CERTIFICATION TEST REPORT

Report Number. : R13135764-E3

Applicant	:	Nurvv Limited Thames House, 5 Church Street Twickenham, TW1 3NJ, UK
Model	:	NR1 (Right)
FCC ID	:	2ARGD-NR1
EUT Description	:	Running Tracking/Monitoring/Coaching Device
Test Standard(s)	:	FCC 47 CFR PART 15 SUBPART C ISED RSS-247 ISSUE 2 ISED RSS-GEN ISSUE 5

Date Of Issue:
2019-12-30

Prepared by:
UL LLC
12 Laboratory Dr.
Research Triangle Park, NC 27709 U.S.A.
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NVLAP TESTING

NVLAP Lab code: 200246-0

REPORT REVISION HISTORY

Rev.	Issue Date	Revisions	Revised By
--	--	Initial Issue	--

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: Nurvv Limited
Thames House, 5 Church Street
Twickenham, TW1 3NJ, UK

EUT DESCRIPTION: Running tracking/monitoring/coaching device

MODEL NAME: NR1 (Right)

SERIAL NUMBER: No.06F494 (radiated and line conducted)
1MPM4 1901 0283 (antenna port conducted)

DATE TESTED: 2019-12-17 to 2019-12-30

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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Approved & Released For
UL LLC By:

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Project Engineer
Consumer Technology Division
UL LLC

Prepared By:

Niklas Haydon
Engineer
Consumer Technology Division
UL LLC

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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, KDB 558074 D01 15.247 Meas Guidance v05r02, RSS-GEN Issue 5, and RSS-247 Issue 2.

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, 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

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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
Radio Frequency (Spectrum Analyzer)	141.2 Hz
Occupied Channel Bandwidth	2.00%
RF output power, conducted	1.3 dB (PK) 0.45 dB (AV)
Power Spectral Density, conducted	2.47 dB
Unwanted Emissions, conducted	2.50 dB
All emissions, radiated	4.88 dB
Conducted Emissions (0.150-30MHz) - LISN	3.07 dB
Temperature	2.26°C
Humidity	6.79%
DC Supply voltages	1.70%
Time	3.39%

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

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5. EQUIPMENT UNDER TEST

5.1. EUT DESCRIPTION

The EUT is a running tracking, monitoring, and coaching device for the right sole with a BLE and ANT radio. This report covers the ANT radio.

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	ANT	4.50	2.82

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes chip antenna, with a maximum gain of 2.3 dBi.

5.4. SOFTWARE AND FIRMWARE

The firmware installed in the EUT during testing was v3081r.

5.5. WORST-CASE CONFIGURATION AND MODE

Radiated emissions below 1GHz, above 18GHz, and power line conducted emission were performed with the EUT set to transmit at the channel with highest output power as worst-case scenario.

Band edge and radiated emissions between 1GHz and 18GHz were performed with the EUT set to transmit at the highest power on low, middle and high channels.

The fundamental of the EUT was investigated in three orthogonal orientations X,Y,Z, and on a charger or on the sole. It was determined that Z orientation on the charger was worst-case orientation; therefore, all final radiated testing was performed with the EUT in Z orientation on the charger.

The EUT only supports 1mbps, therefore all testing was done at 1mbps.

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5.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	**Manufacturer**	**Model**	**Serial Number**	**FCC ID**
Power supply	Bose	S008AHU0500160	072381Z60770084AE	N/A
Power supply	Bose	PSA05F-050QBT1	064184Z42943910AE	N/A

I/O CABLES

I/O Cable List						
Cable No	**Port**	**# of identical ports**	**Connector Type**	**Cable Type**	**Cable Length (m)**	**Remarks**
1	USB	1	Micro-USB	USB	<3	None
2	UART	1	USB	USB	<3	For test setup only

TEST SETUP

Test software placed the radio into the necessary modes for testing.

SETUP DIAGRAMS

Please refer to R13135764-EP1 for setup diagrams.

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6. MEASUREMENT METHOD

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

6 dB BW: ANSI C63.10 Subclause -11.8.2 RBW ≤ DTS BW

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

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

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

Out-of-band emissions in non-restricted bands: ANSI C63.10-2013 Section 11.11 & 6.10.4

Out-of-band emissions in restricted bands: ANSI C63.10-2013 Section 11.12.1 & 6.10.5

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

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

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7. TEST AND MEASUREMENT EQUIPMENT

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

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

Equip. 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				
AT0073	Hybrid Broadband Antenna	Sunol Sciences Corp.	JB3	2019-008-08	2020-08-08
	1-18 GHz				
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	2019-05-02	2020-05-02
N-SAC02	Gain-loss string: 25-1000MHz	Various	Various	2019-05-02	2020-05-02
N-SAC03	Gain-loss string: 1-18GHz	Various	Various	2019-03-15	2020-03-15
	Receiver & Software				
SA0026	Spectrum Analyzer	Agilent	N9030A	2019-03-19	2020-03-19
SOFTEMI	EMI Software	UL	Version 9.5	NA	NA
	Additional Equipment used				
s/n 181474341	Environmental Meter	Fisher Scientific	15-077-963	2018-07-27	2020-07-27

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

Equip. ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
	1-18 GHz				
AT0072	Double-Ridged Waveguide Horn Antenna, 1 to 18 GHz	ETS Lindgren	3117	2019-04-22	2020-04-22
	18-40 GHz				
AT0076	Horn Antenna, 18-26.5GHz	ARA	MWH-1826/B	2019-11-07	2020-11-07
	Gain-Loss Chains				
S-SAC03	Gain-loss string: 1-18GHz	Various	Various	2019-03-13	2020-03-13
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				
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	NA	NA
	Additional Equipment used				
s/n 181474409	Environmental Meter	Fisher Scientific	15-077-963	2018-07-27	2020-07-27

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Test Equipment Used - Wireless Conducted Measurement Equipment

Equipment ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
	Conducted Room 2				
T177 (PRE0079253)	Spectrum Analyzer	Agilent Technologies	E4446A	2019-04-22	2020-04-22
PWM002 (PRE0137344)	RF Power Meter	Keysight Technologies	N1911A	2019-08-23	2020-08-23
PWS002 (PRE0137348)	Peak and Avg Power Sensor, 50MHz to 18GHz	Keysight Technologies	N1921A	2019-08-23	2020-08-23
SN 181474341	Environmental Meter	Fisher Scientific	15-077-963	2018-07-27	2020-07-27
76021	DC Regulated Power Supply	CircuitSpecialists.Com	CSI3005X5	N/A	N/A
SOFTEMI	EMC Software	UL	Version 10.3 (2019-09-24)	NA	NA

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

Equipment ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
CDECABLE001	ANSI C63.4 1m extension cable.	UL	Per Annex B of ANSI C63.4	2019-07-10	2020-07-10
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	NA	NA

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8. ANTENNA PORT TEST RESULTS

8.1. ON TIME AND DUTY CYCLE

LIMITS

None; for reporting purposes only.

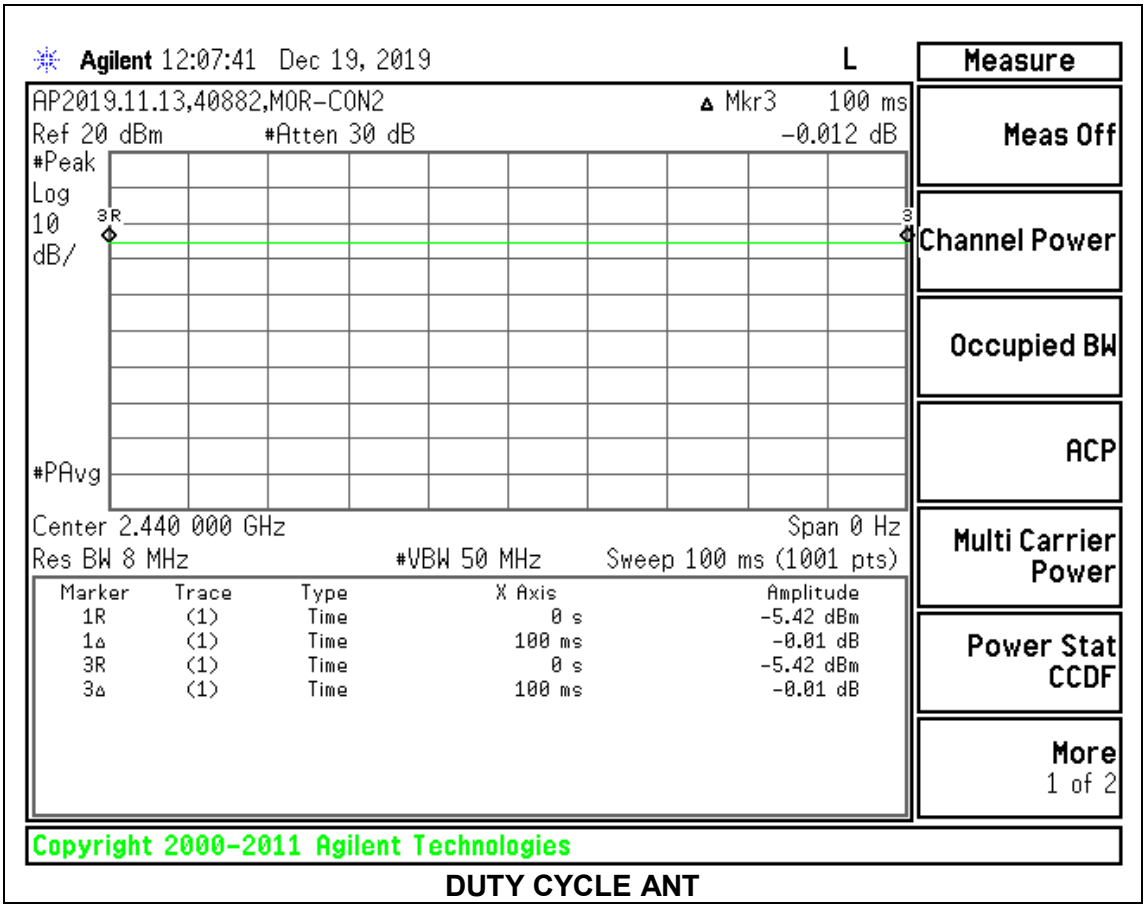
PROCEDURE

KDB 558074 Zero-Span Spectrum Analyzer Method.

