Test of Model EX-5r (Dual Polarized)

To: FCC 47 CFR Part 15.407 & IC RSS-210

Test Report Serial No.: EXLT03-A5 Rev A

TEST REPORT

FROM

Test of Model EX-5r (Dual Polarized)

To: FCC 47 CFR Part 15.407 & IC RSS-210

Test Report Serial No.: EXLT03-A5 Rev A

Note: this report only contains data with regard to the 5,250 to 5,350 MHz operational mode of the EX-5r. 5.8 GHz test data is reported in MiCOM Labs test report EXLT03-A2

This report supersedes None

Manufacturer: Exalt Communications, Inc
580 Division Street
Campbell, California 95008
USA

Product Function: 5 GHz (Dual Polarized) Point to Point Fixed Link Radio

Copy No: pdf **Issue Date:** 10th July '06

This Test Report is Issued Under the Authority of;

MiCOM Labs, Inc.
3922 Valley Avenue, Suite B
Pleasanton, CA 94566 USA
Phone: +1 (925) 462-0304
Fax: +1 (925) 462-0306
www.micomlabs.com

ACCREDITED
CERTIFICATE #2381.01

MiCOM Labs is an ISO 17025 Accredited Testing Laboratory

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ACCREDITATION & LISTINGS

MiCOM Labs, Inc. an accredited laboratory complies with the international standard BS EN ISO/IEC 17025. The company is accredited by the American Association for Laboratory Accreditation (A2LA) www.a2la.org test laboratory number 2381.01. MiCOM Labs test schedule is available at the following URL; http://www.a2la.org/scopepdf/2381-01.pdf

THE AMERICAN
ASSOCIATION
FOR LABORATORY
ACCREDITATION

ACCREDITED LABORATORY

A2LA has accredited

MICOM LABS
Pleasanton, CA

for technical competence in the field of

Electrical Testing

The accreditation covers the specific tests and types of tests listed on the agreed scope of accreditation. This laboratory meets the requirements of ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration Laboratories" and any additional program requirements in the identified field of testing.

Presented this 14th day of September 2005.

American Association for Laboratory Accreditation
Corporate SEAL 1978 District of Columbia
A2LA

President
For the Accreditation Council
Certificate Number 2381.01
Valid to: November 30, 2007

For tests or types of tests to which this accreditation applies, please refer to the laboratory's Electrical Scope of Accreditation.

LISTINGS

MiCOM Labs test facilities are listed by the following organizations;

North America

United States of America
Federal Communications Commission (FCC) Listing #: 102167

DOCUMENT HISTORY

Document History		
Revision	Date	Comments
Draft		
Rev A	10th July '06	Initial Release

1. TEST RESULT CERTIFICATE

Manufacturer:	Exalt Communications, Inc 580 Division Street Campbell, California 95008 USA	Tested By:	MiCOM Labs, Inc. 3922 Valley Avenue 'B' Pleasanton California, 94566, USA
EUT:	EX-5r 5 GHz (Dual Polarized) Point to Point Fixed Link Radio	Telephone:	+1 925 462 0304
Model:	EX-5r	Fax:	+1 925 462 0306
S/N:	001		
Test Date(s):	19th May to 7th June '06	Website:	www.micomlabs.com

STANDARD(S)	TEST RESULTS
FCC 47 CFR Part 15.407 & IC RSS-210	EQUIPMENT COMPLIES

MiCOM Labs, Inc. tested the equipment mentioned in accordance with the requirements set forth in the above standards. Test results indicate that the equipment tested is capable of demonstrating compliance with the requirements as documented within this report.

Notes:

1. This document reports conditions under which testing was conducted and the results of testing performed.
2. Details of test methods used have been recorded and kept on file by the laboratory.
3. Test results apply only to the item(s) tested.

ACCREDITED
CERTIFICATE #2381.01

Approved & Released for MiCOM Labs, Inc. by:

Graeme Grieve
Quality Manager MiCOM Labs,

Gordon Hurst
President & CEO MiCOM Labs, Inc.

2. REFERENCES AND MEASUREMENT UNCERTAINTY

2.1. Normative References

Ref.	Publication	Year	Title
(i)	FCC 47 CFR Part 15.407	Sept 2005	Code of Federal Regulations
(ii)	Industry Canada RSS-210	Issue 6 Sept. 2005	Low Power License-Exempt Radiocommunication Devices (All Frequency Bands): Category 1 Equipment
(iii)	Industry Canada RSS-Gen	Issue 1 Sept. 2005	General Requirements and Information for the Certification of Radiocommunication Equipment
(iv)	ANSI C63.4	2003	American National Standards for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
(v)	CISPR 22/ EN 55022	1997 1998	Limits and Methods of Measurements of Radio Disturbance Characteristics of Information Technology Equipment
(vi)	M 3003	Edition 1 Dec. 1997	Expression of Uncertainty and Confidence in Measurements
(vii)	LAB34	Edition 1 Aug 2002	The expression of uncertainty in EMC Testing
(viii)	ETSI TR 100 028	2001	Parts 1 and 2 Electromagnetic compatibility and Radio Spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics
(ix)	A2LA	14th September 2005	Reference to A2LA Accreditation Status – A2LA Advertising Policy
(x)	FCC Public Notice – DA 02-2138	2002	Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices

2.2. Test and Uncertainty Procedures

Conducted and radiated emission measurements were conducted in accordance with American National Standards Institute ANSI C63.4, listed in the Normative References section of this report.

Measurement uncertainty figures are calculated in accordance with ETSI TR 100 028 Parts 1 and 2.

Measurement uncertainties stated are based on a standard uncertainty multiplied by a coverage factor k = 2, providing a level of confidence of approximately 95 % in accordance with UKAS document M 3003 listed in the Normative References section of this report.

3. PRODUCT DETAILS AND TEST CONFIGURATIONS

3.1. Technical Details

Details	Description
Purpose:	Test of the Exalt Communications Inc Model EX-5r (Dual Polarized) to FCC Part 15.407 and Industry Canada RSS-210 regulations.
Applicant:	As Manufacturer
Manufacturer:	Exalt Communications, Inc 580 Division Street Campbell, California 95008 USA
Laboratory performing the tests:	MiCOM Labs, Inc. 3922 Valley Avenue, Suite "B" Pleasanton, California 94566 USA
Test report reference number:	EXLT03-A5 Rev A
Date EUT received:	19th May 2005
Standard(s) applied:	FCC 47 CFR Part 15.407 & IC RSS-210
Dates of test (from - to):	19th May to 7th June '06
No of Units Tested:	1
Type of Equipment:	5 GHz Point to Point Fixed Link Radio
Manufacturers Trade Name:	Model EX-5r (Dual Polarized)
Model:	EX-5r
Location for use:	Indoor and Outdoor use
Declared Frequency Range(s):	5,250 to 5,350 MHz
Type of Modulation:	QPSK; 16QAM; 64QAM
Declared Nominal Output Power:	+13 dBm
EUT Modes of Operation:	QPSK; 16QAM; and 64QAM modulation available at 7.5 MHz, 15 MHz, 30 MHz, & 60 MHz Bandwidths.
Transmit/Receive Operation:	Time Division Duplex (TDD)
Rated Input Voltage and Current:	48 Vdc 0.8 A and/or 24Vdc 1.6A. .
Operating Temperature Range:	Declared range -25 to +65ºC
ITU Emission Designator:	7.5 MHz Bandwidth – 8M4W7D 15 MHz Bandwidth – 16M6W7D 30 MHz Bandwidth – 33M1W7D 60 MHz Bandwidth – 64M8W7D
Microprocessor(s) Model:	MPC852T
Clock/Oscillator(s):	25MHz, 1.544 MHz, 2.048 MHz, 12.880 MHz, 44.736 MHz, 34.368 MHz, 100 MHz, 120 MHz
Frequency Stability:	±7 ppm
Equipment Dimensions:	12" x 12" x 4"
Weight:	15 lbs
Primary function of equipment:	Point to Point Transmission of T1/E1/Ethernet Data

3.2. Scope of Test Program

The scope of the test program was to test the Exalt Communications EX-5r radio for compliance against FCC 47 CFR Part 15.407 and Industry Canada RSS-210 specifications

The Exalt Communications EX-5r employs QPSK, 16QAM & 64QAM modulation in the frequency ranges 5.250 to 5.350 GHz.

There are four selectable transmission bandwidths;

- 7.5 MHz
- 15 MHz
- 30 MHz
- 60 MHz

The EX-5r is a fixed point to point radio that may be deployed in several configurations.;-

(1) As a dual polarized radio, operating on the same frequency with a coherent transmitter on both polarizations, into an external dual-polarized antenna (parabolic dish or panel);

(2) As a dual-polarized radio, operating on the same frequency with a coherent transmitter on both polarizations, with and integrated dual-polarized antenna;

(3) As a single polarity radio, connected to a single external antenna (parabolic dish or panel);

(4) As a single pole radio with diversity polarization switching, connected to a dual-pol external antenna (parabolic dish or panel);

(5) As a single-pol radio with diversity polarization switching with an integrated dual pol panel antenna.

The EX-5r, when operated in dual-polarization mode, uses a coherent transmitter driven from the same reference oscillator(s). In addition, all cabling is done by identical length of phase and amplitude matched cable to ensure that the two transmitted signals are always coherent in both phase and power. As a result of the commonality, all conducted measurements were made on a single antenna port.

The EX-5i was configured as a dual-polarized transmitter for Radiated Emission testing purposes as this represents the highest emissions. An external dual polarized parabolic dish and external single-polarized panel antenna were used for testing as these represent the highest emissions possible and the highest gain antennas for the above configurations. In addition, testing was performed using the integrated dual-panel antenna to illustrate that the emissions were not impacted by the minor mechanical change to the integrated panel antenna (with lower gain antenna).

Exalt Communications Model EX-5r

5 GHz Point to Point Microwave Radio

3.3. Equipment Model(s) and Serial Number(s)

Type (EUT/ Support)	Equipment Description (Including Brand Name)	Mfr	Model No.	Serial No.
EUT	5 GHz (Dual Polarized) Point to Point Microwave Radio	Exalt Communications Inc	EX-5r	
Support	Power supply 115Vac 60Hz to +48Vdc, 0.8A	International Power Sources	CUP70-18 B2	70480-0000106

Test Measurement Set Up

3.4. Antenna Details

Antenna Type	Gain (dBi)	Manufacturer	Model No.	Serial No.
Dual Polarized Parabolic	37.5	Radio Waves	SPD6-5.2	14734
Single Polarized Panel	28.0	MTI	MT-486001	00213
Dual Polarized Integral Panel	20.0	Exalt	N/A	None

3.5. Cabling and I/O Ports

Number and type of I/O ports

1. 10/100 BT: 1 ports
2. T1/E1: 2 ports
3. Sync in

3.6. Test Configurations

Matrix of test configurations

Band	BW (MHz)	Modulation								
		QPSK			16QAM			64QAM		
		Low (MHz)	Mid (MHz)	High (MHz)	Low (MHz)	Mid (MHz)	High (MHz)	Low (MHz)	Mid (MHz)	High (MHz)
5.3	7.5	5260	5296	5332	5260	5296	5332	5260	5296	5332
	15	5265	5296	5327	5265	5296	5327	5265	5296	5327
	30	5272	5290	5308	5272	5290	5308	5272	5290	5308
	60		5290			5290			5290	

It was established at the start of the test program that the equipment when configured with either the 28 dBi or 37.5 dBi antenna and operating with QPSK modulation scheme has the highest Radiated Emission and Peak Emission levels. For the sake of brevity in reporting the test results the report includes results for all of the QPSK configurations shown in the table above (and in the Radiated Emissions section of the report, results for the 28 dBi and 37.5 dBi antenna configurations).

Appendix A of the report contains selected worst case test results for 16QAM and 64QAM configurations, and for the 20 dBi integral antenna.

Only worst case plots are provided for each test parameter identified within this report. Plots not included are held on file by the test laboratory and available upon request with client permission.

Conducted Emissions Testing

The EUT has two identical antenna ports and can be configured (see description of other possible configurations in Section 3.2) as a dual polarized radio, operating on the same frequency with a coherent transmitter on both polarizations, into an external dual-polarized antenna. All conducted measurements were made on a single antenna port.

Radiated Emissions Testing

The test configurations used are described in each Radiated Emissions section.

3.7. Equipment Modifications

The following modifications were required to bring the equipment into compliance:

1. None.

3.8. Deviations from the Test Standard

The following deviations from the test standard were required in order to complete the test program:

1. NONE

3.9. Subcontracted Testing or Third Party Data

Radiated emissions are tested below and verified above 1 GHz at TUV Rheinland of North America's 10m chamber located at the following address;-

2305 Mission College Blvd.
Santa Clara
California 95054
USA

TUV Rheinland of North America IC Registration Number: IC 4453-1

4. TEST SUMMARY

List of Measurements

The following table represents the list of measurements required under the **FCC CFR47 Part 15.407** and **Industry Canada RSS-210**.and **Industry Canada RSS-Gen.**

Section(s)	Test Items	Description	Condition	Result	Test Report Section
15.407(a) **A9.2(2)** **4.4**	26dB and 99% Emission BW	Emission bandwidth measurement	Conducted	Complies	5.1.1
15.407(a) **A9.2(2)** **4.6**	Peak Transmit Power	Peak Power Measurement	Conducted	Complies	5.1.2
15.407(a) **A9.2(2)**	Peak Power Spectral Density	PPSD	Conducted	Complies	5.1.3
15.407(a)(6)	Peak Excursion Ratio	<13dB in any 1MHz bandwidth	Conducted	Complies	5.1.4
15.407(g) **15.31** **§2.1**,§**9.5(e)** **4.5**	Frequency Stability	Limits: contained within band of operation at all times.	Manufacturer declaration	Complies	5.1.5
15.407(f) **5.5**	Radio Frequency Radiation Exposure	Exposure to radio frequency energy levels, Maximum Permissible Exposure (MPE)	Calculation	Complies	5.1.6

List of Measurements (continued)

The following table represents the list of measurements required under the **FCC CFR47 Part 15.407** and **Industry Canada RSS-210** and **Industry Canada RSS-Gen**.

Section(s)	Test Items	Description	Condition	Result	Test Report Section
15.407(b)(2) **15.205(a)** **15.209(a)** **2.2, 2.6** **A9.3(2)** **4.7**	Radiated Emissions		Radiated		5.1.7
	Transmitter Radiated Spurious Emissions	Emissions above 1 GHz		Complies	*5.1.7.1*
	Radiated Band Edge	Band edge results		Complies	*5.1.8.2*
	Peak Field Strength Measurements				*5.1.8.3*
Industry Canada only **RSS-Gen §4.8, §6**	Receiver Radiated Spurious Emissions	Emissions above 1 GHz		Complies	*5.1.8.*
15.407(b)(6) **15.205(a)** **15.209(a)** **2.2**	Radiated Emissions	Emissions <1 GHz (30M-1 GHz)		Complies	*5.1.9*
15.407(b)(6) **15.207** **7.2.2**	AC Wireline Conducted Emissions 150 kHz–30 MHz	Conducted Emissions	Conducted	Complies	5.1.10

Note 1: *Test results reported in this document relate only to the items tested*
Note 2: *The required tests demonstrated compliance as per client declaration of test configuration, monitoring methodology and associated pass/fail criteria*

5. TEST RESULTS

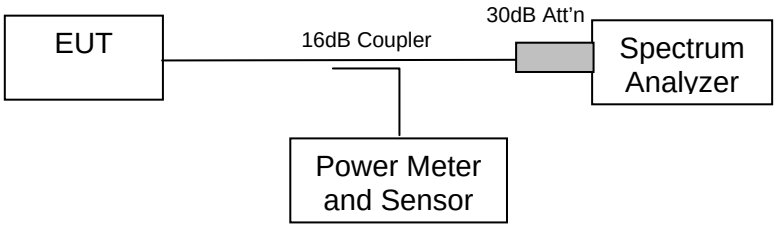
5.1. Device Characteristics

5.1.1. 26 dB and 99 % Bandwidth

FCC, Part 15 Subpart C §15.407(a)
Industry Canada RSS-210 § A9.2(2)
Industry Canada RSS-Gen 4.4

Test Procedure
The bandwidth at 26 dB and 99 % is measured with the transmit power set to maximum and a spectrum analyzer connected to each of the EUT's two antenna ports in turn, while EUT is operating in transmission mode at the appropriate center frequency. The spectrum analyzer utilized the 6 dB resolution bandwidth filter for all measurements.

Test Measurement Set up



Measurement set up for 26 dB and 99 % bandwidth test

Radio parameters.
Power Level: maximum
Duty Cycle: 100% (test mode)

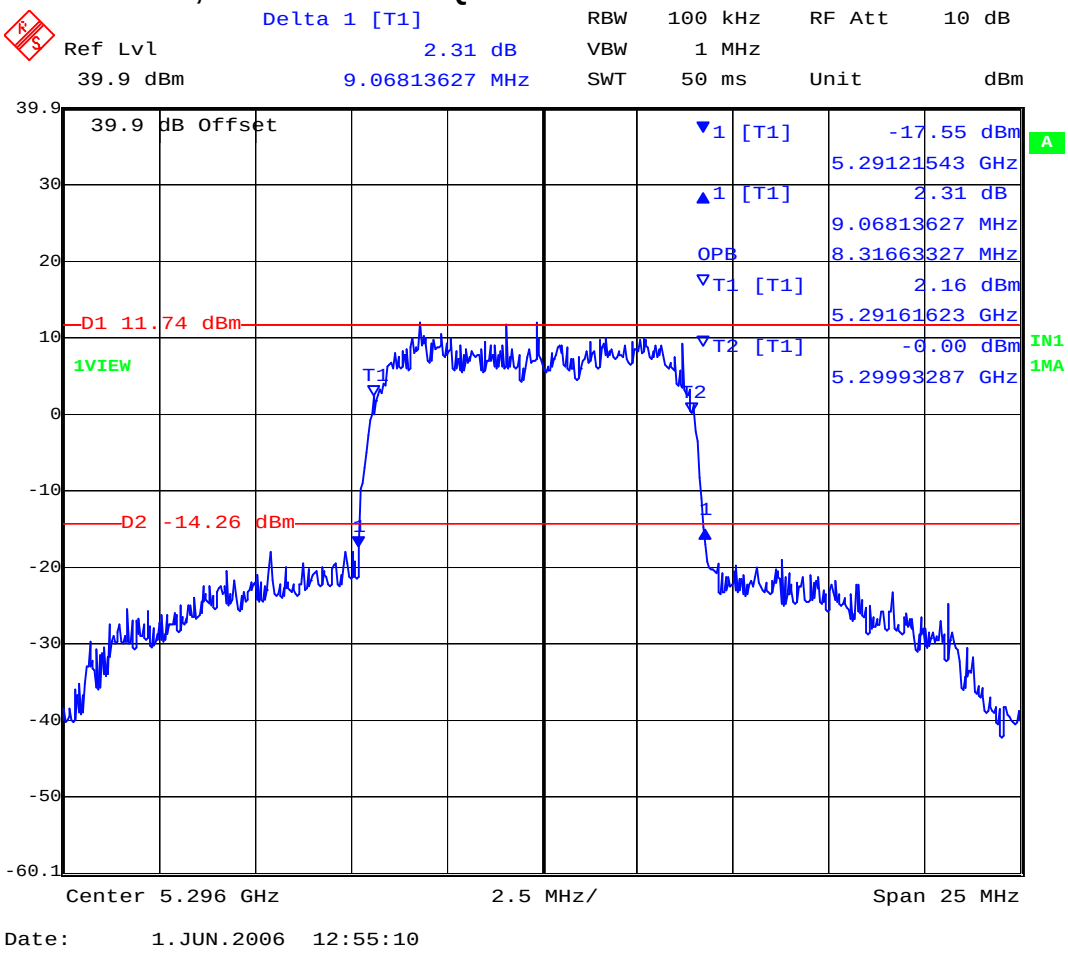
Measurement Results for 26 dB and 99 % Operational Bandwidth(s)

Ambient conditions.
Temperature: 17 to 23 °C Relative humidity: 31 to 57 % Pressure: 999 to 1012 mbar

TABLE OF RESULTS – 5.3 GHz Band - 7.5 MHz Bandwidth QPSK

Center Frequency (MHz)	Antenna Port #1				Antenna Port #2 Verification			
	26 dB BW (MHz)	26 dB Plot #	99 % BW (MHz)	99 % BW Plots	26 dB BW (MHz)	26 dB Plot #	99 % BW (MHz)	99 % BW Plots
5,260	9.0681	On File	8.3166	On File				
5,296	9.0681	01	8.3166	01	9.168	01a	8.317	01a
5,332	9.0681	On File	8.3166	On File				

Plot 01
5,296 MHz 7.5 MHz QPSK 26 dB and 99% Bandwidth



Plot 01a Port 2 Verification
5,296 MHz 7.5 MHz QPSK 26 dB and 99% Bandwidth

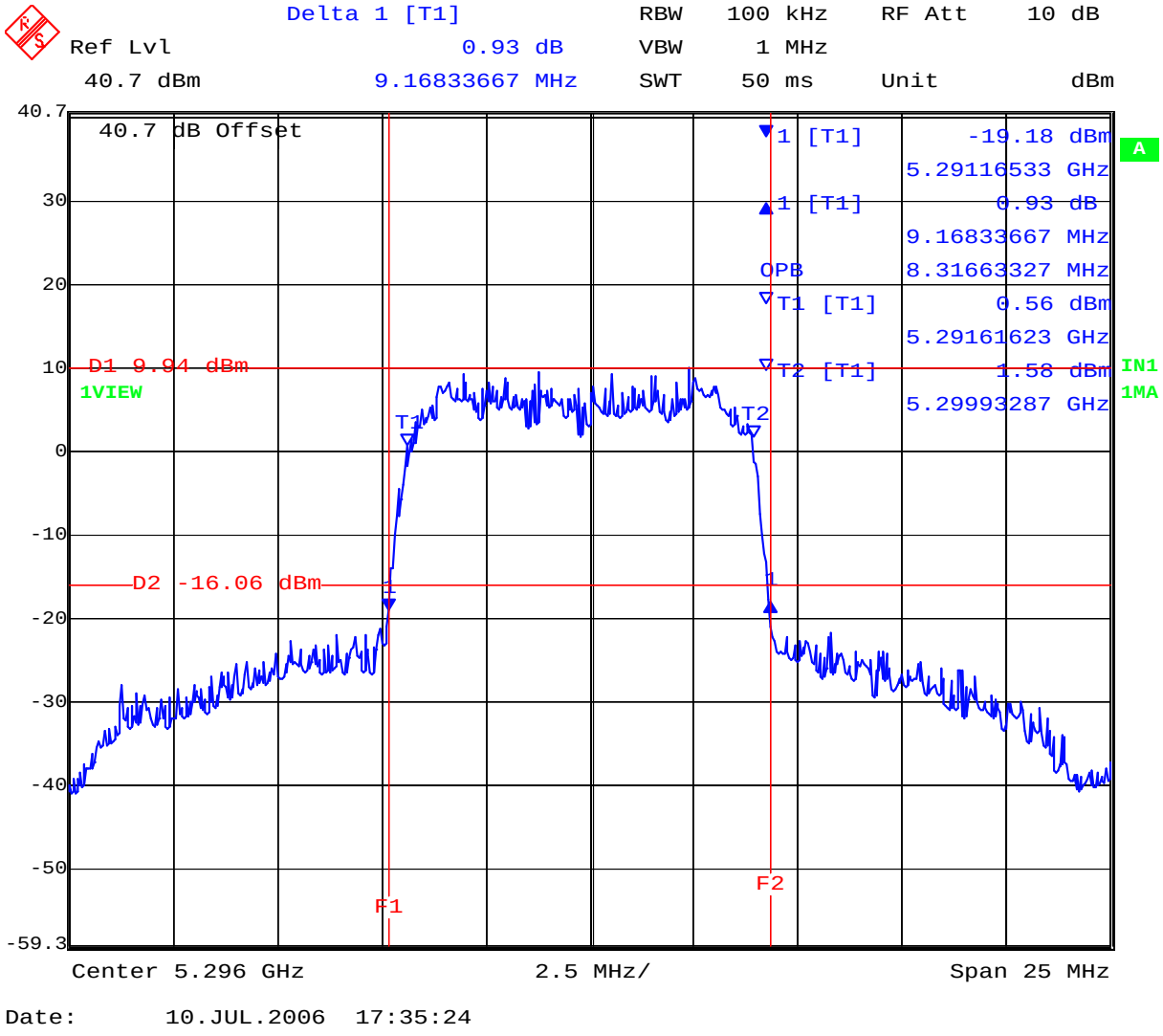
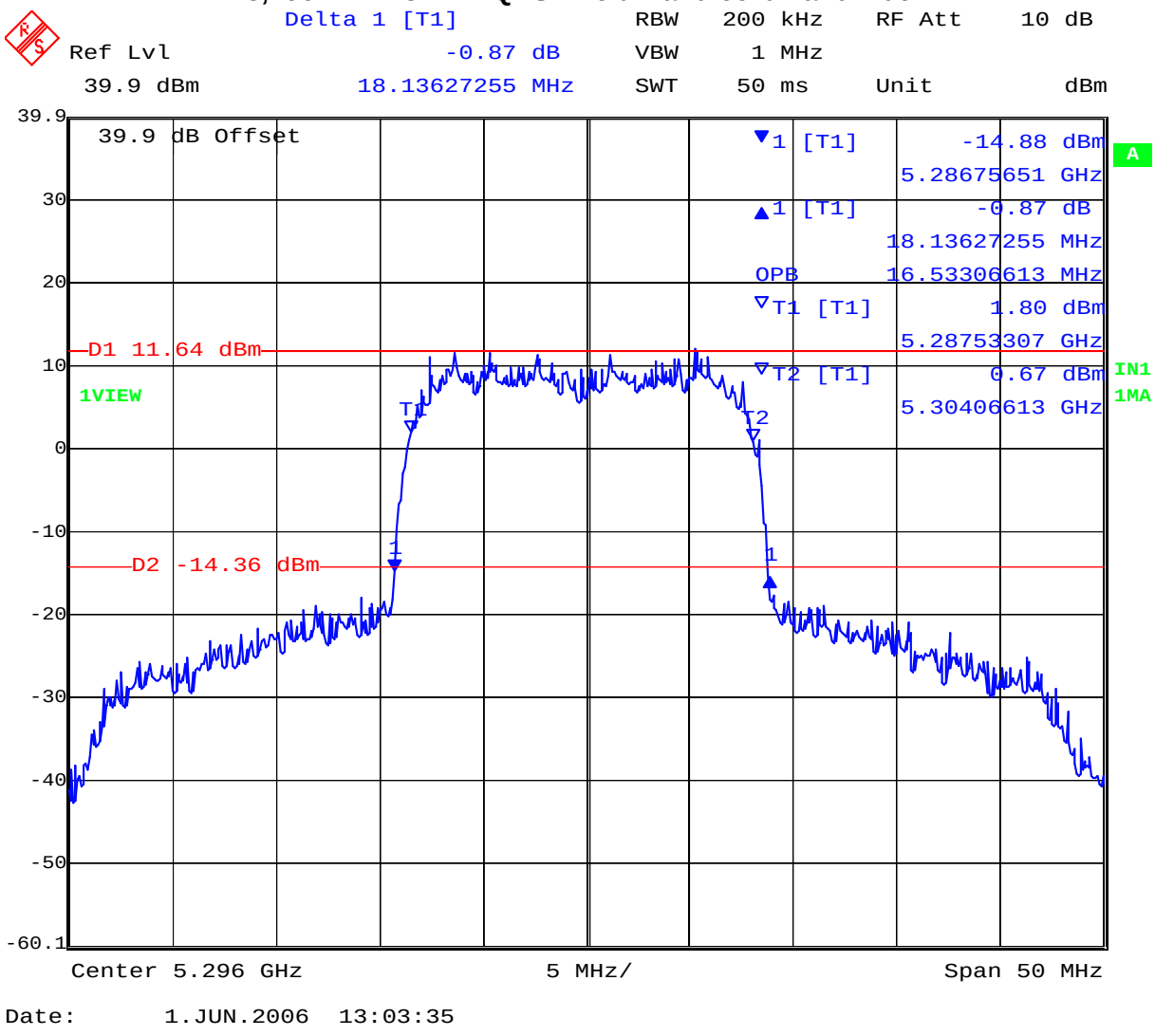


TABLE OF RESULTS – 5.3 GHz Band - 15 MHz Bandwidth QPSK

Center Frequency (MHz)	Antenna Port #1				Antenna Port #2 Verification			
	26 dB BW (MHz)	26 dB Plot #	99 % BW (MHz)	99 % BW Plots	26 dB BW (MHz)	26 dB Plot #	99 % BW (MHz)	99 % BW Plots
5,265	18.1362	On File	16.5330	On File				
5,296	18.1362	02	16.5330	02	18.136	02a	16.533	02a
5,327	18.1232	On File	16.5330	On File				

Plot 02
5,296 MHz 15 MHz QPSK 26 dB and 99% Bandwidth



Plot 02a Port 2 Verification
5,296 MHz 15 MHz QPSK 26 dB and 99% Bandwidth

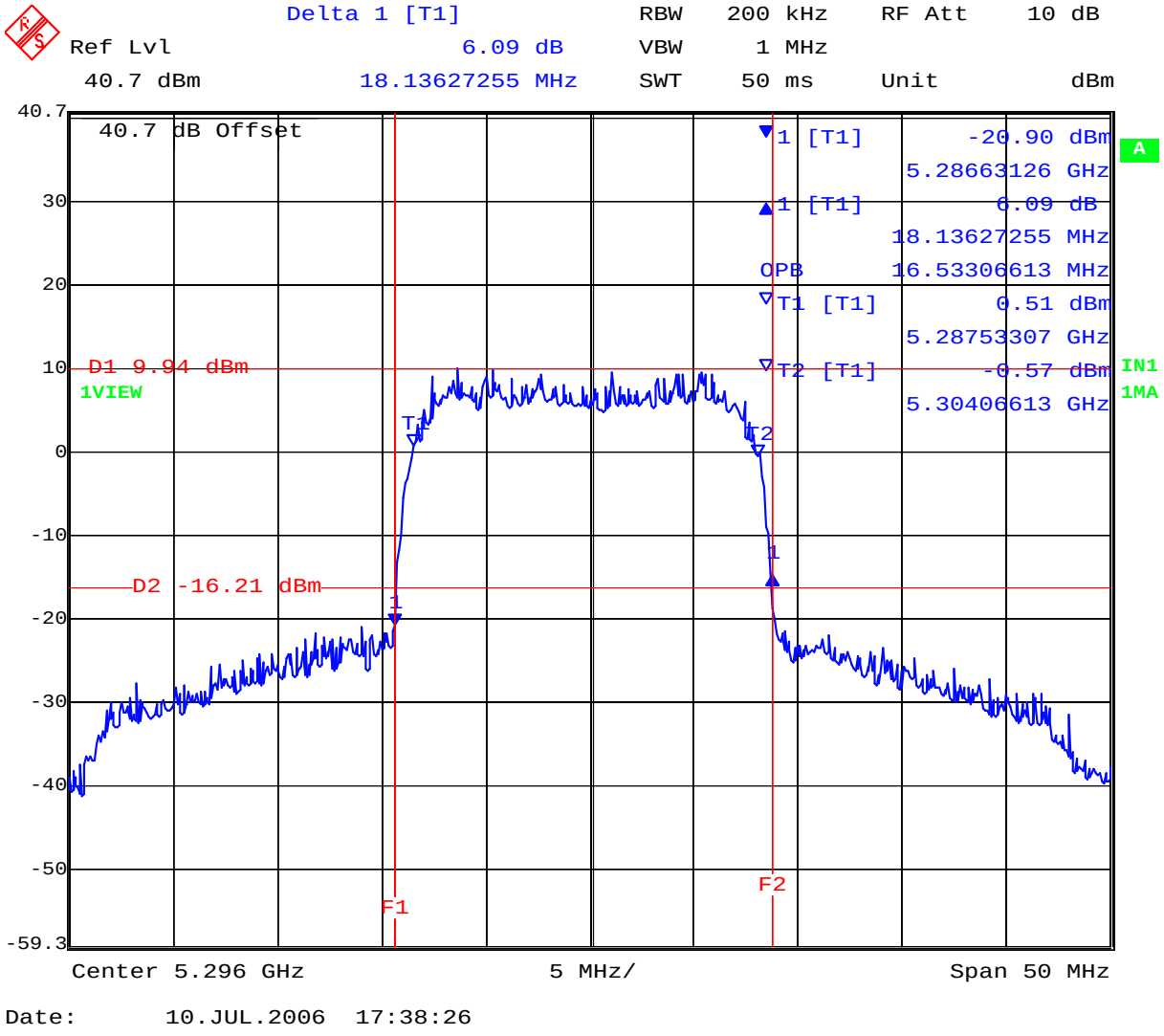
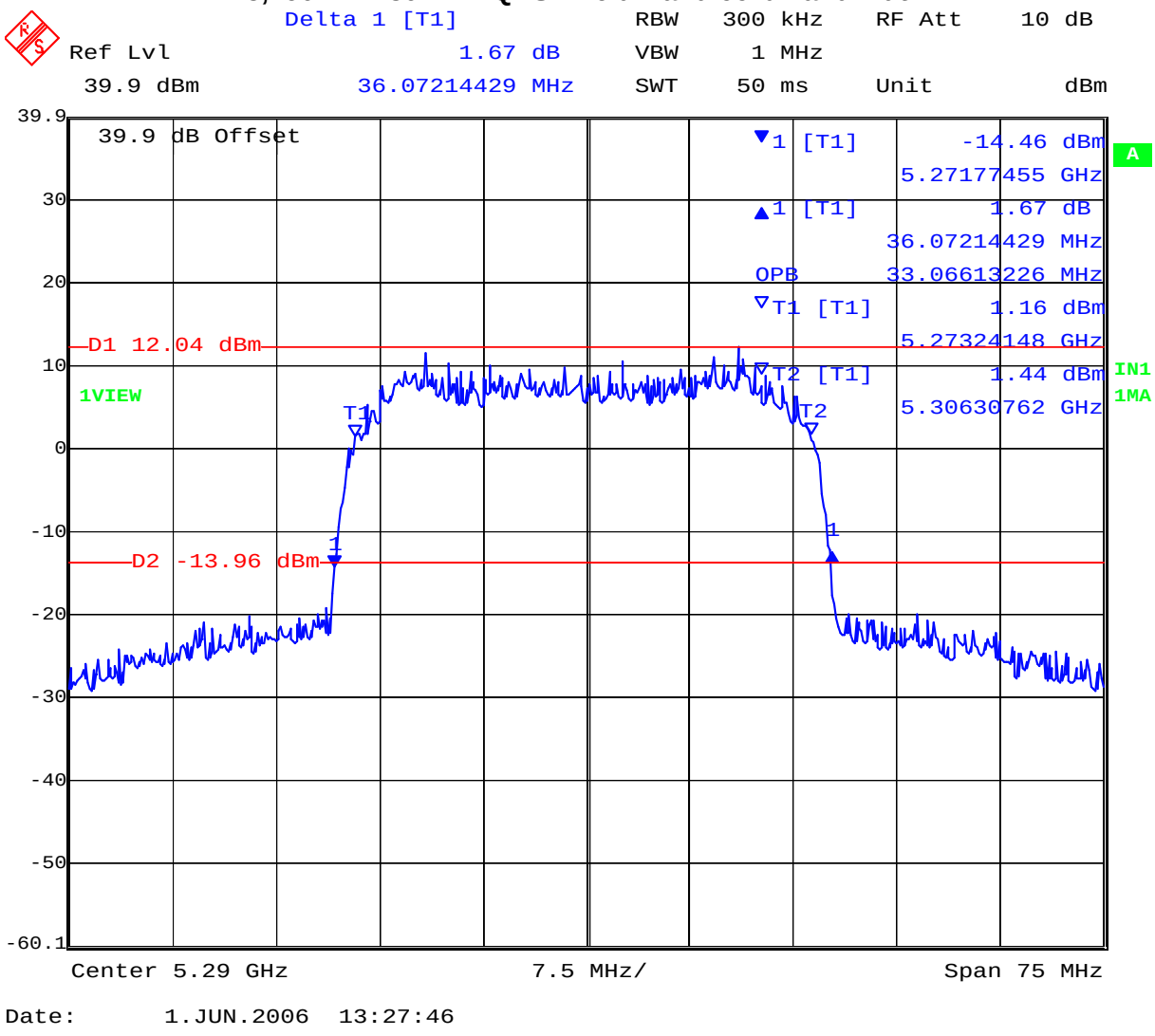


