



## CLASS II PERMISSIVE CHANGE TEST REPORT

**Report Number: 102133872MPK-002**

**Project Number: G102133872**

**May 27, 2015**

**Testing performed on**

**Tile**

**Model: T1003**

**FCC ID: 2ABXLT1002**

**IC: 11858A-T1002**

**to**

**FCC Part 15 Subpart C (15.247)**

**Industry Canada RSS-210 Issue 8, Annex 8**

**FCC Part 15, Subpart B**

**Industry Canada ICES-003**

**For**

**Tile, Inc.**

Test Performed by:

Intertek

1365 Adams Court

Menlo Park, CA 94025 USA

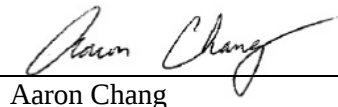
Test Authorized by:

Tile, Inc.

2121 S. El Camino Real, Suite C-100

San Mateo, CA 94403, USA

Prepared by:

  
Aaron Chang

**Date:** May 27, 2015

Reviewed by:

  
Krishna K Vemuri

**Date:** May 27, 2015

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## Report No. 102133872MPK-002

**Equipment Under Test:****Trade Name:****Model Number:****Serial Numbers:**

Tile

Tile, Inc.

T1003

Rev1.6-1 (Tx Sample)

Rev1.6-4 (Standby/Rx Sample)

**Applicant:****Contact:****Address:**

Tile, Inc.

Mike Farley

Tile, Inc.

2121 S. El Camino Real, Suite C-100

San Mateo, CA 94403

USA

**Country****Tel. Number:****Email:**

(831) 320-4211

mike@thetileapp.com

**Applicable Regulation:**

FCC Part 15 Subpart C (15.247)

Industry Canada RSS-210 Issue 8, Annex 8

FCC Part 15, Subpart B

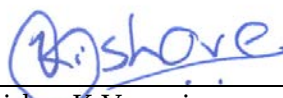
Industry Canada ICES-003

**Date of Test:**

May 13 to 22, 2015

*We attest to the accuracy of this report:*

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Aaron Chang  
Project Engineer

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Krishna K Vemuri  
EMC Senior Staff Engineer

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## 1.0 Summary of Tests

| Test                                          | Reference<br>FCC          | Reference<br>Industry Canada | Result                         |
|-----------------------------------------------|---------------------------|------------------------------|--------------------------------|
| <b>Radiated Emissions</b>                     | 15.109                    | ICES-003                     | Complies                       |
| <b>AC Line Conducted Emission</b>             | 15.107                    | ICES-003                     | Not applicable <sup>1</sup>    |
| <b>RF Output Power</b>                        | 15.247(b)(3)              | RSS-210, A8.4                | Complies                       |
| <b>Out of Band Antenna Conducted Emission</b> | 15.247(d)                 | RSS-210, A8.5                | Complies                       |
| <b>Transmitter Radiated Emissions</b>         | 15.247(d), 15.209, 15.205 | RSS-210, A8.5                | Complies                       |
| <b>AC Line Conducted Emission</b>             | 15.207                    | RSS-GEN                      | Not applicable <sup>1</sup>    |
| <b>Antenna Requirement</b>                    | 15.203                    | RSS-GEN                      | Complies<br>(Internal Antenna) |
| <b>RF Exposure</b>                            | 15.247(i), 2.1093(d)      | RSS-102                      | Complies *                     |

<sup>1</sup> EUT is battery powered only & not rechargeable.

\* Compliance with the SAR requirements is considered without testing because the RF power of channel is below SAR Test Exclusion Threshold. The SAR Test Exclusion Threshold (TET in mW) was calculated according to the KDB 447498, sec 4.3.1.1) using formula:

$$TET = 3 \times d / \sqrt{f_{(GHz)}}$$

where d = 5 mm – is the minimum test separation distance. At f = 2.45 GHz, TET = 9.6 mW (10 mW if rounded).

**EUT receive date:** May 13, 2015

**EUT receive condition:** The pre-production version of the EUT was received in good condition with no apparent damage. As declared by the Applicant, it is identical to the production units.

**Test start date:** May 13, 2015

**Test completion date:** May 22, 2015

The test results in this report pertain only to the item tested.

## 2.0 General Information

### 2.1 Product Description

Equipment under Test (EUT) is the Tile, Model T1003. As described by the manufacturer, Tile is intended to be used on a variety of items in order to track them using a smartphone enabled with Bluetooth Low Energy technology. Description of product as it is marketed as “Tile Bluetooth Location Finder -The World’s Largest Lost & Found”.

Information about the 2.4GHz radio is presented below:

|                                     |                                                                               |
|-------------------------------------|-------------------------------------------------------------------------------|
| <b>Applicant</b>                    | Tile, Inc.                                                                    |
| <b>Model No.</b>                    | T1003                                                                         |
| <b>FCC Identifier</b>               | 2ABXLT1002                                                                    |
| <b>IC Identifier</b>                | 11858A-T1002                                                                  |
| <b>IEEE Reference standard</b>      | 802.15.1 Bluetooth Low Energy (LE)                                            |
| <b>Type of transmission</b>         | Direct Sequence Spread Spectrum (DSSS)                                        |
| <b>Modes</b>                        | Single mode (Classic Bluetooth mode is not supported)                         |
| <b>Rated RF Output</b>              | -3.16 dBm (0.483 mW)                                                          |
| <b>Frequency Range</b>              | 2402 – 2480 MHz                                                               |
| <b>Type of modulation/data rate</b> | GFSK / 1Mbps                                                                  |
| <b>Number of Channel(s)</b>         | 40 (from 0 to 39)                                                             |
| <b>Duty Cycle (during testing)</b>  | >98%                                                                          |
| <b>Antenna(s) &amp; Gain</b>        | Meandering inverted F PCB antenna, Gain: 0 dBi                                |
| <b>Applicant Name &amp; Address</b> | Tile, Inc.<br>2121 S. El Camino Real, Suite C-100<br>San Mateo, CA 94403, USA |

## 2.2 Related Submittal(s) Grants

None.

## 2.3 Test Facility

The test site used to collect the radiated data is site 1 (10-m semi-anechoic chamber). This test facility and site measurement data have been fully placed on file with the FCC, IC and A2LA accredited.

## 2.4 Test Methodology

Antenna conducted measurements were performed according to the FCC documents “Guidance for Performing Compliance Measurement on Digital Transmission Systems (DTS) Operating under §15.247” (KDB 558074), and RSS-210, RSS-GEN, and

Radiated emissions and AC mains conducted emissions measurements were performed according to the procedures in ANSI C63.10. Radiated tests were performed at an antenna to EUT distance of 3 meters, unless stated otherwise in the "Data Sheet" of this report.

## 2.5 Measurement Uncertainty

Compliance with the limits was based on the results of the measurements and doesn't take into account the measurement uncertainty.

Estimated Measurement Uncertainty

| Measurement                                    | Expanded Uncertainty (k=2) |                 |           |
|------------------------------------------------|----------------------------|-----------------|-----------|
|                                                | 0.15 MHz – 1 GHz           | 1 GHz – 2.5 GHz | > 2.5 GHz |
| RF Power and Power Density – antenna conducted | -                          | 0.7 dB          | -         |
| Unwanted emissions - antenna conducted         | 1.1 dB                     | 1.3 dB          | 1.9 dB    |
| Bandwidth – antenna conducted                  | -                          | 30 Hz           | -         |
| Radiated emissions                             | 4.2 dB                     | 3.4 dB          | 4.4 dB    |
| AC mains conducted emissions                   | 2.4 dB                     | -               | -         |

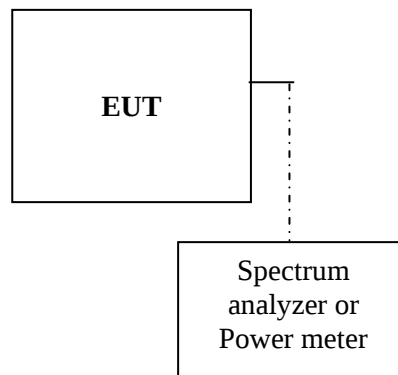
## 3.0 System Test Configuration

### 3.1 Support Equipment

EUT was tested as a standalone device. No Support equipment is used in test setup.

### 3.2 Block Diagram of Test Setup

Antenna was removed and co-axial connector with a cable was installed for Conducted Measurements.  
Internal antenna was used for Radiated Measurements.



**S** = Shielded  
**U** = Unshielded

**F** = With Ferrite  
**m** = Length in Meters

### 3.3 Justification

For radiated emission measurements the EUT is placed on a non-conductive table. The EUT is programmed to transmit full power.

The model: T1002 was previously evaluated by Intertek to the standards: FCC 15.247, FCC 15B, RSS-210 & ICES-003 under Intertek Report # 101867573MPK-002 (FCC ID: 2ABXLT1002, IC: 11858A-T1002) for the operating frequency range: 2402 to 2480 MHz.

As declared by the applicant, the model: T1003 is identical to the previously approved model: T1002 in respect to RF circuitry and RF components. The only difference between T1003 and T1002 is digital parts circuitry of audio amplifier and over all PCB layout. Therefore, a Class II Permissive Change was performed to show compliance for T1003: RF Output Power, Out of Band Antenna Conducted Emission, Radiated Spurious Emissions and Digital parts emissions.

### 3.4 Software Exercise Program

The EUT exercise program used during radiated and conducted testing was provided by Tile, Inc.

### 3.5 Mode of Operation during Test

During transmitter testing, the transmitter was setup to transmit at maximum RF power on low, middle and high frequencies/channels.

### 3.5 Modifications Required for Compliance

Intertek installed no modifications during compliance testing in order to bring the product into compliance.

### 3.6 Additions, Deviations and Exclusions from Standards

No additions, deviations or exclusions from the standard were made.

## 4.0 Measurement Results

### 4.1 Maximum Peak Conducted Output Power at Antenna Terminals FCC Rule: 15.247(b)(3); RSS-210 A8.4;

#### 4.1.1 Requirement

For antennas with gains of 6 dBi or less, maximum allowed transmitter output is 1 watt or 30 dBm.  
For antennas with gains greater than 6 dBi, transmitter output level must be decreased appropriately, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

#### 4.1.2 Procedure

The procedure described in FCC Publication 558074 D01 DTS Meas Guidance v03r02 June 5, 2014 was used. Specifically, section 9.1.1 RBW  $\geq$  DTS Bandwidth was utilized as the spectrum analyzer's resolution bandwidth was greater than the DTS bandwidth.

1. Set the RBW  $\geq$  DTS Bandwidth
2. Set the VBW  $\geq 3 \times$  RBW
3. Set the span  $\geq 3 \times$  RBW
4. Detector = Peak
5. Sweep time = Auto couple
6. Trace mode = Max Hold
7. Allow trace to fully stabilize
8. Use peak marker function to determine the peak amplitude level.

