June 10, 2008

Ultratech Engineering Labs, Inc.
3000 Bristol Circle
Oakville, Ontario
L6H 6G4

Subject: **Type Acceptance Application under FCC 47 CFR, Part 2 & 90 - Non-Broadcast RF Bi-Directional Amplifier Operating in the Frequency Range 138 - 174 MHz.**

Applicant: **Comprod Communications**
Product: **VHF Signal Booster Class B**
Model: **08US1008**
FCC ID: **WDM-08US1008**

Dear Sir/Madam,

As appointed agent for **Comprod Communications**, We would like to submit FCC certification application of the above product. Please find report and application documents uploaded your E-filing site.

If you have any queries, please do not hesitate to contact us.

Yours truly,

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

TML/DH

Encl.

UltraTech
Group of Labs

FCC TCB & IC CB

Ultratech's Accreditations:

ANSI American National Standards Institute
0685

31040/SIT

C-1376

Industry Canada Industrie Canada
Approved Test Facility
46390-2049

NVLAP
200093-0

BSMI
SL2-IN-E-1119R

Korea RRL
2005-82 & 83

3000 Bristol Circle,
Oakville, Ontario,
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Tel.: (905) 829-1570
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Website: www.ultratech-labs.com
Email: vic@ultratech-labs.com

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June 10, 2008

Comprod Communications
3405 North Benzing Road
Orchard Park, NY 14127
USA

Attn.: **Mr. Jesse Roberts**

Subject: **Certification Testing in accordance with FCC 47 CFR, Part 2 & 90 - Non-Broadcast RF Bi-Directional Amplifier operating in the Frequency Range 138 - 174 MHz.**

Product: **VHF Signal Booster Class B**
Model: **08US1008**
FCC ID: **WDM-08US1008**

Dear Mr. Roberts,

The product sample has been tested in accordance with **FCC 47 CFR, Part 2 & 90 - Non-Broadcast RF Bi-Directional Amplifier operating in the Frequency Range 138 - 174 MHz,** and the results and observation were recorded in the engineering report, Our File No.: CMPR002_FCC90

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

VHF Signal Booster Class B
Model No.: 08US1008
FCC ID: WDM-08US1008

Applicant:

Comprod Communications
3405 North Benzing Road
Orchard Park, NY 14127
USA

Tested in Accordance With

Federal Communications Commission (FCC)
47 CFR, Part 2 & 90

UltraTech's File No.: CMPR002_FCC90

This Test report is Issued under the Authority of Tri M. Luu, Professional Engineer, Vice President of Engineering UltraTech Group of Labs Date: June 10, 2008	LICENSED PROFESSIONAL ENGINEER T.M. LUU PROVINCE OF ONTARIO
Report Prepared by: Dharmajit Solanki Issued Date: June 10, 2008	Tested by: Hung Trinh, EMI/RFI Technician Test Dates: May 19-25, 2008

- *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
Website: www.ultratech-labs.com, Email: vic@ultratech-labs.com, Email: tri@ultratech-labs.com

ANSI American National Standards Institute	FC	VCI	Industry Canada / Industrie Canada Approved Test Facility	NVLAP	BSMI	Korea MIC-RRL
0685	31040/SIT	C-1376	46390-2049	200093-0	SL2-IN-E-1119R	2005-82 & 83

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EXHIBIT 1. INTRODUCTION

1.1. SCOPE

Reference:	FCC Part 2 & 90
Title:	Telecommunication - Code of Federal Regulations, CFR 47, Part 2 & 90
Purpose of Test:	To gain FCC Certification Authorization for Radio Amplifier operating in the Frequency Range 138 - 174 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.

1.2. RELATED SUBMITTAL(S)/GRANT(S)

None

1.3. NORMATIVE REFERENCES

Publication	Year	Title
FCC CFR Parts 0-19, 80-End	2007	Code of Federal Regulations – Telecommunication
ANSI C63.4	2003	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 16-1-1	2004	Specification for Radio Disturbance and Immunity measuring apparatus and methods
TIA/EIA 603, Edition C	2004	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards

EXHIBIT 2. PERFORMANCE ASSESSMENT

2.1. CLIENT INFORMATION

APPLICANT	
Name:	Comprod Communications
Address:	3405 North Benzing Road Orchard Park, NY 14127 USA
Contact Person:	Mr. Jesse Roberts Phone #: 716-825-2007 Fax #: 716-825-4030 Email Address: Jesseroberts@comprodcom.com

MANUFACTURER	
Name:	Comprod Communications
Address:	3405 North Benzing Road Orchard Park, NY 14127 USA
Contact Person:	Mr. Jesse Roberts Phone #: 716-825-2007 Fax #: 716-825-4030 Email Address: Jesseroberts@comprodcom.com

2.2. EQUIPMENT UNDER TEST (EUT) INFORMATION

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

Brand Name:	Comprod Communications
Product Name:	VHF Signal Booster Class B
Model Name or Number:	08US1008
Type of Equipment:	Zone Enhancers for the Land Mobile Service
Power Supply:	100-240 V, 50 / 60 Hz
Transmitting/Receiving Antenna Type:	Non-Integral
Application of EUT	Extends RF coverage area of radio communications indoor/outdoor environments.

2.3. EUT'S TECHNICAL SPECIFICATIONS

TRANSMITTER	
Equipment Type:	Base station (fixed use)
Intended Operating Environment:	Commercial, Light Industry & Heavy Industry
RF Output Power Rating (Conducted):	o Single output: 35 dBm or 2.91 Watts o 2 outputs: 28.0 dBm per channel o 3 outputs: 26.3 dBm per channel
Operating Frequency Range:	138 – 174 MHz
RF Input/Output Impedance:	50 Ohms
Pass Band Gain @ min attenuation:	+90.5 dB maximum
Occupied Bandwidth (99%):	EXTENDER
Emission Designation*:	EXTENDER
Antenna Connector Type:	N Type
Antenna Description:	Antenna gain: 3.5 dBd maximum

RECEIVER	
Equipment Type:	Base station (fixed use)
Intended Operating Environment:	Commercial, Light Industry & Heavy Industry
Power Supply Requirement:	100-240 V, 50/60 Hz
RF Input Power Rating:	o Single input: -53 dBm to -12.9 dBm (Minimum to Maximum) o 2 inputs: Automatic gain controlled to ensure 28.0 dBm output per channel o 3 inputs: Automatic gain controlled to ensure 26.3 dBm output per channel
Operating Frequency Range:	• 138 – 174 MHz

2.4. LIST OF EUT'S PORTS

Port Number	EUT's Port Description	Number of Identical Ports	Connector Type	Cable Type (Shielded/Non-shielded)
1	AC Power Input	1	3-prong male plug	Non-shielded
2	Low Frequency RF Input Port	1	N-type Female	Shielded
3	High Frequency RF Input Port	1	N-type Female	Shielded
4	Low Frequency RF Output Port	1	N-type Female	Shielded
5	High Frequency RF Output Port	1	N-type Female	Shielded

2.5. ASSOCIATED EQUIPMENT

Procom Bandpass Filters with the 20 dB bandwidth of 3.5 MHz.

2.6. ANCILLARY EQUIPMENT

N/A

2.7. DRAWING OF TEST SETUP

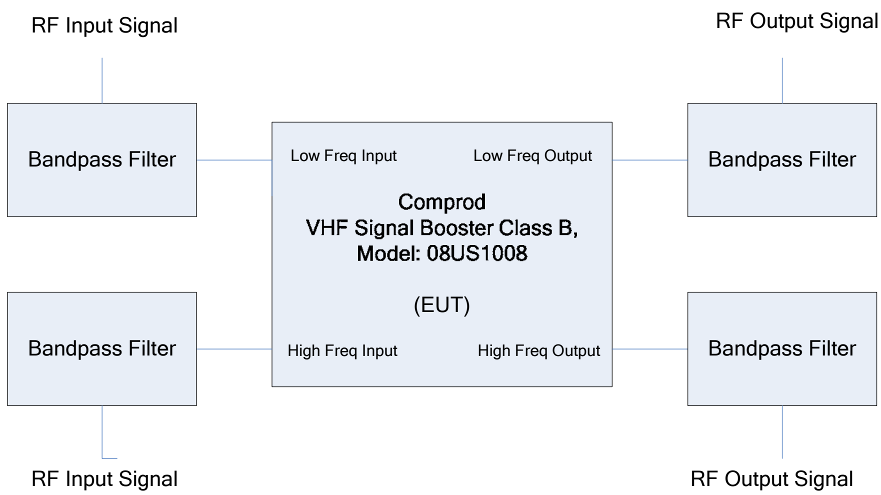


EXHIBIT 3. EUT OPERATING CONDITIONS AND CONFIGURATIONS DURING TESTS

3.1. CLIMATE TEST CONDITIONS

The climate conditions of the test environment are as follows:

Temperature:	22°C
Humidity:	54%
Pressure:	100 kPa
Power input source:	120 V, 60 Hz

3.2. OPERATIONAL TEST CONDITIONS & ARRANGEMENT FOR TEST SIGNALS

Operating Modes:	The amplifier was operated in a continuous transmission mode with the carrier modulated as specified in the Test Data.
Special Test Software:	N/A
Special Hardware Used:	N/A
Transmitter Test Antenna:	The EUT is tested with the amplifier other antenna port terminated to a 50 Ohms RF Load.

Transmitter Test Signals	
Frequency Sub-band(s): 138 – 174 MHz	 138.1, 155.1, 161.9 and 173.3 MHz
Transmitter Output Test Signals: Normal Test Modulation: Modulating signal source:	 F3E, F1D External

EXHIBIT 4. SUMMARY OF TEST RESULTS

4.1. 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 3-10 TDK Semi-Anechoic Chamber situated in the Town of Oakville, province of Ontario. This test site has 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 3-10 TDK Semi-Anechoic Chamber has been filed with FCC office (FCC File No.: 31040/SIT 1300B3) and Industry Canada office (Industry Canada File No.: IC2049-1). Last Date of Site Calibration: May 17, 2007.

4.2. APPLICABILITY & SUMMARY OF EMISSION TEST RESULTS @ FCC PART 2 & 90

FCC PARAGRAPH.	TEST REQUIREMENTS	APPLICABILITY (YES/NO)
90.541, 90.635 & 2.1046	RF Power Output & Inter-modulation	Yes
1.1307, 1.1310, 2.1091, 2.1093,	RF Exposure Limit	Yes
90.213 & 2.1055	Frequency Stability	N/A for Amplifier
90.242(b)(8) & 2.1047(a)	Audio Frequency Response	N/A for Amplifier
90.210 & 2.1047(b)	Modulation Limiting	N/A for Amplifier
2.1049	Occupied Bandwidth	Yes
90.210, 90.543(c) & 2.1051	Emission Limits - Spurious Emissions at Antenna Terminal	Yes
90.210, 90.543(c) & 2.1051	Emission Limits - Field Strength of Spurious Emissions	Yes

NOTE: This product has been tested and found to comply with FCC Part 15, Subpart B, Class B – Unintentional Radiators and Radio Receivers, the test will be available upon request.

4.3. MODIFICATIONS INCORPORATED IN THE EUT FOR COMPLIANCE PURPOSES

None

4.4. DEVIATION OF STANDARD TEST PROCEDURES

None

EXHIBIT 5. MEASUREMENTS, EXAMINATIONS & TEST DATA FOR EMC EMISSIONS

5.1. TEST PROCEDURES

This section contains test results only. Details of test methods and procedures can be found in Exhibit 7 of this report

5.2. 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.

5.3. MEASUREMENT EQUIPMENT USED:

The measurement equipment used complied with the requirements of the Standards referenced in the Methods & Procedures ANSI C63.4:2003 and CISPR 16-1-1.

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

The essential function of the EUT is to amplify and transmit voice/data to and from radios over RF link.

5.5. RF POWER OUTPUT & INTERMODULATION @ FCC 2.1046, 90.541 & 90.635

5.5.1. Limits

FCC 90.635:- The effective radiated power (ERP) and antenna height for base station transmitters must not exceed the limits in this section as per below:

Base Station Transmitters	Maximum ERP (Watts)
Operating frequency range: (769-775, 794-806, 806-824, 851-869 MHz)	500 Watts and 152 meters (AAT) in Suburban Area 1 Kilowatts and 304 meters in Urban Area

FCC 90.205:- Please refer to FCC CFR 47, Part 90, Subpart I, Para. 90.205 for specification details.

5.5.2. Method of Measurements

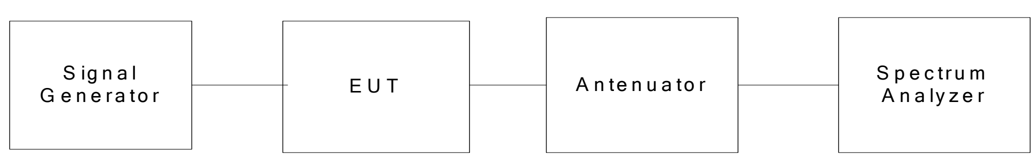
Refer to Exhibit7, § 7.1 (Conducted) of this report for measurement details

5.5.3. Test Equipment List

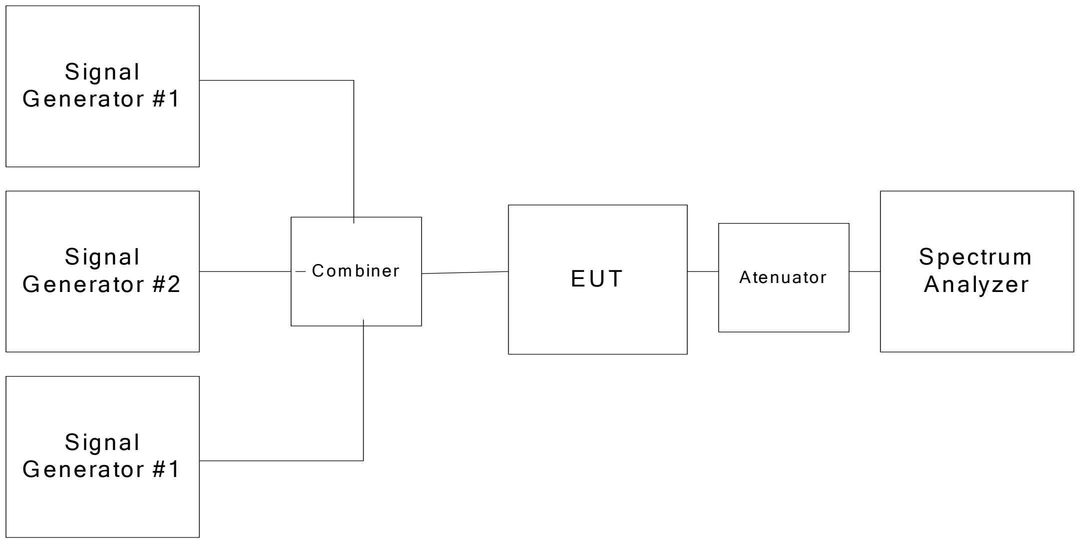
Test Instruments	Manufacturer	Model No.	Serial No.	Frequency Range
Spectrum Analyzer/ EMI Receiver	Rohde & Schawrz	FSEK30	100077	20 Hz – 40 GHz with external mixer
Attenuator(s)	Bird	..	…	DC – 22 GHz

5.5.4. Test Arrangement

<u>**Single Channel Input**</u>:



Multiple Channel Inputs:



5.5.5. Test Data

5.5.5.1. RF Conducted Output Power – Low Frequency Port

Input Level: -12.9 dBm

Frequency Bands (MHz)	Centre Test Frequency of Each Sub-bands (MHz)	Total RF Output Power at Antenna Port (dBm)	Total RF Output Power at Antenna Port (Watts)
138 - 174	138.1	34.64	2.91
138 - 174	155.1	32.32	1.71
138 - 174	161.9	32.90	1.95
138 - 174	173.3	33.71	2.35

5.5.5.2. RF Conducted Output Power – High Frequency Port

Input Level: -12.9 dBm

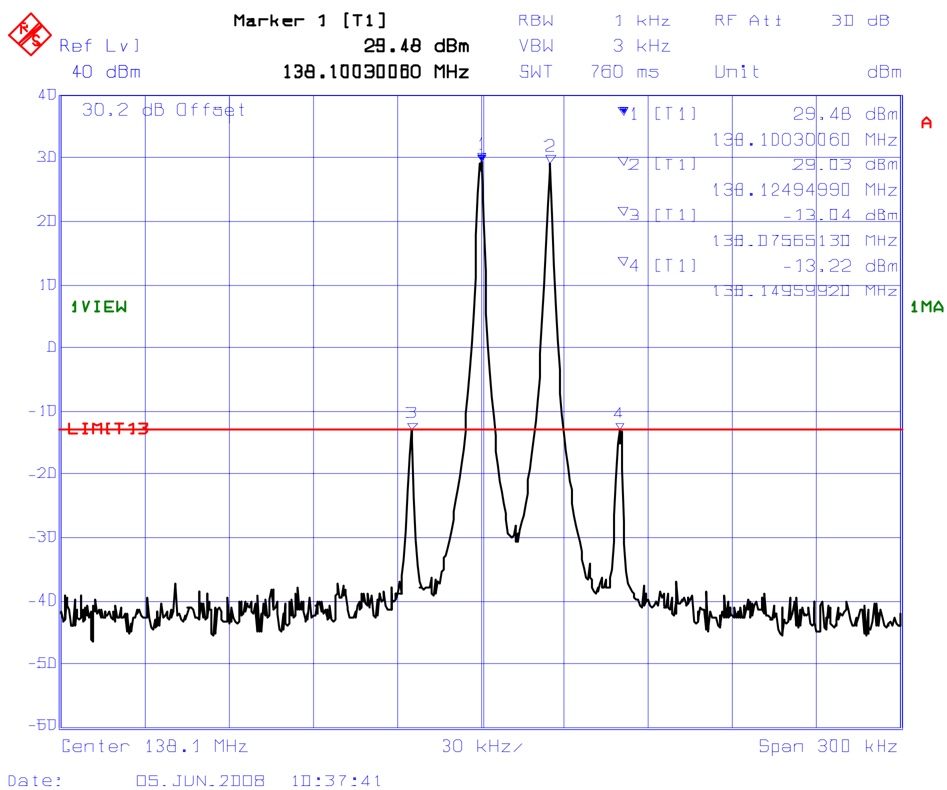
Frequency Bands (MHz)	Centre Test Frequency of Each Sub-bands (MHz)	Total RF Output Power at Antenna Port (dBm)	Total RF Output Power at Antenna Port (Watts)
138 - 174	138.1	34.53	2.84
138 - 174	155.1	32.39	1.73
138 - 174	161.9	33.26	2.12
138 - 174	173.3	34.30	2.69

5.5.5.3. Inter-modulation Measurements

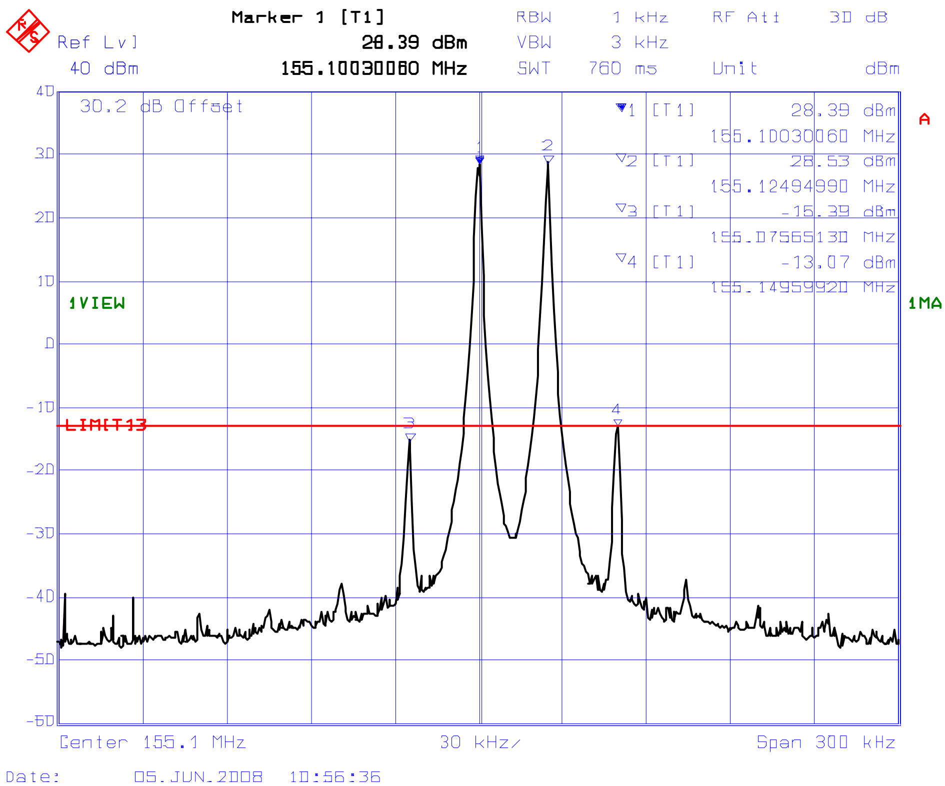
Please Refer to Plots # 1-8 for Inter-modulation.

