <600kHz. Using a spectrum analyzer capable of ACCP measurements, set the measurement bandwidth as shown in the tables above. Measure the ACCP in dBm. These measurements should be made at maximum power. Calculate the coupled power by subtracting the measurements made in this step from the reference power measured in the previous step. The absolute ACCP values must be less than the values given in the table for each condition above.

(3) Measuring the power level at frequency offsets <ls-thn-eq>600kHz. Set a spectrum analyzer to 30 kHz resolution bandwidth, 1 MHz video bandwidth and sample mode detection. Sweep <plus-minus>6 MHz from the carrier frequency. Set the reference level to the RMS value of the transmitter power and note the absolute power. The response at frequencies greater than 600 kHz must be less than the values in the tables above.

(4) Upper power limit measurement. The absolute coupled power in dBm measured above must be compared to the table entry for each given frequency offset. For those mobile stations with power control, these measurements should be repeated with power control at maximum power reduction. The absolute ACCP at maximum power reduction must be less than the values in the tables above

(c) Out-of-band emission limit. On any frequency outside of the frequency ranges covered by the ACCP tables in this section, the power of any emission must be reduced below the unmodulated carrier power (P) by at least 43 + 10 log (P) dB.

(d) Authorized bandwidth. Provided that the ACCP requirements of this section are met, applicants may request any authorized bandwidth that does not exceed the channel size.

(e) For operations in the 764 to 776 MHz and 794 to 806 MHz bands, all emissions including harmonics in the band 1559-1610 MHz shall be limited to -70 dBW/MHz equivalent isotropically radiated power (EIRP) for wideband signals, and -80 dBW EIRP for discrete emissions of less than 700 Hz bandwidth. For the purpose of equipment authorization, a transmitter shall be tested with an antenna that is representative of the type that will be used with the equipment in normal operation.

(f) When an emission outside of the authorized bandwidth causes harmful interference, the Commission may, at its discretion, require greater attenuation than specified in this section.

[63 FR 58651, Nov. 2, 1998, as amended at 65 FR 66655, Nov. 7, 2000]

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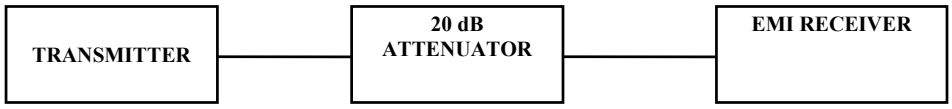
6.10.3. Test Equipment List

Test Instruments	Manufacturer	Model No.	Serial No.	Frequency Range
EMI Receiver/ EMI Receiver	Hewlett Packard	HP 8593EM	3412A00103	9 kHz – 26.5 GHz
Attenuator(s)	Bird	..	…	DC – 22 GHz
Audio Oscillator	Hewlett Packard	HP 204C	0989A08798	DC to 1.2 MHz

6.10.4. Test Arrangement



6.10.5. Test Data

6.10.5.1. 99% Occupied Bandwidth – FM with 2.5 kHz Since wave signal

Frequency (MHz)	Channel Spacing (kHz)	Measured 99% OBW (kHz)	Recommended 99% OBW (kHz)
764	12.5	10.1	< 12.5
770	12.5	10.1	< 12.5
776	12.5	10.1	< 12.5
764	25.0	15.5	< 25.0
770	25.0	15.0	< 25.0
776	25.0	15.5	< 25.0

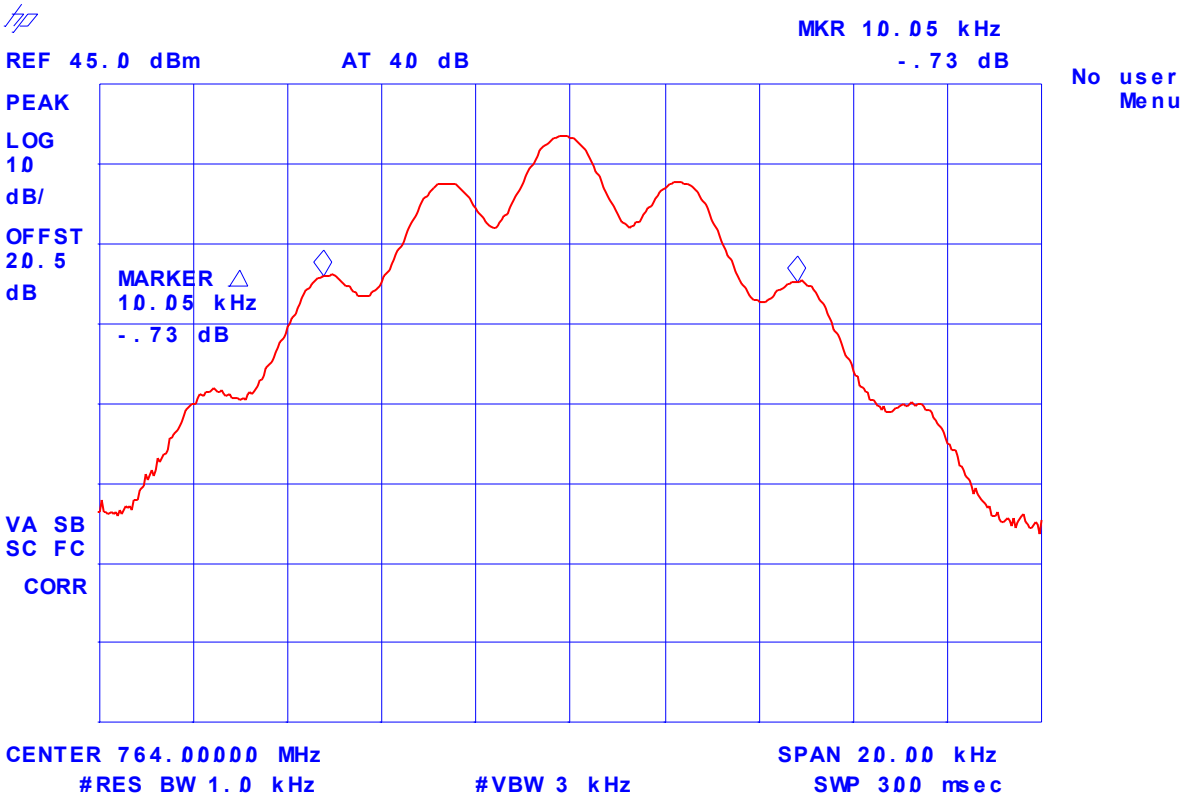
*** Please refer to Plots 1 to 6 for detailed measurements

6.10.5.2. 99% Occupied Bandwidth – FM Level 4 Modulation with 9600 b/s Ranodm Data

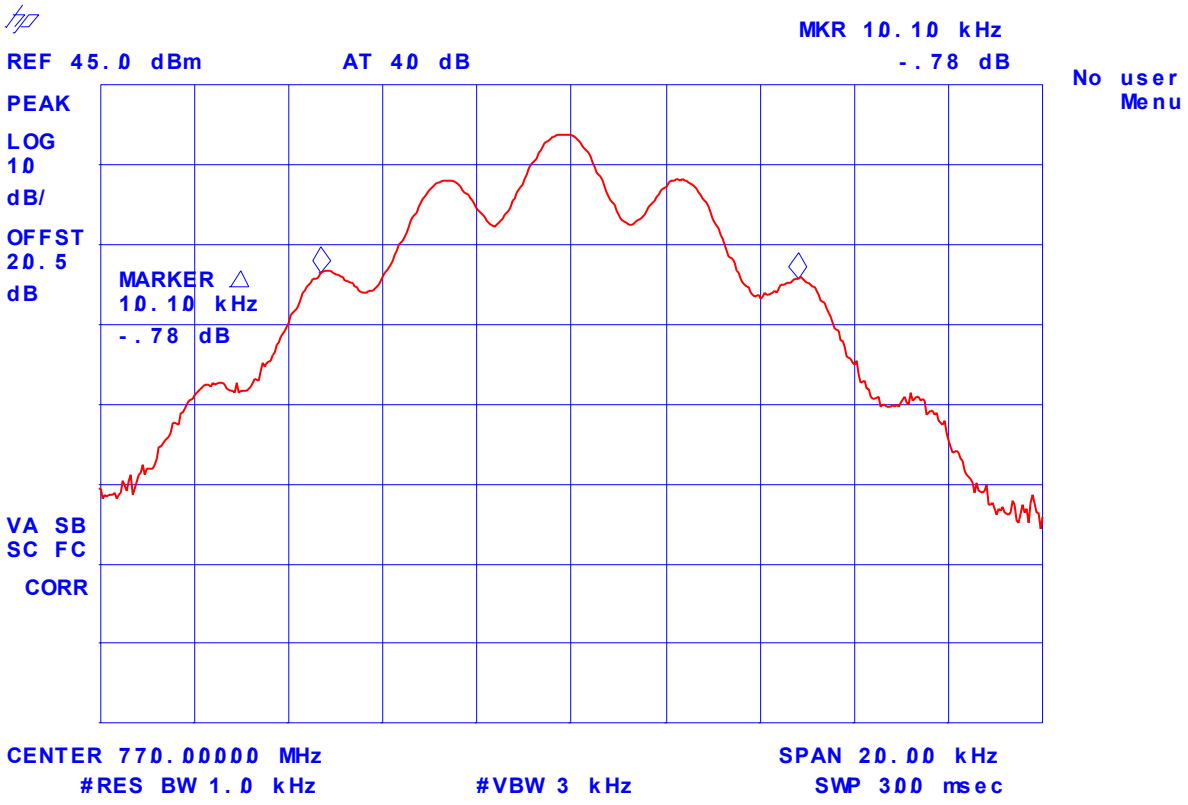
Frequency (MHz)	Channel Spacing (kHz)	Measured 99% OBW (kHz)	Recommended 99% OBW (kHz)
764	12.5	9.1	< 12.5
770	12.5	9.2	< 12.5
776	12.5	9.3	< 12.5
764	25.0	13.8	< 25.0
770	25.0	13.8	< 25.0
776	25.0	13.8	< 25.0

*** Please refer to Plots 7 to 12 for detailed measurements

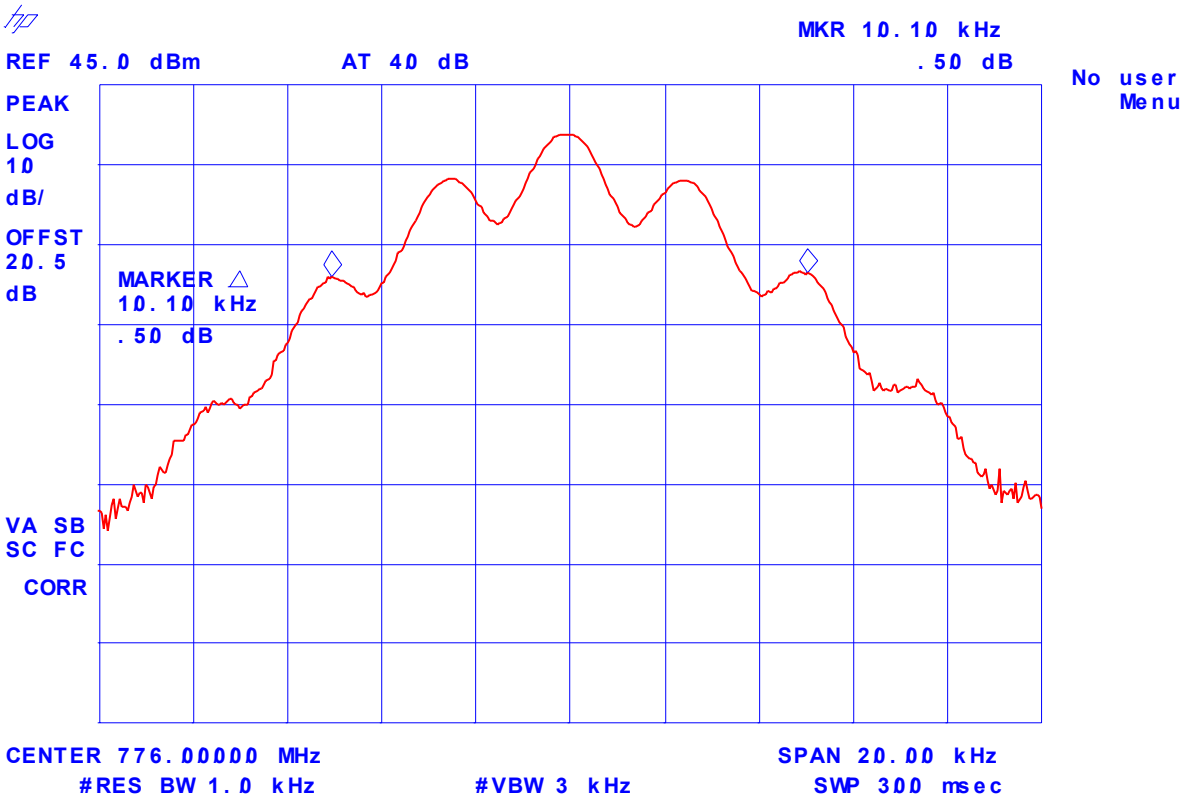
Plot #1: **99% OBW - 764 MHz, 12.5 kHz Channel Spacing**
Modulation: FM modulation with 2.5 kHz Sine wave signal.



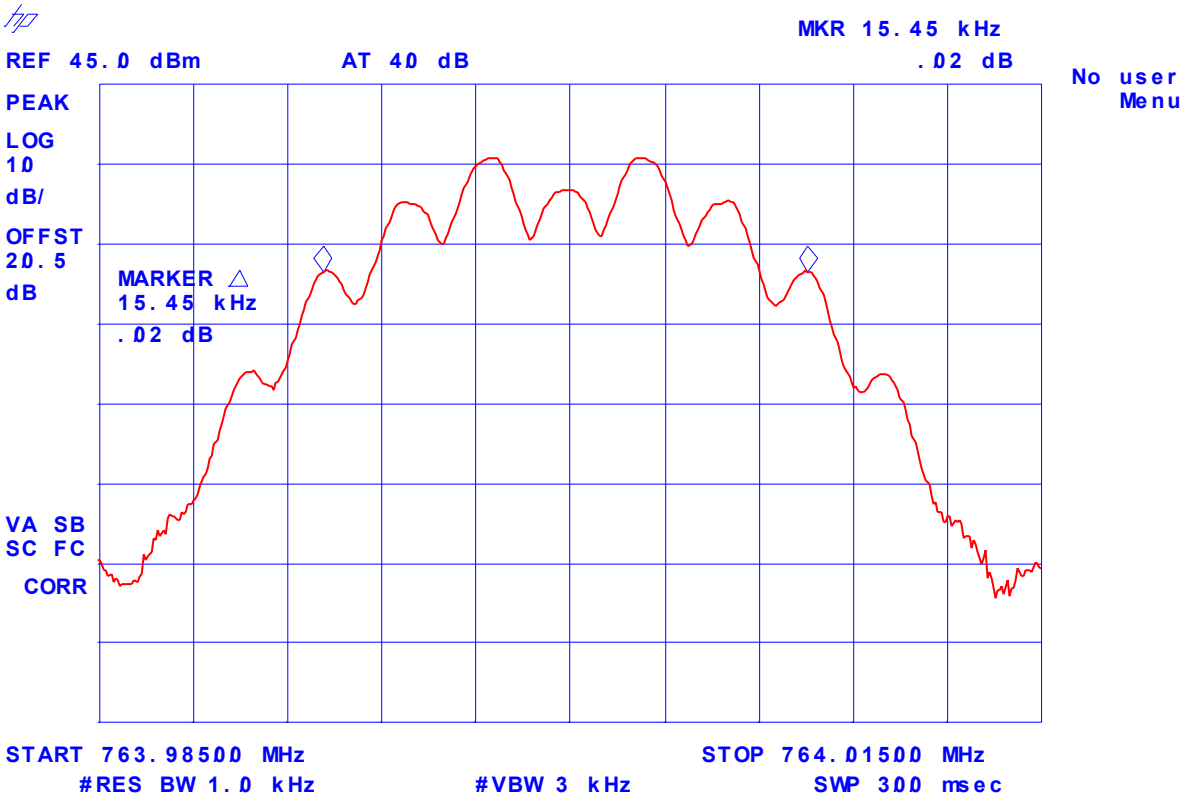
Plot #2: **99% OBW - 770 MHz, 12.5 kHz Channel Spacing**
Modulation: FM modulation with 2.5 kHz Sine wave signal.