TABLE OF RESULTS – 5.3 GHz Band - 30 MHz Bandwidth QPSK

Center Frequency (MHz)	Antenna Port #1				Antenna Port #2 Verification			
	26 dB BW (MHz)	26 dB Plot #	99 % BW (MHz)	99 % BW Plots	26 dB BW (MHz)	26 dB Plot #	99 % BW (MHz)	99 % BW Plots
5,272	36.0721	On File	33.0661	On File				
5,290	36.0721	03	33.0661	03	36.273	03a	33.066	03a
5,308	35.9218	On File	33.0661	On File				

Plot 03
5,290 MHz 30 MHz QPSK 26 dB and 99% Bandwidth



Plot 03a Port 2 Verification
5,290 MHz 30 MHz QPSK 26 dB and 99% Bandwidth

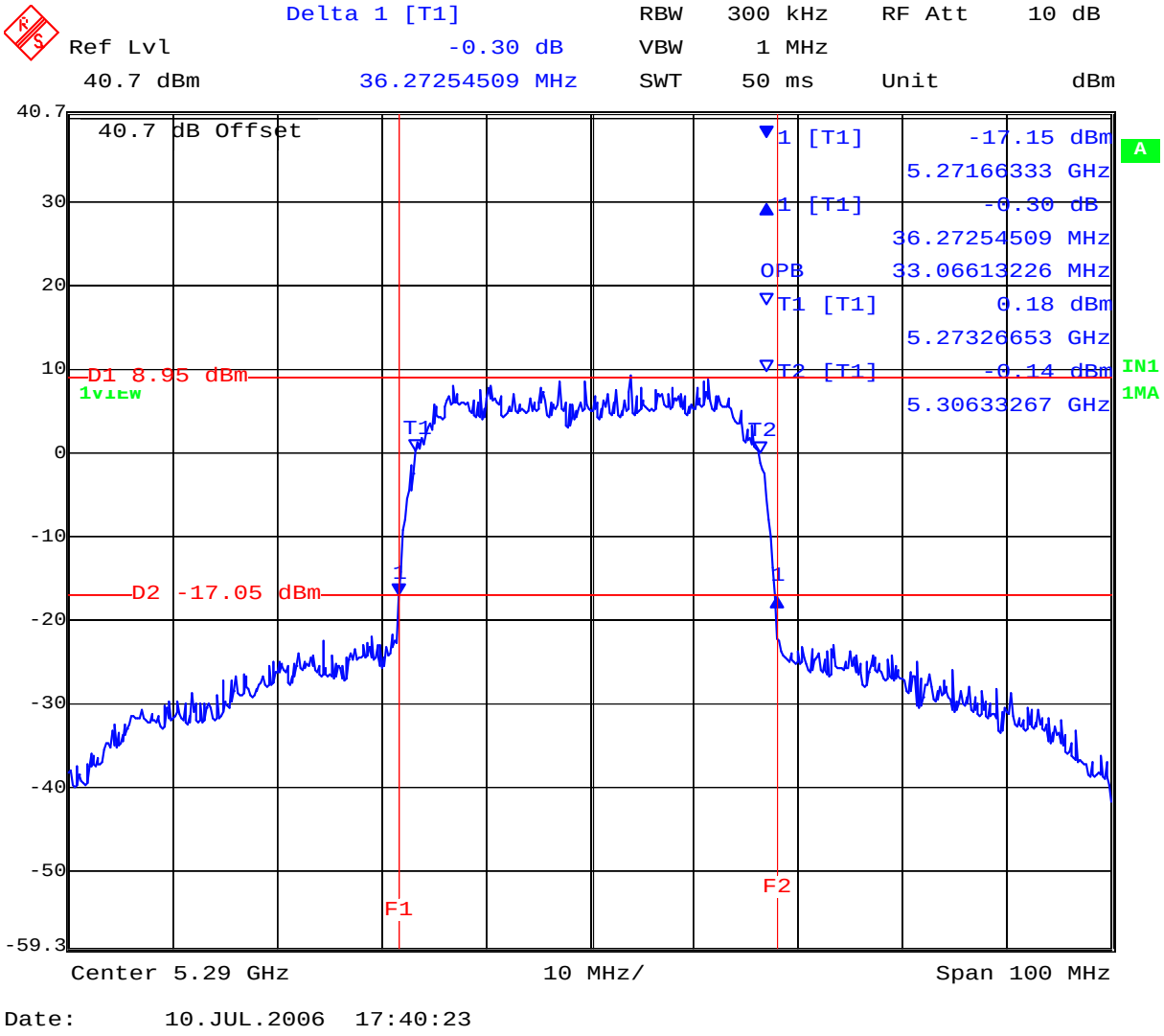
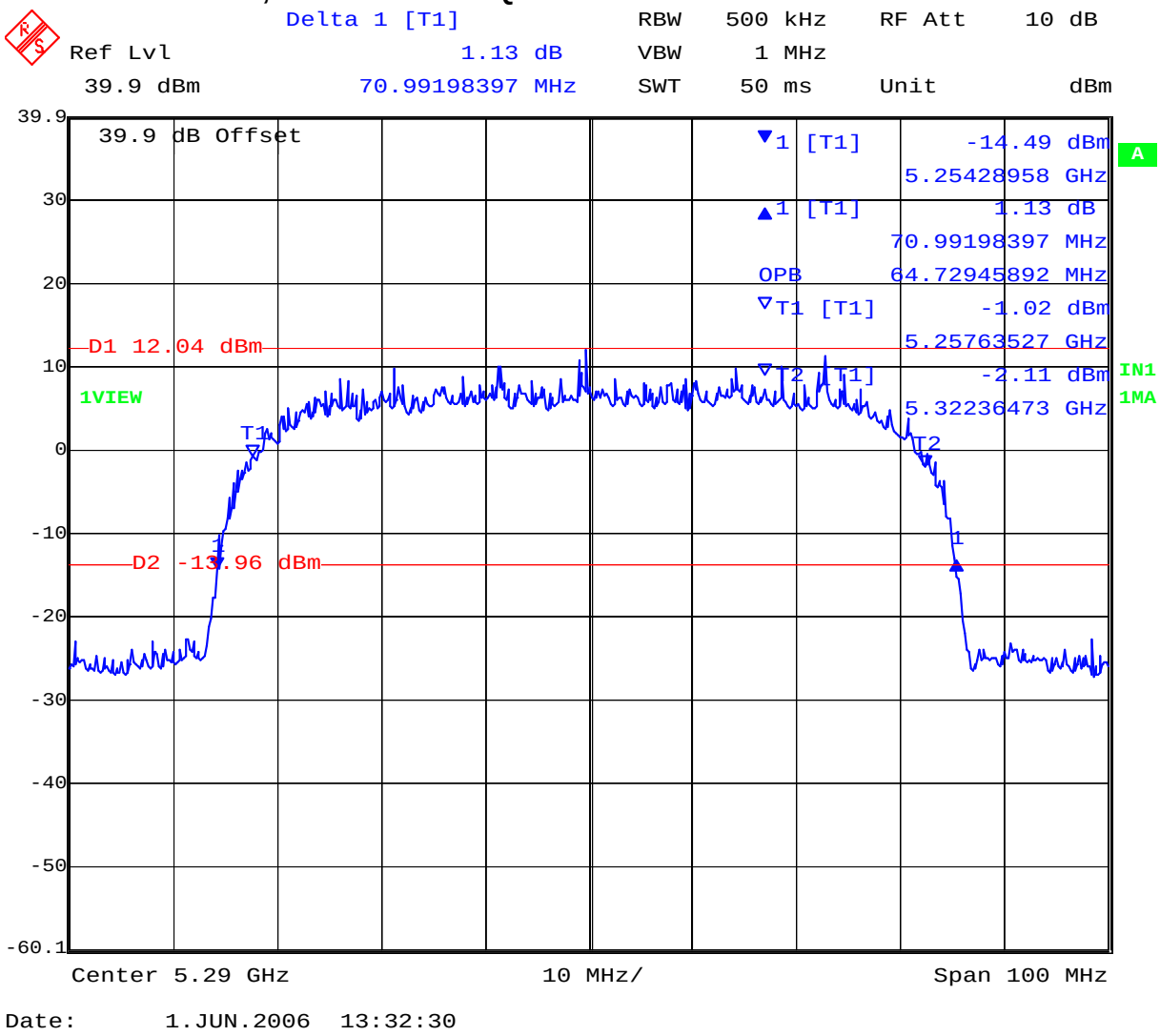


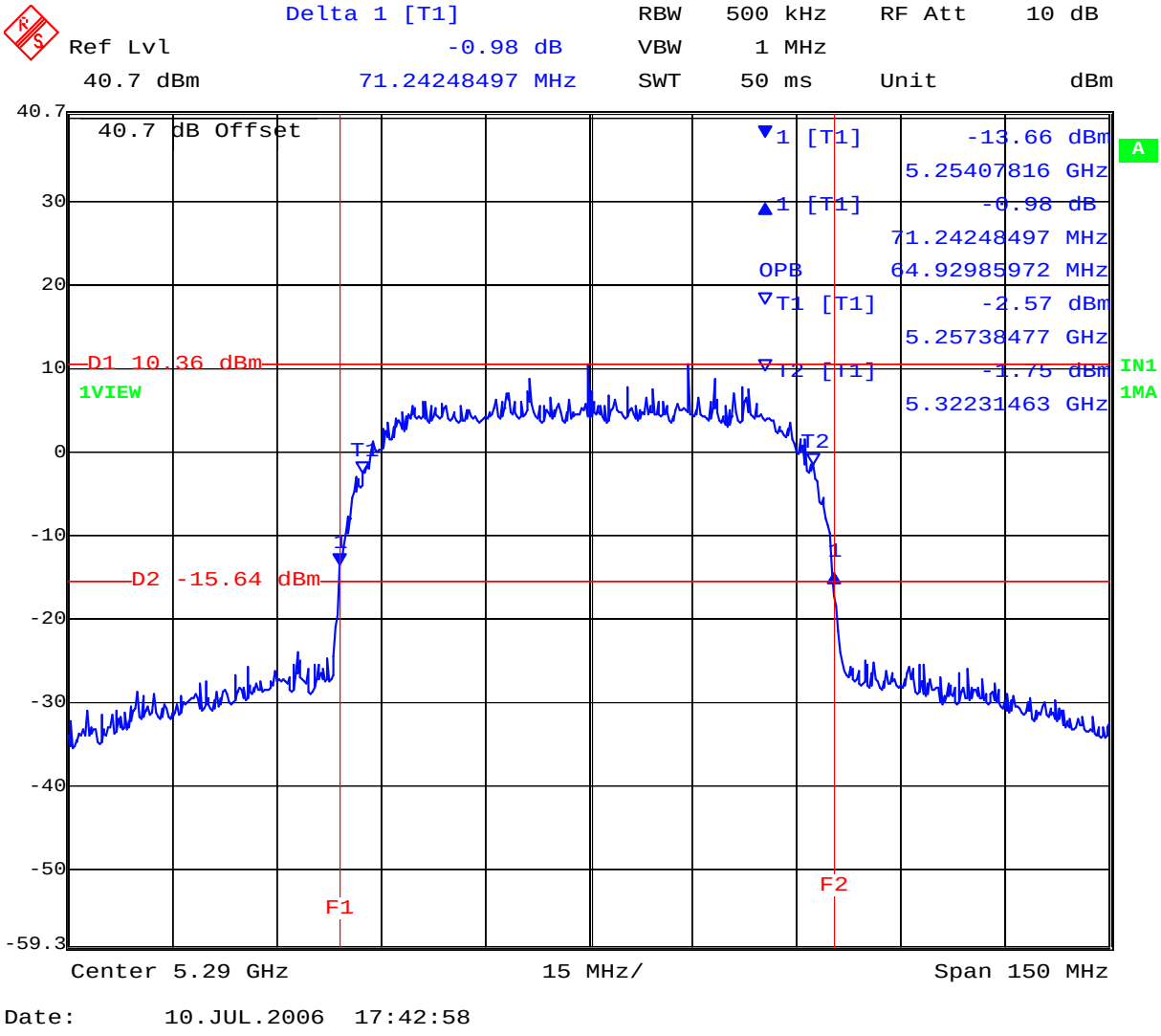
TABLE OF RESULTS – 5.3 GHz Band - 60 MHz Bandwidth QPSK

Center Frequency (MHz)	Antenna Port #1				Antenna Port #2 Verification			
	26 dB BW (MHz)	26 dB Plot #	99 % BW (MHz)	99 % BW Plots	26 dB BW (MHz)	26 dB Plot #	99 % BW (MHz)	99 % BW Plots
5,290	70.9919	04	64.7294	04	71.242	04a	64.930	04a

Plot 04
5,290 MHz 60 MHz QPSK 26 dB and 99% Bandwidth



Plot 04a Port 2 Verification
5,290 MHz 60 MHz QPSK 26 dB and 99% Bandwidth



Specification

Limits

FCC, Part 15 §15.407 (a)(2) and Industry Canada RSS-210 § A9.2(2)

For the 5.25-5.35 GHz band the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26 dB emission bandwidth in megahertz. In addition, the peak power spectral density shall not exceed 11 dBm in any 1 megahertz band.

Industry Canada RSS-Gen 4.4

When an occupied bandwidth value is not specified in the applicable RSS, the transmitted signal bandwidth to be reported is to be its 99% emission bandwidth, as calculated or measured.

Laboratory Measurement Uncertainty for Spectrum Measurement

Measurement uncertainty	±2.81 dB

Traceability

Method	Test Equipment Used
Measurements were made per work instruction WI-03 'Measurement of RF Spectrum Mask'	0158, 0193, 0252, 0313, 0314, 0070, 0116, 0117

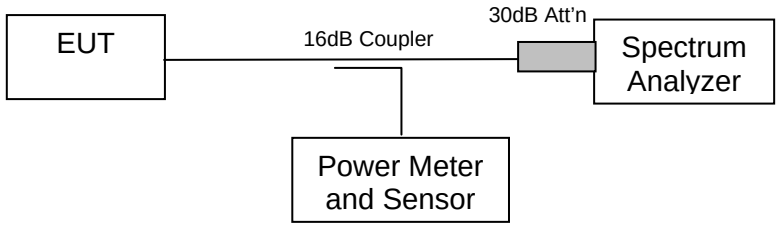
5.1.2. Peak Output Power

FCC, Part 15 Subpart C §15.407(a)
Industry Canada RSS-210 §9.9(2)
Industry Canada RSS-Gen 4.6

Test Procedure
The Peak Output Power is measured with the transmit power set to maximum and connecting the input of the power meter and sensor to each of the EUT's two antenna ports in turn. The measurement results included all associated offsets.

Measurements were made while EUT was operating in a continuous transmission mode i.e. 100 % duty cycle at the appropriate center frequency.

Test Measurement Set up



Measurement set up for Transmitter Peak Output Power

§15.407(a)(2)

For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or 11 dBm + 10log B, where B is the 26 dB emission bandwidth in megahertz.

Maximum Transmit Power

Limit 5250 – 5350: Lesser of 250 mW (+24dBm) or 11 + 10 Log (B) dBm

BW (MHz)	Maximum 26 dB Bandwidth (MHz)	Calculation of Limit 11 + 10 Log (B) (dBm)	Limit (dBm)
7.5	9.0681	+20.57	+20.57
15	18.1363	+23.58	+23.58
30	36.0721	+26.57	+24.00
60	70.9920	+29.51	+24.00

Antenna Gain - Maximum Permissible Peak Transmit Power

If transmitting antennas of directional gain greater than 6 dBi are used, the maximum conducted output power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Antenna Type	Gain (dBi)	Bandwidth (MHz)	Antenna Gain >6dBi (dB)	Max. Allowable Conducted Power Pwr Per Antenna port (dBm)	Number of Antenna ports	Max. EIRP (dBm)
Single Polarized Patch Panel	28	7.5	22	20.57-22 = -1.43	One	+26.57
		15		23.58-22 = +1.58		+29.58
		30 & 60		24 – 22 = +2		+30.00
Dual Polarized Parabolic Antenna	37.5	7.5	31.5	20.57-31.5 - 3 = -13.93	Two	+26.57
		15		23.58-31.5 – 3 = -10.92		+29.58
		30 & 60		24 – 31.5 -3 = -10.50		+30.00
Dual Polarized Integral Panel (Ref Appendix A)	20.0	7.5	14	20.57-14 – 3 =+3.57	Two	+26.57
		15		23.58-14 - 3 =+6.58		+29.58
		30 & 60		24 - 14 -3 = +7.0		+30.0

Radio parameters.
Power Level: maximum
Duty Cycle: 100% (test mode)

Measurement Results for Peak Output Power

Ambient conditions.
Temperature: 17 to 23 °C Relative humidity: 31 to 57 % Pressure: 999 to 1012 mbar

TABLE OF RESULTS – 5.3 GHz Band - 7.5 MHz Bandwidth QPSK

Center Frequency (MHz)	Antenna Port #1			Antenna Port #2		
	Peak Power (dBm)	Limit (dBm)	Margin (db)	Peak Power (dBm)	Limit (dBm)	Margin (dB)
5,260	+19.49	+20.57	-1.08	+18.12	+20.57	-2.45
5,296	+20.06	+20.57	-0.51	+18.29	+20.57	-2.28
5,332	+20.27	+20.57	-0.30	+18.68	+20.57	-1.89

TABLE OF RESULTS – 5.3 GHz Band - 15 MHz Bandwidth QPSK

Center Frequency (MHz)	Antenna Port #1			Antenna Port #2		
	Peak Power (dBm)	Limit (dBm)	Margin (db)	Peak Power (dBm)	Limit (dBm)	Margin (dB)
5,265	+19.67	+23.58	-3.91	+18.29	+23.58	-5.29
5,296	+20.11	+23.58	-3.47	+18.36	+23.58	-5.22
5,327	+20.32	+23.58	-3.26	+18.75	+23.58	-4.83

TABLE OF RESULTS – 5.3 GHz Band - 30 MHz Bandwidth QPSK

Center Frequency (MHz)	Antenna Port #1			Antenna Port #2		
	Peak Power (dBm)	Limit (dBm)	Margin (db)	Peak Power (dBm)	Limit (dBm)	Margin (dB)
5,272	+19.66	+24.00	-4.34	+18.28	+24.00	-5.72
5,290	+19.92	+24.00	-4.08	+18.33	+24.00	-5.67
5,308	+20.08	+24.00	-3.92	+18.45	+24.00	-5.55

TABLE OF RESULTS – 5.3 GHz Band - 60 MHz Bandwidth QPSK

Center Frequency (MHz)	Antenna Port #1			Antenna Port #2		
	Peak Power (dBm)	Limit (dBm)	Margin (db)	Peak Power (dBm)	Limit (dBm)	Margin (dB)
5,290	+19.14	+24.00	-4.86	+17.61	+24.00	-6.39

Specification

Limits

FCC, Part 15 §15.407 (a)(2) and Industry Canada RSS-210 § A9.2(2)

For the 5.25-5.35 GHz band the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26 dB emission bandwidth in megahertz. In addition, the peak power spectral density shall not exceed 11 dBm in any 1 megahertz band.

Industry Canada RSS-Gen 4.4

When an occupied bandwidth value is not specified in the applicable RSS, the transmitted signal bandwidth to be reported is to be its 99% emission bandwidth, as calculated or measured.

Laboratory Measurement Uncertainty for Power Measurements

Measurement uncertainty	±1.33 dB

Traceability

Method	Test Equipment Used
Measurements were made per work instruction WI-01 'Measuring RF Output Power'	0158, 0193, 0252, 0313, 0314, 0070, 0116, 0117

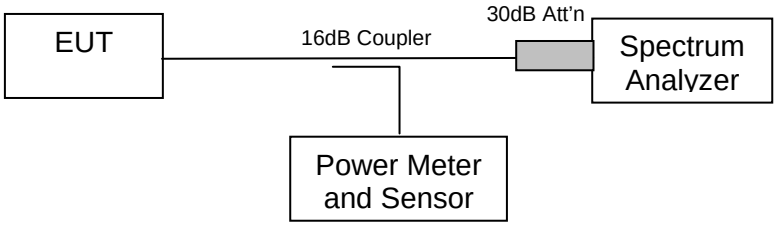
5.1.3. Peak Power Spectral Density

FCC, Part 15 Subpart C §15.407(a)
Industry Canada RSS-210 § A9.2(2)

Test Procedure

The Peak Power Spectral Density is measured with the transmit power set to maximum and a spectrum analyzer connected to each of the EUT's two antenna ports in turn. The maximum level in a 3 kHz bandwidth was measured. A peak value was found over the full emission bandwidth and the frequency span reduced to obtain enhanced resolution. The Peak Power Spectral Density is the highest level found across the emission in a 1 MHz resolution bandwidth.

Test Measurement Set up



Measurement set up for Peak Power Spectral Density

Antenna Gain - Maximum Permissible Peak Power Spectral Density

If transmitting antennas of directional gain greater than 6 dBi are used, the maximum conducted output power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. The peak power spectral density (in the 5250 – 5350 MHz frequency band) shall nbot exceed + 11 dBm in any 1 MHz band.

Antenna Type	Gain (dBi)	Antenna Gain >6dBi (dB)	Number of Antenna ports	Max. Allowable Peak Power Spectral Density per Antenna port (dBm)
Single Polarized Patch Panel	28	22	One	11 – 22 = -11.0
Dual Polarized Parabolic Antenna	37.5	31.5	Two	11 – 31.5 - 3 = -23.5
Dual Polarized Integral Panel (Ref Appendix A)	20.0	14	Two	11 – 14 - 3 = -6

Measurement Results for Peak Power Spectral Density

Ambient conditions.
Temperature: 17 to 23 °C Relative humidity: 31 to 57 % Pressure: 999 to 1012 mbar

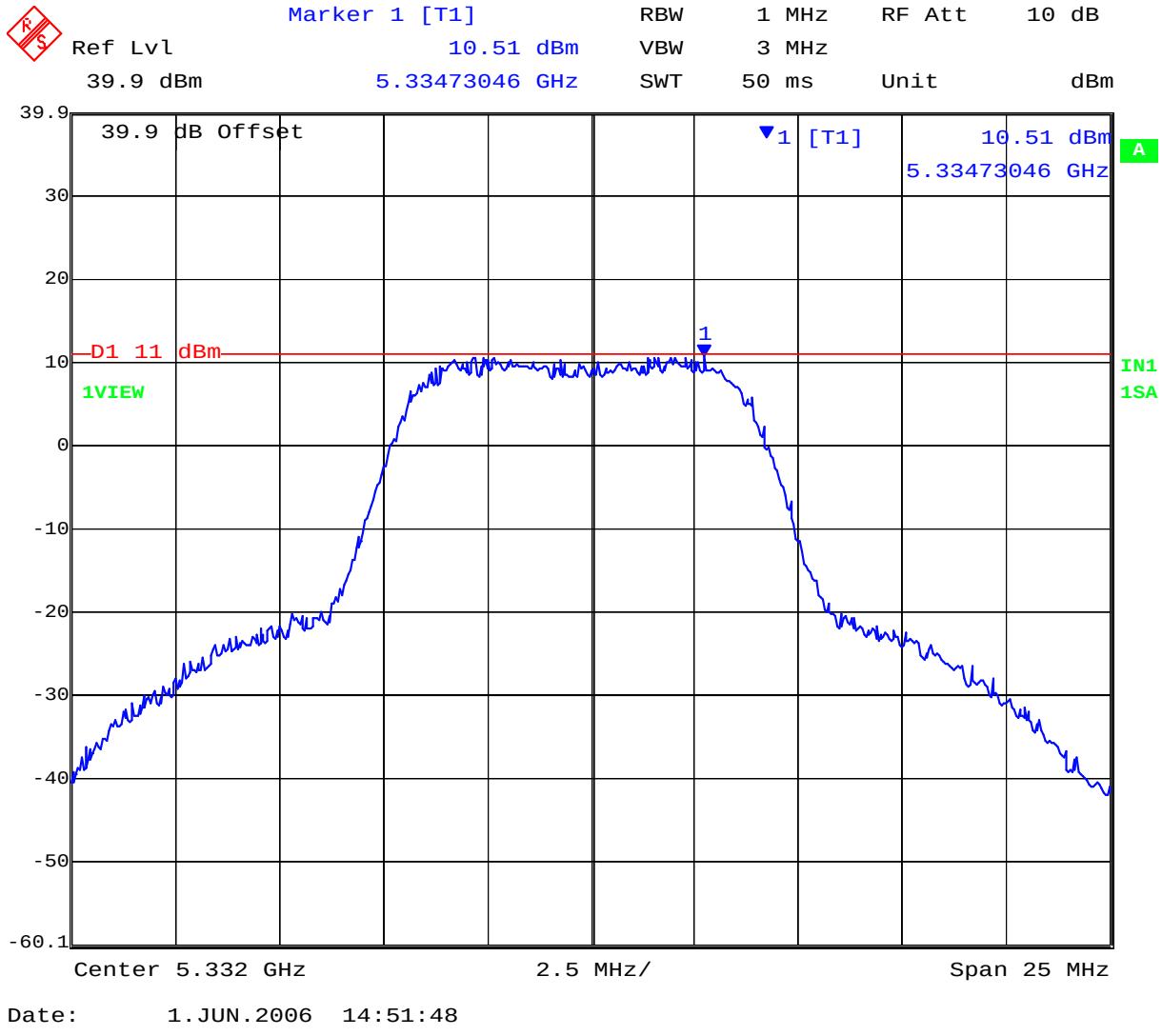
Radio parameters.
Power Level: maximum
Duty Cycle: 100% (test mode)

TABLE OF RESULTS – 5.3 GHz Band - 7.5 MHz Bandwidth QPSK

Center Freq (MHz)	Antenna Port #1			Antenna Port #2 Verification		
	Peak Freq (MHz)	PPSD (dBm)	Plot #	Peak Freq (MHz)	PPSD (dBm)	Plot #
5,260	5262.830	+10.10	On File			
5,296	5292.968	+10.44	On File			
5,332	5334.730	+10.51	05	5328.969	+10.24	05a

