

TEST REPORT

Report Number: R14665749-E1

Applicant : Stryker Medical
3800 E Centre Ave
Portage, MI 49002-5826, United States

Model : LBCA1KU1WA

Contains FCC ID : Z7ALBCA1KU1WA

Contains IC : 4919E-LBCA1KU1WA

EUT Description : Bluetooth Room Interface Board

Test Standard(s) : FCC 47 CFR PART 15 SUBPART C: 2023
ISED RSS-247 ISSUE 2: 2017
ISED RSS-GEN ISSUE 5 + A2: 2021

Date Of Issue:
2023-10-11

Prepared by:
UL LLC
12 Laboratory Dr.
Research Triangle Park, NC 27709 U.S.A.
TEL: (919) 549-1400



REPORT REVISION HISTORY

Rev.	Issue Date	Revisions	Revised By
V1	2023-06-30	Initial Issue	Charles Moody
V2	2023-07-06	Updated IC and FCC ID and Model Number	Charles Moody
V3	2023-10-04	Removed Output Power Measurements	Charles Moody
V4	2023-10-11	Editorial Change	Charles Moody

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: Stryker Medical
3800 E Centre Ave
Portage, MI 49002-5826, United States

EUT DESCRIPTION: Bluetooth Room Interface Board

MODEL: LBCA1KU1WA

SERIAL NUMBER: 300901380922

SAMPLE RECEIPT DATE: 2023-06-09

DATE TESTED: 2023-06-19 TO 2023-06-28

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
CFR 47 Part 15 Subpart C: 2023	See section 2
ISED RSS-247 Issue 2: 2017	See section 2
ISED RSS-GEN Issue 5 + A2: 2021	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.

Approved & Released For
UL LLC By:

Prepared By:



Michael Antola
Staff Engineer
Consumer, Medical and IT Segment
UL LLC

Charles Moody
Engineer
Consumer, Medical and IT Segment
UL LLC

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.

Data provided by the client includes:
 1.) Antenna gain, see section 6.3

FCC Clause	ISED Clause	Requirement	Result	Comment
See Comment		Duty Cycle	Reporting purposes only	Per ANSI C63.10, Section 11.6.
See Comment	RSS-GEN 6.7	20dB BW/99% OBW	Not Performed	Refer to Note 1
15.247 (a)(1)	RSS-247 (5.1) (b)	Hopping Frequency Separation		
15.247 (a)(1)(iii)	RSS-247 (5.1) (d)	Number of Hopping Channels		
15.247 (a)(1)(iii)	RSS-247 (5.1) (d)	Average Time of Occupancy		
15.247 (b)(1)	RSS-247 (5.4) (b)	Output Power		
See Comment		Average Power		
15.247 (d)	RSS-247 (5.5)	Conducted Spurious Emissions	Not Performed	Refer to Note 1
15.209, 15.205	RSS-GEN 8.9, 8.10	Radiated Emissions	Complies	None
15.207	RSS-Gen 8.8	AC Mains Conducted Emissions		

Note 1: This test report covers a Class 2 Permissive Change to a device which has implemented a new antenna. For this report only AC mains and radiated emissions testing was performed.

3. TEST METHODOLOGY

The tests documented in this report were performed in accordance with FCC 47 CFR Part 2, FCC 47 CFR 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, Certificate Number 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
<input checked="" type="checkbox"/>	Building: 2800 Perimeter Park Dr. Suite B Morrisville, NC 27560, U.S.A	US0067	27265	825374
<input type="checkbox"/>	Building: 12 Laboratory Dr RTP, NC 27709, U.S.A.		2180C	

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	U _{Lab}
Worst Case Conducted Disturbance, 0.15 to 30 MHz	3.40 dB
Worst Case Radiated Disturbance, All ranges	6.01 dB

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)

$$36.5 \text{ dBuV} + 18.7 \text{ dB/m} + 0.6 \text{ dB} - 26.9 \text{ dB} = 28.9 \text{ dBuV/m}$$

MAINS CONDUCTED EMISSIONS

Where relevant, the following sample calculation is provided:

Final Voltage (dBuV) = Measured Voltage (dBuV) + Cable Loss (dB) + Limiter Factor (dB) + LISN Insertion Loss.

