TEST REPORT

Report Number. : R13640848-E1

Applicant	:	Ademco Inc. 2 Corporate Center Dr. Melville, NY, 11747, USA
Model	:	LTEM-P
FCC ID	:	CFS-LTEMP
IC	:	573F-LTEMP
EUT Description	:	Wireless Communicator
Test Standard(s)	:	FCC 47 CFR PART 15 SUBPART C ISED RSS-247 ISSUE 2 ISED RSS-GEN ISSUE 5 + A1

Date Of Issue:
2021-01-20

Prepared by:
UL LLC
12 Laboratory Dr.
Research Triangle Park, NC 27709 U.S.A.
TEL: (919) 549-1400

NVLAP TESTING

NVLAP Lab code: 200246-0

REPORT REVISION HISTORY

Rev.	Issue Date	Revisions	Revised By
1	2021-01-04	Initial Issue	M. Antola
2	2021-01-20	Added CABID to Section 4.	Brian T. Kiewra

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: Ademco Inc.
2 Corporate Center Dr.
Melville, NY 11747 USA

EUT DESCRIPTION: Wireless Communicator

MODEL: LTEM-P

SERIAL NUMBER: Non-serialized production unit

SAMPLE RECEIPT DATE: 2020-12-17

DATE TESTED: 2020-12-17 TO 2020-12-30

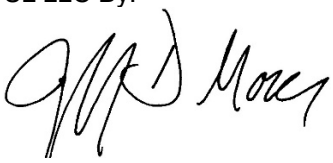
APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
CFR 47 Part 15 Subpart C	Complies
ISED RSS-247 Issue 2	Complies
ISED RSS-GEN Issue 5 + A1	Complies

UL LLC 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 LLC and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL LLC 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 or any agency of the U.S. government.

Approved & Released For
UL LLC By:



Jeff Moser
Operations Manager
Consumer Technology Division
UL LLC

Prepared By:

Mike Antola
Staff Engineer
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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	Compliant	None.
15.247 (b) (3)	RSS-247 5.4 (d)	Output Power	Compliant	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	Compliant	None.
15.247 (d)	RSS-247 5.5	Conducted Spurious Emissions	Compliant	None.
15.209, 15.205	RSS-GEN 8.9, 8.10	Radiated Emissions	Compliant	None.
15.207	RSS-Gen 8.8	AC Mains Conducted Emissions	Compliant	None.

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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, RSS-GEN Issue 5 + A1, and RSS-247 Issue 2

4. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 12 Laboratory Drive, Research Triangle Park, North Carolina, USA and 2800 Perimeter Park Dr., Morrisville, North Carolina, USA. 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.

12 Laboratory Dr.	2800 Perimeter Park Dr.
Site Code: 2180C	
☐ Chamber A RTP	☒ North Chamber
☐ Chamber C RTP	☒ South Chamber

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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	UNCERTAINTY
Radio Frequency (Spectrum Analyzer)	141.2 Hz
Occupied Channel Bandwidth	1.22%
RF output power, conducted	1.3 dB (PK) 0.45 dB (AV)
RF output power, radiated (SAC) < 180 MHz	6.18 dB
RF output power, radiated (SAC) >=180 MHz	3.23 dB
Power Spectral Density, conducted	2.47 dB
Unwanted Emissions, conducted	1.94 dB
All emissions, radiated	6.01dB
Conducted Emissions (0.150-30MHz) - LISN	3.40 dB
Temperature	0.57°C
Humidity	3.39%
DC Supply voltages	1.70%
Time	3.39%

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

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5.4. SAMPLE CALCULATION

RADIATED EMISSIONS

Where relevant, the following sample calculation is provided:
Field Strength (dBuV/m) = Measured Voltage (dBuV) + Antenna Factor (dB/m) + Cable Loss (dB) – Preamp Gain (dB)
36.5 dBuV + 18.7 dB/m + 0.6 dB – 26.9 dB = 28.9 dBuV/m

MAINS CONDUCTED EMISSIONS

Where relevant, the following sample calculation is provided:
Final Voltage (dBuV) = Measured Voltage (dBuV) + Cable Loss (dB) + Limiter Factor (dB) + LISN Insertion Loss.
36.5 dBuV + 0 dB +10.1 dB+ 0 dB = 46.6 dBuV

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6. EQUIPMENT UNDER TEST

6.1. EUT DESCRIPTION

The EUT is a wireless communicator which contains an on-board BLE and WWAN module. Additional wireless plug-in modules are available as an option. This test report covers the BLE radio only.

6.2. MAXIMUM OUTPUT POWER

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

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
2402 - 2480	BLE	0.64	1.16

6.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes an integral trace antenna, with a maximum gain of 4.2 dBi.

6.4. SOFTWARE AND FIRMWARE

The EUT firmware installed during testing was 03.492.000.

The test utility software used during testing was BLE RF test.

6.5. WORST-CASE CONFIGURATION AND MODE

Radiated emissions below 1GHz, above 18GHz, and power line conducted emission were performed with the EUT set to transmit at the channel with highest output power and PSD as worst-case scenario.

Band edge and radiated emissions between 1GHz and 18GHz were performed with the EUT set to transmit at the highest power on low, middle and high channels.

The intended installation is upright therefore, all final radiated testing was performed in this orientation.

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6.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	**Manufacturer**	**Model**	**Serial Number**	**FCC ID**
Laptop	Lenovo	L470	PF0ZV66P	-

I/O CABLES

I/O Cable List						
Cable No.	**Port**	**# of Identical Ports**	**Connector Type**	**Cable Type**	**Cable Length (m)**	**Remarks**
1	Serial	1	USB	Communication	1	-
2	Power	1	Barrel	Power	1	-

TEST SETUP

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

SETUP DIAGRAMS

Please refer to E13640848-EP1 for setup diagrams

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7. MEASUREMENT METHOD

Duty Cycle: ANSI C63.10 Subclause 11.6

6 dB BW: ANSI C63.10 Subclause 11.8.1 RBW ≥ DTS BW

Occupied BW (99%): ANSI C63.10-2013 Section 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 Method AVGPM-G (Measurement using a gated RF average-reading power meter)

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

Emissions in non-restricted frequency bands: ANSI C63.10 Subclause -11.11, 6.10.4

Emissions in restricted frequency bands: ANSI C63.10 Subclause -11.12.1, 6.10.5

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

General Radiated Spurious Emissions: ANSI C63.10-2013 Section 6.3 - 6.6

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8. TEST AND MEASUREMENT EQUIPMENT

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

Test Equipment Used - Radiated Disturbance Emissions Test Equipment (Morrisville - South Chamber)

Equip. ID	Description	Manufacturer/Brand	Model Number	Last Cal.	Next Cal.
	0.009-30MHz				
AT0079	Active Loop Antenna	ETS-Lindgren	6502	2020-08-20	2021-08-20
	30-1000 MHz				
AT0075	Hybrid Broadband Antenna	Sunol Sciences Corp.	JB3	2020-10-27	2021-10-27
	1-18 GHz				
AT0067	Double-Ridged Waveguide Horn Antenna, 1 to 18 GHz	ETS Lindgren	3117	2020-04-28	2021-04-28
	Gain-Loss Chains				
S-SAC01	Gain-loss string: 0.009-30MHz	Various	Various	2020-07-10	2021-07-10
S-SAC02	Gain-loss string: 25-1000MHz	Various	Various	2020-07-10	2021-07-10
S-SAC03	Gain-loss string: 1-18GHz	Various	Various	2020-07-06	2021-07-06
	Receiver & Software				
SA0025	Spectrum Analyzer	Agilent	N9030A	2020-03-17	2021-03-17
SOFTEMI	EMI Software	UL	Version 9.5 (2020-08-18)		
	Additional Equipment used				
s/n 200037635	Environmental Meter	Fisher Scientific	06-662-4	2020-01-22	2022-01-22

Test Equipment Used - Radiated Disturbance Emissions Test Equipment (Morrisville - North Chamber)

Equip. ID	Description	Manufacturer/Brand	Model Number	Last Cal.	Next Cal.
	18-40 GHz				
AT0063	Horn Antenna, 18-26.5GHz	ARA	MWH-1826/B	2020-10-30	2021-10-30
	Gain-Loss Chains				
N-SAC04	Gain-loss string: 18-40GHz	Various	Various	2020-07-31	2021-07-31
	Receiver & Software				
SA0026	Spectrum Analyzer	Agilent	N9030A	2020-07-16	2021-07-16
SOFTEMI	EMI Software	UL	Version 9.5	NA	NA
	Additional Equipment used				
s/n 200037610	Environmental Meter	Fisher Scientific	06-662-4	2020-01-22	2022-01-22

Test Equipment Used - Wireless Conducted Measurement Equipment

Equipment ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
	Conducted Room 2				
T177 (PRE0079253)	Spectrum Analyzer	Agilent Technologies	E4446A	2020-04-30	2021-04-30
PWM005	RF Power Meter	Keysight Technologies	N1912A	2020-07-14	2021-07-14
PWS005	Peak and Avg Power Sensor, 50MHz to 6GHz	Keysight Technologies	N1921A	2020-05-26	2021-05-26
HI0090 (PRE0191271)	Environmental Meter	Fisher Scientific	15-077-963	2020-06-26	2021-06-26
SOFTEMI	Antenna Port Software	UL	Version 2020.12.3	NA	NA

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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 B (msec)	Period (msec)	Duty Cycle x (linear)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)	1/B Minimum VBW (kHz)
2.4GHz Band						
BLE	0.391	0.623	0.628	62.76%	4.06	2.558

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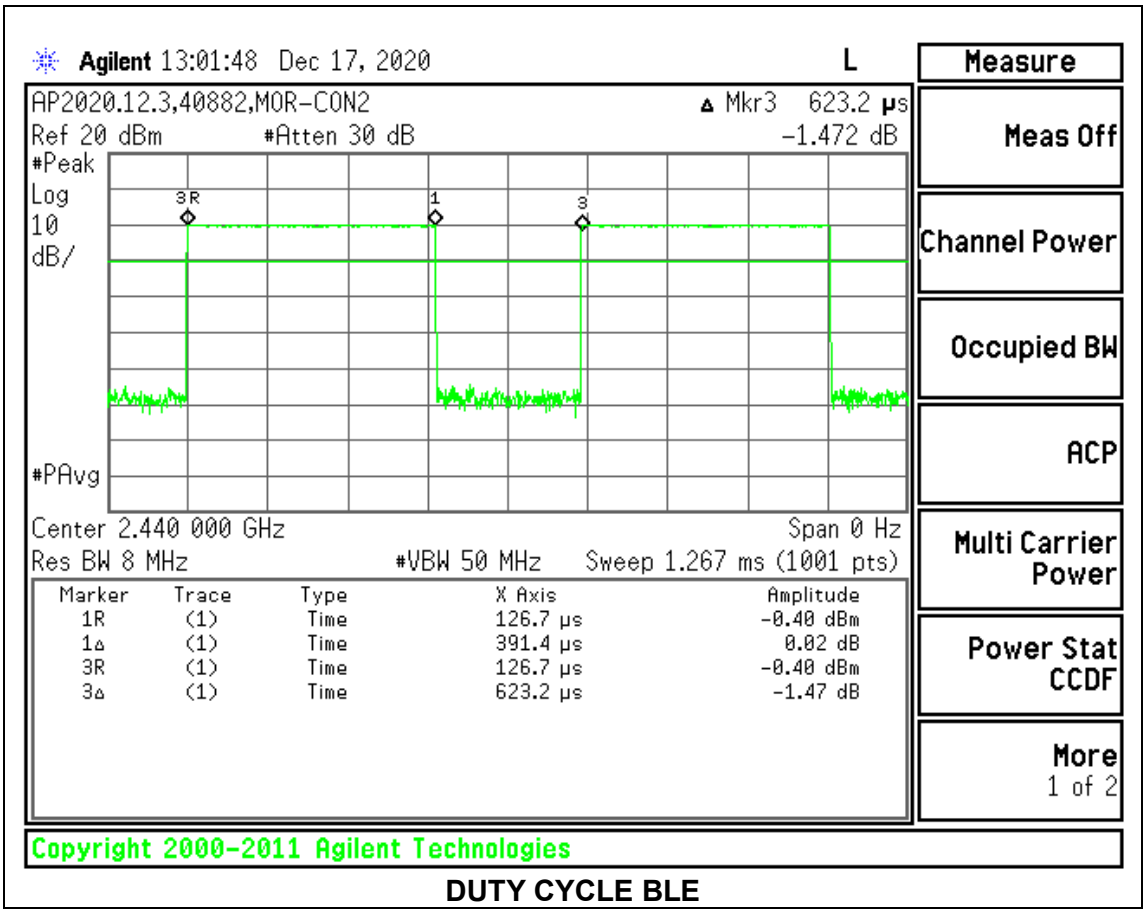
DUTY CYCLE PLOTS



