



# **CERTIFICATION TEST REPORT**

**Report Number. :** R13135764-E2

**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.  
TEL: (919) 549-1400



## REPORT REVISION HISTORY

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

## TABLE OF CONTENTS

<b>REPORT REVISION HISTORY .....</b>	<b>2</b>
<b>TABLE OF CONTENTS .....</b>	<b>3</b>
<b>1. ATTESTATION OF TEST RESULTS .....</b>	<b>5</b>
<b>2. TEST METHODOLOGY .....</b>	<b>6</b>
<b>3. FACILITIES AND ACCREDITATION .....</b>	<b>6</b>
<b>4. CALIBRATION AND UNCERTAINTY .....</b>	<b>7</b>
4.1. MEASURING INSTRUMENT CALIBRATION .....	7
4.2. SAMPLE CALCULATION .....	7
4.3. MEASUREMENT UNCERTAINTY .....	7
<b>5. EQUIPMENT UNDER TEST .....</b>	<b>8</b>
5.1. EUT DESCRIPTION .....	8
5.2. MAXIMUM OUTPUT POWER .....	8
5.3. DESCRIPTION OF AVAILABLE ANTENNAS .....	8
5.4. SOFTWARE AND FIRMWARE .....	8
5.5. WORST-CASE CONFIGURATION AND MODE .....	8
5.6. DESCRIPTION OF TEST SETUP .....	9
<b>6. MEASUREMENT METHOD .....</b>	<b>10</b>
<b>7. TEST AND MEASUREMENT EQUIPMENT .....</b>	<b>11</b>
<b>8. ANTENNA PORT TEST RESULTS .....</b>	<b>14</b>
8.1. ON TIME AND DUTY CYCLE .....	14
8.2. 99% BANDWIDTH .....	15
8.2.1. BLE (1Mbps) .....	15
8.3. 6 dB BANDWIDTH .....	16
8.3.1. BLE (1Mbps) .....	16
8.4. OUTPUT POWER .....	17
8.4.1. BLE (1Mbps) .....	17
8.5. AVERAGE POWER .....	18
8.5.1. BLE (1Mbps) .....	18
8.6. POWER SPECTRAL DENSITY .....	19
8.6.1. BLE (1Mbps) .....	19
8.7. CONDUCTED SPURIOUS EMISSIONS .....	20
8.7.1. BLE (1Mbps) .....	21
<b>9. RADIATED TEST RESULTS .....</b>	<b>22</b>

---

9.1.	<i>LIMITS AND PROCEDURE</i> .....	22
9.2.	<i>TRANSMITTER ABOVE 1 GHz</i> .....	24
9.2.1.	BLE (1Mbps).....	24
9.3.	<i>WORST CASE BELOW 30MHZ</i> .....	34
9.4.	<i>WORST CASE BELOW 1 GHZ</i> .....	35
9.5.	<i>WORST CASE 18-26 GHZ</i> .....	37
10.	<b>AC POWER LINE CONDUCTED EMISSIONS</b> .....	39
11.	<b>SETUP PHOTOS</b> .....	42

## 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 2019-12-19

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.

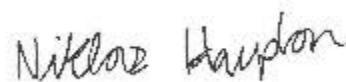
This document may not be altered or revised in any way unless done so by UL LLC and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL LLC will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the U.S. government.

Approved & Released For  
UL LLC By:



Brian Kiewra  
Project Engineer  
Consumer Technology Division  
UL LLC

Prepared By:



Niklas Haydon  
Engineer  
Consumer Technology Division  
UL LLC

## 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	
<input type="checkbox"/> Chamber A RTP	<input checked="" type="checkbox"/> North Chamber
<input type="checkbox"/> Chamber C RTP	<input checked="" type="checkbox"/> South Chamber

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:

$$\begin{aligned} \text{Field Strength (dBuV/m)} &= \text{Measured Voltage (dBuV)} + \text{Antenna Factor (dB/m)} + \text{Cable} \\ &\text{Loss (dB)} - \text{Preamp Gain (dB)} \\ 36.5 \text{ dBuV} + 18.7 \text{ dB/m} + 0.6 \text{ dB} - 26.9 \text{ dB} &= 28.9 \text{ dBuV/m} \end{aligned}$$

#### **MAINS CONDUCTED EMISSIONS**

Where relevant, the following sample calculation is provided:

$$\begin{aligned} \text{Final Voltage (dBuV)} &= \text{Measured Voltage (dBuV)} + \text{Cable Loss (dB)} + \text{Limiter Factor (dB)} + \\ &\text{LISN Insertion Loss.} \\ 36.5 \text{ dBuV} + 0 \text{ dB} + 10.1 \text{ dB} + 0 \text{ dB} &= 46.6 \text{ dBuV} \end{aligned}$$

### 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%.

## 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 BLE 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	BLE	4.59	2.88

### 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.



## 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.

---

## 6. MEASUREMENT METHOD

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

6 dB BW: ANSI C63.10 Subclause -11.8.2  $RBW \leq DTS\ BW$

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

## 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.
	<b>0.009-30MHz</b>	<b>(Loop Ant.)</b>			
AT0079	Active Loop Antenna	ETS-Lindgren	6502	2019-08-08	2020-08-08
	<b>30-1000 MHz</b>				
AT0073	Hybrid Broadband Antenna	Sunol Sciences Corp.	JB3	2019-008-08	2020-08-08
	<b>1-18 GHz</b>				
AT0067	Double-Ridged Waveguide Horn Antenna, 1 to 18 GHz	ETS Lindgren	3117	2019-03-22	2020-03-22
	<b>Gain-Loss Chains</b>				
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
	<b>Receiver &amp; Software</b>				
SA0026	Spectrum Analyzer	Agilent	N9030A	2019-03-19	2020-03-19
SOFTEMI	EMI Software	UL	Version 9.5 (2019-06-12)	NA	NA
	<b>Additional Equipment used</b>				
s/n 181474341	Environmental Meter	Fisher Scientific	15-077-963	2018-07-27	2020-07-27

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

Equip. ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
	<b>18-40 GHz</b>				
AT0076	Horn Antenna, 18-26.5GHz	ARA	MWH-1826/B	2019-11-07	2020-11-07
	<b>Gain-Loss Chains</b>				
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
	<b>Receiver &amp; Software</b>				
SA0027 (18-40GHz RSE)	Spectrum Analyzer	Agilent	N9030A	2019-05-15	2020-05-15
SOFTEMI	EMI Software	UL	Version 9.5 (2019-06-12)	NA	NA
	<b>Additional Equipment used</b>				
s/n 181474409	Environmental Meter	Fisher Scientific	15-077-963	2018-07-27	2020-07-27

Test Equipment Used - Wireless Conducted Measurement Equipment

Equipment ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
	<b>Conducted Room 2</b>				
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

## 8. ANTENNA PORT TEST RESULTS

### 8.1. ON TIME AND DUTY CYCLE

#### LIMITS

None; for reporting purposes only.

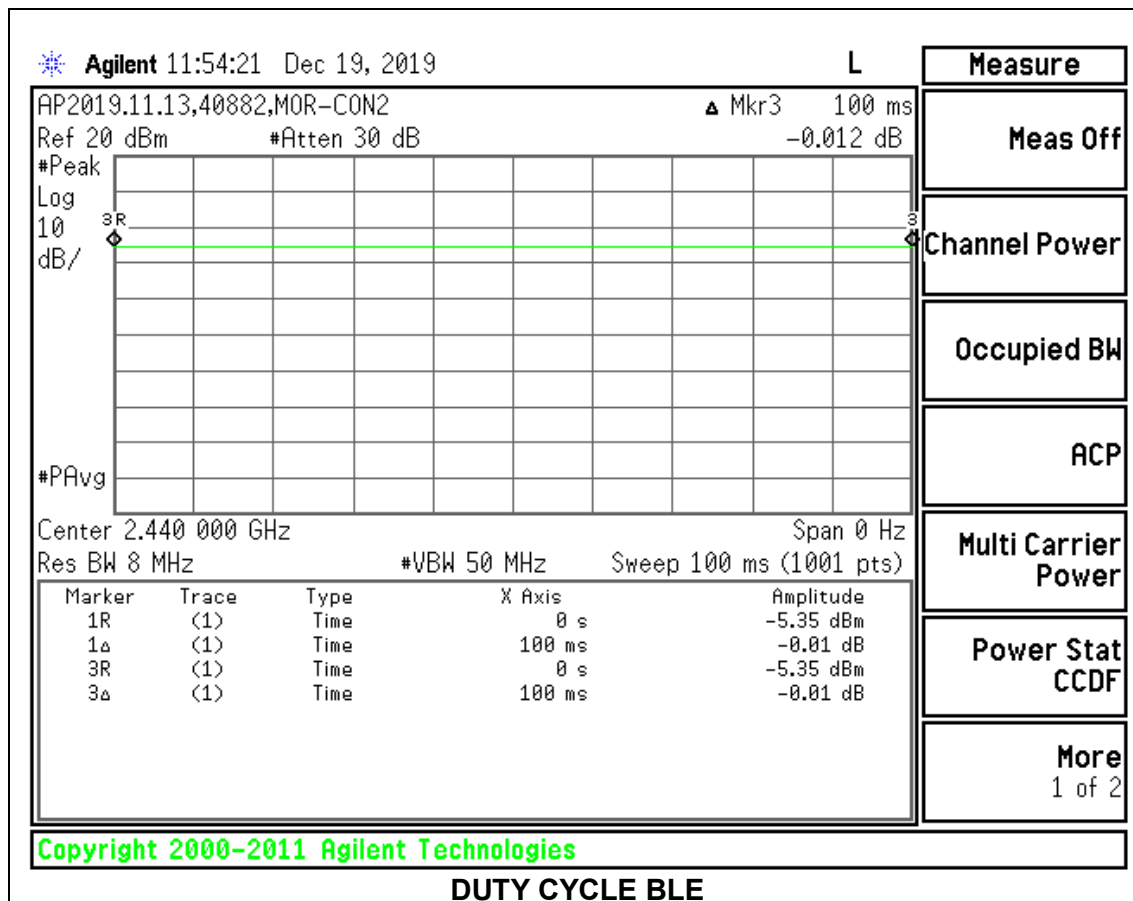
#### PROCEDURE

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						
BLE	100.00	100.00	1.000	100.00%	0.00	0.010

