TEST REPORT

FROM

SIEMIC, INC.
Accessing global markets

FOR

Applied Wireless ID Group, Inc.

RFID Reader Module

Model: MPR-1510R3.2E

TO

47 CFR 15.247:2005 & RSS-210 Issue 6:2005

Test Report Serial No.:
SL06062201-AWID-006

This report supersedes None

Remarks:	Equipment complied with the specification	[X]
	Equipment did not comply with the specification	[ ]

This Test Report is Issued Under the Authority of:

.....
Tested by: Kerwinn Corpuz, Test Engineer

.....
Reviewed by: Leslie Bai, Lab Manager

Issue date: 22 June 2006
Manufacturer: Applied Wireless ID Group, Inc.

Registration No. 783147 | Registration No. 4842 | Lab Code: KR0032 | RTA No. D23/16V

NVLAP Lab Code: 200729-0

This test report may be reproduced in full only.

This page has been left blank intentionally.

CONTENTS

EXECUTIVE SUMMARY 5

1 TECHNICAL DETAILS 6

2 TESTS REQUIRED 7

3 ANTENNA REQUIREMENT 8

4 MEASUREMENTS, EXAMINATIONS AND DERIVED RESULTS 9

5 TEST INSTRUMENTATION 84

APPENDIX A: EUT TEST CONDITIONS 85

APPENDIX B: EXTERNAL PHOTOS 86

APPENDIX C: CIRCUIT/BLOCK DIAGRAMS 87

APPENDIX D: INTERNAL PHOTOS 88

APPENDIX E: PRODUCT DESCRIPTION 89

APPENDIX F: FCC LABEL LOCATION 90

APPENDIX G: USER MANUAL 91

This page has been left blank intentionally.

Executive Summary

The purpose of this test programme was to demonstrate compliance of the Applied Wireless ID Group, Inc., RFID Reader Module, model: MPR-1510R3.2E against the current 47 CFR 15.247:2005 & RSS-210 Issue 6:2005. The MPR-1510R3.2E demonstrated compliance with the 47 CFR 15.247:2005 & RSS-210 Issue 6:2005.

Applied Wireless ID Group, Inc. is the applicant and claimed manufacturer of this tested product. For the detailed description of this product, please refer to the MPR-1510R3.2E User Manual.

The equipment under test is a frequency hopping system operating in the 902-928MHz band.

The equipment was tested with six protocols:

1) GEN-2 = EPC Class1 Generation2
2) ISOB = ISO18000-6 Type B
3) Class-1 = EPC Class1
4) Class-0 = EPC Class 0/0+
5) EPC1.19 = EPC V1.19 Rev.2
6) EM = EM Micro

The equipment was tested with the following antennas:

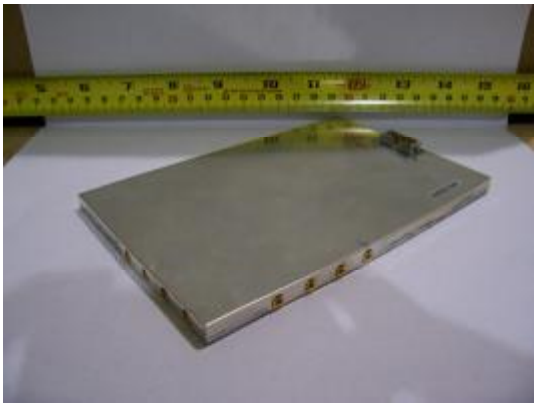
1) Mti, model MT-263003/N; 10 dBi Linear polarization directional antenna (Patch)
2) Snyder Antenna Systems, part # ANT-UHF-1x4-SMA; 2 dBi Dipole antenna (Dipole)

Additional antennas that will be sold with RFID Reader Module:

3) AWID, model HYBRID 915MHz; 6 dBi Circular polarized antenna (Patch)
4) Mti, model MT-262002/N/A; 8 dBi Linear polarization directional antenna (Patch)

The following modification was made to the equipment in order to comply with radiated emissions limits:
A ferrite was added to serial cable near RFID module with 3 turns. Ferrite: FAIR-RITE, Part number: 2643801002.

The test has demonstrated that this unit complies with stipulated standards.



EUT Sample

1 Technical Details

Purpose	Compliance testing of MPR-1510R3.2E with 47 CFR 15.247:2005 & RSS-210 Issue 6:2005
Applicant / Client	Applied Wireless ID Group, Inc. 382 Route 59, Section 292. Monsey, NY 10952
Manufacturer	Applied Wireless ID Group, Inc. 18300 Sutter Blvd. Morgan Hill, CA 95037
Laboratory performing the tests	SIEMIC Labs 2206 Ringwood Avenue San Jose, CA 95131
Test location(s)	SIEMIC Labs 2206 Ringwood Avenue San Jose, CA 95131
Test report reference number	SL06062201-AWID-006
Date EUT received	28 April 2006
Standard applied	47 CFR 15.247:2005 & RSS-210 Issue 6:2005
Dates of test (from – to)	28 April 2006 to 22 June 2006
No of Units:	1
Equipment Category:	DSS
Trade/Product Name:	MPR-1510R3.2E
Type/Model Name/No:	MPR-1510R3.2E
Technical Variants:	None
FCC ID No.	OGSM32EA
IC ID No.	6449A-M32EA

2 Tests Required

The product was tested in accordance with the following specifications.
The test results recorded in this Test Report are exclusively referred to the tested sample(s).

Test Standard		Description	Pass / Fail
47 CFR Part 15.247: 2005	RSS 210 Issue6: 2005		
15.203		Antenna Requirement	Pass
15.205	RSS210(A8.5)	Restricted Band of Operation	Pass
15.207(a)	RSSGen(7.2.2)	Conducted Emissions Voltage	Pass
15.247(a)(1)	RSS210(A8.1)	Channel Separation	Pass
15.247(a)(1)	RSS210(A8.1)	Occupied Bandwidth	Pass
15.247(a)(1)	RSS210(A8.1)	Number of Hopping Channels	Pass
15.247(a)(1)	RSS210(A8.1)	Time of Occupancy	Pass
15.247(b)	RSS210(A8.4)	Output Power	Pass
15.247(c)	RSS210(A8.4)	Antenna Gain > 6 dBi	Pass
15.247(d)	RSS210(A8.5)	Conducted Spurious Emissions	Pass
15.209; 15.247(d)	RSS210(A8.5)	Radiated Spurious Emissions	Pass
15.247(e)	RSS210(A8.3)	Power Spectral Density	N/A*
15.247(f)	RSS210(A8.3)	Hybrid System Requirement	N/A*
15.247(g)	RSS210(A8.1)	Hopping Capability	Pass
15.247(h)	RSS210(A8.1)	Hopping Coordination Requirement	Pass
15.247(i)	RSSGen(5.5)	Maximum Permissible Exposure	Pass
	RSSGen(4.8)	Receiver Spurious Emissions	Pass
ANSI C63.4: 2003			

Notes: Deviations to above standards are outlined in specific test sections if applicable.
Cable loss and external attenuation are compensated for in the measurement system when applicable.
** Equipment is a Frequency Hopping System.*

3 Antenna Requirement

Requirement(s): 47 CFR §15.203

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

Antenna requirement must meet at least one of the following:

a) Antenna must be permanently attached to the device.

b) Antenna must use a unique type of connector to attach to the device.

c) Device must be professionally installed. Installer shall be responsible for ensuring that the correct antenna is employed with the device.

The antenna has its own unique type of connector which meets the requirement.

1) Mti, model MT-263003/N; Reversed polarity TNC (Patch)
2) Snyder Antenna Systems, part # ANT-UHF-1x4-SMA; Reversed polarity TNC (Dipole)
3) AWID, model HYBRID 915MHz; Reversed polarity TNC (Patch)
4) Mti, model MT-262002/N/A; Reversed polarity TNC (Patch)

Note: The RFID Module (EUT) uses an MMCX connector. If the RFID module (EUT) will be installed in another enclosure, an internal cable of MMCX to reversed polarity TNC will be used. An additional external cable that will be attached to the antenna is supplied to mate with reversed polarity TNC connector.

4 Measurements, Examinations and Derived Results

4.1 General observations

Equipment serial number(s)		
Module:	Part number:	Serial number:
MPR-1510R3.2E	MPR-1510R3.2E	none

4.2 Test Results

4.2.1 Conducted Emissions Voltage

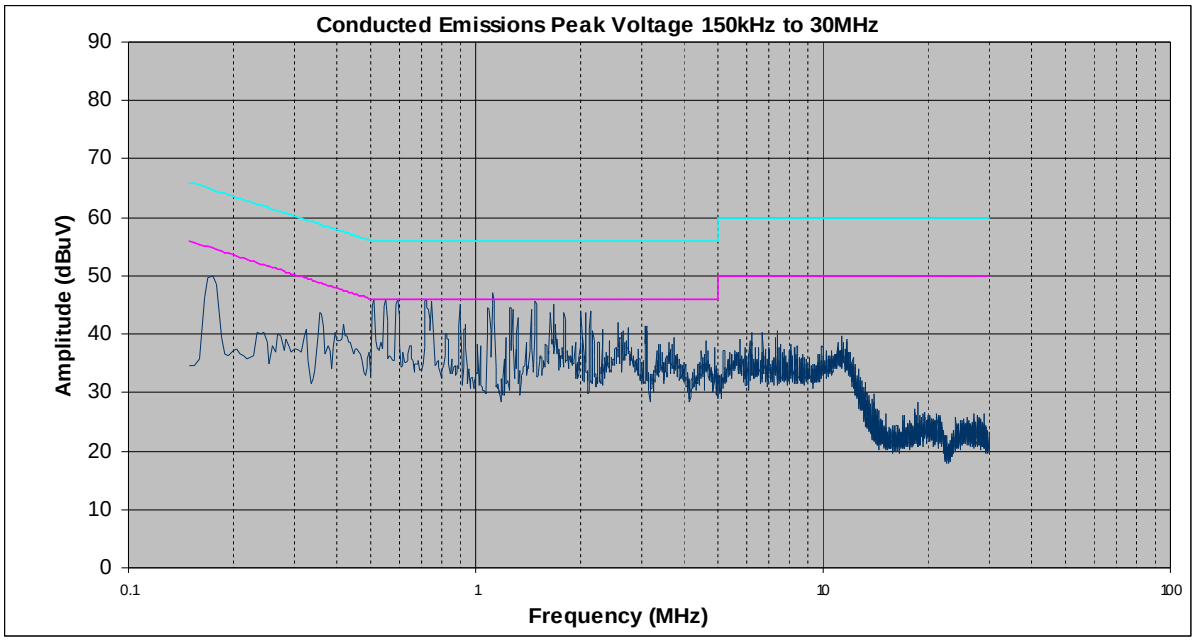
Requirement(s): 47 CFR §15.207 & RSS-Gen Issue 1(7.2.2)

Procedures:

The EUT and supporting equipment were set up in accordance with the requirements of the standard on top of a 1.5m x 1m x 0.8m high, non-metallic table. The power supply for the EUT was fed through a 50Ω/50μH EUT LISN, connected to filtered mains. The RF OUT of the EUT LISN was connected to the EMI test receiver via a low-loss coaxial cable. All other supporting equipment were powered separately from another mains.

The EUT was switched on and allowed to warm up to its normal operating condition. The EUT was set to frequency hopping mode. Preliminary test were made to six protocols with the worse case protocol (EPC C0) reported. A scan was made on the NEUTRAL line over the required frequency range using an EMI test receiver. High peaks, relative to the limit line, were then selected. The EMI test receiver was then tuned to the selected frequencies and the necessary measurements made with a receiver bandwidth setting of 10kHz. Quasi-peak and Average measurements were made. The procedure was then repeated for the PHASE line.

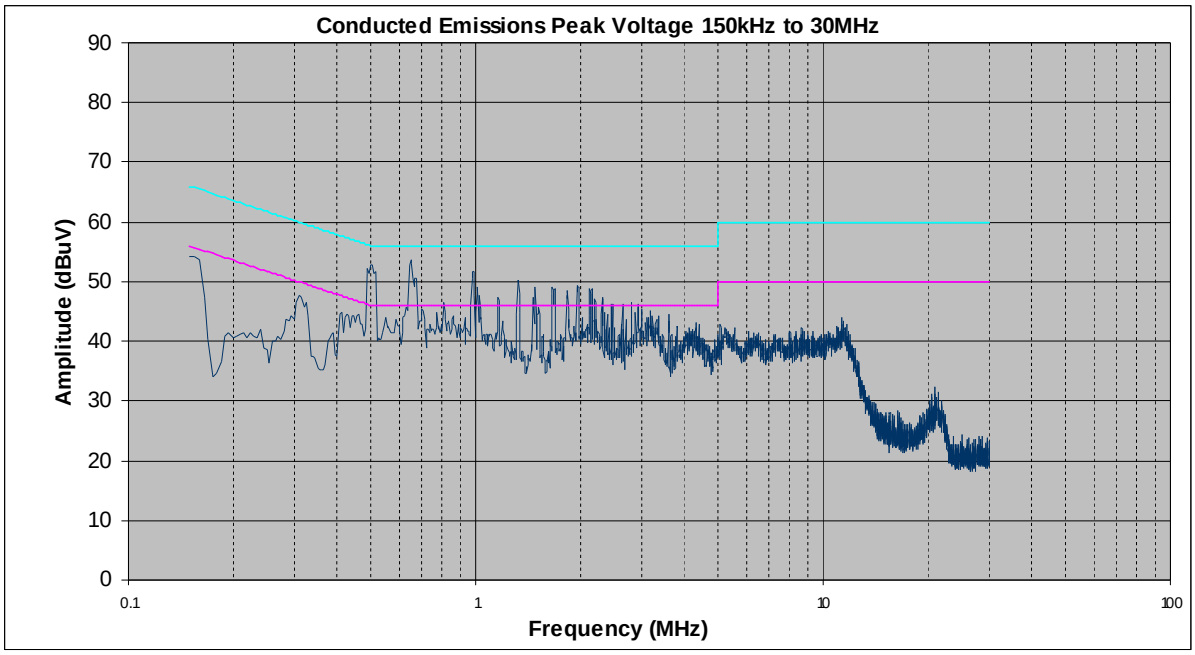
Results: **Note – measurement between Tx and Standby are no different to emissions.**



Phase Line Plot at 120Vac, 60Hz

Freq. (MHz)	Corrected Amplitude (dBµV) QP	Limit (dBµV) QP	Margin (dB) QP	Corrected Amplitude (dBµV) AVG	Limit (dBµV) AVG	Margin (dB) AVG
0.54	34.3	56	-21.7	26.5	46	-19.5
0.7	38.5	56	-17.5	29.7	46	-16.3
1.019	35.4	56	-20.6	27.4	46	-18.6
1.12	39	56	-17	30	46	-16
1.374	34.6	56	-21.4	24.3	46	-21.7

Phase Line Table



Neutral Line Plot at 120Vac, 60Hz

Freq. (MHz)	Corrected Amplitude (dBµV) QP	Limit (dBµV) QP	Margin (dB) QP	Corrected Amplitude (dBµV) AVG	Limit (dBµV) AVG	Margin (dB) AVG
0.508	38.3	56	-17.7	30.7	46	-15.3
0.66	40.7	56	-15.3	35.5	46	-10.5
0.996	39.2	56	-16.8	32.5	46	-13.5
1.33	35.6	56	-20.4	27.7	46	-18.3
1.975	37.2	56	-18.8	31.2	46	-14.8

Neutral Line Table

Tested By: Kerwinn Corpuz

Date Tested: 21 June 2006

4.2.2 Occupied Bandwidth

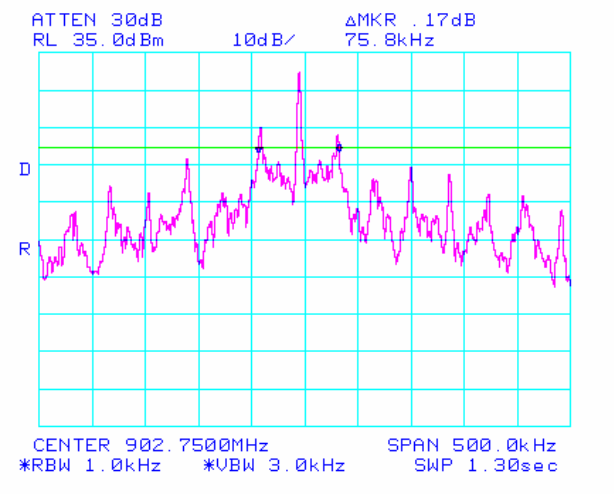
Requirement(s): 47 CFR §15.247(a)(1) & RSS-210 Issue 6(A8.1)

Procedures: The 20dB bandwidths were measured conducted using a spectrum analyzer at low, mid, and hi channels. 20 dB Bandwidth Limit: < 500 kHz.

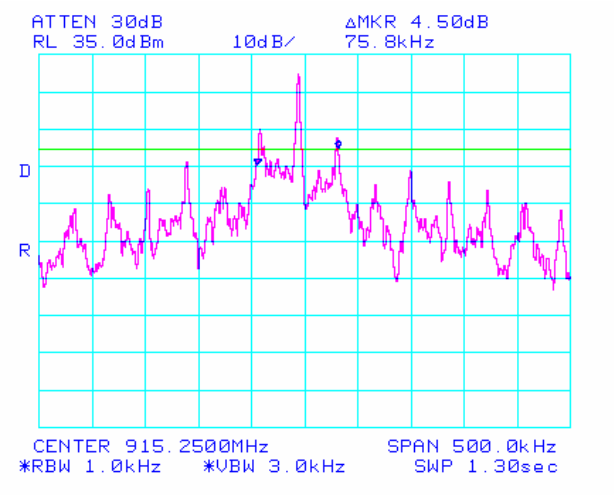
Results:

Plot #	Protocol	Channel	Channel Frequency (MHz)	Occupied Bandwidth	Channel Bandwidth (kHz)
1	GEN-2	Low	902.75	20 dB	75.8
2	GEN-2	Mid	915.25	20 dB	75.8
3	GEN-2	High	927.25	20 dB	75.8
4	ISOB	Low	902.75	20 dB	83.3
5	ISOB	Mid	915.25	20 dB	85
6	ISOB	High	927.25	20 dB	85.8
7	CLASS-1	Low	902.75	20 dB	284.2
8	CLASS-1	Mid	915.25	20 dB	283.3
9	CLASS-1	High	927.25	20 dB	285
10	CLASS-0	Low	902.75	20 dB	152.5
11	CLASS-0	Mid	915.25	20 dB	152.5
12	CLASS-0	High	927.25	20 dB	153.3
13	EPC1.19	Low	902.75	20 dB	243.3
14	EPC1.19	Mid	915.25	20 dB	243.3
15	EPC1.19	High	927.25	20 dB	243.3
16	EM	Low	902.75	20 dB	1.7
17	EM	Mid	915.25	20 dB	1.7
18	EM	High	927.25	20 dB	1.7

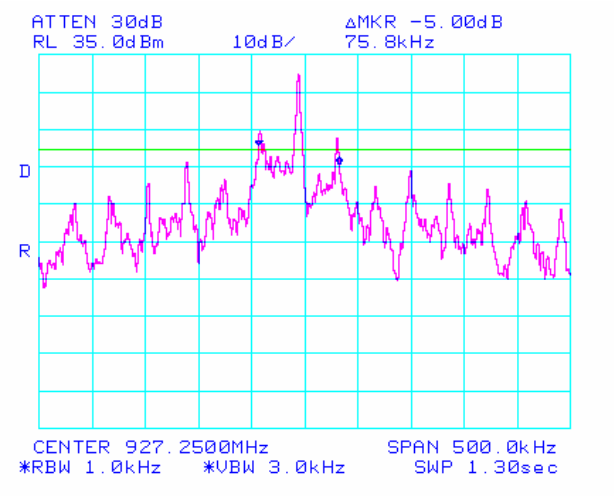
Plot #	Protocol	Channel	Channel Frequency (MHz)	Occupied Bandwidth	Channel Bandwidth (kHz)
A	GEN-2	Low	902.75	99%	274.2
B	GEN-2	Mid	915.25	99%	271.7
C	GEN-2	High	927.25	99%	271.7
D	ISOB	Low	902.75	99%	328.3
E	ISOB	Mid	915.25	99%	325
F	ISOB	High	927.25	99%	315
G	CLASS-1	Low	902.75	99%	415.8
H	CLASS-1	Mid	915.25	99%	420
I	CLASS-1	High	927.25	99%	402.5
J	CLASS-0	Low	902.75	99%	270.8
K	CLASS-0	Mid	915.25	99%	269.2
L	CLASS-0	High	927.25	99%	265
M	EPC1.19	Low	902.75	99%	311.7
N	EPC1.19	Mid	915.25	99%	318.3
O	EPC1.19	High	927.25	99%	318.3
P	EM	Low	902.75	99%	0.8334
Q	EM	Mid	915.25	99%	0.8334
R	EM	High	927.25	99%	0.8334



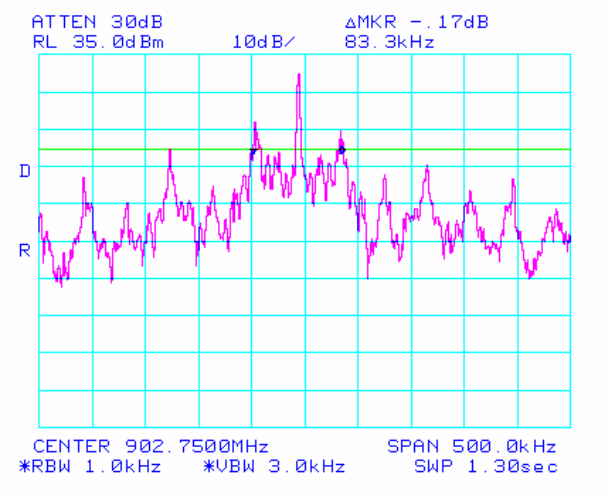
Plot 1: 20dB Bandwidth (Low) with GEN-2 protocol



