TEST REPORT

Report Number. : R14124093-E3

Applicant	:	Colgate-Palmolive Company 909 Rive Road Piscataway, NJ, 08855 USA
Model	:	PD1
FCC ID	:	2AL5Y-PD1
EUT Description	:	Rechargeable Toothbrush
Test Standard(s)	:	FCC 47 CFR PART 15 SUBPART C: 2022

Date Of Issue:
2022-02-25

Prepared by:
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ACCREDITED
CERT #0751.06

REPORT REVISION HISTORY

Rev.	Issue Date	Revisions	Revised By
V1	2022-02-14	Initial Issue	Niklas Haydon
V2	2022-02-25	Removed Canada References	Haley Ackun

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: Colgate-Palmolive Company
909 Rive Road
Piscataway, NJ, 08855 USA

EUT DESCRIPTION: Rechargeable Toothbrush

MODEL: PD1

SERIAL NUMBER: Non-serialized

SAMPLE RECEIPT DATE: 2021-12-21 (antenna port conducted)
2022-01-12 (radiated)

DATE TESTED: 2022-01-05 TO 2022-01-19

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
CFR 47 Part 15 Subpart C: 2022	See Section 2

UL LLC tested the above equipment in accordance with the requirements set forth in the above standards. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical components. All samples tested were in good operating condition throughout the entire test program. Measurement Uncertainties are published for informational purposes only and were not taken into account unless noted otherwise.

This document may not be altered or revised in any way unless done so by UL LLC and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL LLC will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by A2LA, NIST, any agency of the Federal Government, or any agency of the U.S. government.

Approved & Released For
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Prepared By:

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2. TEST RESULTS SUMMARY

FCC Clause	Requirement	Result	Comment
See Comment	Duty Cycle	Reporting purposes only	ANSI C63.10 Section 11.6.
-	99% OBW	Reporting purposes only	ANSI C63.10 Section 6.9.3.
15.247 (a) (2)	6dB BW	Complies	None.
15.247 (b) (3)	Output Power	Complies	None.
See Comment	Average power	Reporting purposes only	Per ANSI C63.10, Section 11.9.2.3.2.
15.247 (e)	PSD	Complies	None.
15.247 (d)	Conducted Spurious Emissions	Complies	None.
15.209, 15.205	Radiated Emissions	Complies	Refer to Section 10.2.
15.207	AC Mains Conducted Emissions	Not Applicable	The EUT is battery operated.

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.

3. TEST METHODOLOGY

The tests documented in this report were performed in accordance with FCC CFR 47 Part 2, FCC CFR 47 Part 15: 2022, ANSI C63.10-2013, KDB 558074 D01 15.247 Meas Guidance v05r02, KDB 414788 D01 Radiated Test Site v01r01.

4. FACILITIES AND ACCREDITATION

UL LLC is accredited by a2La, cert. # 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	825374
☒	Building: 2800 Perimeter Park Dr. Suite B Morrisville, NC 27560, U.S.A	US0067	27265	825374

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

6. EQUIPMENT UNDER TEST

6.1. EUT DESCRIPTION

The EUT is a rechargeable toothbrush with a BLE transceiver.

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	-0.34	0.92

6.3. DESCRIPTION OF AVAILABLE ANTENNAS

The antenna(s) gain and type, as provided by the manufacturer' are as follows:

The radio utilizes an chip antenna, with a maximum gain of -0.5 dBi.

6.4. SOFTWARE AND FIRMWARE

The firmware installed in the EUT during testing was 2.0.32. This firmware utilized
- Nordic SDK version - 15.3
- Nordic Soft Device 140
- Nordic nrf52 stack version 6.1.1

The test utility software used during testing was Nordic nRF Connect software.

6.5. WORST-CASE CONFIGURATION AND MODE

The EUT is battery powered and charged through wireless power transfer; therefore no ac mains line conducted testing was performed.

Radiated emissions below 1GHz and above 18GHz 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 X orientation was worst-case orientation; therefore, all final radiated testing was performed with the EUT in X orientation.

The only data rate support by the EUT is 1Mbps; therefore all testing was performed at 1Mbps.

6.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	**Manufacturer**	**Model**	**Serial Number**	**FCC ID**
Support Laptop	HP	11-ah112dx	N/A	TX3-RTL8822BE

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	Shielded	<3M	Debug Cable for testing purposes only

TEST SETUP

Test software exercised the radio card.

SETUP DIAGRAMS

Please refer to R14124093-EP1 for setup diagrams.

7. MEASUREMENT METHOD

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)

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

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

8. TEST AND MEASUREMENT EQUIPMENT

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

Test Equipment Used - Radiated Disturbance Emissions Test Equipment (Morrisville – Chamber 2)

Equip. ID	Description	Manufacturer/Brand	Model Number	Last Cal.	Next Cal.
	0.009-30MHz				
AT0079	Active Loop Antenna	ETS-Lindgren	6502	2021-08-19	2022-08-19
	30-1000 MHz				
AT0073	Hybrid Broadband Antenna	Sunol Sciences Corp.	JB3	2021-08-30	2022-08-30
	1-18 GHz				
AT0072	Double-Ridged Waveguide Horn Antenna, 1 to 18 GHz	ETS Lindgren	3117	2021-05-03	2022-05-03
	18-40 GHz				
AT0063	Horn Antenna, 18-26.5GHz	ARA	MWH-1826/B	2021-11-04	2022-11-04
	Gain-Loss Chains				
C2-SAC01	Gain-loss string: 0.009-30MHz	Various	Various	2021-07-09	2022-07-09
C2-SAC02	Gain-loss string: 25-1000MHz	Various	Various	2021-07-09	2022-07-09
C2-SAC03	Gain-loss string: 1-18GHz	Various	Various	2021-07-09	2022-07-09
C2-SAC04	Gain-loss string: 18-40GHz	Various	Various	2021-07-09	2022-07-09
	Receiver & Software				
197955	Spectrum Analyzer	Rohde & Schwarz	ESW44	2021-03-10	2022-03-10
SOFTEMI	EMI Software	UL	Version 9.5 (18 Oct 2021)		
	Additional Equipment used				
s/n 200037635	Environmental Meter	Fisher Scientific	06-662-4	2020-01-22	2022-01-22

Test Equipment Used - Radiated Disturbance Emissions Test Equipment (Morrisville – Chamber 4)

Equip. ID	Description	Manufacturer/Brand	Model Number	Last Cal.	Next Cal.
	1-18 GHz				
206211	Double-Ridged Waveguide Horn Antenna, 1 to 18 GHz	ETS Lindgren	3117	2021-03-11	2022-03-11
	Gain-Loss Chains				
C4-SAC03	Gain-loss string: 1-18GHz	Various	Various	2021-05-07	2022-05-07
	Receiver & Software				
206496	Spectrum Analyzer	Rohde & Schwarz	ESW44	2021-03-09	2022-03-09
SOFTEMI	EMI Software	UL	Version 9.5 (18 Oct 2021)		
	Additional Equipment used				
s/n 210701941	Environmental Meter	Fisher Scientific	15-077-963	2021-8-16	2023-08-16

Test Equipment Used - Wireless Conducted Measurement Equipment

Equipment ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
	Conducted Room 2				
SA0025	Spectrum Analyzer	Keysight Technologies	N9030A	2021-04-01	2022-04-01
T1023 (PRE0078421)	EMPower USB RF Power Sensor, 10MHz to 6GHz (USB ID: 1.72.237.189.27.0.0.88)	ETS Lindgren	7002-006	2021-02-01	2022-02-01
PWM003	RF Power Meter	Keysight Technologies	N1911A	2021-08-30	2022-08-30
PWS004 (PRE0126443)	Peak and Avg Power Sensor, 50MHz to 6GHz	Keysight Technologies	E9323A	2021-08-19	2022-08-19
76023 (EC0225)	Temp/Humid Chamber	Cincinnati Sub-Zero	ZPH-8-3.5-SCT/AC	2021-05-27	2022-05-27
HI0090	Environmental Meter	Fisher Scientific	15-077-963	2021-07-12	2022-07-12
SOFTEMI	Antenna Port Software	UL	Version 2021.11.3	NA	NA
ETSI Power Software	EMPower ETSI Burst Measurement System	ETS-Lindgren	Version 1.0.3.18	NA	NA

9. ANTENNA PORT TEST RESULTS

9.1. ON TIME AND DUTY CYCLE

LIMITS

None; for reporting purposes only.

