



TEST REPORT

Report Number. : R13605195-E2

Applicant : Gentherm
1047 Cooke Blvd.
Burlington, Ontario L7T 4A8 Canada

Model : 12025733B

FCC ID : 2AYO9-WFDCRFIF

IC : 26868-WFDCRFIF

EUT Description : Wireless Freight Elevator Door Controller RF MAC Module

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

Date Of Issue:
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REPORT REVISION HISTORY

Rev.	Issue Date	Revisions	Revised By
V1	2021-03-25	Initial Issue	Niklas Haydon
V2	2021-04-20	Misc. editorial updates	Mike Antola

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: Gentherm
1047 Cooke Blvd.
Burlington, Ontario L7T 4A8 Canada

EUT DESCRIPTION: Wireless Freight Elevator Door Controller RF MAC Module

MODEL: 12025733B

SERIAL NUMBER: 1A013743B (labeled on each EUT)

SAMPLE RECEIPT DATE: 2020-11-24

DATE TESTED: 2020-12-14 to 2020-12-31

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

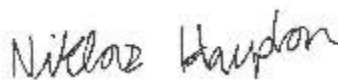
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2. TEST RESULTS SUMMARY

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

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, and RSS-247 Issue 2.

4. FACILITIES AND ACCREDITATION

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

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

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

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}
Worst Case Conducted Disturbance, 0.15 to 30 MHz	3.07 dB
Worst Case Radiated Disturbance, 9KHz to 30 MHz	2.52 dB
Worst Case Radiated Disturbance, 30 to 1000 MHz	4.88 dB
Worst Case Radiated Disturbance, 1000 to 18000 MHz	4.26dB
Worst Case Radiated Disturbance, 18000 to 26000 MHz	4.39 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)

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

MAINS CONDUCTED EMISSIONS

Where relevant, the following sample calculation is provided:

Final Voltage (dBuV) = Measured Voltage (dBuV) + Cable Loss (dB) + Limiter Factor (dB) + LISN Insertion Loss.

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

6. EQUIPMENT UNDER TEST

6.1. EUT DESCRIPTION

The EUT is an RF MAC module for a wireless freight elevator door controller that supports 802.15.4.

6.2. MAXIMUM OUTPUT POWER

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

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
2405 - 2480	802.15.4	17.10	51.29

6.3. DESCRIPTION OF AVAILABLE ANTENNAS

The antenna gain and type, as provided by the manufacturer, are as follows:

The radio utilizes a Planar Inverted F PCB antenna, with a maximum gain of 0 dBi.

6.4. SOFTWARE AND FIRMWARE

The EUT firmware installed during testing was RFR2_v2.3_TST.hex

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.

Radiated band edge was performed with the EUT set to transmit at the highest power for low, mid, and 2475MHz channels. Additional testing was performed at 2480MHz with the EUT set to its reduced power setting. Radiated emissions between 1GHz and 18GHz was 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 X orientation was worst-case orientation; therefore, all final radiated testing was performed with the EUT in X orientation.

6.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID
Laptop	HP	Pavilion	5CD5234LG5	NA
Board used for Power	Vector Electronics	NA	NA	NA

I/O CABLES

I/O Cable List						
Cable No.	Port	# of Identical Ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	NA	NA	+/-	Power	<3m	Connected to DC Power Supply
2	3-pin	1	3-pin	USB	<3m	USB to 3 pin for test set up only

TEST SETUP

The EUT is connected to a test laptop and test software exercised the radio card. The laptop was disconnected after the modes were set.

SETUP DIAGRAMS

Please refer to R13605195-EP1 for setup diagrams.

7. MEASUREMENT METHOD

Duty cycle: ANSI C63.10 Subclause 11.6

6 dB BW: ANSI C63.10 Subclause -11.8.1 RBW $\geq$ DTS BW

Occupied BW (99%): ANSI C63.10-2013 Section 6.9.3

Output Power: ANSI C63.10 Subclause -11.9.1.3 PKPM1 Peak Power Meter Method
ANSI C63.10 Subclause – 11.9.2.3.2 AVGPM-G Method.

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

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

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

Conducted emissions in restricted frequency bands: ANSI C63.10 Subclause -11.12.2

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

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

8. TEST AND MEASUREMENT EQUIPMENT

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

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

Equip. 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
	30-1000 MHz				
AT0074	Hybrid Broadband Antenna	Sunol Sciences Corp.	JB3	2020-07-27	2021-07-27
	1-18 GHz				
AT0072	Double-Ridged Waveguide Horn Antenna, 1 to 18 GHz	ETS Lindgren	3117	2020-04-27	2021-04-27
	18-40 GHz				
AT0063	Horn Antenna, 18-26.5GHz	ARA	MWH-1826/B	2020-10-30	2021-10-30
	Gain-Loss Chains				
N-SAC01	Gain-loss string: 0.009-30MHz	Various	Various	2020-07-29	2021-07-29
N-SAC02	Gain-loss string: 25-1000MHz	Various	Various	2020-07-29	2021-07-29
N-SAC03	Gain-loss string: 1-18GHz	Various	Various	2020-07-28	2021-07-28
N-SAC04	Gain-loss string: 18-40GHz	Various	Various	2020-07-31	2021-07-31
	Receiver & Software				
SA0026	Spectrum Analyzer	Agilent	N9030A	2020-07-16	2021-07-16
SOFTEMI	EMI Software	UL	Version 9.5	NA	NA
	Additional Equipment used				
s/n 200037610	Environmental Meter	Fisher Scientific	06-662-4	2020-01-22	2022-01-22

Test Equipment Used - Wireless Conducted Measurement Equipment

Equipment ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
	Conducted Room 2				
T177	Spectrum Analyzer	Agilent Technologies	E4446A	2020-04-30	2021-04-30
PWM005	RF Power Meter	Keysight Technologies	N1912A	2020-07-14	2021-07-14
PWS005	Peak and Avg Power Sensor, 50MHz to 6GHz	Keysight Technologies	N1921A	2020-05-26	2021-05-26
76023 (EC0225)	Temp/Humid Chamber	Cincinnati Sub-Zero	ZPH-8-3.5-SCT/AC	2020-05-27	2021-05-27
HI0090 (PRE0191271)	Environmental Meter	Fisher Scientific	15-077-963	2020-06-26	2021-06-26
76021	DC Regulated Power Supply	CircuitSpecialists.Com	CSI3005X5	NA	NA
SOFTEMI	Antenna Port Software	UL	Version 2020.12.3	NA	NA

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	2020-03-26	2021-03-26
HI0091	Environmental Meter	Fisher Scientific	14-650-118	2020-06-26	2021-06-26
LISN003	LISN, 50-ohm/50-uH, 2-conductor, 25A	Fischer Custom Com.	FCC-LISN-50-25-2-01-550V	2020-08-18	2021-08-18
75141	EMI Test Receiver 9kHz-7GHz	Rohde & Schwarz	ESCI 7	2020-08-18	2021-08-18
ATA222	Transient Limiter, 0.009-100MHz	Electro-Metrics	EM-7600	2020-03-26	2021-03-26
76021	DC Regulated Power Supply	CircuitSpecialists.Com	CSI3005X5	NA	NA
PS215	AC Power Source	Elgar	CW2501M (s/n 1523A02397)	NA	NA
SOFTEMI	EMI Software	UL	Version 9.5	NA	NA
	Miscellaneous (if needed)				
HPF017	100kHz High-pass Filter	Solar Electronics Co.	7801-100	2020-02-19	2021-02-19
MM0167	Multi-meter	Agilent	U1232A	2020-08-05	2021-08-05

9. ANTENNA PORT TEST RESULTS

9.1. ON TIME AND DUTY CYCLE

LIMITS

None; for reporting purposes only.

PROCEDURE

KDB 558074 Zero-Span Spectrum Analyzer Method.

ON TIME AND DUTY CYCLE RESULTS

Note: Worse case “real-world” duty cycle of the EUT is 4% as declared by the manufacturer. Details as to how the manufacturer implemented the protocol limitations are documented in the operational description exhibit. It is this value that is used to derive the duty cycle correction factor that is referenced throughout the report. See calculation below:

$$\begin{aligned}\text{Duty Cycle Correction Factor [Linear Voltage Averaging Mode]} &= 20*\log(\text{DC}) \\ &= 20*\log(0.04) = -27.96\text{dB}\end{aligned}$$

9.2. 99% BANDWIDTH

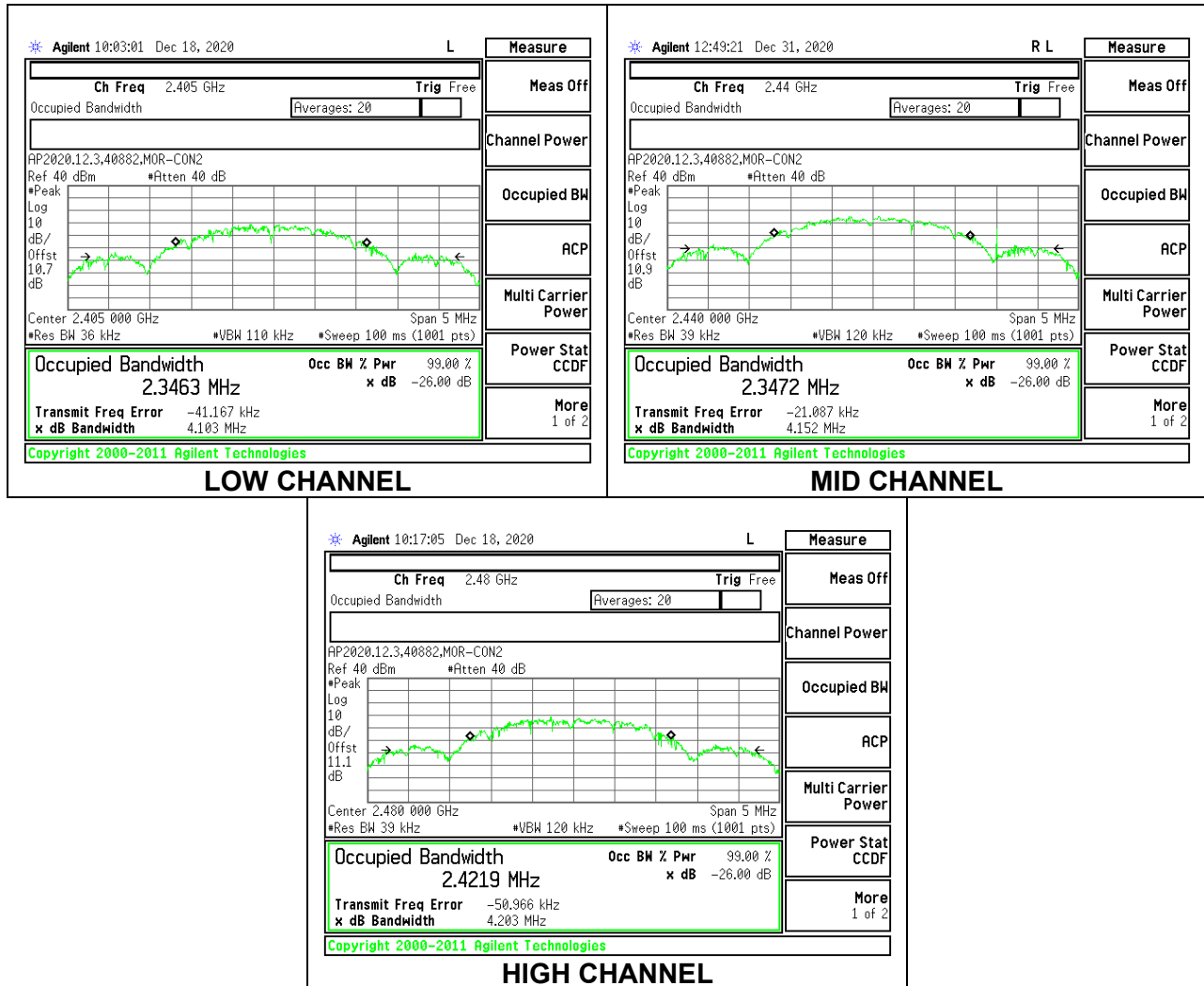
LIMITS

None; for reporting purposes only.