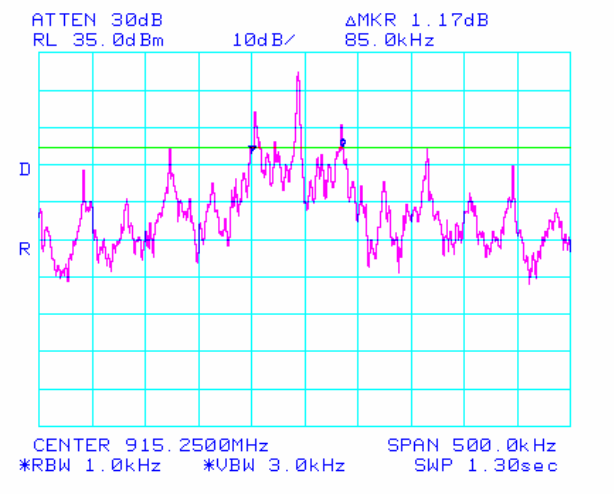
Plot 2: 20dB Bandwidth (Mid) with GEN-2 protocol



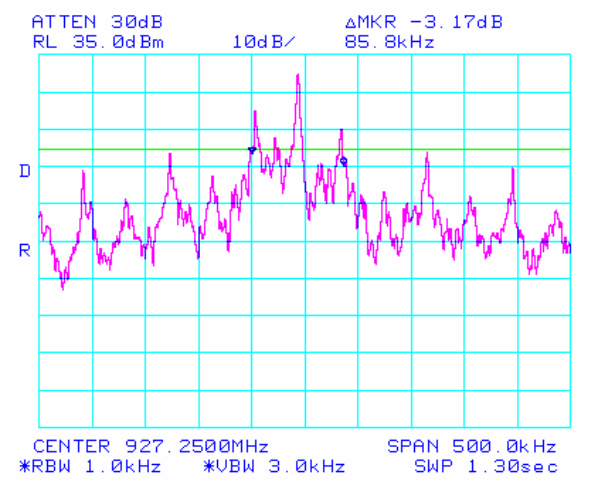
Plot 3: 20dB Bandwidth (High) with GEN-2 protocol



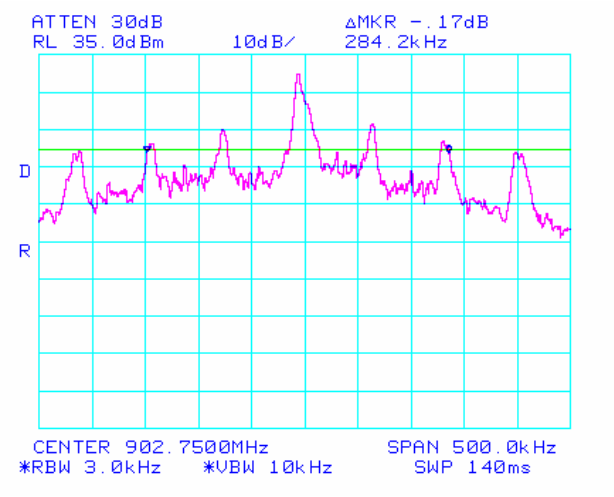
Plot 4: 20dB Bandwidth (Low) with ISOB protocol



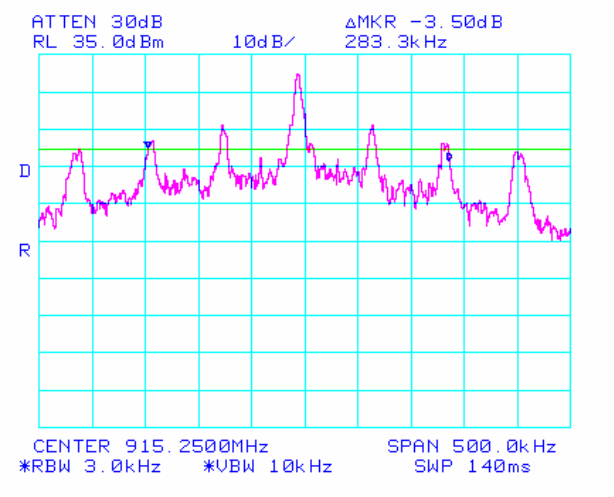
Plot 5: 20dB Bandwidth (Mid) with ISOB protocol



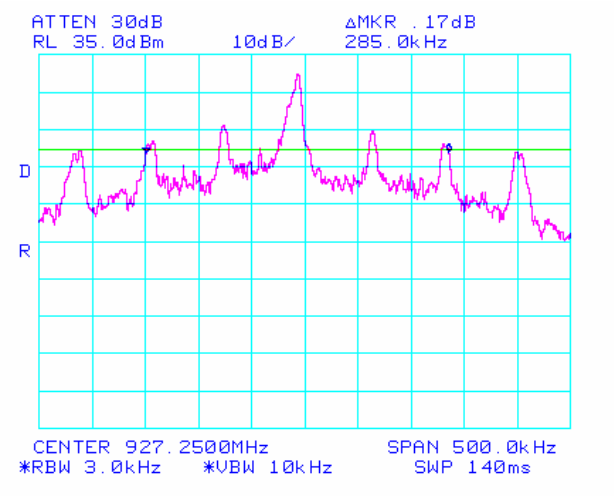
Plot 6: 20dB Bandwidth (High) with ISOB protocol



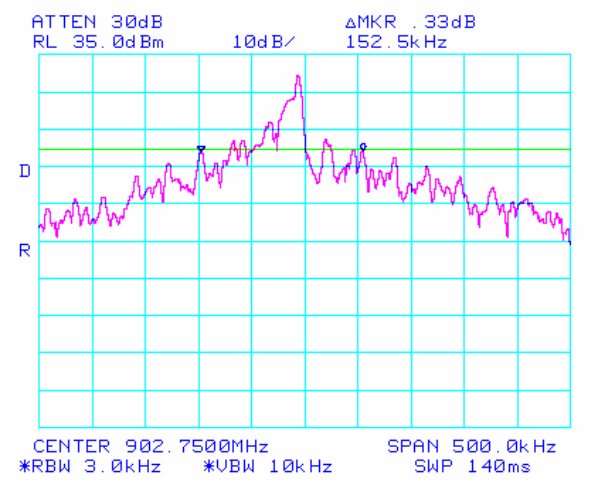
Plot 7: 20dB Bandwidth (Low) with CLASS-1 protocol



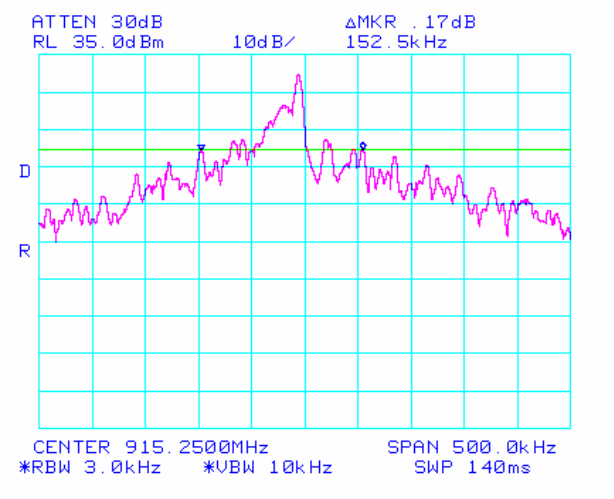
Plot 8: 20dB Bandwidth (Mid) with CLASS-1 protocol



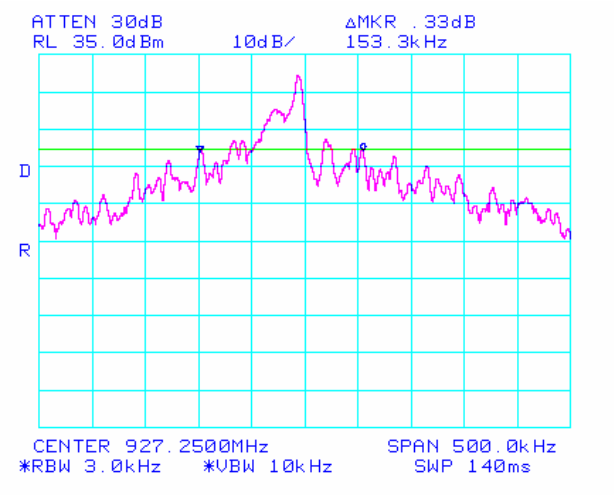
Plot 9: 20dB Bandwidth (High) with CLASS-1 protocol



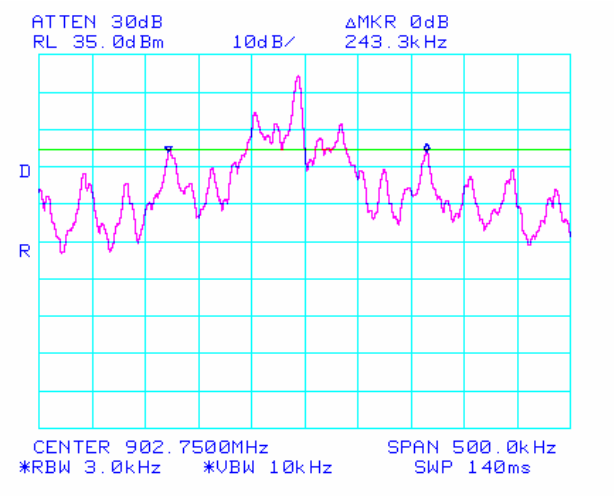
Plot 10: 20dB Bandwidth (Low) with CLASS-0 protocol



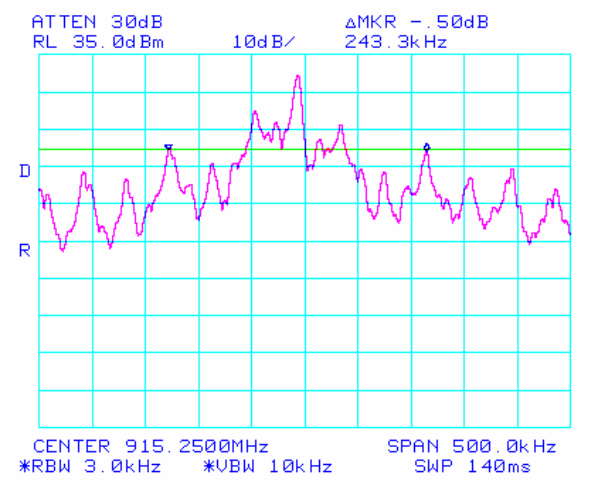
Plot 11: 20dB Bandwidth (Mid) with CLASS-0 protocol



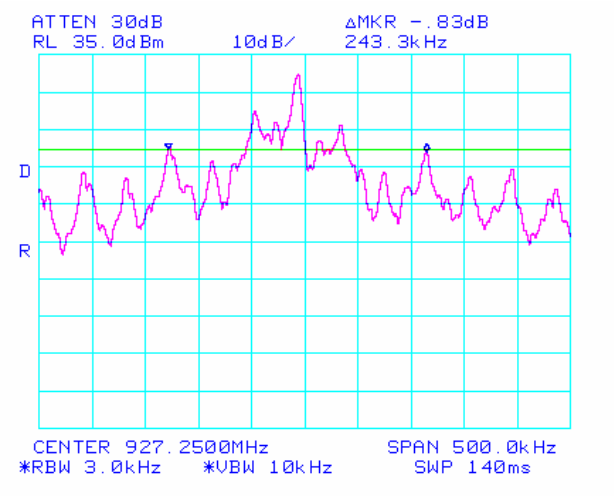
Plot 12: 20dB Bandwidth (High) with CLASS-0 protocol



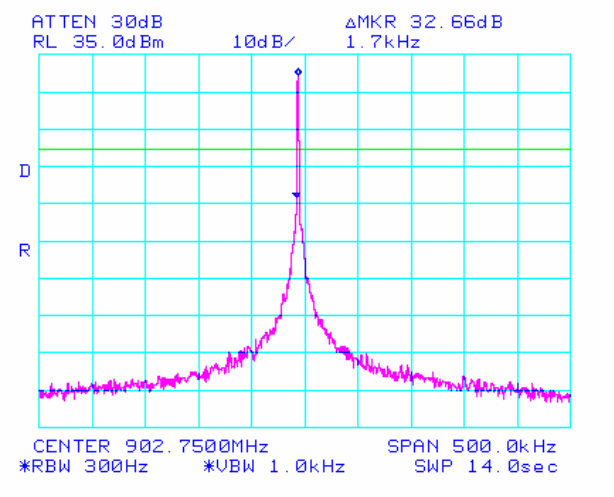
Plot 13: 20dB Bandwidth (Low) with EPC1.19 protocol



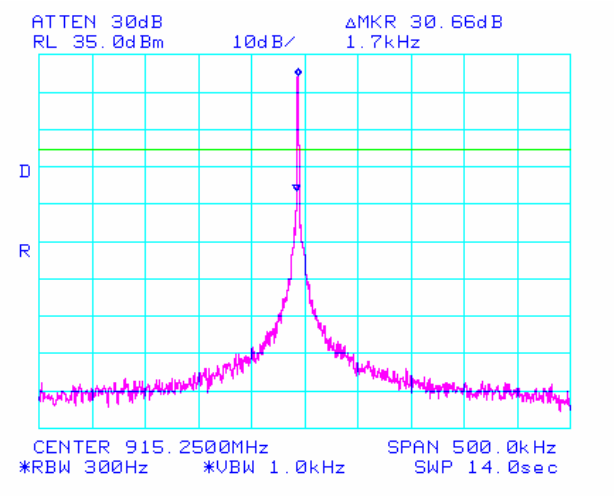
Plot 14: 20dB Bandwidth (Mid) with EPC1.19 protocol



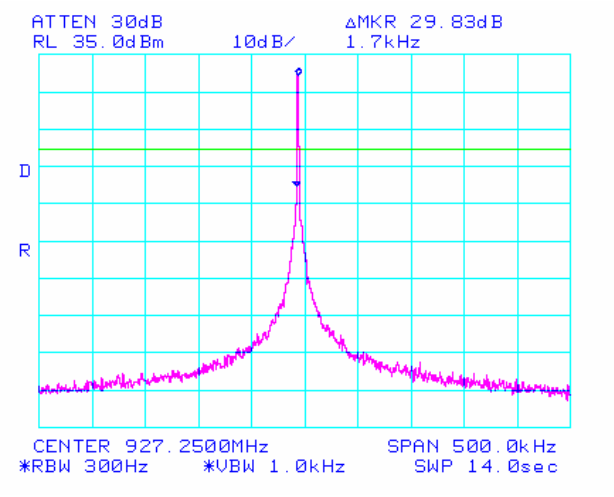
Plot 15: 20dB Bandwidth (High) with EPC1.19 protocol



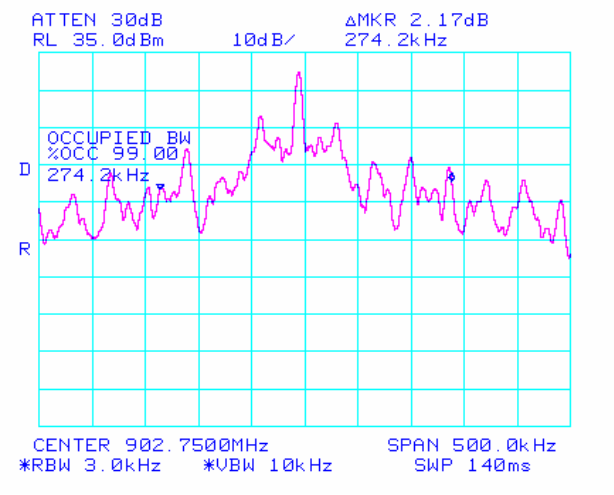
Plot 16: 20dB Bandwidth (Low) with EM protocol



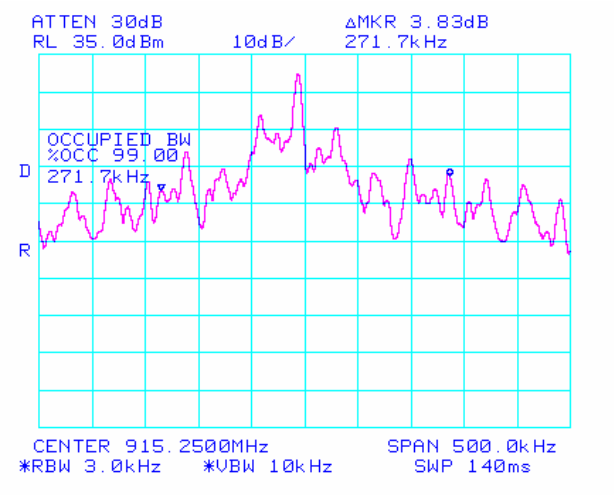
Plot 17: 20dB Bandwidth (Mid) with EM protocol



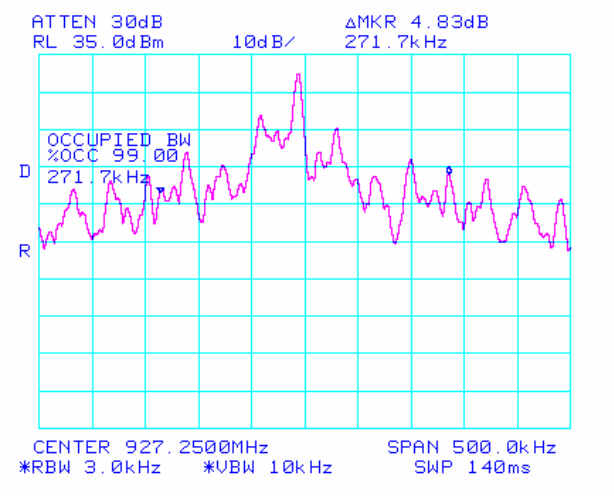
Plot 18: 20dB Bandwidth (High) with EM protocol



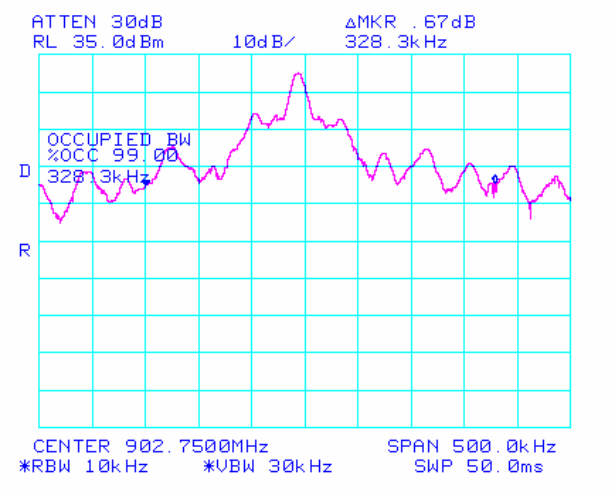
Plot A: 99% Bandwidth (Low) with GEN-2 protocol



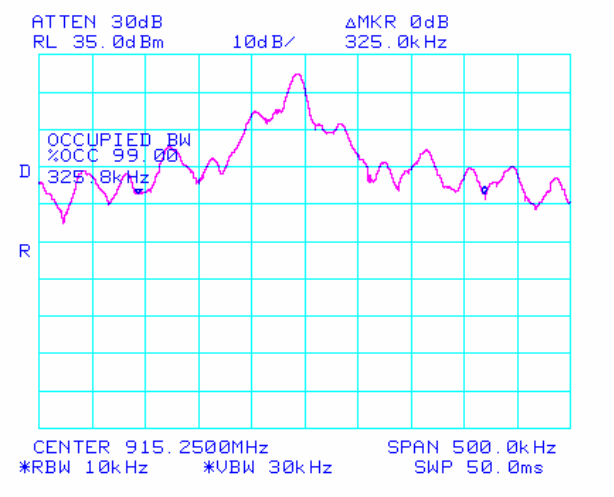
Plot B: 99% Bandwidth (Mid) with GEN-2 protocol



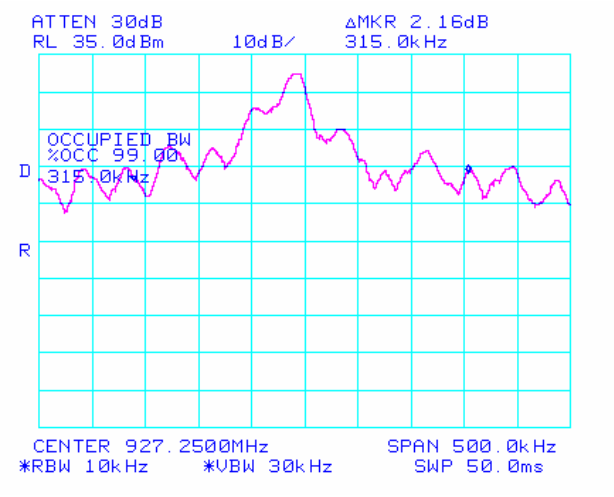
Plot C: 99% Bandwidth (High) with GEN-2 protocol



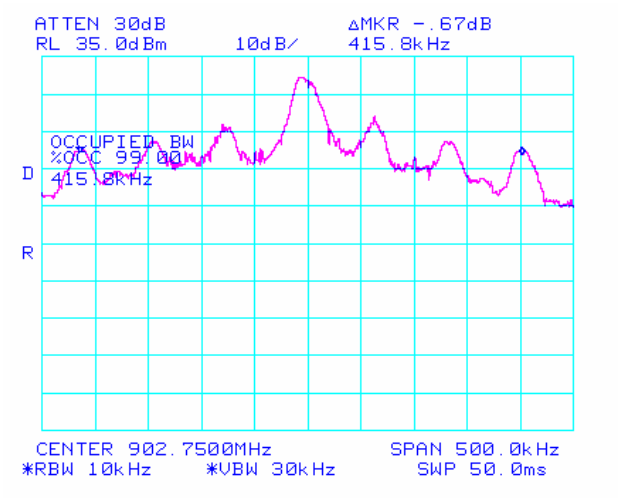
Plot D: 99% Bandwidth (Low) with ISOB protocol



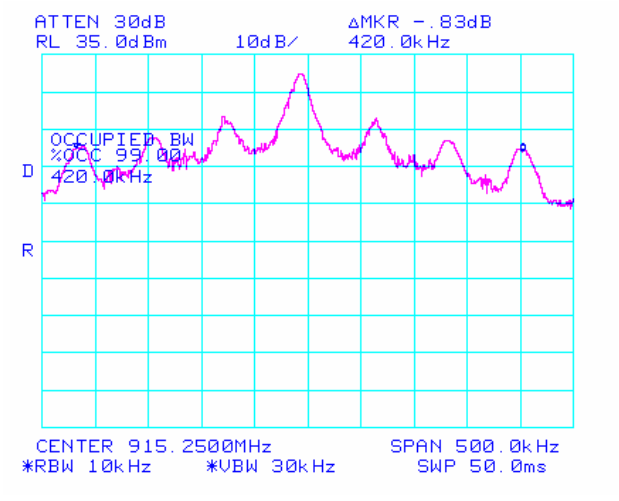
Plot E: 99% Bandwidth (Mid) with ISOB protocol



