



TEST REPORT

Report Number: 13259310-E5V2 & E6V2

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

Model : A2403, A2404, A2405

FCC ID : BCG-E3544A
IC : 579C-E3544A

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 15, 2020

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NVLAP Lab code: 200065-0

REPORT REVISION HISTORY

Rev.	Issue Date	Revisions	Revised By
V1	8/27/2020	Initial Revision	Chin Pang
V2	9/15/2020	Address TCB Questions	Francisco Guarnero

TABLE OF CONTENTS

REPORT REVISION HISTORY	2
TABLE OF CONTENTS	3
1. ATTESTATION OF TEST RESULTS	4
2. TEST RESULT SUMMARY	5
3. TEST METHODOLOGY	5
4. FACILITIES AND ACCREDITATION	5
5. DECISION RULES AND MEASUREMENT UNCERTAINTY	6
5.2. <i>DECISION RULES.....</i>	6
5.3. <i>MEASUREMENT UNCERTAINTY.....</i>	6
6. RADIATED TEST RESULTS.....	7
7. INTRODUCTION OF TEST DATA REUSE.....	9
7.1. <i>EUT DESCRIPTION</i>	9
7.2. <i>INTRODUCTION</i>	9
7.3. <i>DIFFERENCE IN MODEL NUMBER.....</i>	9
7.4. <i>SPOT CHECK VERIFICATION RESULTS SUMMARY</i>	9
7.4.1. TX ABOVE 1 GHz 802.11ax HE20 MODE IN THE 5.2 GHz BAND.....	10
7.4.2. TX ABOVE 1 GHz 802.11ax HE20 MODE IN THE 5.3 GHz BAND.....	14
7.4.3. TX ABOVE 1 GHz 802.11ax HE20 MODE IN THE 5.6 GHz BAND.....	18
7.4.4. TX ABOVE 1 GHz 802.11ax HE20 MODE IN THE 5.8 GHz BAND.....	22
7.5. <i>REFERENCE DETAIL</i>	26
7.6. <i>DESCRIPTION OF TEST SETUP.....</i>	26
7.7. <i>WORST-CASE CONFIGURATION AND MODE.....</i>	28
8. MEASUREMENT METHOD.....	28
9. TEST AND MEASUREMENT EQUIPMENT	28
10. SETUP PHOTOS.....	28
Appendix A - Conducted Data for FCC Part 15 E.....	29
Appendix B - Conducted Data for ISED RSS 247.....	30
Appendix C - Radiated Data (13179116-E5 & E6).....	31

1. ATTESTATION OF TEST RESULTS

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

EUT DESCRIPTION: SMARTPHONE

MODEL: A2403, A2404, A2405

SERIAL NUMBER: (Original): G6TZX04APT5N, G6TCQ01XQ5HX
(Spot Check): G6TD203Y04HT, G6TD204J04DG

DATE TESTED: JULY 28, 2020 – AUGUST 08, 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
UL Verification Services Inc. By:



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Senior Engineer
Consumer Technology Division
UL Verification Services Inc.

Prepared By:



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Test Engineer
Consumer Technology Division
UL Verification Services Inc.

2. TEST RESULT 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 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 _{Lab}
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 (MHz)	Field Strength Limit (uV/m) at 3 m	Field Strength Limit (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, TD-SCDMA, CDMA, IEEE 802.11a/b/g/n/ac/ax, Bluetooth, Ultra-Wide band, GPS and NFC. All models support at least one UICC based SIM. The second SIM, if present, is either UICC based pSIM (physical SIM) or e-SIM (electronic SIM). The device has a built-in inductive charging receiver. The rechargeable battery is also 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-E3542A, IC: 579C-E3542A to cover variant model BCG-E3544A, 579C-3544A. 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 A2403, A2404, and A2405 are electrically identical and the model numbers are allocated for marketing and logistic purposes only. Model A2403 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 A2403, FCC ID: BCG-E3544A, IC: 579C-3544A for radiated spurious and radiated band-edge in accordance with the Test Plan that was approved via KDB inquiry.

BCG-E3544A / 579C-E3544A SPOT CHECK RESULTS										
Technology	Mode	Test Item	Channel	Measured	Original model		Spot check model		Delta (dB)	
					A2172		A2403, A2404, A2405			
				BCG-E3542A 579C-E3542A		BCG-E3544A 579C-E3544A		Peak	Ave	Peak
				Frequency (GHz)	Peak (dBuV)	Ave (dBuV)	Peak	Ave	Peak	Ave
WiFi (5GHz)	ax, HE20 5.2 & 5.3GHz	RBE	Low, 36	5150	62.66	50.96	65.62	51.22	2.96	-0.26
			High, 64	5350	64.84	50.67	65.17	51.07	0.33	0.4
	ax, HE20 5.6GHz	RBE	Low, 100	5451	58.32	48.56	59.39	45.51	1.07	-3.05
	ax, HE20 5.8GHz	RBE	High,165	5850	-36.86 (EIRP)		-36.98 (EIRP)		-0.12	
	ax, HE20 5.3/5.6/5.8GHz	RSE	Mid, 60	15.902	54.86	43.76	51.64	41.13	-3.22	-2.63
			Mid,116	12.015	50.28	40.28	52.46	41.98	2.18	1.7
			Mid,157	12.178	50.32	39.37	49.29	39.22	-1.03	-0.15

Comparison of the models, upper deviation is within 3dB for the worst case measurements relative to the limit (note some peak values are more than 3dB higher but the corresponding average value, which has less margin relative to the average limit for emissions, is within 3dB of the reference model) and all measurements are under FCC/IC Technical Limits.

Note: The output powers were verified on model A2403 to match with model A2172 before radiated emissions spot check was performed.

