



# **TEST REPORT**

**Report Number:** 13146732-E5V1 & E6V1

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

**Model :** A2399, A2400, A2401

**FCC ID :** BCG-E3541A  
**IC :** 579C-E3541A

**EUT Description :** SMARTPHONE

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

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

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## REPORT REVISION HISTORY

| Rev. | Issue Date | Revisions        | Revised By |
|------|------------|------------------|------------|
| V1   | 9/21/2020  | Initial Revision | 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:** A2399, A2400, A2401

**SERIAL NUMBER:** (Original): C7CCW023Q91T, C7CCT01RQ920  
(Spot Check): C7CCT01RQ920, C7CCT010Q920

**DATE TESTED:** JULY 17 – AUGUST 27, 2020

| APPLICABLE STANDARDS     |              |
|--------------------------|--------------|
| STANDARD                 | TEST RESULTS |
| CFR 47 Part 15 Subpart E | 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  
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Prepared By:



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## 2. TEST SUMMARY

| FCC Clause                 | ISED Clause                    | Requirement        | Result   | Comment |
|----------------------------|--------------------------------|--------------------|----------|---------|
| 15.209, 15.205, 15.407 (b) | RSS-GEN 8.9, 8.10, RSS-247 6.2 | 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, FCC KDB 662911 D01 v02r01, FCC KDB 789033 D02 v02r01, ANSI C63.10-2013, 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 (ISED:2324B-1) | <input type="checkbox"/> Chamber D (ISED:22541-1)            | <input checked="" type="checkbox"/> Chamber I (ISED:2324A-5) |
| <input type="checkbox"/> Chamber B (ISED:2324B-2) | <input checked="" type="checkbox"/> Chamber E (ISED:22541-2) | <input type="checkbox"/> Chamber J (ISED:2324A-6)            |
| <input type="checkbox"/> Chamber C (ISED:2324B-3) | <input type="checkbox"/> Chamber F (ISED:22541-3)            | <input type="checkbox"/> Chamber K (ISED:2324A-1)            |
|                                                   | <input type="checkbox"/> Chamber G (ISED:22541-4)            | <input checked="" type="checkbox"/> Chamber L (ISED:2324A-3) |
|                                                   | <input type="checkbox"/> Chamber H (ISED:22541-5)            |                                                              |

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: 2324A.

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

## 5. DECISION RULES AND MEASUREMENT UNCERTAINTY

### 5.1. METROLOGICAL TRACEABILITY

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations and 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. RADIATED TEST RESULTS

### LIMITS

FCC §15.205 and §15.209 -Restricted bands

FCC §15.407(b)(1-3) -Un-Restricted bands

RSS 247 Issue 2 Sections

6.2.1.2 (for 5150-5250 MHz band)

6.2.2.2 (for 5250-5350 MHz band)

6.2.3.2 (for 5470-5600 MHz and 5650-5725 MHz bands)

6.2.4.2 (for 5725-5850 MHz band)

| Frequency Range<br>(MHz) | Field Strength Limit<br>(uV/m) at 3 m | Field Strength Limit<br>(dBuV/m) at 3 m |
|--------------------------|---------------------------------------|-----------------------------------------|
| 30 - 88                  | 100                                   | 40                                      |
| 88 - 216                 | 150                                   | 43.5                                    |
| 216 - 960                | 200                                   | 46                                      |
| Above 960                | 500                                   | 54                                      |

### TEST PROCEDURE

The EUT is placed on a non-conducting table 80 cm above the ground plane for measurement below 1GHz; 1.5 m above the ground plane for measurement above 1GHz. The antenna to EUT distance is 3 meters. The EUT is configured in accordance with ANSI C63.10. The EUT is set to transmit in a continuous mode.

For measurements below 1 GHz the resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

For pre-scans above 1 GHz the resolution bandwidth is set to 1 MHz; the video bandwidth is set to 30 KHz for peak measurements.

For final measurements above 1 GHz the resolution bandwidth is set to 1 MHz; the video bandwidth is set to 3 MHz for peak measurements and as applicable for average measurements.

The spectrum from 30 MHz to 1GHz and 18GHz to 40 GHz is investigated with the transmitter set to transmit at the channel with highest output power as worst-case scenario. 1GHz to 18GHz was set to the lowest, middle, and highest channels in the 5 GHz bands.

The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized in both the vertical and the horizontal positions.

**KDB 414788 Open Field Site(OFS) and Chamber Correlation Justification**

Base on FCC 15.31 (f) (2): measurements may be performed at a distance closer than that specified in the regulations; however, an attempt should be made to avoid making measurements in the near field.

OFS and chamber correlation testing had been performed and chamber measured test result is the worst case test result.

## 7. INTRODUCTION OF TEST DATA REUSE

### 7.1. 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.

### 7.2. INTRODUCTION

This application for certification is leveraging the data reuse procedures from KDB 484596 D01 based on reference FCC ID: BCG-E3539A, IC: 579C-E3539A to cover variant model BCG-E3541A, 579C-E3541A. 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.

### 7.3. DIFFERENCE IN MODEL NUMBER

Models A2399, A2400, and A2401 are electrically identical and the model numbers are allocated for marketing and logistic purposes only. Model A2399 was used for the spot check testing described in this report.

### 7.4. SPOT CHECK VERIFICATION RESULTS SUMMARY

Spot check verification has been done on device model A2399, FCC ID: BCG-E3541A, IC: 579C-E3541A for radiated spurious and radiated band-edge in accordance with the Test Plan that was approved via KDB inquiry.

| BCG-E3541A, 579C-E3541A SPOT CHECK RESULTS |                         |           |          |                 |                        |            |                        |       |            |       |
|--------------------------------------------|-------------------------|-----------|----------|-----------------|------------------------|------------|------------------------|-------|------------|-------|
| Technology                                 | Mode                    | Test Item | Channel  | Measured        | Original model         |            | Spot check model       |       | Delta (dB) |       |
|                                            |                         |           |          |                 | A2176                  |            | A2399, A2400, A2401    |       |            |       |
|                                            |                         |           |          |                 | BCG-E3539A 579C-E3539A |            | BCG-E3541A 579C-E3541A |       |            |       |
|                                            |                         |           |          | Frequency (GHz) | Peak (dBuV)            | Ave (dBuV) | Peak                   | Ave   | Peak       | Ave   |
| WiFi (5GHz)                                | ax, HE20 5.2 & 5.3GHz   | RBE       | Low, 36  | 5150            | 62.88                  | 50.4       | 68.06                  | 52.36 | 5.18       | 1.96  |
|                                            |                         |           | High, 64 | 5350            | 62.48                  | 50.9       | 67.59                  | 51.27 | 5.11       | 0.37  |
|                                            | ax, HE20 5.6GHz         | RBE       | Low, 100 | 5451            | 58.06                  | 48.13      | 63.03                  | 46.67 | 4.97       | -1.46 |
|                                            | ax, HE20 5.8GHz         | RBE       | High,165 | 5850            | -17.68 (EIRP)          |            | -14.35 (EIRP)          |       | 3.33       |       |
|                                            | ax, HE20 5.3/5.6/5.8GHz | RSE       | Mid, 60  | 12.416          | 48.28                  | 37.91      | 51.06                  | 40.18 | 2.78       | 2.27  |
|                                            |                         |           | Mid,116  | 11.490          | 52.67                  | 41.82      | 49.24                  | 39.13 | -3.43      | -2.69 |
|                                            |                         |           | Mid,157  | 12.521          | 50.66                  | 40.22      | 51.19                  | 40.27 | 0.53       | 0.05  |

Comparison with parent model data for spurious emissions shows a delta of less than 3dB, and the parent model's data is considered representative of this model. The variant's band edge emissions, although slightly higher than 3dB above the parent model, are more than 10dB below the limit. The data for band edge emissions is taken in the worst operating mode with respect to band-edge emissions, and therefore no additional testing for band edge is required.

Note: The output powers were verified on model A2399 to match with model A2176 before radiated emissions spot check was performed.



