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FCC PT 90, PT 80, PT 22 AMPLIFIER TEST REPORT

APPLICANT	CRESCEND TECHNOLOGIES, LLC
ADDRESS	920 EAST STATE PARKWAY SCHAUMBURG IL 60173 USA
FCC ID	CWWVHFP15XXFF1
IC LABEL	7291A-VHFP15XXFF1
MODEL NUMBER	VHFP15XXFF1
PRODUCT DESCRIPTION	VHF Amplifier
DATE SAMPLE RECEIVED	May 14, 2007
DATE TESTED	May 21, 2007
TESTED BY	Richard Block
APPROVED BY	Mario de Aranzeta
TIMCO REPORT NO.	2038AUT7TestReport.PDF
TEST RESULTS	<input checked="" type="checkbox"/> PASS <input type="checkbox"/> FAIL

**THE ATTACHED REPORT SHALL NOT BE REPRODUCED EXCEPT IN FULL
WITHOUT THE WRITTEN APPROVAL OF TIMCO ENGINEERING, INC.**



Certificate # 0955-01

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ATTESTATION STATEMENT

This equipment has been tested in accordance with the standards identified in the referenced test report. To the best of my knowledge and belief, these tests were performed using the measurement procedures described in this report.



Certificate #0955-01

All instrumentation and accessories used to test products for compliance to the indicated standards are calibrated regularly in accordance with ISO 17025 requirements.

I attest that the necessary measurements were made by me or under my supervision, at Timco Engineering, Inc. located at 849 N.W. State Road 45, Newberry, Florida 32669 USA.

Authorized by: Mario de Aranzeta
Signature: On File
Function: Test Lab Supervisor / Engineer
Date: July 19, 2007

REPORT SUMMARY

Disclaimer	The test results relate only to the items tested.
Purpose of Test	To show the DUT in compliance with FCC CFR 47, Part 90 Part 80, and Part 22 requirements for VHF radios.
Test Procedures	ANSI/TIA 603-C: 2004, FCC CFR 47 Part 90, Part 80, Part 22 ANSI C63.4: 2003
Related Approval	N/A

TEST ENVIRONMENT AND TEST SETUP

Test Facility	All tests were conducted by Timco Engineering Inc. located at 849 NW State Road 45, Newberry, FL 32669 USA
Laboratory Test Condition	Temperature: 26°C Relative humidity: 50%.
Deviation from the standards	No deviation
Modification to the DUT	No modification was made.
Test Exercise (software etc.)	The DUT was placed in continuous transmitting mode of operation.
System Setup	Stand alone device.

DUT DESCRIPTION

Manufactured by	Crescend Technologies, LLC
Product Description	VHF Amplifier
FCC ID	CWWVHFP15XXFF1
IC Label	IC: 7291A-VHFP15XXFF1
M/N	VHFP15XXFF1
Family M/Ns	N/A
S/N	N/A
Operating Freq	USA: 150 – 174 MHz Canada: 138 – 174 MHz
Max. Output Pwr	High: 150 W Low: 50 W
Modulation	FM
Power Source	13.8 VDC DC Power
Test Item	Preproduction
Type of DUT	Fixed Amplifier

TEST EQUIPMENT

Device	Manufacturer	Model	Serial Number	Cal/Char Date	Due Date
Analyzer Tan Tower Spectrum Analyzer	HP	8566B Opt 462	3138A07786 3144A20661	CAL 12/7/05	12/7/07
Analyzer Tan Tower RF Preselector	HP	85685A	3221A01400	CAL 12/7/05	12/7/07
Analyzer Tan Tower Quasi-Peak Adapter	HP	85650A	3303A01690	CAL 12/8/05	12/8/07
Analyzer Tan Tower Preamplifier	HP	8449B-H02	3008A00372	CAL 12/8/05	12/8/07
Antenna: Biconnical	Electro- Metrics	BIA-25	1171	CAL 4/29/05	4/29/07
Antenna: Log-Periodic	Electro- Metrics	LPA-25	1122	CAL 12/1/06	12/1/08
Antenna: Double- Ridged Horn	Electro- Metrics	RGA-180	2319	CAL 12/29/06	12/29/08
LISN	Electro- Metrics	ANS-25/2	2604	CAL 10/5/06	10/5/08
Termaline Wattmeter	Bird Electronic Corporation	611	16405	CAL 3/15/07	3/15/09