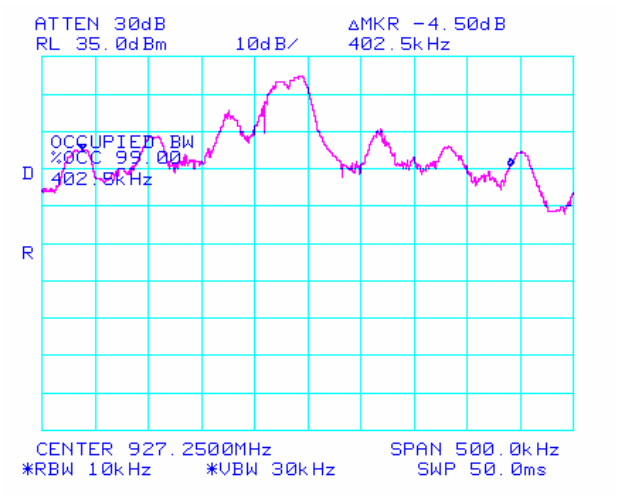
Plot F: 99% Bandwidth (High) with ISOB protocol



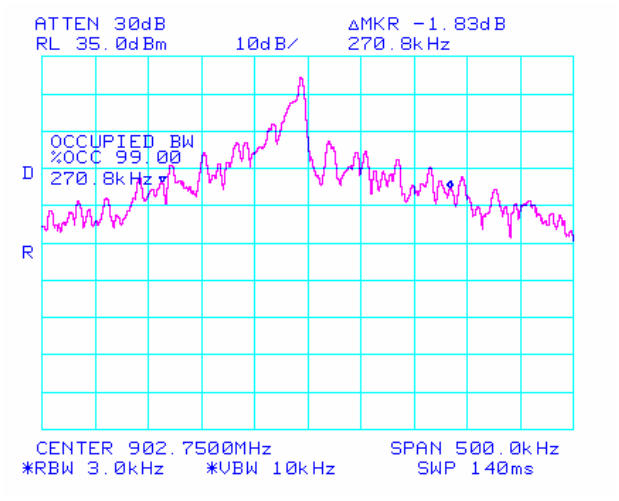
Plot G: 99% Bandwidth (Low) with CLASS-1 protocol



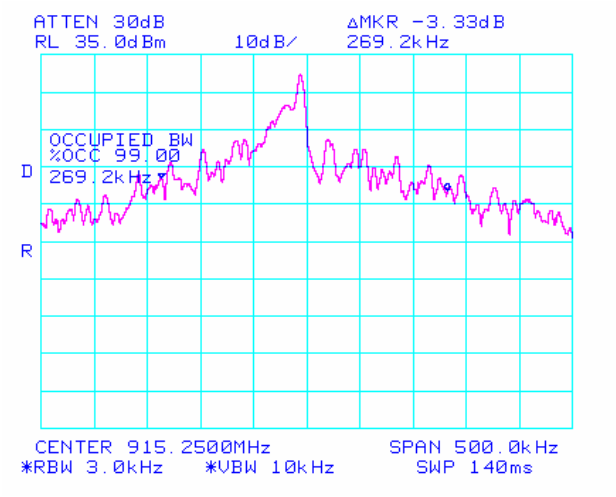
Plot H: 99% Bandwidth (Mid) with CLASS-1 protocol



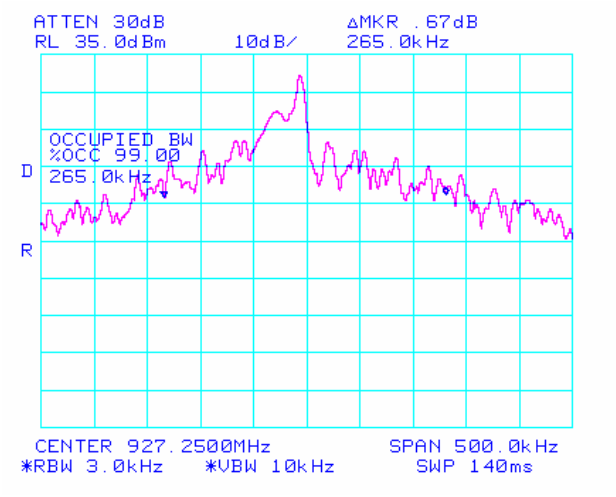
Plot I: 99% Bandwidth (High) with CLASS-1 protocol



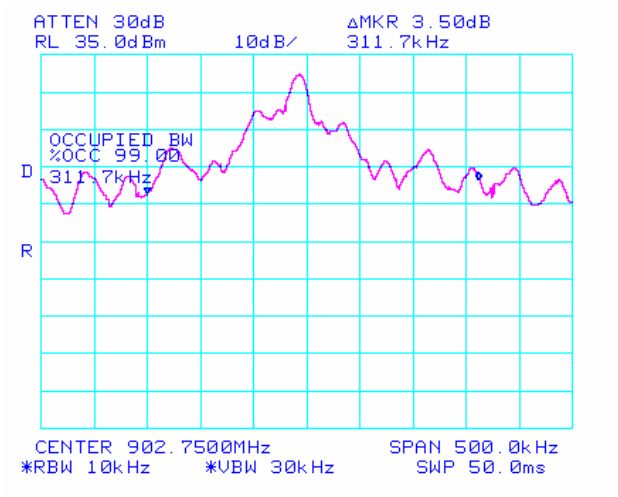
Plot J: 99% Bandwidth (Low) with CLASS-0 protocol



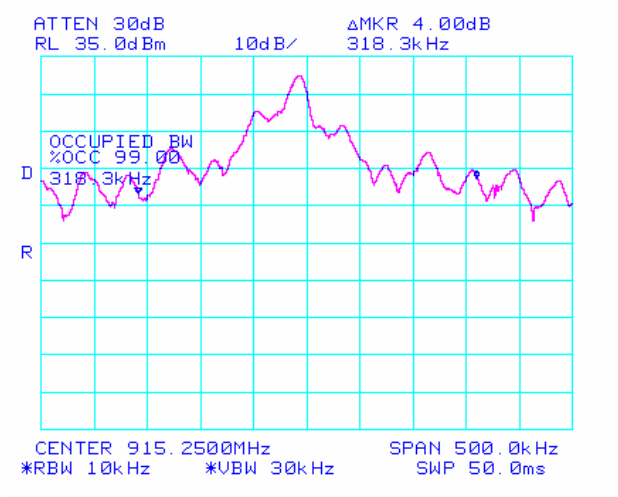
Plot K: 99% Bandwidth (Mid) with CLASS-0 protocol



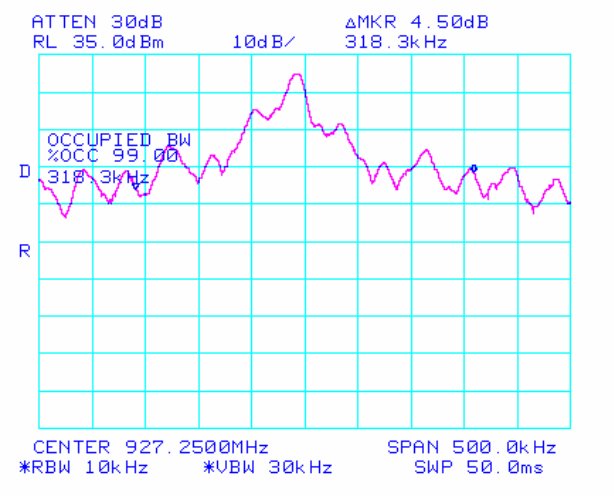
Plot L: 99% Bandwidth (High) with CLASS-0 protocol



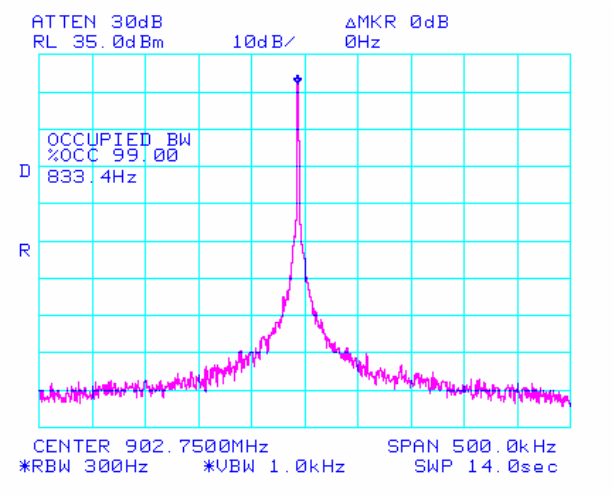
Plot M: 99% Bandwidth (Low) with EPC1.19 protocol



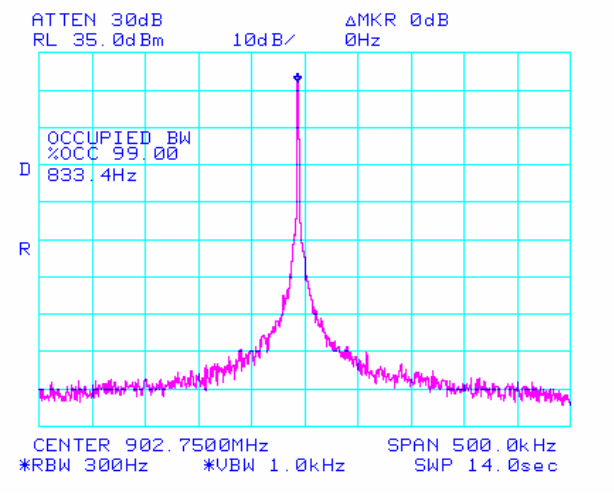
Plot N: 99% Bandwidth (Mid) with EPC1.19 protocol



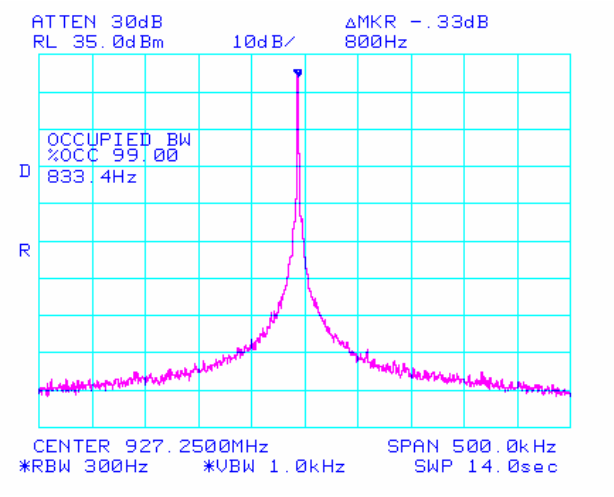
Plot O: 99% Bandwidth (High) with EPC1.19 protocol



Plot P: 99% Bandwidth (Low) with EM protocol



Plot Q: 99% Bandwidth (Mid) with EM protocol



Plot R: 99% Bandwidth (High) with EM protocol

Tested By: Kerwinn Corpuz

Date Tested: 02 May and 02 June 2006

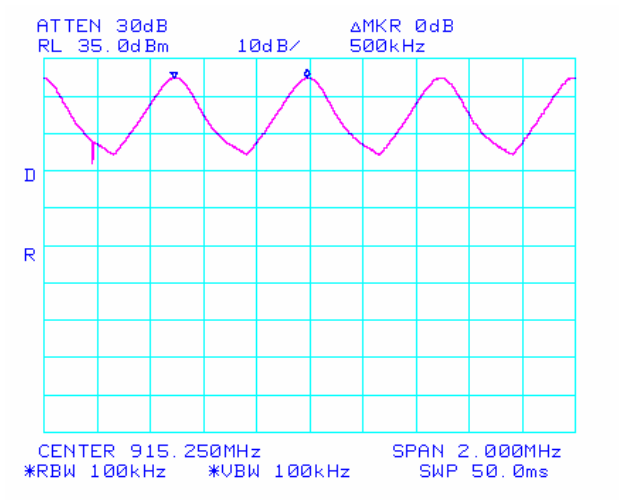
4.2.3 Carrier Frequency Separation

Requirement(s): 47 CFR §15.247(a)(1) & RSS-210 (A8.1)

Procedures: The carrier frequency separation measurement was taken conducted using a spectrum analyzer.

Results:

Plot #	Carrier Frequency Separation (MHz)
19	0.500



Plot 19: Carrier Frequency Separation

Tested By: Kerwinn Corpuz

Date Tested: 02 May 2006

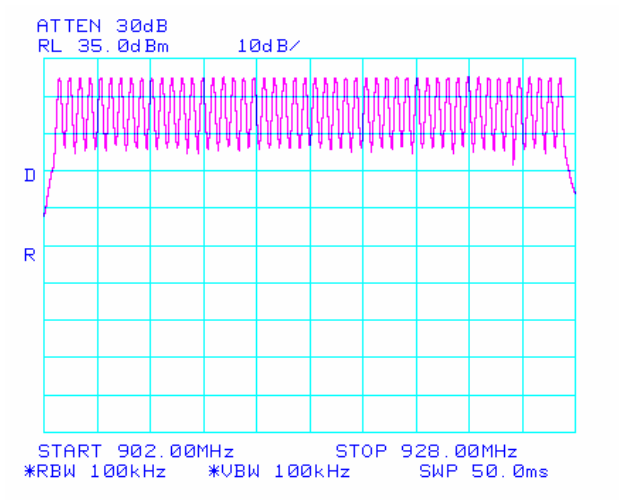
4.2.4 Number of Hopping Channels

Requirement(s): 47 CFR §15.247(a)(1) & RSS-210 (A8.1)

Procedures: The number of hopping channels was measured conducted with a spectrum analyzer.

Results:

Plot #	Number of Hopping Channels
20	50



Plot 20: Number of Hopping Channels

Tested By: Kerwinn Corpuz

Date Tested: 02 May 2006

4.2.5 Time of Occupancy

Requirement(s): 47 CFR §15.247(a)(1) & RSS-210 (A8.1)

The average time of occupancy shall not be greater than 0.4 second within a 20 second period.

Procedures: The time of occupancy was measured conducted with a spectrum analyzer.

Results:

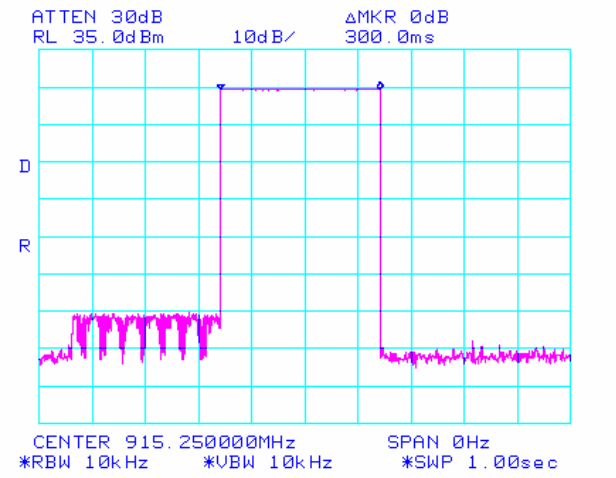
Plot #	Time of Occupancy (sec)
21 to 22	0.3978

Dwell time = 0.3 sec

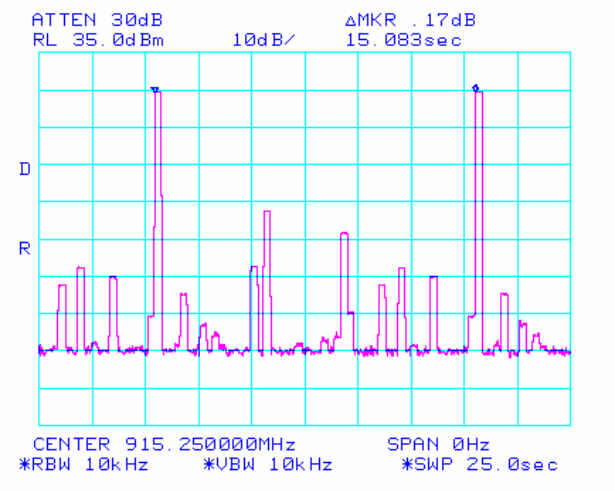
Time between occupancy = 15.083 sec

Time of occupancy = period / time between occupancy * dwell time

Therefore; 20 / 15.083 * 0.3 = 0.3978 second



Plot 21: Dwell Time (1 of 2)



Plot 22: Time between Occupancy (2 of 2)

Tested By: Kerwinn Corpuz

Date Tested: 02 May 2006

4.2.6 Peak Output Power

Requirement(s): 47 CFR §15.247(b) & RSS-210 (A8.4)

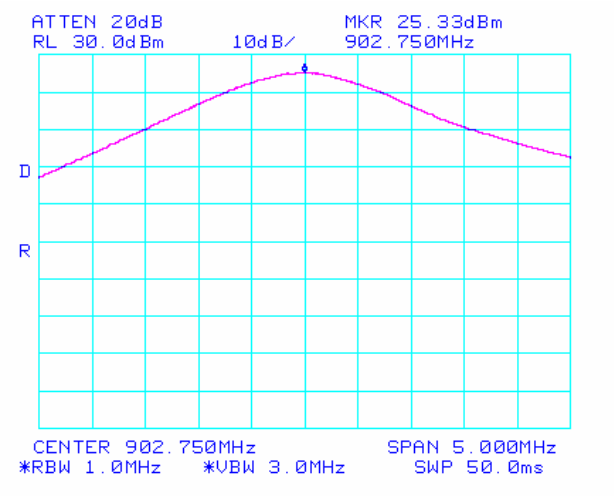
Procedures: The peak output power was measured conducted using a spectrum analyzer at low, mid, and hi channels. The highest antenna gain that will be used is 10 dBi, therefore the peak power output limit is 0.4 watt (26 dBm).

To maintain the output power below the limit, the software output attenuation index was set to 203.

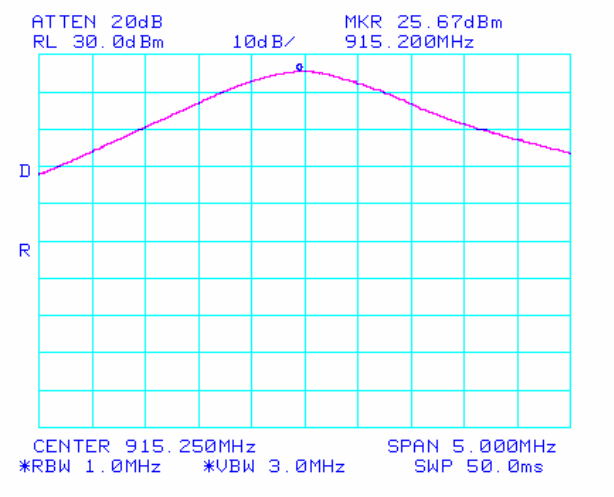
Reference level offset to spectrum analyzer: 20.1 dB (attenuator + cable loss)

Results:

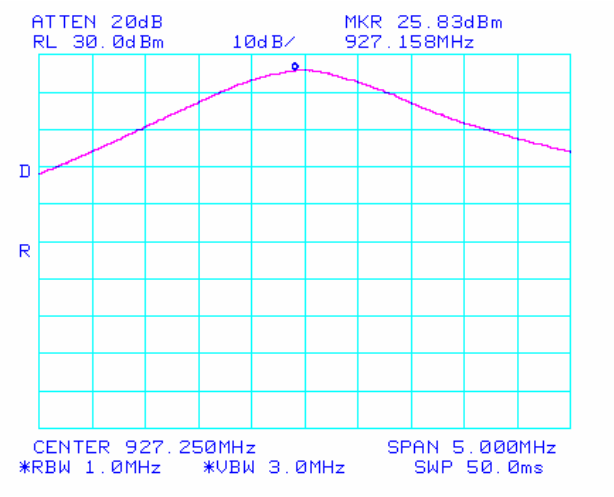
Plot #	Protocol	Channel	Channel Frequency (MHz)	Peak Power (dBm)
23	GEN-2	Low	902.75	25.33
24	GEN-2	Mid	915.25	25.67
25	GEN-2	High	927.25	25.83
26	ISOB	Low	902.75	25.17
27	ISOB	Mid	915.25	25.5
28	ISOB	High	927.25	25.83
29	CLASS-1	Low	902.75	25.17
30	CLASS-1	Mid	915.25	25.5
31	CLASS-1	High	927.25	25.83
32	CLASS-0	Low	902.75	25.17
33	CLASS-0	Mid	915.25	25.5
34	CLASS-0	High	927.25	25.83
35	EPC1.19	Low	902.75	25.17
36	EPC1.19	Mid	915.25	25.5
37	EPC1.19	High	927.25	25.83
38	EM	Low	902.75	25.17
39	EM	Mid	915.25	25.5
40	EM	High	927.25	25.67



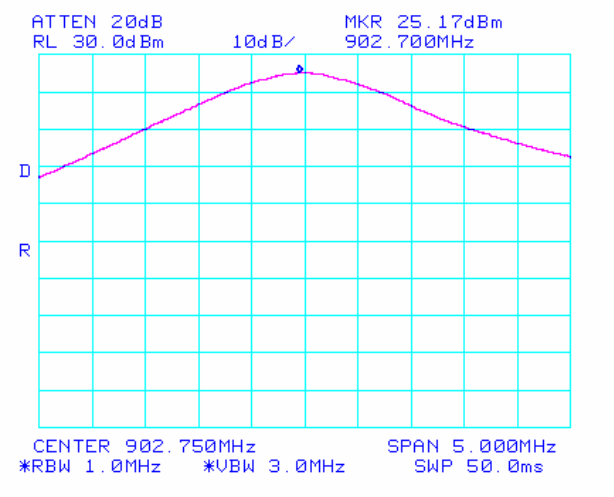
Plot 23: Peak Power (Low) with GEN-2 protocol