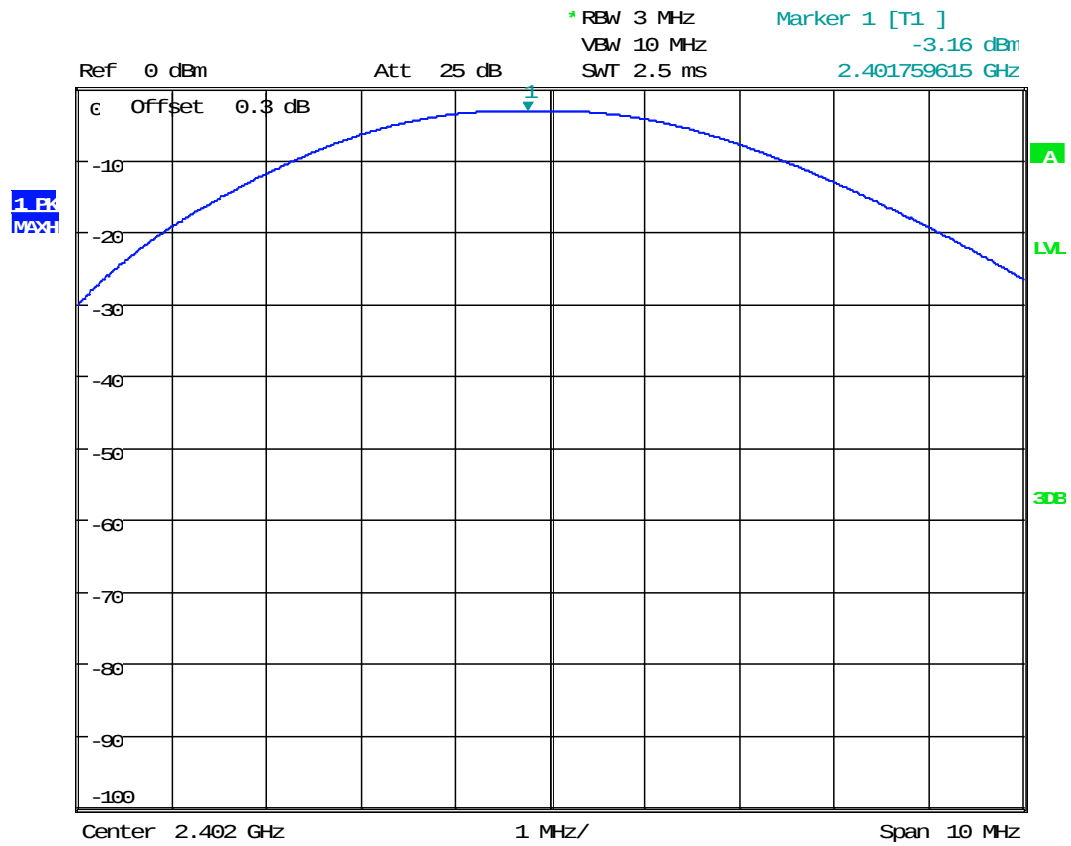
#### 4.1.3 Test Result

Refer to the following plots 2.1 – 2.3 for the test details.

| Frequency,<br>MHz | Conducted Power<br>(peak),<br>dBm | Conducted Power (peak),<br>mW | Plot |
|-------------------|-----------------------------------|-------------------------------|------|
| 2402              | -3.16                             | 0.483                         | 2.1  |
| 2434              | -3.18                             | 0.481                         | 2.2  |
| 2480              | -3.34                             | 0.463                         | 2.3  |

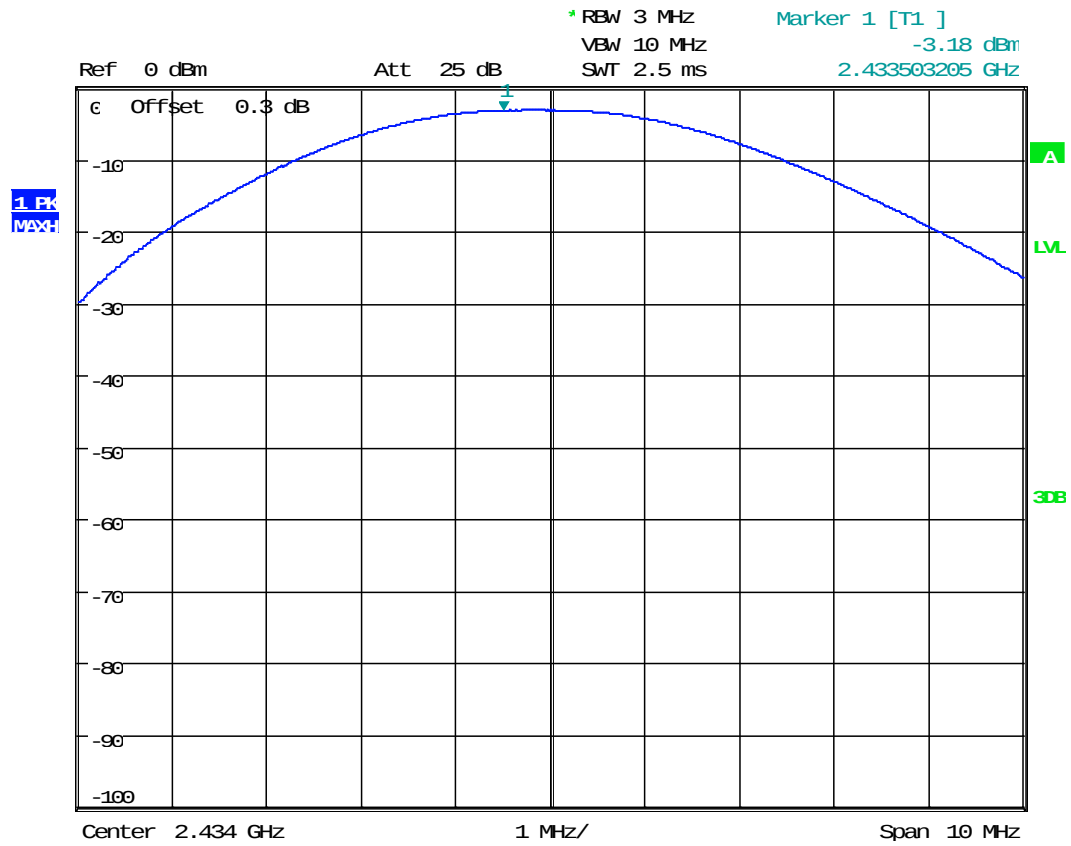
|                |                 |
|----------------|-----------------|
| <b>Results</b> | <b>Complies</b> |
|----------------|-----------------|

Plot 2. 1



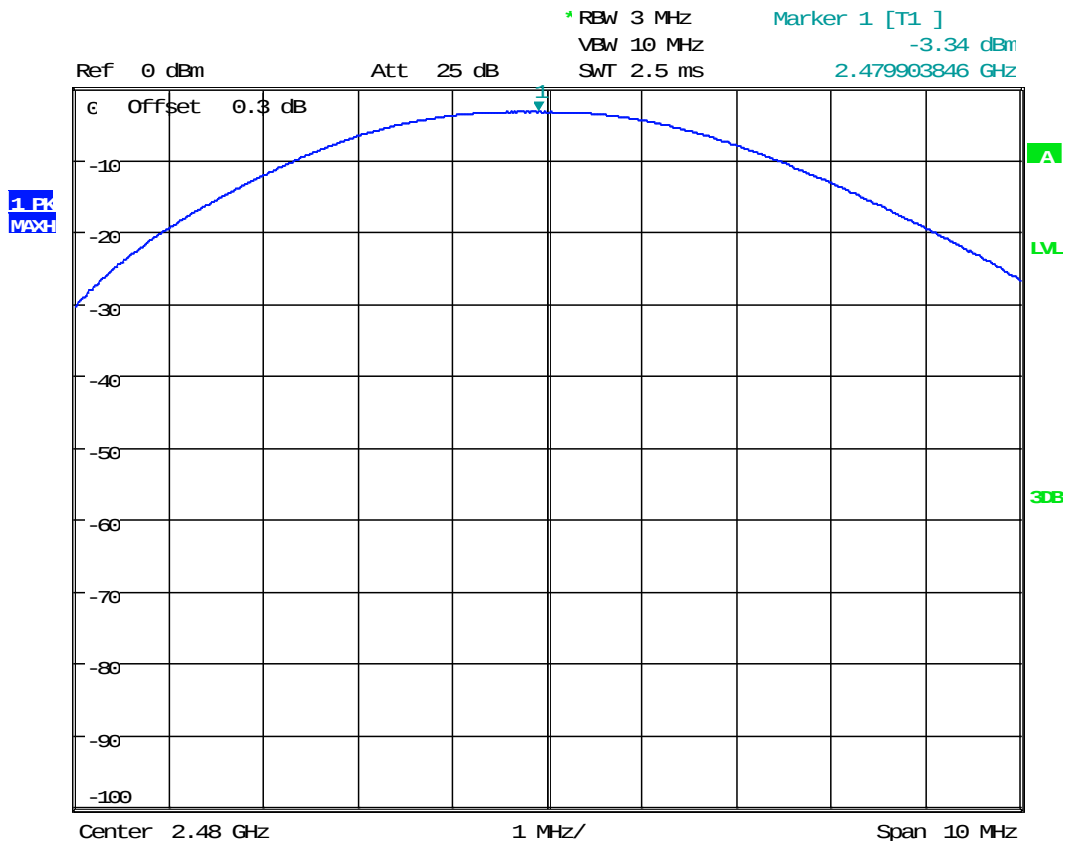
Date: 19.MAY.2015 14:41:46

Plot 2. 2



Date: 19.MAY.2015 14:42:54

Plot 2.3



Date: 19.MAY.2015 14:44:05

## 4.2 Unwanted Conducted Emissions

FCC: 15.247(d); RSS-210 A8.5;

### 4.2.1 Requirement

In any 100 kHz bandwidth outside the EUT pass-band, the RF power shall be below the maximum in-band 100 kHz emissions by at least 20 dB (if peak power of in-band emission is measured) or 30 dB (if average power of in-band emission is measured).

In addition, radiated emissions which fall in the restricted bands, as defined in § 15.205(a), must also comply with the radiated emission limits specified in § 15.209(a)

### 4.2.2 Procedure

The procedure described in FCC Publication 558074 D01 DTS Meas Guidance v03r02 June 5, 2014, specifically section 11.0 Emissions in non-restricted frequency bands.

A spectrum analyzer was connected to the antenna port of the transmitter.

1. Set the RBW = 100 kHz.
2. Set the VBW  $\geq 3 \times$  RBW.
3. Detector = peak.
4. Sweep time = auto couple.
5. Trace mode = max hold.
6. Allow trace to fully stabilize.
7. Use the peak marker function to determine the maximum amplitude level.

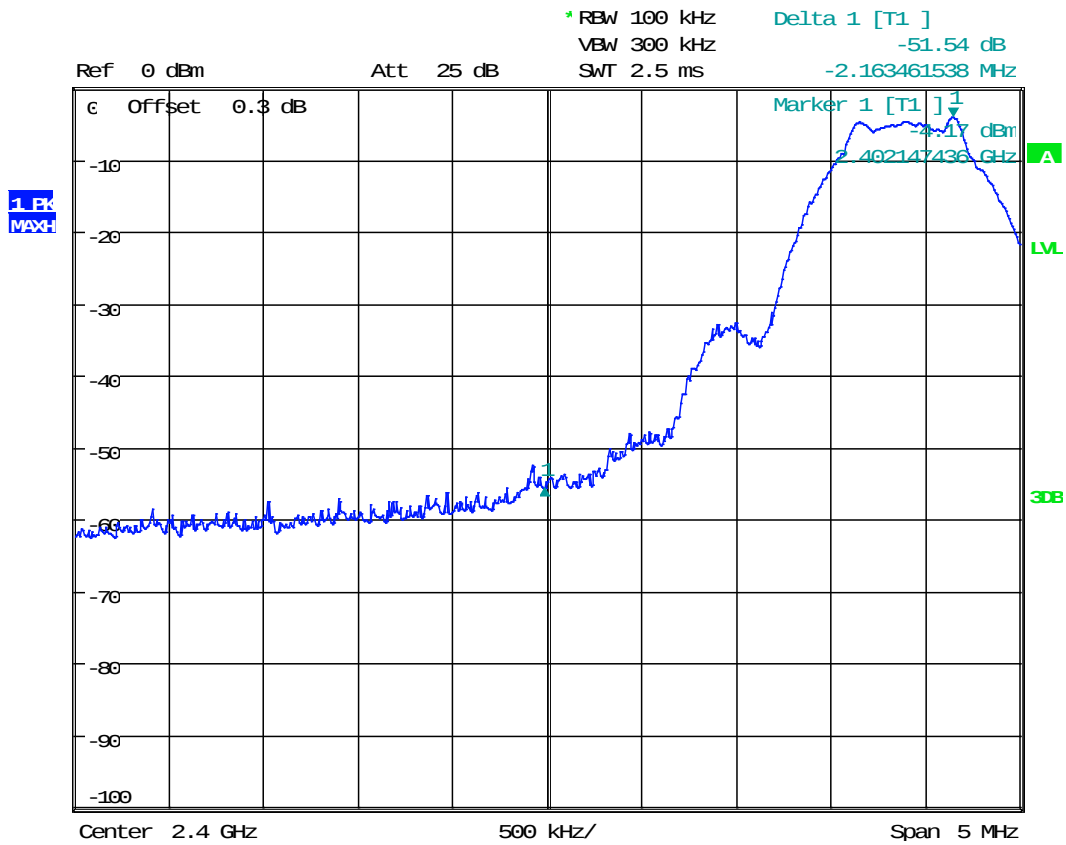
The unwanted emissions were measured from 30 MHz to 25 GHz. Plots below are corrected for cable loss and then compared to the limits.