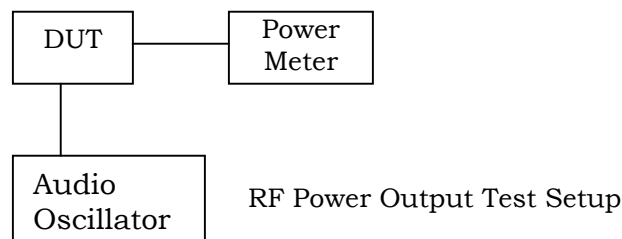
TEST PROCEDURE

Power Line Conducted Interference

The procedure used was ANSI 63.4-2003 using a 50uH LISN. Both lines were observed with the DUT transmitting. The bandwidth of the spectrum analyzer was 10 kHz with an appropriate sweep speed.

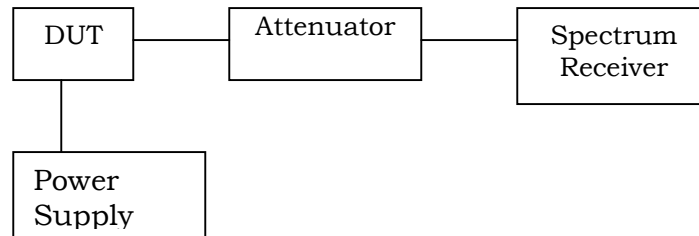
RF Power Output

The RF power output was measured at the antenna feed point using a peak power meter. A 50-ohm, resistive wattmeter was connected to the RF output connector. With a nominal battery voltage, and the transmitter properly adjusted the RF output measures:



Spurious Emissions At Antenna Terminals (Conducted)

The carrier was modulated 100%. The spectrum was scanned from 0.4 to at least the 10th harmonic of the fundamental. Above 1 GHz the resolution bandwidth was 1 MHz and the VBW = 3 MHz and the span to 50 MHz. The measurements were made in accordance with standard ANSI/TIA-603-C: 2004



Radiation Interference

The test procedure used was ANSI/TIA-603-C: 2004 and ANSI C63.4-2003 using an Agilent spectrum receiver with pre-selector. The bandwidth (RBW) of the spectrum receiver was 100 kHz up to 1 GHz and 1 MHz above 1 GHz with an appropriate sweep speed. The VBW above 1 GHz was 3 MHz. The analyzer was calibrated in dB above a microvolt at the output of the antenna.

Modulation Characteristic

Audio frequency response

The audio frequency response was measured in accordance with ANSI/TIA 603-C: 2004.

Audio Low Pass Filter

The audio low pass filter for voice-modulated equipment was measured in accordance with ANSI/TIA 603-C: 2004.

Audio Input versus modulation

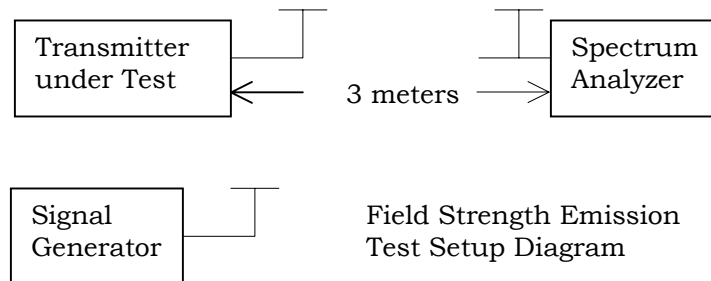
The audio input level needed for a particular percentage of modulation was measured in accordance with ANSI/TIA 603-C: 2004. Curves are provided for audio input frequencies of 300, 1000, and 3000 Hz.

Frequency Stability

The frequency stability was measured per ANSI/TIA 603-C: 2004.

Field Strength of Spurious Emissions

The spectrum was scanned from 30 MHz to at least the tenth harmonic of the fundamental. This test was conducted per ANSI/TIA 603-C: 2004 using the substitution method.