Plot 05

5,332 MHz 7.5 MHz Bandwidth QPSK Peak Power Spectral Density



Plot 05a Port 2 Verification

5,332 MHz 7.5 MHz Bandwidth QPSK Peak Power Spectral Density

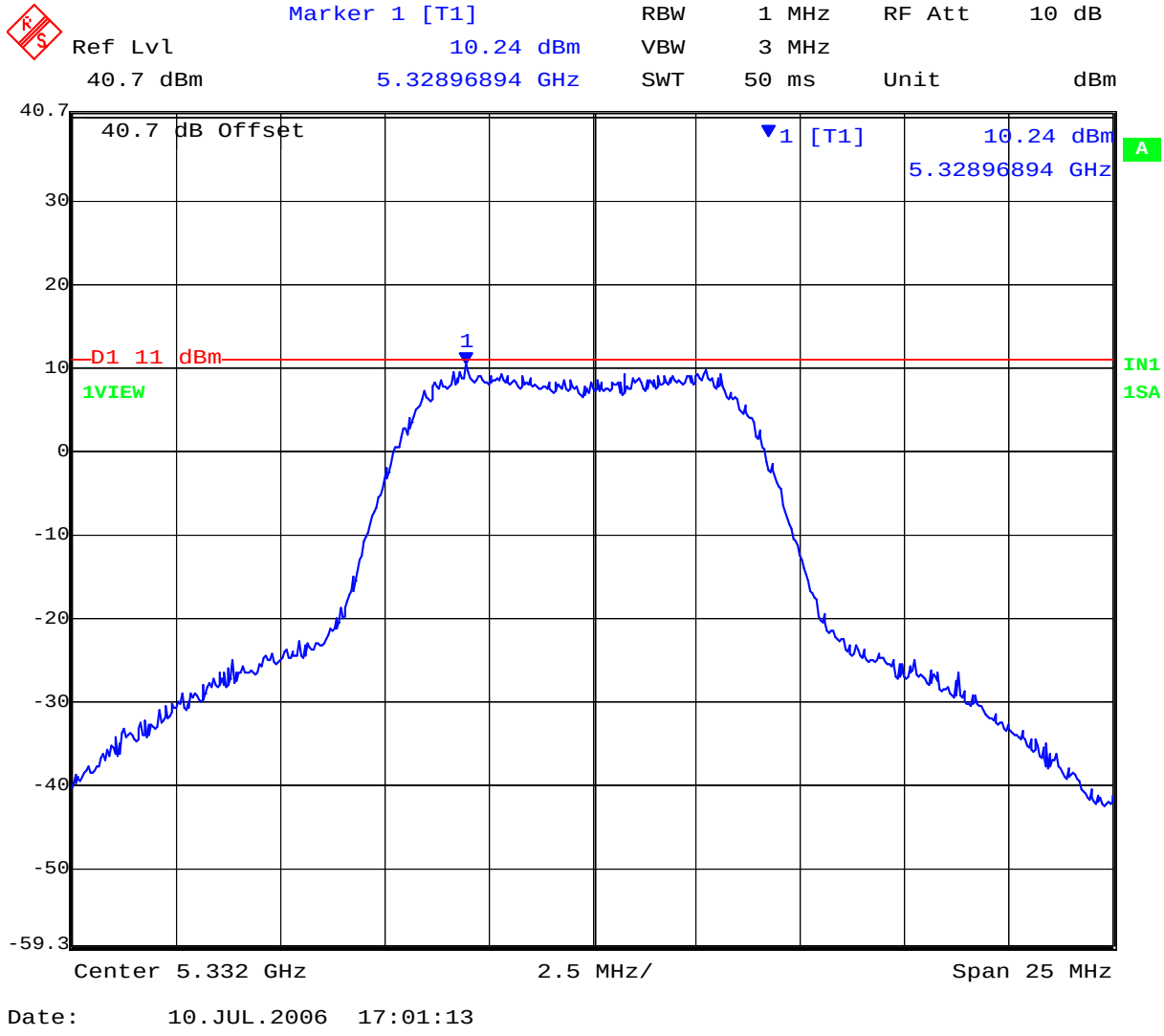
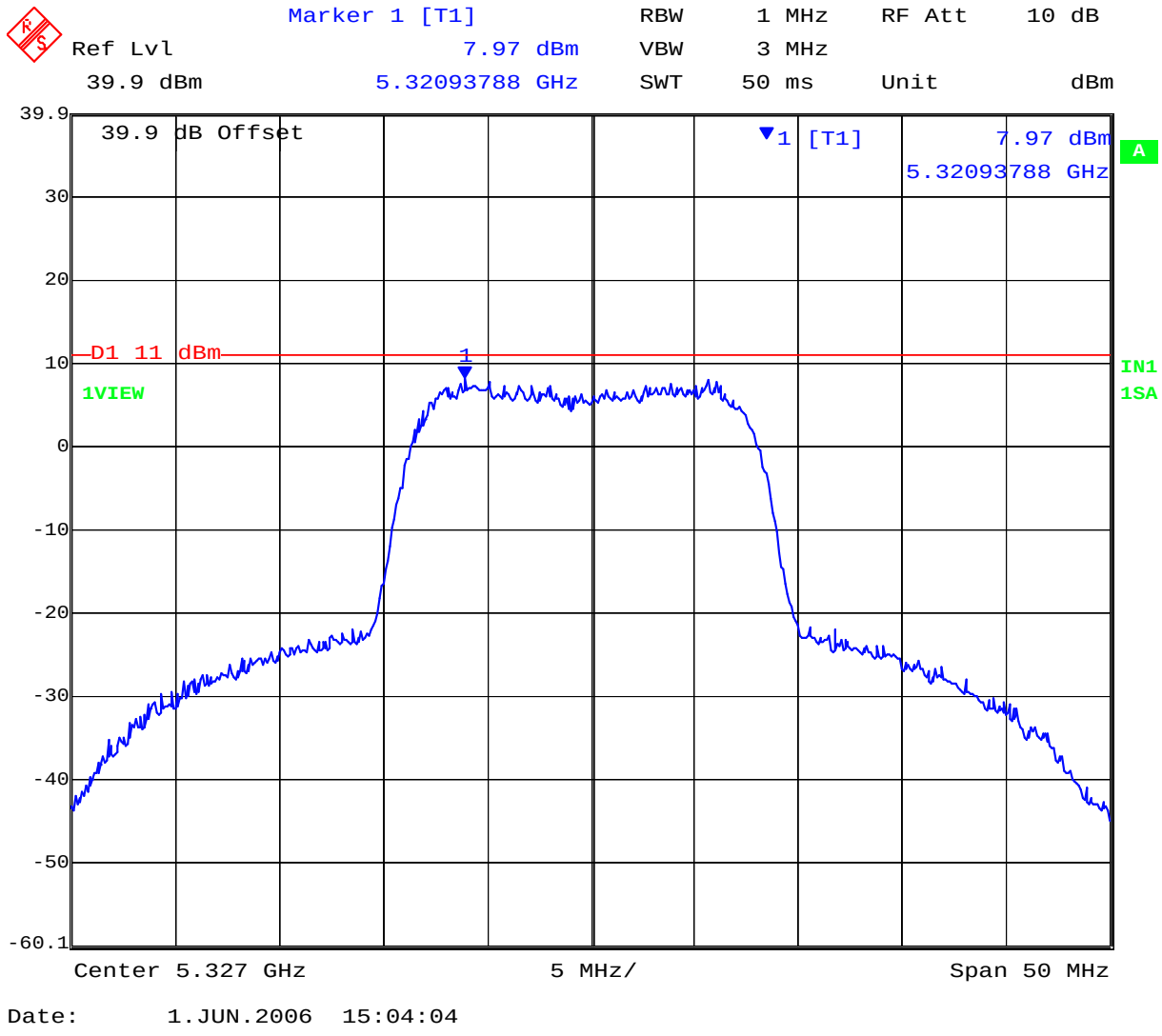


TABLE OF RESULTS – 5.3 GHz Band - 15 MHz Bandwidth QPSK

Center Freq (MHz)	Antenna Port #1			Antenna Port #2 Verification		
	Peak Freq (MHz)	PPSD (dBm)	Plot #	Peak Freq (MHz)	PPSD (dBm)	Plot #
5,265	5270.060	+7.66	On File			
5,296	5289.637	+7.45	On File			
5,327	5320.937	+7.97	06	5320.838	+6.66	06a

Plot 06

5,327 MHz 15 MHz Bandwidth QPSK Peak Power Spectral Density



Plot 06a Port 2 Verification

5,327 MHz 15 MHz Bandwidth QPSK Peak Power Spectral Density

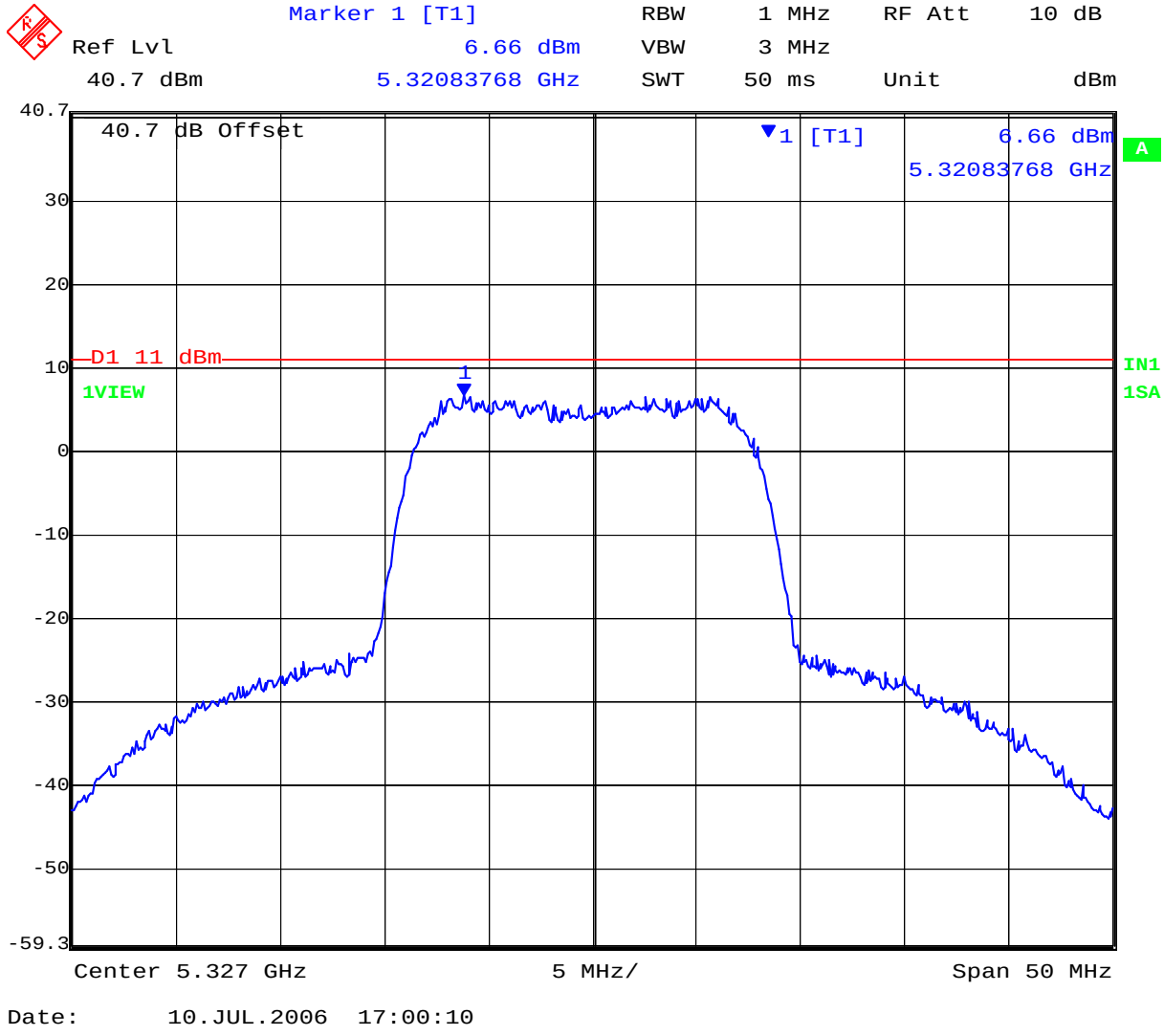
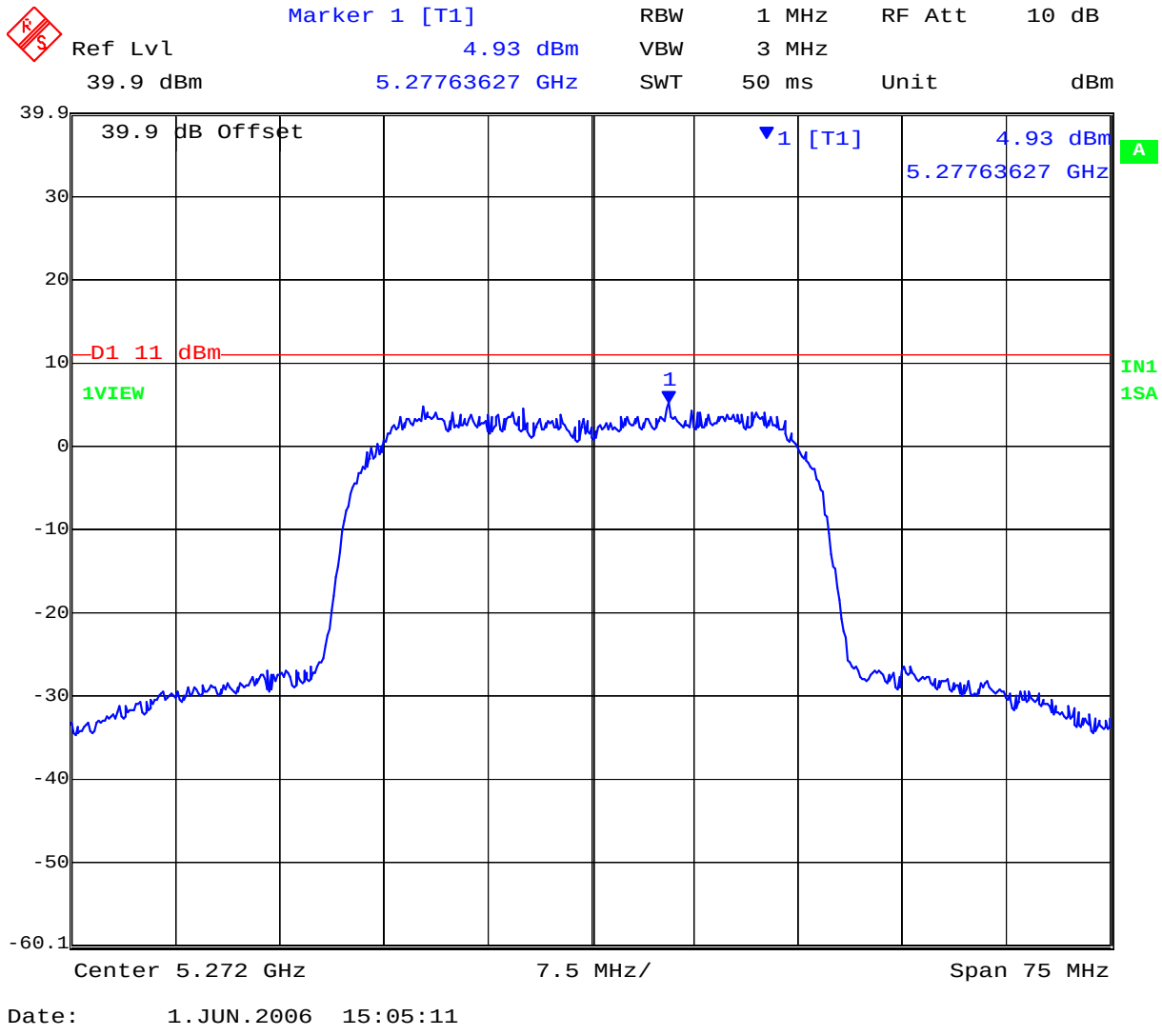


TABLE OF RESULTS – 5.3 GHz Band - 30 MHz Bandwidth QPSK

Center Freq (MHz)	Antenna Port #1			Antenna Port #2 Verification		
	Peak Freq (MHz)	PPSD (dBm)	Plot #	Peak Freq (MHz)	PPSD (dBm)	Plot #
5,272	5277.636	+4.93	07	5283.799	+3.31	07a
5,290	5298.792	+4.43	On File			
5,308	5296.051	+4.45	On File			

Plot 07

5,272 MHz 30 MHz Bandwidth QPSK Peak Power Spectral Density



Plot 07a Port 2 Verification

5,272 MHz 30 MHz Bandwidth QPSK Peak Power Spectral Density

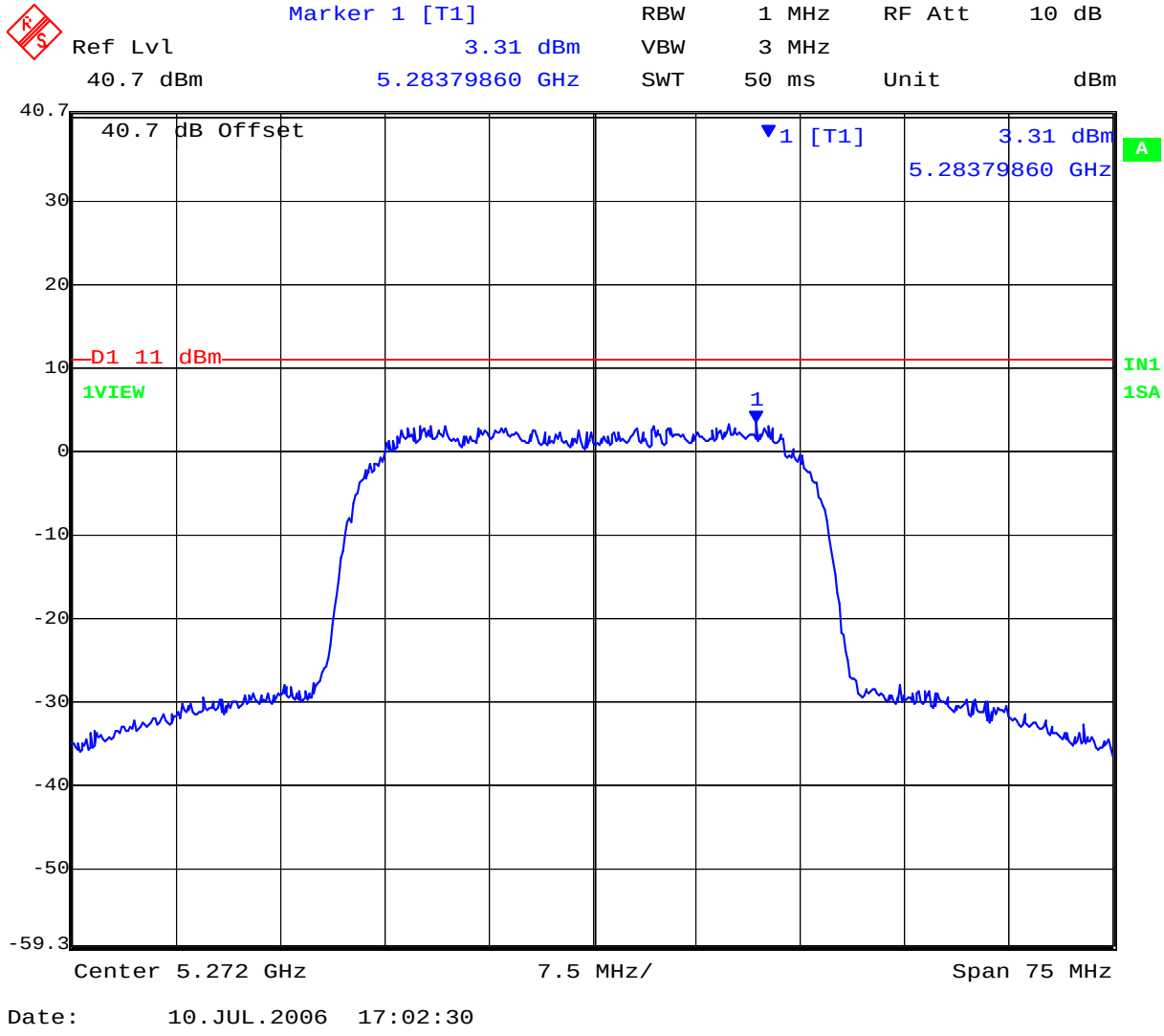
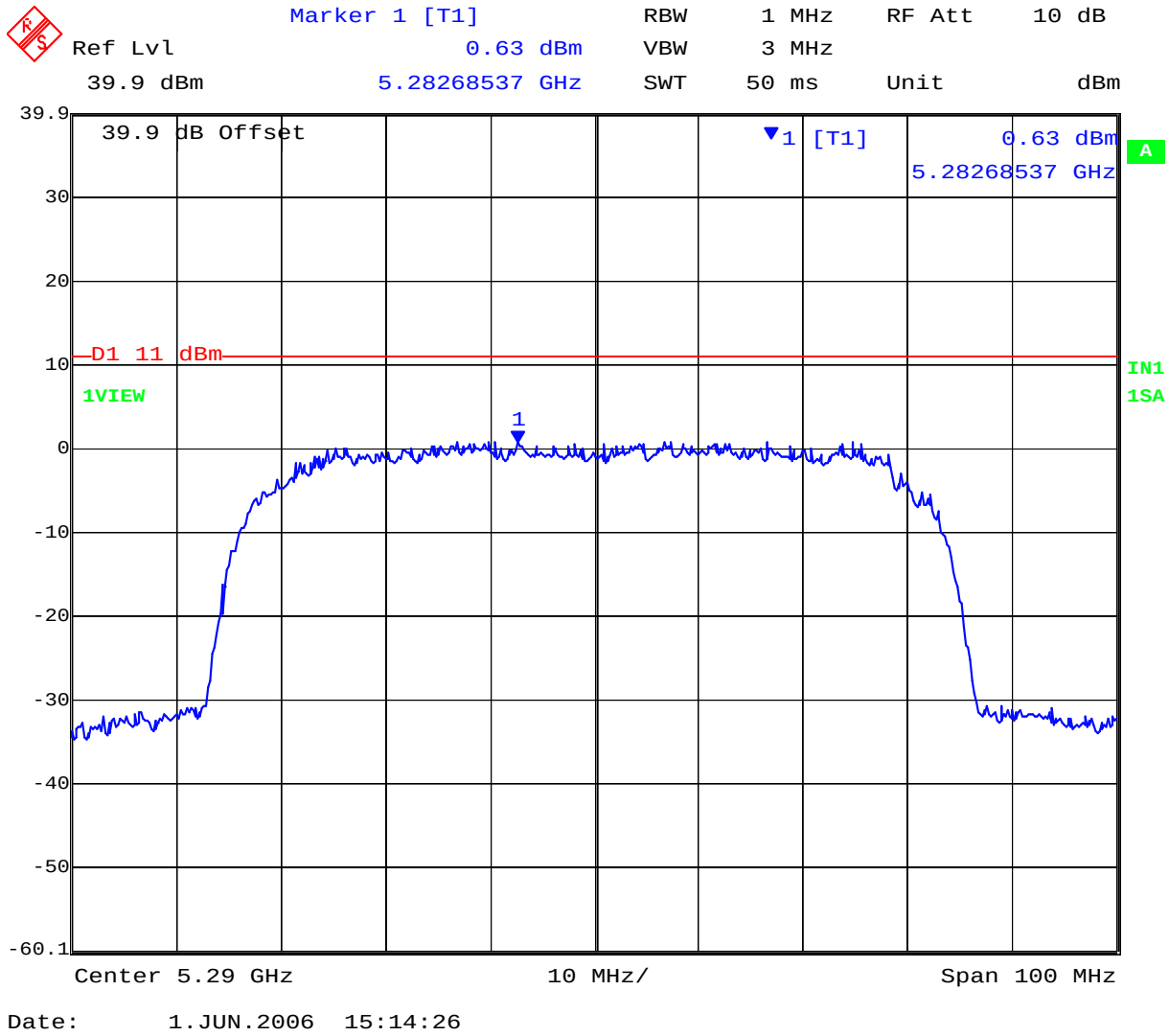


TABLE OF RESULTS – 5.3 GHz Band - 60 MHz Bandwidth QPSK

Center Freq (MHz)	Antenna Port #1			Antenna Port #2 Verification		
	Peak Freq (MHz)	PPSD (dBm)	Plot #	Peak Freq (MHz)	PPSD (dBm)	Plot #
5,290	5282.685	+0.63	08	5283.888	-0.04	08a

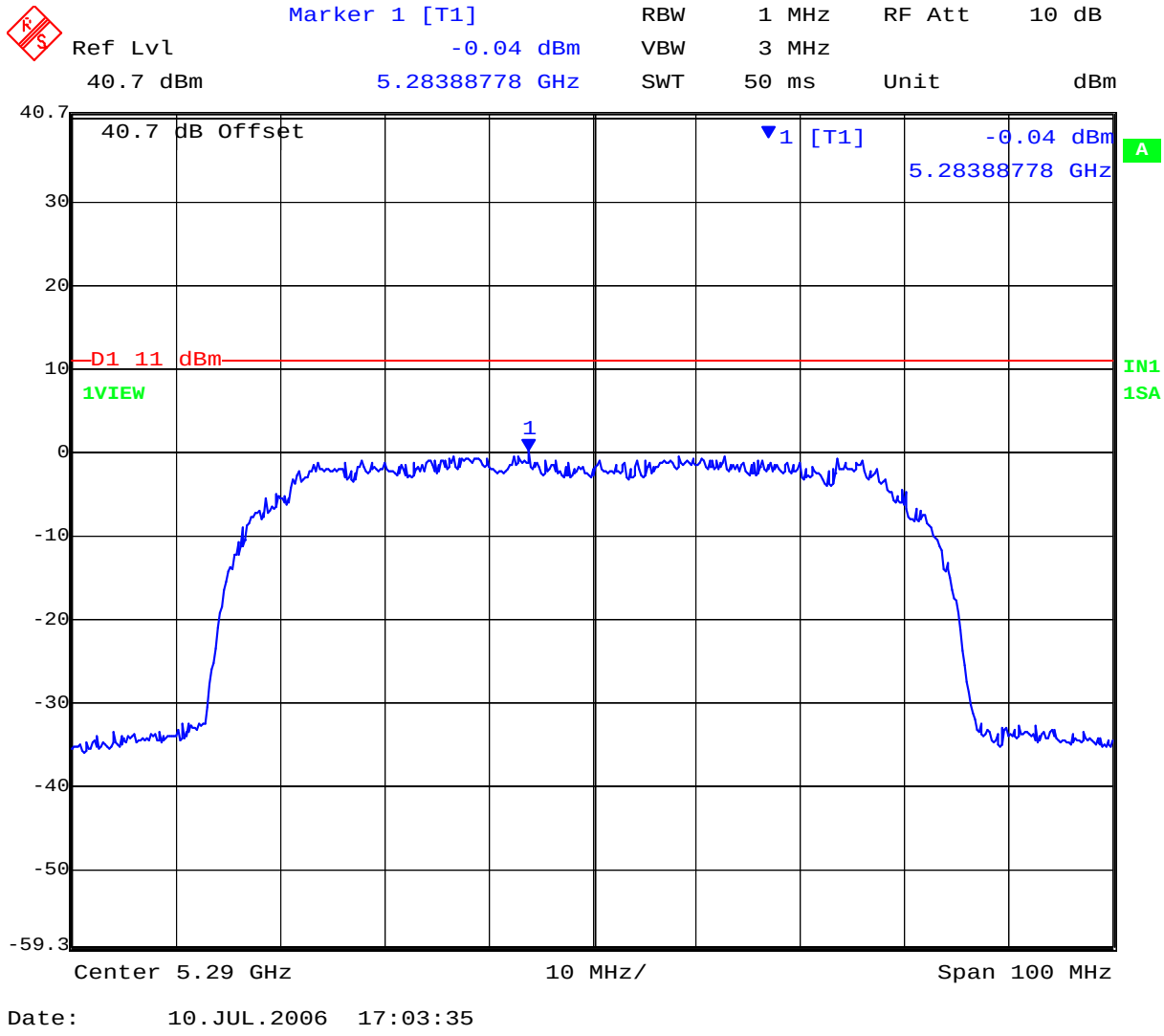
Plot 08

5,290 MHz 60 MHz Bandwidth QPSK Peak Power Spectral Density



Plot 08a Port 2 Verification

5,290 MHz 60 MHz Bandwidth QPSK Peak Power Spectral Density



Specification

FCC, Part 15 §15.407 (a)(2) and Industry Canada RSS-210 § A9.2(2)

For the 5.25-5.35 GHz band the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26 dB emission bandwidth in megahertz. In addition, the peak power spectral density shall not exceed +11 dBm in any 1 megahertz band.

Laboratory Measurement Uncertainty for Spectral Density

Measurement uncertainty	±1.33 dB

Traceability

Method	Test Equipment Used
Measurements were made per work instruction WI-01 'Measuring RF Output Power'	0158, 0193, 0252, 0313, 0314, 0070, 0116, 0117

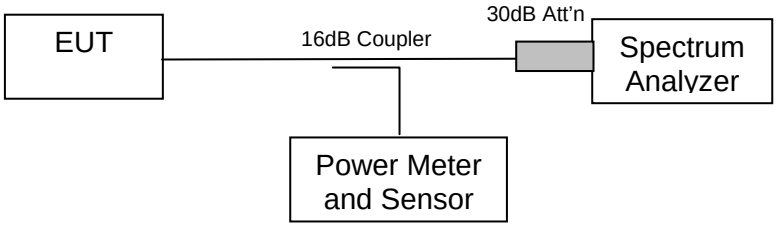
5.1.4. Peak Excursion Ratio

FCC, Part 15 Subpart C §15.407(a)(6)

Test Procedure

The Peak Excursion Ratio is measured with the transmit power set to maximum and a spectrum analyzer connected to one of the EUTs two antenna ports, while EUT is operating in transmission mode at the appropriate center frequency. Method 3 in Normative Reference (x) Section 2.1 was implemented to determine module Peak Excursion Ratio. The Peak Excursion Ratio is the difference in amplitude (dB) between the two traces.

Test Measurement Set up



Measurement set up for Peak Excursion Ratio

and a spectrum analyzer connected to each of the EUT's two antenna ports in turn

Measurement Results for Peak Excursion Ratio

Ambient conditions.
Temperature: 17 to 23 °C Relative humidity: 31 to 57% Pressure: 999 to 1012 mbar

Radio parameters.
Power Level: maximum
Duty Cycle: 100% (test mode)

TABLE OF RESULTS – 5.3 GHz Band - 7.5 MHz Bandwidth QPSK

Centre Frequency (MHz)	Peak Excursion Ratio (dB)	Plot #
5,260	9.40	On File
5,296	9.46	On File
5,332	9.57	09

Plot 09

5,332 MHz - 7.5 MHz QPSK - Peak Excursion Ratio

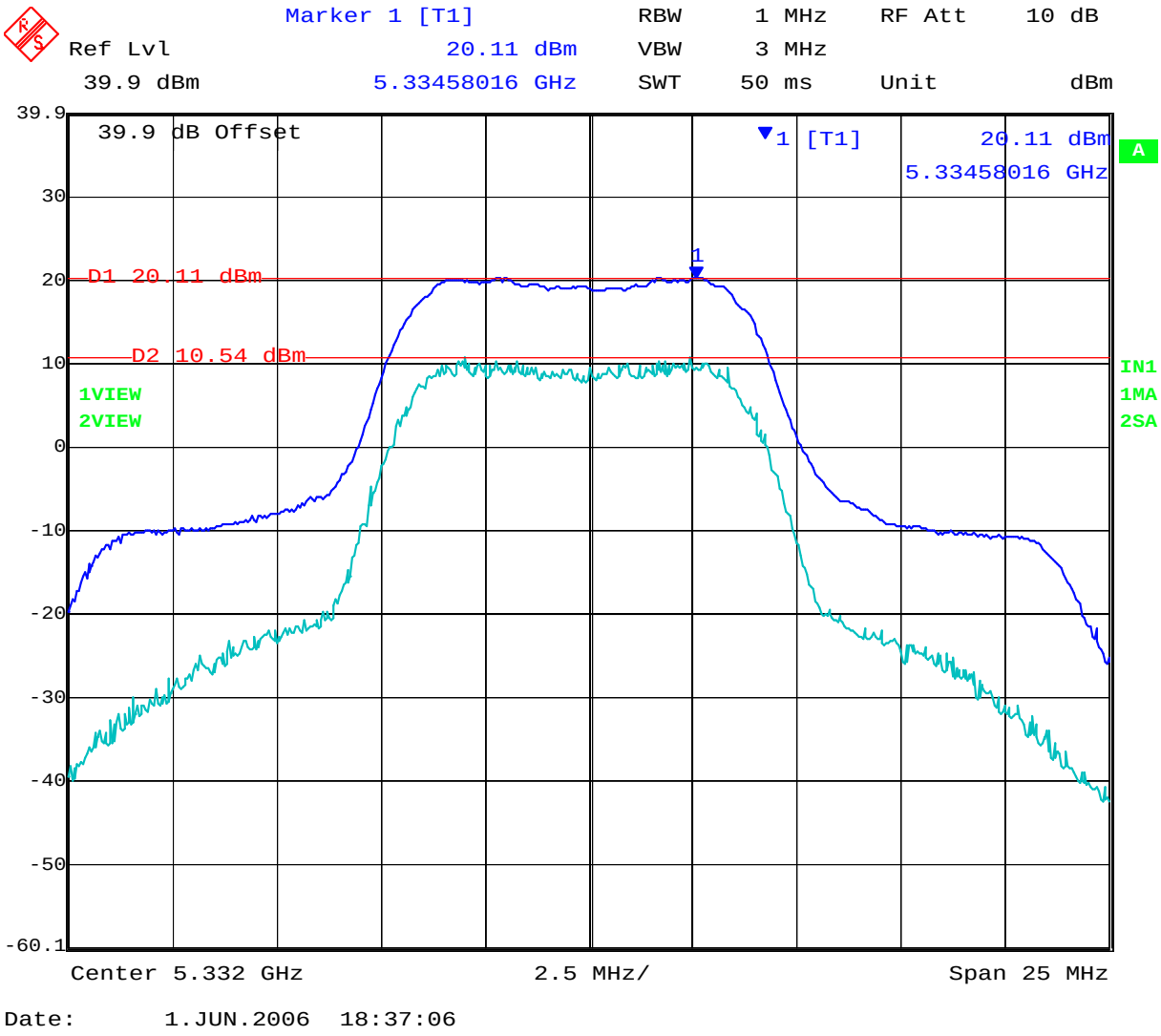


TABLE OF RESULTS – 5.3 GHz Band - 15 MHz Bandwidth QPSK

Centre Frequency (MHz)	Peak Excursion Ratio (dB)	Plot #
5,265	11.05	On File
5,296	11.27	10
5,327	10.57	On File

Plot 10

5,296 MHz - 15 MHz QPSK - Peak Excursion Ratio

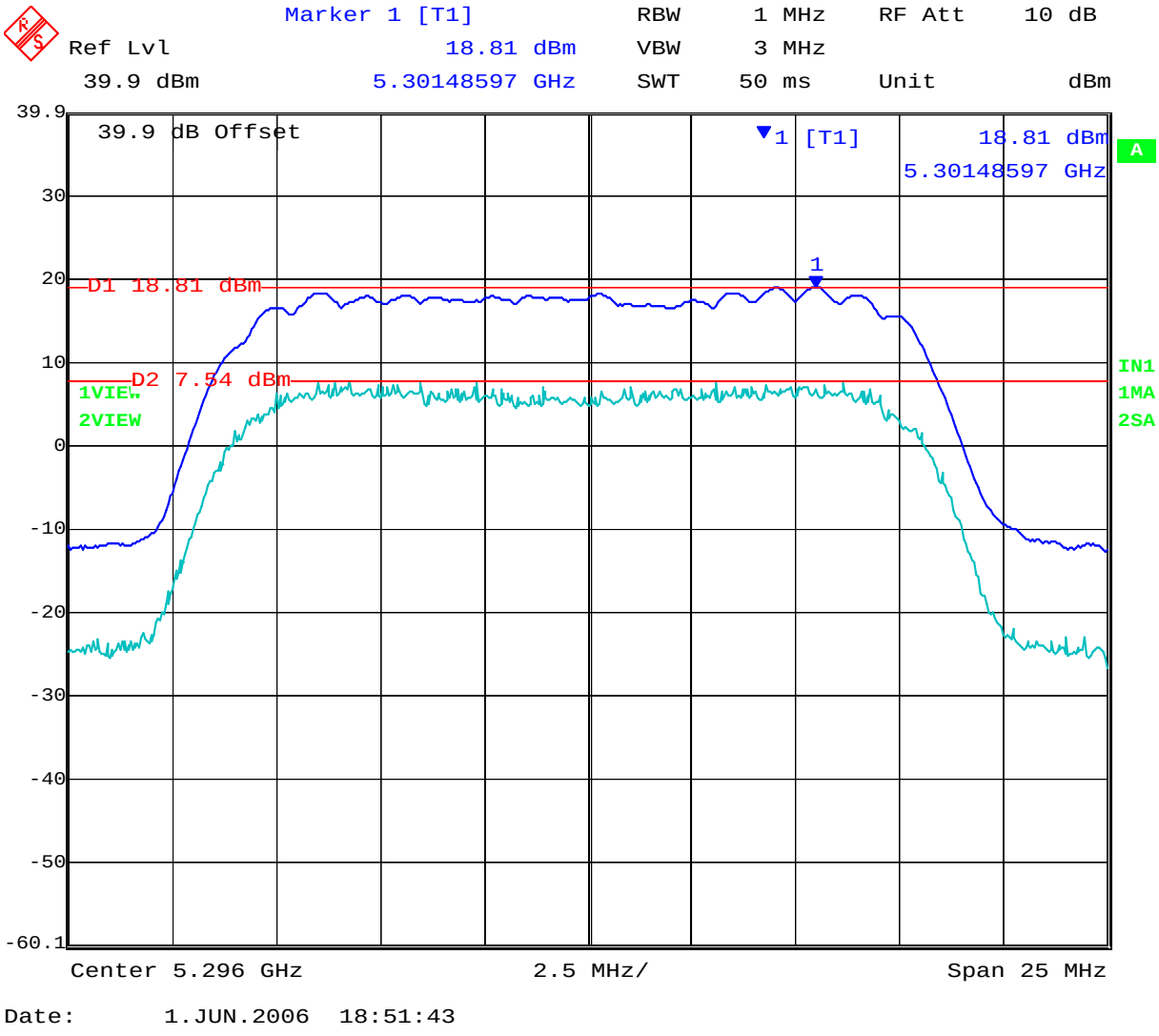


TABLE OF RESULTS – 5.3 GHz Band - 30 MHz Bandwidth QPSK

Centre Frequency (MHz)	Peak Excursion Ratio (dB)	Plot #
5,272	11.78	On File
5,290	11.97	On File
5,308	12.07	11