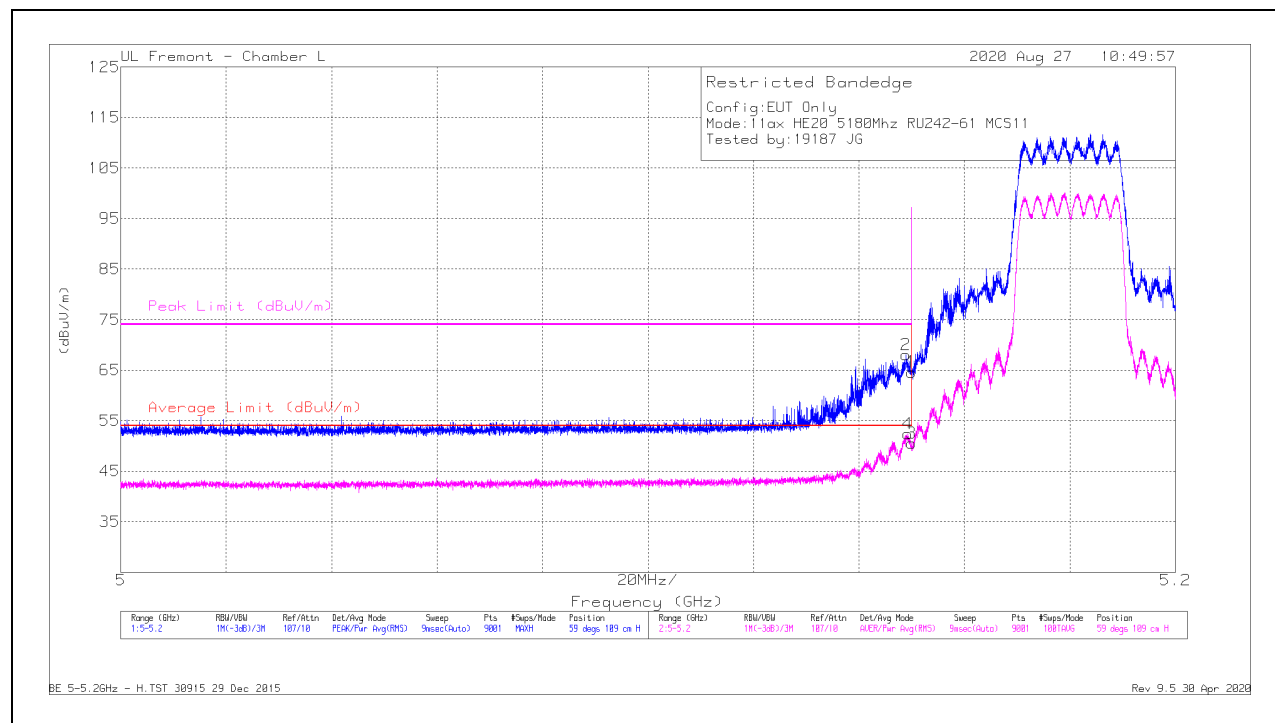
## SPOT CHECK

### 7.4.1. TX ABOVE 1 GHz 802.11ax HE20 MODE IN THE 5.2 GHz BAND

#### 2TX Antenna 5 + Antenna 6 OFDMA MODE 242 Tones, RU Index 61

#### BANDEDGE (LOW CHANNEL)

#### HORIZONTAL RESULT



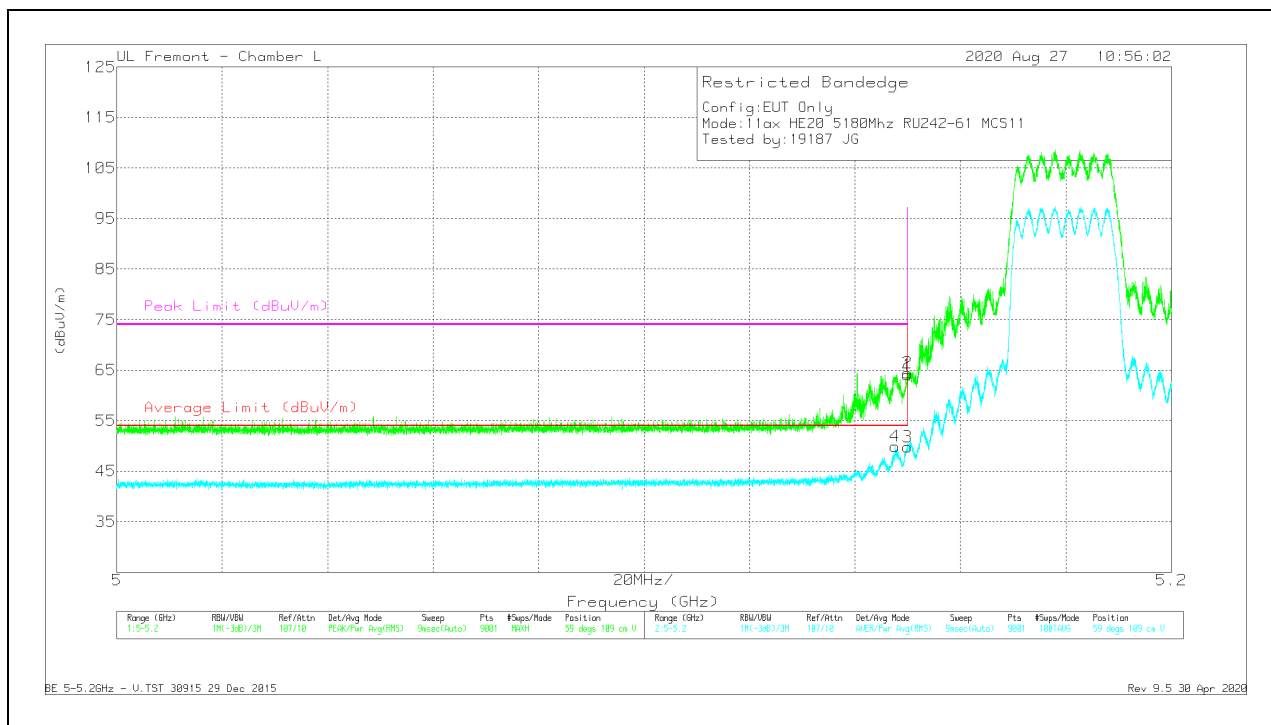
| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | AF 344 (dB/m) | Amp/Cbll/Filtr/Pa d (dB) | Corrected Reading (dBuV/m) | Average Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|--------|-----------------|----------------------|-----|---------------|--------------------------|----------------------------|------------------------|-------------|---------------------|----------------|----------------|-------------|----------|
| 1      | * 5.15          | 47.83                | Pk  | 34.3          | -17.5                    | 64.63                      | -                      | -           | 74                  | -9.37          | 59             | 109         | H        |
| 2      | * 5.14893       | 51.26                | Pk  | 34.3          | -17.5                    | 68.06                      | -                      | -           | 74                  | -5.94          | 59             | 109         | H        |
| 3      | * 5.15          | 33.74                | RMS | 34.3          | -17.5                    | 50.54                      | 54                     | -3.46       | -                   | -              | 59             | 109         | H        |
| 4      | * 5.14922       | 35.56                | RMS | 34.3          | -17.5                    | 52.36                      | 54                     | -1.64       | -                   | -              | 59             | 109         | 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 344 (dBm) | Amp/CbL/Filt/Pad (dB) | Corrected Reading (dBuV/m) | Average Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|--------|-----------------|----------------------|-----|--------------|-----------------------|----------------------------|------------------------|-------------|---------------------|----------------|----------------|-------------|----------|
| 1      | * 5.15          | 47.29                | Pk  | 34.3         | -17.5                 | 64.09                      | -                      | -           | 74                  | -9.91          | 59             | 109         | V        |
| 2      | * 5.14998       | 47.63                | Pk  | 34.3         | -17.5                 | 64.43                      | -                      | -           | 74                  | -9.57          | 59             | 109         | V        |
| 3      | * 5.15          | 33.01                | RMS | 34.3         | -17.5                 | 49.81                      | 54                     | -4.19       | -                   | -              | 59             | 109         | V        |
| 4      | * 5.14762       | 33.08                | RMS | 34.3         | -17.5                 | 49.88                      | 54                     | -4.12       | -                   | -              | 59             | 109         | V        |

