



# **TEST REPORT**

**Report Number:** 13259319-E2V2

**Applicant :** APPLE INC.  
1 APPLE PARK WAY  
CUPERTINO, CA 95014, U.S.A

**Model :** A2407, A2408, A2409

**FCC ID :** BCG-E3547A

**IC :** 579C-E3547A

**EUT Description :** SMARTPHONE

**Test Standard(s) :** FCC 47 CFR PART 15 SUBPART C  
ISED RSS-247 ISSUE 2  
ISED RSS-GEN ISSUE 5

**Date Of Issue:**  
September 24, 2020

**Prepared by:**  
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## REPORT REVISION HISTORY

| Rev. | Issue Date | Revisions                        | Revised By         |
|------|------------|----------------------------------|--------------------|
| V1   | 9/21/2020  | Initial Issue                    | Chin Pang          |
| V2   | 9/24/2020  | Address TCB question section 6.4 | Francisco Guarnero |

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## 1. ATTESTATION OF TEST RESULTS

**COMPANY NAME:** APPLE INC.  
1 APPLE PARK WAY  
CUPERTINO, CA 95014, U.S.A

**EUT DESCRIPTION:** SMARTPHONE

**MODEL:** A2407, A2408, A2409

**SERIAL NUMBER:** (Original) G6TCP01UQ5R9, G6TCM020Q5T6  
(Spot Check): G6TCN009Q5W0, G6TD20AR0RR

**DATE TESTED:** JULY 29, 2020 – SEPTEMBER 24, 2020

| APPLICABLE STANDARDS     |              |
|--------------------------|--------------|
| STANDARD                 | TEST RESULTS |
| CFR 47 Part 15 Subpart C | Complies     |
| ISED RSS-247 Issue 2     | Complies     |
| ISED RSS-GEN Issue 5     | Complies     |

UL Verification Services Inc. tested the above equipment in accordance with the requirements set forth in the above standards. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical components. All samples tested were in good operating condition throughout the entire test program. Measurement Uncertainties are published for informational purposes only and were not taken into account unless noted otherwise.

This document may not be altered or revised in any way unless done so by UL Verification Services Inc. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Verification Services Inc. will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of the U.S. government.

Approved & Released For  
UL Verification Services Inc. By:



Chin Pang  
Senior Engineer  
Consumer Technology Division  
UL Verification Services Inc.

Prepared By:



Tony Li  
Test Engineer  
Consumer Technology Division  
UL Verification Services Inc.

## 2. TEST RESULTS SUMMARY

| FCC Clause     | ISED Clause       | Requirement        | Result   | Comment |
|----------------|-------------------|--------------------|----------|---------|
| 15.209, 15.205 | RSS-GEN 8.9, 8.10 | Radiated Emissions | complies | None.   |

## 3. TEST METHODOLOGY

The tests documented in this report were performed in accordance with FCC CFR 47 Part 2, FCC CFR 47 Part 15, ANSI C63.10-2013, KDB 558074 D01 15.247 Meas Guidance v05r02, KDB 662911, RSS-GEN Issue 5, and RSS-247 Issue 2.

## 4. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 47173 and 47266 Benicia Street, and 47658 Kato Road, Fremont, California, USA. Line conducted emissions are measured only at the 47173 address. The following table identifies which facilities were utilized for radiated emission measurements documented in this report. Specific facilities are also identified in the test results sections.

| 47173 Benicia Street                            | 47266 Benicia Street                                       | 47658 Kato Rd.  |
|---|--|---|
| <input type="checkbox"/> Chamber A (IC:2324B-1) | <input type="checkbox"/> Chamber D (IC:22541-1)            | <input checked="" type="checkbox"/> Chamber I (IC: 2324A-5) |
| <input type="checkbox"/> Chamber B (IC:2324B-2) | <input type="checkbox"/> Chamber E (IC:22541-2)            | <input type="checkbox"/> Chamber J (IC: 2324A-6)            |
| <input type="checkbox"/> Chamber C (IC:2324B-3) | <input type="checkbox"/> Chamber F (IC:22541-3)            | <input checked="" type="checkbox"/> Chamber K (IC: 2324A-1) |
|   | <input type="checkbox"/> Chamber G (IC:22541-4)            | <input type="checkbox"/> Chamber L (IC: 2324A-3)            |
|   | <input checked="" type="checkbox"/> Chamber H (IC:22541-5) | <input type="checkbox"/> Chamber M (IC: 2324A-2)            |

The above test sites and facilities are covered under FCC Test Firm Registration # 208313. Chambers above are covered under Industry Canada company address and respective code.

UL Verification Services Inc. is accredited by NVLAP, Laboratory Code 200065-0

## 5. DECISION RULES AND MEASUREMENT UNCERTAINTY

### 5.1. METROLOGICAL TRACEABILITY

All test and measuring equipment utilized to perform the tests documented in this report are calibrated on a regular basis, with a maximum time between calibrations of one year or the manufacturers' recommendation, whichever is less, and where applicable is traceable to recognized national standards.

### 5.2. DECISION RULES

The Decision Rule is based on Simple Acceptance in accordance with ISO Guide 98-4:2012 Clause 8.2. (Measurement uncertainty is not taken into account when stating conformity with a specified requirement.)

### 5.3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

| PARAMETER   | U <sub>Lab</sub> |
|---|------------------|
| Worst Case Conducted Disturbance, 9KHz to 0.15 MHz  | 3.39 dB          |
| Worst Case Conducted Disturbance, 0.15 to 30 MHz    | 3.07 dB          |
| Worst Case Radiated Disturbance, 9KHz to 30 MHz     | 2.52 dB          |
| Worst Case Radiated Disturbance, 30 to 1000 MHz     | 4.88 dB          |
| Worst Case Radiated Disturbance, 1000 to 18000 MHz  | 4.24 dB          |
| Worst Case Radiated Disturbance, 18000 to 26000 MHz | 4.37 dB          |
| Worst Case Radiated Disturbance, 26000 to 40000 MHz | 5.17 dB          |

Uncertainty figures are valid to a confidence level of 95%.

## 6. INTRODUCTION OF TEST DATA REUSE

### 6.1. EUT DESCRIPTION

The Apple iPhone is a smartphone with multimedia functions (music, application support, and video), cellular GSM, GPRS, EGPRS, UMTS, LTE, 5G, CDMA, IEEE 802.11a/b/g/n/ac/ax, Bluetooth, Ultra-Wideband, GPS, NFC and WPT. All models support at least one UICC based SIM. The second SIM is either an UICC based p-SIM (physical SIM) or e-SIM (electronic SIM). The device supports a built-in inductive charging transmitter and receiver. The rechargeable battery is not user accessible.

### 6.2. INTRODUCTION

This application for certification is leveraging the data reuse procedures from KDB 484596 D01 based on reference FCC ID: BCG-E3545A, IC: 579C-E3545A to cover variant model BCG-E3547A, 579C-E3547A. The major difference between the parent/reference model and the variant model is the depopulation in the variant model of the mmWave transmitter. All other circuitry and features are identical. The data reuse test plan was approved via manufacturer KDB inquiry.

### 6.3. DIFFERENCE IN MODEL NUMBER

Models A2407, A2408, and A2409 are electrically identical and the model numbers are allocated for marketing and logistic purposes only. Model A2407 was used for the spot check testing described in this report.

### 6.4. SPOT CHECK VERIFICATION RESULTS SUMMARY

Spot check verification has been done on device model A2407, FCC ID: BCG-E3547A, IC: 579C-E3547A for radiated spurious and radiated band-edge in accordance with the Test Plan that was approved via KDB inquiry.

| BCG-E3547A, 579C-E3547A SPOT CHECK RESULTS |       |           |         |                 |                           |       |                           |       |            |      |
|--|-------|-----------|---------|-----------------|---------------------------|-------|---------------------------|-------|------------|------|
| Technology                                 | Mode  | Test Item | Channel | Measured        | Original model            |       | Spot check model          |       | Delta (dB) |      |
|  |       |           |         |                 | BCG-E3545A<br>579C-E3545A |       | BCG-E3547A<br>579C-E3547A |       |            |      |
|  |       |           |         |                 | A2341                     |       | A2407, A2408,<br>A2409    |       |            |      |
|  |       |           |         | Frequency (MHz) | Peak                      | Ave   | Peak                      | Ave   | Peak       | Ave  |
| BLE  | 1Mbps | RBE       | Low     | 2390.0          | 52.40                     | 44.26 | 54.81                     | 42.80 | 1.67       | 2.01 |
|  |       |           | High    | 2483.5          | 51.71                     | 39.68 | 51.87                     | 40.24 | 0.16       | 0.56 |
|  | 1Mbps | RSE       | Mid     | 12.11           | 51.44                     | 40.19 | 50.73                     | 38.59 | -0.71      | -1.6 |

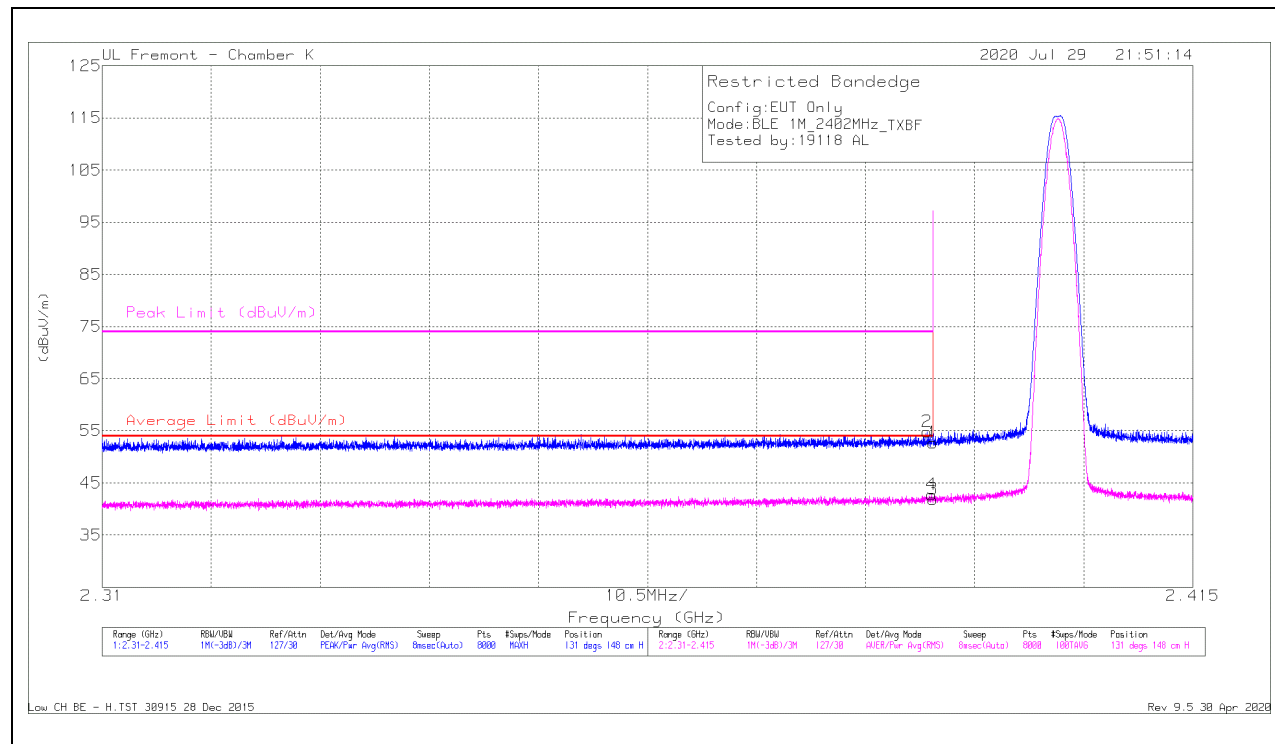
Comparison of the models, upper deviation is within 3dB range and all tests are under FCC Technical Limits. The test report for FCC ID BCG-E3545A, IC: 579C-E3545A is therefore being used to support the application for certification for FCC ID: BCG-E3547A & IC: 579C-E3547A.

Note: The output powers were verified on model A2407 to match with model A2341 before radiated emissions spot check was performed.

## SPOT CHECK DATA

### BANDEDGE (LOW CHANNEL)

### HORIZONTAL RESULT



| Marker | Frequency (GHz) | Meter Reading (dBUV) | Det | AF EMC4294 (dB/m) | Amp/Cbl/Filt/Psd (dB) | Corrected Reading (dBUV/m) | Average Limit (dBUV/m) | Margin (dB) | Peak Limit (dBUV/m) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|--------|-----------------|----------------------|-----|-------------------|-----------------------|----------------------------|------------------------|-------------|---------------------|----------------|----------------|-------------|----------|
| 1      | * 2.39          | 55.84                | Pk  | 31.9              | -35                   | 52.74                      | -                      | -           | 74                  | -21.26         | 131            | 148         | H        |
| 2      | * 2.38943       | 57.91                | Pk  | 31.9              | -35                   | 54.81                      | -                      | -           | 74                  | -19.19         | 131            | 148         | H        |
| 3      | * 2.39          | 44.97                | RMS | 31.9              | -35                   | 41.87                      | 54                     | -12.13      | -                   | -              | 131            | 148         | H        |
| 4      | * 2.38986       | 45.9                 | RMS | 31.9              | -35                   | 42.8                       | 54                     | -11.2       | -                   | -              | 131            | 148         | H        |

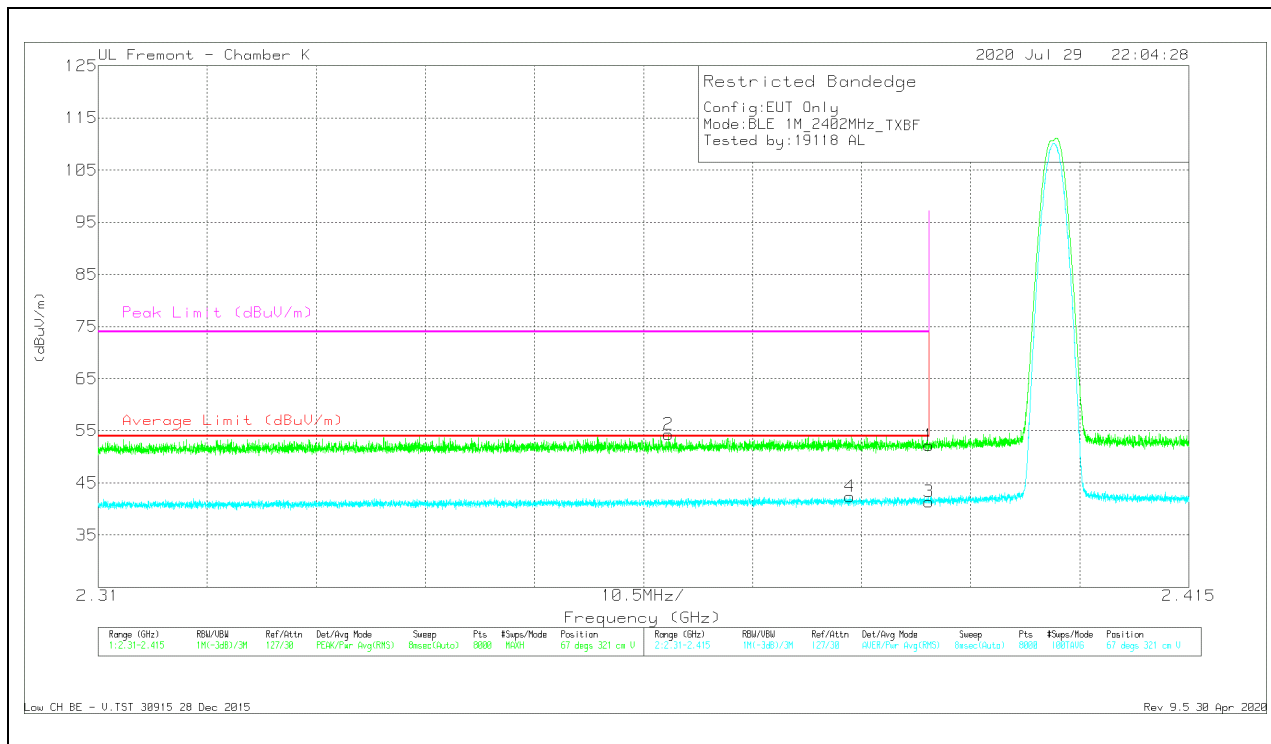
\* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

RMS - RMS detection



## VERTICAL RESULT

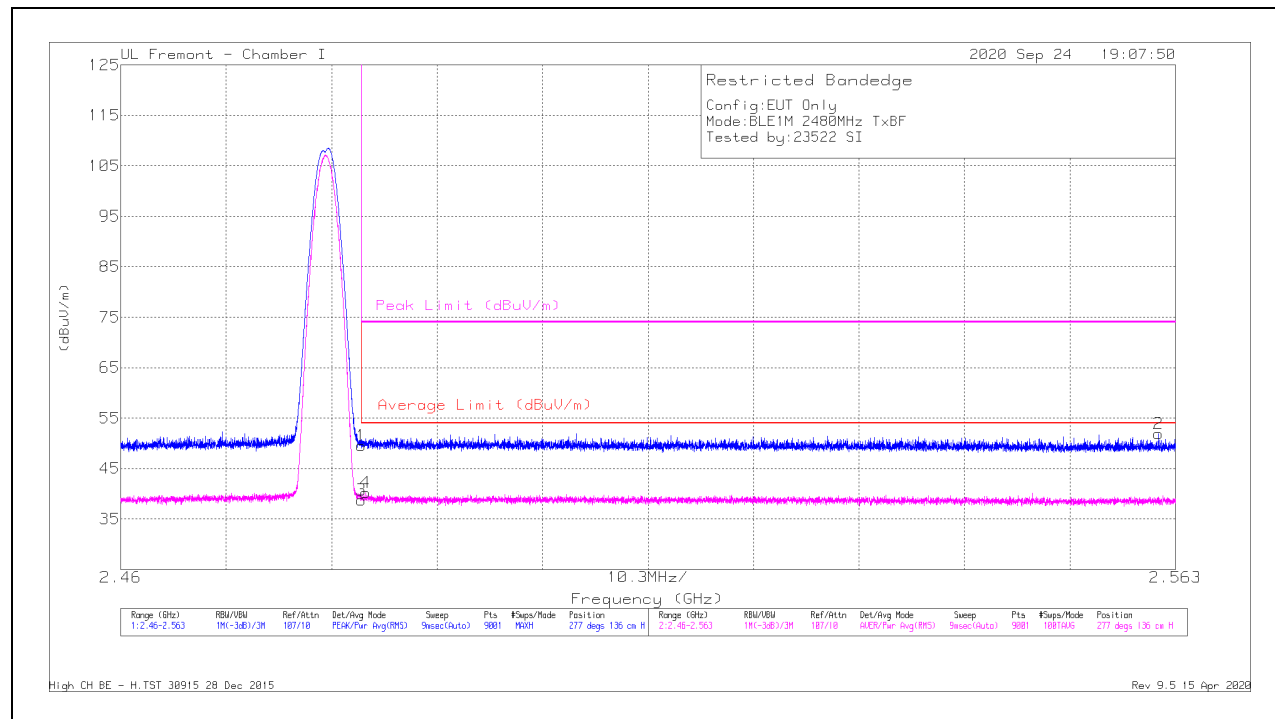


| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | AF EMC4294 (dBm) | Amp/Cbl/Filtr/Pa d (dB) | Corrected Reading (dBuV/m) | Average Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|--------|-----------------|----------------------|-----|------------------|-------------------------|----------------------------|------------------------|-------------|---------------------|----------------|----------------|-------------|----------|
| 1      | * 2.39          | 55.34                | Pk  | 31.9             | -35                     | 52.24                      | -                      | -           | 74                  | -21.76         | 67             | 321         | V        |
| 2      | * 2.3649        | 57.61                | Pk  | 31.8             | -35.1                   | 54.31                      | -                      | -           | 74                  | -19.69         | 67             | 321         | V        |
| 3      | * 2.39          | 44.47                | RMS | 31.9             | -35                     | 41.37                      | 54                     | -12.63      | -                   | -              | 67             | 321         | V        |
| 4      | * 2.38237       | 45.57                | RMS | 31.9             | -35.1                   | 42.37                      | 54                     | -11.63      | -                   | -              | 67             | 321         | V        |

\* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band  
Pk - Peak detector  
RMS - RMS detection

## BANDEDGE (HIGH CHANNEL)

### HORIZONTAL RESULT



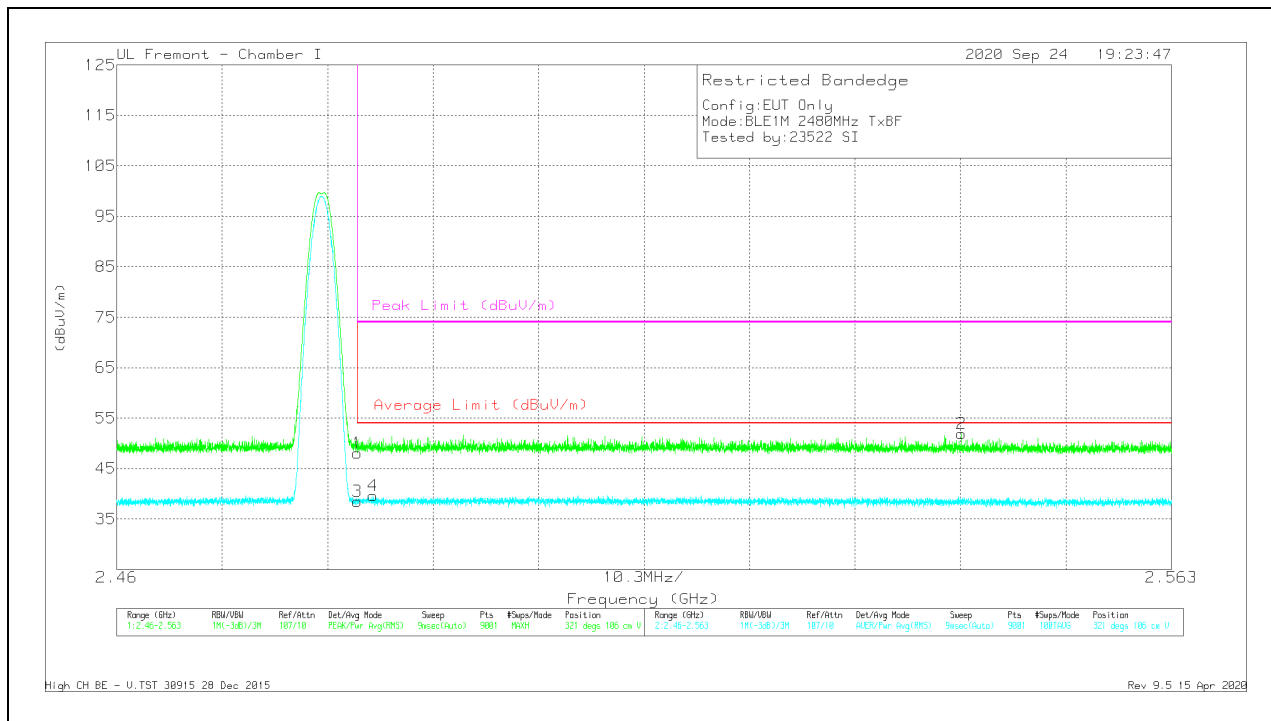
| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | AF T346 (dB/m) | Amp/Cbl/Fitr/Pa d (dB) | Corrected Reading (dBuV/m) | Average Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|--------|-----------------|----------------------|-----|----------------|------------------------|----------------------------|------------------------|-------------|---------------------|----------------|----------------|-------------|----------|
| 1      | * 2.48351       | 34.82                | Pk  | 32.4           | -17.7                  | 49.52                      | -                      | -           | 74                  | -24.48         | 277            | 136         | H        |
| 2      | 2.56133         | 37.37                | Pk  | 32.3           | -17.8                  | 51.87                      | -                      | -           | 74                  | -22.13         | 277            | 136         | H        |
| 3      | * 2.48351       | 24.08                | RMS | 32.4           | -17.7                  | 38.78                      | 54                     | -15.22      | -                   | -              | 277            | 136         | H        |
| 4      | * 2.48393       | 25.54                | RMS | 32.4           | -17.7                  | 40.24                      | 54                     | -13.76      | -                   | -              | 277            | 136         | H        |

\* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

RMS - RMS detection

## VERTICAL RESULT

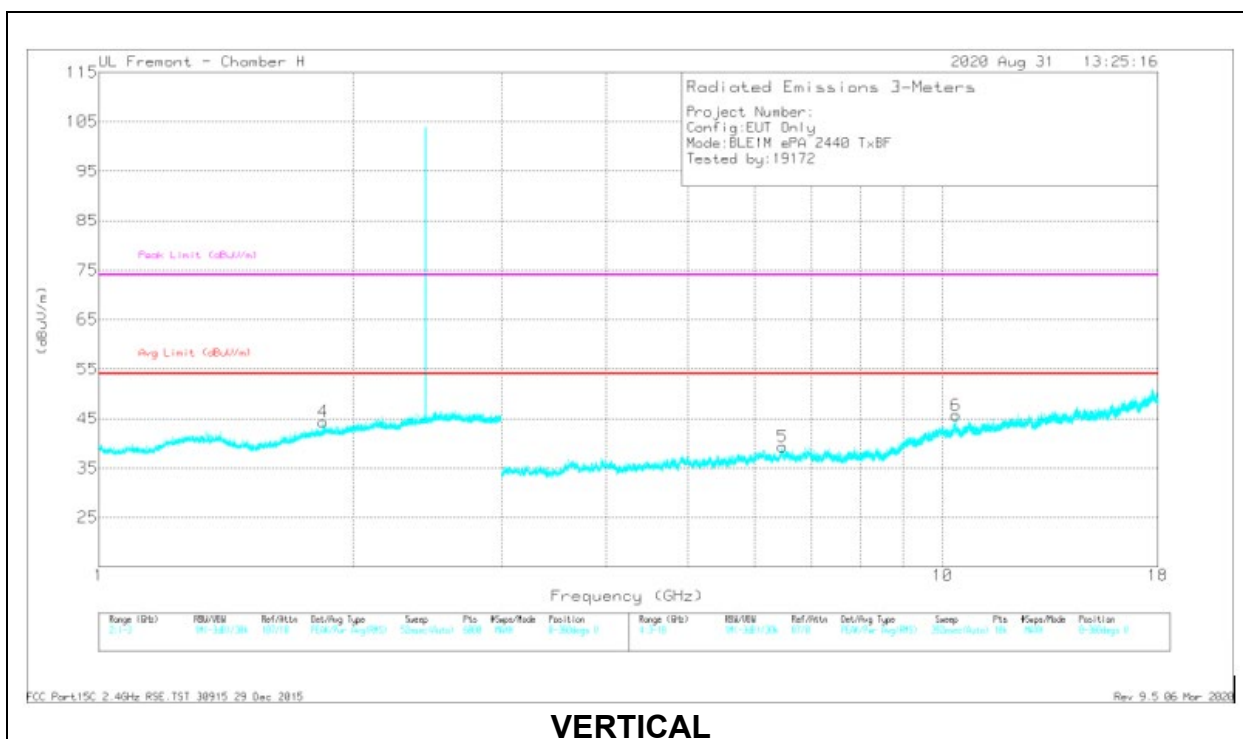
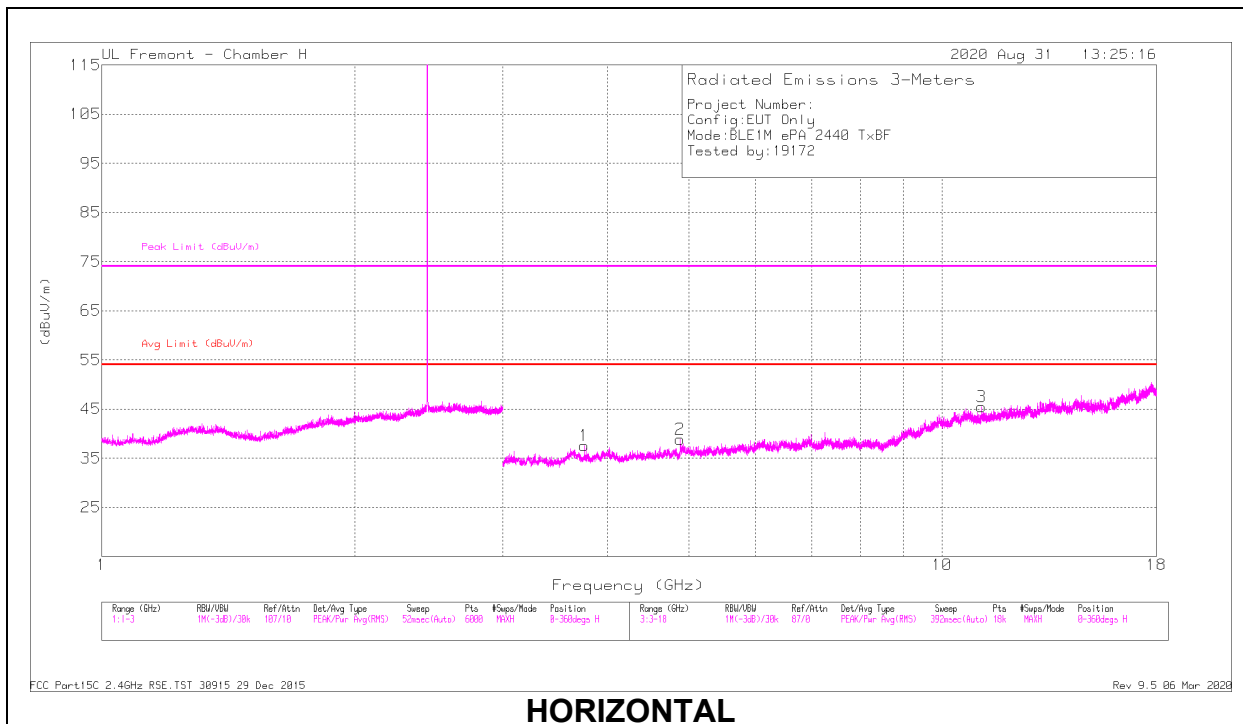


| Marker | Frequency (GHz) | Motor Reading (dBuV) | Det | AF T346 (dB/m) | Amp/Cbl/Ftr/Pa d (dB) | Corrected Reading (dBuV/m) | Average Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|--------|-----------------|----------------------|-----|----------------|-----------------------|----------------------------|------------------------|-------------|---------------------|----------------|----------------|-------------|----------|
| 1      | * 2.48351       | 33.31                | Pk  | 32.4           | -17.7                 | 48.01                      | -                      | -           | 74                  | -25.99         | 321            | 106         | V        |
| 2      | 2.54249         | 37.3                 | Pk  | 32.4           | -17.8                 | 51.9                       | -                      | -           | 74                  | -22.1          | 321            | 106         | V        |
| 3      | * 2.48351       | 23.84                | RMS | 32.4           | -17.7                 | 38.54                      | 54                     | -15.46      | -                   | -              | 321            | 106         | V        |
| 4      | * 2.48505       | 24.8                 | RMS | 32.5           | -17.7                 | 39.6                       | 54                     | -14.4       | -                   | -              | 321            | 106         | V        |

\* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band  
Pk - Peak detector  
RMS - RMS detection

## HARMONICS AND SPURIOUS EMISSIONS

### MID CHANNEL RESULTS



## RADIATED EMISSIONS

| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det  | AF T862 (dB/m) | Amp/Cbl/Filtr/P ad (dB) | Corrected Reading (dBuV/m) | Avg Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|--------|-----------------|----------------------|------|----------------|-------------------------|----------------------------|--------------------|-------------|---------------------|----------------|----------------|-------------|----------|
| 1      | * 3.75363       | 42.61                | PK2  | 32.8           | -32.5                   | 42.91                      | -                  | -           | 74                  | -31.09         | 92             | 247         | H        |
|        | * 3.75148       | 30.59                | MAv1 | 32.8           | -32.4                   | 30.99                      | 54                 | -23.01      | -                   | -              | 92             | 247         | H        |
| 2      | * 4.87947       | 42.14                | PK2  | 34.3           | -31.4                   | 45.04                      | -                  | -           | 74                  | -28.96         | 319            | 102         | H        |
|        | * 4.87909       | 31.42                | MAv1 | 34.3           | -31.4                   | 34.32                      | 54                 | -19.68      | -                   | -              | 319            | 102         | H        |
| 3      | * 11.13136      | 35.83                | PK2  | 38             | -23.1                   | 50.73                      | -                  | -           | 74                  | -23.27         | 22             | 242         | H        |
|        | * 11.13741      | 23.79                | MAv1 | 38             | -23.2                   | 38.59                      | 54                 | -15.41      | -                   | -              | 22             | 242         | H        |
| 4      | 1.82219         | 32.25                | MAv1 | 30.3           | -24.6                   | 37.95                      | -                  | -           | -                   | -              | 294            | 333         | V        |
|        | 1.85784         | 44.54                | PK2  | 30.7           | -24.6                   | 50.64                      | -                  | -           | -                   | -              | 294            | 333         | V        |
| 5      | 6.44603         | 28                   | MAv1 | 35.7           | -28.8                   | 34.9                       | -                  | -           | -                   | -              | 222            | 373         | V        |
|        | 6.45603         | 39.59                | PK2  | 35.6           | -28.7                   | 46.49                      | -                  | -           | -                   | -              | 222            | 373         | V        |
| 6      | 10.36088        | 24.68                | MAv1 | 37.8           | -23.1                   | 39.38                      | -                  | -           | -                   | -              | 187            | 397         | V        |
|        | 10.37828        | 36.53                | PK2  | 37.9           | -23.5                   | 50.93                      | -                  | -           | -                   | -              | 187            | 397         | V        |

\* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

PK2 - KDB558074 Method: Maximum Peak

MAv1 - KDB558074 Option 1 Maximum RMS Average

## 6.5. REFERENCE DETAIL

Reference application that contains the reused reference data which is attached to this report in Appendix A.

| Equipment Class | Reference FCC ID & IC     | Reference Report | Report Title/Section             |
|-----------------|---------------------------|------------------|----------------------------------|
| DTS             | BCG-E3545A<br>579C-E3545A | 13259315-E2      | FCC IC_BLE Report / All sections |

## 6.6. DESCRIPTION OF AVAILABLE ANTENNAS

| Frequency Range (GHz) | ANT 4 (dBi) | ANT 3 (dBi) |
|-----------------------|-------------|-------------|
| 2.4                   | -1.9        | 0.4         |

## 6.7. SOFTWARE AND FIRMWARE

The EUT firmware installed during testing was 18.1.148.558

## 6.8. WORST-CASE CONFIGURATION AND MODE

Radiated band edge and spurious emissions from 1GHz to 18GHz were performed based on the Model A2341 worst case with the EUT set at highest power at Low/Middle/High channels.

There are two vendors of the WiFi/Bluetooth radio modules: variant 1 and variant 2. The Wi-Fi/Bluetooth radio modules have the same mechanical outline (e.g., the same package dimension and pin-out layout), use the same on-board antenna matching circuit, have an identical antenna structure, and are built and tested to conform to the same specifications and to operate within the same tolerances.

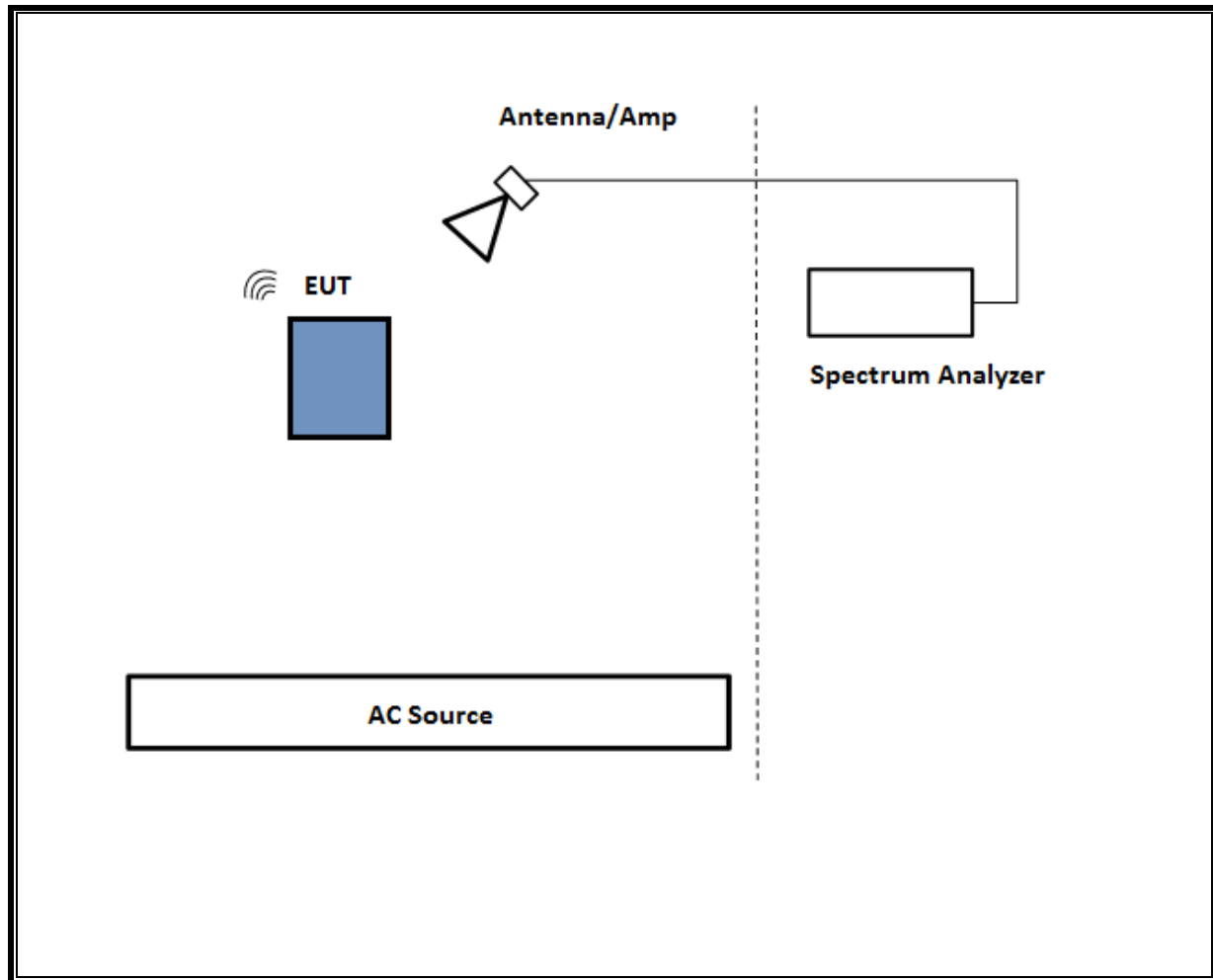
## 6.9. DESCRIPTION OF TEST SETUP

| SUPPORT TEST EQUIPMENT        |      |                      |                |                   |                  |              |
|-------------------------------|------|----------------------|----------------|-------------------|------------------|--------------|
| Description                   |      | Manufacturer         | Model          | Serial Number     |                  | FCC ID/ DoC  |
| Laptop                        |      | Apple                | A1502          | HRP003436         |                  | QDS-BRCM1080 |
| Laptop AC/DC adapter          |      | Liteon Technology    | PA-1450-BA1    | B123              |                  | NA           |
| EUT AC/DC adapter             |      | Apple                | A1385          | D29325SM03XDHLHC9 |                  | NA           |
| I/O CABLES (RF RADIATED TEST) |      |                      |                |                   |                  |              |
| Cable No.                     | Port | # of Identical Ports | Connector Type | Cable Type        | Cable Length (m) | Remarks      |
| 1                             | AC   | 1                    | AC             | Un-shielded       | 2                | N/A          |
| 2                             | USB  | 1                    | USB            | Un-shielded       | 1                | N/A          |

### TEST SETUP

The EUT is connected to a test laptop during the tests. Test software exercised the radio card.

**SETUP DIAGRAM FOR RADIATED TESTS Above 1 GHz**





## 7. MEASUREMENT METHOD

Output Power: ANSI C63.10 Subclause -11.9.1.3 Method PKPM1 Peak-reading power meter

Output Power: ANSI C63.10 Subclause -11.9.2.3.1 Measurement using average gated power meter

Radiated emissions non-restricted frequency bands: ANSI C63.10 Subclause -11.11 & Clause 13

Radiated emissions restricted frequency bands: ANSI C63.10 Subclause -11.12.1 & Clause 13

Band-edge: ANSI C63.10 Subclause -11.13.3.2 & Clause 13 Integration method -Peak detection

Band-edge: ANSI C63.10 Subclause -11.13.3.3 & Clause 13 Integration method -Trace averaging with continuous transmission at full power

## 8. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

| TEST EQUIPMENT LIST                  |                 |                        |                      |            |            |
|--------------------------------------|-----------------|------------------------|----------------------|------------|------------|
| Description                          | Manufacturer    | Model                  | ID Num               | Cal Due    | Last Cal   |
| Antenna, Horn 1-18GHz                | ETS Lindgren    | 3117                   | T862                 | 08/19/2021 | 08/19/2020 |
| Amplifier, 1 to 18GHz, 35dB          | Amplical        | AFS42-00101800-25-S-42 | T1568                | 04/14/2021 | 04/14/2020 |
| EMI Test Receiver                    | Rohde & Schwarz | ESW44                  | Pre0179372           | 02/25/2021 | 02/25/2020 |
| EMI Test Receiver                    | Rohde & Schwarz | ESW44                  | Pre0179522           | 02/20/2021 | 02/20/2020 |
| Antenna, Horn 1-18GHz                | ETS Lindgren    | 3117                   | EMC4294              | 11/01/2020 | 11/01/2019 |
| Antenna, Horn 1-18GHz                | ETS Lindgren    | 3117                   | T346                 | 07/20/2021 | 07/20/2020 |
| Amplifier, 1 to 18GHz, 35dB          | AMPLICAL        | AMP1G18-35             | T1569                | 01/30/2021 | 01/30/2020 |
| Power Meter, P-series single channel | Keysight        | N1911A                 | PRE0177682           | 01/21/2021 | 01/21/2020 |
| Power Sensor                         | Keysight        | N1921A                 | T1226                | 02/13/2021 | 02/13/2020 |
| UL AUTOMATION SOFTWARE               |                 |                        |                      |            |            |
| Radiated Software                    | UL              | UL EMC                 | Ver 9.5, Mar 6, 2020 |            |            |

## 9. SETUP PHOTOS

Please refer to 13259315-EP1 for setup photos

## **Appendix A – Reference Test Report**

Attached is the test report (13259315-E2) containing the reference data from the parent model as detailed in section 6.5.



# **TEST REPORT**

**Report Number. :** 13259315-E2V3

**Applicant :** APPLE INC.  
1 APPLE PARK WAY  
CUPERTINO, CA 95014, U.S.A

**Model :** A2341

**FCC ID :** BCG-E3545A

**IC :** 579C-E3545A

**EUT Description :** SMARTPHONE

**Test Standard(s) :** FCC 47 CFR PART 15 SUBPART C  
ISED RSS-247 ISSUE 2  
ISED RSS-GEN ISSUE 5

**Date Of Issue:**  
September 21, 2020

**Prepared by:**  
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NVLAP Lab code: 200065-0

## REPORT REVISION HISTORY

| Rev. | Issue Date | Revisions               | Revised By |
|------|------------|-------------------------|------------|
| V1   | 8/26/2020  | Initial Issue           | Chin Pang  |
| V2   | 9/18/2020  | Address TCB's Questions | Chin Pang  |
| V3   | 9/21/2020  | Address TCB's Questions | Chin Pang  |

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## 1. ATTESTATION OF TEST RESULTS

**COMPANY NAME:** APPLE INC.  
1 APPLE PARK WAY  
CUPERTINO, CA 95014, U.S.A

**EUT DESCRIPTION:** SMARTPHONE

**MODEL:** A2341

**SERIAL NUMBER:** G6TCP01UQ5R9, G6TCM020Q5T6

**DATE TESTED:** FEBRUARY 18, 2020 – AUGUST 14, 2020

| APPLICABLE STANDARDS     |              |
|--------------------------|--------------|
| STANDARD                 | TEST RESULTS |
| CFR 47 Part 15 Subpart C | Complies     |
| ISED RSS-247 Issue 2     | Complies     |
| ISED RSS-GEN Issue 5     | Complies     |

UL Verification Services Inc. tested the above equipment in accordance with the requirements set forth in the above standards. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical components. All samples tested were in good operating condition throughout the entire test program. Measurement Uncertainties are published for informational purposes only and were not taken into account unless noted otherwise.

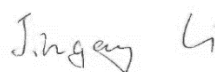
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## 2. TEST RESULTS SUMMARY

| FCC Clause     | ISED Clause       | Requirement                  | Result                  | Comment                              |
|----------------|-------------------|------------------------------|-------------------------|--------------------------------------|
| See Comment    |                   | Duty Cycle                   | Reporting purposes only | ANSI C63.10 Section 11.6.            |
| -              | RSS-GEN 6.7       | 99% OBW                      | Reporting purposes only | ANSI C63.10 Section 6.9.3.           |
| 15.247 (a) (2) | RSS-247 5.2 (a)   | 6dB BW                       | complies                | None.                                |
| 15.247 (b) (3) | RSS-247 5.4 (d)   | Output Power                 | complies                | None.                                |
| See Comment    |                   | Average power                | Reporting purposes only | Per ANSI C63.10, Section 11.9.2.3.2. |
| 15.247 (e)     | RSS-247 5.2 (b)   | PSD                          | complies                | None.                                |
| 15.247 (d)     | RSS-247 5.5       | Conducted Spurious Emissions | complies                | None.                                |
| 15.209, 15.205 | RSS-GEN 8.9, 8.10 | Radiated Emissions           | complies                | None.                                |
| 15.207         | RSS-Gen 8.8       | AC Mains Conducted Emissions | complies                | None.                                |

## 3. TEST METHODOLOGY

The tests documented in this report were performed in accordance with FCC CFR 47 Part 2, FCC CFR 47 Part 15, ANSI C63.10-2013, KDB 558074 D01 15.247 Meas Guidance v05r02, KDB 662911, RSS-GEN Issue 5, and RSS-247 Issue 2.

## 4. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 47173 and 47266 Benicia Street, and 47658 Kato Road, Fremont, California, USA. Line conducted emissions are measured only at the 47173 address. The following table identifies which facilities were utilized for radiated emission measurements documented in this report. Specific facilities are also identified in the test results sections.

| 47173 Benicia Street                            | 47266 Benicia Street                                       | 47658 Kato Rd.  |
|---|--|---|
| <input type="checkbox"/> Chamber A (IC:2324B-1) | <input type="checkbox"/> Chamber D (IC:22541-1)            | <input checked="" type="checkbox"/> Chamber I (IC: 2324A-5) |
| <input type="checkbox"/> Chamber B (IC:2324B-2) | <input checked="" type="checkbox"/> Chamber E (IC:22541-2) | <input checked="" type="checkbox"/> Chamber J (IC: 2324A-6) |
| <input type="checkbox"/> Chamber C (IC:2324B-3) | <input type="checkbox"/> Chamber F (IC:22541-3)            | <input type="checkbox"/> Chamber K (IC: 2324A-1)            |
|   | <input type="checkbox"/> Chamber G (IC:22541-4)            | <input type="checkbox"/> Chamber L (IC: 2324A-3)            |
|   | <input type="checkbox"/> Chamber H (IC:22541-5)            | <input type="checkbox"/> Chamber M (IC: 2324A-2)            |

The above test sites and facilities are covered under FCC Test Firm Registration # 208313. Chambers above are covered under Industry Canada company address and respective code.

UL Verification Services Inc. is accredited by NVLAP, Laboratory Code 200065-0

## 5. DECISION RULES AND MEASUREMENT UNCERTAINTY

### 5.1. METROLOGICAL TRACEABILITY

All test and measuring equipment utilized to perform the tests documented in this report are calibrated on a regular basis, with a maximum time between calibrations of one year or the manufacturers' recommendation, whichever is less, and where applicable is traceable to recognized national standards.

### 5.2. DECISION RULES

The Decision Rule is based on Simple Acceptance in accordance with ISO Guide 98-4:2012 Clause 8.2. (Measurement uncertainty is not taken into account when stating conformity with a specified requirement.)

### 5.3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

| PARAMETER   | U <sub>Lab</sub> |
|---|------------------|
| Worst Case Conducted Disturbance, 9KHz to 0.15 MHz  | 3.39 dB          |
| Worst Case Conducted Disturbance, 0.15 to 30 MHz    | 3.07 dB          |
| Worst Case Radiated Disturbance, 9KHz to 30 MHz     | 2.52 dB          |
| Worst Case Radiated Disturbance, 30 to 1000 MHz     | 4.88 dB          |
| Worst Case Radiated Disturbance, 1000 to 18000 MHz  | 4.24 dB          |
| Worst Case Radiated Disturbance, 18000 to 26000 MHz | 4.37 dB          |
| Worst Case Radiated Disturbance, 26000 to 40000 MHz | 5.17 dB          |

Uncertainty figures are valid to a confidence level of 95%.

