



Engineering and Testing for EMC and Safety Compliance

TYPE CERTIFICATION REPORT

Ohmart/ Vega
C/O The Ohmart Corporation 4241 Allendorf Drive
Cincinnati, OH 45209
United States

MODEL: PULS656667
FCC ID: MOIPULS656667
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 C63.4-2001	STANDARD FORMAT MEASUREMENT/TECHNICAL REPORT PERSONAL COMPUTER AND PERIPHERALS

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

REPORT PREPARED BY TEST ENGINEER: DESMOND FRASER

Document Number: 2003093/ QRTL03-847-

No part of this report may be reproduced without the full written approval of Rhein Tech Laboratories, Inc.

360 Herndon Parkway
Suite 1400
Herndon, VA 20170
Phone: 703-689-0368 Fax: 703-689-2056

TABLE OF CONTENTS

1	GENERAL INFORMATION	5
1.1	TEST FACILITY	5
1.2	RELATED SUBMITTAL(S)/GRANT(S)	5
2	CONFORMANCE STATEMENT	6
2.1	EXERCISING THE EUT	7
3	CONDUCTED LIMITS - §15.207	7
4	RADIATED EMISSION LIMITS - §15.209	8
4.1	RADIATED EMISSION LIMITS TEST PROCEDURE	8
4.2	FIELD STRENGTH CALCULATION	8
4.3	RADIATED EMISSION LIMITS TEST DATA	8
4.4	TEST EQUIPMENT USED FOR TESTING	10
5	TESTED SYSTEM DETAILS	11
TABLE 5-1: EQUIPMENT UNDER TEST (EUT)		11
FIGURE 5-1: CONFIGURATION OF TESTED SYSTEM		11
6	TEST PLOTS	12
7	CONCLUSION	16

TABLE OF TABLES

TABLE 4-1:	FIELD STRENGTH OF CARRIER WITH 17.0 DBI ROD ANTENNA AND PLASTIC HOUSING	8
TABLE 4-2:	FIELD STRENGTH OF CARRIER WITH 21.0 DBI HORN ANTENNA AND PLASTIC HOUSING	8
TABLE 4-3:	FIELD STRENGTH OF CARRIER WITH 10.0 DBI HORN ANTENNA WITH PLASTIC HOUSING	9
TABLE 4-5:	FIELD STRENGTH OF CARRIER WITH ALL ANTENNAS AND PLASTIC HOUSING	9
TABLE 4-6:	RADIATED SPURIOUS EMISSIONS TEST EQUIPMENT	10
TABLE 5-1:	EQUIPMENT UNDER TEST (EUT).....	11

TABLE OF PLOTS

PLOT 6-1	PULSE WIDTH AND RISE TIME NORMAL MEASUREMENT MODE.....	12
PLOT 6-2	EUT 17.0 ROD DBI ANTENNA 100% DUTY CYCLE MODE	13
PLOT 6-3	EUT 10.0 DBI HORN ANTENNA 100% DUTY CYCLE MODE.....	14
PLOT 6-4	EUT 21.0 DBI HORN ANTENNA 100% DUTY CYCLE MODE.....	15

TABLE OF FIGURES

FIGURE 5-1:	CONFIGURATION OF TESTED SYSTEM	11
-------------	--------------------------------------	----

TABLE OF APPENDICES

APPENDIX A:	AGENCY AUTHORIZATION	17
APPENDIX B:	CONFIDENTIALITY REQUEST	18
APPENDIX C:	OPERATIONAL DESCRIPTION.....	19
APPENDIX D:	LABEL INFORMATION	20
APPENDIX E:	SCHEMATICS	23
APPENDIX F:	MANUAL.....	24
APPENDIX G:	TEST CONFIGURATION PHOTOGRAPHS.....	25
APPENDIX H:	EUT EXTERNAL PHOTOGRAPHS	32
APPENDIX I:	INTERNAL EUT PHOTOGRAPHS	51

