



## FCC/ISED Test Report

**FOR:**

CalAmp Wireless Networks Corp.

**Model Name:**

VLU11B / VLU11

**Product Description:**

Lojack vehicle recovery system

**FCC ID:** APV-VLU11B / APV-VLU11

**IC ID:** 5483C-VLU11B / 5483C-VLU11

**Per:**

47 CFR: Part 22, Part 24, Part 27

RSS-130; RSS-132 Issue 3; RSS-133 Issue 6; RSS-139 Issue 3

**REPORT #:** EMC\_CALAM\_085\_19001\_FCC\_22\_24\_27\_ISED

**DATE:** 2019-05-10



A2LA Accredited

IC recognized #  
3462B-2

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**1 Assessment**

The following device as further described in section 3 of this report was evaluated for radiated spurious emissions in simultaneous transmission of cellular and unlicensed radios according to criteria specified in the Code of Federal Regulations Title 47 parts 22, 24, 27 and Industry Canada Radio Standard Specifications RSS: 130, 132 Issue 3, 133 Issue 6 and 139 Issue3.

| Company                        | Description                    | Model #                |
|--------------------------------|--------------------------------|------------------------|
| CalAmp Wireless Networks Corp. | Lojack vehicle recovery system | VLU11VMAB/<br>VLU11VMA |

No deficiencies were ascertained.

**Responsible for Testing Laboratory:**

| 2019-05-10 | Compliance | Cindy Li<br>(Lab Manager) |           |
|------------|------------|---------------------------|-----------|
| Date       | Section    | Name                      | Signature |

**Responsible for the Report:**

| 2019-05-10 | Compliance | Chin Ming Lui<br>(Associate EMC Engineer) |           |
|------------|------------|-------------------------------------------|-----------|
| Date       | Section    | Name                                      | Signature |

The test results of this test report relate exclusively to the test item specified in Section3.

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      |
| Lab Manager:                | Cindy Li               |
| Responsible Project Leader: | Cathy Palacios         |

### 2.2 Identification of the Client

|                   |                                |
|-------------------|--------------------------------|
| Applicant's Name: | CalAmp Wireless Networks Corp. |
| Street Address:   | 2177 Salk Ave, Suite 200       |
| City/Zip Code     | Carlsbad, CA 92008             |
| Country           | USA                            |

### 2.3 Identification of the Manufacturer

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

**3 Equipment Under Test (EUT)****3.1 EUT Specifications**

|                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|-------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Firmware Version Identification Number (FVIN):</b>             | 11.00.01                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Hardware Version Identification Number (HVIN):</b>             | REV 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Product Marketing Name (PMN):</b>                              | VLU11B (for BTLE populated unit)<br>VLU11 (for BTLE depopulated unit)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Antenna (Primary &amp; Diversity) Information as declared:</b> | Primary                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Other Radios included in the device:</b>                       | <ul style="list-style-type: none"> <li>❖ <u>BTLE</u> <ul style="list-style-type: none"> <li>• Module: Designed by CalAmp Wireless Networks based on Texas Instruments Chip CC2640</li> <li>• Main Antenna: <ul style="list-style-type: none"> <li>▪ Type: Chip</li> <li>▪ Location: Internal</li> <li>▪ Gain: 5.36 dBi</li> <li>▪ Operating Frequency: 2402 – 2480 MHz</li> </ul> </li> </ul> </li> <li>❖ <u>GPS</u> <ul style="list-style-type: none"> <li>• Chip based, no module</li> <li>• Antenna location: Internal</li> </ul> </li> <li>❖ <u>VHF</u> <ul style="list-style-type: none"> <li>• Freq Proprietary Tech</li> <li>• Antenna: Unspecified</li> <li>• Operating Frequency: 173.075 MHz</li> <li>• Type(s) of Modulation: FSK</li> </ul> </li> </ul> |
| <b>Power Supply/ Rated Operating Voltage Range:</b>               | Battery / Low 7 VDC, Nominal 12-24 VDC, High 32 VDC                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Operating Temperature Range:</b>                               | Low -20° C, High 60° C                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Sample Revision</b>                                            | <input type="checkbox"/> Prototype Unit; <input type="checkbox"/> Production Unit; <input checked="" type="checkbox"/> Pre-Production                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>EUT Dimensions(mm):</b>                                        | 159x56x28                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Weight(grams):</b>                                             | 320                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>EUT Diameter</b>                                               | <input checked="" type="checkbox"/> < 60 cm <input type="checkbox"/> Other _____                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

| Module Information           |                                                      |
|------------------------------|------------------------------------------------------|
| Module Name:                 | UBLOX - SARA R410M                                   |
| Model Number:                | SARA-R410M-52B                                       |
| FCC/IC ID:                   | FCC ID: XPY2AGQN4NNN<br>IC ID: 8595A-2AGQN4NNN       |
| Frequency Band of Operation: | FDD LTE 2, 4, 5, 12, 13                              |
| Main Antenna:                | Type: Custom<br>Location: Internal<br>Gain: 2.58 dBi |

### 3.2 EUT Sample details

| EUT # | IMEI number     | HW Version | SW Version | Notes/Comments       |
|-------|-----------------|------------|------------|----------------------|
| 1     | 357812093380480 | REV 1      | 11.00.01   | Radiated Measurement |

### 3.3 Support Equipment

| SE # | Type            | Model  | Manufacturer | Serial Number |
|------|-----------------|--------|--------------|---------------|
| 1    | DC Power Supply | E3634A | Agilent      | MY53290018    |

### 3.4 Test Sample Configuration

| EUT Set-up # | Combination of AE used for test set up | Comments   |
|--------------|----------------------------------------|------------|
| 1            | EUT# 1 + SE#1                          | Worst Case |

### 3.5 Mode of Operation details

| Mode of Operation | Description of Operating modes    | Additional Information                                                                                                                                                                                                                                                                                                                    |
|-------------------|-----------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Op. 1             | Cellular and BTLE Co-Transmission | <p>Cellular was tested on Low, Mid, High Channels at the maximum power in a co-transmission mode.</p> <p>Special commands through command window used to configure BTLE radio to High channel provided by the client that will not be available to the end user</p> <p>For radiated measurements: The internal antenna was connected.</p> |

### 3.6 Justification for Worst Case Mode of Operation

During the testing process the EUT was tested with transmitter sets on low, mid and high channels at the maximum power simultaneous transmission with BTLE radio High channel, which is the worst case of the radios supported, based on the maximum average conducted output power from the reports.

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.

## 4 Subject of Investigation

The objective of the evaluation conducted by CETECOM Inc. is to support a request for new equipment authorization under **FCC ID: APV-VLU11B / IC ID: 5483C-VLU11B** (for BTLE Populated Unit), and **FCC ID: APV-VLU11 / IC ID: 5483C-VLU11** (for BTLE Depopulated Unit).

The pre-certified module to be integrated (UBLOX SARA R410M) as described in Section 3, Radiated Spurious Emissions test was performed. Results have been checked to meet limits per Code of Federal Regulations Title 47 parts 22, 24, 27 and Industry Canada Radio Standard Specifications RSS: 130, 132 Issue 3, 133 Issue 6 and 139 Issue 3.

The conducted module test data that can be obtained under the **FCC Filing ID: XPY2AGQN4NNN** is applicable for the host described in section 3.

### 4.1 Dates of Testing:

03/04/2019 – 03/13/2019

### 4.2 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     | ±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)          |

### 4.3 Environmental Conditions during Testing:

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

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

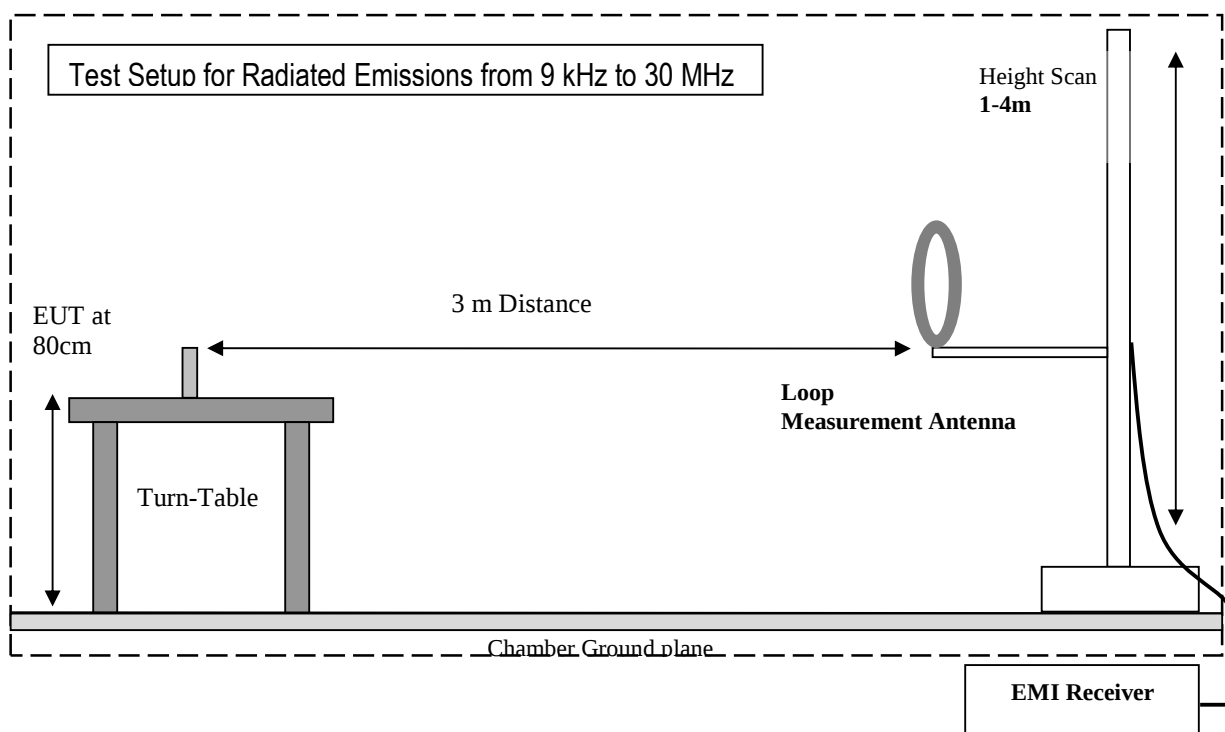
Deviating test conditions are indicated at individual test description where applicable.

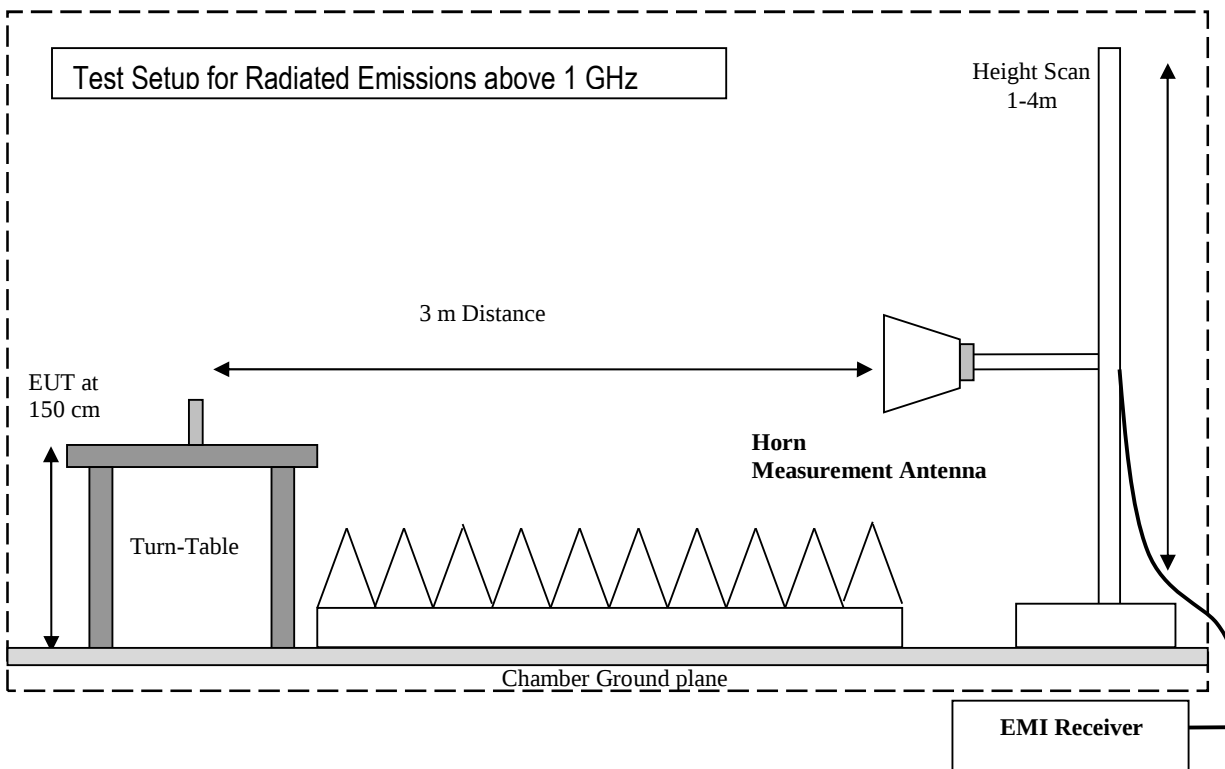
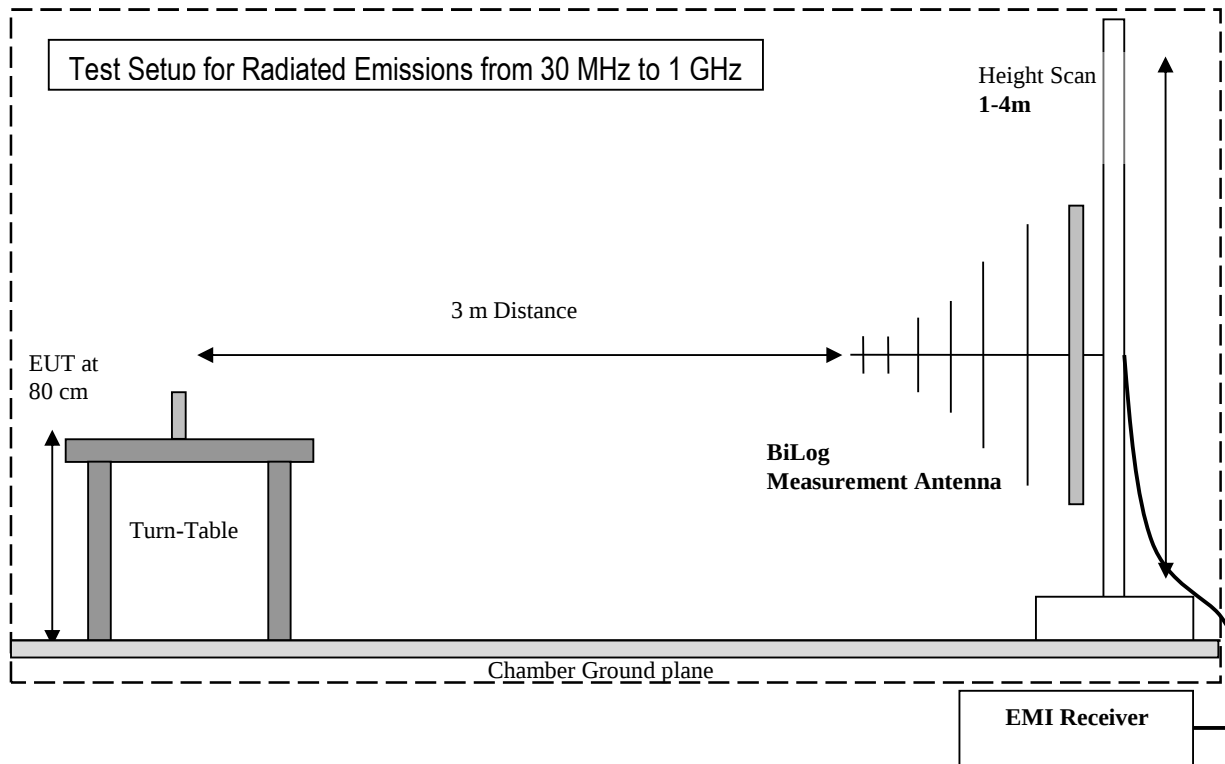
## 5 Measurement Procedures

Testing is performed according to the guidelines provided in FCC publication (KDB) 971168 D01 v03 – “Measurement Guidance for Certification of Licensed Digital Transmitters” and according to ANSI C63.26 as detailed below.

### 5.1 Radiated Measurement

- 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.





## 5.2 Sample Calculations for Field Strength Measurements

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

- Measured reading in dB $\mu$ V
- Cable Loss between the receiving antenna and SA in dB and
- 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:

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

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                                 |

**6 Measurement Results Summary****6.1 FCC 22, RSS-132:**

| Test Specification                              | Test Case                    | Temperature and Voltage Conditions | Mode | Pass                                | Fail                     | NA                       | NP                                  | Result                       |
|-------------------------------------------------|------------------------------|------------------------------------|------|-------------------------------------|--------------------------|--------------------------|-------------------------------------|------------------------------|
| §2.1046; §22.913 (a)                            | RF Output Power              | Nominal                            | -    | <input type="checkbox"/>            | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | Complies<br>Note 1<br>Note 2 |
| §2.1055; §22.355                                | Frequency Stability          | Nominal                            | -    | <input type="checkbox"/>            | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | Complies<br>Note 1<br>Note 2 |
| §2.1049; §22.917                                | Occupied Bandwidth           | Nominal                            | -    | <input type="checkbox"/>            | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | Complies<br>Note 1<br>Note 2 |
| §2.1051; §22.917                                | Band Edge Compliance         | Nominal                            | -    | <input type="checkbox"/>            | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | Complies<br>Note 1<br>Note 2 |
| §2.1051; §22.917                                | Conducted Spurious Emissions | Nominal                            | -    | <input type="checkbox"/>            | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | Complies<br>Note 1<br>Note 2 |
| §2.1053;<br>§22.917(a);<br>RSS-132 Issue 3-5.5; | Radiated Spurious Emissions  | Nominal                            | Op.1 | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            | Complies                     |

Note 1: NA= Not Applicable; NP= Not Performed.

Note 2: Leveraged from module certification FCC ID: XPY2AGQN4NNN

**6.2 FCC 24, RSS-133:**

| Test Specification                                | Test Case                    | Temperature and Voltage Conditions | Mode | Pass                     | Fail                     | NA                       | NP                       | Result                       |
|---------------------------------------------------|------------------------------|------------------------------------|------|--------------------------|--------------------------|--------------------------|--------------------------|------------------------------|
| §2.1046; §24.232 (a)                              | RF Output Power              | Nominal                            | -    | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | ■                        | Complies<br>Note 1<br>Note 2 |
| §2.1055; §24.235                                  | Frequency Stability          | Nominal                            | -    | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | ■                        | Complies<br>Note 1<br>Note 2 |
| §2.1049; §24.238                                  | Occupied Bandwidth           | Nominal                            | -    | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | ■                        | Complies<br>Note 1<br>Note 2 |
| §2.1051; §24.238                                  | Band Edge Compliance         | Nominal                            | -    | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | ■                        | Complies<br>Note 1<br>Note 2 |
| §2.1051; §24.238                                  | Conducted Spurious Emissions | Nominal                            | -    | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | ■                        | Complies<br>Note 1<br>Note 2 |
| §2.1053;<br>§24.238(a);<br>RSS-133 Issue 6-6.5.1; | Radiated Spurious Emissions  | Nominal                            | Op.1 | ■                        | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Complies                     |

Note 1: NA= Not Applicable; NP= Not Performed.

Note 2: Leveraged from module certification FCC ID: XPY2AGQN4NNN

**6.3 FCC 27, RSS-130, RSS-139:**

| Test Specification                                                                   | Test Case                    | Temperature and Voltage Conditions | Mode | Pass                                | Fail                     | NA                       | NP                                  | Result                       |
|--------------------------------------------------------------------------------------|------------------------------|------------------------------------|------|-------------------------------------|--------------------------|--------------------------|-------------------------------------|------------------------------|
| §2.1046; §27.50 (d)                                                                  | RF Output Power              | Nominal                            | -    | <input type="checkbox"/>            | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | Complies<br>Note 1<br>Note 2 |
| §2.1055; §27.54                                                                      | Frequency Stability          | Nominal                            | -    | <input type="checkbox"/>            | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | Complies<br>Note 1<br>Note 2 |
| §2.1049; §27.53                                                                      | Occupied Bandwidth           | Nominal                            | -    | <input type="checkbox"/>            | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | Complies<br>Note 1<br>Note 2 |
| §2.1051; §27.53                                                                      | Band Edge Compliance         | Nominal                            | -    | <input type="checkbox"/>            | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | Complies<br>Note 1<br>Note 2 |
| §2.1051; §27.53                                                                      | Conducted Spurious Emissions | Nominal                            | -    | <input type="checkbox"/>            | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | Complies<br>Note 1<br>Note 2 |
| §2.1053;<br>§27.53(g);<br>§27.53(h);<br>RSS-130 Issue 1-4.6;<br>RSS-139 Issue 3-6.6; | Radiated Spurious Emissions  | Nominal                            | Op.1 | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            | Complies                     |

Note 1: NA= Not Applicable; NP= Not Performed.

Note 2: Leveraged from module certification FCC ID: XPY2AGQN4NNN

## 7 Test Result Data

### 7.1 ERP/EIRP

| FCC Rule Parts | Band   | Frequency Range (MHz) | Power conducted (W) | Gain (dBi) | Gain Linear | EIRP (W) | ERP (W) | Frequency deviation (ppm) | Emission Designator | Limit EIRP (W) | Limit ERP (W) |
|----------------|--------|-----------------------|---------------------|------------|-------------|----------|---------|---------------------------|---------------------|----------------|---------------|
| 24E            | LTE 2  | 1850 – 1910           | 0.302               | 2.58       | 1.811       | 0.547    | -       | 1.0                       | 1M12G7D             | 2              | -             |
| 27             | LTE 4  | 1710 – 1755           | 0.245               | 2.58       | 1.811       | 0.445    | -       | 1.0                       | 1M24G7D             | 1              | -             |
| 22H            | LTE 5  | 824 – 849             | 0.316               | 2.58       | 1.811       | -        | 0.349   | 1.0                       | 1M11W7D             | -              | 7             |
| 27             | LTE 12 | 699 – 716             | 0.269               | 2.58       | 1.811       | -        | 0.297   | 1.0                       | 1M11W7D             | -              | 3             |
| 27             | LTE 13 | 777 – 787             | 0.275               | 2.58       | 1.811       | -        | 0.304   | 1.0                       | 1M21W7D             | -              | 3             |

Note: ERP/EIRP are based on calculations for highest emissions from maximum conducted output power in grant of cellular module UBLOX SARA R410M (FCC ID: XPY2AGQN4NNN) by adding the declared maximum gain of the utilized cellular antenna per operational description.

