TEST REPORT

Report Number. : R13541206-E1

Applicant	:	Microsoft Corporation One Microsoft Way Redmond, WA 98052-6399 USA
Model	:	1964
FCC ID	:	C3K1964
IC	:	3048A-1964
EUT Description	:	Portable Computing Device
Test Standard(s)	:	FCC 47 CFR PART 15 SUBPART C ISED RSS-247 ISSUE 2 ISED RSS-GEN ISSUE 5 + A2

Date Of Issue:
2021-05-25

Prepared by:
UL LLC
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ilac-MRA

ACCREDITED
CERT #0751.06

REPORT REVISION HISTORY

Rev.	Issue Date	Revisions	Revised By
v1	2021-05-25	Initial Issue	Niklas Haydon

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: Microsoft Corporation
One Microsoft Way
Redmond, WA 98052-6399
USA

EUT DESCRIPTION: Portable Computing Device

MODEL: 1964

SERIAL NUMBER: 0F0002Z211200C (radiated)
0F000AN211200C (radiated)
0F0008Z211200C (radiated)
0F0003K211200C (antenna port conducted)
0F0003W211200C (antenna port conducted)
0F0003V211200C (antenna port conducted)

SAMPLE RECEIPT DATE: 2021-04-12

DATE TESTED: 2021-04-12 to 2021-04-15

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
CFR 47 Part 15 Subpart C	Complies
ISED RSS-247 Issue 2	Complies
ISED RSS-GEN Issue 5 + A2	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
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Prepared By:

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2. TEST RESULTS SUMMARY

This report contains data provided by the applicant which can impact the validity of results. UL LLC is only responsible for the validity of results after the integration of the data provided by the customer.

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

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3. TEST METHODOLOGY

The tests documented in this report were performed in accordance with FCC CFR 47 Part 2, FCC CFR 47 Part 15, ANSI C63.10-2013, KDB 558074 D01 15.247 Meas Guidance v05r02, KDB 414788 D01 Radiated Test Site v01r01, RSS-GEN Issue 5 + A2, and RSS-247 Issue 2.

4. FACILITIES AND ACCREDITATION

UL LLC is accredited by A2LA, certification #0751.06, for all testing performed within the scope of this report. Testing was performed at the locations noted below.

	Address	ISED CABID	ISED Company Number	FCC Registration
☒	Building: 12 Laboratory Dr RTP, NC 27709, U.S.A	US0067	2180C	703469
☒	Building: 2800 Perimeter Park Dr Morrisville, NC 27560, U.S.A			

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5. DECISION RULES AND MEASUREMENT UNCERTAINTY

5.1. METROLOGICAL TRACEABILITY

All test and measuring equipment utilized to perform the tests documented in this report are calibrated on a regular basis, with a maximum time between calibrations of one year or the manufacturers' recommendation, whichever is less, and where applicable is traceable to recognized national standards.

5.2. DECISION RULES

The Decision Rule is based on Simple Acceptance in accordance with ISO Guide 98-4:2012 Clause 8.2. (Measurement uncertainty is not taken into account when stating conformity with a specified requirement.)

5.3. MEASUREMENT UNCERTAINTY

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

PARAMETER	UNCERTAINTY
Radio Frequency (Spectrum Analyzer)	141.2 Hz
Occupied Channel Bandwidth	1.22%
RF output power, conducted	1.3 dB (PK) 0.45 dB (AV)
Power Spectral Density, conducted	2.47 dB
Unwanted Emissions, conducted	1.94 dB
All emissions, radiated	6.01 dB
Conducted Emissions (0.150-30MHz) - LISN	3.40 dB
Temperature	0.57°C
Humidity	3.39%
DC Supply voltages	1.70%
Time	3.39%

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

5.4. SAMPLE CALCULATION

RADIATED EMISSIONS
Where relevant, the following sample calculation is provided:
Field Strength (dBuV/m) = Measured Voltage (dBuV) + Antenna Factor (dB/m) + Cable Loss (dB) – Preamp Gain (dB)
36.5 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

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6. EQUIPMENT UNDER TEST

6.1. EUT DESCRIPTION

The EUT is a portable computing device. This report covers the BLE radio in the device.

6.2. MAXIMUM OUTPUT POWER

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

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
2402 - 2480	BLE	4.66	2.92

6.3. DESCRIPTION OF AVAILABLE ANTENNAS

The antenna(s) gain and type, as provided by the manufacturer' are as follows:
The radio utilizes an PIFA antenna, with a maximum gain of 3.9 dBi.

6.4. SOFTWARE AND FIRMWARE

OS: Windows Build 19041.vb_release 191206-1406
Test tool version 22.35020.0.0-01924
WLAN driver 22.20.0.5
BT driver 22.30.0.4

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6.5. WORST-CASE CONFIGURATION AND MODE

Radiated emissions below 1GHz, above 18GHz, and power line conducted emission were performed with the EUT set to transmit at the channel with highest power spectral density 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 for 125Kbps and 2Mbps. 125Kbps had the highest power density, therefore was test as worst-case to represent 500Kbps and 1Mbps.

The fundamental of the EUT was investigated in the three available configurations (A, B and C as described in the test setup photos). Where a configuration can be portable it was also investigated in three orthogonal orientations (X, Y, Z) modes. It was determined that A configuration was the worst-case configuration orientation; therefore, all final radiated testing was performed with the EUT in configuration A.

All radios that can transmit simultaneously have been evaluated for radiated for all possible combinations of transmission and found to be in compliance.

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6.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	**Manufacturer**	**Model**	**Serial Number**	**FCC ID**
USB Hub	J5create	JCA374	AY2A1904000477	NA
USB Hub	J5create	JCA374	AY3A2010013253	NA
USB Hub	J5create	JCD383	DL3A1903011541	NA
USB Hub	J5create	JCD383	FY5A2010034764	NA
Earbuds	Sony	MDR-EX14AP	NA	NA
Earbuds	Sony	MDR-EX14AP	NA	NA
Earbuds	JVC	HA-FXL	NA	NA
Power Supply	Microsoft	1706	0D130U0HD210C	NA
Power Supply	Microsoft	1706	0D130U0GX310C	N/A
Power Supply	Microsoft	1706	0D130U0HD710C	N/A
Power Supply	Microsoft	1706	0D130U0GU310C	N/A
Power Supply	Microsoft	1706	0D130U0HDL10C	N/A

I/O CABLES

I/O Cable List						
Cable No.	**Port**	**# of Identical Ports**	**Connector Type**	**Cable Type**	**Cable Length (m)**	**Remarks**
1	Mains	1	12-pin	Mains	<3	Goes to ac/dc adapter
2	USB-C	2	USB-C	USB	<3	

TEST SETUP

Test software on the EUT exercised the radio card.

SETUP DIAGRAMS

Please refer to R13541206-EP1 for setup diagrams.

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7. MEASUREMENT METHOD

Duty Cycle: ANSI C63.10 Subclause 11.6

99% and 6 dB BW: ANSI C63.10 Subclause - 11.8.1 and 6.9.3

Output Power: ANSI C63.10 Subclause - 11.9.1.3 Method PKPM1 Peak-reading power meter
11.9.2.3.2 Method AVGPM-G Gated average power meter

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

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

Emissions non-restricted frequency bands: ANSI C63.10 Subclause -11.11 and 6.10.4

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

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

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8. TEST AND MEASUREMENT EQUIPMENT

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

Test Equipment Used - Wireless Conducted Measurement Equipment

Equipment ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
	Conducted Room 1				
SA0025	Spectrum Analyzer	Agilent	N9030A	2021-04-01	2022-04-01
PWM002	RF Power Meter	Keysight Technologies	N1911A	2020-07-31	2021-07-31
PWS001	Peak and Avg Power Sensor, 50MHz to 18GHz	Keysight Technologies	N1921A	2020-05-27	2021-05-27
PWS002	Peak and Avg Power Sensor, 50MHz to 18GHz	Keysight Technologies	N1921A	2020-07-31	2021-07-31
HI0090	Environmental Meter	Fisher Scientific	15-077-963	2020-06-26	2021-06-26
SOFTEMI	Antenna Port Software	UL	Version 2021.4.9 2021.4.13	NA	NA
	Conducted Room 2				
SA0027	Spectrum Analyzer	Keysight Technologies	N9030A	2020-06-10	2021-06-10
PWM004	RF Power Meter	Keysight Technologies	N1911A	2020-07-31	2021-07-31
PWS002	Peak and Avg Power Sensor, 50MHz to 18GHz	Keysight Technologies	N1921A	2020-07-31	2021-07-31
HI0091	Environmental Meter	Fisher Scientific	15-077-963	2020-06-26	2021-06-26
SOFTEMI	Antenna Port Software	UL	Version 2021.4.9 2021.4.13	NA	NA

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

Equipment ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
HI0091	Environmental Meter	Fisher Scientific	14-650-118	2020-06-26	2021-06-26
LISN003	LISN, 50-ohm/50-uH, 250uH 2-conductor, 25A	Fischer Custom Com.	FCC-LISN-50/250-25-2-01	2020-08-18	2021-08-18
75141	EMI Test Receiver 9kHz-7GHz	Rohde & Schwarz	ESCI 7	2020-08-18	2021-08-18
ATA222	Transient Limiter, 0.009-100MHz	Electro-Metrics	EM-7600	2021-04-05	2022-04-05
PS214	AC Power Source	Elgar	CW2501M (s/n 1523A02396)	NA	NA
SOFTEMI	EMI Software	UL	Version 9.5 (04 Mar 21)		

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Test Equipment Used - Radiated Disturbance Emissions (E-field) – Chamber C

Equipment ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
	1-18 GHz				
AT0062	HORN Antenna	ETS-Lindgren	3117	2021-02-03	2022-02-03
	Gain-Loss Chains				
C-SAC02	Gain-loss string: 1-18GHz	Various	Various	2021-04-15	2022-04-15
	Receiver & Software				
206496	Spectrum Analyzer	Rohde & Schwarz	ESW44	2020-03-09	2022-03-09
SOFTEMI	EMI Software	UL	Version 9.5 (04 Mar 21)	NA	NA
	Additional Equipment used				
HI0085	Temp/Humid/Pressure Meter	EXTECH	SD700	2020-04-20	2021-04-30

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

Equipment 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	2020-04-27	2021-04-27
	Gain-Loss Chains				
N-SAC03	Gain-loss string: 1-18GHz	Various	Various	2020-07-28	2021-07-28
	Receiver & Software				
197954	Spectrum Analyzer	Rohde & Schwarz	ESW44	2021-03-30	2022-03-30
SOFTEMI	EMI Software	UL	Version 9.5 (04 Mar 2021)		
	Additional Equipment used				
s/n 181474341	Environmental Meter	Fisher Scientific	15-077-963	2020-08-06	2021-08-06

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

Equipment ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
	0.009-30MHz				
AT0079	Active Loop Antenna	ETS-Lindgren	6502	2020-08-20	2021-08-20
	30-1000 MHz				
AT0075	Hybrid Broadband Antenna	Sunol Sciences Corp.	JB3	2020-10-27	2021-10-27
	18-40 GHz				
AT0063	Horn Antenna, 18-26.5GHz	ARA	MWH-1826/B	2020-10-30	2021-10-30
	Gain-Loss Chains				
S-SAC01	Gain-loss string: 0.009-30MHz	Various	Various	2020-07-10	2021-07-10
S-SAC02	Gain-loss string: 25-1000MHz	Various	Various	2020-07-10	2021-07-10
S-SAC04	Gain-loss string: 18-40GHz	Various	Various	2020-07-07	2021-07-07
	Receiver & Software				
197955	Spectrum Analyzer	Rohde & Schwarz	ESW44	2021-03-10	2022-03-10
SOFTEMI	EMI Software	UL	Version 9.5 (04 Mar 2021)		
	Additional Equipment used				
s/n 200037635	Environmental Meter	Fisher Scientific	06-662-4	2020-01-22	2022-01-22

NOTES:

1. For equipment listed above that was calibrated during the testing period, please note the equipment was used for testing after calibration.
2. For equipment listed above that has a calibration due date during the testing period, the testing was completed before the equipment expiration date.

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9. ANTENNA PORT TEST RESULTS

9.1. ON TIME AND DUTY CYCLE

LIMITS

None; for reporting purposes only.

PROCEDURE

KDB 558074 Zero-Span Spectrum Analyzer Method.

ON TIME AND DUTY CYCLE RESULTS

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						
125Kbps	3.105	3.750	0.828	82.80%	0.82	0.322
500Kbps	1.069	1.875	0.570	57.01%	2.44	0.935
1Mbps	0.389	0.625	0.622	62.24%	2.06	2.571
2Mbps	0.206	0.625	0.330	32.96%	4.82	4.854

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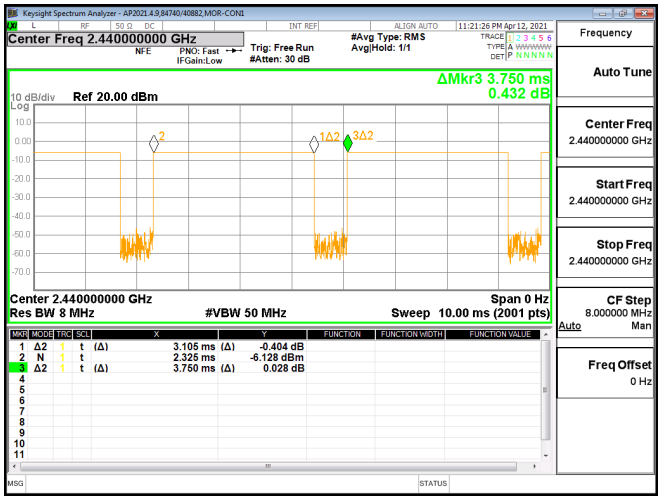
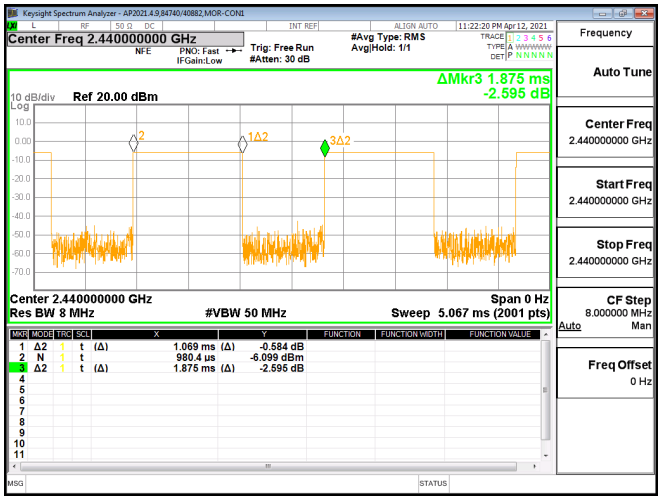
DUTY CYCLE PLOTS



125Kbps



500Kbps

1Mbps

2Mbps

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9.2. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

RESULTS

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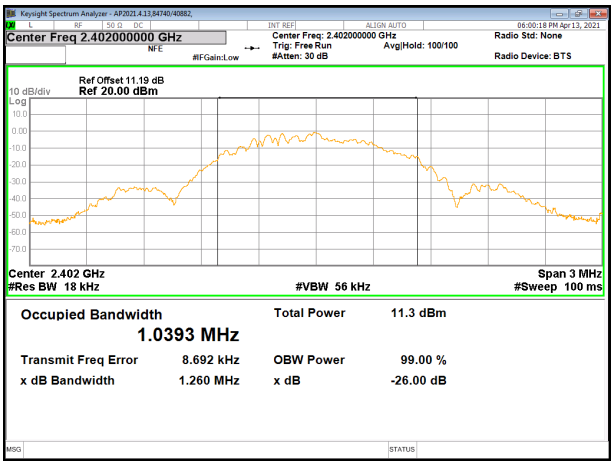
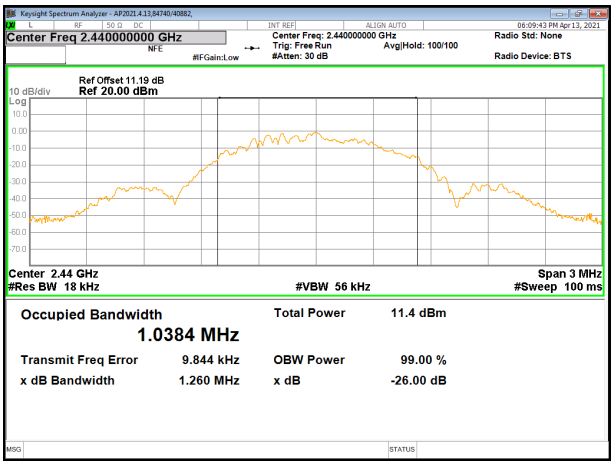
9.2.1. BLE (1Mbps)

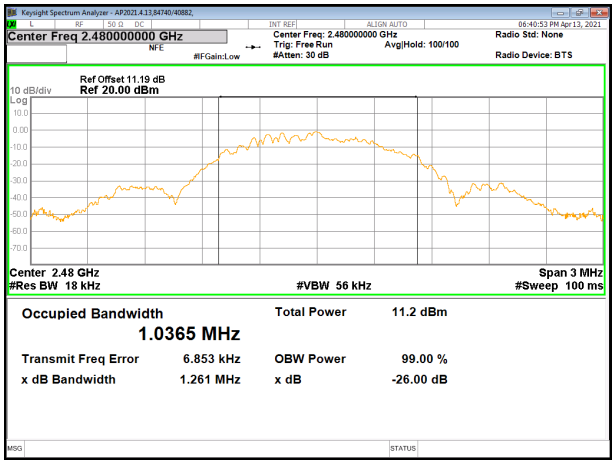
Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2402	1.0393
Middle	2440	1.0384
High	2480	1.0365



LOW CHANNEL



MID CHANNEL



HIGH CHANNEL

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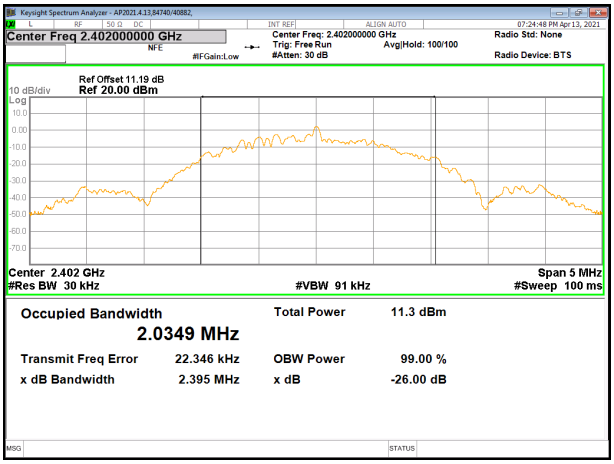
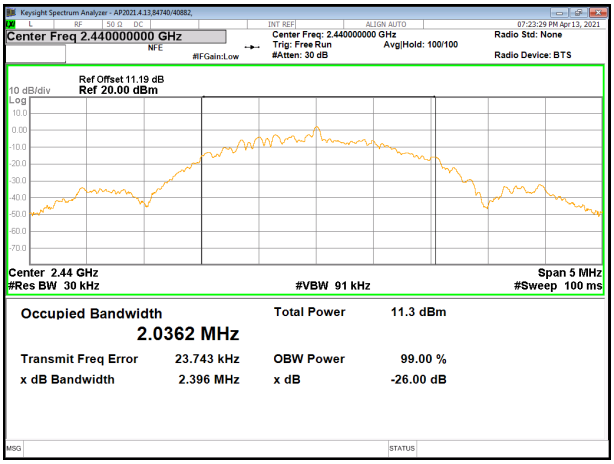
9.2.2. BLE (2Mbps)

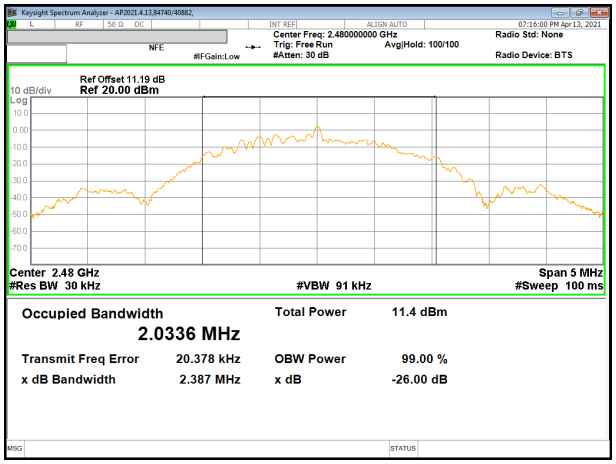
Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2402	2.0349
Middle	2440	2.0362
High	2480	2.0336