DUTY CYCLE BLE

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9.2. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

RESULTS

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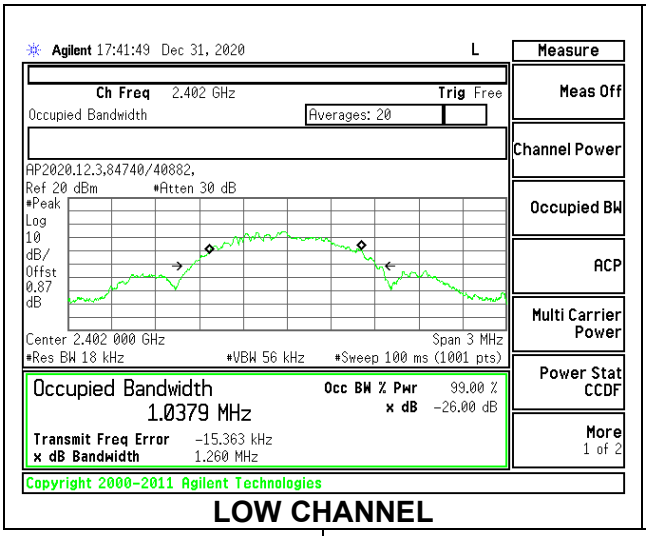
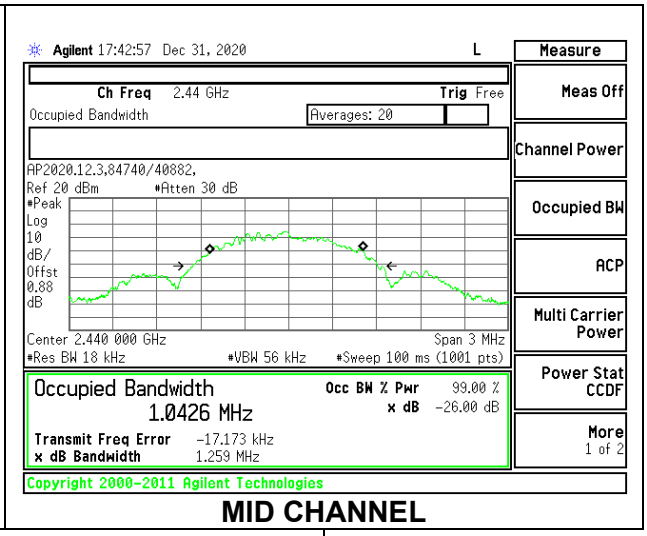
9.2.1. BLE (1Mbps)

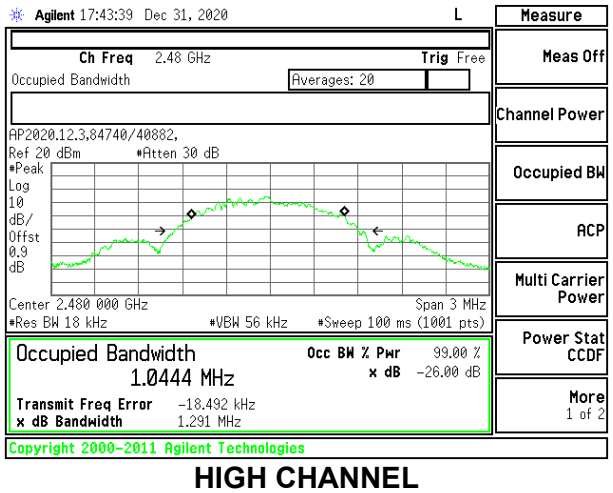
Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2402	1.0379
Middle	2440	1.0426
High	2480	1.0444



LOW CHANNEL



MID CHANNEL



HIGH CHANNEL

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

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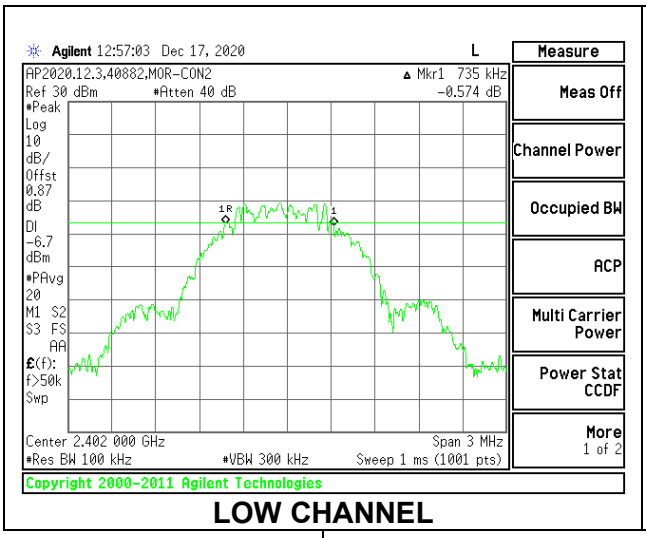
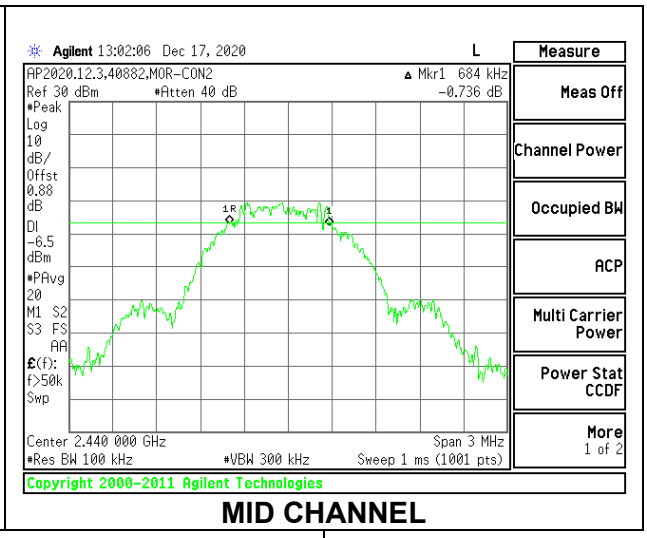
9.3.1. BLE (1Mbps)

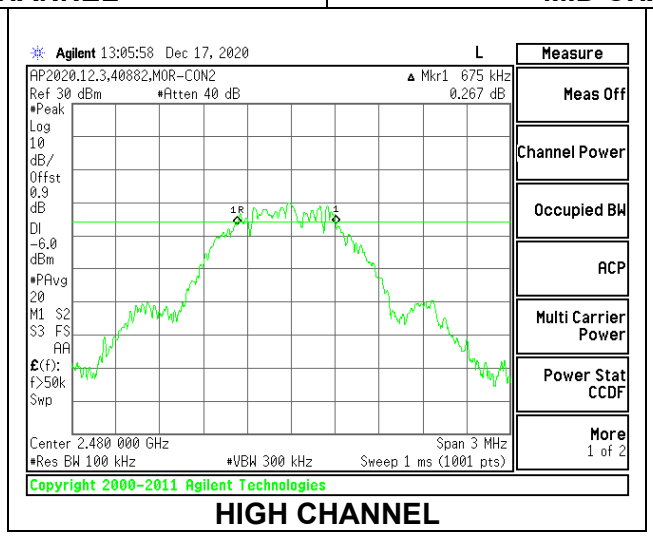
Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2402	0.7350	0.5
Middle	2440	0.6840	0.5
High	2480	0.6750	0.5



LOW CHANNEL



MID CHANNEL



HIGH CHANNEL

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.

The cable assembly insertion loss of 0.87 dB was entered as an offset in the power meter to allow for peak reading of power.

RESULTS

9.4.1. BLE (1Mbps)

Tested By:	40882
Date:	2020-12-17

Channel	Frequency (MHz)	Peak Power Reading (dBm)	Limit (dBm)	Margin (dB)
Low	2402	0.640	30	-29.360
Middle	2440	0.420	30	-29.580
High	2480	0.330	30	-29.670

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9.5. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

The cable assembly insertion loss of 0.87 dB was entered as an offset in the power meter to allow for a gated average reading of power.

RESULTS

9.5.1. BLE (1Mbps)

Tested By:	40882
Date:	2020-12-17

Channel	Frequency (MHz)	AV power (dBm)
Low	2402	0.54
Middle	2440	0.36
High	2480	0.27

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

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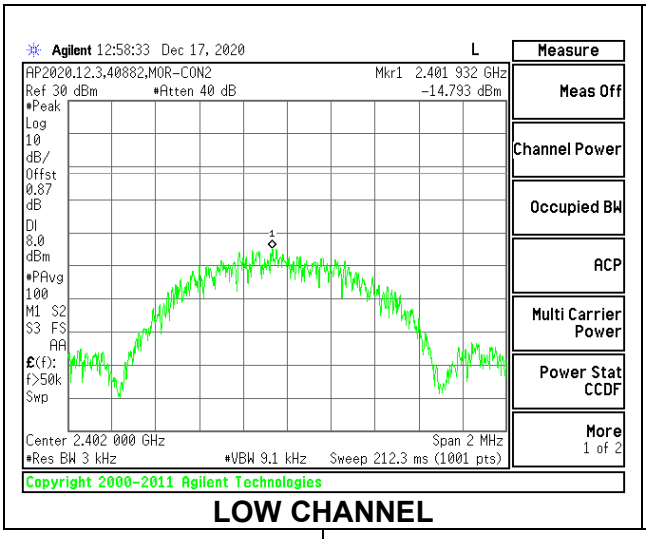
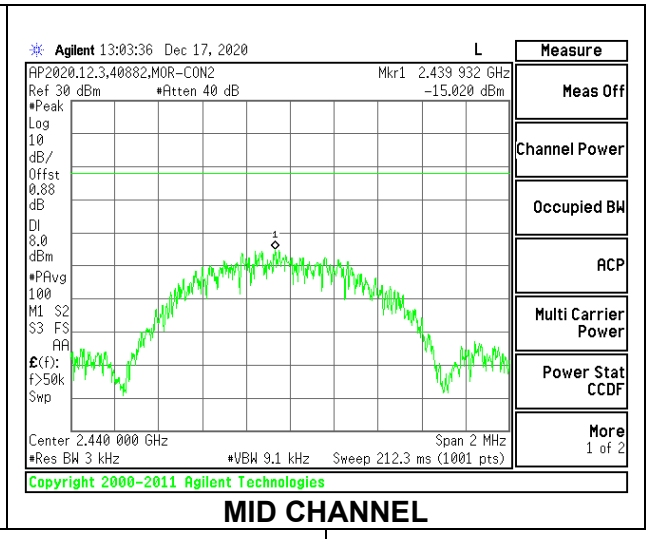
9.6.1. BLE (1Mbps)

