



Canada

# EMC & RF Test Report

As per

## RSS-247 Issue 1:2015 & FCC Part 15 Subpart 15.247:2016

Unlicensed Intentional Radiators

on the

### AWA24R

Issued by:

**TÜV SÜD Canada Inc.**  
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Testing produced for



Min Xie,  
EMC Project  
Engineer

See Appendix A for full client &  
EUT details.



R-4023, G-506  
C-4498, T-1246



|             |                                                         |                                                                                     |
|-------------|---------------------------------------------------------|-------------------------------------------------------------------------------------|
| Client      | <b>Artaflex</b>                                         |  |
| Product     | <b>AWA24R</b>                                           |                                                                                     |
| Standard(s) | RSS 247 Issue 1:2015<br>FCC Part 15 Subpart 15.247:2016 |                                                                                     |

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|-------------|---------------------------------------------------------|-------------------------------------------------------------------------------------|
| Client      | <b>Artaflex</b>                                         |  |
| Product     | <b>AWA24R</b>                                           |                                                                                     |
| Standard(s) | RSS 247 Issue 1:2015<br>FCC Part 15 Subpart 15.247:2016 |                                                                                     |

## Report Scope

This report addresses the EMC verification testing and test results of the **Artaflex, Model: AWA24R**, and is herein referred to as EUT (Equipment Under Test). The EUT was tested for compliance against the following standards:

RSS-247 Issue 1:2015

FCC Part 15 Subpart C 15.247:2016

Test procedures, results, justifications, and engineering considerations, if any, follow later in this report.

This report does not imply product endorsement by any government, accreditation agency, or TÜV SÜD Canada Inc.

Opinions or interpretations expressed in this report, if any, are outside the scope of TÜV SÜD Canada Inc accreditations. Any opinions expressed do not necessarily reflect the opinions of TÜV SÜD Canada Inc, unless otherwise stated.

|             |                                                         |                                                                                     |
|-------------|---------------------------------------------------------|-------------------------------------------------------------------------------------|
| Client      | <b>Artaflex</b>                                         |  |
| Product     | <b>AWA24R</b>                                           |                                                                                     |
| Standard(s) | RSS 247 Issue 1:2015<br>FCC Part 15 Subpart 15.247:2016 |                                                                                     |

## Summary

The results contained in this report relate only to the item(s) tested.

|                                      |              |
|--------------------------------------|--------------|
| EUT:                                 | AWA24R       |
| FCC Certification #, FCC ID:         | UP2AWA24R    |
| Industry Canada Certification #, IC: | 6797A-AWA24R |
| EUT passed all tests performed       | Yes          |
| Tests conducted by                   | Min Xie      |

For testing dates, see "Testing Environmental Conditions and Dates".

|             |                                                         |                                                                                     |
|-------------|---------------------------------------------------------|-------------------------------------------------------------------------------------|
| Client      | Artaflex                                                |  |
| Product     | AWA24R                                                  |                                                                                     |
| Standard(s) | RSS 247 Issue 1:2015<br>FCC Part 15 Subpart 15.247:2016 |                                                                                     |

## Test Results Summary

| Standard/Method                  | Description                                | Class/Limit           | Result                                     |
|----------------------------------|--------------------------------------------|-----------------------|--------------------------------------------|
| FCC 15.203                       | Antenna Requirement                        | Unique                | Pass<br>See Justification                  |
| FCC 15.205<br>RSS-GEN (Table 6)  | Restricted Bands for Intentional Operation | QuasiPeak Average     | Pass                                       |
| FCC 15.207<br>RSS-GEN (Table 3)  | Power Line Conducted Emissions             | QuasiPeak Average     | Pass                                       |
| FCC 15.209<br>RSS-GEN (Table 4)  | Spurious Radiated Emissions                | QuasiPeak Average     | Pass                                       |
| FCC 15.247(a)2<br>RSS-247 5.2(1) | 6 dB Bandwidth                             | > 500 kHz             | Pass                                       |
| FCC 15.247(b)2<br>RSS-247 5.4(4) | Max Output Power                           | < 1 Watt              | Pass                                       |
| FCC 15.247(b)4<br>RSS-247 5.4(4) | Antenna Gain                               | < 6 dBi               | Pass<br>See Justifications                 |
| FCC 15.247(d)<br>RSS-247 5.5     | Antenna Conducted Spurious                 | < 20 dBc              | Pass                                       |
| FCC 15.247(e)<br>RSS-247 5.2(2)  | Spectral Density                           | < 8 dBm<br>(3 kHz BW) | Pass                                       |
| FCC 15.247(i)<br>RSS-102         | RF Exposure                                | > 20 cm separation.   | Pass<br>See justification and Calculations |
| <b>Overall Result</b>            |                                            |                       | <b>Pass</b>                                |

If the product as tested or otherwise complies with the specification, the EUT is deemed to comply with the requirement and is deemed a 'PASS' grade. If not 'FAIL' grade will be issued. Note that 'PASS' / 'FAIL' grade is independent of any measurement uncertainties. A 'PASS' / 'FAIL' grade within measurement uncertainty is marked with a '\*'.

|             |                                                         |                                                                                     |
|-------------|---------------------------------------------------------|-------------------------------------------------------------------------------------|
| Client      | Artaflex                                                |  |
| Product     | AWA24R                                                  |                                                                                     |
| Standard(s) | RSS 247 Issue 1:2015<br>FCC Part 15 Subpart 15.247:2016 |                                                                                     |

### **Notes, Justifications, or Deviations**

The following notes, justifications for tests not performed or deviations from the above listed specifications apply:

For the Antenna requirement specified in FCC 15.203 (RSS-247 section 5.5), the unit uses an external dipole antenna (2.15 dBi gain dipole antenna – Invertek Systems W24-SSMA-M) with less than 6 dBi gain.

For the Restricted Bands of operation, the EUT is designed to only operate between 2400 – 2483.5 MHz.

The EUT is not a hybrid system and FCC 15.247 (f) does not apply to it. However the 15.247 (d) requirement of power density were met and are detailed later in this test report.

For maximum permissible exposure, this device operates at less than 1 Watt at 2400 – 2483.5 MHz and is designed to operate greater than 20 cm from personnel during normal operation. No testing is required, however worst case calculated exposure compliance follows later in this report. See RF exposure exhibits for details.

Power line conducted emissions were not applicable as the EUT is a modular transmitter, DC powered, does not connect directly to the public low voltage supply, and relies on its host for supply.

The EUT have two power settings PA5 and PA2. PA5 have higher output power than PA2. Channels 0 to 4 and 66 to 78 were set to PA2 and Channels 5 to 65 were set to PA5. Low band edge measurements were performed on Channels 0 and 5; high band edge were performed for Channels 65 and 78. All other measurements were performed at PA5.

### **Sample Calculation(s)**

#### **Radiated Emission Test**

Margin = Limit – (Received Signal + Antenna Factor + Cable Loss – Pre-Amp Gain)

Margin = 50.5dB $\mu$ V/m – (50dB $\mu$ V + 10dB + 2.5dB – 20dB)

Margin = 8.0 dB (pass)

|             |                                                         |                                                                                     |
|-------------|---------------------------------------------------------|-------------------------------------------------------------------------------------|
| Client      | <b>Artaflex</b>                                         |  |
| Product     | <b>AWA24R</b>                                           |                                                                                     |
| Standard(s) | RSS 247 Issue 1:2015<br>FCC Part 15 Subpart 15.247:2016 |                                                                                     |

## Applicable Standards, Specifications and Methods

|                              |                                                                                                                                       |
|------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|
| ANSI C63.4:2014              | Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz  |
| ANSI C63.10:2013             | American National Standard For Testing Unlicensed Wireless Devices                                                                    |
| CFR 47 FCC 15 Subpart C:2016 | Code of Federal Regulations – Radio Frequency Devices, Intentional Radiators                                                          |
| CISPR 22:2008                | Information Technology Equipment - Radio Disturbance Characteristics - Limits and Methods of Measurement                              |
| FCC KDB 558074: 2016         | FCC KDB 558074 Digital Transmission Systems, measurements and procedures                                                              |
| ICES-003 Issue 6 2016        | Digital Apparatus - Spectrum Management and Telecommunications Policy Interference-Causing Equipment Standard                         |
| RSS-GEN Issue 4 2014         | General Requirements and Information for the Certification of Radio Apparatus                                                         |
| RSS-247 Issue 1:2015         | Issue 1: Digital Transmission Systems (DTSS), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices |
| ISO 17025:2005               | General Requirements for the Competence of Testing and Calibration Laboratories                                                       |

|             |                                                         |                                                                                     |
|-------------|---------------------------------------------------------|-------------------------------------------------------------------------------------|
| Client      | <b>Artaflex</b>                                         |  |
| Product     | <b>AWA24R</b>                                           |                                                                                     |
| Standard(s) | RSS 247 Issue 1:2015<br>FCC Part 15 Subpart 15.247:2016 |                                                                                     |

## Document Revision Status

Revision 0 - October 21, 2016  
Initial Release

Revision 1 - November 2, 2016  
Deleted high pass filter in equipment list on Page 27. Testing was performed without the high pass filter.

|             |                                                         |                                                                                     |
|-------------|---------------------------------------------------------|-------------------------------------------------------------------------------------|
| Client      | <b>Artaflex</b>                                         |  |
| Product     | <b>AWA24R</b>                                           |                                                                                     |
| Standard(s) | RSS 247 Issue 1:2015<br>FCC Part 15 Subpart 15.247:2016 |                                                                                     |

## Definitions and Acronyms

The following definitions and acronyms are applicable in this report.  
See also ANSI C63.14.

**AE** – Auxiliary Equipment. A digital accessory that feeds data into or receives data from another device (host) that in turn, controls its operation.

**BW** – Bandwidth. Unless otherwise stated, this refers to the 6 dB bandwidth.

**EMC** – Electro-Magnetic Compatibility. The ability of an equipment or system to function satisfactorily in its electromagnetic environment without introducing intolerable electromagnetic disturbances to anything in that environment.

**EMI** – Electro-Magnetic Immunity. The ability to maintain a specified performance when the equipment is subjected to disturbance (unwanted) signals of specified levels.

**EUT** – Equipment Under Test. A device or system being evaluated for compliance that is representative of a product to be marketed.

**ITE** – Information Technology Equipment with a primary function(s) of entry, storage, display, retrieval, transmission, processing, switching, or control, of data.

**LISN** – Line Impedance Stabilization Network

**NCR** – No Calibration Required

**RF** – Radio Frequency

|             |                                                         |                                                                                     |
|-------------|---------------------------------------------------------|-------------------------------------------------------------------------------------|
| Client      | Artaflex                                                |  |
| Product     | AWA24R                                                  |                                                                                     |
| Standard(s) | RSS 247 Issue 1:2015<br>FCC Part 15 Subpart 15.247:2016 |                                                                                     |

## Testing Facility

Testing for EMC on the EUT was carried out at TÜV SÜD Canada labs near Toronto, Ontario. The testing lab consists of a 3m semi-anechoic chamber calibrated to be able to allow measurements on an EUT that has a maximum width or length of up to 2m and a height of up to 3m. The chamber is equipped with a turntable that is capable of testing devices up to 3300lb in weight. This facility is capable of testing products that are rated for 120Vac and 240Vac single phase, or devices that are rated for a 208Vac 3 phase input. DC capability is also available for testing. The chamber is equipped with a mast that controls the polarization and height of the antenna. Control of the mast occurs in the control room adjoining the shielded chamber. Radiated emission measurements are performed using a BiLog antenna and a Horn antenna where applicable. Conducted emissions, unless otherwise stated, are performed using a LISN and using the Vertical Ground plane if applicable.

### Calibrations and Accreditations

The 3m semi-anechoic chamber is registered with Federal Communications Commission (FCC, CA6844), Industry Canada (IC, 6844A-3) and Voluntary Control Council for Interference (VCCI, R-4023, G-506, C-4498, and T-1246). This chamber was calibrated for Normalized Site Attenuation (NSA) using test procedures outlined in ANSI C63.4 "Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz". The chamber is lined with ferrite tiles and absorption cones to minimize any undesired reflections. The NSA data is kept on file at TÜV SÜD Canada. For radiated susceptibility testing, a 16 point field calibration has been performed on the chamber. The field uniformity data is kept on file at TÜV SÜD Canada. TÜV SÜD Canada Inc is accredited to ISO 17025 by A2LA with Testing Certificate #2555.01. The laboratory's current scope of accreditation listing can be found as listed on the A2LA website. All measuring equipment is calibrated on an annual or bi-annual basis as listed for each respective test.

|             |                                                         |                                                                                     |
|-------------|---------------------------------------------------------|-------------------------------------------------------------------------------------|
| Client      | <b>Artaflex</b>                                         |  |
| Product     | <b>AWA24R</b>                                           |                                                                                     |
| Standard(s) | RSS 247 Issue 1:2015<br>FCC Part 15 Subpart 15.247:2016 |                                                                                     |

### ***Testing Environmental Conditions and Dates***

Following environmental conditions were recorded in the facility during time of testing

| <b>Date</b> | <b>Test</b>                 | <b>Initials</b> | <b>Temperature (°C)</b> | <b>Humidity (%)</b> | <b>Pressure (kPa)</b> |
|-------------|-----------------------------|-----------------|-------------------------|---------------------|-----------------------|
| 2016/7/28   | Radiated Emissions          | MX              | 20 – 24                 | 40 – 51             | 98.0 – 102.0          |
| 2016/7/29   | Antenna Conducted Emissions | MX              | 20 – 24                 | 40 – 51             | 98.0 – 102.0          |

|             |                                                         |                                                                                     |
|-------------|---------------------------------------------------------|-------------------------------------------------------------------------------------|
| Client      | <b>Artaflex</b>                                         |  |
| Product     | <b>AWA24R</b>                                           |                                                                                     |
| Standard(s) | RSS 247 Issue 1:2015<br>FCC Part 15 Subpart 15.247:2016 |                                                                                     |

## Detailed Test Results Section

|             |                                                         |                                                                                     |
|-------------|---------------------------------------------------------|-------------------------------------------------------------------------------------|
| Client      | Artaflex                                                |  |
| Product     | AWA24R                                                  |                                                                                     |
| Standard(s) | RSS 247 Issue 1:2015<br>FCC Part 15 Subpart 15.247:2016 |                                                                                     |

## 6dB Bandwidth of Digitally Modulated Systems – 15.247

### Purpose

The purpose of this test is to ensure that the bandwidth occupied exceeds a stated minimum. This helps ensure the utilization of the frequency allocation is sufficiently wide. This also helps prevent corruption of data by ensuring adequate data separation to distinguish the reception of the intended information.

### Limits and Methods

The Limit is as specified in FCC Part 15 and RSS 247.

Systems using digital modulation techniques may operate in the 902 - 928 MHz, 2400 - 2483.5 MHz and 5725 - 5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz. This should be measured with a 100 kHz RBW and a 300 kHz VBW.

The method is given in ANSI C63.10 Clause 11.8 DTS bandwidth and Section 6.9.3 Occupied bandwidth test.

### Results

The EUT passed. The minimum measured 6 dB BW was of all modulations were greater than 500 kHz.

Additionally, the 99% bandwidth were measured for information purpose. There is no requirement on 99% bandwidth.

Three channels were measured. The following tables show the 6 dB and 99% bandwidth:

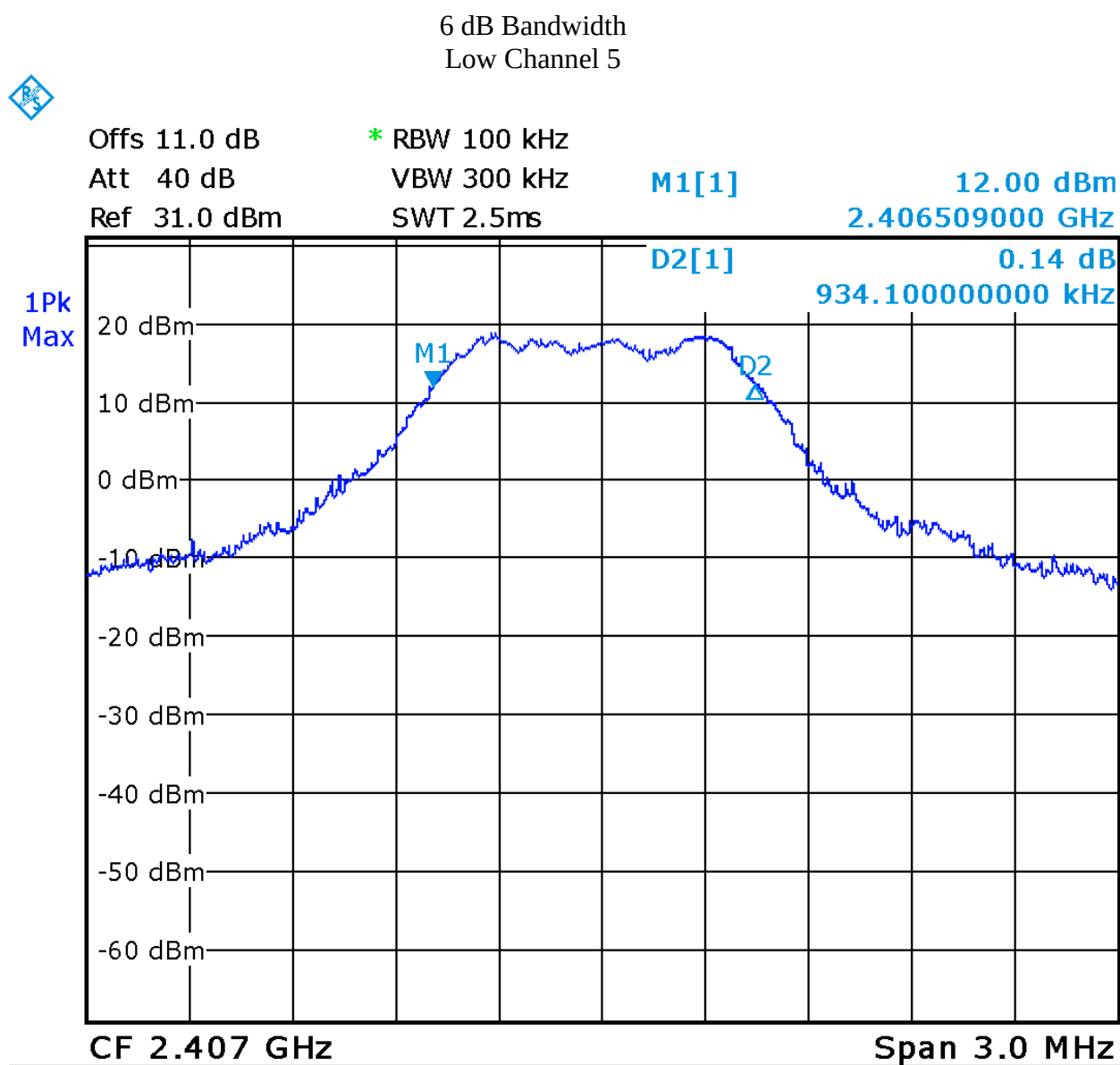
| Bandwidth |                 |                      |                     |
|-----------|-----------------|----------------------|---------------------|
| Channel   | Frequency (MHz) | 6 dB Bandwidth (kHz) | 99% Bandwidth (MHz) |
| 5         | 2407            | 934.10               | 1.14                |
| 39        | 2441            | 928.10               | 1.17                |
| 65        | 2467            | 926.10               | 1.17                |

### Graph(s)

The graphs shown below show the DTS BW and OBW during the operation of the device. This measurement is a peak measurement. Max hold is performed for a duration of not less than 1 minute.

|             |                                                         |                                                                                     |
|-------------|---------------------------------------------------------|-------------------------------------------------------------------------------------|
| Client      | Artaflex                                                |  |
| Product     | AWA24R                                                  |                                                                                     |
| Standard(s) | RSS 247 Issue 1:2015<br>FCC Part 15 Subpart 15.247:2016 |                                                                                     |

External attenuator and cable loss were accounted for as reference offset in the spectrum analyzer.



