



CERTIFICATION TEST REPORT

Report Number. : R12924905-E4

Applicant : Bose Corporation
100 The Mountain
Framingham, MA 01701, USA

Model : 431389RF

FCC ID : A94431389RF

IC : 3232A-431389RF

EUT Description : BT/BLE RF module

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

Date Of Issue:
2020-02-12

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REPORT REVISION HISTORY

Rev.	Issue Date	Revisions	Revised By
--	--	Initial Issue	--
V2	2019-10-05	Updated model and FCC/IC IDs	Niklas Haydon
v3	2020-02-12	Revised OBW data in Section 8.2.1	Brian T. Kiewra

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: Bose Corporation
100 The Mountain
Framingham, MA 01701, USA

EUT DESCRIPTION: BT/BLE RF module

MODEL: 431389RF

SERIAL NUMBER: Rev 1-1, Rev 1-6, Rev 1-17

DATE TESTED: 2019-08-13 to 2020-02-12

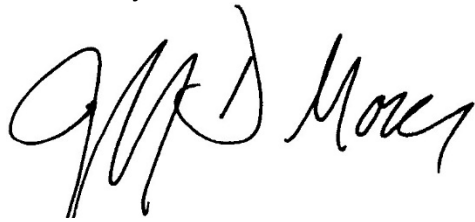
APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
CFR 47 Part 15 Subpart C	Complies
ISED RSS-247 Issue 2	Complies
ISED RSS-GEN Issue 5	Complies

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.

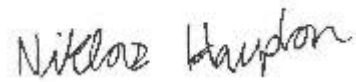
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2. TEST METHODOLOGY

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., Suite B	
ISED Site Code: 2180C			
☐	Chamber A RTP	☒	North Chamber
☐	Chamber C RTP	☒	South Chamber

The above test sites and facilities are covered under FCC Test Firm Registration # 703469. Chambers above are covered under Industry Canada company address and respective code.

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

4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

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

4.2. SAMPLE CALCULATION

RADIATED EMISSIONS

Where relevant, the following sample calculation is provided:

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

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

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
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 BT/BLE RF module.

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	4.77	3.00

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes an external dipole antenna, with a maximum gain of 0 dBi.

5.4. SOFTWARE AND FIRMWARE

The firmware installed in the EUT during testing was 0.3.001

The EUT driver software installed in the host support equipment during testing was 100.0.0.0

The test utility software, BlueTest3, used during testing was 3.1.4

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

5.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List			
Description	Manufacturer	Model	Serial Number
Laptop	Lenovo	T450s	RTP0416PC0BHFP3
Laptop Charger	Lenovo	ADLX65NDC2A	11S45N0255Z1ZSH953B8X2

I/O CABLES

I/O Cable List						
Cable No.	Port	# of Identical Ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	USB	1	USB Type C	USB	<2	None

TEST SETUP

The EUT is connected to a test laptop during the tests. Test software exercised the radio card.

SETUP DIAGRAMS

Please refer to R12924905-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 -11.8.1

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

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

AC Line Conducted Emissions: ANSI C63.10:2013 Sections 6.2

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				
AT0074	Hybrid Broadband Antenna	Sunol Sciences Corp.	JB3	2019-07-16	2020-07-16
	1-18 GHz				
AT0067	Double-Ridged Waveguide Horn Antenna, 1 to 18 GHz	ETS Lindgren	3117	2019-03-22	2020-03-22
	18-40 GHz				
AT0076	Horn Antenna, 18-26.5GHz	ARA	MWH-1826/B	2018-11-08	2019-11-08
	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
N-SAC04	Gain-loss string: 18-40GHz	Various	Various	2018-09-30	2019-09-30
	Receiver & Software				
SA0026	Spectrum Analyzer	Agilent	N9030A	2019-03-19	2020-03-19
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 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.
	1-18 GHz				
AT0072	Double-Ridged Waveguide Horn Antenna, 1 to 18 GHz	ETS Lindgren	3117	2019-04-22	2020-04-22
	Gain-Loss Chains				
S-SAC03	Gain-loss string: 1-18GHz	Various	Various	2019-03-13	2020-03-13
	Receiver & Software				
SA0025	Spectrum Analyzer	Agilent	N9030A	2019-02-28	2020-02-28
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

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

Equipment ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
CBL087	Coax cable, RG223, N-male to BNC-male, 20-ft.	Pasternack	PE3W06143-240	2019-05-29	2020-05-29
s/n 161016511	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	2019-08-21	2020-08-22
TL001	Transient Limiter, 0.009-30MHz	Com-Power	LIT-930A	2019-05-29	2020-05-29
PS215	AC Power Source	Elgar	CW2501M (s/n 1523A02397)	NA	NA
SOFTEMI	EMI Software	UL	Version 9.5	NA	NA

Test Equipment Used - Wireless Conducted Measurement Equipment (Morrisville – Conducted 2)

Equipment ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
72822 (PRE0100902)	Spectrum Analyzer	Agilent Technologies	E4446A	2018-11-19	2019-11-19
72822 (PRE0100902)	Spectrum Analyzer	Agilent Technologies	E4446A	2020-01-02	2021-01-02
PWM005	RF Power Meter	Keysight Technologies	N1911A	2019-07-08	2020-07-08
PWS005	Peak and Avg Power Sensor, 50MHz to 6GHz	Keysight Technologies	E9323A	2019-05-06	2020-07-08
76023 (EC0225)	Temp/Humid Chamber	Cincinnati Sub-Zero	ZPH-8-3.5-SCT/AC	2019-06-14	2020-06-14
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

8. ANTENNA PORT TEST RESULTS

8.1. ON TIME AND DUTY CYCLE

LIMITS

None; for reporting purposes only.

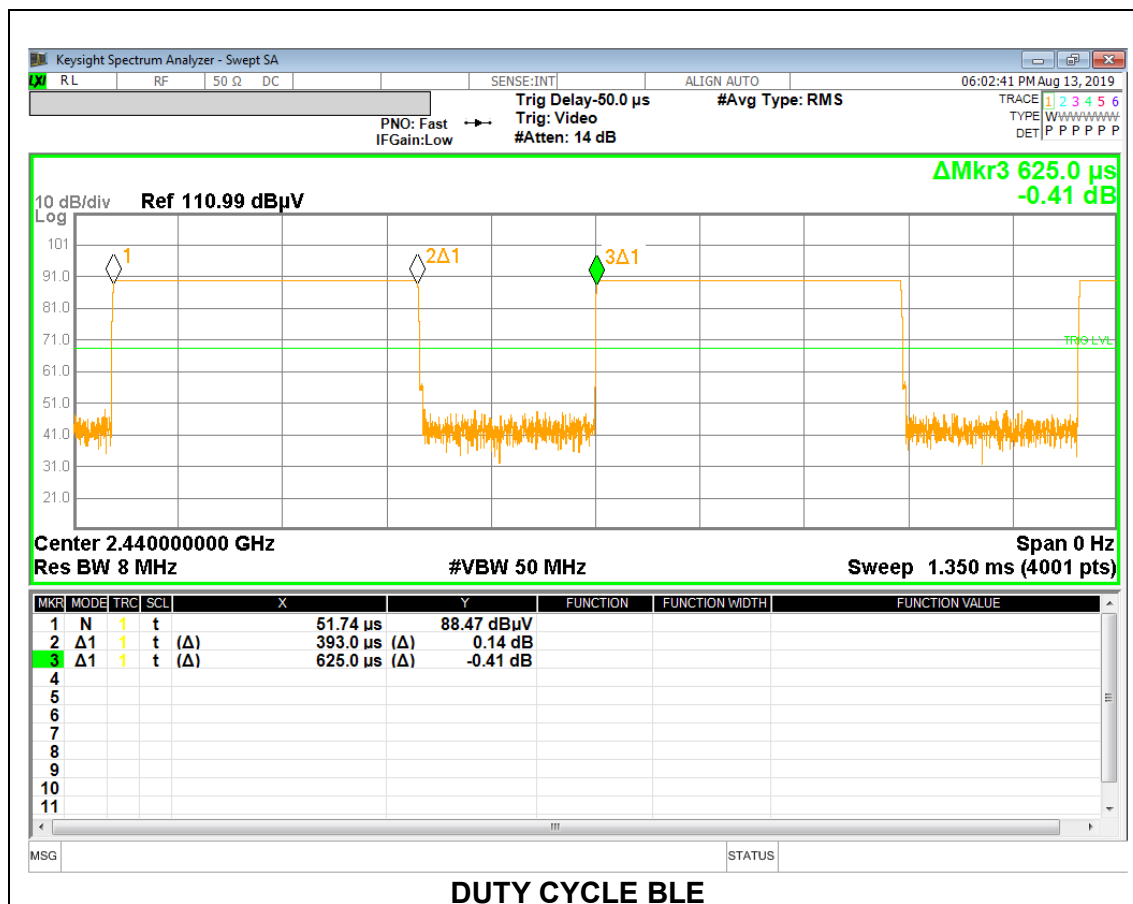
PROCEDURE

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	0.393	0.625	0.629	62.88%	2.01	2.545

DUTY CYCLE PLOTS



Tested by: 17051

8.2. 99% BANDWIDTH

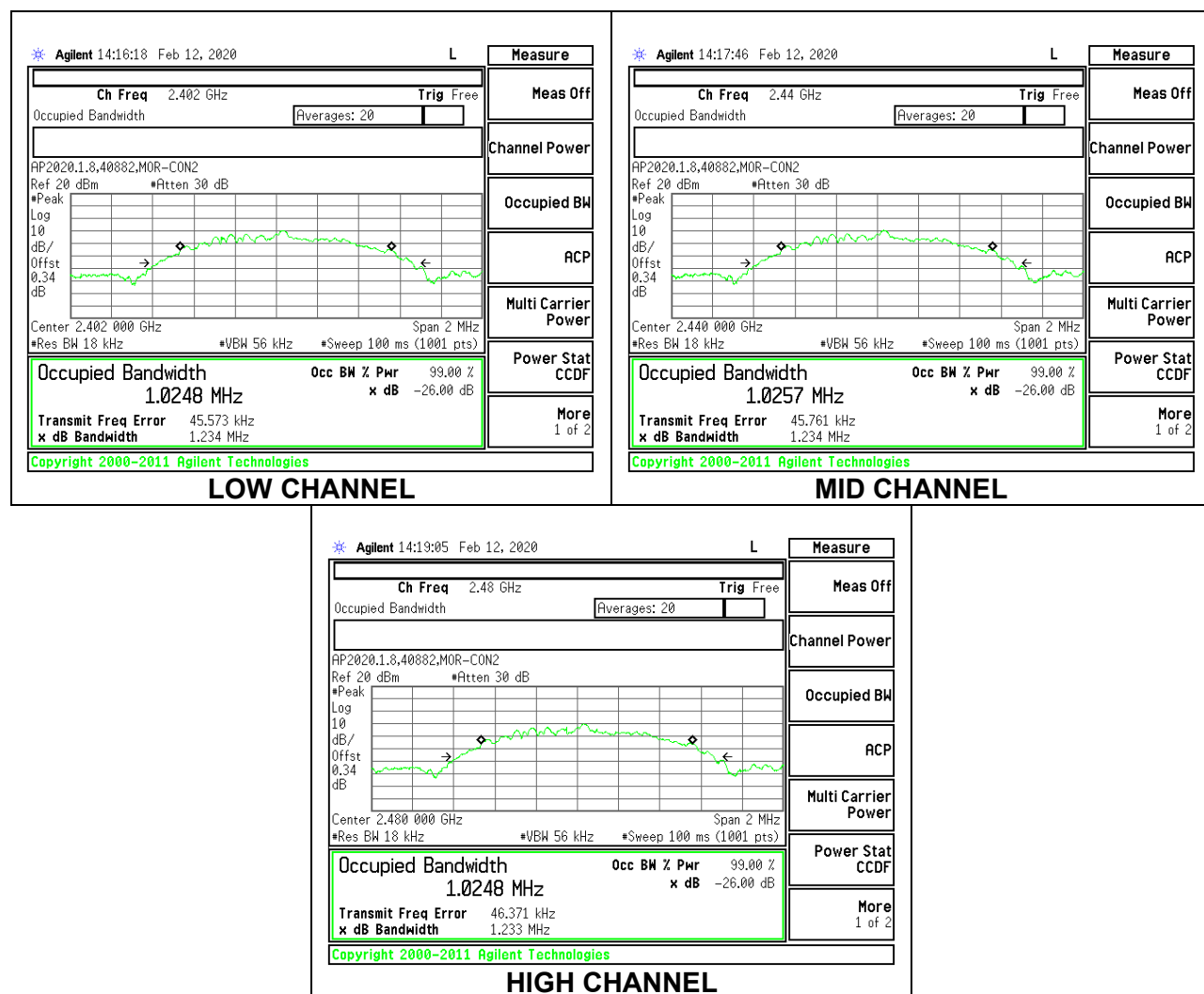
LIMITS

None; for reporting purposes only.