ON TIME AND DUTY CYCLE RESULTS

Mode	ON Time B (msec)	Period (msec)	Duty Cycle x (linear)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)	1/B Minimum VBW (kHz)
2.4GHz Band						
ANT	100.00	100.00	1.000	100.00%	0.00	0.010

DUTY CYCLE PLOTS



DUTY CYCLE ANT

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8.2. 99% BANDWIDTH

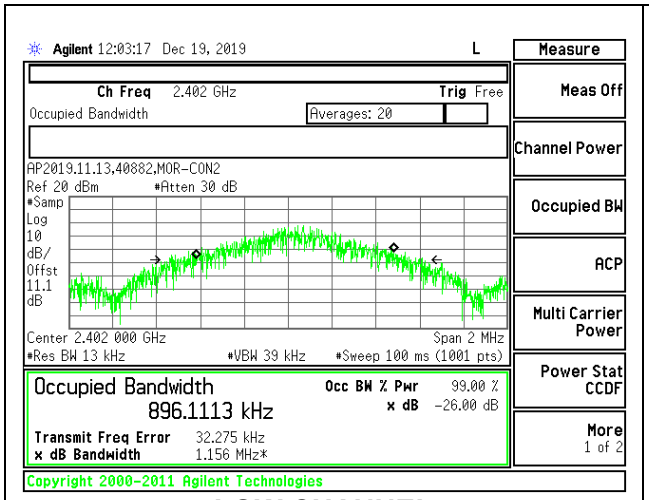
LIMITS

None; for reporting purposes only.

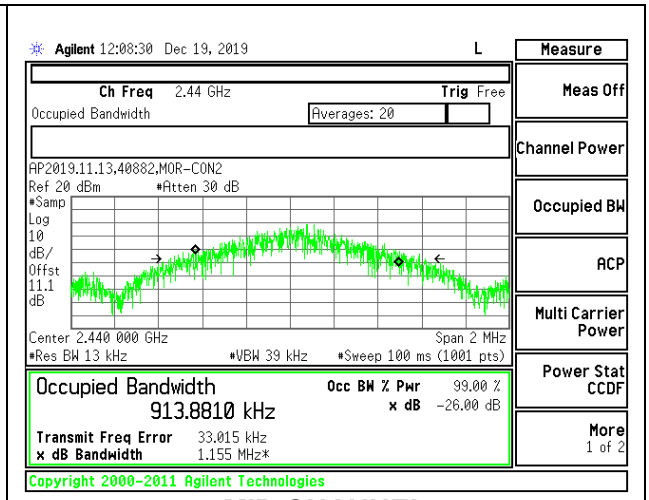
RESULTS

8.2.1. ANT (1Mbps)

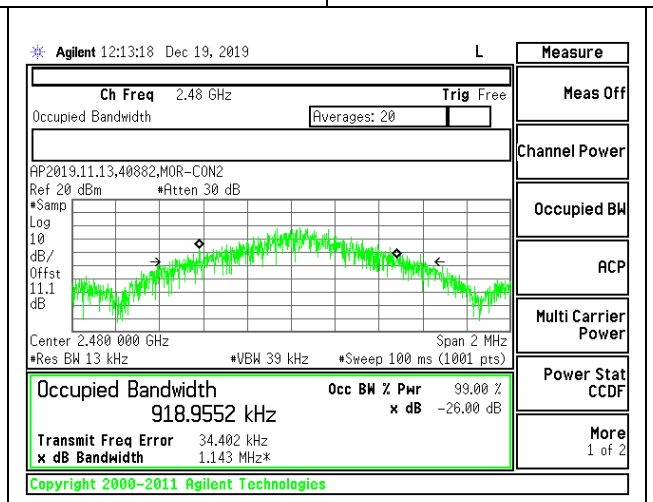
Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2402	0.896
Middle	2440	0.914
High	2480	0.919



LOW CHANNEL



MID CHANNEL



HIGH CHANNEL

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8.3. 6 dB BANDWIDTH

LIMITS

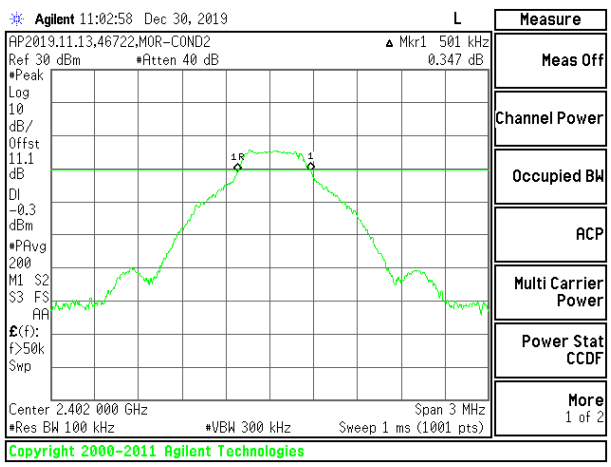
FCC §15.247 (a) (2)
RSS-247 5.2 (a)

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

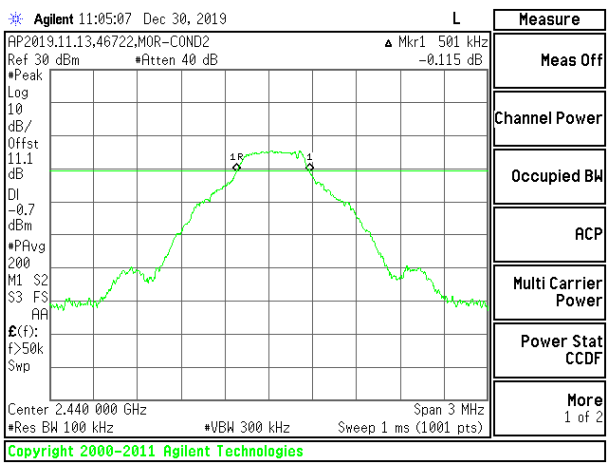
RESULTS

8.3.1. ANT (1Mbps)

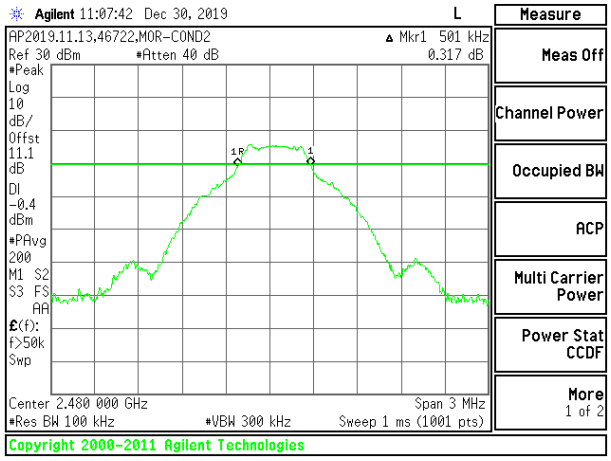
Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2402	0.501	0.5
Middle	2440	0.501	0.5
High	2480	0.501	0.5



LOW CHANNEL



MID CHANNEL



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8.4. 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 11.13 dB (including 10 dB pad and 1.13 dB cable) was entered as an offset in the power meter to allow for a peak reading of power.

RESULTS

8.4.1. ANT (1Mbps)

Tested By:	40882
Date:	2019-12-2019

Channel	Frequency (MHz)	Peak Power Reading (dBm)	Limit (dBm)	Margin (dB)
Low	2402	4.50	30	-25.500
Middle	2440	4.45	30	-25.550
High	2480	4.40	30	-25.600

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8.5. 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 11.13 dB (including 10 dB pad and 1.13 dB cable) was entered as an offset in the power meter to allow for a gated average reading of power.

RESULTS

8.5.1. ANT (1Mbps)

Tested By:	40882
Date:	2019-12-2019

Channel	Frequency (MHz)	AV power (dBm)
Low	2402	4.38
Middle	2440	4.37
High	2480	4.32

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8.6. POWER SPECTRAL DENSITY

LIMITS

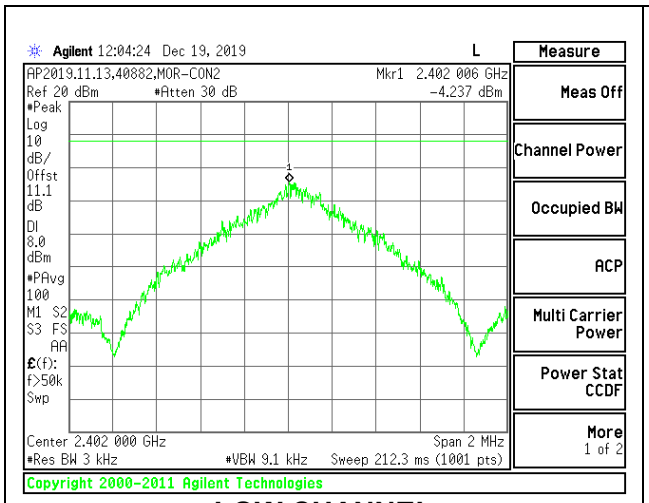
FCC §15.247 (e)
RSS-247 (5.2) (b)

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.

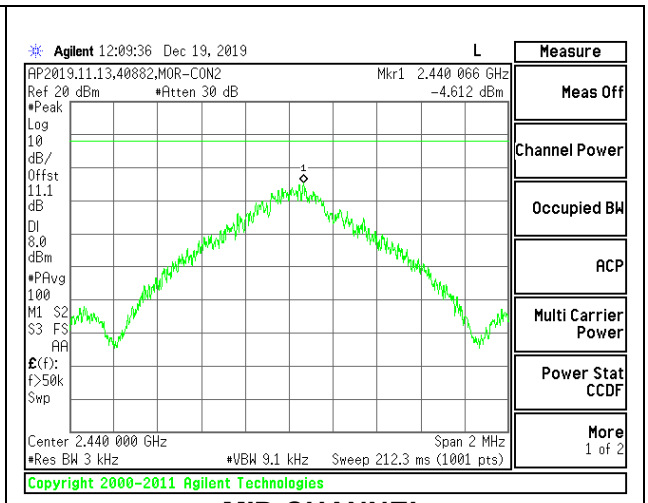
RESULTS

8.6.1. ANT (1Mbps)

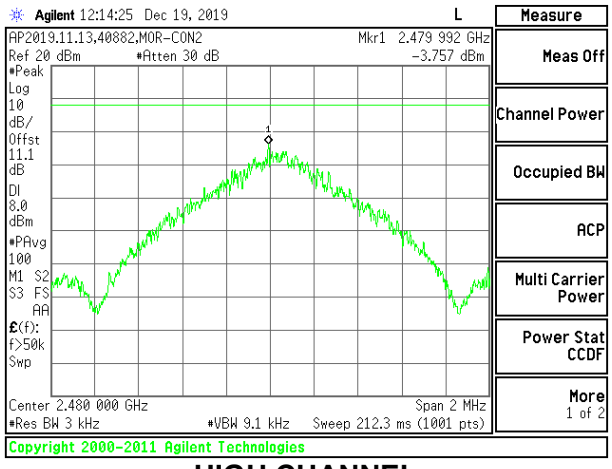
Channel	Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Margin (dB)
Low	2402	-4.24	8	-12.24
Middle	2440	-4.61	8	-12.61
High	2480	-3.76	8	-11.76



LOW CHANNEL



MID CHANNEL



HIGH CHANNEL

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8.7. 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

