



Electromagnetic Compatibility Test Report

**Test Report No: AXW 051016 rev.2
Issued on: December 7, 2016**

**Product Name
RRU Mid Power**

FCC ID:NEO30ID7D8C17A19A

**Tested According to
FCC 47 CFR, Part 27
728 - 746 MHz Band**

**Tests Performed for
Axell Wireless**

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Test Report details:

Test commencement date: 26.04.2016
Test completion date: 29.09.2016
Customer's representative: Boaz Reuven
Issued on: 07.12.2016

Revision details:

| Version | Date | Details/Reasons |
|---------|------------|---------------------------------------|
| Rev. 1 | 05.10.2016 | - |
| Rev. 2 | 07.12.2016 | Corrections according to ACB comments |

Assessment information:

This report contains an assessment of the EUT against Radio testing based upon tests carried out on the samples submitted. The results contained in this report relate only to the items tested. Manufactured products will not necessarily give identical results due to production and measurement tolerances. QualiTech, Radio Lab does not assume responsibility for any conclusion and generalization drawn from the test results with regards to other specimens or samples of type of the equipment represented by test item.

The EUT was set up and exercised using the configuration, modes of operation and arrangements defined in this report only.

EUT Models:

Per customer's declaration the RRU Mid Power has two models, AC and DC .both models are identical and belong to one product family and differ only in power input supply without any influence to the RF path. Full testing were performed on AC model and Mean Output Power, Radiated spurious emissions, and frequency stability tests for DC model as shown in present document.

Modifications:

Modifications made to the EUT

None.

Modifications made to the Test Standard

None.

Summary of Compliance Status

| Test Spec. Clause | Test Case | Remarks |
|--|--|---------|
| Specific Requirements | | |
| -KDB 935210 D05 v01r01, sec. 3.3 | Out-of-Band Rejection | Done |
| General Requirements | | |
| -47 CFR §2.1049(h) -KDB 935210 D05 v01r01, sec.3.4 | Occupied Bandwidth - Input-versus-output signal comparison | Pass |
| -47 CFR §27.50(c)(3) -47 CFR §2.1046(a) -KDB 935210 D05 v01r01, sec 3.5.4 | Mean Output Power and Amplifier/Booster Gain | Pass |
| -47 CFR §27.53(g) -47 CFR §2.1051 -KDB 935210 D05v01r01, sec. 3.6.2, Conducted | Out-of-Band/Out-of-Block & Intermodulation Emissions Conducted Measurements | Pass |
| -47 CFR §27.53(g) -47 CFR §2.1051 -KDB 935210 D05v01r01, sec. 3.6.3, Conducted | Spurious Emission Conducted Measurement | Pass |
| -47 CFR §27.53(g) -47 CFR §2.1053 -KDB 935210 D05v01r01, sec. 3.6.8, Radiated | Spurious Emissions – Radiated Measurement | Pass |
| -47 CFR §27.54 -47 CFR §2.1055 -KDB 935210 D05v01r01, sec. 3.7, Conducted | Frequency Stability | Pass |

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1. General

1.1. Referenced documents

KDB 935210 D05 v01r01: Measurements Guidance for Industrial and Non-consumer Signal Booster, Repeater and Amplifiers Devices.

ANSI/TIA-603-D: Land Mobile FM or PM Communications Equipment and Performance Standards.

1.2. Product Description

FCC ID:NEO30ID7D8C17A19A

IC:8749A-30ID7817A19

Model Numbers:

id-DAS-RRU-M-3007-3008-3017-3019-AC.

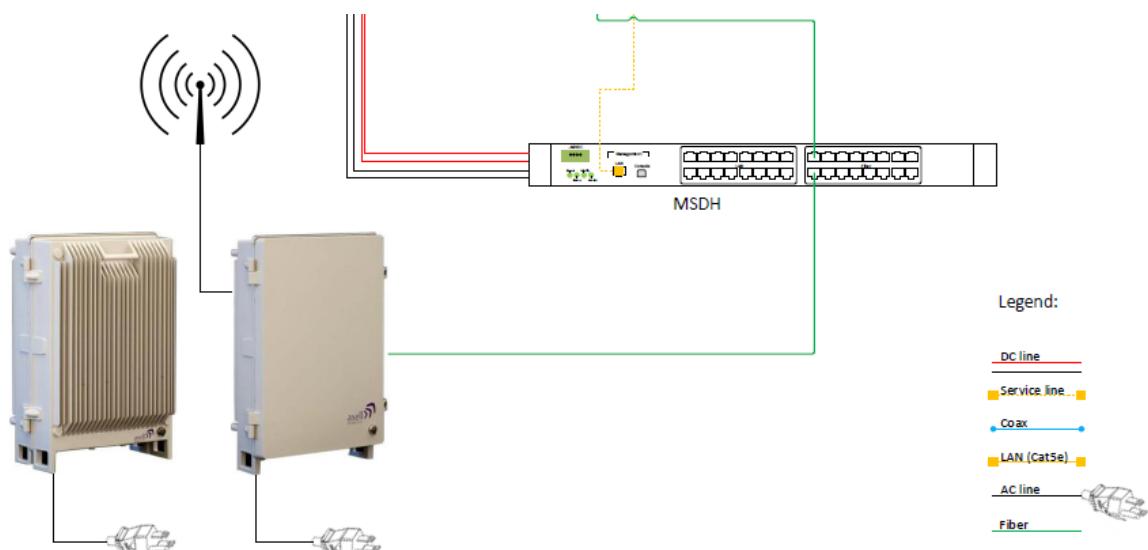
id-DAS-RRU-M-3007-3008-3017-3019-DC.

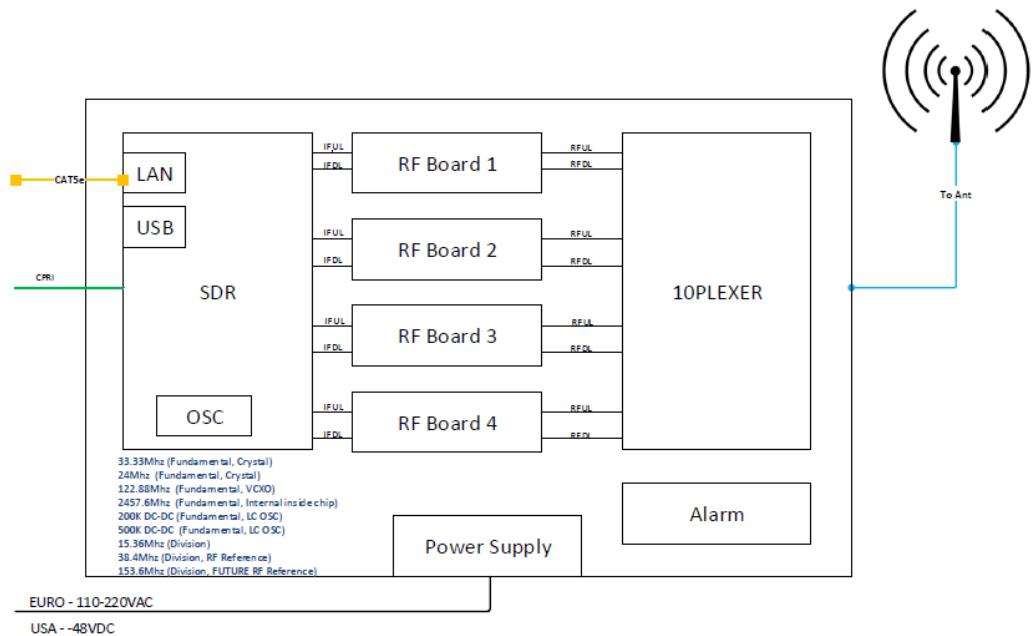
Serial Number:16033001

Description of the EUT system/test Item:

idRU – The idRU is an IP 65 outdoor as well as indoor four-band remote unit, where two units can be cascaded through a CPRI link to support eight bands. Each band can provide medium-power of $31.5, \pm 0.5$ dB per band. The Remote Units serve as the backhaul port of any IP device or switch in the neighborhood; thus, it distributes combined cellular and data services according to user defined configuration profiles. The idRU is connected to the MSDH via 10 Gbit/s CPRI interfaces, where each interface contains an Embedded 1Gbit/s IP backhaul link.

Description of the EUT system/test Item:




Bands and Modulations:

| Technology | Direction | *Modulation & Bandwidth | Frequency Band | Maximum Measured Output Power |
|-----------------|-----------|-------------------------|----------------|-------------------------------|
| AC Model | | | | |
| LTE | Downlink | 64 QAM 5 MHz | 728 - 746 MHz | 31.35 |
| | | 64 QAM 10 MHz | | 31.46 |
| | | 64 QAM 15 MHz | | 31.53 |
| DC Model | | | | |
| LTE | Downlink | 64 QAM 5 MHz | 728 - 746 MHz | 31.30 |
| | | 64 QAM 10 MHz | | 31.34 |
| | | 64 QAM 15 MHz | | 31.50 |

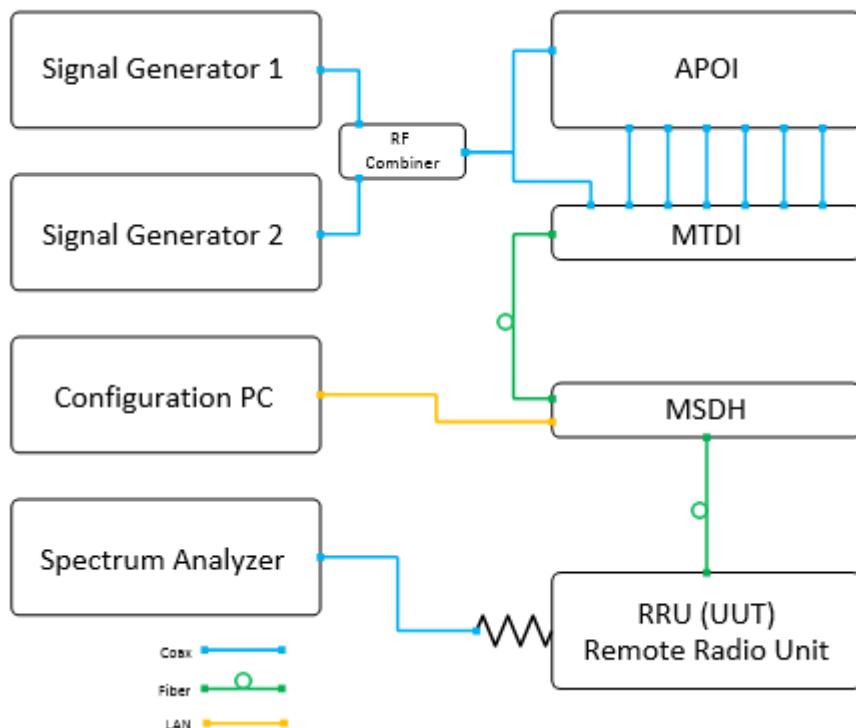
*Note:-Due to the EUT has only LTE wideband signals as shown above, all tests were performed with AWGN 4.1 MHz modulation which is representative the existing modulations according to 935210 D05 Indus Booster Basic Meas v01r01,section 3.1. Testing with a MSK modulation signal for narrowband signals isn't applicable in this circumstance.

Support /Ancillary Equipment:

For the purposes of this test report, ancillary equipment is defined as equipment which is used in conjunction with the EUT to provide operational features to the EUT.

The system was configured in a typical fashion, as it would be normally used. However, the ancillary equipment can influence the test results.

Test Setup and Module Description:



Signal Generator 1 and Signal Generator 2 generates a single tone or two-tones to the system. The tones can be selected to be CW or modulated . The signal can be routed either to the APOI or MTDI via Coax.

The APOI (Active Point of Interface), conditions and controls level of up to 16 low power BTS sectors of up to 30dBm. (Separate low PIM attenuators are used for higher power signals.)

The signals are conditioned by up to eight, band-specific modules, supporting two same-band sectors. The conditioned signals of each module are converged and fed to the corresponding (band-specific) MTDI module for digitization.

The MTDI (Multi Technology Digital Interface) unit digitizes and filters up to 16 conditioned cellular RF sectors from one more A-POI shelves. It then combines the signals over a single CPRI link that is routed towards the MSDH.

The MSDH (Multi Sector Digital Hub) serves as the idDAS central switching hub and control system. It routes digitized cellular resources received from MTDI units, along with data from the Ethernet network, over CPRI links towards the relevant remotes.