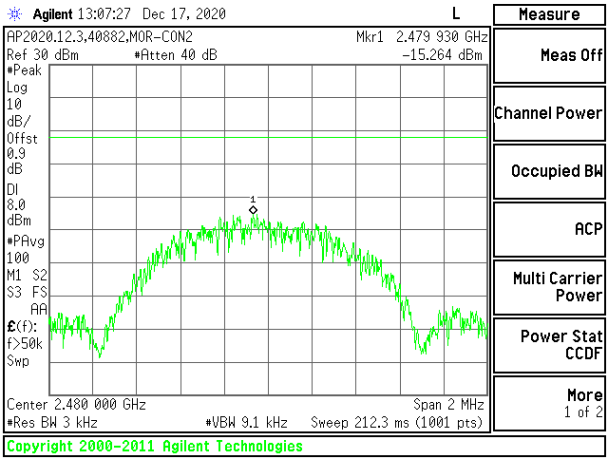
Channel	Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Margin (dB)
Low	2402	-14.79	8	-22.79
Middle	2440	-15.02	8	-23.02
High	2480	-15.26	8	-23.26



LOW CHANNEL



MID CHANNEL



HIGH CHANNEL

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

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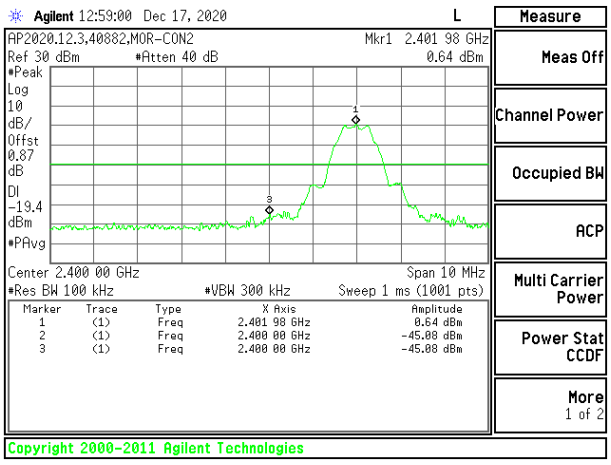
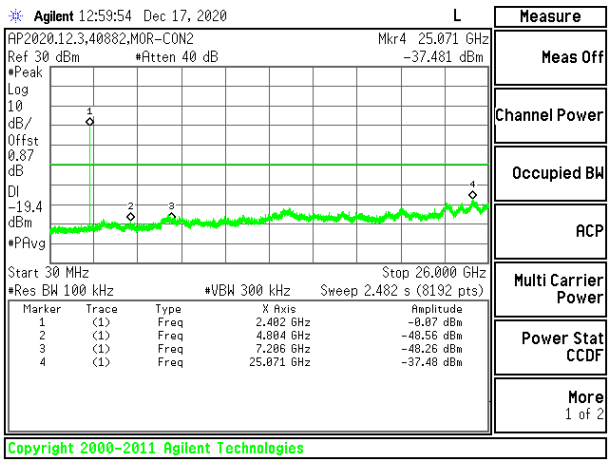
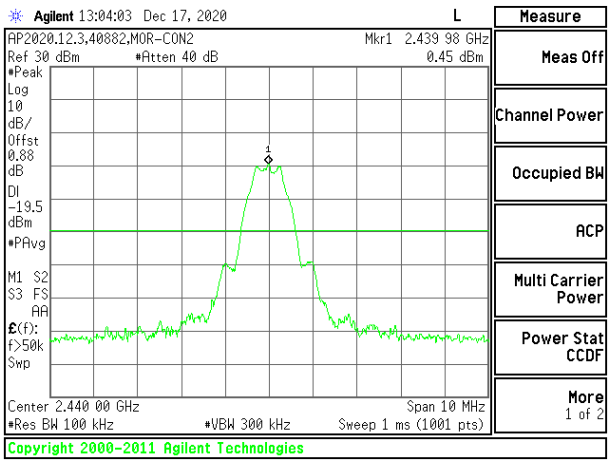
9.7.1. BLE (1Mbps)



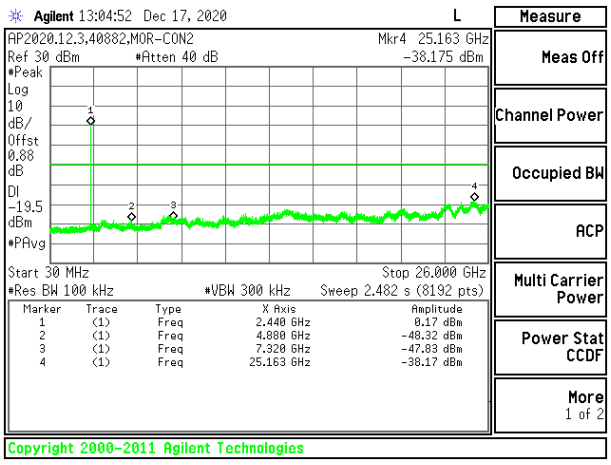
LOW CHANNEL BANDEDGE



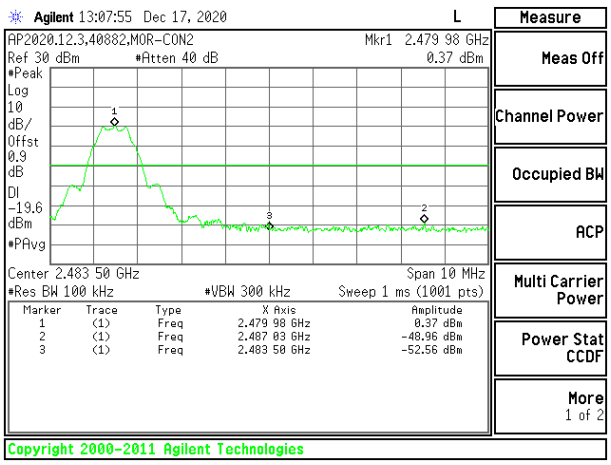
OUT-OF-BAND LOW CHANNEL



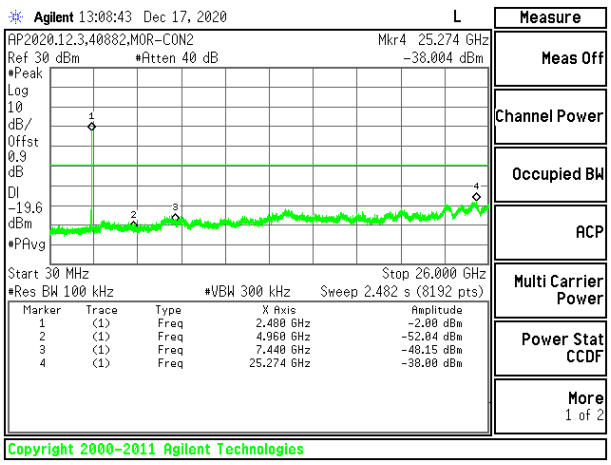
IN-BAND REFERENCE LEVEL



OUT-OF-BAND MID CHANNEL



HIGH CHANNEL BANDEDGE



OUT-OF-BAND HIGH CHANNEL

10. RADIATED TEST RESULTS

10.1. LIMITS AND PROCEDURE

LIMITS

FCC §15.205 and §15.209

RSS-GEN, Section 8.9 and 8.10.

Frequency Range (MHz)	Field Strength Limit (uV/m) at 3 m	Field Strength Limit (dBuV/m) at 3 m
0.009-0.490	2400/F(kHz) @ 300 m	-
0.490-1.705	24000/F(kHz) @ 30 m	-
1.705 - 30	30 @ 30m	-
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 in the 30-1000MHz range, 9kHz for peak and/or quasi-peak detection measurements in the 0.15-30MHz range and 200Hz for peak and/or quasi-peak measurements in the 9-150kHz range. 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 voltage averaging measurements. For this test program, average measurements were made using voltage average detection with the resolution bandwidth set to 1 MHz; the video bandwidth set to 3 MHz.

The spectrum from 1 GHz to 18 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in each applicable band. Below 1GHz and above 18GHz emissions, the channel with the highest output power was tested.

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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.

3D antenna use - For below 30MHz testing, investigation was done on three antenna orientations (parallel, perpendicular, and ground-parallel).

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.

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

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

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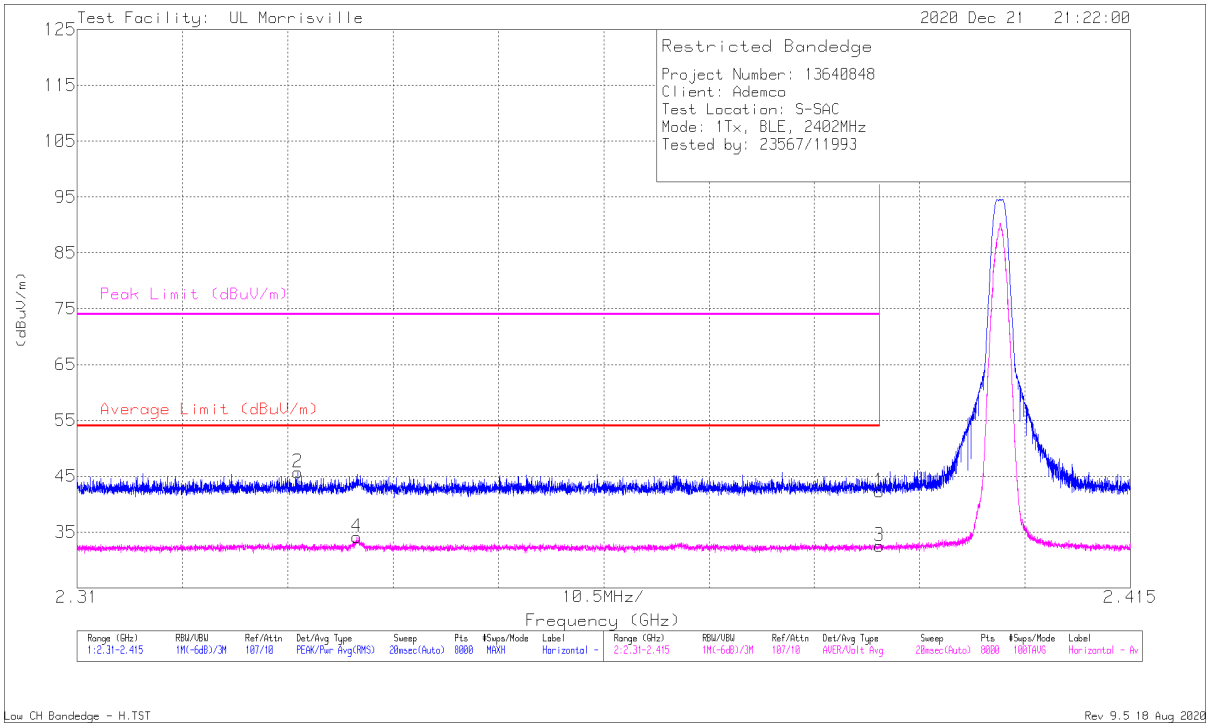
10.2. TRANSMITTER ABOVE 1 GHz

10.2.1. BLE (1Mbps)

Antenna 1

BANDEDGE (LOW CHANNEL)

HORIZONTAL RESULT



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0067 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	DC Corr (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	34.21	Pk	32.1	-24	0	42.31	-	-	74	-31.69	224	142	H
2	* ** 2.332	37.31	Pk	32.1	-23.7	0	45.71	-	-	74	-28.29	224	142	H
3	* ** 2.39	20.38	ADV	32.1	-24	4.06	32.54	54	-21.46	-	-	224	142	H
4	* ** 2.33788	21.67	ADV	32.2	-23.8	4.06	34.13	54	-19.87	-	-	224	142	H

