



CERTIFICATION TEST REPORT

Report Number: R12444044-E6

Applicant : CyberOptics Corporation
5900 Golden Hills Drive
Golden Valley, MN 55416, USA

Model : APS3

Brand name / Tradename : WaferSense APS3

FCC ID : SPD003

EUT Description : Airborne Particle Sensor

Test Standard(s) : LP0002:2018

Date Of Issue:

2020-03-02

Prepared by:

UL LLC

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REPORT REVISION HISTORY

Ver.	Issue Date	Revisions	Revised By
1	2019-12-22	Initial Issue	Brian T. Kiewra
2	2020-02-20	Removed references to APS-FPD throughout report and added AC mains and radiated testing with EUT powered by AC adaptor.	Brian T. Kiewra
3	2020-03-02	Added notes to Section 5.1 and 5.6. Revised antenna gain in Section 5.3. Added support power supply and USB Cable info.	Brian T. Kiewra

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: CyberOptics Corporation
5900 Golden Hills Drive
Golden Valley, MN 55416, USA

EUT DESCRIPTION: Airborne Particle Sensor

BRAND NAME: WaferSense APS3

MODEL: APS3

SERIAL NUMBER: JE108101

DATE TESTED: 2018-11-19 to 2020-02-20

LP0002 Clause	Requirement	Result	Comment
See Comment	Duty Cycle	Reporting purposes only	Per ANSI C63.10, Section 11.6
See Comment	20dB BW	Reporting purposes only	Per ANSI C63.10 Sections 6.9.2 and 6.9.3.
3.10.1.6 (1A)	Hopping Frequency Separation	Compliant	None
3.10.1.6 (1A, a)	Number of Hopping Channels	Compliant	None
3.10.1.6 (1A, a)	Average Time of Occupancy	Compliant	None
3.10.1.2 (1A)	Output Power	Compliant	None
See Comment	Average Power	Reporting purposes only	Per ANSI C63.10 Section 11.9.2.3
3.10.1.5	Conducted Spurious Emissions	Compliant	None
2.7, 2.8, 2.11	Radiated Emissions	Compliant	None
2.3	AC Mains Conducted Emissions	Compliant	None

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:

A handwritten signature in black ink, appearing to read "J Moser".

Jeffrey Moser
Operations Manager
UL – Consumer Technology Division

Prepared By:

A handwritten signature in blue ink, appearing to read "B.T. Kiewra".

Brian T. Kiewra
Project Engineer
UL – Consumer Technology Division

2. 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, ANSI C63.4: 2014 and NCC LP0002:2018.

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 12 Laboratory Drive, Research Triangle Park, North Carolina 27709, USA and 2800 Perimeter Park Dr., Suite B, Morrisville, North Carolina 27560, USA. The following table identifies which facilities were utilized for radiated emission measurements documented in this report. Specific facilities are also identified in the test results sections.

12 Laboratory Dr.	2800 Perimeter Park Dr.
☐ Chamber A	☒ Chamber North
☐ Chamber C	☒ Chamber South

UL LLC (RTP) is accredited by NVLAP, Laboratory Code 200246-0

4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations and is traceable to recognized national standards.

4.2. 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

4.3. MEASUREMENT UNCERTAINTY

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

PARAMETER	UNCERTAINTY
Occupied Channel Bandwidth	2.00%
RF output power, conducted	1.3 dB (PK), 0.45 dB (AV)
Unwanted Emissions, conducted	2.50 dB
All emissions, radiated	4.88 dB

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

5. EQUIPMENT UNDER TEST

5.1. EUT DESCRIPTION

The EUT is an airborne particle sensor with a Bluetooth radio. The EUT only supports GFSK modulation.

APS3 is intended to be used inside semiconductor fabrication tools, and is the shape of a wafer, that is 300 mm diameter.

Note: The product has no wireless communication function for wireless charging, it only transmits radio waves converted from radio frequency energy to electrical energy. It does not belong in Qi(WPC), AFA – Inductive(PMA), or AFA- Resonant (A4WP).

5.2. 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	Basic GFSK	12.92	19.59

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes an inverted-F PCB antenna with a maximum gain of 1.4 dBi.

5.4. SOFTWARE AND FIRMWARE

The firmware installed in the EUT during testing was BC4 v26.4279

The test utility software used during testing was BlueTest3 v1.24

5.5. 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 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 was investigated in three orthogonal orientations X, Y, and Z. It was determined that X orientation was worst-case orientation in transmit mode and X orientation in receive mode. Therefore, all final radiated testing was performed with the APS3 in these orientations.

Only GFSK/DH5 supported.

5.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID
Battery Pack	Power Bank	XT-5000	NA	NA
Power Adaptor	CUI Inc.	SM15-5-V-138	NA	NA
USB Cable	Qualtek	3021001-03	NA	NA

Note: The applicant has declared that the support equipment will not be sold with EUT and they are provided by applicant or test lab.

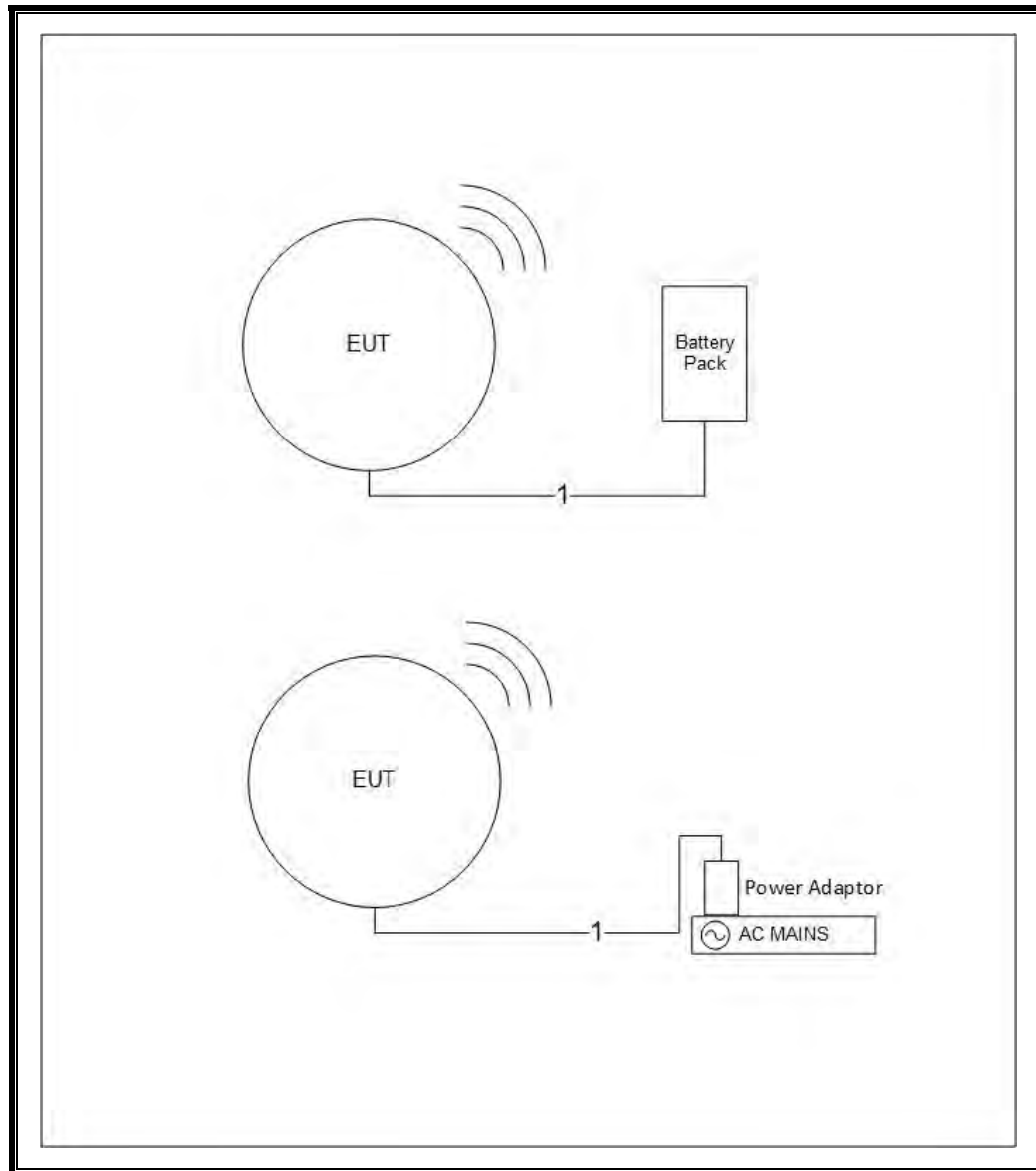
I/O CABLES

I/O Cable List						
Cable No.	Port	# of Identical Ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	USB	1	USB	USB	<1m	Connected to battery pack or power adaptor

TEST SETUP

The EUT was installed in a typical configuration. The customer provided test software to exercise the EUTs during test. Refer to the following diagram.

SETUP DIAGRAMS



6. 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 - North Chamber)

Equipment ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
0.009-30MHz (Loop Ant.)					
AT0079	Active Loop Antenna	ETS-Lindgren	6502	2018-01-02	2019-01-02
AT0079	Active Loop Antenna	ETS-Lindgren	6502	2019-08-08	2020-08-08
30-1000 MHz					
AT0073	Hybrid Broadband Antenna	Sunol Sciences Corp.	JB3	2018-08-06	2019-08-06
AT0073	Hybrid Broadband Antenna	Sunol Sciences Corp.	JB3	2019-08-08	2020-08-08
1-18 GHz					
AT0072	Double-Ridged Waveguide Horn Antenna, 1 to 18 GHz	ETS Lindgren	3117	2018-04-30	2019-04-30
AT0067	Double-Ridged Waveguide Horn Antenna, 1 to 18 GHz	ETS Lindgren	3117	2019-03-22	2020-03-22
Gain-Loss Chains					
N-SAC01	Gain-loss string: 0.009-30MHz	Various	Various	2018-09-06	2019-09-06
N-SAC01	Gain-loss string: 0.009-30MHz	Various	Various	2019-05-02	2020-05-02
N-SAC02	Gain-loss string: 25-1000MHz	Various	Various	2018-05-20	2019-05-20
N-SAC02	Gain-loss string: 25-1000MHz	Various	Various	2019-05-02	2020-05-02
N-SAC03	Gain-loss string: 1-18GHz	Various	Various	2018-03-23	2019-03-23
N-SAC03	Gain-loss string: 1-18GHz	Various	Various	2019-03-15	2020-03-15
Receiver & Software					
SA0027	Spectrum Analyzer	Agilent	N9030A	2018-04-04	2019-04-04
SA0026	Spectrum Analyzer	Agilent	N9030A	2019-03-19	2020-03-19
SOFTEMI	EMI Software	UL	Version 9.5 (2019-06-12)		
Additional Equipment used					
s/n 181474341	Environmental Meter	Fisher Scientific	15-077-963	2018-07-27	2020-07-27
s/n 161024690	Environmental Meter	Fisher Scientific	15-077-963	2016-12-21	2018-12-21

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	2019-08-08	2020-08-08
30-1000 MHz					
AT0074	Hybrid Broadband Antenna	Sunol Sciences Corp.	JB3	2019-07-16	2020-07-16
1-18 GHz					
AT0069	Double-Ridged Waveguide Horn Antenna, 1 to 18 GHz	ETS Lindgren	3117	2018-04-30	2019-04-30
AT0072	Double-Ridged Waveguide Horn Antenna, 1 to 18 GHz	ETS Lindgren	3117	2019-04-22	2020-04-22
18-26 GHz					
AT0076	Horn Antenna, 18-26.5GHz	ARA	MWH-1826/B	2019-11-07	2020-11-07
Gain-Loss Chains					
S-SAC02	Gain-loss string: 25-1000MHz	Various	Various	2019-05-02	2020-05-02
S-SAC03	Gain-loss string: 1-18GHz	Various	Various	2018-03-20	2019-03-20
S-SAC03	Gain-loss string: 1-18GHz	Various	Various	2019-03-13	2020-03-13
S-SAC04	Gain-loss string: 18-40GHz	Various	Various	2018-09-30	2019-03-31
S62/AMP017/ CBL269426-001	Gain-loss string: 18-40GHz	Huber+Suhner Miteq MegaPhase	SUCOFLEX 102EA TTA1840-35-HG NC12-K1K1-216	2019-03-21	2020-03-21
Receiver & Software					
SA0026	Spectrum Analyzer	Agilent	N9030A	2018-03-20	2019-03-20
SA0025	Spectrum Analyzer	Agilent	N9030A	2018-04-30	2019-04-30
SA0025	Spectrum Analyzer	Agilent	N9030A	2019-02-28	2020-02-28
SA0027 (18-40GHz RSE)	Spectrum Analyzer	Agilent	N9030A	2019-05-15	2020-05-15
SOFTEMI	EMI Software	UL	Version 9.5 (2019-06-12)		
Additional Equipment used					
s/n 161024887	Environmental Meter	Fisher Scientific	15-077-963	2016-12-23	2018-12-23
s/n 181474409	Environmental Meter	Fisher Scientific	15-077-963	2018-07-27	2020-07-27

Note: All equipment was within calibration at time of use.

Test Equipment Used - Wireless Conducted Measurement Equipment

Equipment ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
T177 (PRE0079253)	Spectrum Analyzer	Agilent Technologies	E4446A	2018-04-12	2019-04-12
PWM004 (PRE0137346)	RF Power Meter	Keysight Technologies	N1911A	2018-07-30	2019-07-30
PWS004 (PRE0126443)	Peak and Avg Power Sensor, 50MHz to 6GHz	Keysight Technologies	E9323A	2018-07-30	2019-07-30
76021	DC Regulated Power Supply	CircuitSpecialists.Com	CSI3005X5	N/A	N/A
MM0168 (PRE0126454)	True RMS Multimeter	Agilent	U1232A	2018-10-12	2019-10-31
SN 161024885	Environmental Meter	Fisher Scientific	15-077-963	2016-12-23	2018-12-23
SOFTEMI	EMI Software	UL	APv9.1 (2018.11.13)		

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	2019-05-29	2020-05-29
s/n 181562858	Environmental Meter	Fisher Scientific	14-650-118	2018-09-04	2020-09-04
LISN003	LISN, 50-ohm/50-uH, 2-conductor, 25A	Fischer Custom Com.	FCC-LISN-50-25-2-01-550V	2019-08-19	2020-08-19
75141 (PRE0101521)	EMI Test Receiver 9kHz-7GHz	Rohde & Schwarz	ESCI 7	2019-08-20	2020-08-20
TL001	Transient Limiter, 0.009-30MHz	Com-Power	LIT-930A	2019-05-29	2020-05-29
PS214	AC Power Source	Elgar	CW2501M (s/n 1523A02396)	NA	NA
SOFTEMI	EMI Software	UL	Version 9.5 (2019-06-12)		
MM0169	Multi-meter	Agilent	U1232A	2019-03-15	2020-03-15
CDECABLE001	ANSI C63.4 1m extension cable.	UL	Per Annex B of ANSI C63.4	2019-07-10	2020-07-10

7. MEASUREMENT METHODS

Duty Cycle: KDB 558074 Zero-Span Spectrum Analyzer Method

20 dB BW: ANSI C63.10 Section 6.9.2.

99% Occupied Bandwidth: ANSI C63.10, Section 6.9.3

Hopping Frequency Separation: ANSI C63.10 Section 7.8.2

Number of Hopping Channels: ANSI C63.10 Section 7.8.3

Average Time of Occupancy: ANSI C63.10 Section 7.8.4

Output Power: ANSI C63.10 Section 7.8.5

Average Power: ANSI C63.10 Section 11.9.2.3

Out-of-band emissions in non-restricted bands: ANSI C63.10 Section 7.8.6 & 7.8.8

Out-of-band emissions in restricted bands: ANSI C63.10:2013 Sections 6.3-6.6

Rx Mode Radiated Testing: ANSI C63.4: 2014 Section 12.2.5

AC Mains Emissions Testing: ANSI C63.10 Section 6.2

8. ANTENNA PORT TEST RESULTS

8.1. ON TIME AND DUTY CYCLE

LIMITS

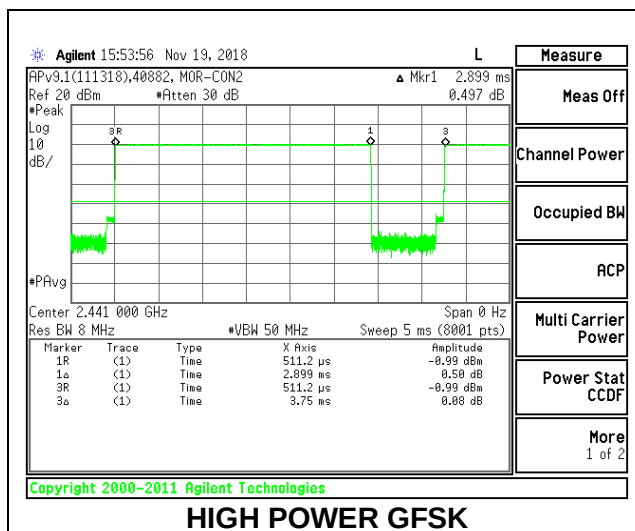
None; for reporting purposes only.

PROCEDURE

ANSI C63.10, Section 11.6 : Zero-Span Spectrum Analyzer Method.

Mode	ON Time B (msec)	Period (msec)	Duty Cycle x (linear)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)	1/T Minimum VBW (kHz)
Bluetooth GFSK	2.90	3.75	0.773	77.3%	1.12	0.345

DUTY CYCLE PLOTS



8.2. 20 dB AND 99% BANDWIDTH

LIMITS

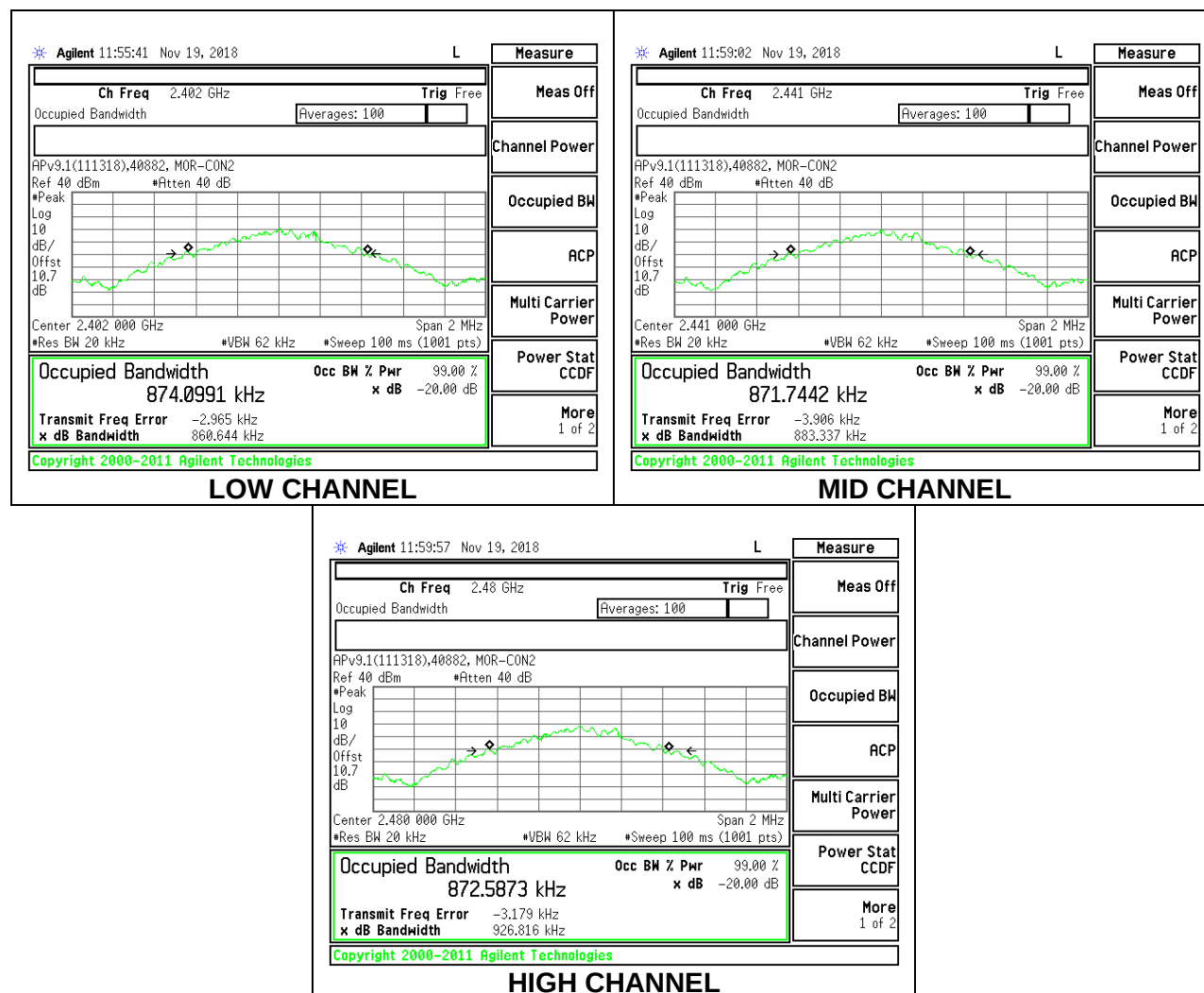
None; for reporting purposes only. Test per ANSI C63.10 Sections 6.9.2 and 6.9.3.

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The RBW is set to 1-5% of the 20 dB bandwidth. The VBW is set to $\geq 3 \times$ RBW. The sweep time is coupled.

8.2.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION

Channel	Frequency (MHz)	20dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	2402	0.861	0.874
Mid	2441	0.883	0.872
High	2480	0.927	0.873



8.3. HOPPING FREQUENCY SEPARATION

LIMITS

NCC LP0002 3.10.1.6 (1A)

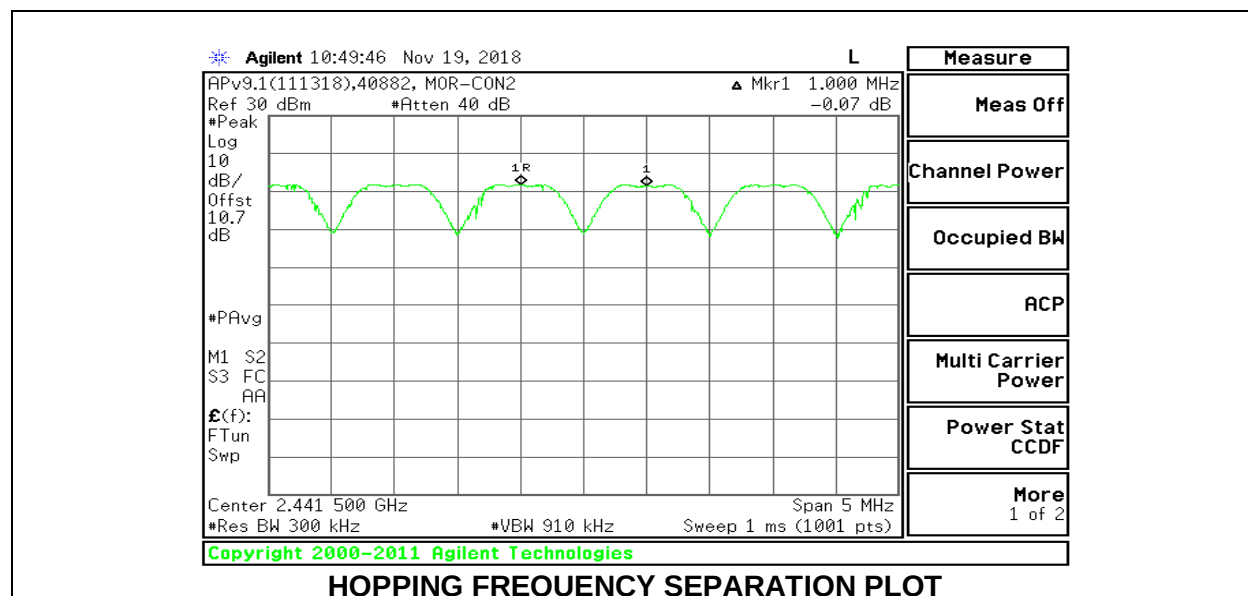
Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The RBW is set to 300 kHz and the VBW is set to 300 kHz. The sweep time is coupled.

8.3.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION



Ch. A	Ch. B	Ch. 1 to Ch. 2 Sep.	Max. 20 dB BW	2/3 20 dB BW	Margin
(MHz)	(MHz)	(MHz)	(MHz)	(MHz)	(MHz)
2441	2442	1.000	0.927	0.618	-0.382

8.4. NUMBER OF HOPPING CHANNELS

LIMITS

NCC LP0002 3.10.1.6 (1A,a)

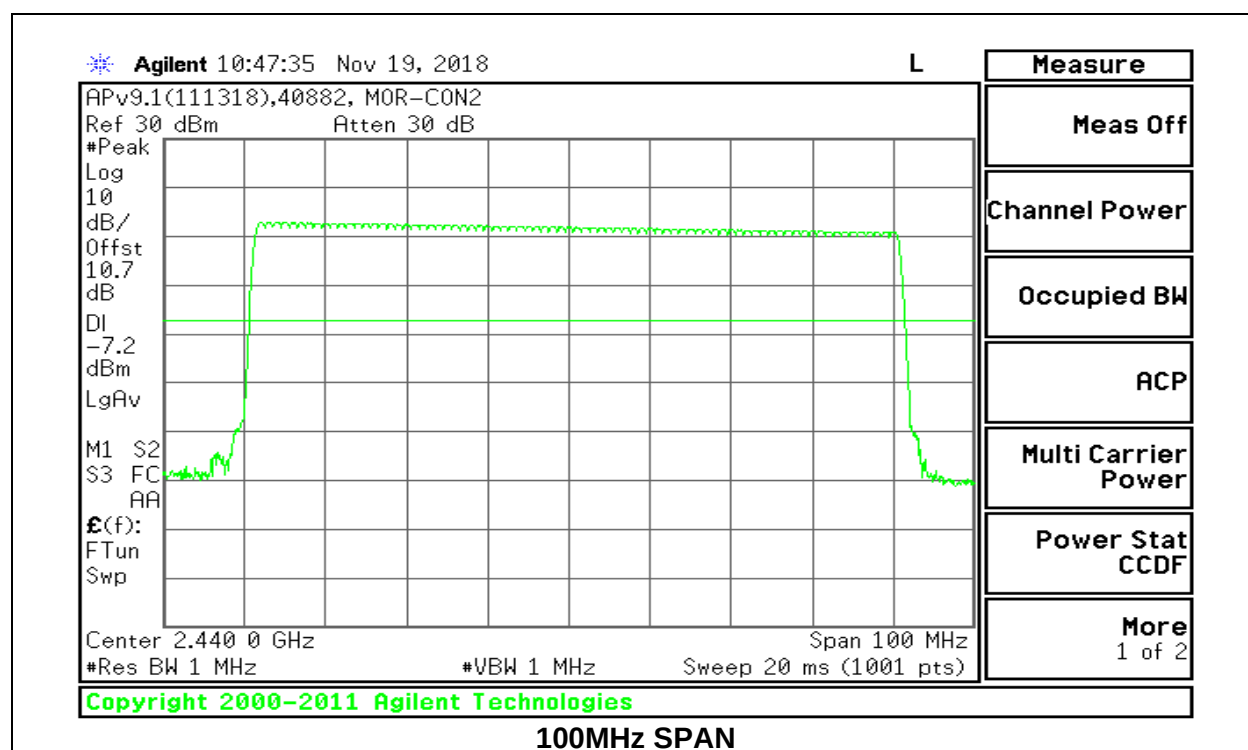
Frequency hopping systems in the 2400 – 2483.5 MHz band shall use at least 15 non-overlapping channels.

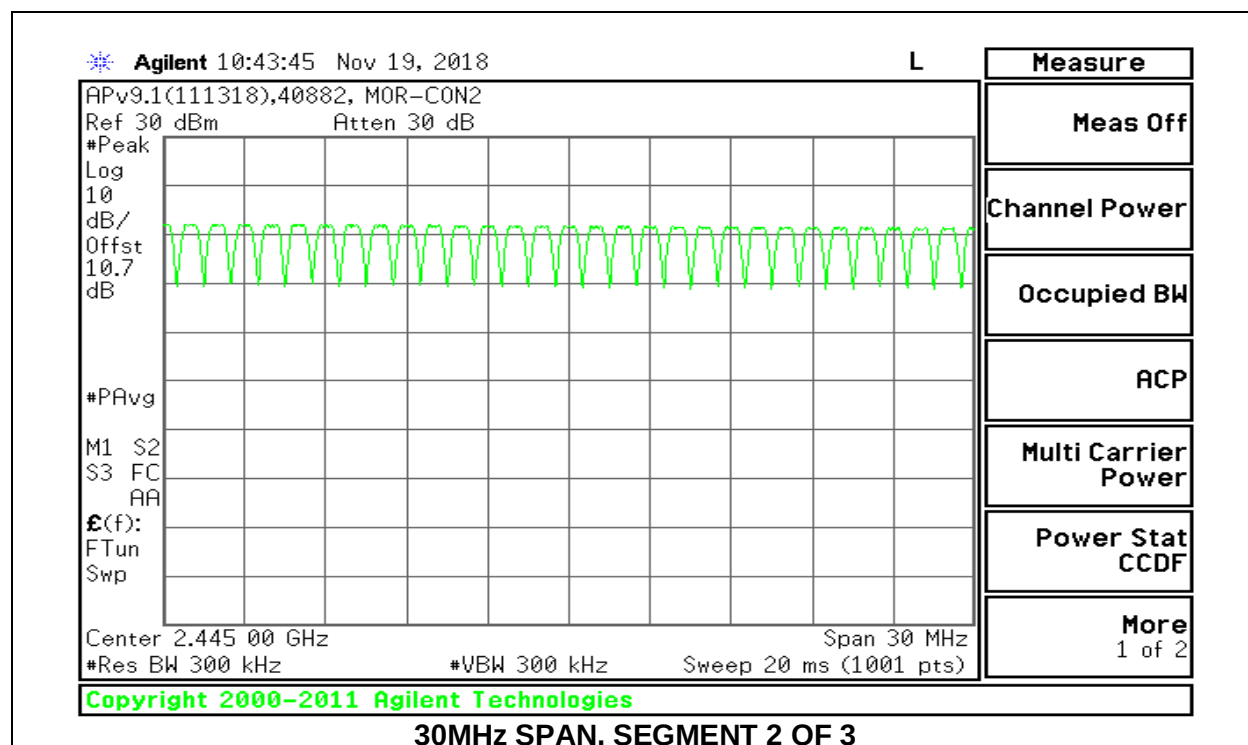
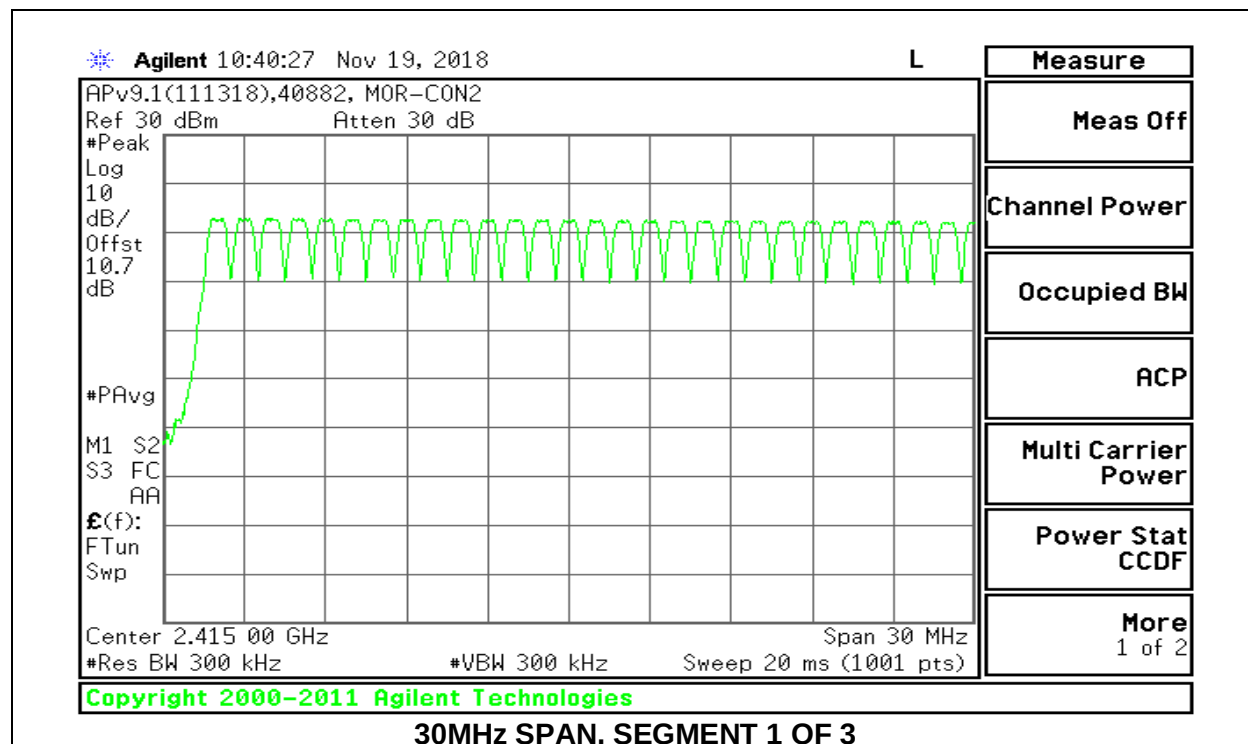
TEST PROCEDURE

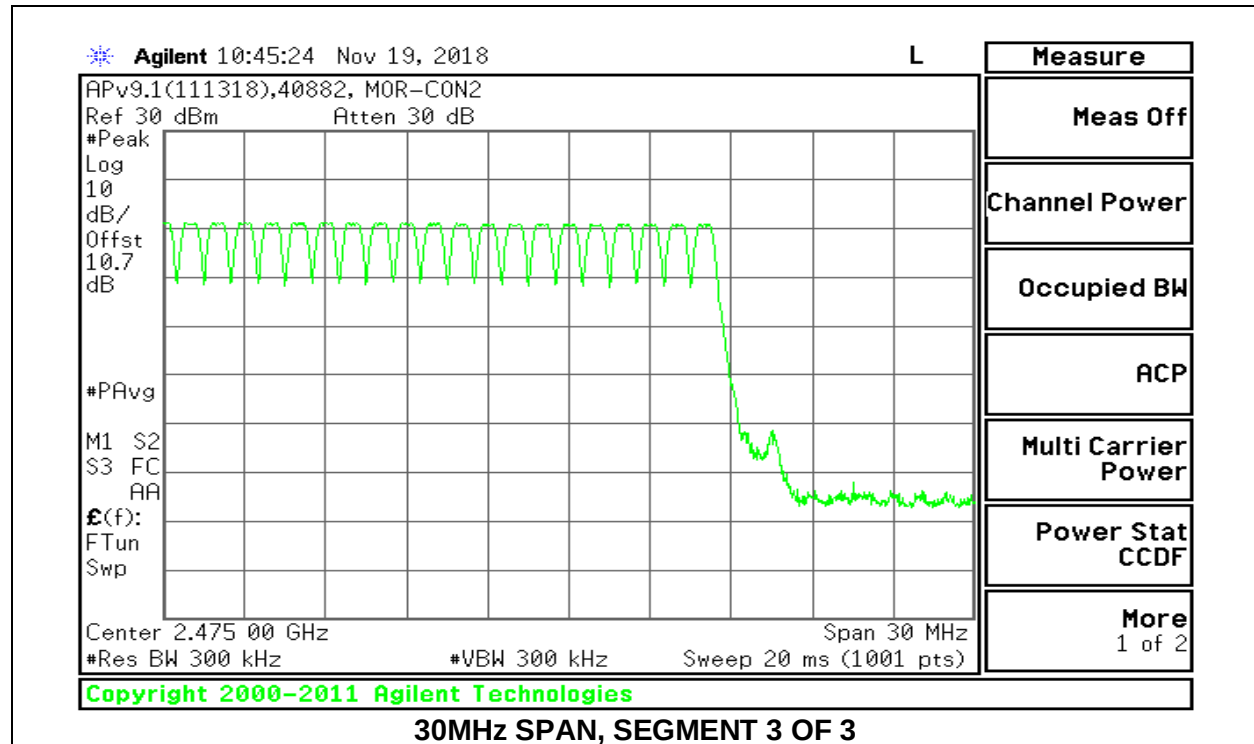
The transmitter output is connected to a spectrum analyzer. The span is set to cover the entire authorized band, in either a single sweep or in multiple contiguous sweeps. The RBW is set to a maximum of 1 % of the span. The analyzer is set to Max Hold.