## 6. EQUIPMENT UNDER TEST

### 6.1. EUT DESCRIPTION

The Apple iPhone is a smartphone with multimedia functions (music, application support, and video), cellular GSM, GPRS, EGPRS, UMTS, LTE, 5G, CDMA, IEEE 802.11a/b/g/n/ac/ax, Bluetooth, Ultra-Wideband, GPS, NFC and WPT. All models support at least one UICC based SIM. The second SIM is either an UICC based p-SIM (physical SIM) or e-SIM (electronic SIM). The device supports a built-in inductive charging transmitter and receiver. The rechargeable battery is not user accessible.

### 6.2. MAXIMUM OUTPUT POWER

The transmitter has a maximum peak conducted output power as follows:

| Antenna           | Configuration | Frequency Range (MHz) | Mode   | Output Power (dBm) | Output Power (mW) |
|-------------------|---------------|-----------------------|--------|--------------------|-------------------|
| ANT 4             | High Power    | 2402 - 2480           | BLE 1M | 20.27              | 106.41            |
|                   | Low Power     |                       |        | 12.79              | 19.01             |
|                   | High Power    | 2404 - 2478           | BLE 2M | 20.22              | 105.20            |
|                   | Low Power     |                       |        | 12.72              | 18.71             |
| ANT 3             | High Power    | 2402 - 2480           | BLE 1M | 20.25              | 105.93            |
|                   | Low Power     |                       |        | 12.79              | 19.01             |
|                   | High Power    | 2404 - 2478           | BLE 2M | 20.19              | 104.47            |
|                   | Low Power     |                       |        | 12.85              | 19.28             |
| BF, ANT 4 + ANT 3 | High Power    | 2402 - 2480           | BLE 1M | 20.15              | 103.51            |
|                   | Low Power     |                       |        | 15.88              | 38.73             |
|                   | High Power    | 2404 - 2478           | BLE 2M | 20.19              | 104.47            |
|                   | Low Power     |                       |        | 15.92              | 39.08             |

### 6.3. DESCRIPTION OF AVAILABLE ANTENNAS

| Frequency Range (GHz) | ANT 4 (dBi) | ANT 3 (dBi) |
|-----------------------|-------------|-------------|
| 2.4                   | -1.9        | 0.4         |

### 6.4. SOFTWARE AND FIRMWARE

The EUT firmware installed during testing was 18.1.148.558

## **6.5. WORST-CASE CONFIGURATION AND MODE**

The EUT was investigated in three orthogonal orientations X (Flatbed), Y (Landscape) and Z (Portrait) on ANT 4 (Core 0), ANT 3 (Core 1) and 2TX beamforming (ANT4 + ANT 3). It was determined that X orientation was the worst-case for ANT 4 and MIMO and Z (Portrait) was the worst-case orientation for ANT 3.

Radiated band edge and harmonic and spurious emissions from 1GHz to 18GHz were performed with the EUT set to transmit at highest power on Low/Middle/High channels.

Radiated emissions below 1GHz, 18-26GHz and AC power line conducted emissions were performed with the EUT transmitting at the channel with the highest output power as worst-case scenario. There were no emissions found below 30MHz within 20dB of the limit

For below 1GHz, tests were performed with EUT connected to AC power adapter as the worst case and for above 1GHz, tests were performed with EUT only.. For AC power line conducted emission, tests were investigated with AC power adapter and with laptop.

For simultaneous transmission of multiple channels in the 2.4GHz BLE and 5GHz bands. No noticeable emission was found.

There are two vendors of the WiFi/Bluetooth radio modules: variant 1 and variant 2. The Wi-Fi/Bluetooth radio modules have the same mechanical outline (e.g., the same package dimension and pin-out layout), use the same on-board antenna matching circuit, have an identical antenna structure, and are built and tested to conform to the same specifications and to operate within the same tolerances.

Baseline testing was performed on the two variants to determine the worst case on all conducted power and radiated emissions.

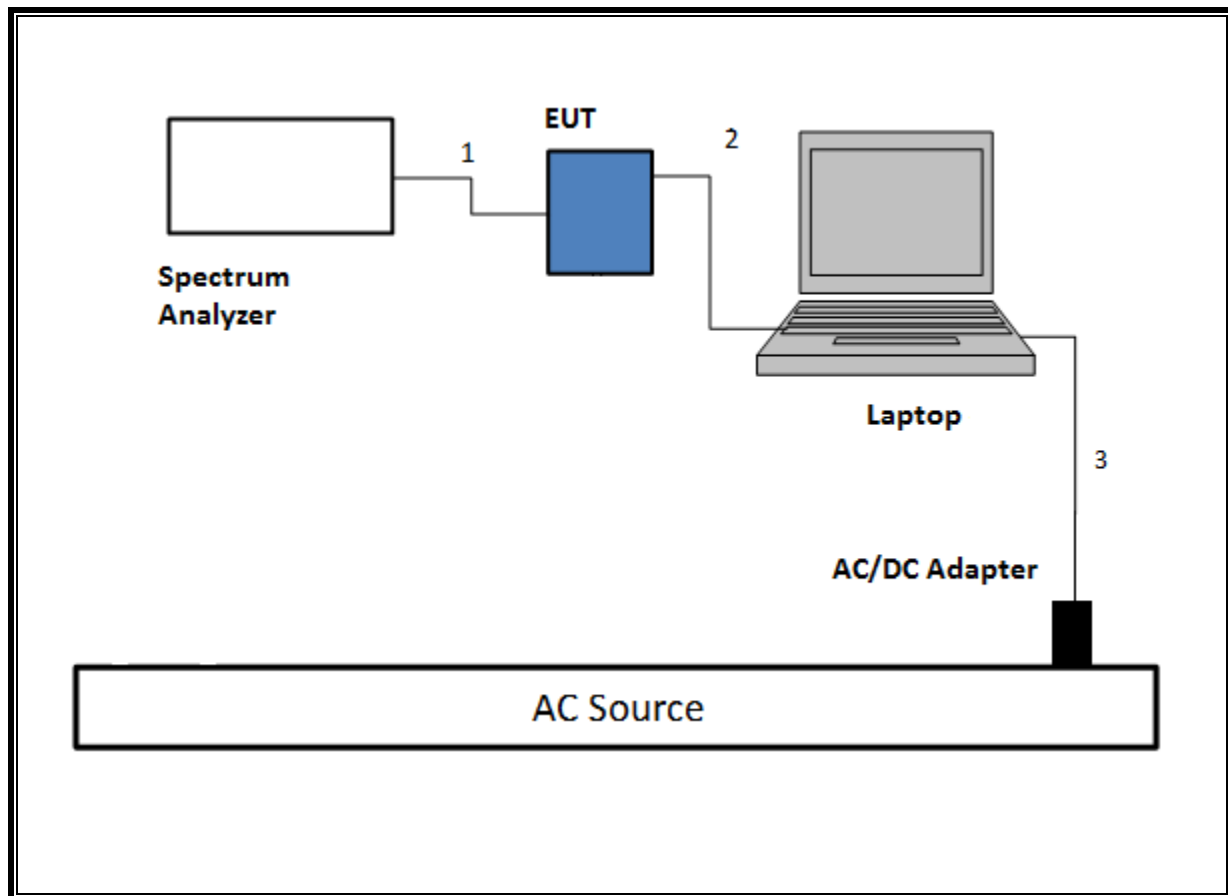
## 6.6. DESCRIPTION OF TEST SETUP

| SUPPORT TEST EQUIPMENT         |         |                      |                   |               |                  |                      |
|--------------------------------|---------|----------------------|-------------------|---------------|------------------|----------------------|
| Description                    |         | Manufacturer         | Model             | Serial Number |                  | FCC ID/ DoC          |
| Laptop                         |         | Apple                | Apple             | A1989         |                  | C02YL3ZMJHC8         |
| Laptop AC/DC adapter           |         | Liteon Technology    | Liteon Technology | A1718         |                  | C4N711404U3GN8RAW    |
| EUT AC/DC adapter              |         | Apple                | Apple             | A2305         |                  | C4H951700S7PF4F4F    |
| I/O CABLES (RF CONDUCTED TEST) |         |                      |                   |               |                  |                      |
| Cable No.                      | Port    | # of Identical Ports | Connector Type    | Cable Type    | Cable Length (m) | Remarks              |
| 1                              | Antenna | 1                    | SMA               | Un-shielded   | 0.2              | To spectrum Analyzer |
| 2                              | USB     | 1                    | USB               | Shielded      | 1.0              | N/A                  |
| 3                              | AC      | 1                    | AC                | Un-shielded   | 2                | N/A                  |
| I/O CABLES (RF RADIATED TEST)  |         |                      |                   |               |                  |                      |
| Cable No.                      | Port    | # of Identical Ports | Connector Type    | Cable Type    | Cable Length (m) | Remarks              |
| 1                              | AC      | 1                    | AC                | Un-shielded   | 2                | N/A                  |
| 2                              | USB     | 1                    | USB               | Un-shielded   | 1                | N/A                  |

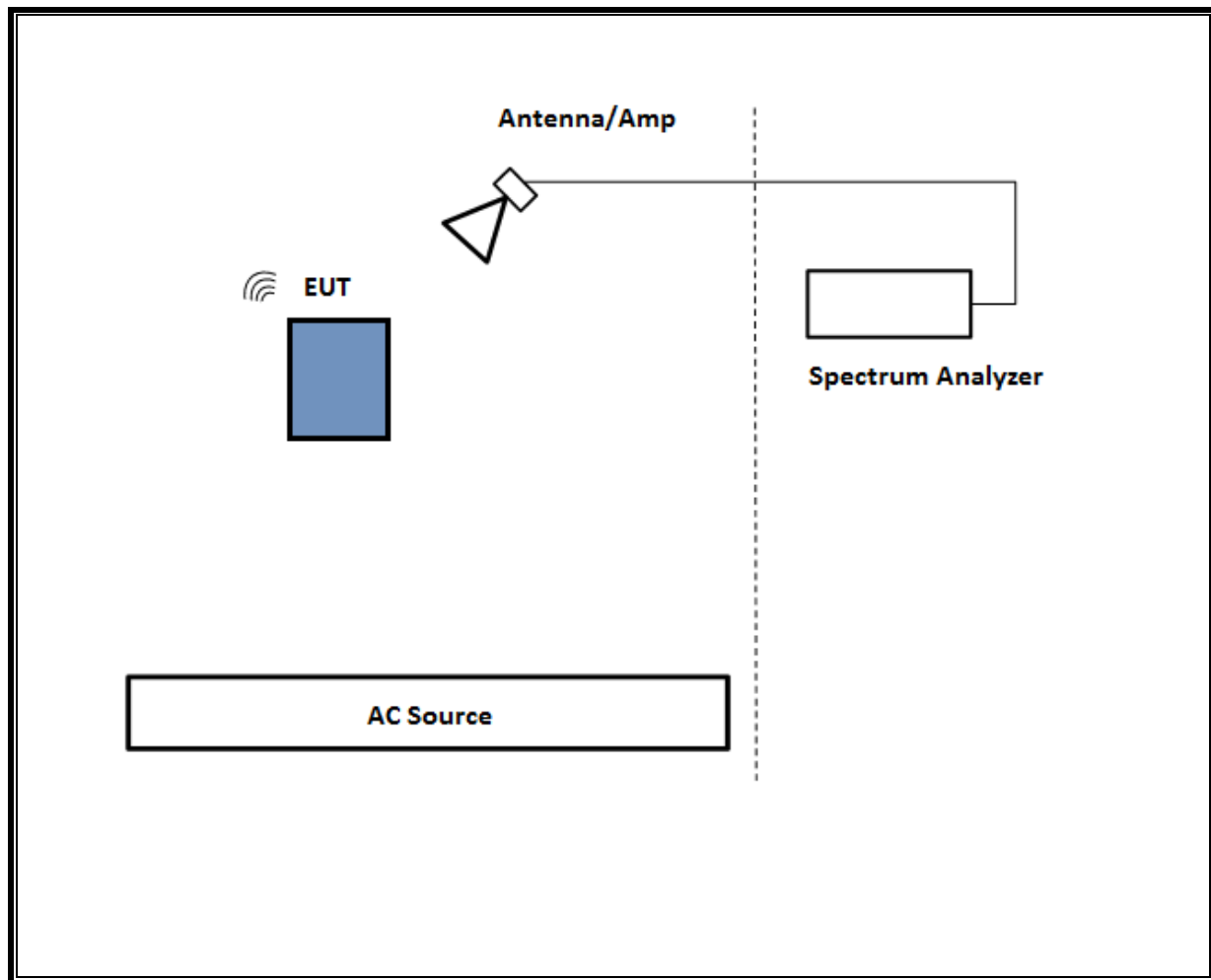
### TEST SETUP

The EUT is connected to a test laptop during the tests. Test software exercised the radio card.

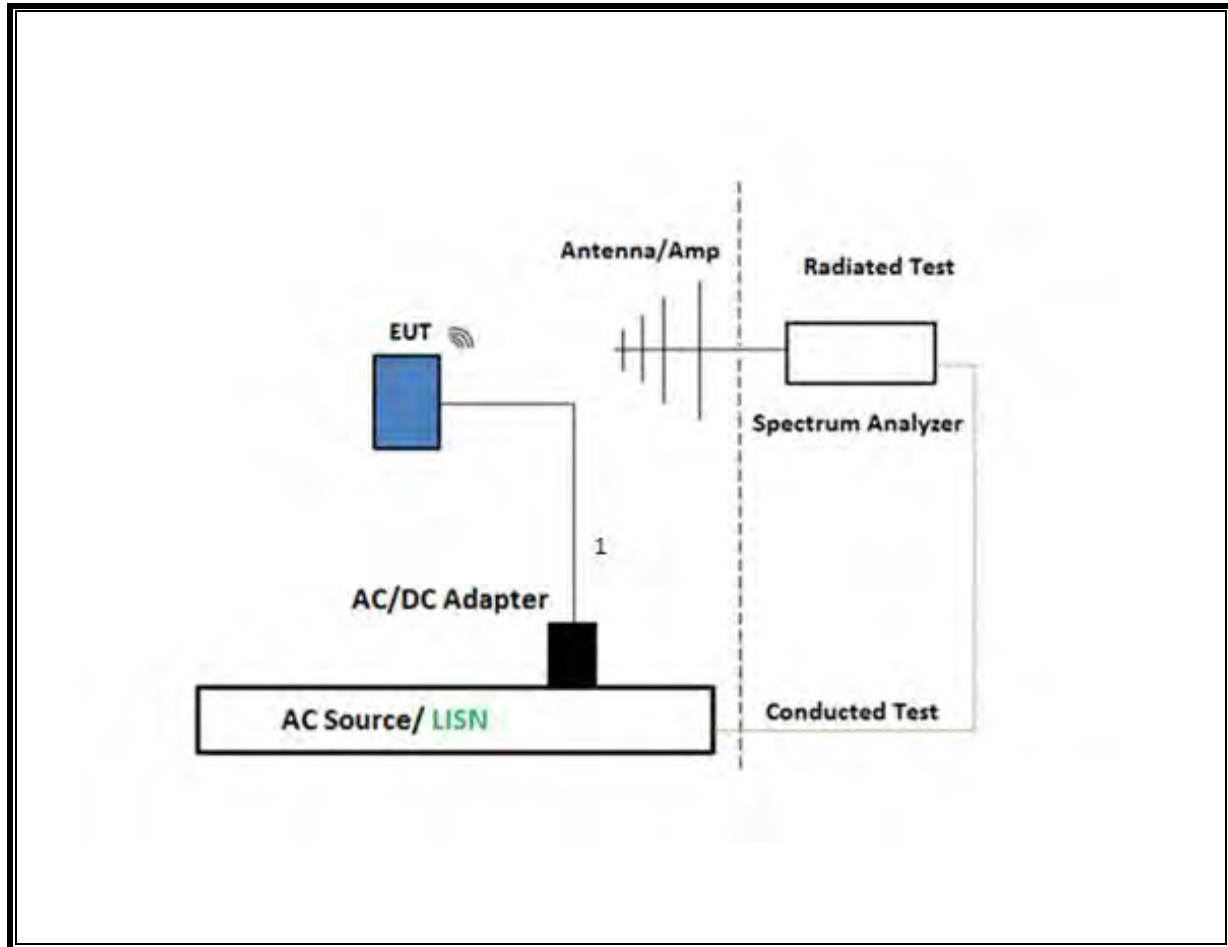
**SETUP DIAGRAM FOR CONDUCTED TESTS**



**SETUP DIAGRAM FOR RADIATED TESTS Above 1GHz**

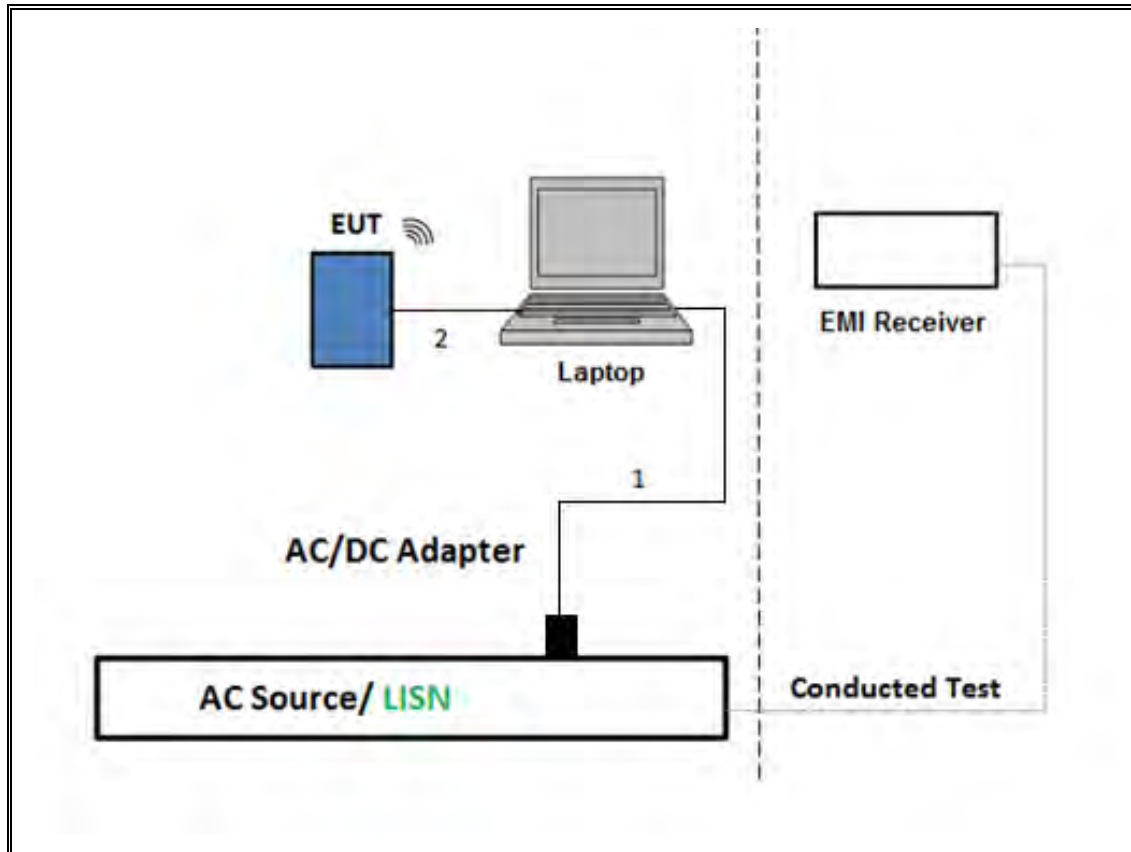


**SETUP DIAGRAM FOR Below 1GHz and AC LINE CONDUCTED TEST**





**TEST SETUP- AC LINE CONDUCTED: LAPTOP CONFIGURATION**



## 7. MEASUREMENT METHOD

On Time and Duty Cycle: KDB 558074 D01 v05r02, Section 6.

6 dB BW: ANSI C63.10 Subclause -11.8.1 RBW  $\geq$  DTS BW

Occupied BW (99%): ANSI C63.10-2013 Subclause 6.9.3

Output Power: ANSI C63.10 Subclause -11.9.1.3 Method PKPM1 Peak-reading power meter

Output Power: ANSI C63.10 Subclause -11.9.2.3.2 Measurement using gated average power meter.

PSD: ANSI C63.10 Subclause -11.10.2 Method PKPSD (peak PSD)

Radiated emissions non-restricted frequency bands: ANSI C63.10 Subclause -11.11 & Clause 13

Radiated emissions restricted frequency bands: ANSI C63.10 Subclause -11.12.1 & Clause 13

Conducted emissions in restricted frequency bands: ANSI C63.10 Subclause -11.12.2

Band-edge: ANSI C63.10 Subclause -11.13.3.2 & Clause 13 Integration method -Peak detection

Band-edge: ANSI C63.10 Subclause -11.13.3.3 & Clause 13 Integration method -Trace averaging with continuous transmission at full power

AC Power Line Conducted Emissions: ANSI C63.10-2013, Clause 6.2.

Radiated emissions non-restricted frequency bands ANSI C63.10 Subclause -11.11 & Clause 13

Radiated Spurious Emissions Below 30MHz: ANSI C63.10-2013 Clause 6.4 & Clause 13

**NOTE:** Test procedures and settings for BLE beamforming mode are the same as BLE normal mode.

## 8. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

| TEST EQUIPMENT LIST                      |                                 |                         |                            |            |            |
|--|---------------------------------|-------------------------|----------------------------|------------|------------|
| Description                              | Manufacturer                    | Model                   | ID Num                     | Cal Due    | Last Cal   |
| *Antenna, Horn 1-18GHz                   | ETS Lindgren                    | 3117                    | T862                       | 08/20/2020 | 08/20/2019 |
| RF Amplifier, 1-18GHz                    | MITEQ                           | AFS42-00101800-25-S-42  | 171460                     | 08/24/2020 | 08/24/2019 |
| EMI Test Receiver                        | Rohde & Schwarz                 | ESW44                   | Pre0179522                 | 02/20/2021 | 02/20/2020 |
| Antenna, Horn 1-18GHz                    | ETS-Lindgren                    | 3117                    | T712                       | 03/09/2021 | 03/09/2020 |
| Amplifier, 1 to 18GHz                    | Ampical                         | AMP1G18-35              | 138301                     | 01/14/2021 | 01/14/2020 |
| Antenna, Double Ridge Guide Horn Antenna | A.H. Systems, Inc.              | SAS-571                 | T963                       | 01/25/2021 | 01/25/2020 |
| Amplifier, 1 to 18GHz, 35dB              | AMPLICAL                        | AMP1G18-35              | T1569                      | 01/30/2021 | 01/30/2020 |
| Antenna, Horn 1-18GHz                    | ETS-Lindgren                    | 3117                    | T712                       | 03/09/2021 | 03/09/2020 |
| Amplifier, 1 to 18GHz                    | Ampical                         | AMP1G18-35              | 138301                     | 01/14/2021 | 01/14/2020 |
| Spectrum Analyzer, PXA, 3Hz to 44GHz     | Keysight Technologies Inc       | N9030A-544              | T1210                      | 01/22/2021 | 01/22/2020 |
| Spectrum Analyzer, PXA, 3Hz to 44GHz     | Keysight Technologies Inc       | N9030A                  | T1466                      | 01/23/2021 | 01/23/2020 |
| Spectrum Analyzer, PXA 3Hz to 44GHz      | Keysight                        | N9030A                  | T917                       | 01/21/2021 | 01/21/2020 |
| Spectrum Analyzer, PXA 3Hz to 44GHz      | Keysight                        | N9030A                  | T1466                      | 01/23/2021 | 01/23/2020 |
| *Antenna, Broadband Hybrid, 30-2000MHz   | Sunol Sciences                  | JB1                     | T130                       | 08/09/2020 | 08/09/2019 |
| *Amplifier, 10KHz to 1GHz, 32dB          | Sonoma                          | 310N                    | T173                       | 06/06/2020 | 06/06/2019 |
| Antenna Horn, 18 to 26GHz                | ARA                             | SWH-28                  | T125                       | 04/17/2021 | 04/17/2020 |
| Pre-Amp 18-26GHz                         | Agilent Technology              | 8449B                   | T404                       | 04/08/2021 | 04/08/2020 |
| Antenna Horn, 18 to 26GHz                | ARA                             | SWH-28                  | T125                       | 04/17/2021 | 04/17/2020 |
| Pre-Amp 18-26GHz                         | Agilent Technology              | 8449B                   | T404                       | 04/08/2021 | 04/08/2020 |
| Spectrum Analyzer, PXA, 3Hz to 44GHz     | Agilent (Keysight) Technologies | N9030A                  | T1454                      | 01/23/2021 | 01/23/2020 |
| Power Meter, P-series single channel     | Keysight                        | N1911A                  | PRE0177682                 | 01/21/2021 | 01/21/2020 |
| Power Sensor                             | Keysight                        | N1921A                  | T1226                      | 02/13/2021 | 02/13/2020 |
| Antenna, Active Loop 9KHz to 30MHz       | EMCO                            | 6502                    | T1616                      | 10/28/2020 | 10/28/2019 |
| AC Line Conducted                        |                                 |                         |                            |            |            |
| Description                              | Manufacturer                    | Model                   | ID Num                     | Cal Due    | Last Cal   |
| EMI Test Receiver 9kHz-7GHz              | Rohde & Schwarz                 | ESR                     | T1436                      | 02/20/2021 | 02/20/2020 |
| Power Cable, Line Conducted Emissions    | UL                              | PR1                     | T861                       | 10/27/2020 | 10/27/2019 |
| LISN for Conducted Emissions CISPR-16    | FISCHER CUSTOM COMMUNICATIONS   | FCC-LISN-50/250-25-2-01 | PRE0186446                 | 01/23/2021 | 01/23/2020 |
| UL AUTOMATION SOFTWARE                   |                                 |                         |                            |            |            |
| Radiated Software                        | UL                              | UL EMC                  | Ver 9.5, Mar 6, 2020       |            |            |
| Conducted Software                       | UL                              | UL EMC                  | 2020.2.26                  |            |            |
| AC Line Conducted Software               | UL                              | UL EMC                  | Ver 9.5, February 21, 2020 |            |            |

\*Testing is completed before equipment expiration date.

