TEST REPORT

Report Number: R13573691-E1

Applicant	:	Crown Equipment Corporation 44 South Washington Street New Bremen, OH 45869 USA
Model	:	HD4010
Contains FCC ID	:	YGP4000-01
Contains IC	:	9016A-HD4000A
EUT Description	:	HD4010 Truck Charger
Test Standard(s)	:	FCC 47 CFR PART 15 SUBPART C ISED RSS-247 ISSUE 2 ISED RSS-GEN ISSUE 5+A2

Date Of Issue:
2023-02-09

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
1	2021-09-27	Initial Issue	Brian T. Kiewra
2	2022-08-09	Corrected RSS-GEN reference in section 1. Revised test procedure in Sections 10 and 11.	Brian T. Kiewra
3	2023-02-03	Revised EUT description	Brian T. Kiewra
4	2023-02-09	Revised Section 5.4	Niklas Haydon

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: Crown Equipment Corporation
44 South Washington Street
New Bremen, OH 45869 USA

EUT DESCRIPTION: HD4010 Truck Charger

MODEL: HD4010

SERIAL NUMBER: Non-Serialized

SAMPLE RECEIPT DATE: 2020-11-09

DATE TESTED: 2020-11-09 to 2020-11-12

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

Bob DeLisi
Principal Engineer
Consumer Technology Division
UL LLC

Prepared By:

Brian T. Kiewra
Project Engineer
Consumer Technology Division
UL LLC

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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	See Comment	See Note
15.247 (a) (2)	RSS-247 5.2 (a)	6dB BW		
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	See Comment	See Note
15.247 (d)	RSS-247 5.5	Conducted Spurious Emissions		
15.209, 15.205	RSS-GEN 8.9, 8.10	Radiated Emissions	Compliant	None.
15.207	RSS-Gen 8.8	AC Mains Conducted Emissions	See Comment	See Note

Note: This report is a C2PC report for a limited certified module in a host. Conducted antenna port testing other than output power will be covered by the report in the original filing.

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+A2, and RSS-247 Issue 2.

4. FACILITIES AND ACCREDITATION

UL LLC is accredited by A2LA, certification # 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: 12 Laboratory Dr RTP, NC 27709, U.S.A	US0067	2180C	825374
☒	Building: 2800 Perimeter Park Dr. Suite B Morrisville, NC 27560, U.S.A		27265	

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}
AV Power Measurement Direct Method (Power Meter)	0.45 dB
PK Power Measurement Direct Method (Power Meter)	1.30 dB
Worst Case Radiated Disturbance, 9KHz to 30 MHz	2.87 dB
Worst Case Radiated Disturbance, 30 to 1000 MHz	6.01 dB
Worst Case Radiated Disturbance, 1000 to 18000 MHz	4.73 dB
Worst Case Radiated Disturbance, 18000 to 26000 MHz	4.51 dB
Worst Case Radiated Disturbance, 26000 to 40000 MHz	5.29 dB

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

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6. EQUIPMENT UNDER TEST

6.1. EUT DESCRIPTION

The EUT is a HD4010 Truck Charger.

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	7.03	5.05

6.3. DESCRIPTION OF AVAILABLE ANTENNAS

Refer to module reports for antenna information.

6.4. SOFTWARE AND FIRMWARE

The EUT firmware installed during testing was 154152-002-01D.
The test utility software used during testing was Application code 164527-001-09.h86.

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 Y orientation was worst-case orientation; therefore, all final radiated testing was performed with the EUT in Y orientation.

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6.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	**Manufacturer**	**Model**	**Serial Number**	**Remarks**
Laptop	Dell	Latitude E6450	00186-252-799-454	For configuration only, not present during test
USB to Serial Interface	phytools	Peak	IPEH-0020220216002	For configuration only, not present during test

I/O CABLES

I/O Cable List						
Cable No.	**Port**	**# of Identical Ports**	**Connector Type**	**Cable Type**	**Cable Length (m)**	**Remarks**
1	DC Mains	1	quick connect	Single conductor	<3m	Provides DC power to EUT

SETUP DIAGRAMS

Please refer to 13573691-EP1 for setup diagrams

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7. 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)

Equipment ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
0.009-30MHz (Loop Ant.)					
AT0079	Active Loop Antenna	ETS-Lindgren	6502	2020-08-20	2021-08-20
1-18 GHz					
AT0067	Double-Ridged Waveguide Horn Antenna, 1 to 18 GHz	ETS Lindgren	3117	2020-04-28	2021-04-28
18-40 GHz					
AT0063	Horn Antenna, 18-26.5GHz	ARA	MWH-1826/B	2020-10-30	2021-10-30
AT0061	Horn Antenna, 26-40GHz	ARA	MWH-2640/B	2020-10-30	2021-10-30
Gain-Loss Chains					
S-SAC01	Gain-loss string: 0.009-30MHz	Various	Various	2020-07-10	2021-07-10
S-SAC03	Gain-loss string: 1-18GHz	Various	Various	2020-07-06	2021-07-06
S-SAC04	Gain-loss string: 18-40GHz	Various	Various	2020-07-07	2021-07-07
Receiver & Software					
SA0025	Spectrum Analyzer	Agilent	N9030A	2020-03-17	2021-03-17
SA0027	Spectrum Analyzer	Agilent	N9030A	2020-06-10	2021-06-10
SOFTEMI	EMI Software	UL	Version 9.5 (2020-08-18)		
Additional Equipment used					
s/n 181474409	Environmental Meter	Fisherbrand	15-077-963	2020-08-06	2021-08-06
76022	DC Regulated Power Supply	Circuit Specialists	CSI3005X5	NA	NA

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

Equipment ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
30-1000 MHz					
AT0074	Hybrid Broadband Antenna	Sunol Sciences Corp.	JB3	2020-07-27	2021-07-27
Gain-Loss Chains					
N-SAC02	Gain-loss string: 25-1000MHz	Various	Various	2020-07-29	2021-07-29
Receiver & Software					
SA0026	Spectrum Analyzer	Agilent	N9030A	2020-07-16	2021-07-16
SOFTEMI	EMI Software	UL	Version 9.5 (2020-08-18)		
Additional Equipment used					
s/n 200037610	Environmental Meter	Fisher Scientific	06-662-4	2020-01-22	2022-01-22
76022	DC Regulated Power Supply	Circuit Specialists	CSI3005X5	NA	NA

Test Equipment Used - Wireless Conducted Measurement Equipment

Equipment ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
PWS001 (PRE0137347)	Peak and Avg Power Sensor, 50MHz to 18GHz	Keysight Technologies	N1921A	2020-05-27	2021-05-27
PWM002 (PRE0137344)	RF Power Meter	Keysight Technologies	N1911A	2020-07-31	2021-07-31
HI0091	Environmental Meter	Fisher Scientific	15-077-963	2020-06-26	2021-06-26
76022	DC Regulated Power Supply	CircuitSpecialists.Com	CSI3005X5	NA	NA

8. MEASUREMENT METHOD

On Time and Duty Cycle: ANSI C63.10-2013 Section 11.6.