RESULTS

9.2.1. 802.15.4

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2405	2.3463
Middle	2440	2.3472
High	2480	2.4219



9.3. 6 dB BANDWIDTH

LIMITS

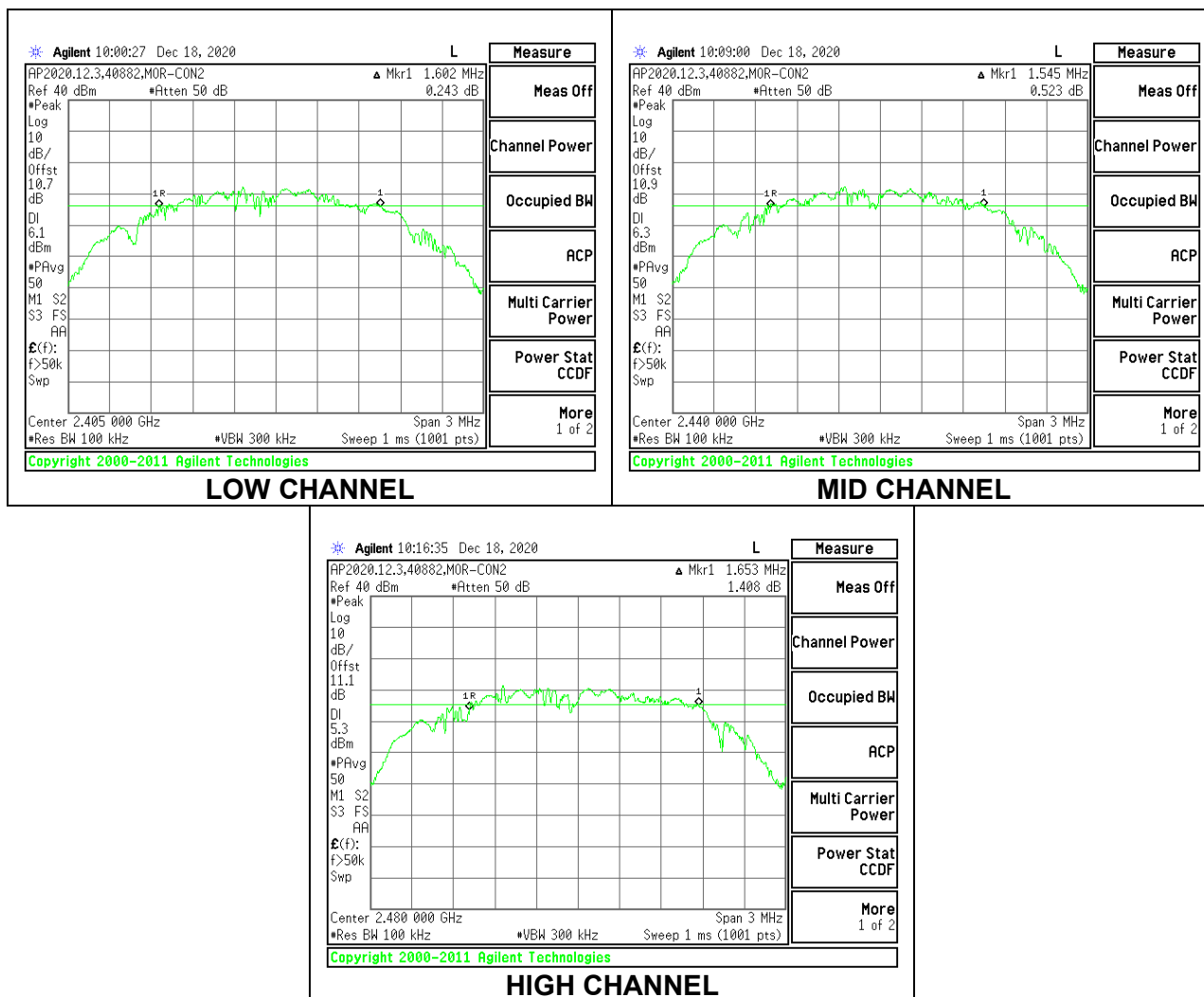
FCC §15.247 (a) (2)
RSS-247 5.2 (a)

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

RESULTS

9.3.1. 802.15.4

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2405	1.602	0.5
Middle	2440	1.545	0.5
High	2480	1.653	0.5



9.4. OUTPUT POWER

LIMITS

FCC §15.247 (b) (3)
RSS-247 5.4 (d)

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

TEST PROCEDURE

The transmitter output is connected to a power meter.

The cable assembly insertion loss of 10.4 dB (including 10 dB pad and 0.4 dB cable) was entered as an offset in the power meter to allow for a peak reading of power.

RESULTS

9.4.1. 802.15.4

Tested By:	2020-12-18, 2020-12-30
Date:	40882

Channel	Frequency (MHz)	Peak Power Reading (dBm)	Limit (dBm)	Margin (dB)
Low	2402	17.100	30	-12.900
Middle	2440	16.830	30	-13.170
High	2475	16.500	30	-13.500
High	2480	-0.749	30	-30.749

9.5. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

The cable assembly insertion loss of 10.4 dB (including 10 dB pad and 0.4 dB cable) was entered as an offset in the power meter to allow for a gated average reading of power.

RESULTS

9.5.1. 802.15.4

Tested By:	2020-12-18, 2020-12-30
Date:	40882

Channel	Frequency (MHz)	AV power (dBm)
Low	2402	16.96
Middle	2440	16.68
High	2475	16.36
High	2480	-8.96

9.6. POWER SPECTRAL DENSITY

LIMITS

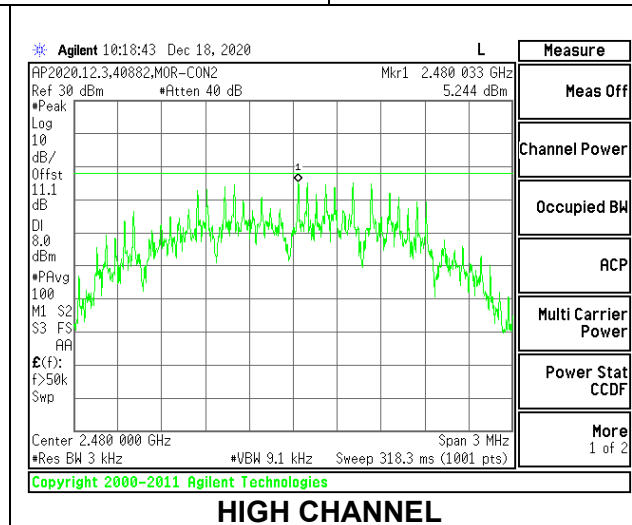
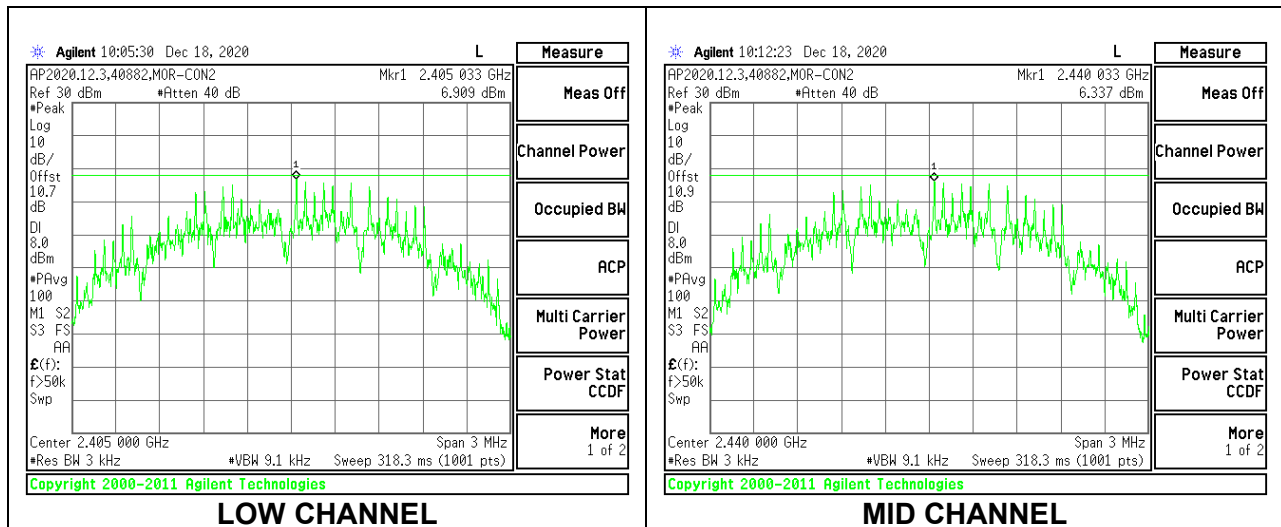
FCC §15.247 (e)
RSS-247 (5.2) (b)

The power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

RESULTS

9.6.1. 802.15.4

Channel	Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Margin (dB)
Low	2402	6.91	8	-1.09
Middle	2440	6.34	8	-1.66
High	2480	5.24	8	-2.76



9.7. CONDUCTED SPURIOUS EMISSIONS

LIMITS

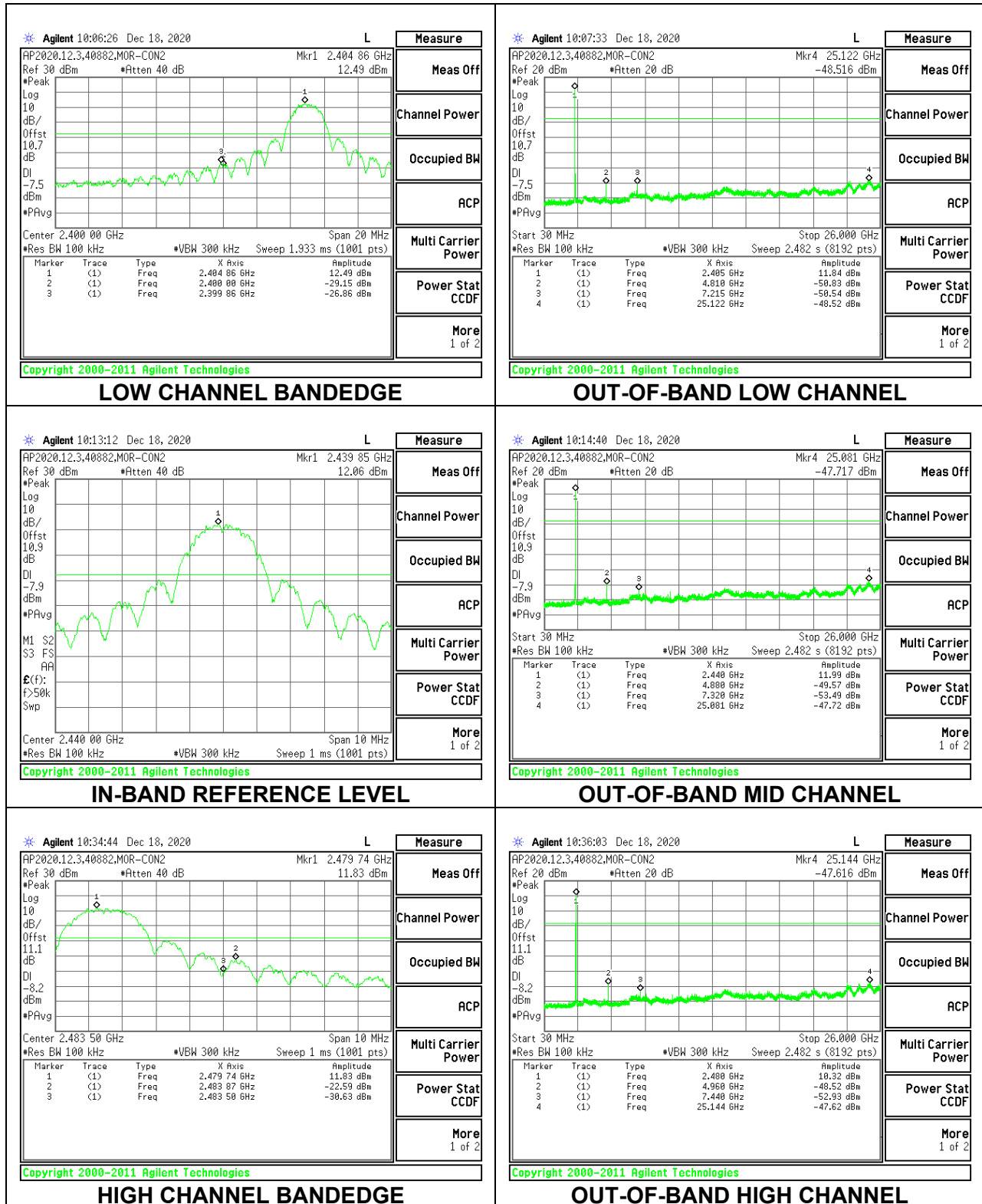
FCC §15.247 (d)
RSS-247 5.5

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

RESULTS

Note: Testing was performed at the EUT's highest available power setting at 2480MHz as this represents worse case.

9.7.1. 802.15.4



10. RADIATED TEST RESULTS

10.1. LIMITS AND PROCEDURE

LIMITS

FCC §15.205 and §15.209
RSS-GEN, Section 8.9 and 8.10.

