



## FCC / ISED Test Report

**FOR:**  
Axon Enterprise, Inc.

**Model Name:**  
Axon Body 3

**Product Description:**  
Body Worn Camera

FCC ID: X4GS01200  
IC: 8803A-S01200

Applied Rules and Standards:  
47 CFR Part 15.247 (DTS)  
RSS-247 Issue 2 (DTSs) & RSS-Gen Issue 5

REPORT #: EMC\_AXONN-044-19001\_15.247\_DTS

DATE: 2019-07-17



A2LA Accredited

IC recognized #  
3462B-1

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CETECOM Inc. is a Delaware Corporation with Corporation number: 2905571

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## 1 Assessment

The following device was evaluated against the applicable criteria specified in FCC rules Parts 15.247 of Title 47 of the Code of Federal Regulations and the relevant ISED Canada standard RSS-247.

No deviations were ascertained.

| Company               | Description      | Marketing Name | Model # |
|-----------------------|------------------|----------------|---------|
| Axon Enterprise, Inc. | Body Worn Camera | Axon Body 3    | AX1023  |

### Responsible for Testing Laboratory:

| 2019-07-17 | Compliance | Cindy Li<br>(EMC Lab Manager) |           |
|------------|------------|-------------------------------|-----------|
| Date       | Section    | Name                          | Signature |

### Responsible for the Report:

| 2019-07-17 | Compliance | Kevin Wang<br>(Senior EMC Engineer) |           |
|------------|------------|-------------------------------------|-----------|
| Date       | Section    | Name                                | Signature |

The test results of this test report relate exclusively to the test item specified in Section 3.

CETECOM Inc. USA does not assume responsibility for any conclusions and generalizations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by the test item. The test report may only be reproduced or published in full. Reproduction or publication of extracts from the report requires the prior written approval of CETECOM Inc. USA.

## 2 Administrative Data

### 2.1 Identification of the Testing Laboratory Issuing the EMC Test Report

|                             |                        |
|-----------------------------|------------------------|
| Company Name:               | CETECOM Inc.           |
| Department:                 | Compliance             |
| Street Address:             | 411 Dixon Landing Road |
| City/Zip Code               | Milpitas, CA 95035     |
| Country                     | USA                    |
| Telephone:                  | +1 (408) 586 6200      |
| Fax:                        | +1 (408) 586 6299      |
| EMC Lab Manager:            | Cindy Li               |
| Responsible Project Leader: | Kevin Wang             |

### 2.2 Identification of the Client

|                   |                        |
|-------------------|------------------------|
| Applicant's Name: | Axon Enterprise, Inc.  |
| Street Address:   | 17800 N 85th St.       |
| City/Zip Code     | Scottsdale, AZ / 85255 |
| Country           | USA                    |

### 2.3 Identification of the Manufacturer

|                        |                   |
|------------------------|-------------------|
| Manufacturer's Name:   | Same as Applicant |
| Manufacturers Address: | -----             |
| City/Zip Code          | -----             |
| Country                | -----             |

### 3 Equipment Under Test (EUT)

#### 3.1 EUT Specifications

|   |  |
|---|--|
| <b>Marketing Name:</b>                              | Axon Body 3  |
| <b>Model No:</b>                                    | AX1023   |
| <b>HW Version :</b>                                 | PVT  |
| <b>SW Version :</b>                                 | 1.0.151  |
| <b>FCC-ID :</b>                                     | X4G01200   |
| <b>IC:</b>  | 8803A-S01200   |
| <b>FWIN:</b>  | N/A  |
| <b>HVIN:</b>  | AX1023   |
| <b>PMN:</b>   | Axon Body 3  |
| <b>Product Description:</b>                         | Body Worn Camera, with Wi-Fi 802.11a/b/g/n40/ac80, Bluetooth Classis + BLE, Passive NFC TAG, LTE, 3G Fallback support, GPS/GLONASS Receiver<br>Model AX1023 has Sierra Wireless WP7610 |
| <b>Frequency Range / number of channels:</b>        | Nominal band: 2400 MHz – 2483.5 MHz;<br>Center to center: 2402 MHz (ch 0) – 2480 MHz (ch 39), 40 channels  |
| <b>Type(s) of Modulation:</b>                       | Bluetooth version 4.0, Low Energy, using Dynamic Sequence Spread Spectrum with GFSK modulation.  |
| <b>Modes of Operation:</b>                          | Bluetooth LE in both advertising and connected mode of operation   |
| <b>Antenna Information as declared:</b>             | max gain 3.4 dBi for 2.4GHz, refer to section 3.6 for more information   |
| <b>Max. Peak Output Power:</b>                      | Conducted Power 11.95 dBm  |
| <b>Power Supply/ Rated Operating Voltage Range:</b> | Rechargeable Battery Vmin: 3.4 VDC/ Vnom: 3.8 VDC / Vmax: 4.3 VDC  |
| <b>Operating Temperature Range</b>                  | -20° to 50° C  |
| <b>Other Radios included in the device:</b>         | Bluetooth Basic / EDR: GFSK, $\pi/4$ DQPSK, 8DPSK<br>Wi-Fi 802.11 a/b/g/n/ac, Qualcomm WCN3680B<br>GPS, Qualcomm WGR7640<br>UMTS/LTE, Sierra Wireless WP7610                           |
| <b>Sample Revision</b>                              | <input type="checkbox"/> Prototype Unit; <input type="checkbox"/> Production Unit; <input checked="" type="checkbox"/> Pre-Production  |

### 3.2 EUT Sample details

| EUT # | Serial Number | HW Version | SW Version | Notes/Comments   |
|-------|---------------|------------|------------|------------------|
| 1     | X60000190     | DVT3       | 1.0.48     | Conducted Sample |
| 2     | X60495001     | PVT1       | 1.0.68     | Radiated Sample  |

### 3.3 Accessory Equipment (AE) details

| AE # | Type       | Model           | Manufacturer | Serial Number |
|------|------------|-----------------|--------------|---------------|
| 1    | Laptop     | HSTNN-I33C-4    | HP           | -             |
| 2    | USB Cable  | -               | AXON         | -             |
| 3    | AC Adaptor | KSA01A5210100D5 | Ktec         | -             |

### 3.4 Test Sample Configuration

| EUT Set-up # | Combination of AE used for test set up | Comments  |
|--------------|--|---|
| 1            | EUT#1 + AE#1 + AE#2                    | The radio of the EUT was configured to a fixed channel transmission with 62% duty cycle using Putty tool and Qualcomm software QRCT to configure the EUT. The measurement equipment was connected to the 50 ohm RF port of the EUT. |
| 2            | EUT#2 + AE#1 + AE#2                    | The radio of the EUT was configured to a fixed channel transmission with 62% duty cycle using Putty tool and Qualcomm software QRCT to configure the EUT. The internal antenna was connected.                                       |
| 3            | EUT#2 + AE#2 + AE#3                    | The radio of the EUT was configured to a fixed channel transmission with 62% duty cycle using Putty tool and Qualcomm software QRCT to configure the EUT. The internal antenna was connected.                                       |

### 3.5 Justification for Worst Case Mode of Operation

During the testing process, the EUT was tested with transmitter sets on low, mid and high channels, and highest possible duty cycle of 62%. For radiated measurements, all data in this report shows the worst case between horizontal and vertical antenna polarizations and for all orientations of the EUT.

### 3.6 Antenna Gain provided by the Customer

|                    |      |      |      |      |      |
|--------------------|------|------|------|------|------|
| Frequency (MHz)    | 2400 | 2420 | 2440 | 2460 | 2480 |
| Antenna Gain (dBi) | 2.01 | 2.9  | 2.81 | 3.4  | 3.22 |

|                    |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
|--------------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| Frequency (MHz)    | 5150 | 5200 | 5250 | 5300 | 5350 | 5400 | 5450 | 5500 | 5550 | 5600 | 5650 | 5700 | 5750 | 5800 | 5850 |
| Antenna Gain (dBi) | 2.93 | 2.63 | 3.02 | 3.25 | 3.58 | 3.94 | 3.85 | 4.11 | 3.96 | 4.14 | 4.1  | 4.13 | 3.57 | 3.29 | 3.58 |

#### 4 Subject of Investigation

The objective of the measurements done by CETECOM Inc. was to assess the performance of the EUT according to the relevant requirements specified in FCC rules Part 15.247 of Title 47 of the Code of Federal Regulations and Radio Standard Specification RSS-247 of ISED Canada.

This test report is to support a request for new equipment authorization under the:

- FCC ID: X4GS01200
- IC: 8803A-S01200

Testing procedures are based on 558074 D01 DTS Meas Guidance v04 – “GUIDANCE FOR PERFORMING COMPLIANCE MEASUREMENTS ON DIGITAL TRANSMISSION SYSTEMS (DTS) OPERATING UNDER SECTION 15.247” - April 5, 2017, by the Federal Communications Commission, Office of Engineering and Technology, Laboratory Division.

#### 5 Measurement Results Summary

| Test Specification                           | Test Case                                       | Temperature and Voltage Conditions | Mode | Pass | NA | NP | Result   |
|--|---|------------------------------------|------|------|----|----|----------|
| §15.247(a)(1)<br>RSS-247 5.2(a)              | Emission Bandwidth                              | Nominal                            | BTLE | ■    | □  | □  | Complies |
| §15.247(e)<br>RSS-247 5.2(b)                 | Power Spectral Density                          | Nominal                            | BTLE | ■    | □  | □  | Complies |
| §15.247(b)(1)<br>RSS-247 5.4(d)              | Maximum Conducted Output Power and EIRP         | Nominal                            | BTLE | ■    | □  | □  | Complies |
| §15.247(d)<br>RSS-247 5.5                    | Band edge compliance<br>Unrestricted Band Edges | Nominal                            | BTLE | ■    | □  | □  | Complies |
| §15.247; 15.209; 15.205<br>RSS-Gen 8.9; 8.10 | Band edge compliance<br>Restricted Band Edges   | Nominal                            | BTLE | ■    | □  | □  | Complies |
| §15.247(d); §15.209<br>RSS-Gen 6.13          | TX Spurious emissions-<br>Radiated              | Nominal                            | BTLE | ■    | □  | □  | Complies |
| §15.207(a)<br>RSS Gen 8.8                    | AC Conducted Emissions                          | Nominal                            | BTLE | ■    | □  | □  | Complies |

**Note:** NA= Not Applicable; NP= Not Performed.



## 6 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus, with 95% confidence interval (in dB delta to result), based on a coverage factor k=1.

### Radiated measurement

|                    |                                 |
|--------------------|---------------------------------|
| 9 kHz to 30 MHz    | ±2.5 dB (Magnetic Loop Antenna) |
| 30 MHz to 1000 MHz | ±2.0 dB (Biconilog Antenna)     |
| 1 GHz to 40 GHz    | ±2.3 dB (Horn Antenna)          |

### Conducted measurement

|                   |                |
|-------------------|----------------|
| 150 kHz to 30 MHz | ±0.7 dB (LISN) |
|-------------------|----------------|

|                          |         |
|--------------------------|---------|
| RF conducted measurement | ±0.5 dB |
|--------------------------|---------|

According to TR 102 273 a multiplicative propagation of error is assumed for RF measurement systems. For this reason the RMS method is applied to dB values and not to linear values as appropriate for additive propagation of error. Also used: <http://physics.nist.gov/cuu/Uncertainty/typeb.html>. The above calculated uncertainties apply to direct application of the Substitution method. The Substitution method is always used when the EUT comes closer than 3 dB to the limit.

### 6.1 Environmental Conditions During Testing:

The following environmental conditions were maintained during the course of testing:

- Ambient Temperature: 20-25° C
- Relative humidity: 40-60%

### 6.2 Dates of Testing:

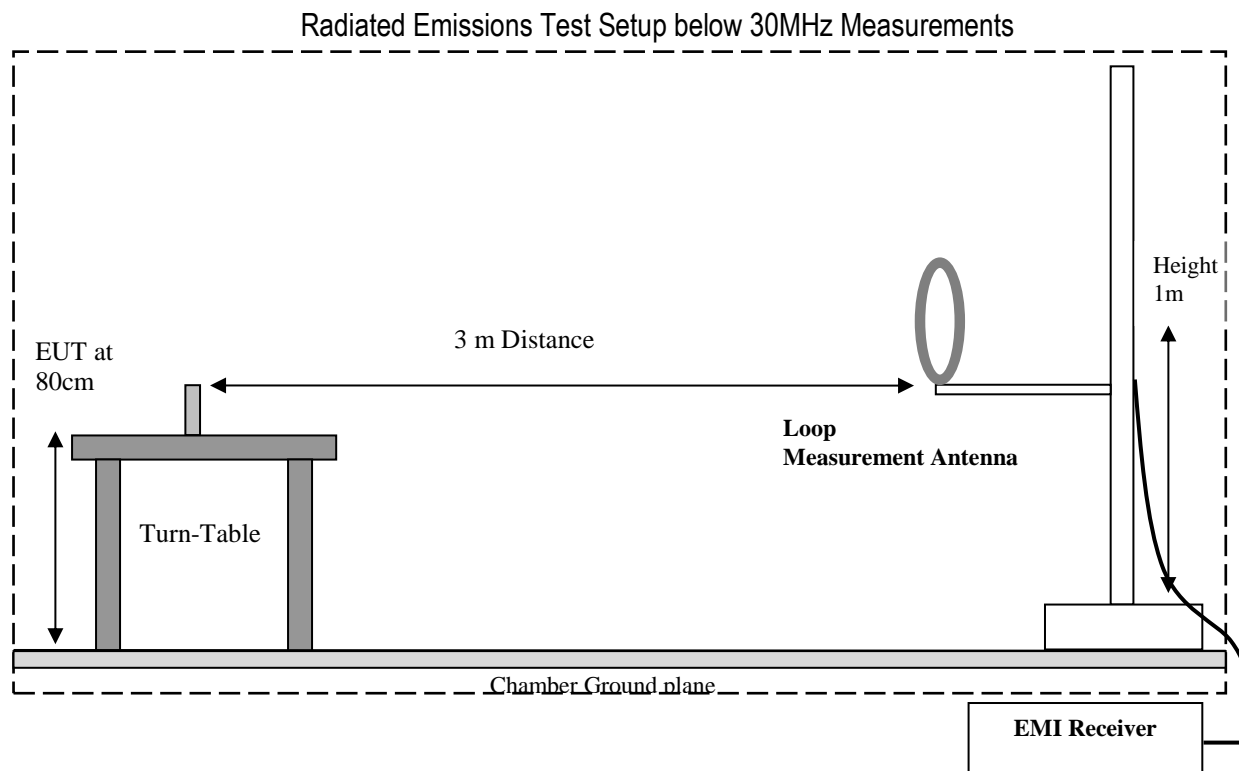
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## 7 Measurement Procedures