LOW CHANNEL



MID CHANNEL



HIGH CHANNEL

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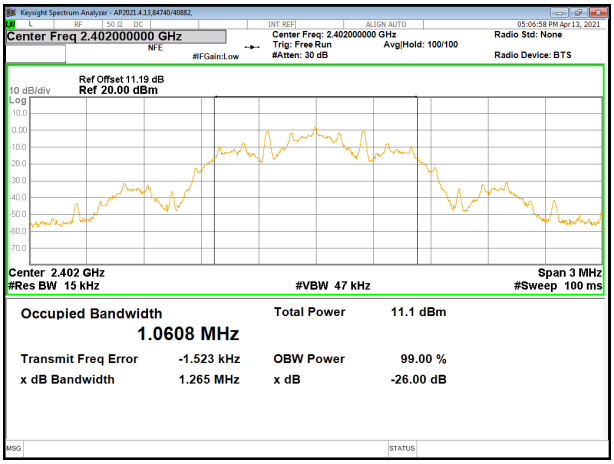
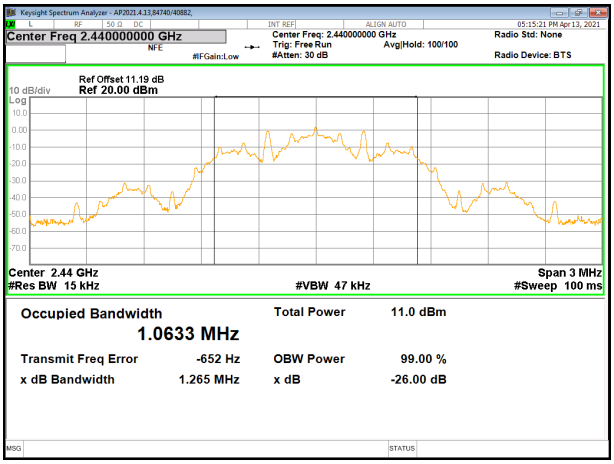
9.2.3. BLE (125Kbps)

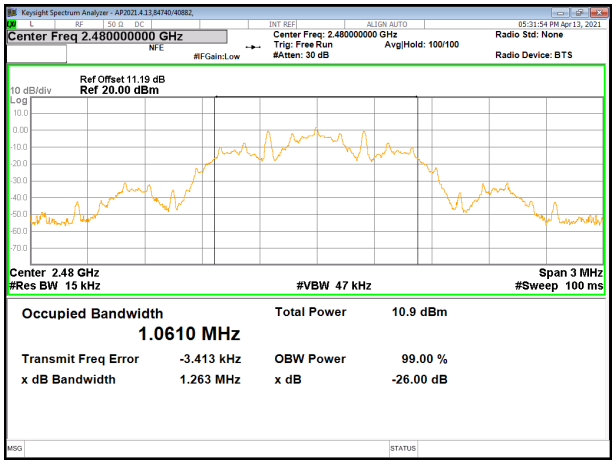
Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2402	1.0608
Middle	2440	1.0633
High	2480	1.0610



LOW CHANNEL



MID CHANNEL



HIGH CHANNEL

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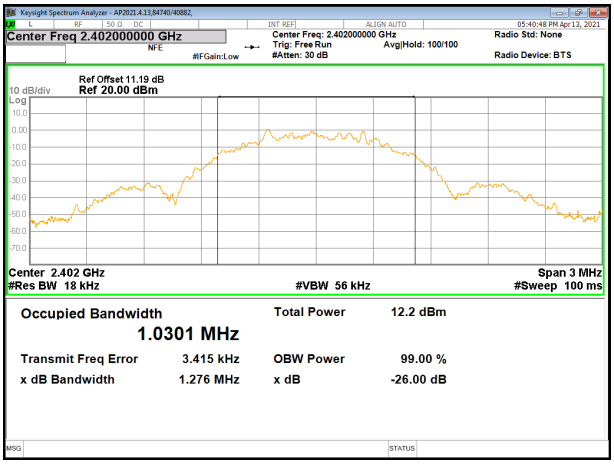
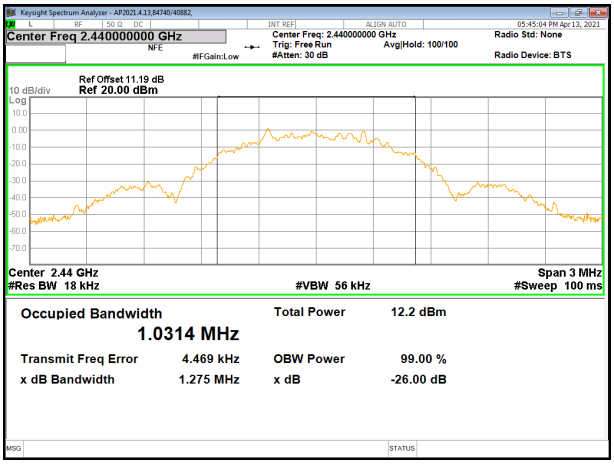
9.2.4. BLE (500Kbps)

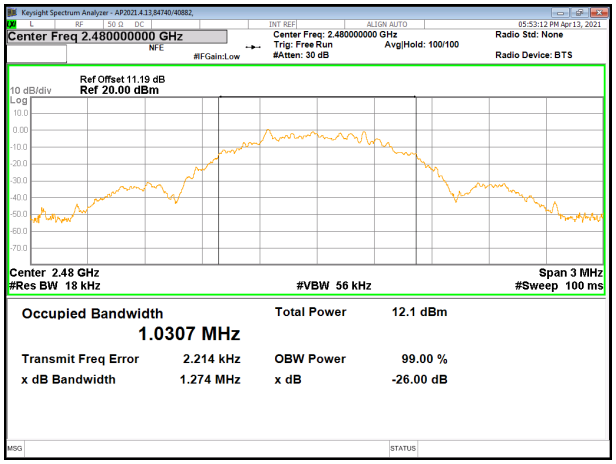
Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2402	1.0301
Middle	2440	1.0314
High	2480	1.0307



LOW CHANNEL



MID CHANNEL



HIGH CHANNEL

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9.3. 6 dB BANDWIDTH

LIMITS

FCC §15.247 (a) (2)

RSS-247 5.2 (a)

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

RESULTS

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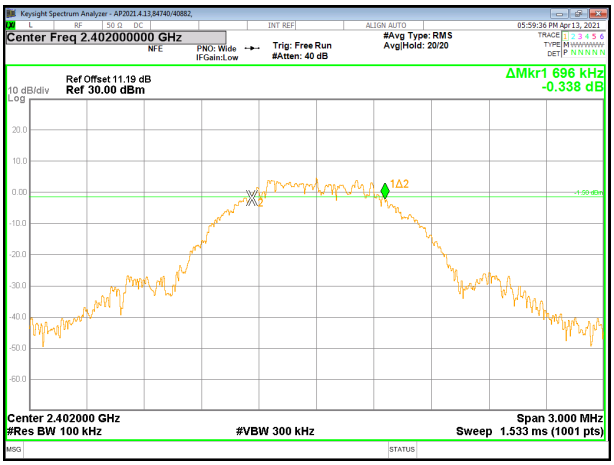
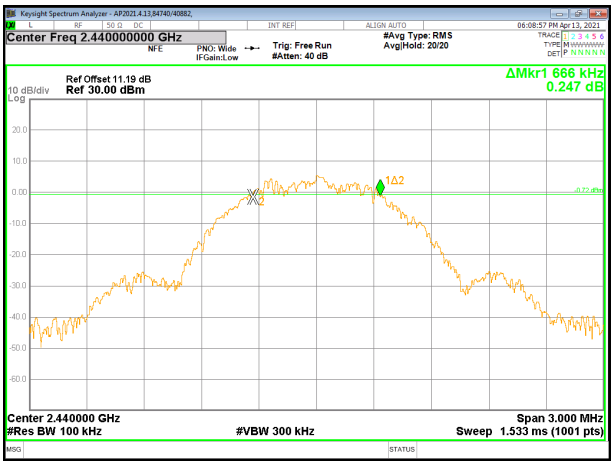
9.3.1. BLE (1Mbps)

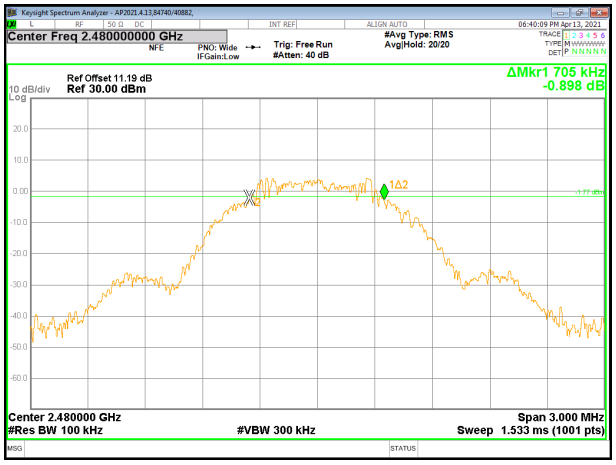
Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2402	0.696	0.5
Middle	2440	0.666	0.5
High	2480	0.705	0.5



LOW CHANNEL



MID CHANNEL



HIGH CHANNEL

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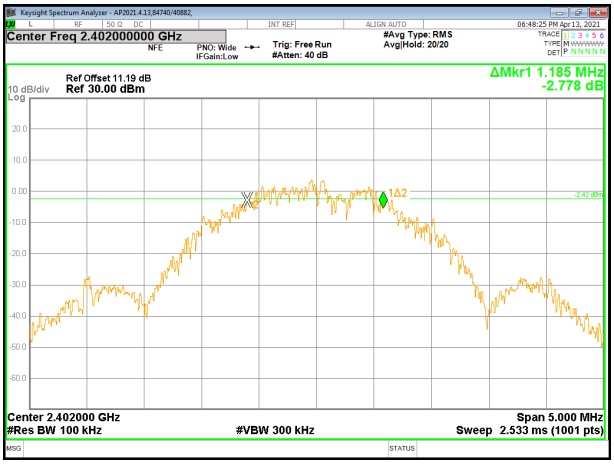
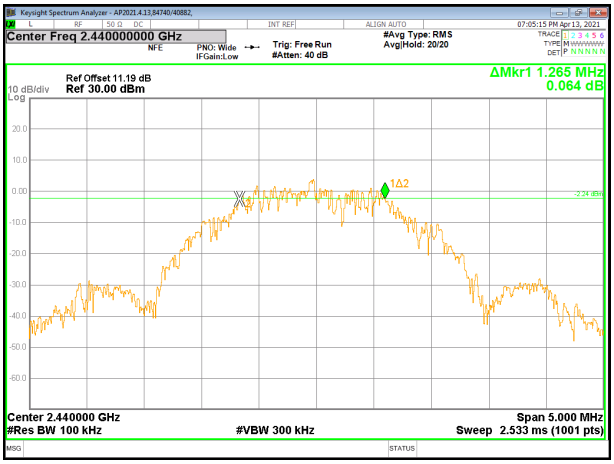
9.3.2. BLE (2Mbps)

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2402	1.185	0.5
Middle	2440	1.265	0.5
High	2480	1.070	0.5



LOW CHANNEL



MID CHANNEL

HIGH CHANNEL

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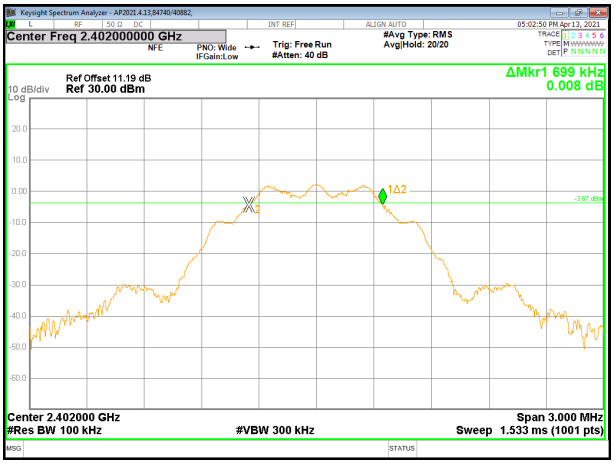
9.3.3. BLE (125Kbps)

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2402	0.699	0.5
Middle	2440	0.654	0.5
High	2480	0.702	0.5



LOW CHANNEL

MID CHANNEL

HIGH CHANNEL

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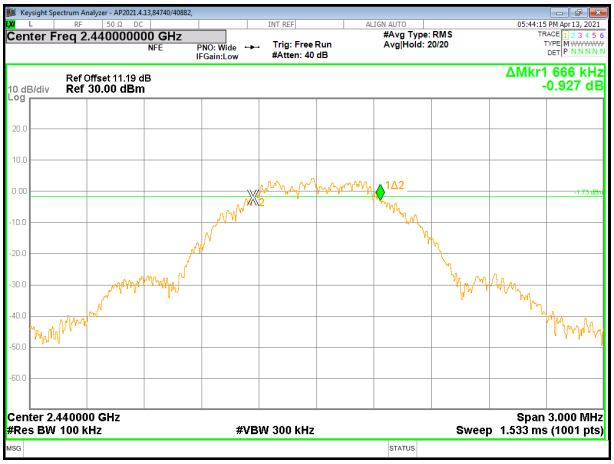
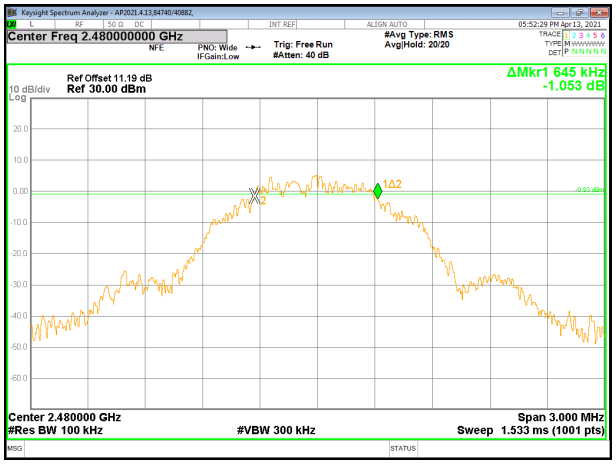
9.3.4. BLE (500Kbps)

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2402	0.654	0.5
Middle	2440	0.666	0.5
High	2480	0.645	0.5

LOW CHANNEL



MID CHANNEL



HIGH CHANNEL

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9.4. OUTPUT POWER

LIMITS

FCC §15.247 (b) (3)

RSS-247 5.4 (d)

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

TEST PROCEDURE

The transmitter output is connected to a power meter.

The cable assembly insertion loss of 11.04 dB (including 9.77 dB pad and 1.27 dB cable) was entered as an offset in the power meter and peak power was measured.

RESULTS

9.4.1. BLE (1Mbps)

Tested By:	84740/40882
Date:	2021-04-14

Channel	Frequency (MHz)	Peak Power Reading (dBm)	Limit (dBm)	Margin (dB)
Low	2402	4.17	30	-25.83
Middle	2440	4.22	30	-25.78
High	2480	4.66	30	-25.34

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9.4.2. BLE (2Mbps)

Tested By:	84740/40882
Date:	2021-04-14

Channel	Frequency (MHz)	Peak Power Reading (dBm)	Limit (dBm)	Margin (dB)
Low	2402	4.19	30	-25.81
Middle	2440	4.26	30	-25.74
High	2480	4.46	30	-25.54

9.4.3. BLE (125Kbps)

Tested By:	84740/40882
Date:	2021-04-14

Channel	Frequency (MHz)	Peak Power Reading (dBm)	Limit (dBm)	Margin (dB)
Low	2402	4.16	30	-25.84
Middle	2440	4.23	30	-25.77
High	2480	4.46	30	-25.54

9.4.4. BLE (500Kbps)

Tested By:	84740/40882
Date:	2021-04-14

Channel	Frequency (MHz)	Peak Power Reading (dBm)	Limit (dBm)	Margin (dB)
Low	2402	4.20	30	-25.80
Middle	2440	4.24	30	-25.76
High	2480	4.51	30	-25.49

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9.5. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

The cable assembly insertion loss of 11.04 dB (including 9.77 dB pad and 1.27 dB cable) was entered as an offset in the power meter and gated average power was measured.

RESULTS

9.5.1. BLE (1Mbps)

Tested By:	84740/40882
Date:	2021-04-14

Channel	Frequency (MHz)	AV power (dBm)
Low	2402	4.02
Middle	2440	4.08
High	2480	4.33

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9.5.2. BLE (2Mbps)

Tested By:	84740/40882
Date:	2021-04-14

Channel	Frequency (MHz)	AV power (dBm)
Low	2402	4.05
Middle	2440	4.11
High	2480	4.34

9.5.3. BLE (125Kbps)

Tested By:	84740/40882
Date:	2021-04-14

Channel	Frequency (MHz)	AV power (dBm)
Low	2402	4.01
Middle	2440	4.09
High	2480	4.33

9.5.4. BLE (500Kbps)

Tested By:	84740/40882
Date:	2021-04-14

Channel	Frequency (MHz)	AV power (dBm)
Low	2402	4.05
Middle	2440	4.11
High	2480	4.34

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9.6. POWER SPECTRAL DENSITY

LIMITS

FCC §15.247 (e)

RSS-247 (5.2) (b)

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

RESULTS

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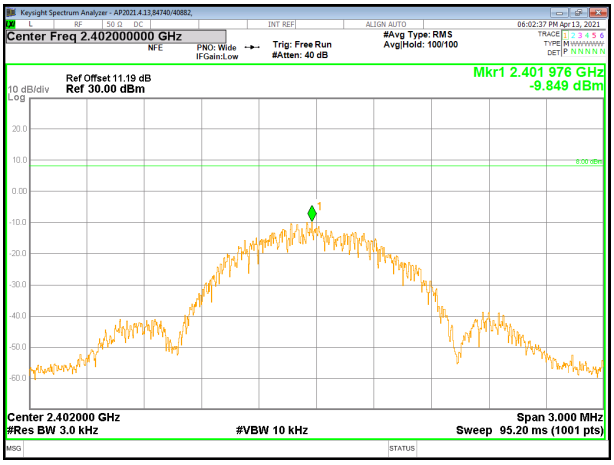
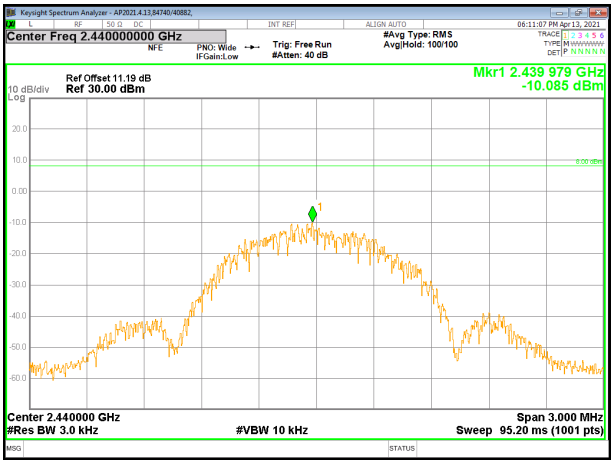
9.6.1. BLE (1Mbps)

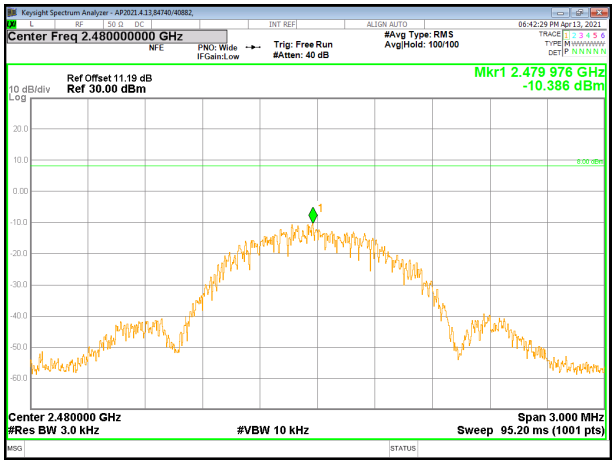
Channel	Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Margin (dB)
Low	2402	-9.85	8	-17.85
Middle	2440	-10.09	8	-18.09
High	2480	-10.39	8	-18.39