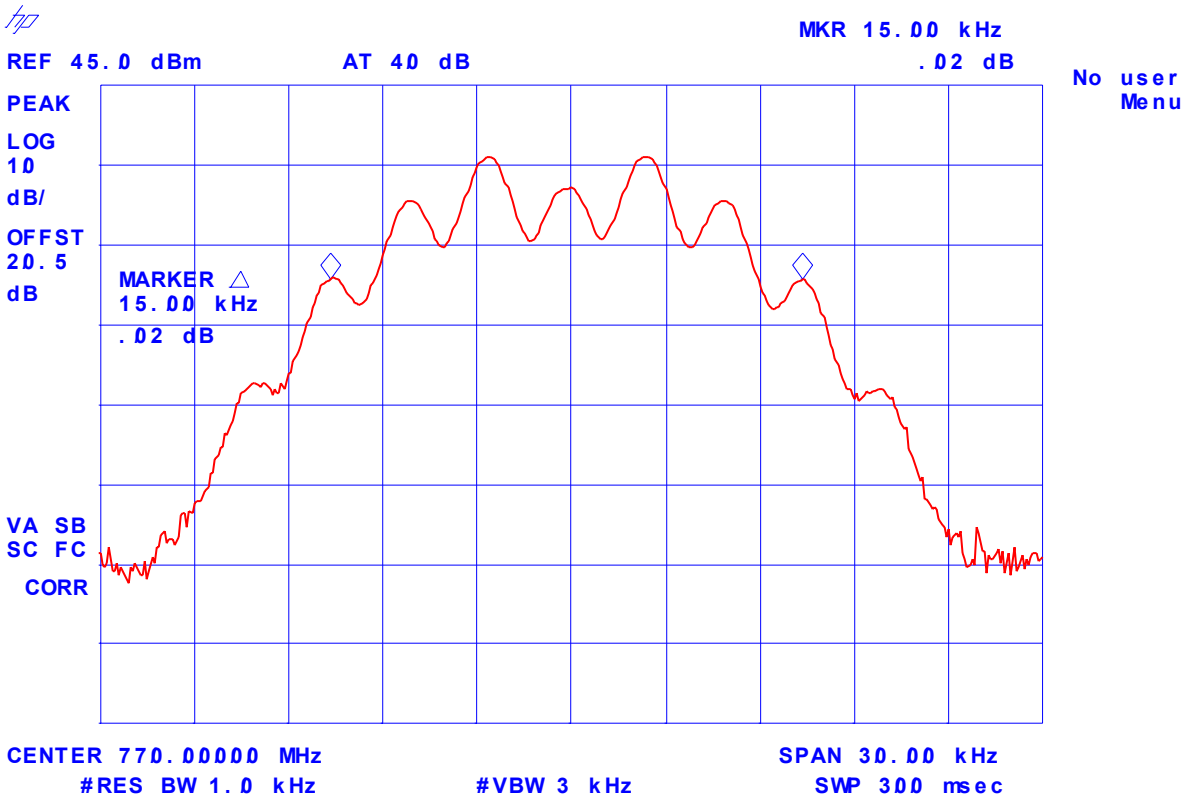
Plot #3: **99% OBW - 776 MHz, 12.5 kHz Channel Spacing**
Modulation: FM modulation with 2.5 kHz Sine wave signal.



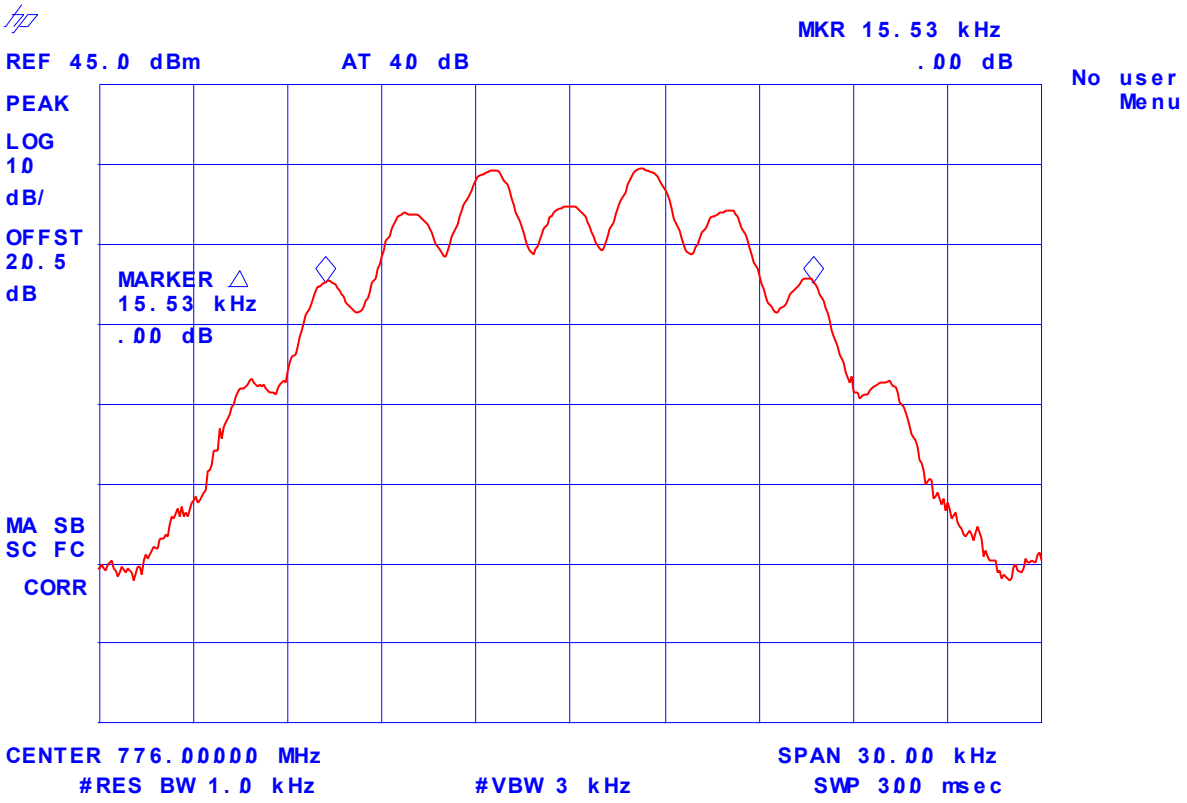
Plot #4: **99% OBW - 764 MHz, 25 kHz Channel Spacing**
Modulation: FM modulation with 2.5 kHz Sine wave signal.



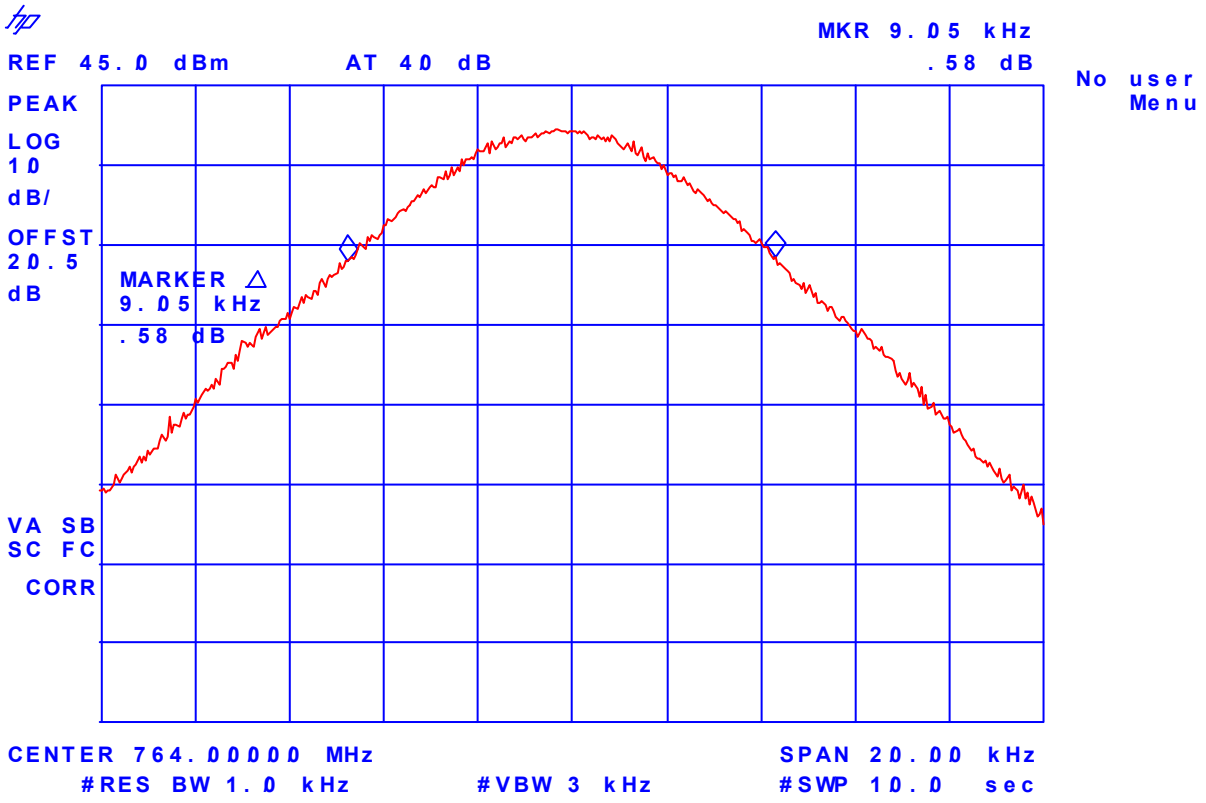
Plot #5: **99% OBW - Configuration: 770 MHz, 25 kHz Channel Spacing**
Modulation: FM modulation with 2.5 kHz Sine wave signal.



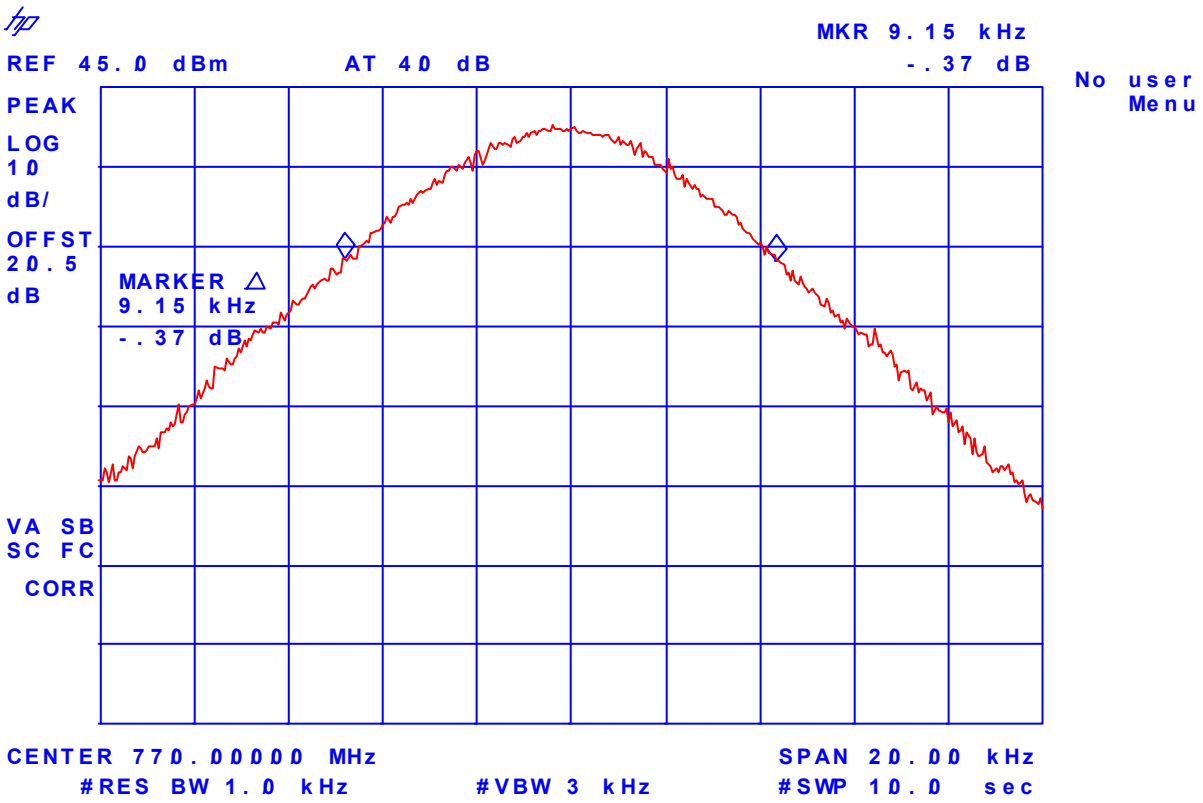
Plot #6: **99% OBW - 776 MHz, 25 kHz Channel Spacing**
Modulation: FM modulation with 2.5 kHz Sine wave signal.



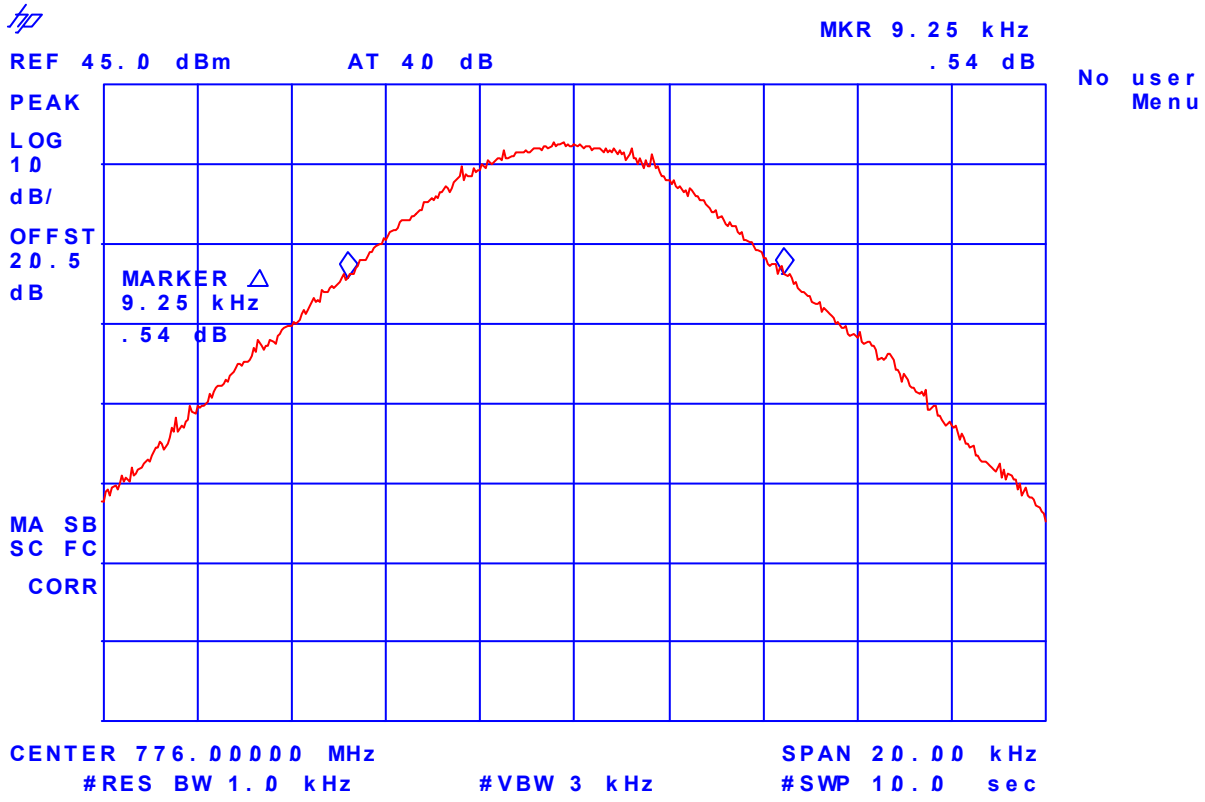
Plot # 7: **764 MHz, 12.5 kHz Channel Spacing, 99 % OBW**
Modulation: FM modulation with an external 9600 b/s random data source.



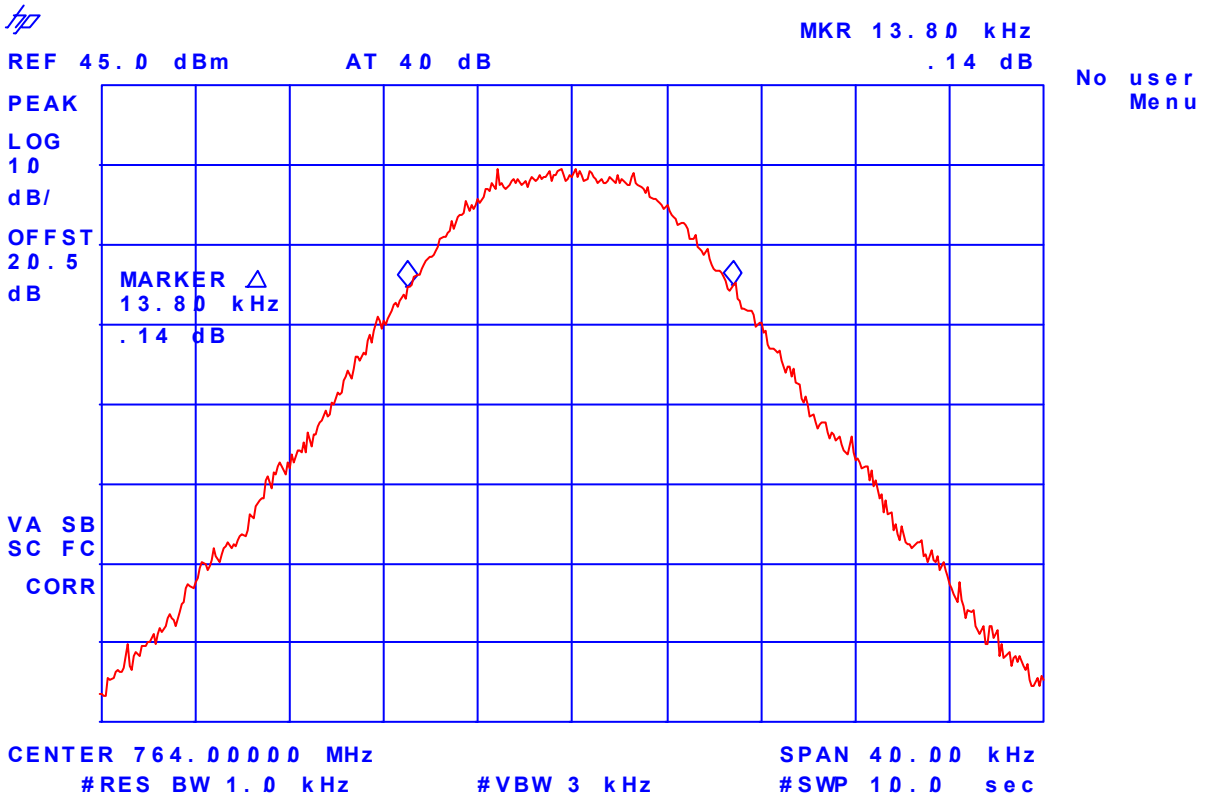
Plot #8: **770 MHz, 12.5 kHz Channel Spacing, 99 % OBW**
Modulation: FM modulation with an external 9600 b/s random data source.