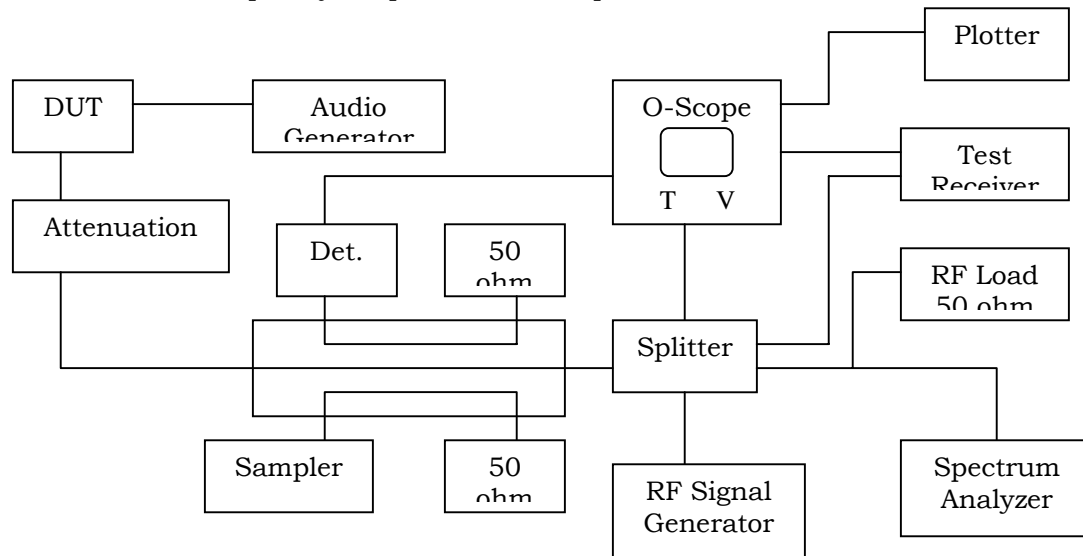


Transient Frequency Behavior

The test procedure was ANSI/TIA 603-C: 2004 Para 2.2.19.

- Using the variable attenuator. The transmitter level was set to 40 dB below the test receivers maximum input level,
- Then the transmitter was turned off.
- With the transmitter off the signal generator was set 20dB below the level of the transmitter in the above step, this level will be maintained with the signal generator through-out the test.
- Reduce the attenuation between the transmitter and the RF detector by 30 dB.
- With the levels set as above the transient frequency behavior was observed & recorded.

Transient Frequency Response Test setup



TEST RESULT

RF POWER OUTPUT

Rule Part No.: Pt 2.1046(a), Pt 90, Pt 80.215, Pt 22

Requirements: Pt 2.1046

Test Data: High Power = 150 W

Low Power = 50 W

DC Power Consumption

Vdc = 13.8 V

High Ic = 25 Amps

Low Ic = 14.5 Amps

OCCUPIED BANDWIDTH

Rule Parts No: Pt 2.1049, Pt 90.210(b), Pt 80.211, Pt 22

Test Requirement:

Part 90.210(b) 25kHz Channel Spacing

Data in the plots show that on any frequency removed from the assigned frequency by more than 50%, but not more than 100%: At least 25dB. On any frequency removed from the assigned frequency by more than 100%, but not more than 250%: At least 35 dB. On any frequency removed from the assigned frequency by more than 250%, of the authorized bandwidth: At least $43 + 10\log(P)$ dB.

