



Engineering and Testing for EMC and Safety Compliance

TYPE CERTIFICATION REPORT

VEGA Grieshaber KG
Am Hohenstein 113
77761 Schiltach
Germany

MODELS: VEGAPULS 65 & VEGAPULS 66
FCC ID: O6QPULS6566
IC: 3892A-PS6566

July 29, 2003

Standards Referenced for this Report	
Part 2: 2001	Frequency Allocations and Radio Treaty Matters; General Rules and Regulations
Part 15: 2001	Radio frequency devices - §15.209: Radiated Emissions Limits
ANSI C63.4-2003	Standard Format Measurement/Technical Report Personal Computer and Peripherals
RSS-210	Low Power License-Exempt Radio Communication Devices (All Frequency Bands)

Frequency Range	Output Power (W) Conducted	Frequency Tolerance (ppm)	Emission Designator
6.3 GHz		N/A	N/A

REPORT PREPARED BY TEST ENGINEER: DESMOND FRASER

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1 General Information

The following Type Certification Report is prepared on behalf of Vega Grieshaber KG in accordance with the Federal Communications Commission and Industry Canada Rules and Regulations. The Equipment Under Test (EUT) was Model # VEGAPULS 65 & VEGAPULS 66, FCC ID: O6QPULS6566. The test results reported in this document relate only to the item that was tested.

All measurements contained in this application were conducted in accordance with FCC Rules and Regulations CFR 47, Industry Canada RSS-210, and ANSI C63.4 Methods of Measurement of Radio Noise Emissions, 2003. The instrumentation utilized for the measurements conforms to the ANSI C63.4 standard for EMI and Field Strength Instrumentation. Calibration checks are performed regularly on the instruments, and all accessories including high pass filter, coaxial attenuator, preamplifier and cables.

1.1 Test Facility

The open area test site and conducted measurement facility used to collect the radiated data is located on the parking lot of Rhein Tech Laboratories, Inc. 360 Herndon Parkway, Suite 1400, Herndon, Virginia 20170. This site has been fully described in a report dated March 3, 2000, submitted to and approved by the Federal Communications Commission to perform AC line conducted and radiated emissions testing (ANSI C63.4 2003).

1.2 Related Submittal(s)/Grant(s)

This is an original application report.

2 Conformance Statement

Standards Referenced for this Report	
Part 2: 2001	Frequency Allocations and Radio Treaty Matters; General Rules and Regulations
Part 15: 2001	Radio frequency devices - §15.209: Radiated Emissions Limits
ANSI C63.4-2003	Standard Format Measurement/Technical Report Personal Computer and Peripherals
RSS-210	Low Power License-Exempt Radio Communication Devices (All Frequency Bands)

Frequency Range	Output Power (W) Conducted	Frequency Tolerance (ppm)	Emission Designator
6.3 GHz		N/A	N/A

We, the undersigned, hereby declare that the equipment tested and referenced in this report conforms to the identified standard(s) as described in this attached test record. No modifications were made to the equipment during testing in order to achieve compliance with these standards. Furthermore, there was no deviation from, additions to, or exclusions from, the above standards for Certification methodology.

Signature: 

Date: July 29, 2003

Typed/Printed Name: Desmond A. Fraser


Position: President

Signature: 

Date: July 29, 2003

Typed/Printed Name: Desmond A. Fraser

Position: Test Engineer

 Accredited by the National Voluntary Accreditation Program for the specific scope of accreditation under Lab Code 200061-0.

Note: This report may not be used by the client to claim product endorsement by NVLAP or any agency of the U.S. Government.