RESULTS

8.2.1. BLE (1Mbps)

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2402	1.0248
Middle	2440	1.0257
High	2480	1.0248



8.3. 6 dB BANDWIDTH

LIMITS

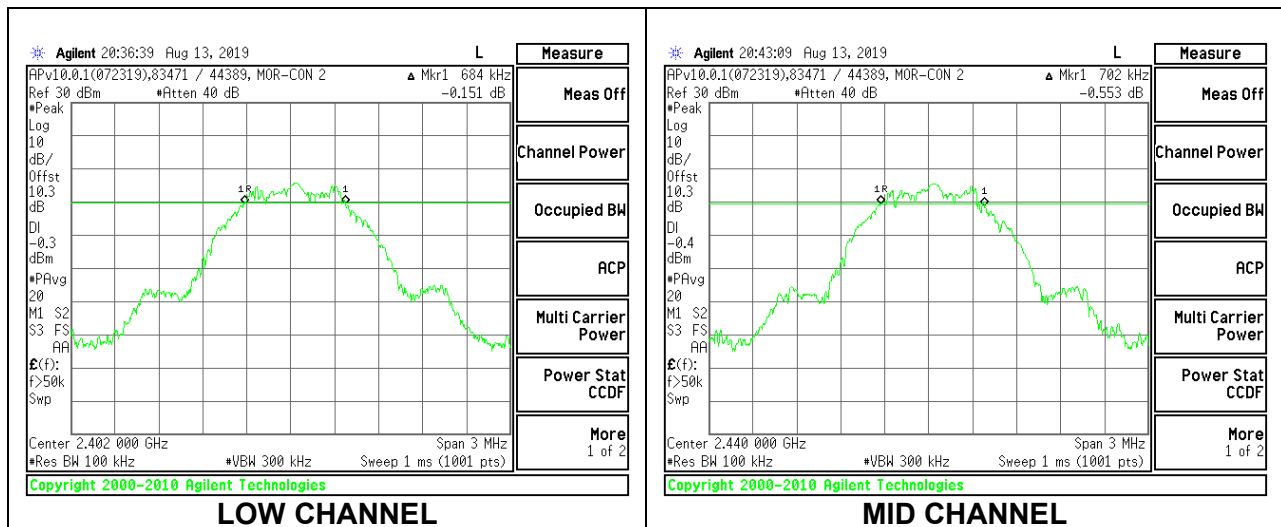
FCC §15.247 (a) (2)
RSS-247 5.2 (a)

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	0.6840	0.5
Middle	2440	0.7020	0.5
High	2480	0.6990	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 0.27dB 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:	24293/44389
Date:	2019-09-12

Channel	Frequency (MHz)	Peak Power Reading (dBm)	Limit (dBm)	Margin (dB)
Low	2402	4.77	30	-25.230
Middle	2440	4.51	30	-25.490
High	2480	3.56	30	-26.440

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 0.27 dB 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:	24293/44389
Date:	2019-09-12

Channel	Frequency (MHz)	AV power (dBm)
Low	2402	4.58
Middle	2440	4.31
High	2480	3.38

8.6. POWER SPECTRAL DENSITY

LIMITS

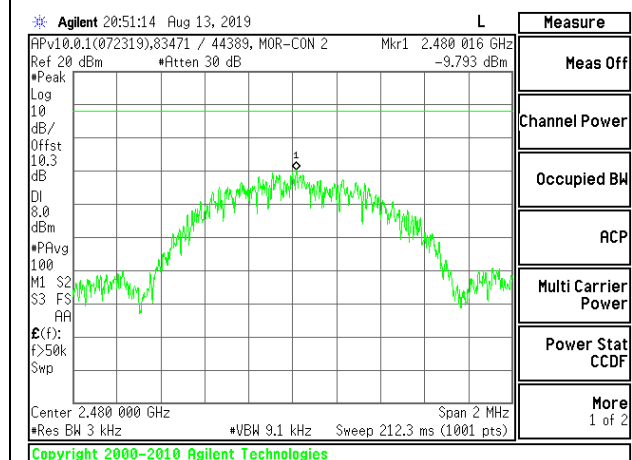
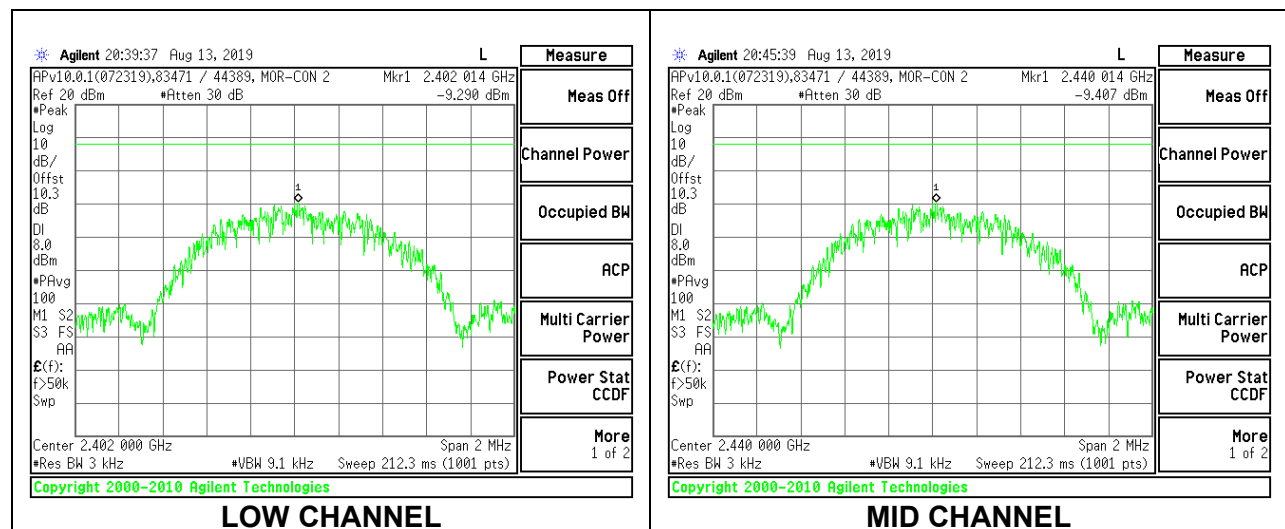
FCC §15.247 (e)
RSS-247 (5.2) (b)

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	-9.29	8	-17.29
Middle	2440	-9.41	8	-17.41
High	2480	-9.79	8	-17.79



HIGH CHANNEL

8.7. CONDUCTED SPURIOUS EMISSIONS

LIMITS

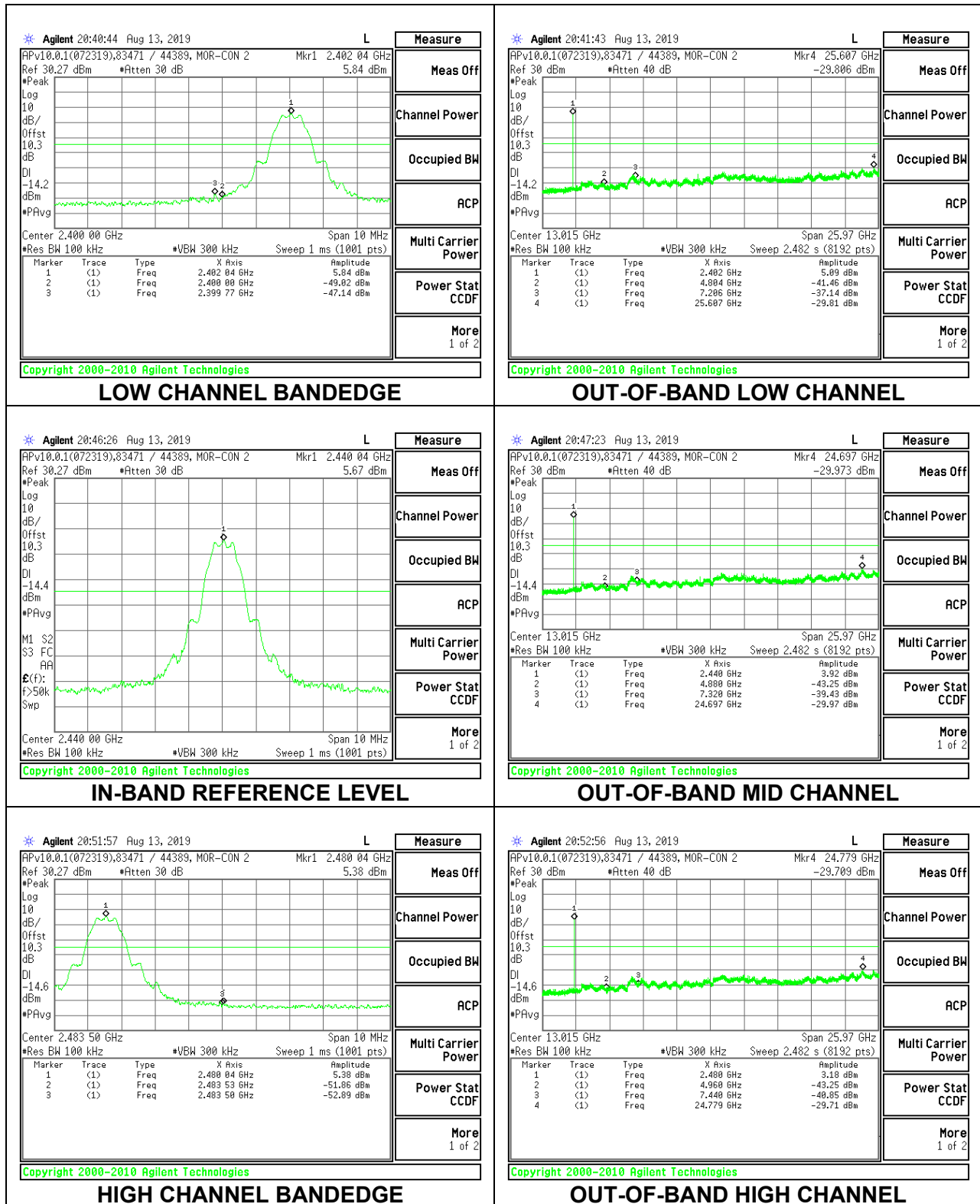
FCC §15.247 (d)

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 and/or quasi-peak detection measurements in the 30-1000MHz range, 9kHz for peak and/or quasi-peak detection measurements in the 0.15-30MHz range and 200Hz for peak and/or quasi-peak detection measurements in the 9 to 150kHz range. Peak detection is used unless otherwise noted as quasi-peak.

