

Tantalus Systems Corp.

NC-2200

Class II Permissive Change Report of Measurements

per

Industry Canada RSS-119 Issue 12 & RSS-GEN Issue 4

and

FCC CFR47 Part 90

Revision 1.0
December 14, 2016

Approval		
Checked By:	 _____ Parm Singh, Director EMC Division	December 14 2016 _____ Date
Testd By:	 _____ Aman Jathaul	December 14 2016 _____ Date

Test Report Summary

FCC CFR47 Part 90 / IC RSS-119

220-222MHz Fixed Radio Base Station

FCC ID: OZFN22001 **IC:** 3669A-NC2200

Organization Requesting Report: Tantalus Systems Corp.

Contact: Mark Fairburn, Sr. RF Design Engineer

Test Organization: Quality Auditing Institute Ltd.

Contact: Parm Singh

Test Personnel: Aman Jathaul

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Section I: Information for Test Report of Measurements

Testing Details

TESTED BY: Aman Jathaul

TEST CONDITIONS: Temperature and Humidity: 22°, 47%

Test Facilities

Founded in 1994 by a group of experienced certification and testing experts, QAI is an independent third-party testing, inspection and certification organization which serves the building industry, government and individuals with cost effective solutions through our in-house capabilities / services, and an established world-wide network of qualified affiliates. To help get your product to market, trust the provider that many leading global manufacturers do: QAI.

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QAI EMC ACCREDITATION

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EMC Laboratory Location	FCC Designation (3m SAC)	IC Registration (3m SAC)	A2LA Certificate
Burnaby, BC Canada	CA9543	21146-1	3657.02

Test Equipment List

Device	Model Number	Equipment Description	Serial No.	Last Cal	Next Cal
Rohde & Schwarz	ESU40	EMI Receiver	100011	20-Nov-2015	20-Nov-2017
Rhode & Schwarz	EMC 32	6.20.0	Emissions Pre-scan Test Software	N/A	N/A
Fischer	FCC-LISN-50-25-2	LISN	9928	Nov 19 2015	Nov 19 2018

Measurement Uncertainty

Parameter	Uncertainty
Radio Frequency	$\pm 1 \times 10^{-5}$ MHz
Radiated Emissions	± 3 dB
Temperature	$\pm 1^{\circ}\text{C}$
Humidity	± 5 %
DC and low frequency voltages	± 3 %

Company Tested

NAME: Tantalus Systems Corp.
ADDRESS: 200–3555 Gilmore Way
Burnaby, BC V5G 0B3
Canada
CONTACT PERSON: Mr. Mark Fairburn
PHONE NUMBER: 1-604-299-0458 x229

Equipment Under Test

THE TEST SYSTEM: EUT: The Tantalus Systems NC-2201 is a fixed radio base station that communicates to 220MHZ WAN collectors.

Product ID: NC-2201

Manufacturer: Tantalus Systems Corp.

Part Numbers:

Transmitter Card:	100-0011-O
Controller Card:	100-0016-U
Reference Card:	100-0010-D
Backplane:	100-0017-I
Power Amplifier:	CA220BW2-5050R
Duplexer:	120-0035
Tx BP Cavity	11-54-02185-R1

TEST SETUP: To test the relevant parametrics of this Class II permissive change, specifically RF output power and intentional harmonics, the duplexer output was connected in series with a 70dB high power attenuator directly to the test equipment.

A conducted measurement was used to ensure that the worst case emissions were measured and are not dependant on the driving impedance of the antenna at the associated frequency of the unintentional emission.

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

CONCLUSION: The Class II modifications to the NC-2201 fixed radio base station complies with the requirements of FCC CFR47 and the requirements of Industry Canada RSS-Gen.

Section II: IC RSS-119 Iss.12

DATE: Nov.12 2016.

REGULATORY STANDARD: RSS-119 Iss.8 Section 4

APPLICABLE TESTS: **4.1 – Transmitter Output Power**

Measure and record the transmitter output power using a measurement (resolution) bandwidth at least two to three times the width of the occupied bandwidth for transmitters equipped with masks D and E to capture the true peak emission of the equipment under test. For transmitters equipped with other masks, a measurement bandwidth wider than the occupied bandwidth of the transmitter shall be used.