Date: 29.JUL.2016 14:56:35

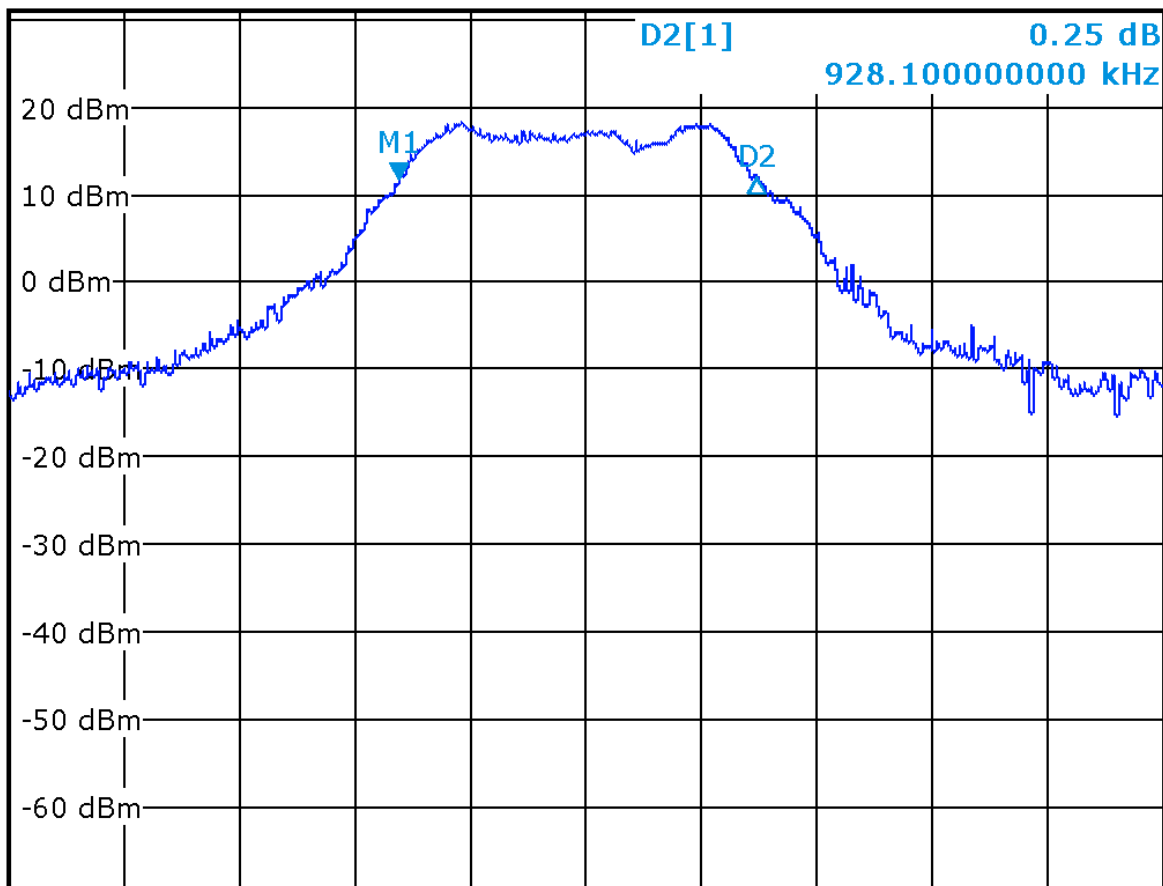
|             |                                                         |                                                                                     |
|-------------|---------------------------------------------------------|-------------------------------------------------------------------------------------|
| Client      | Artaflex                                                |  |
| Product     | AWA24R                                                  |                                                                                     |
| Standard(s) | RSS 247 Issue 1:2015<br>FCC Part 15 Subpart 15.247:2016 |                                                                                     |

6 dB Bandwidth  
Mid Channel 39



Offs 11.0 dB      \* RBW 100 kHz  
 Att 40 dB      VBW 300 kHz      M1[1]      11.65 dBm  
 Ref 31.0 dBm      SWT 2.5ms      2.440515000 GHz

1Pk  
Max



CF 2.441 GHz

Span 3.0 MHz

Date: 29.JUL.2016 13:20:53

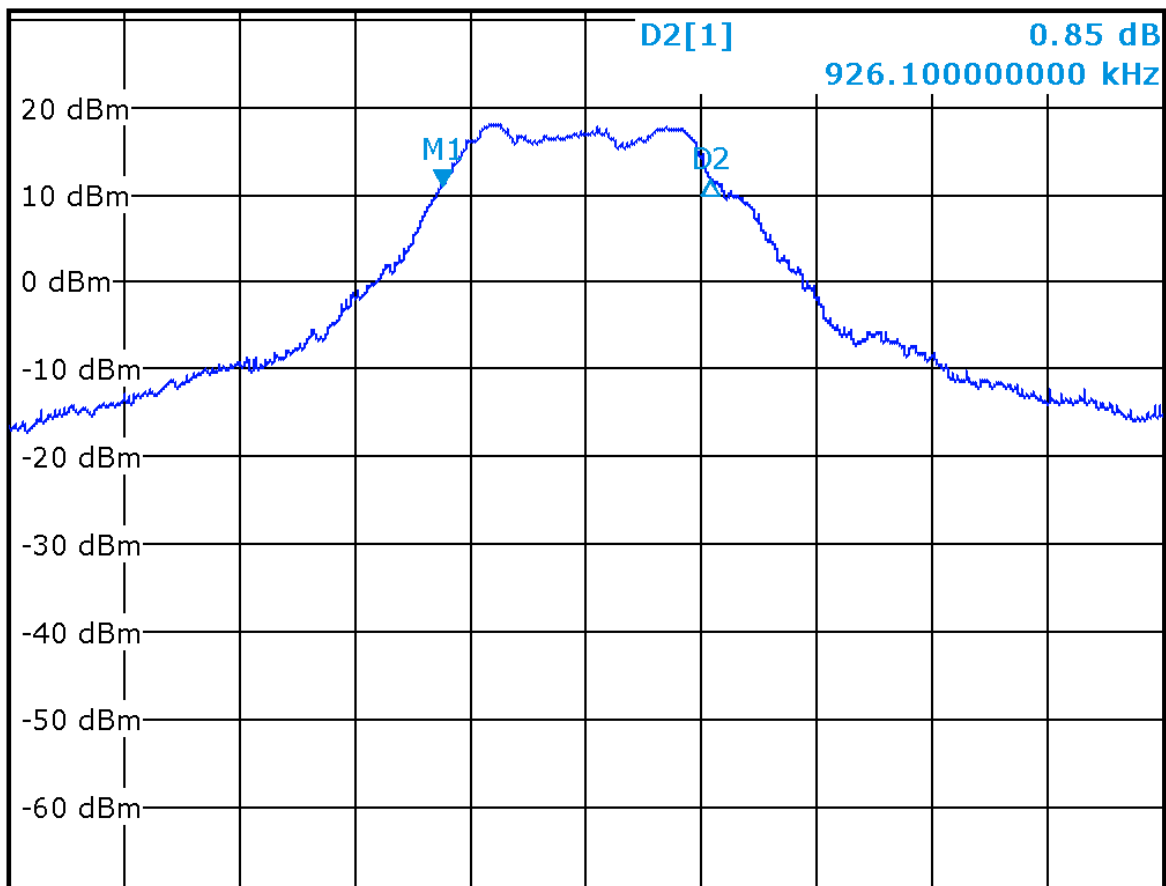
|             |                                                         |                                                                                     |
|-------------|---------------------------------------------------------|-------------------------------------------------------------------------------------|
| Client      | Artaflex                                                |  |
| Product     | AWA24R                                                  |                                                                                     |
| Standard(s) | RSS 247 Issue 1:2015<br>FCC Part 15 Subpart 15.247:2016 |                                                                                     |

6 dB Bandwidth  
High Channel 65



Offs 11.0 dB      \* RBW 100 kHz  
 Att 40 dB      VBW 300 kHz      M1[1]      10.91 dBm  
 Ref 31.0 dBm      SWT 2.5ms      2.466505000 GHz

1Pk  
Max



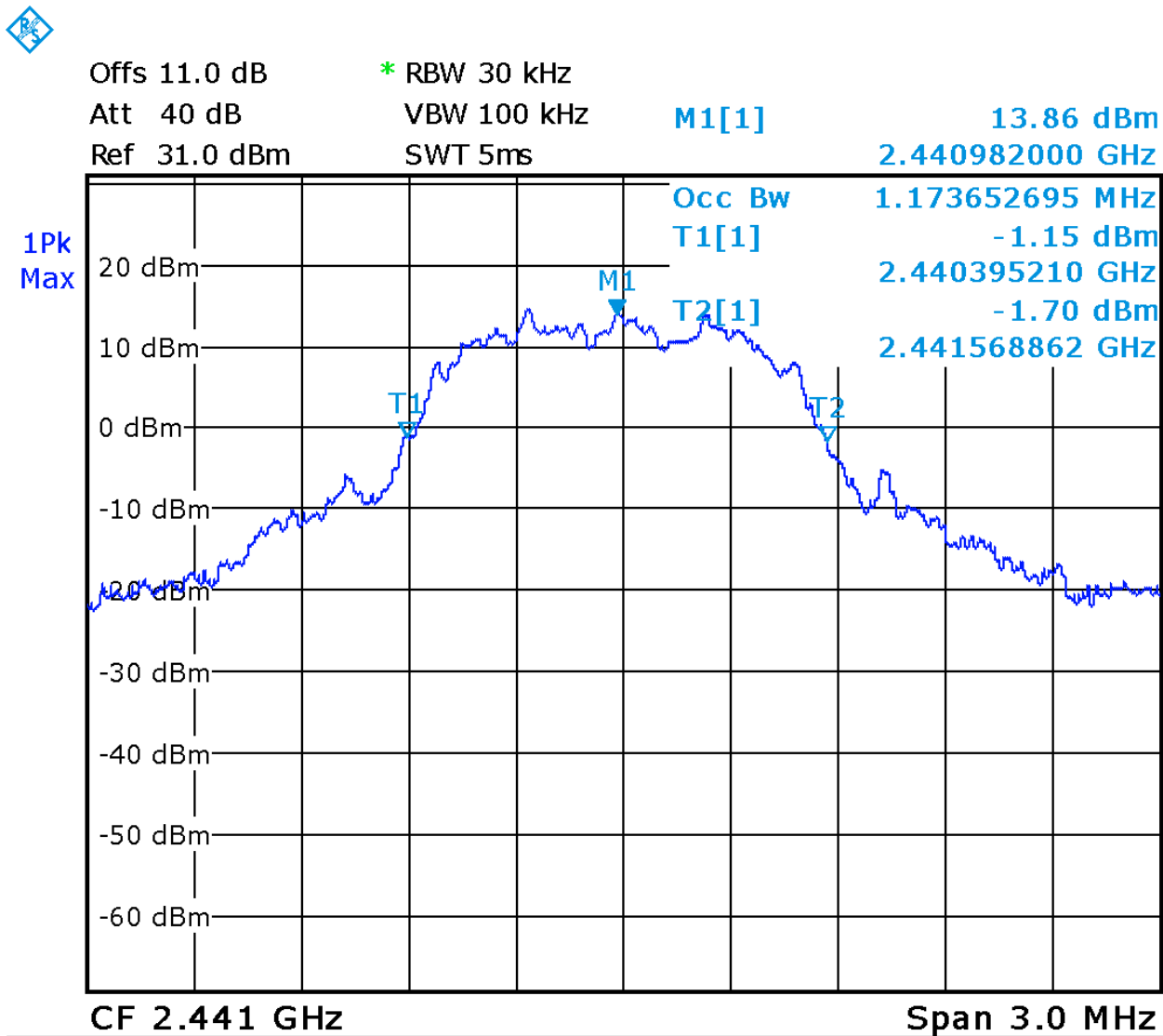
CF 2.467 GHz

Span 4.0 MHz

Date: 29.JUL.2016 16:09:05

|             |                                                         |                                                                                               |
|-------------|---------------------------------------------------------|-----------------------------------------------------------------------------------------------|
| Client      | Artaflex                                                | <br>Canada |
| Product     | AWA24R                                                  |                                                                                               |
| Standard(s) | RSS 247 Issue 1:2015<br>FCC Part 15 Subpart 15.247:2016 |                                                                                               |

99% BW – Mid Channel 39



Date: 29.JUL.2016 13:34:19

Note: See 'Appendix B – EUT & Test Setup Photographs' for photos showing the test set-up.

|             |                                                         |                                                                                     |
|-------------|---------------------------------------------------------|-------------------------------------------------------------------------------------|
| Client      | <b>Artaflex</b>                                         |  |
| Product     | <b>AWA24R</b>                                           |                                                                                     |
| Standard(s) | RSS 247 Issue 1:2015<br>FCC Part 15 Subpart 15.247:2016 |                                                                                     |

## Test Equipment List

| Equipment         | Model No.   | Manufacturer           | Last calibration / Verification date | Next calibration/ Verification due date | Asset #  |
|-------------------|-------------|------------------------|--------------------------------------|-----------------------------------------|----------|
| Spectrum Analyzer | ESL6        | Rohde & Schwarz        | Nov 25, 2015                         | Nov 25, 2017                            | GEMC 160 |
| 10 dB attenuator  | 605-10-1F18 | Meca Electronics, Inc. | Jun 3, 2016                          | Jun 3, 2017                             | GEMC 225 |

This report module is based on GEMC template "FCC – Power Line Conducted Emissions Class B\_Rev1"

|             |                                                         |                                                                                     |
|-------------|---------------------------------------------------------|-------------------------------------------------------------------------------------|
| Client      | Artaflex                                                |  |
| Product     | AWA24R                                                  |                                                                                     |
| Standard(s) | RSS 247 Issue 1:2015<br>FCC Part 15 Subpart 15.247:2016 |                                                                                     |

## Maximum Peak Envelope Conducted Power - DM

### Purpose

The purpose of this test is to ensure that the maximum power conducted to the radiating element does not exceed the limits specified. This ensures that if the end-user replaces the antenna, that the maximum power does not exceed an amount which may create an excessive power level.

### Limits and Methods

The limits are defined in FCC Part 15.247(b) and RSS 247.

For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands, the peak limit is 1 watt.

The method is given in ANSI C63.10 Clause 11.9.1.1  $RBW \geq DTS$  bandwidth method.

### Results

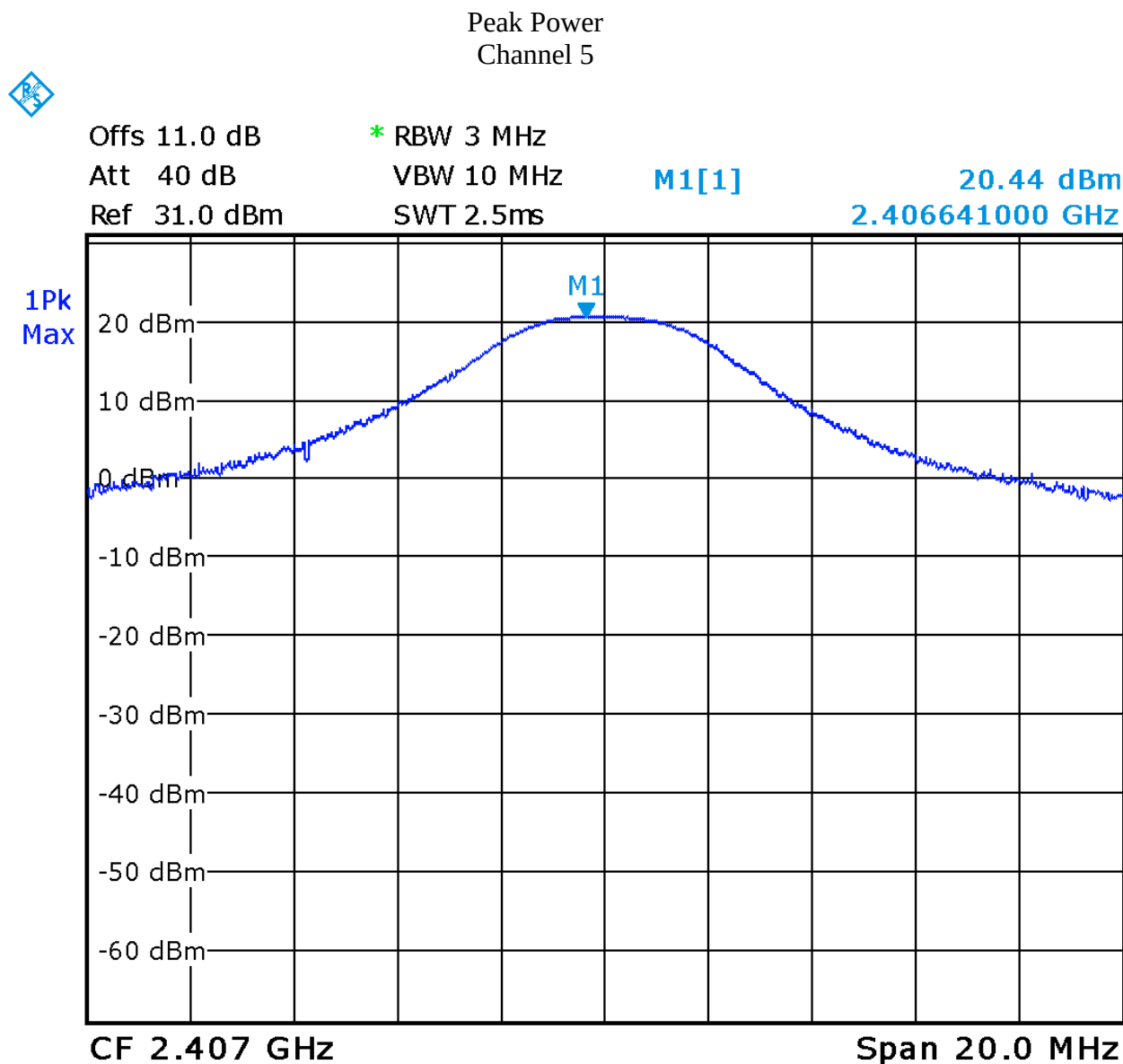
The EUT passed. The peak power of the EUT was set to transmit at maximum power. Three Channels were measured. The external attenuator and cable loss are accounted for as reference offset in the spectrum analyzer. The following table show the peak power:

| Peak Power |                 |                  |                 |
|------------|-----------------|------------------|-----------------|
| Channel    | Frequency (MHz) | Peak Power (dBm) | Peak Power (mW) |
| 5          | 2407            | 20.44            | 110.66          |
| 39         | 2441            | 20.17            | 103.99          |
| 65         | 2467            | 19.84            | 96.38           |

|             |                                                         |                                                                                     |
|-------------|---------------------------------------------------------|-------------------------------------------------------------------------------------|
| Client      | Artaflex                                                |  |
| Product     | AWA24R                                                  |                                                                                     |
| Standard(s) | RSS 247 Issue 1:2015<br>FCC Part 15 Subpart 15.247:2016 |                                                                                     |

## Readings

The plots shown below shows the peak power output of the device during the antenna conducted measurement during transmit operation of the EUT. The measurement RBW is  $\geq$  than the DTS bandwidth.



Date: 29.JUL.2016 15:33:37

|             |                                                         |                                                                                     |
|-------------|---------------------------------------------------------|-------------------------------------------------------------------------------------|
| Client      | Artaflex                                                |  |
| Product     | AWA24R                                                  |                                                                                     |
| Standard(s) | RSS 247 Issue 1:2015<br>FCC Part 15 Subpart 15.247:2016 |                                                                                     |

Peak Power  
Channel 39



Offs 11.0 dB

\* RBW 3 MHz

Att 40 dB

VBW 10 MHz

M1[1]

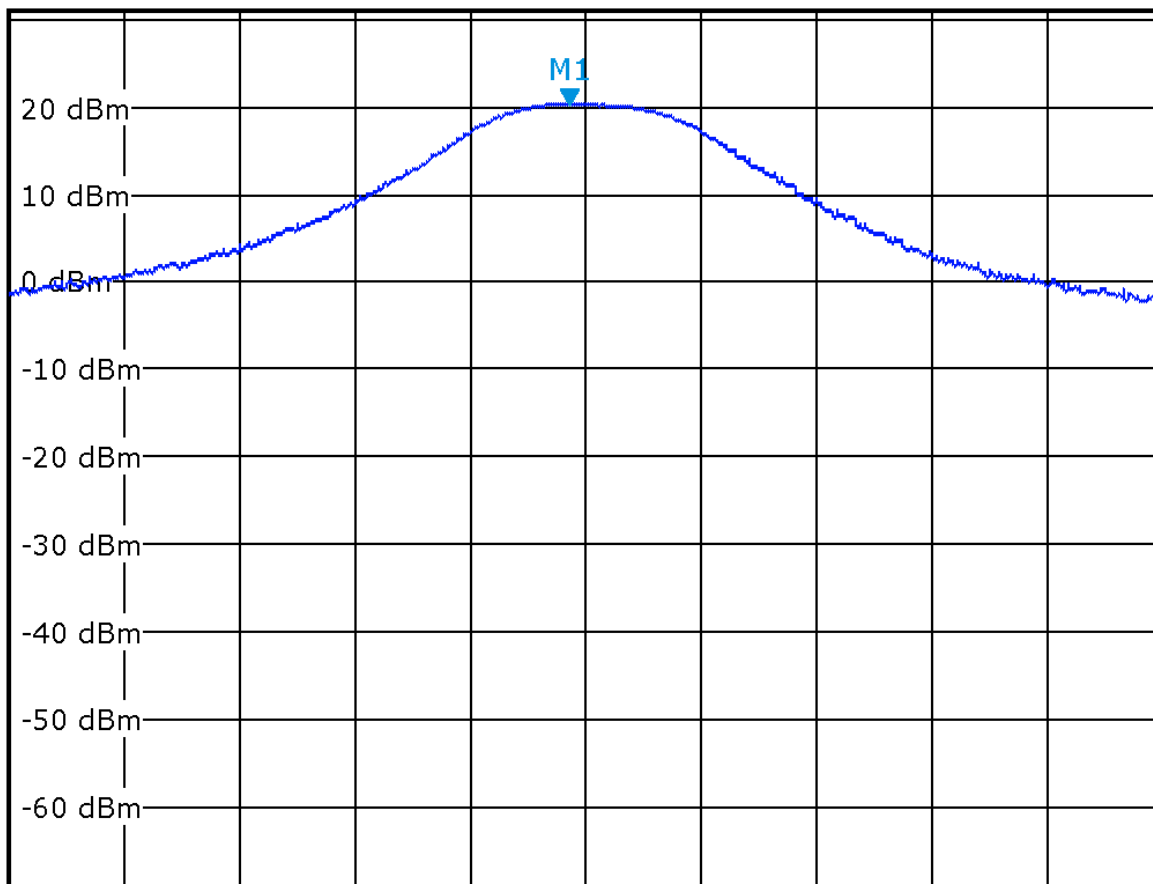
20.17 dBm

Ref 31.0 dBm

SWT 2.5ms

2.440721000 GHz

1Pk  
Max

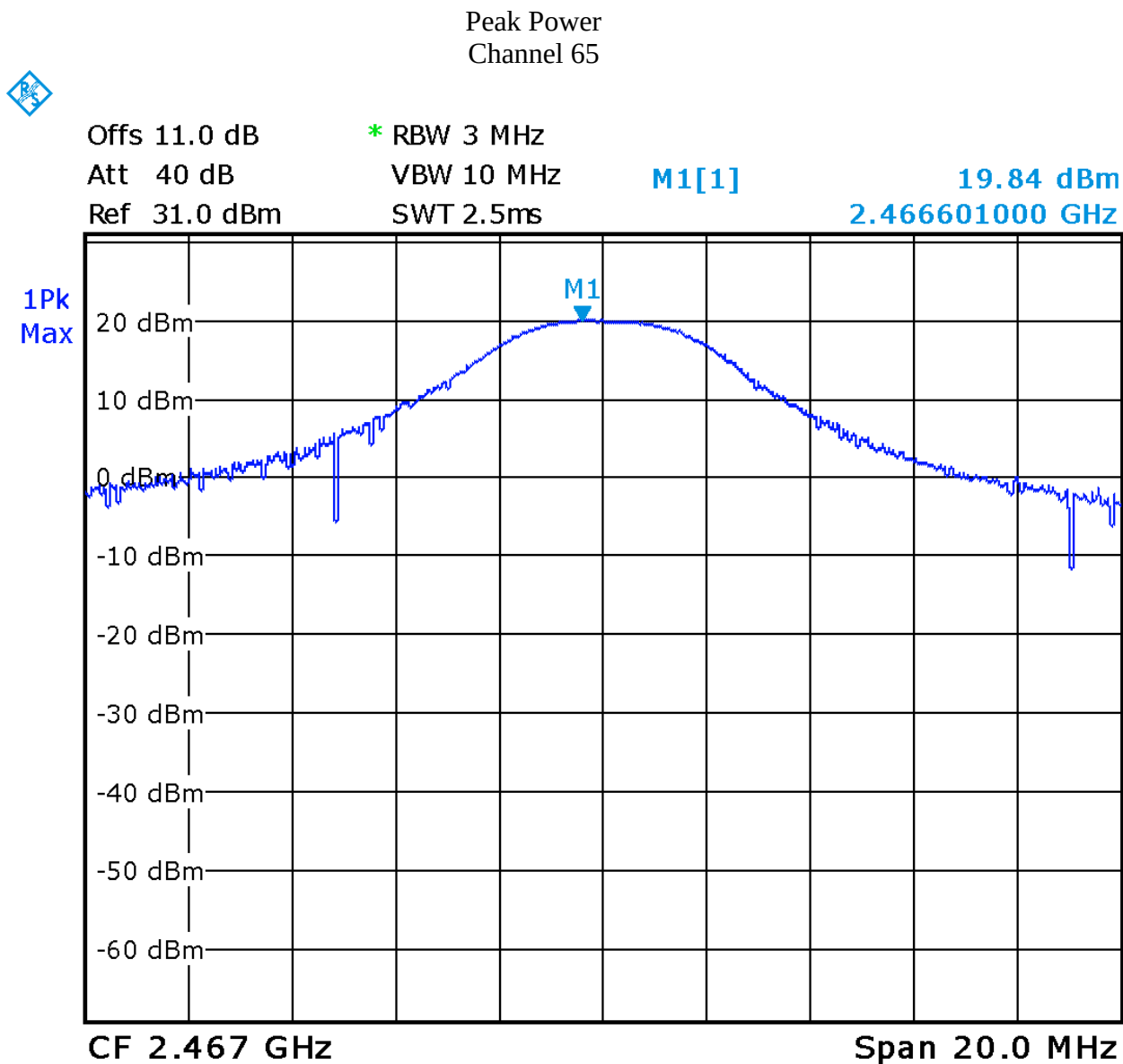


CF 2.441 GHz

Span 20.0 MHz

Date: 29.JUL.2016 14:46:26

|             |                                                         |                                                                                     |
|-------------|---------------------------------------------------------|-------------------------------------------------------------------------------------|
| Client      | Artaflex                                                |  |
| Product     | AWA24R                                                  |                                                                                     |
| Standard(s) | RSS 247 Issue 1:2015<br>FCC Part 15 Subpart 15.247:2016 |                                                                                     |



