TEST REPORT

Report Number. : R14558600-E2

Applicant	:	Lutron Electronics CO INC 7200 Suter Rd Coopersburg, PA, 18036-1249, US
Model	:	A-WN-D01-OCC/A-WN-D01-RF
Brand	:	Lutron
FCC ID	:	JPZ0146
IC	:	2851A-JPZ0146
EUT Description	:	Low voltage lighting control interface
Test Standard(s)	:	FCC 47 CFR PART 15 SUBPART C: 2022 ISED RSS-247 ISSUE 2: 2017 ISED RSS-GEN ISSUE 5 + A2: 2021

Date Of Issue:
2022-12-29

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

ACCREDITED
CERT #0751.06

REPORT REVISION HISTORY

Rev.	Issue Date	Revisions	Revised By
V1	2022-11-17	Initial Issue	Noah Bennett
V2	2022-11-23	Revised DC equation in Section 9.1 Revised Zigbee references to 802.15.4	Brian Kiewra
V3	2022-12-02	Corrected typos is section 9.1 and firmware version in section 6.4	Brian Kiewra
V4	2022-12-15	Added attenuator to antenna port equipment list in section 8. Added additional model on cover page and sections 1 and 6.1. Writeup of model descriptions added to section 6.1	Brian Kiewra
V5	2022-12-29	Addressed TCB Feedback	Noah Bennett

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TABLE OF CONTENTS

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: Lutron Electronics CO INC
7200 Suter Rd
Coopersburg, PA, 18036-1249, US

EUT DESCRIPTION: Low voltage lighting control interface

MODEL: A-WN-D01-OCC/A-WN-D01-RF

BRAND: Lutron

SERIAL NUMBER: Non-Serialized

SAMPLE RECEIPT DATE: 2022-11-07

DATE TESTED: 2022-11-07 TO 2022-11-10

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
CFR 47 Part 15 Subpart C	Complies
ISED RSS-247 Issue 2	Complies
ISED RSS-GEN Issue 5 + A1 + A2	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 Kiewra
Project Engineer
Consumer Technology Division
UL LLC.

Prepared By:

Noah Bennett
Electrical Engineer
Consumer Technology Division
UL LLC.

2. TEST RESULTS SUMMARY

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. Below is a list of the data/info provided by the customer:

1. Antenna Gain and Type (Section 6.3)
2. Cable Loss (Section 9.4, 9.5)
3. Worst-Case data rates. (Section 6.5)
4. Operational Duty Cycle (Section 9.1)

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 (a)	RSS-Gen 8.8	AC Power Lines Conducted Measurements	Complies	None.

3. TEST METHODOLOGY

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

4. FACILITIES AND ACCREDITATION

UL LLC is accredited by A2LA, Certificate Number 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
☒	Building 2800 Suite Perimeter Park Dr. Suite B Morrisville, NC 27560, U.S.A	US0067	27265	825374

5. DECISION RULES AND MEASUREMENT UNCERTAINTY

5.1. METROLOGICAL TRACEABILITY

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

5.2. DECISION RULES

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

5.3. MEASUREMENT UNCERTAINTY

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

PARAMETER	U_{Lab}
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%

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 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

6. EQUIPMENT UNDER TEST

6.1. EUT DESCRIPTION

The EUT is a low voltage lighting control interface with integrated wireless communication. It contains a RF transceiver and antenna that cannot be changed by the user. The device is used as part of an integrated lighting system. The purpose of the wireless communication is to receive commands and transmit status back to the control system.

Model A-WN-D01-OCC (tested model) includes an onboard PIR Occupancy Sensor so the device can support native room occupancy scanning. The model number A-WN-D01-RF utilizes the same PCB and wireless circuitry but the PIR circuit is not populated in manufacturing. Testing on the A-WN-D01-OCC device covers the evaluation of the A-WN-D01-RF.

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)
2405-2475	802.15.4	18.58	72.11

6.3. DESCRIPTION OF AVAILABLE ANTENNAS

The antenna(s) gain and type, as provided by the manufacturer' are as follows:
The radio utilizes a permanently attached dipole antenna, with a maximum gain of 1.0 dBi.

6.4. SOFTWARE AND FIRMWARE

The EUT firmware installed during testing was 07910266.
The test utility software used during testing was Lutron Radio Certification GUI v1.2.

6.5. WORST-CASE CONFIGURATION AND MODE

Radiated emissions below 1GHz and above 18GHz were performed with the EUT set to transmit at the channel with highest power spectral density 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 channel at it's only data rate.

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.

6.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	**Manufacturer**	**Model**	**Serial Number**	**FCC ID**
Laptop	HP	14-dk1003dx	5CG016B3DL	TX2-RTL8821CE
EUT Power Supply	Lutron	DFC-OEM-DBI	N/A	N/A

I/O CABLES

I/O Cable List						
Cable No.	**Port**	**# of Identical Ports**	**Connector Type**	**Cable Type**	**Cable Length (m)**	**Remarks**
1	AC Power	1	Type B (NEMA 5-15)	Unshielded Copper Wire	<3m	Used to connect EUT power supply to AC Mains

TEST SETUP

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

SETUP DIAGRAMS

Please refer to R14558600-EP1 for setup diagrams

7. MEASUREMENT METHOD

On time and Duty Cycle: ANSI C63.10 subclause 11.6

6 dB BW: ANSI C63.10 Subclause -11.8.1

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)

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

Radiated emissions restricted frequency bands: ANSI C63.10 Subclause -11.12.1 and 6.10.5

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

AC Power-line conducted emissions ANSI C63.10-2013 Section 6.2

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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 - Wireless Conducted Measurement Equipment

Equipment ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
HI0090	Environmental Meter	Fisher Scientific	15-077-963	2022-07-20	2023-07-20
SA0025	Spectrum Analyzer	Keysight Technologies	N9030A	2022-05-02	2023-05-02
PWM003	RF Power Meter	Keysight Technologies	N1911A	2022-09-10	2023-09-10
PWS002	Wideband Power Sensor 50MHz-18GHz	Keysight Technologies	N1921A	2022-09-27	2023-09-27
226559	SMA Coaxial 10dB Attenuator 25MHz-18GHz	CentricRF	C18S2-10	2022-05-03	2023-05-03
SOFTEMI	Antenna Port Software	UL	Version 2022.8.16		

Test Equipment Used - Radiated Disturbance Emissions Test Equipment (Morrisville – Chamber 1)

Equip. ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
	0.009-30MHz				
AT0079	Active Loop Antenna	ETS-Lindgren	6502	2022-09-12	2023-09-12
	30-1000 MHz				
AT0066	Hybrid Broadband Antenna	Sunol Sciences Corp.	JB1	2022-03-01	2023-03-01
	1-18 GHz				
AT0072	Double-Ridged Waveguide Horn Antenna, 1 to 18 GHz	ETS Lindgren	3117	2022-05-11	2023-05-11
	18-40 GHz				
204704	Horn Antenna, 18-26.5GHz	Com-Power	AH-626	2022-07-11	2023-07-11
	Gain-Loss Chains				
C1-SAC01	Gain-loss string: 0.009-30MHz	Various	Various	2022-05-05	2023-05-05
C1-SAC02	Gain-loss string: 25-1000MHz	Various	Various	2022-05-05	2023-05-05
C1-SAC03	Gain-loss string: 1-18GHz	Various	Various	2022-05-05	2023-05-05
C1-SAC04	Gain-loss string: 18-40GHz	Various	Various	2022-05-05	2023-05-05
	Receiver & Software				
197954	Spectrum Analyzer	Rohde & Schwarz	ESW44	2022-04-14	2023-04-14
SA0026	Spectrum Analyzer	Agilent	N9030A	2022-08-02	2023-08-02
SOFTEMI	EMI Software	UL	Version 9.5 (18 Oct 2021)		
	Additional Equipment used				
200539	Environmental Meter	Fisher Scientific	15-077-963 s/n 18474341	2022-10-05	2023-10-05

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	2022-04-05	2023-04-05
HI0091	Environmental Meter	Fisher Scientific	15-077-963	2022-07-20	2023-07-20
LISN003	LISN, 50-ohm/50-uH, 250uH 2-conductor, 25A	Fischer Custom Com.	FCC-LISN-50/250-25-2-01	2022-08-01	2023-08-01
75141	EMI Test Receiver 9kHz-7GHz	Rohde & Schwarz	ESCI 7	2022-08-03	2023-08-03
ATA222	Transient Limiter, 0.009-100MHz	Electro-Metrics	EM-7600	2022-04-05	2023-04-05
PS215	AC Power Source	Elgar	CW2501M (s/n 1523A02397)	NA	NA
SOFTEMI	EMI Software	UL	Version 9.5 (18 Oct 2021)		

9. ANTENNA PORT TEST RESULTS

9.1. ON TIME AND DUTY CYCLE

LIMITS

None; for reporting purposes only.

PROCEDURE

On time and Duty Cycle: ANSI C63.10 subclause 11.6

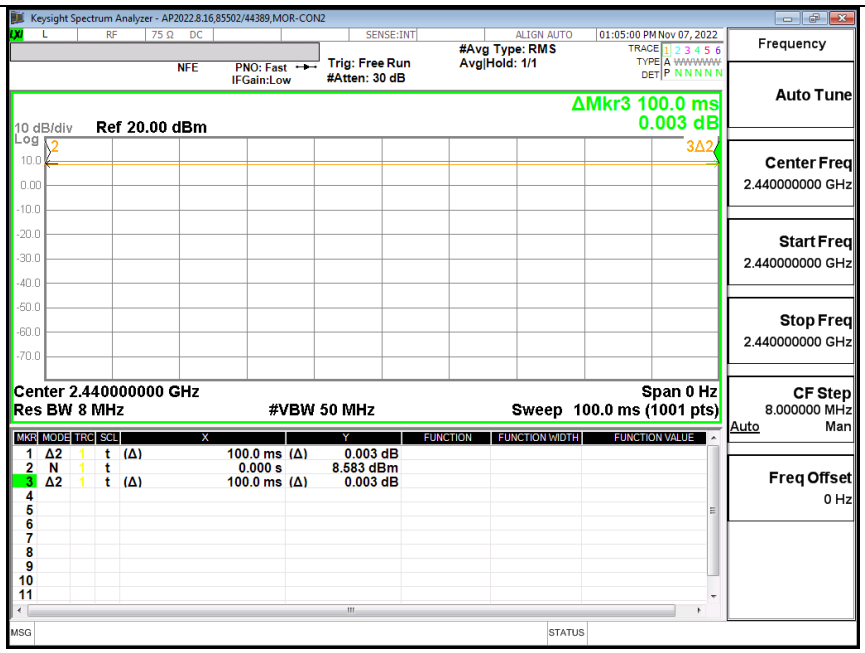
KDB 558074 Zero-Span Spectrum Analyzer Method.

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						
802.15.4	100.0	100.0	1.000	100.00%	0.00	0.010

Note: The manufacture has declared a real-life duty cycle of 32% over a 100ms window for 802.15.4. The correction factor, therefore, would be 20log(0.32) = -9.90dB. According to KDB 558074 D01, Question 3, Answer 3, Part C), this -9.90dB can be manually subtracted from average measurements, when the duty cycle of the EUT in test mode is >98%. This correction has been performed as applicable on radiated measurements in section 10.

