



## FCC / IC Test Report

FOR:

Angler Labs Inc.

**Model Name:**

AL-TRK-001

**Product Description:**

Bluetooth Low Energy Fish track logger that is placed on a fishing rod

**FCC ID:** 2AIMG-TRK001

**IC ID:** 21376-TRK001

**Applied Rules and Standards:**

47 CFR Part 15.247 (DTS)

RSS-247 Issue 1 (DTSs)

RSS-Gen Issue 4

**REPORT #:** EMC\_ANGLE-001-16001\_15.247\_DTS\_Rev 2

**DATE:** 2016-11-16



A2LA Accredited

IC recognized #  
3462B-1

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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 IC standard RSS-247 Issue 1, and RSS-Gen Issue 4.

Deviation:

Only pre-scans radiated measurement above 18GHz were conducted. Final measurements were not necessary, because all emissions were greater than 20 dB below the limit.

Company	Description	Model #
Angler Labs Inc.	Bluetooth Low Energy Fish track logger that is placed on a fishing rod	AL-TRK-001

**Responsible for Testing Laboratory:**

2016-11-16	Compliance	Franz Engert (Compliance Manager)	 <small>Digitally signed by Franz Engert DN: cn=Franz Engert, c=US, o=CETECOM, ou=Compliance, email=franz.engert@cetecom. com</small>
Date	Section	Name	Signature

**Responsible for the Report:**

2016-11-16	Compliance	Kris Lazarov (EMC Engineer)	 <small>Digitally signed by Kris Lazarov DN: cn=Kris Lazarov, o, ou, email=kris.lazarov@cetecom.com c=US</small>
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

<b>Company Name:</b>	CETECOM Inc.
<b>Department:</b>	Compliance
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<b>City/Zip Code</b>	Milpitas, CA 95035
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<b>Compliance Manager:</b>	Franz Engert
<b>Responsible Project Leader:</b>	Kris Lazarov

### 2.2 Identification of the Client

<b>Applicant's Name:</b>	Angler Labs Inc.
<b>Street Address:</b>	940 Pearce Mill Rd
<b>City/Zip Code</b>	Wexford, PA 15090
<b>Country</b>	USA
<b>Contact Person:</b>	Landon Bloomer
<b>Phone No.</b>	412-691-0564
<b>e-mail:</b>	Landon@anglr.tech

### 2.3 Identification of the Manufacturer

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



### 3 Equipment Under Test (EUT)

#### 3.1 EUT Specifications

<b>Model No:</b>	AL-TRK-001
<b>HW Version :</b>	Rev4
<b>SW Version :</b>	1.0.6.968
<b>FCC-ID :</b>	2AIMG-TRK001
<b>IC-ID:</b>	21376-TRK001
<b>HVIN:</b>	AL-TRK001
<b>PMN:</b>	ANGLR Tracker
<b>Product Description:</b>	Bluetooth Low Energy Fish track logger that is placed on a fishing rod
<b>Frequency Range / number of channels:</b>	Nominal band: 2402 – 2480; Center to center: 2402(ch 0) – 2480(ch 39), 40 channels
<b>Type(s) of Modulation:</b>	Bluetooth version 4.0, Low Energy, GFSK modulation.
<b>Modes of Operation:</b>	Bluetooth LE
<b>Antenna Information as declared:</b>	Chip antenna max gain = 5.64dBi
<b>Max. Output Powers:</b>	Peak Conducted Power 0dBm
<b>Power Supply/ Rated Operating Voltage Range:</b>	lithium battery pack Vmin: 3.0V dc/ Vnom: 3.7V dc / Vmax: 4.2V dc
<b>Operating Temperature Range</b>	-20 °C to 60 °C
<b>Other Radios included in the device:</b>	N/A
<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	Engineering Sample 1	Rev4	1.0.6.968	Radiated Sample
2	Engineering Sample 2	Rev4	1.0.6.968	Conducted Sample

**3.3 Accessory Equipment (AE) details**

AE #	Type	Model	Manufacturer	Serial Number
1	USB Power Adapter	AK717	OnePlus	511452552217
2	USB Charging Dock	900ANAB0002LF	Sunburst Electronics	N/A

**3.4 Test Sample Configuration**

EUT Set-up #	Combination of AE used for test set up	Comments
1	EUT#1	
2	EUT#2	
3	EUT#1 + AE#1 +AE#2	

#### 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 Issue 1 of Industry Canada.

This test report is to support a request for new equipment authorization under the FCC ID: 2AIMG-TRK001 and IC ID: 21376-TRK001

Testing procedures are based on 558074 D01 DTS Meas Guidance v03r03 - "GUIDANCE FOR PERFORMING COMPLIANCE MEASUREMENTS ON DIGITAL TRANSMISSION SYSTEMS (DTS) OPERATING UNDER §15.247; 9-Jun-15" 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	Fail	NA	NP	Result
§15.247(a)(1) RSS-247 5.2(1)	Emission Bandwidth	Nominal	BTLE	■	□	□	□	Complies
§15.247(e) RSS-247 5.2(2)	Power Spectral Density	Nominal	BTLE	■	□	□	□	Complies
§15.247(b)(1) RSS-247 5.4(4)	Maximum Conducted Output Power and EIRP	Nominal	BTLE	■	□	□	□	Complies
§15.247(d) RSS-247 5.5	Band edge compliance Unrestricted Band Edges	Nominal	BTLE	■	□	□	□	Complies
§15.247; 15.209; 15.205 RSS-Gen 8.9; 8.10	Band edge compliance Restricted Band Edges	Nominal	BTLE	■	□	□	□	Complies
§15.247(d); §15.209 RSS-Gen 6.13	TX Spurious emissions- Radiated	Nominal	BTLE	■	□	□	□	Complies
§15.207(a) RSS Gen 8.8	AC Conducted Emissions	Nominal	BTLE	■	□	□	□	Complies

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

## 6 Measurements

### 6.1 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 30MHz	$\pm 2.5$ dB (Magnetic Loop Antenna)
30 MHz to 1000 MHz	$\pm 2.0$ dB (Biconilog Antenna)
1 GHz to 40 GHz	$\pm 2.3$ dB (Horn Antenna)

#### Conducted measurement

150 kHz to 30 MHz	$\pm 0.7$ dB (LISN)
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RF conducted measurement	$\pm 0.5$ dB
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### 6.2 Environmental Conditions during Testing:

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

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

### 6.3 Dates of Testing:

10/04/2016

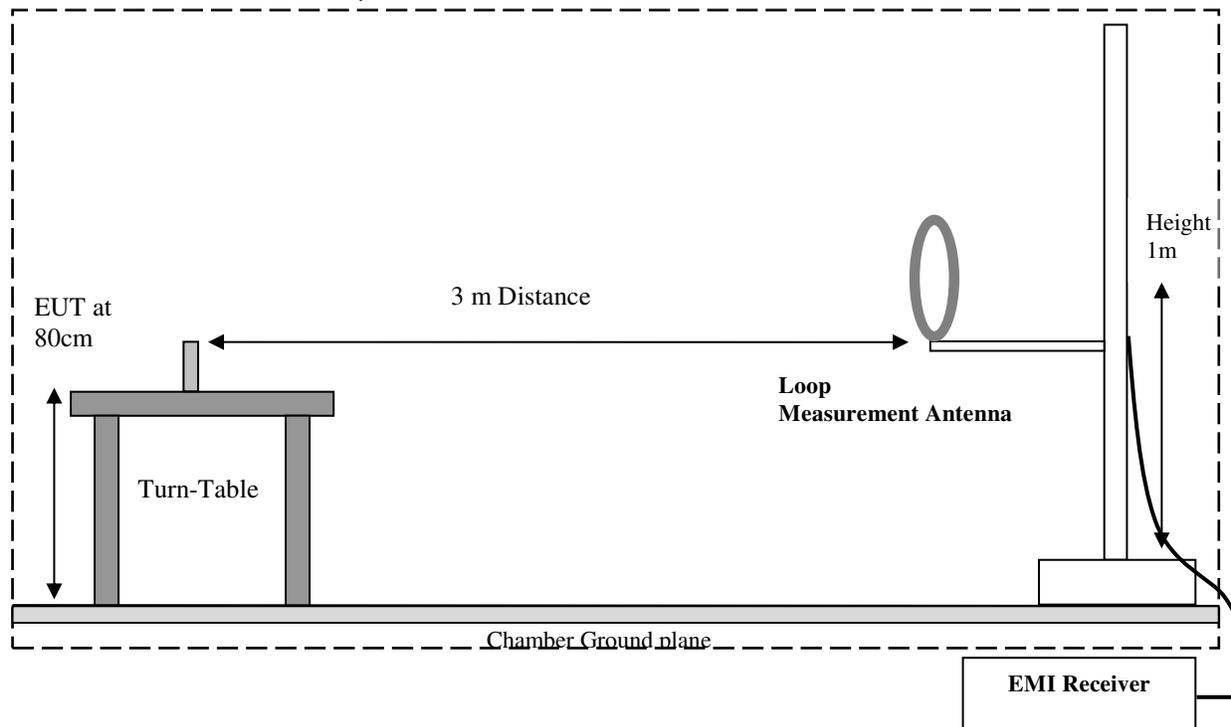
## 7 Measurement Procedures

### 7.1 Radiated Measurement

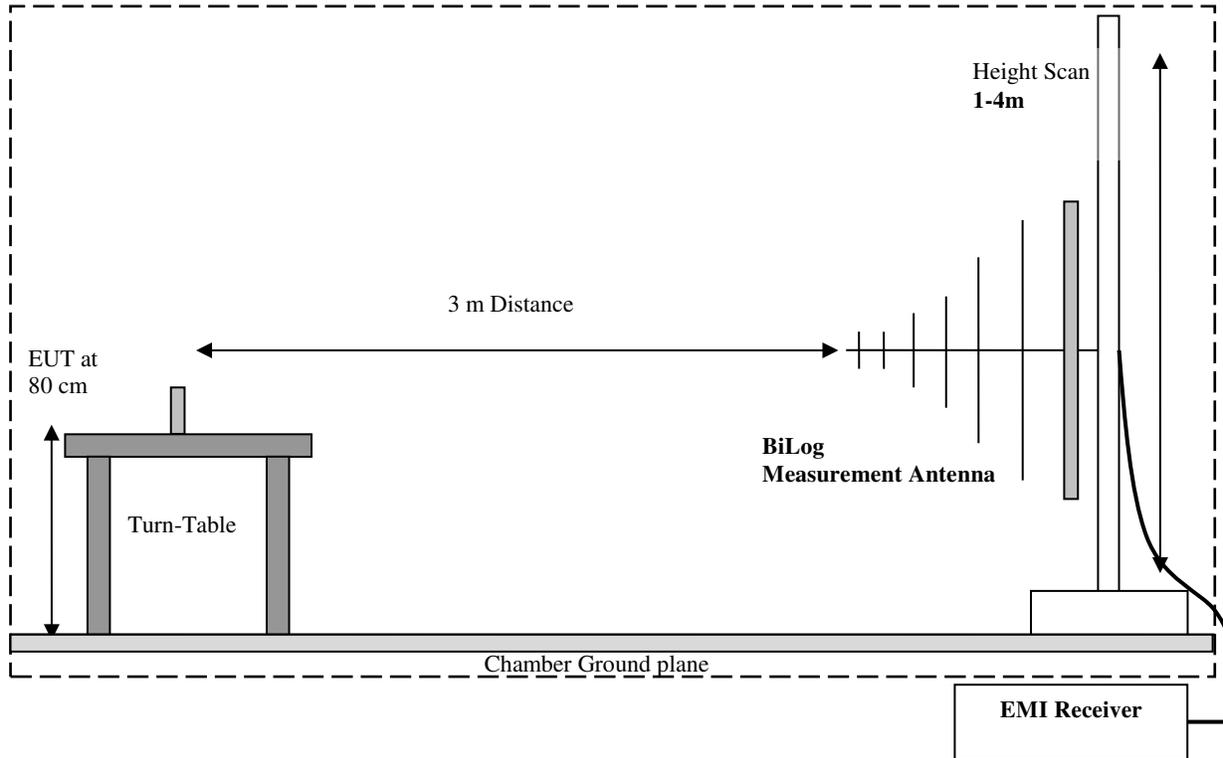
The radiated measurement is performed according to: ANSI C63.10 (2013)

- 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.

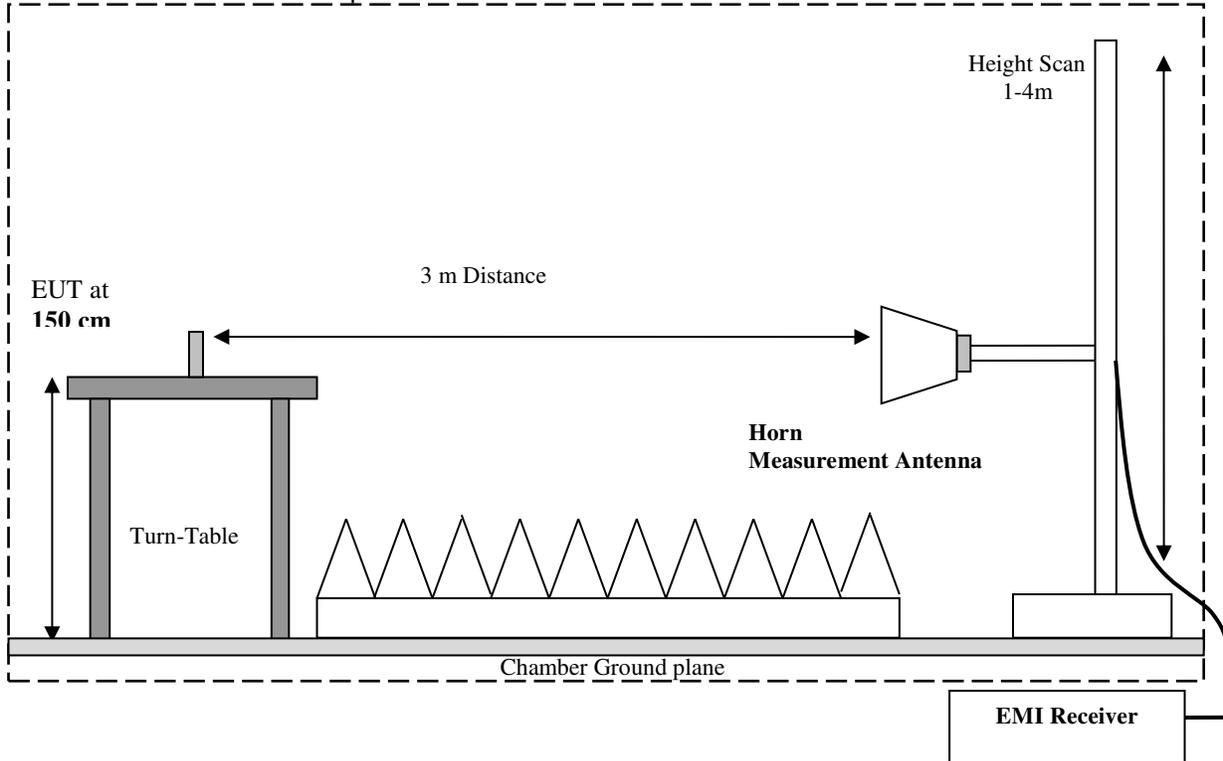
Radiated Emissions Test Setup below 30MHz Measurements