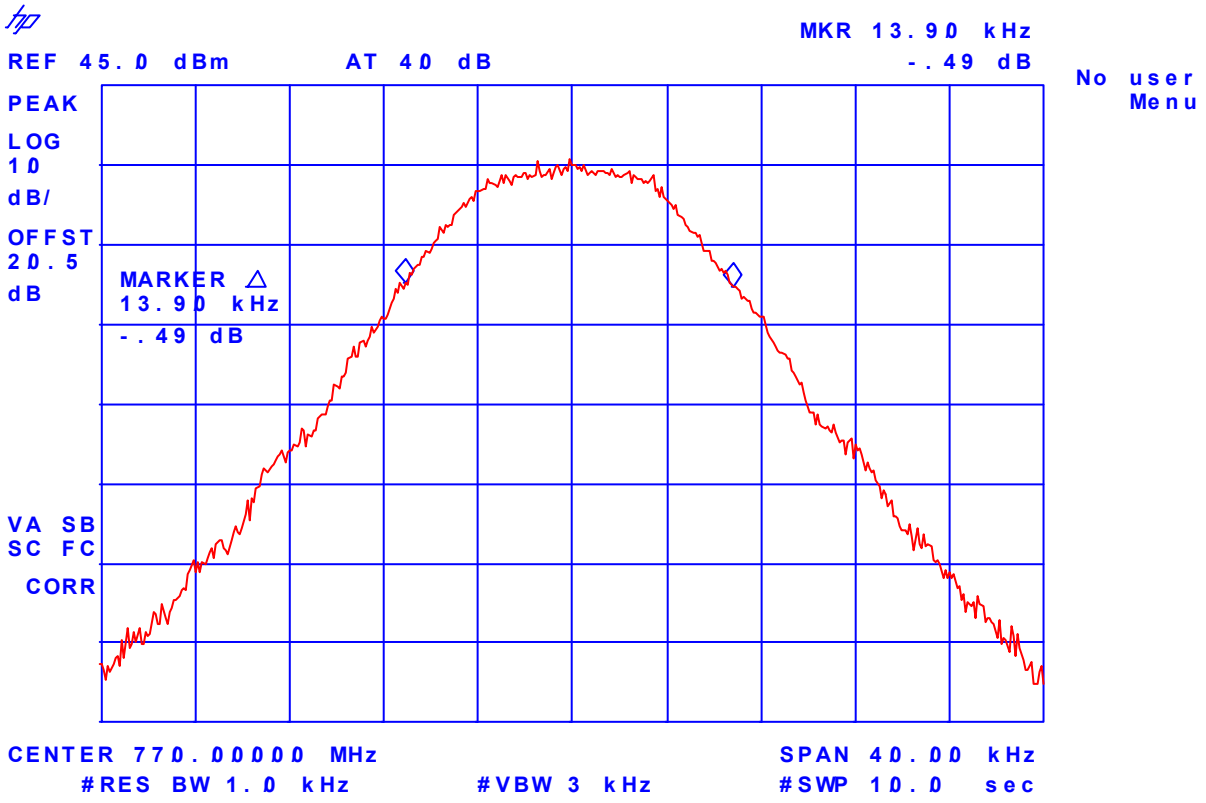
Plot #9: **776 MHz, 12.5 kHz Channel Spacing, 99 % OBW**
Modulation: FM modulation with an external 9600 b/s random data source.



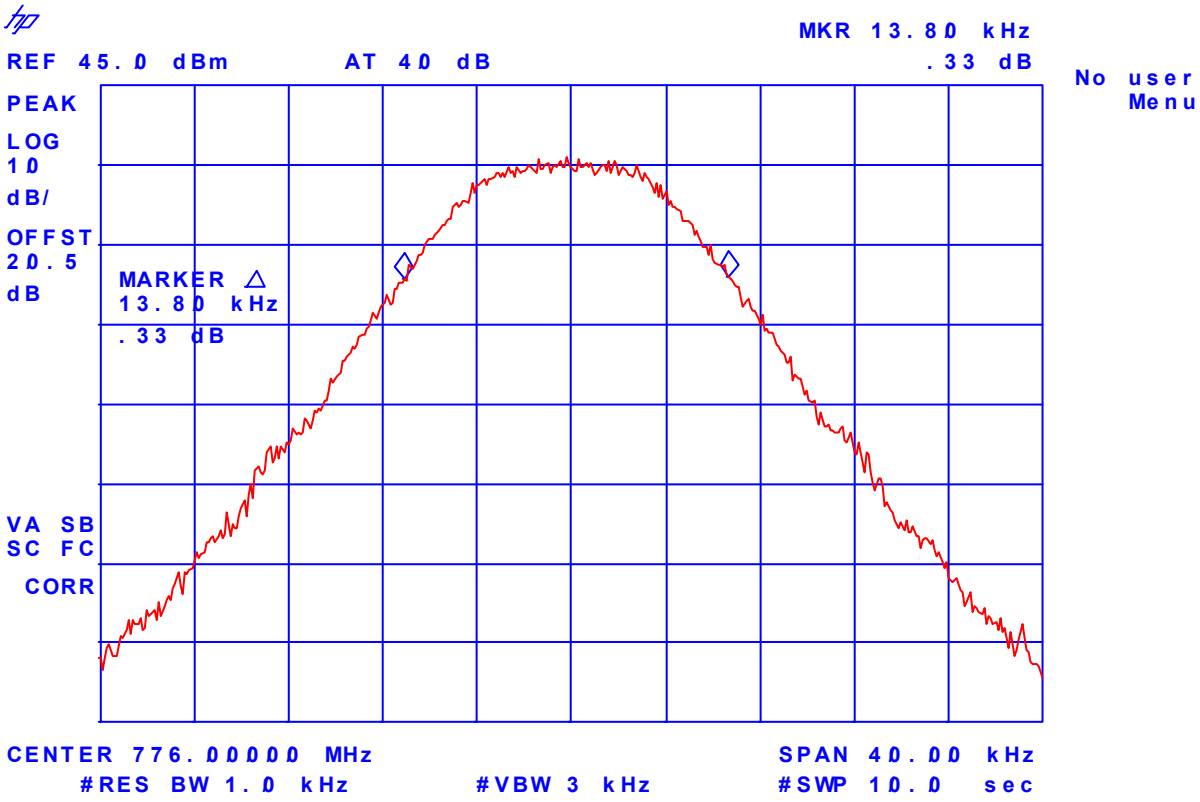
Plot #10: **764 MHz, 25 kHz Channel Spacing, 99 % OBW**
Modulation: FM modulation with an external 9600 b/s random data source.



Plot #11: **770 MHz, 25 kHz Channel Spacing, 99 % OBW**
Modulation: FM modulation with an external 9600 b/s random data source.



Plot #12: **776 MHz, 25 kHz Channel Spacing, 99 % OBW**
Modulation: FM modulation with an external 9600 b/s random data source.



6.10.5.3. Emission Limitations – Adjacent Channel Coupled Power (ACCP)

6.10.5.3.1. Test Configuration #1: 764 MHz, 40.3 dBm, 12.5 kHz Channel Spacing, Modulation: FM Voice (2.5 kHz Sine Wave Signal)

Offset (kHz)	Measurement BW (kHz)	Measured ACCP at Fc – Offset (dBc)	Measured ACCP at Fc + Offset (dBc)	Maximum ACCP Relative (dBc)
9.375	6.25	-45.21	-45.37	-40
15.625	6.25	-61.85	-61.18	-60
21.875	6.25	-61.27	-62.53	-60
37.500	25.00	-63.88	-63.92	-60
62.500	25.00	-68.12	-68.33	-65
87.500	25.00	-71.34	-72.01	-65
150.000	100.00	-67.15	-66.82	-65
250.000	100.00	-68.16	-68.67	-65
>400 to receive band in the receive band	30 (Swept)	<-100	<-100	-75
400 to receive band in the receive band	30 (Swept)	<-100	<-100	-100

6.10.5.3.2. Test Configuration #2: 764 MHz, 40.3 dBm, 25 kHz Channel Spacing, Modulation: FM Voice (2.5 kHz Sine Wave Signal)

Offset (kHz)	Measurement BW (kHz)	Measured ACCP at Fc – Offset (dBc)	Measured ACCP at Fc + Offset (dBc)	Maximum ACCP Relative (dBc)
15.625	6.25	-55.59	-56.01	-40
21.875	6.25	-63.49	-62.82	-60
37.500	25.00	-62.99	-62.84	-60
62.500	25.00	-65.65	-65.65	-65
87.500	25.00	-66.75	66.86	-65
150.000	100.00	-67.28	-67.36	-65
250.000	100.00	-68.18	-68.23	-65
>400 to receive band in the receive band	30 (Swept)	<-100	<-100	-75
400 to receive band in the receive band	30 (Swept)	<-100	<-100	-100

6.10.5.3.3. Test Configuration #3: 770 MHz, 40.8 dBm, 12.5 kHz Channel Spacing, Modulation: FM Voice (2.5 kHz Sine Wave Signal)

Offset (kHz)	Measurement BW (kHz)	Measured ACCP at Fc – Offset (dBc)	Measured ACCP at Fc + Offset (dBc)	Maximum ACCP Relative (dBc)
9.375	6.25	-45.37	-45.52	-40
15.625	6.25	-61.78	-61.23	-60
21.875	6.25	-61.35	-62.04	-60
37.500	25.00	-63.18	-63.94	-60
62.500	25.00	-68.57	-69.16	-65
87.500	25.00	-71.55	-71.95	-65
150.000	100.00	-67.39	-67.02	-65
250.000	100.00	-68.72	-68.18	-65
>400 to receive band in the receive band	30 (Swept)	<-100	<-100	-75
400 to receive band in the receive band	30 (Swept)	<-100	<-100	-100

6.10.5.3.4. Test Configuration #4: 770 MHz, 40.8 dBm, 25 kHz Channel Spacing, Modulation: FM Voice (2.5 kHz Sine Wave Signal)

Offset (kHz)	Measurement BW (kHz)	Measured ACCP at Fc – Offset (dBc)	Measured ACCP at Fc + Offset (dBc)	Maximum ACCP Relative (dBc)
15.625	6.25	-54.58	-55.02	-40
21.875	6.25	-62.29	-62.69	-60
37.500	25.00	-62.90	-62.82	-60
62.500	25.00	-65.52	-65.48	-65
87.500	25.00	-66.54	-66.67	-65
150.000	100.00	-67.56	-67.62	-65
250.000	100.00	-68.27	-68.24	-65
>400 to receive band in the receive band	30 (Swept)	<-100	<-100	-75
400 to receive band in the receive band	30 (Swept)	<-100	<-100	-100

6.10.5.3.5. Test Configuration #5: 776 MHz, 40.8 dBm, 12.5 kHz Channel Spacing, Modulation: FM Voice (2.5 kHz Sine Wave Signal)

Offset (kHz)	Measurement BW (kHz)	Measured ACCP at Fc – Offset (dBc)	Measured ACCP at Fc + Offset (dBc)	Maximum ACCP Relative (dBc)
9.375	6.25	-45.32	-44.19	-40
15.625	6.25	-61.85	-63.06	-60
21.875	6.25	-61.22	-68.98	-60
37.500	25.00	-63.27	-68.02	-60
62.500	25.00	-68.06	-69.12	-65
87.500	25.00	-71.89	-72.38	-65
150.000	100.00	-67.33	-67.87	-65
250.000	100.00	-68.15	-68.35	-65
>400 to receive band in the receive band	30 (Swept)	<-100	<-100	-75
400 to receive band in the receive band	30 (Swept)	<-100	<-100	-100

6.10.5.3.6. Test Configuration #6: 776 MHz, 40.8 dBm, 25 kHz Channel Spacing, Modulation: FM Voice (2.5 kHz Sine Wave Signal)

Offset (kHz)	Measurement BW (kHz)	Measured ACCP at Fc – Offset (dBc)	Measured ACCP at Fc + Offset (dBc)	Maximum ACCP Relative (dBc)
15.625	6.25	-54.77	-55.34	-40
21.875	6.25	-62.82	-62.77	-60
37.500	25.00	-62.54	-62.54	-60
62.500	25.00	-65.41	-65.41	-65
87.500	25.00	-66.42	-66.12	-65
150.000	100.00	-67.32	-67.27	-65
250.000	100.00	-68.16	-68.45	-65
>400 to receive band in the receive band	30 (Swept)	<-100	<-100	-75
400 to receive band in the receive band	30 (Swept)	<-100	<-100	-100

6.10.5.3.7. Test Configuration #7: 764 MHz, 40.3 dBm, 12.5 kHz Channel Spacing, Modulation: FM 9600 b/s random Data

Offset (kHz)	Measurement BW (kHz)	Measured ACCP at Fc – Offset (dBc)	Measured ACCP at Fc + Offset (dBc)	Maximum ACCP Relative (dBc)
9.375	6.25	-46.18	-45.66	-40
15.625	6.25	-60.56	-62.88	-60
21.875	6.25	61.01	-62.68	-60
37.500	25.00	-68.16	-67.82	-60
62.500	25.00	-71.63	-70.63	-65
87.500	25.00	-72.41	-72.70	-65
150.000	100.00	-66.84	-66.68	-65
250.000	100.00	-68.10	-68.93	-65
>400 to receive band in the receive band	30 (Swept)	<-100	<-100	-75
400 to receive band in the receive band	30 (Swept)	<-100	<-100	-100

6.10.5.3.8. Test Configuration #8: 764 MHz, 40.3 dBm, 25 kHz Channel Spacing, Modulation: FM 9600 b/s random Data

Offset (kHz)	Measurement BW (kHz)	Measured ACCP at Fc – Offset (dBc)	Measured ACCP at Fc + Offset (dBc)	Maximum ACCP Relative (dBc)
15.625	6.25	-46.68	-48.00	-40
21.875	6.25	-61.84	-63.41	-60
37.500	25.00	-68.67	-68.21	-60
62.500	25.00	-72.48	-71.27	-65
87.500	25.00	-72.56	-72.43	-65
150.000	100.00	-67.56	-67.35	-65
250.000	100.00	-68.27	-68.13	-65
>400 to receive band in the receive band	30 (Swept)	<-100	<-100	-75
400 to receive band in the receive band	30 (Swept)	<-100	<-100	-100

6.10.5.3.9. Test Configuration #9: 770 MHz, 40.8 dBm, 12.5 kHz Channel Spacing, Modulation: FM 9600 b/s random Data

Offset (kHz)	Measurement BW (kHz)	Measured ACCP at Fc – Offset (dBc)	Measured ACCP at Fc + Offset (dBc)	Maximum ACCP Relative (dBc)
9.375	6.25	-44.16	-44.19	-40
15.625	6.25	-65.55	-63.06	-60
21.875	6.25	-68.38	-68.98	-60
37.500	25.00	-68.18	-68.02	-60
62.500	25.00	-71.33	-71.37	-65
87.500	25.00	-72.06	-72.38	-65
150.000	100.00	-67.66	-67.88	-65
250.000	100.00	-68.18	-68.41	-65
>400 to receive band in the receive band	30 (Swept)	<-100	<-100	-75
400 to receive band in the receive band	30 (Swept)	<-100	<-100	-100

6.10.5.3.10. Test Configuration #10: 770 MHz, 40.8 dBm, 25 kHz Channel Spacing, Modulation: FM 9600 b/s random Data

Offset (kHz)	Measurement BW (kHz)	Measured ACCP at Fc – Offset (dBc)	Measured ACCP at Fc + Offset (dBc)	Maximum ACCP Relative (dBc)
15.625	6.25	-46.68	-48.00	-40
21.875	6.25	-61.84	-63.41	-60
37.500	25.00	-68.67	-68.21	-60
62.500	25.00	-72.48	-71.27	-65
87.500	25.00	-72.56	-72.43	-65
150.000	100.00	-67.56	-67.35	-65
250.000	100.00	-68.27	-68.13	-65
>400 to receive band in the receive band	30 (Swept)	<-100	<-100	-75
400 to receive band in the receive band	30 (Swept)	<-100	<-100	-100

6.10.5.3.11. Test Configuration #11: 776 MHz, 40.8 dBm, 12.5 kHz Channel Spacing, Modulation: FM 9600 b/s random Data

Offset (kHz)	Measurement BW (kHz)	Measured ACCP at Fc – Offset (dBc)	Measured ACCP at Fc + Offset (dBc)	Maximum ACCP Relative (dBc)
9.375	6.25	-44.16	-44.19	-40
15.625	6.25	-65.55	-63.06	-60
21.875	6.25	-68.38	-68.98	-60
37.500	25.00	-68.18	-68.02	-60
62.500	25.00	-71.33	-71.37	-65
87.500	25.00	-72.06	-72.38	-65
150.000	100.00	-67.66	-67.88	-65
250.000	100.00	-68.18	-68.41	-65
>400 to receive band in the receive band	30 (Swept)	<-100	<-100	-75
400 to receive band in the receive band	30 (Swept)	<-100	<-100	-100