DUTY CYCLE PLOTS



DUTY CYCLE 802.15.4

9.2. 99% BANDWIDTH

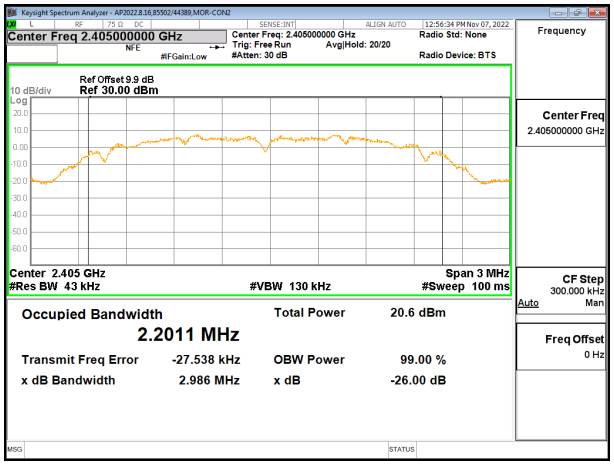
LIMITS

None; for reporting purposes only.

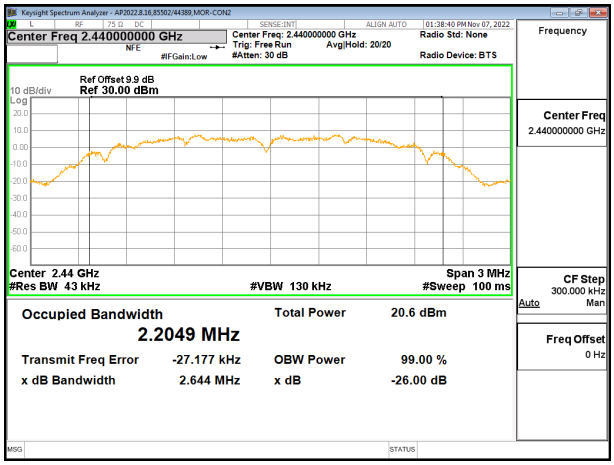
RESULTS

9.2.1. 802.15.4

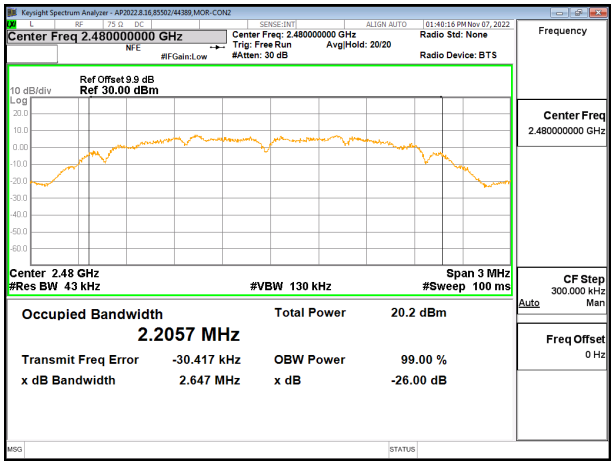
Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2405	2.2011
Middle	2445	2.2049
High	2480	2.2057



LOW CHANNEL



MID CHANNEL



HIGH CHANNEL

9.3. 6 dB BANDWIDTH

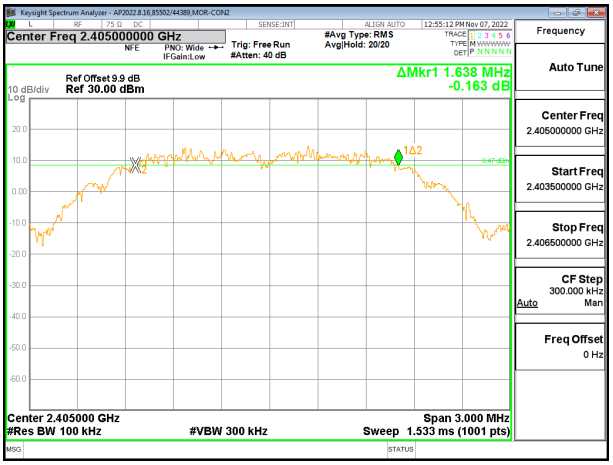
LIMITS

FCC §15.247 (a) (2)
RSS-247 5.2 (a)
The minimum 6 dB bandwidth shall be at least 500 kHz.

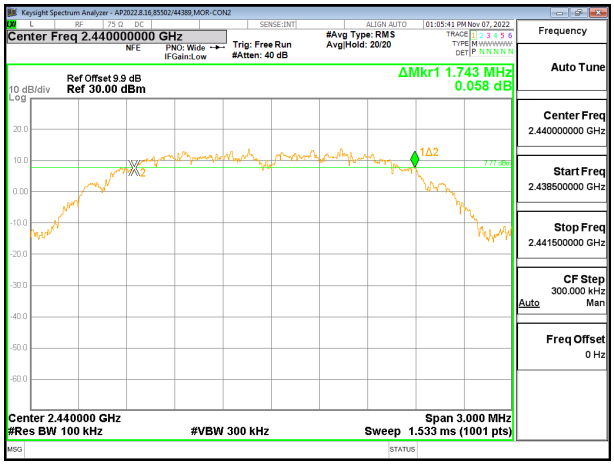
RESULTS

9.3.1. 802.15.4

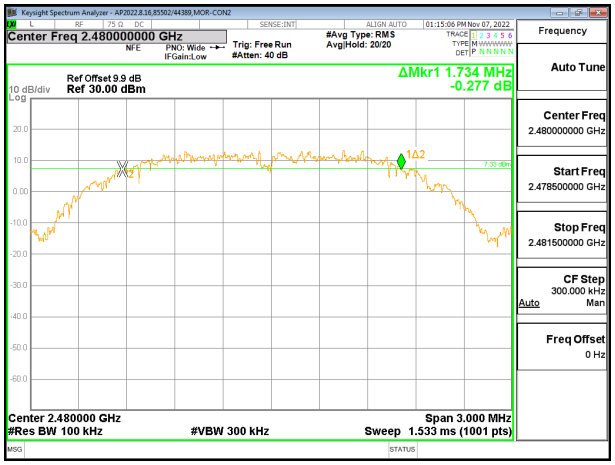
Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2405	1.638	0.5
Middle	2445	1.743	0.5
High	2480	1.734	0.5



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 9.90 dB (including 9.65 dB pad and 0.25 dB cable) was entered as an offset in the power meter.

RESULTS

9.4.1. 802.15.4

Tested By:	85502/44389
Date:	2022-11-07

Channel	Frequency (MHz)	Peak Power Reading (dBm)	Limit (dBm)	Margin (dB)
Low	2405	18.58	30	-11.420
Middle	2445	18.48	30	-11.520
High	2480	18.25	30	-11.750

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 9.90 dB (including 9.65 dB pad and 0.25 dB cable) was entered as an offset in the power meter.

RESULTS

9.5.1. 802.15.4

Tested By:	85502/44389
Date:	2022-11-07

Channel	Frequency (MHz)	AV power (dBm)
Low	2405	18.48
Middle	2445	18.36
High	2480	18.14

9.6. POWER SPECTRAL DENSITY

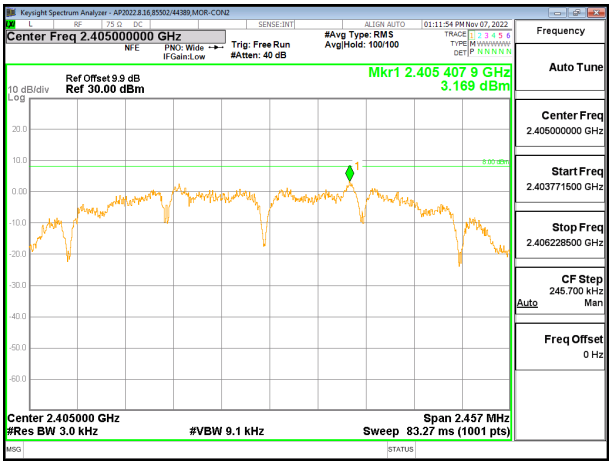
LIMITS

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.

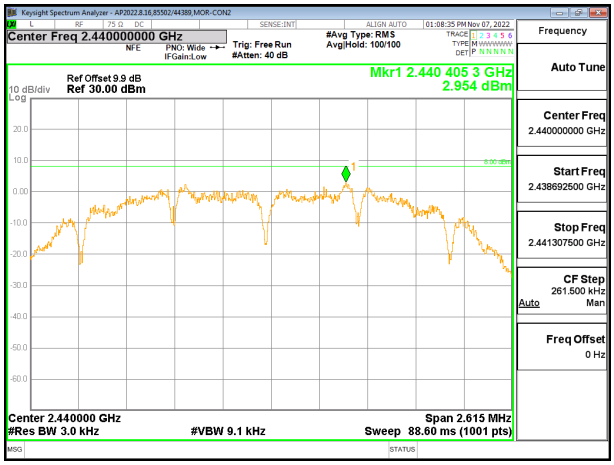
RESULTS

9.6.1. 802.15.4

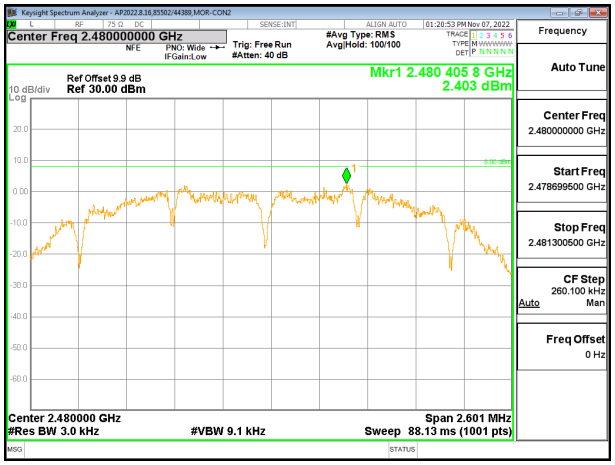
Channel	Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Margin (dB)
Low	2405	3.169	8	-4.83
Middle	2445	2.954	8	-5.05
High	2480	2.403	8	-5.60



LOW CHANNEL



MID CHANNEL



HIGH CHANNEL

9.7. CONDUCTED SPURIOUS EMISSIONS

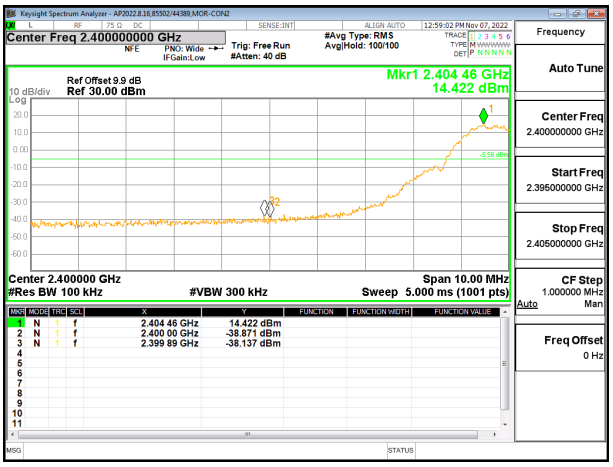
LIMITS

FCC §15.247 (d)
RSS-247 5.5

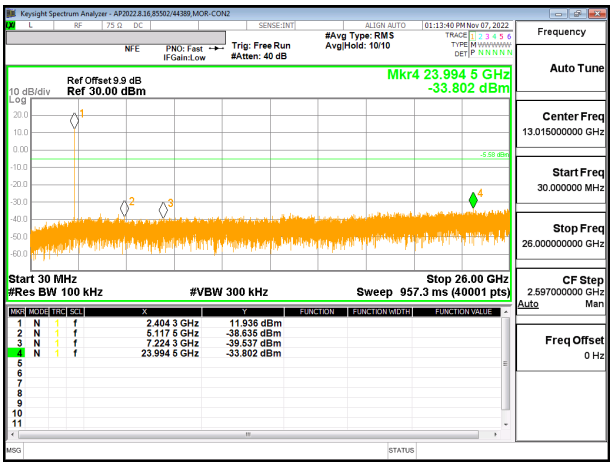
Output power was measured based on the use of a peak measurement; therefore the required attenuation is -20 dBc.