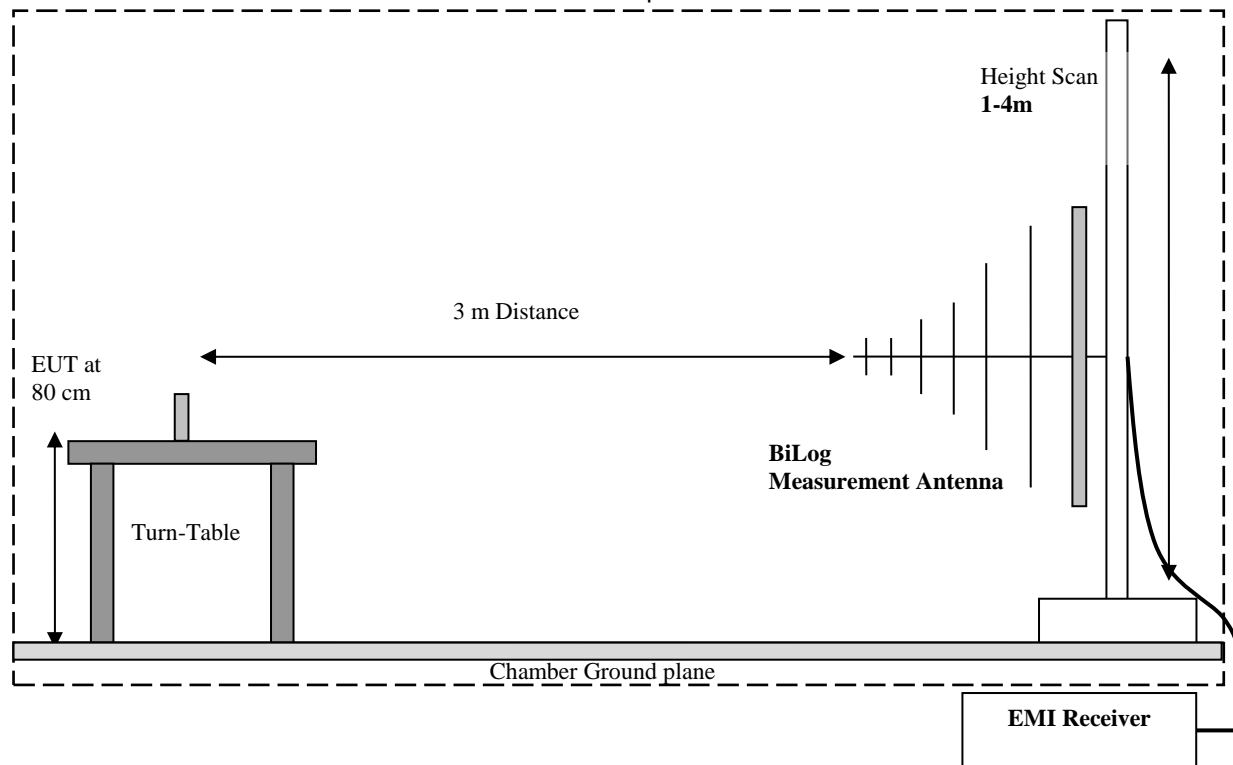
### 7.1 Radiated Measurement

The radiated measurement is performed according to ANSI C63.10 (2013)

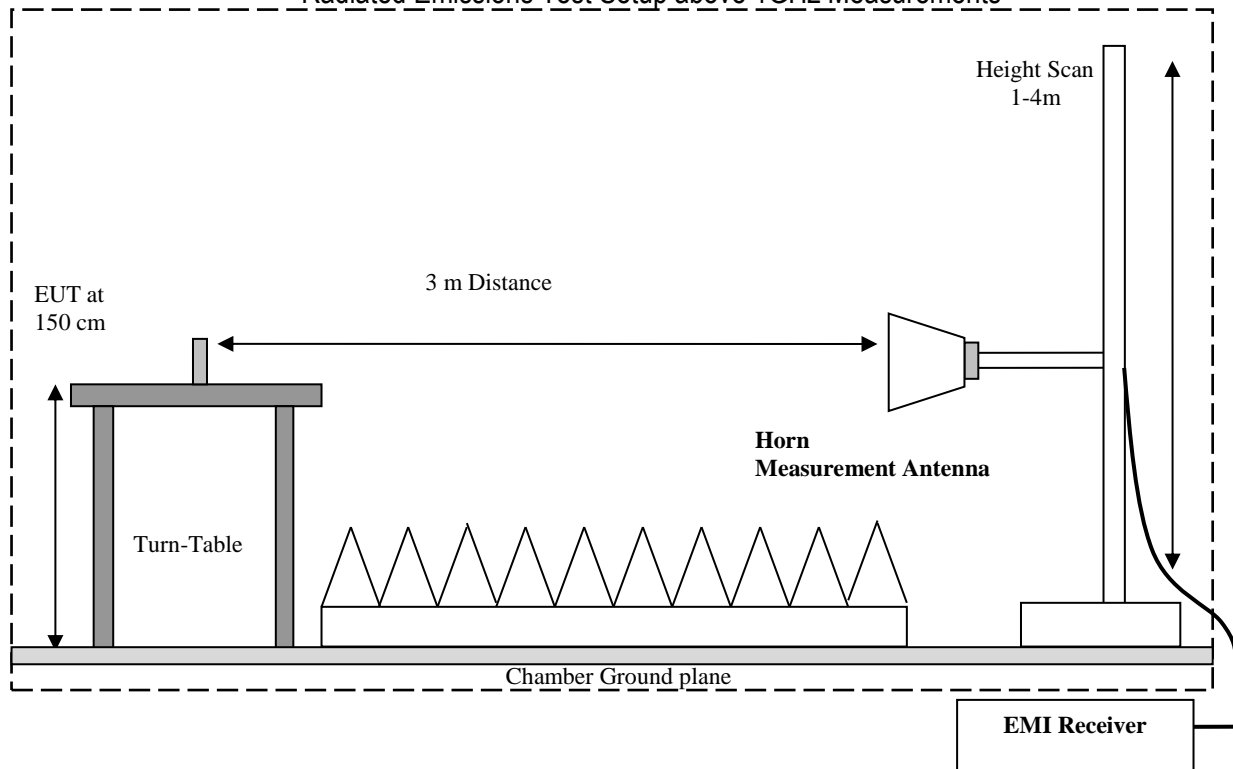
- The exploratory measurement is accomplished by running a matrix of 16 sweeps over the required frequency range with R&S Test-SW EMC32 for 4 positions of the turntable, two orthogonal positions of the EUT and both antenna polarizations. This procedure exceeds the requirement of the above standards to cover the 3 orthogonal axis of the EUT. A max peak detector is utilized during the exploratory measurement. The Test-SW creates an overall maximum trace for all 12 sweeps and saves the settings for each point of this trace. The maximum trace is part of the test report.
- The 10 highest emissions are selected with an automatic algorithm of EMC32 searching for peaks in the noise floor and ensuring that broadband signals are not selected multiple times.
- The maxima are then put through the final measurement and again maximized in a 90deg range of the turntable, fine search in frequency domain and height scan between 1m and 4m.
- The above procedure is repeated for all possible ways of power supply to EUT and for all supported modulations.
- In case there are no emissions above noise floor level only the maximum trace is reported as described above.
- The results are split up into up to 4 frequency ranges due to antenna bandwidth restrictions. A magnetic loop is used from 9 kHz to 30 MHz, a Biconilog antenna is used from 30 MHz to 1 GHz, and two different horn antennas are used to cover frequencies up to 40 GHz.



## Radiated Emissions Test Setup 30MHz-1GHz Measurements



## Radiated Emissions Test Setup above 1GHz Measurements



### 7.1.1 Sample Calculations for Field Strength Measurements

Field Strength is calculated from the Spectrum Analyzer/ Receiver readings, taking into account the following parameters:

1. Measured reading in dB $\mu$ V
2. Cable Loss between the receiving antenna and SA in dB and
3. Antenna Factor in dB/m

All radiated measurement plots in this report are taken from a test SW that calculates the Field Strength based on the following equation:

$$FS \text{ (dB}\mu\text{V/m)} = \text{Measured Value on SA (dB}\mu\text{V)} - \text{Cable Loss (dB)} + \text{Antenna Factor (dB/m)}$$

Example:

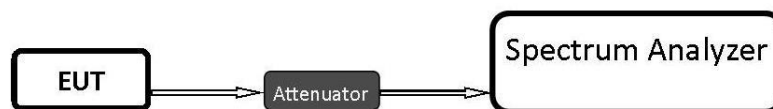
| Frequency (MHz) | Measured SA (dB $\mu$ V) | Cable Loss (dB) | Antenna Factor Correction (dB) | Field Strength Result (dB $\mu$ V/m) |
|-----------------|--------------------------|-----------------|--------------------------------|--------------------------------------|
| 1000            | 80.5                     | 3.5             | 14                             | 98.0                                 |

### 7.2 Power Line Conducted Measurement Procedure

AC Power Line conducted emissions measurements performed according to: ANSI C63.4 (2014)

### 7.3 RF Conducted Measurement Procedure

Testing procedures are based on 558074 D01 DTS Meas Guidance v04 – “GUIDANCE FOR PERFORMING COMPLIANCE MEASUREMENTS ON DIGITAL TRANSMISSION SYSTEMS (DTS) OPERATING UNDER SECTION 15.247” - April 5, 2017, by the Federal Communications Commission, Office of Engineering and Technology, Laboratory Division.



- Connect the equipment as shown in the above diagram.
- Adjust the settings of the SA (Rohde-Schwarz Spectrum Analyzer) to connect the EUT at the required mode of test.
- Measurements are to be performed with the EUT set to the low, middle and high channels and for worst case modulation schemes.

## 8 Test Result Data

### 8.1 Maximum Peak Conducted Output Power

#### 8.1.1 Measurement according to FCC 558074 D01 DTS Meas Guidance v04

##### Spectrum Analyzer settings:

- RBW  $\geq$  DTS bandwidth
- VBW  $\geq 3 \times$  RBW
- Span  $\geq 3 \times$  RBW
- Sweep = Auto couple
- Detector function = Peak
- Trace = Max hold
- Use peak marker function to determine the peak amplitude level

#### 8.1.2 Limits:

##### Maximum Peak Output Power:

- FCC §15.247 (b)(1): 1 W
- IC RSS-247: 1 W

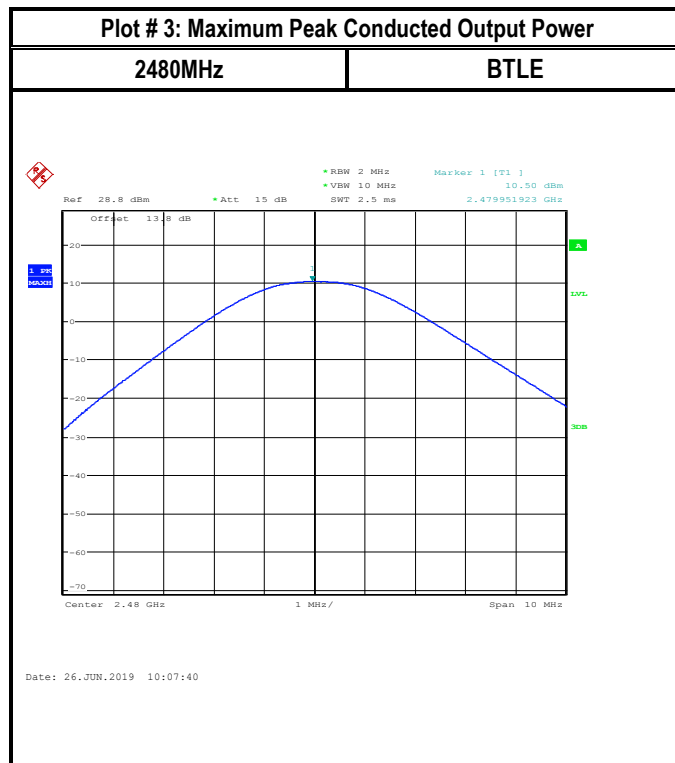
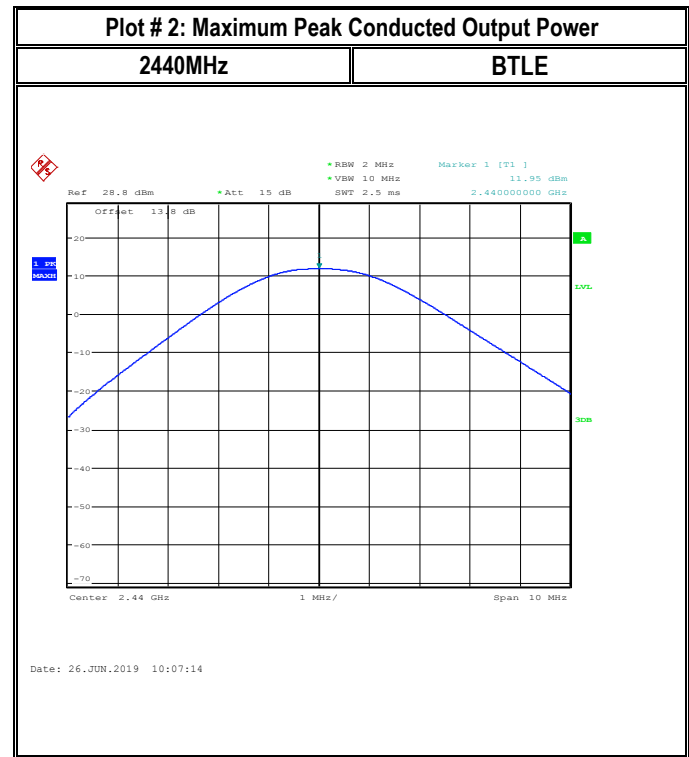
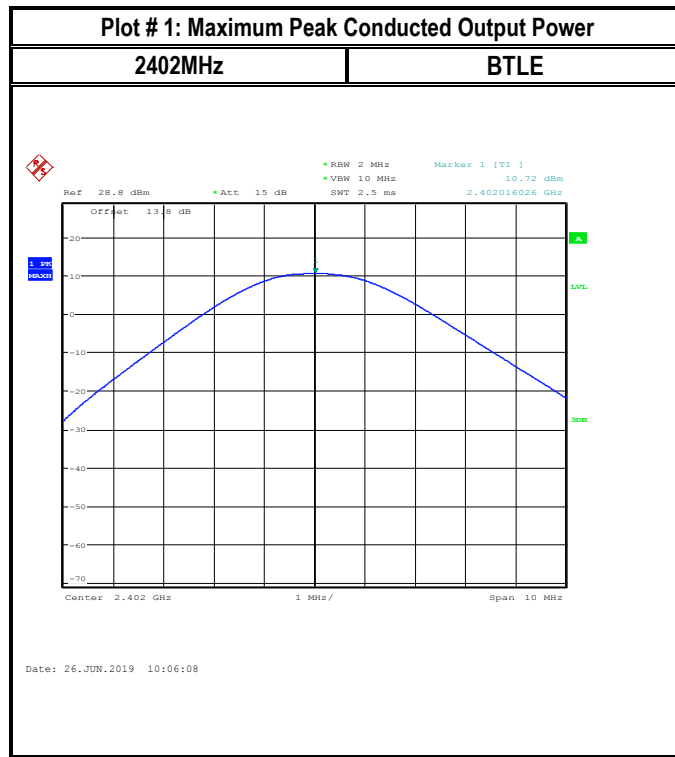
#### 8.1.3 Test conditions and setup:

| Ambient Temperature | EUT Set-Up # | EUT operating mode            | Power Input | Antenna Gain |
|---------------------|--------------|-------------------------------|-------------|--------------|
| 22° C               | 1            | GFSK continuous fixed channel | 110VAC      | 3.4 dBi      |

#### 8.1.4 Measurement result:

| Plot # | Frequency (MHz) | Maximum Peak Conducted Output Power (dBm) | EIRP (dBm) | Limit (dBm)         | Result |
|--------|-----------------|---|------------|---------------------|--------|
| 1      | 2402            | 10.72                                     | 14.12      | 30 (Pk) / 36 (EIRP) | Pass   |
| 2      | 2440            | 11.95                                     | 15.35      | 30 (Pk) / 36 (EIRP) | Pass   |
| 3      | 2480            | 10.5                                      | 13.9       | 30 (Pk) / 36 (EIRP) | Pass   |

### 8.1.5 Measurement Plots:



## 8.2 Power Spectral Density

### 8.2.1 Measurement according to FCC 558074 D01 DTS Meas Guidance v04

#### Spectrum Analyzer settings for Peak PSD method:

- Set analyzer center frequency to DTS channel center frequency
- Set the span to 1.5 x DTS bandwidth
- Set RBW to:  $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$
- Set the VBW  $\geq 3 \times \text{RBW}$
- Detector = Peak
- Sweep time = Auto couple
- Trace mode = Max hold
- Allow trace to fully stabilize
- Use the peak marker function to determine the maximum amplitude level within the RBW
- If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat

### 8.2.2 Limits:

#### FCC§15.247(e) & RSS-247 5.2(2)

- For digitally modulated systems, the peak 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.

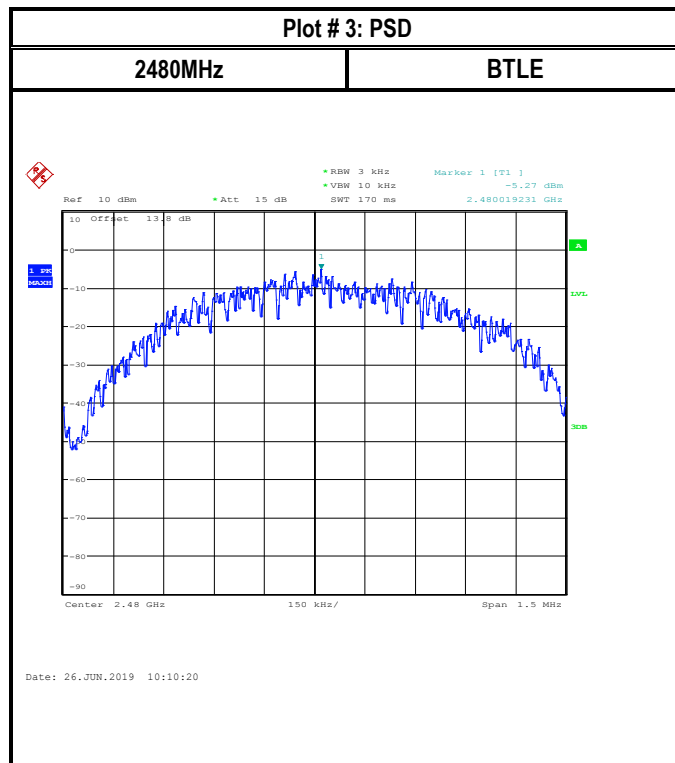
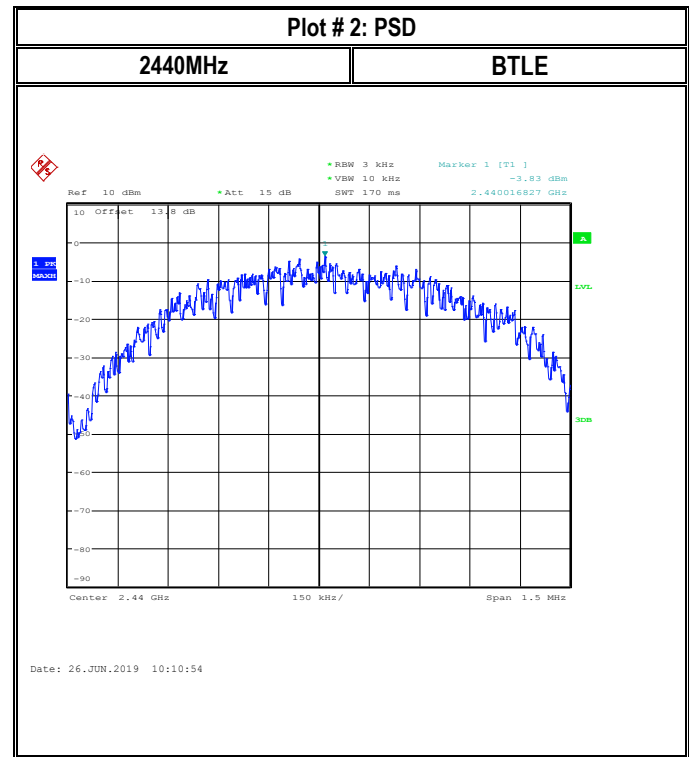
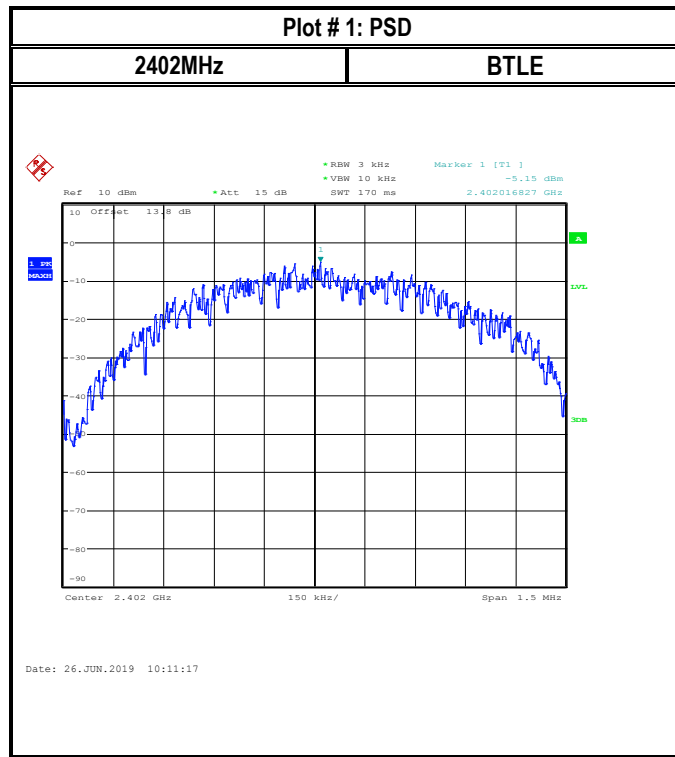
### 8.2.3 Test conditions and setup:

| Ambient Temperature | EUT Set-Up # | EUT operating mode            | Power Input | Antenna Gain |
|---------------------|--------------|-------------------------------|-------------|--------------|
| 22° C               | 1            | GFSK continuous fixed channel | 110VAC      | 3.4 dBi      |

### 8.2.4 Measurement result:

| Plot # | Frequency (MHz) | Maximum Power Spectral Density (dBm/3 kHz) | PSD Adjusted for Antenna Gain (dBm/3 kHz) | Limit ( dBm / 3 kHz ) | Result |
|--------|-----------------|--|---|-----------------------|--------|
| 1      | 2402            | -5.15                                      | -1.75                                     | 8                     | Pass   |
| 2      | 2440            | -3.83                                      | -0.43                                     | 8                     | Pass   |
| 3      | 2480            | -5.27                                      | -1.87                                     | 8                     | Pass   |

## 8.2.5 Measurement Plots:





### 8.3 Band Edge Compliance

#### 8.3.1 Measurement according to FCC 558074 D01 DTS Meas Guidance v04

##### Spectrum Analyzer settings for band edge:

- Set the center frequency and span to encompass frequency range to be measured
- RBW = 100 kHz
- VBW  $\geq 3 \times$  RBW
- Sweep Time: Auto couple
- Detector = Peak
- Trace = Max hold
- Allow trace to fully stabilize
- Use the peak marker function to determine the maximum amplitude level
- Set the marker on the emission at the band edge, or on the highest modulation product outside of the band, if this level is greater than that at the band edge

#### 8.3.2 Limits non restricted band:

##### FCC§15.247 (d)

- In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. 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) (see §15.205(c)).

##### RSS-247 5/5

- In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30dB instead of 20dB.

##### Spectrum Analyzer settings for restricted band:

- Peak measurements are made using a peak detector and RBW=1 MHz

### 8.3.3 Limits restricted band §15.247/15.209/15.205 and RSS-Gen 8.9/8.10

- \*PEAK LIMIT= 74 dBμV/m @3m =-21.23 dBm
- \*AVG. LIMIT= 54 dBμV/m @3m =-41.23 dBm
- Start frequency & stop frequency according to frequency range specified in the restricted band table in FCC section 15.205 & RSS-Gen 8.10
- Measurements with a peak detector were used to show compliance to average limits, thus showing compliance to both peak and average limits.

(a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

| MHz               | MHz                 | MHz           | GHz         |
|-------------------|---------------------|---------------|-------------|
| 0.090-0.110       | 16.42-16.423        | 399.9-410     | 4.5-5.15    |
| 10.495-0.505      | 16.69475-16.69525   | 608-614       | 5.35-5.46   |
| 2.1735-2.1905     | 16.80425-16.80475   | 960-1240      | 7.25-7.75   |
| 4.125-4.128       | 25.5-25.67          | 1300-1427     | 8.025-8.5   |
| 4.17725-4.17775   | 37.5-38.25          | 1435-1626.5   | 9.0-9.2     |
| 4.20725-4.20775   | 73-74.6             | 1645.5-1646.5 | 9.3-9.5     |
| 6.215-6.218       | 74.8-75.2           | 1660-1710     | 10.6-12.7   |
| 6.26775-6.26825   | 108-121.94          | 1718.8-1722.2 | 13.25-13.4  |
| 6.31175-6.31225   | 123-138             | 2200-2300     | 14.47-14.5  |
| 8.291-8.294       | 149.9-150.05        | 2310-2390     | 15.35-16.2  |
| 8.362-8.366       | 156.52475-156.52525 | 2483.5-2500   | 17.7-21.4   |
| 8.37625-8.38675   | 156.7-156.9         | 2690-2900     | 22.01-23.12 |
| 8.41425-8.41475   | 162.0125-167.17     | 3260-3267     | 23.6-24.0   |
| 12.29-12.293      | 167.72-173.2        | 3332-3339     | 31.2-31.8   |
| 12.51975-12.52025 | 240-285             | 3345.8-3358   | 36.43-36.5  |
| 12.57675-12.57725 | 322-335.4           | 3600-4400     | Above 38.6  |
| 13.36-13.41       |                     |               |             |

### 8.3.4 Test conditions and setup:

| Ambient Temperature | EUT Set-Up # | EUT operating mode            | Power Input | Antenna Gain |
|---------------------|--------------|-------------------------------|-------------|--------------|
| 22° C               | 1            | GFSK continuous fixed channel | 110VAC      | 3.4 dBi      |