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
** - indicates frequency in Taiwan NCC LP0002 Restricted Band
Pk - Peak detector
ADV - Linear Voltage Average

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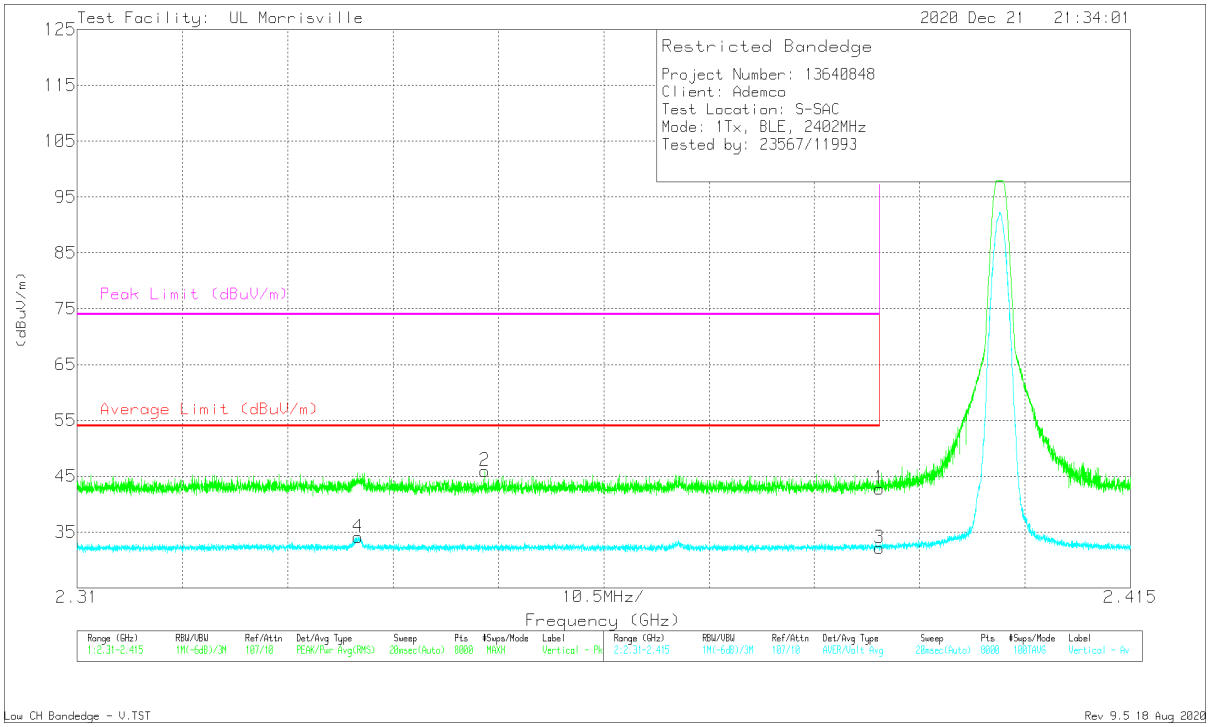
VERTICAL RESULT



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0067 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	DC Corr (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	34.71	Pk	32.1	-24	0	42.81	-	-	74	-31.19	213	156	V
2	* ** 2.35063	37.64	Pk	32.2	-23.9	0	45.94	-	-	74	-28.06	213	156	V
3	* ** 2.39	19.99	ADV	32.1	-24	4.06	32.15	54	-21.85	-	-	213	156	V
4	* ** 2.33799	21.65	ADV	32.2	-23.8	4.06	34.11	54	-19.89	-	-	213	156	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
** - indicates frequency in Taiwan NCC LP0002 Restricted Band
Pk - Peak detector
ADV - Linear Voltage Average

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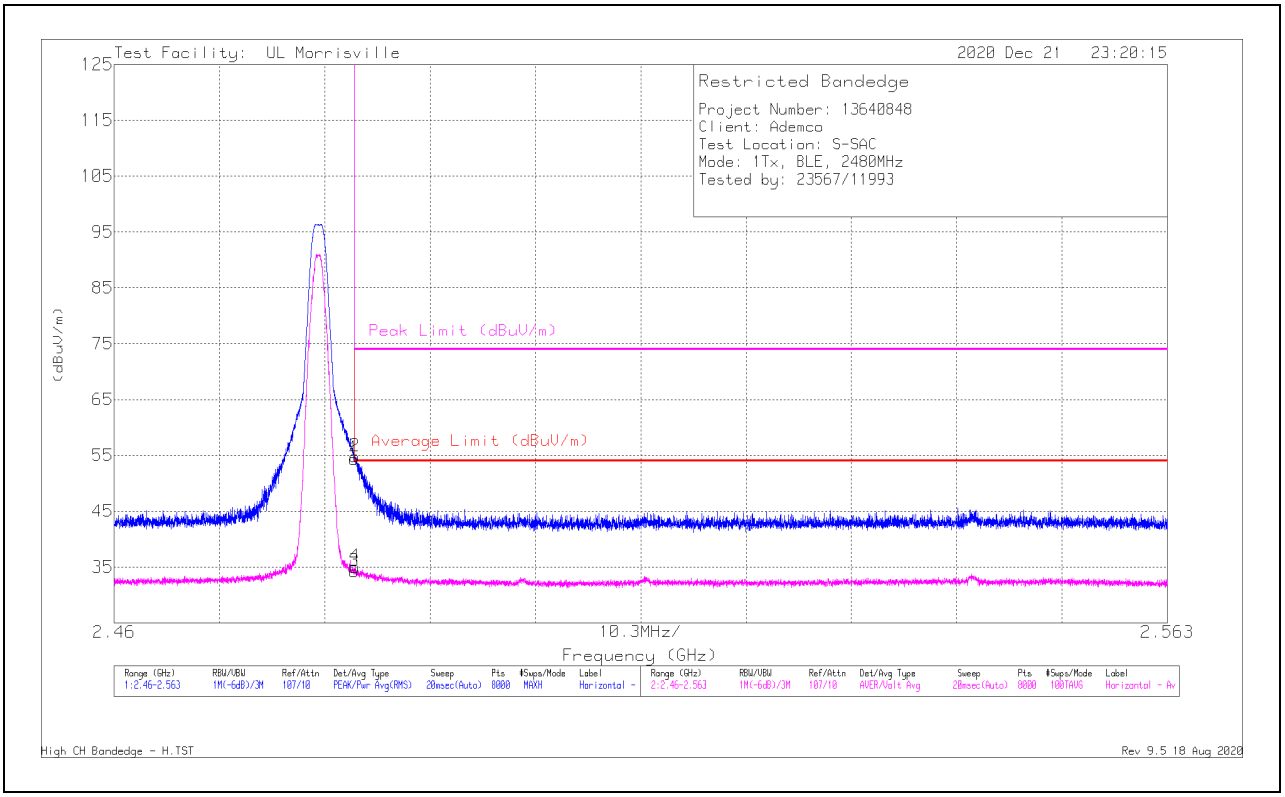
BANDEDGE (HIGH CHANNEL)

HORIZONTAL RESULT



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0067 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 2.4835	46.38	Pk	32.4	-24.4	0	54.38	-	-	74	-19.62	343	327	H
2	* ** 2.48356	46.82	Pk	32.4	-24.4	0	54.82	-	-	74	-19.18	343	327	H
3	* ** 2.4835	22.17	ADV	32.4	-24.4	4.06	34.23	54	-19.77	-	-	343	327	H
4	* ** 2.48353	22.99	ADV	32.4	-24.4	4.06	35.05	54	-18.95	-	-	343	327	H

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
** - indicates frequency in Taiwan NCC LP0002 Restricted Band
Pk - Peak detector
ADV - Linear Voltage Average

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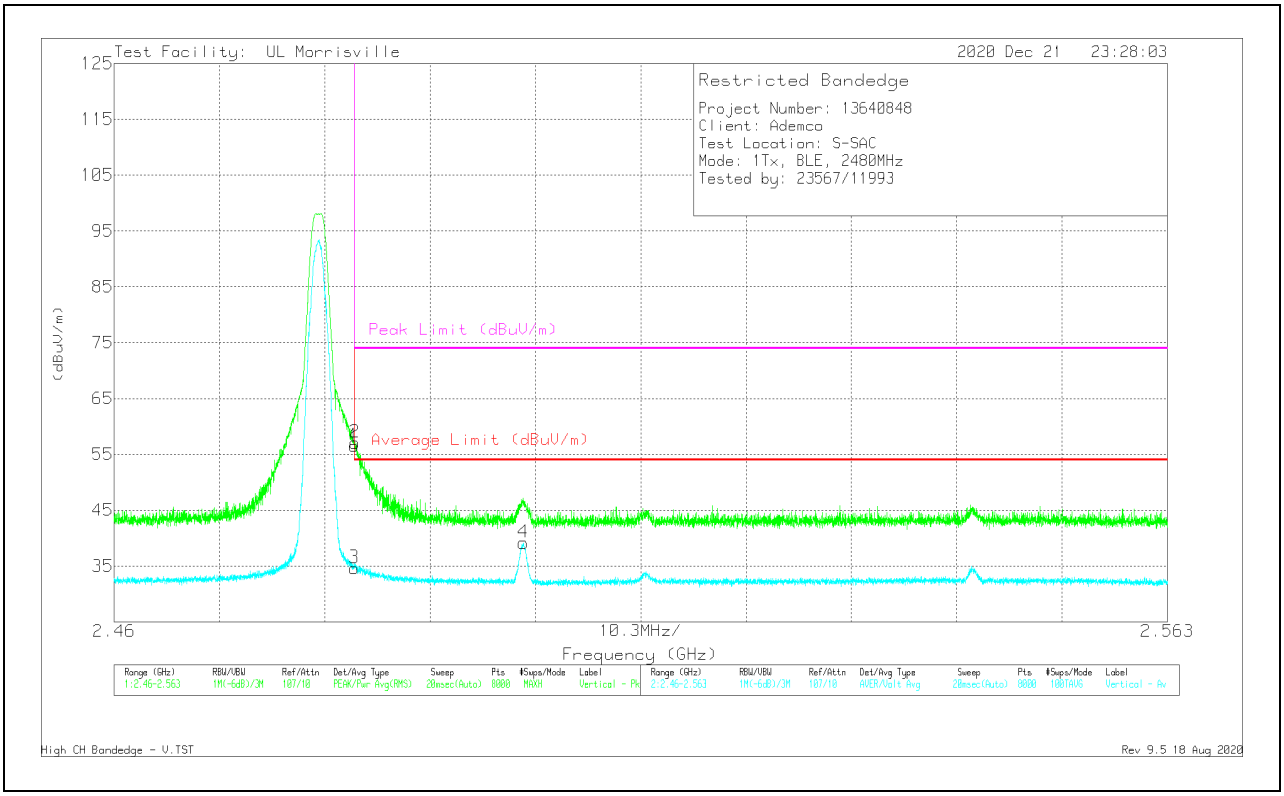
VERTICAL RESULT



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0067 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 2.4835	48.53	Pk	32.4	-24.4	0	56.53	-	-	74	-17.47	196	148	V
2	* ** 2.48353	49.1	Pk	32.4	-24.4	0	57.1	-	-	74	-16.9	196	148	V
3	* ** 2.4835	22.57	ADV	32.4	-24.4	4.06	34.63	54	-19.37	-	-	196	147	V
4	** 2.50002	27.32	ADV	32.4	-24.6	4.06	39.18	54	-14.82	-	-	196	147	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
** - indicates frequency in Taiwan NCC LP0002 Restricted Band
Pk - Peak detector
ADV - Linear Voltage Average