## 9. ANTENNA PORT TEST RESULTS

### 9.1. ON TIME AND DUTY CYCLE

#### LIMITS

None; for reporting purposes only.

#### PROCEDURE

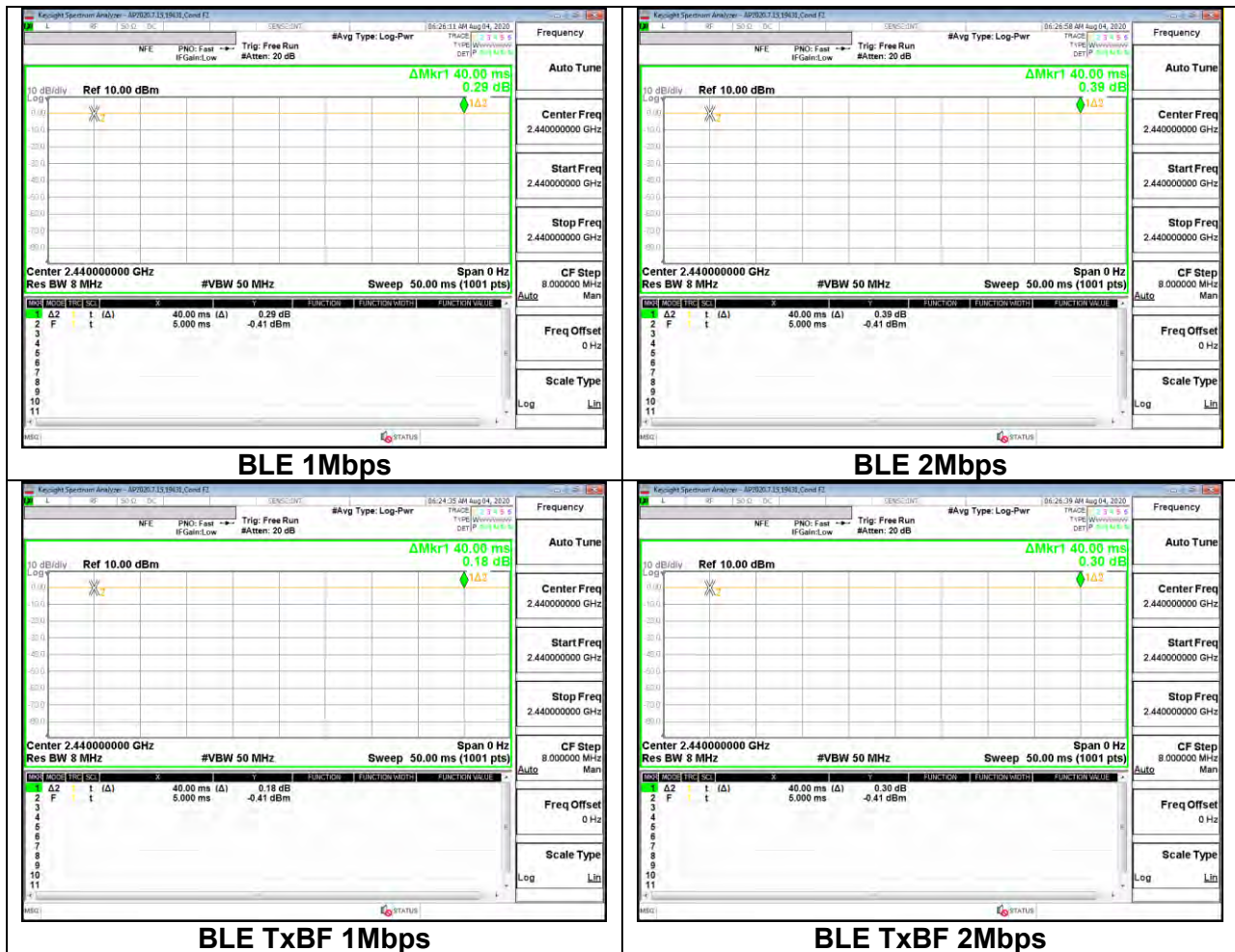
KDB 558074 Zero-Span Spectrum Analyzer Method.

#### ON TIME AND DUTY CYCLE RESULTS

| Mode               | ON Time<br>B<br>(msec) | Period<br>(msec) | Duty Cycle<br>x<br>(linear) | Duty<br>Cycle<br>(%) | Duty Cycle<br>Correction Factor<br>(dB) | 1/B<br>Minimum VBW<br>(kHz) |
|--------------------|------------------------|------------------|-----------------------------|----------------------|---|-----------------------------|
| <b>2.4GHz Band</b> |                        |                  |                             |                      |   |                             |
| BLE, 1Mbps         | 1.000                  | 1.000            | 1.000                       | 100.00               | 0.00                                    | 0.010                       |
| BLE, 2Mbps         | 1.000                  | 1.000            | 1.000                       | 100.00               | 0.00                                    | 0.010                       |
| BLE TxBF, 1Mbps    | 1.000                  | 1.000            | 1.000                       | 100.00               | 0.00                                    | 0.010                       |
| BLE TxBF, 2Mbps    | 1.000                  | 1.000            | 1.000                       | 100.00               | 0.00                                    | 0.010                       |

Note: Low power duty cycle is same as higher power

## DUTY CYCLE PLOTS



## **9.2. 99% BANDWIDTH**

### **LIMITS**

None; for reporting purposes only.

### **RESULTS**

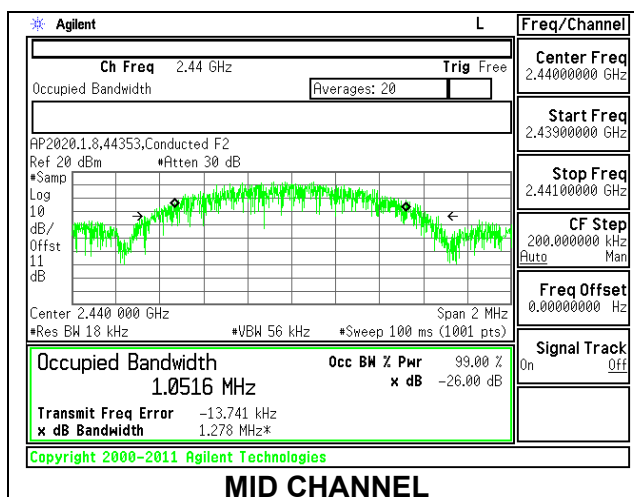
Only High Power modes result is reported, it covers all Low Power modes. Only Mid channel plot is reported to show setting parameter complies with testing method/procedure.

|            |       |              |            |
|------------|-------|--------------|------------|
| <b>ID:</b> | 44353 | <b>Date:</b> | 02/24/2020 |
|------------|-------|--------------|------------|

### 9.2.1. HIGH POWER BLE (1Mbps)

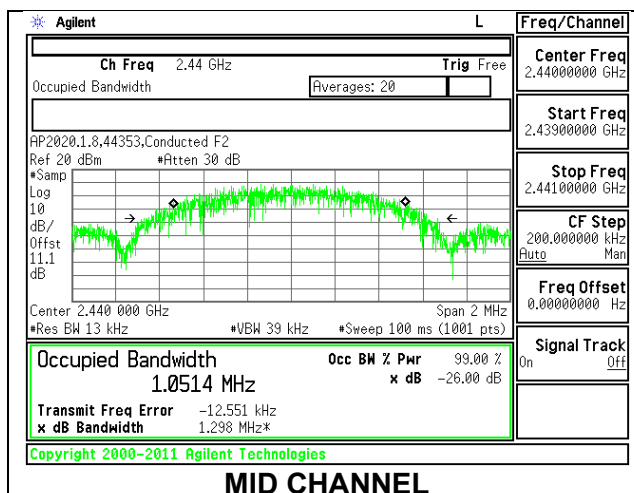
#### ANT 4

| Channel | Frequency (MHz) | 99% Bandwidth (MHz) |
|---------|-----------------|---------------------|
| Low     | 2402            | 1.0413              |
| Middle  | 2440            | 1.0516              |
| High    | 2480            | 1.0498              |



#### ANT 3

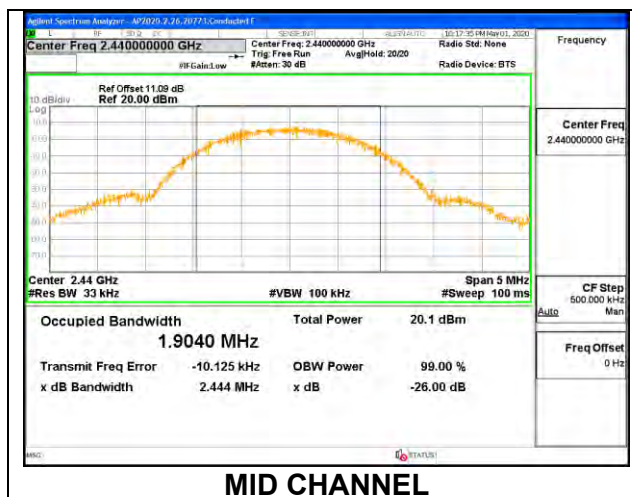
| Channel | Frequency (MHz) | 99% Bandwidth (MHz) |
|---------|-----------------|---------------------|
| Low     | 2402            | 1.0496              |
| Middle  | 2440            | 1.0514              |
| High    | 2480            | 1.0510              |



## 9.2.2. HIGH POWER BLE (2Mbps)

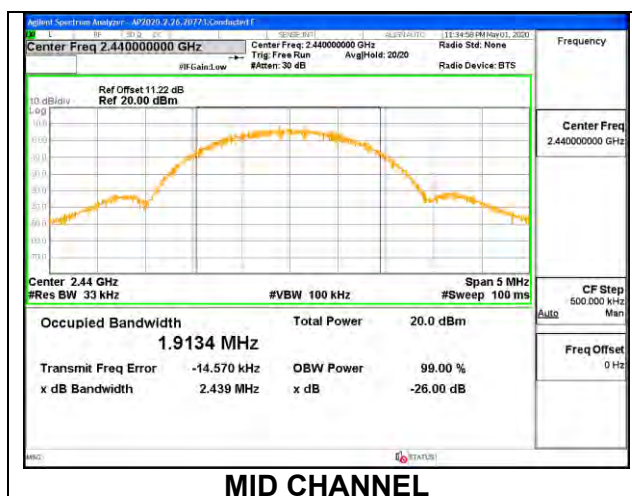
### ANT 4

| Channel | Frequency (MHz) | 99% Bandwidth (MHz) |
|---------|-----------------|---------------------|
| Low     | 2404            | 1.9011              |
| Middle  | 2440            | 1.9040              |
| High    | 2478            | 1.9075              |



### ANT 3

| Channel | Frequency (MHz) | 99% Bandwidth (MHz) |
|---------|-----------------|---------------------|
| Low     | 2404            | 1.9234              |
| Middle  | 2440            | 1.9134              |
| High    | 2478            | 1.9187              |

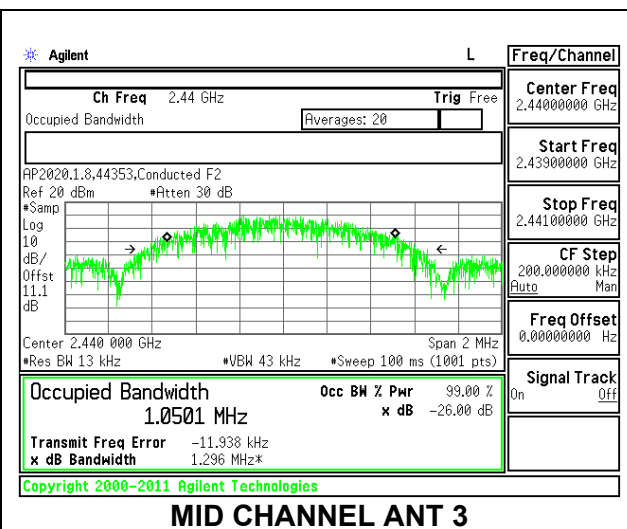
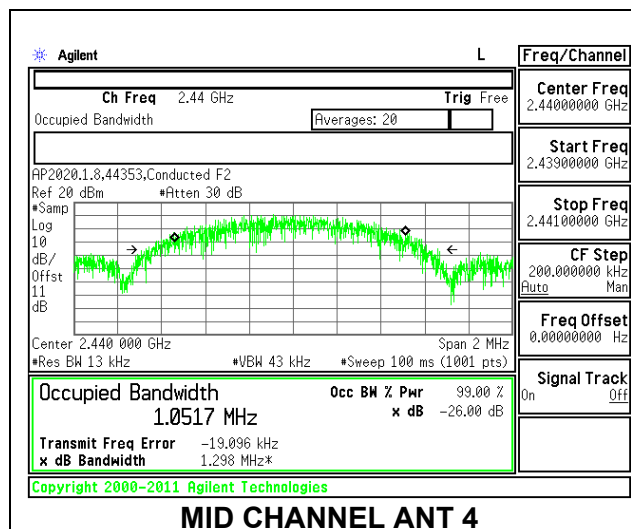




### 9.2.3. HIGH POWER BLE TXBF (1Mbps)

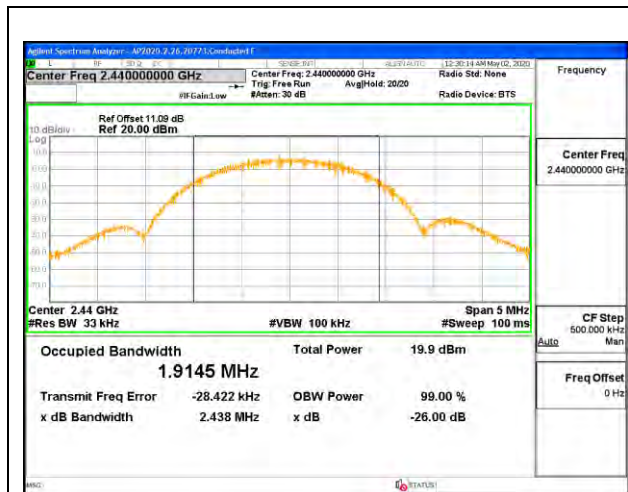
| Channel | Frequency<br>(MHz) | 99% Bandwidth<br>ANT 4<br>(MHz) | 99% Bandwidth<br>ANT 3<br>(MHz) |
|---------|--------------------|---------------------------------|---------------------------------|
| Low     | 2402               | 1.0496                          | 1.0503                          |
| Mid     | 2440               | 1.0517                          | 1.0501                          |
| High    | 2480               | 1.0502                          | 1.0488                          |

|     |       |       |            |
|-----|-------|-------|------------|
| ID: | 44353 | Date: | 02/24/2020 |
|-----|-------|-------|------------|



### 9.2.4. HIGH POWER BLE TXBF (2Mbps)

| Channel | Frequency<br>(MHz) | 99% Bandwidth<br>ANT 4<br>(MHz) | 99% Bandwidth<br>ANT 3<br>(MHz) |
|---------|--------------------|---------------------------------|---------------------------------|
| Low     | 2404               | 1.9341                          | 1.9194                          |
| Mid     | 2440               | 1.9145                          | 1.9195                          |
| High    | 2478               | 1.9237                          | 1.9204                          |



**MID CHANNEL ANT 4**



**MID CHANNEL ANT 3**

### **9.3. 6 dB BANDWIDTH**

#### **LIMITS**

FCC §15.247 (a) (2)

RSS-247 5.2 (a)

The minimum 6 dB bandwidth shall be at least 500 kHz.

#### **RESULTS**

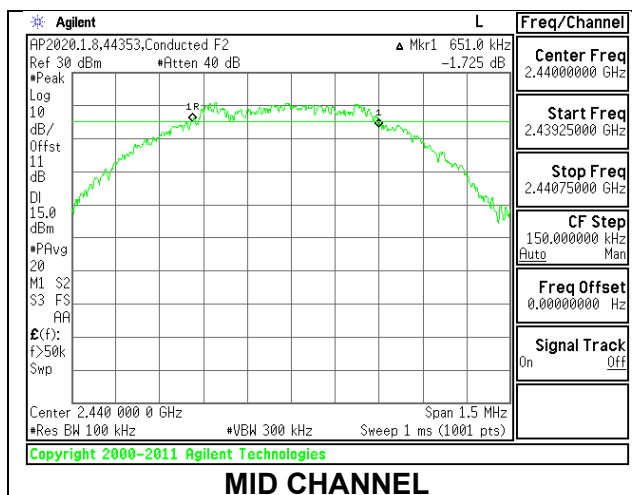
The 6dB bandwidth was measured for the narrowest bandwidth mode, High Power 1Mbps, to demonstrate compliance with the minimum required bandwidth of 500 kHz. Other modes were not tested as their bandwidth is greater than the High Power 1Mbps mode, as demonstrated by the 99% bandwidth measurements performed on all modes.

Only Mid channel plot is reported to show setting parameter complies with testing method/procedure.

### 9.3.1. HIGH POWER BLE (1Mbps)

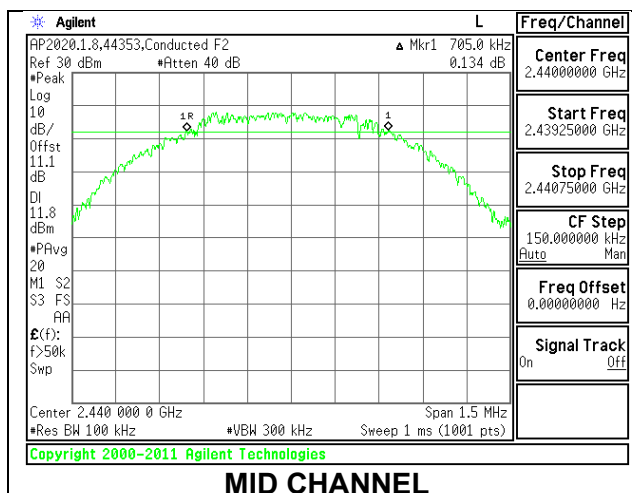
#### ANT 4

| Channel | Frequency (MHz) | 6 dB Bandwidth (MHz) | Minimum Limit (MHz) |
|---------|-----------------|----------------------|---------------------|
| Low     | 2402            | 0.6810               | 0.5                 |
| Middle  | 2440            | 0.6510               | 0.5                 |
| High    | 2480            | 0.6720               | 0.5                 |



#### ANT 3

| Channel | Frequency (MHz) | 6 dB Bandwidth (MHz) | Minimum Limit (MHz) |
|---------|-----------------|----------------------|---------------------|
| Low     | 2402            | 0.7020               | 0.5                 |
| Middle  | 2440            | 0.7050               | 0.5                 |
| High    | 2480            | 0.6820               | 0.5                 |



## 9.4. OUTPUT POWER

### LIMITS

FCC §15.247 (b) (3)

RSS-247 5.4 (d)

The maximum antenna gain is less than or equal to 6 dBi, therefore the limit is 30 dBm.

### TEST PROCEDURE

The transmitter output is connected to a power meter with wideband power sensor..

The cable assembly insertion loss of 10.5 dB (including 10 dB pad and 0.5 dB cable) was entered as an offset in the power meter to allow for peak reading of power.

### DIRECTIONAL ANTENNA GAIN

For 1 TX:

There is only one transmitter output therefore the directional gain is equal to the antenna gain.

For 2 TX:

Tx chains are correlated for power due to the device supporting Beamforming. The directional gains are as follows:

| Band<br>(GHz) | ANT 4<br>Antenna<br>Gain<br>(dBi) | ANT 3<br>Antenna<br>Gain<br>(dBi) | Uncorrelated Chains<br>Directional<br>Gain<br>(dBi) | Correlated Chains<br>Directional<br>Gain<br>(dBi) |
|---------------|-----------------------------------|-----------------------------------|---|---|
| 2.4           | -1.90                             | 0.40                              | -0.60   | 2.34  |

### RESULTS

### 9.4.1. HIGH POWER BLE (1Mbps)

#### ANT 4

|            |           |
|------------|-----------|
| Tested By: | 20773     |
| Date:      | 7/27/2020 |

| Channel | Frequency<br>(MHz) | Peak Power<br>Reading<br>(dBm) | Limit<br>(dBm) | Margin<br>(dB) |
|---------|--------------------|--------------------------------|----------------|----------------|
| Low     | 2402               | 20.22                          | 30             | -9.78          |
| Middle  | 2440               | 20.27                          | 30             | -9.73          |
| High    | 2480               | 20.23                          | 30             | -9.77          |

#### ANT 3

|            |           |
|------------|-----------|
| Tested By: | 20773     |
| Date:      | 7/27/2020 |

| Channel | Frequency<br>(MHz) | Peak Power<br>Reading<br>(dBm) | Limit<br>(dBm) | Margin<br>(dB) |
|---------|--------------------|--------------------------------|----------------|----------------|
| Low     | 2402               | 20.20                          | 30             | -9.80          |
| Middle  | 2440               | 20.25                          | 30             | -9.75          |
| High    | 2480               | 20.22                          | 30             | -9.78          |

### 9.4.2. HIGH POWER BLE (2Mbps)

#### ANT 4

|            |           |
|------------|-----------|
| Tested By: | 20773     |
| Date:      | 7/27/2020 |

| Channel | Frequency<br>(MHz) | Peak Power<br>Reading<br>(dBm) | Limit<br>(dBm) | Margin<br>(dB) |
|---------|--------------------|--------------------------------|----------------|----------------|
| Low     | 2404               | 20.15                          | 30             | -9.85          |
| Middle  | 2440               | 20.22                          | 30             | -9.78          |
| High    | 2478               | 20.18                          | 30             | -9.82          |

#### ANT 3

|            |           |
|------------|-----------|
| Tested By: | 20773     |
| Date:      | 7/27/2020 |

| Channel | Frequency<br>(MHz) | Peak Power<br>Reading<br>(dBm) | Limit<br>(dBm) | Margin<br>(dB) |
|---------|--------------------|--------------------------------|----------------|----------------|
| Low     | 2404               | 20.14                          | 30             | -9.86          |
| Middle  | 2440               | 20.19                          | 30             | -9.81          |
| High    | 2478               | 20.12                          | 30             | -9.88          |

### 9.4.3. LOW POWER BLE (1Mbps)

#### ANT 4

|            |           |
|------------|-----------|
| Tested By: | 20773     |
| Date:      | 7/27/2020 |

| Channel | Frequency<br>(MHz) | Peak Power<br>Reading<br>(dBm) | Limit<br>(dBm) | Margin<br>(dB) |
|---------|--------------------|--------------------------------|----------------|----------------|
| Low     | 2402               | 12.75                          | 30             | -17.25         |
| Middle  | 2440               | 12.77                          | 30             | -17.23         |
| High    | 2480               | 12.79                          | 30             | -17.21         |

#### ANT 3

|            |           |
|------------|-----------|
| Tested By: | 20773     |
| Date:      | 7/27/2020 |

| Channel | Frequency<br>(MHz) | Peak Power<br>Reading<br>(dBm) | Limit<br>(dBm) | Margin<br>(dB) |
|---------|--------------------|--------------------------------|----------------|----------------|
| Low     | 2402               | 12.62                          | 30             | -17.38         |
| Middle  | 2440               | 12.79                          | 30             | -17.21         |
| High    | 2480               | 12.69                          | 30             | -17.31         |