#### DUTY CYCLE PLOTS



## 8.2. 99% BANDWIDTH

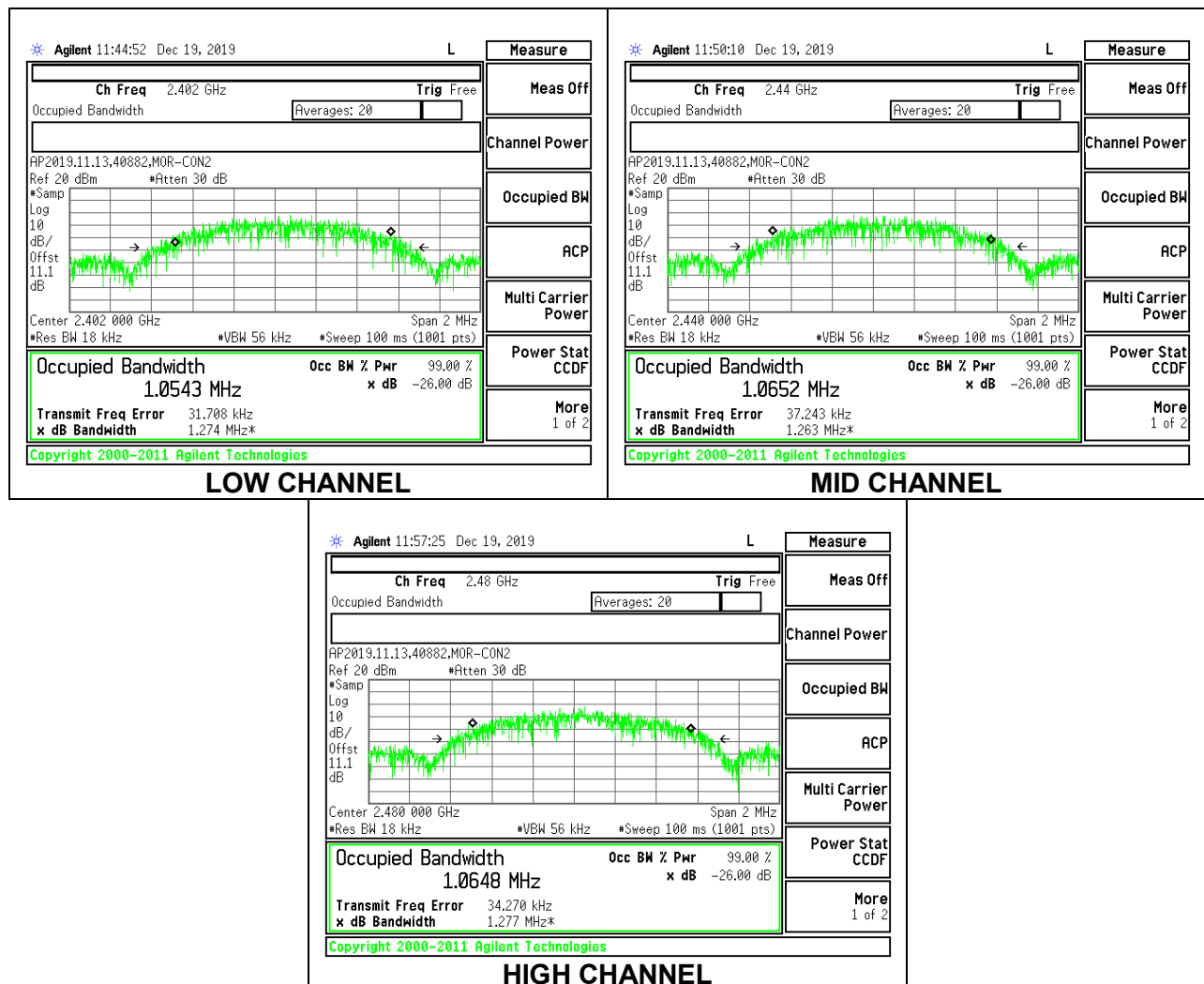
### LIMITS

None; for reporting purposes only.

### RESULTS

#### 8.2.1. BLE (1Mbps)

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2402	1.054
Middle	2440	1.065
High	2480	1.065



### 8.3. 6 dB BANDWIDTH

#### LIMITS

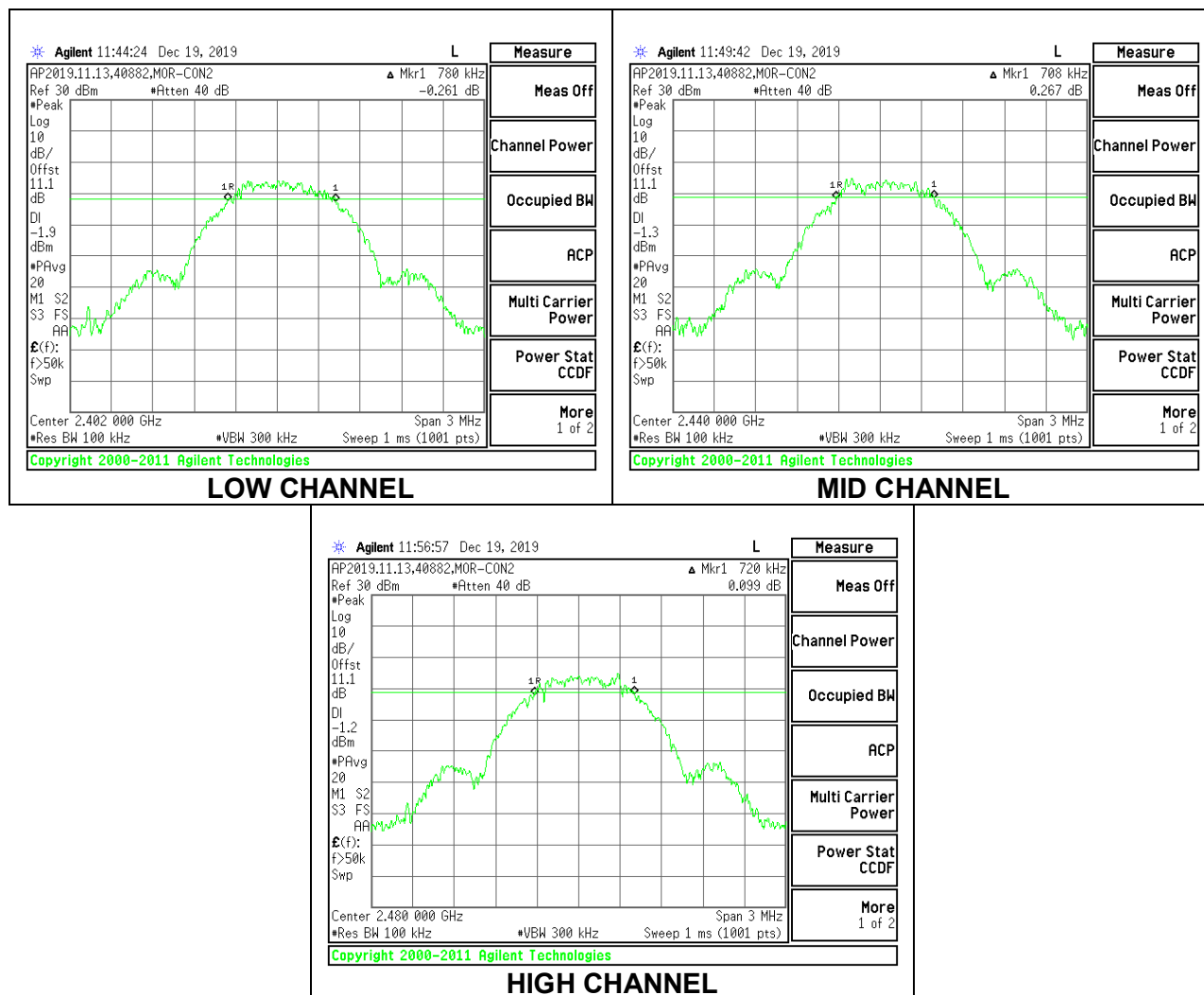
FCC §15.247 (a) (2)  
RSS-247 5.2 (a)

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

#### RESULTS

##### 8.3.1. BLE (1Mbps)

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2402	0.780	0.5
Middle	2440	0.708	0.5
High	2480	0.720	0.5





## 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. BLE (1Mbps)

Tested By:	40882
Date:	2019-12-19

Channel	Frequency (MHz)	Peak Power Reading (dBm)	Limit (dBm)	Margin (dB)
Low	2402	4.49	30	-25.510
Middle	2440	4.59	30	-25.410
High	2480	4.40	30	-25.600

## 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. BLE (1Mbps)

Tested By:	40882
Date:	2019-12-19

Channel	Frequency (MHz)	AV power (dBm)
Low	2402	4.38
Middle	2440	4.36
High	2480	4.34

## 8.6. POWER SPECTRAL DENSITY

### LIMITS

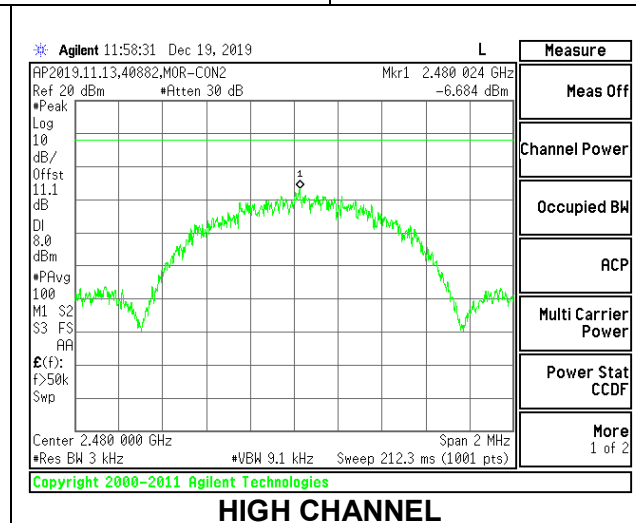
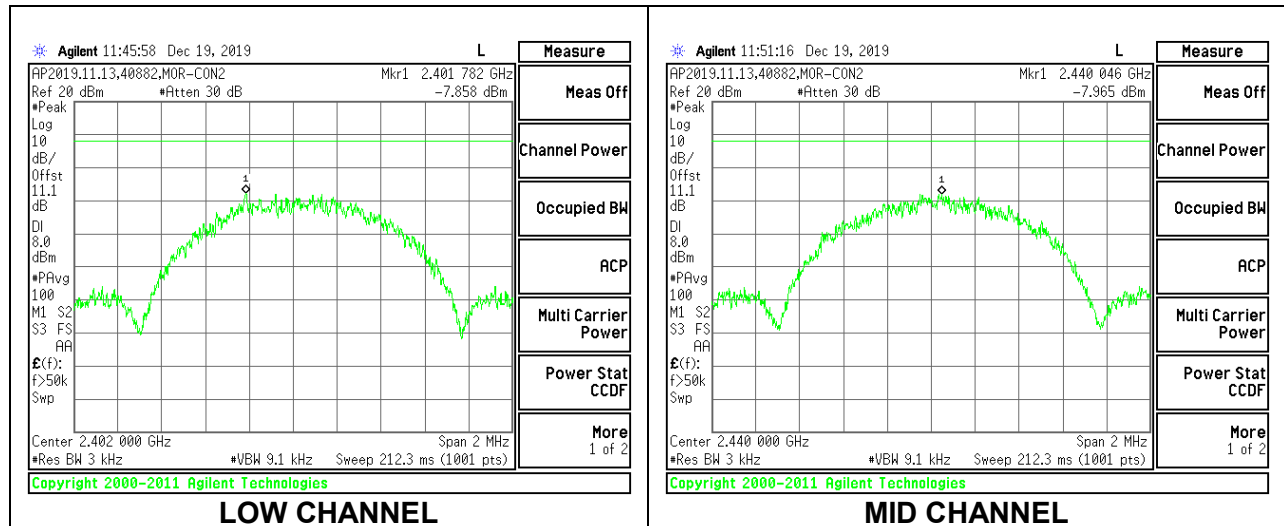
FCC §15.247 (e)  
RSS-247 (5.2) (b)

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. BLE (1Mbps)

Channel	Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Margin (dB)
Low	2402	-7.86	8	-15.86
Middle	2440	-7.97	8	-15.97
High	2480	-6.68	8	-14.68