Normal Mode: All Channels Observed

8.4.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION







8.5. AVERAGE TIME OF OCCUPANCY

LIMITS

NCC LP0002 3.10.1.6 (1A, a)

The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

TEST PROCEDURE

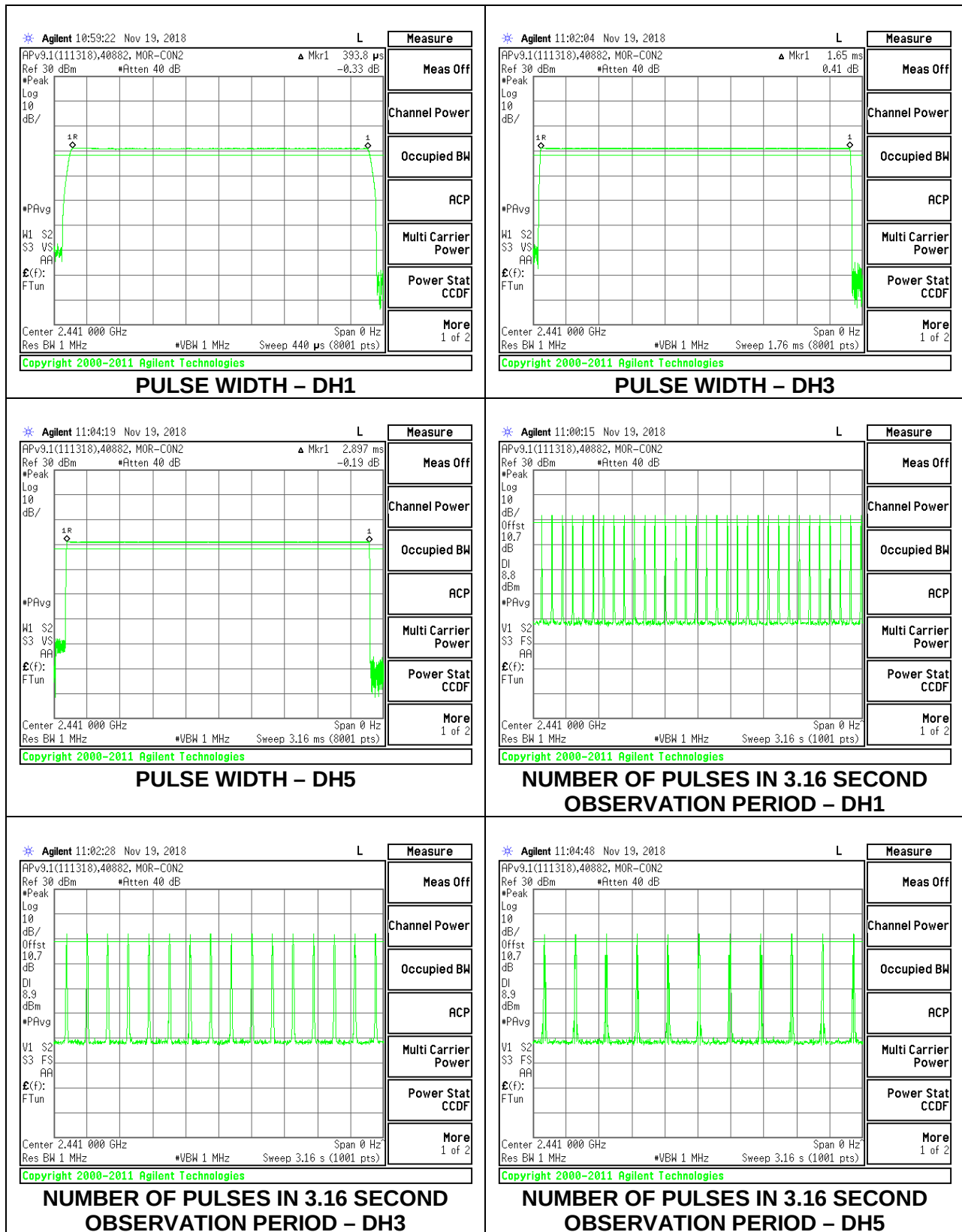
The transmitter output is connected to a spectrum analyzer. The span is set to 0 Hz, centered on a single, selected hopping channel. The width of a single pulse is measured in a fast scan. The number of pulses is measured in a 3.16 second scan, to enable resolution of each occurrence.

The average time of occupancy in the specified 3.16 second period (79 channels * 0.4 s) is equal to $10 * (\# \text{ of pulses in } 3.16 \text{ s}) * \text{pulse width}$.

For AFH mode, the average time of occupancy in the specified 8 second period (20 channels * 0.4 seconds) is equal to $10 * (\# \text{ of pulses in } 0.8 \text{ s}) * \text{pulse width}$.

8.5.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION

DH Packet	Pulse Width (msec)	Number of Pulses in 3.16 seconds	Average Time of Occupancy (sec)	Limit (sec)	Margin (sec)
GFSK Normal Mode					
DH1	0.394	32	0.1261	0.4	-0.2739
DH3	1.65	16	0.2640	0.4	-0.1360
DH5	2.897	11	0.3187	0.4	-0.0813
DH Packet	Pulse Width (sec)	Number of Pulses in 0.8 seconds	Average Time of Occupancy (sec)	Limit (sec)	Margin (sec)
GFSK AFH Mode					
DH1	0.394	8	0.03152	0.4	-0.3685
DH3	1.65	4	0.06600	0.4	-0.3340
DH5	2.897	2.75	0.07967	0.4	-0.3203



8.6. OUTPUT POWER

LIMITS

NCC LP0002 3.10.1.2 (1A)

The maximum antenna gain is less than 6 dBi, therefore the limit is 30 dBm. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

TEST PROCEDURE

Measurements perform using a wideband gated RF power meter.

The cable assembly insertion loss of 10.7 dB (including 10 dB pad and 0.7 dB cable) was entered as an offset in the power meter to allow for a peak reading of power.

8.6.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION

Tested By:	40882
Date:	2018-11-19

Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2402	12.92	30	-17.08
Middle	2441	11.89	30	-18.11
High	2480	10.78	30	-19.22

8.7. AVERAGE POWER

LIMITS

None; for reporting purposes only

TEST PROCEDURE

Measurements perform using a wideband gated RF power meter.

The cable assembly insertion loss of 10.7 dB (including 10 dB pad and 0.7 dB cable) was entered as an offset in the power meter to allow for a gated average reading of power.

8.7.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION

Tested By:	40882
Date	2018-11-19

Channel	Frequency (MHz)	Average Power (dBm)
Low	2402	12.77
Middle	2441	11.73
High	2480	10.6

8.8. CONDUCTED SPURIOUS EMISSIONS

LIMITS

NCC LP0002 3.10.1.5

In any 100kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, the attenuation shall be as below:

- 1) The attenuation shall be at least 20dB when the conducted power is measured according to the Appendix II of this part, based on either an RF conducted or a radiated measurement.
- 2) (2) The attenuation shall be at least 30dB when the conducted power is measured according to the paragraph (2)(2.3) of this section (3.10.1).

In addition, radiated emissions which fall in section 2.7 the restricted bands must also comply with the radiated emission limit specified in section 2.8.

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

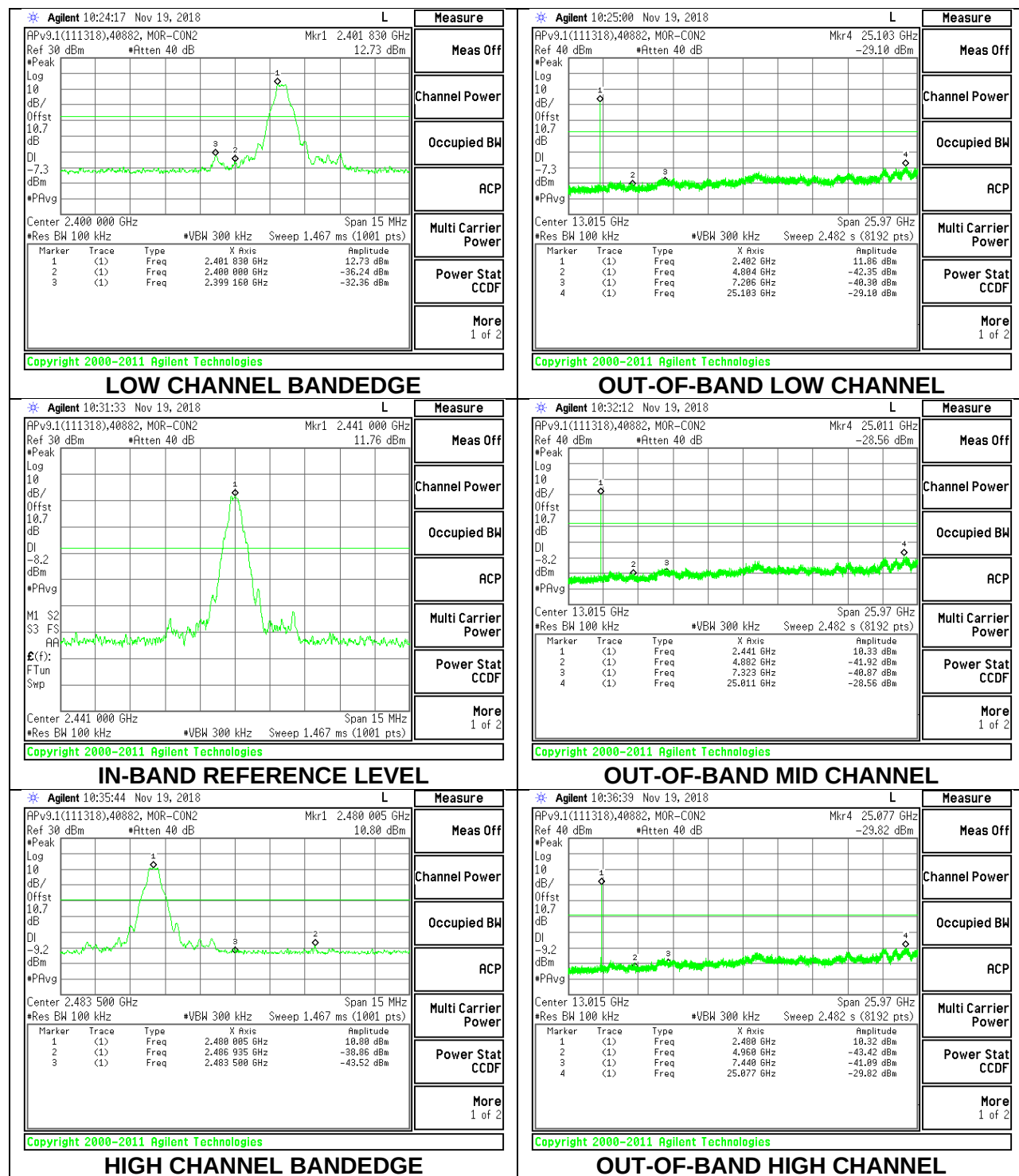
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

The bandedges at 2.4 and 2.4835 GHz are investigated with the transmitter set to the normal hopping mode.

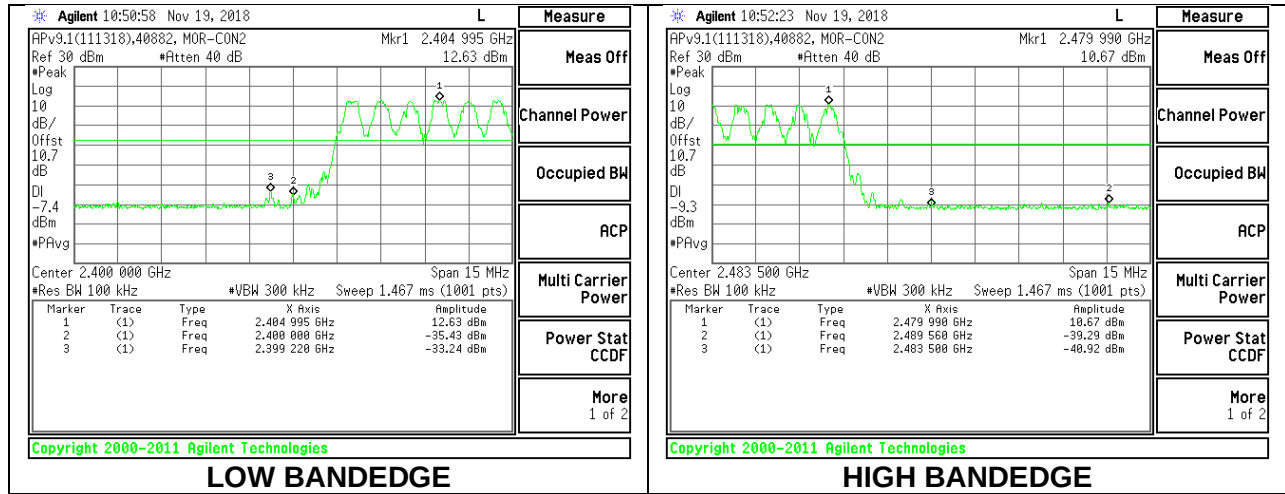
RESULTS

8.8.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION

SPURIOUS EMISSIONS, NON-HOPPING



SPURIOUS BANDEGE EMISSIONS WITH HOPPING ON



9. RADIATED TEST RESULTS

LIMITS

NCC LP0002 2.7, 2.8, and 2.11.

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 measurements above 1GHz in Transmit mode and 80 cm above the ground plane for measurements above 1GHz in Receive mode. The antenna to EUT distance is 3 meters. The EUT is configured in accordance with ANSI C63.10 for Transmit mode testing and ANSI C63.4 for Receive mode testing. The EUT is set to transmit in a continuous mode for Transmit testing.

For measurements below 1 GHz the resolution bandwidth is set to 120 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements for the 30-1000 MHz range, 9 kHz for peak detection measurements or 9 kHz for quasi-peak detection measurements for the 0.15-30 MHz range and 200 Hz for peak detection measurements or 200 Hz for quasi-peak detection measurements for the 9 to 150 kHz range. Peak detection is used unless otherwise noted as quasi-peak.

For pre-scans above 1 GHz the resolution bandwidth is set to 1 MHz; the video bandwidth is set to 30 kHz for peak measurements.

For final measurements above 1 GHz the resolution bandwidth is set to 1 MHz; the video bandwidth is set to 3 MHz for peak measurements and as applicable for average measurements. For this test program, Transmit mode average measurements were performed using Peak detection with the resolution bandwidth set for 1 MHz and the Video Bandwidth set for 1/Ton, where Ton equals the transmit on time. Receive mode average measurements were performed using RMS.

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.

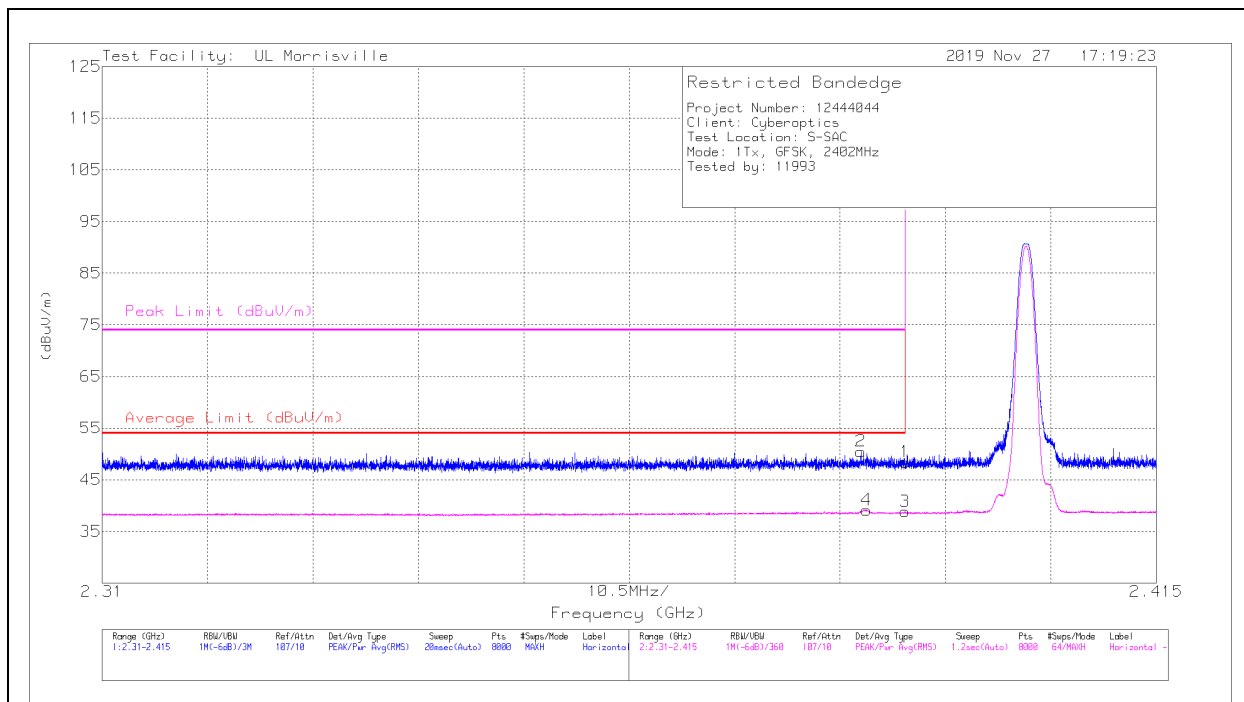
The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized in both the vertical and the horizontal positions.

9.1. TRANSMITTER ABOVE 1 GHz

9.1.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION – APS3 BATTERY

BANDEDGE (LOW CHANNEL)

HORIZONTAL RESULT



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 (dB/m)	Amp/Cbl/Filtr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 2.39	40.63	Pk	31.9	-24.1	48.43	-	-	74	-25.57	172	323	H
2	* ** 2.38557	42.7	Pk	31.9	-24.1	50.5	-	-	74	-23.5	172	323	H
3	* ** 2.39	31.06	V1TR	31.9	-24.1	38.86	54	-15.14	-	-	172	323	H
4	* ** 2.38614	31.33	V1TR	31.9	-24.1	39.13	54	-14.87	-	-	172	323	H

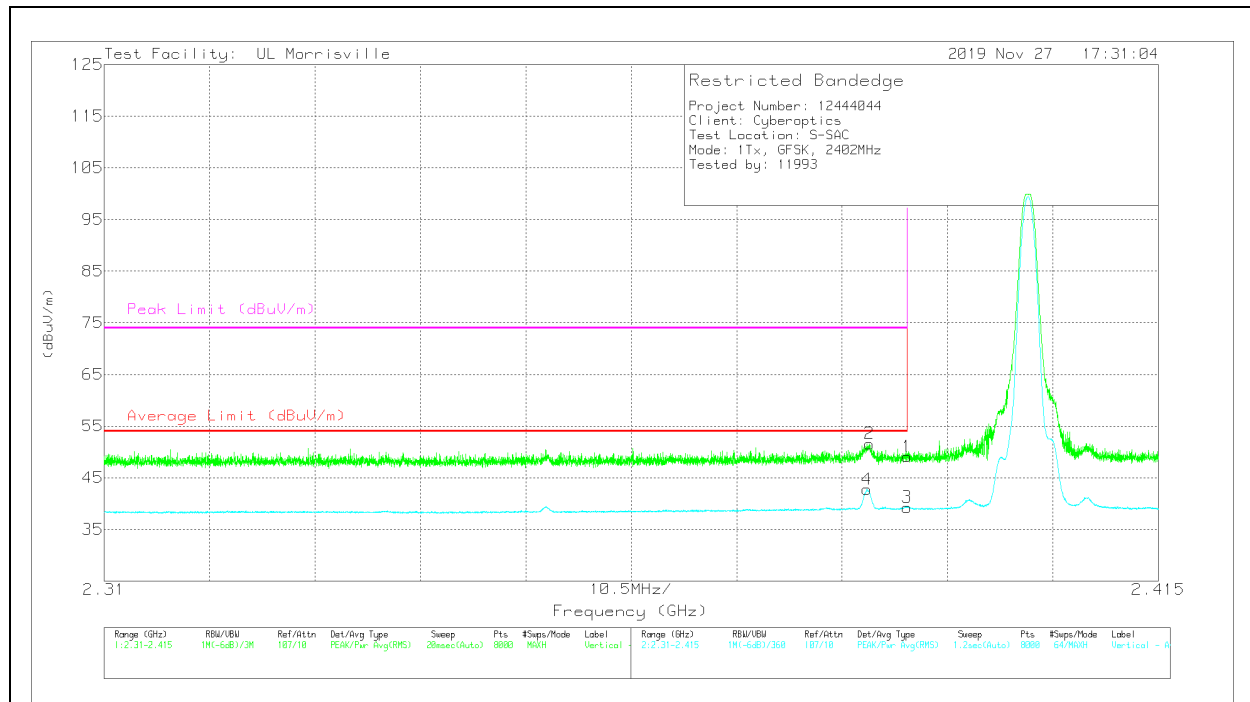
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

** - indicates frequency in Taiwan NCC LP0002 Restricted Band

Pk - Peak detector

V1TR - VB=1/Ton, RMS Average where: Ton is packet duration

VERTICAL RESULT



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 (dB/m)	Amp/Cbl/Filtr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 2.39	41.27	Pk	31.9	-24.1	49.07	-	-	74	-24.93	92	341	V
2	* ** 2.38624	43.8	Pk	31.9	-24.1	51.6	-	-	74	-22.4	92	341	V
3	* ** 2.39	31.48	V1TR	31.9	-24.1	39.28	54	-14.72	-	-	92	341	V
4	* ** 2.38597	34.95	V1TR	31.9	-24.1	42.75	54	-11.25	-	-	92	341	V

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

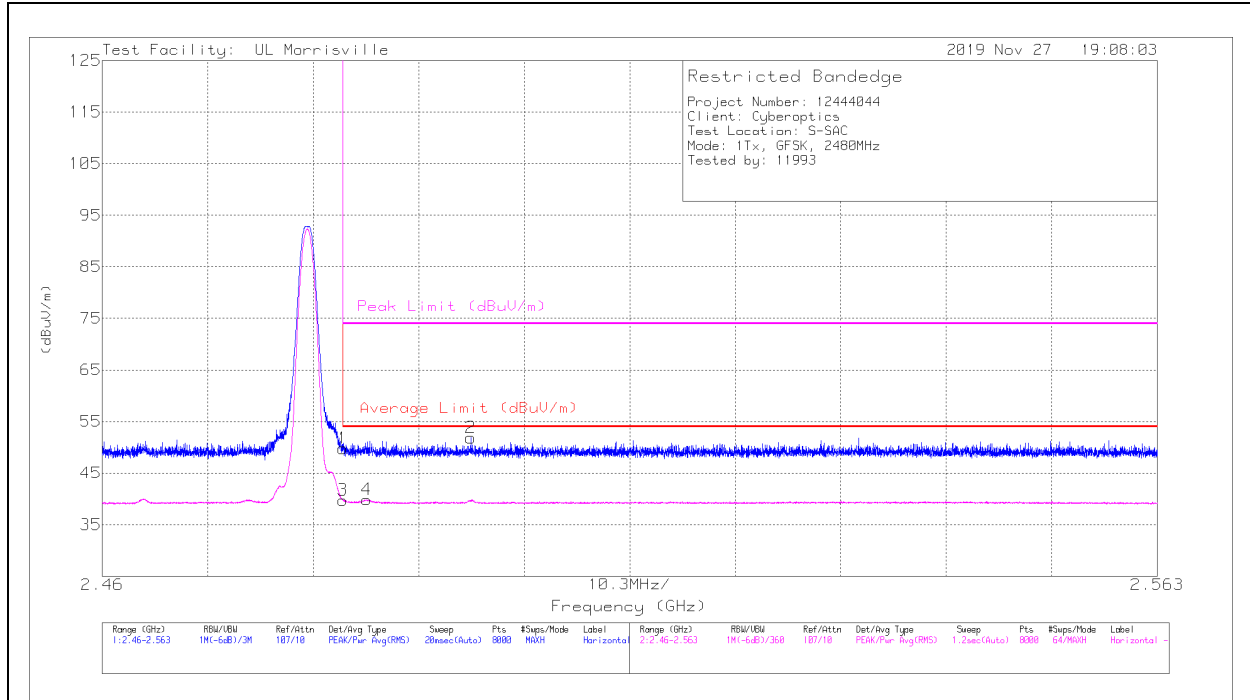
** - indicates frequency in Taiwan NCC LP0002 Restricted Band

Pk - Peak detector

V1TR - VB=1/Ton, RMS Average where: Ton is packet duration

BANDEDGE (HIGH CHANNEL)

HORIZONTAL RESULT



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 (dB/m)	Amp/Cbl/Filtr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 2.4835	41.49	Pk	32.3	-24	49.79	-	-	74	-24.21	286	396	H
2	* ** 2.49598	43.56	Pk	32.3	-24	51.86	-	-	74	-22.14	286	396	H
3	* ** 2.4835	31.47	V1TR	32.3	-24	39.77	54	-14.23	-	-	286	396	H
4	* ** 2.48581	31.56	V1TR	32.3	-24	39.86	54	-14.14	-	-	286	396	H

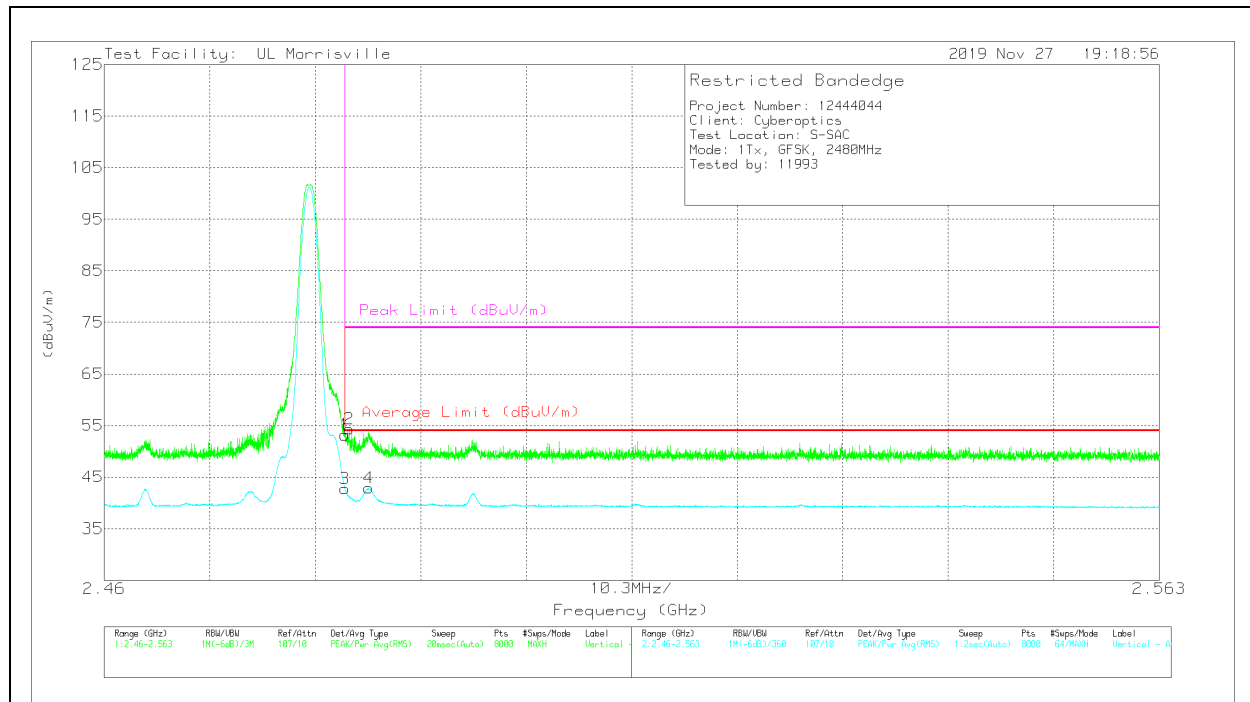
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

** - indicates frequency in Taiwan NCC LP0002 Restricted Band

Pk - Peak detector

V1TR - VB=1/Ton, RMS Average where: Ton is packet duration

VERTICAL RESULT



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 (dB/m)	Amp/Cbl/Filtr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 2.4835	44.91	Pk	32.3	-24	53.21	-	-	74	-20.79	74	351	V
2	* ** 2.48391	46.03	Pk	32.3	-24	54.33	-	-	74	-19.67	74	351	V
3	* ** 2.4835	34.44	V1TR	32.3	-24	42.74	54	-11.26	-	-	74	351	V
4	* ** 2.48583	34.56	V1TR	32.3	-24	42.86	54	-11.14	-	-	74	351	V

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

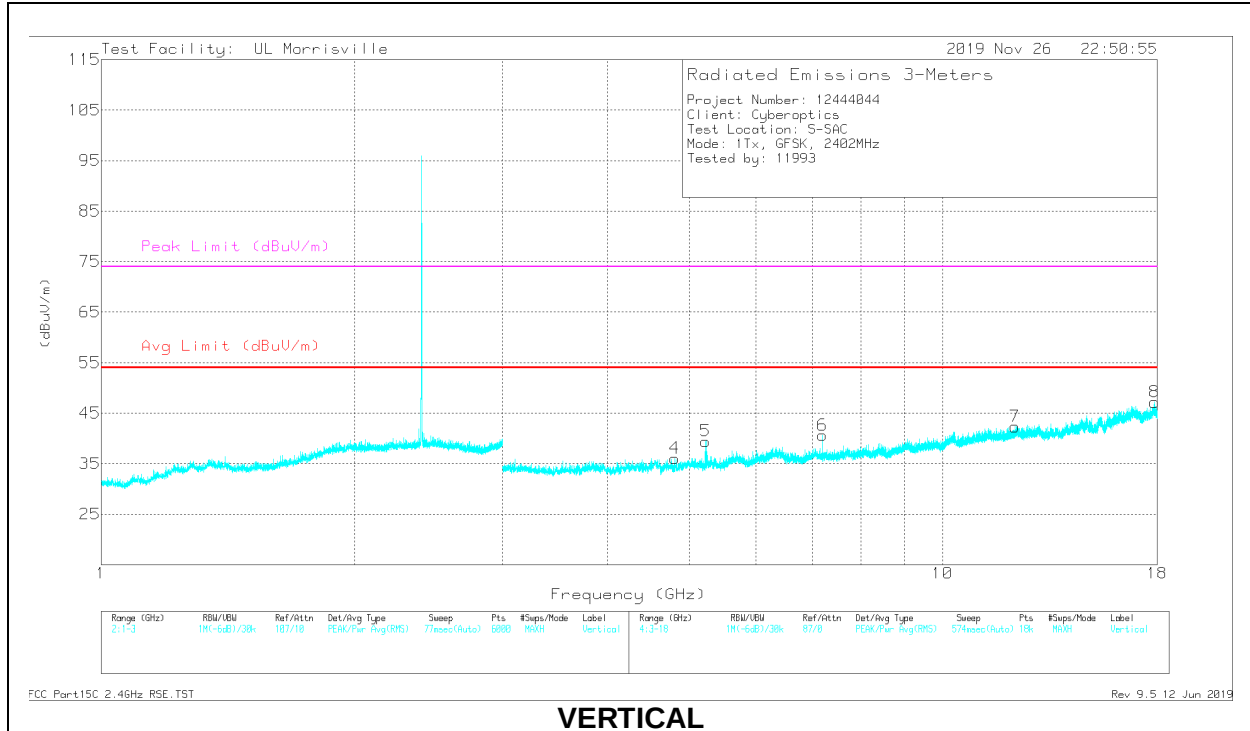
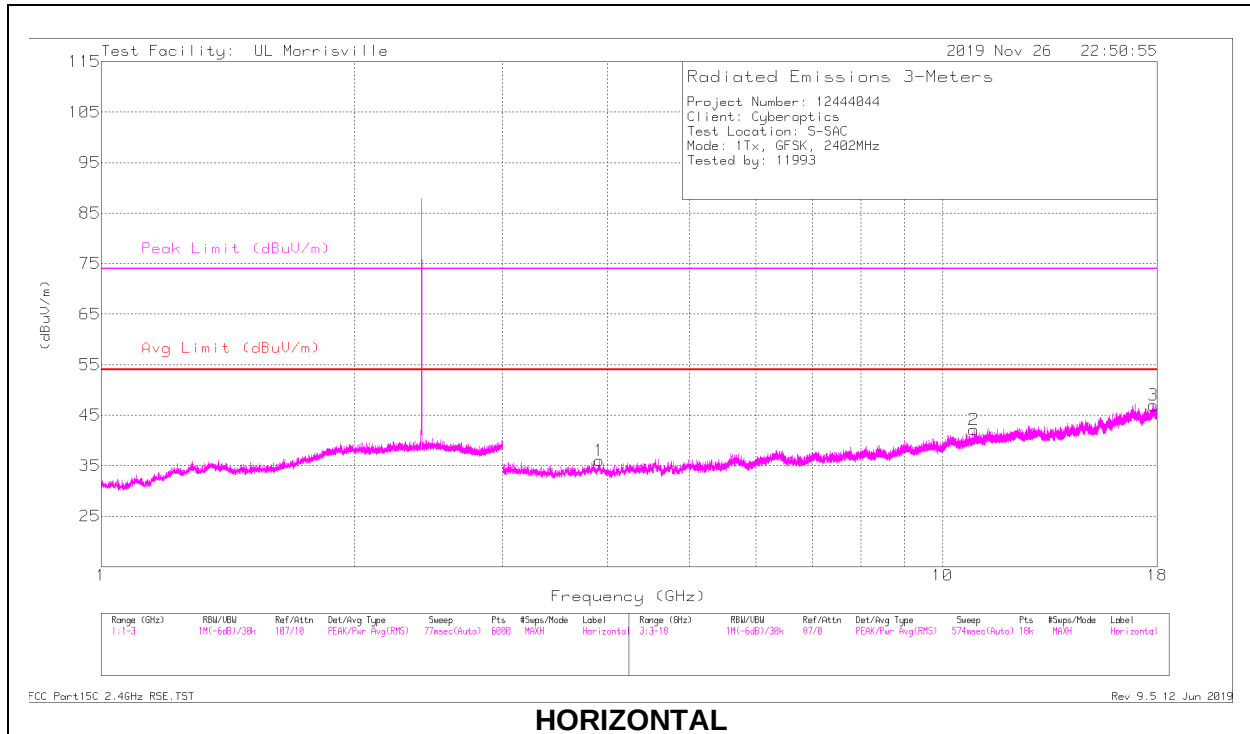
** - indicates frequency in Taiwan NCC LP0002 Restricted Band