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

Pk - Peak detector

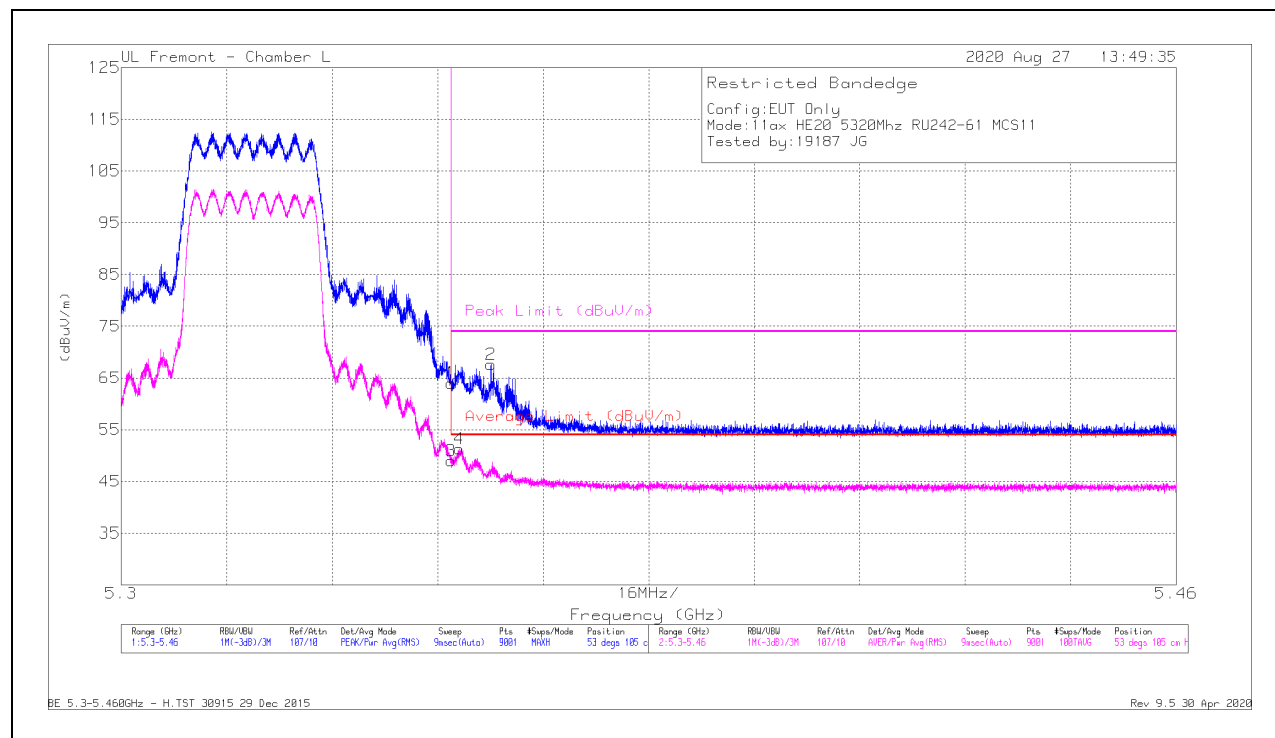
RMS - RMS detection

## 7.4.2. TX ABOVE 1 GHz 802.11ax HE20 MODE IN THE 5.3 GHz BAND

### 2TX Antenna 5 + Antenna 6 OFDMA MODE 242 Tones, RU Index 61

### BANDEDGE (HIGH CHANNEL)

### HORIZONTAL RESULT



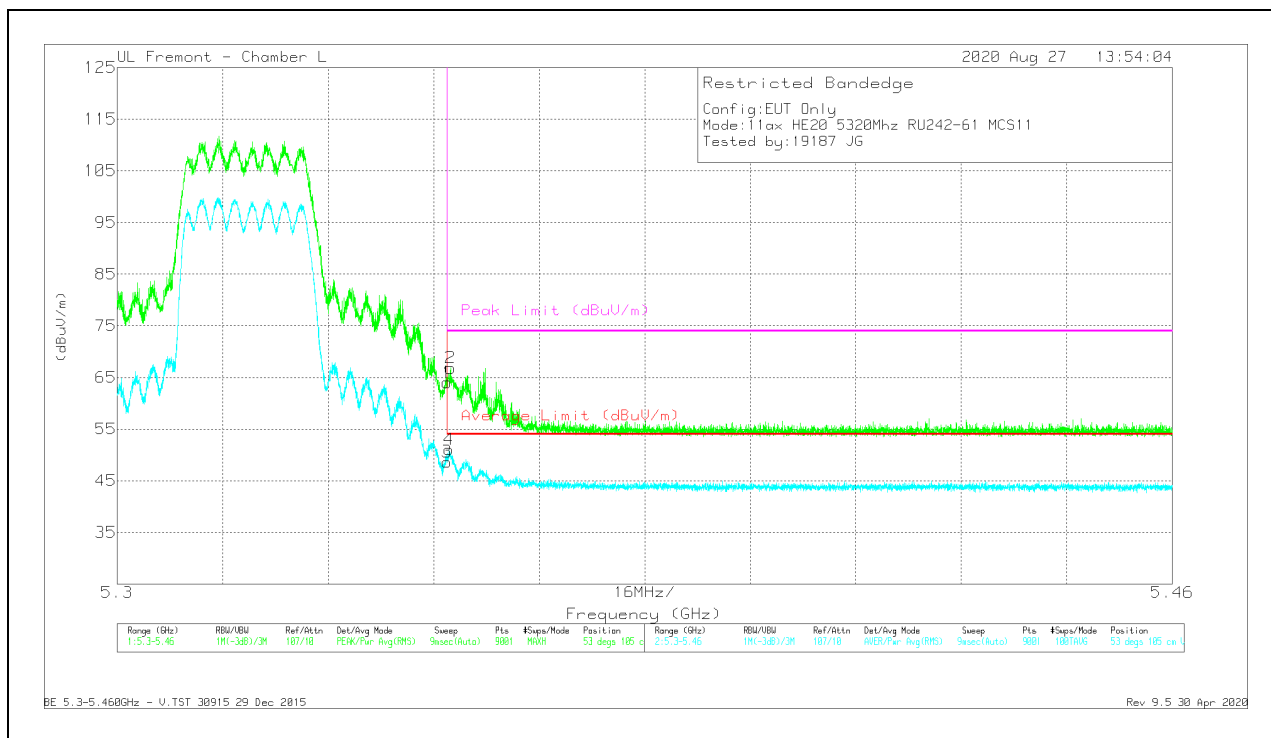
| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | AF 344 (dB/m) | Amp/Cbl/Filt/Pad (dB) | Corrected Reading (dBuV/m) | Average Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|--------|-----------------|----------------------|-----|---------------|-----------------------|----------------------------|------------------------|-------------|---------------------|----------------|----------------|-------------|----------|
| 1      | * 5.35001       | 46.61                | Pk  | 34.5          | -17.1                 | 64.01                      | -                      | -           | 74                  | -9.99          | 53             | 105         | H        |
| 2      | * 5.35607       | 50.19                | Pk  | 34.5          | -17.1                 | 67.59                      | -                      | -           | 74                  | -6.41          | 53             | 105         | H        |
| 3      | * 5.35001       | 31.57                | RMS | 34.5          | -17.1                 | 48.97                      | 54                     | -5.03       | -                   | -              | 53             | 105         | H        |
| 4      | * 5.35124       | 33.87                | RMS | 34.5          | -17.1                 | 51.27                      | 54                     | -2.73       | -                   | -              | 53             | 105         | 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 344 (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      | * 5.35001       | 46.64                | Pk  | 34.5          | -17.1                  | 64.04                      | -                      | -           | 74                  | -9.96          | 53             | 105         | V        |
| 2      | * 5.35054       | 49.44                | Pk  | 34.5          | -17.1                  | 66.84                      | -                      | -           | 74                  | -7.16          | 53             | 105         | V        |
| 3      | * 5.35001       | 31.25                | RMS | 34.5          | -17.1                  | 48.65                      | 54                     | -5.35       | -                   | -              | 53             | 105         | V        |
| 4      | * 5.35031       | 33.63                | RMS | 34.5          | -17.1                  | 51.03                      | 54                     | -2.97       | -                   | -              | 53             | 105         | V        |

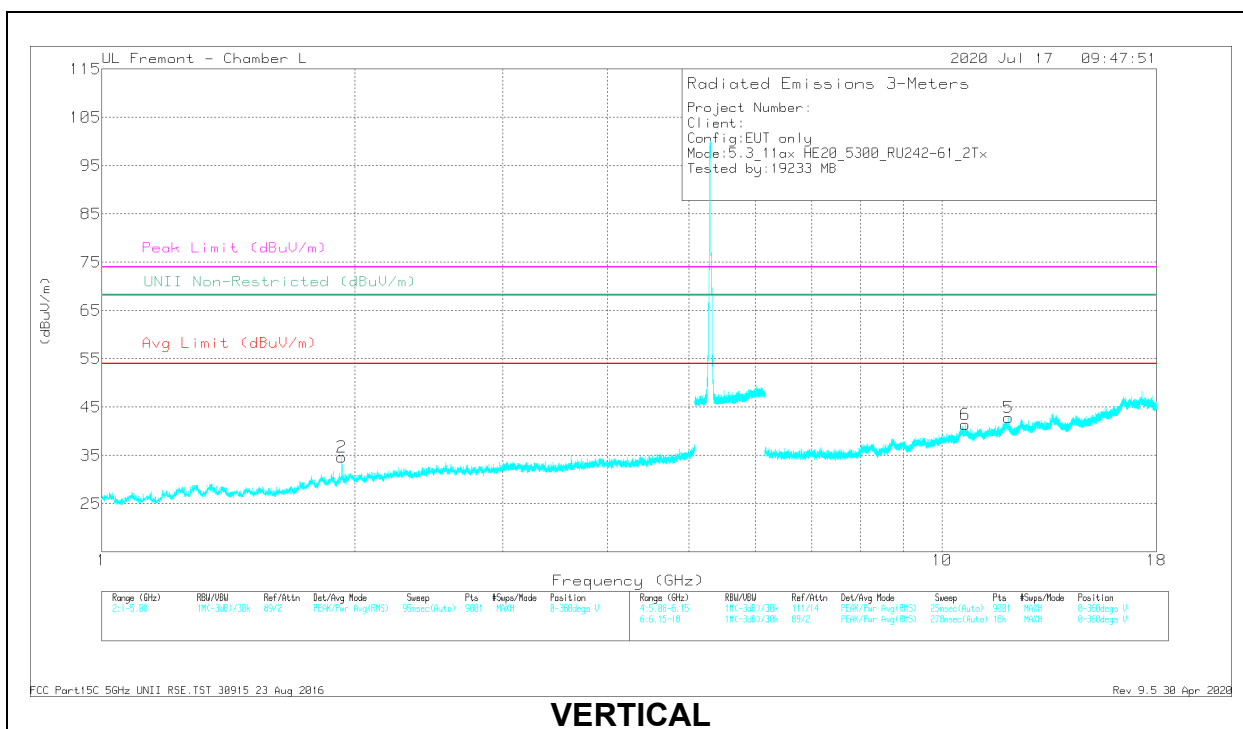
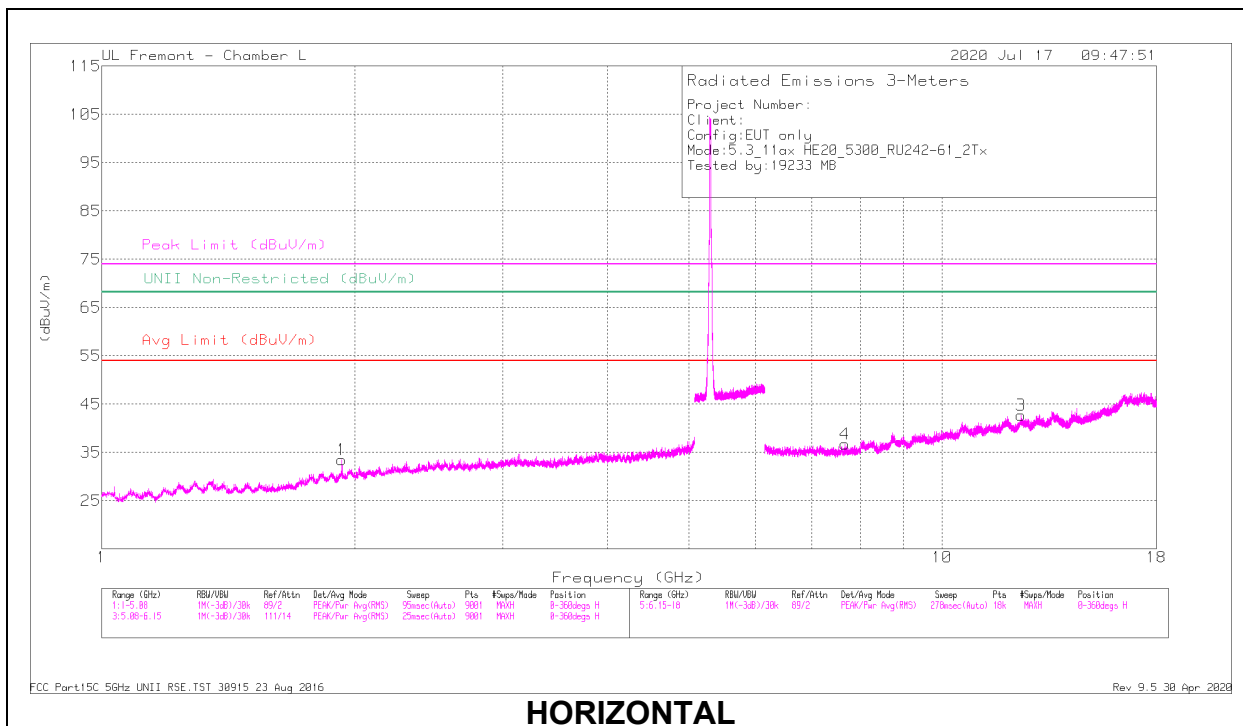
\* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