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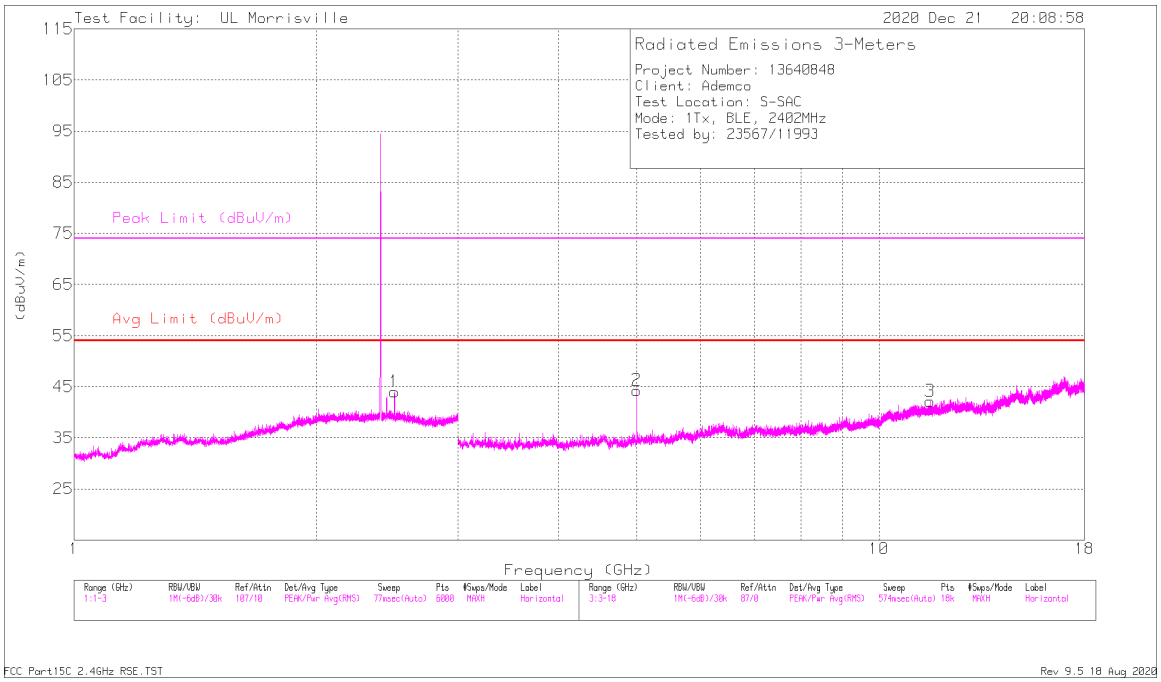
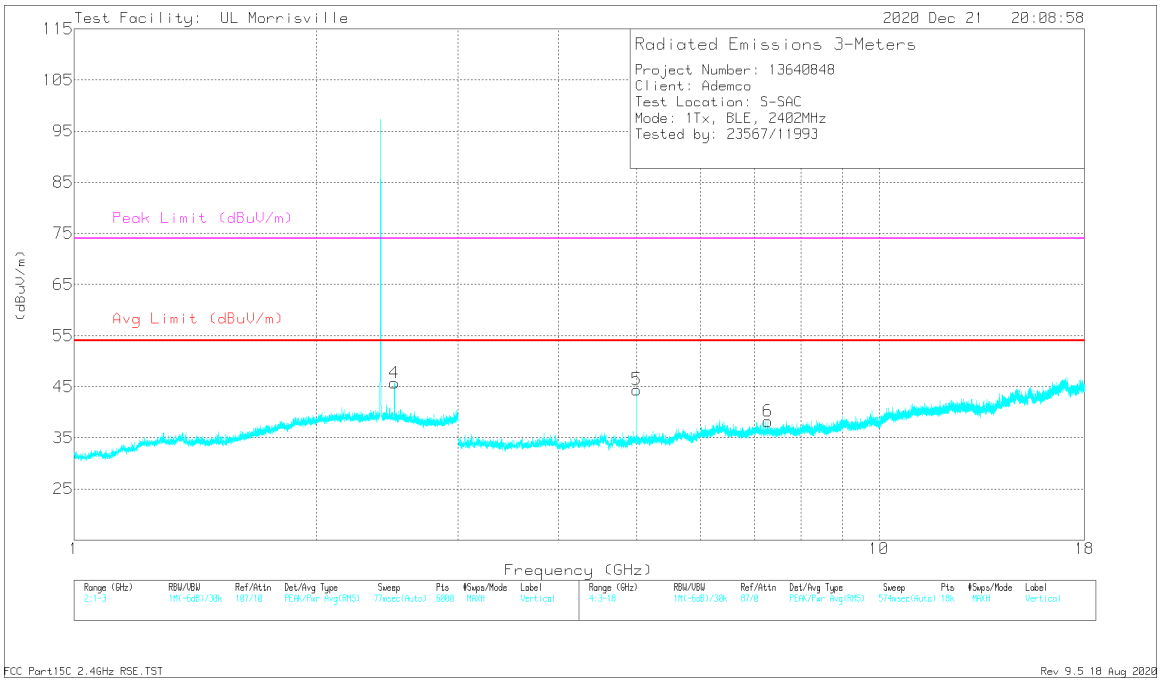
HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL RESULTS



HORIZONTAL



VERTICAL

RADIATED EMISSIONS

Markers	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0067 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 2.49979	41.09	PK2	32.4	-24.6	0	48.89	-	-	74	-25.11	284	264	H
	* ** 2.49997	33.83	ADV	32.4	-24.6	4.06	45.69	54	-8.31	-	-	284	264	H
4	* ** 2.4997	41.64	PK2	32.4	-24.6	0	49.44	-	-	74	-24.56	305	263	V
	* ** 2.49995	36.24	ADV	32.4	-24.6	4.06	48.1	54	-5.9	-	-	305	263	V
2	* ** 4.99992	46.19	PK2	33.9	-31.2	0	48.89	-	-	74	-25.11	319	224	H
	* ** 4.99999	41.39	ADV	33.9	-31.2	4.06	48.15	54	-5.85	-	-	319	224	H
3	* ** 11.57357	34.01	PK2	38.3	-24.3	0	48.01	-	-	74	-25.99	329	278	H
	* ** 11.57438	21	ADV	38.3	-24.3	4.06	39.06	54	-14.94	-	-	329	278	H
5	* ** 4.99994	46.33	PK2	33.9	-31.2	0	49.03	-	-	74	-24.97	49	138	V
	* ** 4.99997	41.36	ADV	33.9	-31.2	4.06	48.12	54	-5.88	-	-	49	138	V
6	* ** 7.27316	35.41	PK2	35.6	-27.6	0	43.41	-	-	74	-30.59	106	119	V
	* ** 7.27224	22.67	ADV	35.6	-27.6	4.06	34.73	54	-19.27	-	-	106	119	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
** - indicates frequency in Taiwan NCC LP0002 Restricted Band
PK2 - Maximum Peak
ADV - Linear Voltage Average

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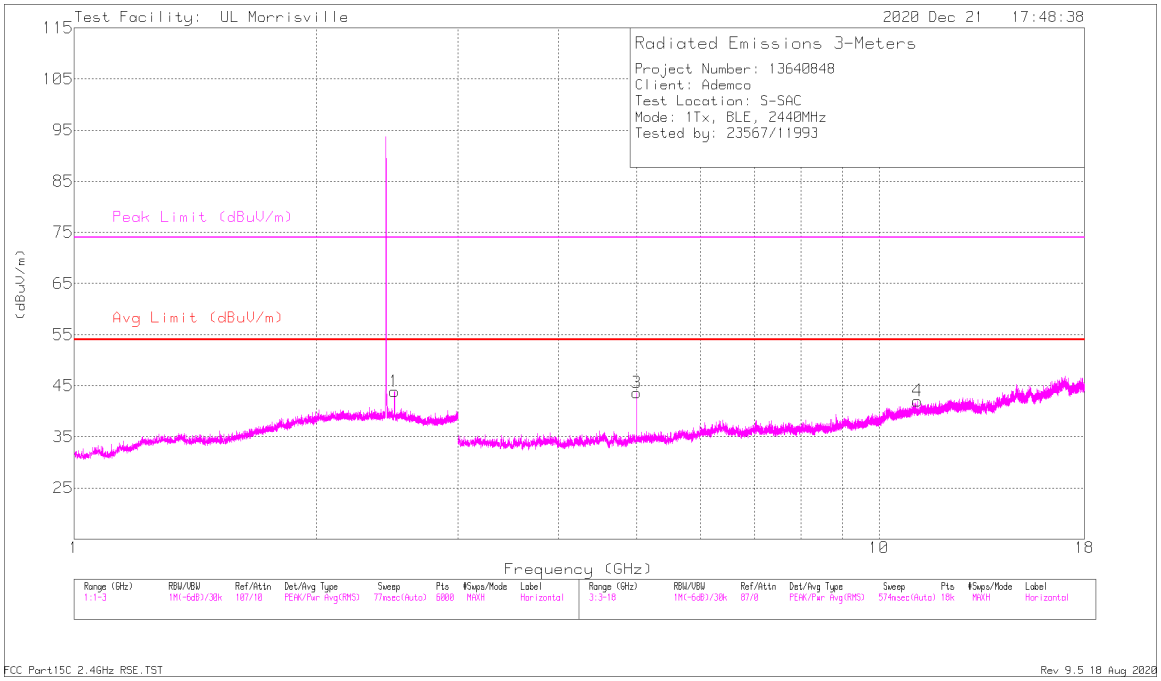
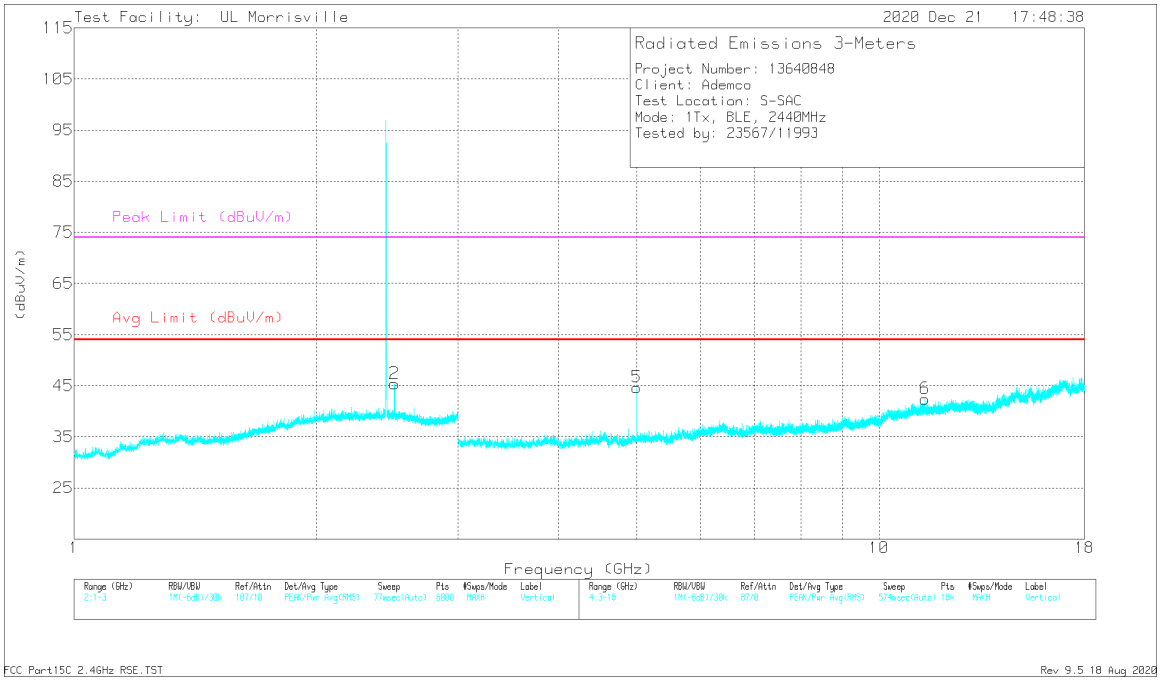
MID CHANNEL RESULTS