### 4.2.3 Test Result

|                |                 |
|----------------|-----------------|
| <b>Results</b> | <b>Complies</b> |
|----------------|-----------------|

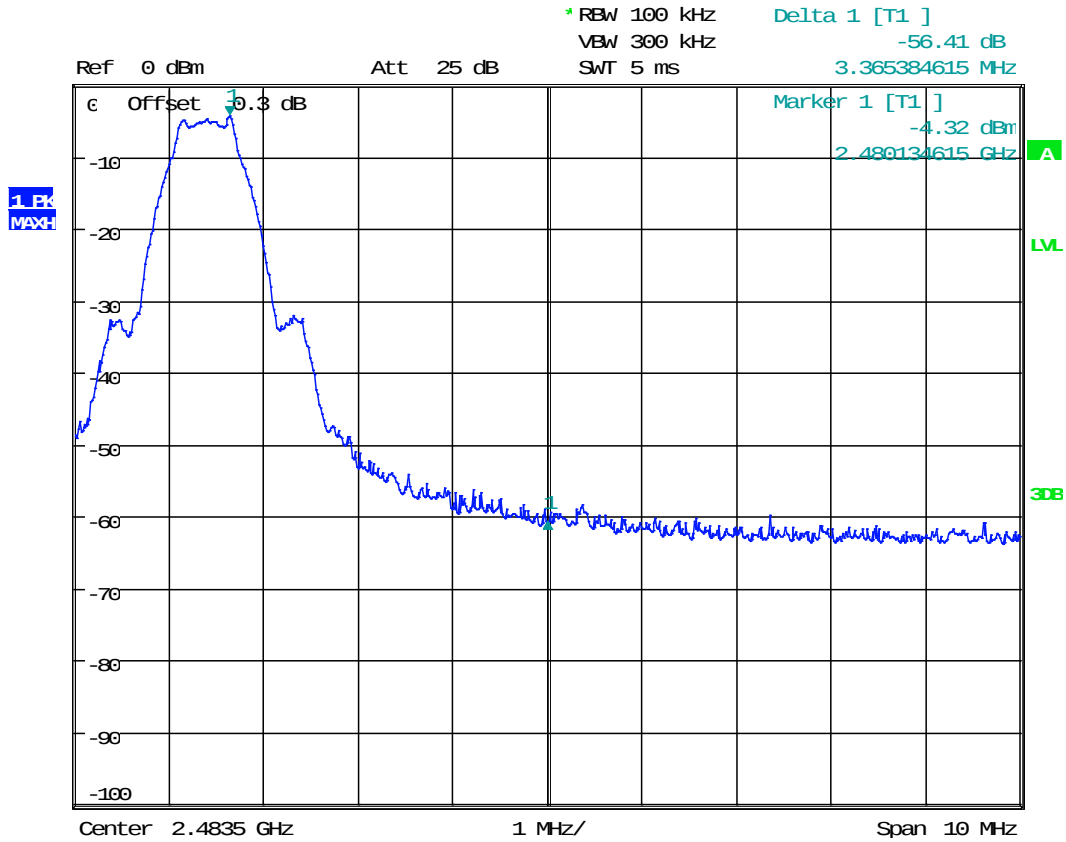
See plots below for details.

Tx @ Low Channel, 2400 MHz Band Edge



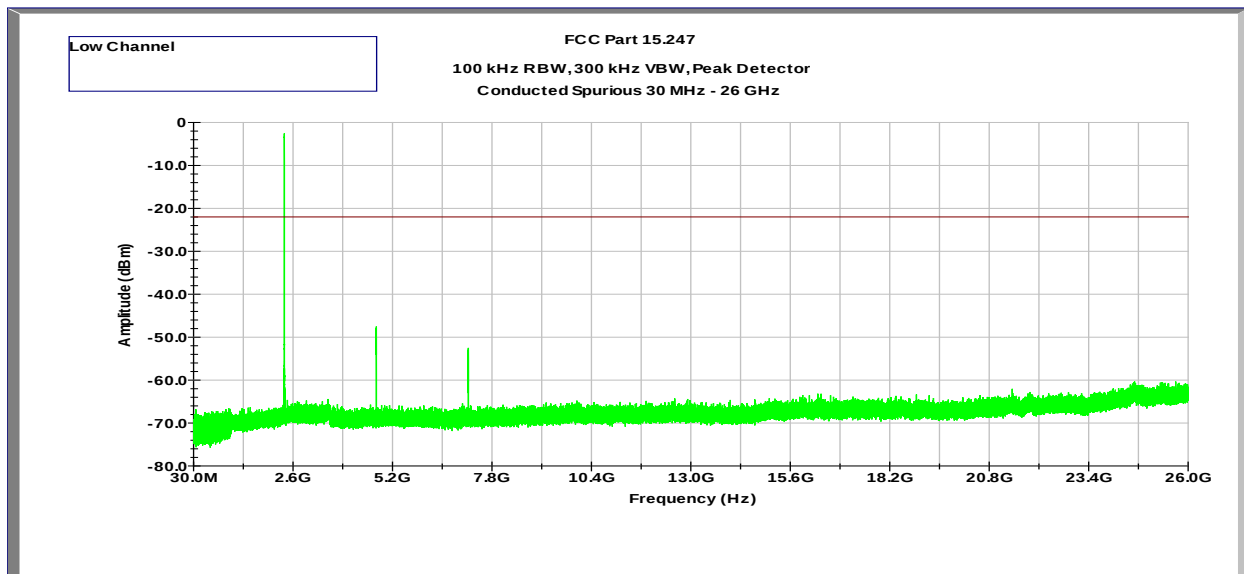
Date: 19.MAY.2015 15:02:51

Tx @ High Channel, 2483.5 MHz Band Edge

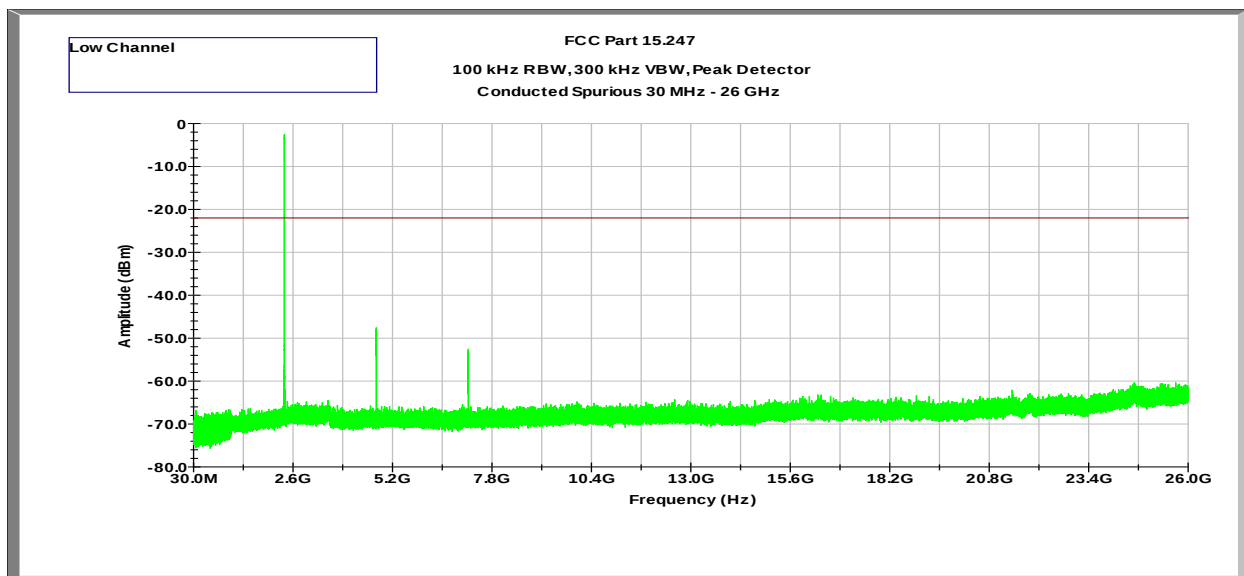


Date: 19.MAY.2015 15:04:58

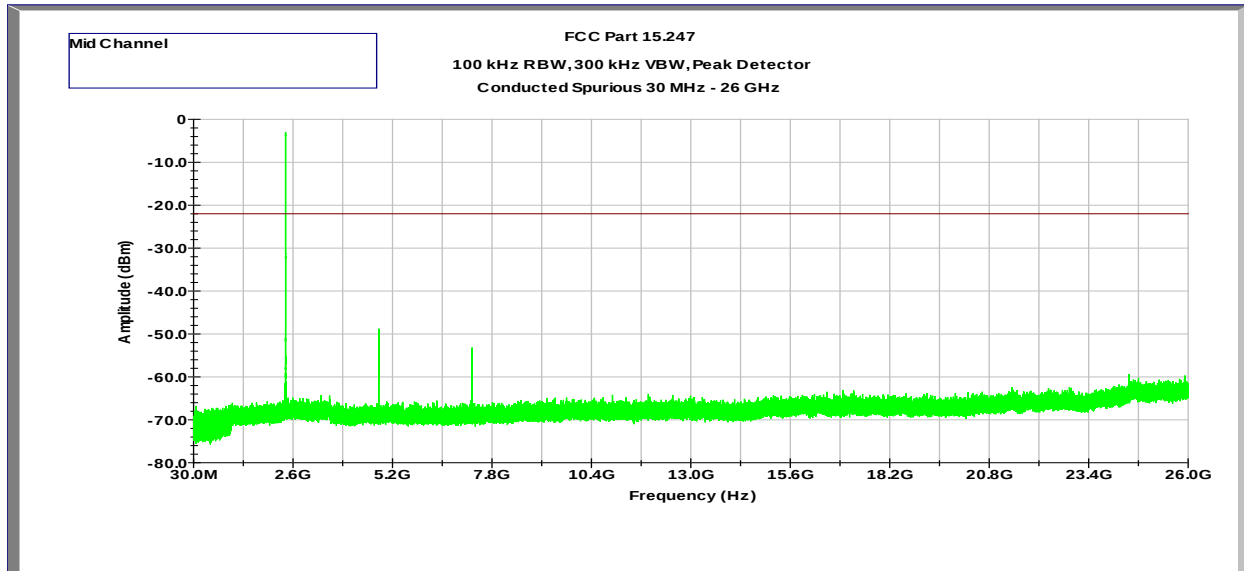
Conducted Spurious Emissions, Tx @ Low Channel, 2402 MHz



Conducted Spurious Emissions, Tx @ Middle Channel, 2434 MHz



Conducted Spurious Emissions, Tx @ High Channel, 2480 MHz



#### 4.3 Transmitter Radiated Emissions

FCC Rules: 15.247(d), 15.209, 15.205; RSS-210;

##### 4.3.1 Requirement

Radiated emissions which fall in the restricted bands, as defined in §15.205(a), must comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

In any 100 kHz bandwidth outside the EUT pass-band, the RF power shall be below the maximum in-band 100 kHz emissions by at least 20 dB (if peak power of in-band emission is measured) or 30 dB (if average power of in-band emission is measured).

##### 4.3.2 Procedure

Radiated emission measurements were performed from 30 MHz to 25 GHz according to the procedure described in ANSI C64.10. Spectrum Analyzer Resolution Bandwidth is 100 kHz or greater for frequencies 30 MHz to 1000 MHz, 1 MHz for frequencies above 1000 MHz. Above 1000 MHz Peak and Average measurements were performed.