RMS - RMS detection

# HARMONICS AND SPURIOUS EMISSIONS

## MID CHANNEL RESULTS



## RADIATED EMISSIONS

| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det  | AF 344 (dB/m) | Amp/Cb I/Filtr/Pad (dB) | Corrected Reading (dBuV/m) | Avg Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | PK Margin (dB) | UNII Non-Restricted (dBuV/m) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|--------|-----------------|----------------------|------|---------------|-------------------------|----------------------------|--------------------|-------------|---------------------|----------------|------------------------------|----------------|----------------|-------------|----------|
| 1      | 1.93119         | 42.87                | PK-U | 30.6          | -32                     | 41.47                      | -                  | -           | -                   | -              | 68.2                         | -26.73         | 115            | 209         | H        |
| 3      | * 12.41685      | 31.56                | PK-U | 39            | -19.5                   | 51.06                      | -                  | -           | 74                  | -22.94         | -                            | -              | 234            | 383         | H        |
|        | * 12.41421      | 20.68                | ADR  | 39            | -19.5                   | 40.18                      | 54                 | -13.82      | -                   | -              | -                            | -              | 234            | 383         | H        |
| 4      | * 7.66411       | 33.84                | PK-U | 35.7          | -23.4                   | 46.14                      | -                  | -           | 74                  | -27.86         | -                            | -              | 142            | 394         | H        |
|        | * 7.66124       | 22.45                | ADR  | 35.7          | -23.4                   | 34.75                      | 54                 | -19.25      | -                   | -              | -                            | -              | 142            | 394         | H        |
| 2      | 1.93139         | 44.86                | PK-U | 30.6          | -32                     | 43.46                      | -                  | -           | -                   | -              | 68.2                         | -24.74         | 285            | 186         | V        |
| 5      | * 11.99435      | 30.67                | PK-U | 38.7          | -19.7                   | 49.67                      | -                  | -           | 74                  | -24.33         | -                            | -              | 101            | 381         | V        |
|        | * 11.99381      | 21.33                | ADR  | 38.7          | -19.7                   | 40.33                      | 54                 | -13.67      | -                   | -              | -                            | -              | 101            | 381         | V        |
| 6      | * 10.66748      | 30.67                | PK-U | 37.9          | -19.5                   | 49.07                      | -                  | -           | 74                  | -24.93         | -                            | -              | 201            | 397         | V        |
|        | * 10.66653      | 20.64                | ADR  | 37.9          | -19.5                   | 39.04                      | 54                 | -14.96      | -                   | -              | -                            | -              | 201            | 397         | V        |

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

PK-U - U-NII: Maximum Peak

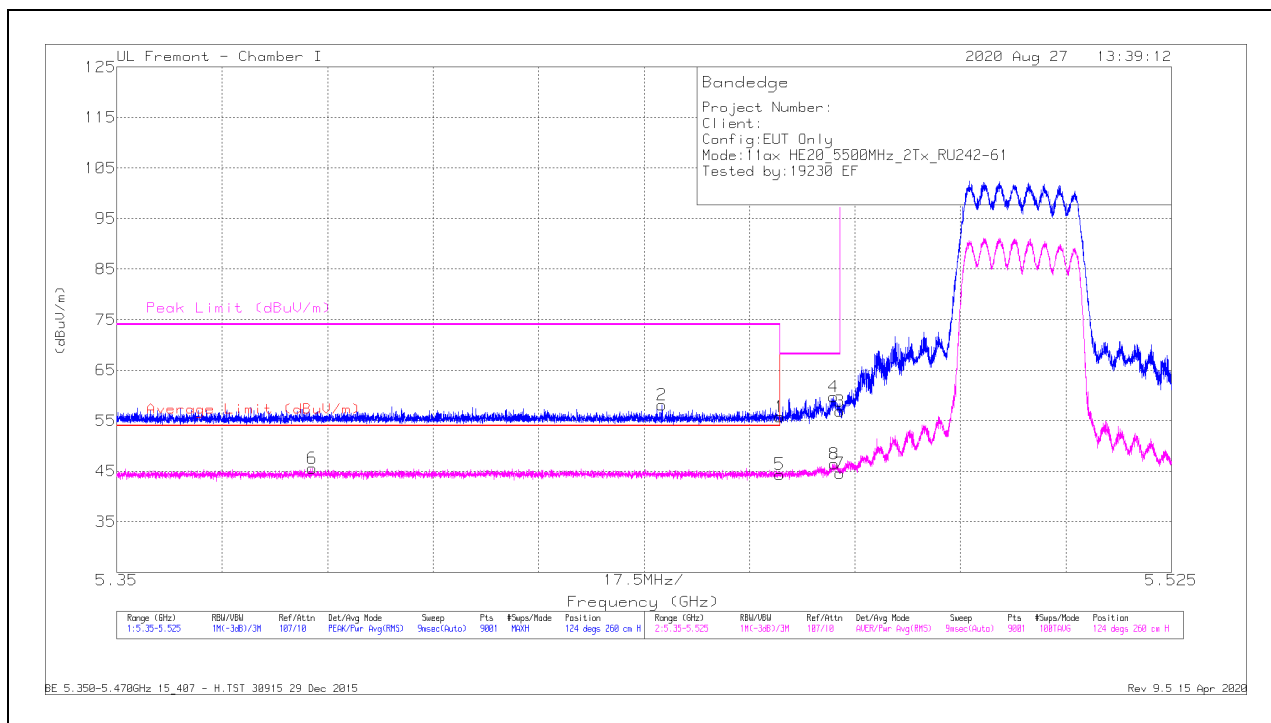
ADR - U-NII AD primary method, RMS average

### 7.4.3. TX ABOVE 1 GHz 802.11ax HE20 MODE IN THE 5.6 GHz BAND

#### 2TX Antenna 5 + Antenna 6 OFDMA MODE 242 Tones, RU Index 61

#### BANDEDGE (LOW CHANNEL)

#### HORIZONTAL RESULT



| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | AF T346 (dB/m) | Amp/Cb I/Filt/Pa d (dB) | DC Corr (dB) | Correct ed Reading (dBuV/ m) | Average Limit (dBuV/ m) | Margin (dB) | Peak Limit (dBuV/ m) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|--------|-----------------|----------------------|-----|----------------|-------------------------|--------------|------------------------------|-------------------------|-------------|----------------------|----------------|----------------|-------------|----------|
| 1      | * 5.45999       | 34.95                | Pk  | 34.6           | -13.8                   | 0            | 55.75                        | -                       | -           | 74                   | -18.25         | 124            | 260         | H        |
| 2      | * 5.44047       | 37.19                | Pk  | 34.7           | -13.8                   | 0            | 58.09                        | -                       | -           | 74                   | -15.91         | 124            | 260         | H        |
| 3      | 5.46999         | 35.92                | Pk  | 34.7           | -13.8                   | 0            | 56.82                        | -                       | -           | 68.2                 | -11.38         | 124            | 260         | H        |
| 4      | 5.46894         | 38.93                | Pk  | 34.6           | -13.8                   | 0            | 59.73                        | -                       | -           | 68.2                 | -8.47          | 124            | 260         | H        |
| 5      | * 5.45999       | 23.59                | RMS | 34.6           | -13.8                   | 0            | 44.39                        | 54                      | -9.61       | -                    | -              | 124            | 260         | H        |
| 6      | * 5.38239       | 24.73                | RMS | 34.7           | -13.8                   | 0            | 45.63                        | 54                      | -8.37       | -                    | -              | 124            | 260         | H        |
| 7      | 5.46999         | 23.71                | RMS | 34.7           | -13.8                   | 0            | 44.61                        | -                       | -           | -                    | -              | 124            | 260         | H        |
| 8      | 5.46904         | 25.69                | RMS | 34.6           | -13.8                   | 0            | 46.49                        | -                       | -           | -                    | -              | 124            | 260         | H        |