### 7.2 Radiated Spurious Emissions

#### 7.2.1 Measurement according to FCC: CFR 47 Part 2.1053; CFR Part 22.917; CFR Part 24.238, Part 27.53 utilizing KDB 971168 D01 Power Meas License Digital Systems v03, and according to ANSI C63.26 2017

##### Spectrum Analyzer Settings for FCC 22

| Frequency Range      | 30 MHz – 1 GHz | 1 – 1.58 GHz | 1.58 – 9 GHz |
|----------------------|----------------|--------------|--------------|
| Resolution Bandwidth | 100 kHz        | 1 MHz        | 1 MHz        |
| Video Bandwidth      | 100 kHz        | 1 MHz        | 1 MHz        |
| Detector             | Peak           | Peak         | Peak         |
| Trace Mode           | Max Hold       | Max Hold     | Max Hold     |
| Sweep Time           | Auto           | Auto         | Auto         |

##### Spectrum Analyzer Settings for FCC 24 and 27

| Frequency Range      | 30MHz – 1 GHz | 1 – 2.7 GHz | 2.7 – 18 GHz | 18 – 19.1 GHz |
|----------------------|---------------|-------------|--------------|---------------|
| Resolution Bandwidth | 100 kHz       | 1 MHz       | 1 MHz        | 1 MHz         |
| Video Bandwidth      | 100 kHz       | 1 MHz       | 1 MHz        | 1 MHz         |
| Detector             | Peak          | Peak        | Peak         | Peak          |
| Trace Mode           | Max Hold      | Max Hold    | Max Hold     | Max Hold      |
| Sweep Time           | Auto          | Auto        | Auto         | Auto          |

**7.2.2 Limits:**

- **FCC Part 22.917(a) and Part 24.238(a), Part 27.53 (g), and Part 27.53 (h)**
- **RSS-130-4.6, RSS-132 Issue 3 5.5, RSS-133 Issue 6 6.5.1, RSS-139 Issue 3 6.6**

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least  $43 + 10 \log(P)$  dB = (-13dBm)

**7.2.3 Test conditions and setup:**

| <b>Ambient Temperature (C)</b> | <b>EUT operating mode</b> | <b>Power Input</b> |
|--------------------------------|---------------------------|--------------------|
| 24                             | Op. 1                     | 12 VDC             |

**7.2.4 Measurement result:****BTLE Populated Unit**

| Plot #  | Cellular Channel | EUT operating mode | Scan Frequency  | Critical Frequency [MHz] | Emission level [dBm] | Limit [dBm] | Result |
|---------|------------------|--------------------|-----------------|--------------------------|----------------------|-------------|--------|
| 1 – 3   | Low              | LTE 2              | 30 MHz – 18 GHz | 1847.207                 | -31.70               | -13         | Pass   |
| 4 – 8   | Mid              | LTE 2              | 9 kHz – 26 GHz  | 1887.194                 | -40.53               | -13         | Pass   |
| 9 – 11  | High             | LTE 2              | 30 MHz – 18 GHz | 1917.414                 | -46.53               | -13         | Pass   |
| 12 – 14 | Low              | LTE 4              | 30 MHz – 18 GHz | 3422.249                 | -41.66               | -13         | Pass   |
| 15 – 18 | Mid              | LTE 4              | 9 kHz – 18 GHz  | 3473.146                 | -43.41               | -13         | Pass   |
| 19 – 21 | High             | LTE 4              | 30 MHz – 18 GHz | 3508.794                 | -39.98               | -13         | Pass   |
| 22 – 24 | Low              | LTE 5              | 30 MHz – 9 GHz  | 659.355                  | -54.60               | -13         | Pass   |
| 25 – 28 | Mid              | LTE 5              | 9 kHz – 9 GHz   | 669.116                  | -47.76               | -13         | Pass   |
| 29 – 31 | High             | LTE 5              | 30 MHz – 9 GHz  | 678.633                  | -36.33               | -13         | Pass   |
| 32 – 34 | Low              | LTE 12             | 30 MHz – 9 GHz  | 108.007                  | -48.96               | -13         | Pass   |
| 35 – 38 | Mid              | LTE 12             | 9 kHz – 9 GHz   | 108.006                  | -51.82               | -13         | Pass   |
| 39 – 41 | High             | LTE 12             | 30 MHz – 9 GHz  | 107.987                  | -51.75               | -13         | Pass   |
| 42 – 45 | Mid              | LTE 13             | 9 kHz – 9 GHz   | 0.537                    | -42.93               | -13         | Pass   |

## 7.2.5 Measurement Plots:

**BTLE Populated Unit****LTE Band 2**

Plot # 1 Radiated Emissions: 30 MHz - 1 GHz

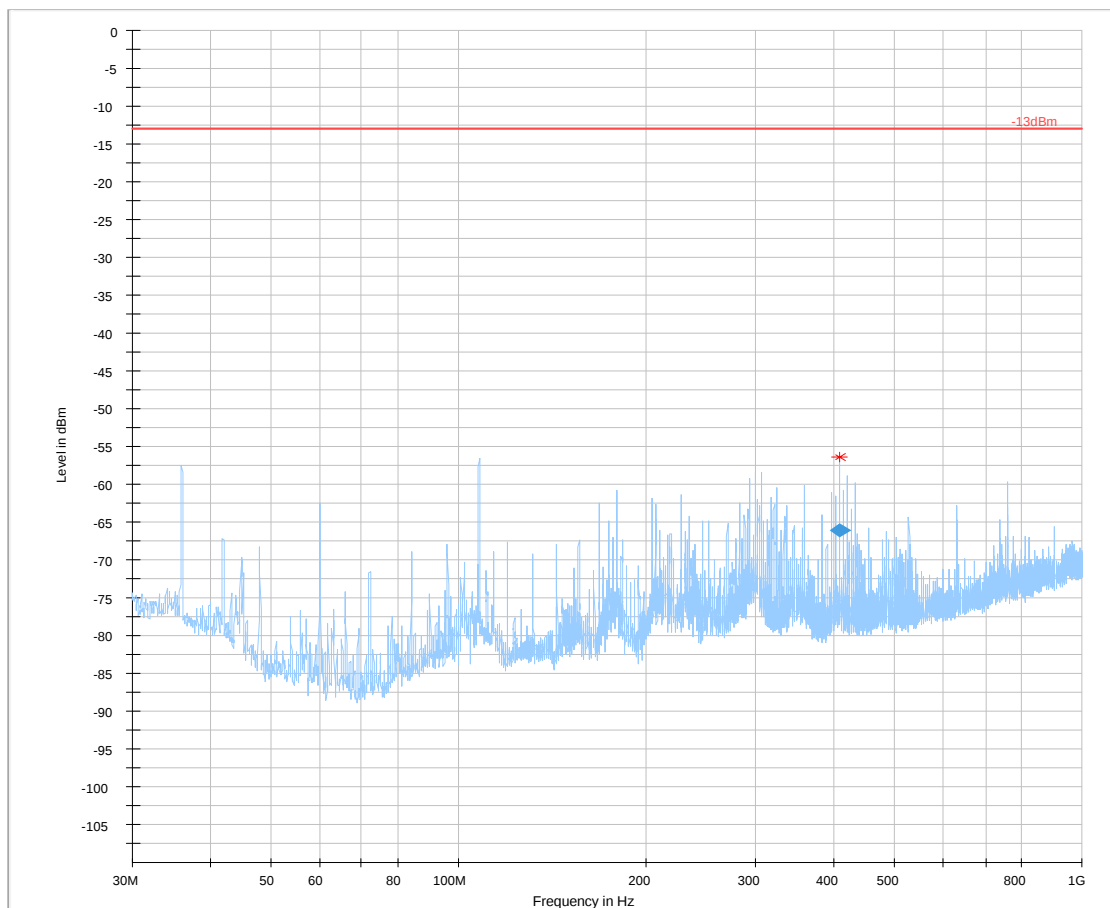
Channel: Low

**Final Result**

| Frequency (MHz) | RMS (dBm) | Limit (dBm) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB) |
|-----------------|-----------|-------------|-------------|-----------------|-----------------|-------------|-----|---------------|------------|
| 407.978         | -66.12    | -13.00      | 53.12       | 200.0           | 100.0           | 206.0       | H   | 34.0          | -109       |

(continuation of the "Final\_Result" table from column 16 ...)

| Frequency (MHz) | Comment               |
|-----------------|-----------------------|
| 407.978         | 5:21:52 PM - 3/5/2019 |



Preview Result 1-PK+

\*

Critical\_Freqs PK+

-13dBm

◆

Final\_Result RMS

## Plot # 2 Radiated Emissions: 1 GHz - 3 GHz

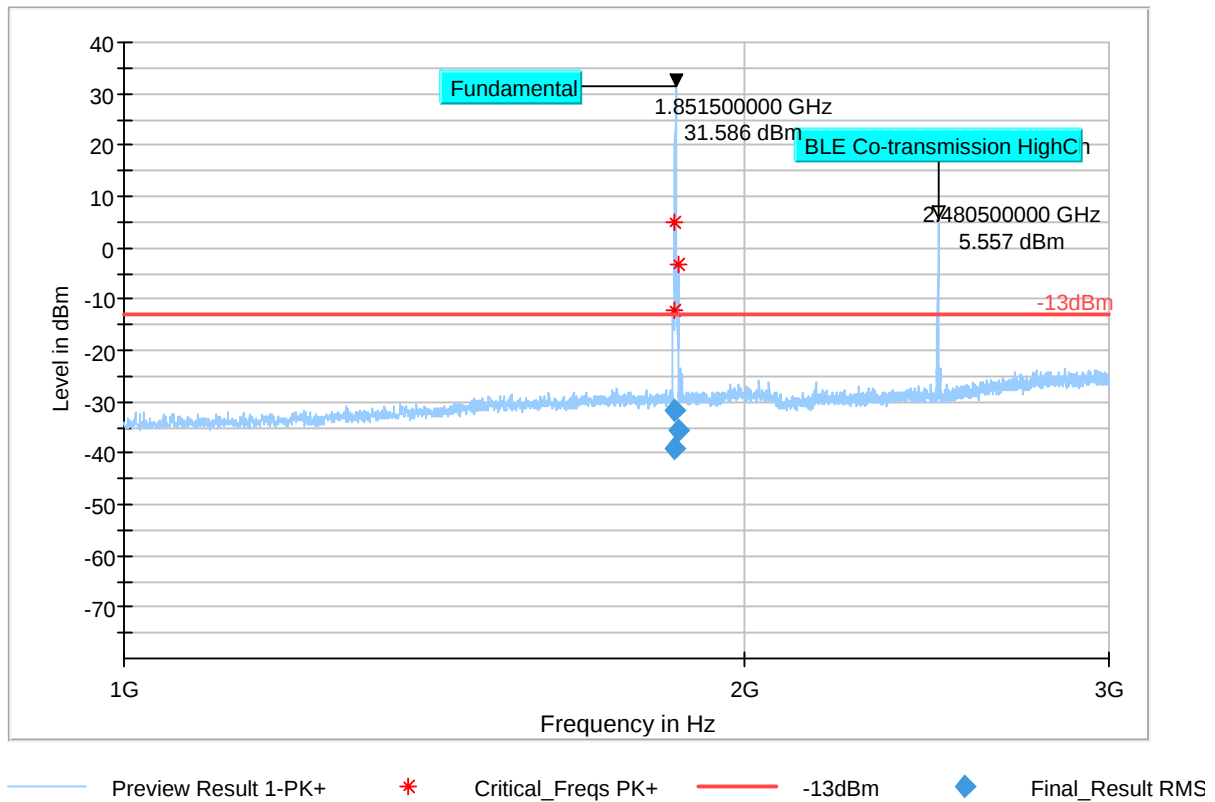
Channel: Low

## Final Result

| Frequency (MHz) | RMS (dBm) | Limit (dBm) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB) |
|-----------------|-----------|-------------|-------------|-----------------|-----------------|-------------|-----|---------------|------------|
| 1845.897        | -39.27    | -13.00      | 26.27       | 500.0           | 1000.0          | 149.0       | V   | 240.0         | -87        |
| 1847.207        | -31.70    | -13.00      | 18.70       | 500.0           | 1000.0          | 215.0       | H   | 5.0           | -87        |
| 1855.107        | -35.47    | -13.00      | 22.47       | 500.0           | 1000.0          | 132.0       | H   | 231.0         | -87        |

(continuation of the "Final\_Result" table from column 16 ...)

| Frequency (MHz) | Comment               |
|-----------------|-----------------------|
| 1845.897        | 4:47:39 PM - 3/5/2019 |
| 1847.207        | 4:39:49 PM - 3/5/2019 |
| 1855.107        | 4:43:21 PM - 3/5/2019 |



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

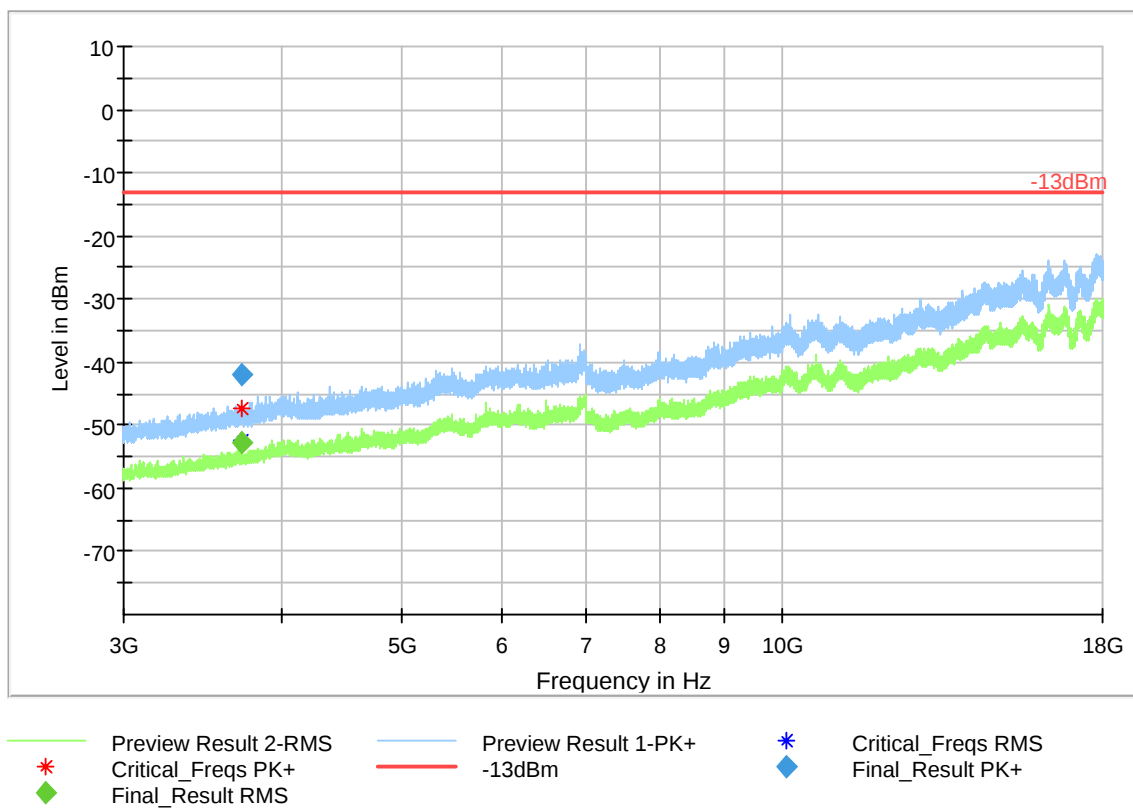
Channel: Low

**Final Result**

| Frequency (MHz) | MaxPeak (dBm) | RMS (dBm) | Limit (dBm) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) |
|-----------------|---------------|-----------|-------------|-------------|-----------------|-----------------|-------------|-----|---------------|
| 3718.353        | ---           | -52.86    | ---         | ---         | 200.0           | 1000.0          | 120.0       | H   | 54.0          |
| 3718.720        | -42.09        | ---       | -13.00      | 29.09       | 200.0           | 1000.0          | 120.0       | H   | 55.0          |

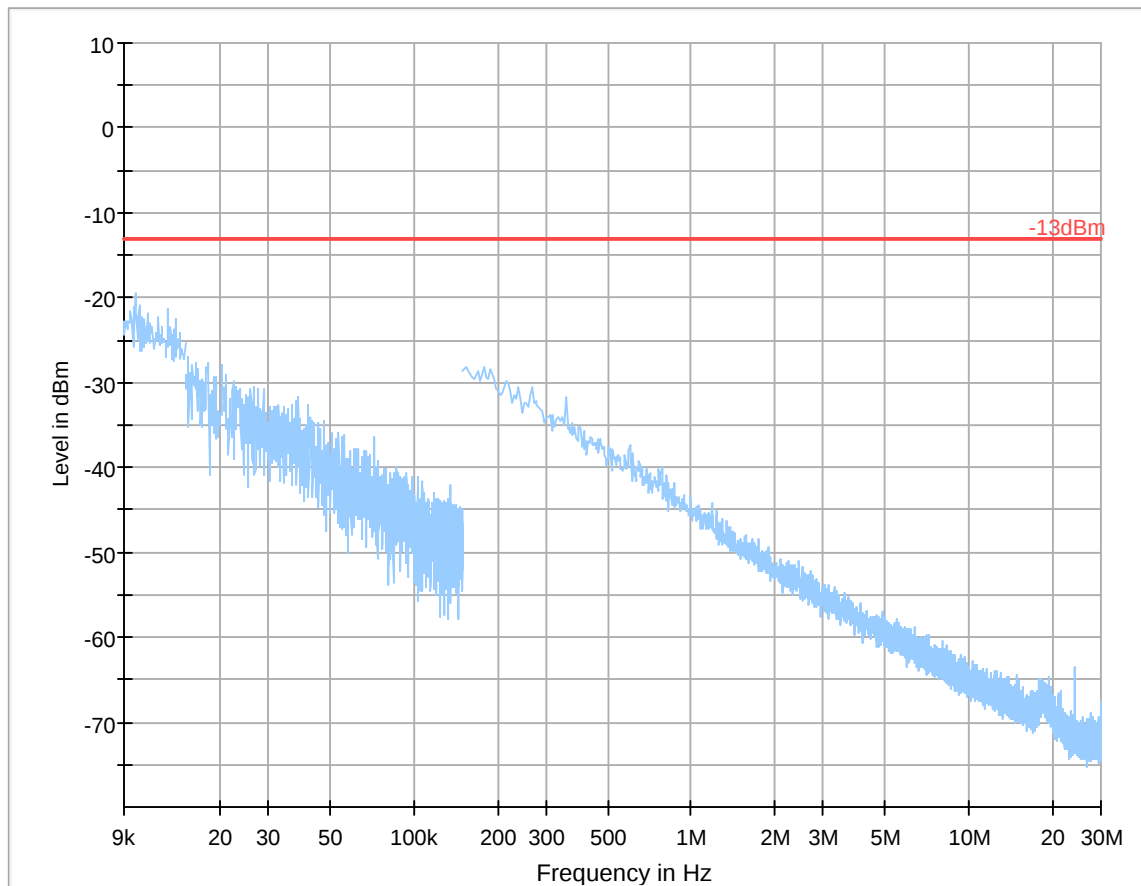
(continuation of the "Final\_Result" table from column 15 ...)

| Frequency (MHz) | Corr. (dB) | Comment               |
|-----------------|------------|-----------------------|
| 3718.353        | -104       | 4:22:02 PM - 3/4/2019 |
| 3718.720        | -104       | 4:18:53 PM - 3/4/2019 |



**Plot # 4 Radiated Emissions: 9 kHz - 30 MHz**

**Channel: Mid**



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

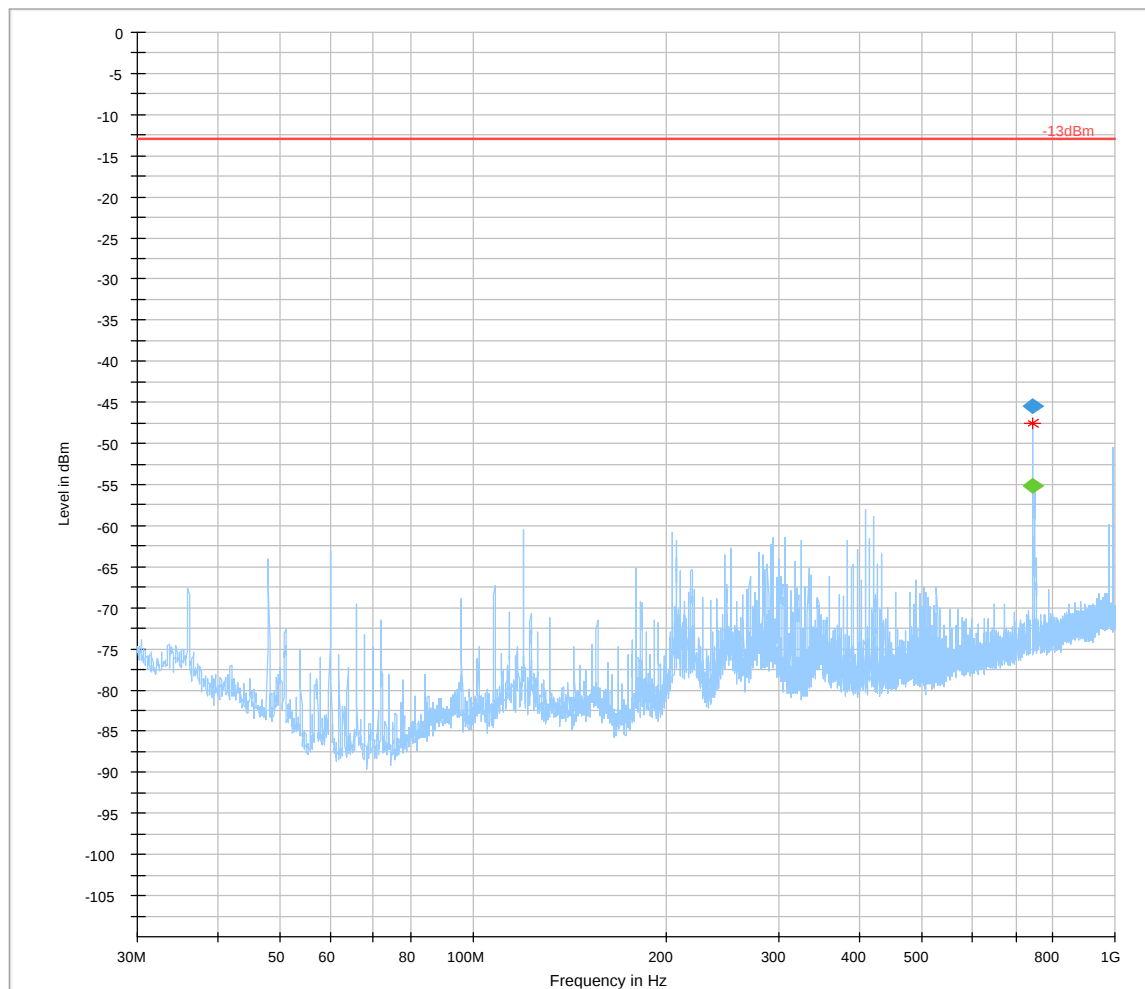
Channel: Mid

**Final Result**

| Frequency (MHz) | MaxPeak (dBm) | RMS (dBm) | Limit (dBm) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Poi | Azimuth (deg) |
|-----------------|---------------|-----------|-------------|-------------|-----------------|-----------------|-------------|-----|---------------|
| 743.094         | ---           | -55.19    | -13.00      | 42.19       | 200.0           | 100.0           | 107.0       | H   | 330.0         |
| 743.094         | -45.51        | ---       | -13.00      | 32.51       | 200.0           | 100.0           | 107.0       | H   | 330.0         |

(continuation of the "Final\_Result" table from column 15 ...)

| Frequency (MHz) | Corr. (dB) | Comment               |
|-----------------|------------|-----------------------|
| 743.094         | -103       | 1:27:50 PM - 3/4/2019 |
| 743.094         | -103       | 1:27:49 PM - 3/4/2019 |



