

# FCC DSS RF TEST REPORT



|                           |                                                             |
|---------------------------|-------------------------------------------------------------|
| Test Report Number.....   | CMP-19061922-LC-FCC-IC-DSS                                  |
| Applicant.....            | <b>CalAmp</b>                                               |
| Applicant Address.....    | 2177 Salk Ave, Suite 200, Carlsbad, CA 92008 USA            |
| Product Name.....         | HotSpot OBD Dongle                                          |
| Model Number.....         | LMU3240LAW                                                  |
| Family Product/Model..... | N/A                                                         |
| FCC ID.....               | APV-3240LA                                                  |
| ISED ID.....              | 5843C-3240LA                                                |
| Date of EUT received..... | 06/27/2019                                                  |
| Date of Test.....         | 06/27/2019 – 07/11/2019                                     |
| Report Issue Date.....    | 07/19/2019                                                  |
| Test Standards.....       | <b>47CFR Part 15.247</b><br><b>RSS-247 Issue2: Feb 2017</b> |
| Test Result.....          | Pass                                                        |

Issued By:

## Vista Laboratories

1261 Puerta Del Sol, San Clemente, CA 92673 USA

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Tested by:

Bruce Li/Test Engineer

Approved By:

David Zhang/Technical Manager

|                       |                            |
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## Laboratory Introduction

Vista Labs is an A2LA accredited 17025 compliant regulatory compliance testing laboratories (Cert. number: 4848-01) strategically located in Orange County, providing services in the electrical and telecommunication industries. Vista labs is also recognized testing facility for Australia (ACMA), Chinese Taipei (BSMI), Chinese Taipei (NCC), Hong Kong (OFCA), Israel (MOC), Korea (RRA), Singapore (IMDA), Vietnam (MIC), etc.

Our comprehensive testing services include safety testing, EMC emission and susceptibility testing, RF and wireless testing (including DFS).

As your partner, Vista investigates appropriate test standards, develops test plans, performs troubleshooting & failure analysis, reviews documentation, and provides test reports for a complete compliance testing and certification package.



**17025 Product Testing Accreditation Certificate**



**17065 Product Certification Accreditation Certificate**



Electromagnetic Compatibility  
Radio Frequency  
Product Certification  
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## REVISION HISTORY

| Revision | Issue Date | Description      | Note |
|----------|------------|------------------|------|
| Original | 07/19/2019 | Original release | N/A  |
|          |            |                  |      |
|          |            |                  |      |
|          |            |                  |      |
|          |            |                  |      |

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## 1 General Information

### 1.1 Applicant

|                              |                                                  |
|------------------------------|--------------------------------------------------|
| <b>Applicant:</b>            | CalAmp                                           |
| <b>Applicant address:</b>    | 2177 Salk Ave, Suite 200, Carlsbad, CA 92008 USA |
| <b>Manufacturer:</b>         | CalAmp                                           |
| <b>Manufacturer Address:</b> | 2177 Salk Ave, Suite 200, Carlsbad, CA 92008 USA |

### 1.2 Product information

|                                  |                                                                                                                                                                                                                                                                                                                                                                                                            |
|----------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Product Name</b>              | HotSpot OBD Dongle                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Model Number</b>              | LMU3240LAW                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Family Model Number</b>       | N/A                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Serial Number</b>             | N/A                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Frequency Band</b>            | BT BDR/EDR: 2402-2480MHz<br>BLE: 2402-2480MHz<br>802.11b/g/n-20MHz: 2412-2462MHz<br>802.11n-40MHz: 2422-2452MHz<br>802.11a/n-20MHz: 5725-5825MHz<br>802.11n-40MHz: 5755-5795MHz<br>802.11ac: 5775MHz<br>WCDMA Band II: 1852.4 – 1907.6 MHz<br>WCDMA Band V: 826.4 – 846.6 MHz<br>LTE Band 2: 1850.7-1909.3MHz<br>LTE Band 4: 1710.7-1754.3MHz<br>LTE Band 5: 824.7-848.3MHz<br>LTE Band 12: 699.7-715.3MHz |
| <b>Type of modulation</b>        | BT BDR/EDR: GFSK, $\pi/4$ DQPSK, 8DPSK<br>BLE: GFSK<br>802.11b: DSSS (CCK, DQPSK, DBPSK)<br>802.11g: OFDM-CCK (BPSK, QPSK, 16QAM, 64QAM)<br>802.11a/n/ac: OFDM (BPSK, QPSK, 16QAM, 64QAM, 256QAM)<br>WCDMA: QPSK<br>LTE: QPSK, 16QAM                                                                                                                                                                       |
| <b>Equipment Class/ Category</b> | DSS, DTS, UNII, PCB                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Maximum output power</b>      | See test result                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Antenna Information</b>       | LDS antenna<br>P/N: 81XKAG15.G11<br>Peak Gain:<br>2.4GHz: 0.52 dBi, 5GHz: 1.79 dBi;<br>Cellular B2: 2.04 dBi; B4: 2.74 dBi; B5: -0.70 dBi; B12: -0.33 dBi.                                                                                                                                                                                                                                                 |
| <b>Clock Frequencies</b>         | 32.768 KHz, 12 MHz, 48 MHz                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Port/Connectors</b>           | Micro USB, CAN bus                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Input Power</b>               | Vehicle Battery powered: 12-24VDC                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Power Adapter Manu/Model</b>  | N/A                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Power Adapter SN</b>          | N/A                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Hardware version</b>          | N/A                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Software version</b>          | N/A                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Simultaneous Transmission</b> | BT, WLAN and WCDMA/LTE can transmit simultaneously                                                                                                                                                                                                                                                                                                                                                         |

|                       |                            |
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#### Additional Info

EUT is Hot Spot OBD dongle installed into vehicle resides passenger and light duty trucks that support OBD vehicle bus, it is a single box enclosure incorporating a processor, a GPS receiver, a wireless data modem in addition to WLAN, Bluetooth capabilities with vehicle-rated power supply and Vehicle bus interface.

|                       |                            |
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### 1.3 Test standard and method

|                      |                                                             |
|----------------------|-------------------------------------------------------------|
| <b>Test standard</b> | 47CFR Part 15.247                                           |
| <b>Test method</b>   | ANSI C63.10: 2013<br>558074 D01 15.247 Meas Guidance v05r02 |

### 1.4 Test Purpose and statement

The purpose of this test report is intended to demonstrate the compliance of product listed in section 1.2, received from company listed in section 1.1, to the requirements of standard and method listed in section 1.3. Based on our test results, we conclude that the product tested complies with the requirements of the standards indicated.

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## 2 Test site information

|                             |                                                 |
|-----------------------------|-------------------------------------------------|
| <b>Lab performing tests</b> | <b>Vista Laboratories</b>                       |
| <b>Lab Address</b>          | 1261 Puerta Del Sol, San Clemente, CA 92673 USA |
| <b>Phone Number</b>         | +1 (949) 393-1123                               |
| <b>Website</b>              | www.Vista-compliance.com                        |

| Test condition | Test Engineer | Test Environment        | Test Date               |
|----------------|---------------|-------------------------|-------------------------|
| RF conducted   | Bruce Li      | 23.5°C / 58.2%/996 mbar | 06/27/2019 – 07/11/2019 |
| Radiated       | Cameron Wu    | 23.5°C / 58.2%/996 mbar | 06/27/2019 – 07/11/2019 |

## 3 Modification of EUT

The EUT is an engineering test sample loaded with RF testing firmware specifically designed to support the RF TX/RX measurement in different aspects.

## 4 Test configuration and operation

### 4.1 EUT test configuration

EUT is powered by external DC power supply for testing purpose. EUT's RF antenna port is connected to spectrum analyzer through RF test cable for measurement. . The test software is used to set EUT to different transmission mode in terms of radio mode (WLAN, BLE), test channel, data rate, etc.

### 4.2 EUT test mode

| Radio      | Channel | Frequency (MHz) |
|------------|---------|-----------------|
| BT BDR/EDR | 0       | 2402            |
| BT BDR/EDR | 39      | 2441            |
| BT BDR/EDR | 78      | 2480            |

|                       |                            |
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### 4.3 Supporting Equipment

| Index | Description     | Model | S/N           | Brand | Remark |
|-------|-----------------|-------|---------------|-------|--------|
| 1     | DC Power Supply | DP712 | DP7B194900487 | RIGOL | N/A    |
|       |                 |       |               |       |        |
|       |                 |       |               |       |        |
|       |                 |       |               |       |        |
|       |                 |       |               |       |        |
|       |                 |       |               |       |        |

### 4.4 EUT setup diagram



### 4.5 EUT operation

The operation, control and display are done by the built-in buttons and OLED display.

### 4.6 Test software

| Index | Description                 | Remark                                                                                            |
|-------|-----------------------------|---------------------------------------------------------------------------------------------------|
| 1     | Qualcomm Radio Control Tool | To set EUT into continuous TX and RX mode under different modulation, data rate and channel, etc. |
| 2     | EMISoft Vasona 6.0049       | EMC/Spurious emission test software used during testing                                           |
|       |                             |                                                                                                   |
|       |                             |                                                                                                   |

|                       |                            |
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## 6 Test Summary

| FCC Rules                                      | ISED Rules       | Test Item                                                                  | Section | Verdict           |
|------------------------------------------------|------------------|----------------------------------------------------------------------------|---------|-------------------|
| §15.203                                        | -                | Antenna Requirement                                                        | 8.1     | Pass              |
| §15.207 (a)                                    | RSS-Gen §8.8     | AC Power Line Conducted Emissions                                          | N/A     | N/A <sup>1)</sup> |
| §15.247 (a)(1)                                 | RSS-247 §5.1, b) | 20 dB Bandwidth                                                            | 8.2     | Pass              |
| -                                              | RSS-Gen §6.7     | Occupied Bandwidth                                                         | 8.3     | Pass              |
| §15.247 (a)(1)                                 | RSS-247 §5.1, d) | Number of Hopping Channel                                                  | 8.4     | Pass              |
| §15.247(b)(2)                                  | RSS-247 §5.4, b) | Conducted Maximum Output Power                                             | 8.5     | Pass              |
| §15.247 (a)(1)                                 | RSS-247 §5.1, b) | Chanel Separation                                                          | 8.6     | Pass              |
| §15.247 (a)(1)                                 | RSS-247 §5.1, d) | Time of Occupancy                                                          | 8.7     | Pass              |
| §15.247(d)                                     | RSS-247 §5.5     | Conducted Band-Edge & Unwanted Emissions                                   | 8.8     | Pass              |
| §15.247 (a)(1),<br>§15.247 (g), §15.247<br>(h) | RSS-247 §5.1, a) | Frequency Hopping System Requirement                                       | 8.9     | Pass              |
| §15.205, §15.209,<br>§15.247(d)                | RSS-247 §5.5     | Radiated Emissions & Unwanted Emissions<br>into Restricted Frequency Bands | 8.10    | Pass              |

Note1: EUT is powered by Vehicle mains. It does not connect to public AC mains. This item is not applicable.

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## 7 Uncertainty of Measurement

| Test item                      | Measurement Uncertainty (dB) |
|--------------------------------|------------------------------|
| RF Output Power (Conducted)    | ±1.2 dB                      |
| Power Spectral Density         | ±0.9 dB                      |
| Unwanted Emission (conducted)  | ±2.6 dB                      |
| Occupied Channel Bandwidth     | ±5 %                         |
| Radiated Emission (9KHz-30MHz) | ±3.5 dB                      |
| Radiated Emission (30MHz-1GHz) | ±4.6 dB                      |
| Radiated Emission (1-18GHz)    | ±4.9 dB                      |
| Radiated Emission (18-40GHz)   | ±3.5 dB                      |

|                       |                            |
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## 8 Test summary and result

### 8.1 Antenna Requirement

#### 8.1.1 Requirement

Per § 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

#### 8.1.2 Result

Analysis:

- EUT uses LDS antenna.
- The LDS antenna which connect to the main board with unique spring loaded pins when is installed and attached to the main body. No standard RF connector or coupling is used.

Conclusion:

EUT complies with antenna requirement in § 15.203.

|                       |                            |
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## 8.2 20 dB Bandwidth

### 8.2.1 Requirement

Per § 15.247 (a) (1) (i), RSS-247 §5.1, b)

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

### 8.2.2 Test setup



### 8.2.3 Test Procedure

According to section 6.9.2, in ANSI C63.10-2013:

Measurement is made with the occupied bandwidth measurement function incorporated in spectrum analyzer. The following setting are used per ANSI C63.10-2013.

1. Set Center Frequency = Nominal EUT channel center frequency.
2. Set Span to be between two times and five times of the OBW.
3. RBW shall be in the range of 1% to 5% of the OBW, and VBW shall be approximately three times RBW.
4. Set detection mode to peak and trace mode to max hold.
5. Use the occupied bandwidth measurement function to place two markers, one at the lowest frequency and the other at the highest frequency of the envelope of the spectral display, such that each marker is at or slightly below the “-xx dB down amplitude” determined.
6. The occupied bandwidth shall be reported by providing plot(s) of the measuring instrument display; the plot axes and the scale units per division shall be clearly labelled. Tabular data may be reported in addition to the plot(s).