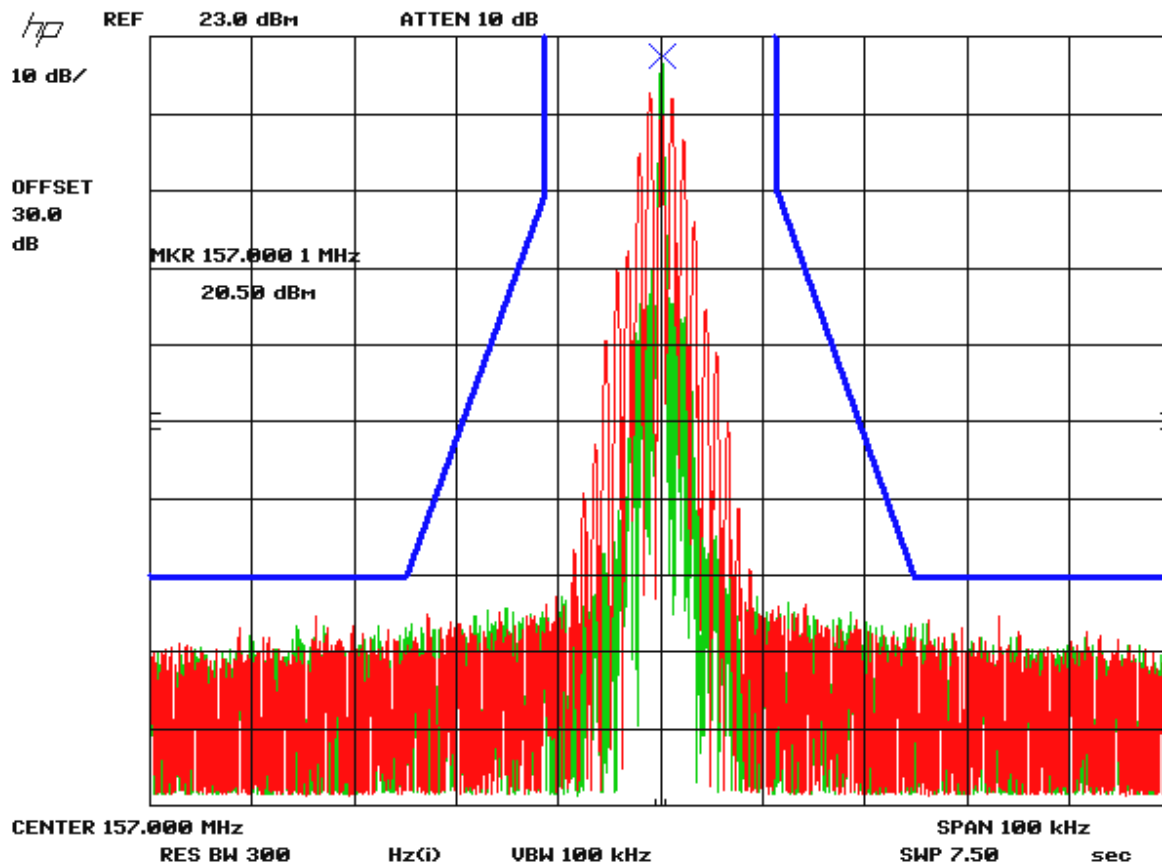
Part 90.210(c) 12.5kHz Channel Spacing Not Equipped with a Low Pass Filter

For transmitters that are not equipped with an audio low pass filter pursuant to S90.211 (b), the power of any emission must be attenuated below the un-modulated carrier output power as follows; (1) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 5 kHz but not more than 10 kHz: At least $83 \log(f_d/5)$ dB; (2) ON any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 10 kHz, but not more than 250% of the authorized bandwidth: At least $29 \log(f_d^2/11)$ dB or 50 dB, whichever is the lesser attenuation; (3) On any frequency removed from the center of the authorized bandwidth by more than 250% of the authorized bandwidth: At least $43 + 10 \log(P_o)$ dB.