## Plot # 6 Radiated Emissions: 1 GHz - 3 GHz

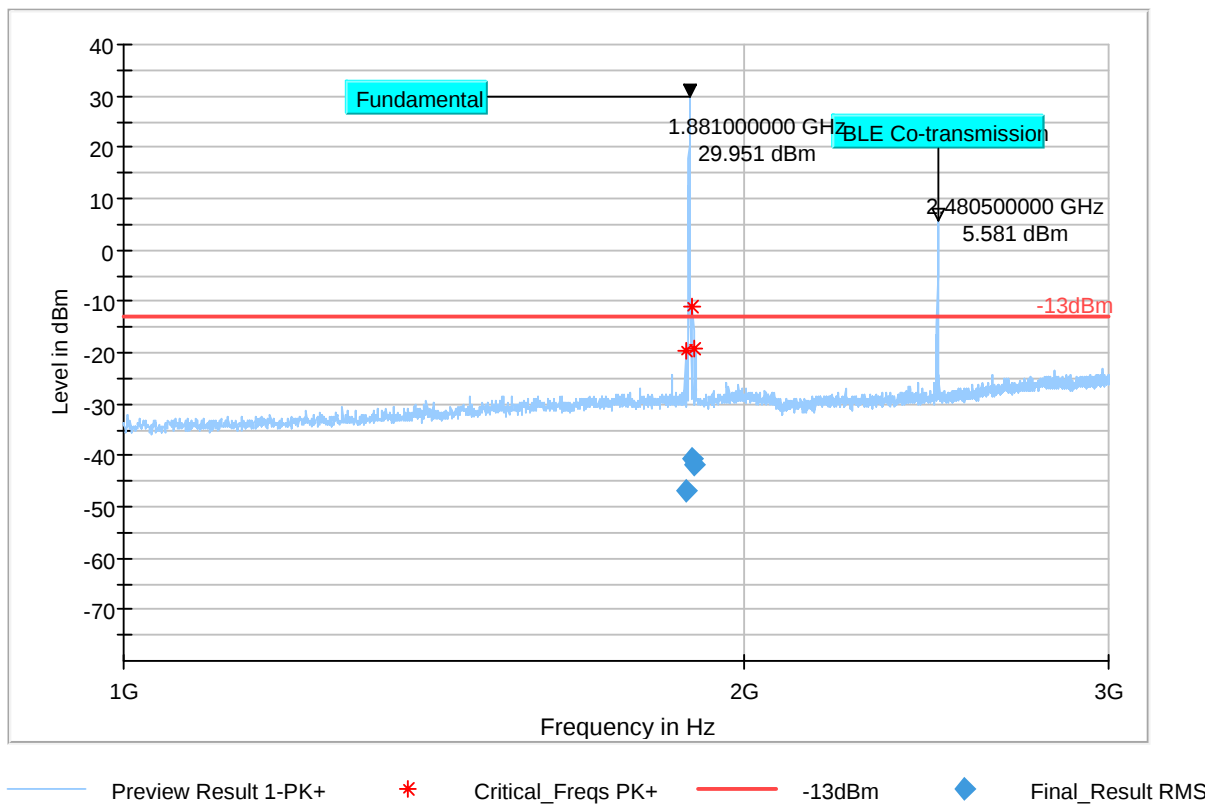
Channel: Mid

**Final Result**

| Frequency (MHz) | RMS (dBm) | Limit (dBm) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB) |
|-----------------|-----------|-------------|-------------|-----------------|-----------------|-------------|-----|---------------|------------|
| 1871.112        | -46.94    | -13.00      | 33.94       | 500.0           | 1000.0          | 173.0       | V   | 105.0         | -87        |
| 1887.194        | -40.53    | -13.00      | 27.53       | 500.0           | 1000.0          | 224.0       | H   | -29.0         | -87        |
| 1891.626        | -41.66    | -13.00      | 28.66       | 500.0           | 1000.0          | 132.0       | H   | 0.0           | -87        |

(continuation of the "Final\_Result" table from column 16 ...)

| Frequency (MHz) | Comment               |
|-----------------|-----------------------|
| 1871.112        | 4:20:51 PM - 3/5/2019 |
| 1887.194        | 4:17:21 PM - 3/5/2019 |
| 1891.626        | 4:25:32 PM - 3/5/2019 |



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

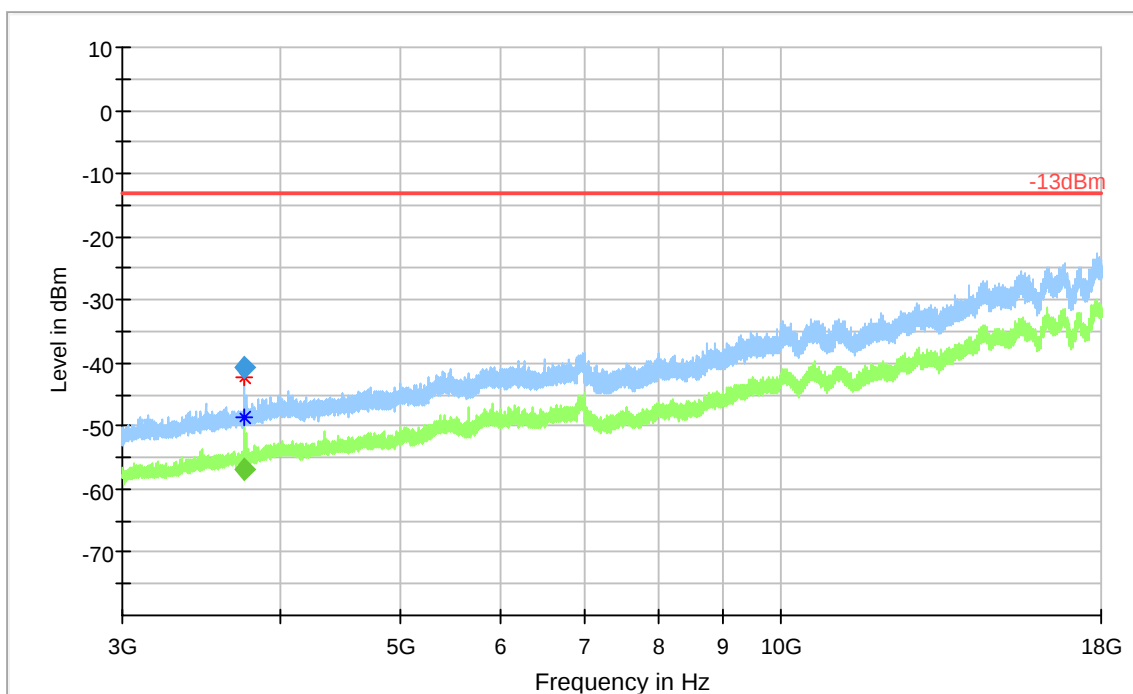
Channel: Mid

**Final Result**

| Frequency (MHz) | MaxPeak (dBm) | RMS (dBm) | Limit (dBm) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) |
|-----------------|---------------|-----------|-------------|-------------|-----------------|-----------------|-------------|-----|---------------|
| 3752.849        | -40.56        | ---       | -13.00      | 27.56       | 200.0           | 1000.0          | 209.0       | V   | 233.0         |
| 3753.818        | ---           | -56.95    | ---         | ---         | 200.0           | 1000.0          | 289.0       | V   | 234.0         |

(continuation of the "Final\_Result" table from column 15 ...)

| Frequency (MHz) | Corr. (dB) | Comment               |
|-----------------|------------|-----------------------|
| 3752.849        | -104       | 3:13:23 PM - 3/4/2019 |
| 3753.818        | -104       | 3:16:20 PM - 3/4/2019 |



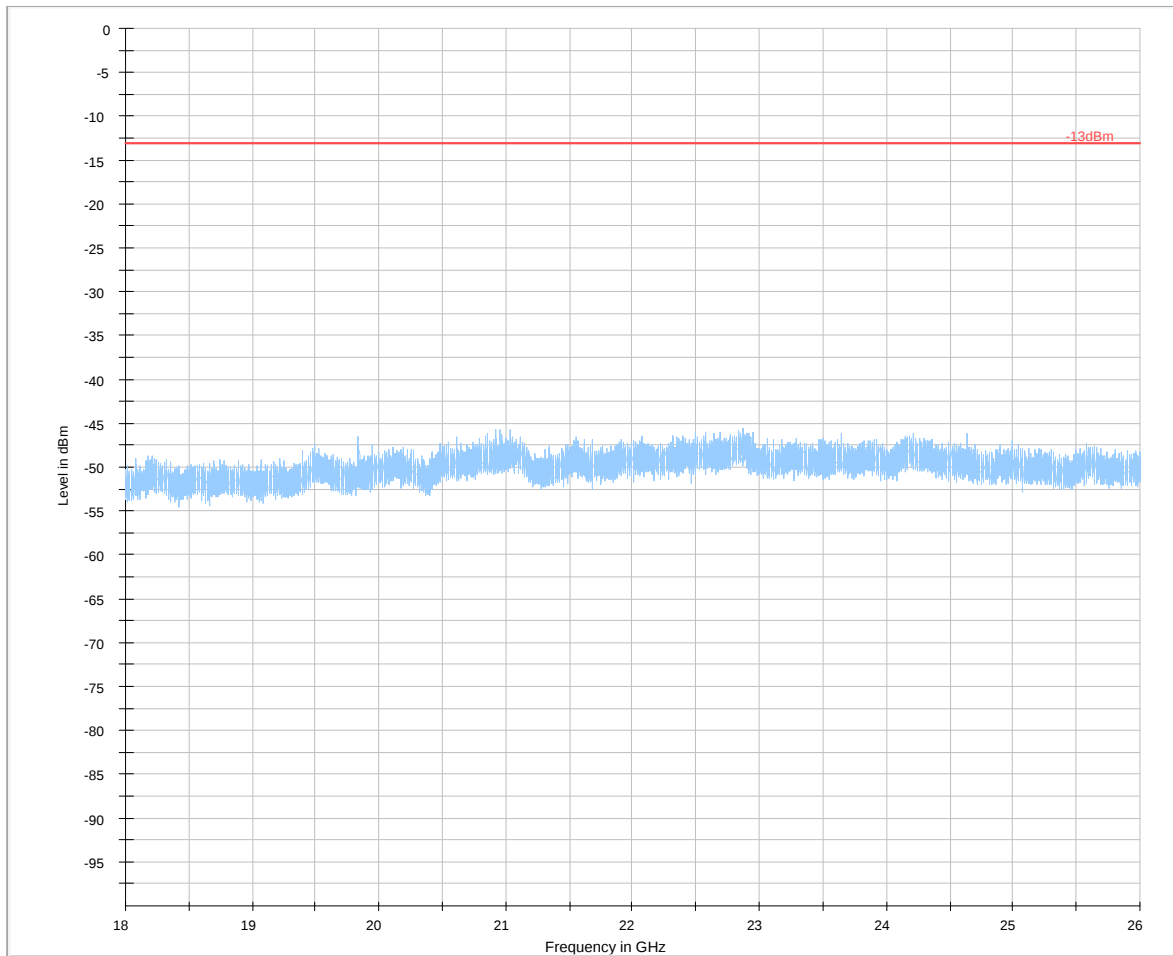
Preview Result 2-RMS  
Critical\_Freqs PK+  
Final\_Result RMS

Preview Result 1-PK+  
-13dBm

Critical\_Freqs RMS  
Final\_Result PK+

**Plot # 8 Radiated Emissions: 18 GHz – 26 GHz**

**Channel: Mid**



— Preview Result 1-RMS     
 ✱ Critical\_Freqs RMS     
 — -13dBm     
 ◆ Final\_Result RMS

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

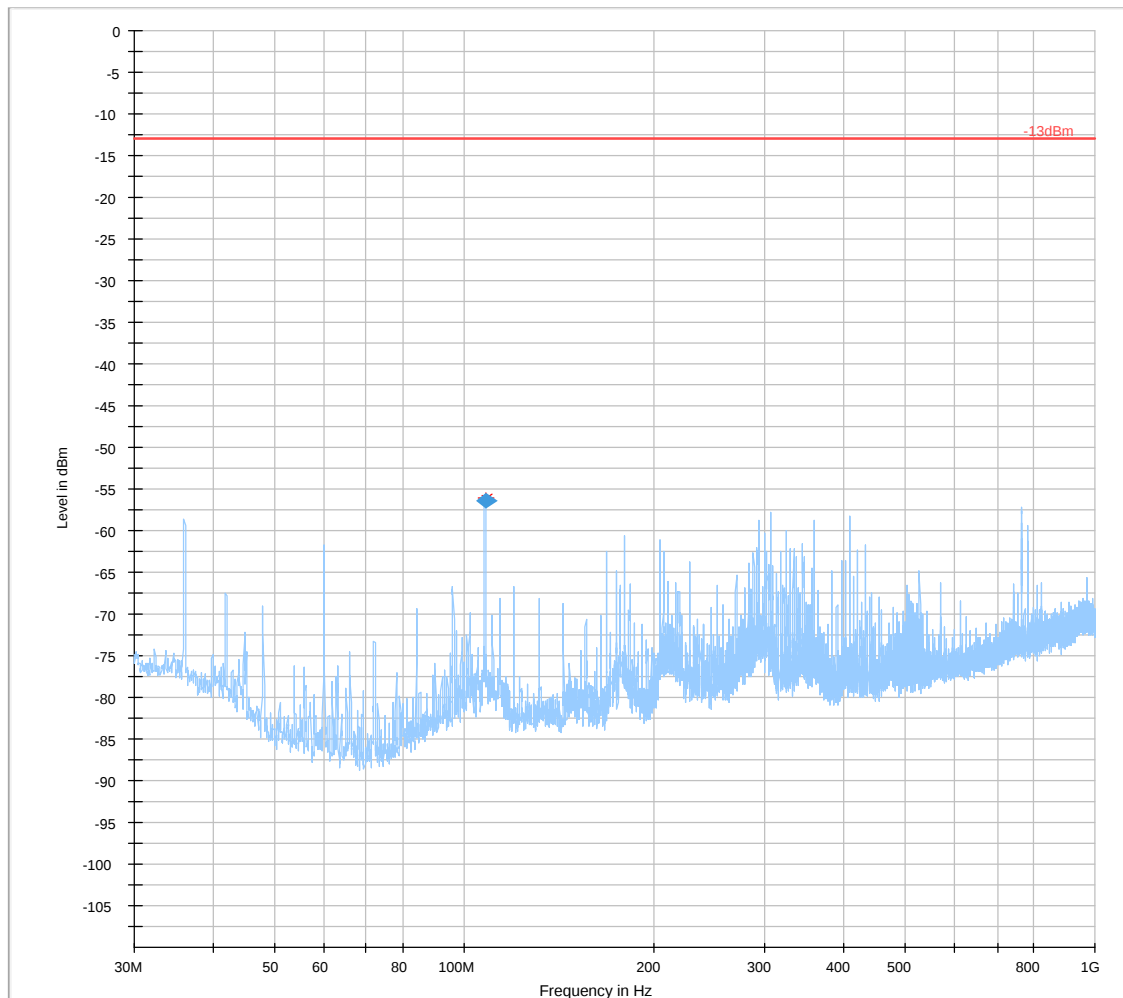
Channel: High

**Final Result**

| Frequency (MHz) | RMS (dBm) | Limit (dBm) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB) |
|-----------------|-----------|-------------|-------------|-----------------|-----------------|-------------|-----|---------------|------------|
| 108.008         | -56.39    | -13.00      | 43.39       | 200.0           | 100.0           | 100.0       | V   | 181.0         | -116       |

(continuation of the "Final\_Result" table from column 16 ...)

| Frequency (MHz) | Comment               |
|-----------------|-----------------------|
| 108.008         | 5:33:57 PM - 3/5/2019 |



Preview Result 1-PK+ \* Critical\_Freqs PK+ -13dBm Final\_Result RMS

## Plot # 10 Radiated Emissions: 1 GHz - 3 GHz

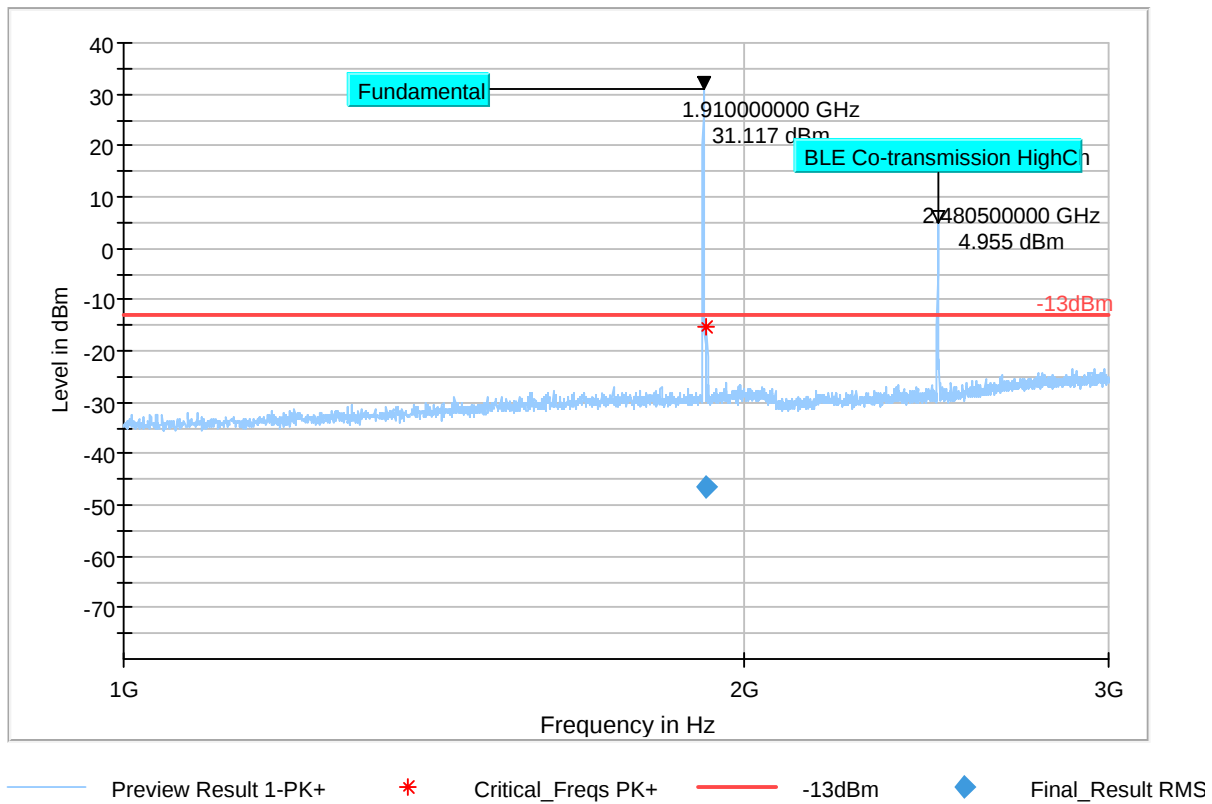
Channel: High

**Final Result**

| Frequency (MHz) | RMS (dBm) | Limit (dBm) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB) |
|-----------------|-----------|-------------|-------------|-----------------|-----------------|-------------|-----|---------------|------------|
| 1917.141        | -46.53    | -13.00      | 33.53       | 500.0           | 1000.0          | 302.0       | V   | 43.0          | -87        |

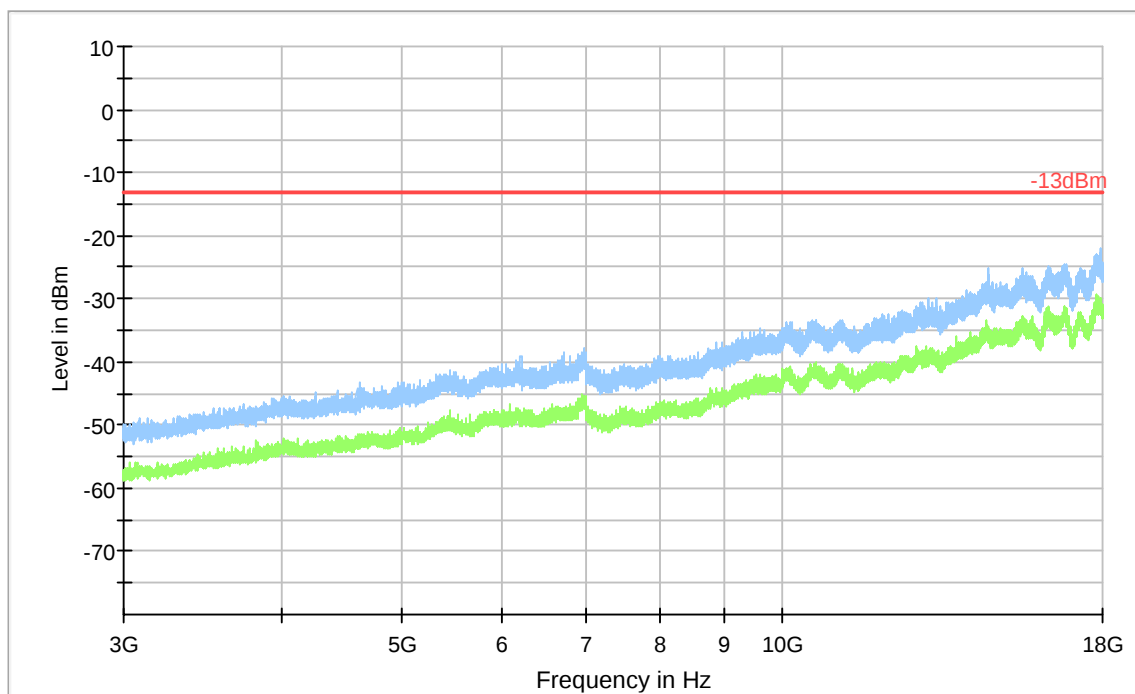
(continuation of the "Final\_Result" table from column 16 ...)

| Frequency (MHz) | Comment               |
|-----------------|-----------------------|
| 1917.141        | 3:43:38 PM - 3/5/2019 |



**Plot # 11 Radiated Emissions: 3 GHz - 18 GHz**

**Channel: High**



— Preview Result 2-RMS      — Preview Result 1-PK+      \* Critical\_Freqs RMS  
\* Critical\_Freqs PK+      — -13dBm      ◆ Final\_Result PK+  
◆ Final\_Result RMS

**LTE Band 4****Plot # 12 Radiated Emissions: 30 MHz - 1 GHz**

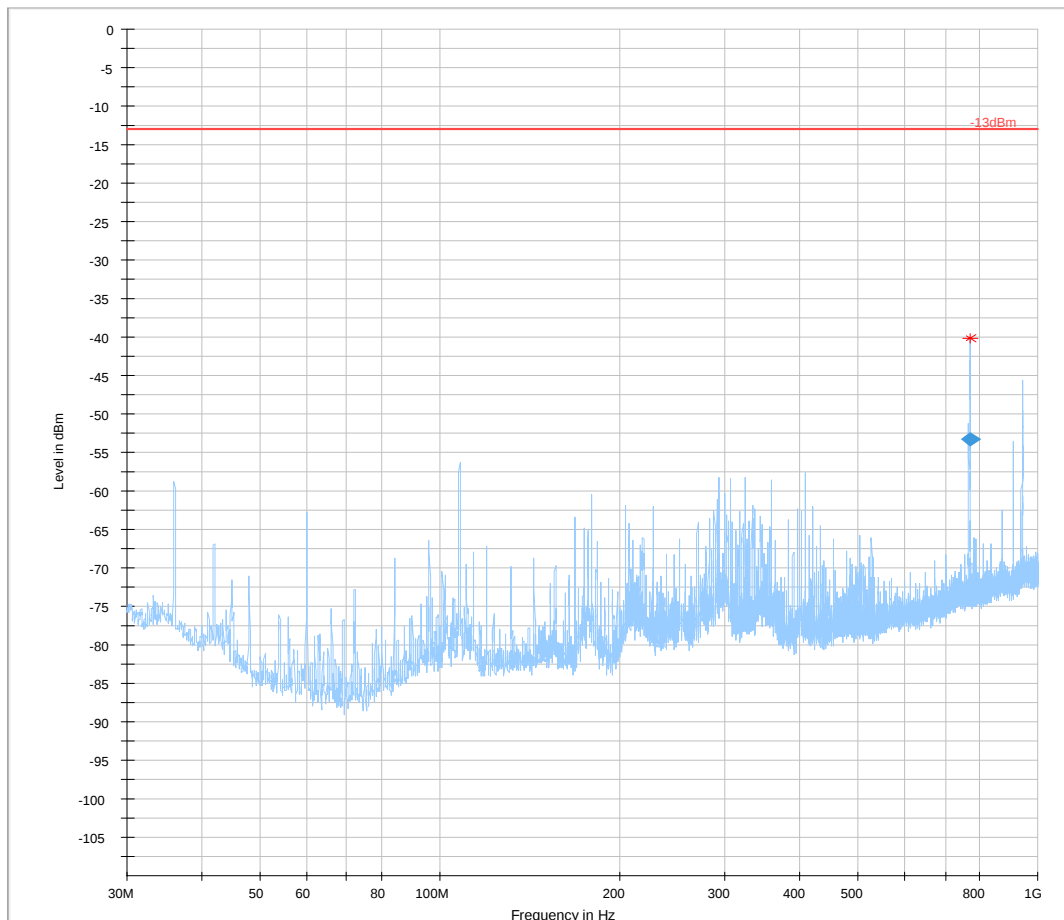
Channel: Low

**Final Result**

| Frequency (MHz) | RMS (dBm) | Limit (dBm) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB) |
|-----------------|-----------|-------------|-------------|-----------------|-----------------|-------------|-----|---------------|------------|
| 769.261         | -53.30    | -13.00      | 40.30       | 200.0           | 100.0           | 119.0       | H   | 133.0         | -103       |