Remark: It was found that the gains of RF input levels were found not linear with respect to the RF output level because are not linear at different test frequencies. This is the effect of the Automatic Gain Control (AGC) of thre Amplifier.

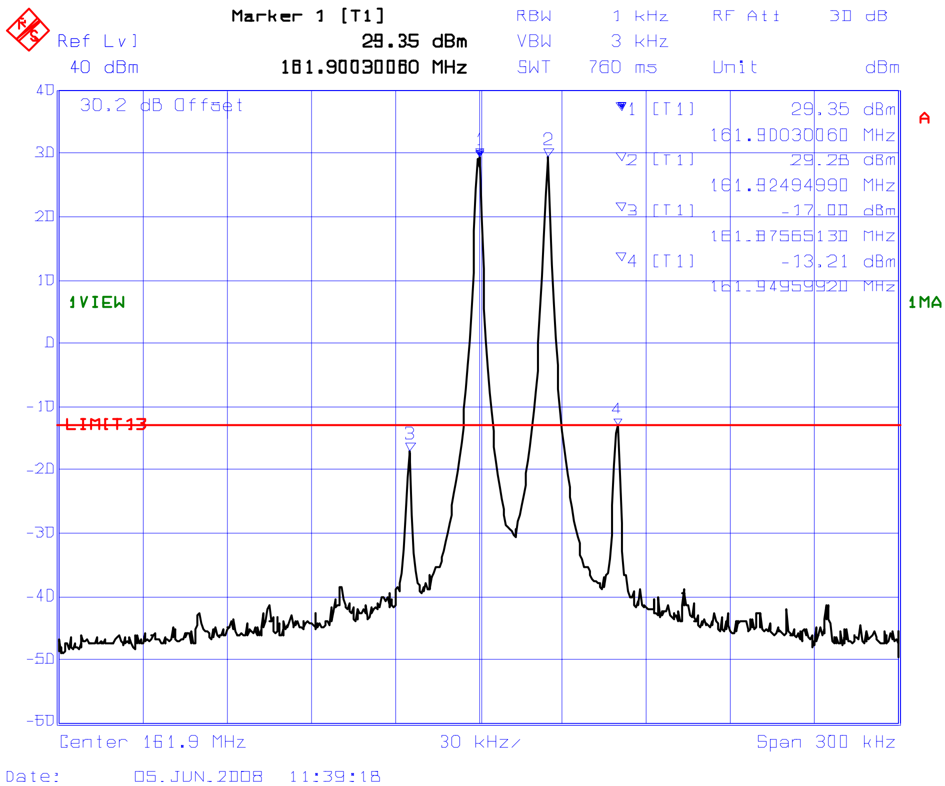
PLOT#: 1 Intermodulation with 2 RF signal inputs/outputs Fc= 138.1 MHz, Fc+25 kHz, RF Input levels = -60 dBm



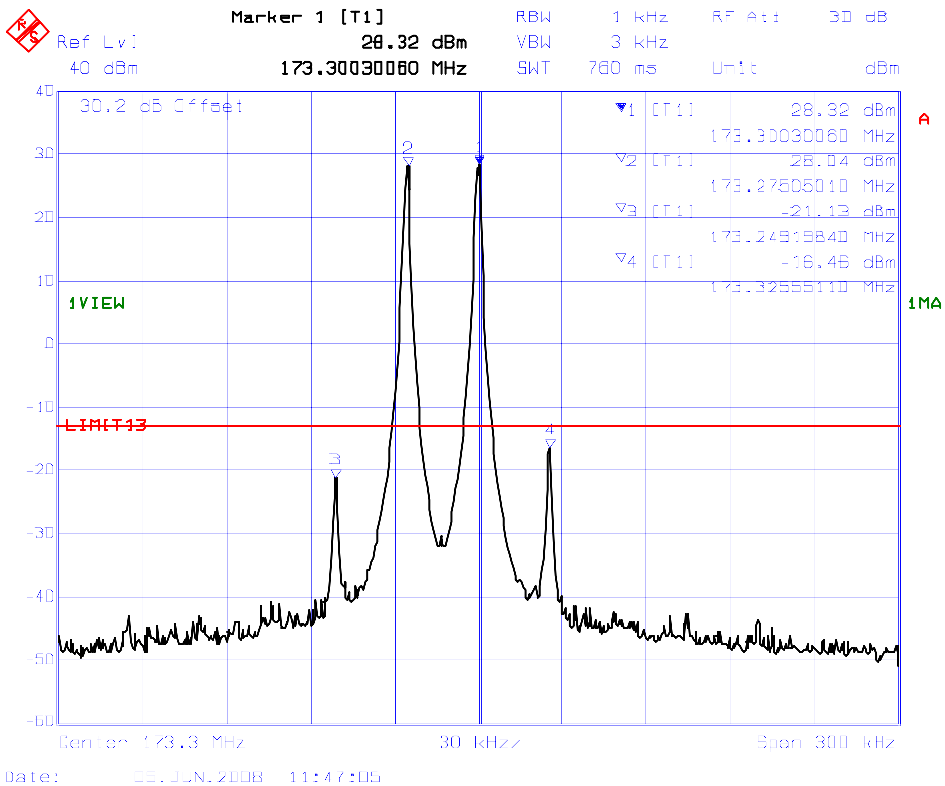
PLOT#: 2 Intermodulation with 2 RF signal inputs/outputs Fc= 155.1 MHz, Fc+25 kHz, RF Input levels = -15.3 dBm



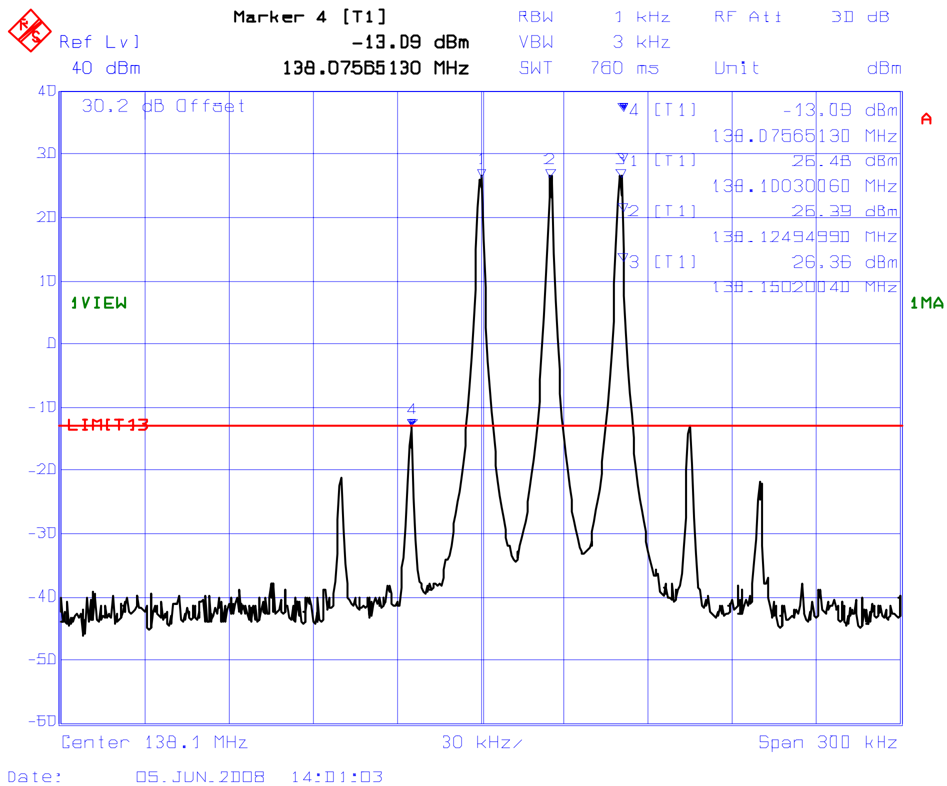
PLOT#: 3 Intermodulation with 2 RF signal inputs/outputs Fc= 161.9 MHz, Fc+25 kHz, RF Input levels = -12.9 dBm



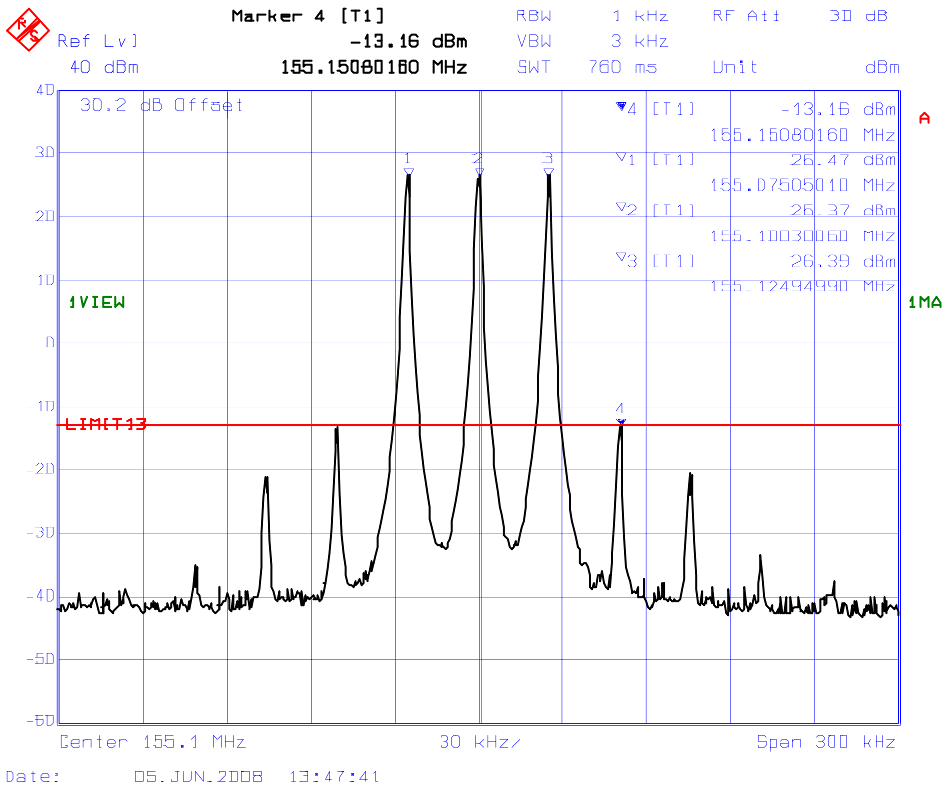
PLOT#: 4 Intermodulation with 2 RF signal inputs/outputs
Fc= 173.3 MHz, Fc+25 kHz, RF Input levels = -12.9 dBm



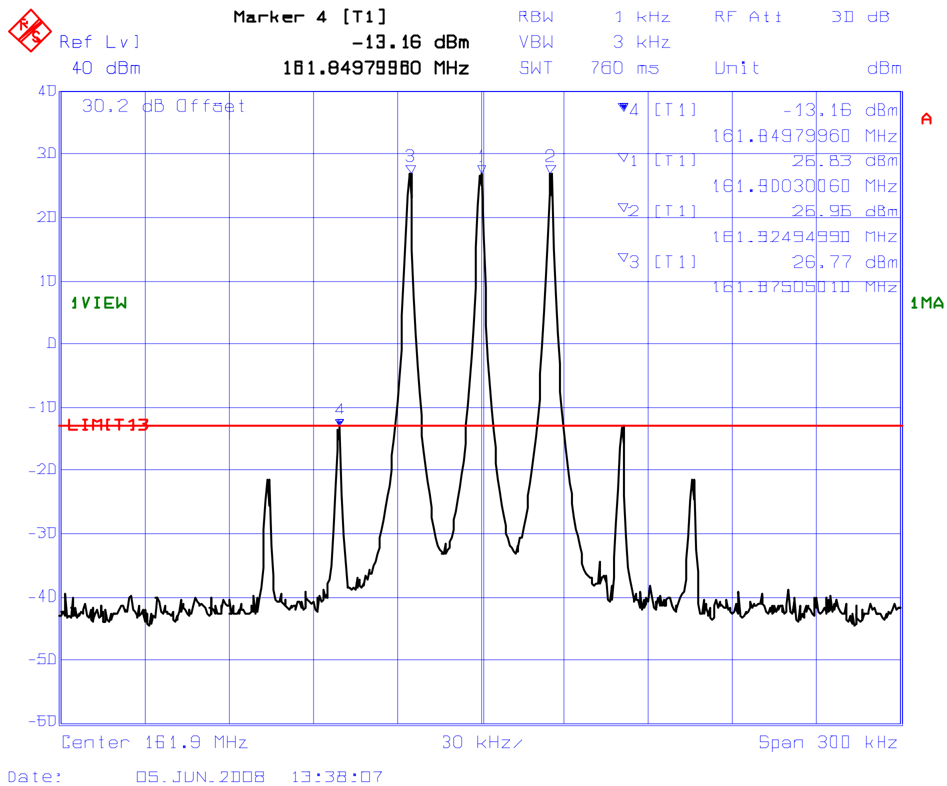
PLOT#: 5 **Intermodulation with 3 RF signal inputs/outputs**
Fc= 138.1 MHz, Fc+25 kHz & Fc-25 kHz, RF Input levels = -62.9 dBm



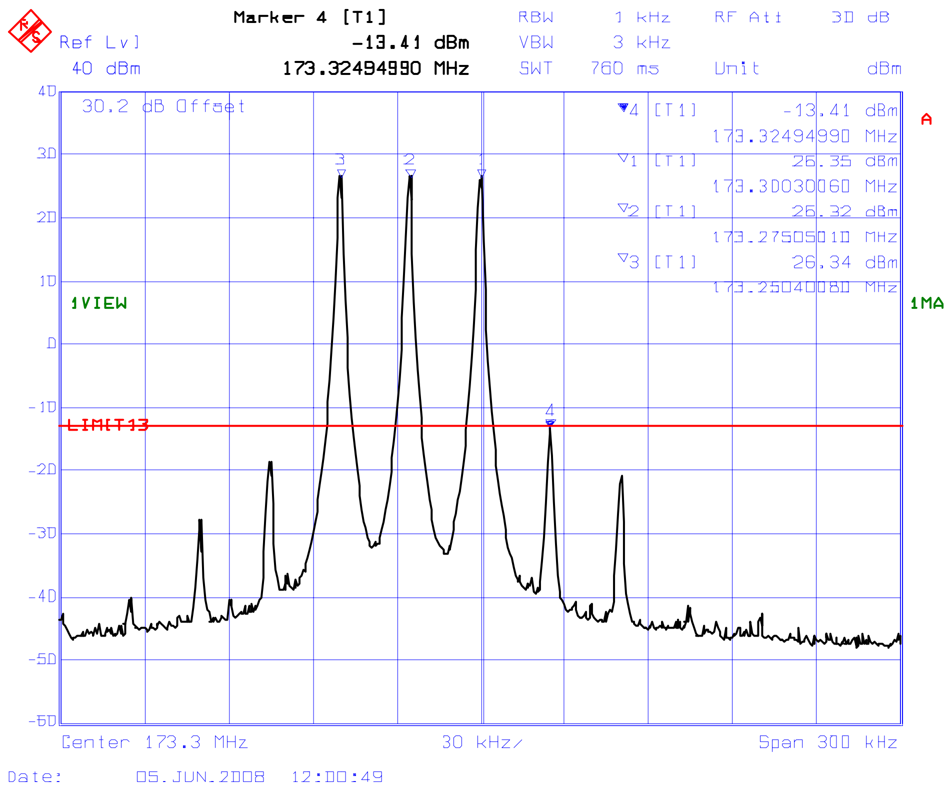
PLOT#: 6 Intermodulation with 3 RF signal inputs/outputs
Fc= 155.1 MHz, Fc+25 kHz & Fc-25 kHz, RF Input levels = -61.7 dBm



PLOT#: 7 Intermodulation with 3 RF signal inputs/outputs
Fc= 161.9 MHz, Fc+25 kHz & Fc-25 kHz, RF Input levels = -61.8 dBm



PLOT#: 8 Intermodulation with 3 RF signal inputs/outputs
Fc= 173.3 MHz, Fc+25 kHz & Fc-25 kHz, RF Input levels = -61.8 dBm



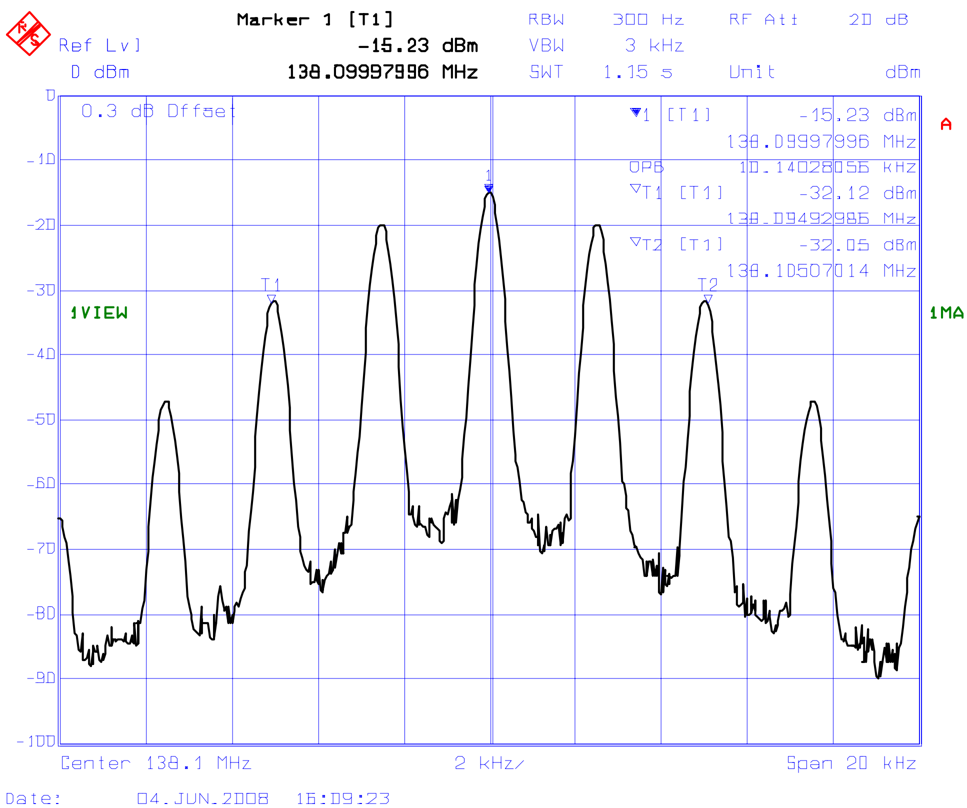
5.5.5.4. Non-Linearity

Remark: 99% OBW of the RF input and RF output signals were measured for comparison.