The EUT is placed on a plastic turntable that is 80 cm (or 150 cm) in height. If the EUT attaches to peripherals, they are connected and operational (as typical as possible). During testing, all cables were manipulated to produce worst-case emissions. The signal is maximized through rotation. The antenna height and polarization are varied during the search for maximum signal level. The antenna height is varied from 1 to 4 meters.

Radiated emissions are taken at 10 meters for frequencies below 1 GHz and at 3 meters for frequencies above 1 GHz, and 1 meter for radiated band edge testing.

Data included is representative of the worst-case configuration (the configuration which resulted in the highest emission levels). Plots below are corrected for distance, cables, preamp, filters and antenna factors then compared to the limits.

#### 4.3.3 Field Strength Calculation

##### Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as follows:

$FS = RA + AF + CF - AG$ ; if measurement is performed at a distance other than specified in the rule, a Distance Correction Factor (DCF) shall be added.

Where FS = Field Strength in dB( $\mu$ V/m)

RA = Receiver Amplitude (including preamplifier) in dB( $\mu$ V); AF = Antenna Factor in dB(1/m)

CF = Cable Attenuation Factor in dB; AG = Amplifier Gain in dB

Assume a receiver reading of 52.0 dB( $\mu$ V) is obtained. The antennas factor of 7.4 dB(1/m) and cable factor of 1.6 dB is added. The amplifier gain of 29 dB is subtracted, giving field strength of 32 dB( $\mu$ V/m). This value in dB( $\mu$ V/m) was converted to its corresponding level in  $\mu$ V/m.

RA = 52.0 dB( $\mu$ V)

AF = 7.4 dB(1/m)

CF = 1.6 dB

AG = 29.0 dB

$FS = 52.0 + 7.4 + 1.6 - 29.0 = 32$  dB( $\mu$ V/m).

Level in  $\mu$ V/m = Common Antilogarithm  $[(32 \text{ dB}\mu\text{V/m})/20] = 39.8 \mu\text{V/m}$ .

#### 4.3.4 Test Results

The data on the following pages list the significant emission frequencies, the limit and the margin of compliance.

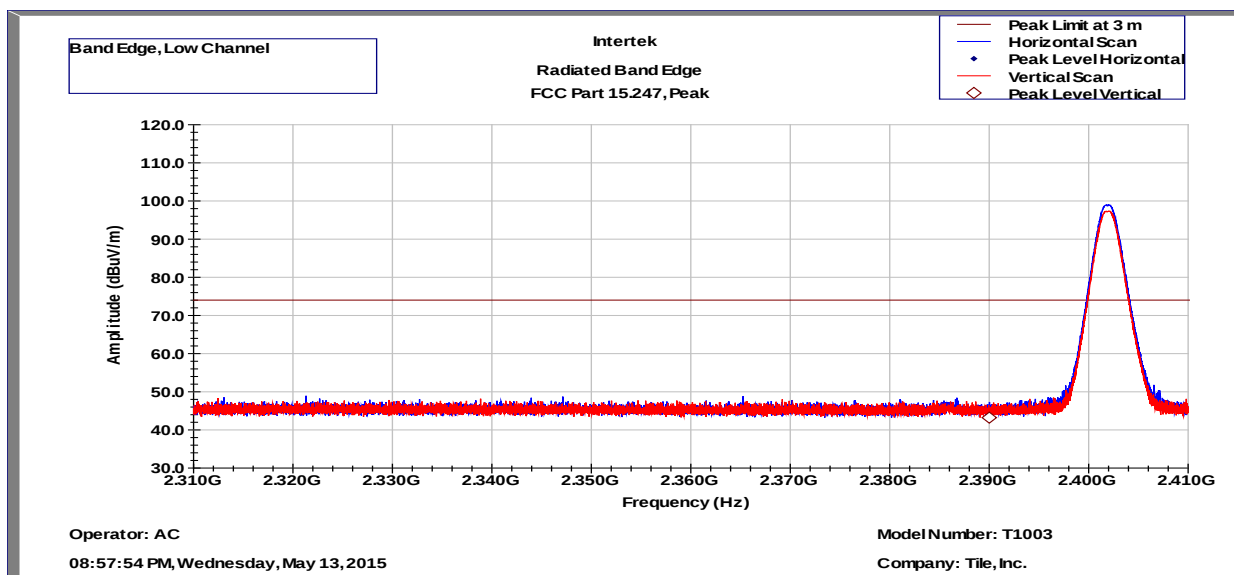
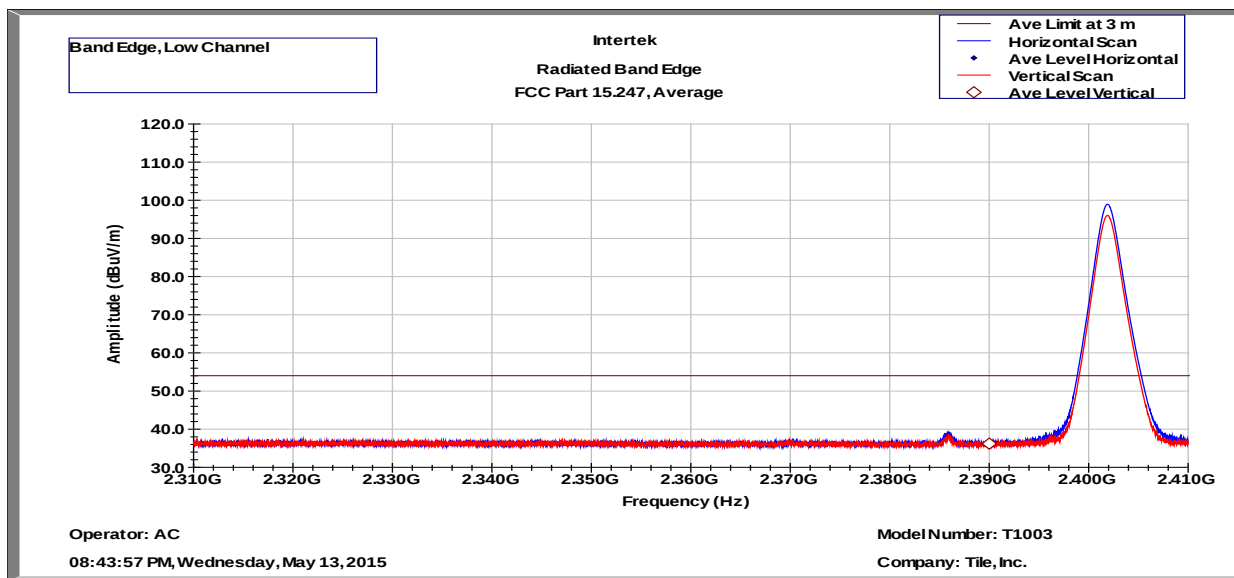
Radiated emission measurements were performed up to 25GHz. Peak emissions that were identified were measured to be greater than 20dB below 74dB $\mu$ V peak limits. No Emissions were identified when scanned from 18-25 GHz.

|                |                           |
|----------------|---------------------------|
| <b>Results</b> | <b>Complies by 0.1dB*</b> |
|----------------|---------------------------|

See plots below for details.

Test Results: 15.209/15.205 Restricted Band Emissions

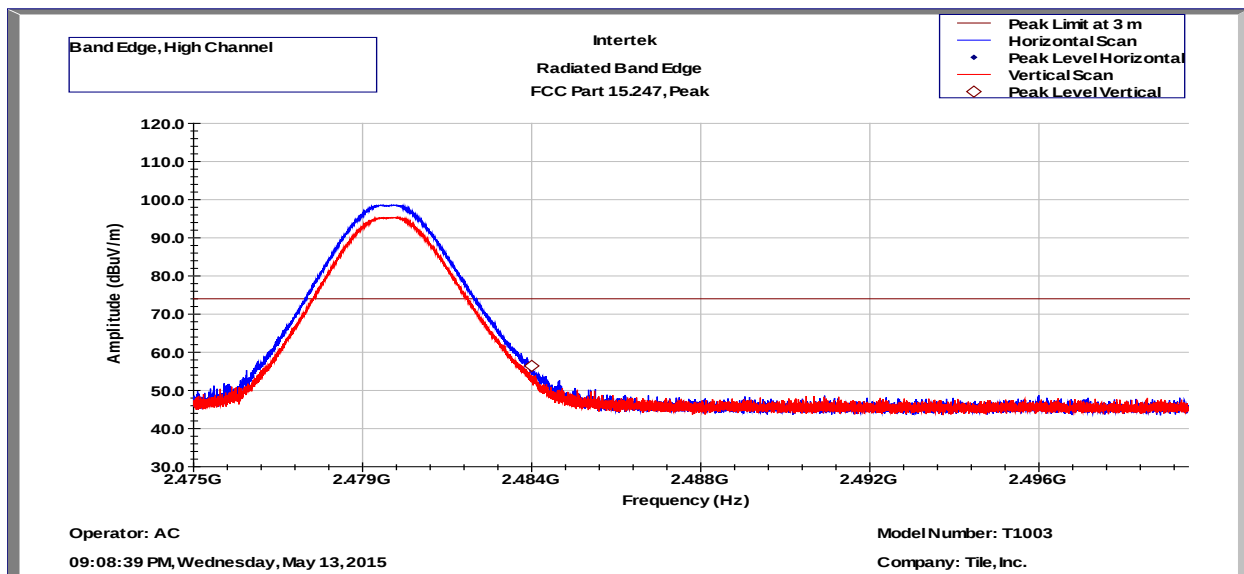
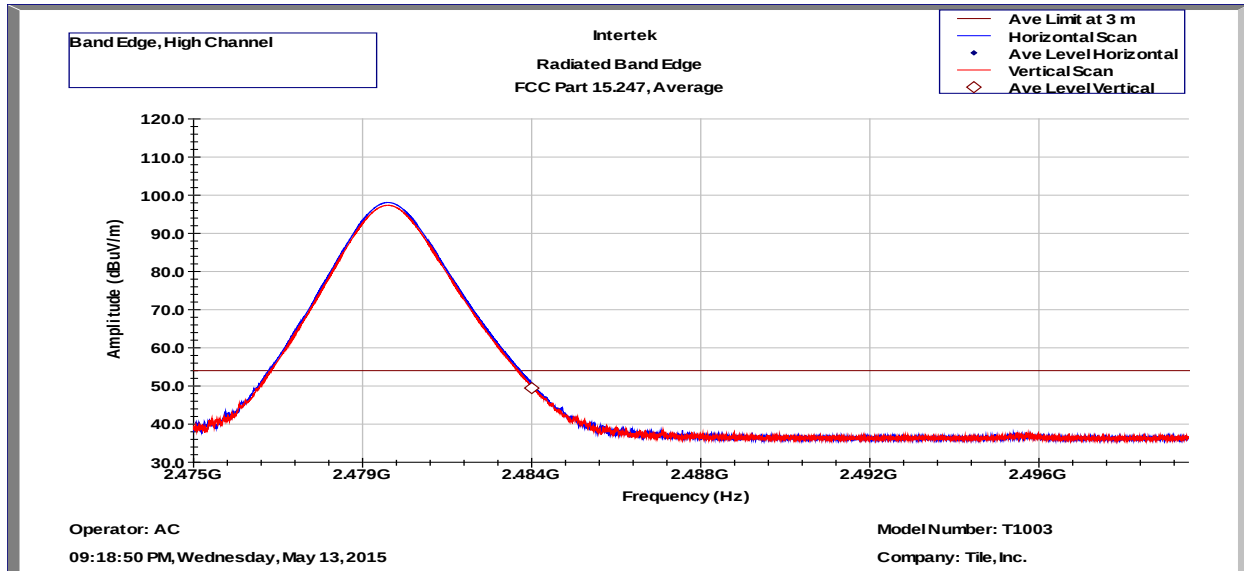
### Out-of-Band Radiated spurious emissions at the Band-edge 2310–2390 MHz