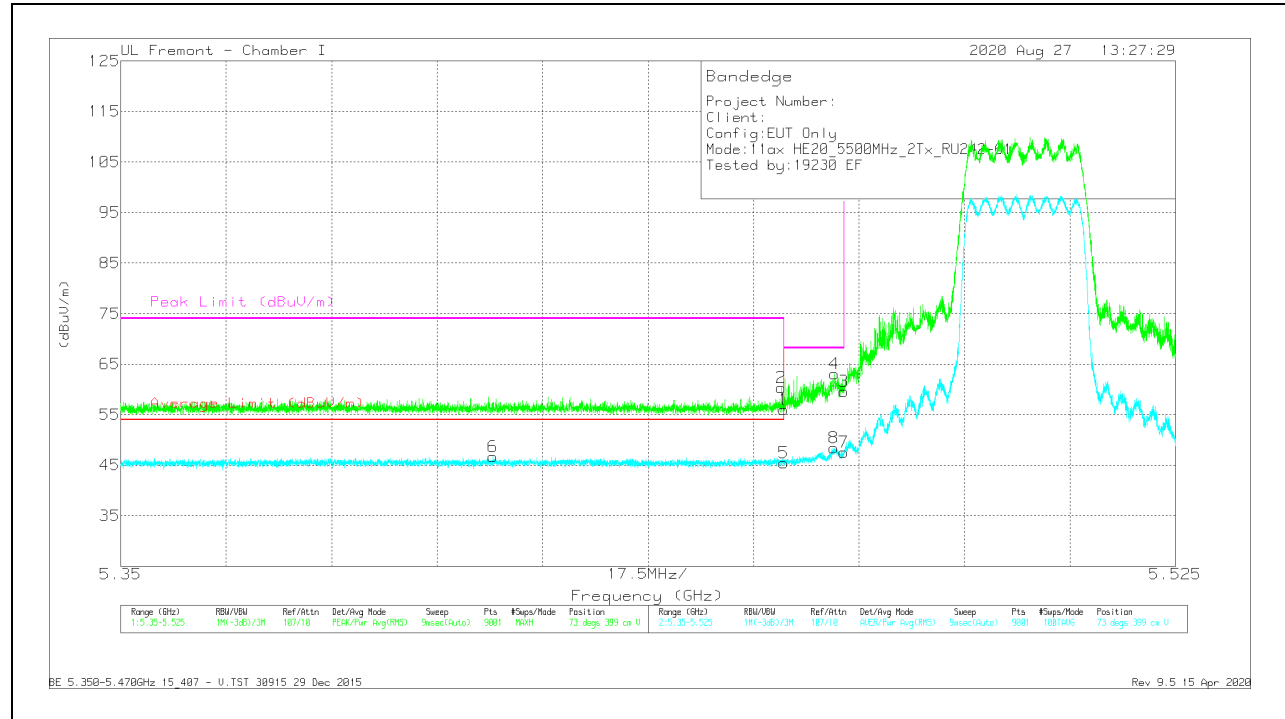
\* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

PK - Peak detector

RMS - RMS detection

## BANDEDGE (LOW CHANNEL)

### VERTICAL RESULT

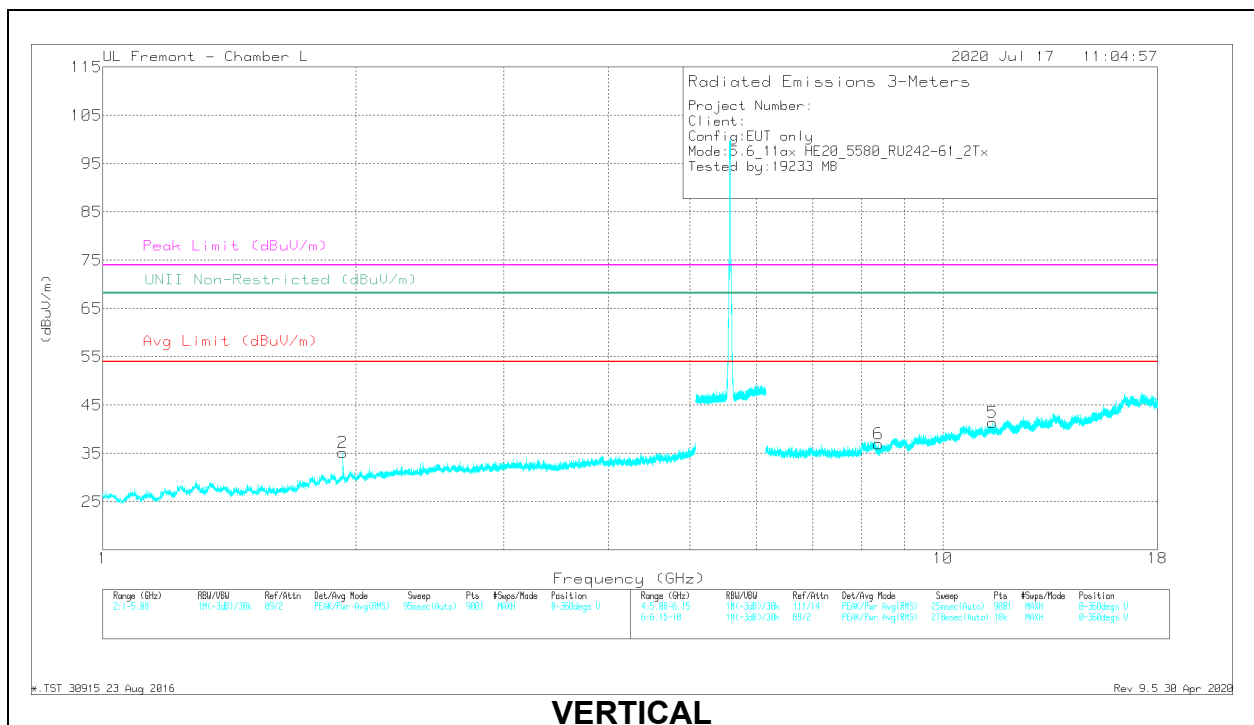
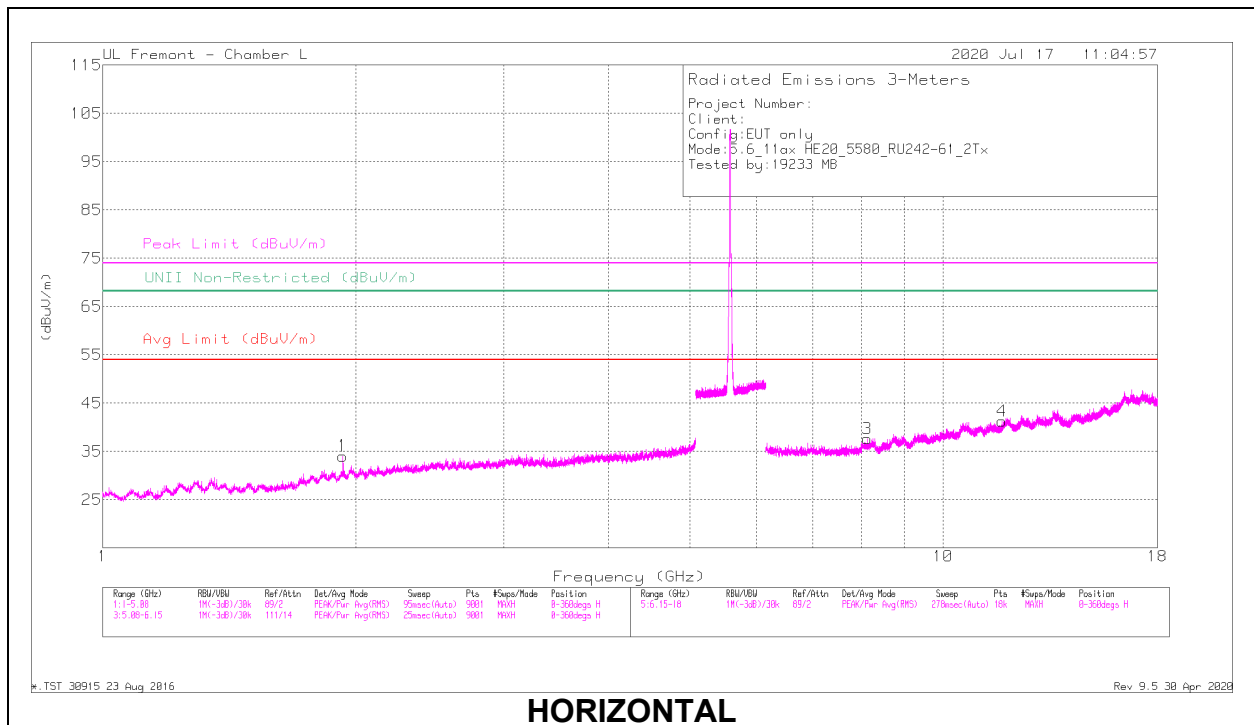


| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | AF T346 (dB/m) | Amp/Cb I/Filt/Pa d (dB) | DC Corr (dB) | Correct ed Reading (dBuV/ m) | Average Limit (dBuV/ m) | Margin (dB) | Peak Limit (dBuV/ m) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|--------|-----------------|----------------------|-----|----------------|-------------------------|--------------|------------------------------|-------------------------|-------------|----------------------|----------------|----------------|-------------|----------|
| 1      | * 5.45999       | 35.22                | Pk  | 34.6           | -13.8                   | 0            | 56.02                        | -                       | -           | 74                   | -17.98         | 73             | 399         | V        |
| 2      | * 5.45957       | 39.49                | Pk  | 34.7           | -13.8                   | 0            | 60.39                        | -                       | -           | 74                   | -13.61         | 73             | 399         | V        |
| 3      | 5.46999         | 38.68                | Pk  | 34.7           | -13.8                   | 0            | 59.58                        | -                       | -           | 68.2                 | -8.62          | 73             | 399         | V        |
| 4      | 5.46847         | 42.23                | Pk  | 34.6           | -13.8                   | 0            | 63.03                        | -                       | -           | 68.2                 | -5.17          | 73             | 399         | V        |
| 5      | * 5.45999       | 24.6                 | RMS | 34.6           | -13.8                   | 0            | 45.4                         | 54                      | -8.6        | -                    | -              | 73             | 399         | V        |
| 6      | * 5.41172       | 25.77                | RMS | 34.7           | -13.8                   | 0            | 46.67                        | 54                      | -7.33       | -                    | -              | 73             | 399         | V        |
| 7      | 5.46999         | 26.63                | RMS | 34.7           | -13.8                   | 0            | 47.53                        | -                       | -           | -                    | -              | 73             | 399         | V        |
| 8      | 5.46828         | 27.62                | RMS | 34.6           | -13.8                   | 0            | 48.42                        | -                       | -           | -                    | -              | 73             | 399         | 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 344 (dB/m) | Amp/Cb I/Filt/Pad (dB) | Corrected Reading (dBuV/m) | Avg Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | PK Margin (dB) | UNII Non-Restricted (dBuV/m) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|--------|-----------------|----------------------|------|---------------|------------------------|----------------------------|--------------------|-------------|---------------------|----------------|------------------------------|----------------|----------------|-------------|----------|
| 1      | 1.93126         | 42.14                | PK-U | 30.6          | -32                    | 40.74                      | -                  | -           | -                   | -              | 68.2                         | -27.46         | 228            | 241         | H        |
| 3      | * 8.12258       | 33.87                | PK-U | 35.7          | -23.1                  | 46.47                      | -                  | -           | 74                  | -27.53         | -                            | -              | 309            | 395         | H        |
|        | * 8.1236        | 23.47                | ADR  | 35.7          | -23.1                  | 36.07                      | 54                 | -17.93      | -                   | -              | -                            | -              | 309            | 395         | H        |
| 4      | * 11.75789      | 30.61                | PK-U | 38.4          | -19.8                  | 49.21                      | -                  | -           | 74                  | -24.79         | -                            | -              | 228            | 382         | H        |
|        | * 11.76135      | 20.13                | ADR  | 38.4          | -19.8                  | 38.73                      | 54                 | -15.27      | -                   | -              | -                            | -              | 228            | 382         | H        |
| 2      | 1.93175         | 43.17                | PK-U | 30.6          | -32                    | 41.77                      | -                  | -           | -                   | -              | 68.2                         | -26.43         | 283            | 198         | V        |
| 5      | * 11.45905      | 31.04                | PK-U | 38.1          | -19.9                  | 49.24                      | -                  | -           | 74                  | -24.76         | -                            | -              | 42             | 392         | V        |
|        | * 11.4559       | 20.93                | ADR  | 38.1          | -19.9                  | 39.13                      | 54                 | -14.87      | -                   | -              | -                            | -              | 42             | 392         | V        |
| 6      | * 8.38405       | 32.74                | PK-U | 35.7          | -22.8                  | 45.64                      | -                  | -           | 74                  | -28.36         | -                            | -              | 244            | 390         | V        |
|        | * 8.3843        | 22.3                 | ADR  | 35.7          | -22.8                  | 35.2                       | 54                 | -18.8       | -                   | -              | -                            | -              | 244            | 390         | V        |

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

PK-U - U-NII: Maximum Peak

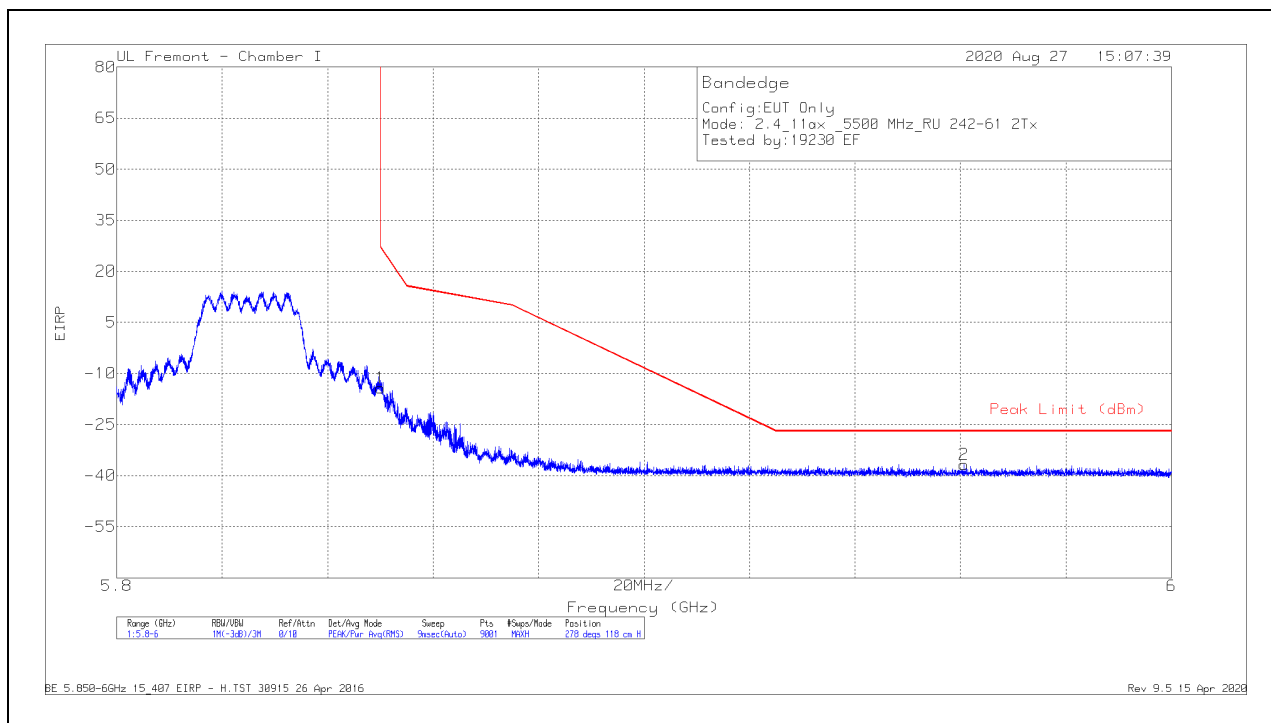
ADR - U-NII AD primary method, RMS average