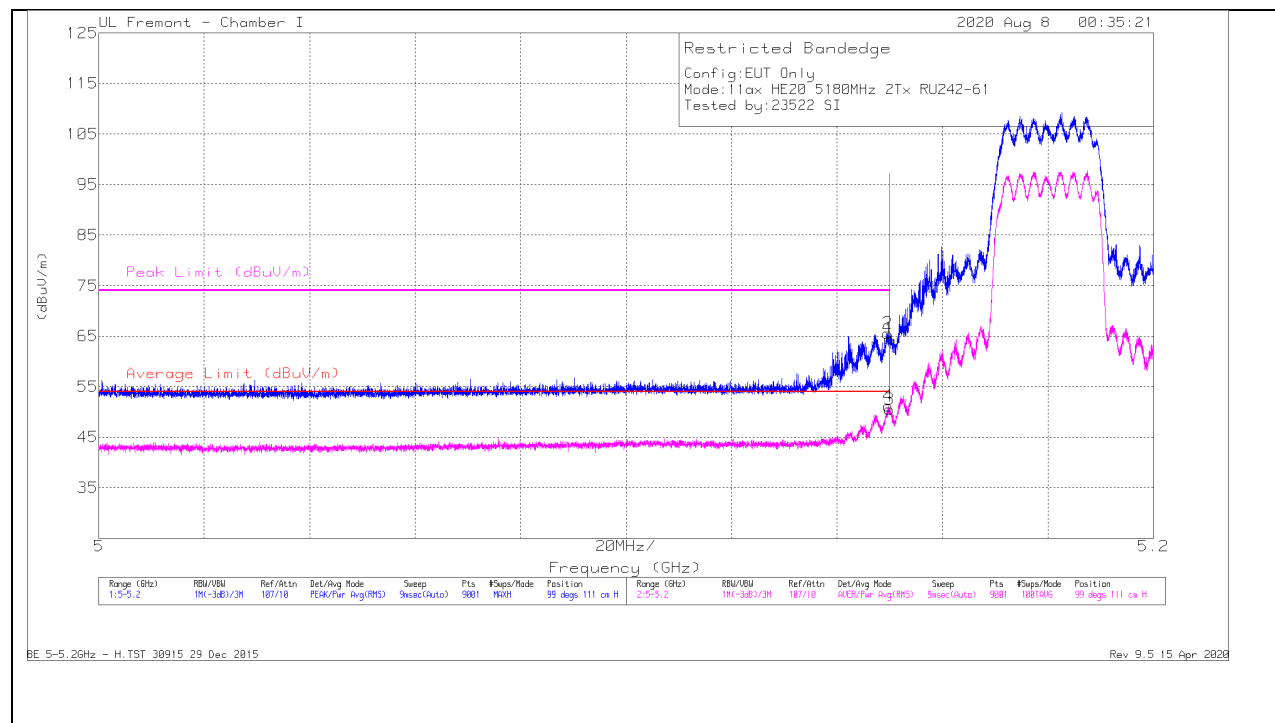
SPOT CHECK

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



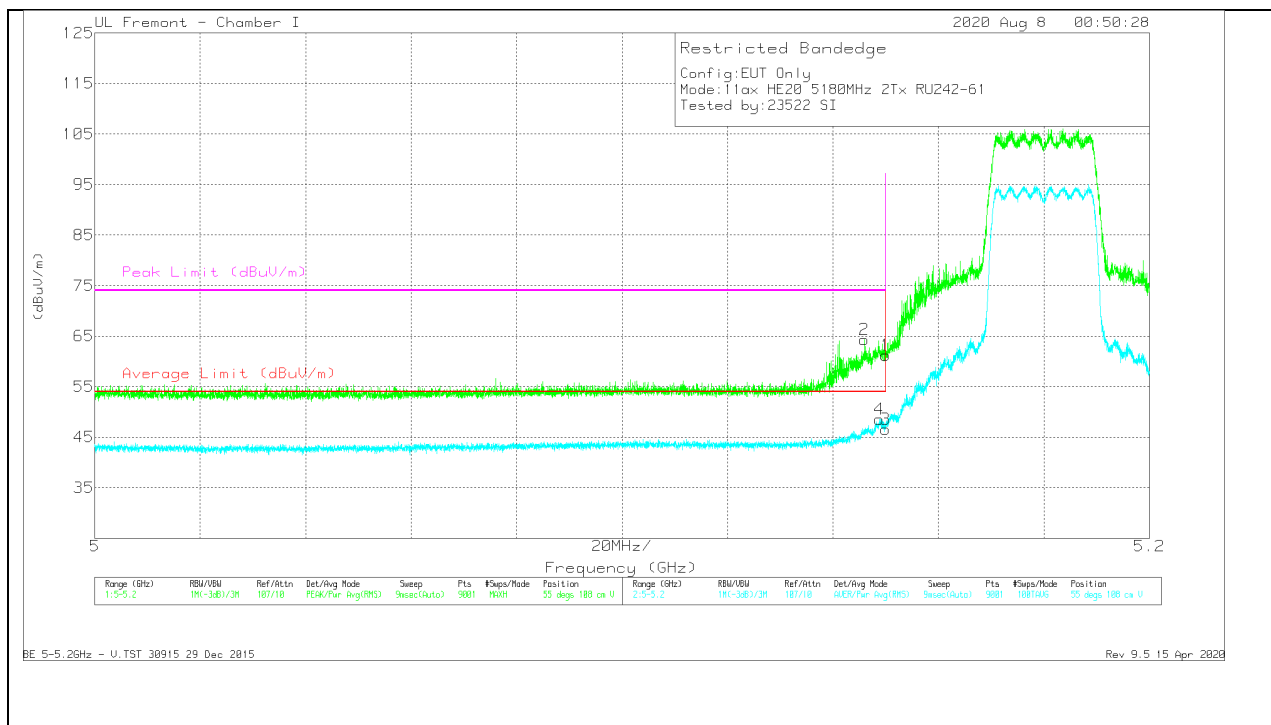
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T346 (dB/m)	Amp/Cbl/Fitr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarization
1	* 5.15	44.92	Pk	34.3	-14.8	64.42	-	-	74	-9.58	99	111	H
2	* 5.14962	46.12	Pk	34.3	-14.8	65.62	-	-	74	-8.38	99	111	H
3	* 5.15	31.07	RMS	34.3	-14.8	50.57	54	-3.43	-	-	99	111	H
4	* 5.14975	31.72	RMS	34.3	-14.8	51.22	54	-2.78	-	-	99	111	H

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

Pk - Peak detector

RMS - RMS detection

VERTICAL RESULT

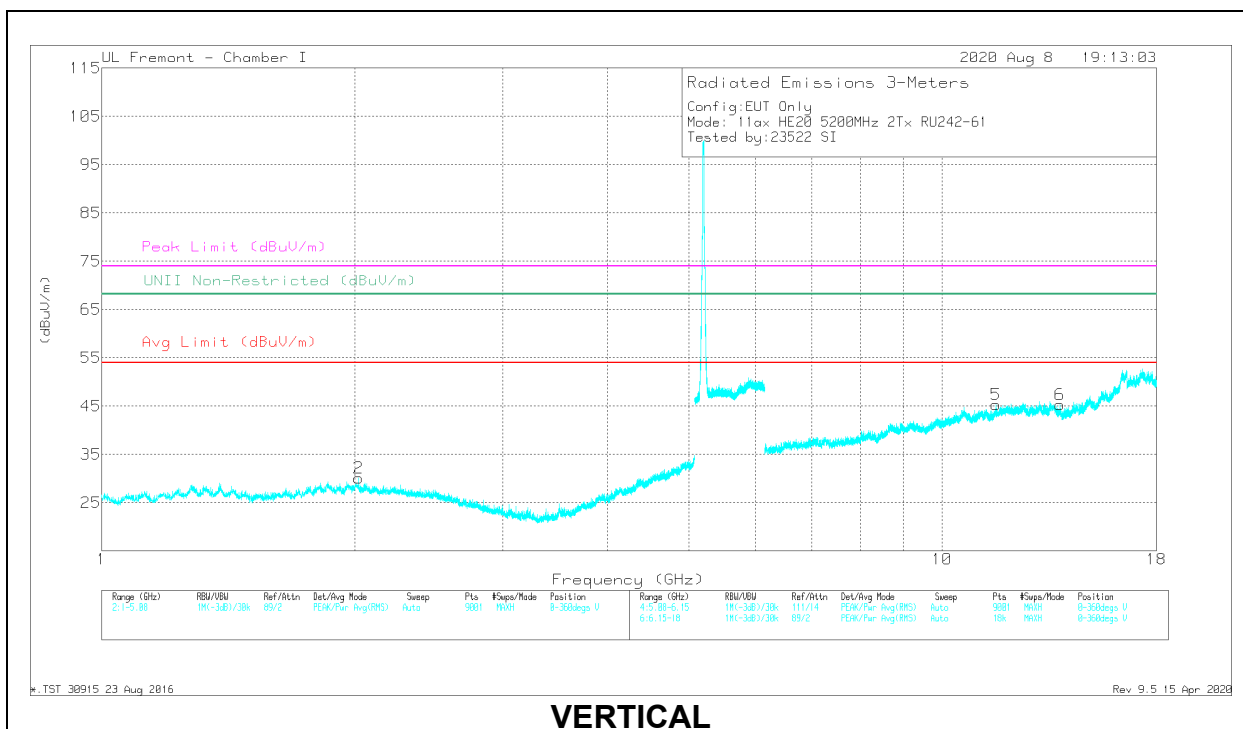
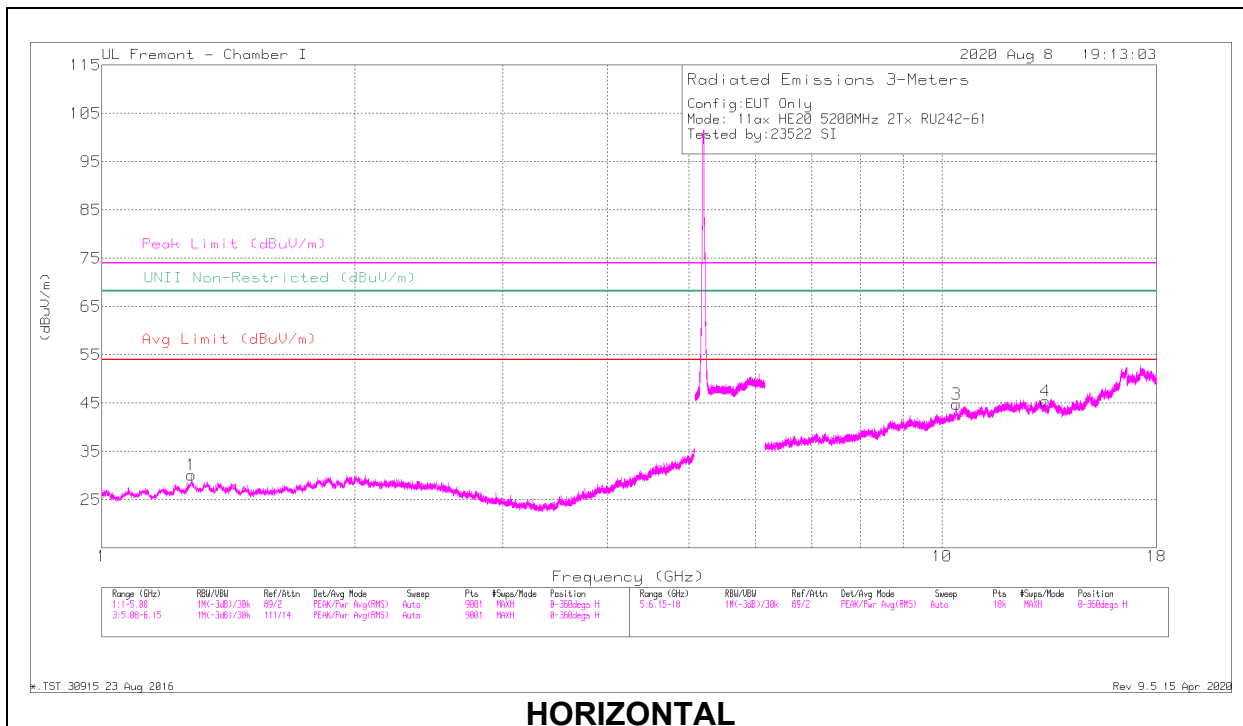


Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T346 (dB/m)	Amp/Cbl/Filt/Pa d (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 5.15	41.76	Pk	34.3	-14.8	61.26	-	-	74	-12.74	55	108	V
2	* 5.14593	44.96	Pk	34.2	-14.8	64.36	-	-	74	-9.64	55	108	V
3	* 5.15	27.04	RMS	34.3	-14.8	46.54	54	-7.46	-	-	55	108	V
4	* 5.14878	29.18	RMS	34.2	-14.8	48.58	54	-5.42	-	-	55	108	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 g (dBuV)	Det	AF T346 (dB/m)	Amp/Cbl/Filtr/P ad (dB)	Correct ed 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	* 1.27786	37.88	PK-U	29.3	-30.5	36.68	-	-	74	-37.32	-	-	273	124	H
	* 1.27989	28.06	ADR	29.3	-30.5	26.86	54	-27.14	-	-	-	-	273	124	H
2	2.01936	34.64	PK-U	31.5	-28.4	37.74	-	-	-	-	68.2	-30.46	48	106	V
3	10.39685	29.73	PK-U	37.6	-14.9	52.43	-	-	-	-	68.2	-15.77	163	316	H
4	* 13.27514	29.69	PK-U	39.1	-15.6	53.19	-	-	74	-20.81	-	-	255	118	H
	* 13.27149	18.76	ADR	39.2	-15.6	42.36	54	-11.64	-	-	-	-	255	118	H
5	* 11.59902	29.41	PK-U	38.3	-15.4	52.31	-	-	74	-21.69	-	-	136	328	V
	* 11.60025	19.38	ADR	38.3	-15.4	42.28	54	-11.72	-	-	-	-	136	328	V
6	13.82288	28.42	PK-U	38.5	-15.6	51.32	-	-	-	-	68.2	-16.88	11	302	V

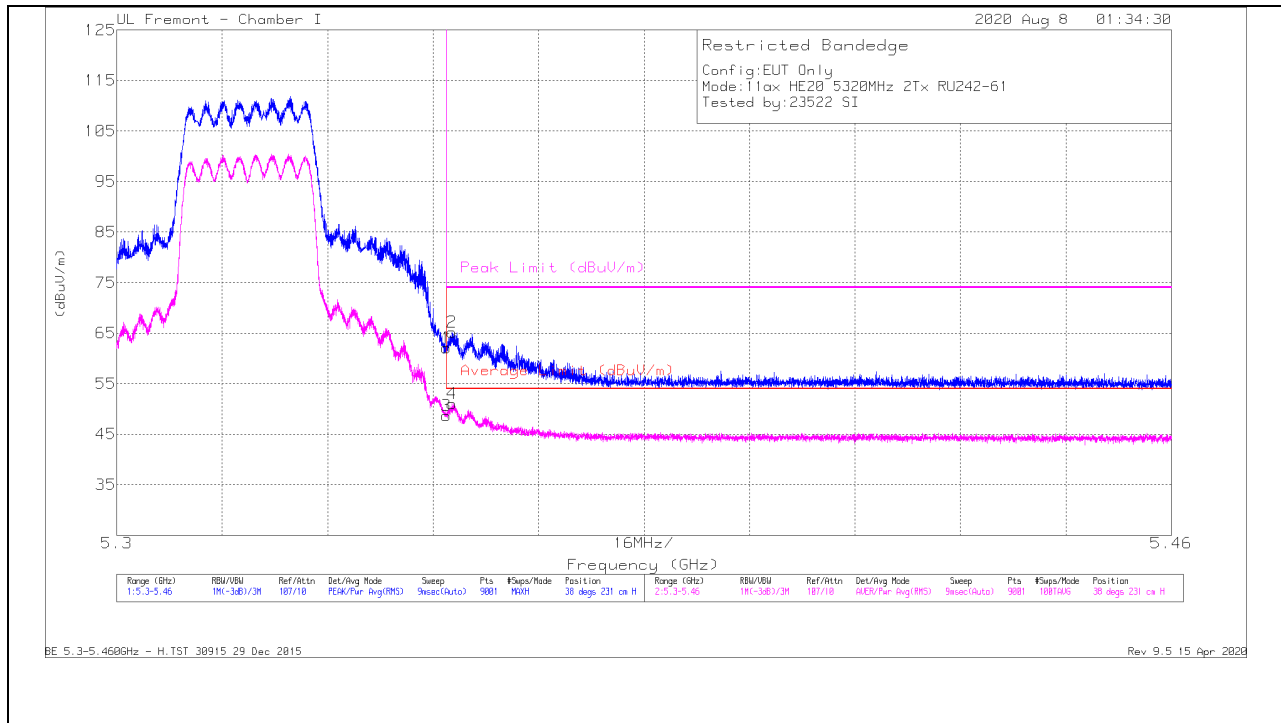
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
PK-U - U-NII: Maximum Peak
ADR - U-NII AD primary method, RMS average

7.4.2. 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



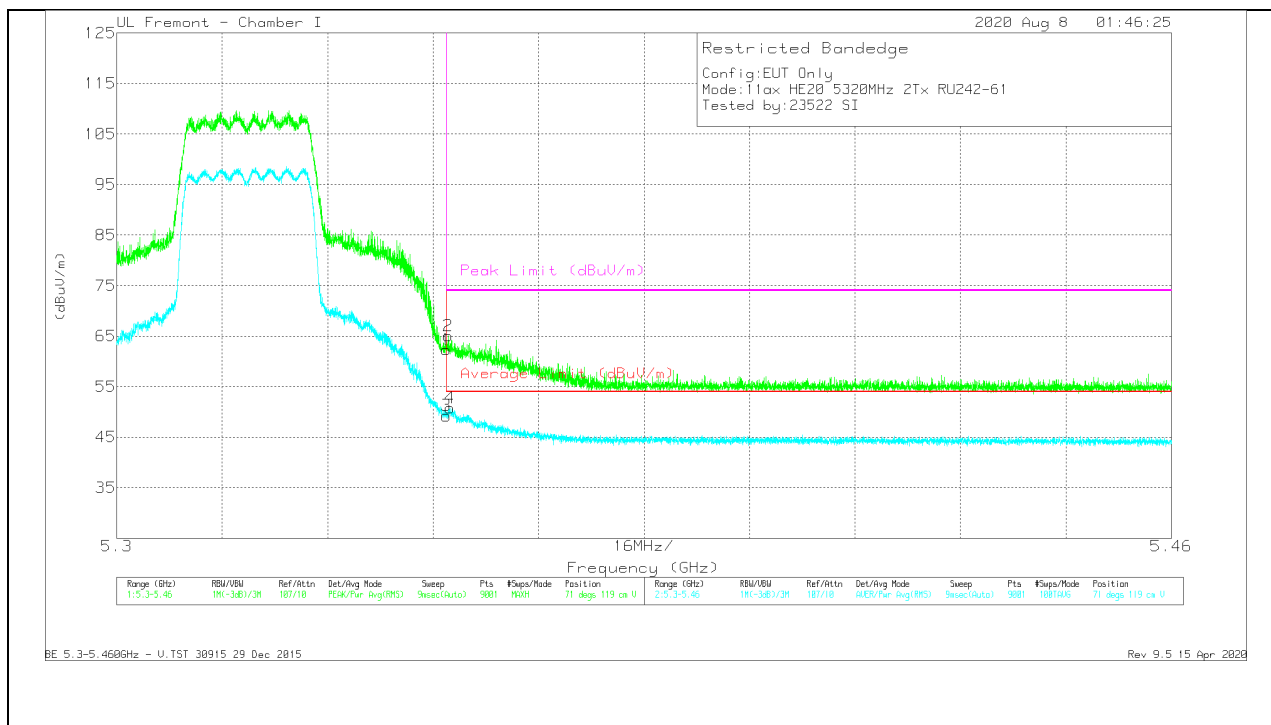
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T346 (dB/m)	Amp/Cbl/Filt/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 5.35001	41.34	Pk	34.7	-14	62.04	-	-	74	-11.96	38	231	H
2	* 5.3509	44.47	Pk	34.7	-14	65.17	-	-	74	-8.83	38	231	H
3	* 5.35001	27.99	RMS	34.7	-14	48.69	54	-5.31	-	-	38	231	H
4	* 5.35083	30.37	RMS	34.7	-14	51.07	54	-2.93	-	-	38	231	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 T346 (dB/m)	Amp/Cbl/Filtr/ Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarization
1	* 5.35001	41.69	Pk	34.7	-14	62.39	-	-	74	-11.61	71	119	V
2	* 5.35029	44.36	Pk	34.7	-14	65.06	-	-	74	-8.94	71	119	V
3	* 5.35001	28.54	RMS	34.7	-14	49.24	54	-4.76	-	-	71	119	V
4	* 5.35056	30.06	RMS	34.7	-14	50.76	54	-3.24	-	-	71	119	V