## **8.7. CONDUCTED SPURIOUS EMISSIONS**

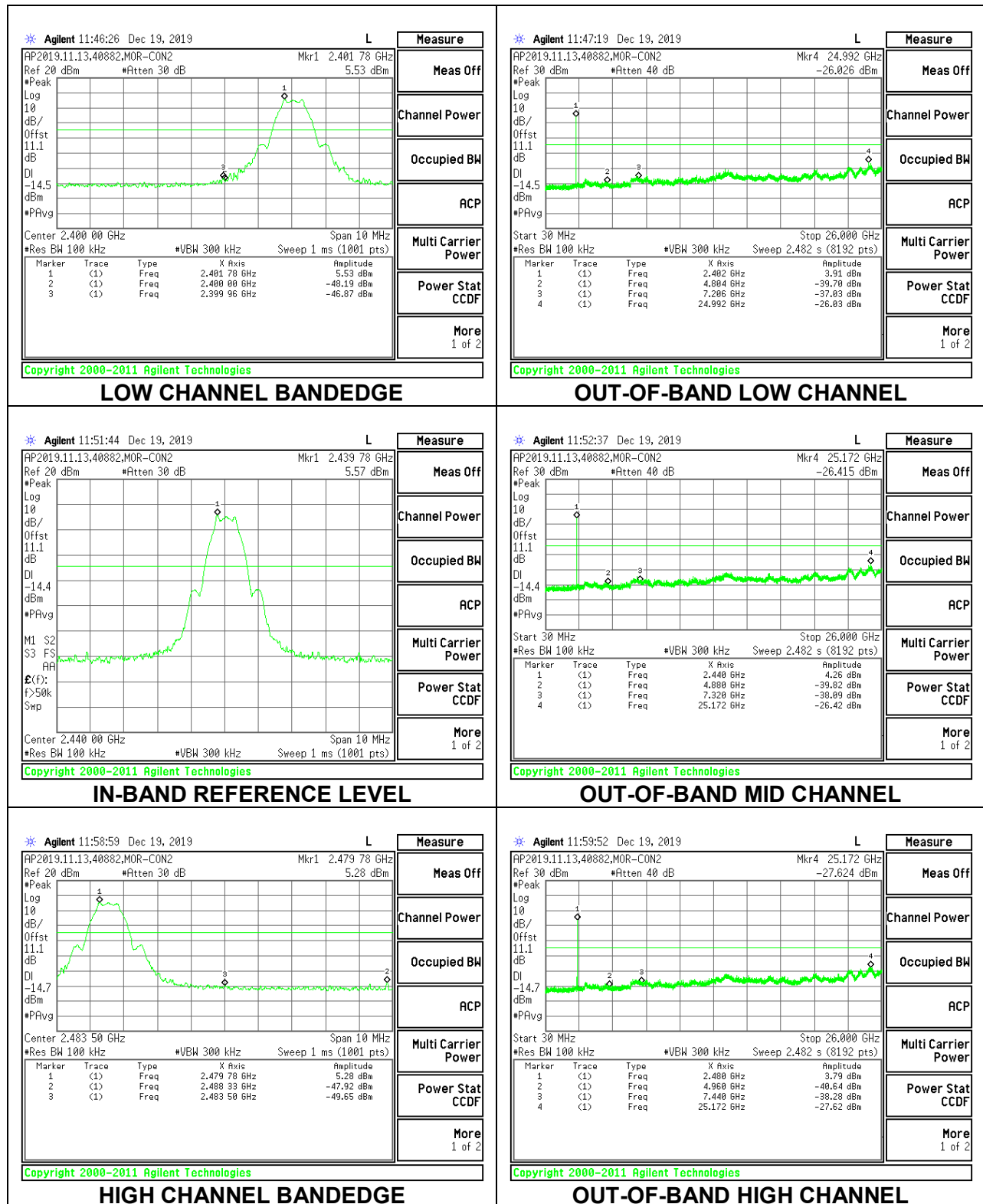
### **LIMITS**

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**

### 8.7.1. BLE (1Mbps)



## 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).

**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.

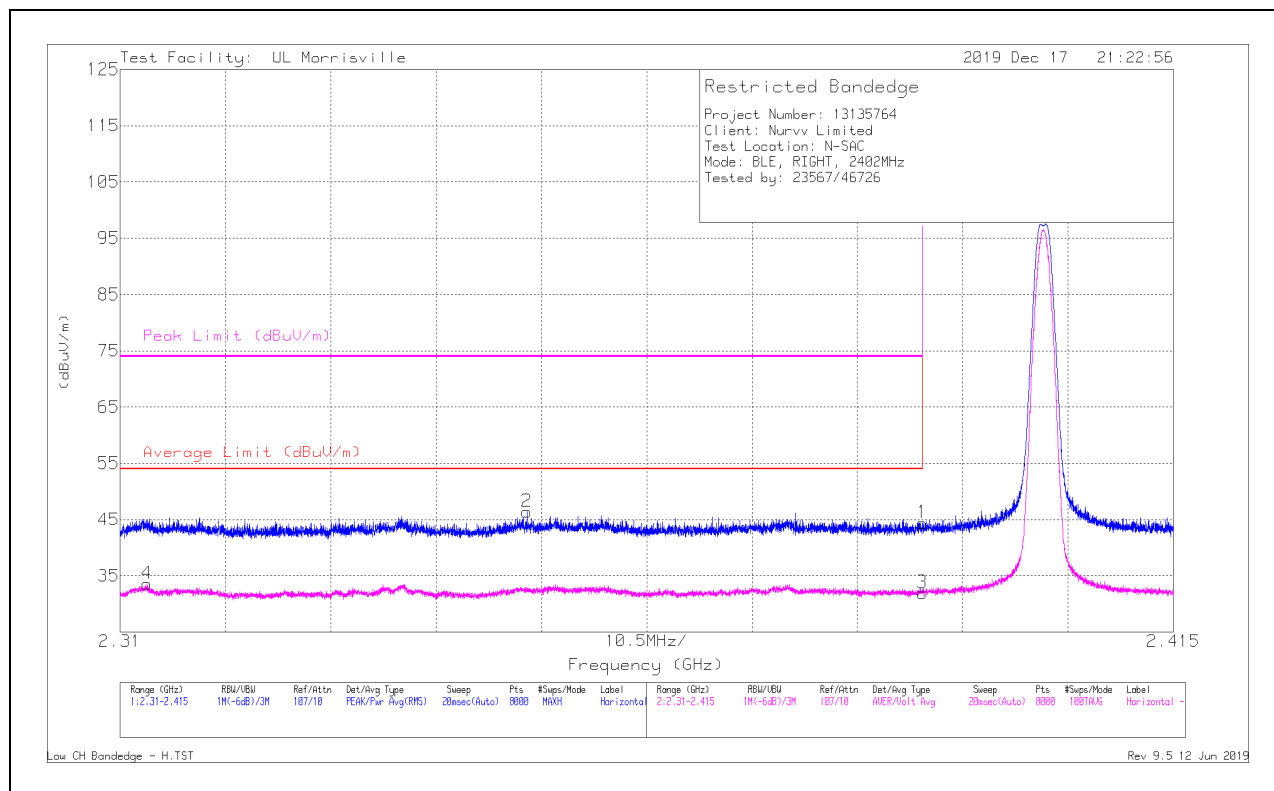
OFS and chamber correlation testing had been performed and chamber measured test result is the worst case test result.

## 9.2. TRANSMITTER ABOVE 1 GHz

### 9.2.1. BLE (1Mbps)

#### 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	36.78	Pk	32	-24.4	44.38	-	-	74	-29.62	236	170	H
2	* 2.35055	38.97	Pk	31.8	-24.4	46.37	-	-	74	-27.63	236	170	H
3	* 2.39	24.3	ADV	32	-24.4	31.9	54	-22.1	-	-	236	170	H
4	* 2.31269	26.28	ADV	31.7	-24.4	33.58	54	-20.42	-	-	236	170	H

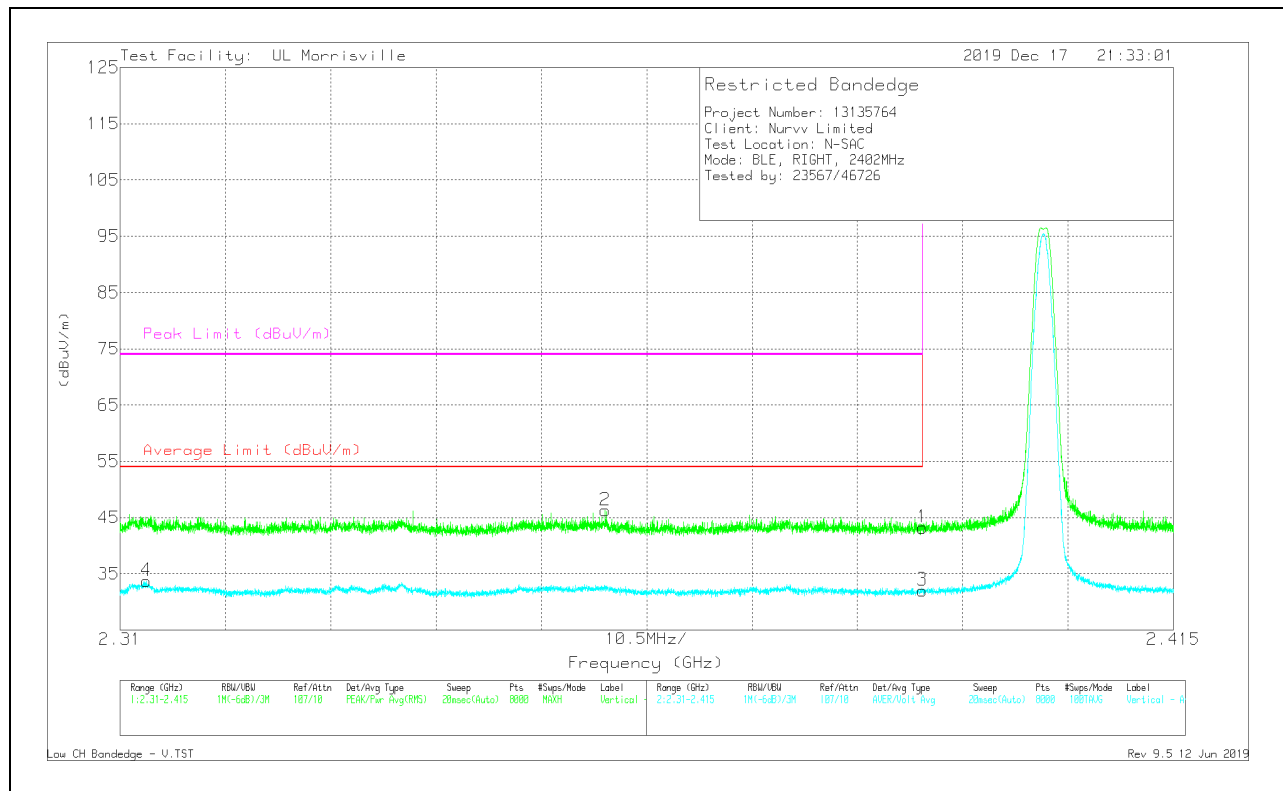
\* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