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.

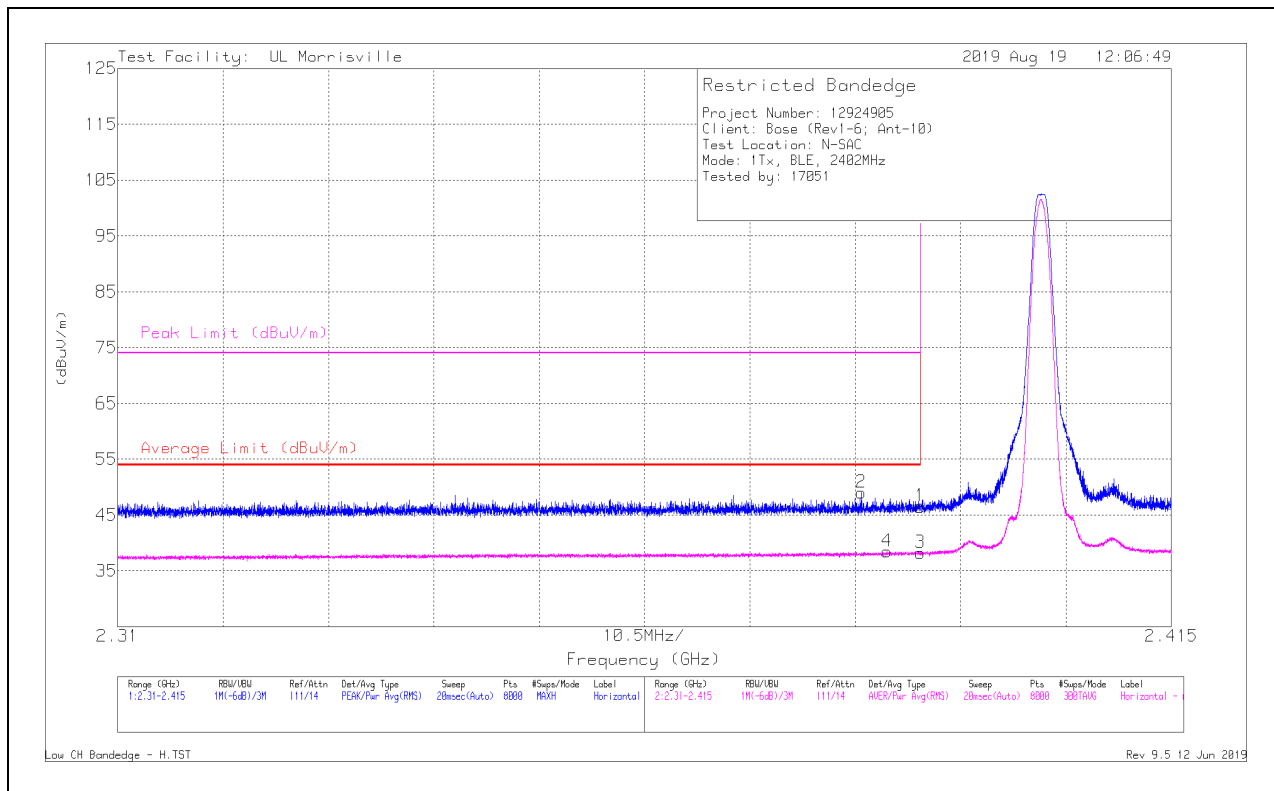
9.2. TRANSMITTER ABOVE 1 GHz

9.2.1. BLE (1Mbps)

Antenna 1

BANDEDGE (LOW CHANNEL)

HORIZONTAL RESULT



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0067 AF (dBuV/m)	Amp/Cbl/Fitr/Pad (dB)	DC Corr (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	38.92	Pk	32	-24.4	0	46.52	-	-	74	-27.48	345	192	H
2	*** 2.38409	41.41	Pk	32	-24.4	0	49.01	-	-	74	-24.99	345	192	H
3	*** 2.39	28.62	RMS	32	-24.4	2.01	38.23	54	-15.77	-	-	345	192	H
4	*** 2.38664	28.86	RMS	32	-24.4	2.01	38.47	54	-15.53	-	-	345	192	H

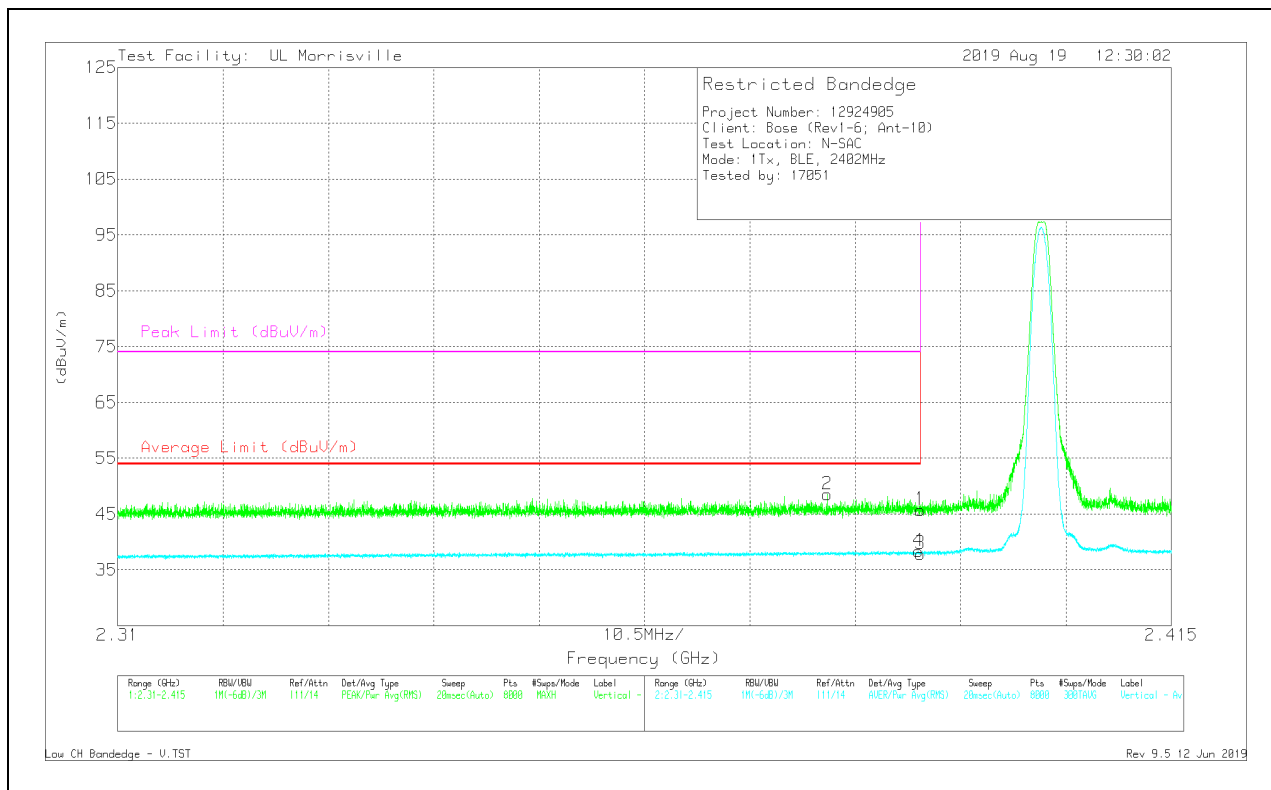
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

** - indicates frequency in Taiwan NCC LP0002 Restricted Band

Pk - Peak detector

RMS - RMS detection

VERTICAL RESULT



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0067 AF (dBuV/m)	Amp/Cbl/Filtr/Pad (dB)	DC Corr (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	38.16	Pk	32	-24.4	0	45.76	-	-	74	-28.24	236	397	V
2	* ** 2.3807	40.93	Pk	32	-24.4	0	48.53	-	-	74	-25.47	236	397	V
3	* ** 2.39	28.29	RMS	32	-24.4	2.01	37.9	54	-16.1	-	-	236	397	V
4	* ** 2.38977	28.76	RMS	32	-24.4	2.01	38.37	54	-15.63	-	-	236	397	V

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

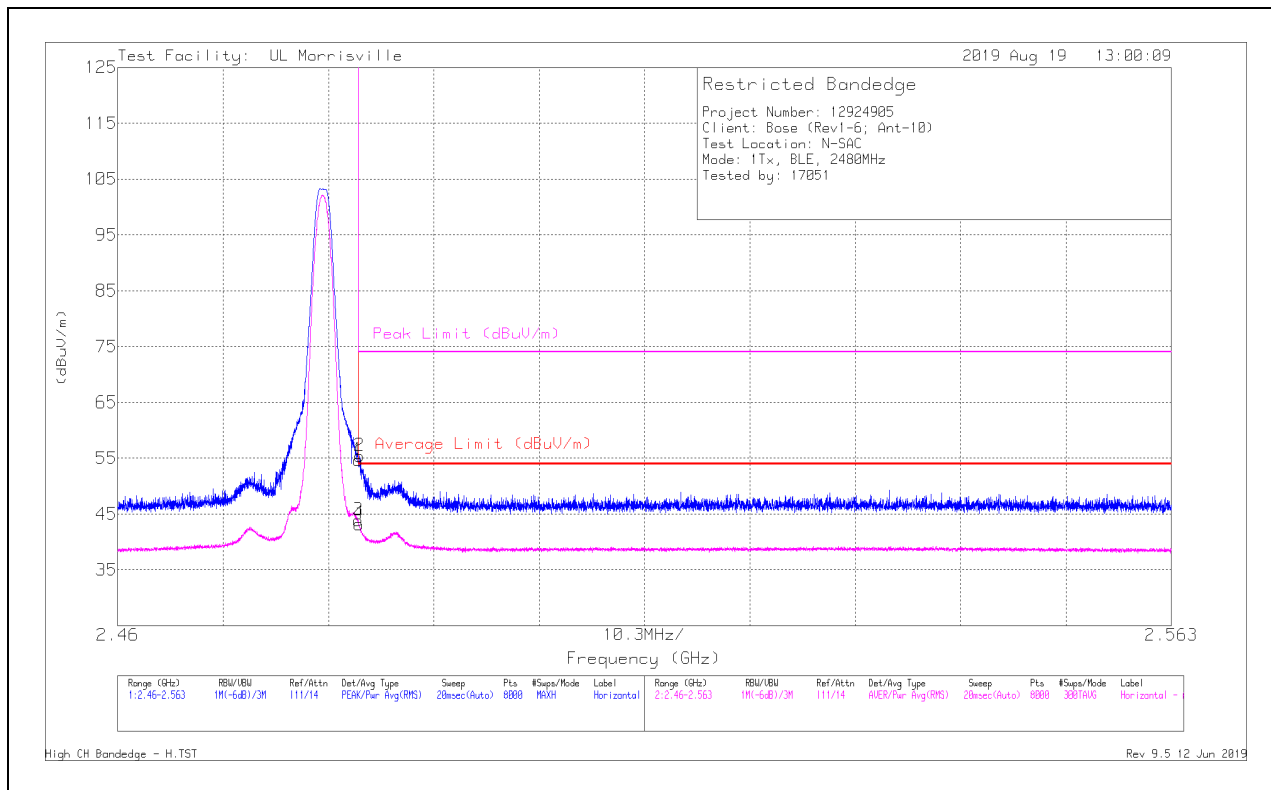
** - indicates frequency in Taiwan NCC LP0002 Restricted Band