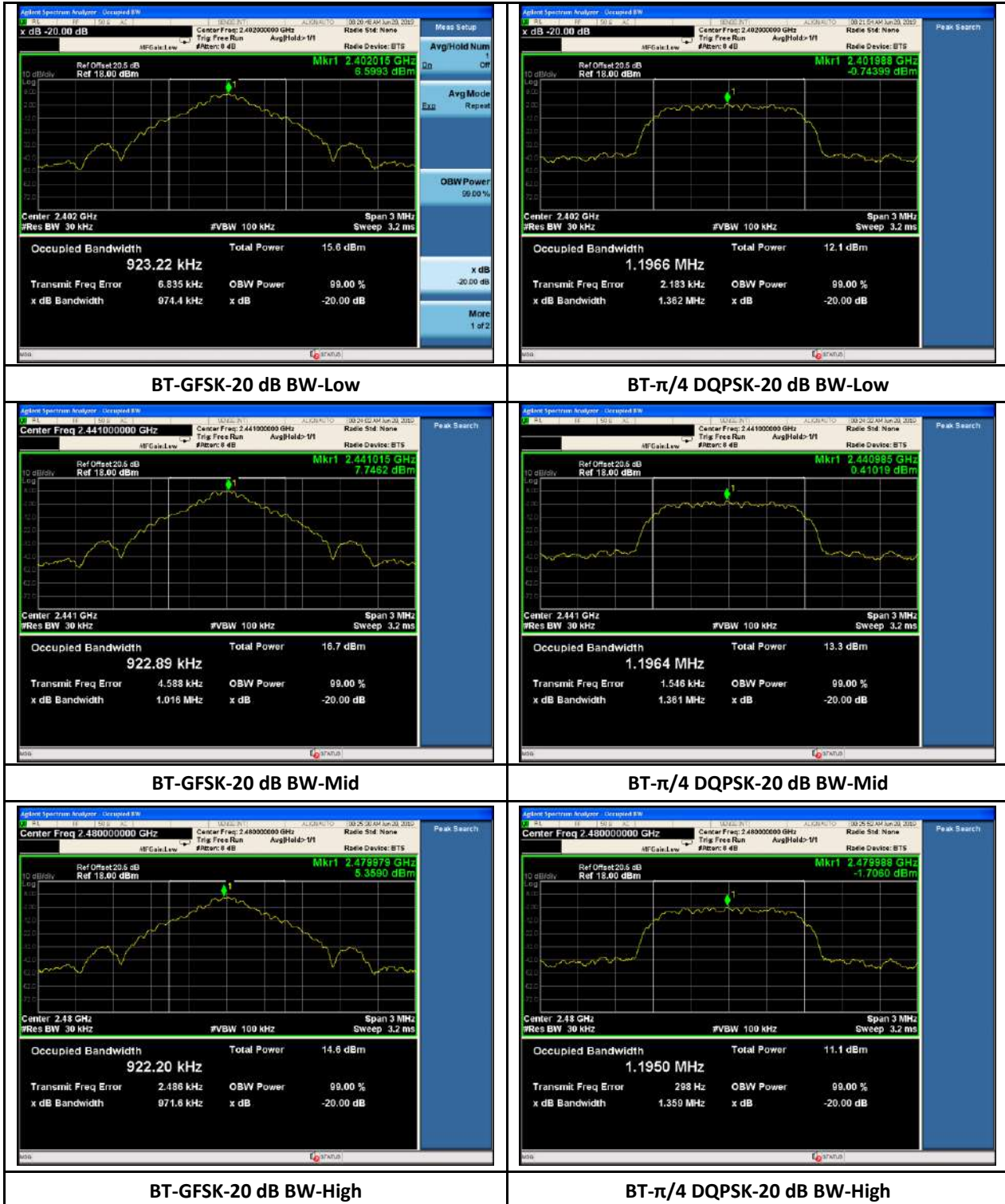
|                       |                            |
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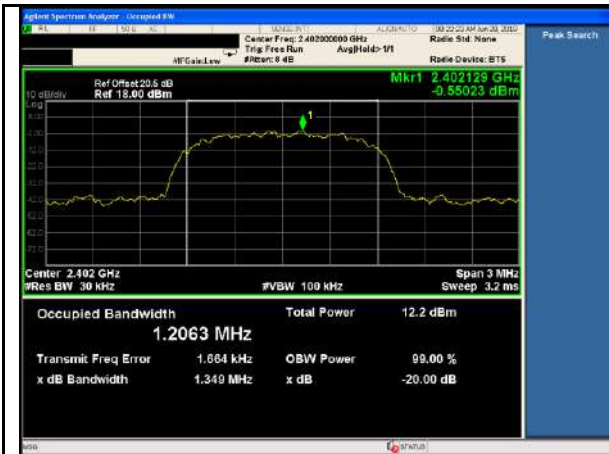


#### 8.2.4 Test Result

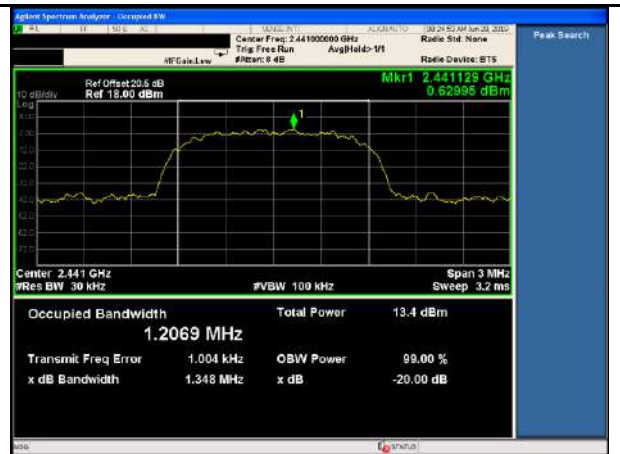
| Mode/<br>Bandwidth | Frequency (MHz) | Data rate | Measured<br>Bandwidth<br>(KHz) | Maximum<br>Bandwidth<br>(KHz) | Result |
|--------------------|-----------------|-----------|--------------------------------|-------------------------------|--------|
| BT-GFSK            | 2402            | 1Mbps     | 974.4                          | N/A                           | Pass   |
| BT-GFSK            | 2441            | 1Mbps     | 1016                           | N/A                           | Pass   |
| BT-GFSK            | 2480            | 1Mbps     | 971.6                          | N/A                           | Pass   |
| BT- $\pi/4$ DQPSK  | 2402            | 2Mbps     | 1362                           | N/A                           | Pass   |
| BT- $\pi/4$ DQPSK  | 2441            | 2Mbps     | 1361                           | N/A                           | Pass   |
| BT- $\pi/4$ DQPSK  | 2480            | 2Mbps     | 1359                           | N/A                           | Pass   |
| BT-8DPSK           | 2402            | 3Mbps     | 1349                           | N/A                           | Pass   |
| BT-8DPSK           | 2441            | 3Mbps     | 1348                           | N/A                           | Pass   |
| BT-8DPSK           | 2480            | 3Mbps     | 1349                           | N/A                           | Pass   |

## 8.2.5 Test Plots

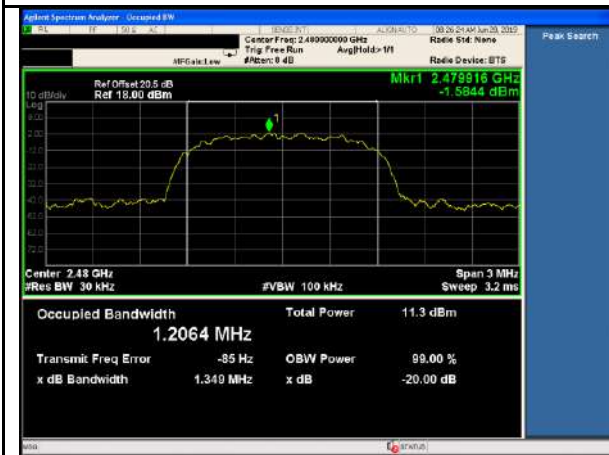




BT-8DPSK-20 dB BW-Low



BT-8DPSK-20 dB BW-Mid



BT-8DPSK-20 dB BW-High

|                       |                            |
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### 8.3 Occupied Bandwidth (99%)

#### 8.3.1 Requirement

RSS-Gen §6.7

The occupied bandwidth or the “99% emission bandwidth” is defined as the frequency range between two points, one above and the other below the carrier frequency, within which 99% of the total transmitted power of the fundamental transmitted emission is contained. The occupied bandwidth shall be reported for all equipment in addition to the specified bandwidth required in the applicable RSSs.

#### 8.3.2 Test setup



#### 8.3.3 Test Procedure

According to section RSS-Gen §6.7

The automatic bandwidth measurement capability of an instrument may be employed using the X dB bandwidth mode with X set to 6 dB, if the functionality described above (i.e., RBW = 100 kHz, VBW  $\geq 3 \times$  RBW, peak detector with maximum hold) is implemented by the instrumentation function. When using this capability, care shall be taken so that the bandwidth measurement is not influenced by any intermediate power nulls in the fundamental emission that might be  $\geq 6$  dB.

1. Set RBW = 1% to 5% of the actual occupied BW.
2. Set the video bandwidth (VBW)  $\geq 3 \times$  RBW.
3. Detector = Peak.
4. Trace mode = max hold.
5. Sweep = auto couple.
6. Span = large enough to capture all products of the modulation process
7. Allow the trace to stabilize.
8. Use automatic bandwidth measurement capability on instrument to obtain BW result.

|                       |                            |
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### 8.3.4 Test Result

| Mode/<br>Bandwidth | Frequency (MHz) | Data rate | Measured 99%<br>OBW (KHz) | Limit (KHz) | Result |
|--------------------|-----------------|-----------|---------------------------|-------------|--------|
| BT-GFSK            | 2402            | 1Mbps     | 923.22                    | N/A         | Pass   |
| BT-GFSK            | 2441            | 1Mbps     | 922.89                    | N/A         | Pass   |
| BT-GFSK            | 2480            | 1Mbps     | 922.20                    | N/A         | Pass   |
| BT- $\pi/4$ DQPSK  | 2402            | 2Mbps     | 1196.6                    | N/A         | Pass   |
| BT- $\pi/4$ DQPSK  | 2441            | 2Mbps     | 1196.4                    | N/A         | Pass   |
| BT- $\pi/4$ DQPSK  | 2480            | 2Mbps     | 1195.0                    | N/A         | Pass   |
| BT-8DPSK           | 2402            | 3Mbps     | 1206.3                    | N/A         | Pass   |
| BT-8DPSK           | 2441            | 3Mbps     | 1206.9                    | N/A         | Pass   |
| BT-8DPSK           | 2480            | 3Mbps     | 1206.4                    | N/A         | Pass   |

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| <b>Model Number:</b>  | LMU3240LAW                 |



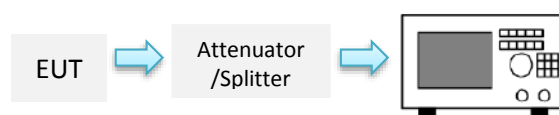
## 8.4 Number of Hopping Channel

### 8.4.1 Requirement

Per § 15.247 (a) (1) (iii), RSS-247 §5.1, d)

Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

### 8.4.2 Test setup



### 8.4.3 Test Procedure

According to section 7.8.3, in ANSI C63.10-2013:

Measurement is made with spectrum analyzer. The following setting is used.

1. Set Span to be the frequency band of operation.
2. Set RBW to less 30% of the channel spacing or the 20 dB bandwidth, whichever is smaller.
3. VBW  $\geq$  RBW.
4. Sweep: Auto.
5. Detector function: Peak.
6. Trace: Max hold.
7. Allow the trace to stabilize.

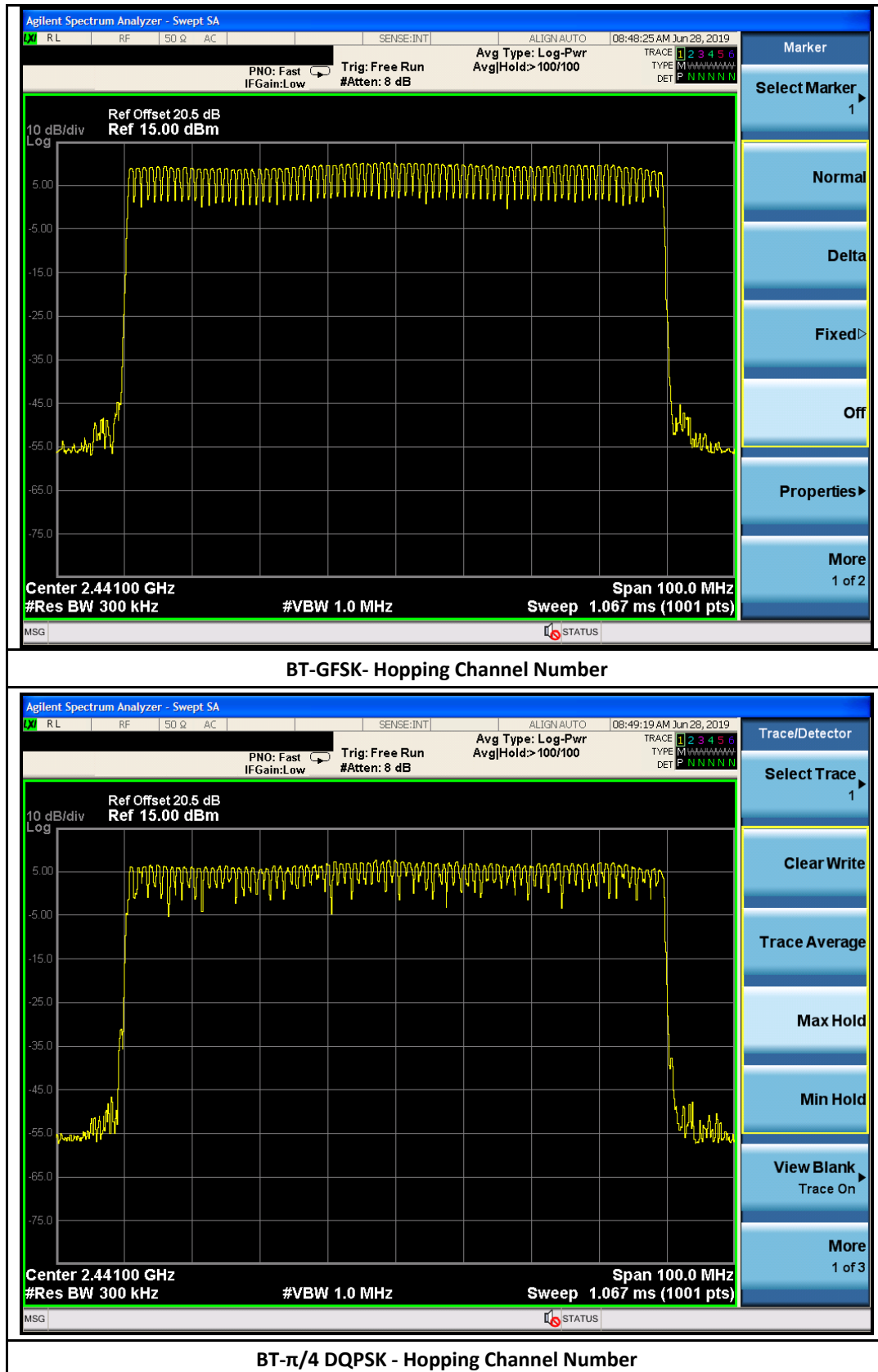
|                       |                            |
|-----------------------|----------------------------|
| <b>Report Number:</b> | CMP-19061922-LC-FCC-IC-DSS |
| <b>Product:</b>       | HotSpot OBD Dongle         |
| <b>Model Number:</b>  | LMU3240LAW                 |