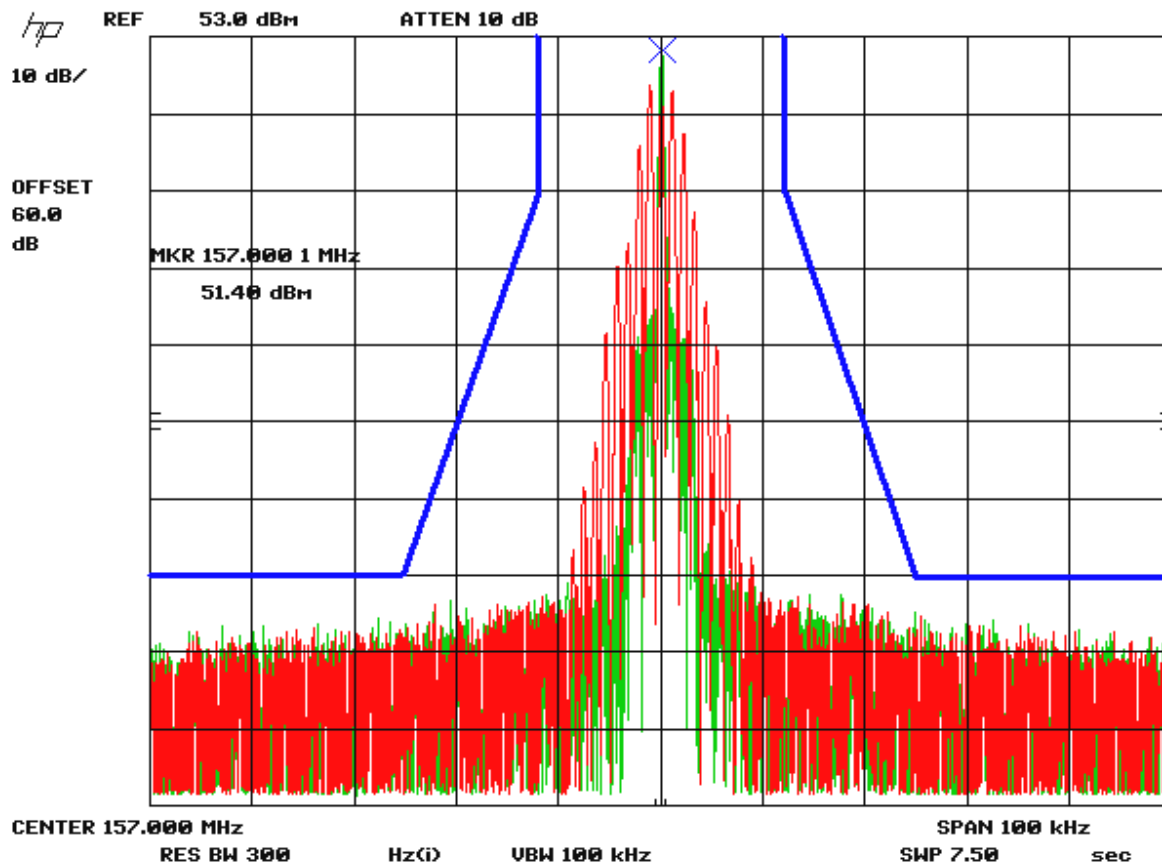
Part 90.210(d) Emission Mask D - 12.5 kHz channel BW equipment.

For transmitters designed to operate with a 12.5 kHz channel bandwidth, any emission must be attenuated below the power (P) of the highest emission contained within the authorized bandwidth as follows:

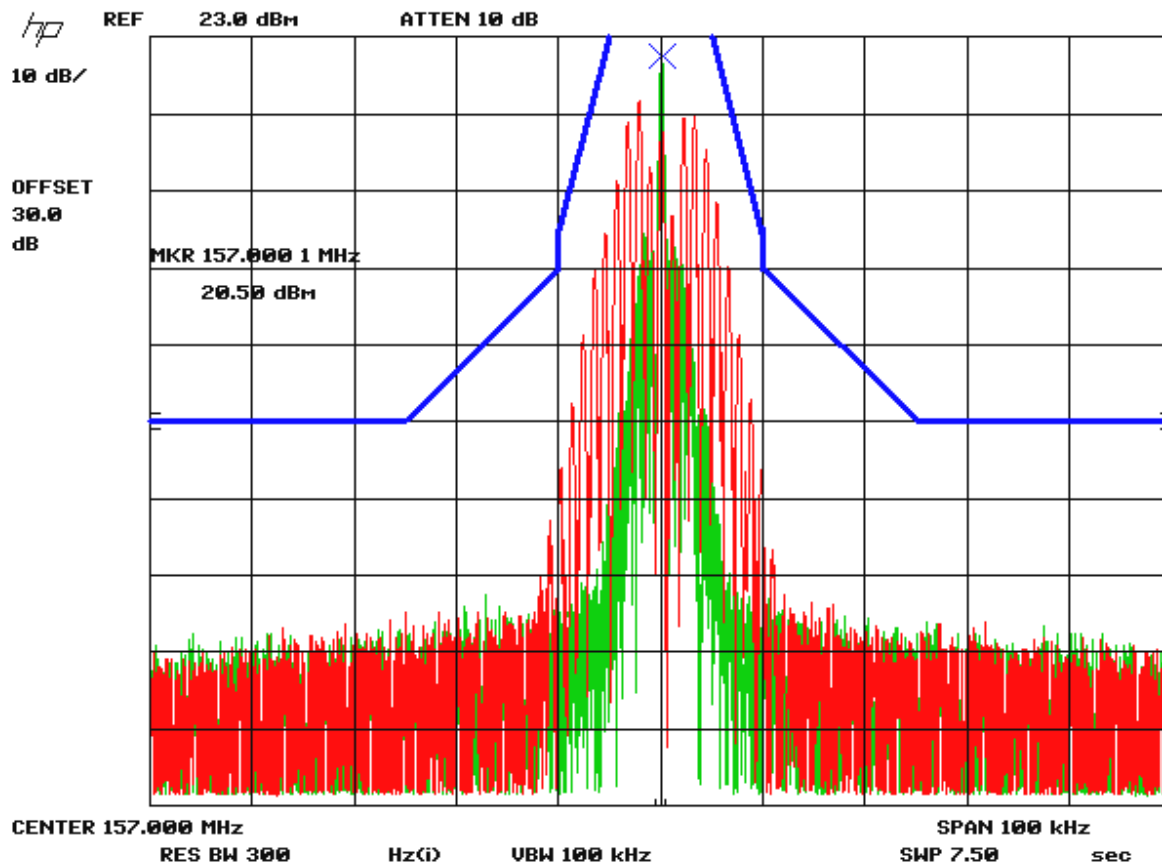
- (1) On any frequency from the center of the authorized bandwidth f_0 to 5.625 kHz removed from f_0 : Zero dB.
- (2) On any frequency from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 5.625 kHz but no more than 12.5 kHz: At least $7.27 (f_d - 2.88 \text{ kHz})$ dB.
- (3) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 12.5 kHz: At least $50 + 10\log(P)$ dB or 70 dB, whichever is the lesser attenuation.



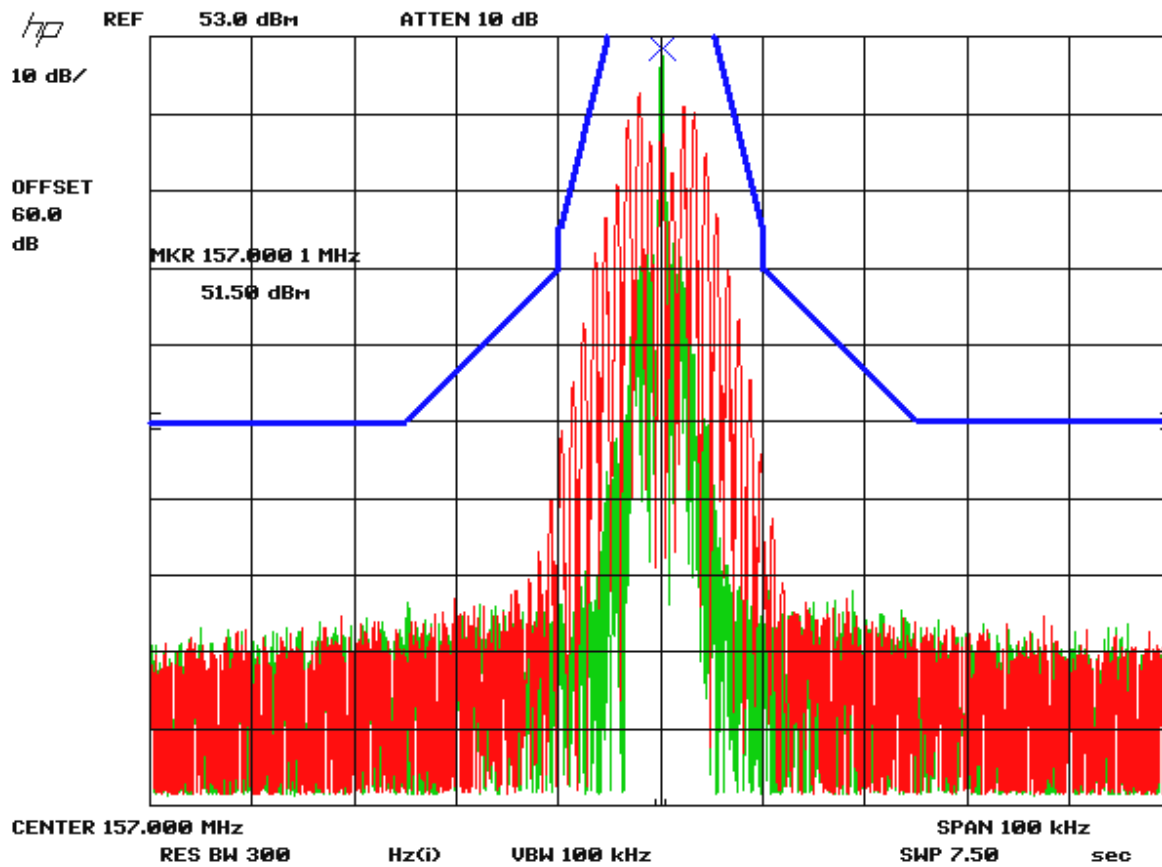
Plot 1 – 157 MHz Emission Mask D – 12.5 kHz Channel Spacing - Input