Frequency Range (MHz)	Field Strength Limit (uV/m) at 3 m	Field Strength Limit (dBuV/m) at 3 m
0.009-0.490	2400/F(kHz) @ 300 m	-
0.490-1.705	24000/F(kHz) @ 30 m	-
1.705 - 30	30 @ 30m	-
30 - 88	100	40
88 - 216	150	43.5
216 - 960	200	46
Above 960	500	54

TEST PROCEDURE

The EUT is placed on a non-conducting table 80 cm above the ground plane for measurement below 1GHz; 1.5 m above the ground plane for measurement above 1GHz. The antenna to EUT distance is 3 meters. The EUT is configured in accordance with ANSI C63.10. The EUT is set to transmit in a continuous mode.

For measurements below 1 GHz the resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements. 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.

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

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

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

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

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.

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

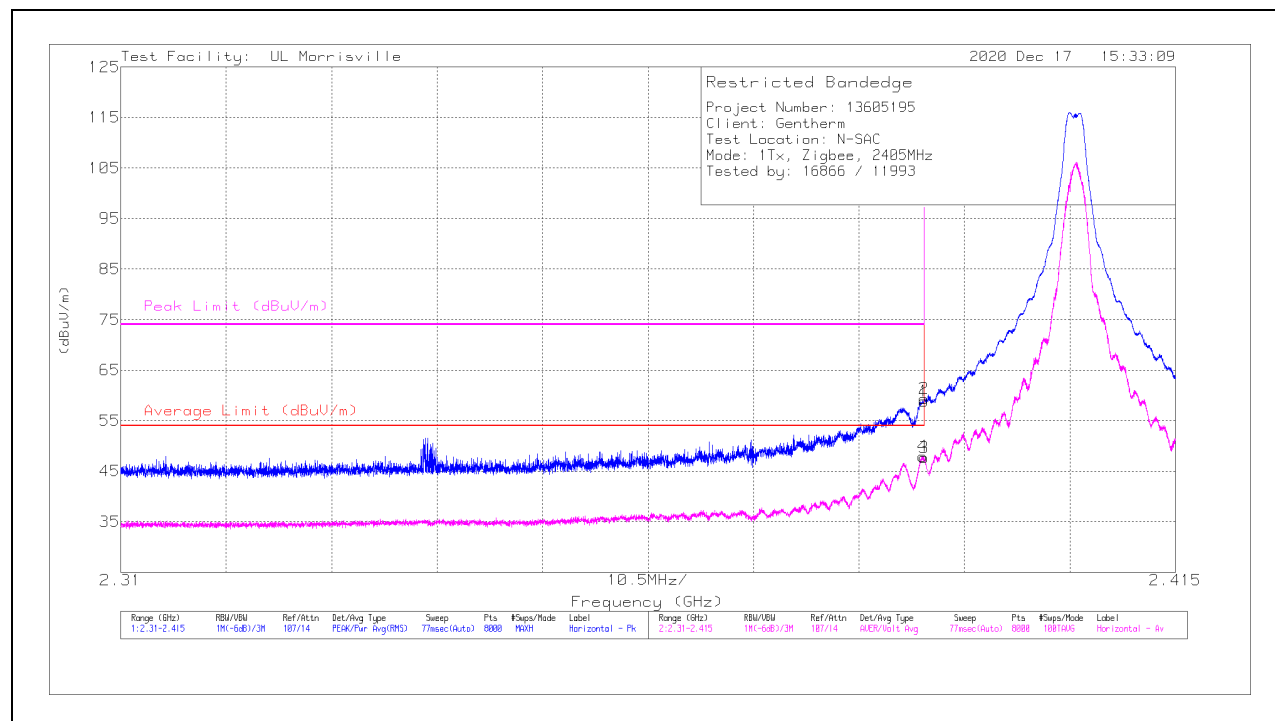
Note: Radiated Bandedge testing was performed at both 2475MHz and 2480MHz, at each of their respective power settings, to ensure compliance.

10.2. TRANSMITTER ABOVE 1 GHz

10.2.1. 802.15.4

BANDEDGE (LOW CHANNEL)

HORIZONTAL RESULT



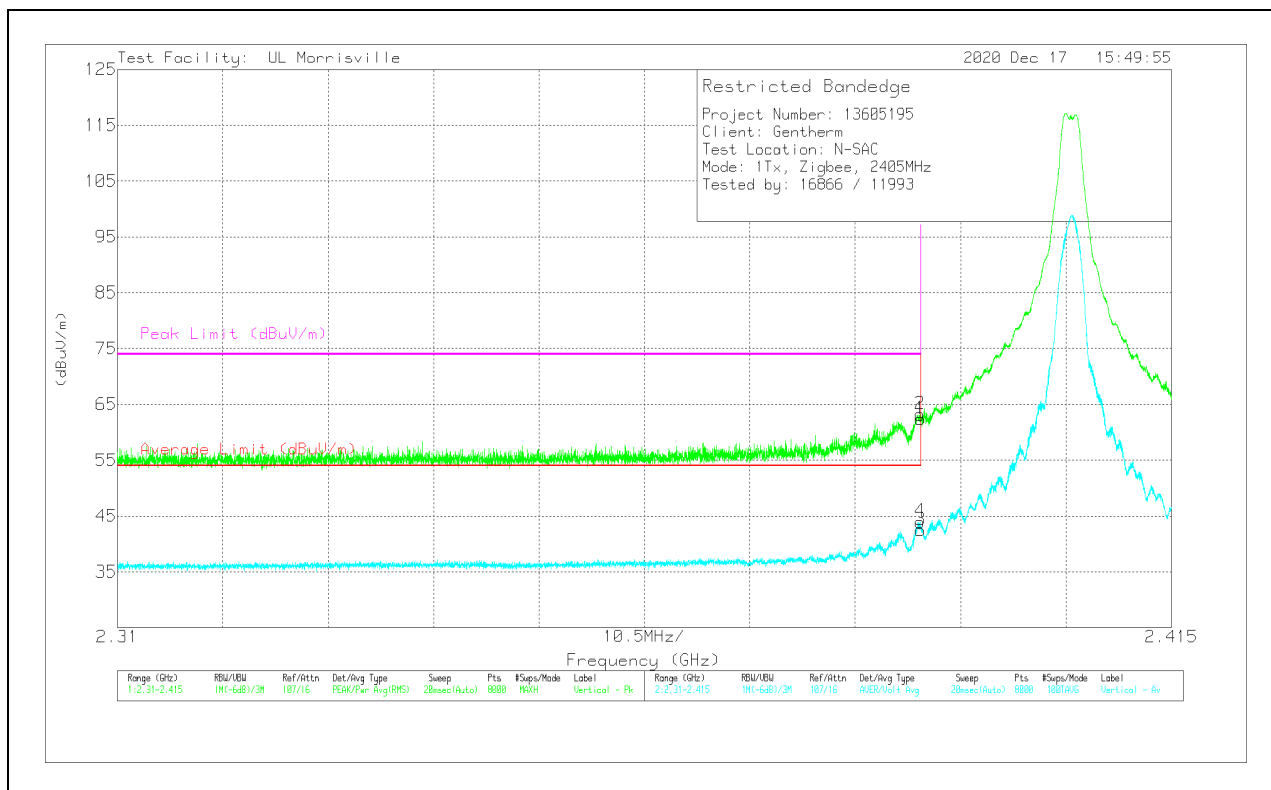
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 dB(/m)	Amp/Cbl/Filtr/Pad (dB)	DCCF (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	*** 2.39	51.48	Pk	31.8	-24.4	0	58.88	-	-	74	-15.12	79	102	H
	*** 2.39	51.48	Pk	31.8	-24.4	-27.96	30.92	54	-23.08	-	-	79	102	H
2	*** 2.38997	51.97	Pk	31.8	-24.4	0	59.37	-	-	74	-14.63	79	102	H
	*** 2.38997	51.97	Pk	31.8	-24.4	-27.96	31.41	54	-22.59	-	-	79	102	H

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

** - indicates frequency in Taiwan NCC LP0002 Restricted Band

Pk - Peak detector

VERTICAL RESULT



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 dB(/m)	Amp/Cbl/Filtr/Pad (dB)	DCCF (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	46.37	Pk	31.8	-24.4	0	53.77	-	-	74	-20.23	114	277	V
	* ** 2.39	46.37	Pk	31.8	-24.4	-27.96	25.81	54	-28.19	-	-	114	277	V
2	* ** 2.38998	47.2	Pk	31.8	-24.4	0	54.6	-	-	74	-19.4	114	277	V
	* ** 2.38998	47.2	Pk	31.8	-24.4	-27.96	26.64	54	-27.36	-	-	114	277	V

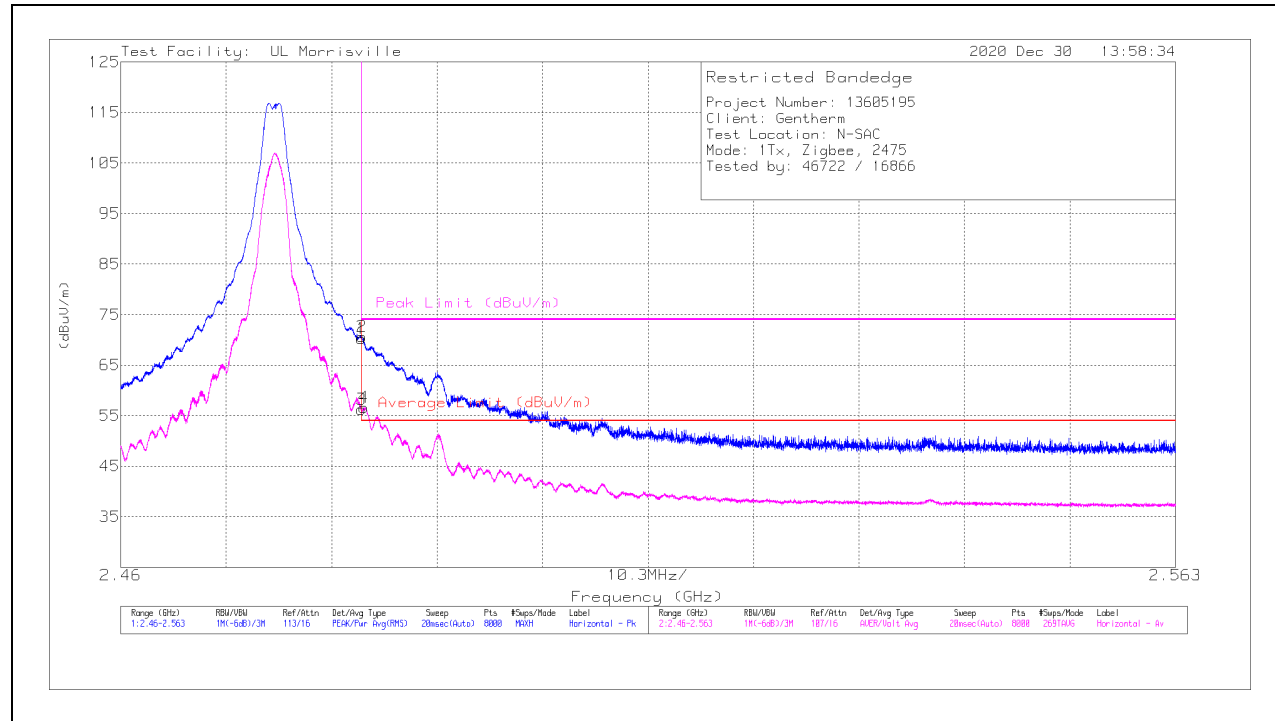
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

** - indicates frequency in Taiwan NCC LP0002 Restricted Band

Pk - Peak detector

BANDEDGE (HIGH CHANNEL, 2475MHz)