2.1 Exercising the EUT

The EUT was configured to continuously transmit at 100% duty cycle in measurement mode. The normal operating measurement mode is a radar pulse with a duty cycle less than 1:100. By configuring the unit to transmit continuously in the continuous measurement mode, desensitization factor was not required. This approach was used because the EUT produces extremely low output power. The EUT was setup at an antenna-to-EUT test distance of **0.3 m** in order to achieve sufficient dynamic range including the use of a harmonic mixer as a result of the carrier low output power. The unit's spurious emissions were also investigated and tested in the restricted and non-restricted band from 9 kHz to 30 GHz. The tests were performed with the EUT polarized horizontally and vertically in order to determine worst-case emissions. The EUT supports only one channel at 6.3 GHz. The conducted power output from the device at the measurement operating mode is **-67.92 dBm** at 6.3 GHz. This information was provided by the manufacturer and verified by RTL. The fast pulse rise time (>4 ns) does not affect the final total power output when the EUT is placed in a 100% continuous duty cycle mode.

3 Conducted Limits - §15.207

This unit is 24 VDC powered. Conducted emissions are not applicable. This device would be installed in industrial sites where 24 VDC supply already exists. The manufacturer does not provide a power supply with the units.

4 Radiated Emission Limits - §15.209; IC RSS-210 §6.2.2(o)(e1), §6.3

4.1 Radiated Emission Limits Test Procedure

Radiated Spurious Emissions applies to harmonics and spurious emissions that fall in the restricted and non-restricted bands. Investigated from 0.009 kHz to 30 GHz, C63.4 2003 was the standard used for the test. The restricted bands are listed in Part 15.205. The maximum permitted average field strength for the restricted band is listed in Part 15.209. The EUT was tested in three orthogonal planes namely X, Y, and Z. The test antenna was horizontally and vertically polarized during testing. The general limit under part 15.209 was applied for all frequencies 0.009 kHz to 30 GHz per FCC 15.209. There was no spurious noise detected from 0.009 kHz to 30 GHz except the carrier at 6.3 GHz. The EUT was investigated and tested with four housings, namely: Stainless Steel, Aluminum, Double Chamber Aluminum, and Plastic. The Plastic housing configuration demonstrated the worst case results. The data below is for the worst case configuration and four antenna configurations.

4.2 Field Strength Calculation

The field strength is calculated by adding the antenna factor and cable factor from the measured Spectrum Analyzer reading.

$$\text{Spectrum Analyzer Level Corrected (dBuV/m)} = \text{Spectrum Analyzer Level (dBuV/m)} + \text{AF (dB/m)} + \text{CL (dB)}$$

AF = antenna factor
 CL = cable loss

4.3 Radiated Emission Limits Test Data

Table 4-1: Field Strength of Carrier with 17.0 dBi Rod Antenna and Plastic Housing

Frequency (GHz)	Detector	Antenna POL	Spectrum Analyzer Level (dBuV)	Site Correction Factor (dB/m)	Spectrum Analyzer Level Corrected (dBuV/m)	FCC Limit (dBuV)	Margin (dB)
6.3	Peak		37.7 ^(1,2)	12.3		74.0	
6.3	Avg	H	37.7 ^(1,2)	12.3	50.0	54.0	-4.0

Note 1: Corrected by -20dB due to 0.3 meters antenna test distance

Note 2: Duty cycle correction was not used in the final calculation

Table 4-2: Field Strength of Carrier with 21.0 dBi Horn Antenna and Plastic Housing

Frequency (GHz)	Detector	Antenna POL	Spectrum Analyzer Level (dBuV)	Site Correction Factor (dB/m)	Spectrum Analyzer Level Corrected (dBuV/m)	FCC Limit (dBuV)	Margin (dB)
6.3	Peak		35.3 ^(1,2)	12.3		74.0	
6.3	Avg	V	35.3 ^(1,2)	12.3	47.6	54.0	-6.4

Note 1: Corrected by -20dB due to 0.3 meters antenna test distance

Note 2: Duty cycle correction was not used in the final calculation

Table 4-3: Field Strength of Carrier with 10.0 dBi Horn Antenna with Plastic Housing