LOW CHANNEL



MID CHANNEL



HIGH CHANNEL

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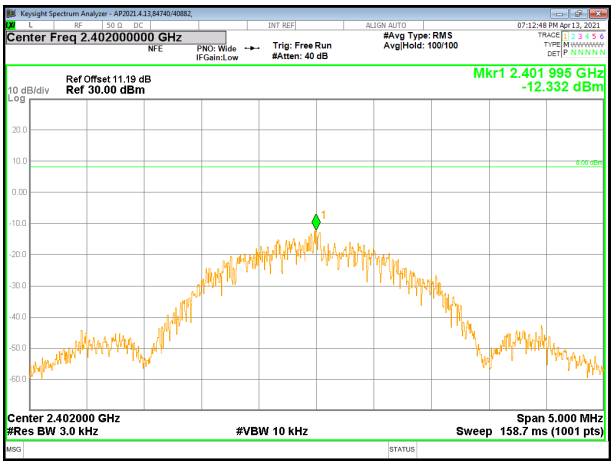
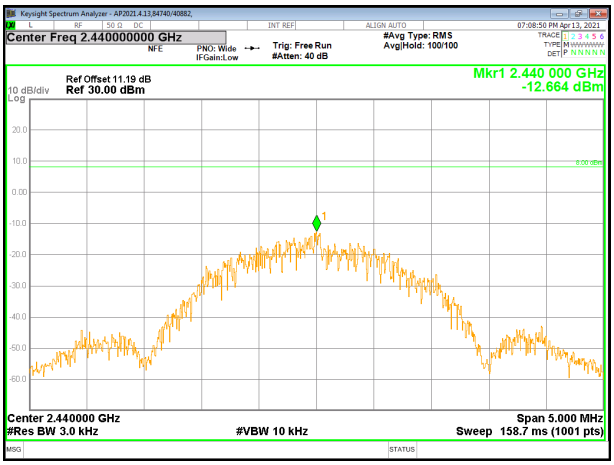
9.6.2. BLE (2Mbps)

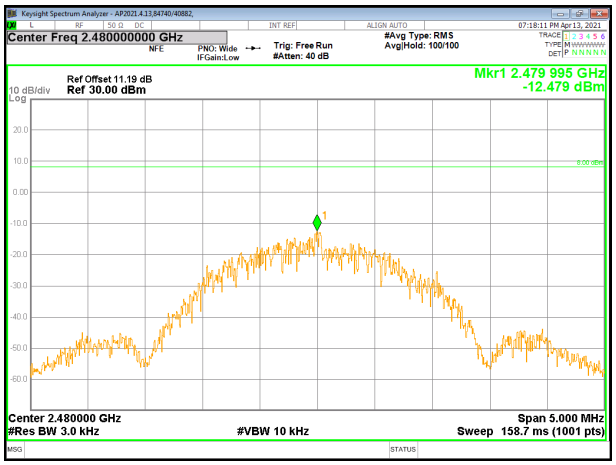
Channel	Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Margin (dB)
Low	2402	-12.33	8	-20.33
Middle	2440	-12.66	8	-20.66
High	2480	-12.48	8	-20.48



LOW CHANNEL



MID CHANNEL



HIGH CHANNEL

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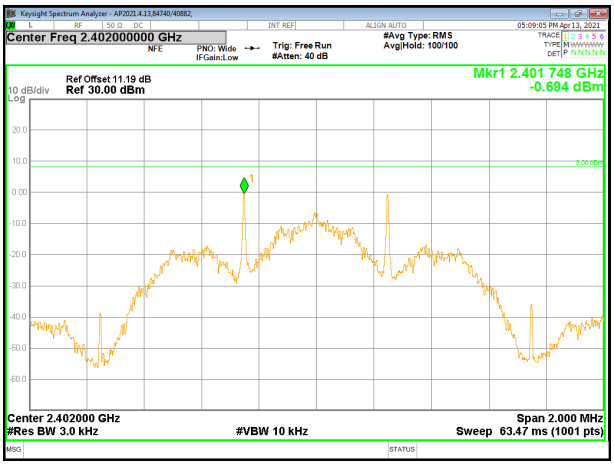
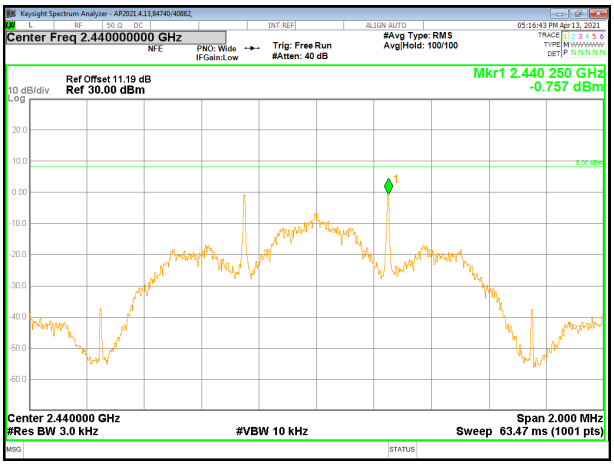
9.6.3. BLE (125Kbps)

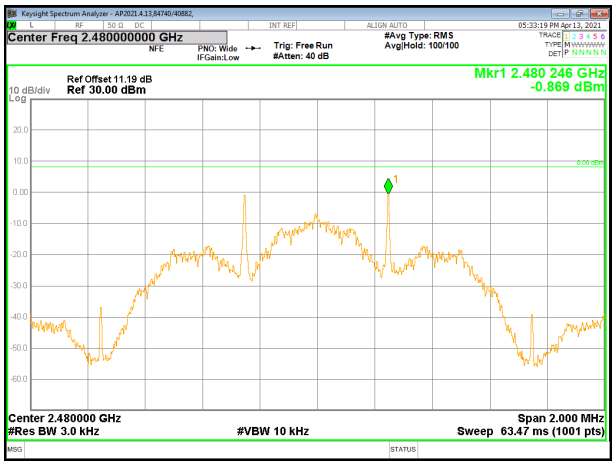
Channel	Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Margin (dB)
Low	2402	-0.69	8	-8.69
Middle	2440	-0.76	8	-8.76
High	2480	-0.87	8	-8.87



LOW CHANNEL



MID CHANNEL



HIGH CHANNEL

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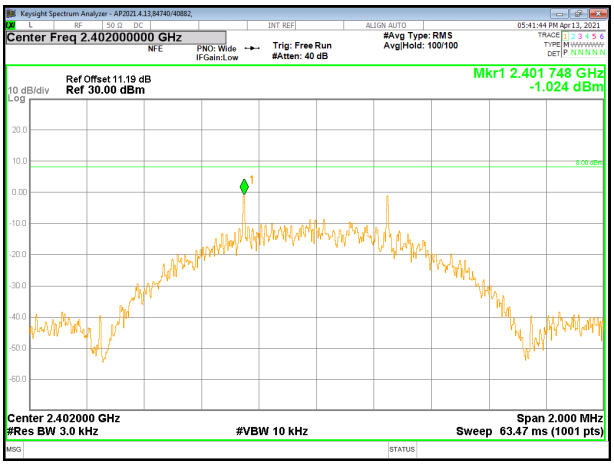
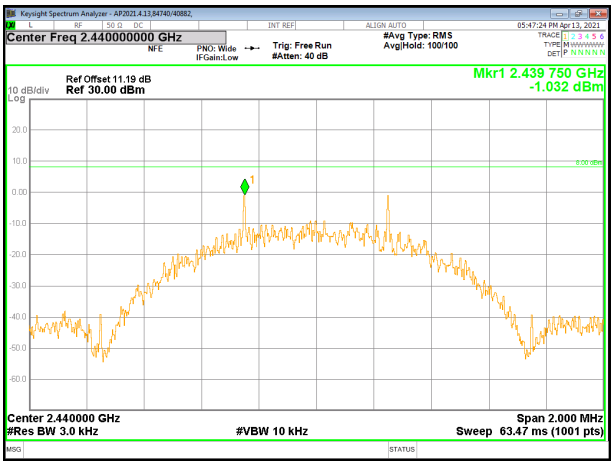
9.6.4. BLE (500Kbps)

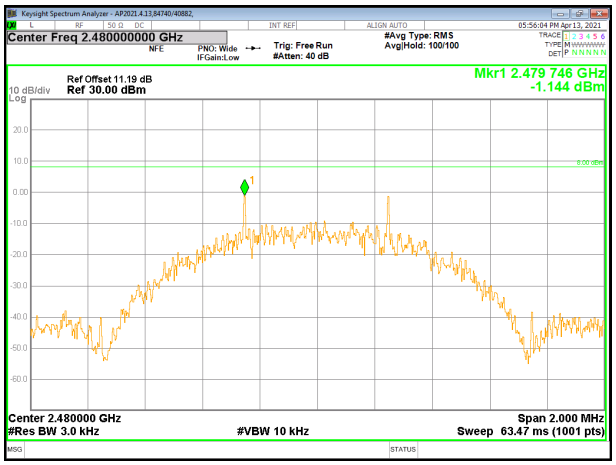
Channel	Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Margin (dB)
Low	2402	-1.02	8	-9.02
Middle	2440	-1.03	8	-9.03
High	2480	-1.14	8	-9.14



LOW CHANNEL



MID CHANNEL



HIGH CHANNEL

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9.7. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

RSS-247 5.5

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

RESULTS

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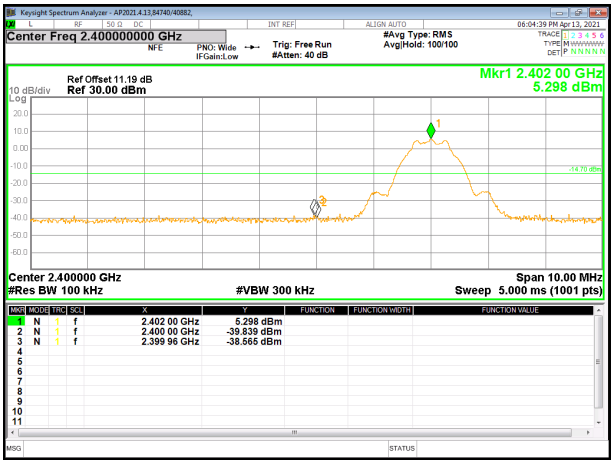
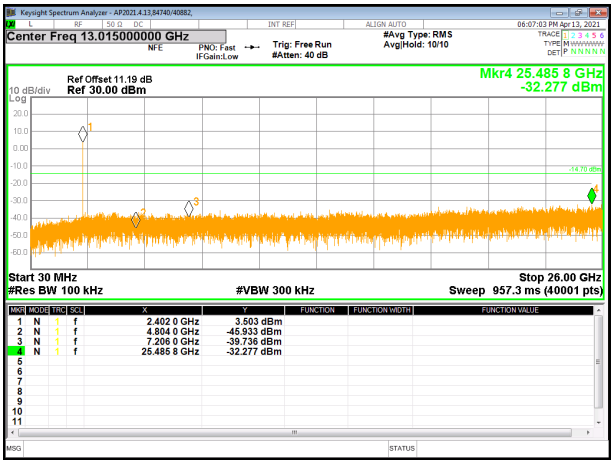
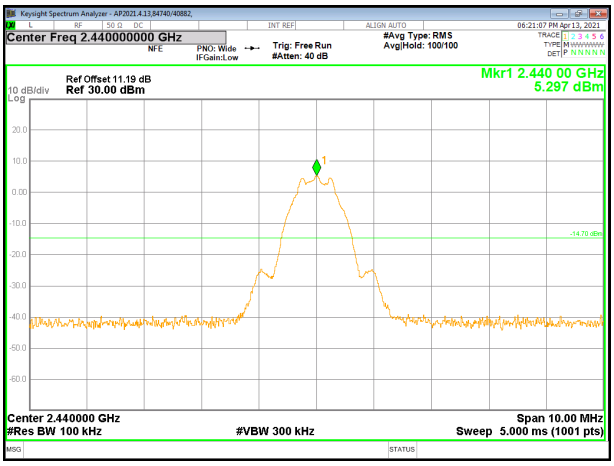
9.7.1. BLE (1Mbps)



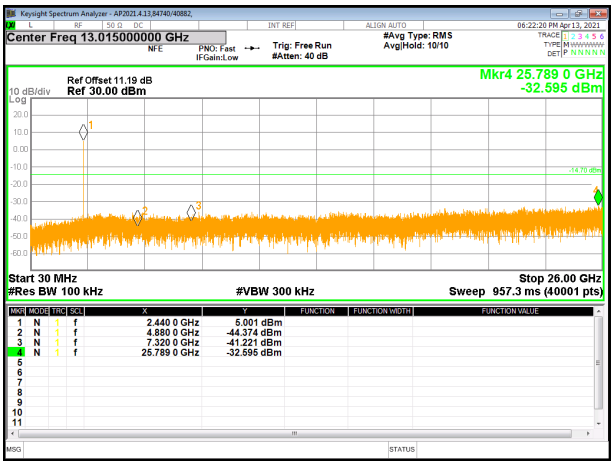
LOW CHANNEL BANDEDGE



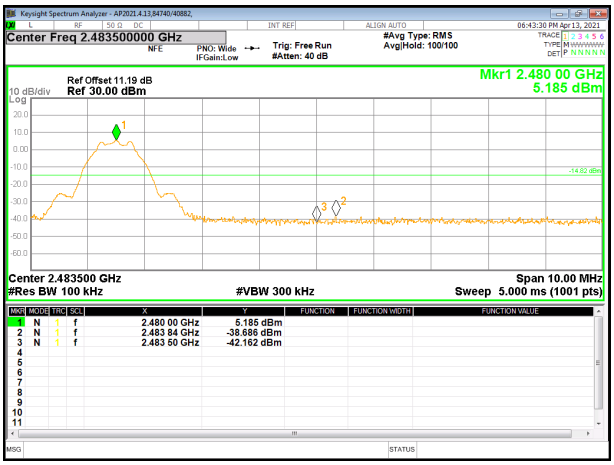
OUT-OF-BAND LOW CHANNEL



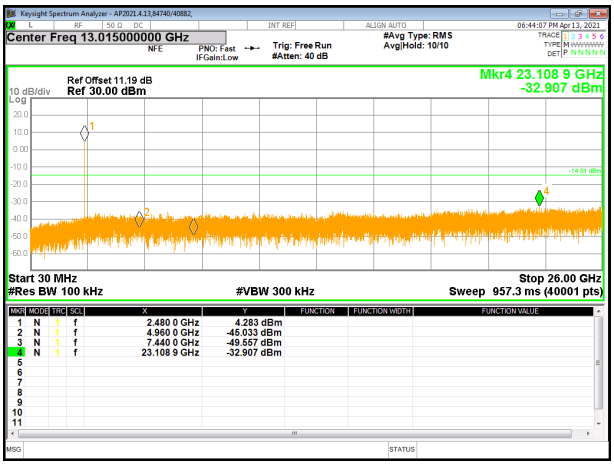
IN-BAND REFERENCE LEVEL



OUT-OF-BAND MID CHANNEL



HIGH CHANNEL BANDEDGE



OUT-OF-BAND HIGH CHANNEL

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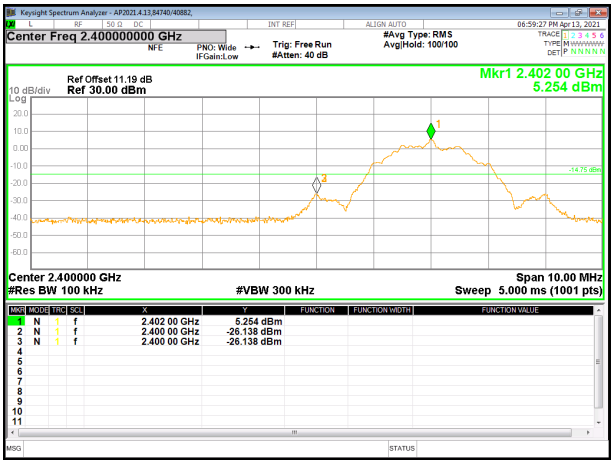
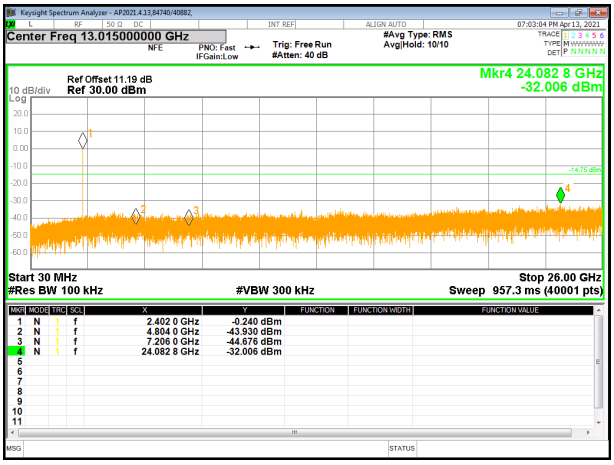
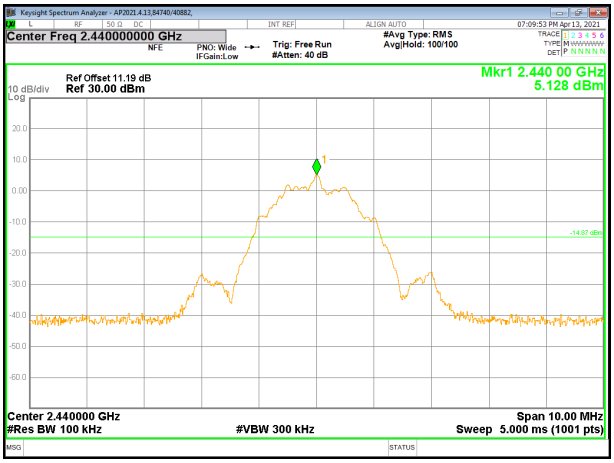
9.7.2. BLE (2Mbps)



LOW CHANNEL BANDEDGE

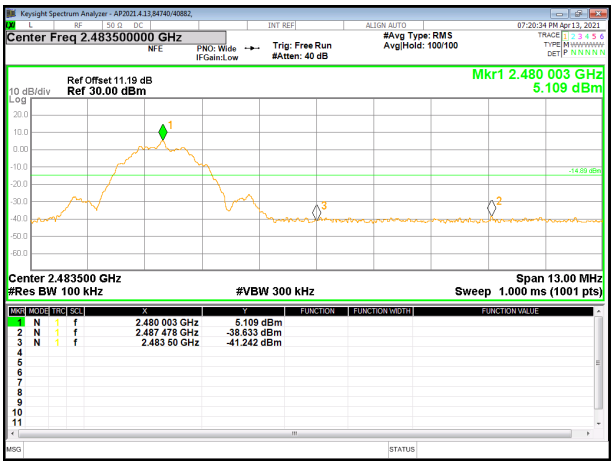


OUT-OF-BAND LOW CHANNEL

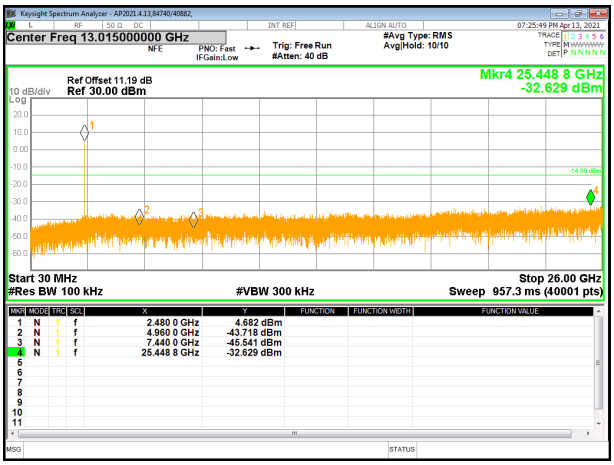


IN-BAND REFERENCE LEVEL

OUT-OF-BAND MID CHANNEL



HIGH CHANNEL BANDEDGE



OUT-OF-BAND HIGH CHANNEL

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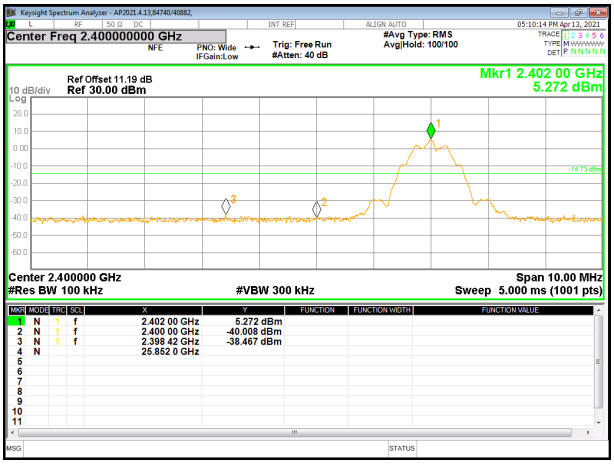
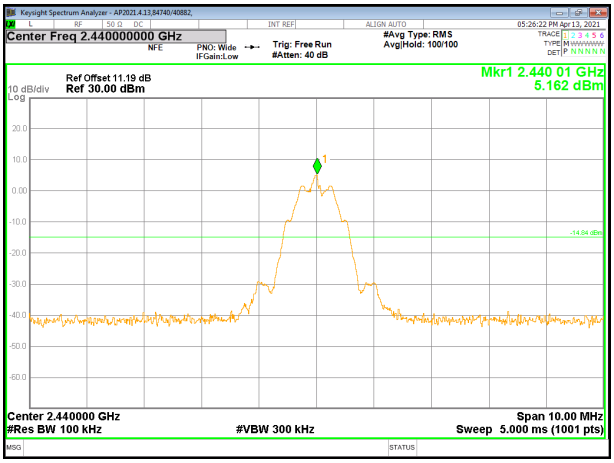
9.7.3. BLE (125Kbps)