Output Power: ANSI C63.10 Subclause -11.9.1.3 Method PKPM1 Peak-reading power meter
ANSI C63.10 Subclause -11.9.2.3.2 Method AVGPM-G (Measurement using a gated RF average-reading power meter)

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

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

General Radiated Emissions: ANSI C63.10:2013 Sections 6.3 – 6.6

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9. ON TIME AND DUTY CYCLE

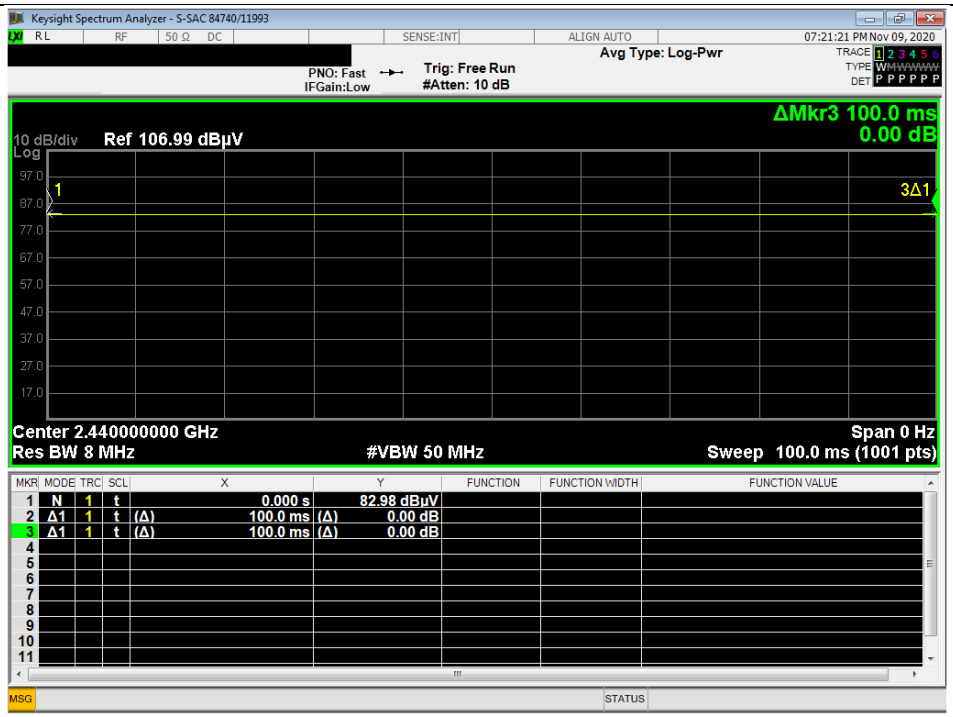
LIMITS

None; for reporting purposes only.

PROCEDURE

ANSI C63.10 Zero-Span Spectrum Analyzer Method.

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 - 1Mbps	100.00	100.00	1.00	100.00%	0.00	0.010



DUTY CYCLE – BLE1Mbps

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10. 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 cable assembly insertion loss of 10.71 dB (including 10.22 dB pad + 0.49 cable) was entered as an offset in the power meter.

The power output was measured at the EUT antenna port using an SMA cable with 10dB attenuator connected to a power meter via wideband power sensor. Peak output power was read directly from the power meter.

RESULTS

10.1.1. BLE (1Mbps)

Tested By:	84740/40882
Date:	2020-11-10

Channel	Frequency (MHz)	Peak Power Reading (dBm)	Limit (dBm)	Margin (dB)
Low	2402	7.03	30	-22.97
Middle	2440	6.83	30	-23.17
High	2480	6.54	30	-23.46

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11. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The cable assembly insertion loss of 10.71 dB (including 10.22 dB pad + 0.49 cable) was entered as an offset in the power meter.

The power output was measured at the EUT antenna port using an SMA cable with 10dB attenuator connected to a power meter via wideband power sensor. Gated average output power was read directly from the power meter.

RESULTS

11.1.1. BLE (1Mbps)

Tested By:	84740/40882
Date:	2020-11-10

Channel	Frequency (MHz)	AV power (dBm)
Low	2402	6.95
Middle	2440	6.75
High	2480	6.43

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12. RADIATED TEST RESULTS

12.1. 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 for the 30-1000 MHz 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 30 KHz for peak measurements.

For final measurements above 1 GHz the resolution bandwidth is set to 1 MHz; the video bandwidth is set to 3 MHz for peak measurements and as applicable for average measurements. The particular averaging method used for this test program was linear voltage averaging.

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 (for >30MHz) to further maximize the emission. Measurements are made with the antenna polarized in both the vertical and the horizontal positions.

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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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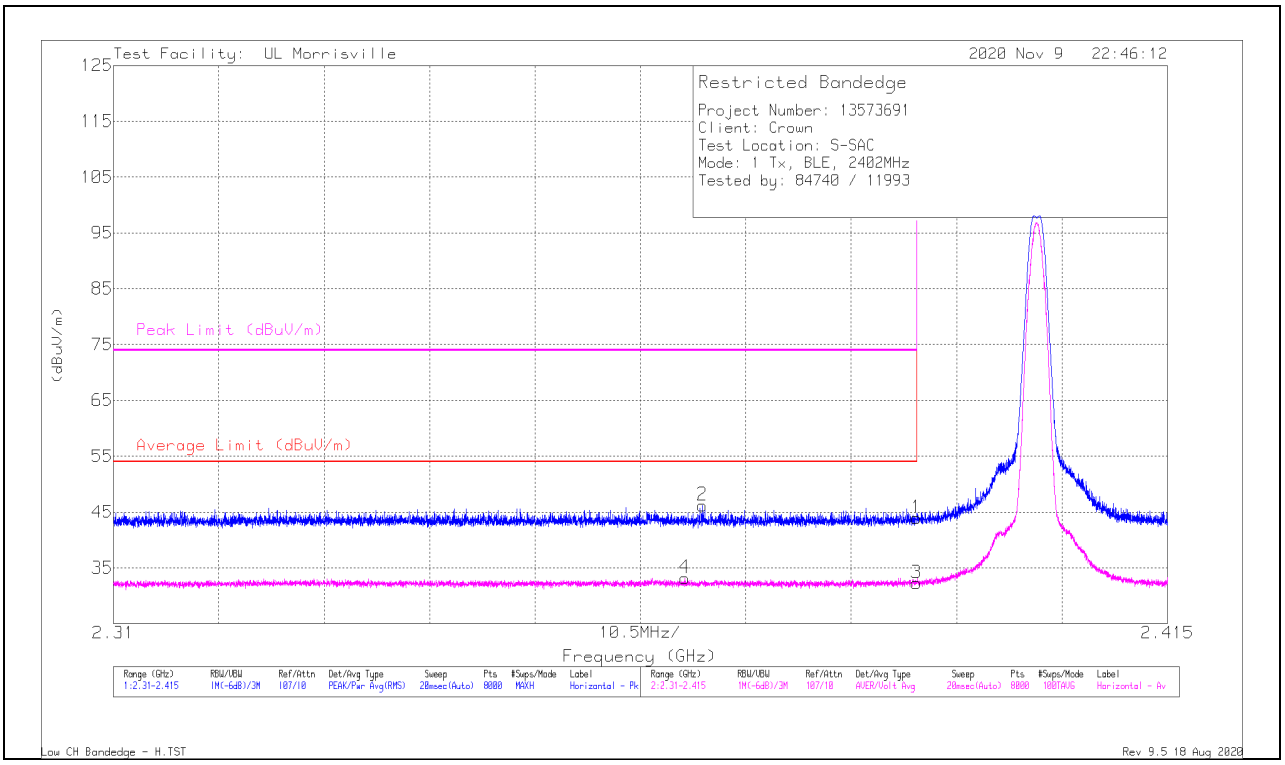
12.2. TRANSMITTER ABOVE 1 GHz

12.2.1. BLE (1Mbps)

BANDEDGE (LOW CHANNEL)