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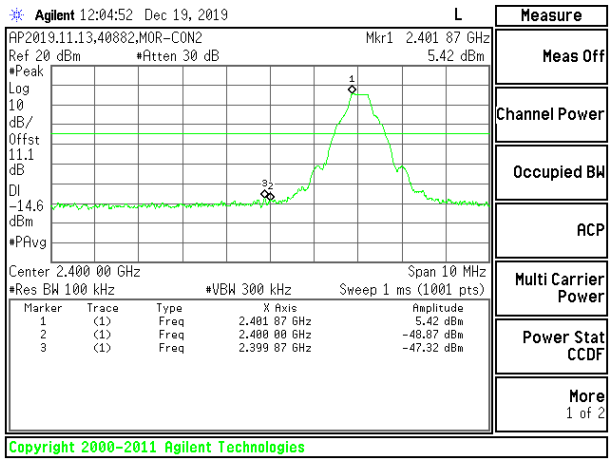
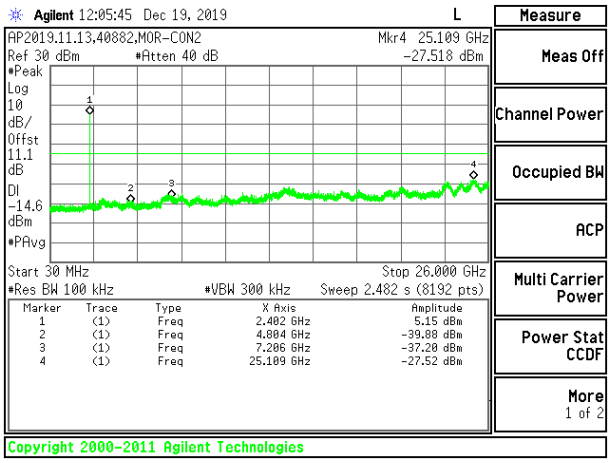
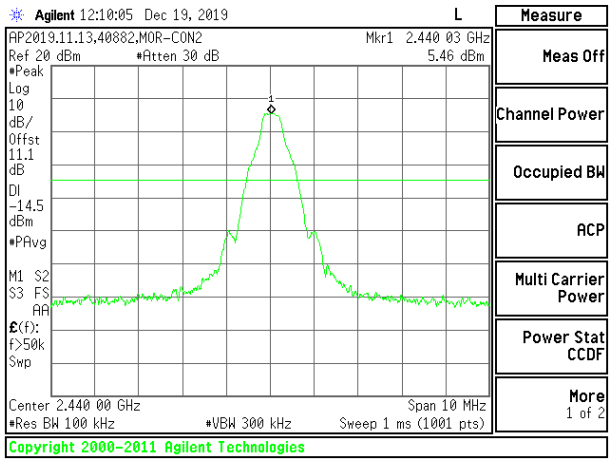
8.7.1. ANT (1Mbps)



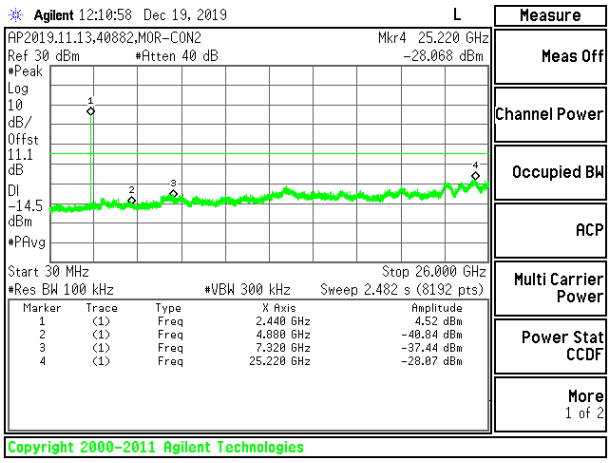
LOW CHANNEL BANDEDGE



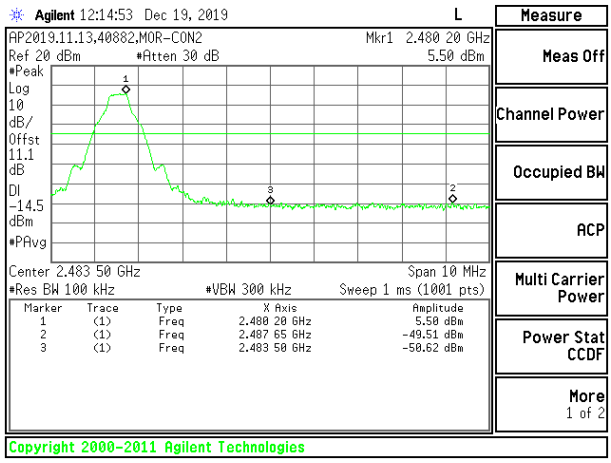
OUT-OF-BAND LOW CHANNEL



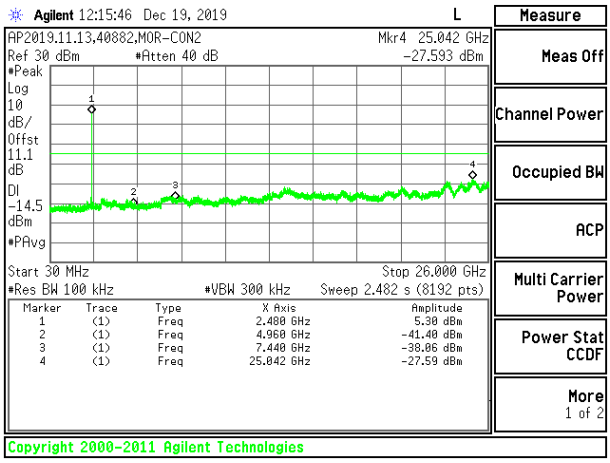
IN-BAND REFERENCE LEVEL



OUT-OF-BAND MID CHANNEL



HIGH CHANNEL BANDEDGE



OUT-OF-BAND HIGH CHANNEL

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9. RADIATED TEST RESULTS

9.1. 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 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 average measurements above 1GHz, the resolution bandwidth and video bandwidth are set as described in ANSI C63.10:2013 for the applicable measurement. The particular averaging method used for this test program was voltage averaging.

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

The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane 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).

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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.

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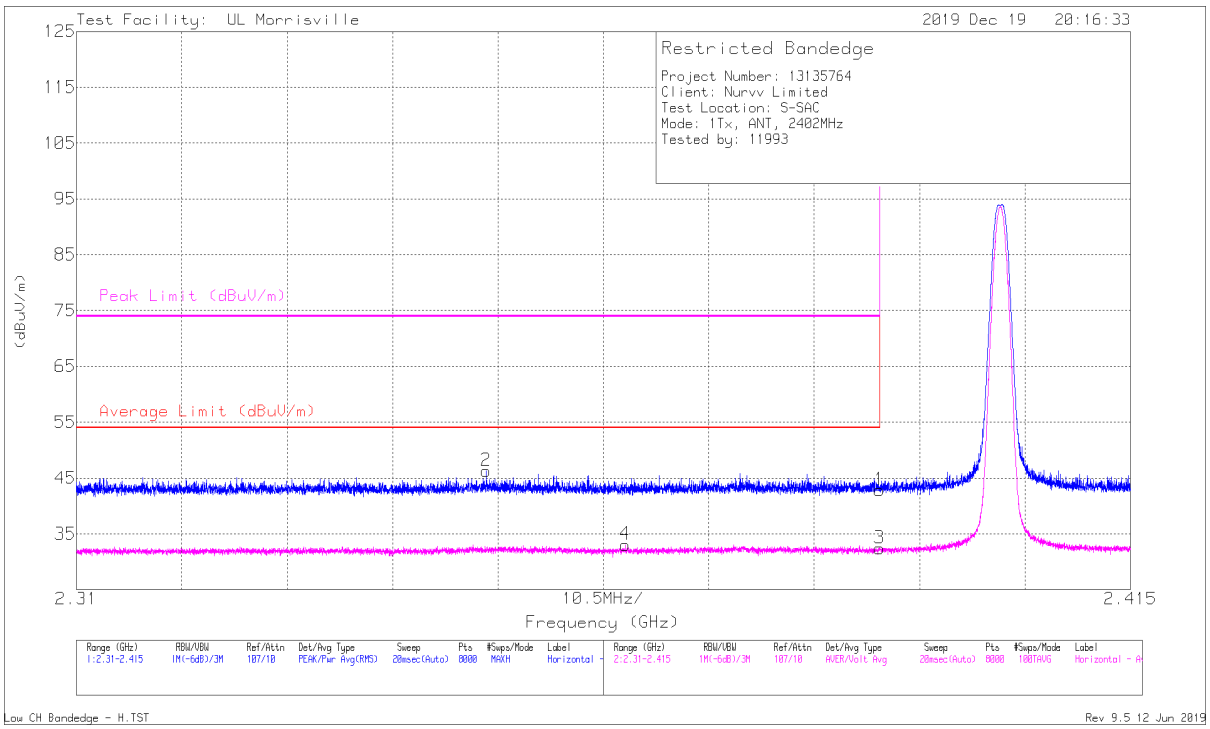
9.2. TRANSMITTER ABOVE 1 GHz

9.2.1. ANT (1Mbps)

BANDEDGE (LOW CHANNEL)

HORIZONTAL RESULT



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	34.92	Pk	31.9	-24	42.82	-	-	74	-31.18	7	145	H
2	* 2.35084	38.28	Pk	31.7	-23.7	46.28	-	-	74	-27.72	7	145	H
3	* 2.39	24.48	ADV	31.9	-24	32.38	54	-21.62	-	-	7	145	H
4	* 2.36466	25.27	ADV	31.7	-23.9	33.07	54	-20.93	-	-	7	145	H

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
Pk - Peak detector
ADV - Linear Voltage Average