RESULTS

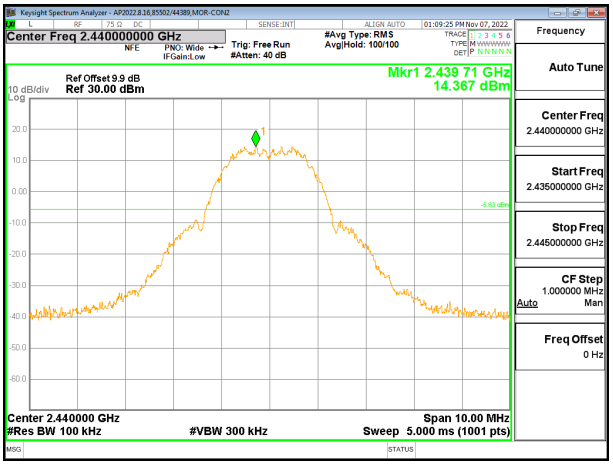
9.7.1. 802.15.4



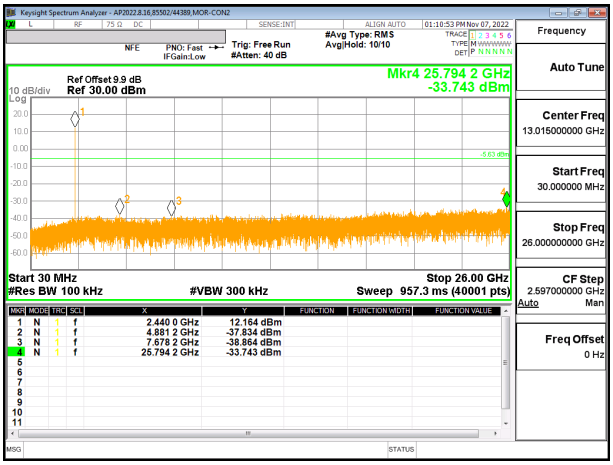
LOW CHANNEL BANDEDGE



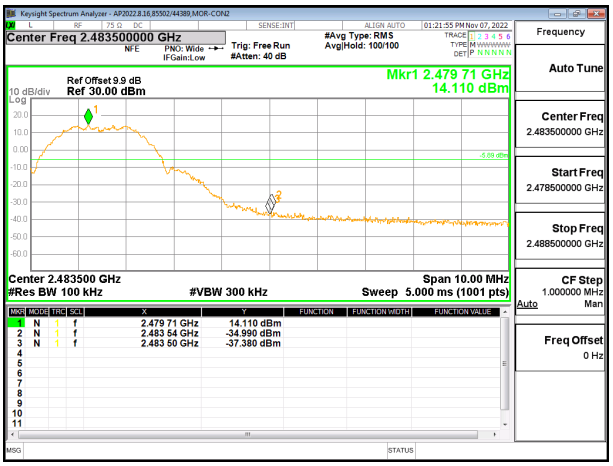
OUT-OF-BAND LOW CHANNEL



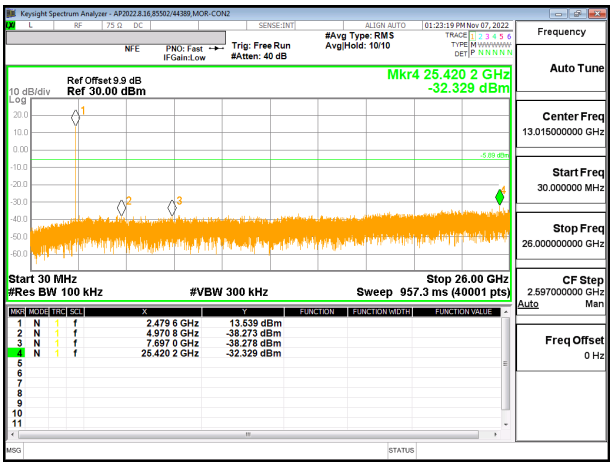
IN-BAND REFERENCE LEVEL



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

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	6.37/F(kHz) @ 30 m	-
1.705 - 30	.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 average measurements. Linear Voltage Averaging was used.

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 power spectral density 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.

Note: For all average measurements, the Real-Life Duty Cycle Correction factor was applied after the tests were run. Therefore, the tabular data are the actual measurements, and the plots may not line up with the tabular. All testing was performed according to ANSI C63.10.

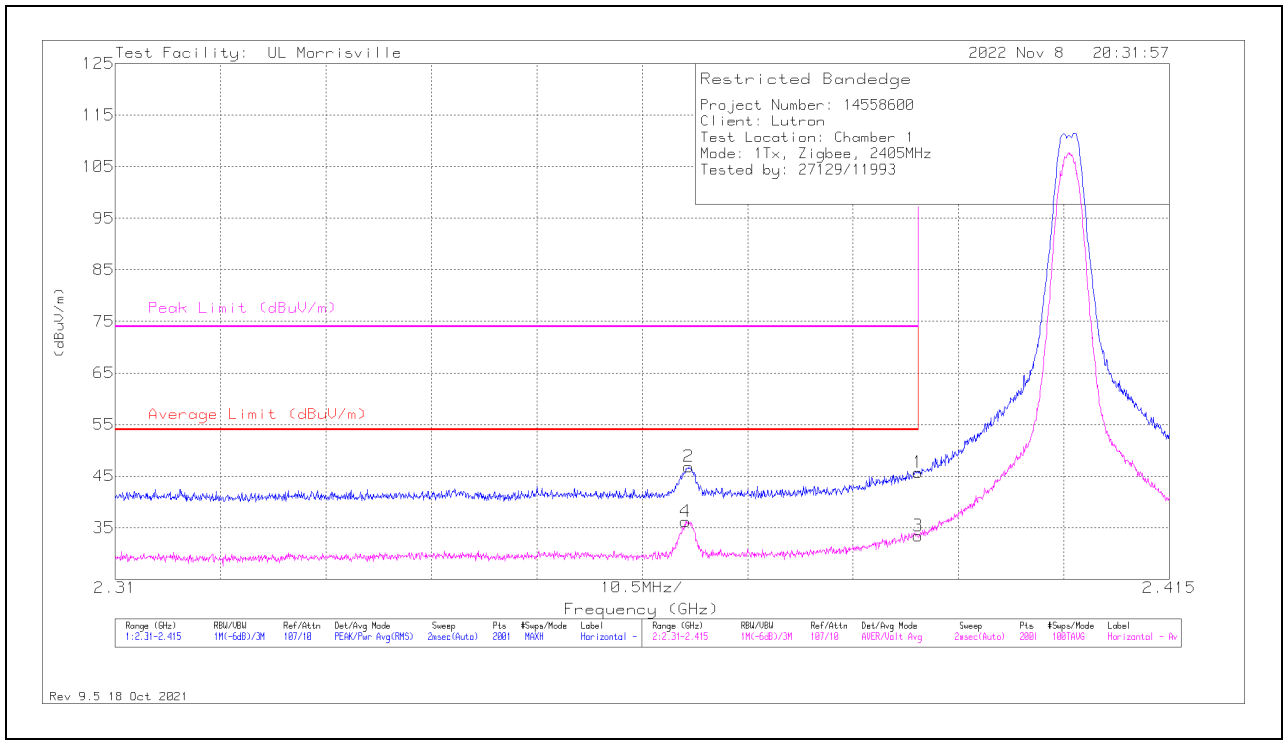
10.2. TRANSMITTER ABOVE 1 GHz

10.2.1. 802.15.4

Antenna 1

BANDEDGE (LOW CHANNEL)

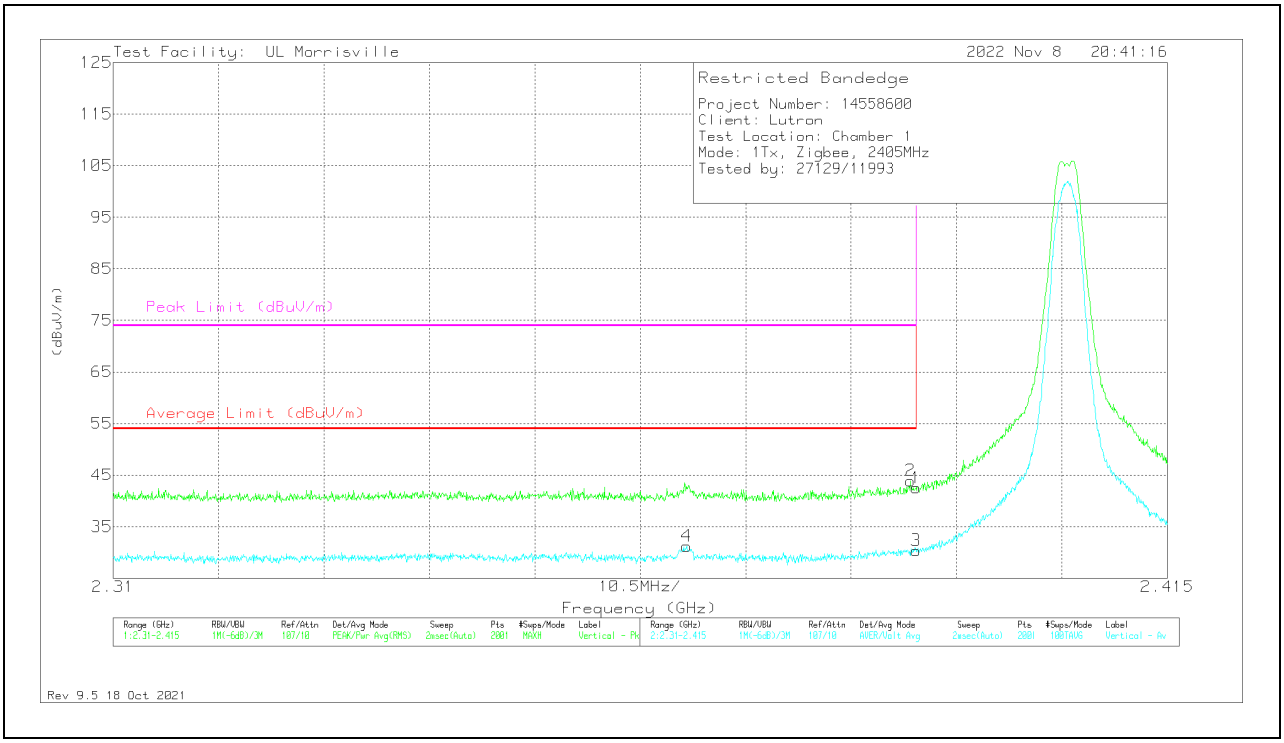
HORIZONTAL RESULT



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 (dB/m)	Gain/Loss (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	* ** 2.38996	38.52	Pk	32	-24.8	0	45.72	-	-	74	-28.28	140	250	H
2	* ** 2.36712	39.64	Pk	32	-24.8	0	46.84	-	-	74	-27.16	140	250	H
3	* ** 2.38996	26.22	ADV	32	-24.8	-9.90	23.52	54	-30.48	-	-	140	250	H
4	* ** 2.36681	29.02	ADV	32	-24.8	-9.90	26.32	54	-27.68	-	-	140	250	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: For all average measurements, the Real-Life Duty Cycle Correction factor was applied after the tests were run. Therefore, the tabular data are the actual measurements, and the plots may not line up with the tabular. All testing was performed according to ANSI C63.10.