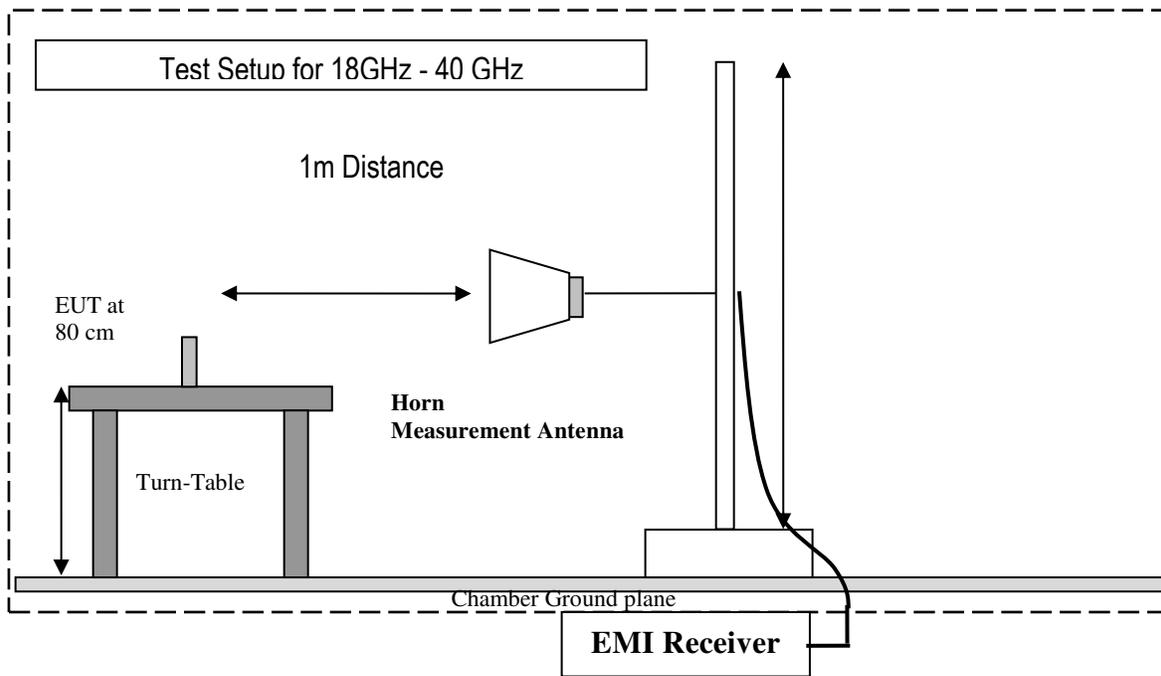


### Radiated Emissions Test Setup 30MHz-1GHz Measurements



### 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

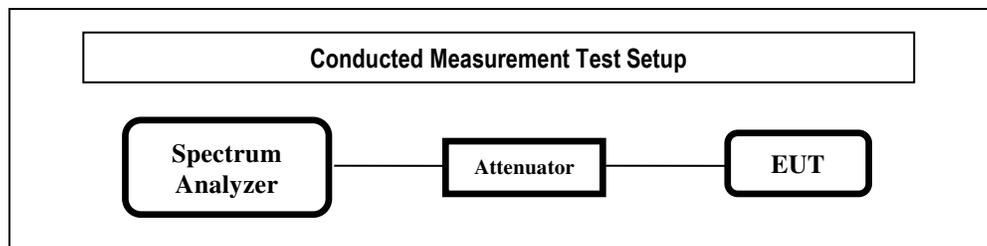
## 7.2 Power Line Conducted Measurement Procedure

AC Power Line conducted emissions measurements performed according to: ANSI C63.10 (2013)

## 7.3 RF Conducted Measurement Procedure

Reference: FCC Measurement Guidance v03r03 - "GUIDANCE FOR PERFORMING COMPLIANCE MEASUREMENTS ON DIGITAL TRANSMISSION SYSTEMS (DTS) OPERATING UNDER §15.247; 9-Jun-15" - by the Federal Communications Commission, Office of Engineering and Technology, Laboratory Division.

## 7.4 Conducted Setup Block diagram



- 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 Emission Bandwidth

#### 8.1.1 Measurement according to FCC KDB 558074 D01 v03r03

##### 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.

#### 8.1.2 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.

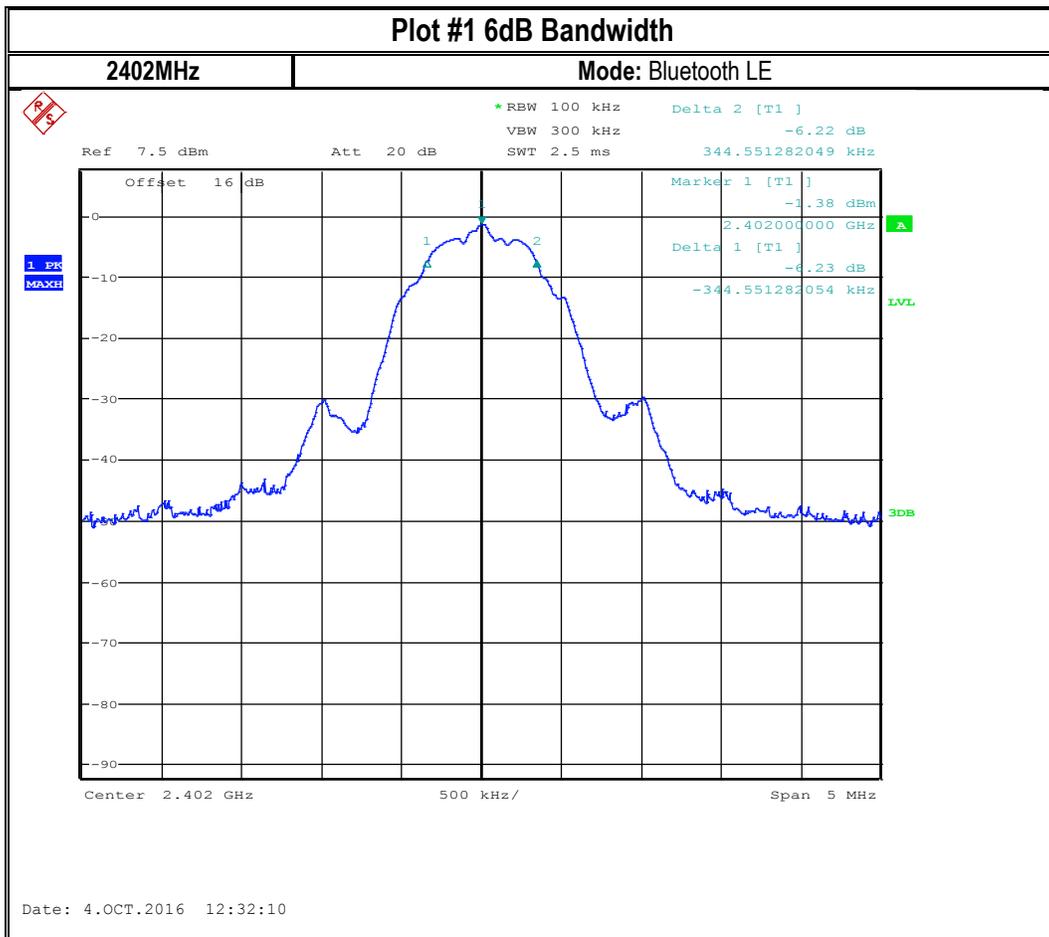
#### 8.1.3 Test conditions and setup:

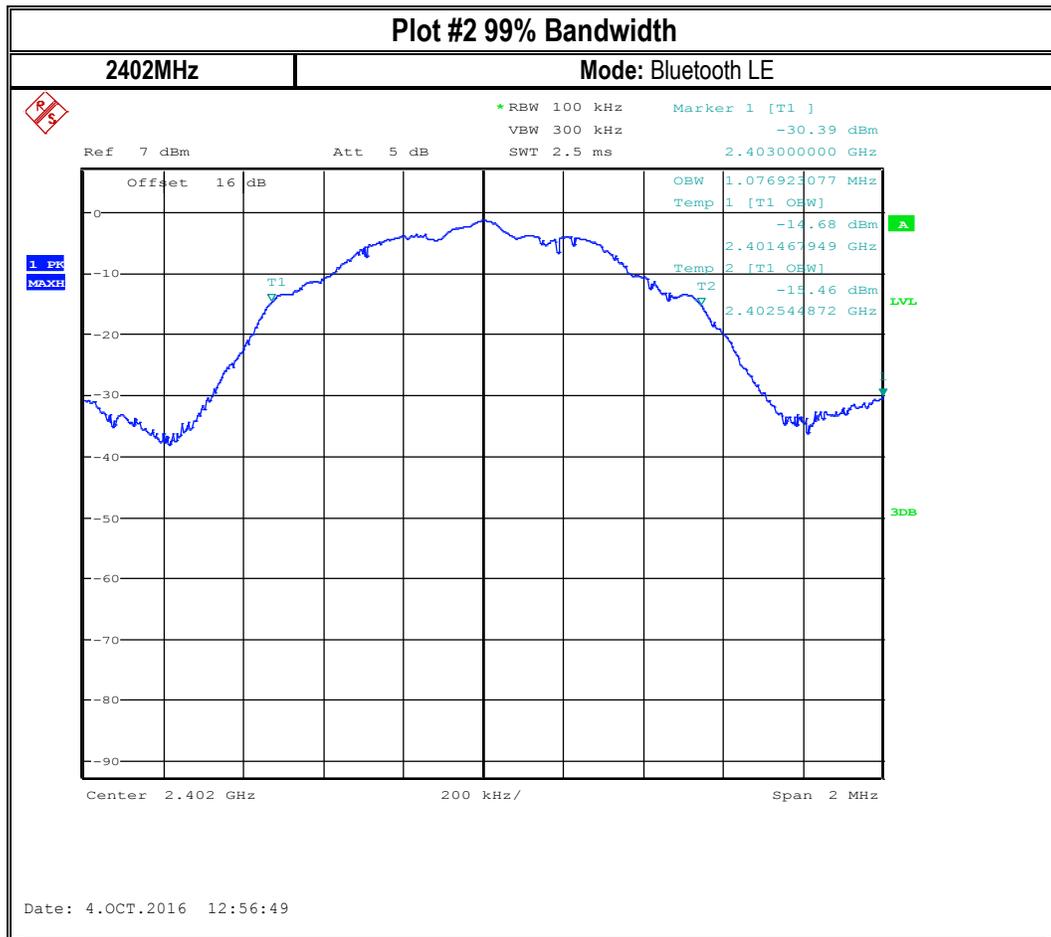
Ambient Temperature	EUT Set-Up #	EUT operating mode	Power Input	Measurement Path Loss (dB)	Antenna Gain (dBi)
22° C	2	BT LE	3.3V DC	16	5.64

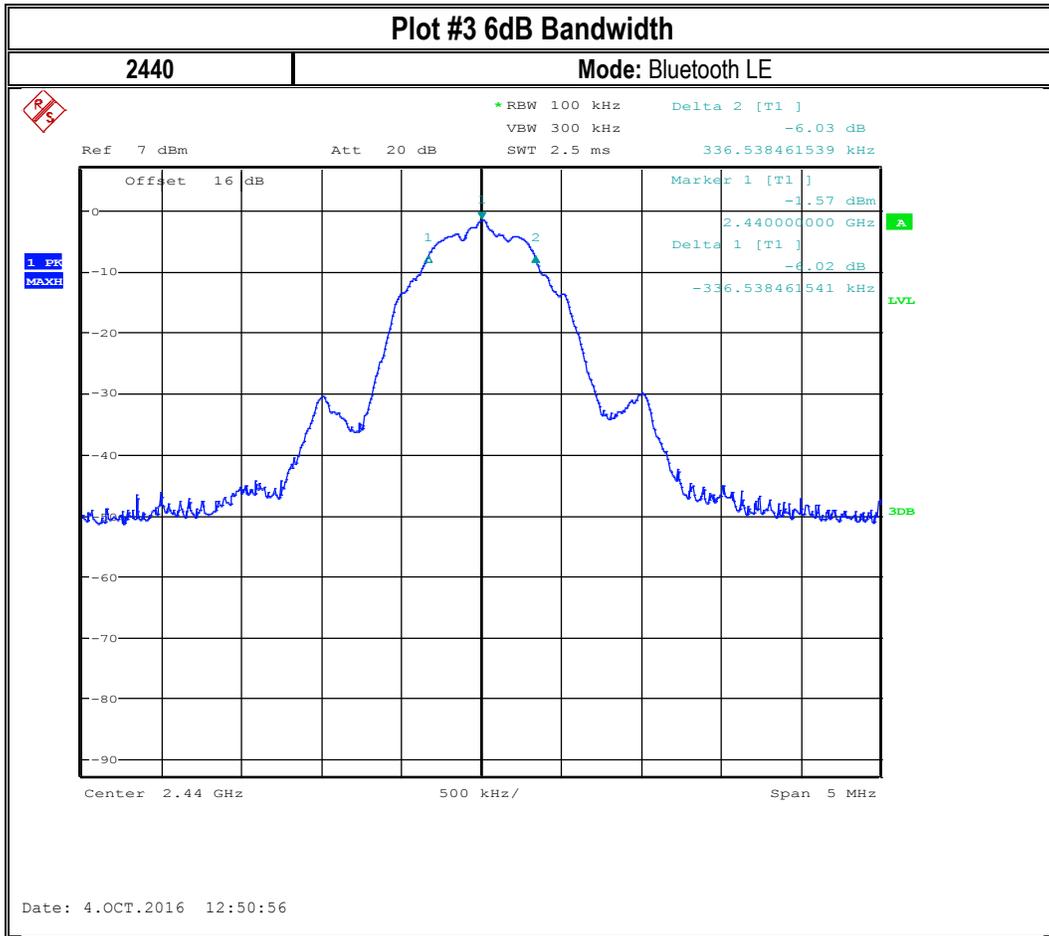
#### 8.1.4 Measurement result:

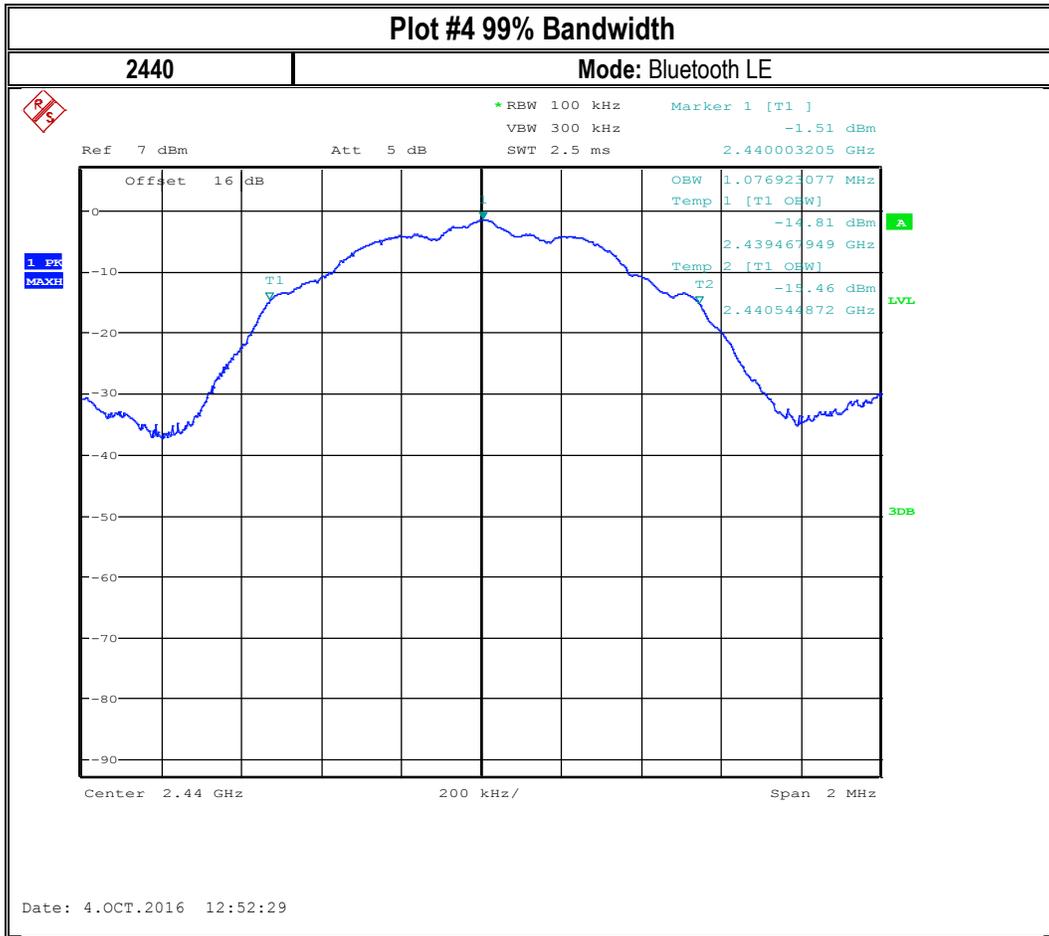
Plot #	Frequency (MHz)	6dB Emissions Bandwidth (MHz)	99% Emissions Bandwidth (MHz)	Limit (MHz)	Result
1 - 2	2402	0.689	1.077	> 0.5	Pass
3 - 4	2440	0.673	1.077	> 0.5	Pass
5 - 6	2480	0.673	1.083	> 0.5	Pass

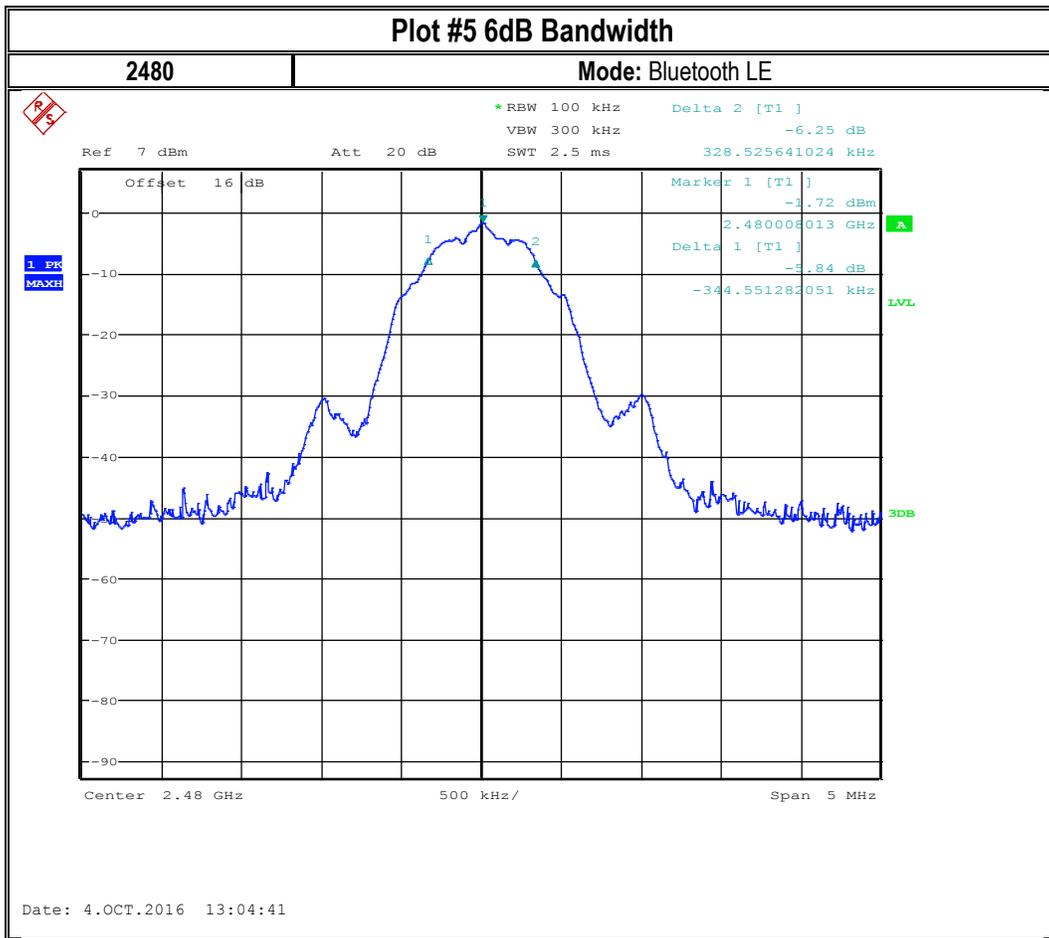
### 8.1.5 Measurement Plots:

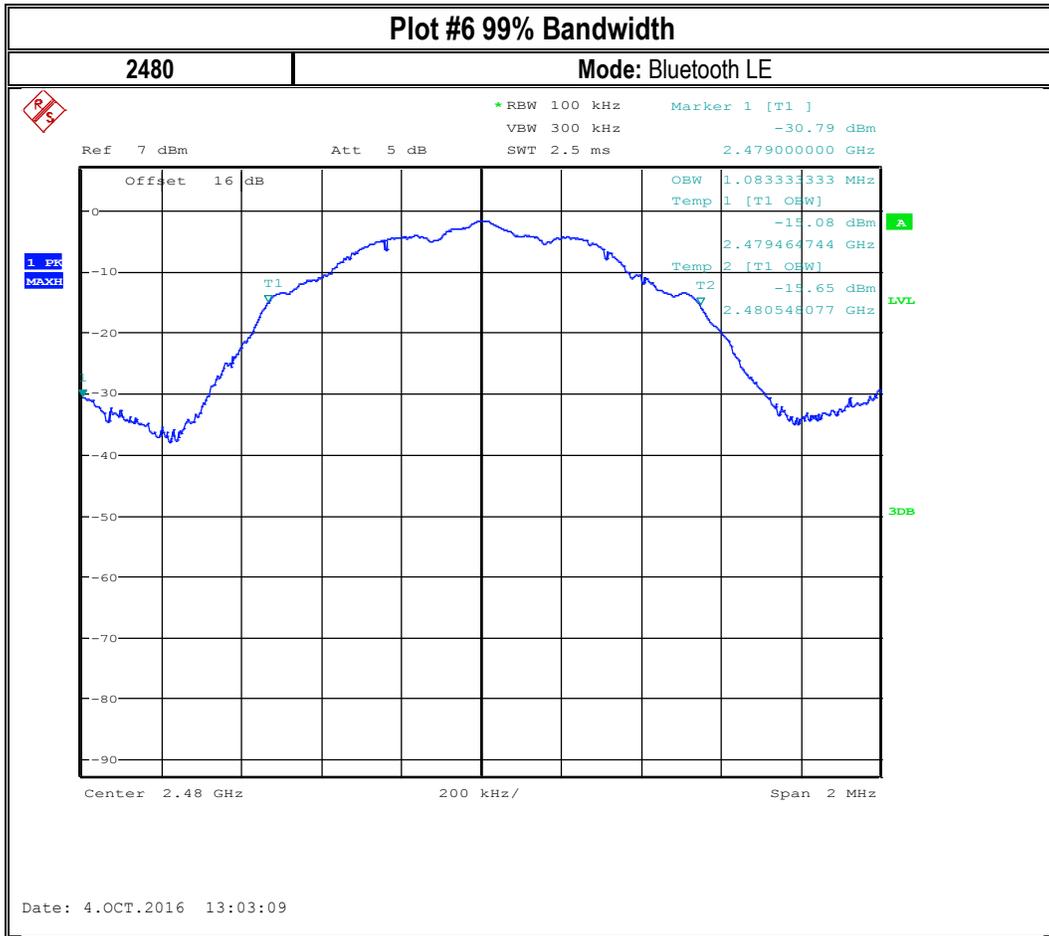












## 8.2 Maximum Peak Conducted Output Power

### 8.2.1 Measurement according to FCC KDB 558074 D01 V03R03

#### Spectrum Analyzer settings:

- Span = approximately 5 times the 20 dB bandwidth
- RBW > the 20 dB bandwidth of the emission being measured
- VBW ≥ RBW
- Sweep = auto
- Detector function = peak
- Trace = max hold
- Use the marker-peak function to set the marker to the peak of the emission.

### 8.2.2 Limits:

#### FCC §15.247 (b)(1)

- For frequency hopping systems employing less than 75 non-overlapping hopping channels in the 2400-2483.5 MHz band: 0.125 W (20.99dBm)

#### RSS-247 5.4(2)

- For FHSs operating in the band 2400-2483.5 MHz, the maximum peak conducted output power shall not exceed 0.125 W (20.99dBm) and the e.i.r.p. shall not exceed 0.5 W (26.99dBm) if the hopset uses less than 75 hopping channels

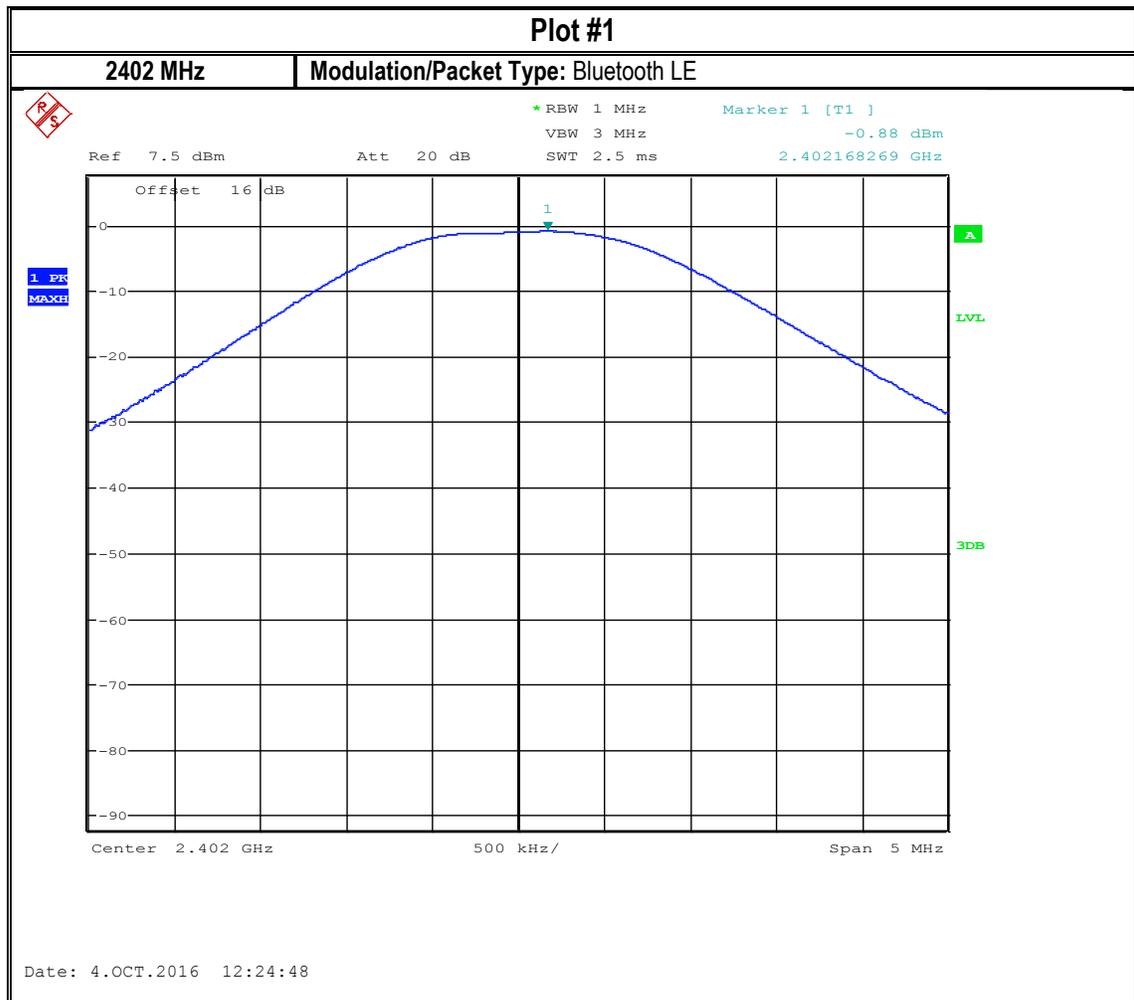
### 8.2.3 Test conditions and setup:

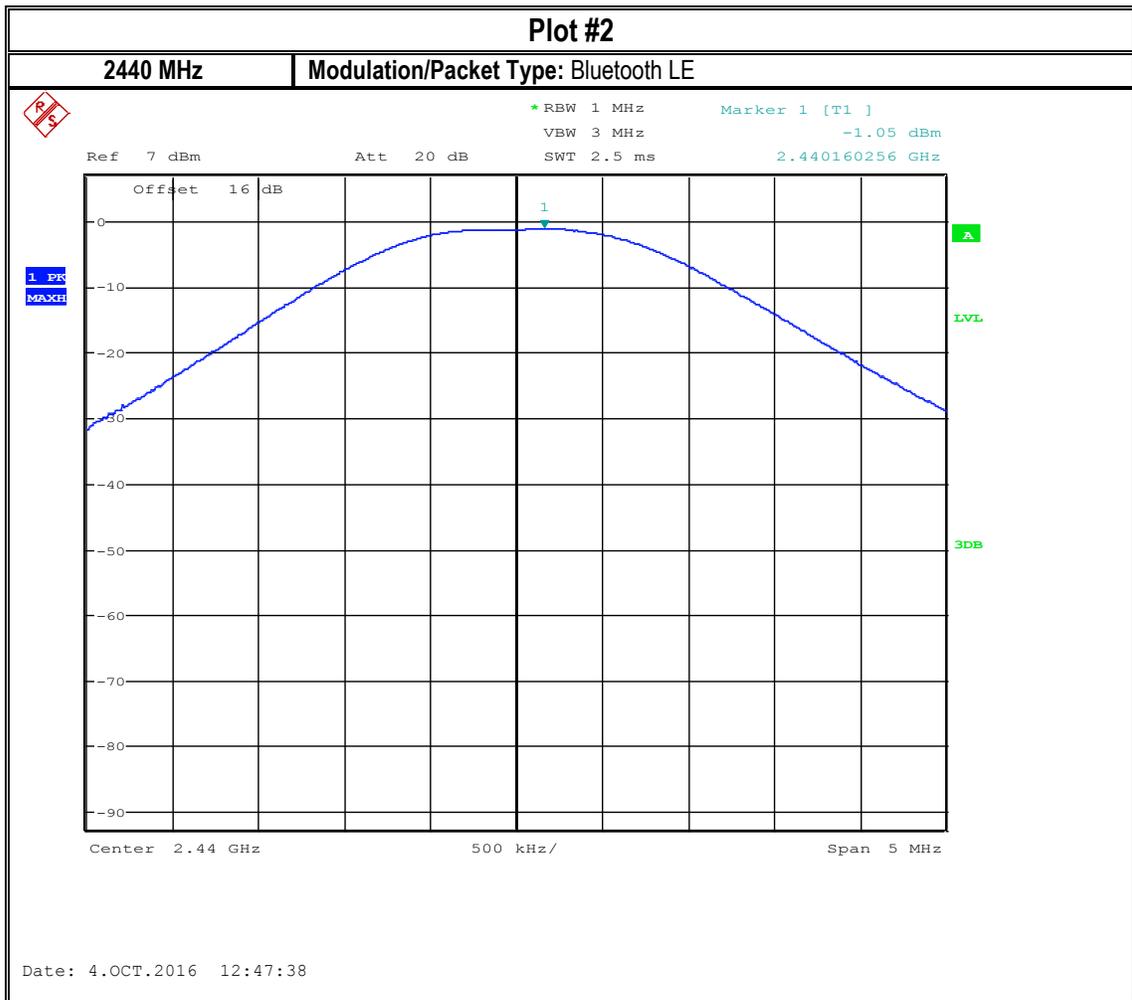
Ambient Temperature	EUT Set-Up #	EUT operating mode	Power Input	Measurement Path Loss (dB)	Antenna Gain (dBi)
22° C	2	BT LE	3.3V DC	16	5.64

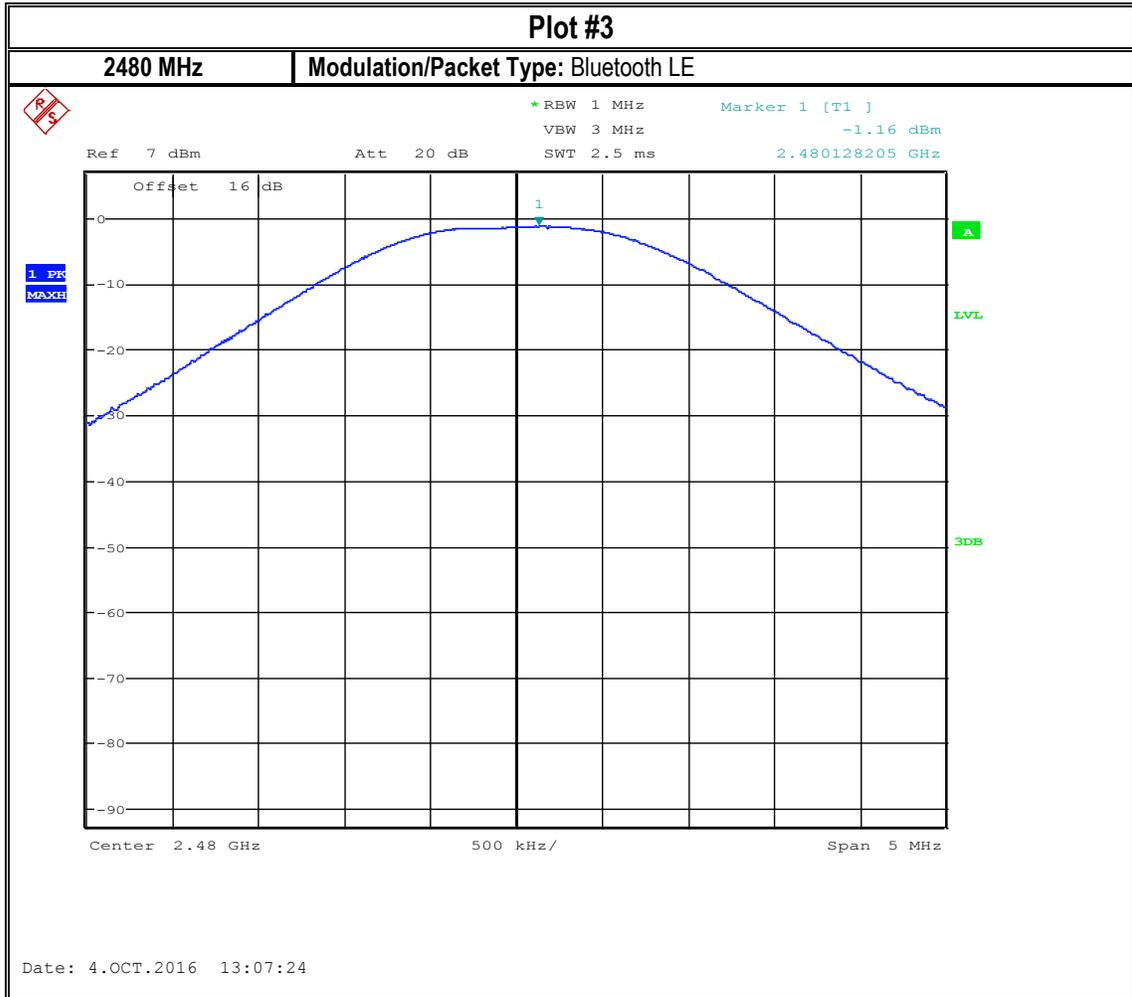
### 8.2.4 Measurement result:

Plot #	Frequency (MHz)	Maximum Peak Conducted Output Power (dBm)	EIRP (dBm)	Limit (dBm)	Result
1	2402	-0.88	4.76	20.99(Pk) / 26.99(EIRP)	Pass
2	2440	-1.05	4.59	20.99(Pk) / 26.99(EIRP)	Pass
3	2480	-1.16	4.48	20.99(Pk) / 26.99(EIRP)	Pass

### 8.2.5 Measurement Plots:







### 8.3 Power Spectral Density

#### 8.3.1 Measurement according to FCC KDB 558074 D01 V03R03

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

- Set analyzer center frequency to DTS channel center frequency.
- Set the span to 1.5 times the 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.

#### 8.3.2 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.

#### 8.3.3 Test conditions and setup:

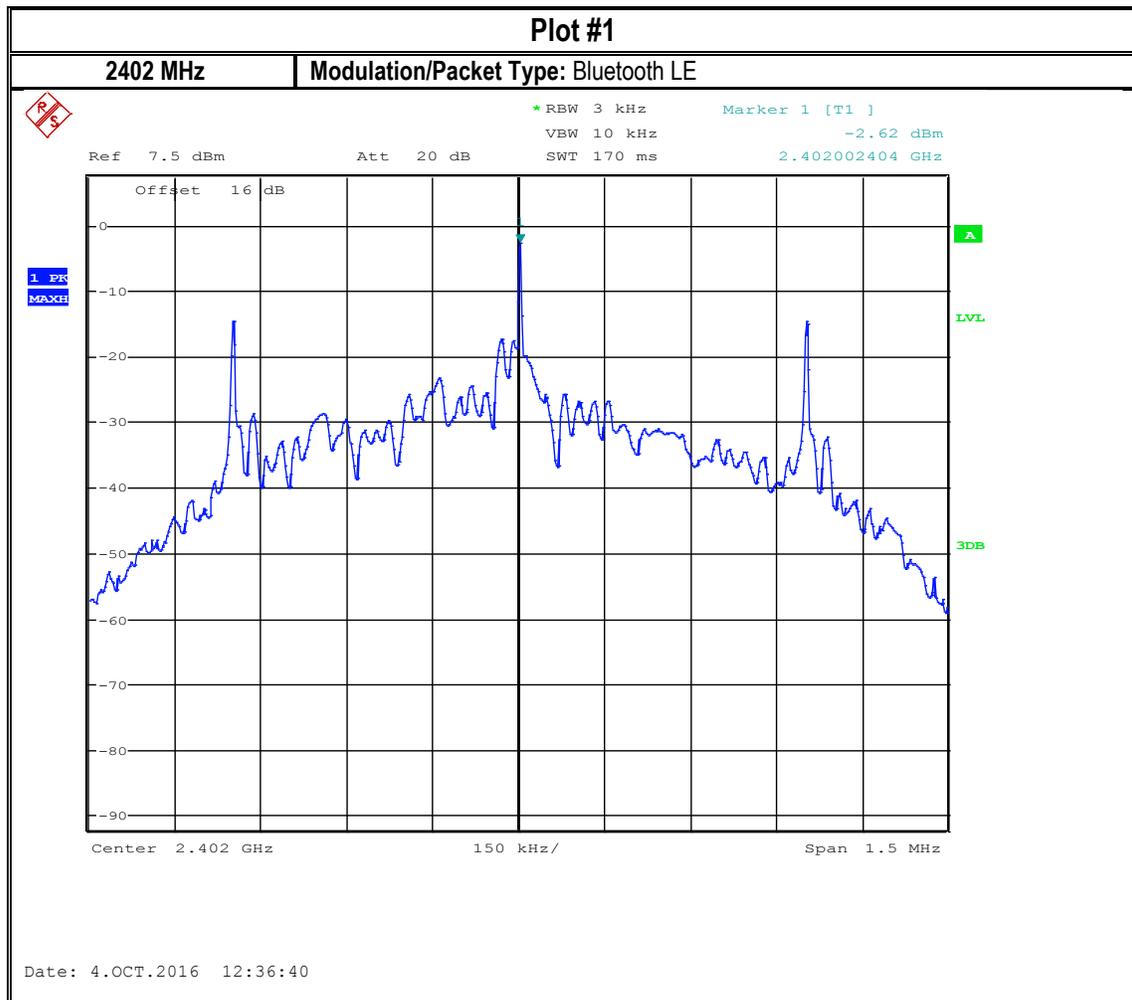
Ambient Temperature	EUT Set-Up #	EUT operating mode	Power Input	Measurement Path Loss (dB)	Antenna Gain (dBi)
22° C	2	BT LE	3.3V DC	16	5.64

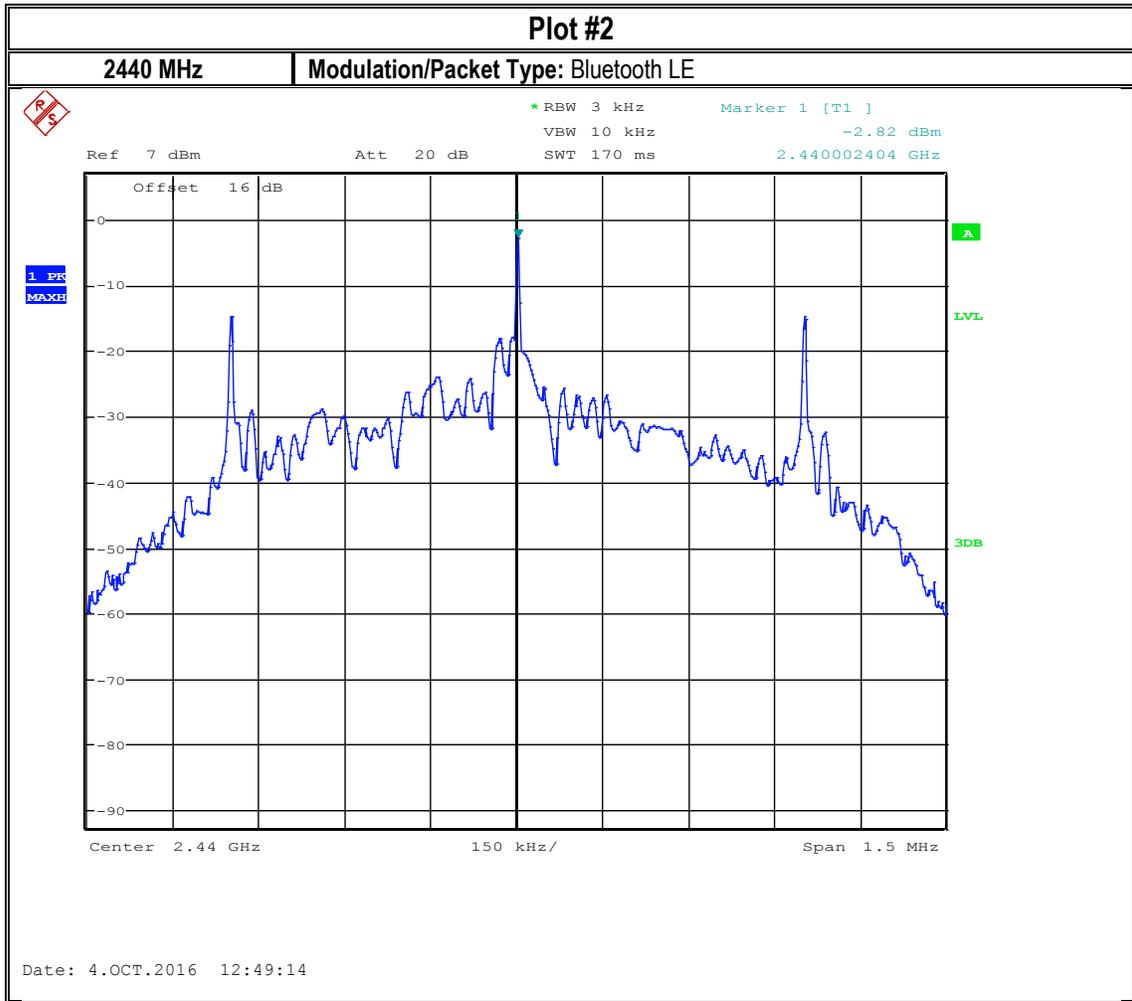
#### 8.3.4 Measurement result:

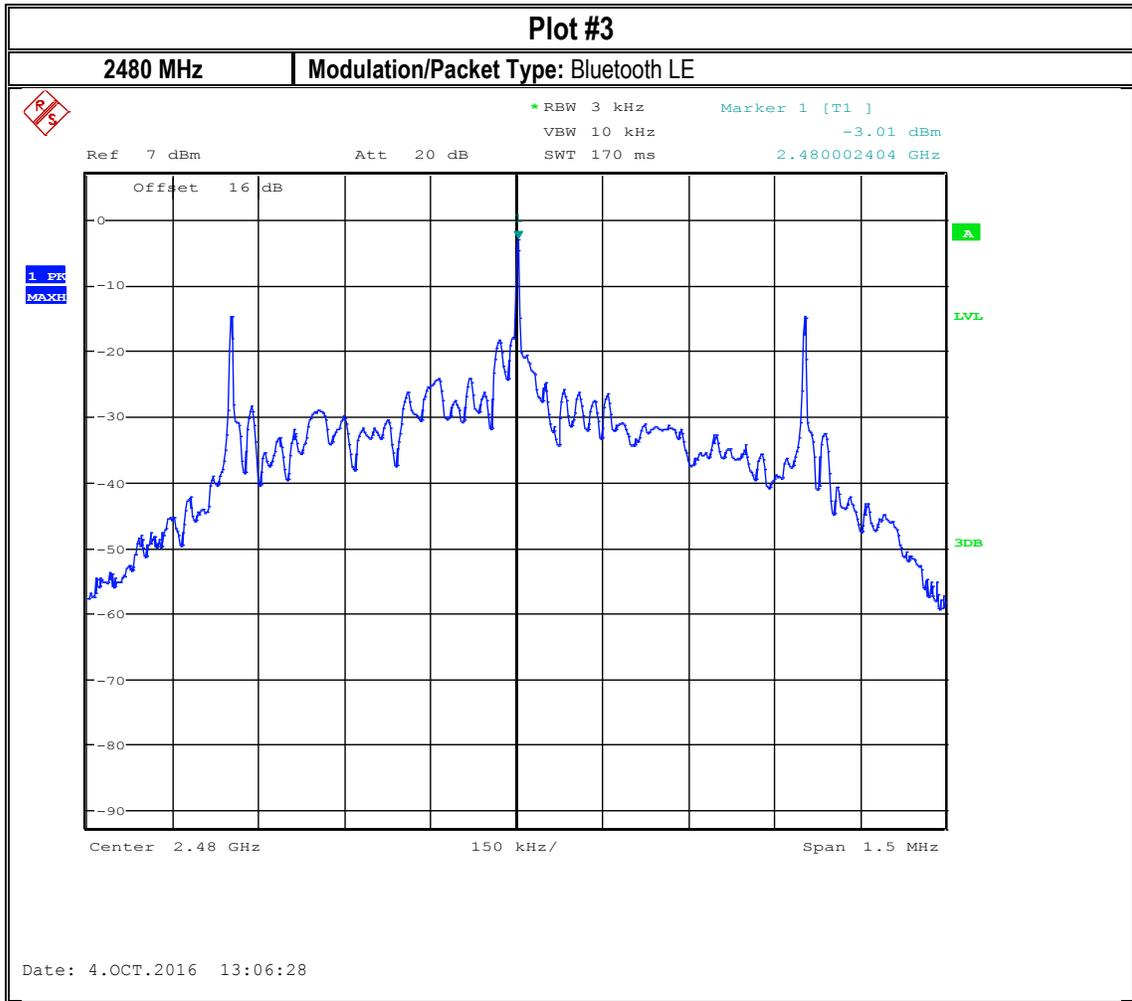
Plot #	Frequency (MHz)	Maximum Power Spectral Density (dBm)	Limit ( dBm / 3 KHz )	Result
1	2402	3.02	8	Pass
2	2440	2.82	8	Pass
3	2480	2.63	8	Pass

Note: PSD results were adjusted to include antenna gain.

### 8.3.5 Measurement Plots:







## 8.4 Band Edge and Restricted Band Compliance

### 8.4.1 Measurement according to FCC KDB 558074 D01 v03r03

#### Spectrum Analyzer settings for non-restricted band edge:

- Span: wide enough to capture the peak level of the emission operating on the channel closest to the band edge, as well as any modulation products which fall outside of the authorized band of operation.
- RBW  $\geq$  1% of the span
- VBW  $\geq$  RBW
- Sweep Time: Auto
- Detector = peak
- Trace = max hold
- Allow the trace to stabilize. 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.

### 8.4.2 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, VBW  $\geq$  RBW



**8.4.3 Limits restricted band §15.247/15.209/15.205 and RSS-Gen 8.9/8.10**

- \*PEAK LIMIT= 74dBµV/m @3m =-21.23dBm
- \*AVG. LIMIT= 54dBµV/m @3m =-41.23dBm
- 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			

**8.4.4 Test conditions and setup:**

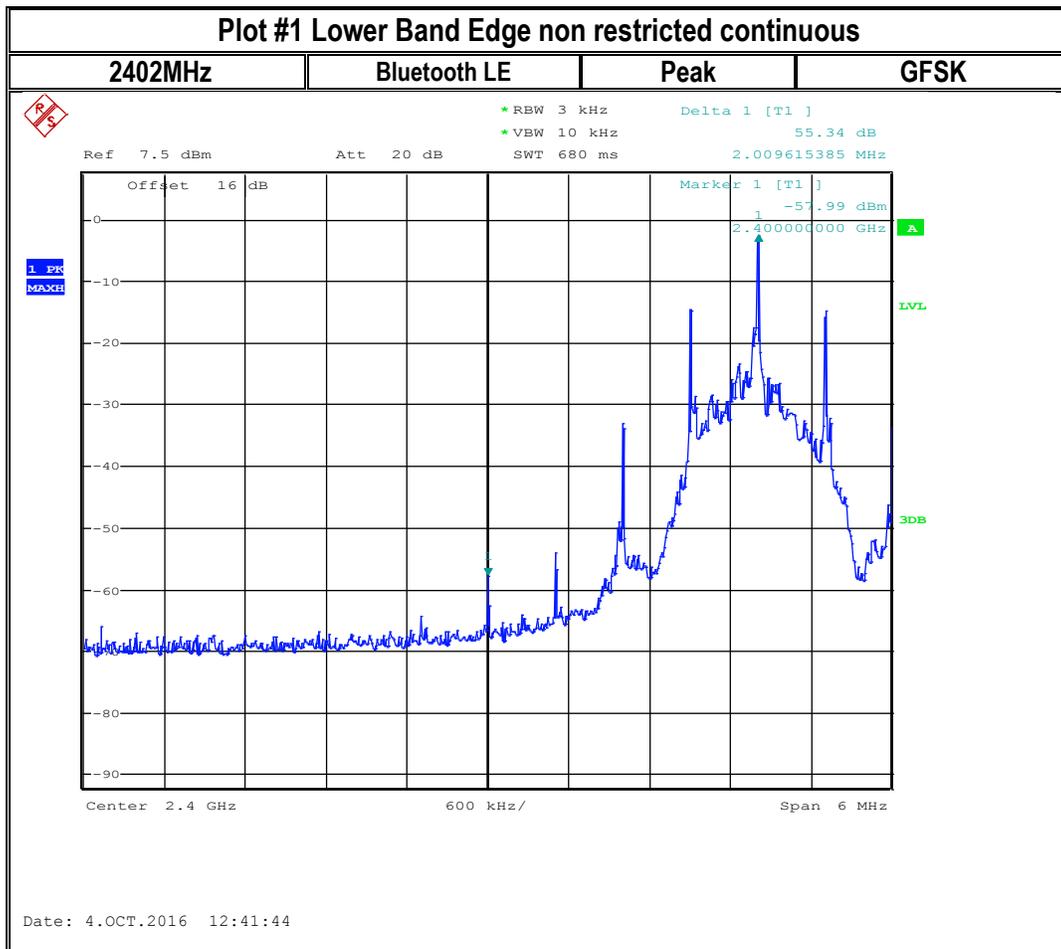
Ambient Temperature	EUT Set-Up #	EUT operating mode	Power Input	Measurement Path Loss (dB)	Antenna Gain (dBi)
22° C	2	BT LE	3.3V DC	16	5.64

**8.4.5 Measurement result:**

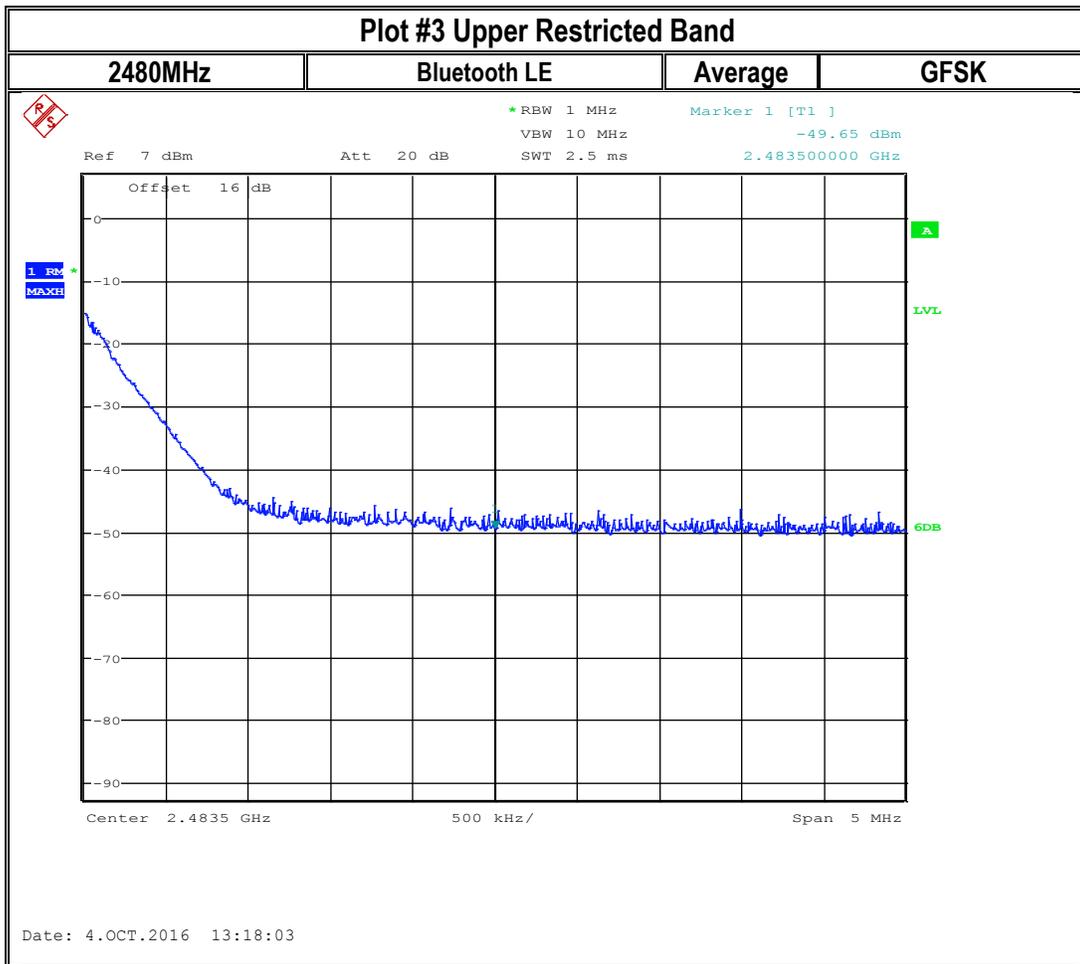
Plot #	Band Edge	Band Edge Delta (dBc)	Limit (dBc)	Result
1	Lower non restricted	> 55dB	20	Pass

Plot #	EUT operating mode	Band Edge	Measured Value (dBm)	Corrected by Ant. Gain (dBm)	Limit (dBm)	Result
2	BT LE	Upper restricted peak	-42.30	-36.66	PEAK = -21.23	Pass
3	BT LE	Upper restricted average	-49.65	-44.01	AVG = -41.23	Pass

### 8.4.6 Measurement Plots:







## 8.5 Radiated Transmitter Spurious Emissions

### 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= 1MHz
  
- 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) =  $40 \log (D/d) = 40 \log (300m / 3m) = 80dB$

### 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 & 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	40dBµV/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 & 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= 74dBµV/m

\*AVG. LIMIT= 54dBµV/m



**8.5.3 Test conditions and setup:**

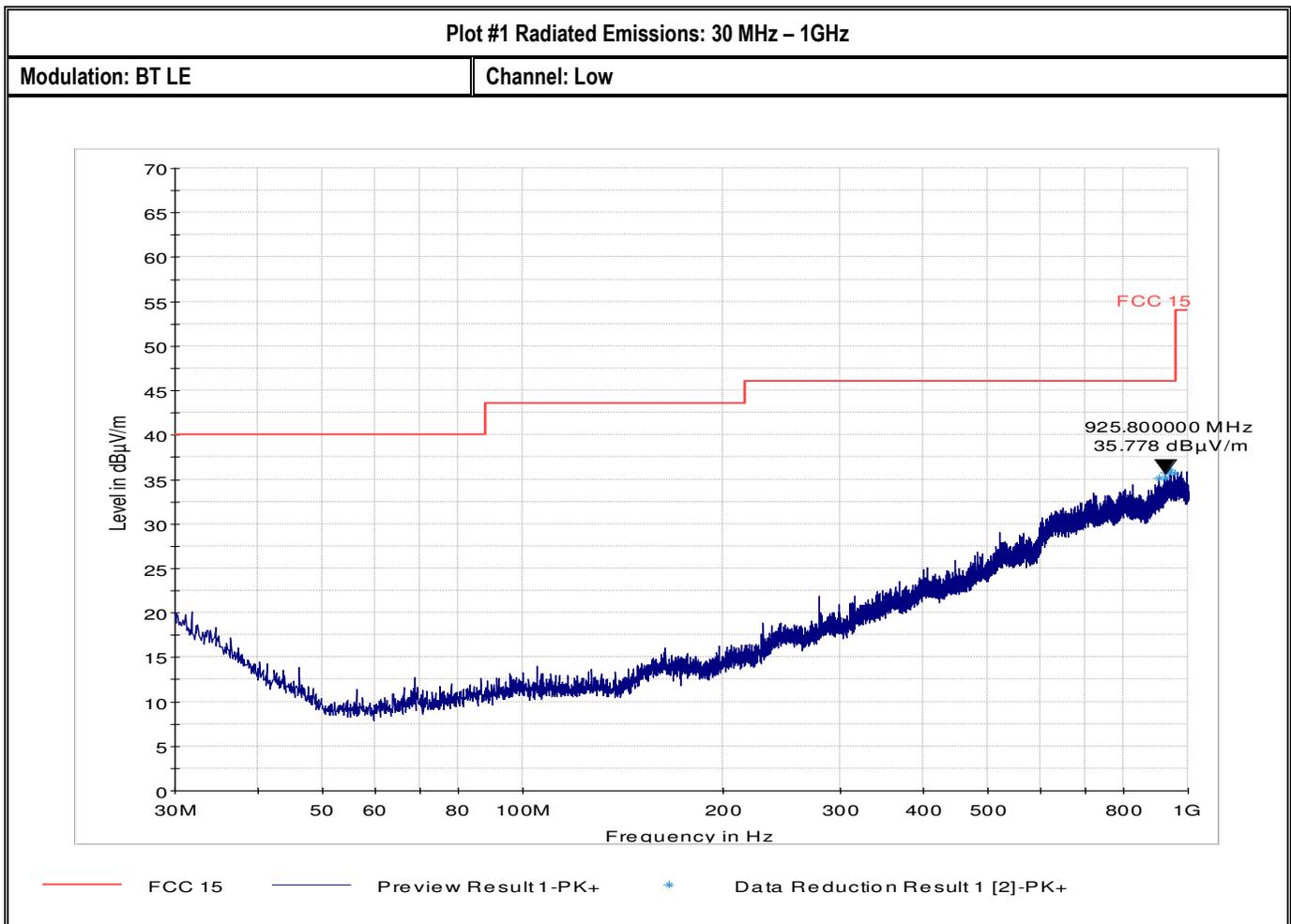
Ambient Temperature	EUT Set-Up #	EUT operating mode	Power Input	Antenna Gain (dBi)
21.6° C	1	BT LE	3.3V DC	5.64