Pk - Peak detector

RMS - RMS detection

BANDEDGE (HIGH CHANNEL)

HORIZONTAL RESULT



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0067 AF (dBuV/m)	Amp/Cbl/Filtr/Pad (dB)	DC Corr (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	46.54	Pk	32.4	-24.3	0	54.64	-	-	74	-19.36	178	112	H
2	*** 2.48363	47.28	Pk	32.4	-24.3	0	55.38	-	-	74	-18.62	178	112	H
3	*** 2.4835	33.74	RMS	32.4	-24.3	2.01	43.85	54	-10.15	-	-	178	112	H
4	*** 2.48357	33.1	RMS	32.4	-24.3	2.01	43.21	54	-10.79	-	-	178	112	H

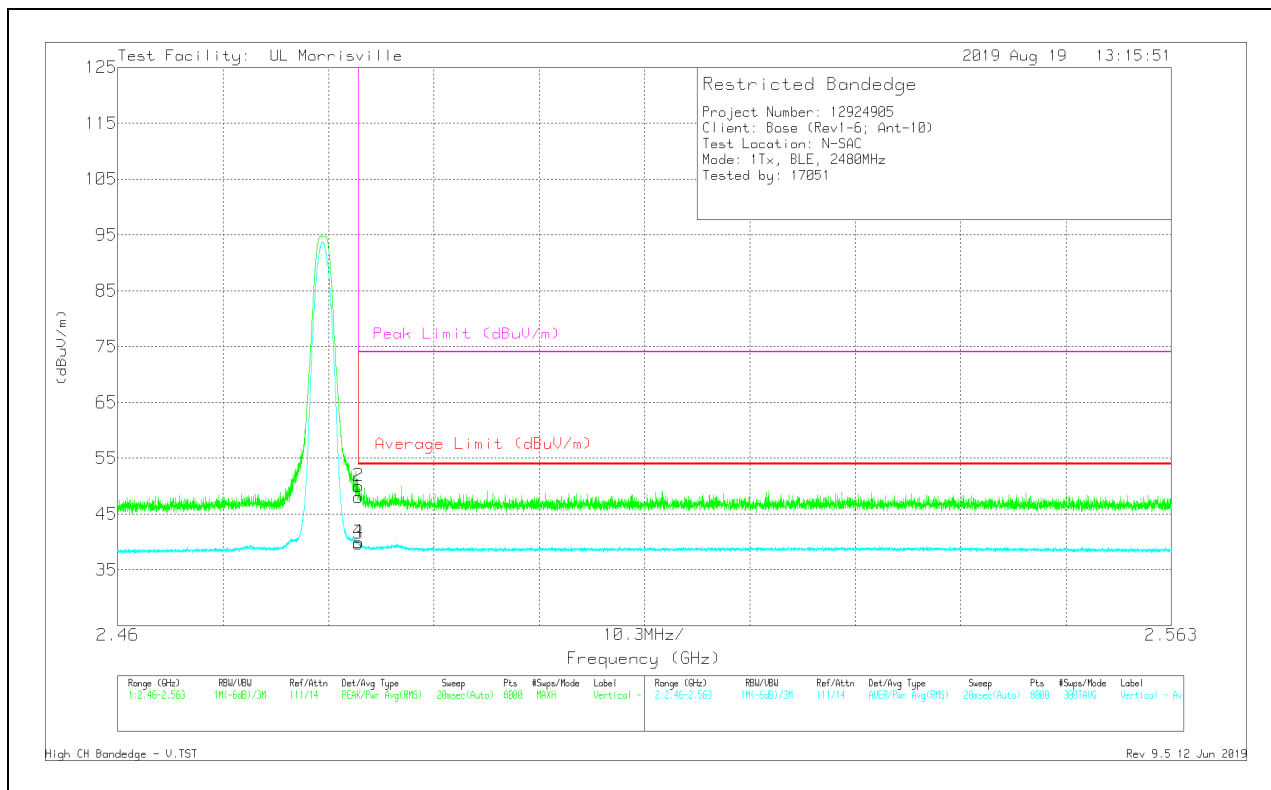
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

** - indicates frequency in Taiwan NCC LP0002 Restricted Band

Pk - Peak detector

RMS - RMS detection

VERTICAL RESULT



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0067 AF (dBuV/m)	Amp/Cbl/Filtr/Pad (dB)	DC Corr (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	39.97	Pk	32.4	-24.3	0	48.07	-	-	74	-25.93	298	100	V
2	*** 2.48354	41.9	Pk	32.4	-24.3	0	50	-	-	74	-24	298	100	V
3	*** 2.4835	29.63	RMS	32.4	-24.3	2.01	39.74	54	-14.26	-	-	298	100	V
4	*** 2.48354	29.81	RMS	32.4	-24.3	2.01	39.92	54	-14.08	-	-	298	100	V

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

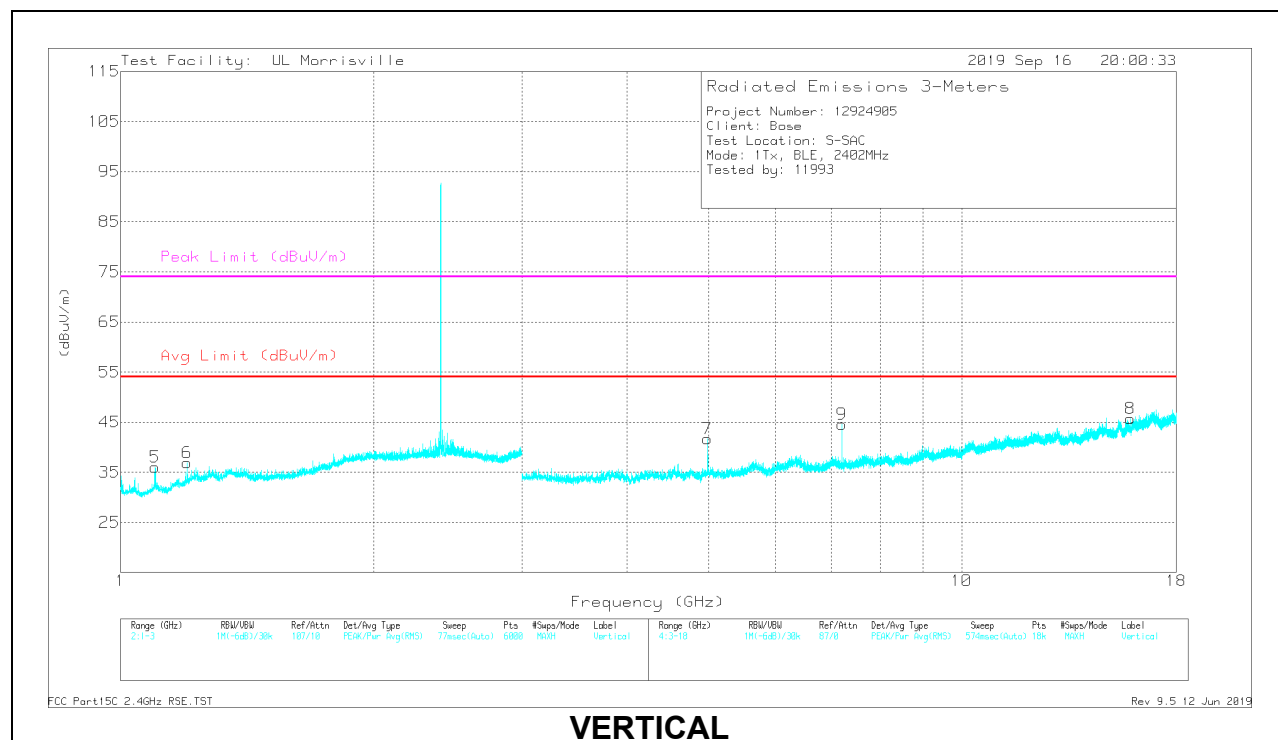
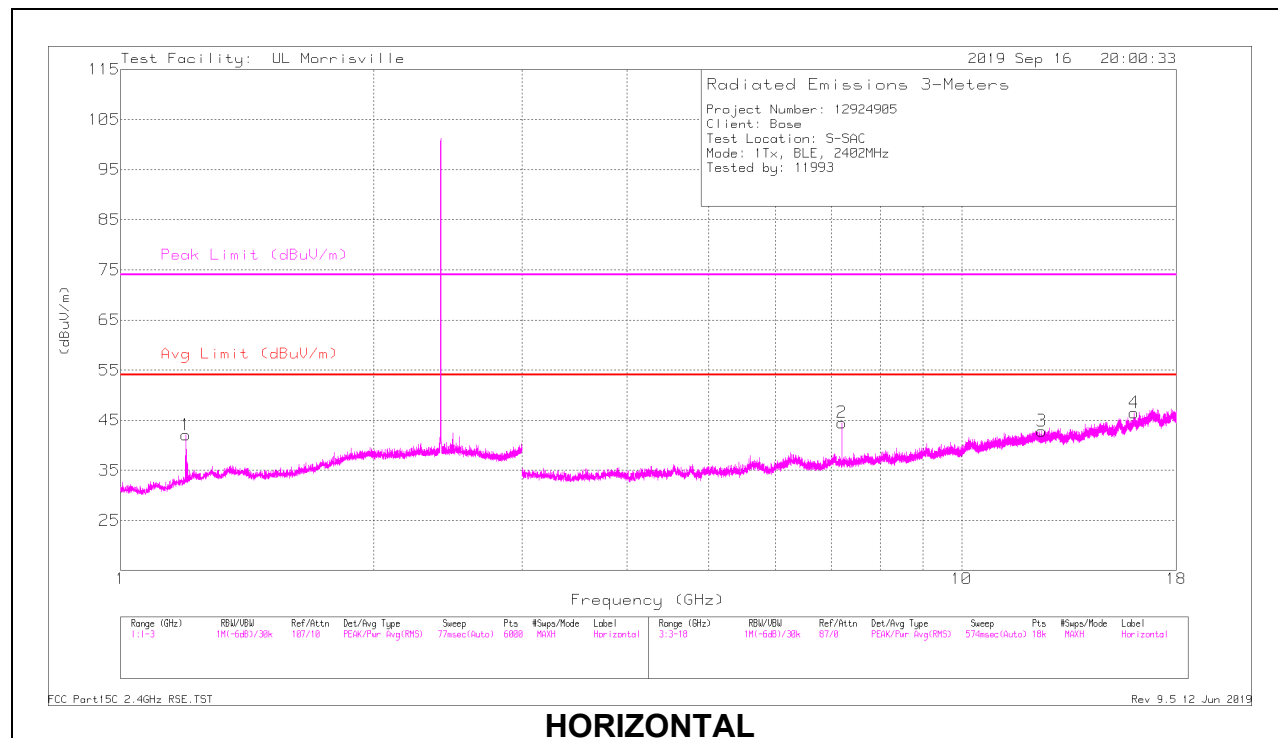
** - indicates frequency in Taiwan NCC LP0002 Restricted Band