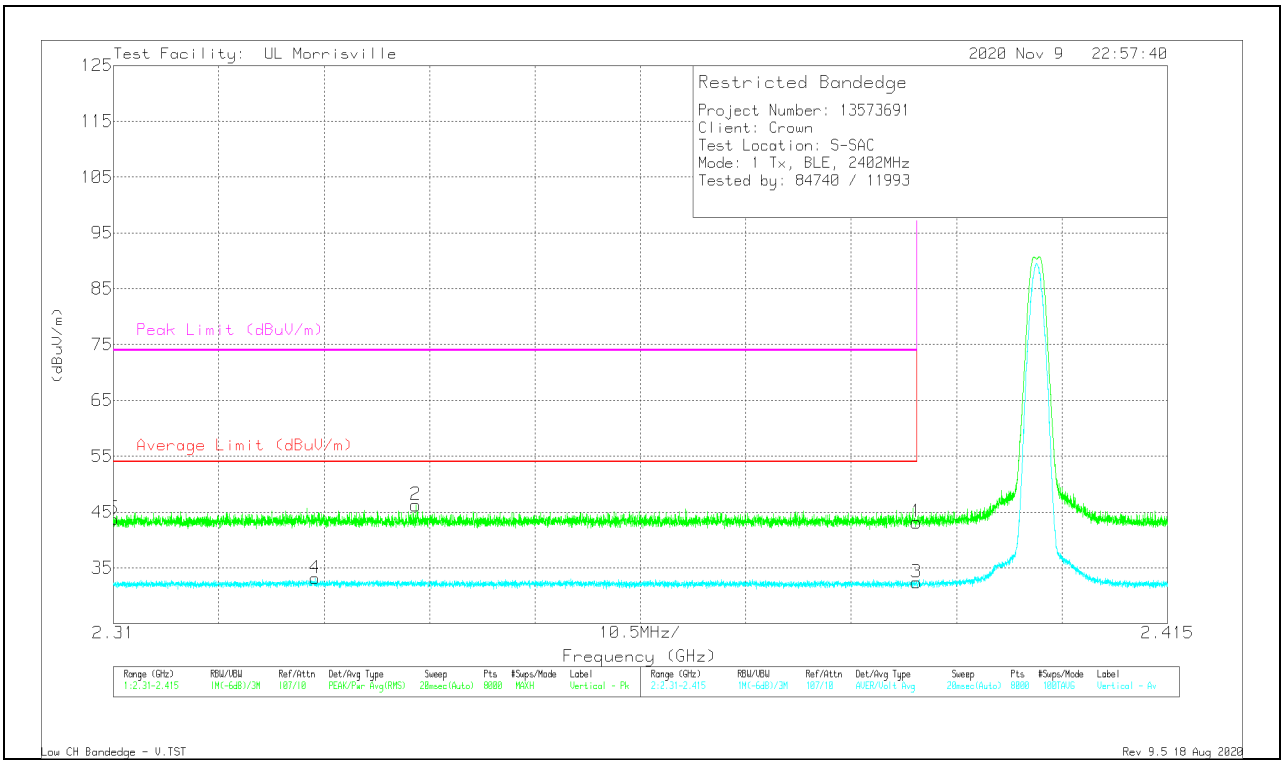
HORIZONTAL RESULT



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0067 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 2.39	35.83	Pk	32.1	-24	43.93	-	-	74	-30.07	296	240	H
2	* ** 2.36865	37.81	Pk	32.2	-23.8	46.21	-	-	74	-27.79	296	240	H
3	* ** 2.39	24.17	ADV	32.1	-24	32.27	54	-21.73	-	-	296	240	H
4	* ** 2.36694	24.89	ADV	32.2	-23.9	33.19	54	-20.81	-	-	296	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

VERTICAL RESULT



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0067 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 2.39	35.06	Pk	32.1	-24	43.16	-	-	74	-30.84	343	303	V
2	* ** 2.34011	37.84	Pk	32.2	-23.8	46.24	-	-	74	-27.76	343	303	V
5	* ** 2.31004	35.34	Pk	32	-23.6	43.74	-	-	74	-30.26	343	303	V
3	* ** 2.39	24.26	ADV	32.1	-24	32.36	54	-21.64	-	-	343	303	V
4	* ** 2.33011	24.71	ADV	32.1	-23.7	33.11	54	-20.89	-	-	343	303	V

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Pk - Peak detector
ADV - Linear Voltage Average

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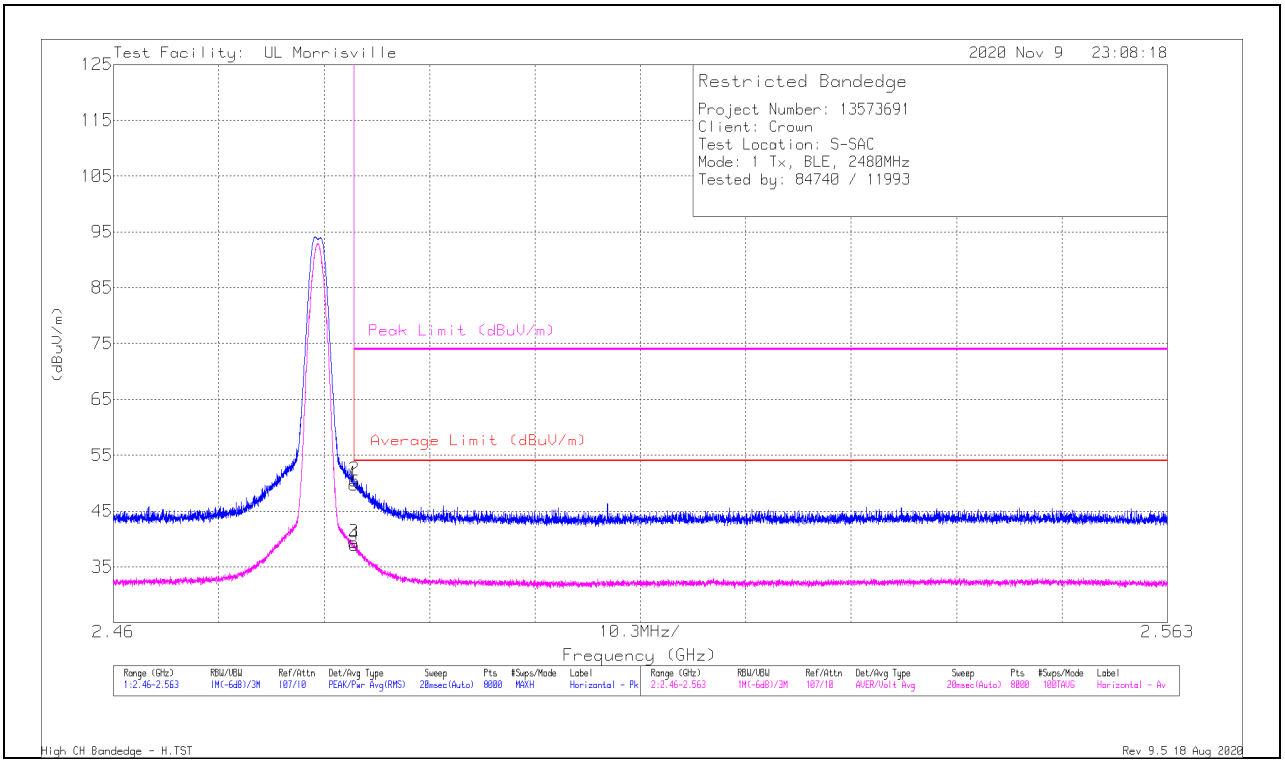
BANDEDGE (HIGH CHANNEL)

HORIZONTAL RESULT



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0067 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	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	41.79	Pk	32.4	-24.4	49.79	-	-	74	-24.21	360	100	H
2	* ** 2.48355	42.52	Pk	32.4	-24.4	50.52	-	-	74	-23.48	360	100	H
3	* ** 2.4835	31.42	ADV	32.4	-24.4	39.42	54	-14.58	-	-	360	100	H
4	* ** 2.48358	30.89	ADV	32.4	-24.4	38.89	54	-15.11	-	-	360	100	H