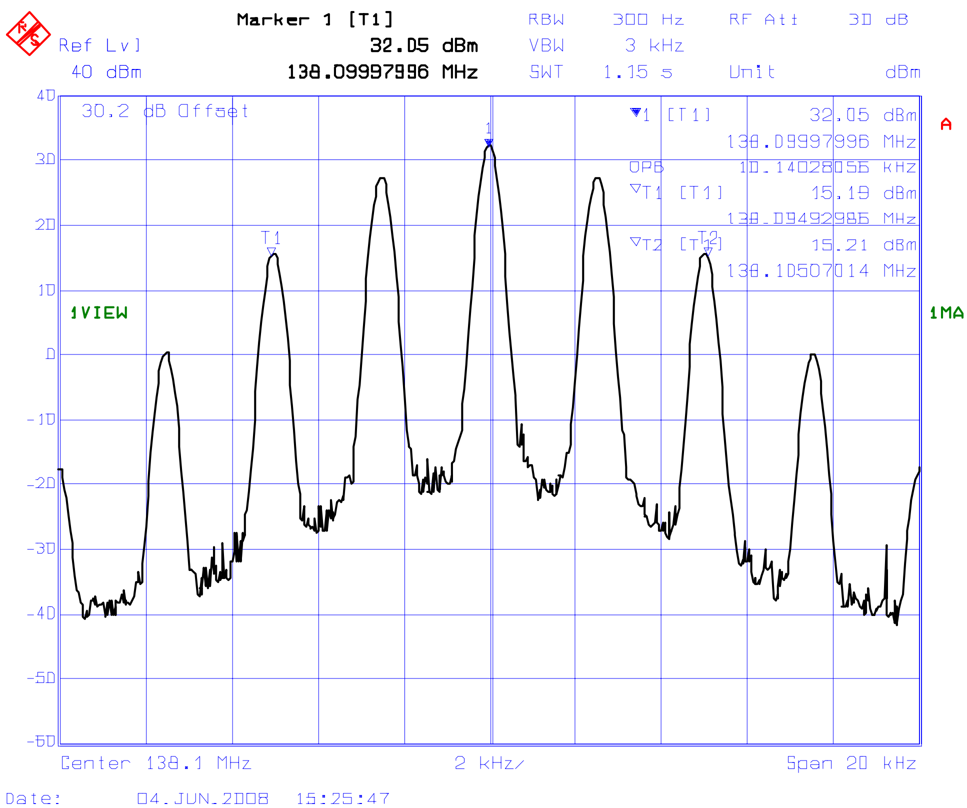
Frequency Band (MHz)	Channel Spacing (kHz)	Modulation	RF IN Measured 99% OBW (kHz)	RF OUT Measured 99% OBW (kHz)
138 – 174	12.5	F3E	10.14	10.14
138 – 174	12.5	F3E	10.14	10.14
138 – 174	12.5	F3E	10.14	10.14
138 – 174	12.5	F3E	10.10	10.10
138 – 174	25.0	F3E	15.21	15.21
138 – 174	25.0	F3E	15.21	15.21
138 – 174	25.0	F3E	15.21	15.21
138 – 174	25.0	F3E	15.21	15.21
138 – 174	12.5	F1D	7.73	77.8
138 – 174	12.5	F1D	7.66	7.96
138 – 174	12.5	F1D	7.74	7.70
138 – 174	12.5	F1D	7.98	7.78
138 – 174	25.0	F1D	14.18	14.18
138 – 174	25.0	F1D	14.18	14.18
138 – 174	25.0	F1D	14.13	14.18
138 – 174	25.0	F1D	14.18	14.28

Comments: The 99% occupied bandwidths of input and output signals are found to be the same, please refer to Plots # 9(a)&(b) to 24(a)&(b)

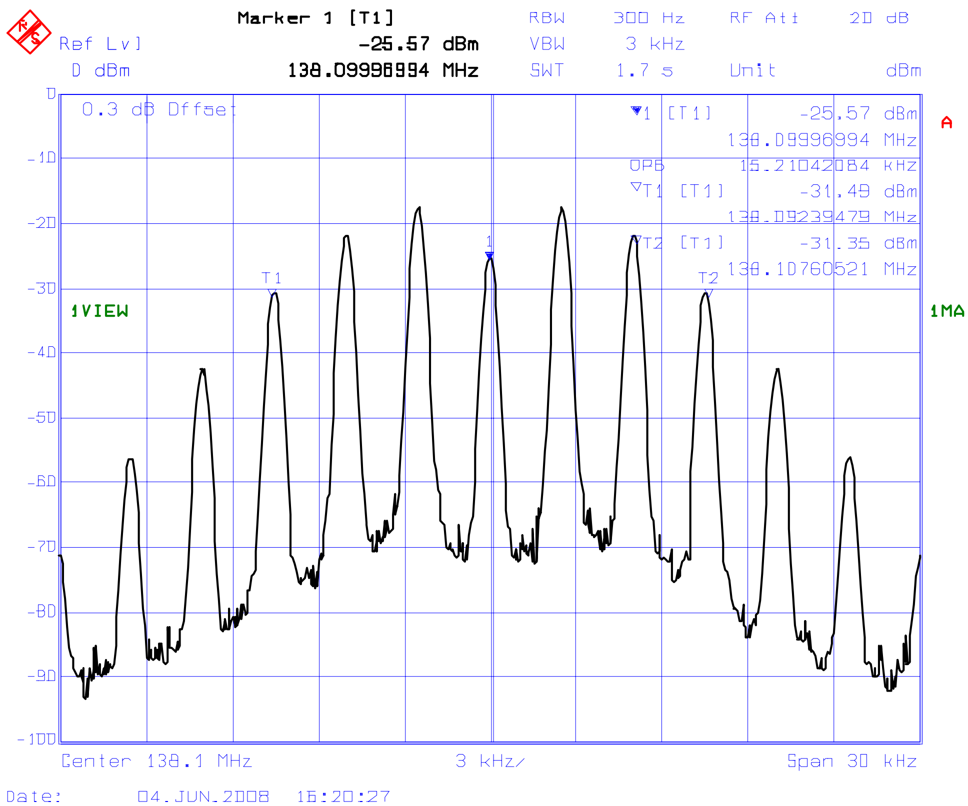
PLOT # 9(a): **99% Occupied Bandwidth – RF Input Signal**
Frequency: 138.1 MHz for 12.5 kHz Channel Spacing
Modulation: FM modulation with 2.5 kHz Sinewave Signal (F3E)



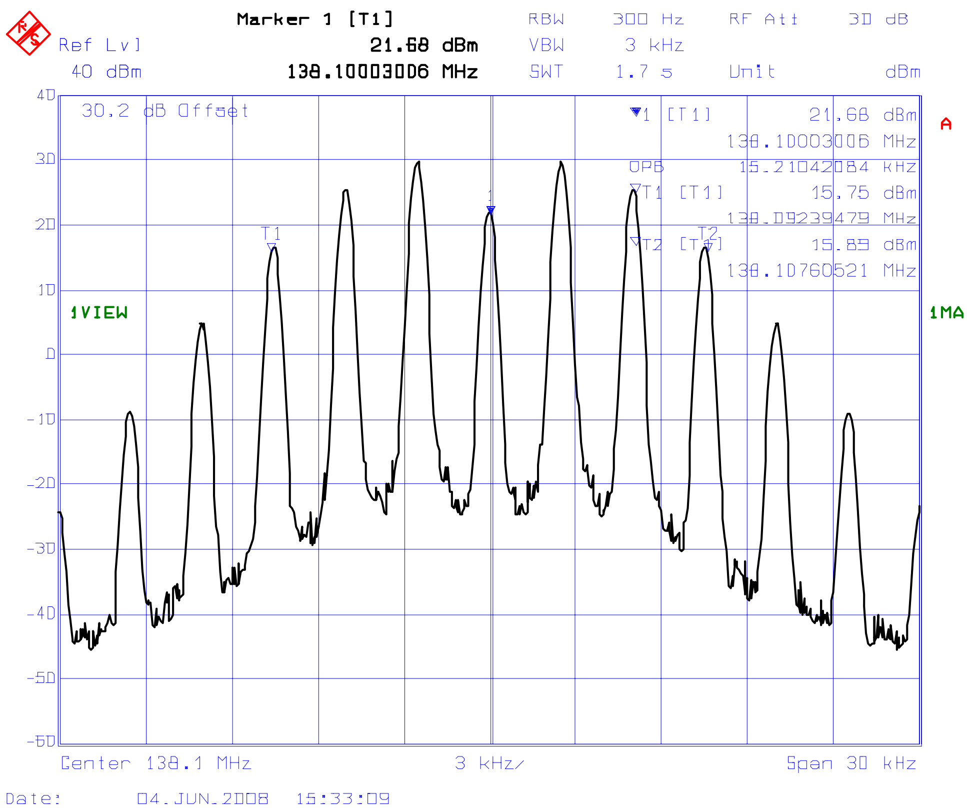
PLOT # 9(b): 99% Occupied Bandwidth – RF Output Signal
Frequency: 138.1 MHz for 25 kHz Channel Spacing
Modulation: FM modulation with 2.5 kHz Sinewave Signal (F3E)



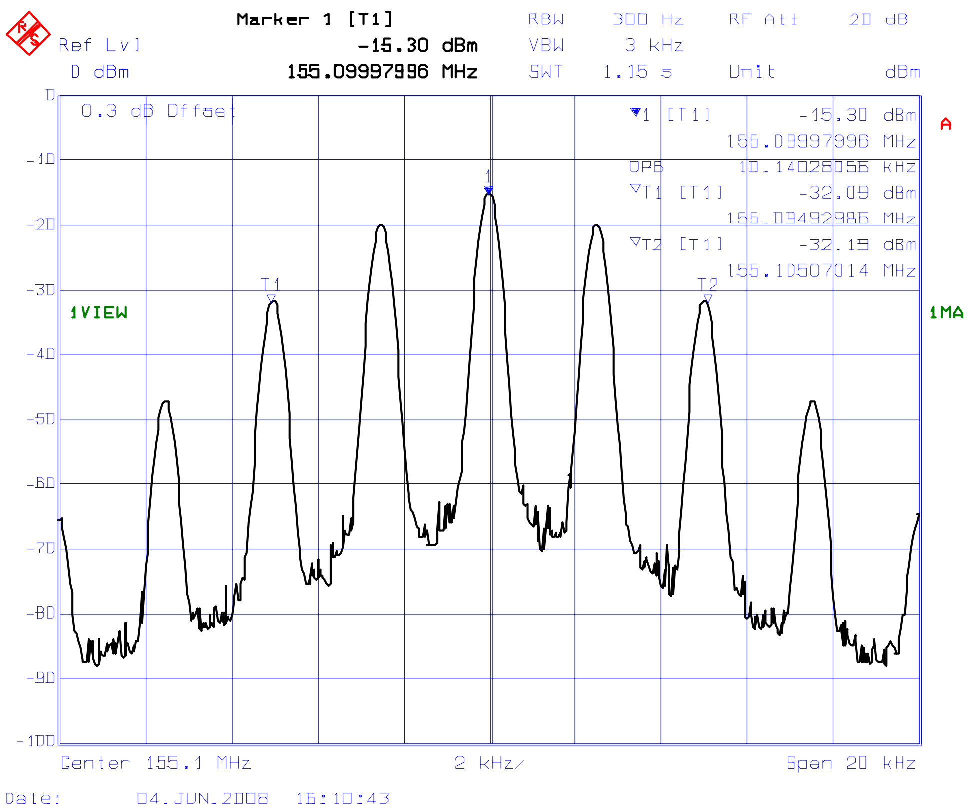
PLOT # 10(a): **99% Occupied Bandwidth – RF Input Signal**
Frequency: 138.1 MHz for 25 kHz Channel Spacing
Modulation: FM modulation with 2.5 kHz Sinewave Signal (F3E)



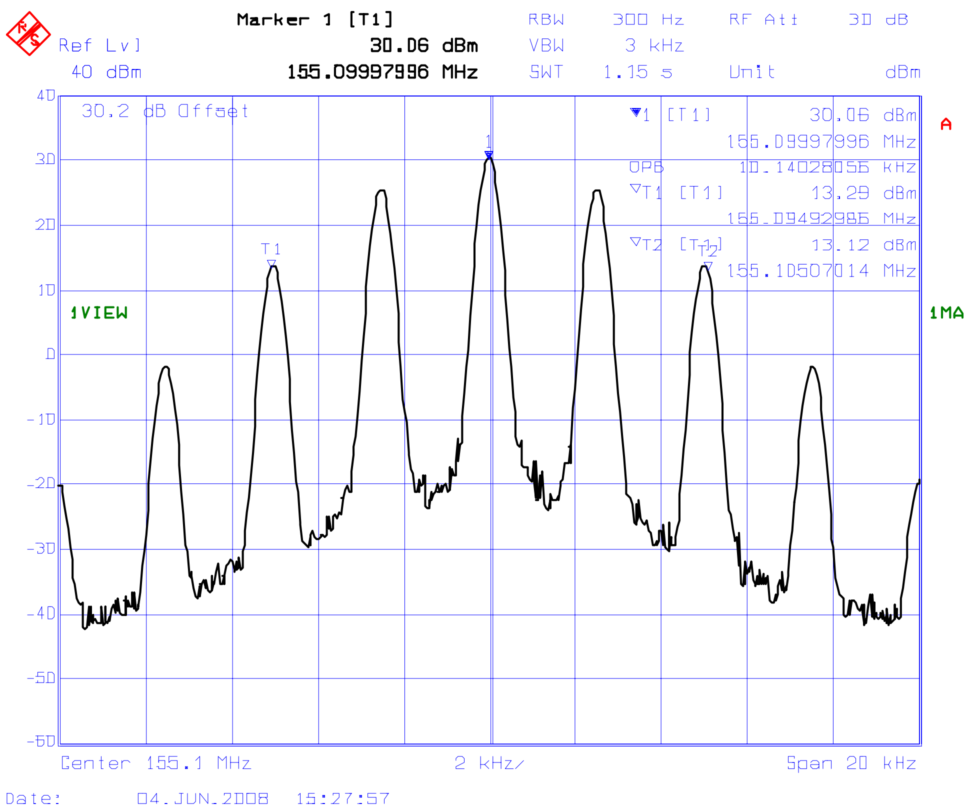
PLOT # 10(b): **99% Occupied Bandwidth – RF Output Signal**
Frequency: 138.1 MHz for 25 kHz Channel Spacing
Modulation: FM modulation with 2.5 kHz Sinewave Signal (F3E)



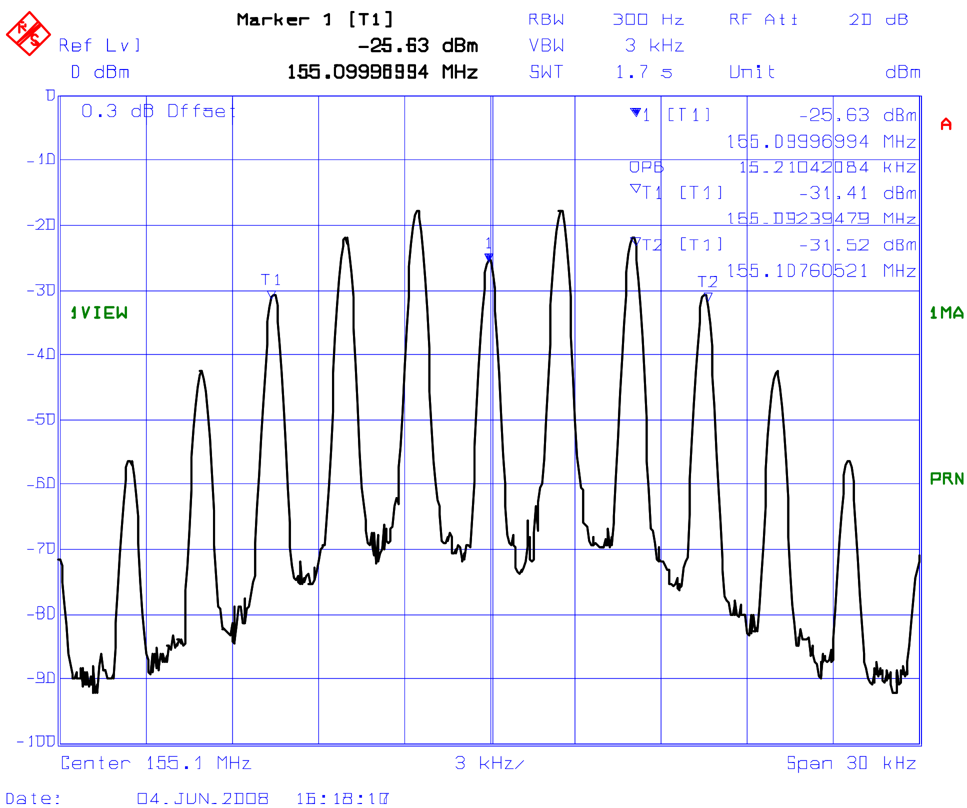
PLOT # 11(a): 99% Occupied Bandwidth – RF Input Signal
Frequency: 155.1 MHz for 12.5 kHz Channel Spacing
Modulation: FM modulation with 2.5 kHz Sinewave Signal (F3E)



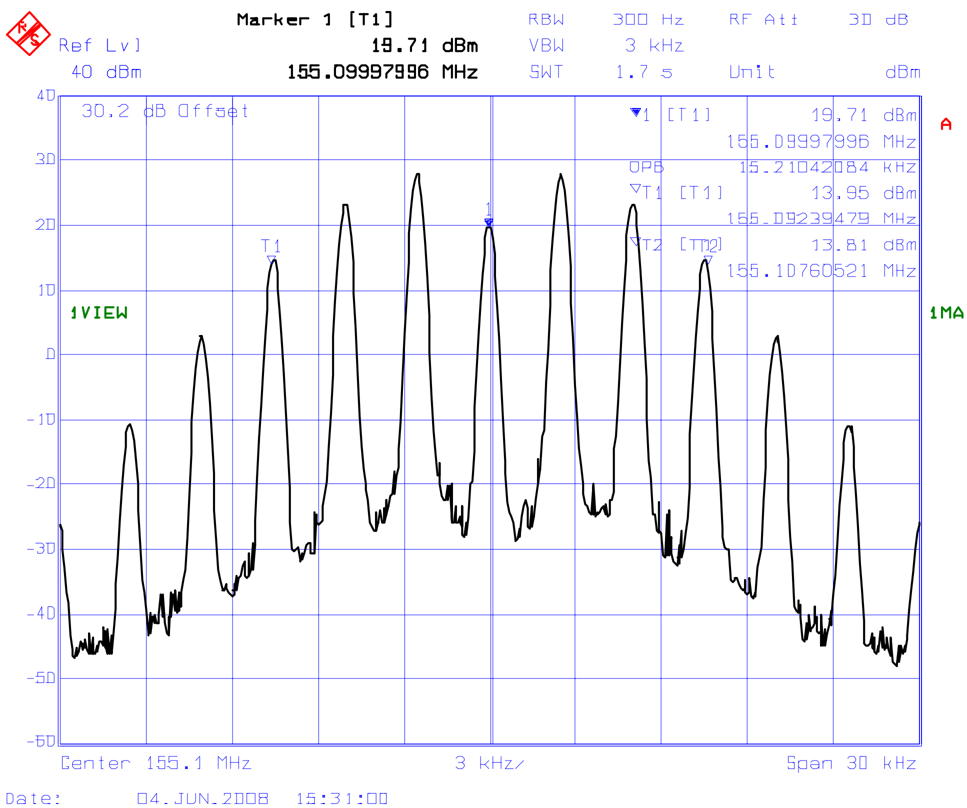
PLOT # 11(b): **99% Occupied Bandwidth – RF Output Signal**
Frequency: 155.1 MHz for 12.5 kHz Channel Spacing
Modulation: FM modulation with 2.5 kHz Sinewave Signal (F3E)