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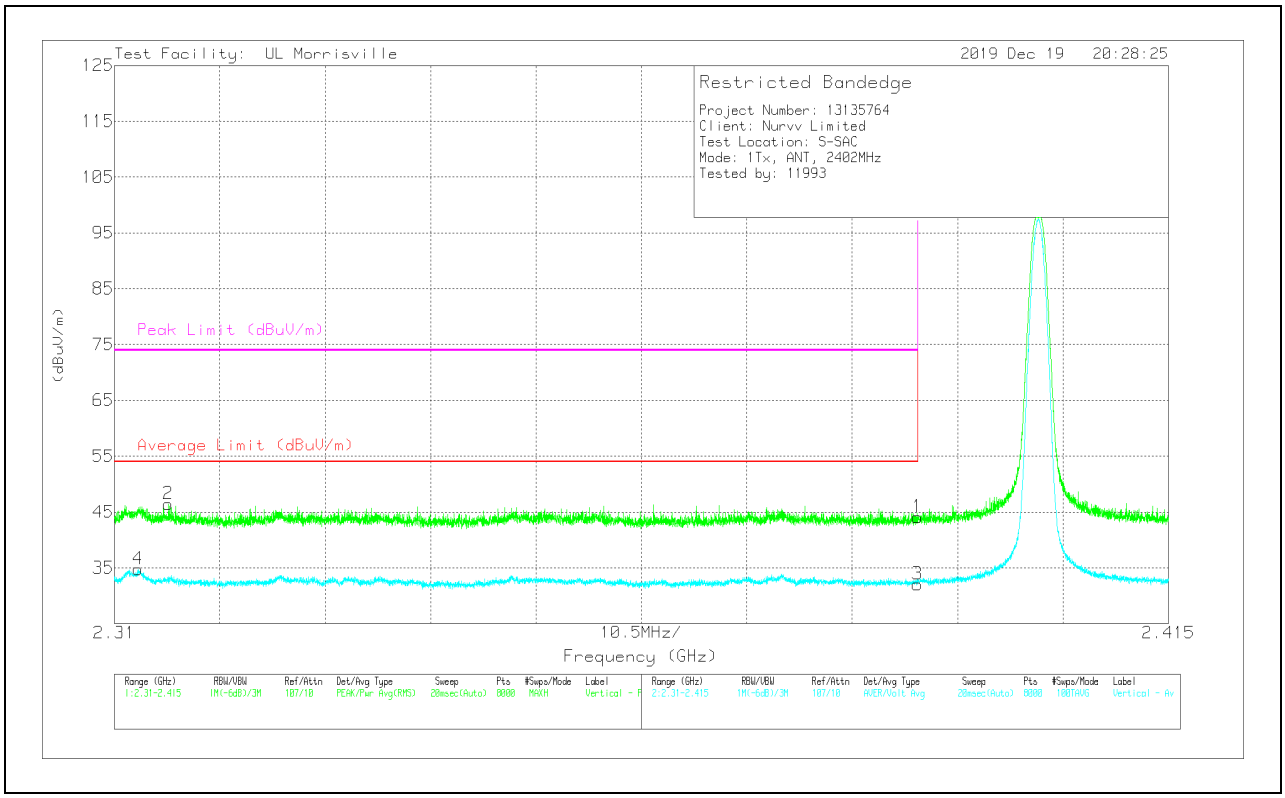
VERTICAL RESULT



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	36.19	Pk	31.9	-24	44.09	-	-	74	-29.91	228	143	V
2	* 2.31538	38.38	Pk	31.7	-23.7	46.38	-	-	74	-27.62	228	143	V
3	* 2.39	24.13	ADV	31.9	-24	32.03	54	-21.97	-	-	228	143	V
4	* 2.31238	26.71	ADV	31.7	-23.7	34.71	54	-19.29	-	-	228	143	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
Pk - Peak detector
ADV - Linear Voltage Average

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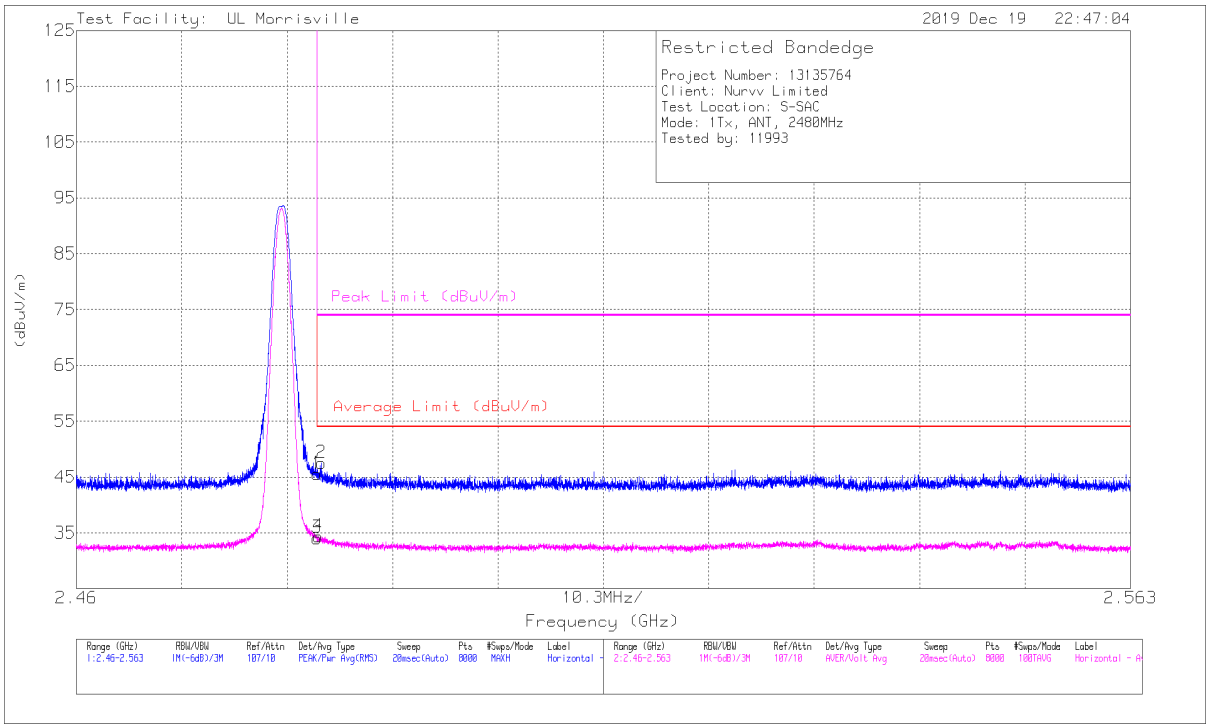
BANDEDGE (HIGH CHANNEL)

HORIZONTAL RESULT



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.4835	37.73	Pk	32.3	-24.5	45.53	-	-	74	-28.47	27	160	H
2	* 2.48395	39.72	Pk	32.3	-24.5	47.52	-	-	74	-26.48	27	160	H
3	* 2.4835	26.26	ADV	32.3	-24.5	34.06	54	-19.94	-	-	27	160	H
4	* 2.4836	26.55	ADV	32.3	-24.5	34.35	54	-19.65	-	-	27	160	H

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
Pk - Peak detector
ADV - Linear Voltage Average

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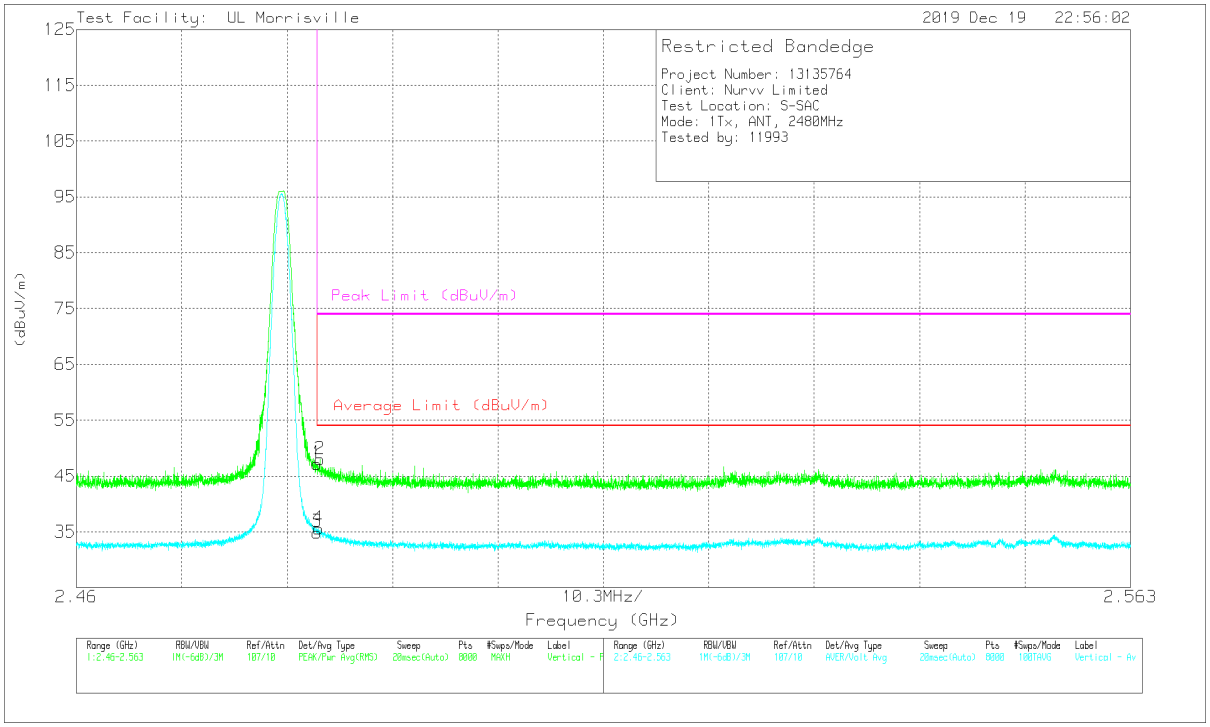
VERTICAL RESULT



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.4835	39.4	Pk	32.3	-24.5	47.2	-	-	74	-26.8	242	161	V
2	* 2.48382	40.17	Pk	32.3	-24.5	47.97	-	-	74	-26.03	242	161	V
3	* 2.4835	27.12	ADV	32.3	-24.5	34.92	54	-19.08	-	-	242	161	V
4	* 2.48366	27.8	ADV	32.3	-24.5	35.6	54	-18.4	-	-	242	161	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
Pk - Peak detector
ADV - Linear Voltage Average