6.10.5.3.12. Test Configuration #12: 776 MHz, 40.8 dBm, 25 kHz Channel Spacing, Modulation: FM 9600 b/s random Data

Offset (kHz)	Measurement BW (kHz)	Measured ACCP at Fc – Offset (dBc)	Measured ACCP at Fc + Offset (dBc)	Maximum ACCP Relative (dBc)
15.625	6.25	-46.34	-48.41	-40
21.875	6.25	-46.77	-62.17	-60
37.500	25.00	-68.20	-68.37	-60
62.500	25.00	-70.18	-71.26	-65
87.500	25.00	-73.38	-72.98	-65
150.000	100.00	-67.26	-67.13	-65
250.000	100.00	-68.14	-68.36	-65
>400 to receive band in the receive band	30 (Swept)	<-100	<-100	-75
400 to receive band in the receive band	30 (Swept)	<-100	<-100	-100

6.11. TRANSMITTER ANTENNA POWER SPURIOUS/HARMONIC CONDUCTED EMISSIONS @ FCC 90.543(C)

6.11.1. Limits

Out-of-band emission limit. On any frequency outside of the frequency ranges covered by the ACCP tables in this section, the power of any emission must be reduced below the unmodulated carrier power (P) by at least 43 + 10 log (P) dB

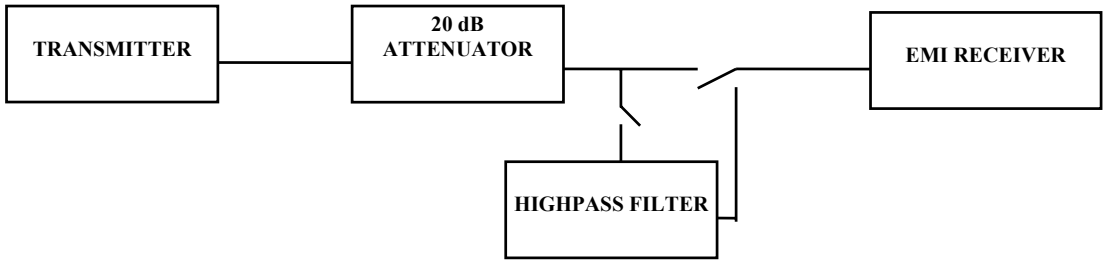
6.11.2. Method of Measurements

Refer to Exhibit 8 § 8.4 of this report for measurement details

6.11.3. Test Equipment List

Test Instruments	Manufacturer	Model No.	Serial No.	Frequency Range
EMI Receiver/ EMI Receiver	Hewlett Packard	HP 8593EM	3412A00103	9 kHz – 26.5 GHz
Attenuator(s)	Bird	..	…	DC – 22 GHz
Audio Oscillator	Hewlett Packard	HP 204C	0989A08798	DC to 1.2 MHz
Highpass Filter, Microphase	Microphase	CR220HID	IITI11000AC	Cut-off Frequency at 600 MHz, 1.3 GHz or 4 GHz

6.11.4. Test Arrangement



6.11.5. Test Data

Remarks:

- Since our prescans showed no differences between the emission measurements from the EUT operating with 12.5 kHz channel spacing and 25 kHz channel spacing. The measurement with 12.5 kHz channel spacing operation will be conducted for final tests.
- Same results were found for both FM Data and FM Voice Modulation.

6.11.5.1. Lowest Frequency (764 MHz)

Fundamental Frequency: 764 MHz
RF Output Power: Minimum: 14.4 dBm (conducted)
Modulation: Frequency modulated with 9600 b/s data

FREQUENCY (MHz)	TRANSMITTER CONDUCTED ANTENNA EMISSIONS (dBm)	(dBc)	LIMIT (dBc)	MARGIN (dB)	PASS/ FAIL
10 – 10,000	**	**	-27.4	**	PASS

- The emissions were scanned from 10 MHz to 10 GHz and no significant emissions were found.
- Refer to Plots 7 to 9 for detailed measurements

Fundamental Frequency: 764 MHz
RF Output Power: Maximum: 40.3 dBm (conducted)
Modulation: Frequency modulated with 9600 b/s data

FREQUENCY (MHz)	TRANSMITTER CONDUCTED ANTENNA EMISSIONS (dBm)	(dBc)	LIMIT (dBc)	MARGIN (dB)	PASS/ FAIL
1527	-49.7	-90.0	-53.3	-36.7	PASS
2292	-56.4	-96.7	-53.3	-43.3	PASS

- The emissions were scanned from 10 MHz to 10 GHz and all emissions less than 50 dB below the FCC Limit was recorded
- Refer to Plots 10 to 12 for detailed measurements

6.11.5.2. Middle Frequency (770 MHz)

Fundamental Frequency: 770 MHz
RF Output Power: Minimum: 15.1 dBm (conducted)
Modulation: Frequency modulated with 9600 b/s data

FREQUENCY	TRANSMITTER CONDUCTED ANTENNA EMISSIONS		LIMIT	MARGIN	PASS/
(MHz)	(dBm)	(dBc)	(dBc)	(dB)	FAIL
10 – 10,000	**	**	-28.1	**	PASS

- The emissions were scanned from 10 MHz to 10 GHz and no significant emissions were found.
- Refer to Plots 13 to 15 for detailed measurements

Fundamental Frequency: 770 MHz
RF Output Power: Maximum: 40.8 dBm (conducted)
Modulation: Frequency modulated with 9600 b/s data

FREQUENCY	TRANSMITTER CONDUCTED ANTENNA EMISSIONS		LIMIT	MARGIN	PASS/
(MHz)	(dBm)	(dBc)	(dBc)	(dB)	FAIL
1540	-49.7	-90.5	-53.8	-36.7	PASS
2310	-51.6	-92.4	-53.8	-38.6	PASS

- The emissions were scanned from 10 MHz to 10 GHz and all emissions less than 50 dB below the FCC Limit was recorded
- Refer to Plots 16 to 18 for detailed measurements

6.11.5.3. Highest Frequency (776 MHz)

Fundamental Frequency: 776 MHz
RF Output Power: Minimum: 15.4 dBm (conducted)
Modulation: Frequency modulated with 9600 b/s data

FREQUENCY	TRANSMITTER CONDUCTED ANTENNA EMISSIONS		LIMIT	MARGIN	PASS/
(MHz)	(dBm)	(dBc)	(dBc)	(dB)	FAIL
10 – 10,000	**	**	-27.4	**	PASS

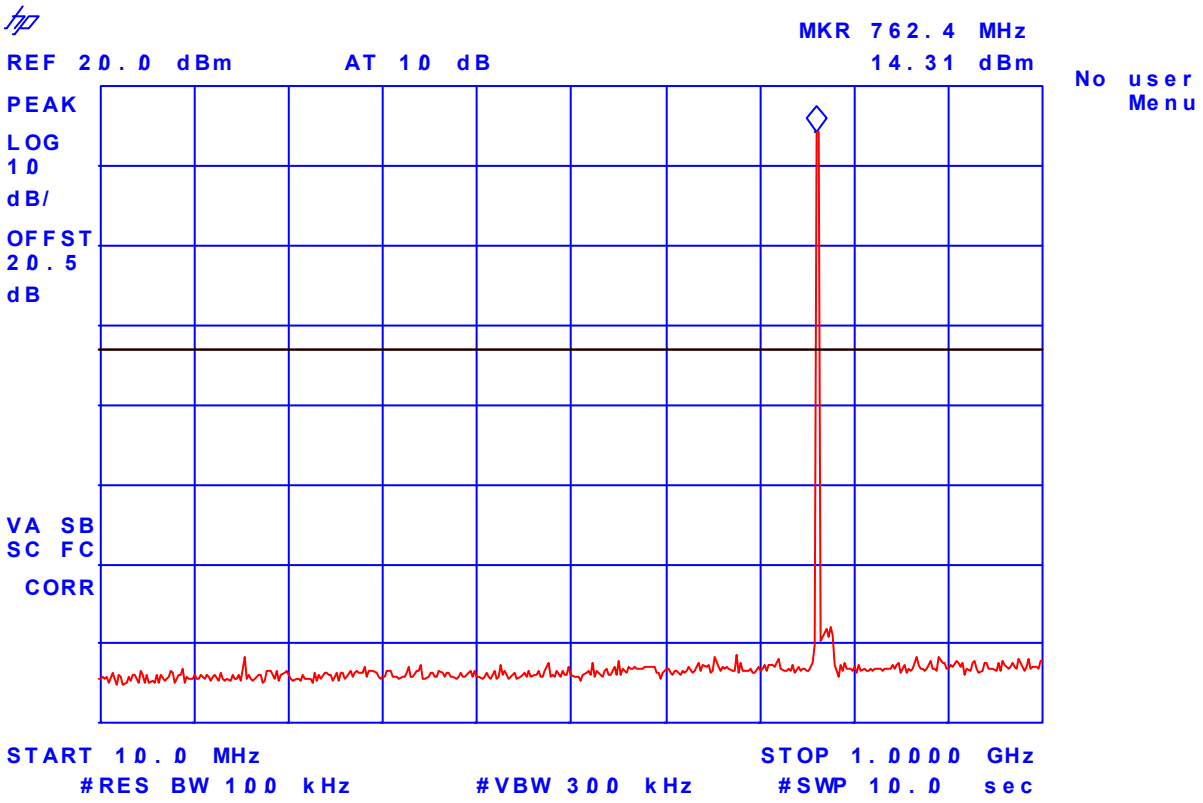
- The emissions were scanned from 10 MHz to 10 GHz and no significant emissions were found.
- Refer to Plots 19 to 21 for detailed measurements

Fundamental Frequency: 776 MHz
RF Output Power: Maximum: 40.8 dBm (conducted)
Modulation: Frequency modulated with 9600 b/s data

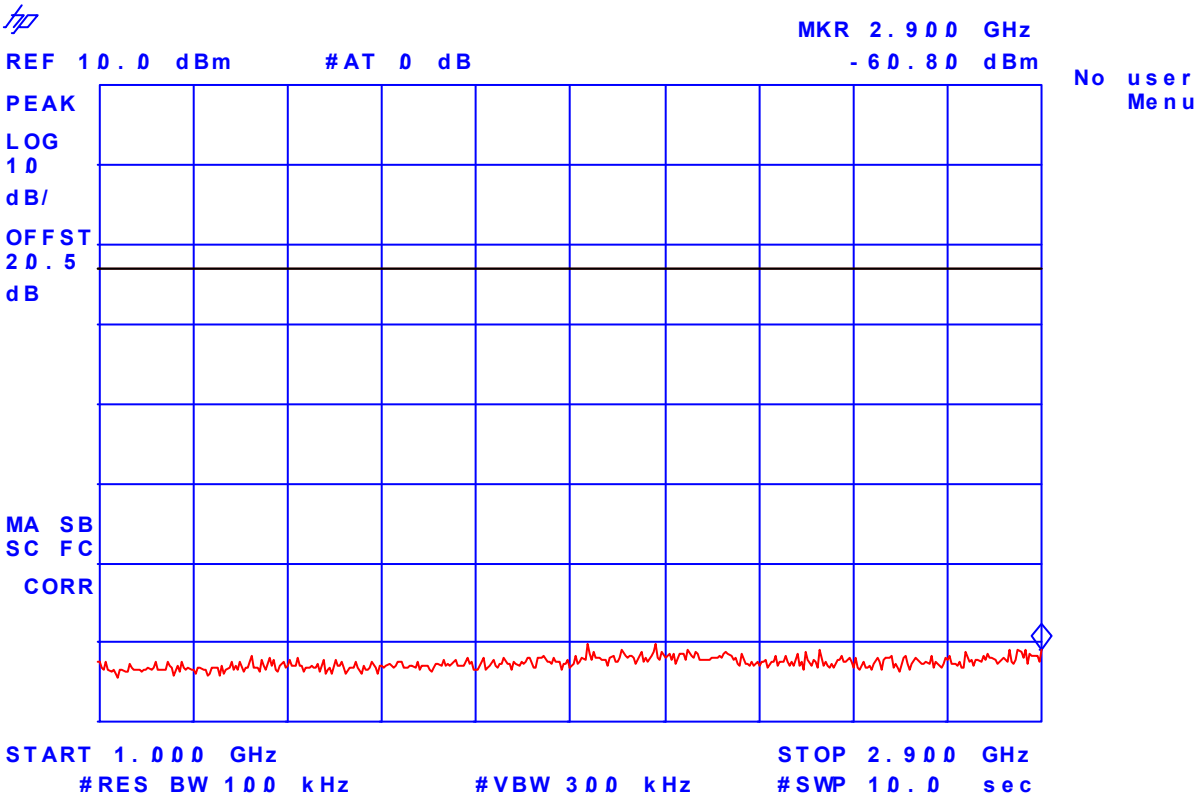
FREQUENCY	TRANSMITTER CONDUCTED ANTENNA EMISSIONS		LIMIT	MARGIN	PASS/
(MHz)	(dBm)	(dBc)	(dBc)	(dB)	FAIL
1552	-53.3	-94.1	-53.8	-40.3	PASS
2328	-50.8	-91.6	-53.8	-37.8	PASS

- The emissions were scanned from 10 MHz to 10 GHz and all emissions less than 50 dB below the FCC Limit was recorded
- Refer to Plots 22 to 24 for detailed measurements

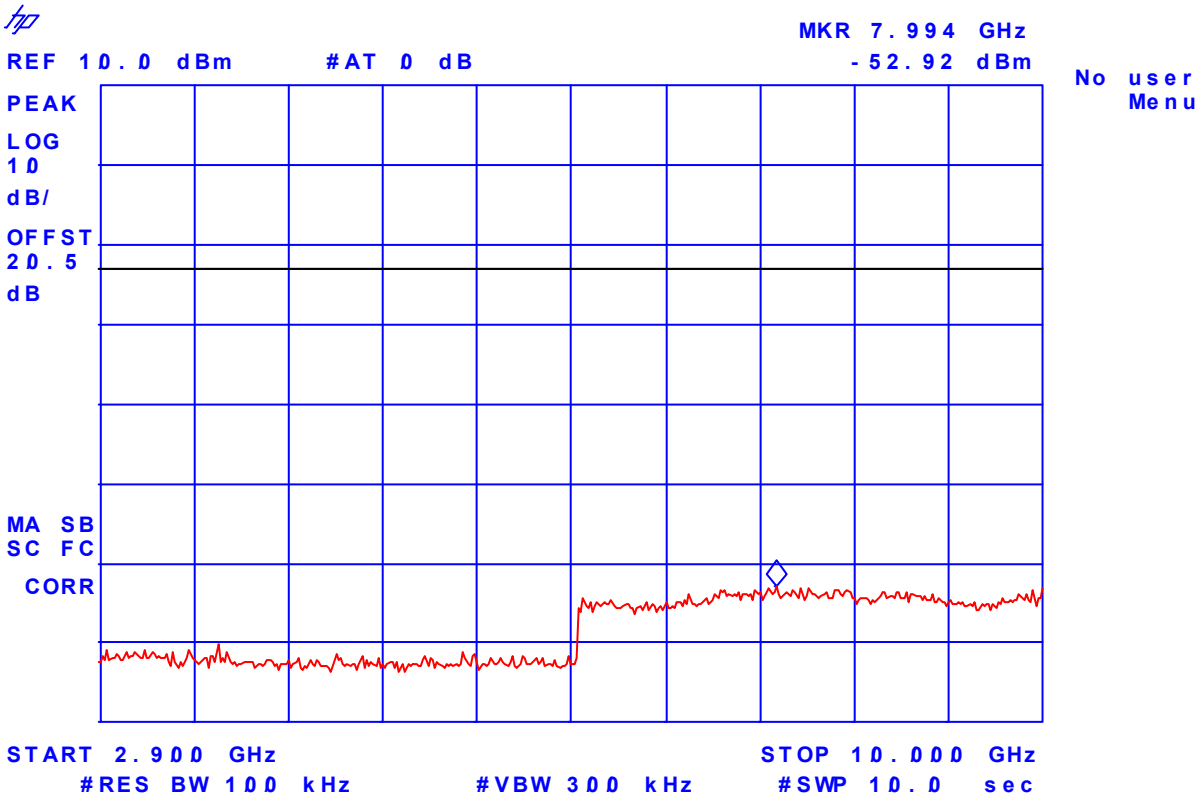
Plot #7: **Transmitter Antenna power Conducted Emissions**
764 MHz, 12.5 kHz Channel Spacing, Power Output: 14.4 dBm
Modulation: FM modulation with an external 9600 b/s random data source.