TABLE OF PHOTOGRAPHS

PHOTOGRAPH 1:	FCC ID LABEL LOCATION.....	22
PHOTOGRAPH 2:	RADIATED EMISSIONS FRONT VIEW 17dBI ROD.....	26
PHOTOGRAPH 3:	RADIATED EMISSIONS REAR VIEW 17dBI ROD.....	27
PHOTOGRAPH 4:	RADIATED EMISSIONS FRONT VIEW 10.0dBI HORN.....	28
PHOTOGRAPH 5:	RADIATED EMISSIONS REAR VIEW 10.0dBI HORN.....	29
PHOTOGRAPH 6:	RADIATED EMISSIONS FRONT VIEW 21.0 dBI HORN.....	30
PHOTOGRAPH 7:	RADIATED EMISSIONS REAR VIEW 21.0 dBI HORN.....	31
PHOTOGRAPH 8:	EUT PLASTIC HOUSING FRONT VIEW.....	33
PHOTOGRAPH 9:	EUT PLASTIC HOUSING INSIDE VIEW.....	34
PHOTOGRAPH 10:	PLASTIC HOUSING FITTING.....	35
PHOTOGRAPH 11:	EUT ALUMINIUM HOUSING.....	36
PHOTOGRAPH 12:	EUT ALUMINIUM HOUSING FRONT VIEW.....	37
PHOTOGRAPH 13:	EUT DOUBLE ALUMINIUM CHAMBER HOUSING FITTING.....	38
PHOTOGRAPH 14:	EUT DOUBLE ALUMINIUM HOUSING FITTING FRONT VIEW.....	39
PHOTOGRAPH 15:	EUT DOUBLE ALUMINIUM CHAMBER HOUSING REAR VIEW.....	40
PHOTOGRAPH 16:	EUT STAINLESS STEEL HOUSING FITTING.....	41
PHOTOGRAPH 17:	EUT STAINLESS STEEL HOUSING FRONT VIEW.....	42
PHOTOGRAPH 18:	EUT STAINLESS STEEL HOUSING TOP VIEW.....	43
PHOTOGRAPH 19:	EUT WITH 17 DBI HORN ANTENNA.....	44
PHOTOGRAPH 20:	EUT 17 DBI HORN ANTENNA.....	45
PHOTOGRAPH 21:	EUT WITH 10.0 DBI HORN ANTENNA.....	46
PHOTOGRAPH 22:	EUT 10.0 DBI HORN ANTENNA.....	47
PHOTOGRAPH 23:	EUT WITH 21.0 DBI HORN ANTENNA.....	48
PHOTOGRAPH 24:	EUT 21.0 DBI HORN ANTENNA.....	49
PHOTOGRAPH 25:	EUT ANTENNA PORT.....	50
PHOTOGRAPH 26:	EUT LCD DISPLAY TOP VIEW.....	52
PHOTOGRAPH 27:	EUT LCD DISPLAY BOTTOM VIEW.....	53
PHOTOGRAPH 28:	EUT LCD DISPLAY INSIDE VIEW.....	54
PHOTOGRAPH 29:	EUT LCD DISPLAY-PCB BOTTOM VIEW.....	55
PHOTOGRAPH 30:	EUT LCD DISPLAY-PCB BOTTOM VIEW.....	56
PHOTOGRAPH 31:	EUT MODULE-ANTENNA PORT VIEW.....	57
PHOTOGRAPH 32:	EUT MODULE FRONT VIEW.....	58
PHOTOGRAPH 33:	EUT MODULE REAR VIEW.....	59
PHOTOGRAPH 34:	EUT MODULE INSIDE VIEW.....	60
PHOTOGRAPH 35:	EUT MODULE PARTS INSIDE VIEW.....	61
PHOTOGRAPH 36:	EUT MODULE PARTS SIDE VIEW.....	62
PHOTOGRAPH 37:	EUT MODULE TOP VIEW.....	63
PHOTOGRAPH 38:	EUT MODULE PARTS PCB1 BOTTOM VIEW.....	64
PHOTOGRAPH 39:	MODULE PARTS PCB1 TOP VIEW.....	65
PHOTOGRAPH 40:	MODULE PARTS PCB2 BOTTOM VIEW.....	66
PHOTOGRAPH 41:	MODULE PARTS PCB2 TOP VIEW.....	67
PHOTOGRAPH 42:	MODULE RF PCB WITH PORT TOP VIEW.....	68
PHOTOGRAPH 43:	MODULE RF PCB WITH OUT PORT TOP VIEW.....	69
PHOTOGRAPH 44:	MODULE RF PCB WITH OUT PORT BOTOM VIEW.....	70
PHOTOGRAPH 45:	MODULE RF PCB SHIELD TOP VIEW.....	71
PHOTOGRAPH 46:	MODULE RF PCB SHIELD BOTTOM VIEW.....	72