Frequency (GHz)	Detector	Antenna POL	Spectrum Analyzer Level (dBuV)	Site Correction Factor (dB/m)	Spectrum Analyzer Level Corrected (dBuV/m)	FCC Limit (dBuV)	Margin (dB)
6.3	Peak		27.7 ^(1,2)	12.3		74.0	
6.3	Avg	H	27.7 ^(1,2)	12.3	40.0	54.0	-14.0

Note 1: Corrected by -20dB due to 0.3 meters antenna test distance

Note 2: Duty cycle correction was not used in the final calculation

Table 4-4: Field Strength of Carrier with All Antennas and Plastic Housing

Frequency (GHz)	Detector	Antenna POL	Spectrum Analyzer Level (dBuV)	Site Correction Factor (dB/m)	Spectrum Analyzer Level Corrected (dBuV/m)	FCC Limit (dBuV)	Margin (dB)
0.009-30	Peak	-(4)-	---	12.3	---	74.0	---
0.009-30	Avg	-(4)-	---	12.3	---	54.0	---

Note 4: No emission above the noise floor detected

Test Personnel:

Desmond Fraser		June 17 & 18, 2003
Test Technician/Engineer	Signature	Dates Of Test

4.4 Test Equipment Used for Testing

Table 4-5: Radiated Spurious Emissions Test Equipment

RTL ASSET #	MANUFACTURER	MODEL	PART TYPE	SERIAL NUMBER	Calibration Due Date
900717	Hewlett Packard	11970U	Harmonic Mixer (40 - 60 GHz)	2332A01110	2/19/04
901218	EMCO	3160-09	Horn Antenna (18-26 GHz)	960281-003	6/14/04
900392	Hewlett Packard	1197OK	Harmonic Mixer (18 - 26 GHz)	3525A00159	2/01/04
900715	Hewlett Packard	11970V	Harmonic Mixer (50 - 75 GHz)	2521A00512	7/19/04
900716	Hewlett Packard	11970W	Harmonic Mixer (75 - 110 GHz)	2521A00710	6/08/05
900126	Hewlett Packard	11970A	Harmonic Mixer (26 - 40 GHz)	2332A01199	6/08/05
900056	ATM	19-443-6	Horn Antenna (40 – 60 GHz)	8041704-01	6/08/05
901218	EMCO	3160-09	Horn Antenna (25-40 GHz)	960452-007	6/08/05
900826	ATM	08-443-6	Horn Antenna (90– 140 GHz)	8041904-01	6/08/05
900719	ATM	05-443-6	Horn Antenna (140 – 220 GHz)	50685	6/08/05
90066	ATM	10-443-6	Horn Antenna (75 – 110 GHz)	805 1905-1	6/08/05
901262	EMCO	3160-9	Horn Antenna (1-18 GHz)	6748	2/04/05
900723	Hewlett Packard		AMP (1GHz-26 GHz)	NA	6/08/05
900744	Olsen	Mixer	90-220 GHz	F80814-1	1/04/05
900744	Olsen	Mixer	140-220 GHz	G80814-1	1/04/05
900444	Miteq	Amplifier	30 –1000 MHz	PR1040	6/08/05
900791	Schaffner-Chase	CBL6112	Antenna (25 MHz 2 GHz)	2099	7/07/05
900151	Rohde & Schwarz	HFH2-Z2	9 KHz to 30 MHz loop antenna	827525	8/09/03
900772	EMCO	3161-02	2-4 GHz	9804-1044	7/08/04
900321	EMCO	3161-03	4-8.2 GHz	9508-1020	7/08/04
900323	EMCO	3161-07	8.2-12 GHz	9508-1054	7/08/06

5 Tested System Details

Listed below are the identifiers and descriptions of all equipment, cables, and internal devices used with the EUT for this test, as applicable.