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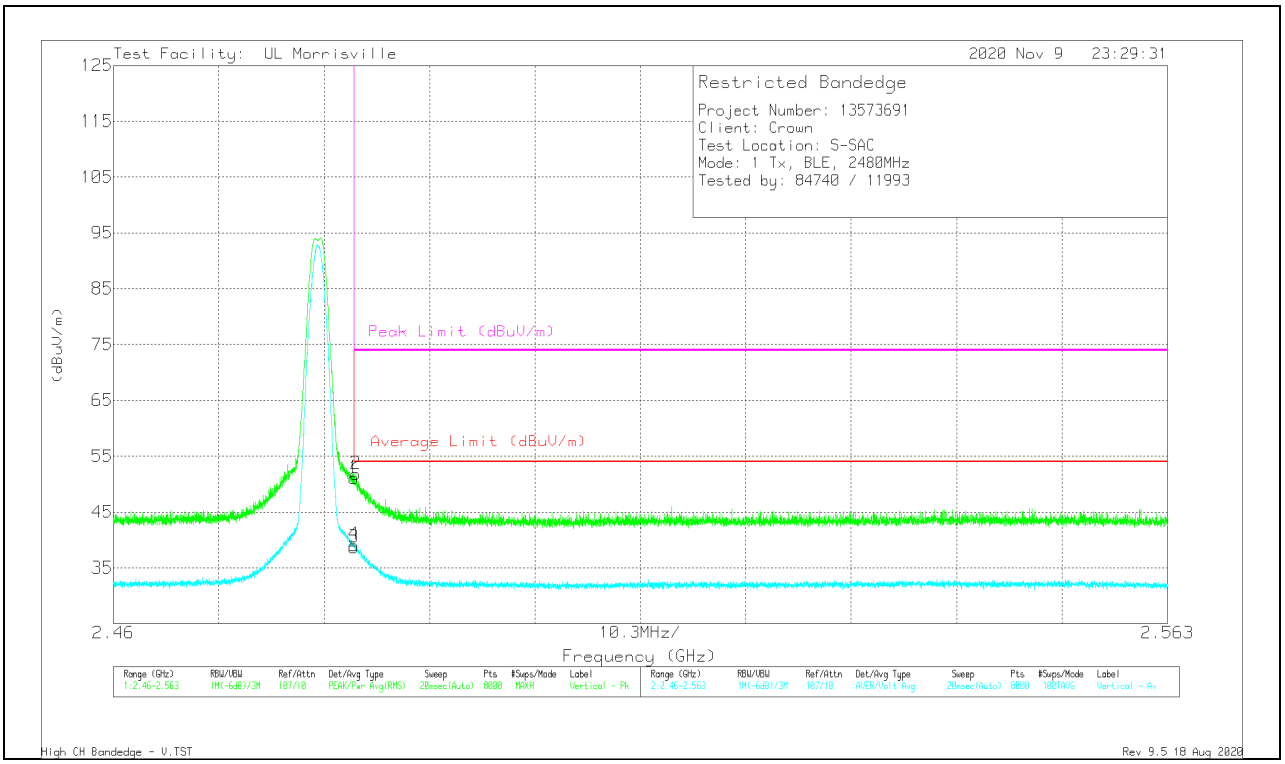
VERTICAL RESULT



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0067 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 2.4835	43.04	Pk	32.4	-24.4	51.04	-	-	74	-22.96	1	101	V
2	* ** 2.48368	43.81	Pk	32.4	-24.4	51.81	-	-	74	-22.19	1	101	V
3	* ** 2.4835	30.69	ADV	32.4	-24.4	38.69	54	-15.31	-	-	1	101	V
4	* ** 2.48351	31.1	ADV	32.4	-24.4	39.1	54	-14.9	-	-	1	101	V

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Pk - Peak detector
ADV - Linear Voltage Average

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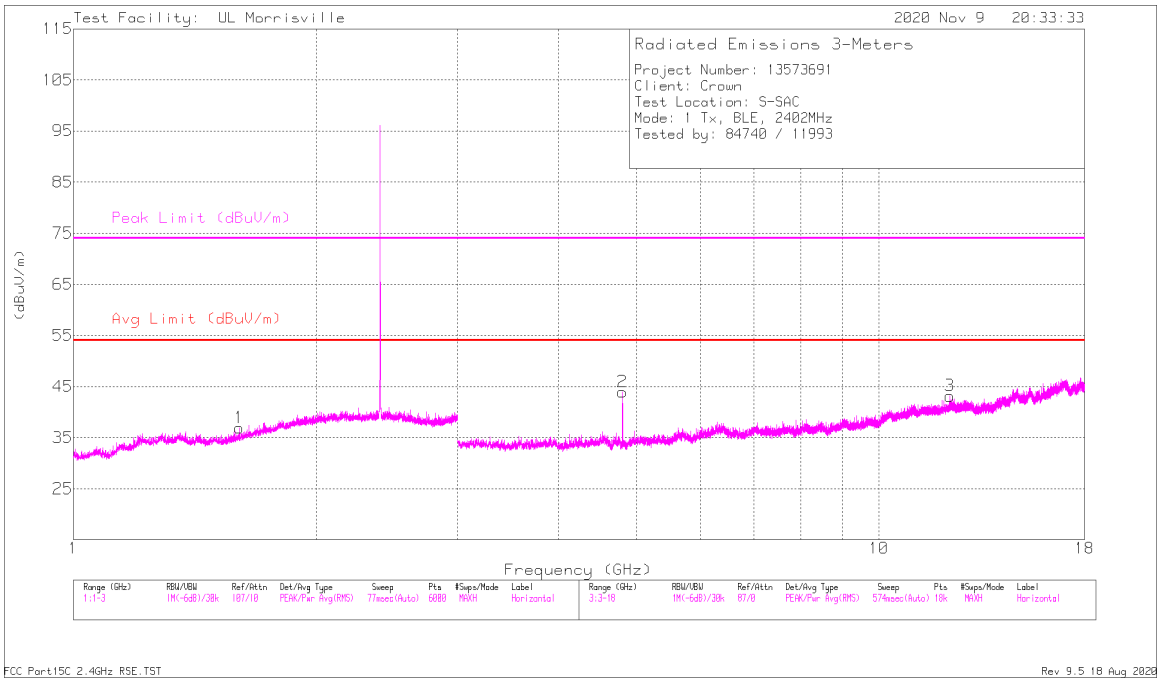
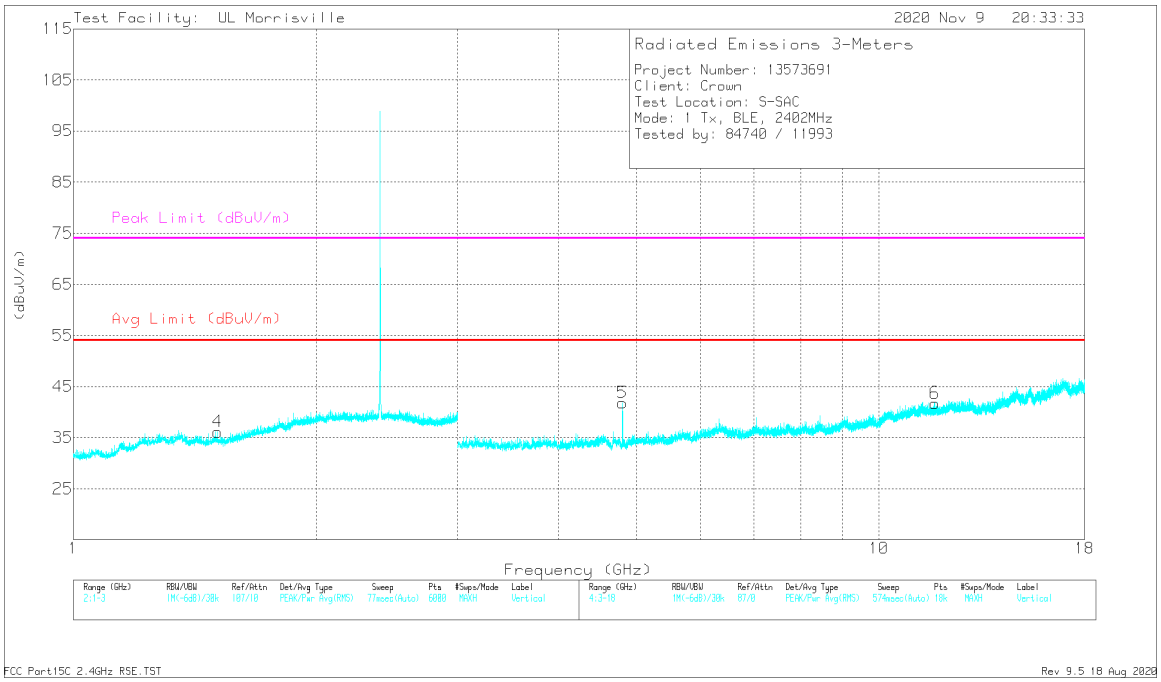
HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL RESULTS