Pk - Peak detector

RMS - RMS detection

HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL RESULTS



RADIATED EMISSIONS

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 (dB/m)	Amp/Cbl/Filtr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	*** 1.19549	42.04	PK2	28.5	-23.8	0	46.74	-	-	74	-27.26	108	264	H
	*** 1.19596	24.25	MAv1	28.5	-23.7	2.01	31.06	54	-22.94	-	-	108	264	H
5	*** 1.10056	38.5	PK2	27.7	-24.3	0	41.9	-	-	74	-32.1	136	357	V
	*** 1.10063	24.78	MAv1	27.7	-24.3	2.01	30.19	54	-23.81	-	-	136	357	V
6	*** 1.19976	43.56	PK2	28.6	-23.7	0	48.46	-	-	74	-25.54	177	395	V
	*** 1.1997	23.34	MAv1	28.6	-23.7	2.01	30.25	54	-23.75	-	-	177	395	V
3	*** 12.455	34.06	PK2	38.9	-24.1	0	48.86	-	-	74	-25.14	42	231	H
	*** 12.45504	21.99	MAv1	38.9	-24.1	2.01	38.8	54	-15.2	-	-	42	231	H
4	*** 16.0471	35.64	PK2	40.8	-23.5	0	52.94	-	-	74	-21.06	294	271	H
	*** 16.04702	23.16	MAv1	40.8	-23.5	2.01	42.47	54	-11.53	-	-	294	271	H
7	*** 4.98674	46.59	PK2	34.1	-31.1	0	49.59	-	-	74	-24.41	234	269	V
	*** 4.98643	27.55	MAv1	34.1	-31.1	2.01	32.56	54	-21.44	-	-	234	269	V
8	*** 15.87059	33.89	PK2	40.5	-23.4	0	50.99	-	-	74	-23.01	67	303	V
	*** 15.87377	22.54	MAv1	40.5	-23.3	2.01	41.75	54	-12.25	-	-	67	303	V
2	7.20524	36.82	Pk	35.7	-28	0	44.52	-	-	-	-	0-360	101	H
9	7.20607	36.88	Pk	35.7	-28	0	44.58	-	-	-	-	0-360	101	V

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

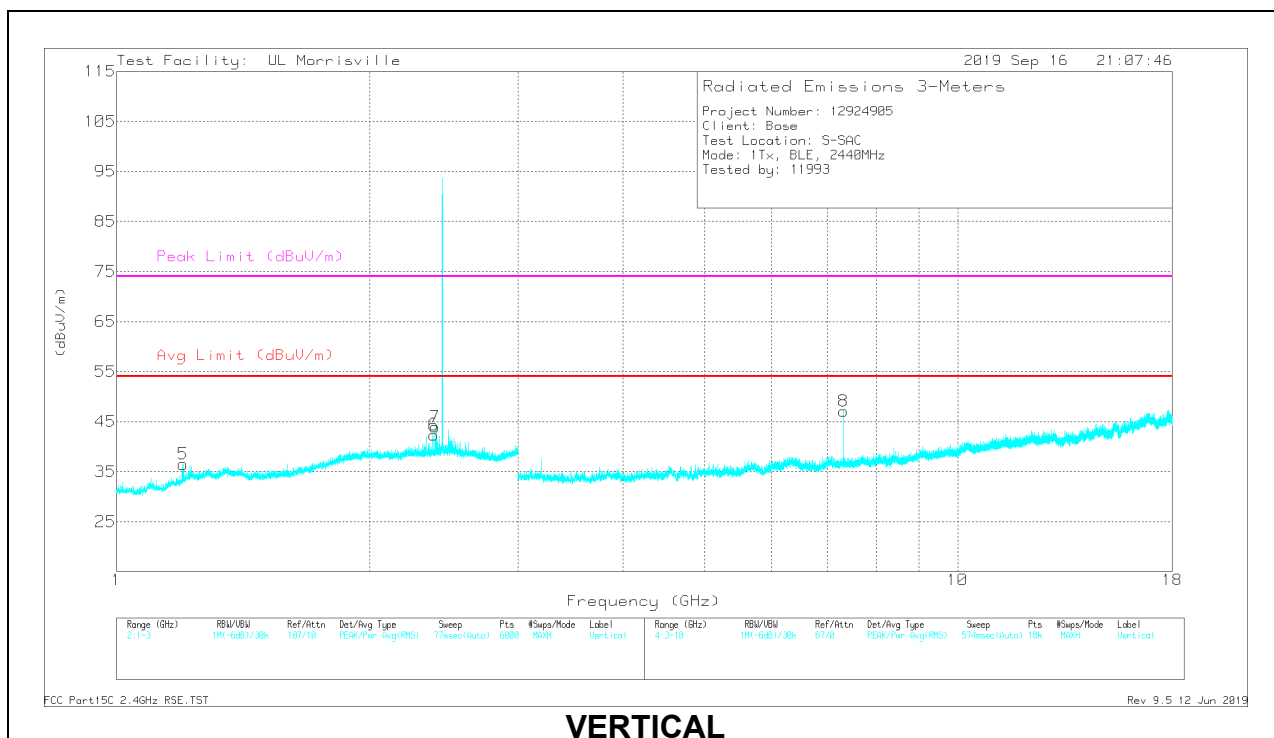
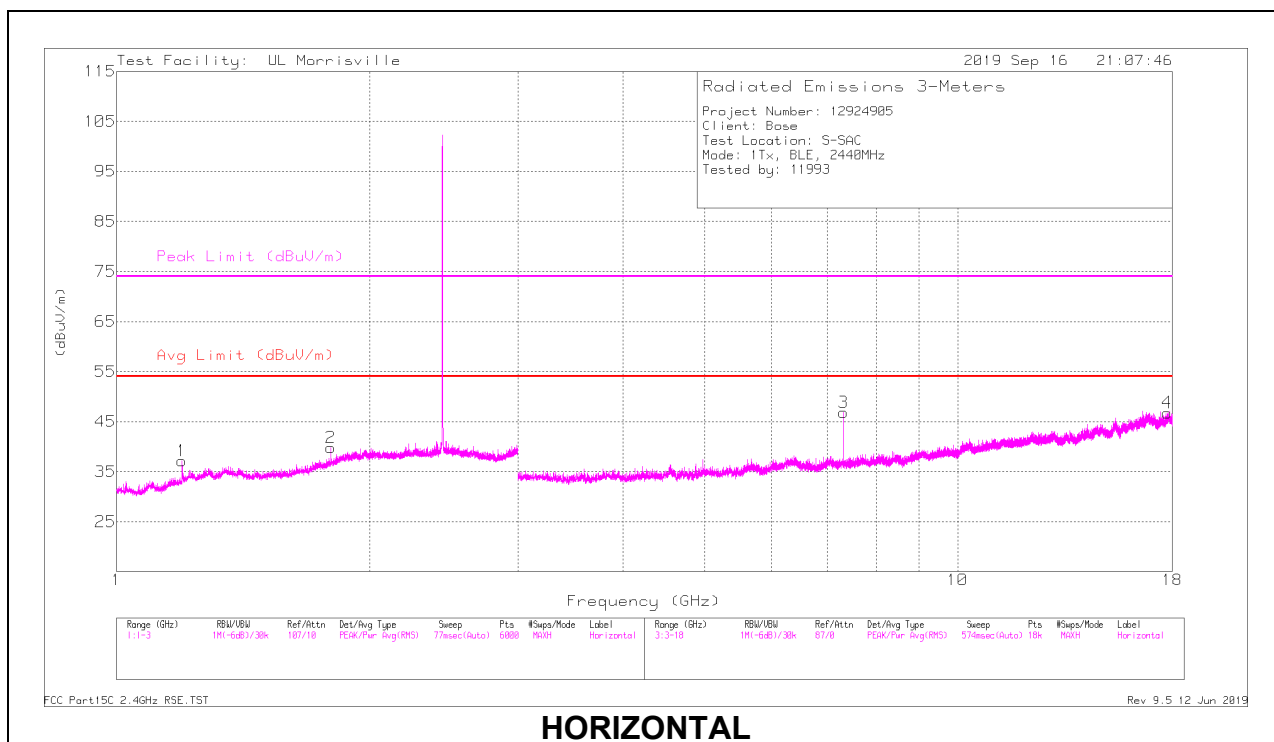
** - indicates frequency in Taiwan NCC LP0002 Restricted Band

Pk - Peak detector

PK2 - KDB558074 Method: Maximum Peak

MAv1 - KDB558074 Option 1 Maximum RMS Average

MID CHANNEL RESULTS



RADIATED EMISSIONS

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 (dB/m)	Amp/Cbl/Filtr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 1.19777	40.47	PK2	28.6	-23.7	0	45.37	-	-	74	-28.63	270	228	H
	* ** 1.19643	23.36	MAv1	28.5	-23.7	2.01	30.17	54	-23.83	-	-	270	228	H
5	* ** 1.19953	38.3	PK2	28.6	-23.7	0	43.2	-	-	74	-30.8	86	284	V
	* ** 1.19899	23.24	MAv1	28.6	-23.7	2.01	30.15	54	-23.85	-	-	86	284	V
6	* ** 2.38592	41.85	PK2	31.9	-24	0	49.75	-	-	74	-24.25	197	213	V
	* ** 2.38602	25.78	MAv1	31.9	-24	2.01	35.69	54	-18.31	-	-	197	213	V
3	* ** 7.32019	42.05	PK2	35.7	-27.5	0	50.25	-	-	74	-23.75	222	103	H
	* ** 7.32039	31.58	MAv1	35.7	-27.5	2.01	41.79	54	-12.21	-	-	222	103	H
4	* ** 17.75986	33.68	PK2	41.2	-21.5	0	53.38	-	-	74	-20.62	60	318	H
	* ** 17.7602	21.89	MAv1	41.2	-21.5	2.01	43.6	54	-10.4	-	-	60	318	H
8	* ** 7.32018	43.48	PK2	35.7	-27.5	0	51.68	-	-	74	-22.32	32	116	V
	* ** 7.31959	34.35	MAv1	35.7	-27.5	2.01	44.56	54	-9.44	-	-	32	116	V
2	1.79647	32.02	Pk	30.1	-22.3	0	39.82	-	-	-	-	0-360	199	H
7	2.39123	36.04	Pk	31.9	-24	0	43.94	-	-	-	-	0-360	199	V