### 8.3.5 Measurement result:

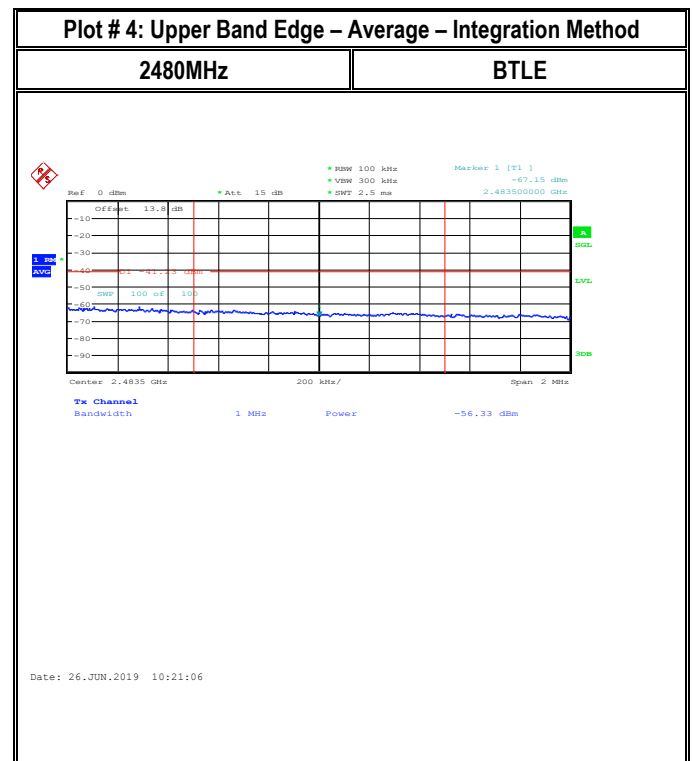
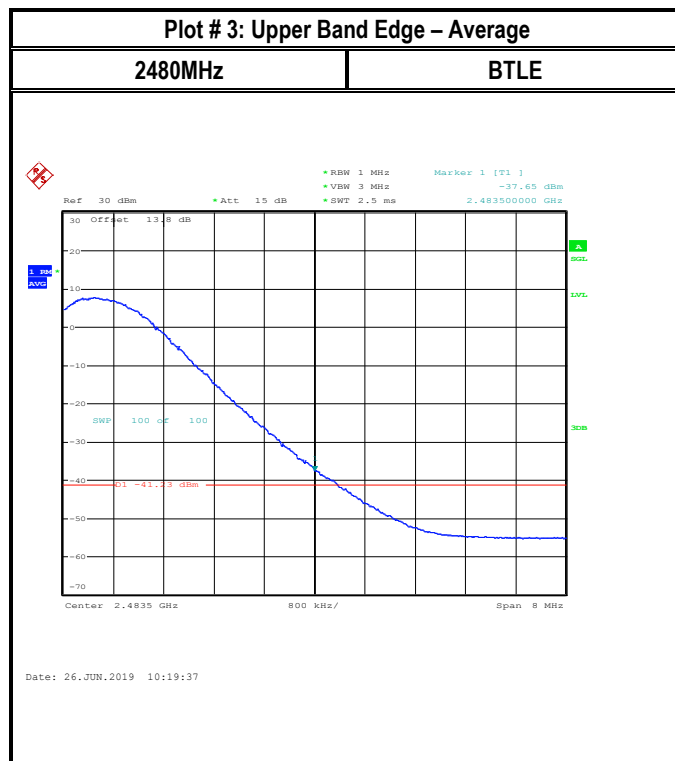
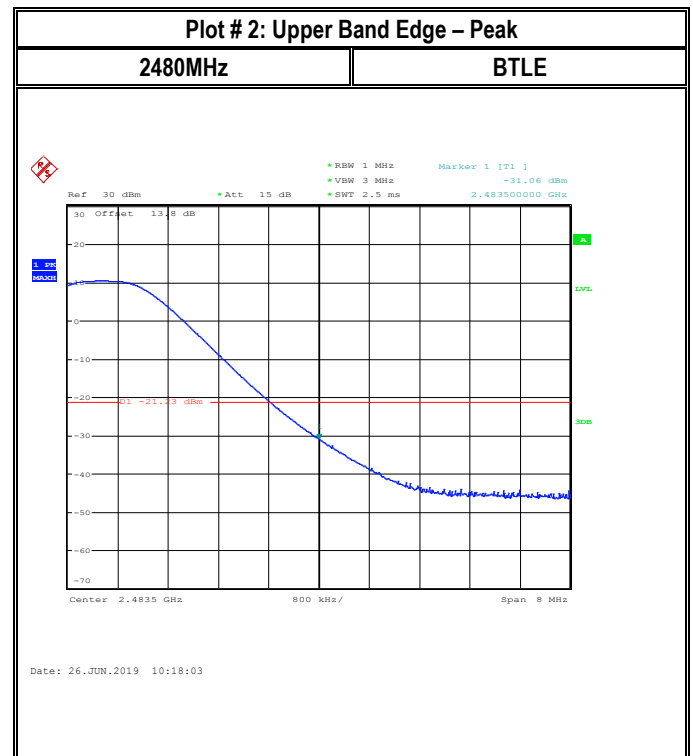
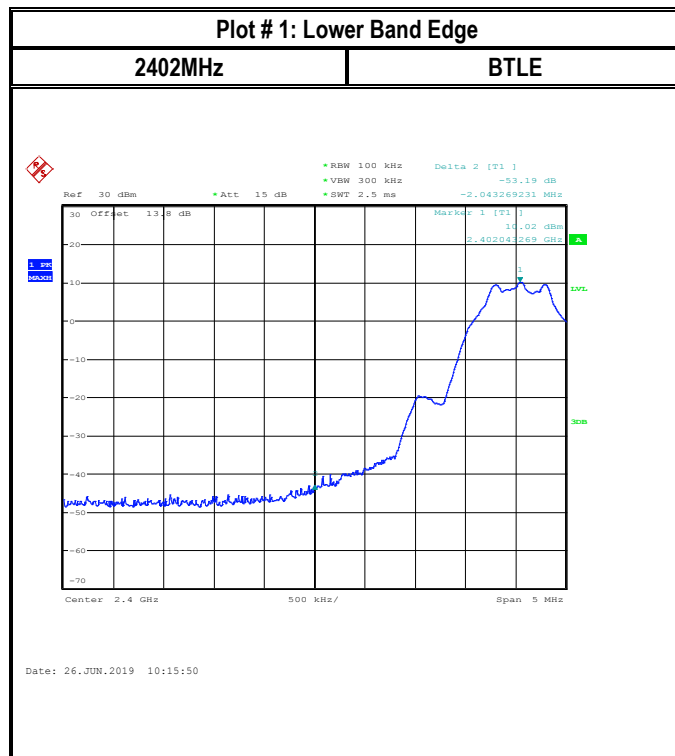
| Plot # | EUT operating mode            | Band Edge             | Band Edge Delta (dBc) | Limit (dBc) | Result |
|--------|-------------------------------|-----------------------|-----------------------|-------------|--------|
| 1      | GFSK continuous fixed channel | Lower, Non-restricted | 53.19                 | >20         | Pass   |

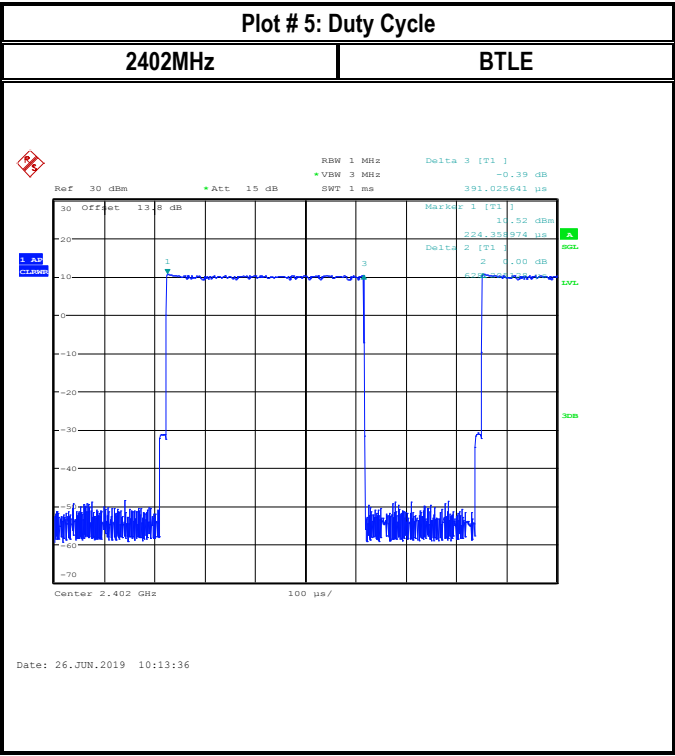
| Plot # | EUT operating mode            | Band Edge             | Measured Peak Value (dBm) | Corrected by duty cycle                     | Corrected by Antenna Gain (dBm) | Limit (dBm) | Result |
|--------|-------------------------------|-----------------------|---------------------------|---|---------------------------------|-------------|--------|
| 2      | GFSK continuous fixed channel | Upper Restricted Peak | -31.06                    | NA due to peak detector, and trace max hold | -27.66                          | -21.23 Peak | Pass   |
| 4      | GFSK continuous fixed channel | Upper Restricted AVG  | -56.33                    | -54.27                                      | -50.87                          | -41.23 AVG  | Pass   |

Duty Cycle:  $D = 0.391/0.628 = 62.24\%$

Duty Cycle Corrector Factor =  $10 * \log(1/D) = 2.06$

### 8.3.6 Measurement Plots:





## 8.4 Emission Bandwidth 6dB and 99% Occupied Bandwidth

### 8.4.1 Measurement according to FCC 558074 D01 DTS Meas Guidance v04

#### Spectrum Analyzer settings:

- Set RBW = 100 kHz
- Set the video bandwidth (VBW)  $\geq 3 \times$  RBW
- Detector = Peak
- Trace mode = Max hold
- Sweep = Auto couple
- Allow the trace to stabilize
- Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

#### 8.4.2 Limits:

FCC §15.247(a)(1) and RSS-247 5.2(1)

- 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.

#### 8.4.3 Test conditions and setup:

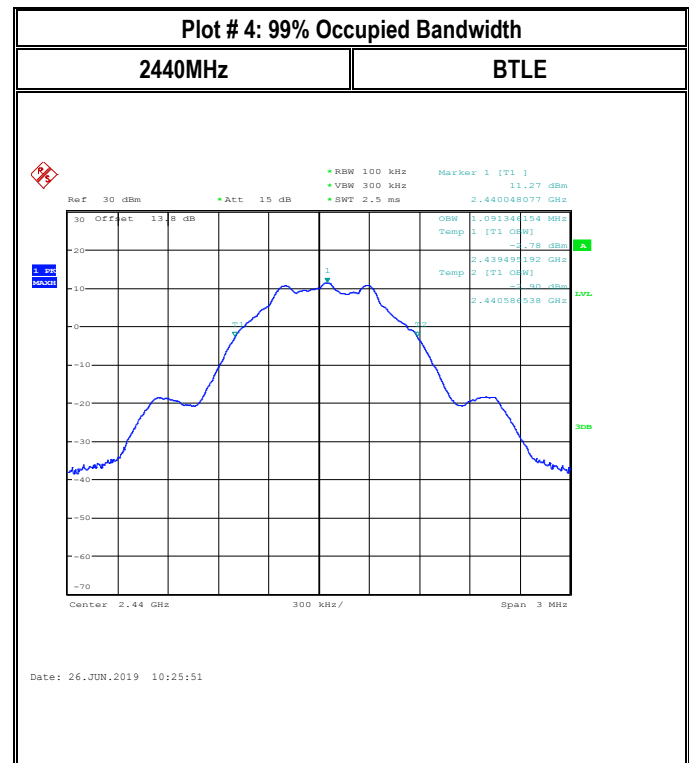
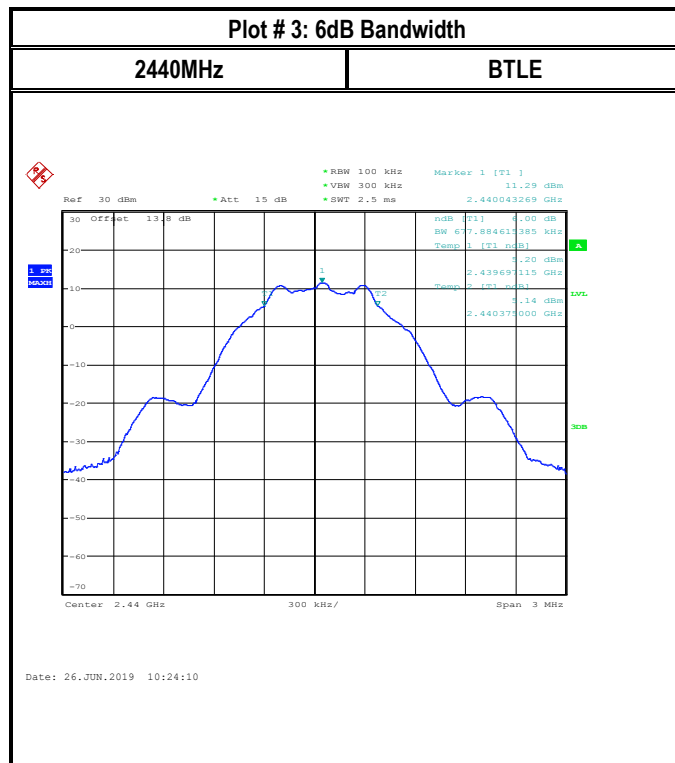
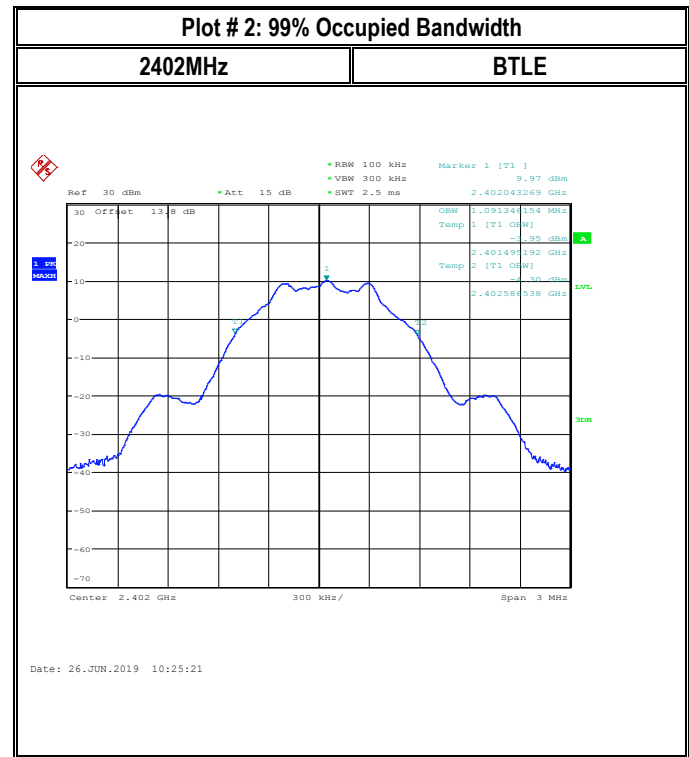
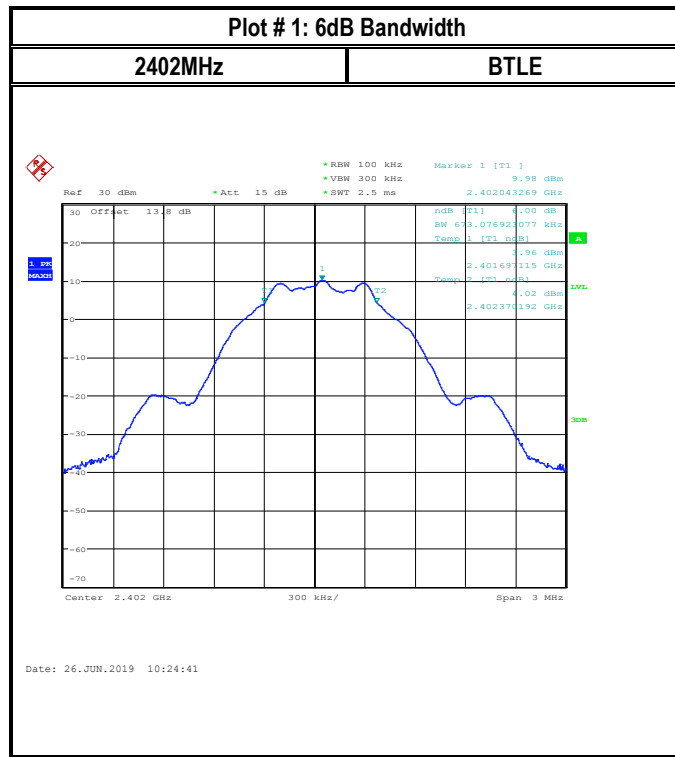
| Ambient Temperature | EUT Set-Up # | EUT operating mode            | Power Input |
|---------------------|--------------|-------------------------------|-------------|
| 22° C               | 1            | GFSK continuous fixed channel | 110VAC      |