HORIZONTAL



VERTICAL

RADIATED EMISSIONS

Markers	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0067 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 2.49982	41.37	PK2	32.4	-24.6	0	49.17	-	-	74	-24.83	276	220	H
	* ** 2.49997	34.69	ADV	32.4	-24.6	4.06	46.55	54	-7.45	-	-	276	220	H
2	* ** 2.49993	41.5	PK2	32.4	-24.6	0	49.3	-	-	74	-24.7	316	236	V
	* ** 2.49998	36.07	ADV	32.4	-24.6	4.06	47.93	54	-6.07	-	-	316	236	V
3	* ** 4.99999	46.26	PK2	33.9	-31.2	0	48.96	-	-	74	-25.04	327	238	H
	* ** 4.99997	41.41	ADV	33.9	-31.2	4.06	48.17	54	-5.83	-	-	327	238	H
4	* ** 11.1634	33.89	PK2	38.1	-24.3	0	47.69	-	-	74	-26.31	78	203	H
	* ** 11.16208	20.69	ADV	38.1	-24.3	4.06	38.55	54	-15.45	-	-	78	203	H
5	* ** 5.00008	46.48	PK2	33.9	-31.2	0	49.18	-	-	74	-24.82	15	214	V
	* ** 5	41.6	ADV	33.9	-31.2	4.06	48.36	54	-5.64	-	-	15	214	V
6	* ** 11.40998	33.78	PK2	38.1	-23.9	0	47.98	-	-	74	-26.02	32	258	V
	* ** 11.41156	20.68	ADV	38.1	-23.9	4.06	38.94	54	-15.06	-	-	32	258	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
** - indicates frequency in Taiwan NCC LP0002 Restricted Band
PK2 - Peak detector
ADV - Linear Voltage Average

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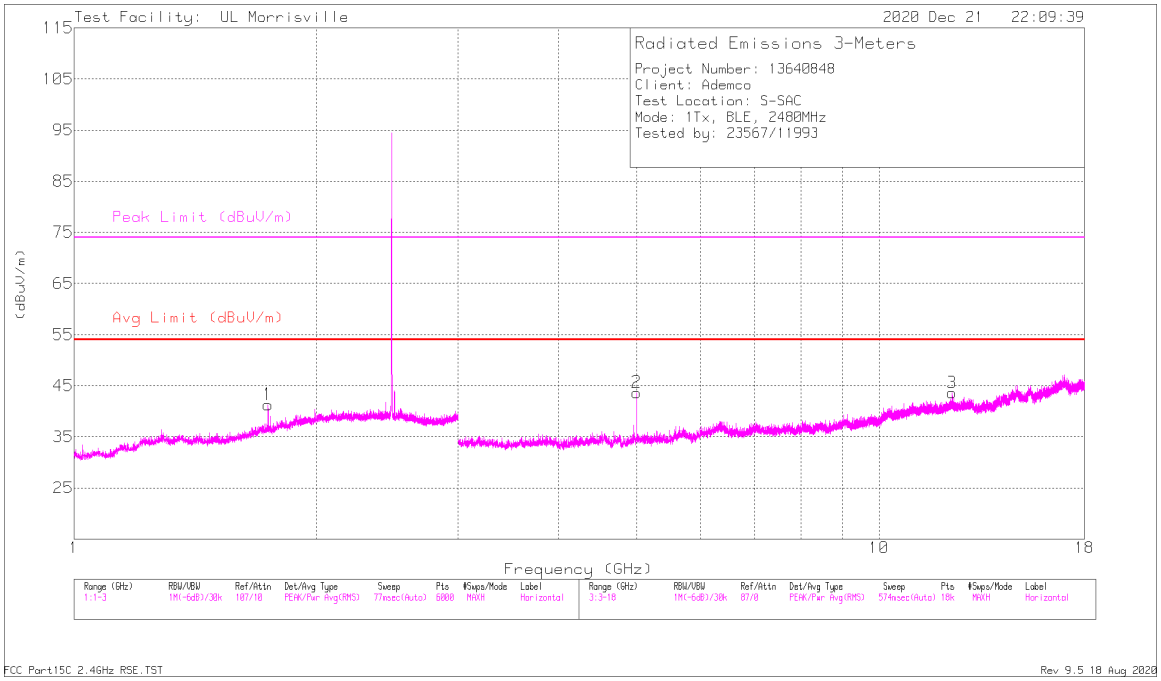
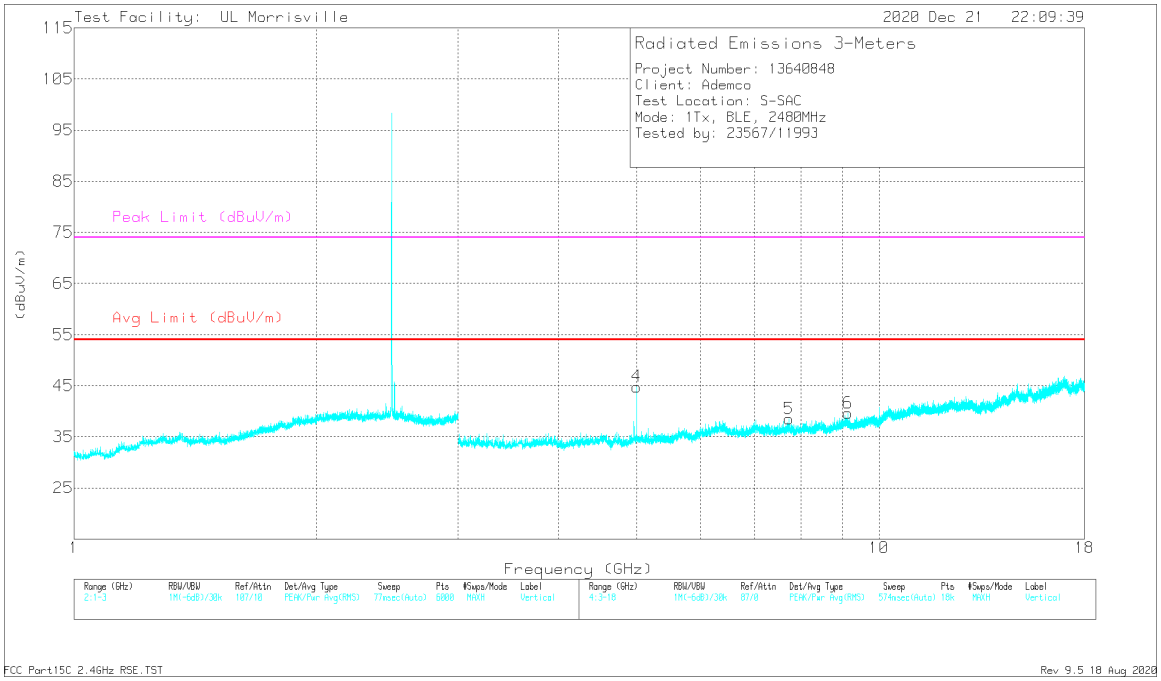
HIGH CHANNEL RESULTS



HORIZONTAL



VERTICAL

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RADIATED EMISSIONS

Markers	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0067 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	** 1.74139	36.21	PK2	29.7	-22.2	0	43.71	-	-	74	-30.29	308	207	H
	** 1.74119	23.02	ADV	29.7	-22.2	4.06	34.58	54	-19.42	-	-	308	207	H
2	* ** 4.99994	46.8	PK2	33.9	-31.2	0	49.5	-	-	74	-24.5	325	256	H
	* ** 4.99999	42	ADV	33.9	-31.2	4.06	48.76	54	-5.24	-	-	325	256	H
3	* ** 12.31693	33.84	PK2	38.9	-23.9	0	48.84	-	-	74	-25.16	114	376	H
	* ** 12.3176	20.91	ADV	38.9	-23.9	4.06	39.97	54	-14.03	-	-	114	376	H
4	* ** 5.00012	45.83	PK2	33.9	-31.2	0	48.53	-	-	74	-25.47	46	122	V
	* ** 4.99999	40.94	ADV	33.9	-31.2	4.06	47.7	54	-6.3	-	-	46	122	V
5	* ** 7.72965	35.72	PK2	35.7	-27.4	0	44.02	-	-	74	-29.98	270	262	V
	* ** 7.72914	22.83	ADV	35.7	-27.4	4.06	35.19	54	-18.81	-	-	270	262	V
6	* ** 9.1528	34.46	PK2	36.3	-26.1	0	44.66	-	-	74	-29.34	338	229	V
	* ** 9.1534	21.75	ADV	36.3	-26.1	4.06	36.01	54	-17.99	-	-	338	229	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
** - indicates frequency in Taiwan NCC LP0002 Restricted Band
PK2 - Peak detector
ADV - Linear Voltage Average

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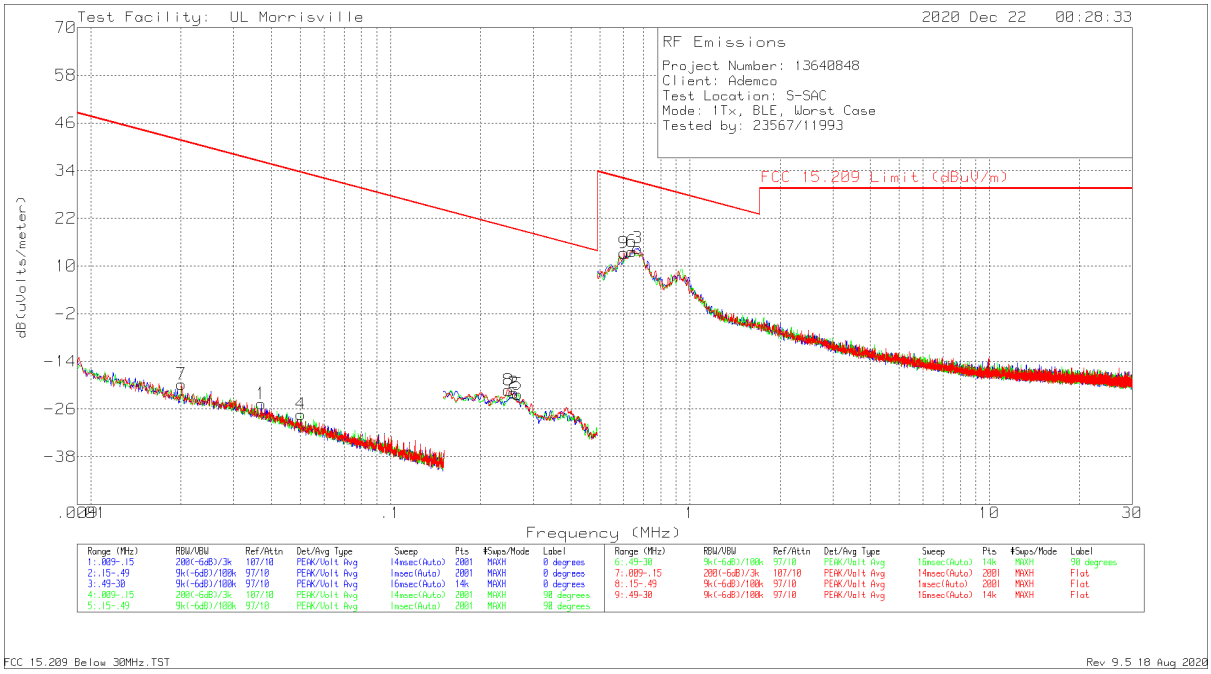
10.3. WORST CASE BELOW 30MHZ

Note for below 30 MHz scans: All measurements were made at a test distance of 3 m. The measured data was extrapolated from the test distance (3m) to the specification distance (300 m from 9-490 kHz and 30 m from 490 kHz – 30 MHz) to clearly show the relative levels of fundamental and spurious emissions and demonstrate compliance with the requirement that the level of any spurious emissions be below the level of the intentionally transmitted signal. The extrapolation factor for the limits were 40*Log (test distance / specification distance).