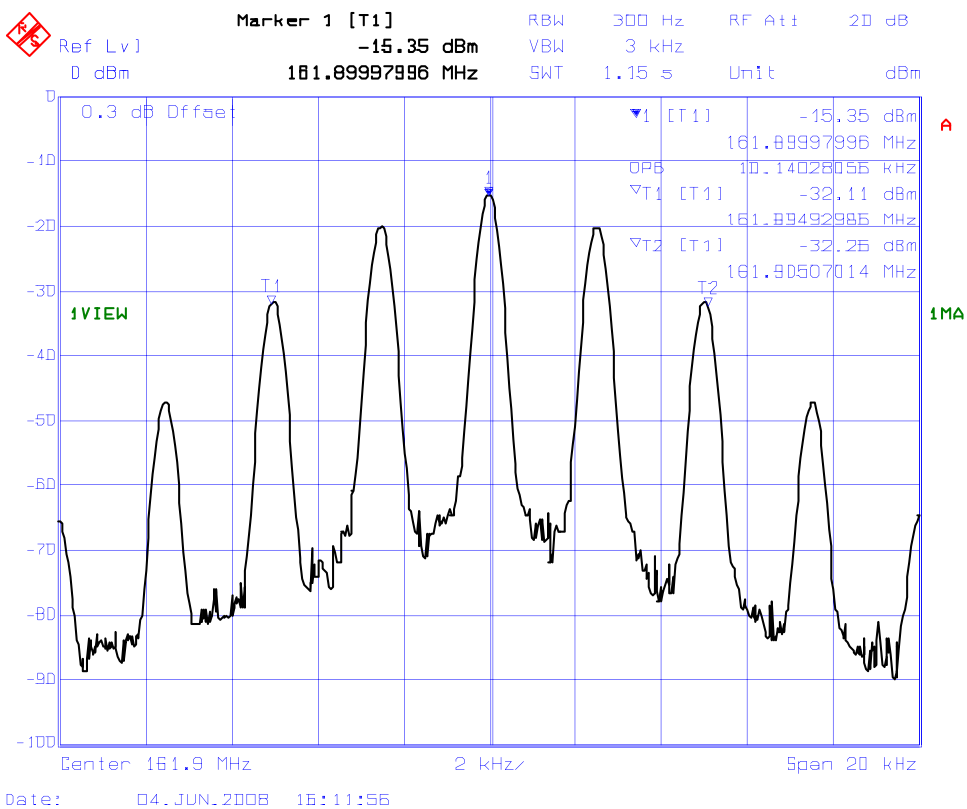
PLOT # 12(a): **99% Occupied Bandwidth – RF Input Signal**
Frequency: 155.1 MHz for 25 kHz Channel Spacing
Modulation: FM modulation with 2.5 kHz Sinewave Signal (F3E)



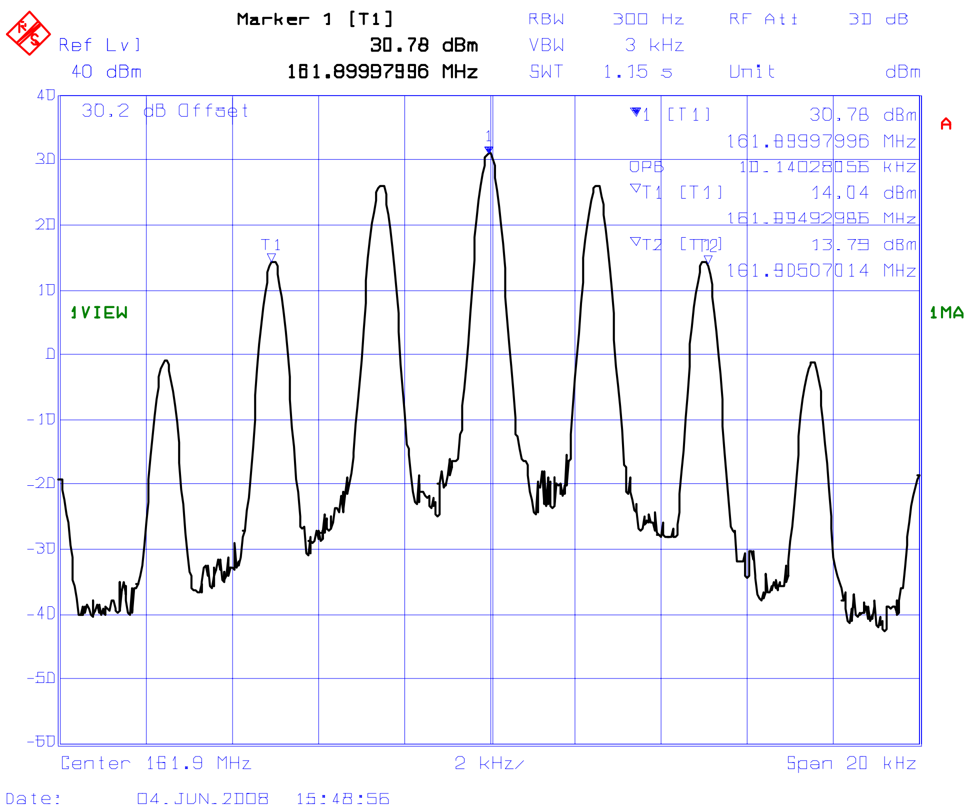
PLOT # 12(b): **99% Occupied Bandwidth – RF Output Signal**
Frequency: 155.1 MHz for 25 kHz Channel Spacing
Modulation: FM modulation with 2.5 kHz Sinewave Signal (F3E)



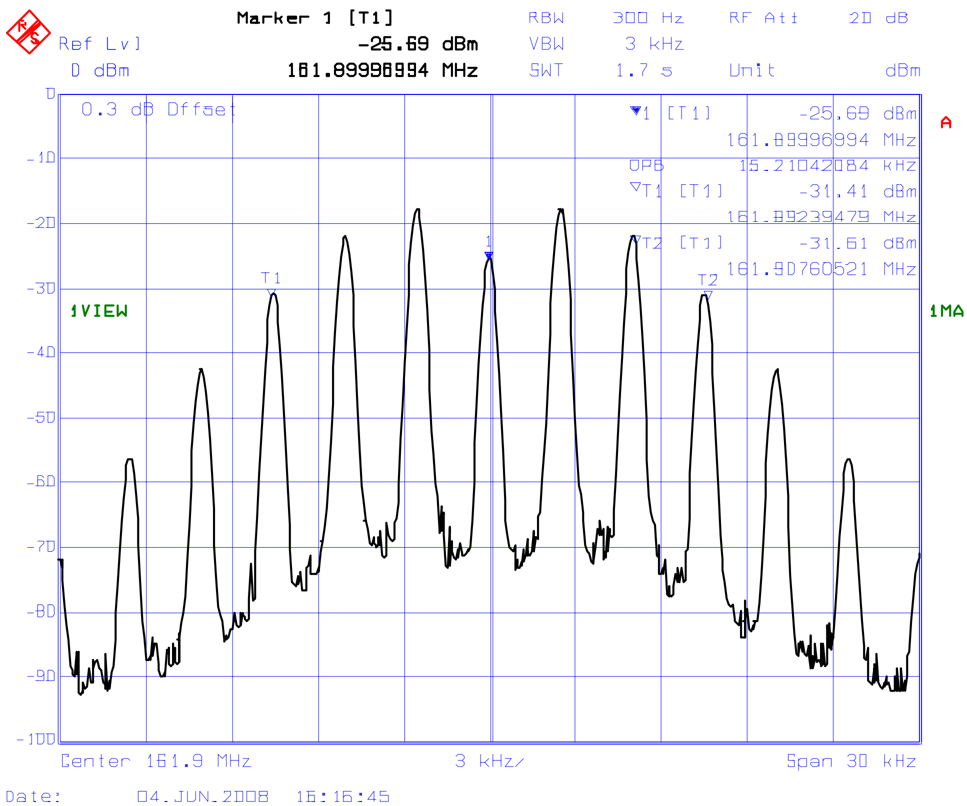
PLOT # 13(a): **99% Occupied Bandwidth – RF Input Signal**
Frequency: 161.9 MHz for 12.5 kHz Channel Spacing
Modulation: FM modulation with 2.5 kHz Sinewave Signal (F3E)



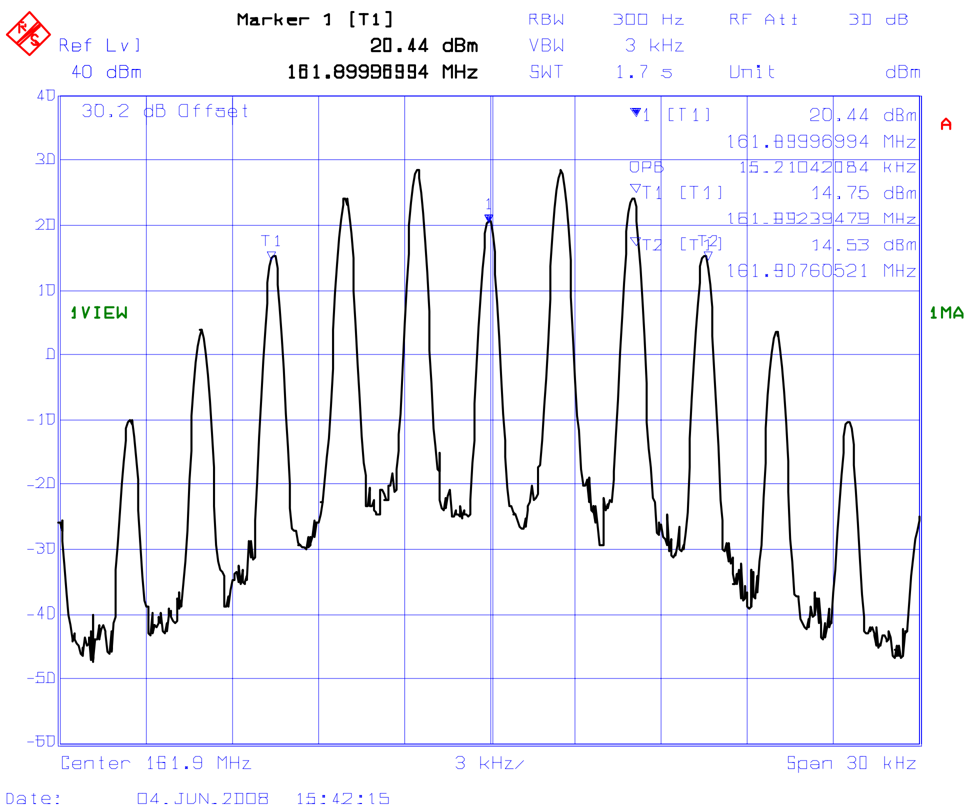
PLOT # 13(b): 99% Occupied Bandwidth – RF Output Signal
Frequency: 161.9 MHz for 12.5 kHz Channel Spacing
Modulation: FM modulation with 2.5 kHz Sinewave Signal (F3E)



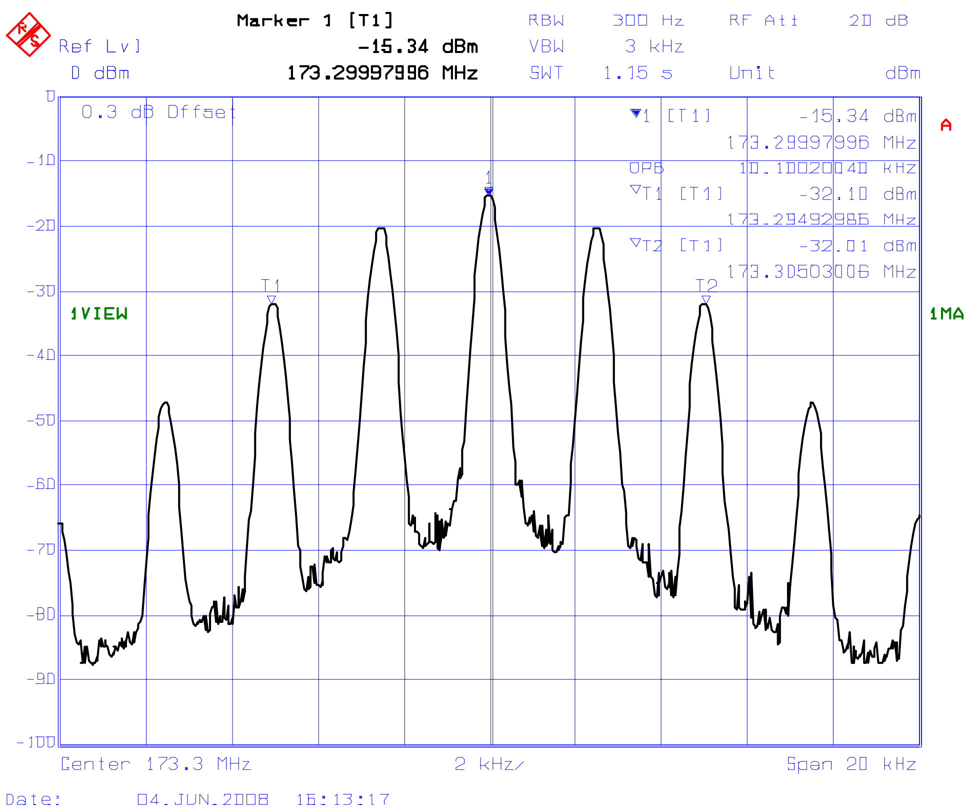
PLOT # 14(a): **99% Occupied Bandwidth – RF Input Signal**
Frequency: 161.9 MHz for 25 kHz Channel Spacing
Modulation: FM modulation with 2.5 kHz Sinewave Signal (F3E)



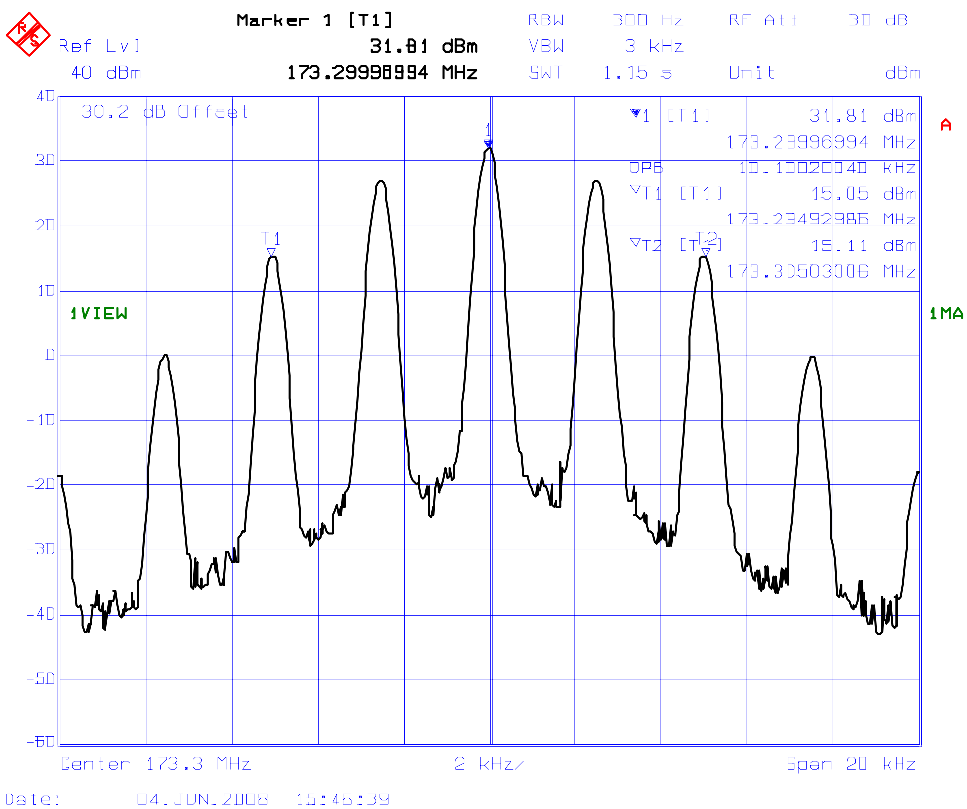
PLOT # 14(b): **99% Occupied Bandwidth – RF Output Signal**
Frequency: 161.9 MHz for 25 kHz Channel Spacing
Modulation: FM modulation with 2.5 kHz Sinewave Signal (F3E)



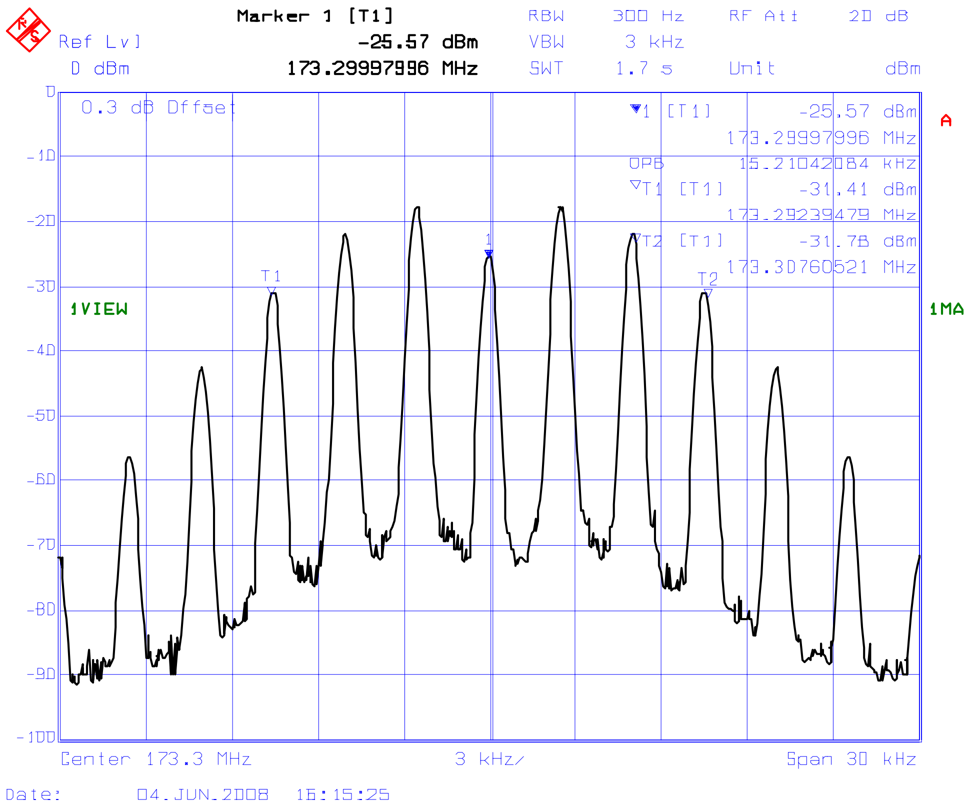
PLOT # 15(a): **99% Occupied Bandwidth – RF Input Signal**
Frequency: 173.3 MHz for 12.5 kHz Channel Spacing
Modulation: FM modulation with 2.5 kHz Sinewave Signal (F3E)