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

6. EQUIPMENT UNDER TEST

6.1. EUT DESCRIPTION

The EUT is a room interface board used within the Stryker Procuity hospital bed (model 3009). The room interface board controls off product communication functionality including the use of a Bluetooth radio. This report covers the full radiated emissions testing, as well as AC Mains emissions and output power of the Bluetooth radio.

6.2. MAXIMUM OUTPUT POWER

This test report covers a Class 2 Permissive Change to a device which has implemented a new antenna. It was confirmed the conducted power remains unchanged. For this report only AC mains and radiated emissions testing was performed.

6.3. DESCRIPTION OF AVAILABLE ANTENNAS

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

The radio utilizes a flex antenna, with a maximum gain of 3 dBi.

6.4. SOFTWARE AND FIRMWARE

The EUT firmware installed during testing was //depot/R&D/Projects/IMS-157 (PACE)/Software Documents/Headwall/SOUP/Infineon_20721_BT_Cert/murata_files/
Perforce Changelist: 133715

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 average output power as worst-case scenario. This was found to be GFSK, 2402 MHz.

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

The fundamental of the EUT was investigated with the antenna in three orthogonal orientations X,Y,Z, it was determined that Y orientation was worst-case orientation; therefore, all final radiated testing was performed with the EUT in Y orientation.

Worst-case data rates as provided by the client were:.

GFSK mode: DH5
QPSK mode : 2-DH5
8PSK mode: 3-DH5

6.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID
Support Laptop	Microsoft	Surface Pro	061486383053	N/A
DC Power Supply	CircuitSpecialist	CSI30003X5	N/A	N/A

I/O CABLES

I/O Cable List						
Cable No.	Port	# of Identical Ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	14-Pin	1	Banana Plug	Unshielded	<3m	Used to Connect EUT to DC Power Supply
2	USB Type A	1	Micro USB	Unshielded	<3m	Used to Connect EUT to Support Laptop

TEST SETUP

The EUT is connected to a test laptop prior to testing to configure the radio. Test software exercised the radio card and the support laptop was disconnected from the EUT prior to testing.

SETUP DIAGRAMS

Please refer to R14665749-EP1 for setup diagrams

7. TEST AND MEASUREMENT EQUIPMENT

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

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

Equipment ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
CBL087	Coax cable, RG223, N-male to BNC-male, 20-ft.	Pasternack	PE3W06143-240	2023-04-04	2024-04-04
HI0091	Environmental Meter	Fisher Scientific	15-077-963	2022-07-20	2023-07-20
LISN003	LISN, 50-ohm/50-uH, 250uH 2-conductor, 25A	Fischer Custom Com.	FCC-LISN-50/250-25-2-01	2022-08-01	2023-08-01
75141	EMI Test Receiver 9kHz-7GHz	Rohde & Schwarz	ESCI 7	2022-08-03	2023-08-03
52859	Transient Limiter, 0.009-100MHz	Electro-Metrics	EM-7600	2023-04-04	2024-04-04
PS214	AC Power Source	Elgar	CW2501M (s/n 1523A02396)	NA	NA
SOFTEMI	EMI Software	UL	Version 9.5 (18 Oct 2021)		

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				
89509	Double-Ridged Waveguide Horn Antenna, 1 to 18 GHz	ETS Lindgren	3117	2023-05-23	2025-05-23
	Gain-Loss Chains				
207640	Gain-loss string: 1-18GHz	Various	Various	2023-05-17	2024-05-17
	Receiver & Software				
197955	Spectrum Analyzer	Rohde & Schwarz	ESW44	2023-04-10	2024-04-10
SOFTEMI	EMI Software	UL	Version 9.5 (18 Oct 2021)		
	Additional Equipment used				
21642	Environmental Meter	Fisher Scientific	15-077-963 (s/n 210701692)	2021-08-16	2023-08-16
220155	DC Power Supply	CircuitSpecialists	CSI30003X5	N/A	N/A