Plot 2 – 157 MHz Emission Mask D – 12.5 kHz Channel Spacing - Output



Plot 3 – 157 MHz Emission Mask C – 25 kHz Channel Spacing – Input



Plot 4 – 157 MHz Emission Mask C – 25 kHz Channel Spacing – Output

SPURIOUS EMISSIONS AT ANTENNA TERMINALS (CONDUCTED)

Rule Part No.: Part 2.1051(a)

Requirements: 12.5 kHz Spacing = $50 + 10\log(P_o) = 50 + 10\log(150) = 71.7$ dB

Test Data: High Power = 150 W unless specified otherwise

150 W

Emission Frequency MHz	dB Below Carrier (dBc)	Emission Frequency MHz	dB Below Carrier (dBc)	Emission Frequency MHz	dB Below Carrier (dBc)
144	0.0	148	0.0	152	0.0
288	95.7	296	96.1	304	97.8
432	88.0	444	88.6	456	90.6
576	99.5	592	99.4	608	100.0
720	100.2	740	94.0	760	94.9
864	97.6	888	98.6	912	97.2
1008	95.9	1036	99.0	1064	96.4
1152	99.1	1184	99.5	1216	100.1
1296	96.0	1332	95.0	1368	93.9
1440	98.3	1480	96.9	1520	100.1

Emission Frequency MHz	dB Below Carrier (dBc)	Emission Frequency MHz	dB Below Carrier (dBc)	Emission Frequency MHz	dB Below Carrier (dBc)
152	0.0	157	0.0	162	0.0
304	96.5	314	92.6	324	95.7
456	85.6	471	70.0	486	90.6
608	97.5	628	96.5	648	100.1
760	93.9	785	89.6	810	98.9
912	100.3	942	94.3	972	103.3
1064	96.9	1099	89.1	1134	101.4
1216	99.1	1256	97.5	1296	107.9
1368	96.9	1413	96.2	1458	99.5
1520	99.3	1570	99.4	1620	107.6

* Emissions are in the noise level and not reported.

[continued]

Emission Frequency MHz	dB Below Carrier (dBc)	Emission Frequency MHz	dB Below Carrier (dBc)	Emission Frequency MHz	dB Below Carrier (dBc)
162	0.0	168	0.0	174	0.0
324	95.3	336	95.1	348	94.6
486	82.5	504	83.1	522	87.4
648	98.9	672	99.2	696	98.9
810	89.2	840	79.1	870	90.3
972	87.8	1008	98.2	1044	97.0
1134	96.5	1176	95.6	1218	95.3
1296	99.3	1344	98.5	1392	96.7
1458	94.4	1512	98.2	1566	94.5
1620	98.2	1680	97.8	1740	99.4

* Emissions are in the noise level and not reported.