Date: 29.JUL.2016 16:32:38

Note: See 'Appendix B – EUT & Test Setup Photographs' for photos showing the test set-up.

|             |                                                         |                                                                                     |
|-------------|---------------------------------------------------------|-------------------------------------------------------------------------------------|
| Client      | <b>Artaflex</b>                                         |  |
| Product     | <b>AWA24R</b>                                           |                                                                                     |
| Standard(s) | RSS 247 Issue 1:2015<br>FCC Part 15 Subpart 15.247:2016 |                                                                                     |

## Test Equipment List

| Equipment         | Model No.   | Manufacturer           | Last calibration / Verification date | Next calibration/ Verification due date | Asset #  |
|-------------------|-------------|------------------------|--------------------------------------|-----------------------------------------|----------|
| Spectrum Analyzer | ESL6        | Rohde & Schwarz        | Nov 25, 2015                         | Nov 25, 2017                            | GEMC 160 |
| 10 dB attenuator  | 605-10-1F18 | Meca Electronics, Inc. | Jun 3, 2016                          | Jun 3, 2017                             | GEMC 225 |

This report module is based on GEMC template "FCC – Power Line Conducted Emissions Class B\_ Rev1"

|             |                                                         |                                                                                     |
|-------------|---------------------------------------------------------|-------------------------------------------------------------------------------------|
| Client      | Artaflex                                                |  |
| Product     | AWA24R                                                  |                                                                                     |
| Standard(s) | RSS 247 Issue 1:2015<br>FCC Part 15 Subpart 15.247:2016 |                                                                                     |

## *Antenna Spurious Conducted Emissions (-20 dBc Requirement) – 15.247*

### **Purpose**

The purpose of this test is to ensure that the maximum power conducted to the radiating element at frequencies outside of the authorized spectrum does not exceed the limits specified. This ensures that the only the intended signal is delivered to the radiating element.

### **Limits and Methods**

The limits are defined in 15.247(d) and RSS 247.

In any 100 kHz band, the peak spurious harmonics emissions must be at least 20 dB below the fundamental. Spurious Conducted emissions are to be evaluated up to the 10<sup>th</sup> harmonic. This -20 dBc requirement also applies at the 'band edge' or 2.4 GHz and 2.4835 GHz.

The method is given in ANSI C63.10 Section 11.11 Emission in non-restricted frequency bands.

### **Results**

The EUT passed the limits.

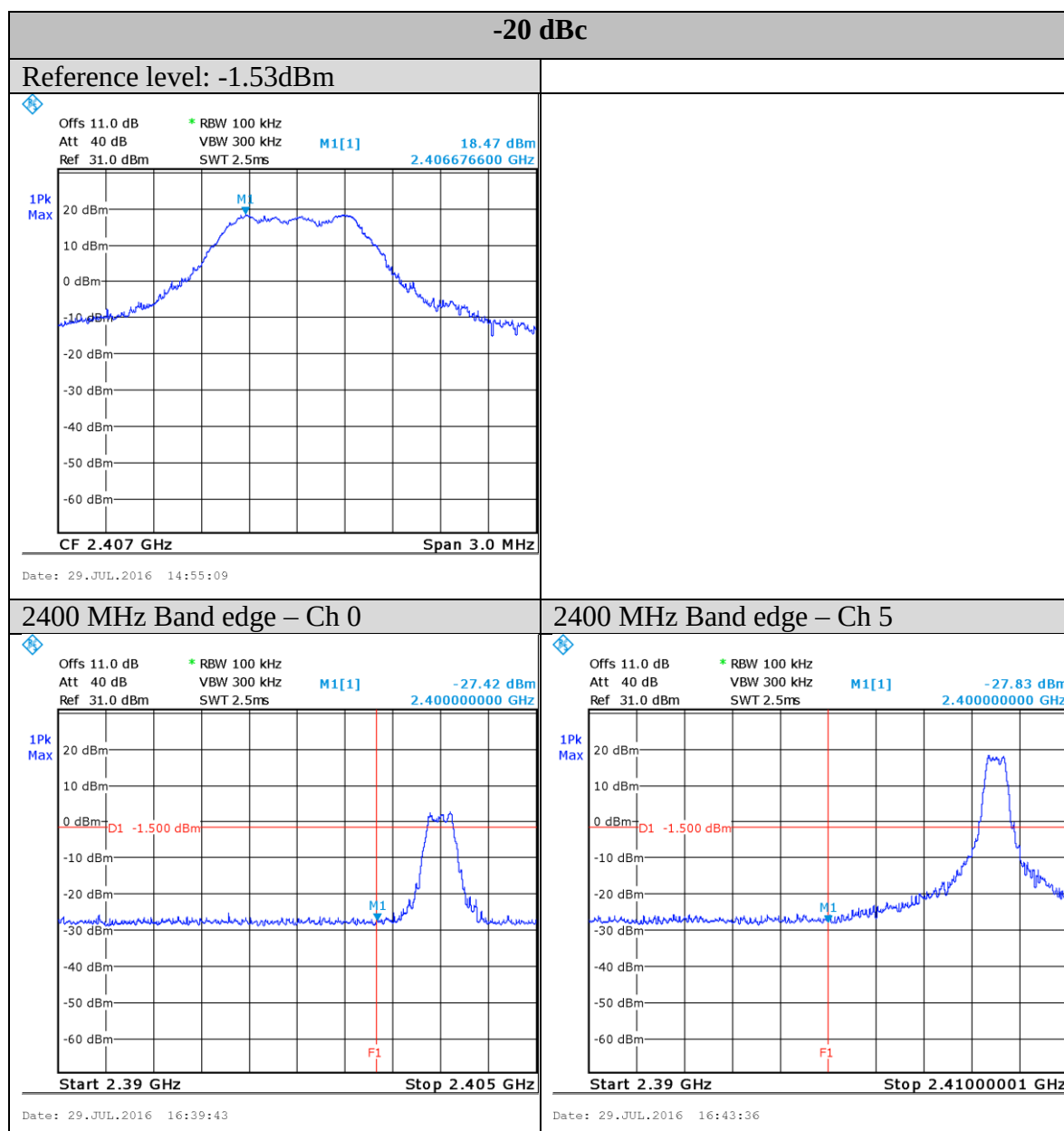
The EUT have two power settings PA5 and PA2. PA5 have higher output power than PA2. Channels 0 to 4 and 66 to 78 were set to PA2 and Channels 5 to 65 were set to PA5. Low band edge measurements were performed on Channels 0 and 5; high band edge were performed for Channels 65 and 78.

The worst case was presented as a graph for the spectrum. The -20 dBc requirement is shown for the lower band edge at 2.4 GHz in the low band. The -20 dBc requirement is also shown for the higher band edge at 2.4835 GHz in the high band.

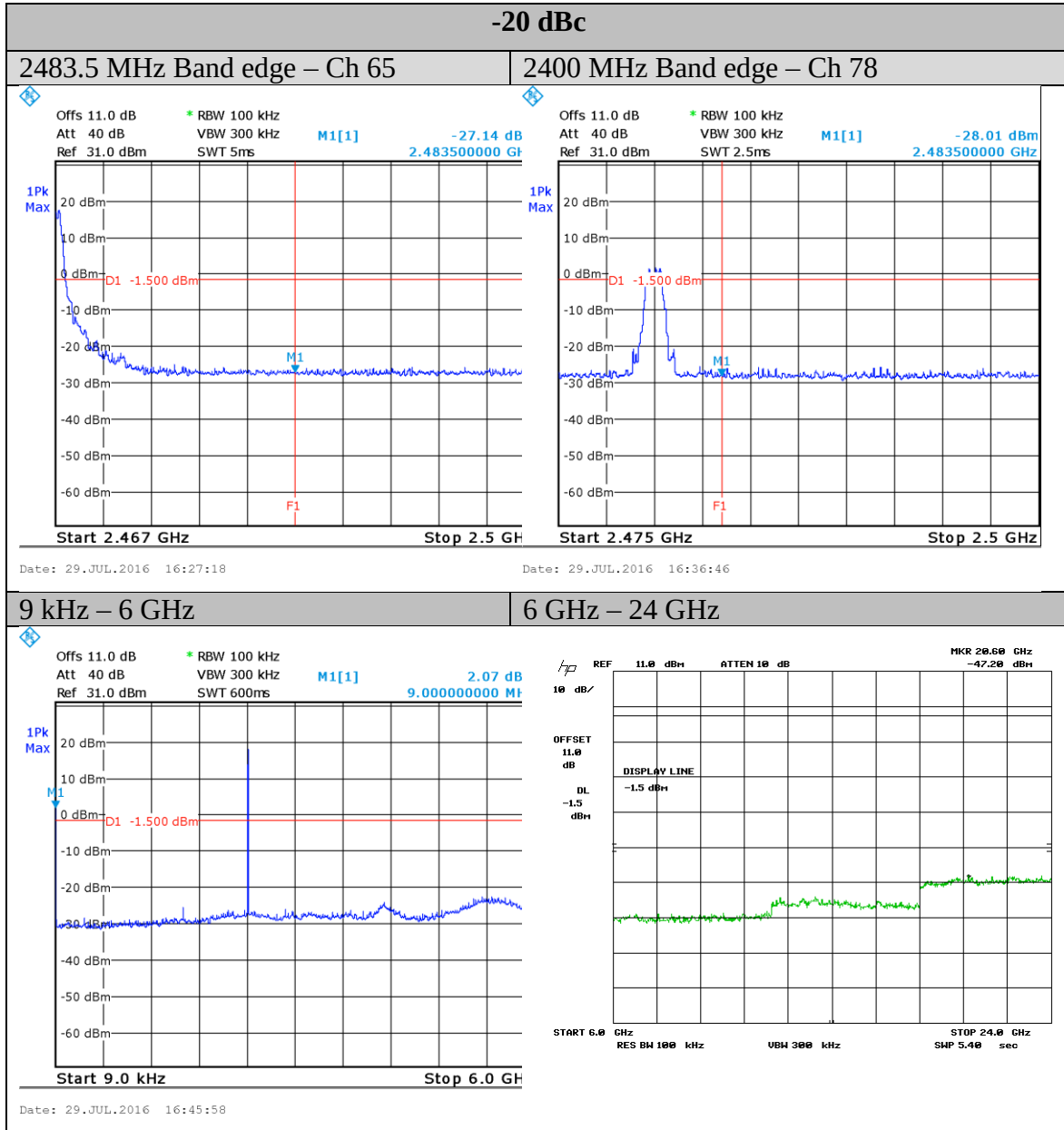
|             |                                                         |                                                                                     |
|-------------|---------------------------------------------------------|-------------------------------------------------------------------------------------|
| Client      | Artaflex                                                |  |
| Product     | AWA24R                                                  |                                                                                     |
| Standard(s) | RSS 247 Issue 1:2015<br>FCC Part 15 Subpart 15.247:2016 |                                                                                     |

## Graph(s)

The graphs shown below shows the peak power output of the device during the antenna conducted measurement during transmit operation of the EUT.



|             |                                                         |                                                                                               |
|-------------|---------------------------------------------------------|-----------------------------------------------------------------------------------------------|
| Client      | Artaflex                                                | <br>Canada |
| Product     | AWA24R                                                  |                                                                                               |
| Standard(s) | RSS 247 Issue 1:2015<br>FCC Part 15 Subpart 15.247:2016 |                                                                                               |



Note: See 'Appendix B – EUT & Test Setup Photographs' for photos showing the test set-up.

|             |                                                         |                                                                                     |
|-------------|---------------------------------------------------------|-------------------------------------------------------------------------------------|
| Client      | <b>Artaflex</b>                                         |  |
| Product     | <b>AWA24R</b>                                           |                                                                                     |
| Standard(s) | RSS 247 Issue 1:2015<br>FCC Part 15 Subpart 15.247:2016 |                                                                                     |

## Test Equipment List

| Equipment          | Model No.   | Manufacturer           | Last calibration / Verification date | Next calibration/ Verification due date | Asset #  |
|--------------------|-------------|------------------------|--------------------------------------|-----------------------------------------|----------|
| Spectrum Analyzer  | 8566B       | HP                     | Nov 27, 2015                         | Nov 27, 2017                            | GEMC 190 |
| Quasi Peak Adapter | 85650A      | HP                     | Nov 27, 2015                         | Nov 27, 2017                            | GEMC 191 |
| Spectrum Analyzer  | ESL6        | Rohde & Schwarz        | Nov 25, 2015                         | Nov 25, 2017                            | GEMC 160 |
| 10 dB attenuator   | 605-10-1F18 | Meca Electronics, Inc. | Jun 3, 2016                          | Jun 3, 2017                             | GEMC 225 |

This report module is based on GEMC template "FCC – Power Line Conducted Emissions Class B\_Rev1"

|             |                                                         |                                                                                     |
|-------------|---------------------------------------------------------|-------------------------------------------------------------------------------------|
| Client      | Artaflex                                                |  |
| Product     | AWA24R                                                  |                                                                                     |
| Standard(s) | RSS 247 Issue 1:2015<br>FCC Part 15 Subpart 15.247:2016 |                                                                                     |

## ***Radiated Emissions – 15.247***

### **Purpose**

The purpose of this test is to ensure that the RF energy unintentionally emitted from the EUT does not exceed the limits listed below as defined in the applicable test standard, as measured from a receiving antenna. This helps protect broadcast radio services such as television, FM radio, pagers, cellular telephones, emergency services, and so on, from unwanted interference.

### **Limit and Method**

The method is given in ANSI C 63.10

The limits are as defined in FCC Part 15, Section 15.209 and RSS GEN:

The limits, as defined in 15.247(d) for unintentional radiated emissions apply for those emissions that fall in the restricted bands, as defined in Section 15.205(a). These emissions must comply with the radiated emission limits specified in Section 15.209(a).

All unintentional emissions must also meet the ‘Spurious Conducted Emissions’ requirements of -20 dBc or greater. See also ‘Spurious Conducted Emissions’ for further details.

0.009 MHz – 0.490 MHz, 2400/F (kHz) uV/m at 300 m<sup>1</sup>

0.490 MHz – 1.705 MHz, 24000/F (kHz) uV/m at 30 m<sup>1</sup>

1.705 MHz – 30 MHz, 30 uV/m at 30 m<sup>1</sup>

30 MHz – 88 MHz, 100 uV/m (40.0 dBuV/m<sup>1</sup>) at 3 m

88 MHz – 216 MHz, 150 uV/m (43.5 dBuV/m<sup>1</sup>) at 3 m

216 MHz – 960 MHz, 200 uV/m (46.0 dBuV/m<sup>1</sup>) at 3 m

Above 960 MHz, 500 uV/m (54.0 dBuV/m<sup>1</sup>) at 3 m

Above 1000 MHz, 500 uV/m (54 dBuV/m<sup>2</sup>) at 3m

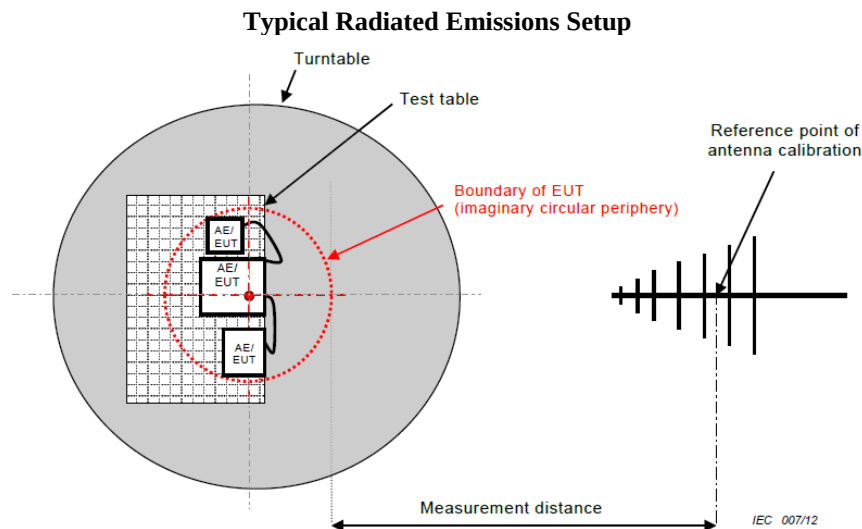
Above 1000 MHz, 500 uV/m (74 dBuV/m<sup>3</sup>) at 3m

<sup>1</sup>Limit is with Quasi Peak detector with bandwidths as defined in CISPR-16-1-1

<sup>2</sup>Limit is with 1 MHz measurement bandwidth and using an Average detector

<sup>3</sup>Limit is with 1 MHz measurement bandwidth and using a Peak detector

|             |                                                         |                                                                                     |
|-------------|---------------------------------------------------------|-------------------------------------------------------------------------------------|
| Client      | Artaflex                                                |  |
| Product     | AWA24R                                                  |                                                                                     |
| Standard(s) | RSS 247 Issue 1:2015<br>FCC Part 15 Subpart 15.247:2016 |                                                                                     |



## Measurement Uncertainty

The expanded measurement uncertainty is calculated in accordance with CISPR 16-4-2 and is  $\pm 4.4$  dB with a 'k=2' coverage factor and a 95% confidence level.

## Preliminary Graphs

Note the graphs shown below are for graphical illustration only. For final measurements with the appropriate detector, please refer to the final measurement table where applicable. The graph shown below is a maximized peak measurement graph, measured with a resolution bandwidth greater than the final required detector and over a full 0-360 rotation. This peaking process is done as a worst case measurement. This process enables the detection of frequencies of concern for final measurement, and provides considerable time savings.

In accordance with FCC Part 15, Subpart A, Section 15.33, the device was scanned to the 10<sup>th</sup> harmonic (a minimum of a 24.835 GHz).