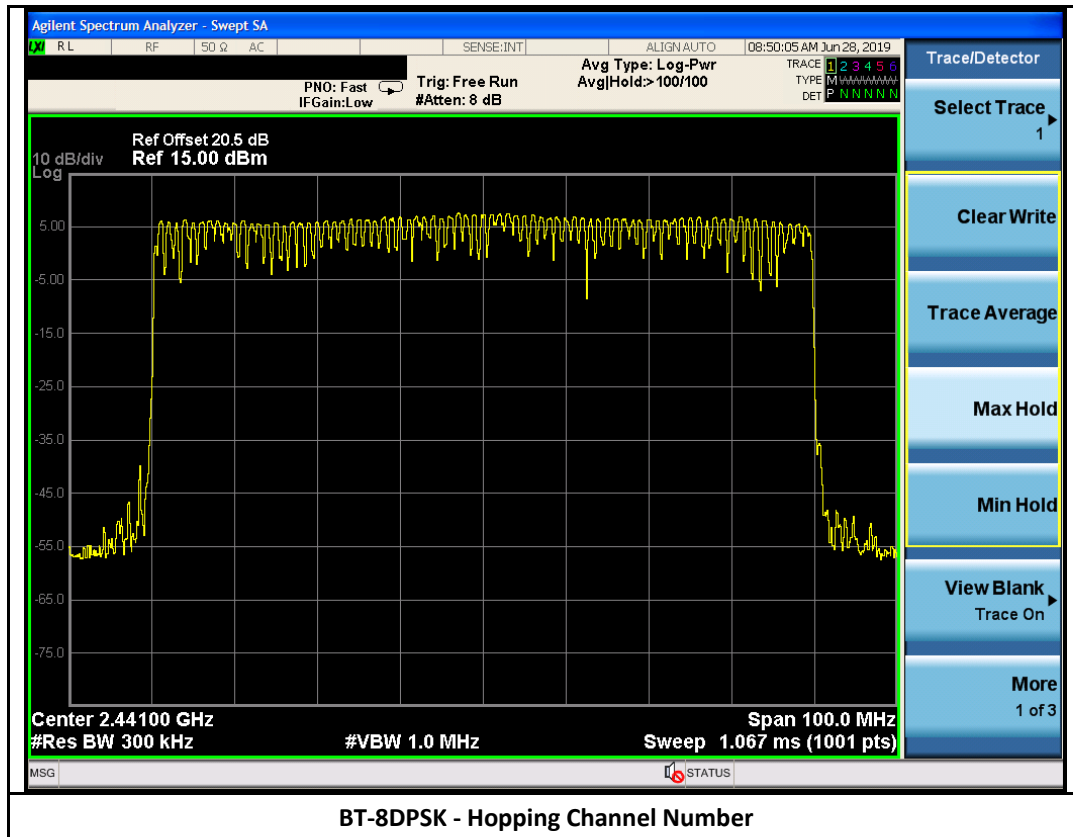


#### 8.4.4 Test Result

| Mode/<br>Bandwidth | Frequency (MHz) | Data rate | Channel<br>Number | Minimum<br>Limit | Result |
|--------------------|-----------------|-----------|-------------------|------------------|--------|
| BT-GFSK            | 2441            | 1Mbps     | 79                | 15               | Pass   |
| BT- $\pi/4$ DQPSK  | 2441            | 2Mbps     | 79                | 15               | Pass   |
| BT-8DPSK           | 2441            | 3Mbps     | 79                | 15               | Pass   |

#### 8.4.5 Test Plots





|                       |                            |
|-----------------------|----------------------------|
| <b>Report Number:</b> | CMP-19061922-LC-FCC-IC-DSS |
| <b>Product:</b>       | HotSpot OBD Dongle         |
| <b>Model Number:</b>  | LMU3240LAW                 |



## 8.5 Maximum Output Power

### 8.5.1 Requirement

Per § 15.247 (a)(1), RSS-247 §5.4, b)

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

Per § 15.247 (b)(1), For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts.

### 8.5.2 Test setup



### 8.5.3 Test Procedure

According to section 7.8.5 of ANSI C63.10-2013. The measurement was made with EUT directly connected to spectrum analyzer. The following setting is used.

1. Set the RBW > 20 dB BW
2. Set VBW ≥ RBW.
3. Set span to approximately five times the 20 dB bandwidth, centered on a hopping channel.
4. Sweep time = auto couple.
5. Detector = peak.
6. Trace mode = max hold.
7. Allow trace to fully stabilize.
8. Use peak marker function to determine the peak amplitude level.

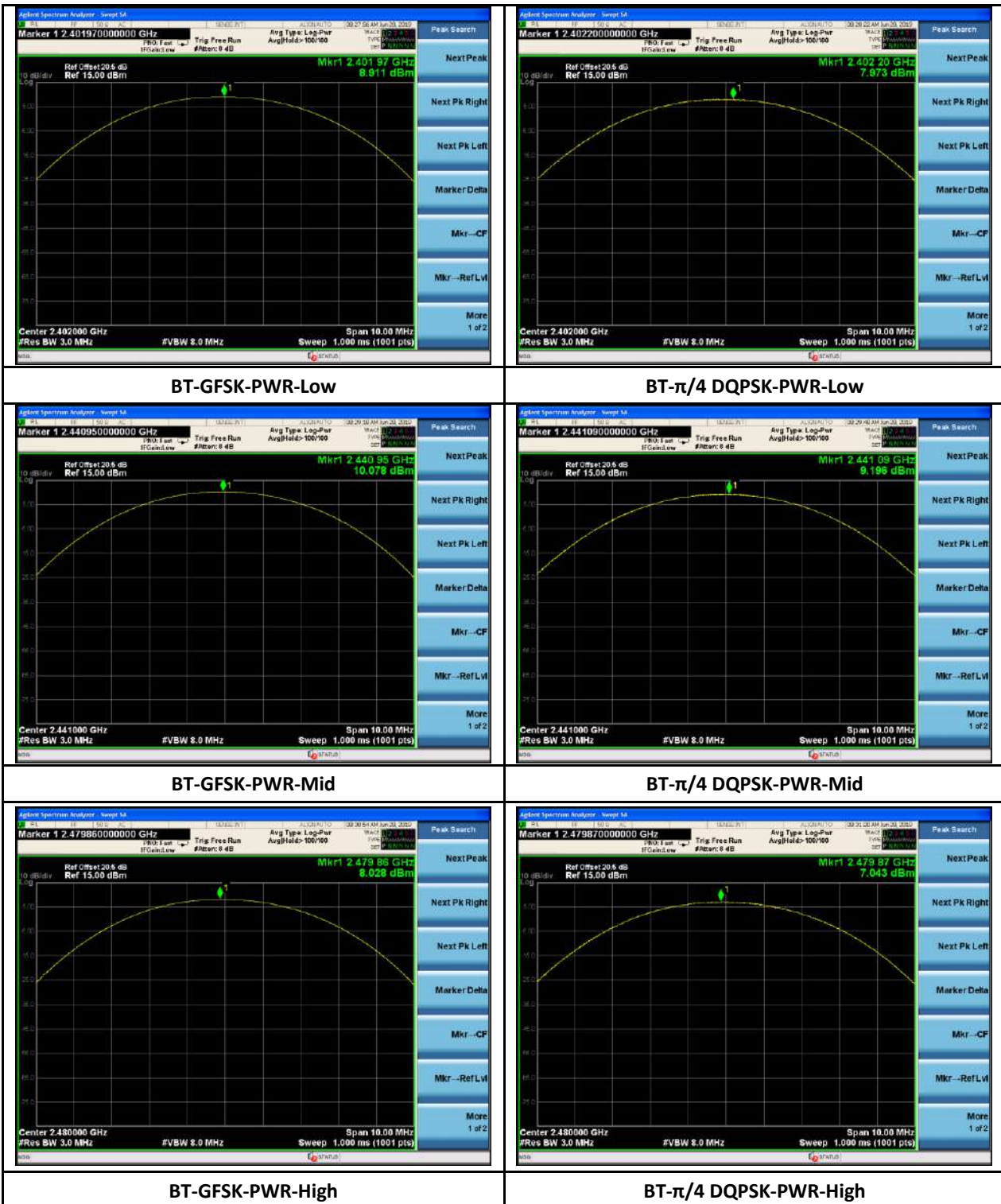
|                       |                            |
|-----------------------|----------------------------|
| <b>Report Number:</b> | CMP-19061922-LC-FCC-IC-DSS |
| <b>Product:</b>       | HotSpot OBD Dongle         |
| <b>Model Number:</b>  | LMU3240LAW                 |



#### 8.5.4 Test Result

| Mode/<br>Bandwidth | Frequency (MHz) | Data rate | Measured<br>Output Power<br>(dBm) | Maximum<br>Output<br>Power<br>(dBm) | Result |
|--------------------|-----------------|-----------|-----------------------------------|-------------------------------------|--------|
| BT-GFSK            | 2402            | 1Mbps     | 8.911                             | 21                                  | Pass   |
| BT-GFSK            | 2440            | 1Mbps     | 10.078                            | 21                                  | Pass   |
| BT-GFSK            | 2480            | 1Mbps     | 8.028                             | 21                                  | Pass   |
| BT- $\pi/4$ DQPSK  | 2402            | 2Mbps     | 7.973                             | 21                                  | Pass   |
| BT- $\pi/4$ DQPSK  | 2440            | 2Mbps     | 9.196                             | 21                                  | Pass   |
| BT- $\pi/4$ DQPSK  | 2480            | 2Mbps     | 7.043                             | 21                                  | Pass   |
| BT-8DPSK           | 2402            | 3Mbps     | 8.138                             | 21                                  | Pass   |
| BT-8DPSK           | 2440            | 3Mbps     | 9.318                             | 21                                  | Pass   |
| BT-8DPSK           | 2480            | 3Mbps     | 7.238                             | 21                                  | Pass   |

### 8.5.5 Test Plots





BT-8DPSK-PWR-Low



BT-8DPSK-PWR-Mid



BT-8DPSK-PWR-High

|                       |                            |
|-----------------------|----------------------------|
| <b>Report Number:</b> | CMP-19061922-LC-FCC-IC-DSS |
| <b>Product:</b>       | HotSpot OBD Dongle         |
| <b>Model Number:</b>  | LMU3240LAW                 |



## 8.6 Channel Separation

### 8.6.1 Requirement

Per § 15.247 (a) (1), RSS-247 §5.1, b)

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

### 8.6.2 Test setup



### 8.6.3 Test Procedure

According to section 7.8.2 of ANSI C63.10-2013. The measurement was made with spectrum analyzer. The following setting is used.

1. Set Span to wide enough to capture the peaks of two adjacent channels.
2. RBW: Start with the RBW set to approximately 30% of the channel spacing
3. VBW  $\geq$  RBW.
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Use the peak marker function to determine separation between the peaks of adjacent channels.

|                       |                            |
|-----------------------|----------------------------|
| <b>Report Number:</b> | CMP-19061922-LC-FCC-IC-DSS |
| <b>Product:</b>       | HotSpot OBD Dongle         |
| <b>Model Number:</b>  | LMU3240LAW                 |



#### 8.6.4 Test Result

| Mode/<br>Bandwidth | Frequency (MHz) | Data rate | Channel<br>Separation<br>(KHz) | 2/3 of 20 dB<br>Bandwidth<br>(KHz) | Result |
|--------------------|-----------------|-----------|--------------------------------|------------------------------------|--------|
| BT-GFSK            | 2402            | 1Mbps     | 1005                           | 649.60                             | Pass   |
| BT-GFSK            | 2441            | 1Mbps     | 990                            | 677.33                             | Pass   |
| BT-GFSK            | 2480            | 1Mbps     | 995                            | 647.73                             | Pass   |
| BT- $\pi/4$ DQPSK  | 2402            | 2Mbps     | 1010                           | 908.00                             | Pass   |
| BT- $\pi/4$ DQPSK  | 2441            | 2Mbps     | 1005                           | 907.33                             | Pass   |
| BT- $\pi/4$ DQPSK  | 2480            | 2Mbps     | 1010                           | 906.00                             | Pass   |
| BT-8DPSK           | 2402            | 3Mbps     | 1060                           | 899.33                             | Pass   |
| BT-8DPSK           | 2441            | 3Mbps     | 1005                           | 898.67                             | Pass   |
| BT-8DPSK           | 2480            | 3Mbps     | 1005                           | 899.33                             | Pass   |

### 8.6.5 Test Plots



BT-GFSK-Channel Separation-Low



BT- $\pi/4$  DQPSK-Channel Separation-Low



BT-GFSK-Channel Separation-Mid



BT- $\pi/4$  DQPSK-Channel Separation-Mid



BT-GFSK-Channel Separation-High



BT- $\pi/4$  DQPSK-Channel Separation-High



BT-8DPSK-Channels Separation-Low



BT-8DPSK-Channels Separation-Mid



BT-8DPSK-Channels Separation-High

|                       |                            |
|-----------------------|----------------------------|
| <b>Report Number:</b> | CMP-19061922-LC-FCC-IC-DSS |
| <b>Product:</b>       | HotSpot OBD Dongle         |
| <b>Model Number:</b>  | LMU3240LAW                 |



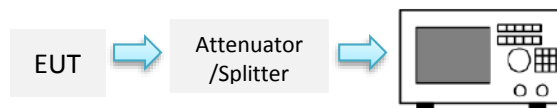
## 8.7 Time of Occupancy

### 8.7.1 Requirement

Per § 15.247 (a) (1) (iii), RSS-247 §5.1, d)

The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

### 8.7.2 Test setup



### 8.7.3 Test Procedure

According to section 7.8.4 of ANSI C63.10-2013. The measurement was made with spectrum analyzer. The following setting is used.