### 9.4.4. LOW POWER BLE (2Mbps)

#### ANT 4

|            |           |
|------------|-----------|
| Tested By: | 20773     |
| Date:      | 7/27/2020 |

| Channel | Frequency<br>(MHz) | Peak Power<br>Reading<br>(dBm) | Limit<br>(dBm) | Margin<br>(dB) |
|---------|--------------------|--------------------------------|----------------|----------------|
| Low     | 2404               | 12.69                          | 30             | -17.31         |
| Middle  | 2440               | 12.72                          | 30             | -17.28         |
| High    | 2478               | 12.62                          | 30             | -17.38         |

#### ANT 3

|            |           |
|------------|-----------|
| Tested By: | 20773     |
| Date:      | 7/27/2020 |

| Channel | Frequency<br>(MHz) | Peak Power<br>Reading<br>(dBm) | Limit<br>(dBm) | Margin<br>(dB) |
|---------|--------------------|--------------------------------|----------------|----------------|
| Low     | 2404               | 12.71                          | 30             | -17.29         |
| Middle  | 2440               | 12.85                          | 30             | -17.15         |
| High    | 2478               | 12.79                          | 30             | -17.21         |

#### 9.4.5. HIGH POWER BLE TXBF (1Mbps)

##### ANT 4 + ANT 3

|            |           |
|------------|-----------|
| Tested By: | 20773     |
| Date:      | 7/27/2020 |

| Channel | Frequency<br>(MHz) | Output Power<br>ANT 4<br>(dBm) | Output Power<br>ANT 3<br>(dBm) | Total Power<br>(dBm) | Limit<br>(dBm) | Margin<br>(dB) |
|---------|--------------------|--------------------------------|--------------------------------|----------------------|----------------|----------------|
| Low     | 2402               | 17.10                          | 17.14                          | 20.13                | 30             | -9.87          |
| Middle  | 2440               | 17.08                          | 17.20                          | 20.15                | 30             | -9.85          |
| High    | 2480               | 17.10                          | 17.12                          | 20.12                | 30             | -9.88          |

#### 9.4.6. HIGH POWER BLE TXBF (2Mbps)

##### ANT 4 + ANT 3

|            |           |
|------------|-----------|
| Tested By: | 20773     |
| Date:      | 7/27/2020 |

| Channel | Frequency<br>(MHz) | Output Power<br>ANT 4<br>(dBm) | Output Power<br>ANT 3<br>(dBm) | Total Power<br>(dBm) | Limit<br>(dBm) | Margin<br>(dB) |
|---------|--------------------|--------------------------------|--------------------------------|----------------------|----------------|----------------|
| Low     | 2404               | 17.10                          | 17.07                          | 20.10                | 30             | -9.90          |
| Middle  | 2440               | 17.19                          | 17.16                          | 20.19                | 30             | -9.81          |
| High    | 2478               | 17.05                          | 17.08                          | 20.08                | 30             | -9.92          |

#### 9.4.7. LOW POWER BLE TXBF (1Mbps)

##### ANT 4 + ANT 3

|            |           |
|------------|-----------|
| Tested By: | 20773     |
| Date:      | 7/27/2020 |

| Channel | Frequency<br>(MHz) | Output Power<br>ANT 4<br>(dBm) | Output Power<br>ANT 3<br>(dBm) | Total Power<br>(dBm) | Limit<br>(dBm) | Margin<br>(dB) |
|---------|--------------------|--------------------------------|--------------------------------|----------------------|----------------|----------------|
| Low     | 2402               | 12.73                          | 12.78                          | 15.77                | 30             | -14.23         |
| Middle  | 2440               | 12.89                          | 12.85                          | 15.88                | 30             | -14.12         |
| High    | 2480               | 12.82                          | 12.86                          | 15.85                | 30             | -14.15         |

#### 9.4.8. LOW POWER BLE TXBF (2Mbps)

##### ANT 4 + ANT 3

|            |           |
|------------|-----------|
| Tested By: | 20773     |
| Date:      | 7/27/2020 |

| Channel | Frequency<br>(MHz) | Output Power<br>ANT 4<br>(dBm) | Output Power<br>ANT 3<br>(dBm) | Total Power<br>(dBm) | Limit<br>(dBm) | Margin<br>(dB) |
|---------|--------------------|--------------------------------|--------------------------------|----------------------|----------------|----------------|
| Low     | 2404               | 12.85                          | 12.88                          | 15.88                | 30             | -14.12         |
| Middle  | 2440               | 12.90                          | 12.92                          | 15.92                | 30             | -14.08         |
| High    | 2478               | 12.77                          | 12.76                          | 15.78                | 30             | -14.22         |



## **9.5. AVERAGE POWER**

### **LIMITS**

None; for reporting purposes only.

### **TEST PROCEDURE**

The transmitter output is connected to a power meter with wideband power sensor.

The cable assembly insertion loss of 10.5 dB (including 10 dB pad and 0.5 dB cable) was entered as an offset in the power meter to allow for a gated average reading of power.

### **RESULTS**

### 9.5.1. HIGH POWER BLE (1Mbps)

#### ANT 4

|            |           |
|------------|-----------|
| Tested By: | 20773     |
| Date:      | 7/25/2020 |

| Channel | Frequency<br>(MHz) | AV power<br>(dBm) |
|---------|--------------------|-------------------|
| Low     | 2402               | 19.76             |
| Middle  | 2440               | 19.86             |
| High    | 2480               | 19.83             |

#### ANT 3

|            |           |
|------------|-----------|
| Tested By: | 20773     |
| Date:      | 7/25/2020 |

| Channel | Frequency<br>(MHz) | AV power<br>(dBm) |
|---------|--------------------|-------------------|
| Low     | 2402               | 19.71             |
| Middle  | 2440               | 19.91             |
| High    | 2480               | 19.86             |

### 9.5.2. HIGH POWER BLE (2Mbps)

#### ANT 4

|            |           |
|------------|-----------|
| Tested By: | 20773     |
| Date:      | 7/25/2020 |

| Channel | Frequency<br>(MHz) | AV power<br>(dBm) |
|---------|--------------------|-------------------|
| Low     | 2404               | 19.68             |
| Middle  | 2440               | 19.86             |
| High    | 2478               | 19.80             |

#### ANT 3

|            |           |
|------------|-----------|
| Tested By: | 20773     |
| Date:      | 7/25/2020 |

| Channel | Frequency<br>(MHz) | AV power<br>(dBm) |
|---------|--------------------|-------------------|
| Low     | 2404               | 19.76             |
| Middle  | 2440               | 19.89             |
| High    | 2478               | 19.79             |

### 9.5.3. LOW POWER BLE (1Mbps)

#### ANT 4

|            |           |
|------------|-----------|
| Tested By: | 20773     |
| Date:      | 7/25/2020 |

| Channel | Frequency<br>(MHz) | AV power<br>(dBm) |
|---------|--------------------|-------------------|
| Low     | 2402               | 12.25             |
| Middle  | 2440               | 12.33             |
| High    | 2480               | 12.37             |

#### ANT 3

|            |           |
|------------|-----------|
| Tested By: | 20773     |
| Date:      | 7/25/2020 |

| Channel | Frequency<br>(MHz) | AV power<br>(dBm) |
|---------|--------------------|-------------------|
| Low     | 2402               | 12.20             |
| Middle  | 2440               | 12.38             |
| High    | 2480               | 12.29             |

### 9.5.4. LOW POWER BLE (2Mbps)

#### ANT 4

|            |           |
|------------|-----------|
| Tested By: | 20773     |
| Date:      | 7/25/2020 |

| Channel | Frequency<br>(MHz) | AV power<br>(dBm) |
|---------|--------------------|-------------------|
| Low     | 2404               | 12.19             |
| Middle  | 2440               | 12.32             |
| High    | 2478               | 12.26             |

#### ANT 3

|            |           |
|------------|-----------|
| Tested By: | 20773     |
| Date:      | 7/25/2020 |

| Channel | Frequency<br>(MHz) | AV power<br>(dBm) |
|---------|--------------------|-------------------|
| Low     | 2404               | 12.30             |
| Middle  | 2440               | 12.41             |
| High    | 2478               | 12.39             |

### 9.5.5. HIGH POWER BLE TXBF (1Mbps)

#### ANT 4 + ANT 3

|            |           |
|------------|-----------|
| Tested By: | 20773     |
| Date:      | 7/25/2020 |

| Channel | Frequency<br>(MHz) | Average Power<br>ANT 4<br>(dBm) | Average Power<br>ANT 3<br>(dBm) | Total Power<br>(dBm) |
|---------|--------------------|---------------------------------|---------------------------------|----------------------|
| Low     | 2402               | 17.21                           | 17.23                           | 20.23                |
| Middle  | 2440               | 17.39                           | 17.41                           | 20.41                |
| High    | 2480               | 17.19                           | 17.32                           | 20.27                |

### 9.5.6. HIGH POWER BLE TXBF (2Mbps)

#### ANT 4 + ANT 3

|            |           |
|------------|-----------|
| Tested By: | 20773     |
| Date:      | 7/25/2020 |

| Channel | Frequency<br>(MHz) | Average Power<br>ANT 4<br>(dBm) | Average Power<br>ANT 3<br>(dBm) | Total Power<br>(dBm) |
|---------|--------------------|---------------------------------|---------------------------------|----------------------|
| Low     | 2402               | 17.14                           | 17.31                           | 20.24                |
| Middle  | 2440               | 17.23                           | 17.29                           | 20.27                |
| High    | 2480               | 17.29                           | 17.16                           | 20.24                |

### 9.5.7. LOW POWER BLE TXBF (1Mbps)

#### ANT 4 + ANT 3

|            |           |
|------------|-----------|
| Tested By: | 20773     |
| Date:      | 7/25/2020 |

| Channel | Frequency<br>(MHz) | Average Power<br>ANT 4<br>(dBm) | Average Power<br>ANT 3<br>(dBm) | Total Power<br>(dBm) |
|---------|--------------------|---------------------------------|---------------------------------|----------------------|
| Low     | 2402               | 12.31                           | 12.24                           | 15.29                |
| Middle  | 2440               | 12.40                           | 12.39                           | 15.41                |
| High    | 2480               | 12.37                           | 12.42                           | 15.41                |

### 9.5.8. LOW POWER BLE TXBF (2Mbps)

#### ANT 4 + ANT 3

|            |           |
|------------|-----------|
| Tested By: | 20773     |
| Date:      | 7/25/2020 |

| Channel | Frequency<br>(MHz) | Average Power<br>ANT 4<br>(dBm) | Average Power<br>ANT 3<br>(dBm) | Total Power<br>(dBm) |
|---------|--------------------|---------------------------------|---------------------------------|----------------------|
| Low     | 2402               | 12.31                           | 12.39                           | 15.36                |
| Middle  | 2440               | 12.39                           | 12.42                           | 15.42                |
| High    | 2480               | 12.28                           | 12.36                           | 15.33                |

## **9.6. POWER SPECTRAL DENSITY**

### **LIMITS**

FCC §15.247 (e)

RSS-247 (5.2) (b)

The power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

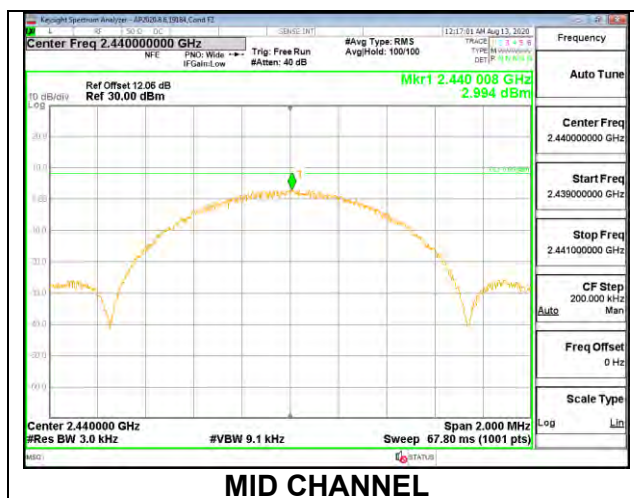
### **RESULTS**

Only Mid channel plot is reported to show setting parameter complies with testing method/procedure.

### 9.6.1. HIGH POWER BLE (1Mbps)

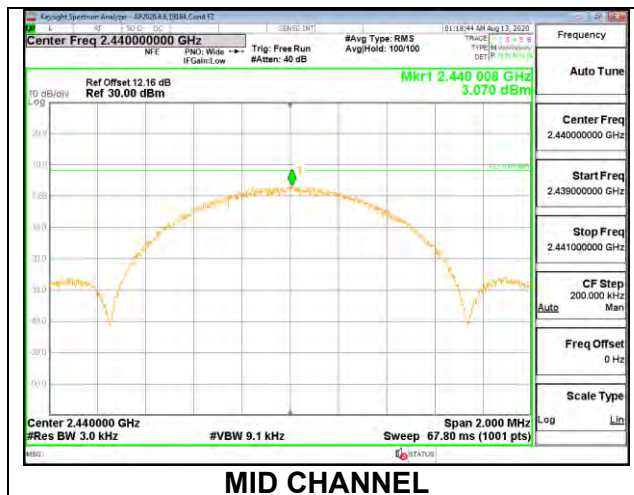
#### ANT 4

| Channel | Frequency (MHz) | PSD (dBm/3kHz) | Limit (dBm/3kHz) | Margin (dB) |
|---------|-----------------|----------------|------------------|-------------|
| Low     | 2402            | 2.864          | 8                | -5.14       |
| Middle  | 2440            | 2.994          | 8                | -5.01       |
| High    | 2480            | 3.091          | 8                | -4.91       |



#### ANT 3:

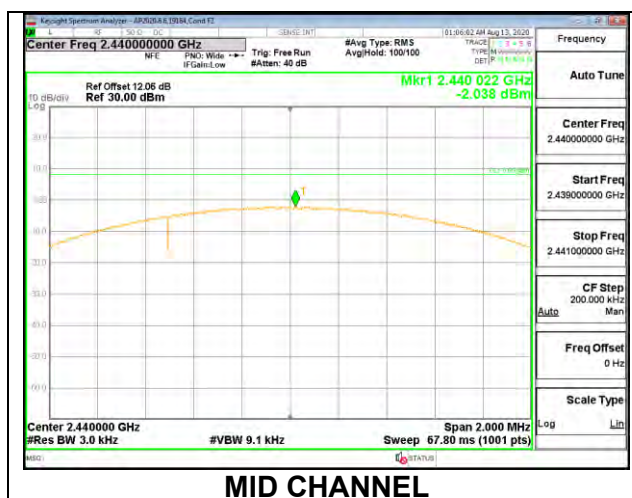
| Channel | Frequency (MHz) | PSD (dBm/3kHz) | Limit (dBm/3kHz) | Margin (dB) |
|---------|-----------------|----------------|------------------|-------------|
| Low     | 2402            | 3.267          | 8                | -4.73       |
| Middle  | 2440            | 3.070          | 8                | -4.93       |
| High    | 2480            | 3.054          | 8                | -4.95       |



## 9.6.2. HIGH POWER BLE (2Mbps)

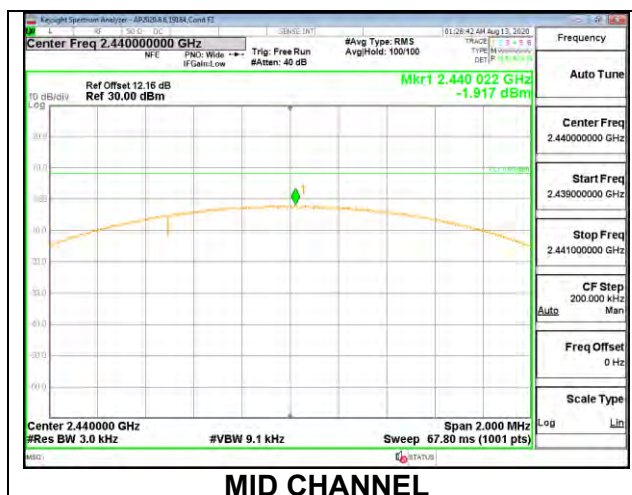
### ANT 4

| Channel | Frequency (MHz) | PSD (dBm/3kHz) | Limit (dBm/3kHz) | Margin (dB) |
|---------|-----------------|----------------|------------------|-------------|
| Low     | 2404            | -2.117         | 8                | -10.12      |
| Middle  | 2440            | -2.038         | 8                | -10.04      |
| High    | 2478            | -2.153         | 8                | -10.15      |



### ANT 3

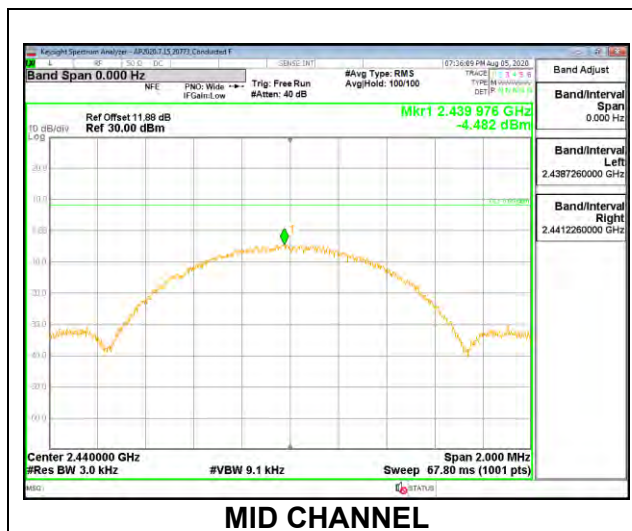
| Channel | Frequency (MHz) | PSD (dBm/3kHz) | Limit (dBm/3kHz) | Margin (dB) |
|---------|-----------------|----------------|------------------|-------------|
| Low     | 2402            | -1.942         | 8                | -9.94       |
| Middle  | 2440            | -1.917         | 8                | -9.92       |
| High    | 2480            | -2.120         | 8                | -10.12      |



### 9.6.3. LOW POWER BLE (1Mbps)

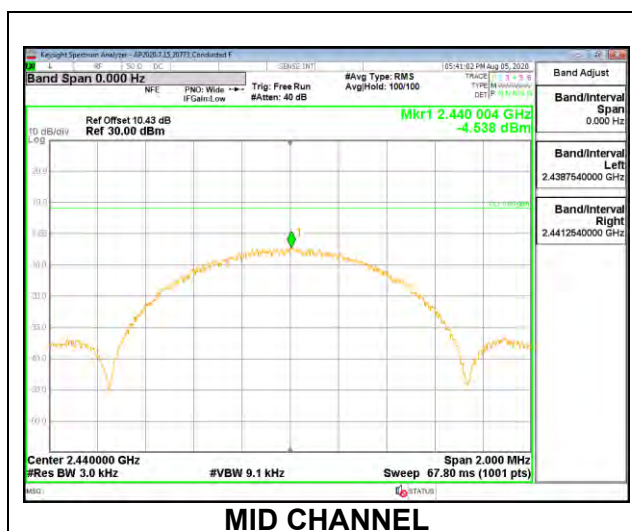
#### ANT 4

| Channel | Frequency (MHz) | PSD (dBm/3kHz) | Limit (dBm/3kHz) | Margin (dB) |
|---------|-----------------|----------------|------------------|-------------|
| Low     | 2402            | -4.668         | 8                | -12.67      |
| Middle  | 2440            | -4.482         | 8                | -12.48      |
| High    | 2480            | -1.850         | 8                | -9.85       |



#### ANT 3

| Channel | Frequency (MHz) | PSD (dBm/3kHz) | Limit (dBm/3kHz) | Margin (dB) |
|---------|-----------------|----------------|------------------|-------------|
| Low     | 2402            | -4.691         | 8                | -12.69      |
| Middle  | 2440            | -4.538         | 8                | -12.54      |
| High    | 2480            | -4.304         | 8                | -12.30      |

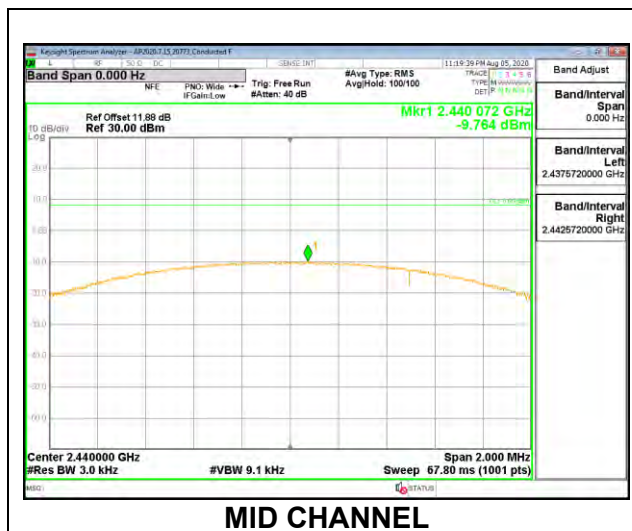




### 9.6.4. LOW POWER BLE (2Mbps)

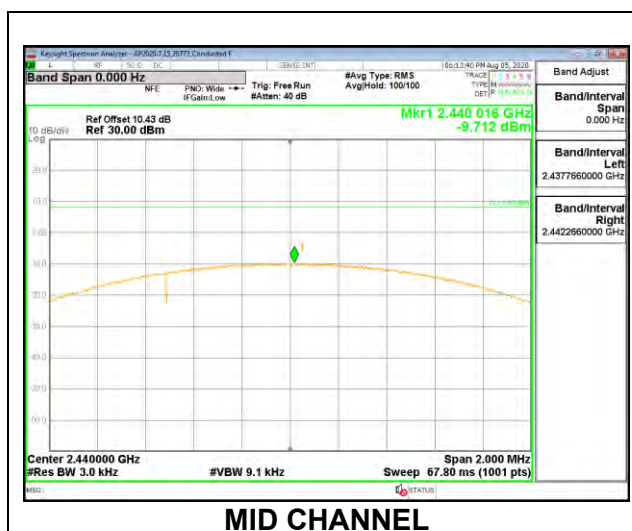
#### ANT 4

| Channel | Frequency (MHz) | PSD (dBm/3kHz) | Limit (dBm/3kHz) | Margin (dB) |
|---------|-----------------|----------------|------------------|-------------|
| Low     | 2404            | -9.850         | 8                | -17.85      |
| Middle  | 2440            | -9.764         | 8                | -17.76      |
| High    | 2478            | -10.891        | 8                | -18.89      |



#### ANT 3

| Channel | Frequency (MHz) | PSD (dBm/3kHz) | Limit (dBm/3kHz) | Margin (dB) |
|---------|-----------------|----------------|------------------|-------------|
| Low     | 2404            | -9.807         | 8                | -17.81      |
| Middle  | 2440            | -9.712         | 8                | -17.71      |
| High    | 2478            | -9.745         | 8                | -17.75      |

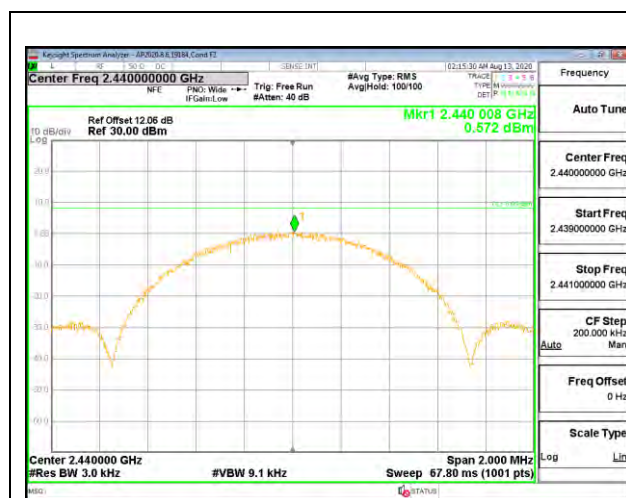


### 9.6.5. HIGH POWER BLE TXBF (1Mbps)

|                    |      |  |
|--------------------|------|--|
| Duty Cycle CF (dB) | 0.00 | Included in Calculations of Corr'd PSD |
|--------------------|------|--|

#### PSD Results

| Channel | Frequency<br>(MHz) | ANT 4<br>Meas<br>(dBm/<br>3kHz) | ANT 3<br>Meas<br>(dBm/<br>3kHz) | Total<br>Corr'd<br>PSD<br>(dBm/<br>3kHz) | Limit<br>(dBm/<br>3kHz) | Margin<br>(dB) |
|---------|--------------------|---------------------------------|---------------------------------|--|-------------------------|----------------|
| Low     | 2402               | 0.255                           | 0.130                           | 3.20                                     | 8.0                     | -4.80          |
| Mid     | 2440               | 0.572                           | 0.420                           | 3.51                                     | 8.0                     | -4.49          |
| Hjigh   | 2480               | 0.266                           | 0.594                           | 3.44                                     | 8.0                     | -4.56          |