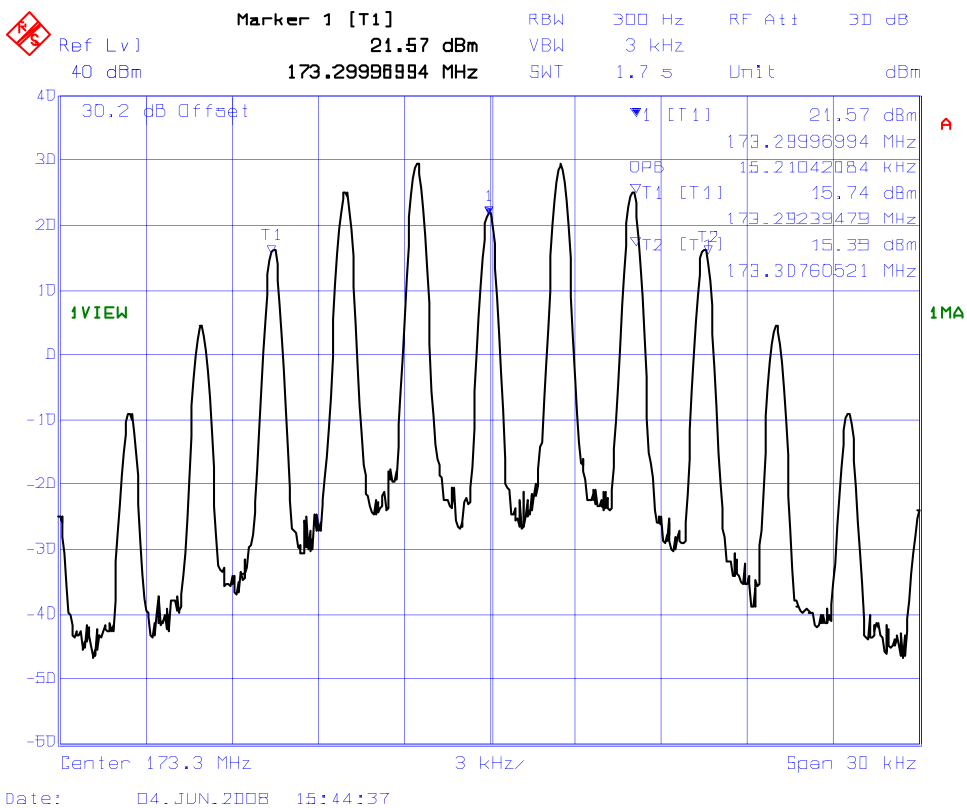
PLOT # 15(b): 99% Occupied Bandwidth – RF Output Signal
Frequency: 173.3 MHz for 12.5 kHz Channel Spacing
Modulation: FM modulation with 2.5 kHz Sinewave Signal (F3E)



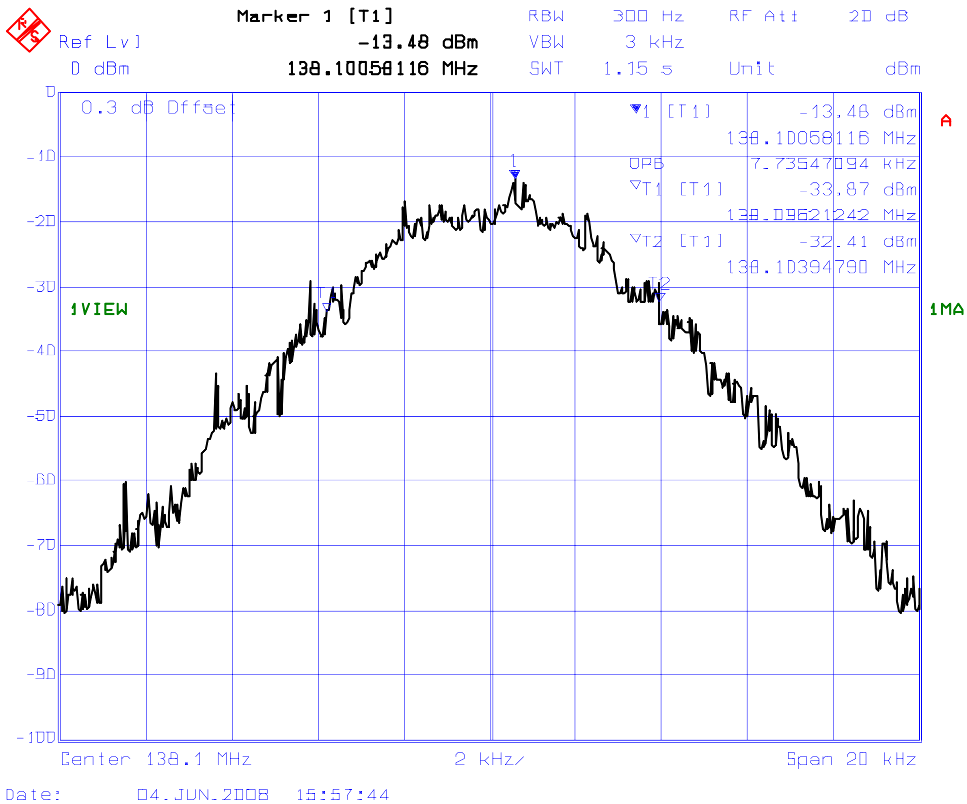
PLOT # 16(a): 99% Occupied Bandwidth – RF Input Signal
Frequency: 173.3 MHz for 25 kHz Channel Spacing
Modulation: FM modulation with 2.5 kHz Sinewave Signal (F3E)



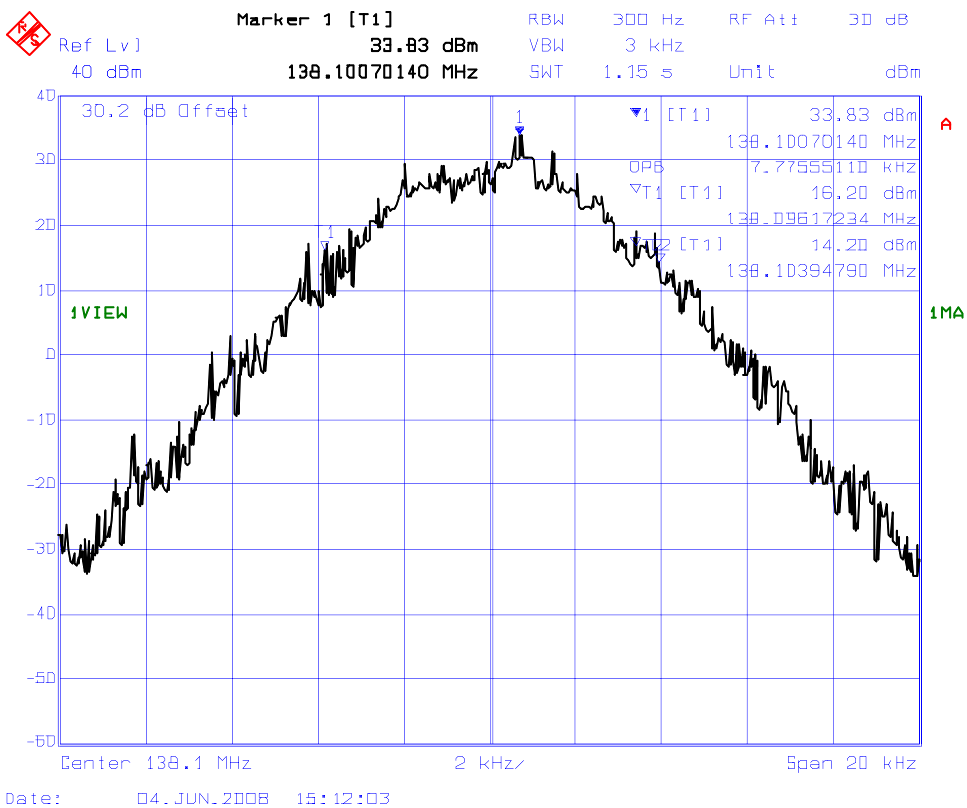
PLOT # 16(b): **99% Occupied Bandwidth – RF Output Signal**
Frequency: 173.3 MHz for 25 kHz Channel Spacing
Modulation: FM modulation with 2.5 kHz Sinewave Signal (F3E)



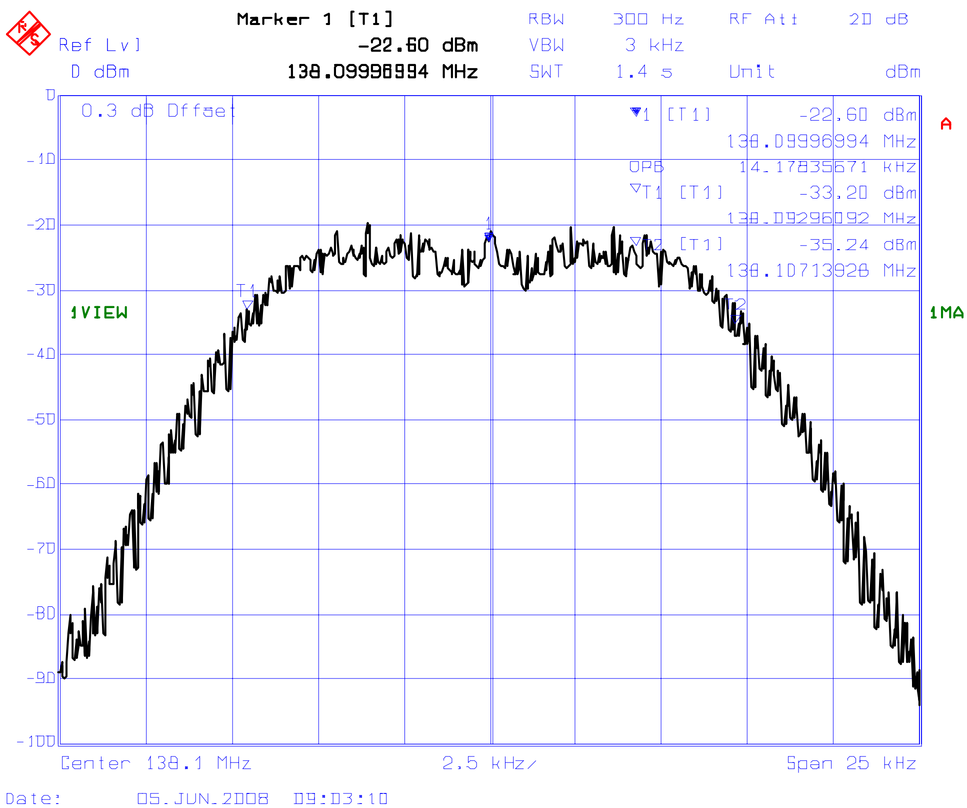
PLOT # 17(a): **99% Occupied Bandwidth – RF Input Signal**
Frequency: 138.1 MHz for 12.5 kHz Channel Spacing
Modulation: FM modulation with 9600 b/s random data (F1D)



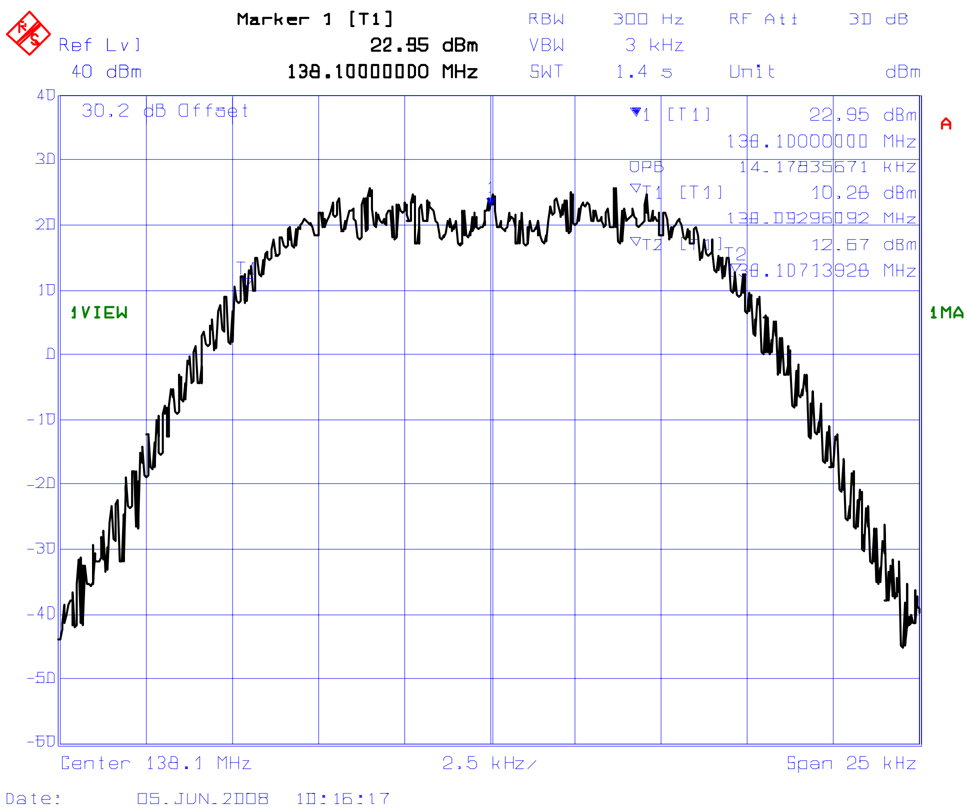
PLOT # 17(b): 99% Occupied Bandwidth – RF Output Signal
Frequency: 138.1 MHz for 12.5 kHz Channel Spacing
Modulation: FM modulation with 9600 b/s random data (F1D)



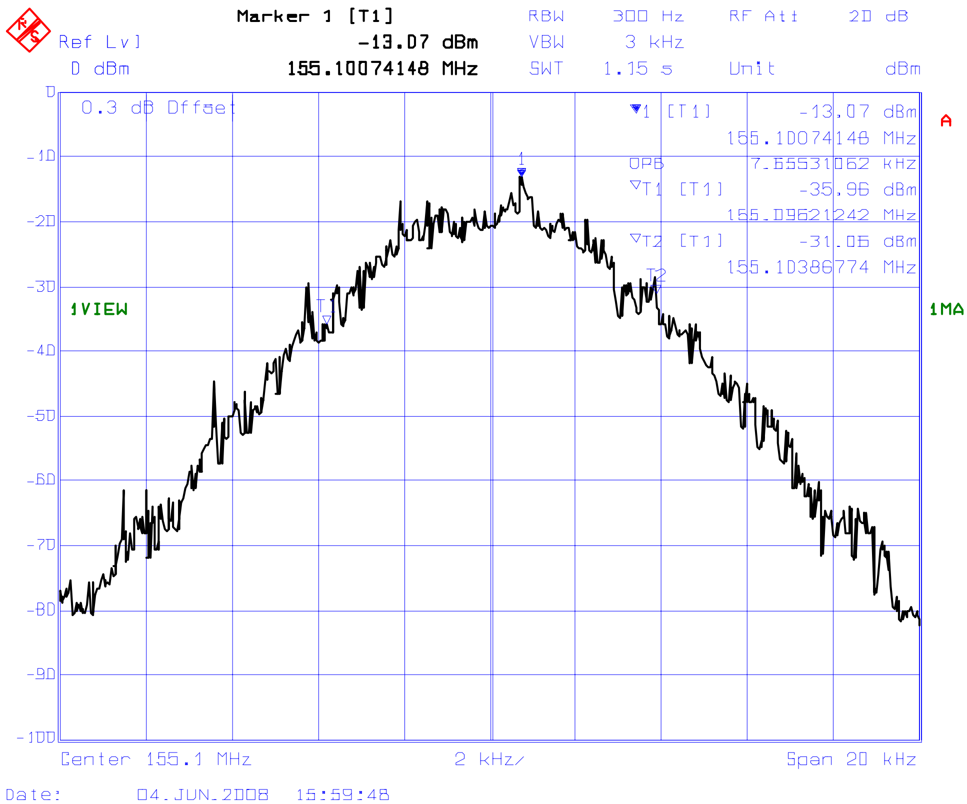
PLOT # 18(a): **99% Occupied Bandwidth – RF Input Signal**
Frequency: 138.1 MHz for 25 kHz Channel Spacing
Modulation: FM modulation with 9600 b/s random data (F1D)



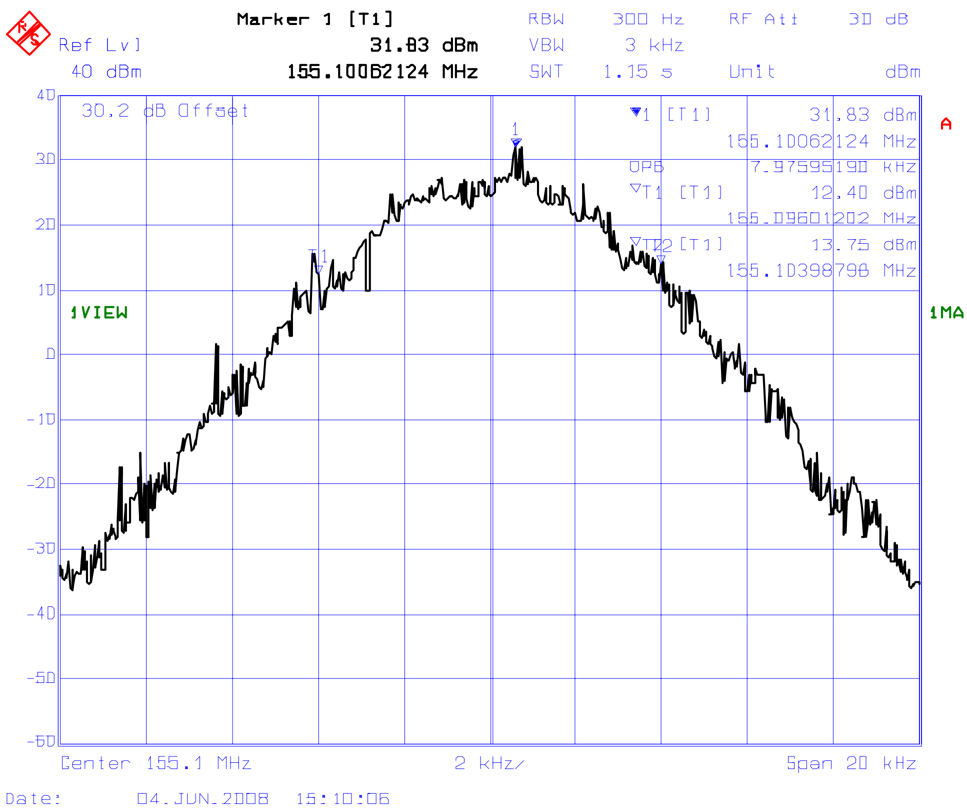
PLOT # 18(b): 99% Occupied Bandwidth – RF Output Signal Frequency: 138.1 MHz for 25 kHz Channel Spacing Modulation: FM modulation with 9600 b/s random data (F1D)



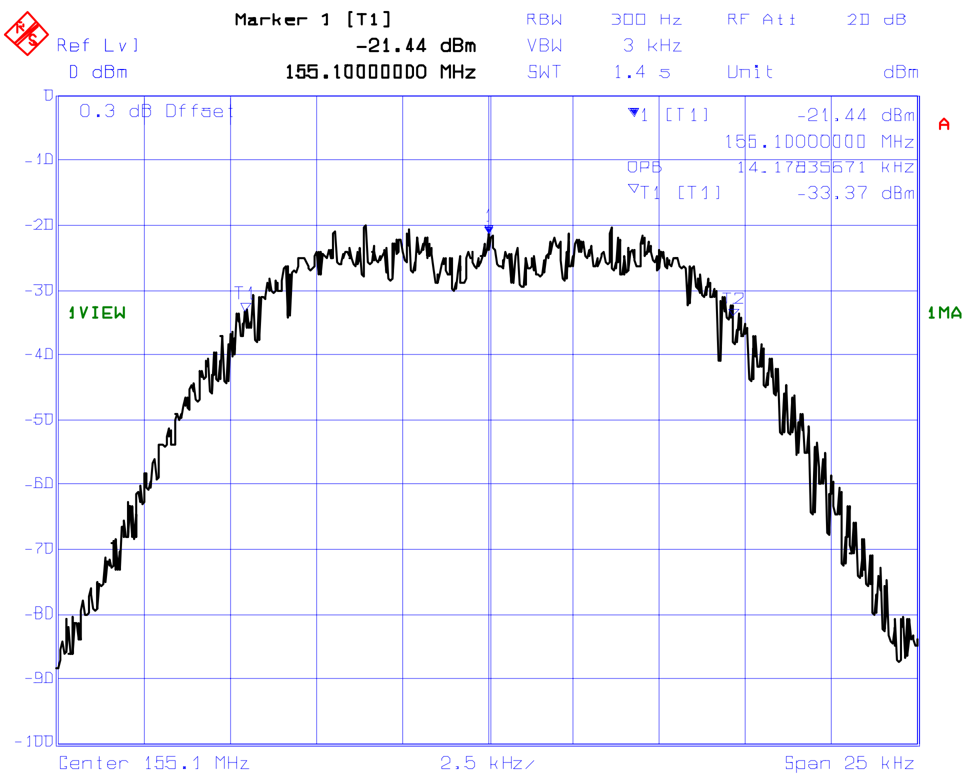
PLOT # 19(a): **99% Occupied Bandwidth – RF Input Signal**
Frequency: 155.1 MHz for 12.5 kHz Channel Spacing
Modulation: FM modulation with 9600 b/s random data (F1D)