(continuation of the "Final\_Result" table from column 16 ...)

| Frequency (MHz) | Comment               |
|-----------------|-----------------------|
| 769.261         | 5:44:10 PM - 3/5/2019 |



Preview Result 1-PK+



Critical\_Freqs PK+



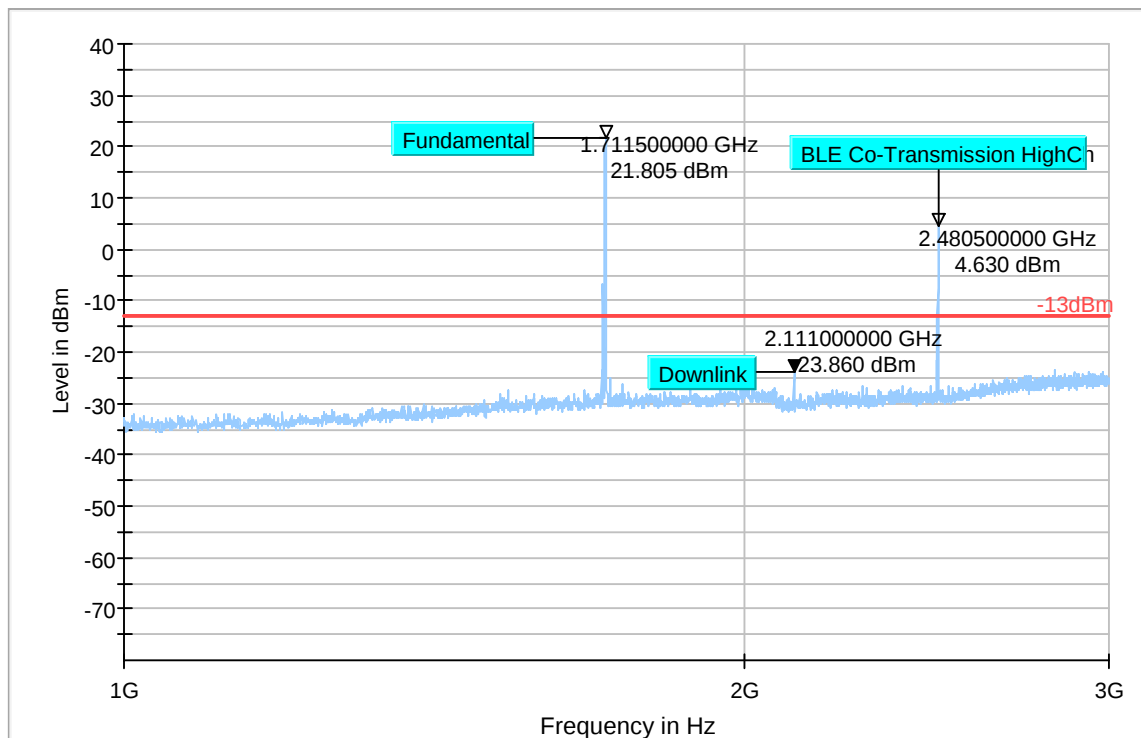
-13dBm



Final\_Result RMS

**Plot # 13 Radiated Emissions: 1 GHz - 3 GHz**

**Channel: Low**



— Preview Result 1-PK+     
 \* Critical\_Freqs PK+     
 — -13dBm     
 ◆ Final\_Result RMS

## Plot # 14 Radiated Emissions: 3 GHz - 18 GHz

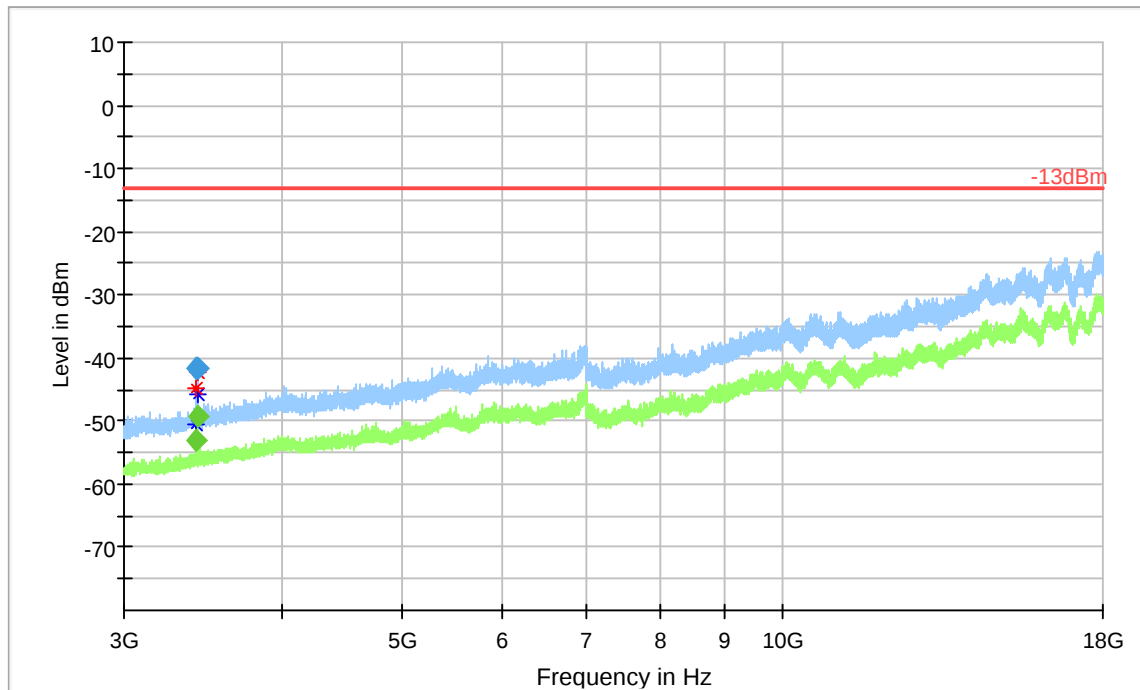
Channel: Low

## Final Result

| Frequency (MHz) | MaxPeak (dBm) | RMS (dBm) | Limit (dBm) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) |
|-----------------|---------------|-----------|-------------|-------------|-----------------|-----------------|-------------|-----|---------------|
| 3422.249        | -41.66        | ---       | -13.00      | 28.66       | 200.0           | 1000.0          | 149.0       | H   | 273.0         |
| 3422.990        | ---           | -52.93    | ---         | ---         | 200.0           | 1000.0          | 215.0       | H   | 272.0         |
| 3438.404        | ---           | -49.14    | ---         | ---         | 200.0           | 1000.0          | 297.0       | H   | -35.0         |
| 3439.420        | -41.68        | ---       | -13.00      | 28.68       | 200.0           | 1000.0          | 293.0       | H   | -38.0         |

(continuation of the "Final\_Result" table from column 15 ...)

| Frequency (MHz) | Corr. (dB) | Comment               |
|-----------------|------------|-----------------------|
| 3422.249        | -105       | 5:04:44 PM - 3/4/2019 |
| 3422.990        | -105       | 5:11:38 PM - 3/4/2019 |
| 3438.404        | -105       | 5:08:03 PM - 3/4/2019 |
| 3439.420        | -105       | 5:01:06 PM - 3/4/2019 |



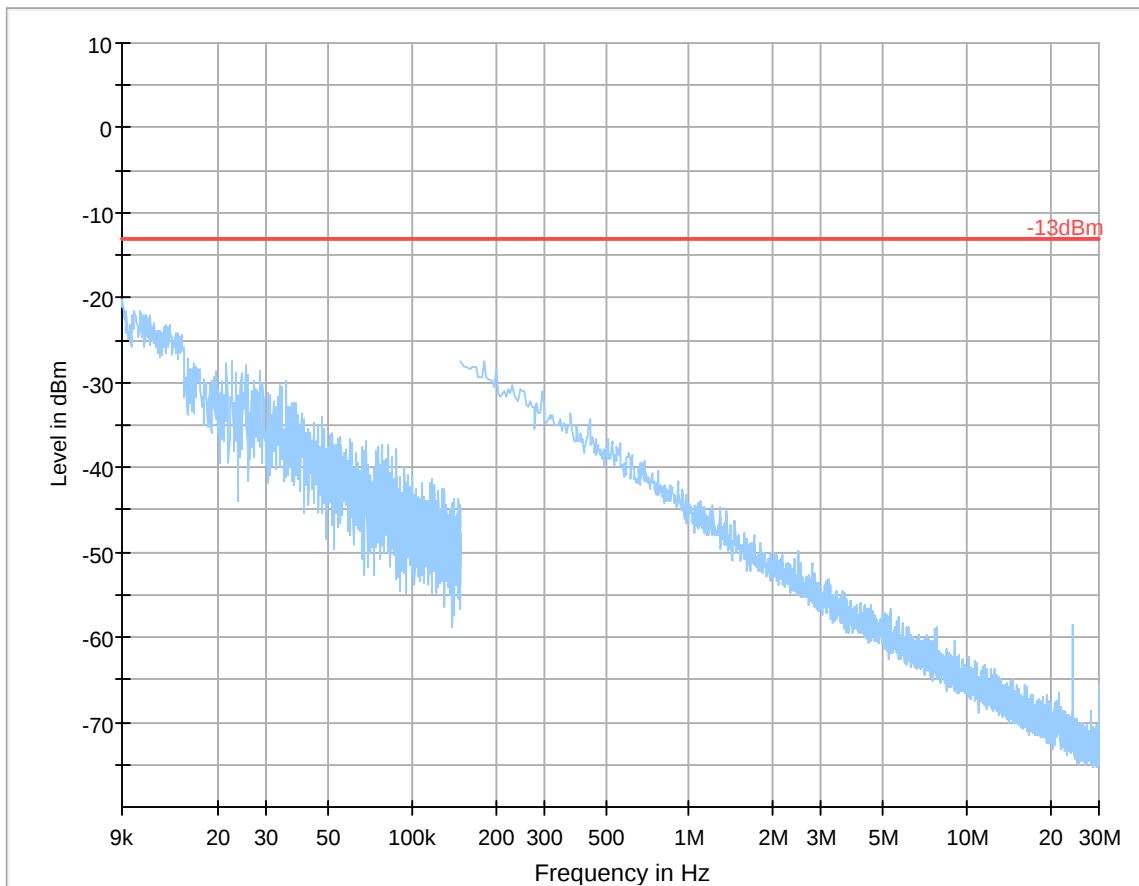
\* Critical\_Freqs PK+  
◆ Final\_Result RMS

Preview Result 1-PK+  
-13dBm

\* Critical\_Freqs RMS  
◆ Final\_Result PK+

**Plot # 15 Radiated Emissions: 9 kHz - 30 MHz**

**Channel: Mid**



## Plot # 16 Radiated Emissions: 30 MHz – 1 GHz

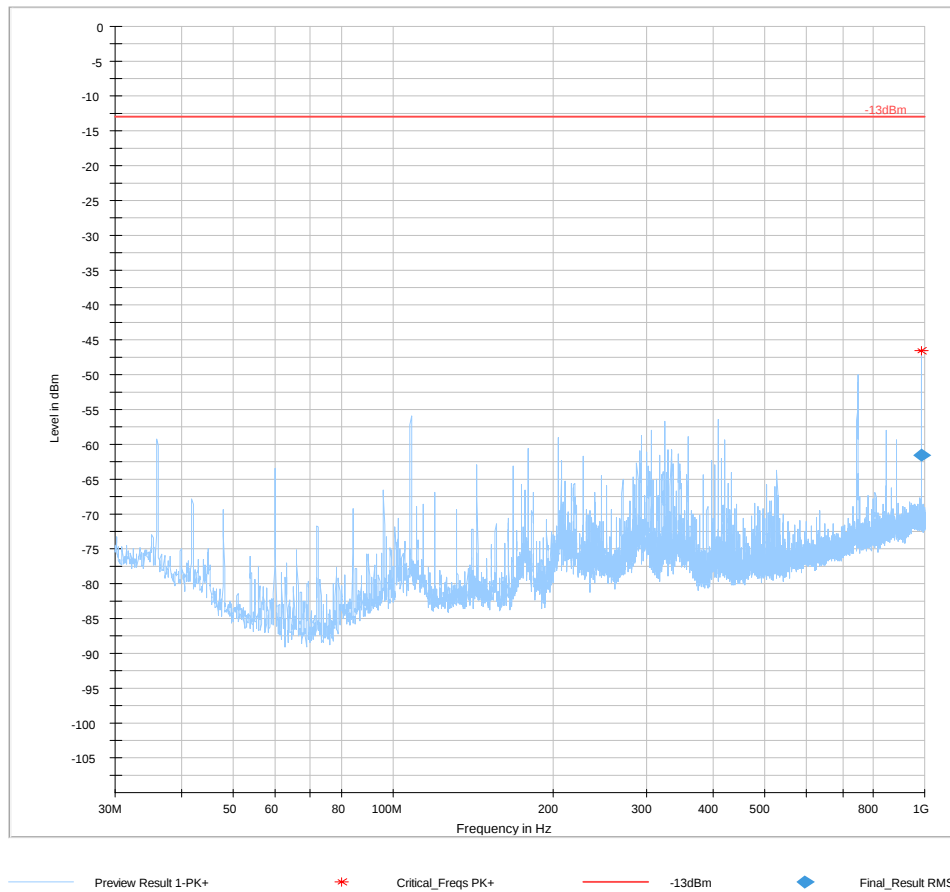
Channel: Mid

**Final Result**

| Frequency (MHz) | RMS (dBm) | Limit (dBm) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB) |
|-----------------|-----------|-------------|-------------|-----------------|-----------------|-------------|-----|---------------|------------|
| 986.168         | -61.56    | -13.00      | 48.56       | 200.0           | 100.0           | 100.0       | H   | 141.0         | -100       |

(continuation of the "Final\_Result" table from column 16 ...)

| Frequency (MHz) | Comment               |
|-----------------|-----------------------|
| 986.168         | 5:56:50 PM - 3/5/2019 |



## Plot # 17 Radiated Emissions: 1 GHz - 3 GHz

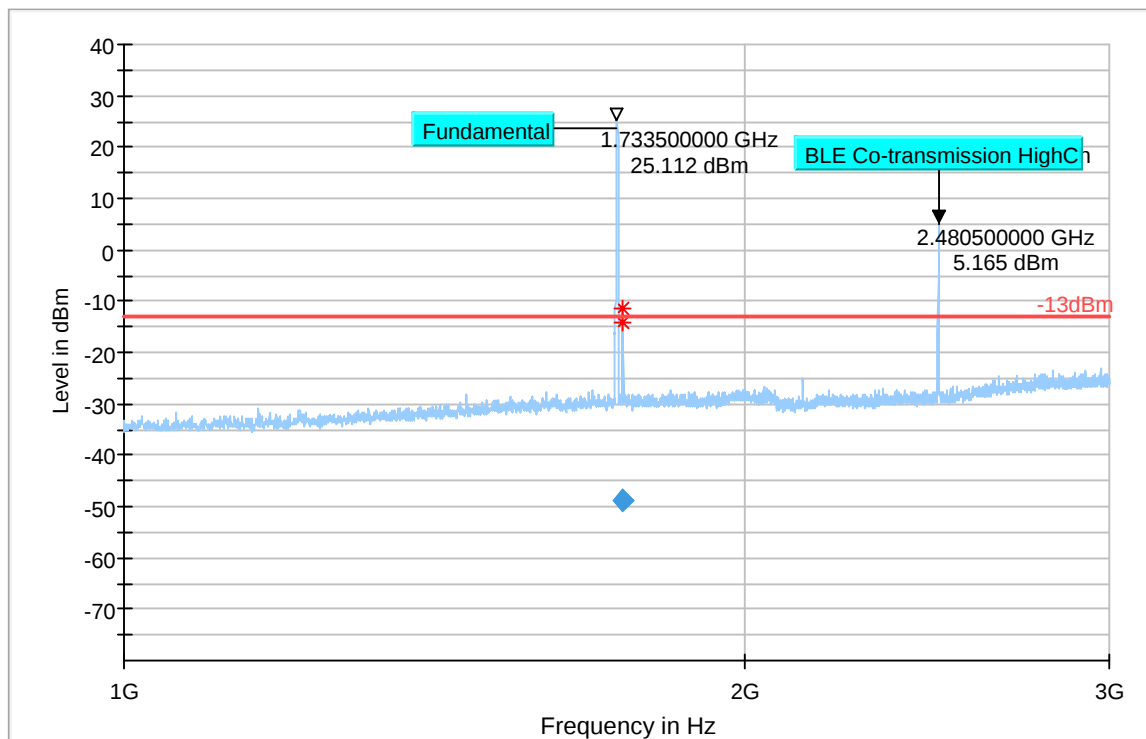
Channel: Mid

**Final Result**

| Frequency (MHz) | RMS (dBm) | Limit (dBm) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB) |
|-----------------|-----------|-------------|-------------|-----------------|-----------------|-------------|-----|---------------|------------|
| 1743.402        | -48.73    | -13.00      | 35.73       | 500.0           | 1000.0          | 201.0       | H   | 0.0           | -87        |
| 1745.203        | -48.81    | -13.00      | 35.81       | 500.0           | 1000.0          | 205.0       | H   | 0.0           | -87        |

(continuation of the "Final\_Result" table from column 16 ...)

| Frequency (MHz) | Comment               |
|-----------------|-----------------------|
| 1743.402        | 2:56:46 PM - 3/5/2019 |
| 1745.203        | 2:52:05 PM - 3/5/2019 |



Preview Result 1-PK+



Critical\_Freqs PK+

-13dBm



Final\_Result RMS

## Plot # 18 Radiated Emissions: 3 GHz – 18GHz

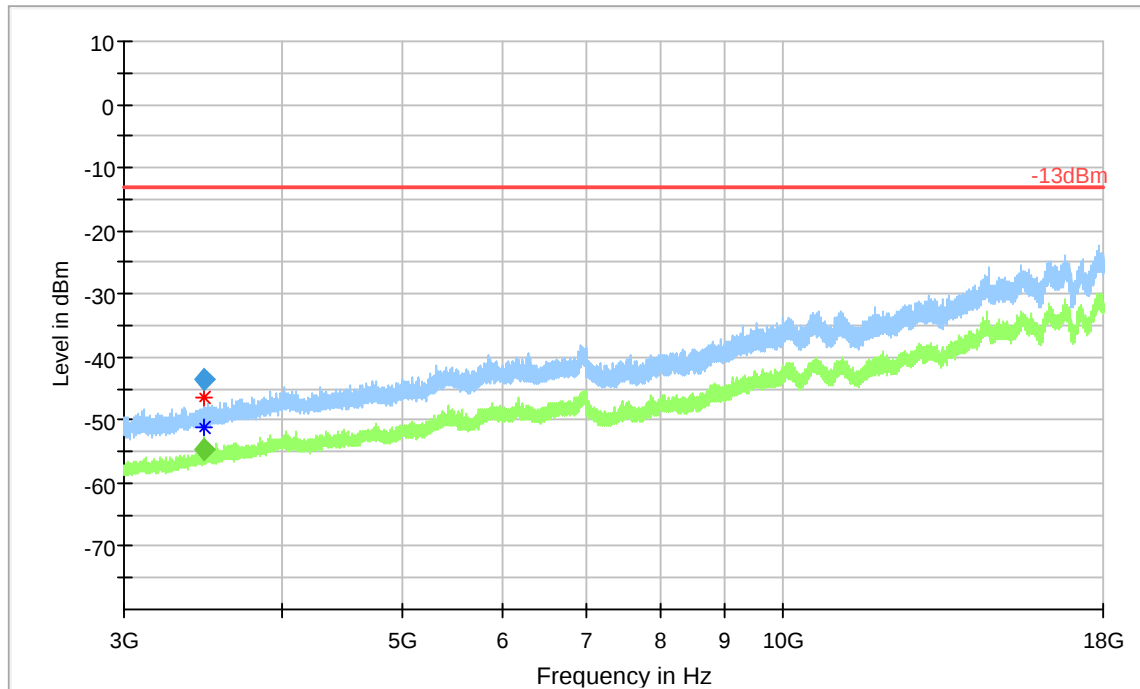
Channel: Mid

## Final Result

| Frequency (MHz) | MaxPeak (dBm) | RMS (dBm) | Limit (dBm) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) |
|-----------------|---------------|-----------|-------------|-------------|-----------------|-----------------|-------------|-----|---------------|
| 3473.146        | -43.41        | ---       | -13.00      | 30.41       | 200.0           | 1000.0          | 233.0       | V   | -72.0         |
| 3474.292        | ---           | -54.63    | ---         | ---         | 200.0           | 1000.0          | 236.0       | V   | -9.0          |

(continuation of the "Final\_Result" table from column 15 ...)

| Frequency (MHz) | Corr. (dB) | Comment               |
|-----------------|------------|-----------------------|
| 3473.146        | -105       | 4:44:27 PM - 3/4/2019 |
| 3474.292        | -105       | 4:47:39 PM - 3/4/2019 |



Preview Result 2-RMS      Preview Result 1-PK+      Critical\_Freqs RMS  
Critical\_Freqs PK+      -13dBm      Final\_Result PK+  
Final\_Result RMS

## Plot # 19 Radiated Emissions: 30 MHz - 1 GHz

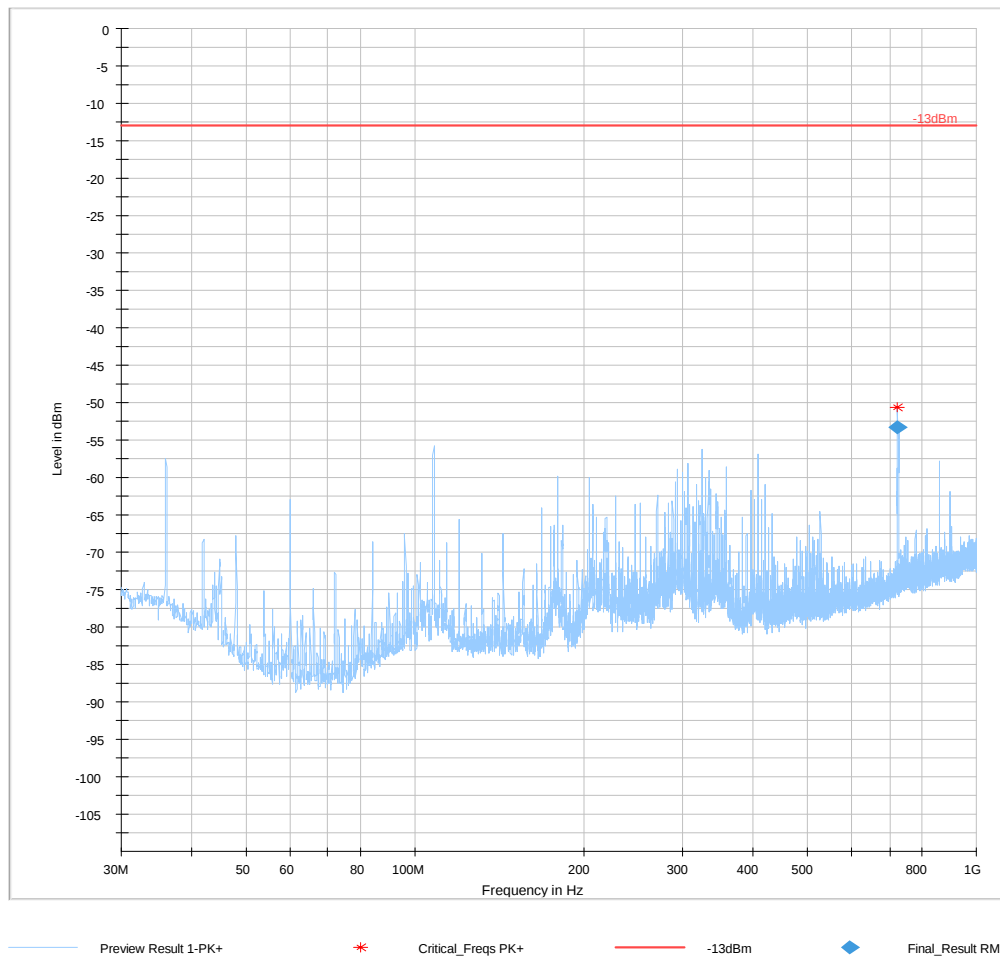
Channel: High

**Final Result**

| Frequency (MHz) | RMS (dBm) | Limit (dBm) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB) |
|-----------------|-----------|-------------|-------------|-----------------|-----------------|-------------|-----|---------------|------------|
| 725.195         | -53.22    | -13.00      | 40.22       | 200.0           | 100.0           | 123.0       | H   | 318.0         | -104       |