Plot 11

5,308 MHz - 30 MHz QPSK - Peak Excursion Ratio

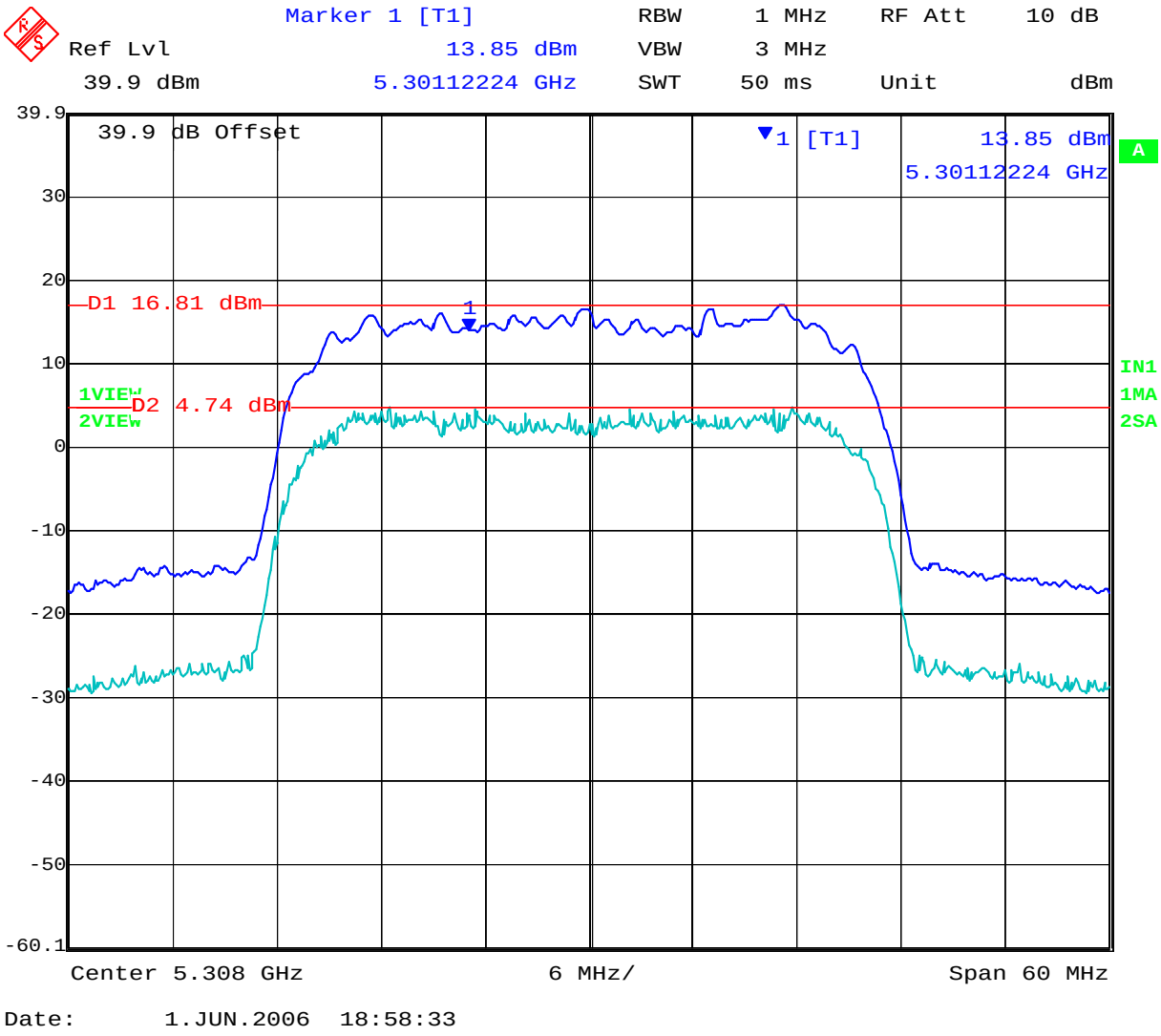
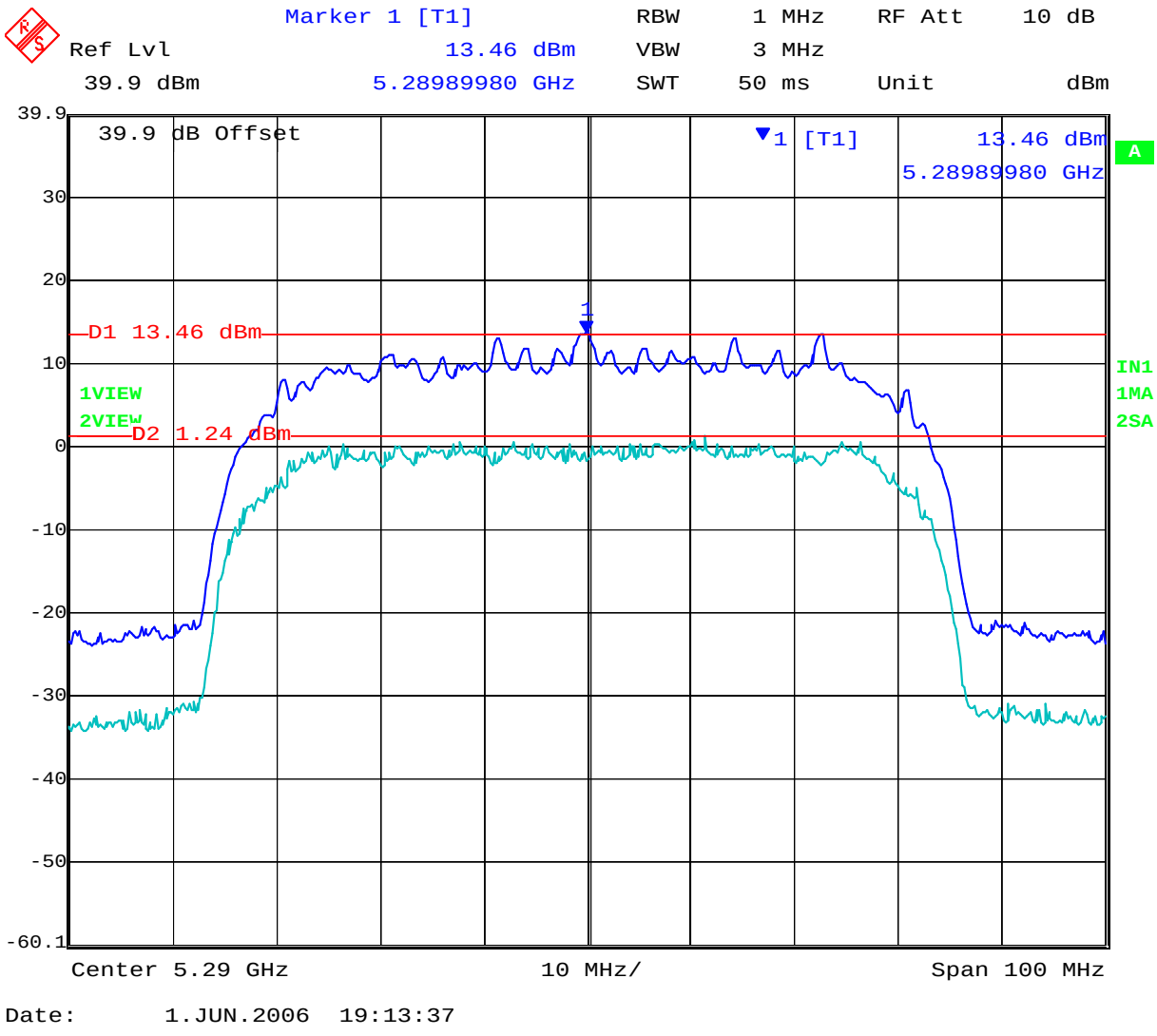


TABLE OF RESULTS – 5.3 GHz Band - 60 MHz Bandwidth QPSK

Centre Frequency (MHz)	Peak Excursion Ratio (dB)	Plot #
5,290	12.22	12

Plot 12

5,290 MHz - 60 MHz QPSK - Peak Excursion Ratio



Specification

Limits

§15.407 (a)(6) The ratio of the peak excursion of the modulation envelope (measured using a peak hold function) to the peak transmit power (measured as specified in this paragraph) shall not exceed 13dB across any 1MHz bandwidth or the emission bandwidth whichever is less

Laboratory Measurement Uncertainty for Spectrum Measurement

Measurement uncertainty	± 2.81dB

Traceability

Method	Test Equipment Used
Measurements were made per work instruction WI-03 'Measurement of RF Spectrum Mask'	0158, 0193, 0252, 0313, 0314, 0070, 0116, 0117

5.1.5. Frequency Stability

FCC, Part 15 Subpart C §15.407(g)
Industry Canada RSS-210 §2.1,§9.5(e)

Test Procedure

The manufacturer of the equipment is responsible for ensuring that the frequency stability is such that emissions are always maintained within the band of operation under all conditions.

Manufacturer Declaration

The manufacturer testifies that the frequency stability of the device is +/- 7ppm. This determination is based on the specifications of critical oscillator components in the RF transmitter stage, and these specifications have been adjusted to account for all multiplications or distortions that may occur in the upconversion process. Modulation within the EUT cannot be turned off. The center frequencies for all operational bandwidths are tuned several MHz away from the band edges to assure that out-of-band emissions are met, inclusive of any changes to frequency as a result of the frequency stability specification

The frequency stability of the reference oscillator sets the frequency stability of the RF transceiver signals. Therefore all of the RF signals should have ±7ppm stability.
This stability accounts for room temp tolerance of the crystal oscillator circuit, frequency variation across temperature, and crystal ageing.

±7ppm at 5.350 GHz translates to a maximum frequency shift of ±37.45 KHz. As the edge of the channels is at least one MHz from either of the band edges, ±37.45 KHz is more than sufficient to guarantee that the intentional emission will remain in the band over the entire operating range of the radio.
This stability accounts for room temp tolerance of the crystal oscillator circuit, frequency variation across temperature, and crystal ageing.

Specification

Limits

§15.407 (g) Manufacturers of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the user's manual.

RSS-210 §9.5(e)
The frequency stability shall be better than ±10 ppm. Alternatively, the applicant can show that the unwanted emission masks of the outermost channels are complied with when tested under all conditions of normal operation as specified in the user manual.

5.1.6. Maximum Permissible Exposure

FCC, Part 15 Subpart C §15.407(f)
Industry Canada RSS-Gen §5.5

Calculations for Maximum Permissible Exposure Levels

Power Density = Pd (mW/cm^2) = EIRP/(4πd^2)

EIRP = P * G

P = Peak output power (mW)

G = Antenna numeric gain (numeric)

d = Separation distance (cm)

Numeric Gain = 10 ^ (G (dBi)/10)

For 20 dBi (100 num.) antenna P (worst case) = +10 dBm (10 num)

For 28 dBi (631 num.) antenna P (worst case) = +2 dBm (1.585 num)

For 37.5 dBi (5623 num.) antenna P(worst case) = -7.5 dBm (0.178 num)

Because the EUT belongs to the General Population / Uncontrolled Exposure the limit of power density is 1mW/cm^2

Antenna Gain (dBi)	Single/ Dual Pole	Antenna Numeric Gain (numeric)	Peak Output Power (dBm)		Peak Output Power (mW)		Calculated Safe Distance @ 1mW/cm^2 Limit (cm)
			Ant Port #1	Ant Port #2	Ant Port #1	Ant Port #2	
20.0	Dual	100	+7.0	+7.0	5.0	5.0	8.9
28.0	Single	631	+2.0		1.6		8.9
37.5	Dual	5623	-10.5	-10.5	0.09	0.09	8.9

Specification
Maximum Permissible Exposure Limits

§15.407 (f) U-NII devices are subject to the radio frequency radiation exposure requirements specified in §1.1307 (b), 2.1091 and 2.1093 as appropriate. All equipment shall be considered to operate in a "general population/uncontrolled" environment.

Limit S = 1mW / cm^2 from 1.310 Table 1

Note: for mobile or fixed location transmitters the minimum separation distance is 20cm, even if calculations indicate the MPE distance to be less.

RSS-Gen §5.5 Before equipment certification is granted, the application requirements of RSS-102 shall be met.

Laboratory Measurement Uncertainty for Power Measurements

Measurement uncertainty	±1.33 dB

5.1.7. Radiated Emissions

Transmitter Radiated Spurious Emissions (above 1 GHz)

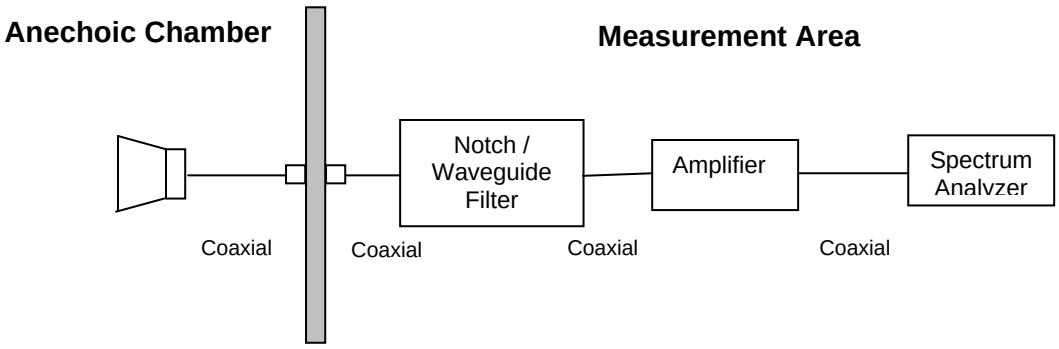
FCC, Part 15 Subpart C §15.407(b)(2), §15.205(a)/15.209(a)
Industry Canada RSS-210 §A9.3(2); §2.2; §2.6; RSS-Gen §4.7

Test Procedure

Radiated emissions above 1 GHz are measured in the anechoic chamber at a 3-meter distance on every azimuth in both horizontal and vertical polarities. The emissions are recorded and maximized as a function of azimuth by rotation through 360° with a spectrum analyzer in peak hold mode. Depending on the frequency band spanned a notch filter and waveguide filter was used to remove the fundamental frequency. The highest emissions relative to the limit are listed for each frequency spanned.

All measurements on any frequency or frequencies over 1 MHz are based on the use of measurement instrumentation employing an average detector function. All measurements above 1 GHz were performed using a minimum resolution bandwidth of 1 MHz.

Test Measurement Set up



Measurement set up for Radiated Emission Test

Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Loss, and subtracting Amplifier Gain from the measured reading. All factors are included in the reported data.

FS = R + AF + CORR - FO

where: FS = Field Strength
R = Measured Spectrum analyzer Input Amplitude
AF = Antenna Factor
CORR = Correction Factor = CL – AG + NFL
CL = Cable Loss
AG = Amplifier Gain
FO = Distance Falloff Factor
NFL = Notch Filter Loss or Waveguide Loss

For example:
Given receiver input reading of 51.5 dBμV; Antenna Factor of 8.5 dB; Cable Loss of 1.3 dB; Falloff Factor of 0 dB, an Amplifier Gain of 26 dB and Notch Filter Loss of 1 dB. The Field Strength of the measured emission is:

FS = 51.5 + 8.5 + 1.3 - 26.0 +1 = 36.3 dBμV/m

Conversion between dBμV/m (or dBμV) and μV/m (or μV) are done as:

Level (dBμV/m) = 20 * Log (level (μV/m))

40 dBμV/m = 100 μV/m
48 dBμV/m = 250 μV/m

The following formula is used to convert the equipment isotropic radiated power (eirp) to field strength

$E = 1000000 \times \sqrt{30P} / 3$ μV/m, where P is the EIRP in Watts

Therefore: -27 dBm/MHz = 68.23 dBuV/m

Measurement Results Transmitter Radiated Spurious Emissions above 1 GHz

The following table describes the two configurations of equipment that were tested for radiated emissions.

Radio parameters.
Duty Cycle: 100% (test mode)
Power Level: As specified by the following matrix, see Section 5.1.2 Peak Output Power

Antenna Configuration	EUT Configuration	BW (MHz)	Number of Antenna ports	Max. Allowable Conducted Pwr Per Antenna port (dBm)	
				Antenna port #1	Antenna port #2
28 dBi Single Polarized Patch Panel	One antenna port connected to a single pole external antenna.	7.5	One	-1.43	
		15		+1.58	
		30 & 60		+2.00	
37.5 dBi Dual Polarized Parabolic Antenna	Two antenna ports, dual polarized radio, operating on the same frequency with a coherent transmitter on both polarizations, into an external dual-polarized antenna.	7.5	Two	-13.93	-13.93
		15		-10.92	-10.92
		30 & 60		-10.50	-10.50

Measurement Results Transmitter Radiated Spurious Emissions above 1 GHz

Ambient conditions.
Temperature: 17 to 23°C Relative humidity: 31 to 57 % Pressure: 999 to 1012 mbar

TABLE OF RESULTS – 5,332 MHz 28 dBi Antenna 7.5 MHz Bandwidth QPSK

Freq. (MHz)	Pol. (H/V)	Measurement Type Peak/Avg	Field Strength (dBµV/m)	RB/ NRB	Limit (dBµV/m)	Margin (dB)

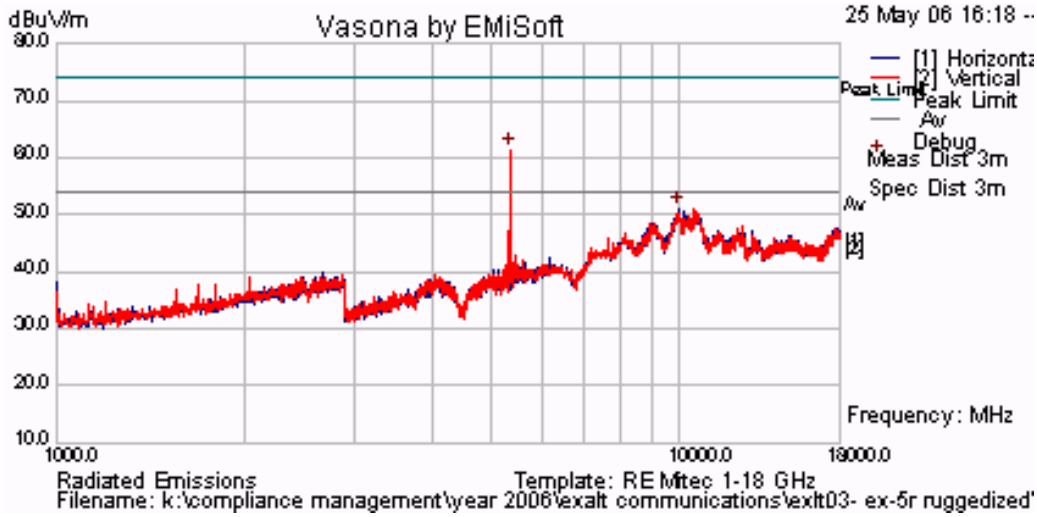
RB - Restricted Band / NRB – Non-Restricted Band.

Note. The peak emission shown in the graph below is fundamental breaking through the notch filter.

Worst case plot shown for 7.5 MHz Bandwidth QPSK Modulation. All other results for this bandwidth are held on file.

Plot 13

5,332 MHz Radiated Emissions for 28 dBi Antenna 7.5 MHz Bandwidth QPSK



Radiated Spurious Emissions above 1 GHz (continued)

TABLE OF RESULTS – 5,327 MHz 28 dBi Antenna 15 MHz Bandwidth QPSK

Freq. (MHz)	Pol. (H/V)	Measurement Type Peak/Avg	Field Strength (dBµV/m)	RB/ NRB	Limit (dBµV/m)	Margin (dB)

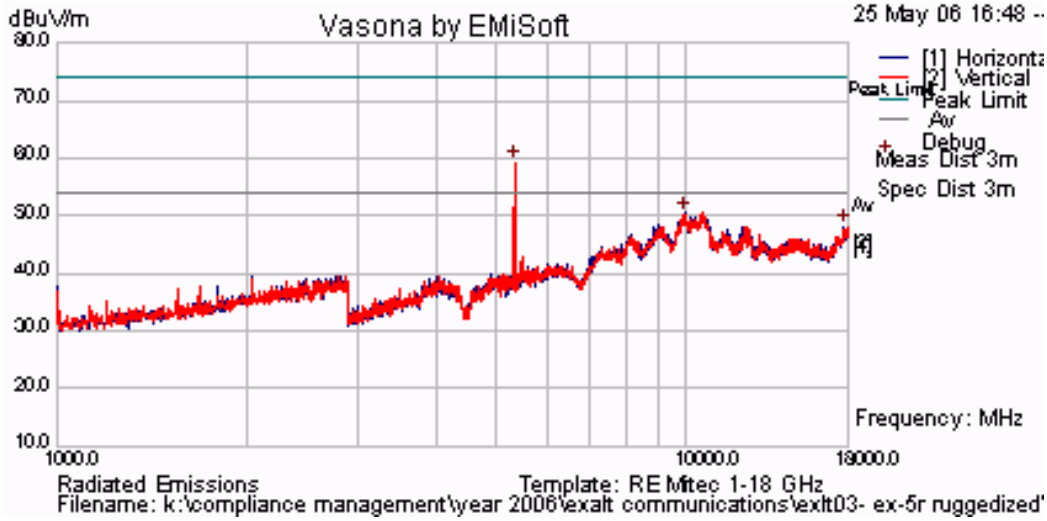
RB - Restricted Band / NRB – Non-Restricted Band.

Note. The peak emission shown in the graph below is fundamental breaking through the notch filter.

Worst case plot shown for 15 MHz Bandwidth QPSK Modulation. All other results for this bandwidth are held on file.

Plot 14

5,327 MHz Radiated Emissions for 28 dBi Antenna 15 MHz Bandwidth QPSK



Radiated Spurious Emissions above 1 GHz (continued)

TABLE OF RESULTS – 5,290MHz 28 dBi Antenna 30 MHz Bandwidth QPSK

Freq. (MHz)	Pol. (H/V)	Measurement Type Peak/Avg	Field Strength (dBμV/m)	RB/ NRB	Limit (dBμV/m)	Margin (dB)
9990	H	Peak	52.49	NRB	54	-1.51

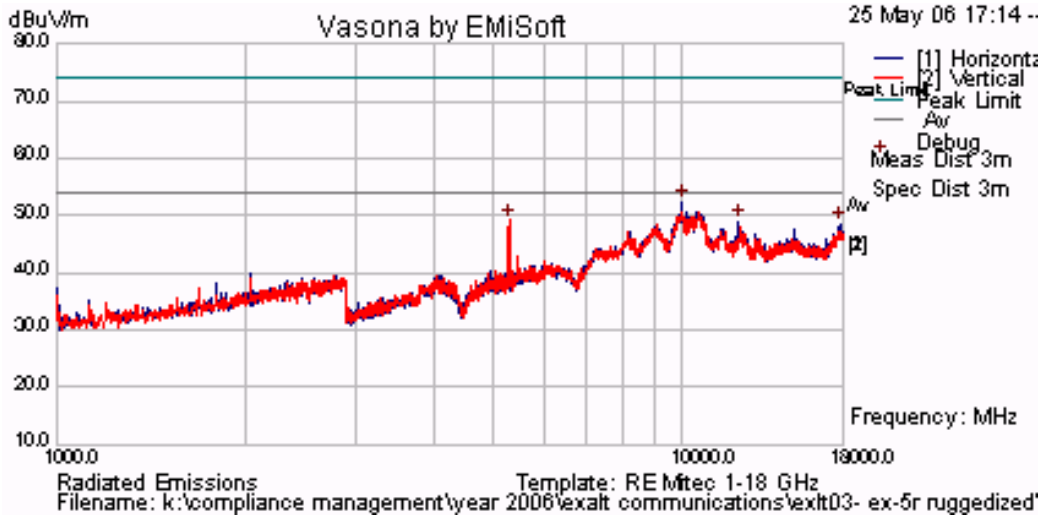
RB - Restricted Band / NRB – Non-Restricted Band.

Note. The peak emission shown in the graph below is fundamental breaking through the notch filter. As no peak emissions were greater that the Average Limit (54 dBμV/m) peak emission are reported in the above matrix

Worst case plot shown for 30 MHz Bandwidth QPSK Modulation. All other results for this bandwidth are held on file.

Plot 15

5,290 MHz Radiated Emissions for 28 dBi Antenna 30 MHz Bandwidth QPSK



Radiated Spurious Emissions above 1 GHz (continued)

TABLE OF RESULTS – 5,290 MHz 28 dBi Antenna 60 MHz Bandwidth QPSK

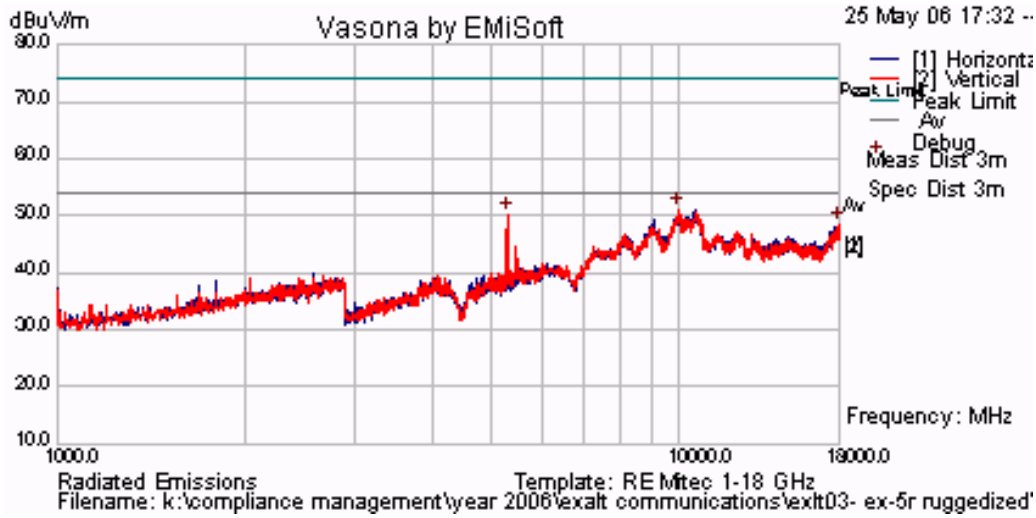
Freq. (MHz)	Pol. (H/V)	Measurement Type Peak/Avg	Field Strength (dBµV/m)	RB/ NRB	Limit (dBµV/m)	Margin (dB)

RB - Restricted Band / NRB – Non-Restricted Band.

Note. No emissions were observed above the limit.

Plot 16

5,290 MHz Radiated Emissions for 28 dBi Antenna 60 MHz Bandwidth QPSK



Radiated Spurious Emissions above 1 GHz (continued)

TABLE OF RESULTS – 5,332 MHz 37.5 dBi Antenna 7.5 MHz Bandwidth QPSK

Freq. (MHz)	Pol. (H/V)	Measurement Type Peak/Avg	Field Strength (dBµV/m)	RB/ NRB	Limit (dBµV/m)	Margin (dB)

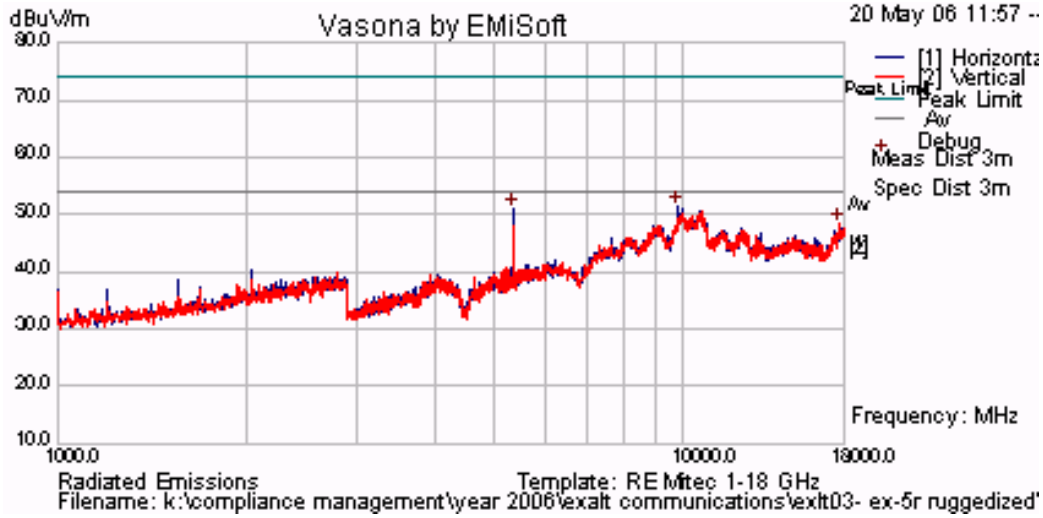
RB - Restricted Band / NRB – Non-Restricted Band.

No emissions were observed above the limit.

Worst case plot shown for 7.5 MHz Bandwidth QPSK Modulation. All other results for this bandwidth are held on file.

Plot 17

5,332 MHz Radiated Emissions for 37.5 dBi Antenna 7.5 MHz Bandwidth QPSK



Radiated Spurious Emissions above 1 GHz (continued)

TABLE OF RESULTS – 5,327 MHz 37.5 dBi Antenna 15 MHz Bandwidth QPSK

Freq. (MHz)	Pol. (H/V)	Measurement Type Peak/Avg	Field Strength (dBµV/m)	RB/ NRB	Limit (dBµV/m)	Margin (dB)

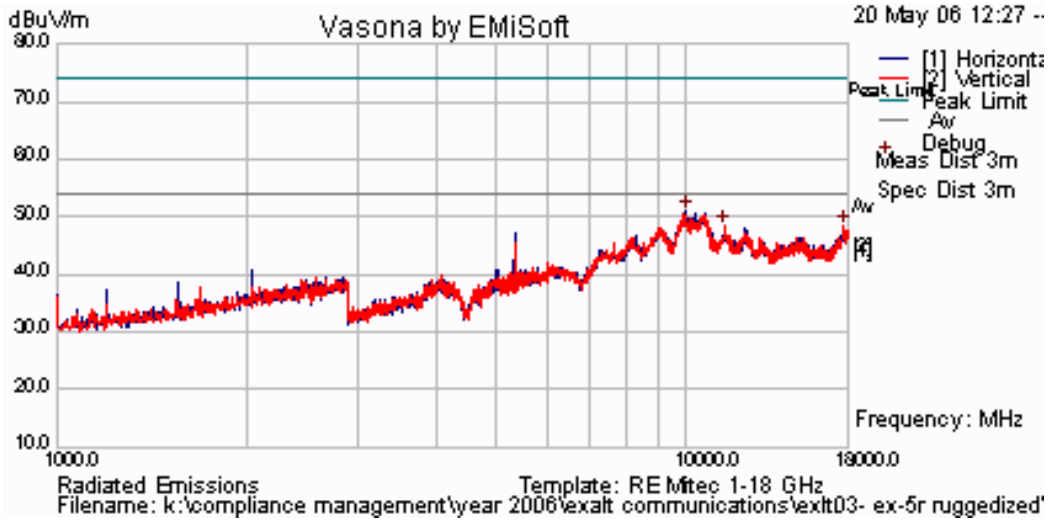
RB - Restricted Band / NRB – Non-Restricted Band.