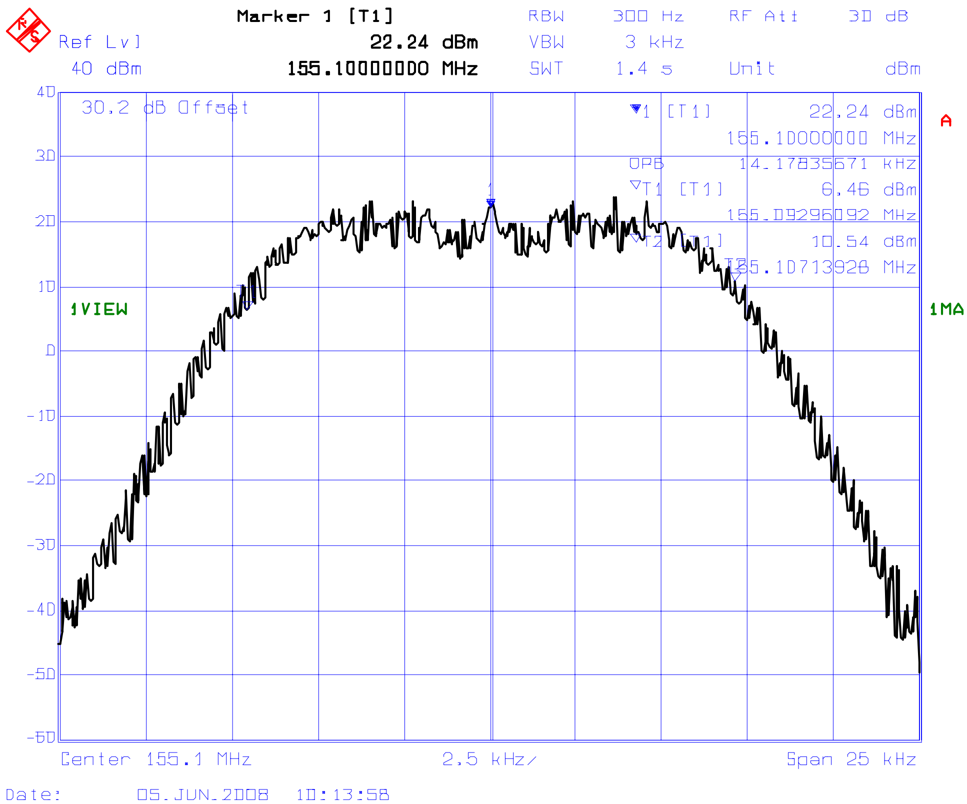
PLOT # 19(b): 99% Occupied Bandwidth – RF Output Signal Frequency: 155.1 MHz for 12.5 kHz Channel Spacing Modulation: FM modulation with 9600 b/s random data (F1D)



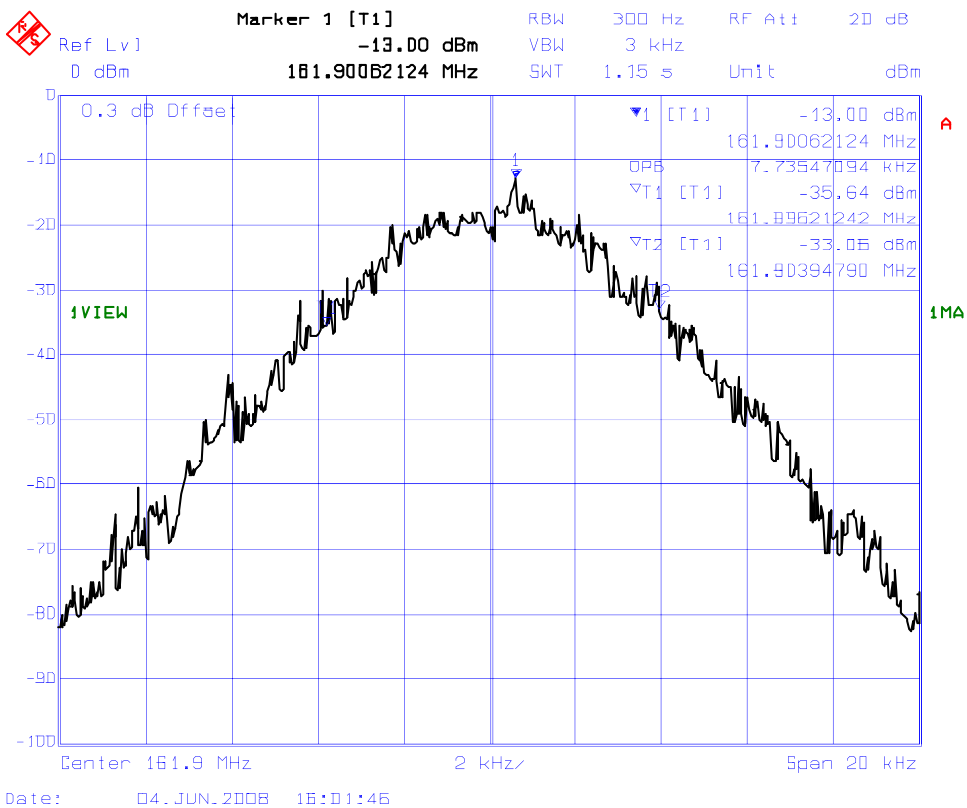
PLOT # 20(a): **99% Occupied Bandwidth – RF Input Signal**
Frequency: 155.1 MHz for 25 kHz Channel Spacing
Modulation: FM modulation with 9600 b/s random data (F1D)



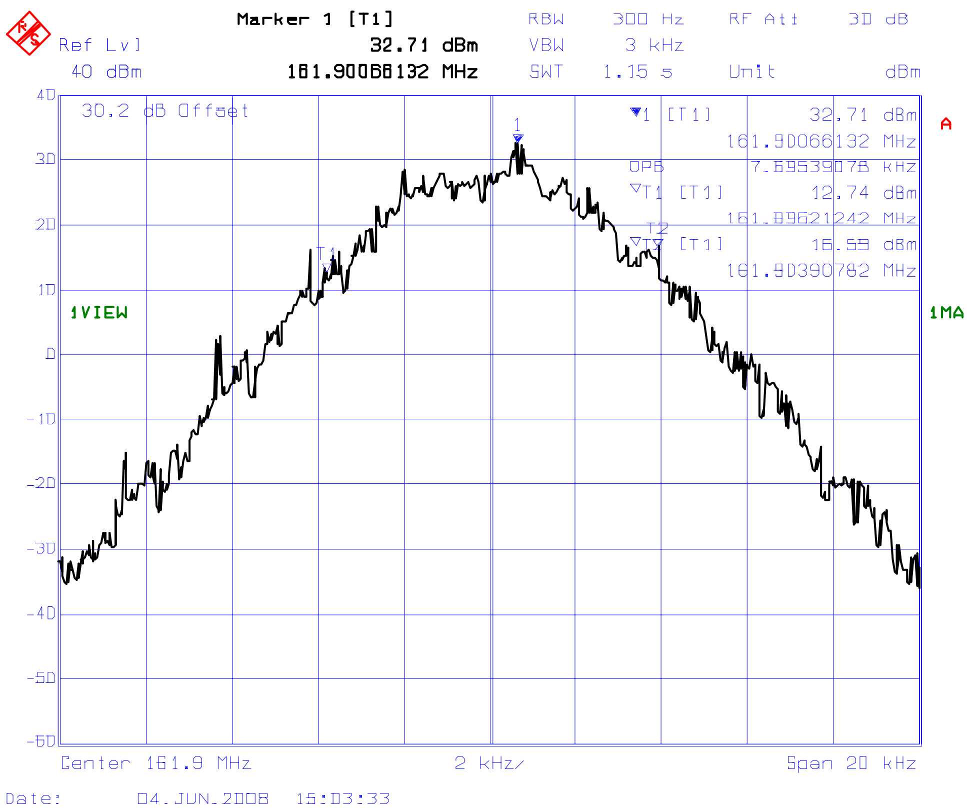
PLOT # 20(b): **99% Occupied Bandwidth – RF Output Signal**
Frequency: 155.1 MHz for 25 kHz Channel Spacing
Modulation: FM modulation with 9600 b/s random data (F1D)



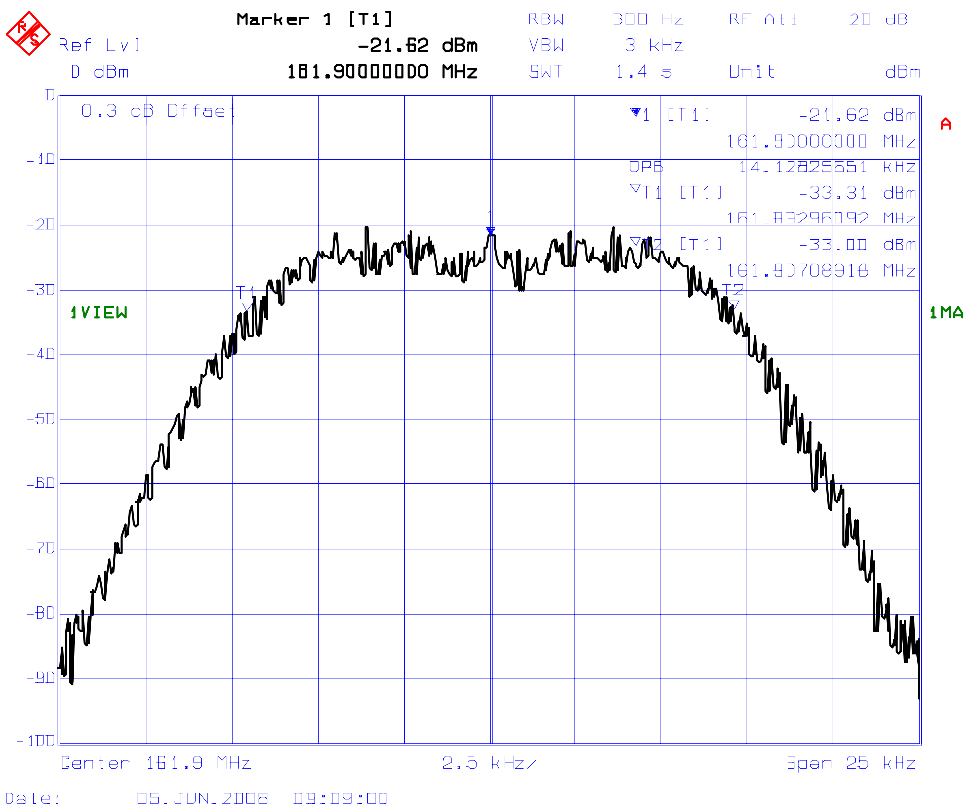
PLOT # 21(a): **99% Occupied Bandwidth – RF Input Signal**
Frequency: 161.9 MHz for 12.5 kHz Channel Spacing
Modulation: FM modulation with 9600 b/s random data (F1D)



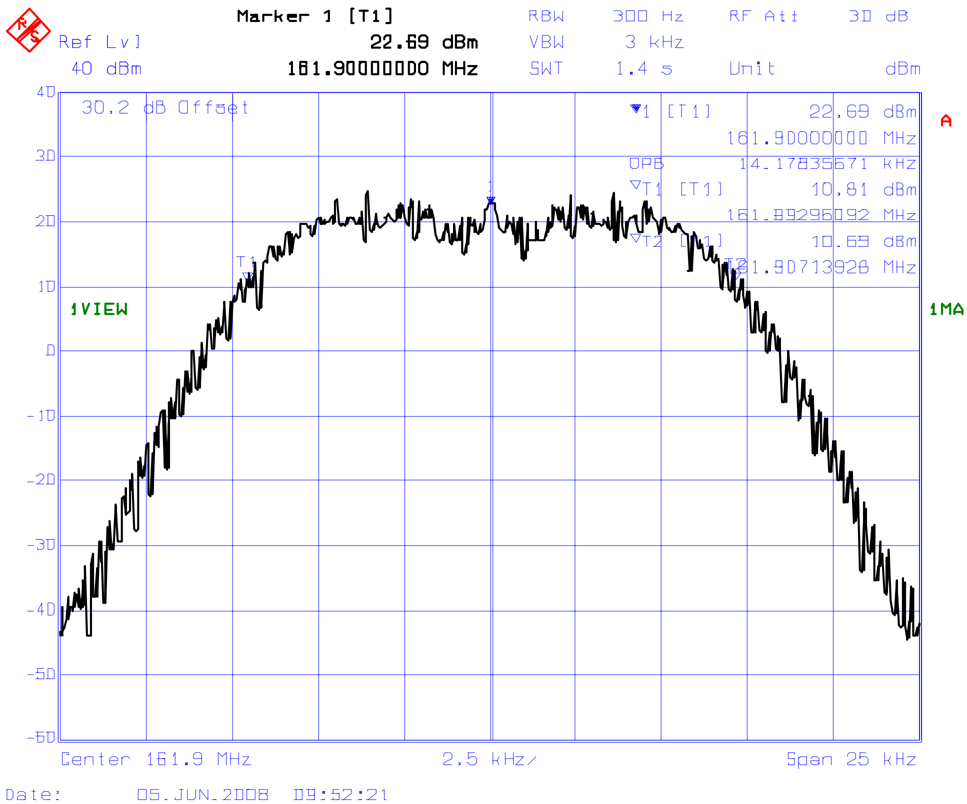
PLOT # 21(b): 99% Occupied Bandwidth – RF Output Signal
Frequency: 161.9 MHz for 12.5 kHz Channel Spacing
Modulation: FM modulation with 9600 b/s random data (F1D)



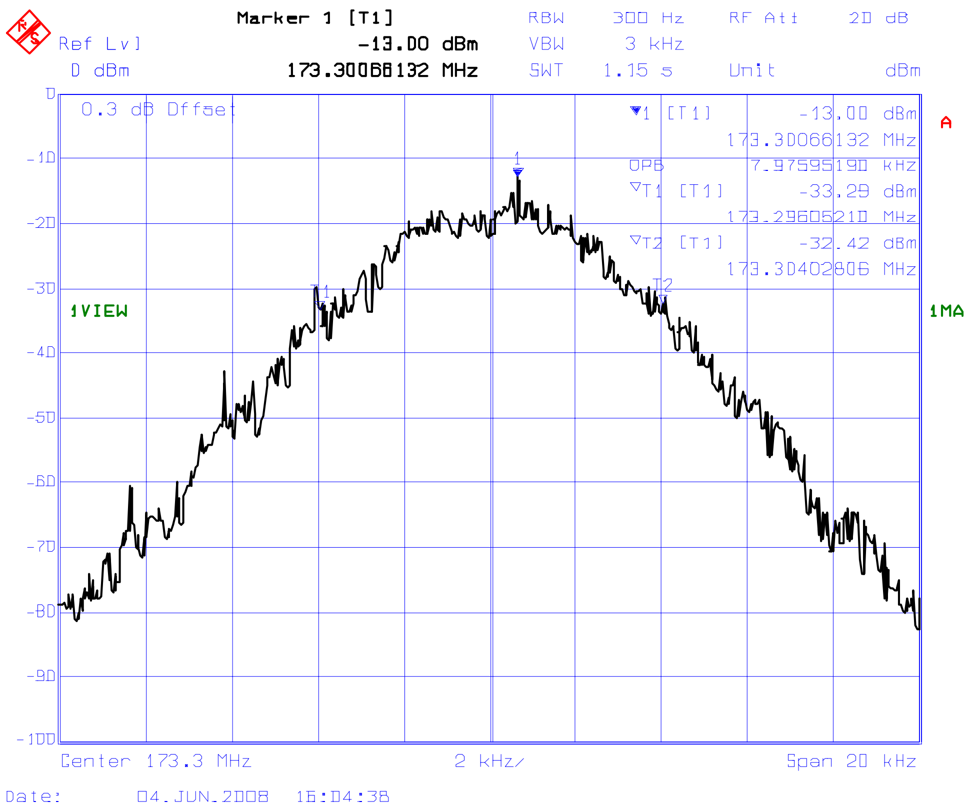
PLOT # 22(a): **99% Occupied Bandwidth – RF Input Signal**
Frequency: 161.9 MHz for 25 kHz Channel Spacing
Modulation: FM modulation with 9600 b/s random data (F1D)



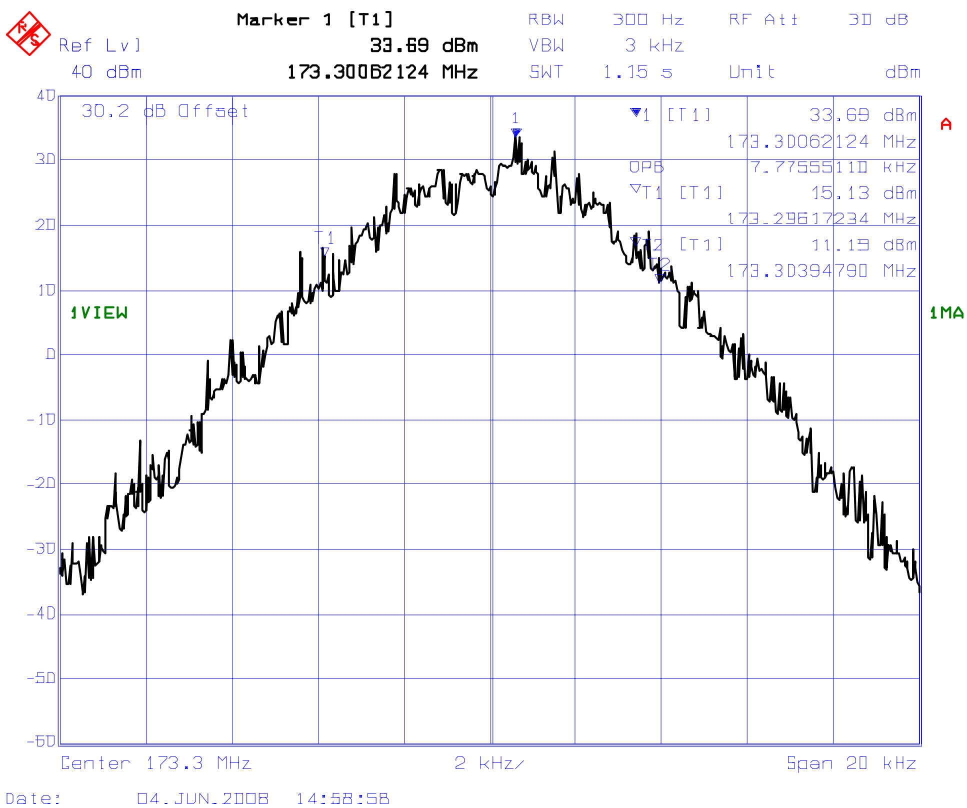
PLOT # 22(b): 99% Occupied Bandwidth – RF Output Signal
Frequency: 161.9 MHz for 25 kHz Channel Spacing
Modulation: FM modulation with 9600 b/s random data (F1D)