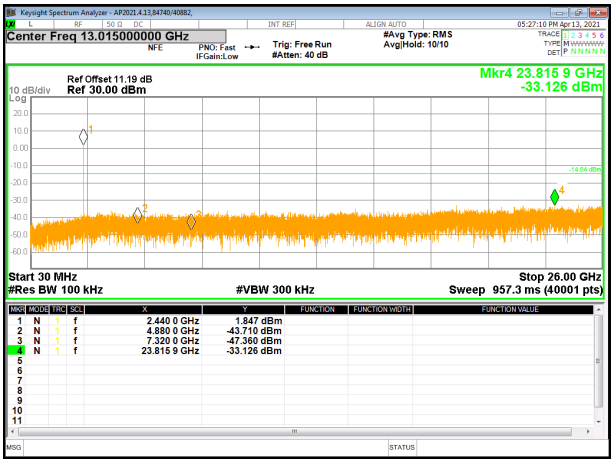


LOW CHANNEL BANDEDGE

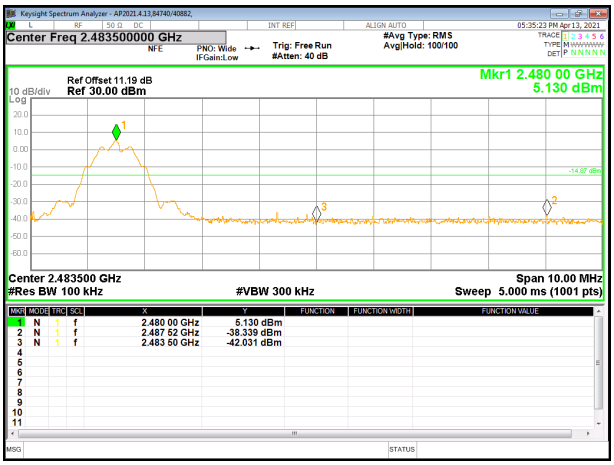
OUT-OF-BAND LOW CHANNEL



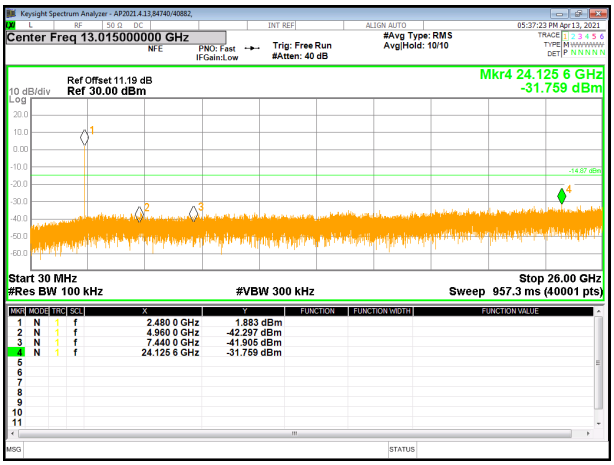
IN-BAND REFERENCE LEVEL



OUT-OF-BAND MID CHANNEL



HIGH CHANNEL BANDEDGE



OUT-OF-BAND HIGH CHANNEL

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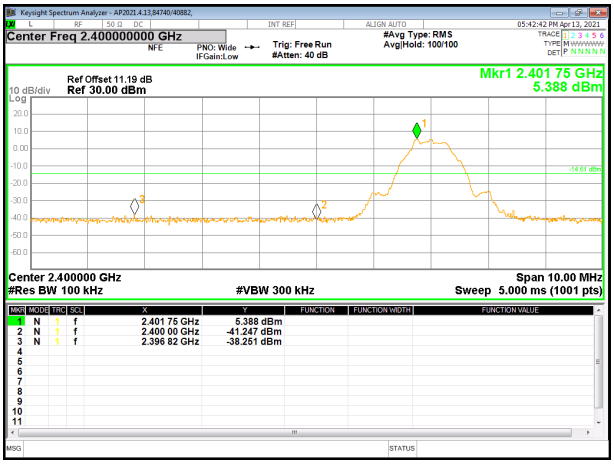
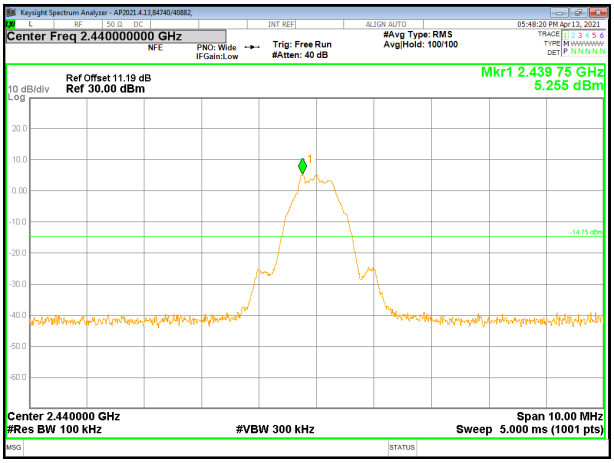
9.7.4. BLE (500Kbps)



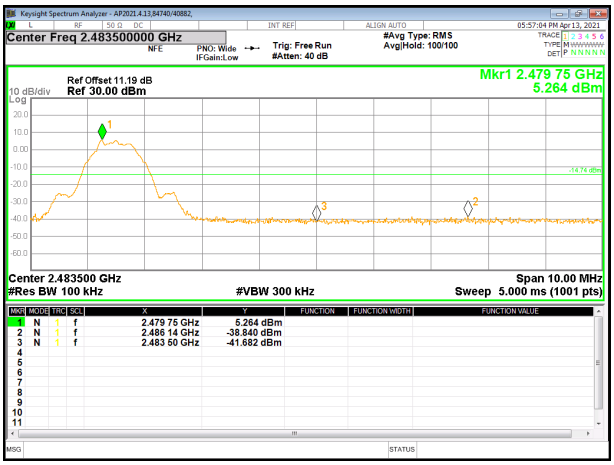
LOW CHANNEL BANDEDGE

OUT-OF-BAND LOW CHANNEL

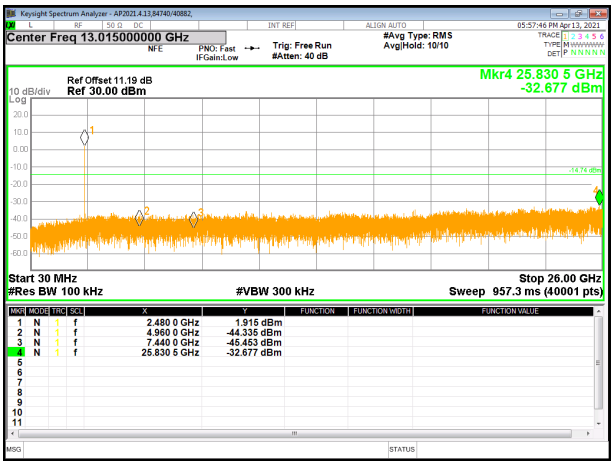


IN-BAND REFERENCE LEVEL

OUT-OF-BAND MID CHANNEL



HIGH CHANNEL BANDEDGE



OUT-OF-BAND HIGH CHANNEL

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10. RADIATED TEST RESULTS

10.1. LIMITS AND PROCEDURE

LIMITS

FCC §15.205 and §15.209

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

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	-

Frequency Range (MHz)	Field Strength Limit (uV/m) at 3 m	Field Strength Limit (dBuV/m) at 3 m
30 - 88	100	40
88 - 216	150	43.5
216 - 960	200	46
Above 960	500	54

TEST PROCEDURE

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

For measurements below 1 GHz the resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements 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 or average (9-90kHz and 110-490kHz).

For pre-scans above 1 GHz the resolution bandwidth is set to 1 MHz; the video bandwidth is set to 3 MHz for peak measurements.

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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 RMS 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).

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.

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

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

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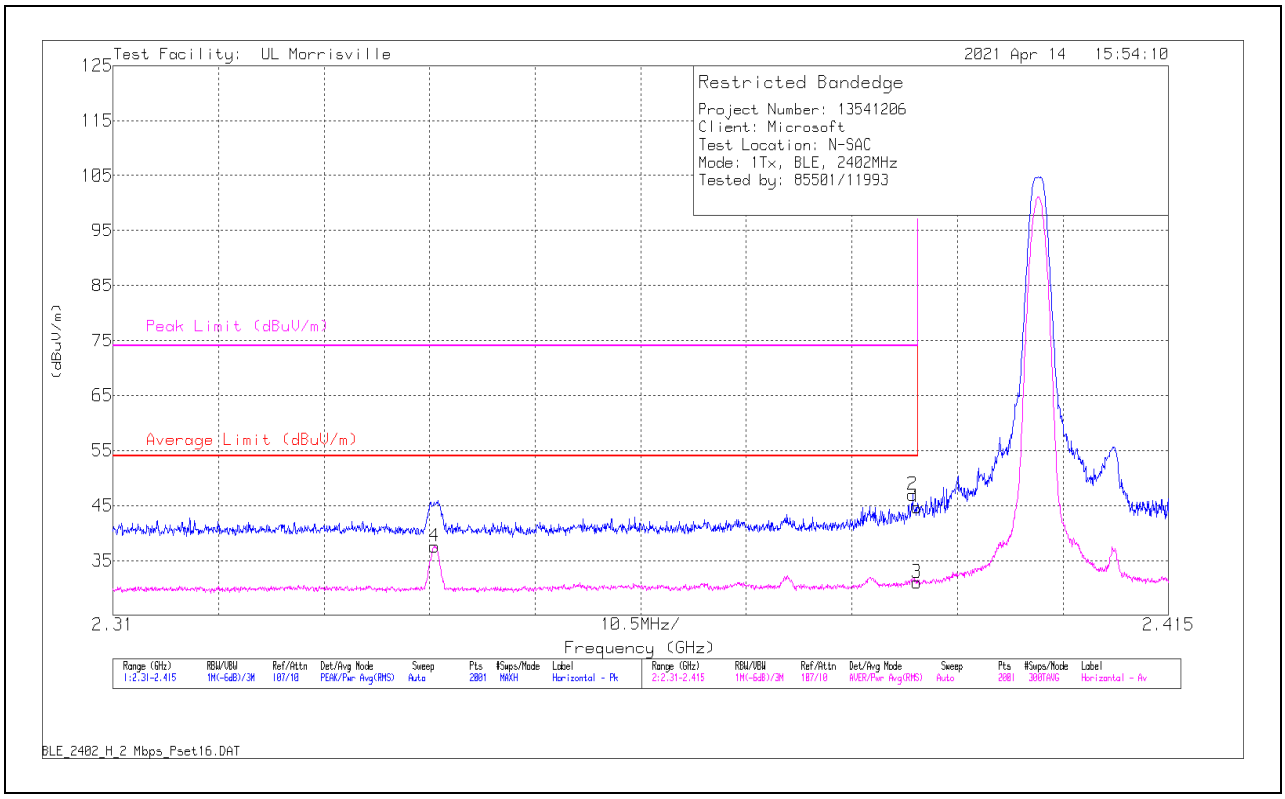
10.2. TRANSMITTER ABOVE 1 GHz

10.2.1. BLE (2Mbps)

Antenna A

BANDEDGE (LOW CHANNEL)

HORIZONTAL RESULT



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 (dB/m)	Amp/Cbl/Fltr/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	* ** 2.38996	37.31	Pk	31.8	-24.4	0	44.71	-	-	74	-29.29	21	135	H
2	* ** 2.38954	39.58	Pk	31.8	-24.4	0	46.98	-	-	74	-27.02	21	135	H
3	* ** 2.38996	18.58	RMS	31.8	-24.4	4.82	30.8	54	-23.2	-	-	21	135	H
4	* ** 2.34197	25.28	RMS	31.7	-24.4	4.82	37.4	54	-16.6	-	-	21	135	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

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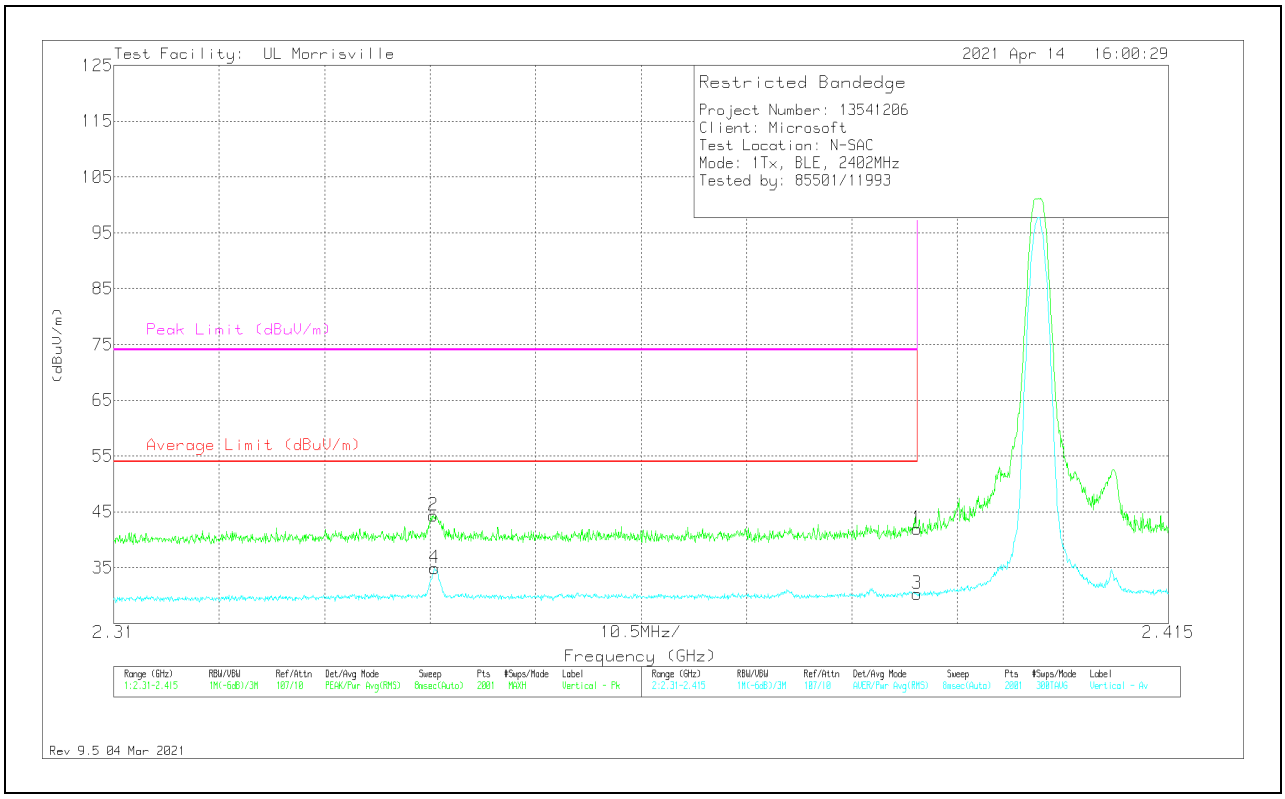
VERTICAL RESULT



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 (dB/m)	Amp/Cbl/Fltr/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	* ** 2.38996	34.57	Pk	31.8	-24.4	0	41.97	-	-	74	-32.03	51	256	V
2	* ** 2.34182	37	Pk	31.7	-24.4	0	44.3	-	-	74	-29.7	51	256	V
3	* ** 2.38996	18.08	RMS	31.8	-24.4	4.82	30.3	54	-23.7	-	-	51	256	V
4	* ** 2.34192	22.78	RMS	31.7	-24.4	4.82	34.9	54	-19.1	-	-	51	256	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

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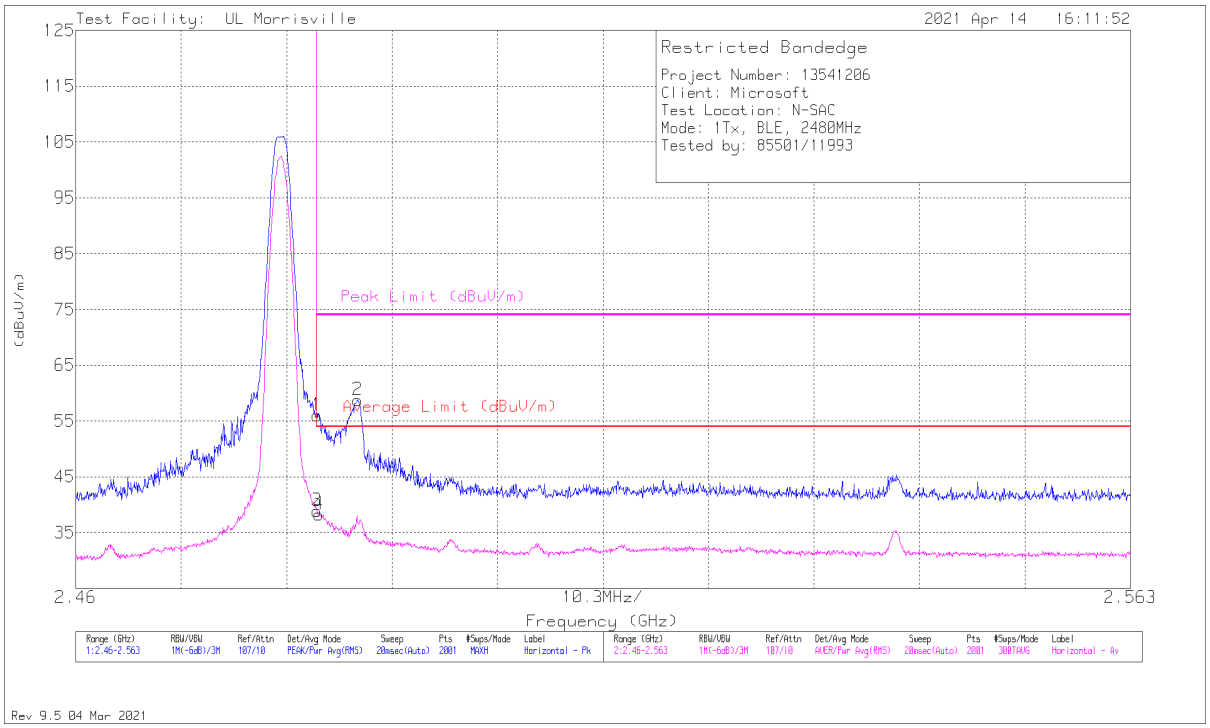
BANDEDGE (HIGH CHANNEL)

HORIZONTAL RESULT



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 (dB/m)	Amp/Cbl/Fltr/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	* ** 2.48354	47.88	Pk	32.4	-24.3	0	55.98	-	-	74	-18.02	30	119	H
2	* ** 2.48755	50.58	Pk	32.5	-24.3	0	58.78	-	-	74	-15.22	30	119	H
3	* ** 2.48354	30.79	RMS	32.4	-24.3	4.82	43.71	54	-10.29	-	-	30	119	H
4	* ** 2.48374	30.2	RMS	32.4	-24.3	4.82	43.12	54	-10.88	-	-	30	119	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

