



## Compliance Testing, LLC

Previously Flom Test Lab

EMI, EMC, RF Testing Experts Since 1963

toll-free: (866) 311-3268

fax: (480) 926-3598

<http://www.ComplianceTesting.com>

[info@ComplianceTesting.com](mailto:info@ComplianceTesting.com)

### Test Report

Prepared for: Time Keeping Systems Inc.

Model: DD-001 - Duress Device

Description: Wireless positioning and duress alarm for prison guards

Serial Number: N/A

FCC ID: MTD-DD-001

IC: 12375A-DD001

To

FCC Part 15.247 DTS

Date of Issue: May 10, 2017

On the behalf of the applicant:

Time Keeping Systems Inc.  
30700 Bainbridge Rd  
Cleveland, OH 44139

Attention of:

Dean Chriss  
Ph: (216)595-1026  
E-mail: [dchriss@guard1.com](mailto:dchriss@guard1.com)

Prepared By  
Compliance Testing, LLC  
1724 S. Nevada Way  
Mesa, AZ 85204  
(480) 926-3100 phone / (480) 926-3598 fax  
[www.compliancetesting.com](http://www.compliancetesting.com)  
Project No: p1650002

Kenneth Lee  
Project Test Engineer

This report may not be reproduced, except in full, without written permission from Compliance Testing.  
All results contained herein relate only to the sample tested.



## Test Report Revision History

| Revision | Date            | Revised By  | Reason for Revision                                                           |
|----------|-----------------|-------------|-------------------------------------------------------------------------------|
| 1.0      | June 15, 2016   | Kenneth Lee | Original Document                                                             |
| 2.0      | August 29, 2016 | Kenneth Lee | Updated Band Edge Tables                                                      |
| 3.0      | May 5, 2017     | Kenneth Lee | Updated Radiated Spurious Test Procedure<br>Updated Band Edge Table and Plots |
| 4.0      | May 9, 2017     | Kenneth Lee | Updated Band Edge Table and added Duty Cycle Correction                       |



## Table of Contents

| <b><u>Description</u></b>                            | <b><u>Page</u></b> |
|------------------------------------------------------|--------------------|
| Standard Test Conditions Engineering Practices ..... | 6                  |
| Test Results Summary .....                           | 7                  |
| Peak Output Power .....                              | 8                  |
| Conducted Spurious Emission .....                    | 9                  |
| Radiated Spurious Emissions .....                    | 14                 |
| Emissions at Band Edges .....                        | 15                 |
| Occupied Bandwidth .....                             | 24                 |
| Transmitter Power Spectral Density (PSD).....        | 28                 |
| Test Equipment Utilized .....                        | 32                 |

**ILAC / A2LA**

Compliance Testing, LLC, has been accredited in accordance with the recognized International Standard ISO/IEC 17025:2005. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to the joint ISO-ILAC-IAF Communiqué dated January 2009).

The tests results contained within this test report all fall within our scope of accreditation, unless noted below.

Please refer to <http://www.compliancetesting.com/labscope.html> for current scope of accreditation.

Testing Certificate Number: **2152.01**



**FCC Site Reg. #349717**

**IC Site Reg. #2044A-2**

**Non-accredited tests contained in this report:**

**N/A**

**The applicant has been cautioned as to the following**

**15.21 - Information to User**

The user's manual or instruction manual for an intentional radiator shall caution the user that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

**15.27(a) - Special Accessories**

Equipment marked to a consumer must be capable of complying with the necessary regulations in the configuration in which the equipment is marketed. Where special accessories, such as shielded cables and/or special connectors are required to enable an unintentional or intentional radiator to comply with the emission limits in this part, the equipment must be marketed with, i.e. shipped and sold with, those special accessories. However, in lieu of shipping or packaging the special accessories with the unintentional or intentional radiator, the responsible party may employ other methods of ensuring that the special accessories are provided to the consumer without an additional charge.

Information detailing any alternative method used to supply the special accessories for a grant of equipment authorization or retained in the verification records, as appropriate. The party responsible for the equipment, as detailed in § 2.909 of this chapter, shall ensure that these special accessories are provided with the equipment. The instruction manual for such devices shall include appropriate instructions on the first page of text concerned with the installation of the device that these special accessories must be used with the device. It is the responsibility of the user to use the needed special accessories supplied with the equipment.



## Standard Test Conditions Engineering Practices

Except as noted herein, the following conditions and procedures were observed during the testing:

In accordance with ANSI C63.10-2009 and unless otherwise indicated in the specific measurement results, the ambient temperature of the actual EUT was maintained within the range of 10° to 40°C (50° to 104°F) unless the particular equipment requirements specified testing over a different temperature range. Also, unless otherwise indicated, the humidity levels were in the range of 10% to 90% relative humidity.

Measurement results, unless otherwise noted, are worst-case measurements.

| Environmental Conditions |                 |                    |
|--------------------------|-----------------|--------------------|
| Temperature<br>(°C)      | Humidity<br>(%) | Pressure<br>(mbar) |
| 23.4                     | 26.1            | 949.8              |

### EUT Description

**Model:** DD-001 - Duress Device

**Description:** Wirelss positioning and duress alarm for prison guards

**Firmware:** N/A

**Software:** N/A

**Serial Number:** N/A

**Additional Information:** The EUT implements a 5.44 dBi integral antenna.

### EUT Operation during Tests

The EUT was set into a test mode which enabled it to be put into low, middle and high channels, while transmitting at max power. The EUT was fully tested in both the 0 dBm and +25 dBm modes.

**Accessories:** None

**Cables:** None

**Modifications:** None

### 15.203: Antenna Requirement:

- ☒ The antenna is permanently attached to the EUT
- ☐ The antenna uses a unique coupling
- ☐ The EUT must be professionally installed
- ☐ The antenna requirement does not apply



## Test Results Summary

| Specification                | Test Name                          | Pass, Fail, N/A | Comments               |
|------------------------------|------------------------------------|-----------------|------------------------|
| 15.247(b)                    | Peak Output Power                  | Pass            |                        |
| 15.247(b)                    | Conducted Spurious Emissions       | Pass            |                        |
| 15.247(d), 15.209(a), 15.205 | Radiated Spurious Emissions        | Pass            |                        |
| 15.247(d), 15.209(a), 15.205 | Emissions At Band Edges            | Pass            |                        |
| 15.247(a)(2)                 | Occupied Bandwidth                 | Pass            |                        |
| 15.247(e)                    | Transmitter Power Spectral Density | Pass            |                        |
| 15.207                       | A/C Powerline Conducted Emissions  | N/A             | EUT is battery powered |



## Peak Output Power

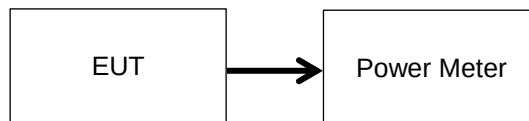
**Engineer:** Kenneth Lee

**Test Date:** 06/13/2016

### Test Procedure

The EUT was connected directly to a spectrum analyzer. The peak readings were taken and the result was then compared to the limit.

### Test Setup



### Transmitter Peak Output Power

#### 0 dBm

| Tuned Frequency (MHz) | Measured Value (dBm) | Specification Limit | Result |
|-----------------------|----------------------|---------------------|--------|
| 2402                  | -1.27                | 1 W (30 dBm)        | Pass   |
| 2426                  | -0.52                | 1 W (30 dBm)        | Pass   |
| 2480                  | -1.59                | 1 W (30 dBm)        | Pass   |

#### +25 dBm

| Tuned Frequency (MHz) | Measured Value (dBm) | Specification Limit | Result |
|-----------------------|----------------------|---------------------|--------|
| 2402                  | 23.76                | 1 W (30 dBm)        | Pass   |
| 2426                  | 23.63                | 1 W (30 dBm)        | Pass   |
| 2480                  | 23.56                | 1 W (30 dBm)        | Pass   |



## Conducted Spurious Emission

**Engineer:** Kenneth Lee

**Test Date:** 06/15/2016

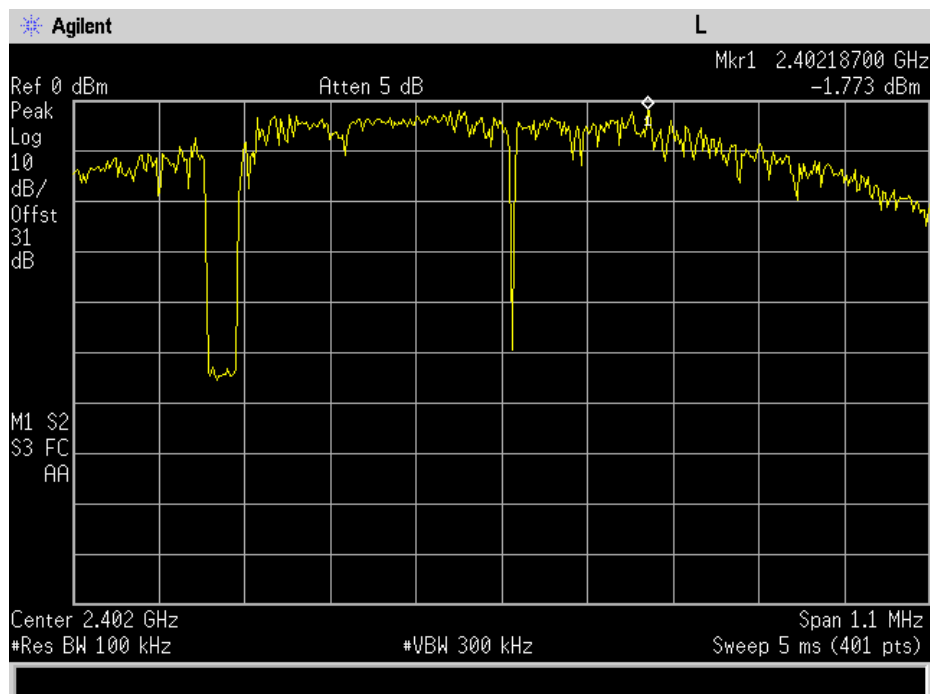
### Test Procedure

The EUT was connected to a spectrum analyzer to verify that the EUT met the requirements for spurious emissions. The frequency range from 30 MHz to the 10<sup>th</sup> harmonic of the fundamental transmitter was observed. Only detectable spurious emissions were recorded and plotted. The peak output power is added to the recorded measurement to provide the corrected spurious level dBc.