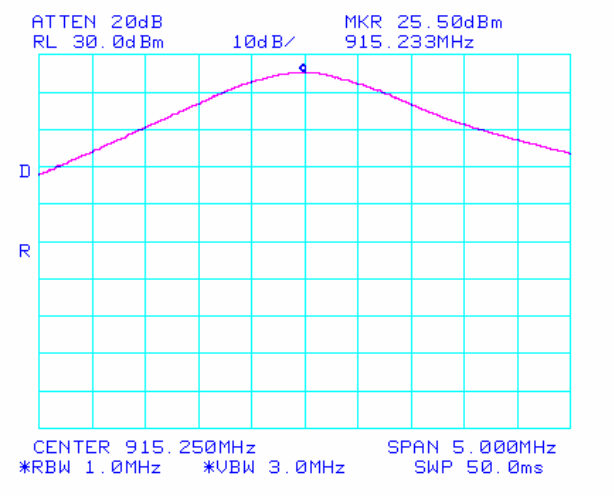
Plot 24: Peak Power (Mid) with GEN-2 protocol



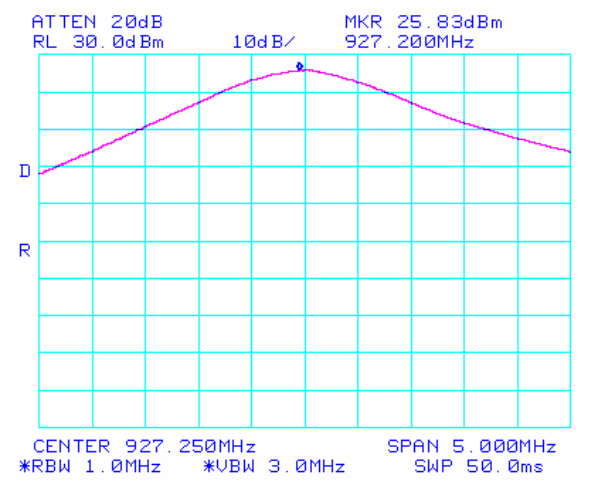
Plot 25: Peak Power (High) with GEN-2 protocol



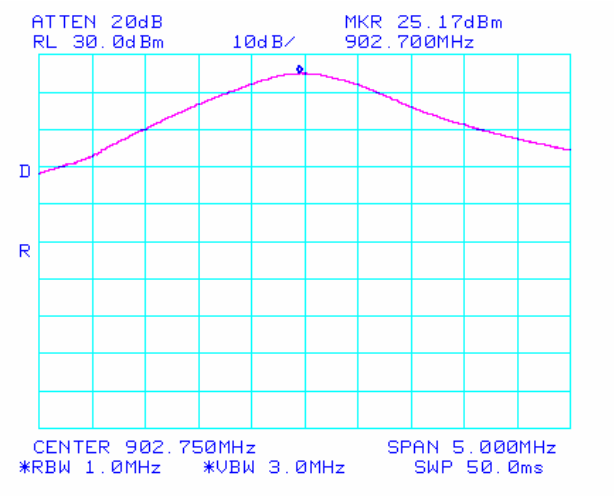
Plot 26: Peak Power (Low) with ISOB protocol



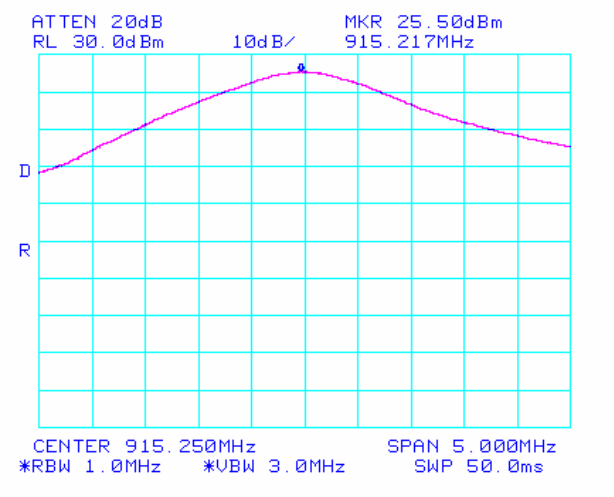
Plot 27: Peak Power (Mid) with ISOB protocol



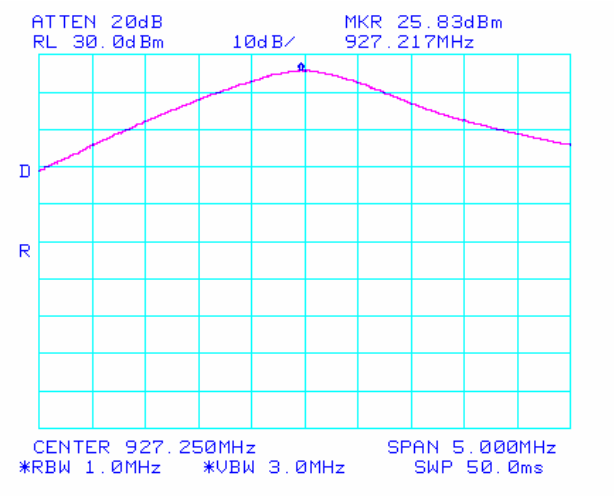
Plot 28: Peak Power (High) with ISOB protocol



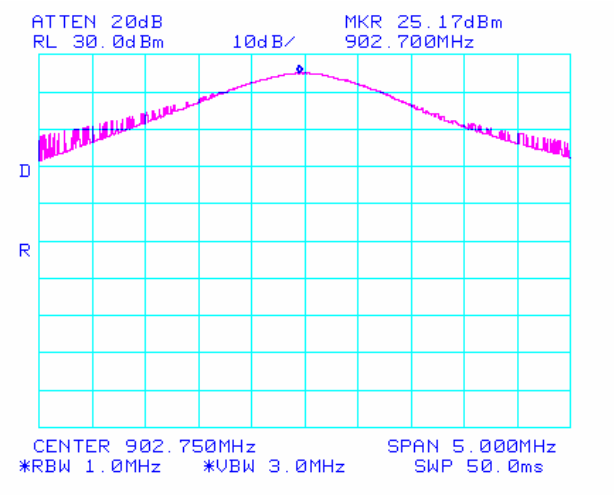
Plot 29: Peak Power (Low) with CLASS-1 protocol



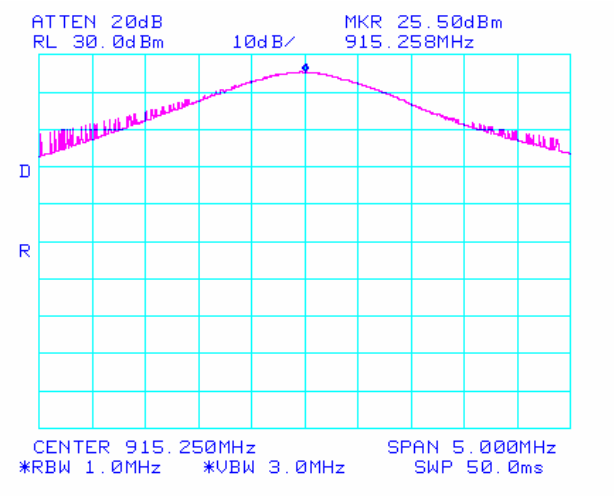
Plot 30: Peak Power (Mid) with CLASS-1 protocol



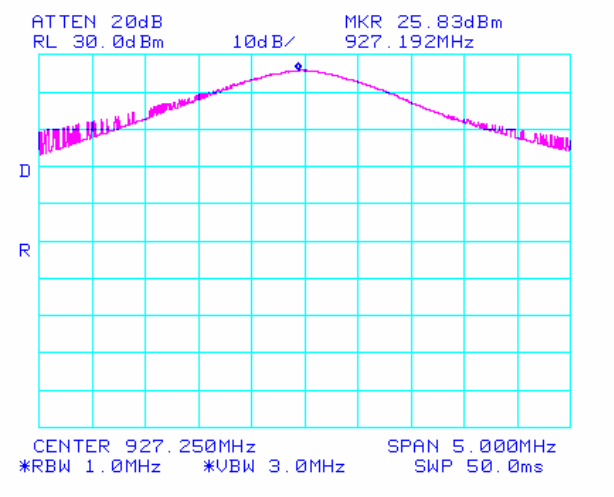
Plot 31: Peak Power (High) with CLASS-1 protocol



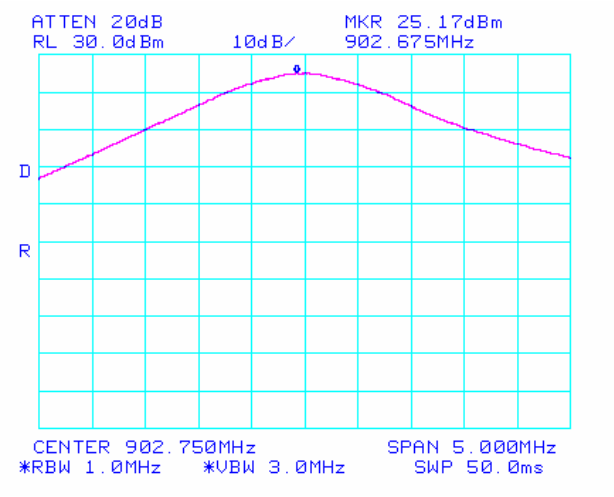
Plot 32: Peak Power (Low) with CLASS-0 protocol



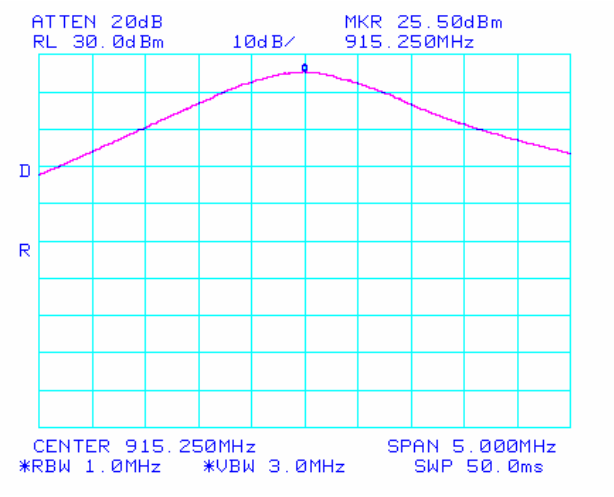
Plot 33: Peak Power (Mid) with CLASS-0 protocol



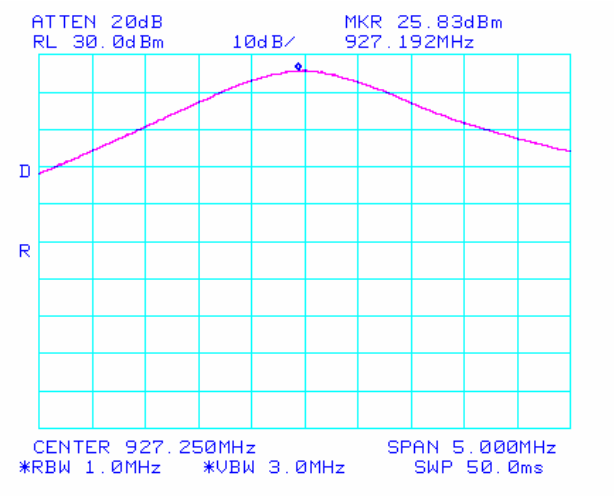
Plot 34: Peak Power (High) with CLASS-0 protocol



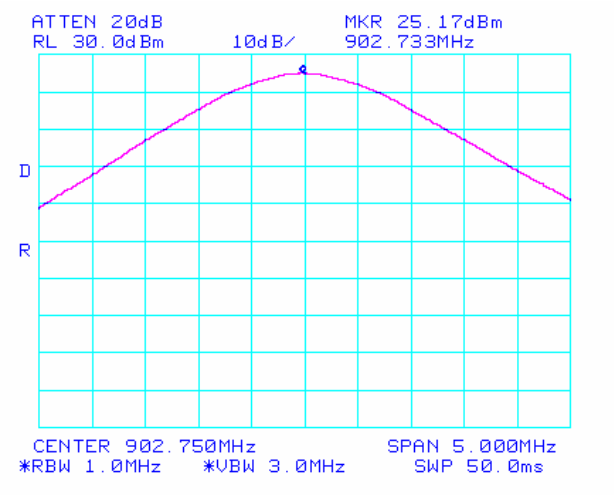
Plot 35: Peak Power (Low) with EPC1.19 protocol



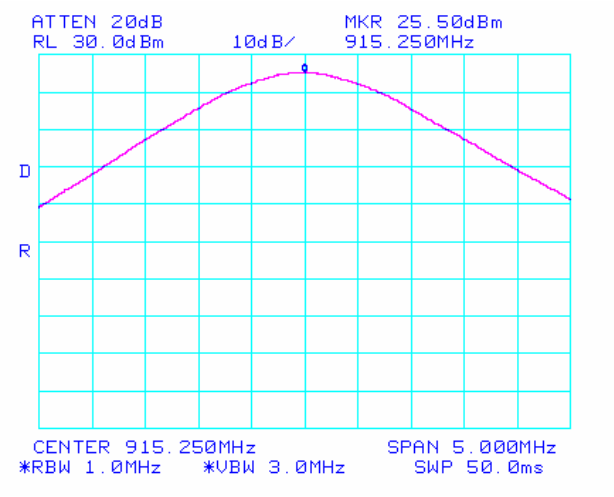
Plot 36: Peak Power (Mid) with EPC1.19 protocol



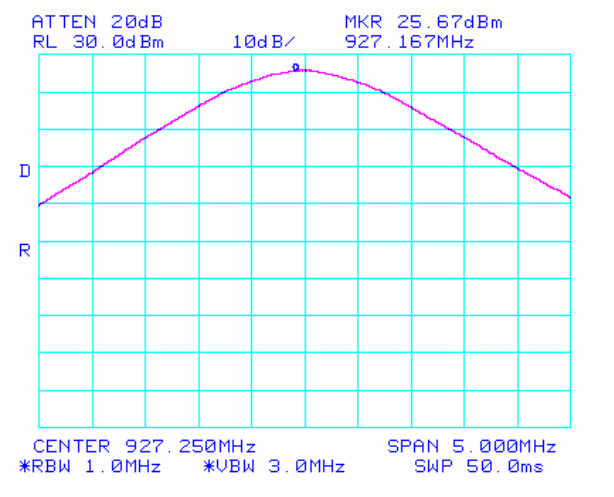
Plot 37: Peak Power (High) with EPC1.19 protocol



Plot 38: Peak Power (Low) with EM protocol



Plot 39: Peak Power (Mid) with EM protocol



Plot 40: Peak Power (High) with EM protocol

Tested By: Kerwinn Corpuz

Date Tested: 21 June 2006

4.2.7 Spurious Emissions at Antenna Terminals

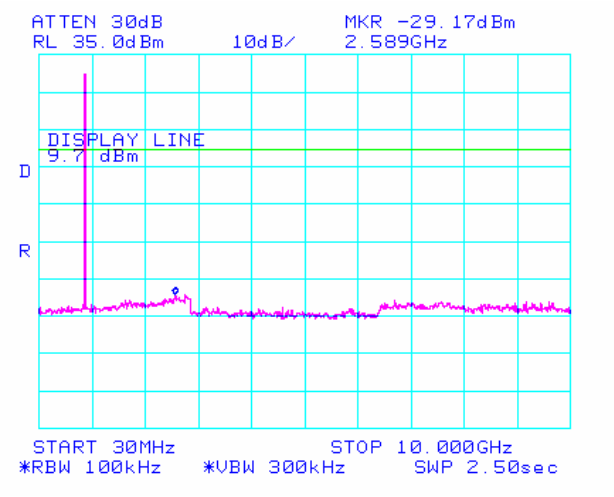
Requirement(s): 47 CFR §15.247(d) & RSS-210 (A8.5)

Procedures: The conducted spurious emissions were measured conducted using a spectrum analyzer at low, mid, and hi channels.

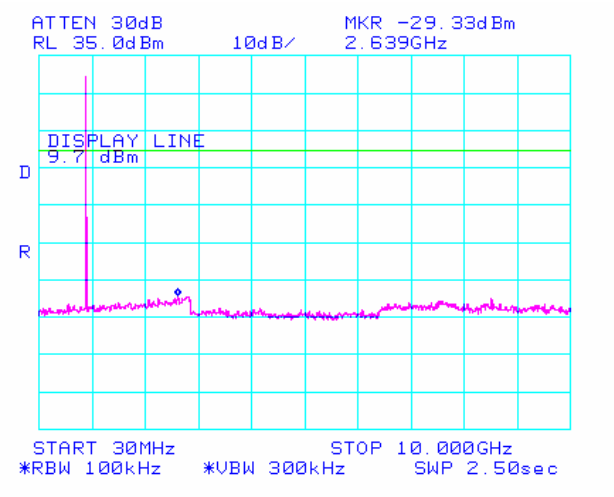
Results:

Plots #	Protocol	Channel	Channel Frequency (MHz)	Pass/Fail
41	GEN-2	Low	902.75	Pass
42	GEN-2	Mid	915.25	Pass
43	GEN-2	High	927.25	Pass
44	ISOB	Low	902.75	Pass
45	ISOB	Mid	915.25	Pass
46	ISOB	High	927.25	Pass
47	CLASS-1	Low	902.75	Pass
48	CLASS-1	Mid	915.25	Pass
49	CLASS-1	High	927.25	Pass
50	CLASS-0	Low	902.75	Pass
51	CLASS-0	Mid	915.25	Pass
52	CLASS-0	High	927.25	Pass
53	EPC1.19	Low	902.75	Pass
54	EPC1.19	Mid	915.25	Pass
55	EPC1.19	High	927.25	Pass
56	EM	Low	902.75	Pass
57	EM	Mid	915.25	Pass
58	EM	High	927.25	Pass

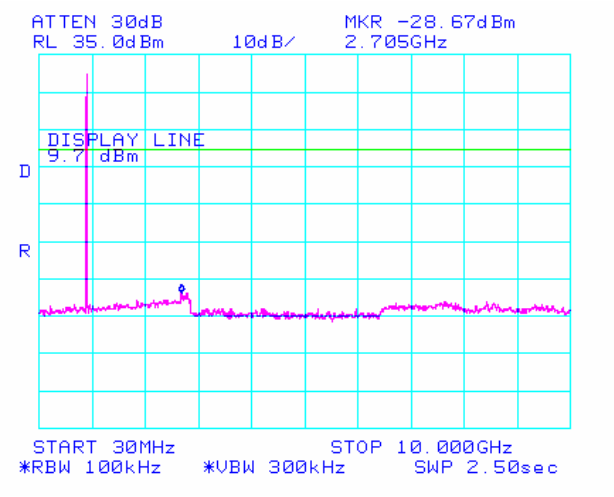
Note: Emission over the limit line in the following plots is the fundamental.



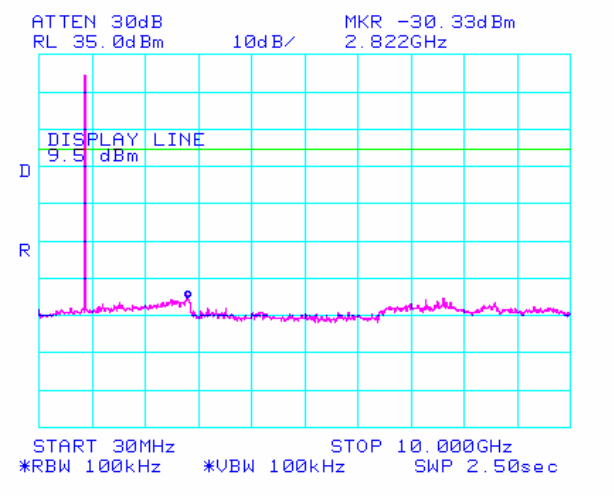
Plot 41: Conducted Spurious Emissions (Low) with GEN-2 protocol



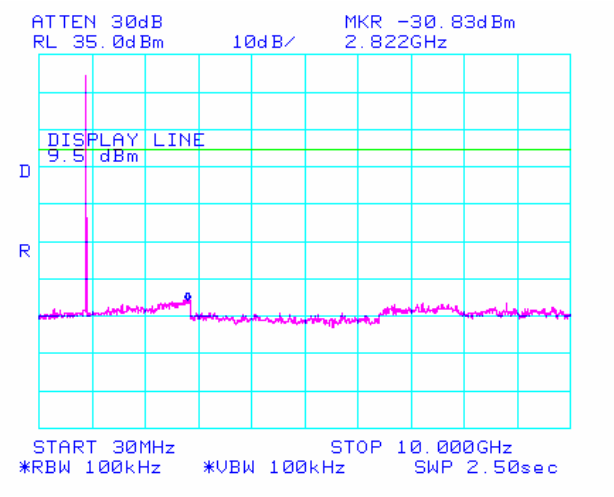
Plot 42: Conducted Spurious Emissions (Mid) with GEN-2 protocol



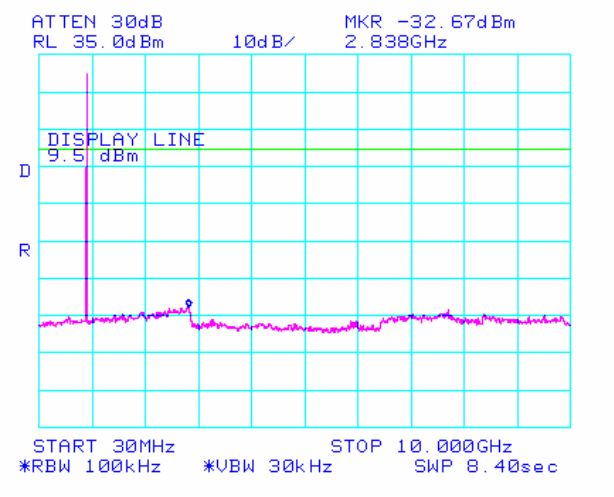
Plot 43: Conducted Spurious Emissions (High) with GEN-2 protocol



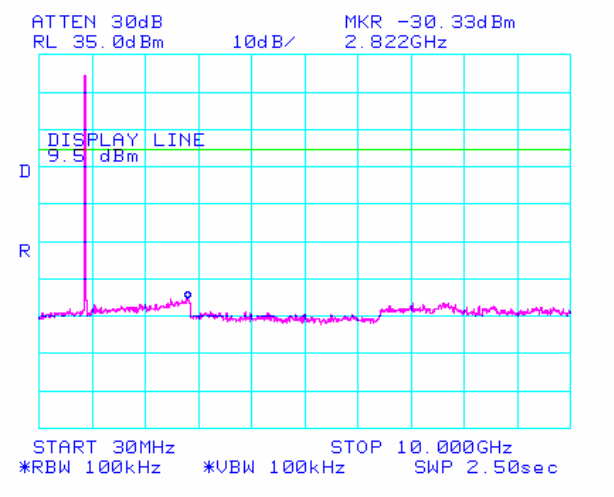
Plot 44: Conducted Spurious Emissions (Low) with ISOB protocol