ADV - Linear Voltage Average



## VERTICAL RESULT

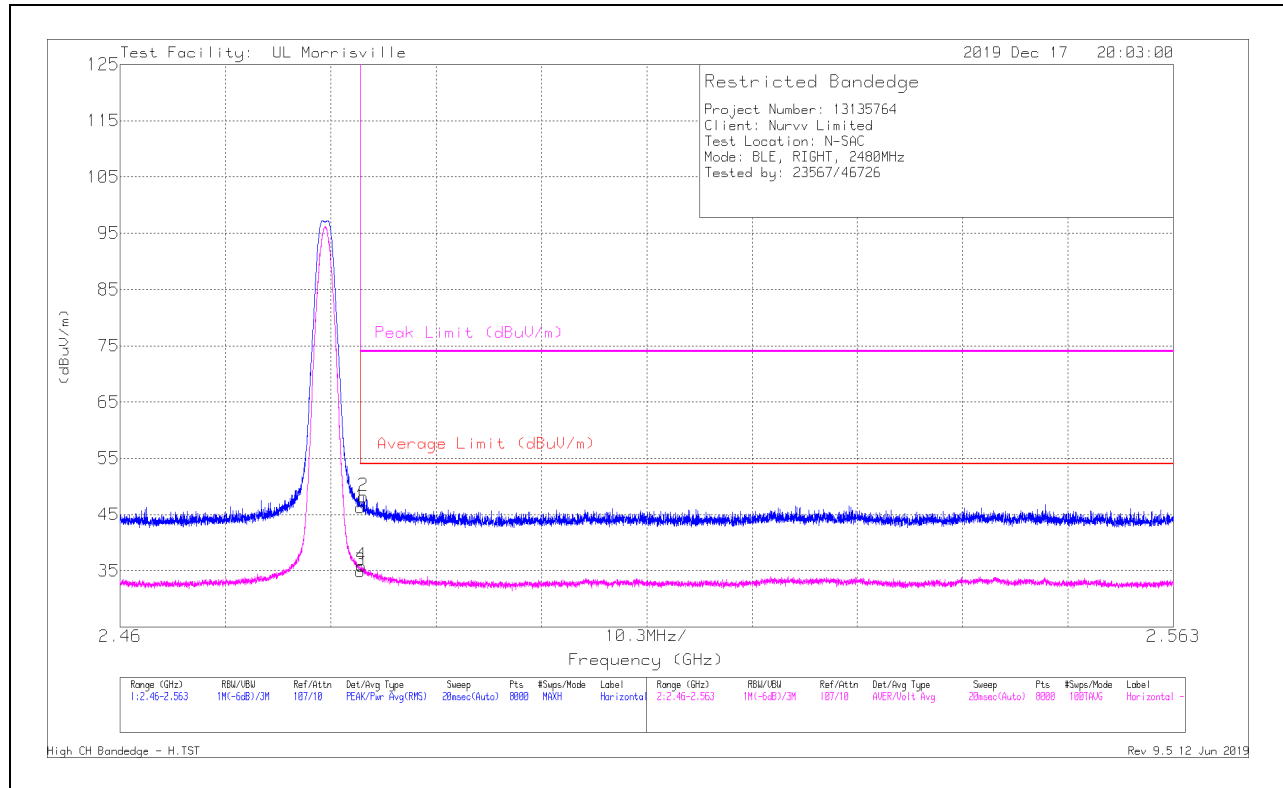


Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0067 AF (dBuV/m)	Amp/Cbl/Filtr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	35.61	Pk	32	-24.4	43.21	-	-	74	-30.79	332	118	V
2	* 2.35836	38.87	Pk	31.8	-24.4	46.27	-	-	74	-27.73	332	118	V
3	* 2.39	24.44	ADV	32	-24.4	32.04	54	-21.96	-	-	332	118	V
4	* 2.31263	26.42	ADV	31.7	-24.4	33.72	54	-20.28	-	-	332	118	V

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

Pk - Peak detector

ADV - Linear Voltage Average

**BANDEGE (HIGH CHANNEL)****HORIZONTAL RESULT**

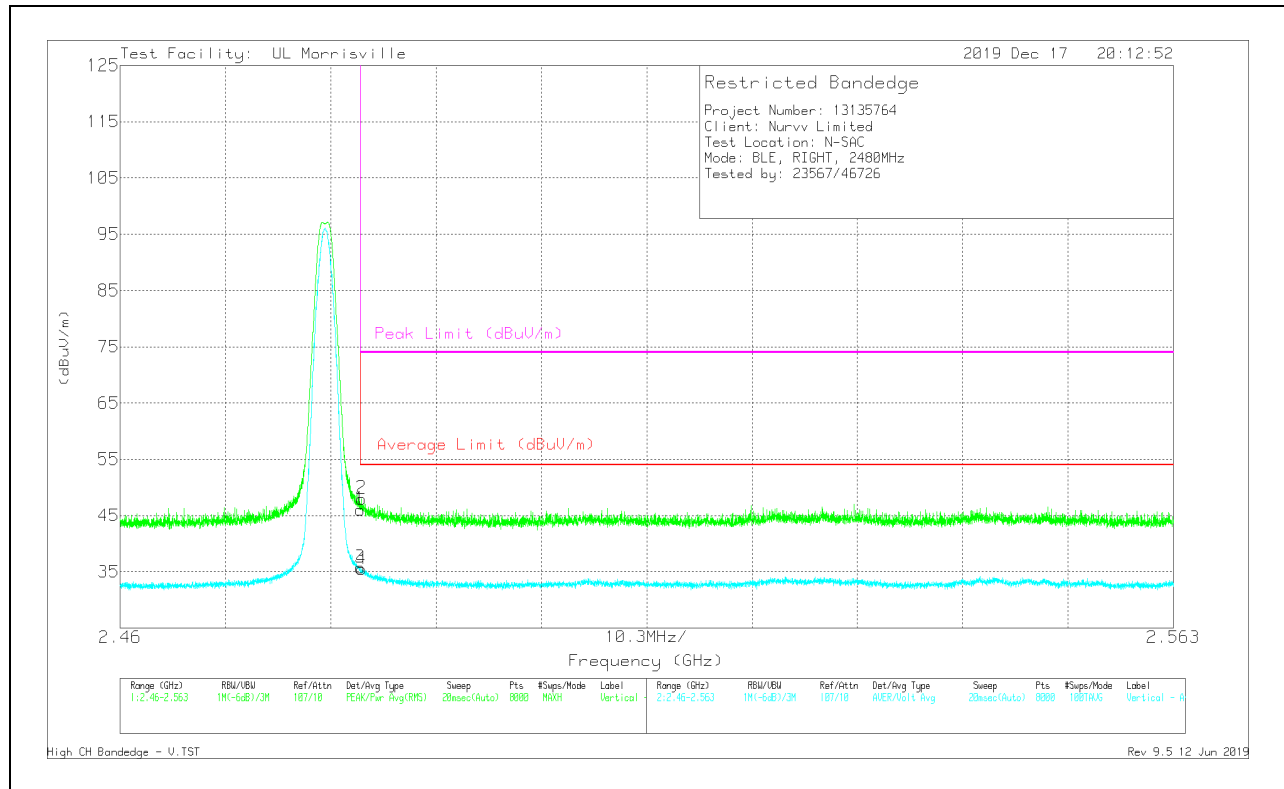
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0067 AF (dBuV/m)	Amp/Cbl/Filtr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.4835	38.2	Pk	32.4	-24.3	46.3	-	-	74	-27.7	163	260	H
2	* 2.48381	40.17	Pk	32.4	-24.3	48.27	-	-	74	-25.73	163	260	H
3	* 2.4835	26.87	ADV	32.4	-24.3	34.97	54	-19.03	-	-	163	260	H
4	* 2.4836	27.79	ADV	32.4	-24.3	35.89	54	-18.11	-	-	163	260	H

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

Pk - Peak detector

ADV - Linear Voltage Average

## 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	37.97	Pk	32.4	-24.3	46.07	-	-	74	-27.93	117	311	V
2	* 2.48363	39.9	Pk	32.4	-24.3	48	-	-	74	-26	117	311	V
3	* 2.4835	27.66	ADV	32.4	-24.3	35.76	54	-18.24	-	-	117	311	V
4	* 2.4836	27.42	ADV	32.4	-24.3	35.52	54	-18.48	-	-	117	311	V

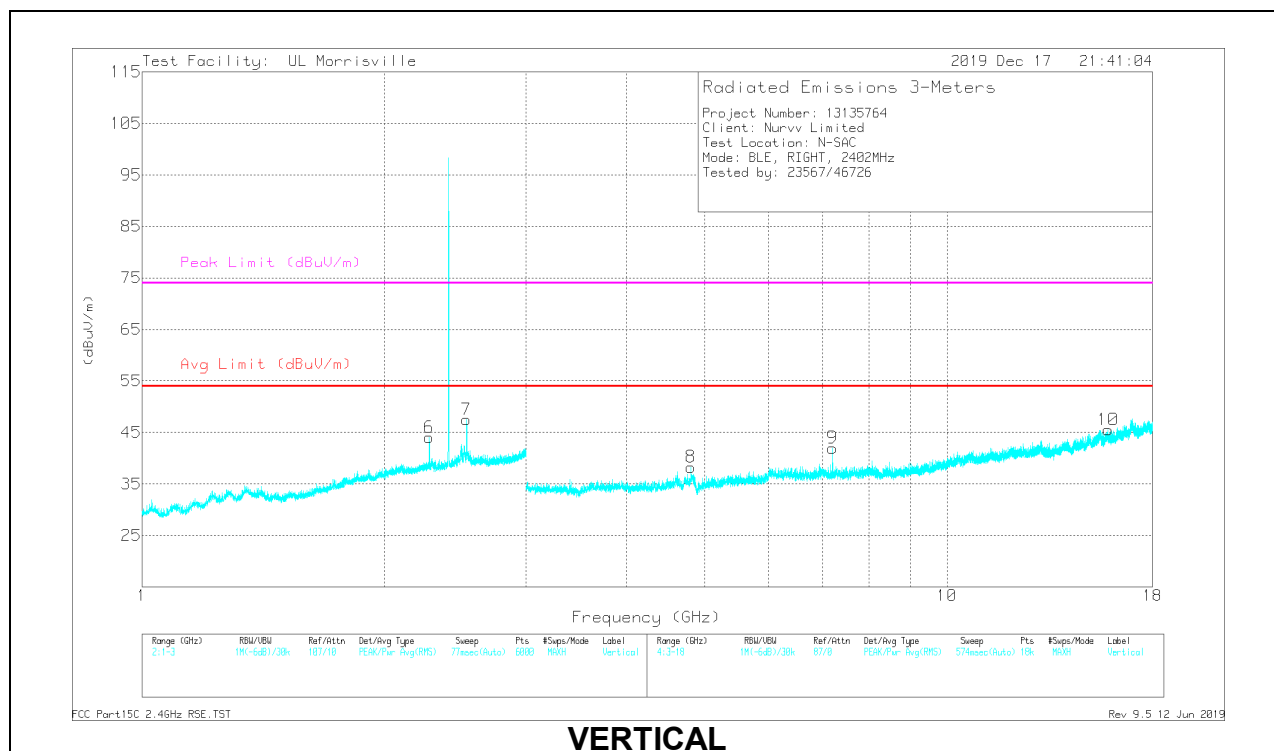
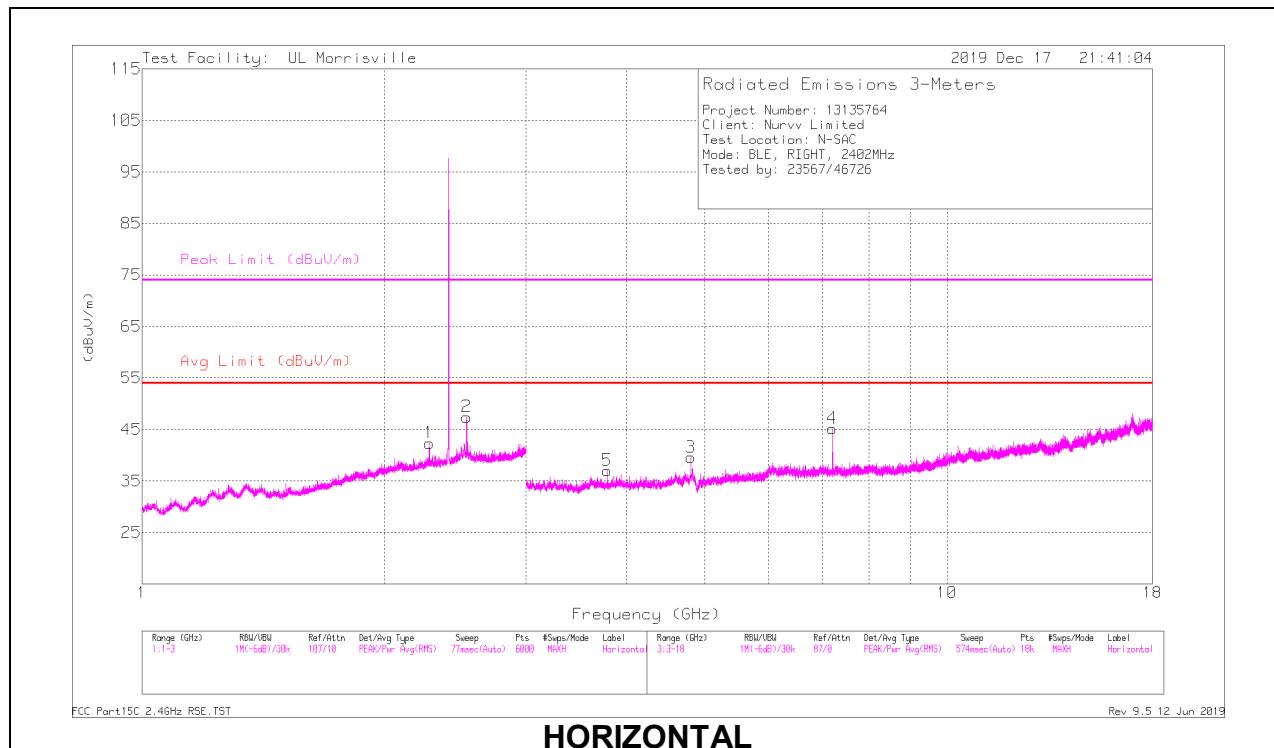
\* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