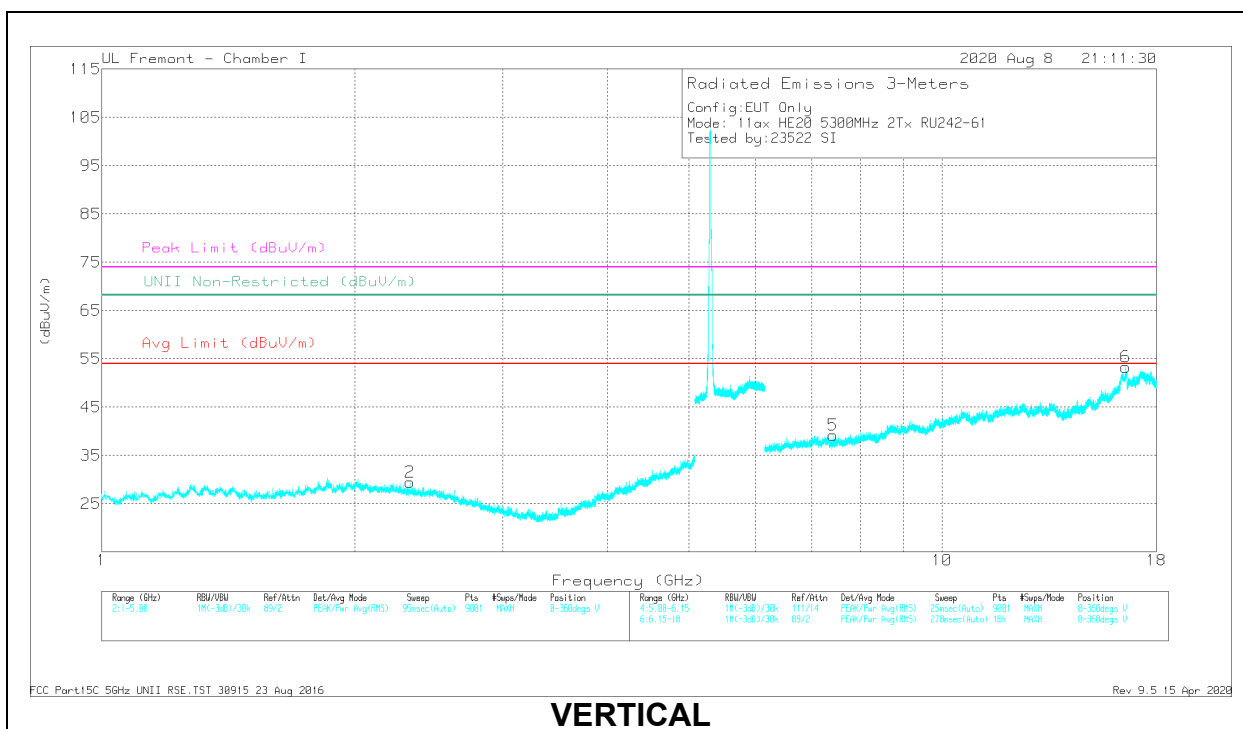
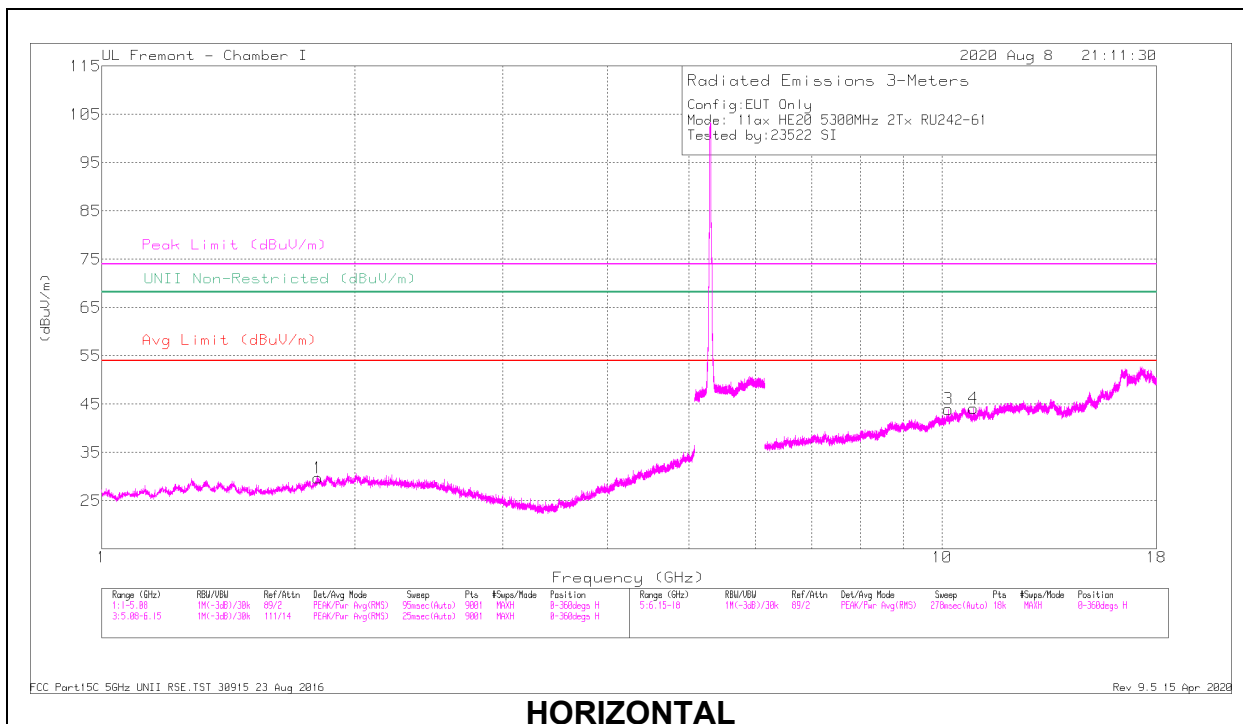
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

RMS - RMS detection

HARMONICS AND SPURIOUS EMISSIONS

MID CHANNEL RESULTS



RADIATED EMISSIONS

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T346 (dB/m)	Amp/Cb I/Filt/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
1	1.80707	37.87	PK-U	30.1	-28.8	39.17	-	-	-	-	68.2	-29.03	275	154	H
2	* 2.3274	35.94	PK-U	31.7	-27.8	39.84	-	-	74	-34.16	-	-	181	399	V
	* 2.32916	25.37	ADR	31.8	-27.8	29.37	54	-24.63	-	-	-	-	181	399	V
3	10.18483	28.69	PK-U	37.3	-15.1	50.89	-	-	-	-	68.2	-17.31	106	124	H
4	* 10.894	28.04	PK-U	38	-14.4	51.64	-	-	74	-22.36	-	-	322	283	H
	* 10.89367	17.53	ADR	38	-14.4	41.13	54	-12.87	-	-	-	-	322	283	H
5	* 7.42252	28.67	PK-U	35.7	-18.3	46.07	-	-	74	-27.93	-	-	153	101	V
	* 7.42565	18.8	ADR	35.7	-18.3	36.2	54	-17.8	-	-	-	-	153	101	V
6	16.54398	30.58	PK-U	41.5	-11.8	60.28	-	-	-	-	68.2	-7.92	251	201	V