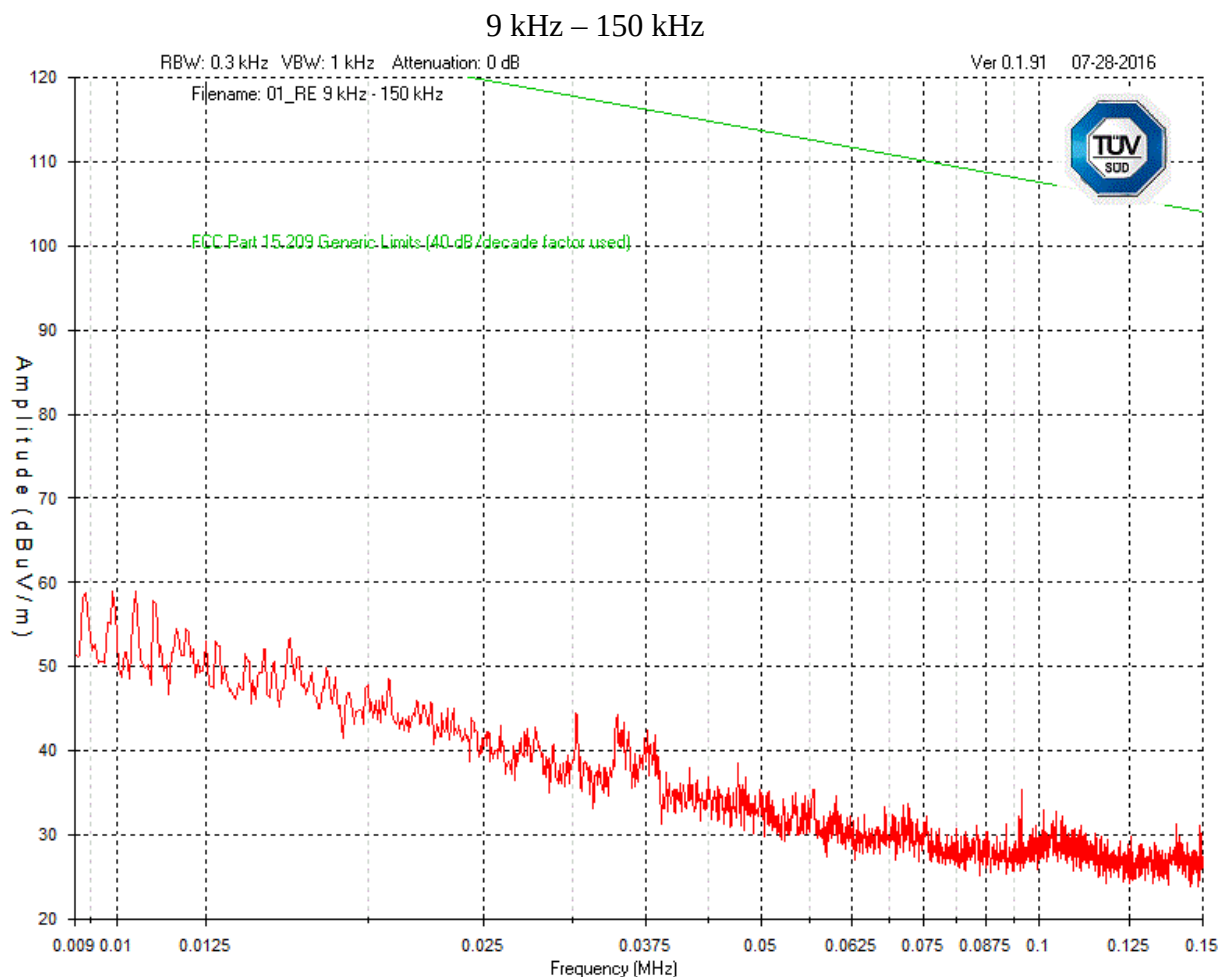
Devices scanned may be scanned at alternate test distances, and in accordance with FCC Part 15, Subpart A, Section 15.31, an extrapolation factor of 20 dB/decade was used above 30 MHz and 40 dB/decade below 30 MHz. For example for 1 meter measurements, an extrapolation factor 9.5 dB from 20 Log (1m / 3m) is applied.

The EUT have two power settings PA5 and PA2. PA5 have higher output power than PA2. Channels 0 to 4 and 66 to 78 were set to PA2 and Channels 5 to 65 were set to PA5. Low

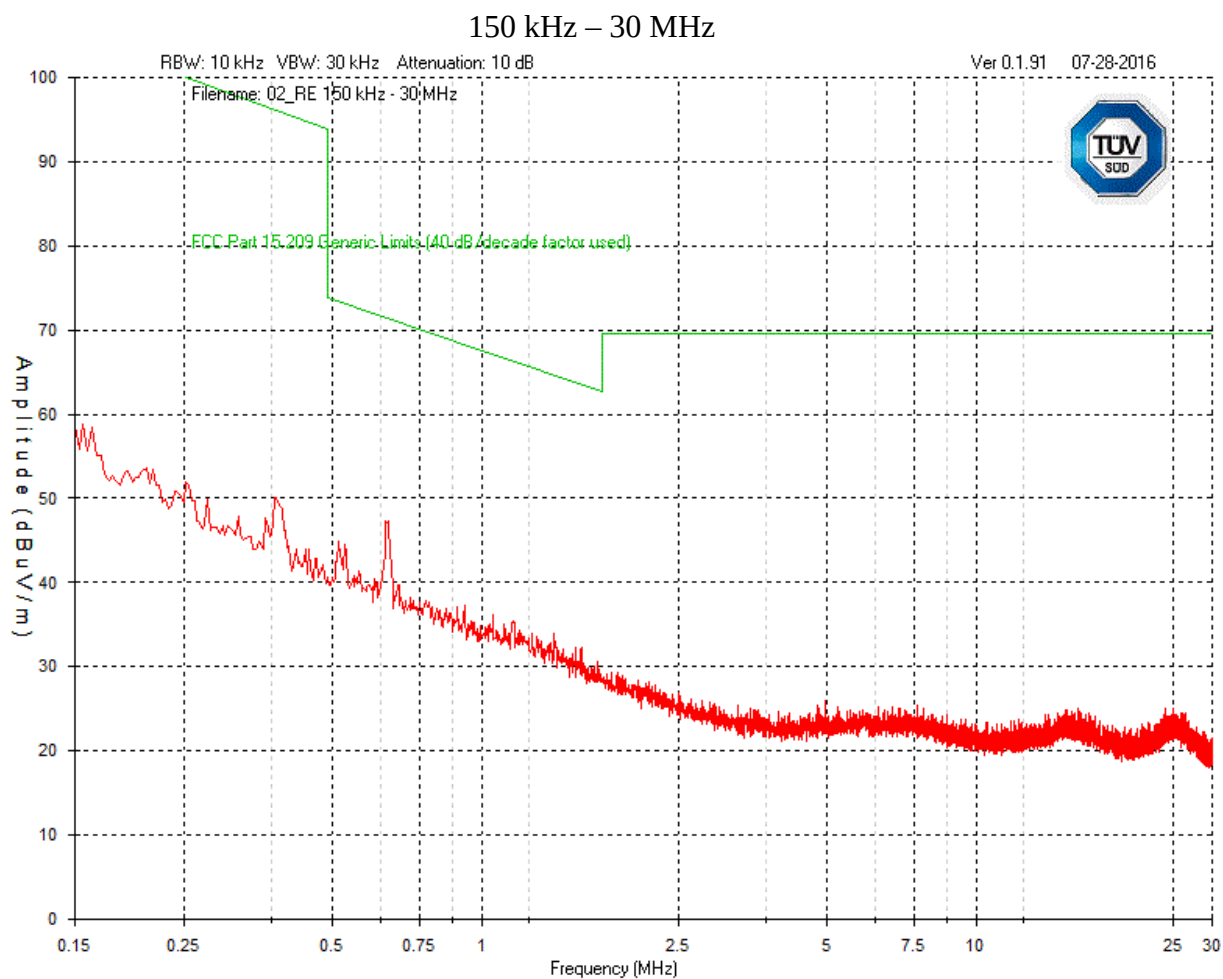
|             |                                                         |                                                                                     |
|-------------|---------------------------------------------------------|-------------------------------------------------------------------------------------|
| Client      | Artaflex                                                |  |
| Product     | AWA24R                                                  |                                                                                     |
| Standard(s) | RSS 247 Issue 1:2015<br>FCC Part 15 Subpart 15.247:2016 |                                                                                     |

band edge measurements were performed on Channels 0 and 5; high band edge were performed for Channels 65 and 78.

Band edge measure graphs were shown for illustrations purpose. See final measurement section for all measurements.

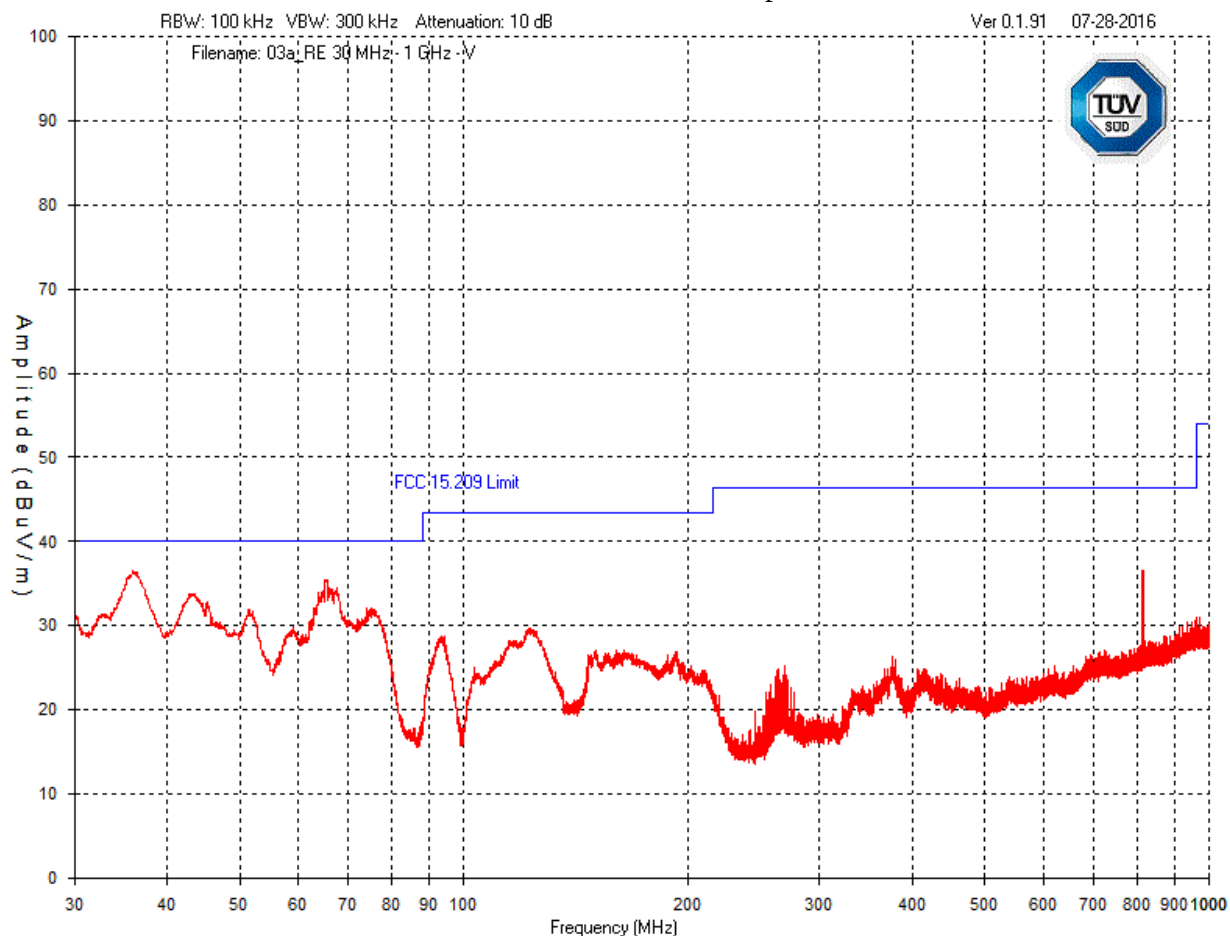


|             |                                                         |                                                                                     |
|-------------|---------------------------------------------------------|-------------------------------------------------------------------------------------|
| Client      | Artaflex                                                |  |
| Product     | AWA24R                                                  |                                                                                     |
| Standard(s) | RSS 247 Issue 1:2015<br>FCC Part 15 Subpart 15.247:2016 |                                                                                     |



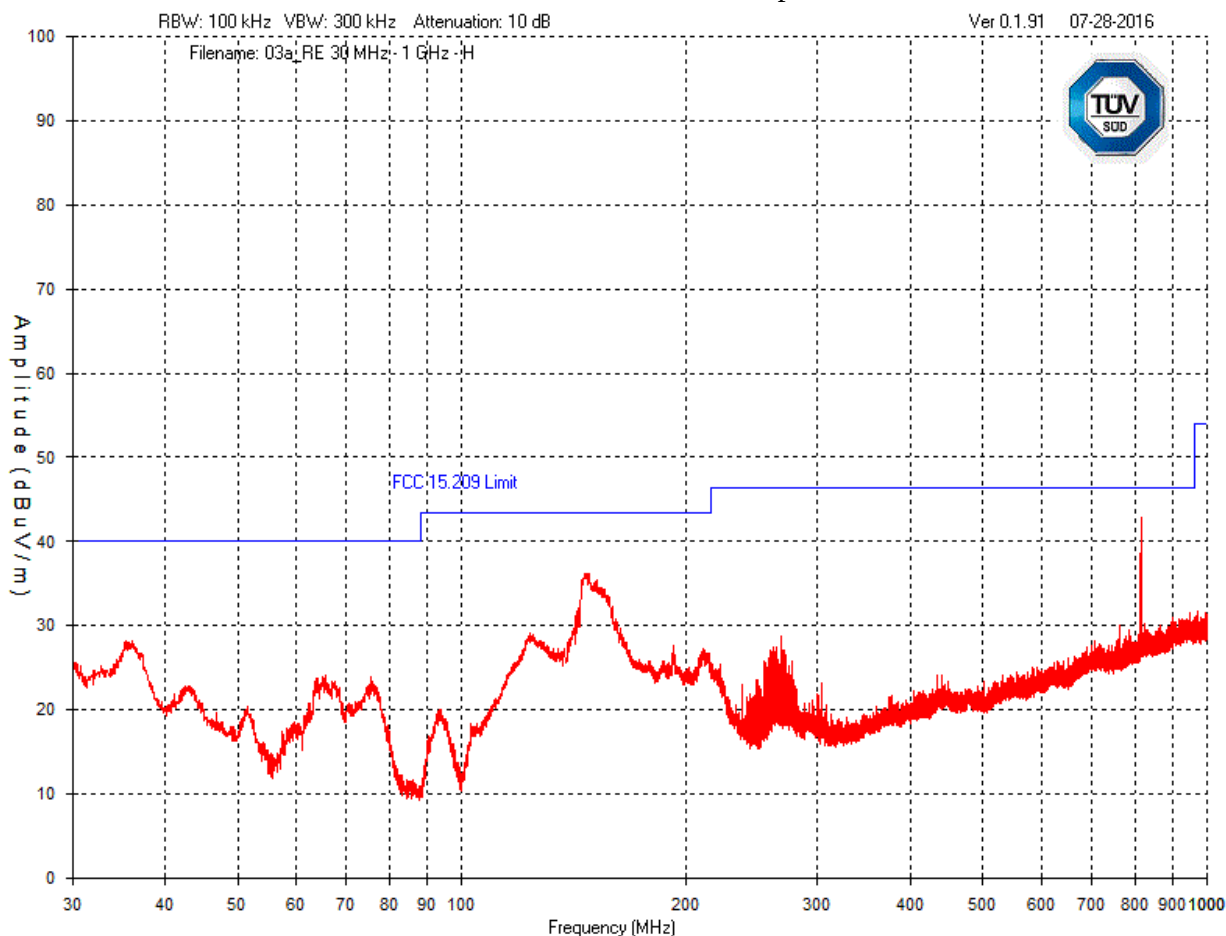
|             |                                                         |                                                                                     |
|-------------|---------------------------------------------------------|-------------------------------------------------------------------------------------|
| Client      | Artaflex                                                |  |
| Product     | AWA24R                                                  |                                                                                     |
| Standard(s) | RSS 247 Issue 1:2015<br>FCC Part 15 Subpart 15.247:2016 |                                                                                     |

Low Channel - 30 MHz – 1 GHz  
Vertical – Peak Emission Graph



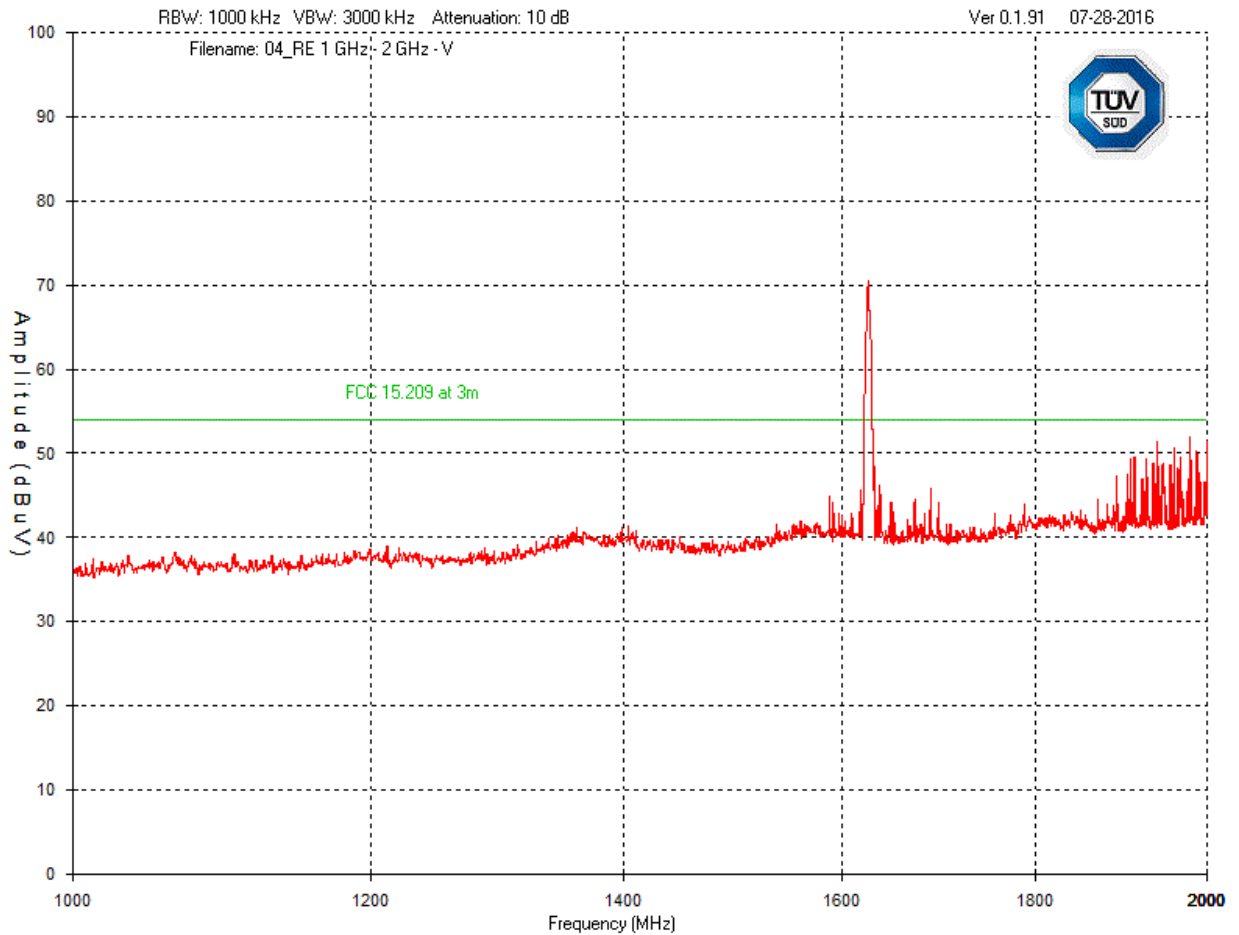
|             |                                                         |                                                                                     |
|-------------|---------------------------------------------------------|-------------------------------------------------------------------------------------|
| Client      | Artaflex                                                |  |
| Product     | AWA24R                                                  |                                                                                     |
| Standard(s) | RSS 247 Issue 1:2015<br>FCC Part 15 Subpart 15.247:2016 |                                                                                     |

Low Channel – 30 MHz – 1 GHz  
Horizontal - Peak Emission Graph



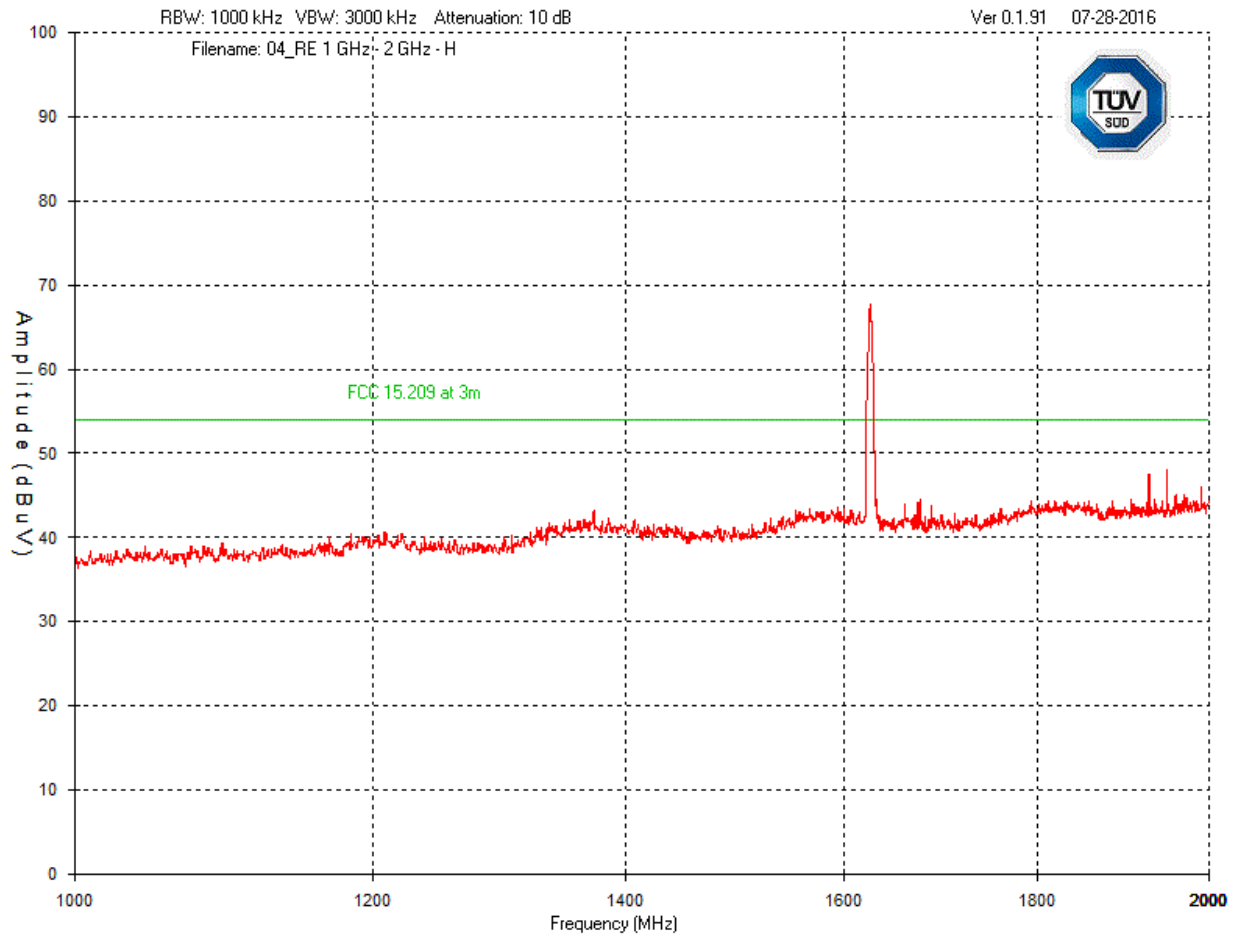
|             |                                                         |                                                                                     |
|-------------|---------------------------------------------------------|-------------------------------------------------------------------------------------|
| Client      | Artaflex                                                |  |
| Product     | AWA24R                                                  |                                                                                     |
| Standard(s) | RSS 247 Issue 1:2015<br>FCC Part 15 Subpart 15.247:2016 |                                                                                     |