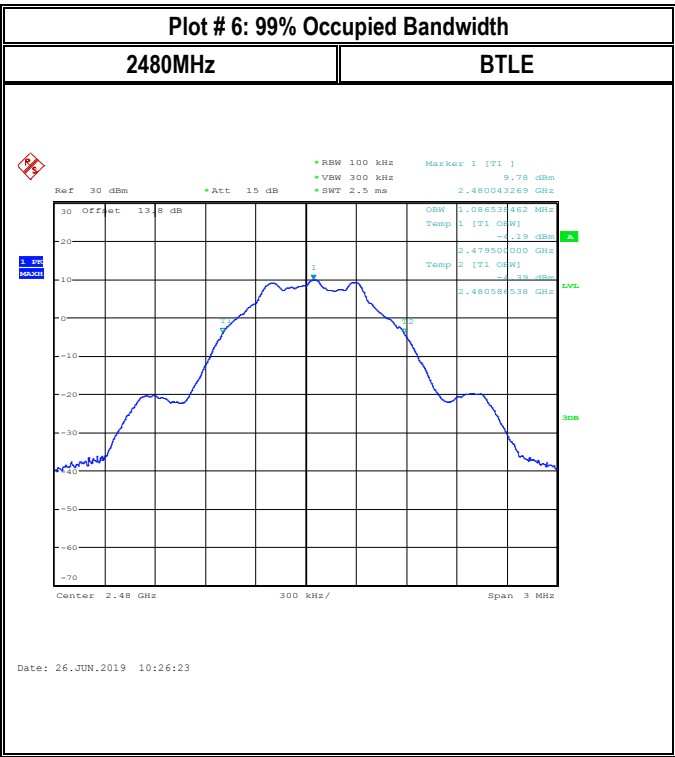
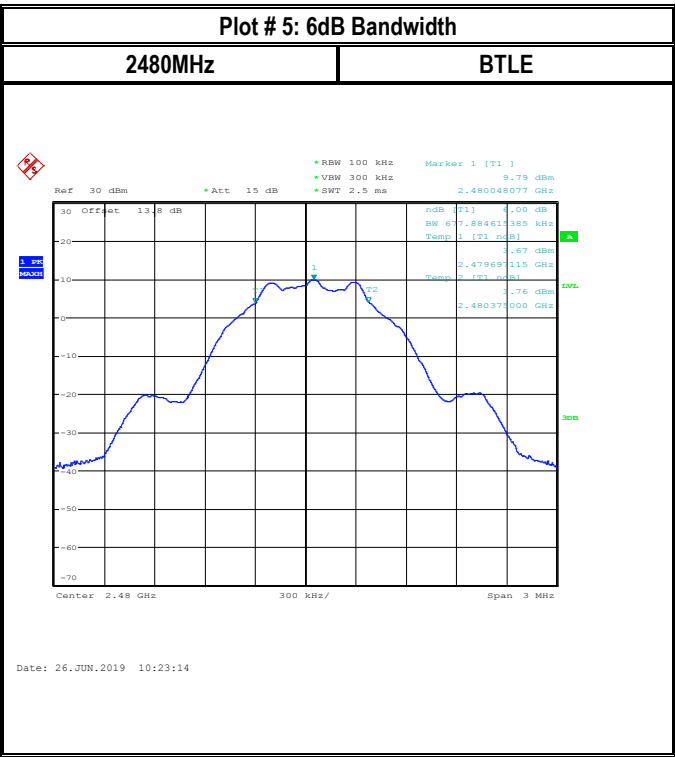
#### 8.4.4 Measurement result:

| Plot # | Frequency (MHz) | 6dB Emissions Bandwidth (MHz) | Limit (MHz) | Result |
|--------|-----------------|-------------------------------|-------------|--------|
| 1      | 2402            | 0.673                         | > 0.5       | Pass   |
| 3      | 2440            | 0.677                         | > 0.5       | Pass   |
| 5      | 2480            | 0.677                         | > 0.5       | Pass   |

| Plot # | Frequency (MHz) | 99% Occupied Bandwidth (MHz) | Limit (MHz) | Result |
|--------|-----------------|------------------------------|-------------|--------|
| 2      | 2402            | 1.091                        | > 0.5       | Pass   |
| 4      | 2440            | 1.091                        | > 0.5       | Pass   |
| 6      | 2480            | 1.086                        | > 0.5       | Pass   |

### 8.4.5 Measurement Plots:







## 8.5 Radiated Transmitter Spurious Emissions and Restricted Bands

### 8.5.1 Measurement according to ANSI C63.10 (2013)

#### Spectrum Analyzer Settings:

- Frequency = 9 KHz – 30 MHz
- RBW = 9 KHz
- Detector: Peak
  
- Frequency = 30 MHz – 1 GHz
- Detector = Peak / Quasi-Peak
- RBW= 120 KHz (<1GHz)
  
- Frequency > 1 GHz
- Detector = Peak / Average
- RBW = 1 MHz
  
- Radiated spurious emissions shall be measured for the transmit frequencies, transmit power, and data rate for the lowest, middle and highest channel in each frequency band of operation and for the highest gain antenna for each antenna type, and using the appropriate parameters and test requirements.
- The highest (or worst-case) data rate shall be recorded for each measurement.
- For testing at distance other than the specified in the standard, the limit conversion is calculated by using 40 dB/decade extrapolation factor as follow: Conversion factor (CF) =  $40 \log (D/d) = 40 \log (300\text{m} / 3\text{m}) = 80\text{dB}$

### 8.5.2 Limits:

#### FCC §15.247

- In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. 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) (see §15.205(c)).

## FCC §15.209 &amp; RSS-Gen 8.9

- Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

| Frequency of emission (MHz) | Field strength (μV/m) | Measurement Distance (m) | Field strength @ 3m (dBμV/m) |
|-----------------------------|-----------------------|--------------------------|------------------------------|
| 0.009–0.490                 | 2400/F(kHz) / -----   | 300                      | -                            |
| 0.490–1.705                 | 24000/F(kHz) / -----  | 30                       | -                            |
| 1.705–30.0                  | 30 / (29.5)           | 30                       | -                            |
| 30–88                       | 100                   | 3                        | 40 dBμV/m                    |
| 88–216                      | 150                   | 3                        | 43.5 dBμV/m                  |
| 216–960                     | 200                   | 3                        | 46 dBμV/m                    |
| Above 960                   | 500                   | 3                        | 54 dBμV/m                    |

## FCC §15.205 &amp; RSS-Gen 8.10

- Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

| MHz               | MHz                 | MHz           | GHz         |
|-------------------|---------------------|---------------|-------------|
| 0.090-0.110       | 16.42-16.423        | 399.9-410     | 4.5-5.15    |
| 10.495-0.505      | 16.69475-16.69525   | 608-614       | 5.35-5.46   |
| 2.1735-2.1905     | 16.80425-16.80475   | 960-1240      | 7.25-7.75   |
| 4.125-4.128       | 25.5-25.67          | 1300-1427     | 8.025-8.5   |
| 4.17725-4.17775   | 37.5-38.25          | 1435-1626.5   | 9.0-9.2     |
| 4.20725-4.20775   | 73-74.6             | 1645.5-1646.5 | 9.3-9.5     |
| 6.215-6.218       | 74.8-75.2           | 1660-1710     | 10.6-12.7   |
| 6.26775-6.26825   | 108-121.94          | 1718.8-1722.2 | 13.25-13.4  |
| 6.31175-6.31225   | 123-138             | 2200-2300     | 14.47-14.5  |
| 8.291-8.294       | 149.9-150.05        | 2310-2390     | 15.35-16.2  |
| 8.362-8.366       | 156.52475-156.52525 | 2483.5-2500   | 17.7-21.4   |
| 8.37625-8.38675   | 156.7-156.9         | 2690-2900     | 22.01-23.12 |
| 8.41425-8.41475   | 162.0125-167.17     | 3260-3267     | 23.6-24.0   |
| 12.29-12.293      | 167.72-173.2        | 3332-3339     | 31.2-31.8   |
| 12.51975-12.52025 | 240-285             | 3345.8-3358   | 36.43-36.5  |
| 12.57675-12.57725 | 322-335.4           | 3600-4400     | Above 38.6  |
| 13.36-13.41       |                     |               |             |

- 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) (see §15.205(c)).