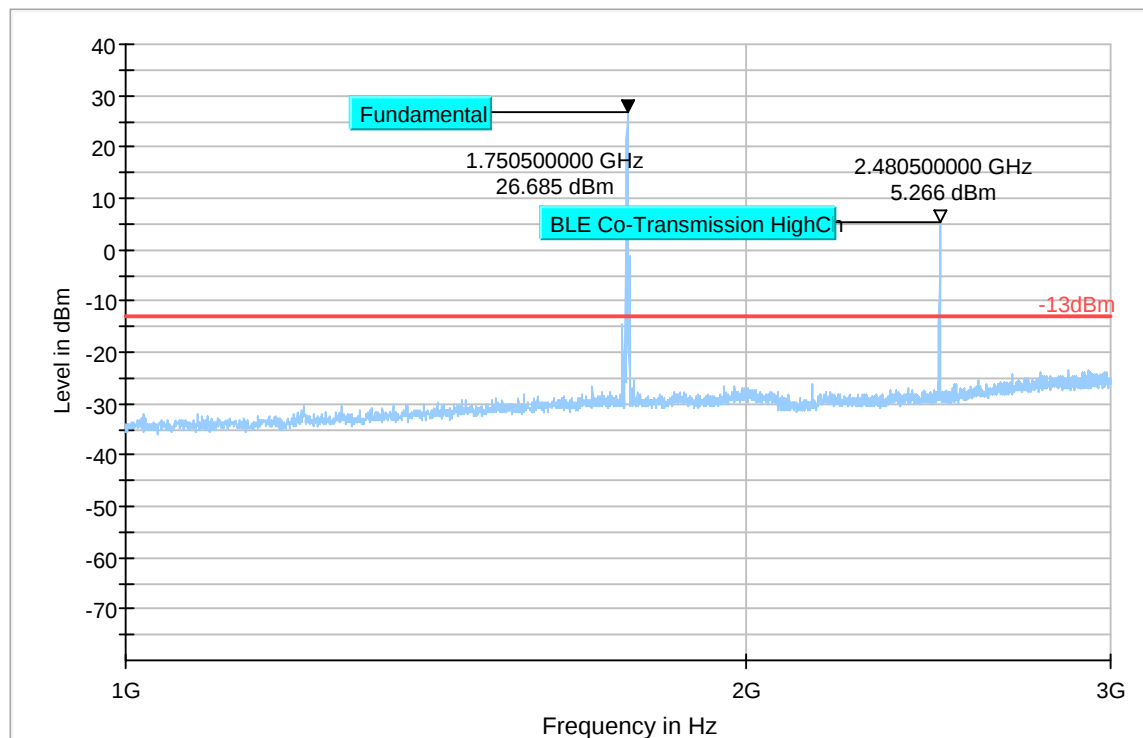
(continuation of the "Final\_Result" table from column 16 ...)

| Frequency (MHz) | Comment               |
|-----------------|-----------------------|
| 725.195         | 6:13:30 PM - 3/5/2019 |



**Plot # 20 Radiated Emissions: 1 GHz - 3 GHz**

**Channel: High**



Preview Result 1-PK+    \*    Critical\_Freqs PK+    -13dBm    ◆    Final\_Result RMS

## Plot # 21 Radiated Emissions: 3 GHz - 18 GHz

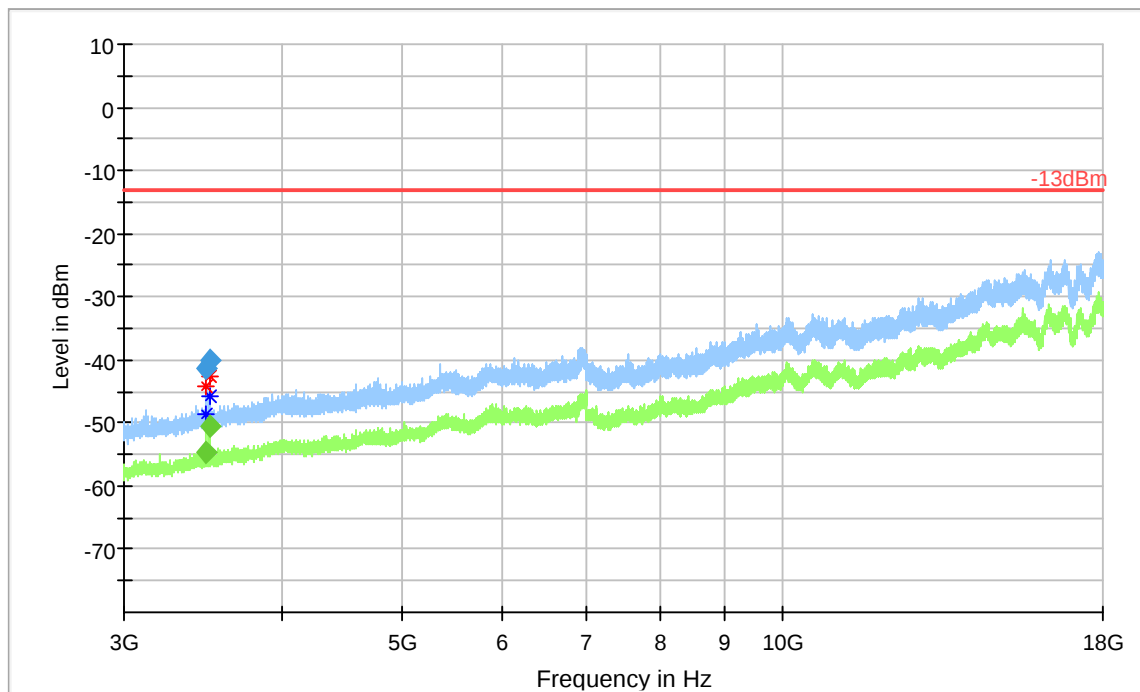
Channel: High

## Final Result

| Frequency (MHz) | MaxPeak (dBm) | RMS (dBm) | Limit (dBm) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) |
|-----------------|---------------|-----------|-------------|-------------|-----------------|-----------------|-------------|-----|---------------|
| 3491.565        | ---           | -54.71    | ---         | ---         | 200.0           | 1000.0          | 150.0       | V   | 251.0         |
| 3492.529        | -41.27        | ---       | -13.00      | 28.27       | 200.0           | 1000.0          | 149.0       | V   | 251.0         |
| 3508.431        | ---           | -50.44    | ---         | ---         | 200.0           | 1000.0          | 145.0       | H   | -2.0          |
| 3508.794        | -39.98        | ---       | -13.00      | 26.98       | 200.0           | 1000.0          | 148.0       | H   | 1.0           |

(continuation of the "Final\_Result" table from column 15 ...)

| Frequency (MHz) | Corr. (dB) | Comment               |
|-----------------|------------|-----------------------|
| 3491.565        | -104       | 5:40:59 PM - 3/4/2019 |
| 3492.529        | -104       | 5:34:00 PM - 3/4/2019 |
| 3508.431        | -104       | 5:37:30 PM - 3/4/2019 |
| 3508.794        | -104       | 5:30:30 PM - 3/4/2019 |



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

Preview Result 1-PK+  
-13dBm

Critical\_Freqs RMS  
Final\_Result PK+

**LTE Band 5****Plot # 22 Radiated Emissions: 30 MHz - 1 GHz**

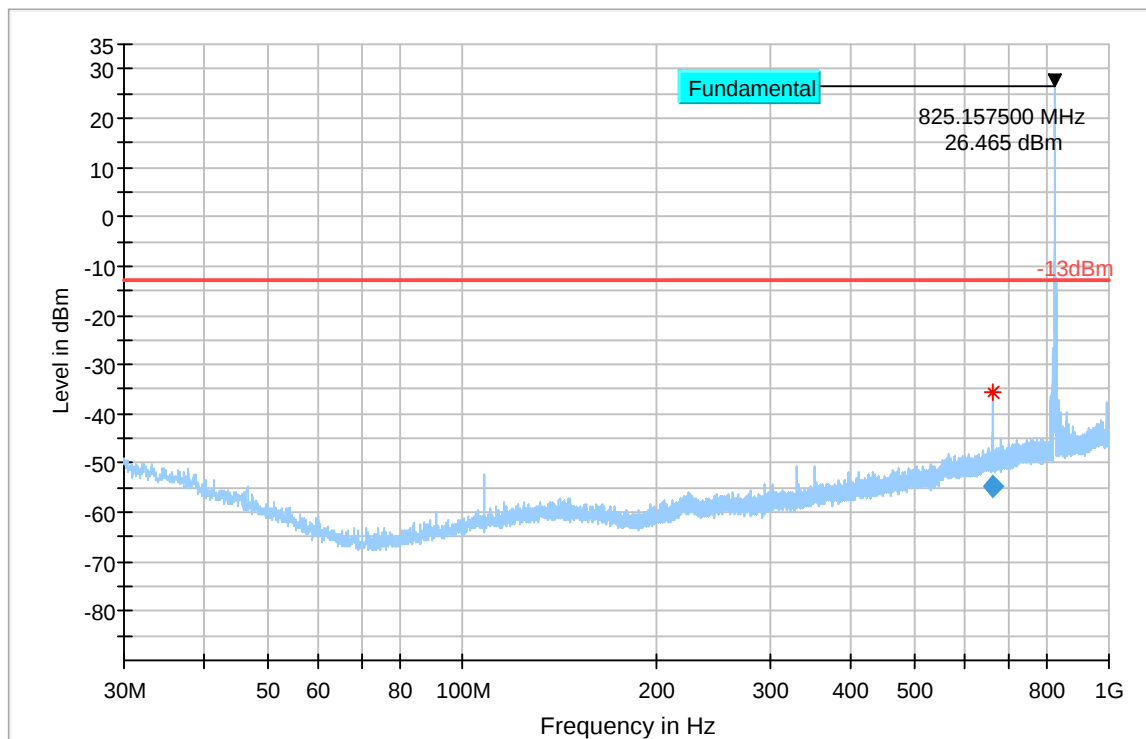
Channel: Low

**Final Result**

| Frequency (MHz) | RMS (dBm) | Limit (dBm) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB) |
|-----------------|-----------|-------------|-------------|-----------------|-----------------|-------------|-----|---------------|------------|
| 659.355         | -54.60    | -13.00      | 41.60       | 500.0           | 100.0           | 149.0       | H   | 208.0         | -72        |

(continuation of the "Final\_Result" table from column 16 ...)

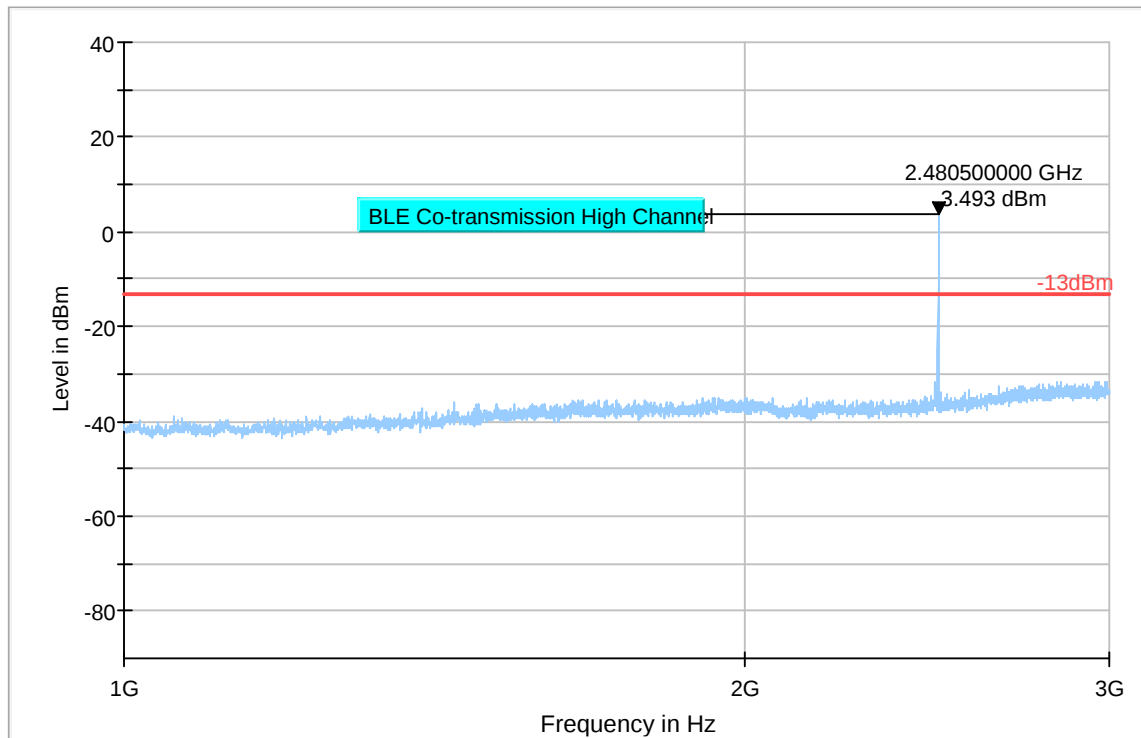
| Frequency (MHz) | Comment               |
|-----------------|-----------------------|
| 659.355         | 5:21:24 PM - 3/6/2019 |



— Preview Result 1-RMS    \* Critical\_Freqs RMS    — -13dBm    ◆ Final\_Result RV

**Plot # 23 Radiated Emissions: 1 GHz - 3 GHz**

**Channel: Low**



## Plot # 24 Radiated Emissions: 3 GHz - 9 GHz

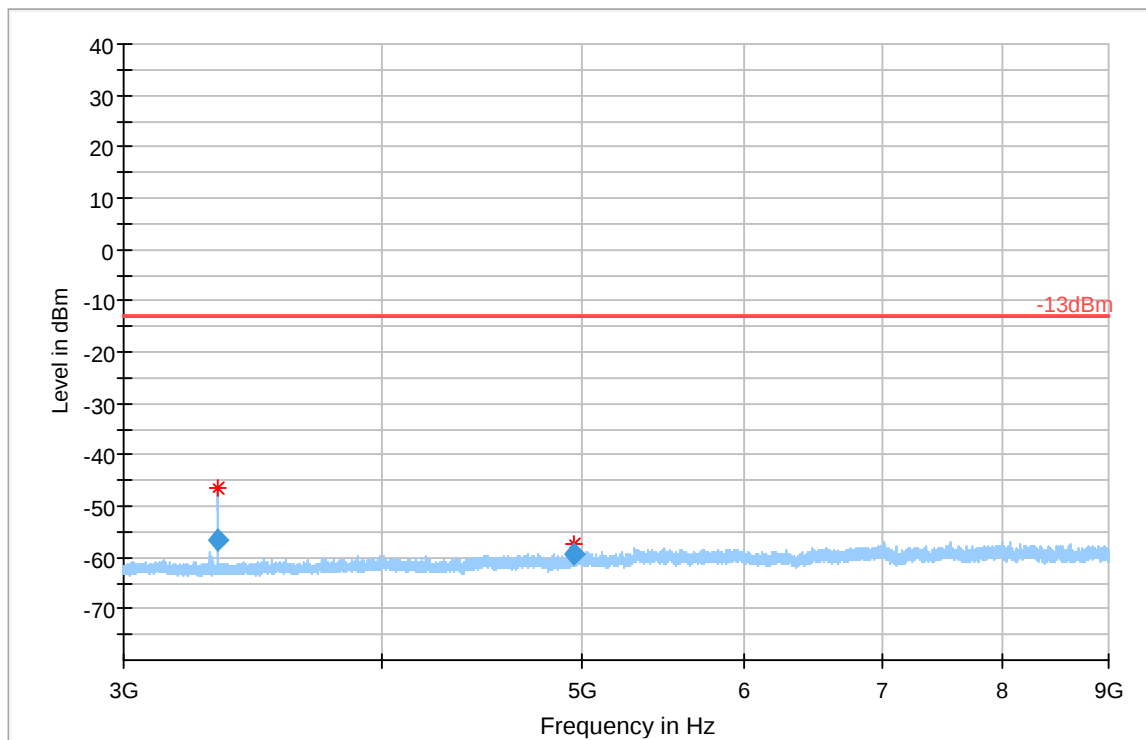
Channel: Low

**Final Result**

| Frequency (MHz) | RMS (dBm) | Limit (dBm) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB) |
|-----------------|-----------|-------------|-------------|-----------------|-----------------|-------------|-----|---------------|------------|
| 3334.146        | -56.46    | -13.00      | 43.46       | 500.0           | 1000.0          | 278.0       | H   | 88.0          | -132       |
| 4959.973        | -59.27    | -13.00      | 46.27       | 500.0           | 1000.0          | 296.0       | V   | 263.0         | -128       |

(continuation of the "Final\_Result" table from column 16 ...)

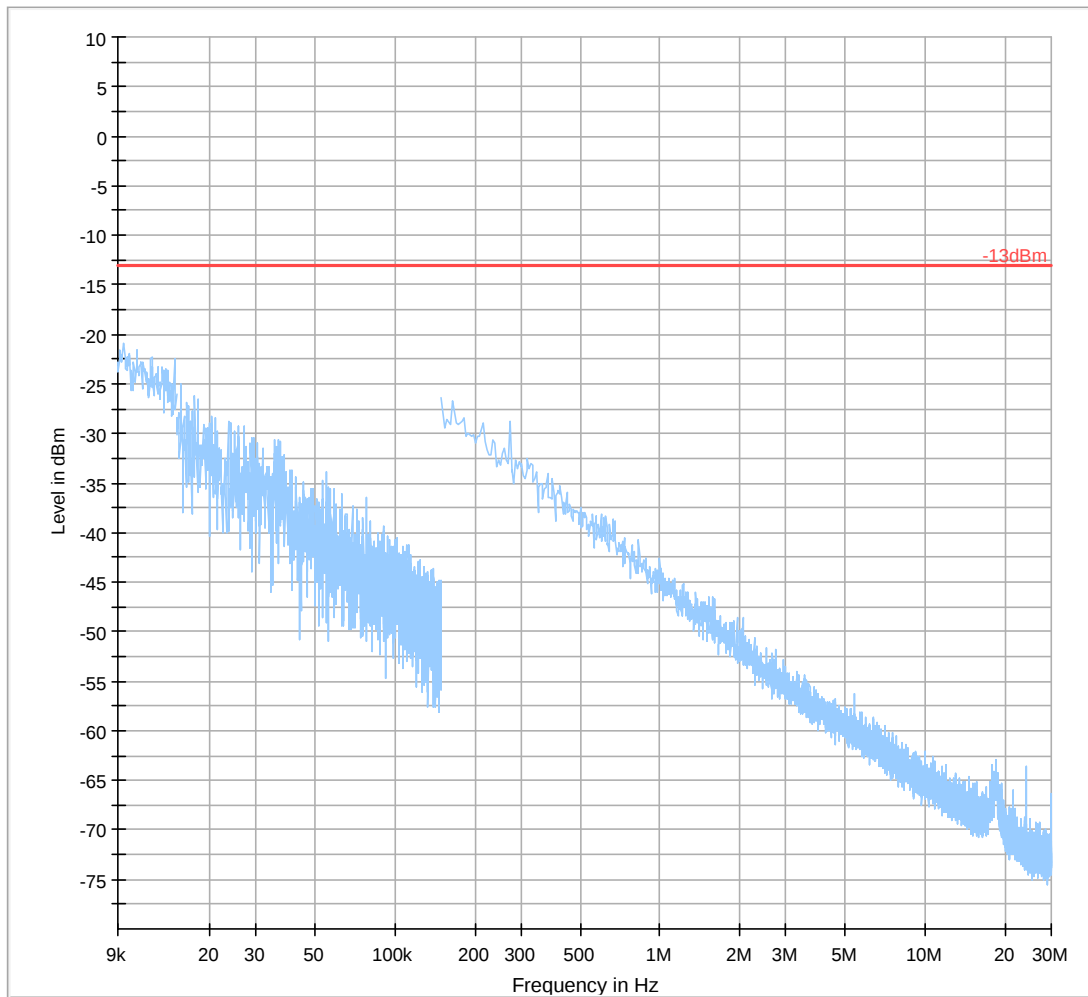
| Frequency (MHz) | Comment                |
|-----------------|------------------------|
| 3334.146        | 11:01:09 AM - 3/5/2019 |
| 4959.973        | 11:04:35 AM - 3/5/2019 |



Preview Result 1-RMS    \*    Critical\_Freqs RMS    -13dBm    ◆    Final\_Result RM

**Plot # 25 Radiated Emissions: 9 kHz - 30 MHz**

**Channel: Mid**



## Plot # 26 Radiated Emissions: 30 MHz – 1 GHz

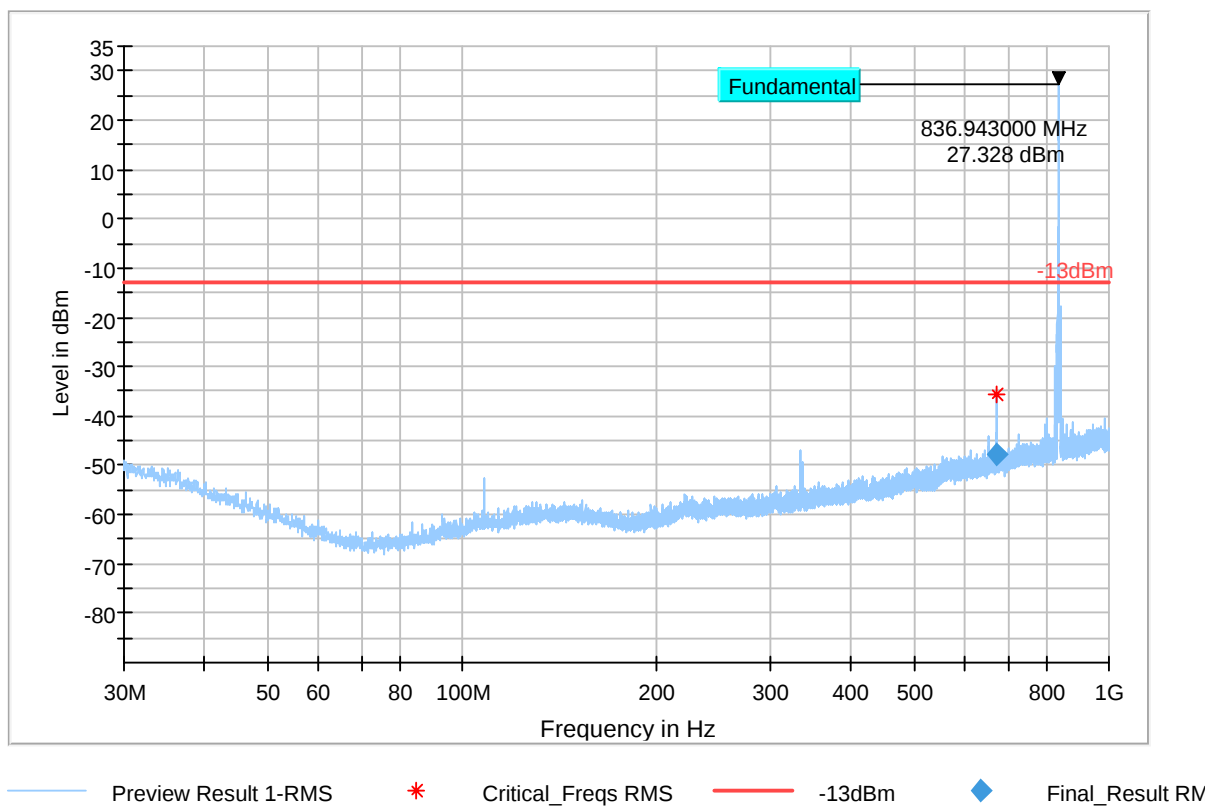
Channel: Mid

**Final Result**

| Frequency (MHz) | RMS (dBm) | Limit (dBm) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB) |
|-----------------|-----------|-------------|-------------|-----------------|-----------------|-------------|-----|---------------|------------|
| 669.116         | -47.76    | -13.00      | 34.76       | 500.0           | 100.0           | 150.0       | H   | 224.0         | -72        |