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				
135144	Active Loop Antenna	ETS-Lindgren	6502	2023-01-17	2024-01-17
	30-1000 MHz				
90627	Hybrid Broadband Antenna	Sunol Sciences Corp.	JB3	2022-09-07	2023-09-07
	1-18 GHz				
88761	Double-Ridged Waveguide Horn Antenna, 1 to 18 GHz	ETS Lindgren	3117	2022-09-13	2023-09-13
	18-40 GHz				
204704	Horn Antenna, 18-26.5GHz	Com-Power	AH-626	2022-07-11	2023-07-11
	Gain-Loss Chains				
91975	Gain-loss string: 0.009-30MHz	Various	Various	2023-06-06	2024-06-06
91978	Gain-loss string: 25-1000MHz	Various	Various	2023-06-06	2024-06-06
91977	Gain-loss string: 1-18GHz	Various	Various	2023-06-06	2024-06-06
136042	Gain-loss string: 18-40GHz	Various	Various	2023-06-06	2024-06-06
	Receiver & Software				
81018	Spectrum Analyzer	Agilent	E4446A	2022-08-02	2023-08-02
90416	Spectrum Analyzer	Keysight	N9030A	2023-06-09	2024-06-30
SOFTEMI	EMI Software	UL	Version 9.5 (18 Oct 2021)		
	Additional Equipment used				
200540	Environmental Meter	Fisher Scientific	15-077-963 s/n 181474409	2022-10-05	2023-10-05

8. MEASUREMENT METHODS

On Time and Duty Cycle: ANSI C63.10-2013 Section 11.6

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

Radiated Band-edge: ANSI C63.10-2013 Section 6.10.5

AC Power-line conducted emissions: ANSI C63.10-2013, Section 6.2.

9. ANTENNA PORT TEST RESULTS

9.1. ON TIME AND DUTY CYCLE

LIMITS

None; for reporting purposes only.

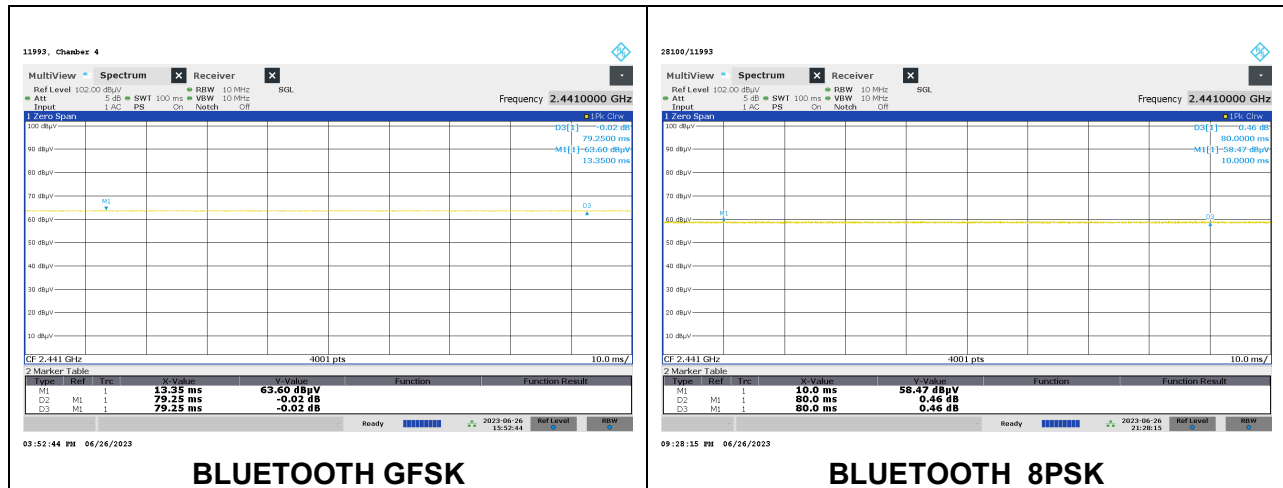
PROCEDURE

ANSI C63.10, Section 11.6 : 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/T Minimum VBW (kHz)
Bluetooth GFSK	79.25	79.25	1.000	100.00	0.00	0.010
Bluetooth 8PSK	80.00	80	1.000	100.00	0.00	0.010

DUTY CYCLE PLOTS



10. RADIATED TEST RESULTS

LIMITS

FCC §15.205 and §15.209
RSS-GEN, Section 8.9 and 8.10.

