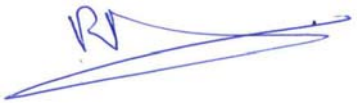
Nemko Test Report:	153666-3TRFWL
Applicant:	Redline Communications 302 Town Center Blvd. Markham, Ontario, Canada, L3R 0E8
Apparatus:	RDL-3000
FCC ID:	QC8-RDL3000
In Accordance With:	FCC Part 15 Subpart C, 15.247 FHSS System and Digitally Modulated Radiators 902–928 MHz, 2400–2483.5 MHz, 5725–5850 MHz
Authorized By:	 Laboratory Manager
Date:	November 4, 2010
Total Number of Pages:	40

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Section 1 : Report Summary

These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with Part 15, Subpart C. Radiated tests were conducted in accordance with ANSI C63.4-2003.

The assessment summary is as follows:

Apparatus Assessed:	RDL-3000
Specification:	FCC Part 15 Subpart C, 15.247
Compliance Status:	Complies
Exclusions:	None
Non-compliances:	None
Report Release History:	Original Release
Test Location:	Nemko Canada Inc. 303 River Road Ottawa, Ontario K1V 1H2
Registration Number:	176392 (3 m Semi-Anechoic Chamber)
Tests Performed By:	Kevin Ma, Technical Assessor
Test Dates:	October 2010

Note that the results contained in this report relate only to the items tested and were obtained in the period between the date of initial receipt of samples and the date of issue of the report.

This test report has been completed in accordance with the requirements of ISO/IEC 17025. All results contain in this report are within Nemko Canada's ISO/IEC 17025 accreditation.

Section 2 : Equipment Under Test

2.1 Identification of Equipment Under Test (EUT)

The following information identifies the EUT under test:

Type of Equipment:	Broad-band wireless infrastructure product
Brand Name:	Redline
Model Name:	RDL-3000
Model Number:	NA
Nemko Sample Number:	2
FCC ID:	QC8-RDL3000
Date of Receipt:	July 23, 2010

2.2 Accessories

The following information identifies accessories used to exercise the EUT during testing:

Description:	POE Power Adapter
Brand Name:	Cincon Electronics Co., Ltd.
Model Name or Number:	TR60A-POE-L
Serial Number:	002179
Nemko Sample Number:	2
Connection Port:	Shielded Ethernet
Cable Length and Type:	LAN cable

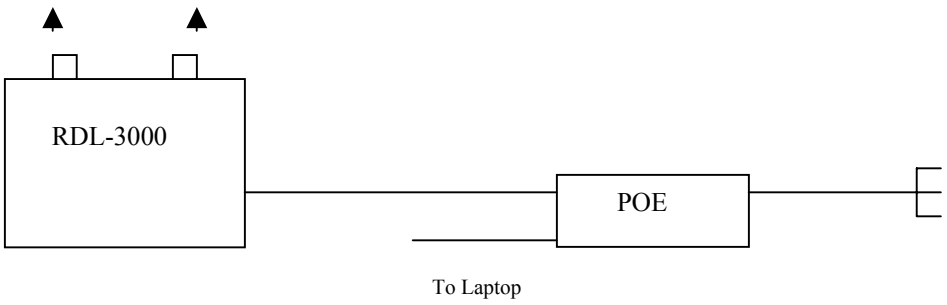
2.3 EUT Description

The EUT is a 2×2 MIMO point-to-point (PTP) carrier grade broadband wireless infrastructure product, designed to operate in the 5.725–5.85 GHz bands.

2.4 Technical Specifications of the EUT

Operating Band:	5725–5850 MHz
Operating Frequency:	5 MHz Channel: 5727.5–5847.5 MHz 10 MHz Channel: 5730–5845 MHz 20 MHz Channel: 5735–5840 MHz
Modulation:	OFDM using 64-QAM, 16-QAM, QPSK and BPSK modulation for sub-carriers
Channel Bandwidth:	5, 10 and 20 MHz
Emission Designator:	W7D
Antenna Data:	A2308MFD, 14-inch, 8 degree, 23 dBi flat panel antenna, 4.9–5.8 GHz, dual-polarization A2FT2906LTPD, 2 foot, 6 degree, 29 dBi parabolic antenna, 4.9–5.8 GHz, dual-polarization A3FT3204LTPD, 3 foot, 4 degree, 32 dBi parabolic antenna, 4.9–5.8 GHz, dual-polarization A9014MTD, 90 degree, 14 dBi sector flat panel, 4.9–5.95 GHz, dual polarization A6015MTD, 60 degree, 15.5 dBi sector flat panel, 4.9–5.95 GHz, dual polarization
Power Supply Requirements:	–48VDC PoE

2.5 EUT Setup diagram



2.6 Operation of the EUT during testing

The EUT was in a continuous transmitting mode with random data frames. The modulation, channel bandwidth and channel frequency was changed using a Web-base interface of the Ethernet port.

2.7 Modifications incorporated in the EUT

There were no modifications performed to the EUT during this assessment.

Section 3 : Test Conditions

3.1 Specifications

The apparatus was assessed against the following specifications:

FCC Part 15 Subpart C, 15.247
FHSS System and Digitally Modulated Radiators
902–928 MHz, 2400–2483.5 MHz, 5725–5850 MHz

3.2 Deviations From Laboratory Test Procedures

No deviations were made from laboratory test procedures.

3.3 Test Environment

All tests were performed under the following environmental conditions:

Temperature range	:	15–30 °C
Humidity range	:	20–75 %
Pressure range	:	86–106 kPa
Power supply range	:	±5 % of rated voltages

3.4 Measurement Uncertainty

Nemko Canada measurement uncertainty has been calculated using guidance of UKAS LAB 34:2003 and TIA-603-B Nov 7, 2002. All calculations have been performed to provide a confidence level of 95 % and can be found in Nemko Canada document MU-003.

3.5 Test Equipment

Equipment	Manufacturer	Model No.	Asset/Serial No.	Cal. Date	Next Cal.
3 m EMI Test Chamber	TDK	SAC-3	FA002047	Mar. 09/10	Mar. 09/11
Flush Mount Turntable	Sunol	FM2022	FA002082	NCR	NCR
Controller	Sunol	SC104V	FA002060	NCR	NCR
Antenna Mast	Sunol	TLT2	FA002061	NCR	NCR
International Power Supply	California Inst.	3001i	FA001021	COU	COU
Receiver/Spectrum Analyzer	Rohde & Schwarz	ESU 26	FA002043	Jan. 14/10	Jan. 14/11
Spectrum Analyzer	Rohde & Schwarz	FSU	FA001877	Sept. 29/10	Sept. 29/11
Bilog Antenna	Sunol	JB3	FA002108	Jan. 18/10	Jan. 18/11
Horn Antenna #2	EMCO	3115	FA000825	Jan. 18/10	Jan. 18/11
1–18 GHz Amplifier	JCA	JCA118-503	FA002091	Oct 07/10	Oct 07/11
Temperature Chamber	Thermotron	SM-16C	FA001030	NCR	NCR
Multimeter	Fluke	16	FA001831	Jan. 12/10	Jan. 12/11
Air probe	Fluke	None	FA001561	NCR	NCR
Horn 18–26.5 GHz	Electro-Metrics	SH-50/60-1	FA000479	COU	COU
18–26 GHz Amplifier	NARDA	BBS-1826N612	FA001550	COU	COU
18.0 – 40.0GHz Horn Antenna	EMCO	3116	FA001847	May 13/10	May 13/11
26 – 40.0 GHz Amplifier	NARDA	DBL-2640N610	FA001556	COU	COU
Frequency Counter	HP	5352B	FA001915	Jan 08/10	Jan 08/11
Combiner	Mini-circuits	ZA3PD-4	FA001156	COU	COU
Notch Filter	Microwave Circuits	5725-5850MHz	FA001921	COU	COU

COU – Calibrate on Use
NCR – No Calibration Required

Section 4 : Results Summary

This section contains the following:

FCC Part 15 Subpart C : Test Results

The column headed 'Required' indicates whether the associated clauses were invoked for the apparatus under test. The following abbreviations are used:

N No : not applicable / not relevant.

Y Yes : Mandatory i.e. the apparatus shall conform to these tests.

N/T Not Tested, mandatory but not assessed. (See Report Summary)

4.1 FCC Part 15 Subpart C : Test Results

Part 15	Test Description	Required	Result
15.31(e)	Variation of power supply	Y	PASS
15.207(a)	Powerline Conducted Emissions	Y	PASS
15.209(a)	Radiated Emissions within Restricted Bands	Y	PASS
15.247(a)(1)	Frequency hopping systems	N	
15.247(a)(1)(i)	Frequency hopping systems operating in the 902–928 MHz band	N	
15.247(a)(1)(ii)	Frequency hopping systems operating in the 5725–5850 MHz band	N	
15.247(a)(1)(iii)	Frequency hopping systems operating in the 2400–2483.5 MHz band	N	
15.247(a)(2)	6 dB BW for systems using digital modulation techniques	Y	PASS
15.247(b)(1)	Maximum peak output power of Frequency hopping systems operating in the 2400–2483.5 MHz band and 5725–5850 MHz band	N	
15.247(b)(2)	Maximum peak output power of Frequency hopping systems operating in the 902–928 MHz band	N	
15.247(b)(3)	Maximum peak output power of systems using digital modulation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands	Y	PASS
15.247(b)(4)	Maximum peak output power	Y	PASS
15.247(c)(1)	Fixed point-to-point Operation with directional antenna gains greater than 6 dBi	Y	PASS
15.247(c)(2)	Transmitters operating in the 2400–2483.5 MHz band that emit multiple directional beams	N	
15.247(d)	Conducted Spurious Emissions	Y	PASS
15.247(e)	Power Spectral Density for Digitally Modulated Devices	Y	PASS
15.247(f)	Time of Occupancy for Hybrid Systems	N	

Appendix A : Test Results

Clause 15.207(a) Powerline Conducted Emissions

Frequency of Conducted limit (dBµV)

Emission (MHz)	Quasi-peak	Average
0.15–0.5	66 to 56*	56 to 46*
0.5–5	56	46
5–30	60	50

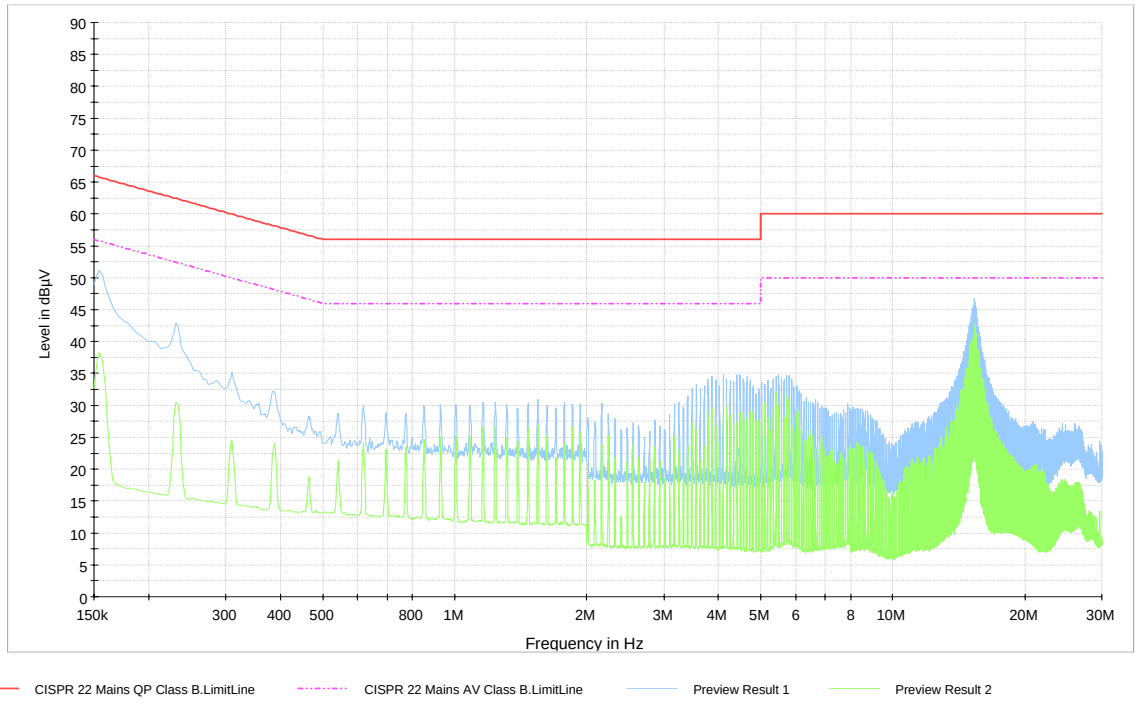
* Decreases with the logarithm of the frequency.