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

PK-U - U-NII: Maximum Peak

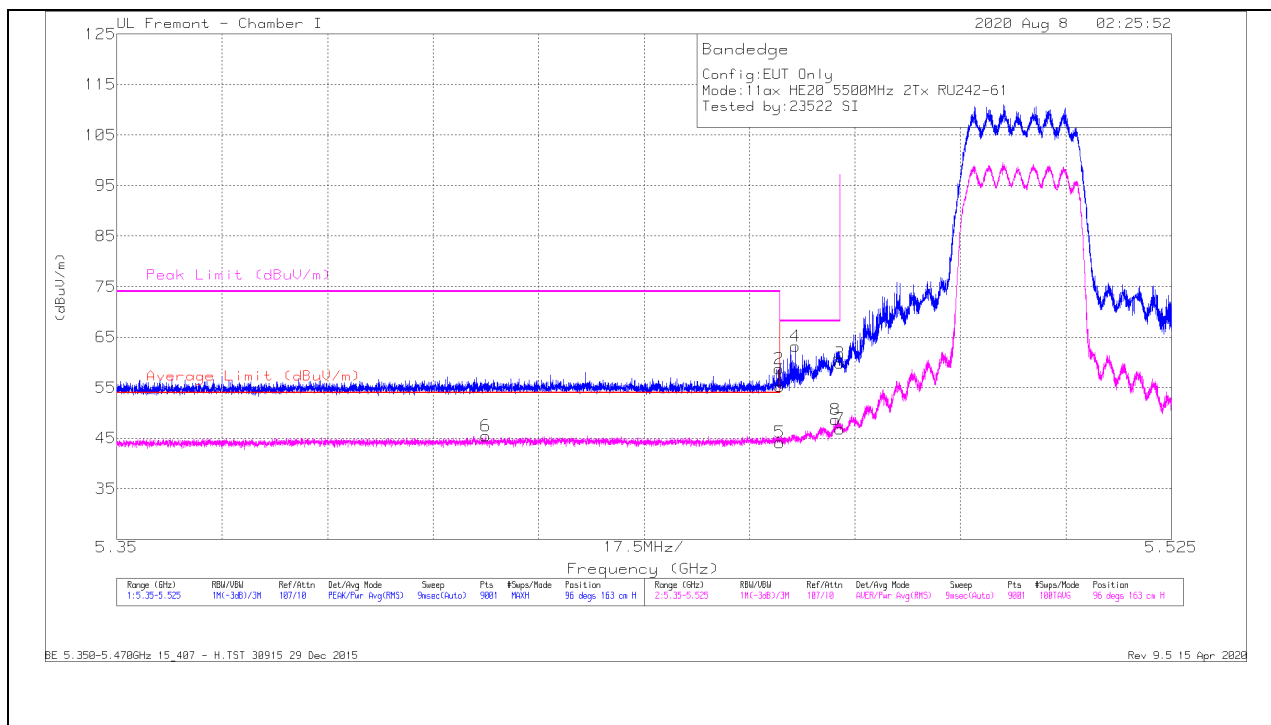
ADR - U-NII AD primary method, RMS average

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/Cbl/Filt/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	* 5.45999	34.42	Pk	34.6	-13.8	55.22	-	-	74	-18.78	96	163	H
2	* 5.45988	37.81	Pk	34.7	-13.8	58.71	-	-	74	-15.29	96	163	H
3	5.46999	38.98	Pk	34.7	-13.8	59.88	-	-	68.2	-8.32	96	163	H
4	5.46256	42.4	Pk	34.6	-13.8	63.2	-	-	68.2	-5	96	163	H
5	* 5.45999	23.35	RMS	34.6	-13.8	44.15	54	-9.85	-	-	96	163	H
6	* 5.41121	24.53	RMS	34.7	-13.8	45.43	54	-8.57	-	-	96	163	H
7	5.46999	25.96	RMS	34.7	-13.8	46.86	-	-	-	-	96	163	H
8	5.46923	27.93	RMS	34.6	-13.8	48.73	-	-	-	-	96	163	H

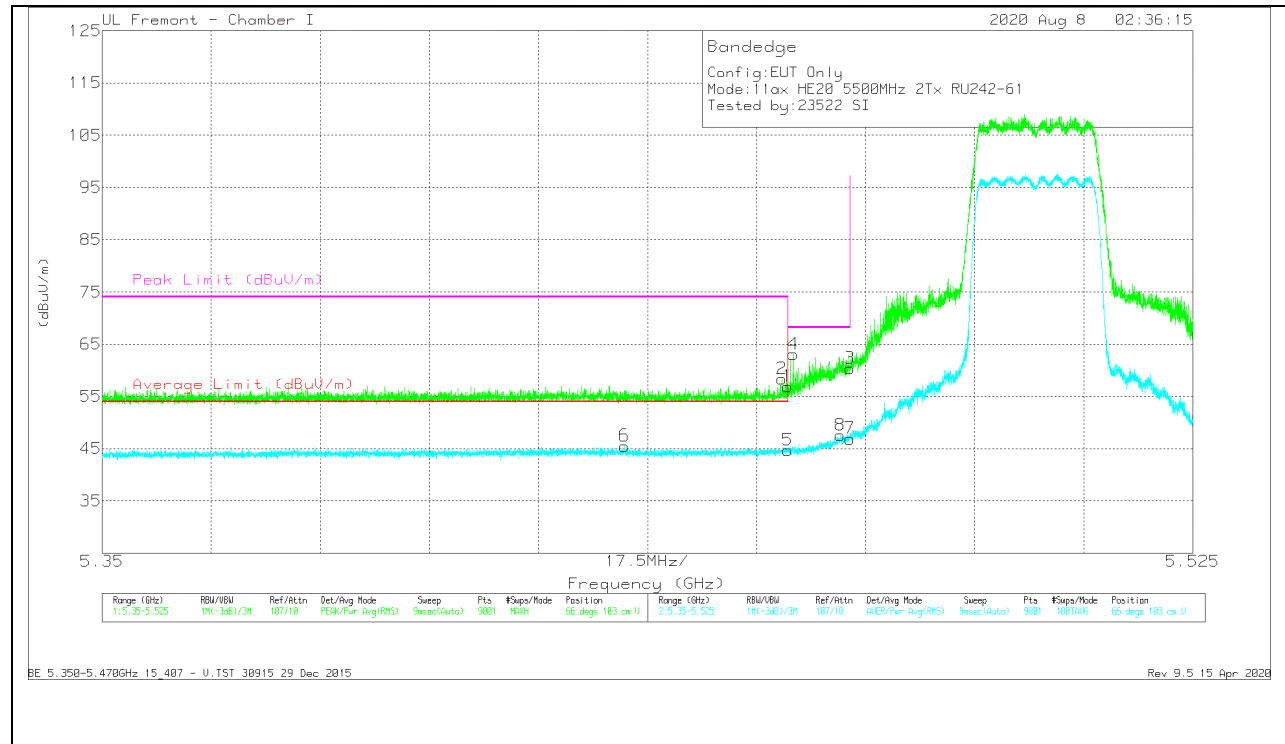
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

RMS - RMS detection

BANDEDGE (LOW CHANNEL)