1. Set Span to zero, centered on a hopping channel.
2. RBW shall be  $\leq$  channel spacing.
3. VBW  $\geq$  RBW.
5. Detector = peak.
6. Sweep time = auto couple. As necessary to capture the entire dwell time per hopping channel; where possible use a video trigger and trigger delay so that the transmitted signal starts a little to the right of the start of the plot. The trigger level might need slight adjustment to prevent triggering when the system hops on an adjacent channel; a second plot might be needed with a longer sweep time to show two successive hops on a channel.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Use the marker-delta function to determine the transmit time per hop.

|                       |                            |
|-----------------------|----------------------------|
| <b>Report Number:</b> | CMP-19061922-LC-FCC-IC-DSS |
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| <b>Model Number:</b>  | LMU3240LAW                 |



#### 8.7.4 Test Result

| Mode/<br>Bandwidth | Frequency<br>(MHz) | Data rate | Packet | Burst Width<br>(ms/hop/ch) | Dwell Time<br>(s) | Limit (s) | Result |
|--------------------|--------------------|-----------|--------|----------------------------|-------------------|-----------|--------|
| BT-GFSK            | 2402               | 1Mbps     | DH1    | 0.3776                     | 0.121             | ≤0.4      | Pass   |
| BT-π/4 DQPSK       | 2402               | 1Mbps     | 2DH3   | 1.626                      | 0.260             | ≤0.4      | Pass   |
| BT-8DPSK           | 2402               | 1Mbps     | 3DH5   | 2.872                      | 0.306             | ≤0.4      | Pass   |

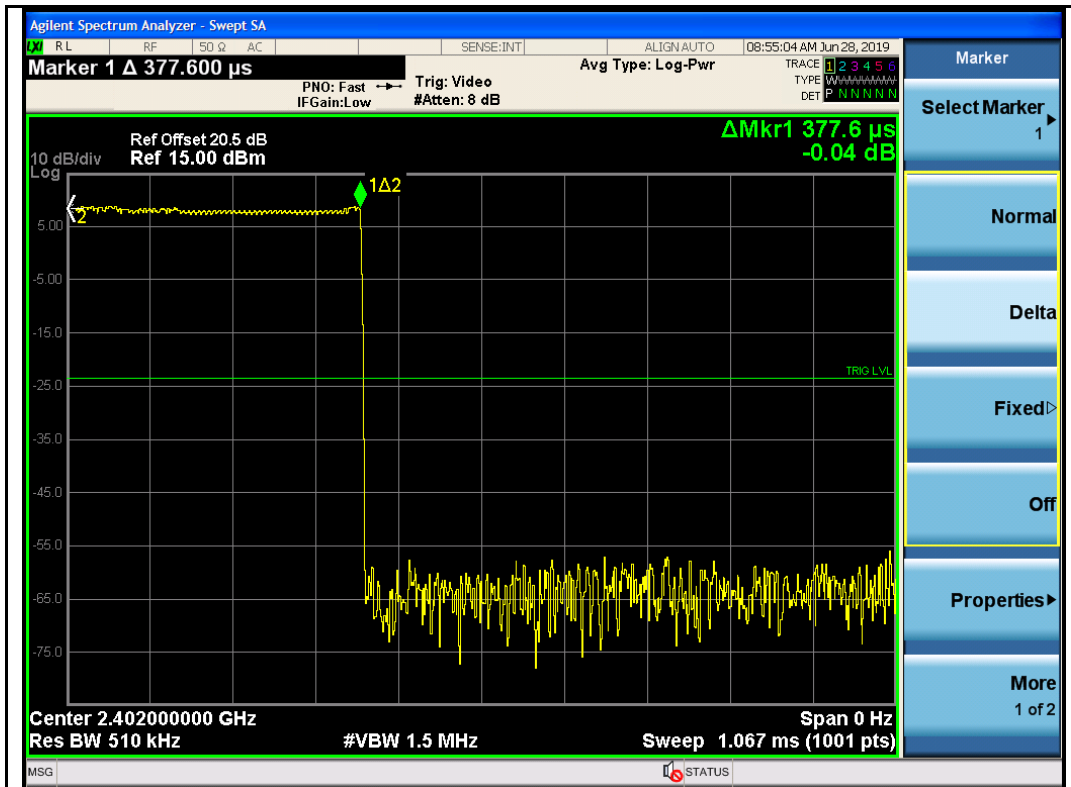
The test period:  $T=0.4 \text{ second} / \text{channel} * 79 \text{ channels} = 31.6 \text{ s}$

DH1 Dwell time = Burst Width (ms) \*  $(1600 / (2 * 79)) * 31.6$

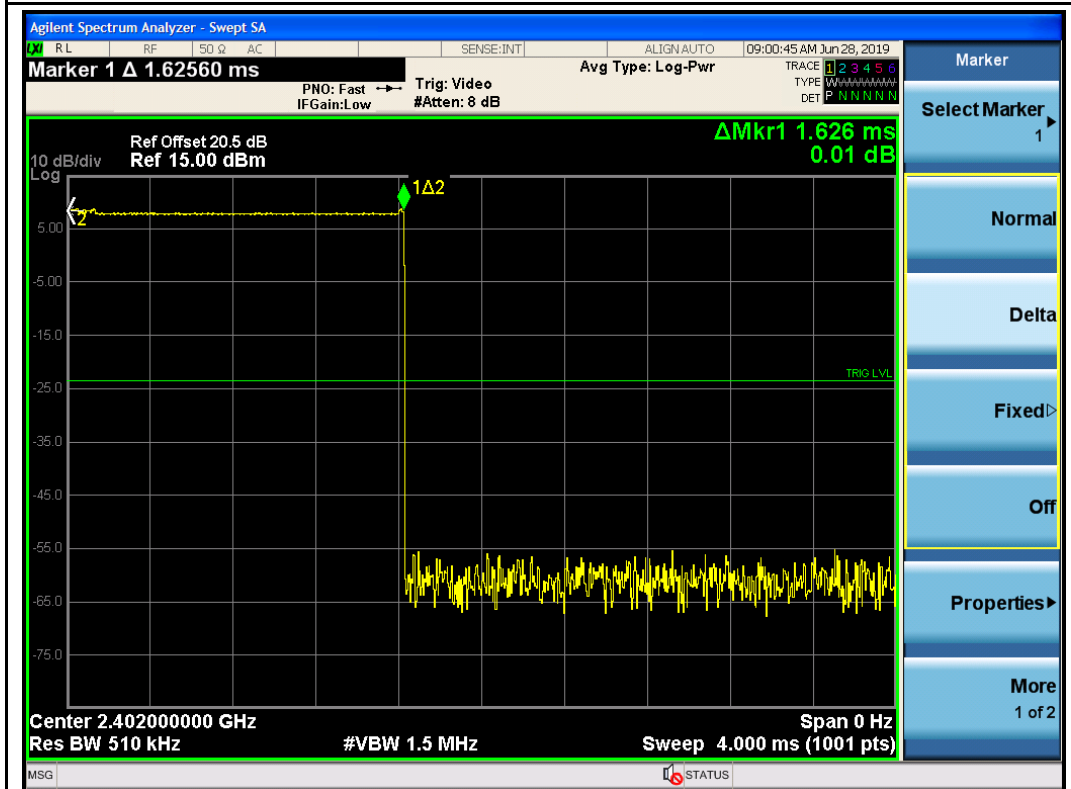
DH3 Dwell time = Burst Width (ms) \*  $(1600 / (4 * 79)) * 31.6$

DH5 Dwell time = Burst Width (ms) \*  $(1600 / (6 * 79)) * 31.6$

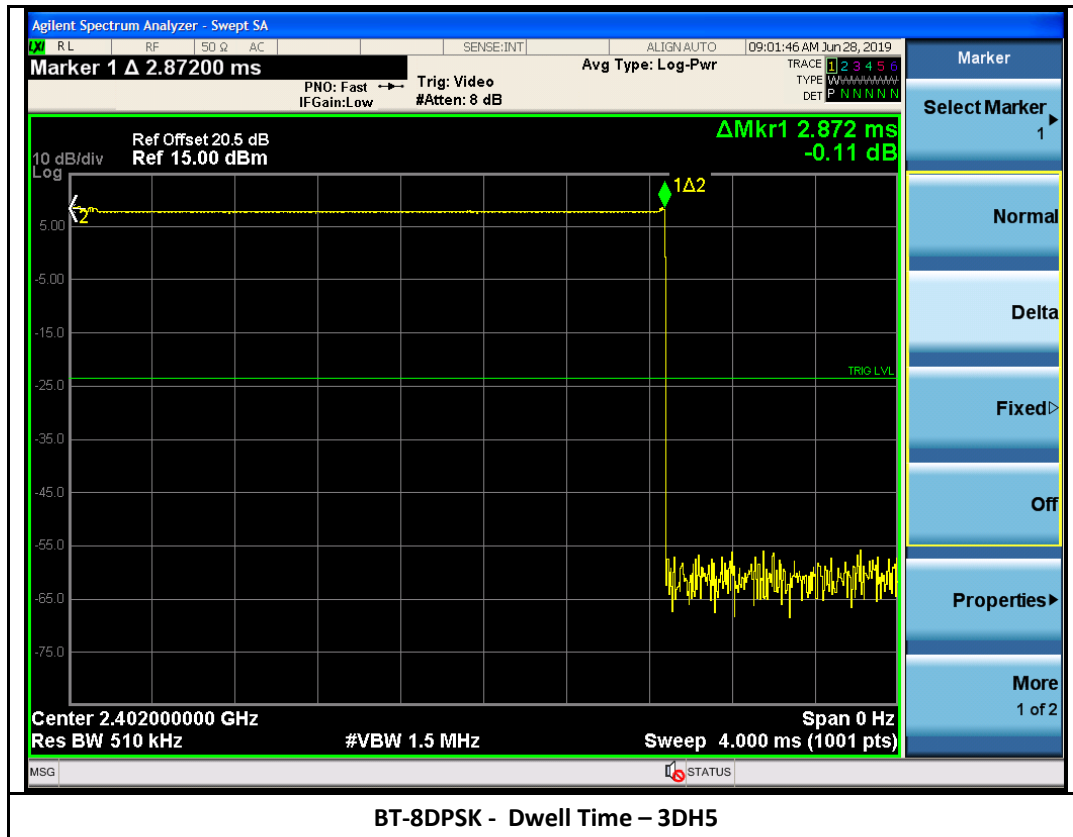
### 8.7.5 Test Plots



BT-GFSK- Dwell Time – DH1



BT- $\pi/4$  DQPSK - Dwell Time – 2DH3



|                       |                            |
|-----------------------|----------------------------|
| <b>Report Number:</b> | CMP-19061922-LC-FCC-IC-DSS |
| <b>Product:</b>       | HotSpot OBD Dongle         |
| <b>Model Number:</b>  | LMU3240LAW                 |



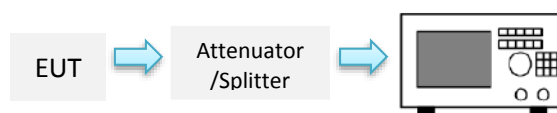
## 8.8 Conducted Band-Edge & Unwanted Emissions Measurement

### 8.8.1 Requirement

Per § 15.247 (d), 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.

### 8.8.2 Test setup



### 8.8.3 Test Procedure

According to section 7.8.8 of ANSI C63.10-2013.

Connect the primary antenna port through an attenuator to the spectrum analyzer input; in the results, account for all losses between the unlicensed wireless device output and the spectrum analyzer. The instrument shall span 30 MHz to 10 times the operating frequency in GHz, with a resolution bandwidth of 100 kHz, video bandwidth of 300 kHz, and a coupled sweep time with a peak detector. The band 30 MHz to the highest frequency may be split into smaller spans, as long as the entire spectrum is covered. The following setting is used.