ADV - Linear Voltage Average

## 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	* 2.27421	43.79	PK2	31.8	-24.3	51.29	-	-	74	-22.71	101	265	H
	* 2.27406	34.78	ADV	31.8	-24.3	42.28	54	-11.72	-	-	101	265	H
6	* 2.27364	42.91	PK2	31.8	-24.3	50.41	-	-	74	-23.59	179	117	V
	* 2.274	34.29	ADV	31.8	-24.3	41.79	54	-12.21	-	-	179	117	V
3	* 4.80461	43.85	PK2	34.1	-31.6	46.35	-	-	74	-27.65	8	129	H
	* 4.80435	34.1	ADV	34.1	-31.6	36.6	54	-17.4	-	-	8	129	H
5	* 3.78125	40.92	PK2	33.4	-33	41.32	-	-	74	-32.68	325	311	H
	* 3.78147	28.1	ADV	33.4	-33	28.5	54	-25.5	-	-	325	311	H
8	* 4.80477	44.29	PK2	34.1	-31.6	46.79	-	-	74	-27.21	54	107	V
	* 4.80391	33.12	ADV	34.1	-31.6	35.62	54	-18.38	-	-	54	107	V
10	* 15.85255	35.6	PK2	40.2	-25.2	50.6	-	-	74	-23.4	266	250	V
	* 15.8528	23.06	ADV	40.2	-25.2	38.06	54	-15.94	-	-	266	250	V
2	2.53026	39.14	Pk	32.6	-24.3	47.44	-	-	-	-	0-360	198	H
7	2.52992	39.19	Pk	32.6	-24.3	47.49	-	-	-	-	0-360	102	V
4	7.20524	39.59	Pk	35.6	-30	45.19	-	-	-	-	0-360	102	H
9	7.2069	36.39	Pk	35.6	-30	41.99	-	-	-	-	0-360	102	V

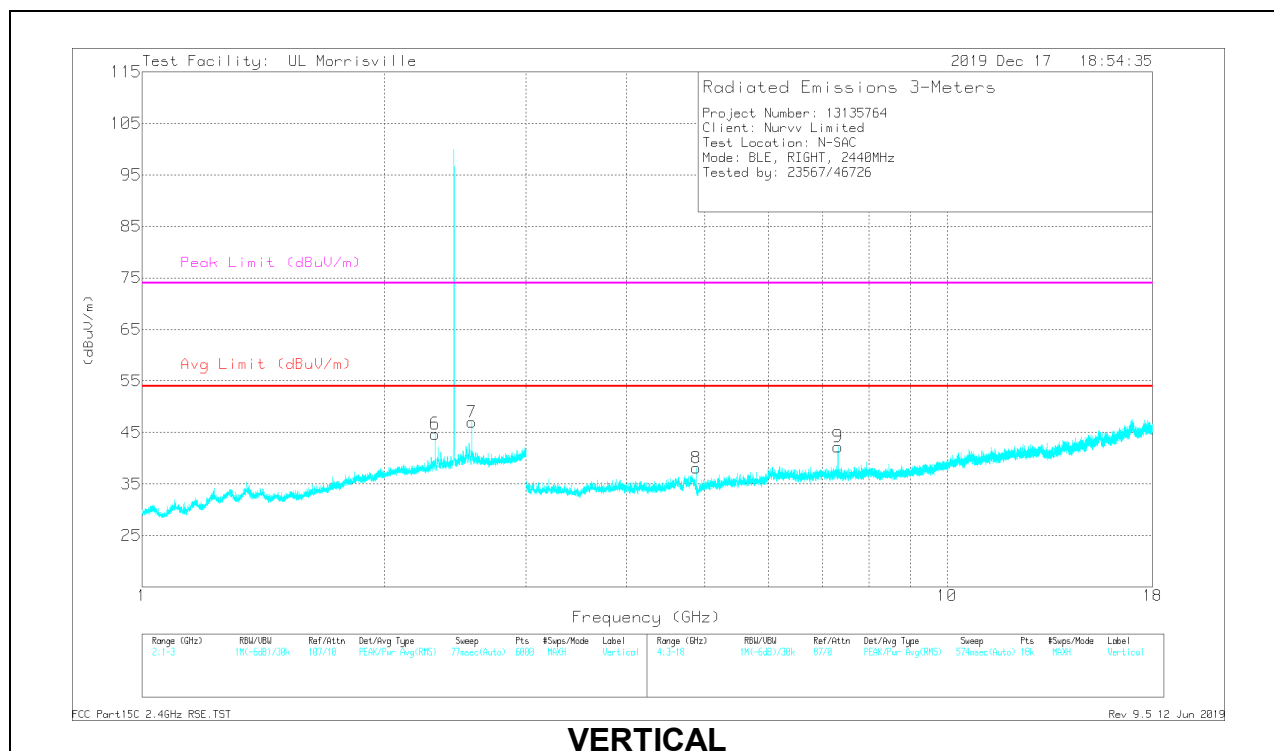
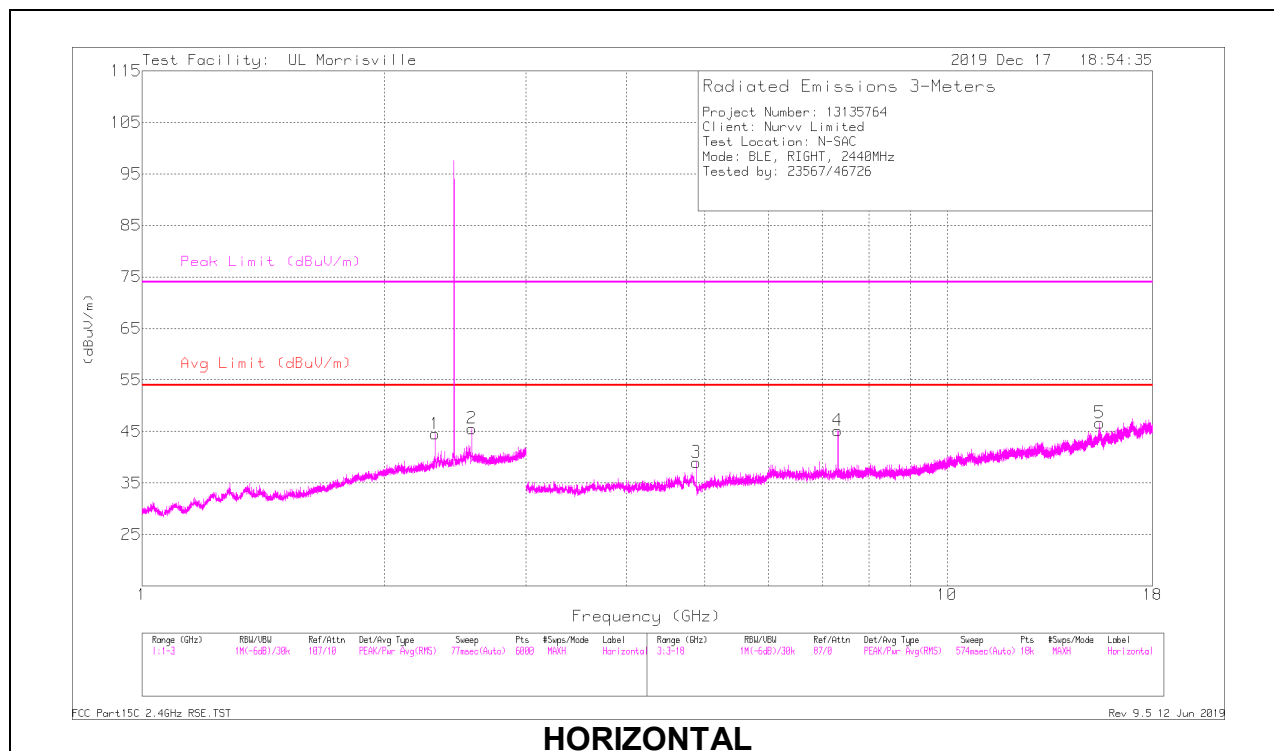
\* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

PK2 - Maximum Peak

ADV - Linear Voltage Average

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	* 2.3123	43.34	PK2	31.7	-24.4	50.64	-	-	74	-23.36	171	106	H
	* 2.31203	34.3	ADV	31.7	-24.4	41.6	54	-12.4	-	-	171	106	H
6	* 2.31168	43.79	PK2	31.7	-24.4	51.09	-	-	74	-22.91	175	115	V
	* 2.31208	35.69	ADV	31.7	-24.4	42.99	54	-11.01	-	-	175	115	V
3	* 4.87972	41.96	PK2	33.9	-31.3	44.56	-	-	74	-29.44	3	105	H
	* 4.88017	32.49	ADV	33.9	-31.3	35.09	54	-18.91	-	-	3	105	H
4	* 7.3208	43.19	PK2	35.6	-29.2	49.59	-	-	74	-24.41	201	172	H
	* 7.32076	33.73	ADV	35.6	-29.2	40.13	54	-13.87	-	-	201	172	H
5	* 15.47905	34.8	PK2	40.1	-23.7	51.2	-	-	74	-22.8	5	344	H
	* 15.48147	22	ADV	40.1	-23.7	38.4	54	-15.6	-	-	5	344	H
8	* 4.87964	42.55	PK2	33.9	-31.3	45.15	-	-	74	-28.85	56	102	V
	* 4.87977	32.41	ADV	33.9	-31.3	35.01	54	-18.99	-	-	56	102	V
9	* 7.32083	42.19	PK2	35.6	-29.2	48.59	-	-	74	-25.41	253	102	V
	* 7.32072	32.2	ADV	35.6	-29.2	38.6	54	-15.4	-	-	253	102	V
2	2.56826	37.48	Pk	32.4	-24.3	45.58	-	-	-	-	0-360	198	H
7	2.56793	38.91	Pk	32.4	-24.3	47.01	-	-	-	-	0-360	102	V