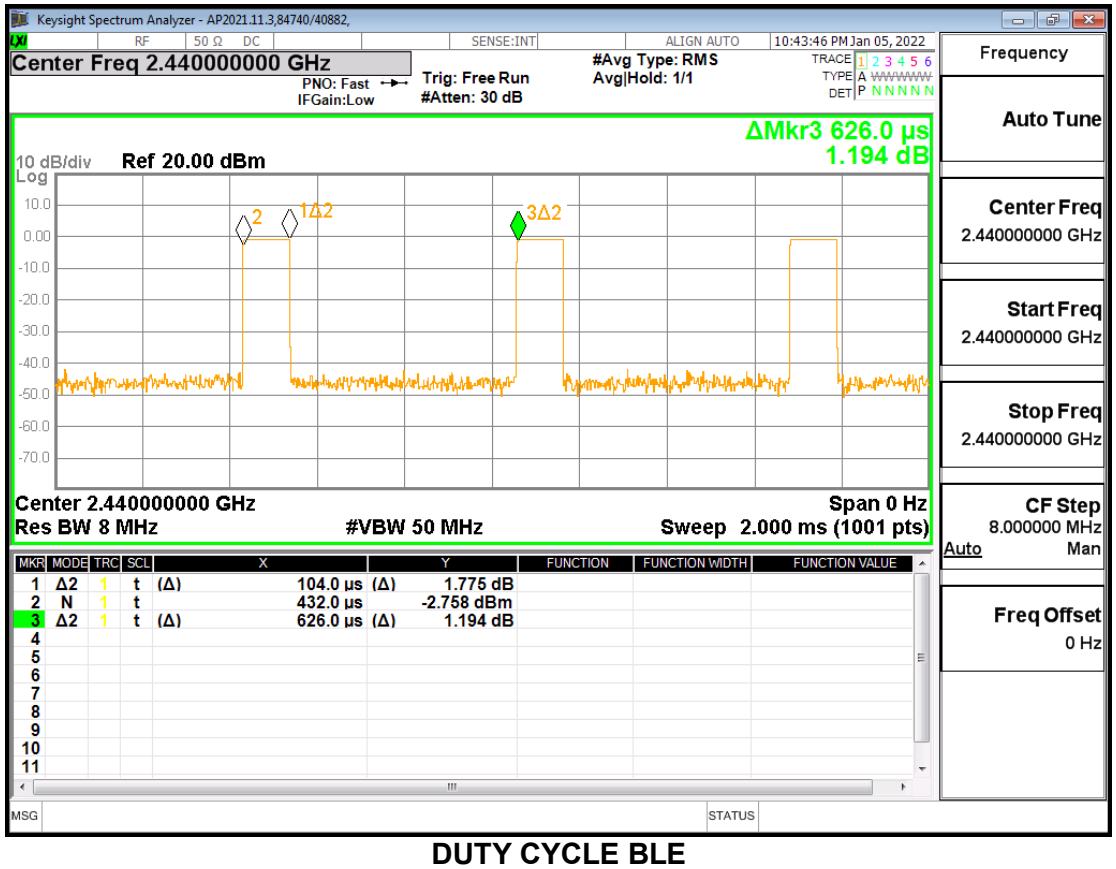
PROCEDURE

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	0.104	0.626	0.166	16.61	15.59	9.615

DUTY CYCLE PLOTS



DUTY CYCLE BLE

9.2. 99% BANDWIDTH

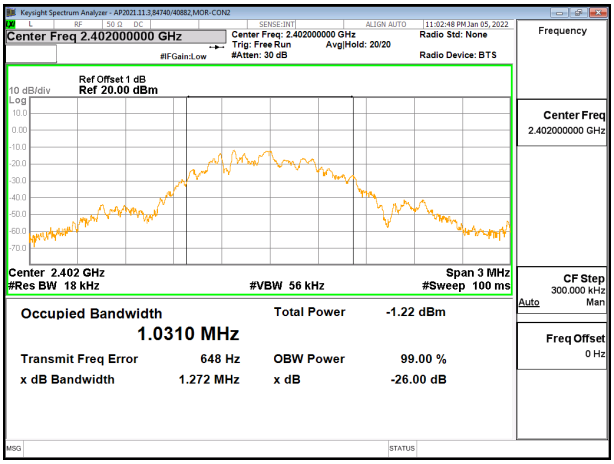
LIMITS

None; for reporting purposes only.

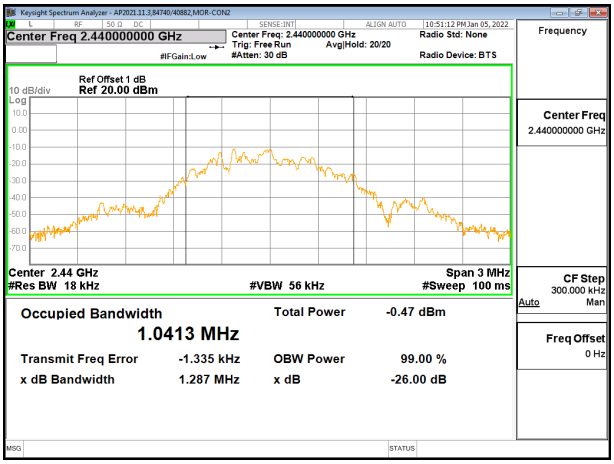
RESULTS

9.2.1. BLE (1Mbps)

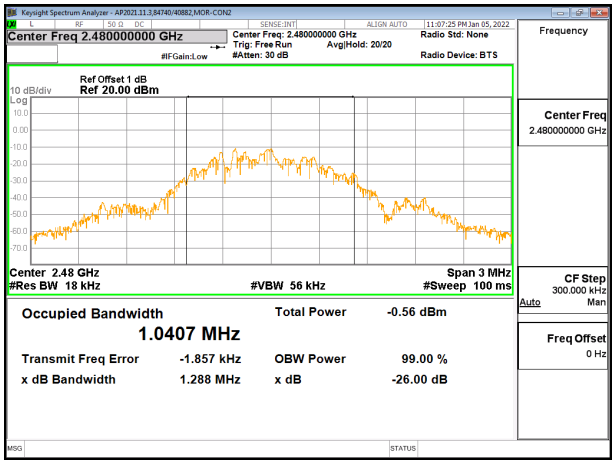
Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2402	1.0310
Middle	2440	1.0413
High	2480	1.0407



LOW CHANNEL



MID CHANNEL



HIGH CHANNEL

9.3. 6 dB BANDWIDTH

LIMITS

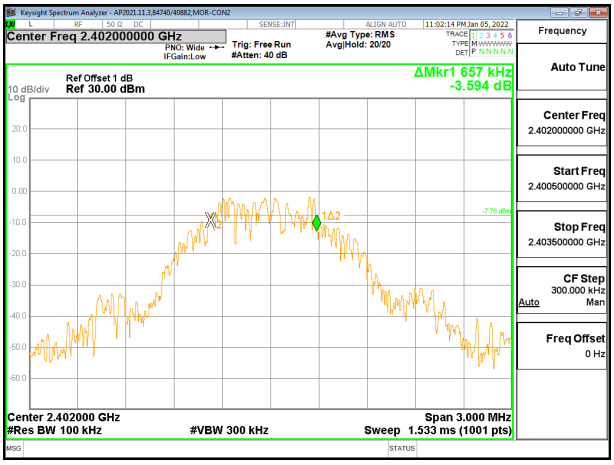
FCC §15.247 (a) (2)

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

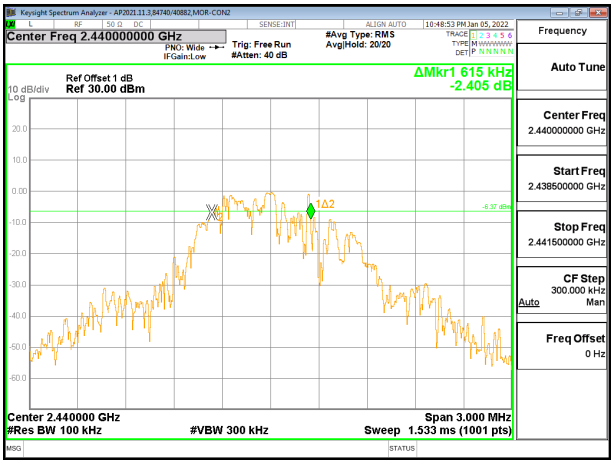
RESULTS

9.3.1. BLE (1Mbps)

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2402	0.657	0.5
Middle	2440	0.615	0.5
High	2480	0.657	0.5



LOW CHANNEL



MID CHANNEL

HIGH CHANNEL

9.4. OUTPUT POWER

LIMITS

FCC §15.247 (b) (3)

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 for a 1 dB cable was entered as an offset in the power meter.

The power output was measured on the EUT antenna port using SMA cable with 10dB attenuator connected to a power meter via wideband power sensor. Peak output power was read directly from power meter.

RESULTS

9.4.1. BLE (1Mbps)

Tested By:	84740/40882
Date:	2022-01-05

Channel	Frequency (MHz)	Peak Power Reading (dBm)	Limit (dBm)	Margin (dB)
Low	2402	-1.64	30	-31.64
Middle	2440	-1.09	30	-31.09
High	2480	-0.34	30	-30.34

9.5. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a gated average power meter.

The cable assembly insertion loss for a 1 dB cable was entered as an offset in the power meter.

The power output was measured on the EUT antenna port using SMA cable with 10dB attenuator connected to a power meter via wideband power sensor. Gated average output power was read directly from power meter.

RESULTS

9.5.1. BLE (1Mbps)

Tested By:	84740/40882
Date:	2022-01-05

Channel	Frequency (MHz)	AV power (dBm)
Low	2402	-1.69
Middle	2440	-1.14
High	2480	-0.38

9.6. POWER SPECTRAL DENSITY

LIMITS

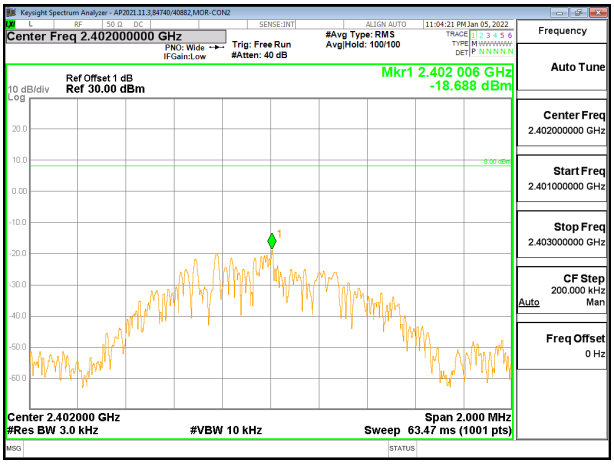
FCC §15.247 (e)