VERTICAL RESULT

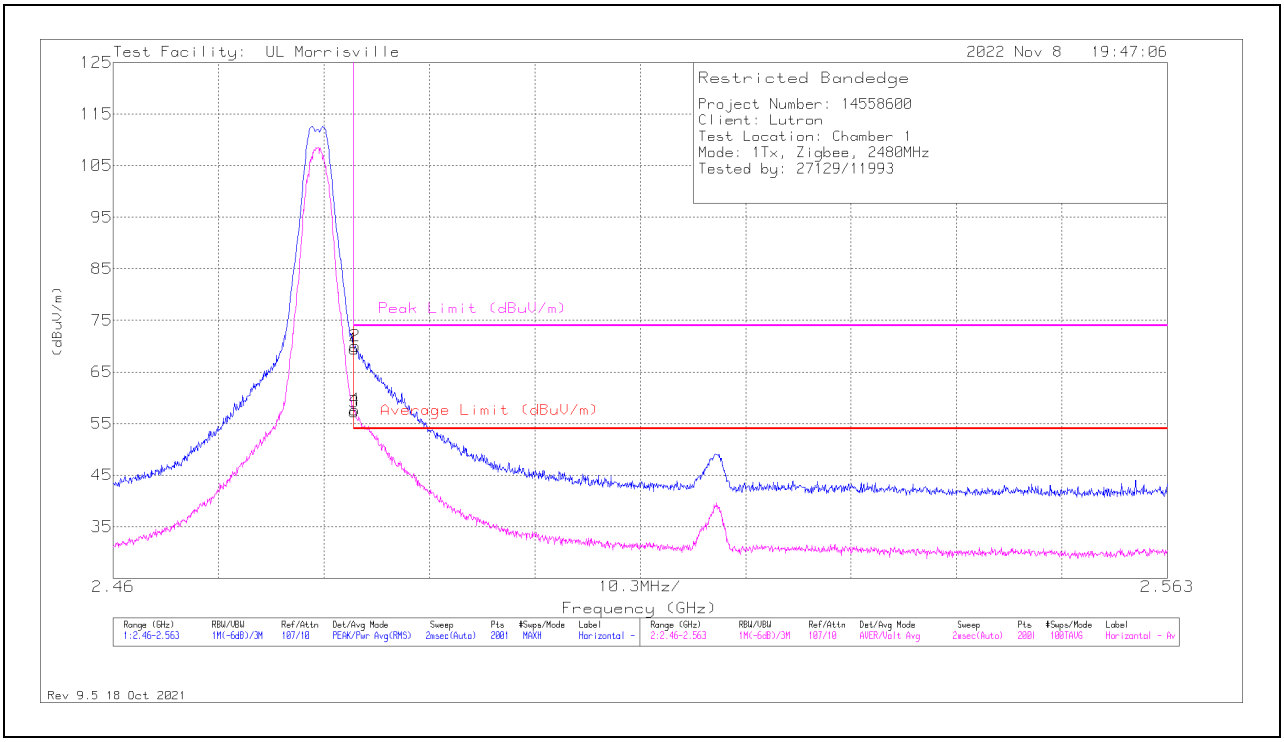


Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 (dB/m)	Gain/Loss (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 2.38996	35.3	Pk	32	-24.8	0	42.5	-	-	74	-31.5	45	363	V
2	* ** 2.38943	36.62	Pk	32	-24.7	0	43.92	-	-	74	-30.08	45	363	V
3	* ** 2.38996	23.15	ADV	32	-24.8	-9.90	20.45	54	-33.55	-	-	45	363	V
4	* ** 2.36712	24.04	ADV	32	-24.8	-9.90	21.34	54	-32.66	-	-	45	363	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: For all average measurements, the Real-Life Duty Cycle Correction factor was applied after the tests were run. Therefore, the tabular data are the actual measurements, and the plots may not line up with the tabular. All testing was performed according to ANSI C63.10.

BANDEDGE (HIGH CHANNEL)

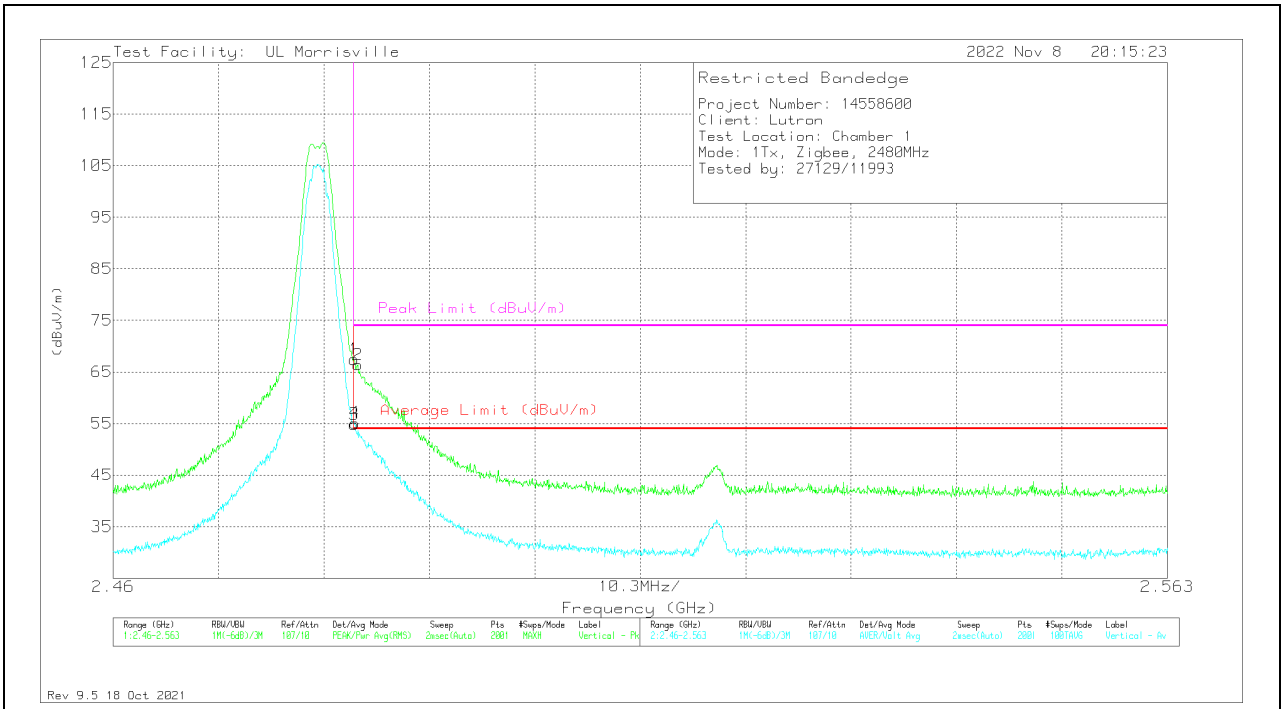
HORIZONTAL RESULT



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 (dB/m)	Gain/Loss (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	61.33	Pk	32.5	-24.4	0	69.43	-	-	74	-4.57	310	373	H
2	* ** 2.48364	61.9	Pk	32.5	-24.4	0	70	-	-	74	-4	310	373	H
3	* ** 2.48354	49.14	ADV	32.5	-24.4	-9.90	47.34	54	-6.66	-	-	310	373	H
4	* ** 2.48359	49.57	ADV	32.5	-24.4	-9.90	47.77	54	-6.23	-	-	310	373	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: For all average measurements, the Real-Life Duty Cycle Correction factor was applied after the tests were run. Therefore, the tabular data are the actual measurements, and the plots may not line up with the tabular. All testing was performed according to ANSI C63.10.

VERTICAL RESULT

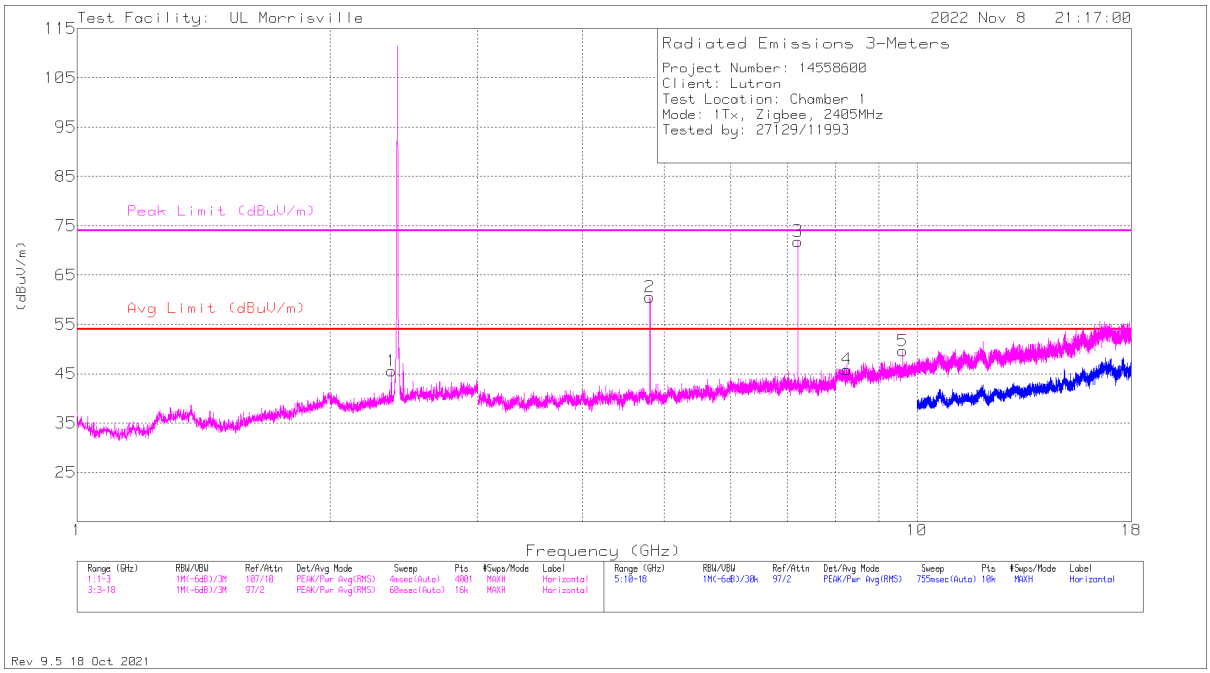


Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 (dB/m)	Gain/Loss (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 2.48354	59.34	Pk	32.5	-24.4	0	67.44	-	-	74	-6.56	239	334	V
2	* ** 2.4839	58.3	Pk	32.5	-24.4	0	66.4	-	-	74	-7.6	239	334	V
3	* ** 2.48354	46.76	ADV	32.5	-24.4	-9.90	44.96	54	-9.04	-	-	239	334	V
4	* ** 2.48359	47.03	ADV	32.5	-24.4	-9.90	45.23	54	-8.77	-	-	239	334	V