Test Results: Pass

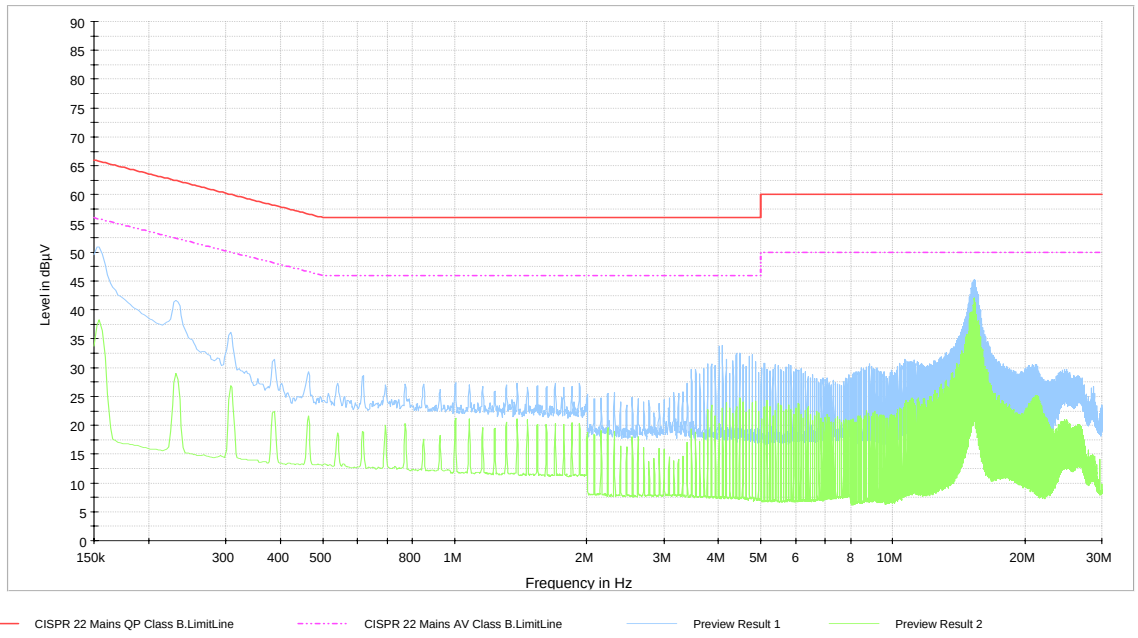
Additional Observations:

All plots were obtained using a receiver with an IF of 9 kHz using a Quasi-Peak and Average detector. The plots have been corrected with the cable loss and LISN loss to show compliance.

Phase:



Neutral:



Clause 15.209(a) Radiated Emissions within Restricted Bands

Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength		Measurement Distance (meters)
	(µV/m)	(dBµV/m)	
0.009–0.490	2400/F	67.6−20log(F)	300
0.490–1.705	24000/F	87.6−20log(F)	30
1.705–30.0	30	29.5	30
30–88	100	40.0	3
88–216	150	43.5	3
216–960	200	46.0	3
Above 960	500	54.0	3

Note: F = fundamental frequency in kHz

Test Results: Pass

Additional Observations:

The Spectrum was searched from 30 MHz to the 40 GHz.

These results apply to emissions found in the Restricted bands defined in FCC Part 15 Subpart C, 15.205.

Peak Detector with 100 kHz/300 kHz RBW/VBW was used for measurements below 1 GHz and 1 MHz/3 MHz RBW/VBW for frequencies above 1 GHz. Since EUT has 100 % duty cycle average measurements were performed at the frequencies above 1 GHz with 1 MHz/10 Hz RBW/VBW spectrum analyzer settings.

For type of sector flat panel antenna, the highest gain (15.5 dBi) antenna was chosen for the test.

All modulations were investigated, only the worst case data is presented.

5 MHz Channel

Antenna	Channel MHz	Frequency, MHz	Pol	FS Peak, dBµV/m	FS Peak Limit, dBµV/m	Margin, dB	FS Avg, dBµV/m	FS Avg Limit, dBµV/m	Margin, dB
Sector flat panel 15.5 dBi	5727.5	5408.70	V	59.54	74.00	14.46	45.83	54.00	8.17
		5351.23	H	56.45	74.00	17.55	43.17	54.00	10.83
	5790	5381.55	V	61.58	74.00	12.42	46.63	54.00	7.37
		5440.08	H	59.05	74.00	14.95	44.95	54.00	9.05
	5847.5	5380.85	V	60.10	74.00	13.90	45.60	54.00	8.40
		5399.71	H	57.50	74.00	16.50	43.45	54.00	10.55
Flat panel 23 dBi	5727.5	5380.14	V	65.46	74.00	8.54	51.58	54.00	2.42
		5408.53	H	64.28	74.00	9.72	49.20	54.00	4.80
	5790	5379.97	V	68.62	74.00	5.38	53.87	54.00	0.13
		5350.17	H	66.99	74.00	7.01	51.95	54.00	2.05
	5847.5	5380.14	V	67.22	74.00	6.78	53.24	54.00	0.76
		5382.08	H	66.66	74.00	7.34	51.20	54.00	2.80
Parabolic 29 dBi	5727.5	5407.99	V	67.35	74.00	6.65	52.95	54.00	1.05
		5362.33	H	63.50	74.00	10.50	48.01	54.00	5.99
	5790	5380.85	V	67.45	74.00	6.55	53.18	54.00	0.82
		5361.63	H	63.90	74.00	10.10	48.91	54.00	5.09
	5847.5	5389.31	V	67.23	74.00	6.77	53.42	54.00	0.58
		5361.81	H	63.07	74.00	10.93	49.40	54.00	4.60
Parabolic 32 dBi	5727.5	5406.76	V	67.53	74.00	6.47	53.67	54.00	0.33
		5399.89	H	65.81	74.00	8.19	51.25	54.00	2.75
	5790	5371.15	V	66.93	74.00	7.07	53.23	54.00	0.77
		5400.06	H	65.07	74.00	8.93	51.47	54.00	2.53
	5847.5	5408.35	V	67.25	74.00	6.75	53.86	54.00	0.14
		5399.89	H	65.89	74.00	8.11	52.07	54.00	1.93

10 MHz Channel

Antenna	Channel MHz	Frequency, MHz	Pol	FS Peak, dBµV/m	FS Peak Limit, dBµV/m	Margin, dB	FS Avg, dBµV/m	FS Avg Limit, dBµV/m	Margin, dB
Sector flat panel 15.5 dBi	5730	5381.38	V	60.18	74.00	13.82	46.58	54.00	7.42
		5439.90	H	59.54	74.00	14.46	44.32	54.00	9.68
	5790	5381.55	V	61.24	74.00	12.76	46.19	54.00	7.81
		5428.79	H	59.06	74.00	14.94	44.10	54.00	9.90
	5845	5381.20	V	62.02	74.00	11.98	48.36	54.00	5.64
		5351.58	H	60.28	74.00	13.72	46.58	54.00	7.42
Flat panel 23 dBi	5730	5379.97	V	67.41	74.00	6.59	53.48	54.00	0.52
		5350.71	H	64.96	74.00	9.04	51.18	54.00	2.82
	5790	5379.79	V	67.15	74.00	6.85	53.26	54.00	0.74
		5454.71	H	64.46	74.00	9.54	50.66	54.00	3.34
	5845	5379.97	V	67.68	74.00	6.32	53.89	54.00	0.11
		5454.01	H	64.53	74.00	9.47	51.15	54.00	2.85
Parabolic 29 dBi	5730	5390.19	V	67.30	74.00	6.70	53.91	54.00	0.09
		5361.99	H	62.85	74.00	11.15	49.45	54.00	4.55
	5790	5381.03	V	67.10	74.00	6.90	53.40	54.00	0.60
		5361.99	H	64.79	74.00	9.21	49.46	54.00	4.54
	5845	5381.02	V	67.52	74.00	6.48	53.89	54.00	0.11
		5360.57	H	61.69	74.00	12.31	48.15	54.00	5.85
Parabolic 32 dBi	5730	5407.47	V	70.96	74.00	3.04	53.58	54.00	0.42
		5400.06	H	67.84	74.00	6.16	51.49	54.00	2.51
	5790	5371.15	V	69.89	74.00	4.11	53.34	54.00	0.66
		5400.08	H	64.30	74.00	9.70	51.46	54.00	2.54
	5845	5371.15	V	68.38	74.00	5.62	53.98	54.00	0.02
		5399.88	H	66.92	74.00	7.08	52.14	54.00	1.86

20 MHz Channel

Antenna	Channel MHz	Frequency, MHz	Pol	FS Peak, dBµV/m	FS Peak Limit, dBµV/m	Margin, dB	FS Avg, dBµV/m	FS Avg Limit, dBµV/m	Margin, dB
Sector flat panel 15.5 dBi	5735	5381.38	V	60.68	74.00	13.32	46.51	54.00	7.49
		5355.11	H	61.65	74.00	12.35	47.84	54.00	6.16
	5790	5379.44	V	61.20	74.00	12.80	47.32	54.00	6.68
		5353.35	H	62.40	74.00	11.60	48.24	54.00	5.76
	5840	5419.10	V	62.18	74.00	11.82	48.14	54.00	5.86
		5353.52	H	63.64	74.00	10.36	48.79	54.00	5.21
Flat panel 23 dBi	5735	5380.14	V	68.02	74.00	5.98	53.76	54.00	0.24
		5421.39	H	65.14	74.00	8.86	50.99	54.00	3.01
	5790	5364.63	V	68.29	74.00	5.71	53.91	54.00	0.09
		5458.65	H	66.85	74.00	7.15	52.28	54.00	1.72
	5840	5379.79	V	67.54	74.00	6.46	53.93	54.00	0.07
		5455.24	H	66.58	74.00	7.42	51.58	54.00	2.42
Parabolic 29 dBi	5735	5408.35	V	67.88	74.00	6.12	53.78	54.00	0.22
		5361.18	H	63.91	74.00	10.09	50.37	54.00	3.63
	5790	5388.61	V	68.35	74.00	5.65	53.88	54.00	0.12
		5361.28	H	64.27	74.00	9.73	50.77	54.00	3.23
	5840	5381.73	V	67.42	74.00	6.58	53.09	54.00	0.91
		5361.63	H	62.29	74.00	11.71	48.06	54.00	5.94
Parabolic 32 dBi	5735	5370.62	V	67.25	74.00	6.75	52.82	54.00	1.18
		5399.89	H	64.38	74.00	9.62	51.13	54.00	2.87
	5790	5372.38	V	66.26	74.00	7.74	53.15	54.00	0.85
		5399.89	H	64.20	74.00	9.80	50.03	54.00	3.97
	5840	5371.86	V	71.34	74.00	2.66	53.78	54.00	0.22
		5399.88	H	65.85	74.00	8.15	50.83	54.00	3.17

Clause 15.247(a)(2) 6 dB bandwidth for systems using digital modulation techniques

Systems using digital modulation techniques may operate in the 902–928 MHz, 2400–2483.5 MHz and 5725–5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

Test Results: Pass

Additional Observations:

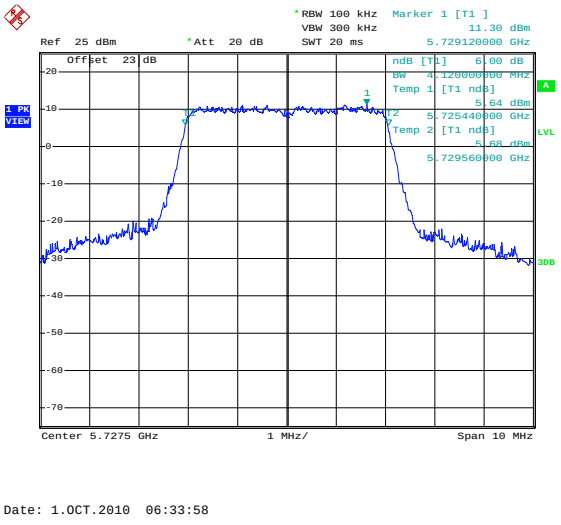
The peak detector was used with 100 kHz/300 kHz RBW/VBW.
The span was wider than 6 dB bandwidth.