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

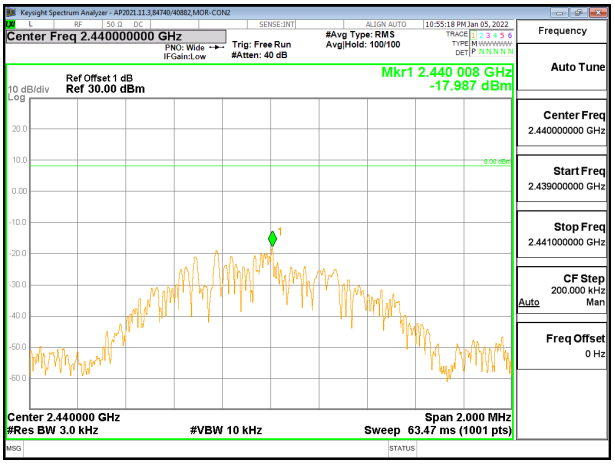
RESULTS

9.6.1. BLE (1Mbps)

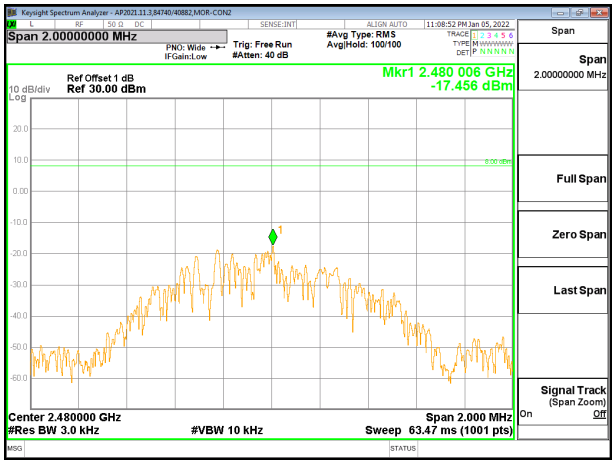
Channel	Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Margin (dB)
Low	2402	-18.69	8	-26.69
Middle	2440	-17.99	8	-25.99
High	2480	-17.46	8	-25.46



LOW CHANNEL



MID CHANNEL



HIGH CHANNEL

9.7. CONDUCTED SPURIOUS EMISSIONS

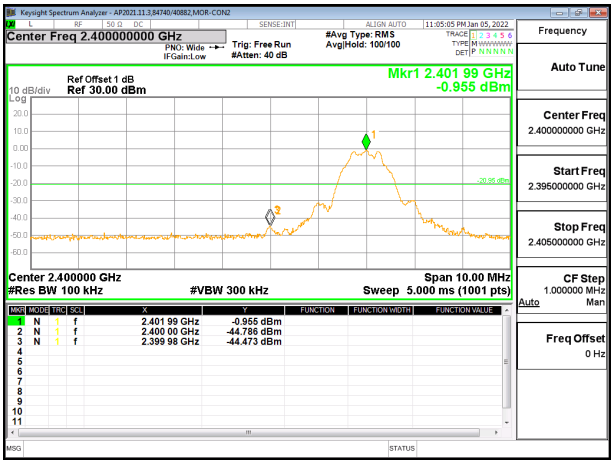
LIMITS

FCC §15.247 (d)

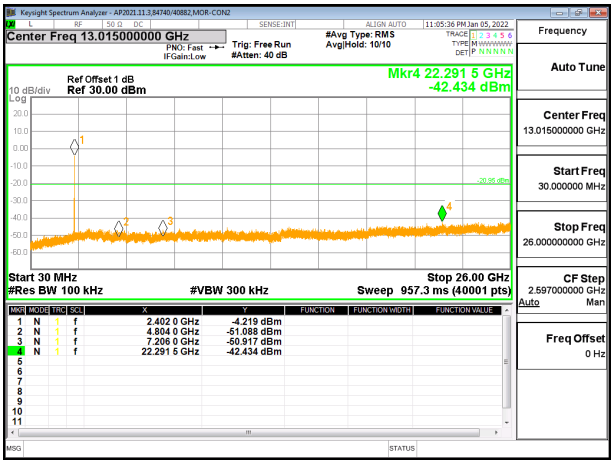
Output power was measured based on the use of a peak measurement, therefore the required attenuation is -20dBc.

RESULTS

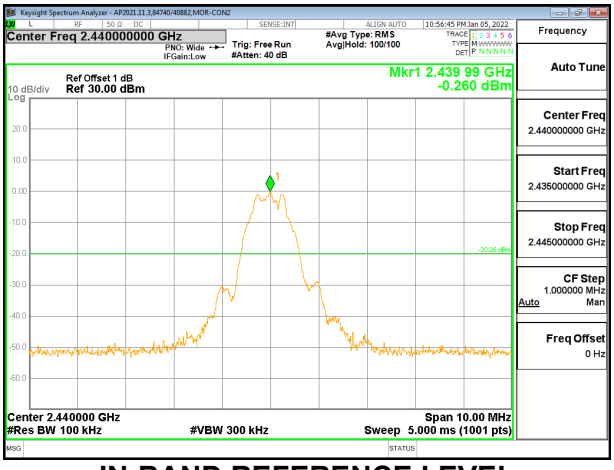
9.7.1. BLE (1Mbps)



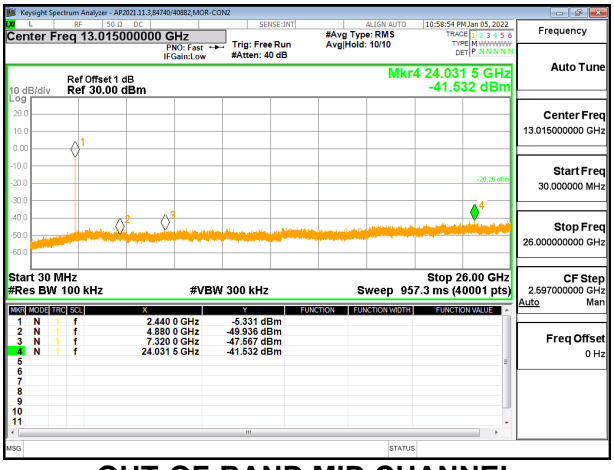
LOW CHANNEL BANDEDGE



OUT-OF-BAND LOW CHANNEL

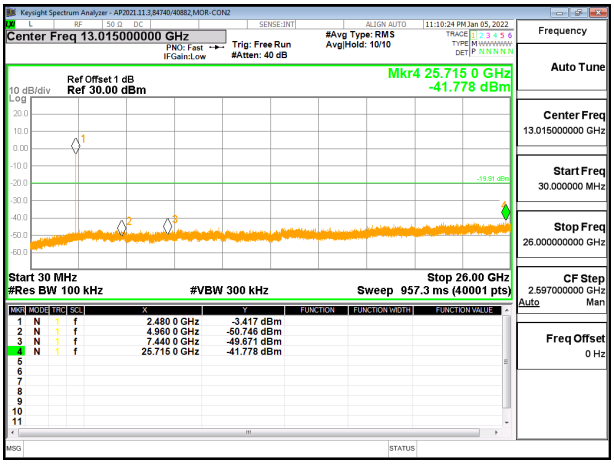


IN-BAND REFERENCE LEVEL



OUT-OF-BAND MID CHANNEL

HIGH CHANNEL BANDEDGE



OUT-OF-BAND HIGH CHANNEL

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

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.

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 voltage 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.

NOTE: The limits in CFR 47, Part 15, Subpart C, paragraph 15.209(a), are identical to those in RSS-Gen section 8.9, Table 6, since the measurements are performed in terms of magnetic field strength and converted to electric field strength levels (as reported in the table), using the free space impedance of 377 Ohms. For example the measurement at frequency X kHz resulted in a level of Y dBuV/m, which is equivalent to Y – 51.5 = Z dBuA/m, which has the same margin, W dB, to the corresponding RSS-Gen Table 6 limit as it has to 15.209(a) limit.

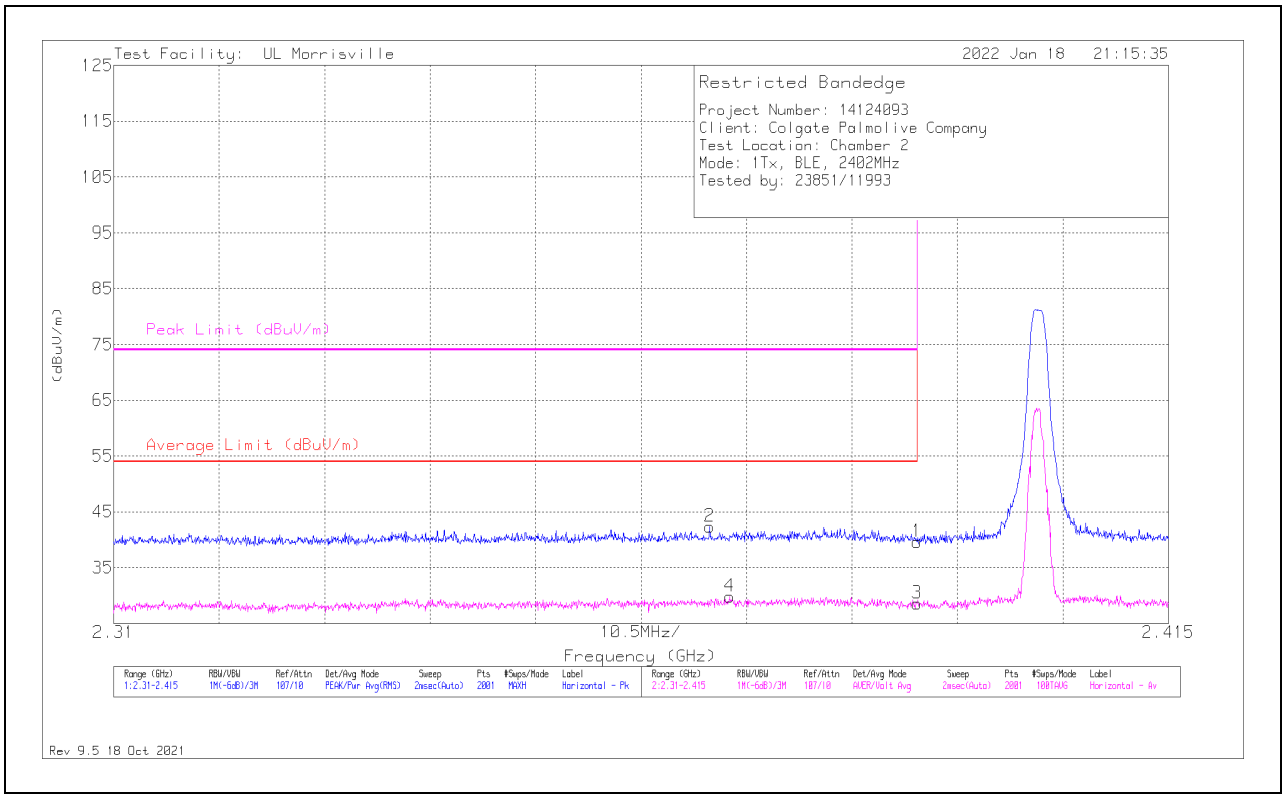
10.2. TRANSMITTER ABOVE 1 GHz

10.2.1. BLE (1Mbps)

Antenna 1

BANDEDGE (LOW CHANNEL)