Table 5-1: Equipment Under Test (EUT)

DESCRIPTION	MANUFACTURER	MODEL	SERIAL NO.	FCC ID	CABLE DESCRIPTIONS	RTL BAR CODE
Transmitter (EUT)	VEGA Grieshaber KG	VEGAPULS 65 & 66	N/A	O6QPULS6566	Unshielded	15188
Antenna	VEGA Grieshaber KG	17.0 dBi Rod	N/A	N/A	N/A	15326
Antenna	VEGA Grieshaber KG	21.0 dBi Horn	N/A	N/A	N/A	15187
Antenna	VEGA Grieshaber KG	10.0 dBi Horn	N/A	N/A	N/A	15166

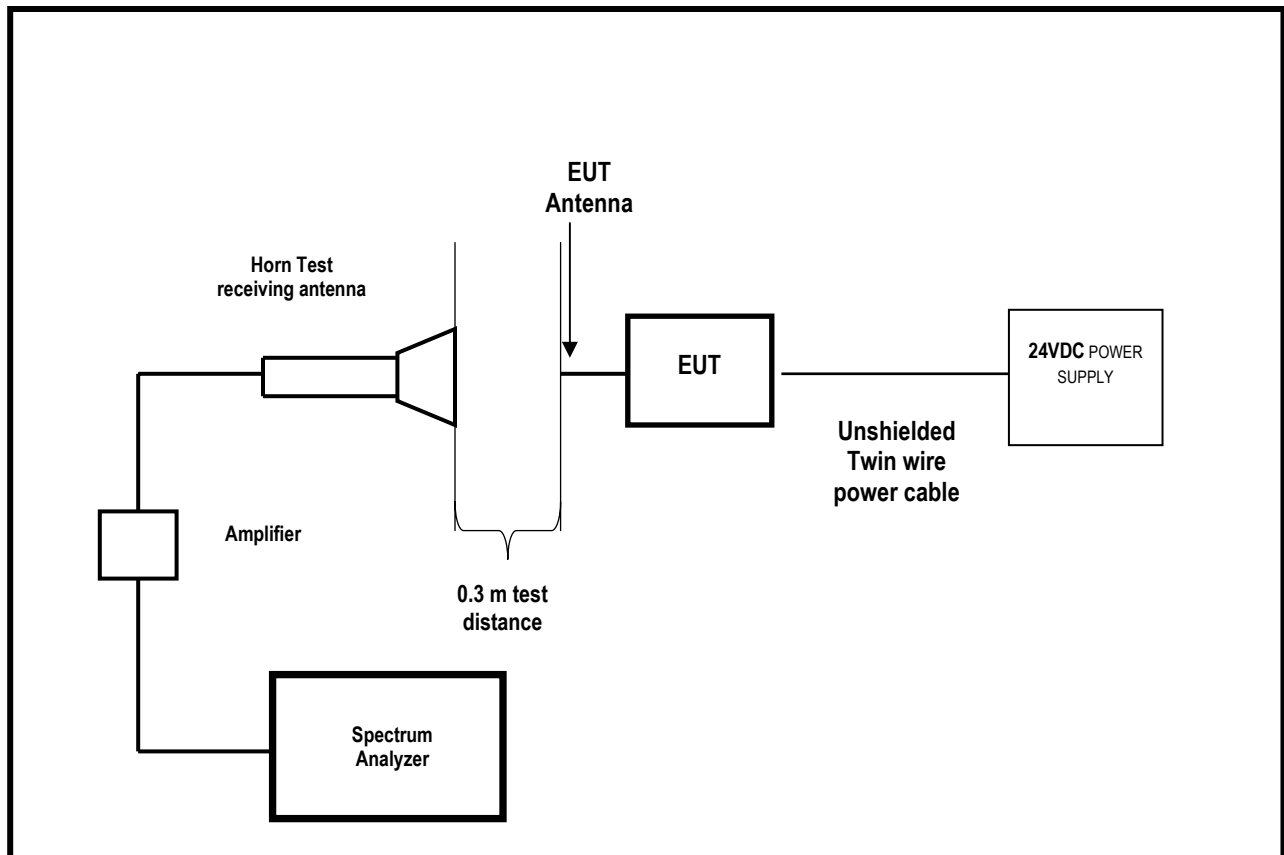
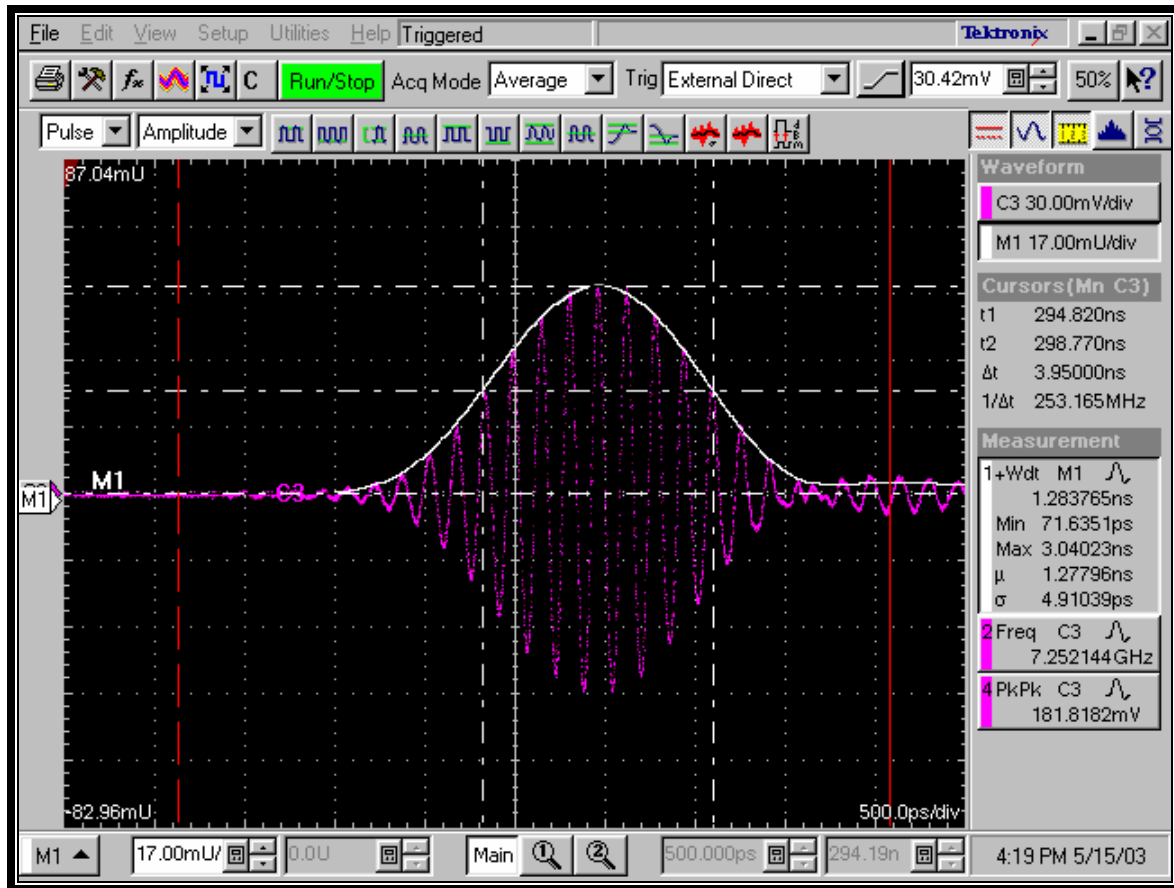
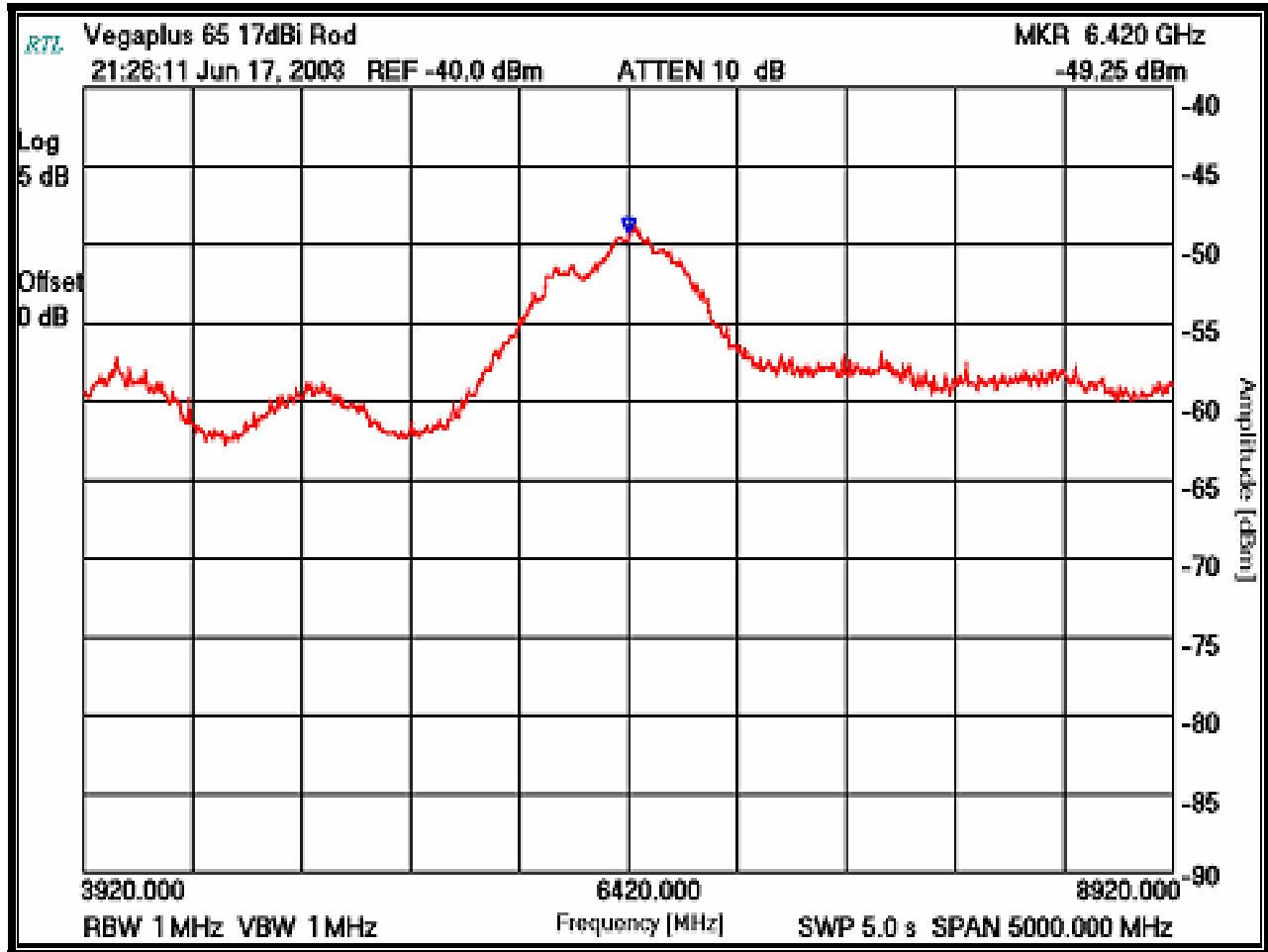