Pk - Peak detector

V1TR - VB=1/Ton, RMS Average where: Ton is packet duration

HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL RESULTS



RADIATED EMISSIONS

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 (dB/m)	Amp/Cbl/Filtr/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	* ** 3.90796	40.62	PK-U	33.4	-31.8	42.22	-	-	74	-31.78	177	153	H
	* ** 3.90586	28.58	V1TR	33.4	-31.8	30.18	54	-23.82	-	-	177	153	H
2	* ** 10.8963	33.74	PK-U	37.9	-24.4	47.24	-	-	74	-26.76	200	230	H
	* ** 10.89627	22.49	V1TR	37.9	-24.4	35.99	54	-18.01	-	-	200	230	H
3	* ** 17.80709	33.17	PK-U	41.2	-20.8	53.57	-	-	74	-20.43	147	358	H
	* ** 17.80709	21.5	V1TR	41.2	-20.8	41.9	54	-12.1	-	-	147	358	H
4	* ** 4.80406	40.98	PK-U	34.2	-31	44.18	-	-	74	-29.82	220	256	V
	* ** 4.80401	33.49	V1TR	34.2	-31	36.69	54	-17.31	-	-	220	256	V
5	** 5.22564	37.7	PK-U	34.3	-30.5	41.5	-	-	74	-32.5	61	305	V
	** 5.22487	26.9	V1TR	34.3	-30.5	30.7	54	-23.3	-	-	61	305	V
7	* ** 12.20651	33.86	PK-U	38.9	-23.8	48.96	-	-	74	-25.04	309	274	V
	* ** 12.20795	22.49	V1TR	38.9	-23.8	37.59	54	-16.41	-	-	309	274	V
8	* ** 17.86956	32.74	PK-U	41.2	-20.6	53.34	-	-	74	-20.66	241	254	V
	* ** 17.86588	21.96	V1TR	41.2	-20.7	42.46	54	-11.54	-	-	241	255	V
6	7.20607	32.91	Pk	35.7	-28	40.61	-	-	-	-	0-360	199	V

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

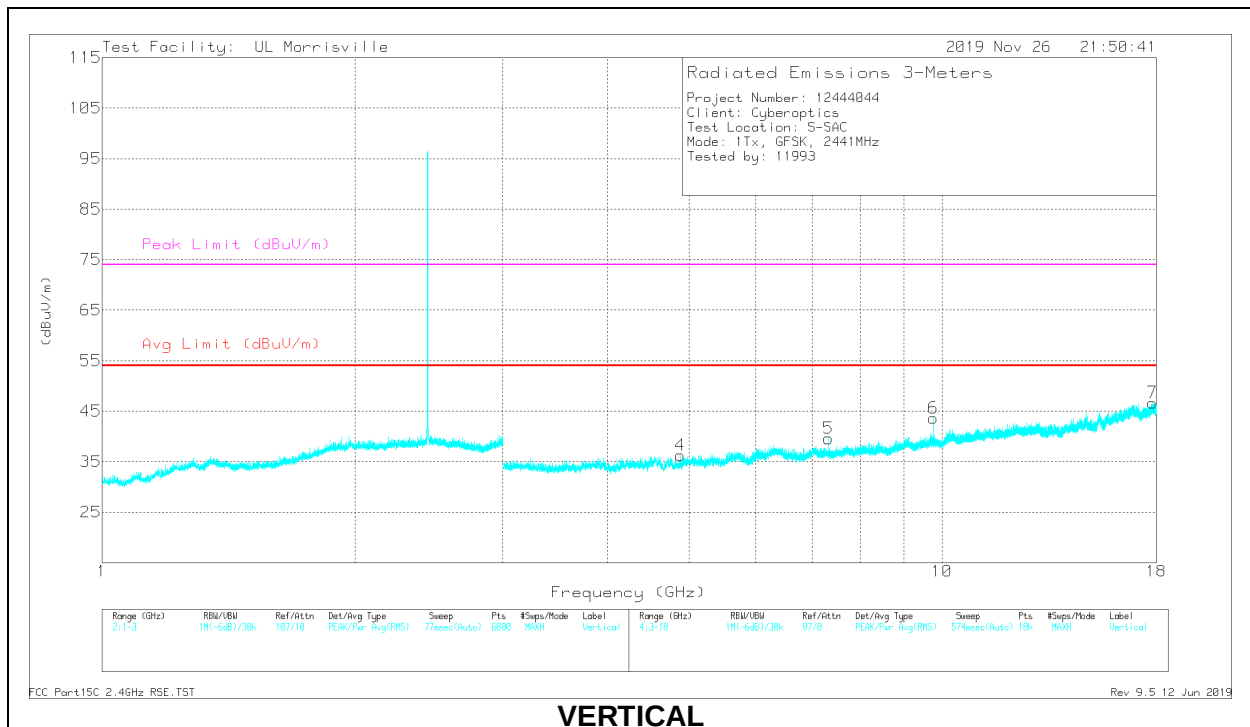
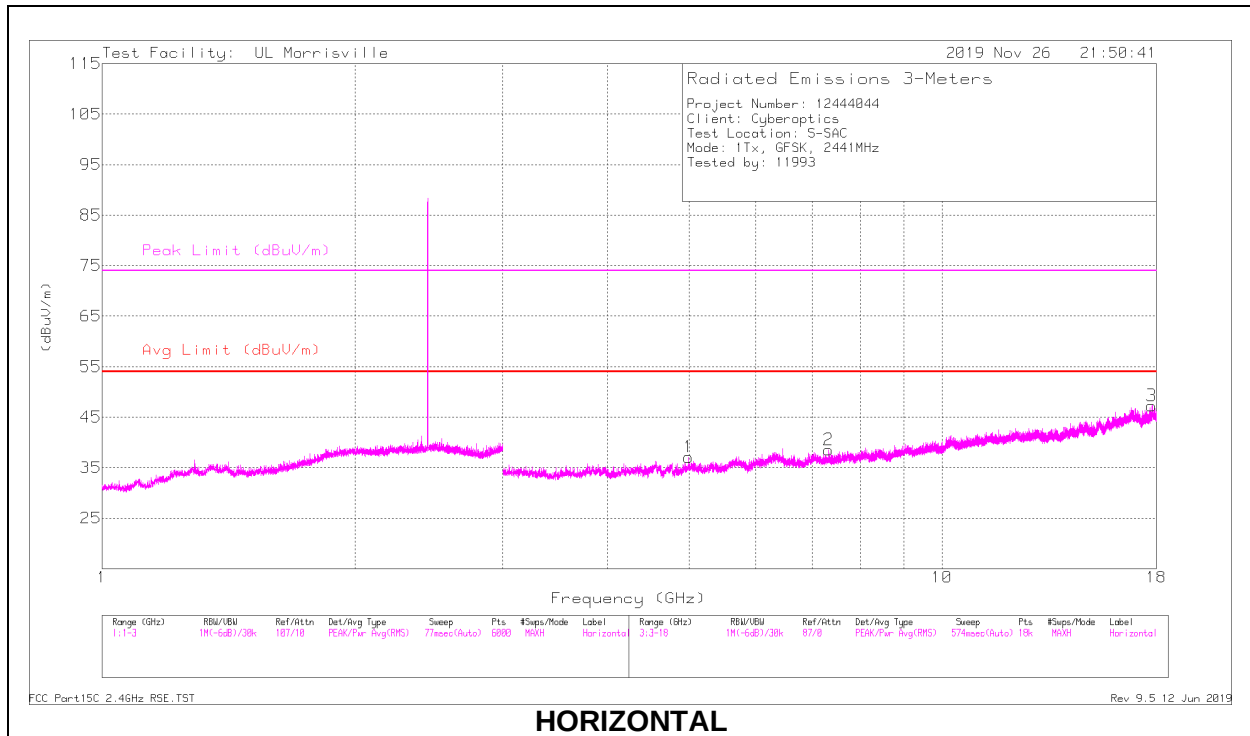
** - indicates frequency in Taiwan NCC LP0002 Restricted Band

PK-U - Maximum Peak

V1TR - VB=1/Ton, RMS Average where: Ton is packet duration

Pk - Peak detector

MID CHANNEL RESULTS



RADIATED EMISSIONS

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 (dB/m)	Amp/Cbl/Filtr/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	*** 4.99291	40.25	PK-U	34.1	-31.1	43.25	-	-	74	-30.75	22	216	H
	*** 4.9911	27.72	V1TR	34.1	-31.1	30.72	54	-23.28	-	-	22	216	H
2	*** 7.3297	35.64	PK-U	35.7	-27.5	43.84	-	-	74	-30.16	101	116	H
	*** 7.3281	24.08	V1TR	35.7	-27.5	32.28	54	-21.72	-	-	101	116	H
3	*** 17.76988	33.02	PK-U	41.2	-21.4	52.82	-	-	74	-21.18	139	238	H
	*** 17.7703	22.12	V1TR	41.2	-21.4	41.92	54	-12.08	-	-	139	238	H
4	*** 4.88234	40.94	PK-U	34	-30.6	44.34	-	-	74	-29.66	143	320	V
	*** 4.88203	32.29	V1TR	34	-30.6	35.69	54	-18.31	-	-	143	320	V
5	*** 7.32349	39.57	PK-U	35.7	-27.5	47.77	-	-	74	-26.23	313	290	V
	*** 7.32331	30.65	V1TR	35.7	-27.5	38.85	54	-15.15	-	-	313	290	V
7	*** 17.81971	32.87	PK-U	41.2	-20.8	53.27	-	-	74	-20.73	44	250	V
	*** 17.81937	22.2	V1TR	41.4	-22.5	41.1	54	-12.9	-	-	44	251	V
6	9.76288	32.13	Pk	37.1	-25.6	43.63	-	-	-	-	0-360	199	V

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

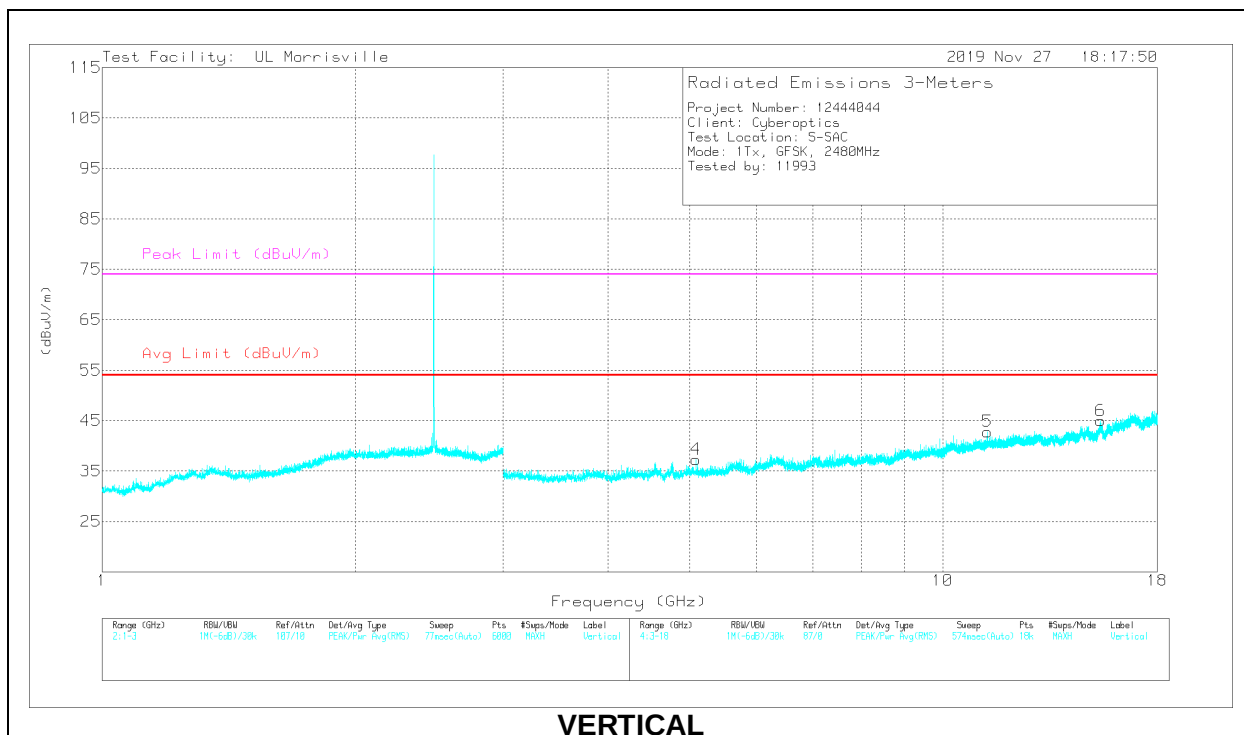
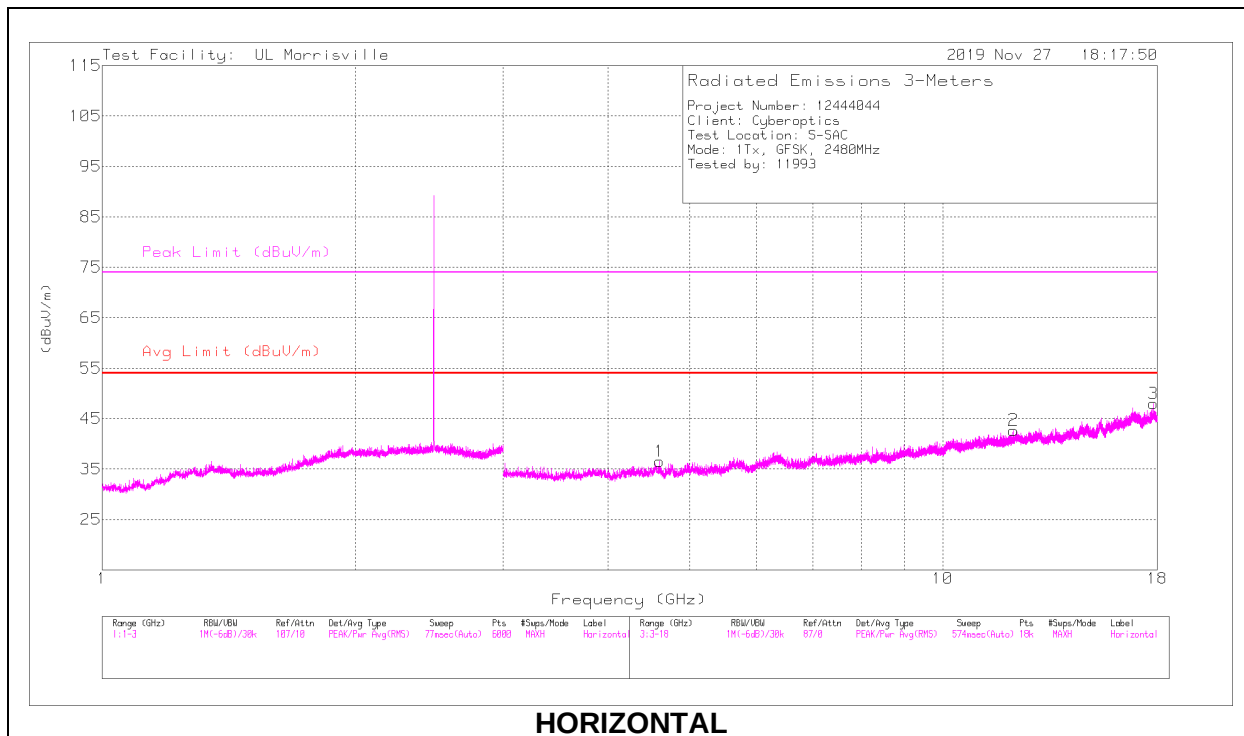
** - indicates frequency in Taiwan NCC LP0002 Restricted Band

PK-U - Maximum Peak

V1TR - VB=1/Ton, RMS Average where: Ton is packet duration

Pk - Peak detector

HIGH CHANNEL RESULTS



RADIATED EMISSIONS

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 (dB/m)	Amp/Cbl/Filtr/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	* ** 4.60277	39.58	PK-U	34.1	-31.6	42.08	-	-	74	-31.92	172	318	H
	* ** 4.59964	28	V1TR	34.1	-31.6	30.5	54	-23.5	-	-	172	318	H
2	* ** 12.14263	33.6	PK-U	38.8	-24	48.4	-	-	74	-25.6	96	131	H
	* ** 12.14392	22.13	V1TR	38.8	-24	36.93	54	-17.07	-	-	96	131	H
3	* ** 17.80758	33.76	PK-U	41.2	-20.8	54.16	-	-	74	-19.84	194	272	H
	* ** 17.80573	22.08	V1TR	41.2	-20.8	42.48	54	-11.52	-	-	194	272	H
4	* ** 5.08344	38.88	PK-U	34.2	-31.1	41.98	-	-	74	-32.02	23	136	V
	* ** 5.08367	27.56	V1TR	34.2	-31.1	30.66	54	-23.34	-	-	23	136	V
5	* ** 11.31225	33.19	PK-U	38	-22.9	48.29	-	-	74	-25.71	337	327	V
	* ** 11.31205	21.42	V1TR	38	-22.9	36.52	54	-17.48	-	-	337	327	V
6	* ** 15.41708	32.99	PK-U	39.9	-21.7	51.19	-	-	74	-22.81	60	326	V
	* ** 15.41755	21.64	V1TR	39.9	-21.7	39.84	54	-14.16	-	-	60	326	V

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

** - indicates frequency in Taiwan NCC LP0002 Restricted Band

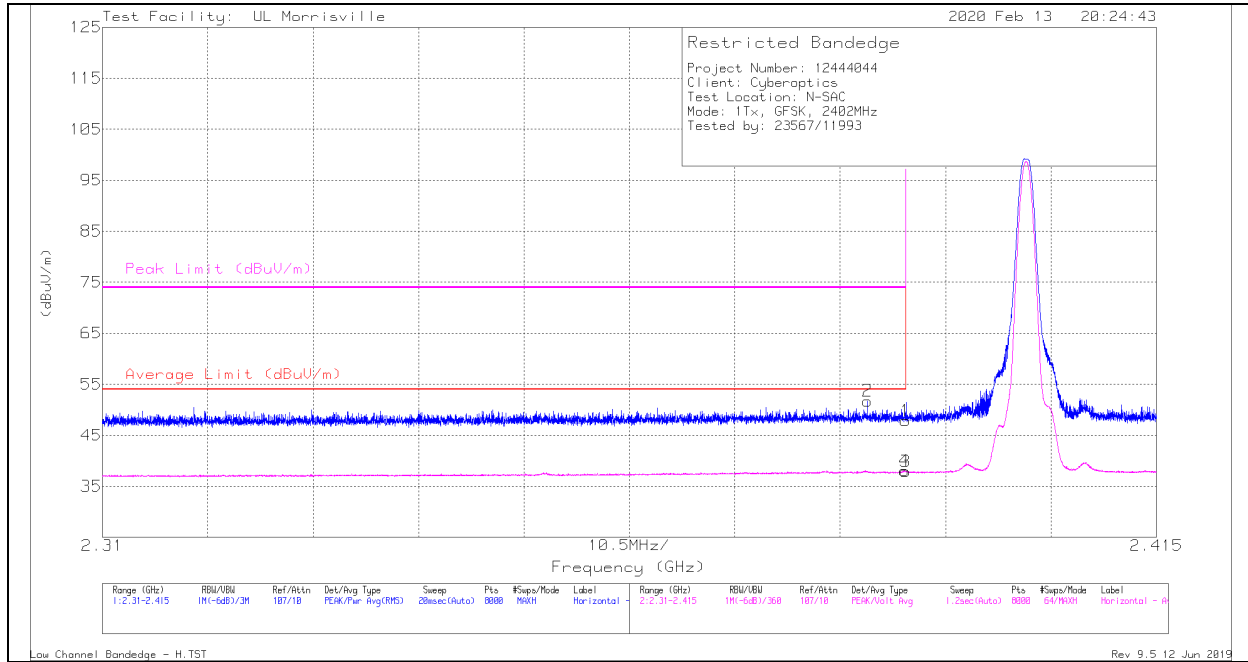
PK-U - Maximum Peak

V1TR - VB=1/Ton, RMS Average where: Ton is packet duration

9.1.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION – APS3 POWER SUPPLY

BANDEDGE (LOW CHANNEL)

HORIZONTAL RESULT



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0067 AF (dBuV/m)	Amp/Cbl/Filtr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 2.39	40.37	Pk	32	-24.5	47.87	-	-	74	-26.13	24	290	H
2	* ** 2.38623	44.25	Pk	32	-24.5	51.75	-	-	74	-22.25	24	290	H
3	* ** 2.39	30.4	V1TV	32	-24.5	37.9	54	-16.1	-	-	24	290	H
4	* ** 2.38992	30.54	V1TV	32	-24.5	38.04	54	-15.96	-	-	24	290	H

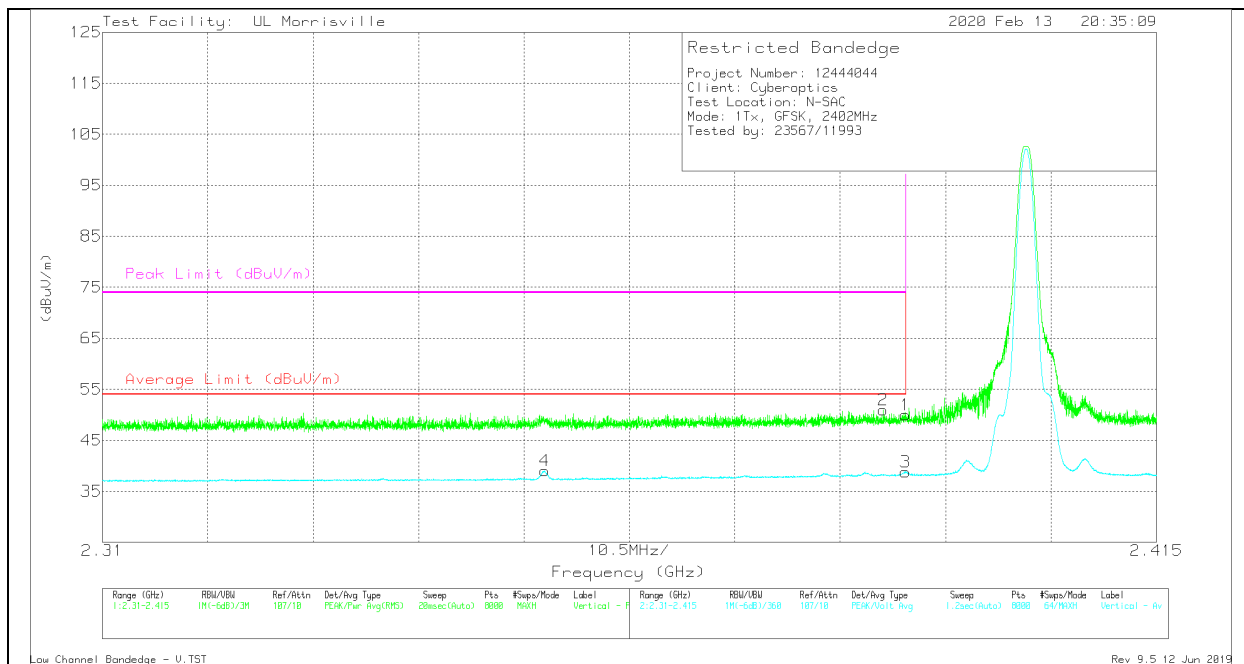
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

** - indicates frequency in Taiwan NCC LP0002 Restricted Band

Pk - Peak detector

V1TV - U-NII: VB=1/Ton, Linear Voltage Average where: Ton is packet duration

VERTICAL RESULT



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0067 AF (dBuV/m)	Amp/Cbl/Filtr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 2.39	42.46	Pk	32	-24.5	49.96	-	-	74	-24.04	167	220	V
2	* ** 2.38776	43.42	Pk	32	-24.5	50.92	-	-	74	-23.08	167	220	V
3	* ** 2.39	31.28	V1TV	32	-24.5	38.78	54	-15.22	-	-	167	220	V
4	* ** 2.35405	31.83	V1TV	31.8	-24.6	39.03	54	-14.97	-	-	167	220	V

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

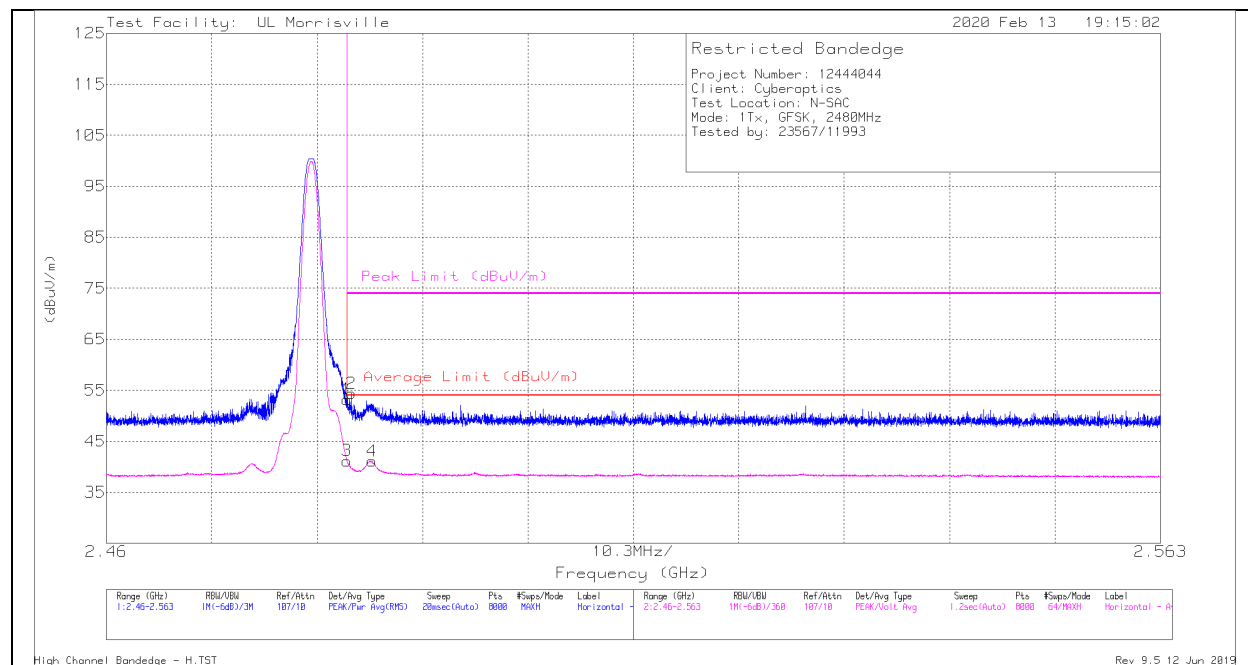
** - indicates frequency in Taiwan NCC LP0002 Restricted Band

Pk - Peak detector

V1TV - U-NII: VB=1/Ton, Linear Voltage Average where: Ton is packet duration

BANDEDGE (HIGH CHANNEL)

HORIZONTAL RESULT



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0067 AF (dBuV/m)	Amp/Cbl/Ftr/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	45.13	Pk	32.4	-24.3	53.23	-	-	74	-20.77	65	367	H
2	*** 2.48394	46.26	Pk	32.4	-24.3	54.36	-	-	74	-19.64	65	367	H
3	*** 2.4835	33.09	V1TV	32.4	-24.3	41.19	54	-12.81	-	-	65	367	H
4	*** 2.48593	33.03	V1TV	32.4	-24.3	41.13	54	-12.87	-	-	65	367	H

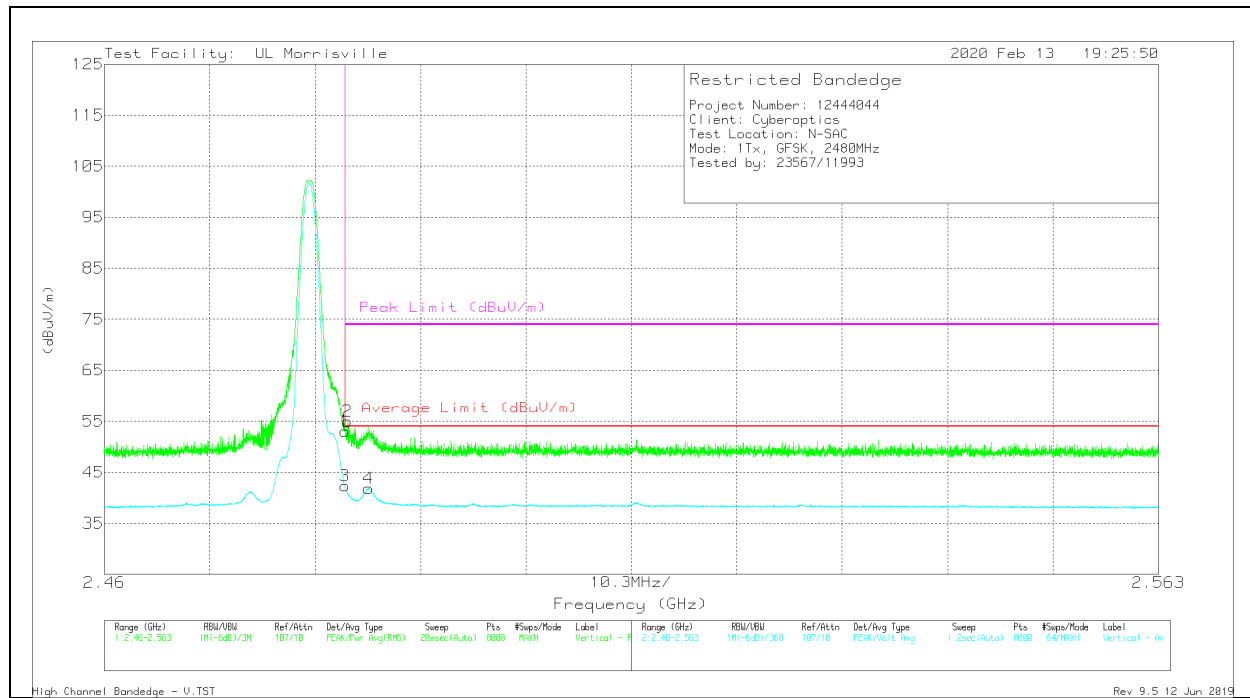
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

** - indicates frequency in Taiwan NCC LP0002 Restricted Band

Pk - Peak detector

V1TV - U-NII: VB=1/Ton, Linear Voltage Average where: Ton is packet duration

VERTICAL RESULT



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0067 AF (dBuV/m)	Amp/Cbl/Filtr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 2.4835	44.97	Pk	32.4	-24.3	53.07	-	-	74	-20.93	334	362	V
2	* ** 2.48373	46.87	Pk	32.4	-24.3	54.97	-	-	74	-19.03	334	362	V
3	* ** 2.4835	34.23	V1TV	32.4	-24.3	42.33	54	-11.67	-	-	334	362	V
4	* ** 2.48581	33.79	V1TV	32.4	-24.3	41.89	54	-12.11	-	-	334	362	V