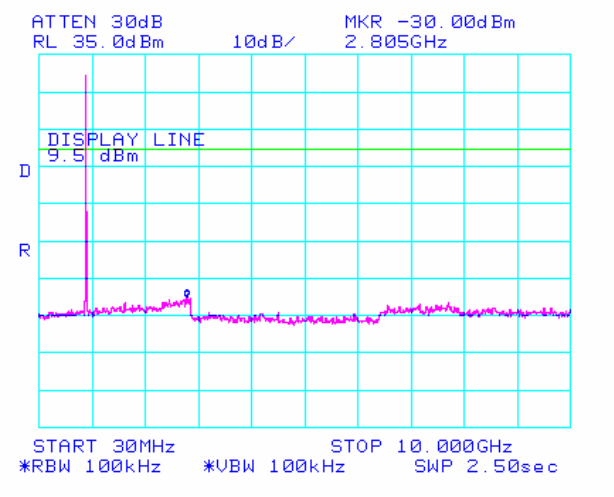
Plot 45: Conducted Spurious Emissions (Mid) with ISOB protocol



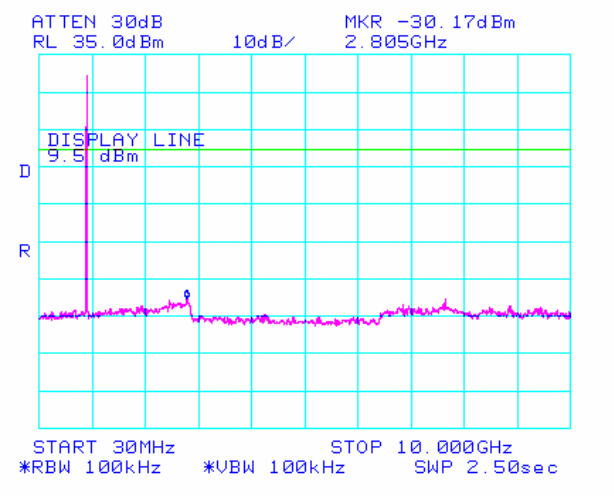
Plot 46: Conducted Spurious Emissions (High) with ISOB protocol



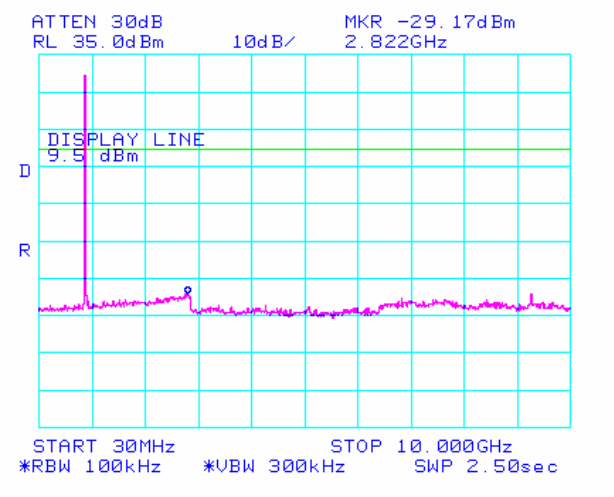
Plot 47: Conducted Spurious Emissions (Low) with CLASS-1 protocol



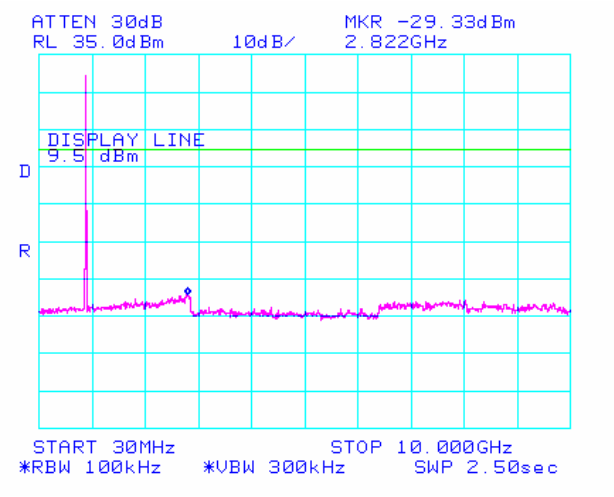
Plot 48: Conducted Spurious Emissions (Mid) with CLASS-1 protocol



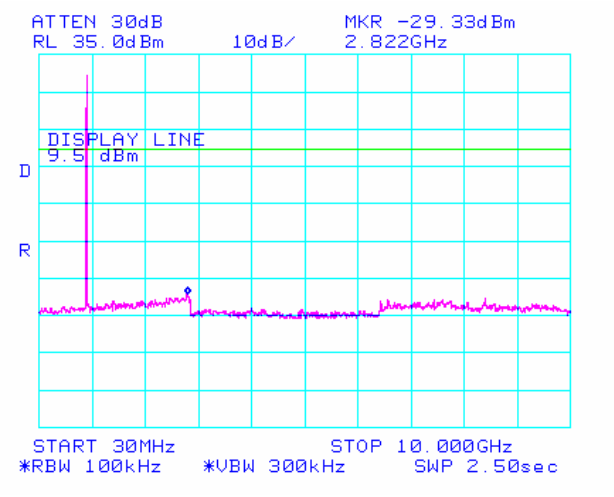
Plot 49: Conducted Spurious Emissions (High) with CLASS-1 protocol



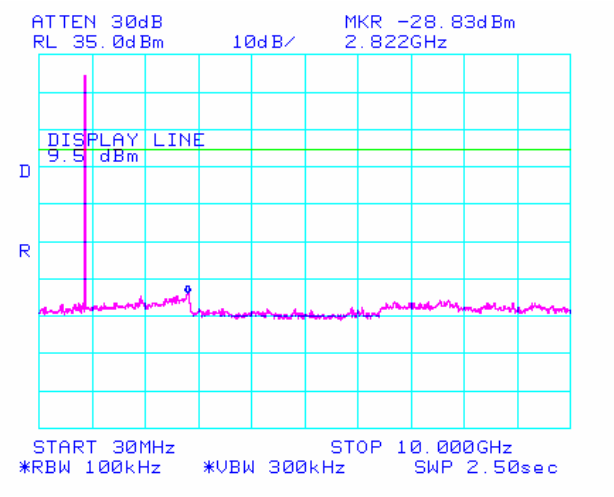
Plot 50: Conducted Spurious Emissions (Low) with CLASS-0 protocol



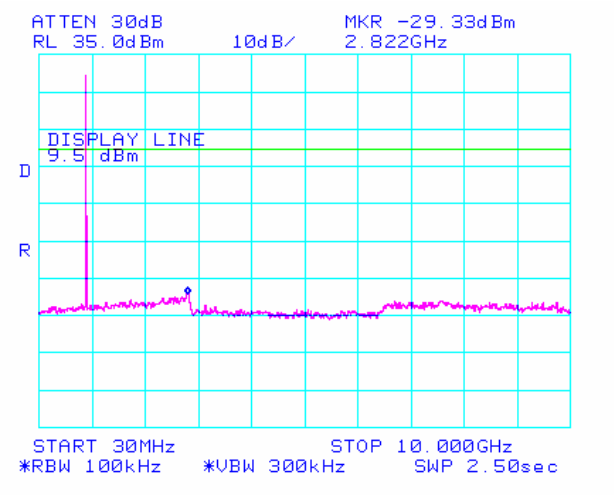
Plot 51: Conducted Spurious Emissions (Mid) with CLASS-0 protocol



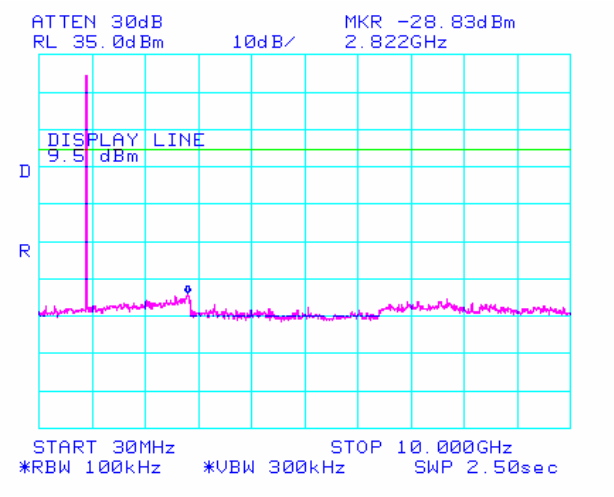
Plot 52: Conducted Spurious Emissions (High) with CLASS-0 protocol



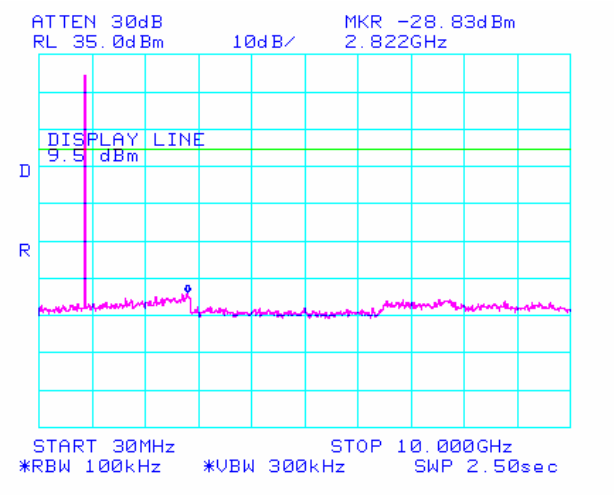
Plot 53: Conducted Spurious Emissions (Low) with EPC1.19 protocol



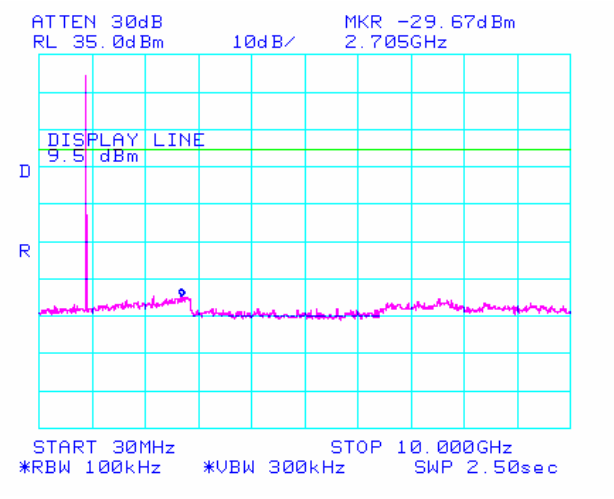
Plot 54: Conducted Spurious Emissions (Mid) with EPC1.19 protocol



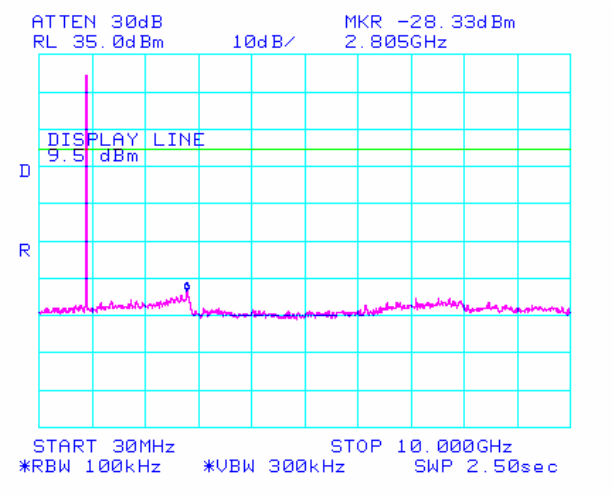
Plot 55: Conducted Spurious Emissions (High) with EPC1.19 protocol



Plot 56: Conducted Spurious Emissions (Low) with EM protocol



Plot 57: Conducted Spurious Emissions (Mid) with EM protocol



Plot 58: Conducted Spurious Emissions (High) with EM protocol

Tested By: Kerwinn Corpuz

Date Tested: 02 May and 02 June 2006

4.2.8 Radiated Spurious Emissions < 1 GHz

Requirement(s): 47 CFR §15.247(d) & RSS-210 (A8.5)

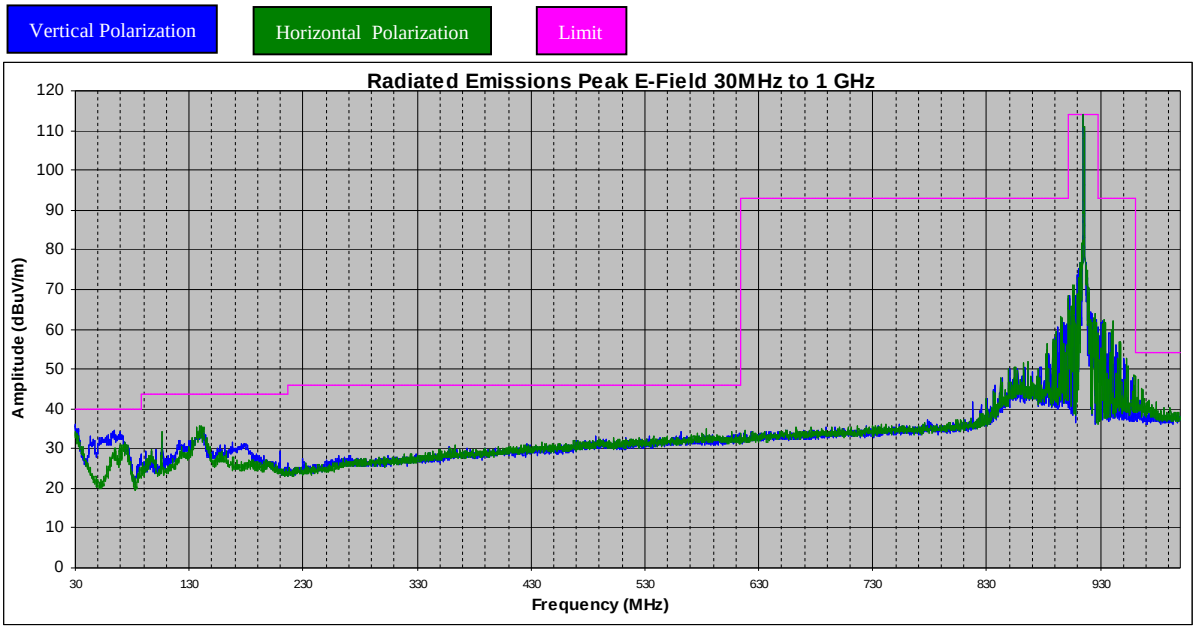
Procedures: Radiated emissions were measured according to ANSI C63.4. The EUT was set to transmit at the highest output power. The EUT was set to transmit at mid channel. Note that setting the channel other than mid, the spurious emissions are the same. For dipole antenna, preliminary test were performed to 3 orthogonal axis and found X axis as the worse case.

Preliminary test were made to six protocols with the worse case protocol (EPC C0) reported.

The limit is converted from microvolts/meter to decibel microvolts/meter.

Sample Calculation: Corrected Amplitude = Raw Amplitude(dBµV/m) + ACF(dB) + Cable Loss(dB)

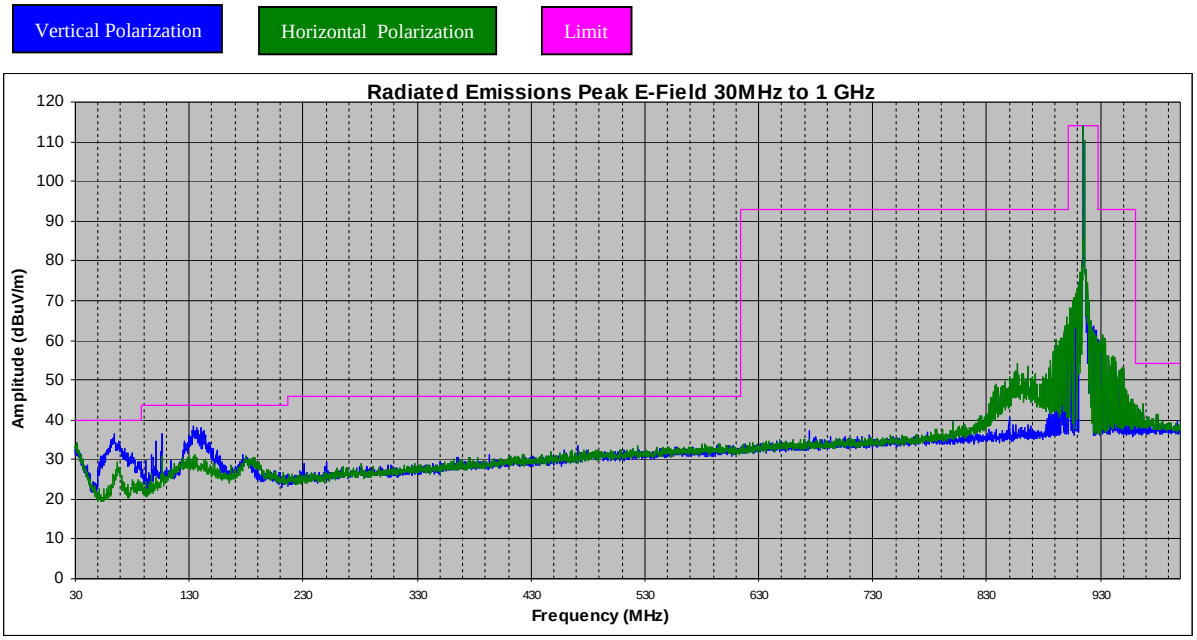
Results:



Radiated Emissions Plot with 10 dBi Patch Antenna

Freq (MHz)	Peak Corrected at 3m (dBµV/m)	Limit (dBµV/m)	Delta (dB)	Polarization (V/H)
960.04	48.6	54	-5.4	H
960.62	48.2	54	-5.8	H
963.72	47.6	54	-6.4	H
966.05	45.1	54	-8.9	H

Radiated Emissions Data with 10 dBi Patch Antenna



Radiated Emissions Plot with 2 dBi Dipole Antenna

Freq (MHz)	Peak Corrected at 3m (dBµV/m)	Limit (dBµV/m)	Delta (dB)	Polarization (V/H)
63.85	36.4	40	-3.6	V
105.76	36.4	43.5	-7.1	V
133.4	38.4	43.5	-5.1	V
140	37.6	43.5	-5.9	V

Radiated Emissions Data with 2 dBi Dipole Antenna

Tested By: Kerwinn Corpuz

Date Tested: 03 May and 20 June 2006

4.2.9 Radiated Spurious Emissions > 1 GHz

Requirement(s): 47 CFR §15.247(d) & RSS-210 (A8.5)

Procedures: Equipment was setup in a semi-anechoic chamber. For measurements above 1 GHz an average measurement was taken with a 10Hz video bandwidth. The EUT was tested at low, mid and high with the highest output power. The EUT was tested with six protocols with the worse case protocol (EPC C0) reported. Investigated up to 10th harmonic of the operating frequency.

For dipole antenna, preliminary test were performed to 3 orthogonal axes and found X axis as the worse case.