Results

Complies

## Out-of-Band Radiated spurious emissions at the Band-edge 2483.5–2500 MHz

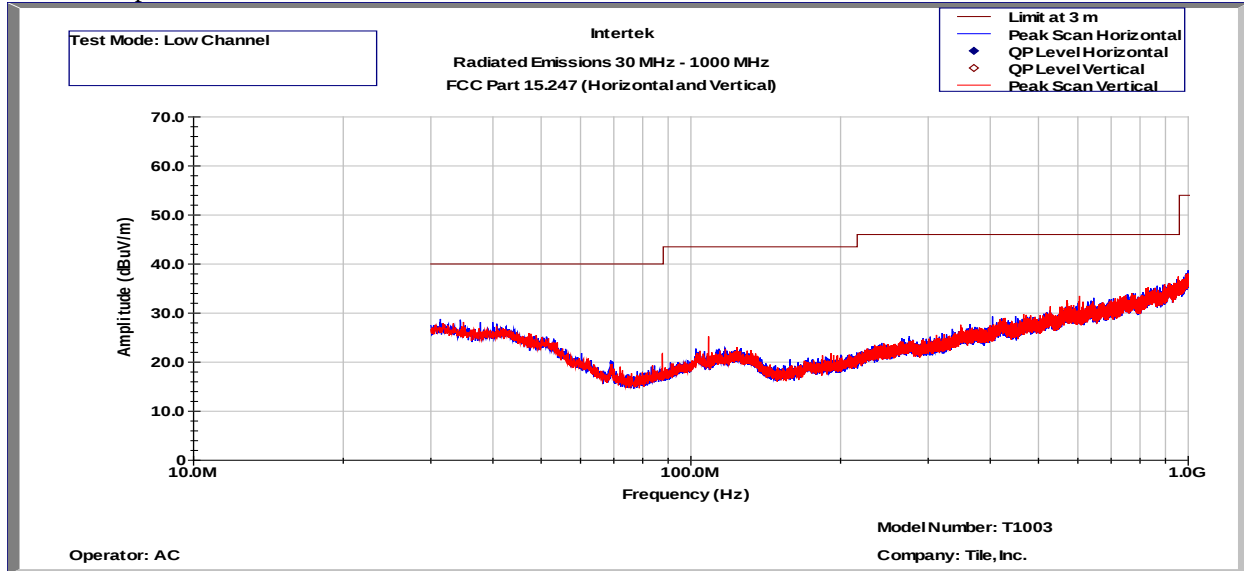


**Results**

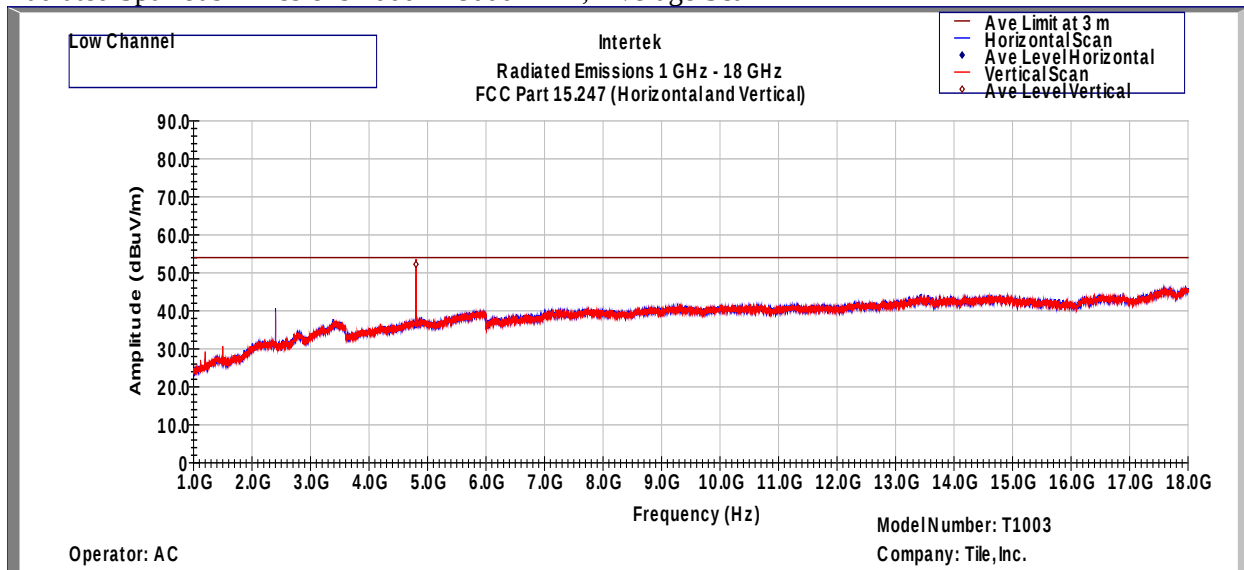
**Complies**

Test Results: 15.209 Radiated Spurious Emissions Low Channel, Tx at 2402MHz

### Radiated Spurious Emissions 30 MHz - 1000 MHz

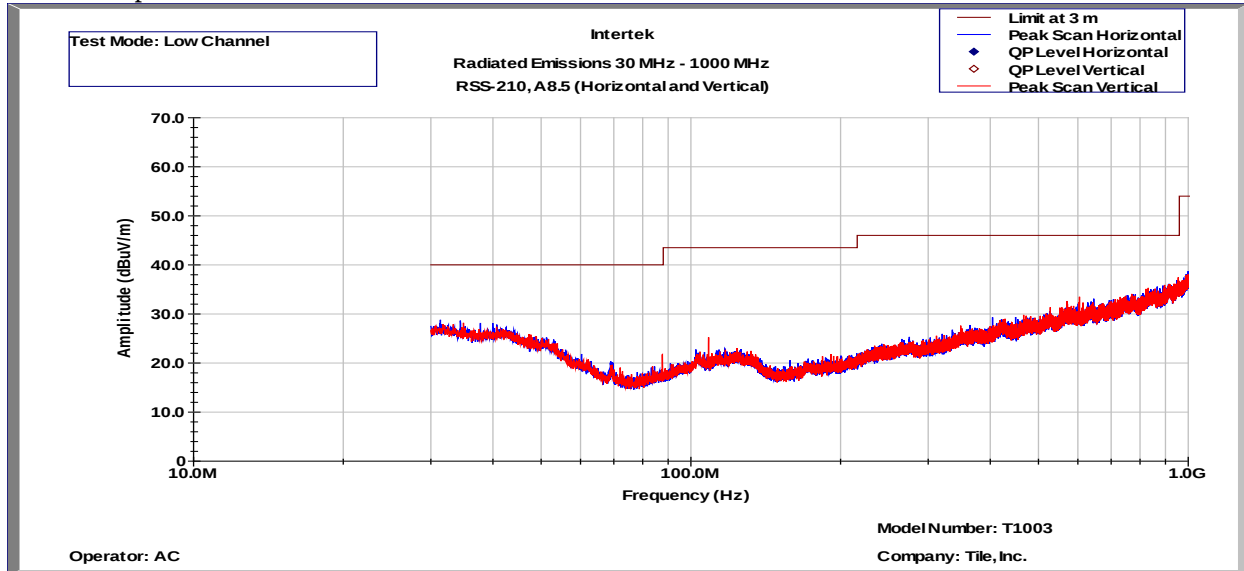


### Radiated Spurious Emissions 1000 - 18000 MHz, Average Scan

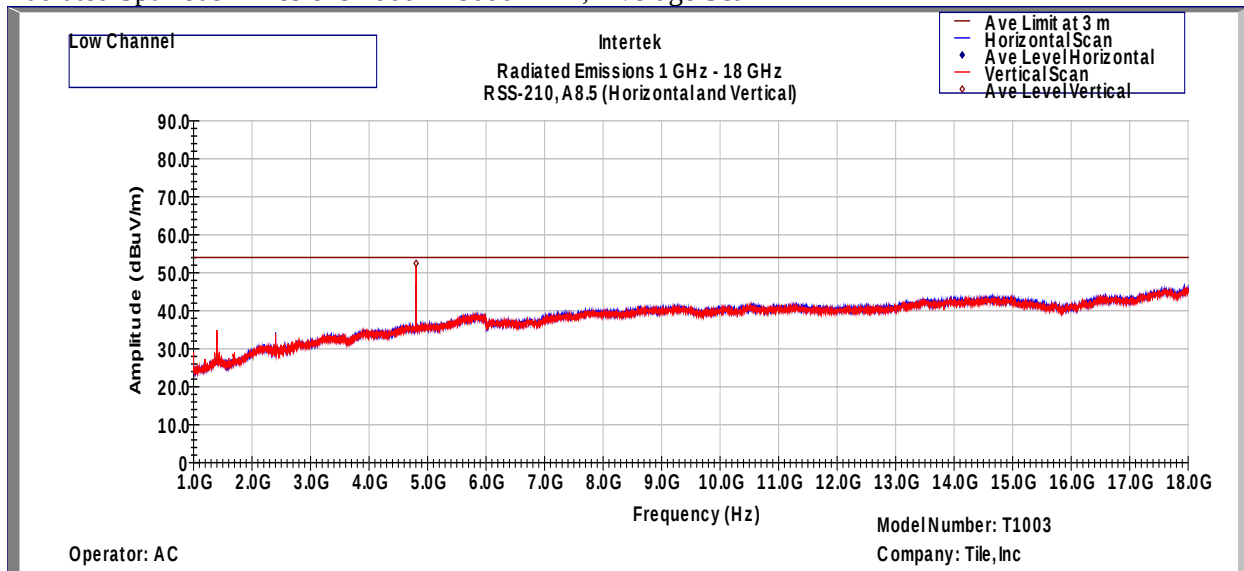


| Frequency | Ave Level | Ave Limit@3m | Margin | Raw    | Cable | Preamp | AF      |
|-----------|-----------|--------------|--------|--------|-------|--------|---------|
| MHz       | (dBuV/m)  | (dBuV/m)     | (dB)   | (dBuV) | (dB)  | (dB)   | dB(1/m) |
| 4804      | 52.2      | 54           | -1.8   | 46.6   | 4.8   | 34.4   | 32.5    |

## Radiated Spurious Emissions 30 MHz - 1000 MHz



## Radiated Spurious Emissions 1000 - 18000 MHz, Average Scan



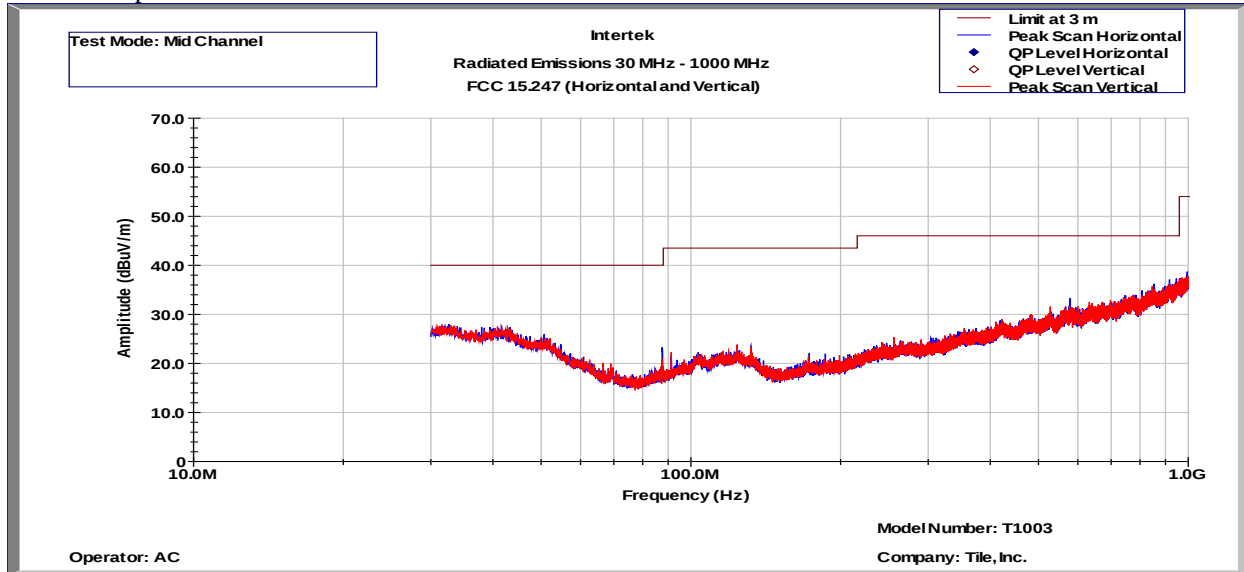
| Frequency | Ave Level | Ave Limit@3m | Margin | Raw    | Cable | Preamp | AF      |
|-----------|-----------|--------------|--------|--------|-------|--------|---------|
| MHz       | (dBuV/m)  | (dBuV/m)     | (dB)   | (dBuV) | (dB)  | (dB)   | dB(1/m) |
| 4804      | 52.4      | 54           | -1.6   | 46.8   | 4.8   | 34.4   | 32.5    |