### Test Setup

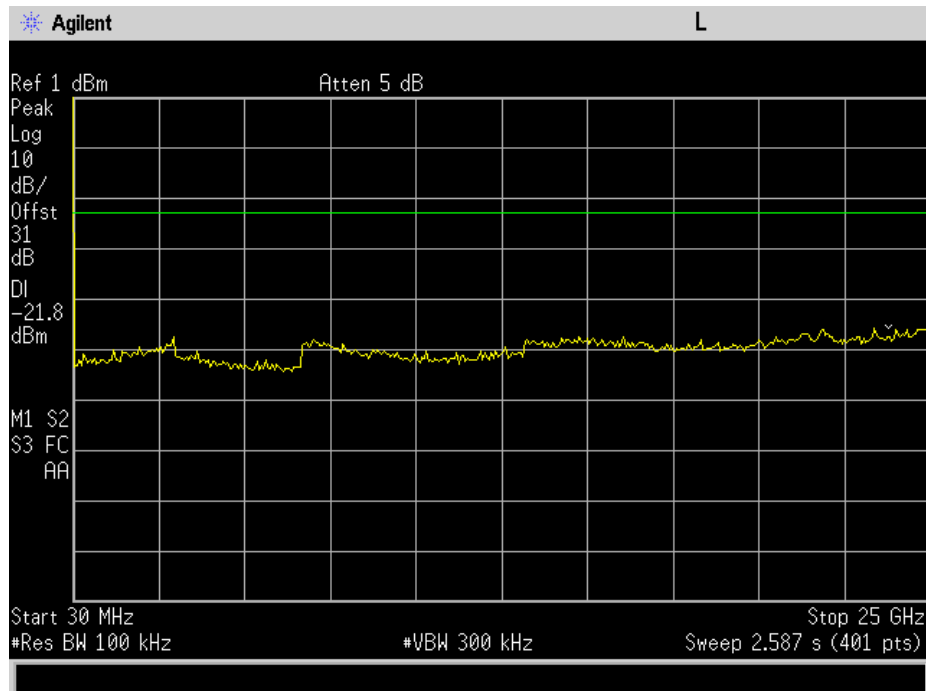


### 0 dBm Reference Level

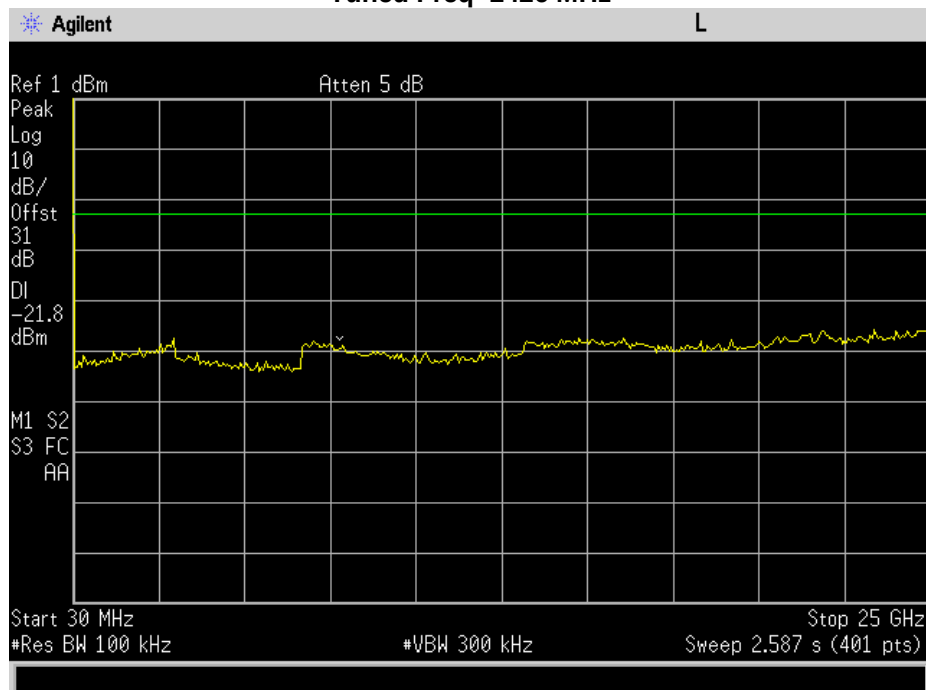




**0 dBm**  
**Conducted Spurious Emissions**  
**Tuned Freq=2402 MHz**

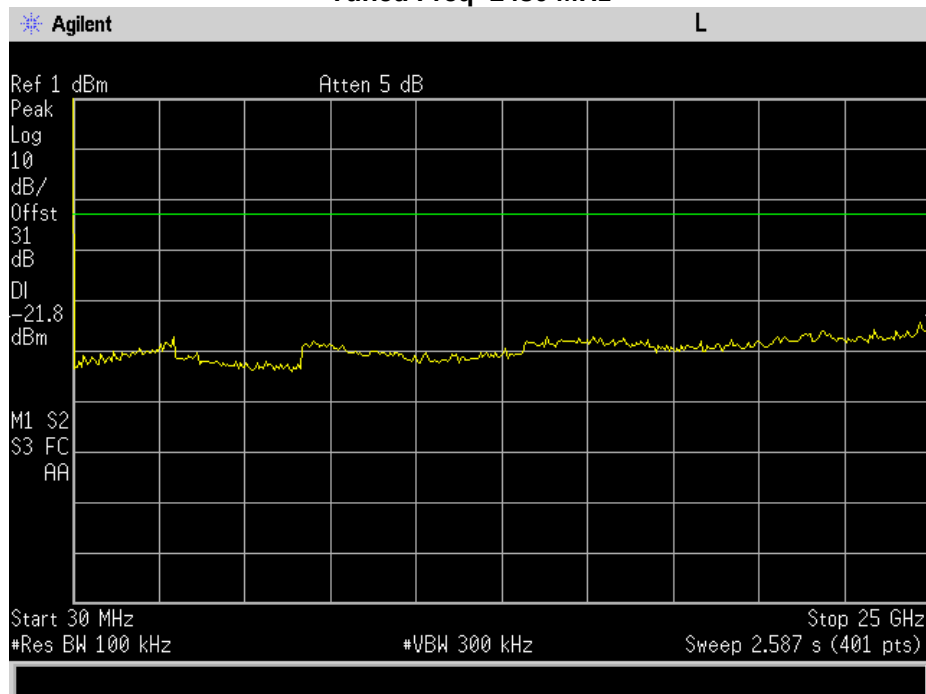


**0 dBm**  
**Conducted Spurious Emissions**  
**Tuned Freq=2426 MHz**

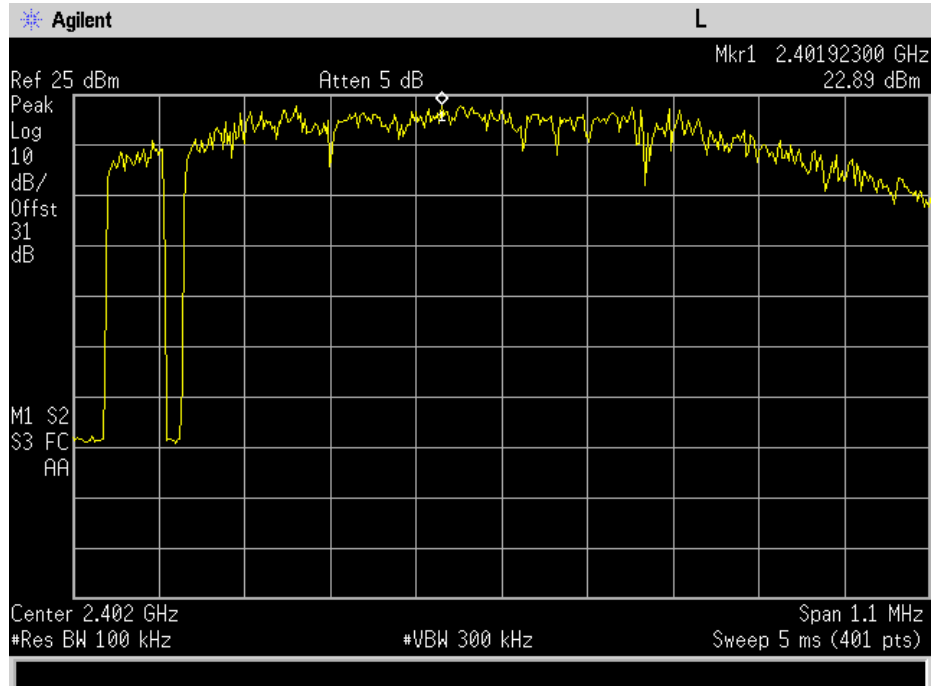




0 dBm  
Conducted Spurious Emissions  
Tuned Freq=2480 MHz

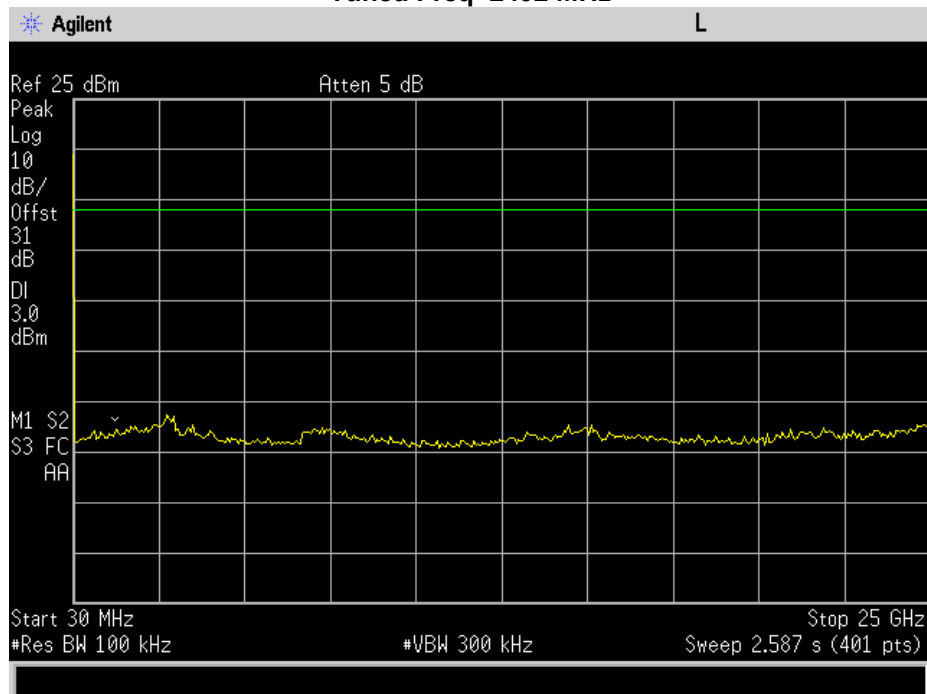


+25 dBm Reference Level

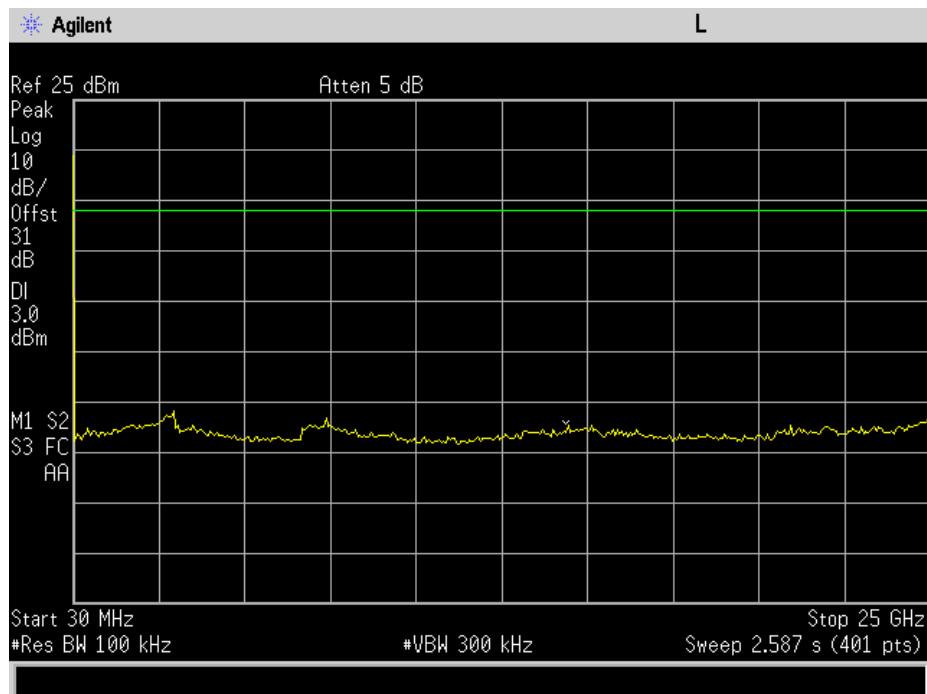




**+25 dBm**  
**Conducted Spurious Emissions**  
**Tuned Freq=2402 MHz**

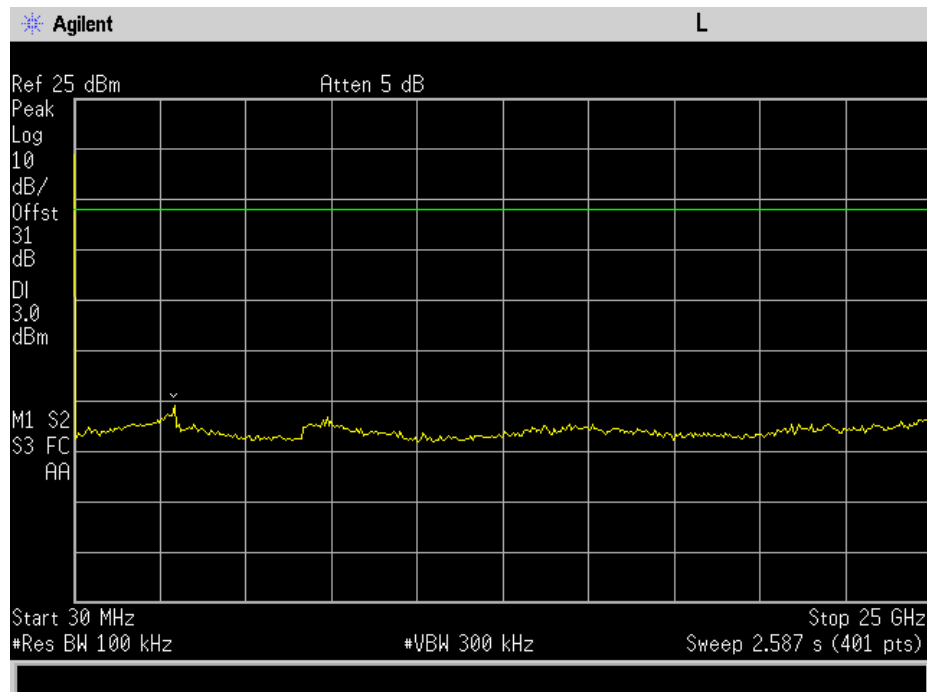


**+25 dBm**  
**Conducted Spurious Emissions**  
**Tuned Freq=2426 MHz**





**+25 dBm**  
**Conducted Spurious Emissions**  
**Tuned Freq=2480 MHz**





## Radiated Spurious Emissions

**Engineer:** Kenneth Lee

**Test Date:** 06/14/2016

### Test Procedure Radiated Spurious Emissions: 30 – 1000 MHz

The EUT was tested in a semi-anechoic test chamber set 3m from the receiving antenna. A spectrum analyzer was used to verify that the EUT met the requirements for Radiated Emissions. The EUT was tested by rotating it 360° with the antennas in both the vertical and horizontal orientation and was raised from 1 to 4 meters to ensure the TX signal levels were maximized.

No emission were detected within 10 dB of the limit, representative plots have been included in Annex A to show this. No antenna gain was taken into account in the representative plots.

All emissions from 30 MHz to 1 GHz were examined.

Measured Level includes antenna and receiver cable correction factors.

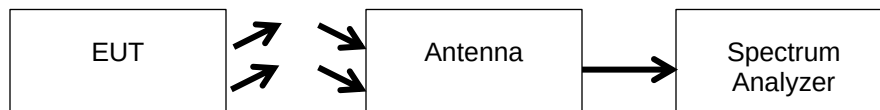
Correction factors were input into the spectrum analyzer before recording “Measured Level”.

RBW = 100 KHz

VBW = 300 KHz

Detector – Quasi Peak

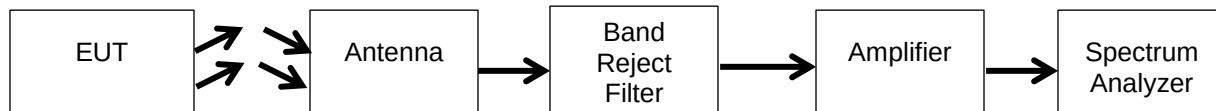
#### Test Setup



### Test Procedure for Radiated Spurious Emissions above 1 GHz

The EUT was tested in a semi anechoic chamber set 3m from the receiving antenna. A spectrum analyzer was used to verify that the EUT met the requirements for Radiated Spurious Emissions. The antenna, band reject filter, amplifier and cable correction factors were input into the spectrum analyzer before recording the Measured Level to ensure accurate readings. The spectrum for each tuned frequency was examined to the 10th harmonic. No emission were detected within 10 dB of the limit, representative plots have been included in Annex A to show this. No antenna gain was taken into account in the representative plots.

#### Test Setup



See Annex A for test data

## Emissions at Band Edges

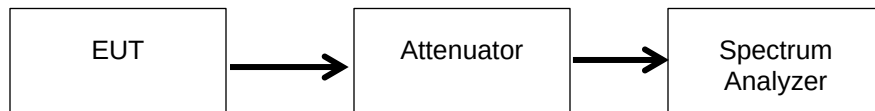
**Engineer:** Kenneth Lee

**Test Date:** 06/13/2016

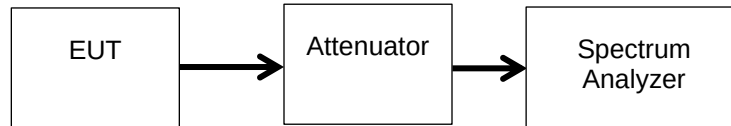