2. Test Facility & Uncertainty of Measurement

2.1. Accreditation/ Registration reference

- *A2LA Certificate Number: 1633.01*
- *IC Canada: Site# 4808A-1*

2.2. Test Facility description

The tests were performed at the EMC Laboratory, QualiTech Division, ECI Telecom Group

Address: 30, Hasivim St., Petah Tikva, Israel.

Tel: 972-3-926-6994

3m Anechoic Chamber:

The 3m-screened chamber is used in two configurations: the semi-anechoic configuration for Radiated Emission measurements and the full-anechoic configuration for Radiated Immunity tests.

3m Anechoic Chamber:

| | |
|---|--|
| Measurement distance | 3m |
| Chamber dimensions | 9.5m x 6.5m x 5.2m |
| Antenna height | 1 - 4m |
| Shielding Effectiveness | Magnetic field $\geq 80\text{dB}$ at 15 kHz $\geq 90\text{dB}$ at 100 kHz Electric field $> 120\text{dB}$ from 1MHz to 1GHz $> 110\text{dB}$ from 1GHz to 10GHz |
| Absorbing material | Ferrite tiles on the walls and ceiling Emerson and Cumming absorbing material in selected positions on the walls |
| Normalized Site Attenuation measured at 5 positions | $\pm 3.9\text{dB}$, 30MHz to 200MHz $\pm 3\text{dB}$, 200MHz to 1000MHz |
| Transmission Loss measured at 5 positions, at 1.5m height | $\pm 3\text{dB}$, 1GHz to 18GHz |

Uncertainty of Measurement:

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report according to CISPR 16-4-2 “Specification for radio disturbance and immunity measuring apparatus and methods – Part 4-2: Uncertainties, statistics and limit modelling – Uncertainty in EMC measurements”. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

| Test Name | Test Method & Range | Uncertainty | |
|--------------------------|---|--|--|
| | | Combined std. Uc(y) | Expanded U |
| Radiated Emission | 30MHz÷230MHz, Horiz. polar. 30MHz÷230MHz, Ver. polar. 230MHz÷1000MHz, Horiz. polar. 230MHz÷1000MHz, Vert. polar. | [dB] 1.8 1.967 1.487 1.499 | [dB] 3.6 3.934 2.973 2.998 |
| Conducted Emission | 9 kHz÷150 kHz 150 kHz÷30MHz | [dB] 1.378 1.095 | [dB] 2.756 2.190 |
| Radio frequency | Up to 18 GHz | $\pm 1 \times 10^{-6}$ | $< \pm 1 \times 10^{-5}$ |
| Total Conducted RF Power | Up to 18 GHz | ± 1.378 dB | $< \pm 1.5$ dB |
| Conducted Power density | Up to 18 GHz | ± 1.378 dB | $< \pm 3$ dB |
| Temperature | 23.6 °C | ± 0.6 °C | $< \pm 2$ °C |
| Humidity | 54.9% | ± 3.1 % | $< \pm 5$ % |
| DC Voltage | 0-60 VDC | ± 0.3 % | $< \pm 3$ % |

Note: QualiTech EMC labs expanded measurement instrumentation has less uncertainty than the industry norm and compliance is deemed to occur as no measured disturbance exceeds the disturbance limit.

Note: The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor of $k=2$, providing a level of confidence of approximately 95%.

3. Examination Test Results

3.1. Out-of-Band Rejection

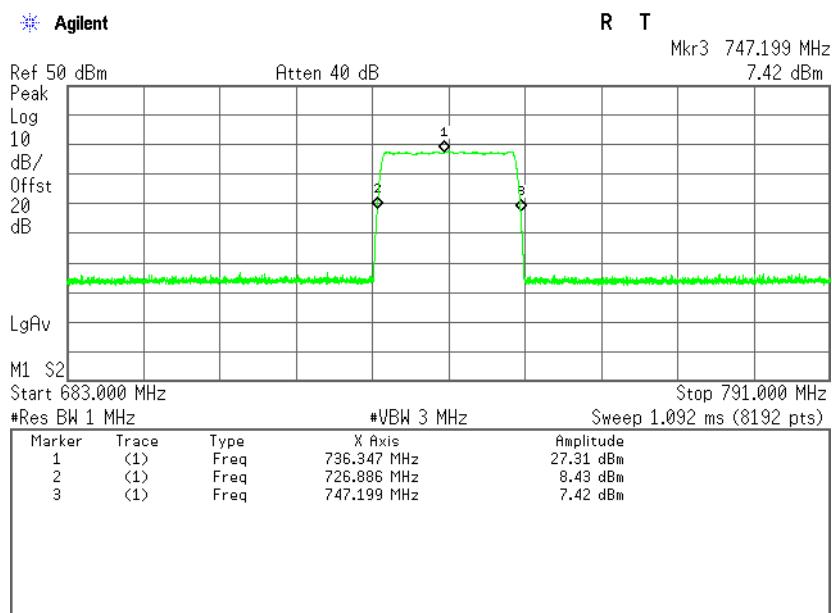
| | | | |
|-------------------------|----------------------------------|------------------------|----------------------------------|
| Reference document: | KDB 935210 D05 v01r01 | | |
| Method of testing: | KDB 935210 D05 v01r01, Conducted | | Done |
| Operating conditions: | Under normal test conditions | | |
| Environment conditions: | Ambient Temperature: 22°C | Relative Humidity: 48% | Atmospheric Pressure: 1011.4 hPa |
| Test Result: | See below | | See Plot 3.1 |

Test results:

| Modulation | ±250% of Passband*, MHz | Frequency fo, MHz | -20dB lowest point, MHz | -20dB highest point, MHz |
|------------|-------------------------|-------------------|-------------------------|--------------------------|
| CW | 683.000....791.000 | 736.347 | 726.886 | 747.199 |

* 18MHz passband

Plot 3.1: Out-of-Band rejection, CW



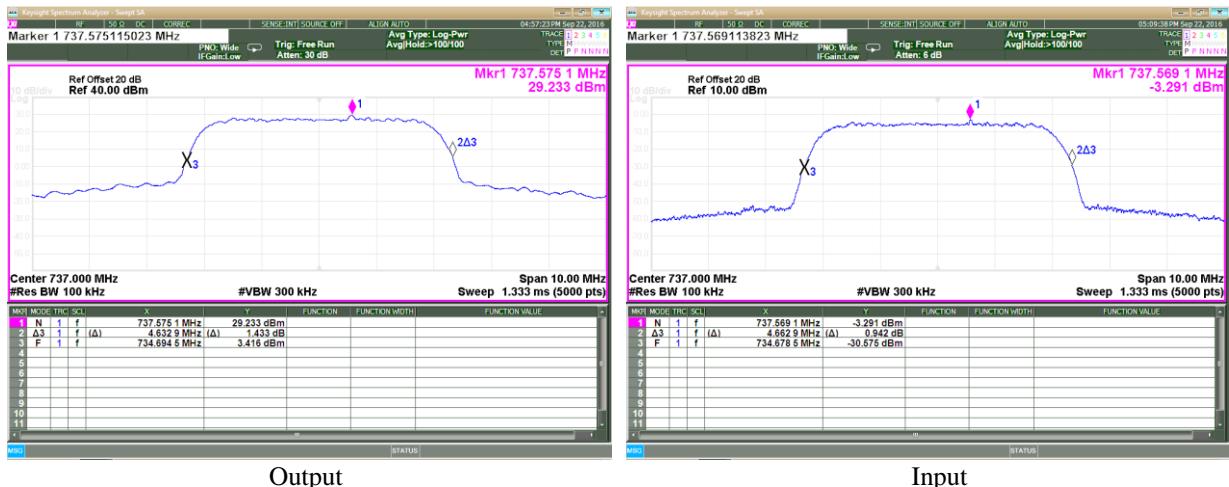
3.2. Occupied Bandwidth - Input-versus-output signal comparison

| | | | |
|-------------------------|--|------------------------|----------------------------------|
| Reference document: | §2.1049(h) | | |
| Test Requirements: | The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power. The spectral plot of the input signal shall be similar to the output signal | | |
| Method of testing: | KDB 935210 D05 v01r01, Conducted | Pass | |
| Operating conditions: | Under normal test conditions | | |
| Environment conditions: | Ambient Temperature: 22°C | Relative Humidity: 48% | Atmospheric Pressure: 1011.4 hPa |
| Test Result: | See below | See Plot 3.2.1 | |

Test results:

| Mode | Operating Frequency, MHz | 26dB Bandwidth, MHz | |
|-------------|--------------------------|---------------------|-----------------|
| | | Output | Input |
| | | 0.5dB below AGC | 0.5dB below AGC |
| AWGN 4.1MHz | 737.000 | 4.633 MHz | 4.663 MHz |

Plot 3.2.1: Input-versus-output signal comparison, AWGN 4.1MHz



3.3. Mean Output Power and Amplifier/Booster Gain

| | | | |
|-------------------------|--|------------------------|----------------------------------|
| Reference document: | 47 CFR §27.50(c)(3), §2.1046(a), | | |
| Test Requirements: | Fixed and base stations transmitting a signal with an emission bandwidth greater than 1 MHz must not exceed an ERP of 1000 watts/MHz and an antenna height of 305 m HAAT | | |
| Method of testing: | For 47CFR: KDB 935210 D05 v01r01, sec 3.5(power meter method); | | Pass |
| Operating conditions: | Under normal test conditions | | |
| Environment conditions: | Ambient Temperature: 22°C | Relative Humidity: 48% | Atmospheric Pressure: 1011.4 hPa |
| Test Result: | See below | | - |

Test results:

| Mode | Operating Frequency (f ₀) ¹ MHz | Measured AVG Power | | | | Mean Gain ² [dBm] | Max Ant Gain [dBd] | ERP Calculated [W] | Power Limit [W/M Hz] | Pass/Fail |
|--------------|--|--------------------|-----------|-------------|-----------|------------------------------|--------------------|--------------------|----------------------|-----------|
| | | Output | | Input | | | | | | |
| AWGN 4.1 MHz | 736.350 | 1.31 W/MHz | 31.17 dBm | 1.05 mW/MHz | -0.20 dBm | 31.37 | 11.85 | 20.99 | 1000 | Pass |

¹ from "Out-of-Band Rejection" test

² Mean Gain [dBm] = Measured AVG Power (Output) [W] - Measured AVG Power (Input) [W]

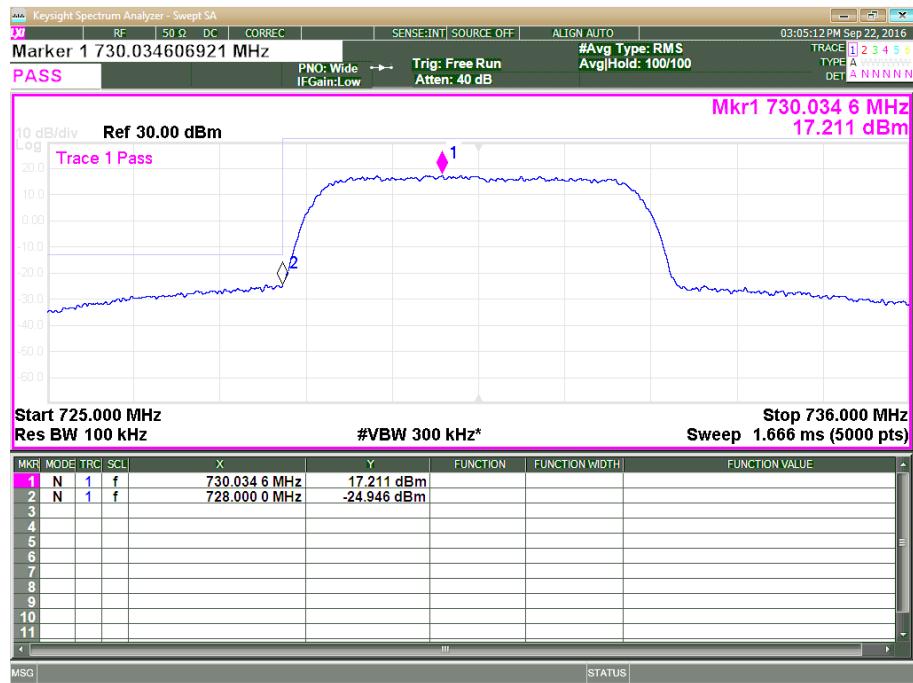
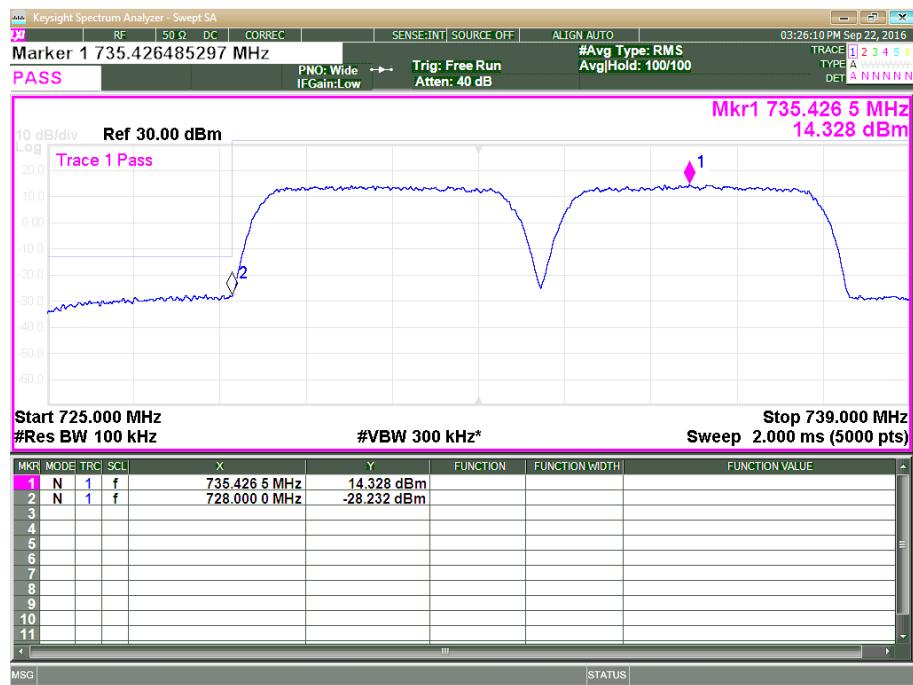
3.4. Out-of-Band/Out-of-Block & Intermodulation Emissions Conducted Measurements

