



TEST REPORT

Report Number. : R13974365-E2

Applicant : Lutron Electronics Co Inc.
7200 Suter Rd.
Coopersburg, PA, 18036, U.S.A

Model : AFC1

FCC ID : JPZ0138

IC : 2851A-JPZ0138

EUT Description : Low Voltage Lighting Control Interface

Test Standard(s) : FCC 47 CFR PART 15 SUBPART C: 2021
ISED RSS-247 ISSUE 2: 2017
ISED RSS-GEN ISSUE 5 + A2: 2021

Date Of Issue:
2021-11-12

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



REPORT REVISION HISTORY

Rev.	Issue Date	Revisions	Revised By
V1	2021-09-23	Initial Issue	Haley Ackun
V2	2021-10-28	Added new AC mains data	Haley Ackun
V3	2021-11-12	Editorial revisions. Added references to KDB 558074 Section 11 Q#3c to section 7 and 10	Brian T. Kiewra

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: Lutron Electronics Co Inc.
7200 Suter Rd.
Coopersburg, PA, 18036, U.S.A

EUT DESCRIPTION: Low Voltage Lighting Control Device

MODEL: AFC1

SERIAL NUMBER: 50017454b

SAMPLE RECEIPT DATE: 2021-08-24

DATE TESTED: 2021-08-24 TO 2021-09-22 & 2021-10-28


APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
CFR 47 Part 15 Subpart C: 2021	Complies
ISED RSS-247 Issue 2: 2017	Complies
ISED RSS-GEN Issue 5 + A2: 2021	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.

Approved & Released For
UL LLC. By:



Brian T. Kiewra
Project Engineer/Operations Leader
Consumer Technology Division
UL LLC.

Prepared By:



Haley Ackun
Laboratory Engineer
Consumer Technology Division
UL LLC.

2. TEST RESULTS SUMMARY

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

This report contains data provided by the applicant which can impact the validity of results. UL LLC is only responsible for the validity of results after the integration of the data provided by the customer.

3. TEST METHODOLOGY

The tests documented in this report were performed in accordance with FCC CFR 47 Part 2, FCC CFR 47 Part 15: 2021, ANSI C63.10-2013, KDB 558074 D01 15.247 Meas Guidance v05r02, KDB 414788 D01 Radiated Test Site v01r01, RSS-GEN Issue 5 + A2: 2021, and RSS-247 Issue 2: 2017.

4. FACILITIES AND ACCREDITATION

UL LLC is accredited by a2La, cert. # 0751.06 for all testing performed within the scope of this report. Testing was performed at the locations noted below.

	Address	ISED CABID	ISED Company Number	FCC Registration
<input type="checkbox"/>	Building: 12 Laboratory Dr RTP, NC 27709, U.S.A	US0067	2180C	703469
<input checked="" type="checkbox"/>	Building: 2800 Perimeter Park Dr. Suite B Morrisville, NC 27560, U.S.A	US0067	27265	703469

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)
Power Spectral Density, conducted	2.47 dB
Unwanted Emissions, conducted	1.94 dB
All emissions, radiated	6.01 dB
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%.

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)
 $36.5 \text{ dBuV} + 18.7 \text{ dB/m} + 0.6 \text{ dB} - 26.9 \text{ dB} = 28.9 \text{ dBuV/m}$

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.
 $36.5 \text{ dBuV} + 0 \text{ dB} + 10.1 \text{ dB} + 0 \text{ dB} = 46.6 \text{ dBuV}$

6. EQUIPMENT UNDER TEST

6.1. EUT DESCRIPTION

The EUT is a low voltage lighting control interface that supports BLE and 802.15.4. This report covers testing performed for 802.15.4 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)
2405 - 2480	802.15.4	19.14	82.04

6.3. DESCRIPTION OF AVAILABLE ANTENNAS

The antenna type and gain, as provided by the manufacturer, are as follows:
The radio utilizes a dipole antenna, with a maximum gain of 2.15 dBi.

6.4. SOFTWARE AND FIRMWARE

The EUT firmware installed during testing was 0799630.
The test utility software used during testing was Docklight v2.2.8.

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 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 fundamental of the EUT was investigated in three orthogonal orientations X,Y,Z, it was determined that Z orientation was worst-case orientation; therefore, all final radiated testing was performed with the EUT in Z orientation.

The EUT supports 250 kbps and therefore all final radiated emissions were performed with the EUT set to 250 kbps.

The following power settings were utilized for radiated bandedge and power:
Low/mid/high channel 1: power setting 19
High channel 2: power setting 12

All other testing run at power setting 19 all channels.

6.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID
Laptop	Dell	P75F	HZGGLP2	-
Power Supply	Lutron	DFC-OEM-DBI	J211602702A1	-

I/O CABLES

I/O Cable List						
Cable No	Port	# of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	1	1	I/O	18 AWG	< 1m	Connects EUT to Power Supply

TEST SETUP

Test software exercised the radio card.

SETUP DIAGRAMS

Please refer to R13974365-EP1 for setup diagrams

7. MEASUREMENT METHOD

Duty Cycle: ANSI C63.10 Section 11.6

6 dB BW: ANSI C63.10 Subclause -11.8.2

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 non-restricted frequency bands: ANSI C63.10 Subclause -11.11 and 6.10.4

Emissions restricted frequency bands: ANSI C63.10 Subclause -11.12.1 and 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

KDB 558074 D01 15.247 Meas Guidance v05r02 Section 11 Question #3 Answer 3(c)

8. TEST AND MEASUREMENT EQUIPMENT

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

Test Equipment Used - Wireless Conducted Measurement Equipment

Equipment ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
SA0027	Spectrum Analyzer	Keysight Technologies	N9030A	2021-06-25	2022-06-25
PWM001	RF Power Meter	Keysight Technologies	N1912A	2021-07-16	2022-07-16
PWS003	Peak and Avg Power Sensor, 50MHz to 6GHz	Keysight Technologies	E9323A	2021-05-27	2022-05-27
207726	Temp/Humid Chamber	Thermotron	SM-32-8200	2021-01-04	2022-01-04
HI0090	Environmental Meter	Fisher Scientific	15-077-963	2021-07-12	2022-07-12
SOFTEMI	Antenna Port Software	UL	Version 2021.08.11	NA	NA
Additional Equipment used					
MM0167 (PRE0126458)	True RMS Multimeter	Agilent	U1232A	2020-08-05	2021-08-31

Test Equipment Used - Line-Conducted Emissions – Voltage (Morrisville – Conducted 1)

Equipment ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
CBL087	Coax cable, RG223, N-male to BNC-male, 20-ft.	Pasternack	PE3W06143-240	2021-04-05	2022-04-05
HI0090	Environmental Meter	Fisher Scientific	15-077-963	2021-07-12	2022-07-12
LISN003	LISN, 50-ohm/50-uH, 250uH 2-conductor, 25A	Fischer Custom Com.	FCC-LISN-50/250-25-2-01	2021-08-16	2022-08-16
75141	EMI Test Receiver 9kHz-7GHz	Rohde & Schwarz	ESCI 7	2021-08-17	2022-08-17
ATA222	Transient Limiter, 0.009-100MHz	Electro-Metrics	EM-7600	2021-04-05	2022-04-05
PS214	AC Power Source	Elgar	CW2501M (s/n 1523A02396)	NA	NA
SOFTEMI	EMI Software	UL	Version 9.5 (18 Oct 2021)		

Test Equipment Used - Radiated Disturbance Emissions Test Equipment (Morrisville – Chamber 4)

Equipment ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
	1-18 GHz				
206211	Double-Ridged Waveguide Horn Antenna, 1 to 18 GHz	ETS Lindgren	3117	2021-03-11	2022-03-11
	Gain-Loss Chains				
C4-SAC03	Gain-loss string: 1-18GHz	Various	Various	2021-05-07	2022-05-07
	Receiver & Software				
206496	Spectrum Analyzer	Rohde & Schwarz	ESW44	2021-03-09	2022-03-09
s/n 200037635	Environmental Meter	Fisher Scientific	06-662-4	2020-01-21	2022-01-21
SOFTEMI	EMI Software	UL	Version 9.5 (28 Jun 2021)		

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

Equip. ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
	0.009-30MHz				
AT0079	Active Loop Antenna	ETS-Lindgren	6502	2021-08-19	2022-08-19
	30-1000 MHz				
AT0066	Hybrid Broadband Antenna	Sunol Sciences Corp.	JB1	2021-02-19	2022-02-19
	1-18 GHz				
AT0072	Double-Ridged Waveguide Horn Antenna, 1 to 18 GHz	ETS Lindgren	3117	2021-05-03	2022-05-03
AT0078	Double-Ridged Waveguide Horn Antenna, 1 to 18 GHz	ETS Lindgren	3117	2020-11-19	2021-11-19
	Gain-Loss Chains				
N-SAC01	Gain-loss string: 0.009-30MHz	Various	Various	2021-07-20	2022-07-20
N-SAC02	Gain-loss string: 25-1000MHz	Various	Various	2021-07-20	2022-07-20
N-SAC03	Gain-loss string: 1-18GHz	Various	Various	2021-07-20	2022-07-20
	Receiver & Software				
197954	Spectrum Analyzer	Rohde & Schwarz	ESW44	2021-03-30	2022-03-30
SOFTEMI	EMI Software	UL	Version 9.5 (09 Aug 2021)		
	Additional Equipment used				
s/n 200037610	Environmental Meter	Fisher Scientific	06-662-4	2020-01-22	2022-01-22

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

Equip. ID	Description	Manufacturer	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				
S-SAC04	Gain-loss string: 18-40GHz	Various	Various	2021-07-09	2022-07-09
	Receiver & Software				
SA0020	Spectrum Analyzer	Agilent	E4446A	2021-05-25	2022-05-25
SOFTEMI	EMI Software	UL	Version 9.5 (09 Aug 2021)		
	Additional Equipment used				
s/n 200037635	Environmental Meter	Fisher Scientific	06-662-4	2020-01-22	2022-01-22

*Note: All equipment was in cal at the time testing was performed.

9. ANTENNA PORT TEST RESULTS

9.1. ON TIME AND DUTY CYCLE

LIMITS

None; for reporting purposes only.

PROCEDURE

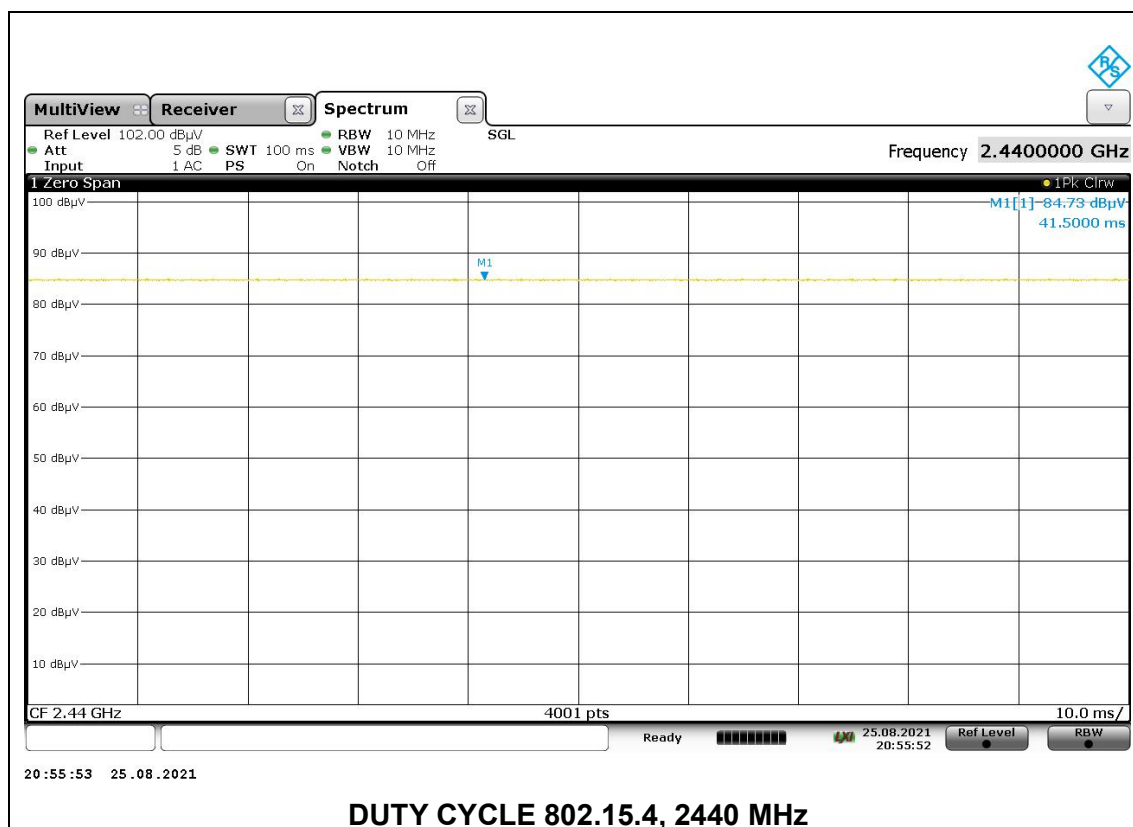
KDB 558074 Zero-Span Spectrum Analyzer Method.

ANSI C63.10 Section 11.6

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						
802.15.4	100.000	100.000	1.000	100.00%	0.00	0.010

DUTY CYCLE PLOTS



*Note: The “real world” duty cycle of the EUT is 30% as declared by the manufacturer. This value is used to derive the duty cycle correction factor used in this report. A duty cycle correction factor of -10.45 was applied to all radiated average data. See calculation below.