Sample Calculation:

EUT Field Strength = Raw Amplitude(dBµV/m) – Amplifier Gain(dB) + Antenna Factor(dB) + Cable Loss(dB) + Filter Attenuation(dB, if used)

Results:

***f_o* = 0.90275 GHz (Low) with 10 dBi Patch antenna**

Frequency	Azimuth	Detector	Antenna Polarization	Antenna Height	Raw Amplitude @ 3m	Pre Amp	ACF	Cable Loss	Corrected Amplitude @ 3m	Limit @3m	Delta
(GHz)	(degrees)	(Pk/Avg)	(V/H)	(m)	(dBuV/m)	(dB)	(dB)	(dB)	(dBuV/m)	(dBuV/m)	(dB)
2.70825	180	Pk	V	1.1	56	32.68	29.46	2.36	55.13	74	-18.87
2.70825	180	Avg	V	1.1	51.5	32.68	29.46	2.36	50.63	54	-3.37
2.70825	230	Pk	H	1.1	55.2	32.68	29.57	2.36	54.44	74	-19.56
2.70825	230	Avg	H	1.1	50.3	32.68	29.57	2.36	49.54	54	-4.46
1.8055	190	Pk	V	1.1	51.3	32.20	26.92	1.84	47.86	74	-26.14
1.8055	190	Avg	V	1.1	46.4	32.20	26.92	1.84	42.96	54	-11.04
1.8055	180	Pk	H	1.1	49.3	32.20	26.94	1.84	45.88	74	-28.12
1.8055	180	Avg	H	1.1	43.3	32.20	26.94	1.84	39.88	54	-14.12
3.611	10	Pk	V	1.1	51.3	33.34	31.63	2.65	52.23	74	-21.77
3.611	10	Avg	V	1.1	44.7	33.34	31.63	2.65	45.63	54	-8.37
3.611	45	Pk	H	1.1	50.1	33.34	31.56	2.65	50.97	74	-23.03
3.611	45	Avg	H	1.1	42.6	33.34	31.56	2.65	43.47	54	-10.53
4.51375	170	Pk	V	1.1	48.9	33.31	32.15	3.30	51.05	74	-22.95
4.51375	170	Avg	V	1.1	42.1	33.31	32.15	3.30	44.25	54	-9.75
4.51375	260	Pk	H	1.1	46.4	33.31	32.09	3.30	48.49	74	-25.51
4.51375	260	Avg	H	1.1	35.8	33.31	32.09	3.30	37.89	54	-16.11

Note: Emissions after 5th harmonic measured noise floor.

f_o = 0.91525 GHz (Mid) with 10 dBi Patch antenna

Frequency	Azimuth	Detector	Antenna Polarization	Antenna Height	Raw Amplitude @ 3m	Pre Amp	ACF	Cable Loss	Corrected Amplitude @ 3m	Limit @3m	Delta
(GHz)	(degrees)	(Pk/Avg)	(V/H)	(m)	(dBuV/m)	(dB)	(dB)	(dB)	(dBuV/m)	(dBuV/m)	(dB)
1.8305	200	Pk	V	1.1	53	32.21	27.04	1.86	49.69	74	-24.31
1.8305	200	Avg	V	1.1	48.1	32.21	27.04	1.86	44.79	54	-9.21
1.8305	165	Pk	H	1.1	53.5	32.21	27.06	1.86	50.21	74	-23.79
1.8305	165	Avg	H	1.1	48.3	32.21	27.06	1.86	45.01	54	-8.99
2.74575	180	Pk	V	1.1	55.8	32.69	29.70	2.36	55.17	74	-18.83
2.74575	180	Avg	V	1.1	50.4	32.69	29.70	2.36	49.77	54	-4.23
2.74575	22	Pk	H	1.1	53	32.69	29.84	2.36	52.51	74	-21.49
2.74575	225	Avg	H	1.1	47	32.69	29.84	2.36	46.51	54	-7.49
3.661	145	Pk	V	1.1	53.3	33.42	31.72	2.73	54.34	74	-19.66
3.661	145	Avg	V	1.1	46.7	33.42	31.72	2.73	47.74	54	-6.26
3.661	235	Pk	H	1.1	49.6	33.42	31.66	2.73	50.57	74	-23.43
3.661	235	Avg	H	1.1	41.2	33.42	31.66	2.73	42.17	54	-11.83
4.57625	175	Pk	V	1.1	47.5	33.37	32.21	3.33	49.68	74	-24.32
4.57625	175	Avg	V	1.1	41	33.37	32.21	3.33	43.18	54	-10.82
4.57625	260	Pk	H	1.1	46	33.37	32.15	3.33	48.11	74	-25.89
4.57625	260	Avg	H	1.1	35.6	33.37	32.15	3.33	37.71	54	-16.29

Note: Emissions after 5th harmonic measured noise floor.

f_o = 0.92725 GHz (High) with 10 dBi Patch antenna

Frequency	Azimuth	Detector	Antenna Polarization	Antenna Height	Raw Amplitude @ 3m	Pre Amp	ACF	Cable Loss	Corrected Amplitude @ 3m	Limit @3m	Delta
(GHz)	(degrees)	(Pk/Avg)	(V/H)	(m)	(dBuV/m)	(dB)	(dB)	(dB)	(dBuV/m)	(dBuV/m)	(dB)
1.8545	190	Pk	V	1.1	53	32.23	27.16	1.88	49.81	74	-24.19
1.8545	190	Avg	V	1.1	48.5	32.23	27.16	1.88	45.31	54	-8.69
1.8545	140	Pk	H	1.1	52.3	32.23	27.17	1.88	49.13	74	-24.87
1.8545	140	Avg	H	1.1	47	32.23	27.17	1.88	43.83	54	-10.17
2.78175	170	Pk	V	1.1	53.1	32.70	29.94	2.37	52.70	74	-21.30
2.78175	170	Avg	V	1.1	47.7	32.70	29.94	2.37	47.30	54	-6.70
2.78175	240	Pk	H	1.1	53.5	32.70	30.10	2.37	53.26	74	-20.74
2.78175	240	Avg	H	1.1	47.8	32.70	30.10	2.37	47.56	54	-6.44
3.709	175	Pk	V	1.1	52.1	33.49	31.82	2.83	53.25	74	-20.75
3.709	175	Avg	V	1.1	46	33.49	31.82	2.83	47.15	54	-6.85
3.709	270	Pk	H	1.1	48.7	33.49	31.75	2.83	49.78	74	-24.22
3.709	270	Avg	H	1.1	40.2	33.49	31.75	2.83	41.28	54	-12.72
4.63625	170	Pk	V	1.1	47.2	33.47	32.30	3.37	49.40	74	-24.60
4.63625	170	Avg	V	1.1	40.3	33.47	32.30	3.37	42.50	54	-11.50
4.63625	265	Pk	H	1.1	45.6	33.47	32.23	3.37	47.73	74	-26.27
4.63625	265	Avg	H	1.1	35.5	33.47	32.23	3.37	37.63	54	-16.37

Note: Emissions after 5th harmonic measured noise floor.

f_o = 0.90275 GHz (Low) with 2 dBi Dipole antenna

Frequency	Azimuth	Detector	Antenna Polarization	Antenna Height	Raw Amplitude @ 3m	Pre Amp	ACF	Cable Loss	Corrected Amplitude @ 3m	Limit @3m	Delta
(GHz)	(degrees)	(Pk/Avg)	(V/H)	(m)	(dBuV/m)	(dB)	(dB)	(dB)	(dBuV/m)	(dBuV/m)	(dB)
1.8055	180	Pk	V	1	57	32.20	26.92	1.84	53.56	74	-20.44
1.8055	180	Avg	V	1	53.4	32.20	26.92	1.84	49.96	54	-4.04
1.8055	0	Pk	H	1.2	49.7	32.20	26.94	1.84	46.28	74	-27.72
1.8055	0	Avg	H	1.2	44	32.20	26.94	1.84	40.58	54	-13.42
2.70825	260	Pk	V	1	55	32.68	29.46	2.36	54.13	74	-19.87
2.70825	260	Avg	V	1	48.2	32.68	29.46	2.36	47.33	54	-6.67
2.70825	170	Pk	H	1.2	51.7	32.68	29.57	2.36	50.94	74	-23.06
2.70825	170	Avg	H	1.2	45	32.68	29.57	2.36	44.24	54	-9.76
3.611	270	Pk	V	1	53	33.34	31.63	2.65	53.93	74	-20.07
3.611	270	Avg	V	1	46.2	33.34	31.63	2.65	47.13	54	-6.87
3.611	20	Pk	H	1.2	48.6	33.34	31.56	2.65	49.47	74	-24.53
3.611	20	Avg	H	1.2	41	33.34	31.56	2.65	41.87	54	-12.13
4.51375	170	Pk	V	1	54.2	33.31	32.15	3.30	56.35	74	-17.65
4.51375	170	Avg	V	1	46.6	33.31	32.15	3.30	48.75	54	-5.25
4.51375	-	-	H	-	-	-	-	-	-	-	-
5.4165	180	Pk	V	1	51	33.32	33.40	3.59	54.67	74	-19.33
5.4165	180	Avg	V	1	42	33.32	33.40	3.59	45.67	54	-8.33
5.4165	-	-	H	-	-	-	-	-	-	-	-

Note: 4.51375 GHz, 5.4165 GHz (horizontal) and emissions after 6th harmonic measured noise floor.

f_o = 0.91525 GHz (Mid) with 2 dBi Dipole antenna

Frequency	Azimuth	Detector	Antenna Polarization	Antenna Height	Raw Amplitude @ 3m	Pre Amp	ACF	Cable Loss	Corrected Amplitude @ 3m	Limit @3m	Delta
(GHz)	(degrees)	(Pk/Avg)	(V/H)	(m)	(dBuV/m)	(dB)	(dB)	(dB)	(dBuV/m)	(dBuV/m)	(dB)
1.8305	0	Pk	V	1	57.9	32.21	27.04	1.86	54.59	74	-19.41
1.8305	0	Avg	V	1	51.4	32.21	27.04	1.86	48.09	54	-5.91
1.8305	30	Pk	H	1.2	51.3	32.21	27.06	1.86	48.01	74	-25.99
1.8305	30	Avg	H	1.2	44.8	32.21	27.06	1.86	41.51	54	-12.49
2.74575	0	Pk	V	1	55.3	32.69	29.70	2.36	54.67	74	-19.33
2.74575	0	Avg	V	1	51.1	32.69	29.70	2.36	50.47	54	-3.53
2.74575	345	Pk	H	1.2	51.7	32.69	29.84	2.36	51.21	74	-22.79
2.74575	345	Avg	H	1.2	46.6	32.69	29.84	2.36	46.11	54	-7.89
3.661	330	Pk	V	1	52.2	33.42	31.72	2.73	53.24	74	-20.76
3.661	330	Avg	V	1	45.9	33.42	31.72	2.73	46.94	54	-7.06
3.661	325	Pk	H	1.2	49	33.42	31.66	2.73	49.97	74	-24.03
3.661	325	Avg	H	1.2	41.2	33.42	31.66	2.73	42.17	54	-11.83
4.57625	175	Pk	V	1	50.9	33.37	32.21	3.33	53.08	74	-20.92
4.57625	175	Avg	V	1	42.6	33.37	32.21	3.33	44.78	54	-9.22
4.57625	-	-	H	-	-	-	-	-	-	-	-
5.4915	175	Pk	V	1	50.2	33.21	33.49	3.60	54.08	74	-19.92
5.4915	175	Avg	V	1	41.8	33.21	33.49	3.60	45.68	54	-8.32
5.4915	-	-	H	-	-	-	-	-	-	-	-

Note: 4.57625 GHz, 5.4915 GHz (horizontal) and emissions after 6th harmonic measured noise floor.

f_o = 0.92725 GHz (High) with 2 dBi Dipole antenna

Frequency	Azimuth	Detector	Antenna Polarization	Antenna Height	Raw Amplitude @ 3m	Pre Amp	ACF	Cable Loss	Corrected Amplitude @ 3m	Limit @3m	Delta
(GHz)	(degrees)	(Pk/Avg)	(V/H)	(m)	(dBuV/m)	(dB)	(dB)	(dB)	(dBuV/m)	(dBuV/m)	(dB)
1.8545	170	Pk	V	53.3	32.23	27.16	1.88	50.11	74	-23.89	53.3
1.8545	170	Avg	V	46.7	32.23	27.16	1.88	43.51	54	-10.49	46.7
1.8545	10	Pk	H	49.6	32.23	27.17	1.88	46.43	74	-27.57	49.6
1.8545	10	Avg	H	44	32.23	27.17	1.88	40.83	54	-13.17	44
2.78175	315	Pk	V	51.2	32.70	29.94	2.37	50.80	74	-23.20	51.2
2.78175	315	Avg	V	43.5	32.70	29.94	2.37	43.10	54	-10.90	43.5
2.78175	160	Pk	H	49.1	32.70	30.10	2.37	48.86	74	-25.14	49.1
2.78175	160	Avg	H	42.9	32.70	30.10	2.37	42.66	54	-11.34	42.9
3.709	165	Pk	V	54.3	33.49	31.82	2.83	55.45	74	-18.55	54.3
3.709	165	Avg	V	47.2	33.49	31.82	2.83	48.35	54	-5.65	47.2
3.709	0	Pk	H	49.2	33.49	31.75	2.83	50.28	74	-23.72	49.2
3.709	0	Avg	H	40.6	33.49	31.75	2.83	41.68	54	-12.32	40.6
4.63625	170	Pk	V	51.4	33.47	32.30	3.37	53.60	74	-20.40	51.4
4.63625	170	Avg	V	43.2	33.47	32.30	3.37	45.40	54	-8.60	43.2
4.63625	-	-	H	-	-	-	-	-	-	-	-
5.5635	180	Pk	V	49	33.15	33.58	3.62	53.05	74	-20.95	49
5.5635	180	Avg	V	40.1	33.15	33.58	3.62	44.15	54	-9.85	40.1
5.5635	-	-	H	-	-	-	-	-	-	-	-

Note: 4.63625 GHz, 5.5635 GHz (horizontal) and emissions after 6th harmonic measured noise floor.

Tested By: Kerwinn Corpuz

Date Tested: 04 May and 20 June 2006

4.2.10 Radiated Emissions – Band Edge

Requirement(s): 47 CFR §15.247(d) & RSS-210 (A8.5)

Procedures: Radiated emissions were measured according to ANSI C63.4. Equipment was tested with six protocols at low and high channel. An offset was set to spectrum analyzer with 25 dB. Limit = 20 dB attenuation from peak power.

Sample Calculation:
EUT Field Strength = Raw Amplitude(dBµV/m) + Antenna Factor(dB) + Cable Loss(dB)

Results:

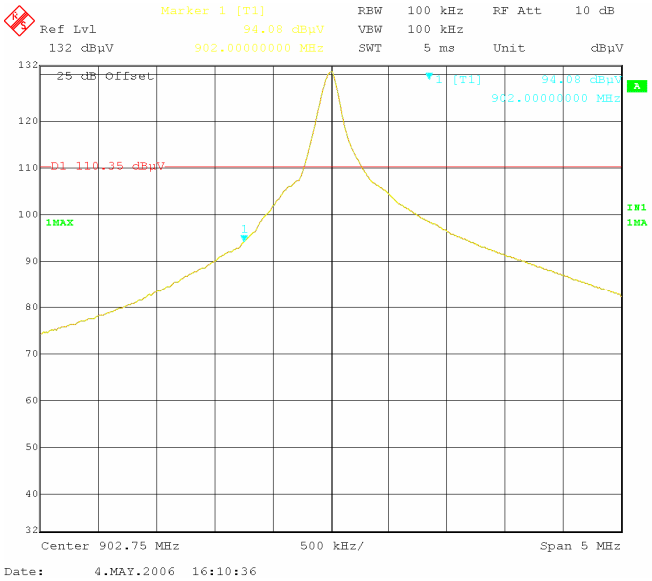
With 10 dBi Patch Antenna:

Plot #	Freq (MHz)	Peak Corrected at 3m (dBµV/m)	Limit (dBµV/m)	Delta (dB)	Polarization (V/H)	Protocol
59	902	94.08	110.35	-16.27	V	GEN-2
60	928	99.44	110.35	-10.91	V	GEN-2
61	902	94.79	111.3	-16.51	H	GEN-2
62	928	99.98	111.3	-11.32	H	GEN-2
63	902	95.34	110.35	-15.01	V	ISOB
64	928	97.97	110.35	-12.38	V	ISOB
65	902	96.71	111.3	-14.59	H	ISOB
66	928	100.09	111.3	-11.21	H	ISOB
67	902	102.41	110.35	-7.94	V	CLASS-1
68	928	104.24	110.35	-6.11	V	CLASS-1
69	902	103.68	111.3	-7.62	H	CLASS-1
70	928	105.94	111.3	-5.36	H	CLASS-1
71	902	98.99	110.35	-11.36	V	CLASS-0
72	928	98.42	110.35	-11.93	V	CLASS-0
73	902	99.71	111.3	-11.59	H	CLASS-0
74	928	99.76	111.3	-11.54	H	CLASS-0
75	902	93.29	110.35	-17.06	V	EPC1.19
76	928	98.07	110.35	-12.28	V	EPC1.19
77	902	94.06	111.3	-17.24	H	EPC1.19
78	928	99.65	111.3	-11.65	H	EPC1.19
79	902	58.88	110.35	-51.47	V	EM
80	928	58.87	110.35	-51.48	V	EM
81	902	59.25	111.3	-52.05	H	EM
82	928	61.17	111.3	-50.13	H	EM

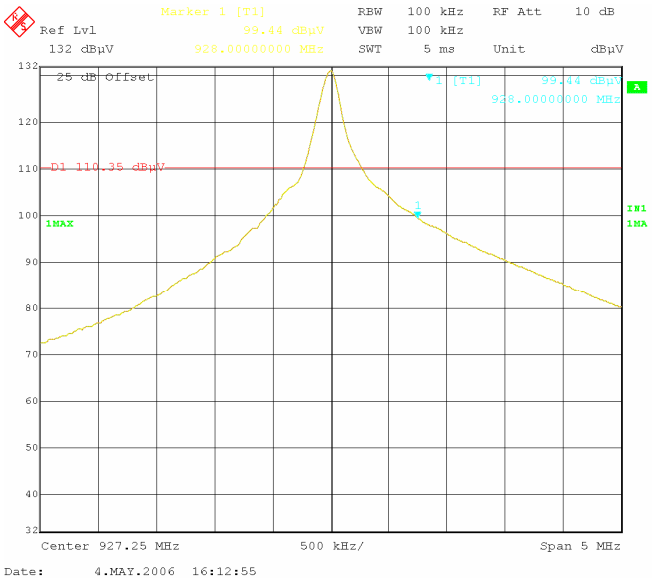
With 2 dBi Dipole Antenna:

Note: Preliminary test were performed to 3 orthogonal axes and found X axis as the worse case and also having the receiving antenna at horizontal polarization.

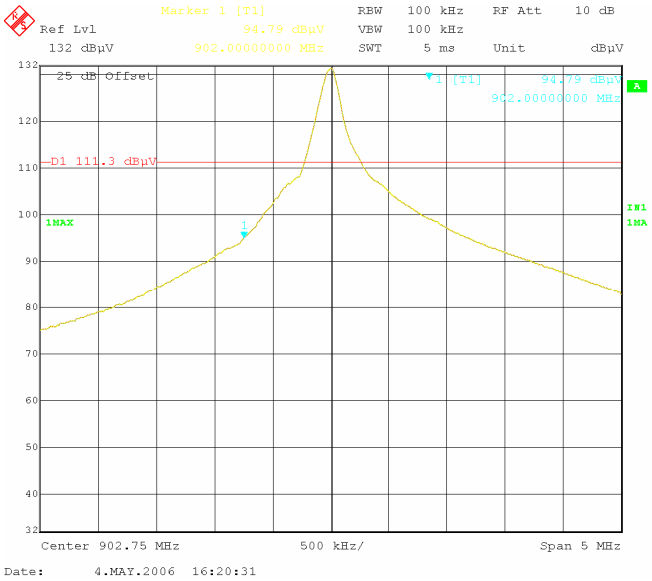
Plot #	Freq (MHz)	Peak Corrected at 3m (dBµV/m)	Limit (dBµV/m)	Delta (dB)	Polarization (V/H)	Protocol
83	902	94.37	111.24	-16.87	H	GEN-2
84	928	98.07	111.24	-13.17	H	GEN-2
85	902	94.11	111.24	-17.13	H	ISOB
86	928	98.23	111.24	-13.01	H	ISOB
87	902	100.81	111.24	-10.43	H	CLASS-1
88	928	103.7	111.24	-7.54	H	CLASS-1
89	902	99.16	111.24	-12.08	H	CLASS-0
90	928	99.83	111.24	-11.41	H	CLASS-0
91	902	94.29	111.24	-16.95	H	EPC1.19
92	928	98.34	111.24	-12.9	H	EPC1.19
93	902	59.37	111.24	-51.87	H	EM
94	928	60.55	111.24	-50.69	H	EM



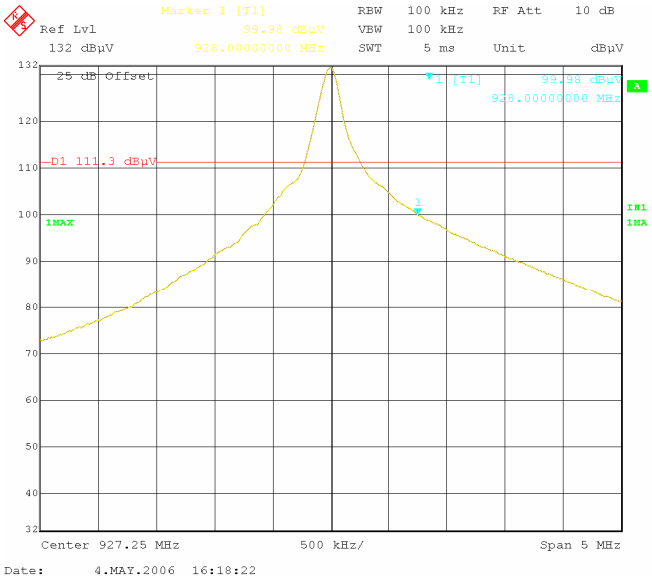
Plot 59: Lower Edge (Vertical) with GEN-2 protocol [10dBi Patch]



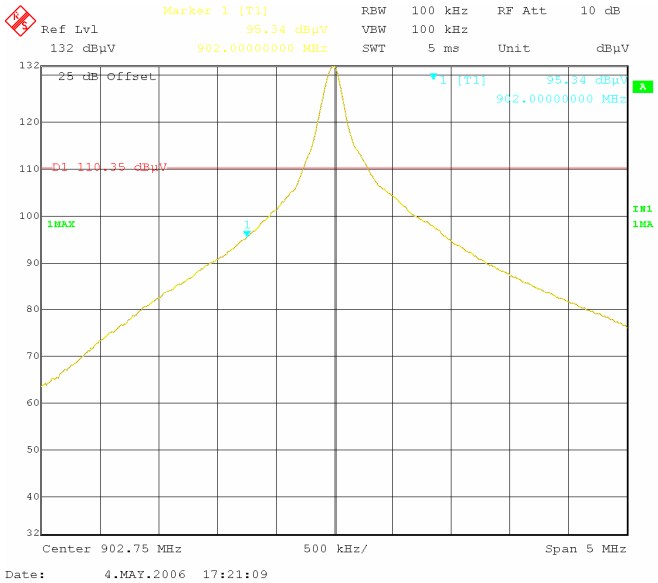
Plot 60: Upper Edge (Vertical) with GEN-2 protocol [10dBi Patch]



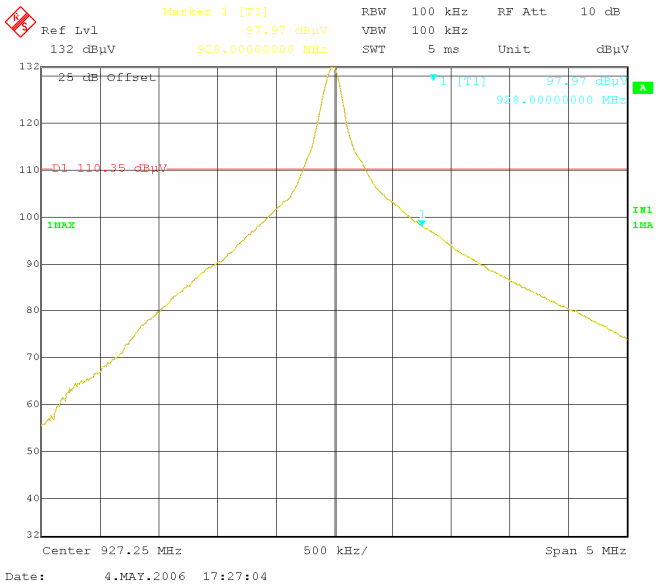
Plot 61: Lower Edge (Horizontal) with GEN-2 protocol [10dBi Patch]



