

# Tantalus Systems Corp.

# XR-3100

**Customized Test Report Requested By  
Tantalus Systems**

for

**Report of Measurements**

per

**FCC CFR47 Part 90 and Part 15/C**

Revision 1.2

December 7, 2005

Approval		
Checked By:	<hr/> Robert Stirling, P.Eng	<hr/> Date

Protocol Labs, Abbotsford BC, Canada  
FCC Registration Number 96437  
Industry Canada Registration Number IC3384

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## Section I: Information for Test Report of Measurements

### Testing Details

TESTED BY: David Johanson/Parminder Singh  
 TEST CONDITIONS: Temperature and Humidity: 25°, 67%  
 TEST VOLTAGE: 208Vac 60Hz

### Test Facilities

Protocol Labs  
 28945 McTavish Rd.  
 Abbotsford BC, Canada, V4X 2E7  
 FCC Registration Number 96437  
 Industry Canada Registration Number IC3384

### Test Equipment List

EMISSIONS:

Device	Model Number	Serial No.	Last Cal	Next Cal
Antenna	EMCO 6912	380	11/10/04	11/10/05
Antenna	LPA-30	563	13/10/04	13/10/05
Antenna	3105	2024	25/02/05	25/02/06
LISN	Solar 8012-50-R-24-BNC	863092	22/10/04	22/10/05
Tower	Rhientech Labs	Custom	NR	NR
Turntable	Protocol	Custom	NR	NR
<b>High Frequency Stack</b>				
Spectrum Analyzer	Hewlett Packard 8566B	2241A02102	22/03/05	22/03/06
RF-Preselector	Hewlett Packard 85685A	3107A01222	22/03/05	22/03/06
Quasi-PeakAdapter	Hewlett Packard 85650A	2043A00240	22/03/05	22/03/06

### Company Tested

NAME: Tantalus Systems Corp.  
 ADDRESS: 100-2955 Virtual Way  
 Vancouver, BC V5M 4X6  
 CONTACT PERSON: Mr. Brent Pearce  
 EMAIL: [bpearce@tantalus.com](mailto:bpearce@tantalus.com)  
 PHONE NUMBER: 604-299-0458 ex:203

**Equipment Under Test**

THE TEST SYSTEM:           EUT:                   XR-3100

                                  Manufacturer:        Tantalus Systems Corp.  
                                  Serial number:       ENG01

                                  AUX equipment:     COM\_POWER board

                                  Manufacturer:        Tantalus Systems Corp.  
                                  Part Numbers:        200-0014-C  
                                  Serial number:        ENG01

                                  AUX equipment:     Laptop PC.

                                  Manufacturer:        Toshiba.

                                  Test Software:       N/A

TEST SETUP:                This EUT is a unit that combines the subunits:  
                                  TUNet 3205     (FCC ID: OZFR22002)  
                                  TC-1200       (FCC ID: OZFT90002).

The two subunits are not interconnected and are just colocated in the same housing.

This report only highlights the results of specific requested tests to verify that the two sub units are still in compliance to FCC regulations.

The TUNet 3205 was retested using procedures as outlined in Part 90 and used the substitution method to confirm the radiated emission levels.

The TC-1200 was retested using procedures as outlined in Part 15.247 and used the EIRP alternative test procedures as outlined in FCC Public notice DA 00-705. The results are based on using the default antenna. It should be noted that the measurements require that the TC-1200 transmit in a continuous broadcast operation; the TC-1200 was tested with a computer COM port interface board that would provide a different power source. Measurements have shown that the output transmission levels are higher when using this alternate power source. These higher levels were used in this report where applicable.

CABLING:

Cable	Pins	Connector	Load/Termination	Shielded	Ferrites
Power	3	Terminal	No	No	No

MODIFICATIONS:           No modifications were required for this unit to pass.

CONCLUSION:               The XR-3100 unit that was tested shows that the two subunits TC1200 and the TUNet 3205 Series Transceivers still complies with the requirements of FCC CFR47 Part 15/C and CFR47 Part 90 for the frequencies that were investigated.