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

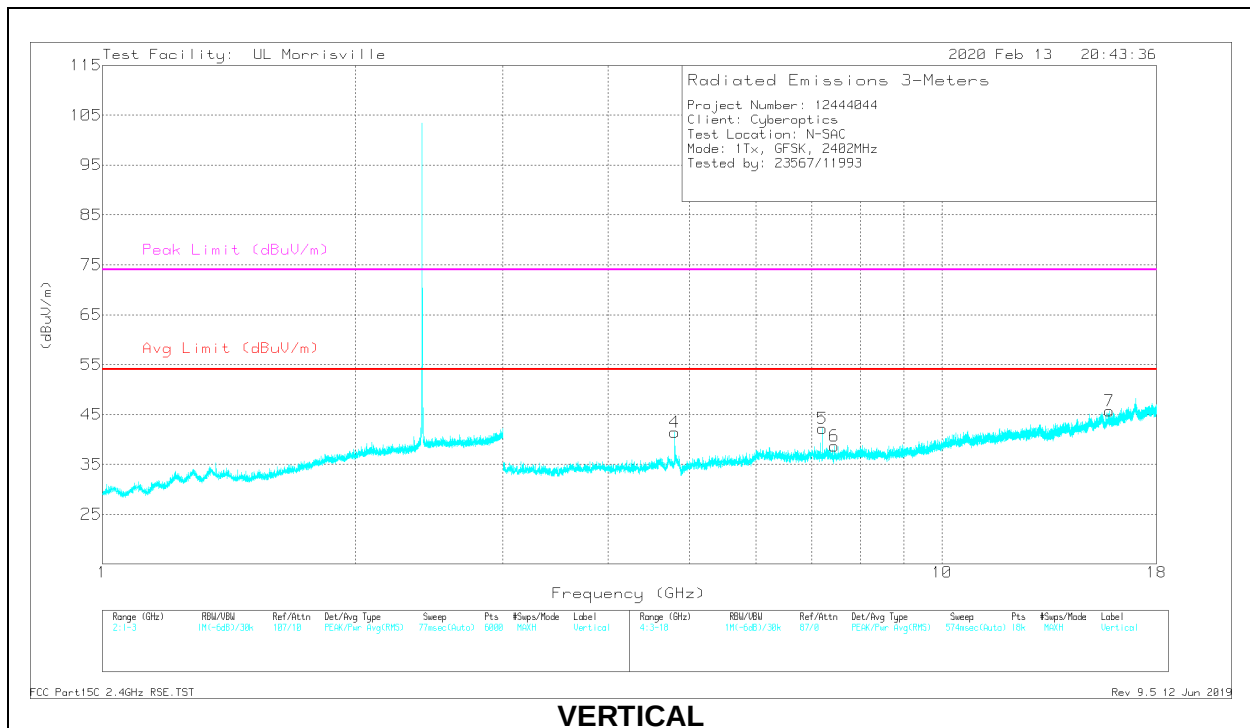
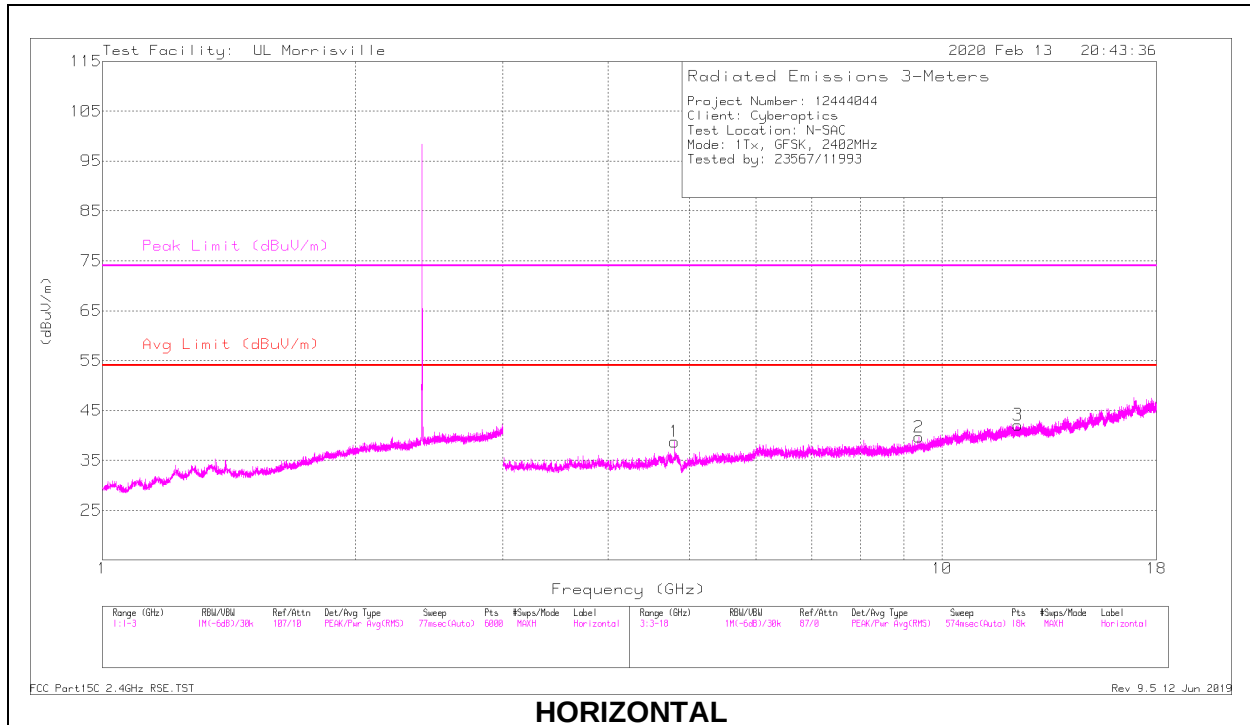
** - indicates frequency in Taiwan NCC LP0002 Restricted Band

Pk - Peak detector

V1TV - U-NII: VB=1/Ton, Linear Voltage Average where: Ton is packet duration

HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL RESULTS



RADIATED EMISSIONS

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0067 AF (dBuV/m)	Amp/Cbl/Filtr/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	*** 4.80412	45.34	PK-U	34.1	-31.6	47.84	-	-	74	-26.16	286	258	H
	*** 4.80397	37.15	V1TV	34.1	-31.6	39.65	54	-14.35	-	-	286	258	H
2	*** 9.38087	37.33	PK-U	36.4	-28.1	45.63	-	-	74	-28.37	232	157	H
	*** 9.38077	24.45	V1TV	36.4	-28.1	32.75	54	-21.25	-	-	232	157	H
3	*** 12.3141	36.4	PK-U	38.8	-25.7	49.5	-	-	74	-24.5	37	113	H
	*** 12.31369	22.63	V1TV	38.8	-25.7	35.73	54	-18.27	-	-	37	113	H
4	*** 4.80434	45.97	PK-U	34.1	-31.6	48.47	-	-	74	-25.53	124	111	V
	*** 4.80397	37.88	V1TV	34.1	-31.6	40.38	54	-13.62	-	-	124	111	V
6	*** 7.44463	37.65	PK-U	35.7	-29.3	44.05	-	-	74	-29.95	346	191	V
	*** 7.44477	25	V1TV	35.7	-29.3	31.4	54	-22.6	-	-	346	191	V
7	*** 15.8136	36.13	PK-U	40.2	-24.7	51.63	-	-	74	-22.37	197	106	V
	*** 15.81491	23.35	V1TV	40.2	-24.8	38.75	54	-15.25	-	-	197	106	V
5	7.20524	36.56	Pk	35.6	-30	42.16	-	-	-	-	0-360	198	V

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

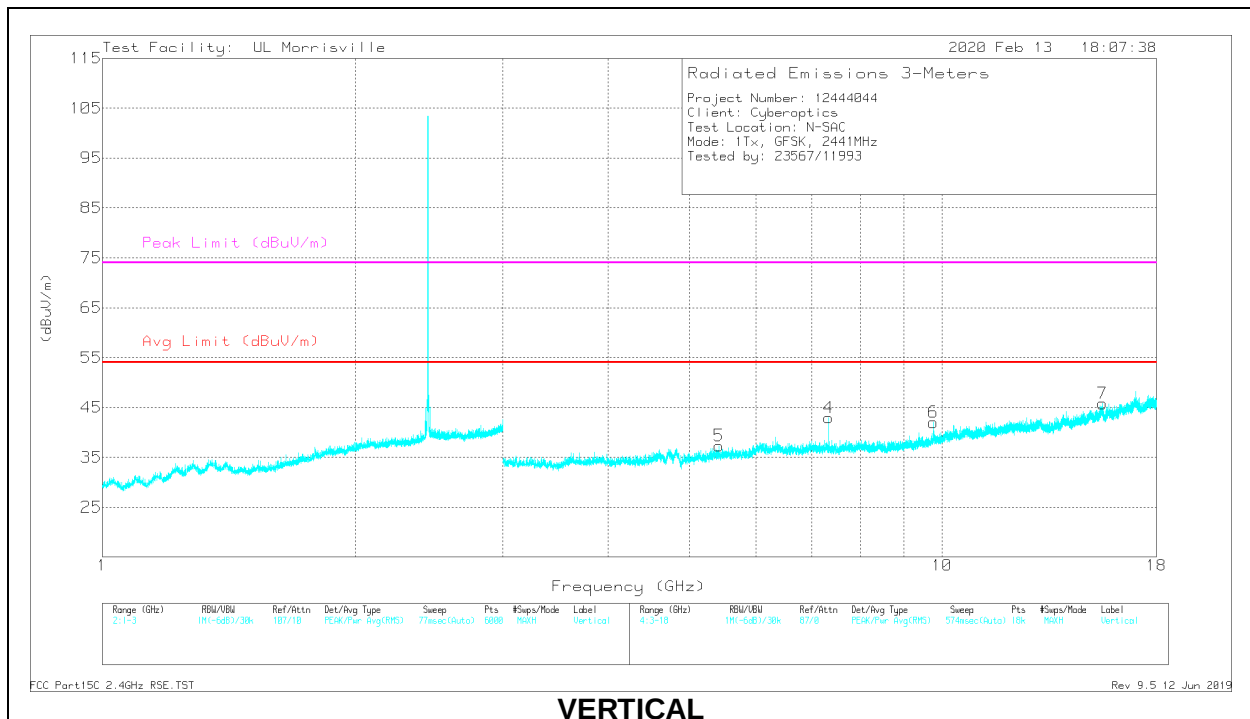
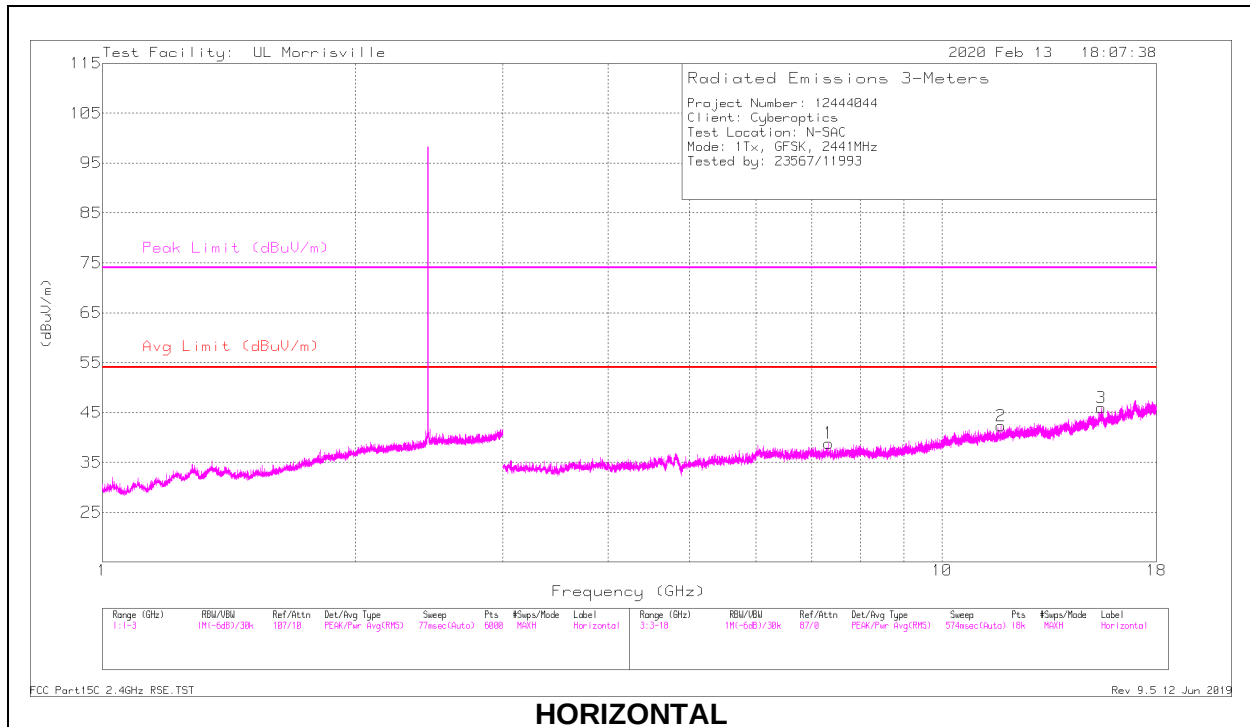
** - indicates frequency in Taiwan NCC LP0002 Restricted Band

PK-U: Maximum Peak

V1TV: VB=1/Ton, Linear Voltage Average where: Ton is packet duration

Pk - Peak detector

MID CHANNEL RESULTS



RADIATED EMISSIONS

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0067 AF (dBuV/m)	Amp/Cbl/Filtr/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	*** 7.32266	41.22	PK-U	35.6	-29.2	47.62	-	-	74	-26.38	356	308	H
	*** 7.32292	30.22	V1TV	35.6	-29.2	36.62	54	-17.38	-	-	356	308	H
2	*** 11.74363	34.86	PK-U	38.4	-25.8	47.46	-	-	74	-26.54	229	256	H
	*** 11.7446	22.33	V1TV	38.4	-25.8	34.93	54	-19.07	-	-	229	256	H
3	*** 15.47748	35.85	PK-U	40.1	-23.7	52.25	-	-	74	-21.75	84	344	H
	*** 15.47693	22.38	V1TV	40.1	-23.7	38.78	54	-15.22	-	-	84	344	H
4	*** 7.32348	43.59	PK-U	35.6	-29.2	49.99	-	-	74	-24.01	7	289	V
	*** 7.32306	35.64	V1TV	35.6	-29.2	42.04	54	-11.96	-	-	7	289	V
5	*** 5.42239	39.47	PK-U	34.4	-31	42.87	-	-	74	-31.13	227	284	V
	*** 5.42287	26.83	V1TV	34.4	-31	30.23	54	-23.77	-	-	227	284	V
7	*** 15.53292	34.88	PK-U	40.2	-24.1	50.98	-	-	74	-23.02	269	144	V
	*** 15.53291	22.41	V1TV	40.2	-24.1	38.51	54	-15.49	-	-	269	144	V
6	9.76455	32.42	Pk	36.8	-27.2	42.02	-	-	-	-	0-360	198	V

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

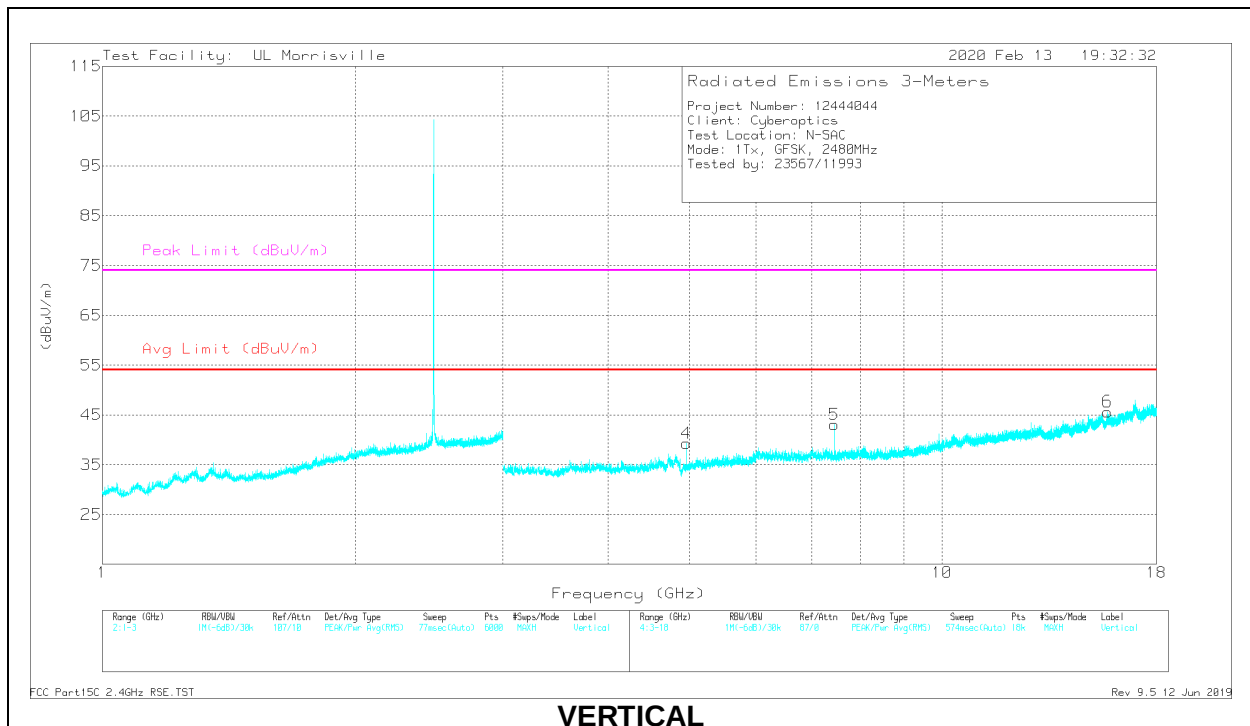
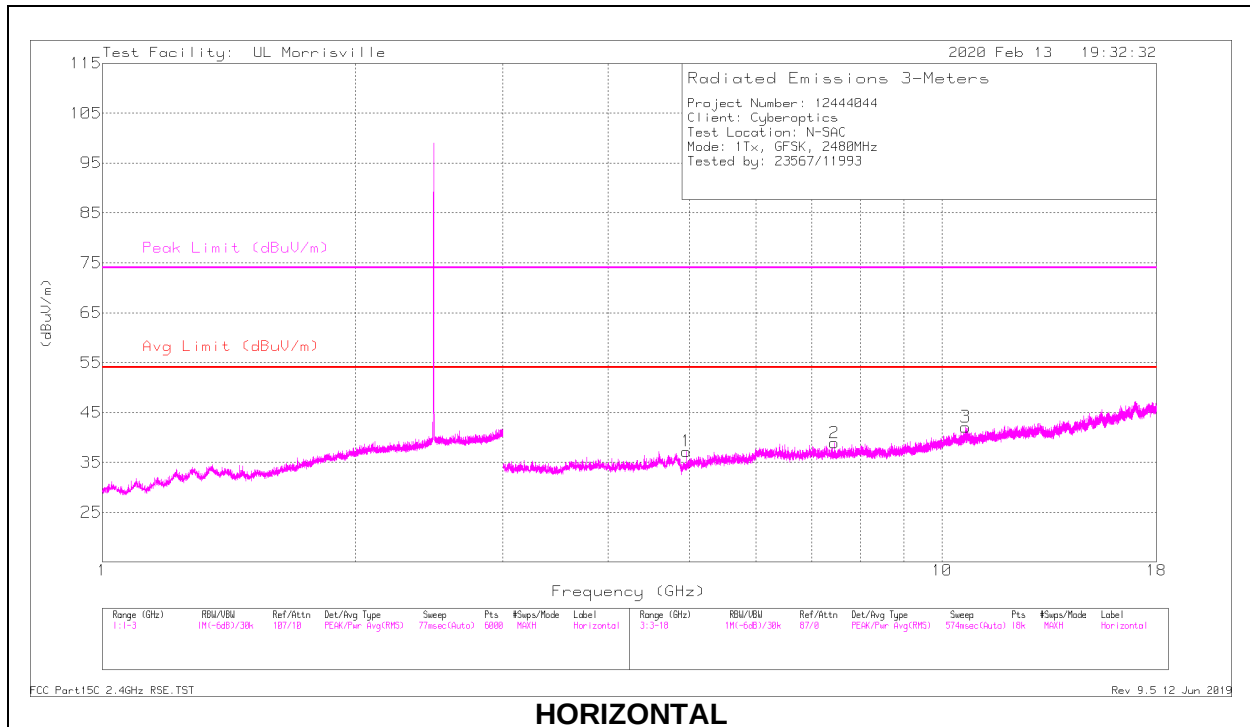
** - indicates frequency in Taiwan NCC LP0002 Restricted Band

PK-U: Maximum Peak

V1TV: VB=1/Ton, Linear Voltage Average where: Ton is packet duration

Pk - Peak detector

HIGH CHANNEL RESULTS



RADIATED EMISSIONS

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0067 AF (dBuV/m)	Amp/Cbl/Filtr/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	*** 4.95976	43.35	PK-U	33.9	-32.3	44.95	-	-	74	-29.05	272	266	H
	*** 4.96002	33.56	V1TV	33.9	-32.3	35.16	54	-18.84	-	-	272	266	H
2	*** 7.44035	40.46	PK-U	35.6	-29.2	46.86	-	-	74	-27.14	329	301	H
	*** 7.43992	30.01	V1TV	35.6	-29.2	36.41	54	-17.59	-	-	329	301	H
3	*** 10.6649	35.08	PK-U	37.7	-25.2	47.58	-	-	74	-26.42	33	222	H
	*** 10.66391	22.6	V1TV	37.7	-25.2	35.1	54	-18.9	-	-	33	222	H
4	*** 4.9596	43.24	PK-U	33.9	-32.3	44.84	-	-	74	-29.16	48	245	V
	*** 4.95998	35.18	V1TV	33.9	-32.3	36.78	54	-17.22	-	-	48	245	V
5	*** 7.44046	43.06	PK-U	35.6	-29.2	49.46	-	-	74	-24.54	351	229	V
	*** 7.44003	34.94	V1TV	35.6	-29.2	41.34	54	-12.66	-	-	351	229	V
6	*** 15.75067	35.81	PK-U	40.1	-24.2	51.71	-	-	74	-22.29	0	128	V
	*** 15.74951	22.75	V1TV	40.1	-24.2	38.65	54	-15.35	-	-	0	128	V

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

** - indicates frequency in Taiwan NCC LP0002 Restricted Band

PK-U: Maximum Peak

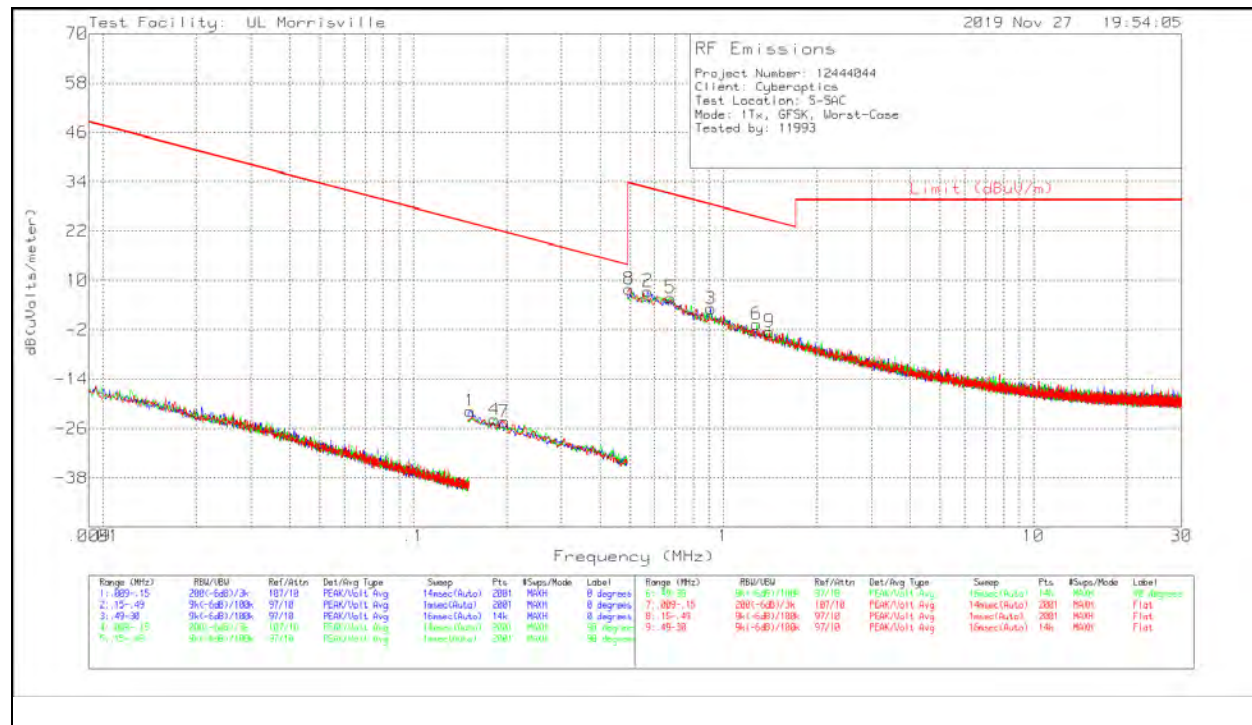
V1TV: VB=1/Ton, Linear Voltage Average where: Ton is packet duration

9.2. WORST CASE BELOW 1 GHz

Note: All measurements were made at a test distance of 3 m. The spurious emissions data in the plots and tabular data are corrected from the measurement distance (3m) to the specification distance (300 m from 9-490 kHz and 30 m from 490 kHz – 30 MHz). The correction factor for the limits were $40 \cdot \log(\text{test distance} / \text{specification distance})$.

Although these tests were performed at a test site other than an open area test site, adequate comparison measurements were confirmed against an open area test site. Therefore, sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field based on KDB 414788.

SPURIOUS EMISSIONS 0.009 to 30 MHz (WORST-CASE CONFIGURATION) – APS3 BATTERY

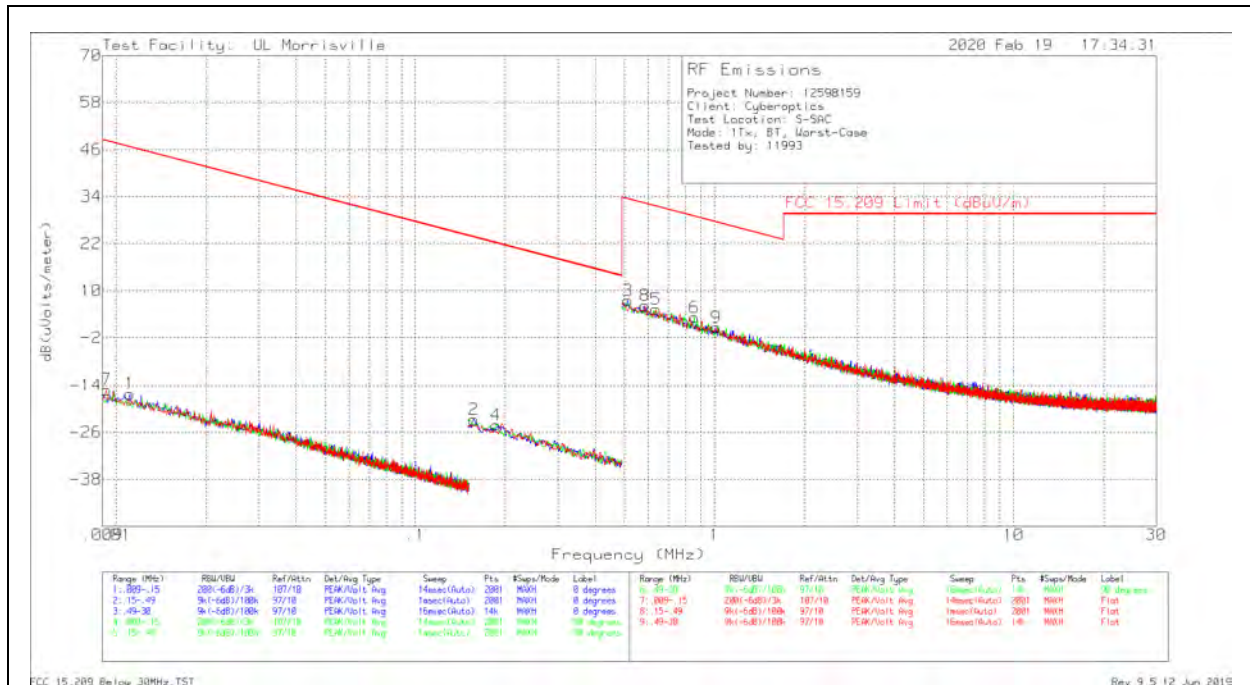


0.009 to 30MHz Data

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AT0079 AF (dB/m)	Cbl (dB)	Dist. Corr. Factor (dB)	Corrected Reading dB(uVolts/meter)	LP0002 QP/AV Limit (dBuV/m)	LP0002 PK Limit (dBuV/m)	Worst-Case Margin (dB)	Azimuth (Degs)
1	.15264	47.15	Pk	11	.1	-80	-21.75	23.93	43.93	-45.68	0-360
4	.1829	45	Pk	11	.1	-80	-23.9	22.36	42.36	-46.26	0-360
7	.19667	44.52	Pk	11	.1	-80	-24.38	21.73	41.73	-46.11	0-360
8	.49632	36.82	Pk	11	.1	-40	7.92	33.69	-	-25.77	0-360
2	.5701	36.26	Pk	11	.1	-40	7.36	32.48	-	-25.12	0-360
5	.6755	34.68	Pk	11	.1	-40	5.78	31.01	-	-25.23	0-360
3	.9116	32.03	Pk	11	.1	-40	3.13	28.41	-	-25.28	0-360
6	1.2805	28.05	Pk	11.1	.2	-40	-.65	25.46	-	-26.11	0-360
9	1.40698	26.22	Pk	11.1	.2	-40	-2.48	24.64	-	-27.12	0-360

Pk - Peak detector

SPURIOUS EMISSIONS 0.009 to 30 MHz (WORST-CASE CONFIGURATION) – APS3 POWER SUPPLY

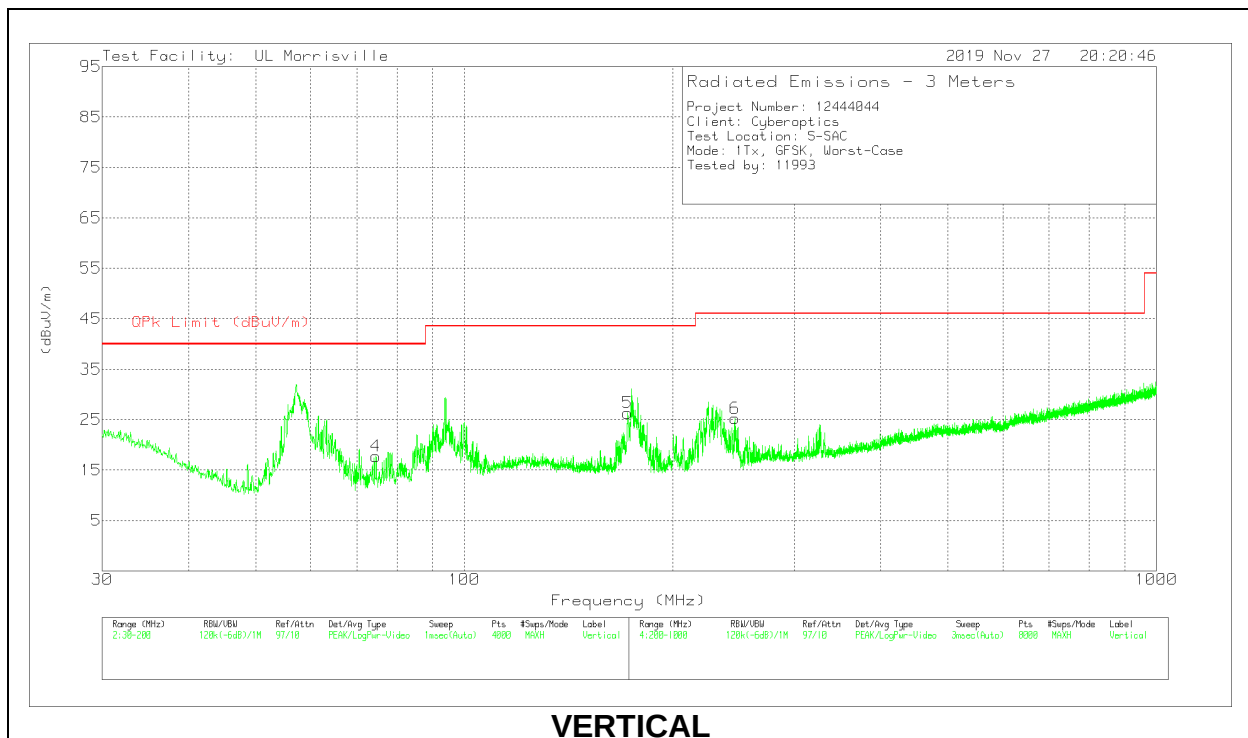
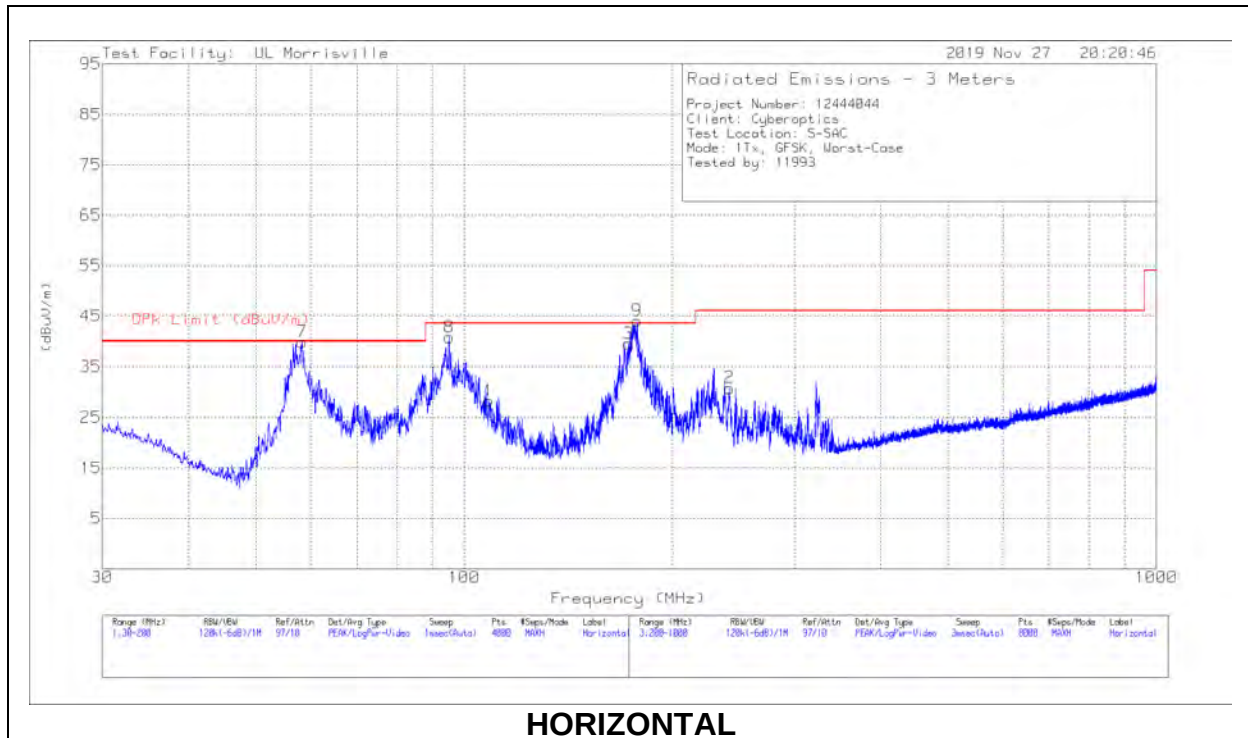


0.009 to 30MHz Data

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AT0079 AF (dB/m)	Cbl (dB)	Dist. Corr. Factor (dB)	Corrected Reading dB(uVolts/meter)	FCC 15.209 Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
7	.00928	46.06	Pk	18.7	.1	-80	-15.14	48.25	-63.39	0-360
1	.01113	45.98	Pk	17.7	.1	-80	-16.22	46.67	-62.89	0-360
2	.15697	46.13	Pk	11	.1	-80	-22.77	23.69	-46.46	0-360
4	.18621	44.78	Pk	11	.1	-80	-24.12	22.2	-46.32	0-360
3	.51319	36.36	Pk	11	.1	-40	7.46	33.4	-25.94	0-360
8	.58697	35.05	Pk	11	.1	-40	6.15	32.23	-26.08	0-360
5	.63756	34.12	Pk	11	.1	-40	5.22	31.51	-26.29	0-360
6	.85679	32.03	Pk	11	.1	-40	3.13	28.95	-25.82	0-360
9	1.017	29.37	Pk	11	.2	-40	.57	27.46	-26.89	0-360