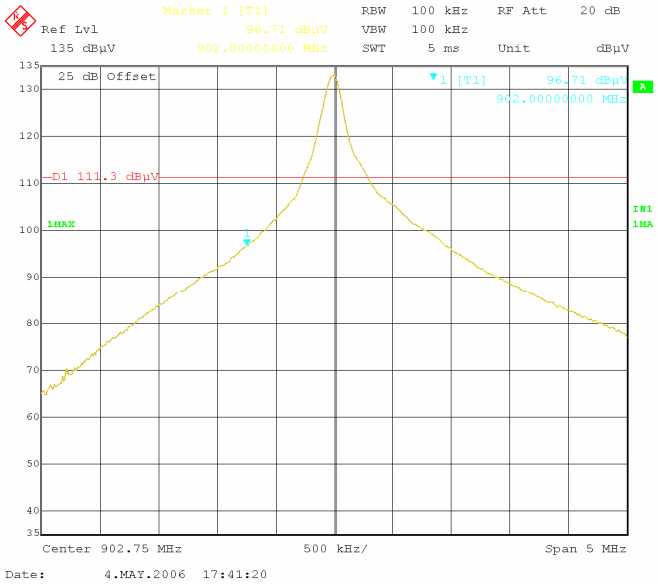
Plot 62: Upper Edge (Horizontal) with GEN-2 protocol [10dBi Patch]



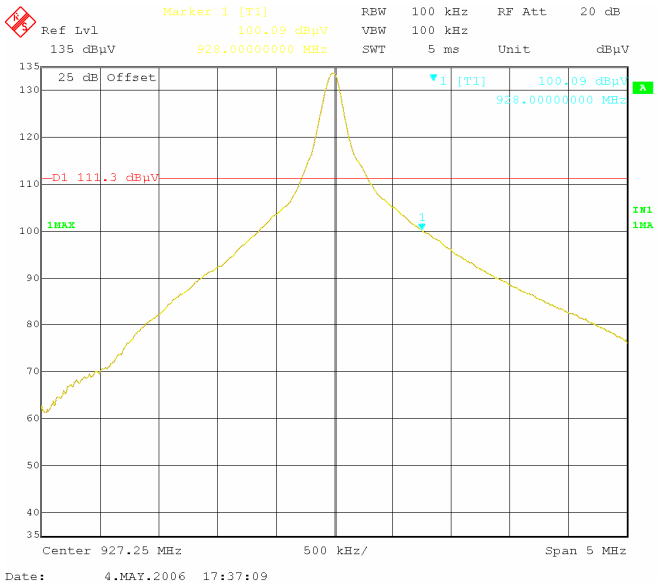
Plot 63: Lower Edge (Vertical) with ISOB protocol [10dBi Patch]



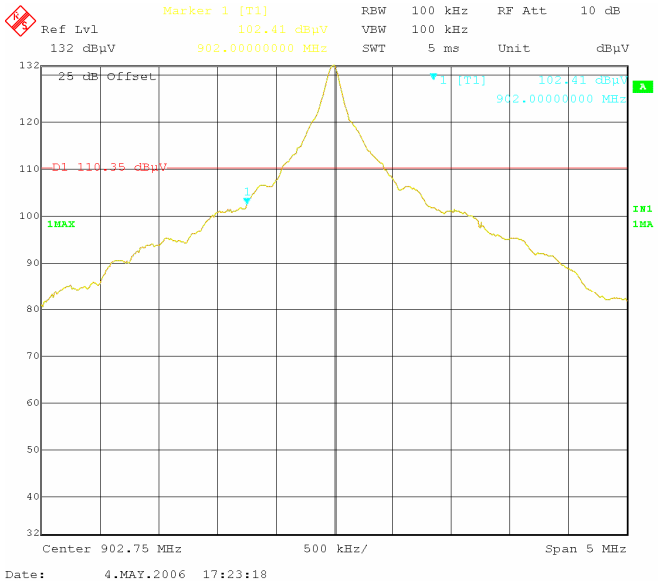
Plot 64: Upper Edge (Vertical) with ISOB protocol [10dBi Patch]



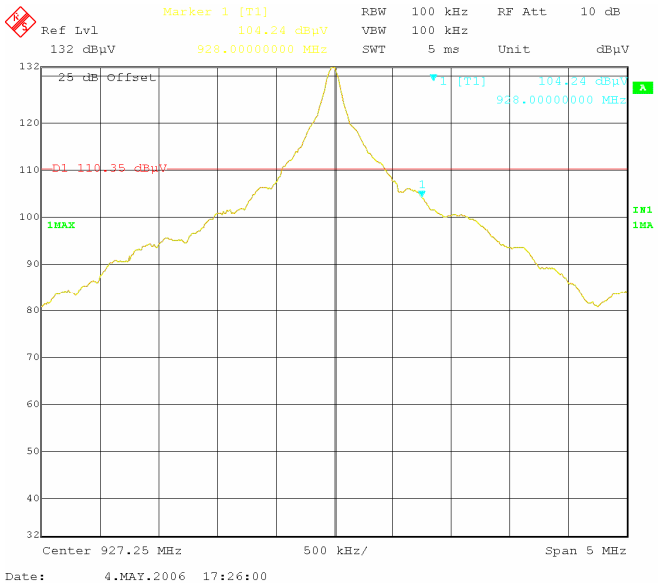
Plot 65: Lower Edge (Horizontal) with ISOB protocol [10dBi Patch]



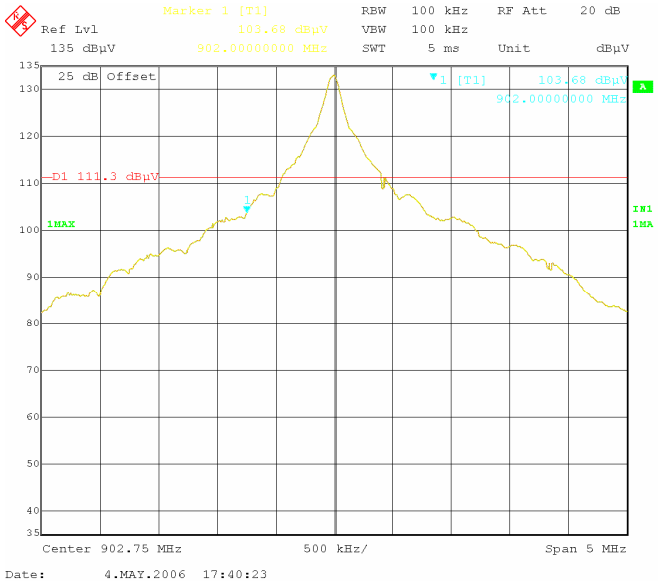
Plot 66: Upper Edge (Horizontal) with ISOB protocol [10dBi Patch]



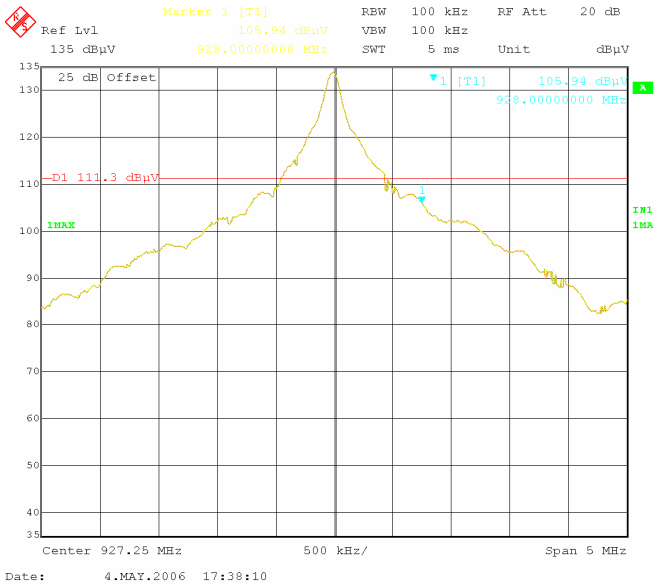
Plot 67: Lower Edge (Vertical) with CLASS-1 protocol [10dBi Patch]



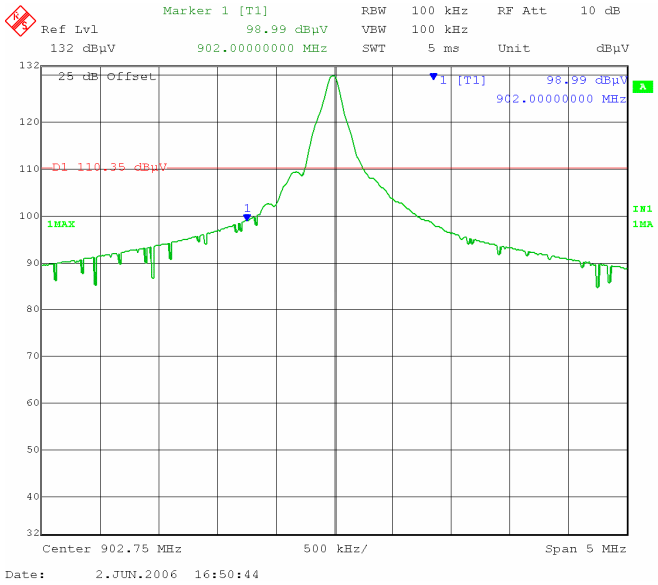
Plot 68: Upper Edge (Vertical) with CLASS-1 protocol [10dBi Patch]



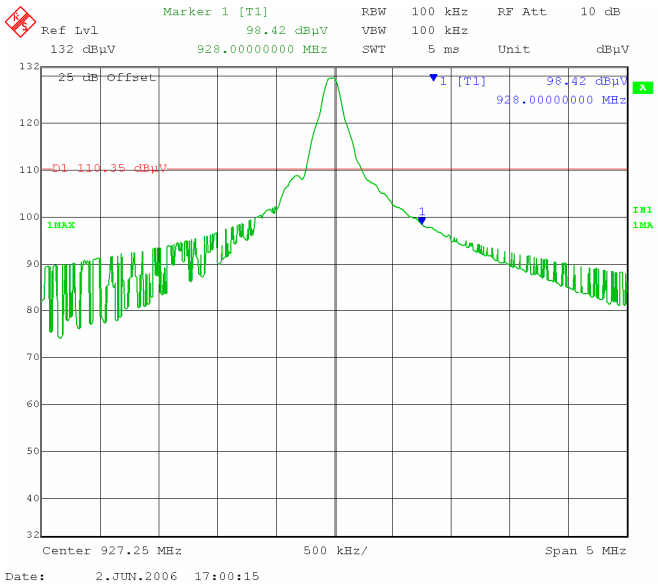
Plot 69: Lower Edge (Horizontal) with CLASS-1 protocol [10dBi Patch]



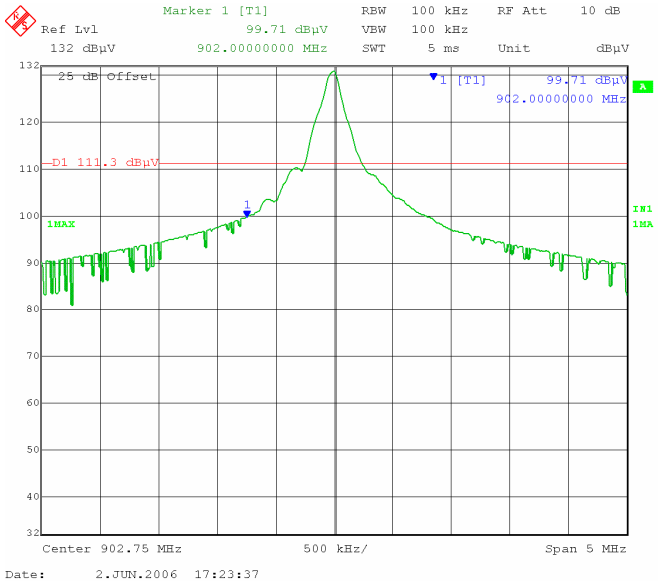
Plot 70: Upper Edge (Horizontal) with CLASS-1 protocol [10dBi Patch]



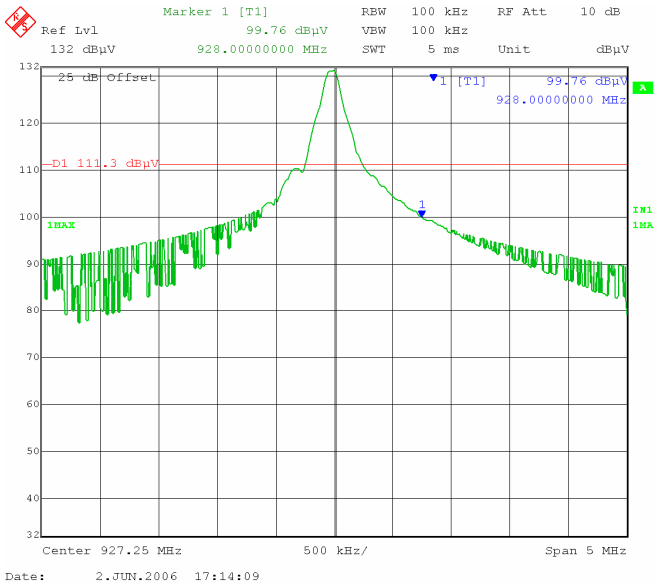
Plot 71: Lower Edge (Vertical) with CLASS-0 protocol [10dBi Patch]



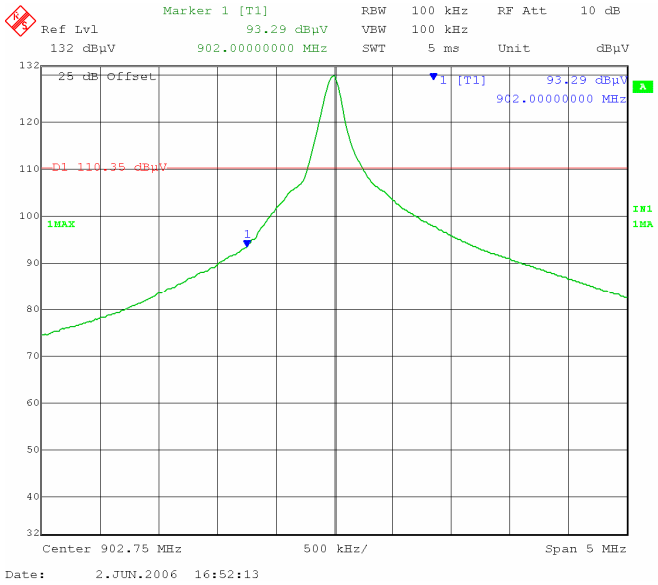
Plot 72: Upper Edge (Vertical) with CLASS-0 protocol [10dBi Patch]



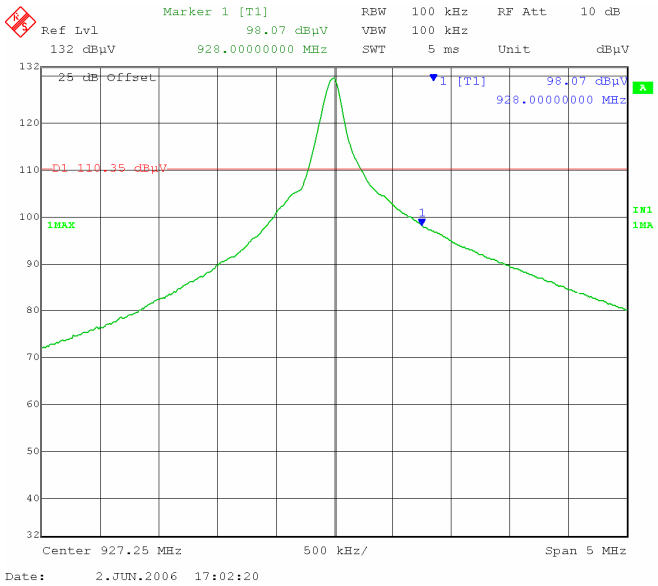
Plot 73: Lower Edge (Horizontal) with CLASS-0 protocol [10dBi Patch]



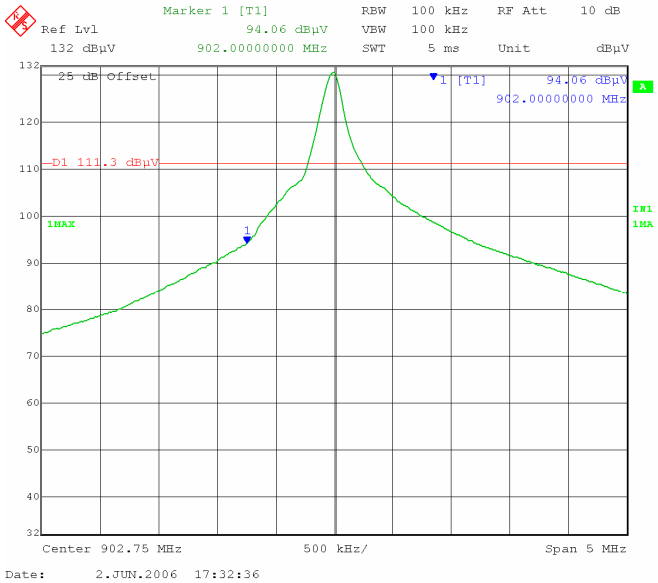
Plot 74: Upper Edge (Horizontal) with CLASS-0 protocol [10dBi Patch]



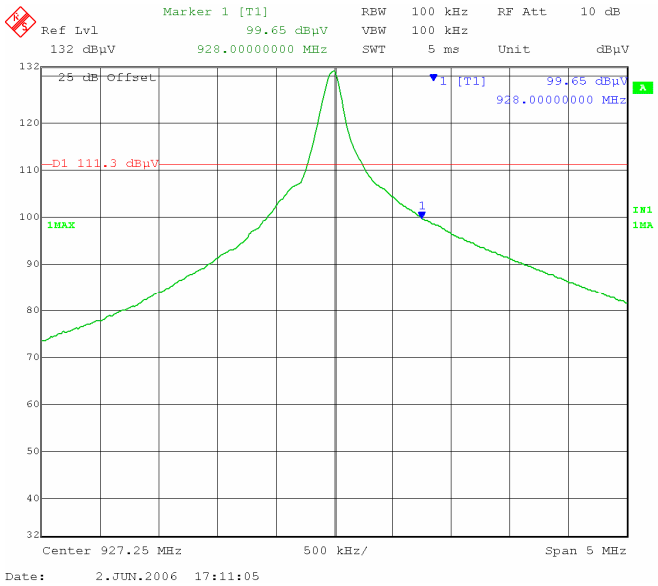
Plot 75: Lower Edge (Vertical) with EPC1.19 protocol [10dBi Patch]



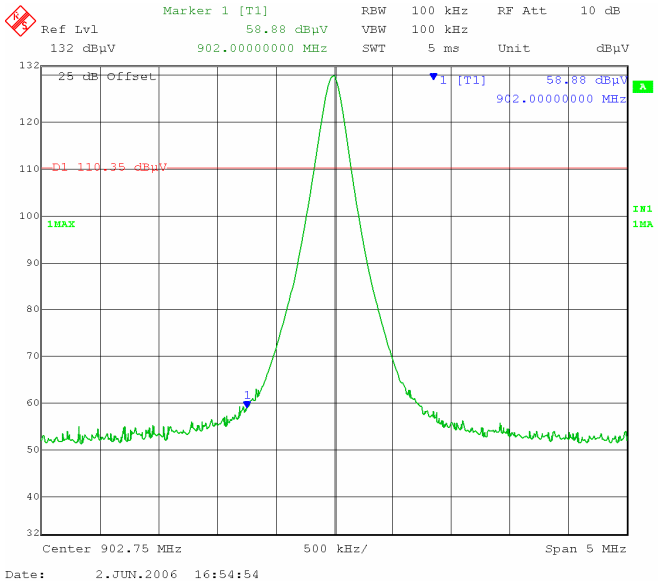
Plot 76: Upper Edge (Vertical) with EPC1.19 protocol [10dBi Patch]



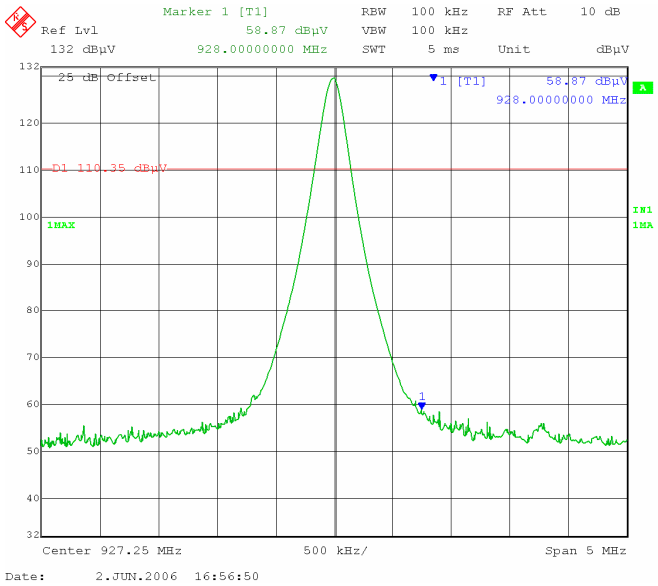
Plot 77: Lower Edge (Horizontal) with EPC1.19 protocol [10dBi Patch]



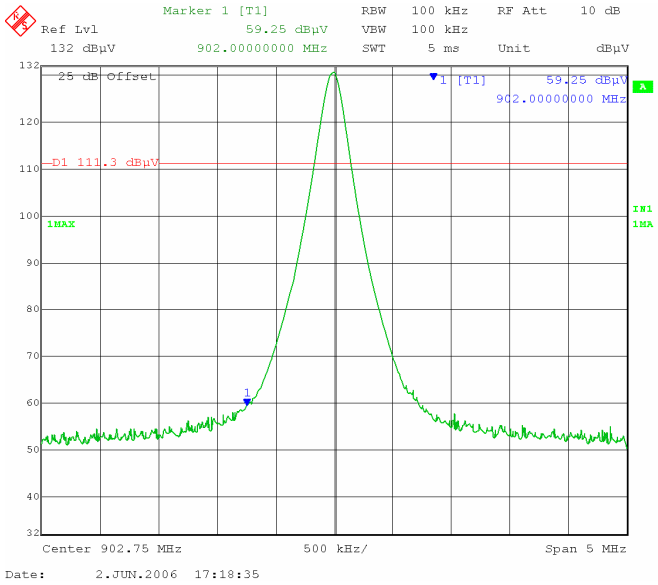
Plot 78: Upper Edge (Horizontal) with EPC1.19 protocol [10dBi Patch]