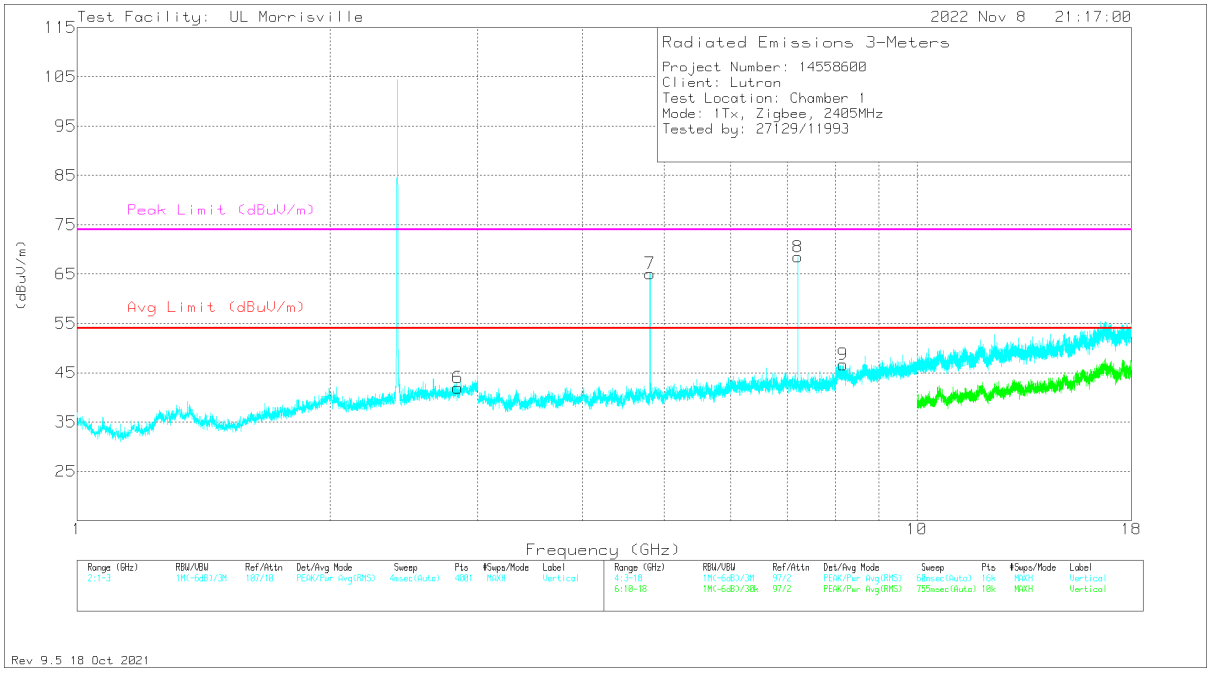
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
** - indicates frequency in Taiwan NCC LP0002 Restricted Band
Pk - Peak detector
ADV - Linear Voltage Average
Note: For all average measurements, the Real-Life Duty Cycle Correction factor was applied after the tests were run. Therefore, the tabular data are the actual measurements, and the plots may not line up with the tabular. All testing was performed according to ANSI C63.10.

HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL RESULTS



HORIZONTAL



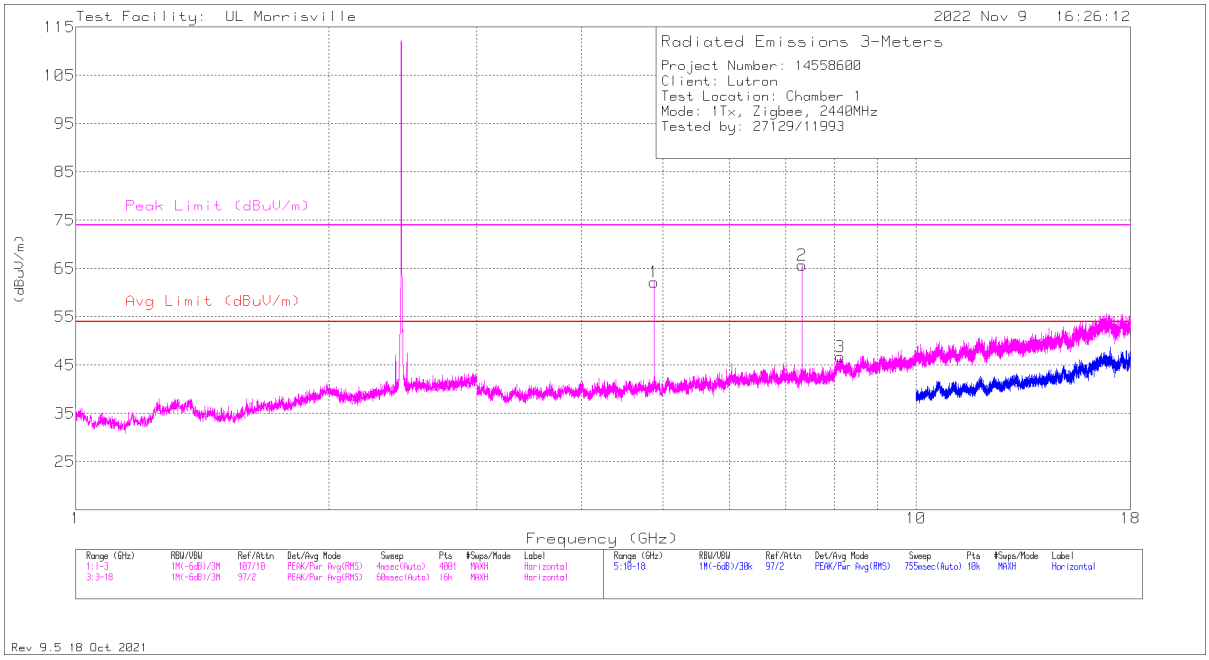
VERTICAL

RADIATED EMISSIONS

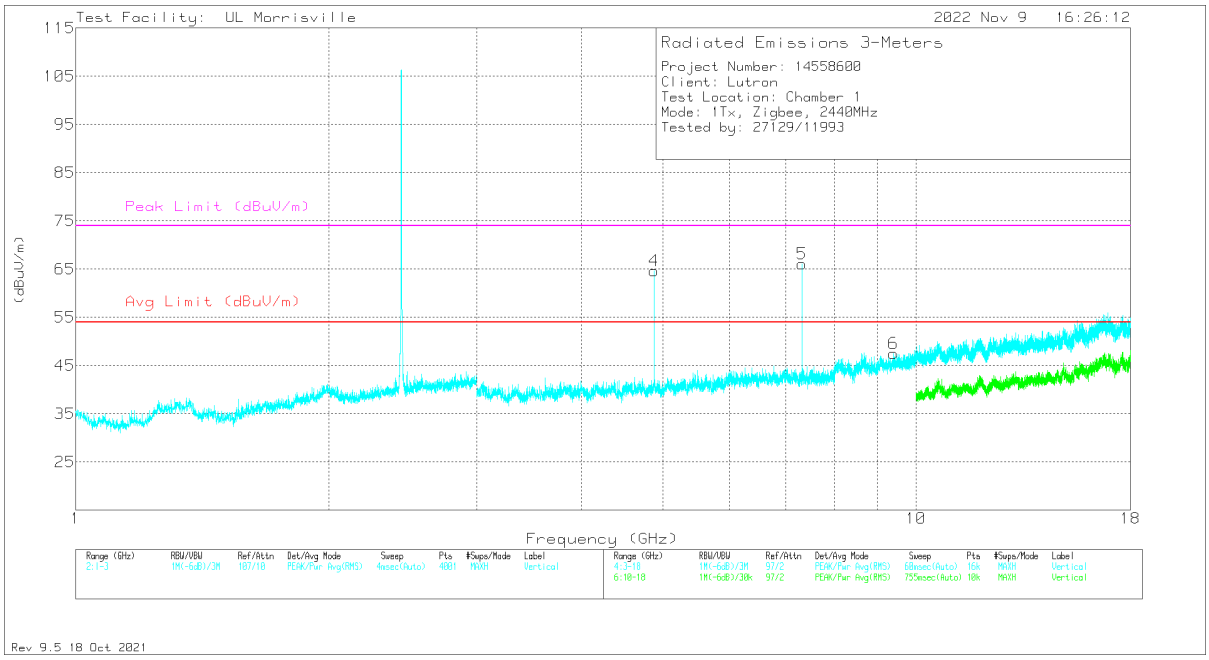
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 (dB/m)	Gain/Loss (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 2.367	38.36	Pk	32	-24.8	0	45.56	54	-8.44	74	-28.44	0-360	199	H
6	* ** 2.84	33.45	Pk	32.5	-24	0	41.95	54	-12.05	74	-32.05	0-360	200	V
2	* ** 4.80894	59.67	PK2	34.1	-32	0	61.77	-	-	74	-12.23	176	120	H
	* ** 4.80879	53.76	ADV	34.1	-32	-9.90	45.96	54	-8.04	-	-	176	120	H
4	* ** 8.25094	39.18	Pk	35.8	-29.1	0	45.88	54	-8.12	74	-28.12	0-360	101	H
7	* ** 4.81096	64.03	PK2	34.1	-32	0	66.13	-	-	74	-7.87	44	107	V
	* ** 4.81108	58.75	ADV	34.1	-32	-9.90	50.95	54	-3.05	-	-	44	107	V
9	* ** 8.17125	40.07	Pk	35.8	-29.2	0	46.67	54	-7.33	74	-27.33	0-360	200	V
8	7.21313	62.96	Pk	35.7	-30.2	0	68.46	-	-	-	-	0-360	101	V
3	7.21688	65.93	Pk	35.7	-29.8	0	71.83	-	-	-	-	0-360	101	H
5	9.6225	41.42	Pk	36.8	-28.6	0	49.62	-	-	-	-	0-360	200	H

* - 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: For all average measurements, the Real-Life Duty Cycle Correction factor was applied after the tests were run. Therefore, the tabular data are the actual measurements, and the plots may not line up with the tabular. All testing was performed according to ANSI C63.10.