No emissions were observed above the limit.

Worst case plot shown for 15 MHz Bandwidth QPSK Modulation. All other results for this bandwidth are held on file.

Plot 18

5,327 MHz Radiated Emissions for 37.5 dBi Antenna 15 MHz Bandwidth QPSK



Radiated Spurious Emissions above 1 GHz (continued)

TABLE OF RESULTS – 5,272 MHz 37.5 dBi Antenna 30 MHz Bandwidth QPSK

Freq. (MHz)	Pol. (H/V)	Measurement Type Peak/Avg	Field Strength (dBµV/m)	RB/ NRB	Limit (dBµV/m)	Margin (dB)

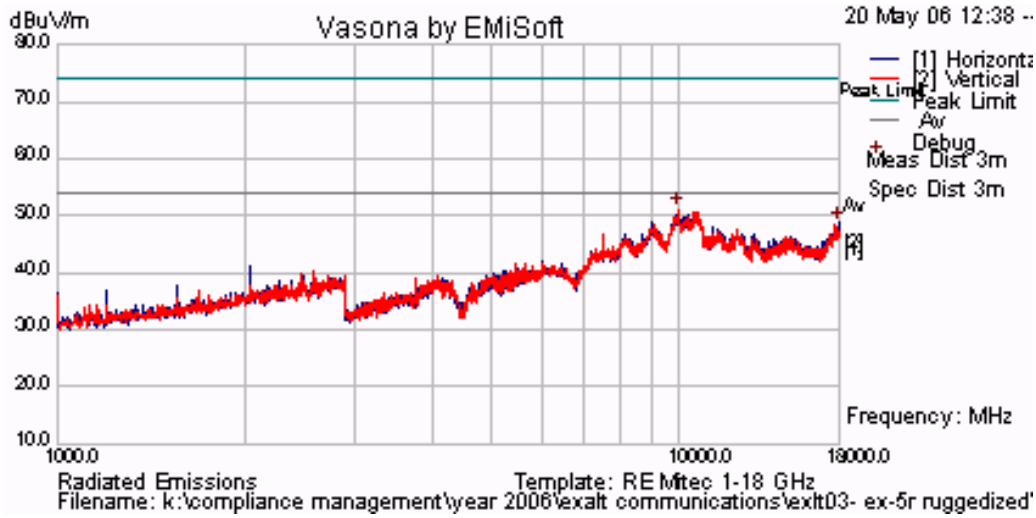
RB - Restricted Band / NRB – Non-Restricted Band.

No emissions were observed above the limit.

Worst case plot shown for 30 MHz Bandwidth QPSK Modulation. All other results for this bandwidth are held on file.

Plot 19

5,272 MHz Radiated Emissions for 37.5 dBi Antenna 30 MHz Bandwidth QPSK



Radiated Spurious Emissions above 1 GHz (continued)

TABLE OF RESULTS – 5,290 MHz 37.5 dBi Antenna 60 MHz Bandwidth QPSK

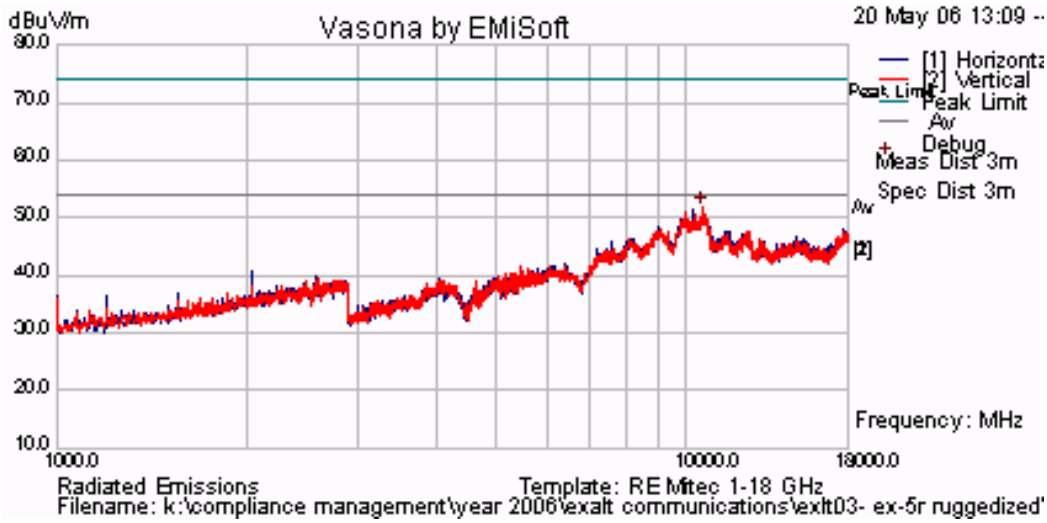
Freq. (MHz)	Pol. (H/V)	Measurement Type Peak/Avg	Field Strength (dBµV/m)	RB/ NRB	Limit (dBµV/m)	Margin (dB)

RB - Restricted Band / NRB – Non-Restricted Band.

No emissions were observed above the limit.

Plot 20

5,290 MHz Radiated Emissions for 37.5 dBi Antenna 60 MHz Bandwidth QPSK



Specification Limits

15.407 (b)(2). All emissions outside of the 5,150-5,350MHz band shall not exceed an EIRP of -27dBm/MHz.

§15.205 (a) Except as shown in paragraph (d) of 15.205 (a), only spurious emissions are permitted in any of the frequency bands listed.

§15.205 (a) Except as shown in paragraphs (d) and (e) of this section, the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section §15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

§15.209 (a) 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.

RSS-210 §A9.3(2) For transmitters operating in the 5250-5350 MHz band, all emissions outside the 5150-5350 MHz band shall not exceed -27 dBm/MHz e.i.r.p. Devices operating in the 5250-5350 MHz band that generate emissions in the 5150-5250 MHz band shall not exceed out of band emission limit of 27 dBm/MHz e.i.r.p. in the 5150-5250 MHz band in order to operate indoor/outdoor, or alternatively shall comply with the spectral power density for operation within the 5150-5250 MHz band and shall be labeled “for indoor use only”.

RSS-Gen §4.7 The search for unwanted emissions shall be from the lowest frequency internally generated or used in the device (local oscillator, intermediate of carrier frequency), or from 30 MHz , whichever is the lowest frequency, to the 5th harmonic of the highest frequency generated without exceeding 40 GHz.

Frequency (MHz)	Field Strength (µV/m)	Field Strength (dBµV/m)	Measurement Distance (meters)
30-88	100	40.0	3
88-216	150	43.5	3
216-960	200	46.0	3
Above 960	500	54.0	3

Laboratory Measurement Uncertainty for Radiated Emissions

Measurement uncertainty	+5.6/ -4.5 dB

Traceability

Method	Test Equipment Used
Measurements were made per work instruction WI-03 ‘Measurement of Radiated Emissions’	0088, 0158, 0134, 0304, 0311, 0315, 0310, 0312

Radiated Band-Edge – Restricted Bands

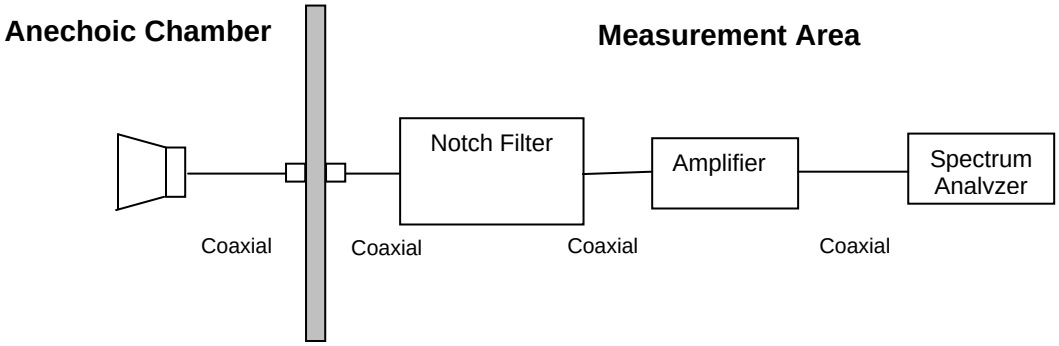
Note: The data in this section along with the data in sections 5.1.7 (Conducted Spurious emissions) and section 5.1.8.1 (Transmitter Radiated Spurious Emissions) shows that the EUT is in compliance with the -27dBm/MHz EIRP limit for out of band emissions.

Test Procedure

Radiated emissions above 1 GHz are measured in the anechoic chamber at a 3-meter distance on every azimuth in both horizontal and vertical polarities. The emissions are recorded and maximized as a function of azimuth by rotation through 360° with a spectrum analyzer in peak hold mode. A notch filter was used to remove the fundamental frequency. The highest emissions relative to the limit are listed for each frequency spanned.

All measurements on any frequency or frequencies over 1 MHz are based on the use of measurement instrumentation employing an average detector function. All measurements above 1 GHz were performed using a minimum resolution bandwidth of 1 MHz.

Test Measurement Set up



Measurement set up for Radiated Emission Test

Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Loss, and subtracting Amplifier Gain from the measured reading. All factors are included in the reported data.

FS = R + AF + CORR - FO

where: FS = Field Strength
R = Measured Spectrum analyzer Input Amplitude
AF = Antenna Factor
CORR = Correction Factor = CL – AG + NFL
CL = Cable Loss
AG = Amplifier Gain
FO = Distance Falloff Factor
NFL = Band-stop Filter Loss or Waveguide Loss

For example:
Given receiver input reading of 51.5 dBμV; Antenna Factor of 8.5 dB; Cable Loss of 1.3 dB; Falloff Factor of 0 dB, an Amplifier Gain of 26 dB and Notch Filter Loss of 1 dB. The Field Strength of the measured emission is:

FS = 51.5 + 8.5 + 1.3 - 26.0 +1 = 36.3 dBμV/m

Conversion between dBμV/m (or dBμV) and μV/m (or μV) are done as:

Level (dBμV/m) = 20 * Log (level (μV/m))

40 dBμV/m = 100 μV/m
48 dBμV/m = 250 μV/m

Radiated Band Edge - Test Configurations

The following table describes the two configurations of equipment that were tested.

Radio parameters.
Duty Cycle: 100% (test mode)
Power Level: As specified by the following matrix, see Section 5.1.2 Peak Output Power

Antenna Configuration	EUT Configuration	BW (MHz)	Number of Antenna ports	Max. Allowable Conducted Pwr Per Antenna port (dBm)	
				Antenna port #1	Antenna port #2
28 dBi Single Polarized Patch Panel	One antenna port connected to a single pole external antenna.	7.5	One	-1.43	
		15		+1.58	
		30 & 60		+2.00	
37.5 dBi Dual Polarized Parabolic Antenna	Two antenna ports, dual polarized radio, operating on the same frequency with a coherent transmitter on both polarizations, into an external dual-polarized antenna.	7.5	Two	-13.93	-13.93
		15		-10.92	-10.92
		30 & 60		-10.50	-10.50

Radiated Band Edge Test Results for 28 dBi Panel Antenna

TABLE OF RESULTS - 5.3 GHz Band - 7.5 MHz Bandwidth QPSK

Tx Freq. (MHz)	Restricted Band Frequency (MHz)	Measured (dBuV/m)	Limit (dBuV/m)	Margin (dB)
$5{,}260_{PEAK}$	5,150	64.52	74	-9.48
$5{,}260_{AVE}$	5,150	41.10	54	-12.90
$5{,}332_{PEAK}$	5,350	67.42	74	-6.58
$5{,}332_{AVE}$	5,350	43.76	54	-10.24

TABLE OF RESULTS - 5.3 GHz Band - 15 MHz Bandwidth QPSK

Tx Freq. (MHz)	Restricted Band Frequency (MHz)	Measured (dBuV/m)	Limit (dBuV/m)	Margin (dB)
$5{,}265_{PEAK}$	5,150	62.28	74	-11.72
$5{,}265_{AVE}$	5,150	41.10	54	-12.90
$5{,}327_{PEAK}$	5,350	73.76	74	-0.24
$5{,}327_{AVE}$	5,350	48.01	54	-5.99

TABLE OF RESULTS - 5.3 GHz Band - 30 MHz Bandwidth QPSK

Tx Freq. (MHz)	Restricted Band Frequency (MHz)	Measured (dBuV/m)	Limit (dBuV/m)	Margin (dB)
$5{,}272_{PEAK}$	5,150	62.28	74	-11.72
$5{,}272_{AVE}$	5,150	40.99	54	-13.01
$5{,}308_{PEAK}$	5,350	71.41	74	-2.59
$5{,}308_{AVE}$	5,350	48.45	54	-5.55

Radiated Band Edge Test Results for 28 dBi Panel Antenna (continued)

TABLE OF RESULTS - 5.3 GHz Band - 60 MHz Bandwidth QPSK

Tx Freq. (MHz)	Restricted Band Frequency (MHz)	Measured (dBuV/m)	Limit (dBuV/m)	Margin (dB)
$5{,}290_{PEAK}$	5,150	62.55	74	-11.45
$5{,}290_{AVE}$	5,150	41.10	54	-12.90
$5{,}290_{PEAK}$	5,350	69.09	74	-4.91
$5{,}290_{AVE}$	5,350	47.37	54	-6.63

Radiated Band Edge Test Results for 37.5 dBi Parabolic Antenna

TABLE OF RESULTS - 5.3 GHz Band - 7.5 MHz Bandwidth QPSK

Tx Freq. (MHz)	Restricted Band Frequency (MHz)	Measured (dBuV/m)	Limit (dBuV/m)	Margin (dB)
$5{,}260_{PEAK}$	5,150	62.96	74	-11.04
$5{,}260_{AVE}$	5,150	41.10	54	-12.90
$5{,}332_{PEAK}$	5,350	64.15	74	-9.85
$5{,}332_{AVE}$	5,350	41.82	54	-12.18

TABLE OF RESULTS - 5.3 GHz Band - 15 MHz Bandwidth QPSK

Tx Freq. (MHz)	Restricted Band Frequency (MHz)	Measured (dBuV/m)	Limit (dBuV/m)	Margin (dB)
$5{,}265_{PEAK}$	5,150	62.28	74	-11.72
$5{,}265_{AVE}$	5,150	41.10	54	-12.90
$5{,}327_{PEAK}$	5,350	63.58	74	-10.42
$5{,}327_{AVE}$	5,350	42.26	54	-11.74

TABLE OF RESULTS - 5.3 GHz Band - 30 MHz Bandwidth QPSK

Tx Freq. (MHz)	Restricted Band Frequency (MHz)	Measured (dBuV/m)	Limit (dBuV/m)	Margin (dB)
$5{,}272_{PEAK}$	5,150	62.14	74	-11.86
$5{,}272_{AVE}$	5,150	41.10	54	-12.90
$5{,}308_{PEAK}$	5,350	63.17	74	-10.83
$5{,}308_{AVE}$	5,350	41.82	54	-12.18

Radiated Band Edge Test Results for 37.5 dBi Parabolic Antenna (continued)

TABLE OF RESULTS - 5.3 GHz Band - 60 MHz Bandwidth QPSK

Tx Freq. (MHz)	Restricted Band Frequency (MHz)	Measured (dBuV/m)	Limit (dBuV/m)	Margin (dB)
$5{,}290_{PEAK}$	5,150	62.28	74	-11.72
$5{,}290_{AVE}$	5,150	41.10	54	-12.90
$5{,}290_{PEAK}$	5,350	64.86	74	-9.14
$5{,}290_{AVE}$	5,350	43.57	54	-10.43