MID CHANNEL ANT 4



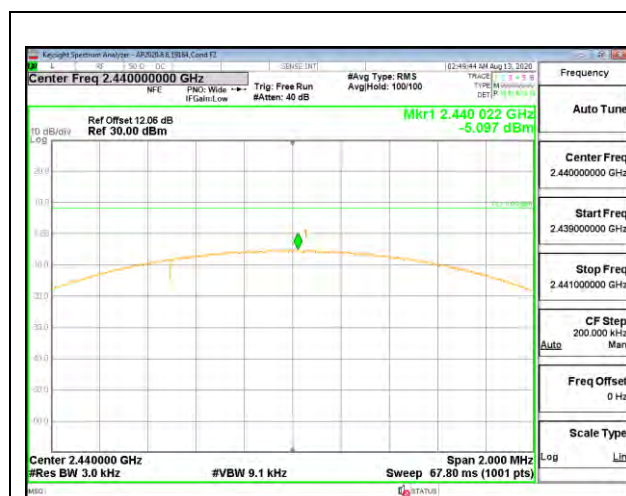
MID CHANNEL ANT 3

### 9.6.6. HIGH POWER BLE TXBF (2Mbps)

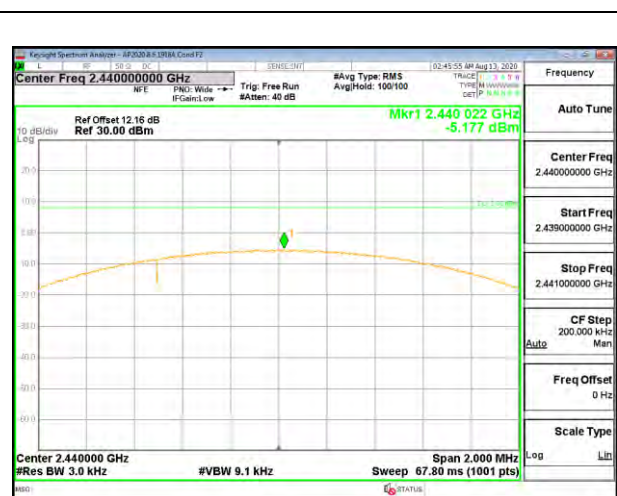
|                    |      |  |
|--------------------|------|--|
| Duty Cycle CF (dB) | 0.00 | Included in Calculations of Corr'd PSD |
|--------------------|------|--|

#### PSD Results

| Channel | Frequency<br>(MHz) | ANT 4<br>Meas<br>(dBm/<br>3kHz) | ANT 3<br>Meas<br>(dBm/<br>3kHz) | Total<br>Corr'd<br>PSD<br>(dBm/<br>3kHz) | Limit<br>(dBm/<br>3kHz) | Margin<br>(dB) |
|---------|--------------------|---------------------------------|---------------------------------|--|-------------------------|----------------|
| Low     | 2404               | -5.030                          | -4.996                          | -2.00                                    | 8.0                     | -10.00         |
| Mid     | 2440               | -5.097                          | -5.177                          | -2.13                                    | 8.0                     | -10.13         |
| Hjigh   | 2478               | -4.950                          | -5.219                          | -2.07                                    | 8.0                     | -10.07         |



MID CHANNEL ANT 4



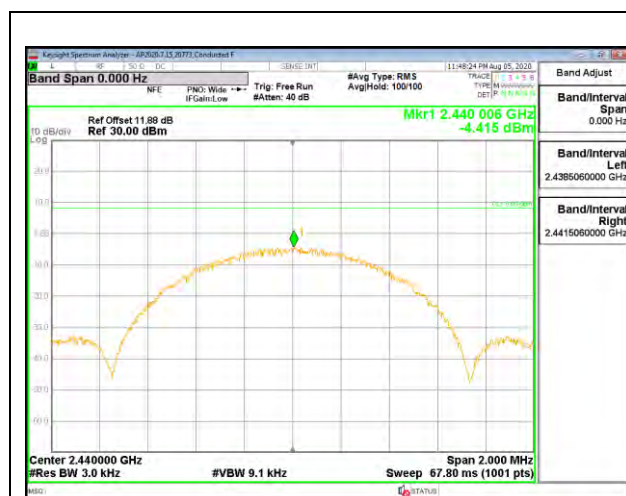
MID CHANNEL ANT 3

### 9.6.7. LOW POWER BLE TXBF (1Mbps)

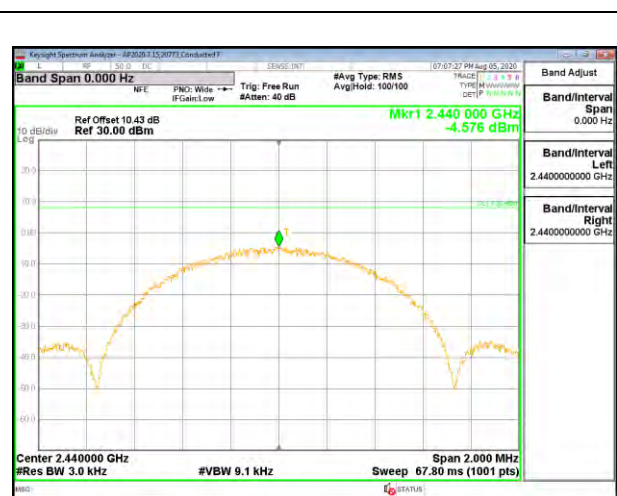
|                    |      |  |
|--------------------|------|--|
| Duty Cycle CF (dB) | 0.00 | Included in Calculations of Corr'd PSD |
|--------------------|------|--|

#### PSD Results

| Channel | Frequency<br>(MHz) | ANT 4<br>Meas<br>(dBm/<br>3kHz) | ANT 3<br>Meas<br>(dBm/<br>3kHz) | Total<br>Corr'd<br>PSD<br>(dBm/<br>3kHz) | Limit<br>(dBm/<br>3kHz) | Margin<br>(dB) |
|---------|--------------------|---------------------------------|---------------------------------|--|-------------------------|----------------|
| Low     | 2402               | -4.406                          | -4.662                          | -1.52                                    | 8.0                     | -9.52          |
| Mid     | 2440               | -4.415                          | -4.576                          | -1.48                                    | 8.0                     | -9.48          |
| Hijgh   | 2480               | -2.156                          | -4.624                          | -0.21                                    | 8.0                     | -8.21          |



MID CHANNEL ANT 4



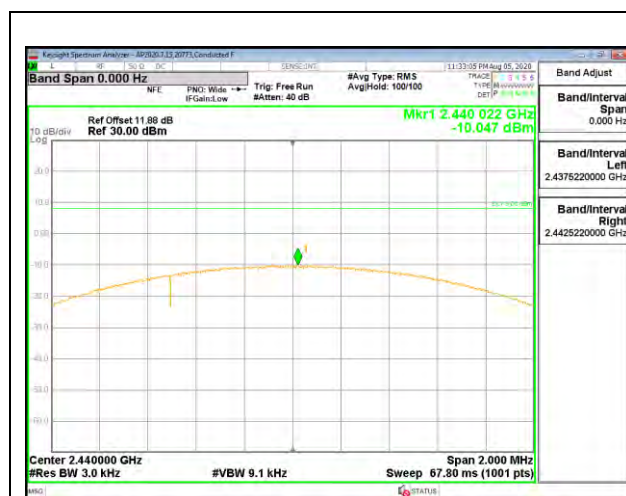
MID CHANNEL ANT 3

### 9.6.8. LOW POWER BLE TXBF (2Mbps)

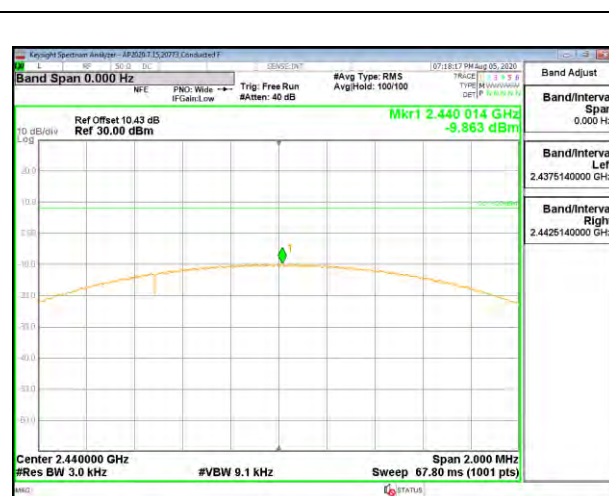
|                    |      |  |
|--------------------|------|--|
| Duty Cycle CF (dB) | 0.00 | Included in Calculations of Corr'd PSD |
|--------------------|------|--|

#### PSD Results

| Channel | Frequency<br>(MHz) | ANT 4<br>Meas<br>(dBm/<br>3kHz) | ANT 3<br>Meas<br>(dBm/<br>3kHz) | Total<br>Corr'd<br>PSD<br>(dBm/<br>3kHz) | Limit<br>(dBm/<br>3kHz) | Margin<br>(dB) |
|---------|--------------------|---------------------------------|---------------------------------|--|-------------------------|----------------|
| Low     | 2404               | -9.851                          | -10.053                         | -6.94                                    | 8.0                     | -14.94         |
| Mid     | 2440               | -10.047                         | -9.863                          | -6.94                                    | 8.0                     | -14.94         |
| Hjigh   | 2478               | -10.988                         | -8.532                          | -6.58                                    | 8.0                     | -14.58         |



MID CHANNEL ANT 4



MID CHANNEL ANT 3

## **9.7. CONDUCTED SPURIOUS EMISSIONS**

### **LIMITS**

FCC §15.247 (d)

RSS-247 5.5

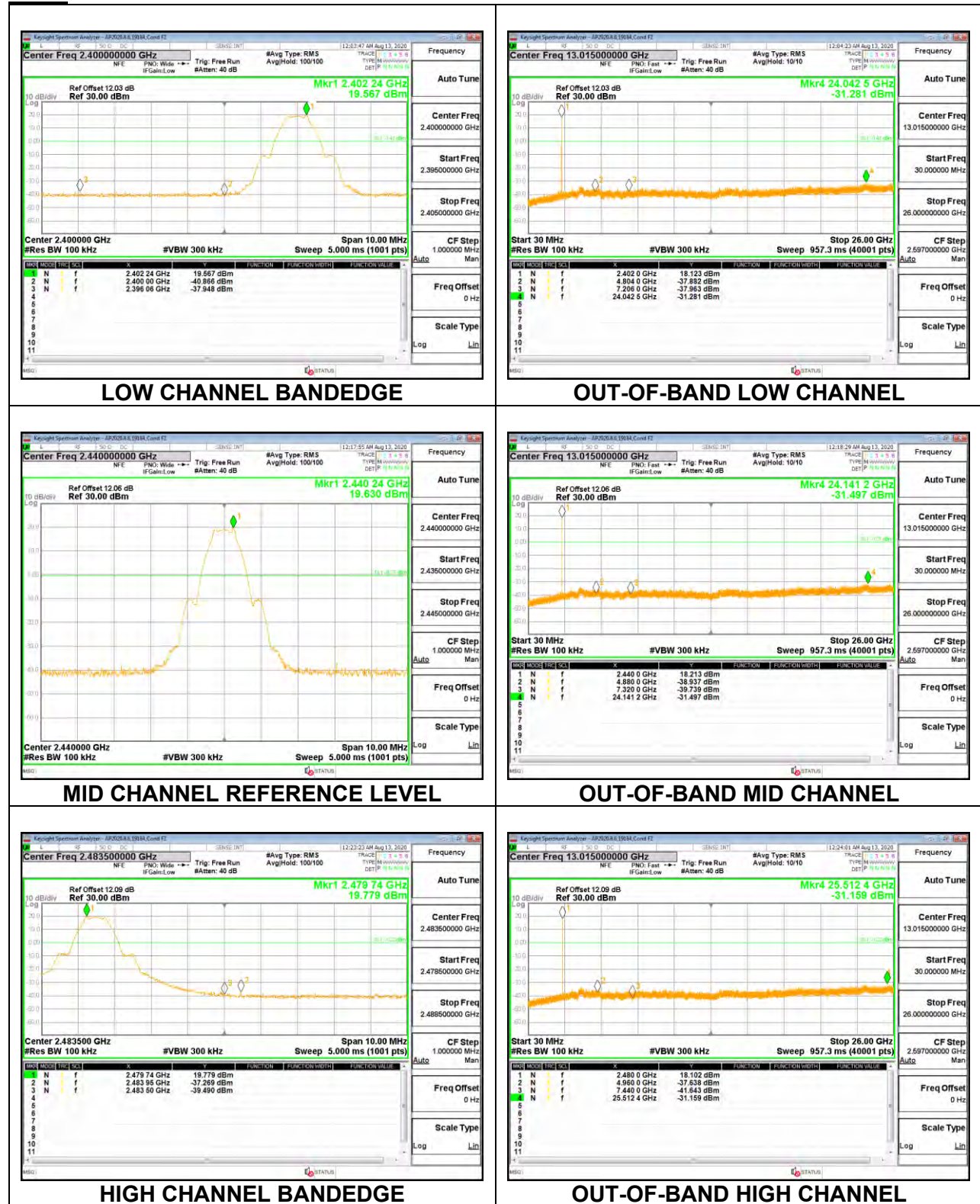
Output power was measured based on the use of a peak measurement, therefore the required attenuation is 20 dB.