### Test Procedure

The EUT was connected directly to a spectrum analyzer. A spectrum analyzer was used to verify that the EUT met the requirements for band edge. The cable and antenna correction factors were input into the analyzer as a reference level offset to ensure accurate readings. For the restricted band the amplifier and band reject filter correction factors were also input to the spectrum analyzer. The Antenna Gain of the EUT was added to the readings to ensure compliance. For the +25 dBm mode, the procedure of KDB 558074 Section 13.3.2 was used.

#### Band Edge Test Setup



#### Restricted Band Test Setup



#### 0 dBm

| Restricted Band (MHz) | Tuned Frequency (MHz) | Emission Frequency (MHz) | Measured Value (dBuV/m) | Marker Delta Correction (dB) | Antenna Gain (dB) | Corrected Value (dBuV/m) | Peak Limit (dBuV/m) | Result |
|-----------------------|-----------------------|--------------------------|-------------------------|------------------------------|-------------------|--------------------------|---------------------|--------|
| 2300 – 2390           | 2402                  | 2390                     | 43.97                   | N/A                          | 5.44              | 49.41                    | 74                  | Pass   |
| 2483.5 - 2500         | 2480                  | 2483.5                   | 65.09                   | N/A                          | 5.44              | 70.53                    | 74                  | Pass   |

#### 0 dBm

| Restricted Band (MHz) | Tuned Frequency (MHz) | Emission Frequency (MHz) | Measured Value (dBuV/m) | Marker Delta Correction (dB) | Antenna Gain (dB) | Corrected Value (dBuV/m) | Avg Limit (dBuV/m) | Result |
|-----------------------|-----------------------|--------------------------|-------------------------|------------------------------|-------------------|--------------------------|--------------------|--------|
| 2300 – 2390           | 2402                  | 2390                     | 43.97                   | N/A                          | 5.44              | 49.41                    | 54                 | Pass   |
| 2483.5 - 2500         | 2480                  | 2483.5                   | 65.09                   | -26.71                       | 5.44              | 43.82                    | 54                 | Pass   |



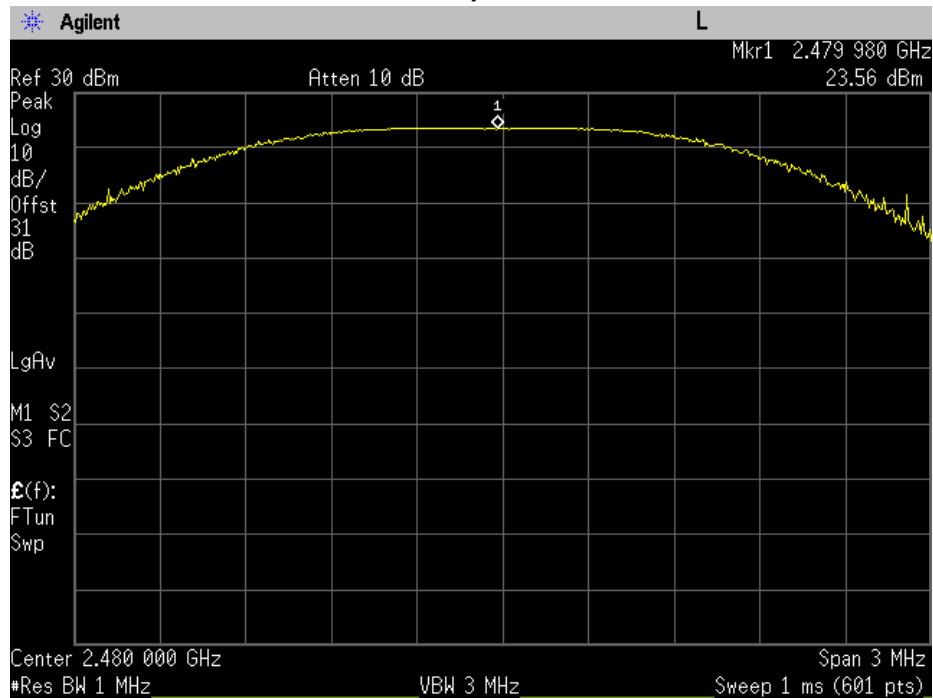
**+25 dBm**

| Restricted Band (MHz) | Tuned Frequency (MHz) | Emission Frequency (MHz) | Integration Result (dBm) | Conversion (dBm to dBuV) | Duty Cycle Correction (dB) | Corrected Value (dBuV/m) | Avg Limit (dBuV/m) | Result |
|-----------------------|-----------------------|--------------------------|--------------------------|--------------------------|----------------------------|--------------------------|--------------------|--------|
| 2300 – 2390           | 2402                  | 2389.5                   | -69.19                   | -11.8                    | 25.79                      | 51.8                     | 54                 | Pass   |
| 2483.5 - 2500         | 2480                  | 2484                     | -67.30                   | -11.8                    | 25.79                      | 53.7                     | 54                 | Pass   |