All modulations were investigated, only the worst-case test results are reported.

5 MHz Channel

Frequency, MHz	6 dB BW, MHz	Limit, MHz	Margin, MHz
5727.5	4.12	0.5	3.62
5790	4.12	0.5	3.62
5847.5	4.14	0.5	3.64

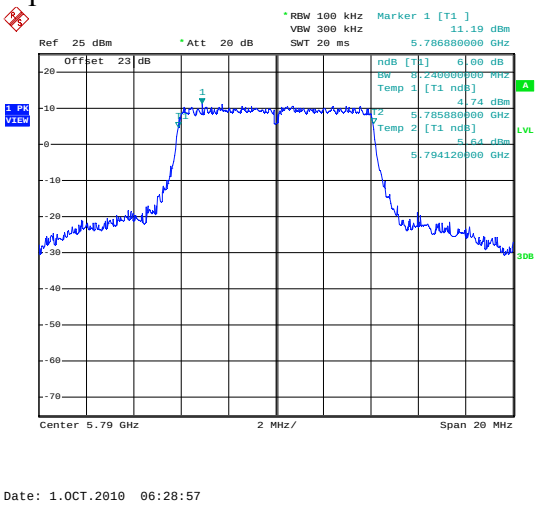
6 dB BW spectral plot sample:



10 MHz Channel

Frequency, MHz	6 dB BW, MHz	Limit, MHz	Margin, MHz
5730	8.24	0.5	7.74
5790	8.24	0.5	7.74
5845	8.24	0.5	7.74

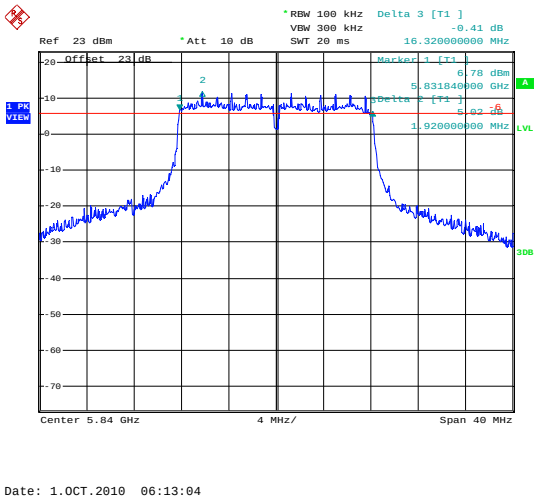
6 dB BW spectral plot sample:



20 MHz Channel

Frequency, MHz	6 dB BW, MHz	Limit, MHz	Margin, MHz
5735	16.16	0.5	15.66
5790	16.32	0.5	15.82
5840	16.32	0.5	15.82

6 dB BW spectral plot sample:



Clause 15.247(b)(3) Maximum peak output power of systems using digital modulation in the 902–928 MHz, 2400–2483.5 MHz and 5725–5850 MHz bands

For systems using digital modulation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands: 1 W. As an alternative to a peak power measurement, compliance with the 1 W limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signalling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.

Clause 15.247(b)(4) Maximum peak output power

The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Clause 15.247(c)(1) Fixed point-to-point Operation with directional antenna gains greater than 6 dBi

(ii) Systems operating in the 5725–5850 MHz band that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted output power.
(iii) Fixed, point-to-point operation, as used in paragraphs (c)(1)(i) and (c)(1)(ii) of this section, excludes the use of point-to-multipoint systems, omnidirectional applications, and multiple co-located intentional radiators transmitting the same information. The operator of the spread spectrum or digitally modulated intentional radiator or, if the equipment is professionally installed, the installer is responsible for ensuring that the system is used exclusively for fixed, point-to-point operations. The instruction manual furnished with the intentional radiator shall contain language in the installation instructions informing the operator and the installer of this responsibility.

Test Results: Pass

Additional Observations:

Transmit output power was measured while supply voltage was varied from 102 VAC to 138 VAC (85 % to 115 % of the nominal rated supply voltage) via POE adapter. No change in transmit output power was observed.

The output RF power was measured on the antenna port 1 and 2 by means of a spectrum analyzer and following the *'Power Output Option 2, Method 1'* procedure from the FCC guidelines for Measurement of Digital Transmission Systems operating under Section 15.247. The power at each antenna port was measured individually and the aggregate power was summed up mathematically.

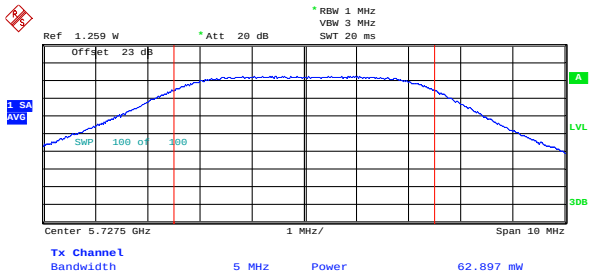
5 MHz Channel

Low Channel: Central nominal frequency: 5727.5 MHz

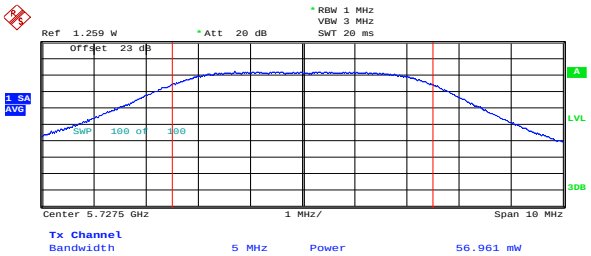
Modulation	Conducted Power		Combined power	Power Limit	Margin	Antenna Gain	e.i.r.p,
	Ant 1, (mW)	Ant 2, (mW)	(dBm)	(dB)	(dB)	(dBi)	(dBm)
BPSK	62.037	57.104	20.76	30.00	9.24	14.00	34.76
QPSK	62.378	56.451	20.75	30.00	9.25	14.00	34.75
16QAM	62.574	57.066	20.78	30.00	9.22	14.00	34.78
64QAM	62.897	56.961	20.79	30.00	9.21	14.00	34.79
BPSK	62.037	57.104	20.76	30.00	9.24	15.50	36.26
QPSK	62.378	56.451	20.75	30.00	9.25	15.50	36.25
16QAM	62.574	57.066	20.78	30.00	9.22	15.50	36.28
64QAM	62.897	56.961	20.79	30.00	9.21	15.50	36.29
BPSK	62.037	57.104	20.76	30.00	9.24	23.00	43.76
QPSK	62.378	56.451	20.75	30.00	9.25	23.00	43.75
16QAM	62.574	57.066	20.78	30.00	9.22	23.00	43.78
64QAM	62.897	56.961	20.79	30.00	9.21	23.00	43.79
BPSK	62.037	57.104	20.76	30.00	9.24	29.00	49.76
QPSK	62.378	56.451	20.75	30.00	9.25	29.00	49.75
16QAM	62.574	57.066	20.78	30.00	9.22	29.00	49.78
64QAM	62.897	56.961	20.79	30.00	9.21	29.00	49.79
BPSK	51.705	45.782	19.89	30.00	10.11	32.00	51.89
QPSK	51.519	46.358	19.91	30.00	10.09	32.00	51.91
16QAM	51.693	45.914	19.89	30.00	10.11	32.00	51.89
64QAM	51.091	46.423	19.89	30.00	10.11	32.00	51.89

Output power sample spectral plots:

Antenna Port 1



Antenna Port 2

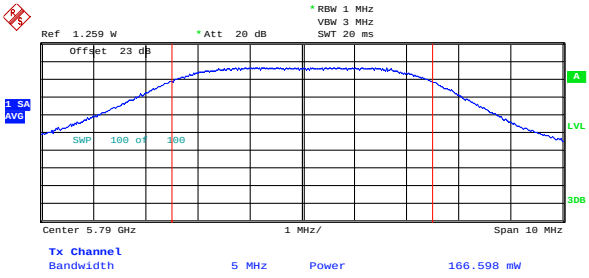


Mid Channel: Central nominal frequency: 5790 MHz

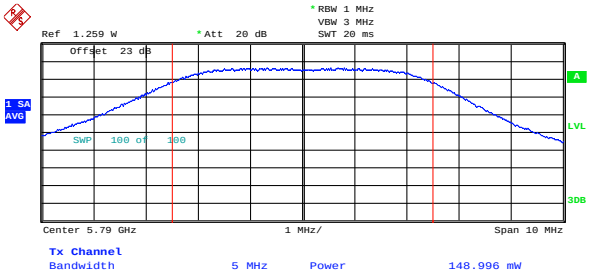
Modulation	Conducted Power		Combined power	Power Limit	Margin	Antenna Gain	e.i.r.p,
	Ant 1, (mW)	Ant 2, (mW)	(dBm)	(dB)	(dB)	(dBi)	(dBm)
BPSK	165.661	149.984	24.99	30.00	5.01	14.00	38.99
QPSK	164.069	149.991	24.97	30.00	5.03	14.00	38.97
16QAM	164.806	148.832	24.96	30.00	5.04	14.00	38.96
64QAM	166.598	148.996	24.99	30.00	5.01	14.00	38.99
BPSK	165.661	149.984	24.99	30.00	5.01	15.50	40.49
QPSK	164.069	149.991	24.97	30.00	5.03	15.50	40.47
16QAM	164.806	148.832	24.96	30.00	5.04	15.50	40.46
64QAM	166.598	148.996	24.99	30.00	5.01	15.50	40.49
BPSK	165.661	149.984	24.99	30.00	5.01	23.00	47.99
QPSK	164.069	149.991	24.97	30.00	5.03	23.00	47.97
16QAM	164.806	148.832	24.96	30.00	5.04	23.00	47.96
64QAM	166.598	148.996	24.99	30.00	5.01	23.00	47.99
BPSK	83.238	75.967	22.02	30.00	7.98	29.00	51.02
QPSK	83.074	75.869	22.01	30.00	7.99	29.00	51.01
16QAM	83.345	75.609	22.01	30.00	7.99	29.00	51.01
64QAM	83.921	75.015	22.01	30.00	7.99	29.00	51.01
BPSK	52.087	41.472	19.71	30.00	10.29	32.00	51.71
QPSK	52.641	41.455	19.74	30.00	10.26	32.00	51.74
16QAM	52.965	41.495	19.75	30.00	10.25	32.00	51.75
64QAM	52.894	40.826	19.72	30.00	10.28	32.00	51.72

Output power sample spectral plots:

Antenna Port 1



Antenna Port 2

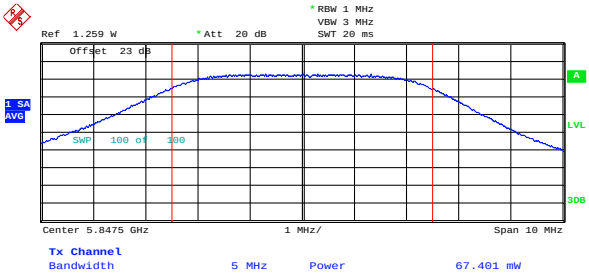


High Channel: Central nominal frequency: 5847.5 MHz

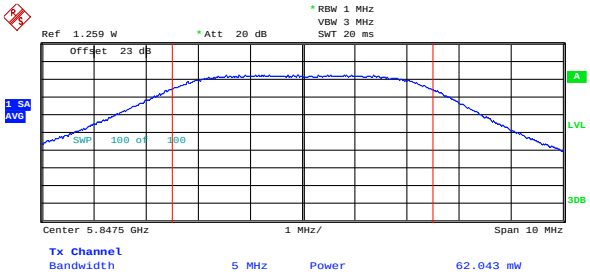
Modulation	Conducted Power		Combined power	Power Limit	Margin	Antenna Gain	e.i.r.p,
	Ant 1, (mW)	Ant 2, (mW)	(dBm)	(dB)	(dB)	(dBi)	(dBm)
BPSK	67.401	62.043	21.12	30.00	8.88	14.00	35.12
QPSK	67.229	62.346	21.13	30.00	8.87	14.00	35.13
16QAM	66.986	62.189	21.11	30.00	8.89	14.00	35.11
64QAM	67.245	62.309	21.12	30.00	8.88	14.00	35.12
BPSK	67.401	62.043	21.12	30.00	8.88	15.50	36.62
QPSK	67.229	62.346	21.13	30.00	8.87	15.50	36.63
16QAM	66.986	62.189	21.11	30.00	8.89	15.50	36.61
64QAM	67.245	62.309	21.12	30.00	8.88	15.50	36.62
BPSK	67.401	62.043	21.12	30.00	8.88	23.00	44.12
QPSK	67.229	62.346	21.13	30.00	8.87	23.00	44.13
16QAM	66.986	62.189	21.11	30.00	8.89	23.00	44.11
64QAM	67.245	62.309	21.12	30.00	8.88	23.00	44.12
BPSK	67.401	62.043	21.12	30.00	8.88	29.00	50.12
QPSK	67.229	62.346	21.13	30.00	8.87	29.00	50.13
16QAM	66.986	62.189	21.11	30.00	8.89	29.00	50.11
64QAM	67.245	62.309	21.12	30.00	8.88	29.00	50.12
BPSK	50.957	46.594	19.89	30.00	10.11	32.00	51.89
QPSK	51.570	46.878	19.93	30.00	10.07	32.00	51.93
16QAM	51.329	46.222	19.89	30.00	10.11	32.00	51.89
64QAM	51.596	46.824	19.93	30.00	10.07	32.00	51.93

Output power sample spectral plots:

Antenna Port 1



Antenna Port 2



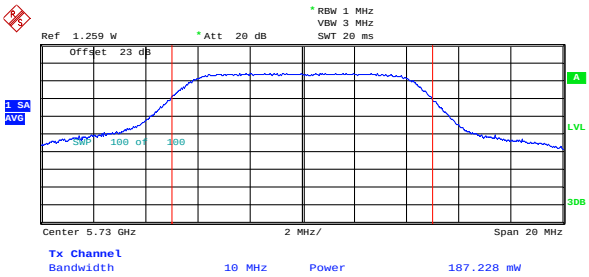
10 MHz Channel

Low Channel: Central nominal frequency: 5730 MHz

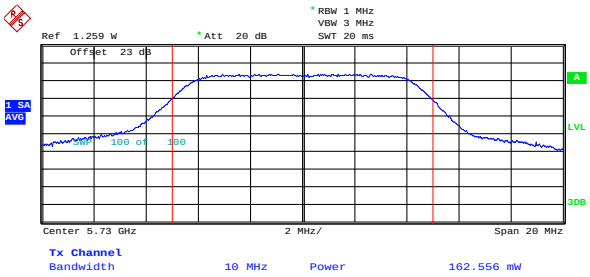
Modulation	Conducted Power		Combined power	Power Limit	Margin	Antenna Gain	e.i.r.p,
	Ant 1, (mW)	Ant 2, (mW)	(dBm)	(dB)	(dB)	(dBi)	(dBm)
BPSK	184.425	162.909	25.41	30.00	4.59	14.00	39.41
QPSK	186.336	163.440	25.44	30.00	4.56	14.00	39.44
16QAM	185.932	162.478	25.42	30.00	4.58	14.00	39.42
64QAM	187.228	162.556	25.44	30.00	4.56	14.00	39.44
BPSK	184.425	162.909	25.41	30.00	4.59	15.50	40.91
QPSK	186.336	163.440	25.44	30.00	4.56	15.50	40.94
16QAM	185.932	162.478	25.42	30.00	4.58	15.50	40.92
64QAM	187.228	162.556	25.44	30.00	4.56	15.50	40.94
BPSK	184.425	162.909	25.41	30.00	4.59	23.00	48.41
QPSK	186.336	163.440	25.44	30.00	4.56	23.00	48.44
16QAM	185.932	162.478	25.42	30.00	4.58	23.00	48.42
64QAM	187.228	162.556	25.44	30.00	4.56	23.00	48.44
BPSK	81.934	76.952	22.01	30.00	7.99	29.00	51.01
QPSK	80.750	75.800	21.95	30.00	8.05	29.00	50.95
16QAM	80.904	75.631	21.95	30.00	8.05	29.00	50.95
64QAM	80.968	75.283	21.94	30.00	8.06	29.00	50.94
BPSK	52.486	38.364	19.58	30.00	10.42	32.00	51.58
QPSK	52.614	38.325	19.59	30.00	10.41	32.00	51.59
16QAM	52.830	38.143	19.59	30.00	10.41	32.00	51.59
64QAM	52.579	38.217	19.58	30.00	10.42	32.00	51.58

Output power sample spectral plots:

Antenna Port 1



Antenna Port 2

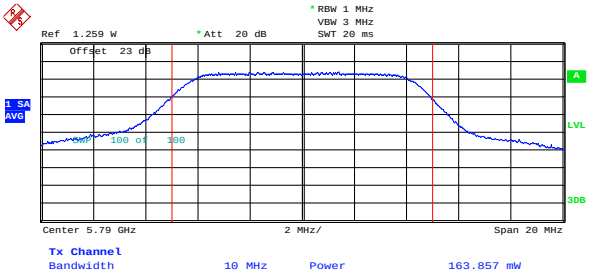


Mid Channel: Central nominal frequency: 5790 MHz

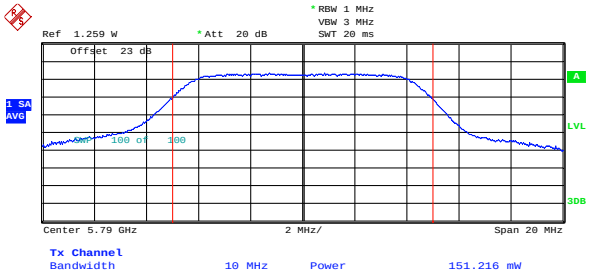
Modulation	Conducted Power		Combined power	Power Limit	Margin	Antenna Gain	e.i.r.p,
	Ant 1, (mW)	Ant 2, (mW)	(dBm)	(dB)	(dB)	(dBi)	(dBm)
BPSK	163.857	151.216	24.98	30.00	5.02	14.00	38.98
QPSK	163.264	152.247	24.99	30.00	5.01	14.00	38.99
16QAM	163.063	152.597	24.99	30.00	5.01	14.00	38.99
64QAM	161.208	152.073	24.96	30.00	5.04	14.00	38.96
BPSK	163.857	151.216	24.98	30.00	5.02	15.50	40.48
QPSK	163.264	152.247	24.99	30.00	5.01	15.50	40.49
16QAM	163.063	152.597	24.99	30.00	5.01	15.50	40.49
64QAM	161.208	152.073	24.96	30.00	5.04	15.50	40.46
BPSK	163.857	151.216	24.98	30.00	5.02	23.00	47.98
QPSK	163.264	152.247	24.99	30.00	5.01	23.00	47.99
16QAM	163.063	152.597	24.99	30.00	5.01	23.00	47.99
64QAM	161.208	152.073	24.96	30.00	5.04	23.00	47.96
BPSK	82.840	65.241	21.70	30.00	8.30	29.00	50.70
QPSK	82.827	65.021	21.70	30.00	8.30	29.00	50.70
16QAM	83.081	65.018	21.71	30.00	8.29	29.00	50.71
64QAM	83.961	65.331	21.74	30.00	8.26	29.00	50.74
BPSK	45.081	41.205	19.36	30.00	10.64	32.00	51.36
QPSK	44.863	41.422	19.36	30.00	10.64	32.00	51.36
16QAM	45.562	41.068	19.38	30.00	10.62	32.00	51.38
64QAM	45.102	41.576	19.38	30.00	10.62	32.00	51.38

Output power sample spectral plots:

Antenna Port 1



Antenna Port 2

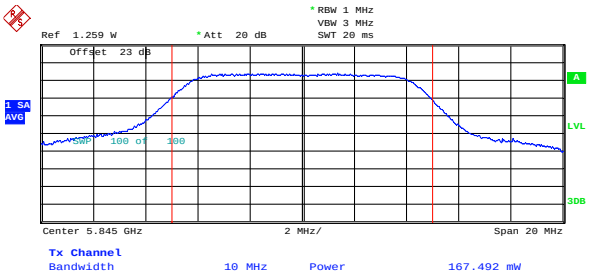


High Channel: Central nominal frequency: 5845 MHz

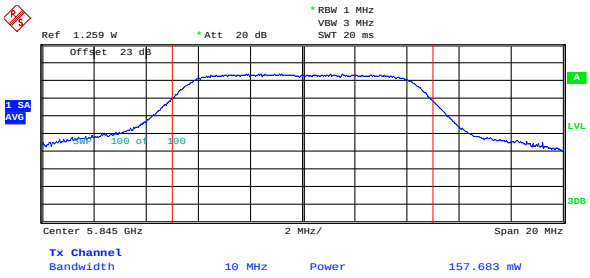
Modulation	Conducted Power		Combined power	Power Limit	Margin	Antenna Gain	e.i.r.p,
	Ant 1, (mW)	Ant 2, (mW)	(dBm)	(dB)	(dB)	(dBi)	(dBm)
BPSK	167.492	157.683	25.12	30.00	4.88	14.00	39.12
QPSK	166.781	155.600	25.08	30.00	4.92	14.00	39.08
16QAM	167.454	154.282	25.07	30.00	4.93	14.00	39.07
64QAM	167.340	154.980	25.08	30.00	4.92	14.00	39.08
BPSK	167.492	157.683	25.12	30.00	4.88	15.50	40.62
QPSK	166.781	155.600	25.08	30.00	4.92	15.50	40.58
16QAM	167.454	154.282	25.07	30.00	4.93	15.50	40.57
64QAM	167.340	154.980	25.08	30.00	4.92	15.50	40.58
BPSK	167.492	157.683	25.12	30.00	4.88	23.00	48.12
QPSK	166.781	155.600	25.08	30.00	4.92	23.00	48.08
16QAM	167.454	154.282	25.07	30.00	4.93	23.00	48.07
64QAM	167.340	154.980	25.08	30.00	4.92	23.00	48.08
BPSK	83.170	79.039	22.10	30.00	7.90	29.00	51.10
QPSK	83.123	79.644	22.12	30.00	7.88	29.00	51.12
16QAM	83.361	79.070	22.11	30.00	7.89	29.00	51.11
64QAM	83.821	79.612	22.13	30.00	7.87	29.00	51.13
BPSK	43.305	40.459	19.23	30.00	10.77	32.00	51.23
QPSK	43.242	40.625	19.24	30.00	10.76	32.00	51.24
16QAM	42.966	40.347	19.21	30.00	10.79	32.00	51.21
64QAM	43.107	40.466	19.22	30.00	10.78	32.00	51.22