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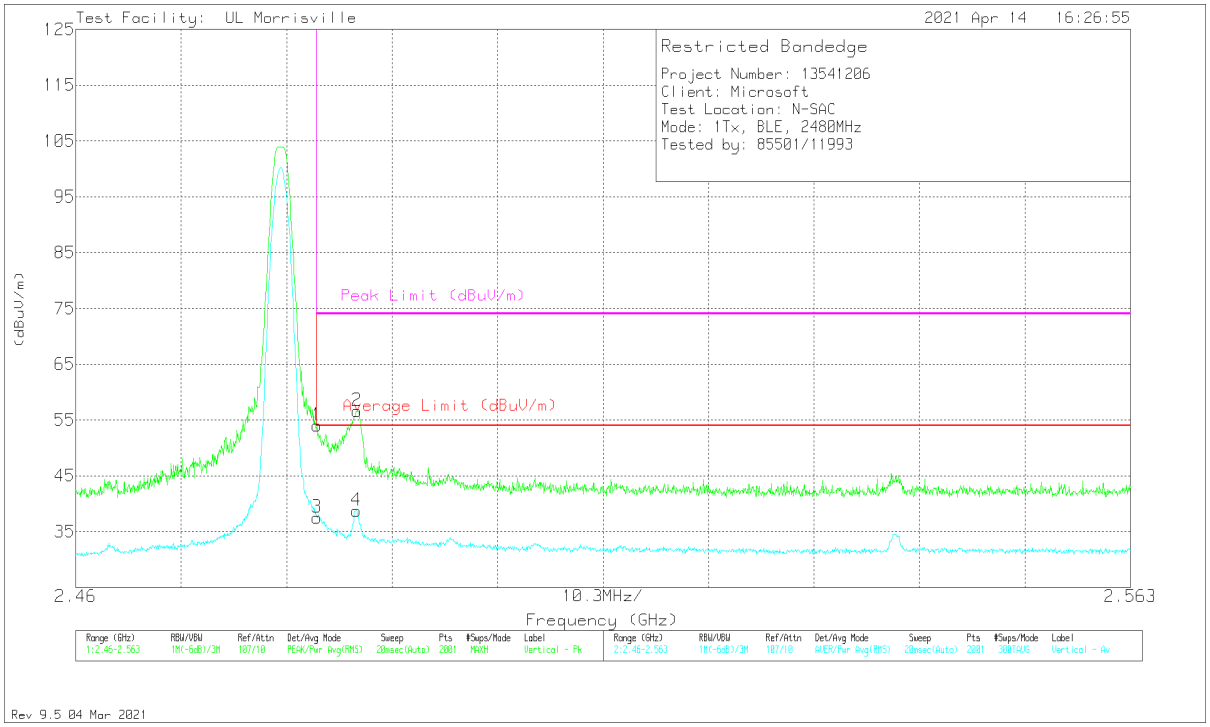
VERTICAL RESULT



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 (dB/m)	Amp/Cbl/Fltr/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	* ** 2.48354	45.93	Pk	32.4	-24.3	0	54.03	-	-	74	-19.97	54	270	V
2	* ** 2.4875	48.48	Pk	32.5	-24.3	0	56.68	-	-	74	-17.32	54	270	V
3	* ** 2.48354	29.44	RMS	32.4	-24.3	4.82	42.36	54	-11.64	-	-	54	270	V
4	* ** 2.4874	30.56	RMS	32.5	-24.3	4.82	43.58	54	-10.42	-	-	54	270	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

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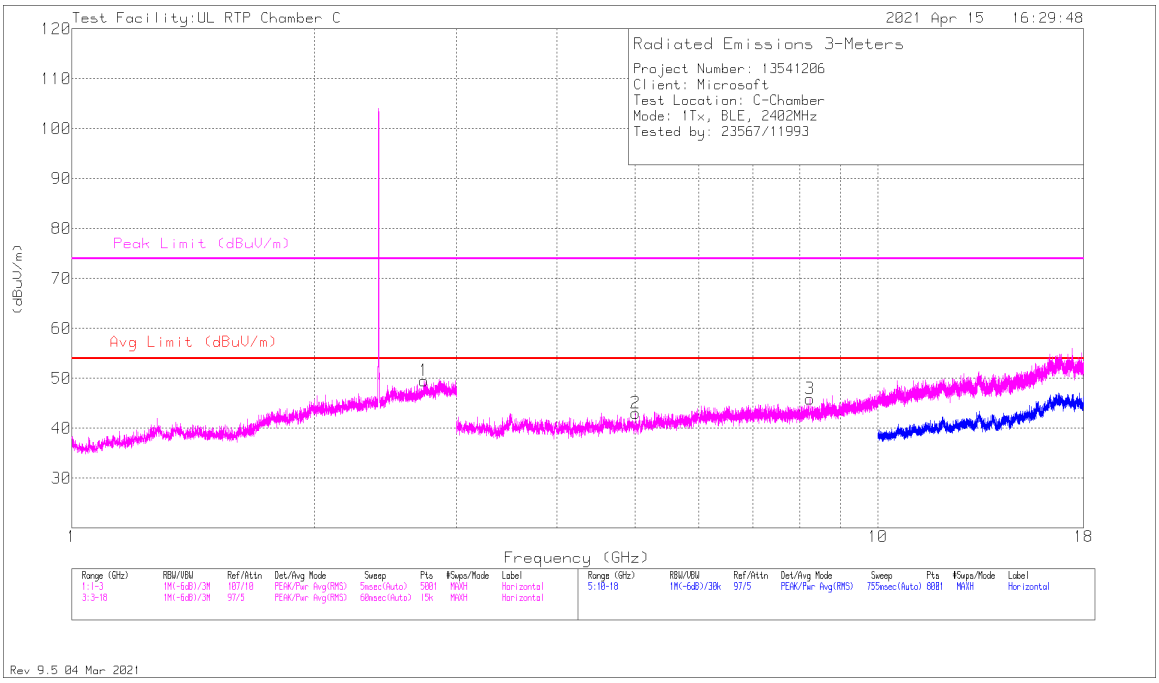
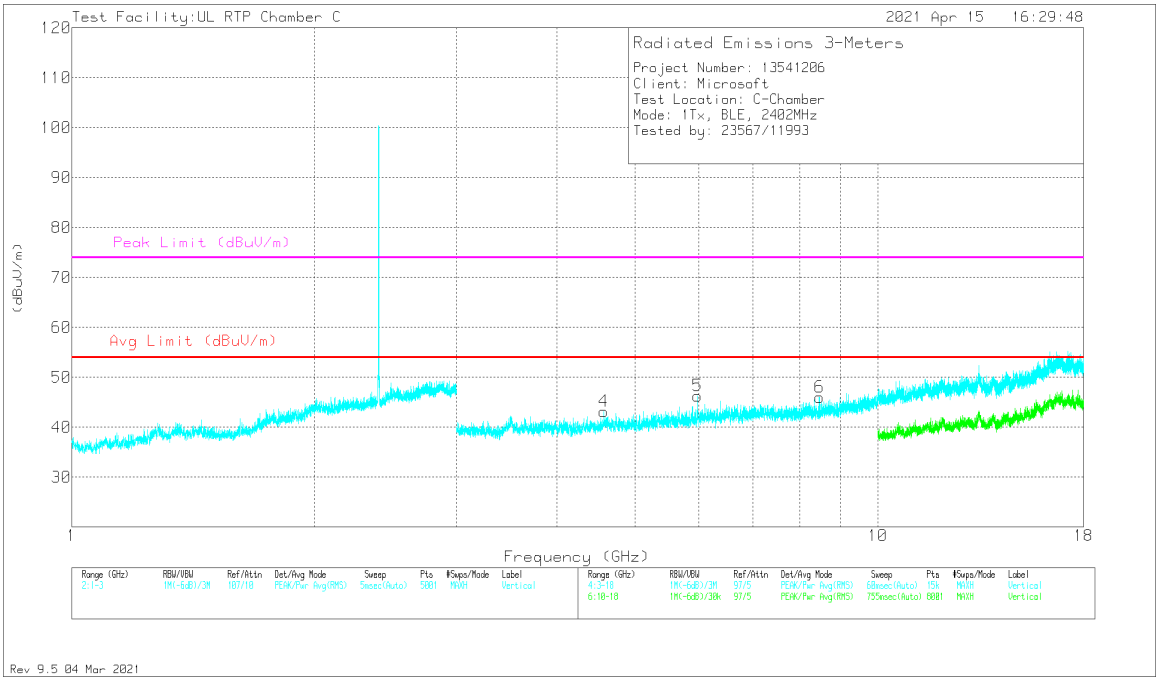
HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL RESULTS



HORIZONTAL



VERTICAL

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RADIATED EMISSIONS

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0062 (dB/m)	Amp/Cbl/Fltr (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	* ** 2.73456	34.33	PK2	32.4	-16.8	0	49.93	-	-	74	-24.07	138	217	H
	* ** 2.73462	23.08	ADR	32.4	-16.8	4.82	43.5	54	-10.5	-	-	138	217	H
2	* ** 5.005	56.24	Pk	34	-47.2	0	43.04	54	-10.96	74	-30.96	0-360	101	H
3	* ** 8.239	53.19	Pk	36	-43.3	0	45.89	54	-8.11	74	-28.11	0-360	200	H
4	* ** 4.573	55.39	Pk	34.2	-46.4	0	43.19	54	-10.81	74	-30.81	0-360	101	V
6	* ** 8.4615	53.44	Pk	35.9	-43.3	0	46.04	54	-7.96	74	-27.96	0-360	200	V
5	5.972	57.12	Pk	35.4	-46.2	0	46.32	-	-	-	-	0-360	200	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
** - indicates frequency in Taiwan NCC LP0002 Restricted Band
Pk - Peak detector
PK2 - Maximum Peak
ADR - RMS average

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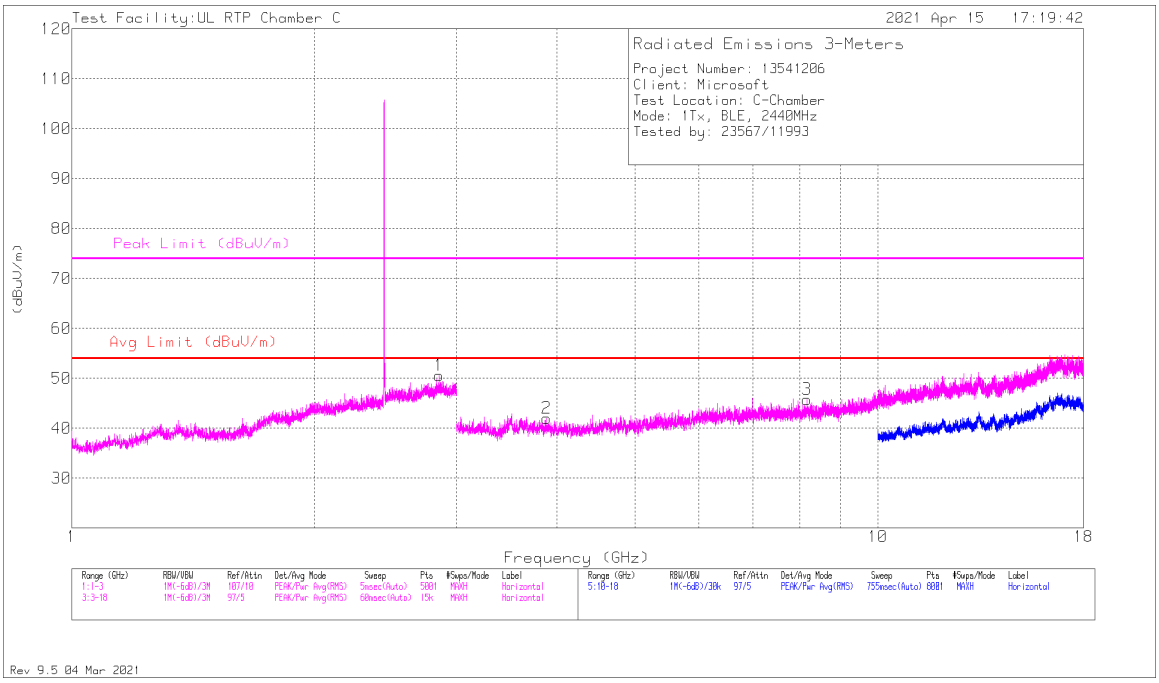
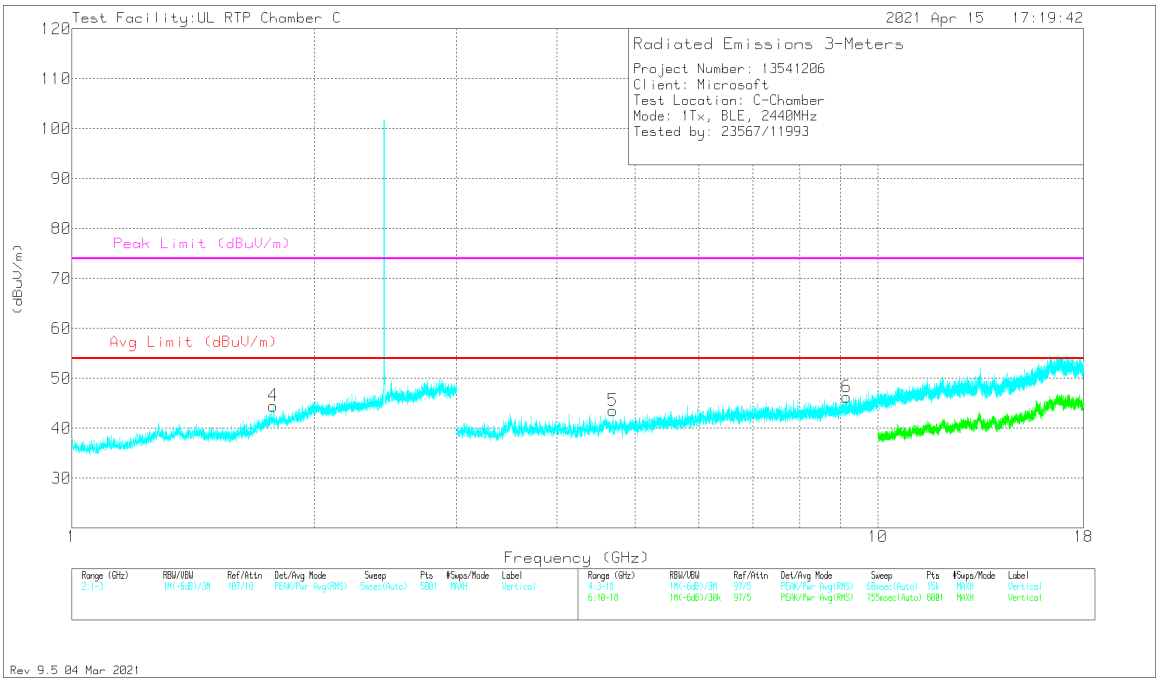
MID CHANNEL RESULTS



HORIZONTAL



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RADIATED EMISSIONS

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0062 (dB/m)	Amp/Cbl/Fltr (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	* ** 2.8528	34.55	PK2	32.5	-16.8	0	50.25	-	-	74	-23.75	72	323	H
	* ** 2.8522	22.91	ADR	32.5	-16.8	4.82	43.43	54	-10.57	-	-	72	323	H
4	** 1.7764	33.73	Pk	29.6	-18.8	0	44.53	54	-9.47	74	-29.47	0-360	101	V
2	* ** 3.886	56.75	Pk	33.6	-48.3	0	42.05	54	-11.95	74	-31.95	0-360	200	H
3	* ** 8.171	52.83	Pk	36	-43.1	0	45.73	54	-8.27	74	-28.27	0-360	200	H
5	* ** 4.694	56.8	Pk	34.1	-47.4	0	43.5	54	-10.5	74	-30.5	0-360	200	V
6	* ** 9.153	52.87	Pk	36.4	-43	0	46.27	54	-7.73	74	-27.73	0-360	200	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
** - indicates frequency in Taiwan NCC LP0002 Restricted Band
Pk - Peak detector
PK2 - Maximum Peak
ADR - RMS average

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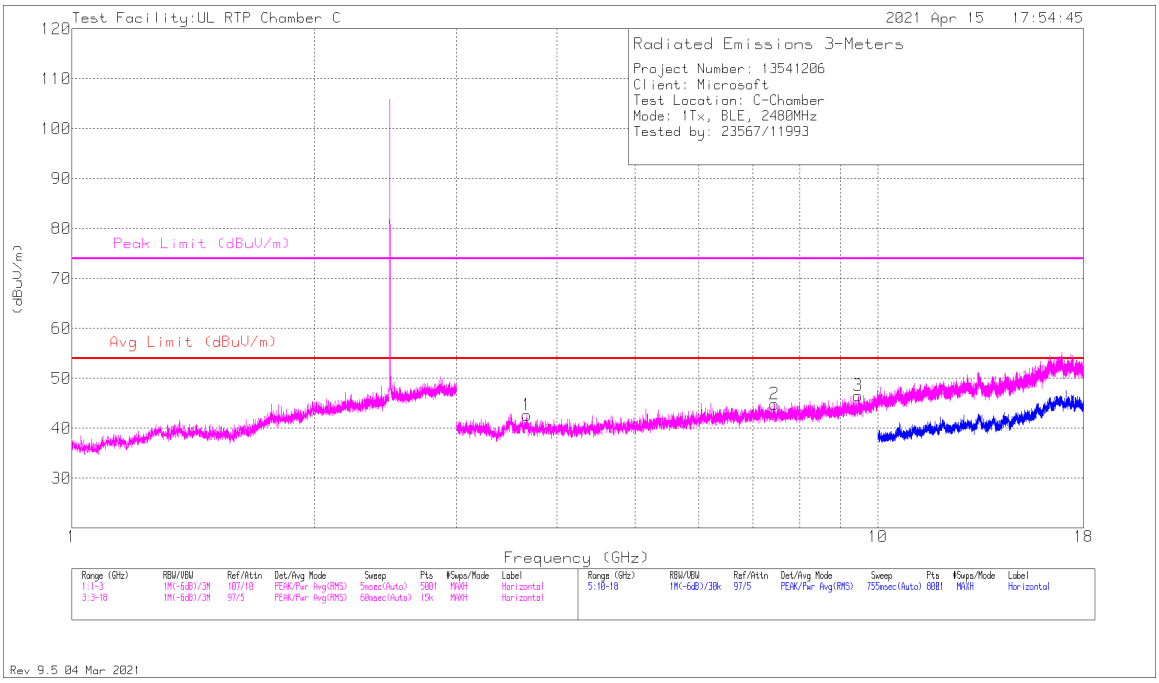
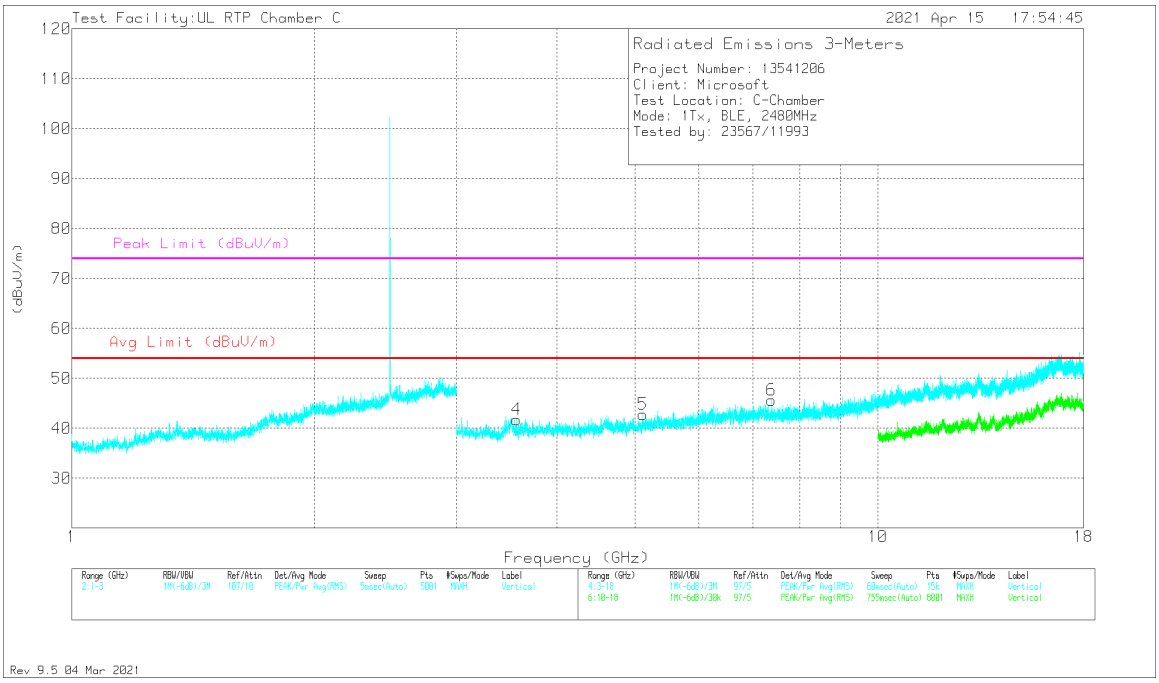
HIGH CHANNEL RESULTS