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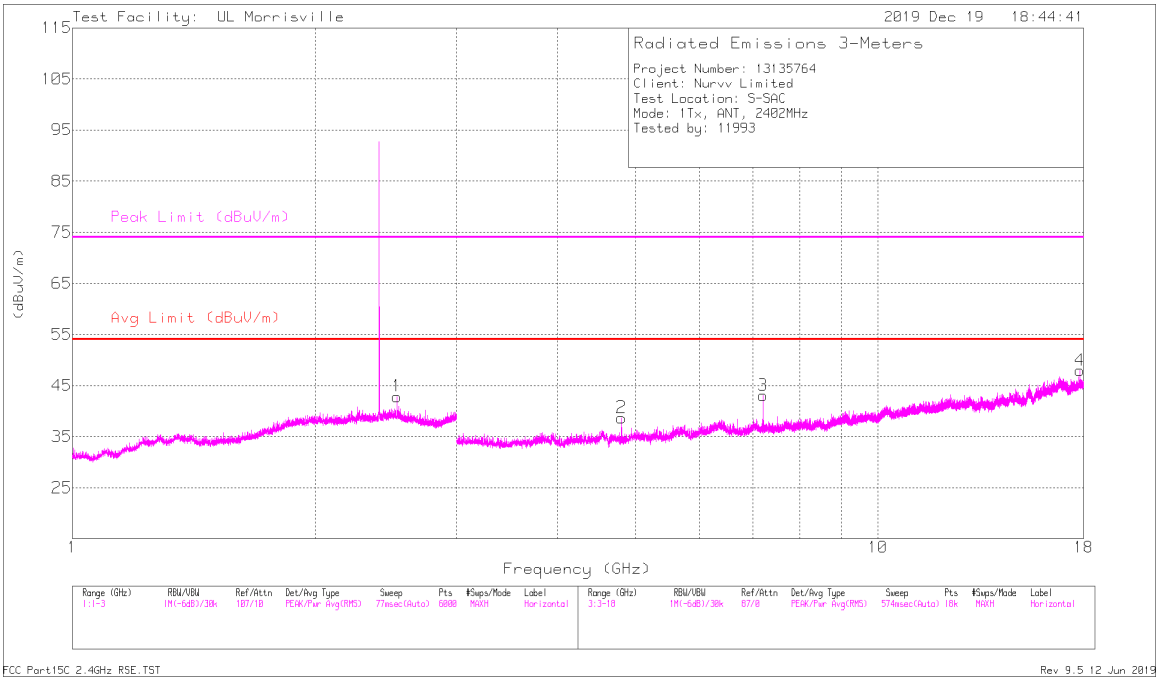
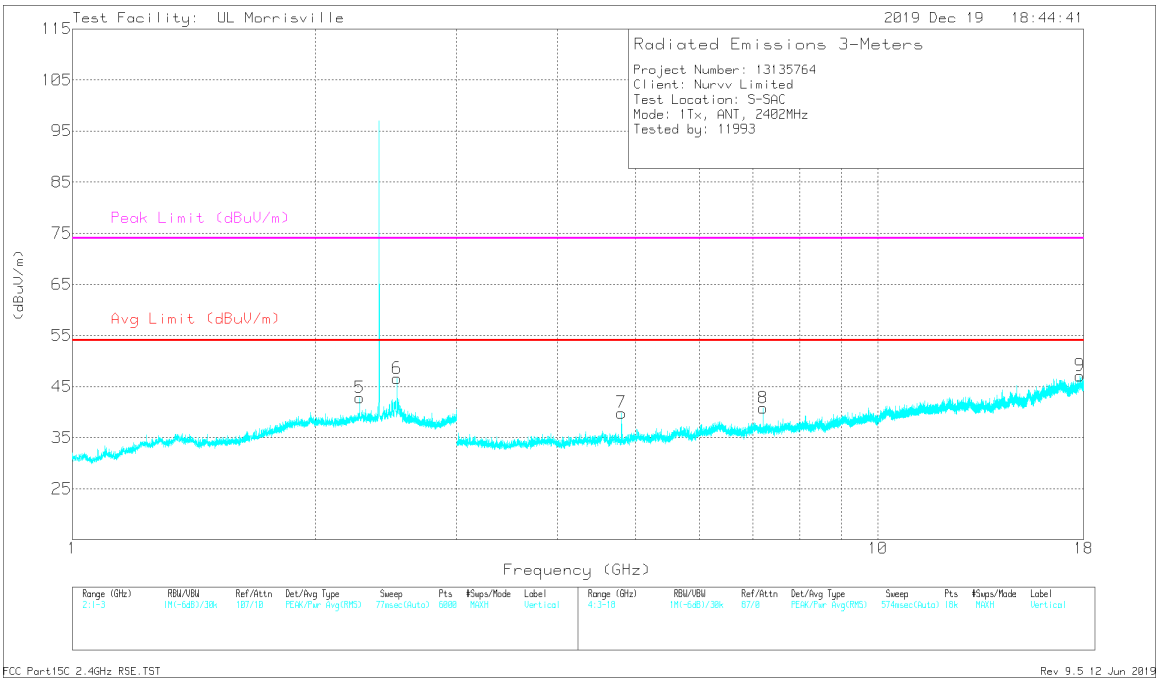
HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL RESULTS



HORIZONTAL



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RADIATED EMISSIONS

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	2.5299	41.41	PK2	32.4	-24.8	49.01	-	-	74	-24.99	6	287	H
	2.53006	33.07	ADV	32.4	-24.8	40.67	54	-13.33	-	-	6	287	H
5	* 2.2738	40.72	PK2	31.8	-23.5	49.02	-	-	74	-24.98	233	160	V
	* 2.27407	31.7	ADV	31.8	-23.5	40	54	-14	-	-	233	160	V
6	2.52991	43.79	PK2	32.4	-24.8	51.39	-	-	74	-22.61	64	117	V
	2.53003	36.44	ADV	32.4	-24.8	44.04	54	-9.96	-	-	64	117	V
2	* 4.80373	42.27	PK2	34.2	-31	45.47	-	-	74	-28.53	168	189	H
	* 4.80407	33.7	ADV	34.2	-31	36.9	54	-17.1	-	-	168	189	H
4	* 17.82419	32.8	PK2	41.2	-20.8	53.2	-	-	74	-20.8	99	236	H
	* 17.82326	20.28	ADV	41.2	-20.8	40.68	54	-13.32	-	-	99	236	H
7	* 4.80373	42.64	PK2	34.2	-31	45.84	-	-	74	-28.16	210	228	V
	* 4.80406	34.34	ADV	34.2	-31	37.54	54	-16.46	-	-	210	228	V
9	* 17.81585	33.01	PK2	41.2	-20.8	53.41	-	-	74	-20.59	61	158	V
	* 17.81603	20.25	ADV	41.2	-20.8	40.65	54	-13.35	-	-	61	158	V
3	7.20607	35.35	Pk	35.7	-28	43.05	-	-	-	-	0-360	101	H
8	7.20607	33.11	Pk	35.7	-28	40.81	-	-	-	-	0-360	101	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
PK2 - Maximum Peak
ADV - Linear Voltage Average
Pk - Peak detector

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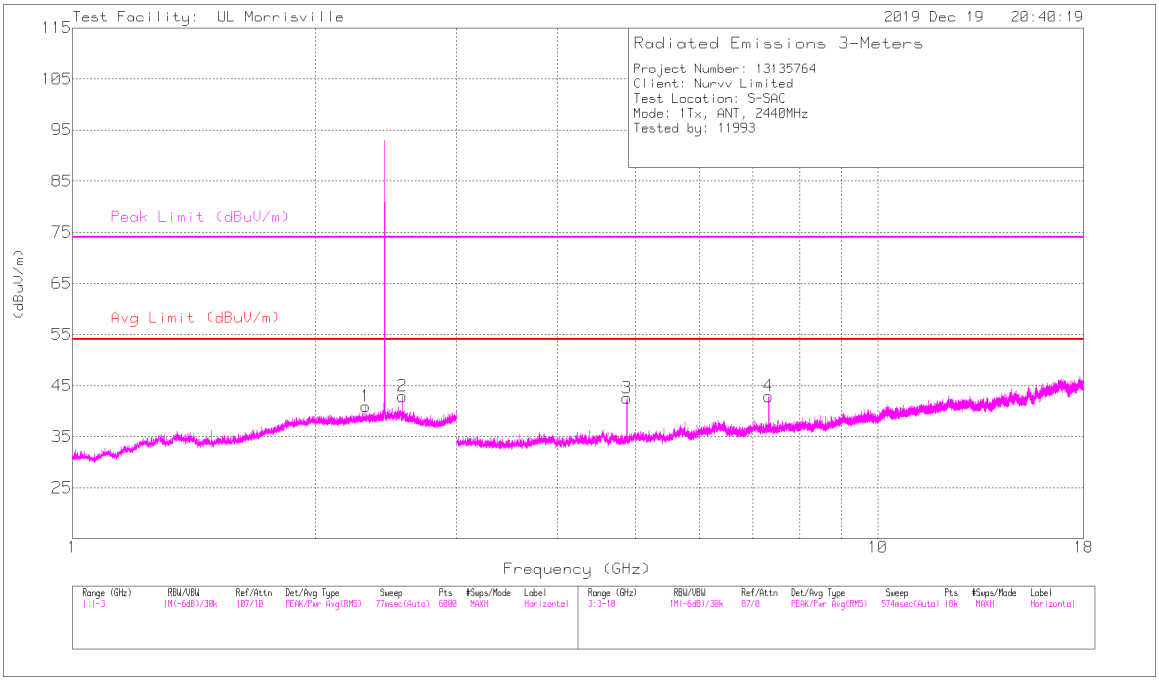
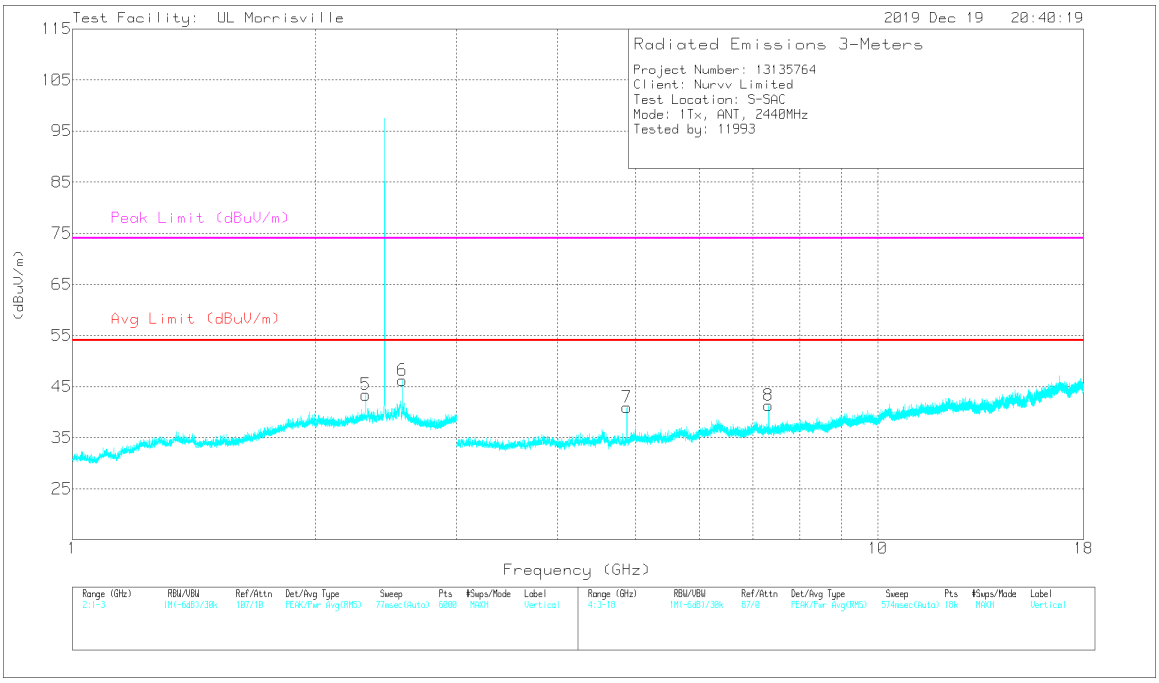
MID CHANNEL RESULTS