MID CHANNEL RESULTS



HORIZONTAL



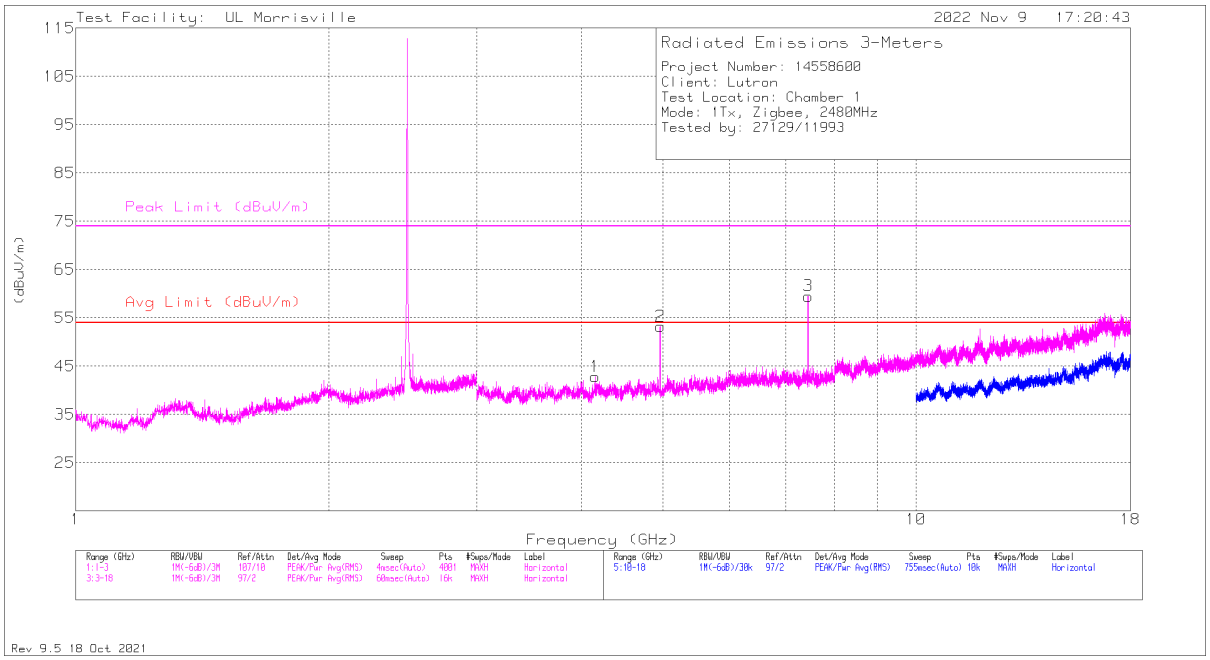
VERTICAL

RADIATED EMISSIONS

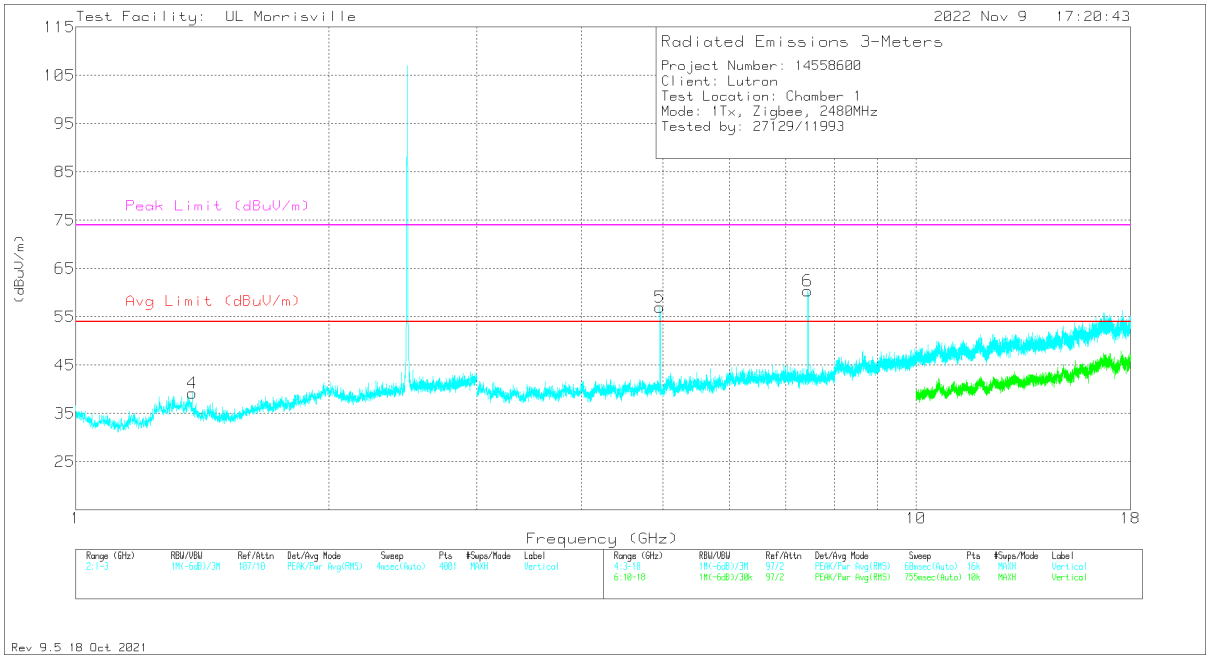
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 (dB/m)	Gain/Loss (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 4.88097	59.92	PK2	34	-31.5	0	62.42	-	-	74	-11.58	201	383	H
	* ** 4.88099	53.89	ADV	34	-31.5	-9.90	46.49	54	-7.51	-	-	201	383	H
2	* ** 7.31832	58.7	PK2	35.6	-29.6	0	64.7	-	-	74	-9.3	128	384	H
	* ** 7.31807	52.36	ADV	35.6	-29.6	-9.90	48.46	54	-5.54	-	-	128	384	H
3	* ** 8.12438	40.58	Pk	35.8	-29.6	0	46.78	54	-7.22	74	-27.22	0-360	200	H
4	* ** 4.87892	61.04	PK2	34	-31.3	0	63.74	-	-	74	-10.26	40	106	V
	* ** 4.87882	55.12	ADV	34	-31.3	-9.90	47.92	54	-6.08	-	-	40	106	V
5	* ** 7.31838	60.99	PK2	35.6	-29.6	0	66.99	-	-	74	-7.01	356	106	V
	* ** 7.32145	54.24	ADV	35.6	-29.4	-9.90	50.54	54	-3.46	-	-	356	106	V
6	* ** 9.40406	39.24	Pk	36.6	-28.3	0	47.54	54	-6.46	74	-26.46	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: For all average measurements, the Real-Life Duty Cycle Correction factor was applied after the tests were run. Therefore, the tabular data are the actual measurements, and the plots may not line up with the tabular. All testing was performed according to ANSI C63.10.

HIGH CHANNEL RESULTS



HORIZONTAL



VERTICAL

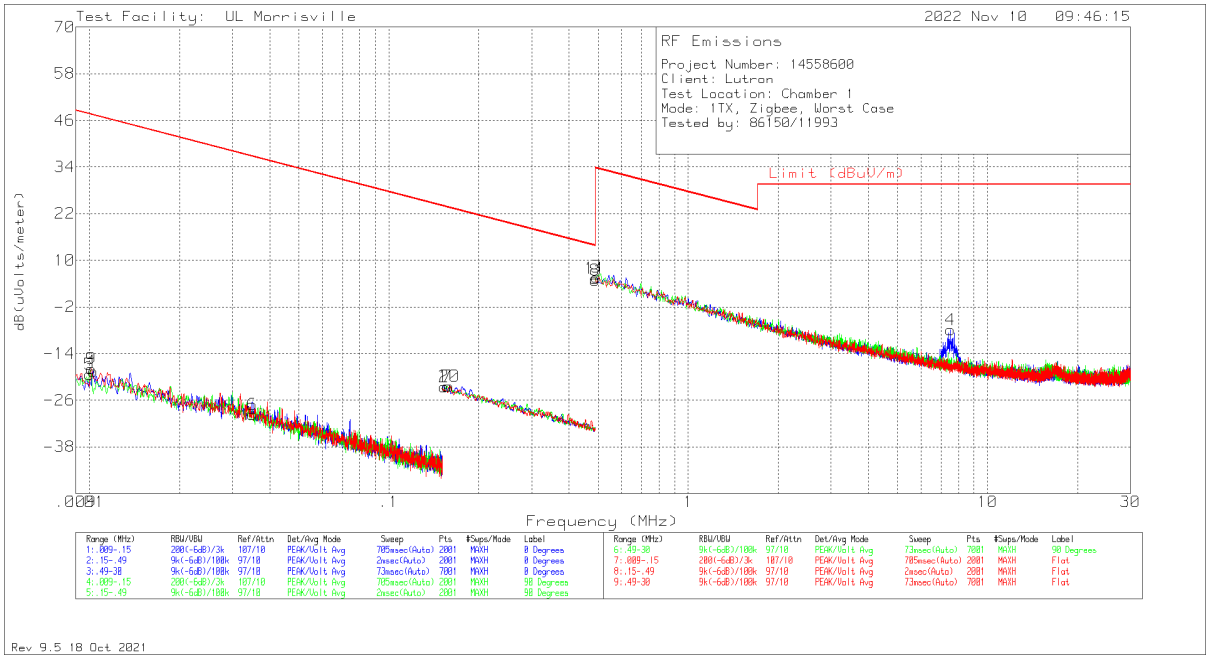
RADIATED EMISSIONS

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 (dB/m)	Gain/Loss (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
4	* ** 1.375	35.75	Pk	29.2	-25.8	0	39.15	54	-14.85	74	-34.85	0-360	101	V
1	* ** 4.15125	41.97	Pk	33.4	-32.5	0	42.87	54	-11.13	74	-31.13	0-360	101	H
2	* ** 4.9588	54.56	PK2	34	-32.7	0	55.86	-	-	74	-18.14	181	330	H
	* ** 4.95874	47.81	ADV	34	-32.7	-9.90	39.21	54	-14.79	-	-	181	330	H
3	* ** 7.43843	54.92	PK2	35.6	-29.6	0	60.92	-	-	74	-13.08	107	178	H
	* ** 7.43838	47.66	ADV	35.6	-29.6	-9.90	43.76	54	-10.24	-	-	107	178	H
5	* ** 4.95895	56.53	PK2	34	-32.7	0	57.83	-	-	74	-16.17	78	130	V
	* ** 4.95889	50.05	ADV	34	-32.7	-9.90	41.45	54	-12.55	-	-	78	130	V
6	* ** 7.43819	55.83	PK2	35.6	-29.6	0	61.83	-	-	74	-12.17	356	106	V
	* ** 7.43818	48.74	ADV	35.6	-29.6	-9.90	44.84	54	-9.16	-	-	356	106	V

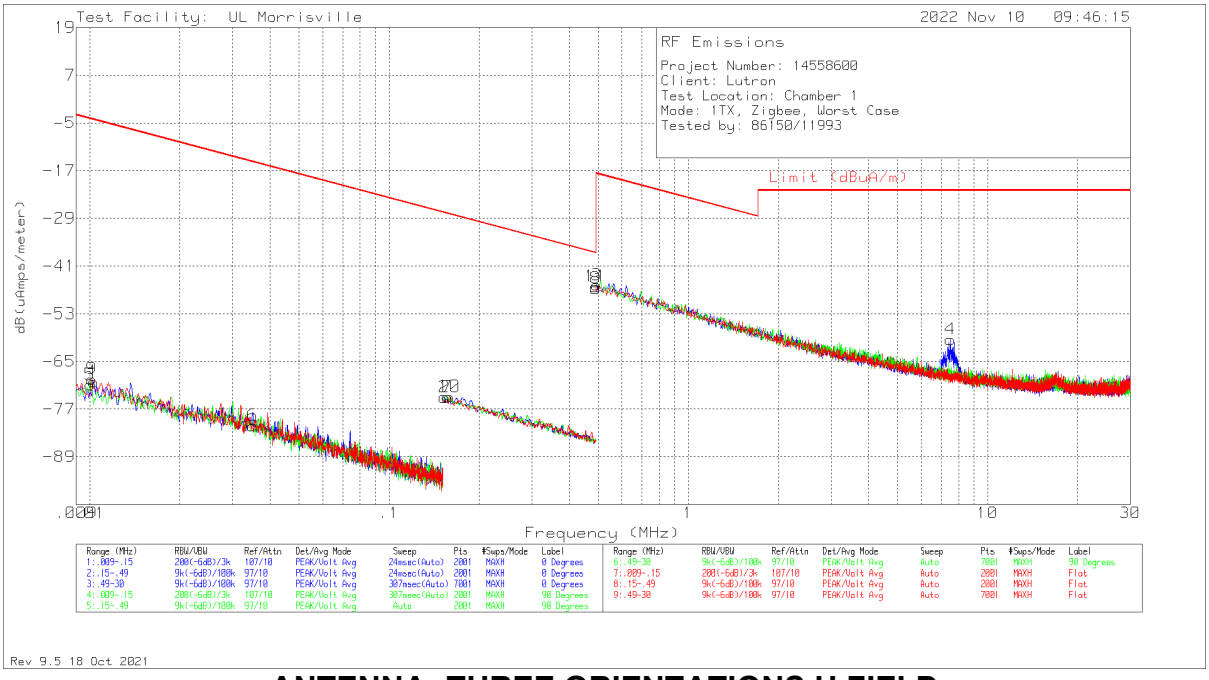
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
** - indicates frequency in Taiwan NCC LP0002 Restricted Band
Pk - Peak detector
PK2 - Maximum Peak
ADV - Linear Voltage Average
Note: For all average measurements, the Real-Life Duty Cycle Correction factor was applied after the tests were run. Therefore, the tabular data are the actual measurements, and the plots may not line up with the tabular. All testing was performed according to ANSI C63.10.