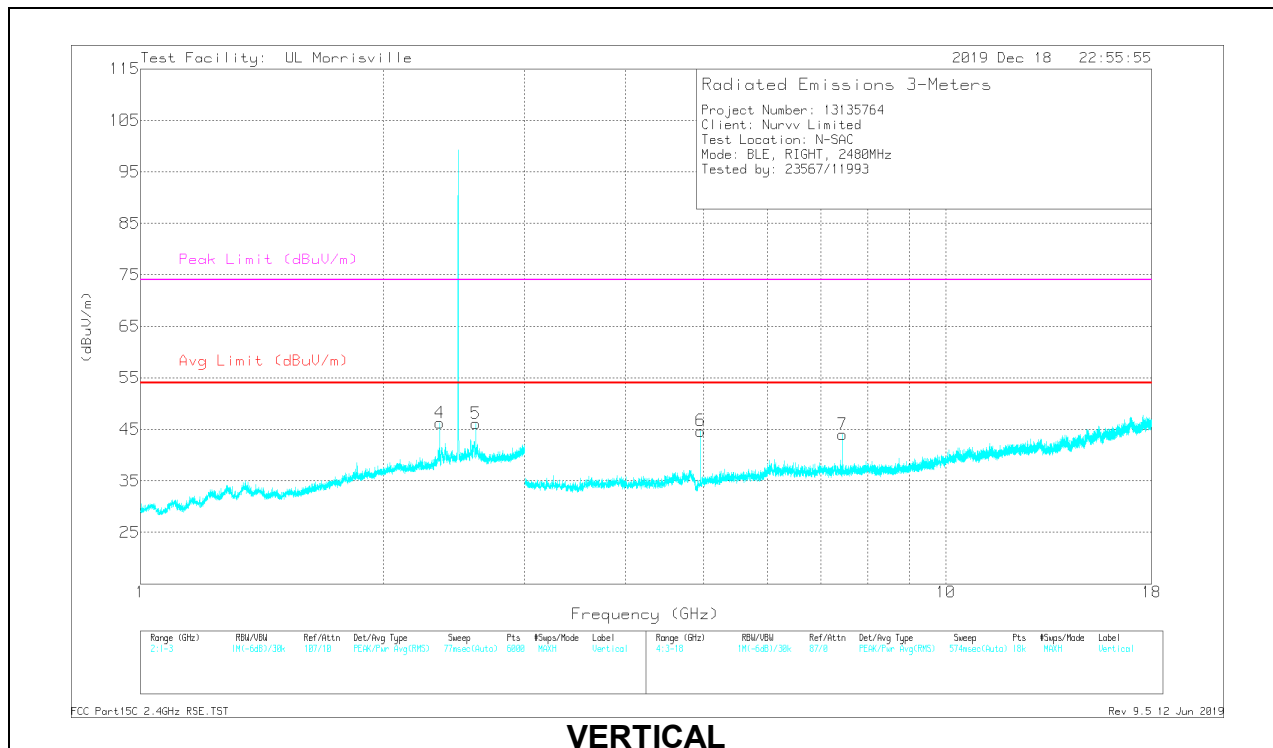
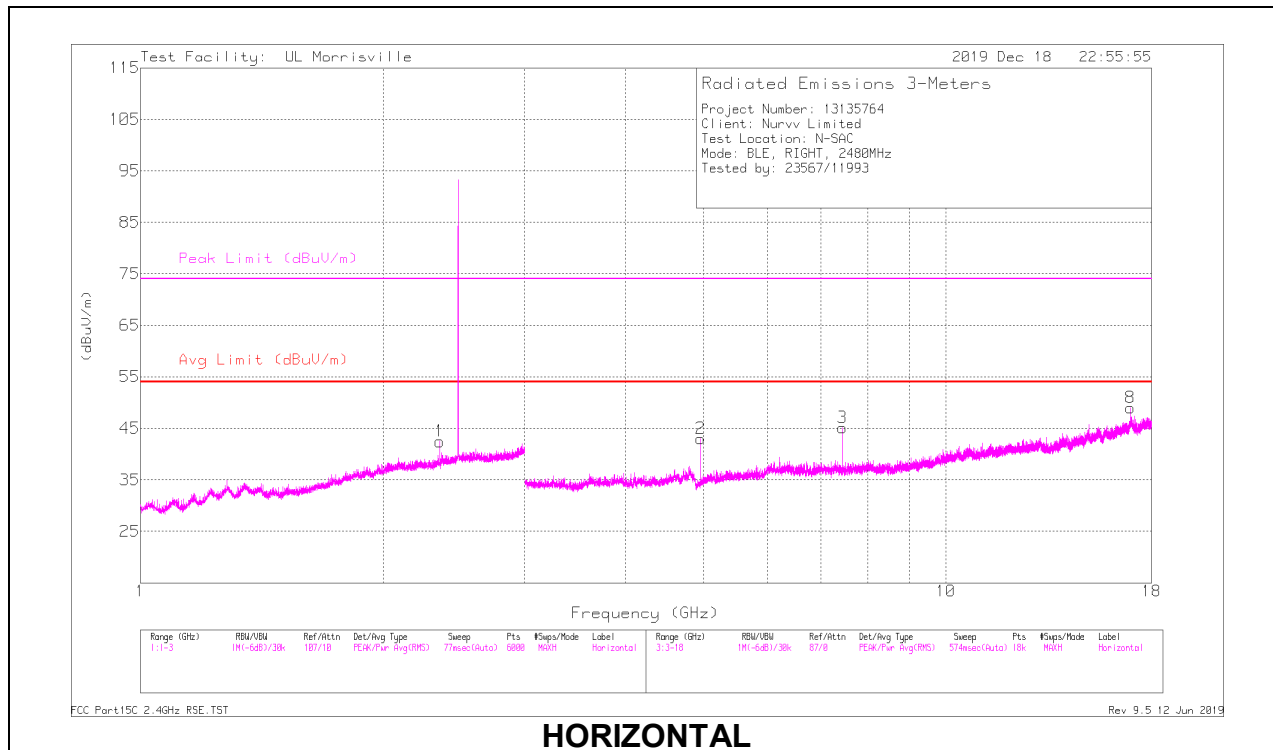
\* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

PK2 - Maximum Peak

ADV - Linear Voltage Average

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	* ** 2.35158	39.13	PK2	31.8	-24.4	46.53	-	-	74	-27.47	119	194	H
	* ** 2.35197	27.9	ADV	31.8	-24.4	35.3	54	-18.7	-	-	119	194	H
4	* ** 2.35216	44.05	PK2	31.8	-24.4	51.45	-	-	74	-22.55	287	102	V
	* ** 2.35199	36.08	ADV	31.8	-24.4	43.48	54	-10.52	-	-	287	102	V
5	** 2.60785	44.05	PK2	32.4	-24.2	52.25	-	-	74	-21.75	316	104	V
	** 2.60804	34.76	ADV	32.4	-24.2	42.96	54	-11.04	-	-	316	104	V
2	* ** 4.9604	44.73	PK2	33.9	-32.3	46.33	-	-	74	-27.67	75	102	H
	* ** 4.96032	37.26	ADV	33.9	-32.3	38.86	54	-15.14	-	-	75	102	H
3	* ** 7.44095	44	PK2	35.6	-29.2	50.4	-	-	74	-23.6	79	187	H
	* ** 7.43948	35.16	ADV	35.6	-29.2	41.56	54	-12.44	-	-	79	187	H
6	* ** 4.95958	46.45	PK2	33.9	-32.3	48.05	-	-	74	-25.95	140	104	V
	* ** 4.95958	37.91	ADV	33.9	-32.3	39.51	54	-14.49	-	-	140	104	V
7	* ** 7.43944	43.02	PK2	35.6	-29.2	49.42	-	-	74	-24.58	123	199	V
	* ** 7.43951	33.88	ADV	35.6	-29.2	40.28	54	-13.72	-	-	123	199	V
8	16.93995	30.9	Pk	41.4	-23.3	49	-	-	-	-	0-360	198	H

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

\*\* - indicates frequency in Taiwan NCC LP0002 Restricted Band

PK2 - Maximum Peak

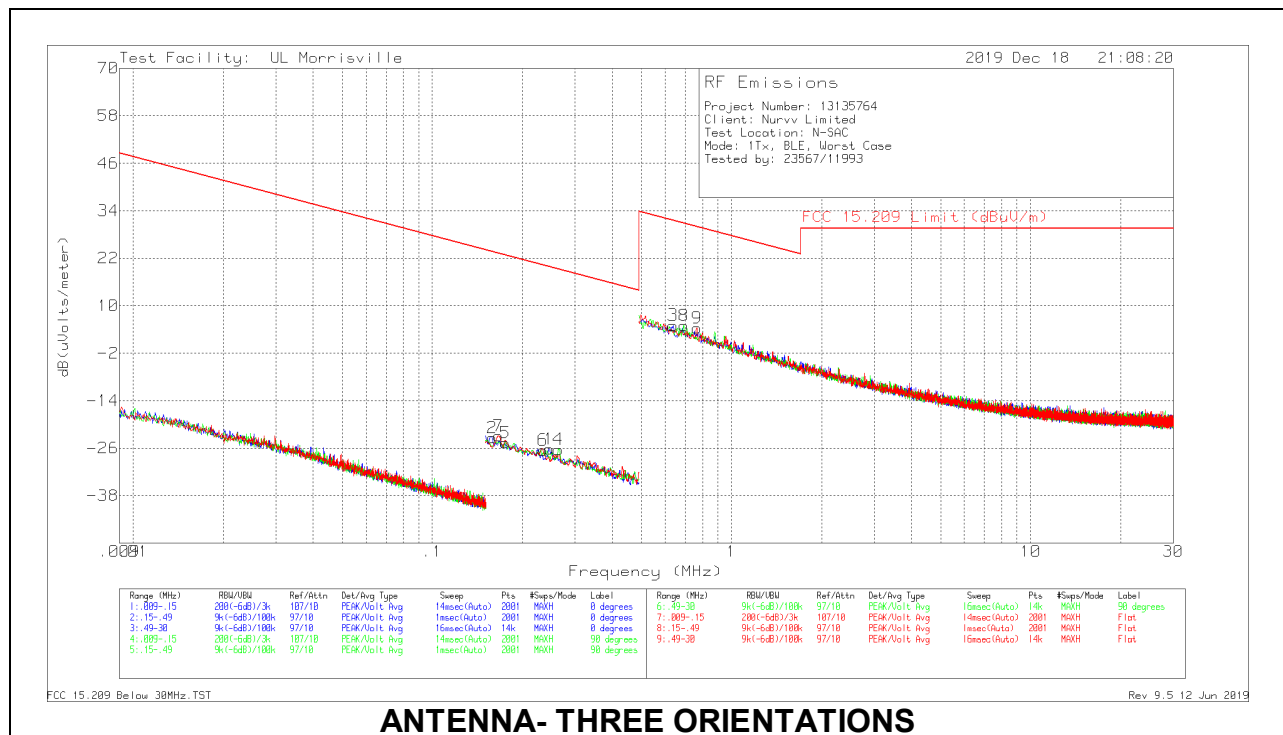
ADV - Linear Voltage Average

Pk - Peak detector

### 9.3. WORST CASE BELOW 30MHZ

#### SPURIOUS EMISSIONS BELOW 30 MHz (WORST-CASE CONFIGURATION)

Note: All measurements were made at a test distance of 3 m. The measured data was extrapolated from the test distance (3m) to the specification distance (300 m from 9-490 kHz and 30 m from 490 kHz – 30 MHz) to clearly show the relative levels of fundamental and spurious emissions and demonstrate compliance with the requirement that the level of any spurious emissions be below the level of the intentionally transmitted signal. The extrapolation factor for the limits were 40\*Log (test distance / specification distance).