### 8.8.4 Test Result

See test plots

## 8.8.5 Test Plots



BT-GFSK-Band Edge-Low-Non hopping



BT-GFSK-Band Edge-Low-Hopping



BT-GFSK-Band Edge-High-Non hopping



BT-GFSK-Band Edge-High-Hopping



BT- $\pi/4$  DQPSK-Band Edge-Low-Non hopping



BT- $\pi/4$  DQPSK-Band Edge-Low-Hopping



BT- $\pi/4$  DQPSK-Band Edge-High-Non hopping



BT- $\pi/4$  DQPSK-Band Edge-High-Hopping



BT-8DPSK-Band Edge-Low-Non hopping



BT-8DPSK-Band Edge-Low-Hopping



BT-8DPSK-Band Edge-High-Non hopping



BT-8DPSK-Band Edge-High-Hopping

Report Number: CMP-19061922-LC-FCC-IC-DSS  
 Product: HotSpot OBD Dongle  
 Model Number: LMU3240LAW



BT-GFSK-CSE-Low



BT- $\pi/4$  DQPSK-CSE-Low



BT-GFSK-CSE-Mid



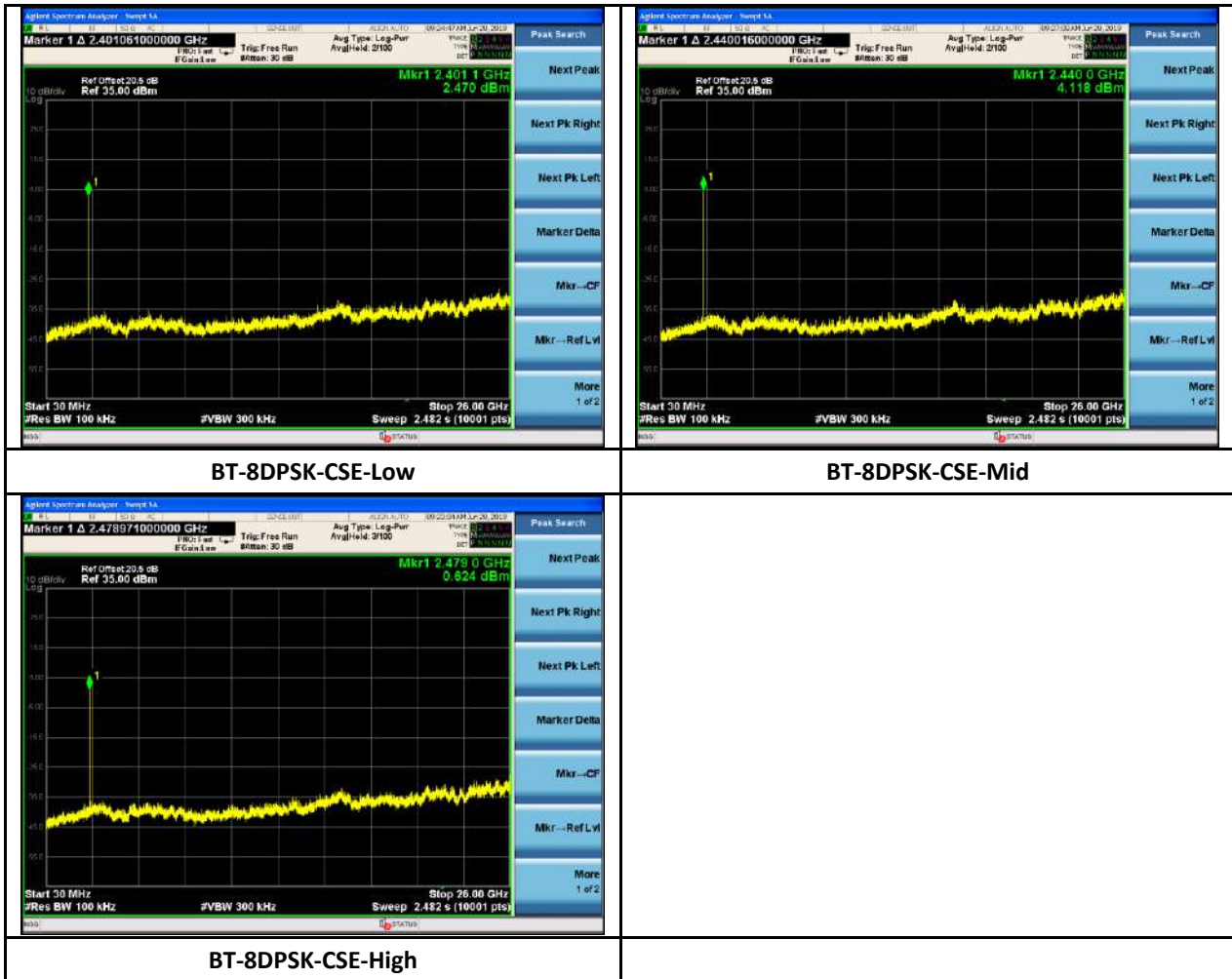
BT- $\pi/4$  DQPSK-CSE-Mid



BT-GFSK-CSE-High



BT- $\pi/4$  DQPSK-CSE-High



|                       |                            |
|-----------------------|----------------------------|
| <b>Report Number:</b> | CMP-19061922-LC-FCC-IC-DSS |
| <b>Product:</b>       | HotSpot OBD Dongle         |
| <b>Model Number:</b>  | LMU3240LAW                 |



## 8.9 Frequency Hopping System Requirement

### 8.9.1 Requirement

Per § 15.247 (a) (1), RSS-247 §5.1, a)

the system shall hop to channel frequencies that are selected at the system hopping rate from a pseudo randomly ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

Per § 15.247 (g), frequency hopping spread spectrum systems are not required to employ all available hopping channels during each transmission. However, the system, consisting of both the transmitter and the receiver, must be designed to comply with all of the regulations in this section should the transmitter be presented with a continuous data (or information) stream. In addition, a system employing short transmission bursts must comply with the definition of a frequency hopping system and must distribute its transmissions over the minimum number of hopping channels specified in this section.

Per § 15.247 (h), the incorporation of intelligence within a frequency hopping spread spectrum system that permits the system to recognize other users within the spectrum band so that it individually and independently chooses and adapts its hopsets to avoid hopping on occupied channels is permitted. The coordination of frequency hopping systems in any other manner for the express purpose of avoiding the simultaneous occupancy of individual hopping frequencies by multiple transmitters is not permitted.

### 8.9.2 Result

#### Analysis:

This device uses Bluetooth radio which operates in 2400-2483.5 MHz band. Bluetooth uses a radio technology called frequency-hopping spread spectrum, which chops up the data being sent and transmits chunks of it on up to 79 bands (1 MHz each; centered from 2402 to 2480MHz) in the range 2,400-2,483.5MHz. The transmitter switches hop frequencies 1,600 times per second to assure a high degree of data security. All Bluetooth devices participating in a given piconet are synchronized to the frequency-hopping channel for the piconet. The frequency hopping sequence is determined by the master's device address and the phase of the hopping sequence (the frequency to hop at a specific time) is determined by the master's internal clock. Therefore, all slaves in a piconet must know the master's device address and must synchronize their clocks with the master's clock.

Adaptive Frequency Hopping (AFH) was introduced in the Bluetooth specification to provide an effective way for a Bluetooth radio to counteract normal interference. AFH identifies "bad" channels, where either other wireless devices are interfering with the Bluetooth signal or the Bluetooth signal is interfering with another device. The AFH-enabled Bluetooth device will then communicate with other devices within its piconet to share details of any identified bad

channels. The devices will then switch to alternative available "good" channels, away from the areas of interference, thus having no impact on the bandwidth used.

|                       |                            |
|-----------------------|----------------------------|
| <b>Report Number:</b> | CMP-19061922-LC-FCC-IC-DSS |
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| <b>Model Number:</b>  | LMU3240LAW                 |



This device was tested with an Bluetooth system receiver to check that the device maintained hopping synchronization, and the device complied with these requirements for DA 00-705 and FCC Part 15.247 rule.

An example of Pseudorandom Frequency Hopping Sequence Table as below:

08, 24, 40, 56, 40, 56, 72, 09, 01, 09, 33, 41, 33, 41, 65, 73, 53, 69, 06, 22, 04, 20, 36, 52, 38, 46, 70, 78, 68, 76, 21, 29, 10, 26, 42, 58, 44, 60, 76, 13, 03, 11, 35, 43, 37, 45, 69, 77, 55, 71, 08, 24, 08, 24, 40, 56, 40, 48, 72, 01, 72, 01, 25, 33, 12, 28, 44, 60, 42, 58, 74, 11, 05, 13, 37, 45 etc.

The system receiver has input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shift frequencies in synchronization with the transmitted signals.

### **Conclusion:**

EUT complies with frequency hopping system requirement in § 15.247.

## 8.10 Radiated Band-Edge & Spurious Emissions into Restricted Frequency Bands

### 8.10.1 Requirement

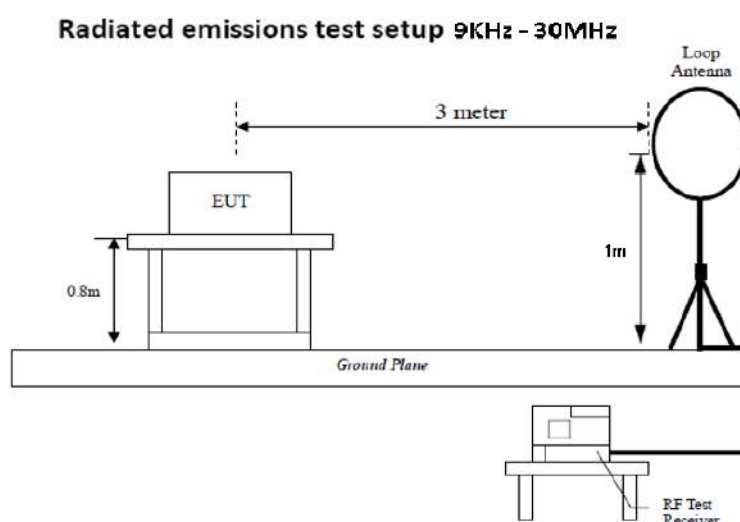
§ 15.247 (d), RSS-247 §5.5

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, the attenuation required under this paragraph shall be 30 dB instead of 20 dB.

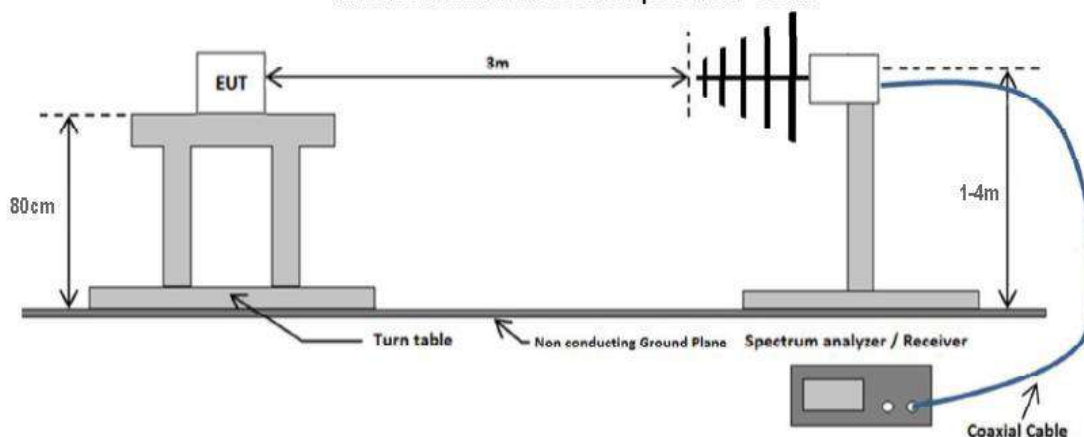
Attenuation below the general limits specified in §15.209(a) and RSS-Gen is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

| Frequency range (MHz) | Field Strength ( $\mu\text{V}/\text{m}$ ) |
|-----------------------|-------------------------------------------|
| 0.009~0.490           | 2400/F(KHz)                               |
| 0.490~1.705           | 24000/F(KHz)                              |
| 1.705~30.0            | 30                                        |
| 30 – 88               | 100                                       |
| 88 – 216              | 150                                       |
| 216 960               | 200                                       |
| Above 960             | 500                                       |

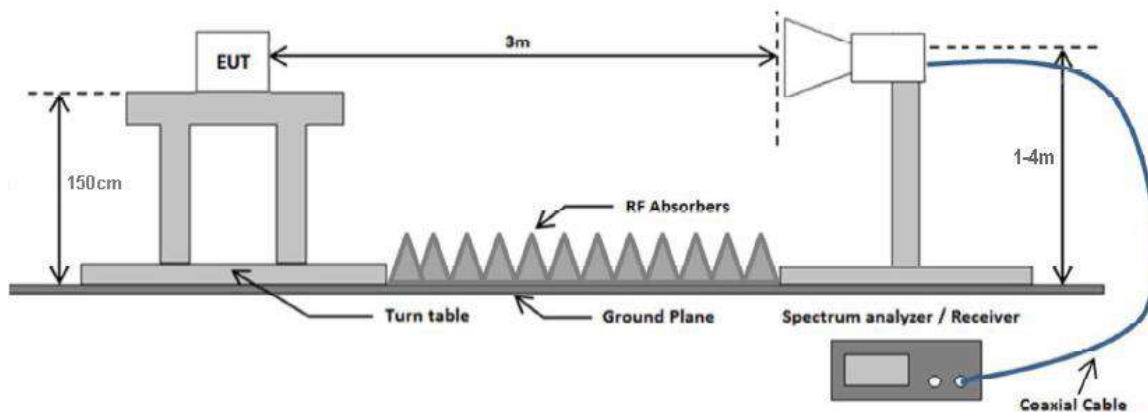
### 8.10.2 Test setup



**Radiated emissions test setup 30 MHz - 1 GHz**



**Radiated emissions test setup above 1 GHz**



|                       |                            |
|-----------------------|----------------------------|
| <b>Report Number:</b> | CMP-19061922-LC-FCC-IC-DSS |
| <b>Product:</b>       | HotSpot OBD Dongle         |
| <b>Model Number:</b>  | LMU3240LAW                 |



### 8.10.3 Test Procedure

According to section 8.6 in KDB 558074 D01 DTS Meas Guidance v05r02 and subclause 11.12.2.7 Radiated spurious emission measurements in ANSI C62.10-2013 as well as the procedures for maximizing and measuring radiated emissions that are described in ANSI C63.10 was followed. Boresight antenna mast was used during the scanning to point to EUT to maximize the emission. The process will be repeated in 3 EUT orientations.

1. The EUT was switched on and allowed to warm up to its normal operating condition.
2. The test was carried out at the selected frequency points obtained from the EUT characterization. Maximization of the emissions, was carried out by rotating the EUT, changing the antenna polarization, and adjusting the antenna height in the following manner:
  - a. Vertical or horizontal polarization (whichever gave the higher emission level over a full rotation of the EUT) was chosen.
  - b. The EUT was then rotated to the direction that gave the maximum emission.
  - c. Finally, the antenna height was adjusted to the height that gave the maximum emission.
3. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 300 Hz for frequency below 150KHz.
4. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 10 kHz for frequency between 150KHz – 30MHz.
5. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasi-Peak detection at frequency between 30MHz - 1GHz.
6. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 3MHz with Peak detection for Peak and average measurement at frequency above 1GHz.
7. Steps 2 and 3 were repeated for the next frequency point, until all selected frequency points were measured.