The below 30 MHz limits in CFR 47, Part 15, Subpart C, paragraph 15.209 (a), are identical to those in RSS-GEN Section 8.9, Table 6, since the measurements are performed in terms of magnetic field strength and converted to electric field strength levels (as reported in the table) using the free space impedance of 377Ω. For example, the measurement frequency 20.08 KHz resulted in a level of -19.72 dBuV/m, which is equivalent to -19.72-51.5 = -71.22 dBuA/m, which has the same margin, -61.27 dB, to the corresponding RSS-GEN Table 6 limit as it has to be 15.209(a) limit.

SPURIOUS EMISSIONS BELOW 30 MHz (WORST-CASE CONFIGURATION)



ANTENNA- THREE ORIENTATIONS

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Below 30MHz Data

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AT0079 (dB/m)	Cbl (dB)	Dist. Corr. Factor (dB)	Corrected Reading dB (uVolts/meter)	FCC 15.209 AV/QP Limit (dBuV/m)	FCC 15.209 PK Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
7	.02008	46.48	Pk	13.7	.1	-80	-19.72	41.55	61.55	-61.27	0-360
1	.03705	42.64	Pk	12.6	.1	-80	-24.66	36.23	56.23	-60.89	0-360
4	.05025	41.11	Pk	11.5	.1	-80	-27.29	33.58	53.58	-60.87	0-360
8	.24792	47.86	Pk	10.8	.1	-80	-21.24	19.72	39.72	-40.96	0-360
2	.25872	47.33	Pk	10.7	.1	-80	-21.87	19.35	39.35	-41.22	0-360
5	.2662	46.92	Pk	10.7	.1	-80	-22.28	19.1	39.1	-41.38	0-360
9	.60172	42.27	Pk	10.8	.2	-40	13.27	32.02	-	-18.75	0-360
6	.64178	42.69	Pk	10.8	.2	-40	13.69	31.46	-	-17.77	0-360
3	.66918	43.51	Pk	10.8	.2	-40	14.51	31.09	-	-16.58	0-360

Pk - Peak detector

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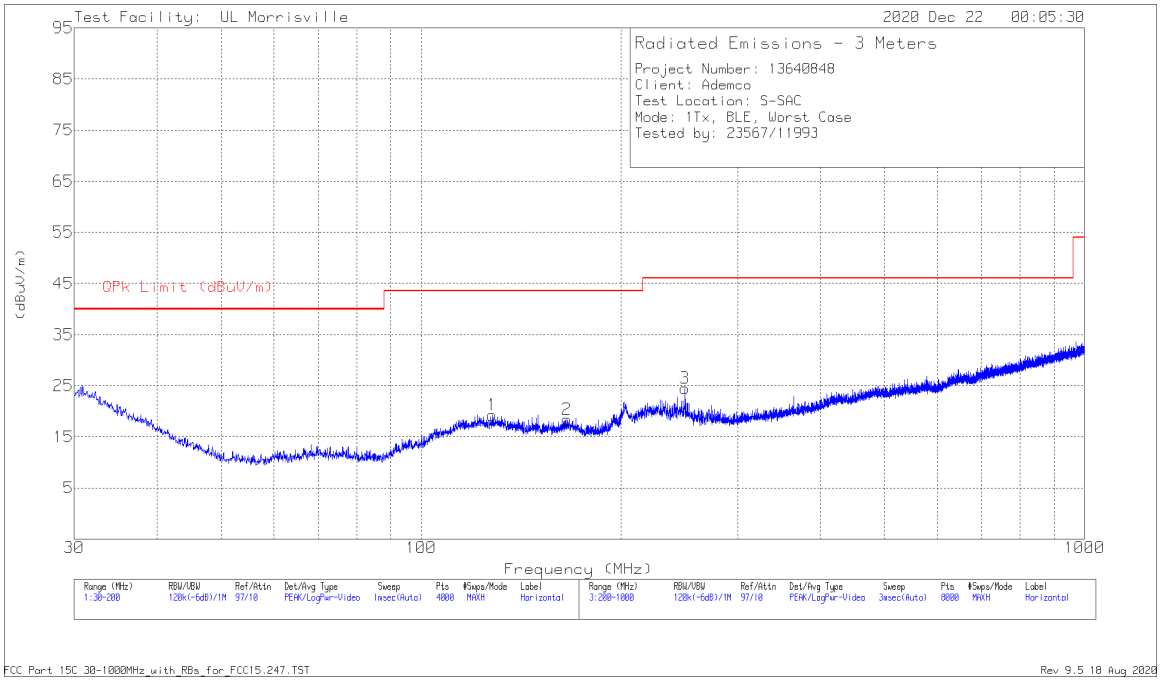
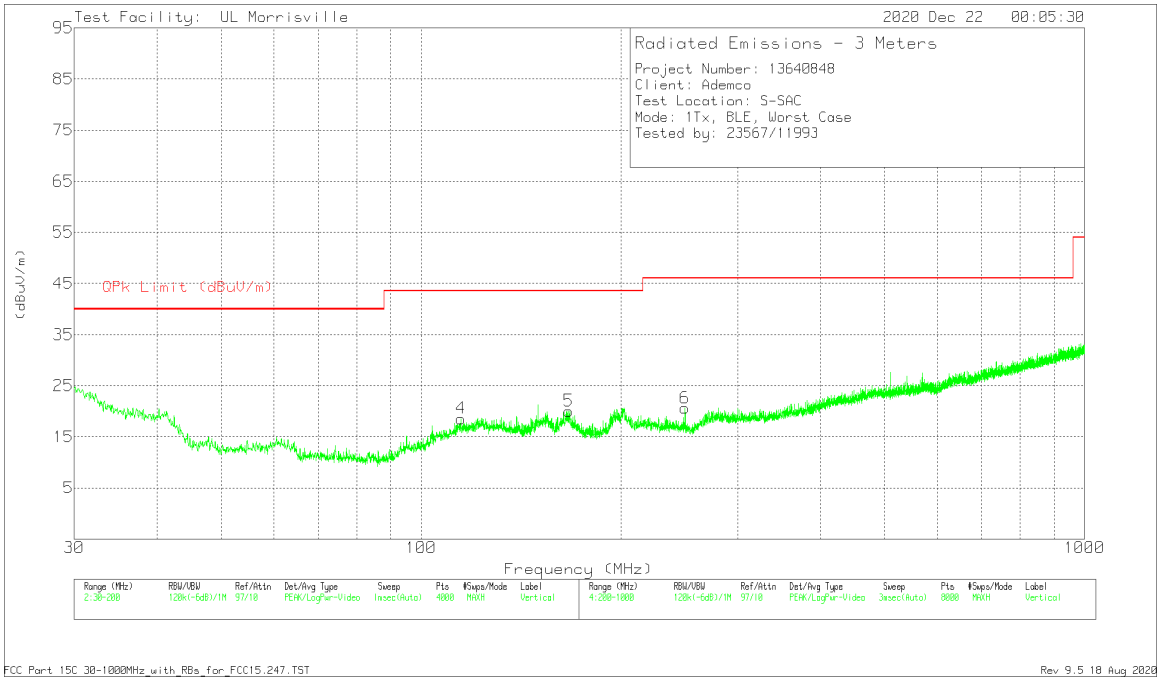
10.4. WORST CASE BELOW 1 GHZ

SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION)



HORIZONTAL



VERTICAL

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Below 1GHz Data

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AT0075 AF (dB/m)	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 128.1154	29.32	Pk	20.1	-30.2	19.22	43.52	-24.3	0-360	400	H
2	* ** 165.9927	29.95	Pk	18.3	-29.9	18.35	43.52	-25.17	0-360	200	H
4	* ** 114.8094	29.38	Pk	19.6	-30.4	18.58	43.52	-24.94	0-360	101	V
5	* ** 166.9279	31.73	Pk	18.2	-29.9	20.03	43.52	-23.49	0-360	101	V
3	* ** 250.0065	35.99	Pk	17.6	-29.1	24.49	46.02	-21.53	0-360	101	H
6	* ** 249.9065	32.13	Pk	17.6	-29.1	20.63	46.02	-25.39	0-360	101	V

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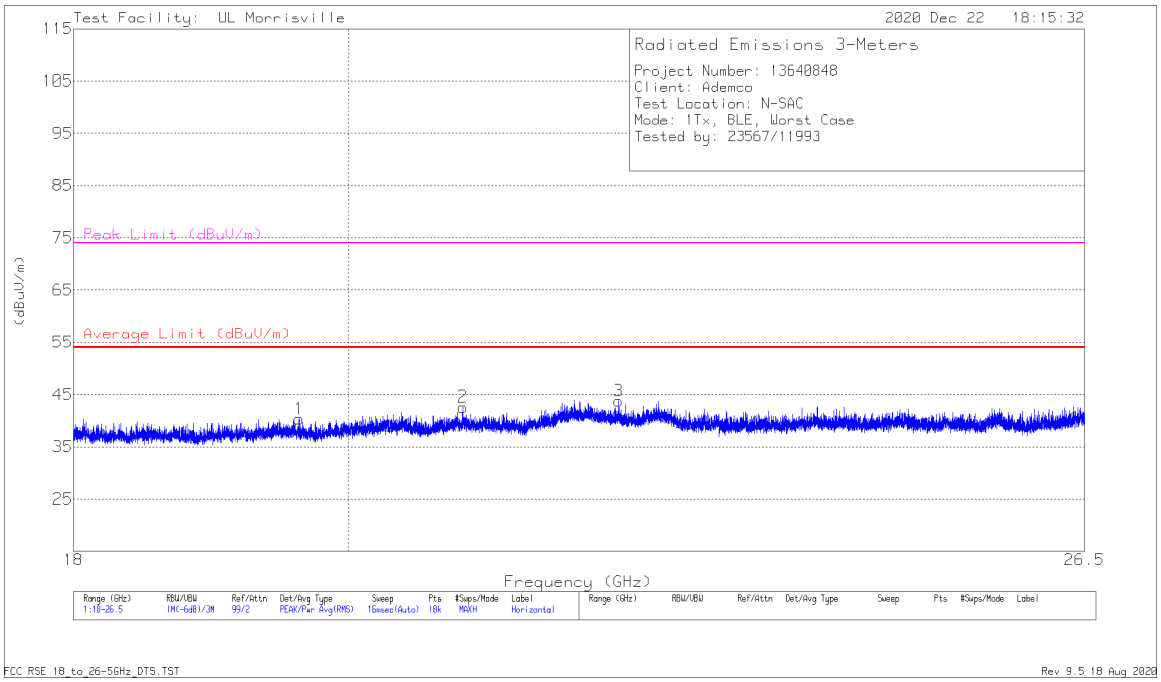
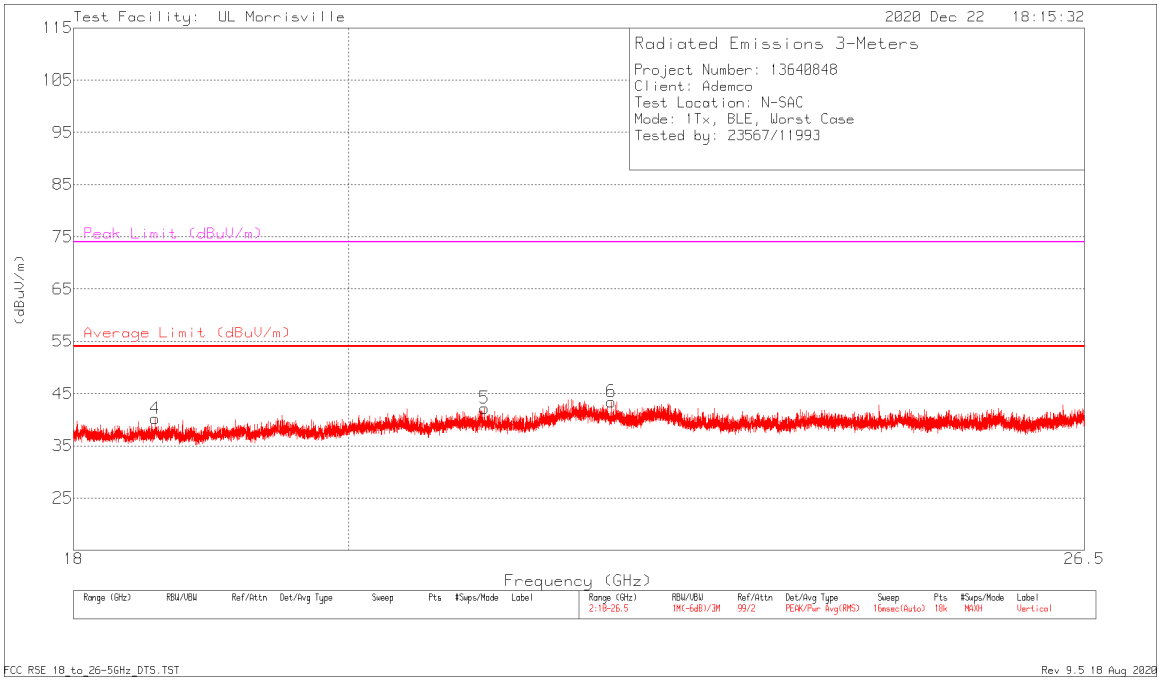
10.5. WORST CASE 18-26 GHZ