VERTICAL RESULT

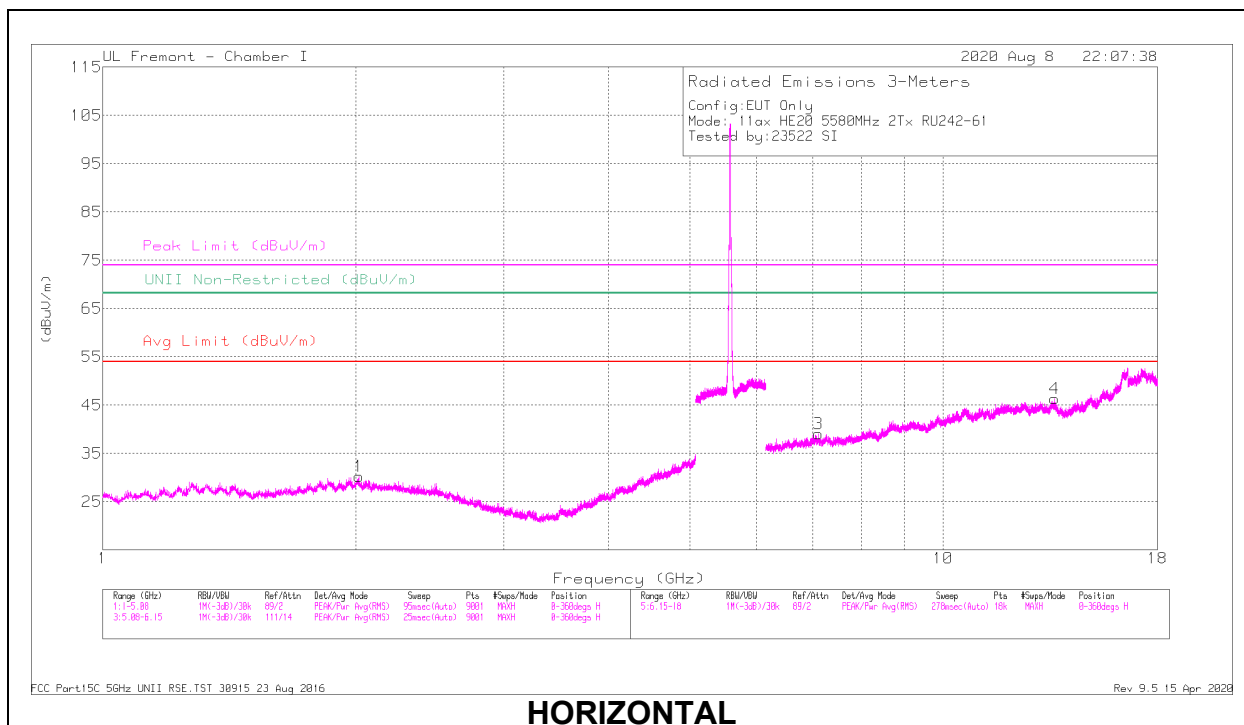


Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T346 (dB/m)	Amp/Cbl/Filt/Pa d (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 5.45999	36.11	Pk	34.6	-13.8	55.41	-	-	74	-18.59	66	103	V
2	* 5.4591	40.49	Pk	34.7	-13.8	59.39	-	-	74	-14.61	66	103	V
3	5.46999	39.46	Pk	34.7	-13.8	60.36	-	-	68.2	-7.84	66	103	V
4	5.46089	42.24	Pk	34.6	-13.8	63.04	-	-	68.2	-5.16	66	103	V
5	* 5.45999	23.91	RMS	34.6	-13.8	44.71	54	-9.29	-	-	66	103	V
6	* 5.4338	24.61	RMS	34.6	-13.7	45.51	54	-8.49	-	-	66	103	V
7	5.46999	25.98	RMS	34.7	-13.8	46.88	-	-	-	-	66	103	V
8	5.46841	26.81	RMS	34.6	-13.8	47.61	-	-	-	-	66	103	V

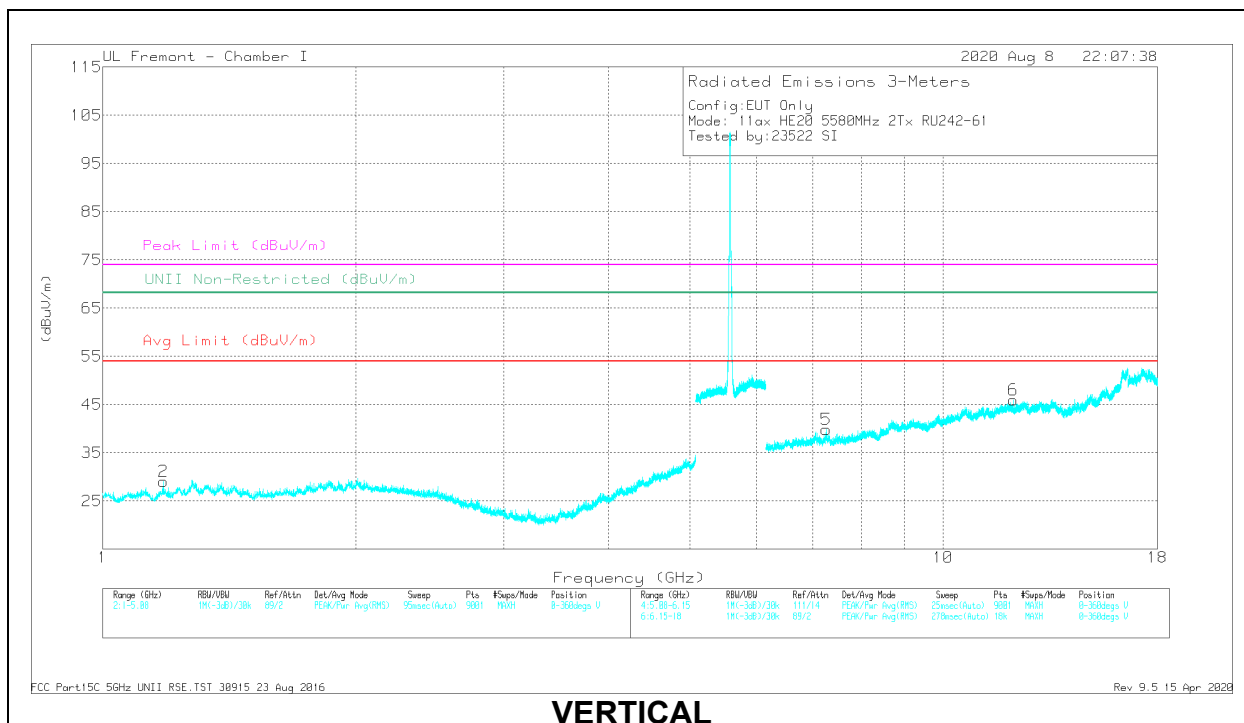
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
Pk - Peak detector
RMS - RMS detection

HARMONICS AND SPURIOUS EMISSIONS

MID CHANNEL RESULTS



HORIZONTAL



VERTICAL

RADIATED EMISSIONS

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T346 (dB/m)	Amp/Cb l/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
1	2.02031	34.24	PK-U	31.5	-28.4	37.34	-	-	-	-	68.2	-30.86	56	145	H
2	* 1.1792	38.86	PK-U	27.6	-30.8	35.66	-	-	74	-38.34	-	-	275	185	V
	* 1.18242	28.22	ADR	27.8	-30.8	25.22	54	-28.78	-	-	-	-	275	185	V
3	7.1072	28.96	PK-U	35.9	-18.5	46.36	-	-	-	-	68.2	-21.84	207	108	H
4	13.58013	30.76	PK-U	38.8	-16.3	53.26	-	-	-	-	68.2	-14.94	17	254	H
5	* 7.26252	28.25	PK-U	35.7	-17.2	46.75	-	-	74	-27.25	-	-	50	279	V
	* 7.26344	17.88	ADR	35.7	-17.2	36.38	54	-17.62	-	-	-	-	50	279	V
6	* 12.1227	29.36	PK-U	38.8	-15.7	52.46	-	-	74	-21.54	-	-	40	195	V
	* 12.11986	18.88	ADR	38.8	-15.7	41.98	54	-12.02	-	-	-	-	40	195	V

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

PK-U - U-NII: Maximum Peak

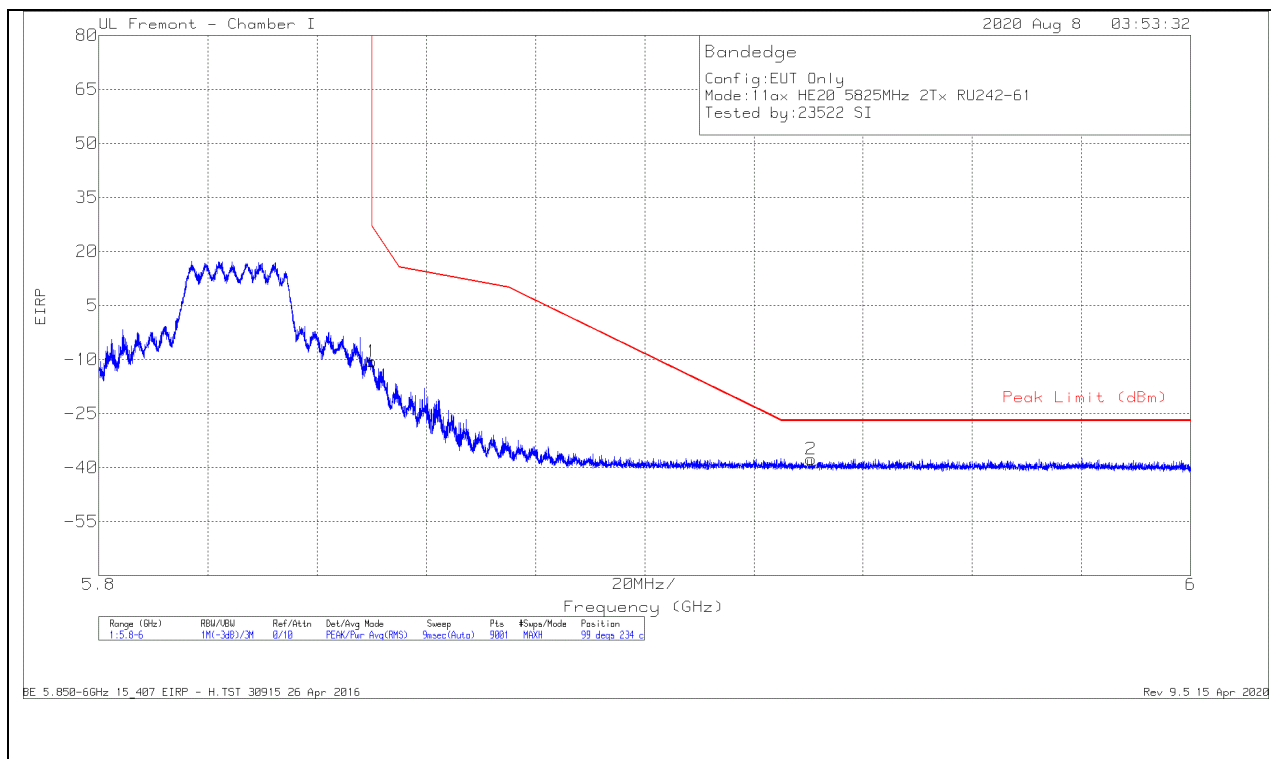
ADR - U-NII AD primary method, RMS average