HORIZONTAL RESULT



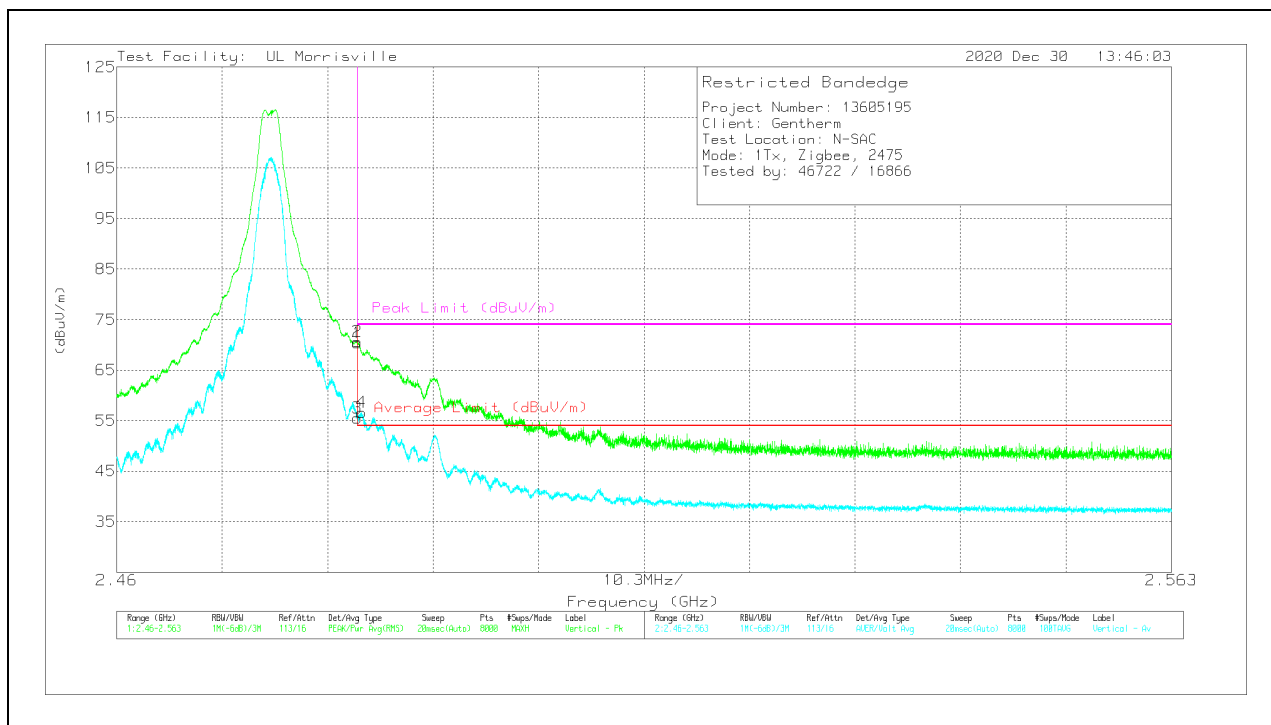
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 dB/(m)	Amp/Cbl/ Ftr/Pad (dB)	DCCF (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 2.4835	62.22	Pk	32.4	-24.3	0	70.32	-	-	74	-3.68	69	154	H
	* ** 2.4835	62.22	Pk	32.4	-24.3	-27.96	42.36	54	-11.64	-	-	69	154	H
2	* ** 2.48354	62.52	Pk	32.4	-24.3	0	70.62	-	-	74	-3.38	69	154	H
	* ** 2.48354	62.52	Pk	32.4	-24.3	-27.96	42.66	54	-11.34	-	-	69	154	H

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

** - indicates frequency in Taiwan NCC LP0002 Restricted Band

Pk - Peak detector

VERTICAL RESULT



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 dB/(m)	Amp/Cbl/ Ftr/Pad (dB)	DCCF (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	62.26	Pk	32.4	-24.3	0	70.36	-	-	74	-3.64	39	355	V
	* ** 2.4835	62.26	Pk	32.4	-24.3	-27.96	42.4	54	-11.6	-	-	39	355	V
2	* ** 2.48351	62.59	Pk	32.4	-24.3	0	70.69	-	-	74	-3.31	39	355	V
	* ** 2.48351	62.59	Pk	32.4	-24.3	-27.96	42.73	54	-11.27	-	-	39	355	V

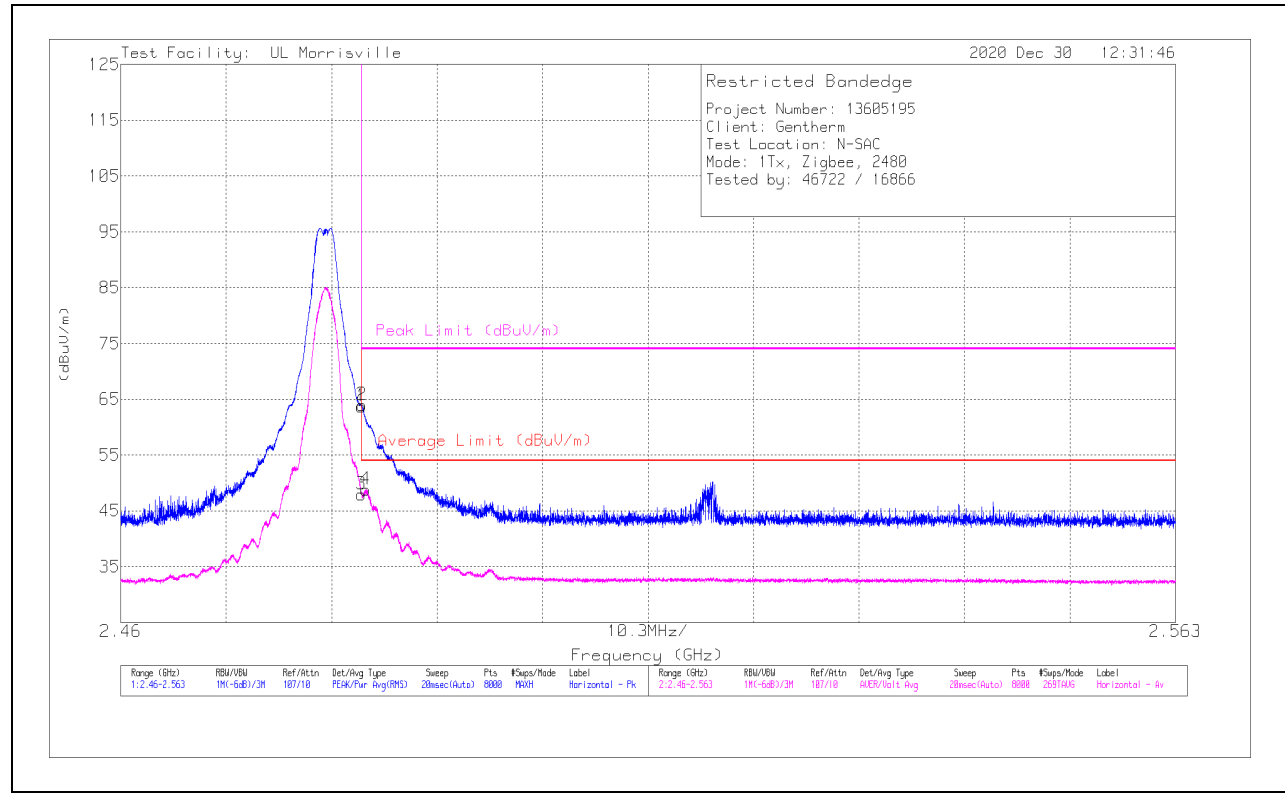
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

** - indicates frequency in Taiwan NCC LP0002 Restricted Band

Pk - Peak detector

BANDEDGE (HIGH CHANNEL, 2480MHz)

HORIZONTAL RESULT



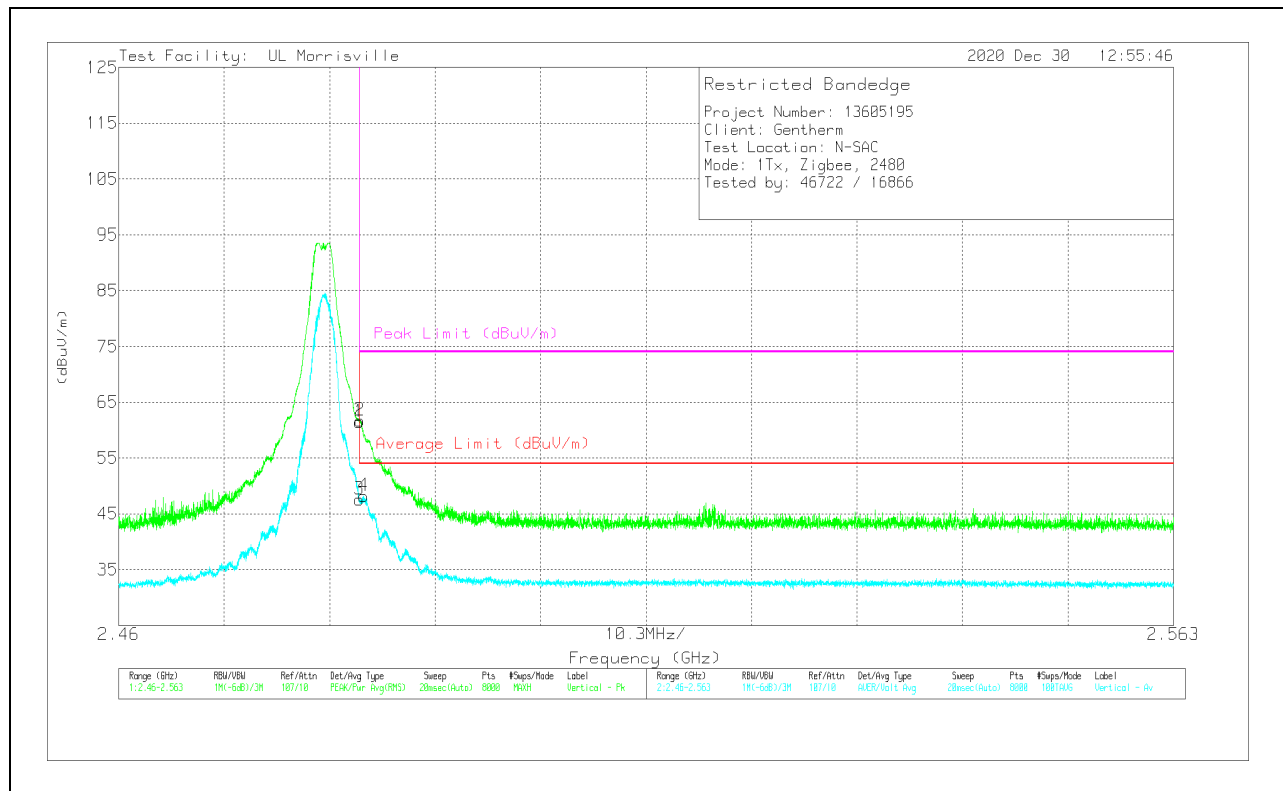
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 dB/(m)	Amp/Cbl/ Ftr/Pad (dB)	DCCF (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	*** 2.4835	55.62	Pk	32.4	-24.3	0	63.72	-	-	74	-10.28	78	206	H
	*** 2.4835	55.62	Pk	32.4	-24.3	-27.96	35.76	54	-18.24	-	-	78	206	H
2	*** 2.48355	55.82	Pk	32.4	-24.3	0	63.92	-	-	74	-10.08	78	206	H
	*** 2.48355	55.82	Pk	32.4	-24.3	-27.96	35.96	54	-18.04	-	-	78	206	H

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

** - indicates frequency in Taiwan NCC LP0002 Restricted Band

Pk - Peak detector

VERTICAL RESULT



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 dB/(m)	Amp/Cbl/Fltr/Pad (dB)	DCCF (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	53.33	Pk	32.4	-24.3	0	61.43	-	-	74	-12.57	49	325	V
	* ** 2.4835	53.33	Pk	32.4	-24.3	-27.96	33.47	54	-20.53	-	-	49	325	V
2	* ** 2.48356	53.64	Pk	32.4	-24.3	0	61.74	-	-	74	-12.26	49	325	V
	* ** 2.48356	53.64	Pk	32.4	-24.3	-27.96	33.78	54	-20.22	-	-	49	325	V

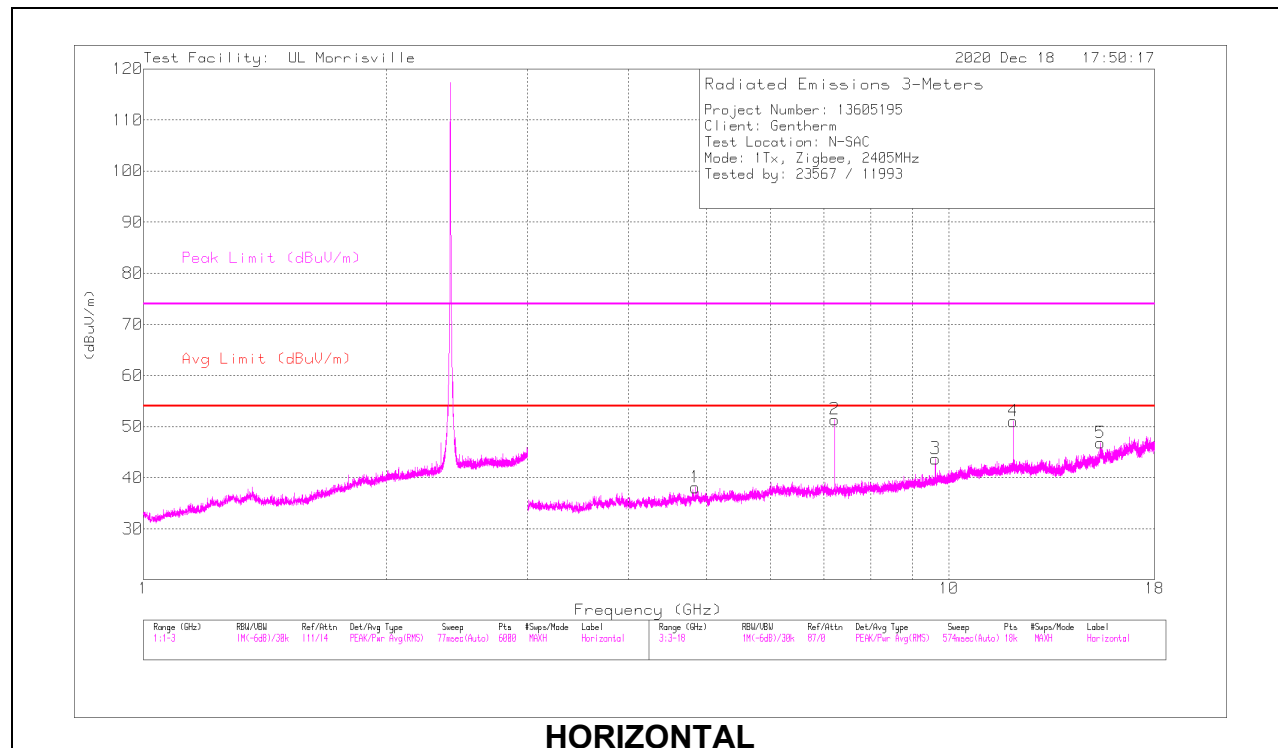
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