4.2 Transmitter Unwanted Emissions

When the transmitter unwanted emissions are being measured, a sufficient number of sweeps must be measured to ensure that the emission profile is developed. The video bandwidth shall be at least three times the width of the instrument resolution bandwidth.

For transmitters that do not produce a full power unmodulated carrier, reference to the unmodulated carrier power refers to the total output power contained in the occupied bandwidth when the transmitter is modulated with signals representative of those encountered in a real system operation.

4.2.2 Emission Mask F

In order to show compliance with the emission mask up to and including 50 kHz removed from the edge of the authorized bandwidth, adjust the resolution bandwidth to 100 Hz with the measuring instrument in a peak mode. For emissions beyond 50 kHz from the edge of the authorized bandwidth, the resolution bandwidth shall be 100 kHz for frequencies at or below 1 GHz, and 1 MHz for frequencies above 1 GHz. However, for emission mask F, at a displacement frequency of less than 3.75 kHz, the resolution bandwidth shall be 30 Hz.

TEST SETUP: The EUT's were operated and tested at 120V 60Hz for the tests and the power amplifier was transmitting at both the maximum and minimum output power capability of the device.

MEASUREMENT METHOD: To test the relevant parametrics of this Class II permissive change, specifically RF output power and intentional harmonics, the duplexer output was connected in series with a 40dB high power attenuator directly to the test equipment.

A conducted measurement was used to ensure that the worst case emissions were measured and are not dependant on the driving impedance of the antenna at the associated frequency of the unintentional emission.

Test Results – Summary

Testing was performed pursuant to Industry Canada RSS-119 Issue 12

Test	Standard	Description	Result
Radiated Emissions Transmit Mode	RSS-119 4.2.2	The radiated emissions are measured in the 0.009 – 2.2GHz Range	See Figures 1 to 3 and Tables 2 to 4
Output Power	RSS-119 4.1	Output power will not exceed current authorised output power	See Table 1

PERFORMANCE: Complies.

Section III: FCC CFR47 Part 90

DATE: Nov.12 2016.

REGULATORY STANDARD: CFR47 Part 90

APPLICABLE TESTS: **90.210** Measurements of emission power can be expressed in either peak or average values provided that emission powers are expressed with the same parameters used to specify the unmodulated transmitter carrier power. For transmitters that do not produce a full power unmodulated carrier, reference to the unmodulated transmitter carrier power refers to the total power contained in the channel bandwidth.

(f) Emission Mask F. For transmitters operating in the 220–222 MHz frequency band, any emission must be attenuated below the power (P) of the highest emission contained within the authorized bandwidth as follows:

- (1) On any frequency from the center of the authorized bandwidth f_0 to the edge of the authorized bandwidth f_e : Zero dB.
- (2) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 2 kHz up to and including 3.75 kHz: $30 + 20(f_d - 2)$ dB or $55 + 10 \log(P)$, or 65 dB, whichever is the lesser attenuation.
- (3) On any frequency beyond 3.75 kHz removed from the center of the authorized bandwidth f_d : At least $55 + 10 \log(P)$ dB.

(m) For frequencies more than 50 kHz removed from the edge of the authorized bandwidth a resolution of at least 10 kHz must be used for frequencies below 1000MHz. Above 1000 MHz the resolution bandwidth of the instrumentation must be at least 1 MHz. If it can be shown that use of the above instrumentation settings do not accurately represent the true interference potential of the equipment under test, then an alternate procedure may be used provided prior Commission approval is obtained

(note): There are no guidelines in cfr47 part 90 concerning resolution bandwidth for emissions within 3.75kHz of the carrier. The harmonized standard of Industry Canada was therefore used, specifically:
For emission mask F, at a displacement frequency of less than 3.75 kHz, the resolution bandwidth shall be 30 Hz.

MODIFICATIONS No modifications were required for the devices to pass the test.

MEASUREMENT DATA: See Figure 2 to 3 and Tables 2 to 4 in Appendix A.

PERFORMANCE: Complies.