## 7.4.4. TX ABOVE 1 GHz 802.11ax HE20 MODE IN THE 5.8 GHz BAND

### 2TX Antenna 5 + Antenna 6 OFDMA MODE 242 Tones, RU Index 61

### BANDEDGE (HIGH CHANNEL)

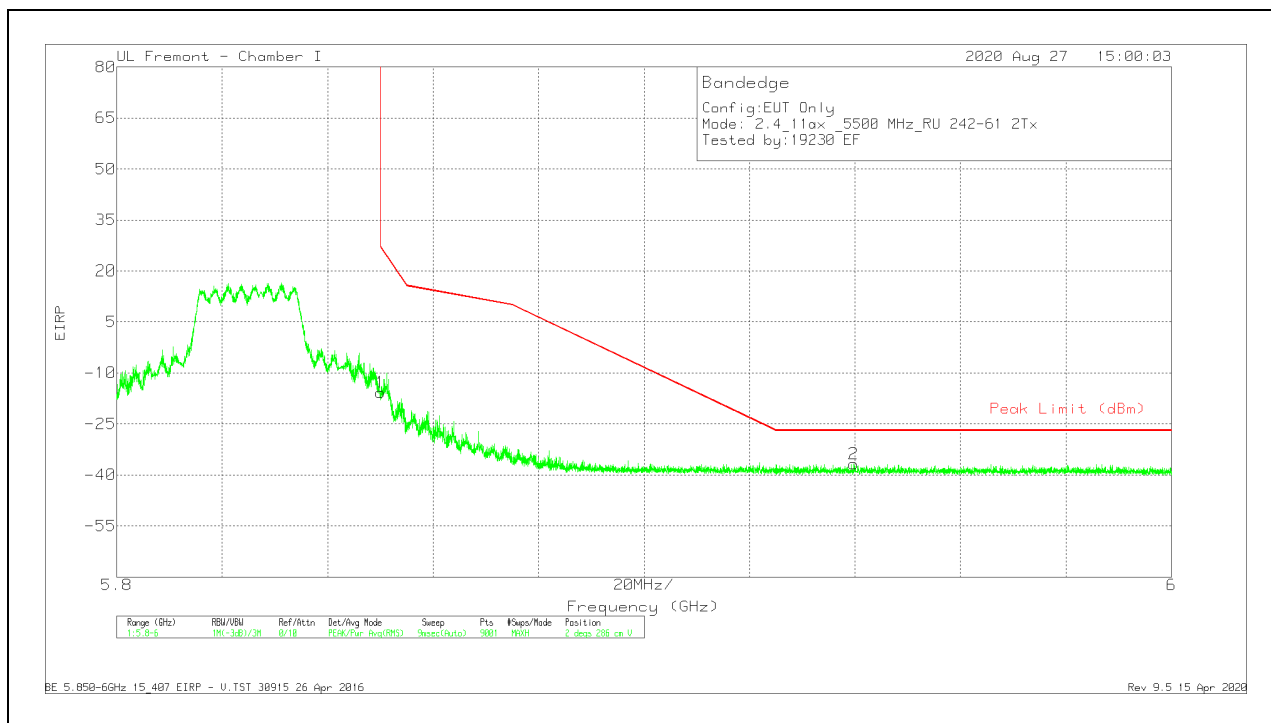
### HORIZONTAL RESULT



| Marker | Frequency (GHz) | Meter Reading (dBm) | Det | AF T346 (dB/m) | Amp/Cbl/Fitr/P ad (dB) | Conversion Factor (dB) | DC Corr (dB) | Corrected Reading EIRP | Peak Limit (dBm) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|--------|-----------------|---------------------|-----|----------------|------------------------|------------------------|--------------|------------------------|------------------|----------------|----------------|-------------|----------|
| 1      | 5.85002         | -47.55              | Pk  | 35             | -13.6                  | 11.8                   | 0            | -14.35                 | 26.95            | -41.3          | 278            | 118         | H        |
| 2      | 5.96067         | -70.19              | Pk  | 35.2           | -13.5                  | 11.8                   | 0            | -36.69                 | -27              | -9.69          | 278            | 118         | H        |

Pk - Peak detector

## VERTICAL RESULT

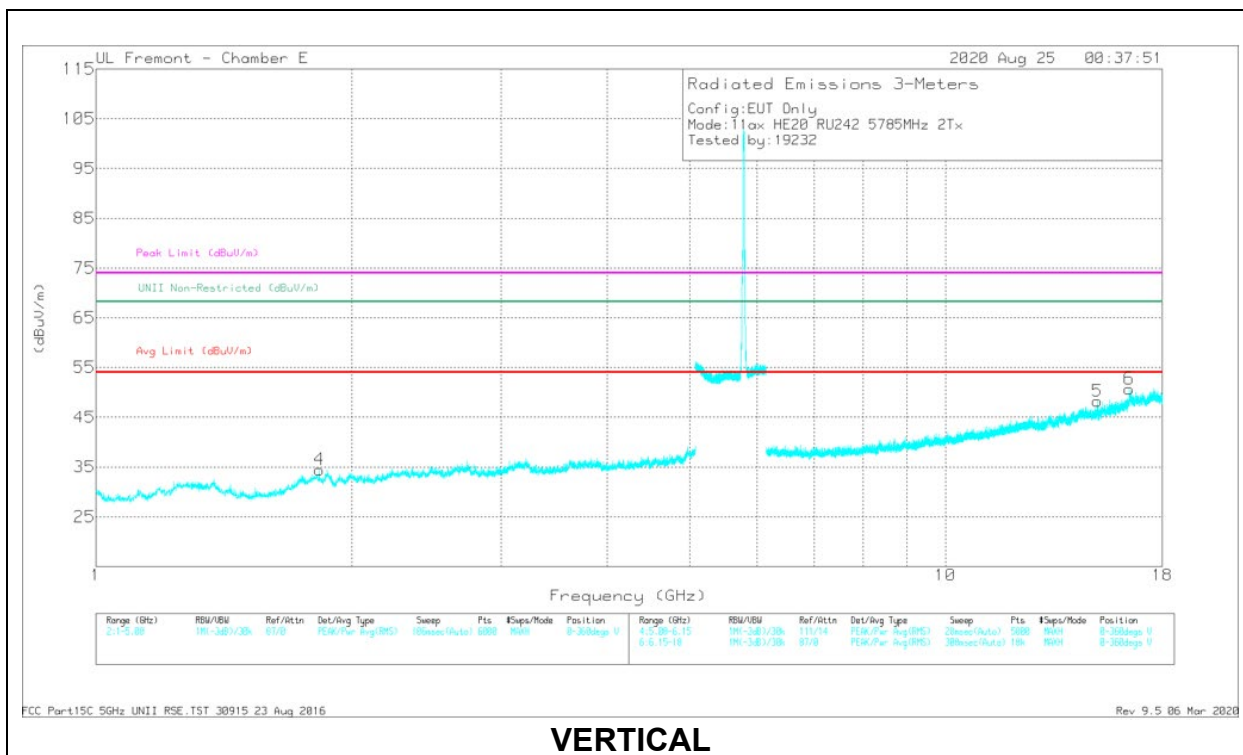
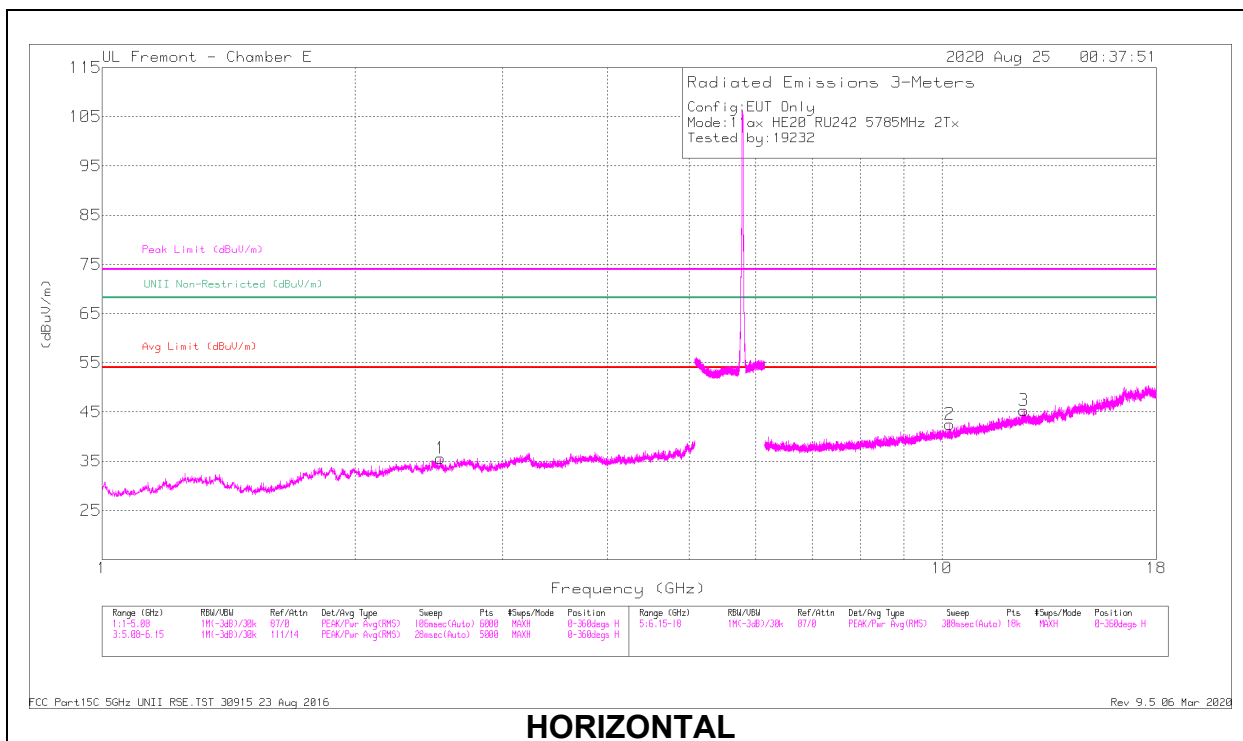


| Marker | Frequency (GHz) | Meter Reading (dBm) | Det | AFT346 (dBm) | Amp/Cbl/Filt/P ad (dB) | Conversion Factor (dB) | DC Corr (dB) | Corrected Reading EIRP | Peak Limit (dBm) | PK Margin (dB) | Azimuth (Degr) | Height (cm) | Polarity |
|--------|-----------------|---------------------|-----|--------------|------------------------|------------------------|--------------|------------------------|------------------|----------------|----------------|-------------|----------|
| 1      | 5.85002         | -49.01              | PK  | 35           | -13.6                  | 11.8                   | 0            | -15.81                 | 26.95            | -42.76         | 2              | 286         | V        |
| 2      | 5.93971         | -70.3               | PK  | 35.1         | -13.4                  | 11.8                   | 0            | -36.8                  | -27              | -9.8           | 2              | 286         | V        |