Pk - Peak detector

SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION) – APS3 BATTERY



30 to 1000MHz Data

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AT0074 AF (dB/m)	Cbl/Amp	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 108.6454	40.73	Pk	18.5	-30.9	28.33	43.52	-15.19	0-360	299	H
3	* ** 172.928	43.33	Qp	17.8	-30.5	30.63	43.52	-12.89	316	171	H
4	* ** 74.594	34.93	Pk	14	-31.2	17.73	40	-22.27	0-360	101	V
5	* ** 172.2843	39.02	Pk	17.8	-30.5	26.32	43.52	-17.2	0-360	101	V
2	* ** 241.6054	43.01	Pk	17.7	-29.9	30.81	46.02	-15.21	0-360	101	H
6	* ** 246.006	37.55	Pk	17.6	-29.9	25.25	46.02	-20.77	0-360	101	V
7	58.3123	57.76	Pk	13.5	-31.4	39.86	-	-	0-360	398	H
8	95.1269	56.88	Pk	14.9	-31	40.78	-	-	0-360	299	H
9	177.8533	56.98	Pk	17.5	-30.4	44.08	-	-	0-360	199	H

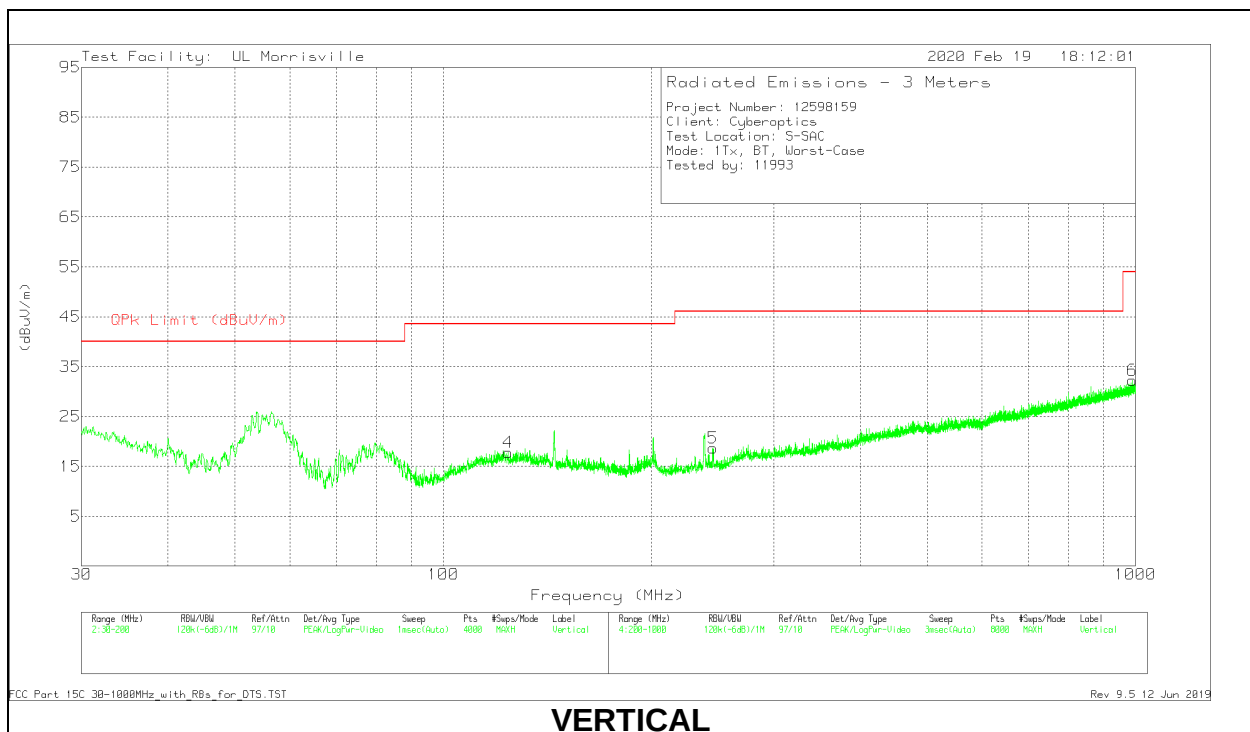
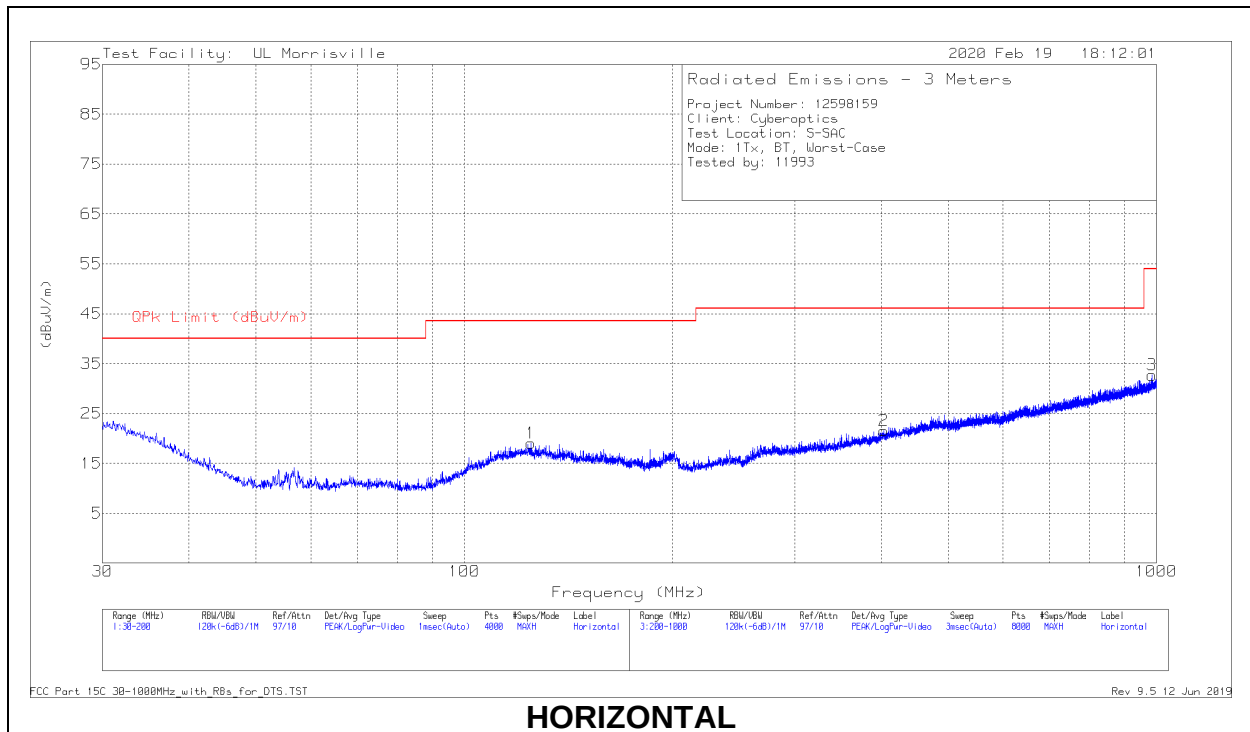
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

** - indicates frequency in Taiwan NCC LP0002 Restricted Band

Pk - Peak detector

Qp - Quasi-Peak detector

SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION) – APS3 POWER SUPPLY



30 to 1000MHz Data

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AT0074 AF (dB/m)	Cbl/Amp	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 124.7995	29.98	Pk	19.9	-30.8	19.08	43.52	-24.44	0-360	299	H
4	* ** 124.0768	28.71	Pk	19.9	-30.8	17.81	43.52	-25.71	0-360	102	V
2	* ** 403.5265	28.86	Pk	21.8	-29.1	21.56	46.02	-24.46	0-360	299	H
3	* ** 984.902	29.4	Pk	29.2	-25.9	32.7	53.97	-21.27	0-360	102	H
5	* ** 245.1059	30.85	Pk	17.7	-29.9	18.65	46.02	-27.37	0-360	101	V
6	* ** 989.2026	28.85	Pk	29.3	-25.9	32.25	53.97	-21.72	0-360	198	V

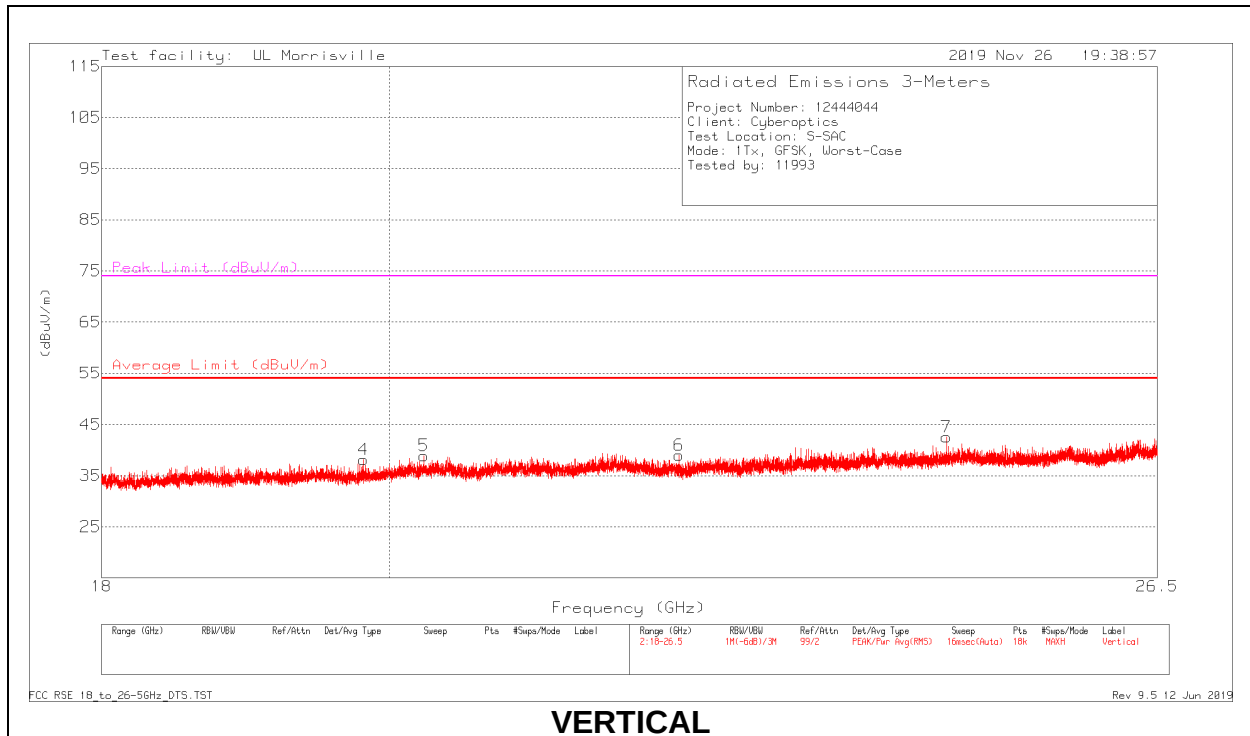
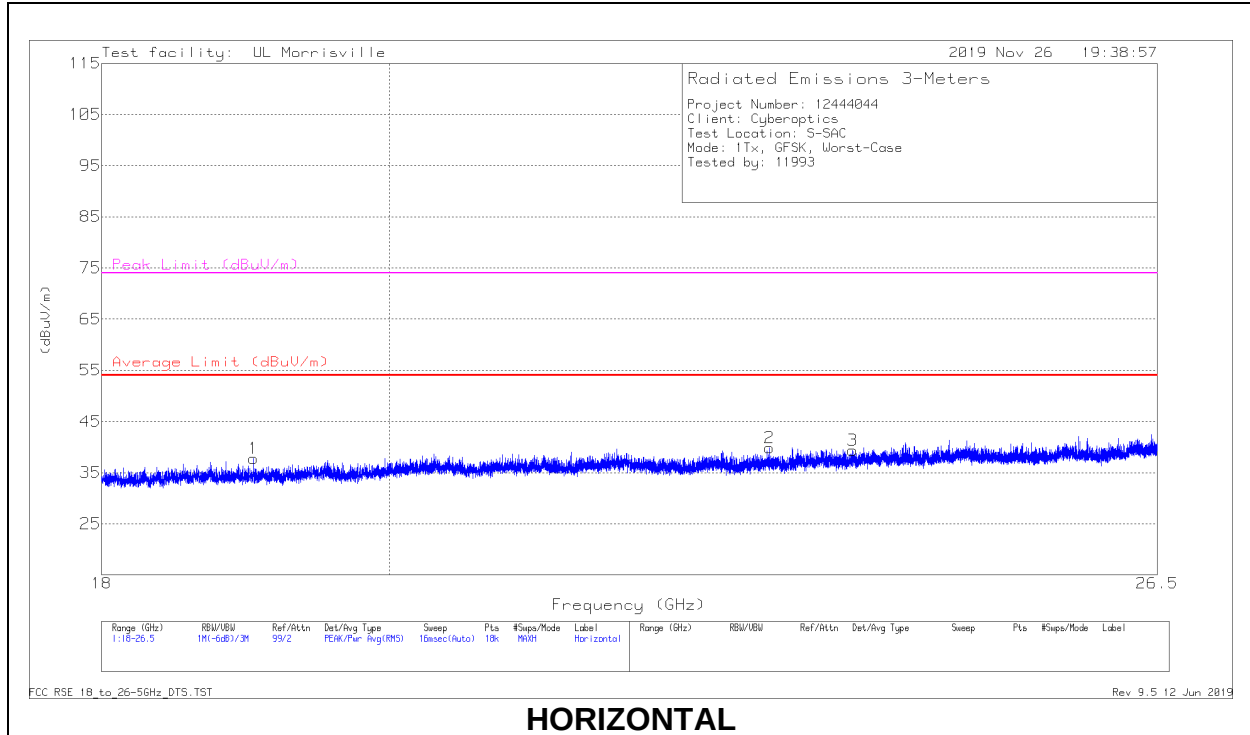
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

** - indicates frequency in Taiwan NCC LP0002 Restricted Band

Pk - Peak detector

9.3. WORST CASE 18-26 GHz

SPURIOUS EMISSIONS 18-26 GHz (WORST-CASE CONFIGURATION) – APS3 BATTERY



18 – 26GHz DATA

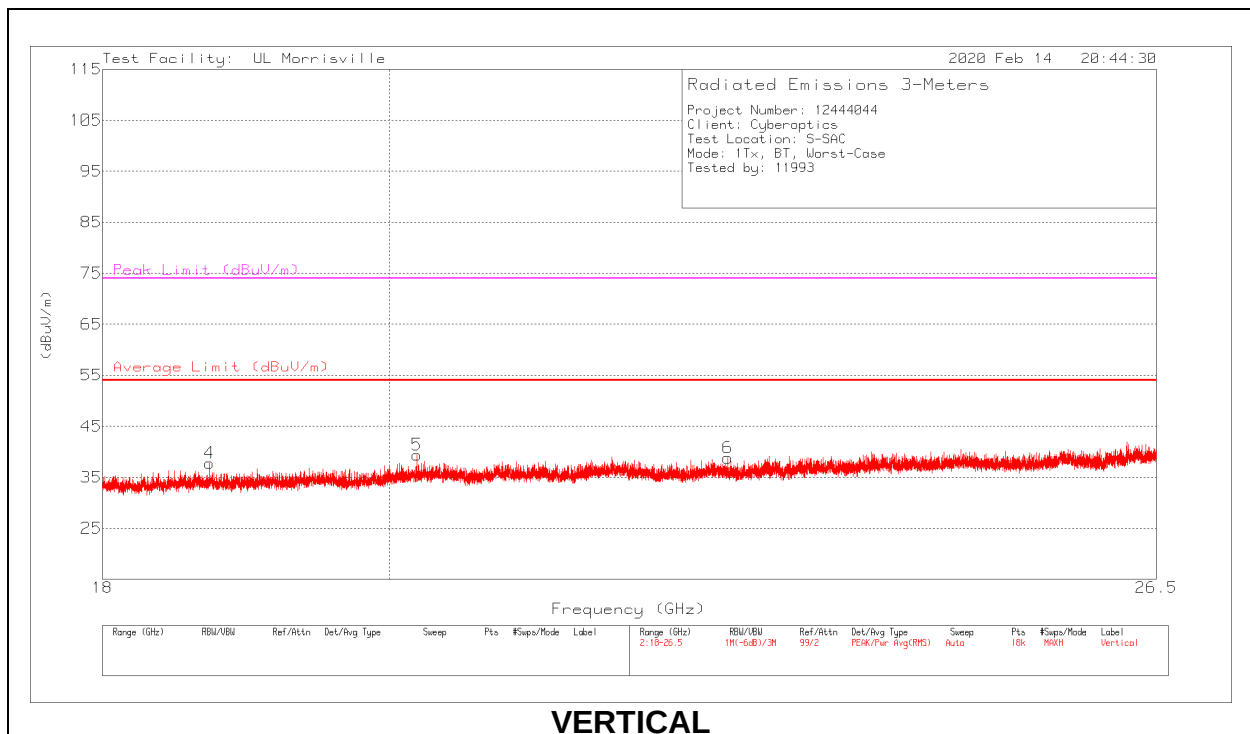
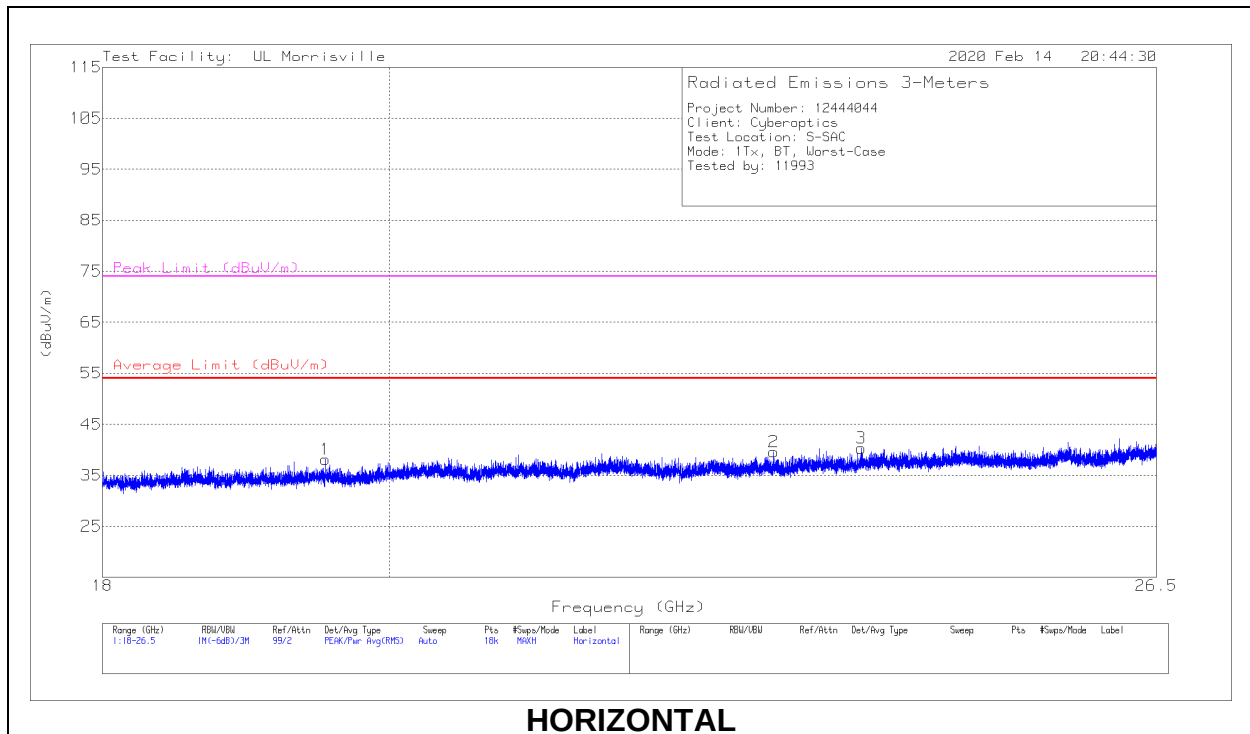
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0076 AF (dB/m)	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 19.02997	40.75	Pk	32.7	-35.7	37.75	54	-16.25	74	-36.25	0-360	198	H
2	* ** 22.98836	39.88	Pk	33.8	-33.8	39.88	54	-14.12	74	-34.12	0-360	148	H
3	* ** 23.70192	39.04	Pk	34	-33.7	39.34	54	-14.66	74	-34.66	0-360	148	H
4	* ** 19.81391	40.5	Pk	32.9	-35.3	38.1	54	-15.9	74	-35.9	0-360	202	V
5	* ** 20.25735	40.4	Pk	33	-34.5	38.9	54	-15.1	74	-35.1	0-360	102	V
6	* ** 22.24126	39.92	Pk	33.6	-34.5	39.02	54	-14.98	74	-34.98	0-360	102	V
7	24.52977	41.36	Pk	34.3	-33.1	42.56	54	-11.44	74	-31.44	0-360	202	V

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

** - indicates frequency in Taiwan NCC LP0002 Restricted Band

Pk - Peak detector

SPURIOUS EMISSIONS 18-26 GHz (WORST-CASE CONFIGURATION) – APS3 POWER SUPPLY



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	* ** 19.53386	40.83	Pk	32.8	-35.5	38.13	54	-15.87	74	-35.87	0-360	148	H
2	* ** 23.0285	39.63	Pk	33.8	-33.8	39.63	54	-14.37	74	-34.37	0-360	148	H
3	* ** 23.77795	39.9	Pk	34	-33.6	40.3	54	-13.7	74	-33.7	0-360	148	H
4	* ** 18.72065	40.8	Pk	32.6	-35.6	37.8	54	-16.2	74	-36.2	0-360	202	V
5	* ** 20.20257	41.2	Pk	32.8	-34.6	39.4	54	-14.6	74	-34.6	0-360	152	V
6	* ** 22.6422	39.62	Pk	33.5	-34.3	38.82	54	-15.18	74	-35.18	0-360	298	V

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

** - indicates frequency in Taiwan NCC LP0002 Restricted Band

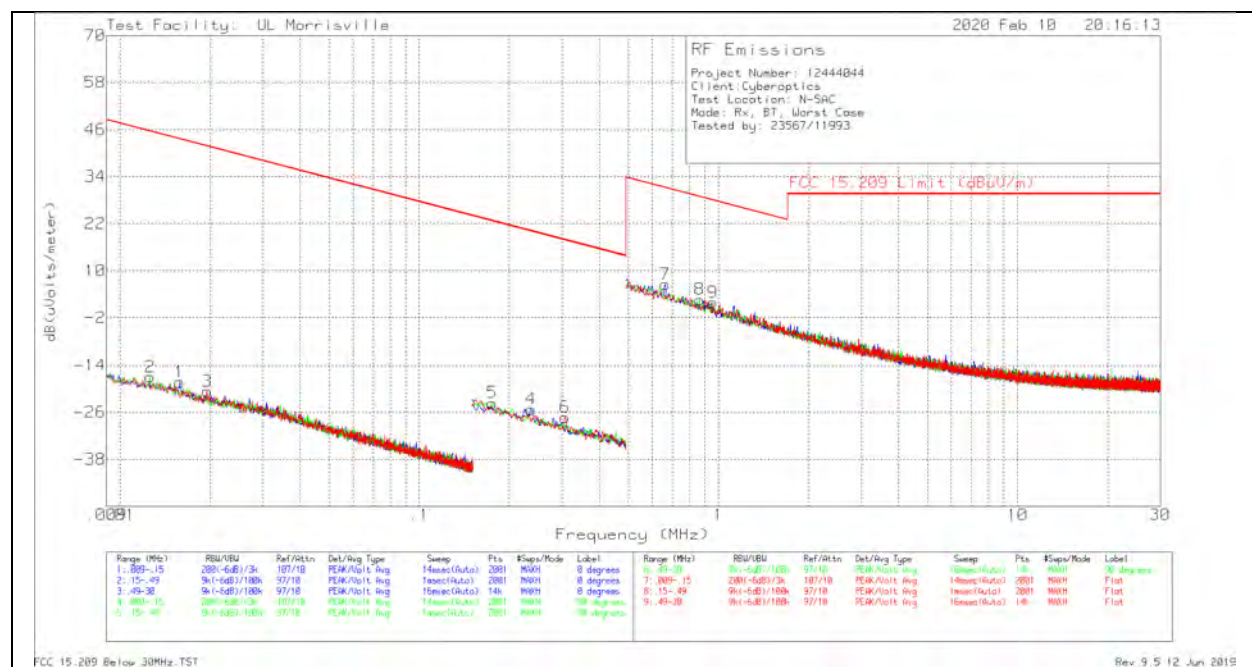
Pk - Peak detector

9.4. RECEIVER SPURIOUS

Note: All measurements were made at a test distance of 3 m. The spurious emissions data in the plots and tabular data are corrected from the measurement distance (3m) to the specification distance (300 m from 9-490 kHz and 30 m from 490 kHz – 30 MHz). The correction factor for the limits were 40*Log (test distance / specification distance).

Although these tests were performed at a test site other than an open area test site, adequate comparison measurements were confirmed against an open area test site. Therefore, sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field based on KDB 414788.

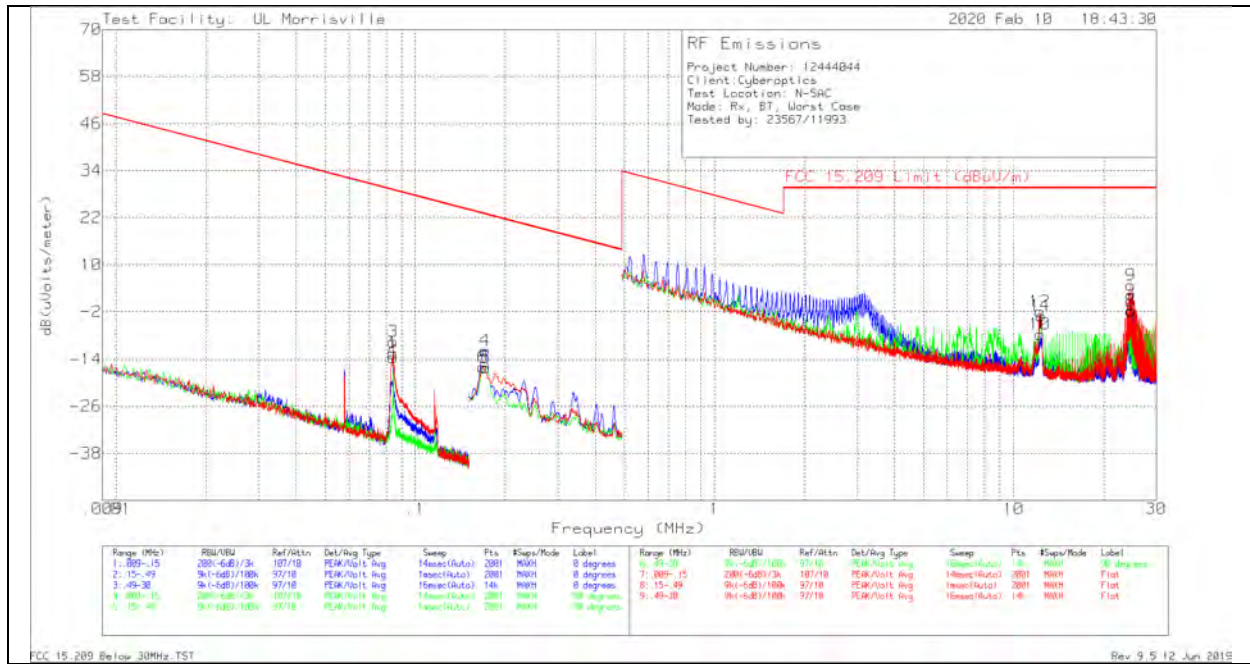
SPURIOUS EMISSIONS 0.009 to 30 MHz – APS3 BATTERY



Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AT0079 AF (dB/m)	Cbl (dB)	Dist. Corr. Factor (dB)	Corrected Reading dB(uVolts/meter)	LP0002 QP/AV Limit (dBuV/m)	LP0002 PK Limit (dBuV/m)	Worst-Case Margin (dB)	Azimuth (Degs)
2	.01262	45.84	Pk	17.1	.1	-80	-16.96	45.58	65.58	-62.54	0-360
1	.01582	45.9	Pk	15.7	.1	-80	-18.3	43.62	63.62	-61.92	0-360
3	.01951	45.04	Pk	14.2	.1	-80	-20.66	41.8	61.8	-62.46	0-360
5	.17542	45.32	Pk	11	.1	-80	-23.58	22.72	42.72	-46.3	0-360
4	.23662	43.72	Pk	11	.1	-80	-25.18	20.12	40.12	-45.3	0-360
6	.30751	41.64	Pk	11	.1	-80	-27.26	17.85	37.85	-45.11	0-360
7	.66286	35.42	Pk	11	.1	-40	6.52	31.18	-	-24.66	0-360
8	.86522	31.51	Pk	11	.1	-40	2.61	28.86	-	-26.25	0-360
9	.96008	30.81	Pk	11	.1	-40	1.91	27.96	-	-26.05	0-360

Pk - Peak detector

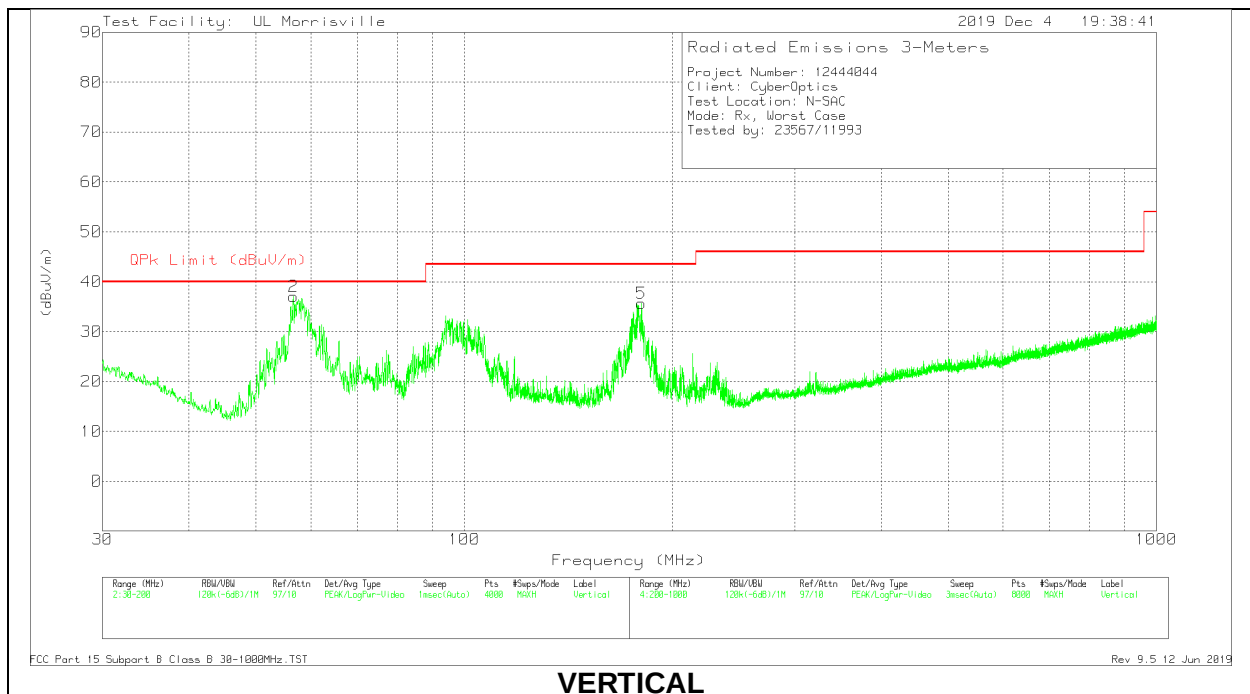
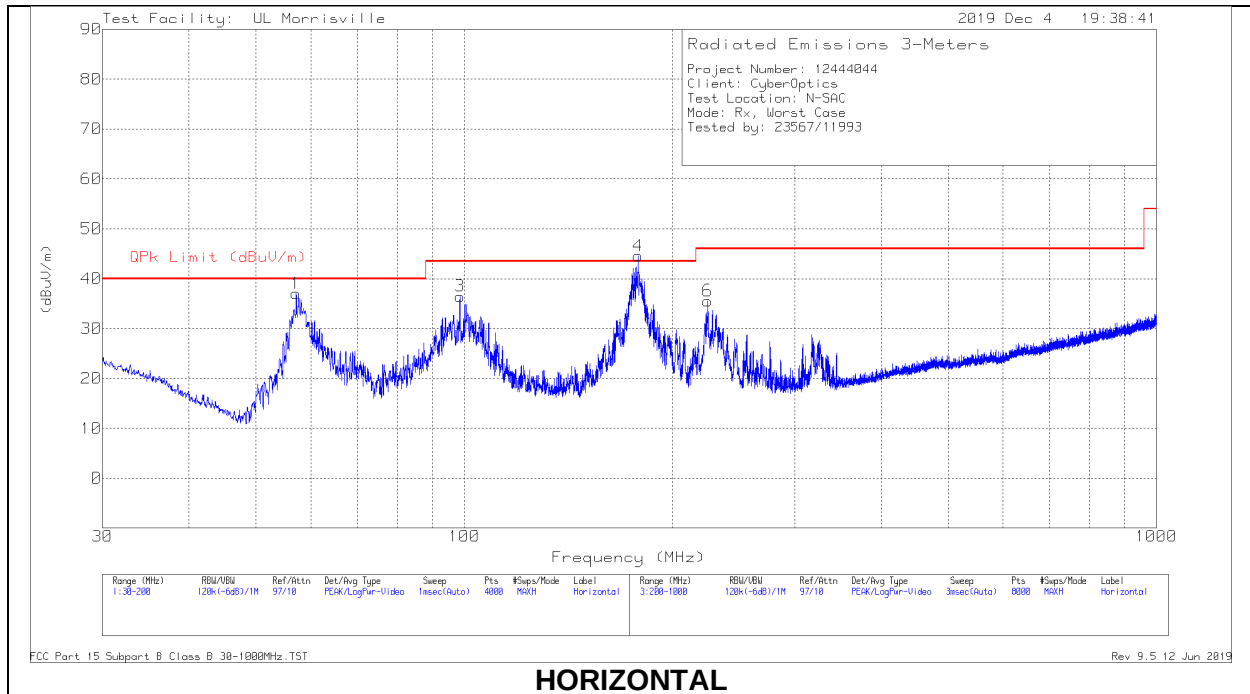
SPURIOUS EMISSIONS 0.009 to 30 MHz – APS3 POWER SUPPLY



Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AT0079 AF (dB/m)	Cbl (dB)	Dist. Corr. Factor (dB)	Corrected Reading dB(uVolts/meter)	FCC 15.209 Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
1	.0844	56.28	Pk	11.1	.1	-80	-12.52	29.08	-41.6	0-360
2	.0844	55.3	Pk	11.1	.1	-80	-13.5	29.08	-42.58	0-360
3	.0844	59.2	Pk	11.1	.1	-80	-9.6	29.08	-38.68	0-360
6	.16777	52.86	Pk	11	.1	-80	-16.04	23.11	-39.15	0-360
4	.17091	57.05	Pk	11	.1	-80	-11.85	22.95	-34.8	0-360
5	.17244	52.81	Pk	11	.1	-80	-16.09	22.87	-38.96	0-360
12	12.24842	27.32	Pk	10.1	.6	-40	-1.98	29.54	-31.52	0-360
10	12.24948	21.53	Pk	10.1	.6	-40	-7.77	29.54	-37.31	0-360
11	12.3749	26.23	Pk	10.1	.6	-40	-3.07	29.54	-32.61	0-360
8	24.58233	28.43	Pk	8.9	.8	-40	-1.87	29.54	-31.41	0-360
9	24.6656	35.06	Pk	8.9	.8	-40	4.76	29.54	-24.78	0-360
7	24.74254	28.74	Pk	8.8	.8	-40	-1.66	29.54	-31.2	0-360

Pk - Peak detector

SPURIOUS EMISSIONS 30 TO 1000 MHz – APS3 BATTERY



30 to 1000MHz Data

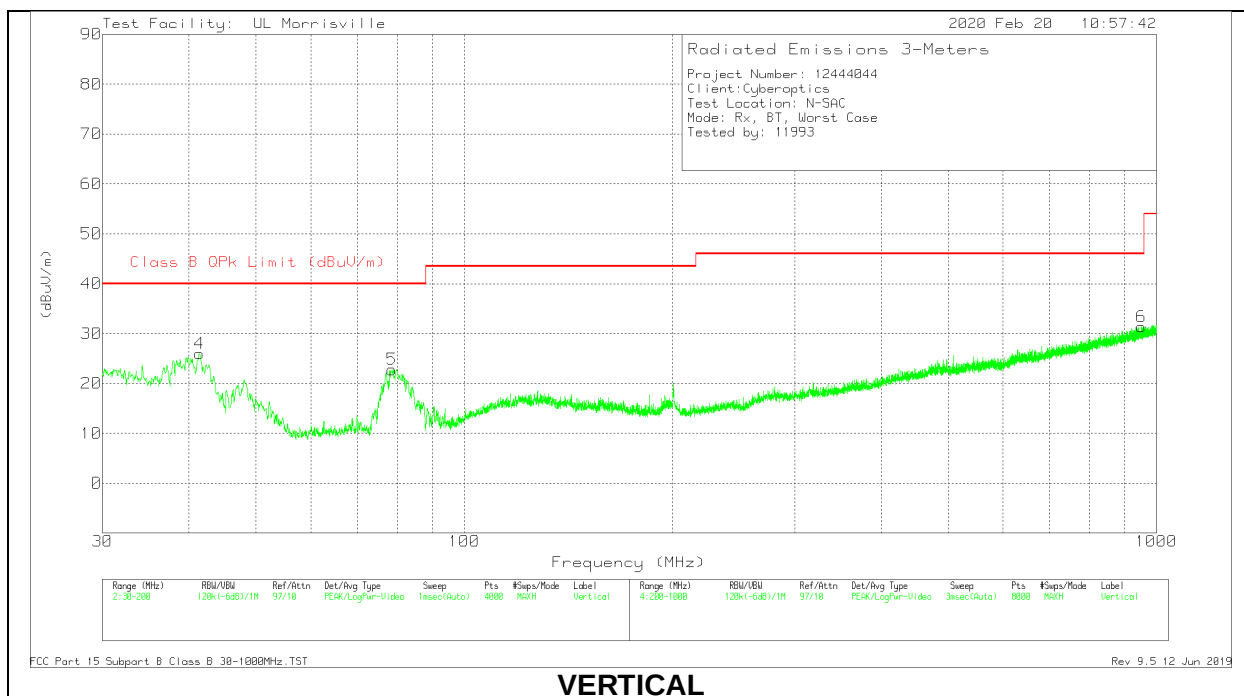
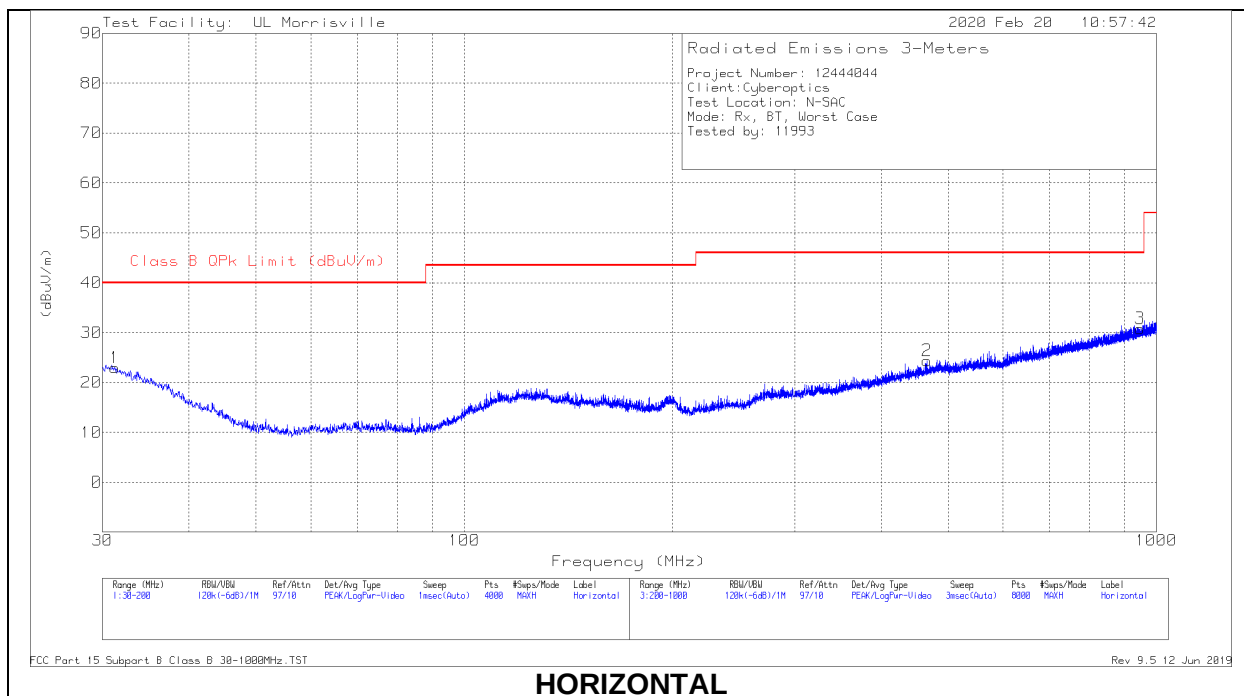
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AT0073 AF (dB/m)	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
2	56.6162	44.17	Qp	13.4	-31.4	26.17	40	-13.83	329	119	V
1	57.3071	45.77	Qp	13.4	-31.4	27.77	40	-12.23	80	393	H
3	98.5702	51.38	Pk	16	-30.9	36.48	43.52	-7.04	0-360	199	H
4	178.4807	44.51	Qp	17.4	-30.3	31.61	43.52	-11.91	23	185	H
5	180.2764	48.56	Pk	17.3	-30.2	35.66	43.52	-7.86	0-360	102	V
6	224.6032	48.67	Pk	16.9	-30	35.57	46.02	-10.45	0-360	102	H

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

** - indicates frequency in Taiwan NCC LP0002 Restricted Band

Pk - Peak detector

SPURIOUS EMISSIONS 30 TO 1000 MHz – APS3 POWER SUPPLY

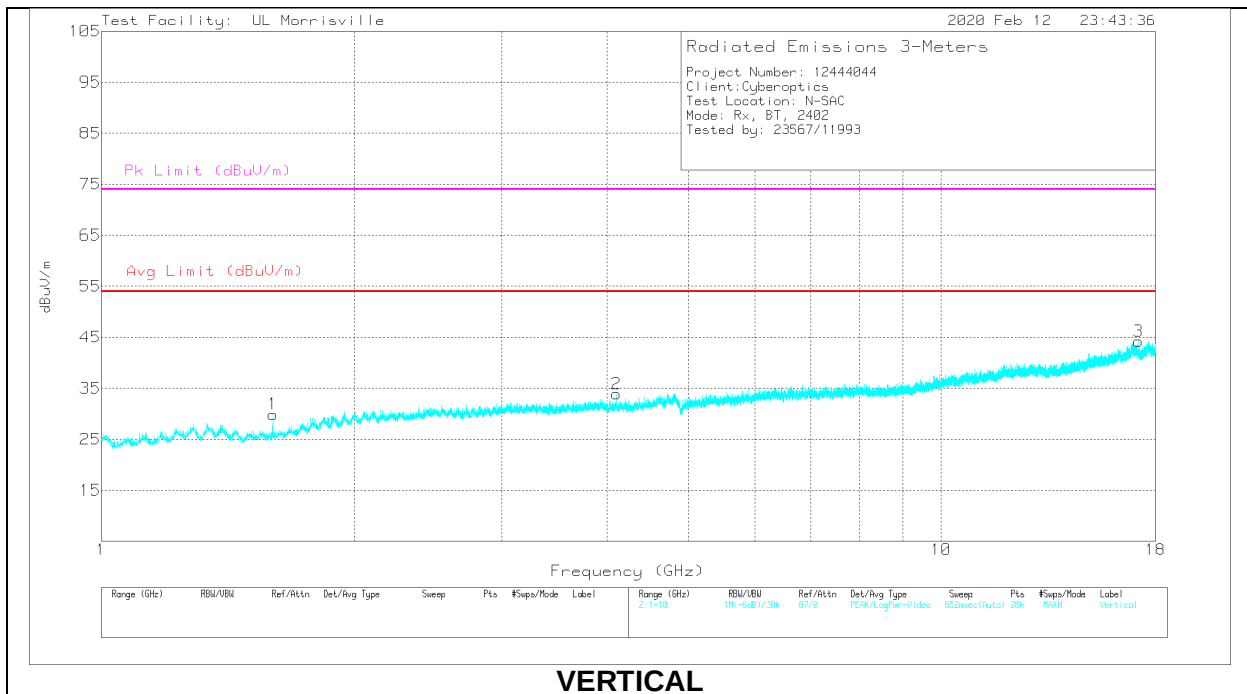
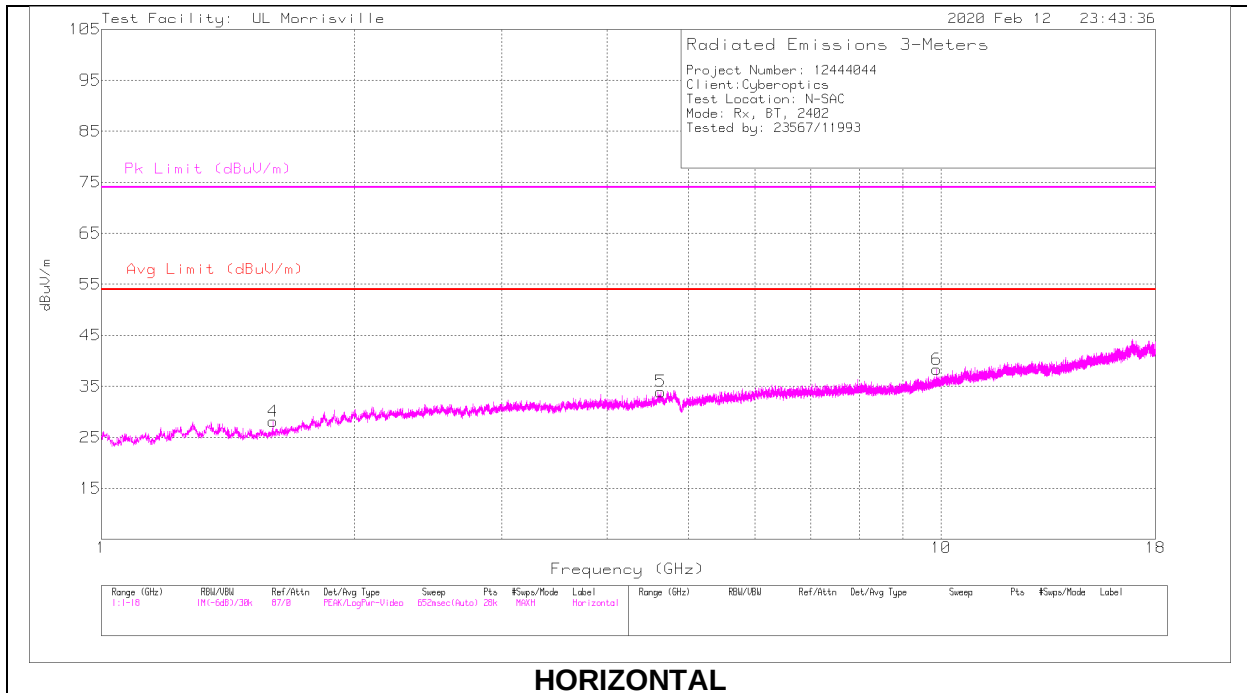


30 to 1000MHz Data

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AT0074 AF (dB/m)	Cbl/Amp	Corrected Reading (dBuV/m)	Class B QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	31.2753	28.56	Pk	26.2	-31.8	22.96	40	-17.04	0-360	298	H
4	41.4355	38.85	Pk	18.7	-31.6	25.95	40	-14.05	0-360	102	V
5	78.6326	40.29	Pk	13.7	-31.2	22.79	40	-17.21	0-360	102	V
2	466.4346	30.09	Pk	23.3	-29	24.39	46.02	-21.63	0-360	102	H
3	946.497	28.42	Pk	28.9	-26.5	30.82	46.02	-15.2	0-360	398	H
6	950.4976	29	Pk	28.9	-26.5	31.4	46.02	-14.62	0-360	298	V

Pk - Peak detector

SPURIOUS EMISSIONS 1 – 18GHz – APS3 BATTERY LOW CHANNEL



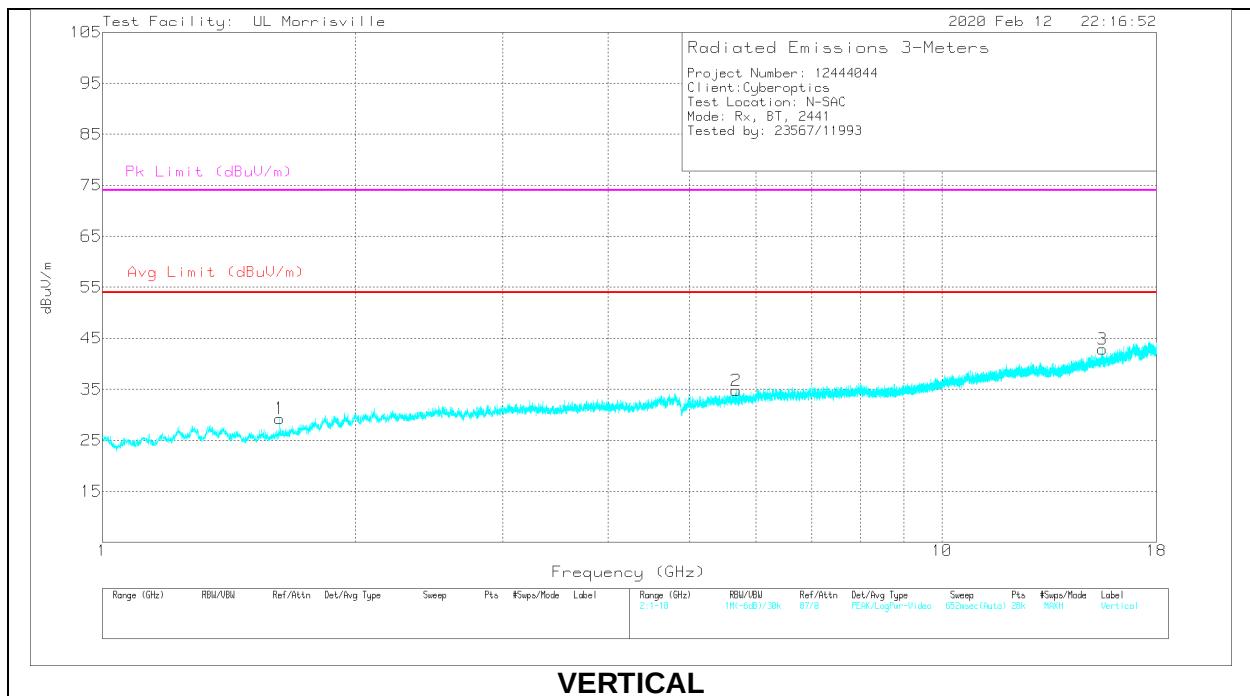
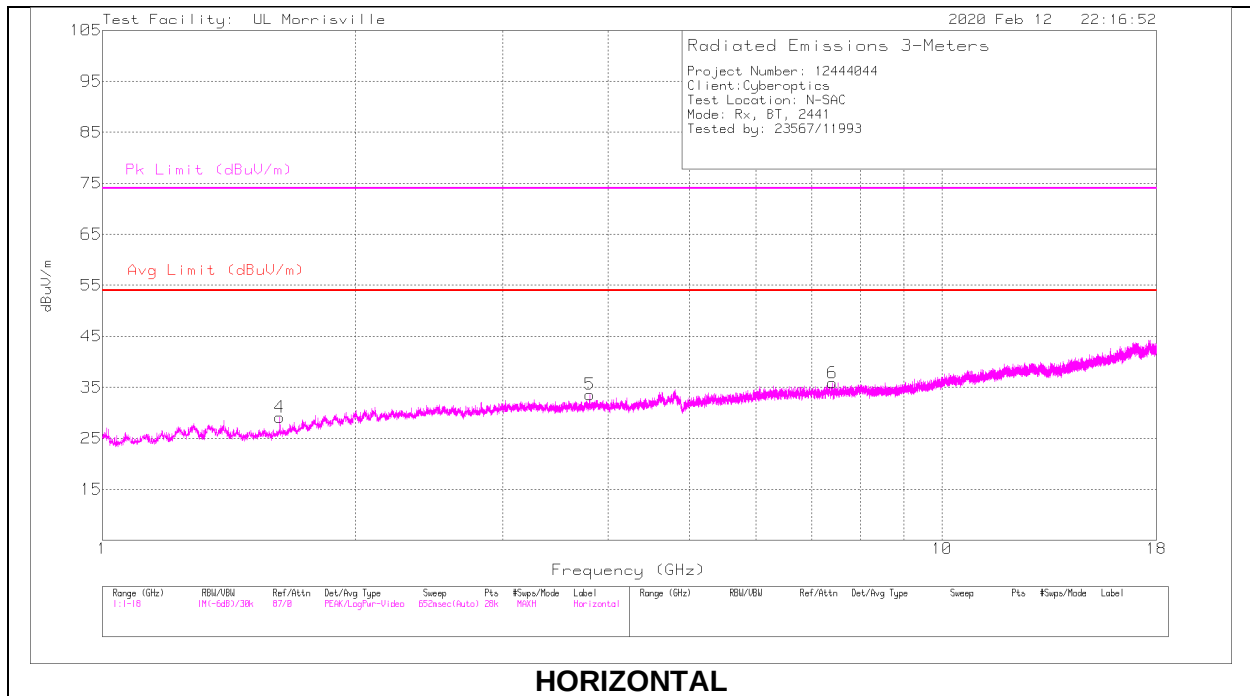
1 to 18GHz Data

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0067 AF (dBuV/m)	Amp/Cbl/Filtr/Pad (dB)	Corrected Reading dBuV/m	Avg Limit (dBuV/m)	Margin (dB)	Pk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
4	1.60029	43.68	Pk	28.1	-36.2	35.58	-	-	74	-38.42	269	262	H
	1.60029	34.83	Av	28.1	-36.2	26.73	54	-27.27	-	-	269	262	H
1	1.60034	43.95	Pk	28.1	-36.2	35.85	-	-	74	-38.15	214	161	V
	1.60034	39.55	Av	28.1	-36.2	31.45	54	-22.55	-	-	214	161	V
2	4.10643	39.7	Pk	33.5	-33.1	40.1	-	-	74	-33.9	160	149	V
	4.10643	31.15	Av	33.5	-33.1	31.55	54	-22.45	-	-	160	149	V
5	4.63578	38.6	Pk	34.1	-32.7	40	-	-	74	-34	173	177	H
	4.63578	31.38	Av	34.1	-32.7	32.78	54	-21.22	-	-	173	177	H
6	9.87609	34.55	Pk	37	-27.9	43.65	-	-	74	-30.35	155	116	H
	9.87609	26.67	Av	37	-27.9	35.77	54	-18.23	-	-	155	116	H
3	17.18166	34.21	Pk	41.1	-25.3	50.01	-	-	74	-23.99	178	312	V
	17.18166	26.17	Av	41.1	-25.3	41.97	54	-12.03	-	-	178	312	V

Pk - Peak detector

Av - Average detection

SPURIOUS EMISSIONS 1 – 18GHz – APS3 BATTERY MID CHANNEL



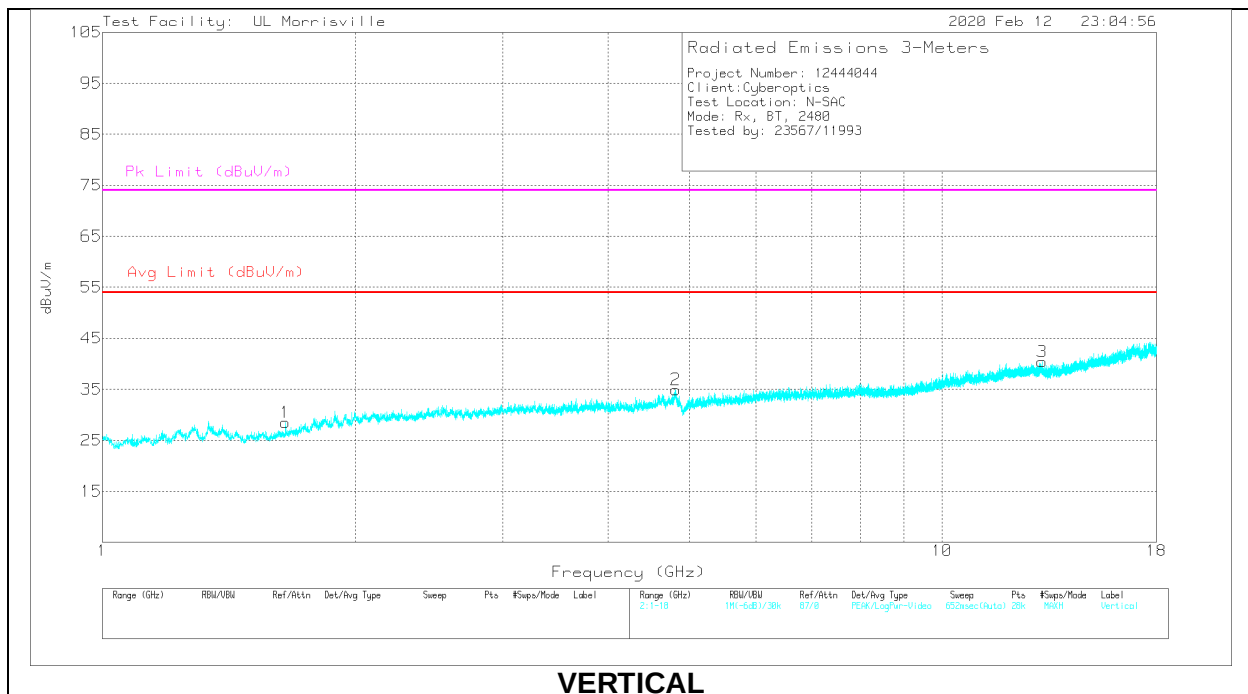
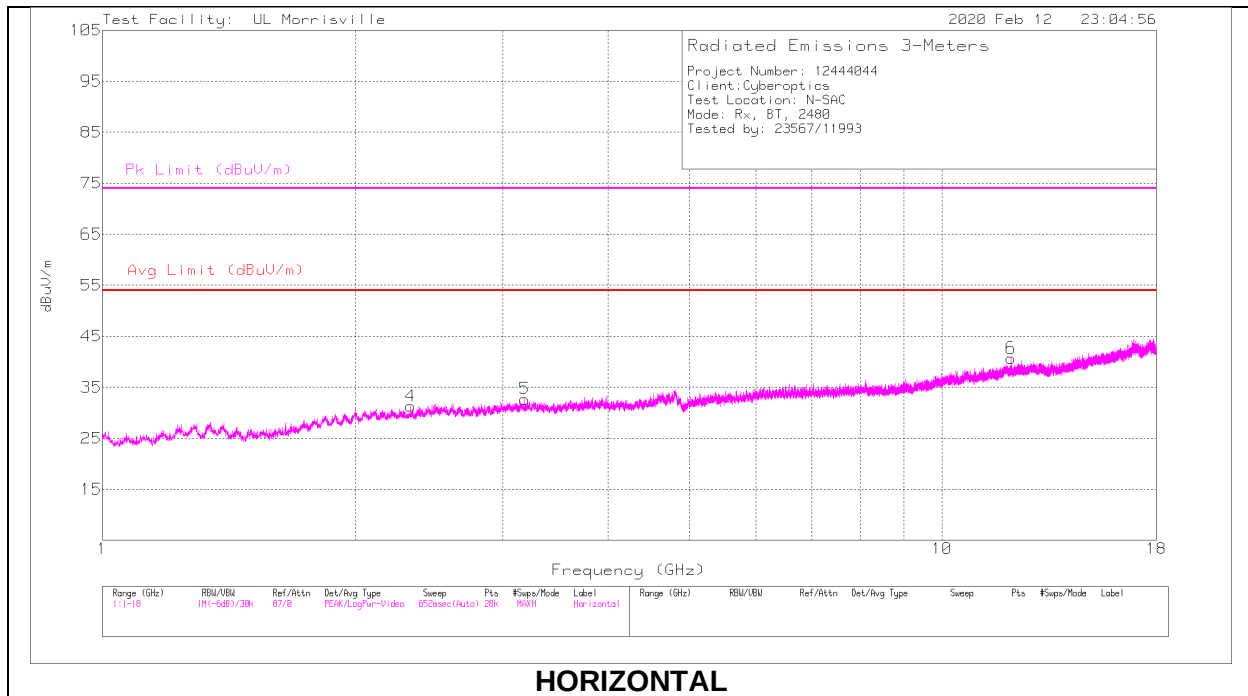
1 to 18GHz Data

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0067 AF (dBuV/m)	Amp/Cbl/Filtr/Pad (dB)	Corrected Reading dBuV/m	Avg Limit (dBuV/m)	Margin (dB)	Pk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
4	1.62643	42.55	Pk	28.4	-36.1	34.85	-	-	74	-39.15	100	382	H
	1.62643	36.08	Av	28.4	-36.1	28.38	54	-25.62	-	-	100	382	H
1	1.62653	43.82	Pk	28.4	-36.1	36.12	-	-	74	-37.88	222	225	V
	1.62653	37.84	Av	28.4	-36.1	30.14	54	-23.86	-	-	222	225	V
5	3.80687	38.43	Pk	33.5	-33	38.93	-	-	74	-35.07	305	195	H
	3.80687	30.94	Av	33.5	-33	31.44	54	-22.56	-	-	305	195	H
2	5.6855	38.59	Pk	34.6	-32.6	40.59	-	-	74	-33.41	78	244	V
	5.6855	30.78	Av	34.6	-32.6	32.78	54	-21.22	-	-	78	244	V
6	7.40278	36.48	Pk	35.6	-30.1	41.98	-	-	74	-32.02	190	340	H
	7.40278	28.21	Av	35.6	-30.1	33.71	54	-20.29	-	-	190	340	H
3	15.52634	33.35	Pk	40.2	-25.1	48.45	-	-	74	-25.55	200	242	V
	15.52634	25.55	Av	40.2	-25.1	40.65	54	-13.35	-	-	200	242	V

Pk - Peak detector

Av - Average detection

SPURIOUS EMISSIONS 1 – 18GHz – APS3 BATTERY HIGH CHANNEL



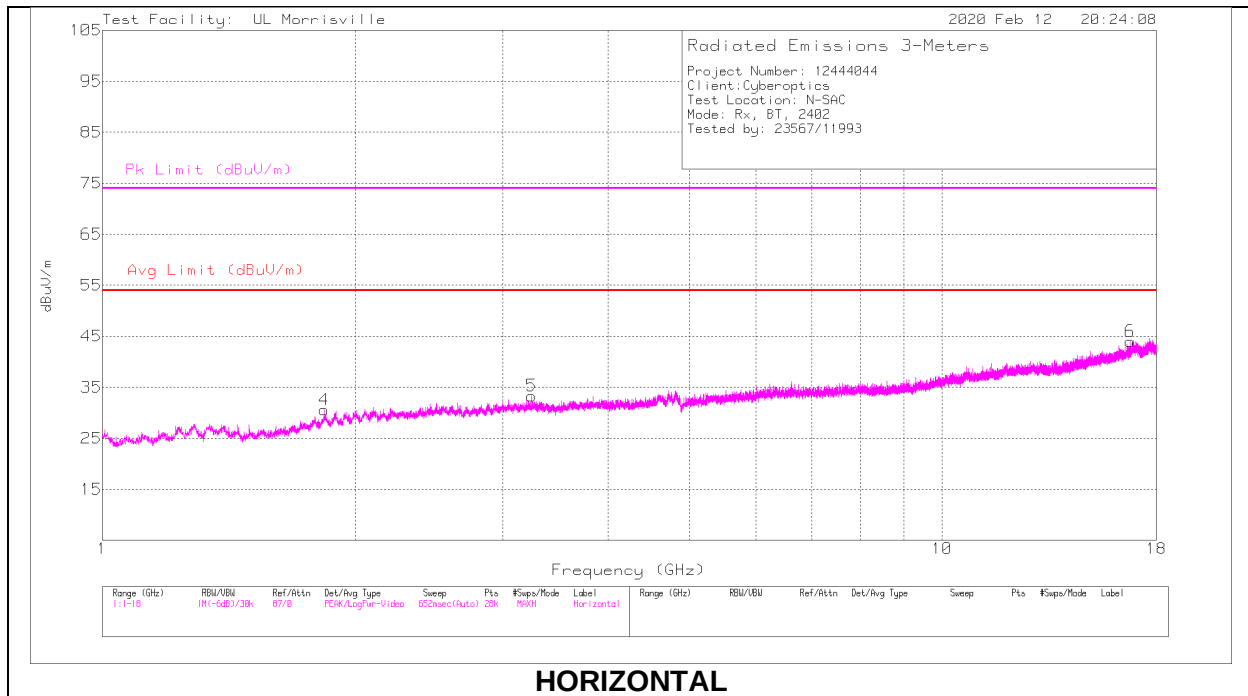
1 to 18GHz Data

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0067 AF (dBuV/m)	Amp/Cbl/Filtr/Pad (dB)	Corrected Reading dBuV/m	Avg Limit (dBuV/m)	Margin (dB)	Pk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	1.6523	44.18	Pk	28.7	-36	36.88	-	-	74	-37.12	271	293	V
	1.6523	38.36	Av	28.7	-36	31.06	54	-22.94	-	-	271	293	V
4	2.32737	39.35	Pk	31.7	-34.8	36.25	-	-	74	-37.75	57	257	H
	2.32737	33.04	Av	31.7	-34.8	29.94	54	-24.06	-	-	57	257	H
5	3.18224	39.18	Pk	32.9	-33.8	38.28	-	-	74	-35.72	291	301	H
	3.18224	31.51	Av	32.9	-33.8	30.61	54	-23.39	-	-	291	301	H
2	4.81529	40.76	Pk	34.1	-32.8	42.06	-	-	74	-31.94	237	111	V
	4.81529	32.13	Av	34.1	-32.8	33.43	54	-20.57	-	-	237	111	V
6	12.08629	33.67	Pk	38.7	-26.5	45.87	-	-	74	-28.13	91	295	H
	12.08629	25.45	Av	38.7	-26.5	37.65	54	-16.35	-	-	91	295	H
3	13.15536	35.17	Pk	38.8	-27.6	46.37	-	-	74	-27.63	139	362	V
	13.15536	26.8	Av	38.8	-27.6	38	54	-16	-	-	139	362	V