HORIZONTAL



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RADIATED EMISSIONS

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0062 (dB/m)	Amp/Cbl/Fltr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 3.672	57.21	Pk	33.3	-47.9	42.61	54	-11.39	74	-31.39	0-360	101	H
2	* ** 7.441	53.51	Pk	35.9	-44.5	44.91	54	-9.09	74	-29.09	0-360	199	H
3	* ** 9.456	51.24	Pk	36.8	-41.5	46.54	54	-7.46	74	-27.46	0-360	199	H
4	* ** 3.565	57.3	Pk	33.2	-48.7	41.8	54	-12.2	74	-32.2	0-360	200	V
5	* ** 5.109	54.33	Pk	34.2	-45.7	42.83	54	-11.17	74	-31.17	0-360	200	V
6	* ** 7.379	53.69	Pk	35.9	-43.9	45.69	54	-8.31	74	-28.31	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

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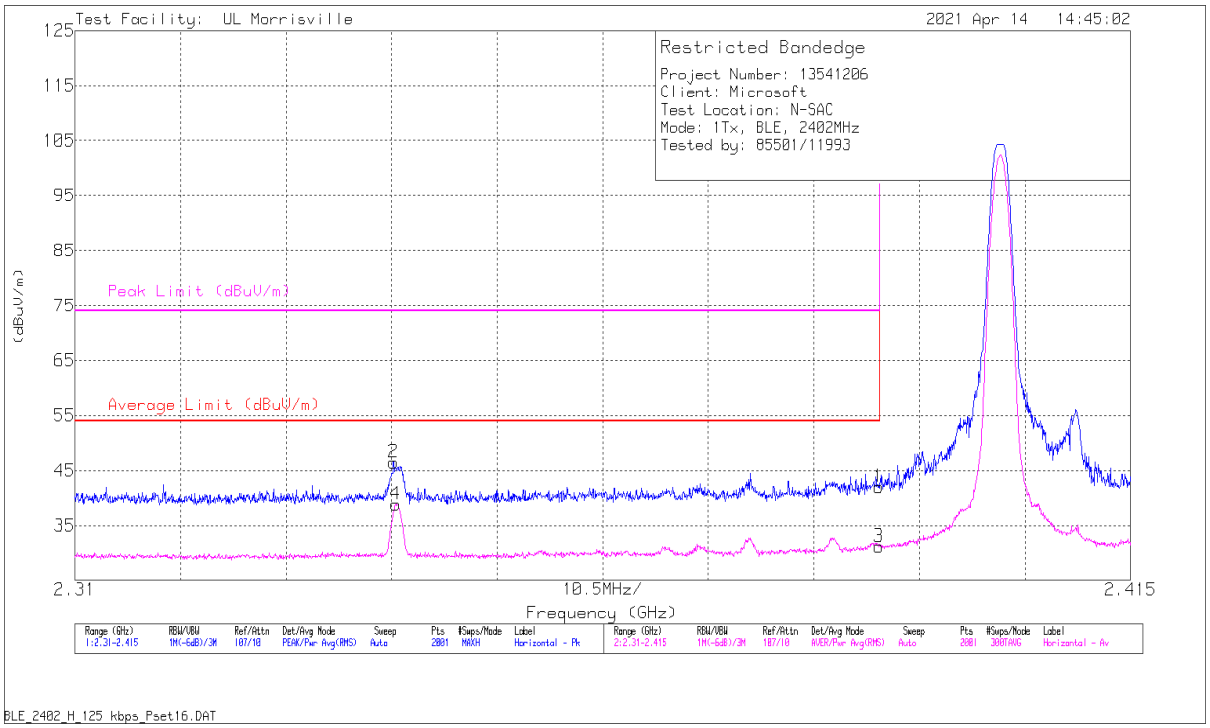
10.2.2. BLE (125Kbps)

Antenna A

BANDEDGE (LOW CHANNEL)

HORIZONTAL RESULT



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 (dB/m)	Amp/Cbl/Fltr/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	* ** 2.38996	34.65	Pk	31.8	-24.4	0	42.05	-	-	74	-31.95	28	149	H
2	* ** 2.34166	39.19	Pk	31.7	-24.4	0	46.49	-	-	74	-27.51	28	149	H
3	* ** 2.38996	23.72	RMS	31.8	-24.4	.82	31.94	54	-22.06	-	-	28	149	H
4	* ** 2.34192	31.59	RMS	31.7	-24.4	.82	39.71	54	-14.29	-	-	28	149	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

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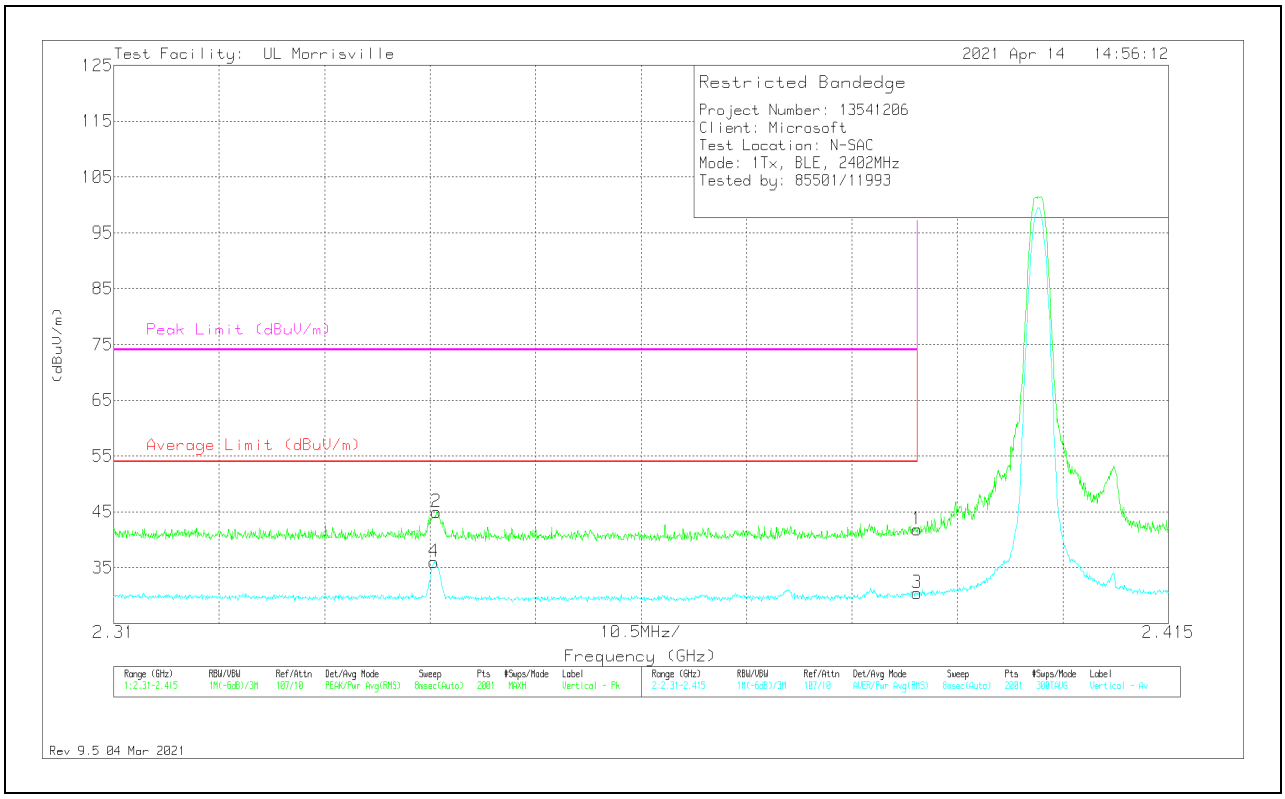
VERTICAL RESULT



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 (dB/m)	Amp/Cbl/Fltr/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	* ** 2.38996	34.46	Pk	31.8	-24.4	0	41.86	-	-	74	-32.14	50	306	V
2	* ** 2.34213	37.65	Pk	31.7	-24.4	0	44.95	-	-	74	-29.05	50	306	V
3	* ** 2.38996	23.08	RMS	31.8	-24.4	.82	31.3	54	-22.7	-	-	50	306	V
4	* ** 2.34187	28.73	RMS	31.7	-24.4	.82	36.85	54	-17.15	-	-	50	306	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

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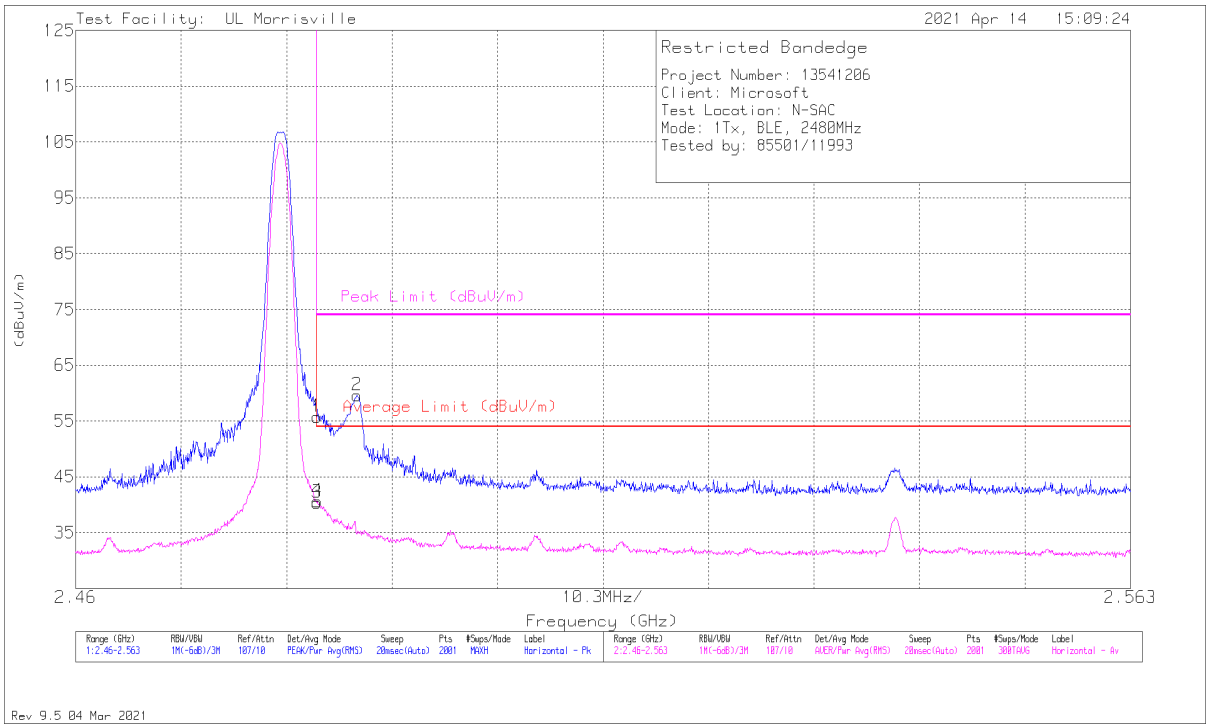
BANDEDGE (HIGH CHANNEL)

HORIZONTAL RESULT



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 (dB/m)	Amp/Cbl/Fltr/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	* ** 2.48354	47.6	Pk	32.4	-24.3	0	55.7	-	-	74	-18.3	31	150	H
2	* ** 2.4875	51.37	Pk	32.5	-24.3	0	59.57	-	-	74	-14.43	31	150	H
3	* ** 2.48354	32.25	RMS	32.4	-24.3	.82	41.17	54	-12.83	-	-	31	150	H
4	* ** 2.48359	32.49	RMS	32.4	-24.3	.82	41.41	54	-12.59	-	-	31	150	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

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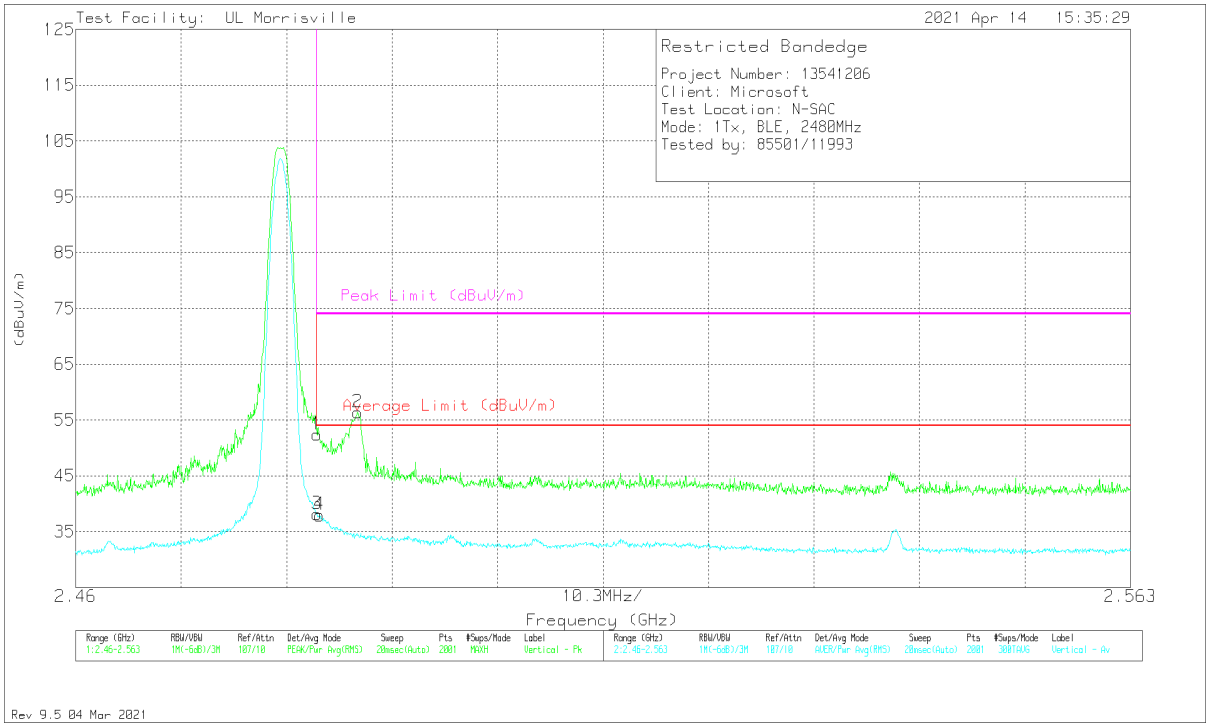
VERTICAL RESULT



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 (dB/m)	Amp/Cbl/Fltr/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	* ** 2.48354	44.31	Pk	32.4	-24.3	0	52.41	-	-	74	-21.59	50	268	V
2	* ** 2.48755	48.13	Pk	32.5	-24.3	0	56.33	-	-	74	-17.67	50	268	V
3	* ** 2.48354	29.97	RMS	32.4	-24.3	.82	38.89	54	-15.11	-	-	50	268	V
4	* ** 2.48379	29.84	RMS	32.4	-24.3	.82	38.76	54	-15.24	-	-	50	268	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

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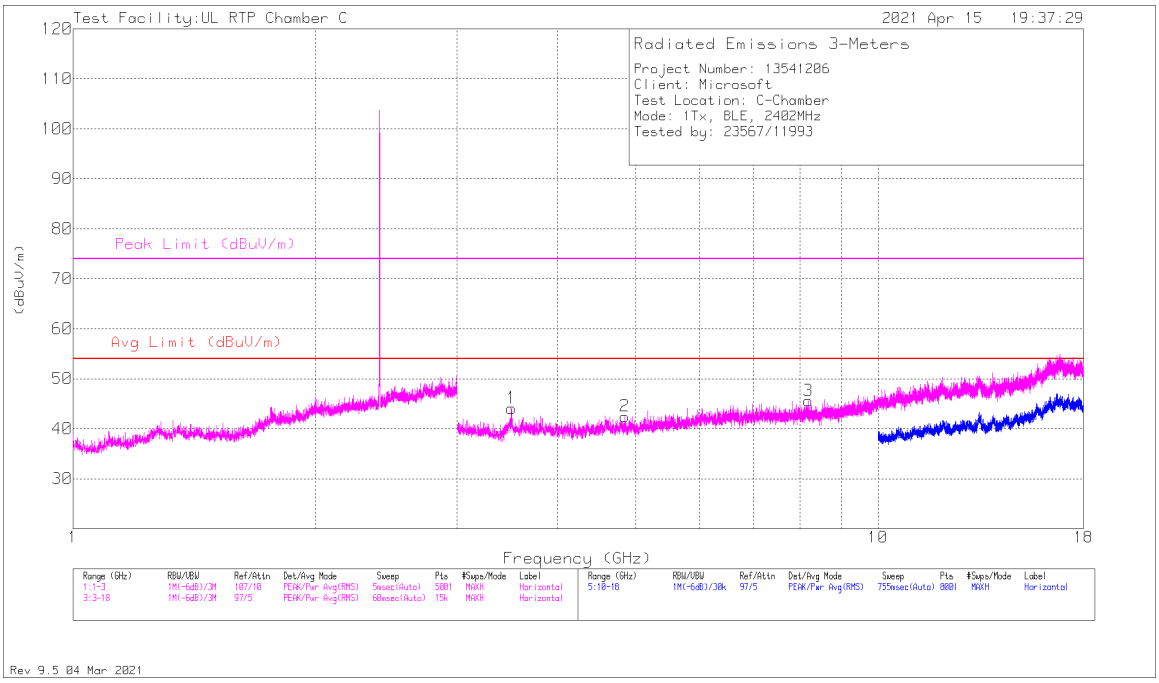
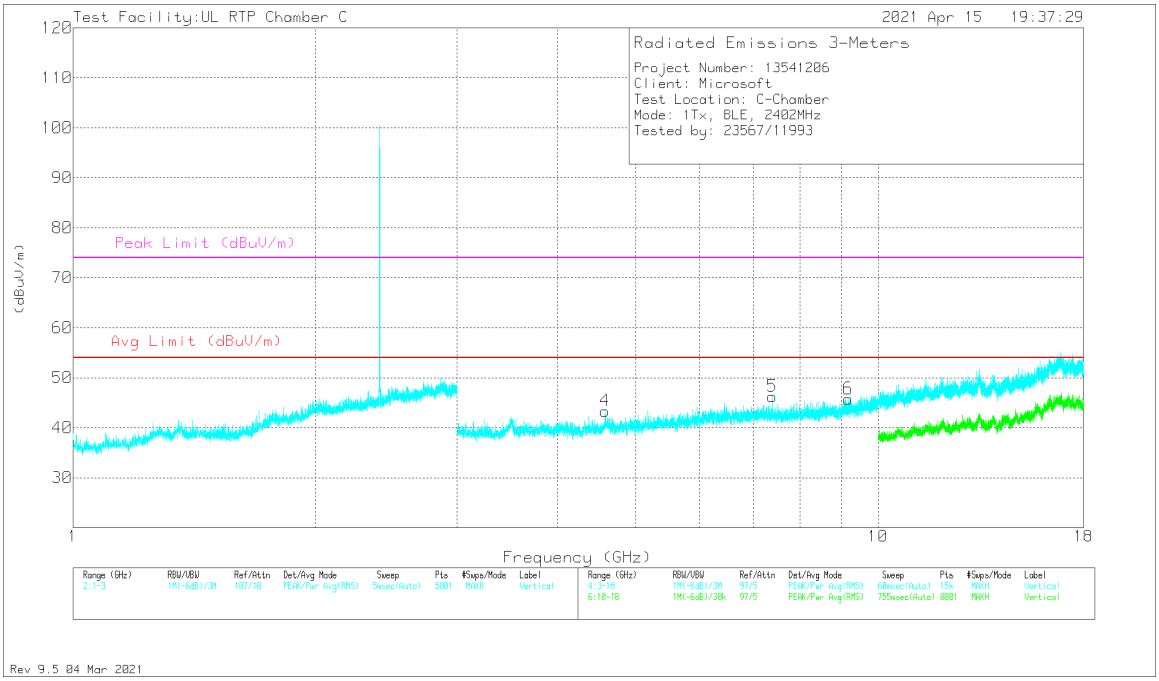
HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL RESULTS