#### ANTENNA- THREE ORIENTATIONS

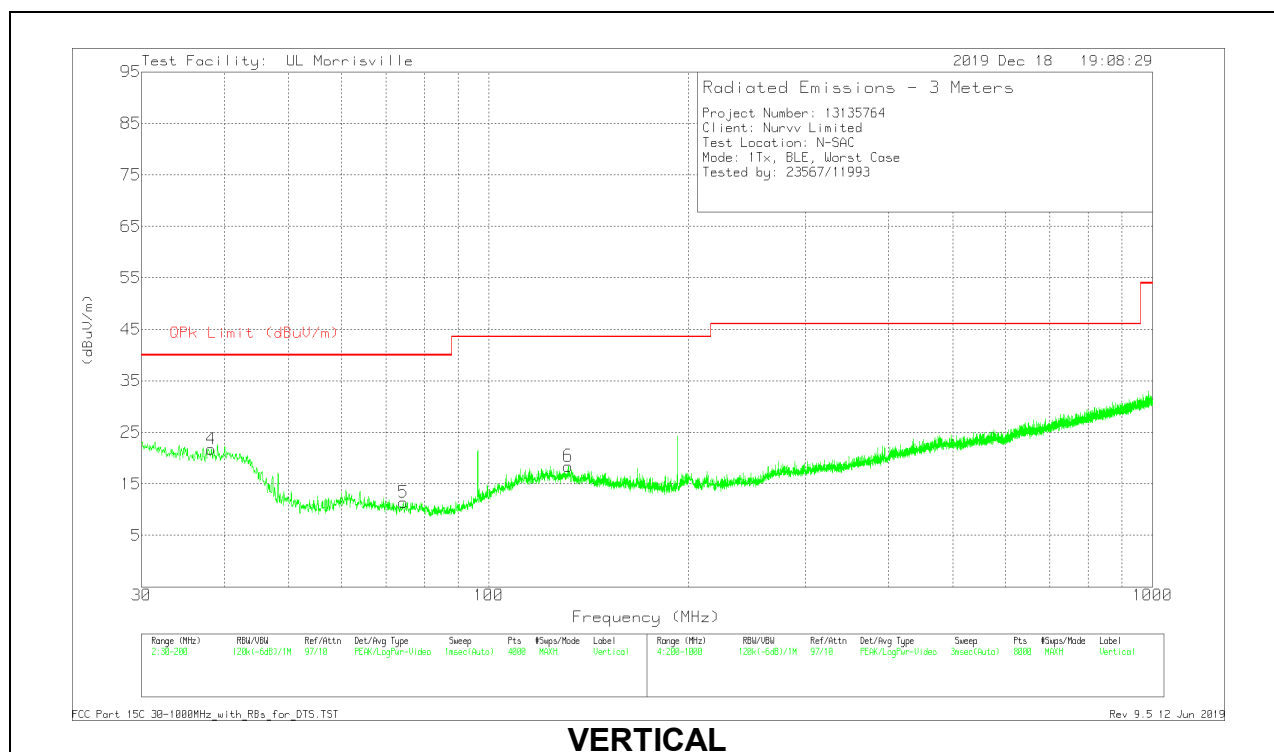
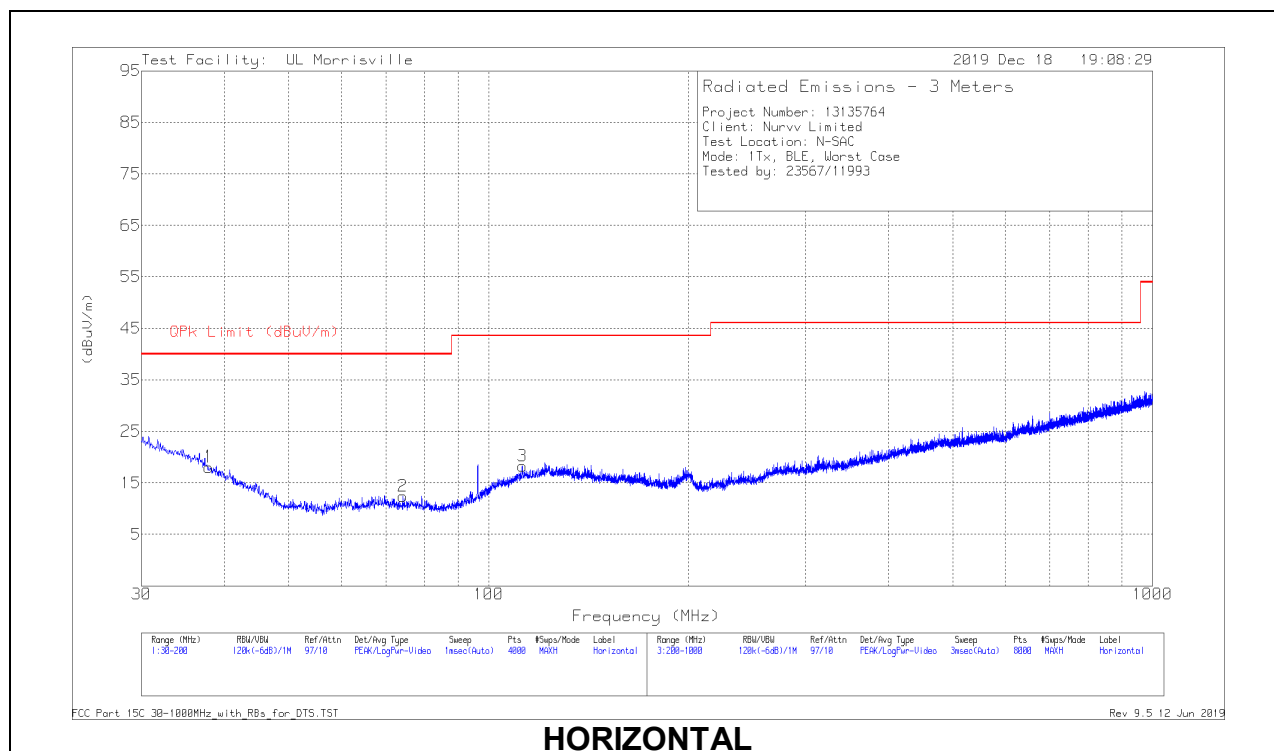
#### Below 30MHz Data

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 Qp/Avg Limit (dBuV/m)	FCC 15.209 Pk Limit (dBuV/m)	Worst-case Margin (dB)	Azimuth (Degs)
2	.15833	45.47	Pk	11	.1	-80	-23.43	23.61	43.61	-47.04	0-360
7	.16649	46	Pk	11	.1	-80	-22.9	23.18	43.18	-46.08	0-360
5	.17567	44.29	Pk	11	.1	-80	-24.61	22.71	42.71	-47.32	0-360
6	.23449	42.41	Pk	11	.1	-80	-26.49	20.2	40.2	-46.69	0-360
1	.2458	42.68	Pk	11	.1	-80	-26.22	19.79	39.79	-46.01	0-360
4	.26373	42.58	Pk	11	.1	-80	-26.32	19.18	39.18	-45.5	0-360
3	.63756	33.94	Pk	11	.1	-40	5.04	31.51	-	-26.47	0-360
8	.69237	33.88	Pk	11	.1	-40	4.98	30.8	-	-25.82	0-360
9	.76615	33.25	Pk	11	.1	-40	4.35	29.92	-	-25.57	0-360

Pk - Peak detector

## 9.4. WORST CASE BELOW 1 GHZ

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



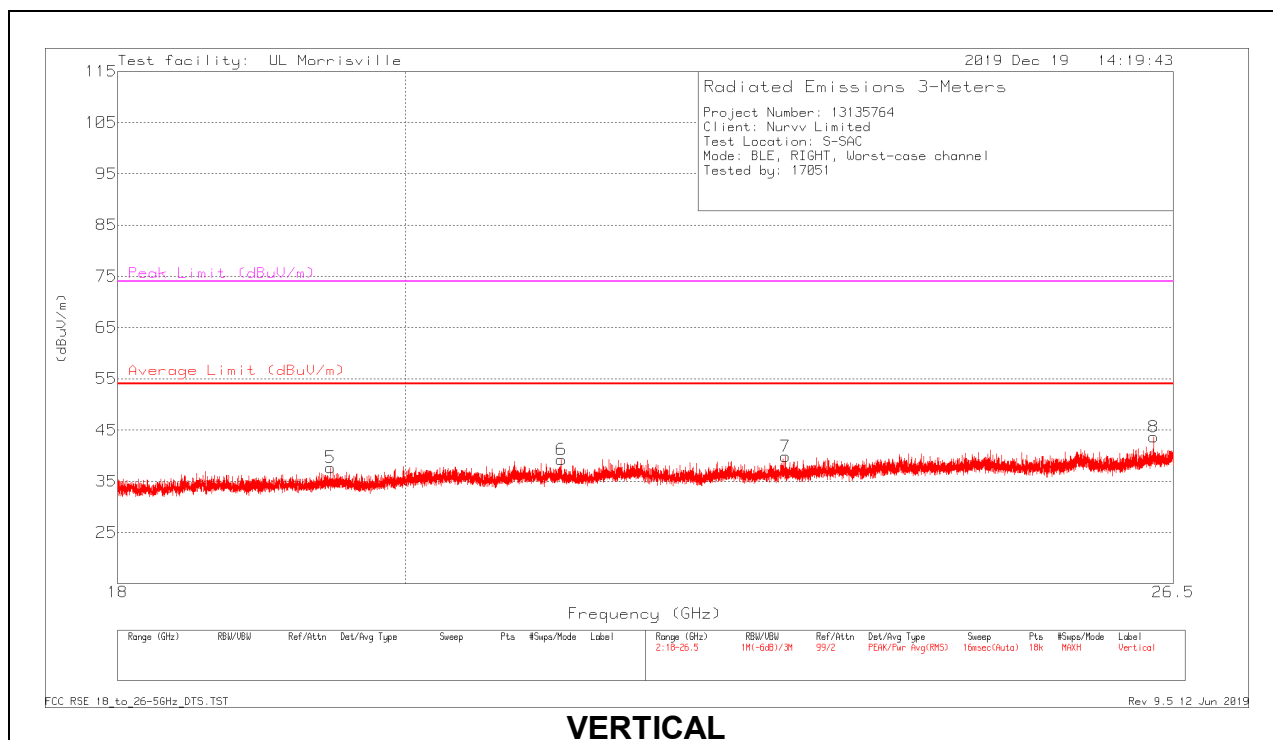
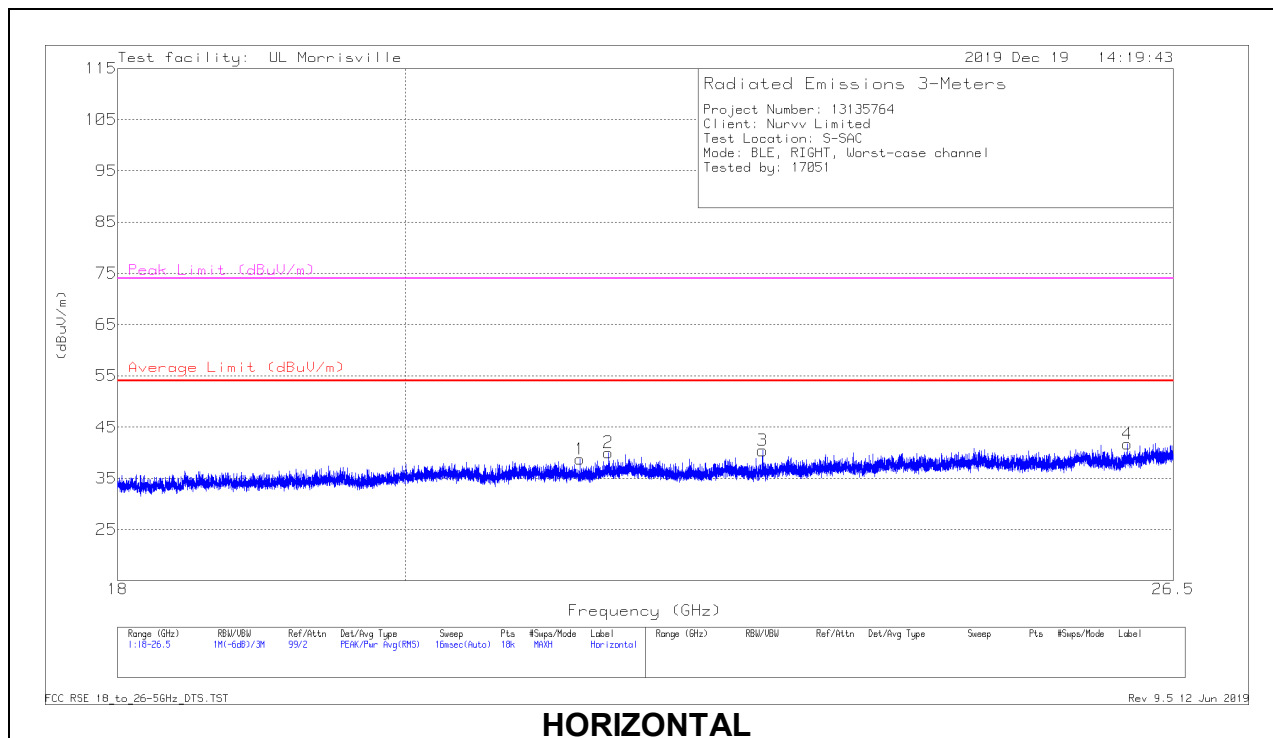
## Below 1GHz Data