HORIZONTAL



VERTICAL

RADIATED EMISSIONS

Markers	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0067 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 1.6052	35.91	PK2	28.4	-22.2	42.11	-	-	74	-31.89	72	291	H
	* ** 1.60597	22.78	ADV	28.4	-22.2	28.98	54	-25.02	-	-	72	291	H
4	* ** 1.51172	35.85	PK2	28	-22.5	41.35	-	-	74	-32.65	271	236	V
	* ** 1.51029	22.72	ADV	28	-22.4	28.32	54	-25.68	-	-	271	236	V
2	* ** 4.80432	45.57	PK2	34	-30.9	48.67	-	-	74	-25.33	144	245	H
	* ** 4.80402	38.4	ADV	34	-30.9	41.5	54	-12.5	-	-	144	245	H
3	* ** 12.24306	33.58	PK2	38.8	-24.2	48.18	-	-	74	-25.82	120	147	H
	* ** 12.24324	20.88	ADV	38.8	-24.2	35.48	54	-18.52	-	-	120	147	H
5	* ** 4.80442	43.59	PK2	34	-30.9	46.69	-	-	74	-27.31	47	192	V
	* ** 4.80411	35.58	ADV	34	-30.9	38.68	54	-15.32	-	-	47	192	V
6	* ** 11.73154	33.03	PK2	38.5	-24.1	47.43	-	-	74	-26.57	253	167	V
	* ** 11.7291	20.82	ADV	38.5	-24.1	35.22	54	-18.78	-	-	253	167	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
Pk - Peak detector

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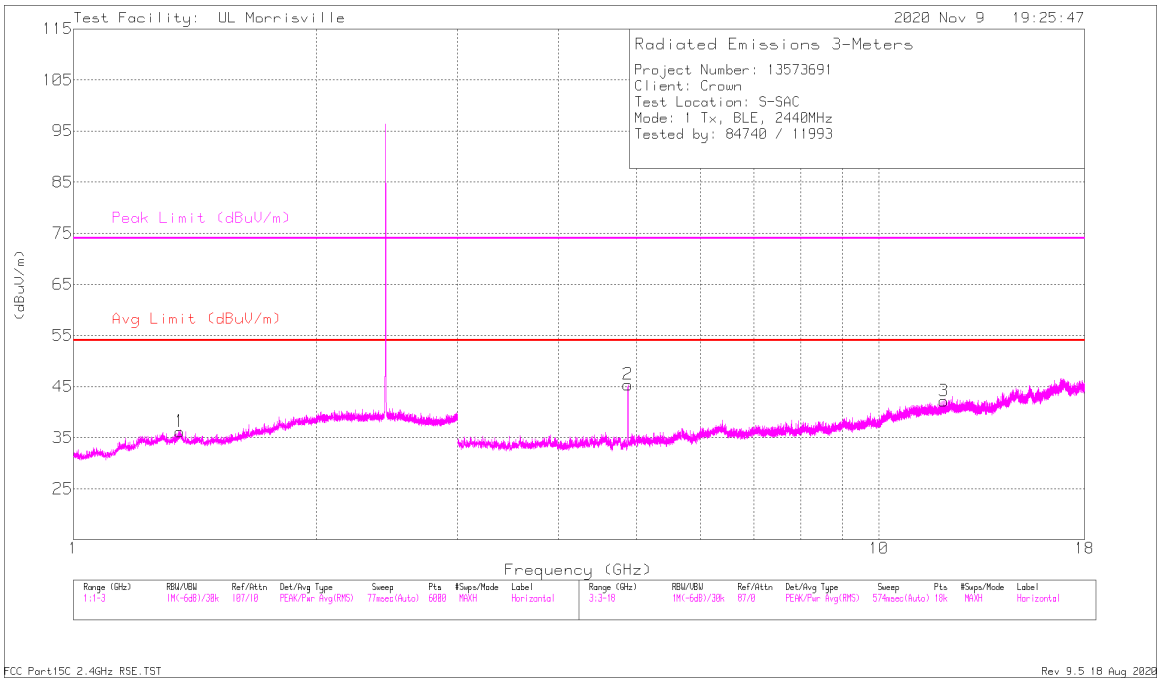
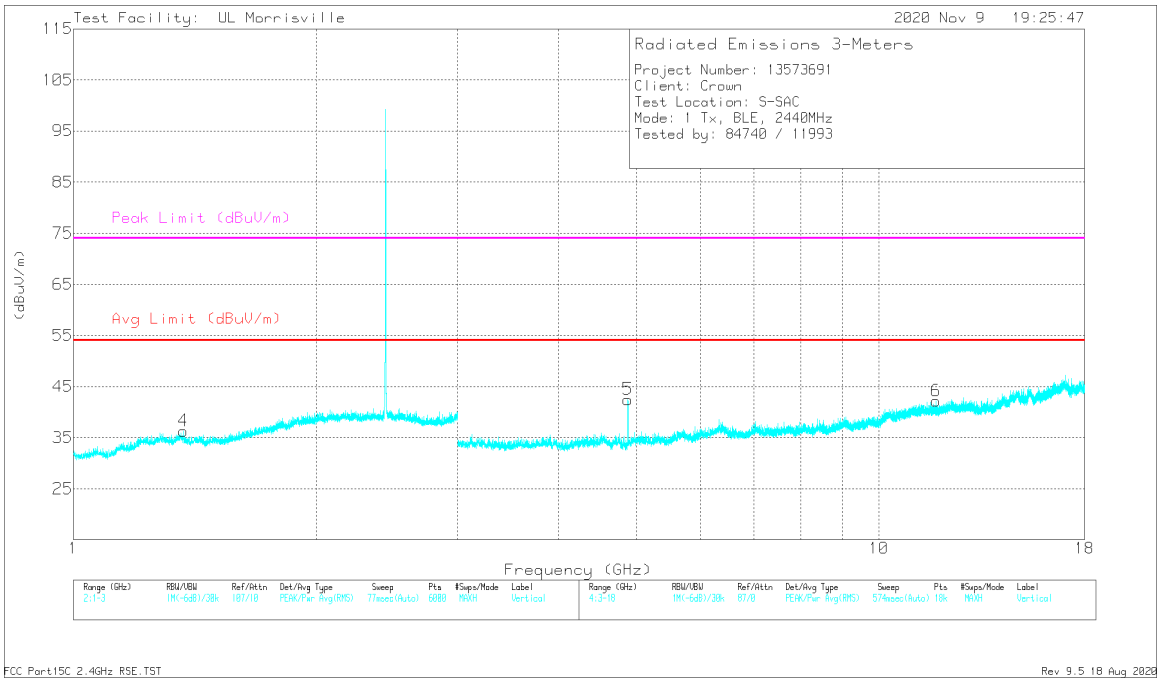
MID CHANNEL RESULTS



HORIZONTAL



VERTICAL

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RADIATED EMISSIONS

Markers	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0067 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 1.35437	35.92	PK2	29	-22.9	42.02	-	-	74	-31.98	160	264	H
	* ** 1.35723	23.04	ADV	28.9	-22.9	29.04	54	-24.96	-	-	160	264	H
4	* ** 1.37105	35.36	PK2	28.8	-22.9	41.26	-	-	74	-32.74	192	399	V
	* ** 1.36827	22.69	ADV	28.8	-22.9	28.59	54	-25.41	-	-	192	399	V
2	* ** 4.88075	37.85	PK2	34	-30.8	41.05	-	-	74	-32.95	192	201	H
	* ** 4.88037	26.5	ADV	34	-30.8	29.7	54	-24.3	-	-	192	201	H
3	* ** 12.0357	33.45	PK2	38.7	-23.9	48.25	-	-	74	-25.75	36	223	H
	* ** 12.0377	20.4	ADV	38.7	-23.8	35.3	54	-18.7	-	-	36	223	H
5	* ** 4.88045	43.94	PK2	34	-30.8	47.14	-	-	74	-26.86	38	307	V
	* ** 4.87998	36.27	ADV	34	-30.8	39.47	54	-14.53	-	-	38	307	V
6	* ** 11.78057	33.83	PK2	38.5	-24	48.33	-	-	74	-25.67	83	147	V
	* ** 11.78055	20.38	ADV	38.5	-24	34.88	54	-19.12	-	-	83	147	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
Pk - Peak detector