1 GENERAL INFORMATION

The following Type Certification Report is prepared on behalf of Ohmart/Vega in accordance with the Federal Communications Commission and Industry Canada Rules and Regulations. The Equipment Under Test (EUT) was Model # PULS65, 66, 67; FCC ID: MOIPULS656667. 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, 1992. 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 1992).

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 C63.4-2001	STANDARD FORMAT MEASUREMENT/TECHNICAL REPORT PERSONAL COMPUTER AND PERIPHERALS

Frequency Range	Output Power (W) Conducted	Frequency Tolerance (ppm)	Emission Designator
6.3GHz		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 Fraser

Position: President

Signature: 

Date: July 29, 2003

Typed/Printed Name: Desmond 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 **0.3m** in order to achieve sufficient dynamic range including the use of a pre-amplifier 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 30GHz. 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 6.3GHz. 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

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

4 RADIATED EMISSION LIMITS - §15.209

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 were investigated from 0.009 KHz to 30 GHz, C63.4, 2001 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 30GHz except the carrier at 6.3GHz. The EUT was investigated and tested with four housing namely: Stainless steel, Aluminum, Double chamber Aluminum, and Plastic housing. 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.

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

$$\text{SCF} = \text{Antenna factor} + \text{Cable Loss} - \text{Amplifier Gain}$$

SCF = Site Correction Factor

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

TEST PERSONNEL:

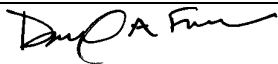
DESMOND FRASER		JUNE 18, 2003
TEST TECHNICIAN/ENGINEER	SIGNATURE	DATE OF TEST

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

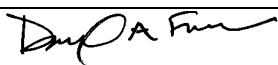
Note 2: Duty cycle correction was not used in the final calculation

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, 2003
TEST TECHNICIAN/ENGINEER	SIGNATURE	DATE 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	11970K	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 – 110GHz)	805 1905-1	6/08/05
901262	EMCO	3160-9	Horn Antenna (1-18GHz)	6748	2/04/05
900723	HP		AMP-1GHz-26GHz	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	9KHz to 30 MHz loop antenna	827525	8/09/03
900772	EMCO	3161-02	2-4GHz	9804-1044	7/08/04
900321	EMCO	3161-03	4-8.2GHz	9508-1020	7/08/04
900323	EMCO	3161-07	8.2-12GHz	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)	Ohmart/Vega	PULS656667	N/A	MOIPULS656667	Unshielded	15188
Antenna	Ohmart/Vega	17.0 dBi Rod	N/A	N/A	N/A	15326
Antenna	Ohmart/Vega	21.0 dBi Rod	N/A	N/A	N/A	15187
Antenna	Ohmart/Vega	10.0 dBi Horn	N/A	N/A	N/A	15166