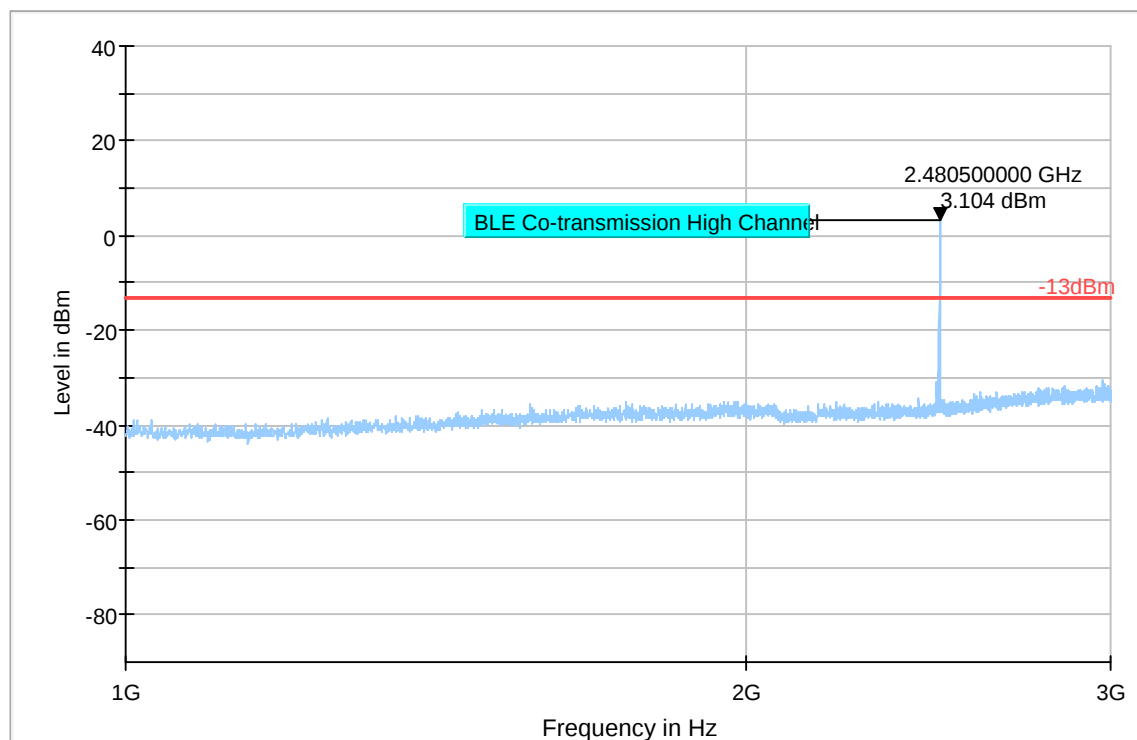
(continuation of the "Final\_Result" table from column 16 ...)

| Frequency (MHz) | Comment               |
|-----------------|-----------------------|
| 669.116         | 5:33:06 PM - 3/6/2019 |



**Plot # 27 Radiated Emissions: 1 GHz - 3 GHz**

**Channel: Mid**



— Preview Result 1-RMS    \* Critical\_Freqs RMS    — -13dBm    ◆ Final\_Result RV

## Plot # 28 Radiated Emissions: 3 GHz – 9 GHz

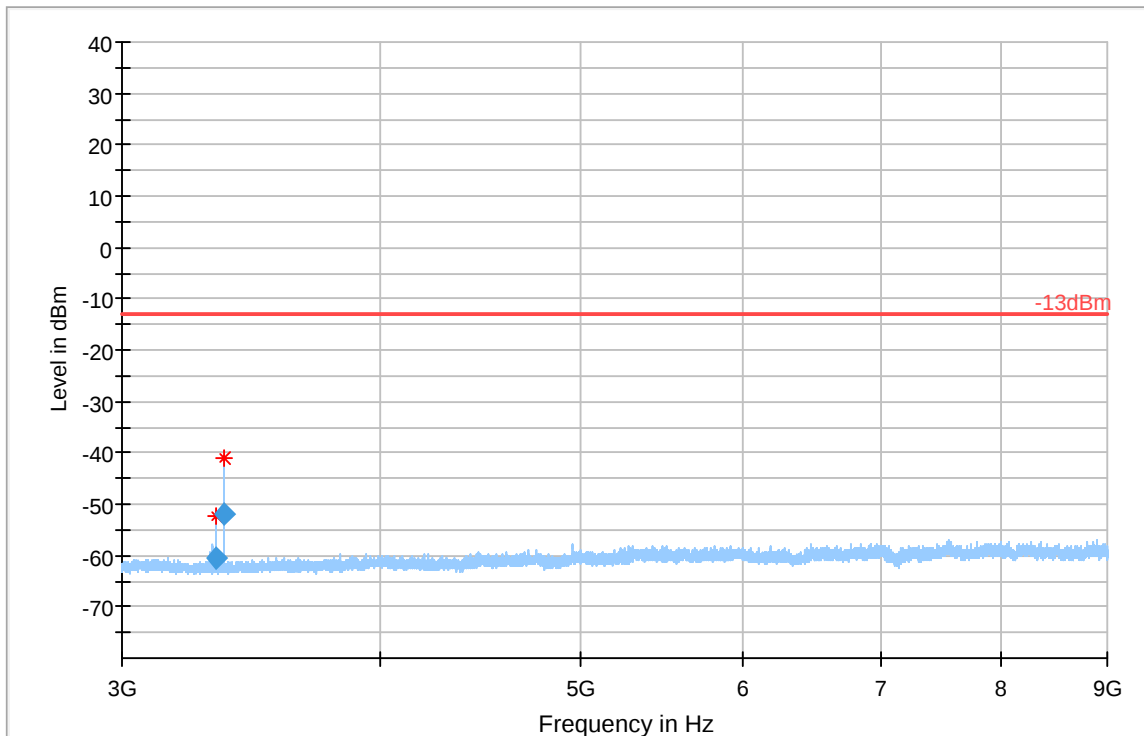
Channel: Mid

## Final Result

| Frequency (MHz) | RMS (dBm) | Limit (dBm) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB) |
|-----------------|-----------|-------------|-------------|-----------------|-----------------|-------------|-----|---------------|------------|
| 3331.759        | -60.47    | -13.00      | 47.47       | 500.0           | 1000.0          | 149.0       | H   | 109.0         | -132       |
| 3364.024        | -51.92    | -13.00      | 38.92       | 500.0           | 1000.0          | 149.0       | H   | 114.0         | -132       |

(continuation of the "Final\_Result" table from column 16 ...)

| Frequency (MHz) | Comment                |
|-----------------|------------------------|
| 3331.759        | 10:43:56 AM - 3/5/2019 |
| 3364.024        | 10:46:56 AM - 3/5/2019 |



Preview Result 1-RMS    \*    Critical\_Freqs RMS    -13dBm    ◆    Final\_Result RM

## Plot # 29 Radiated Emissions: 30 MHz - 1 GHz

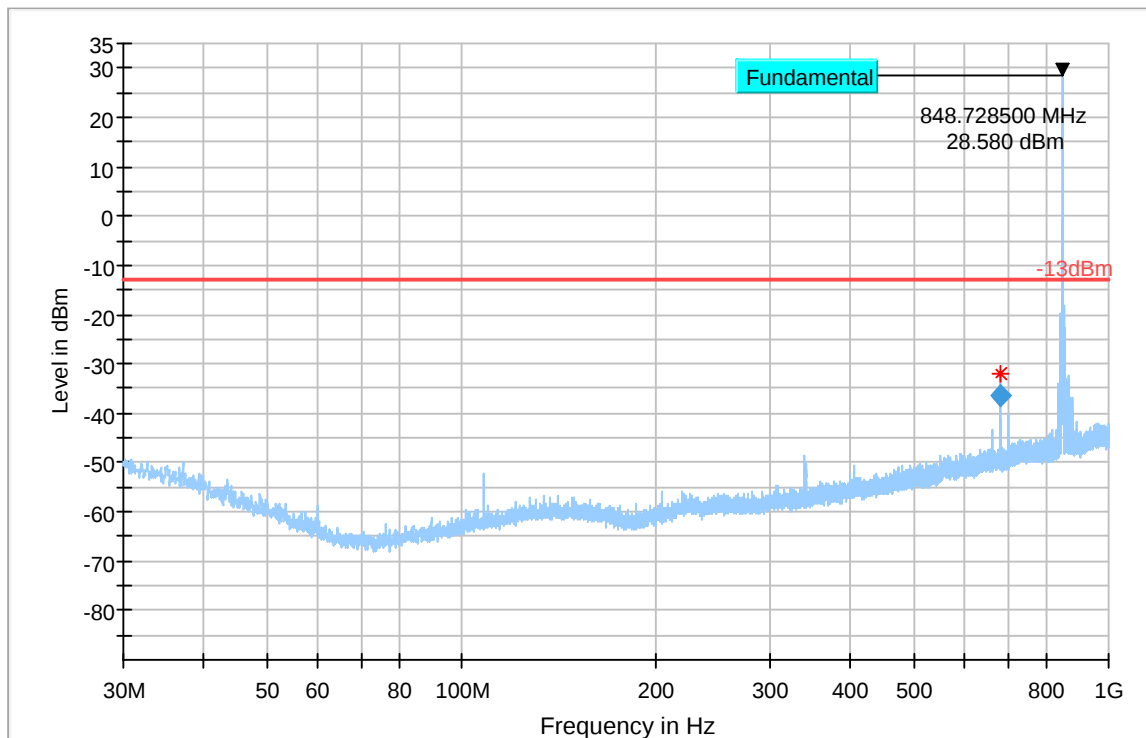
Channel: High

**Final Result**

| Frequency (MHz) | RMS (dBm) | Limit (dBm) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB) |
|-----------------|-----------|-------------|-------------|-----------------|-----------------|-------------|-----|---------------|------------|
| 678.633         | -36.33    | -13.00      | 23.33       | 500.0           | 100.0           | 153.0       | H   | 224.0         | -71        |

(continuation of the "Final\_Result" table from column 16 ...)

| Frequency (MHz) | Comment               |
|-----------------|-----------------------|
| 678.633         | 5:45:32 PM - 3/6/2019 |



— Preview Result 1-RMS    \* Critical\_Freqs RMS    — -13dBm    ◆ Final\_Result RM

## Plot # 30 Radiated Emissions: 1 GHz - 3 GHz

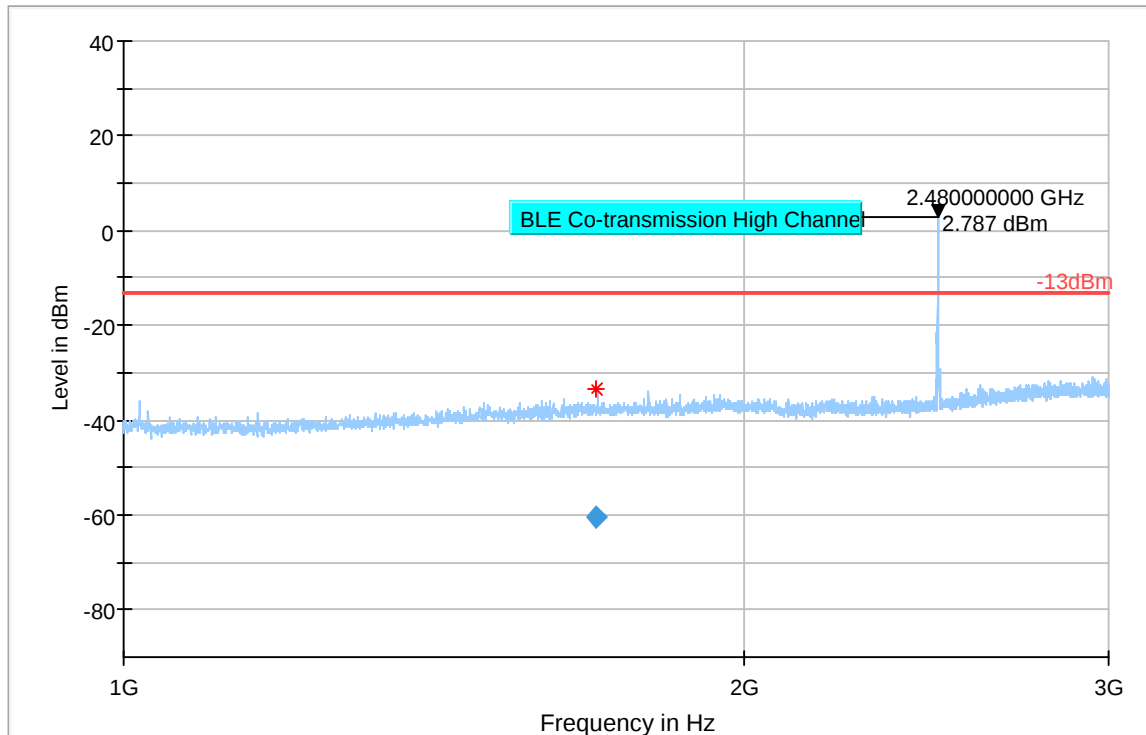
Channel: High

**Final Result**

| Frequency (MHz) | RMS (dBm) | Limit (dBm) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB) |
|-----------------|-----------|-------------|-------------|-----------------|-----------------|-------------|-----|---------------|------------|
| 1692.580        | -60.52    | -13.00      | 47.52       | 500.0           | 1000.0          | 232.0       | H   | 241.0         | -87        |

(continuation of the "Final\_Result" table from column 16 ...)

| Frequency (MHz) | Comment                |
|-----------------|------------------------|
| 1692.580        | 11:48:17 AM - 3/5/2019 |



Preview Result 1-RMS \* Critical\_Freqs RMS -13dBm Final\_Result RV

## Plot # 31 Radiated Emissions: 3 GHz - 9 GHz

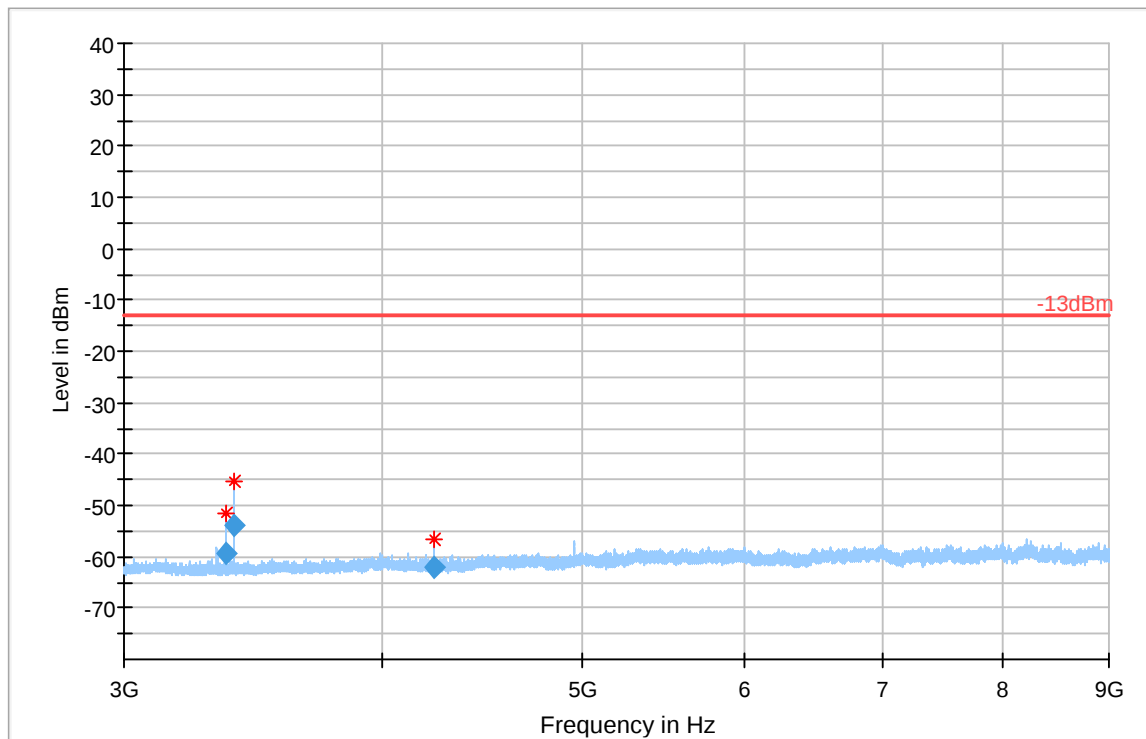
Channel: High

**Final Result**

| Frequency (MHz) | RMS (dBm) | Limit (dBm) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB) |
|-----------------|-----------|-------------|-------------|-----------------|-----------------|-------------|-----|---------------|------------|
| 3360.371        | -59.24    | -13.00      | 46.24       | 500.0           | 1000.0          | 328.0       | H   | 98.0          | -132       |
| 3393.894        | -53.88    | -13.00      | 40.88       | 500.0           | 1000.0          | 186.0       | H   | 119.0         | -132       |
| 4241.676        | -62.18    | -13.00      | 49.18       | 500.0           | 1000.0          | 157.0       | H   | 90.0          | -130       |

(continuation of the "Final\_Result" table from column 16 ...)

| Frequency (MHz) | Comment                |
|-----------------|------------------------|
| 3360.371        | 11:19:42 AM - 3/5/2019 |
| 3393.894        | 11:22:52 AM - 3/5/2019 |
| 4241.676        | 11:16:49 AM - 3/5/2019 |



Preview Result 1-RMS    \*    Critical\_Freqs RMS    -13dBm    ◆    Final\_Result RV

**LTE Band 12****Plot # 32 Radiated Emissions: 30 MHz – 1GHz**

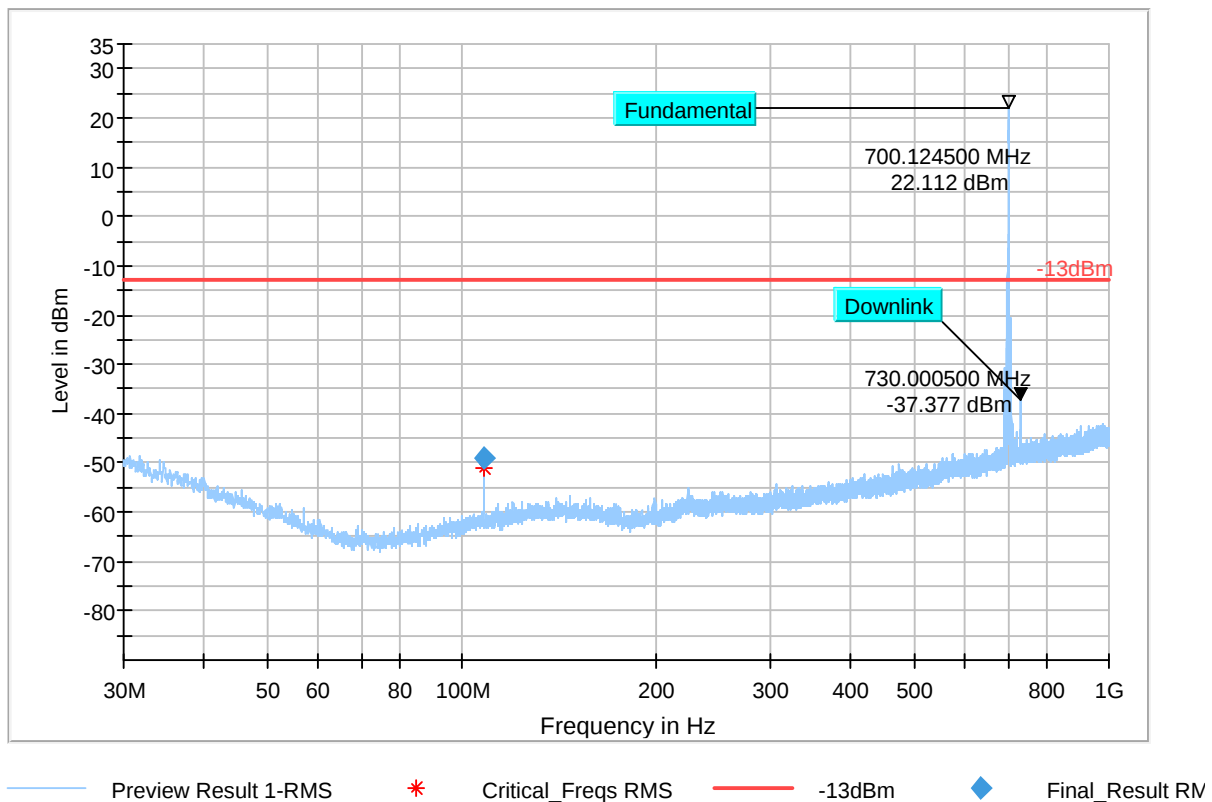
Channel: Low

**Final Result**

| Frequency (MHz) | RMS (dBm) | Limit (dBm) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB) |
|-----------------|-----------|-------------|-------------|-----------------|-----------------|-------------|-----|---------------|------------|
| 108.007         | -48.96    | -13.00      | 35.96       | 500.0           | 100.0           | 300.0       | H   | 119.0         | -83        |

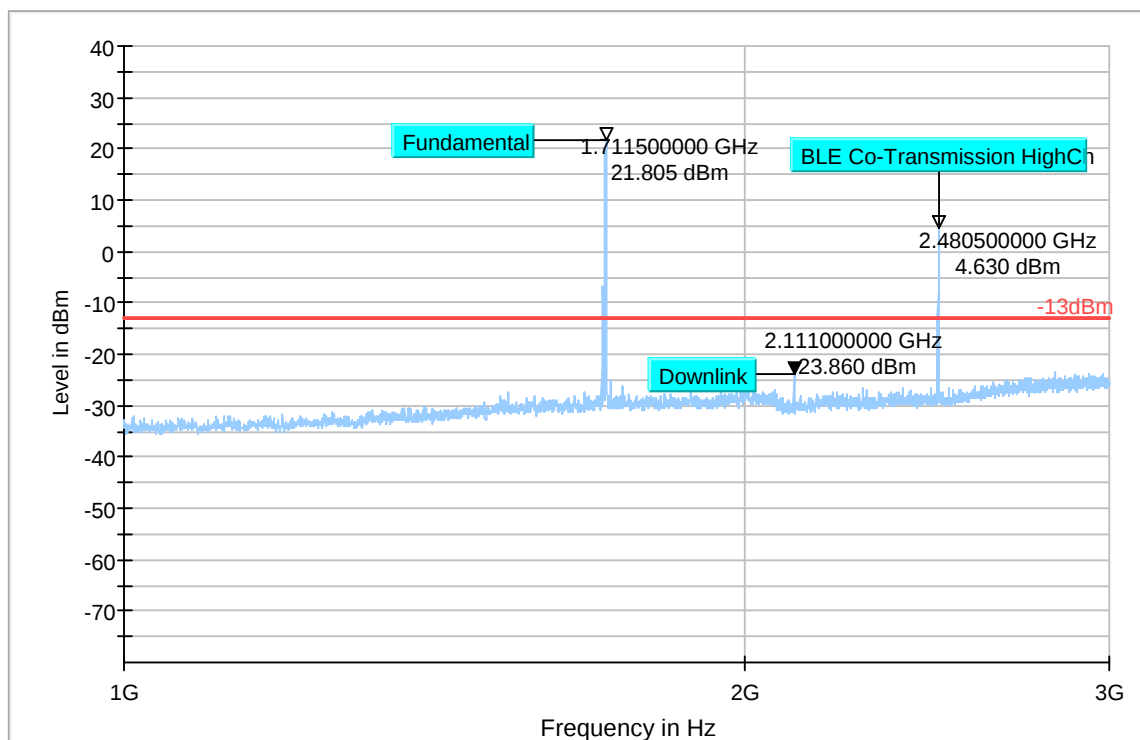
(continuation of the "Final\_Result" table from column 16 ...)

| Frequency (MHz) | Comment               |
|-----------------|-----------------------|
| 108.007         | 3:52:18 PM - 3/6/2019 |



**Plot # 33 Radiated Emissions: 1 GHz - 3 GHz**

**Channel: Low**



Preview Result 1-PK+    \*    Critical\_Freqs PK+    -13dBm    ♦    Final\_Result RMS

## Plot # 34 Radiated Emissions: 3 GHz – 9 GHz

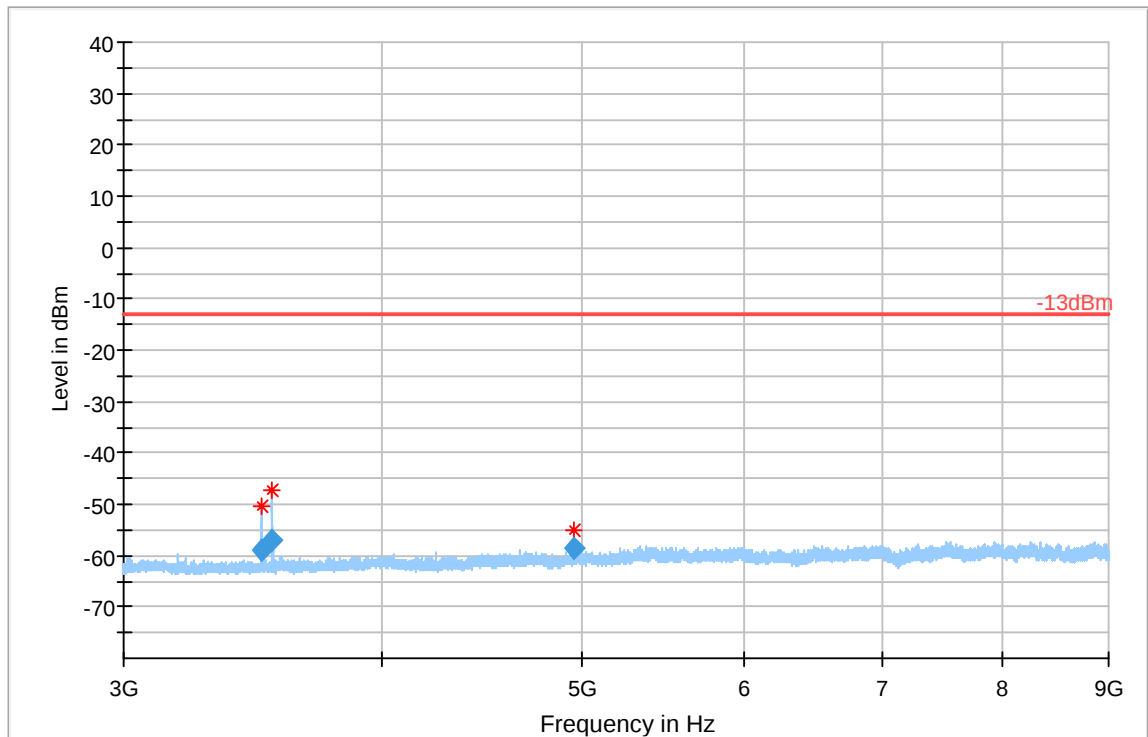
Channel: Low

**Final Result**

| Frequency (MHz) | RMS (dBm) | Limit (dBm) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB) |
|-----------------|-----------|-------------|-------------|-----------------|-----------------|-------------|-----|---------------|------------|
| 3501.003        | -59.13    | -13.00      | 46.13       | 500.0           | 1000.0          | 196.0       | H   | 87.0          | -131       |
| 3542.605        | -56.84    | -13.00      | 43.84       | 500.0           | 1000.0          | 126.0       | H   | 75.0          | -131       |
| 4960.061        | -58.61    | -13.00      | 45.61       | 500.0           | 1000.0          | 167.0       | V   | 264.0         | -128       |

(continuation of the "Final\_Result" table from column 16 ...)