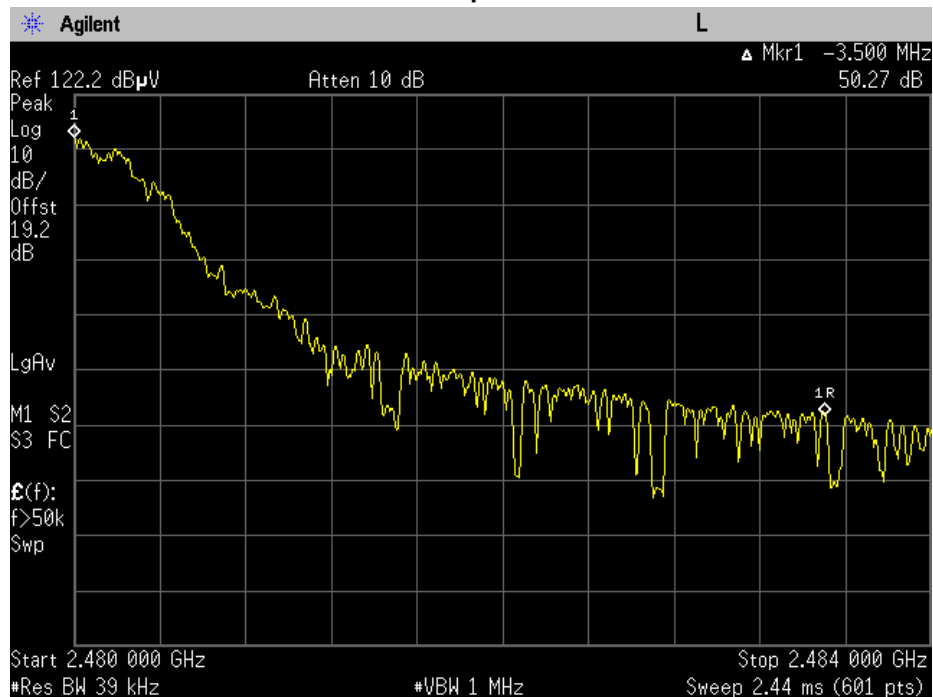


## Marker Delta Method per ANSI C63.10 2013 Section 6.10.6.2

### Step A



### Step B



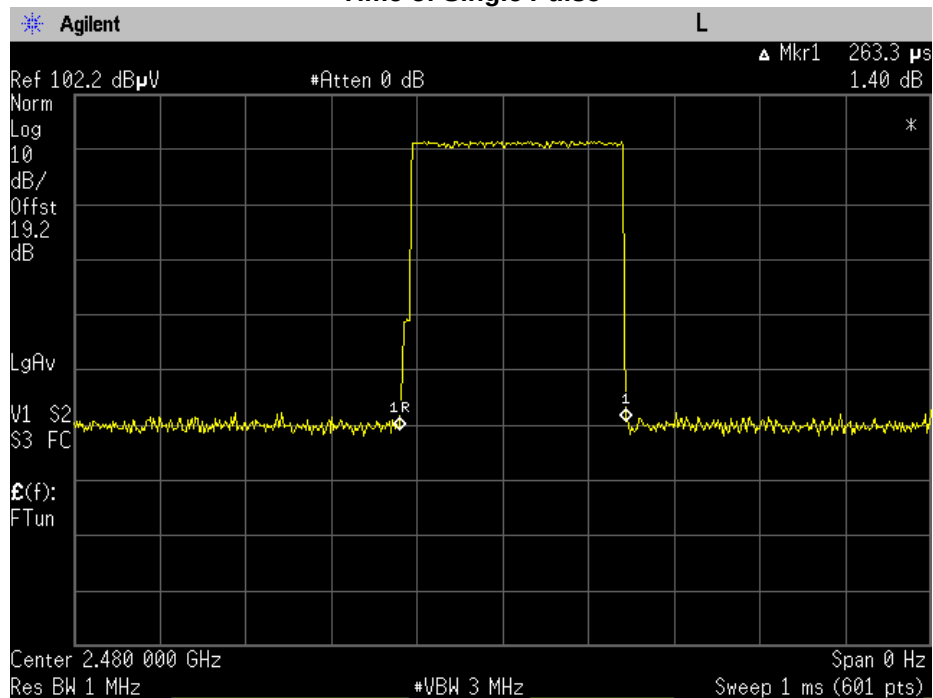
### Step C

$$23.56 - 50.27 = -26.71 \text{ dB}$$

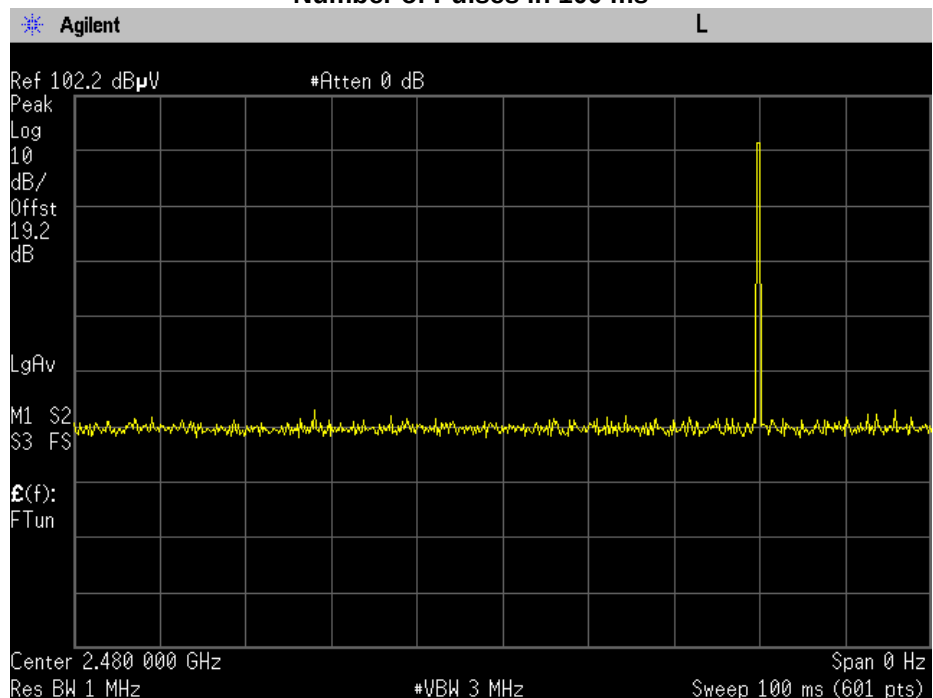


## Duty Cycle Correction Per KDB 558074 Section 6

### Time of Single Pulse



### Number of Pulses in 100 ms



Time of Single Pulse = 263.3 us

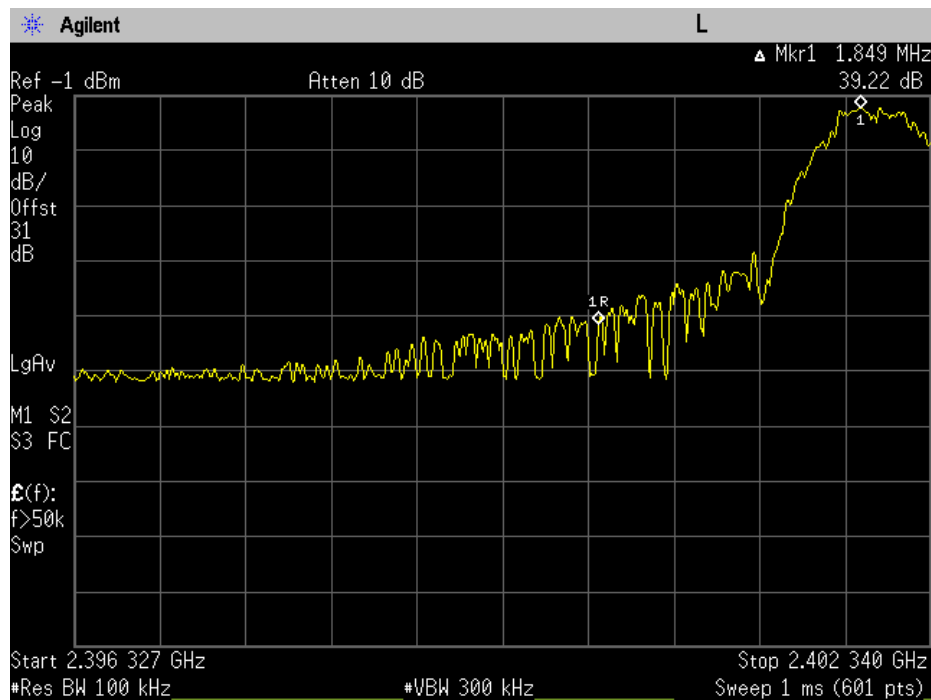
Number of Pulses in 100 ms = 1

$$\frac{263.3 \mu s}{100 \text{ ms}} = 0.002633$$

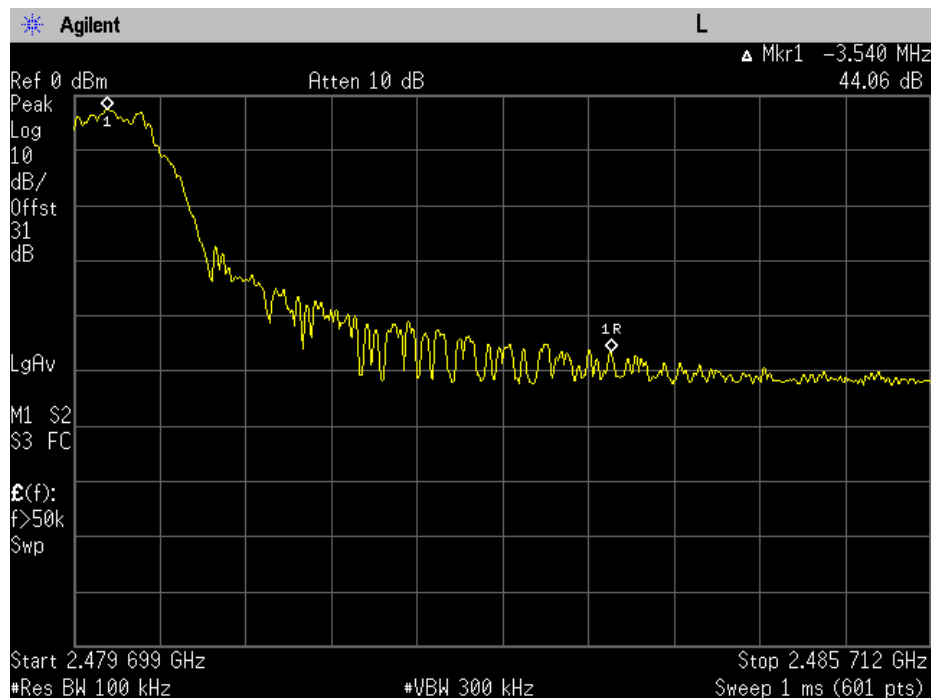
$$\text{Duty Cycle Correction} = 10 \text{ Log}\left(\frac{1}{0.002633}\right) = 25.79 \text{ dB}$$