** - indicates frequency in Taiwan NCC LP0002 Restricted Band

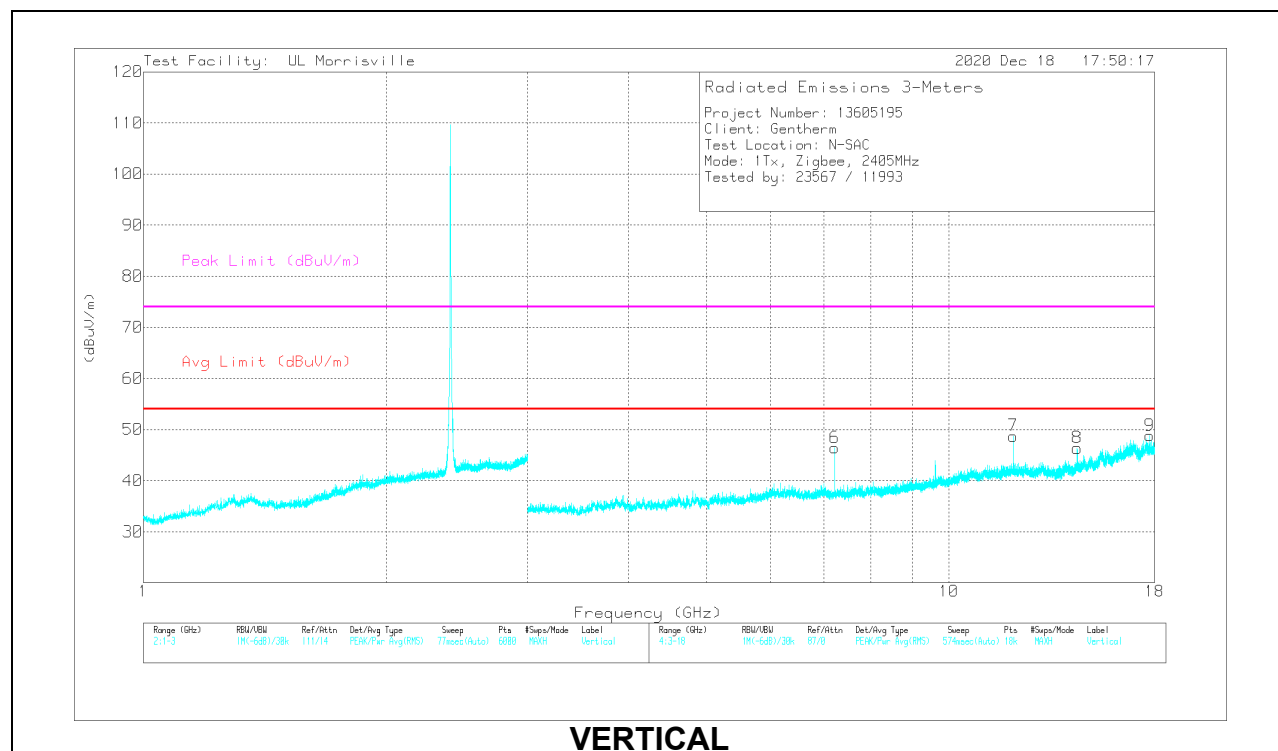
Pk - Peak detector

HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL RESULTS



HORIZONTAL



VERTICAL

RADIATED EMISSIONS

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 dB(/m)	Amp/Cbl/ Fitr/Pad (dB)	DCCF (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	*** 4.84456	40.88	PK2	34.2	-31.1	0	43.98	-	-	74	-30.02	0	244	H
	*** 4.84456	40.88	PK2	34.2	-31.1	-27.96	16.02	54	-37.98	-	-	0	244	H
4	*** 12.02728	46.01	PK2	38.7	-25.8	0	58.91	-	-	74	-15.09	180	273	H
	*** 12.02728	46.01	PK2	38.7	-25.8	-27.96	30.95	54	-23.05	-	-	180	273	H
5	*** 15.42183	37.14	PK2	40.2	-25	0	52.34	-	-	74	-21.66	72	312	H
	*** 15.42183	37.14	PK2	40.2	-25	-27.96	24.38	54	-29.62	-	-	72	312	H
7	*** 12.02238	44.17	PK2	38.7	-25.8	0	57.07	-	-	74	-16.93	163	315	V
	*** 12.02238	44.17	PK2	38.7	-25.8	-27.96	29.11	54	-24.89	-	-	163	315	V
9	*** 17.76405	35.93	PK2	41.6	-23.3	0	54.23	-	-	74	-19.77	63	395	V
	*** 17.76405	35.93	PK2	41.6	-23.3	-27.96	26.27	54	-27.73	-	-	63	395	V
2	7.21274	45.6	Pk	35.7	-29.9	0	51.4	-	-	-	-	0-360	101	H
6	7.21357	40.62	Pk	35.7	-29.9	0	46.42	-	-	-	-	0-360	200	V
3	9.6212	35.12	Pk	36.9	-28.3	0	43.72	-	-	-	-	0-360	101	H
8	14.43231	34.58	Pk	39.3	-27.5	0	46.38	-	-	-	-	0-360	200	V

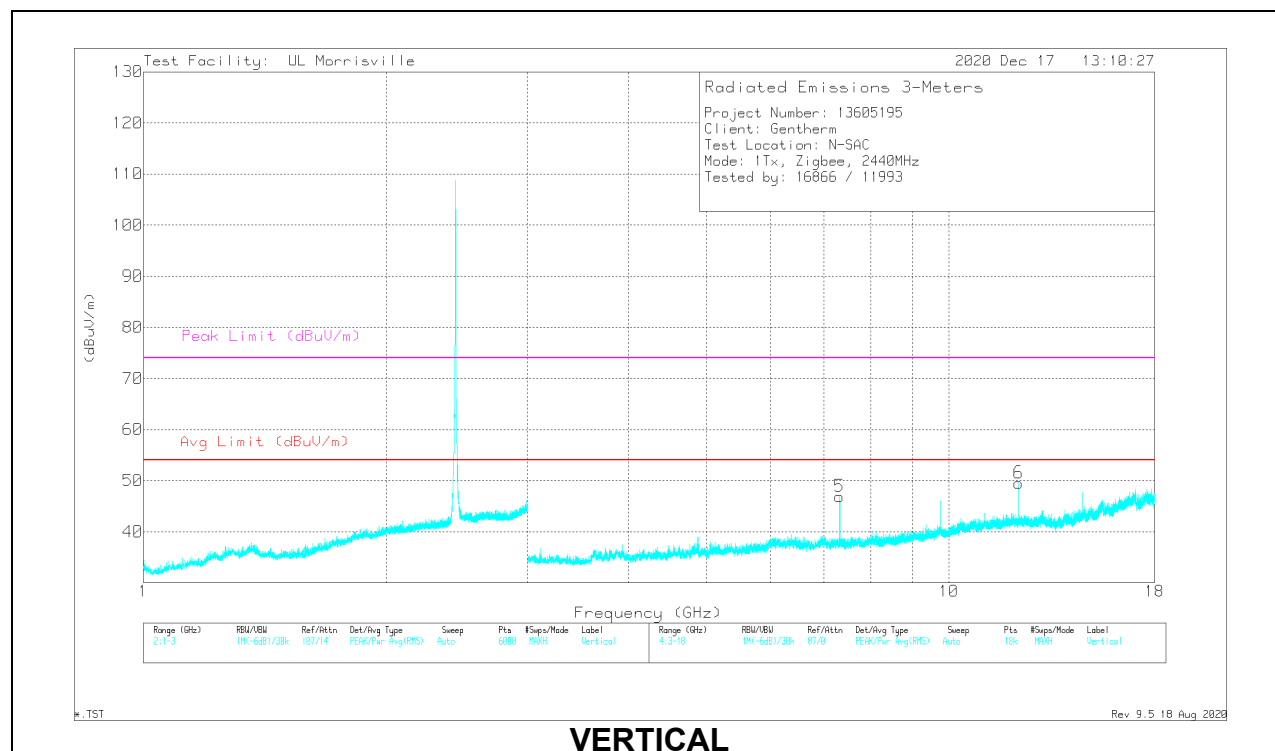
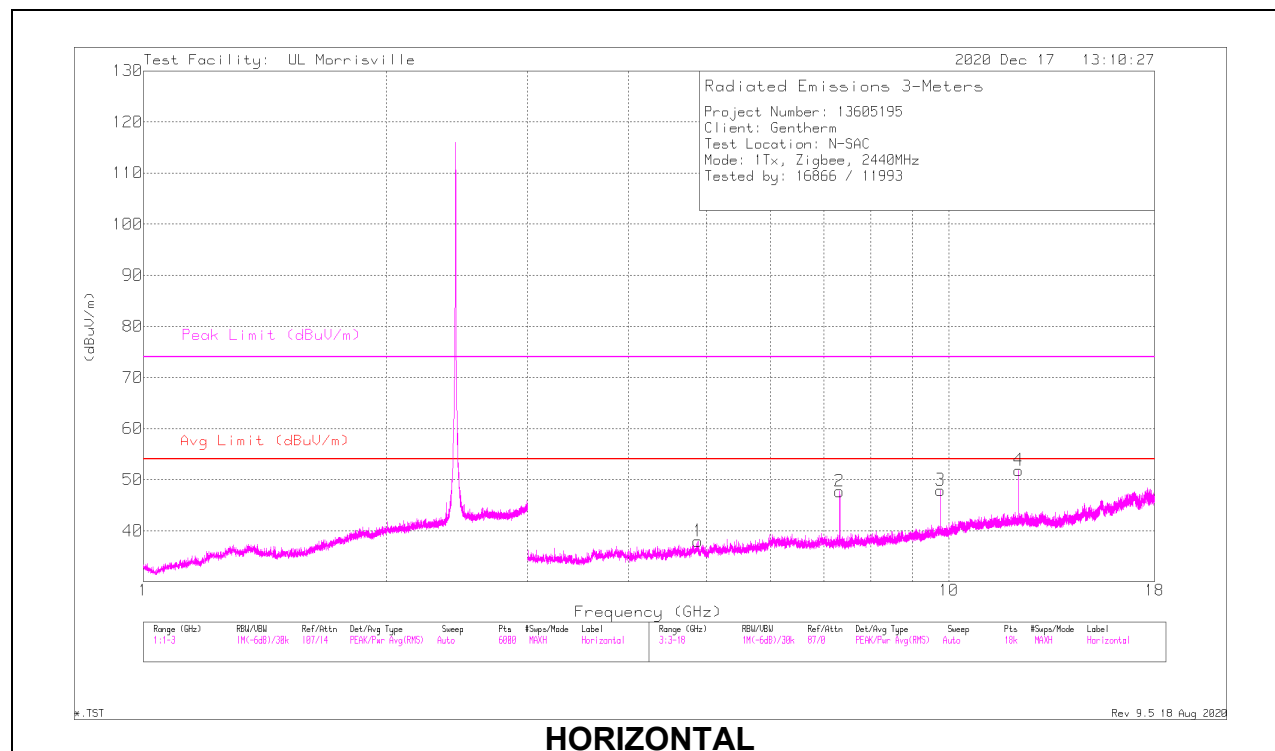
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