\*PEAK LIMIT= 74 dBμV/m

\*AVG. LIMIT= 54 dBμV/m

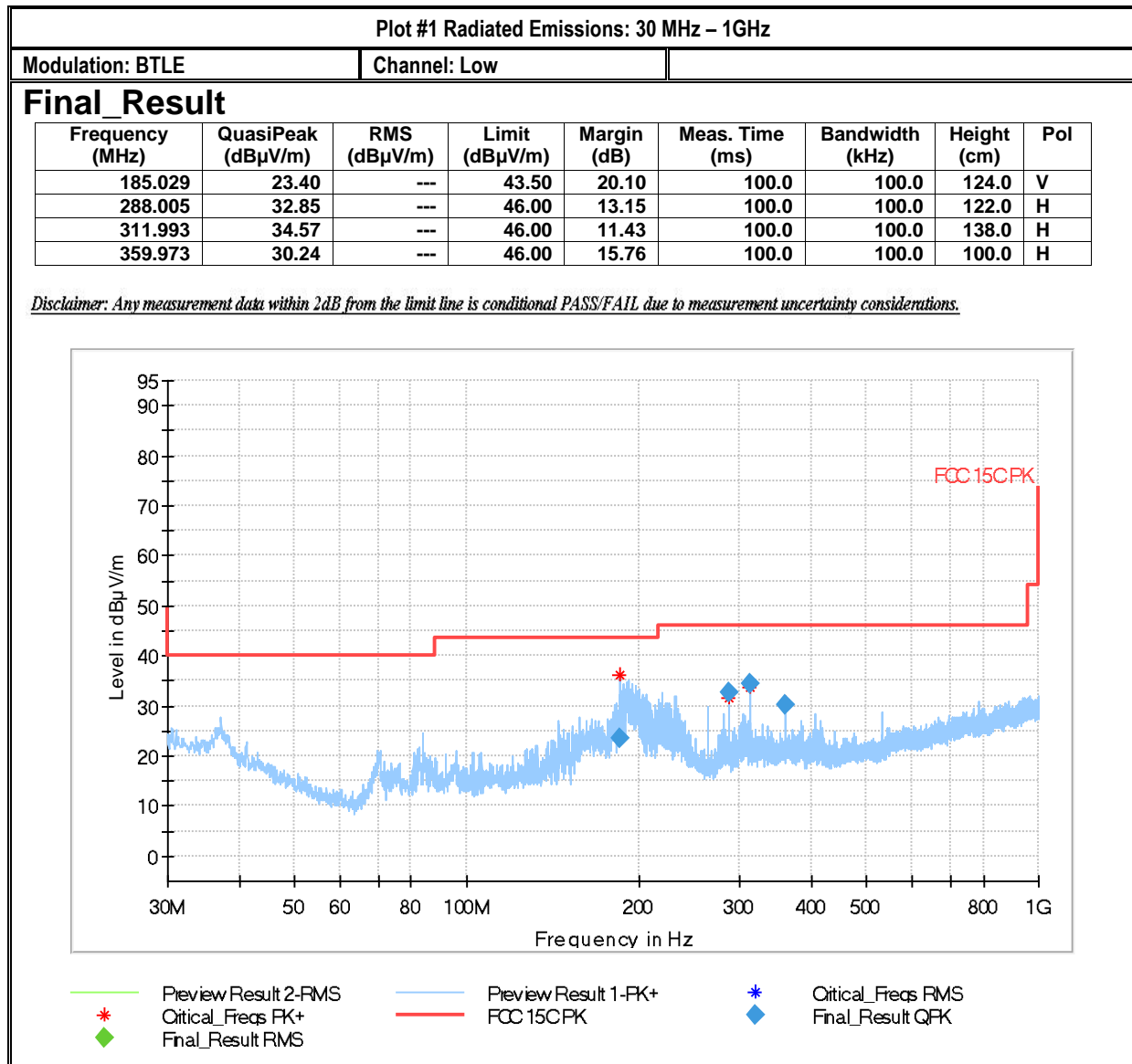
**8.5.3 Test conditions and setup:**

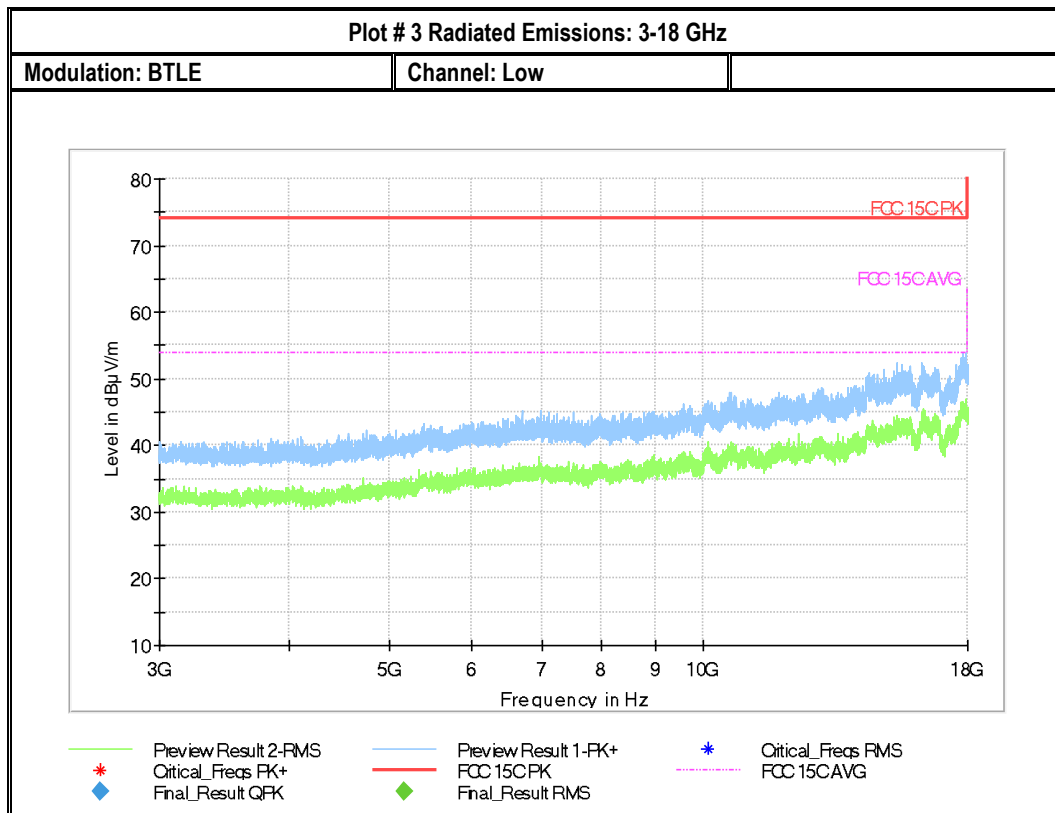
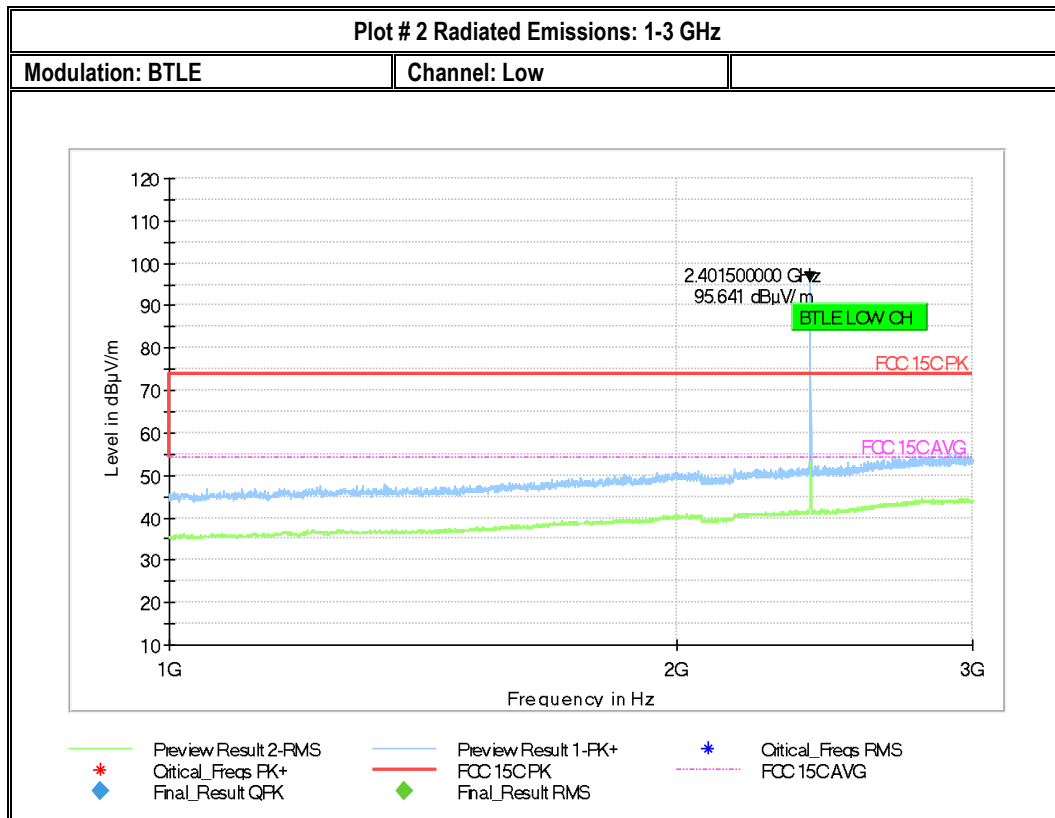
| Ambient Temperature | EUT Set-Up # | EUT operating mode            | Power Input |
|---------------------|--------------|-------------------------------|-------------|
| 22° C               | 2            | GFSK continuous fixed channel | 110VAC      |

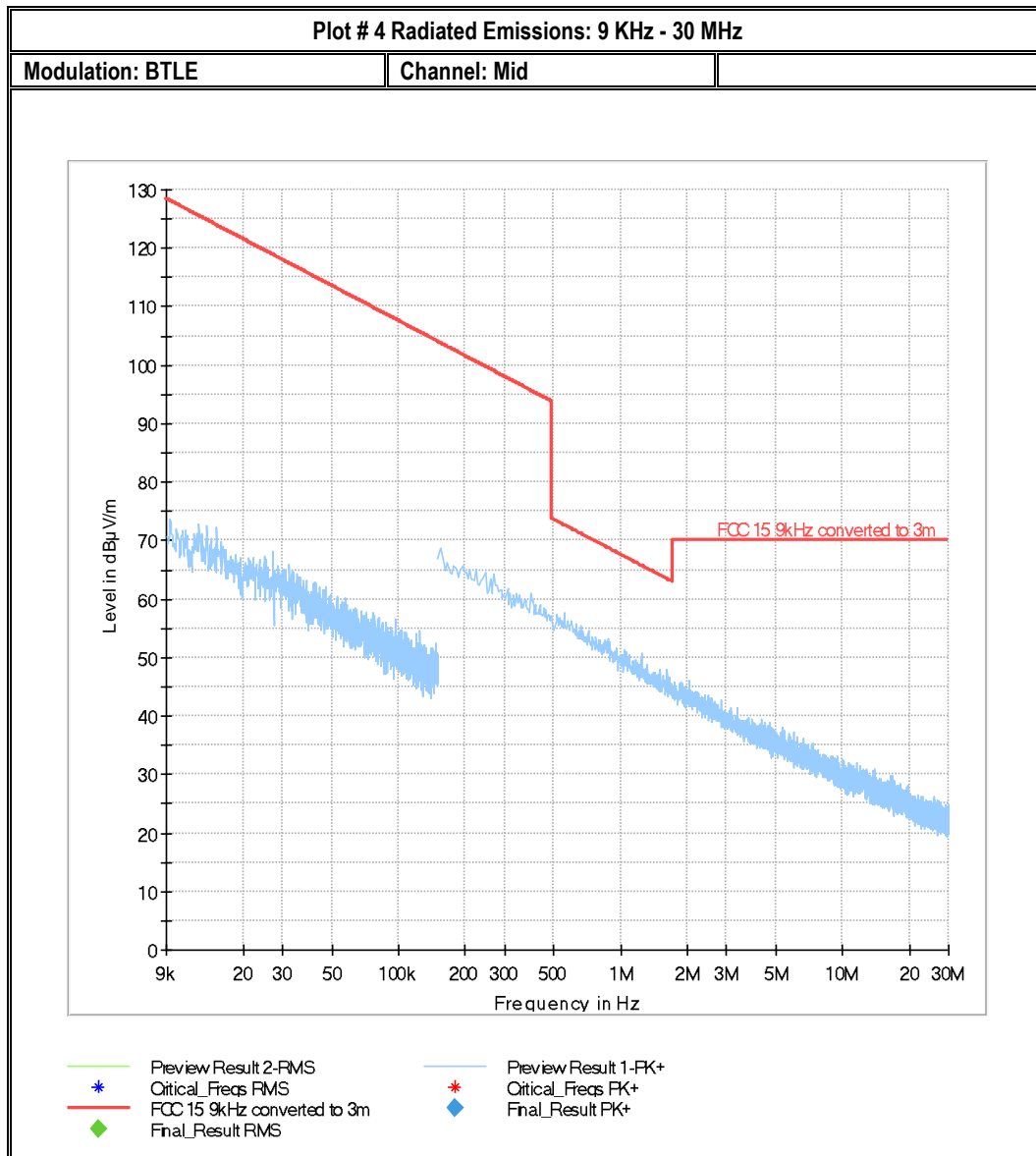
**8.5.4 Measurement result:**

| Plot # | Channel # | Scan Frequency  | Limit             | Result |
|--------|-----------|-----------------|-------------------|--------|
| 1-3    | Low       | 30 MHz – 18 GHz | See section 8.5.2 | Pass   |
| 4-8    | Mid       | 9 kHz – 26 GHz  | See section 8.5.2 | Pass   |
| 9-11   | High      | 30 MHz – 18 GHz | See section 8.5.2 | Pass   |

### 8.5.5 Measurement Plots:







## Plot #5 Radiated Emissions: 30 MHz – 1GHz

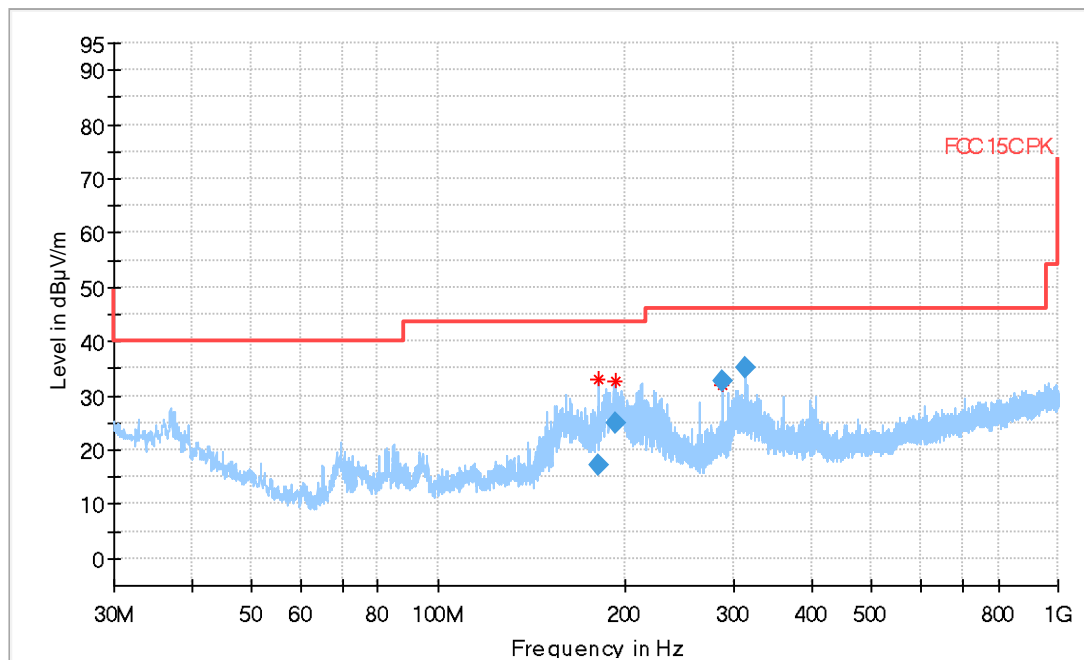
Modulation: BTLE

Channel: Mid

**Final\_Result**

| Frequency (MHz) | QuasiPeak (dBμV/m) | RMS (dBμV/m) | Limit (dBμV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol |
|-----------------|--------------------|--------------|----------------|-------------|-----------------|-----------------|-------------|-----|
| 181.520         | 17.18              | ---          | 43.50          | 26.32       | 100.0           | 100.0           | 209.0       | V   |
| 193.721         | 25.04              | ---          | 43.50          | 18.46       | 100.0           | 100.0           | 108.0       | V   |
| 288.013         | 32.79              | ---          | 46.00          | 13.21       | 100.0           | 100.0           | 124.0       | H   |
| 311.995         | 35.21              | ---          | 46.00          | 10.79       | 100.0           | 100.0           | 138.0       | H   |