0 dBm  
Band Edge 2400 MHz  
Tuned Freq = 2402 MHz

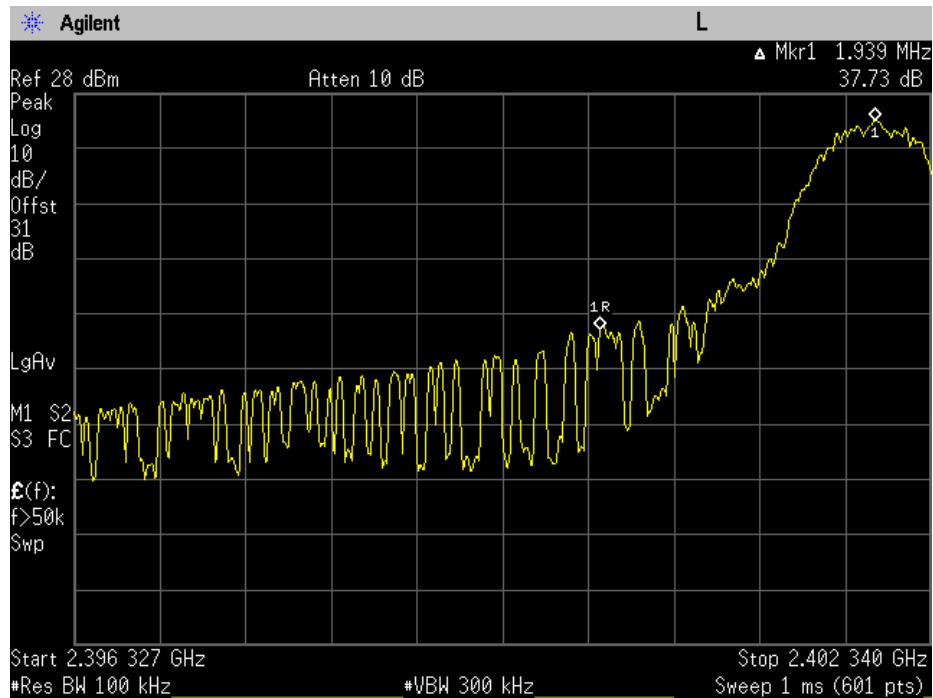


0 dBm  
Band Edge 2483.5 MHz  
Tuned Freq = 2480 MHz

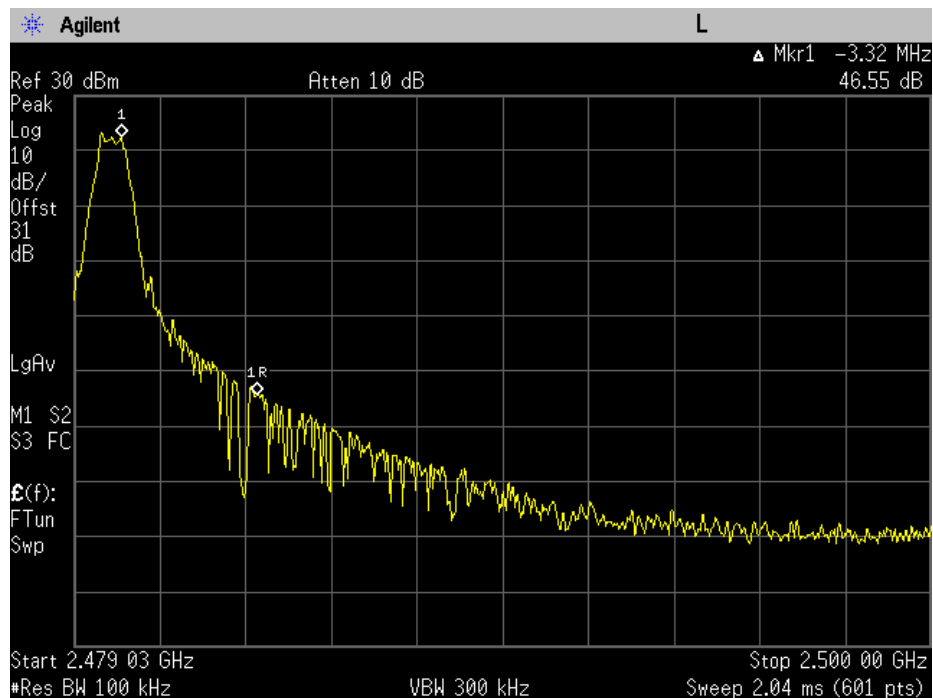




**+25 dBm**  
**Band Edge 2400 MHz**  
**Tuned Freq = 2402 MHz**

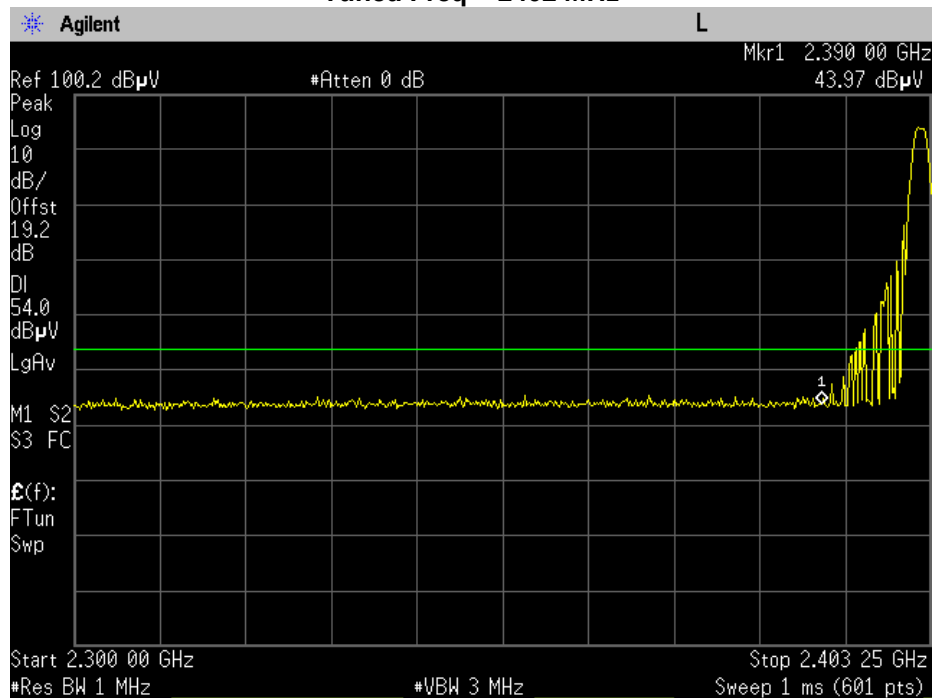


**+25 dBm**  
**Band Edge 2483.5 MHz**  
**Tuned Freq = 2480 MHz**

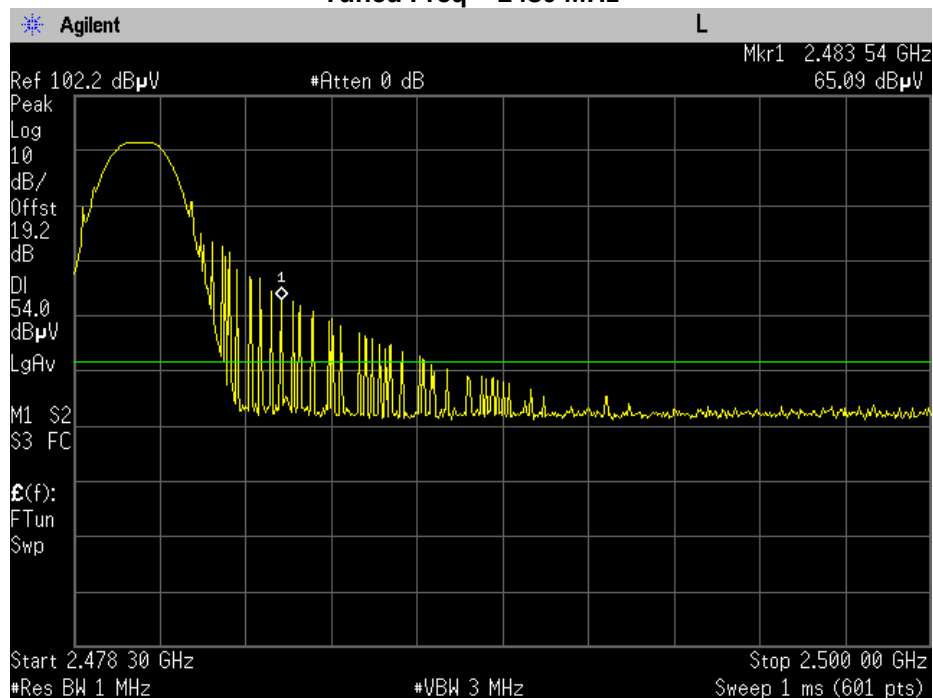




0 dBm  
Restricted Band 2300 – 2390 MHz – Peak  
Tuned Freq = 2402 MHz

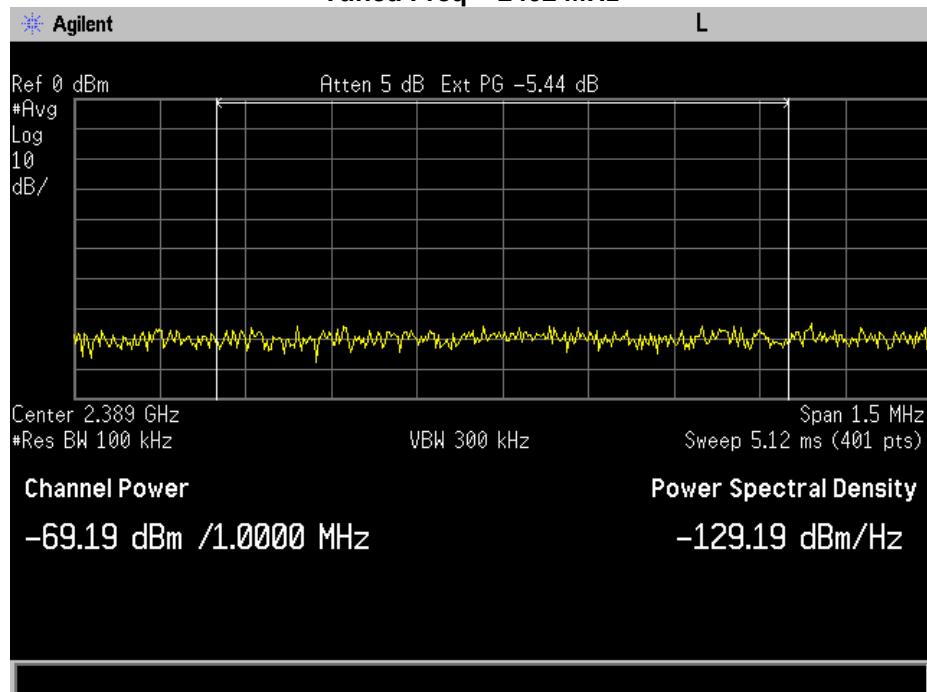


0 dBm  
Restricted Band 2483.5 – 2500 MHz – Peak  
Tuned Freq = 2480 MHz

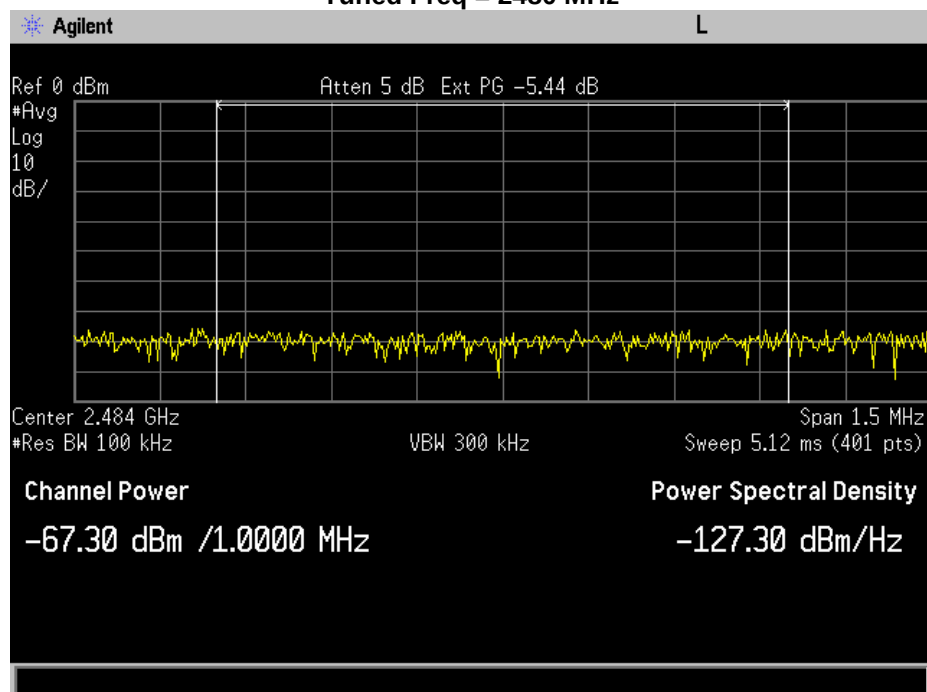




**+25 dBm**  
**Restricted Band 2389.5 MHz**  
**Tuned Freq = 2402 MHz**

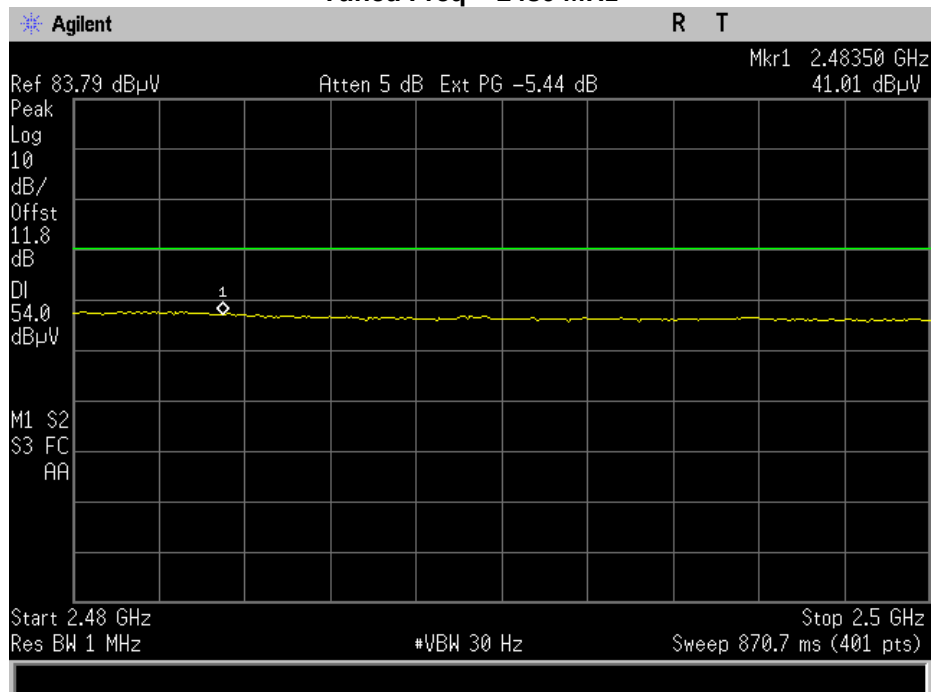


**+25 dBm**  
**Restricted Band 2484 MHz**  
**Tuned Freq = 2480 MHz**

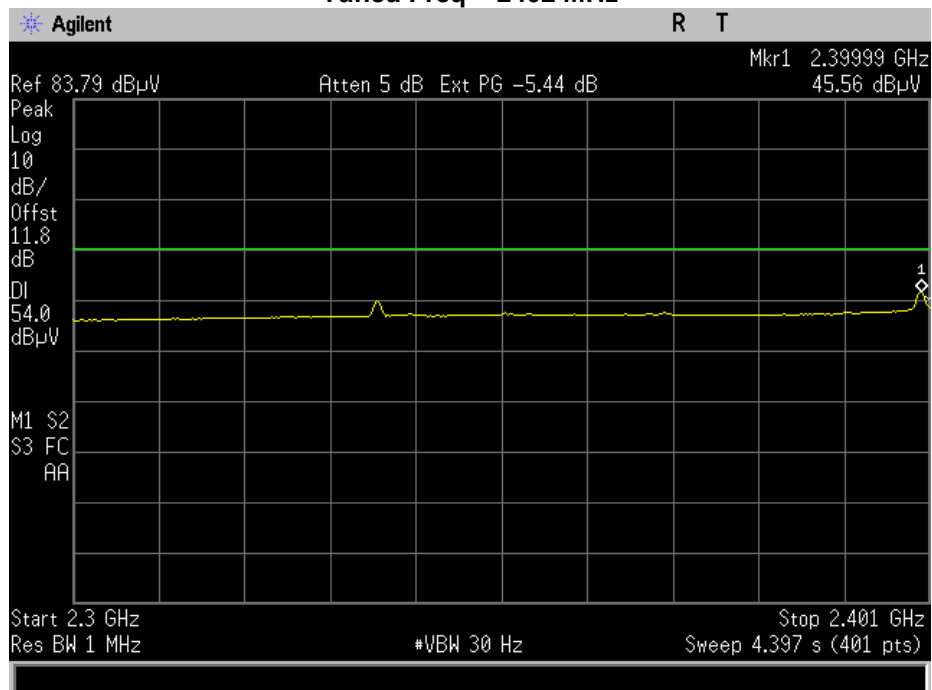




**+25 dBm**  
**Restricted Band 2483.5 – 2500 MHz – Avg**  
**Tuned Freq = 2480 MHz**



**+25 dBm**  
**Restricted Band 2300 – 2390 MHz – Avg**  
**Tuned Freq = 2402 MHz**





## Occupied Bandwidth

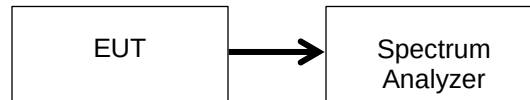
Engineer: Kenneth Lee

Test Date: 06/13/2016

### Test Procedure

The EUT was connected directly to a spectrum analyzer. The Span was set wide enough to capture the entire transmit spectrum and the resolution bandwidth was set to at least 1% of the span. The analyzer was set to max hold and when the entire spectrum was captured the 6dB and 99% bandwidths were measured to verify the bandwidth met the specification.