### **RESULTS**

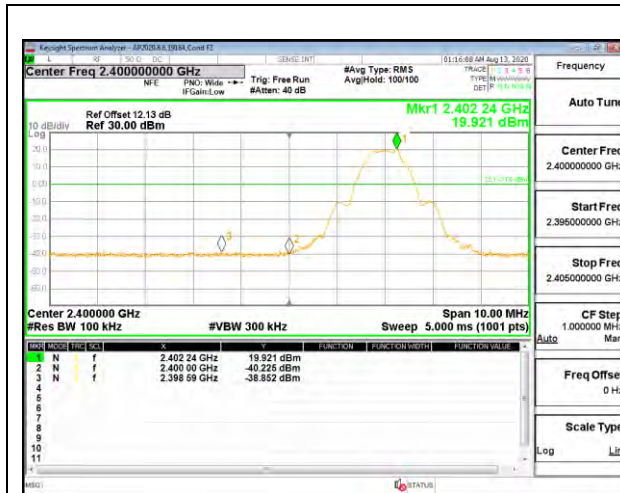


## 9.7.1. HIGH POWER BLE (1Mbps)

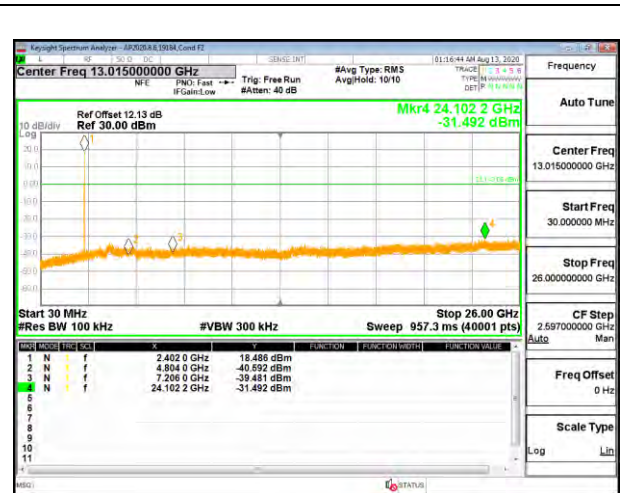
### ANT 4



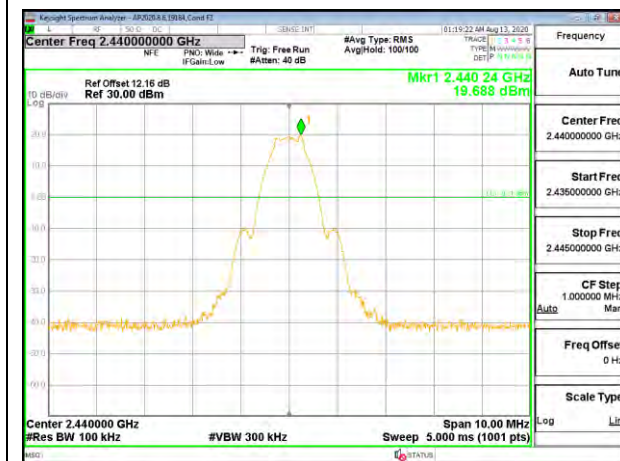
### ANT 3



LOW CHANNEL BANDEDGE



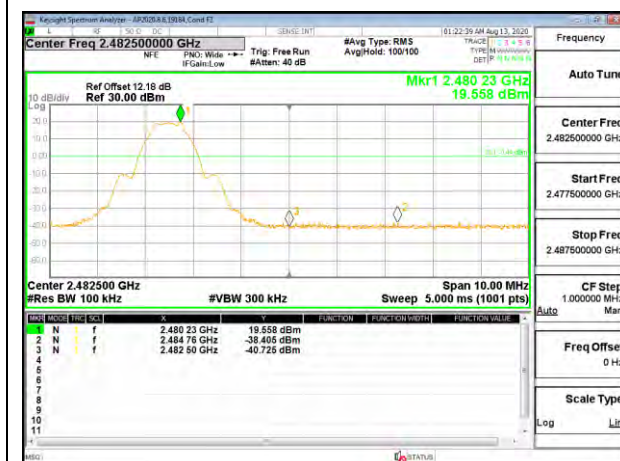
OUT-OF-BAND LOW CHANNEL



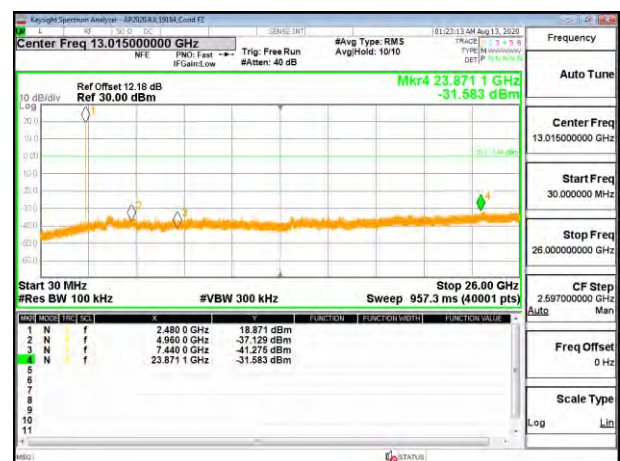
MID CHANNEL REFERENCE LEVEL



OUT-OF-BAND MID CHANNEL



HIGH CHANNEL BANDEDGE

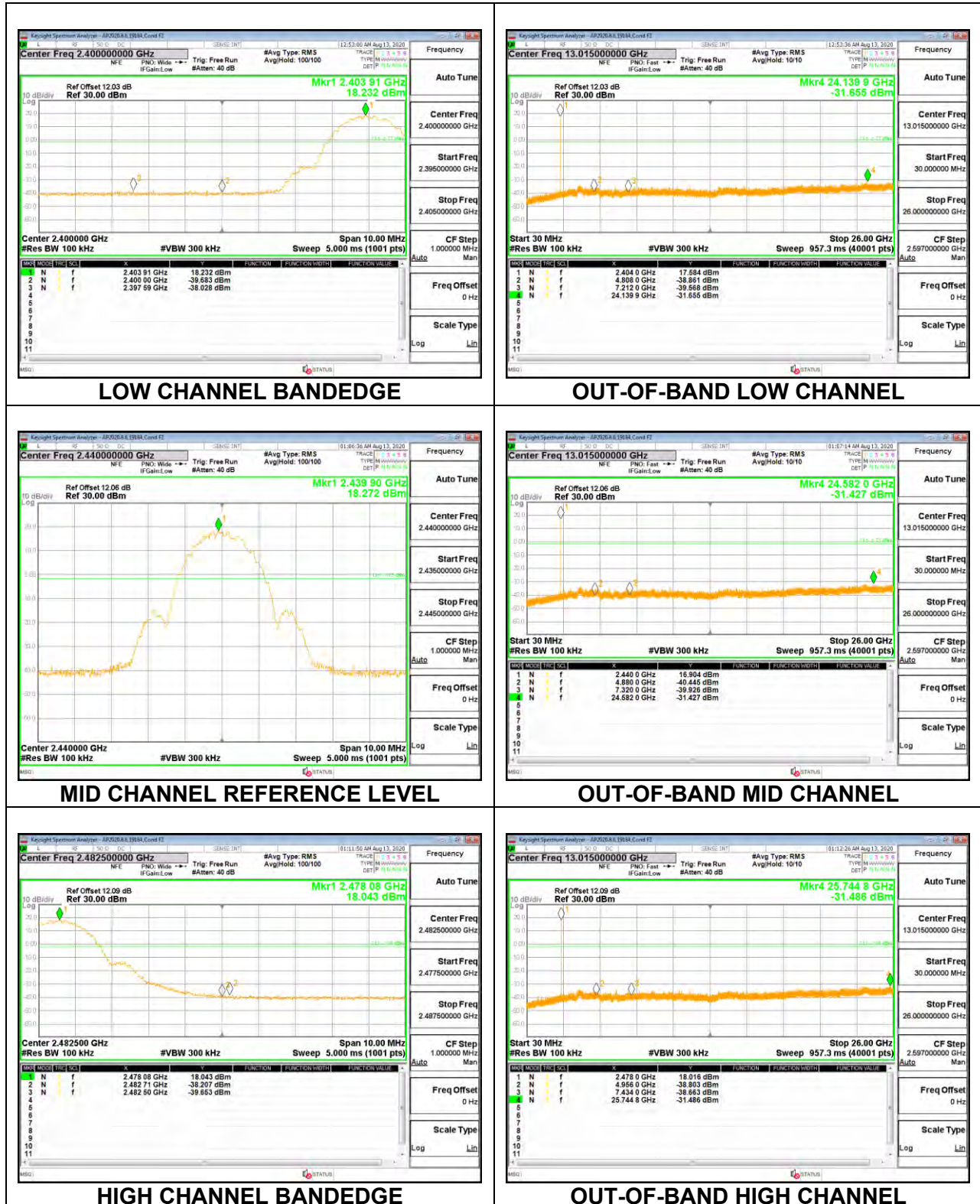


OUT-OF-BAND HIGH CHANNEL

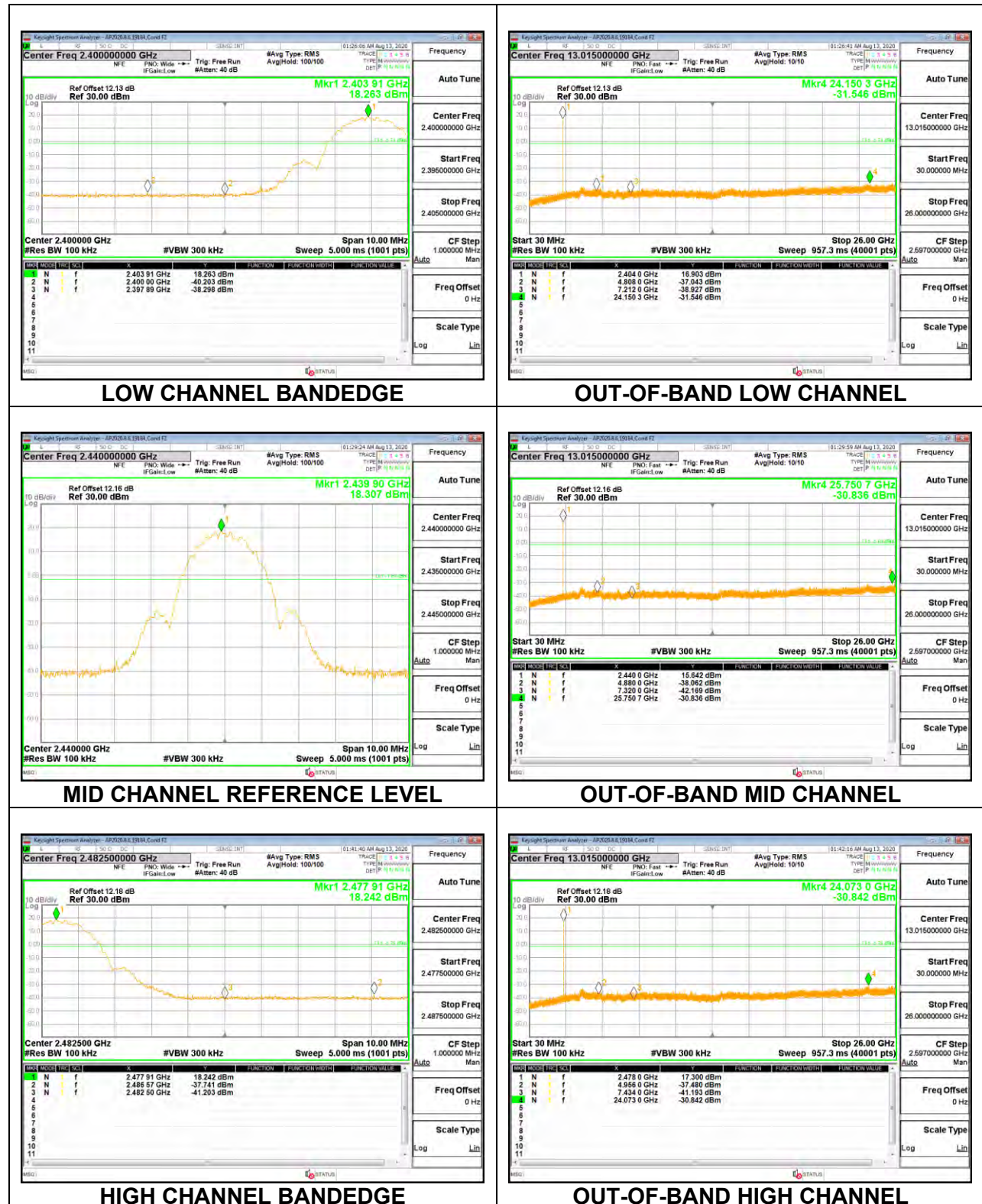


## 9.7.2. HIGH POWER BLE (2Mbps)

### ANT 4



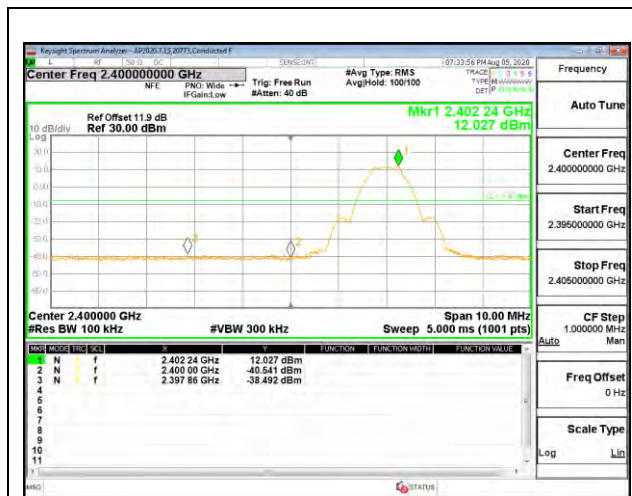
### ANT 3





### 9.7.3. LOW POWER BLE (1Mbps)

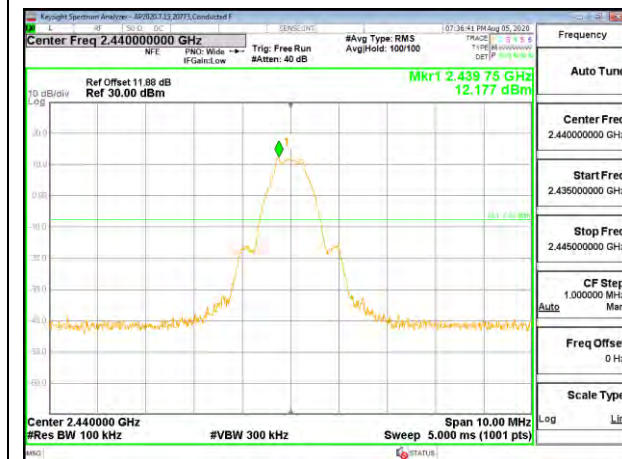
#### ANT 4



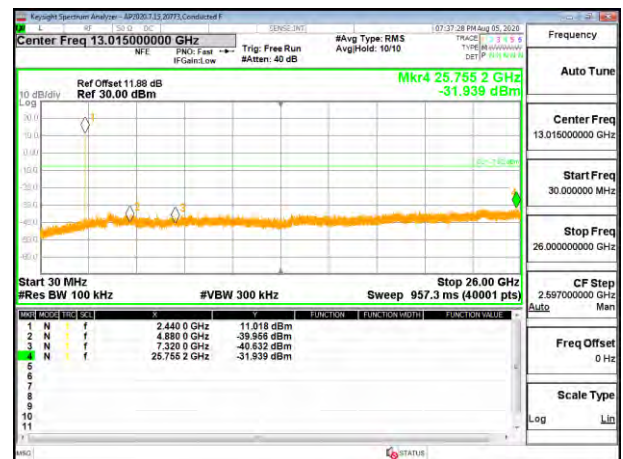
LOW CHANNEL BANDEDGE



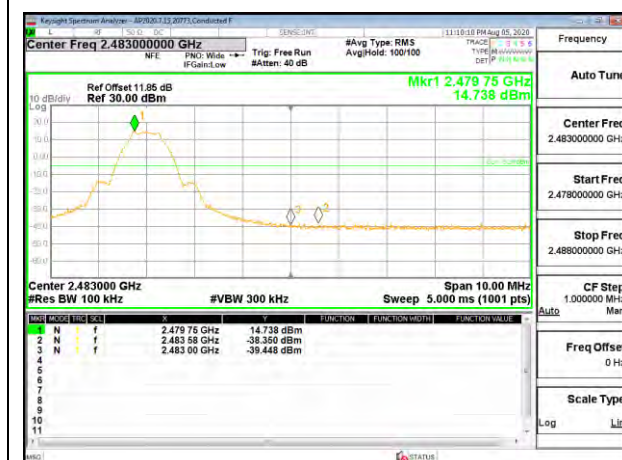
OUT-OF-BAND LOW CHANNEL



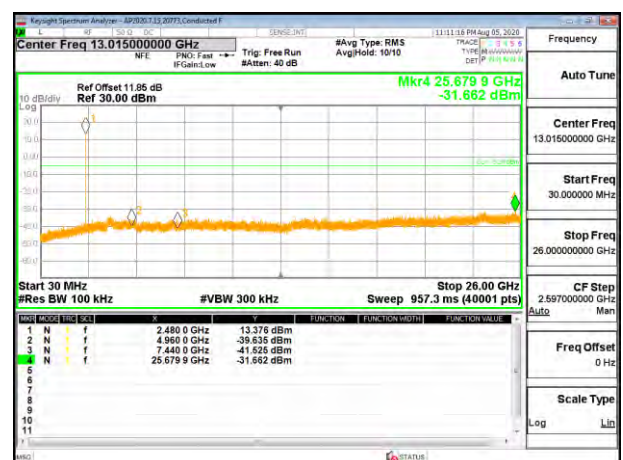
MID CHANNEL REFERENCE LEVEL



OUT-OF-BAND MID CHANNEL

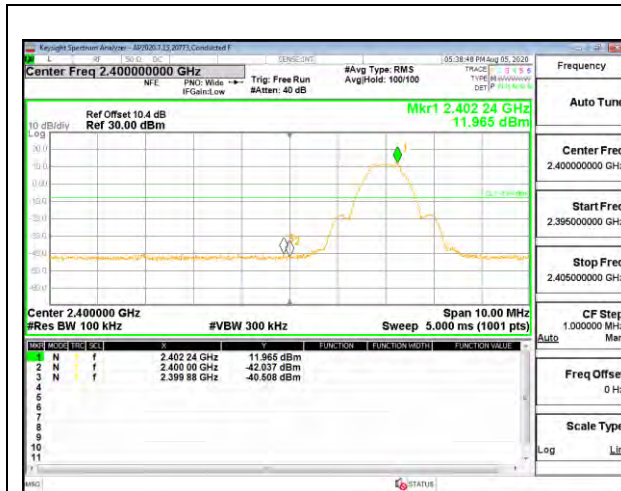


HIGH CHANNEL BANDEDGE

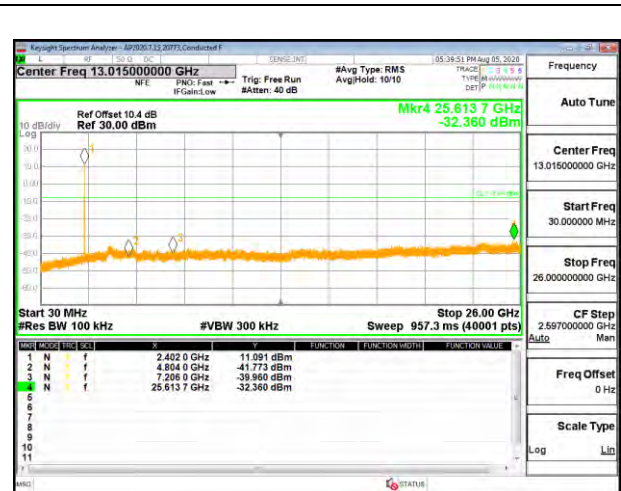


OUT-OF-BAND HIGH CHANNEL

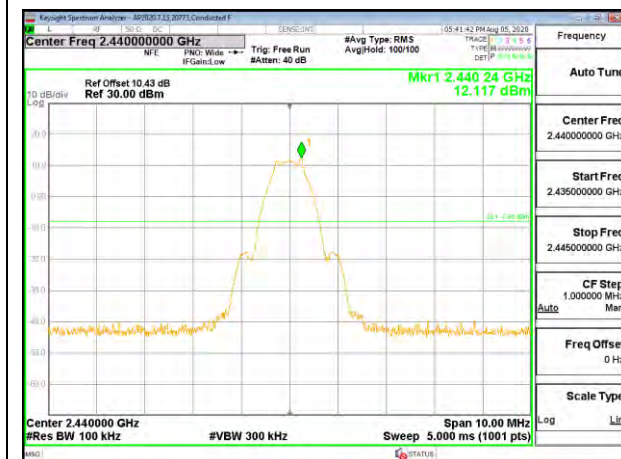
# ANT 3



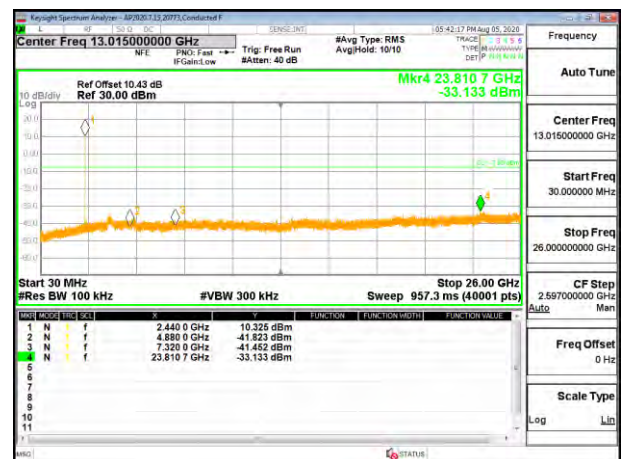
LOW CHANNEL BANDEDGE



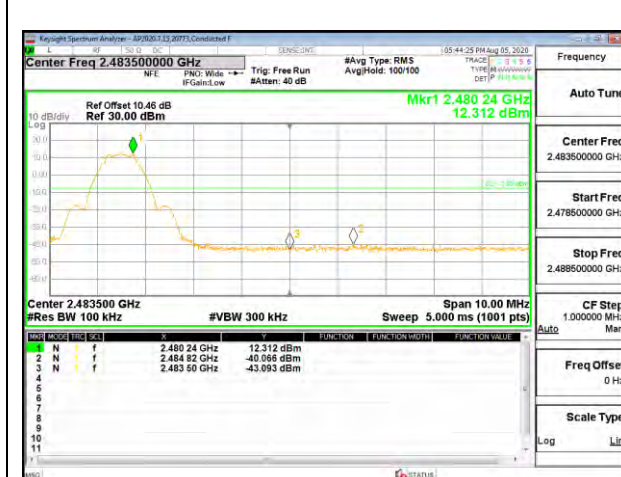