## **Section II: FCC CFR47 Part 90 & Part 15/C Report of Measurements**

### **General**

Tests were conducted on a sample of the equipment for the purpose of demonstrating that the TC-1200 subunit still has compliance with FCC Part 15 – Subpart C - Intentional Radiators. The specific section used for compliance is 15.247 – Operation within the bands 902-928MHz – limited to frequency hopping intentional radiator. This includes the use of the procedures as outlined in FCC Public Notice DA 00-705 (Filing and Measurement Guidelines for Frequency hopping Spread Spectrum Systems) was used as a guide to the tests to be performed.

Tests were also conducted to demonstrate that the TUNet 3205 subunit still has compliance the FCC Part 90 Private Land Mobile Services operating in the band 220-222 MHz.

## **Part 1 - TUNet 3205 Radiated Emission Testing**

DATE: October 5, 2005

TEST STANDARD: FCC CFR47, Part 90,

TEST VOLTAGE: 208Vac 60Hz

TEST SETUP: The EUT was set up in a 3-meter open field test site. Emissions in both horizontal and vertical polarization's were measured while rotating the EUT on a turntable to maximize the emissions signal strength and the results recorded on the attached plots.

As required when using the substitution method, the Antenna port was terminated with a 50 Ohm load and the emissions from the chassis were measured at specific frequencies as requested. The resulting emission levels were then re-measured using the substitution method to confirm the ERP equivalent levels.

### REQUESTED MEASUREMENTS:

When the TUNet 3205 Subunit was operating in Transmit Mode, we were required to re-measure specific spurious emission frequencies and their levels. In all cases, the requested spurious frequency had shifted from the earlier tests, so we measured the closest frequency with the highest emission levels that matched the requested frequencies

Based on the previous reports for the TUNet 3205 all spurious emissions must be less then  $-23.0$  dBm d (in relation to a dipole antenna).

MEASUREMENT DATA: See the attached pages

## For the Transmission Frequency of 221.00247 MHz.

Freq.	Antenna Polarity	Table Orientation	Measured Signal at Generator Output	Antenna Corrections for Equiv to Dipole antenna	Corrected Peak Signal	Limit Lines	Delta Limit
(MHz)		(deg.)	(dBm)	(dB)	(dBm)	(dBm(d))	(dB)
220.9096	Vert	180	-33.0	2.2	-30.8	-23.0	-7.8
221.0785	Vert	300	-29.6	2.2	-27.4	-23.0	-4.4
663.0060	Vert	40	-46.2	2.4	-43.8	-23.0	-20.8
884.0323	Vert	0	-38.6	2.2	-37.0	-23.0	-14.0

## For the Transmission Frequency of 221.4975 MHz.

Freq.	Antenna Polarity	Table Orientation	Measured Signal at Generator Output	Antenna Corrections for Equiv to Dipole antenna	Corrected Peak Signal	Limit Lines	Delta Limit
(MHz)		(deg.)	(dBm)	(dB)	(dBm)	(dBm(d))	(dB)
221.416	Vert	180	-29.3	2.2	-27.1	-23.0	-4.1
221.575	Vert	320	-33.9	2.2	-31.7	-23.0	-8.7
243.352	Vert	200	-51.6	2.2	-49.4	-23.0	-26.4
442.994	Vert	200	-40.7	2.2	-38.5	-23.0	-15.5

## For the Transmission Frequency of 221.9974 MHz.

Freq.	Antenna Polarity	Table Orientation	Measured Signal at Generator Output	Antenna Corrections for Equiv to Dipole antenna	Corrected Peak Signal	Limit Lines	Delta Limit
(MHz)		(deg.)	(dBm)	(dB)	(dBm)	(dBm(d))	(dB)
221.9139	Vert	200	-35.1	2.2	-32.9	-23.0	-9.9
222.0787	Vert	200	-34.1	2.2	-31.9	-23.0	-8.9
443.9948	Vert	180	-39.5	2.1	-37.4	-23.0	-14.4
887.9893	Vert	200	-42.5	2.1	-40.4	-23.0	-17.4

PERFORMANCE:                      Complies.