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

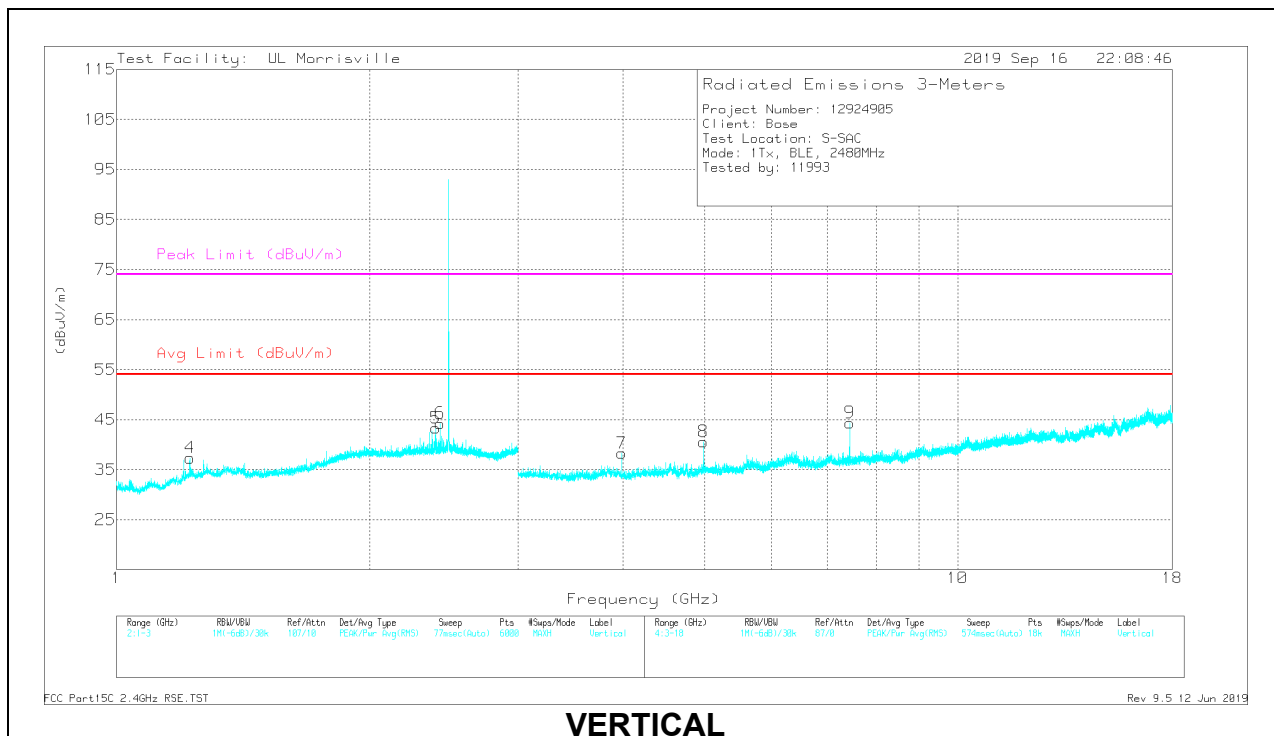
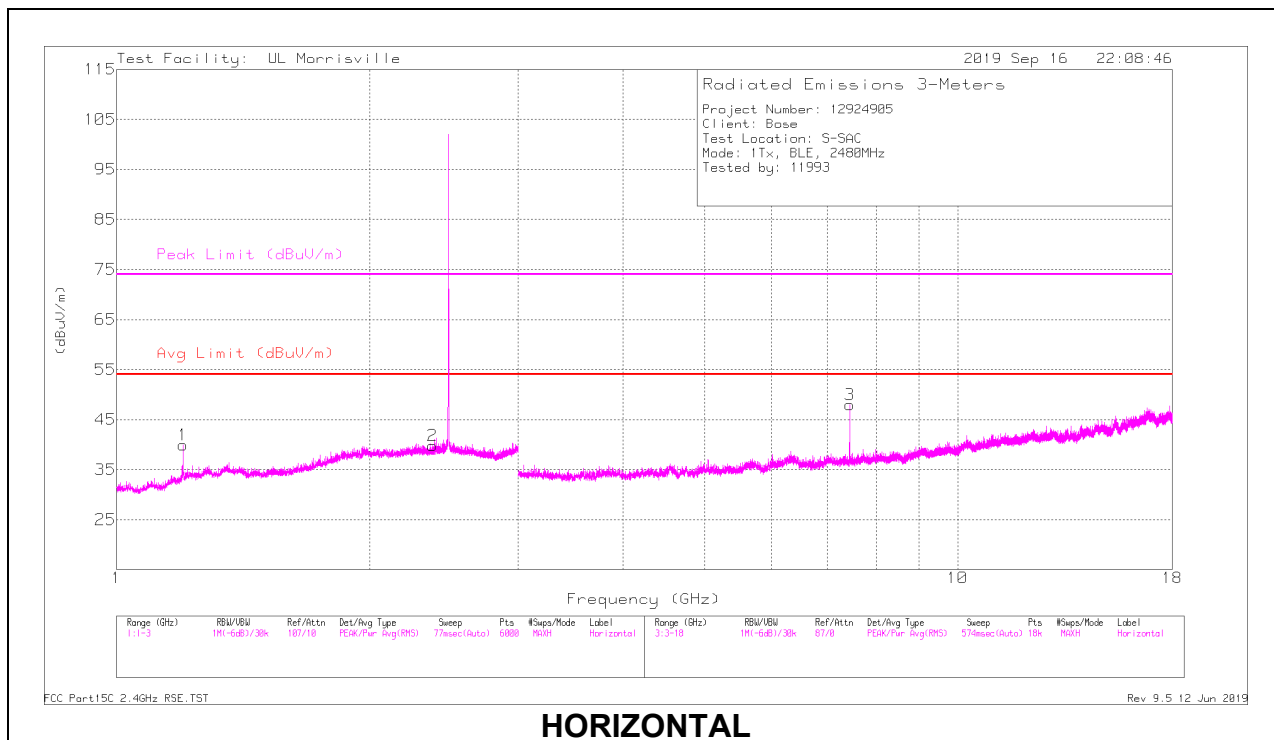
** - indicates frequency in Taiwan NCC LP0002 Restricted Band

Pk - Peak detector

PK2 - KDB558074 Method: Maximum Peak

MAv1 - KDB558074 Option 1 Maximum RMS Average

HIGH CHANNEL RESULTS



RADIATED EMISSIONS

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 (dB/m)	Amp/Cbl/Filtr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 1.19907	40.8	PK2	28.6	-23.7	0	45.7	-	-	74	-28.3	121	206	H
	* ** 1.19714	23.68	MAv1	28.6	-23.7	2.01	30.59	54	-23.41	-	-	121	206	H
2	* ** 2.37701	39.38	PK2	31.8	-24	0	47.18	-	-	74	-26.82	84	293	H
	* ** 2.37659	25.23	MAv1	31.8	-24	2.01	35.04	54	-18.96	-	-	84	293	H
4	* ** 1.2234	38.18	PK2	28.7	-23.6	0	43.28	-	-	74	-30.72	360	187	V
	* ** 1.22383	23.98	MAv1	28.7	-23.5	2.01	31.19	54	-22.81	-	-	360	187	V
3	* ** 7.44021	43.92	PK2	35.8	-27.8	0	51.92	-	-	74	-22.08	25	119	H
	* ** 7.43962	34.59	MAv1	35.8	-27.8	2.01	44.6	54	-9.4	-	-	25	119	H
7	* ** 3.98402	50	PK2	33.4	-31.6	0	51.8	-	-	74	-22.2	295	159	V
	* ** 3.98414	27.76	MAv1	33.4	-31.6	2.01	31.57	54	-22.43	-	-	295	159	V
8	* ** 4.98421	47.95	PK2	34.1	-31.1	0	50.95	-	-	74	-23.05	89	105	V
	* ** 4.98465	27.62	MAv1	34.1	-31.1	2.01	32.63	54	-21.37	-	-	89	105	V
9	* ** 7.44018	43.16	PK2	35.8	-27.8	0	51.16	-	-	74	-22.84	218	186	V
	* ** 7.43984	33.06	MAv1	35.8	-27.8	2.01	43.07	54	-10.93	-	-	218	186	V
5	2.39723	35.35	Pk	31.9	-23.9	0	43.35	-	-	-	-	0-360	199	V
6	2.42324	36.46	Pk	32	-24.2	0	44.26	-	-	-	-	0-360	199	V