| | | | |
|-------------------------|--|--|--|
| Reference document: | 47 CFR §27.53(g), 47 CFR §2.1051 | | |
| Test Requirements: | For operations in the 600 MHz band and the 698-746 MHz band, the power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least $43 + 10 \log (P)$ dB*. Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kilohertz or greater. However, in the 100 kilohertz bands immediately outside and adjacent to a licensee's frequency block, a resolution bandwidth of at least 30 kHz may be employed. | | |
| Method of testing: | KDB 935210 D05v01r01, , Conducted | | |
| Operating conditions: | Under normal test conditions | | |
| S.A. Settings: | RBW: minimum 1% of EBW or 100kHz or 1MHz; VBW: 3 times RBW | | |
| Environment conditions: | Ambient Temperature: 22°C | | Relative Humidity: 48% Atmospheric Pressure: 1011.4 hPa |
| Test Result: | See below | | See Plot 3.4.1 - Plot 3.4.4 |

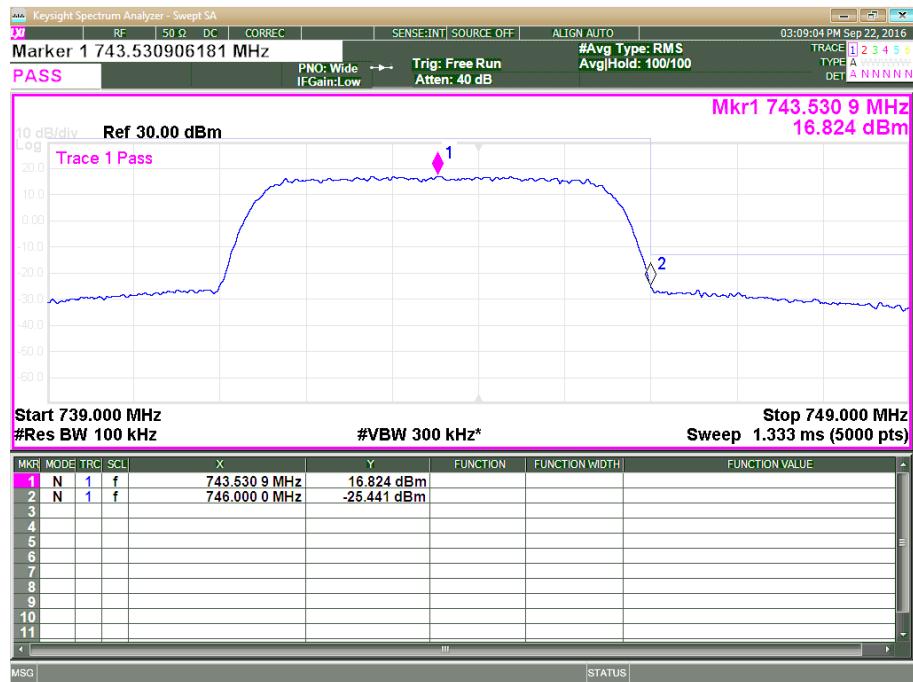
*It translates to a limit of -13dBm

Test results:

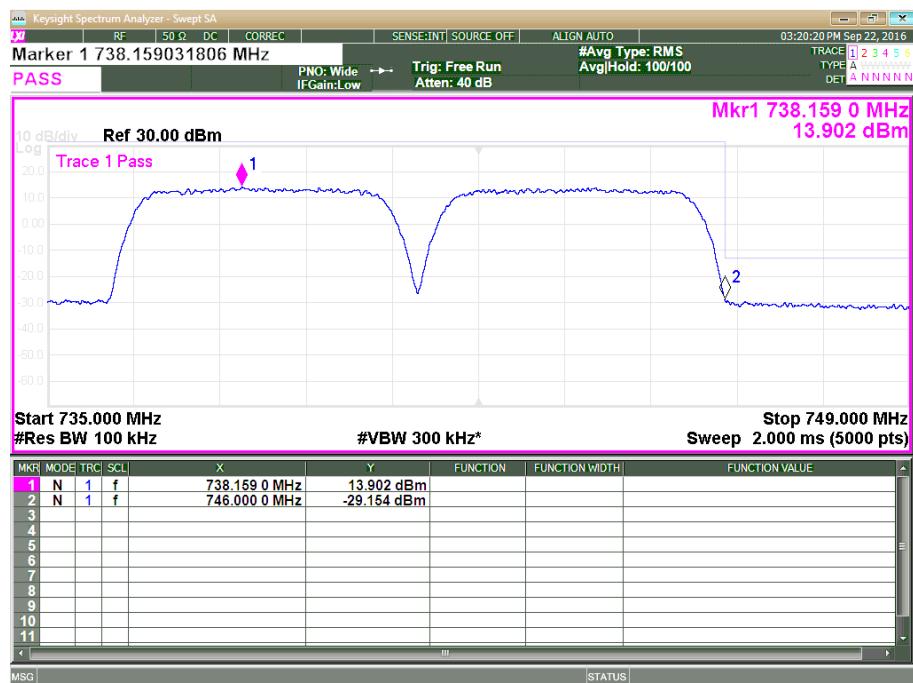
| Modulation | Operating Frequency, MHz | | Emission Frequency, MHz | Emission Level, dBm | Limit, dBm | Delta, dB | Pass/Fail |
|-------------|--------------------------|-----------|-------------------------|---------------------|------------|-----------|-----------|
| | Carrier 1 | Carrier 2 | | | | | |
| AWGN 4.1MHz | 730.500 | NA | 728.000 | -24.95 | -13.00 | -11.95 | Pass |
| | 730.500 | 735.500 | 728.000 | -28.23 | -13.00 | -15.23 | Pass |
| | 743.500 | NA | 746.000 | -25.44 | -13.00 | -12.44 | Pass |
| | 743.500 | 738.500 | 746.000 | -29.15 | -13.00 | -16.15 | Pass |

Plot 3.4.1: Band Edge test results, AWGN 4.1MHz, Fc = 730.5 MHz, single test signal

Plot 3.4.2: Band Edge test results, AWGN 4.1MHz, Fc = 730.5 MHz + 735.5 MHz, two test signals


Plot 3.4.3: Band Edge test results, AWGN 4.1MHz, Fc = 743.5 MHz, single test signal



Plot 3.4.4: Band Edge test results, AWGN 4.1MHz, Fc = 743.5 MHz + 738.5 MHz, two test signals



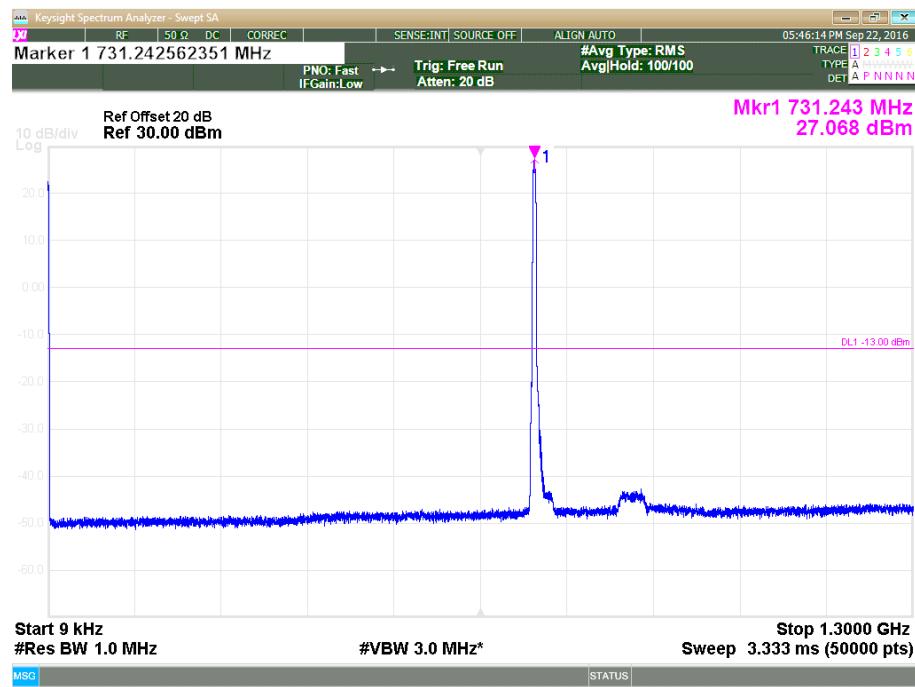
3.5. Spurious Emission Conducted Measurement

| | | | |
|-------------------------|--|-----------------------------|----------------------------------|
| Reference document: | 47 CFR §27.53(g), 47 CFR §2.1051 | | |
| Test Requirements: | For operations in the 600 MHz band and the 698-746 MHz band, the power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least $43 + 10 \log (P)$ dB*. Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kilohertz or greater. However, in the 100 kilohertz bands immediately outside and adjacent to a licensee's frequency block, a resolution bandwidth of at least 30 kHz may be employed. | | |
| Method of testing: | KDB 935210 D05 v01r01 | | |
| Operating conditions: | Under normal test conditions | | |
| S.A. Settings: | RBW: 1MHz, VBW: 3MHz | | |
| Environment conditions: | Ambient Temperature: 22°C | Relative Humidity: 48% | Atmospheric Pressure: 1011.4 hPa |
| Test Result: | See below | See Plot 3.5.1 - Plot 3.5.6 | |