Figure 5-1: Configuration of Tested System

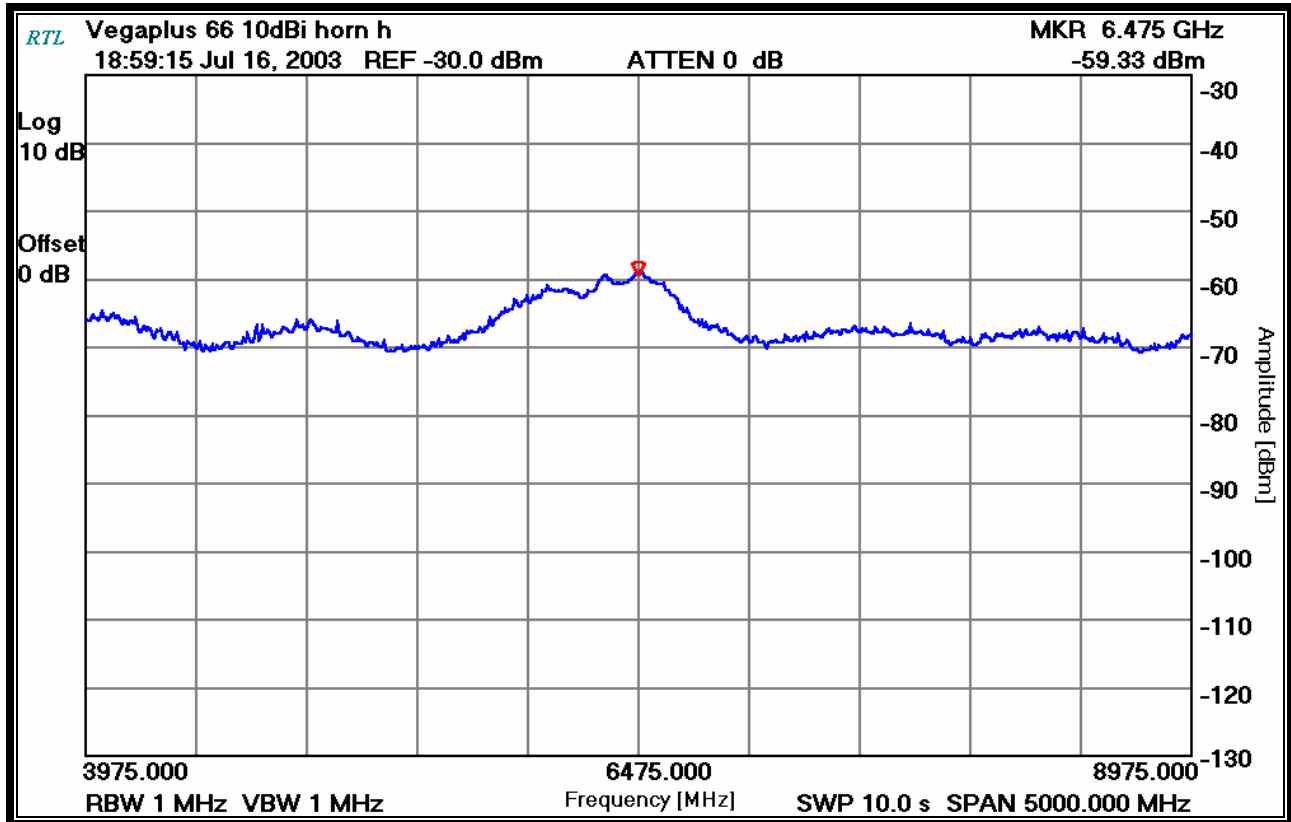
6 Test Plots



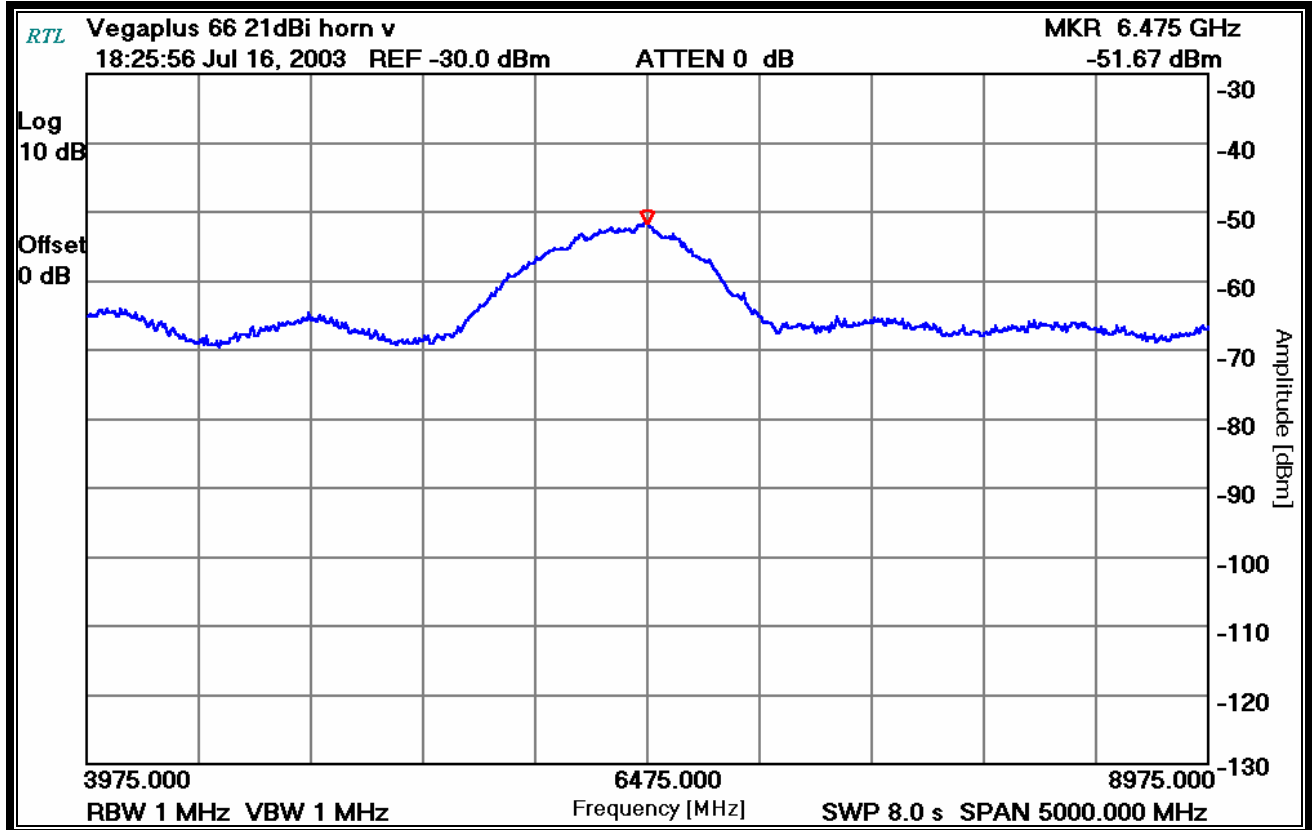
Plot 6-1 Pulse Width and Rise Time Normal Measurement Mode



Plot 6-2 EUT 17.0 dBi Rod Antenna - 100% Duty Cycle Mode



Plot 6-3 EUT 10.0 dBi Horn Antenna - 100% Duty Cycle Mode



Plot 6-4 EUT 21.0 dBi Horn Antenna - 100% Duty Cycle Mode

7 Conclusion

The data in this measurement report shows that the VEGA Grieshaber KG Model # VEGAPULS65 & VEGAPULS 66, FCC ID: O6QPULS6566, complies with all the requirements of Parts 2, and 15 of the FCC Rules, and Regulations, and RSS-210 of Industry Canada.