# Tantalus Systems Corp.

# NC-2202

## 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:** OZFN2202 **IC:** 3669A-NC2202

| | |
|---|---|
| **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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# List of Figures and Tables

## 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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| 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 | ±1 x 10-5 MHz |
| Radiated Emissions | ±3 dB |
| Temperature | ±1°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-2202 is a fixed radio base station that communicates to 220MHZ WAN collectors.

Product ID: NC-2202

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: Figure 1 shows a graphical representation of the test setup. 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 emmissions 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 modfications to the NC-2202 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: Figure 1 shows a graphical representation of the test setup. 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 emmissions 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 2 to 4 and Tables 2 to 4 |
| Output Power | RSS-119 4.1 | Output power will not exceed current authorised output power | 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 fo to the edge of the authorized bandwidth fe:Zero dB.
(2) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in kHz) of more than 2 kHz up to and including 3.75 kHz: 30 + 20(fd -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 fd: 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 **Error! Reference source not found.** 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 | -22.20 | 69.08 | 46.88 | 48.8 |
| 220.4975 | -22.02 | 69.12 | 47.10 | 51.3 |
| 220.9975 | -22.31 | 69.38 | 47.07 | 50.9 |

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

## Test Setup

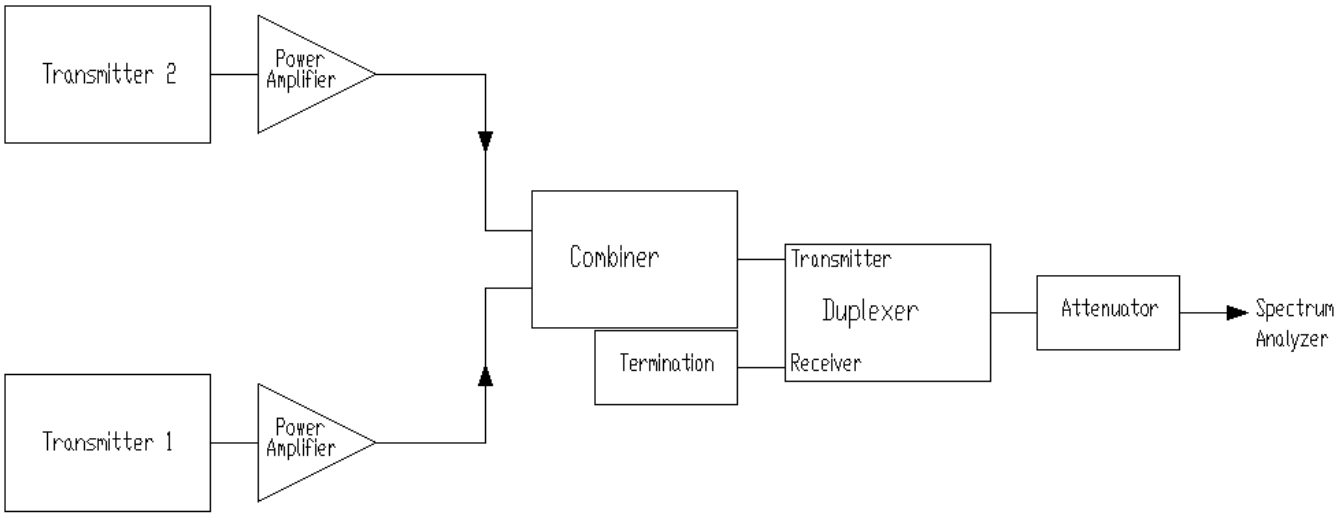


**Figure 2: Graphical representaion of Test Setup**

## Emission Mask F

**Note: Only the emission of the carrier with the highest output power has been reported**

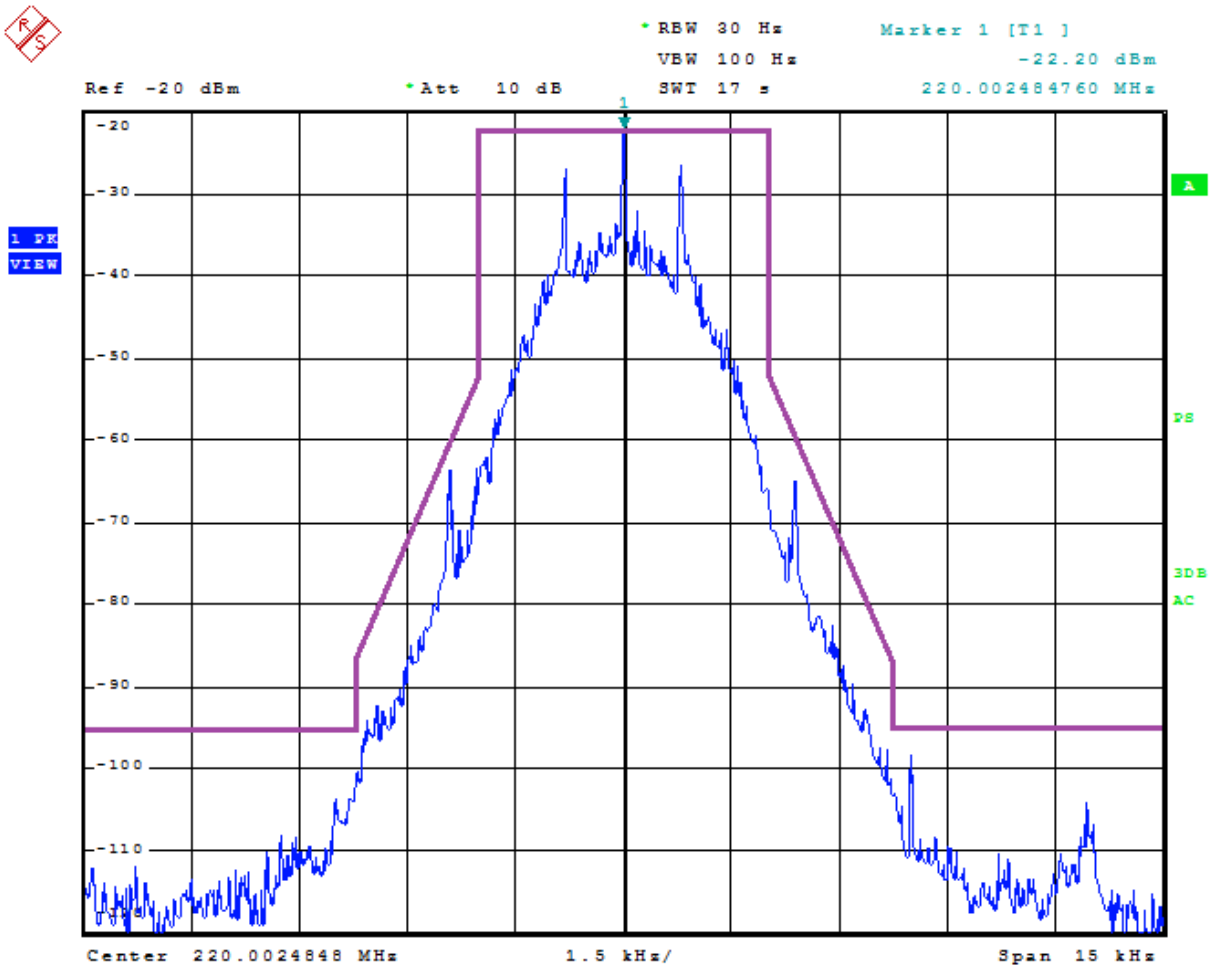


**Figure 3: Low Frequency response of the carrier with the highest output power**

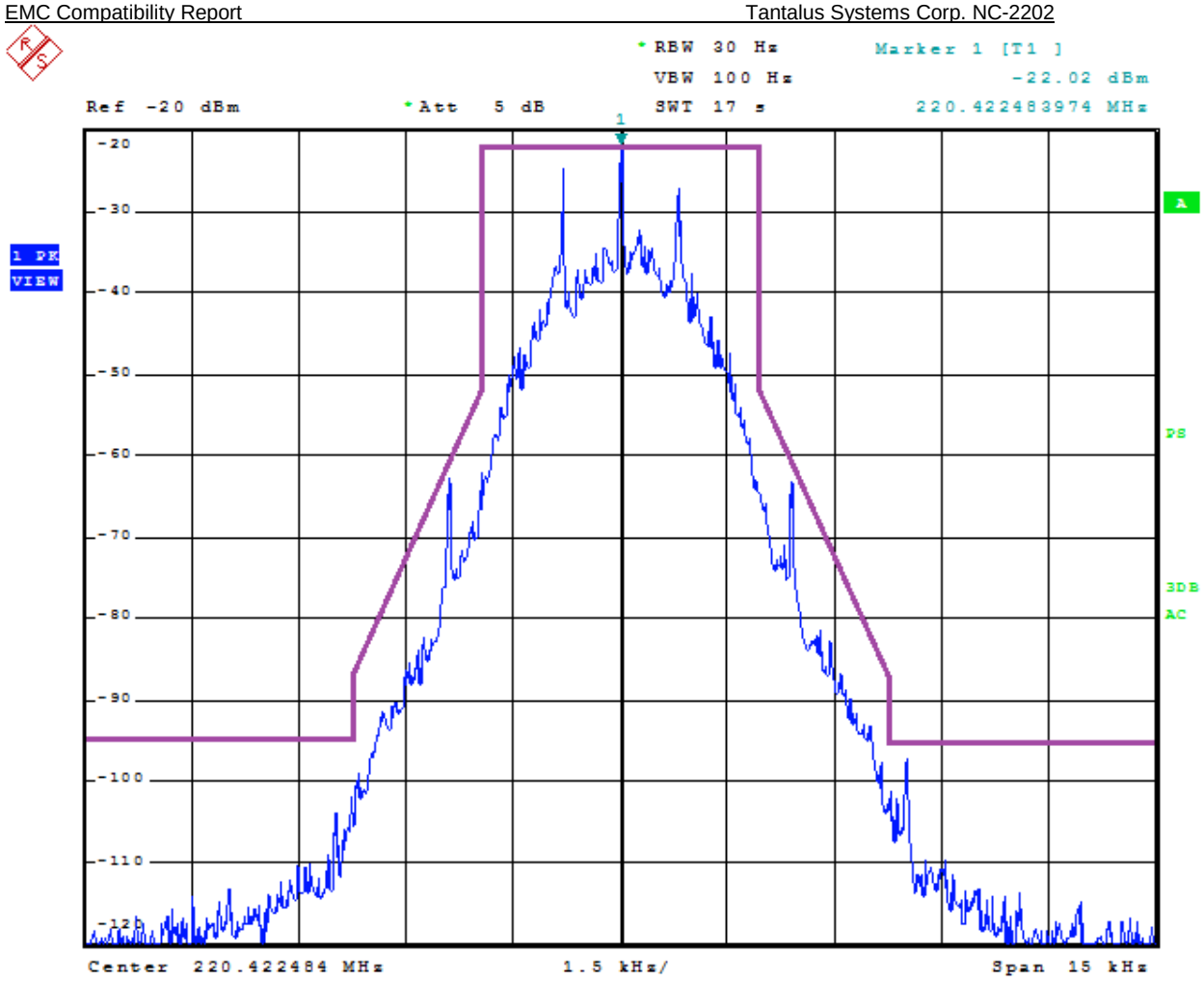


**Figure 4: Mid Frequency response of the carrier with the highest output power**

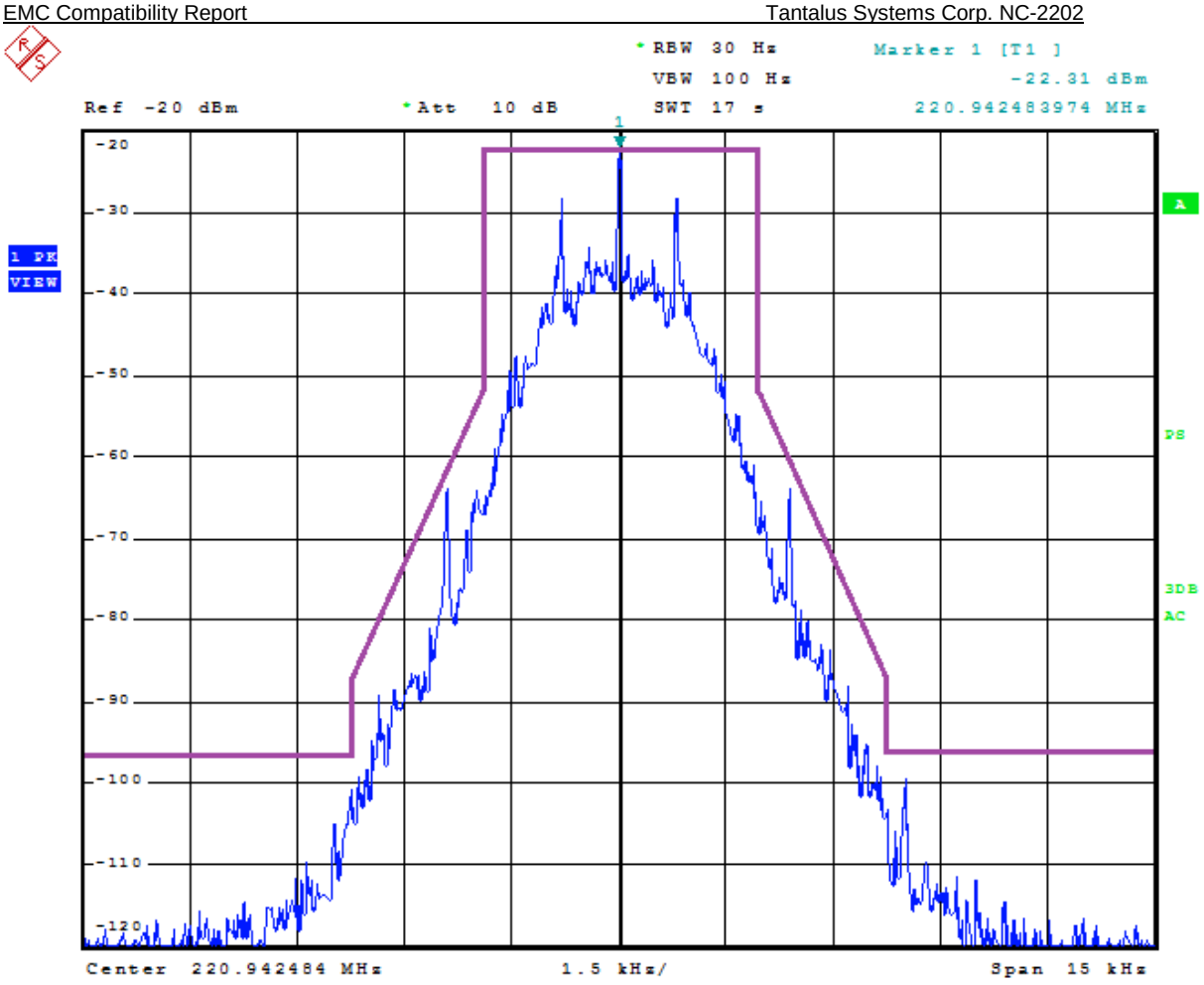


**Figure 5: High Frequency response of the carrier with the highest output power**

# Unintentional Emissions

Tables 2 to 4 tabulate all unintenional 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 6: Unintentional Emission Results at Low Frequency**

| Freq(MHz) | Meas. Output Power (dBm) | Corrected Value (dBm) | Limit (dBm) | Delta (dB) |
|---|---|---|---|---|
| 219.942 | -103.58 | -34.1 | -25 | **9.1** |
| 220.122 | -106.74 | -37.26 | -25 | **12.26** |

**Table 7: Unintentional Emission Results at Mid Frequency**

| Freq(MHz) | Meas. Output Power (dBm) | Corrected Value (dBm) | Limit (dBm) | Delta (dB) |
|---|---|---|---|---|
| 220.347 | -108.27 | -38.79 | -25 | **13.79** |
| 220.653 | -97.95 | -29.03 | -25 | **4.03** |
| 220.643 | -100.58 | -28.48 | -25 | **3.48** |
| 220.571 | -104.74 | -35.26 | -25 | **10.26** |
| 220.707 | -99.51 | -30.03 | -25 | **5.03** |
| 220.720 | -102.76 | -33.28 | -25 | **8.28** |