** - indicates frequency in Taiwan NCC LP0002 Restricted Band

PK2 - Maximum Peak

Pk - Peak detector

MID CHANNEL RESULTS



RADIATED EMISSIONS

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 dB(/m)	Amp/Cbl/ Fitr/Pad (dB)	DCCF (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 4.88106	42.7	PK2	34.1	-31.4	0	45.4	-	-	74	-28.6	79	207	H
	* ** 4.88106	42.7	PK2	34.1	-31.4	-27.96	17.44	54	-36.56	-	-	79	207	H
2	* ** 7.31854	45.95	PK2	35.6	-29.3	0	52.25	-	-	74	-21.75	336	102	H
	* ** 7.31854	45.95	PK2	35.6	-29.3	-27.96	24.29	54	-29.71	-	-	336	102	H
4	* ** 12.20231	44.45	PK2	38.9	-26.6	0	56.75	-	-	74	-17.25	280	101	H
	* ** 12.20231	44.45	PK2	38.9	-26.6	-27.96	28.79	54	-25.21	-	-	280	101	H
5	* ** 7.3185	46.14	PK2	35.6	-29.3	0	52.44	-	-	74	-21.56	175	237	V
	* ** 7.3185	46.14	PK2	35.6	-29.3	-27.96	24.48	54	-29.52	-	-	175	237	V
6	* ** 12.20239	44.99	PK2	38.9	-26.6	0	57.29	-	-	74	-16.71	146	264	V
	* ** 12.20239	44.99	PK2	38.9	-26.6	-27.96	29.33	54	-24.67	-	-	146	264	V
3	9.75705	38.25	Pk	37	-27.3	0	47.95	-	-	-	-	0-360	101	H

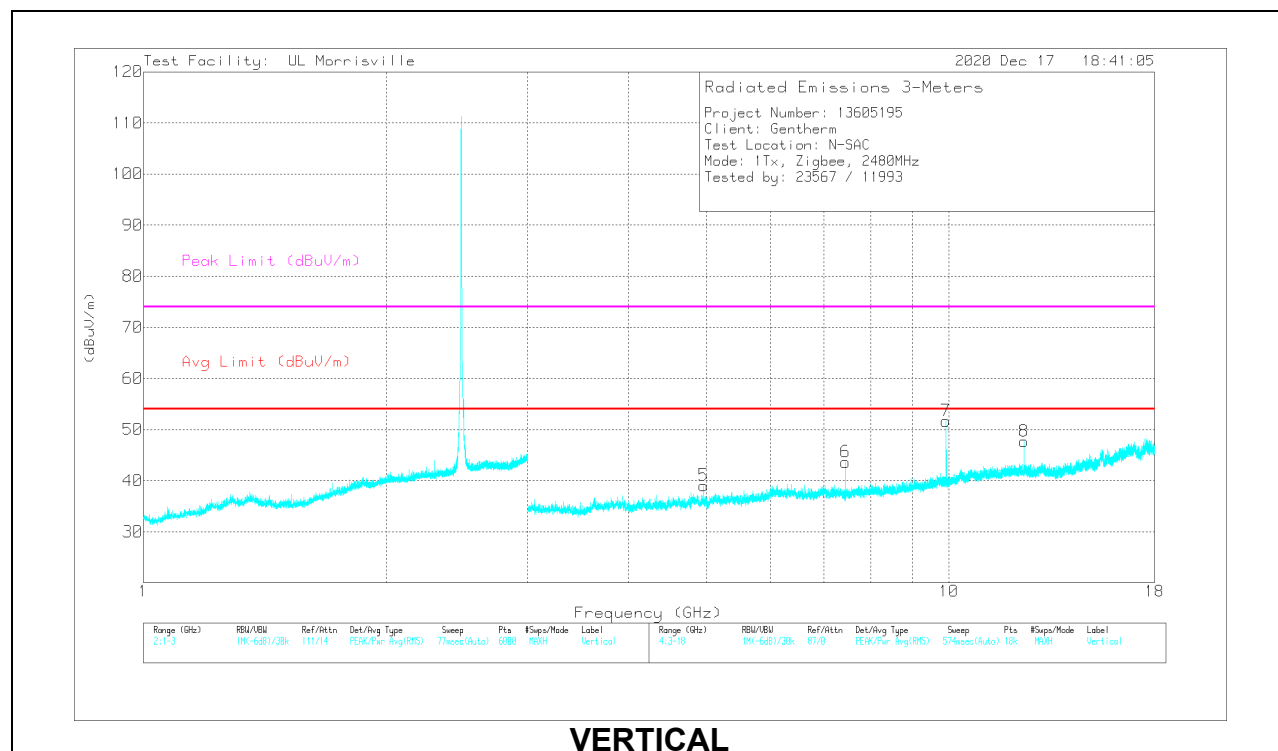
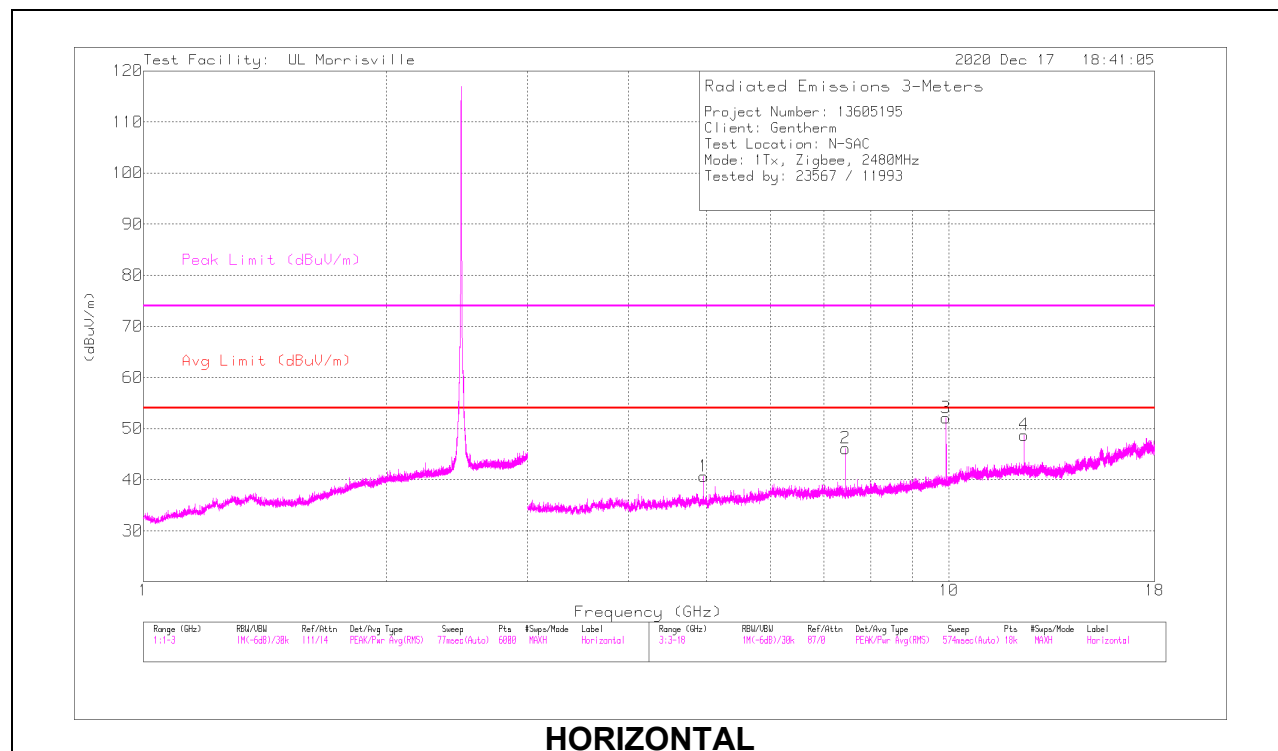
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

** - indicates frequency in Taiwan NCC LP0002 Restricted Band

PK2 - Maximum Peak

Pk - Peak detector

HIGH CHANNEL RESULTS



RADIATED EMISSIONS

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 dB(/m)	Amp/Cbl/ Fitr/Pad (dB)	DCCF (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 4.959	45.95	PK2	34.1	-32.3	0	47.75	-	-	74	-26.25	227	101	H
	* ** 4.959	45.95	PK2	34.1	-32.3	-27.96	19.79	54	-34.21	-	-	227	101	H
2	* ** 7.44146	44.99	PK2	35.7	-29.3	0	51.39	-	-	74	-22.61	282	101	H
	* ** 7.44146	44.99	PK2	35.7	-29.3	-27.96	23.43	54	-30.57	-	-	282	101	H
4	* ** 12.39733	41.79	PK2	38.9	-26.5	0	54.19	-	-	74	-19.81	318	200	H
	* ** 12.39733	41.79	PK2	38.9	-26.5	-27.96	26.23	54	-27.77	-	-	318	200	H
5	* ** 4.9609	46.32	PK2	34.1	-32.4	0	48.02	-	-	74	-25.98	222	318	V
	* ** 4.9609	46.32	PK2	34.1	-32.4	-27.96	20.06	54	-33.94	-	-	222	318	V
6	* ** 7.44134	44	PK2	35.7	-29.3	0	50.4	-	-	74	-23.6	179	231	V
	* ** 7.44134	44	PK2	35.7	-29.3	-27.96	22.44	54	-31.56	-	-	179	231	V
8	* ** 12.40243	42	PK2	38.9	-26.5	0	54.4	-	-	74	-19.6	334	114	V
	* ** 12.40243	42	PK2	38.9	-26.5	-27.96	26.44	54	-27.56	-	-	334	114	V
3	9.92122	42.9	Pk	37	-27.8	0	52.1	-	-	-	-	0-360	101	H
7	9.92122	42.47	Pk	37	-27.8	0	51.67	-	-	-	-	0-360	200	V

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

** - indicates frequency in Taiwan NCC LP0002 Restricted Band

PK2 - Maximum Peak

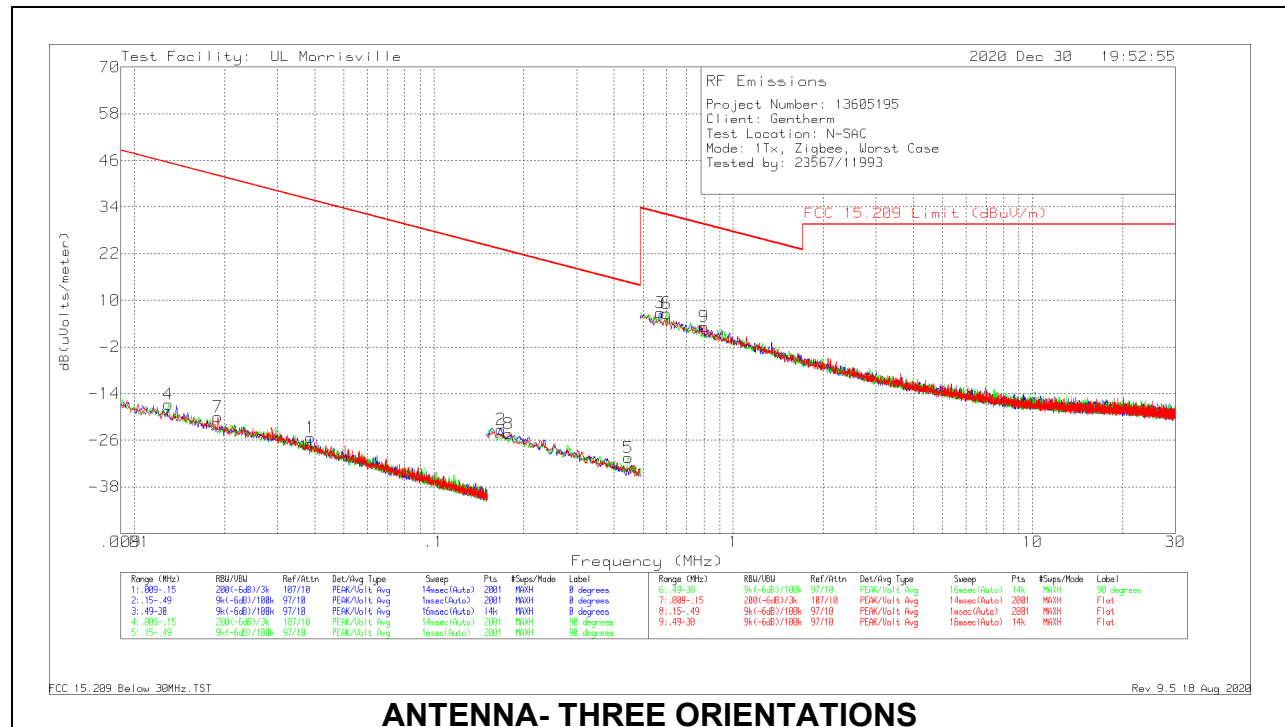
Pk - Peak detector

10.3. WORST CASE BELOW 30MHZ

Note for below 30 MHz scans: All measurements were made at a test distance of 3 m. The measured data was extrapolated from the test distance (3m) to the specification distance (300 m from 9-490 kHz and 30 m from 490 kHz – 30 MHz) to clearly show the relative levels of fundamental and spurious emissions and demonstrate compliance with the requirement that the level of any spurious emissions be below the level of the intentionally transmitted signal. The extrapolation factor for the limits were $40 \cdot \log$ and $20 \cdot \log$ (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 12.98 KHz resulted in a level of -16.75 dBuV/m, which is equivalent to $-16.75 - 51.5 = -68.25$ dBuA/m, which has the same margin, -62.09 dB, to the corresponding RSS-GEN Table 6 limit as it has to be 15.209(a) limit.