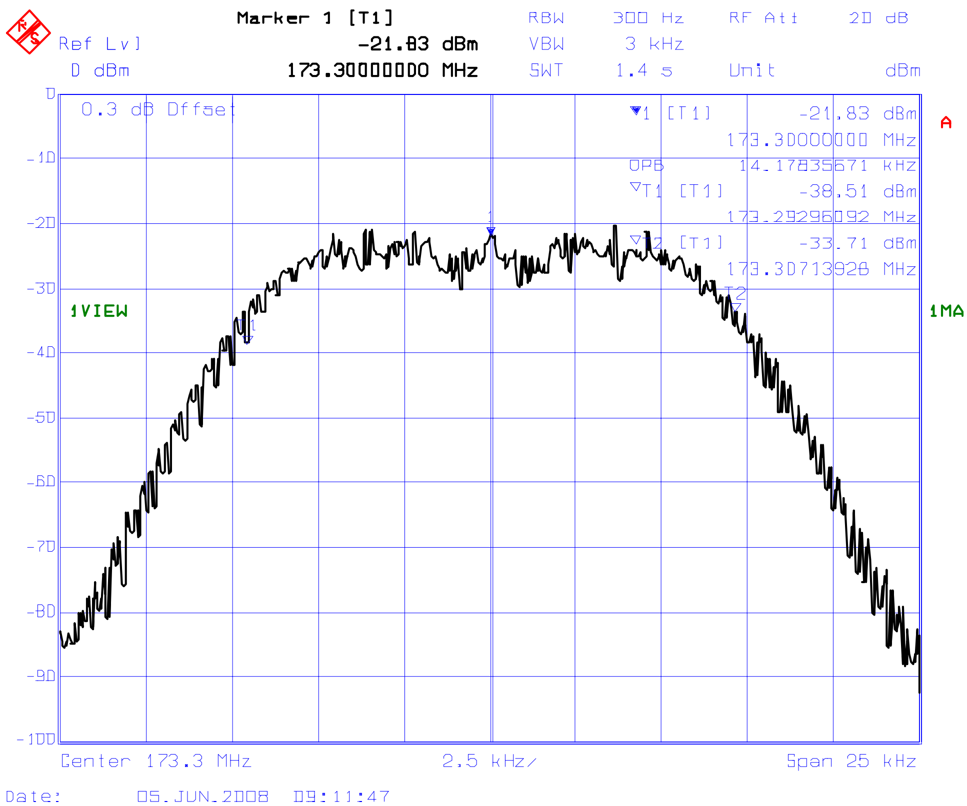
PLOT # 23(a): **99% Occupied Bandwidth – RF Input Signal**
Frequency: 173.3 MHz for 12.5 kHz Channel Spacing
Modulation: FM modulation with 9600 b/s random data (F1D)



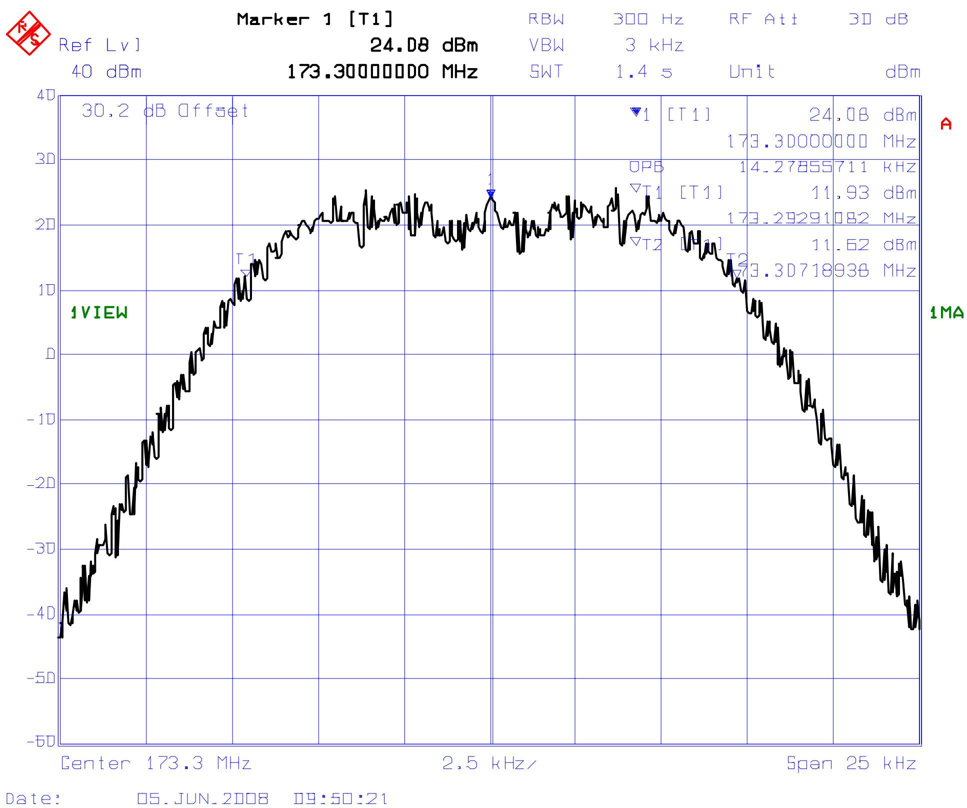
PLOT # 23(b): 99% Occupied Bandwidth – RF Output Signal
Frequency: 173.3 MHz for 12.5 kHz Channel Spacing
Modulation: FM modulation with 9600 b/s random data (F1D)



PLOT # 24(a): **99% Occupied Bandwidth – RF Input Signal**
Frequency: 173.3 MHz for 25 kHz Channel Spacing
Modulation: FM modulation with 2.5 kHz Sinewave Signal (F3E)



PLOT # 24(b): **99% Occupied Bandwidth – RF Output Signal**
Frequency: 173.3 MHz for 25 kHz Channel Spacing
Modulation: FM modulation with 9600 b/s random data (F1D)



5.6. ANTENNA POWER SPURIOUS/HARMONIC CONDUCTED EMISSIONS @ 90.210, 90.543(C), 2.1057 & 2.1051

5.6.1. Limits

The most stringent limit of 43+10*log(P in Watts) dBc is applied for worst case.

5.6.2. Method of Measurements

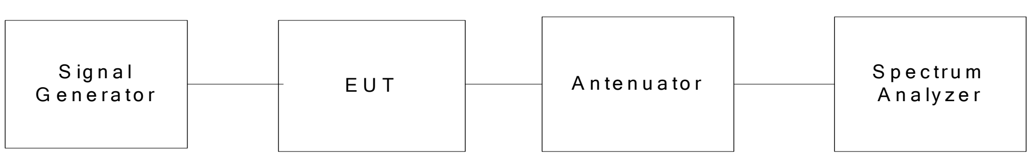
Refer to Exhibit 7 § 7.5 of this report for measurement details

5.6.3. Test Equipment List

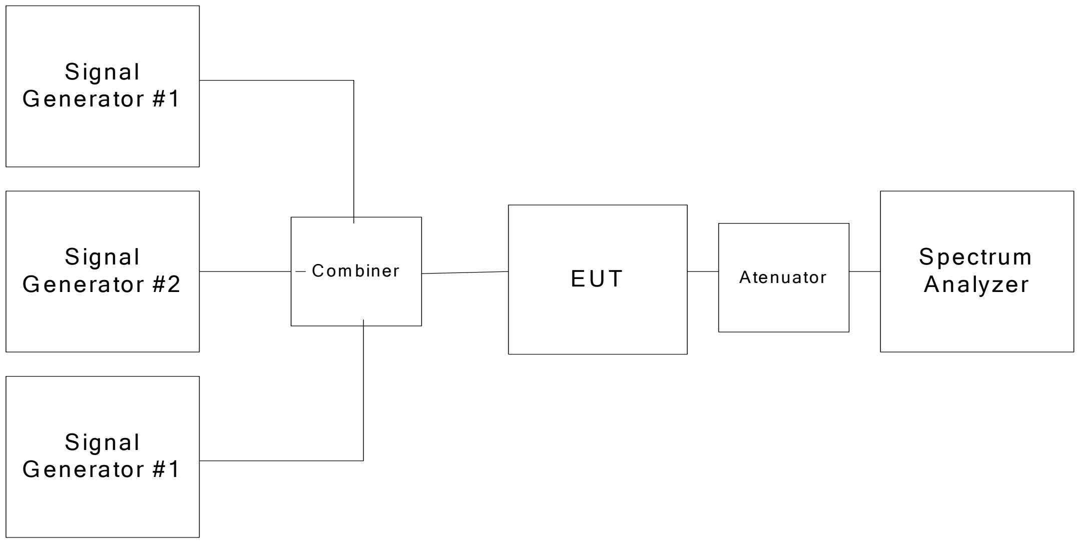
Test Instruments	Manufacturer	Model No.	Serial No.	Frequency Range
Spectrum Analyzer/ EMI Receiver	Rohde & Schawrz	FSEK30	100077	20 Hz – 40 GHz with external mixer
Attenuator(s)	Bird	..	…	DC – 22 GHz
Audio Oscillator	Hewlett Packard	HP 204C	0989A08798	DC to 1.2 MHz
Highpass Filter, Microphase	Microphase	CR220HID	IITI11000AC	Cut-off Frequency at 600 MHz, 1.3 GHz or 4 GHz

5.6.4. Test Arrangement

<u>Single Channel Input</u>:



Multiple Channel Inputs:



5.6.5. Method of Measurements

Refer to Exhibit 7 § 7.5 of this report for measurement details

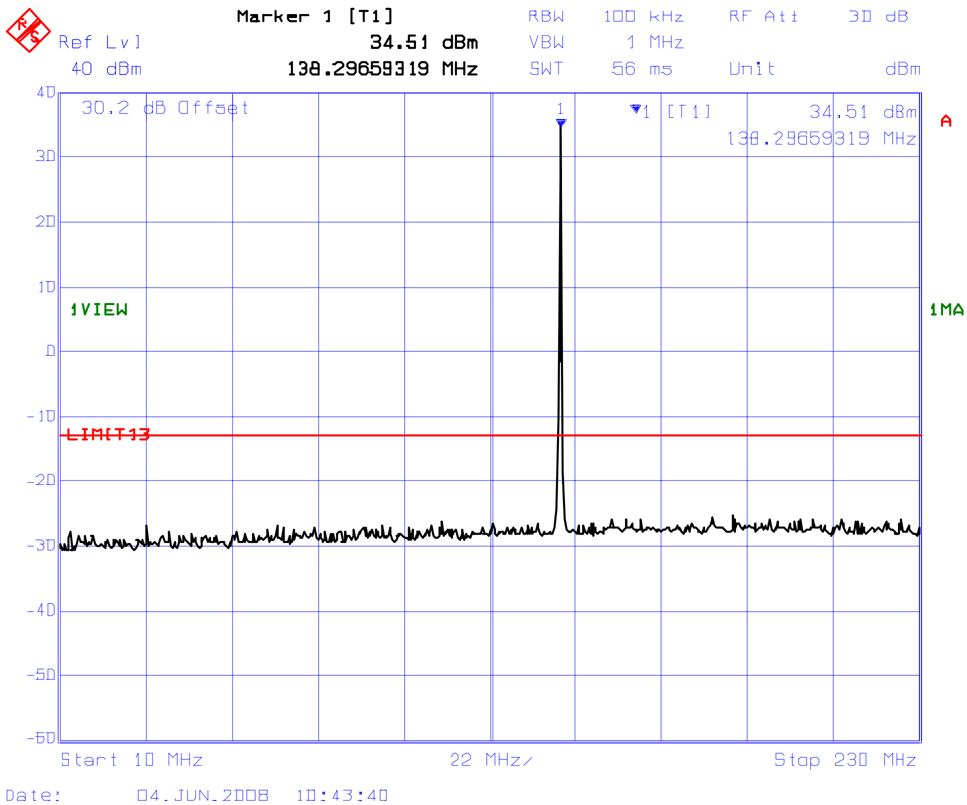
5.6.6. Test Data

All transmitter spurious radiated emissions were scanned from 30 MHz to 10 GHz and found to comply with IC Limits. Please refer to Plots # 25(a)&(b) through 28(a)&(b).

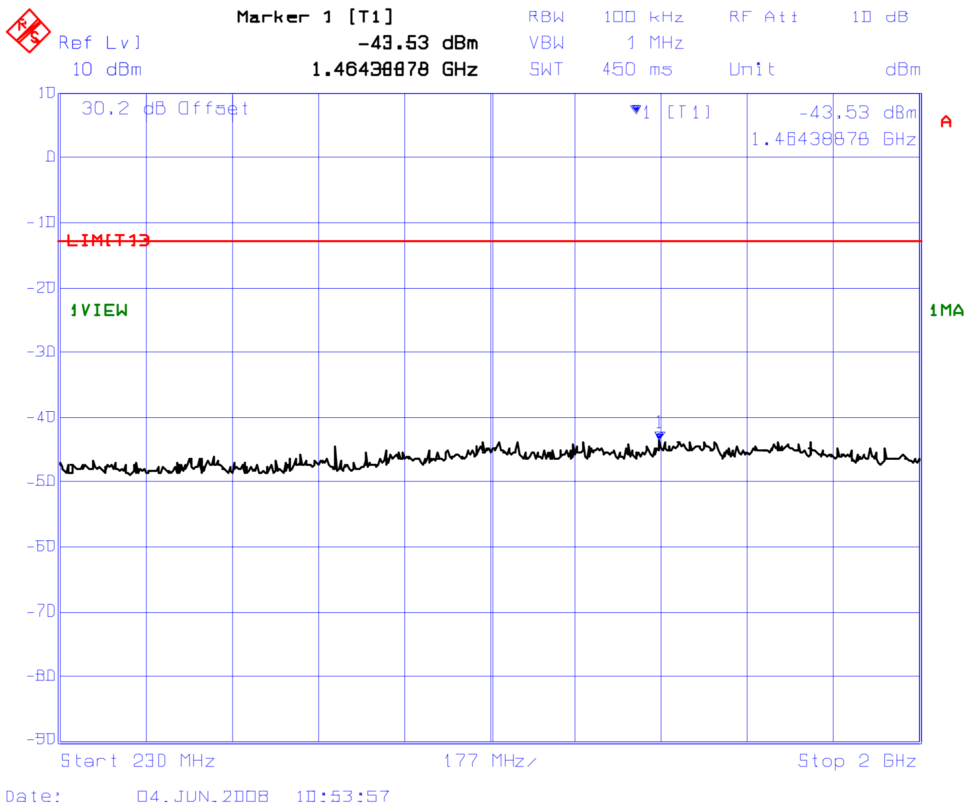
Notes:

(1) The most stringent limit of 43+10*log(P in Watts) dBc is applied for all sub-bands for worst case.
(2) The rf emissions were scanned with all different modulations and there are no difference emissions were found; therefore, the final tests were only performed without modulation and it shall represent for all different modulations required.
(3) Single RF input will be tested to represent the worst case with highest input output powers

PLOT # 25(a): Transmitter Antenna Conducted RF Spurious Emissions @ Antenna Port @ Fc: 138.1 MHz – single Maximum RF input/Output

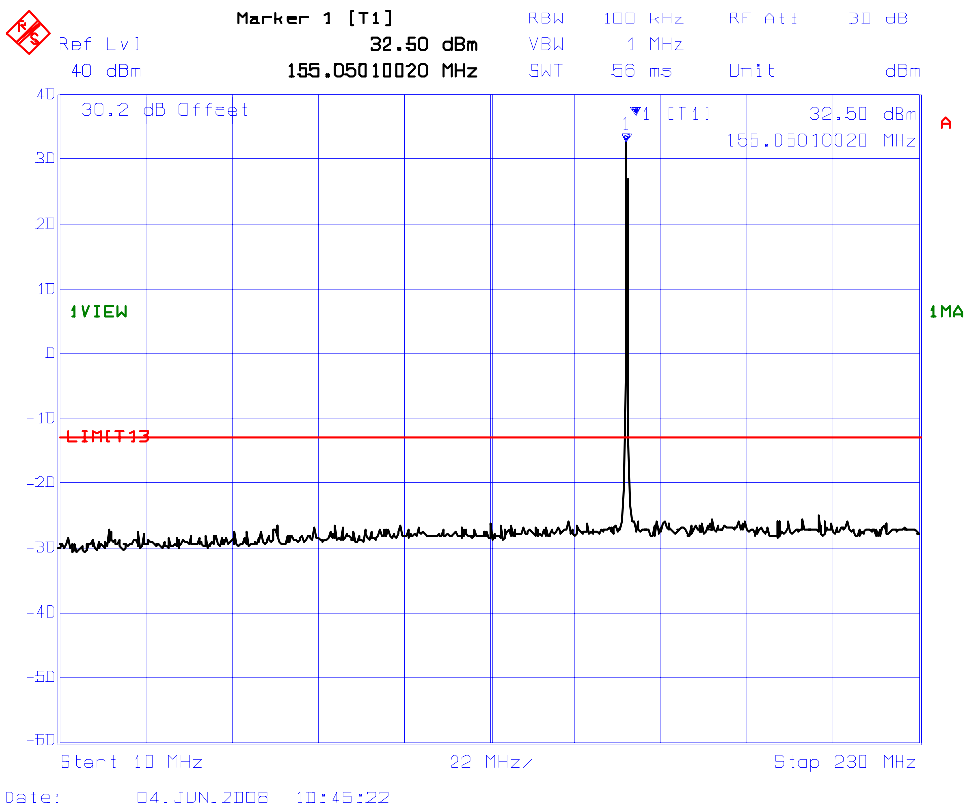


PLOT # 25(b): Transmitter Antenna Conducted RF Spurious Emissions @ Antenna Port @ Fc: 138.1 MHz – single Maximum RF input/Output