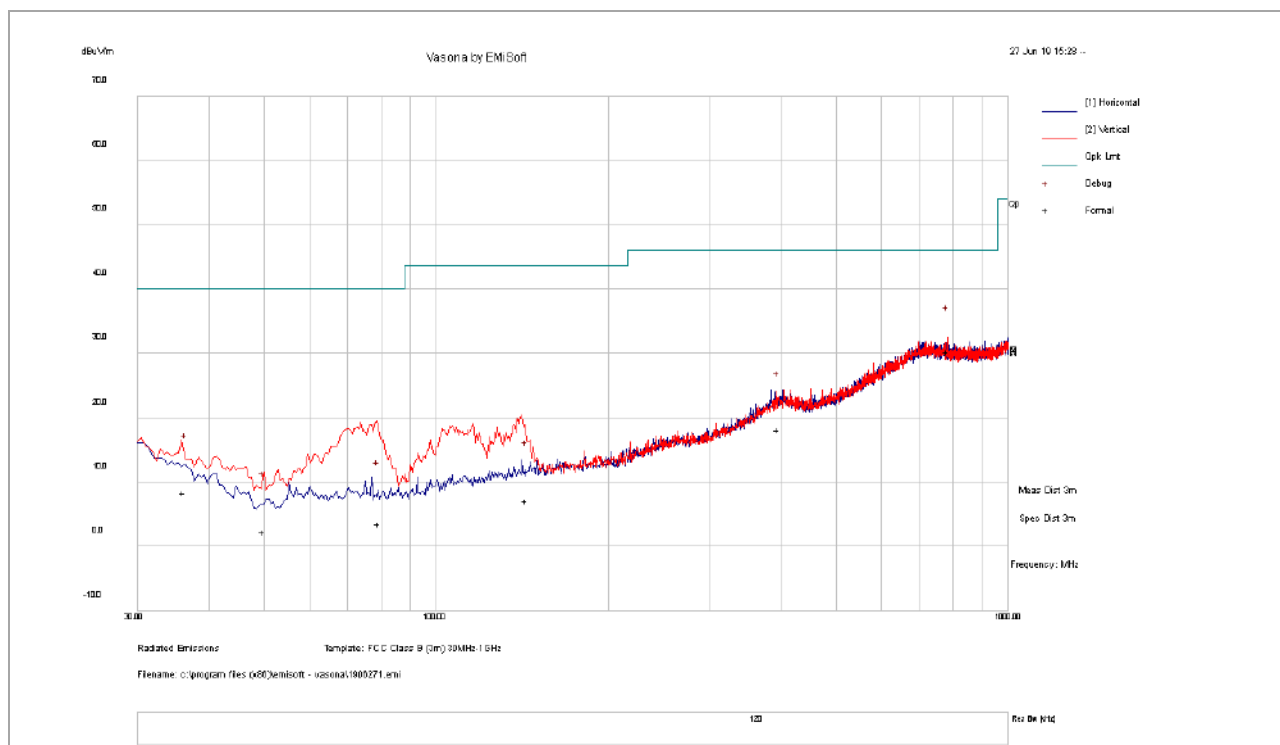
|                       |                            |
|-----------------------|----------------------------|
| <b>Report Number:</b> | CMP-19061922-LC-FCC-IC-DSS |
| <b>Product:</b>       | HotSpot OBD Dongle         |
| <b>Model Number:</b>  | LMU3240LAW                 |



## 8.10.4 Test Result

### 30-1000MHz test result

|                               |                  |                        |            |
|-------------------------------|------------------|------------------------|------------|
| <b>Test Standard:</b>         | 15.209, 15.247   | <b>Mode:</b>           | BDR mode   |
| <b>Frequency Range:</b>       | 30-1000MHz       | <b>Test Date:</b>      | 06/27/2019 |
| <b>Antenna Type/Polarity:</b> | Bi-Log/Hor & Ver | <b>Test Personnel:</b> | Cameron Wu |
| <b>Remark:</b>                | N/A              | <b>Test Result:</b>    | Pass       |



| Frequency MHz | Raw dB | Cable dB | AF dB  | Level dBuV/m | Det | Pol deg | Height cm | Table deg | Limit dBuV/m | Margin dB |
|---------------|--------|----------|--------|--------------|-----|---------|-----------|-----------|--------------|-----------|
| 783.67        | 29.83  | 7.25     | -6.71  | 30.37        | QP  | V       | 400       | 122       | 46           | -15.63    |
| 395.55        | 25.45  | 6.34     | -13.65 | 18.14        | QP  | H       | 158       | 32        | 46           | -27.86    |
| 36.15         | 24.18  | 2.43     | -18.27 | 8.35         | QP  | H       | 387       | 88        | 40           | -31.65    |
| 79.21         | 24.84  | 3.30     | -24.58 | 3.57         | QP  | H       | 341       | 97        | 40           | -36.43    |
| 143.63        | 25.61  | 4.17     | -22.64 | 7.14         | QP  | H       | 126       | 44        | 44           | -36.36    |
| 49.76         | 24.04  | 2.79     | -24.46 | 2.36         | QP  | H       | 232       | 140       | 40           | -37.64    |

Note:

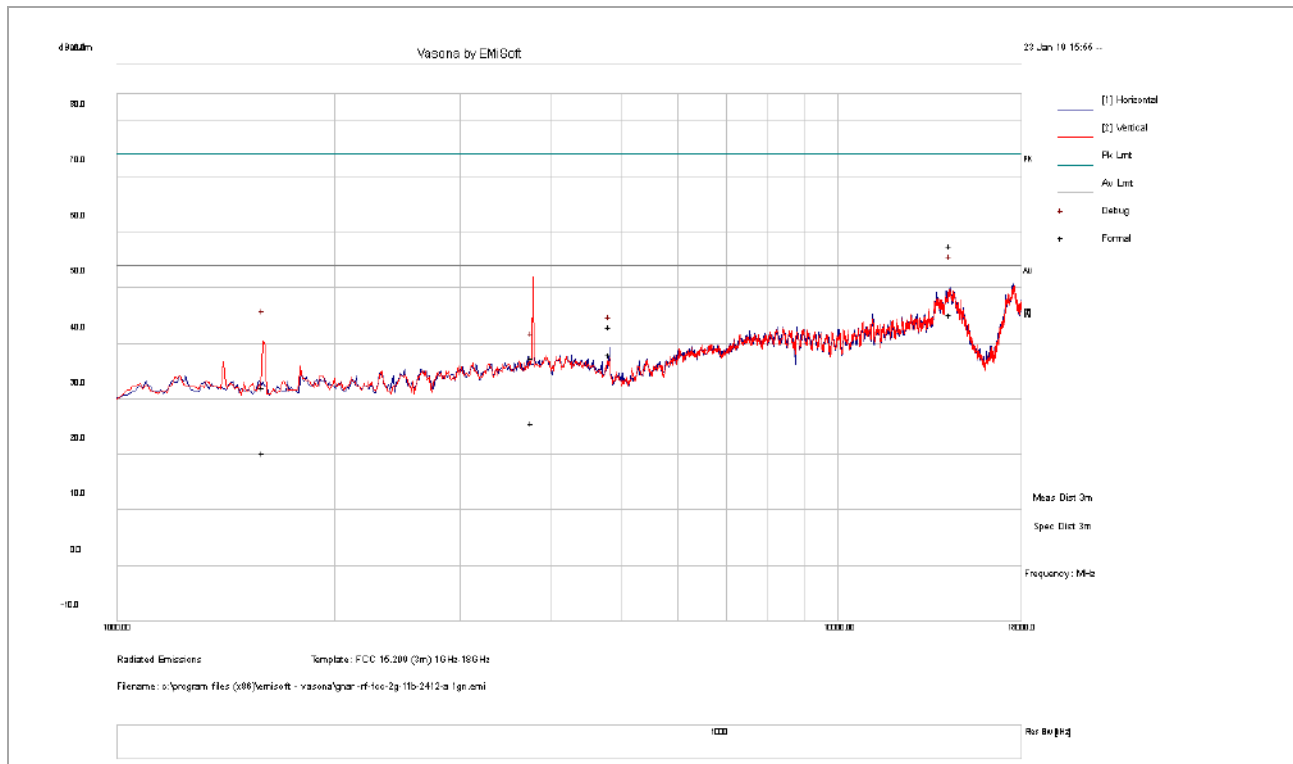
- 1) For below 1GHz, all different channels and modes were verified but only the worst case result is shown here.

**Report Number:** CMP-19061922-LC-FCC-IC-DSS  
**Product:** HotSpot OBD Dongle  
**Model Number:** LMU3240LAW



### 1GHz – 18GHz test result

|                               |                           |                        |                         |
|-------------------------------|---------------------------|------------------------|-------------------------|
| <b>Test Standard:</b>         | <b>15.209, 15.247</b>     | <b>Mode:</b>           | <b>BDR-GFSK-2402MHz</b> |
| <b>Frequency Range:</b>       | <b>1GHz-18GHz</b>         | <b>Test Date:</b>      | <b>07/02/2019</b>       |
| <b>Antenna Type/Polarity:</b> | <b>Horn/Hor &amp; Ver</b> | <b>Test Personnel:</b> | <b>Cameron Wu</b>       |
| <b>Remark:</b>                | <b>N/A</b>                | <b>Test Result:</b>    | <b>Pass</b>             |



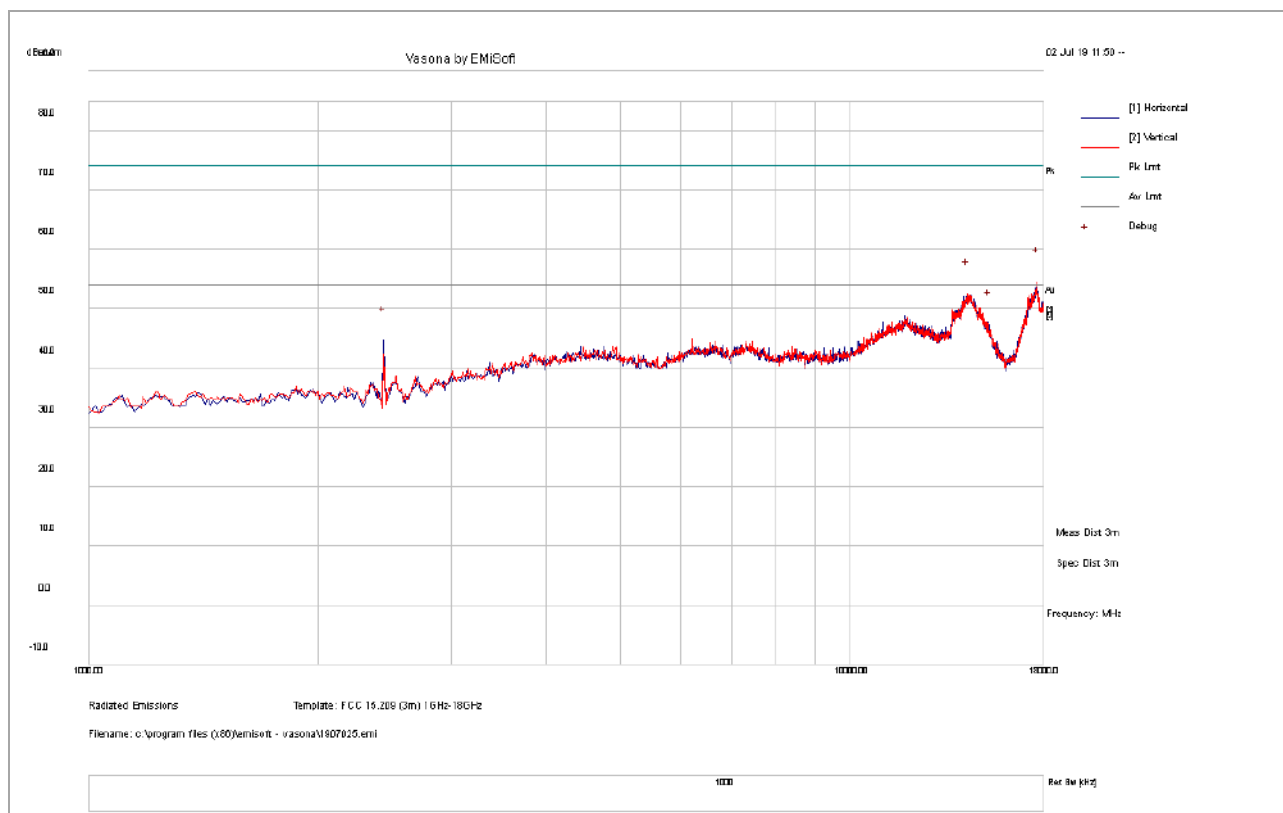
| Frequency MHz | Raw dB | Cable dB | AF dB | Level dBuV/m | Det | Pol deg | Height cm | Table deg | Limit dBuV/m | Margin dB |
|---------------|--------|----------|-------|--------------|-----|---------|-----------|-----------|--------------|-----------|
| 1593.08       | 33.62  | 10.74    | -3.38 | 40.97        | PK  | V       | 354       | 224       | 74           | -33.03    |
| 3198.83       | 24.66  | 11.56    | 3.84  | 40.06        | PK  | H       | 327       | 309       | 74           | -33.94    |
| 1593.08       | 15.88  | 10.74    | -3.38 | 23.24        | AV  | V       | 354       | 224       | 54           | -30.76    |
| 3198.83       | 13.12  | 11.56    | 3.84  | 28.52        | AV  | H       | 327       | 309       | 54           | -25.48    |

|                       |                            |
|-----------------------|----------------------------|
| <b>Report Number:</b> | CMP-19061922-LC-FCC-IC-DSS |
| <b>Product:</b>       | HotSpot OBD Dongle         |
| <b>Model Number:</b>  | LMU3240LAW                 |



## 1GHz – 18GHz test result

|                               |                |                        |                  |
|-------------------------------|----------------|------------------------|------------------|
| <b>Test Standard:</b>         | 15.209, 15.247 | <b>Mode:</b>           | BDR-GFSK-2441MHz |
| <b>Frequency Range:</b>       | 1GHz-18GHz     | <b>Test Date:</b>      | 07/02/2019       |
| <b>Antenna Type/Polarity:</b> | Horn/Hor & Ver | <b>Test Personnel:</b> | Cameron Wu       |
| <b>Remark:</b>                | N/A            | <b>Test Result:</b>    | Pass             |