Duty Cycle Correction Factor = $20 \cdot \log(\text{DC}) = 20 \cdot \log(0.30) = -10.46 \text{ dB}$

The customer is responsible for providing justification of this declared duty cycle.

9.2. 99% BANDWIDTH

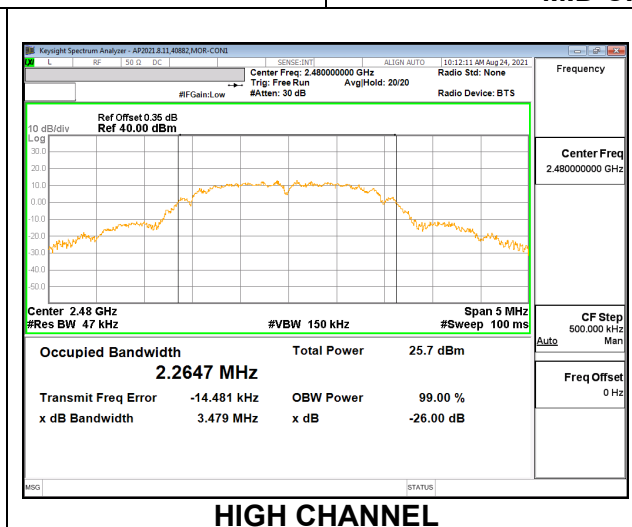
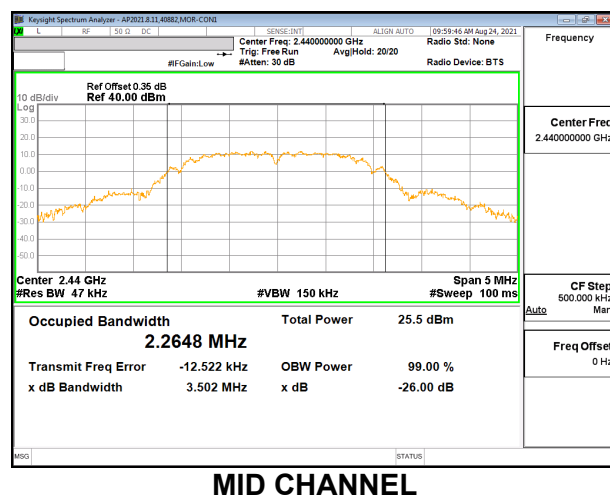
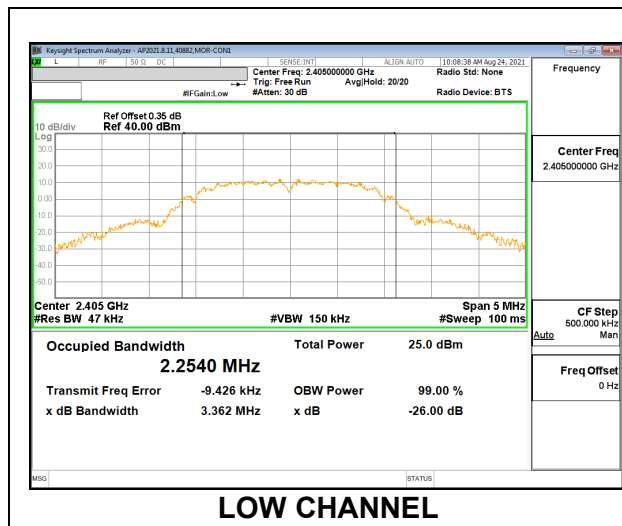
LIMITS

None; for reporting purposes only.

RESULTS

9.2.1. 802.15.4

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2405	2.2540
Middle	2440	2.2648
High	2480	2.2647



9.3. 6 dB BANDWIDTH

LIMITS

FCC §15.247 (a) (2)

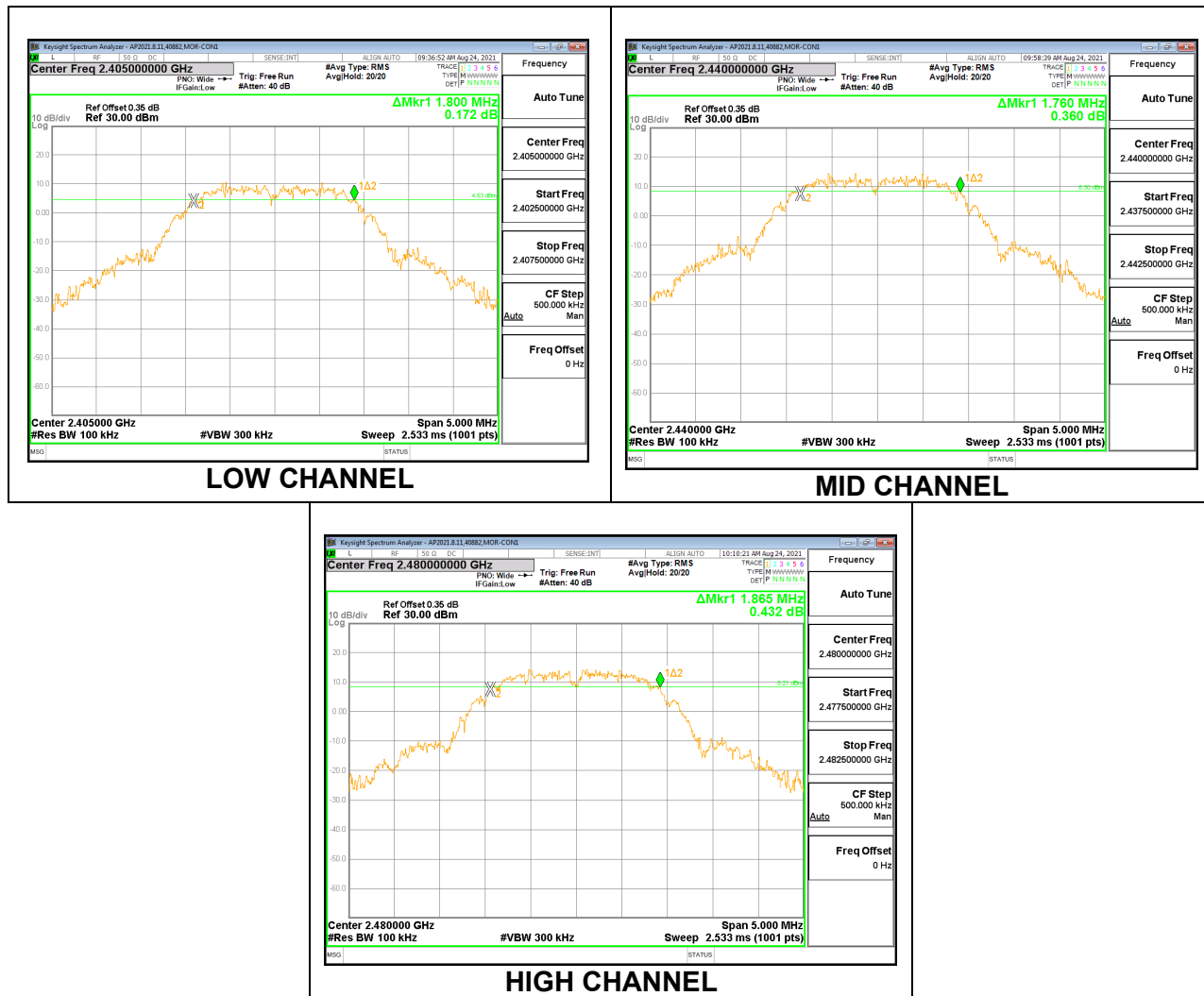
RSS-247 5.2 (a)

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

RESULTS

9.3.1. 802.15.4

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2405	1.800	0.5
Middle	2440	1.760	0.5
High	2480	1.865	0.5



9.4. OUTPUT POWER

LIMITS

FCC §15.247 (b) (3)
RSS-247 5.4 (d)

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

TEST PROCEDURE

The transmitter output is connected to a peak power meter.

The cable assembly insertion loss of 0.35 dB (cable) was entered as an offset in the power meter.

RESULTS

9.4.1. 802.15.4

Tested By:	40882
Date:	2021-08-24

Channel	Frequency (MHz)	Peak Power Reading (dBm)	Limit (dBm)	Margin (dB)
Low	2405	19.14	30	-10.860
Middle	2440	19.02	30	-10.980
High 1	2475	18.73	30	-11.270
High 2	2480	11.43	30	-18.570

*Note: High channel 1 was run at mid and low channel power settings. High channel 2 was run at power setting 12.

9.5. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a gated average power meter.

The cable assembly insertion loss of 0.35 dB (cable) was entered as an offset in the power meter.

RESULTS

9.5.1. 802.15.4

Tested By:	40882
Date:	2021-08-24

Channel	Frequency (MHz)	AV power (dBm)
Low	2402	19.12
Middle	2442	19.00
High 1	2475	18.71
High 2	2480	11.38

*Note: High channel 1 was run at mid and low channel power settings. High channel 2 was run at power setting 12.

9.6. POWER SPECTRAL DENSITY

LIMITS

FCC §15.247 (e)

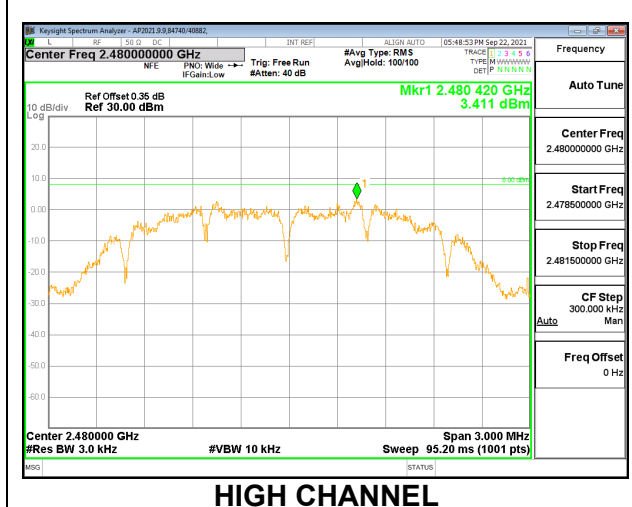
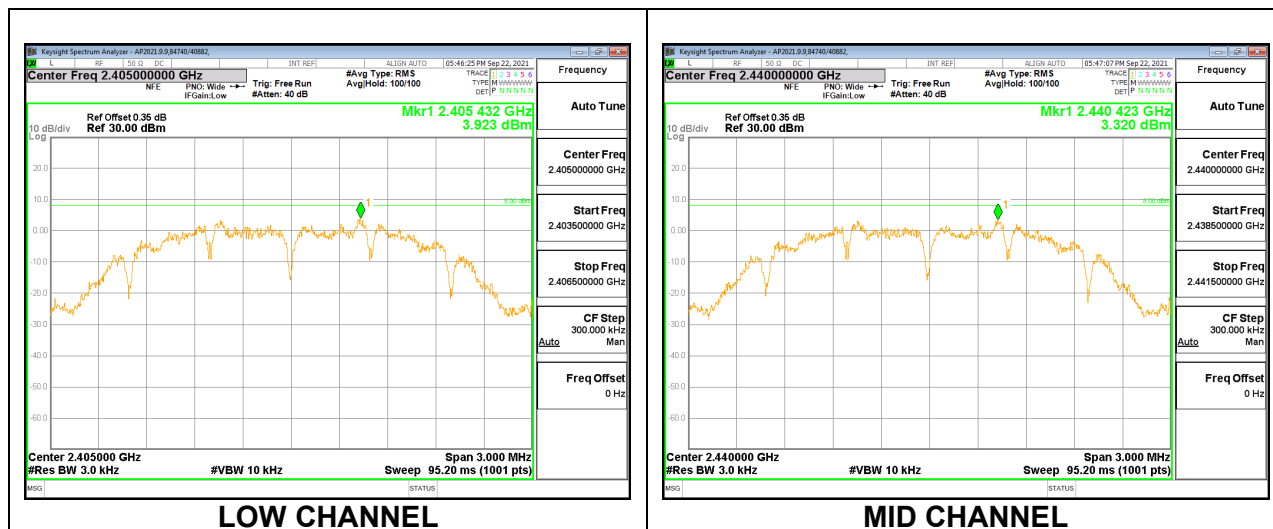
RSS-247 (5.2) (b)

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

9.6.1. 802.15.4

Channel	Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Margin (dB)
Low	2405	3.923	8	-4.08
Middle	2440	3.320	8	-4.68
High	2480	3.411	8	-4.59