Results

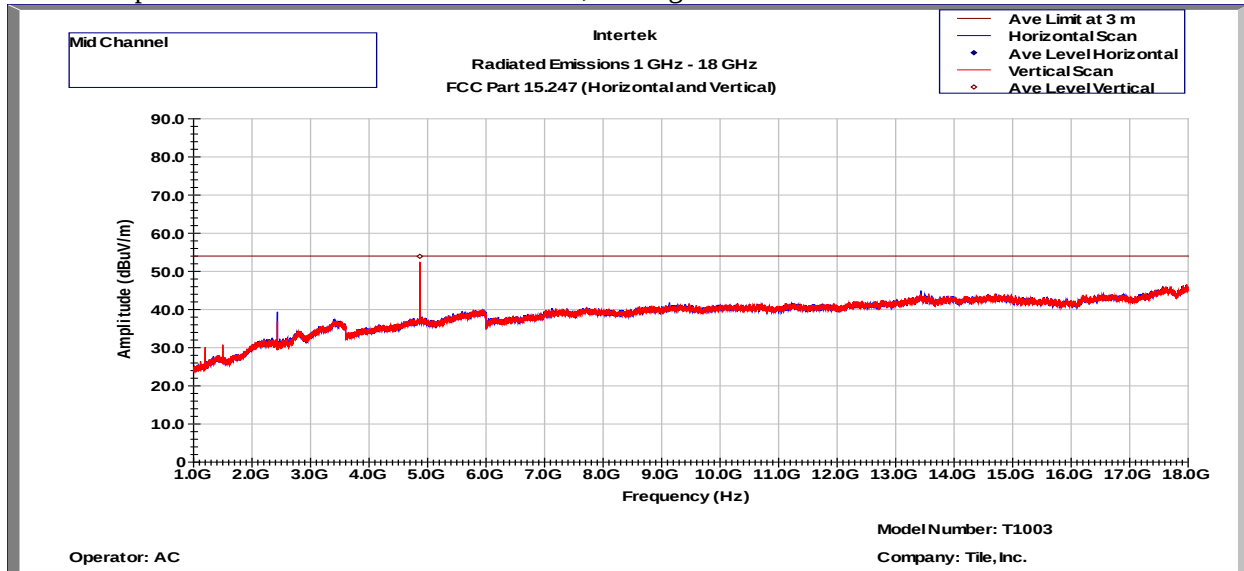
Complies

Test Results: 15.209 Radiated Spurious Emissions Mid Channel, Tx at 2434MHz

## Radiated Spurious Emissions 30 MHz - 1000 MHz



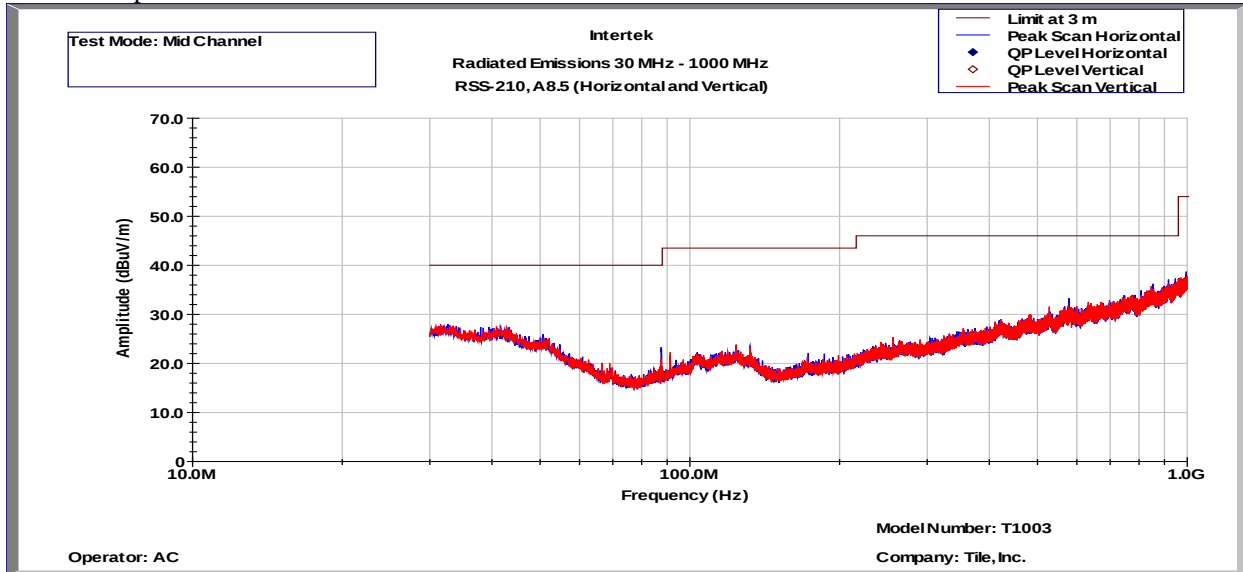
## Radiated Spurious Emissions 1000 - 18000 MHz, Average Scan



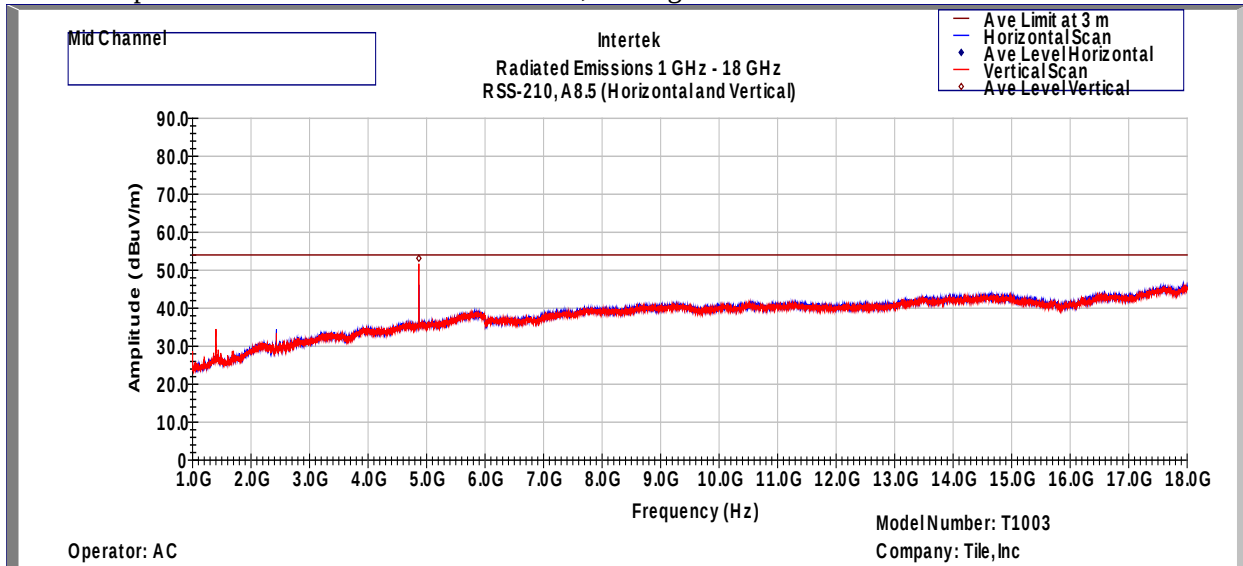
| Frequency | Ave Level | Ave Limit@3m | Margin | Raw    | Cable | Preamp | AF      |
|-----------|-----------|--------------|--------|--------|-------|--------|---------|
| MHz       | (dBuV/m)  | (dBuV/m)     | (dB)   | (dBuV) | (dB)  | (dB)   | dB(1/m) |
| 4868      | 53.9      | 54           | -0.1   | 47.8   | 4.8   | 34.4   | 32.9    |

Test Results: 15.209 Radiated Spurious Emissions Mid Channel, Tx at 2434MHz

## Radiated Spurious Emissions 30 MHz - 1000 MHz



## Radiated Spurious Emissions 1000 - 18000 MHz, Average Scan

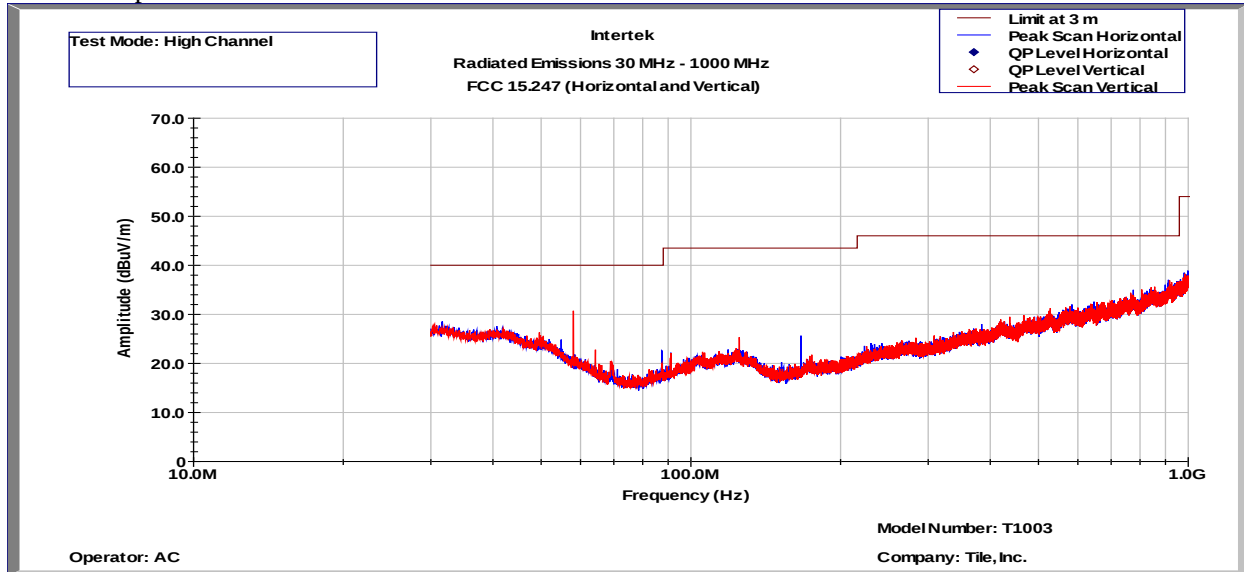


| Frequency | Ave Level | Ave Limit@3m | Margin | Raw    | Cable | Preamp | AF      |
|-----------|-----------|--------------|--------|--------|-------|--------|---------|
| MHz       | (dBuV/m)  | (dBuV/m)     | (dB)   | (dBuV) | (dB)  | (dB)   | dB(1/m) |
| 4868      | 53.1      | 54           | -0.9   | 47     | 4.8   | 34.4   | 32.9    |