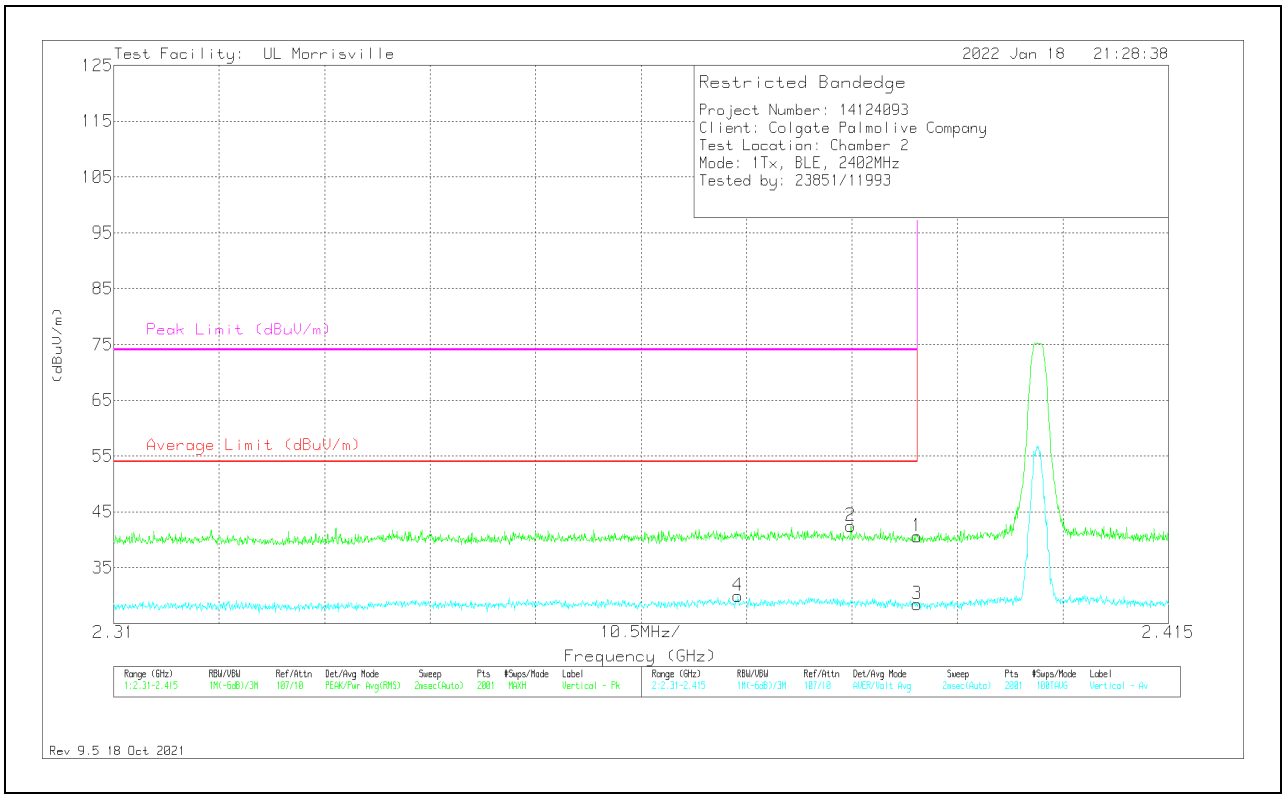
HORIZONTAL RESULT



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 (dB/m)	Amp/Cbl/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 2.38996	31.82	Pk	31.9	-24.1	39.62	54	-14.38	74	-34.38	274	102	H
2	* ** 2.36933	34.09	Pk	32.2	-24	42.29	54	-11.71	74	-31.71	274	102	H

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

VERTICAL RESULT

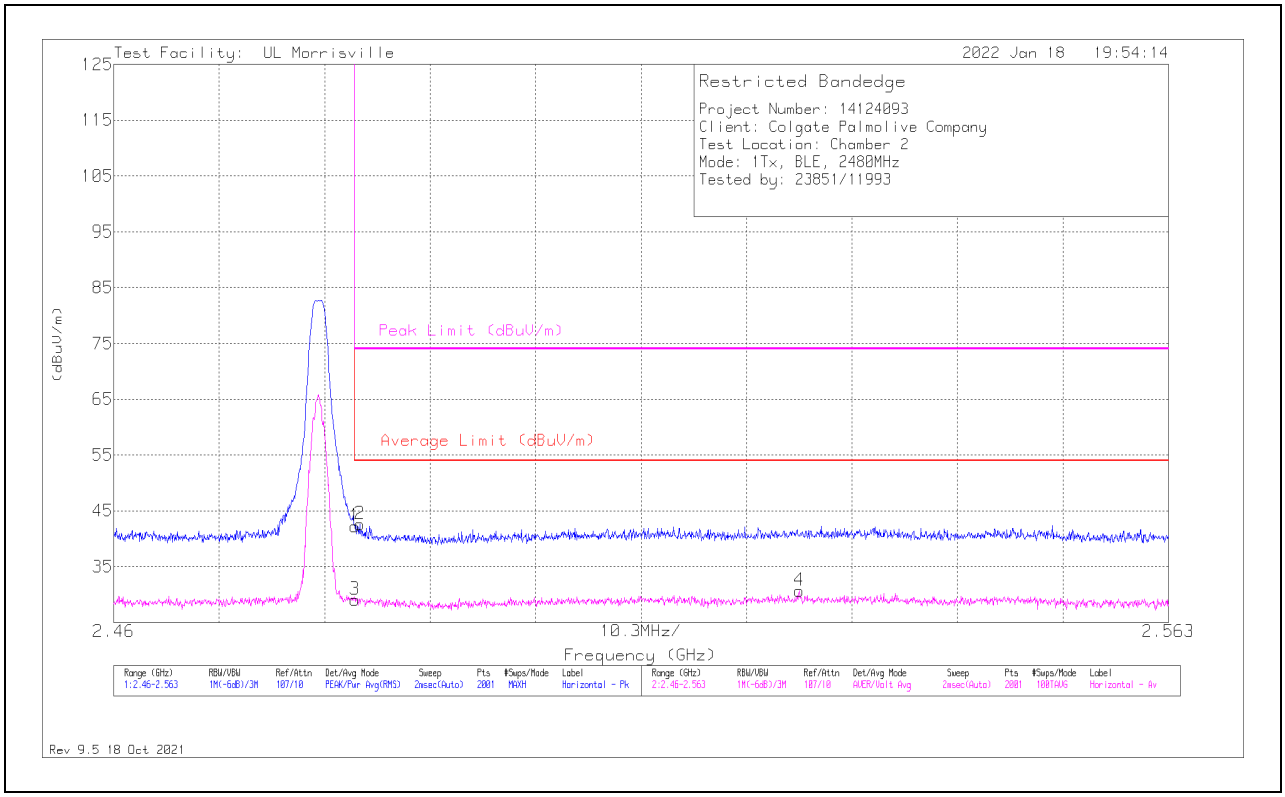


Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 (dB/m)	Amp/Cbl/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 2.38996	32.76	Pk	31.9	-24.1	40.56	54	-13.44	74	-33.44	301	106	V
2	* ** 2.3834	34.22	Pk	32.3	-24.1	42.42	54	-11.58	74	-31.58	301	106	V

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

BANDEDGE (HIGH CHANNEL)