9.7. CONDUCTED SPURIOUS EMISSIONS

LIMITS

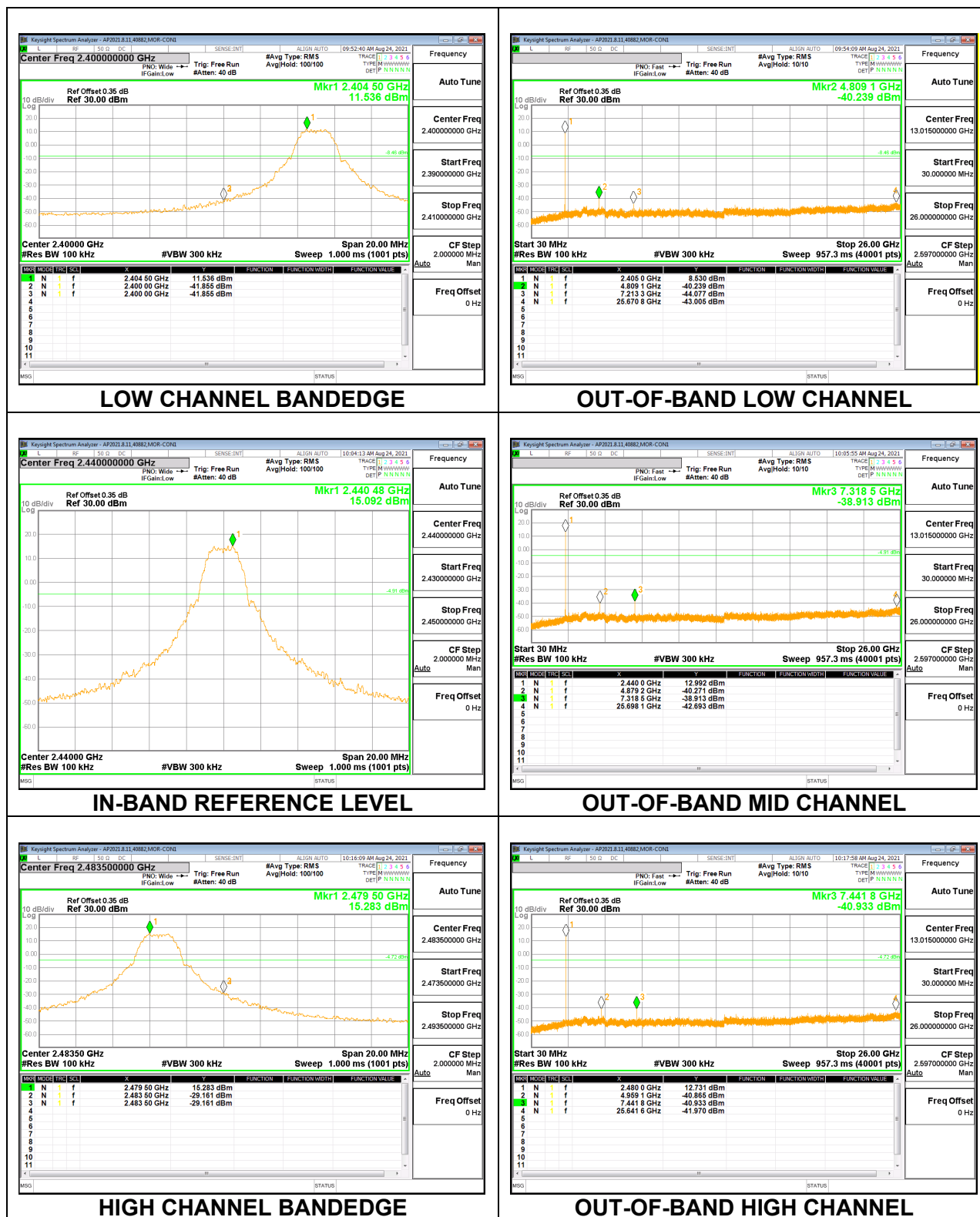
FCC §15.247 (d)

RSS-247 5.5

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

RESULTS

9.7.1. 802.15.4



10. RADIATED TEST RESULTS

10.1. LIMITS AND PROCEDURE

LIMITS

FCC §15.205 and §15.209

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

RSS-GEN, Section 8.9 and 8.10.

Frequency Range (MHz)	Field Strength Limit (uA/m) at 3 m	Field Strength Limit (dBuA/m) at 3 m
0.009-0.490	6.37/F(kHz) @ 300 m	-
0.490-1.705	63.7/F(kHz) @ 30 m	-
1.705 - 30	0.08 @ 30m	-
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 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 detection measurements in the 9 to 150kHz range. Peak detection is used unless otherwise noted as quasi-peak or average (9-90kHz and 110-490kHz).

For pre-scans above 1 GHz the resolution bandwidth is set to 1 MHz; the video bandwidth is set to 3 MHz 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 linear voltage average

measurements. Based on KDB 558074 D01 15.247 Meas Guidance v05r02 Section 11 Question #3 Answer 3(c) a duty cycle correction factor (refer to section 9.1) was applied to the average measurement.

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.

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.

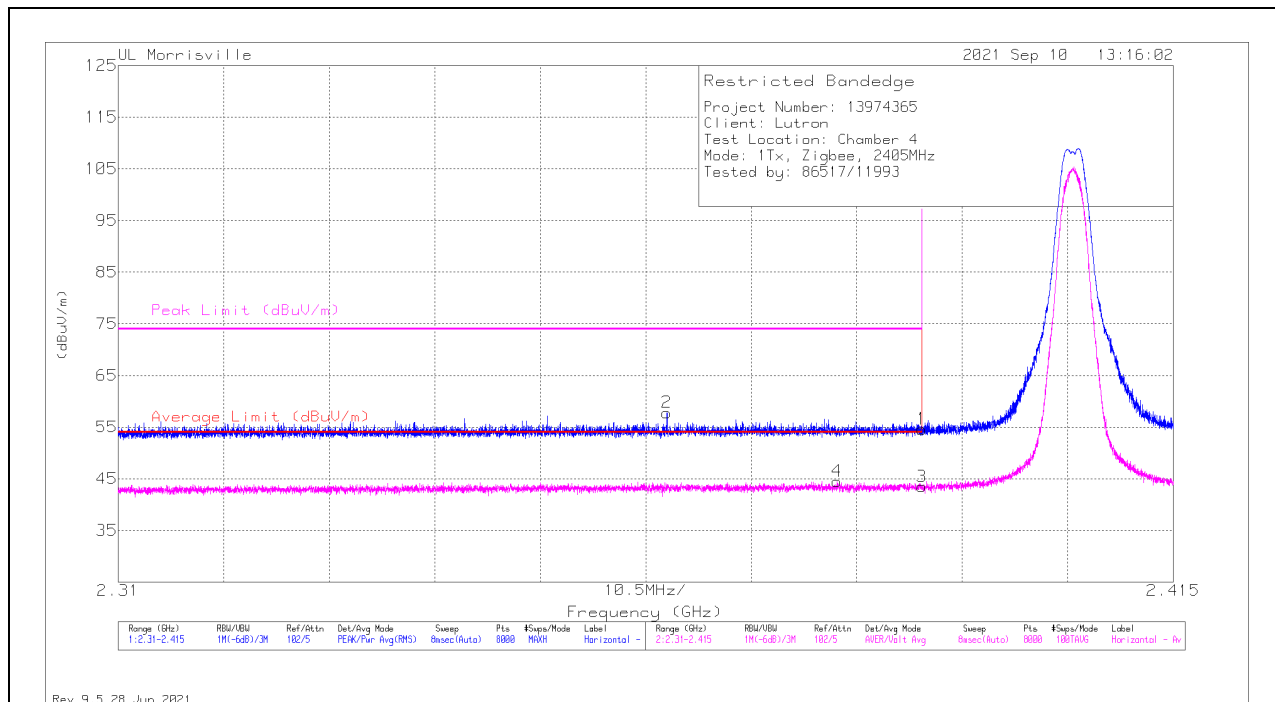
10.2. TRANSMITTER ABOVE 1 GHz

10.2.1. 802.15.4

Antenna 1

BANDEDGE (LOW CHANNEL)

HORIZONTAL RESULT



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	206211 (dB/m)	Amp/Cbl/Filtr/Pad (dB)	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	26.42	Pk	32	-13.8	10	0	54.62	-	-	74	-19.38	203	281	H
2	* ** 2.36461	29.7	Pk	32	-13.9	10	0	57.8	-	-	74	-16.2	203	281	H
3	* ** 2.39	15.3	ADV	32	-13.8	10	-10.46	33.04	54	-20.96	-	-	203	281	H
4	* ** 2.38156	16.32	ADV	32	-13.8	10	-10.46	34.06	54	-19.94	-	-	203	281	H

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

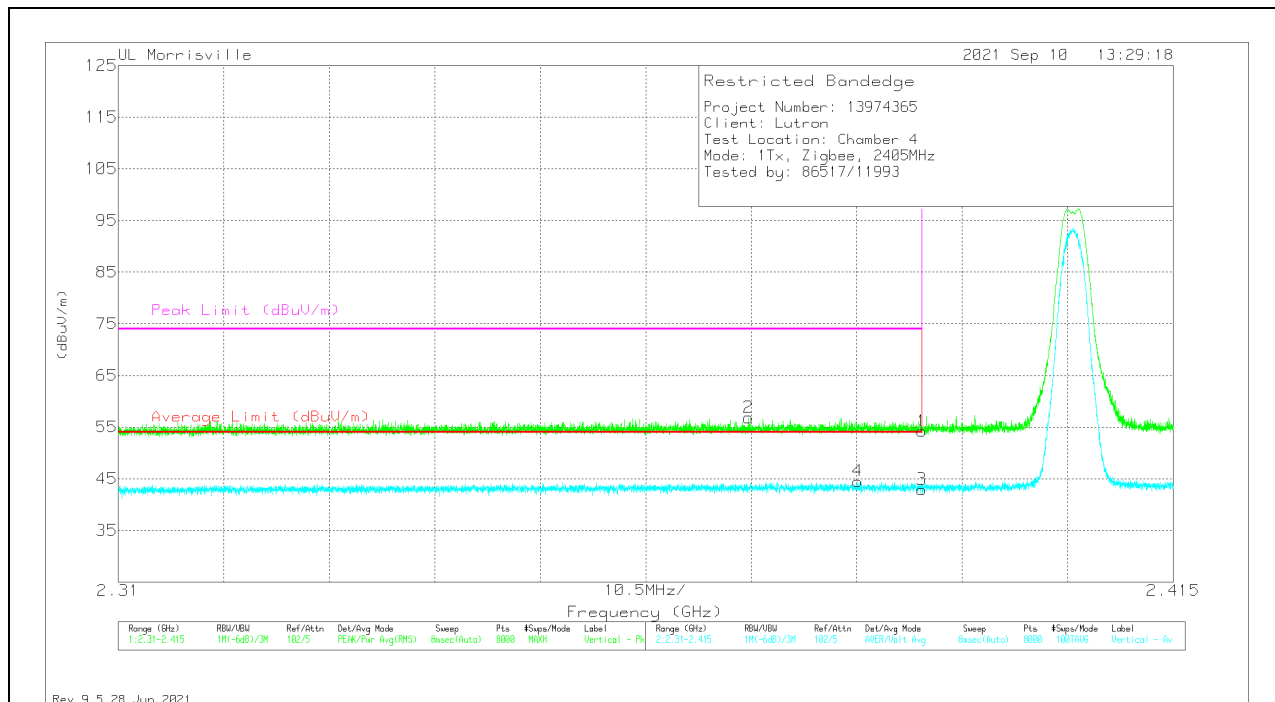
** - indicates frequency in Taiwan NCC LP0002 Restricted Band

Pk - Peak detector

ADV - Linear Voltage Average

Note: DCCF of -10.46 is based on the real-world duty cycle. Refer to section 9.1.

VERTICAL RESULT



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	206211 (dB/m)	Amp/Cbl/Filtr/Pad (dB)	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	25.99	Pk	32	-13.8	10	0	54.19	-	-	74	-19.81	97	382	V
2	** 2.37271	28.74	Pk	32	-13.9	10	0	56.84	-	-	74	-17.16	97	382	V
3	* ** 2.39	14.72	ADV	32	-13.8	10	-10.46	32.46	54	-21.54	-	-	97	382	V
4	* ** 2.38358	16.33	ADV	32	-13.8	10	-10.46	34.07	54	-19.93	-	-	97	382	V

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

** - indicates frequency in Taiwan NCC LP0002 Restricted Band

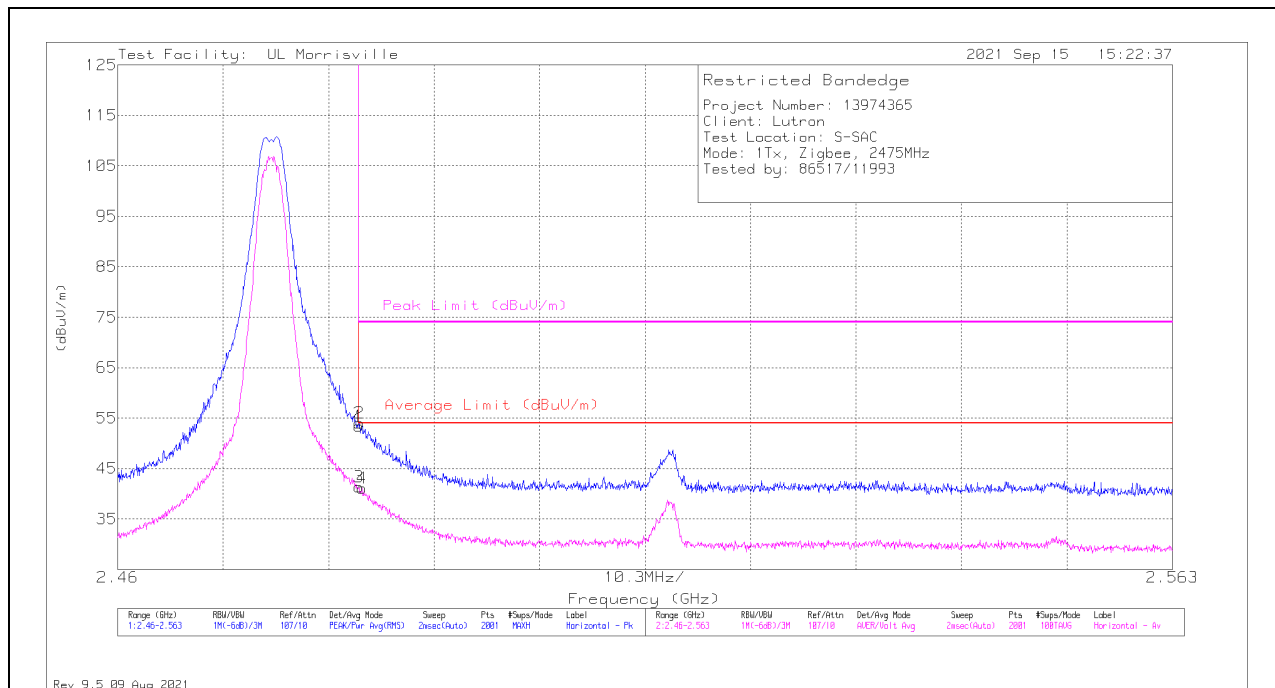
Pk - Peak detector

ADV - Linear Voltage Average

Note: DCCF of -10.46 is based on the real-world duty cycle. Refer to section 9.1.