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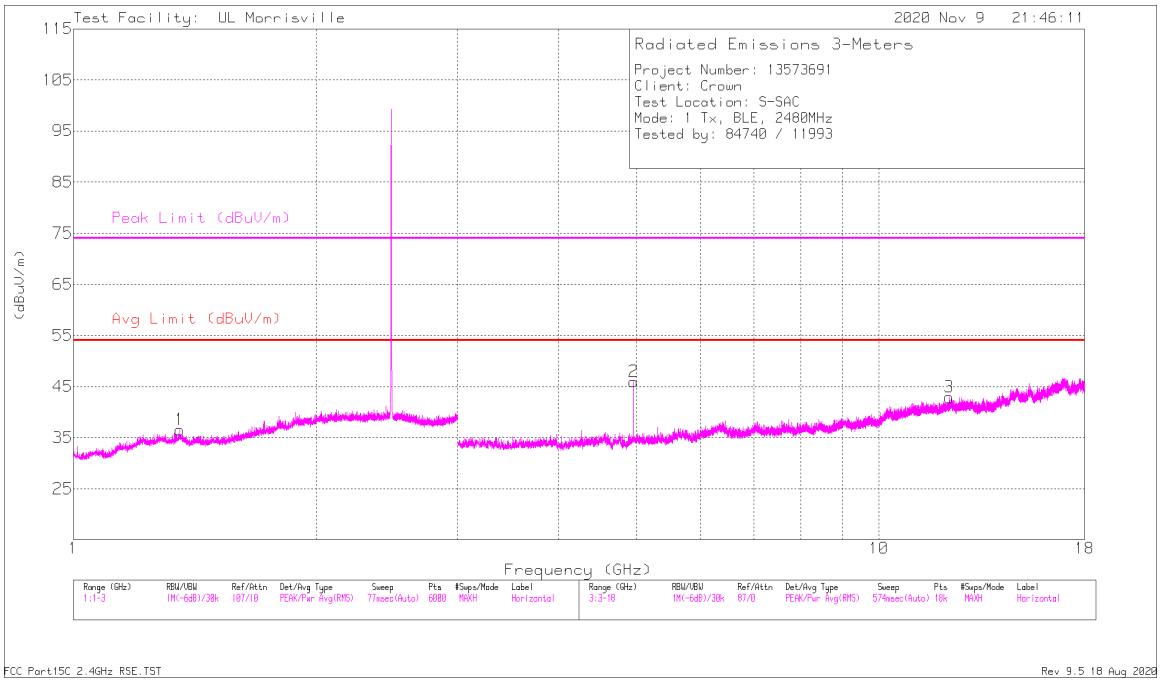
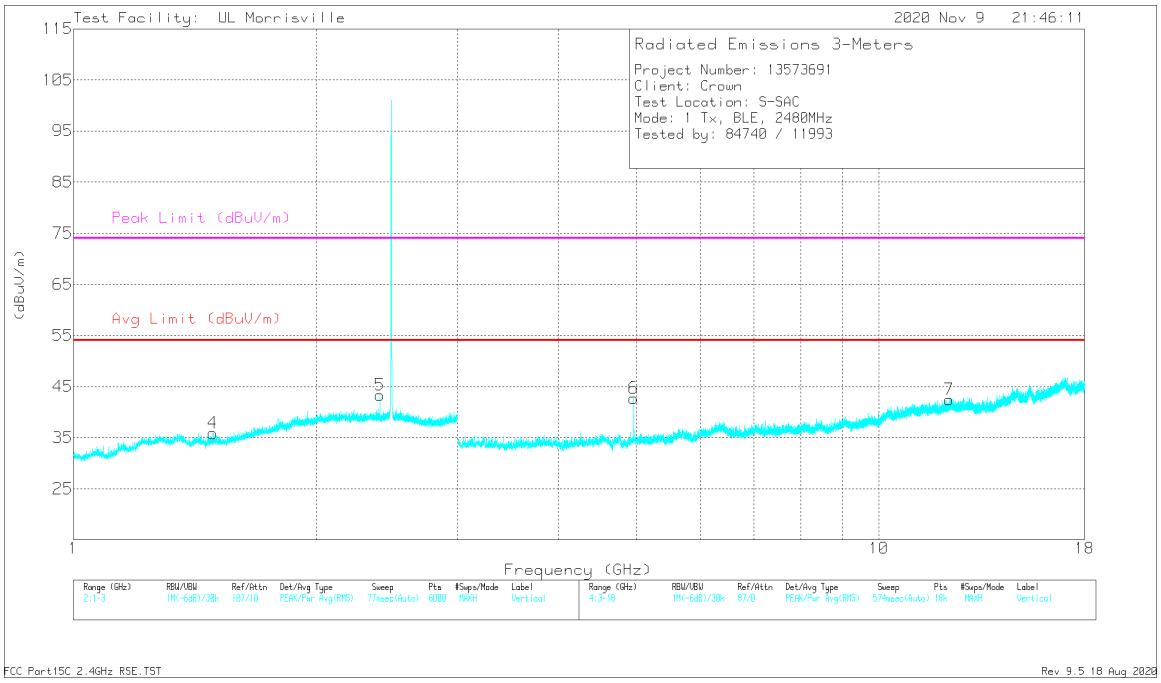
HIGH CHANNEL RESULTS



HORIZONTAL



VERTICAL

RADIATED EMISSIONS

Markers	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0067 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 1.35477	35.44	PK2	29	-22.9	41.54	-	-	74	-32.46	329	272	H
	* ** 1.35636	22.84	ADV	28.9	-22.9	28.84	54	-25.16	-	-	329	272	H
4	* ** 1.48862	35.87	PK2	28.1	-22.4	41.57	-	-	74	-32.43	184	186	V
	* ** 1.49232	22.72	ADV	28	-22.4	28.32	54	-25.68	-	-	184	186	V
2	* ** 4.96031	46.46	PK2	33.9	-31	49.36	-	-	74	-24.64	132	215	H
	* ** 4.95984	39.2	ADV	33.9	-31	42.1	54	-11.9	-	-	132	215	H
3	* ** 12.22032	33.61	PK2	38.8	-24.2	48.21	-	-	74	-25.79	75	177	H
	* ** 12.21955	21.04	ADV	38.8	-24.2	35.64	54	-18.36	-	-	75	177	H
6	* ** 4.95967	44.32	PK2	33.9	-31	47.22	-	-	74	-26.78	48	199	V
	* ** 4.95958	35.98	ADV	33.9	-31	38.88	54	-15.12	-	-	48	199	V
7	* ** 12.23538	33.63	PK2	38.8	-24.2	48.23	-	-	74	-25.77	244	228	V
	* ** 12.23419	21	ADV	38.8	-24.2	35.6	54	-18.4	-	-	244	228	V
5	2.40223	35.33	Pk	32.1	-24.1	43.33	-	-	-	-	0-360	101	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
Pk - Peak detector

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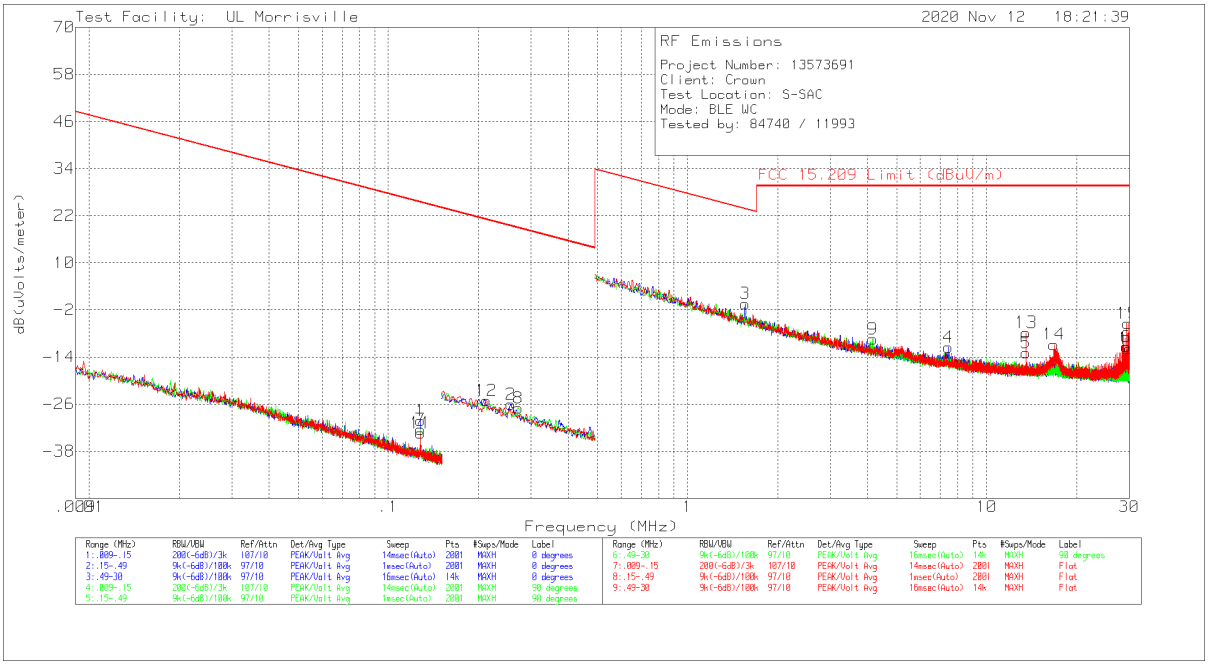
12.3. WORST CASE RADIATED