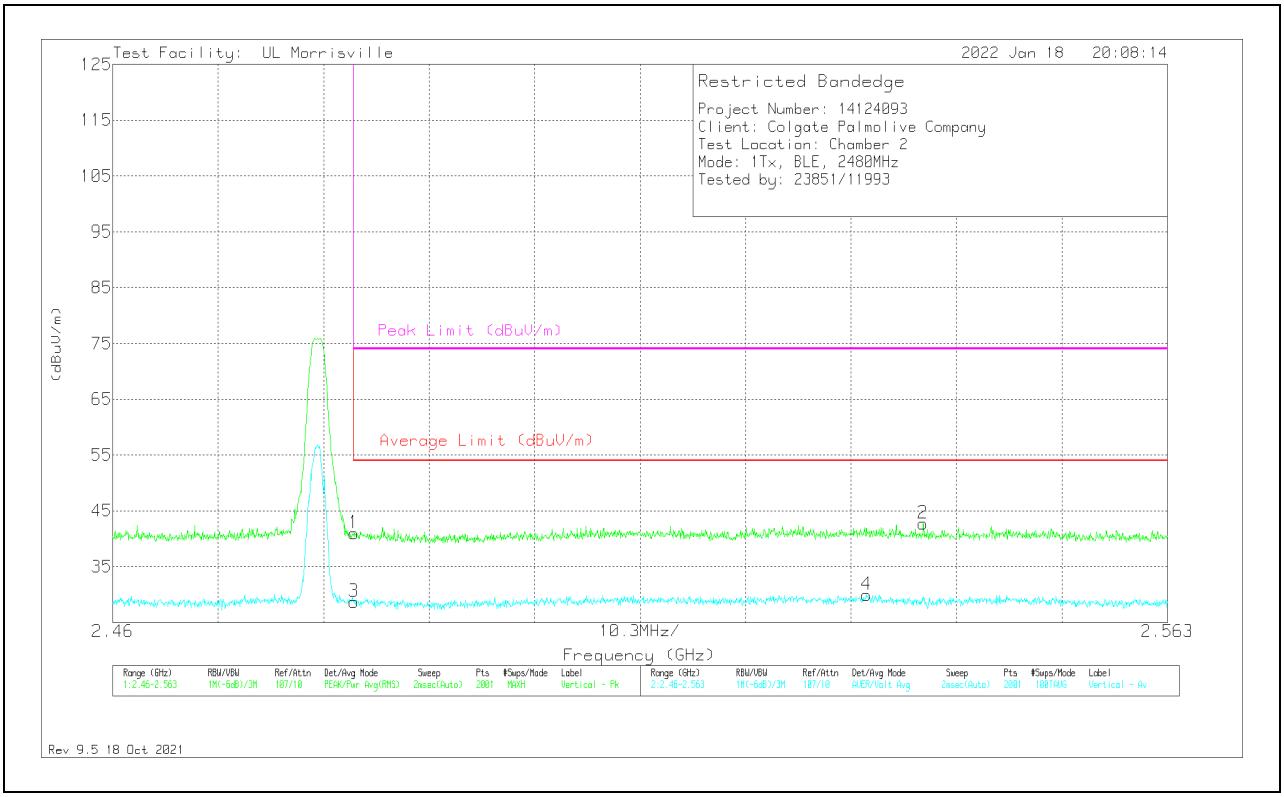
HORIZONTAL RESULT



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 (dB/m)	Amp/Cbl/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 2.48354	34.33	Pk	32.5	-24.6	42.23	54	-11.77	74	-31.77	267	131	H
2	* ** 2.48405	34.77	Pk	32.5	-24.7	42.57	54	-11.43	74	-31.43	267	131	H

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

VERTICAL RESULT

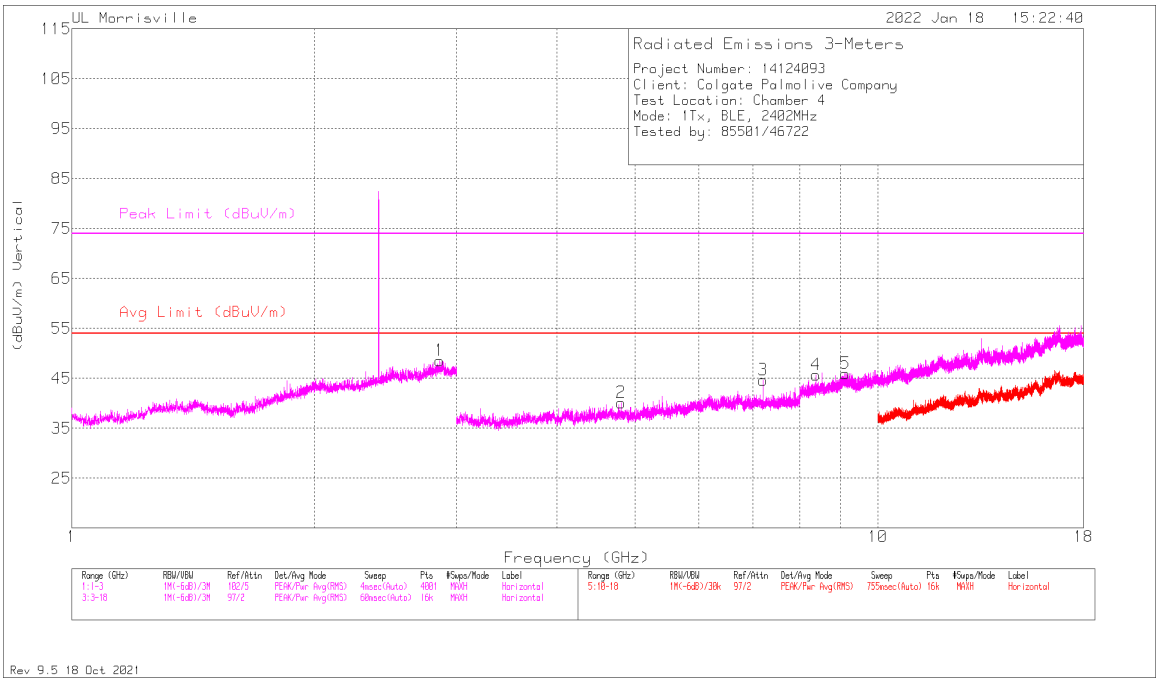


Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 (dB/m)	Amp/Cbl/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 2.48354	33.09	Pk	32.5	-24.6	40.99	54	-13.01	74	-33.01	302	103	V
2	** 2.53916	35.07	Pk	32.7	-25.1	42.67	54	-11.33	74	-31.33	302	103	V

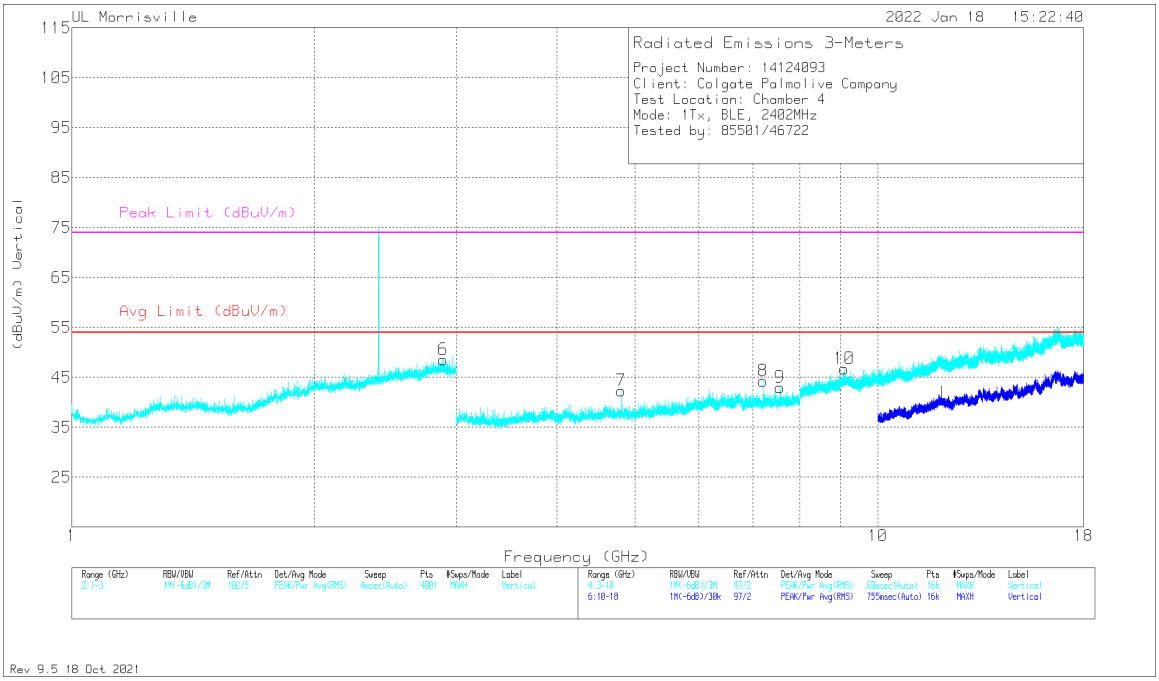
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
** - indicates frequency in Taiwan NCC LP0002 Restricted Band
Pk - Peak detector
ADV - Linear Voltage Average

HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL RESULTS



HORIZONTAL



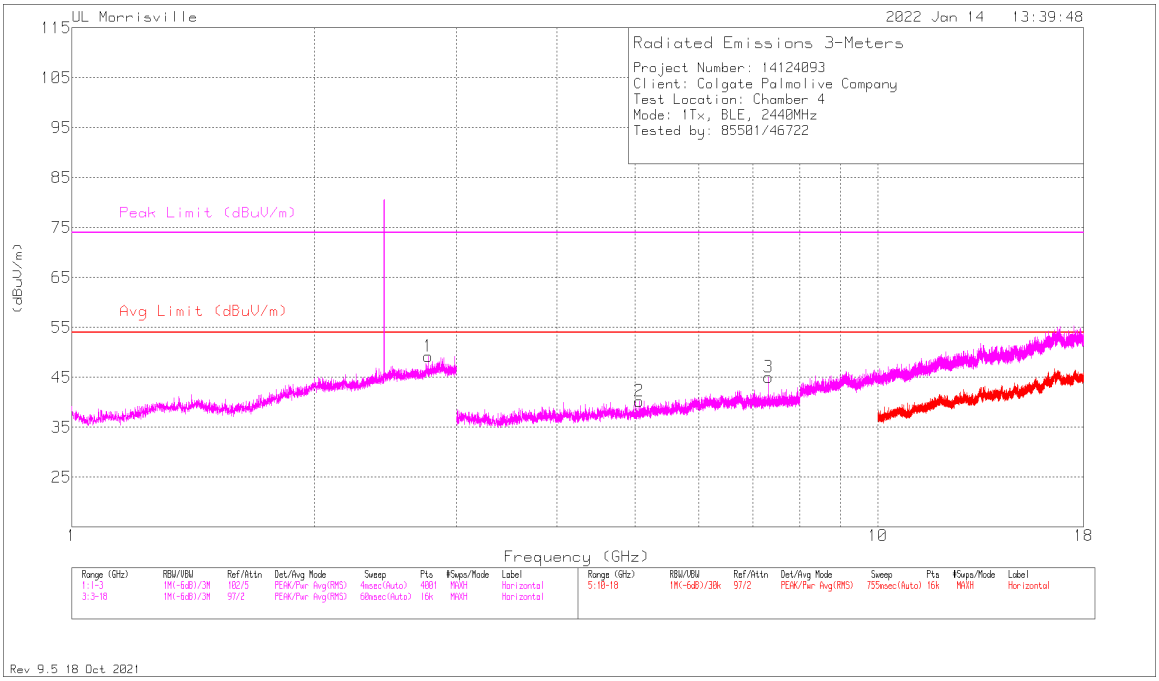
VERTICAL

RADIATED EMISSIONS

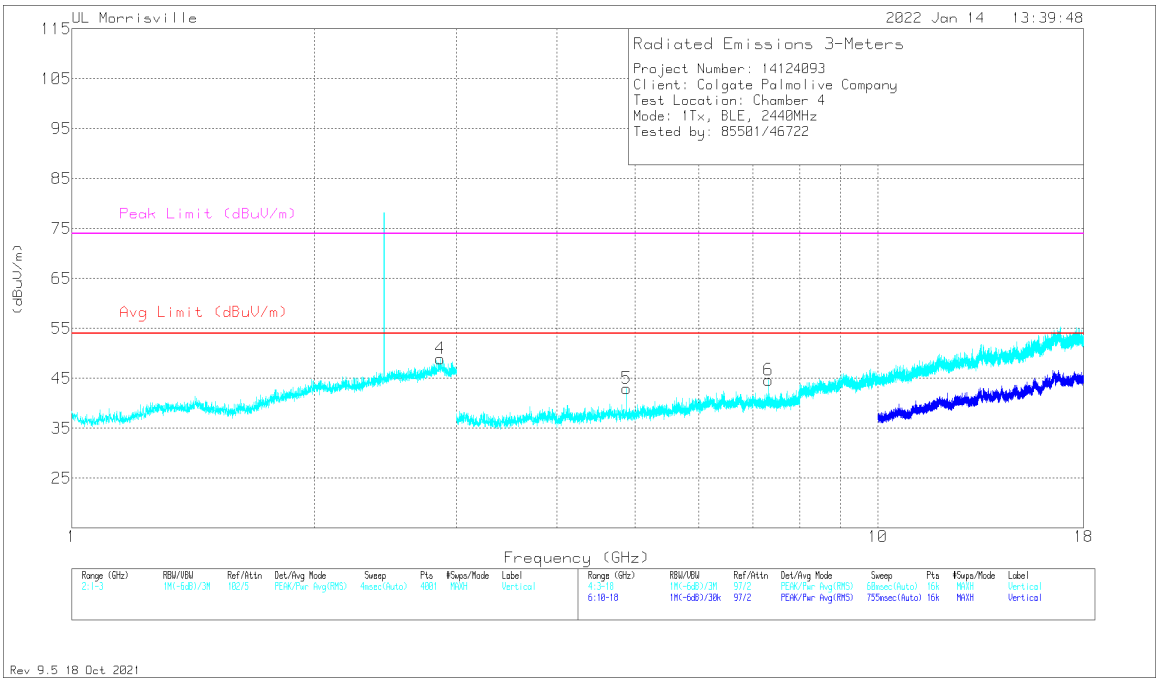
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	206211 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 2.86181	29.02	PK2	32.4	-12.9	48.52	54	-5.48	74	-25.48	338	285	H
6	* ** 2.89071	28.75	PK2	32.5	-12.8	48.45	54	-5.55	74	-25.55	327	205	V
2	* ** 4.80469	38.57	Pk	34	-32.5	40.07	54	-13.93	74	-33.93	0-360	100	H
4	* ** 8.37469	37.71	Pk	35.7	-27.7	45.71	54	-8.29	74	-28.29	0-360	100	H
5	* ** 9.12188	36.09	Pk	36.1	-26.2	45.99	54	-8.01	74	-28.01	0-360	100	H
7	* ** 4.80375	40.86	Pk	34	-32.5	42.36	54	-11.64	74	-31.64	0-360	200	V
9	* ** 7.56656	36.24	Pk	35.6	-28.9	42.94	54	-11.06	74	-31.06	0-360	200	V
10	* ** 9.08906	36.36	Pk	36.1	-25.7	46.76	54	-7.24	74	-27.24	0-360	200	V
3	7.20563	38.38	Pk	35.5	-29.2	44.68	54	-9.32	74	-29.32	0-360	100	H
8	7.20563	37.99	Pk	35.5	-29.2	44.29	54	-9.71	74	-29.71	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
ADV - Linear Voltage Average

MID CHANNEL RESULTS



HORIZONTAL



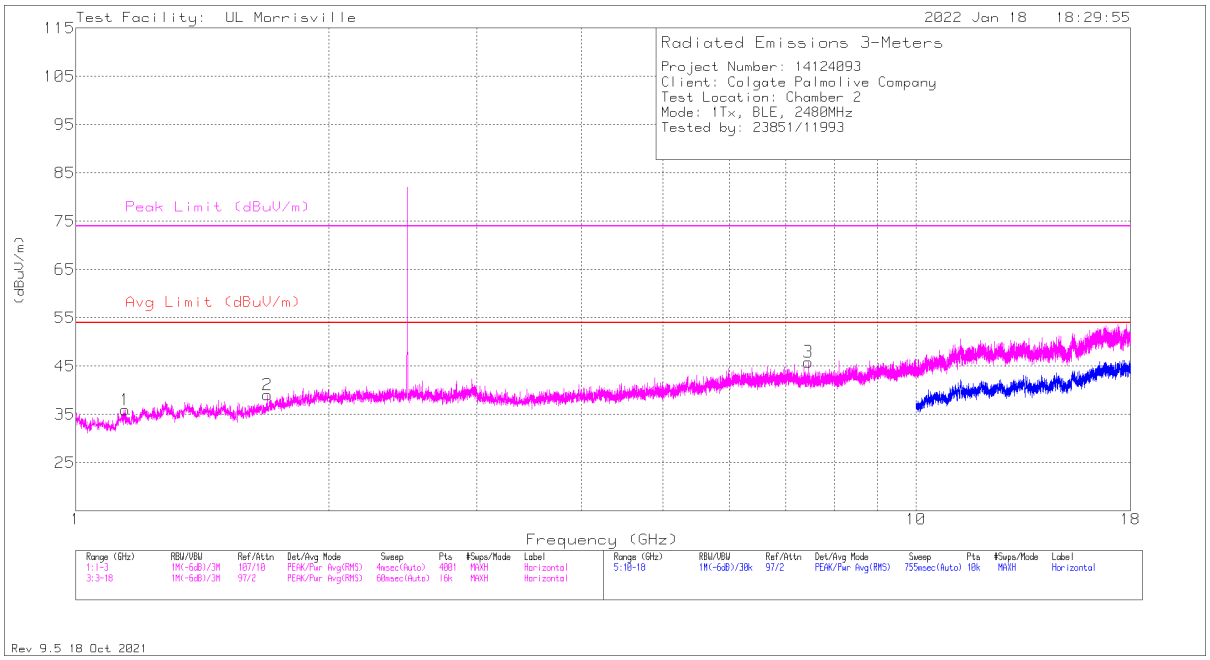
VERTICAL

RADIATED EMISSIONS

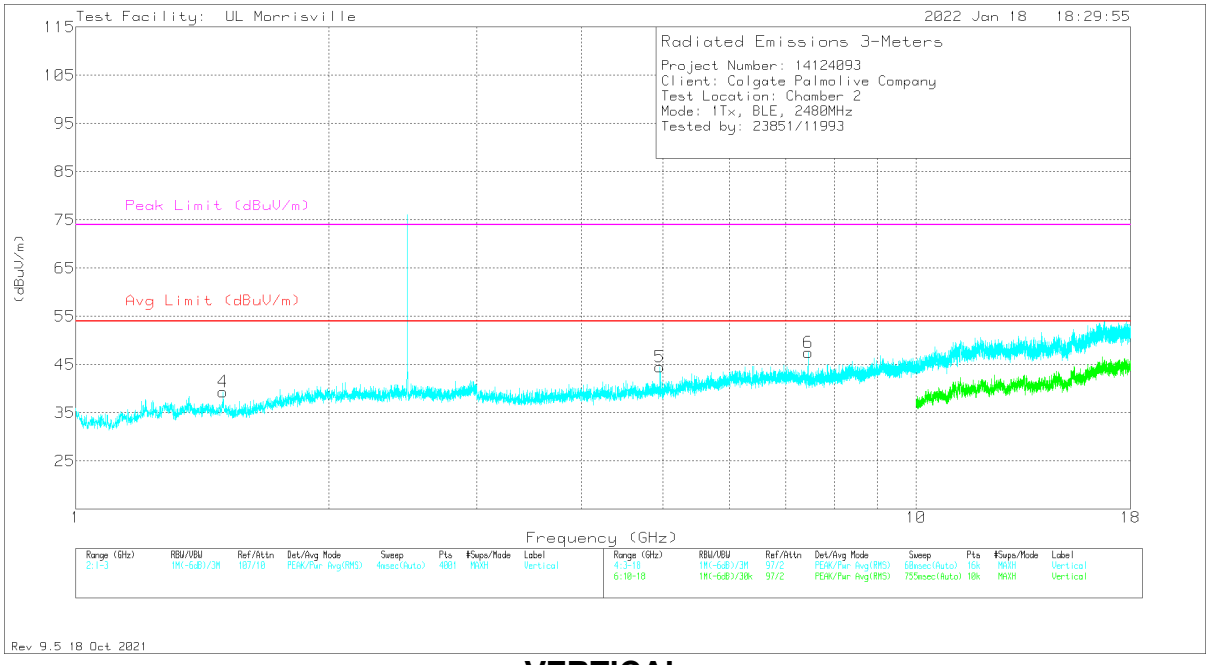
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	206211 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 2.76996	30.22	PK2	32.1	-13.1	49.22	54	-4.78	74	-24.78	189	100	H
4	* ** 2.86352	29.29	PK2	32.4	-12.9	48.79	54	-5.21	74	-25.21	15	387	V
2	* ** 5.0625	38.9	Pk	34.1	-32.7	40.3	54	-13.7	74	-33.7	0-360	100	H
3	* ** 7.32094	38.24	Pk	35.6	-28.8	45.04	54	-8.96	74	-28.96	0-360	100	H
5	* ** 4.88063	41.22	Pk	33.9	-32.2	42.92	54	-11.08	74	-31.08	0-360	200	V
6	* ** 7.31906	37.82	Pk	35.6	-28.8	44.62	54	-9.38	74	-29.38	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
ADV - Linear Voltage Average