**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:**

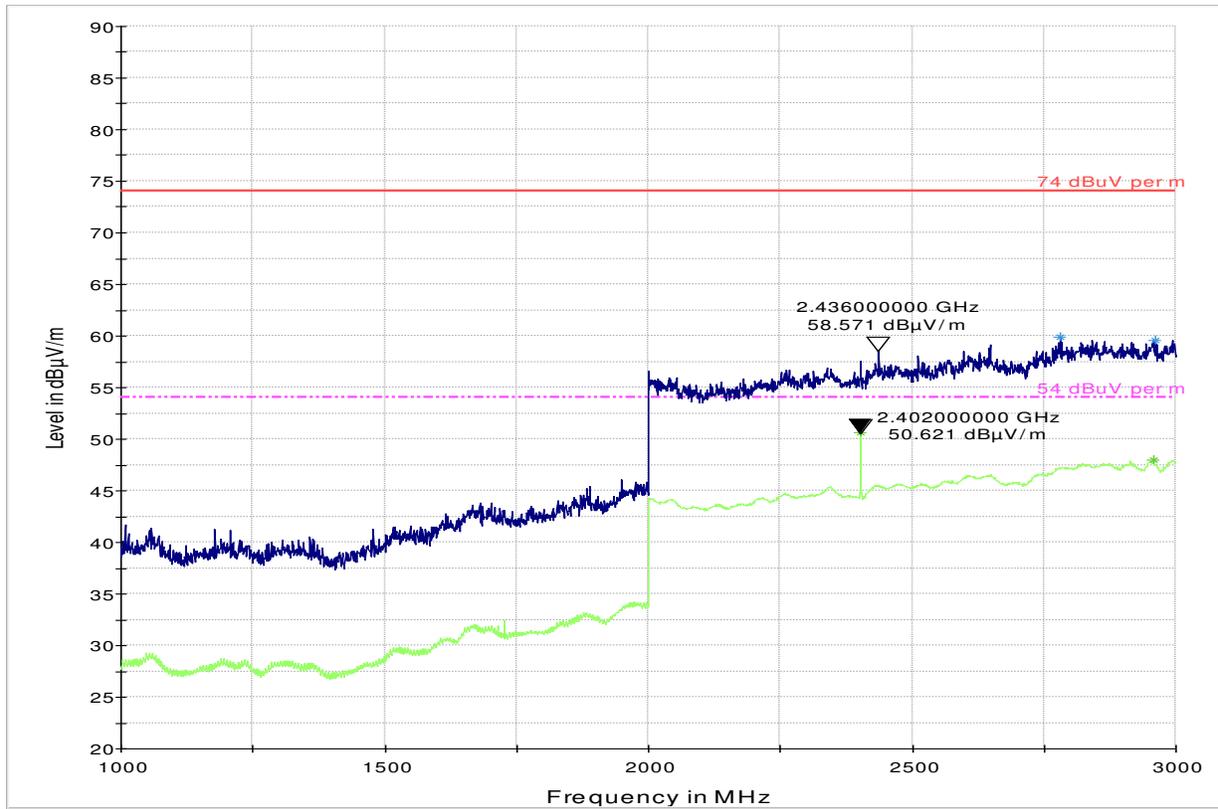
Plots reported here represent the worst case emissions for horizontal and vertical antenna polarizations and for three orientations of the EUT. Unless mentioned otherwise, the emissions outside the limit lines in the plots are from the transmit signal.



Plot # 2 Radiated Emissions: 1-3 GHz

Modulation: BT LE

Channel: Low

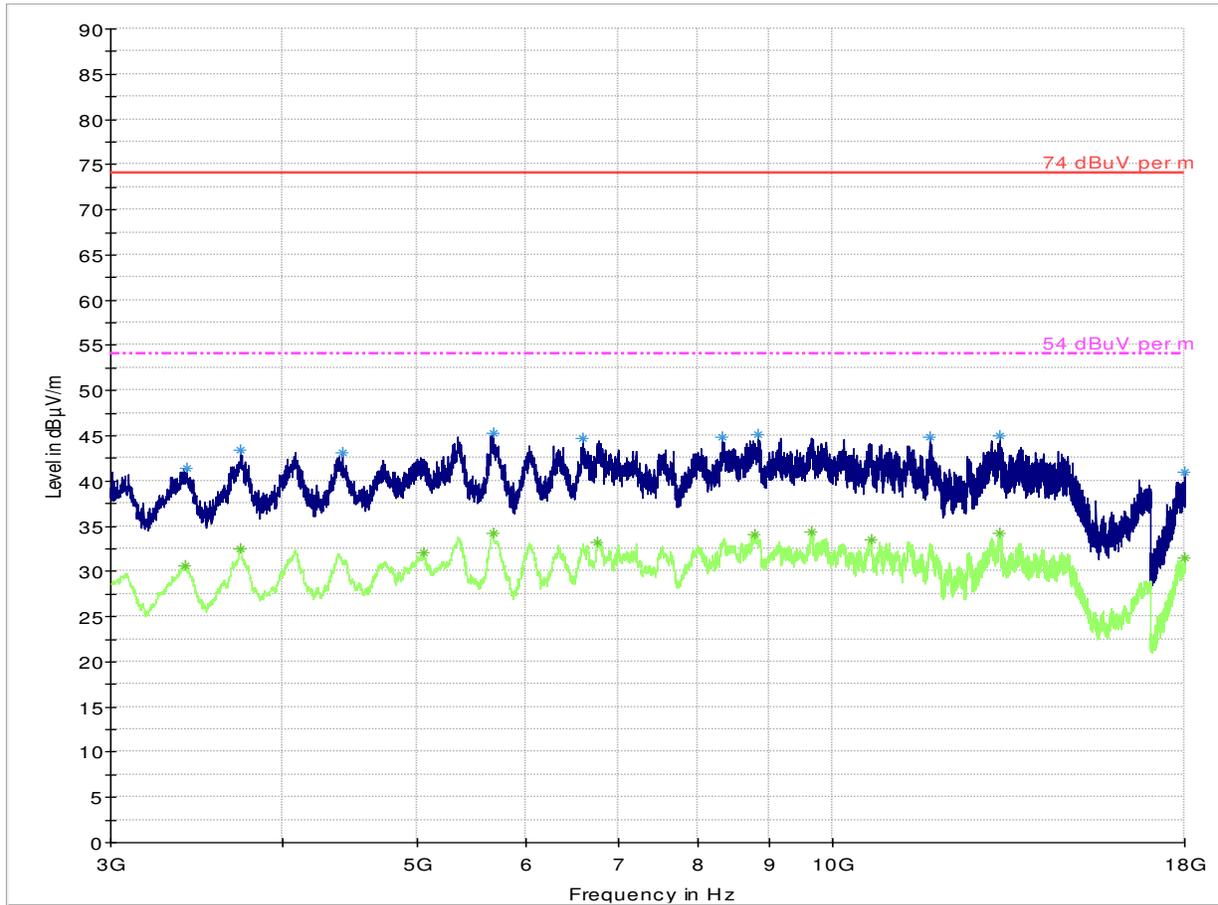


- 74 dBuV per m
- Preview Result 1-PK+
- Data Reduction Result 1 [4]-PK+
- 54 dBuV per m
- Preview Result 2-RMS
- Data Reduction Result 2 [4]-RMS

Plot # 3 Radiated Emissions: 3-18 GHz

Modulation: BT LE

Channel: Low

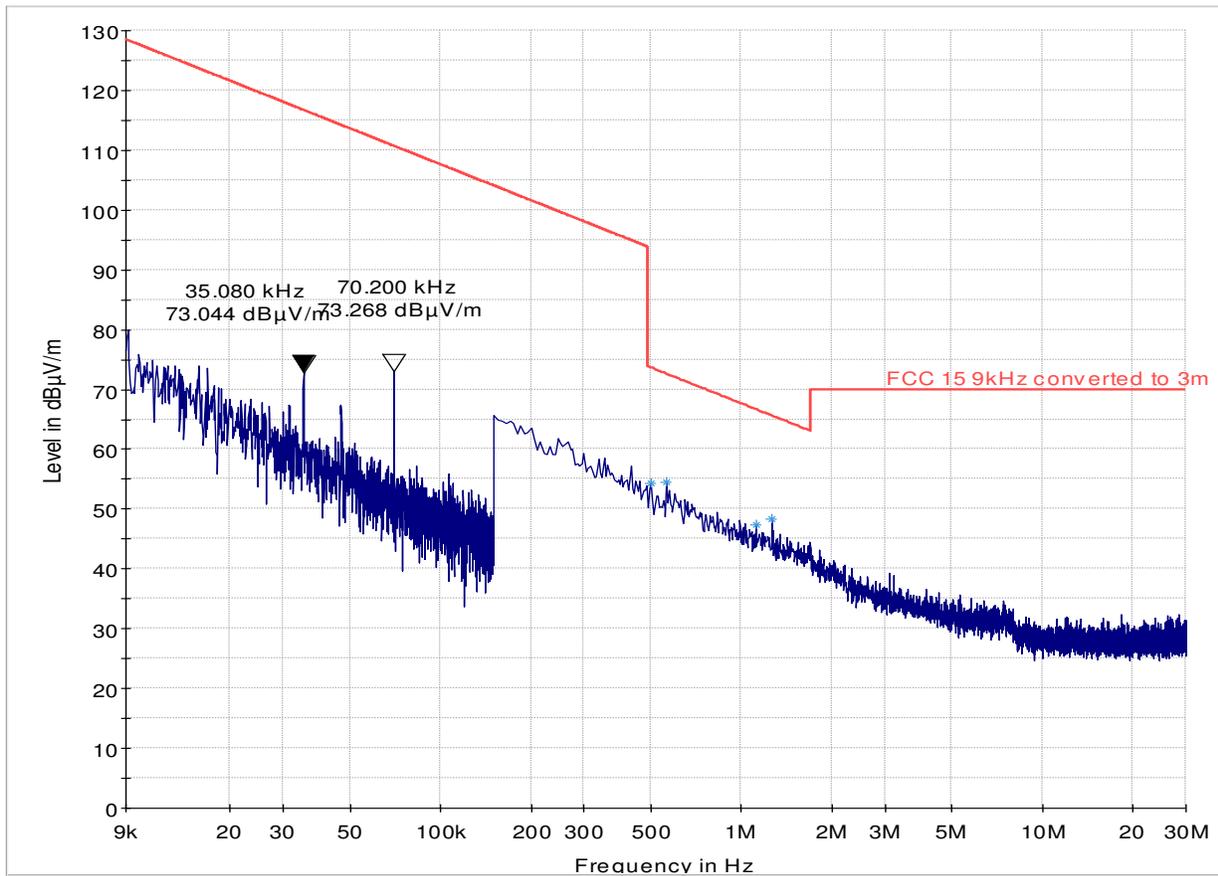


- 74 dBuV per m
- Preview Result 1-PK+
- \* Data Reduction Result 1 [5]-PK+
- - - 54 dBuV per m
- Preview Result 2-RMS
- \* Data Reduction Result 2 [5]-RMS

Plot # 4 Radiated Emissions: 9 KHz - 30 MHz

Modulation: BT LE

Channel: Mid

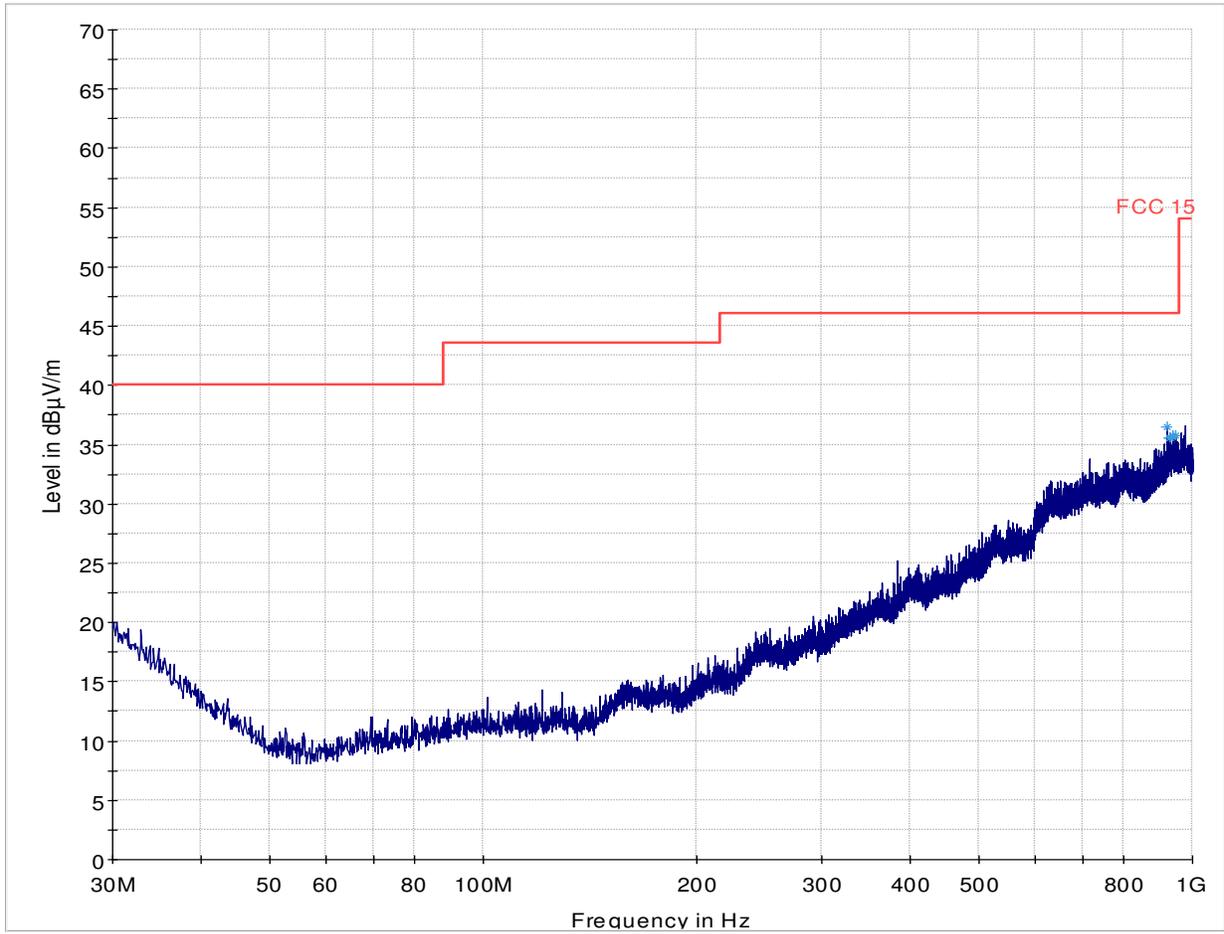


— FCC 15.9kHz converted to 3m    — Preview Result 1-PK+    \* Data Reduction Result 1 [1]-PK+