## Part 2 - TC-1200 Radiated Emission Testing

DATE: October 05, 2005 and November 15, 2005

TEST STANDARD: FCC CFR47, Part 15, Subpart C 15.247

TEST VOLTAGE: 208Vac 60Hz

TEST SETUP: The equipment was set up in a 3-meter open field test site for Frequencies up to 1GHz and at 1-meter for Frequencies above 1GHz. Emissions in both horizontal and vertical polarization's were measured while rotating the EUT on a turntable to maximize the emissions signal strength and the results recorded on the attached plots.

The measurements performed at 1 meter distance, the Distance Correction Factor used was based on the formula:

$$\text{Correction} = 20\text{Log} (d1/d2)$$

Where d1 is the new measurement distance and d2 is the required measurement distance.

### REQUESTED MEASUREMENTS:

When the TC-1200 Subunit was operating in Transmit Mode, with the TUNet-3205 turned off, we re-measured specific spurious emission frequencies and their levels.

The TC-1200 subunit was programmed to broadcast on standalone frequencies at the low (902), middle (915) and high (928) channels.

The TC-1200 subunit is designed to only broadcast about 5% of the time as part of a power savings circuit. As a result of this, all tests that involved measurements of continuous transmissions required the addition of an external DC power supply that is not normally part of the EUT. It is known from pre-screening tests that the radiated levels while in continuous transmit mode, using the DC power adapter results in radiated levels that are higher than when the unit uses the onboard power converter.

For this product, previous measurements contained in Protocol Data Systems Report Number: RN03076, set the limit line for emissions, not in a restricted band, at 99.3 dBuV. This report also contains the information that sets the Duty Cycle correction factor at 28.0 dB.

For the TC-1200 subunit, all spurious emissions must meet the requirements of Part 15.247, 15.205 and 15.209, depending on the frequency. See the attached tables for the appropriate limit lines.

All of the measurements shown below were made when the system under test was set into a mode that only transmits a CW tone in order to facilitate measurement of the spurious measurements. The 20dB bandwidth of the CW signal is 15Hz.

### CABLING DETAILS:

Cable	Pins	Connector	Load/Termination	Shielded	Ferrites
Power	3	Terminal	No	No	No

MEASUREMENT DATA: See the attached pages for the test results.



## For the Transmission Frequency of 902.151 MHz.

Freq.	Har	Restricted bands (15.205(a))	Measured Signal	Equipment Attenuation	Corrected Peak Signal at measured distance	Distance	Corrected Signal at 3m distance (-9.54dB)	Calculated Averaged Signal using Duty Cycle Correction (-28dB)	Limit Lines – FCC 15.247	Delta Limit – FCC 15.247 (Average)
(MHz)			(dB $\mu$ V)	(dB)	(dB $\mu$ V/m)	(m)	(dB $\mu$ V/m)	(dB $\mu$ V/m)	(dB $\mu$ V)	(dB)
1804.000	2nd	N/A	48.4	39.6	88.0	1.0	78.5	50.5	99.3	-48.8
2706.000	3rd	2655-2900*	14.0	44.6	58.6	1.0	49.1	21.1	54.0	-32.9
3608.000	4th	3600-4400*	32.0	49.2	81.2	1.0	71.7	43.7	54.0	-10.3
4510.000	5th	4500-5150*	28.3	53.9	82.2	1.0	72.7	44.7	54.0	-9.3