HIGH CHANNEL RESULTS



HORIZONTAL



VERTICAL

RADIATED EMISSIONS

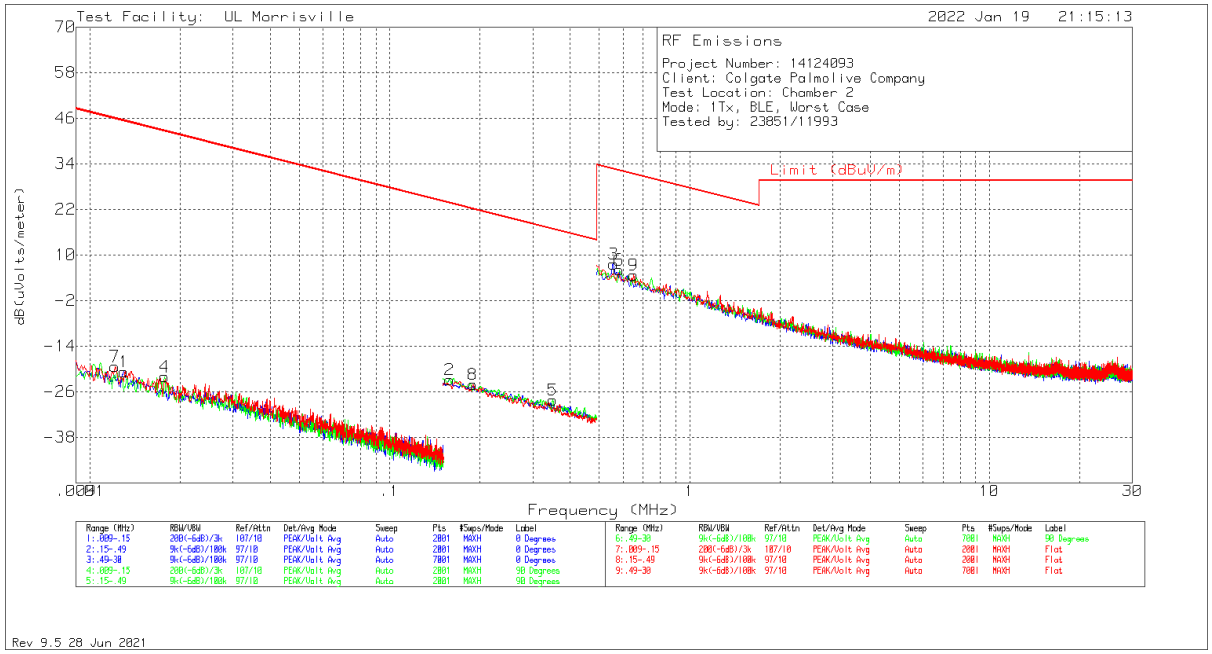
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0072 (dB/m)	Amp/Cbl/Fltr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 1.1445	32.73	Pk	27.8	-24.6	35.93	54	-18.07	74	-38.07	0-360	100	H
2	* ** 1.691	32.36	Pk	29.2	-22.5	39.06	54	-14.94	74	-34.94	0-360	100	H
4	* ** 1.498	33.6	Pk	28.6	-22.8	39.4	54	-14.6	74	-34.6	0-360	101	V
5	* ** 4.95938	41.01	Pk	34	-30.5	44.51	54	-9.49	74	-29.49	0-360	199	V
3	* ** 7.44	37.69	Pk	35.6	-27.4	45.89	54	-8.11	74	-28.11	0-360	101	H
6	* ** 7.44094	39.23	Pk	35.6	-27.3	47.53	54	-6.47	74	-26.47	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 - Maximum Peak
ADV - Linear Voltage Average

10.3. WORST CASE BELOW 30MHZ

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

SPURIOUS EMISSIONS BELOW 30 MHz (WORST-CASE CONFIGURATION)



ANTENNA- THREE ORIENTATIONS

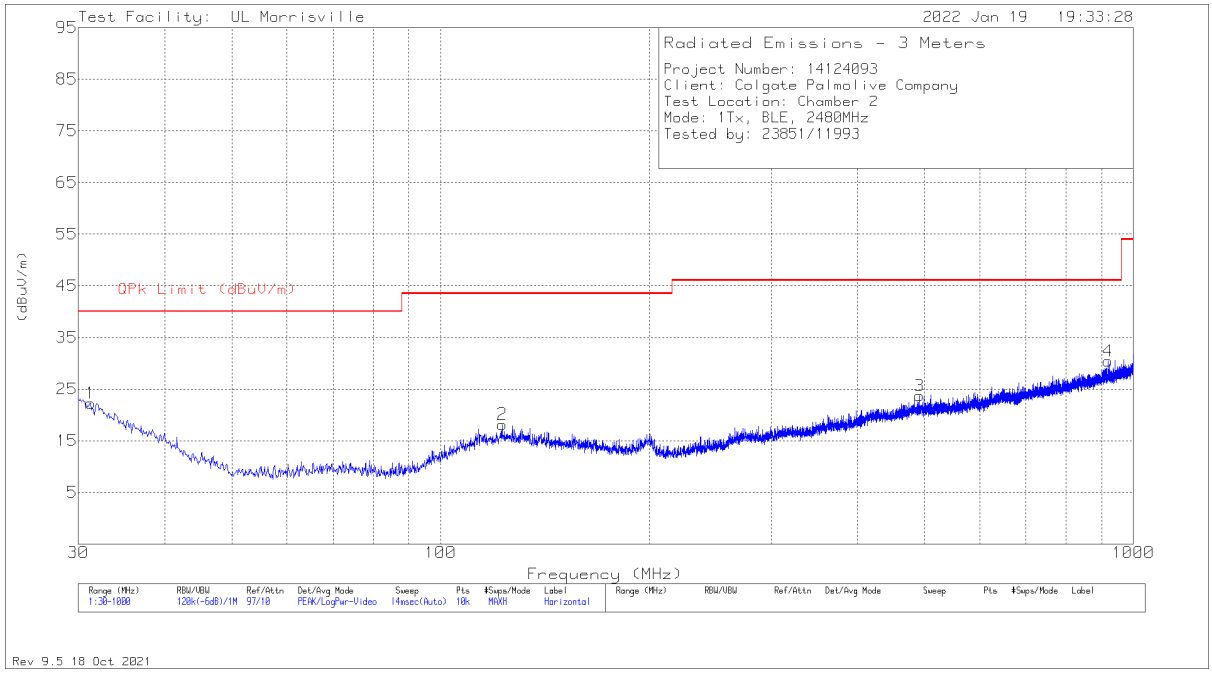
Below 30MHz Data

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AT0079 (dB/m)	Cbl (dB)	Dist. Corr. Factor (dB)	Corrected Reading dB(uVolts/meter)	FCC 15.209 Qp/Av Limit (dBuV/m)	FCC 15.209 Pk Limit (dBuV/m)	Worst-Case Margin (dB)	Azimuth (Degs)	Height (cm)	Loop Angle
1	.01298	42.02	Pk	17.1	.1	-80	-20.78	45.34	65.34	-66.12	0-360	401	On
2	.15833	45.79	Pk	11.2	.1	-80	-22.91	23.61	43.61	-46.52	0-360	401	On
3	.55746	36.21	Pk	11.2	.2	-40	7.61	32.68	-	-25.07	0-360	401	On
4	.01773	42.69	Pk	15.1	.1	-80	-22.11	42.63	62.63	-64.74	0-360	401	Off
5	.34958	40.5	Pk	11.2	.1	-80	-28.2	16.73	36.73	-44.93	0-360	401	Off
6	.58275	34.59	Pk	11.2	.2	-40	5.99	32.29	-	-26.3	0-360	401	Off
7	.01212	42.95	Pk	17.5	.1	-80	-19.45	45.93	65.93	-65.38	0-360	401	Flat
8	.18944	44.58	Pk	11.2	.1	-80	-24.12	22.05	42.05	-46.17	0-360	401	Flat
9	.65021	33.19	Pk	11.3	.2	-40	4.69	31.34	-	-26.65	0-360	401	Flat