Plot #5 Radiated Emissions: 30 MHz – 1GHz

Modulation: BT LE

Channel: Mid

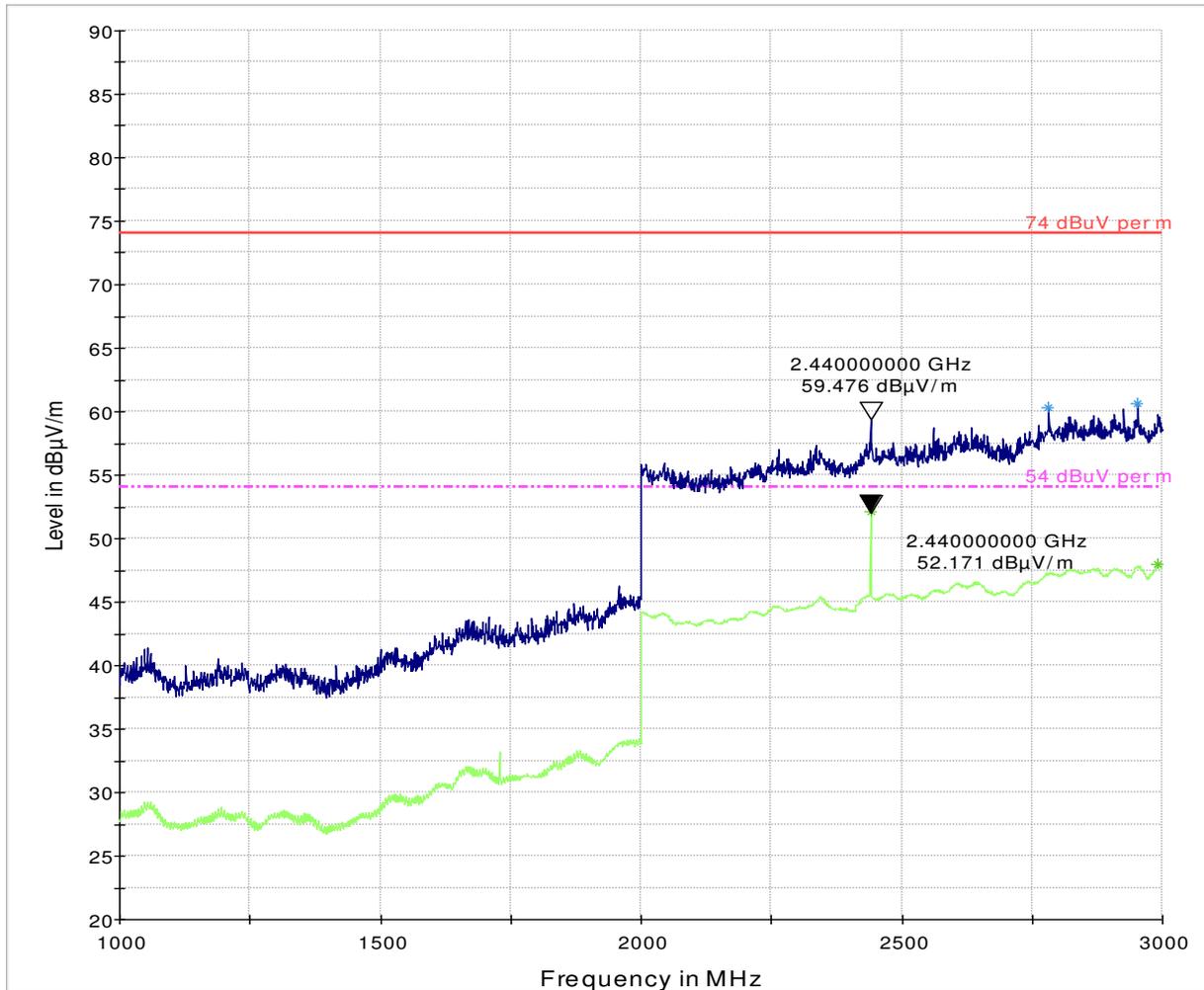


— FCC 15    — Preview Result 1-PK+    \* Data Reduction Result 1 [2]-PK+

Plot #6 Radiated Emissions: 1-3 GHz

Modulation: BT LE

Channel: Mid

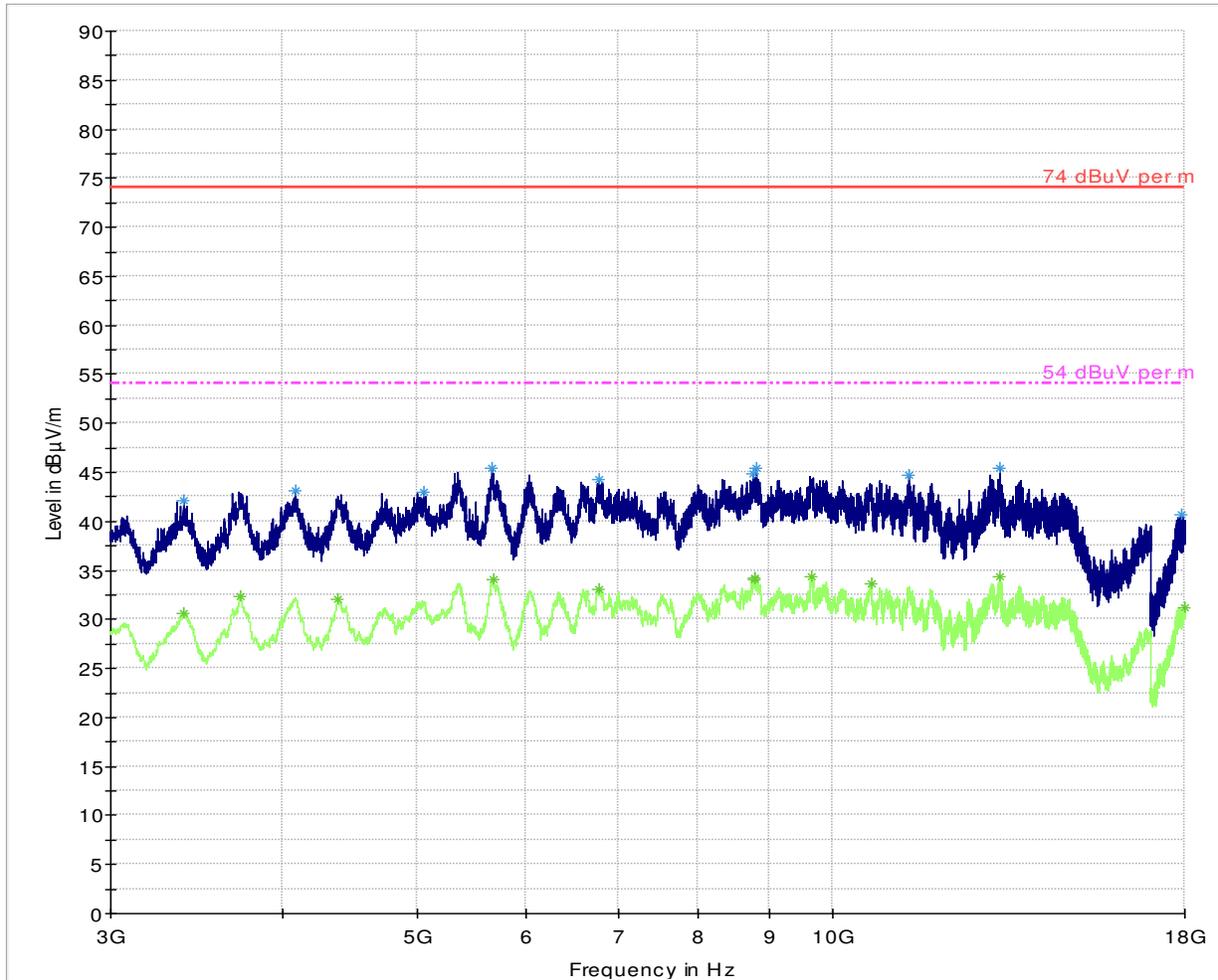


- 74 dBuV per m
- Preview Result 1-PK+
- \* Data Reduction Result 1 [4]-PK+
- - - 54 dBuV per m
- Preview Result 2-RMS
- \* Data Reduction Result 2 [4]-RMS

Plot #7 Radiated Emissions: 3-18 GHz

Modulation: BT LE

Channel: Mid

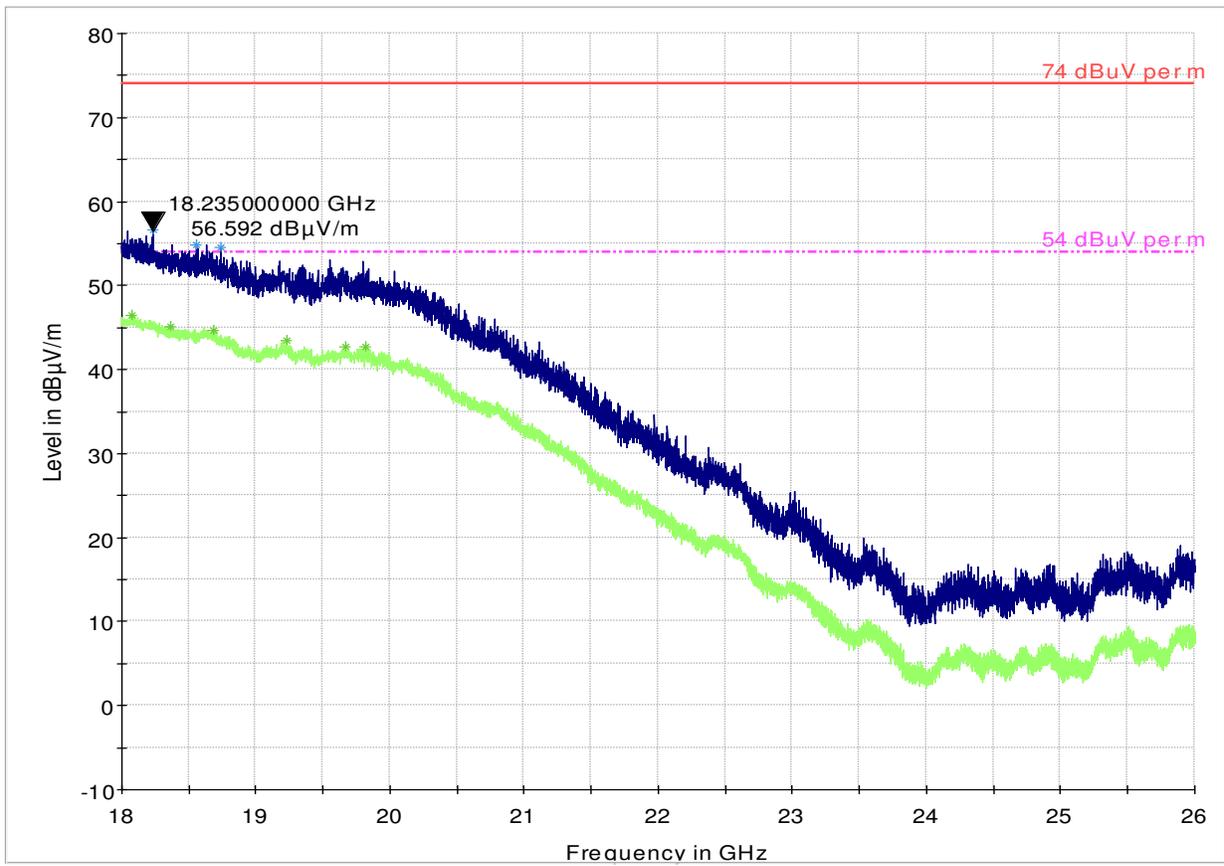


- 74 dBuV per m
- 54 dBuV per m
- Preview Result 1-PK+
- Preview Result 2-RMS
- Data Reduction Result 1 [5]-PK+
- Data Reduction Result 2 [5]-RMS

Plot #8 Radiated Emissions: 18-26 GHz

Modulation: BT LE

Channel: Mid

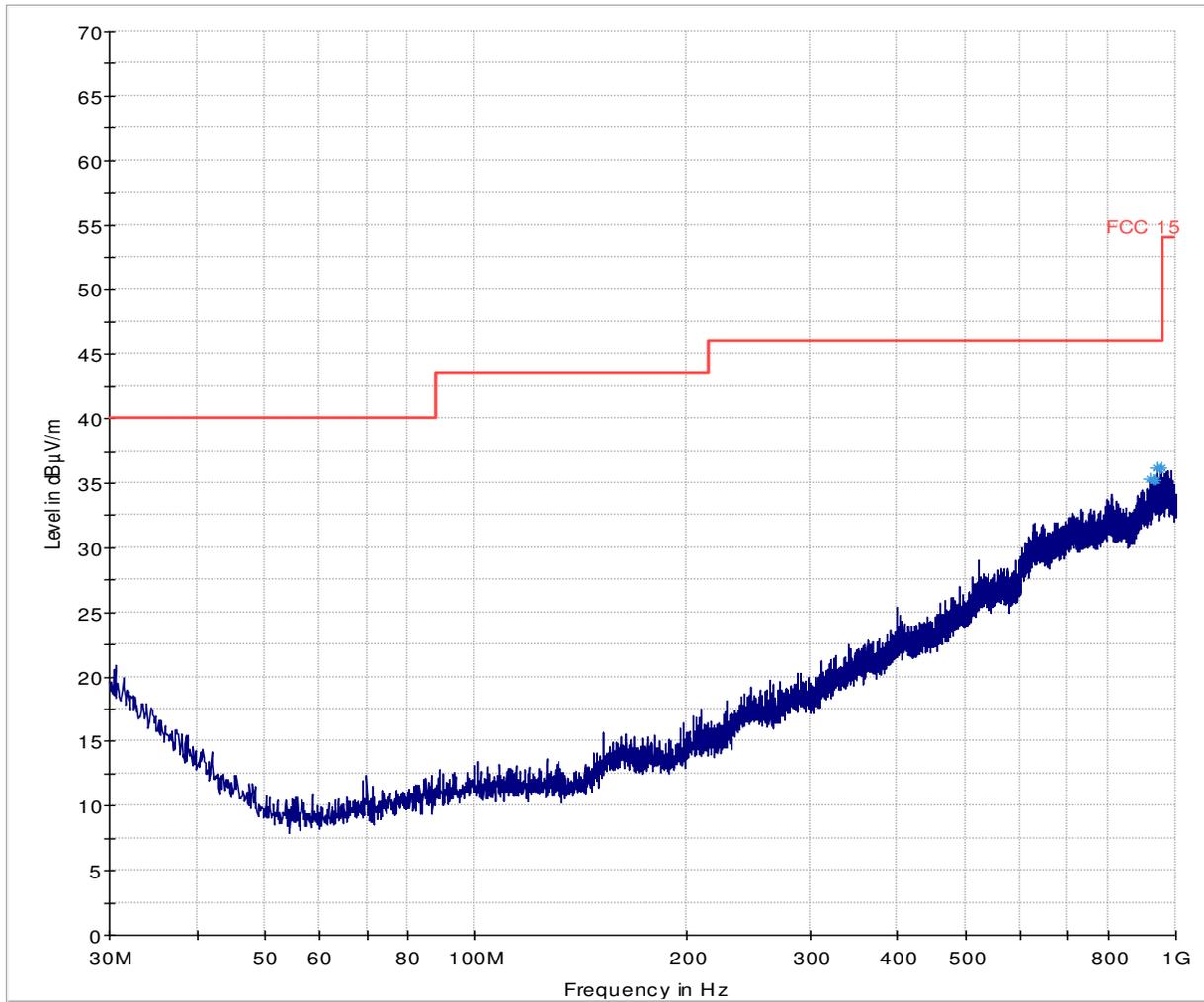


- 74 dBuV per m
- Preview Result 1-PK+
- \* Data Reduction Result 1 [6]-PK+
- - - 54 dBuV per m
- Preview Result 2-RMS
- \* Data Reduction Result 2 [6]-RMS