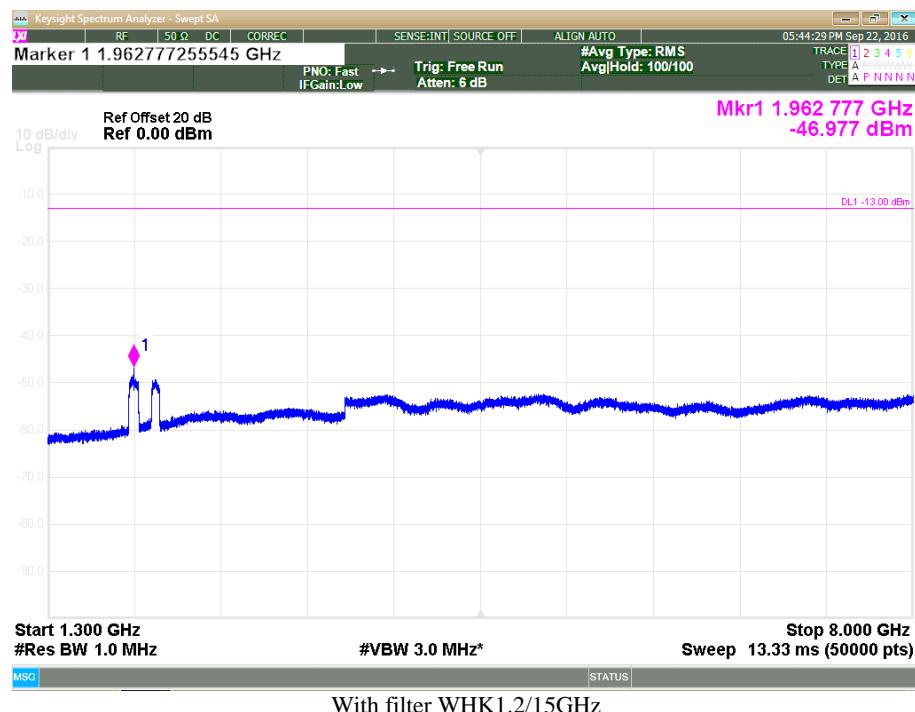
*It translates to a limit of -13 dBm

Test Results: all emission were at least 10 dB below the limit

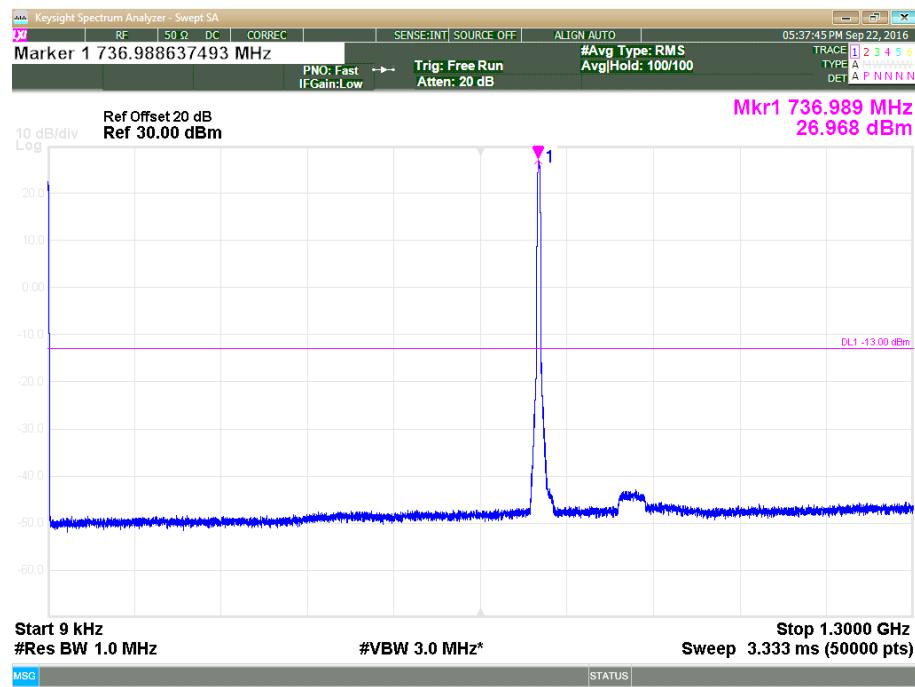
Plot 3.5.1: Spurious Emission Conducted Measurement, AWGN 4.1MHz, Fc = 730.5 MHz, 9 kHz – 1.3 GHz



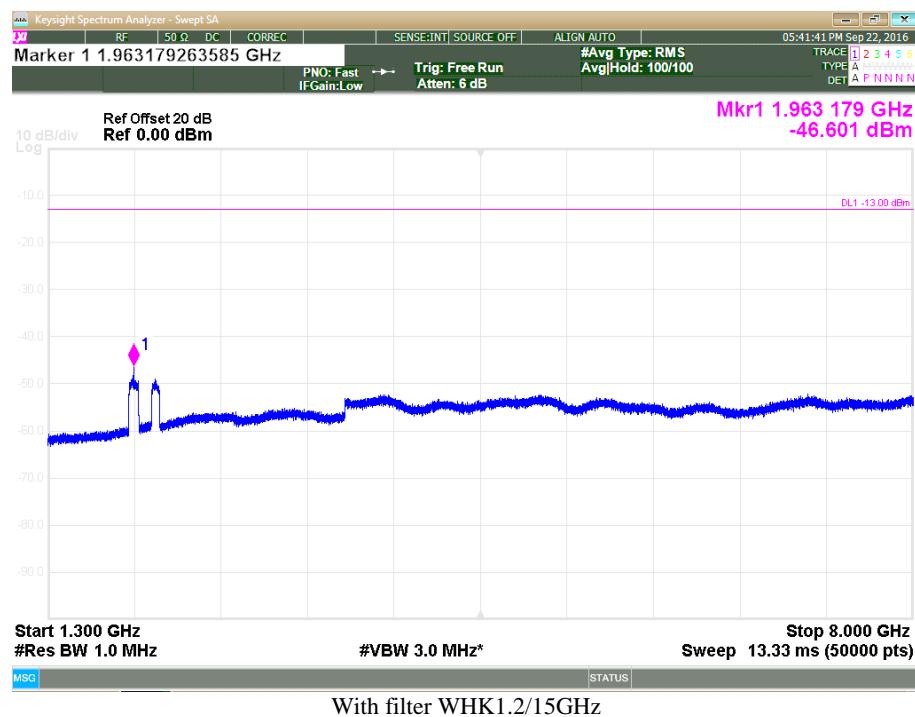
Plot 3.5.2: Spurious Emission Conducted Measurement, AWGN 4.1MHz, Fc = 730.5 MHz, 1.3 GHz – 8 GHz



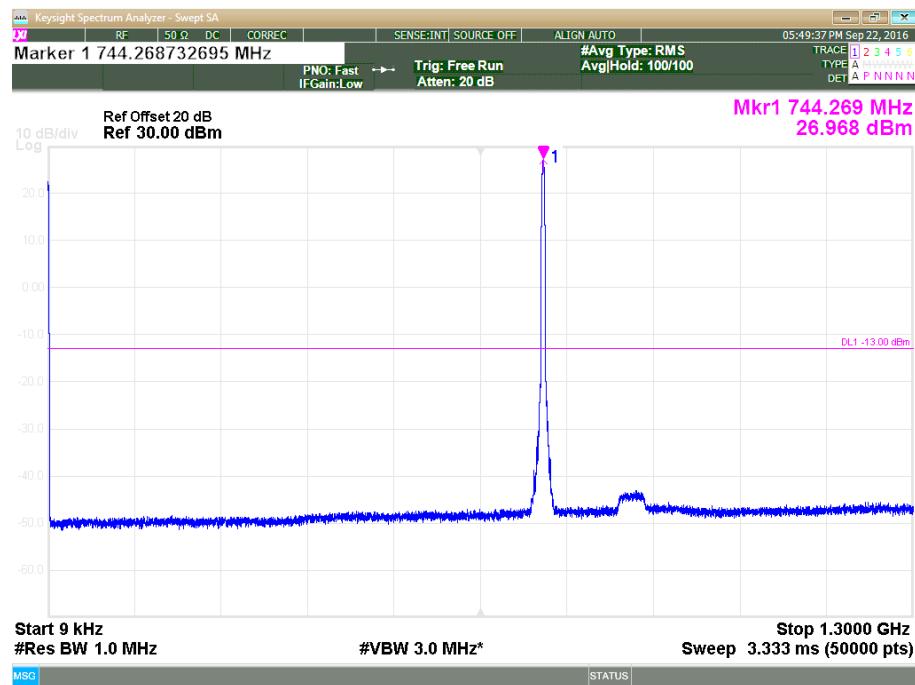
Plot 3.5.3: Spurious Emission Conducted Measurement, AWGN 4.1MHz, Fc = 737.5 MHz, 9 kHz – 1.3 GHz



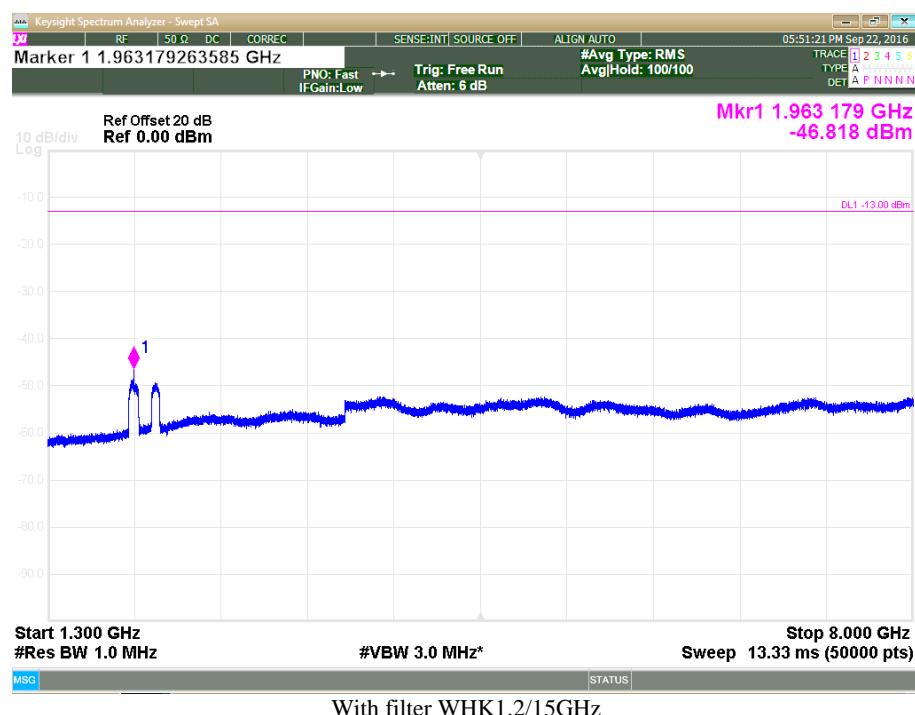
Plot 3.5.4: Spurious Emission Conducted Measurement, AWGN 4.1MHz, Fc = 737.5 MHz, 1.3 GHz – 8 GHz



Plot 3.5.5: Spurious Emission Conducted Measurement, AWGN 4.1MHz, Fc = 743.5 MHz, 9 kHz – 1.3 GHz



Plot 3.5.6: Spurious Emission Conducted Measurement, AWGN 4.1MHz, Fc = 743.500 MHz, 1.3 GHz – 8 GHz



3.6. Spurious Emission, Radiated Measurements

| | | | |
|-------------------------|--|--|--|
| Reference document: | 47 CFR §27.53(g), 47 CFR §2.1053 | | |
| Test Requirements: | For operations in the 600 MHz band and the 698-746 MHz band, the power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least $43 + 10 \log (P)$ dB*. Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kilohertz or greater. However, in the 100 kilohertz bands immediately outside and adjacent to a licensee's frequency block, a resolution bandwidth of at least 30 kHz may be employed. | | |
| Method of testing: | KDB 935210 D05v01r01, Radiated KDB 971168[R8] | | Pass |
| Operating conditions: | Under normal test conditions | | |
| S.A. Settings: | RBW: 1MHz, VBW: 3MHz | | |
| Environment conditions: | Ambient Temperature: 22°C | | Relative Humidity: 48% Atmospheric Pressure: 1011.4 hPa |
| Test Result: | See below | | AC Model-Plots DC Model-Plots 3.6.13-3.6.24 |

*It translates to a limit of $-13 \text{ dBm} = 84 \text{ dB}\mu\text{V/m} @ 3\text{m distance}$

Note: All measurements performed with 4 simultaneous transmissions:

Low frequency: 728.2 MHz, 862.2 MHz, 1930.2 MHz, 2110.2 MHz, Middle frequency: 737.0 MHz, 865.5 MHz, 1962.5 MHz, 2132.5 MHz

High frequency: 745.8 MHz, 868.8 MHz, 1994.8 MHz, 2154.8 MHz

-All measurements were done in horizontal and vertical polarizations; the tables below show the worst case.