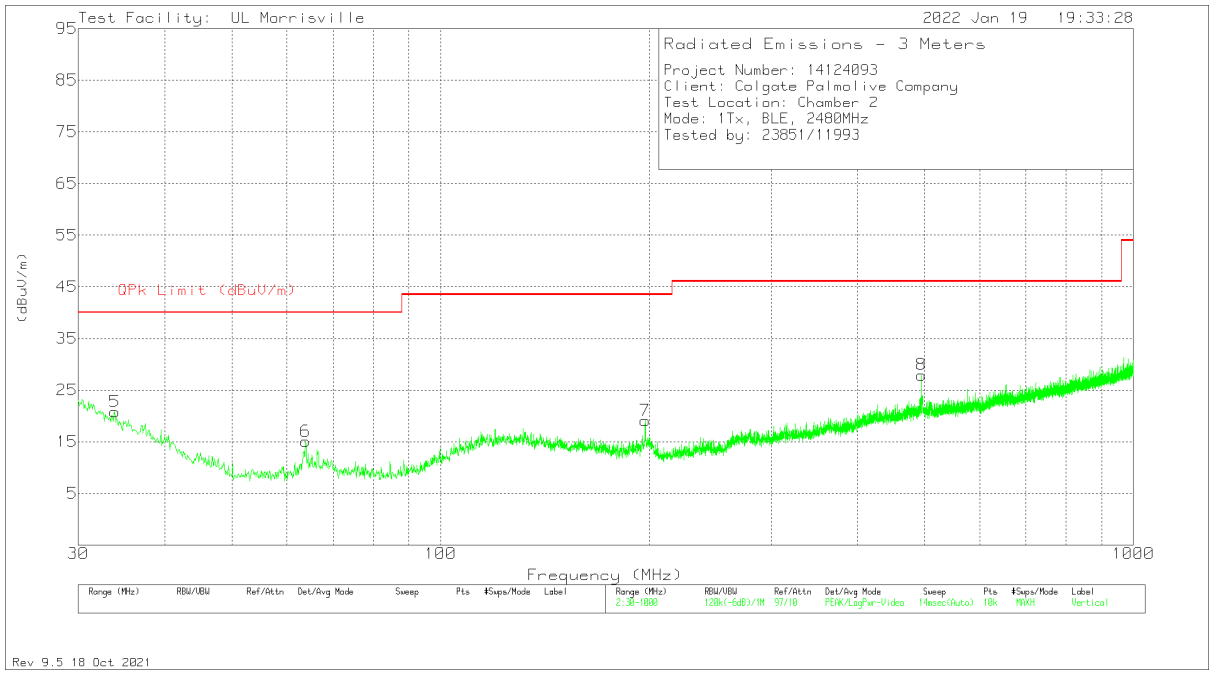
Pk - Peak detector

10.4. WORST CASE BELOW 1 GHZ

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



HORIZONTAL



VERTICAL

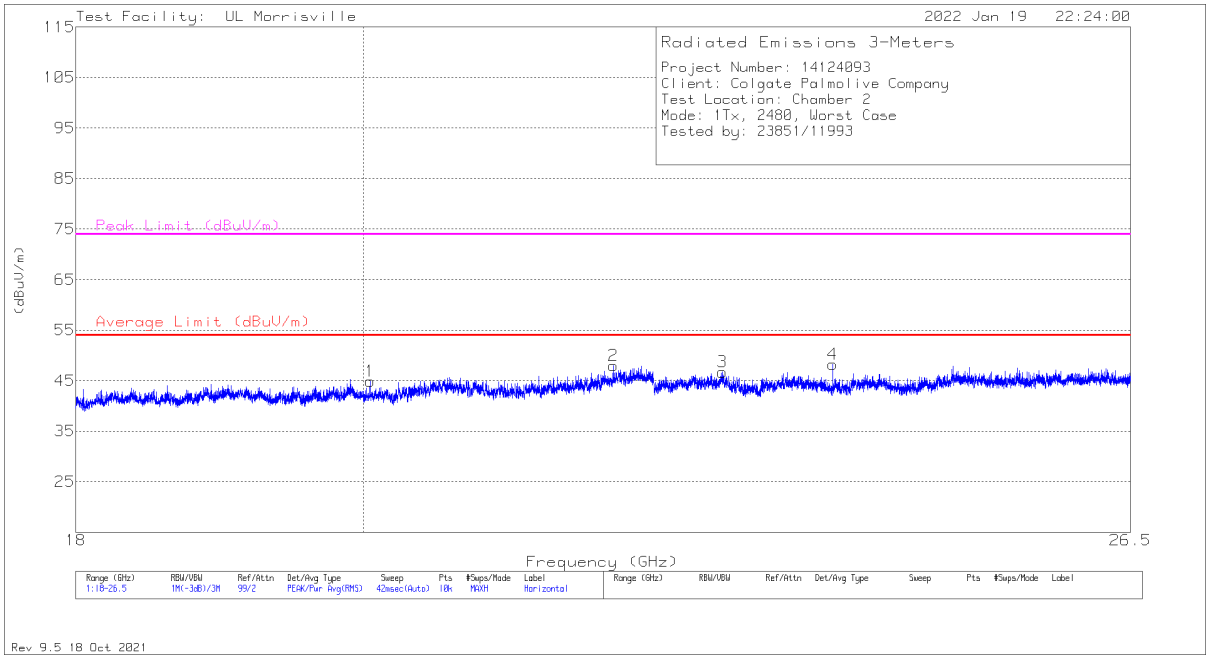
Below 1GHz Data

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AT0073 (dB/m)	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	31.261	27.67	Pk	26	-31.4	22.27	40	-17.73	0-360	199	H
5	33.88	28	Pk	24.3	-31.5	20.8	40	-19.2	0-360	199	V
6	63.853	32.28	Pk	13.8	-31	15.08	40	-24.92	0-360	199	V
2	122.829	28.34	Pk	20	-30.2	18.14	43.52	-25.38	0-360	100	H
7	197.519	30	Pk	18.7	-29.6	19.1	43.52	-24.42	0-360	199	V
3	491.526	27.71	Pk	23.7	-27.7	23.71	46.02	-22.31	0-360	199	H
8	494.339	31.73	Pk	23.7	-27.5	27.93	46.02	-18.09	0-360	100	V
4	919.393	27	Pk	28.6	-25.2	30.4	46.02	-15.62	0-360	399	H

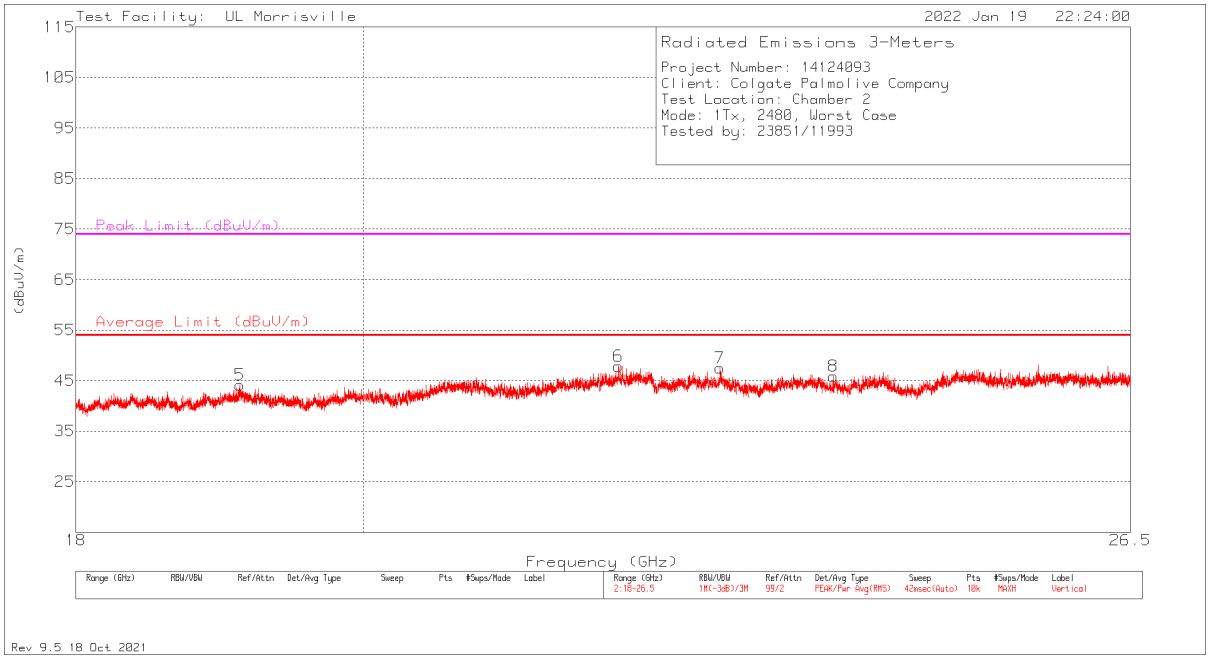
Pk - Peak detector

10.5. WORST CASE 18-26 GHZ

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



HORIZONTAL



VERTICAL

18 – 26GHz Data

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0063 (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	* ** 20.05084	48.44	Pk	33.6	-37.1	44.94	54	-9.06	74	-29.06	0-360	150	H
3	* ** 22.81647	48.79	Pk	35.8	-37.9	46.69	54	-7.31	74	-27.31	0-360	150	H
4	* ** 23.76415	47.98	PK2	34.9	-37.7	45.18	54	-8.82	74	-28.82	331	166	H
5	* ** 19.11679	48.74	Pk	33.4	-38	44.14	54	-9.86	74	-29.86	0-360	250	V
7	* ** 22.79862	49.31	Pk	35.8	-37.6	47.51	54	-6.49	74	-26.49	0-360	150	V
8	* ** 23.76667	48.54	Pk	34.9	-37.6	45.84	54	-8.16	74	-28.16	0-360	101	V
2	21.92406	49.64	Pk	36.6	-38.3	47.94	-	-	-	-	0-360	150	H
6	21.9657	48.57	Pk	36.8	-37.5	47.87	-	-	-	-	0-360	300	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
ADV - Linear Voltage Average

11. SETUP PHOTOS

Please refer to R14124093-EP1 for setup photos.

END OF TEST REPORT