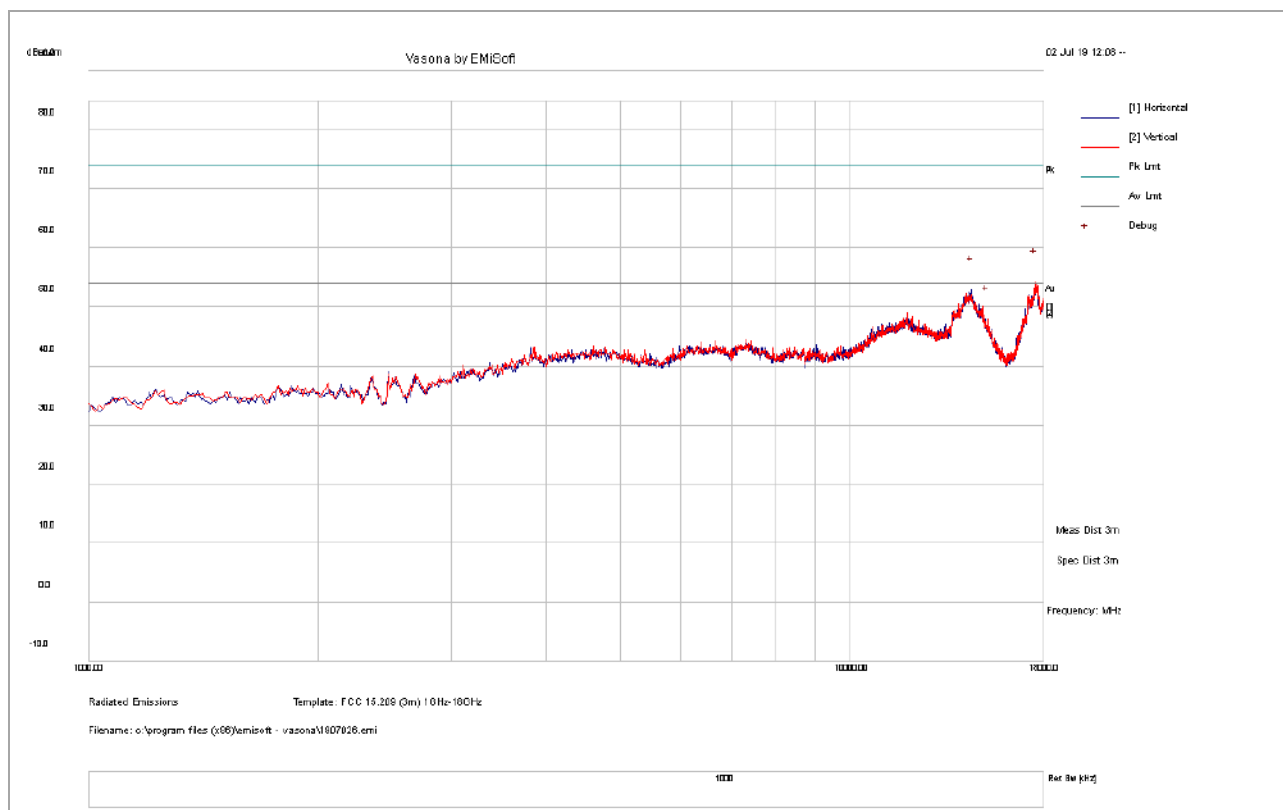
| Frequency MHz | Raw dB | Cable dB | AF dB | Level dBuV/m | Det | Pol deg | Height cm | Table deg | Limit dBuV/m | Margin dB |
|---------------|--------|----------|-------|--------------|-----|---------|-----------|-----------|--------------|-----------|
| 2445.00       | 33.54  | 10.76    | 0.16  | 44.46        | PK  | H       | 200       | 192       | 54           | -9.54     |
| 14281.25      | 15.40  | 22.38    | 14.66 | 52.44        | PK  | V       | 300       | 82        | 54           | -1.56     |
| 15258.75      | 14.15  | 24.31    | 8.76  | 47.22        | PK  | H       | 300       | 119       | 54           | -6.78     |

|                       |                            |
|-----------------------|----------------------------|
| <b>Report Number:</b> | CMP-19061922-LC-FCC-IC-DSS |
| <b>Product:</b>       | HotSpot OBD Dongle         |
| <b>Model Number:</b>  | LMU3240LAW                 |



## 1GHz – 18GHz test result

|                               |                |                        |                  |
|-------------------------------|----------------|------------------------|------------------|
| <b>Test Standard:</b>         | 15.209, 15.247 | <b>Mode:</b>           | BDR-GFSK-2480MHz |
| <b>Frequency Range:</b>       | 1GHz-18GHz     | <b>Test Date:</b>      | 07/02/2019       |
| <b>Antenna Type/Polarity:</b> | Horn/Hor & Ver | <b>Test Personnel:</b> | Cameron Wu       |
| <b>Remark:</b>                | N/A            | <b>Test Result:</b>    | Pass             |



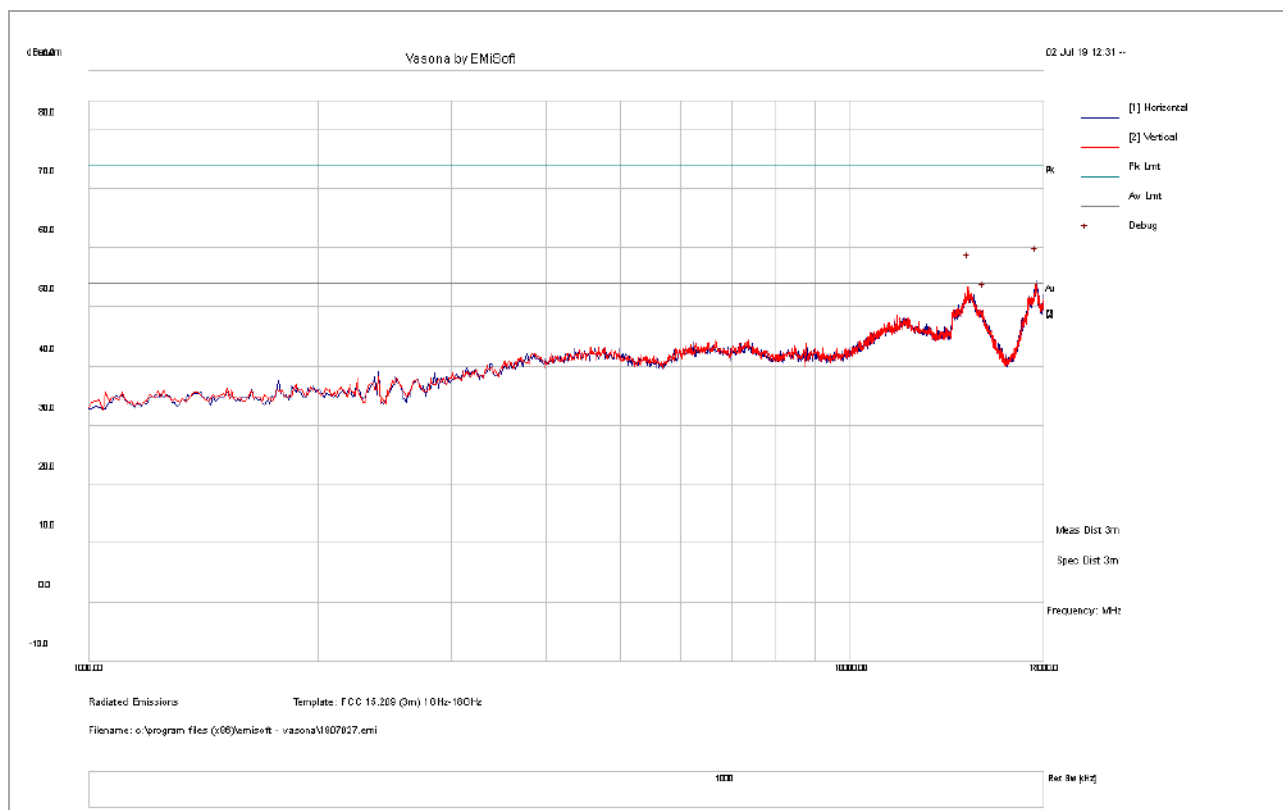
| Frequency MHz | Raw dB | Cable dB | AF dB | Level dBuV/m | Det | Pol deg | Height cm | Table deg | Limit dBuV/m | Margin dB |
|---------------|--------|----------|-------|--------------|-----|---------|-----------|-----------|--------------|-----------|
| 17511.25      | 14.60  | 25.17    | 14.29 | 52.05        | PK  | V       | 100       | 182       | 54           | -1.95     |
| 14451.25      | 15.99  | 22.89    | 14.00 | 52.88        | PK  | H       | 300       | 98        | 54           | -1.12     |
| 15173.75      | 14.21  | 24.37    | 9.24  | 47.83        | PK  | V       | 300       | 221       | 54           | -6.18     |

|                       |                            |
|-----------------------|----------------------------|
| <b>Report Number:</b> | CMP-19061922-LC-FCC-IC-DSS |
| <b>Product:</b>       | HotSpot OBD Dongle         |
| <b>Model Number:</b>  | LMU3240LAW                 |



## 1GHz – 18GHz test result

|                               |                |                        |                   |
|-------------------------------|----------------|------------------------|-------------------|
| <b>Test Standard:</b>         | 15.209, 15.247 | <b>Mode:</b>           | BDR-8DPSK-2402MHz |
| <b>Frequency Range:</b>       | 1GHz-18GHz     | <b>Test Date:</b>      | 07/02/2019        |
| <b>Antenna Type/Polarity:</b> | Horn/Hor & Ver | <b>Test Personnel:</b> | Cameron Wu        |
| <b>Remark:</b>                | N/A            | <b>Test Result:</b>    | Pass              |



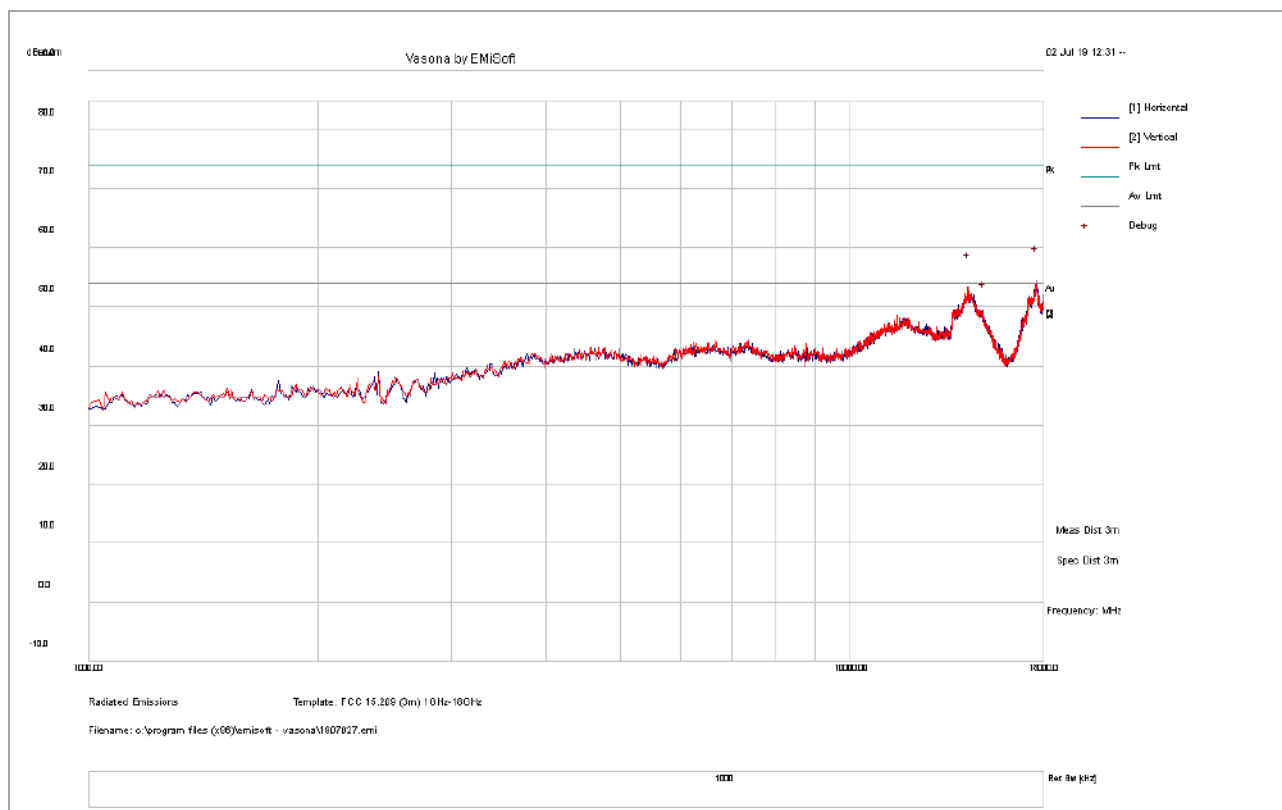
| Frequency MHz | Raw dB | Cable dB | AF dB | Level dBuV/m | Det | Pol deg | Height cm | Table deg | Limit dBuV/m | Margin dB |
|---------------|--------|----------|-------|--------------|-----|---------|-----------|-----------|--------------|-----------|
| 17575.00      | 12.12  | 25.25    | 14.73 | 52.10        | PK  | H       | 100       | 0         | 54           | -1.90     |
| 14334.38      | 15.04  | 22.54    | 14.70 | 52.28        | PK  | V       | 200       | 0         | 54           | -1.72     |
| 15003.75      | 13.64  | 24.50    | 10.21 | 48.35        | PK  | H       | 300       | 0         | 54           | -5.65     |

|                       |                            |
|-----------------------|----------------------------|
| <b>Report Number:</b> | CMP-19061922-LC-FCC-IC-DSS |
| <b>Product:</b>       | HotSpot OBD Dongle         |
| <b>Model Number:</b>  | LMU3240LAW                 |