Test Results :AC Model

| Frequency [MHz] | Radiated Emission Level [dB μ V/m] | Radiated Emission Level* EIRP [dBm] | Limit [dBm] | Margin [dB] | Pass/Fail | Ref Plots |
|--|--|-------------------------------------|-------------|-------------|-----------|--------------|
| All emissions were at least 15dB below the Limit | | | | | Pass | 3.6.1-3.6.12 |

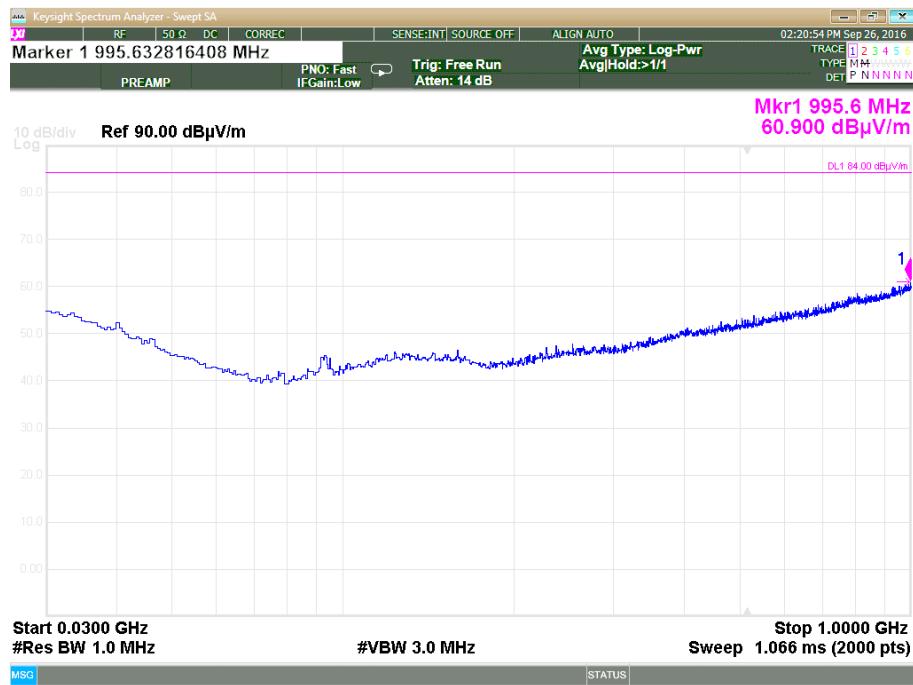
Test Results :DC Model

| Frequency, MHz | Emission Level, dB μ V/m | Antenna Polarization | Substitution Method | | | | Limit [dBm] | Delta**, dB | Pass/Fail | Ref Plots | |
|----------------|------------------------------|----------------------|--------------------------------|---------------------|----------------|------------------------|-------------|-------------|-----------|---------------|--|
| | | | Signal generator output, [dBm] | Antenna Gain, [dBd] | Cable Loss, dB | Calculated ERP*, [dBm] | | | | | |
| Low Frequency | | | | | | | | | | | |
| 70.748 | 65.7 | V | -29.0 | -3.9 | 0.4 | -33.3 | -13.0 | -20.3 | Pass | 3.6.13-3.6.24 | |
| 76.450 | 67.7 | V | -29.0 | -3.5 | 0.4 | -32.9 | -13.0 | -19.9 | Pass | | |
| 94.622 | 73.0 | H | -23.0 | -1.8 | 0.5 | -25.3 | -13.0 | -12.3 | Pass | | |
| 100.852 | 71.7 | V | -25.7 | -1.7 | 0.5 | -27.9 | -13.0 | -14.9 | Pass | | |
| 106.095 | 70.2 | H | -27.5 | -1.7 | 0.6 | -29.8 | -13.0 | -16.8 | Pass | | |
| High Frequency | | | | | | | | | | | |
| 150.791 | 68.21 | V | -26.50 | -0.8 | 0.9 | -27.9 | -13.0 | -14.9 | Pass | | |

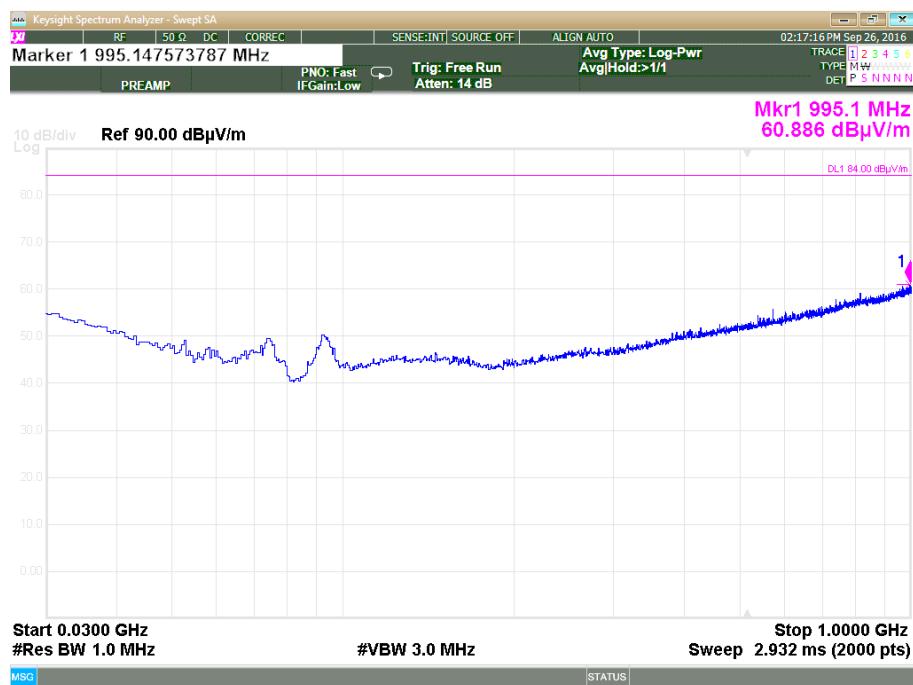
*Calculated ERP = Signal Generator Output + Antenna Gain – Cable Loss

AC Model

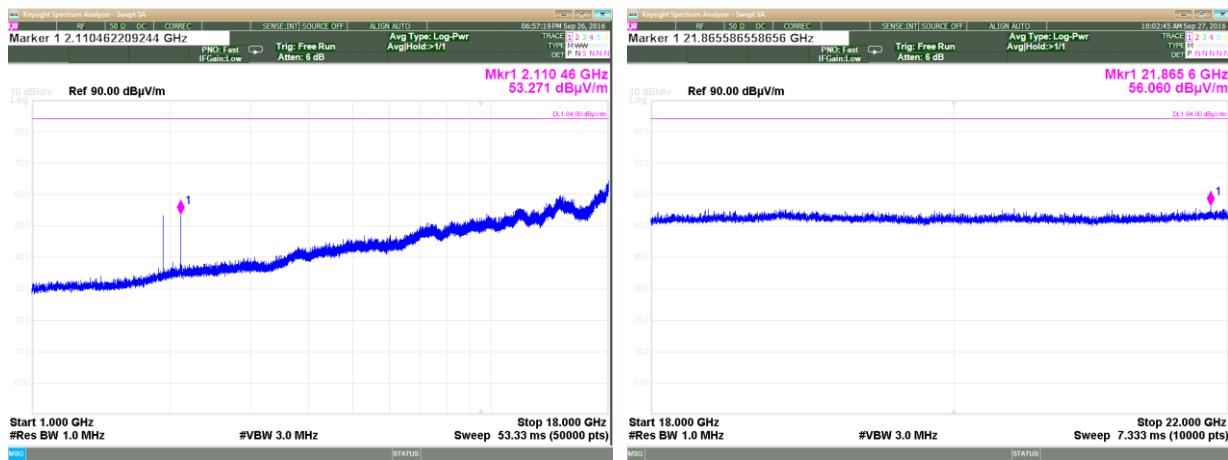
Plot 3.6.1: Spurious Emission test results, 30 MHz – 1 GHz range, Horizontal polarization, Low Frequency



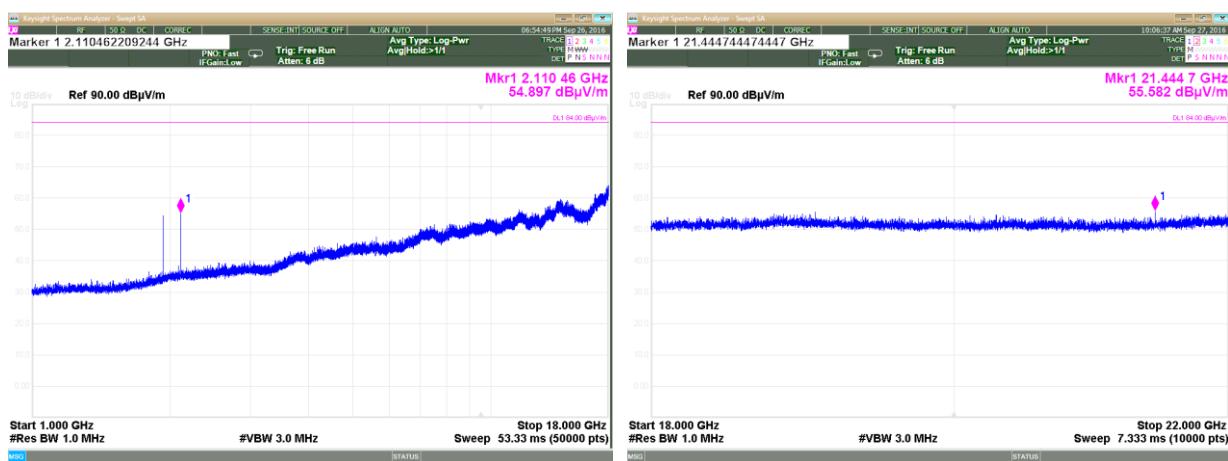
Plot 3.6.2: Spurious Emission test results, 30 MHz – 1 GHz range, Vertical polarization, Low Frequency



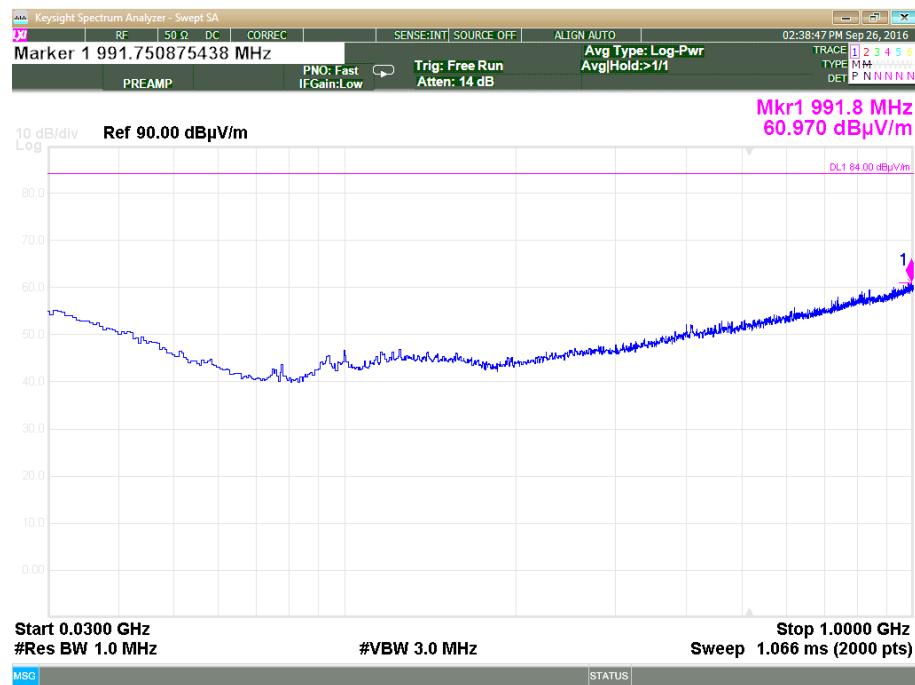
Plot 3.6.3: Spurious Emission test results, 1 GHz – 22 GHz range, Horizontal polarization, Low Frequency



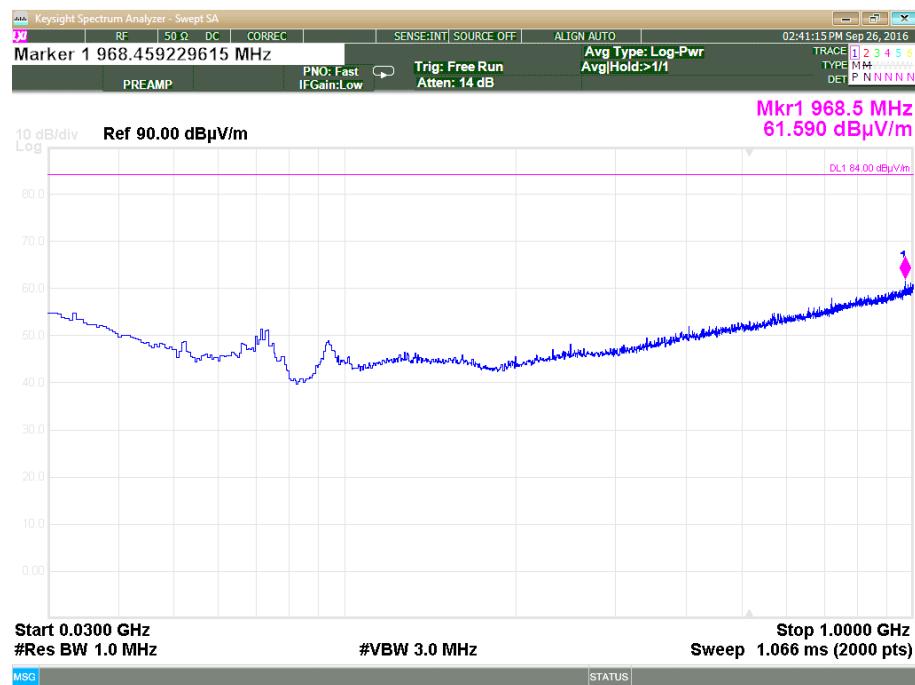
Plot 3.6.4: Spurious Emission test results, 1 GHz – 22 GHz range, Vertical polarization, Low Frequency