Low Channel – 1 GHz – 2 GHz  
Vertical - Peak Emission Graph



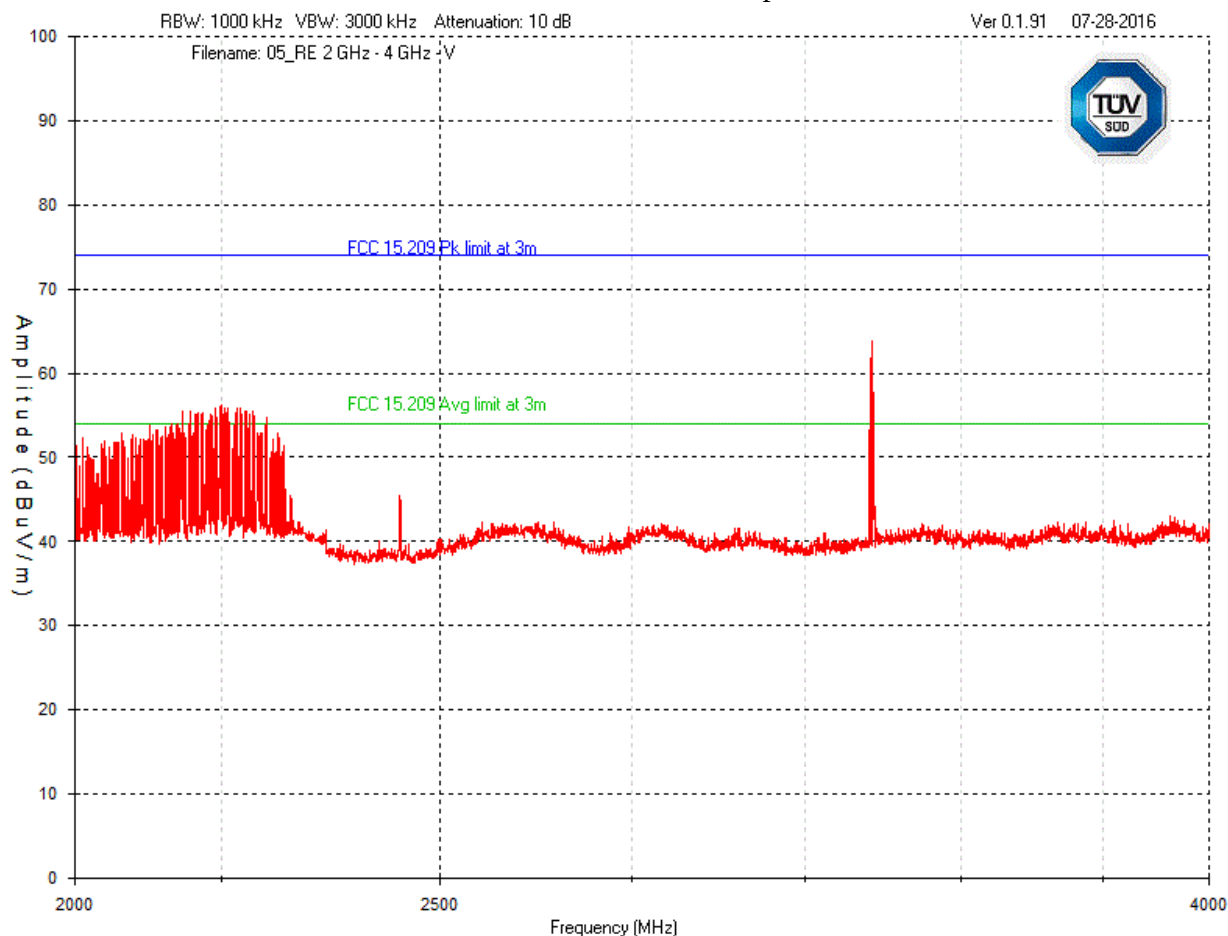
|             |                                                         |                                                                                     |
|-------------|---------------------------------------------------------|-------------------------------------------------------------------------------------|
| Client      | Artaflex                                                |  |
| Product     | AWA24R                                                  |                                                                                     |
| Standard(s) | RSS 247 Issue 1:2015<br>FCC Part 15 Subpart 15.247:2016 |                                                                                     |

Low Channel – 1 GHz – 2 GHz  
Horizontal - Peak Emission Graph



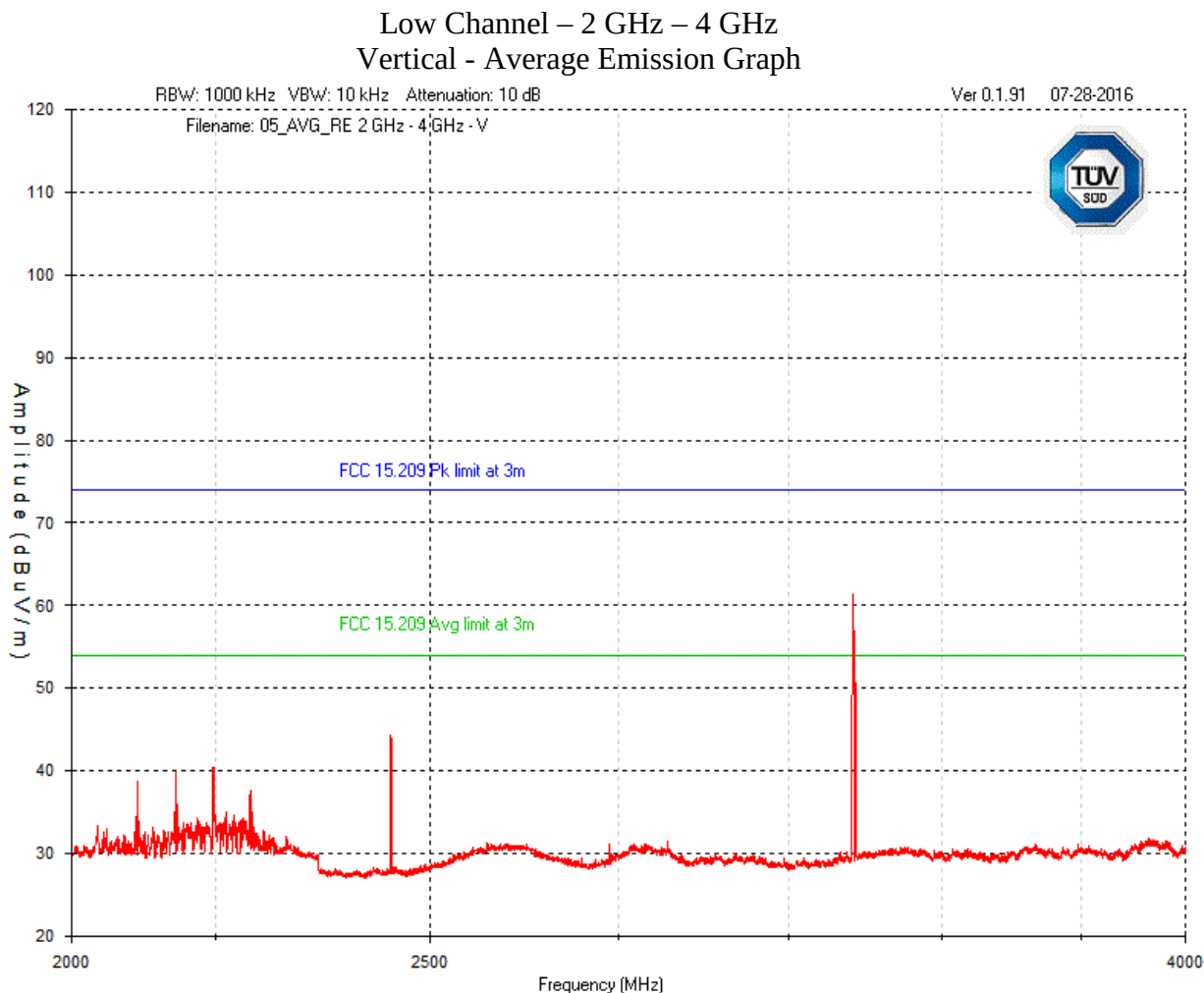
|             |                                                         |                                                                                               |
|-------------|---------------------------------------------------------|-----------------------------------------------------------------------------------------------|
| Client      | Artaflex                                                | <br>Canada |
| Product     | AWA24R                                                  |                                                                                               |
| Standard(s) | RSS 247 Issue 1:2015<br>FCC Part 15 Subpart 15.247:2016 |                                                                                               |

Low Channel – 2 GHz – 4 GHz  
Vertical - Peak Emission Graph



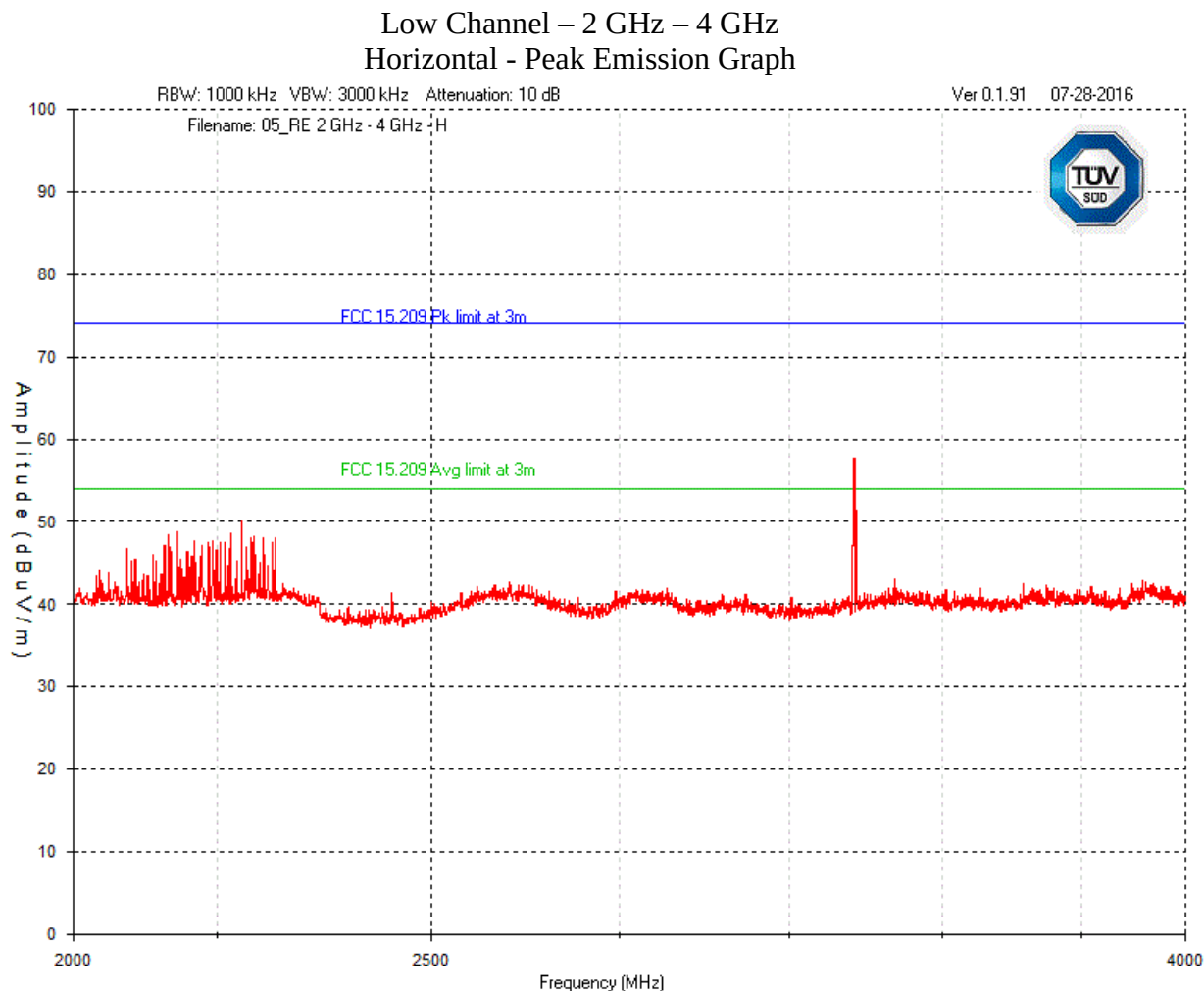
Note: See Final Measurements and Results section starting on page 53 for measurements.

|             |                                                         |                                                                                     |
|-------------|---------------------------------------------------------|-------------------------------------------------------------------------------------|
| Client      | Artaflex                                                |  |
| Product     | AWA24R                                                  |                                                                                     |
| Standard(s) | RSS 247 Issue 1:2015<br>FCC Part 15 Subpart 15.247:2016 |                                                                                     |



Note: See Final Measurements and Results section starting on page 53 for measurements. Emissions at 3.2 GHz is a modulation artifact of the EUT; its Average emission levels is derived from Peak emission; see emission table on page 53 for details.

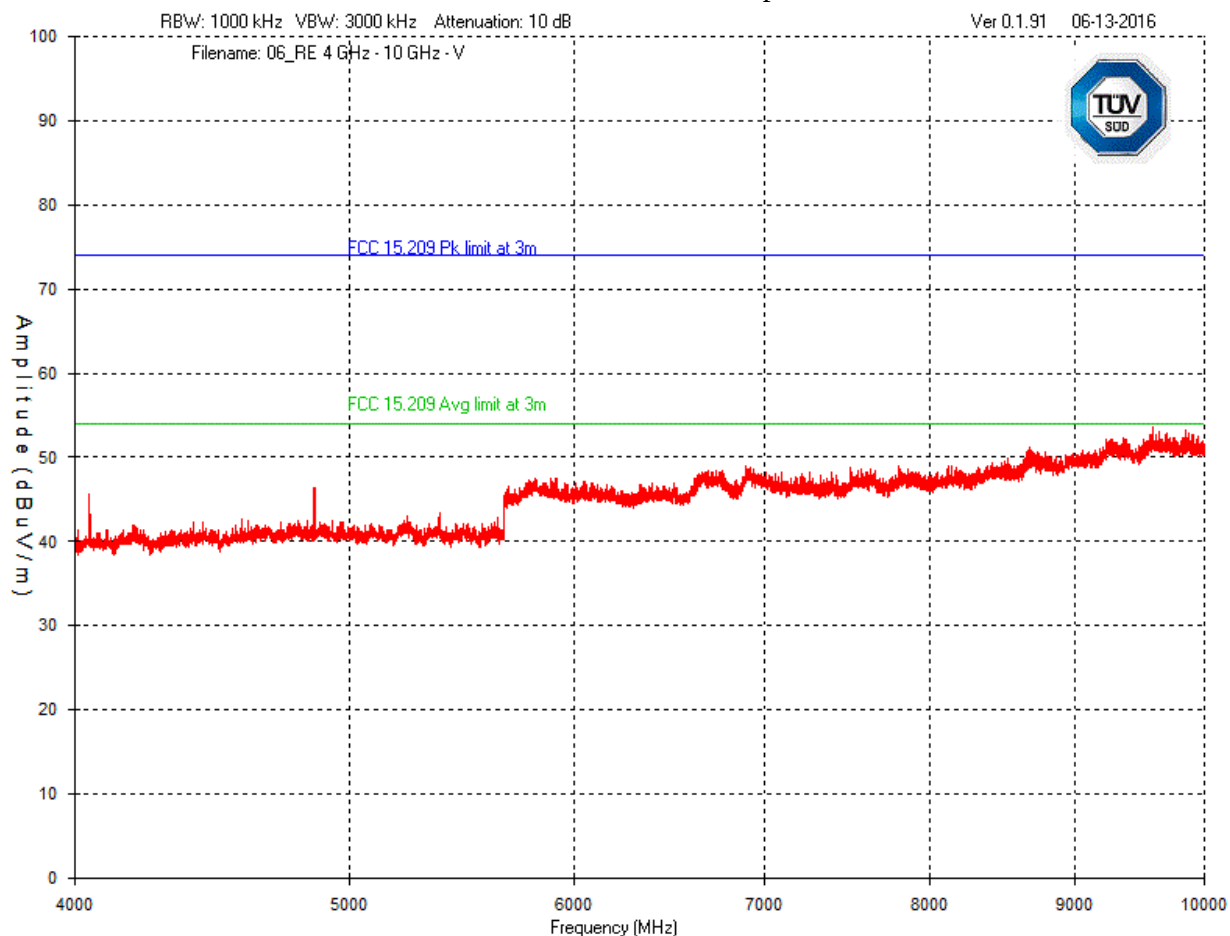
|             |                                                         |                                                                                               |
|-------------|---------------------------------------------------------|-----------------------------------------------------------------------------------------------|
| Client      | Artaflex                                                | <br>Canada |
| Product     | AWA24R                                                  |                                                                                               |
| Standard(s) | RSS 247 Issue 1:2015<br>FCC Part 15 Subpart 15.247:2016 |                                                                                               |



Note: See Final Measurements and Results section starting on page 53 for measurements.

|             |                                                         |                                                                                     |
|-------------|---------------------------------------------------------|-------------------------------------------------------------------------------------|
| Client      | Artaflex                                                |  |
| Product     | AWA24R                                                  |                                                                                     |
| Standard(s) | RSS 247 Issue 1:2015<br>FCC Part 15 Subpart 15.247:2016 |                                                                                     |

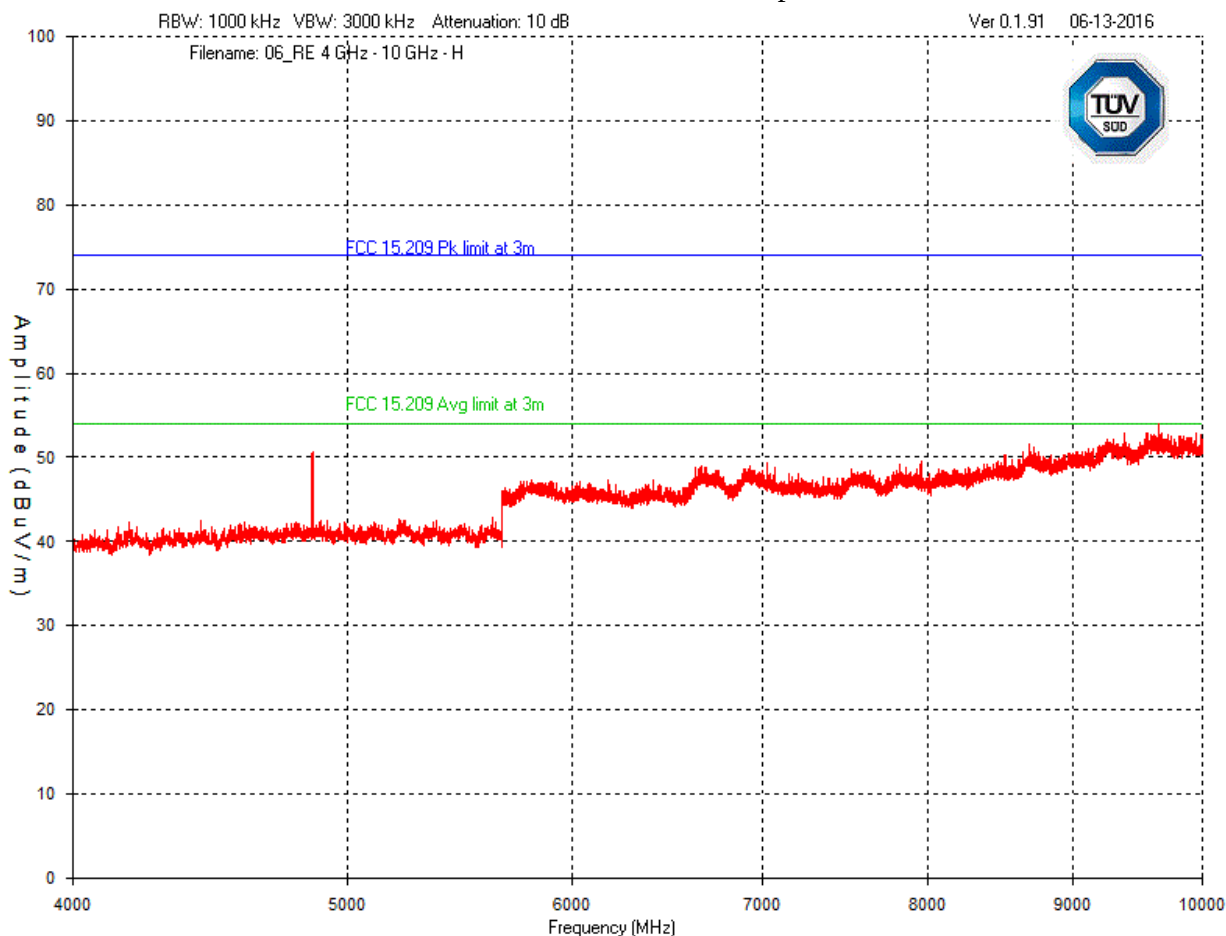
Low Channel – 4 GHz – 10GHz  
Vertical - Peak Emission Graph



Note: See Final Measurements and Results section starting on page 53 for measurements.

|             |                                                         |                                                                                     |
|-------------|---------------------------------------------------------|-------------------------------------------------------------------------------------|
| Client      | Artaflex                                                |  |
| Product     | AWA24R                                                  |                                                                                     |
| Standard(s) | RSS 247 Issue 1:2015<br>FCC Part 15 Subpart 15.247:2016 |                                                                                     |