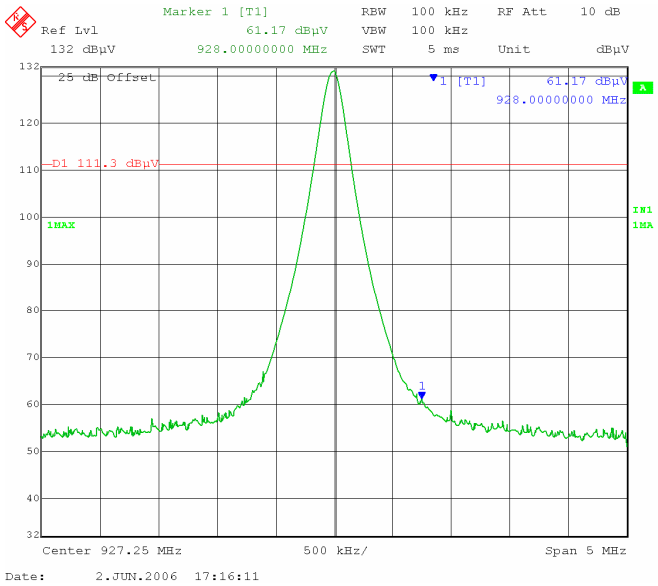
Plot 79: Lower Edge (Vertical) with EM protocol [10dBi Patch]



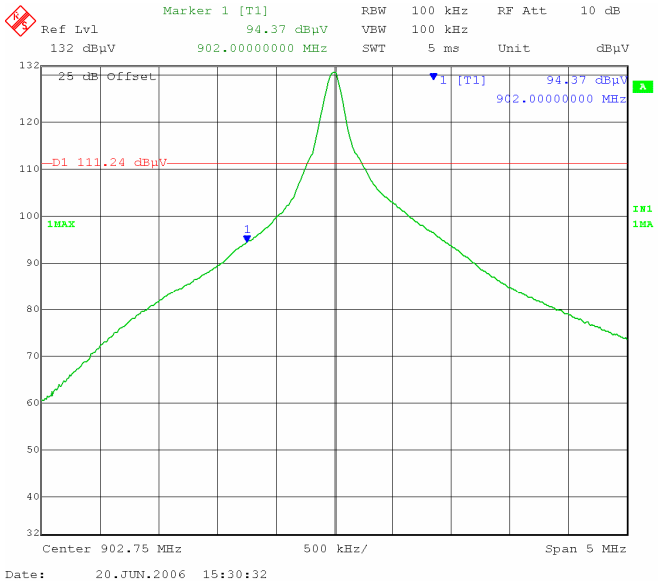
Plot 80: Upper Edge (Vertical) with EM protocol [10dBi Patch]



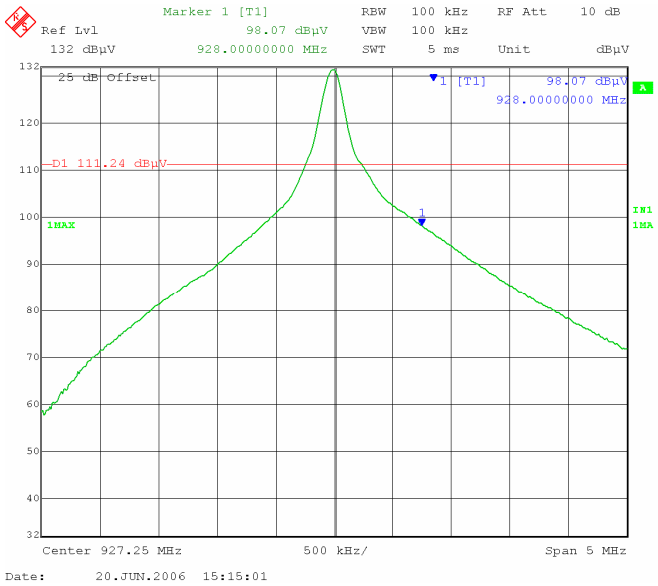
Plot 81: Lower Edge (Horizontal) with EM protocol [10dBi Patch]



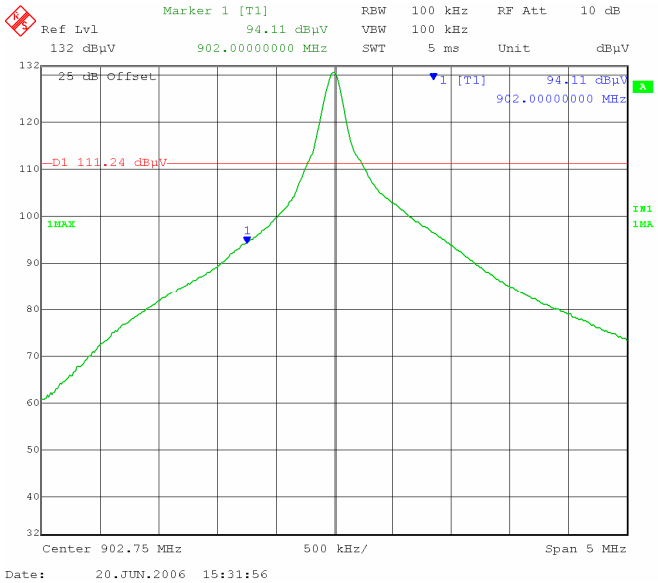
Plot 82: Upper Edge (Horizontal) with EM protocol [10dBi Patch]



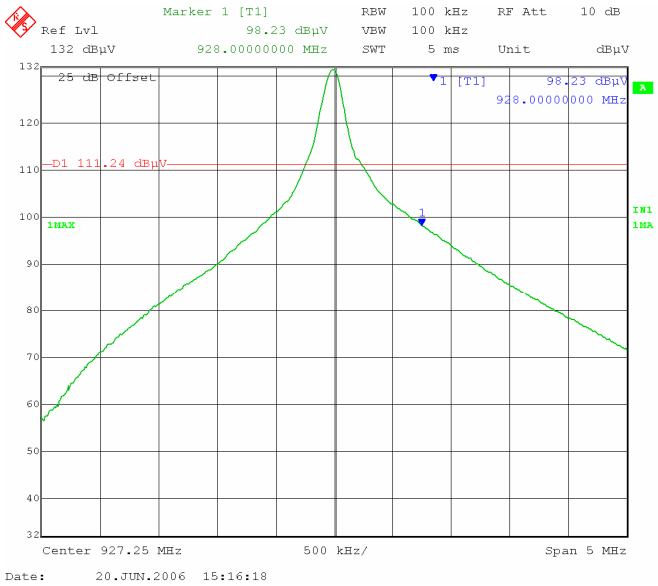
Plot 83: Lower Edge (Horizontal) with GEN-2 protocol [2dBi Dipole]



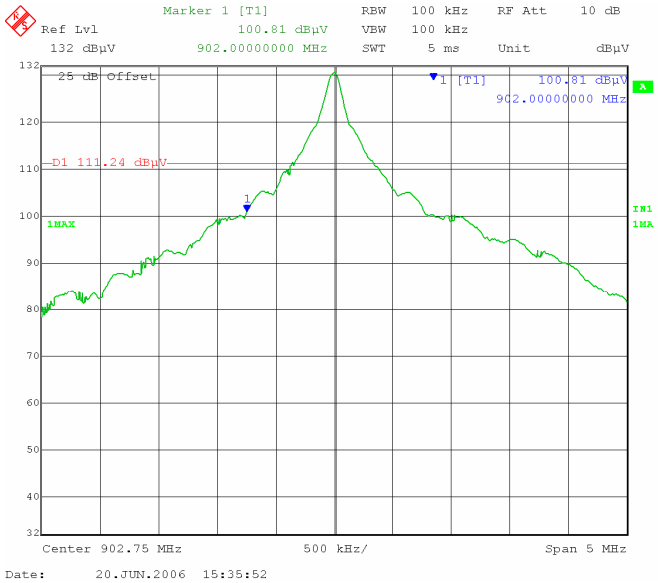
Plot 84: Upper Edge (Horizontal) with GEN-2 protocol [2dBi Dipole]



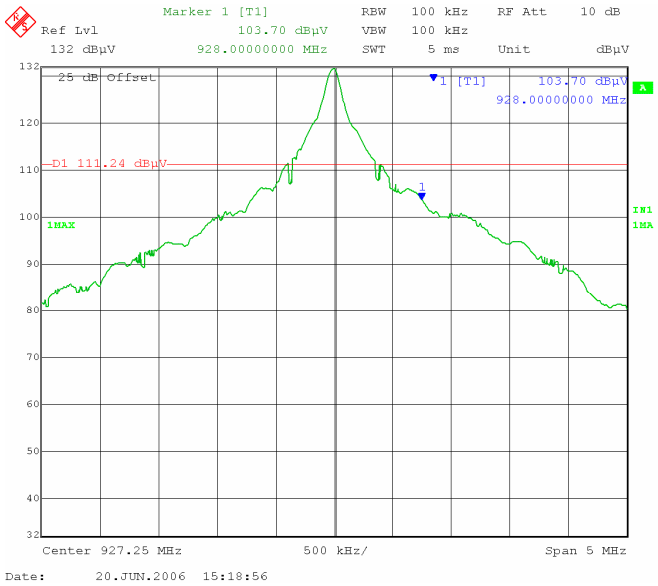
Plot 85: Lower Edge (Horizontal) with ISOB protocol [2dBi Dipole]



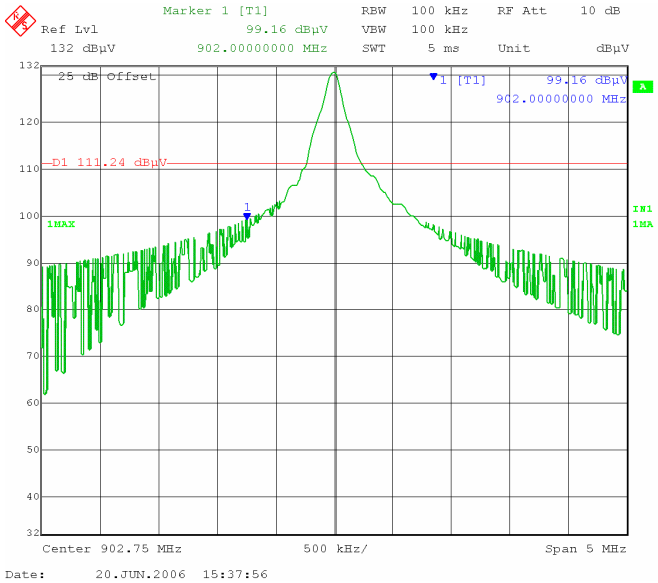
Plot 86: Upper Edge (Horizontal) with ISOB protocol [2dBi Dipole]



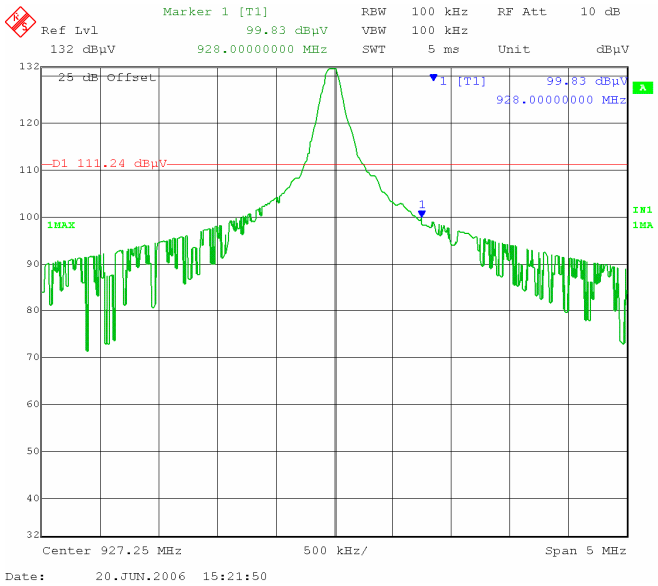
Plot 87: Lower Edge (Horizontal) with CLASS-1 protocol [2dBi Dipole]



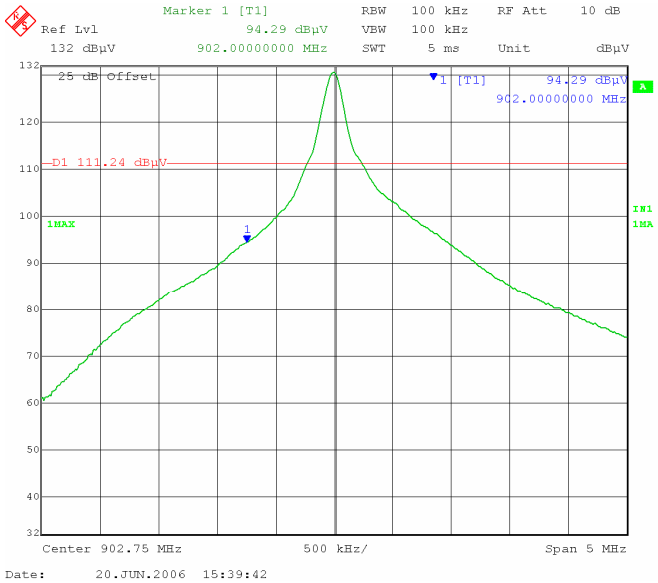
Plot 88: Upper Edge (Horizontal) with CLASS-1 protocol [2dBi Dipole]



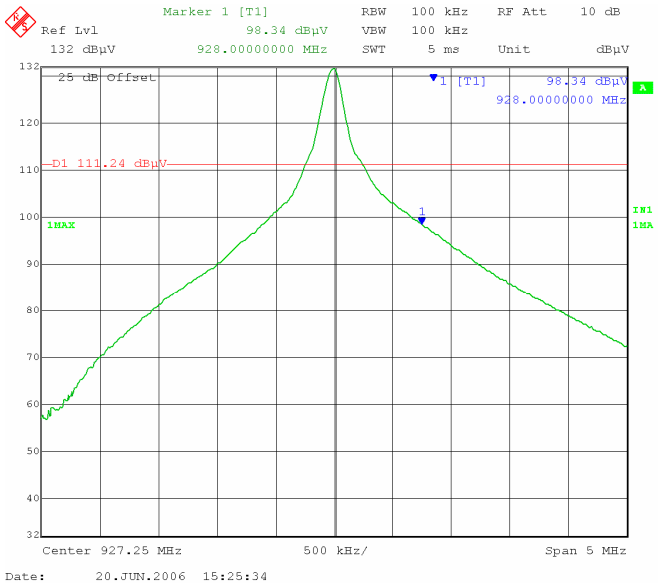
Plot 89: Lower Edge (Horizontal) with CLASS-0 protocol [2dBi Dipole]



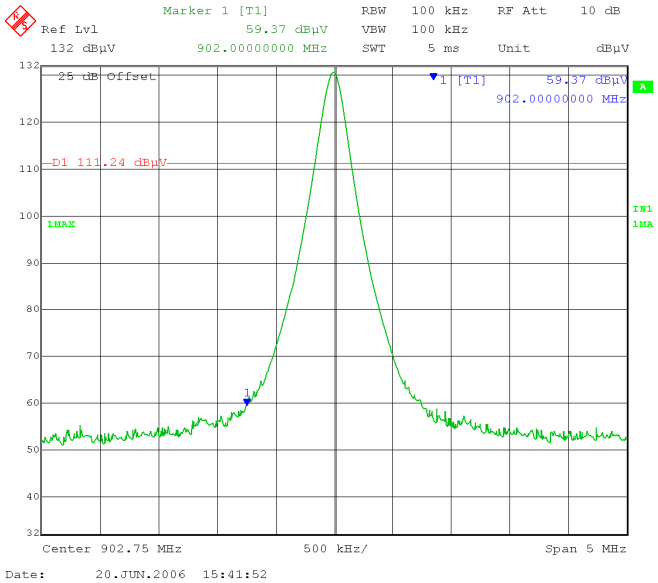
Plot 90: Upper Edge (Horizontal) with CLASS-0 protocol [2dBi Dipole]



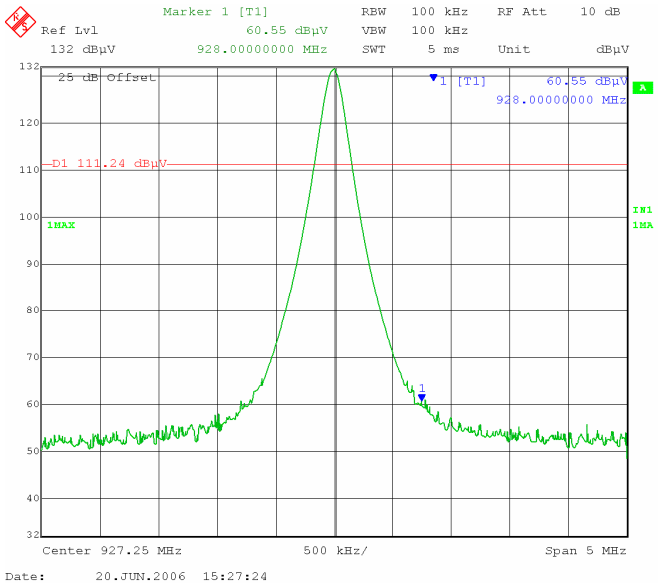
Plot 91: Lower Edge (Horizontal) with EPC1.19 protocol [2dBi Dipole]



Plot 92: Upper Edge (Horizontal) with EPC1.19 protocol [2dBi Dipole]



Plot 93: Lower Edge (Horizontal) with EM protocol [2dBi Dipole]



Plot 94: Upper Edge (Horizontal) with EM protocol [2dBi Dipole]

Tested By: Kerwinn Corpuz

Date Tested: 04 May and 20 June 2006

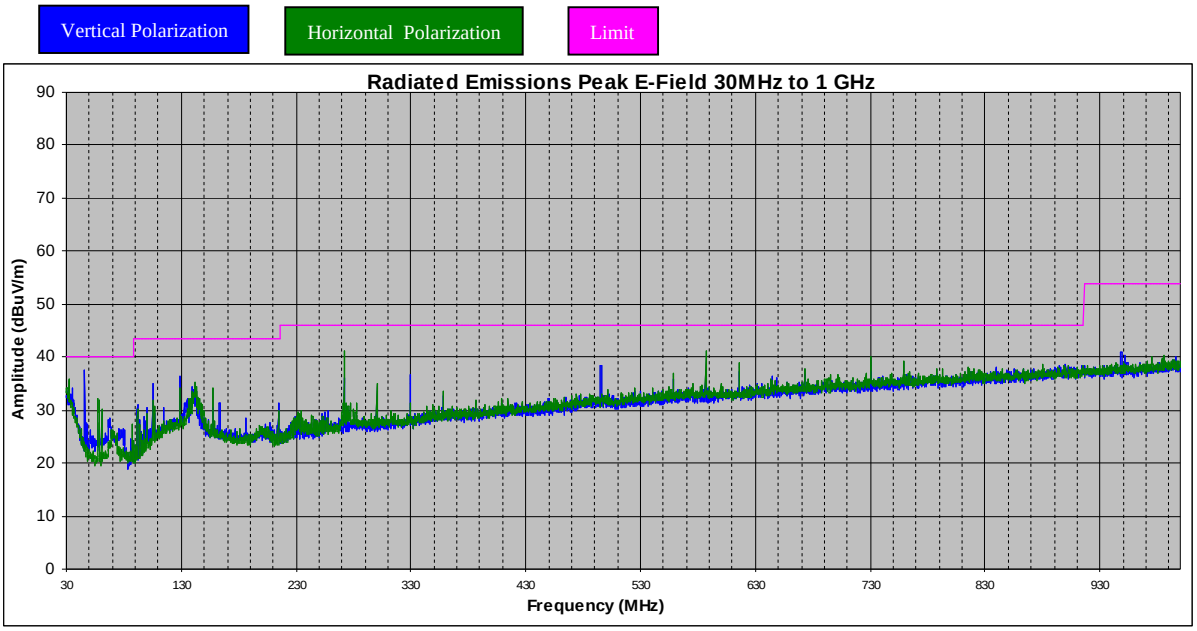
4.2.11 Receiver Spurious Emissions

Requirement(s): RSS-GEN (4.8)

Procedures: Radiated emissions were measured according to RSS-GEN. Measurement was taken with spectrum analyzer.

Sample Calculation: Corrected Amplitude = Raw Amplitude(dBµV/m) + ACF(dB) + Cable Loss(dB)

Results:



Radiated Emissions Plot

Freq (MHz)	Peak Corrected at 3m (dBµV/m)	Limit (dBµV/m)	Delta (dB)
46.20	37.55	40	-2.45
32.81	35.74	40	-4.26
271.82	41.18	46	-4.82
586.78	41.05	46	-4.95
730.15	40.16	46	-5.84

Radiated Emissions Data

Tested By: Kerwinn Corpuz

Date Tested: 03 May and 06 June 2006

5 TEST INSTRUMENTATION

5.1 TEST INSTRUMENTATION

Instrument	Manufacturer	Model	CAL Due Date
Spectrum Analyzer	HP	8568B	04/26/2007
Quasi-Peak Adapter	HP	85650A	04/26/2007
RF Pre-Selector	HP	85685A	04/26/2007
Spectrum Analyzer	HP	8564E	12/29/2006
Power Meter	HP	437B	04/26/2007
Power Sensor	HP	8485A	04/26/2007
Antenna	Emco	3115	07/12/2006
Antenna	Emco	3115	See Note
Signal Generator	Wiltron	68169B	04/26/2007
Chamber	Lingren	3m	08/21/2006
Pre-Amplifier	HP	8449	07/19/2006
DMM	Fluke	73III	07/04/2006
Variac	KRM	AEEC-2090	See Note
Environment Chamber	TestEquity	1007H	10/27/2006
DMM	Fluke	51II	See Note
900 MHz Notch Filter	AWID	N/A	See Note
4GHz High Pass Filter	LORCH Microwave	4HPD-X4000-3R	See Note

Note: Functional Verification

APPENDIX A: EUT TEST CONDITIONS

The following is the description of supporting equipment and details of cables used with the EUT.

Equipment Description (Including Brand Name)	Cable Description
AWID MPR-3014	1. Power cord 2. MMCX to TNC cable

EUT Description	:	RFID Reader Module
Model No	:	MPR-1510R3.2E
Serial No	:	none

The following is the description of how the EUT is exercised during testing.

Test	Description Of Operation
	The EUT was controlled via PC to enter test modes necessary to complete the testing.

APPENDIX B: EXTERNAL PHOTOS

See Attachment

APPENDIX C: CIRCUIT/BLOCK DIAGRAMS

See Attachment

APPENDIX D: INTERNAL PHOTOS

See Attachment

APPENDIX E: PRODUCT DESCRIPTION

Detail description of this product is shown in the User's Guide.

APPENDIX F: FCC LABEL LOCATION

See Attachment

APPENDIX G: USER MANUAL

See Attachment

END OF REPORT