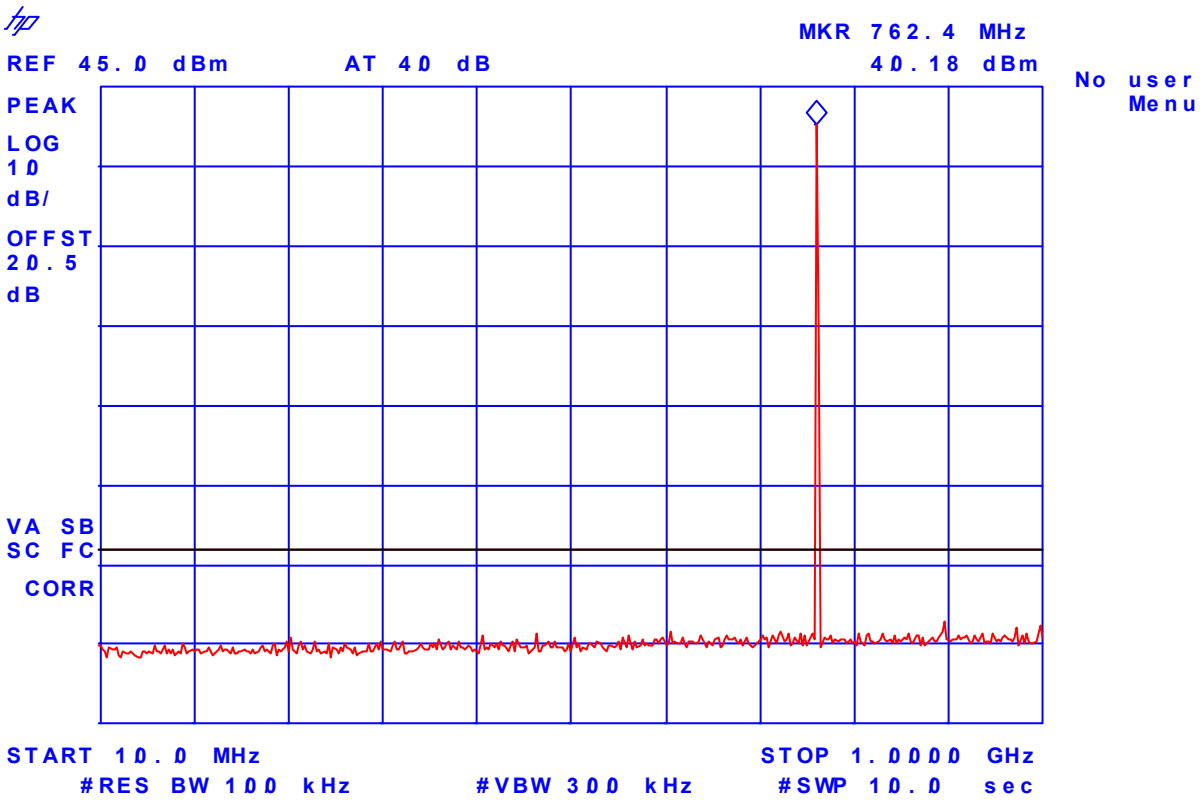
Plot #8: **Transmitter Antenna power Conducted Emissions**
764 MHz, 12.5 kHz Channel Spacing, Power Output: 14.4 dBm
Modulation: FM modulation with an external 9600 b/s random data source.



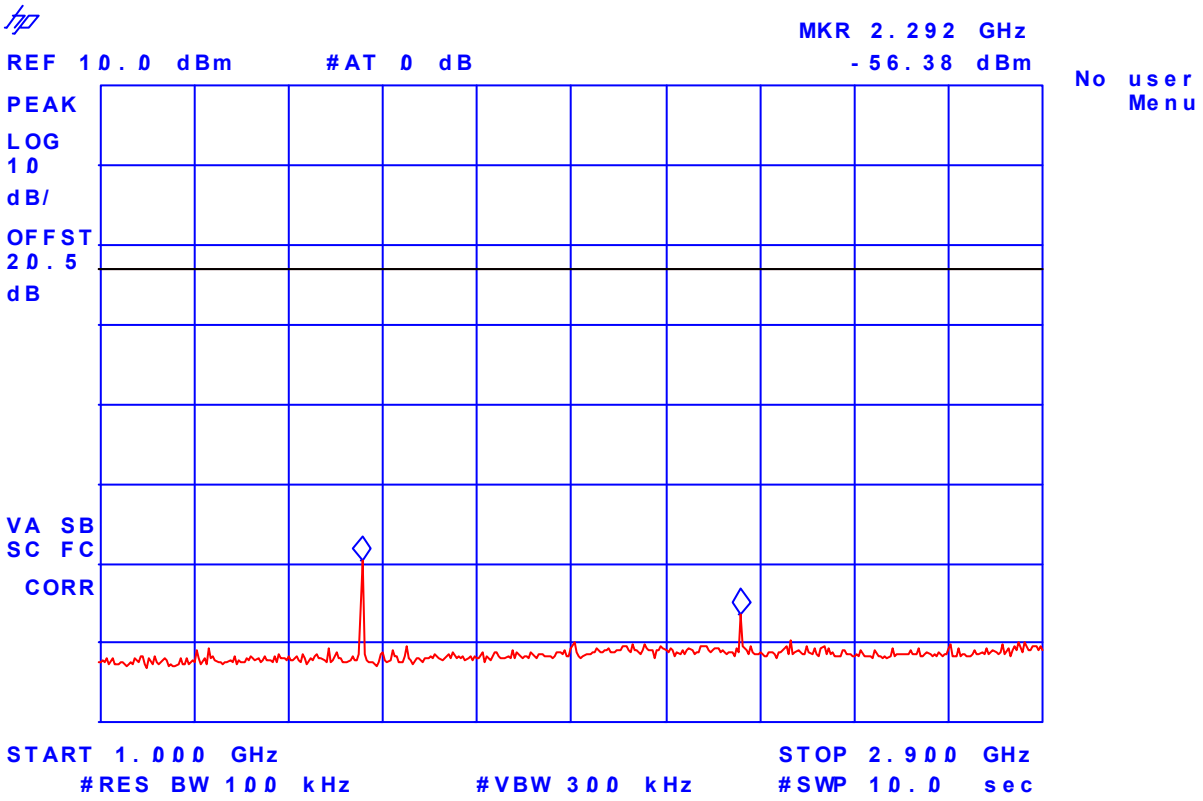
Plot #9: **Transmitter Antenna power Conducted Emissions**
764 MHz, 12.5 kHz Channel Spacing, Power Output: 14.4 dBm
Modulation: FM modulation with an external 9600 b/s random data source.



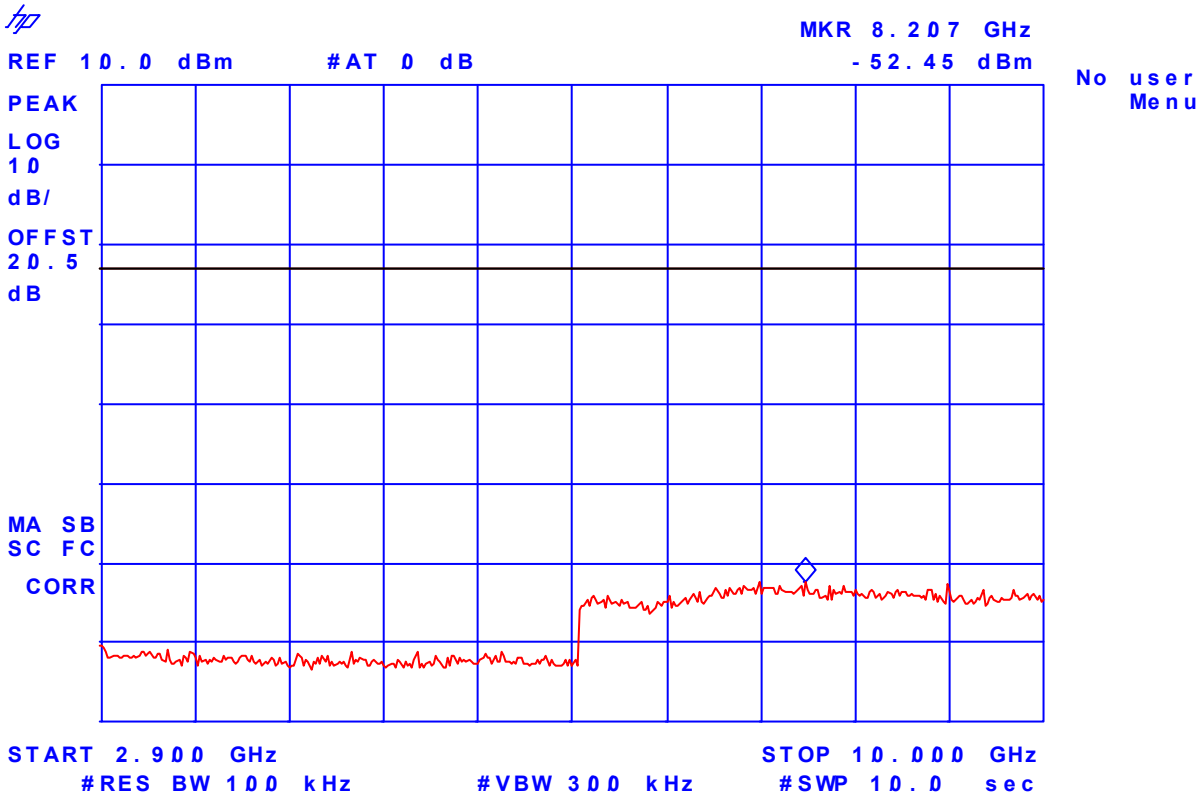
Plot #10: **Transmitter Antenna power Conducted Emissions**
764 MHz, 12.5 kHz Channel Spacing, Power Output: 40.28 dBm
Modulation: FM modulation with an external 9600 b/s random data source.



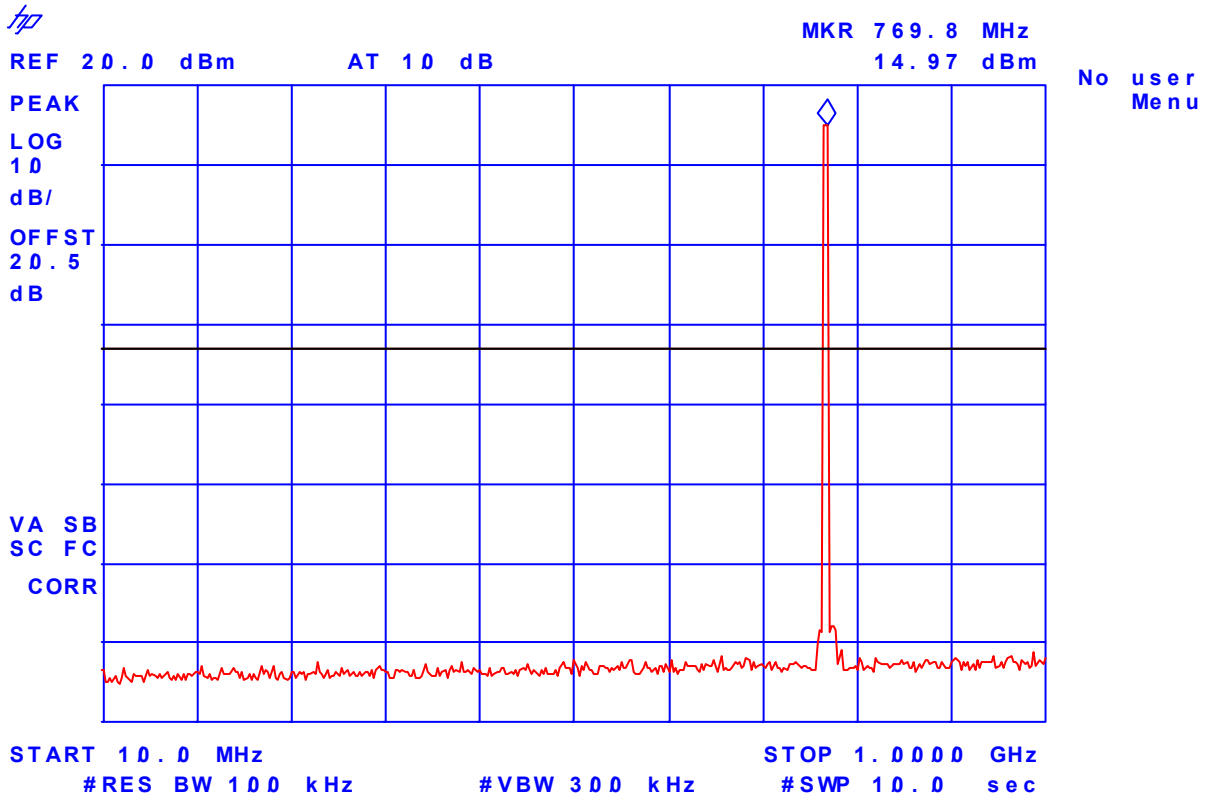
Plot #11: **Transmitter Antenna power Conducted Emissions**
764 MHz, 12.5 kHz Channel Spacing, Power Output: 40.28 dBm
Modulation: FM modulation with an external 9600 b/s random data source.
(1) 1527 MHz, -49.73 dBm
(2) 2292 MHz, -56.38 dBm



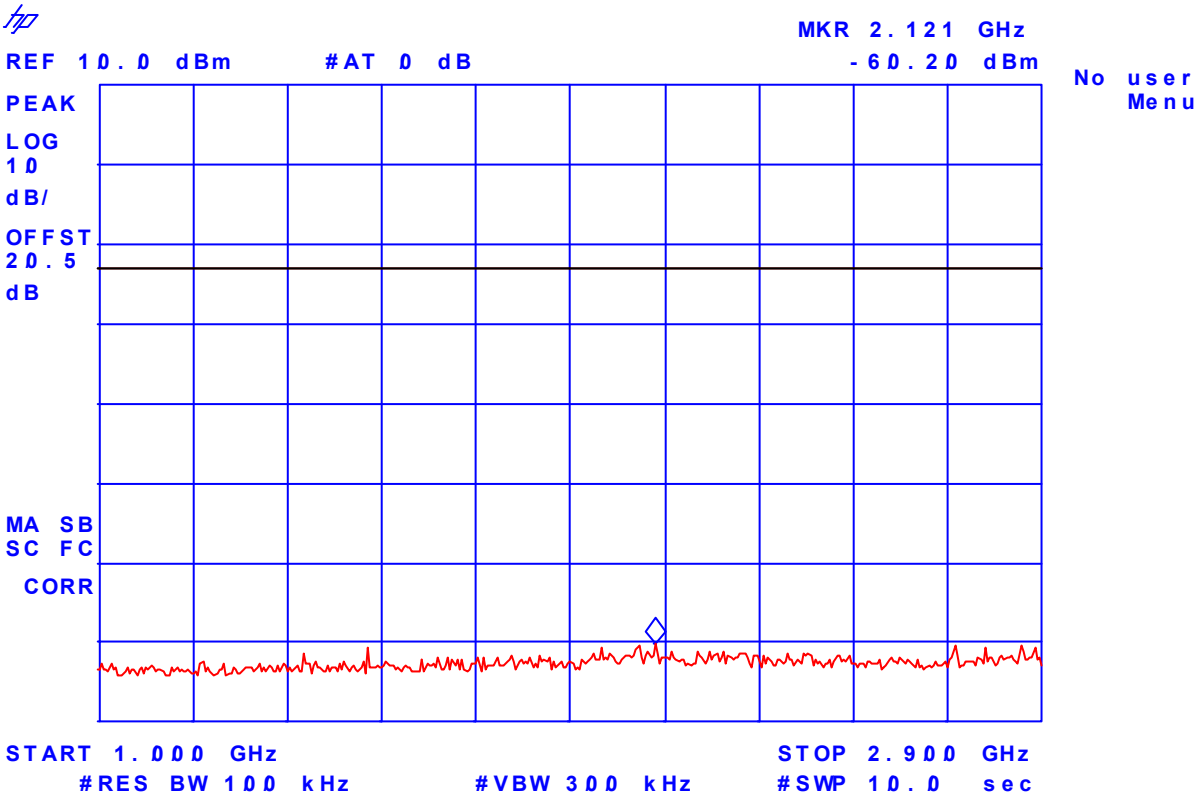
Plot #12: **Transmitter Antenna power Conducted Emissions**
764 MHz, 12.5 kHz Channel Spacing, Power Output: 40.28 dBm
Modulation: FM modulation with an external 9600 b/s random data source.



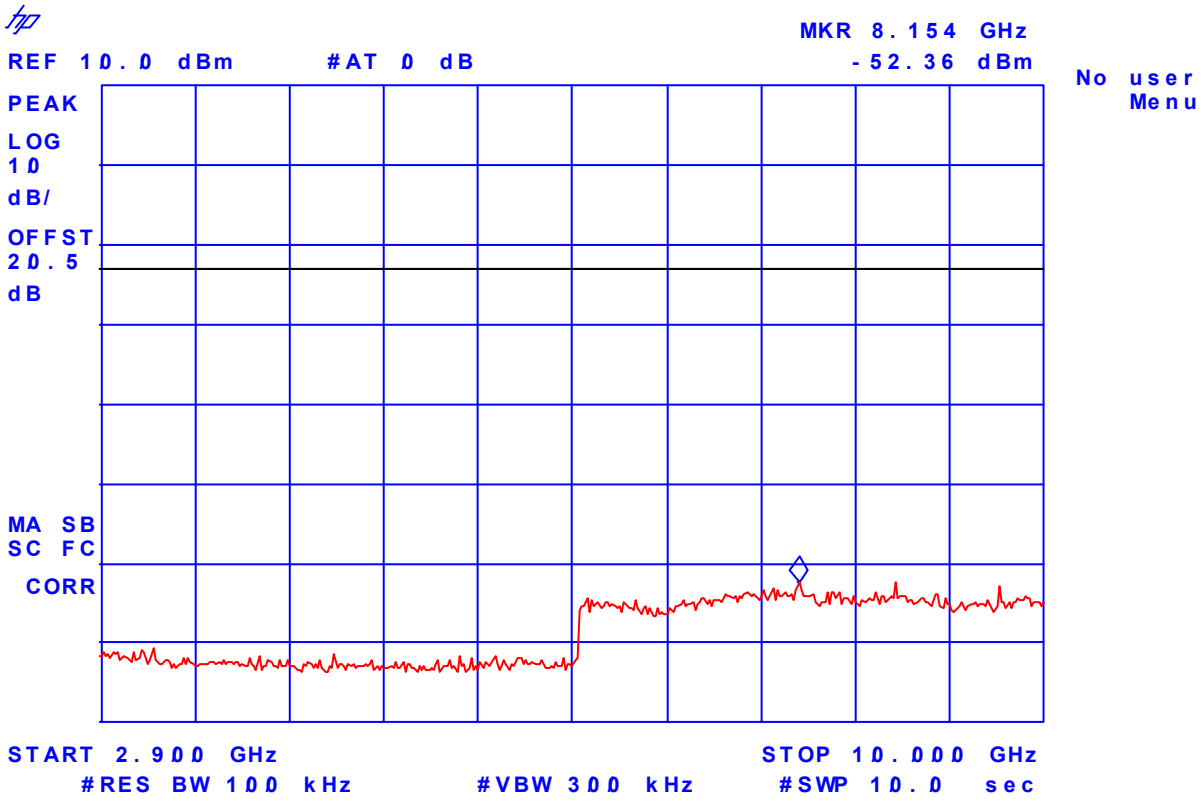
Plot #13: **Transmitter Antenna power Conducted Emissions**
770 MHz, 12.5 kHz Channel Spacing, Power Output: 15.1 dBm
Modulation: FM modulation with an external 9600 b/s random data source.