HORIZONTAL



VERTICAL

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RADIATED EMISSIONS

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.31222	39.54	PK2	31.7	-23.7	47.54	-	-	74	-26.46	220	104	H
	* 2.31203	29.19	ADV	31.7	-23.7	37.19	54	-16.81	-	-	220	104	H
2	2.56821	40.69	PK2	32.3	-25	47.99	-	-	74	-26.01	350	119	H
	2.56805	30.53	ADV	32.3	-25	37.83	54	-16.17	-	-	350	119	H
5	* 2.3121	41.3	PK2	31.7	-23.7	49.3	-	-	74	-24.7	210	185	V
	* 2.31204	32.09	ADV	31.7	-23.7	40.09	54	-13.91	-	-	210	185	V
6	2.56816	44.23	PK2	32.3	-25	51.53	-	-	74	-22.47	224	128	V
	2.56808	35.64	ADV	32.3	-25	42.94	54	-11.06	-	-	224	128	V
3	* 4.88045	44.55	PK2	34	-30.6	47.95	-	-	74	-26.05	155	130	H
	* 4.88006	38.31	ADV	34	-30.6	41.71	54	-12.29	-	-	155	130	H
4	* 7.31966	40.16	PK2	35.7	-27.5	48.36	-	-	74	-25.64	267	101	H
	* 7.31999	32.22	ADV	35.7	-27.5	40.42	54	-13.58	-	-	267	101	H
7	* 4.87985	43.67	PK2	34	-30.6	47.07	-	-	74	-26.93	75	260	V
	* 4.88007	37.26	ADV	34	-30.6	40.66	54	-13.34	-	-	75	260	V
8	* 7.32069	39.17	PK2	35.7	-27.5	47.37	-	-	74	-26.63	109	136	V
	* 7.31993	29.74	ADV	35.7	-27.5	37.94	54	-16.06	-	-	109	136	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
PK2 - Maximum Peak
ADV - Linear Voltage Average

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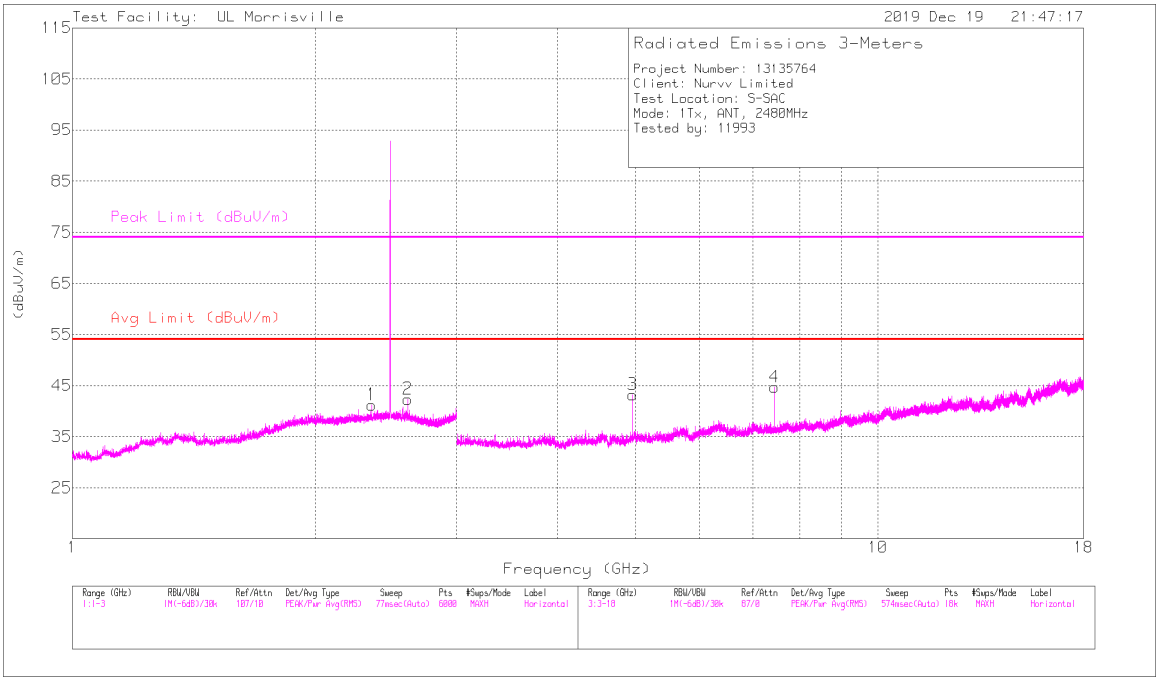
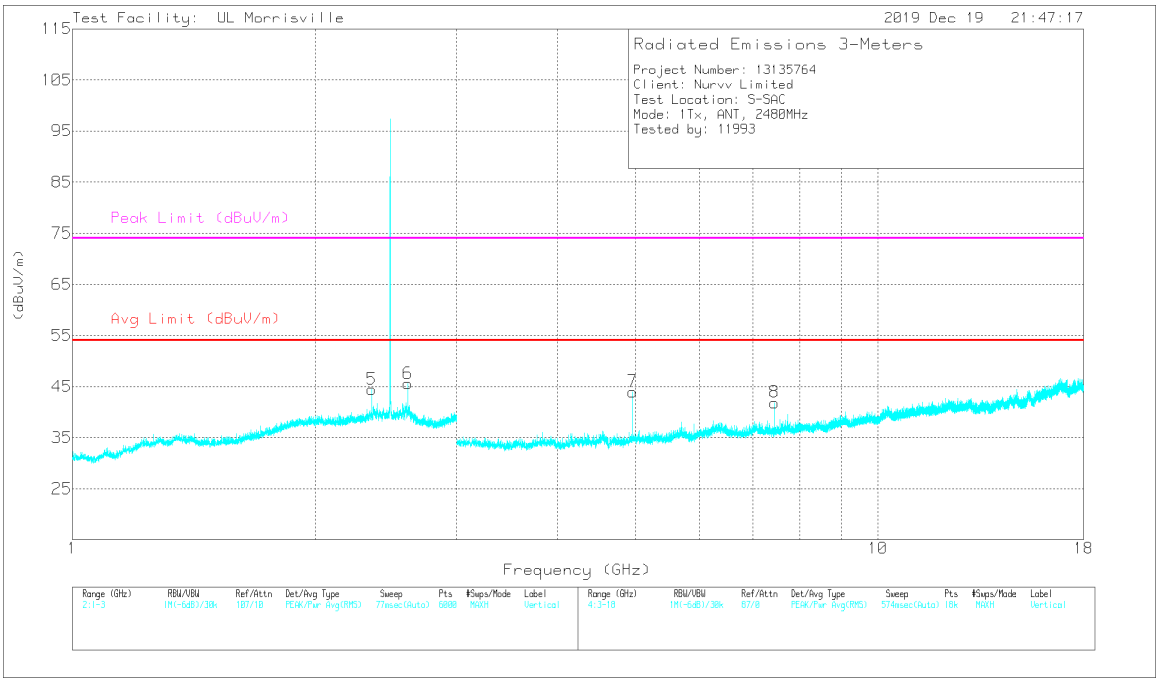
HIGH CHANNEL RESULTS



HORIZONTAL



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RADIATED EMISSIONS

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.35196	39.45	PK2	31.7	-23.8	47.35	-	-	74	-26.65	24	193	H
	* 2.35207	29.19	ADV	31.7	-23.8	37.09	54	-16.91	-	-	24	193	H
2	2.60811	41.57	PK2	32.4	-25.2	48.77	-	-	74	-25.23	16	127	H
	2.60804	32.6	ADV	32.4	-25.2	39.8	54	-14.2	-	-	16	127	H
5	* 2.35182	41.5	PK2	31.7	-23.8	49.4	-	-	74	-24.6	232	104	V
	* 2.35202	33.46	ADV	31.7	-23.8	41.36	54	-12.64	-	-	232	104	V
6	2.60835	43.85	PK2	32.4	-25.2	51.05	-	-	74	-22.95	62	129	V
	2.60802	35.43	ADV	32.4	-25.2	42.63	54	-11.37	-	-	62	129	V
3	* 4.95978	46.17	PK2	34.1	-31	49.27	-	-	74	-24.73	169	129	H
	* 4.96005	40.88	ADV	34.1	-31.1	43.88	54	-10.12	-	-	169	129	H
4	* 7.43959	41.52	PK2	35.8	-27.8	49.52	-	-	74	-24.48	8	206	H
	* 7.4402	32.61	ADV	35.8	-27.8	40.61	54	-13.39	-	-	8	206	H
7	* 4.95999	46.14	PK2	34.1	-31.1	49.14	-	-	74	-24.86	80	208	V
	* 4.96005	40.83	ADV	34.1	-31.1	43.83	54	-10.17	-	-	80	208	V
8	* 7.43949	39.92	PK2	35.8	-27.8	47.92	-	-	74	-26.08	134	171	V
	* 7.43999	31.69	ADV	35.8	-27.8	39.69	54	-14.31	-	-	134	171	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
PK2 - Maximum Peak
ADV - Linear Voltage Average

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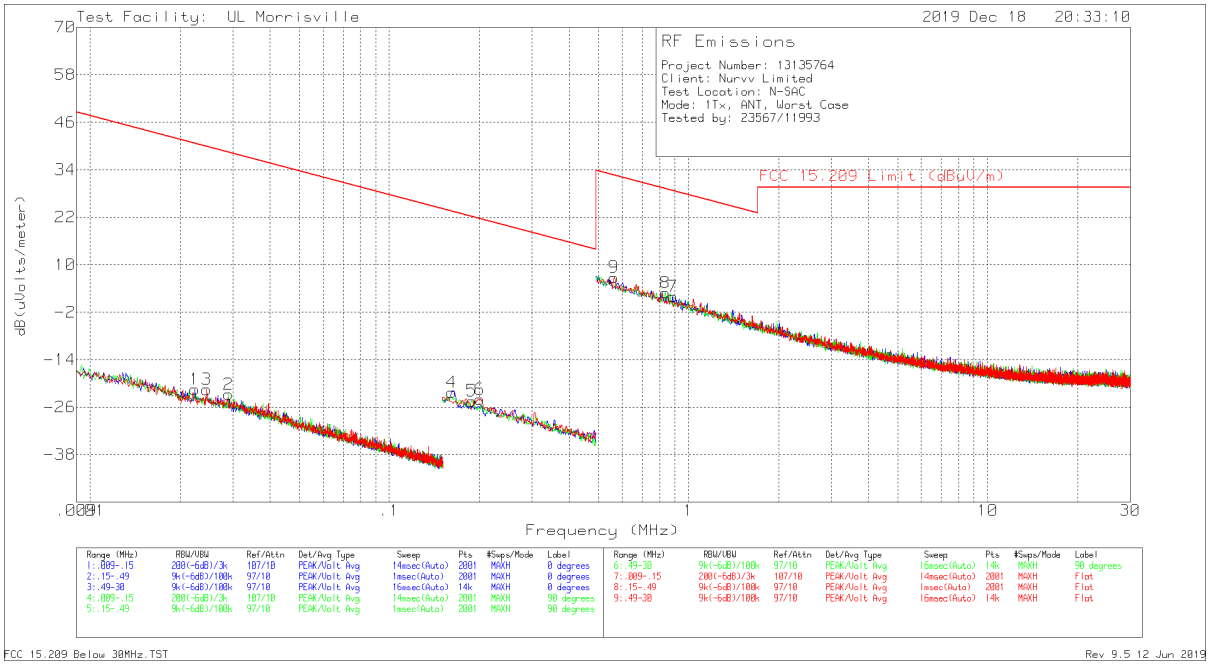
9.3. WORST CASE BELOW 30MHZ