Plot #9 Radiated Emissions: 30 MHz – 1GHz

Modulation: BT LE

Channel: High

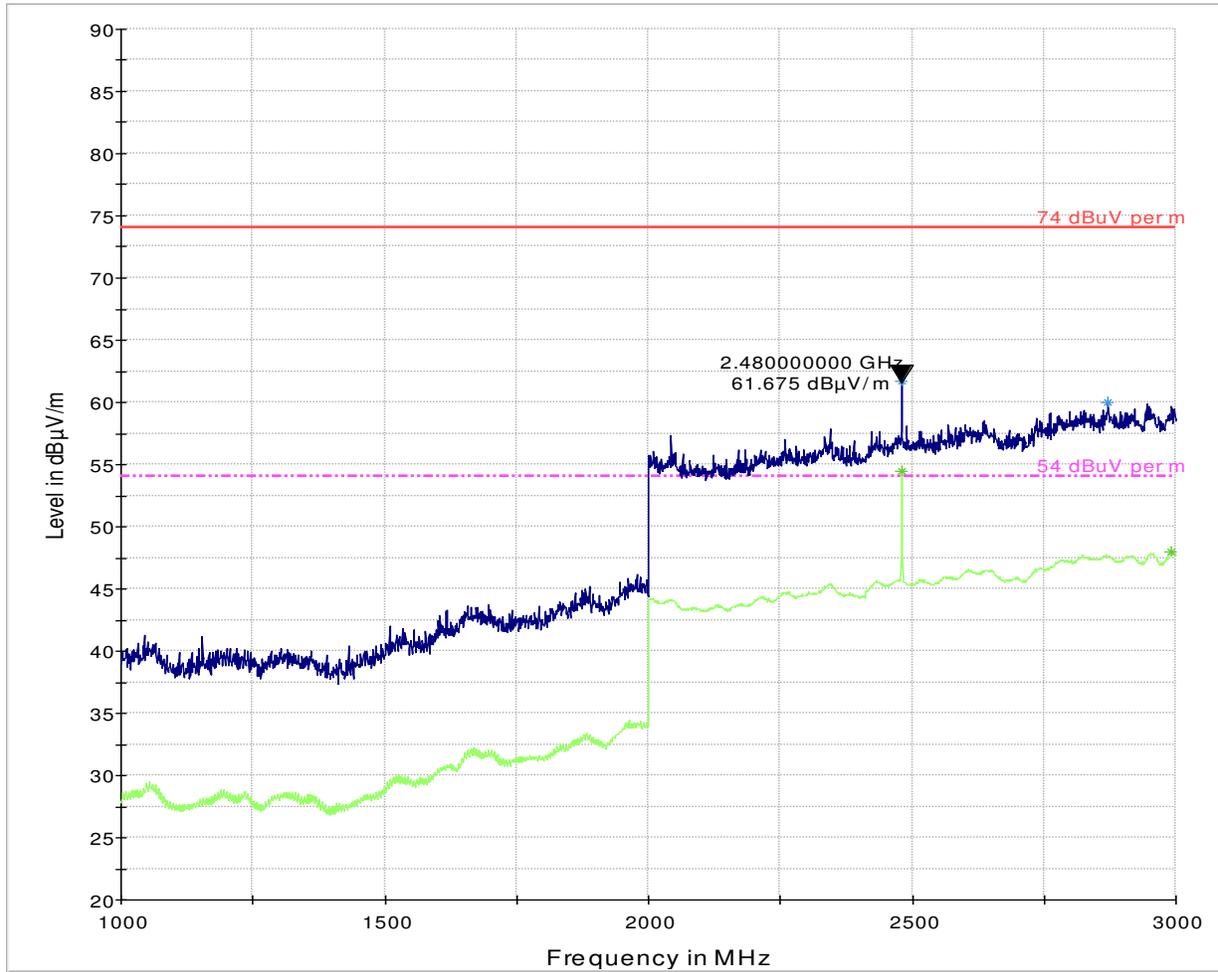


— FCC 15    — Preview Result 1-PK+    \* Data Reduction Result 1 [2]-PK+

Plot # 10 Radiated Emissions: 1-3 GHz and Restricted Bands

Modulation: BT LE

Channel: High



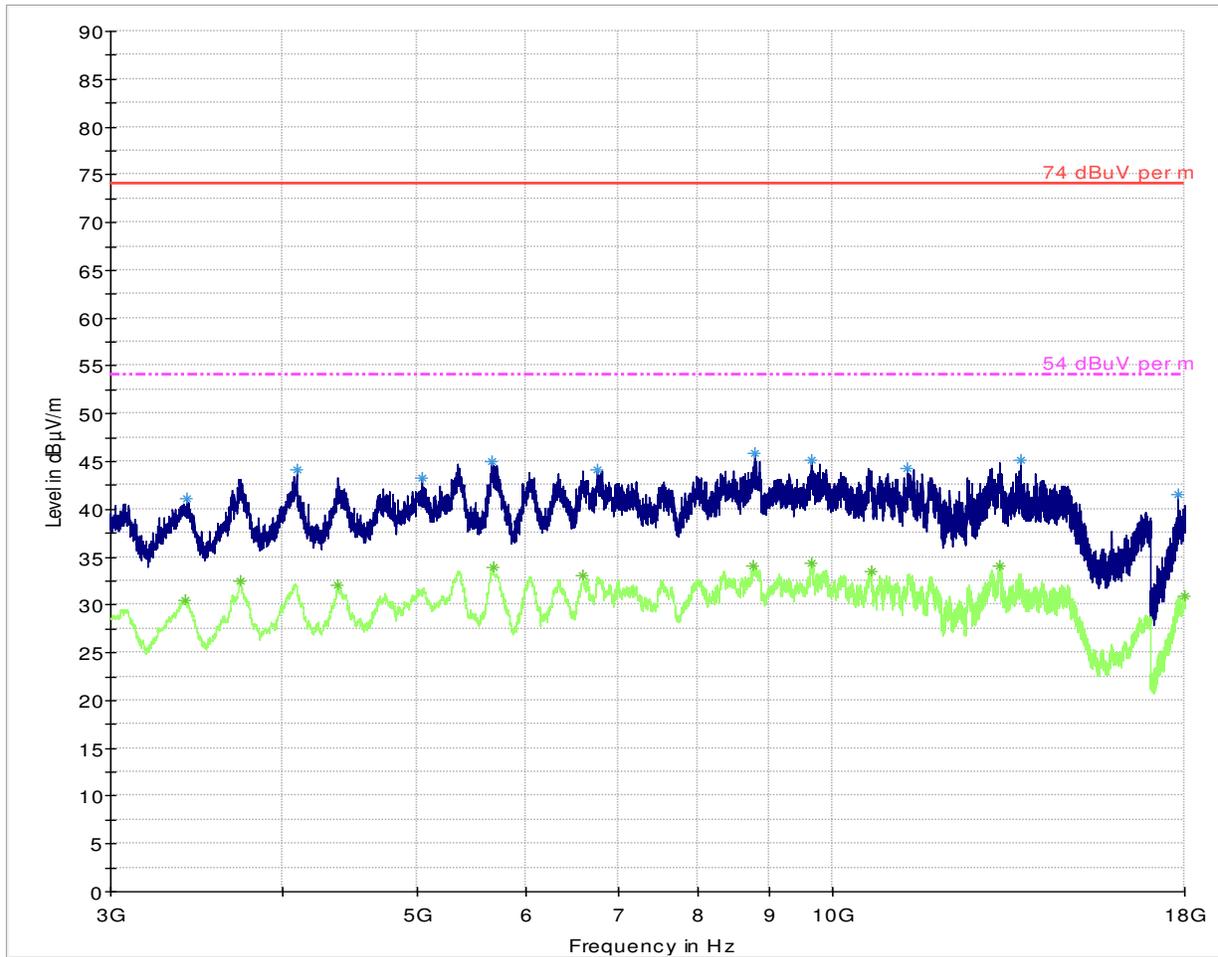
- 74 dBuV per m
- Preview Result 1-PK+
- \* Data Reduction Result 1 [4]-PK+
- - - 54 dBuV per m
- Preview Result 2-RMS
- \* Data Reduction Result 2 [4]-RMS



Plot #11 Radiated Emissions: 3-18 GHz

Modulation: GFSK

Channel: High



- 74 dBuV per m
- 54 dBuV per m
- \* Preview Result 1-PK+
- \* Preview Result 2-RMS
- \* Data Reduction Result 1 [5]-PK+
- \* Data Reduction Result 2 [5]-RMS

## 8.6 AC Power Line Conducted Emissions

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

#### Spectrum Analyzer Settings:

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

### 8.6.2 Limits:

#### 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 (C)	EUT Set-Up #	EUT operating mode	Power line (L1, L2, L3, N)	Power Input
22	3	BT LE	Line & Neutral	110V / 60Hz

### 8.6.4 Measurement Result:

Plot #	Port	EUT Set-Up #	EUT operating mode	Scan Frequency	Limit	Result
1	AC Mains	3	BT LE	150 kHz – 30 MHz	See section 8.6.2	Pass

### 8.6.5 Measurement Plots:

**Plot # 1**

**EUT Information**

EUT Name: AL-TRK-001  
 Manufacturer: Angler Labs Inc.  
 SN / IMEI: N/A  
 Comment: 110V 60Hz

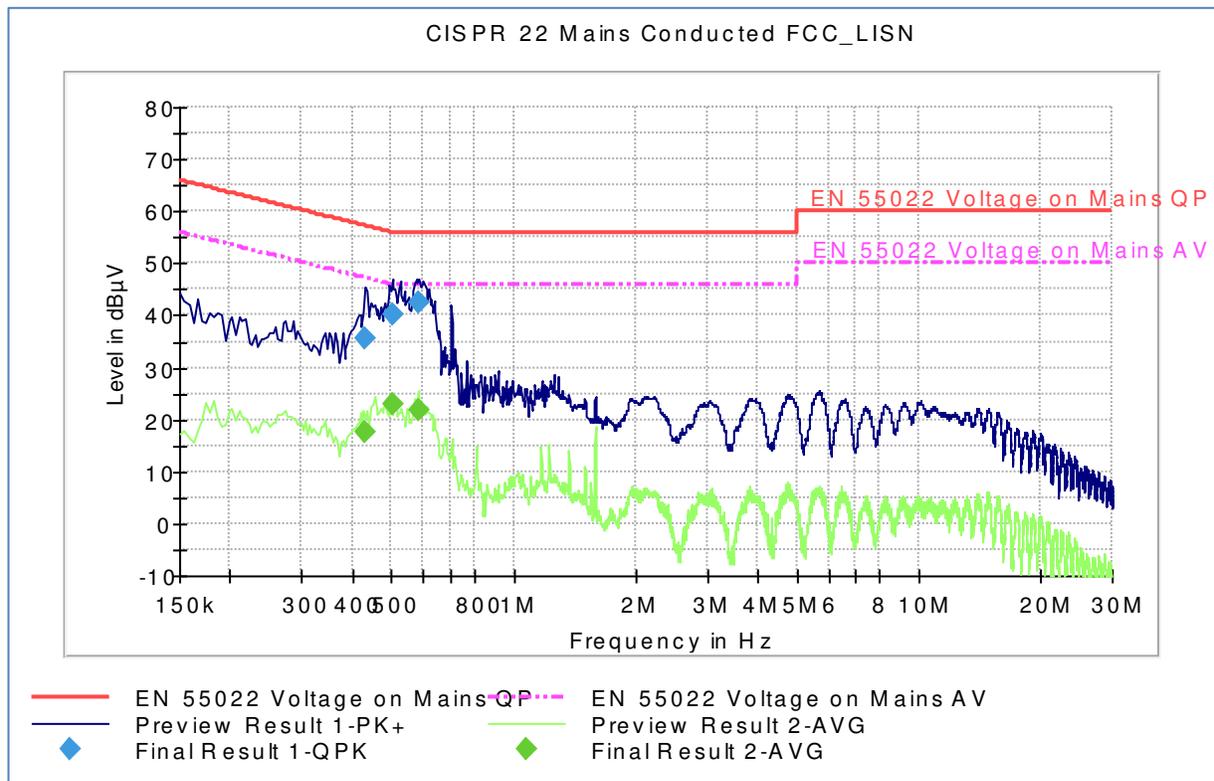
**Quasipeak Measurement Final Result**

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.430000	35.5	500.0	9.000	GN	N	2.6	21.8	57.3	
0.502000	40.3	500.0	9.000	GN	L1	2.1	15.7	56.0	
0.582000	42.3	500.0	9.000	GN	N	1.7	13.7	56.0	

**Average Measurement Final Result**

Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.430000	17.6	500.0	9.000	GN	N	2.6	29.6	47.3	
0.502000	22.8	500.0	9.000	GN	L1	2.1	23.2	46.0	
0.582000	21.7	500.0	9.000	GN	N	1.7	24.3	46.0	

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



Test Date: 10/4/2016 4:00:21

Test Engineer: TNguyen

## 9 Test setup photos

Setup photos are included in supporting file name: "EMC\_ANGLE-001-16001\_15.247\_DTS\_Setup\_Photos\_Rev2.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	6/14/2014
Antenna Loop 6512	Loop Antenna	ETS Lindgren	6512	49838	3 years	3/13/2014
Antenna Horn 3115 SN 35111	Horn Antenna	EMCO	3115	35111	3 years	7/24/2015
Antenna Horn 3116	Horn Antenna	ETS Lindgren	3116	70497	3 years	7/22/2015
Digital Barometer	Compact Digital Barometer	Control Company	35519-055	91119547	2 Years	4/7/2015
FSU26	Spectrum Analyzer	R&S	FSU26	200065	3 years	7/4/2015
FSU26	Spectrum Analyzer	R&S	FSU26	200302	3 years	7/4/2015
Thermometer Humidity TM320	Thermometer Humidity	Dickson	AY1072	0528	1 Year	10/28/2015

Note:

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

<b>Date</b>	<b>Report Name</b>	<b>Changes to report</b>	<b>Report prepared by</b>
2016-10-17	EMC_ANGLE-001-16001_15.247_DTS	Initial Version	Kris Lazarov
2016-11-02	EMC_ANGLE-001-16001_15.247_DTS_Rev 1	Updated Section 7.1 test setup drawings for measurements below 30MHz and above 1GHz; Updated Section 7.2 to correct methods of measurement	Kris Lazarov
2016-11-16	EMC_ANGLE-001-16001_15.247_DTS_Rev 2	Updated the report name; Added deviation in section 1; Updated the report name in section 9; Corrected the equipment table in section 10	Kris Lazarov