10.3. WORST CASE BELOW 30MHZ

SPURIOUS EMISSIONS BELOW 30 MHz (WORST-CASE CONFIGURATION)



ANTENNA- THREE ORIENTATIONS E FIELD



ANTENNA- THREE ORIENTATIONS H FIELD

Below 30MHz Data E FIELD

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AT0079 (dB/m)	Gain/Loss (dB)	Dist. Corr. Factor (dB)	Corrected Reading dB(uVolts/meter)	QP/AV Limit (dBuV/m)	PK Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Loop Angle
5	.00999	42.11	Pk	18.4	.1	-80	-19.39	47.61	67.61	-67	0-360	400	90 degs
9	.01014	43.67	Pk	18.3	.1	-80	-17.93	47.49	67.49	-65.42	0-360	400	Flat
1	.01028	42.99	Pk	18.3	.1	-80	-18.61	47.37	67.37	-65.98	0-360	400	0 degs
6	.03506	37.37	Pk	12.9	.1	-80	-29.63	36.71	56.71	-66.34	0-360	400	90 degs
2	.15289	46.31	Pk	11.1	.1	-80	-22.49	23.92	43.92	-46.41	0-360	400	0 degs
7	.15663	46.36	Pk	11.1	.1	-80	-22.44	23.71	43.71	-46.15	0-360	400	90 degs
10	.15935	46.38	Pk	11.1	.1	-80	-22.42	23.56	43.56	-45.98	0-360	400	Flat
8	.49	33.71	Pk	11	.2	-40	4.91	13.8	33.8	-8.89	0-360	400	90 degs
11	.49	34.15	Pk	11	.2	-40	5.35	13.8	33.8	-8.45	0-360	400	Flat
3	.49422	34.54	Pk	11	.2	-40	5.74	33.73	-	-27.99	0-360	400	0 degs
4	7.51386	20.44	Pk	11	.6	-40	-7.96	29.54	-	-37.5	0-360	400	0 degs

Pk - Peak detector

Below 30MHz Data H FIELD

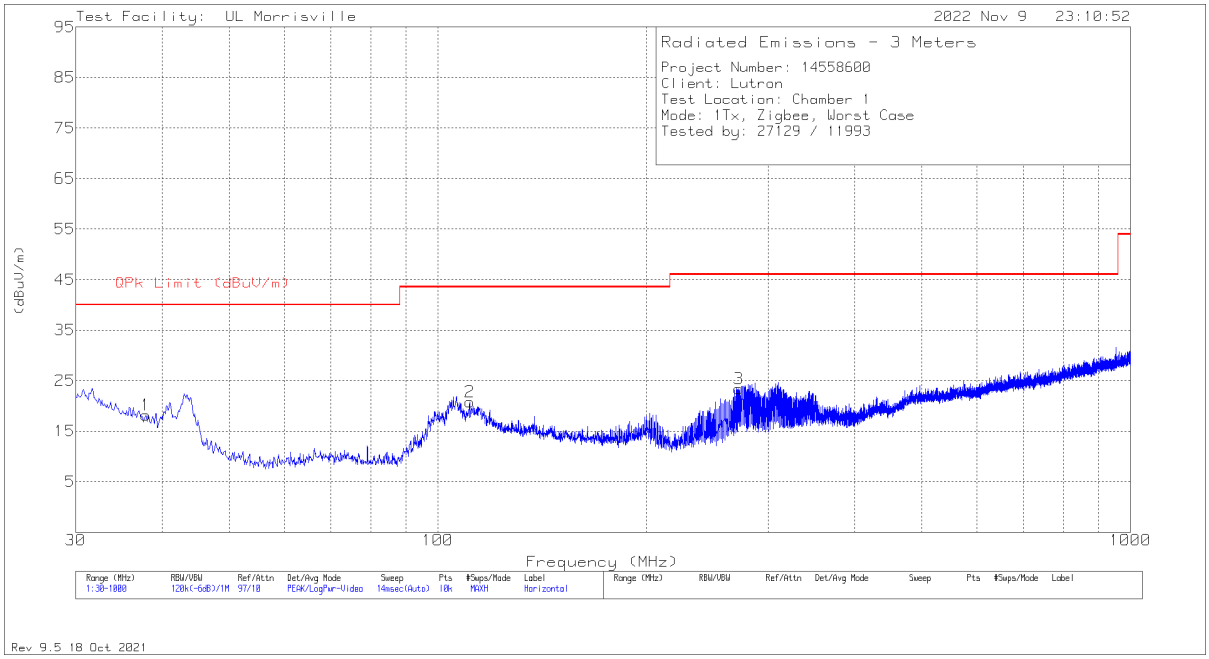
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AT0079 (dB/m)	Gain/Loss (dB)	Dist. Corr. Factor (dB)	Corrected Reading dB(uAmps/meter)	QP/AV Limit (dBuA/m)	PK Limit (dBuA/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Loop Angle
5	.00999	42.11	Pk	-33.1	.1	-80	-70.89	-3.89	16.11	-67	0-360	400	90 degs
9	.01014	43.67	Pk	-33.2	.1	-80	-69.43	-4.01	15.99	-65.42	0-360	400	Flat
1	.01028	42.99	Pk	-33.2	.1	-80	-70.11	-4.13	15.87	-65.98	0-360	400	0 degs
6	.03506	37.37	Pk	-38.6	.1	-80	-81.13	-14.79	5.21	-66.34	0-360	400	90 degs
2	.15289	46.31	Pk	-40.4	.1	-80	-73.99	-27.58	-7.58	-46.41	0-360	400	0 degs
7	.15663	46.36	Pk	-40.4	.1	-80	-73.94	-27.79	-7.79	-46.15	0-360	400	90 degs
10	.15935	46.38	Pk	-40.4	.1	-80	-73.92	-27.94	-7.94	-45.98	0-360	400	Flat
8	.49	33.71	Pk	-40.5	.2	-40	-46.59	-37.7	-17.7	-8.89	0-360	400	90 degs
11	.49	34.15	Pk	-40.5	.2	-40	-46.15	-37.7	-17.7	-8.45	0-360	400	Flat
3	.49422	34.54	Pk	-40.5	.2	-40	-45.76	-17.77	-	-27.99	0-360	400	0 degs
4	7.51386	20.44	Pk	-40.5	.6	-40	-59.46	-21.96	-	-37.5	0-360	400	0 degs

Pk - Peak detector

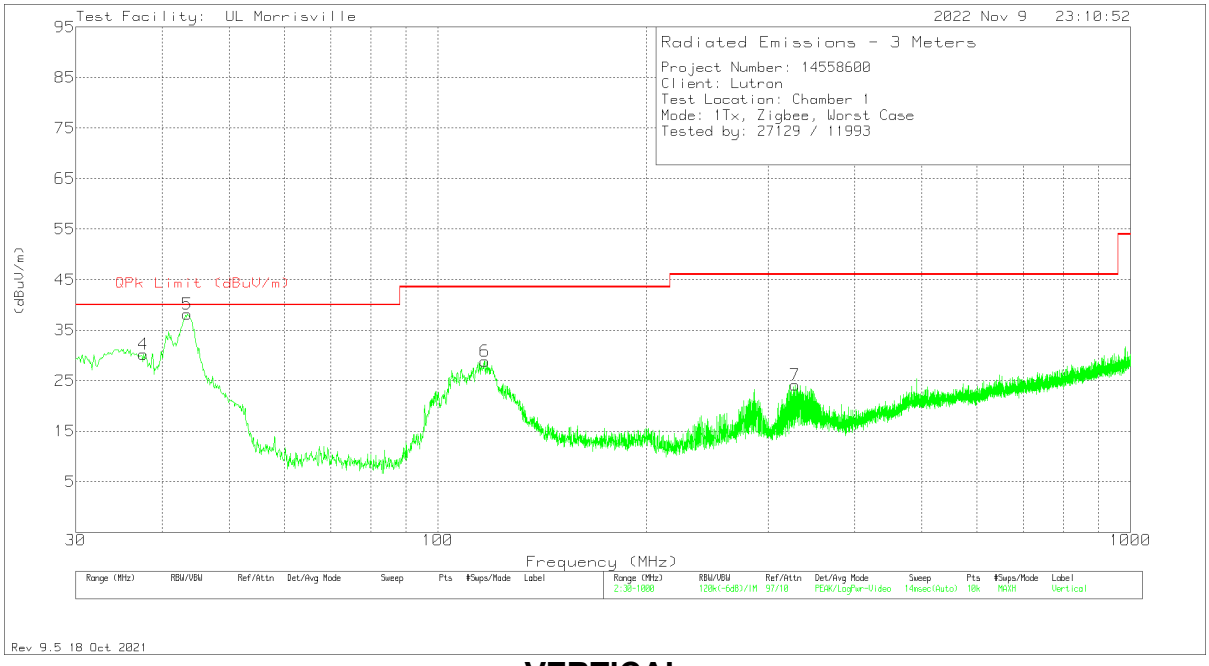
Note: All measurements were made at a test distance of 3 m. The measured data was extrapolated from the test distance (3m) to the specification distance (300 m from 9-490 kHz and 30 m from 490 kHz – 30 MHz) to clearly show the relative levels of fundamental and spurious emissions and demonstrate compliance 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).

10.4. WORST CASE BELOW 1 GHZ

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



HORIZONTAL



VERTICAL

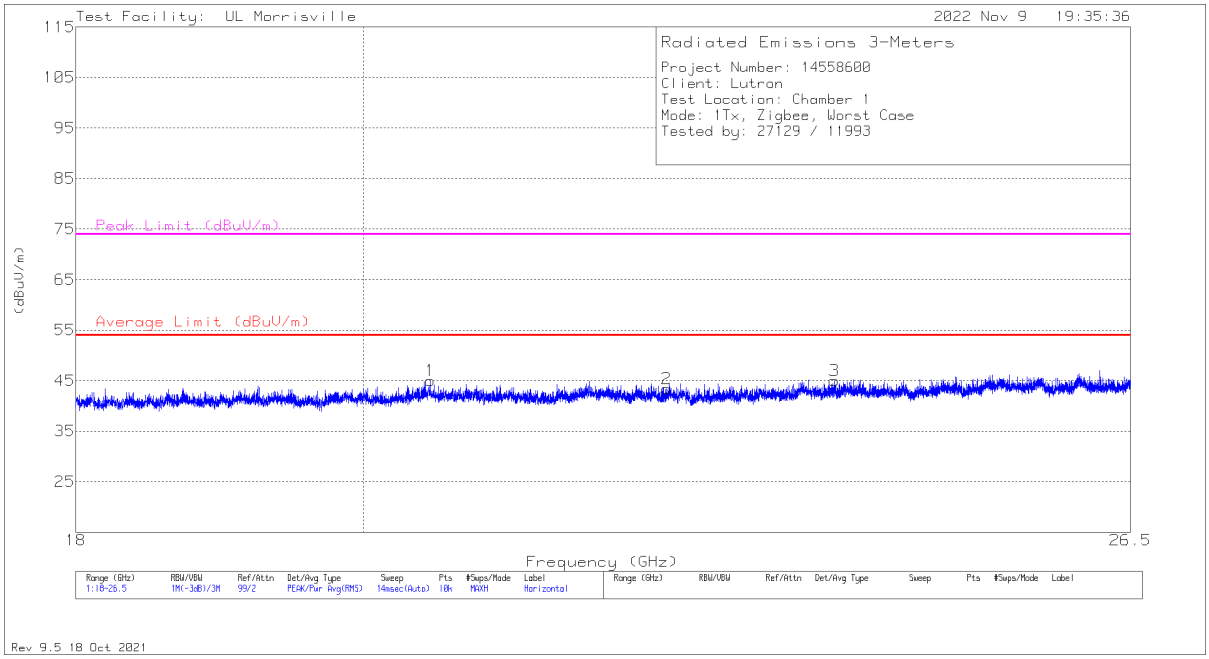
Below 1GHz Data

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AT0066 (dB/m)	Gain/Loss (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 37.857	27.91	Pk	21.6	-31.3	18.21	40	-21.79	0-360	100	H
2	* ** 111.189	32.8	Pk	18.4	-30.4	20.8	43.52	-22.72	0-360	299	H
3	* ** 272.112	33.18	Pk	19	-28.8	23.38	46.02	-22.64	0-360	100	H
4	* ** 37.566	39.87	Pk	21.8	-31.4	30.27	40	-9.73	0-360	100	V
6	* ** 116.815	39.94	Pk	19.2	-30.3	28.84	43.52	-14.68	0-360	100	V
7	* ** 328.178	32.94	Pk	19.7	-28.5	24.14	46.02	-21.88	0-360	100	V
5	43.483	52.22	Pk	17.3	-31.3	38.22	-	-	0-360	100	V