SPURIOUS EMISSIONS BELOW 30 MHz (WORST-CASE CONFIGURATION)



ANTENNA- THREE ORIENTATIONS

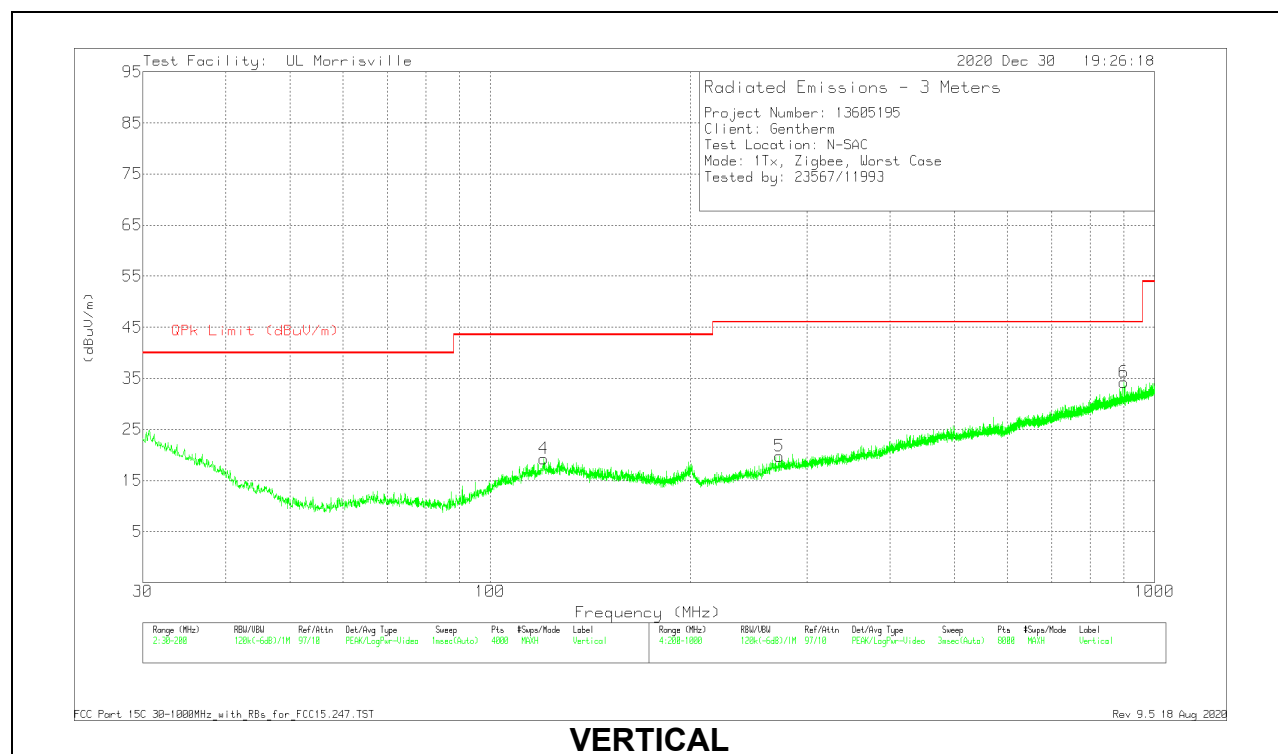
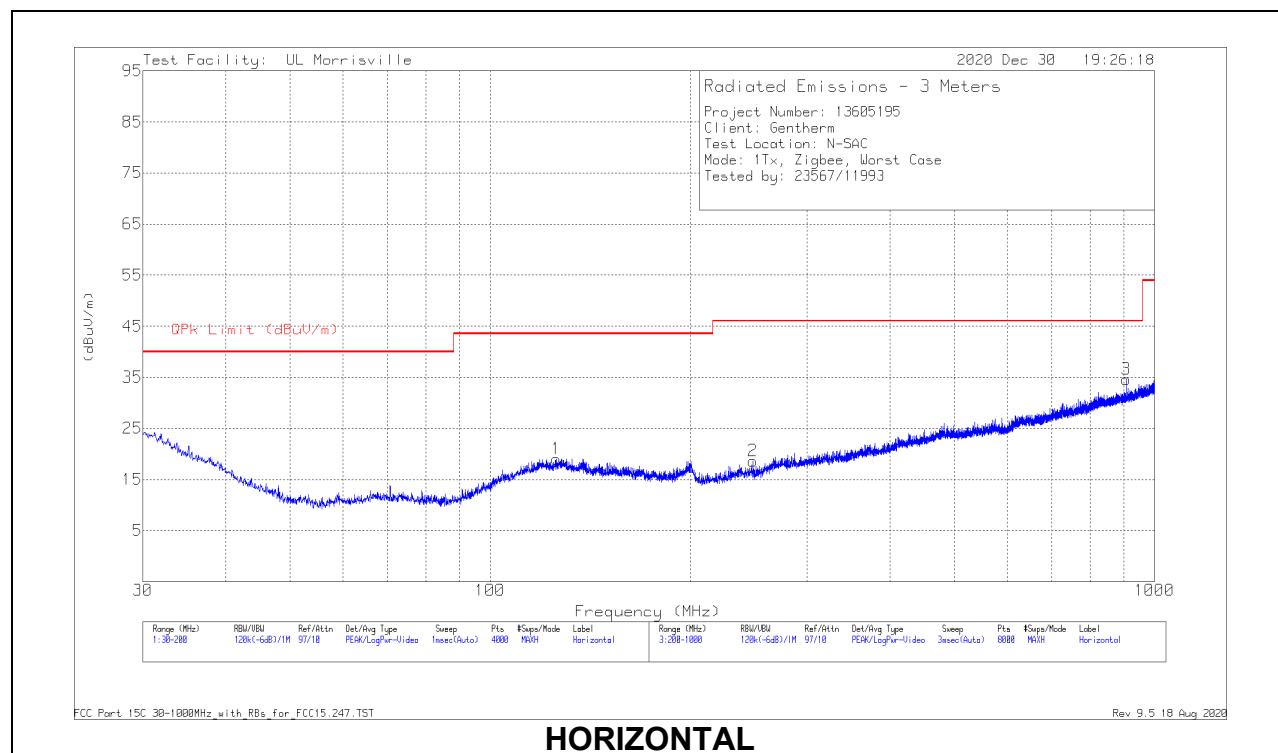
Below 30MHz Data

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/Avg Limit (dBuV/m)	FCC 15.209 Pk Limit (dBuV/m)	Worst Case Margin (dB)	Azimuth (Degs)
4	.01298	46.45	Pk	16.7	.1	-80	-16.75	45.34	65.34	-62.09	0-360
7	.01901	45.76	Pk	14.1	.1	-80	-20.04	42.02	62.02	-62.06	0-360
1	.03868	42.2	Pk	12.4	.1	-80	-25.3	35.86	55.86	-61.16	0-360
2	.16768	45.85	Pk	10.8	.1	-80	-23.25	23.11	43.11	-46.36	0-360
8	.17788	44.81	Pk	10.8	.1	-80	-24.29	22.6	42.6	-46.89	0-360
5	.44614	38.67	Pk	10.7	.2	-80	-30.43	14.61	24.61	-45.04	0-360
3	.5701	35.76	Pk	10.8	.2	-40	6.76	32.48	-	-25.72	0-360
6	.59751	35.71	Pk	10.8	.2	-40	6.71	32.08	-	-25.37	0-360
9	.79777	32.27	Pk	10.8	.2	-40	3.27	29.57	-	-26.3	0-360

Pk - Peak detector

10.4. WORST CASE BELOW 1 GHZ

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



Below 1GHz Data

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AT0074 (dB/m)	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 125.6923	29.13	Pk	20	-30.1	19.03	43.52	-24.49	0-360	199	H
4	* ** 120.4634	29.58	Pk	19.9	-30.2	19.28	43.52	-24.24	0-360	100	V
2	* ** 248.7563	30.07	Pk	17.6	-29	18.67	46.02	-27.35	0-360	99	H
3	** 905.9918	30.91	Pk	28.4	-24.7	34.61	46.02	-11.41	0-360	199	H
5	* ** 272.3094	29.22	Pk	19.3	-28.8	19.72	46.02	-26.3	0-360	299	V
6	** 899.991	30.41	Pk	28.4	-24.6	34.21	46.02	-11.81	0-360	100	V

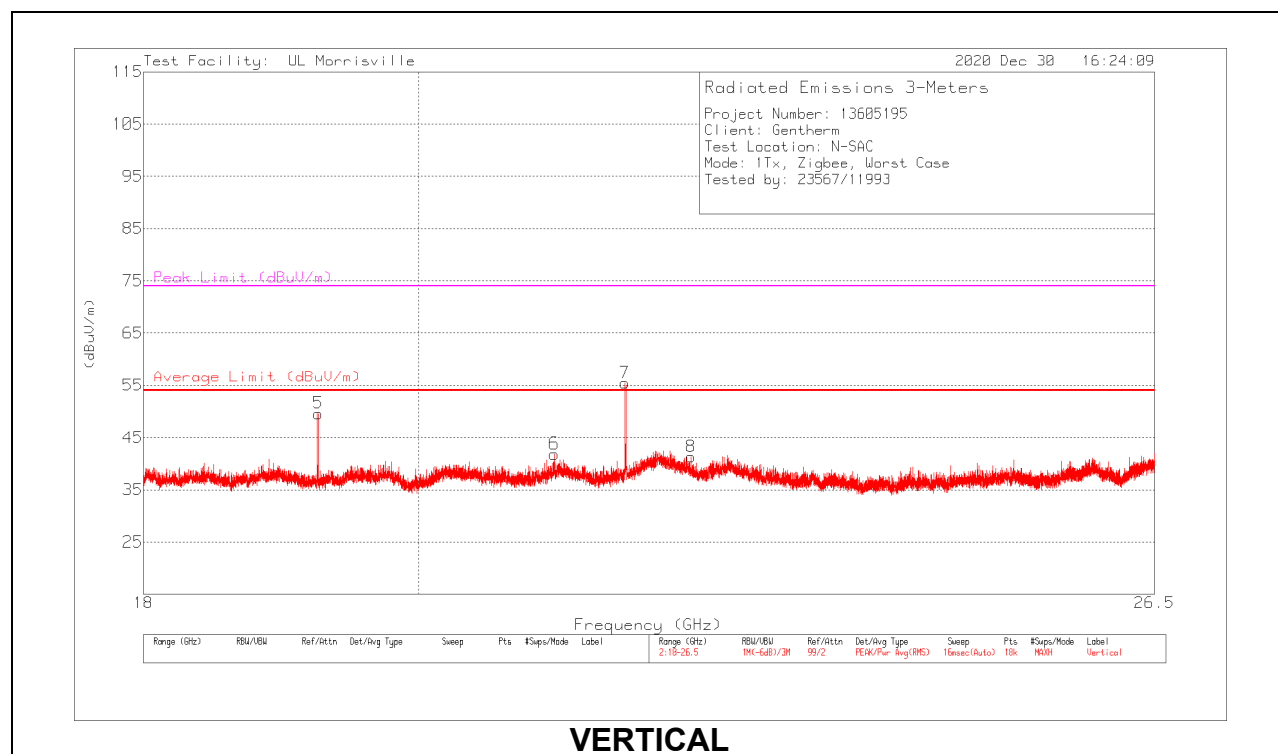
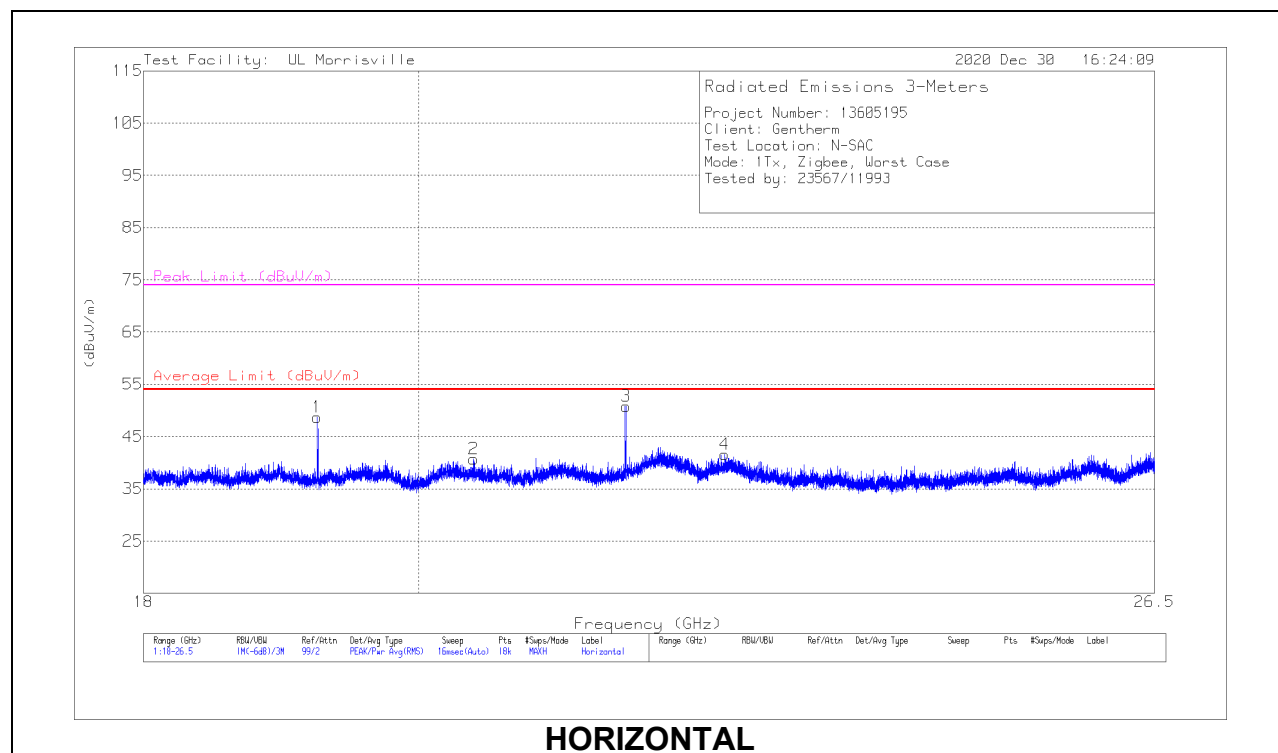
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