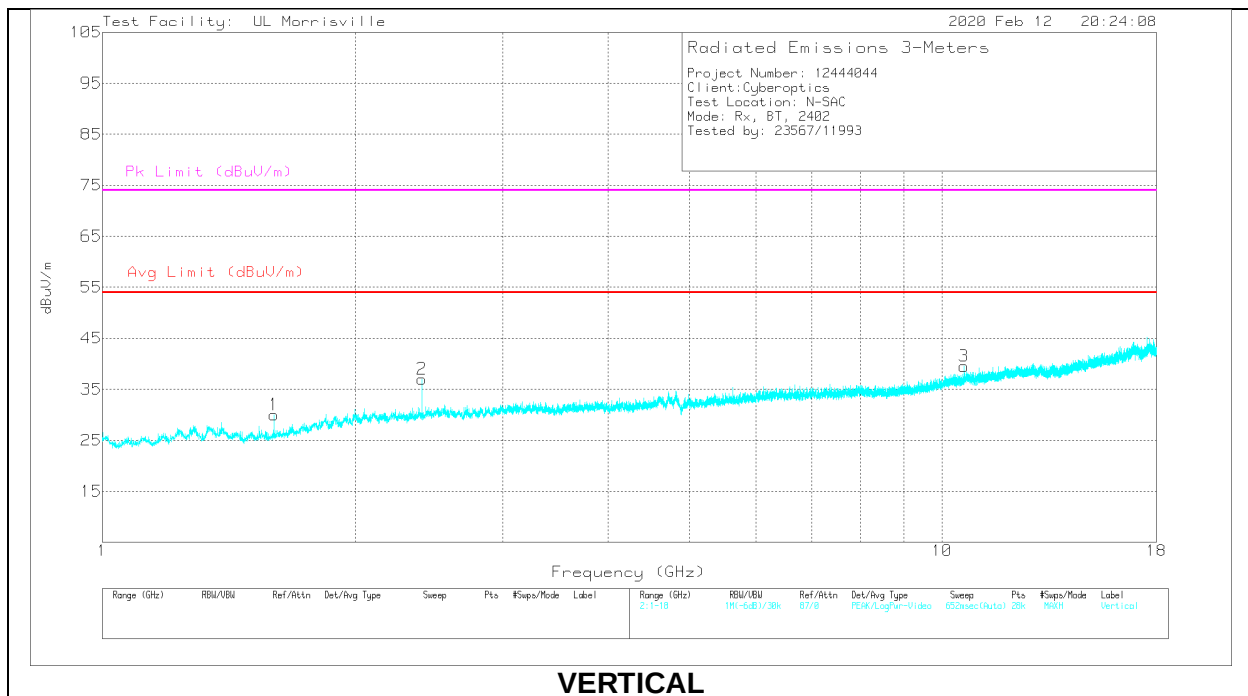
Pk - Peak detector

Av - Average detection

SPURIOUS EMISSIONS 1 – 18GHz – APS3 POWER SUPPLY LOW CHANNEL



HORIZONTAL



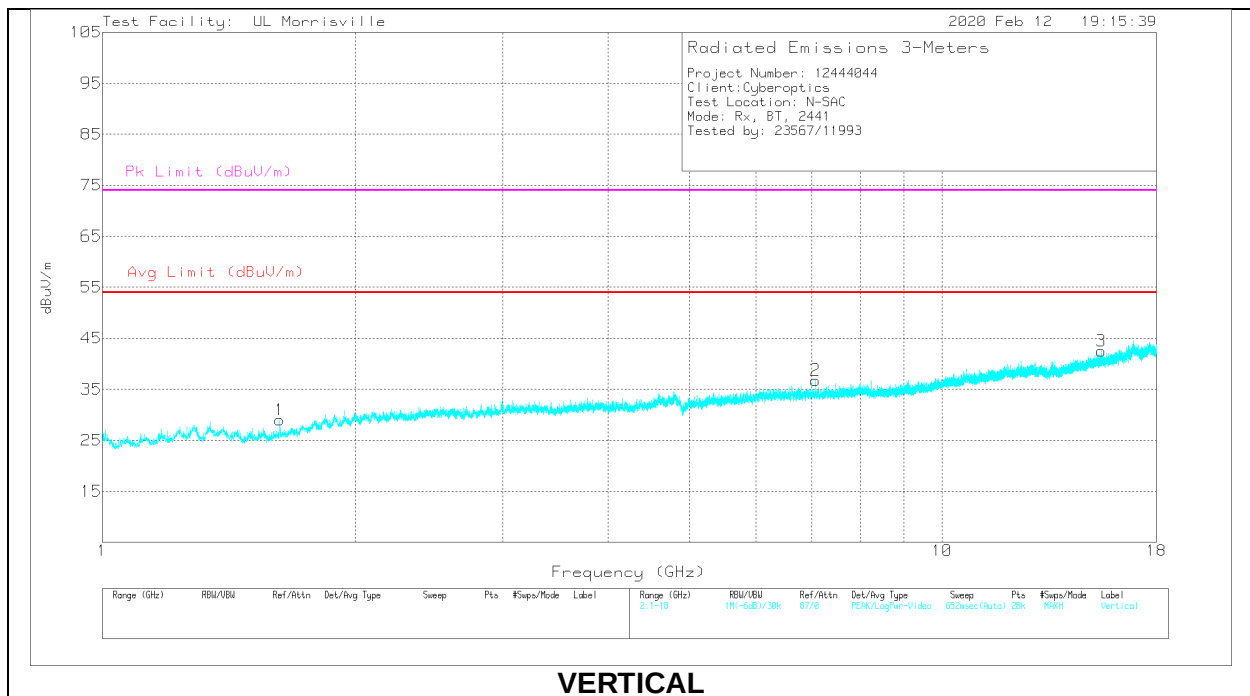
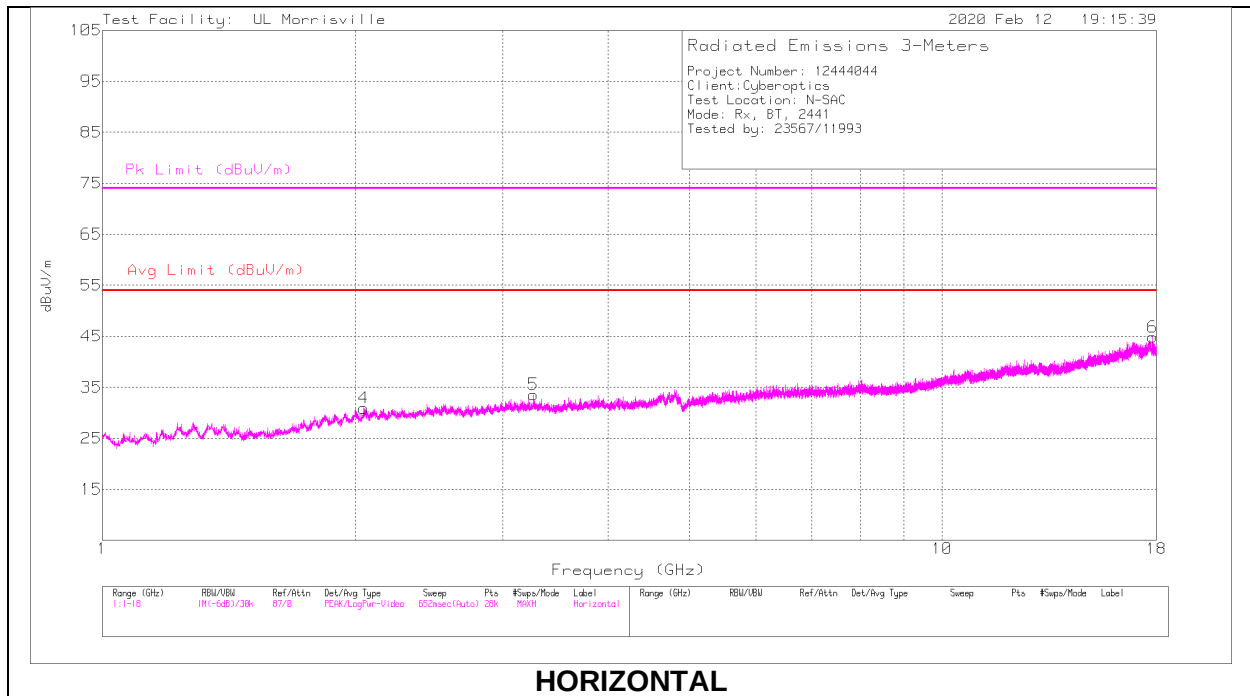
VERTICAL

1 to 18GHz Data

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0067 AF (dBuV/m)	Amp/Cbl/Filtr/Pad (dB)	Corrected Reading dBuV/m	Avg Limit (dBuV/m)	Margin (dB)	Pk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	1.60023	44.06	Pk	28.1	-36.2	35.96	-	-	74	-38.04	340	179	V
	1.60023	38.36	Av	28.1	-36.2	30.26	54	-23.74	-	-	340	179	V
4	1.83785	42.07	Pk	30.7	-35.7	37.07	-	-	74	-36.93	124	195	H
	1.83785	33.5	Av	30.7	-35.7	28.5	54	-25.5	-	-	124	195	H
2	2.40048	40.75	Pk	32	-34.7	38.05	-	-	74	-35.95	152	193	V
	2.40048	34.09	Av	32	-34.7	31.39	54	-22.61	-	-	152	193	V
5	3.24129	38.54	Pk	33	-33.5	38.04	-	-	74	-35.96	267	173	H
	3.24129	31.27	Av	33	-33.5	30.77	54	-23.23	-	-	267	173	H
3	10.62481	34.34	Pk	37.6	-26.8	45.14	-	-	74	-28.86	128	174	V
	10.62481	25.87	Av	37.6	-26.8	36.67	54	-17.33	-	-	128	174	V
6	16.73683	34.17	Pk	41.3	-25.2	50.27	-	-	74	-23.73	25	316	H
	16.73683	25.55	Av	41.3	-25.2	41.65	54	-12.35	-	-	25	316	H

Pk - Peak detector
Av - Average detection

SPURIOUS EMISSIONS 1 – 18GHz – APS3 POWER SUPPLY MID CHANNEL



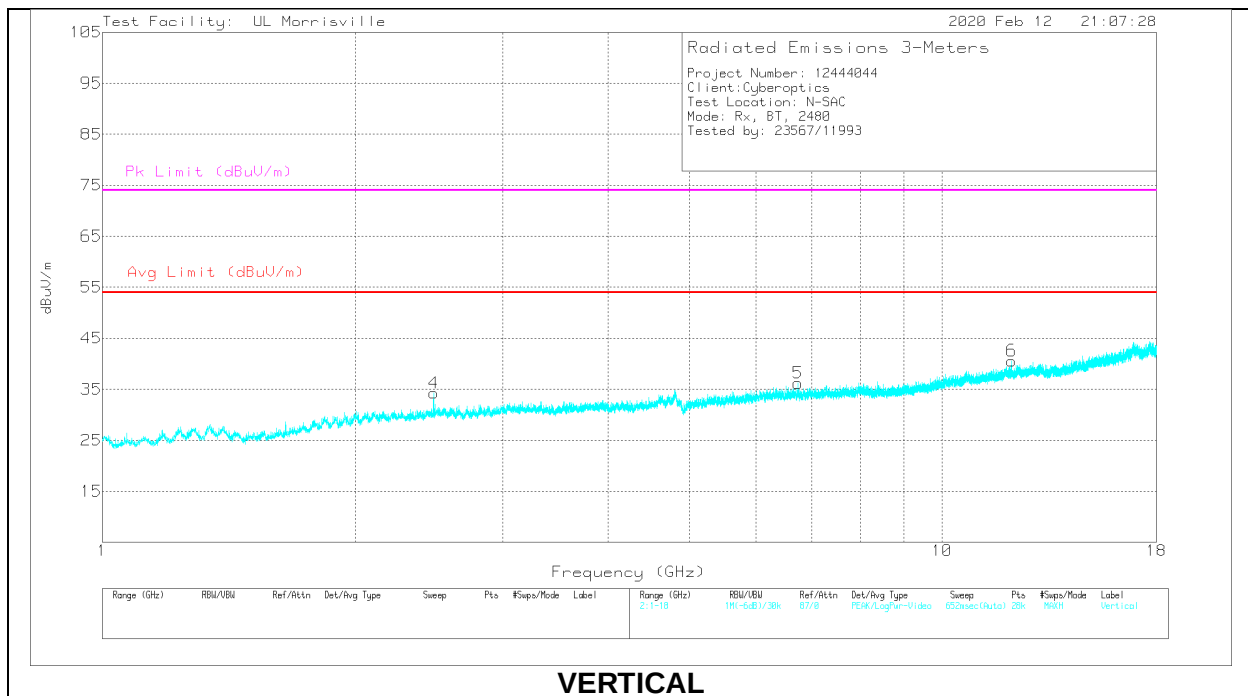
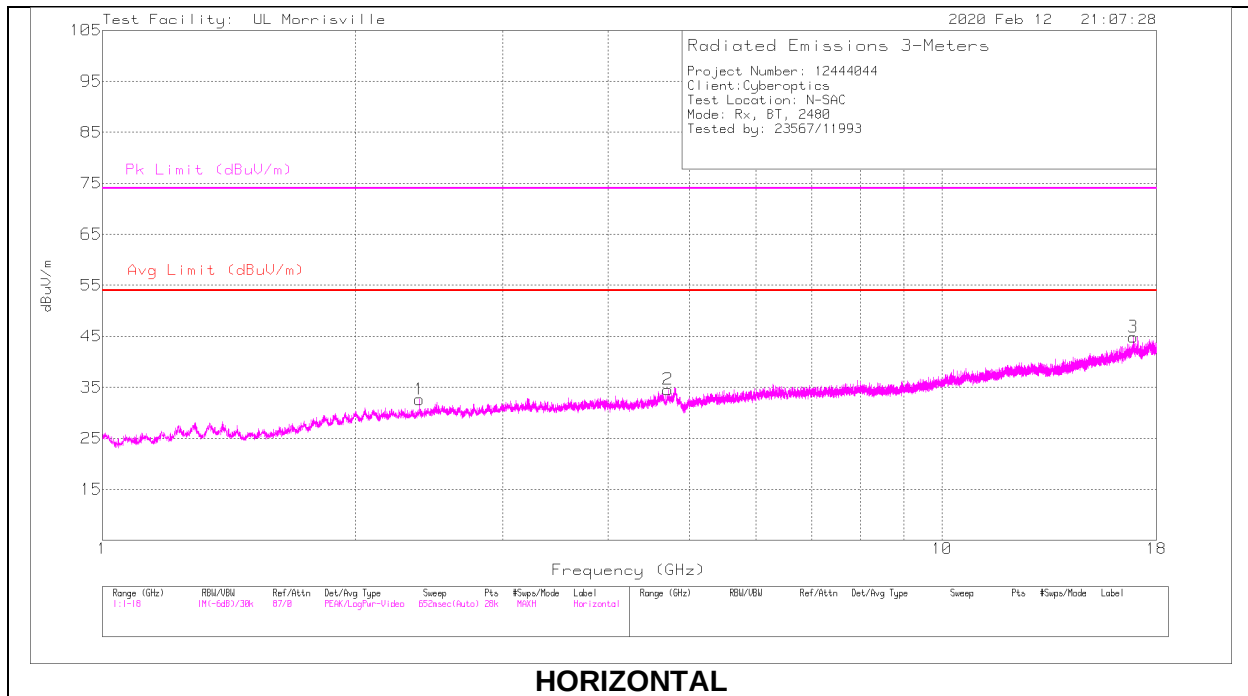
1 to 18GHz Data

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0067 AF (dBuV/m)	Amp/Cbl/Filtr/Pad (dB)	Corrected Reading dBuV/m	Avg Limit (dBuV/m)	Margin (dB)	Pk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	1.62628	43.8	Pk	28.4	-36.1	36.1	-	-	74	-37.9	339	236	V
	1.62628	37.92	Av	28.4	-36.1	30.22	54	-23.78	-	-	339	236	V
4	2.04889	41.23	Pk	31.6	-35.3	37.53	-	-	74	-36.47	9	184	H
	2.04889	32.97	Av	31.6	-35.3	29.27	54	-24.73	-	-	9	184	H
5	3.26087	39.56	Pk	33	-33.6	38.96	-	-	74	-35.04	35	164	H
	3.26087	31.98	Av	33	-33.6	31.38	54	-22.62	-	-	35	164	H
2	7.06664	36.97	Pk	35.6	-30.2	42.37	-	-	74	-31.63	153	149	V
	7.06664	28.53	Av	35.6	-30.2	33.93	54	-20.07	-	-	153	149	V
3	15.48018	34.36	Pk	40.1	-25.2	49.26	-	-	74	-24.74	108	216	V
	15.48018	25.54	Av	40.1	-25.2	40.44	54	-13.56	-	-	108	216	V
6	17.82726	32.56	Pk	41.1	-23.7	49.96	-	-	74	-24.04	145	358	H
	17.82726	24.86	Av	41.1	-23.7	42.26	54	-11.74	-	-	145	358	H

Pk - Peak detector

Av - Average detection

SPURIOUS EMISSIONS 1 – 18GHz – APS3 POWER SUPPLY HIGH CHANNEL



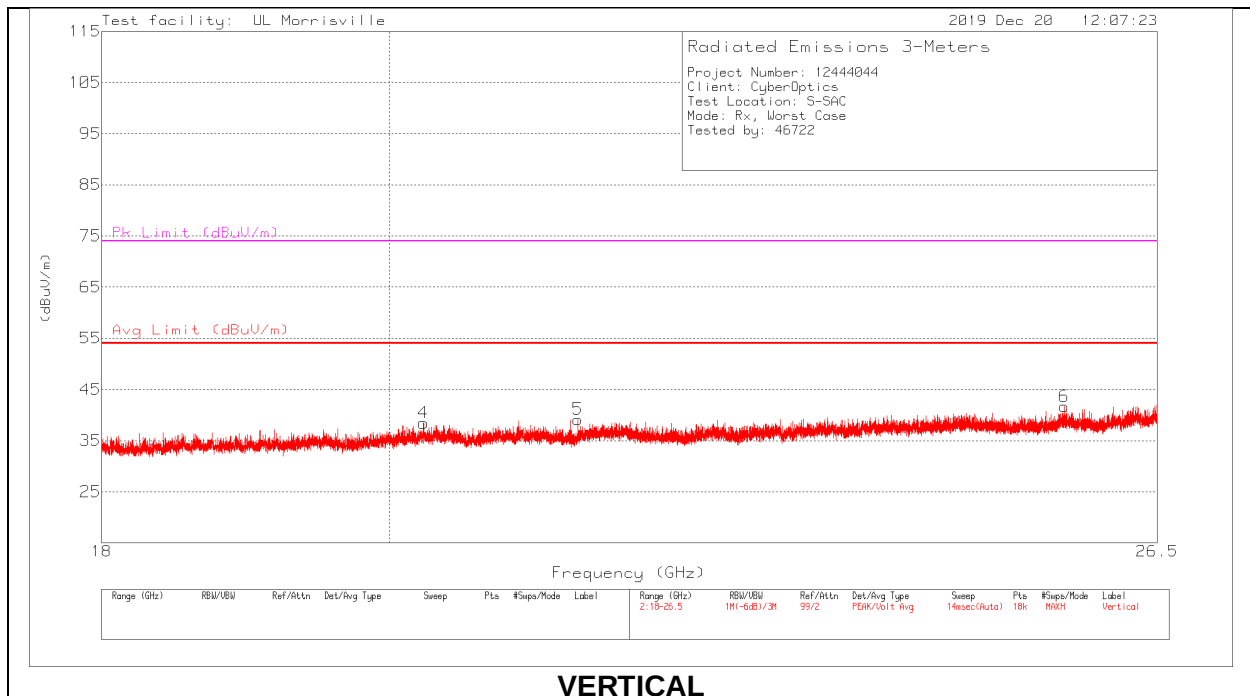
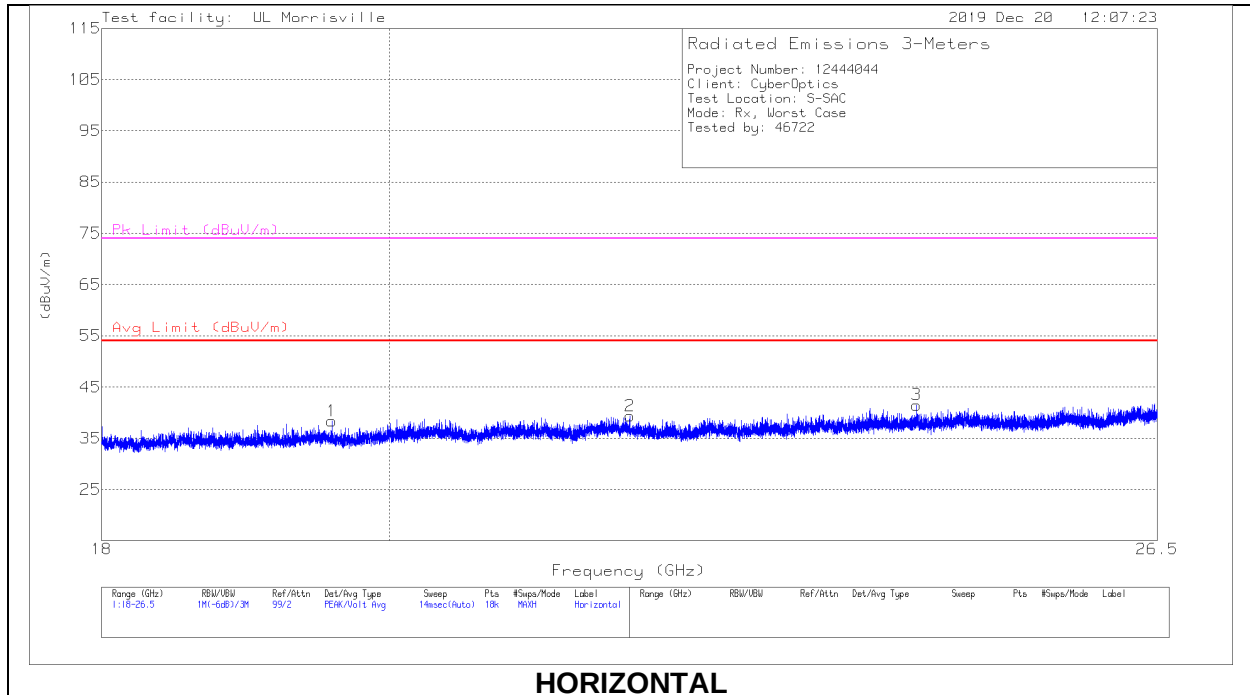
1 to 18GHz Data

Frequency (GHz)	Meter Reading (dBuV)	Det	AT0067 AF (dBuV/m)	Amp/Cbl/Filtr/Pad (dB)	Corrected Reading dBuV/m	Avg Limit (dBuV/m)	Margin (dB)	Pk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
2.38541	40.23	Pk	32	-34.6	37.63	-	-	74	-36.37	293	293	H
2.38541	32.68	Av	32	-34.6	30.08	54	-23.92	-	-	293	293	H
2.47851	38.96	Pk	32.4	-34.6	36.76	-	-	74	-37.24	284	178	V
2.47851	31.65	Av	32.4	-34.6	29.45	54	-24.55	-	-	284	178	V
4.71444	39.16	Pk	33.9	-32.6	40.46	-	-	74	-33.54	217	299	H
4.71444	30.88	Av	33.9	-32.6	32.18	54	-21.82	-	-	217	299	H
6.7371	38.47	Pk	35.6	-31.1	42.97	-	-	74	-31.03	305	167	V
6.7371	29.51	Av	35.6	-31.1	34.01	54	-19.99	-	-	305	167	V
12.10874	32.67	Pk	38.7	-26.5	44.87	-	-	74	-29.13	314	386	V
12.10874	25.64	Av	38.7	-26.5	37.84	54	-16.16	-	-	314	386	V
16.88035	32.99	Pk	41.3	-24.7	49.59	-	-	74	-24.41	22	337	H
16.88035	25.64	Av	41.3	-24.7	42.24	54	-11.76	-	-	22	337	H

Pk - Peak detector

Av - Average detection

SPURIOUS EMISSIONS 18-26 GHz – APS3 BATTERY



18 to 26GHz Data

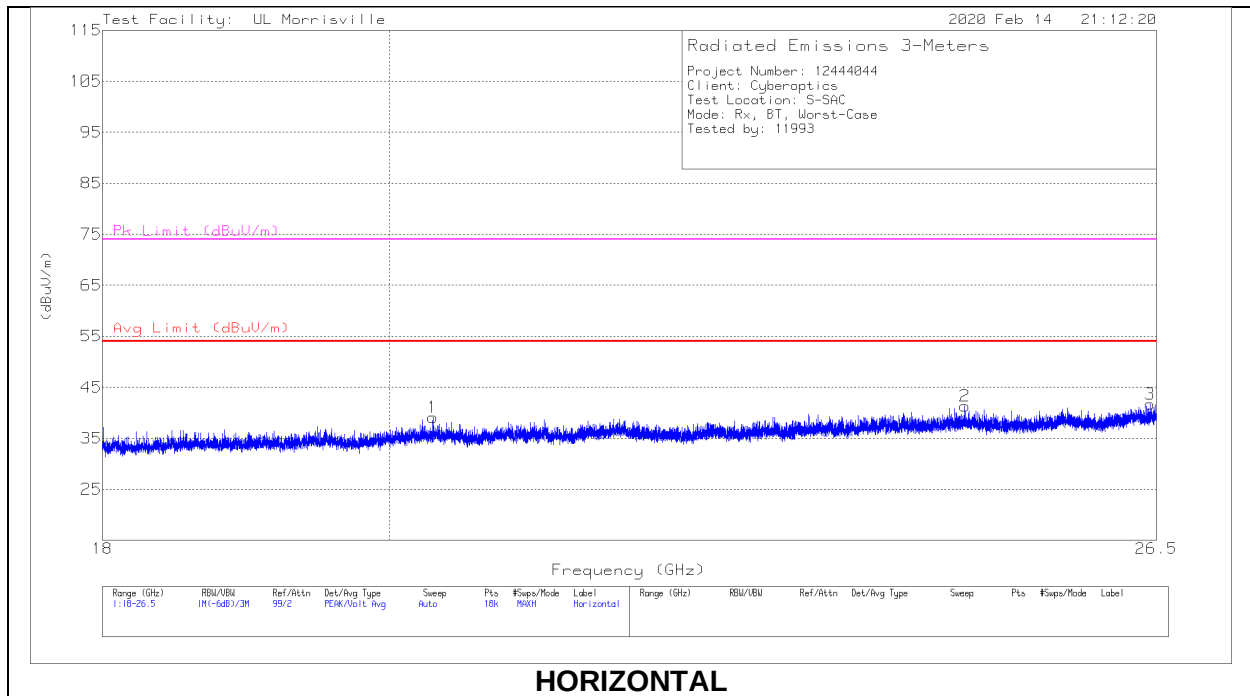
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0076 AF (dB/m)	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Pk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* **19.58392	41.08	Pk	32.8	-35.5	38.38	54	-15.62	74	-35.62	0-360	100	H
4	* **20.2531	39.95	Pk	33	-34.5	38.45	54	-15.55	74	-35.55	0-360	202	V
2	21.84552	40.24	Pk	33.5	-34.4	39.34	54	-14.66	74	-34.66	0-360	148	H
3	24.26484	40.71	Pk	34.2	-33.4	41.51	54	-12.49	74	-32.49	0-360	100	H
5	21.43183	40.27	Pk	33.3	-34.4	39.17	54	-14.83	74	-34.83	0-360	152	V
6	25.61075	40.27	Pk	34.5	-33.1	41.67	54	-12.33	74	-32.33	0-360	252	V

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

** - indicates frequency in Taiwan NCC LP0002 Restricted Band

Pk - Peak detector

SPURIOUS EMISSIONS 18-26 GHz – APS3 POWER SUPPLY



18 to 26GHz Data

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0076 AF (dB/m)	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Pk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	20.32063	40.41	Pk	33.2	-34.5	39.11	54	-14.89	74	-34.89	0-360	148	H
4	20.79146	40.02	Pk	33.1	-34.7	38.42	54	-15.58	74	-35.58	0-360	298	V
5	24.0783	40.59	Pk	34.1	-33.5	41.19	54	-12.81	74	-32.81	0-360	152	V
2	24.70167	39.94	Pk	34.5	-33.1	41.34	54	-12.66	74	-32.66	0-360	248	H
6	26.20389	39.82	Pk	34.9	-32.8	41.92	54	-12.08	74	-32.08	0-360	202	V
3	26.43907	39.52	Pk	35	-32.8	41.72	54	-12.28	74	-32.28	0-360	102	H

Pk - Peak detector

10. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

NCC LP0002 2.3

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.

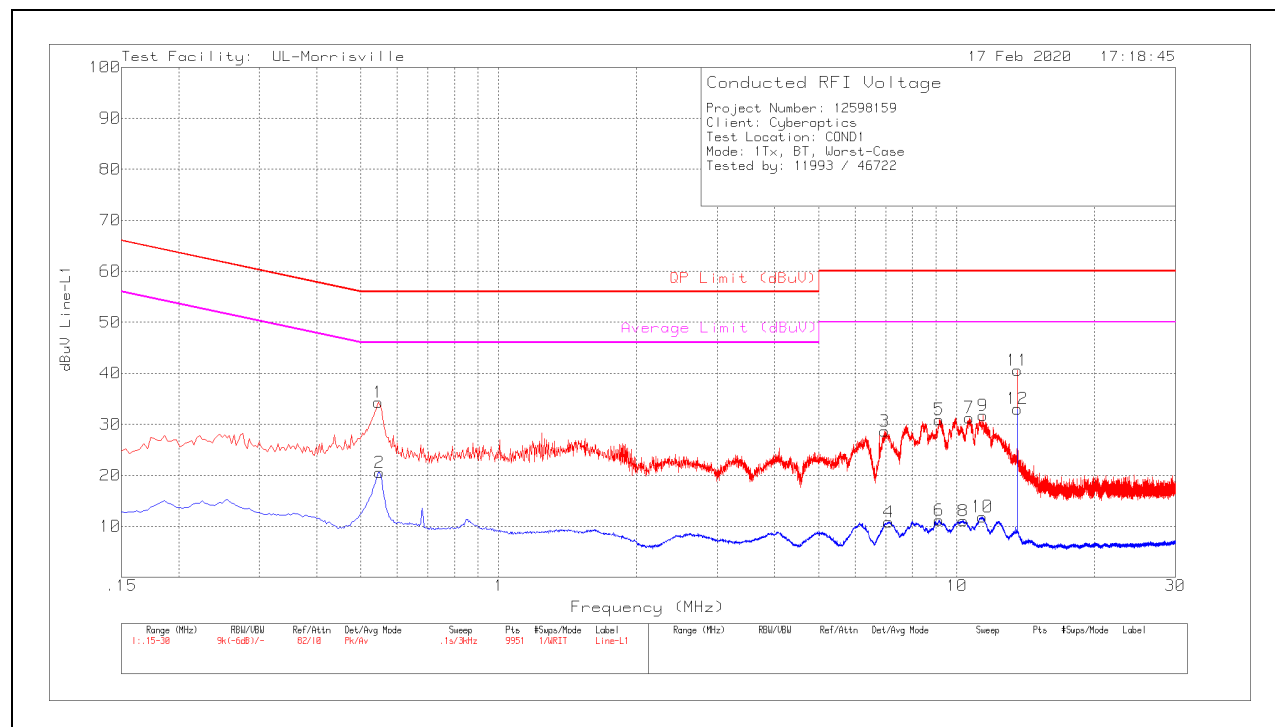
TEST PROCEDURE

The EUT is placed on a non-conducting table 40 cm from the vertical ground plane 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 conducted data is recorded for both lines.

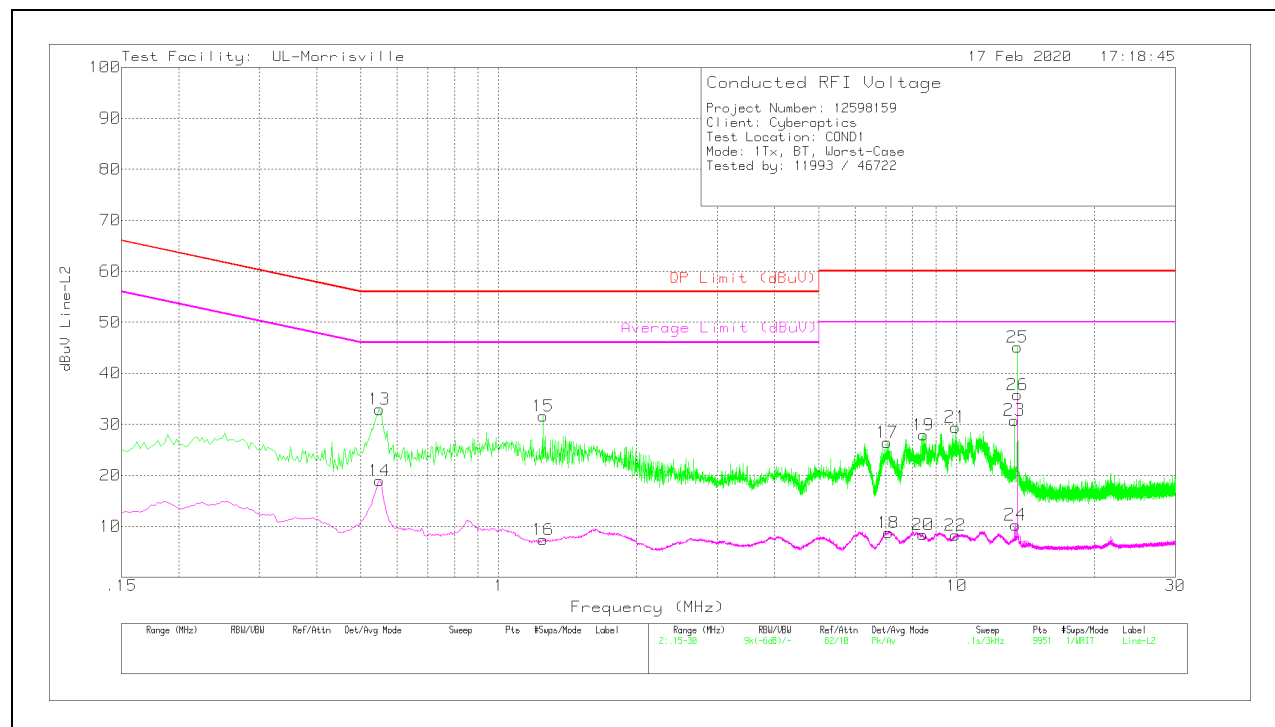
LINE 1 RESULTS



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	.546	24.22	Pk	.1	10	34.32	56	-21.68	-	-
2	.549	10.47	Av	.1	10	20.57	-	-	46	-25.43
3	6.96	18.38	Pk	.1	10.2	28.68	60	-31.32	-	-
4	7.098	.54	Av	.1	10.2	10.84	-	-	50	-39.16
5	9.156	20.53	Pk	.1	10.3	30.93	60	-29.07	-	-
6	9.153	.79	Av	.1	10.3	11.19	-	-	50	-38.81
7	10.638	20.88	Pk	.1	10.3	31.28	60	-28.72	-	-
8	10.329	.66	Av	.1	10.3	11.06	-	-	50	-38.94
9	11.415	21.23	Pk	.1	10.4	31.73	60	-28.27	-	-
10	11.358	1.36	Av	.1	10.4	11.86	-	-	50	-38.14
11	13.563	30.09	Pk	.1	10.4	40.59	60	-19.41	-	-
12	13.56	22.53	Av	.1	10.4	33.03	-	-	50	-16.97