**Table 8: Unintentional Emission Results at High Frequency**

| Freq(MHz) | Meas. Output Power (dBm) | Corrected Value (dBm) | Limit (dBm) | Delta (dB) |
|---|---|---|---|---|
| 221.054 | -111.25 | -41.77 | -25 | **16.77** |
| 220.620 | -99.35 | -29.87 | -25 | **4.87** |
| 220.630 | -97.87 | -28.39 | -25 | **3.39** |
| 220.711 | -99.13 | -29.65 | -25 | **4.65** |
| 220.718 | -101.24 | -31.76 | -25 | **6.76** |
| 220.886 | -107.36 | -37.88 | -25 | **12.88** |

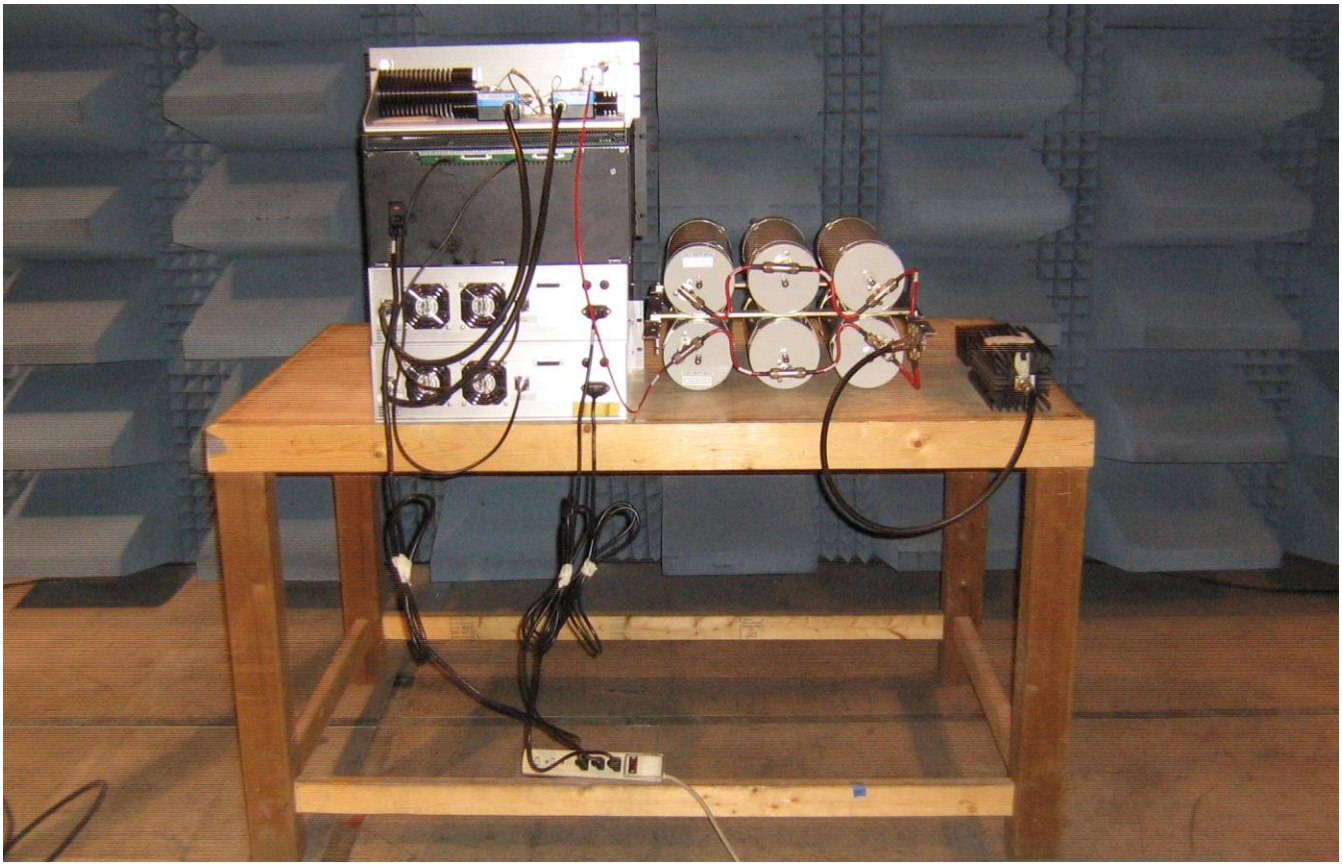

**Figure 9: Test Set-up**