PK - Peak detector

## HARMONICS AND SPURIOUS EMISSIONS

### MID CHANNEL RESULTS



## RADIATED EMISSIONS

| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det  | AF T712 (dB/m) | Amp/Cb I/Filtr/Pa d (dB) | Correct ed Reading (dBuV/ m) | Avg Limit (dBuV/ m) | Margin (dB) | Peak Limit (dBuV/ m) | PK Margin (dB) | UNII Non-Restrict ed (dBuV/ m) | PK Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|--------|-----------------|----------------------|------|----------------|--------------------------|------------------------------|---------------------|-------------|----------------------|----------------|--------------------------------|----------------|----------------|-------------|----------|
| 3      | * 12.52124      | 34.99                | PK-U | 39             | -22.8                    | 51.19                        | -                   | -           | 74                   | -22.81         | -                              | -              | 0              | 101         | H        |
|        | * 12.52042      | 24.07                | ADR  | 39             | -22.8                    | 40.27                        | 54                  | -13.73      | -                    | -              | -                              | -              | 0              | 101         | H        |
| 1      | 2.52972         | 45.55                | PK-U | 32.7           | -36.2                    | 42.05                        | -                   | -           | -                    | -              | 68.2                           | -26.15         | 0              | 101         | H        |
| 2      | 10.21543        | 37.97                | PK-U | 37.1           | -26.5                    | 48.57                        | -                   | -           | -                    | -              | 68.2                           | -19.63         | 0              | 101         | H        |
| 4      | 1.83125         | 45.52                | PK-U | 30.9           | -35.2                    | 41.22                        | -                   | -           | -                    | -              | 68.2                           | -26.98         | 0              | 199         | V        |
| 5      | 15.10757        | 34.98                | PK-U | 39.7           | -20.3                    | 54.38                        | -                   | -           | -                    | -              | 68.2                           | -13.82         | 0              | 101         | V        |
| 6      | 16.46016        | 34.76                | PK-U | 41.3           | -18.9                    | 57.16                        | -                   | -           | -                    | -              | 68.2                           | -11.04         | 0              | 198         | V        |

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

PK-U - U-NII: Maximum Peak

ADR - U-NII AD primary method, RMS average

## 7.5. 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                 |
|-----------------|---------------------------|-----------------------------------------------------------|--------------------------------------|
| NII             | BCG-E3539A<br>579C-E3539A | 13179110-E5 (FCC)<br>13179110-E6 (IC)<br>13179110-E5 & E6 | FCC IC_UNII Report /<br>All sections |

\*-E5 report is conducted measurements for FCC, -E6 is conducted for Canada, -E5 & E6 contains radiated emissions data.

## 7.6. DESCRIPTION OF TEST SETUP

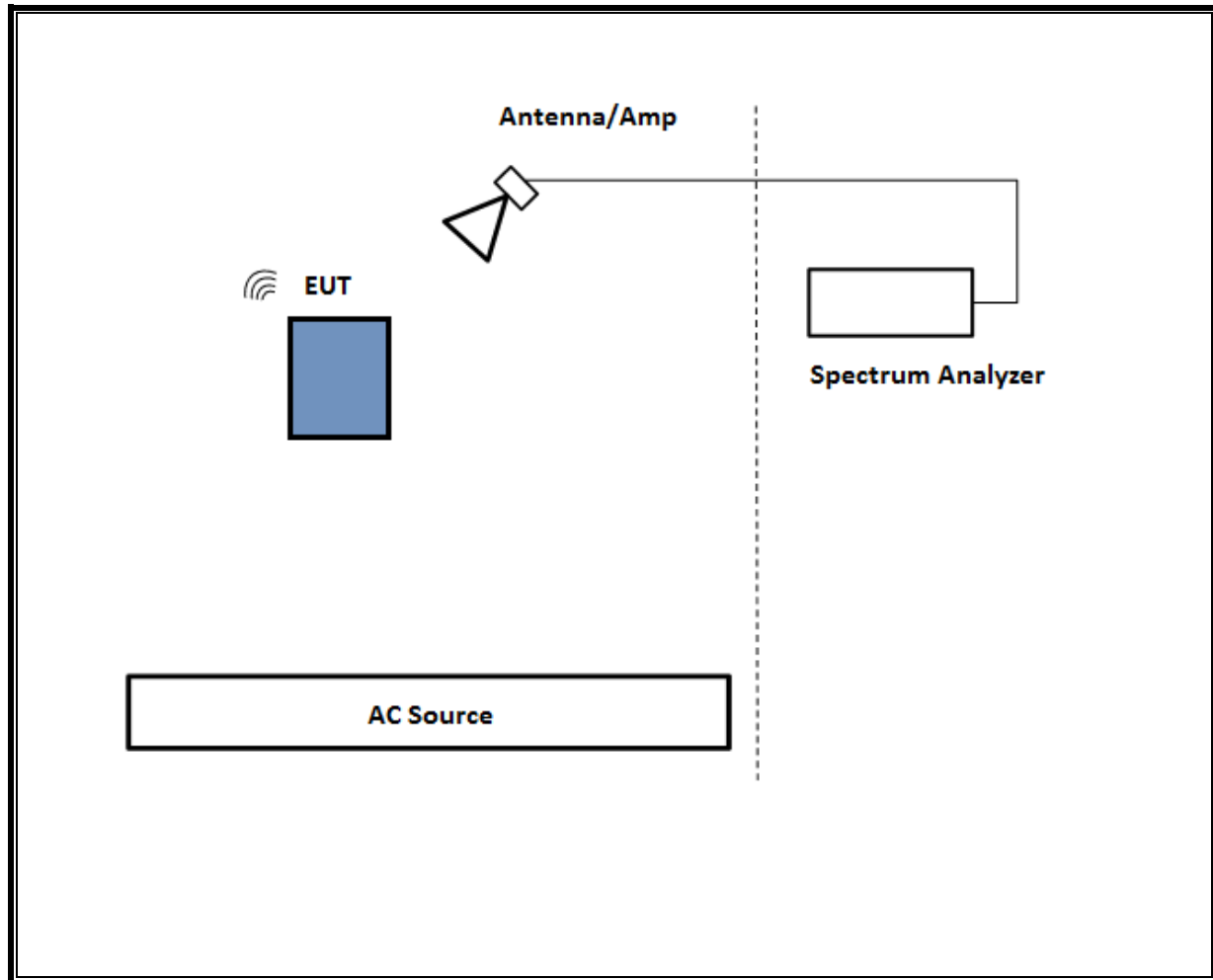
### SUPPORT EQUIPMENT

| Support Equipment List          |                   |       |                   |          |
|---------------------------------|-------------------|-------|-------------------|----------|
| Description                     | Manufacturer      | Model | Serial Number     | FCC ID   |
| Laptop                          | Apple             | A1989 | C02YL3ZMJHC8      | BCGA1989 |
| Laptop 61W USBC-C AC/DC adapter | Liteon Technology | A1718 | C4N711404U3GN8RAW | NA       |
| EUT AC Adapter                  | Apple             | A2305 | D292365CDYADHLHC3 | NA       |

### I/O CABLES (RADIATED ABOVE 1 GHZ)

| I/O Cable List |      |                      |                |            |                  |         |
|----------------|------|----------------------|----------------|------------|------------------|---------|
| Cable No       | Port | # of identical ports | Connector Type | Cable Type | Cable Length (m) | Remarks |
| NA             |      |                      |                |            |                  |         |

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



## 7.7. WORST-CASE CONFIGURATION AND MODE

For radiated harmonics spurious 1-18GHz L/M/H channels were performed with the EUT set at the 2TX CDD mode based on model A2176 with power setting equal or higher than SISO modes as worst-case scenario.

Investigated worst-case data rates as listed below were:

## 8. MEASUREMENT METHOD

| Test Item                                  | Test Method                                             |
|--------------------------------------------|---------------------------------------------------------|
| Unwanted emissions in restricted bands:    | KDB 789033 D02 v02r01, Sections G.3, G.4, G.5, and G.6. |
| Unwanted emissions in non-restricted bands | KDB 789033 D02 v02r01, Sections G.3, G.4, and G.5.      |
| Band-edge                                  | ANSI C63.10-2013, Section 6.10.                         |

## 9. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment were 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                   | T712       | 03/09/2021 | 03/09/2020 |
| Amplifier, 1 to 8GHz, 35dB           | MITEQ                     | AMF-4D-01000800-30-29P | T1169      | 03/03/2021 | 03/03/2020 |
| Spectrum Analyzer, PXA, 3Hz to 44GHz | Keysight Technologies Inc | N9030A                 | T1466      | 01/23/2021 | 01/23/2020 |
| Antenna, Horn 1-18GHz                | ETS Lindgren              | 3117                   | T346       | 07/20/2021 | 07/20/2020 |
| RF Amplifier, 1-18GHz                | MITEQ                     | AFS42-00101800-25-S-42 | PRE0181078 | 05/06/2021 | 05/06/2020 |
| EMI TEST RECEIVER                    | Rohde & Schwarz           | ESW44                  | PRE0179522 | 02/20/2021 | 02/20/2020 |
| Antenna, Horn 1-18GHz                | ETS-Lindgren              | 3117                   | T344       | 05/26/2021 | 05/26/2020 |
| Amplifier, 1 - 18GHz                 | MITEQ                     | AFS42-00101800-25-S-42 | T1568      | 04/14/2021 | 04/14/2020 |
| EMI TEST RECEIVER                    | Rohde & Schwarz           | ESW44                  | PRE0180917 | 02/26/2021 | 02/26/2020 |
| 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 | Rev 9.5, 30 Apr, 2020 |

## 10. SETUP PHOTOS

Please refer to 13179110-EP1 for setup photos

## **Appendix A – Conducted Data for FCC Part 15 E**

Attached is the test report (13179110-E5) containing the reference data from the parent model as detailed in section 7.5. This data will only be included in the report submitted for FCC filing

## **Appendix B - Conducted Data for ISED RSS 247**

This data will only be included in the report (13179110-E6) submitted for ISED filing.

## **Appendix C - Radiated Data (13179110-E5 & E6)**

## END OF TEST REPORT