Appendix A: Test Results

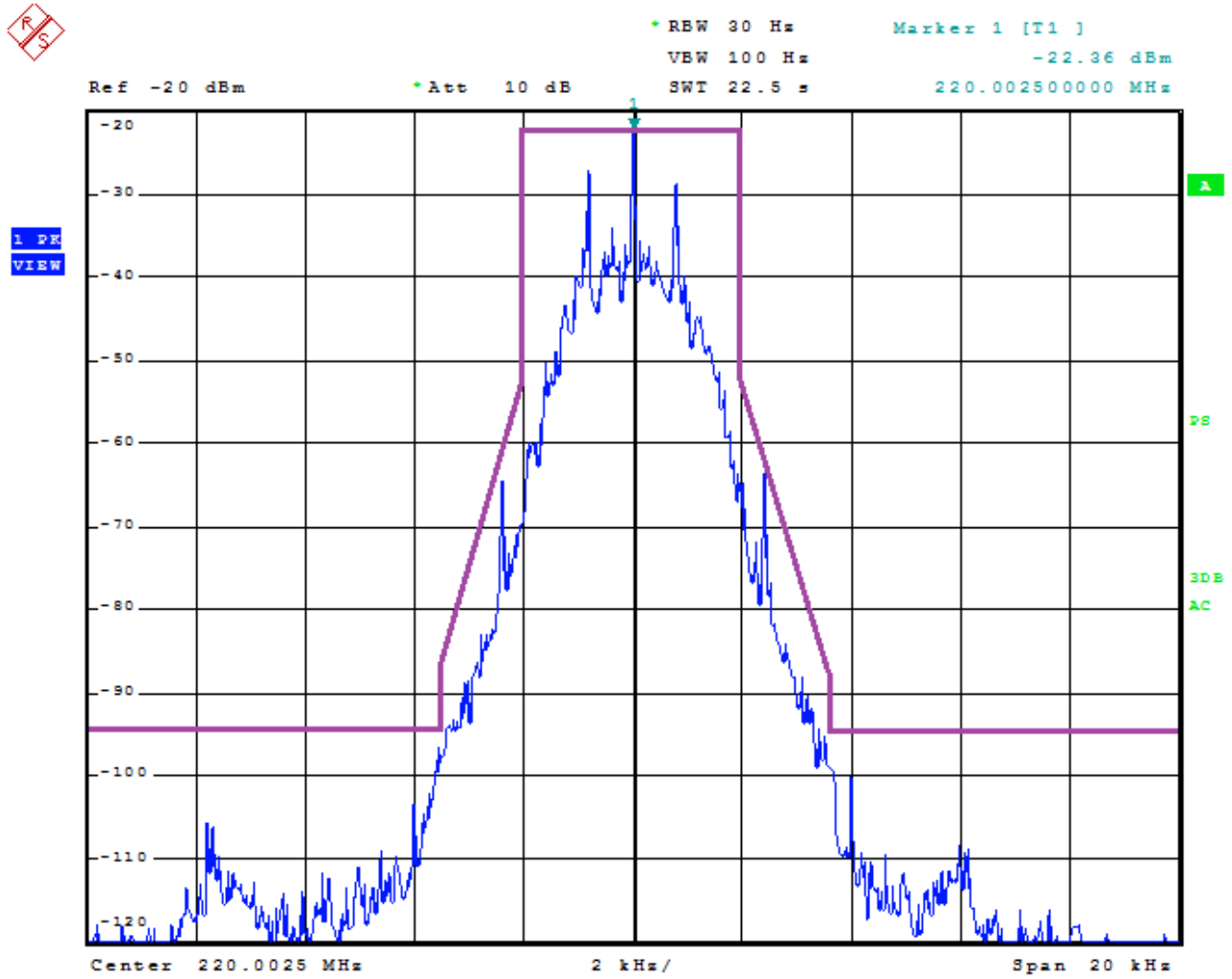
Output Power

Table 1: Conducted Output Power measurements

Freq(MHz)	Meas. Output Power (dBm)	Correction Factor* (dB)	Output Power (dBm)	Output Power (W)
220.0025	-22.36	69.48	47.12	51.5
220.4975	-22.02	69.73	47.71	59.0
220.9975	-23.12	70.07	46.95	49.5

* Correction Factor accounts for a nominal 70dB attenuator and 0.5dB cable loss.