### 1GHz – 18GHz test result

|                               |                |                        |                   |
|-------------------------------|----------------|------------------------|-------------------|
| <b>Test Standard:</b>         | 15.209, 15.247 | <b>Mode:</b>           | BDR-8DPSK-2441MHz |
| <b>Frequency Range:</b>       | 1GHz-18GHz     | <b>Test Date:</b>      | 07/02/2019        |
| <b>Antenna Type/Polarity:</b> | Horn/Hor & Ver | <b>Test Personnel:</b> | Cameron Wu        |
| <b>Remark:</b>                | N/A            | <b>Test Result:</b>    | Pass              |



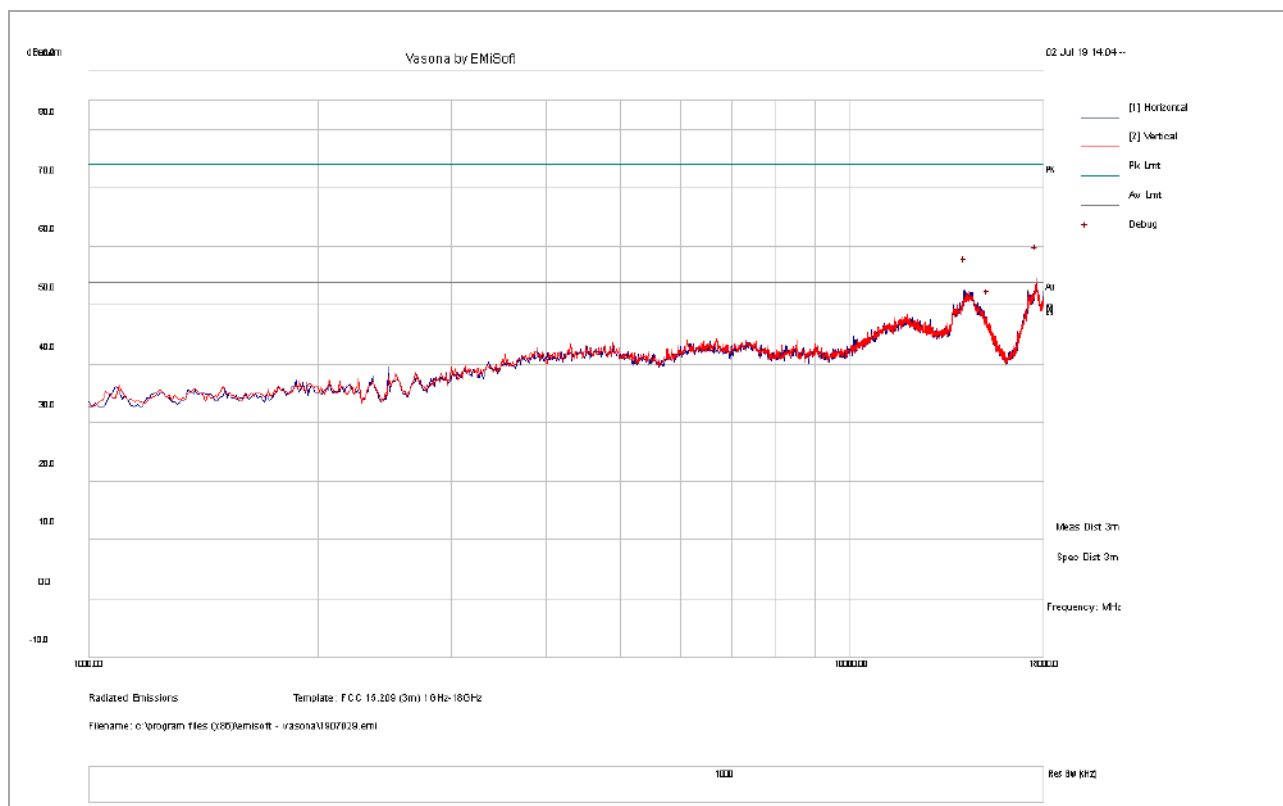
| Frequency MHz | Raw dB | Cable dB | AF dB | Level dBuV/m | Det | Pol deg | Height cm | Table deg | Limit dBuV/m | Margin dB |
|---------------|--------|----------|-------|--------------|-----|---------|-----------|-----------|--------------|-----------|
| 17606.88      | 11.21  | 25.30    | 14.92 | 51.43        | PK  | V       | 200       | 0         | 54           | -2.57     |
| 14281.25      | 14.47  | 22.38    | 14.66 | 51.51        | PK  | H       | 200       | 0         | 54           | -2.49     |
| 15184.38      | 13.36  | 24.36    | 9.18  | 46.90        | PK  | H       | 200       | 0         | 54           | -7.10     |

|                       |                            |
|-----------------------|----------------------------|
| <b>Report Number:</b> | CMP-19061922-LC-FCC-IC-DSS |
| <b>Product:</b>       | HotSpot OBD Dongle         |
| <b>Model Number:</b>  | LMU3240LAW                 |



## 1GHz – 18GHz test result

|                               |                |                        |                   |
|-------------------------------|----------------|------------------------|-------------------|
| <b>Test Standard:</b>         | 15.209, 15.247 | <b>Mode:</b>           | BDR-8DPSK-2480MHz |
| <b>Frequency Range:</b>       | 1GHz-18GHz     | <b>Test Date:</b>      | 07/02/2019        |
| <b>Antenna Type/Polarity:</b> | Horn/Hor & Ver | <b>Test Personnel:</b> | Cameron Wu        |
| <b>Remark:</b>                | N/A            | <b>Test Result:</b>    | Pass              |



| Frequency MHz | Raw dB | Cable dB | AF dB | Level dBuV/m | Det | Pol deg | Height cm | Table deg | Limit dBuV/m | Margin dB |
|---------------|--------|----------|-------|--------------|-----|---------|-----------|-----------|--------------|-----------|
| 17606.88      | 12.09  | 25.30    | 14.92 | 52.31        | PK  | V       | 100       | 0         | 54           | -1.69     |
| 14185.63      | 14.13  | 22.09    | 14.45 | 50.67        | PK  | H       | 100       | 0         | 54           | -3.33     |
| 15216.25      | 13.56  | 24.34    | 9.00  | 46.90        | PK  | V       | 300       | 0         | 54           | -7.10     |

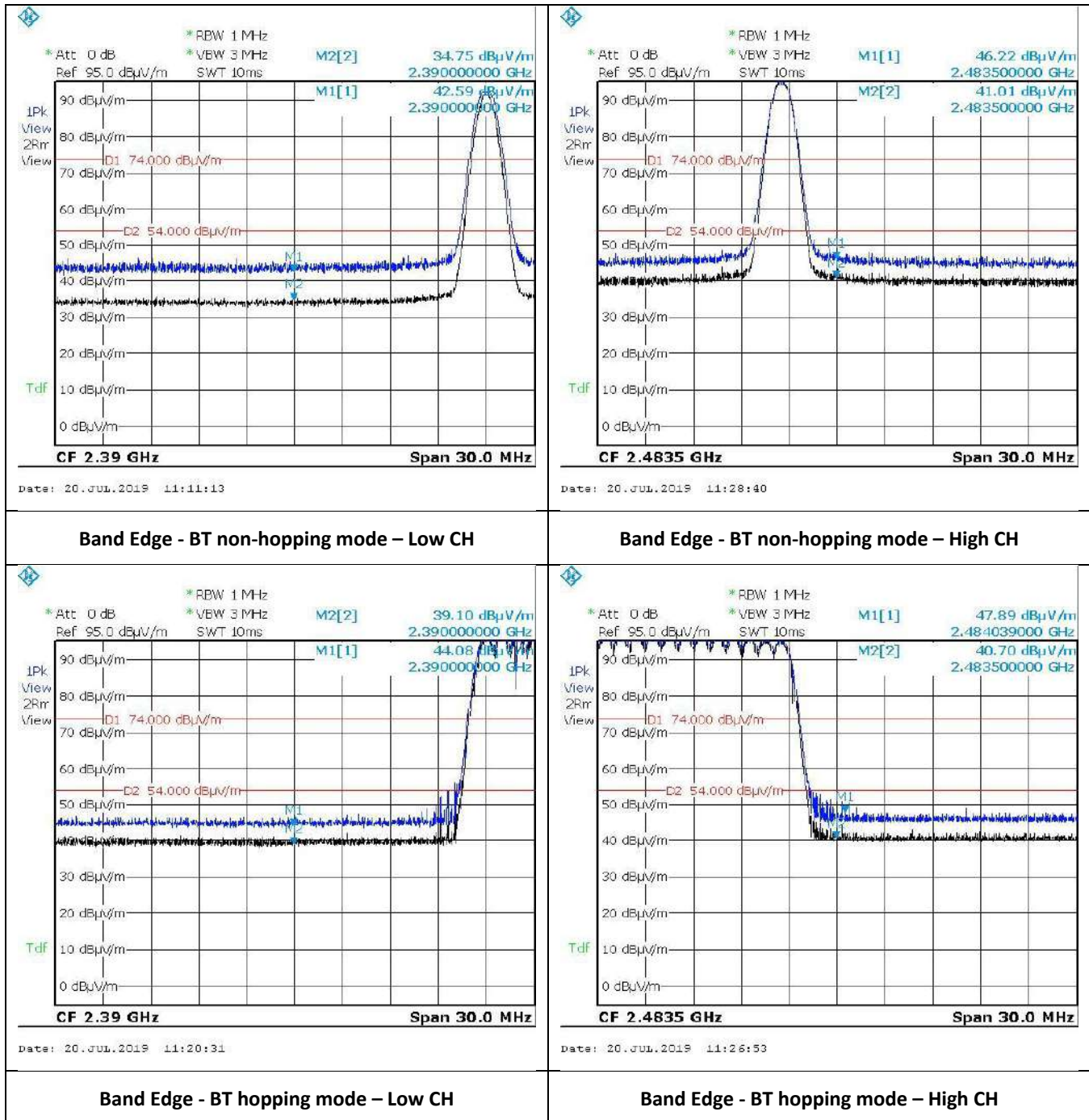
|                       |                            |
|-----------------------|----------------------------|
| <b>Report Number:</b> | CMP-19061922-LC-FCC-IC-DSS |
| <b>Product:</b>       | HotSpot OBD Dongle         |
| <b>Model Number:</b>  | LMU3240LAW                 |



### **18GHz – 40GHz test result**

Note: no substantial emission is found other than the noise floor. Different modes have been verified.

### Restricted Band Measurement Plots:



|                       |                            |
|-----------------------|----------------------------|
| <b>Report Number:</b> | CMP-19061922-LC-FCC-IC-DSS |
| <b>Product:</b>       | HotSpot OBD Dongle         |
| <b>Model Number:</b>  | LMU3240LAW                 |



## 9 Test instrument list

| Equipment                        | Manufacturer    | Model              | Serial Number | Cal. Date  | Cal. Due   |
|----------------------------------|-----------------|--------------------|---------------|------------|------------|
| Semi-Anechoic Chamber            | ETS-Lindgren    | 10M                | VL001         | 5/11/2019  | 5/11/2020  |
| Shielding Control Room           | ETS-Lindgren    | Series 81          | VL006         | N/A        | N/A        |
| Spectrum Analyzer                | Keysight        | N9020A             | MY50110074    | 5/4/2019   | 5/4/2020   |
| EMC Test Receiver                | R&S             | ESL6               | 100230        | 5/7/2019   | 5/7/2020   |
| LISN (9KHz – 30MHz)              | EMCO            | 3816/2             | 9705-1066     | 5/4/2019   | 5/4/2020   |
| Bi-Log Antenna                   | ETS-Lindgren    | 3142E              | 217921        | 11/15/2018 | 11/15/2019 |
| Horn Antenna (1-18GHz)           | Electro-Metrics | EM-6961            | 6292          | 5/2/2019   | 5/2/2020   |
| Horn Antenna (18-40GHz)          | Com-Power       | AH-840             | 101109        | 5/2/2019   | 5/2/2020   |
| Preamplifier                     | RF Bay, Inc.    | LPA-10-20          | 11180621      | 5/10/2019  | 5/10/2020  |
| True RMS Multi-meter             | UNI-T           | UT181A             | C173014829    | 5/10/2019  | 5/10/2020  |
| Temp / Humidity / Pressure Meter | PCE Instruments | PCE-THB 40         | R062028       | 5/9/2019   | 5/9/2020   |
| RF Attenuator                    | Pasternack      | PE7005-3           | VL061         | 5/10/2019  | 5/10/2020  |
| Preamplifier 100KHz - 40GHz      | Aeroflex        | 33711-392-77150-11 | 064           | 5/10/2019  | 5/10/2020  |
| EM Center Control                | ETS-Lindgren    | 7006-001           | 160136        | N/A        | N/A        |
| Turn Table                       | ETS-Lindgren    | 2181-3.03          | VL002         | N/A        | N/A        |
| Boresight Antenna Tower          | ETS-Lindgren    | 2171B              | VL003         | N/A        | N/A        |
| Loop Antenna (9k-30MHz)          | Com-Power       | AL-130             | 121012        | 5/9/2019   | 5/9/2020   |
| RE test cable(below 6GHz)        | Vista           | RE-6GHz-01         | RE-6GHz-01    | 5/10/2019  | 5/10/2020  |
| RE test cable (1-18GHz)          | PhaseTrack      | II-240             | RE-18GHz-01   | 5/10/2019  | 5/10/2020  |
| RE test cable (>18GHz)           | Sucoflex        | 104                | 344903/4      | 5/10/2019  | 5/10/2020  |
| Pulse limiter                    | Com-Power       | LIT-930A           | 531727        | 5/15/2019  | 5/15/2020  |
| CE test cable #1                 | FIRST RF        | FRF-C-1002-001     | CE-6GHz-01    | 5/10/2019  | 5/10/2020  |
| CE test cable#2                  | FIRST RF        | FRF-C-1002-001     | CE-6GHz-02    | 5/9/2019   | 5/9/2020   |
| Wideband Communication           | R&S             | CMW500             | 147508        | 5/8/2019   | 5/8/2020   |