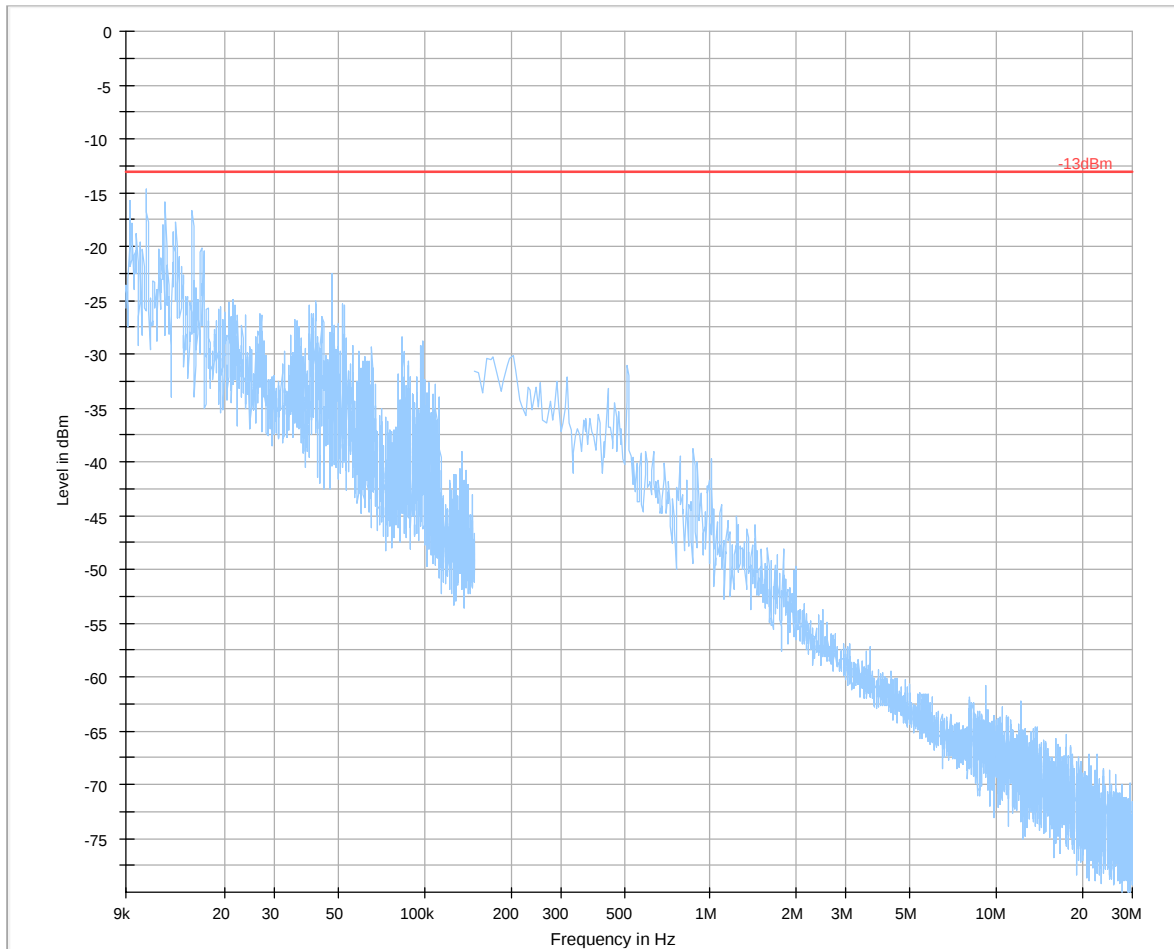
| Frequency (MHz) | Comment               |
|-----------------|-----------------------|
| 3501.003        | 6:33:36 PM - 3/4/2019 |
| 3542.605        | 6:30:34 PM - 3/4/2019 |
| 4960.061        | 6:37:02 PM - 3/4/2019 |



Preview Result 1-RMS \* Critical\_Freqs RMS -13dBm Final\_Result RV

**Plot # 35 Radiated Emissions: 9 kHz - 30 MHz**

**Channel: Mid**



## Plot # 36 Radiated Emissions: 30 MHz – 1GHz

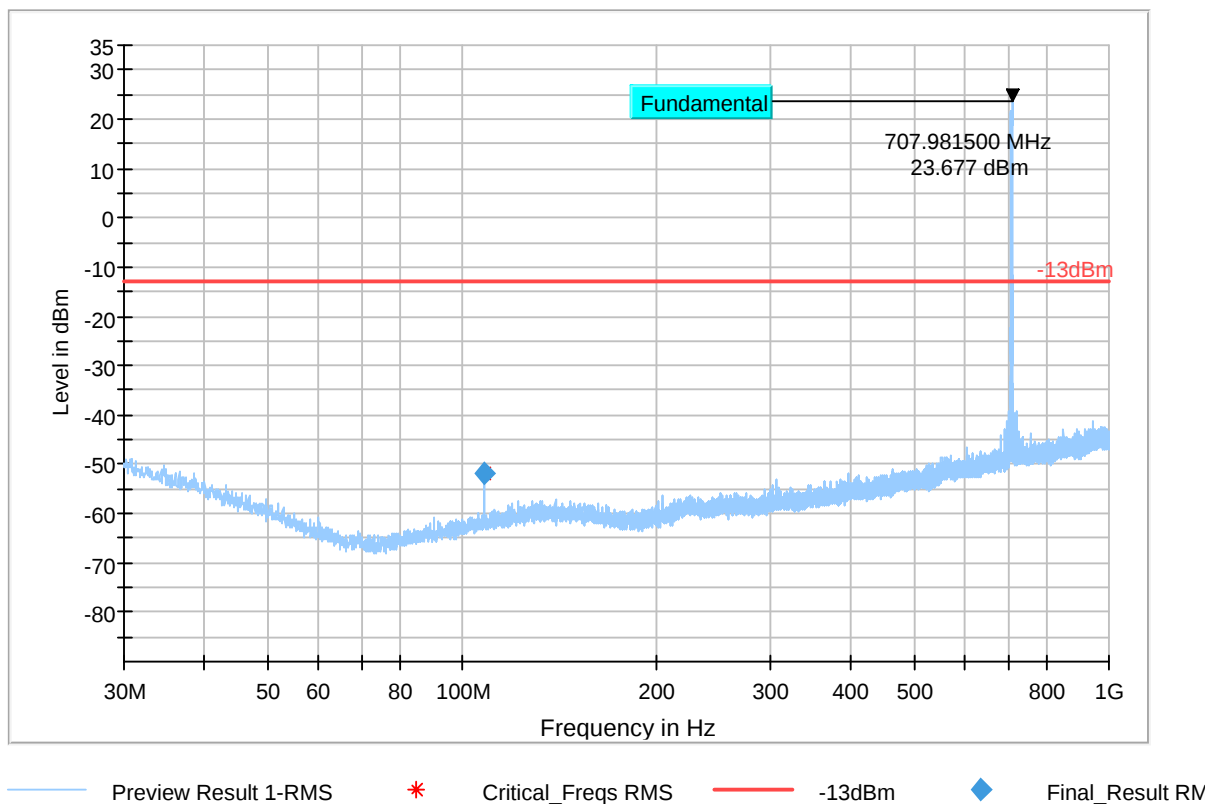
Channel: Mid

**Final Result**

| Frequency (MHz) | RMS (dBm) | Limit (dBm) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB) |
|-----------------|-----------|-------------|-------------|-----------------|-----------------|-------------|-----|---------------|------------|
| 108.006         | -51.82    | -13.00      | 38.82       | 500.0           | 100.0           | 300.0       | V   | 224.0         | -83        |

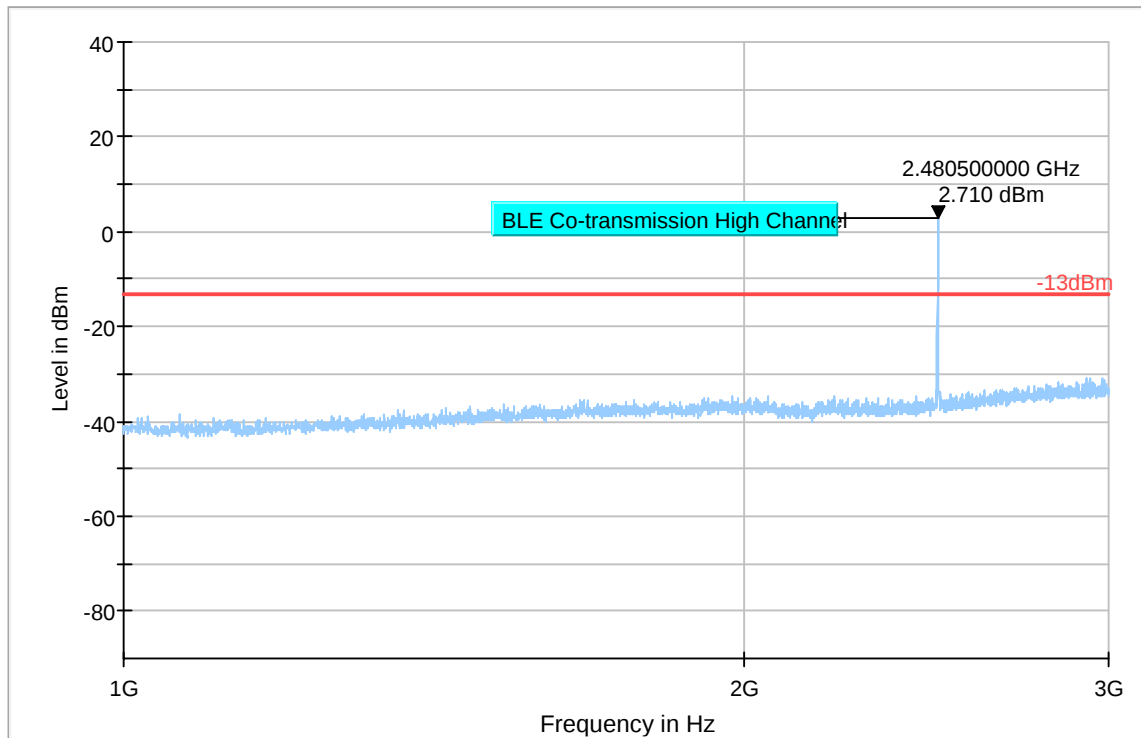
(continuation of the "Final\_Result" table from column 16 ...)

| Frequency (MHz) | Comment               |
|-----------------|-----------------------|
| 108.006         | 4:43:59 PM - 3/6/2019 |



**Plot # 37 Radiated Emissions: 1 GHz - 3 GHz**

**Channel: Mid**



— Preview Result 1-RMS    \* Critical\_Freqs RMS    — -13dBm    ◆ Final\_Result RM

## Plot # 38 Radiated Emissions: 3 GHz – 9 GHz

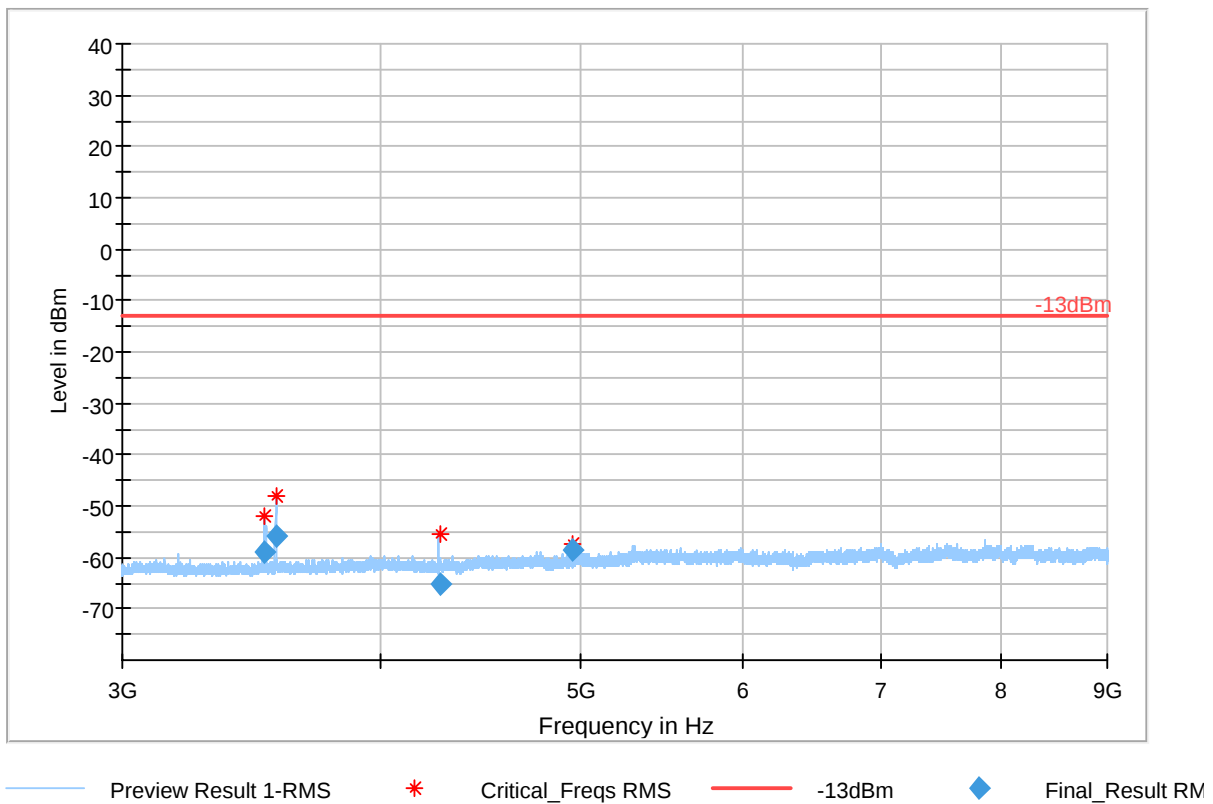
Channel: Mid

**Final Result**

| Frequency (MHz) | RMS (dBm) | Limit (dBm) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB) |
|-----------------|-----------|-------------|-------------|-----------------|-----------------|-------------|-----|---------------|------------|
| 3518.395        | -58.89    | -13.00      | 45.89       | 500.0           | 1000.0          | 141.0       | H   | 98.0          | -131       |
| 3559.516        | -55.70    | -13.00      | 42.70       | 500.0           | 1000.0          | 100.0       | V   | 85.0          | -131       |
| 4276.523        | -65.14    | -13.00      | 52.14       | 500.0           | 1000.0          | 241.0       | V   | 32.0          | -130       |
| 4959.723        | -58.69    | -13.00      | 45.69       | 500.0           | 1000.0          | 233.0       | V   | 316.0         | -128       |

(continuation of the "Final\_Result" table from column 16 ...)

| Frequency (MHz) | Comment               |
|-----------------|-----------------------|
| 3518.395        | 6:04:39 PM - 3/4/2019 |
| 3559.516        | 6:01:24 PM - 3/4/2019 |
| 4276.523        | 6:07:50 PM - 3/4/2019 |
| 4959.723        | 6:11:10 PM - 3/4/2019 |



## Plot # 39 Radiated Emissions: 30 MHz – 1GHz

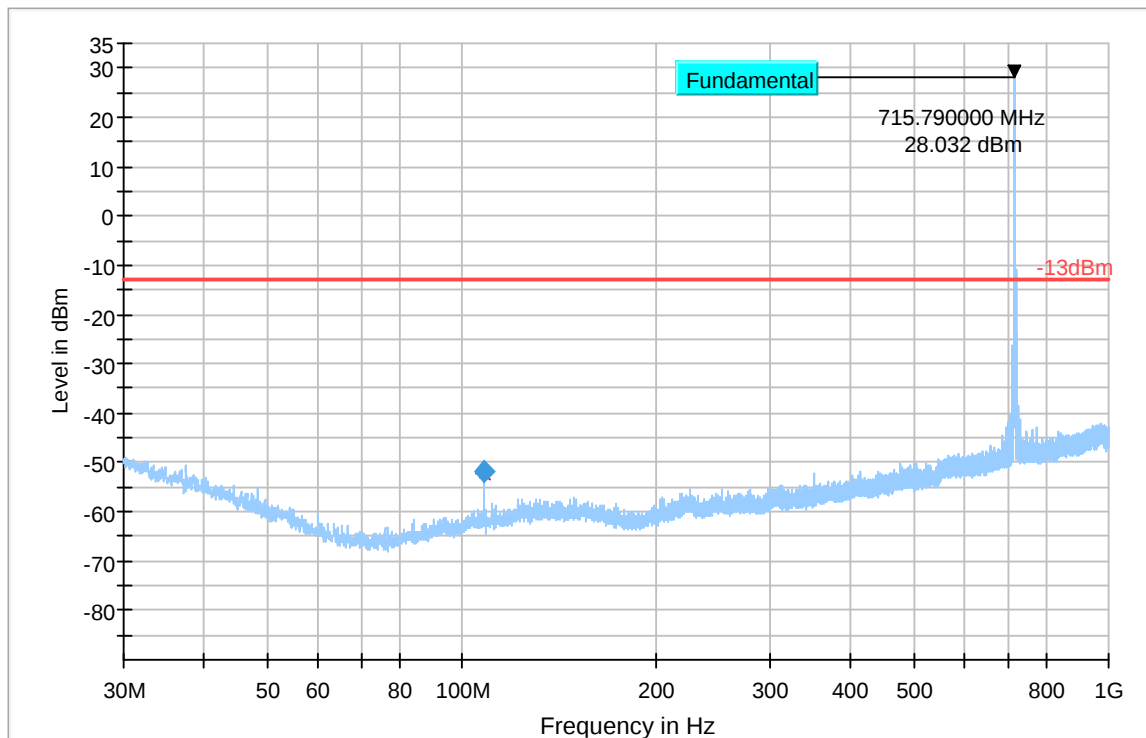
Channel: High

**Final Result**

| Frequency (MHz) | RMS (dBm) | Limit (dBm) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB) |
|-----------------|-----------|-------------|-------------|-----------------|-----------------|-------------|-----|---------------|------------|
| 107.987         | -51.75    | -13.00      | 38.75       | 500.0           | 100.0           | 300.0       | V   | 208.0         | -83        |

(continuation of the "Final\_Result" table from column 16 ...)