### Test Setup



#### 0 dBm 6 dB Occupied Bandwidth Summary

| Frequency (MHz) | Measured Bandwidth (MHz) | Specification Limit (kHz) | Result |
|-----------------|--------------------------|---------------------------|--------|
| 2402            | 689.357                  | $\geq 500$                | Pass   |
| 2426            | 671.472                  | $\geq 500$                | Pass   |
| 2480            | 651.595                  | $\geq 500$                | Pass   |

#### 0 dBm 99% Bandwidth Summary

| Frequency (MHz) | Measured Bandwidth (MHz) | Result |
|-----------------|--------------------------|--------|
| 2402            | 1.0953                   | Pass   |
| 2426            | 1.0949                   | Pass   |
| 2480            | 1.0557                   | Pass   |

#### +25 dBm 6 dB Occupied Bandwidth Summary

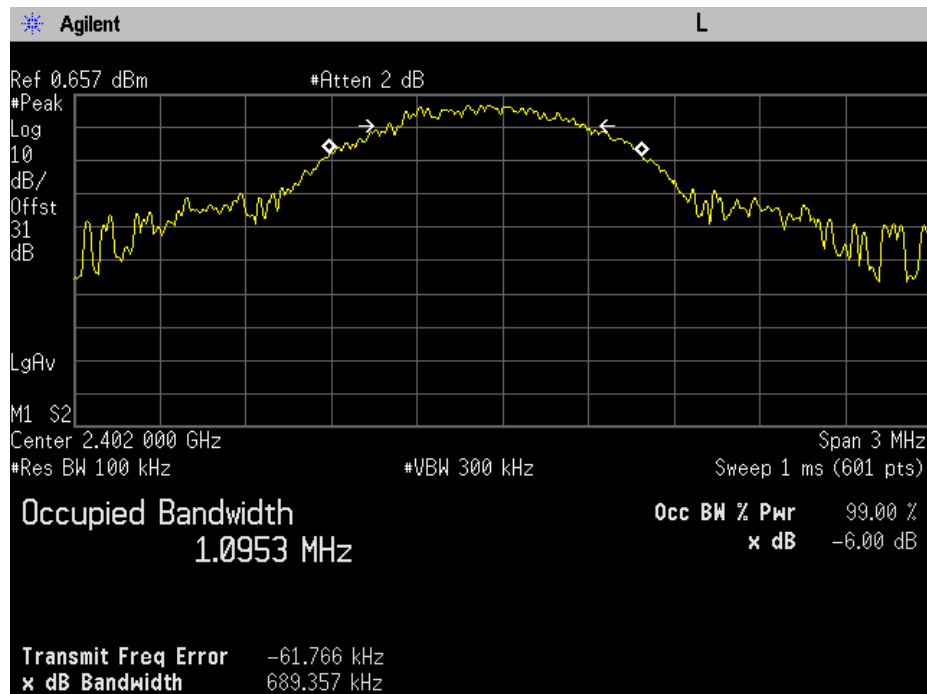
| Frequency (MHz) | Measured Bandwidth (MHz) | Specification Limit (kHz) | Result |
|-----------------|--------------------------|---------------------------|--------|
| 2402            | 697.054                  | $\geq 500$                | Pass   |
| 2426            | 732.824                  | $\geq 500$                | Pass   |
| 2480            | 789.82                   | $\geq 500$                | Pass   |

#### +25 dBm 99% Bandwidth Summary

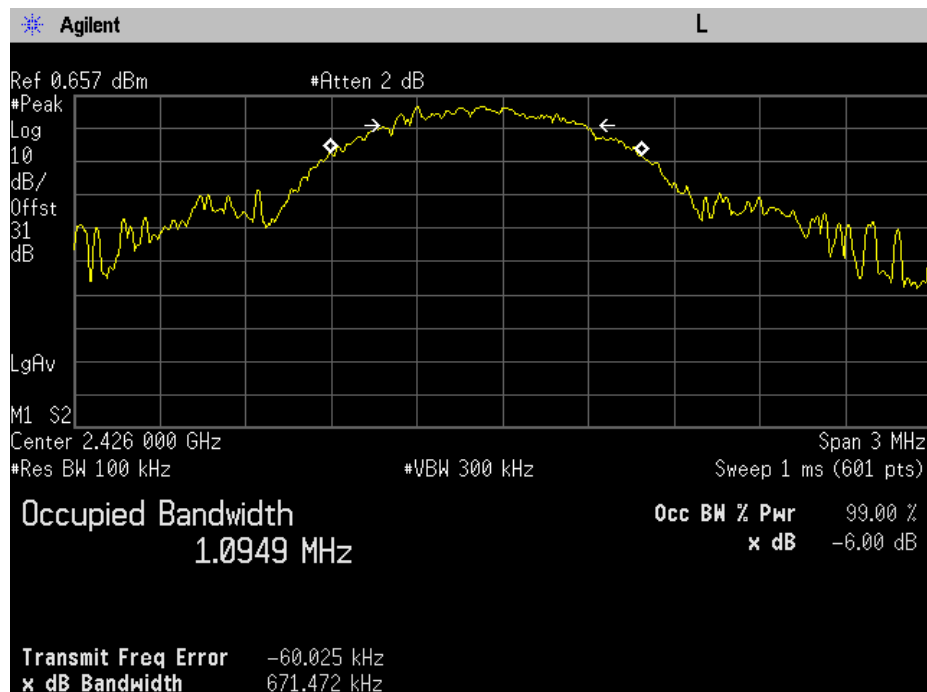
| Frequency (MHz) | Measured Bandwidth (MHz) | Result |
|-----------------|--------------------------|--------|
| 2402            | 1.1264                   | Pass   |
| 2426            | 1.1509                   | Pass   |
| 2480            | 1.1177                   | Pass   |