OUT-OF-BAND LOW CHANNEL



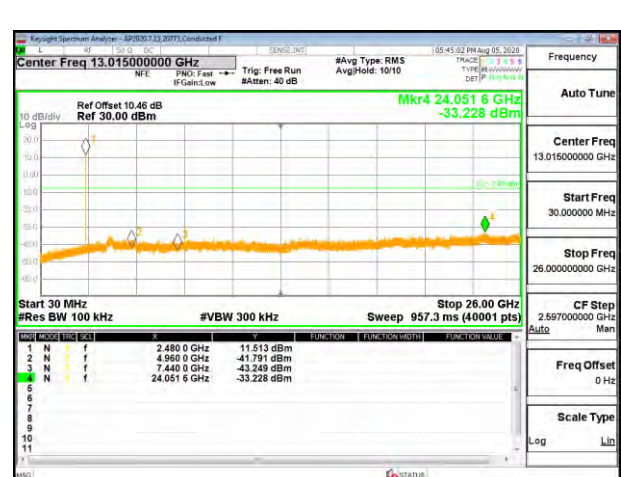
MID CHANNEL REFERENCE LEVEL



OUT-OF-BAND MID CHANNEL



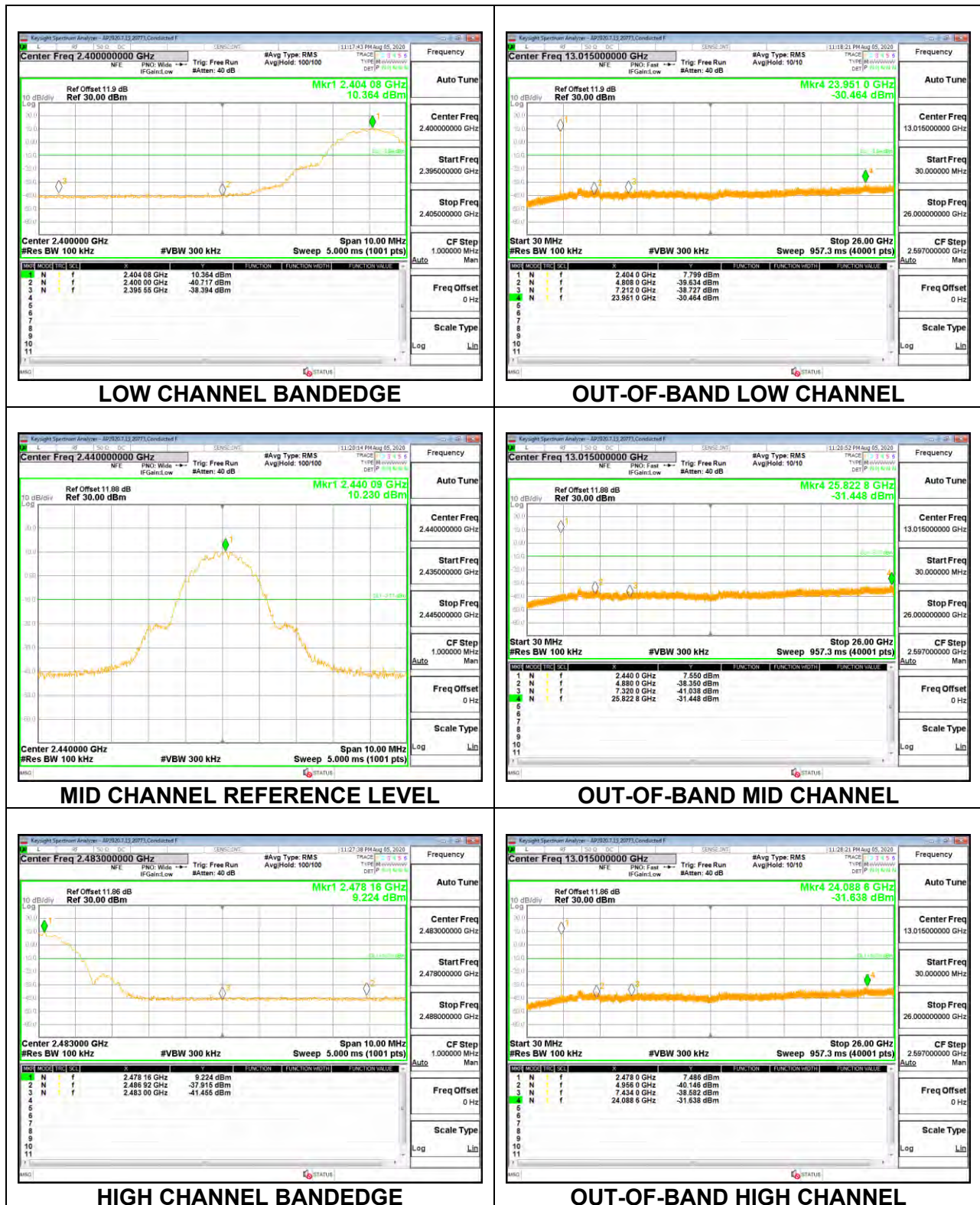
HIGH CHANNEL BANDEDGE



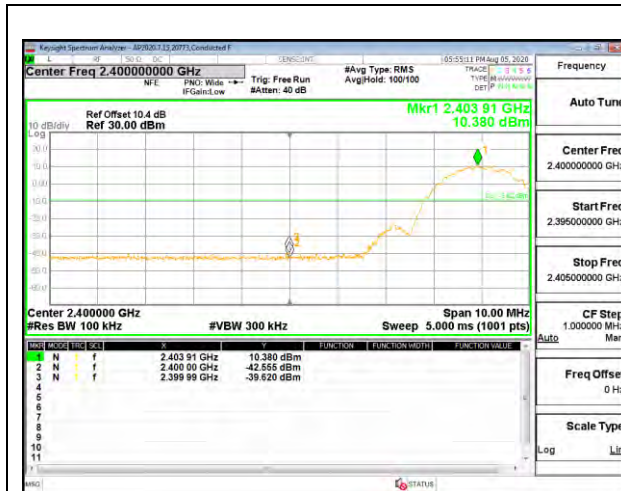
OUT-OF-BAND HIGH CHANNEL



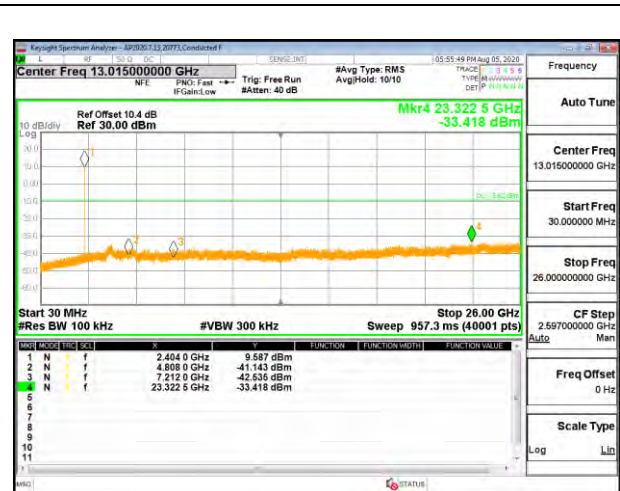
# 9.7.4. LOW POWER BLE (2Mbps) ANT 4



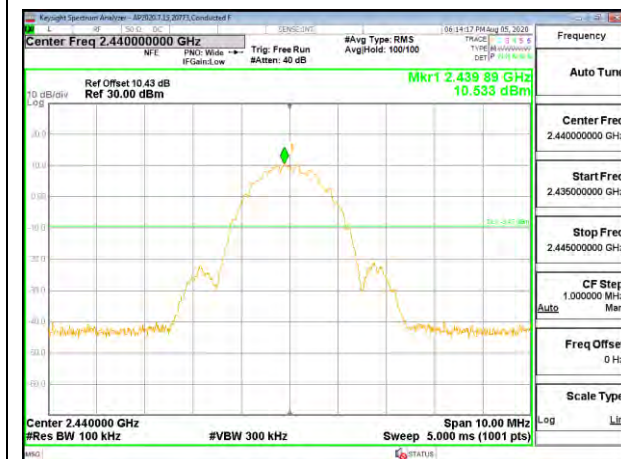
### ANT 3



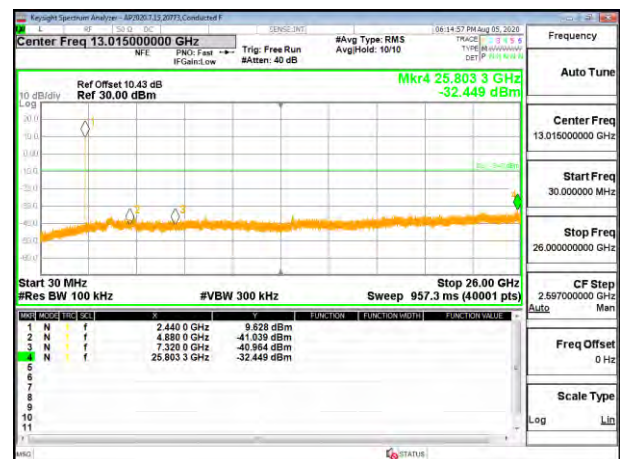
LOW CHANNEL BANDEDGE



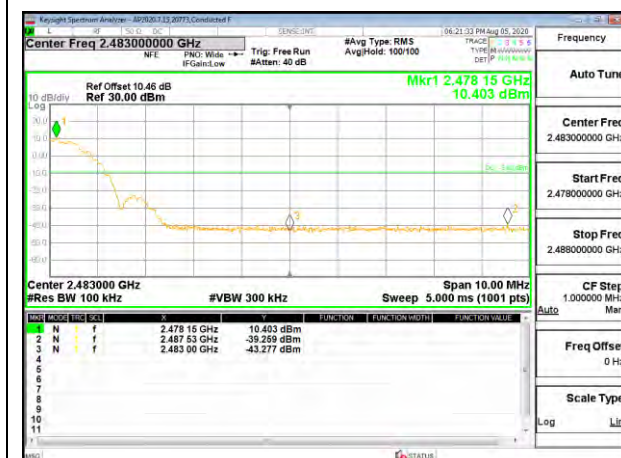
OUT-OF-BAND LOW CHANNEL



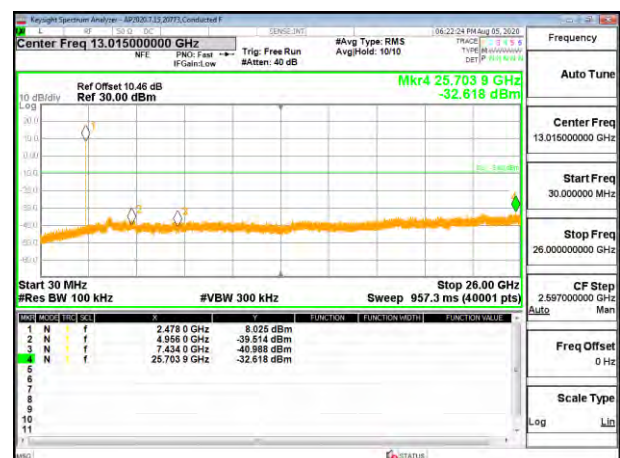
MID CHANNEL REFERENCE LEVEL



OUT-OF-BAND MID CHANNEL



HIGH CHANNEL BANDEDGE

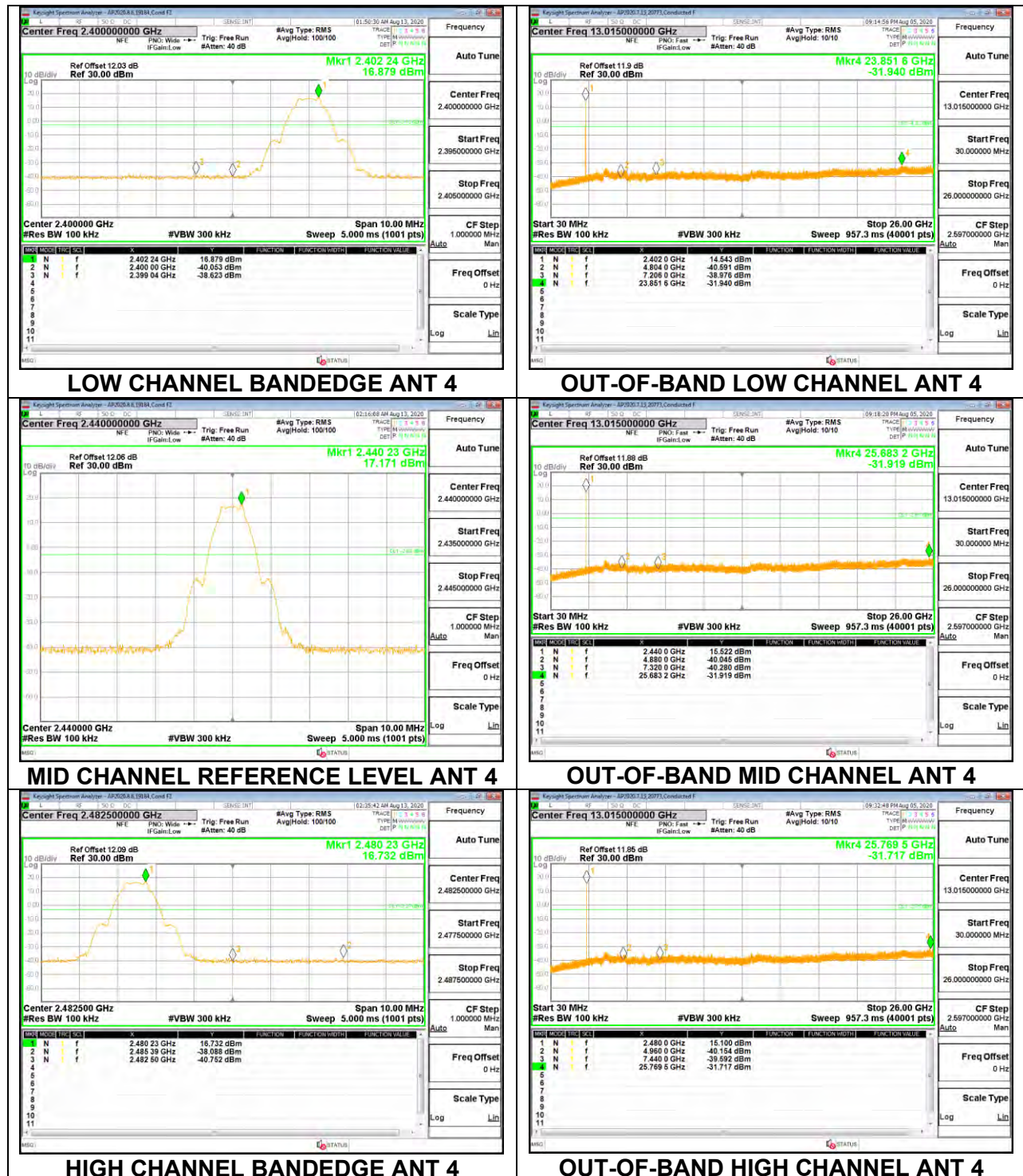


OUT-OF-BAND HIGH CHANNEL

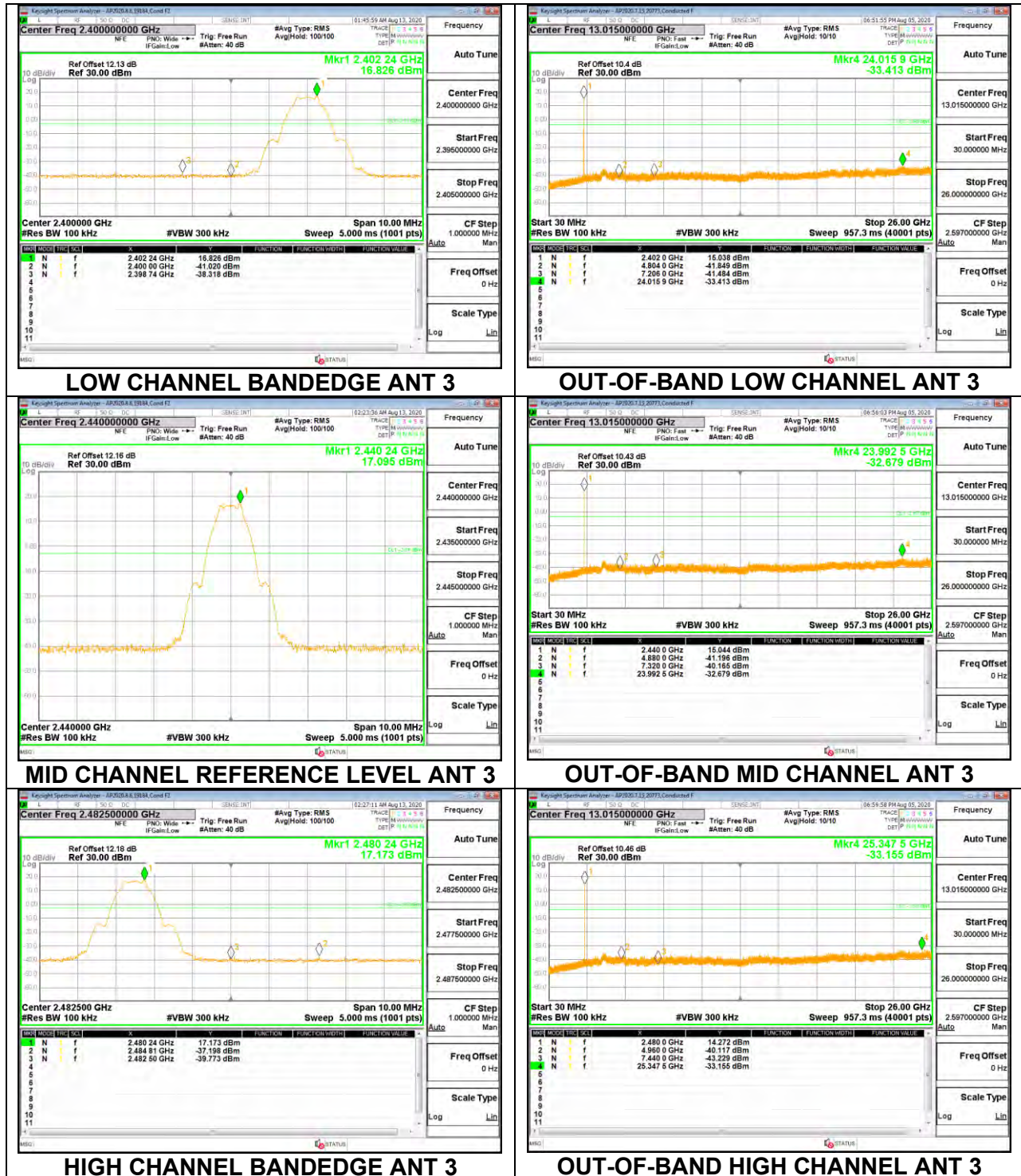


## 9.7.5. HIGH POWER BLE TXBF (1Mbps)

### ANT 4



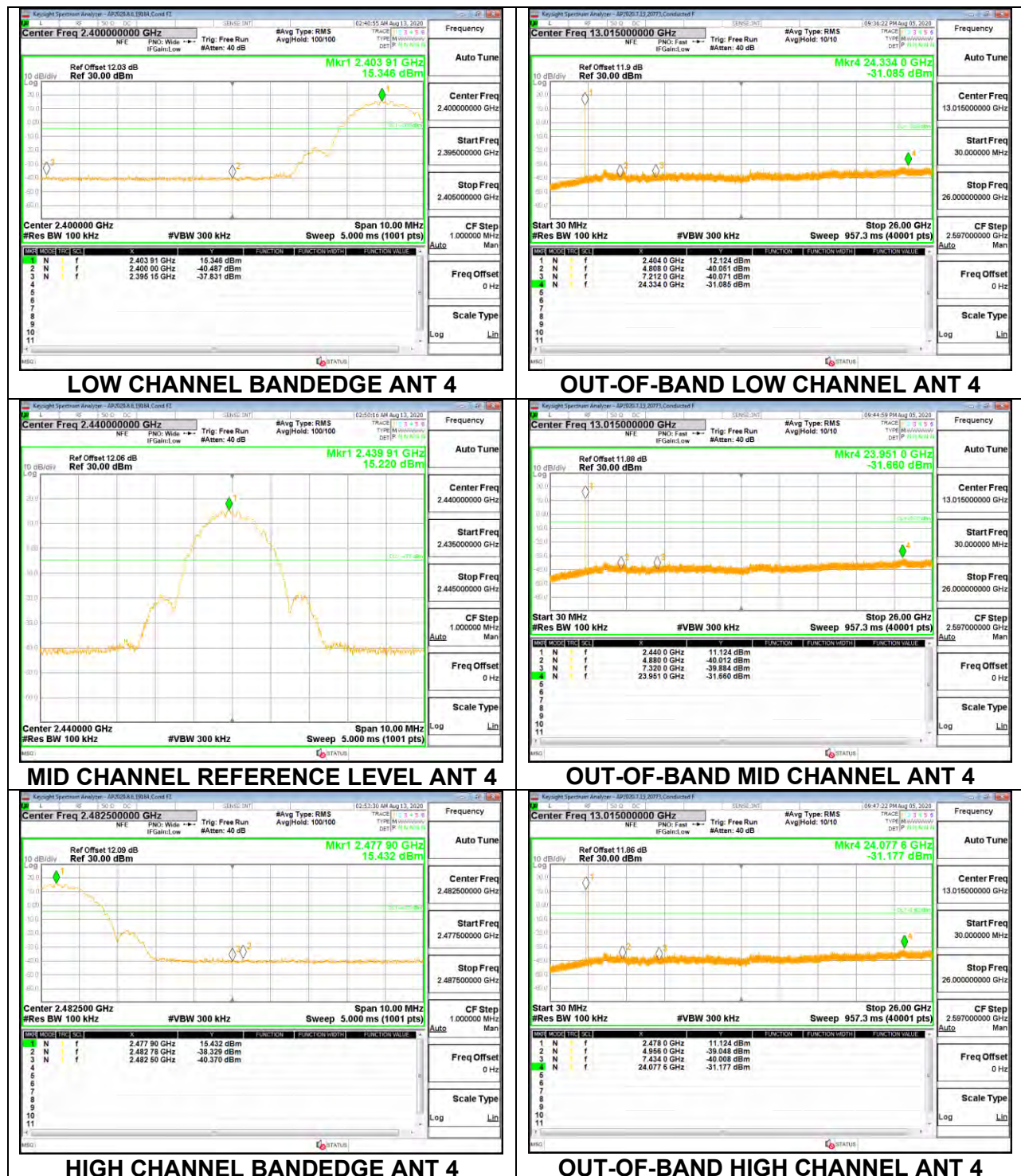
# ANT 3



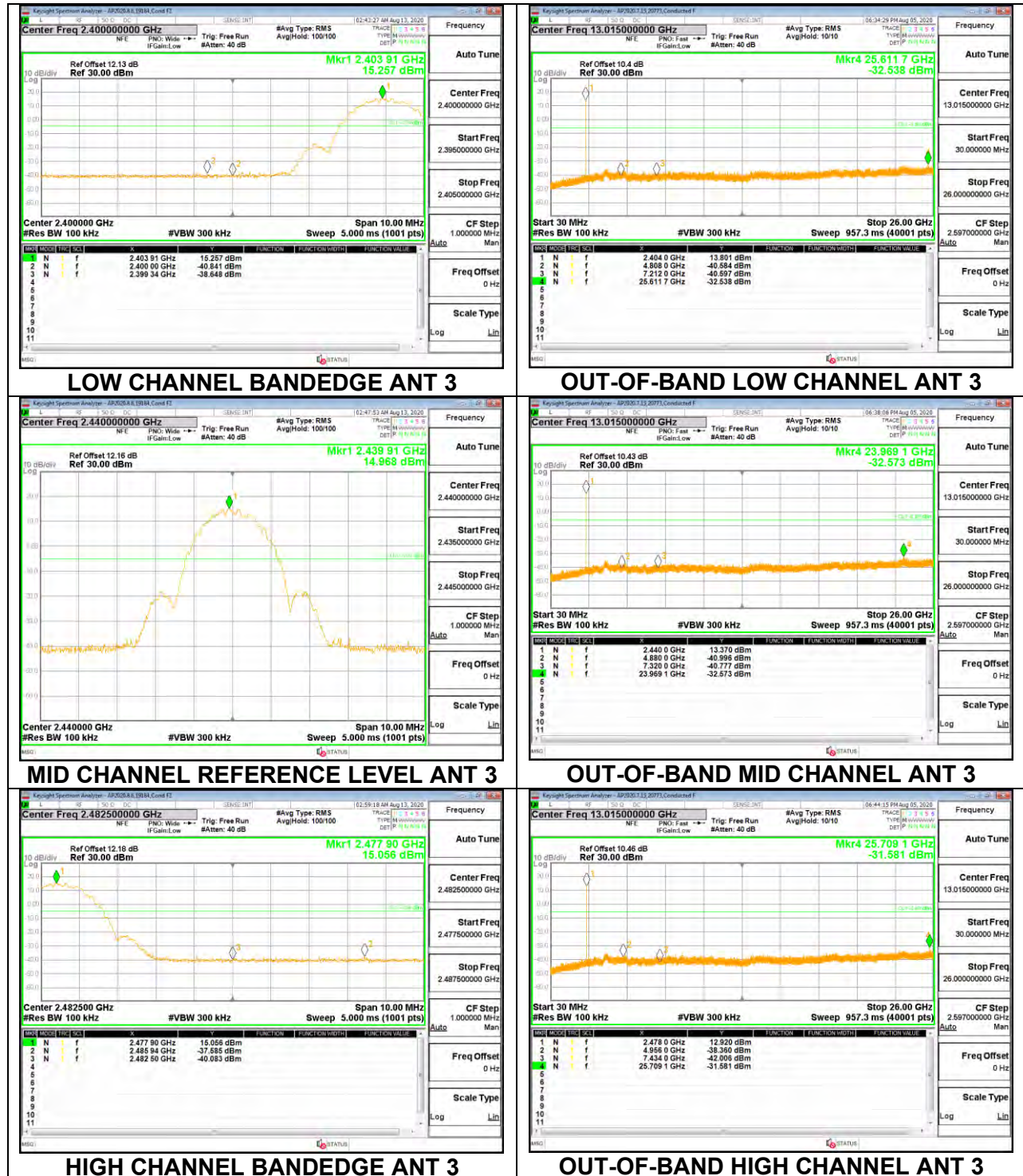


## 9.7.6. HIGH POWER BLE TXBF (2Mbps)

### ANT 4



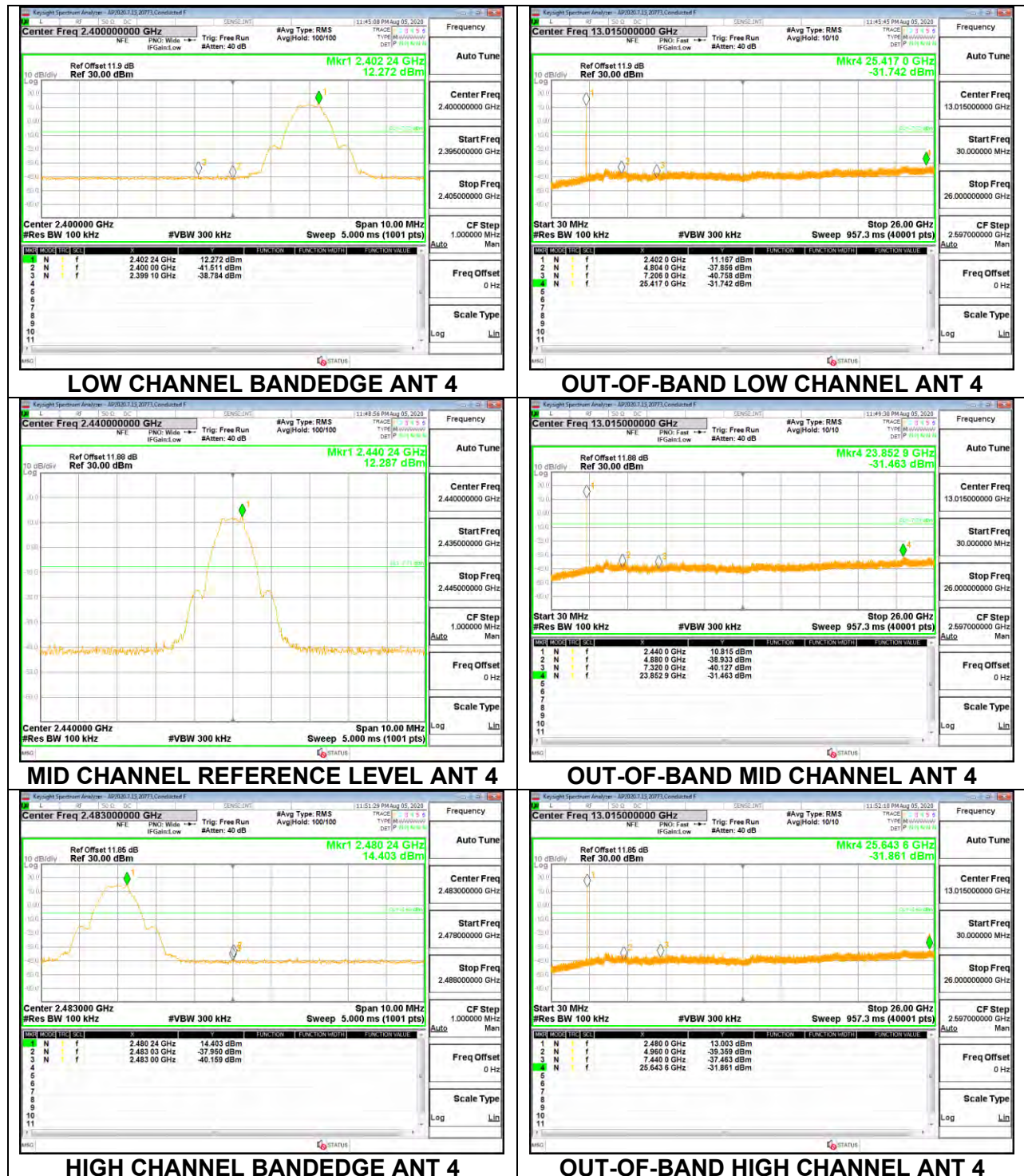
# ANT 3



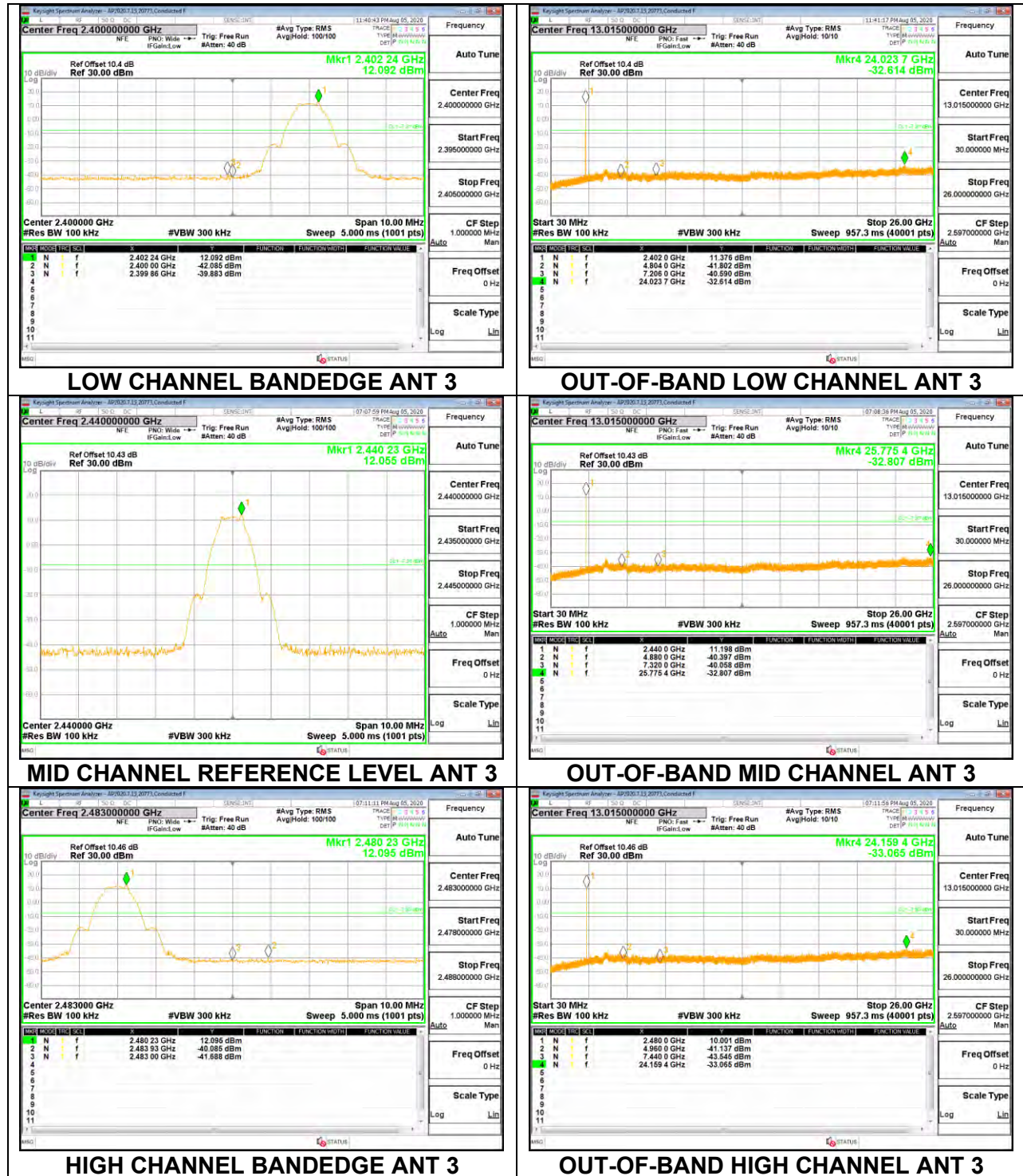


## 9.7.7. LOW POWER BLE TXBF (1Mbps)

### ANT 4



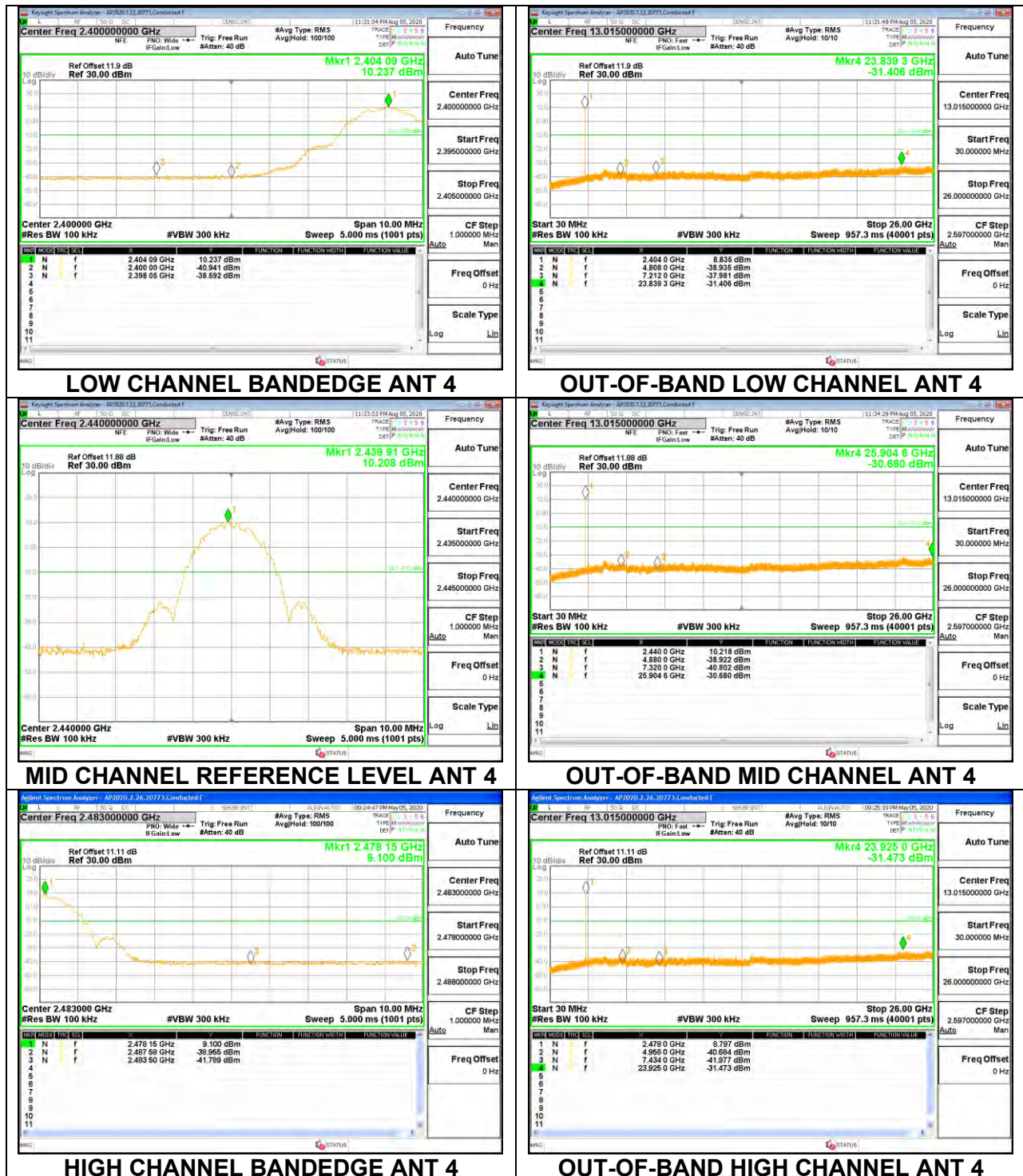
### ANT 3





## 9.7.8. LOW POWER BLE TXBF (2Mbps)

### ANT 4



# ANT 3