SPURIOUS EMISSIONS 18-26 GHz (WORST-CASE CONFIGURATION)



HORIZONTAL



VERTICAL

18 – 26GHz DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0063 AF (dB/m)	Amp/CBL (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 19.62264	47.65	Pk	33.5	-40.8	40.35	54	-13.65	74	-33.65	0-360	200	H
2	* ** 20.8911	49.2	Pk	34.1	-40.7	42.6	54	-11.4	74	-31.4	0-360	101	H
3	* ** 22.17467	48.1	Pk	36.7	-41	43.8	54	-10.2	74	-30.2	0-360	101	H
4	* ** 18.57142	47.44	Pk	33.2	-40.4	40.24	54	-13.76	74	-33.76	0-360	250	V
5	* ** 21.06536	49.02	Pk	34.2	-41	42.22	54	-11.78	74	-31.78	0-360	200	V
6	* ** 22.11375	47.56	Pk	36.7	-40.8	43.46	54	-10.54	74	-30.54	0-360	101	V

UL LLC
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11. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

FCC §15.207 (a)

RSS-Gen 8.8

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56 *	56 to 46 *
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency.

RESULTS

UL LLC
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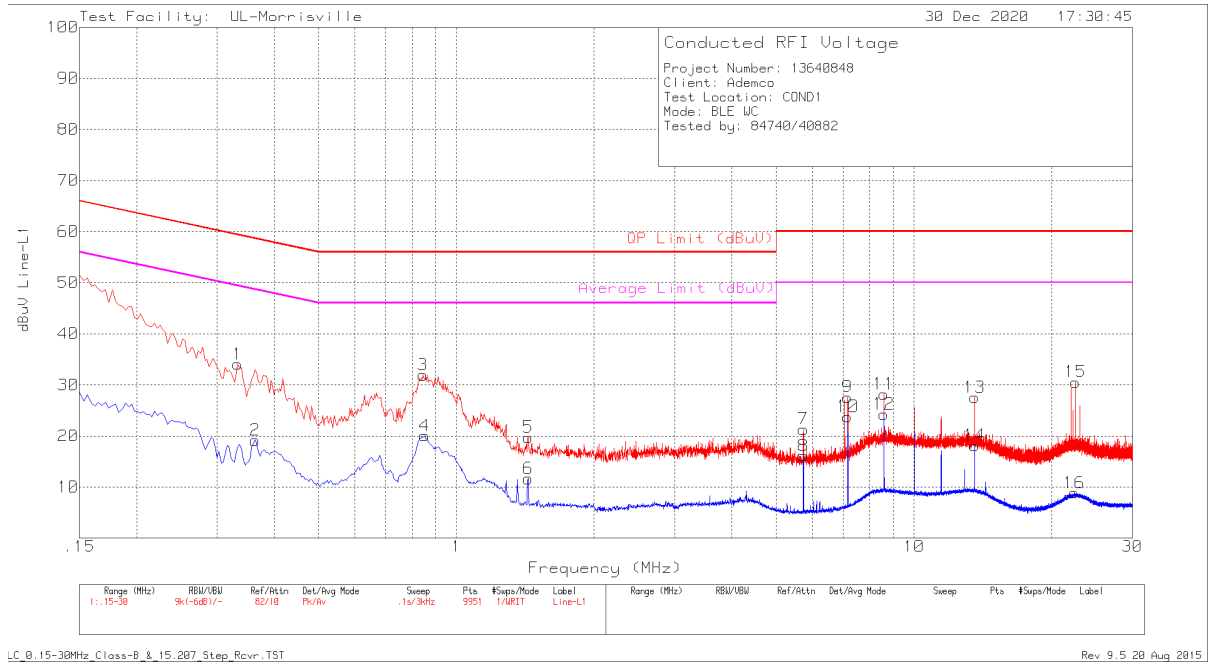
11.1.1. AC Power Line Host

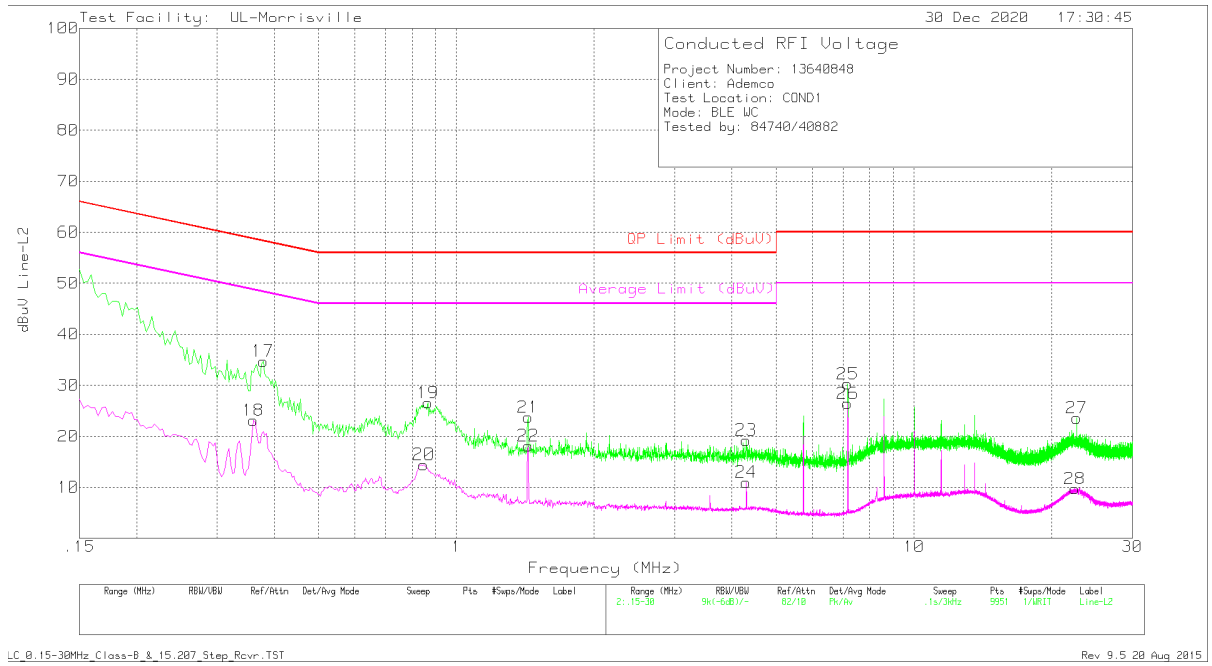
LINE 1 RESULTS



Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	LISN VCF (dB)	Cbl/Limiter (dB)	Corrected Reading dBuV	QP Limit (dBuV)	Margin (dB)	Average Limit (dBuV)	Margin (dB)
1	.333	24.3	Pk	.1	9.7	34.1	59.38	-25.28	-	-
2	.363	9.35	Av	.1	9.7	19.15	-	-	48.66	-29.51
3	.846	22.13	Pk	0	9.8	31.93	56	-24.07	-	-
4	.852	10.22	Av	0	9.8	20.02	-	-	46	-25.98
5	1.434	9.94	Pk	0	9.8	19.74	56	-36.26	-	-
6	1.434	1.85	Av	0	9.8	11.65	-	-	46	-34.35
7	5.73	11.35	Pk	.1	9.9	21.35	60	-38.65	-	-
8	5.73	6.15	Av	.1	9.9	16.15	-	-	50	-33.85
9	7.164	17.62	Pk	.1	9.9	27.62	60	-32.38	-	-
10	7.164	13.79	Av	.1	9.9	23.79	-	-	50	-26.21
11	8.595	18.11	Pk	.1	10	28.21	60	-31.79	-	-
12	8.595	14.19	Av	.1	10	24.29	-	-	50	-25.71
13	13.56	17.44	Pk	.1	10	27.54	60	-32.46	-	-
14	13.56	8.03	Av	.1	10	18.13	-	-	50	-31.87
15	22.53	20.27	Pk	.2	10.1	30.57	60	-29.43	-	-
16	22.383	-1.42	Av	.2	10.1	8.88	-	-	50	-41.12

Pk - Peak detector
Av - Average detection

LINE 2 RESULTS



Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	LISN VCF (dB)	Cbl/Limiter (dB)	Corrected Reading dBuV	QP Limit (dBuV)	Margin (dB)	Average Limit (dBuV)	Margin (dB)
17	.378	24.84	Pk	.1	9.8	34.74	58.32	-23.58	-	-
18	.36	13.34	Av	.1	9.7	23.14	-	-	48.73	-25.59
19	.867	16.76	Pk	0	9.8	26.56	56	-29.44	-	-
20	.849	4.66	Av	0	9.8	14.46	-	-	46	-31.54
21	1.434	13.96	Pk	0	9.8	23.76	56	-32.24	-	-
22	1.434	8.33	Av	0	9.8	18.13	-	-	46	-27.87
23	4.299	9.24	Pk	.1	9.9	19.24	56	-36.76	-	-
24	4.299	1	Av	.1	9.9	11	-	-	46	-35
25	7.164	20.23	Pk	.1	9.9	30.23	60	-29.77	-	-
26	7.164	16.46	Av	.1	9.9	26.46	-	-	50	-23.54
27	22.656	13.28	Pk	.2	10.1	23.58	60	-36.42	-	-
28	22.473	-.54	Av	.2	10.1	9.76	-	-	50	-40.24

Pk - Peak detector
Av - Average detection

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12. SETUP PHOTOS

Please refer to R13640848-EP1 for setup photos

END OF TEST REPORT

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