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AT0073 AF (dB/m)	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 37.8645	28.35	Pk	21.4	-31.7	18.05	40	-21.95	0-360	399	H
2	* 74.2965	29.49	Pk	14	-31.1	12.39	40	-27.61	0-360	199	H
3	* 112.3863	29.95	Pk	19.1	-30.8	18.25	43.52	-25.27	0-360	299	H
4	* 38.2046	32.28	Pk	21.1	-31.6	21.78	40	-18.22	0-360	102	V
5	* 74.3815	28.48	Pk	14	-31.1	11.38	40	-28.62	0-360	102	V
6	* 131.8564	29.43	Pk	19.7	-30.7	18.43	43.52	-25.09	0-360	102	V

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

## 9.5. WORST CASE 18-26 GHZ

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



## 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	* 21.32368	40.07	Pk	33.2	-34.5	38.77	54	-15.23	74	-35.23	0-360	198	H
3	* 22.79757	40.82	Pk	33.6	-34	40.42	54	-13.58	74	-33.58	0-360	198	H
5	* 19.46066	40.37	Pk	32.8	-35.5	37.67	54	-16.33	74	-36.33	0-360	202	V
6	* 21.17823	40.64	Pk	33.1	-34.5	39.24	54	-14.76	74	-34.76	0-360	152	V
7	* 22.98788	39.82	Pk	33.8	-33.8	39.82	54	-14.18	74	-34.18	0-360	298	V
2	21.54611	41.01	Pk	33.4	-34.4	40.01	54	-13.99	74	-33.99	0-360	148	H
4	26.05608	39.68	Pk	34.8	-32.8	41.68	54	-12.32	74	-32.32	0-360	198	H
8	26.31062	41.39	Pk	35	-32.7	43.69	54	-10.31	74	-30.31	0-360	252	V

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

## 10. AC POWER LINE CONDUCTED EMISSIONS

### LIMITS

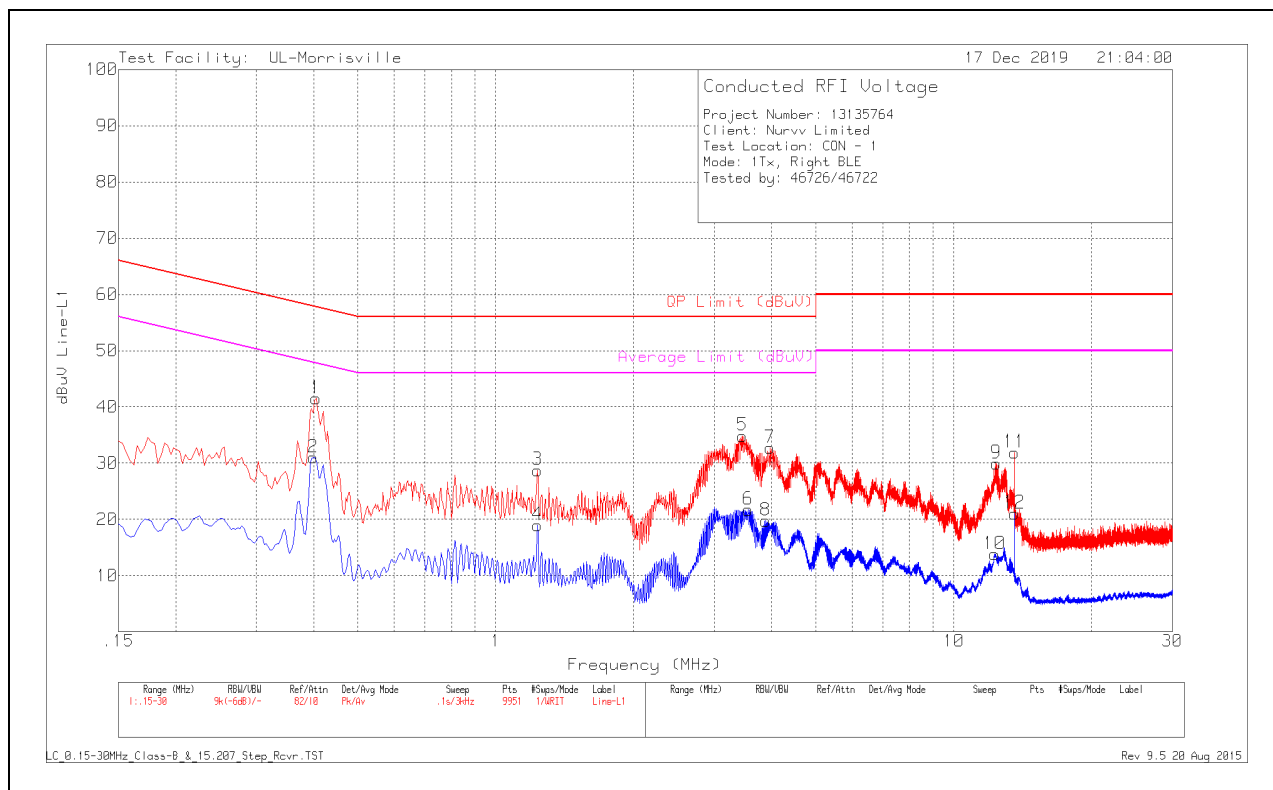
FCC §15.207 (a)  
RSS-Gen 8.8

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

## LINE 1 RESULTS

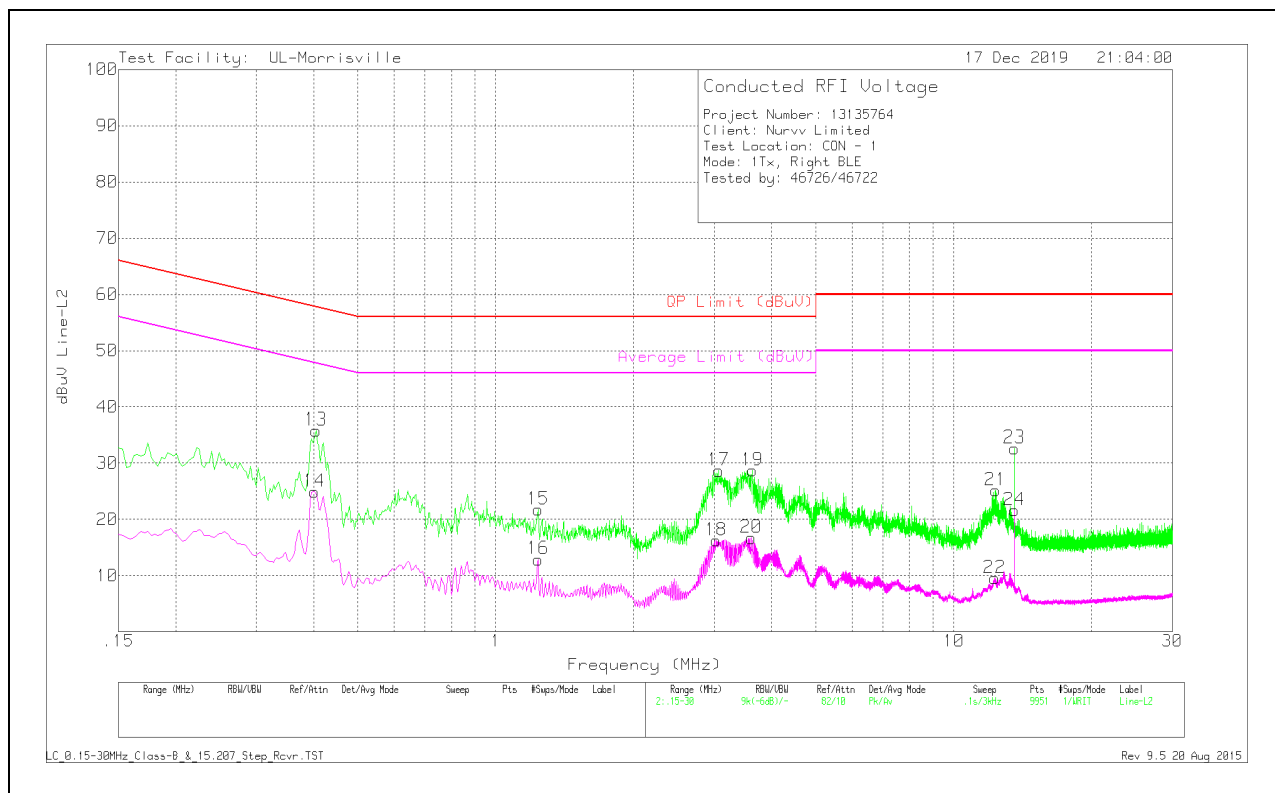


Range 1: Line-L1 .15 - 30MHz										
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	LISN VCF (dB)	Cbl/Limiter (dB)	Corrected Reading dBuV	QP Limit (dBuV)	Margin (dB)	Average Limit (dBuV)	Margin (dB)
1	.405	31.42	Pk	.1	10	41.52	57.75	-16.23	-	-
2	.399	20.93	Av	.1	10	31.03	-	-	47.87	-16.84
3	1.233	18.77	Pk	0	10	28.77	56	-27.23	-	-
4	1.233	8.98	Av	0	10	18.98	-	-	46	-27.02
5	3.453	24.67	Pk	.1	10.1	34.87	56	-21.13	-	-
6	3.555	11.5	Av	.1	10.1	21.7	-	-	46	-24.3
7	3.972	22.51	Pk	.1	10.1	32.71	56	-23.29	-	-
8	3.888	9.55	Av	.1	10.1	19.75	-	-	46	-26.25
9	12.381	19.47	Pk	.1	10.4	29.97	60	-30.03	-	-
10	12.279	3.34	Av	.1	10.4	13.84	-	-	50	-36.16
11	13.56	21.41	Pk	.1	10.4	31.91	60	-28.09	-	-
12	13.56	10.57	Av	.1	10.4	21.07	-	-	50	-28.93

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	.405	25.72	Pk	.1	10	35.82	57.75	-21.93	-	-
14	.402	14.84	Av	.1	10	24.94	-	-	47.81	-22.87
15	1.236	11.77	Pk	0	10	21.77	56	-34.23	-	-
16	1.236	2.91	Av	0	10	12.91	-	-	46	-33.09
17	3.069	18.56	Pk	0	10.1	28.66	56	-27.34	-	-
18	3.03	6.15	Av	0	10.1	16.25	-	-	46	-29.75
19	3.636	18.63	Pk	0	10.1	28.73	56	-27.27	-	-
20	3.612	6.6	Av	0	10.1	16.7	-	-	46	-29.3
21	12.336	14.65	Pk	.1	10.4	25.15	60	-34.85	-	-
22	12.282	-95	Av	.1	10.4	9.55	-	-	50	-40.45
23	13.56	22.15	Pk	.1	10.4	32.65	60	-27.35	-	-
24	13.56	11.14	Av	.1	10.4	21.64	-	-	50	-28.36

Pk - Peak detector  
Av - Average detection

## **11. SETUP PHOTOS**

Please refer to R1315764-EP1 for setup photos.

## **END OF TEST REPORT**