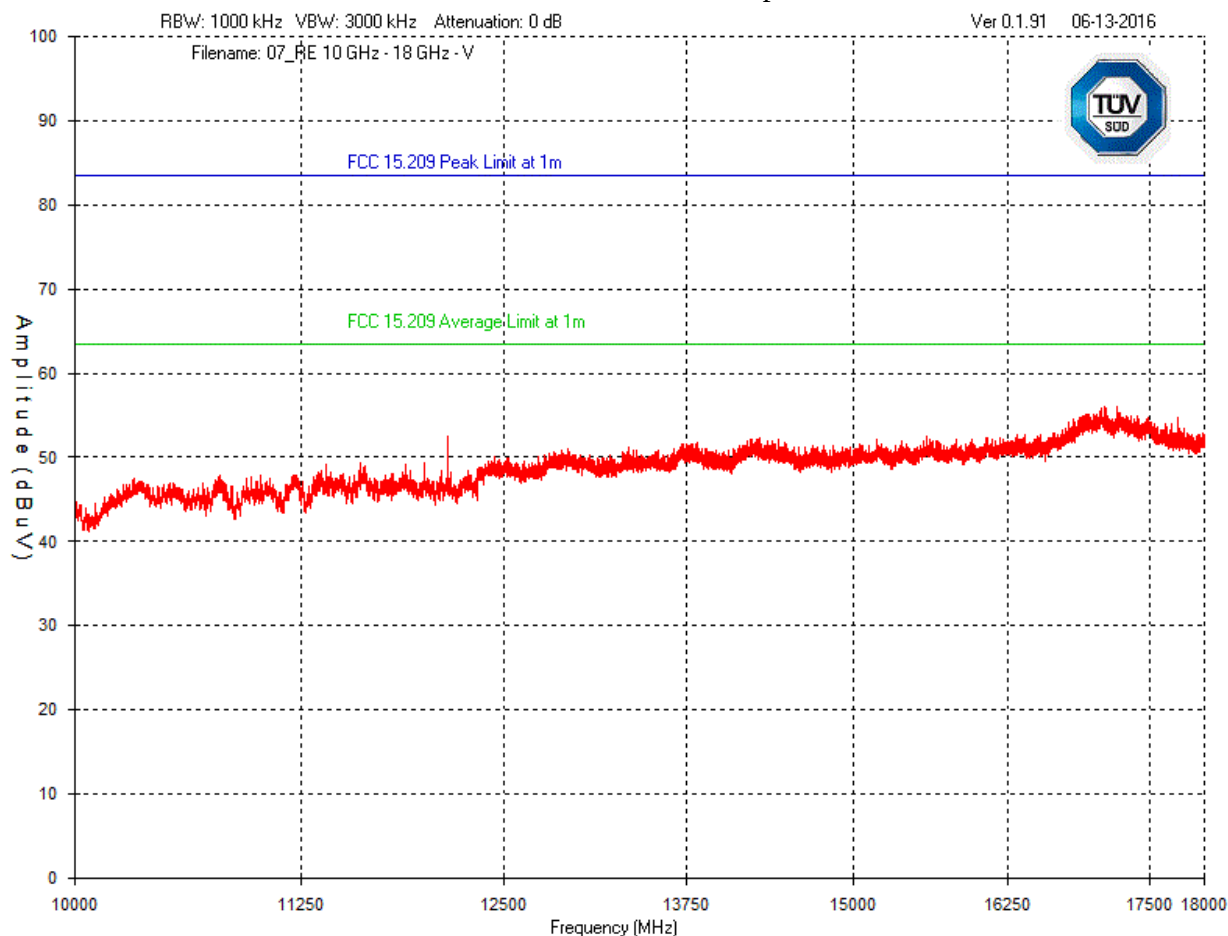
Low Channel – 4 GHz – 10 GHz  
Horizontal - Peak Emission Graph



Note: See Final Measurements and Results section starting on page 53 for measurements.

|             |                                                         |                                                                                               |
|-------------|---------------------------------------------------------|-----------------------------------------------------------------------------------------------|
| Client      | Artaflex                                                | <br>Canada |
| Product     | AWA24R                                                  |                                                                                               |
| Standard(s) | RSS 247 Issue 1:2015<br>FCC Part 15 Subpart 15.247:2016 |                                                                                               |

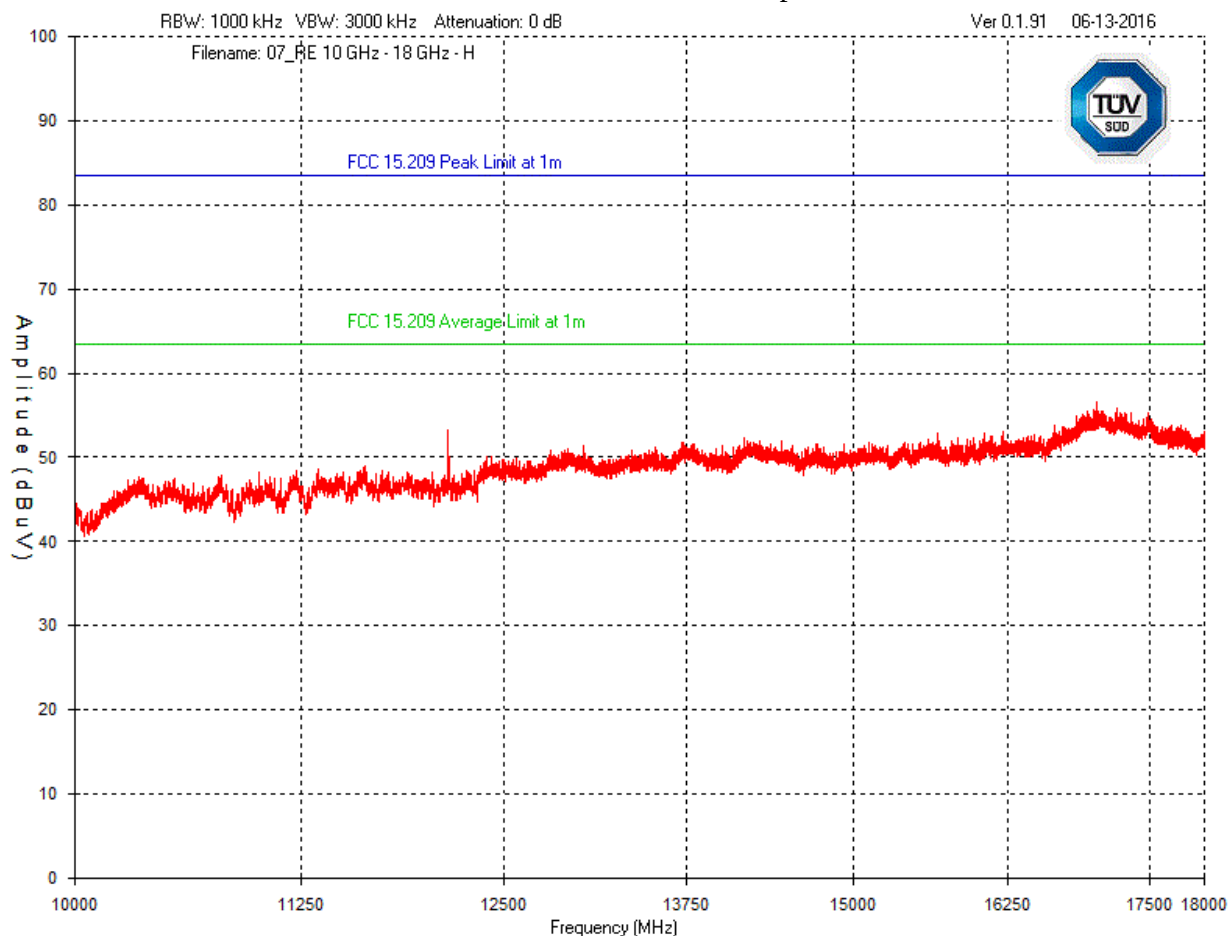
Low Channel – 10 GHz – 18 GHz  
Vertical - Peak Emission Graph



Note: See Final Measurements and Results section starting on page 53 for measurements.

|             |                                                         |                                                                                               |
|-------------|---------------------------------------------------------|-----------------------------------------------------------------------------------------------|
| Client      | Artaflex                                                | <br>Canada |
| Product     | AWA24R                                                  |                                                                                               |
| Standard(s) | RSS 247 Issue 1:2015<br>FCC Part 15 Subpart 15.247:2016 |                                                                                               |

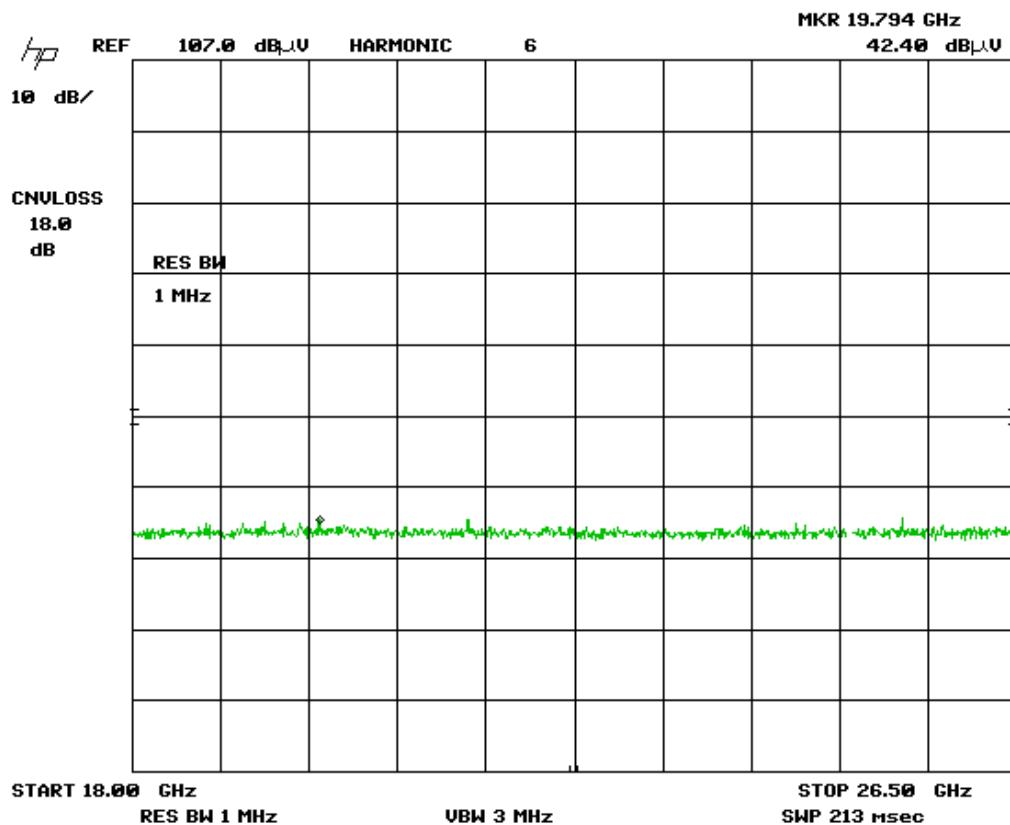
Low Channel – 10 GHz – 18 GHz  
Horizontal - Peak Emission Graph



Note: See Final Measurements and Results section starting on page 53 for measurements.

|             |                                                         |                                                                                     |
|-------------|---------------------------------------------------------|-------------------------------------------------------------------------------------|
| Client      | Artaflex                                                |  |
| Product     | AWA24R                                                  |                                                                                     |
| Standard(s) | RSS 247 Issue 1:2015<br>FCC Part 15 Subpart 15.247:2016 |                                                                                     |

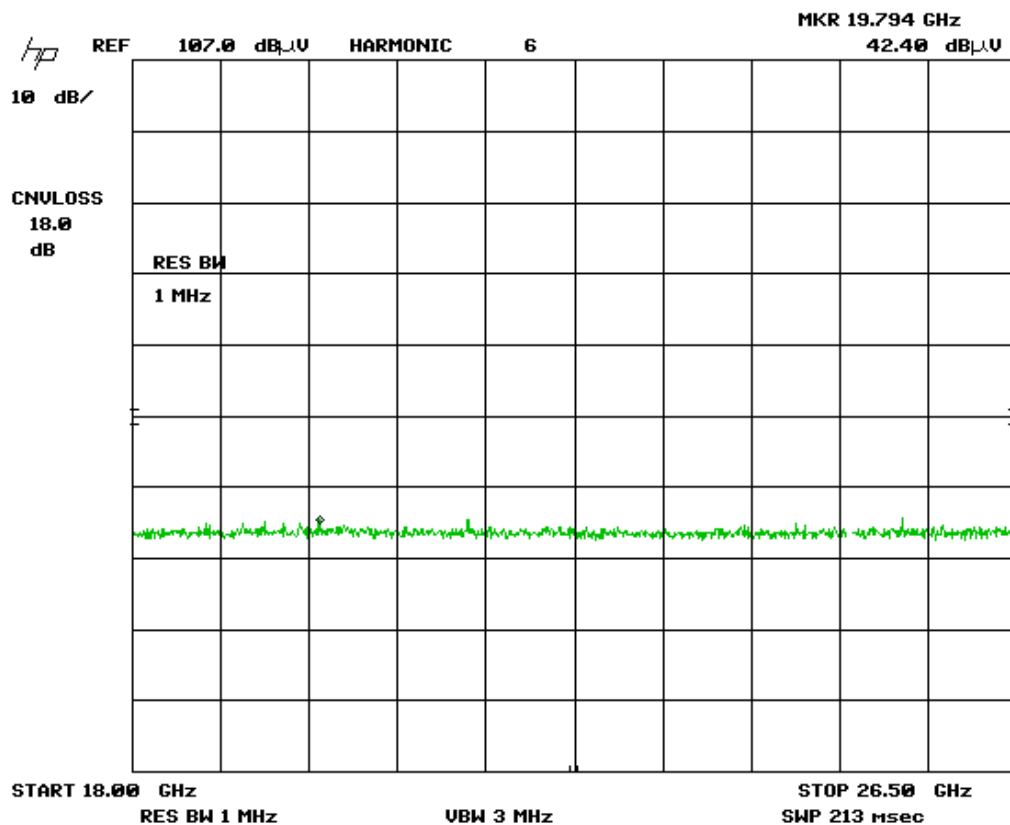
Mid Channel – 18 GHz – 26 GHz  
Horizontal - Peak Emission Graph



Plot was taken at 1 meter distances. All emissions shown were instrument noise floor of measurement instrument. No emissions were found in this frequency range.

|             |                                                         |                                                                                     |
|-------------|---------------------------------------------------------|-------------------------------------------------------------------------------------|
| Client      | Artaflex                                                |  |
| Product     | AWA24R                                                  |                                                                                     |
| Standard(s) | RSS 247 Issue 1:2015<br>FCC Part 15 Subpart 15.247:2016 |                                                                                     |

Mid Channel – 18 GHz – 26 GHz  
Vertical - Peak Emission Graph

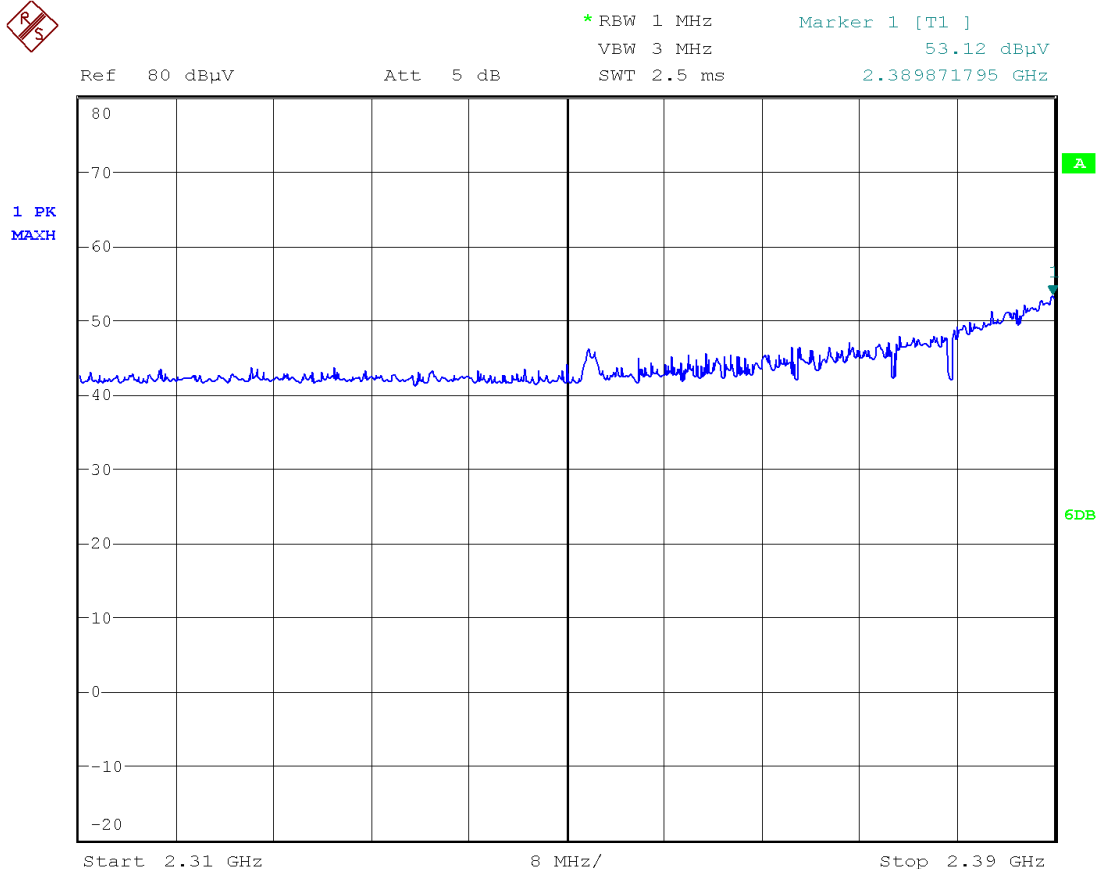


Plot was taken at 1 meter distances. All emissions shown were instrument noise floor of measurement instrument. No emissions were found in this frequency range.

|             |                                                         |                                                                                     |
|-------------|---------------------------------------------------------|-------------------------------------------------------------------------------------|
| Client      | Artaflex                                                |  |
| Product     | AWA24R                                                  |                                                                                     |
| Standard(s) | RSS 247 Issue 1:2015<br>FCC Part 15 Subpart 15.247:2016 |                                                                                     |

## Band edge measurements

### Band Edge – Low Channel 0 Vertical - Peak Emission

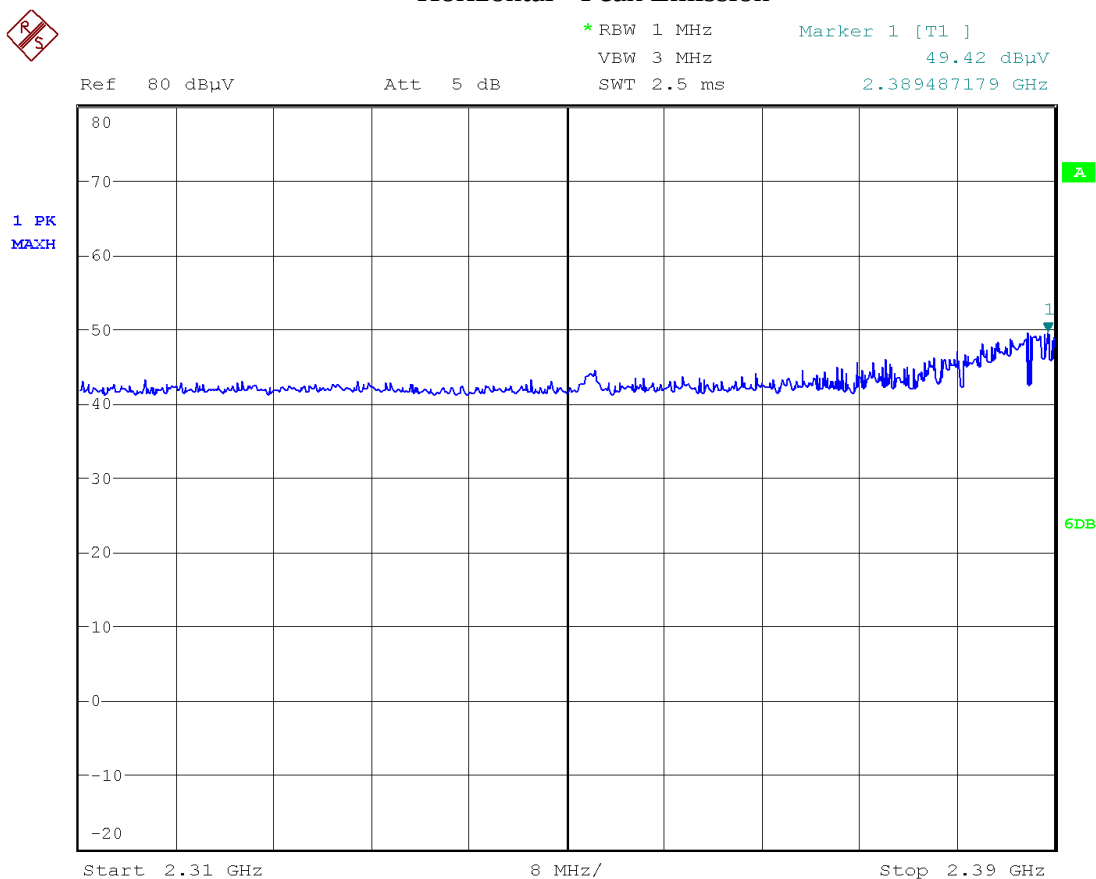


Date: 22.JUL.2016 20:55:10

Note: Band edge plots were taken with 3 m measurements distance. The marker shows the raw value; see Final Measurements and Results section starting on page 53 for corrected values.

|             |                                                         |                                                                                     |
|-------------|---------------------------------------------------------|-------------------------------------------------------------------------------------|
| Client      | Artaflex                                                |  |
| Product     | AWA24R                                                  |                                                                                     |
| Standard(s) | RSS 247 Issue 1:2015<br>FCC Part 15 Subpart 15.247:2016 |                                                                                     |