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)

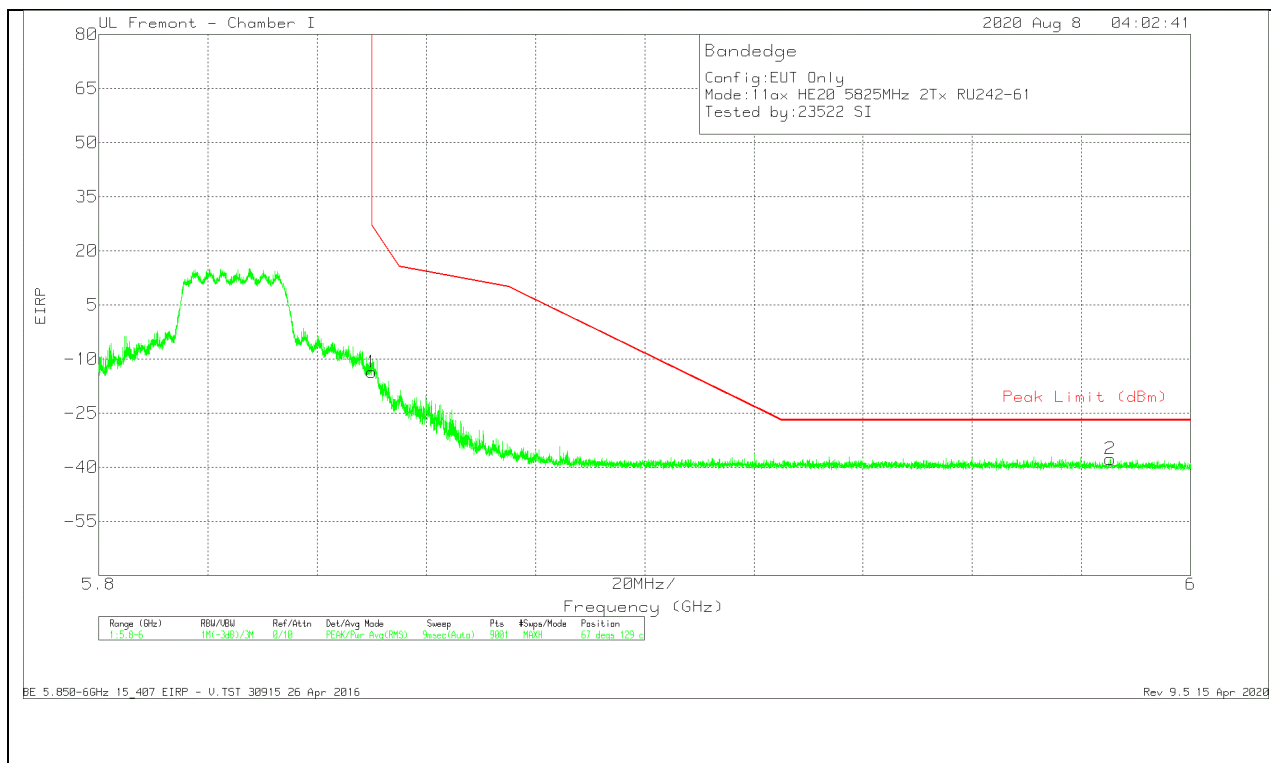
HORIZONTAL RESULT



Marker	Frequency (GHz)	Meter Reading (dBm)	Det	AF T346 (dB/m)	Amp/Cbl/Fitr/Pa d (dB)	Conversion Factor (dB)	Corrected Reading EIRP	Peak Limit (dBm)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	5.85002	-43.81	Pk	35	-13.6	11.8	-10.61	26.95	-37.56	99	234	H
2	5.9312	-70.48	Pk	35.1	-13.4	11.8	-36.98	-27	-9.98	99	234	H

Pk - Peak detector

VERTICAL RESULT

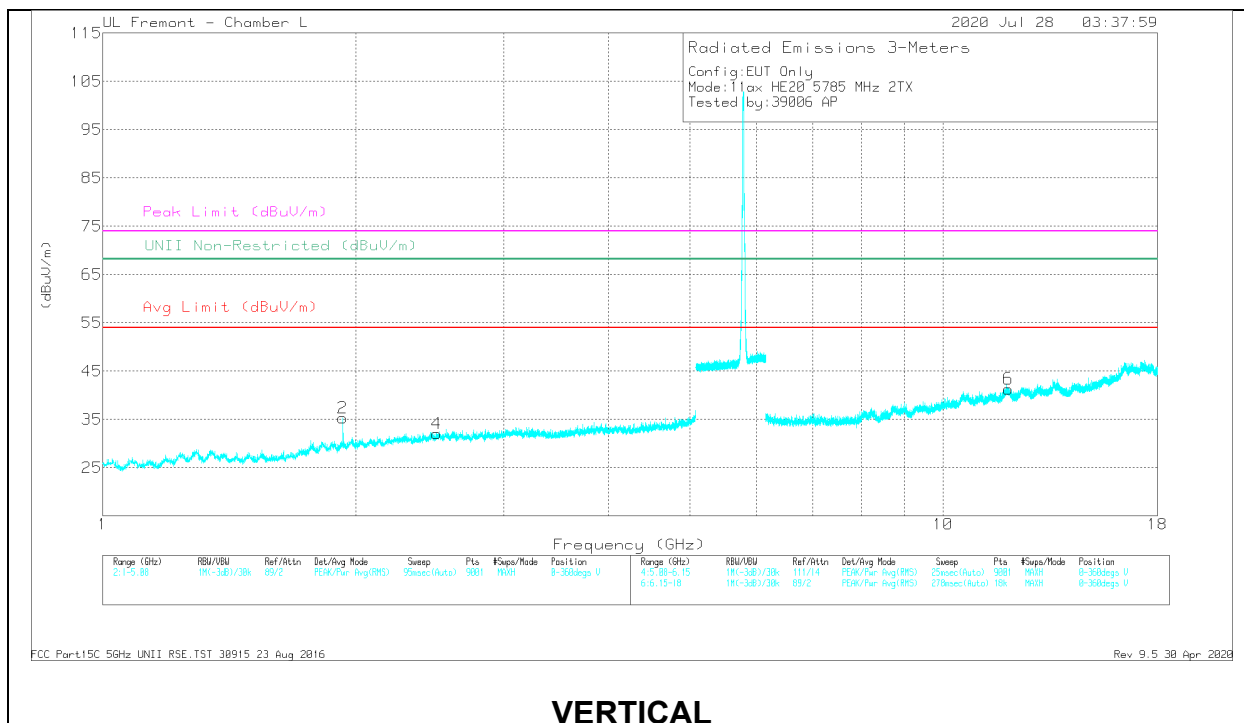
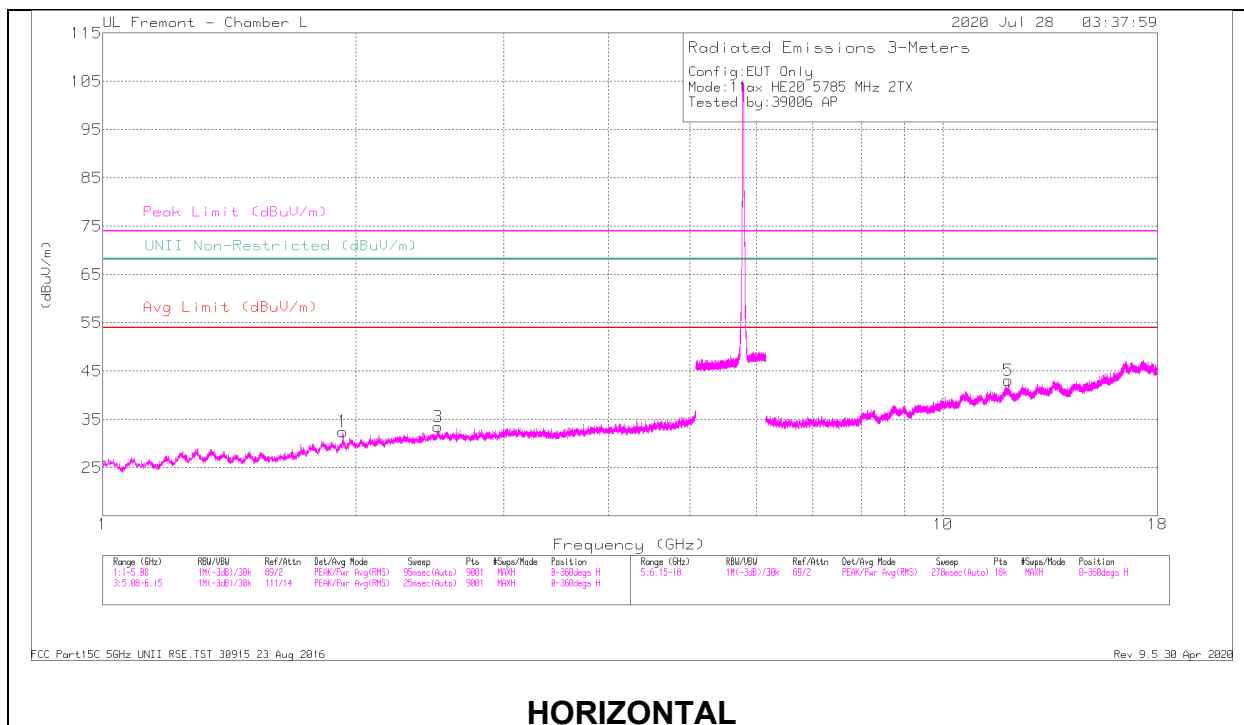