Output power sample spectral plots:

Antenna Port 1



Antenna Port 2



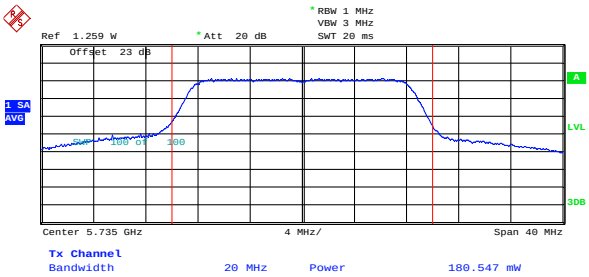
20 MHz Channel

Low Channel: central nominal frequency: 5735 MHz

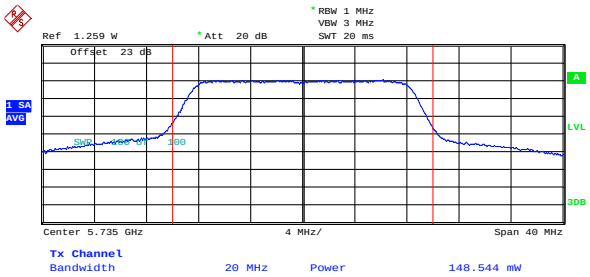
Modulation	Conducted Power		Combined power	Power Limit	Margin	Antenna Gain	e.i.r.p,
	Ant 1, (mW)	Ant 2, (mW)	(dBm)	(dB)	(dB)	(dBi)	(dBm)
BPSK	179.259	145.626	25.12	30.00	4.88	14.00	39.12
QPSK	181.342	145.964	25.15	30.00	4.85	14.00	39.15
16QAM	180.848	146.462	25.15	30.00	4.85	14.00	39.15
64QAM	180.547	148.544	25.17	30.00	4.83	14.00	39.17
BPSK	179.259	145.626	25.12	30.00	4.88	15.50	40.62
QPSK	181.342	145.964	25.15	30.00	4.85	15.50	40.65
16QAM	180.848	146.462	25.15	30.00	4.85	15.50	40.65
64QAM	180.547	148.544	25.17	30.00	4.83	15.50	40.67
BPSK	179.259	145.626	25.12	30.00	4.88	23.00	48.12
QPSK	181.342	145.964	25.15	30.00	4.85	23.00	48.15
16QAM	180.848	146.462	25.15	30.00	4.85	23.00	48.15
64QAM	180.547	148.544	25.17	30.00	4.83	23.00	48.17
BPSK	85.189	82.698	22.25	30.00	7.75	29.00	51.25
QPSK	84.643	82.156	22.22	30.00	7.78	29.00	51.22
16QAM	84.783	82.294	22.23	30.00	7.77	29.00	51.23
64QAM	84.099	82.781	22.22	30.00	7.78	29.00	51.22
BPSK	45.454	39.248	19.28	30.00	10.72	32.00	51.28
QPSK	45.216	38.826	19.24	30.00	10.76	32.00	51.24
16QAM	45.376	38.413	19.23	30.00	10.77	32.00	51.23
64QAM	46.261	38.694	19.29	30.00	10.71	32.00	51.29

Output power sample spectral plots:

Antenna Port 1



Antenna Port 2

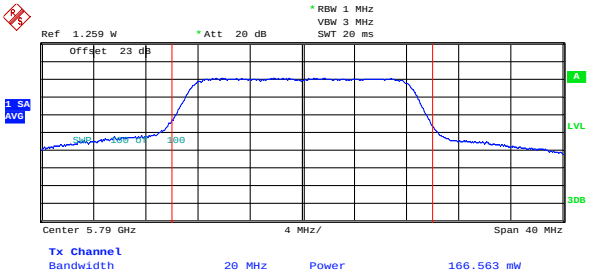


Mid Channel: central nominal frequency: 5790 MHz

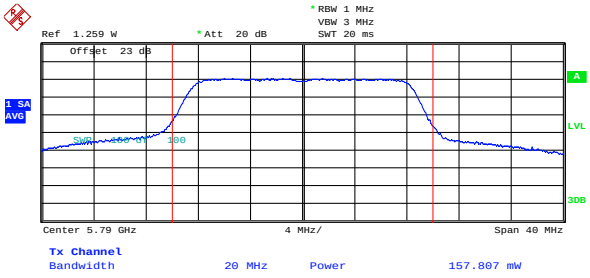
Modulation	Conducted Power		Combined power	Power Limit	Margin	Antenna Gain	e.i.r.p,
	Ant 1, (mW)	Ant 2, (mW)	(dBm)	(dB)	(dB)	(dBi)	(dBm)
BPSK	166.563	157.807	25.11	30.00	4.89	14.00	39.11
QPSK	163.592	156.757	25.06	30.00	4.94	14.00	39.06
16QAM	165.320	157.777	25.09	30.00	4.91	14.00	39.09
64QAM	165.630	157.346	25.09	30.00	4.91	14.00	39.09
BPSK	166.563	157.807	25.11	30.00	4.89	15.50	40.61
QPSK	163.592	156.757	25.06	30.00	4.94	15.50	40.56
16QAM	165.320	157.777	25.09	30.00	4.91	15.50	40.59
64QAM	165.630	157.346	25.09	30.00	4.91	15.50	40.59
BPSK	166.563	157.807	25.11	30.00	4.89	23.00	48.11
QPSK	163.592	156.757	25.06	30.00	4.94	23.00	48.06
16QAM	165.320	157.777	25.09	30.00	4.91	23.00	48.09
64QAM	165.630	157.346	25.09	30.00	4.91	23.00	48.09
BPSK	88.136	83.001	22.33	30.00	7.67	29.00	51.33
QPSK	87.653	82.241	22.30	30.00	7.70	29.00	51.30
16QAM	87.416	83.684	22.33	30.00	7.67	29.00	51.33
64QAM	87.432	82.158	22.29	30.00	7.71	29.00	51.29
BPSK	47.050	42.892	19.54	30.00	10.46	32.00	51.54
QPSK	47.212	43.045	19.55	30.00	10.45	32.00	51.55
16QAM	46.918	43.241	19.55	30.00	10.45	32.00	51.55
64QAM	47.052	43.316	19.56	30.00	10.44	32.00	51.56

Output power sample spectral plots:

Antenna Port 1



Antenna Port 2

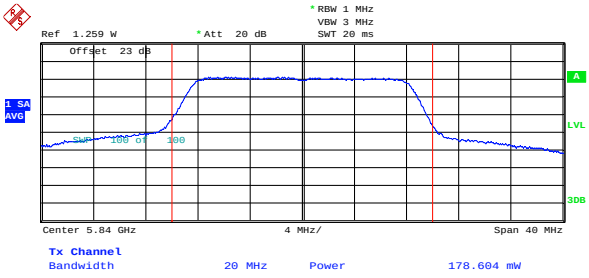


High Channel: central nominal frequency: 5840 MHz

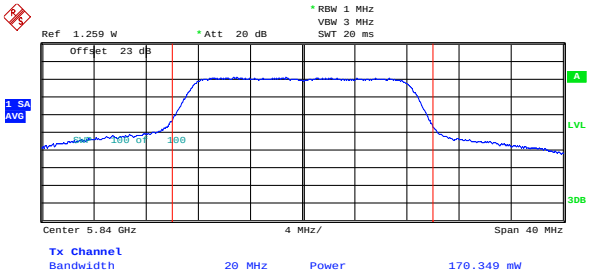
Modulation	Conducted Power		Combined power	Power Limit	Margin	Antenna Gain	e.i.r.p,
	Ant 1, (mW)	Ant 2, (mW)	(dBm)	(dB)	(dB)	(dBi)	(dBm)
BPSK	177.276	169.256	25.40	30.00	4.60	14.00	39.40
QPSK	178.666	169.902	25.42	30.00	4.58	14.00	39.42
16QAM	178.604	170.349	25.43	30.00	4.57	14.00	39.43
64QAM	177.332	168.485	25.39	30.00	4.61	14.00	39.39
BPSK	177.276	169.256	25.40	30.00	4.60	15.50	40.90
QPSK	178.666	169.902	25.42	30.00	4.58	15.50	40.92
16QAM	178.604	170.349	25.43	30.00	4.57	15.50	40.93
64QAM	177.332	168.485	25.39	30.00	4.61	15.50	40.89
BPSK	177.276	169.256	25.40	30.00	4.60	23.00	48.40
QPSK	178.666	169.902	25.42	30.00	4.58	23.00	48.42
16QAM	178.604	170.349	25.43	30.00	4.57	23.00	48.43
64QAM	177.332	168.485	25.39	30.00	4.61	23.00	48.39
BPSK	91.609	87.549	22.53	30.00	7.47	29.00	51.53
QPSK	91.108	87.003	22.51	30.00	7.49	29.00	51.51
16QAM	91.087	87.389	22.52	30.00	7.48	29.00	51.52
64QAM	90.581	87.719	22.51	30.00	7.49	29.00	51.51
BPSK	44.065	37.916	19.14	30.00	10.86	32.00	51.14
QPSK	43.262	38.261	19.11	30.00	10.89	32.00	51.11
16QAM	43.547	38.349	19.13	30.00	10.87	32.00	51.13
64QAM	43.530	38.216	19.12	30.00	10.88	32.00	51.12

Output power sample spectral plots:

Antenna Port 1



Antenna Port 2



Clause 15.247(d) Conducted Spurious Emissions

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions, which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

Test Results: Pass

Additional Observations:

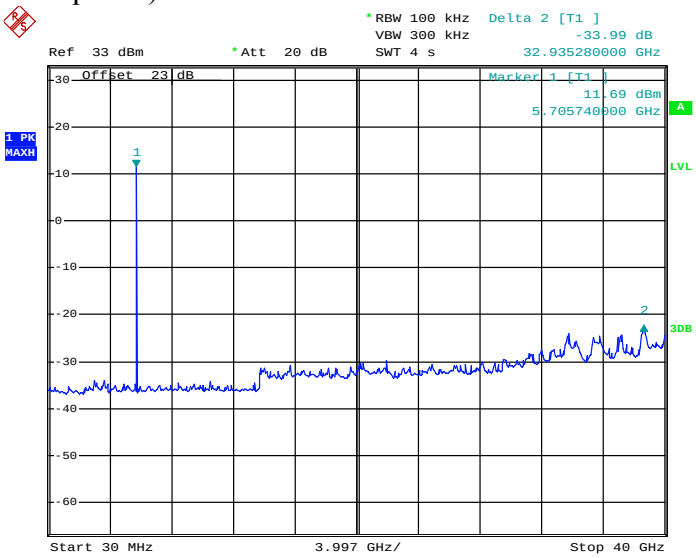
The Spectrum was searched from 30 MHz to 40 GHz for low, mid and high carrier frequencies.

All measurements for spurious emissions were performed conducted using a Spectrum analyzer with Peak Detector with 100 kHz/300 kHz RBW/VBW. The spurious emissions were measured individually on antenna port 1 and 2, and combined with antenna port 1 and 2 by using a RF combiner.

All modulations were investigated, only the worst-case test results are provided.