SPURIOUS EMISSIONS BELOW 30 MHz (WORST-CASE CONFIGURATION)

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 128.14 kHz resulted in a level of -30.21 dBuV/m, which is equivalent to -30.21 - 51.5 = -81.71 dBuA/m, which has the same margin, -55.66 dB, to the corresponding RSS-GEN Table 6 limit as it has to be 15.209(a) limit.



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 QP/AV Limit (dBuV/m)	FCC 15.209 PK Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Orientation
1	.12814	38.79	Pk	10.9	.1	-80	-30.21	25.45	45.45	-55.66	0-360	Face on
2	.25651	43.18	Pk	10.7	.1	-80	-26.02	19.42	39.42	-45.44	0-360	Face on
3	1.55876	28.28	Pk	11.1	.2	-40	-.42	23.75	-	-24.17	0-360	Face on
4	7.43375	17.27	Pk	10.7	.5	-40	-11.53	29.54	-	-41.07	0-360	Face on
5	13.5596	15.89	Pk	10.4	.7	-40	-13.01	29.54	-	-42.55	0-360	Face on
6	29.30004	19.56	Pk	8	1.1	-40	-11.34	29.54	-	-40.88	0-360	Face on
7	.12807	36.59	Pk	10.9	.1	-80	-32.41	25.46	45.46	-57.87	0-360	Face off
8	.27164	42.19	Pk	10.7	.1	-80	-27.01	18.92	38.92	-45.93	0-360	Face off
9	4.16214	18.97	Pk	11.2	.4	-40	-9.43	29.54	-	-38.97	0-360	Face off
10	29.9767	19.12	Pk	7.9	1.1	-40	-11.88	29.54	-	-41.42	0-360	Face off
11	.12807	35.64	Pk	10.9	.1	-80	-33.36	25.46	45.46	-58.82	0-360	Flat
12	.21307	44	Pk	10.8	.1	-80	-25.1	21.03	41.03	-46.13	0-360	Flat
13	13.5596	21.1	Pk	10.4	.7	-40	-7.8	29.54	-	-37.34	0-360	Flat
14	16.77957	18.19	Pk	10.2	.8	-40	-10.81	29.54	-	-40.35	0-360	Flat
15	29.64364	25.45	Pk	8	1.1	-40	-5.45	29.54	-	-34.99	0-360	Flat

Pk - Peak detector

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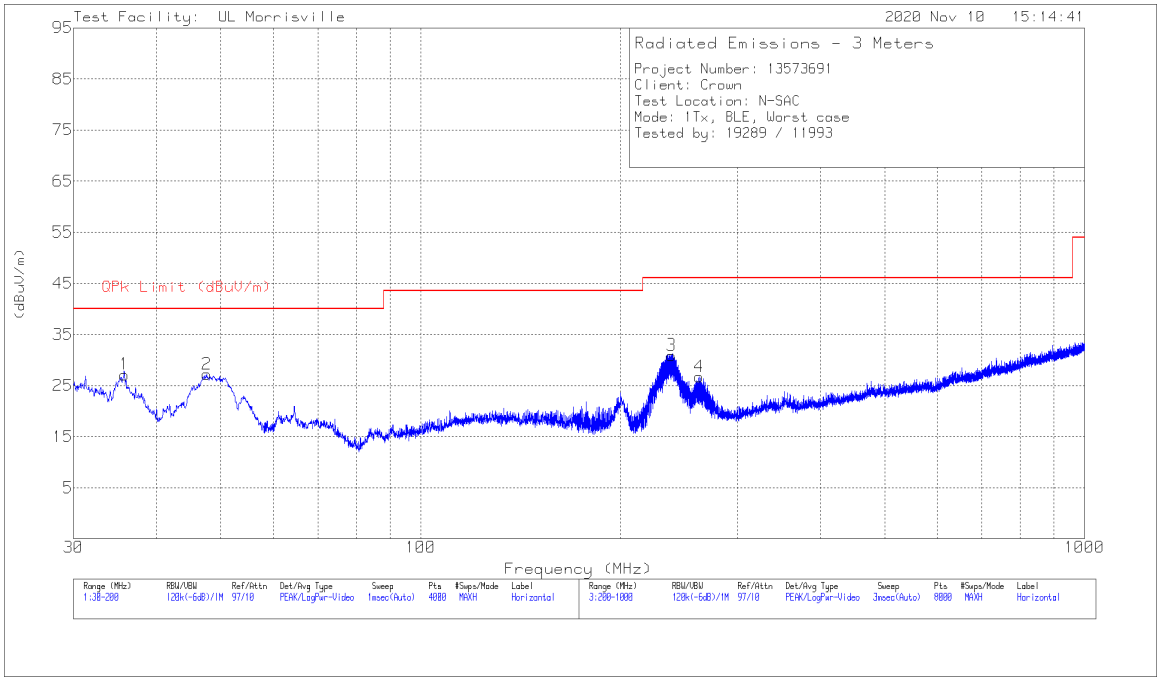
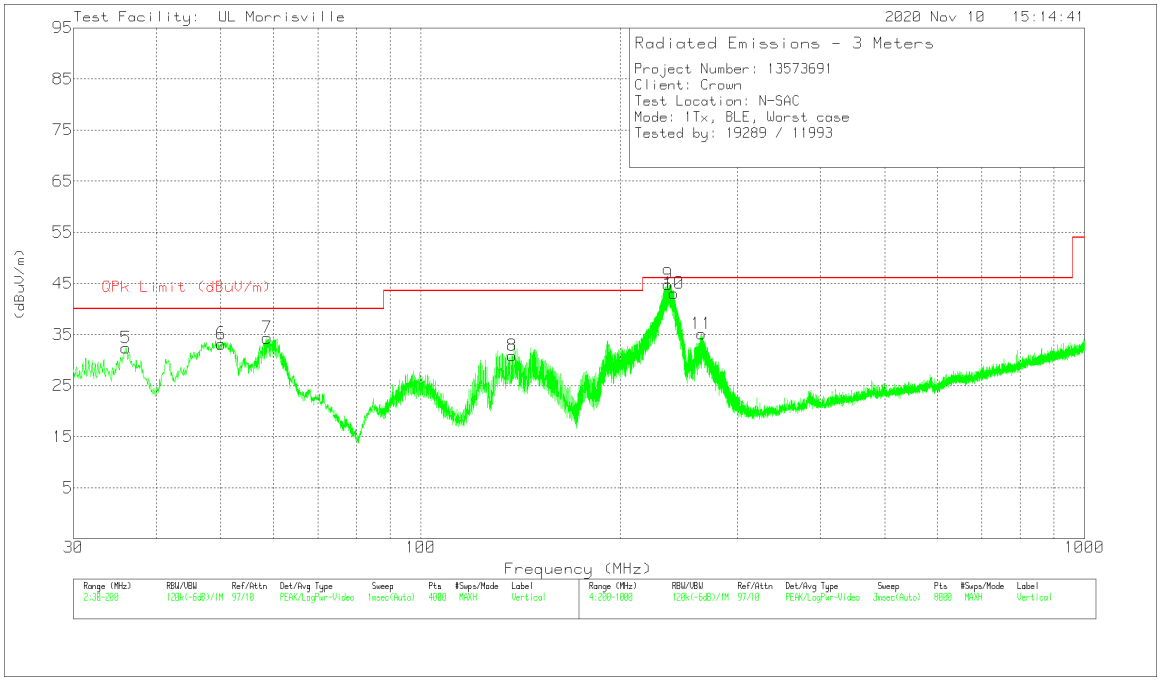
SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION)