Marker	Frequency (GHz)	Meter Reading (dBm)	Det	AF T346 (dB/m)	Amp/Cbl/Fitr/Pad (dB)	Conversion Factor (dB)	Corrected Reading EIRP	Peak Limit (dBm)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	5.85002	-46.88	Pk	35	-13.6	11.8	-13.68	26.95	-40.63	67	129	V
2	5.98529	-70.53	Pk	35.3	-13.6	11.8	-37.03	-27	-10.03	67	129	V

Pk - Peak detector

HARMONICS AND SPURIOUS EMISSIONS

MID CHANNEL RESULTS



RADIATED EMISSIONS

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF 344 (dB/m)	Amp/Cbl /Ftr/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	1.93125	43.41	PK-U	30.6	-32	42.01	-	-	-	-	68.2	-26.19	181	214	H
3	2.50691	38.38	PK-U	32.4	-30.7	40.08	-	-	-	-	68.2	-28.12	230	205	H
2	1.93133	44.15	PK-U	30.6	-32	42.75	-	-	-	-	68.2	-25.45	242	168	V
4	* 2.48778	38.25	PK-U	32.3	-30.8	39.75	-	-	74	-34.25	-	-	298	143	V
	* 2.49194	27.54	ADR	32.3	-30.8	29.04	54	-24.96	-	-	-	-	298	143	V
5	* 11.97069	30.33	PK-U	38.7	-19.5	49.53	-	-	74	-24.47	-	-	101	139	H
	* 11.96878	19.78	ADR	38.7	-19.5	38.98	54	-15.02	-	-	-	-	101	139	H
6	* 11.95417	30.09	PK-U	38.6	-19.4	49.29	-	-	74	-24.71	-	-	136	157	V
	* 11.95544	20.02	ADR	38.6	-19.4	39.22	54	-14.78	-	-	-	-	136	157	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 the Appendixes.

Equipment Class	Reference FCC ID & IC	Reference Report	Report Title/Section
NII	BCG-E3542A 579C-E3542A	13179116-E5 (FCC) 13179116-E6 (IC) 13179116-E5 & E6	FCC IC_UNII Report / 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

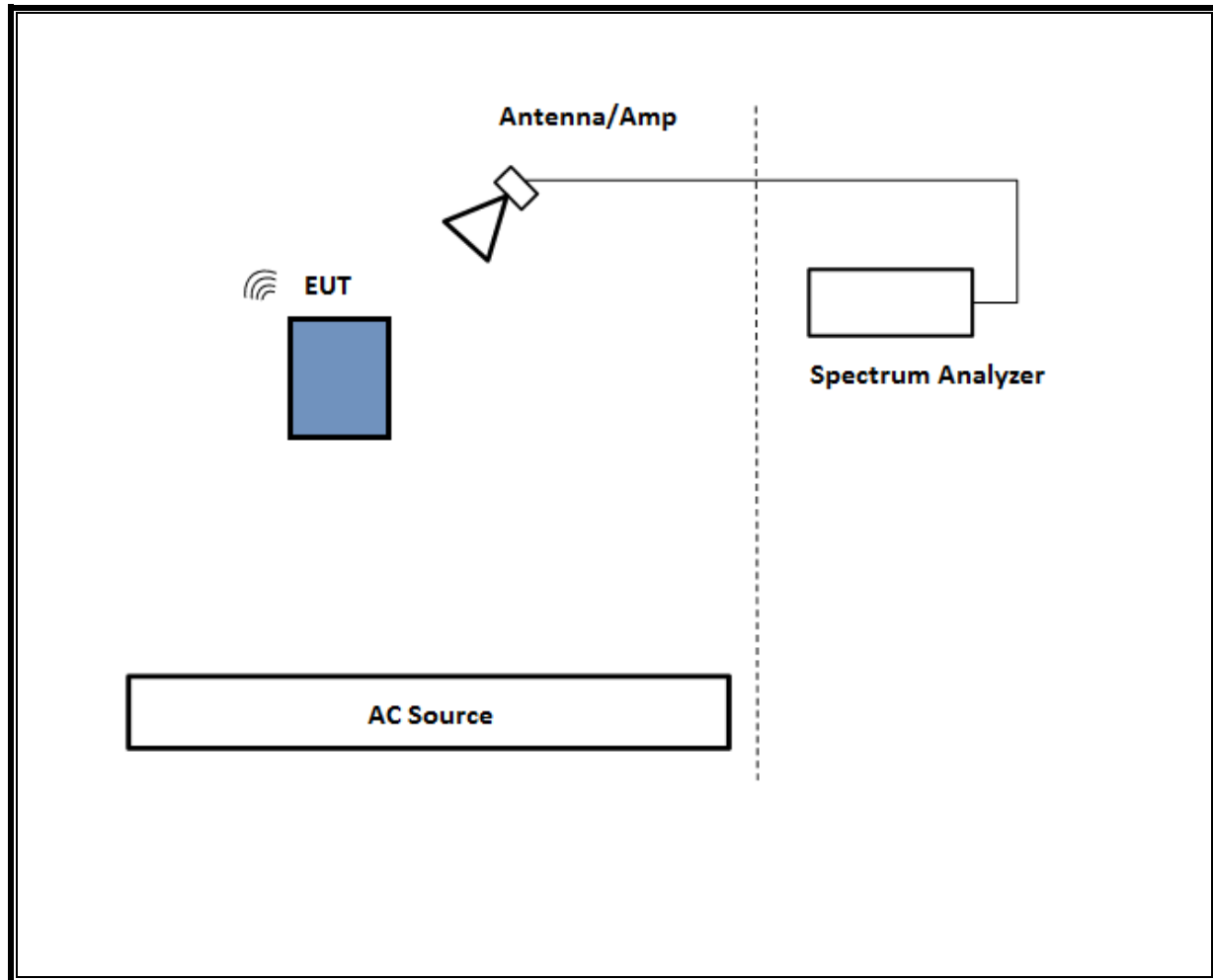
SUPPORT EQUIPMENT

Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID
Laptop	Apple	A1989	C02YL3ZMJHC8	BCGA1989
Laptop 61W USB-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 A2172 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
EMI Test Receiver	Rohde & Schwarz	ESW44	PRE0179372	02/25/2021	02/25/2020
Antenna, Horn 1-18GHz	ETS Lindgren	3117	T346	07/20/2021	07/20/2020
Amplifier, 1 to 18GHz	Miteq	AFS42-00101800-25-S-42	T931	05/11/2021	05/11/2020
Antenna, Horn 1-18GHz	ETS-Lindgren	3117	T344	05/26/2021	05/26/2020
Amplifier, 1 to 18GHz, 35dB	Miteq	AFS42-00101800-25-S-42	T1568	04/14/2021	04/14/2020
EMI Test Receiver	Rohde & Schwarz	ESW44	PRE0179367	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 13179116-EP1 for setup photos