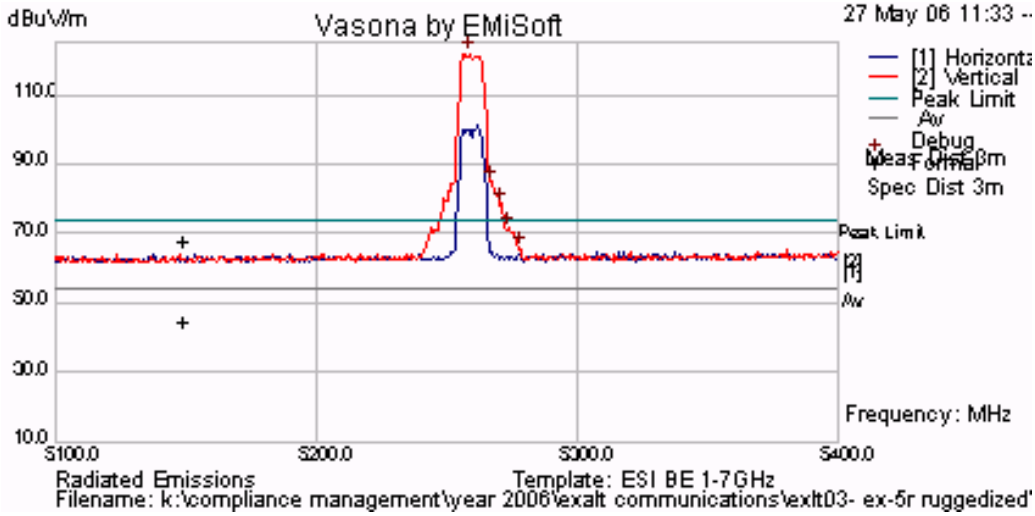
Peak Field Strength Measurements

Peak Field Strength for 28 dBi Antenna

Plot 21

28 dBi Antenna 5,260 MHz 7.5 MHz Bandwidth QPSK

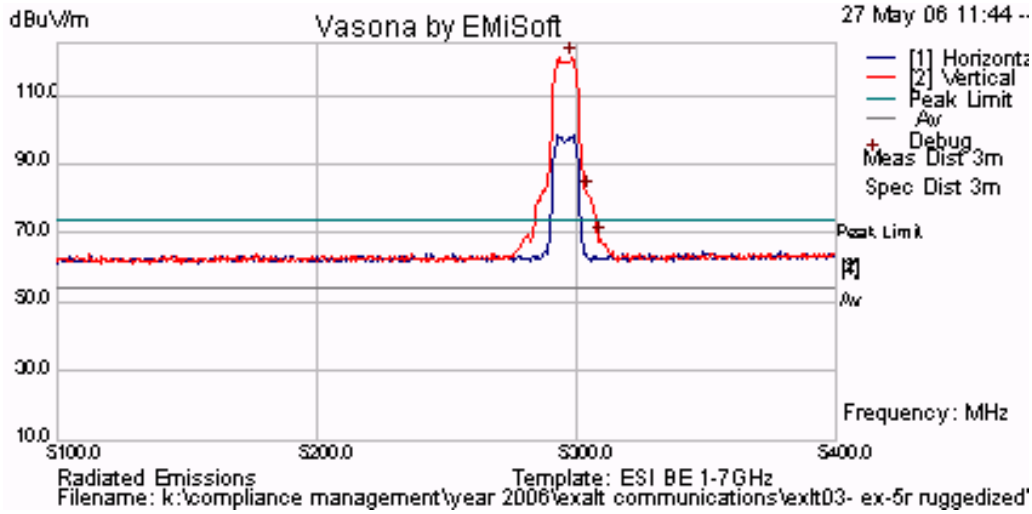
Peak Emission = 121.93 dBµV/m



Plot 22

28 dBi Antenna 5,296 MHz 7.5 MHz Bandwidth QPSK

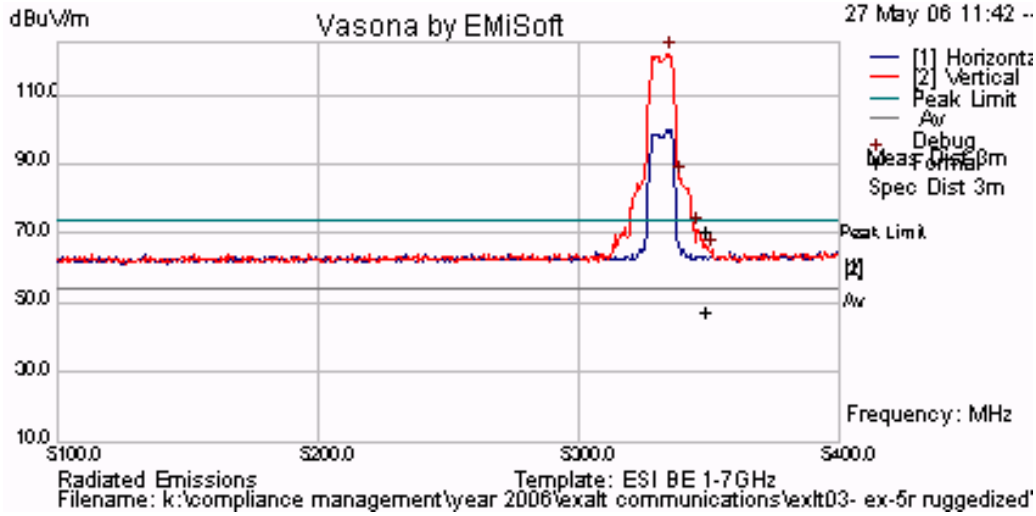
Peak Emission = 120.91 dBµV/m



Plot 23

28 dBi Antenna 5,332 MHz 7.5 MHz Bandwidth QPSK

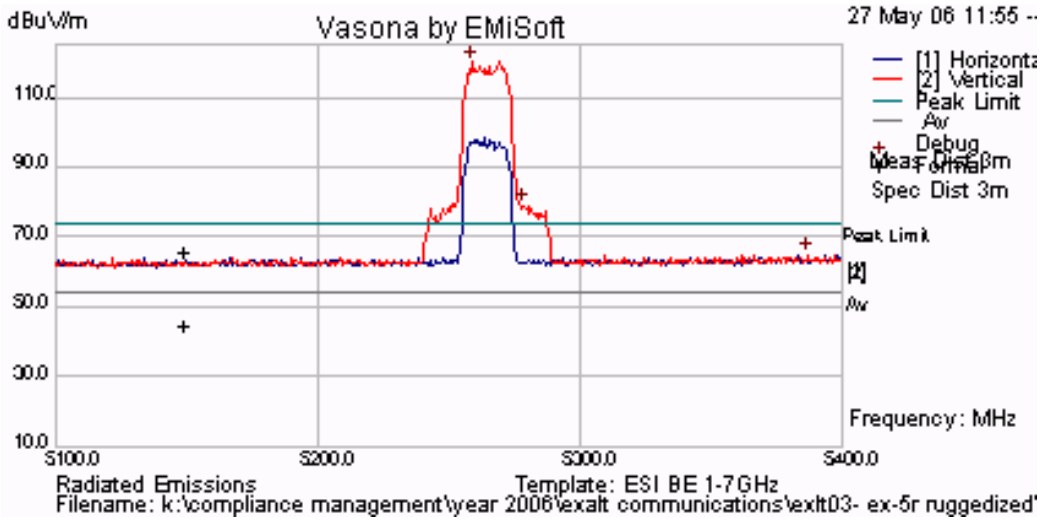
Peak Emission = 121.92 dBµV/m



Plot 24

28 dBi Antenna 5,265 MHz 15 MHz Bandwidth QPSK

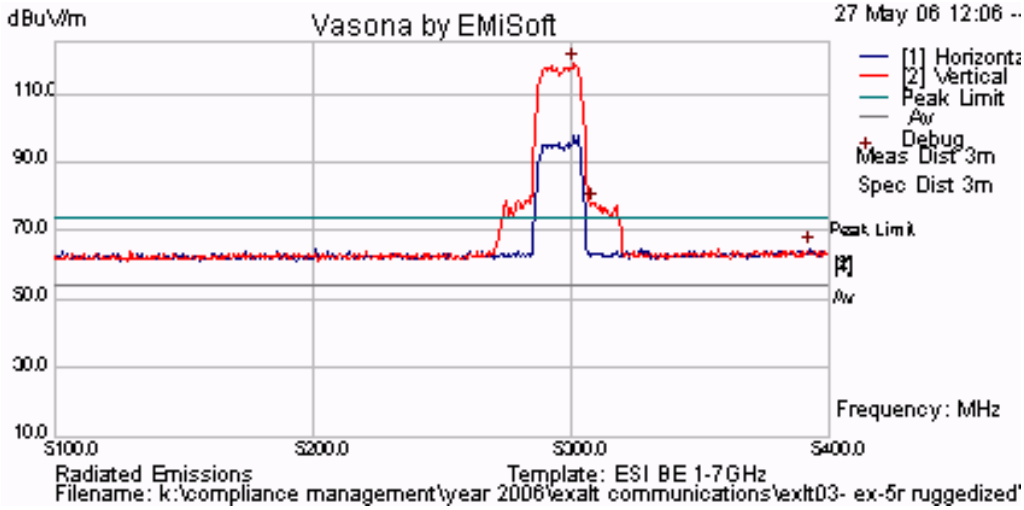
Peak Emission = 120.22 dBµV/m



Plot 25

28 dBi Antenna 5,296 MHz 15 MHz Bandwidth QPSK

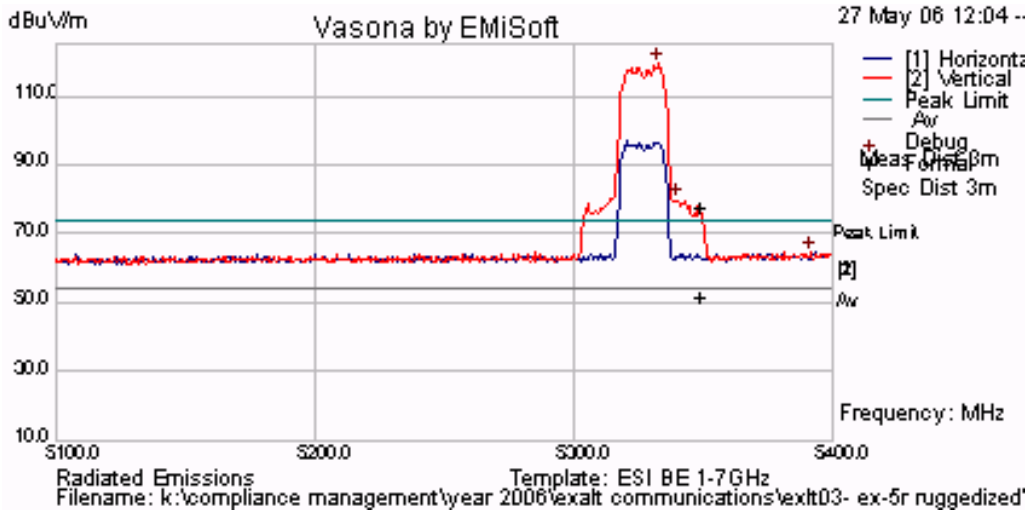
Peak Emission = 118.64 dBµV/m



Plot 26

28 dBi Antenna 5,327 MHz 15 MHz Bandwidth QPSK

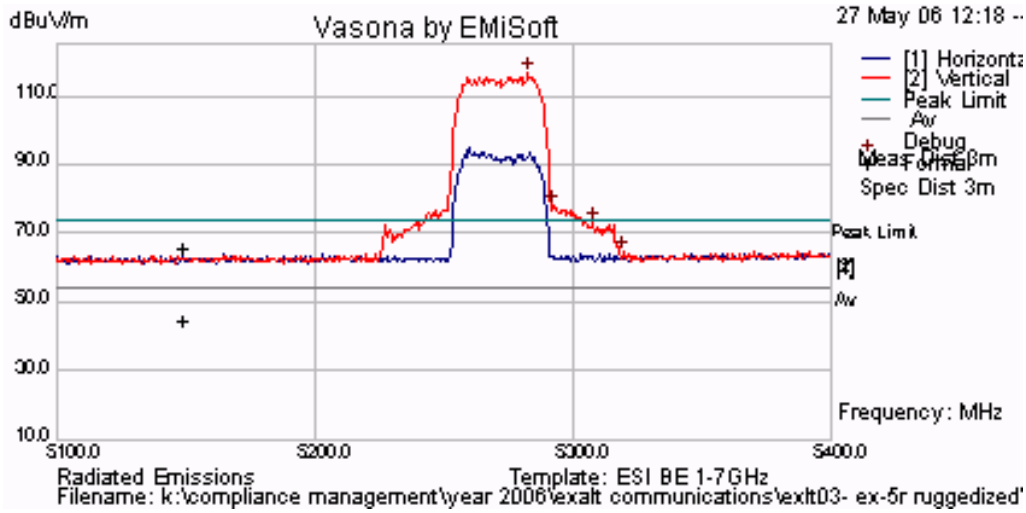
Peak Emission = 119.62 dBµV/m



Plot 27

28 dBi Antenna 5,272 MHz 30 MHz Bandwidth QPSK

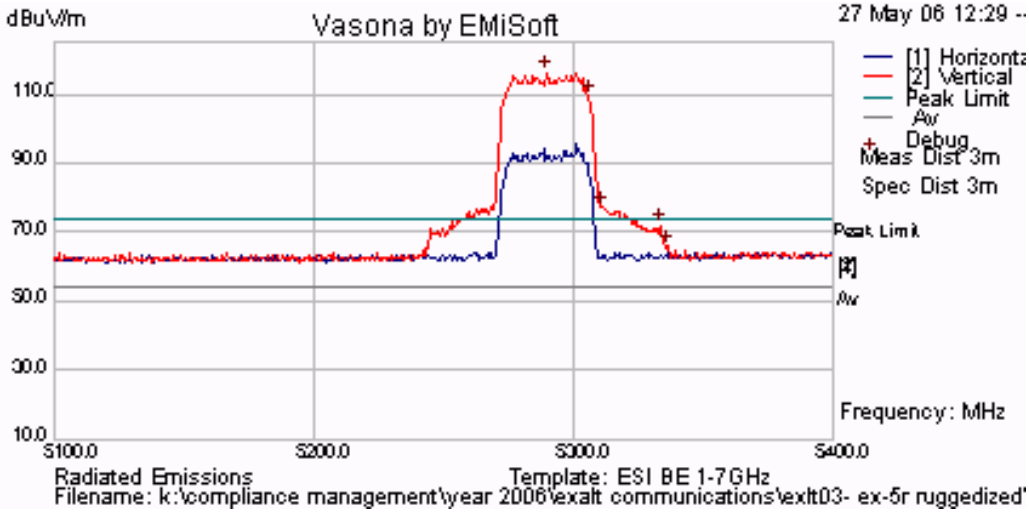
Peak Emission = 116.71 dBµV/m



Plot 28

28 dBi Antenna 5,290 MHz 30 MHz Bandwidth QPSK

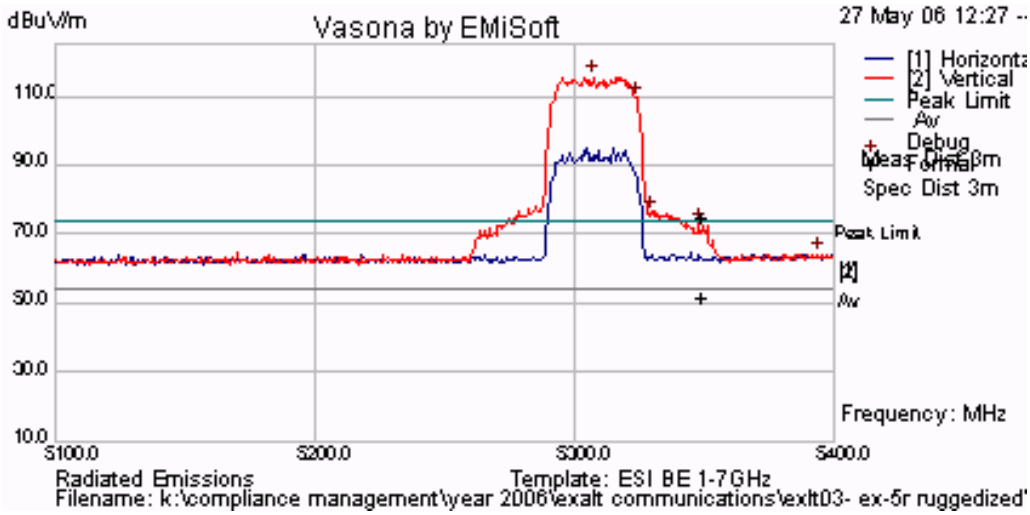
Peak Emission = 116.34 dBµV/m



Plot 29

28 dBi Antenna 5,308 MHz 30 MHz Bandwidth QPSK

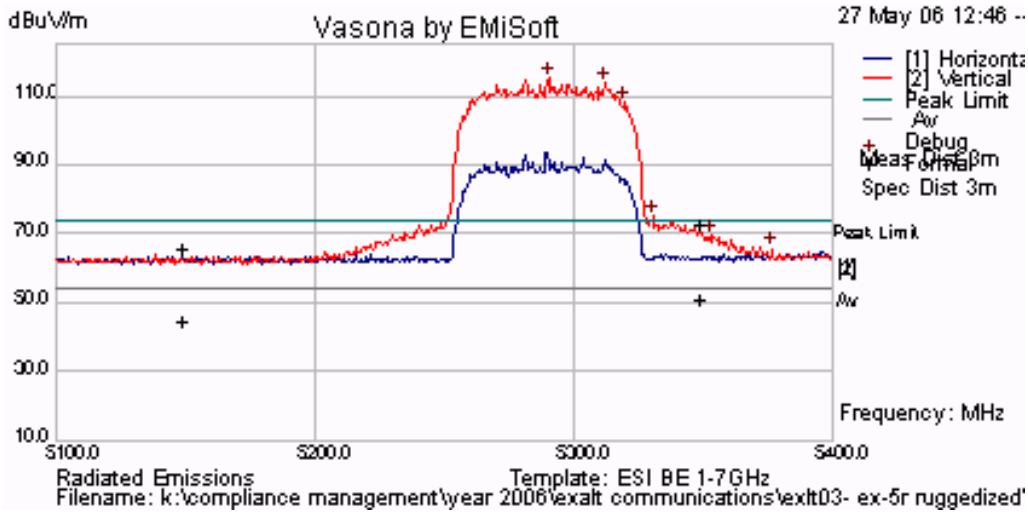
Peak Emission = 115.71 dBµV/m



Plot 30

28 dBi Antenna 5,290 MHz 60 MHz Bandwidth QPSK

Peak Emission = 115.39 dBµV/m

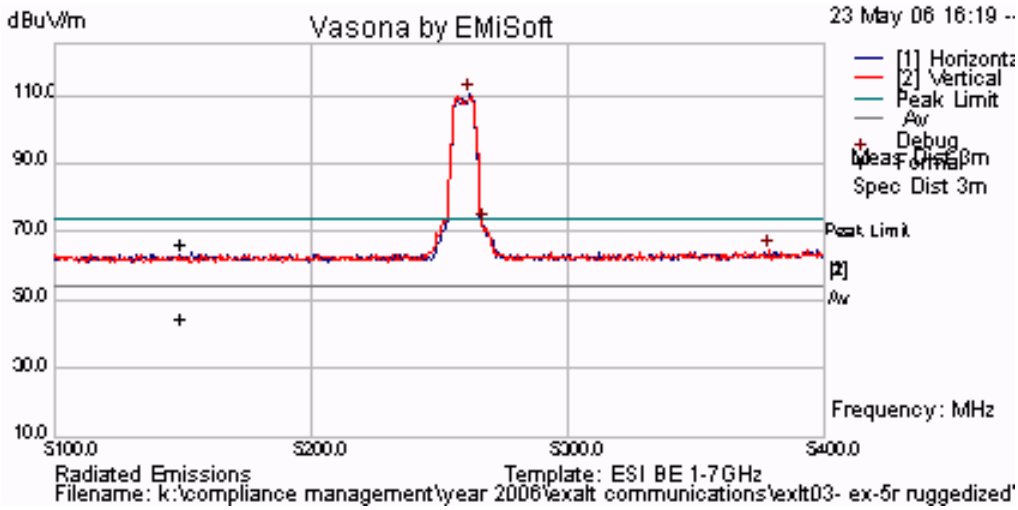


Peak Field Strength for 37.5 dBi Antenna

Plot 31

37.5 dBi Antenna 5,260 MHz 7.5 MHz Bandwidth QPSK

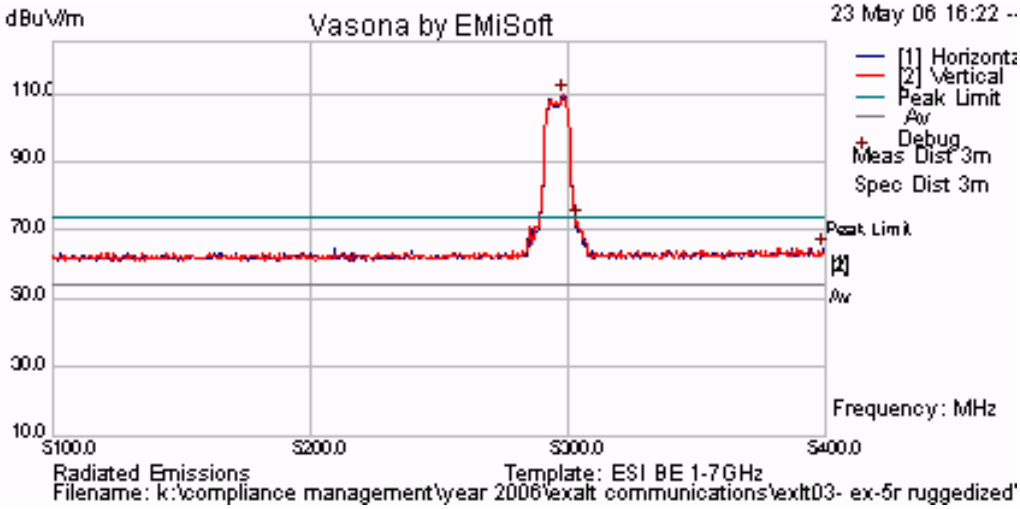
Peak Emission = 110.34 dBµV/m



Plot 32

37.5 dBi Antenna 5,296 MHz 7.5 MHz Bandwidth QPSK

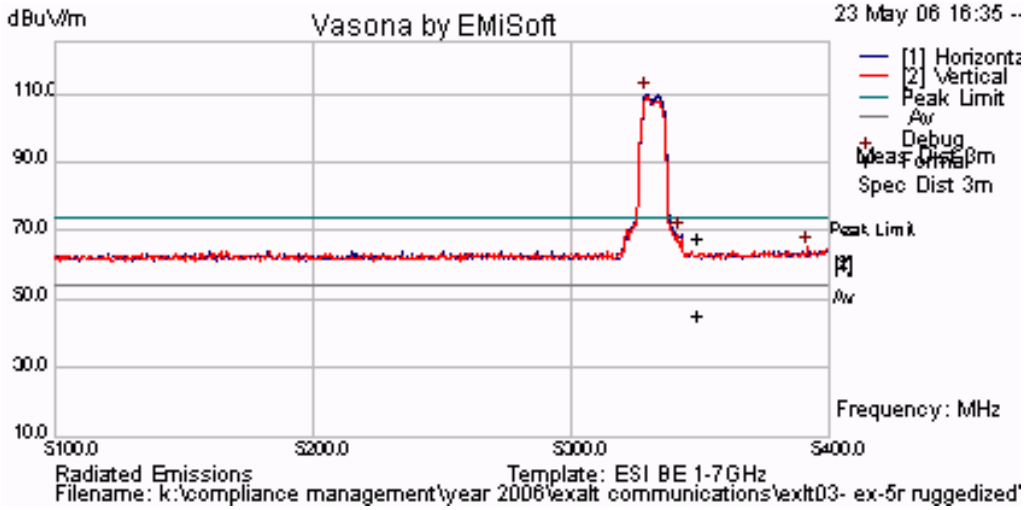
Peak Emission = 109.54 dBµV/m



Plot 33

37.5 dBi Antenna 5,332 MHz 7.5 MHz Bandwidth QPSK

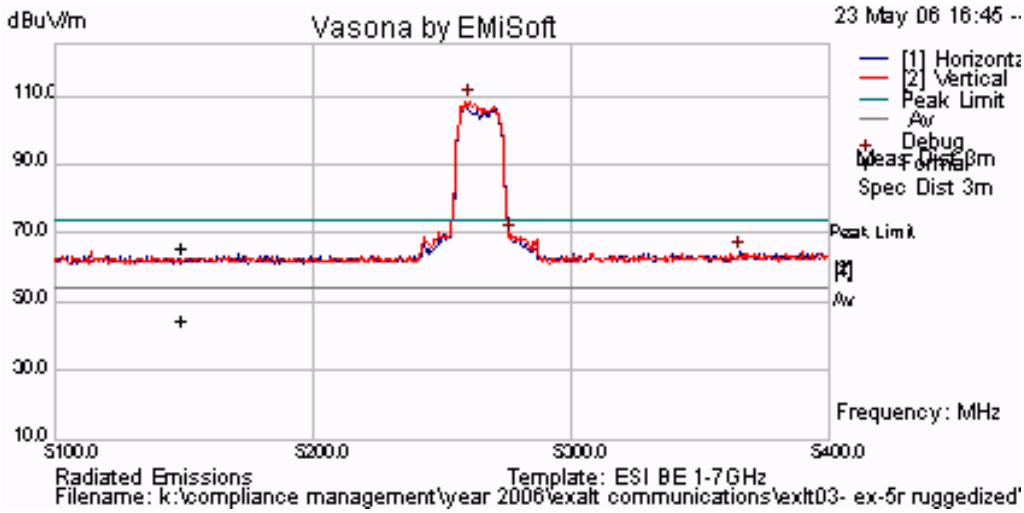
Peak Emission = 109.95 dBµV/m



Plot 34

37.5 dBi Antenna 5,265 MHz 15 MHz Bandwidth QPSK

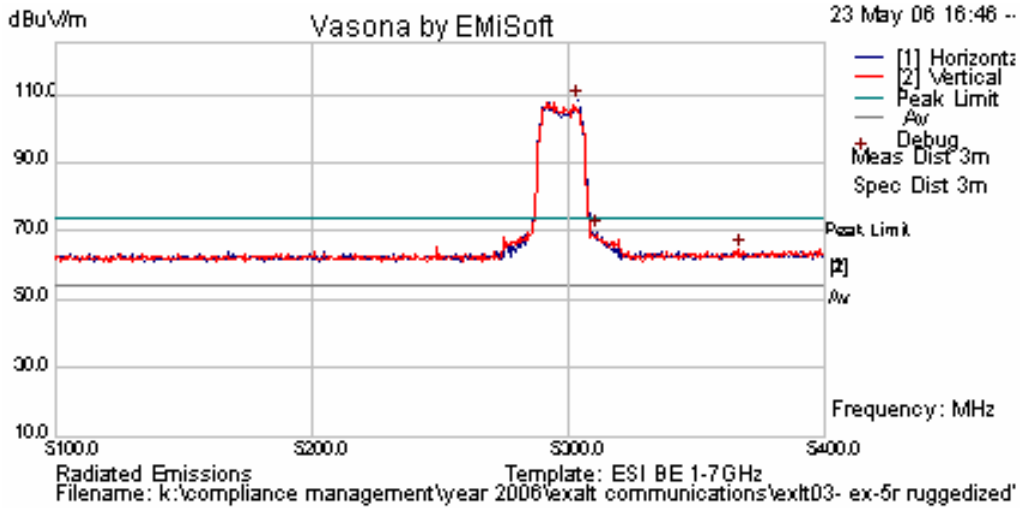
Peak Emission = 108.61 dBµV/m



Plot 35

37.5 dBi Antenna 5,296 MHz 15 MHz Bandwidth QPSK

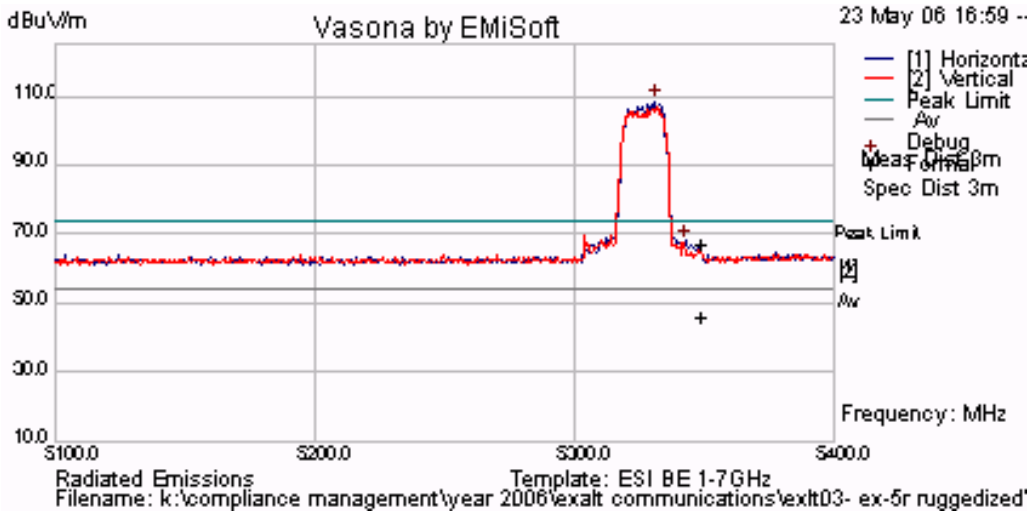
Peak Emission = 108.24 dBµV/m



Plot 36

37.5 dBi Antenna 5,327 MHz 15 MHz Bandwidth QPSK

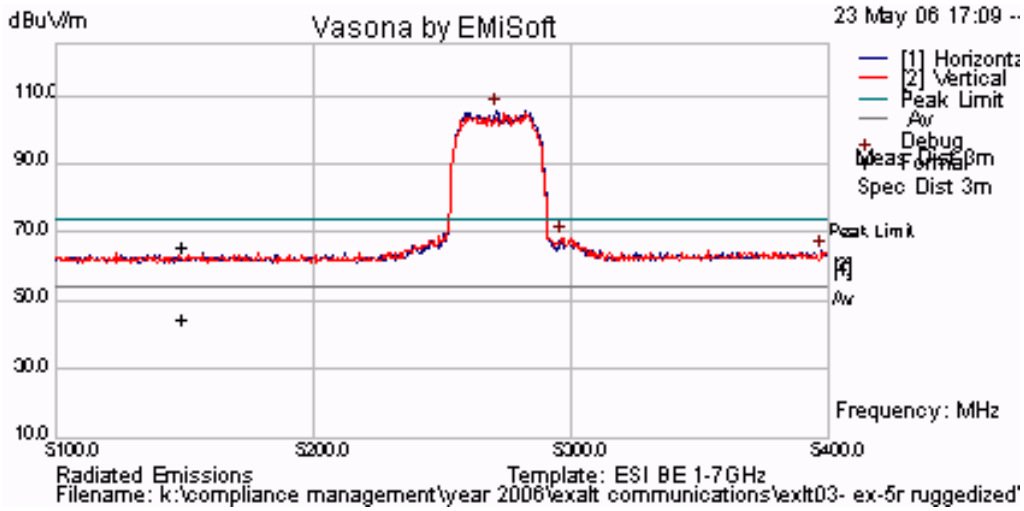
Peak Emission = 108.53 dBµV/m



Plot 37

37.5 dBi Antenna 5,272 MHz 30 MHz Bandwidth QPSK

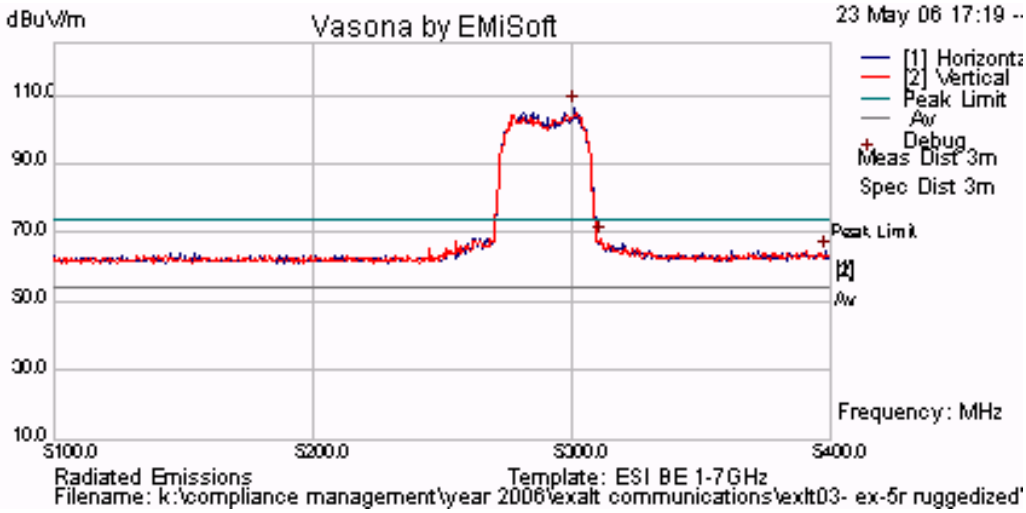
Peak Emission = 105.76 dBµV/m



Plot 38

37.5 dBi Antenna 5,290 MHz 30 MHz Bandwidth QPSK

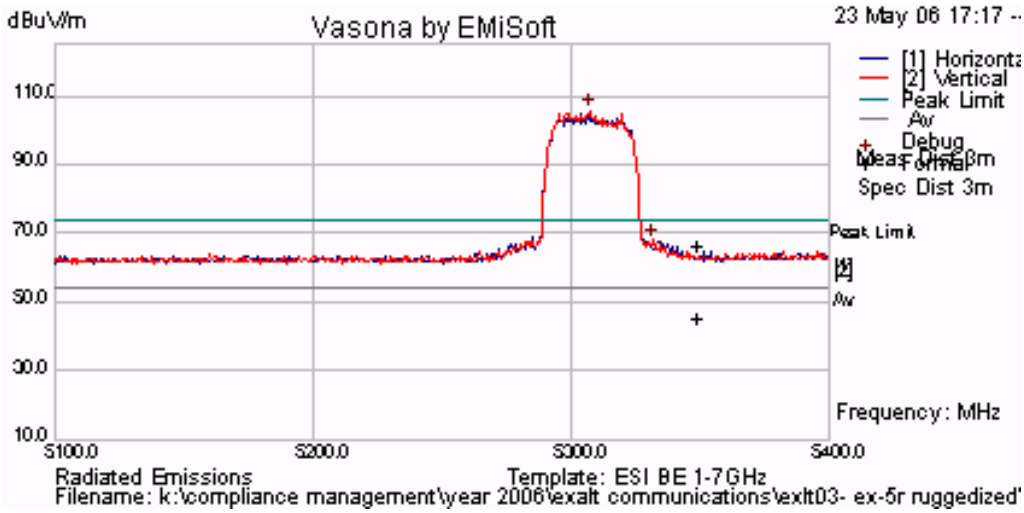
Peak Emission = 106.38 dBµV/m



Plot 39

37.5 dBi Antenna 5,308 MHz 30 MHz Bandwidth QPSK

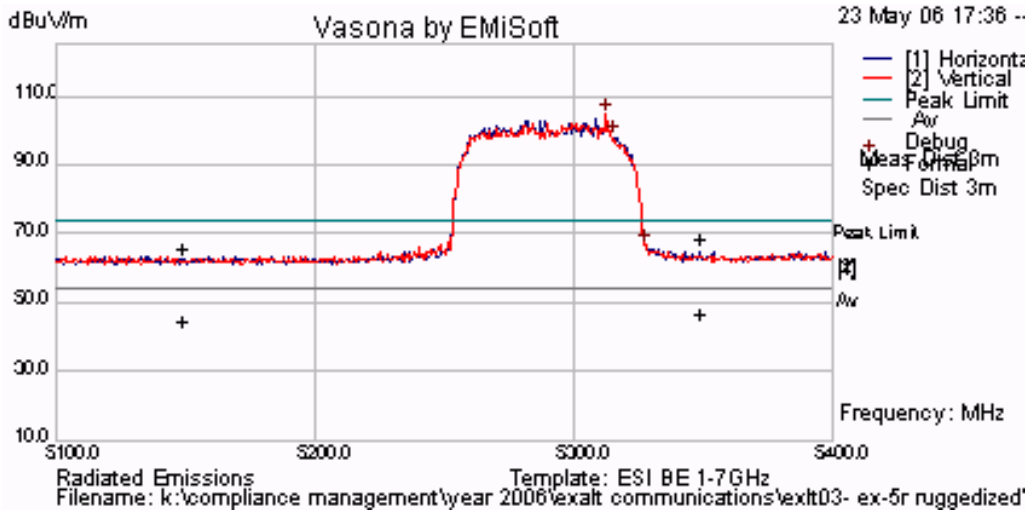
Peak Emission = 105.57 dBµV/m



Plot 40

37.5 dBi Antenna 5,290 MHz 60 MHz Bandwidth QPSK

Peak Emission = 104.49 dBµV/m



Specification

Limits

15.407 (b)(2). All emissions outside of the 5,150-5,350MHz band shall not exceed an EIRP of -27dBm/MHz.

§15.205 (a) Except as shown in paragraph (d) of 15.205 (a), only spurious emissions are permitted in any of the frequency bands listed.

§15.205 (a) Except as shown in paragraphs (d) and (e) of this section, the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section §15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

§15.209 (a) 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.

RSS-210 §A9.3(2) For transmitters operating in the 5250-5350 MHz band, all emissions outside the 5150-5350 MHz band shall not exceed -27 dBm/MHz e.i.r.p. Devices operating in the 5250-5350 MHz band that generate emissions in the 5150-5250 MHz band shall not exceed out of band emission limit of 27 dBm/MHz e.i.r.p. in the 5150-5250 MHz band in order to operate indoor/outdoor, or alternatively shall comply with the spectral power density for operation within the 5150-5250 MHz band and shall be labeled “for indoor use only”.

RSS-Gen §4.7 The search for unwanted emissions shall be from the lowest frequency internally generated or used in the device (local oscillator, intermediate of carrier frequency), or from 30 MHz , whichever is the lowest frequency, to the 5th harmonic of the highest frequency generated without exceeding 40 GHz.

Frequency (MHz)	Field Strength (µV/m)	Field Strength (dBµV/m)	Measurement Distance (meters)
30-88	100	40.0	3
88-216	150	43.5	3
216-960	200	46.0	3
Above 960	500	54.0	3

5.1.8. Receiver Radiated Spurious Emissions (above 1 GHz)

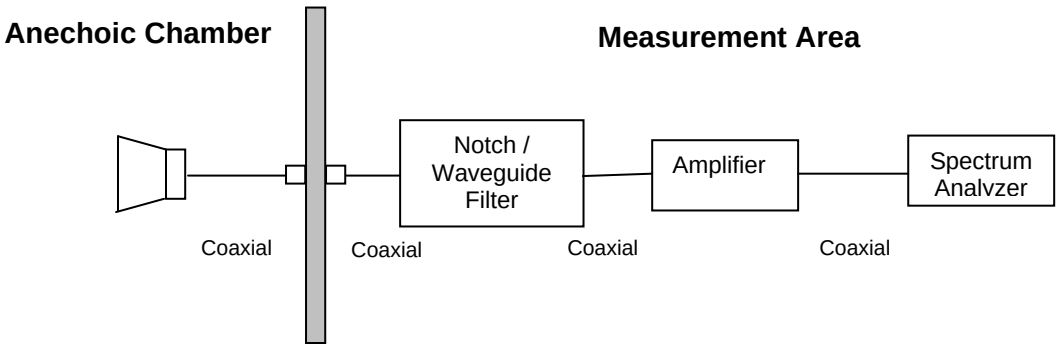
Industry Canada RSS-Gen §4.8, §6

Test Procedure

Radiated emissions above 1 GHz are measured in the anechoic chamber at a 3-meter distance on every azimuth in both horizontal and vertical polarities. The emissions are recorded and maximized as a function of azimuth by rotation through 360° with a spectrum analyzer in peak hold mode. Depending on the frequency band spanned a notch filter and waveguide filter was used to remove the fundamental frequency. The highest emissions relative to the limit are listed for each frequency spanned.

All measurements on any frequency or frequencies over 1 MHz are based on the use of measurement instrumentation employing an average detector function. All measurements above 1 GHz were performed using a minimum resolution bandwidth of 1 MHz.

Test Measurement Set up



Measurement set up for Radiated Emission Test

Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Loss, and subtracting Amplifier Gain from the measured reading. All factors are included in the reported data.

FS = R + AF + CORR - FO

where: FS = Field Strength
R = Measured Spectrum analyzer Input Amplitude
AF = Antenna Factor
CORR = Correction Factor = CL – AG + NFL
CL = Cable Loss
AG = Amplifier Gain
FO = Distance Falloff Factor
NFL = Notch Filter Loss or Waveguide Loss

For example:
Given receiver input reading of 51.5 dBμV; Antenna Factor of 8.5 dB; Cable Loss of 1.3 dB; Falloff Factor of 0 dB, an Amplifier Gain of 26 dB and Notch Filter Loss of 1 dB. The Field Strength of the measured emission is:

FS = 51.5 + 8.5 + 1.3 - 26.0 +1 = 36.3 dBμV/m

Conversion between dBμV/m (or dBμV) and μV/m (or μV) are done as:

Level (dBμV/m) = 20 * Log (level (μV/m))

40 dBμV/m = 100 μV/m
48 dBμV/m = 250 μV/m

Receiver Radiated Spurious Emissions above 1 GHz - Test Configurations

The following table describes the two configurations of equipment that were tested.

Antenna Configuration	EUT Configuration
37.5 dBi Dual Polarized Parabolic Antenna	Two antenna ports, dual polarized radio into an external dual-polarized antenna.
28 dBi Single Polarized Patch Panel	One antenna port connected to a single pole external antenna.

Receiver Radiated Spurious Emissions above 1 GHz

Ambient conditions.
Temperature: 17 to 23°C Relative humidity: 31 to 57 % Pressure: 999 to 1012 mbar

28 dBi Antenna - Receiver Radiated Spurious Emissions above 1 GHz

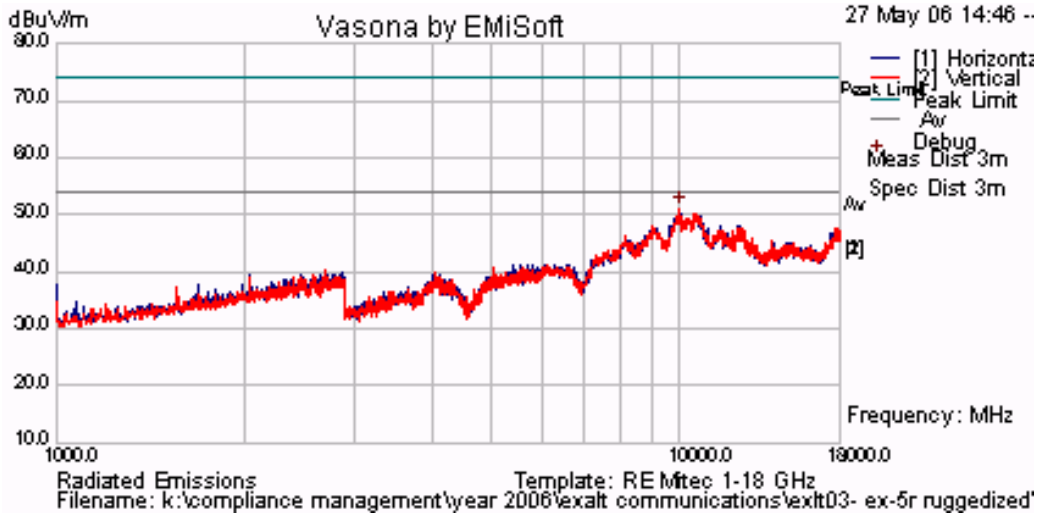
TABLE OF RESULTS – 5,296 MHz 28 dBi Antenna 7.5 MHz Bandwidth QPSK

Freq. (MHz)	Pol. (H/V)	Raw Reading (dBµV/m)	Correction Factor (dB)	Corrected Field Strength (dBµV/m)	Limit (dBµV/m)	Margin (dB)

As no peak emissions were greater than the Average Limit (54 dBµV/m) peak emissions are reported in the above matrix.

Plot 41

5,296 MHz Radiated Emissions for 28 dBi Antenna 7.5 MHz Bandwidth QPSK



28 dBi Antenna - Receiver Radiated Spurious Emissions above 1 GHz

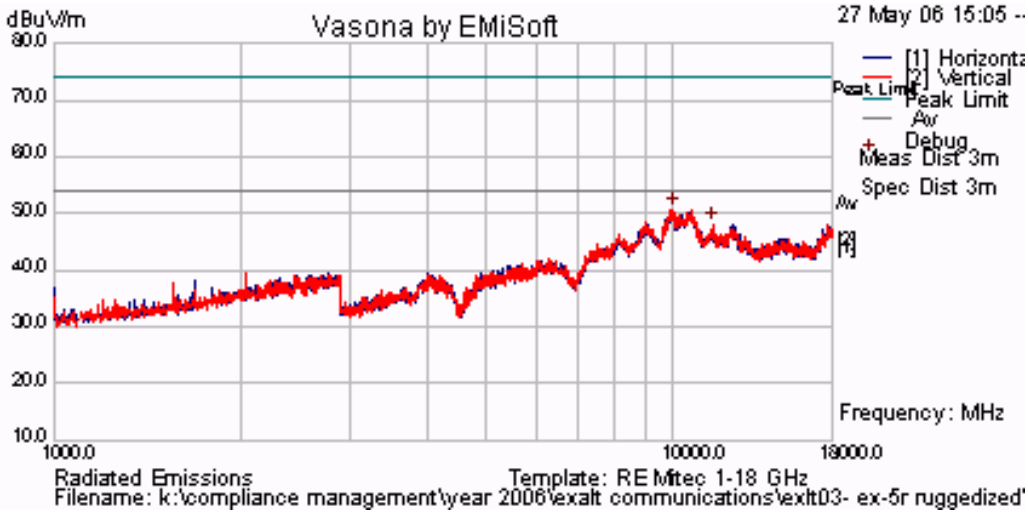
TABLE OF RESULTS – 5,296 MHz 28 dBi Antenna 15 MHz Bandwidth QPSK

Freq. (MHz)	Pol. (H/V)	Raw Reading (dBμV/m)	Correction Factor (dB)	Corrected Field Strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)

As no peak emissions were greater than the Average Limit (54 dBμV/m) peak emissions are reported in the above matrix.

Plot 42

5,296 MHz Radiated Emissions for 28 dBi Antenna 15 MHz Bandwidth QPSK



28 dBi Antenna - Receiver Radiated Spurious Emissions above 1 GHz

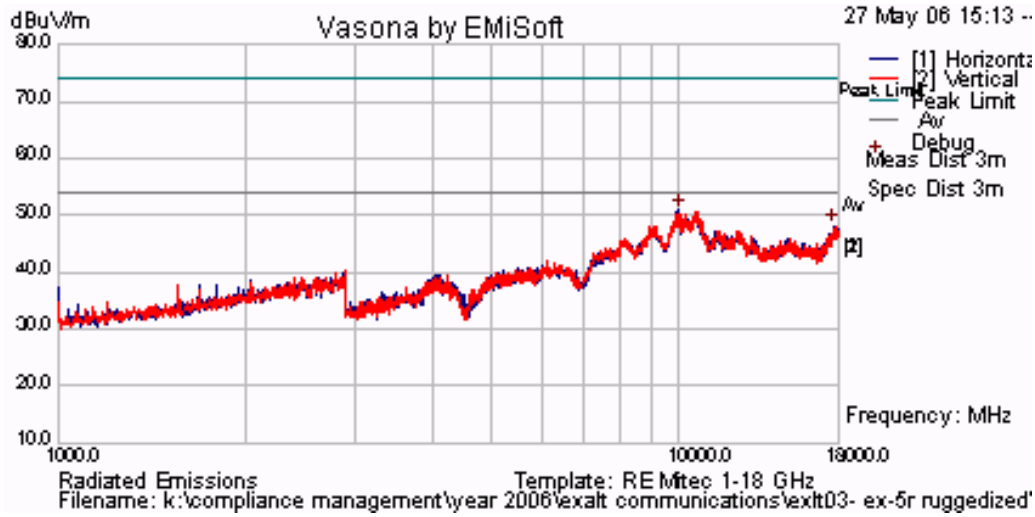
TABLE OF RESULTS –5,290 MHz 28 dBi Antenna 30 MHz Bandwidth QPSK

Freq. (MHz)	Pol. (H/V)	Raw Reading (dBμV/m)	Correction Factor (dB)	Corrected Field Strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)

As no peak emissions were greater than the Average Limit (54 dBμV/m) peak emissions are reported in the above matrix.

Plot 43

5,290 MHz Radiated Emissions for 28 dBi Antenna 30 MHz Bandwidth QPSK



28 dBi Antenna - Receiver Radiated Spurious Emissions above 1 GHz

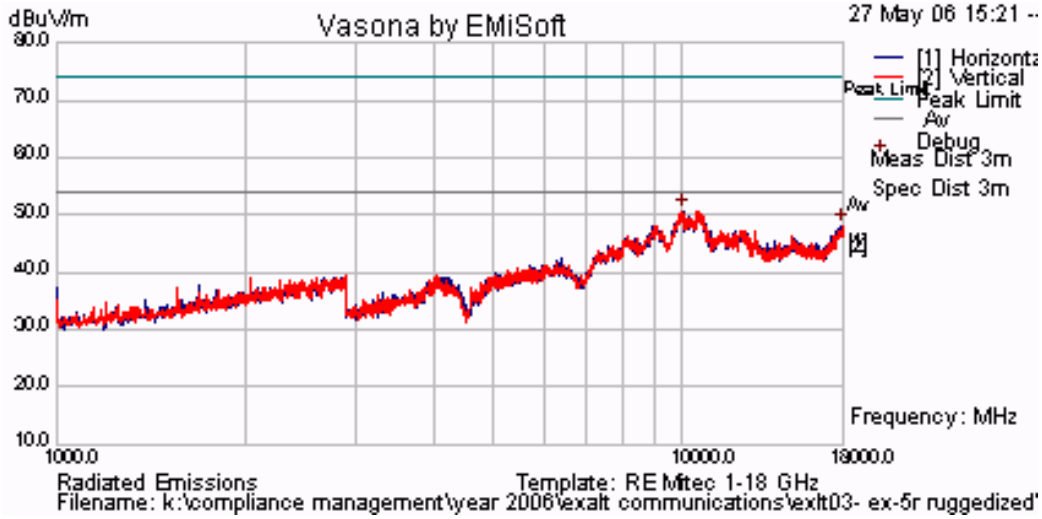
TABLE OF RESULTS – 5,290 MHz 28 dBi Antenna 60 MHz Bandwidth QPSK

Freq. (MHz)	Pol. (H/V)	Raw Reading (dBµV/m)	Correction Factor (dB)	Corrected Field Strength (dBµV/m)	Limit (dBµV/m)	Margin (dB)

As no peak emissions were greater than the Average Limit (54 dBµV/m) peak emissions are reported in the above matrix.