Frequency Range (MHz)	Field Strength Limit (uV/m) at 3 m	Field Strength Limit (dBuV/m) at 3 m
0.009-0.490	2400/F(kHz) @ 300 m	-
0.490-1.705	24000/F(kHz) @ 30 m	-
1.705 - 30	30 @ 30m	-
30 - 88	100	40
88 - 216	150	43.5
216 - 960	200	46
Above 960	500	54

TEST PROCEDURE

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

For measurements below 1 GHz the resolution bandwidth is set to 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 1 MHz resolution bandwidth with 1/T video bandwidth with peak detector for average measurements.

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

Based 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

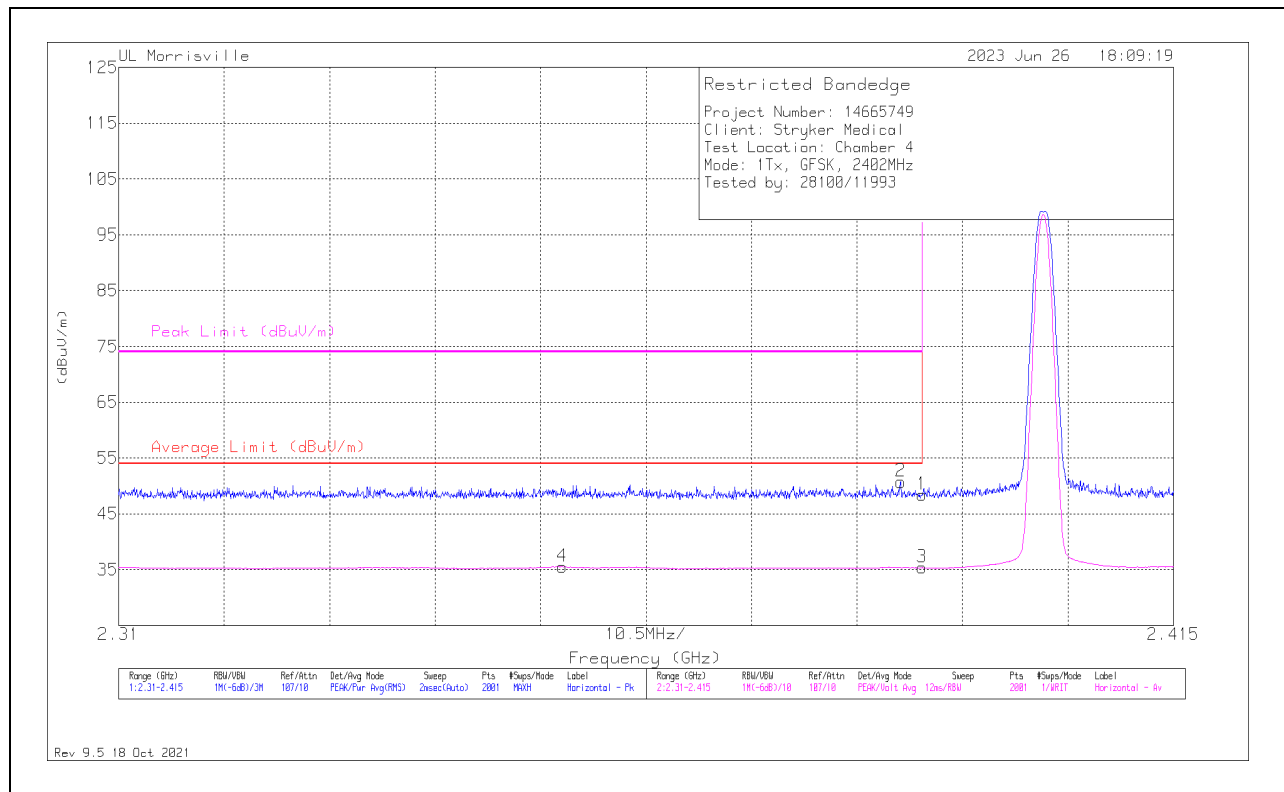
OFS and chamber correlation testing had been performed and chamber measured test result is the worst-case test result.