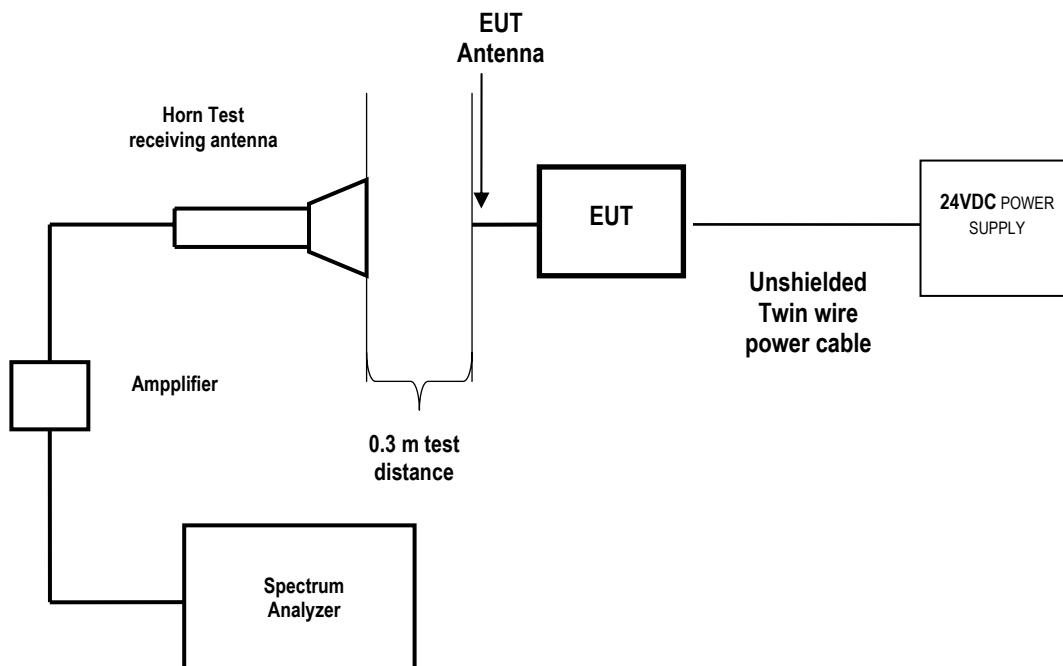
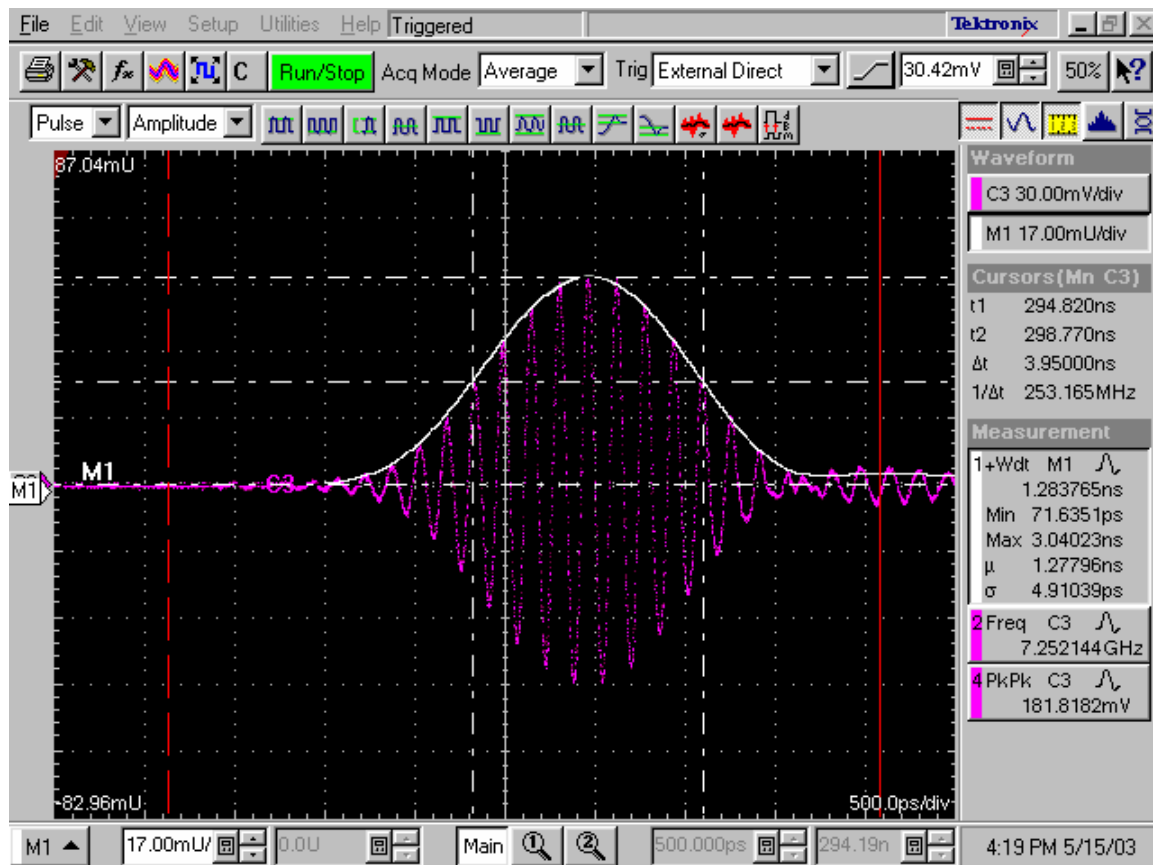