Plot 44

5,290 MHz Radiated Emissions for 28 dBi Antenna 60 MHz Bandwidth QPSK



37.5 dBi Antenna - Receiver Radiated Spurious Emissions above 1 GHz

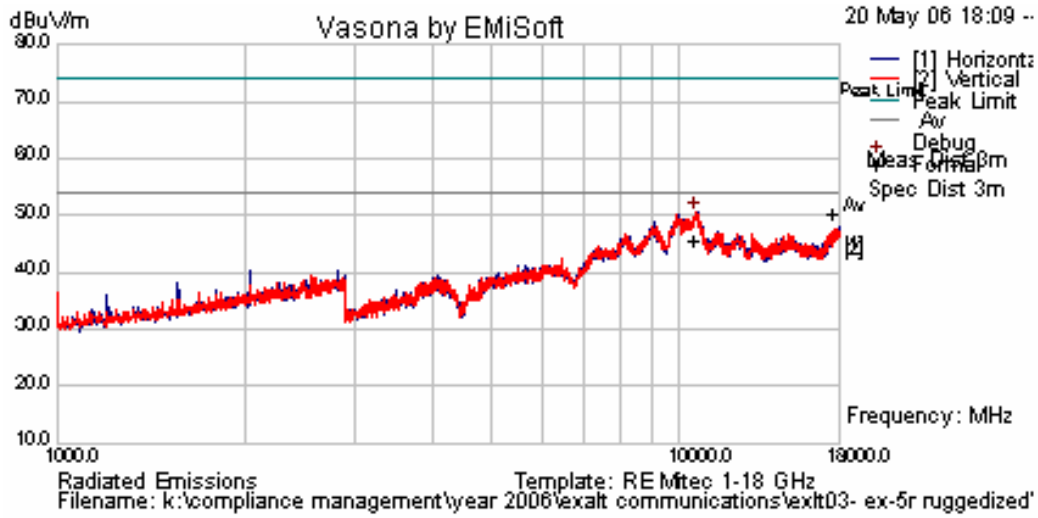
TABLE OF RESULTS – 5,296 MHz 37.5 dBi Antenna 7.5 MHz Bandwidth QPSK

Freq. (MHz)	Pol. (H/V)	Raw Reading (dBμV/m)	Correction Factor (dB)	Corrected Field Strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)

As no peak emissions were greater than the Average Limit (54 dBμV/m) peak emissions are reported in the above matrix.

Plot 45

5,296 MHz Radiated Emissions for 37.5 dBi Antenna 7.5 MHz Bandwidth QPSK



37.5 dBi Antenna - Receiver Radiated Spurious Emissions above 1 GHz

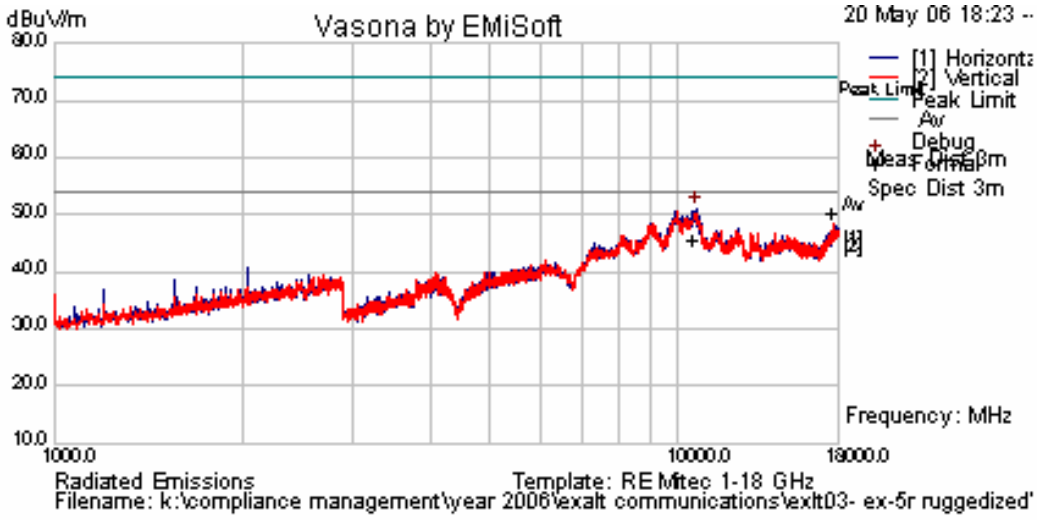
TABLE OF RESULTS – 5,296 MHz 37.5 dBi Antenna 15 MHz Bandwidth QPSK

Freq. (MHz)	Pol. (H/V)	Raw Reading (dBµV/m)	Correction Factor (dB)	Corrected Field Strength (dBµV/m)	Limit (dBµV/m)	Margin (dB)

As no peak emissions were greater than the Average Limit (54 dBµV/m) peak emissions are reported in the above matrix.

Plot 46

5,296 MHz Radiated Emissions for 37.5 dBi Antenna 15 MHz Bandwidth QPSK



37.5 dBi Antenna - Receiver Radiated Spurious Emissions above 1 GHz

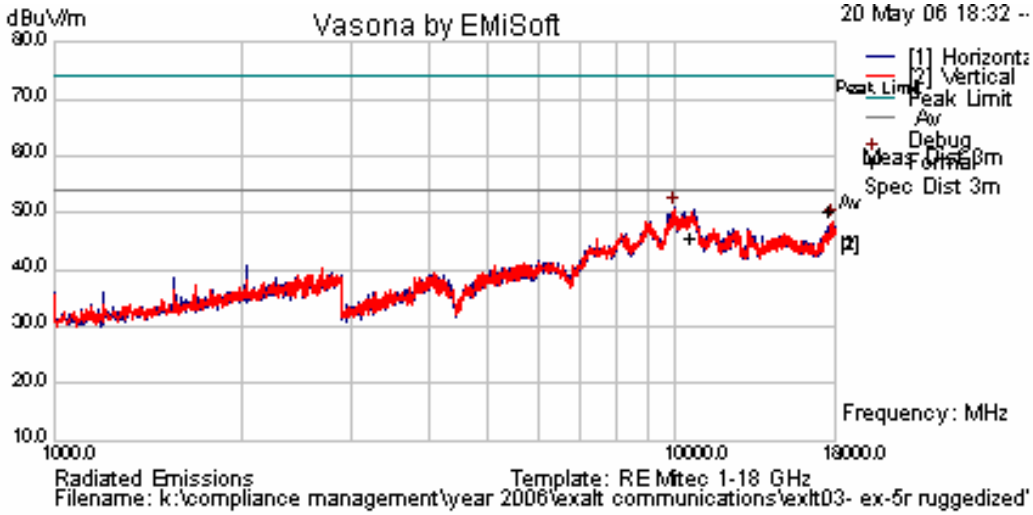
TABLE OF RESULTS –5,290 MHz 37.5 dBi Antenna 30 MHz Bandwidth QPSK

Freq. (MHz)	Pol. (H/V)	Raw Reading (dBμV/m)	Correction Factor (dB)	Corrected Field Strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)

As no peak emissions were greater than the Average Limit (54 dBμV/m) peak emissions are reported in the above matrix.

Plot 47

5,290 MHz Radiated Emissions for 37.5 dBi Antenna 30 MHz Bandwidth QPSK



37.5 dBi Antenna - Receiver Radiated Spurious Emissions above 1 GHz

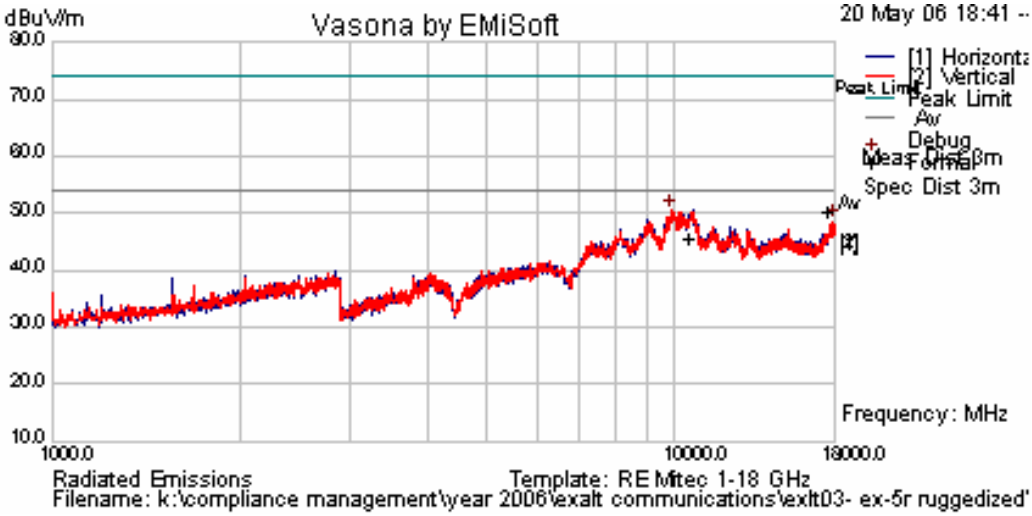
TABLE OF RESULTS – 5,290 MHz 37.5 dBi Antenna 60 MHz Bandwidth QPSK

Freq. (MHz)	Pol. (H/V)	Raw Reading (dBμV/m)	Correction Factor (dB)	Corrected Field Strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)

As no peak emissions were greater than the Average Limit (54 dBμV/m) peak emissions are reported in the above matrix.

Plot 48

5,290 MHz Radiated Emissions for 37.5 dBi Antenna 60 MHz Bandwidth QPSK



Specification

Receiver Radiated Spurious Emissions

Industry Canada RSS-Gen §4.8,
The search for spurious emissions shall be from the lowest frequency internally generated or used in the receiver (e.g. local oscillator, intermediate or carrier frequency), or 30 MHz, whichever is the higher, to at least 3 times the highest tunable or local oscillator frequency, whichever is the higher, without exceeding 40 GHz.

RSS-Gen §6
The following receiver spurious emission limits shall be complied with;
(a) If a radiated measurement is made, all spurious emissions shall comply with the limits of Table 1.

Frequency (MHz)	Field Strength (μV/m)	Field Strength (dBμV/m)	Measurement Distance (meters)
30-88	100	40.0	3
88-216	150	43.5	3
216-960	200	46.0	3
Above 960	500	54.0	3

Laboratory Measurement Uncertainty for Radiated Emissions

Measurement uncertainty	+5.6/ -4.5 dB

Traceability

Method	Test Equipment Used
Measurements were made per work instruction WI-03 'Measurement of Radiated Emissions'	0088, 0158, 0134, 0304, 0311, 0315, 0310, 0312

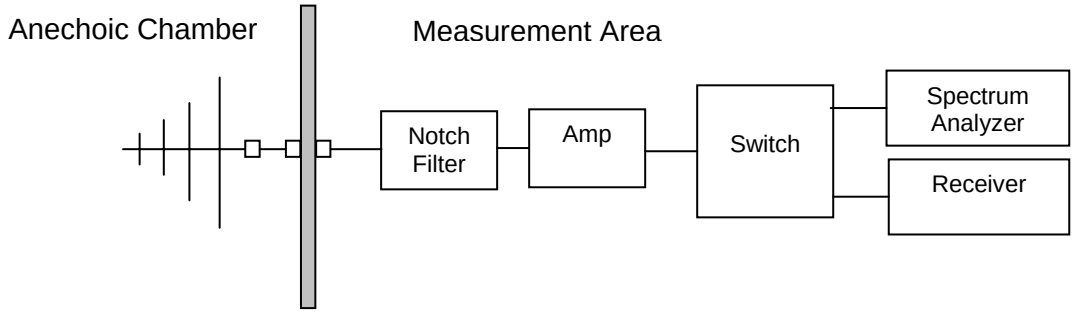
5.1.9. Radiated Spurious Emissions (30M-1 GHz)

FCC, Part 15 Subpart C §15.407(b)(6); §15.205(a); §15.209(a)
Industry Canada RSS-210 §2.2

Test Procedure

Testing 30M-1 GHz was subcontracted to the company identified in Section 3.9 Subcontracted Testing. Preliminary radiated emissions are measured in the anechoic chamber at a 10-meter distance on every azimuth in both horizontal and vertical polarity. The emissions are recorded with a spectrum analyzer in peak hold mode. Emissions closest to the limits are measured in the quasi-peak mode with the tuned receiver using a bandwidth of 120 kHz. Only the highest emissions relative to the limit are listed. The anechoic chamber test set-up is identified in Section 6 Test Set-Up Photographs.

Test Measurement Set up



Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Loss, and subtracting Amplifier Gain from the measured reading. In this test facility, the Antenna Factor, Cable Loss, and Amplifier Gains are loaded into the Rohde & Schwarz Receiver and the corrected field strength can be read directly on the receiver.

$$FS = R + AF + CORR$$

where:

FS = Field Strength
R = Measured Receiver Input Amplitude
AF = Antenna Factor
CORR = Correction Factor = CL – AG + NFL
CL = Cable Loss
AG = Amplifier Gain

For example:
Given a Receiver input reading of 51.5dBμV; Antenna Factor of 8.5dB; Cable Loss of 1.3dB; Falloff Factor of 0dB, an Amplifier Gain of 26dB and Notch Filter Loss of 1dB. The Field Strength of the measured emission is:

FS = 51.5 + 8.5 + 1.3 - 26.0 +1 = 36.3dBμV/m

Conversion between dBμV/m (or dBμV) and μV/m (or μV) are done as:

Level (dBμV/m) = 20 * Log (level (μV/m))

40 dBμV/m = 100μV/m
48 dBμV/m = 250μV/m

Measurement Results for Spurious Emissions (30 MHz – 1 GHz)

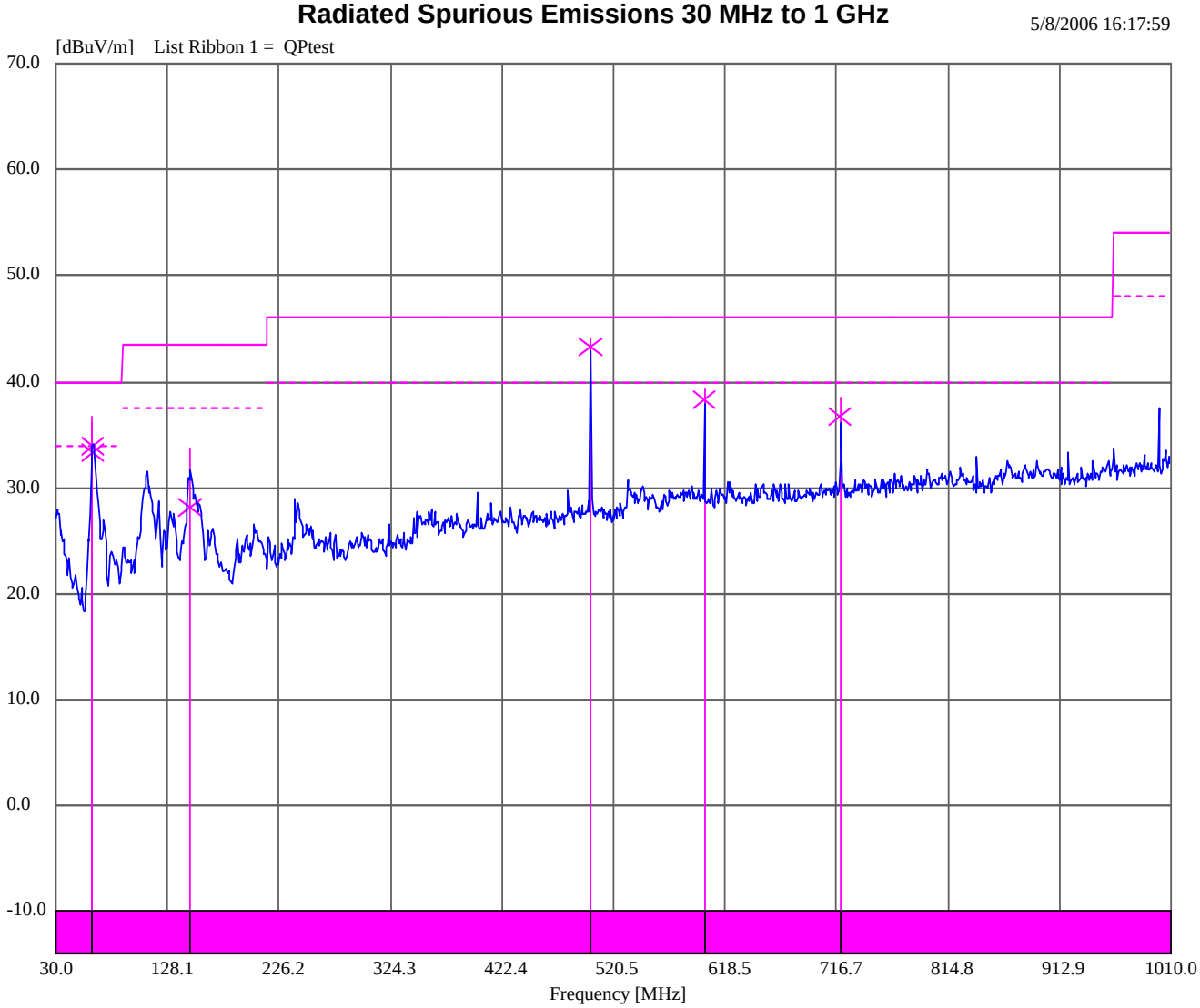
Ambient conditions.
Temperature: 17 to 23 °C Relative humidity: 31 to 57 % Pressure: 999 to 1012 mbar

Radio parameters.
7.5 MHz BW
QPSK Modulation
Max. Power
EUT Antenna: 28 dBi Single Polarized Patch Panel Antenna

TABLE OF RESULTS

Freq. (MHz)	Peak (dBuV/m)	QP (dBuV/m)	QP Lmt (dBuV/m)	QP Margin (dB)	Angle (deg)	Height (cm)	Polarity
62.069537	36.20	33.33	40.00	-6.67	109	376	Vert
62.344704	36.75	33.83	40.00	-6.17	186	350	Vert
147.797148	33.70	28.05	43.50	-15.45	355	397	Horz
499.985419	44.00	43.31	46.00	-2.69	353	201	Horz
599.971986	39.39	38.41	46.00	-7.59	220	143	Horz
719.961254	38.50	36.71	46.00	-9.29	315	154	Horz

Plot 49
Radiated Spurious Emissions 30 MHz to 1 GHz



Specification

Limits

§15.407(b)(6) Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in Section 15.209.

§15.205 (a) Except as shown in paragraph (d) of 15.205 (a), only spurious emissions are permitted in any of the frequency bands listed.

§15.205 (a) Except as shown in paragraphs (d) and (e) of this section, the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section §15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

§15.209 (a) 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.

RSS-210 §2.2 refers to Section 2.7 Table 2 below;-
.

Frequency(MHz)	Field Strength (µV/m)	Field Strength (dBµV/m)	Measurement Distance (meters)
30-88	100	40.0	3
88-216	150	43.5	3
216-960	200	46.0	3
Above 960	500	54.0	3

Laboratory Measurement Uncertainty for Radiated Emissions

Measurement uncertainty	+5.6/ -4.5 dB

Traceability

Method	Test Equipment Used
Measurements were made per Sanmina work instruction	8546A HP Receiver and RF Filter, HP Pre-amp, Antenna EMCO Biconilog

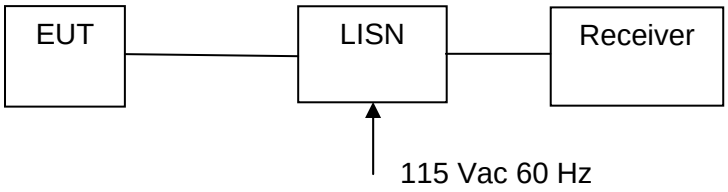
5.1.10. AC Wireline Conducted Emissions (150 kHz – 30 MHz)

FCC, Part 15 Subpart C §15.407(b)(6)/15.207
Industry Canada RSS-Gen §7.2.2

Test Procedure

The EUT is configured in accordance with ANSI C63.4. The conducted emissions are measured in a shielded room with a spectrum analyzer in peak hold in the first instance. Emissions closest to the limit are measured in the quasi-peak mode (QP) with the tuned receiver using a bandwidth of 9 kHz. The emissions are maximized further by cable manipulation. The highest emissions relative to the limit are listed.

Test Measurement Set up



Measurement set up for AC Wireline Conducted Emissions Test

Measurement Results for AC Wireline Conducted Emissions (150 kHz – 30 MHz)

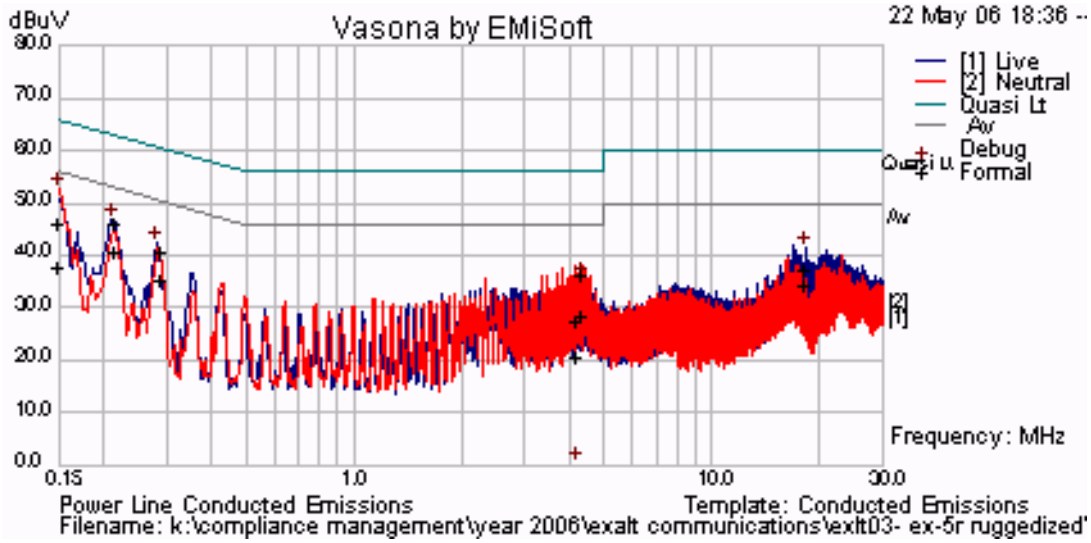
Ambient conditions.
Temperature: 17 to 23 °C Relative humidity: 31 to 57 % Pressure: 999 to 1012 mbar

Radio parameters.
Transmitter: Freq 5488 MHz
Power: Full power on both RF ports
Transmitter Port(s): Terminated in 50 Ohm load
Duty Cycle: 100% both polarities

TABLE OF RESULTS

Freq (MHz)	Line	Peak (dBµV)	QP (dBµV)	QP Limit (dBµV)	QP Margin (dB)	Ave. (dBµV)	Ave. Limit (dBµV)	Ave. Margin (dB)
0.215	Live	46.71	43.63	63.02	-19.4	38.39	53.02	-14.63
18.243	Neutr	41.47	34.66	60	-25.34	32.02	50	-17.98
0.15	Neutr	52.50	43.52	66	-22.48	35.16	56	-20.84
0.29	Neutr	46.71	38.32	60.54	-22.22	32.83	50.54	-17.71
4.381	Neutr	35.51	33.7	56	-22.3	26.26	46	-19.74

Plot 50
AC Wireline Conducted Emissions (150 kHz – 30 MHz)



Specification

Limit

§15.407 (b)(6); Any U-NII devices using an AC power line are required to comply also with the limits set forth in Section 15.207.

§15.207 (a) Except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 μΩ line impedance stabilization network (LISN), see §15.207 (a) matrix below. Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal.

RSS-Gen §7.2.2
The radio frequency voltage that is conducted back into the AC power lines in the frequency range of 0.15 MHz to 30 MHz shall not exceed the limits shown in the table below. The tighter limit applies at the frequency range boundaries.

§15.207 (a) and **RSS-Gen §7.2.2** Limit Matrix
The lower limit applies at the boundary between frequency ranges

Frequency of Emission (MHz)	Conducted Limit (dBμV)	
	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

Laboratory Measurement Uncertainty for Conducted Emissions

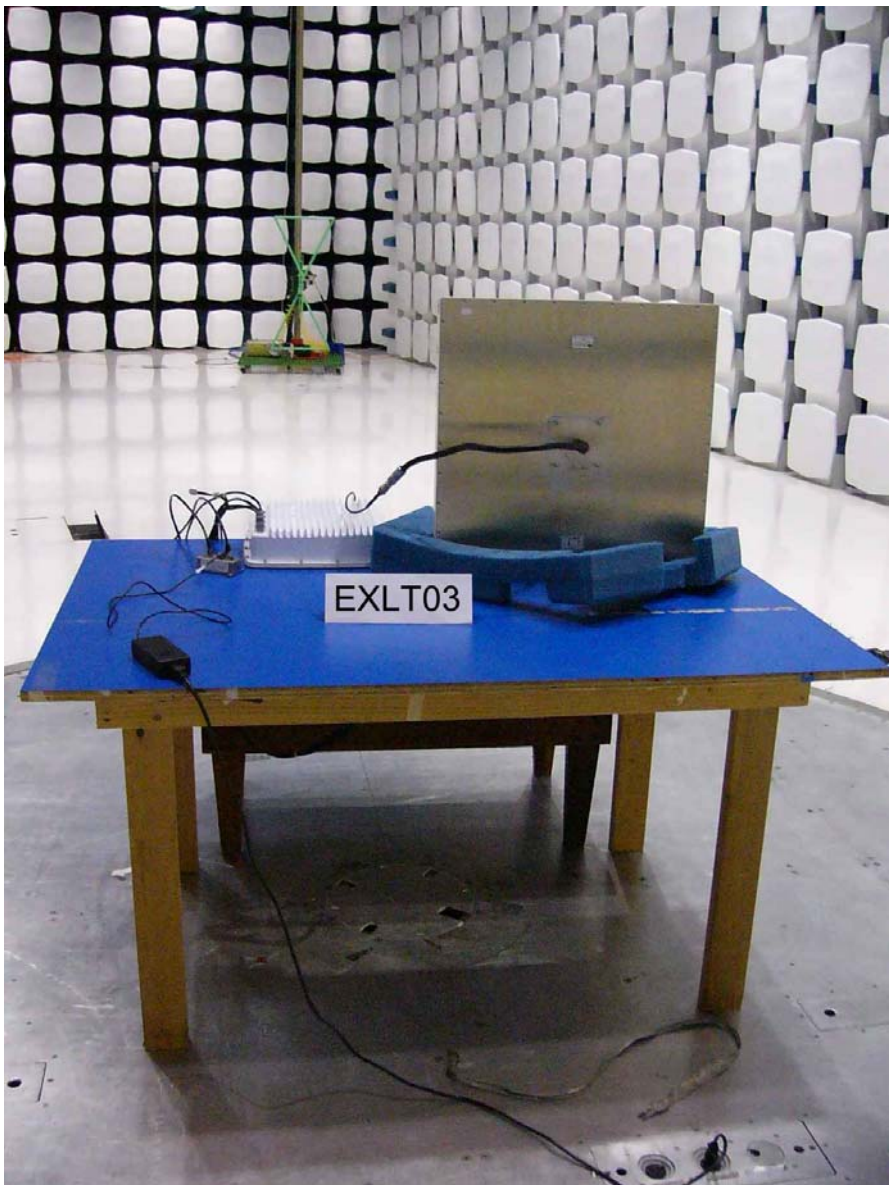
Measurement uncertainty	±2.64 dB

Traceability

Method	Test Equipment Used
Measurements were made per work instruction WI-EMC-01 'Measurement of Conducted Emissions'	0158, 0184, 0193, 0190, 0293, 0307

6. PHOTOGRAPHS

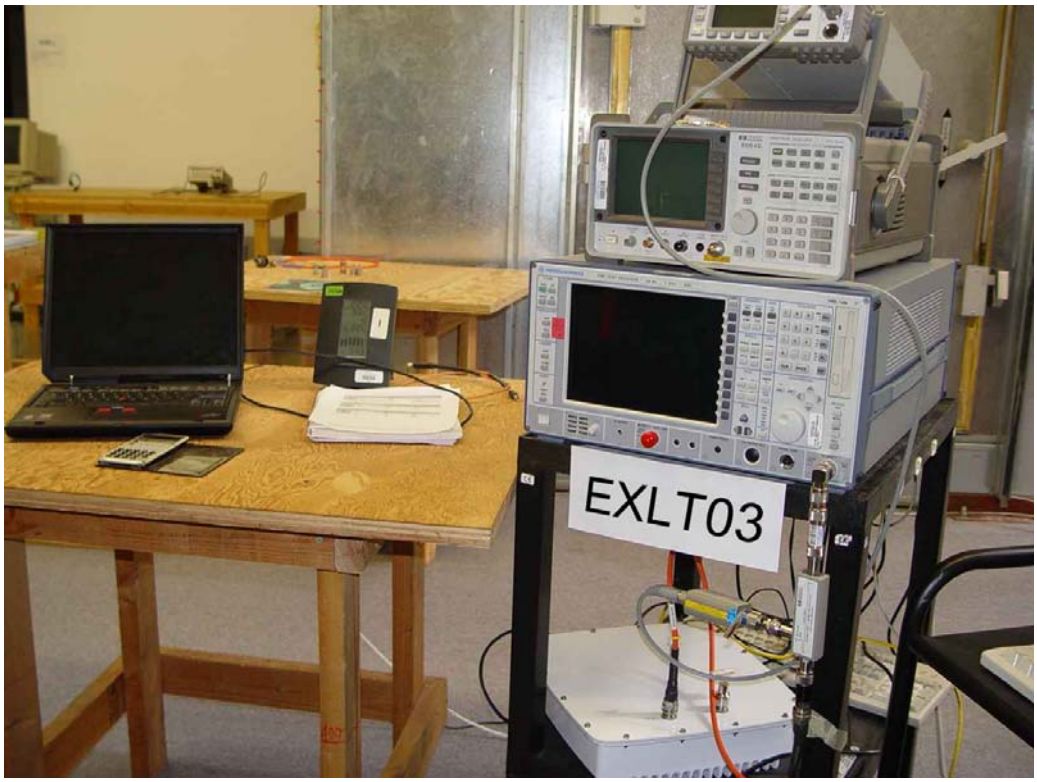
6.1. Radiated Emissions (30 MHz-1 GHz)



6.2. Radiated Emissions >1 GHz

6.3. Conducted Emissions (150 kHz - 30 MHz)

6.4. General Measurement Test Set-Up



7. TEST EQUIPMENT DETAILS

Asset #	Instrument	Manufacturer	Part #	Serial #
0088	Spectrum Analyzer	Hewlett Packard	8564E	3410A00141
0104	1-18GHz Horn Antenna	The Electro-Mechanics Company	3115	9205-3882
0134	Amplifier	Com Power	PA 122	181910
0158	Barometer /Thermometer	Control Co.	4196	E2846
0193	EMI Receiver	Rhode & Schwartz	ESI 7	838496/007
0252	SMA Cable	Megaphase	Sucoflex 104	None
0310	2m SMA Cable	Micro-Coax	UFA210A-0-0787-3G03G0	209089-001
0312	3m SMA Cable	Micro-Coax	UFA210A-1-1181-3G0300	209092-001
0313	Coupler	Hewlett Packard	86205A	3140A01285
0314	30dB N-Type Attenuator	ARRA	N9444-30	1623
0070	Power Meter	Hewlett Packard	437B	3125U11552
0116	Power Sensor	Hewlett Packard	8485A	3318A19694
0117	Power Sensor	Hewlett Packard	8487D	3318A00371
0184	Pulse Limiter	Rhode & Schwartz	ESH3Z2	357.8810.52
0190	LISN	Rhode & Schwartz	ESH3Z5	836679/006
0293	BNC Cable	Megaphase	1689 1GVT4	15F50B001
0307	BNC Cable	Megaphase	1689 1GVT4	15F50B002

Appendix A

Appendix A - 16 QAM and 64 QAM Verification Data
and the
20 dBi Dual Polarized Integral Panel antenna Verification Data

Appendix A - 16 QAM and 64 QAM Verification Data and the 20 dBi Dual Polarized Integral Panel antenna Verification Data

As mentioned previously in Section 3.6 “Test Configurations”, it was established at the start of the test program that the QPSK modulation scheme has the highest Radiated Emission and Peak Emission levels. The Test Report includes results for all of the QPSK configurations and selected worst case test results for 16QAM and 64QAM configurations.

The worst case test results for 16QAM and 64QAM configurations are reported in this appendix.