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

** - indicates frequency in Taiwan NCC LP0002 Restricted Band

Pk - Peak detector

RMS - RMS detection

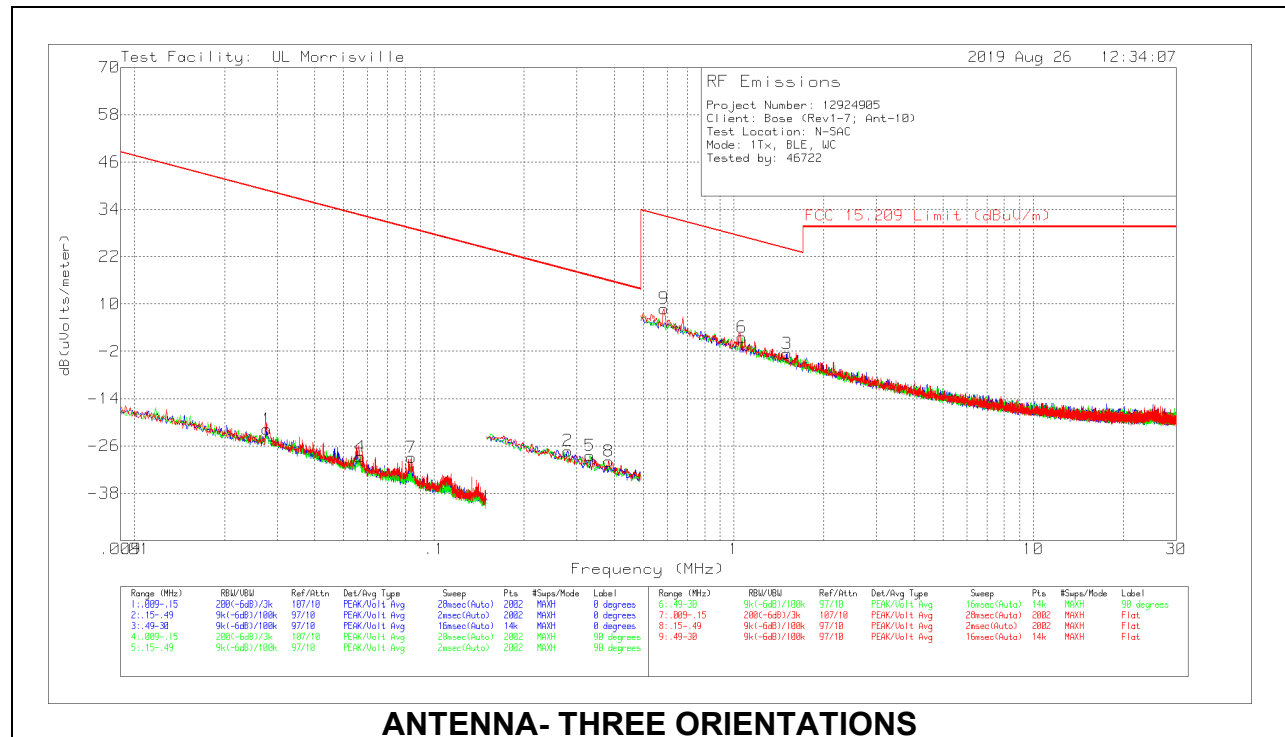
PK2 - KDB558074 Method: Maximum Peak

MAv1 - KDB558074 Option 1 Maximum RMS Average

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

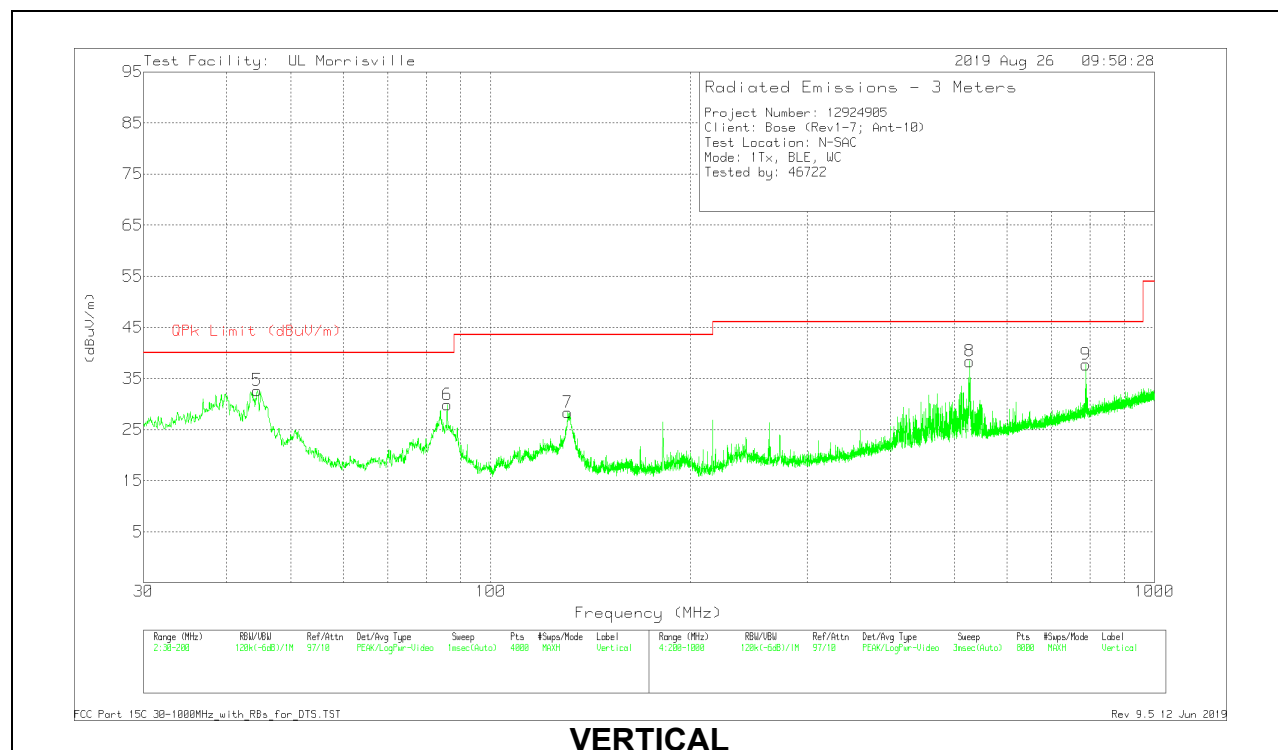
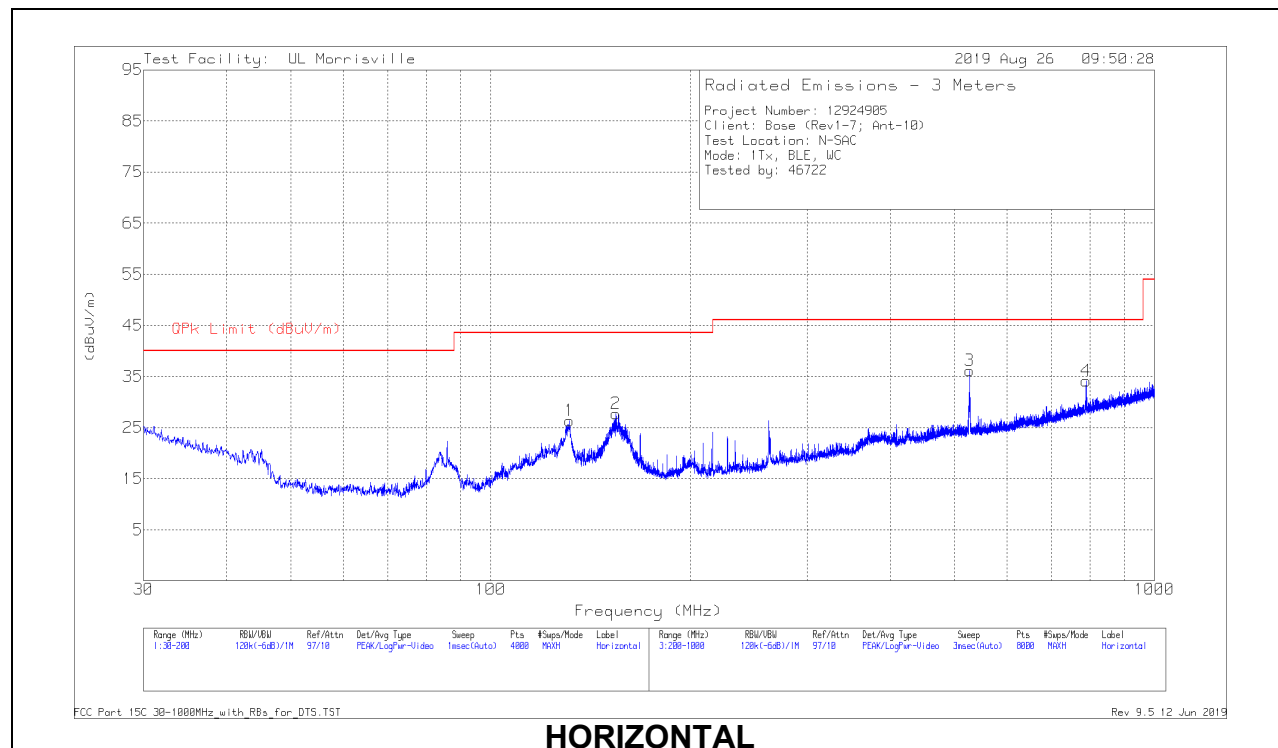
Below 30MHz Data

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 Av and QP Limit (dBuV/m)	FCC 15.209 Pk Limit (dBuV/m)	Worst-Case Margin (dB)	Azimuth (Degs)
1	.02769	44.83	Pk	13.3	.1	-80	-21.77	38.76	58.76	-60.53	0-360
4	.05674	39.73	Pk	11.4	.1	-80	-28.77	32.53	52.53	-61.3	0-360
7	.08418	39.88	Pk	11.1	.1	-80	-28.92	29.1	49.1	-58.02	0-360
2	.27929	41.64	Pk	11	.1	-80	-27.26	18.68	38.68	-45.94	0-360
5	.33114	40.46	Pk	11	.1	-80	-28.44	17.2	37.2	-45.64	0-360
8	.38248	38.99	Pk	11	.1	-80	-29.91	15.95	35.95	-45.86	0-360
9	.58486	37.72	Pk	11	.1	-40	8.82	32.26	-	-23.44	0-360
6	1.06654	30.31	Pk	11	.2	-40	1.51	27.04	-	-25.53	0-360
3	1.50606	26.13	Pk	11.1	.2	-40	-2.57	24.05	-	-26.62	0-360

Pk - Peak detector

9.4. WORST CASE BELOW 1 GHZ

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



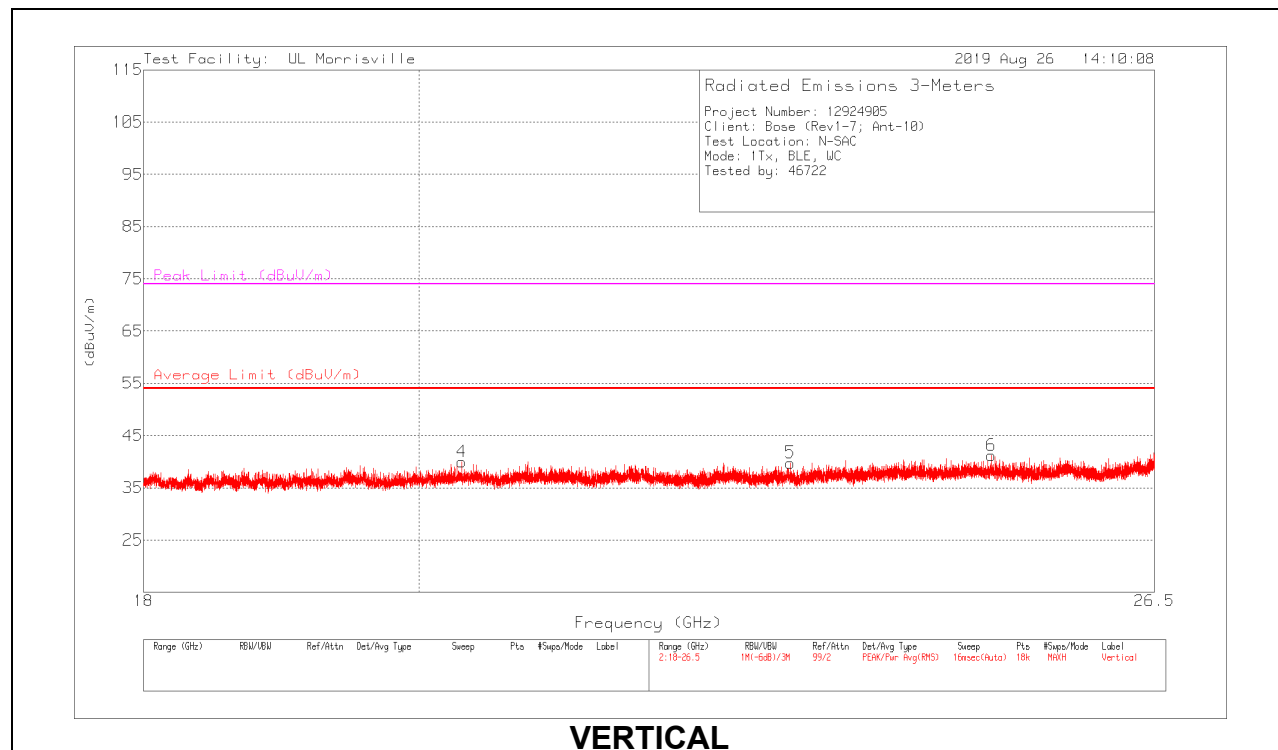
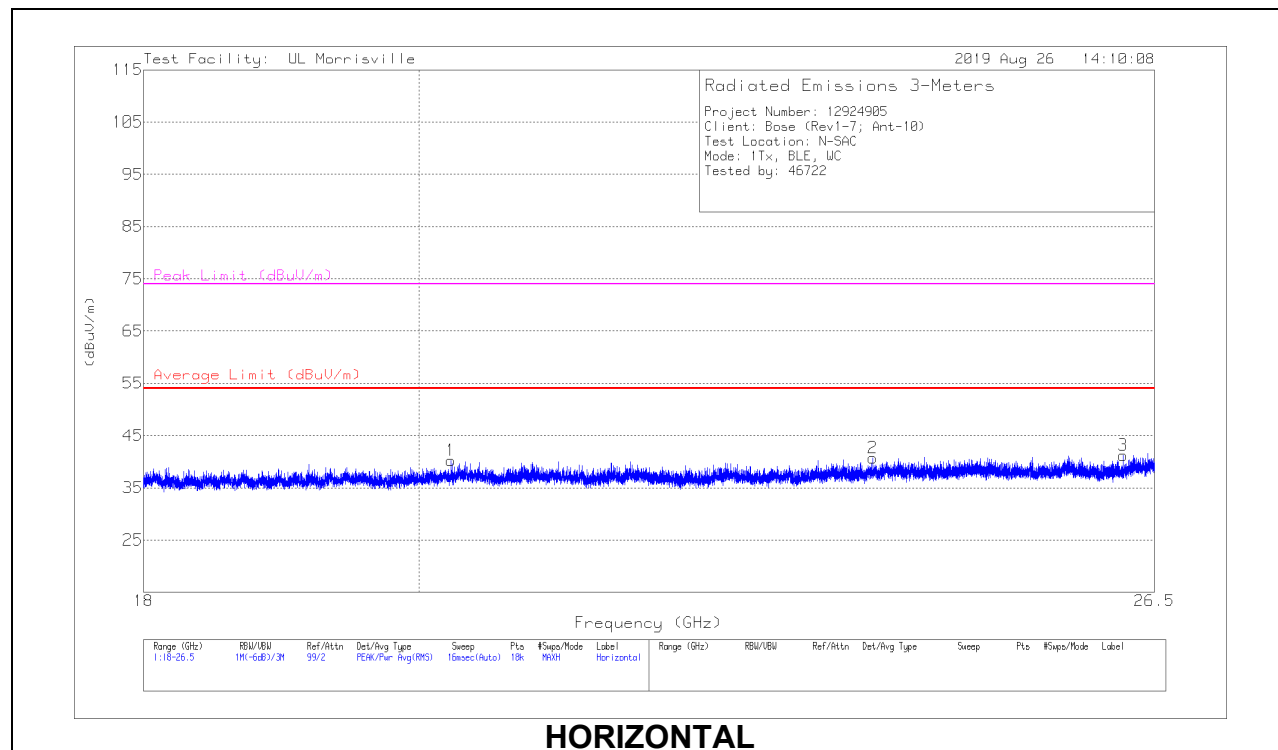
Below 1GHz Data