HORIZONTAL



VERTICAL

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Below 1GHz Data

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AT0074 (dB/m)	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
8	* ** 137.5103	41.53	Pk	19.3	-30	30.83	43.52	-12.69	0-360	100	V
4	* ** 262.8082	36.91	Pk	18.7	-28.9	26.71	46.02	-19.31	0-360	99	H
10	235.8474	55.14	Qp	17.5	-29.1	43.54	46.02	-2.48	302	193	V
11	* ** 264.8084	45.01	Pk	18.9	-28.8	35.11	46.02	-10.91	0-360	199	V
1	35.824	35.76	Pk	22.7	-31.3	27.16	-	-	0-360	99	H
5	35.9941	41.06	Pk	22.6	-31.3	32.36	-	-	0-360	100	V
2	47.5996	43.39	Pk	14.9	-31.1	27.19	-	-	0-360	199	H
6	50.1077	50.26	Pk	14	-31.1	33.16	-	-	0-360	100	V
7	58.7374	51.83	Pk	13.5	-31	34.33	-	-	0-360	100	V
9	235.8047	56.37	Pk	17.5	-29.1	44.77	-	-	0-360	199	V
3	238.805	42.4	Pk	17.6	-29.1	30.9	-	-	0-360	299	H

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

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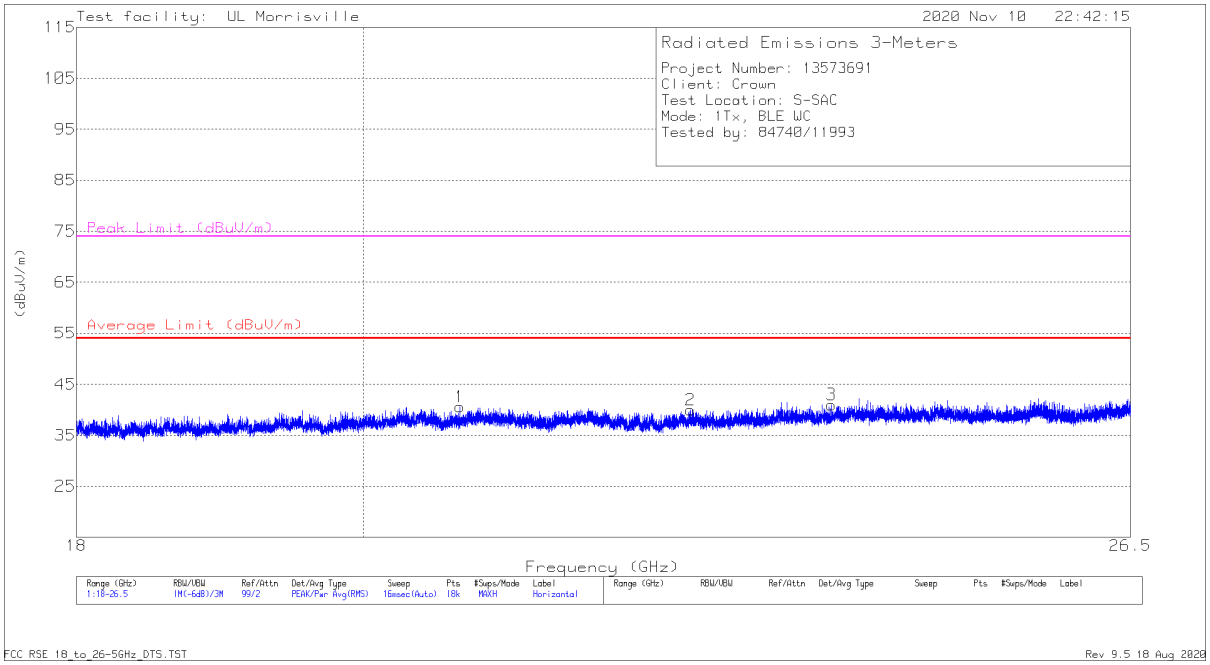
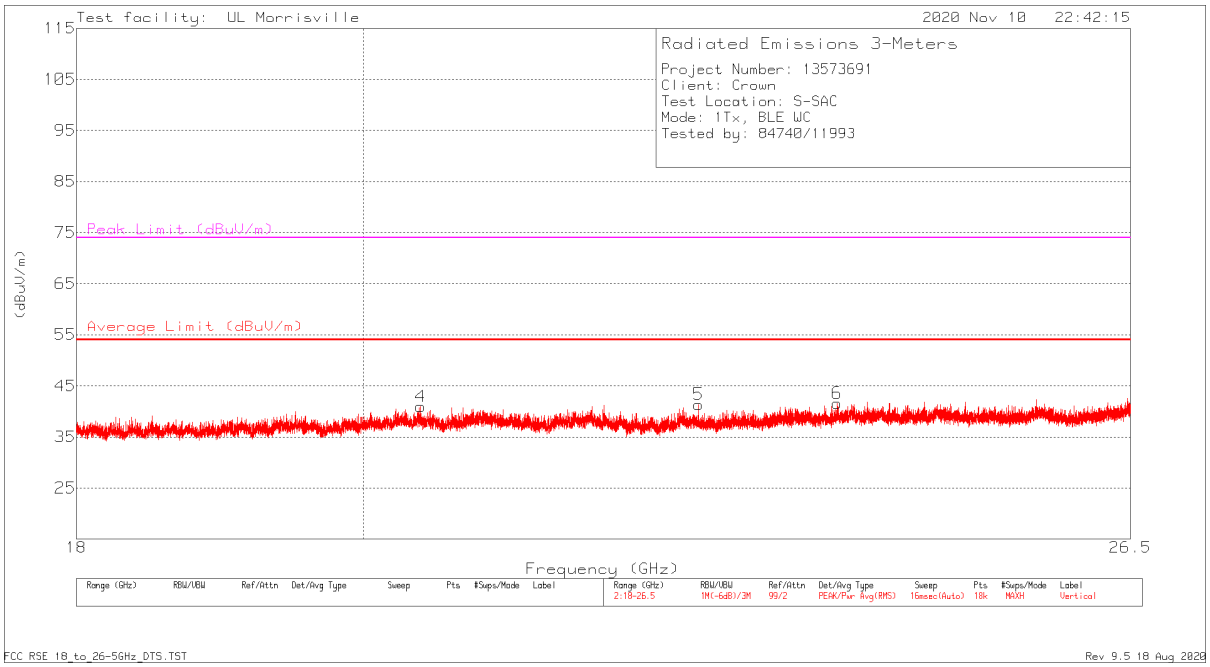
SPURIOUS EMISSIONS 18-26 GHz (WORST-CASE CONFIGURATION)



HORIZONTAL



VERTICAL

18 – 26GHz DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0076 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	* ** 20.72109	46.91	Pk	33.1	-39.4	40.61	54	-13.39	74	-33.39	0-360	101	H
2	* ** 22.54822	45.64	Pk	33.5	-39.2	39.94	54	-14.06	74	-34.06	0-360	299	H
3	* ** 23.74726	45.61	Pk	34	-38.6	41.01	54	-12.99	74	-32.99	0-360	249	H
4	* ** 20.42358	46.52	Pk	33.1	-38.7	40.92	54	-13.08	74	-33.08	0-360	200	V
5	* ** 22.61764	46.66	Pk	33.5	-38.8	41.36	54	-12.64	74	-32.64	0-360	150	V
6	* ** 23.79401	46.11	Pk	34	-38.5	41.61	54	-12.39	74	-32.39	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

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13. SETUP PHOTOS

Please refer to R13573691-EP1 for setup photos

END OF TEST REPORT

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