**0 dBm 6dB ad 99% Bandwidth 2402 MHz**

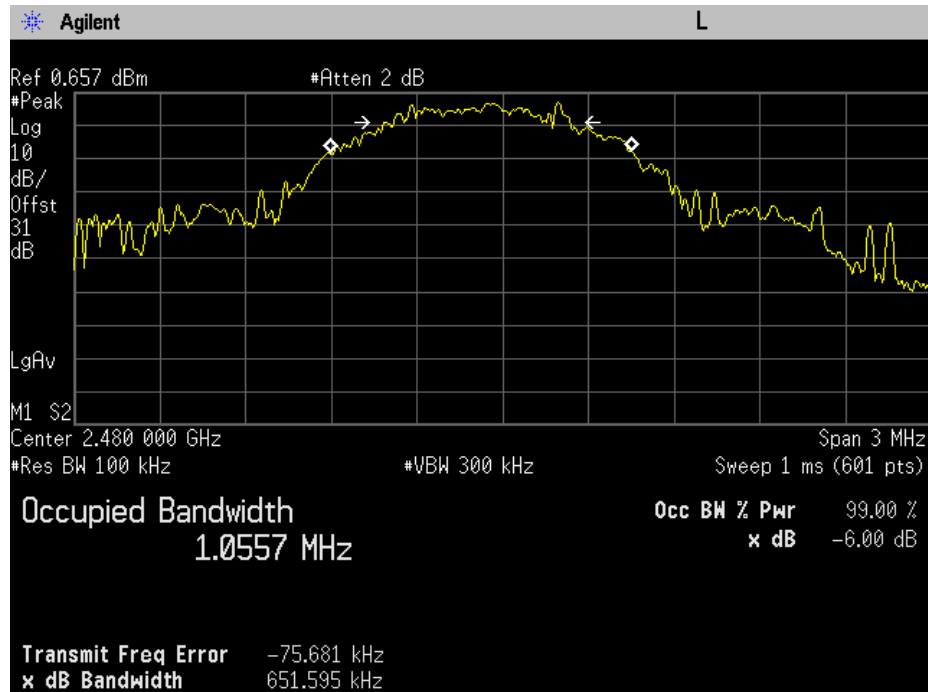


**0 dBm 6dB ad 99% Bandwidth 2426 MHz**

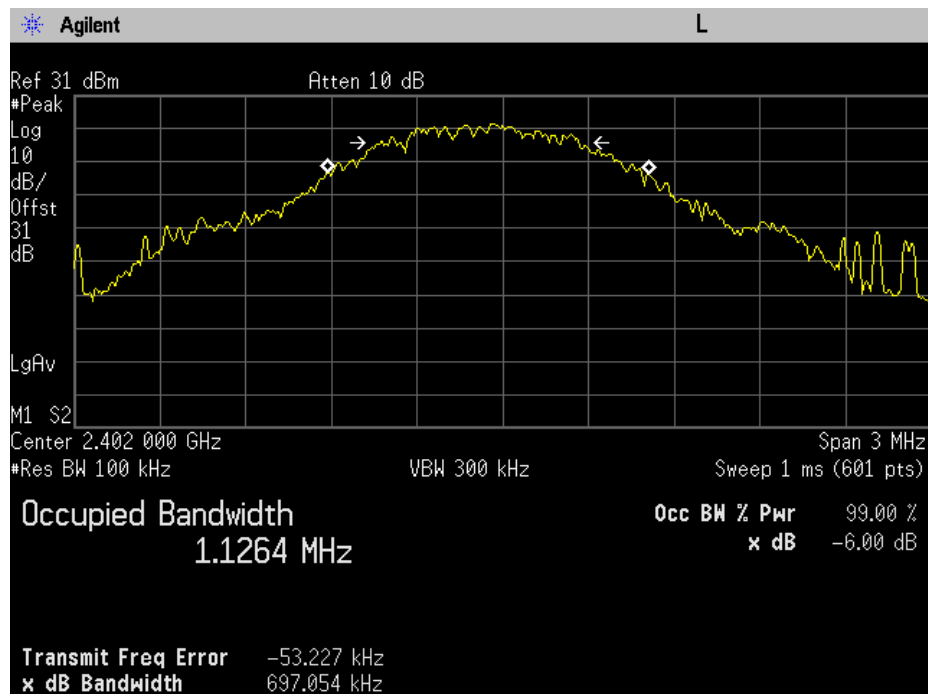




**0 dBm 6dB ad 99% Bandwidth 2480 MHz**

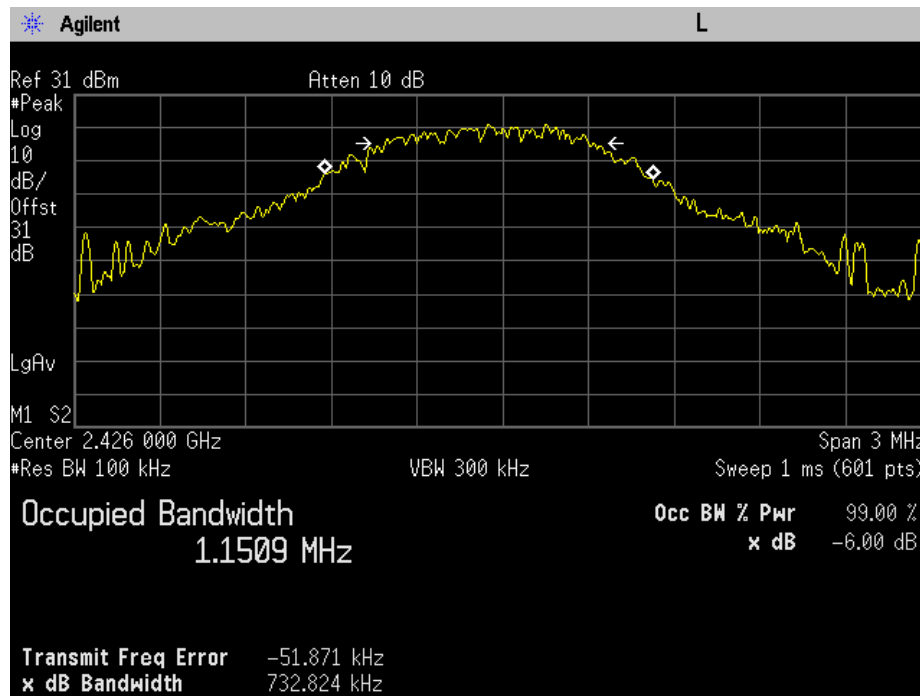


**+25 dBm 6dB ad 99% Bandwidth 2402 MHz**

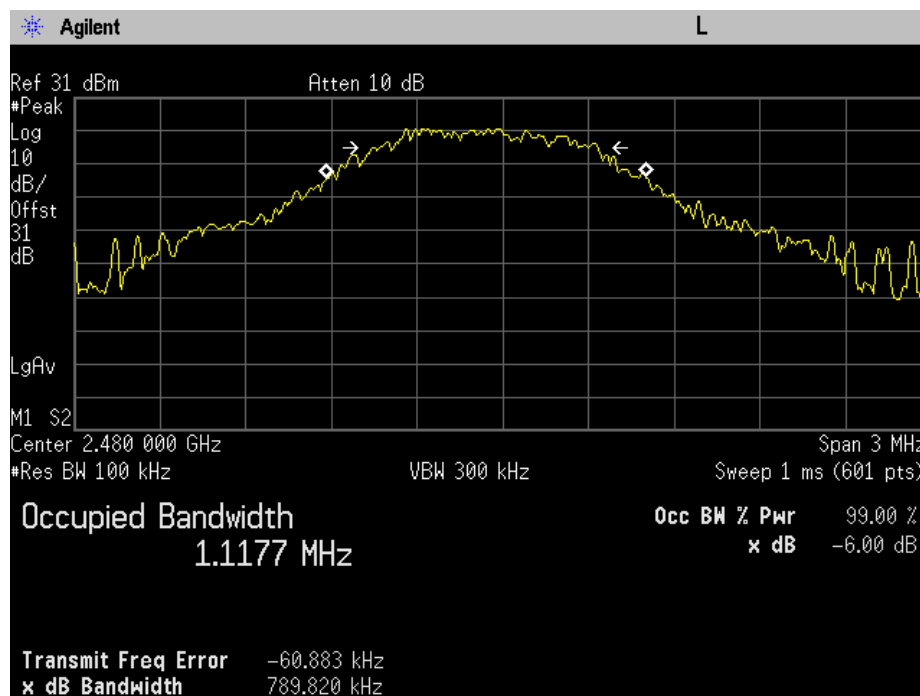




**+25 dBm 6dB ad 99% Bandwidth 2426 MHz**



**+25 dBm 6dB ad 99% Bandwidth 2480 MHz**





## Transmitter Power Spectral Density (PSD)

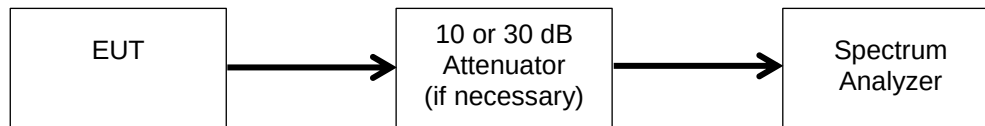
**Engineer:** Kenneth Lee

**Test Date:** 06/14/2016

### Test Procedure

The EUT was connected directly to a spectrum analyzer. The test was performed per section 6.11.2.3 of C63.10 - 2013 "Procedure for determining PSD for DTS devices".

### Test Setup



### 0 dBm PSD Summary

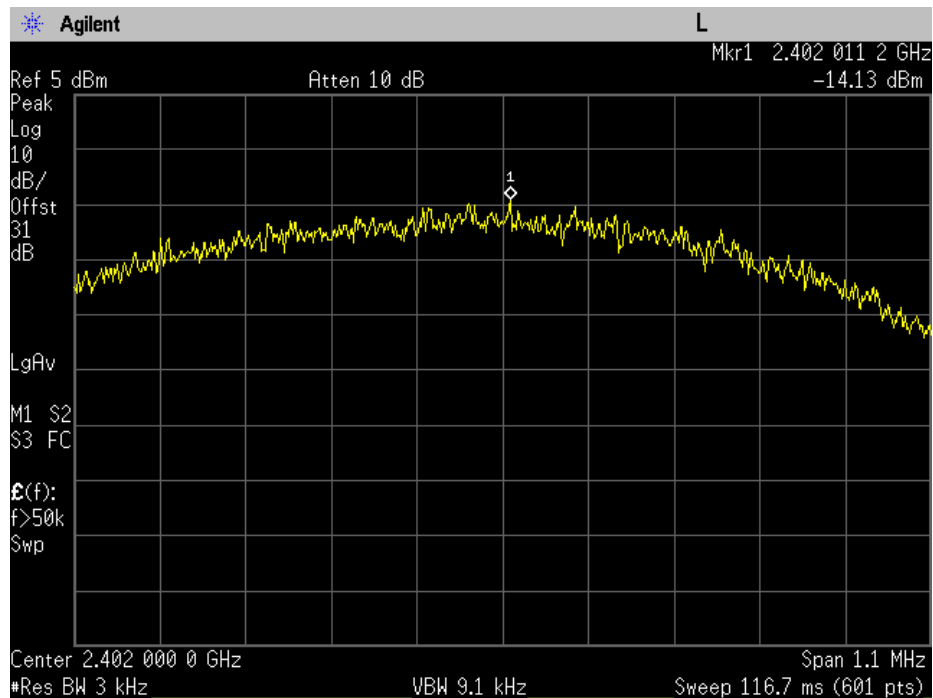
| Frequency (MHz) | Measured Data (dBm) | Specification Limit (dBm) | Result |
|-----------------|---------------------|---------------------------|--------|
| 2402            | -14.13              | 8                         | Pass   |
| 2426            | -15.61              | 8                         | Pass   |
| 2480            | -16.59              | 8                         | Pass   |