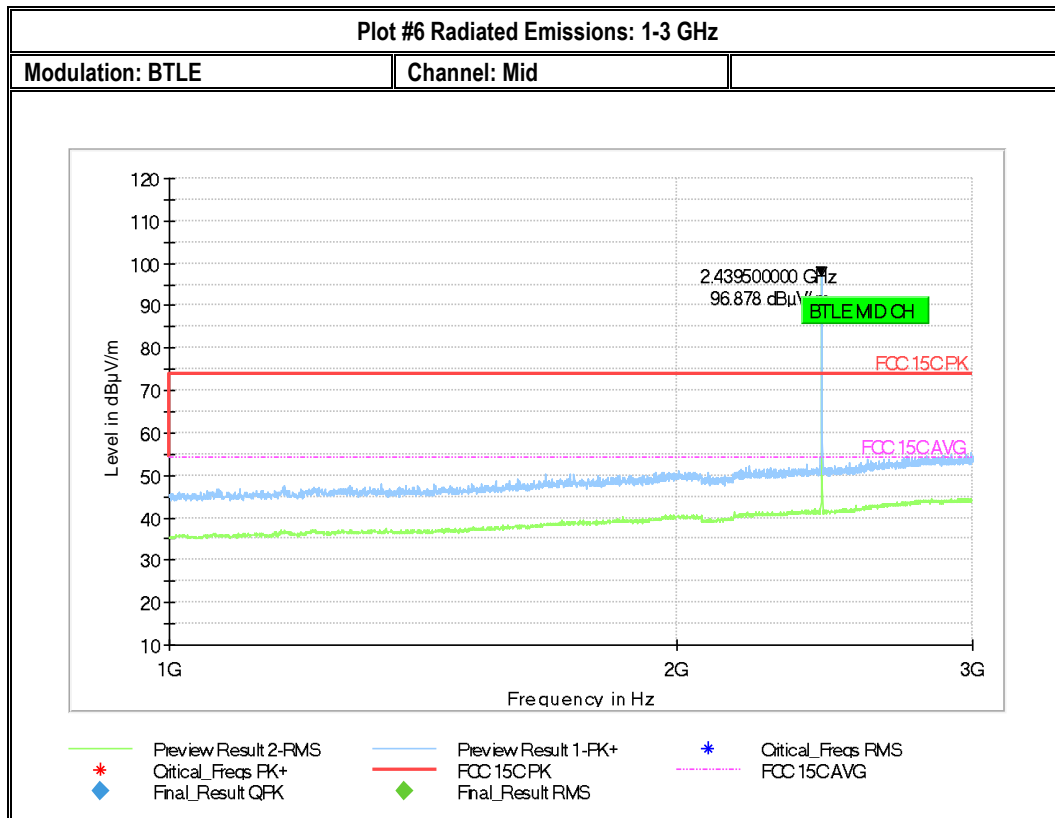
*Disclaimer: Any measurement data within 2dB from the limit line is conditional PASS/FAIL due to measurement uncertainty considerations.*



Preview Result 2-RMS  
 \* Critical\_Freqs FK+  
 ◆ Final\_Result RMS

Preview Result 1-FK+  
 FCC 15C PK

\* Critical\_Freqs RMS  
 ◆ Final\_Result QPK

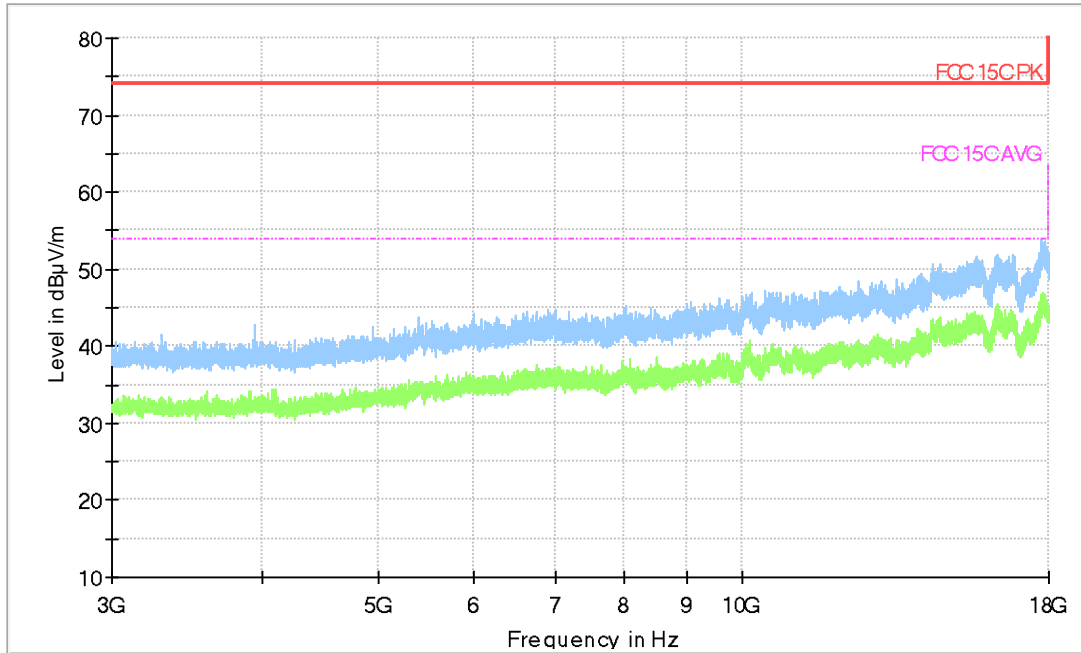




## Plot #7 Radiated Emissions: 3-18 GHz

Modulation: BTLE

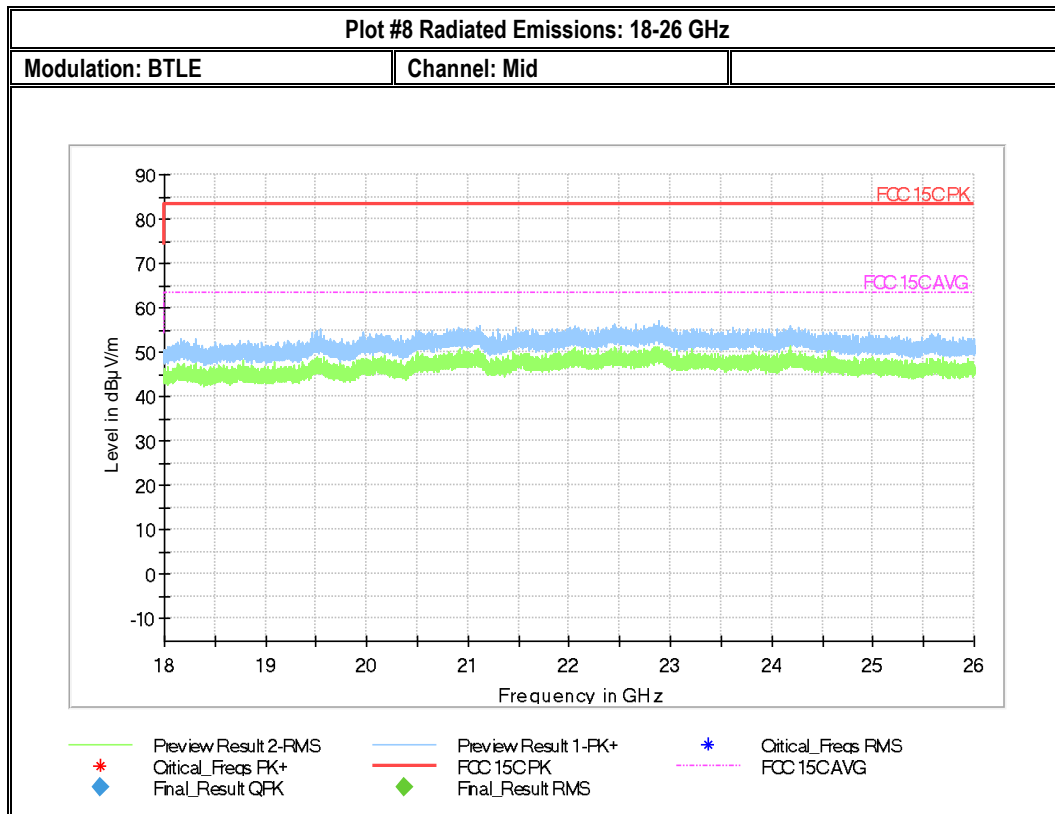
Channel: Mid



Preview Result 2-RMS  
Critical\_Freqs FK+  
Final\_Result QPK

Preview Result 1-FK+  
FCC 15CPK  
Final\_Result RMS

Critical\_Freqs RMS  
FCC 15CAVG



## Plot #9 Radiated Emissions: 30 MHz – 1GHz

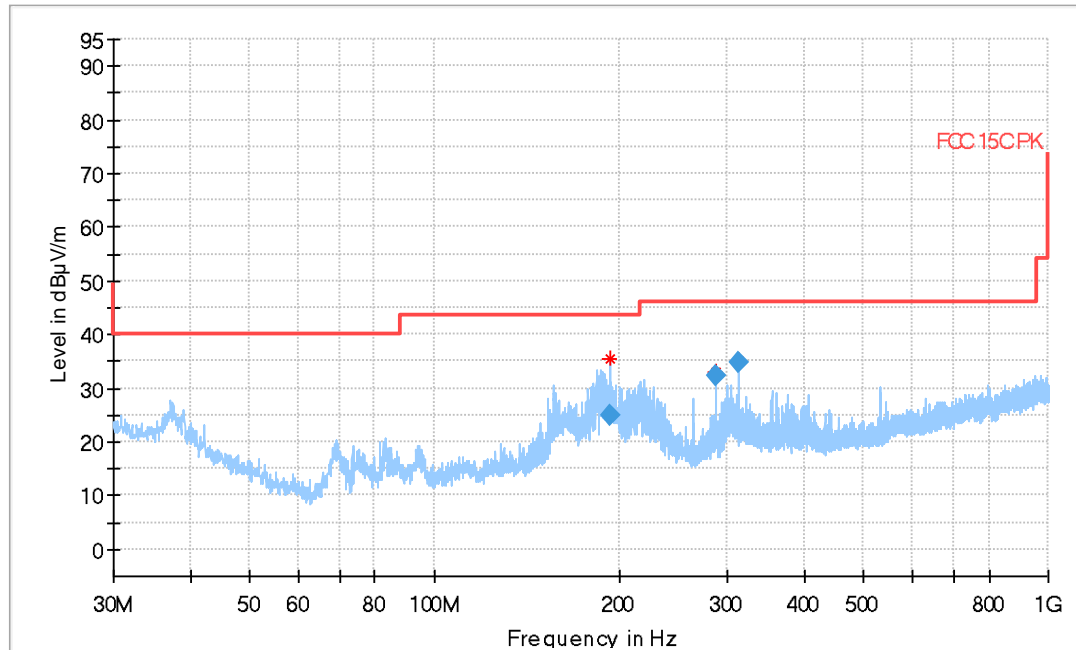
Modulation: BTLE

Channel: High

**Final\_Result**

| Frequency (MHz) | QuasiPeak (dBμV/m) | RMS (dBμV/m) | Limit (dBμV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol |
|-----------------|--------------------|--------------|----------------|-------------|-----------------|-----------------|-------------|-----|
| 193.394         | 24.92              | ---          | 43.50          | 18.58       | 100.0           | 100.0           | 108.0       | V   |
| 287.988         | 32.46              | ---          | 46.00          | 13.54       | 100.0           | 100.0           | 129.0       | H   |
| 312.011         | 34.68              | ---          | 46.00          | 11.32       | 100.0           | 100.0           | 152.0       | H   |

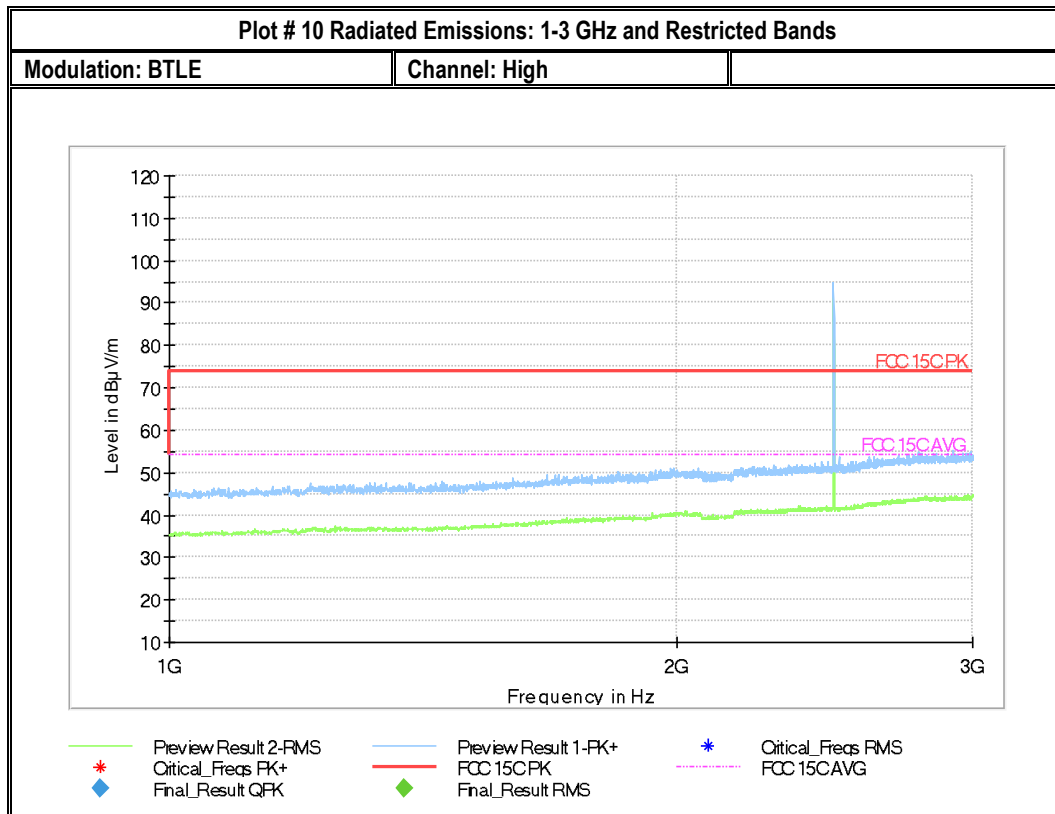
*Disclaimer: Any measurement data within 2dB from the limit line is conditional PASS/FAIL due to measurement uncertainty considerations.*