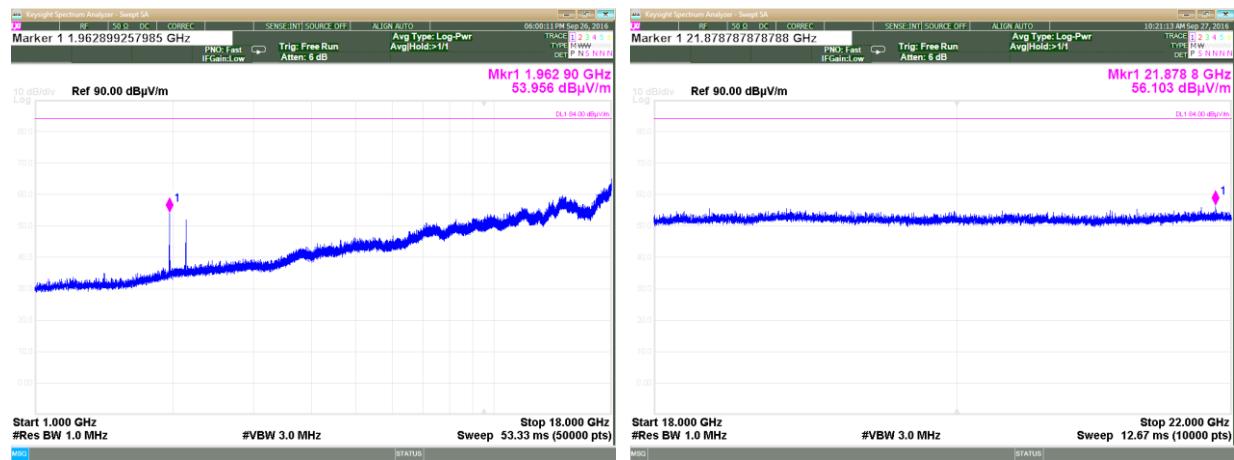
Plot 3.6.5: Spurious Emission test results, 30 MHz – 1 GHz range, Horizontal polarization, Middle Frequency



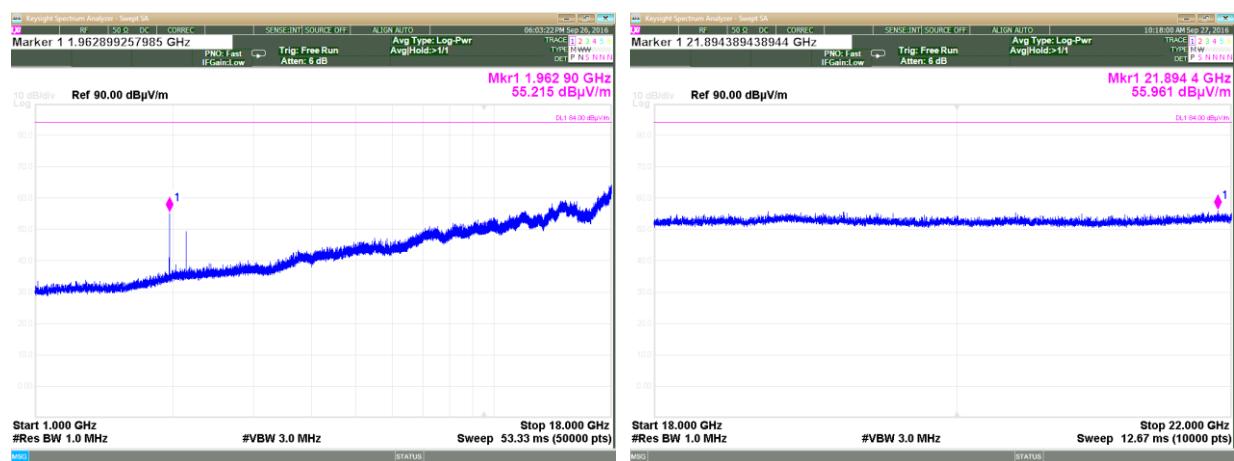
Plot 3.6.6: Spurious Emissions test results, 30 MHz – 1 GHz range, Vertical polarization, Middle Frequency



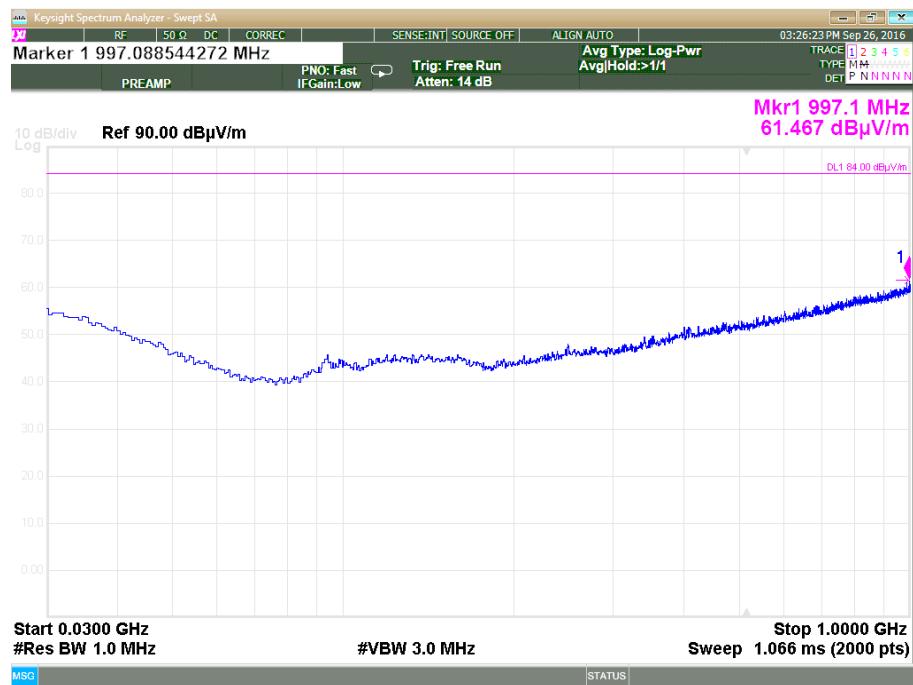
Plot 3.6.7: Spurious Emissions test results, 1 GHz – 22 GHz range, Horizontal polarization, Middle Frequency



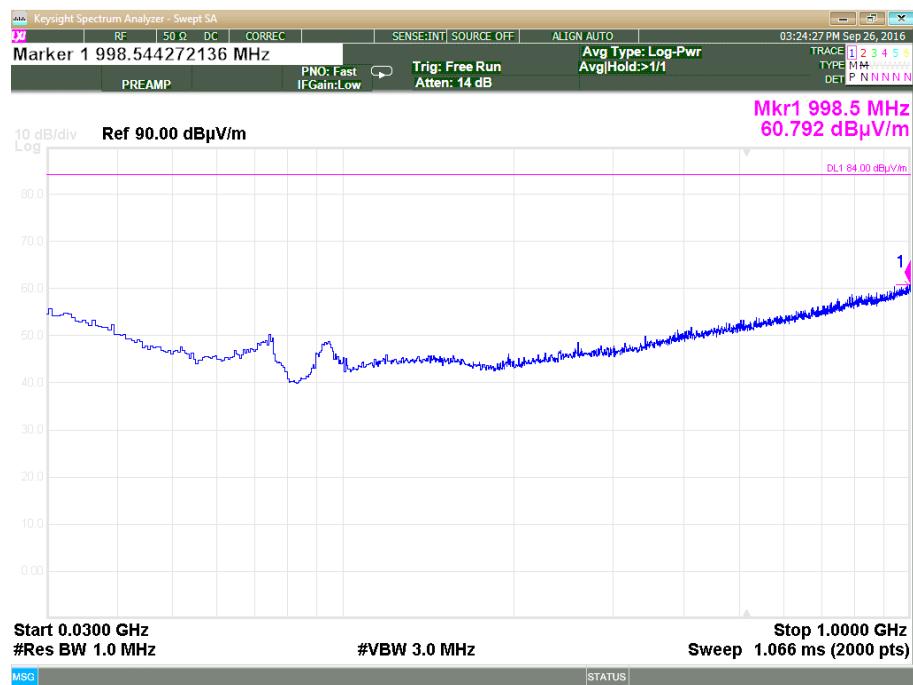
Plot 3.6.8: Spurious Emissions test results, 1 GHz – 22GHz range, Vertical polarization, Middle Frequency



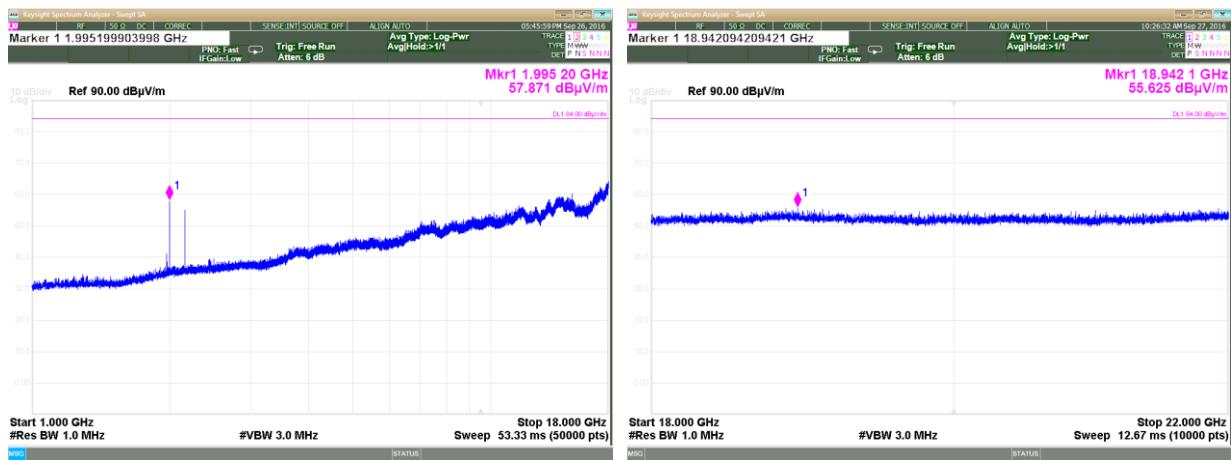
Plot 3.6.9: Spurious Emissions test results, 30 MHz – 1GHz range, Horizontal polarization, High Frequency



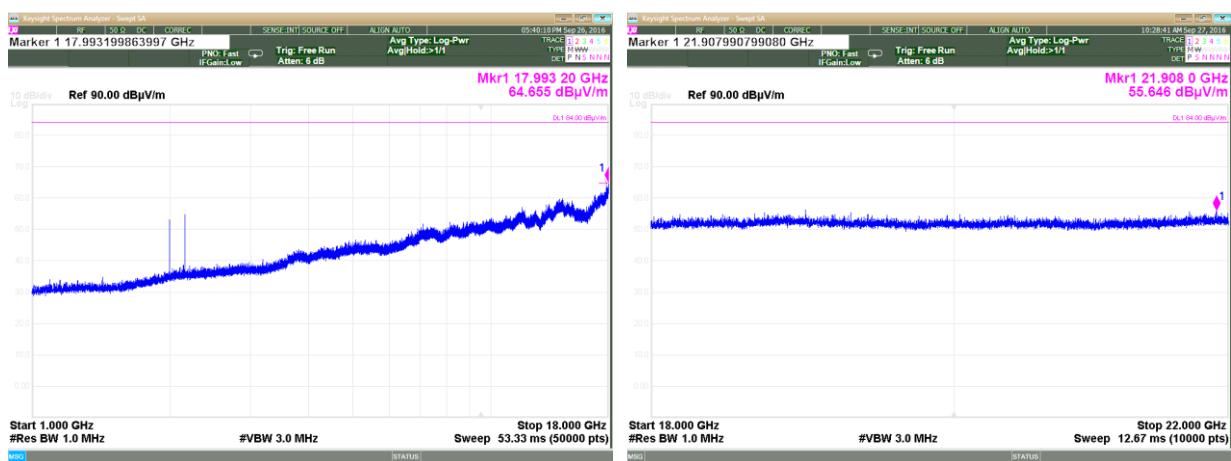
Plot 3.6.10: Spurious Emissions test results, 30 MHz – 1GHz range, Vertical polarization, High Frequency