HORIZONTAL



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RADIATED EMISSIONS

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0062 (dB/m)	Amp/Cbl/Fltr (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	* ** 3.504	56.88	Pk	34.3	-47.1	0	44.08	54	-9.92	74	-29.92	0-360	200	H
2	* ** 4.846	55.77	Pk	34.1	-47.4	0	42.47	54	-11.53	74	-31.53	0-360	101	H
3	* ** 8.192	52.49	Pk	36	-42.9	0	45.59	54	-8.41	74	-28.41	0-360	101	H
4	* ** 4.578	55.37	Pk	34.2	-46.2	0	43.37	54	-10.63	74	-30.63	0-360	101	V
5	* ** 7.39	54.87	Pk	35.9	-44.5	0	46.27	54	-7.73	74	-27.73	0-360	101	V
6	* ** 9.185	52.36	Pk	36.4	-43	0	45.76	54	-8.24	74	-28.24	0-360	200	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
** - indicates frequency in Taiwan NCC LP0002 Restricted Band
Pk - Peak detector

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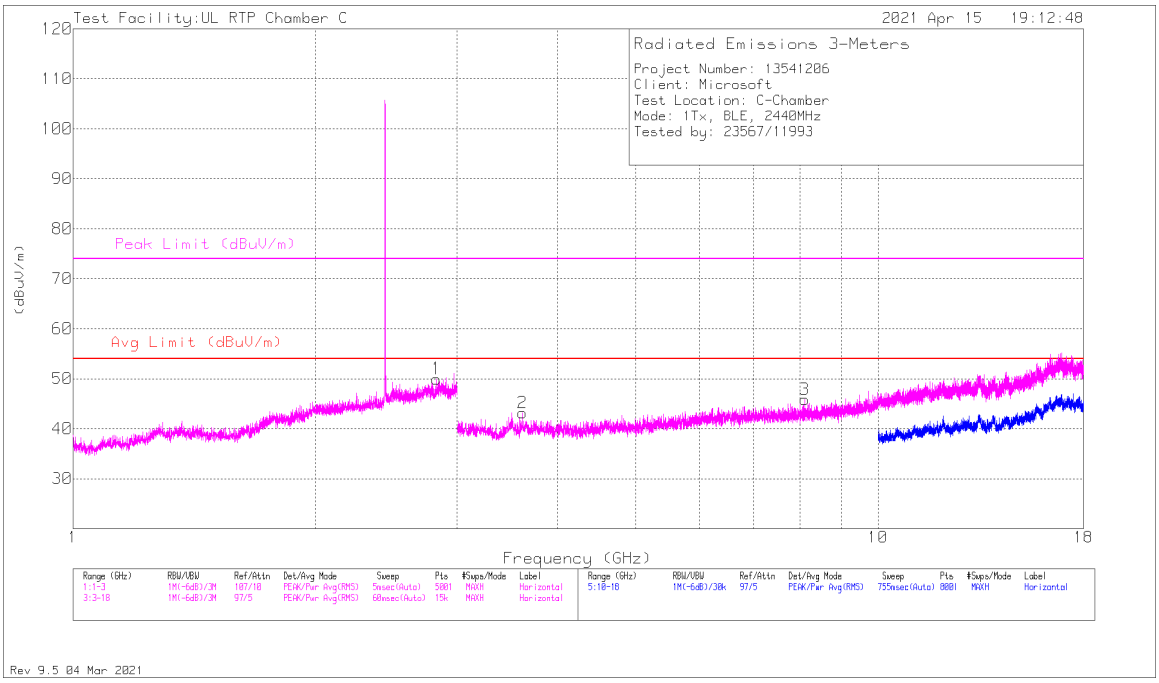
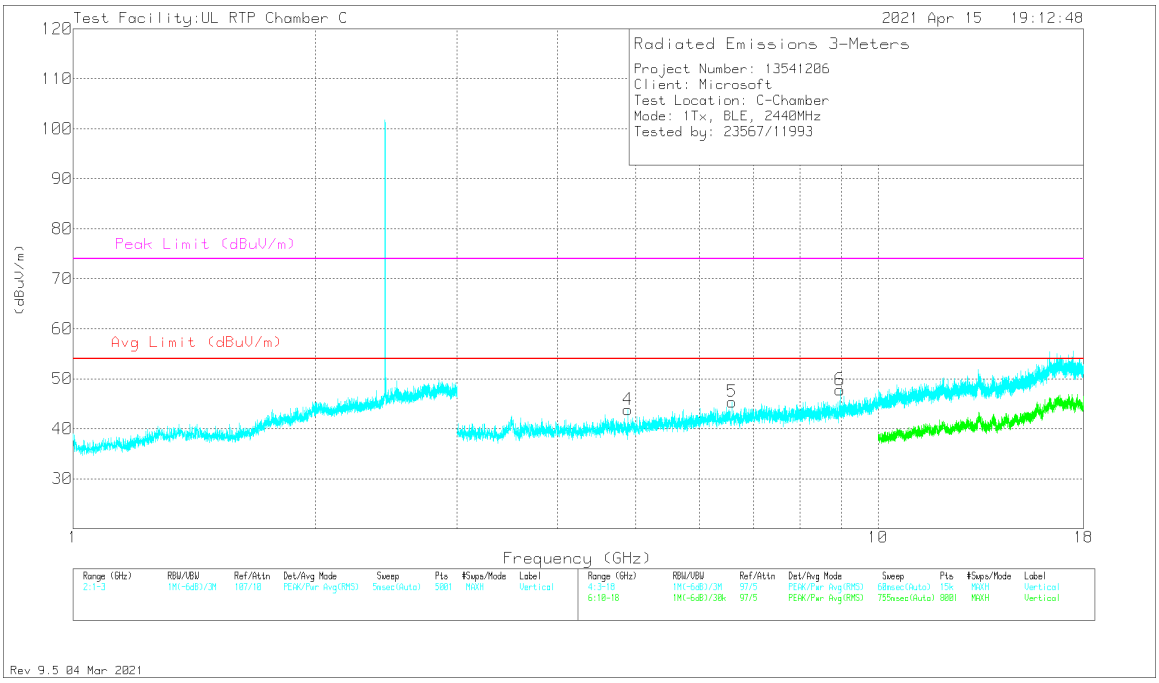
MID CHANNEL RESULTS



HORIZONTAL



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RADIATED EMISSIONS

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0062 (dB/m)	Amp/Cbl/Fltr (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	* ** 2.82656	33.8	PK2	32.5	-17.1	0	49.2	-	-	74	-24.8	281	319	H
	* ** 2.82789	22.66	ADR	32.5	-17.1	0.82	38.88	54	-15.12	-	-	281	319	H
2	* ** 3.616	58.07	Pk	33.2	-48.1	0	43.17	54	-10.83	74	-30.83	0-360	101	H
3	* ** 8.111	53.24	Pk	36	-43.4	0	45.84	54	-8.16	74	-28.16	0-360	200	H
4	* ** 4.887	56.82	Pk	34.1	-47.1	0	43.82	54	-10.18	74	-30.18	0-360	200	V
5	6.582	54.1	Pk	35.8	-44.5	0	45.4	-	-	-	-	0-360	200	V
6	8.969	54.08	Pk	36.3	-42.6	0	47.78	-	-	-	-	0-360	200	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
** - indicates frequency in Taiwan NCC LP0002 Restricted Band
Pk - Peak detector
PK2 - Maximum Peak
ADR - RMS average

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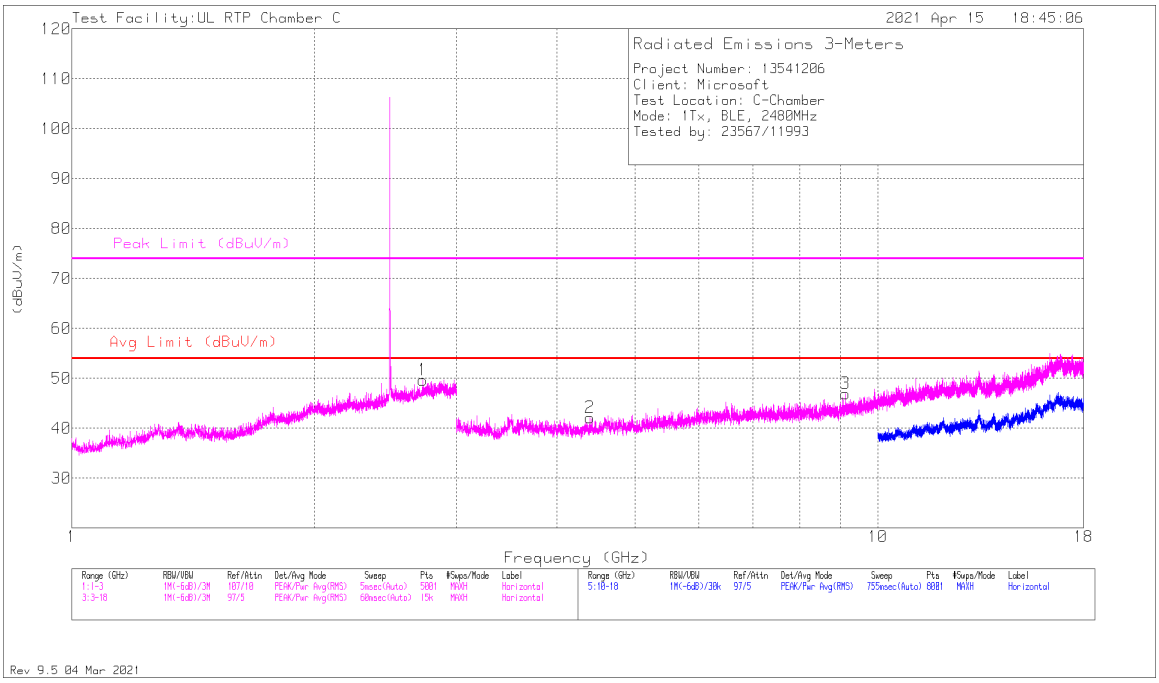
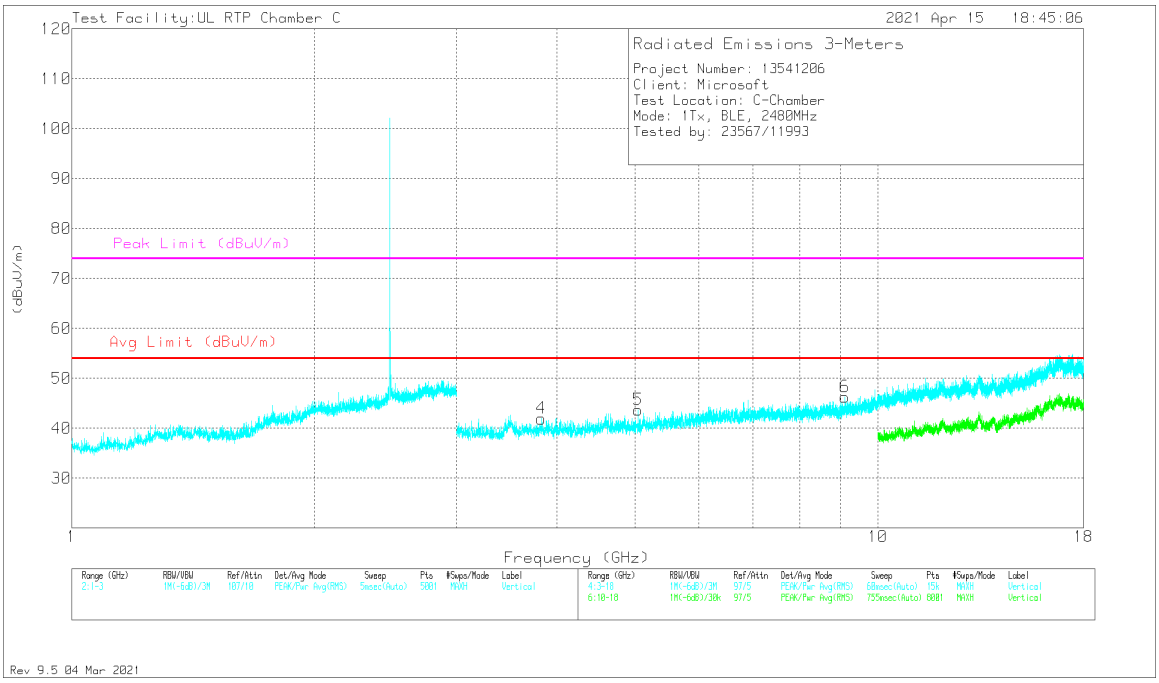
HIGH CHANNEL RESULTS



HORIZONTAL



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RADIATED EMISSIONS

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0062 (dB/m)	Amp/Cbl/Fltr (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	* ** 2.72498	34.36	PK2	32.4	-17	0	49.76	-	-	74	-24.24	0	285	H
	* ** 2.72785	22.7	ADR	32.4	-16.9	0.82	39.02	54	-14.98	-	-	0	285	H
2	* ** 4.391	55.4	Pk	33.8	-47.1	0	42.1	54	-11.9	74	-31.9	0-360	101	H
3	* ** 9.113	52.49	Pk	36.4	-42	0	46.89	54	-7.11	74	-27.11	0-360	101	H
4	* ** 3.825	55.94	Pk	33.5	-47.5	0	41.94	54	-12.06	74	-32.06	0-360	200	V
5	* ** 5.044	56.97	Pk	34.1	-47.4	0	43.67	54	-10.33	74	-30.33	0-360	200	V
6	* ** 9.109	51.92	Pk	36.4	-42	0	46.32	54	-7.68	74	-27.68	0-360	200	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
** - indicates frequency in Taiwan NCC LP0002 Restricted Band
Pk - Peak detector
PK2 - Maximum Peak
ADR - RMS average

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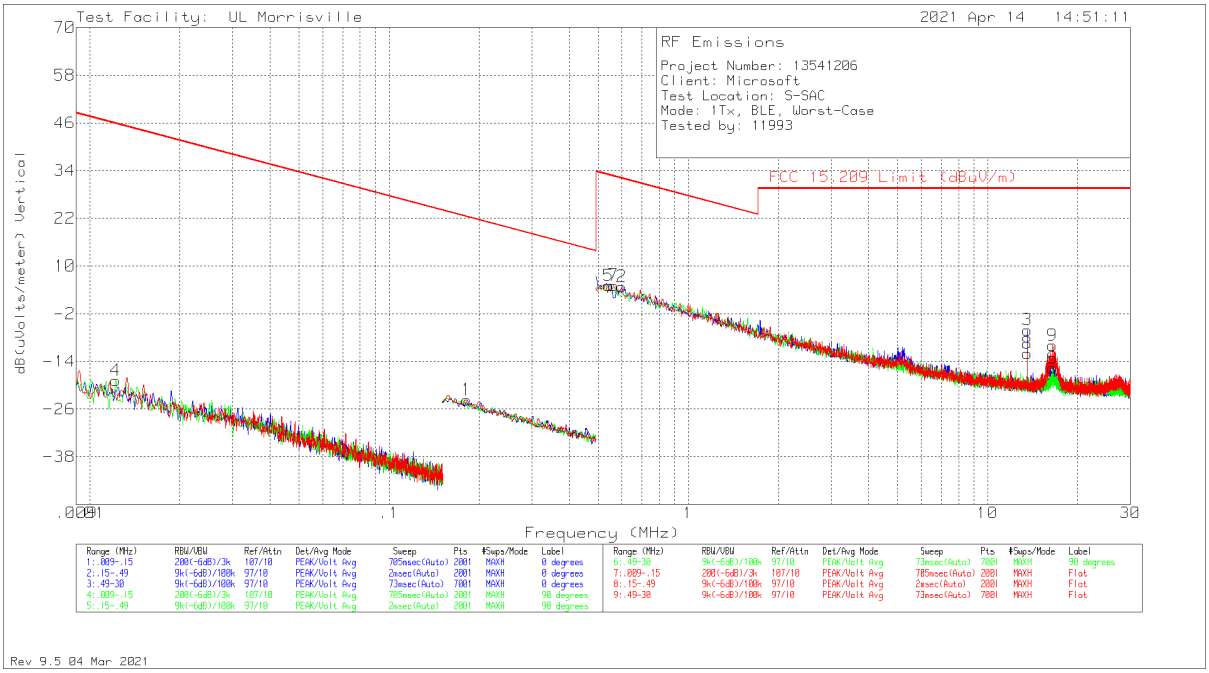
10.3. WORST CASE BELOW 30MHZ

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).

SPURIOUS EMISSIONS BELOW 30 MHz (WORST-CASE CONFIGURATION)



ANTENNA- THREE ORIENTATIONS

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Below 30MHz Data - FCC

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AT0079 (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)	Antenna Face
1	.18145	45.43	Pk	10.8	.1	-80	-23.67	22.43	42.43	-46.1	0-360	On
2	.59962	33.8	Pk	10.8	.2	-40	4.8	32.05	-	-27.25	0-360	On
3	13.5596	22.83	Pk	10.4	.7	-40	-6.07	29.54	-	-35.61	0-360	On
4	.0122	44.12	Pk	17	.1	-80	-18.78	45.88	65.88	-64.66	0-360	Off
5	.54059	34.17	Pk	10.8	.1	-40	5.07	32.95	-	-27.88	0-360	Off
6	16.47707	13.24	Pk	10.3	.8	-40	-15.66	29.54	-	-45.2	0-360	Off
7	.56167	34.22	Pk	10.8	.1	-40	5.12	32.61	-	-27.49	0-360	Flat
8	13.5596	16.92	Pk	10.4	.7	-40	-11.98	29.54	-	-41.52	0-360	Flat
9	16.47286	18.93	Pk	10.3	.8	-40	-9.97	29.54	-	-39.51	0-360	Flat

Pk - Peak detector

Below 30MHz Data - ISED

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AT0079 (dB/m)	Cbl (dB)	Dist. Corr. Factor (dB)	Corrected Reading dB(uAmps/meter)	RSS-GEN Avg/QP Limit (dBuA/m)	RSS-GEN Pk Limit (dBuA/m)	Worst-Case Margin (dB)	Azimuth (Degs)	Antenna Face
1	.18145	45.43	Pk	-40.7	.1	-80	-75.17	-29.07	-9.07	-46.1	0-360	On
2	.59962	33.8	Pk	-40.7	.2	-40	-46.7	-19.45	-	-27.25	0-360	On
3	13.5596	22.83	Pk	-41.1	.7	-40	-57.57	-21.96	-	-35.61	0-360	On
4	.0122	44.12	Pk	-34.5	.1	-80	-70.28	-5.62	15.62	-64.66	0-360	Off
5	.54059	34.17	Pk	-40.7	.1	-40	-46.43	-18.55	-	-27.88	0-360	Off
6	16.47707	13.24	Pk	-41.2	.8	-40	-67.16	-21.96	--	-45.2	0-360	Off
7	.56167	34.22	Pk	-40.7	.1	-40	-46.38	-18.89	-	-27.49	0-360	Flat
8	13.5596	16.92	Pk	-41.1	.7	-40	-63.48	-21.96	-	-41.52	0-360	Flat
9	16.47286	18.93	Pk	-41.2	.8	-40	-61.47	-21.96	-	-39.51	0-360	Flat