(HIGH CHANNEL, 2475 MHz)

HORIZONTAL RESULT



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 (dB/m)	Amp/Cbl/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	*** 2.48354	45.54	Pk	32.5	-24.6	0	53.44	-	-	74	-20.56	232	273	H
2	*** 2.48359	46.12	Pk	32.5	-24.6	0	54.02	-	-	74	-19.98	232	273	H
3	*** 2.48354	33.47	ADV	32.5	-24.6	-10.46	30.91	54	-13.09	-	-	232	273	H
4	*** 2.48384	33.16	ADV	32.5	-24.6	-10.46	30.60	54	-13.40	-	-	232	273	H

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

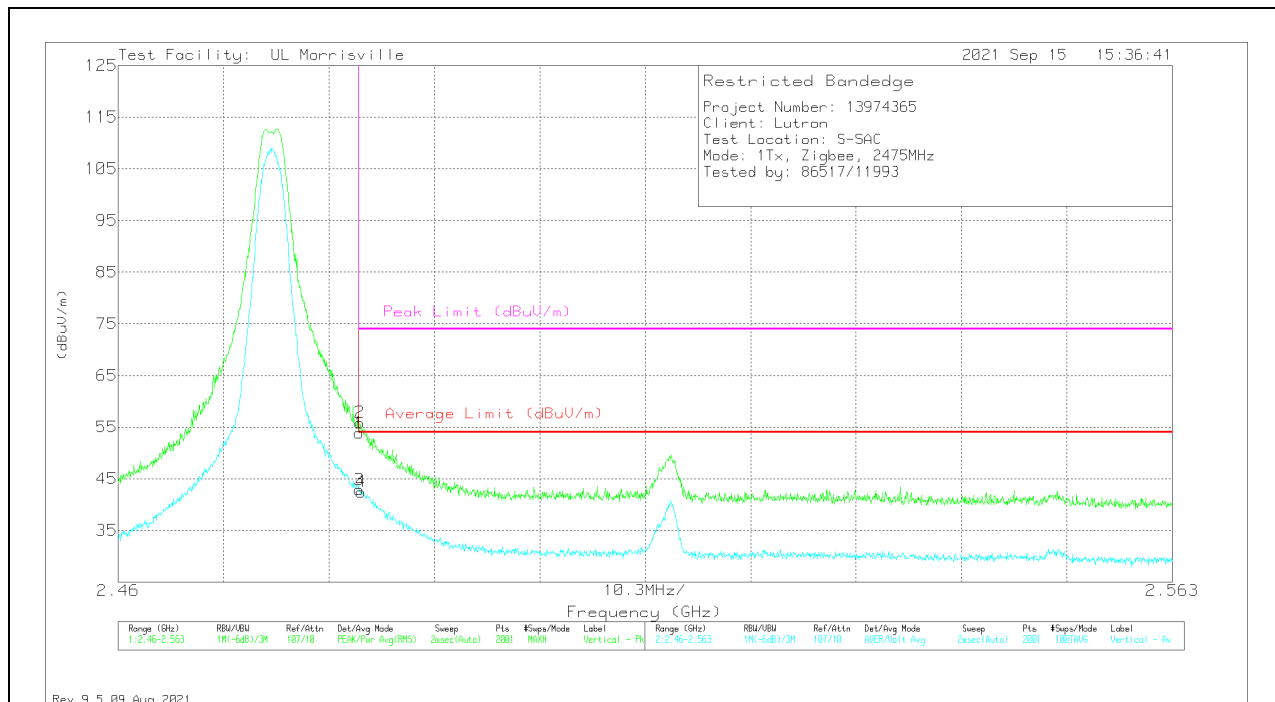
** - indicates frequency in Taiwan NCC LP0002 Restricted Band

Pk - Peak detector

ADV - Linear Voltage Average

Note: DCCF of -10.46 is based on the real-world duty cycle. Refer to section 9.1.

VERTICAL RESULT



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 (dB/m)	Amp/Cbl/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	*** 2.48354	45.96	Pk	32.5	-24.6	0	53.86	-	-	74	-20.14	343	234	V
2	*** 2.48359	47.96	Pk	32.5	-24.6	0	55.86	-	-	74	-18.14	343	234	V
3	*** 2.48354	34.96	ADV	32.5	-24.6	-10.46	32.4	54	-11.60	-	-	343	234	V
4	*** 2.48374	34.56	ADV	32.5	-24.6	-10.46	32.0	54	-12.00	-	-	343	234	V

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

** - indicates frequency in Taiwan NCC LP0002 Restricted Band

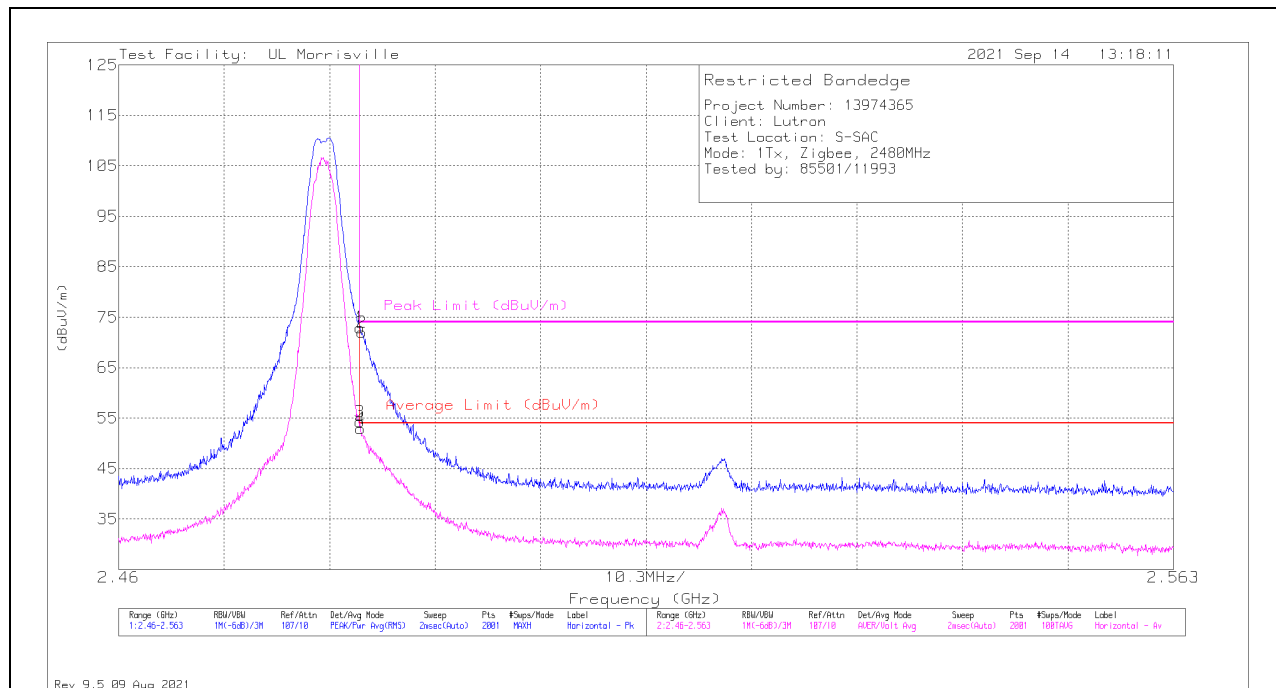
Pk - Peak detector

ADV - Linear Voltage Average

Note: DCCF of -10.46 is based on the real-world duty cycle. Refer to section 9.1.

BANDEDGE (HIGH CHANNEL, 2480 MHz)

HORIZONTAL RESULT



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 (dB/m)	Amp/Cbl/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	*** 2.48354	65.05	Pk	32.5	-24.6	0	72.95	-	-	74	-1.05	229	240	H
2	*** 2.48374	64.16	Pk	32.5	-24.6	0	72.06	-	-	74	-1.94	229	240	H
3	*** 2.48354	46.41	ADV	32.5	-24.6	-10.46	43.85	54	-10.15	-	-	229	240	H
4	*** 2.48364	45	ADV	32.5	-24.6	-10.46	42.44	54	-11.56	-	-	229	240	H

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

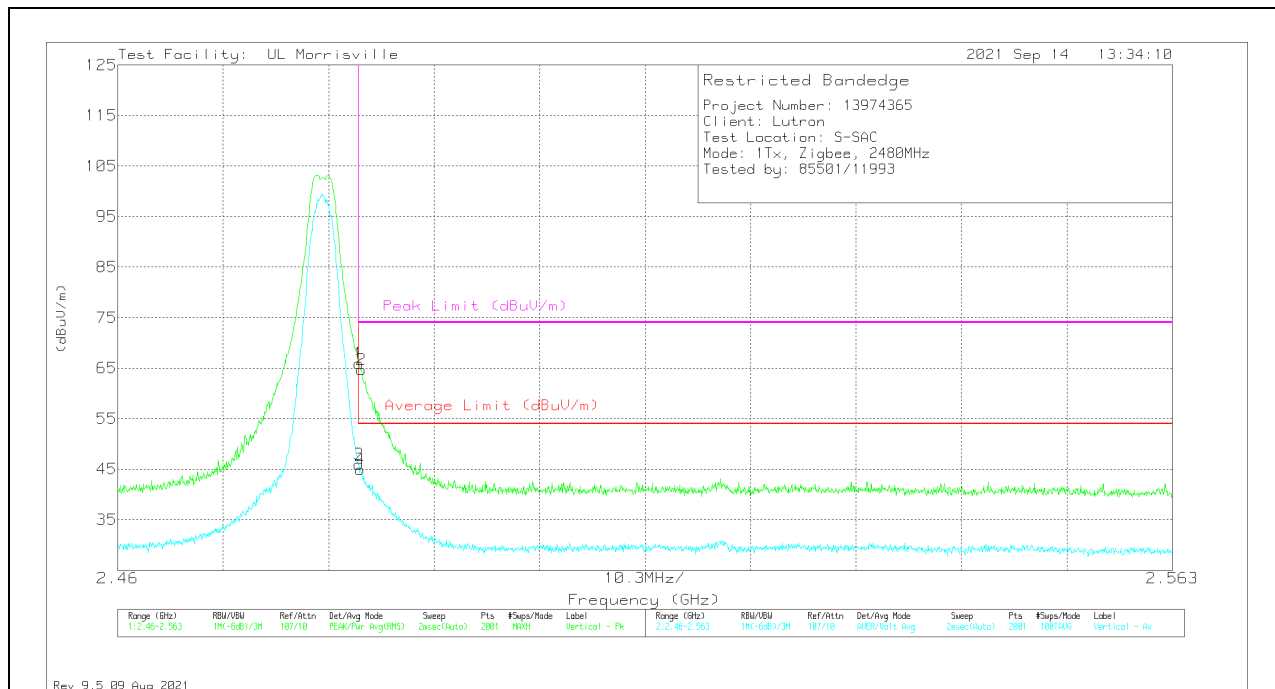
** - indicates frequency in Taiwan NCC LP0002 Restricted Band

Pk - Peak detector

ADV - Linear Voltage Average

Note: DCCF of -10.46 is based on the real-world duty cycle. Refer to section 9.1.