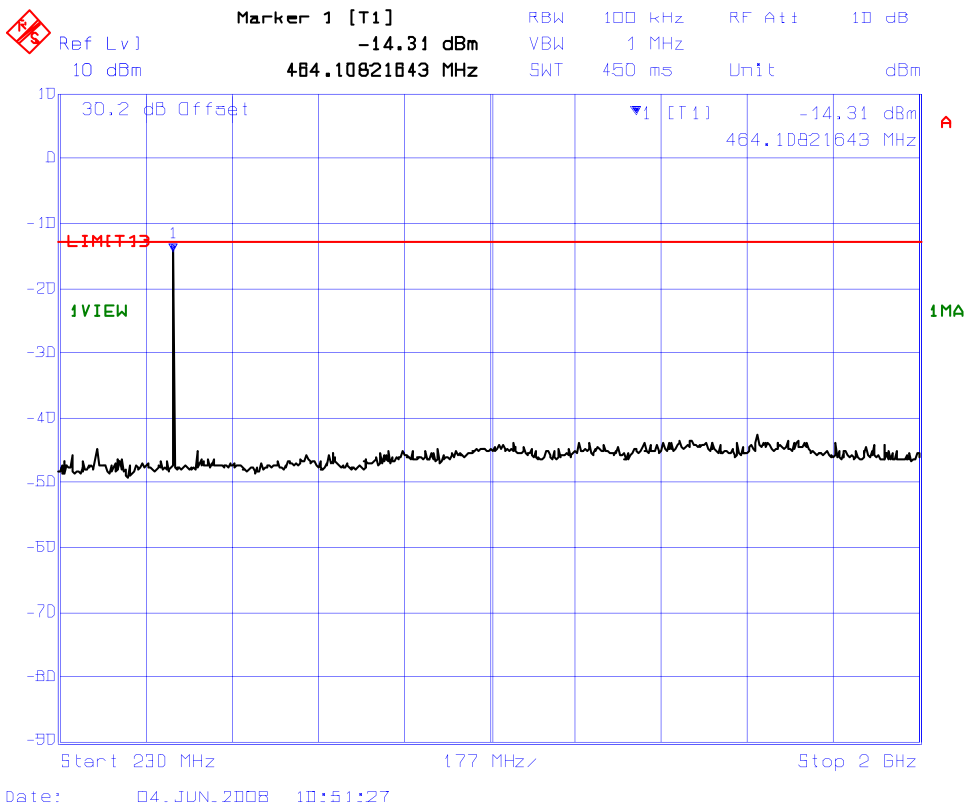


- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*

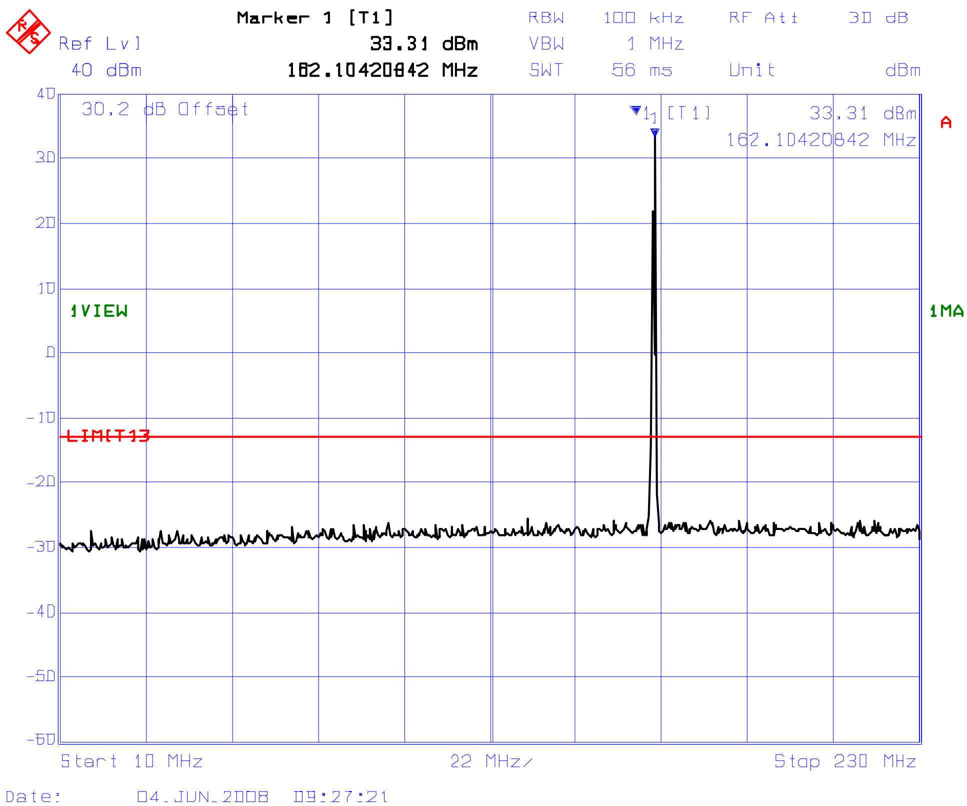
PLOT # 26(a): Transmitter Antenna Conducted RF Spurious Emissions @ Antenna Port @ Fc: 155.1 MHz – single Maximum RF input/Output



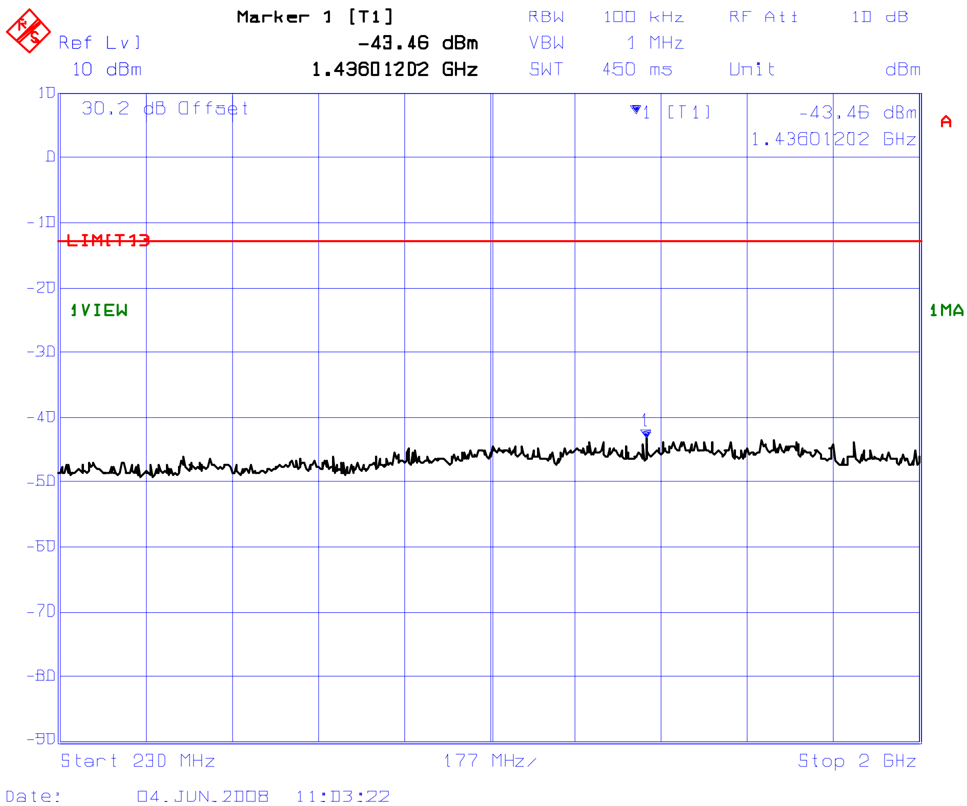
PLOT # 26(b): Transmitter Antenna Conducted RF Spurious Emissions @ Antenna Port @ Fc: 155.1 MHz – single Maximum RF input/Output



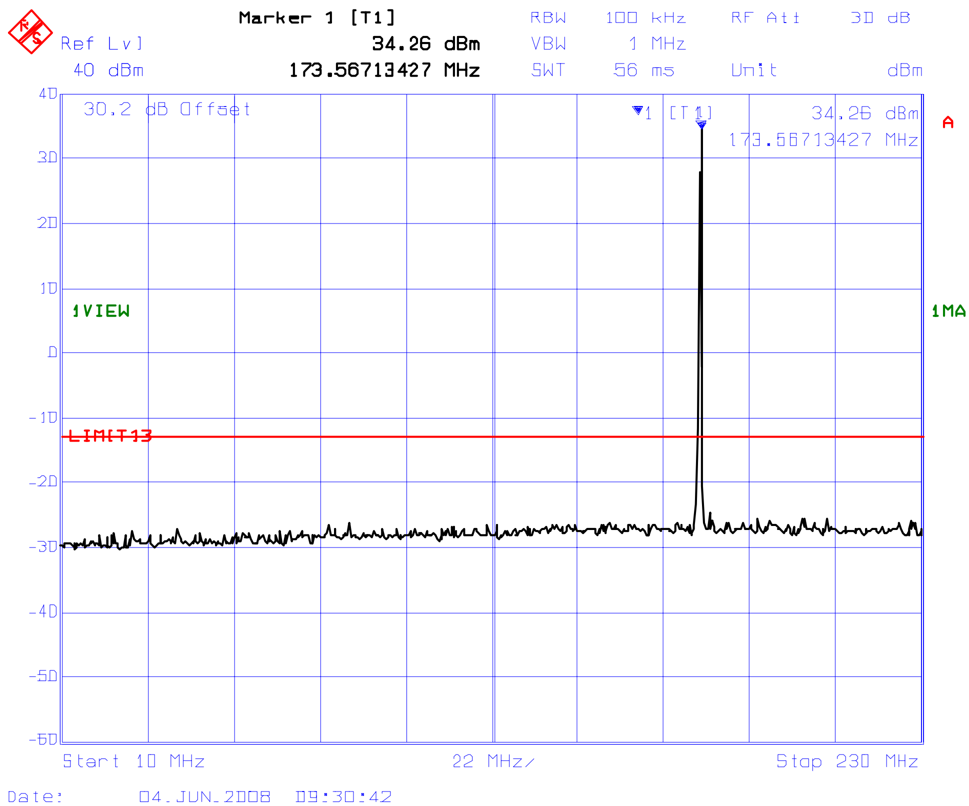
PLOT # 27(a): Transmitter Antenna Conducted RF Spurious Emissions @ Antenna Port @ Fc: 161.9 MHz – single Maximum RF input/Output



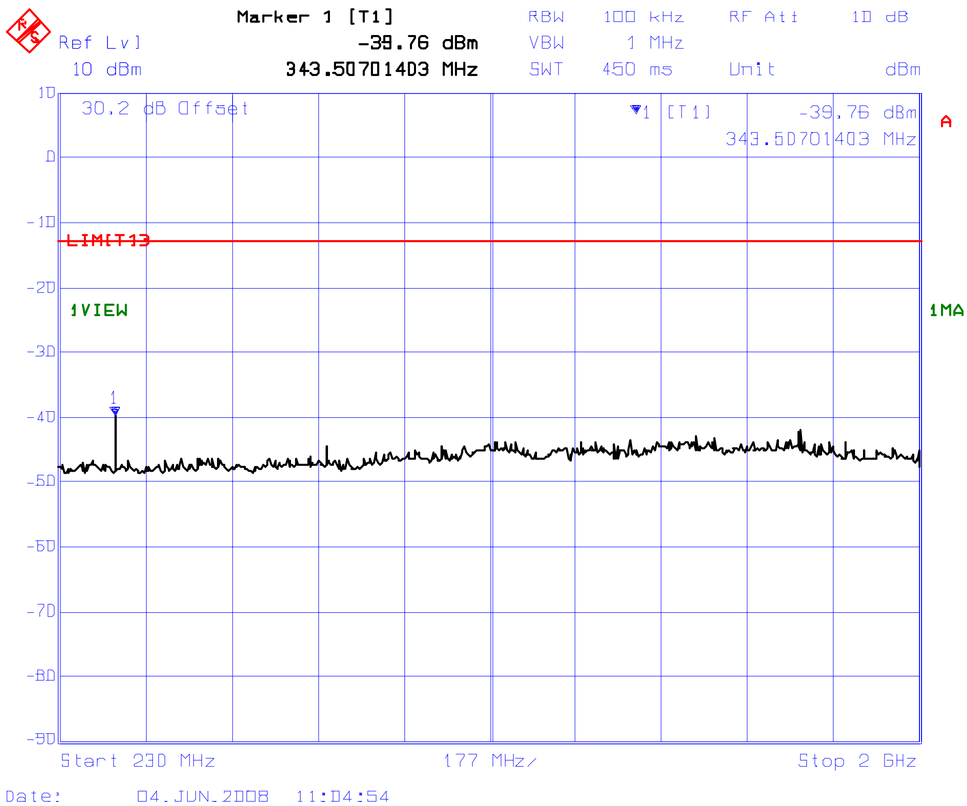
PLOT # 27(b): Transmitter Antenna Conducted RF Spurious Emissions @ Antenna Port @ Fc: 161.9 MHz – single Maximum RF input/Output



PLOT # 28(a): Transmitter Antenna Conducted RF Spurious Emissions @ Antenna Port @ Fc: 173.3 MHz – single Maximum RF input/Output



PLOT # 28(b): Transmitter Antenna Conducted RF Spurious Emissions @ Antenna Port @ Fc: 173.3 MHz – single Maximum RF input/Output



5.7. TRANSMITTER SPURIOUS/HARMONIC RADIATED EMISSIONS @ 90.210, 90.543(C, 2.1057 & 2.1051

5.7.1. Limits

The most stringent limit of 43+10*log(P in Watts) dBc is applied for all sub-bands for worst case.

5.7.2. Method of Measurements

The spurious/harmonic ERP measurements are using substitution method specified in Exhibit 7, § 7.2 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)

5.7.3. Test Equipment List

Test Instruments	Manufacturer	Model No.	Serial No.	Frequency Range
Spectrum Analyzer/ EMI Receiver	Rohde & Schawrz	FSEK30	100077	20 Hz – 40 GHz with external mixer
RF Amplifier	Com-Power	PA-102		1 MHz to 1 GHz, 30 dB gain nominal
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

5.7.4. Test Setup

Please refer to Photo # 1to 2 for detailed of test setup.

5.7.5. Test Data

Remark: The transmitter radiated emissions with single RF input signal was tested to represent for worst case

5.7.5.1. Frequency: 138.1 MHz, Single Maximum Input/Output

- The emissions were scanned from 30 MHz to 2 GHz and no significant rf spurious/harmonic emissions were found .

5.7.5.2. Frequency: 155.1 MHz, Single Maximum Input/Output

- The emissions were scanned from 30 MHz to 2 GHz and no significant rf spurious/harmonic emissions were found .

5.7.5.3. Frequency: 161.9 MHz, Single Maximum Input/Output

- The emissions were scanned from 30 MHz to 2 GHz and no significant rf spurious/harmonic emissions were found .

5.7.5.4. Frequency: 173.3 MHz, Single Maximum Input/Output

- The emissions were scanned from 30 MHz to 2 GHz and no significant rf spurious/harmonic emissions were found .

5.8. RF EXPOSURE REQUIRMENTS @ 1.1310 & 2.1091

5.8.1. 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				
30-300	61.4	0.163	1.0	6
(B) Limits for General Population/Uncontrolled Exposure				
30-300	27.5	0.073	0.2	30

F = Frequency in MHz

5.8.2. Method of Measurements

Refer to FCC @ 1.1310 and 2.1091

- 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)

5.8.3. Test Data

Antenna Gain Limit specified by Manufactuer: 3.5 dBd or 5.65 dBi

Minimum Frequency (MHz)	Maximum Conducted Power (dBm)	Maximum EIRP (dBm)	Calculated RF Safety Distance r (cm)	Manufacturer' Specified Separation Distance (cm)	Compliance
138.1	34.64	30.29	66	66	Complies

Note: **RF EXPOSURE DISTANCE LIMITS: $r = (PG/4\Pi S)^{1/2} = (EIRP/4\Pi S)^{1/2} = (10690.55/(4*3.1416*0.2))^{1/2} = 65.2$ cm**
For General Population/Uncontrolled Exposure: $S = 0.2$ mW/cm^2

Evaluation of RF Exposure Compliance Requirements	
RF Exposure Requirements	**Compliance with IC Rules**
Minimum separation distance between antenna and persons, specified by the manufacturer, for	66 cm

EXHIBIT 6. MEASUREMENT UNCERTAINTY

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

6.1. 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 Γ_1 = 0.2 Antenna VRC Γ_R = 0.67(Bi) 0.3 (Lp) Uncertainty limits $20Log(1\pm\Gamma_1\Gamma_R)$	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 7. MEASUREMENT METHODS

7.1. 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.

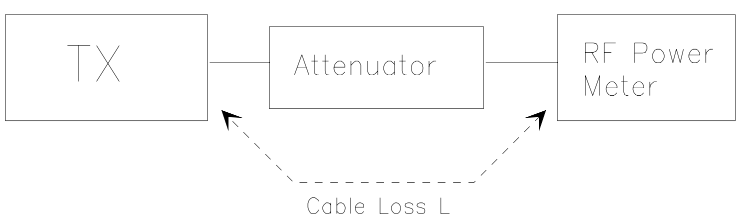
Step 2: Calculation of Average EIRP. See Figure 1

- 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.



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

7.2.1. 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

7.2.2. 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^o 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

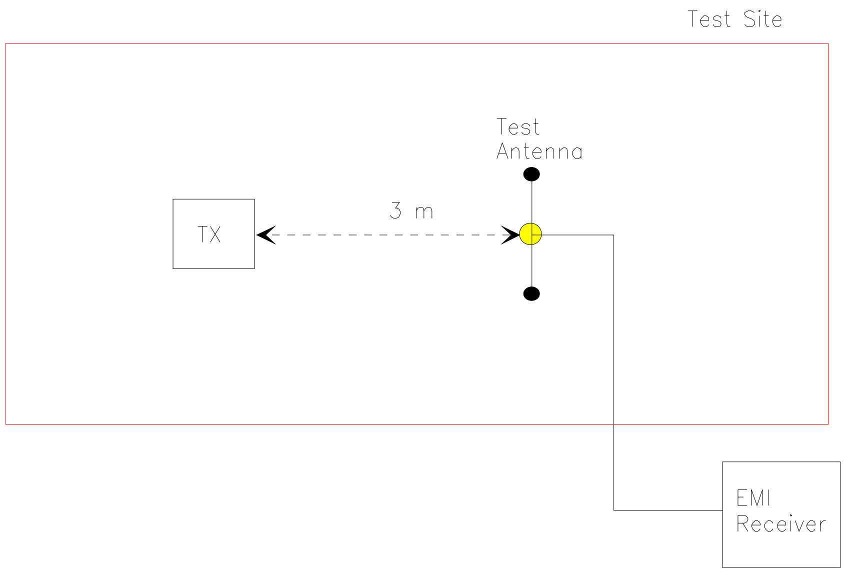
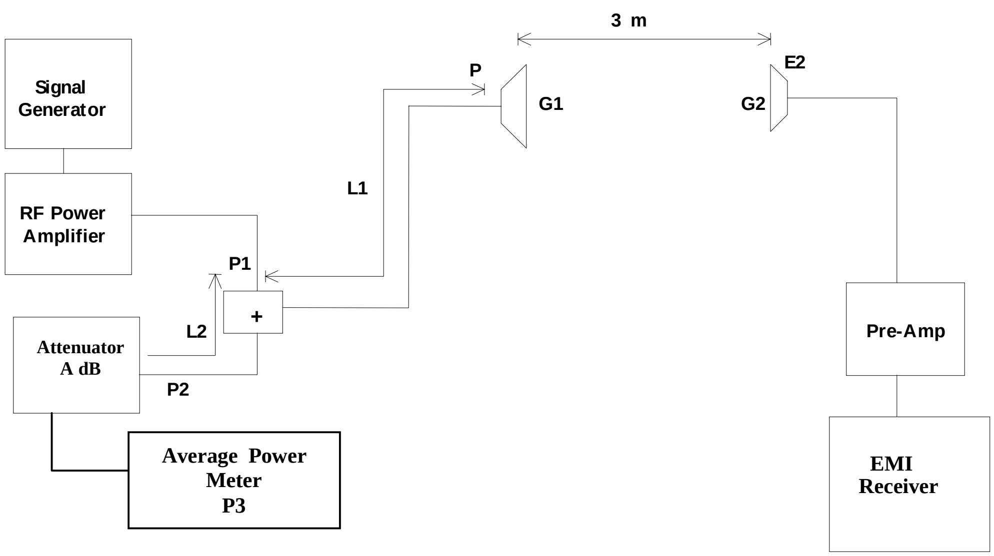


Figure 3



7.3. 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).

7.4. EMISSION MASK

Voice or Digital Modulation Through a Voice Input Port @ 2.1049(c)(i):- The transmitter was modulated by a 2.5 KHz tone signal at an input level 16 dB greater than that required to produce 50% modulation (e.g.: ±2.5 KHz peak deviation at 1 KHz modulating frequency). The input level was established at the frequency of maximum response of the audio modulating circuit.

Digital Modulation Through a Data Input Port @ 2.1049(h):- Transmitters employing digital modulation techniques - when modulated by an input signal such that its amplitude and symbol rate represent the maximum rated conditions under which the equipment will be operated. The signal shall be applied through any filter networks, pseudo-random generators or other devices required in normal service. Additionally, the Emission Masks shall be shown for operation with any devices used for modifying the spectrum when such devices are operational at the discretion of the user.

The following EMI Receiver bandwidth shall be used for measurement of Emission Mask/Out-of-Band Emission Measurements:

(1) For 25 kHz Channel Spacing: RBW = 300 Hz
(2) For 12.5 kHz or 6.25 kHz Channel Spacings: RBW = 100 Hz

The all cases the Video Bandwidth shall be equal or greater than the measuring bandwidth.

7.5. 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 ≥ 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.