Pk - Peak detector

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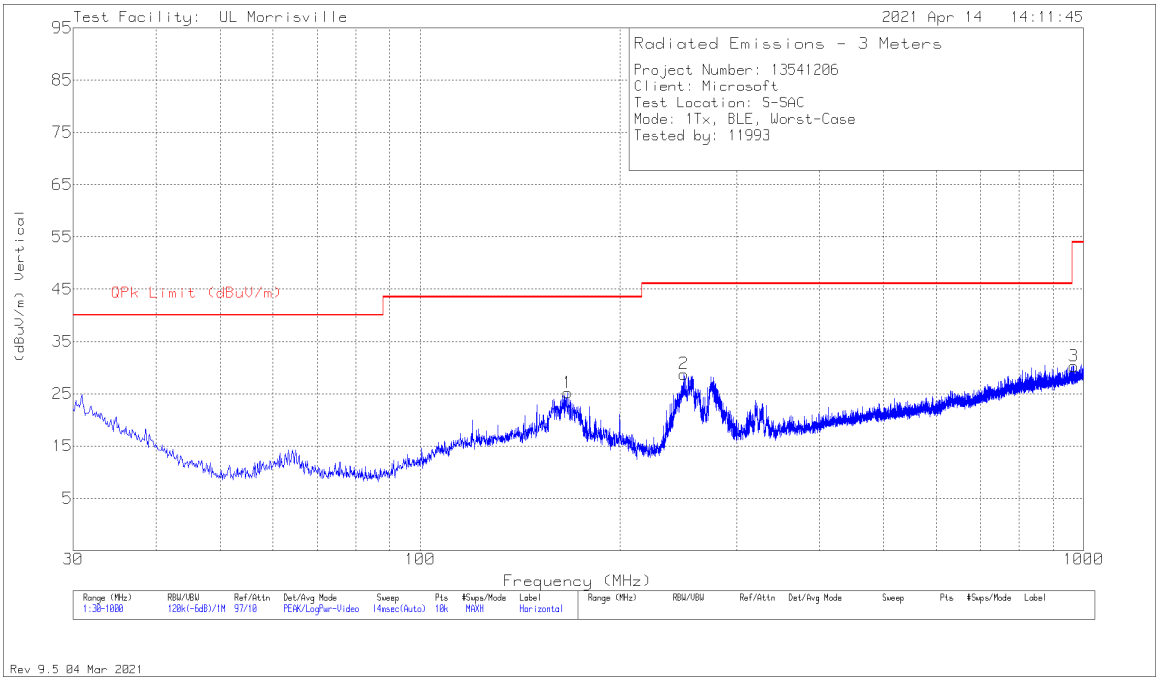
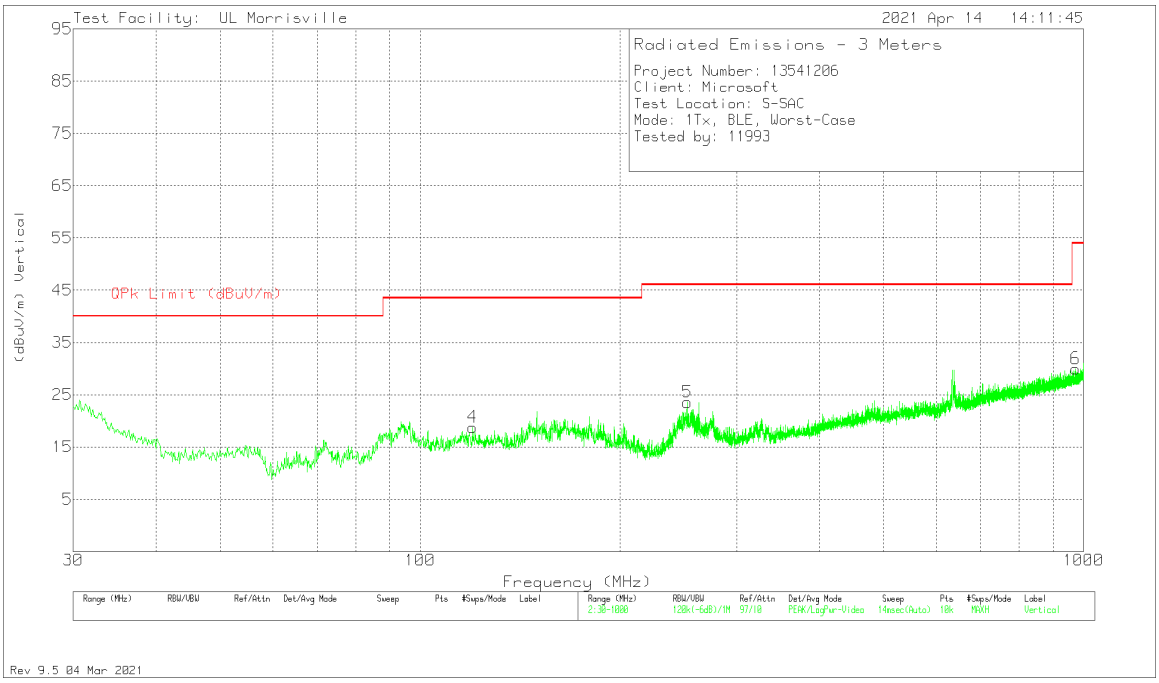
10.4. WORST CASE BELOW 1 GHZ

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	AT0075 AF (dB/m)	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 166.867	36.86	Pk	18.2	-29.9	25.16	43.52	-18.36	0-360	99	H
2	* ** 249.996	40.28	Pk	17.6	-29.1	28.78	46.02	-17.24	0-360	99	H
3	* ** 966.729	25.86	Pk	29.2	-24.8	30.26	53.97	-23.71	0-360	199	H
4	* ** 120.016	29.18	Pk	20	-30.4	18.78	43.52	-24.74	0-360	101	V
5	* ** 253.003	35.26	Pk	17.5	-29.2	23.56	46.02	-22.46	0-360	199	V
6	* ** 973.519	25.36	Pk	29.2	-24.6	29.96	53.97	-24.01	0-360	299	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
** - indicates frequency in Taiwan NCC LP0002 Restricted Band
Pk - Peak detector

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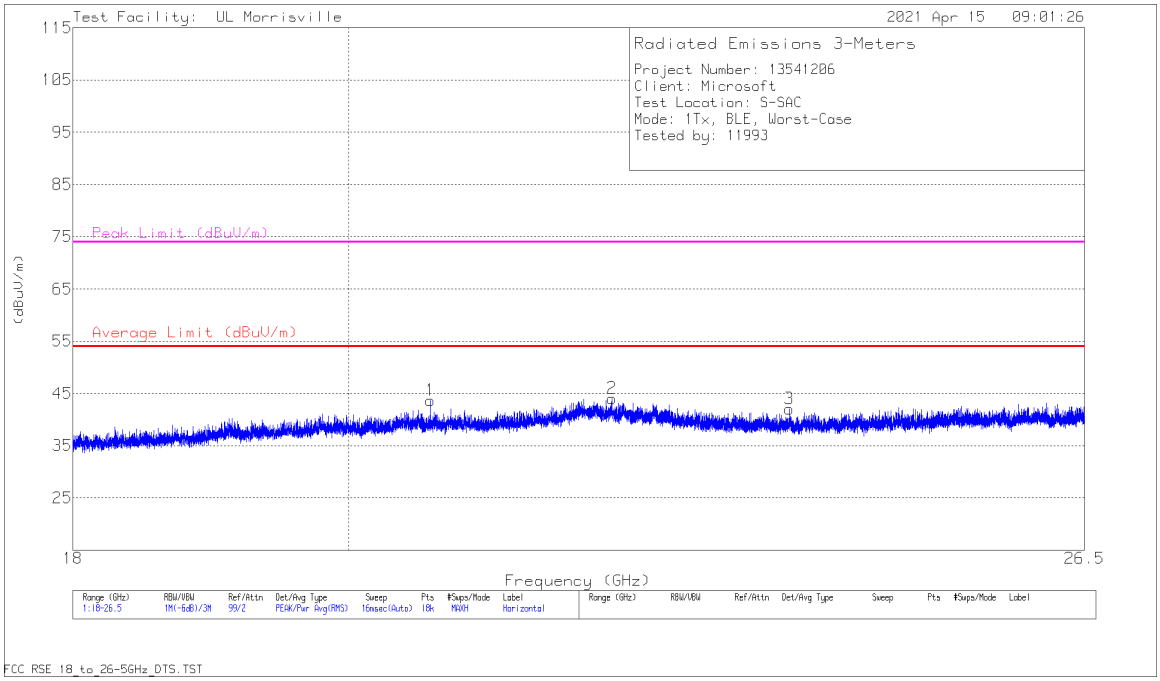
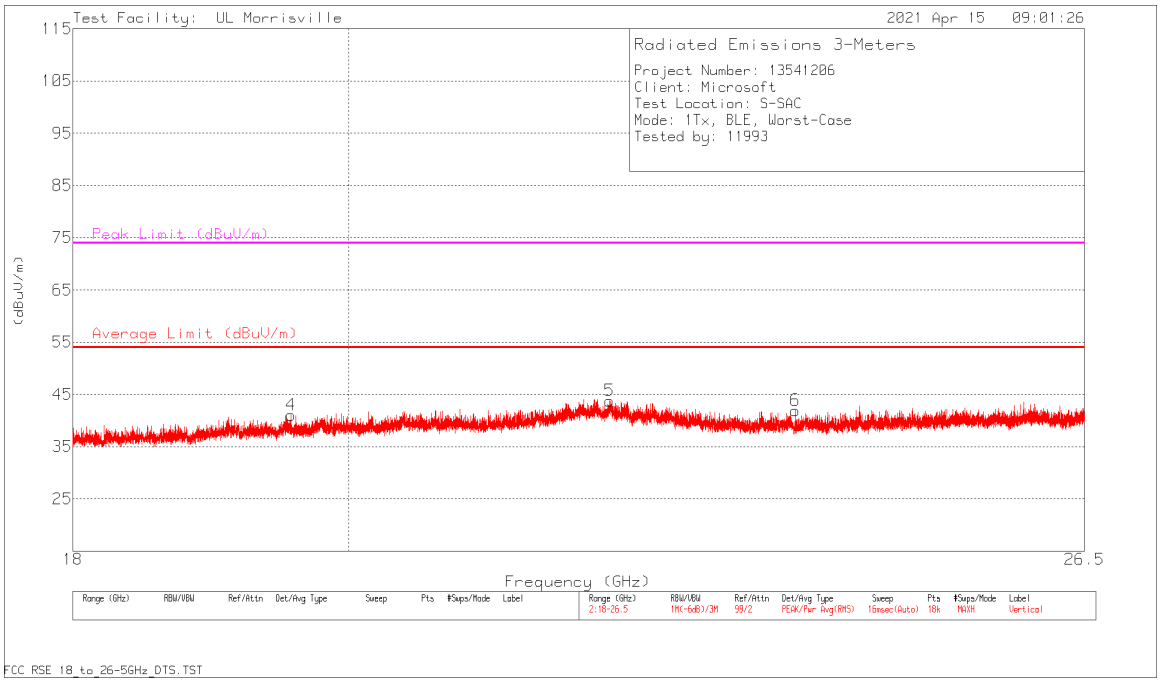
10.5. WORST CASE 18-26 GHZ

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



HORIZONTAL



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18 – 26GHz DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0063 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	* ** 20.63751	48.76	Pk	34	-39.1	43.66	54	-10.34	74	-30.34	0-360	249	H
2	* ** 22.118	46.2	Pk	36.7	-38.9	44	54	-10	74	-30	0-360	249	H
3	* ** 23.67217	45.57	Pk	34.9	-38.4	42.07	54	-11.93	74	-31.93	0-360	199	H
4	* ** 19.56409	46.77	Pk	33.5	-39.2	41.07	54	-12.93	74	-32.93	0-360	101	V
5	* ** 22.10147	46.08	Pk	36.7	-39	43.78	54	-10.22	74	-30.22	0-360	250	V
6	* ** 23.72459	45.79	Pk	34.9	-38.8	41.89	54	-12.11	74	-32.11	0-360	250	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
** - indicates frequency in Taiwan NCC LP0002 Restricted Band
Pk - Peak detector

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11. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

FCC §15.207 (a)

RSS-Gen 8.8

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

* Decreases with the logarithm of the frequency.

RESULTS

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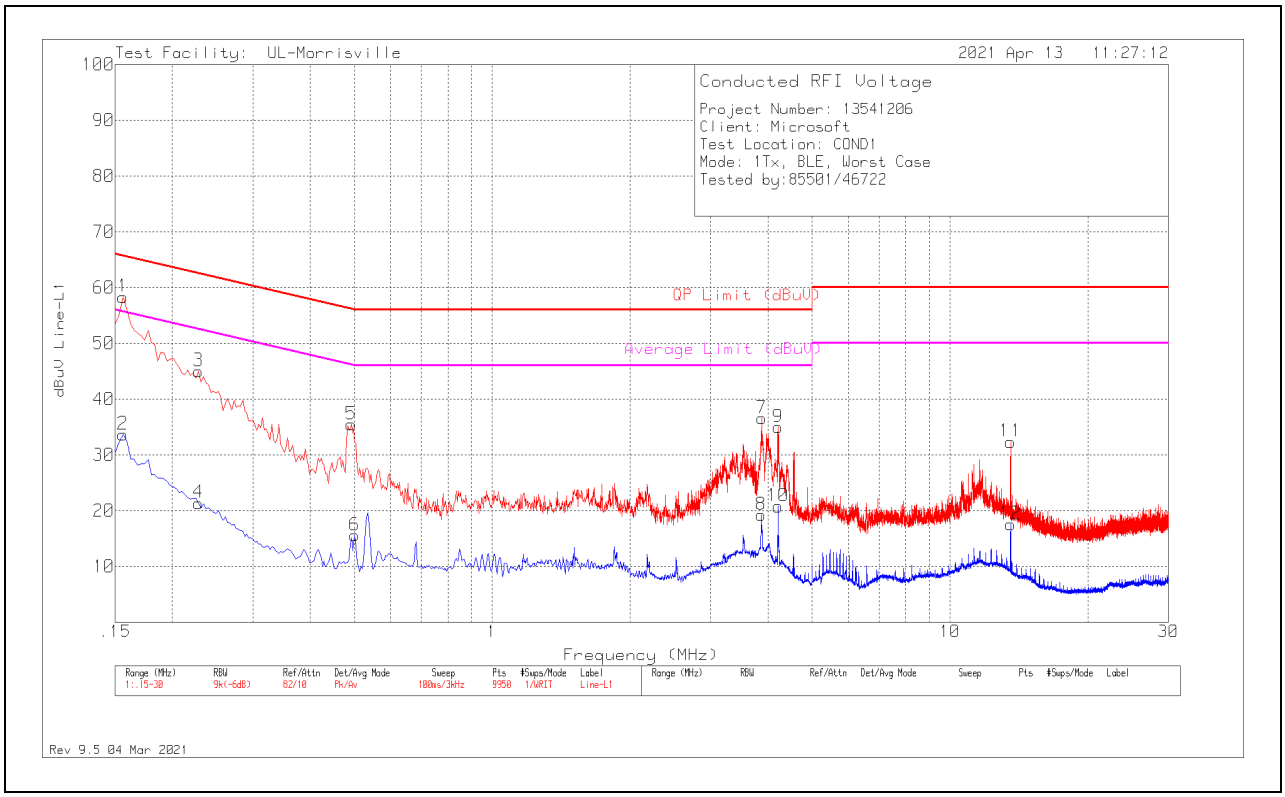
11.1.1. AC Power Line

LINE 1 RESULTS



Range 1: Line-L1 .15 - 30MHz										
Marker	**Frequency (MHz)**	**Meter Reading (dBuV)**	**Det**	**LISN VCF (dB)**	**Cbl/Limiter (dB)**	**Corrected Reading dBuV**	**QP Limit (dBuV)**	**Margin (dB)**	**Average Limit (dBuV)**	**Margin (dB)**
1	.156	48.34	Pk	.2	9.8	58.34	65.67	-7.33	-	-
2	.156	23.69	Av	.2	9.8	33.69	-	-	55.67	-21.98
3	.228	35.14	Pk	.1	9.8	45.04	62.52	-17.48	-	-
4	.228	11.5	Av	.1	9.8	21.4	-	-	52.52	-31.12
5	.492	25.56	Pk	.1	9.8	35.46	56.13	-20.67	-	-
6	.501	5.8	Av	0	9.8	15.6	-	-	46	-30.4
8	3.87	9.36	Av	0	9.9	19.26	-	-	46	-26.74
7	3.876	26.67	Pk	0	9.9	36.57	56	-19.43	-	-
9	4.209	25.1	Pk	0	9.9	35	56	-21	-	-
10	4.209	10.91	Av	0	9.9	20.81	-	-	46	-25.19
11	13.56	22.17	Pk	.1	10.1	32.37	60	-27.63	-	-
12	13.56	7.41	Av	.1	10.1	17.61	-	-	50	-32.39

Pk - Peak detector
Av - Average detector

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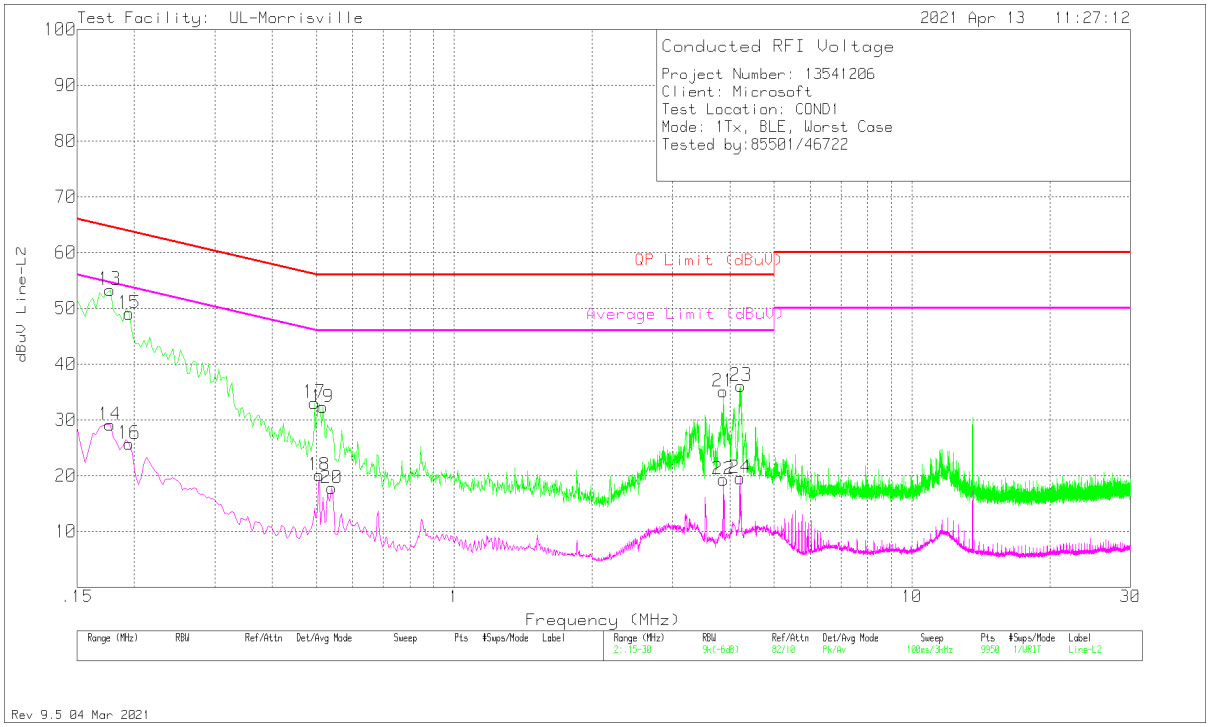
LINE 2 RESULTS



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	.177	43.33	Pk	.2	9.8	53.33	64.63	-11.3	-	-
14	.177	19.15	Av	.2	9.8	29.15	-	-	54.63	-25.48
15	.195	39.1	Pk	.2	9.8	49.1	63.82	-14.72	-	-
16	.195	15.76	Av	.2	9.8	25.76	-	-	53.82	-28.06
17	.495	23.18	Pk	.1	9.8	33.08	56.08	-23	-	-
18	.507	10.22	Av	.1	9.8	20.12	-	-	46	-25.88
19	.516	22.42	Pk	.1	9.8	32.32	56	-23.68	-	-
20	.54	7.9	Av	.1	9.8	17.8	-	-	46	-28.2
21	3.87	25.21	Pk	0	9.9	35.11	56	-20.89	-	-
22	3.873	9.44	Av	0	9.9	19.34	-	-	46	-26.66
24	4.209	9.59	Av	.1	9.9	19.59	-	-	46	-26.41
23	4.23	26.12	Pk	.1	9.9	36.12	56	-19.88	-	-

Pk - Peak detector
Av - Average detector

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12. SETUP PHOTOS

Please refer to R13541206-EP1 for setup photos.

END OF TEST REPORT

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