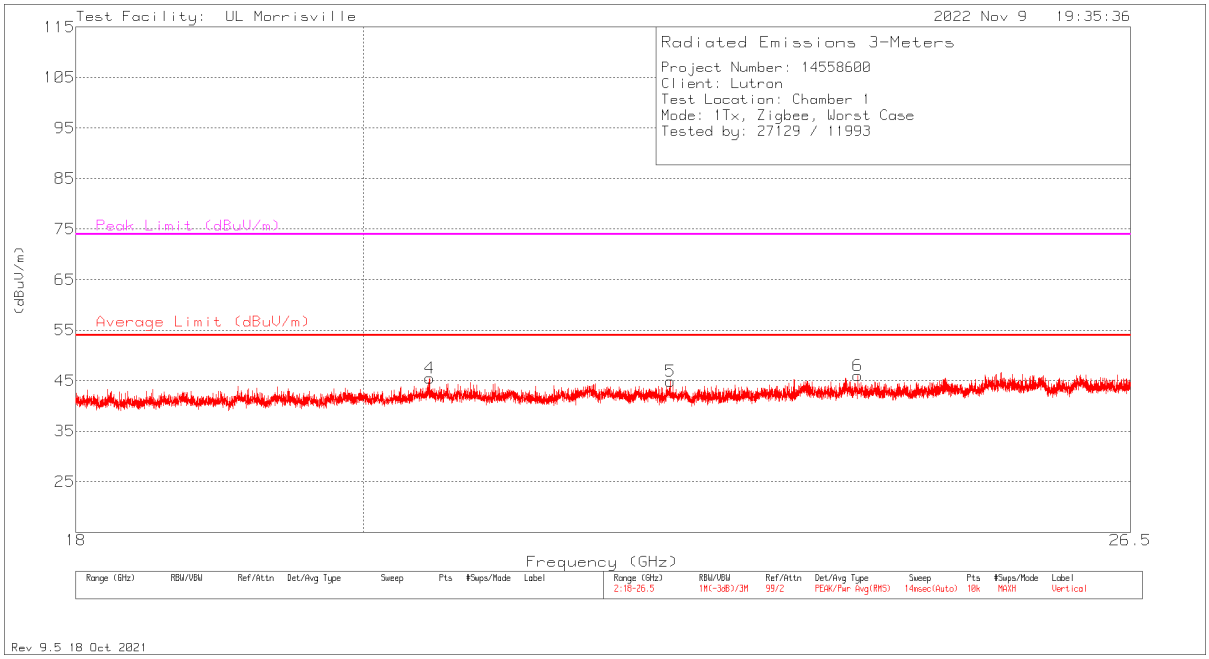
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
** - indicates frequency in Taiwan NCC LP0002 Restricted Band
Pk - Peak detector

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	204704 (dB/m)	Gain/Loss (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 20.5001	49.9	Pk	34.2	-39.1	45	54	-9	74	-29	0-360	250	H
2	* ** 22.35754	48.15	Pk	34.5	-39.2	43.45	54	-10.55	74	-30.55	0-360	299	H
3	* ** 23.77293	48.94	Pk	35.1	-39	45.04	54	-8.96	74	-28.96	0-360	101	H
4	* ** 20.49585	50.37	Pk	34.2	-39.1	45.47	54	-8.53	74	-28.53	0-360	250	V
5	* ** 22.38389	49.61	Pk	34.5	-39.2	44.91	54	-9.09	74	-29.09	0-360	200	V
6	* ** 23.97865	49.58	Pk	35.1	-38.7	45.98	54	-8.02	74	-28.02	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

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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.

TEST PROCEDURE

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

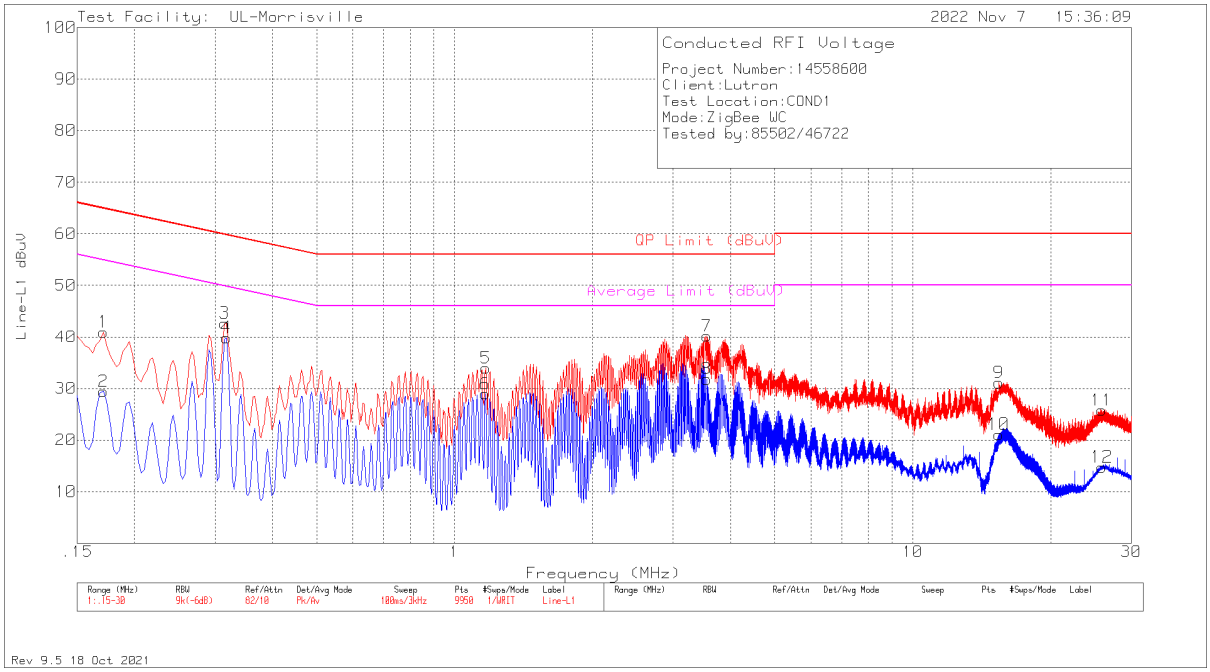
The receiver is set to a resolution bandwidth of 9 kHz. Peak Detection is used unless otherwise noted as quasi-peak or average.

Line conduced data is recorded for both lines.

RESULTS

11.1.1. AC Power Line Norm

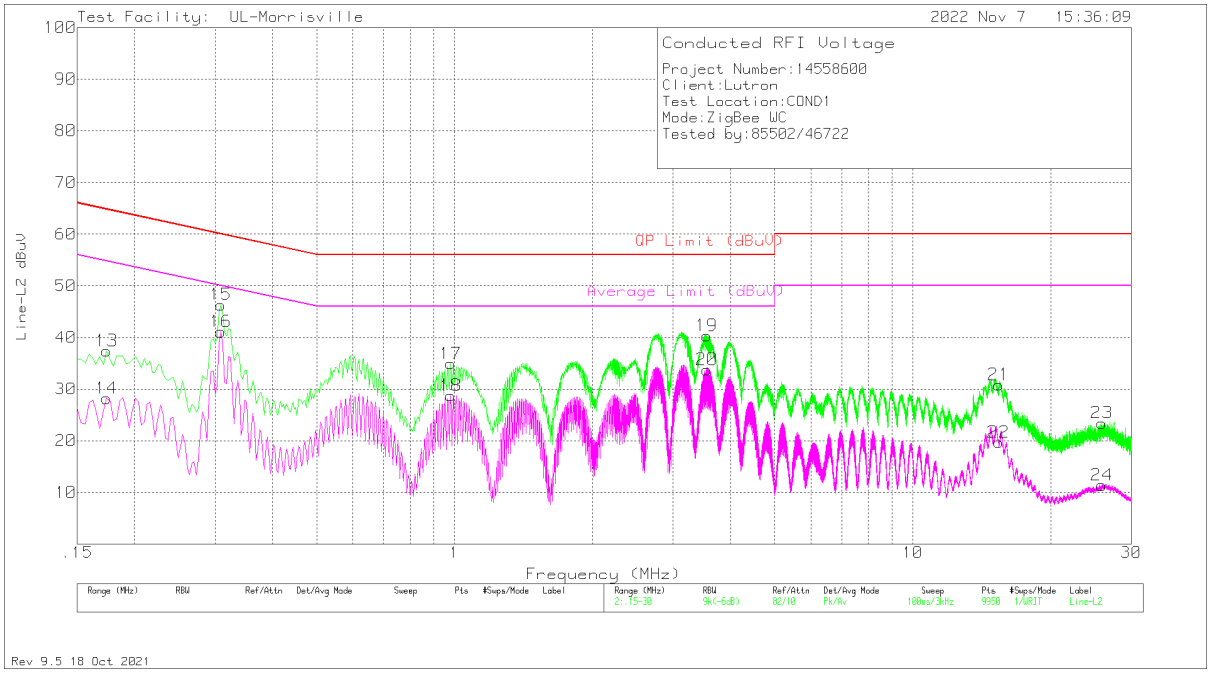
LINE 1 RESULTS



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)
1	.171	30.94	Pk	.2	9.8	40.94	64.91	-23.97	-	-
2	.171	19.44	Av	.2	9.8	29.44	-	-	54.91	-25.47
3	.315	32.76	Pk	.1	9.8	42.66	59.84	-17.18	-	-
4	.318	29.96	Av	.1	9.8	39.86	-	-	49.76	-9.9
5	1.17	24.15	Pk	0	9.8	33.95	56	-22.05	-	-
6	1.167	19.15	Av	0	9.8	28.95	-	-	46	-17.05
7	3.555	30.28	Pk	0	9.9	40.18	56	-15.82	-	-
8	3.555	21.94	Av	0	9.9	31.84	-	-	46	-14.16
9	15.411	20.93	Pk	.1	10.1	31.13	60	-28.87	-	-
10	15.411	10.89	Av	.1	10.1	21.09	-	-	50	-28.91
11	25.881	15.38	Pk	.2	10.2	25.78	60	-34.22	-	-
12	25.878	4.36	Av	.2	10.2	14.76	-	-	50	-35.24

Pk - Peak detector
Av - Average detection

LINE 2 RESULTS



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)
13	.174	27.39	Pk	.2	9.8	37.39	64.77	-27.38	-	-
14	.174	18.21	Av	.2	9.8	28.21	-	-	54.77	-26.56
15	.309	36.43	Pk	.1	9.8	46.33	60	-13.67	-	-
16	.309	31.21	Av	.1	9.8	41.11	-	-	50	-8.89
17	.981	25.14	Pk	0	9.8	34.94	56	-21.06	-	-
18	.981	18.94	Av	0	9.8	28.74	-	-	46	-17.26
19	3.549	30.42	Pk	0	9.9	40.32	56	-15.68	-	-
20	3.552	23.84	Av	0	9.9	33.74	-	-	46	-12.26
21	15.405	20.63	Pk	.1	10.1	30.83	60	-29.17	-	-
22	15.393	9.5	Av	.1	10.1	19.7	-	-	50	-30.3
23	25.887	13.02	Pk	.2	10.2	23.42	60	-36.58	-	-
24	25.878	.99	Av	.2	10.2	11.39	-	-	50	-38.61

Pk - Peak detector
Av - Average detection

12. SETUP PHOTOS

Please refer to R14558575-EP1 for setup photos

END OF TEST REPORT