VERTICAL RESULT



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 (dB/m)	Amp/Cbl/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	*** 2.48354	57.99	Pk	32.5	-24.6	0	65.89	-	-	74	-8.11	343	386	V
2	*** 2.48379	56.82	Pk	32.5	-24.6	0	64.72	-	-	74	-9.28	343	386	V
3	*** 2.48354	38.01	ADV	32.5	-24.6	-10.46	35.45	54	-18.55	-	-	343	386	V
4	*** 2.48369	37.04	ADV	32.5	-24.6	-10.46	34.48	54	-19.52	-	-	343	386	V

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

** - indicates frequency in Taiwan NCC LP0002 Restricted Band

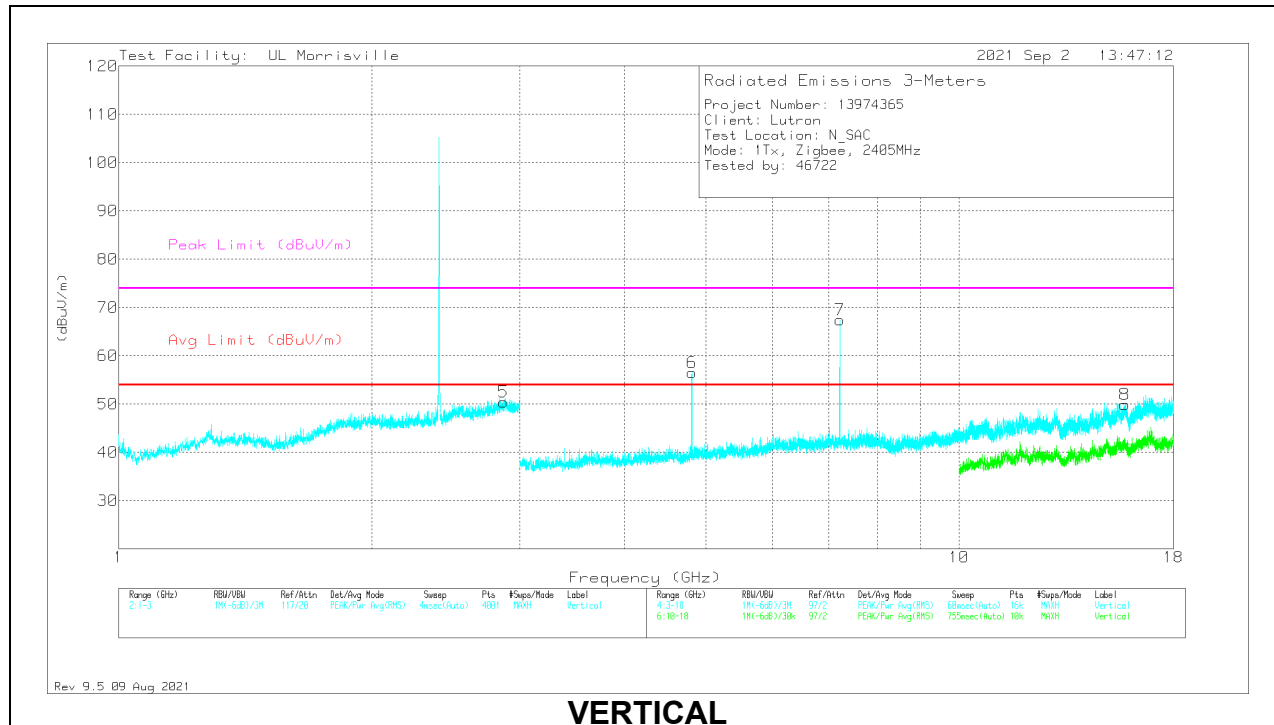
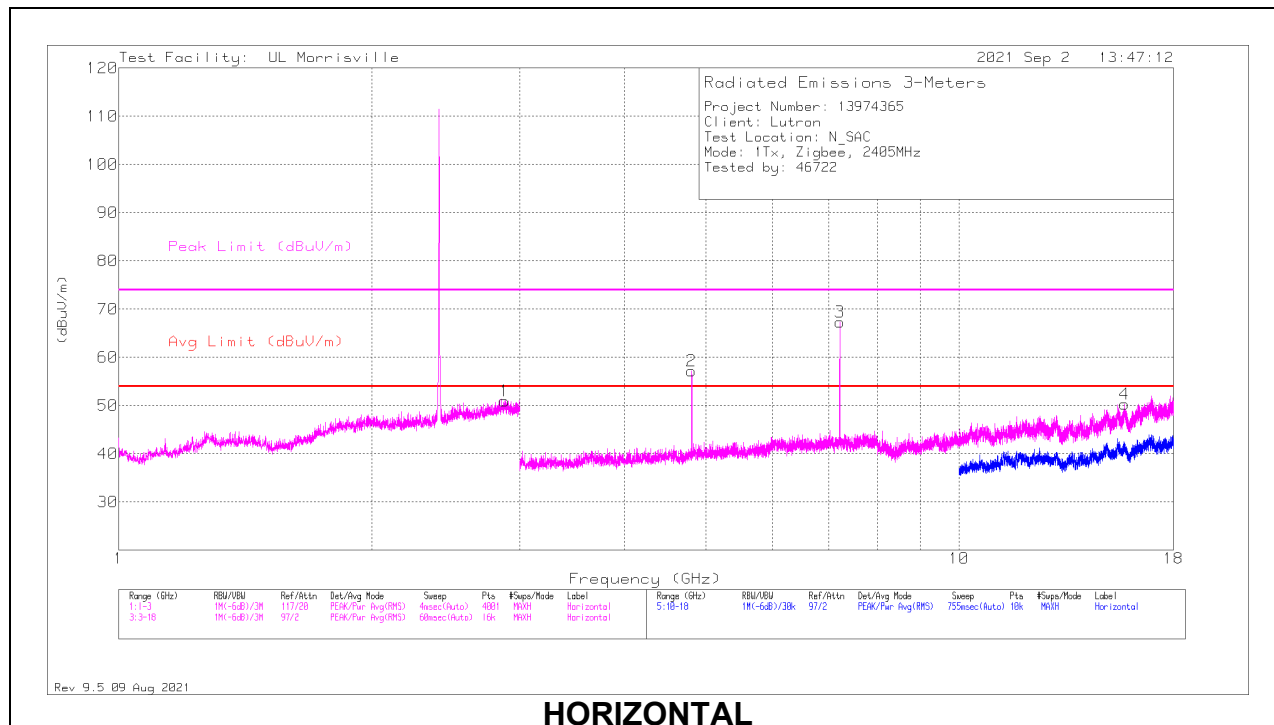
Pk - Peak detector

ADV - Linear Voltage Average

Note: DCCF of -10.46 is based on the real-world duty cycle. Refer to section 9.1.

HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL RESULTS



RADIATED EMISSIONS

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0078 (db/m)	Amp/Cbl/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	* ** 2.87687	43.48	PK2	32.6	-23.5	0	52.58	-	-	74	-21.42	200	205	H
	* ** 2.8775	30.13	ADV	32.6	-23.5	-10.46	28.77	54	-25.23	-	-	200	205	H
5	* ** 2.87331	44	PK2	32.5	-23.8	0	52.7	-	-	74	-21.3	164	270	V
	* ** 2.86975	30.12	ADV	32.5	-23.8	-10.46	28.36	54	-25.64	-	-	164	270	V
2	* ** 4.80664	41.06	PK2	34.1	-31.9	0	43.26	-	-	74	-30.74	294	239	H
	* ** 4.80717	27.79	ADV	34.1	-31.9	-10.46	19.53	54	-34.47	-	-	294	239	H
6	* ** 4.81197	41.13	PK2	34.1	-31.9	0	43.33	-	-	74	-30.67	104	330	V
	* ** 4.81047	27.92	ADV	34.1	-31.9	-10.46	19.66	54	-34.34	-	-	104	330	V
4	* ** 15.74062	35.57	PK2	40.3	-24	0	51.87	-	-	74	-22.13	157	267	H
	* ** 15.73858	22.72	ADV	40.2	-23.8	-10.46	28.66	54	-25.34	-	-	157	267	H
8	* ** 15.75481	35.7	PK2	40.3	-23.8	0	52.2	-	-	74	-21.8	87	324	V
	* ** 15.75431	22.72	ADV	40.3	-23.8	-10.46	28.76	54	-25.24	-	-	87	324	V
3	7.21313	61.46	Pk	35.7	-29.8	0	67.36	-	-	-	-	0-360	101	H
7	7.21594	61.56	Pk	35.7	-29.8	0	67.46	-	-	-	-	0-360	101	V

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

** - indicates frequency in Taiwan NCC LP0002 Restricted Band

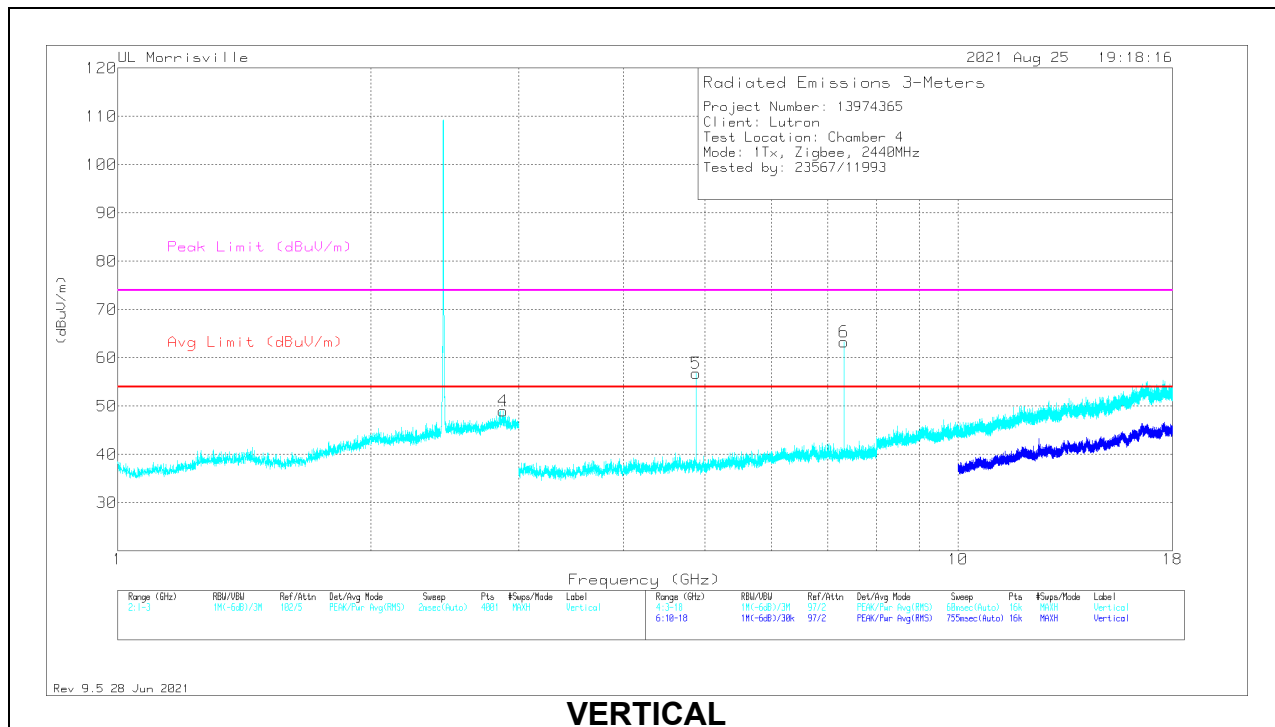
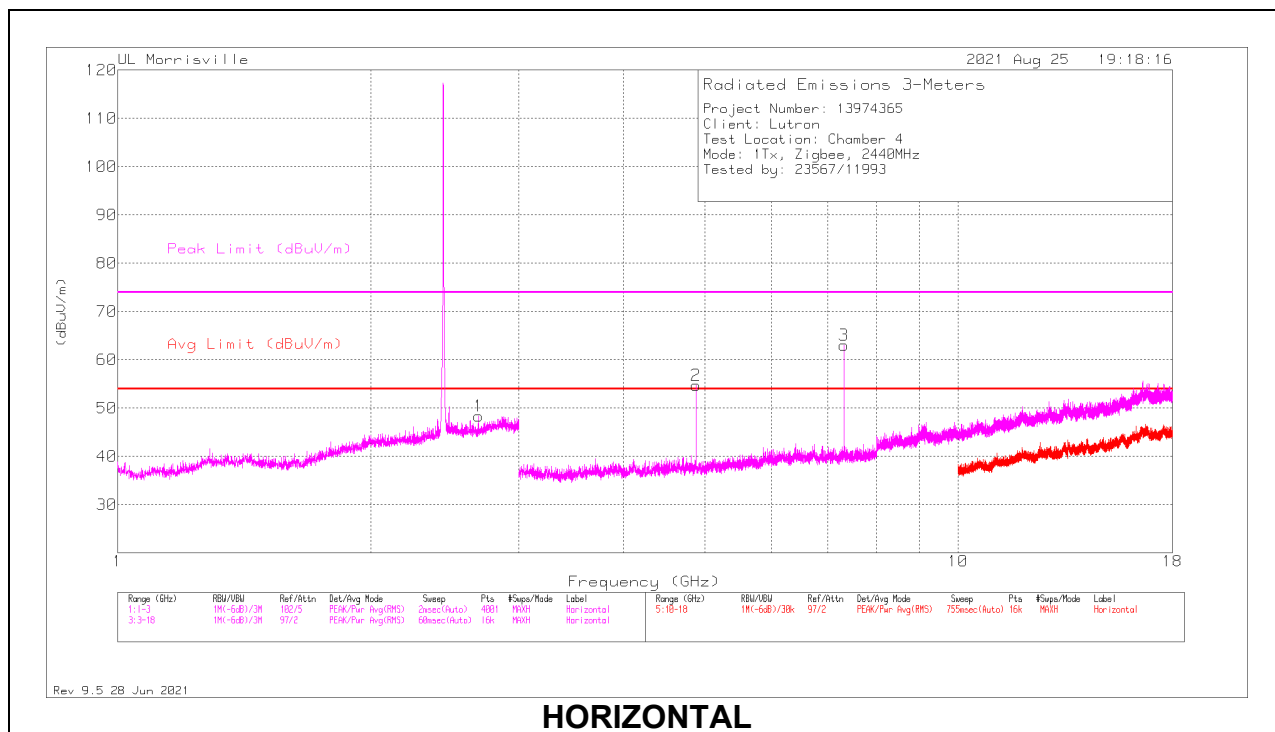
Pk - Peak detector

PK2 - Maximum Peak

ADV - Linear Voltage Average

Note: DCCF of -10.46 is based on the real-world duty cycle. Refer to section 9.1.