### Band Edge – Low Channel 0 Horizontal - Peak Emission

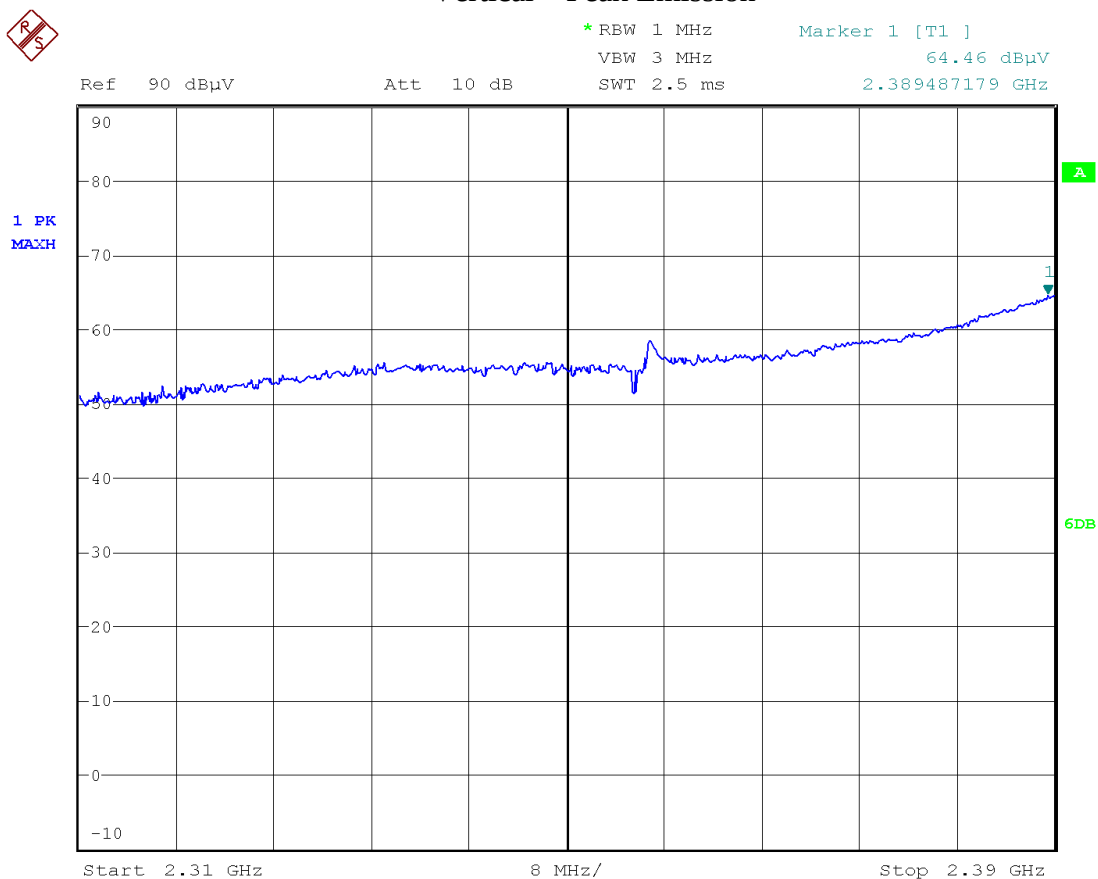


Date: 22.JUL.2016 20:38:06

Note: Band edge plots were taken with 3 m measurements distance. The marker shows the raw value; see Final Measurements and Results section starting on page 53 for corrected values.

|             |                                                         |                                                                                     |
|-------------|---------------------------------------------------------|-------------------------------------------------------------------------------------|
| Client      | Artaflex                                                |  |
| Product     | AWA24R                                                  |                                                                                     |
| Standard(s) | RSS 247 Issue 1:2015<br>FCC Part 15 Subpart 15.247:2016 |                                                                                     |

### Band Edge – Low Channel 5 Vertical – Peak Emission

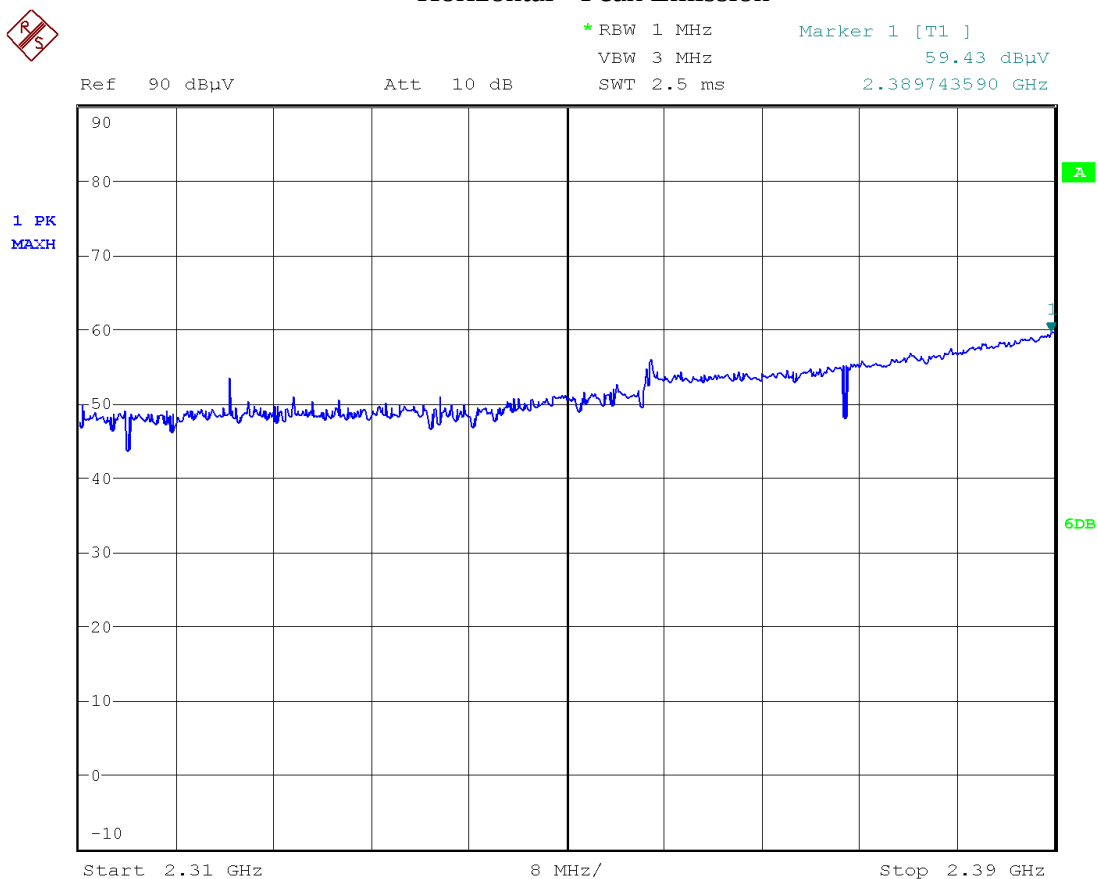


Date: 22.JUL.2016 17:27:49

Note: Band edge plots were taken with 3 m measurements distance. The marker shows the raw value; see Final Measurements and Results section starting on page 53 for corrected values.

|             |                                                         |                                                                                     |
|-------------|---------------------------------------------------------|-------------------------------------------------------------------------------------|
| Client      | Artaflex                                                |  |
| Product     | AWA24R                                                  |                                                                                     |
| Standard(s) | RSS 247 Issue 1:2015<br>FCC Part 15 Subpart 15.247:2016 |                                                                                     |

### Band Edge – Low Channel 5 Horizontal - Peak Emission

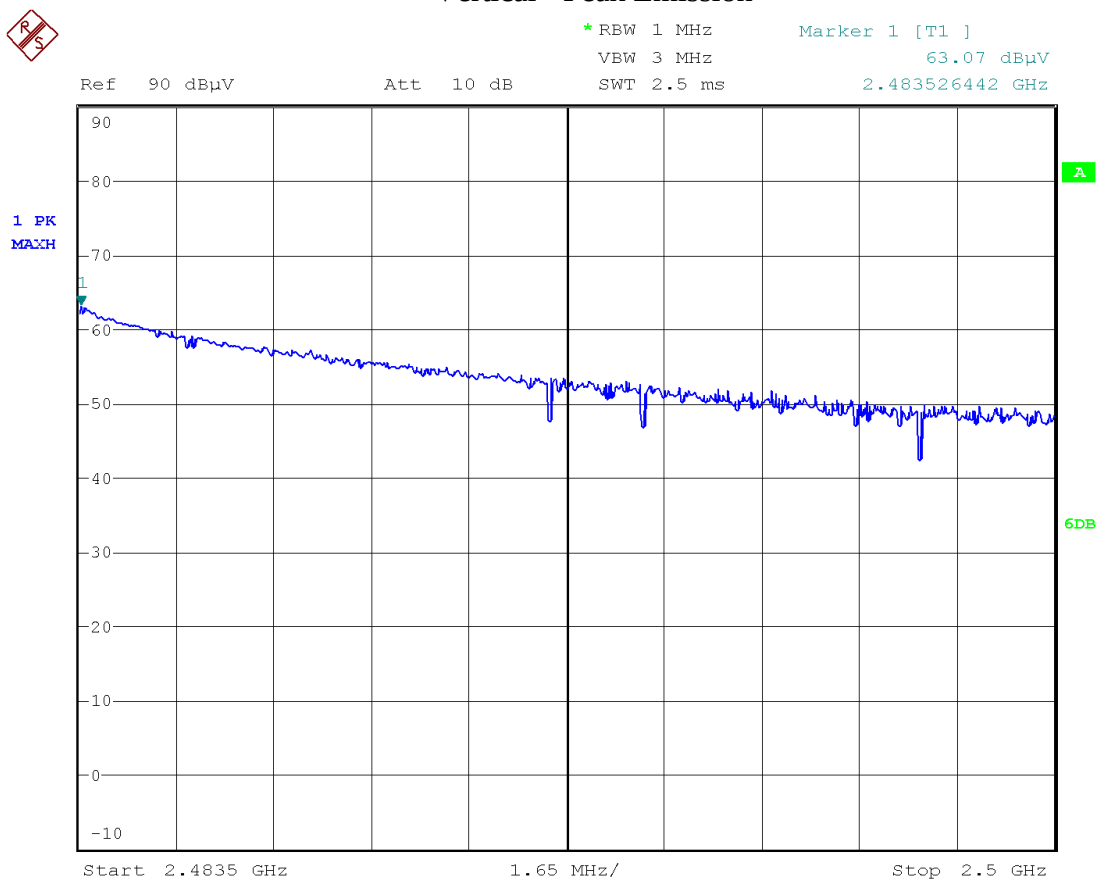


Date: 22.JUL.2016 18:01:55

Note: Band edge plots were taken with 3 m measurements distance. The marker shows the raw value; see Final Measurements and Results section starting on page 53 for corrected values.

|             |                                                         |                                                                                     |
|-------------|---------------------------------------------------------|-------------------------------------------------------------------------------------|
| Client      | Artaflex                                                |  |
| Product     | AWA24R                                                  |                                                                                     |
| Standard(s) | RSS 247 Issue 1:2015<br>FCC Part 15 Subpart 15.247:2016 |                                                                                     |

# Band Edge – Hi Channel 78 Vertical - Peak Emission

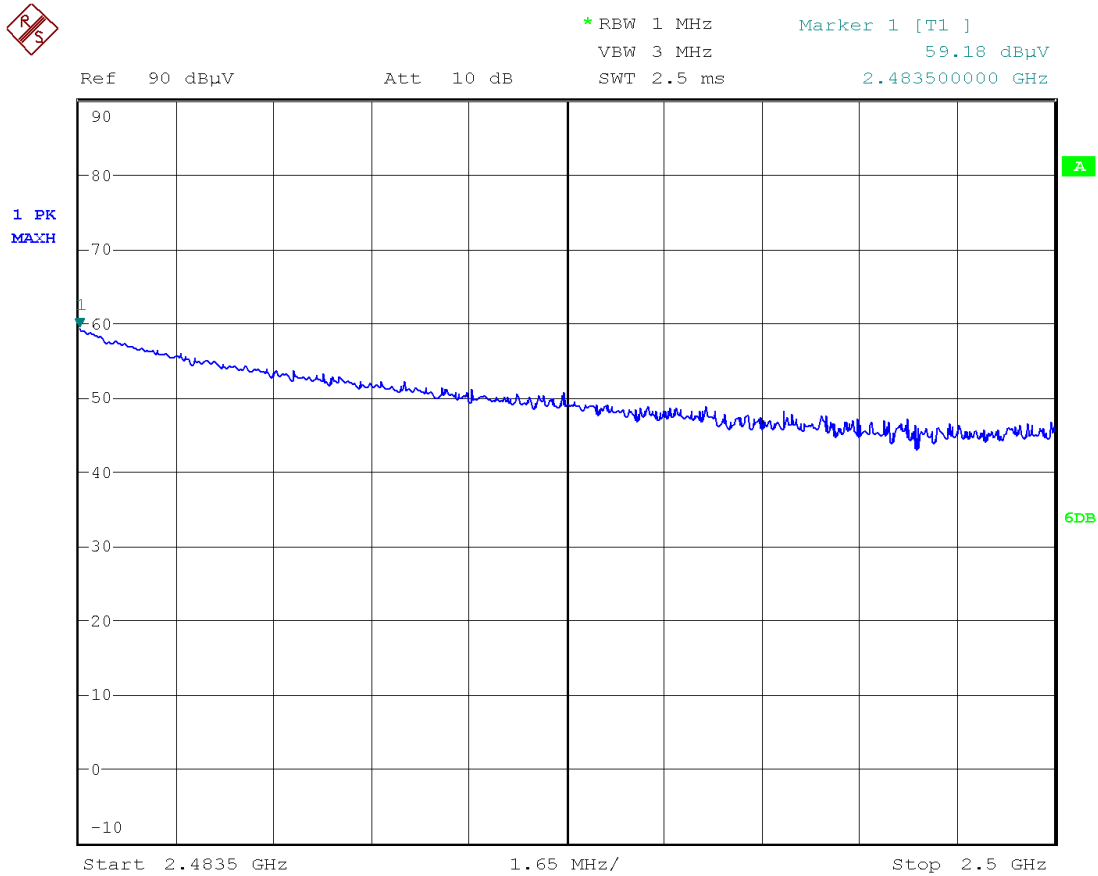


Date: 22.JUL.2016 19:35:37

Note: Band edge plots were taken with 3 m measurements distance. The marker shows the raw value; see Final Measurements and Results section starting on page 53 for corrected values.

|             |                                                         |                                                                                               |
|-------------|---------------------------------------------------------|-----------------------------------------------------------------------------------------------|
| Client      | Artaflex                                                | <br>Canada |
| Product     | AWA24R                                                  |                                                                                               |
| Standard(s) | RSS 247 Issue 1:2015<br>FCC Part 15 Subpart 15.247:2016 |                                                                                               |

### Band Edge – Hi Channel 78 Horizontal - Peak Emission

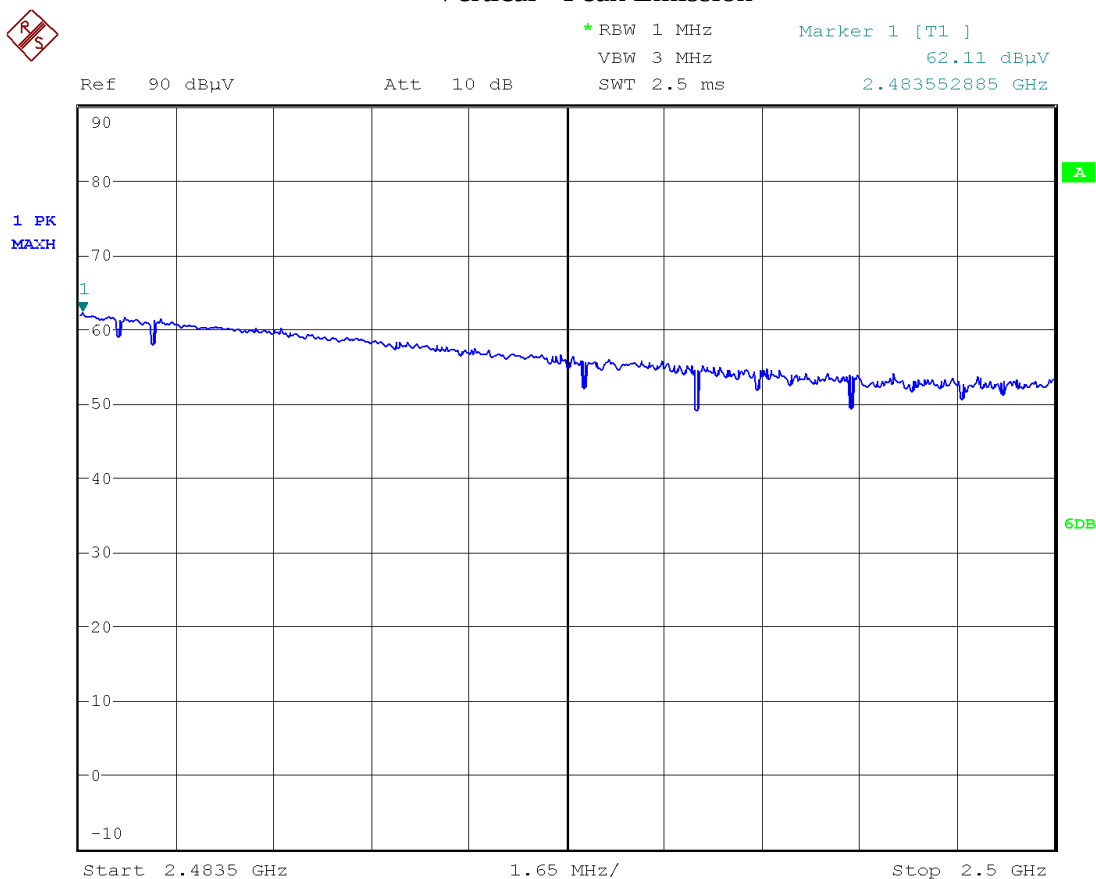


Date: 22.JUL.2016 20:20:54

Note: Band edge plots were taken with 3 m measurements distance. The marker shows the raw value; see Final Measurements and Results section starting on page 53 for corrected values.

|             |                                                         |                                                                                     |
|-------------|---------------------------------------------------------|-------------------------------------------------------------------------------------|
| Client      | Artaflex                                                |  |
| Product     | AWA24R                                                  |                                                                                     |
| Standard(s) | RSS 247 Issue 1:2015<br>FCC Part 15 Subpart 15.247:2016 |                                                                                     |

# Band Edge – Hi Channel 65 Vertical - Peak Emission

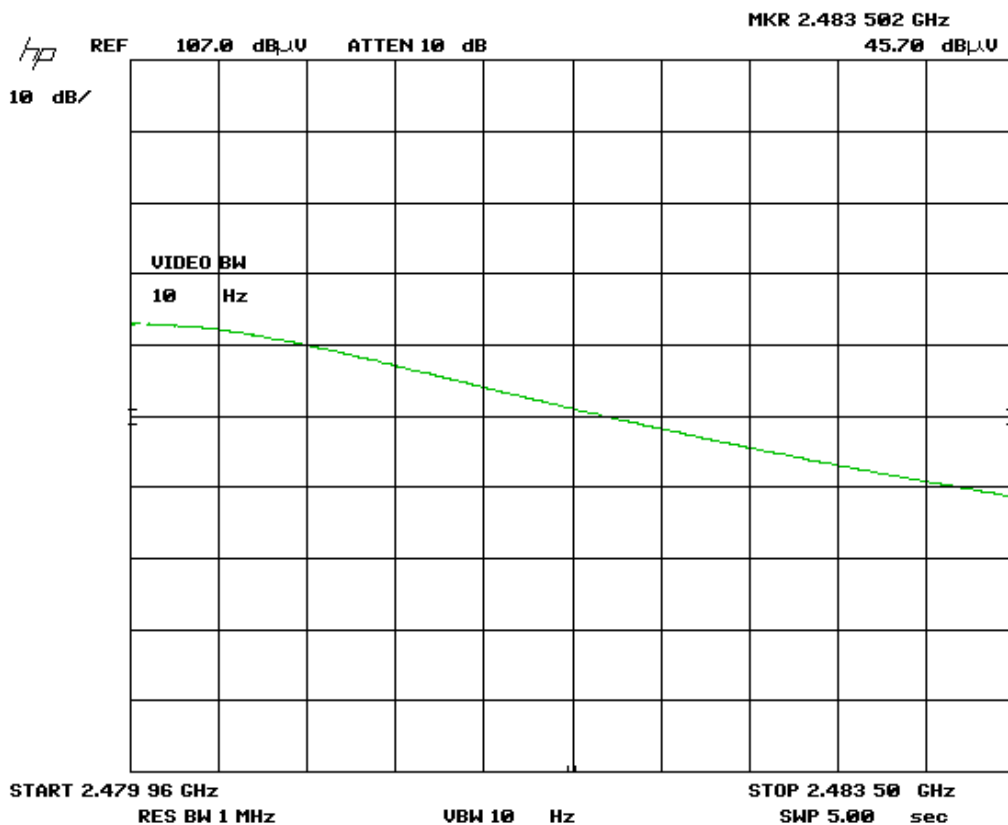


Date: 22.JUL.2016 18:22:22

Note: Band edge plots were taken with 3 m measurements distance. The marker shows the raw value; see Final Measurements and Results section starting on page 53 for corrected values.

|             |                                                         |                                                                                     |
|-------------|---------------------------------------------------------|-------------------------------------------------------------------------------------|
| Client      | Artaflex                                                |  |
| Product     | AWA24R                                                  |                                                                                     |
| Standard(s) | RSS 247 Issue 1:2015<br>FCC Part 15 Subpart 15.247:2016 |                                                                                     |

Band Edge – Hi Channel 65  
Horizontal - Peak Emission



Note: Band edge plots were taken with 3 m measurements distance. The marker shows the raw value; see Final Measurements and Results section starting on page 53 for corrected values.

|             |                                                         |                                                                                     |
|-------------|---------------------------------------------------------|-------------------------------------------------------------------------------------|
| Client      | <b>Artaflex</b>                                         |  |
| Product     | <b>AWA24R</b>                                           |                                                                                     |
| Standard(s) | RSS 247 Issue 1:2015<br>FCC Part 15 Subpart 15.247:2016 |                                                                                     |

## Final Measurements and Results

The EUT passed the limits. Low, middle and high bands were measured.