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AT0074 AF (dB/m)	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	131.4312	36.92	Pk	20.1	-30.7	26.32	43.52	-17.2	0-360	299	H
7	130.7086	38.96	Pk	20.1	-30.7	28.36	43.52	-15.16	0-360	102	V
4	788.8765	33.72	Pk	27.8	-27.4	34.12	46.02	-11.9	0-360	199	H
9	788.3765	37.33	Pk	27.8	-27.4	37.73	46.02	-8.29	0-360	102	V
5	44.4963	46.86	Pk	17.3	-31.5	32.66	40	-7.34	0-360	102	V
6	86.0295	47.26	Pk	13.6	-31	29.86	40	-10.14	0-360	102	V
2	154.3872	39.25	Pk	18.9	-30.4	27.75	43.52	-15.77	0-360	199	H
3	526.8425	39.92	Pk	24.4	-28.2	36.12	46.02	-9.9	0-360	199	H
8	526.9425	42.15	Pk	24.4	-28.2	38.35	46.02	-7.67	0-360	102	V

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)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	20.24696	46.99	Pk	32.9	-39.7	0	40.19	54	-13.81	74	-33.81	0-360	298	H
2	23.79259	45.7	Pk	34	-39	0	40.7	54	-13.3	74	-33.3	0-360	148	H
4	20.33054	46.76	Pk	33	-39.8	0	39.96	54	-14.04	74	-34.04	0-360	298	V
5	23.05164	45.38	Pk	33.7	-39.3	0	39.78	54	-14.22	74	-34.22	0-360	102	V
6	24.89813	45.11	Pk	34.4	-38.3	0	41.21	54	-12.79	74	-32.79	0-360	152	V
3	26.18311	44.13	Pk	34.6	-37.5	0	41.23	54	-12.77	74	-32.77	0-360	298	H

Pk - Peak detector

10. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

FCC §15.207 (a)

RSS-Gen 8.8

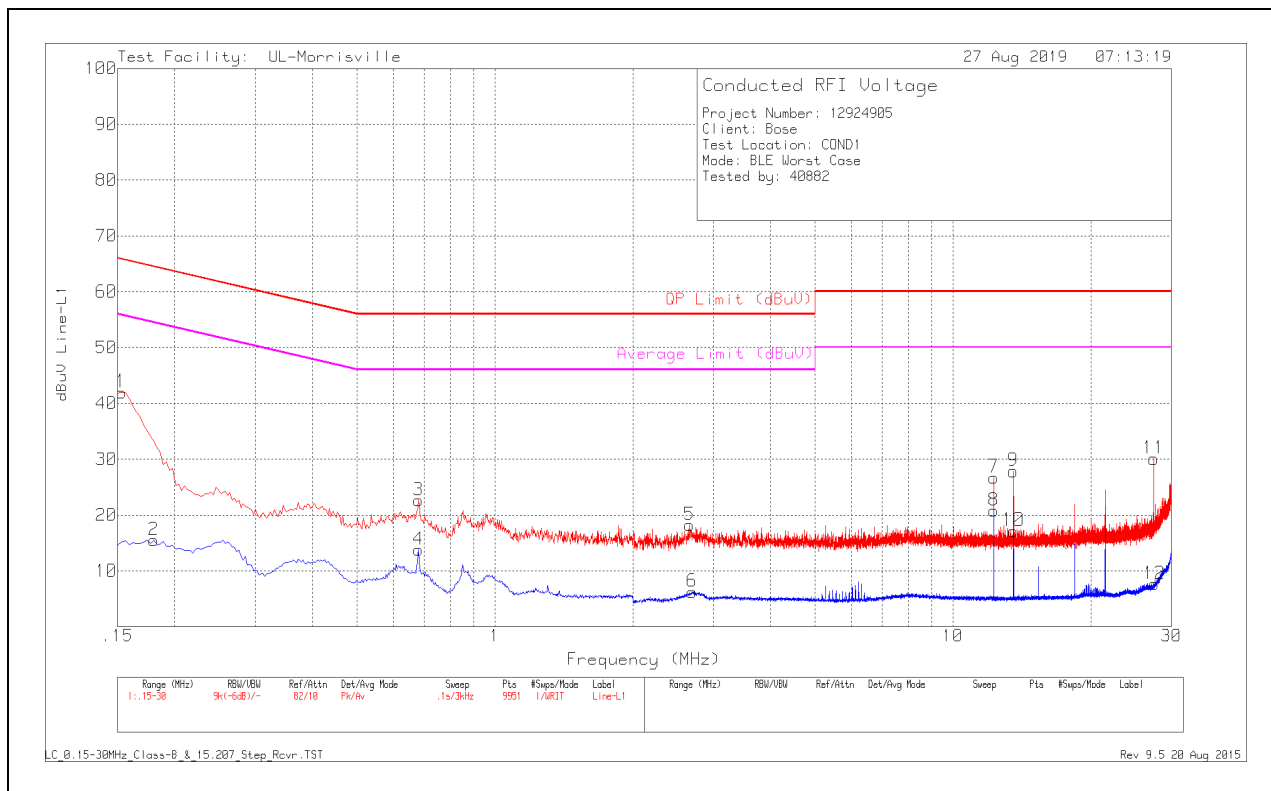
Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56 *	56 to 46 *
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency.

RESULTS

10.1.1. AC Power Line Norm

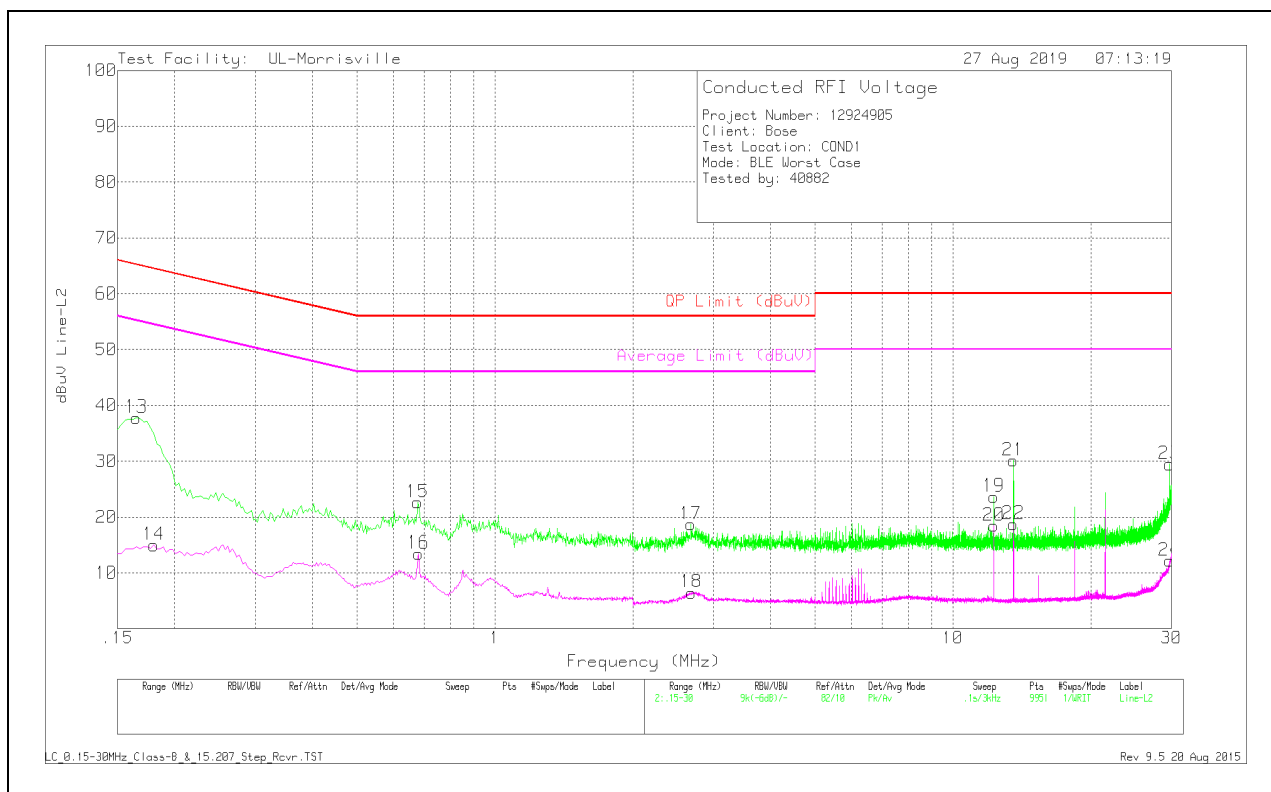
LINE 1 RESULTS



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	.153	31.79	Pk	.2	10	41.99	65.84	-23.85	-	-
2	.18	5.27	Av	.2	10	15.47	-	-	54.49	-39.02
3	.681	12.52	Pk	.1	10	22.62	56	-33.38	-	-
4	.681	3.68	Av	.1	10	13.78	-	-	46	-32.22
5	2.661	8.08	Pk	0	10.1	18.18	56	-37.82	-	-
6	2.694	-3.87	Av	0	10.1	6.23	-	-	46	-39.77
7	12.288	16.23	Pk	.1	10.4	26.73	60	-33.27	-	-
8	12.288	10.31	Av	.1	10.4	20.81	-	-	50	-29.19
9	13.56	17.37	Pk	.1	10.4	27.87	60	-32.13	-	-
10	13.56	6.66	Av	.1	10.4	17.16	-	-	50	-32.84
11	27.471	19.09	Pk	.3	10.7	30.09	60	-29.91	-	-
12	27.546	-3.39	Av	.3	10.7	7.61	-	-	50	-42.39

Pk - Peak detector
Av - Average detector

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	.165	27.6	Pk	.2	10	37.8	65.21	-27.41	-	-
14	.18	4.77	Av	.2	10	14.97	-	-	54.49	-39.52
15	.678	12.63	Pk	0	10	22.63	56	-33.37	-	-
16	.681	3.47	Av	0	10	13.47	-	-	46	-32.53
17	2.679	8.59	Pk	0	10.1	18.69	56	-37.31	-	-
18	2.685	-3.62	Av	0	10.1	6.48	-	-	46	-39.52
19	12.288	13.16	Pk	.1	10.4	23.66	60	-36.34	-	-
20	12.288	7.94	Av	.1	10.4	18.44	-	-	50	-31.56
21	13.56	19.62	Pk	.1	10.4	30.12	60	-29.88	-	-
22	13.56	8.26	Av	.1	10.4	18.76	-	-	50	-31.24
23	29.712	18.37	Pk	.3	10.8	29.47	60	-30.53	-	-
24	29.751	1.06	Av	.3	10.8	12.16	-	-	50	-37.84

Pk - Peak detector
Av - Average detector

11. SETUP PHOTOS

Please refer to R12924905-EP1 for setup photos.

END OF TEST REPORT