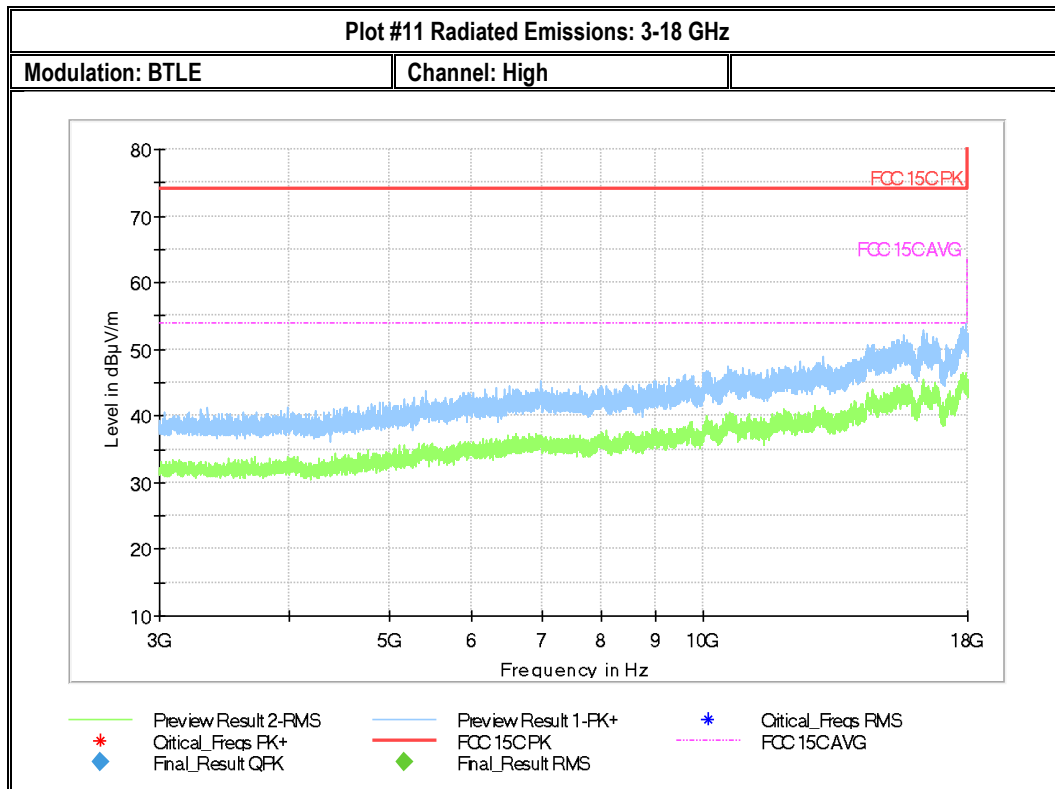


\* Preview Result 2-RMS  
Critical\_Freqs PK+  
Final\_Result RMS

Preview Result 1-PK+  
FCC 15CPK

\* Critical\_Freqs RMS  
Final\_Result QPK





## 8.6 AC Power Line Conducted Emissions

### 8.6.1 Measurement according to ANSI C63.4

#### Analyzer Settings:

- RBW = 9 KHz (CISPR Bandwidth)
- Detector: Peak / Average for Pre-scan
- Quasi-Peak/Average for Final Measurements

### 8.6.2 Limits: §15.207 & RSS-Gen 8.8

#### FCC §15.207(a) & RSS-Gen 8.8

- Except as shown in paragraphs (b) and (c) of this section of the CFR, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table (1), as measured using a 50  $\mu$ H/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between frequency ranges.

| Frequency of emission (MHz) | Conducted limit (dB $\mu$ V) |           |
|-----------------------------|------------------------------|-----------|
|                             | Quasi-peak                   | Average   |
| 0.15–0.5                    | 66 to 56*                    | 56 to 46* |
| 0.5–5                       | 56                           | 46        |
| 5–30                        | 60                           | 50        |

\*Decreases with the logarithm of the frequency.

### 8.6.3 Test conditions and setup:

| Ambient Temperature $^{\circ}$ C | EUT Set-Up # | EUT operating mode | Power line (L1, L2, L3, N) | Power Input |
|----------------------------------|--------------|--------------------|----------------------------|-------------|
| 22 $^{\circ}$ C                  | 3            | GFSK fixed channel | Line & Neutral             | 110V / 60Hz |

### 8.6.4 Measurement Result:

| Plot # | Port         | EUT Set-Up #: | EUT operating mode             | Scan Frequency   | Limit             | Result |
|--------|--------------|---------------|--------------------------------|------------------|-------------------|--------|
| 1      | AC Mains - L | 3             | BT LE continuous fixed channel | 150 kHz – 30 MHz | See section 8.6.2 | Pass   |
| 2      | AC Mains - N | 3             | BT LE continuous fixed channel | 150 kHz – 30 MHz | See section 8.6.2 | Pass   |

## 8.6.5 Measurement Plots:

### Plot # 1

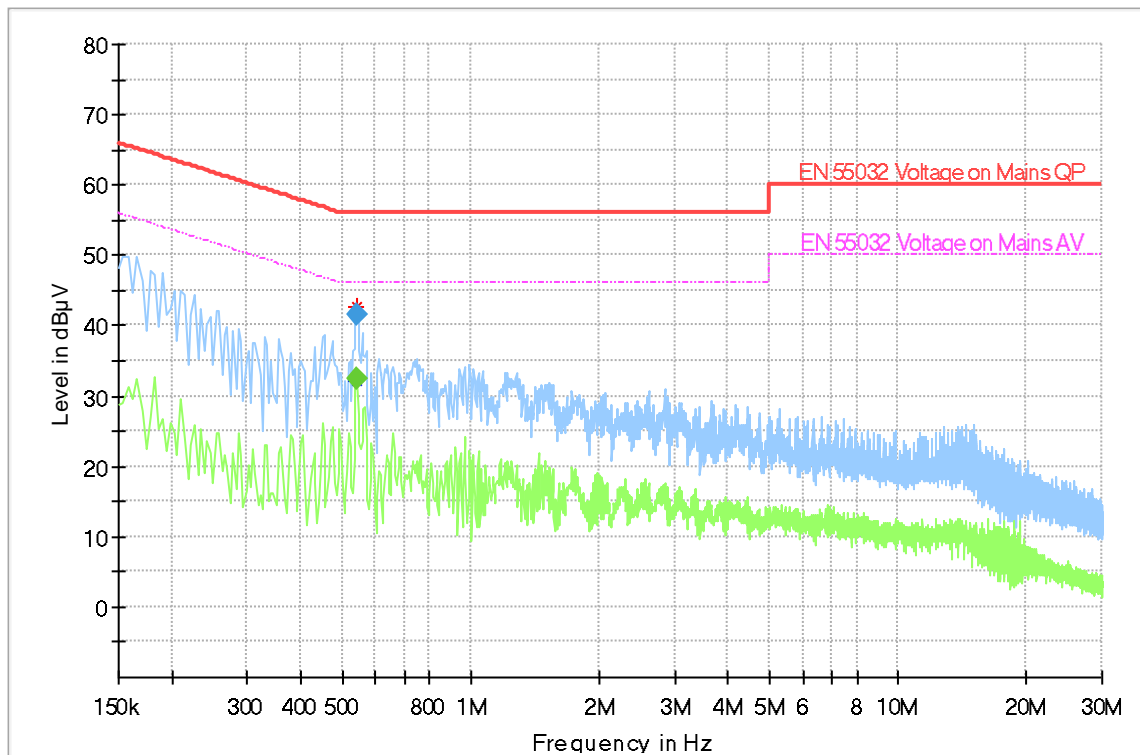
#### EUT Information

EUT Serial Number: X60495001  
Manufacturer: AXON  
Comment: L

#### Final Result

| Frequency (MHz) | QuasiPeak (dBμV) | CAverage (dBμV) | Limit (dBμV) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Line | PE  | Corr. (dB) |
|-----------------|------------------|-----------------|--------------|-------------|-----------------|-----------------|------|-----|------------|
| 0.542000        | ---              | 32.43           | 46.00        | 13.57       | 500.0           | 9.000           | L1   | GND | 10.2       |
| 0.542000        | 41.57            | ---             | 56.00        | 14.43       | 500.0           | 9.000           | L1   | GND | 10.2       |

*Disclaimer: Any measurement data within 2dB from the limit line is conditional PASS/FAIL due to measurement uncertainty considerations.*



|                              |                              |
|------------------------------|------------------------------|
| Preview Result 2-AVG         | Preview Result 1-FK+         |
| * Critical_Freqs AVG         | * Critical_Freqs FK+         |
| EN 55032 Voltage on Mains QP | EN 55032 Voltage on Mains AV |
| ◆ Final_Result QPK           | ◆ Final_Result CAV           |

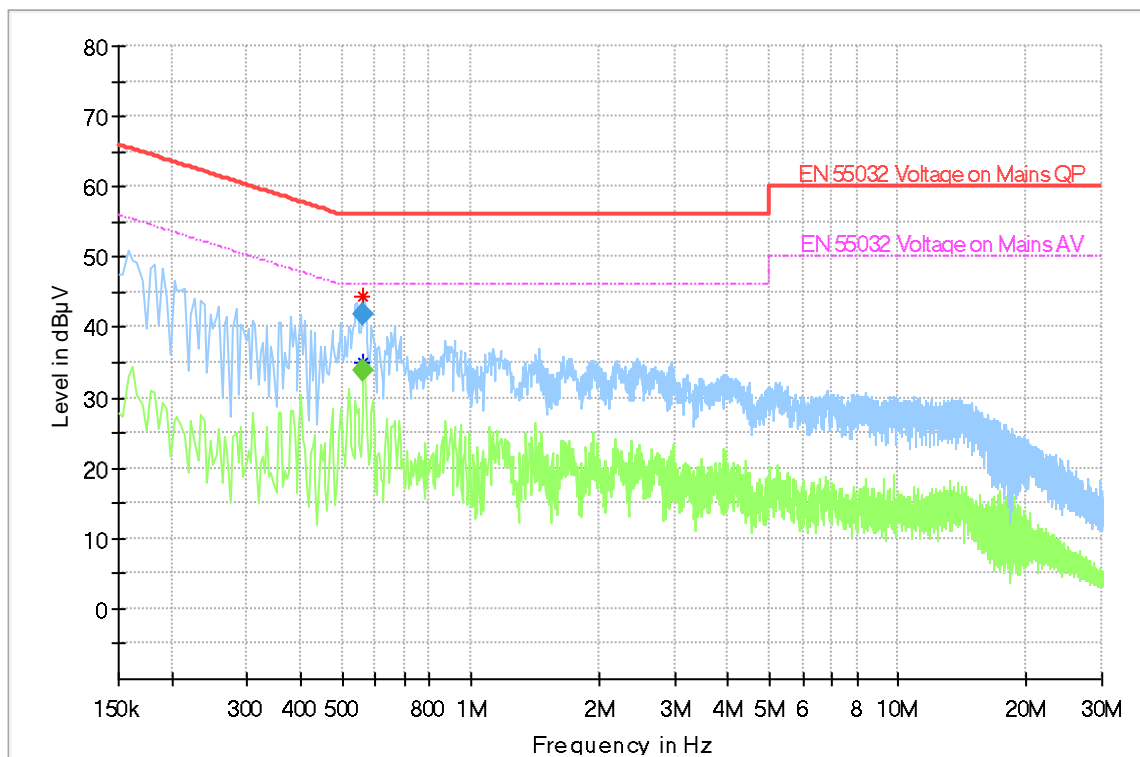
**Plot # 2****EUT Information**

EUT Serial Number: X60495001  
Manufacturer: AXON  
Comment: N

**Final Result**

| Frequency (MHz) | QuasiPeak (dBμV) | CAverage (dBμV) | Limit (dBμV) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Line | PE  | Corr. (dB) |
|-----------------|------------------|-----------------|--------------|-------------|-----------------|-----------------|------|-----|------------|
| 0.558000        | 41.81            | ---             | 56.00        | 14.19       | 500.0           | 9.000           | N    | GND | 10.3       |
| 0.562000        | ---              | 33.99           | 46.00        | 12.01       | 500.0           | 9.000           | N    | GND | 10.3       |

*Disclaimer: Any measurement data within 2dB from the limit line is conditional PASS/FAIL due to measurement uncertainty considerations.*



- |                              |                              |
|------------------------------|------------------------------|
| Preview Result 2-AVG         | Preview Result 1-FK+         |
| * Critical_Freqs AVG         | * Critical_Freqs FK+         |
| EN 55032 Voltage on Mains QP | EN 55032 Voltage on Mains AV |
| ◆ Final_Result QPK           | ◆ Final_Result CAV           |



## 9 Test setup photos

Setup photos are included in supporting file name: "EMC\_AXONN-004-19001\_FCC\_Setup\_Photos.pdf"

## 10 Test Equipment And Ancillaries Used For Testing

| Item Name                  | Equipment Type       | Manufacturer | Model               | Serial # | Calibration Cycle | Last Calibration Date |
|----------------------------|----------------------|--------------|---------------------|----------|-------------------|-----------------------|
| Antenna Biconilog 3142E    | Biconilog Antenna    | EMCO         | 3142E               | 166067   | 3 years           | 6/28/2017             |
| Antenna Horn 3115 SN 35114 | Horn Antenna         | EMCO         | 3115                | 35114    | 3 years           | 7/31/2017             |
| Antenna Horn 3117          | Horn Antenna         | ETS Lindgren | 3117PA              | 169547   | 3 years           | 8/8/2017              |
| Antenna Horn 3116          | Horn Antenna         | ETS Lindgren | 3116C-PA            | 169535   | 3 years           | 9/24/2017             |
| Active Loop Antenna        | Active Loop Antenna  | ETS Lindgren | 6507                | 161344   | 3 years           | 10/26/2017            |
| FSV40                      | Spectrum Analyzer    | R&S          | FSV40               | 101022   | 3 years           | 7/5/2017              |
| Thermometer Humidity       | Thermometer Humidity | Dickson      | TM320               | 5280063  | 3 years           | 11/02/2017            |
| FSU                        | Spectrum Analyzer    | R&S          | FSU26               | 200302   | 2 Years           | 7/5/2017              |
| LISN                       | LISN                 | FCC          | FCC-LISN-50-25-2-08 | 8014     | 3 years           | 11/10/2016            |

Note:

1. Equipment used meets the measurement uncertainty requirements as required per applicable standards for 95% confidence levels.

Calibration due dates, unless defined specifically, falls on the last day of the month. Items indicated "N/A" for cal status either do not specifically require calibration or is internally characterized before use.

**11 History**

| Date       | Report Name                    | Changes to report | Report prepared by |
|------------|--------------------------------|-------------------|--------------------|
| 2019-07-11 | EMC_AXONN-004-19001_15.247_DTS | Initial Version   | Kevin Wang         |
|            |                                |                   |                    |