In accordance with 15.247(d), only frequencies exceeding the 15.209 limit that occur within the bands listed in 15.205, need to be verified with a final detector. Emission outside the restricted bands were measured for information purpose.

The measurements were maximized by rotating the turn table over a full 0-360 rotation and the antenna height was varied from 1 m to 4 m.

| Vertical Emission Table   |          |            |                         |                |                |             |           |
|---------------------------|----------|------------|-------------------------|----------------|----------------|-------------|-----------|
| Frequency (MHz)           | Detector | Raw (dBuV) | Correction Factors (dB) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Pass/Fail |
| 1625.67                   | AVG,     | 51.0       | -4.4                    | 46.6           | 54.0           | 7.4         | Pass      |
| 3252                      | AVG,     | 40.1       | -2.6                    | 37.5           | 54.0           | 16.5        | Pass      |
| Horizontal Emission Table |          |            |                         |                |                |             |           |
| 1625.67                   | AVG,     | 46.3       | -2.5                    | 43.8           | 54.0           | 10.2        | Pass      |
| 3253.67                   | AVG,     | 36.5       | -2.6                    | 33.9           | 54.0           | 20.1        | Pass      |

|             |                                                         |                                                                                     |
|-------------|---------------------------------------------------------|-------------------------------------------------------------------------------------|
| Client      | Artaflex                                                |  |
| Product     | AWA24R                                                  |                                                                                     |
| Standard(s) | RSS 247 Issue 1:2015<br>FCC Part 15 Subpart 15.247:2016 |                                                                                     |

| Test Frequency (MHz)                     | Detection mode | Antenna polarity (Horz/Vert) | Raw signal dB(μV) | Antenna factor dB | Cable loss dB | Attenuator dB | Pre-Amp Gain dB | Received signal dB(μV/m) | Emission limit dB(μV/m) | Margin dB | Result |
|------------------------------------------|----------------|------------------------------|-------------------|-------------------|---------------|---------------|-----------------|--------------------------|-------------------------|-----------|--------|
| Low Channel (5) PA5 Antenna Vertical     |                |                              |                   |                   |               |               |                 |                          |                         |           |        |
| 2407                                     | Peak           | Horz                         | 101.5             | 30.7              | 3.6           | 10.0          | 35.8            | 110.0                    |                         |           | PASS   |
| 2407                                     | Avg            | Horz                         | 77.6              | 30.7              | 3.6           | 10.0          | 35.8            | 86.1                     |                         |           | PASS   |
| 2407                                     | Peak           | Vert                         | 105.1             | 30.7              | 3.6           | 10.0          | 35.8            | 113.6                    |                         |           | PASS   |
| 2407                                     | Avg            | Vert                         | 81.3              | 30.7              | 3.6           | 10.0          | 35.8            | 89.8                     |                         |           | PASS   |
| 2390                                     | Peak           | Horz                         | 59.4              | 30.7              | 3.6           | 10.0          | 35.8            | 67.9                     | 74.0                    | 6.1       | PASS   |
| 2390                                     | Avg            | Horz                         | 35.5              | 30.7              | 3.6           | 10.0          | 35.8            | 44.0                     | 54.0                    | 10.0      | PASS   |
| 2390                                     | Peak           | Vert                         | 64.5              | 30.7              | 3.6           | 10.0          | 35.8            | 73.0                     | 74.0                    | 1.0       | PASS   |
| 2390                                     | Avg            | Vert                         | 40.6              | 30.7              | 3.6           | 10.0          | 35.8            | 49.1                     | 54.0                    | 4.9       | PASS   |
| Mid Channel (39) PA5 Antenna Vertical    |                |                              |                   |                   |               |               |                 |                          |                         |           |        |
| 2441                                     | Peak           | Horz                         | 101.4             | 30.7              | 3.6           | 10.0          | 35.8            | 109.9                    |                         |           | PASS   |
| 2441                                     | Avg            | Horz                         | 77.5              | 30.7              | 3.6           | 10.0          | 35.8            | 86.0                     |                         |           | PASS   |
| 2441                                     | Peak           | Vert                         | 105.6             | 30.7              | 3.6           | 10.0          | 35.8            | 114.1                    |                         |           | PASS   |
| 2441                                     | Avg            | Vert                         | 81.7              | 30.7              | 3.6           | 10.0          | 35.8            | 90.2                     |                         |           | PASS   |
| High Channel (65) PA5 - Antenna Vertical |                |                              |                   |                   |               |               |                 |                          |                         |           |        |
| 2467                                     | Peak           | Horz                         | 101.6             | 30.7              | 3.6           | 10.0          | 35.8            | 110.1                    |                         |           | PASS   |
| 2467                                     | Avg            | Horz                         | 77.7              | 30.7              | 3.6           | 10.0          | 35.8            | 86.2                     |                         |           | PASS   |
| 2467                                     | Peak           | Vert                         | 103.9             | 30.7              | 3.6           | 10.0          | 35.8            | 112.4                    |                         |           | PASS   |
| 2467                                     | Avg            | Vert                         | 80.0              | 30.7              | 3.6           | 10.0          | 35.8            | 88.5                     |                         |           | PASS   |
| 2483.5                                   | Peak           | Horz                         | 61.4              | 30.7              | 3.6           | 10.0          | 35.8            | 69.9                     | 74.0                    | 4.1       | PASS   |
| 2483.5                                   | Avg            | Horz                         | 37.5              | 30.7              | 3.6           | 10.0          | 35.8            | 46.0                     | 54.0                    | 8.0       | PASS   |
| 2483.5                                   | Peak           | Vert                         | 62.1              | 30.7              | 3.6           | 10.0          | 35.8            | 70.6                     | 74.0                    | 3.4       | PASS   |
| 2483.5                                   | Avg            | Vert                         | 38.2              | 30.7              | 3.6           | 10.0          | 35.8            | 46.7                     | 54.0                    | 7.3       | PASS   |

**Note: A duty cycle correction factor of -23.9 dB was used to derive Average emissions from peak emissions.**

|             |                                                         |                                                                                     |
|-------------|---------------------------------------------------------|-------------------------------------------------------------------------------------|
| Client      | Artaflex                                                |  |
| Product     | AWA24R                                                  |                                                                                     |
| Standard(s) | RSS 247 Issue 1:2015<br>FCC Part 15 Subpart 15.247:2016 |                                                                                     |

| Test Frequency (MHz)                   | Detection mode | Antenna polarity (Horz/Vert) | Raw signal dB(μV) | Antenna factor dB | Cable loss dB | Attenuator dB | Pre-Amp Gain dB | Received signal dB(μV/m) | Emission limit dB(μV/m) | Margin dB | Result |
|----------------------------------------|----------------|------------------------------|-------------------|-------------------|---------------|---------------|-----------------|--------------------------|-------------------------|-----------|--------|
| High Channel (78) PA2 Antenna Vertical |                |                              |                   |                   |               |               |                 |                          |                         |           |        |
| 2480                                   | Peak           | Horz                         | 86.1              | 30.7              | 3.6           | 10.0          | 35.8            | 94.6                     |                         |           | PASS   |
| 2480                                   | Avg            | Horz                         | 62.2              | 30.7              | 3.6           | 10.0          | 35.8            | 70.7                     |                         |           | PASS   |
| 2480                                   | Peak           | Vert                         | 89.7              | 30.7              | 3.6           | 10.0          | 35.8            | 98.2                     |                         |           | PASS   |
| 2480                                   | Avg            | Vert                         | 65.8              | 30.7              | 3.6           | 10.0          | 35.8            | 74.3                     |                         |           | PASS   |
| 2483.5                                 | Peak           | Horz                         | 59.2              | 30.7              | 3.6           | 10.0          | 35.8            | 67.7                     | 74.0                    | 6.3       | PASS   |
| 2483.5                                 | Avg            | Horz                         | 35.3              | 30.7              | 3.6           | 10.0          | 35.8            | 43.8                     | 54.0                    | 10.2      | PASS   |
| 2483.5                                 | Peak           | Vert                         | 63.1              | 30.7              | 3.6           | 10.0          | 35.8            | 71.6                     | 74.0                    | 2.4       | PASS   |
| 2483.5                                 | Avg            | Vert                         | 39.2              | 30.7              | 3.6           | 10.0          | 35.8            | 47.7                     | 54.0                    | 6.3       | PASS   |
| Low Channel (0) PA2 Antenna Vertical   |                |                              |                   |                   |               |               |                 |                          |                         |           |        |
| 2402                                   | Peak           | Horz                         | 85.8              | 30.7              | 3.6           | 10.0          | 35.8            | 94.3                     |                         |           | PASS   |
| 2402                                   | Avg            | Horz                         | 61.9              | 30.7              | 3.6           | 10.0          | 35.8            | 70.4                     |                         |           | PASS   |
| 2402                                   | Peak           | Vert                         | 89.6              | 30.7              | 3.6           | 10.0          | 35.8            | 98.1                     |                         |           | PASS   |
| 2402                                   | Avg            | Vert                         | 65.7              | 30.7              | 3.6           | 10.0          | 35.8            | 74.2                     |                         |           | PASS   |
| 2390                                   | Peak           | Horz                         | 49.4              | 30.7              | 3.6           | 10.0          | 35.8            | 57.9                     | 74.0                    | 16.1      | PASS   |
| 2390                                   | Avg            | Horz                         | 25.5              | 30.7              | 3.6           | 10.0          | 35.8            | 34.0                     | 54.0                    | 20.0      | PASS   |
| 2390                                   | Peak           | Vert                         | 53.1              | 30.7              | 3.6           | 10.0          | 35.8            | 61.6                     | 74.0                    | 12.4      | PASS   |
| 2390                                   | Avg            | Vert                         | 29.2              | 30.7              | 3.6           | 10.0          | 35.8            | 37.7                     | 54.0                    | 16.3      | PASS   |

**Note: A duty cycle correction factor of -23.9 dB was used to derive Average emissions from peak emissions.**

|             |                                                         |                                                                                     |
|-------------|---------------------------------------------------------|-------------------------------------------------------------------------------------|
| Client      | <b>Artaflex</b>                                         |  |
| Product     | <b>AWA24R</b>                                           |                                                                                     |
| Standard(s) | RSS 247 Issue 1:2015<br>FCC Part 15 Subpart 15.247:2016 |                                                                                     |

## Test Equipment List

| Equipment                        | Model No.              | Manufacturer    | Last calibration / Verification date | Next calibration/ Verification due date | Asset #   |
|----------------------------------|------------------------|-----------------|--------------------------------------|-----------------------------------------|-----------|
| Spectrum Analyzer                | 8566B                  | HP              | Nov 27, 2015                         | Nov 27, 2017                            | GEMC 190  |
| Quasi Peak Adapter               | 85650A                 | HP              | Nov 27, 2015                         | Nov 27, 2017                            | GEMC 191  |
| Spectrum Analyzer                | FSU                    | Rohde & Schwarz | Jan 19, 2015                         | Jan 19, 2017                            | GEMC 198  |
| Loop Antenna                     | EM 6871                | Electro-Metrics | Feb 3, 2015                          | Feb 5, 2017                             | GEMC 70   |
| Loop Antenna                     | EM 6872                | Electro-Metrics | Feb 3, 2015                          | Feb 5, 2017                             | GEMC 71   |
| BiLog Antenna                    | 3142-C                 | ETS             | Sept 8, 2014                         | Sept 8, 2016                            | GEMC 8    |
| Attenuator 10 dB                 | 8493B                  | Agilent         | Feb 11, 2016                         | Feb 11, 2017                            | GEMC 133  |
| 2.4Ghz-2.5GHz Notch Filter       | BRM50702               | Micro-Tronics   | Jul-15,2016                          | Jul-15,2017                             | GEMC 230  |
| Chase Preamp 9kHz - 2 GHz        | CPA9231A               | Chase           | Sept 9, 2014                         | Sept 9, 2016                            | GEMC 6403 |
| Q-Par Horn Antenna (2 to 18 GHz) | WBH218HN               | Q-par           | Feb 12, 2016                         | Feb 12, 2018                            | GEMC 6375 |
| Horn Antenna 18 GHz - 26.5 GHz   | SAS-572                | A.H. Systems    | Sept 9, 2014                         | Sept 9, 2016                            | GEMC 6371 |
| 18.0-26.5 GHz Harmonic Mixer     | 11970K                 | HP              | Feb 8, 2016                          | Feb 8, 2018                             | GEMC 158  |
| 1-26G pre-amp                    | HP 8449B               | HP              | Sept 9, 2014                         | Sept 9, 2016                            | GEMC 6351 |
| 2.0-8.0 GHz Amplifier            | 11975A                 | HP              | Feb 8, 2016                          | Feb 8, 2018                             | GEMC157   |
| RF Cable 7m                      | LMR-400-7M-50OHM-MN-MN | LexTec          | Feb 1, 2016                          | Feb 1, 2017                             | GEMC 28   |
| RF Cable 1m                      | LMR-400-1M-50OHM-MN-MN | LexTec          | Feb 1, 2016                          | Feb 1, 2017                             | GEMC 29   |

This report module is based on GEMC template "FCC - 15.209 - Radiated Emissions\_Rev1.doc"

|             |                                                         |                                                                                     |
|-------------|---------------------------------------------------------|-------------------------------------------------------------------------------------|
| Client      | Artaflex                                                |  |
| Product     | AWA24R                                                  |                                                                                     |
| Standard(s) | RSS 247 Issue 1:2015<br>FCC Part 15 Subpart 15.247:2016 |                                                                                     |

## Power Spectral Density – 15.247 DM

### Purpose

The purpose of this test is to ensure that the maximum power spectral density to the radiating element does not exceed the limits specified. This ensures that the modulation is significantly wide enough, or low enough in power that it will allow for co-operation of other wireless devices operating within this frequency allocation.

### Limits and Methods

The limits are defined in 15.247(e) and RSS 247.

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

The method is given in ANSI 63.10 11.10.2 Method PKPSD.

### Results

The EUT passed. The EUT was set to transmit at maximum power. Three Channels were measured. The following table show the peak power spectral density:

| Peak PSD |                 |                |                  |           |
|----------|-----------------|----------------|------------------|-----------|
| Channel  | Frequency (MHz) | PSD/3kHz (dBm) | Limit (dBm/3kHz) | Pass/Fail |
| 5        | 2407            | 7.80           | 8                | Pass      |
| 39       | 2441            | 7.45           | 8                | Pass      |
| 65       | 2467            | 7.05           | 8                | Pass      |

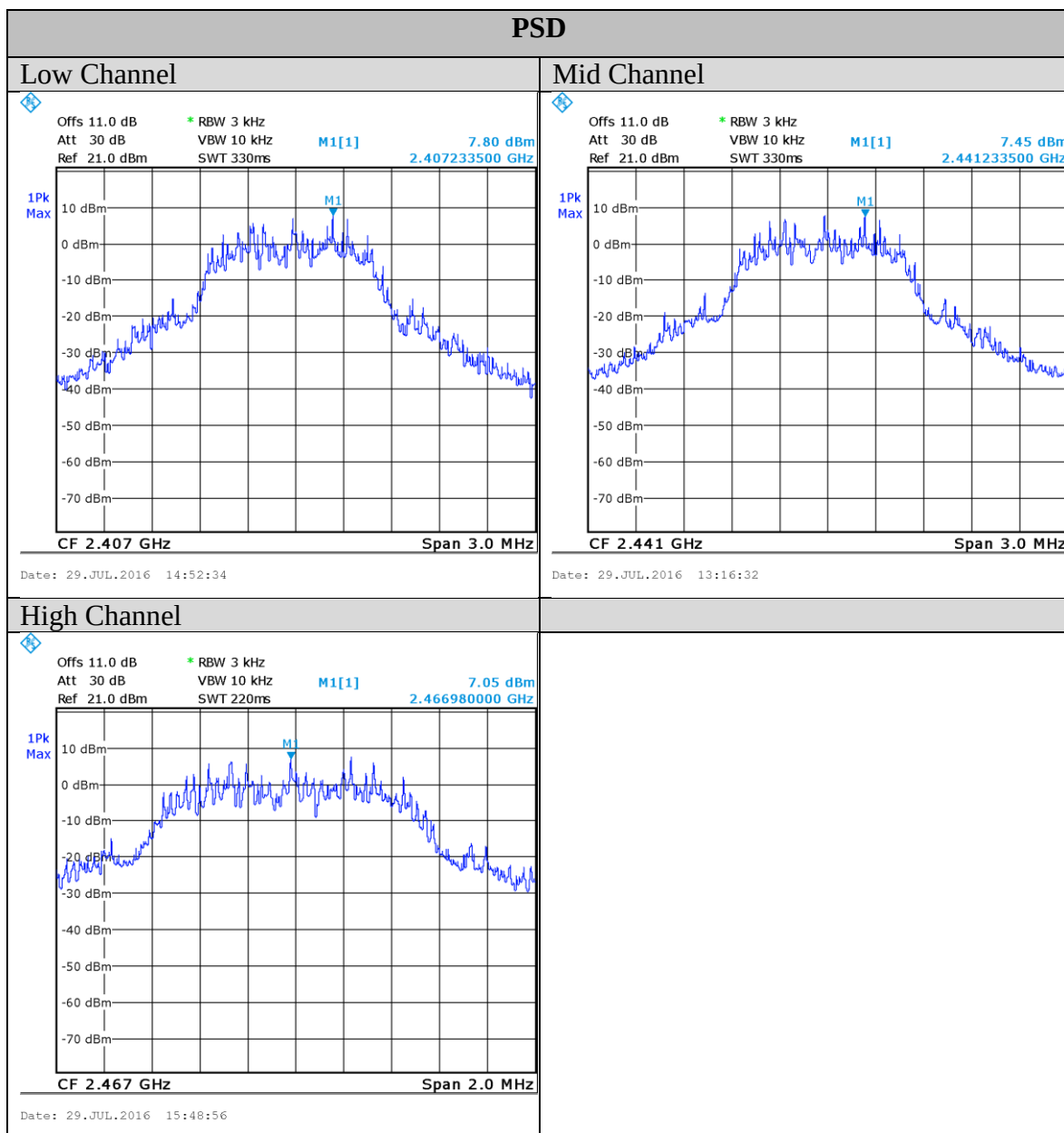
### Graph(s)

The graphs shown below show the power spectral density of the device. This is measured by a max hold on the spectrum analyzer using a RBW of 3 kHz. This measurement is a peak measurement. Max hold is performed for a duration of not less than 1 minute.

Low, middle, and high channel was investigated in each mode, with the worst case being presented.

External attenuator and cable loss were accounted for as reference offset in the spectrum analyzer.

|             |                                                         |                                                                                     |
|-------------|---------------------------------------------------------|-------------------------------------------------------------------------------------|
| Client      | Artaflex                                                |  |
| Product     | AWA24R                                                  |                                                                                     |
| Standard(s) | RSS 247 Issue 1:2015<br>FCC Part 15 Subpart 15.247:2016 |                                                                                     |



Note: See 'Appendix B – EUT & Test Setup Photographs' for photos showing the test set-up.

|             |                                                         |                                                                                     |
|-------------|---------------------------------------------------------|-------------------------------------------------------------------------------------|
| Client      | <b>Artaflex</b>                                         |  |
| Product     | <b>AWA24R</b>                                           |                                                                                     |
| Standard(s) | RSS 247 Issue 1:2015<br>FCC Part 15 Subpart 15.247:2016 |                                                                                     |

## Test Equipment List

| Equipment         | Model No.   | Manufacturer           | Last calibration / Verification date | Next calibration/ Verification due date | Asset #  |
|-------------------|-------------|------------------------|--------------------------------------|-----------------------------------------|----------|
| Spectrum Analyzer | ESL6        | Rohde & Schwarz        | Nov 25, 2015                         | Nov 25, 2017                            | GEMC 160 |
| 10 dB attenuator  | 605-10-1F18 | Meca Electronics, Inc. | Jun 3, 2016                          | Jun 3, 2017                             | GEMC 225 |

This report module is based on GEMC template "FCC – Power Line Conducted Emissions Class B\_Rev1"

|             |                                                         |                                                                                     |
|-------------|---------------------------------------------------------|-------------------------------------------------------------------------------------|
| Client      | <b>Artaflex</b>                                         |  |
| Product     | <b>AWA24R</b>                                           |                                                                                     |
| Standard(s) | RSS 247 Issue 1:2015<br>FCC Part 15 Subpart 15.247:2016 |                                                                                     |

## Appendix A – EUT Summary

|             |                                                         |                                                                                     |
|-------------|---------------------------------------------------------|-------------------------------------------------------------------------------------|
| Client      | <b>Artaflex</b>                                         |  |
| Product     | <b>AWA24R</b>                                           |                                                                                     |
| Standard(s) | RSS 247 Issue 1:2015<br>FCC Part 15 Subpart 15.247:2016 |                                                                                     |

For further details for filing purposes, refer to filing package.

## General EUT Description

| Client                         |                                                                    |
|--------------------------------|--------------------------------------------------------------------|
| Organization / Address         | Artaflex<br>174 W. Beaver Creek Rd.<br>Richmond Hill, ON L4B 1B4   |
| Contact                        | Gerry Iuliano                                                      |
| Phone                          | 905-4700109                                                        |
| Email                          | Gerry_iuliano@artaflex.com                                         |
| EUT Details                    |                                                                    |
| EUT Name                       | AWA24R                                                             |
| FCC ID                         | UP2AWA24R                                                          |
| Industry Canada #              | 6797A-AWA24R                                                       |
| Equipment Category             | 2.4 GHz wireless module                                            |
| Input Voltage and Frequency    | 5VDC                                                               |
| Rated Input Current            | < 100 mA                                                           |
| Connectors available on EUT    | None                                                               |
| Peripherals Required for Test  | Testbed platform                                                   |
| Release type                   | Final                                                              |
| Intentional Radiator Frequency | Yes                                                                |
| EUT Configuration              | Wireless configured to transmit continuously at maximum duty cycle |

Note the EUT is considered to have been received the date of the commencement of the first test, unless otherwise stated. For a close-up picture of the EUT, see 'Appendix B – EUT and Test Setup Photos'.