List of Measurements

The following table represents the list of measurements required under the **FCC CFR47 Part 15.407** and **Industry Canada RSS-210**.and **Industry Canada RSS-Gen.**

Section(s)	Test Items	Description	Condition	Result	Test Report Section
15.407(b)(2) **15.205(a)** **15.209(a)**	Transmitter Radiated Spurious Emissions	Emissions above 1 GHz	Radiated	Complies	*A.1.1*
2.2, 2.6 **A9.3(2)**	Radiated Band Edge	Band edge results	Radiated	Complies	*A.1.2*
4.7	Peak Field Strength Measurements		Radiated	Complies	*A.1.3*
Industry Canada only **RSS-Gen §4.8, §6**	Receiver Radiated Spurious Emissions	Emissions above 1 GHz	Radiated	Complies	*A.1.4*

Note 1: *Test results reported in this document relate only to the items tested*
Note 2: *The required tests demonstrated compliance as per client declaration of test configuration, monitoring methodology and associated pass/fail criteria*

Band	BW (MHz)	Modulation					
		16QAM			64QAM		
		Low (MHz)	Mid (MHz)	High (MHz)	Low (MHz)	Mid (MHz)	High (MHz)
5.3	7.5	5260	5296	5332	5260	5296	5332
	15	5265	5296	5327	5265	5296	5327
	30	5272	5290	5308	5272	5290	5308
	60		5290			5290	

A.1.1. Radiated Emissions

Transmitter Radiated Spurious Emissions (above 1 GHz)

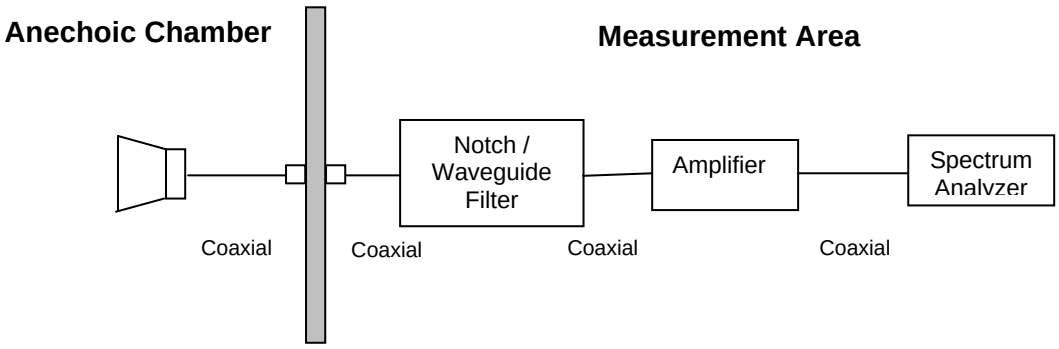
FCC, Part 15 Subpart C §15.407(b)(2), §15.205(a)/15.209(a)
Industry Canada RSS-210 §A9.3(2); §2.2; §2.6; RSS-Gen §4.7

Test Procedure

Radiated emissions above 1 GHz are measured in the anechoic chamber at a 3-meter distance on every azimuth in both horizontal and vertical polarities. The emissions are recorded and maximized as a function of azimuth by rotation through 360° with a spectrum analyzer in peak hold mode. Depending on the frequency band spanned a notch filter and waveguide filter was used to remove the fundamental frequency. The highest emissions relative to the limit are listed for each frequency spanned.

All measurements on any frequency or frequencies over 1 MHz are based on the use of measurement instrumentation employing an average detector function. All measurements above 1 GHz were performed using a minimum resolution bandwidth of 1 MHz.

Test Measurement Set up



Measurement set up for Radiated Emission Test

Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Loss, and subtracting Amplifier Gain from the measured reading. All factors are included in the reported data.

FS = R + AF + CORR - FO

where: FS = Field Strength
R = Measured Spectrum analyzer Input Amplitude
AF = Antenna Factor
CORR = Correction Factor = CL – AG + NFL
CL = Cable Loss
AG = Amplifier Gain
FO = Distance Falloff Factor
NFL = Notch Filter Loss or Waveguide Loss

For example:
Given receiver input reading of 51.5 dBμV; Antenna Factor of 8.5 dB; Cable Loss of 1.3 dB; Falloff Factor of 0 dB, an Amplifier Gain of 26 dB and Notch Filter Loss of 1 dB. The Field Strength of the measured emission is:

FS = 51.5 + 8.5 + 1.3 - 26.0 +1 = 36.3 dBμV/m

Conversion between dBμV/m (or dBμV) and μV/m (or μV) are done as:

Level (dBμV/m) = 20 * Log (level (μV/m))

40 dBμV/m = 100 μV/m
48 dBμV/m = 250 μV/m

The following formula is used to convert the equipment isotropic radiated power (eirp) to field strength

$E = 1000000 \times \sqrt{30P}/3$ μV/m, where P is the EIRP in Watts

Therefore: -27 dBm/MHz = 68.23 dBuV/m

Measurement Results Transmitter Radiated Spurious Emissions above 1 GHz

The following table describes the two configurations of equipment that were tested for radiated emissions.

Radio parameters.
Duty Cycle: 100% (test mode)
Power Level: As specified by the following matrix, see Section 5.1.2 Peak Output Power

Antenna Configuration	EUT Configuration	BW (MHz)	Number of Antenna ports	Max. Allowable Conducted Pwr Per Antenna port (dBm)	
				Antenna port #1	Antenna port #2
20 dBi Dual Polarized Integral Antenna	Two antenna ports, dual polarized radio, operating on the same frequency with a coherent transmitter on both polarizations, into an external dual-polarized antenna.	7.5	Two	+3.57	+3.57
		15		+6.58	+6.58
		30 & 60		+7.0	+7.0
37.5 dBi Dual Polarized Parabolic Antenna	Two antenna ports, dual polarized radio, operating on the same frequency with a coherent transmitter on both polarizations, into an external dual-polarized antenna.	7.5	Two	-13.93	-13.93
		15		-10.92	-10.92
		30 & 60		-10.50	-10.50

Radiated Spurious Emissions above 1 GHz (continued)

QPSK Radiated Emissions 20 dBi Dual Polarized Integral Antenna

TABLE OF RESULTS – 5,296 MHz 20 dBi Antenna 7.5 MHz Bandwidth QPSK

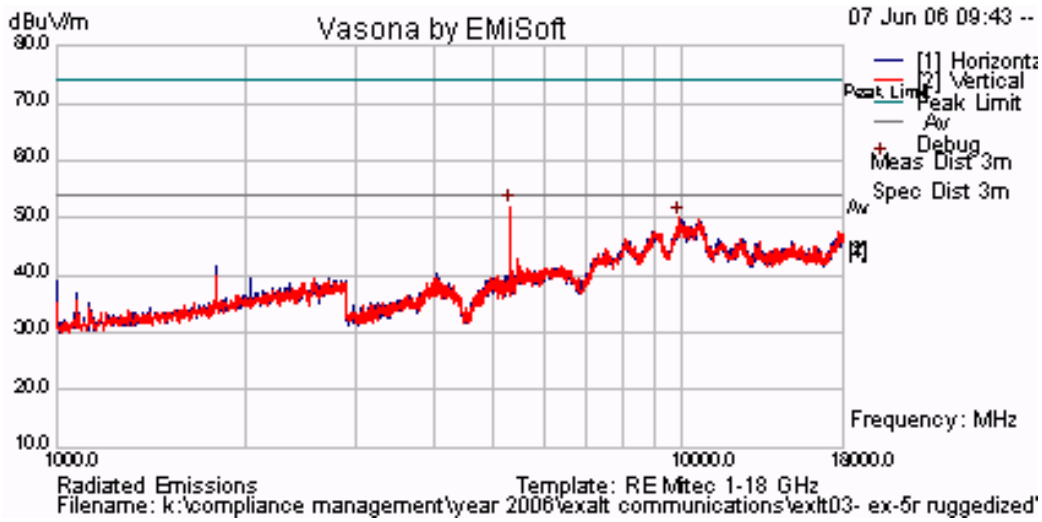
Freq. (MHz)	Pol. (H/V)	Measurement Type Peak/Avg	Field Strength (dBµV/m)	RB/ NRB	Limit (dBµV/m)	Margin (dB)

RB - Restricted Band / NRB – Non-Restricted Band.

Note. No emissions were observed above the limit.

Plot A01

5,296 MHz Radiated Emissions for 20 dBi Antenna 7.5 MHz Bandwidth QPSK



Radiated Spurious Emissions above 1 GHz (continued)

16QAM Radiated Emissions 37.5 dBi Antenna

TABLE OF RESULTS – 5,327 MHz 37.5 dBi Antenna 15 MHz Bandwidth 16QAM

Freq. (MHz)	Pol. (H/V)	Measurement Type Peak/Avg	Field Strength (dBµV/m)	RB/ NRB	Limit (dBµV/m)	Margin (dB)

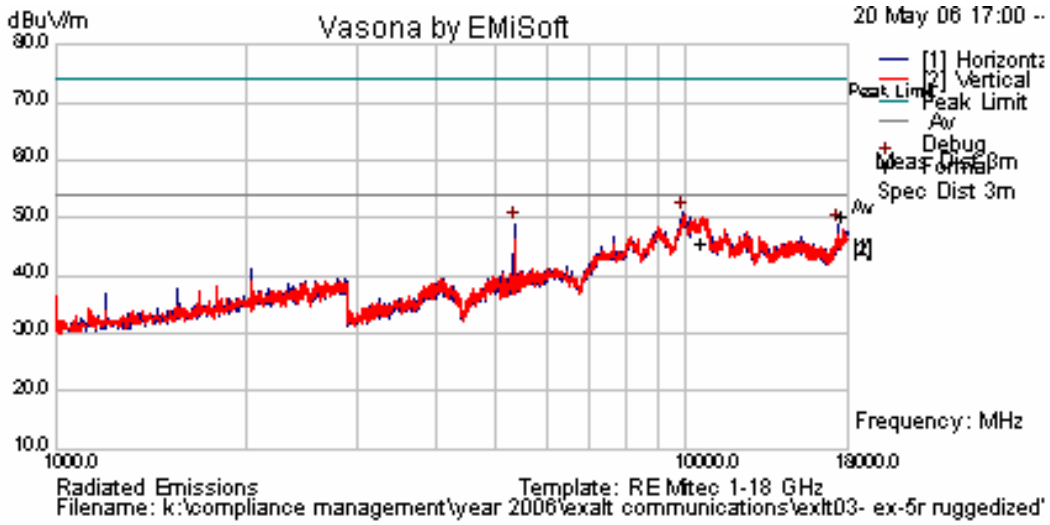
RB - Restricted Band / NRB – Non-Restricted Band.

No emissions were observed above the limit.

Radiated Emissions for 37.5 dBi Antenna

Plot A02

5,327 MHz Radiated Emissions for 37.5 dBi Antenna 15 MHz Bandwidth 16QAM



64QAM Radiated Emissions 37.5 dBi Antenna

TABLE OF RESULTS – 5,327 MHz 37.5 dBi Antenna 15 MHz Bandwidth 64QAM

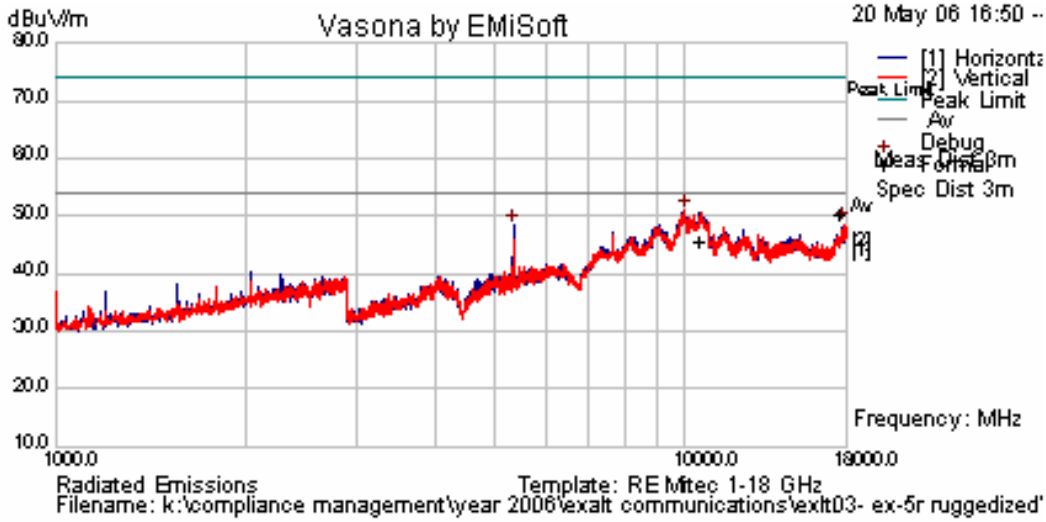
Freq. (MHz)	Pol. (H/V)	Measurement Type Peak/Avg	Field Strength (dBµV/m)	RB/ NRB	Limit (dBµV/m)	Margin (dB)

RB - Restricted Band / NRB – Non-Restricted Band.

No emissions were observed above the limit.

Plot A03

5,327 MHz Radiated Emissions for 37.5 dBi Antenna 60 MHz Bandwidth 64QAM



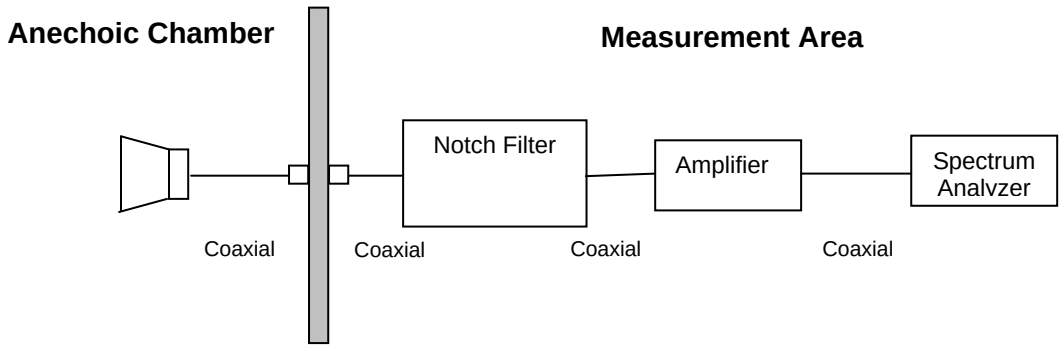
A.1.2. Radiated Band-Edge – Restricted Bands

Test Procedure

Radiated emissions above 1 GHz are measured in the anechoic chamber at a 3-meter distance on every azimuth in both horizontal and vertical polarities. The emissions are recorded and maximized as a function of azimuth by rotation through 360° with a spectrum analyzer in peak hold mode.

All measurements on any frequency or frequencies over 1 MHz are based on the use of measurement instrumentation employing an average detector function. All measurements above 1 GHz were performed using a minimum resolution bandwidth of 1 MHz.

Test Measurement Set up



Measurement set up for Radiated Emission Test

Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Loss, and subtracting Amplifier Gain from the measured reading. All factors are included in the reported data.

FS = R + AF + CORR - FO

where: FS = Field Strength
R = Measured Spectrum analyzer Input Amplitude
AF = Antenna Factor
CORR = Correction Factor = CL – AG + NFL
CL = Cable Loss
AG = Amplifier Gain
FO = Distance Falloff Factor
NFL = Band-stop Filter Loss or Waveguide Loss

For example:
Given receiver input reading of 51.5 dBμV; Antenna Factor of 8.5 dB; Cable Loss of 1.3 dB; Falloff Factor of 0 dB, an Amplifier Gain of 26 dB and Notch Filter Loss of 1 dB. The Field Strength of the measured emission is:

FS = 51.5 + 8.5 + 1.3 - 26.0 +1 = 36.3 dBμV/m

Conversion between dBμV/m (or dBμV) and μV/m (or μV) are done as:

Level (dBμV/m) = 20 * Log (level (μV/m))

40 dBμV/m = 100 μV/m
48 dBμV/m = 250 μV/m

Radiated Band Edge and Peak Field Strength - Test Configurations

The following table describes the two configurations of equipment that were tested for radiated band-edge emissions and peak field strength measurements.

Radio parameters.
Duty Cycle: 100% (test mode)
Power Level: As specified by the following matrix, see Section 5.1.2 Peak Output Power

Antenna Configuration	EUT Configuration	BW (MHz)	Number of Antenna ports	Max. Allowable Conducted Pwr Per Antenna port (dBm)	
				Antenna port #1	Antenna port #2
20 dBi Dual Polarized Integral Antenna	Two antenna ports, dual polarized radio, operating on the same frequency with a coherent transmitter on both polarizations, into an external dual-polarized antenna.	7.5	Two	+3.57	+3.57
		15		+6.58	+6.58
		30 & 60		+7.0	+7.0
37.5 dBi Dual Polarized Parabolic Antenna	Two antenna ports, dual polarized radio, operating on the same frequency with a coherent transmitter on both polarizations, into an external dual-polarized antenna.	7.5	Two	-13.93	-13.93
		15		-10.92	-10.92
		30 & 60		-10.50	-10.50

Radiated Band Edge Test Results for 20 dBi Dual Polarized Integral Antenna

TABLE OF RESULTS - 5.3 GHz Band - 60 MHz Bandwidth QPSK

Tx Freq. (MHz)	Restricted Band Frequency (MHz)	Measured (dBuV/m)	Limit (dBuV/m)	Margin (dB)
$5{,}290_{PEAK}$	5,150	63.52	74.00	-10.48
$5{,}290_{AVE}$	5,150	40.74	54.00	-13.26
$5{,}290_{PEAK}$	5,350	70.21	74.00	-3.79
$5{,}290_{AVE}$	5,350	47.90	54.00	-6.10

Radiated Band Edge Test Results for 37.5 dBi Parabolic Antenna 16/64 QAM

TABLE OF RESULTS - 5.3 GHz Band - 60 MHz Bandwidth 16QAM

Tx Freq. (MHz)	Restricted Band Frequency (MHz)	Measured (dBuV/m)	Limit (dBuV/m)	Margin (dB)
$5{,}290_{PEAK}$	5,150	62.69	74.00	-11.31
$5{,}290_{AVE}$	5,150	40.87	54.00	-13.13
$5{,}290_{PEAK}$	5,350	64.00	74.00	-10.00
$5{,}290_{AVE}$	5,350	41.70	54.00	-12.30

TABLE OF RESULTS - 5.3 GHz Band - 60 MHz Bandwidth 64QAM

Tx Freq. (MHz)	Restricted Band Frequency (MHz)	Measured (dBuV/m)	Limit (dBuV/m)	Margin (dB)
$5{,}290_{PEAK}$	5,150	62.82	74.00	-11.18
$5{,}290_{AVE}$	5,150	40.87	54.00	-13.13
$5{,}290_{PEAK}$	5,350	65.86	74.00	-8.14
$5{,}290_{AVE}$	5,350	43.29	54.00	-10.71

A.1.3. Peak Field Strength Measurements

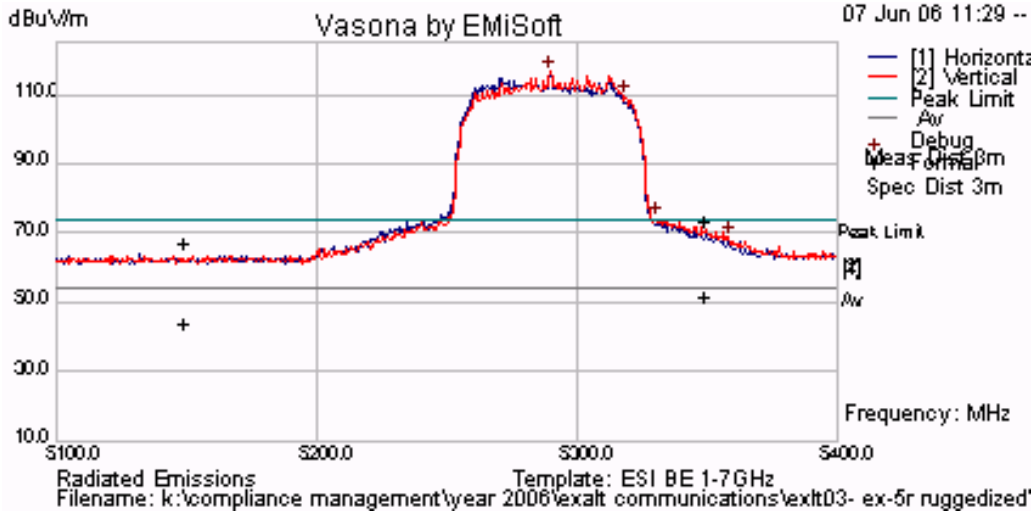
Peak Field Strength Measurements for 20 dBi Dual Polarized Integral Antenna

20 dBi Antenna 5,290 **MHz** **60 MHz Bandwidth QPSK**

Plot A04

20 dBi Antenna 5,290 MHz 60 MHz Bandwidth QPSK

Peak Emission =116.49 dBµV/m



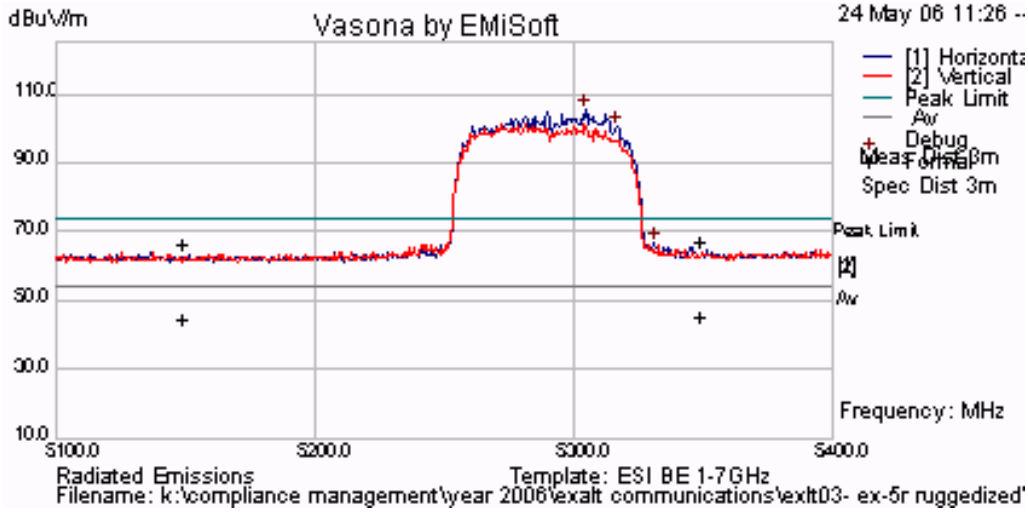
Peak Field Strength Measurements for 37.5 dBi Antenna

37.5 dBi Antenna 5,290 MHz 60 MHz Bandwidth 16QAM

Plot A05

37.5 dBi Antenna 5,290 MHz 60 MHz Bandwidth 16QAM

Peak Emission = 105.51 dBµV/m

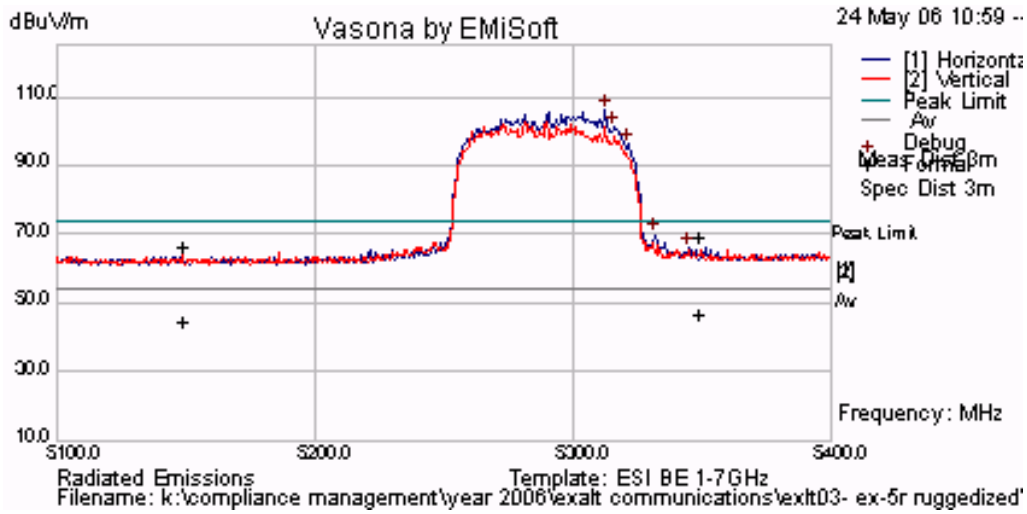


37.5 dBi Antenna 5,290 MHz 60 MHz Bandwidth 64QAM

Plot A06

37.5 dBi Antenna 5,290 MHz 60 MHz Bandwidth 64QAM

Peak Emission = 106.14 dBµV/m



Specification Limits

15.407 (b)(2). All emissions outside of the 5,150-5,350MHz band shall not exceed an EIRP of -27dBm/MHz.

§15.205 (a) Except as shown in paragraph (d) of 15.205 (a), only spurious emissions are permitted in any of the frequency bands listed.

§15.205 (a) Except as shown in paragraphs (d) and (e) of this section, the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section §15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

§15.209 (a) 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.

RSS-210 §A9.3(2) For transmitters operating in the 5250-5350 MHz band, all emissions outside the 5150-5350 MHz band shall not exceed -27 dBm/MHz e.i.r.p. Devices operating in the 5250-5350 MHz band that generate emissions in the 5150-5250 MHz band shall not exceed out of band emission limit of 27 dBm/MHz e.i.r.p. in the 5150-5250 MHz band in order to operate indoor/outdoor, or alternatively shall comply with the spectral power density for operation within the 5150-5250 MHz band and shall be labeled “for indoor use only”.

RSS-Gen §4.7 The search for unwanted emissions shall be from the lowest frequency internally generated or used in the device (local oscillator, intermediate of carrier frequency), or from 30 MHz , whichever is the lowest frequency, to the 5th harmonic of the highest frequency generated without exceeding 40 GHz.

Frequency (MHz)	Field Strength (µV/m)	Field Strength (dBµV/m)	Measurement Distance (meters)
30-88	100	40.0	3
88-216	150	43.5	3
216-960	200	46.0	3
Above 960	500	54.0	3

Laboratory Measurement Uncertainty for Radiated Emissions

Measurement uncertainty	+5.6/ -4.5 dB

Traceability

Method	Test Equipment Used
Measurements were made per work instruction WI-03 ‘Measurement of Radiated Emissions’	0088, 0158, 0134, 0304, 0311, 0315, 0310, 0312

A.1.4. Receiver Radiated Spurious Emissions (above 1 GHz)

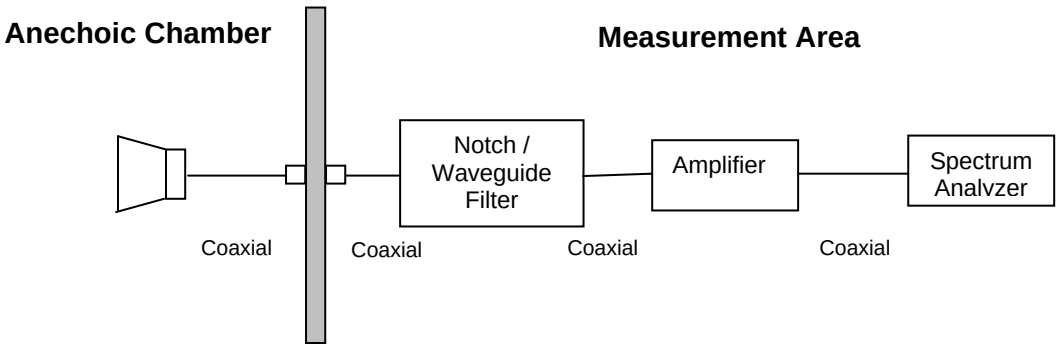
Industry Canada RSS-Gen §4.8, §6

Test Procedure

Radiated emissions above 1 GHz are measured in the anechoic chamber at a 3-meter distance on every azimuth in both horizontal and vertical polarities. The emissions are recorded and maximized as a function of azimuth by rotation through 360° with a spectrum analyzer in peak hold mode. Depending on the frequency band spanned a notch filter and waveguide filter was used to remove the fundamental frequency. The highest emissions relative to the limit are listed for each frequency spanned.

All measurements on any frequency or frequencies over 1 MHz are based on the use of measurement instrumentation employing an average detector function. All measurements above 1 GHz were performed using a minimum resolution bandwidth of 1 MHz.

Test Measurement Set up



Measurement set up for Radiated Emission Test

Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Loss, and subtracting Amplifier Gain from the measured reading. All factors are included in the reported data.

FS = R + AF + CORR - FO

where: FS = Field Strength
R = Measured Spectrum analyzer Input Amplitude
AF = Antenna Factor
CORR = Correction Factor = CL – AG + NFL
CL = Cable Loss
AG = Amplifier Gain
FO = Distance Falloff Factor
NFL = Notch Filter Loss or Waveguide Loss

For example:
Given receiver input reading of 51.5 dBμV; Antenna Factor of 8.5 dB; Cable Loss of 1.3 dB; Falloff Factor of 0 dB, an Amplifier Gain of 26 dB and Notch Filter Loss of 1 dB. The Field Strength of the measured emission is:

FS = 51.5 + 8.5 + 1.3 - 26.0 +1 = 36.3 dBμV/m

Conversion between dBμV/m (or dBμV) and μV/m (or μV) are done as:

Level (dBμV/m) = 20 * Log (level (μV/m))

40 dBμV/m = 100 μV/m
48 dBμV/m = 250 μV/m

Receiver Radiated Spurious Emissions above 1 GHz - Test Configurations

The EUT was tested with the following two configuration.

The following table describes the two configurations of equipment that were tested.

Antenna Configuration	EUT Configuration
20 dBi Dual Polarized Integral Antenna	Two antenna ports, dual polarized radio into an integral dual-polarized antenna.

20 dBi Dual Polarized Integral Antenna - Receiver Radiated Spurious Emissions above 1 GHz

Ambient conditions.
Temperature: 17 to 23°C Relative humidity: 31 to 57 % Pressure: 999 to 1012 mbar

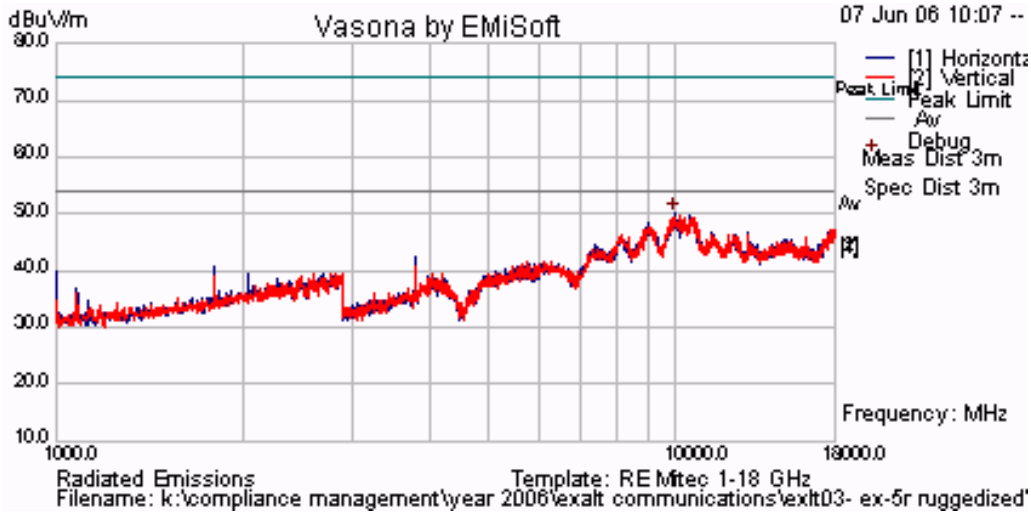
TABLE OF RESULTS – 5,296 MHz 20 dBi Antenna 7.5 MHz Bandwidth QPSK

Freq. (MHz)	Pol. (H/V)	Raw Reading (dBµV/m)	Correction Factor (dB)	Corrected Field Strength (dBµV/m)	Limit (dBµV/m)	Margin (dB)

As no peak emissions were greater than the Average Limit (54 dBµV/m) peak emissions are reported in the above matrix.

Plot A07

5,296 MHz Receiver Radiated Emissions for 20 dBi Antenna 7.5 MHz Bandwidth QPSK



Specification

Receiver Radiated Spurious Emissions

Industry Canada RSS-Gen §4.8,
The search for spurious emissions shall be from the lowest frequency internally generated or used in the receiver (e.g. local oscillator, intermediate or carrier frequency), or 30 MHz, whichever is the higher, to at least 3 times the highest tunable or local oscillator frequency, whichever is the higher, without exceeding 40 GHz.

RSS-Gen §6
The following receiver spurious emission limits shall be complied with;
(a) If a radiated measurement is made, all spurious emissions shall comply with the limits of Table 1.

Frequency (MHz)	Field Strength (μV/m)	Field Strength (dBμV/m)	Measurement Distance (meters)
30-88	100	40.0	3
88-216	150	43.5	3
216-960	200	46.0	3
Above 960	500	54.0	3

Laboratory Measurement Uncertainty for Radiated Emissions

Measurement uncertainty	+5.6/ -4.5 dB

Traceability

Method	Test Equipment Used
Measurements were made per work instruction WI-03 'Measurement of Radiated Emissions'	0088, 0158, 0134, 0304, 0311, 0315, 0310, 0312

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