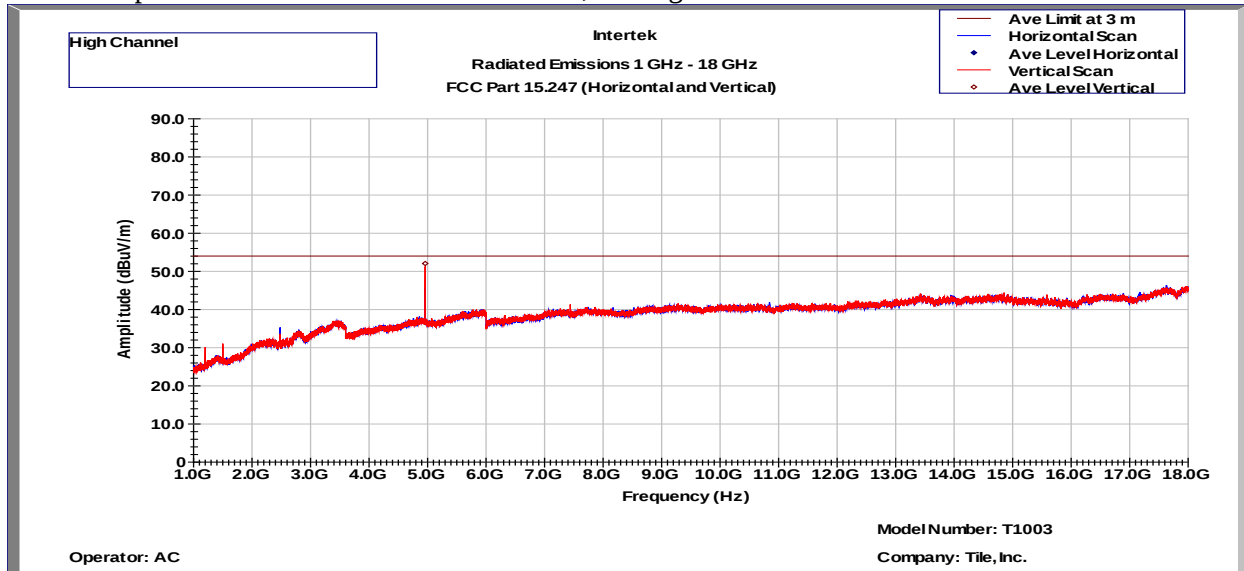
Results ☒ Complies

Test Results: 15.209 Radiated Spurious Emissions High Channel, Tx at 2480MHz

## Radiated Spurious Emissions 30 MHz - 1000 MHz

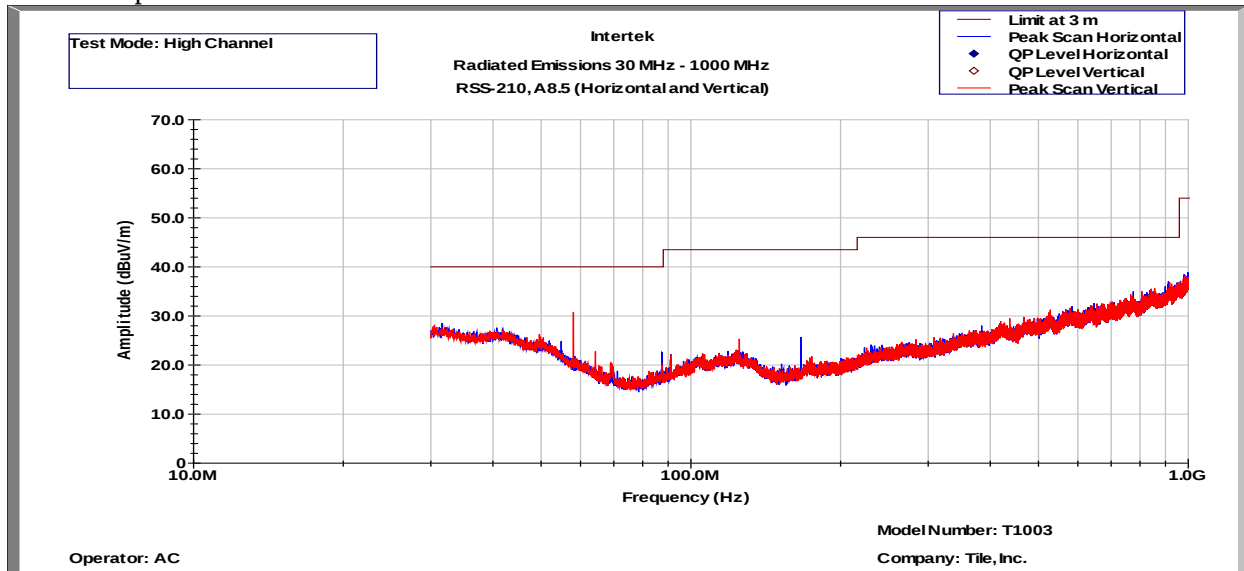


## Radiated Spurious Emissions 1000 - 18000 MHz, Average Scan

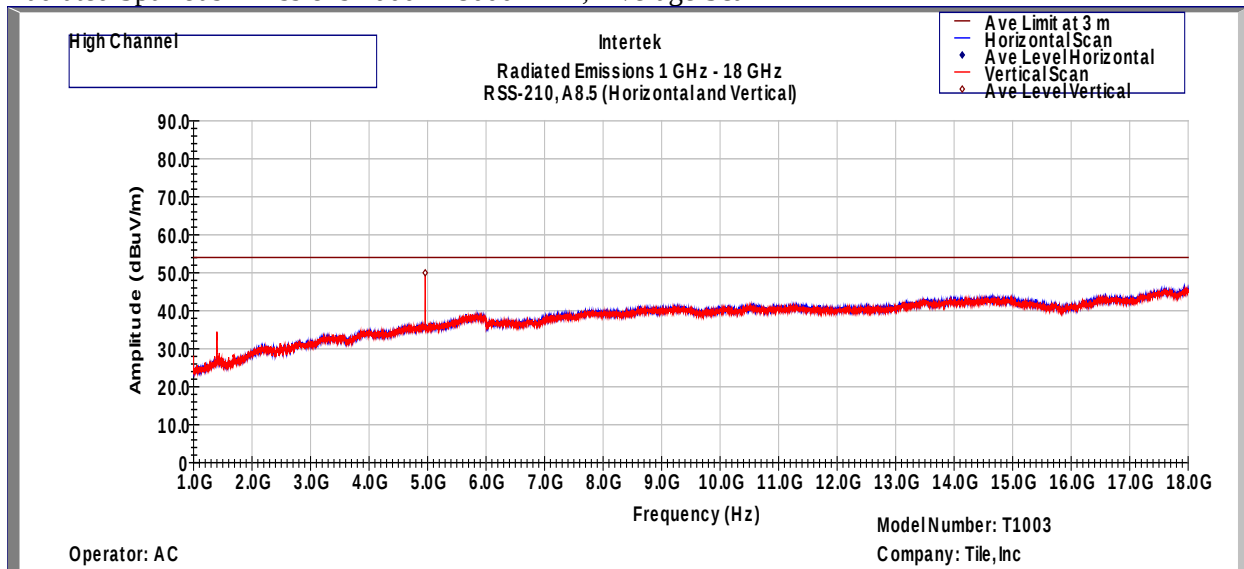


| Frequency | Ave Level | Ave Limit@3m | Margin | Raw    | Cable | Preamp | AF      |
|-----------|-----------|--------------|--------|--------|-------|--------|---------|
| MHz       | (dBuV/m)  | (dBuV/m)     | (dB)   | (dBuV) | (dB)  | (dB)   | dB(1/m) |
| 4960      | 52.1      | 54           | -1.9   | 45.9   | 4.8   | 34.4   | 32.8    |

## Radiated Spurious Emissions 30 MHz - 1000 MHz



## Radiated Spurious Emissions 1000 - 18000 MHz, Average Scan



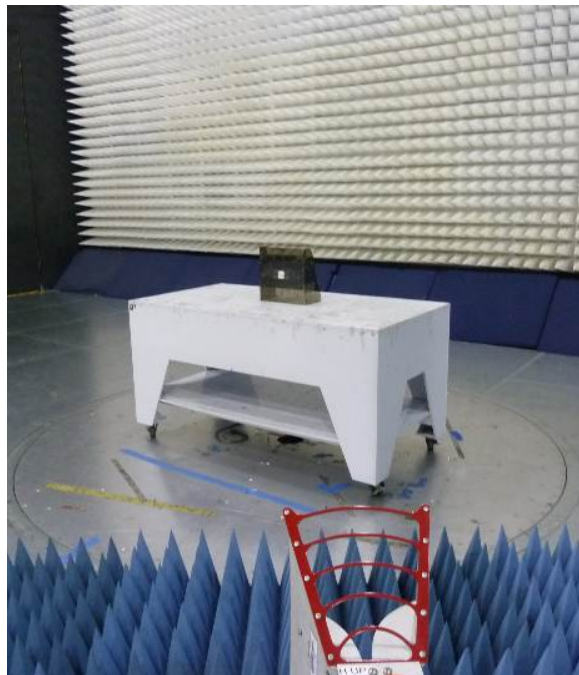
| Frequency | Ave Level | Ave Limit@3m | Margin | Raw    | Cable | Preamplifier | AF      |
|-----------|-----------|--------------|--------|--------|-------|--------------|---------|
| MHz       | (dBuV/m)  | (dBuV/m)     | (dB)   | (dBuV) | (dB)  | (dB)         | dB(1/m) |
| 4960      | 50        | 54           | -4.0   | 43.8   | 4.8   | 34.4         | 32.8    |

Results

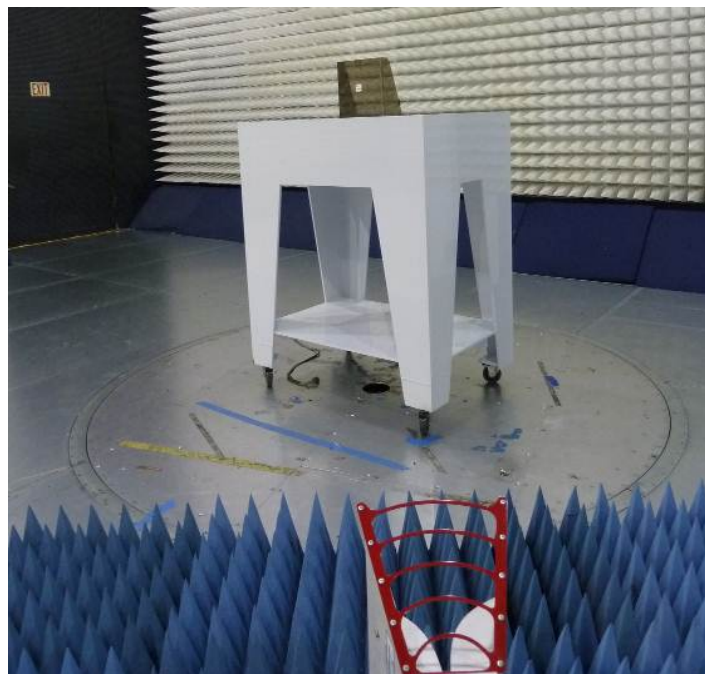
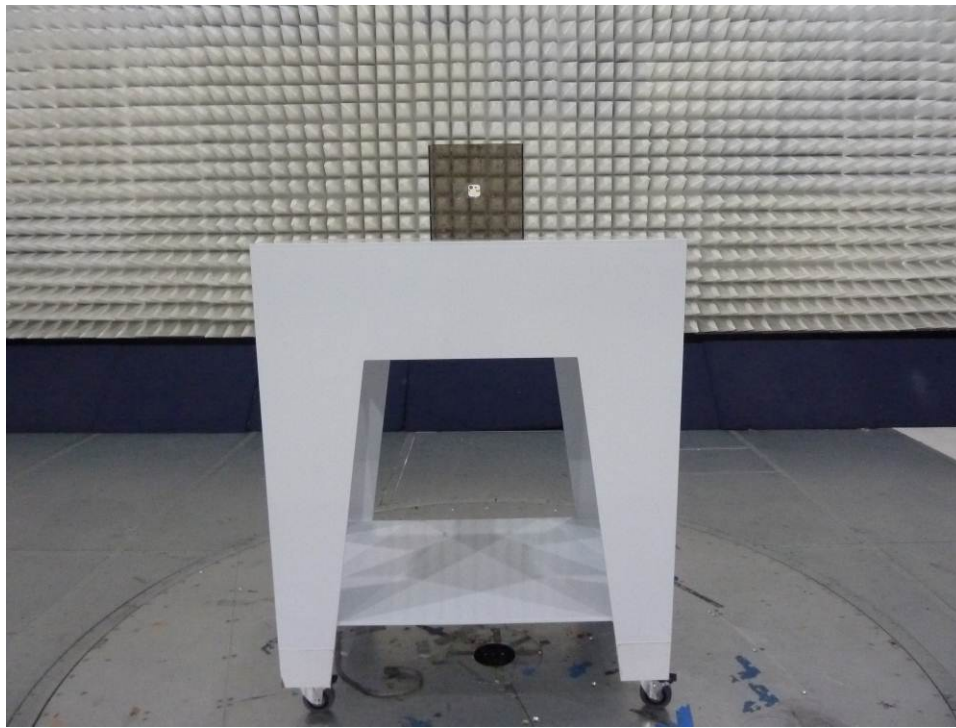
Complies