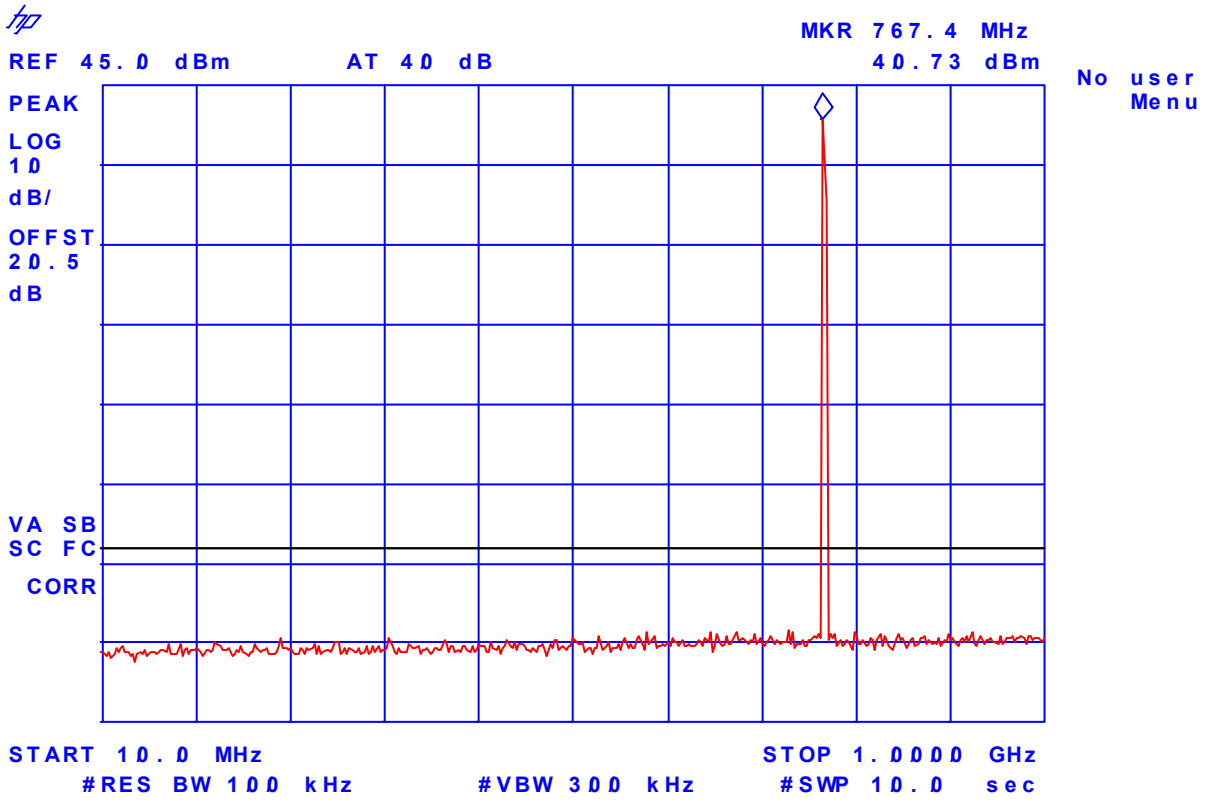
Plot #14: **Transmitter Antenna power Conducted Emissions**
770 MHz, 12.5 kHz Channel Spacing, Power Output: 15.1 dBm
Modulation: FM modulation with an external 9600 b/s random data source.



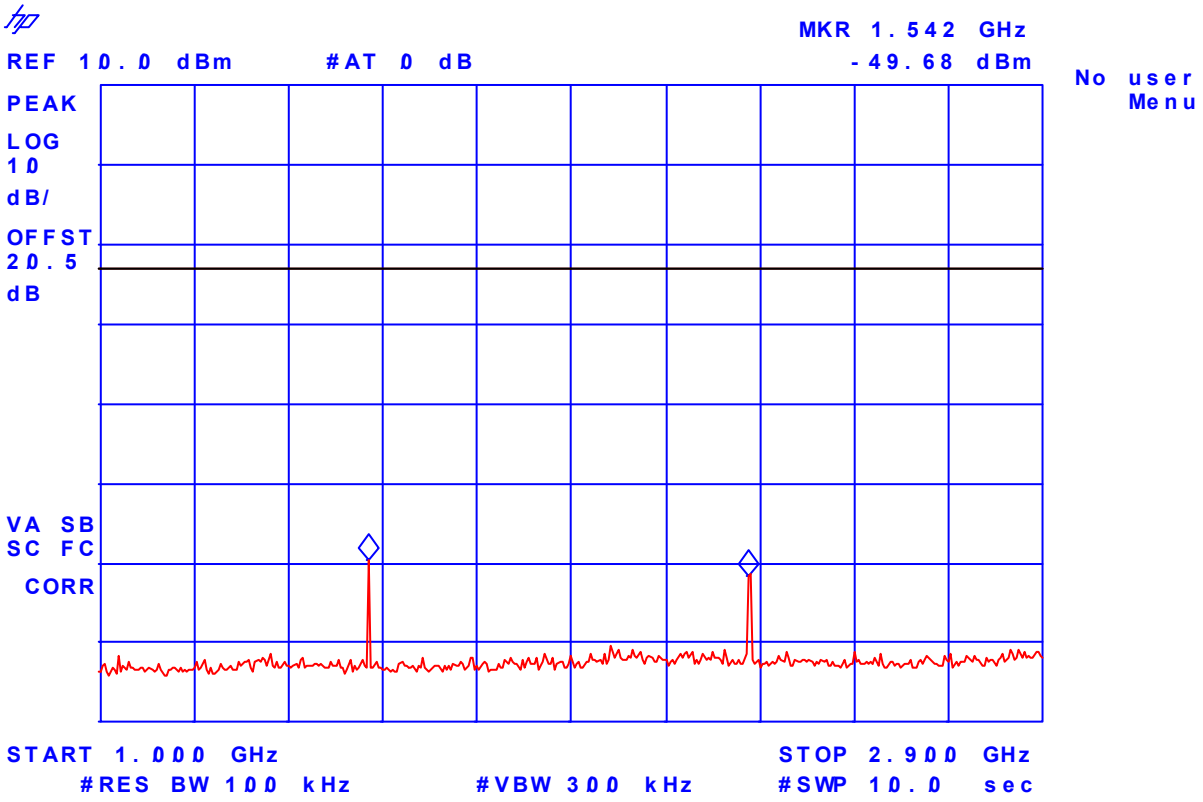
Plot #15: **Transmitter Antenna power Conducted Emissions**
770 MHz, 12.5 kHz Channel Spacing, Power Output: 15.1 dBm
Modulation: FM modulation with an external 9600 b/s random data source.



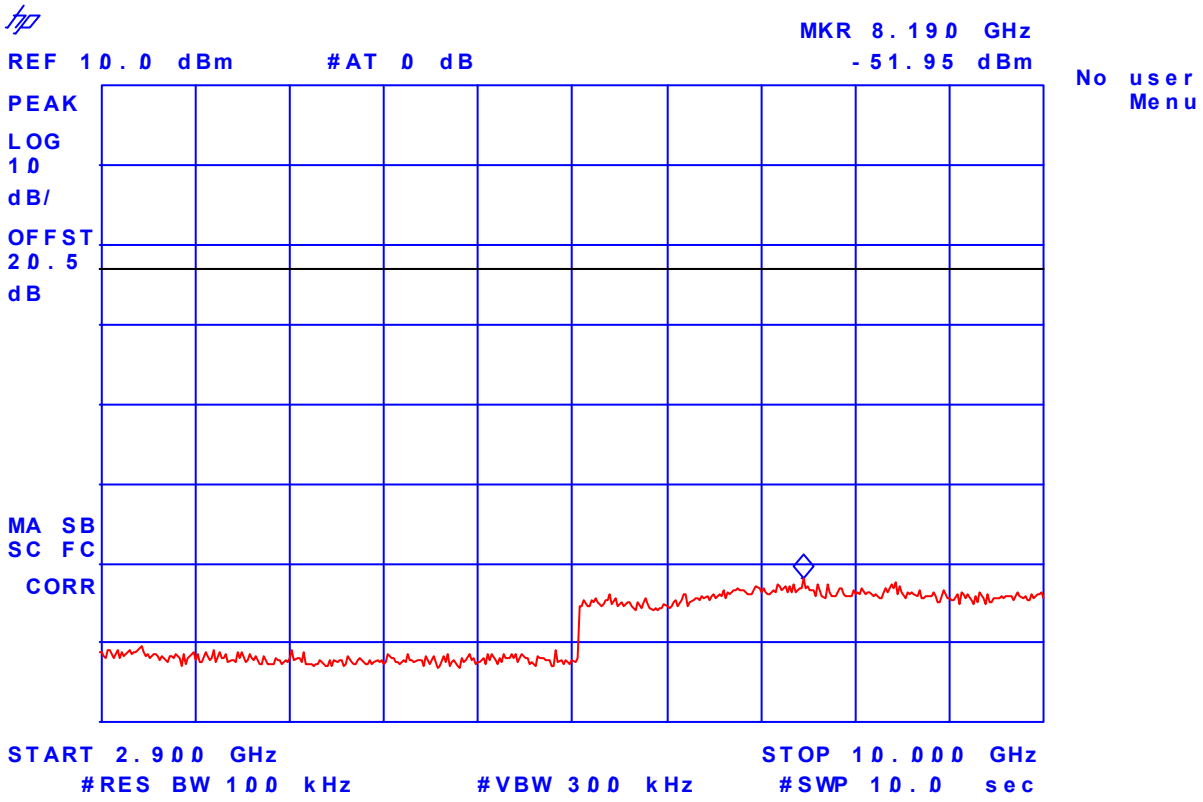
Plot #16: **Transmitter Antenna power Conducted Emissions**
770 MHz, 12.5 kHz Channel Spacing, Power Output: 40.72 dBm
Modulation: FM modulation with an external 9600 b/s random data source.



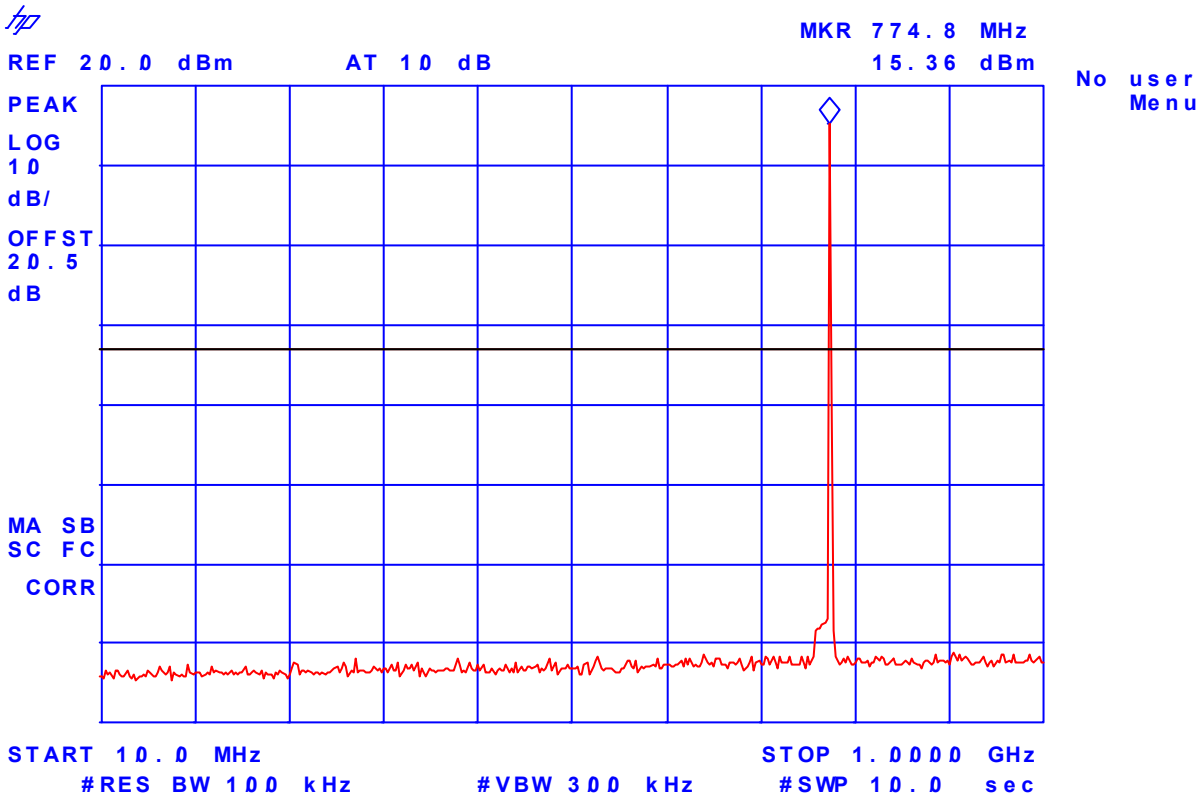
Plot #17: **Transmitter Antenna power Conducted Emissions**
770 MHz, 12.5 kHz Channel Spacing, Power Output: 40.72 dBm
Modulation: FM modulation with an external 9600 b/s random data source.
Test Configuration: Transmitter Antenna Power Conducted Emissions
(3) 1542 MHz, -49.68 dBm
(4) 2306 MHz, -51.62 dBm



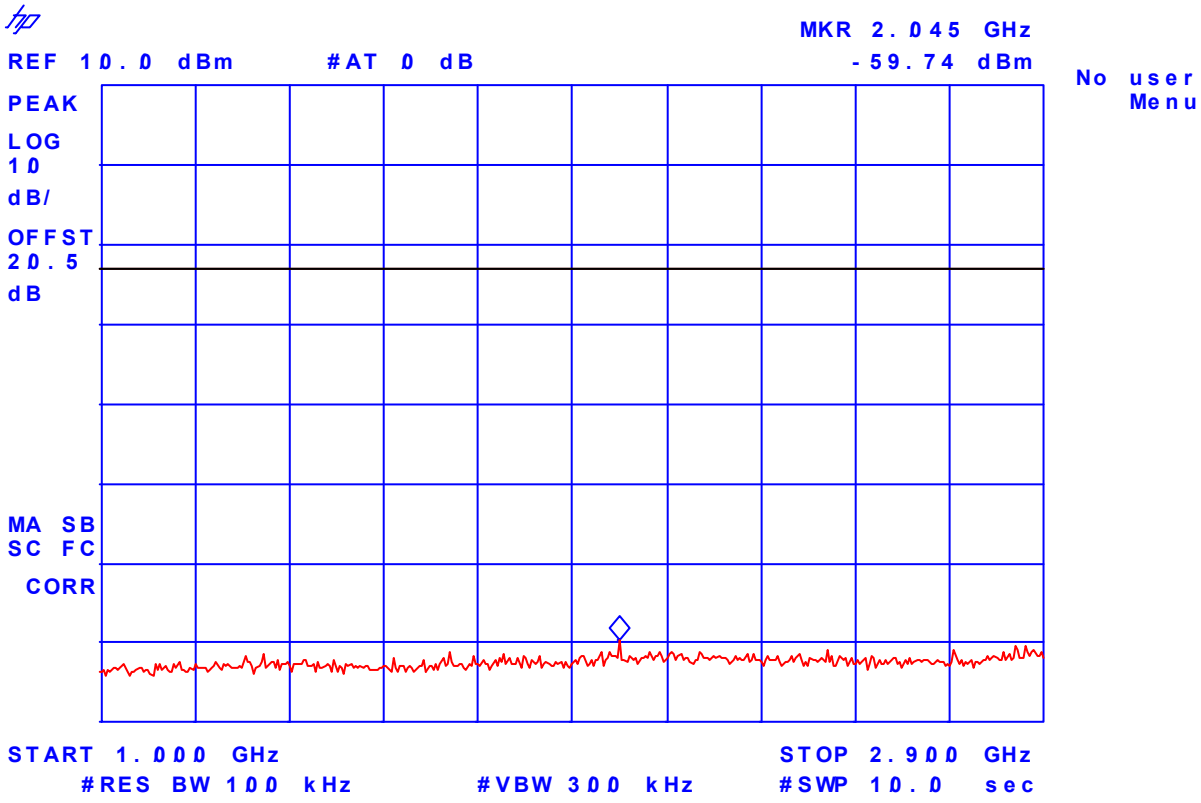
Plot #18: **Transmitter Antenna power Conducted Emissions**
770 MHz, 12.5 kHz Channel Spacing, Power Output: 40.72 dBm
Modulation: FM modulation with an external 9600 b/s random data source.