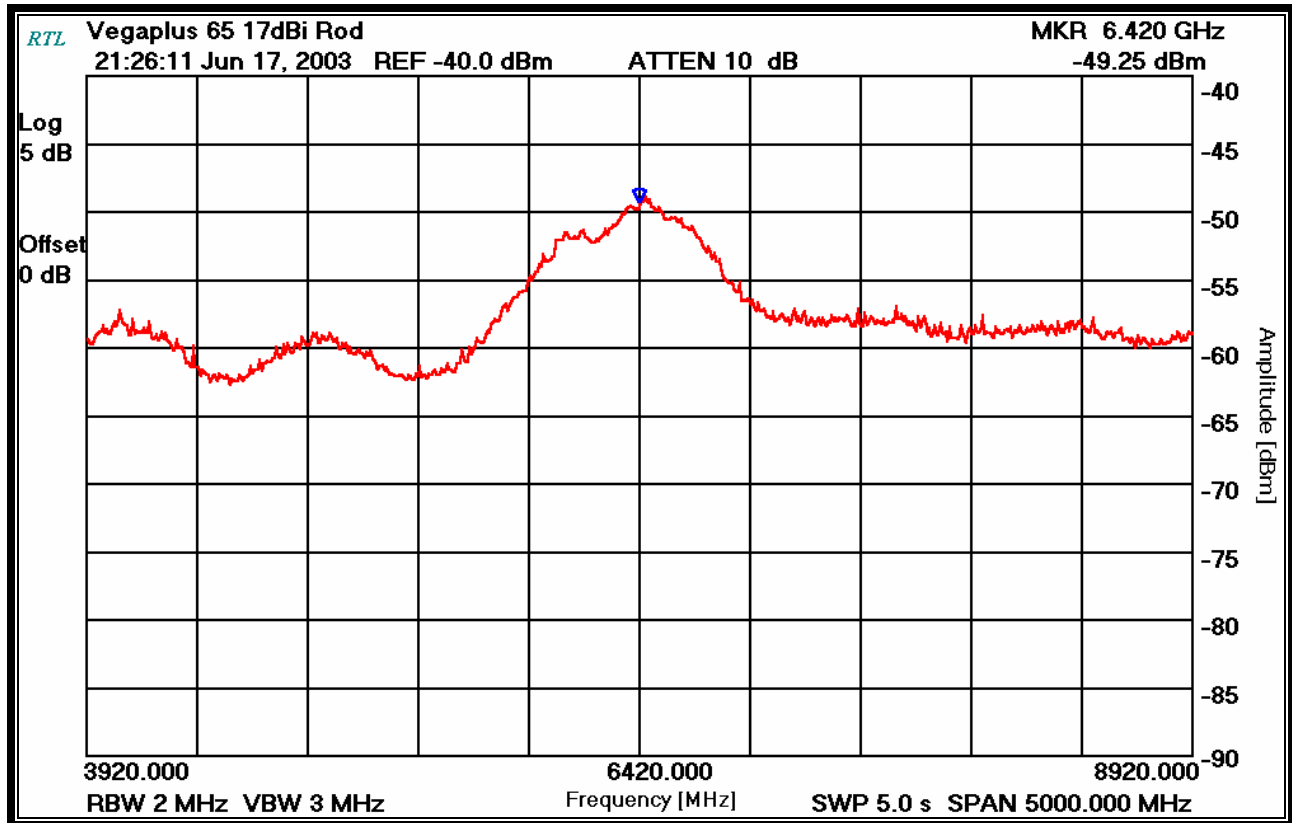