### +25 dBm PSD Summary

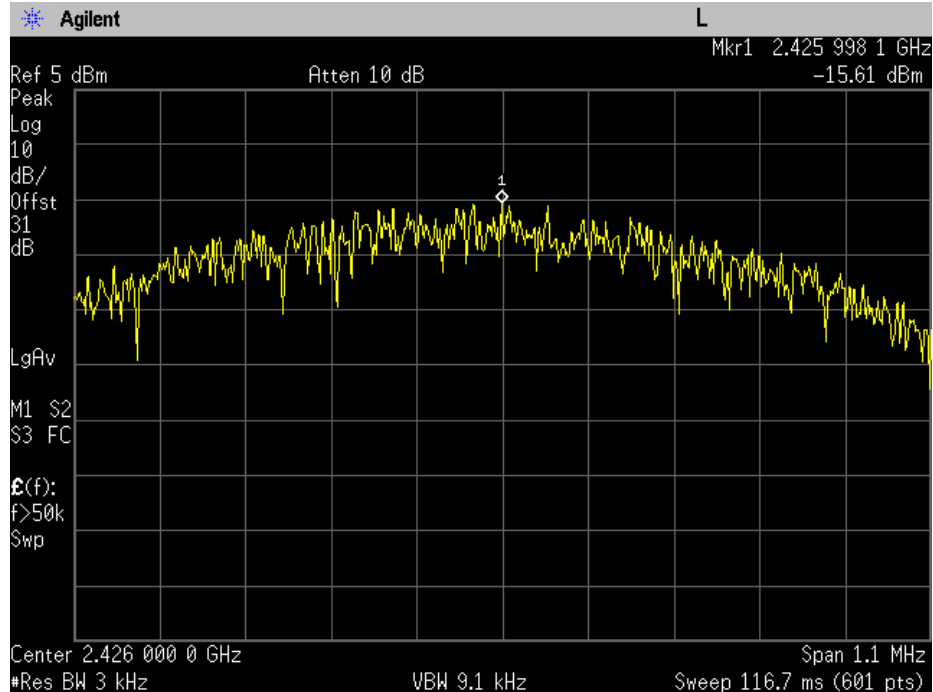
| Frequency (MHz) | Measured Data (dBm) | Specification Limit (dBm) | Result |
|-----------------|---------------------|---------------------------|--------|
| 2402            | 7.67                | 8                         | Pass   |
| 2426            | 6.74                | 8                         | Pass   |
| 2480            | 7.20                | 8                         | Pass   |



### 0 dBm PSD 2402 MHz

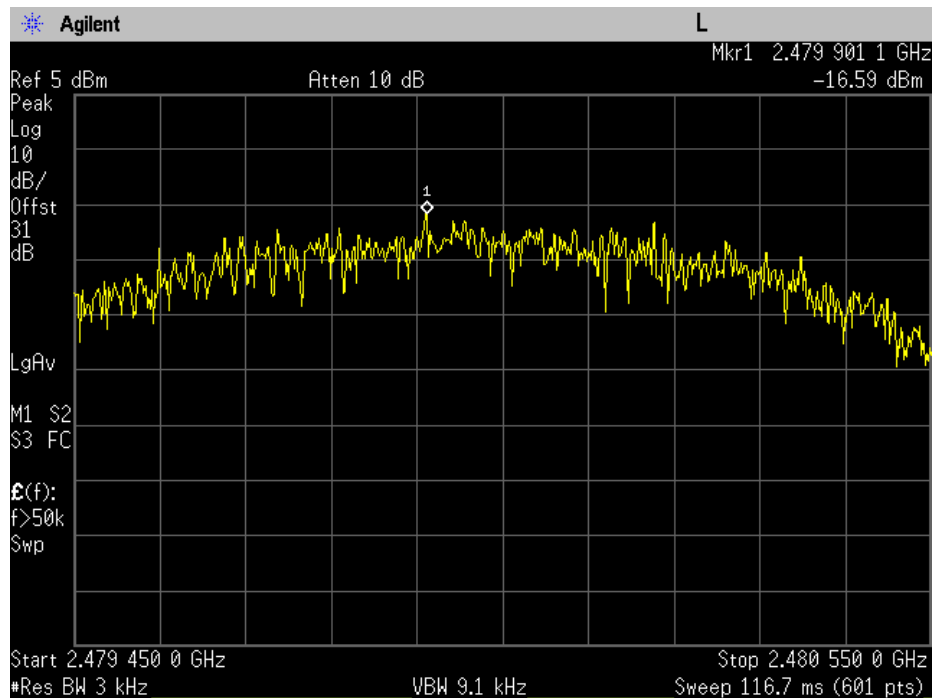


### 0 dBm PSD 2426 MHz

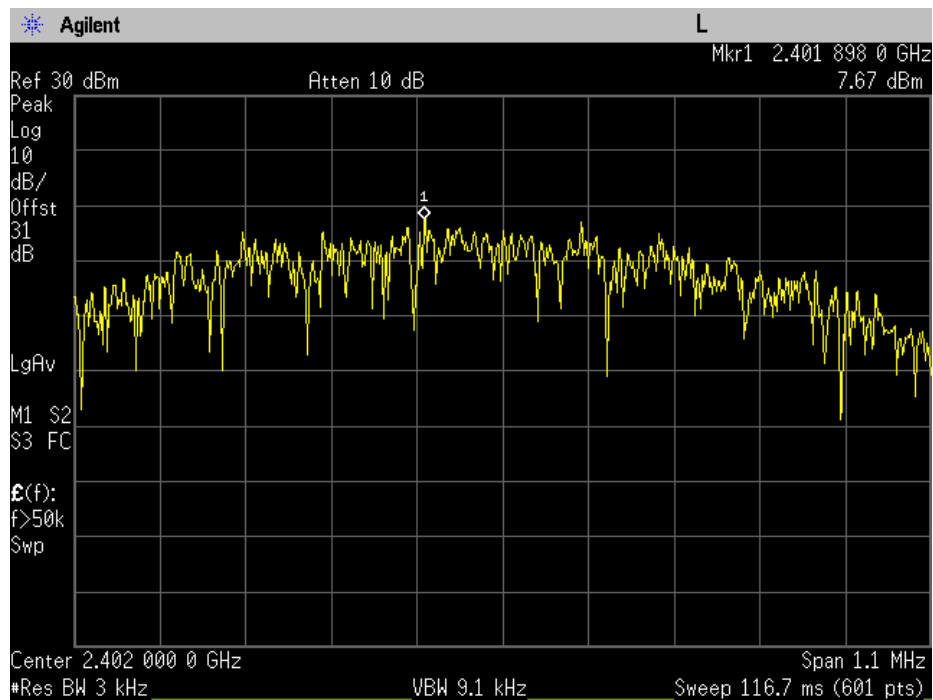




### 0 dBm PSD 2480 MHz

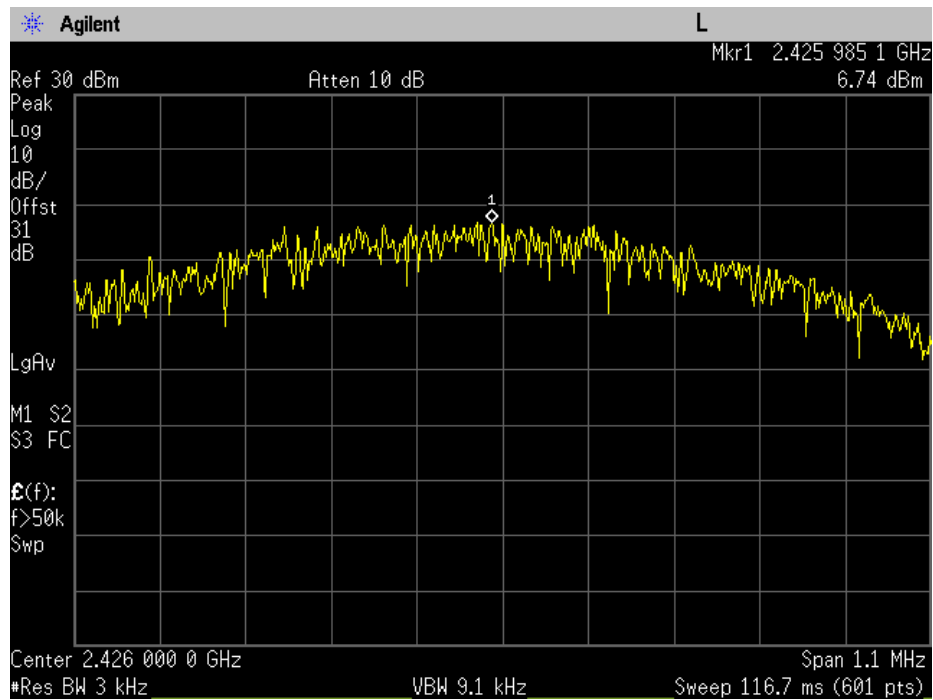


### +25 dBm PSD 2402 MHz

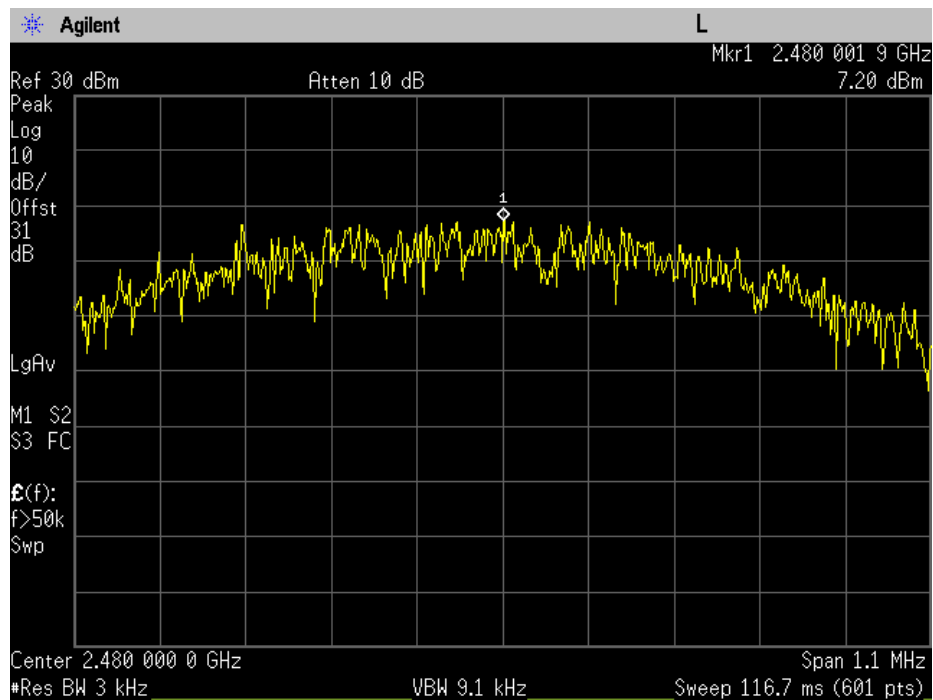




**+25 dBm PSD 2426 MHz**



**+25 dBm PSD 2480 MHz**





### Test Equipment Utilized

| Description                   | Manufacturer | Model #                       | CT Asset # | Last Cal Date           | Cal Due Date |
|-------------------------------|--------------|-------------------------------|------------|-------------------------|--------------|
| Horn Antenna, Amplified       | ARA          | MWH-1826/B                    | i00273     | 4/22/15                 | 4/22/18      |
| Spectrum Analyzer             | Agilent      | E4407B                        | i00331     | 9/18/15                 | 9/18/16      |
| Horn Antenna                  | EMCO         | 3115                          | i00103     | 1/20/15                 | 1/20/17      |
| Bi-Log Antenna                | Schaffner    | CBL 6111D                     | i00349     | 10/19/15                | 10/19/17     |
| EMI Analyzer                  | Agilent      | E7405A                        | i00379     | 2/11/16                 | 2/11/17      |
| 3 Meter Semi-Anechoic Chamber | Panashield   | 3 Meter Semi-Anechoic Chamber | i00428     | 7/27/14                 | 7/27/16      |
| PSA Spectrum Analyzer         | Agilent      | E4445A                        | i00471     | 8/26/15                 | 8/26/16      |
| 1-18 GHz Pre-Amplifier        | Miteq        | AFS44-00101-400-23-10P-44     | i00509     | Verified on: 06/14/2016 |              |

In addition to the above listed equipment standard RF connectors and cables were utilized in the testing of the described equipment. Prior to testing these components were tested to verify proper operation.

END OF TEST REPORT