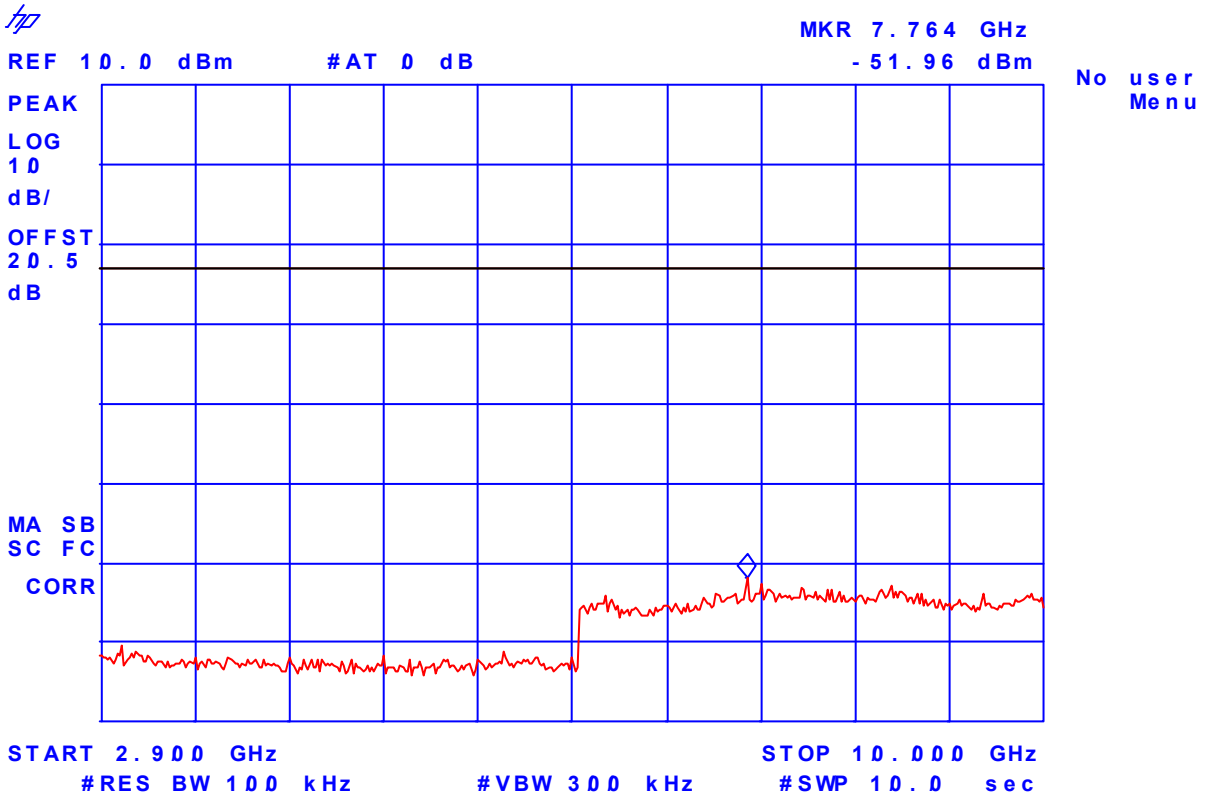
Plot #19: **Transmitter Antenna power Conducted Emissions**
776 MHz, 12.5 kHz Channel Spacing, Power Output: 15.4 dBm
Modulation: FM modulation with an external 9600 b/s random data source.



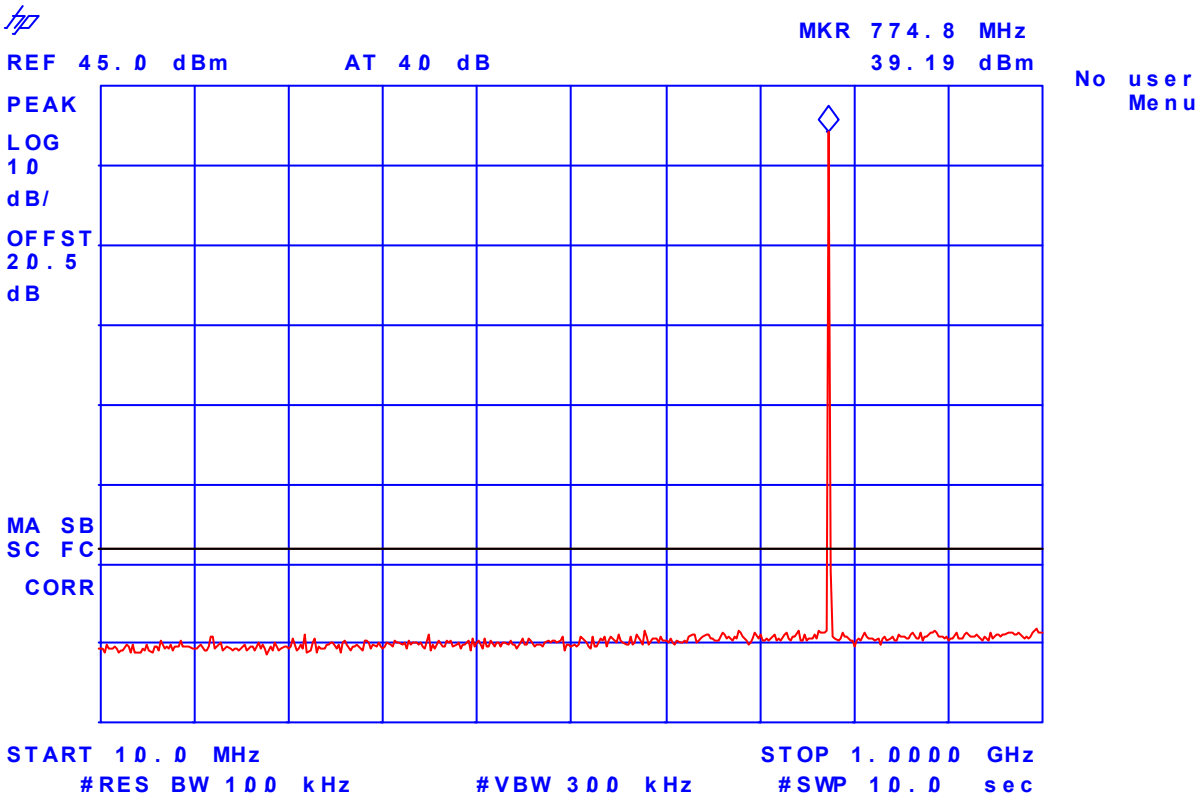
Plot #20: **Transmitter Antenna power Conducted Emissions**
776 MHz, 12.5 kHz Channel Spacing, Power Output: 15.4 dBm
Modulation: FM modulation with an external 9600 b/s random data source.



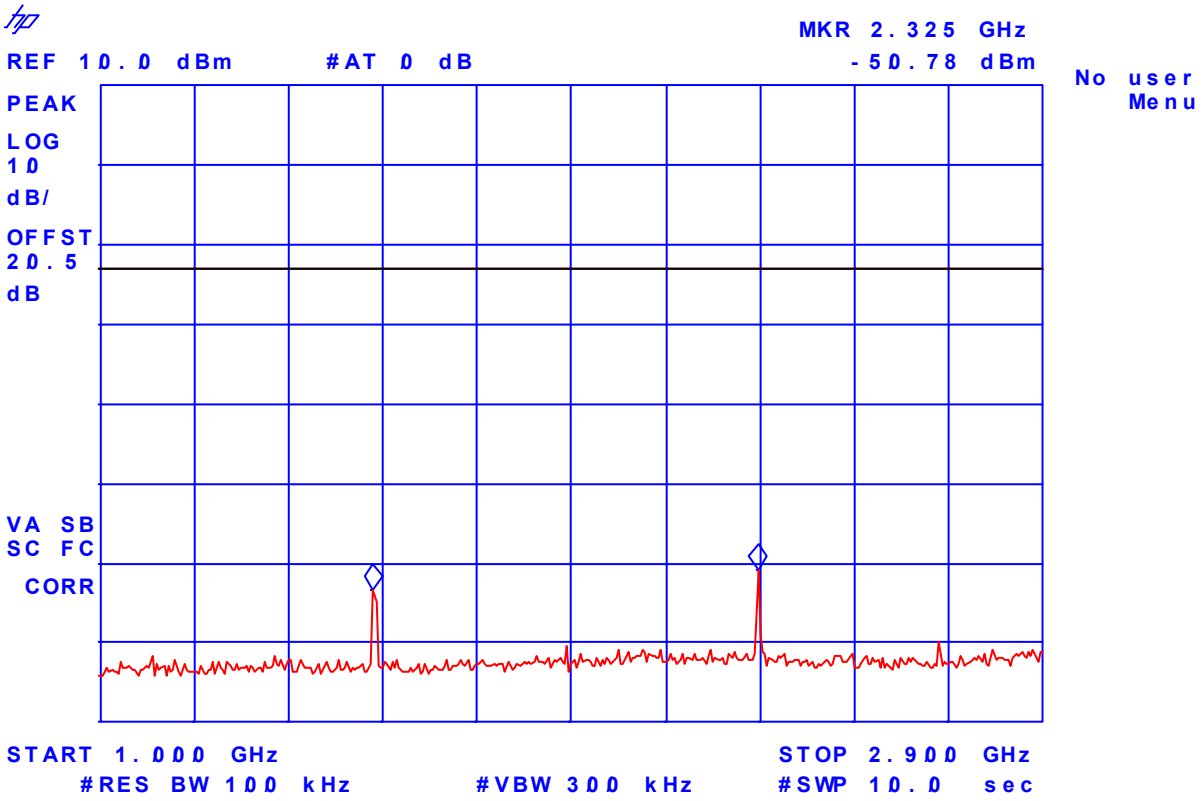
Plot #21: **Transmitter Antenna power Conducted Emissions**
776 MHz, 12.5 kHz Channel Spacing, Power Output: 15.4 dBm
Modulation: FM modulation with an external 9600 b/s random data source.



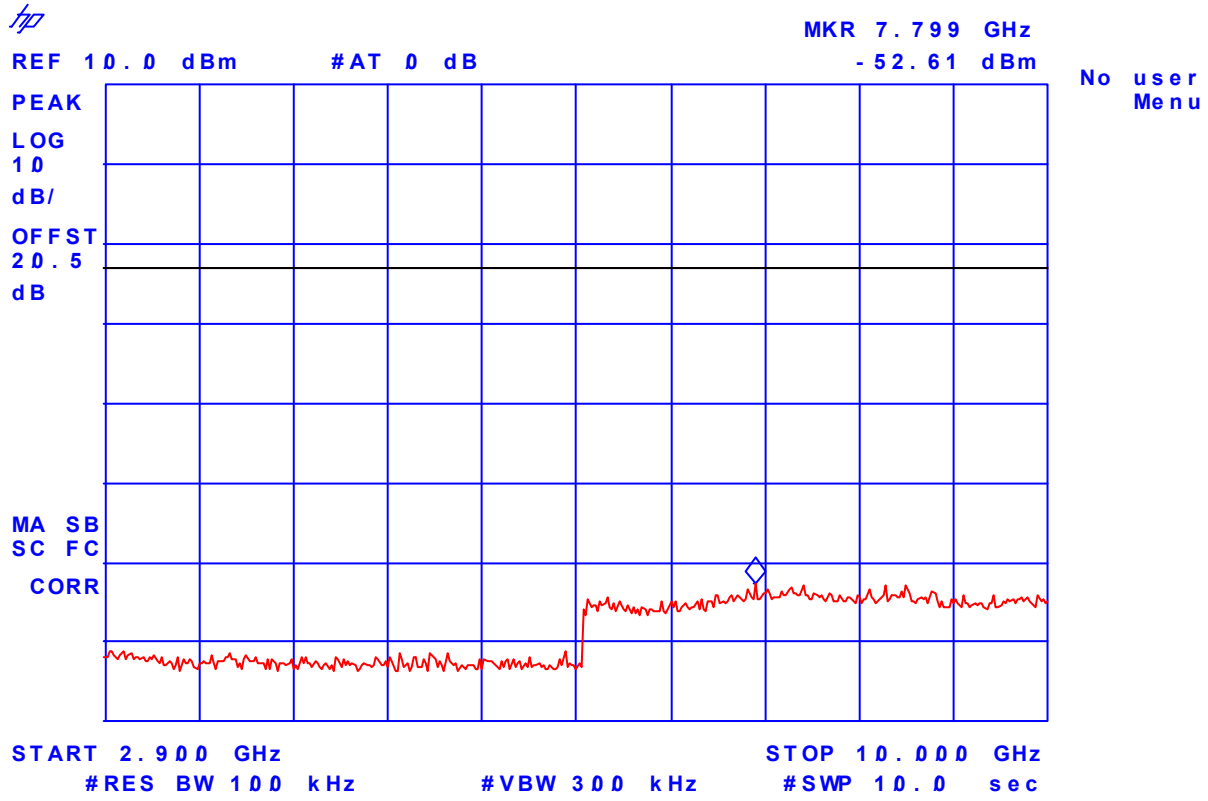
Plot #22: **Transmitter Antenna power Conducted Emissions**
776 MHz, 12.5 kHz Channel Spacing, Power Output: 40.76 dBm
Modulation: FM modulation with an external 9600 b/s random data source.



Plot #23: **Transmitter Antenna power Conducted Emissions**
776 MHz, 12.5 kHz Channel Spacing, Power Output: 40.76 dBm
Modulation: FM modulation with an external 9600 b/s random data source.
(5) 1551 MHz, -53.29 dBm
(6) 2325 MHz, -50.78 dBm



Plot #24: **Transmitter Antenna power Conducted Emissions**
776 MHz, 12.5 kHz Channel Spacing, Power Output: 40.76 dBm
Modulation: FM modulation with an external 9600 b/s random data source.



6.12. TRANSMITTER SPURIOUS/HARMONIC RADIATED EMISSIONS @ FCC 90.543(C)&(E)

6.12.1. Limits

Out-of-band emission limit. On any frequency outside of the frequency ranges covered by the ACCP tables in this section, the power of any emission must be reduced below the unmodulated carrier power (P) by at least 43 + 10 log (P) dB .

90.543(e) - For operations in the 764 to 776 MHz and 794 to 806 MHz bands, all emissions including harmonics in the band 1559-1610 MHz shall be limited to -70 dBW/MHz equivalent isotropically radiated power (EIRP)for wideband signals, and -80 dBW EIRP for discrete emissions of less than 700 Hz bandwidth. For the purpose of equipment authorization, a transmitter shall be tested with an antenna that is representative of the type that will be used with the equipment in normal operation.

6.12.2. Method of Measurements

The spurious/harmonic ERP measurements are using substitution method specified in Exhibit 8, § 8.2 of this report and its value in dBc is calculated as follows:

(1) If the transmitter's antenna is an integral part of the EUT, the ERP is measured using substitution method.
(2) If the transmitter's antenna is non-integral and diverse, the lowest ERP of the carrier with 0 dBi antenna gain is used for calculation of the spurious/harmonic emissions in dBc:
Lowest ERP of the carrier = EIRP – 2.15 dB = Pc + G - 2.15 dB = xxx dBm (conducted) + 0 dBi – 2.15 dB
(3) Spurious /harmonic emissions levels expressed in dBc (dB below carrier) are as follows:

ERP of spurious/harmonic (dBc) = ERP of carrier (dBm) – ERP of spurious/harmonic emission (dBm)

6.12.3. Test Equipment List

Test Instruments	Manufacturer	Model No.	Serial No.	Frequency Range
Spectrum Analyzer/ EMI Receiver	Hewlett Packard	HP 8546A	…	9 kHz to 5.6 GHz with built-in 30 dB Gain Pre-selector, QP, Average & Peak Detectors.
RF Amplifier	Com-Power	PA-102		1 MHz to 1 GHz, 30 dB gain nomimal
Microwave Amplifier	Hewlett Packard	HP 83017A		1 GHz to 26.5 GHz, 30 dB nominal
Biconilog Antenna	EMCO	3142	10005	30 MHz to 2 GHz
Dipole Antenna	EMCO	3121C	8907-434	30 GHz – 1 GHz
Dipole Antenna	EMCO	3121C	8907-440	30 GHz – 1 GHz
Horn Antenna	EMCO	3155	9701-5061	1 GHz – 18 GHz
Horn Antenna	EMCO	3155	9911-5955	1 GHz – 18 GHz
RF Signal Generator	Hewlett Packard	HP 83752B	3610A00457	0.01 – 20 GHz

6.12.4. Test Setup

Please refer to Photos # 1 to 2 in Annex 1 for detailed of test setup.

6.12.5. Test Data

Remarks:

- *FCC 90.543(e) is not applicable for this device which transmit signals which are not wideband or discrete signals.*
- The rf spurious/harmonic emission characteristics between 2 different channel spacing operations are identical. Therefore, the following radiated emissions were performed on the radio set with 12.5 kHz Channel Spacing operation,.
- The Radiated emissions were performed at 3 meters distance. At its maximum power for worst case.
- Same results ere found fro FM Data and Voice modulations.

6.12.5.1. Lowest Frequency (764 MHz)

Fundamental Frequency: 764 MHz
RF Output Power: Minimum: 14.4 dBm (conducted)
Modulation: Frequency modulated with 9600 b/s data

FREQUENCY (MHz)	E-FIELD @3m (dBuV/m)	ERP measured by Substitution Method (dBm)	(dBc)	EMI DETECTOR (Peak/QP)	ANTENNA POLARIZATION (H/V)	LIMIT (dBc)	MARGIN (dB)	PASS/ FAIL
**	**	**	--	PEAK	V	-27.4	--	PASS

The emissions were scanned from 10 MHz to 10 GHz and all emissions were more than 20 dB below the FCC limit.