FIGURE 5-1: CONFIGURATION OF TESTED SYSTEM

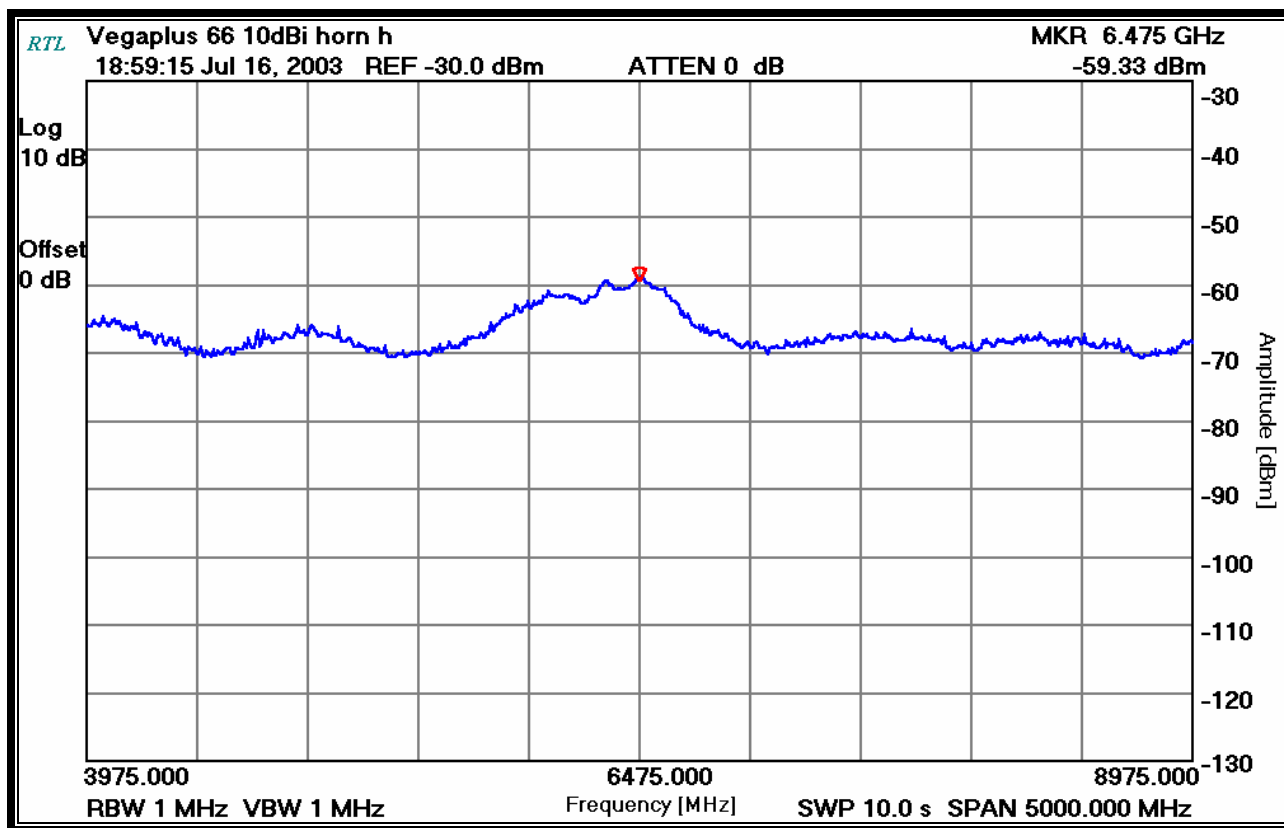
6 TEST PLOTS



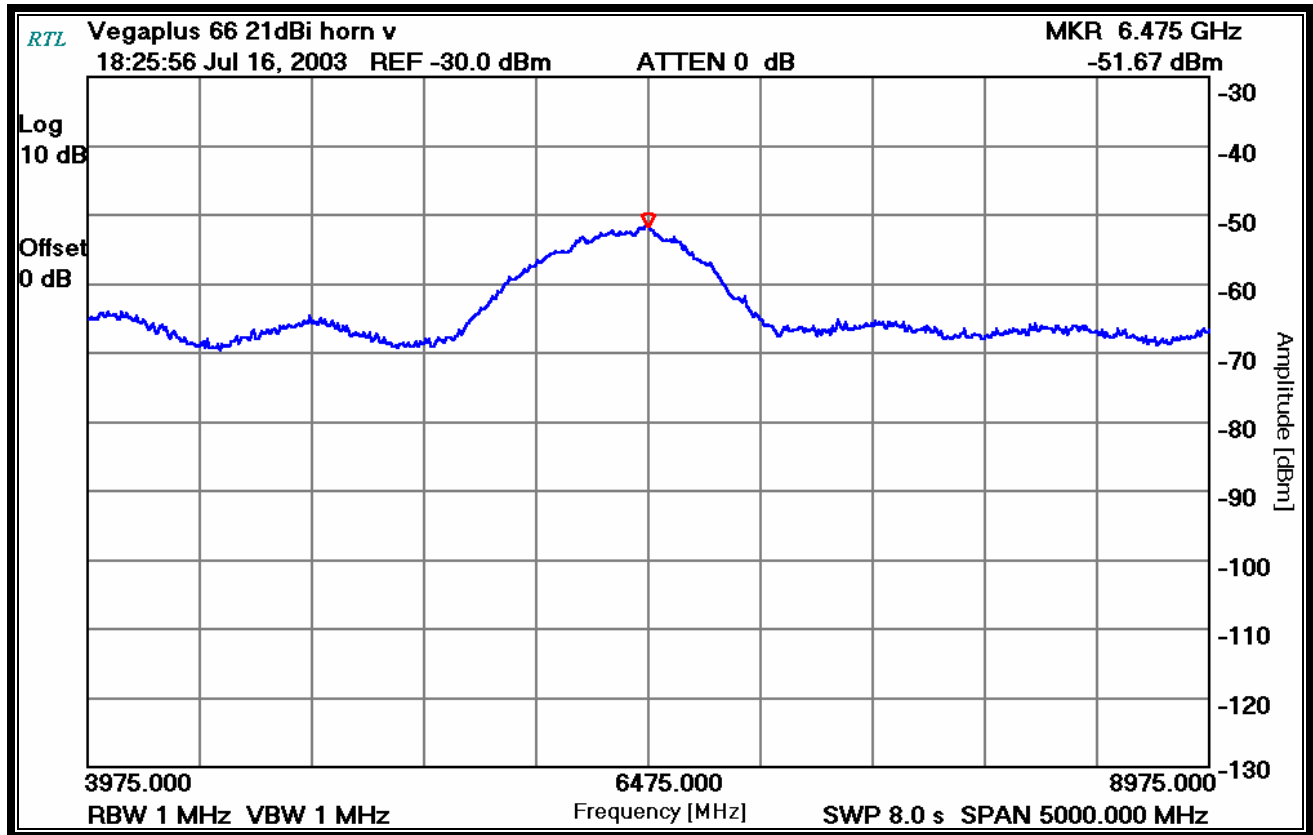
PLOT 6-1 PULSE WIDTH and RISE TIME NORMAL MEASUREMENT MODE



PLOT 6-2 EUT 17.0 ROD DBI 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 Ohmart/Vega, Inc., Model # PULS656667, FCC ID: MOIPULS656667 complies with all the requirements of Parts 2, and 15 of the FCC Rules, and Regulations.