Low Power 50 W

Emission Frequency MHz	dB Below Carrier (dBc)
157	0.0
314	96.4
471	85.3
628	96.9
785	93.3
942	95.9
1099	93.3
1256	97.0
1413	92.8
1570	96.8

FIELD STRENGTH OF SPURIOUS EMISSIONS (RADIATED)

Rule Parts. No.: Part 2.1053

Requirements: Same as conducted emissions

Test Data: 12.5 kHz Spacing

High Power 150W

Emission Frequency MHz	Ant. Polarity V/H	dB Below Carrier (dBc)	Emission Frequency MHz	Ant. Polarity V/H	dB Below Carrier (dBc)	Emission Frequency MHz	Ant. Polarity V/H	dB Below Carrier (dBc)
144		0	148		0	152		0
288	H	89.13	296	V	95.93	304	H	95.91
432	V	102.31	444	V	99.41	456	H	97.58
576	H	97.01	592	V	99.81	608	V	93.12
720	H	107.19	740	V	107.59	760	V	108.69
864	V	110.90	888	V	98.60	912	V	113.75
1008	V	104.32	1036	V	106.32	1064	V	110.16
1152	V	99.97	1184	V	102.67	1216	V	111.87
1296	V	89.01	1332	H	106.91	1368	V	102.07
1440	H	99.66	1480	V	109.36	1520	V	107.18
Emission Frequency MHz	Ant. Polarity V/H	dB Below Carrier (dBc)	Emission Frequency MHz	Ant. Polarity V/H	dB Below Carrier (dBc)	Emission Frequency MHz	Ant. Polarity V/H	dB Below Carrier (dBc)
152		0	157		0	162		0
304	H	92.51	314	V	104.11	324	H	98.51
456	H	97.48	471	V	102.28	486	V	95.43
608	H	90.72	628	H	96.02	648	H	100.35
760	V	109.89	785	H	111.19	810	H	106.11
912	H	113.35	942	V	104.95	972	V	108.43
1064	V	113.96	1099	V	114.36	1134	H	111.55
1216	V	111.47	1256	H	105.17	1296	V	106.65
1368	V	102.47	1413	V	103.97	1458	V	110.04
1520	H	107.18	1570	V	106.38	1620	V	106.37

[Continued]

Emission Frequency MHz	Ant. Polarity V/H	dB Below Carrier (dBc)
162		0
324	H	97.81
486	V	95.63
648	H	101.75
810	H	99.21
972	V	95.23
1134	V	98.95
1296	V	106.35
1458	V	110.24
1620	V	105.67

Emission Frequency MHz	Ant. Polarity V/H	dB Below Carrier (dBc)
168		0
336	H	87.41
504	V	95.12
672	H	100.83
840	V	93.55
1008	V	107.14
1176	H	109.48
1344	H	107.82
1512	V	107.38
1680	H	106.52

Emission Frequency MHz	Ant. Polarity V/H	dB Below Carrier (dBc)
174		0
348	V	88.81
522	V	95.92
696	V	107.23
870	H	103.55
1044	V	94.54
1218	V	112.28
1392	H	107.32
1566	H	107.18
1740	V	105.32

Low Power 50W

Emission Frequency MHz	Ant. Polarity V/H	dB Below Carrier (dBc)
157		0
314	H	85.24
471	H	88.31
628	V	89.85
785	V	103.22
942	H	107.48
1099	V	108.59
1256	H	100.70
1413	V	99.30
1570	V	100.71

POWER LINE CONDUCTED INTERFERENCE

Rules Part No.: Part 15.207

Requirements:

Frequency (MHz)	Quasi Peak Limits (dBuV)	Average Limits (dBuV)
0.15 – 0.5	66 – 56 *	56 – 46 *
0.5 – 5.0	56	46
5.0 – 30	60	50
* Decreases with logarithm of frequency		

Test Data: Not applicable DUT is battery operated exclusively.