Plot 3.6.11: Spurious Emissions test results, 1 GHz – 22 GHz range, Horizontal polarization, High Frequency



Plot 3.6.12: Spurious Emissions test results, 1 GHz – 22GHz range, Vertical polarization, High Frequency



DC Model

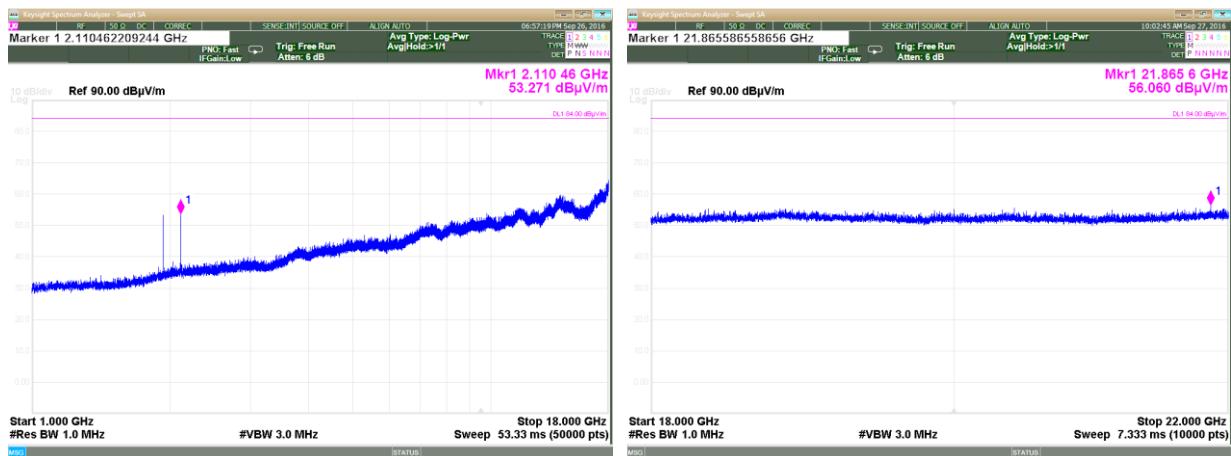
Plot 3.6.13: Spurious Emissions test results, 30 MHz – 1 GHz range, Horizontal polarization, Low Frequency



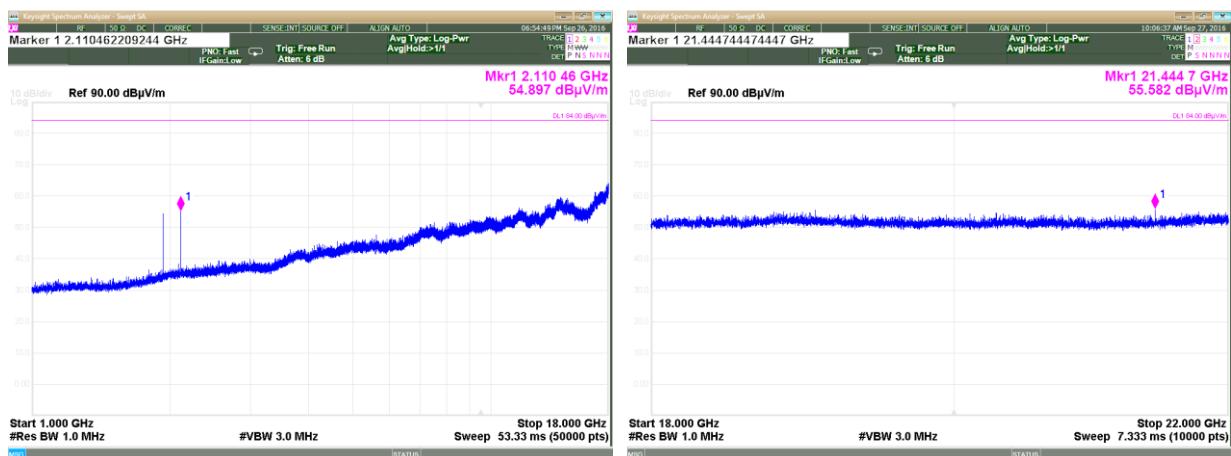
Plot 3.6.14: Spurious Emissions test results, 30 MHz – 1 GHz range, Vertical polarization, Low Frequency



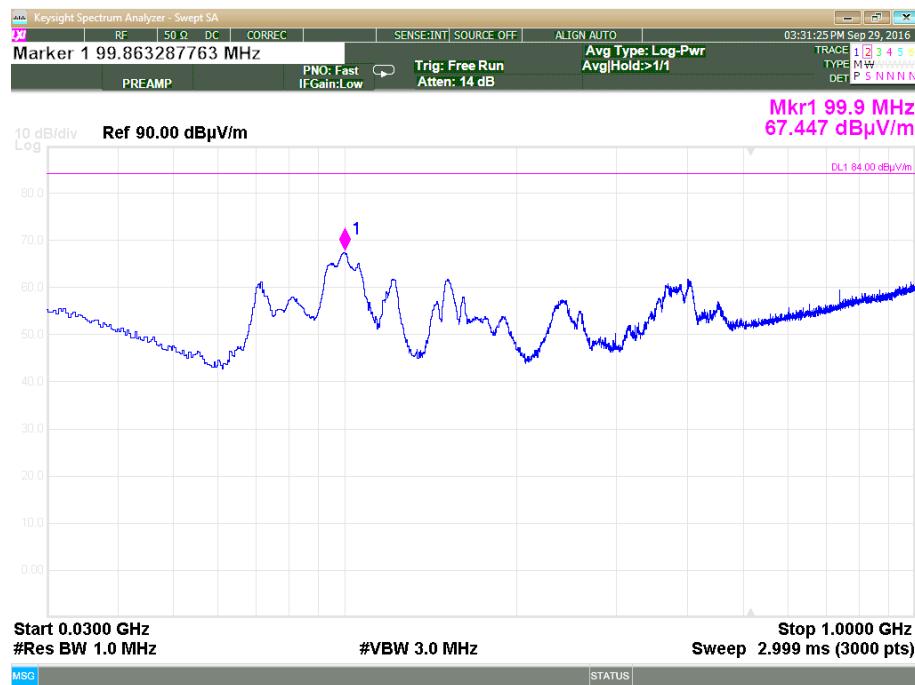
Plot 3.6.15: Spurious Emissions test results, 1 GHz – 22 GHz range, Horizontal polarization, Low Frequency



Plot 3.6.16: Spurious Emissions test results, 1 GHz – 22 GHz range, Vertical polarization, Low Frequency



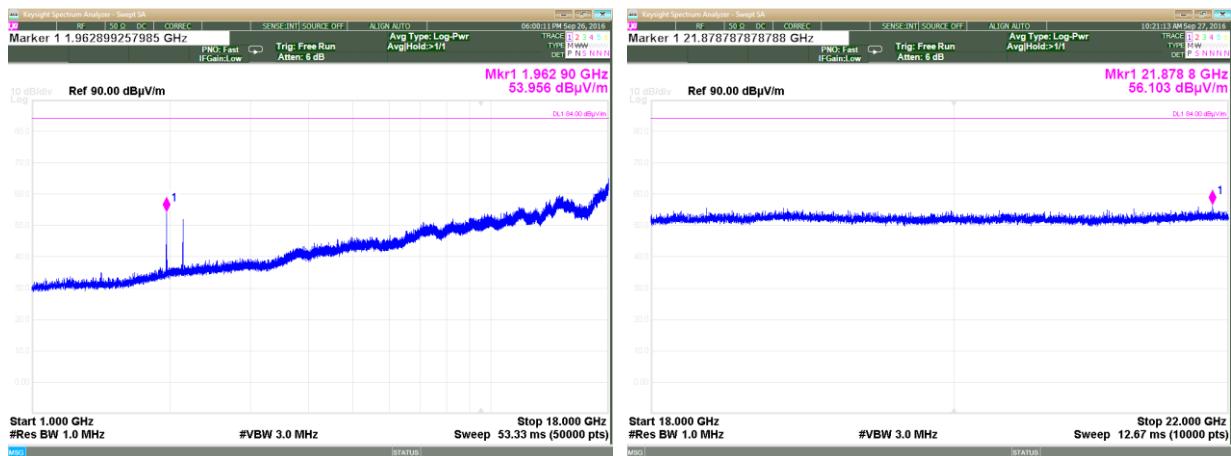
Plot 3.6.17: Spurious Emissions test results, 30 MHz – 1 GHz range, Horizontal polarization, Middle Frequency



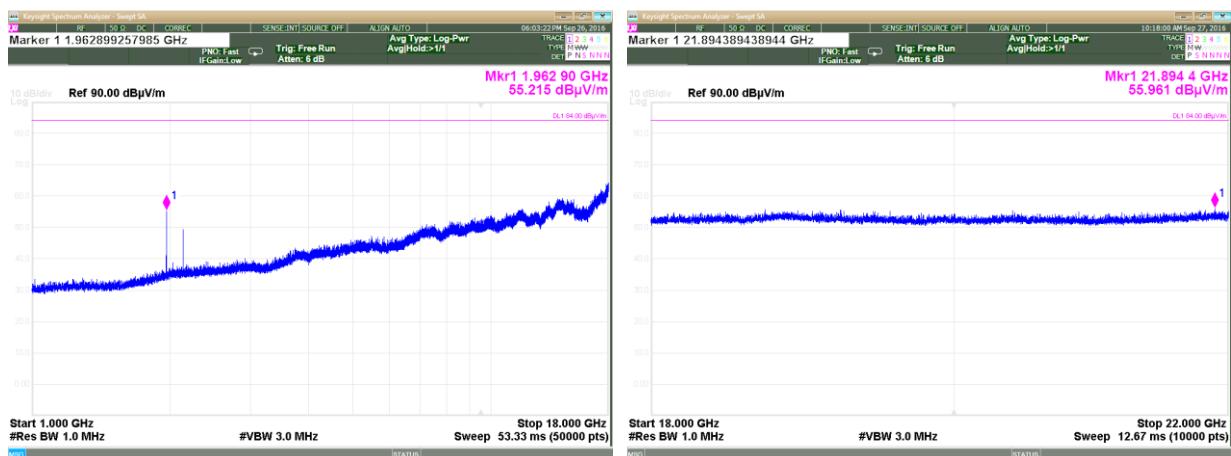
Plot 3.6.18: Spurious Emissions test results, 30 MHz – 1 GHz range, Vertical polarization, Middle Frequency



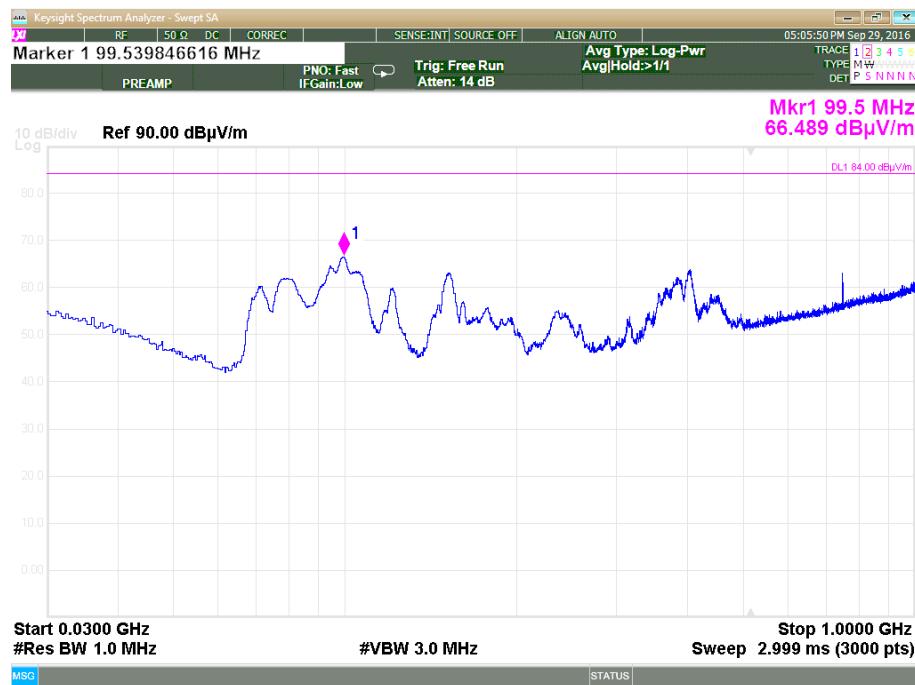
Plot 3.6.19: Spurious Emissions test results, 1 GHz – 22 GHz range, Horizontal polarization, Middle Frequency