MID CHANNEL RESULTS



RADIATED EMISSIONS

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	206211 (dB/m)	Amp/Cbl/Filtr/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	* ** 2.68597	29.03	PK2	31.8	-13.3	0	47.53	-	-	74	-26.47	74	355	H
	* ** 2.68757	16.57	ADV	31.8	-13.3	-10.46	24.61	54	-29.39	-	-	74	355	H
4	* ** 2.87534	29.37	PK2	32.5	-12.8	0	49.07	-	-	74	-24.93	212	373	V
	* ** 2.87472	16.68	ADV	32.5	-12.8	-10.46	25.92	54	-28.08	-	-	212	373	V
2	* ** 4.88088	53.22	PK2	33.9	-32.2	0	54.92	-	-	74	-19.08	229	166	H
	* ** 4.87899	46.74	ADV	33.9	-32.2	-10.46	37.98	54	-16.02	-	-	229	166	H
3	* ** 7.31841	57.15	PK2	35.6	-28.8	0	63.95	-	-	74	-10.05	237	149	H
	* ** 7.31837	50.67	ADV	35.6	-28.8	-10.46	47.01	54	-6.99	-	-	237	149	H
5	* ** 4.881	58.81	PK2	33.9	-32.2	0	60.51	-	-	74	-13.49	107	100	V
	* ** 4.87893	53.28	ADV	33.9	-32.2	-10.46	44.52	54	-9.48	-	-	107	100	V
6	* ** 7.32152	60.35	PK2	35.6	-28.8	0	67.15	-	-	74	-6.85	340	100	V
	* ** 7.32157	53.71	ADV	35.6	-28.8	-10.46	50.05	54	-3.95	-	-	340	100	V

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

** - indicates frequency in Taiwan NCC LP0002 Restricted Band

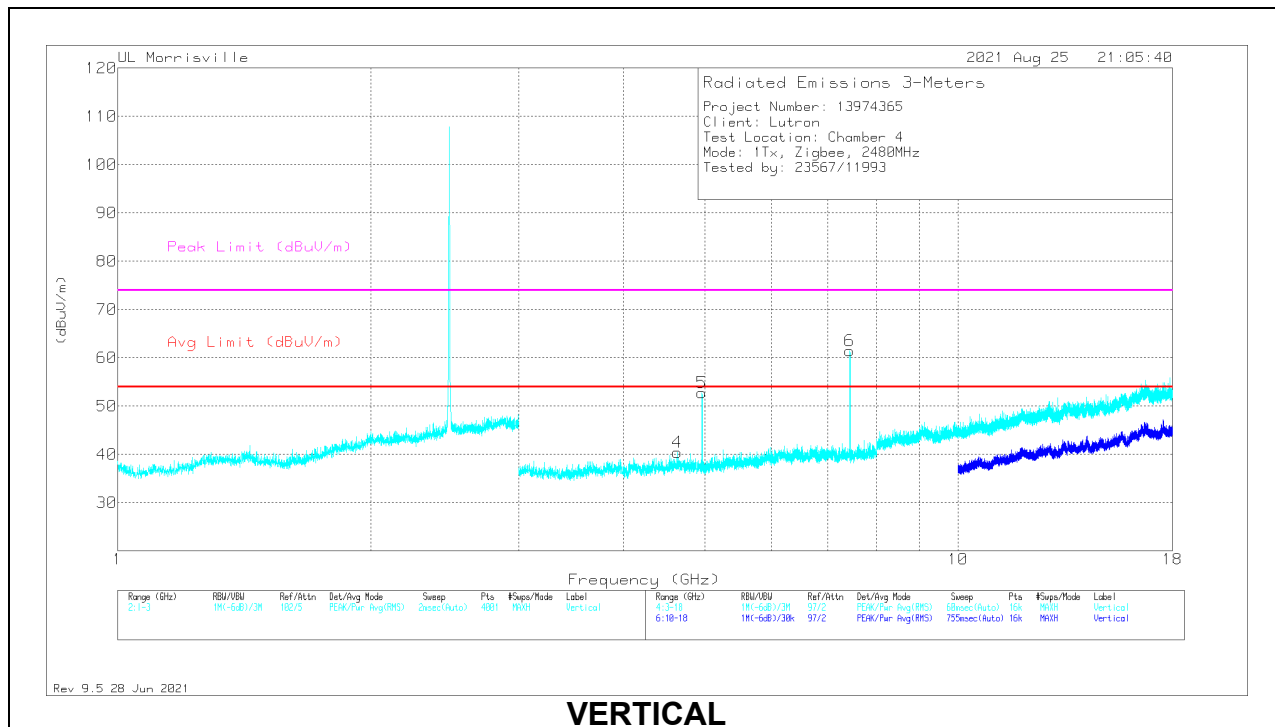
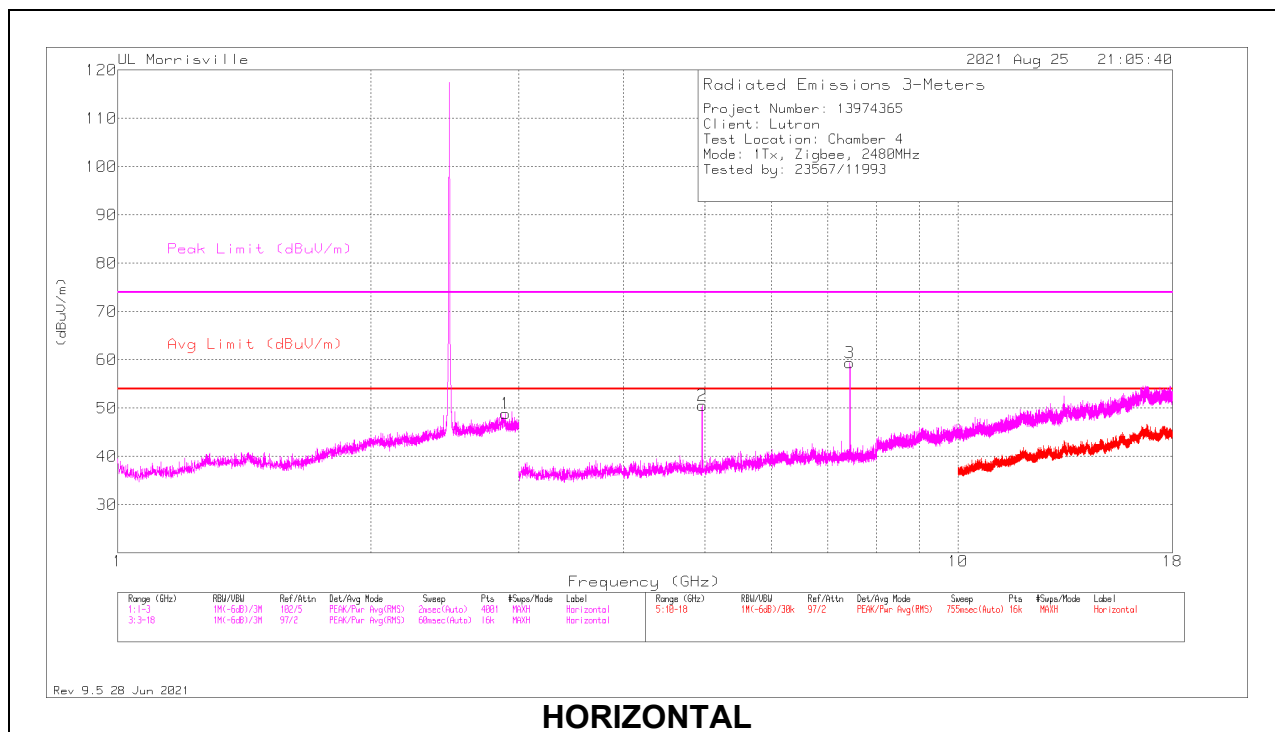
Pk - Peak detector

PK2 - Maximum Peak

ADV - Linear Voltage Average

Note: DCCF of -10.46 is based on the real-world duty cycle. Refer to section 9.1.

HIGH CHANNEL RESULTS



RADIATED EMISSIONS

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	206211 (dB/m)	Amp/Cbl/Filtr/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	* ** 2.89646	29.57	PK2	32.5	-12.8	0	49.27	-	-	74	-24.73	70	300	H
	* ** 2.89716	16.85	ADV	32.5	-12.8	-10.46	26.09	54	-27.91	-	-	70	300	H
2	* ** 4.961	46.98	PK2	33.9	-32	0	48.88	-	-	74	-25.12	240	346	H
	* ** 4.96097	38.48	ADV	33.9	-32	-10.46	29.92	54	-24.08	-	-	240	346	H
3	* ** 7.43834	54.38	PK2	35.6	-29	0	60.98	-	-	74	-13.02	237	169	H
	* ** 7.43836	47.28	ADV	35.6	-29	-10.46	43.42	54	-10.58	-	-	237	169	H
5	* ** 4.95884	51.94	PK2	33.9	-32	0	53.84	-	-	74	-20.16	260	141	V
	* ** 4.95887	45.17	ADV	33.9	-32	-10.46	36.61	54	-17.39	-	-	260	141	V
6	* ** 7.43832	57.15	PK2	35.6	-29	0	63.75	-	-	74	-10.25	340	100	V
	* ** 7.43834	50.86	ADV	35.6	-29	-10.46	47	54	-7	-	-	340	100	V
4	* ** 4.63406	38.59	Pk	34.2	-32.4	0	40.39	54	-13.61	74	-33.61	0-360	200	V

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

** - indicates frequency in Taiwan NCC LP0002 Restricted Band

Pk - Peak detector

PK2 - Maximum Peak

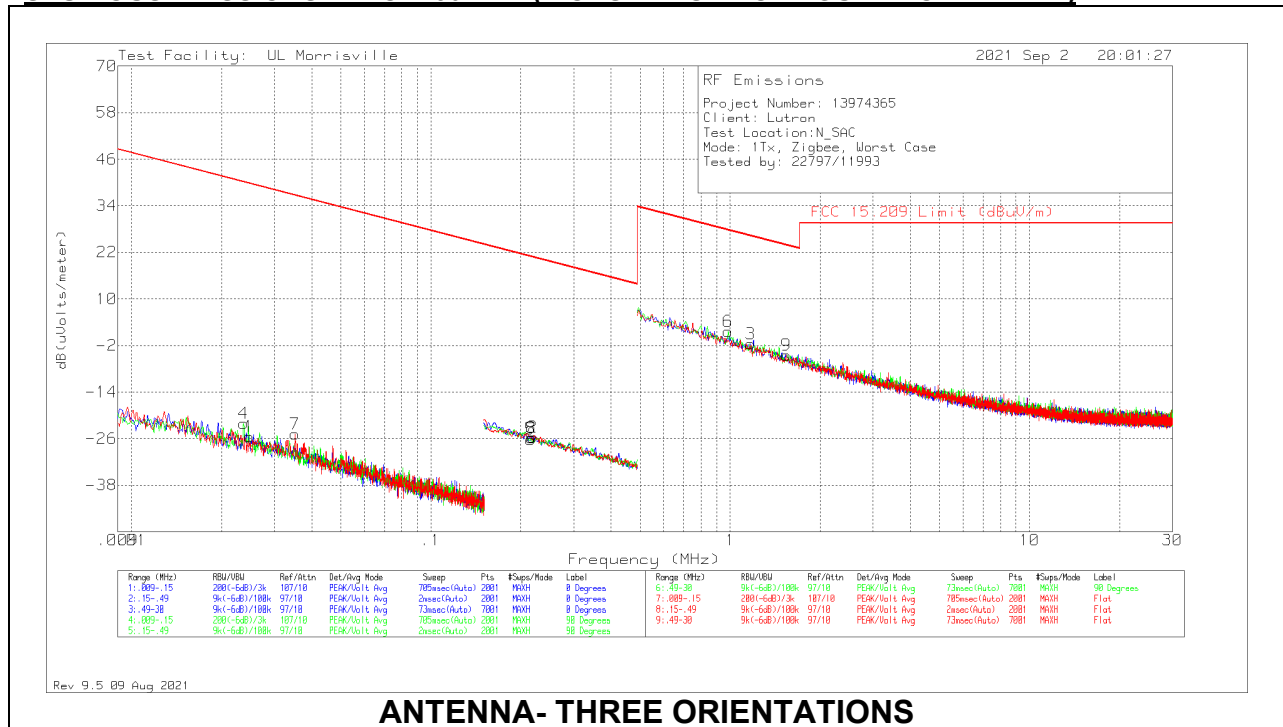
ADV - Linear Voltage Average

Note: DCCF of -10.46 is based on the real-world duty cycle. Refer to section 9.1.

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 $40 \cdot \log(\text{test distance} / \text{specification distance})$.