Emission Mask F



Date: 24.NOV.2016 20:25:08

Figure 2: Low Frequency

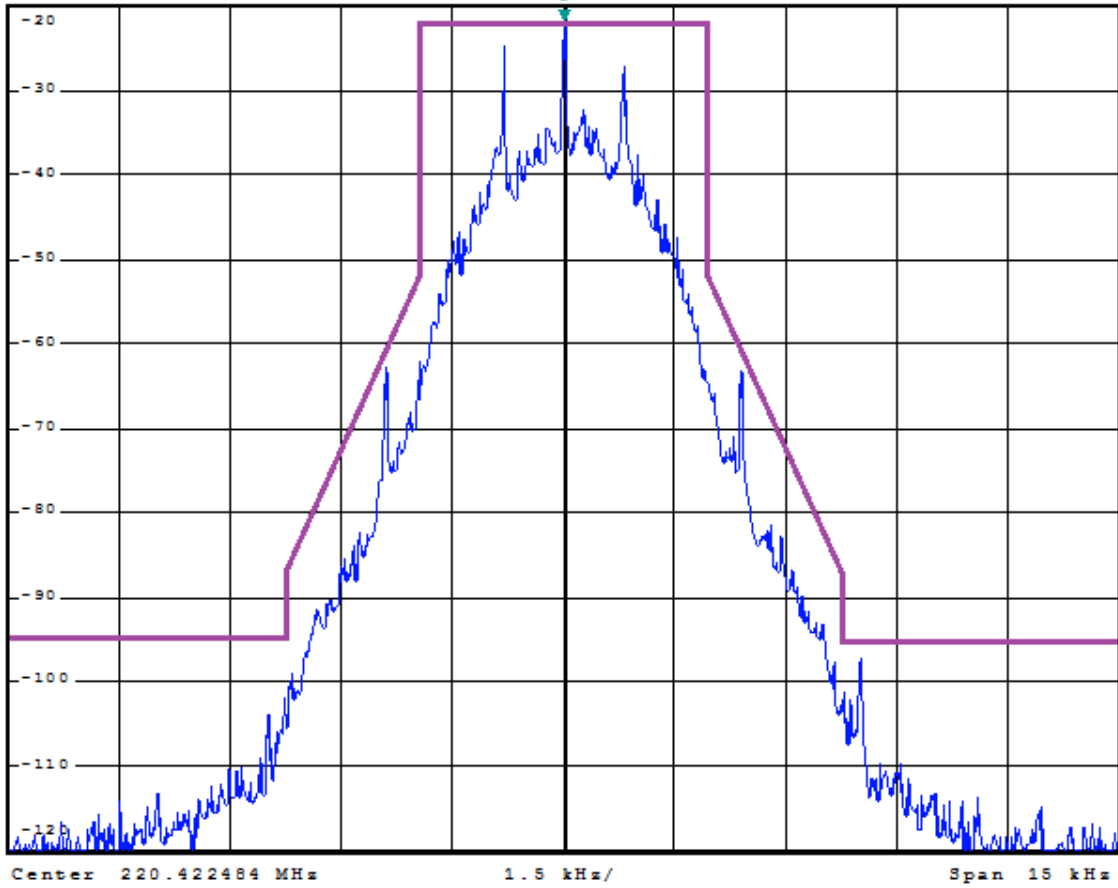


RBW 30 Hz
Marker 1 [T1]
-22.02 dBm
VBW 100 Hz
SWT 17 s
220.422483974 MHz

Ref -20 dBm

Att 5 dB

1 PE
VIEW

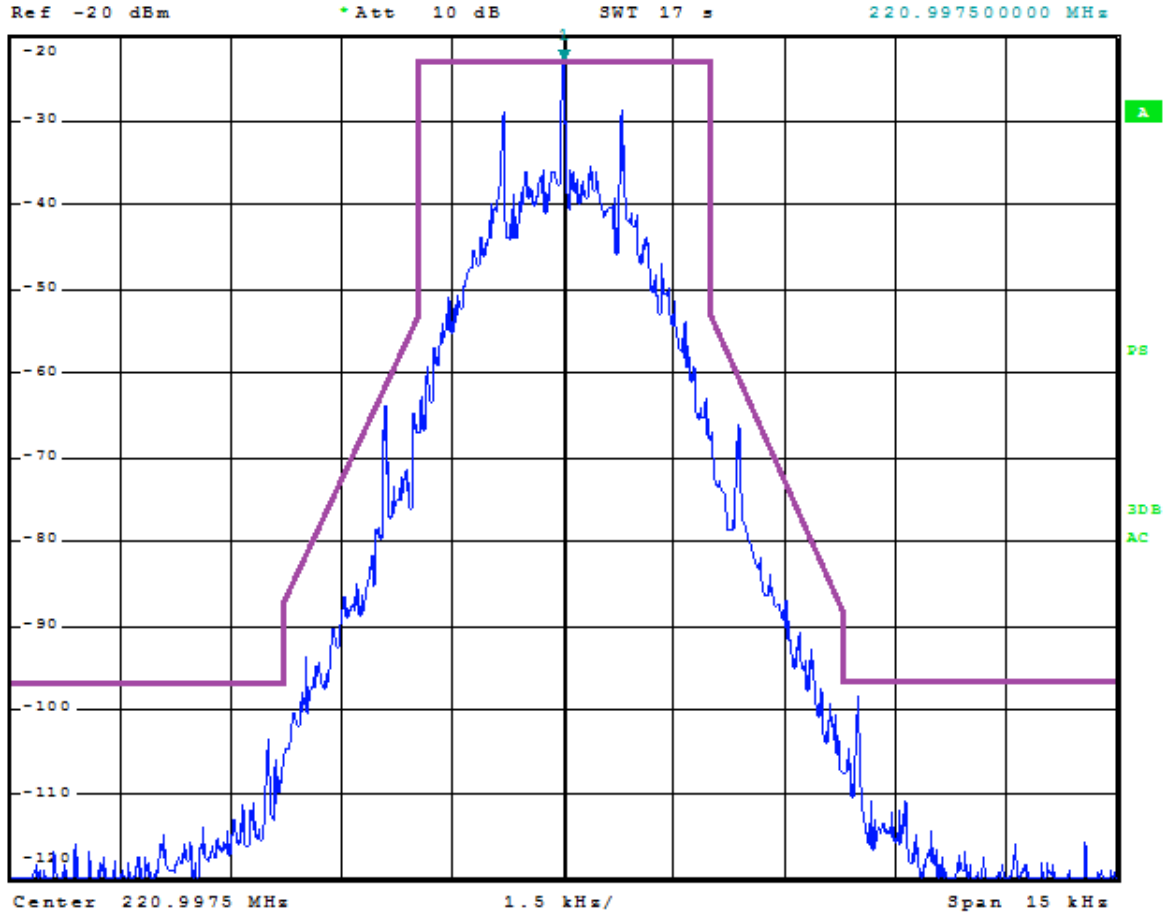


Date: 24.NOV.2016 19:44:36

Figure 3: Mid Frequency



RBW 30 Hz
VBW 100 Hz
SWT 17 s
Marker 1 [T1]
-23.12 dBm
220.997500000 MHz



Date: 24.NOV.2016 20:38:31

Figure 4: High Frequency

Unintentional Emissions

Tables 2 to 4 tabulate all unintentional emissions measured from 0.009Mhz to 2.2GHz.

In accordance with 15.31(o), emissions that are 20dB below the permissible value have not been reported.

Table 5: Unintentional Emission Results at Low Frequency

There were no unintentional emissions detected at the Low frequency

Table 6: Unintentional Emission Results at Mid Frequency

Freq(MHz)	Meas. Output Power (dBm)	Corrected Value (dBm)	Limit* (dBm)	Delta (dB)
220.644	-98.51	-29.03	-25	4.03
220.720	-97.96	-28.48	-25	3.48

Table 7: Unintentional Emission Results at High Frequency

Freq(MHz)	Meas. Output Power (dBm)	Corrected Value (dBm)	Limit* (dBm)	Delta (dB)
220.620	-99.49	-30.01	-25	5.01
220.717	-101.25	-31.77	-25	6.77



Figure 8: Test Set-up