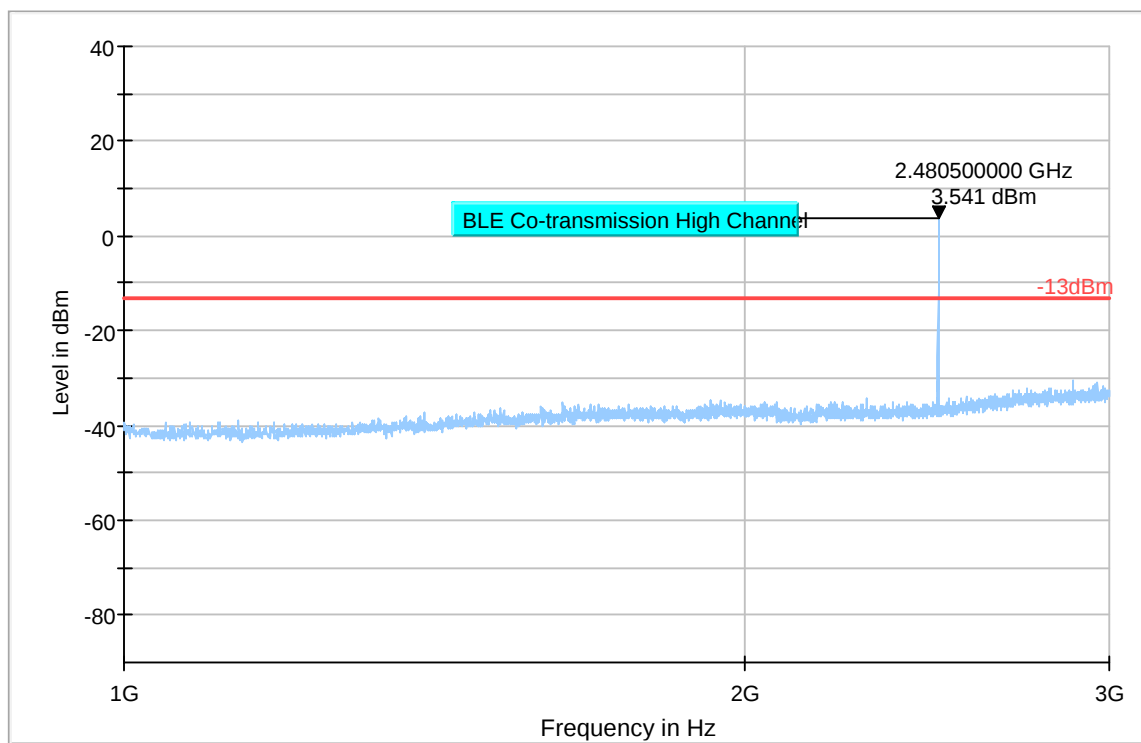
| Frequency (MHz) | Comment               |
|-----------------|-----------------------|
| 107.987         | 5:00:25 PM - 3/6/2019 |



Preview Result 1-RMS \* Critical\_Freqs RMS -13dBm Final\_Result RV

**Plot # 40 Radiated Emissions: 1 GHz - 3 GHz**

**Channel: High**



— Preview Result 1-RMS    \* Critical\_Freqs RMS    — -13dBm    ◆ Final\_Result RM

## Plot # 41 Radiated Emissions: 3 GHz – 9 GHz

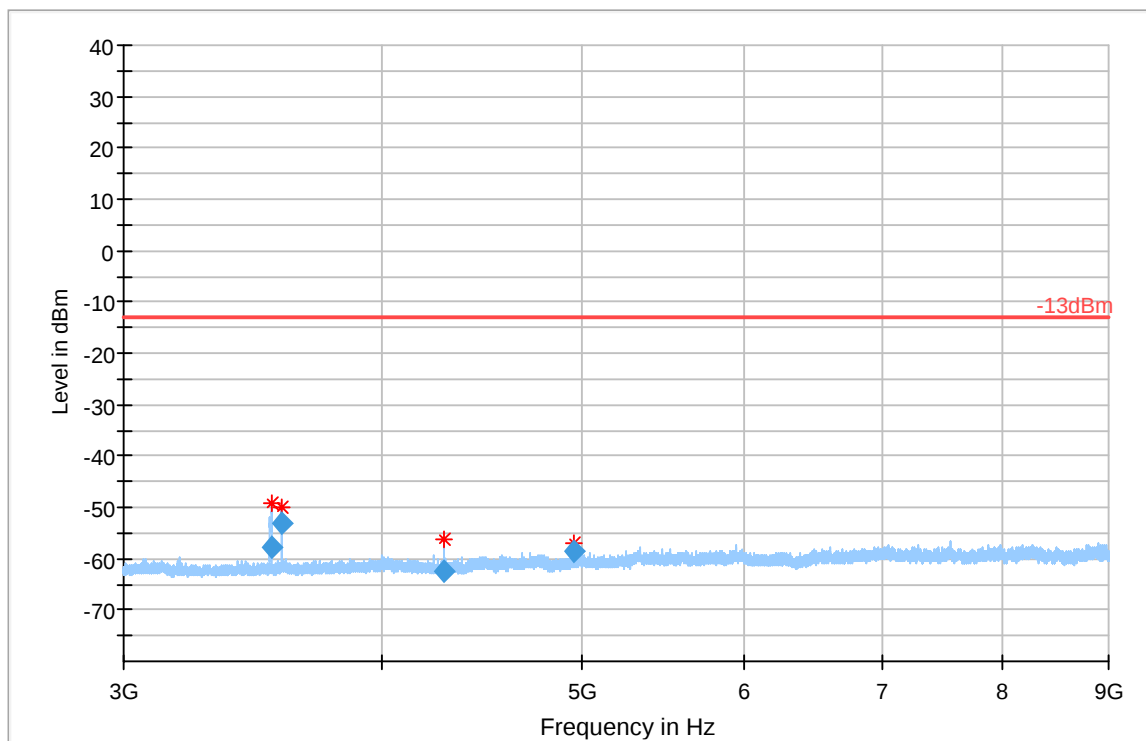
Channel: High

**Final Result**

| Frequency (MHz) | RMS (dBm) | Limit (dBm) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB) |
|-----------------|-----------|-------------|-------------|-----------------|-----------------|-------------|-----|---------------|------------|
| 3536.532        | -57.60    | -13.00      | 44.60       | 500.0           | 1000.0          | 201.0       | H   | 81.0          | -131       |
| 3577.379        | -52.92    | -13.00      | 39.92       | 500.0           | 1000.0          | 267.0       | H   | 72.0          | -131       |
| 4292.345        | -62.37    | -13.00      | 49.37       | 500.0           | 1000.0          | 125.0       | V   | 103.0         | -130       |
| 4959.986        | -58.41    | -13.00      | 45.41       | 500.0           | 1000.0          | 235.0       | V   | 270.0         | -128       |

(continuation of the "Final\_Result" table from column 16 ...)

| Frequency (MHz) | Comment                |
|-----------------|------------------------|
| 3536.532        | 10:06:54 AM - 3/5/2019 |
| 3577.379        | 10:00:30 AM - 3/5/2019 |
| 4292.345        | 10:03:44 AM - 3/5/2019 |
| 4959.986        | 10:10:20 AM - 3/5/2019 |



Preview Result 1-RMS \* Critical\_Freqs RMS -13dBm Final\_Result RM

**LTE Band 13**

Plot # 42 Radiated Emissions: 9 KHz – 30 MHz

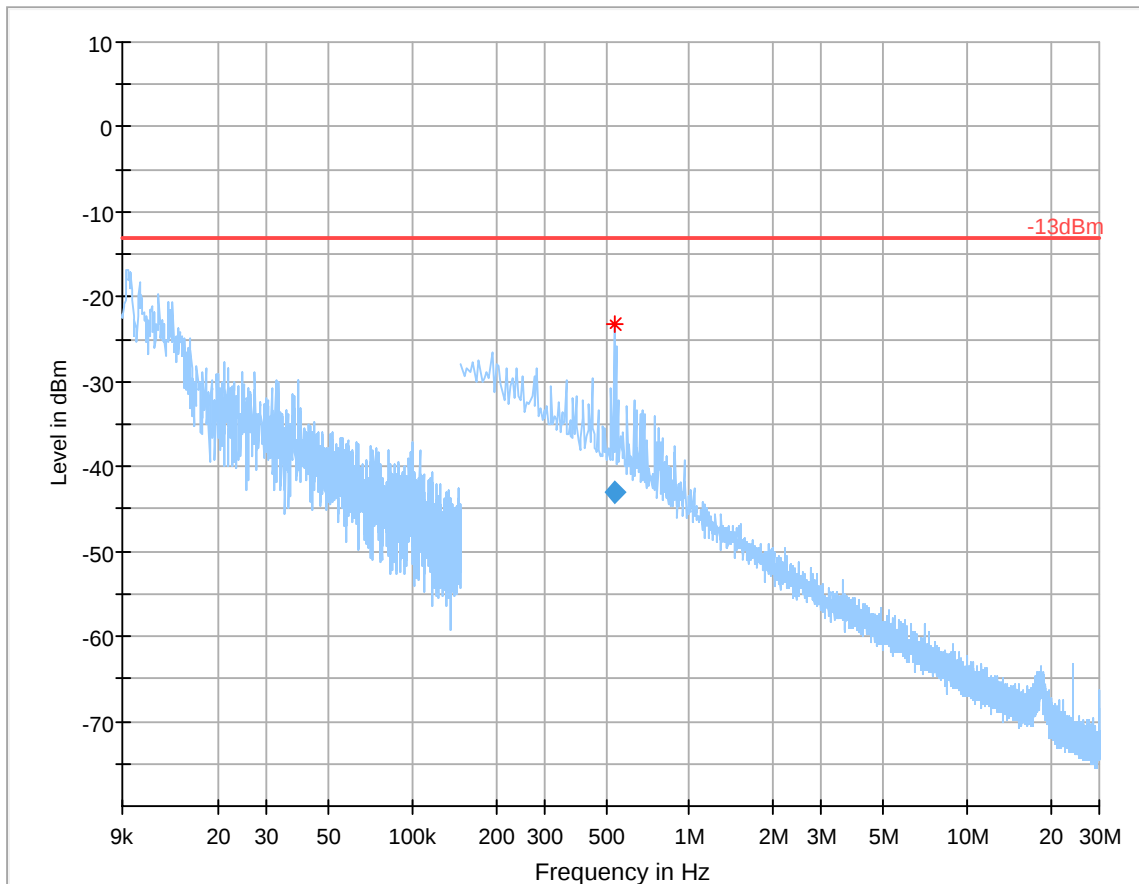
Channel: Mid

**Final Result**

| Frequency (MHz) | MaxPeak (dBm) | QuasiPeak (dBm) | Limit (dBm) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) |
|-----------------|---------------|-----------------|-------------|-------------|-----------------|-----------------|-------------|-----|---------------|
| 0.537000        | -42.93        | ---             | -13.00      | 29.93       | 2.0             | 9.000           | 140.0       | V   | 26.0          |

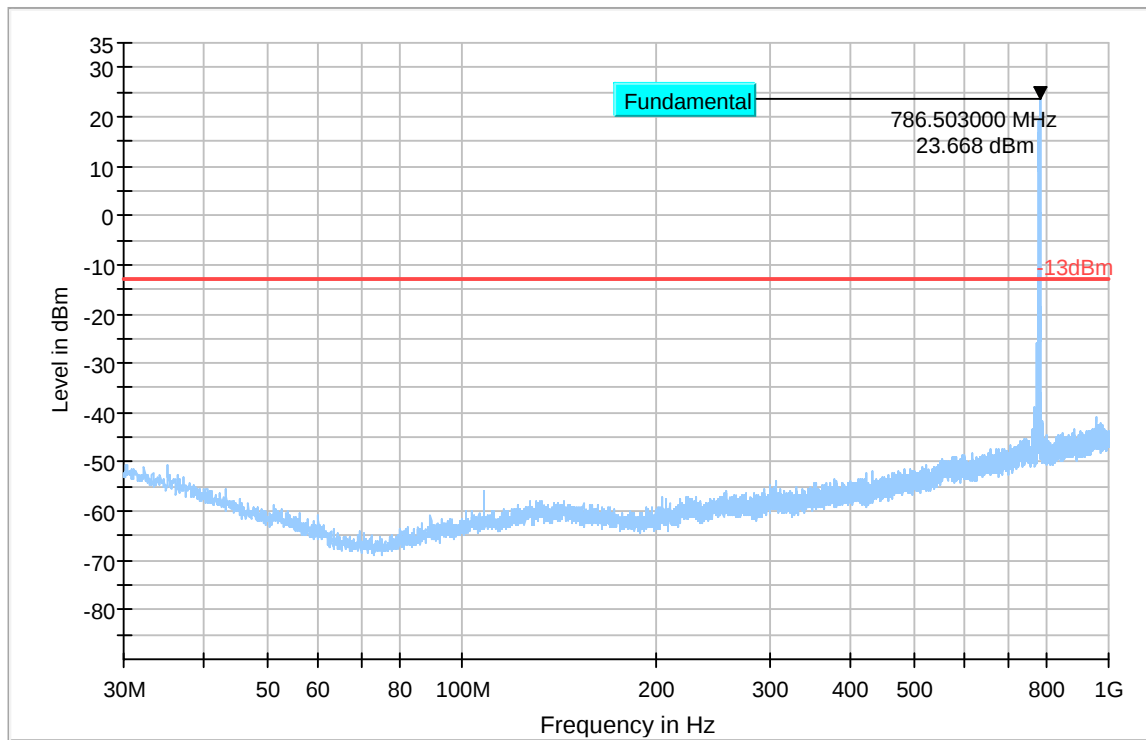
(continuation of the "Final\_Result" table from column 15 ...)

| Frequency (MHz) | Corr. (dB) | Comment               |
|-----------------|------------|-----------------------|
| 0.537000        | -76.6      | 4:43:03 PM - 3/8/2019 |



**Plot # 43 Radiated Emissions: 30 MHz – 1 GHz**

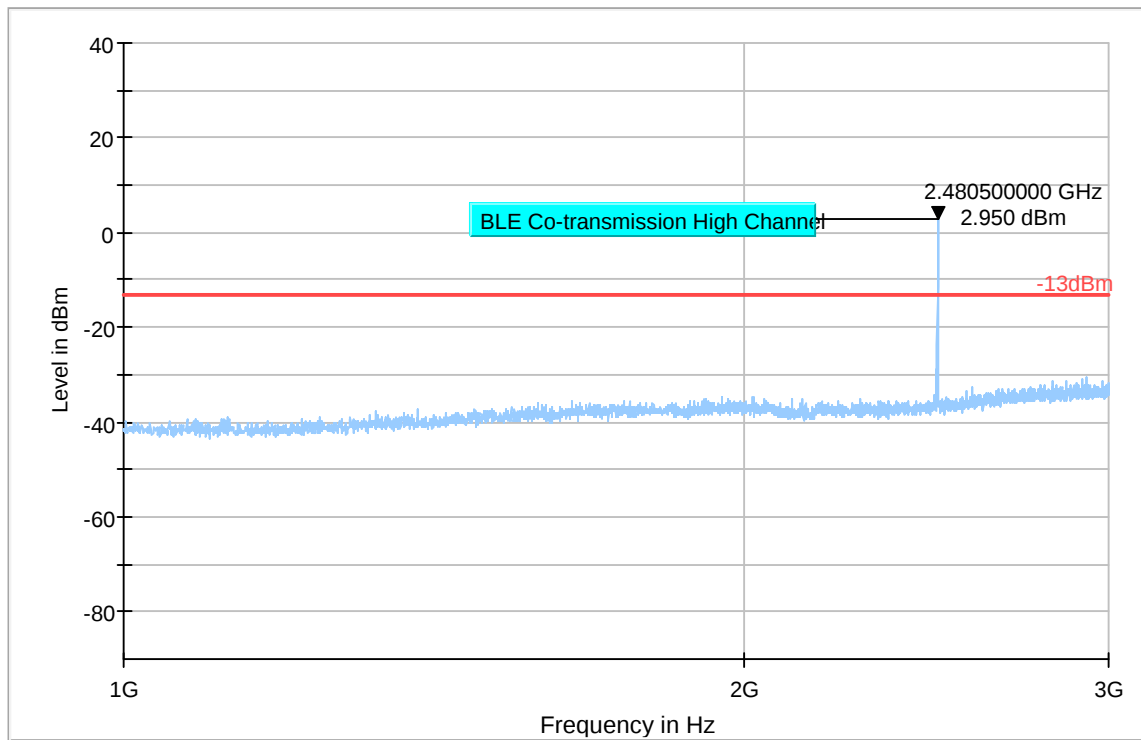
**Channel: Mid**



— Preview Result 1-RMS    \* Critical\_Freqs RMS    — -13dBm    ◆ Final\_Result RV

**Plot # 44 Radiated Emissions: 1 – 3 GHz**

**Channel: Mid**



— Preview Result 1-RMS    \* Critical\_Freqs RMS    — -13dBm    ◆ Final\_Result RM

## Plot # 45 Radiated Emissions: 3 GHz – 9 GHz

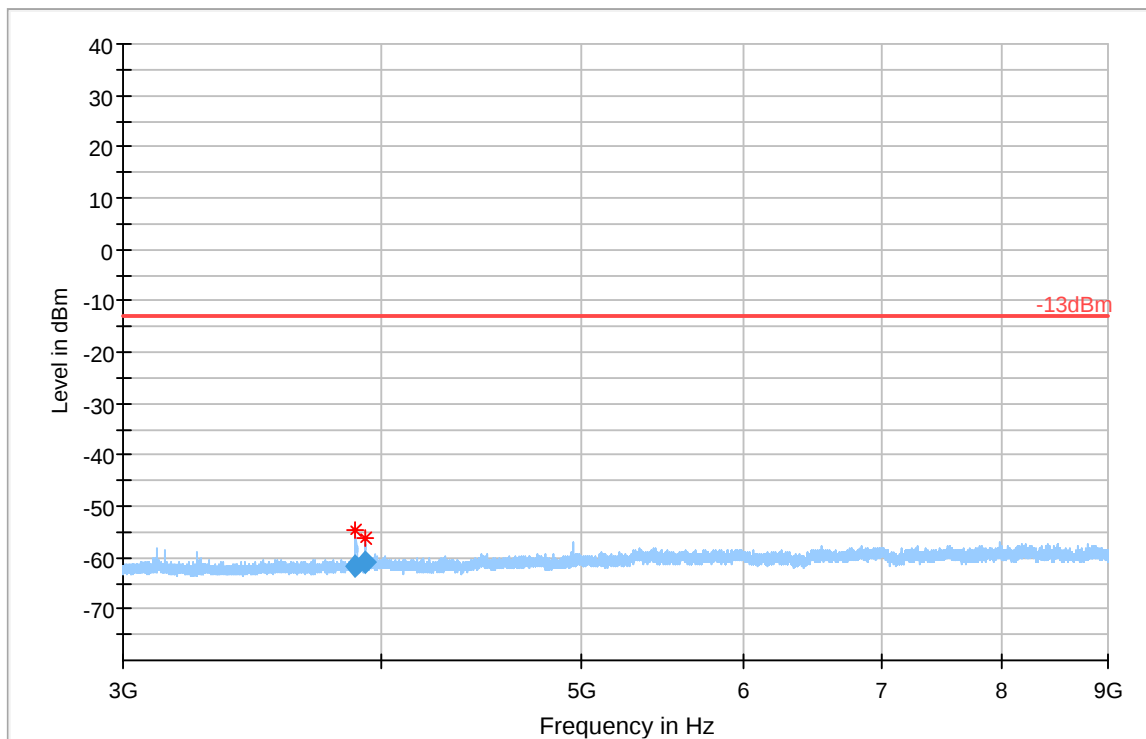
Channel: Mid

**Final Result**

| Frequency (MHz) | RMS (dBm) | Limit (dBm) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB) |
|-----------------|-----------|-------------|-------------|-----------------|-----------------|-------------|-----|---------------|------------|
| 3890.392        | -61.50    | -13.00      | 48.50       | 500.0           | 1000.0          | 283.0       | H   | 192.0         | -130       |
| 3932.467        | -61.05    | -13.00      | 48.05       | 500.0           | 1000.0          | 100.0       | H   | 12.0          | -130       |

(continuation of the "Final\_Result" table from column 16 ...)

| Frequency (MHz) | Comment                |
|-----------------|------------------------|
| 3890.392        | 10:27:36 AM - 3/5/2019 |
| 3932.467        | 10:24:19 AM - 3/5/2019 |



Preview Result 1-RMS \* Critical\_Freqs RMS -13dBm Final\_Result RV

**LTE Spotcheck for BTLE Depopulated Unit:**

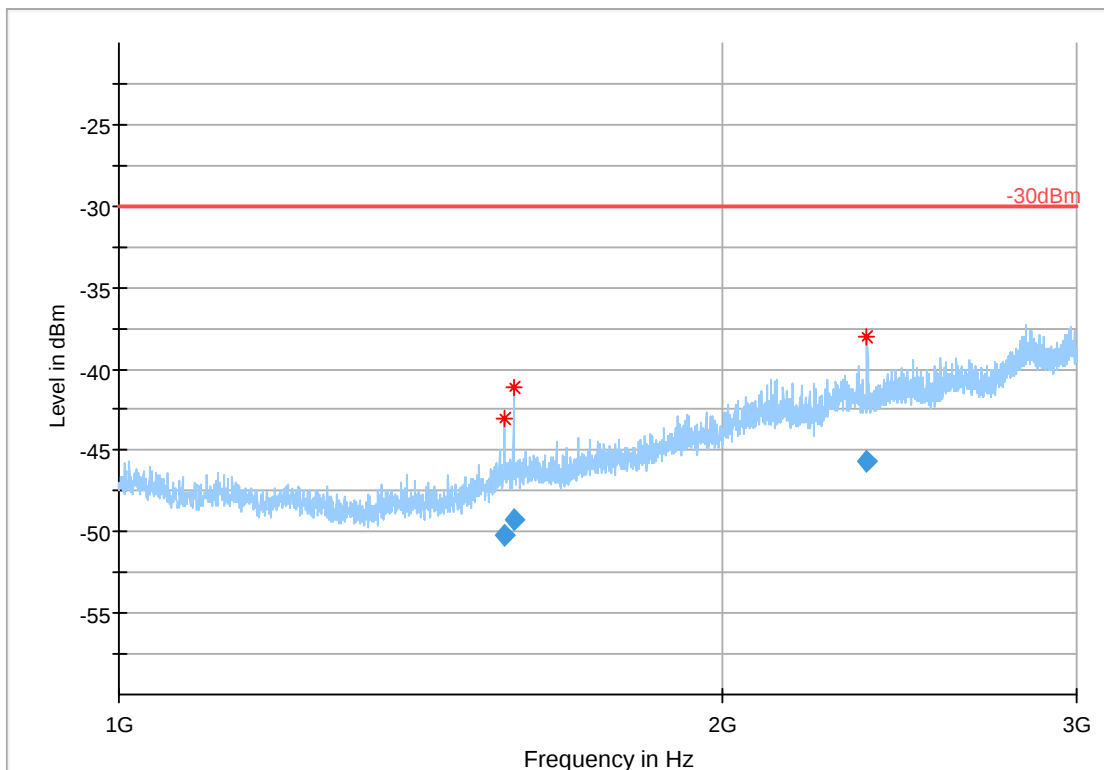
A spotcheck for cellular radiated spurious emissions was performed on the BTLE depopulated unit (FCC ID: APV-VLU11 / IC ID: 5483C-VLU11) for LTE bands 2, 4, 5, 12, and 13. The results were found compliant to the RSE limit. The worst case measurement is provided:

**LTE Band 13****Plot # 46 Radiated Emissions: 1 GHz – 3 GHz****Channel: Mid****Final\_Result**

| Frequency (MHz) | RMS (dBm) | Limit (dBm) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB) |
|-----------------|-----------|-------------|-------------|-----------------|-----------------|-------------|-----|---------------|------------|
| 1556.391650     | -50.17    | -30.00      | 20.17       | 500.0           | 1000.000        | 204.0       | H   | 52.0          | -64.1      |
| 1572.664300     | -49.24    | -30.00      | 19.24       | 500.0           | 1000.000        | 202.0       | H   | 9.0           | -63.8      |
| 2359.235600     | -45.69    | -30.00      | 15.69       | 500.0           | 1000.000        | 152.0       | H   | 48.0          | -60.1      |

(continuation of the "Final\_Result" table from column 16 ...)

| Frequency (MHz) | Comment                |
|-----------------|------------------------|
| 1556.391650     | 11:25:26 AM - 5/3/2019 |
| 1572.664300     | 11:27:45 AM - 5/3/2019 |
| 2359.235600     | 11:29:32 AM - 5/3/2019 |



Note: PTCRB limit is shown, which is more stringent than FCC limit of -13 dBm

**8 Test setup photos**

Setup photos are included in supporting file name: "EMC\_CALAM\_085\_19001\_FCC\_22\_24\_27\_ISED\_Setup\_Photos.pdf"

**9 Test Equipment And Ancillaries Used For Testing**

| Equipment Type                       | Manufacturer    | Model     | Serial #   | Calibration Cycle | Last Calibration Date |
|--------------------------------------|-----------------|-----------|------------|-------------------|-----------------------|
| PASSIVE LOOP ANTENNA                 | ETS LINDGREN    | 6512      | 00164698   | 3 YEARS           | 08/08/2017            |
| BILOG ANTENNA                        | TESEO           | CBL 6141B | 41106      | 3 YEARS           | 11/01/2017            |
| HORN ANTENNA                         | EMCO            | 3115      | 00035114   | 3 YEARS           | 07/31/2017            |
| HORN ANTENNA                         | ETS LINDGREN    | 3117      | 00167061   | 3 YEARS           | 08/08/2017            |
| HORN ANTENNA                         | ETS LINDGREN    | 3116C     | 00166821   | 3 YEARS           | 09/24/2017            |
| UNIVERSAL RADIO COMMUNICATION TESTER | R&S             | CMU 200   | 101821     | 2 YEARS           | 07/06/2017            |
| WIDEBAND RADIO COMMUNICATION         | R&S             | CMW500    | 127068     | 2 YEARS           | 07/01/2017            |
| SIGNAL ANALYZER                      | R&S             | FSV 40    | 101022     | 2 YEARS           | 07/05/2017            |
| DIGITAL BAROMETER                    | VWR             | 35519-055 | 91119547   | 2 YEARS           | 06/20/2017            |
| THERMOMETER HUMIDITY MONITOR         | CONTROL COMPANY | 36934-164 | 191871994  | 2 YEARS           | 01/10/2019            |
| DC POWER SUPPLY                      | AGILENT         | E3634A    | MY53290018 | N/A               | N/A                   |

Note: 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.

**10 Revision History**

| Date       | Report Name                           | Changes to report | Report prepared by |
|------------|---------------------------------------|-------------------|--------------------|
| 2019-05-10 | EMC_CALAM_085_19001_FCC_22_24_27_ISED | Initial version   | Chin Ming Lui      |