SPURIOUS EMISSIONS BELOW 30 MHz (WORST-CASE CONFIGURATION)



ANTENNA- THREE ORIENTATIONS

Below 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 Avg/Qp Limit (dBuV/m)	FCC 15.209 Pk Limit (dBuV/m)	Worst-case Margin (dB)	Azimuth (Degs)
1	.02242	44.65	Pk	13.8	.1	-80	-21.45	40.59	60.59	-62.04	0-360
3	.02455	44.76	Pk	13.6	.1	-80	-21.54	39.8	59.8	-61.34	0-360
2	.02902	43.94	Pk	13.2	.1	-80	-22.76	38.35	58.35	-61.11	0-360
4	.16139	46.59	Pk	11	.1	-80	-22.31	23.45	43.45	-45.76	0-360
5	.18885	44.48	Pk	11	.1	-80	-24.42	22.08	42.08	-46.5	0-360
6	.20058	44.87	Pk	11	.1	-80	-24.03	21.56	41.56	-45.59	0-360
9	.56378	35.68	Pk	11	.1	-40	6.78	32.58	-	-25.8	0-360
8	.83571	31.81	Pk	11	.1	-40	2.91	29.16	-	-26.25	0-360
7	.8863	30.89	Pk	11	.1	-40	1.99	28.65	-	-26.66	0-360

Pk - Peak detector

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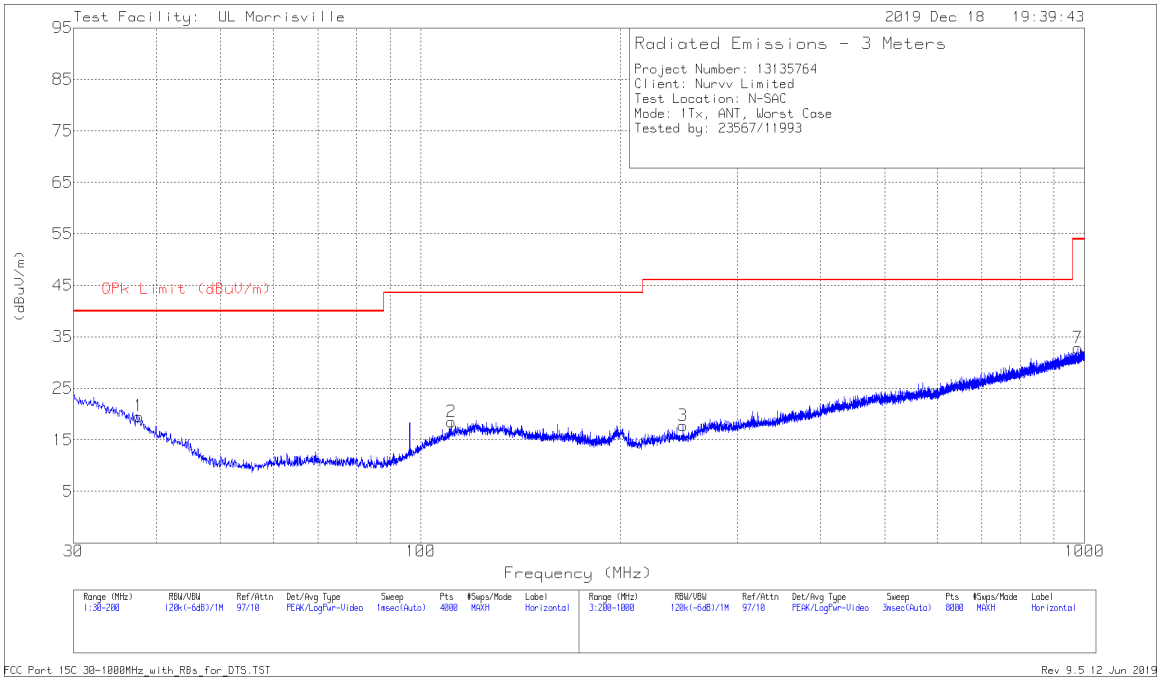
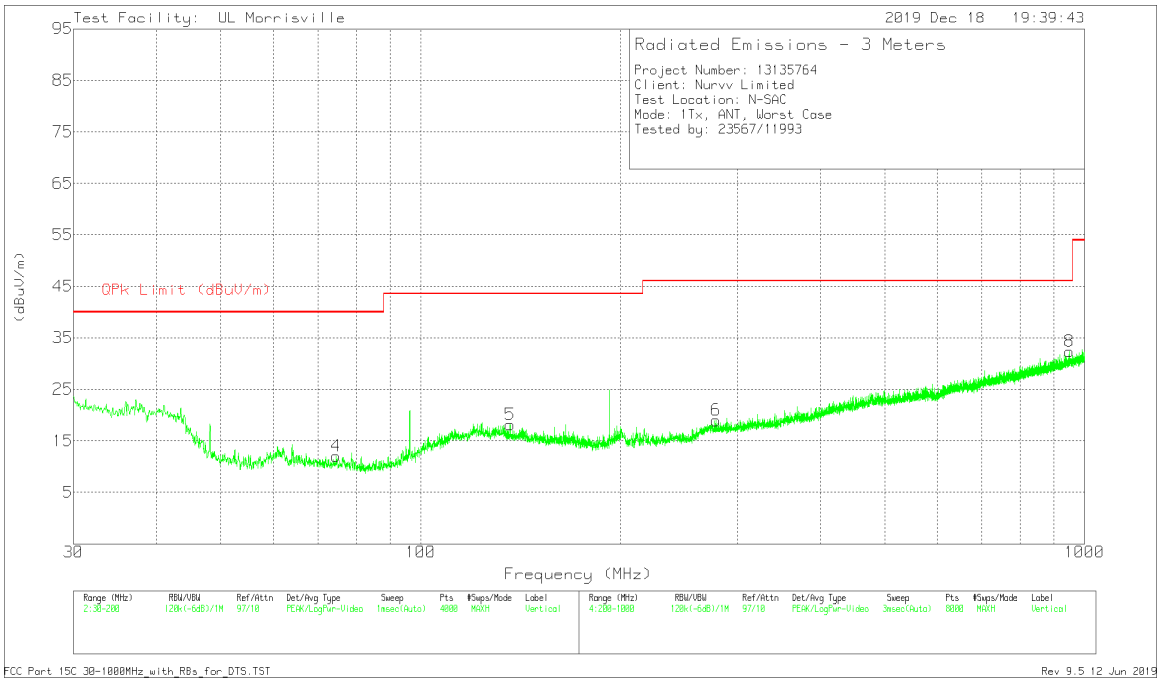
9.4. WORST CASE BELOW 1 GHZ

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



HORIZONTAL



VERTICAL

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Below 1GHz Data

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AT0073 AF (dB/m)	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 37.652	29.77	Pk	21.5	-31.7	19.57	40	-20.43	0-360	399	H
2	* 111.3235	30.3	Pk	19	-30.8	18.5	43.52	-25.02	0-360	98	H
4	* 74.594	29.2	Pk	13.9	-31.1	12	40	-28	0-360	101	V
5	* 136.405	29.36	Pk	19.4	-30.6	18.16	43.52	-25.36	0-360	101	V
3	* 248.4063	29.84	Pk	17.6	-29.7	17.74	46.02	-28.28	0-360	399	H
7	* 977.6011	29.13	Pk	29.1	-25.4	32.83	53.97	-21.14	0-360	101	H
6	* 278.5102	29.16	Pk	19.4	-29.6	18.96	46.02	-27.06	0-360	299	V
8	948.4973	29.11	Pk	29	-25.8	32.31	46.02	-13.71	0-360	299	V

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

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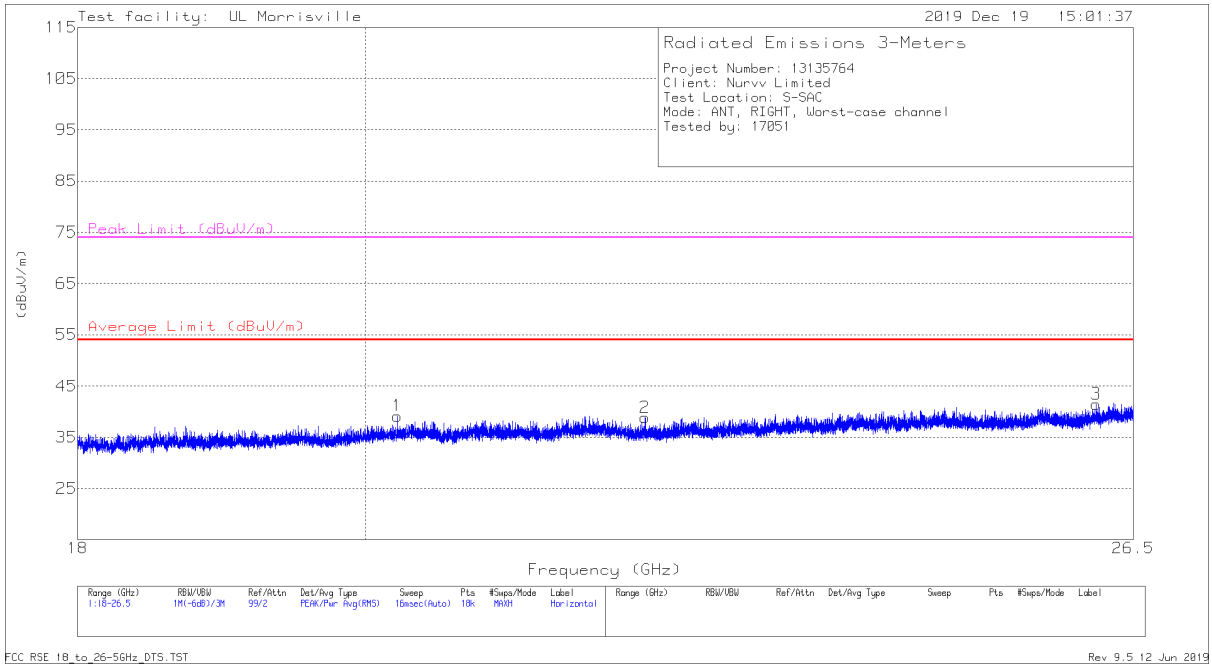
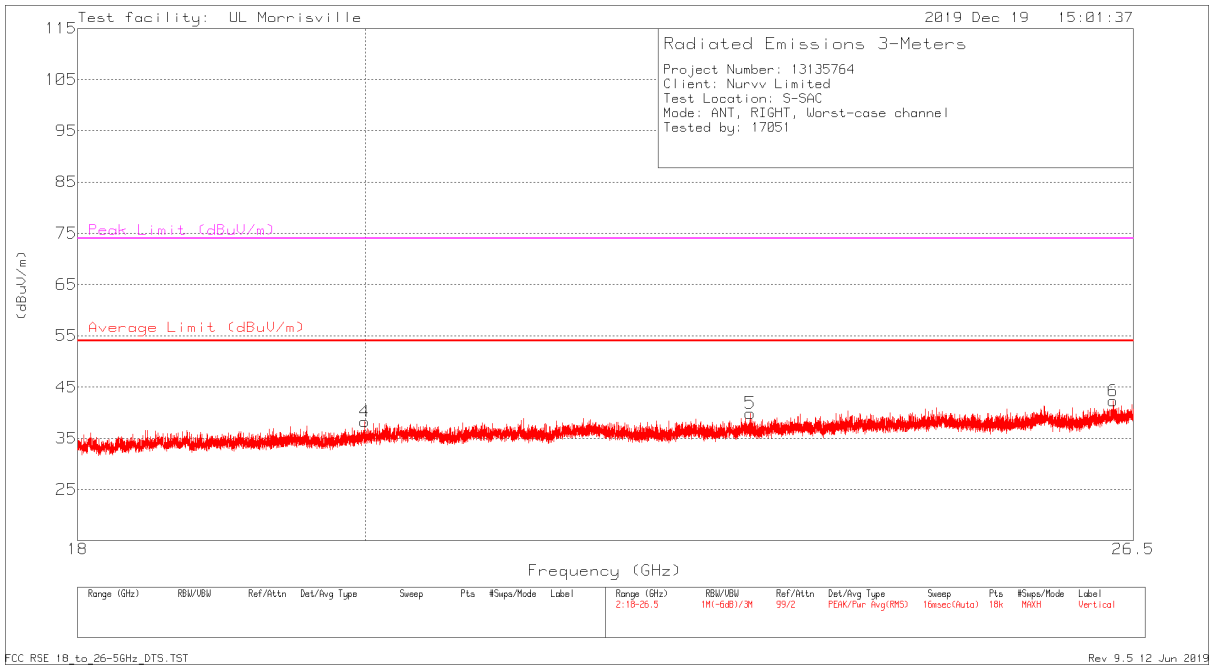
9.5. WORST CASE 18-26 GHZ