## For the Transmission Frequency of 914.983 MHz.

Freq.	Har	Restricted bands (15.205(a))	Measured Signal	Equipment Attenuation	Corrected Peak Signal at measured distance	Distance	Corrected Signal at 3m distance (-9.54dB)	Calculated Averaged Signal using Duty Cycle Correction (-28dB)	Limit Lines – FCC 15.247 (Average)	Delta Limit – FCC 15.247 (Average)
(MHz)			(dB $\mu$ V)	(dB)	(dB $\mu$ V/m)	(m)	(dB $\mu$ V/m)	(dB $\mu$ V/m)	(dB $\mu$ V)	(dB)
1830.010	2nd	N/A	48.5	39.6	88.1	1.0	78.6	50.6	99.3	-48.7
2745.004	3rd	2655-2900*	29.8	44.6	74.4	1.0	64.9	36.9	54.0	-17.1
3660.070	4th	3600-4400*	32.6	49.3	81.9	1.0	72.4	44.4	54.0	-9.6
4574.955	5th	4500-5150*	22.2	51.6	73.8	1.0	64.3	36.3	54.0	17.7

## For the Transmission Frequency of 927.811 MHz.

Freq.	Har	Restricted bands (15.205(a))	Measured Signal	Equipment Attenuation	Corrected Peak Signal at measured distance	Distance	Corrected Signal at 3m distance (-9.54dB)	Calculated Averaged Signal using Duty Cycle Correction (-28dB)	Limit Lines – FCC 15.247 (Average)	Delta Limit – FCC 15.247 (Average)
(MHz)			(dB $\mu$ V)	(dB)	(dB $\mu$ V/m)	(m)	(dB $\mu$ V/m)	(dB $\mu$ V/m)	(dB $\mu$ V)	(dB)
1855.665	2nd	N/A	47.0	39.6	86.6	1.0	77.1	49.1	99.3	-50.2
2783.595	3rd	2655-2900*	36.0	44.6	80.6	1.0	71.1	43.1	54.0	-10.9
3711.300	4th	3600-4400*	34.2	45.9	80.1	1.0	70.6	42.6	54.0	-11.4
4639.119	5th	4500-5150*	21.5	51.8	73.3	1.0	63.8	35.8	54.0	-18.2

Notes: \* - measurements that would be in the noise if a 1MHz RBW is used. In an effort to still comply with the guidelines set out in DA 00-705, these measurements were still made at 1MHz RBW, but a 10Hz video bandwidth was used to reduce the effect of random noise. This value is then reported as a Peak signal, since, in reality, a CW signal can have no "Average" value associated with it.

PERFORMANCE: Complies

### **Part 3 - Co-Located Transmitters Radiated Emission Testing**

DATE: December 15, 2005

TEST STANDARD: FCC CFR47, Part 15, Subpart C 15.247

TEST VOLTAGE: 208Vac 60Hz

TEST SETUP: The equipment was set up in a 3-meter open field test site for Frequencies up to 1GHz and at 1-meter for Frequencies above 1GHz. Emissions in both horizontal and vertical polarization's were measured while rotating the EUT on a turntable to maximize the emissions signal strength and the results recorded on the attached plots.

The measurements performed at 1 meter distance, the Distance Correction Factor used was based on the formula:

$$\text{Correction} = 20\text{Log} (d1/d2)$$

Where d1 is the new measurement distance and d2 is the required measurement distance.

**REQUESTED MEASUREMENTS:**

When the TC-1200 Subunit was operating in Transmit Mode (Part 15), with the TUNet-3205 (Part 90) also operating in the Transmit Mode at the same time, we re-measured specific spurious emission frequencies and their levels.

The EUT was configured so that both the Part 90 transceiver and the Part 15 transceiver were transmitting simulataneously. This was to ensure that no intermodulation products, that may be created, did not exceed the permitted emission limits. Both antennas of the Part 15 device were investigated to ensure that spatial differences did not adversely effect the unwanted emissions,

**CABLING DETAILS:**

Cable	Pins	Connector	Load/Termination	Shielded	Ferrites
Power	3	Terminal	No	No	No

**MEASUREMENT RESULT:** In all investigated cases, no emissions were found that exceeded the allowed limits of 15.205.