SPURIOUS EMISSIONS BELOW 30 MHz (WORST-CASE CONFIGURATION E-FIELD)



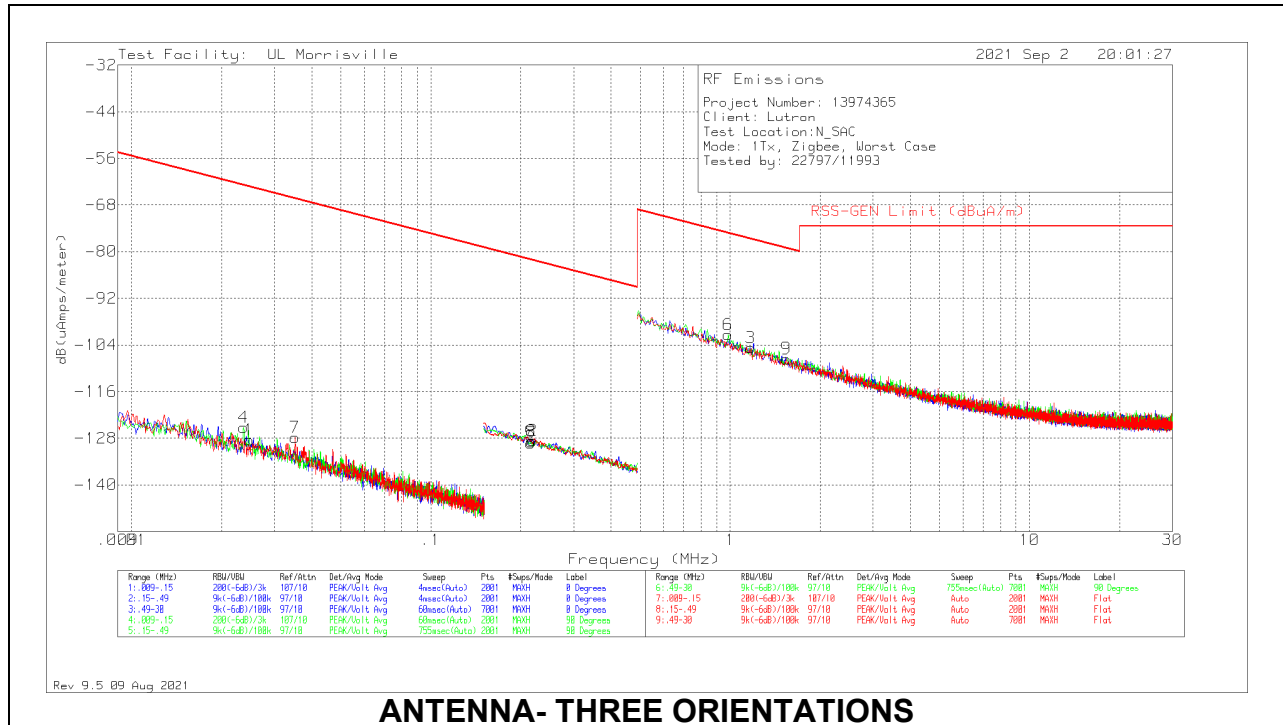
ANTENNA- THREE ORIENTATIONS

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 Qp/Av Limit (dBuV/m)	FCC 15.209 Pk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Loop Angle
4	.0237	43.94	Pk	13.8	.1	-80	-22.16	40.11	60.11	-62.27	0-360	101	90 degs
1	.02476	40.79	Pk	13.7	.1	-80	-25.41	39.73	59.73	-65.14	0-360	101	0 degs
7	.0352	42.21	Pk	12.9	.1	-80	-24.79	36.67	56.67	-61.46	0-360	101	Flat
5	.21528	42.5	Pk	11.2	.1	-80	-20.94	20.94	40.94	-47.14	0-360	101	90 degs
8	.21681	42.86	Pk	11.2	.1	-80	-25.84	20.88	40.88	-46.72	0-360	101	Flat
2	.21885	43.04	Pk	11.2	.1	-80	-25.66	20.8	40.8	-46.46	0-360	101	0 degs
6	.98327	30.11	Pk	11.3	.2	-40	1.61	27.75	-	-26.14	0-360	101	90 degs
3	1.16878	26.84	Pk	11.3	.2	-40	-1.66	26.25	-	-27.91	0-360	101	0 degs
9	1.53978	23.85	Pk	11.4	.2	-40	-4.55	23.86	-	-28.41	0-360	101	Flat

Pk - Peak detector

SPURIOUS EMISSIONS BELOW 30 MHz (WORST-CASE CONFIGURATION H-FIELD)



ANTENNA- THREE ORIENTATIONS

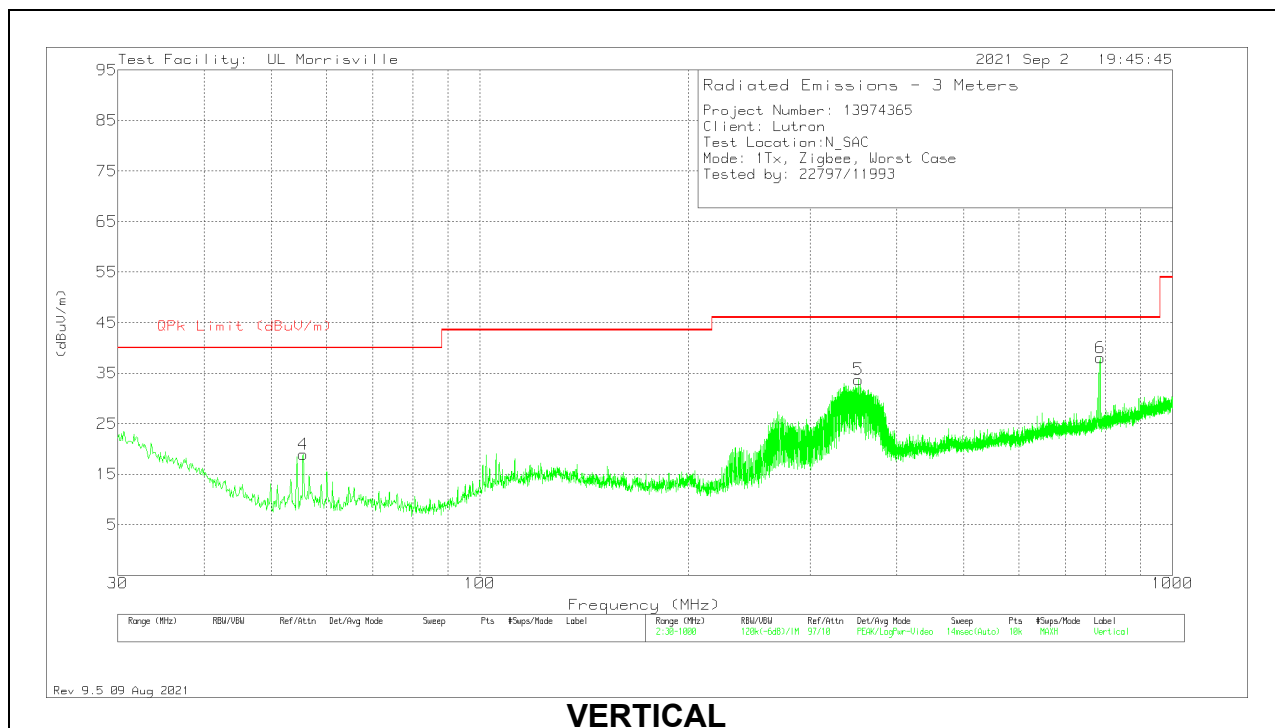
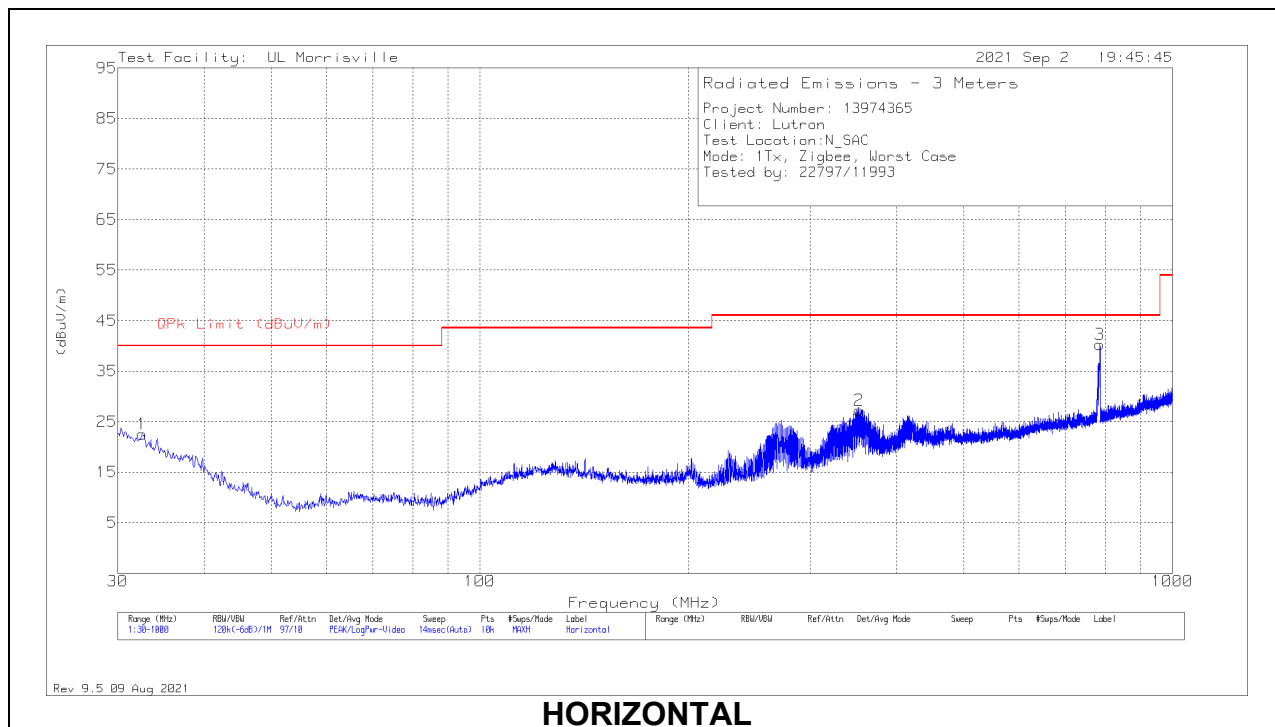
Below 30MHz Data

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AT0079 (dB/m)	Cbl (dB)	Dist. Corr. Factor (dB)	Corrected Reading dB(uAmps/meter)	RSS-GEN Qp/Av Limit (dBuA/m)	RSS-GEN Pk Limit (dBuA/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Loop Angle
4	.0237	43.94	Pk	-37.7	.1	-80	-73.66	-11.39	8.61	-62.27	0-360	101	90 degs
1	.02476	40.79	Pk	-37.8	.1	-80	-76.91	-11.77	8.23	-65.14	0-360	101	0 degs
7	.0352	42.21	Pk	-38.6	.1	-80	-76.29	-14.83	5.17	-61.46	0-360	101	Flat
5	.21528	42.5	Pk	-40.3	.1	-80	-77.7	-30.56	-10.56	-47.14	0-360	101	90 degs
8	.21681	42.86	Pk	-40.3	.1	-80	-77.34	-30.62	-10.62	-46.72	0-360	101	Flat
2	.21885	43.04	Pk	-40.3	.1	-80	-77.16	-30.7	-10.7	-46.46	0-360	101	0 degs
6	.98327	30.11	Pk	-40.2	.2	-40	-49.89	-23.75	-	-26.14	0-360	101	90 degs
3	1.16878	26.84	Pk	-40.2	.2	-40	-53.16	-25.25	-	-27.91	0-360	101	0 degs
9	1.53978	23.85	Pk	-40.1	.2	-40	-56.05	-27.64	-	-28.41	0-360	101	Flat