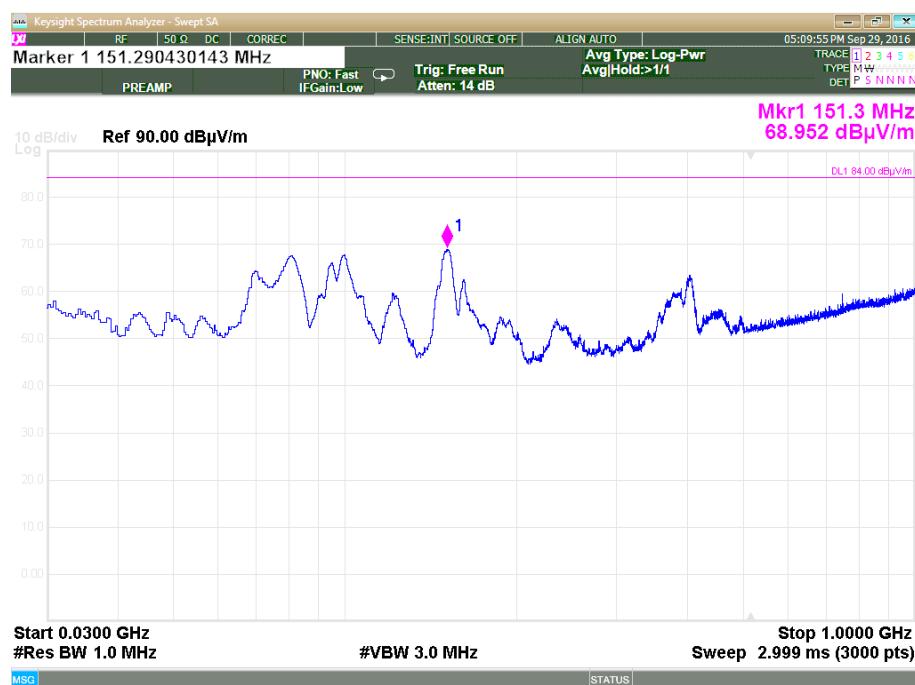
Plot 3.6.20: Spurious Emissions test results, 1 GHz – 22 GHz range, Vertical polarization, Middle Frequency



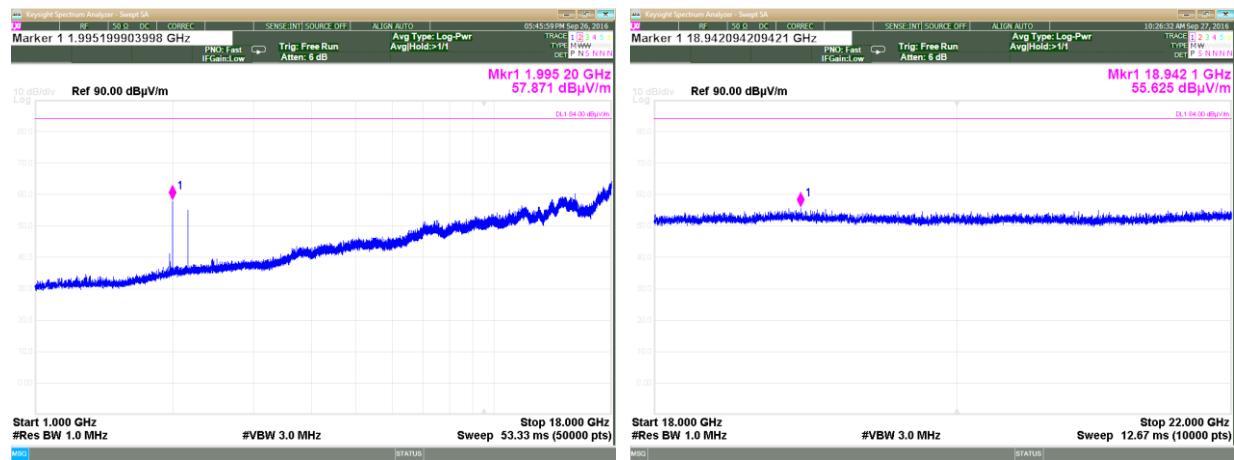
Plot 3.6.21: Spurious Emissions test results, 30 MHz – 1 GHz range, Horizontal polarization, High Frequency



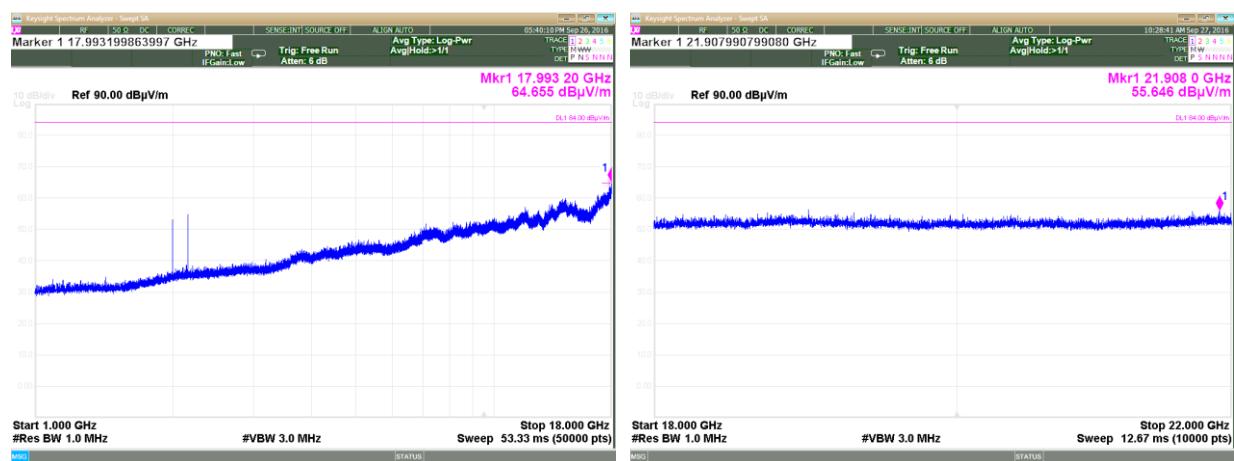
Plot 3.6.22: Spurious Emissions test results, 30 MHz – 1 GHz range, Vertical polarization, High Frequency



Plot 3.6.23: Spurious Emissions test results, 1 GHz – 22 GHz range, Horizontal polarization, High Frequency



Plot 3.6.24: Spurious Emissions test results, 1 GHz – 22 GHz range, Vertical polarization, High Frequency



3.7. Frequency stability

| | | | |
|-------------------------|--|---------------------------|-------------------------------------|
| Reference document: | 47 CFR §27.54, 47 CFR §2.1055 | | |
| Test Requirements: | The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block. | | |
| Method of testing: | KDB 935210 D05v01r01, Conducted | | |
| Operating conditions: | Under normal and extremes test conditions | | |
| Environment conditions: | Ambient Temperature: 22°C | Relative Humidity: 48% | Atmospheric Pressure: 1011.4 hPa |
| Test Result: | See below | - | |

Test results - Fc= 737.5 MHz

Frequency error vs. Voltage: AC Model

| Voltage [Vdc] | Frequency Error [Hz] | Frequency Error [%] | Frequency Error [ppm] | Limit [ppm] | Test Result |
|---|-----------------------------|---------------------|-----------------------|-------------|-------------|
| Carrier frequency at 20°C (120 VAC): 737.5 MHz | | | | | |
| 102-138 | No Frequency Error observed | | | | Pass |

Frequency error vs. Voltage: DC Model

| Voltage [Vdc] | Frequency Error [Hz] | Frequency Error [%] | Frequency Error [ppm] | Limit [ppm] | Test Result |
|--|-----------------------------|---------------------|-----------------------|-------------|-------------|
| Carrier frequency at 20°C (48 VDC): 737.5 MHz | | | | | |
| 40.8-55.2 | No Frequency Error observed | | | | Pass |

Frequency error vs. Temperature

| Temperature, °C | Reference Frequency, MHz | Measured Frequency, MHz | Frequency Error, Hz | Frequency Error, ppm | Limit, ppm | Delta | Pass/Fail |
|-----------------|--------------------------|-------------------------|---------------------|----------------------|------------|-------|-----------|
| -30 | 737.000150 | 737.000130 | -20.00000 | -0.03 | 1.50 | -1.53 | Pass |
| -20 | 737.000150 | 737.000150 | 0.00000 | 0.00 | 1.50 | -1.50 | Pass |
| -10 | 737.000150 | 737.000110 | -40.00000 | -0.05 | 1.50 | -1.55 | Pass |
| 0 | 737.000150 | 737.000130 | -20.00000 | -0.03 | 1.50 | -1.53 | Pass |
| 10 | 737.000150 | 737.000150 | 0.00000 | 0.00 | 1.50 | -1.50 | Pass |
| 20 | Reference temperature | | | | | | |
| 30 | 737.000150 | 737.000130 | -20.00000 | -0.03 | 1.50 | -1.53 | Pass |
| 40 | 737.000150 | 737.000170 | 20.00000 | 0.03 | 1.50 | -1.47 | Pass |
| 50 | 737.000150 | 737.000130 | -20.00000 | -0.03 | 1.50 | -1.53 | Pass |

4. Appendix

Appendix A: List of test equipment used

| Description | Manufacturer | Model | Serial No. | Last Cal | Cal Due |
|-----------------------------------|--------------|------------------------|-------------|------------|------------|
| Anechoic new (large) chamber | ----- | ----- | ----- | 10/03/2016 | 10/03/2018 |
| Bilog Antenna | Teseq | CBL 6141B | 34119 | 03/07/2016 | 03/07/2017 |
| EMC Analyzer | Agilent | E7405A | US41160436 | 02/06/2016 | 02/06/2017 |
| EMI Receiver (2.9GHz) | HP | 8546A | 3617A00318 | 23/05/2016 | 23/05/2017 |
| EMI Receiver (6.5GHz) | HP | 8546A | 3710A00392 | 09/02/2016 | 09/02/2017 |
| Horn Antenna 1-18GHz | A.R.A | DRG-118/A | 17188 | 18/05/2016 | 18/05/2017 |
| Horn Antenna 15-40 GHz | Schwarzbeck | BBHA 9170 | BBHA9170214 | 06/03/2015 | 06/03/2018 |
| LNA Amplifier 1 GHz to 18 GHz | AMP | 7D-010180-30-10P-GW | 618653 | 23/02/2016 | 23/02/2017 |
| Low-Noise Amplifier 18 - 26.5 GHz | Miteq | AMF-5F-18002650-30-10P | 945372 | 23/02/2016 | 23/02/2017 |
| Power Meter | Agilent | N1911A | MY45100784 | 15/01/2015 | 15/01/2017 |
| RF Filter Section (2.9GHz) | HP | 85460A | 3448A00282 | 23/05/2016 | 23/05/2017 |
| RF Filter Section (6.5GHz) | HP | 85460A | 3704A00366 | 09/02/2016 | 09/02/2017 |
| Spectrum Analyzer 3Hz-44GHz | Agilent | E4446A | MY46180602 | 13/11/2014 | 13/11/2016 |
| Wideband Power Sensor | Agilent | N1921A | MY45241242 | 15/01/2015 | 15/01/2017 |

Appendix B: Accreditation Certificate



Accredited Laboratory

A2LA has accredited

QUALITECH

Petah-Tikva, Israel

for technical competence in the field of

Electrical Testing

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005 *General requirements for the competence of testing and calibration laboratories*. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communiqué dated 8 January 2009).

Presented this 28th day of June 2016.

A handwritten signature in blue ink, appearing to read 'Jim C. Bent'.

Senior Director of Quality and Communications
For the Accreditation Council
Certificate Number 1633.01
Valid to June 30, 2018



For the tests to which this accreditation applies, please refer to the laboratory's Electrical Scope of Accreditation.

End of the Test Report