** - indicates frequency in Taiwan NCC LP0002 Restricted Band

Pk - Peak detector

10.5. WORST CASE 18-26 GHZ

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



18 – 26GHz DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0063 AF (dB/m)	Amp/CBL (dB)	DCCF (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 19.23529	58.55	PK2	33.4	-40.7	0	51.25	-	-	74	-22.75	295	266	H
	* ** 19.23529	58.55	PK2	33.4	-40.7	-27.96	23.29	54	-30.71	-	-	295	266	H
2	* ** 20.42358	47.64	Pk	34	-40.9	0	40.74	-	-	74	-33.26	0-360	250	H
	* ** 20.42358	47.64	Pk	34	-40.9	-27.96	12.78	54	-41.22	-	-	0-360	250	H
4	* ** 22.48305	45.99	Pk	36.4	-40.8	0	41.59	-	-	74	-32.41	0-360	200	H
	* ** 22.48305	45.99	Pk	36.4	-40.8	-27.96	13.63	54	-40.37	-	-	0-360	200	H
5	* ** 19.24367	61.14	PK2	33.4	-40.7	0	53.84	-	-	74	-20.16	46	261	V
	* ** 19.24367	61.14	PK2	33.4	-40.7	-27.96	25.88	54	-28.12	-	-	46	261	V
6	* ** 21.063	48.67	Pk	34.2	-41	0	41.87	-	-	74	-32.13	0-360	250	V
	* ** 21.063	48.67	Pk	34.2	-41	-27.96	13.91	54	-40.09	-	-	0-360	250	V
8	* ** 22.19309	45.75	Pk	36.7	-41.1	0	41.35	-	-	74	-32.65	0-360	299	V
	* ** 22.19309	45.75	Pk	36.7	-41.1	-27.96	13.39	54	-40.61	-	-	0-360	299	V
7	21.64056	60.99	Pk	35.5	-41	0	55.49	-	-	-	-	0-360	299	V
3	21.64953	56.27	Pk	35.5	-41	0	50.77	-	-	-	-	0-360	101	H

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

** - indicates frequency in Taiwan NCC LP0002 Restricted Band

PK2 - Maximum Peak

Pk - Peak detector

11. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

FCC §15.207 (a)
RSS-Gen 8.8

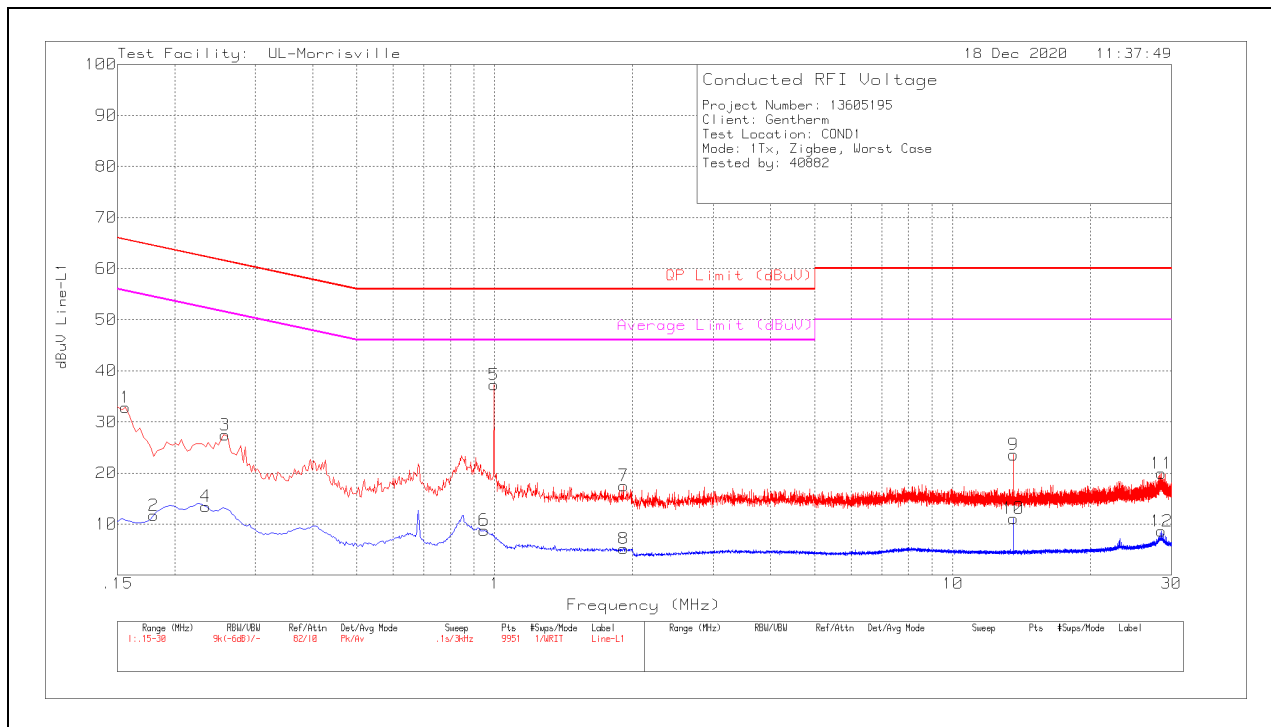
Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56 [*]	56 to 46 [*]
0.5-5	56	46
5-30	60	50

^{*} Decreases with the logarithm of the frequency.

RESULTS

11.1.1. AC Power Line Host

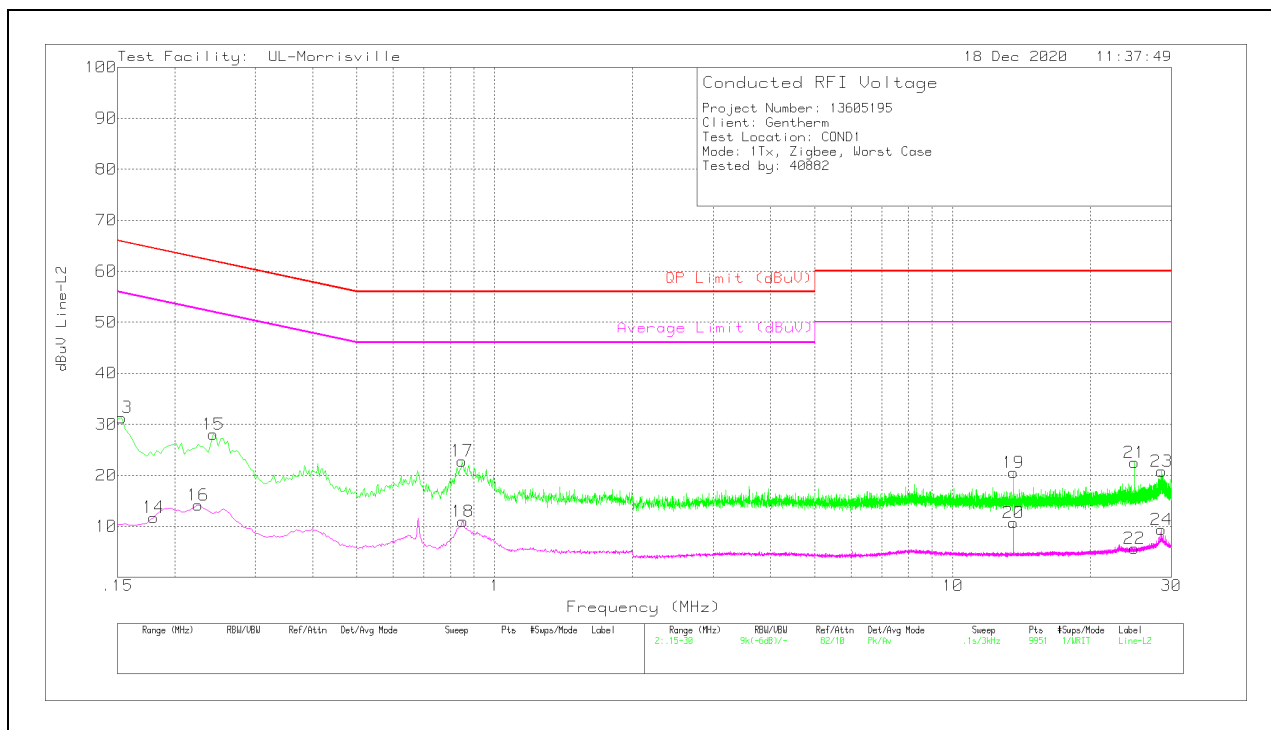
LINE 1 RESULTS



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	.156	22.94	Pk	.2	9.7	32.84	65.67	-32.83	-	-
2	.18	1.83	Av	.2	9.7	11.73	-	-	54.49	-42.76
3	.258	17.65	Pk	.1	9.7	27.45	61.5	-34.05	-	-
4	.234	3.66	Av	.1	9.7	13.46	-	-	52.31	-38.85
5	.996	27.46	Pk	0	9.8	37.26	56	-18.74	-	-
6	.948	-1	Av	0	9.8	8.8	-	-	46	-37.2
7	1.911	7.73	Pk	0	9.8	17.53	56	-38.47	-	-
8	1.9095	-4.59	Av	0	9.8	5.21	-	-	46	-40.79
9	13.56	13.48	Pk	.1	10	23.58	60	-36.42	-	-
10	13.56	1.02	Av	.1	10	11.12	-	-	50	-38.88
11	28.56	9.46	Pk	.3	10.2	19.96	60	-40.04	-	-
12	28.563	-1.86	Av	.3	10.2	8.64	-	-	50	-41.36

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	.153	21.4	Pk	.2	9.7	31.3	65.84	-34.54	-	-
14	.18	1.84	Av	.2	9.7	11.74	-	-	54.49	-42.75
15	.243	18.26	Pk	.1	9.7	28.06	61.99	-33.93	-	-
16	.225	4.33	Av	.1	9.7	14.13	-	-	52.63	-38.5
17	.849	13.01	Pk	0	9.8	22.81	56	-33.19	-	-
18	.852	1.16	Av	0	9.8	10.96	-	-	46	-35.04
19	13.56	10.43	Pk	.1	10	20.53	60	-39.47	-	-
20	13.56	.63	Av	.1	10	10.73	-	-	50	-39.27
21	24.939	12.1	Pk	.2	10.2	22.5	60	-37.5	-	-
22	24.933	-4.71	Av	.2	10.2	5.69	-	-	50	-44.31
23	28.566	10.29	Pk	.3	10.2	20.79	60	-39.21	-	-
24	28.563	-1.17	Av	.3	10.2	9.33	-	-	50	-40.67

Pk - Peak detector
Av - Average detection

12. SETUP PHOTOS

Please refer to R13605195-EP1 for setup photos

END OF TEST REPORT