Fundamental Frequency: 764 MHz
RF Output Power: Maximum: 40.3 dBm (conducted)
Modulation: Frequency modulated with 9600 b/s data

FREQUENCY (MHz)	E-FIELD @3m (dBuV/m)	ERP measured by Substitution Method (dBm)	(dBc)	EMI DETECTOR (Peak/QP)	ANTENNA POLARIZATION (H/V)	LIMIT (dBc)	MARGIN (dB)	PASS/ FAIL
**	**	**	--	PEAK	V	-53.3	--	PASS

The emissions were scanned from 10 MHz to 10 GHz and all emissions were more than 20 dB below the FCC limit.

6.12.5.2. Middle Frequency (770 MHz)

Fundamental Frequency: 770 MHz
RF Output Power: Minimum: 15.1 dBm (conducted)
Modulation: Frequency modulated with 9600 b/s data

FREQUENCY (MHz)	E-FIELD @3m (dBuV/m)	ERP measured by Substitution Method (dBm)	(dBc)	EMI DETECTOR (Peak/QP)	ANTENNA POLARIZATION (H/V)	LIMIT (dBc)	MARGIN (dB)	PASS/ FAIL
**	**	**	--	PEAK	V	-28.1	--	PASS

The emissions were scanned from 10 MHz to 10 GHz and all emissions were more than 20 dB below the FCC limit.

Fundamental Frequency: 770 MHz
RF Output Power: Maximum: 40.8 dBm (conducted)
Modulation: Frequency modulated with 9600 b/s data

FREQUENCY (MHz)	E-FIELD @3m (dBuV/m)	ERP measured by Substitution Method (dBm)	(dBc)	EMI DETECTOR (Peak/QP)	ANTENNA POLARIZATION (H/V)	LIMIT (dBc)	MARGIN (dB)	PASS/ FAIL
**	**	**	--	PEAK	V	-53.8	--	PASS

The emissions were scanned from 10 MHz to 10 GHz and all emissions were more than 20 dB below the FCC limit.

6.12.5.3. Highest Frequency (776 MHz)

Fundamental Frequency: 776 MHz
RF Output Power: Minimum: 15.4 dBm (conducted)
Modulation: Frequency modulated with 9600 b/s data

FREQUENCY (MHz)	E-FIELD @3m (dBuV/m)	ERP measured by Substitution Method (dBm)	(dBc)	EMI DETECTOR (Peak/QP)	ANTENNA POLARIZATION (H/V)	LIMIT (dBc)	MARGIN (dB)	PASS/ FAIL
**	**	**	--	PEAK	V	-28.4	--	PASS

The emissions were scanned from 10 MHz to 10 GHz and all emissions were more than 20 dB below the FCC limit.

Fundamental Frequency: 776 MHz
RF Output Power: Maximum: 40.8 dBm (conducted)
Modulation: Frequency modulated with 9600 b/s data

FREQUENCY (MHz)	E-FIELD @3m (dBuV/m)	ERP measured by Substitution Method (dBm)	(dBc)	EMI DETECTOR (Peak/QP)	ANTENNA POLARIZATION (H/V)	LIMIT (dBc)	MARGIN (dB)	PASS/ FAIL
**	**	**	--	PEAK	V	-53.3	--	PASS

The emissions were scanned from 10 MHz to 10 GHz and all emissions were more than 20 dB below the FCC limit.

EXHIBIT 7. MEASUREMENT UNCERTAINTY

The measurement uncertainties stated were calculated in accordance with the requirements of NIST Technical Note 1297 and NIS 81 (1994)

7.1. RADIATED EMISSION MEASUREMENT UNCERTAINTY

CONTRIBUTION (Radiated Emissions)	PROBABILITY DISTRIBUTION	UNCERTAINTY (± dB)	
		3 m	10 m
Antenna Factor Calibration	Normal (k=2)	±1.0	±1.0
Cable Loss Calibration	Normal (k=2)	±0.3	±0.5
EMI Receiver specification	Rectangular	±1.5	±1.5
Antenna Directivit	Rectangular	+0.5	+0.5
Antenna factor variation with height	Rectangular	±2.0	±0.5
Antenna phase center variation	Rectangular	0.0	±0.2
Antenna factor frequency interpolation	Rectangular	±0.25	±0.25
Measurement distance variation	Rectangular	±0.6	±0.4
Site imperfections	Rectangular	±2.0	±2.0
Mismatch: Receiver VRC $\Gamma_1 = 0.2$ Antenna VRC $\Gamma_R = 0.67$(Bi) 0.3 (Lp) Uncertainty limits 20Log(1±$\Gamma_1\Gamma_R$)	U-Shaped	+1.1 -1.25	±0.5
System repeatability	Std. Deviation	±0.5	±0.5
Repeatability of EUT		-	-
Combined standard uncertainty	Normal	+2.19 / -2.21	+1.74 / -1.72
Expanded uncertainty U	Normal (k=2)	+4.38 / -4.42	+3.48 / -3.44

Calculation for maximum uncertainty when 3m biconical antenna including a factor of k=2 is used:

$U = 2u_c(y) = 2x(+2.19) = +4.38$ dB And $U = 2u_c(y) = 2x(-2.21) = -4.42$ dB

EXHIBIT 8. MEASUREMENT METHODS

8.1. CONDUCTED POWER MEASUREMENTS

- The following shall be applied to the combination(s) of the radio device and its intended antenna(e).
- I f the RF level is user adjustable, all measurements shall be made with the highest power level available to the user for that combination.
- The following method of measurement shall apply to both conducted and radiated measurements.
- The radiated measurements are performed at the Ultratech Calibrated Open Field Test Site.
- The measurement shall be performed using normal operation of the equipment with modulation.

Test procedure shall be as follows:

Step 1: Duty Cycle measurements if the transmitter's transmission is transient

- Using a EMI Receiver with the frequency span set to 0 Hz and the sweep time set at a suitable value to capture the envelope peaks and the duty cycle of the transmitter output signal;
- The duty cycle of the transmitter, x = Tx on / (Tx on + Tx off) with 0<x<1, is measure and recorded in the test report. For the purpose of testing, the equipment shall be operated with a duty cycle that is equal or more than 0.1.

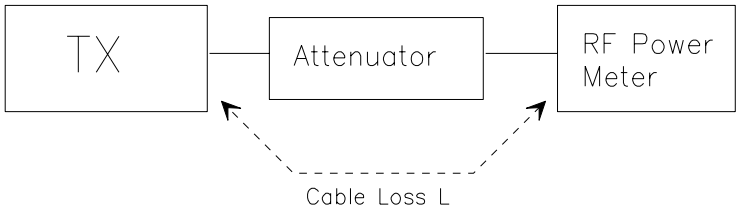
Step 2: Calculation of Average EIRP. See Figure 1

- The average output power of the transmitter shall be determined using a wideband, calibrated RF average power meter with the power sensor with an integration period that exceeds the repetition period of the transmitter by a factor 5 or more. The observed value shall be recorded as "A" (in dBm);
- The e.i.r.p. shall be calculated from the above measured power output "A", the observed duty cycle x, and the applicable antenna assembly gain "G" in dBi, according to the formula:

EIRP = A + G + 10log(1/x)

{ X = 1 for continuous transmission => 10log(1/x) = 0 dB }

Figure 1.



- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*

8.2. RADIATED POWER MEASUREMENTS (ERP & EIRP) USING SUBSTITUTION METHOD

8.2.1. Maximizing RF Emission Level (E-Field)

(a) The measurements was performed with full rf output power and modulation.
(b) Test was performed at listed 3m open area test site (listed with FCC, IC, ITI, NVLAP, ACA & VCCI).
(c) The transmitter under test was placed at the specified height on a non-conducting turntable (80 cm height)
(d) The BICONILOG antenna (20 MHz to 1 GHz) or HORN antenna (1 GHz to 18 GHz) was used for measuring.
(e) Load an appropriate correction factors file in EMI Receiver for correcting the field strength reading level

Total Correction Factor recorded in the EMI Receiver = Cable Loss + Antenna Factor
E (dBuV/m) = Reading (dBuV) + Total Correction Factor (dB/m)

(f) Set the EMI Receiver and #2 as follows:

Center Frequency:	test frequency
Resolution BW:	100 kHz
Video BW:	same
Detector Mode:	positive
Average:	off
Span:	3 x the signal bandwidth

(g) The test antenna was lowered or raised from 1 to 4 meters until the maximum signal level was detected.
(h) The transmitter was rotated through 360^{o} about a vertical axis until a higher maximum signal was received.
(i) The test antenna was lowered or raised again from 1 to 4 meters until a maximum was obtained. This level was recorded.
(j) The recorded reading was corrected to the true field strength level by adding the antenna factor, cable loss and subtracting the pre-amplifier gain.
(k) The above steps were repeated with both transmitters' antenna and test receiving antenna placed in vertical and horizontal polarization. Both readings with the antennas placed in vertical and horizontal polarization shall be recorded.
(l) Repeat for all different test signal frequencies

8.2.2. Measuring the EIRP of Spurious/Harmonic Emissions using Substitution Method

(a) Set the EMI Receiver (for measuring E-Field) and Receiver #2 (for measuring EIRP) as follows:

Center Frequency:	equal to the signal source
Resolution BW:	10 kHz
Video BW:	same
Detector Mode:	positive
Average:	off
Span:	3 x the signal bandwidth

(b) Load an appropriate correction factors file in EMI Receiver for correcting the field strength reading level

Total Correction Factor recorded in the EMI Receiver = Cable Loss + Antenna Factor
E (dBuV/m) = Reading (dBuV) + Total Correction Factor (dB/m)

(c) Select the frequency and E-field levels obtained in the Section 8.2.1 for ERP/EIRP measurements.
(d) Substitute the EUT by a signal generator and one of the following transmitting antenna (substitution antenna):
- DIPOLE antenna for frequency from 30-1000 MHz or
- HORN antenna for frequency above 1 GHz }.

(e) Mount the transmitting antenna at 1.5 meter high from the ground plane.
(f) Use one of the following antenna as a receiving antenna:
- DIPOLE antenna for frequency from 30-1000 MHz or
- HORN antenna for frequency above 1 GHz }.

(g) If the DIPOLE antenna is used, tune it's elements to the frequency as specified in the calibration manual.
(h) Adjust both transmitting and receiving antenna in a VERTICAL polarization.
(i) Tune the EMI Receivers to the test frequency.
(j) Lower or raise the test antenna from 1 to 4 meters until the maximum signal level was detected.
(k) The transmitter was rotated through 360° about a vertical axis until a higher maximum signal was received.
(l) Lower or raise the test antenna from 1 to 4 meters until the maximum signal level was detected.
(m) Adjust input signal to the substitution antenna until an equal or a known related level to that detected from the transmitter was obtained in the test receiver.
(n) Record the power level read from the Average Power Meter and calculate the ERP/EIRP as follows:

P = P1 - L1 = (P2 + L2) – L1 = P3 + A + L2 - L1
EIRP = P + G1 = P3 + L2 - L1 + A + G1
ERP = EIRP – 2.15 dB
Total Correction factor in EMI Receiver # 2 = L2 – L1 + G1

Where: P: Actual RF Power fed into the substitution antenna port after corrected.
P1: Power output from the signal generator
P2: Power measured at attenuator A input
P3: Power reading on the Average Power Meter
EIRP: EIRP after correction
ERP: ERP after correction

(o) Adjust both transmitting and receiving antenna in a HORIZONTAL polarization, then repeat step (k) to (o)
(p) Repeat step (d) to (o) for different test frequency
(q) Repeat steps (c) to (j) with the substitution antenna oriented in horizontal polarization.
(r) Actual gain of the EUT's antenna is the difference of the measured EIRP and measured RF power at the RF port. Correct the antenna gain if necessary.:

Figure 2

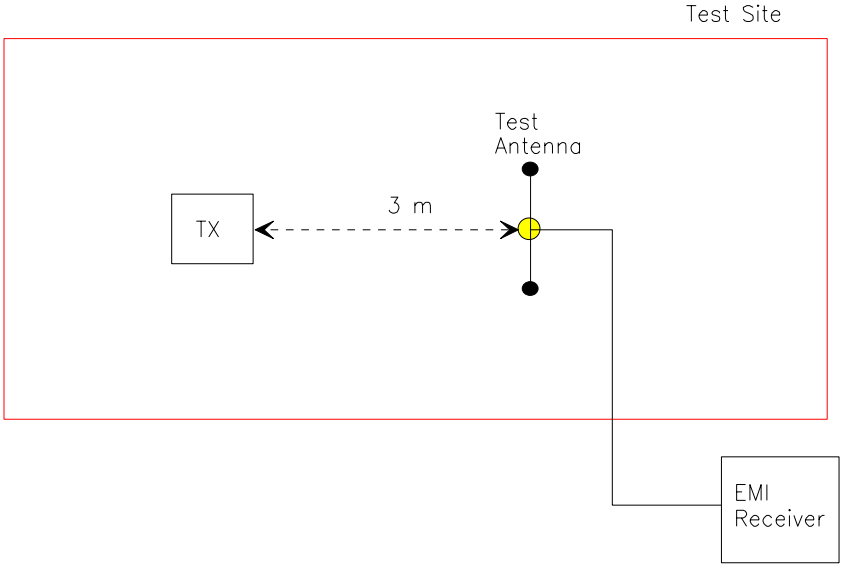
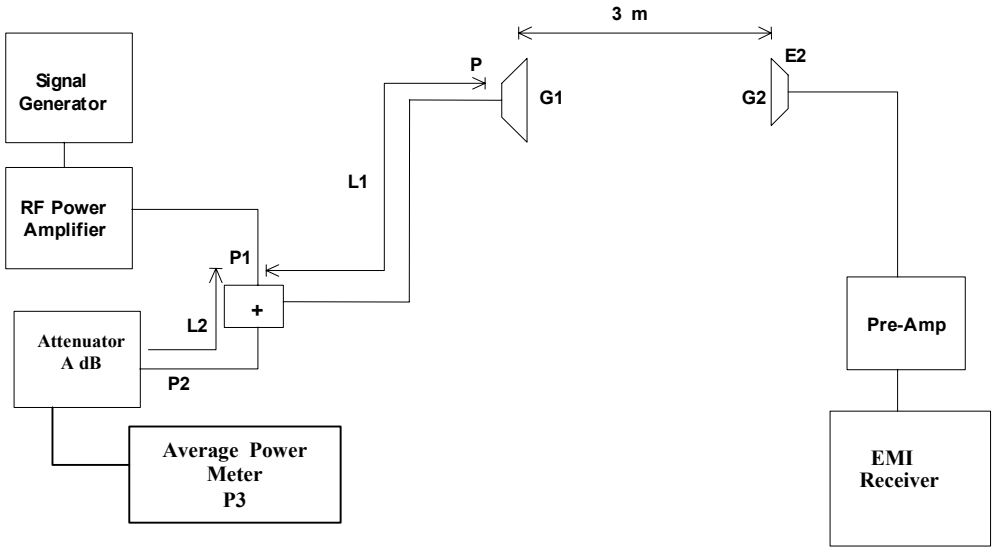


Figure 3



8.3. FREQUENCY STABILITY

Refer to FCC @ 2.1055.

(a) The frequency stability shall be measured with variation of ambient temperature as follows: From -30 to +50 centigrade except that specified in subparagraph (2) & (3) of this paragraph.

(b) Frequency measurements shall be made at extremes of the specified temperature range and at intervals of not more than 10 centigrade through the range. A period of time sufficient to stabilize all of the components of the oscillator circuit at each temperature level shall be allowed prior to frequency measurement. The short-term transient effects on the frequency of the transmitter due to keying (except for broadcast transmitters) and any heating element cycling normally occurring at each ambient temperature level also shall be shown. Only the portion or portions of the transmitter containing the frequency determining and stability circuitry need be subjected to the temperature variation test.

(d) The frequency stability supply shall be measured with variation of primary supply voltage as follows:

(1) Vary primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment.

(2) For hand carried, battery powered equipment, reduce primary supply voltage to the battery operating end point which shall be specified by the manufacturer.

(3) The supply voltage shall be measured at the input to the cable normally provide with the equipment, or at the power supply terminals if cables are not normally provided. Effects on frequency of transmitter keying (except for broadcast transmitters) and any heating element cycling at the nominal supply voltage and at each extreme also shall be shown.

(e) When deemed necessary, the Commission may require tests of frequency stability under conditions in addition to those specifically set out in paragraphs (a), (b), (c) and (d) of this section. (For example, measurements showing the effect of proximity to large metal objects, or of various types of antennas, may be required for portable equipment).

8.4. SPURIOUS EMISSIONS (CONDUCTED)

With transmitter modulation characteristics described in Out-of-Band Emissions measurements @ 2.1049, the transmitter spurious and harmonic emissions were scanned. The spurious and harmonic emissions were measured with the EMI Receiver controls set as RBW = 30 kHz minimum , VBW $\geq$ RBW and SWEEP TIME = AUTO). The transmitter was operated at a full rated power output, and modulated as follows:

FCC CFR 47, Para. 2.1057 - Frequency spectrum to be investigated:- The spectrum was investigated from the lowest radio generated in the equipment up to at least the 10^{th} harmonic of the carrier frequency or to the highest frequency practicable in the present state of the art of measuring techniques, whichever is lower. Particular attention should be paid to harmonics and subharmonics of the carrier frequency. Radiation at the frequencies of multiplier stages should be checked. The
amplitude of spurious emissions which are attenuated more than 20 dB below the permissible value need not be reported.

FCC CFR 47, Para. 2.1051 - Spurious Emissions at Antenna Terminal:- The radio frequency voltage or powers generated within the equipment and appearing on a spurious frequency shall be checked at the equipment output terminals when properly loaded with a suitable artificial antenna. Curves or equivalent data shall show the magnitude of the harmonic and other spurious emission that can be detected when the equipment is operated under the conditions specified in 2.1049 as appropriate. The magnitude of spurious emissions which are attenuated more than 20 dB below the permissible value need not be specified.