#### 4.5.4 Test setup photographs

**The following photographs show the testing configurations used.**



4.5.4 Test setup photographs (Continued)



#### 4.4 Radiated Emissions

FCC Ref: 15.109, ICES 003

##### 4.4.1 Requirement

***Limits for Electromagnetic Radiated Emissions FCC Section 15.109(b), ICES 003\*, RSS GEN***

| <b>Frequency<br/>(MHz)</b> | <b>Class A at 10m<br/>dB(μV/m)</b> | <b>Class B at 3m<br/>dB(μV/m)</b> |
|----------------------------|------------------------------------|-----------------------------------|
| 30-88                      | 39                                 | 40.0                              |
| 88-216                     | 43.5                               | 43.5                              |
| 216-960                    | 46.4                               | 46.0                              |
| Above 960                  | 49.5                               | 54.0                              |

\* According to FCC Part 15.109(g) an alternative to the radiated emission limits shown above, digital devices may be shown to comply with the limit of CISPR Pub. 22

#### 4.4.2 Procedures

Measurements are conducted with a quasi-peak detector instrument in the frequency range of 30 MHz to 1000 MHz and with the average detector instrument in the frequency range above 1000 MHz. The measuring receiver meets the requirements of Section One of CISPR 16 and the measuring antenna correlates to a balanced dipole.

Measurements of the radiated field are made with the antenna located at a distance of 10 meters from the EUT. If the field-strength measurements at 10m cannot be made because of high ambient noise level or for other reasons, measurements of Class B equipment may be made at a closer distance, for example 3m. An inverse proportionality factor of 20 dB per decade should be used to normalize the measured data to the specified distance for determining compliance.

The antenna is adjusted between 1m and 4m in height above the ground plane for maximum meter reading at each test frequency.

The antenna-to-EUT azimuth is varied during the measurement to find the maximum field-strength readings.

The antenna-to-EUT polarization (horizontal and vertical) is varied during the measurements to find the maximum field-strength readings.

The EUT, where intended for tabletop use, is placed on a table whose top is 0.8m (or 1.5m) above the ground plane. The table is constructed of non-conductive materials. Its dimensions are 1m by 1.5m, but may be extended for a larger EUT.

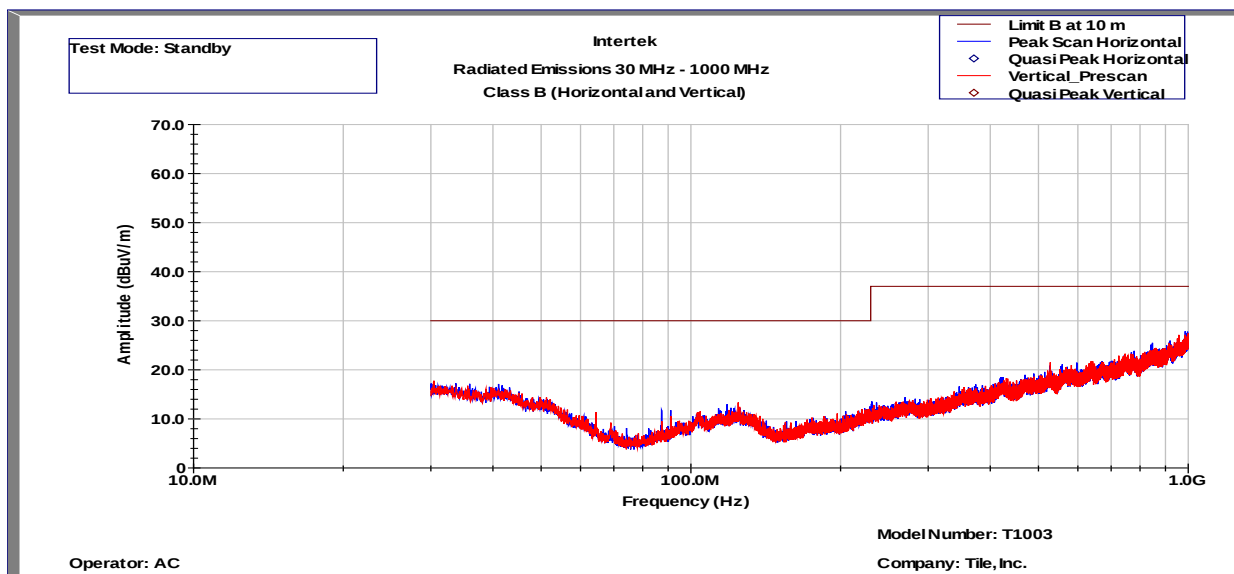
Floor standing EUT are placed on a horizontal metal ground plane and isolated from the ground plane by resting on an insulating material.

Equipment setup for radiated disturbance tests followed the guidelines of ANSI C63.4 and EN 55022.

#### 4.4.3 Test Results

The highest clock frequency used in the EUT is 16 MHz; therefore testing for Radiated Emissions need be tested up to 1 GHz for FCC 15B. Radiated emission measurements were performed from 30 MHz to 1000 MHz. The data on the following pages list the significant emission frequencies, the limit and the margin of compliance.

## Test Results: Radiated Emissions 30 MHz – 1000 MHz



## Radiated Emissions 30 MHz - 1000 MHz

EN55022 Class B

Company: Tile, Inc.

Model Number: Tile

## CISPR Class B (Vertical)

| Frequency | Peak FS  | Limit@10m | Margin | RA     | CF  | AG   | AF      | Azimuth | Height |
|-----------|----------|-----------|--------|--------|-----|------|---------|---------|--------|
| MHz       | dB(uV/m) | dB(uV/m)  | dB     | dB(uV) | dB  | dB   | dB(1/m) | deg     | cm     |
| 30.437    | 17.8     | 30        | -12.2  | 31.3   | 0.6 | 32.1 | 18      | 10.75   | 300    |
| 124.526   | 13.3     | 30        | -16.7  | 32.4   | 1.2 | 32   | 11.8    | 10.75   | 200    |
| 528.143   | 21.5     | 37        | -15.5  | 33     | 2.6 | 32.1 | 18.1    | 348.5   | 100    |

## CISPR Class B (Horizontal)

| Frequency | Peak FS | Limit@10m | Margin | RA     | AG   | AF      | CF  | Azimuth | Height |
|-----------|---------|-----------|--------|--------|------|---------|-----|---------|--------|
| MHz       | dB(uV)  | dB(uV/m)  | dB     | dB(uV) | dB   | dB(1/m) | dB  | deg     | cm     |
| 33.686    | 17.3    | 30        | -12.7  | 31     | 32.1 | 17.8    | 0.6 | 5.5     | 300    |
| 87.327    | 11.8    | 30        | -18.2  | 34.6   | 32.1 | 8.2     | 1.1 | 4.5     | 200    |
| 118.318   | 13      | 30        | -17    | 32.2   | 32   | 11.7    | 1.2 | 15      | 400    |
| 986.469   | 27.9    | 37        | -9.1   | 32.2   | 30.9 | 22.9    | 3.7 | 344.5   | 100    |

Temp: 22C

Humidity: 43%

**Results:** Complies by 9.1 dB.

#### 4.6.4 Test Configuration Photographs

**The following photographs show the testing configurations used.**



4.6.4 Test Configuration Photographs (Continued)



*Electromagnetic Radiated Disturbance Setup Photograph*

## 4.5 AC Line Conducted Emission FCC: 15.207, 15.107; RSS-GEN;

### 4.5.1 Requirement

| Frequency Band<br>MHz | Class B Limit dB( $\mu$ V) |            | Class A Limit dB( $\mu$ V) |         |
|-----------------------|----------------------------|------------|----------------------------|---------|
|                       | Quasi-Peak                 | Average    | Quasi-Peak                 | Average |
| 0.15-0.50             | 66 to 56 *                 | 56 to 46 * | 79                         | 66      |
| 0.50-5.00             | 56                         | 46         | 73                         | 60      |
| 5.00-30.00            | 60                         | 50         | 73                         | 60      |

*Note: \*Decreases linearly with the logarithm of the frequency  
At the transition frequency the lower limit applies.*

### 4.5.2 Procedure

Measurements are carried out using quasi-peak and average detector receivers in accordance with CISPR 16. An AMN is required to provide a defined impedance at high frequencies across the power feed at the point of measurement of terminal voltage and also to provide isolation of the circuit under test from the ambient noise on the power lines. An AMN as defined in CISPR 16 shall be used.

The EUT is located so that the distance between the boundary of the EUT and the closest surface of the AMN is 0.8m.

Where a flexible mains cord is provided by the manufacturer, this shall be 1m long or if in excess of 1m, the excess cable is folded back and forth as far as possible so as to form a bundle not exceeding 0.4m in length.

The EUT is arranged and connected with cables terminated in accordance with the product specification.

Conducted disturbance is measured between the phase lead and the reference ground, and between the neutral lead and the reference ground. Both measured values are reported.

The EUT, where intended for tabletop use, is placed on a table whose top is 0.8m above the ground plane. A vertical, metal reference plane is placed 0.4m from the EUT. The vertical metal reference-plane is at least 2m by 2m. The EUT shall be kept at least 0.8m from any other metal surface or other ground plane not being part of the EUT. The table is constructed of non-conductive materials. Its dimensions are 1m by 1.5m, but may be extended for larger EUT.

Floor standing EUT are placed on a horizontal metal ground plane and isolated from the ground plane by resting on an insulating material. The metal ground plane extends at least 0.5m beyond the boundaries of the EUT and has minimum dimensions of 2m by 2m.

Equipment setup for conducted disturbance tests followed the guidelines of ANSI C63.4.

|                |                                                     |
|----------------|-----------------------------------------------------|
| <b>Results</b> | <b>Not Applicable. EUT is battery powered only.</b> |
|----------------|-----------------------------------------------------|

## 5.0 List of Test Equipment

Measurement equipment used for emission compliance testing utilized the equipment on the following list:

| Equipment              | Manufacturer      | Model/Type           | Asset #   | Cal Int | Cal Due  |
|------------------------|-------------------|----------------------|-----------|---------|----------|
| Pyramidal Horn Antenna | EMCO              | 3160-09              | ITS 00571 | #       | #        |
| Pre-Amplifier          | Miteq             | JSD44-18004000-305P  | ITS 00921 | 12      | 06/09/15 |
| BI-Log Antenna         | Antenna Research  | LPB-2513/A           | ITS 00355 | 12      | 08/21/15 |
| Pre-Amplifier          | Sonoma Instrument | 310                  | ITS 00942 | 12      | 11/26/15 |
| Hygro Thermometer      | Control Co.       | 4085                 | ITS 00322 | 12      | 11/14/15 |
| Pre-Amplifier          | Miteq             | AMF-4D-001180-24-10P | ITS 00526 | 12      | 10/01/15 |
| Spectrum Analyzer      | Rohde & Schwarz   | FSU                  | ITS 00913 | 12      | 12/16/15 |
| EMI Receiver           | Rohde & Schwarz   | ESU                  | ITS 00961 | 12      | 11/10/15 |
| Horn Antenna           | ETS-Lindgren      | 3115                 | ITS 00982 | 12      | 11/21/15 |

# No Calibration required

## 6.0 Document History

| Revision/<br>Job Number | Writer<br>Initials | Reviewers<br>Initials | Date         | Change            |
|-------------------------|--------------------|-----------------------|--------------|-------------------|
| 1.0 / G102133872        | AC                 | KV                    | May 27, 2015 | Original document |