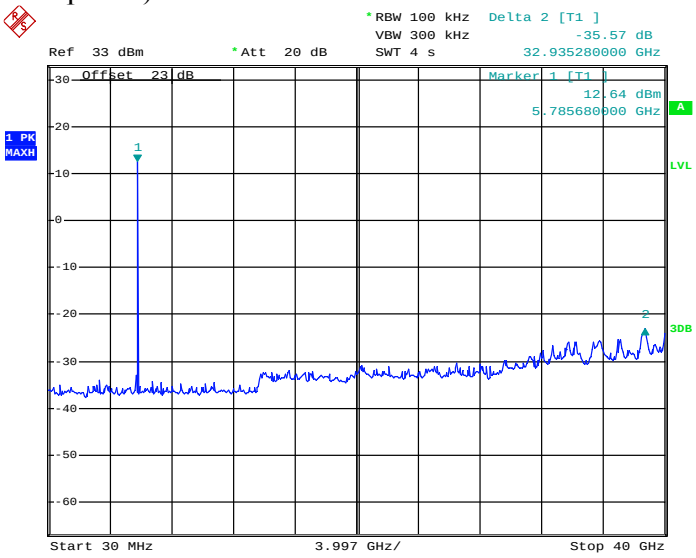
5 MHZ Channel

Low Channel (antenna port 1)



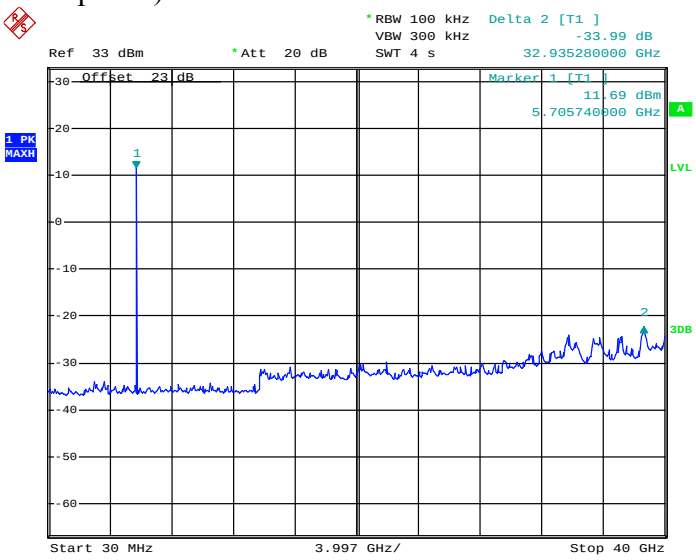
Date: 30.SEP.2010 12:36:09

Mid Channel (antenna port 1)



Date: 30.SEP.2010 12:36:48

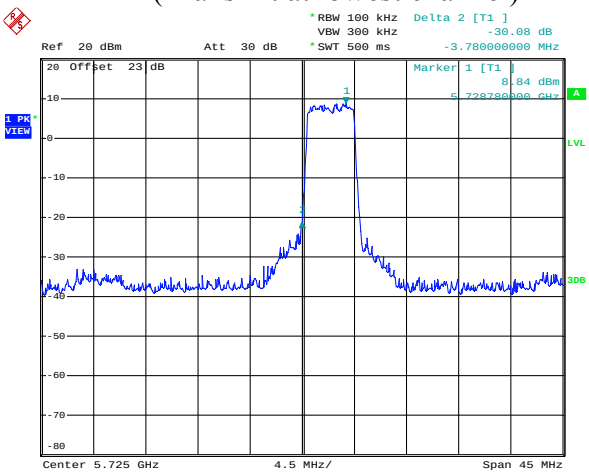
High Channel (antenna port 1)



Date: 30.SEP.2010 12:36:09

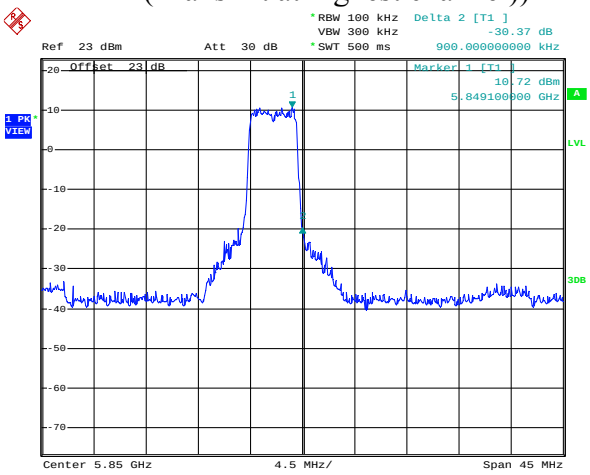
Band edges measurements:

Lower band edge
(Transmit at lowest channel)



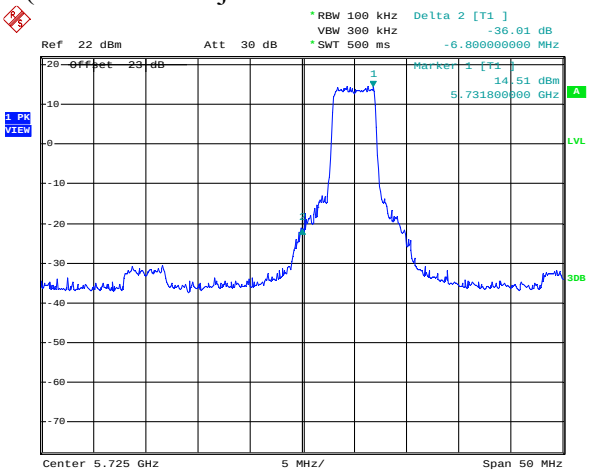
Date: 29.SEP.2010 12:34:54

Upper band edge
(Transmit at highest channel))



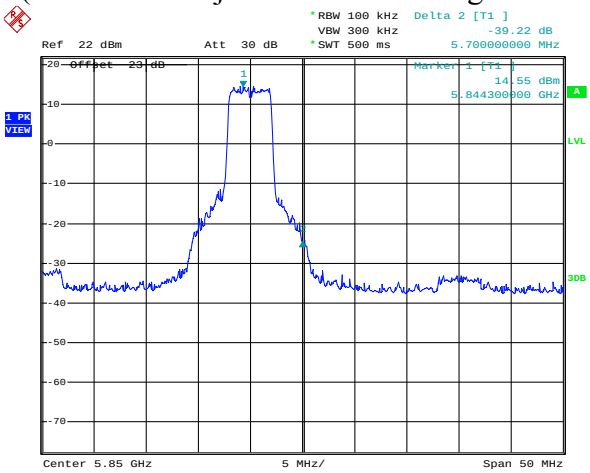
Date: 29.SEP.2010 12:30:11

Lower band edge
(Transmit at adjacent channel of lowest channel)



Date: 30.SEP.2010 08:32:13

Upper band edge
(Transmit at adjacent channel of highest channel)

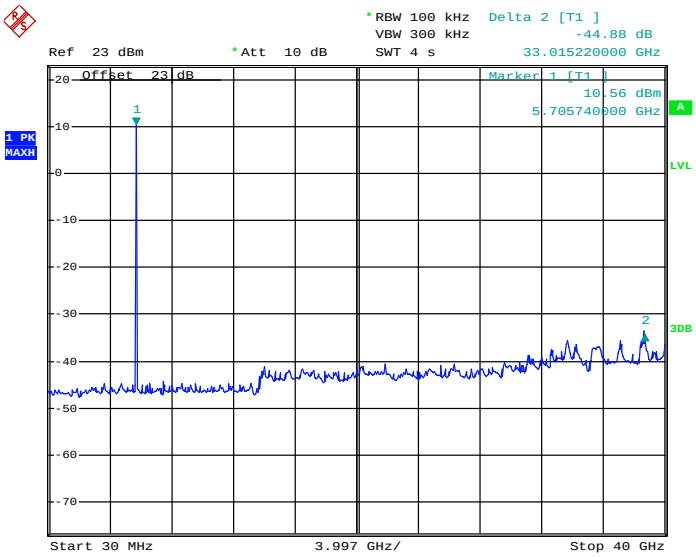


Date: 30.SEP.2010 08:31:14

Band edge results:
Lower band edge:
Minimum attenuation below the fundamental is 30.08dB
Upper band edge:
Minimum attenuation below the fundamental is 30.37dB

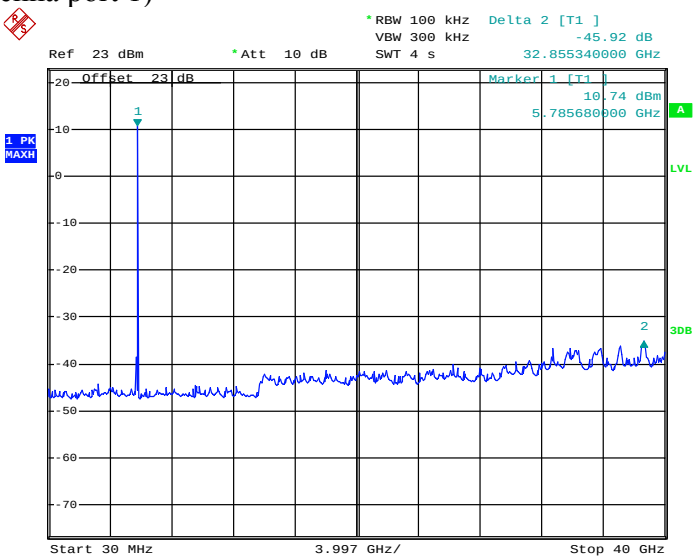
10 MHZ Channel

Low Channel (antenna port 1)



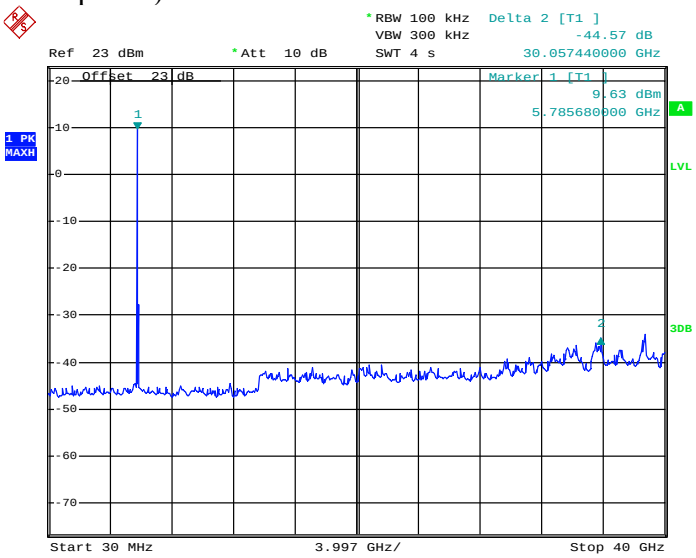
Date: 30.SEP.2010 12:40:05

Mid Channel (antenna port 1)



Date: 30.SEP.2010 12:40:46

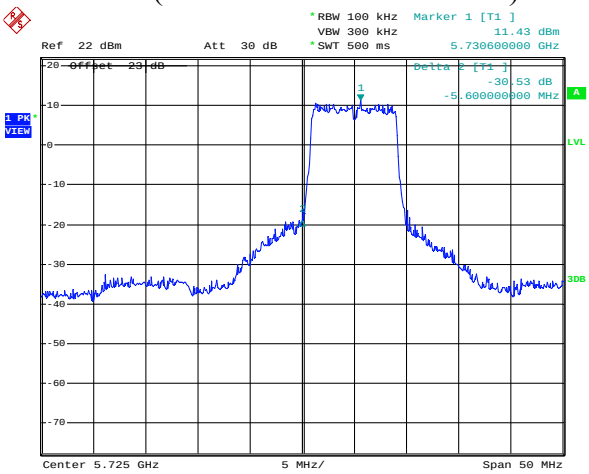
High Channel (antenna port 1)



Date: 30.SEP.2010 12:41:33

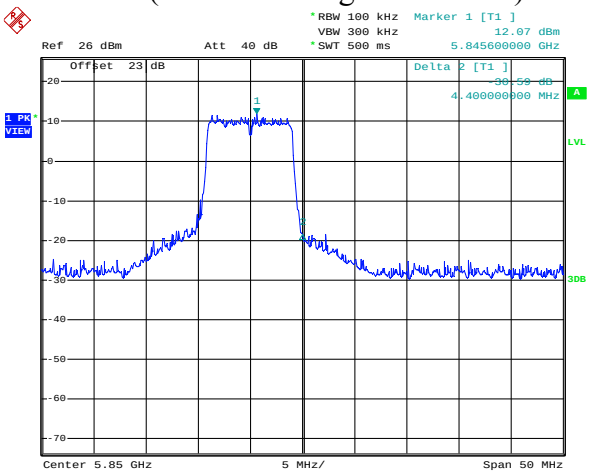
Band edges measurements:

Lower band edge
(Transmit at lowest channel)



Date: 30.SEP.2010 06:19:13

Upper band edge
(Transmit at highest channel)



Date: 30.SEP.2010 05:57:54

<u>Band edge results:</u>

Lower band edge:

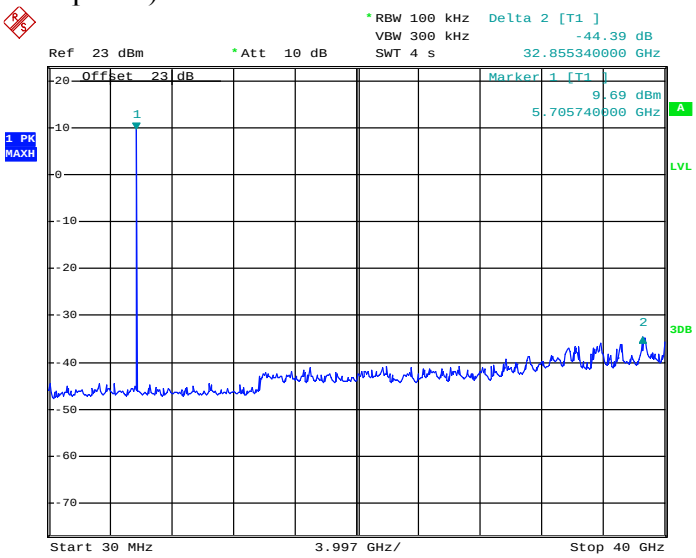
Minimum attenuation below the fundamental is 30.53dB

Upper band edge:

Minimum attenuation below the fundamental is 30.59dB

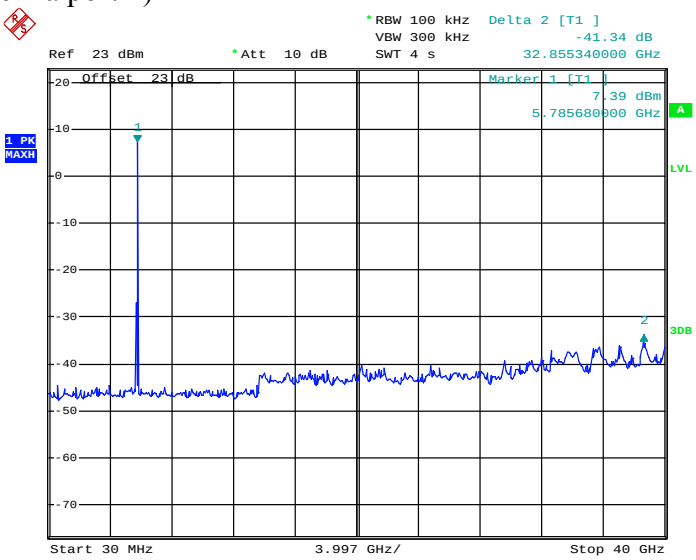
20 MHZ Channel

Low Channel (antenna port 2)



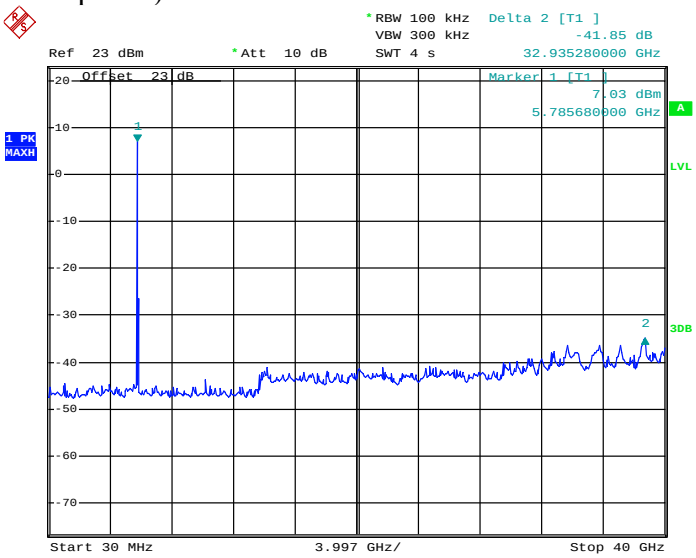
Date: 30.SEP.2010 12:42:28

Mid Channel (antenna port 2)



Date: 30.SEP.2010 12:43:11

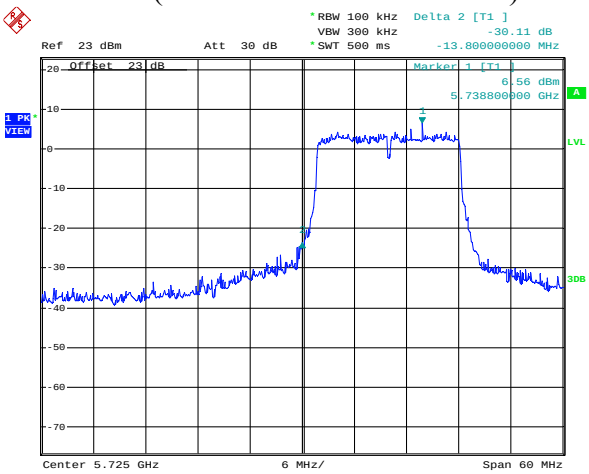
High Channel (antenna port 2)



Date: 30.SEP.2010 12:43:45

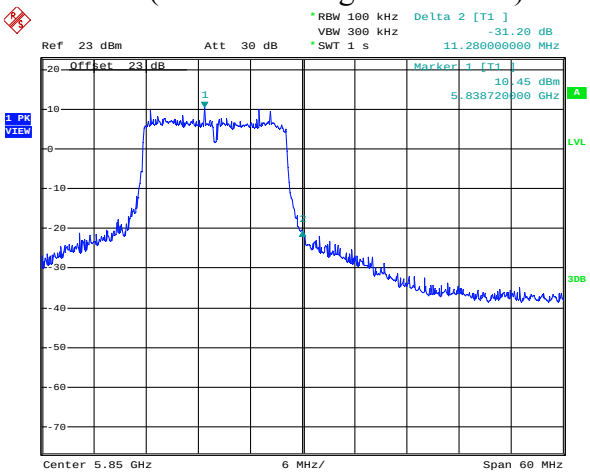
Band edges measurements:

Lower band edge
(Transmit at lowest channel)



Date: 28.SEP.2010 13:24:19

Upper band edge
(Transmit at highest channel)



Date: 28.SEP.2010 12:20:36

Band edge results:

Lower band edge:

Minimum attenuation below the fundamental is 30.11dB

Upper band edge:

Minimum attenuation below the fundamental is 31.20dB

Clause 15.247(e) Power Spectral Density for Digitally Modulated Devices

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

Test Results: Pass

Additional Observations:

The Power Spectral Density was measured on the antenna port 1 and 2 individually by means of a spectrum analyzer and following procedure described in 'PSD Option 2' in FCC guidelines for Measurement of Digital Transmission Systems operating under Section 15.247.

The PSD at each antenna port was measured individually and the aggregate PSD was summed up mathematically.

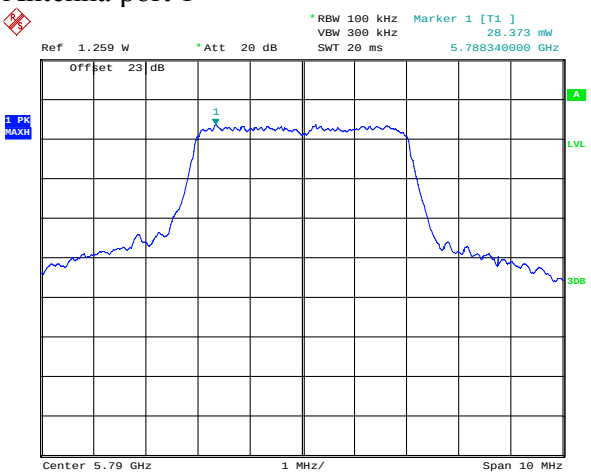
All modulations were investigated, only the worst-case test results are provided.

5 MHz Channel

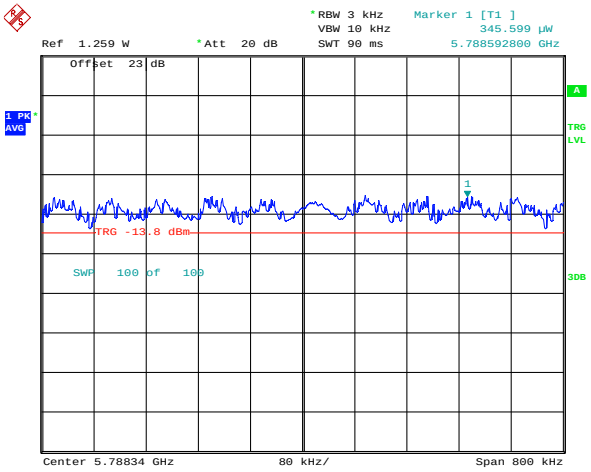
Freq. (MHz)	Antenna 1 Cond. (mW/3 kHz)	Antenna 2 Cond. (mW/3 kHz)	Total PSD Cond. (dBm/3 kHz)	Limit (dBm/3 kHz)	Margin (dB)
5727.5	0.138	0.148	-5.44	8.00	13.44
5790	0.346	0.449	-1.00	8.00	9.00
5847.5	0.227	0.240	-3.31	8.00	11.31

PSD spectral plots samples:

Antenna port 1

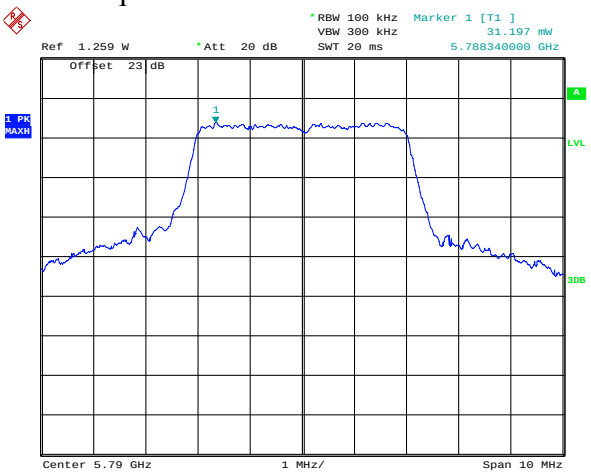


Date: 1.OCT.2010 12:26:34

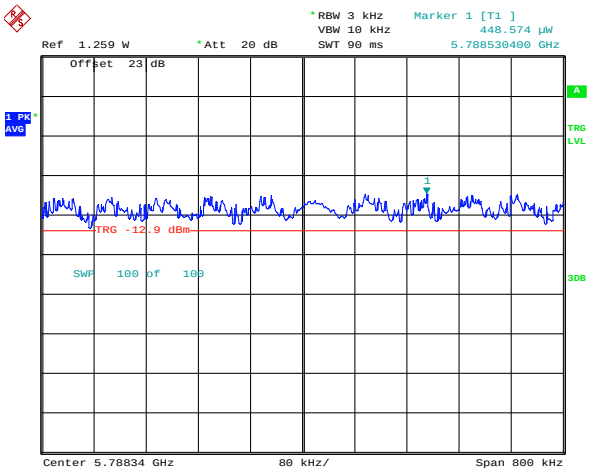


Date: 1.OCT.2010 12:27:58

Antenna port 2



Date: 1.OCT.2010 12:47:05



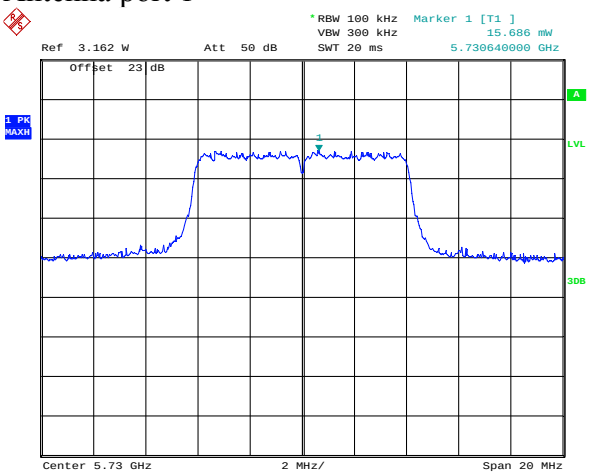
Date: 1.OCT.2010 12:48:19

10 MHz Channel

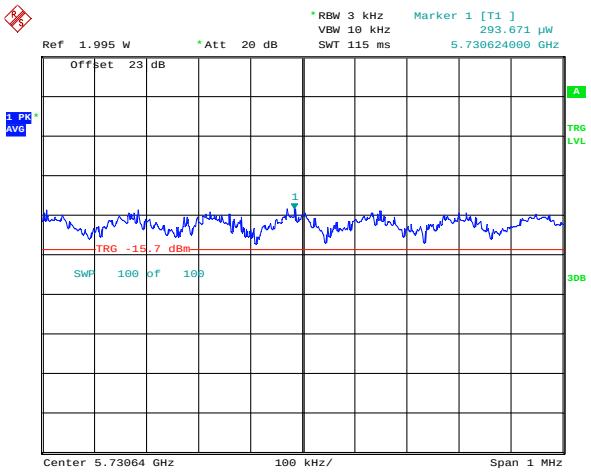
Freq. (MHz)	Antenna 1 Cond. (mW/3 kHz)	Antenna 2 Cond. (mW/3 kHz)	Total PSD Cond. (dBm/3 kHz)	Limit (dBm/3 kHz)	Margin (dB)
5730	0.294	0.224	-2.86	8.00	10.86
5790	0.236	0.191	-3.70	8.00	11.70
5845	0.255	0.246	-3.00	8.00	11.00

PSD spectral plots samples:

Antenna port 1

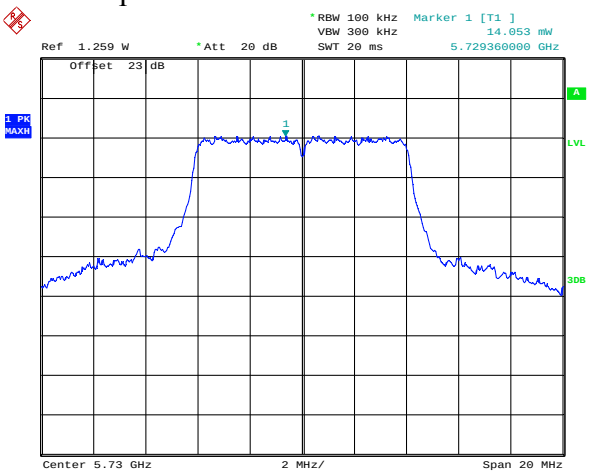


Date: 4.OCT.2010 10:18:15

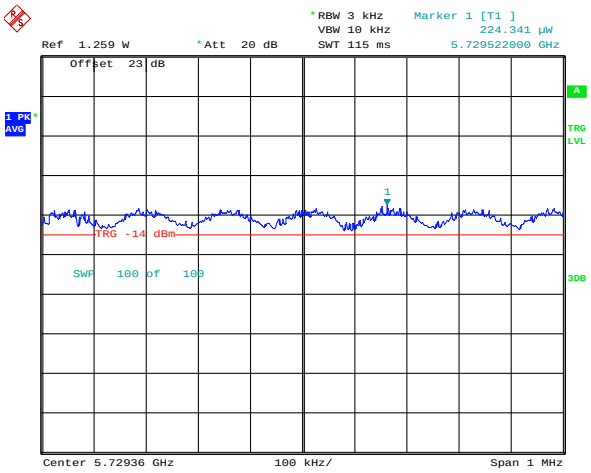


Date: 4.OCT.2010 10:21:12

Antenna port 2



Date: 1.OCT.2010 13:14:52



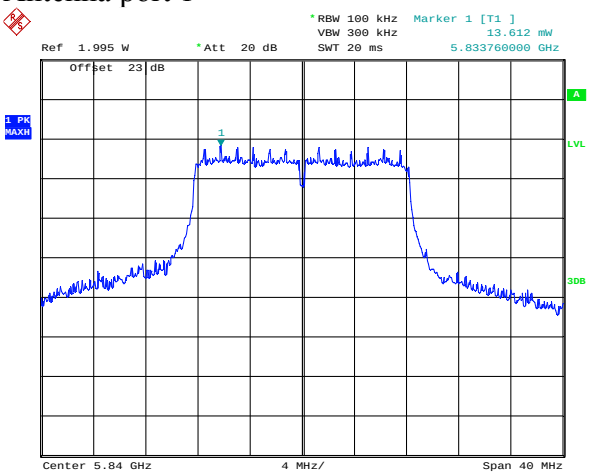
Date: 1.OCT.2010 13:15:55

20 MHz Channel

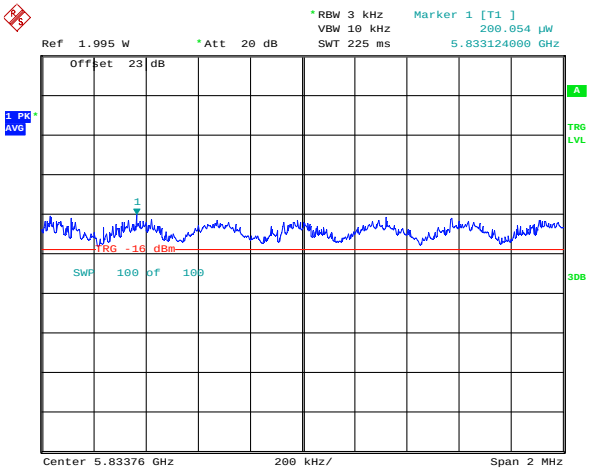
Freq. (MHz)	Antenna 1 Cond. (mW/3 kHz)	Antenna 2 Cond. (mW/3 kHz)	Total PSD Cond. (dBm/3 kHz)	Limit (dBm/3 kHz)	Margin (dB)
5735	0.151	0.145	-5.29	8.00	13.29
5790	0.139	0.213	-4.53	8.00	12.53
5840	0.200	0.160	-4.44	8.00	12.44

PSD spectral plots samples:

Antenna port 1

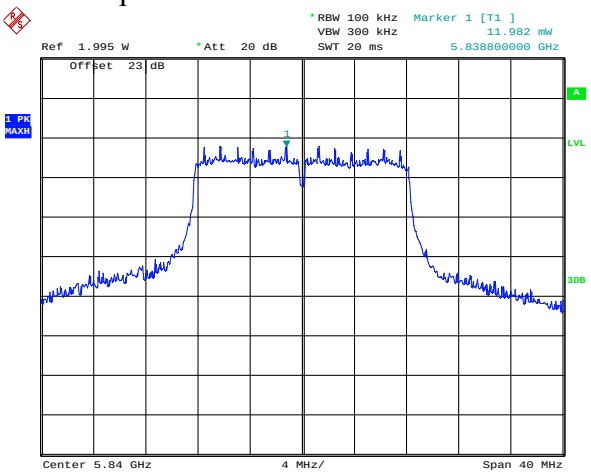


Date: 4.OCT.2010 10:26:57

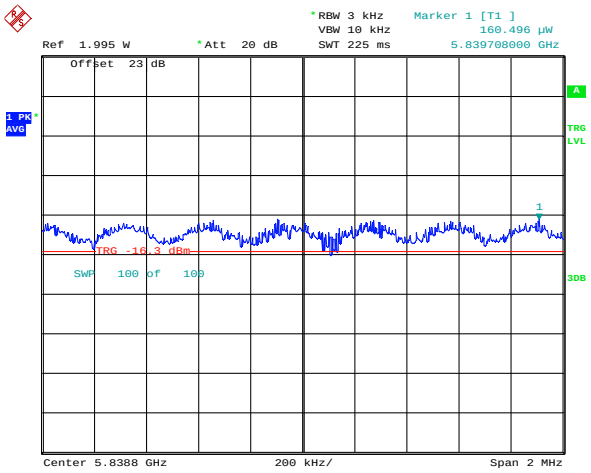


Date: 4.OCT.2010 10:27:57

Antenna port 2



Date: 4.OCT.2010 10:29:26



Date: 4.OCT.2010 10:30:30

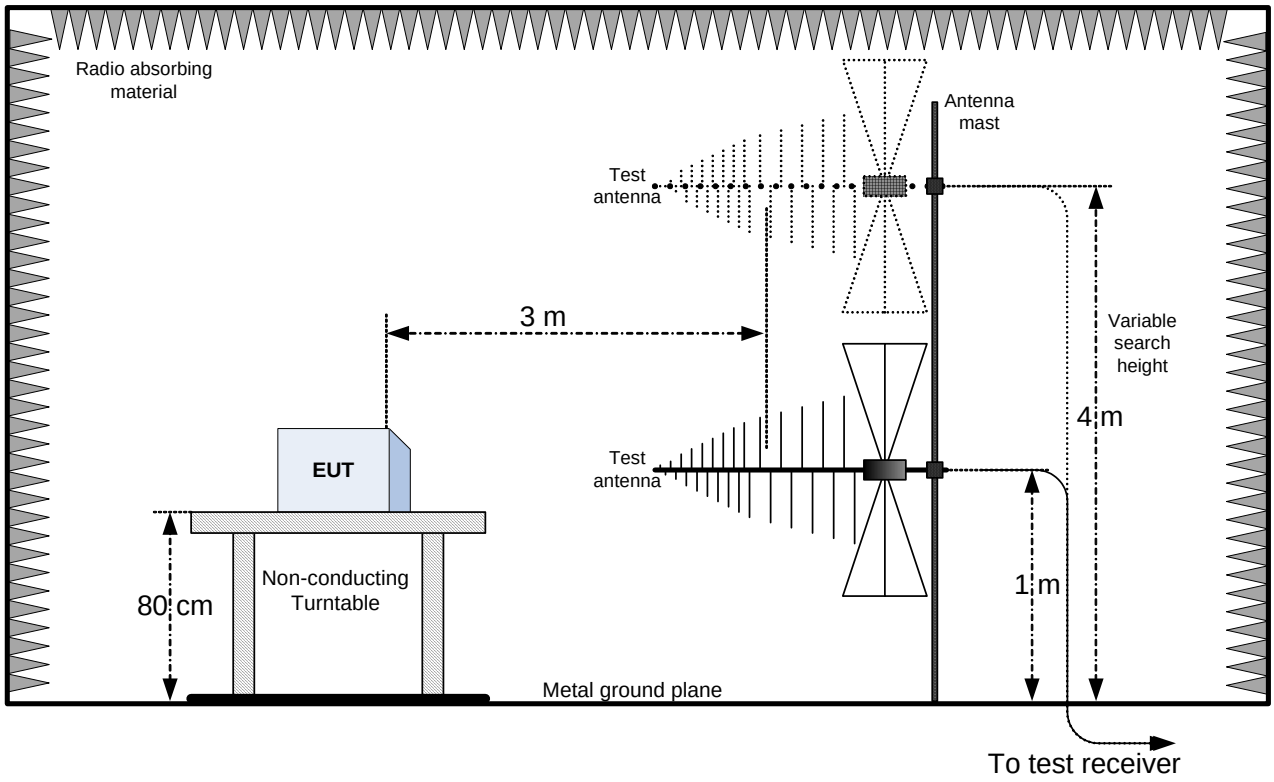
Appendix B : Setup Photographs

Conducted Emissions Setup:

Spurious Emissions Setup:

Appendix C : Block Diagram of Test Setups

Radiated Emissions above 30 MHz Test Site



Conducted Emissions Test Site