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



HORIZONTAL



VERTICAL

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18 – 26GHz DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0076 AF (dB/m)	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 20.23609	40.68	Pk	33	-34.5	39.18	54	-14.82	74	-34.82	0-360	102	H
2	* 22.15814	39.67	Pk	33.6	-34.4	38.87	54	-15.13	74	-35.13	0-360	102	H
4	* 19.99667	40.34	Pk	32.9	-35	38.24	54	-15.76	74	-35.76	0-360	102	V
5	* 23.02991	39.9	Pk	33.8	-33.8	39.9	54	-14.1	74	-34.1	0-360	252	V
3	26.14156	39.4	Pk	34.9	-32.8	41.5	54	-12.5	74	-32.5	0-360	198	H
6	26.30259	39.97	Pk	35	-32.7	42.27	54	-11.73	74	-31.73	0-360	252	V

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

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10. 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

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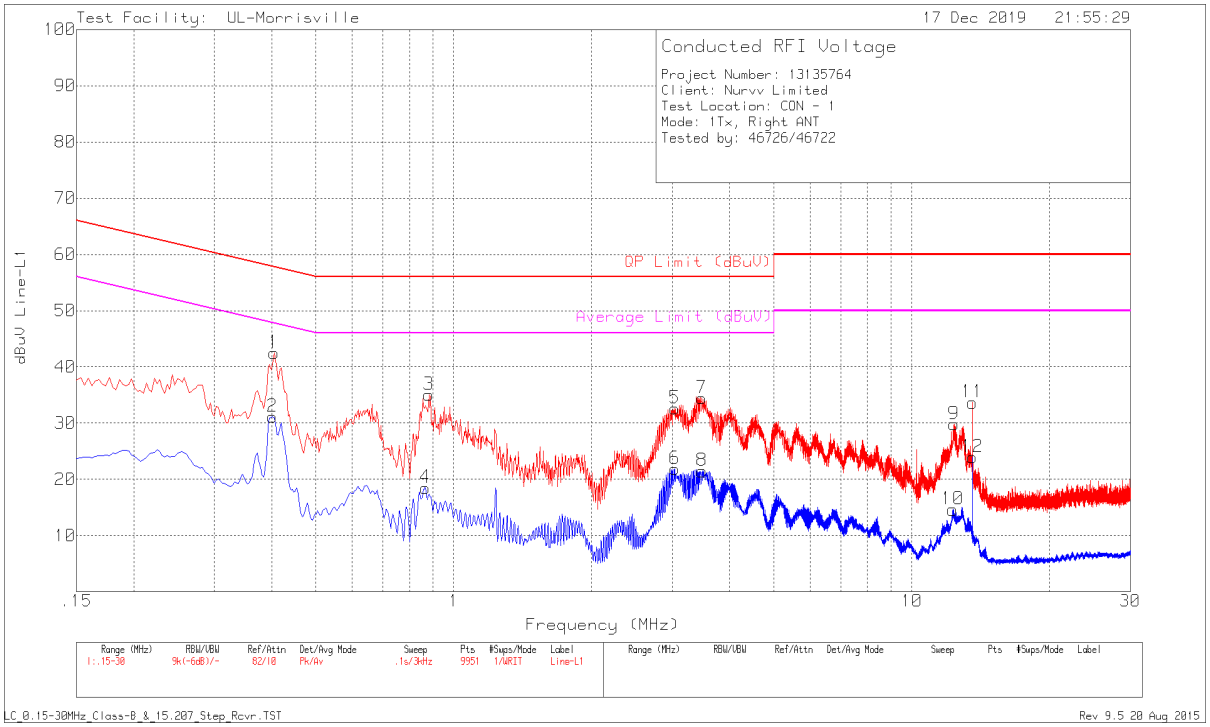
LINE 1 RESULTS



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	.405	32.42	Pk	.1	10	42.52	57.75	-15.23	-	-
2	.402	21.06	Av	.1	10	31.16	-	-	47.81	-16.65
3	.882	25.05	Pk	0	10	35.05	56	-20.95	-	-
4	.867	8.5	Av	0	10	18.5	-	-	46	-27.5
5	3.033	22.39	Pk	.1	10.1	32.59	56	-23.41	-	-
6	3.033	11.65	Av	.1	10.1	21.85	-	-	46	-24.15
7	3.48	24.26	Pk	.1	10.1	34.46	56	-21.54	-	-
8	3.483	11.26	Av	.1	10.1	21.46	-	-	46	-24.54
9	12.36	19.29	Pk	.1	10.4	29.79	60	-30.21	-	-
10	12.282	4.13	Av	.1	10.4	14.63	-	-	50	-35.37
11	13.56	23.16	Pk	.1	10.4	33.66	60	-26.34	-	-
12	13.56	13.43	Av	.1	10.4	23.93	-	-	50	-26.07

Pk - Peak detector
Av - Average detection

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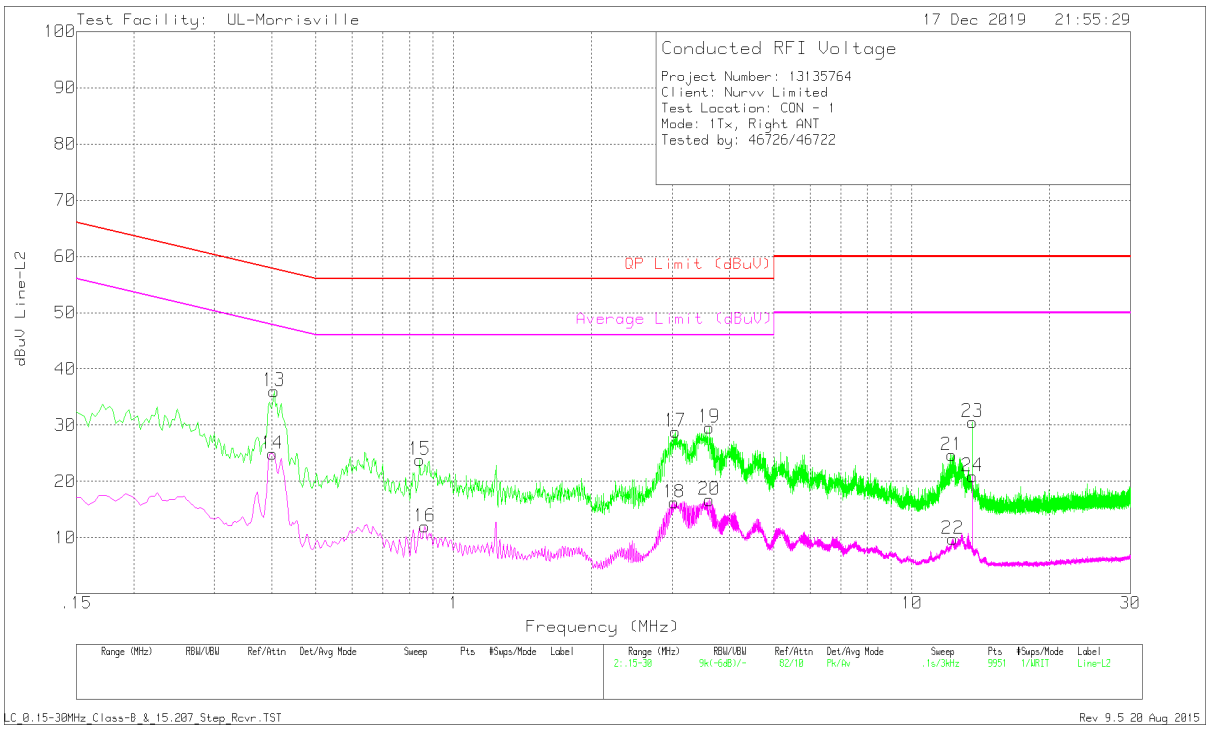
LINE 2 RESULTS



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	.405	25.98	Pk	.1	10	36.08	57.75	-21.67	-	-
14	.402	14.81	Av	.1	10	24.91	-	-	47.81	-22.9
15	.843	13.86	Pk	0	10	23.86	56	-32.14	-	-
16	.864	2	Av	0	10	12	-	-	46	-34
17	3.045	18.77	Pk	0	10.1	28.87	56	-27.13	-	-
18	3.03	6.17	Av	0	10.1	16.27	-	-	46	-29.73
19	3.612	19.5	Pk	0	10.1	29.6	56	-26.4	-	-
20	3.612	6.6	Av	0	10.1	16.7	-	-	46	-29.3
21	12.222	14.19	Pk	.1	10.4	24.69	60	-35.31	-	-
22	12.282	-.72	Av	.1	10.4	9.78	-	-	50	-40.22
23	13.56	20.08	Pk	.1	10.4	30.58	60	-29.42	-	-
24	13.56	10.43	Av	.1	10.4	20.93	-	-	50	-29.07

Pk - Peak detector
Av - Average detection

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11. SETUP PHOTOS

Please refer to R13135764-EP1 for setup photos.

END OF TEST REPORT

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