Pk - Peak detector
Av - Average detection

LINE 2 RESULTS

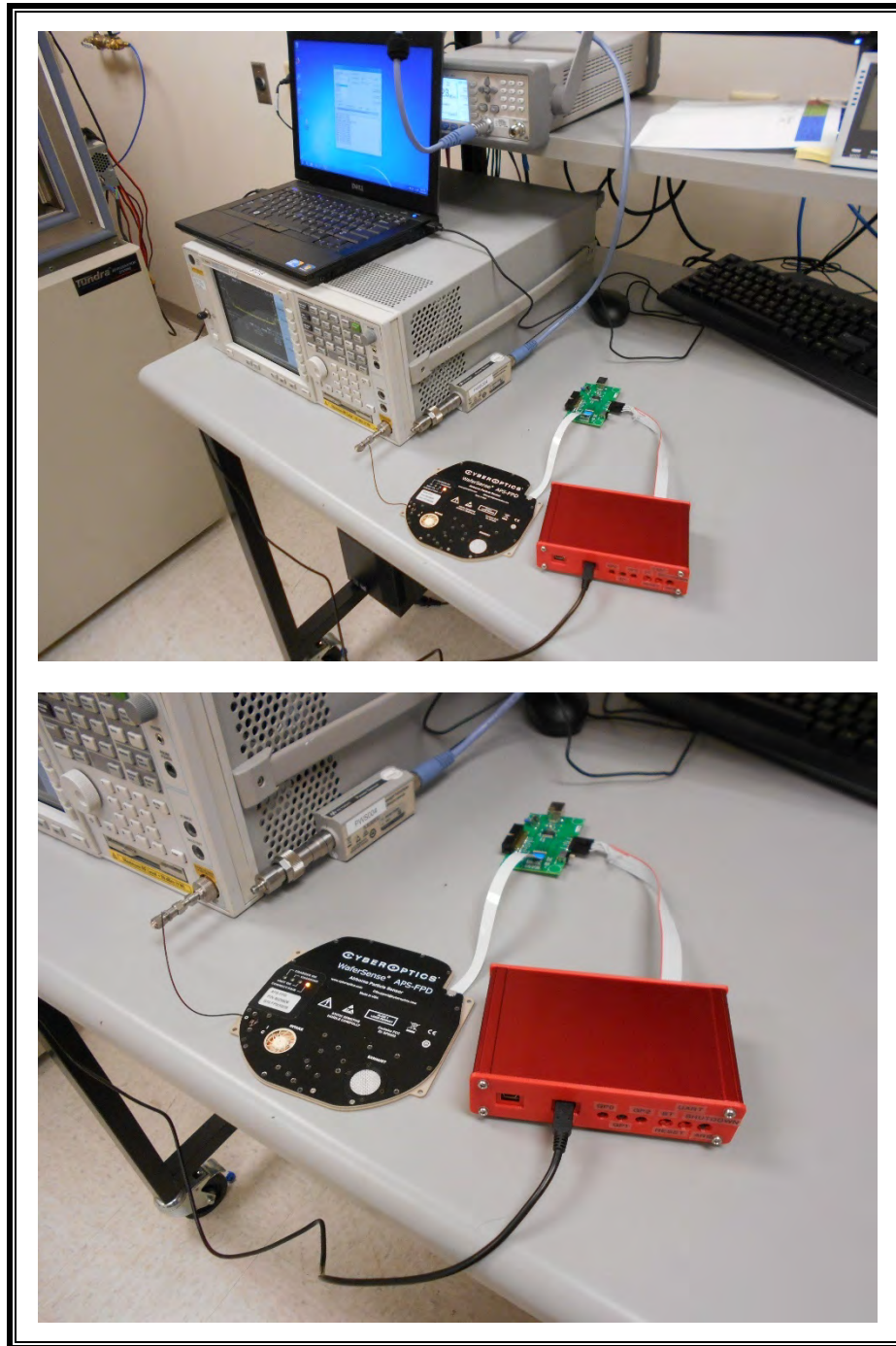


Range 2: Line-L2 .15 - 30MHz										
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	LISN VCF (dB)	Cbl/Limiter (dB)	Corrected Reading dBuV	QP Limit (dBuV)	Margin (dB)	Average Limit (dBuV)	Margin (dB)
13	.549	22.92	Pk	0	10	32.92	56	-23.08	-	-
14	.549	8.97	Av	0	10	18.97	-	-	46	-27.03
15	1.248	21.62	Pk	0	10	31.62	56	-24.38	-	-
16	1.248	-2.59	Av	0	10	7.41	-	-	46	-38.59
17	7.05	16.15	Pk	.1	10.2	26.45	60	-33.55	-	-
18	7.08	-1.52	Av	.1	10.2	8.78	-	-	50	-41.22
19	8.448	17.49	Pk	.1	10.3	27.89	60	-32.11	-	-
20	8.439	-2.01	Av	.1	10.3	8.39	-	-	50	-41.61
21	9.921	19.05	Pk	.1	10.3	29.45	60	-30.55	-	-
22	9.924	-2.16	Av	.1	10.3	8.24	-	-	50	-41.76
23	13.359	20.3	Pk	.1	10.4	30.8	60	-29.2	-	-
24	13.419	-22	Av	.1	10.4	10.28	-	-	50	-39.72
25	13.56	34.66	Pk	.1	10.4	45.16	60	-14.84	-	-
26	13.56	25.27	Av	.1	10.4	35.77	-	-	50	-14.23

Pk - Peak detector
Av - Average detection

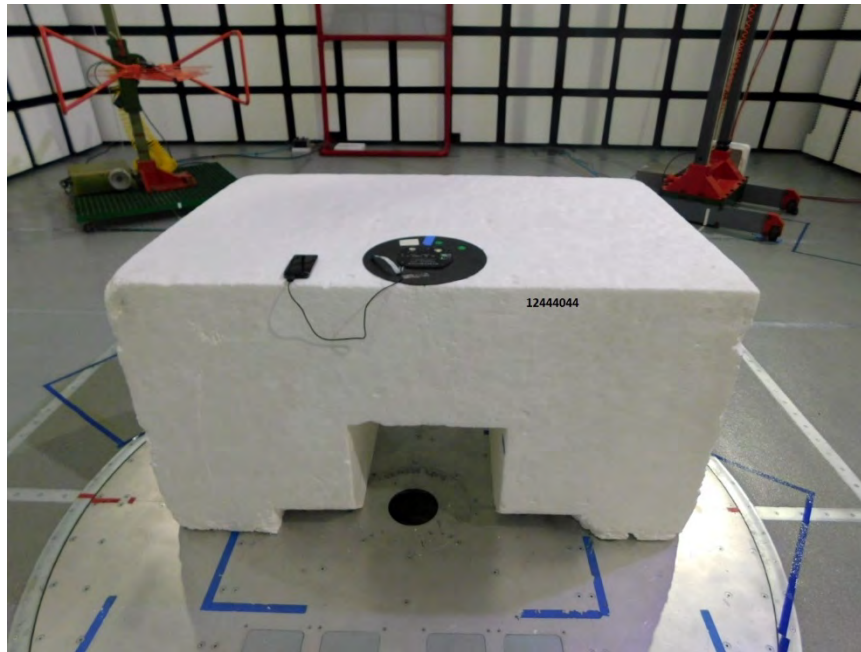
10. SETUP PHOTOS

ANTENNA PORT CONDUCTED

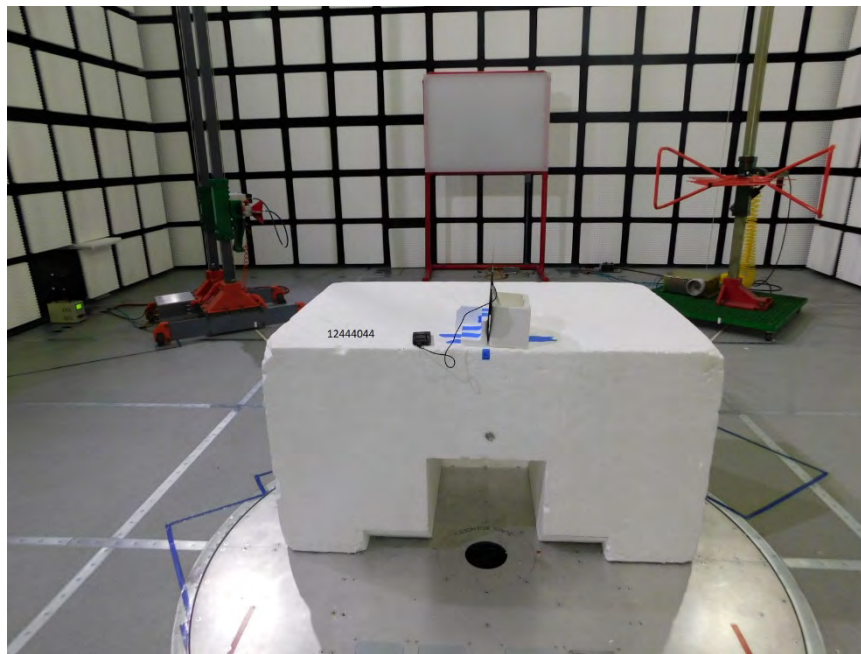


RADIATED SPURIOUS EMISSIONS

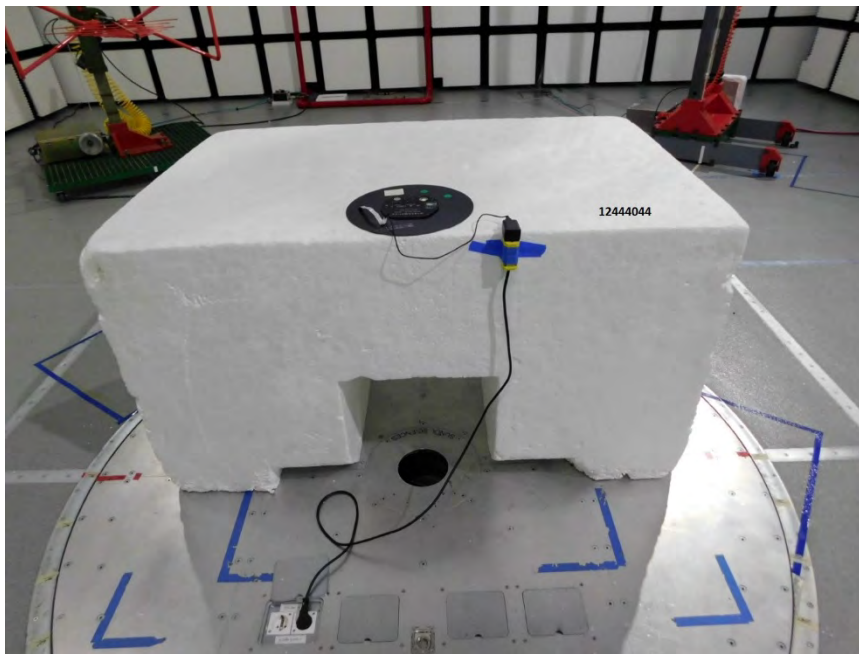
RADIATED SETUP PHOTO <1GHz TRANSMIT BATTERY



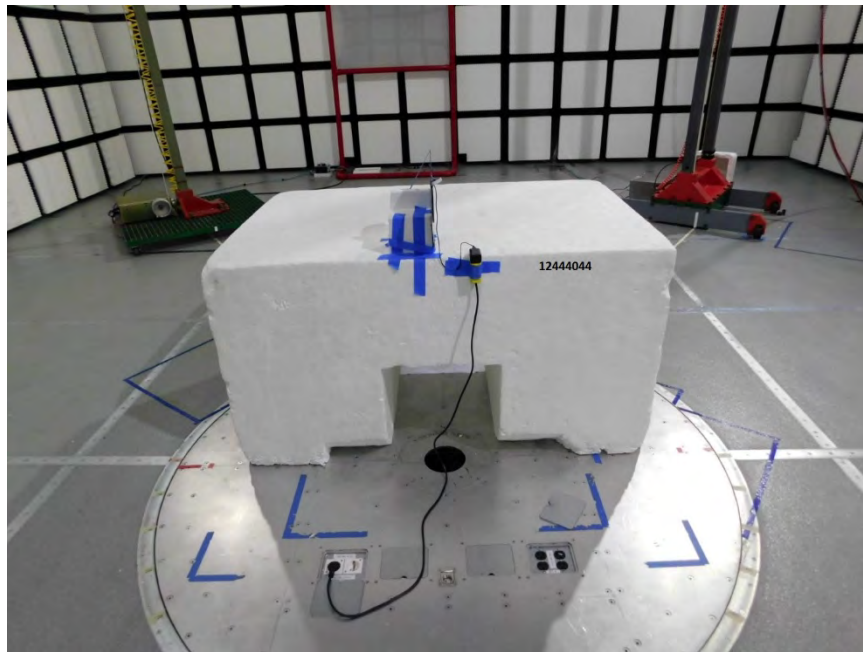
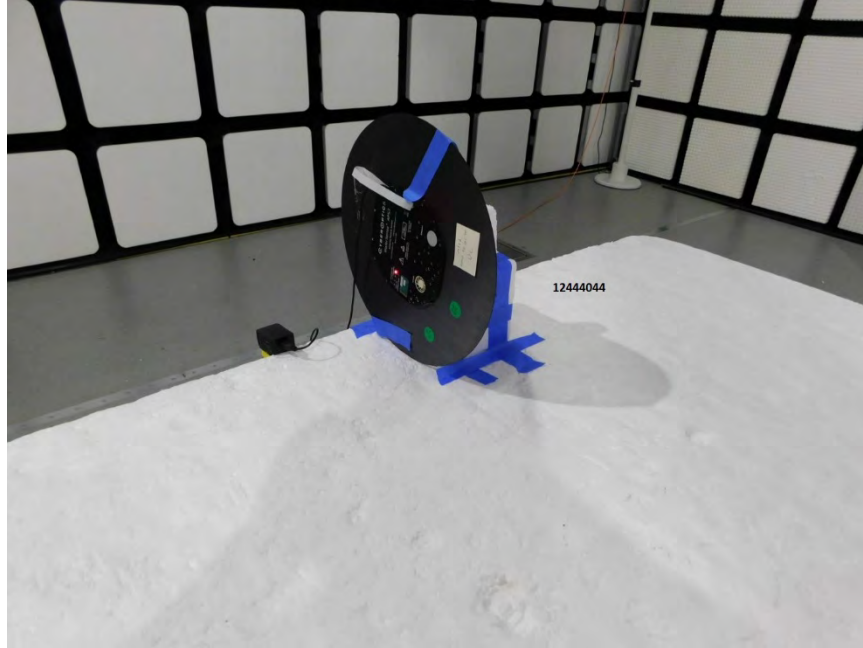
RADIATED SETUP PHOTO <1GHz RECEIVE BATTERY



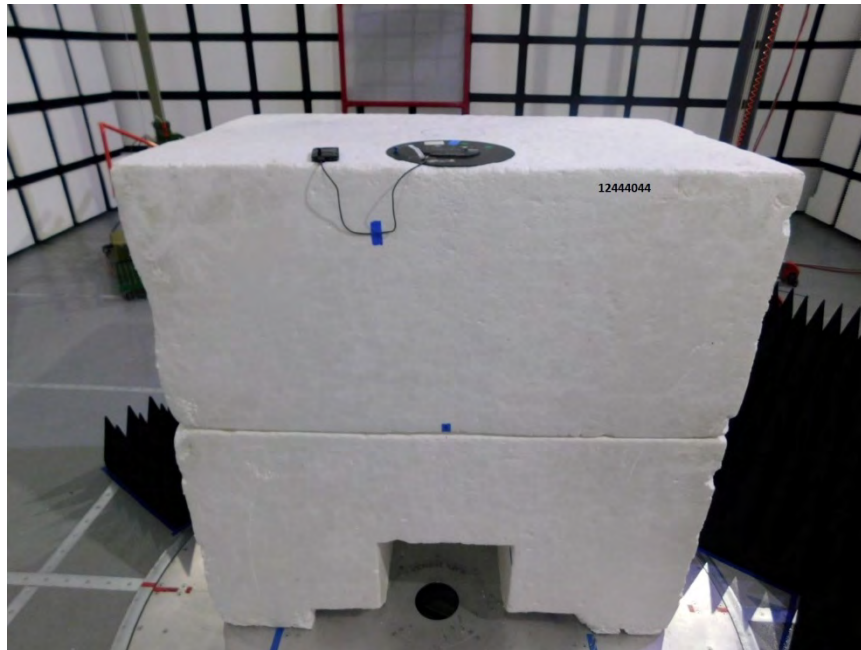
RADIATED SETUP PHOTO <1GHz TRANSMIT POWER
SUPPLY



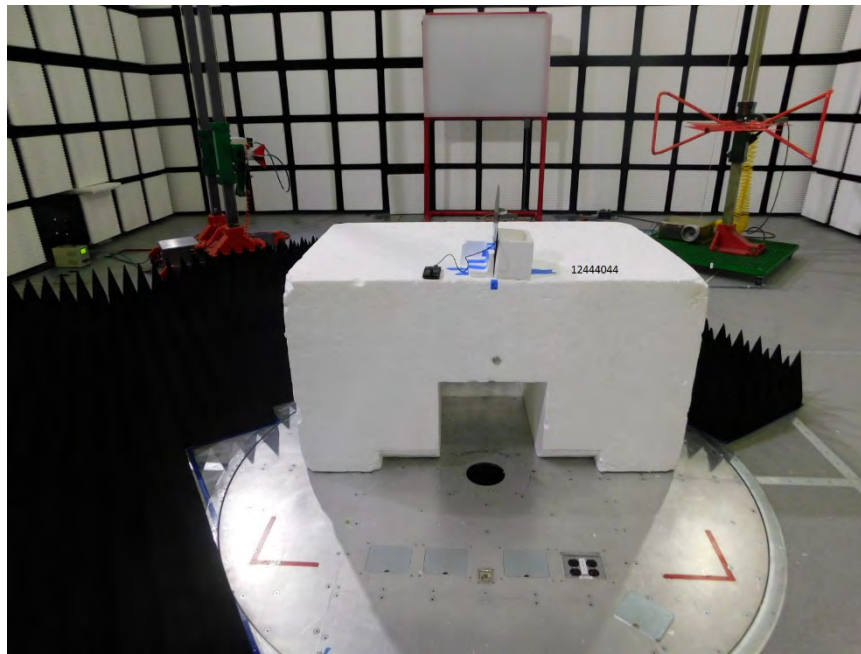
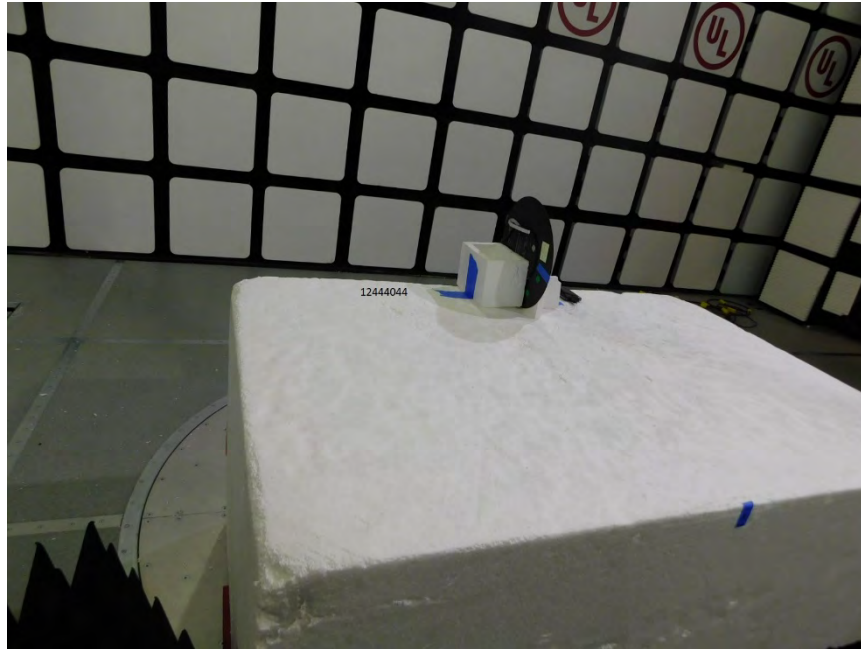
RADIATED SETUP PHOTO <1GHz RECEIVE POWER SUPPLY



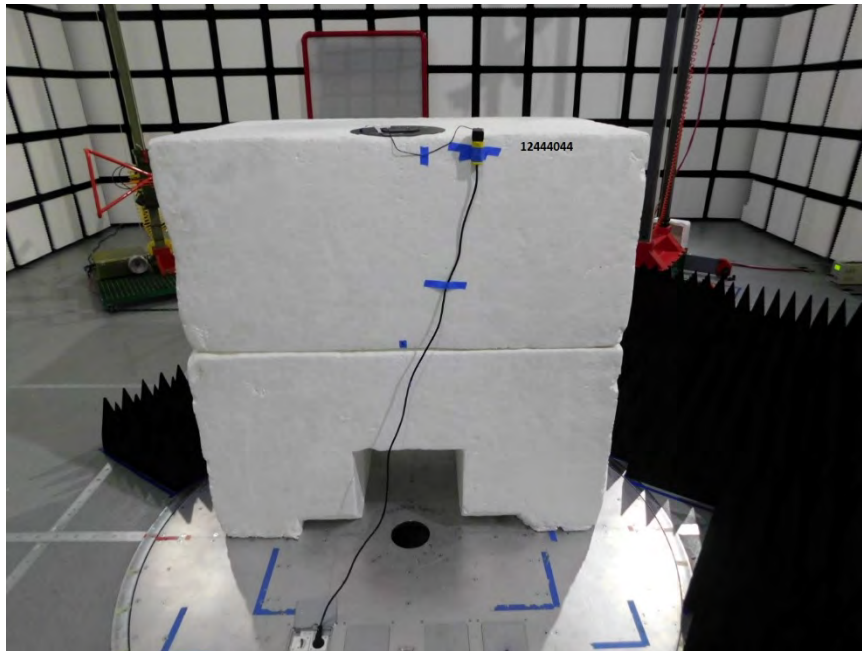
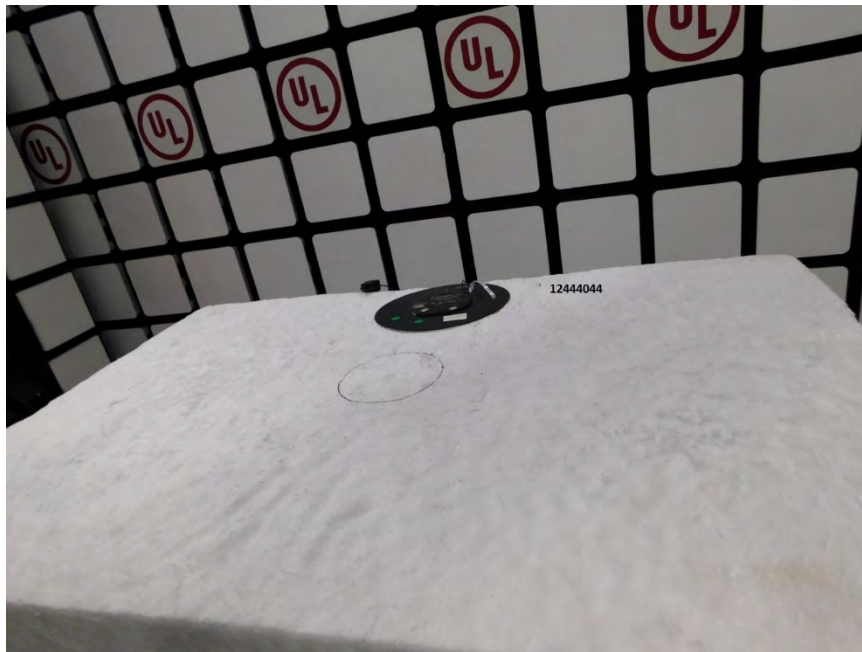
RADIATED SETUP PHOTO >1GHz TRANSMIT BATTERY



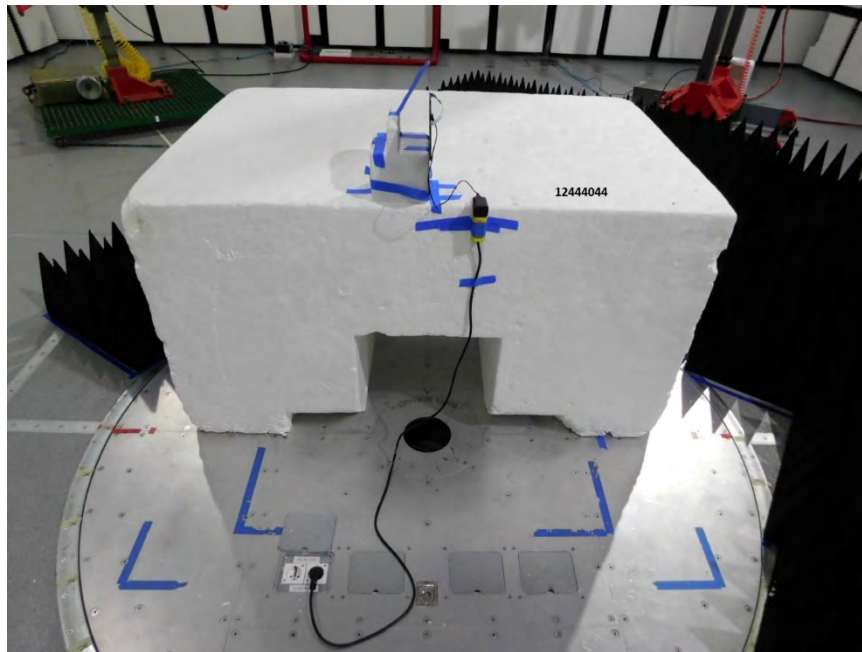
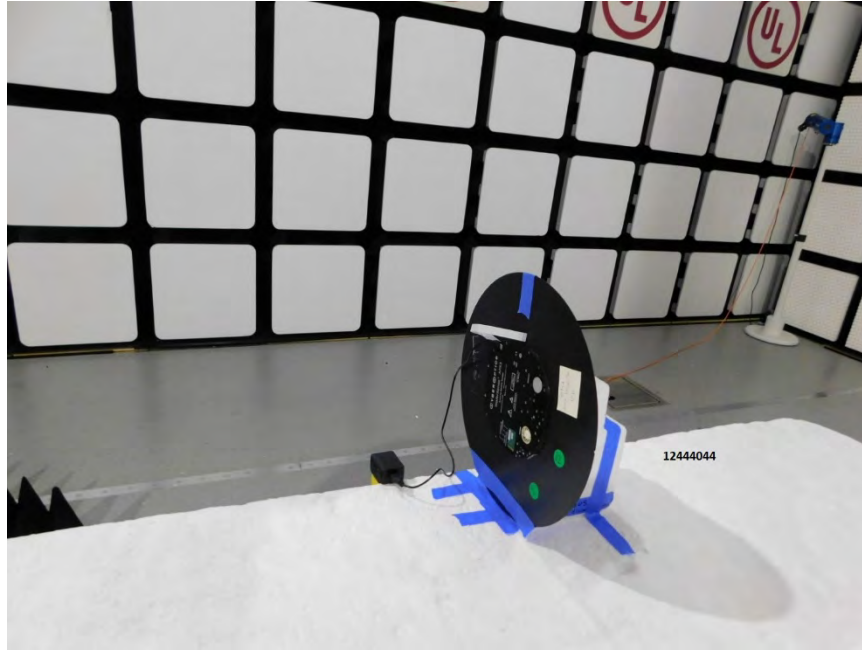
RADIATED SETUP PHOTO >1GHz RECEIVE



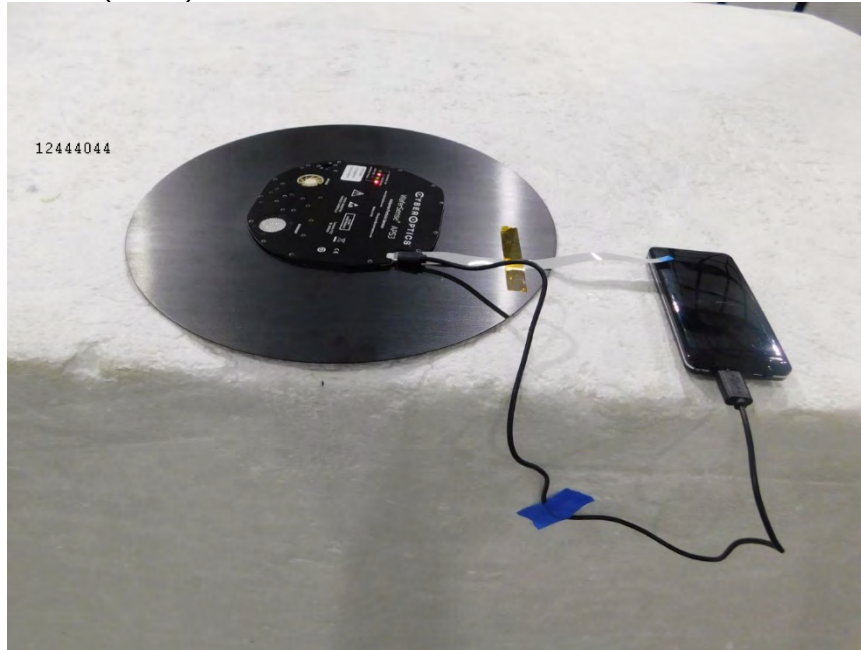
RADIATED SETUP PHOTO >1GHz TRANSMIT POWER
SUPPLY



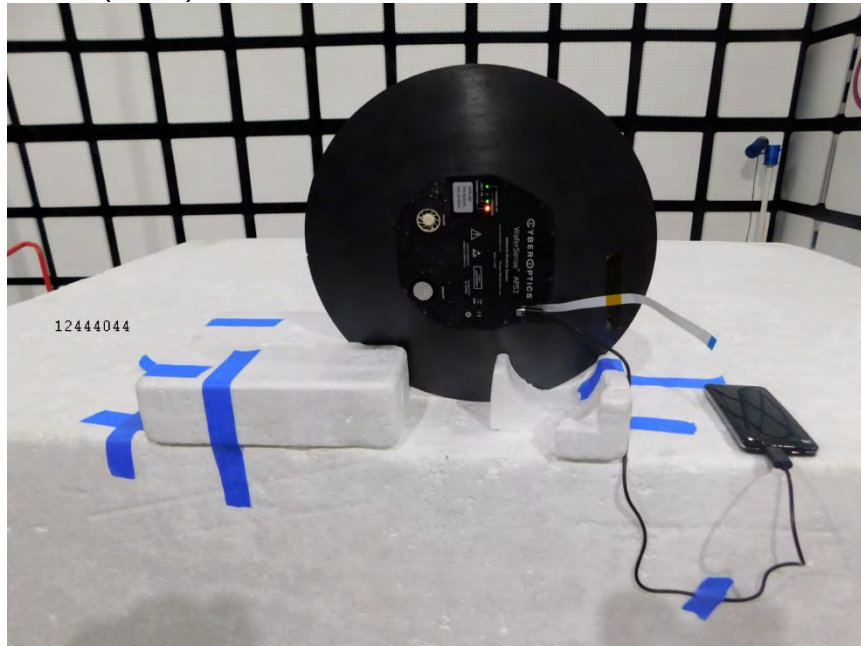
RADIATED SETUP PHOTO >1GHz RECEIVE POWER SUPPLY

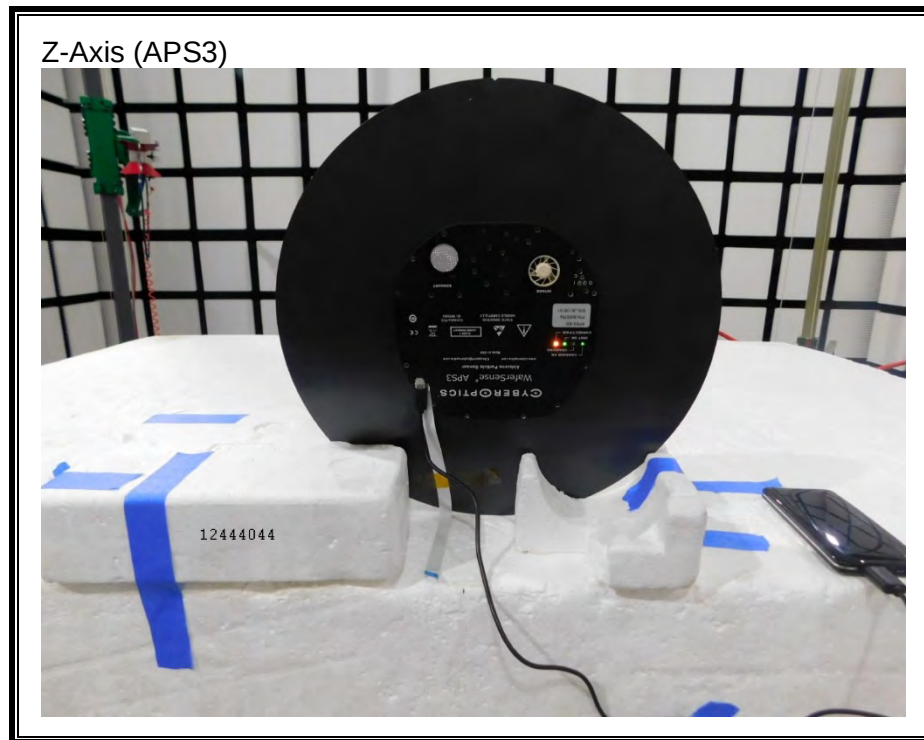


X-Axis (APS3)



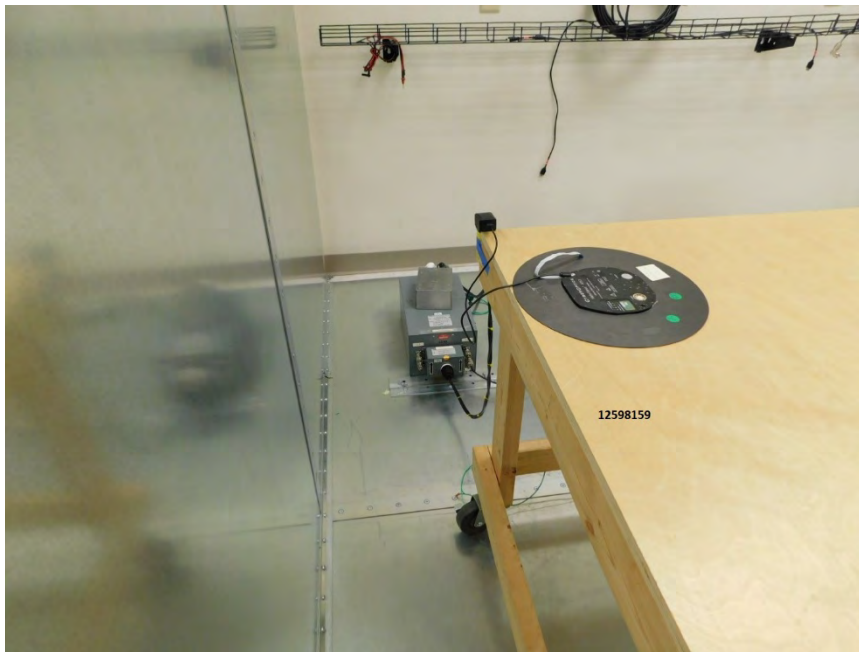
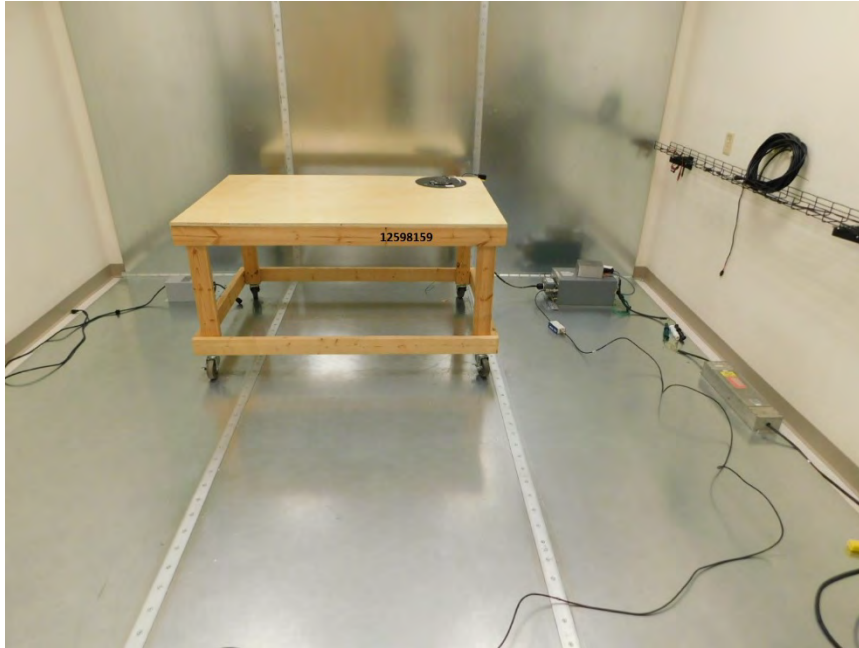
Y-Axis (APS3)





AC MAINS EMISSIONS

AC MAINS SETUP PHOTO



END OF TEST REPORT