Pk - Peak detector

10.4. WORST CASE BELOW 1 GHZ

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



Below 1GHz Data

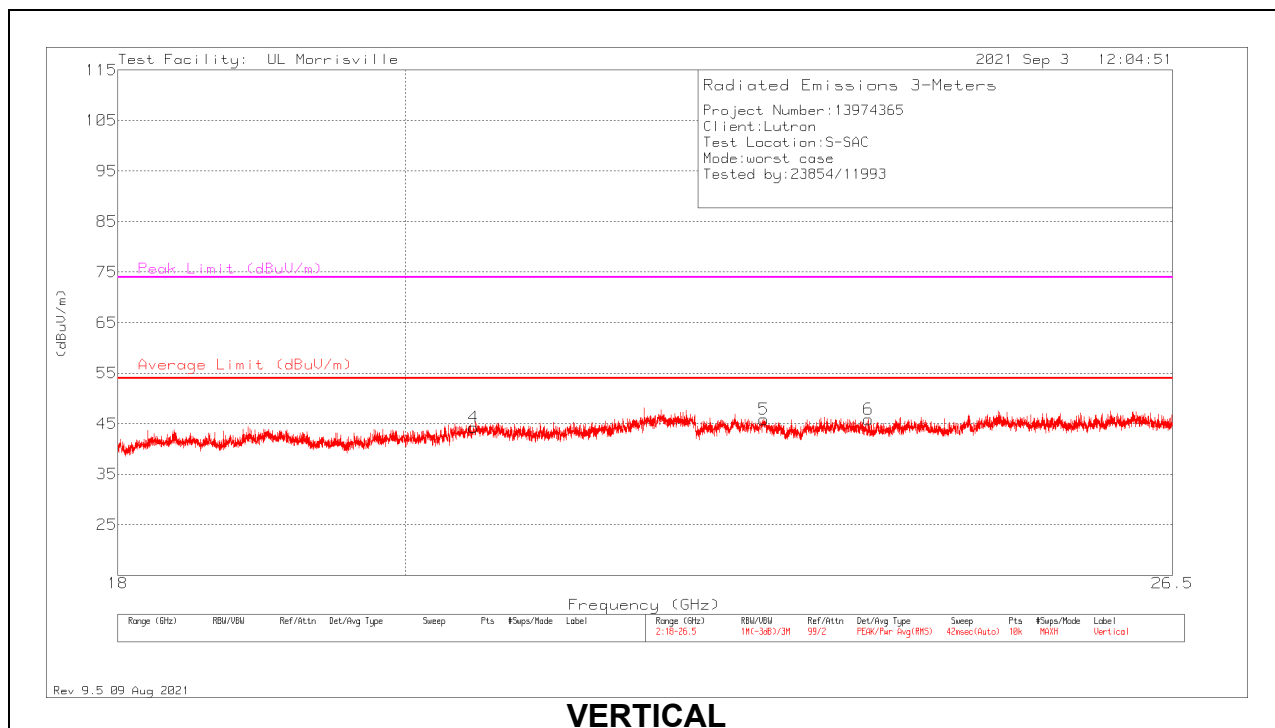
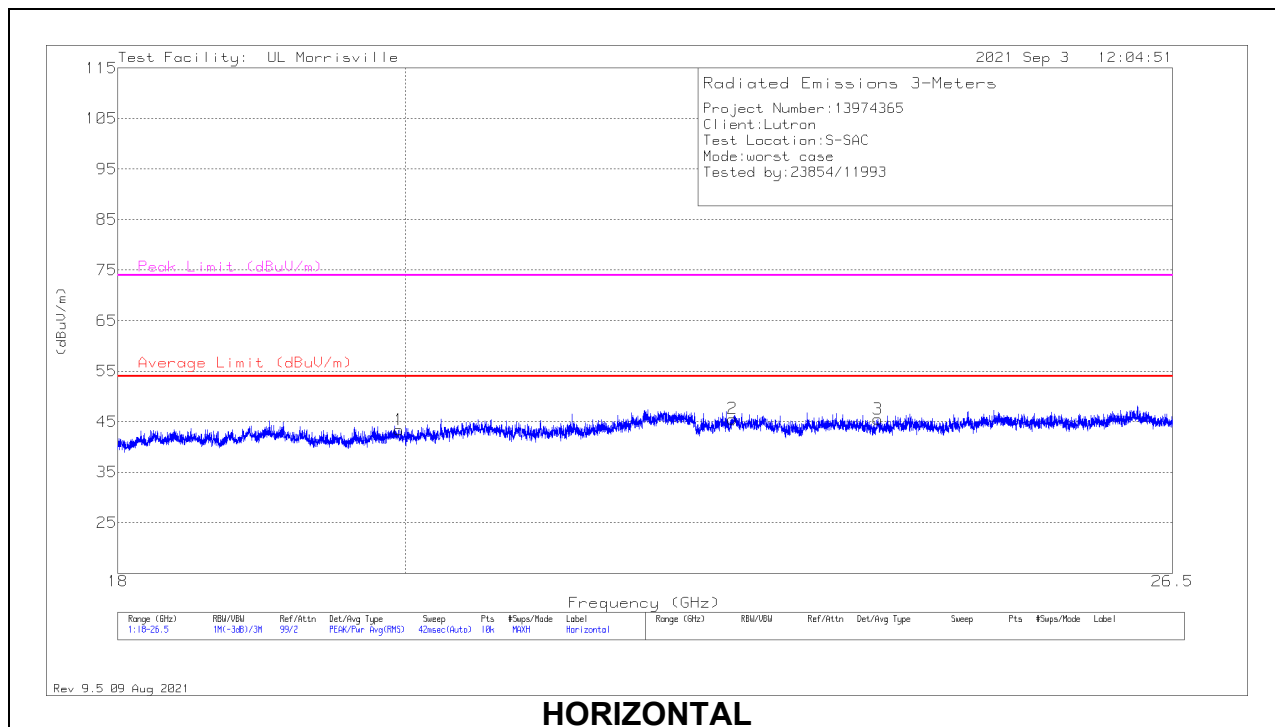
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AT0066 (dB/m)	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	32.522	28.37	Pk	25.7	-31.5	22.57	40	-17.43	0-360	200	H
4	55.608	36.88	Pk	13.1	-31	18.98	40	-21.02	0-360	100	V
5	351.846	41.46	Pk	20.6	-28.3	33.76	46.02	-12.26	0-360	100	V
2	353.107	34.86	Pk	20.6	-28.2	27.26	46.02	-18.76	0-360	299	H
3	785.769	18.3	Qp	27.9	-25.7	20.5	46.02	-25.52	15	165	H
6	786.212	35.81	Pk	27.9	-25.7	38.01	46.02	-8.01	0-360	100	V

Pk - Peak detector

Qp - Quasi-Peak detector

10.5. WORST CASE 18-26 GHZ

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



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	* ** 19.95395	48.02	Pk	33.6	-38.2	43.42	54	-10.58	74	-30.58	0-360	199	H
2	* ** 22.55214	47.07	Pk	36.3	-37.8	45.57	54	-8.43	74	-28.43	0-360	149	H
3	* ** 23.78877	47.63	Pk	34.8	-36.9	45.53	54	-8.47	74	-28.47	0-360	149	H
4	* ** 20.50725	47.92	Pk	34.1	-37.8	44.22	54	-9.78	74	-29.78	0-360	250	V
5	* ** 22.80967	47.82	Pk	35.5	-37.5	45.82	54	-8.18	74	-28.18	0-360	101	V
6	* ** 23.70718	48.42	Pk	34.9	-37.5	45.82	54	-8.18	74	-28.18	0-360	150	V

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

** - indicates frequency in Taiwan NCC LP0002 Restricted Band

Pk - Peak detector

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.

TEST PROCEDURE

The EUT is placed on a non-conducting table 40cm from the vertical ground plane and 80cm above the horizontal ground plane. The EUT is configured in accordance with ANSI C63.10.

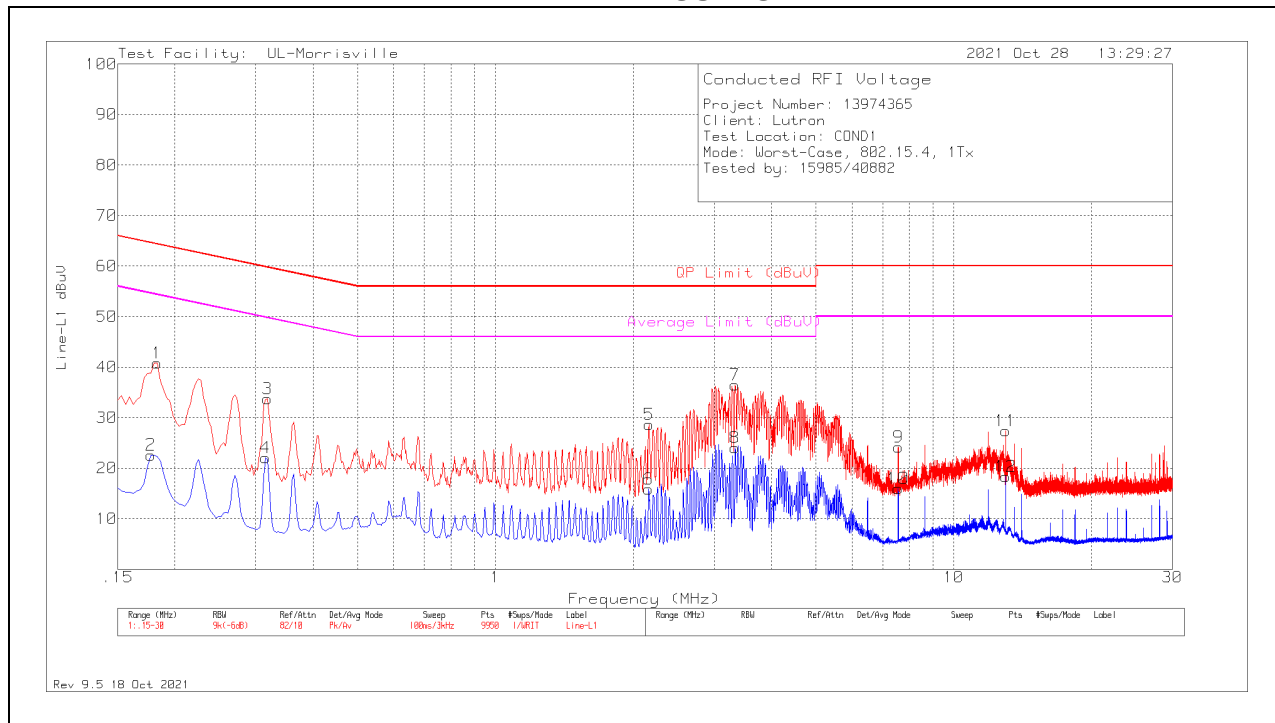
The receiver is set to a resolution bandwidth of 9kHz. Peak detection is used unless otherwise noted as quasi-peak or average.

Line conducted data is recorded for both NEUTRAL and HOT lines.

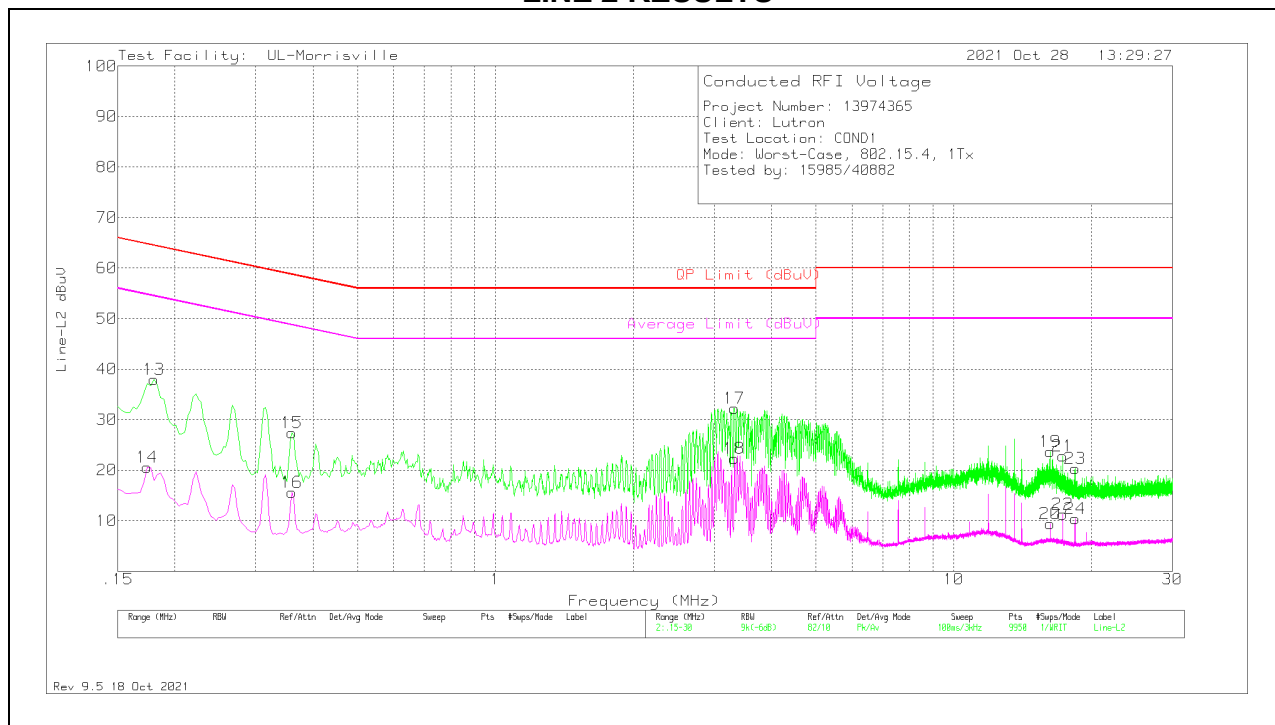
RESULTS

11.1.1. AC Power Line Norm

LINE 1 RESULTS



LINE 2 RESULTS



DATA

Range 1: Line-L1 .15 - 30MHz										
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)
2	.177	12.62	Av	.2	9.8	22.62	-	-	54.63	-32.01
1	.183	30.79	Pk	.2	9.8	40.79	64.35	-23.56	-	-
4	.315	12.13	Av	.1	9.8	22.03	-	-	49.84	-27.81
3	.318	23.87	Pk	.1	9.8	33.77	59.76	-25.99	-	-
6	2.16	6.08	Av	0	9.8	15.88	-	-	46	-30.12
5	2.163	18.81	Pk	0	9.8	28.61	56	-27.39	-	-
7	3.33	26.58	Pk	0	9.9	36.48	56	-19.52	-	-
8	3.336	14.1	Av	0	9.9	24	-	-	46	-22
10	7.566	5.83	Av	.1	10	15.93	-	-	50	-34.07
9	7.569	14.08	Pk	.1	10	24.18	60	-35.82	-	-
11	12.978	17.16	Pk	.1	10.1	27.36	60	-32.64	-	-
12	12.978	8.17	Av	.1	10.1	18.37	-	-	50	-31.63

Range 2: Line-L2 .15 - 30MHz										
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)
14	.174	10.56	Av	.2	9.8	20.56	-	-	54.77	-34.21
13	.18	28.01	Pk	.2	9.8	38.01	64.49	-26.48	-	-
15	.36	17.49	Pk	.1	9.8	27.39	58.73	-31.34	-	-
16	.36	5.67	Av	.1	9.8	15.57	-	-	48.73	-33.16
17	3.324	22.37	Pk	0	9.9	32.27	56	-23.73	-	-
18	3.324	12.46	Av	0	9.9	22.36	-	-	46	-23.64
19	16.221	13.5	Pk	.1	10.1	23.7	60	-36.3	-	-
20	16.224	-81	Av	.1	10.1	9.39	-	-	50	-40.61
21	17.304	12.62	Pk	.1	10.1	22.82	60	-37.18	-	-
22	17.304	1.03	Av	.1	10.1	11.23	-	-	50	-38.77
23	18.39	10.18	Pk	.1	10.1	20.38	60	-39.62	-	-
24	18.39	.22	Av	.1	10.1	10.42	-	-	50	-39.58

Pk - Peak detector
Av - Average detection

12. SETUP PHOTOS

Please refer to R13974365-EP1 for setup photos

END OF TEST REPORT