10.1. TRANSMITTER ABOVE 1 GHz

10.1.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION

BANDEDGE (LOW CHANNEL)

HORIZONTAL RESULT



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	89509 ACF (dB/m)	Gain/Loss (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	42.85	Pk	32	-26.4	48.45	-	-	74	-25.55	230	142	H
2	* ** 2.38786	45.03	Pk	32	-26.3	50.73	-	-	74	-23.27	230	142	H
3	* ** 2.38996	29.76	VA1T	32	-26.4	35.36	54	-18.64	-	-	230	142	H
4	* ** 2.35415	29.83	VA1T	31.8	-26.1	35.53	54	-18.47	-	-	230	142	H

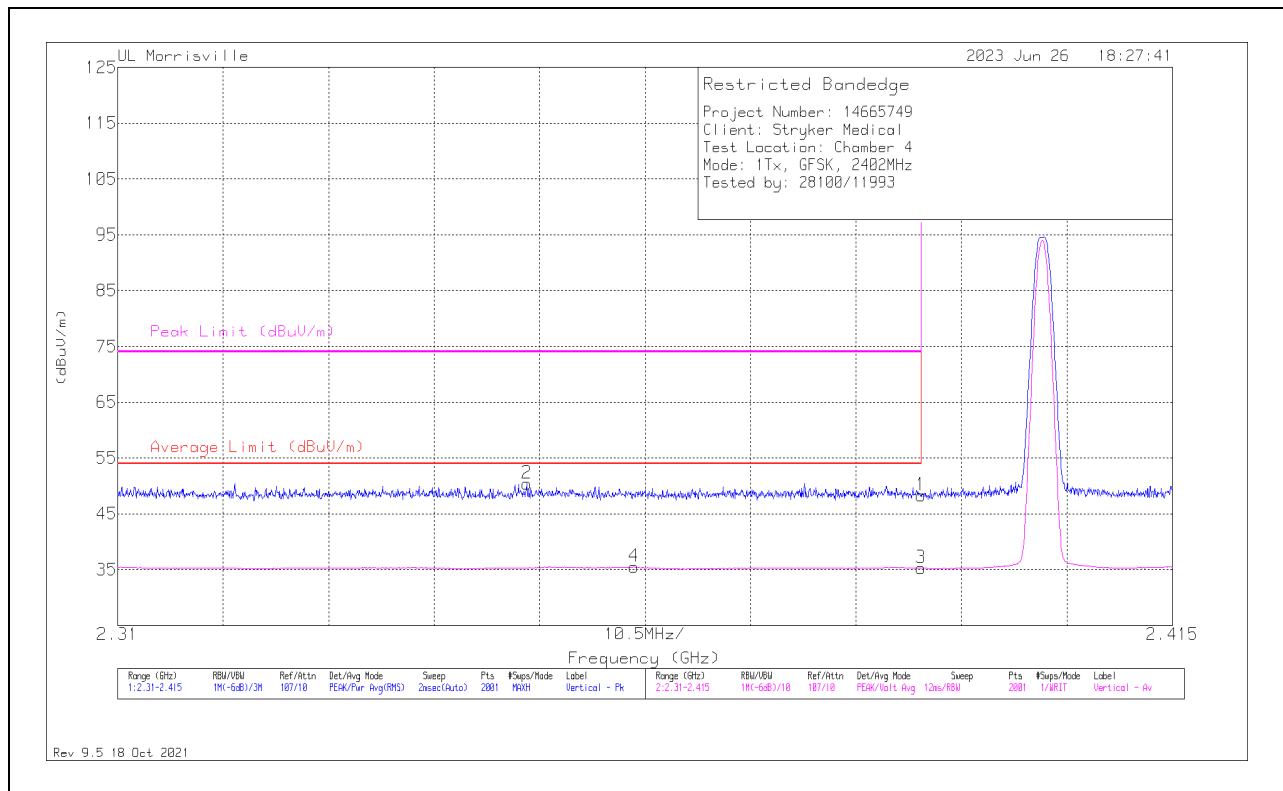
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

** - indicates frequency in Taiwan NCC LP0002 Restricted Band

Pk - Peak detector

VA1T - Linear Voltage Average VB=1/Ton where: Ton is transmit duration

VERTICAL RESULT

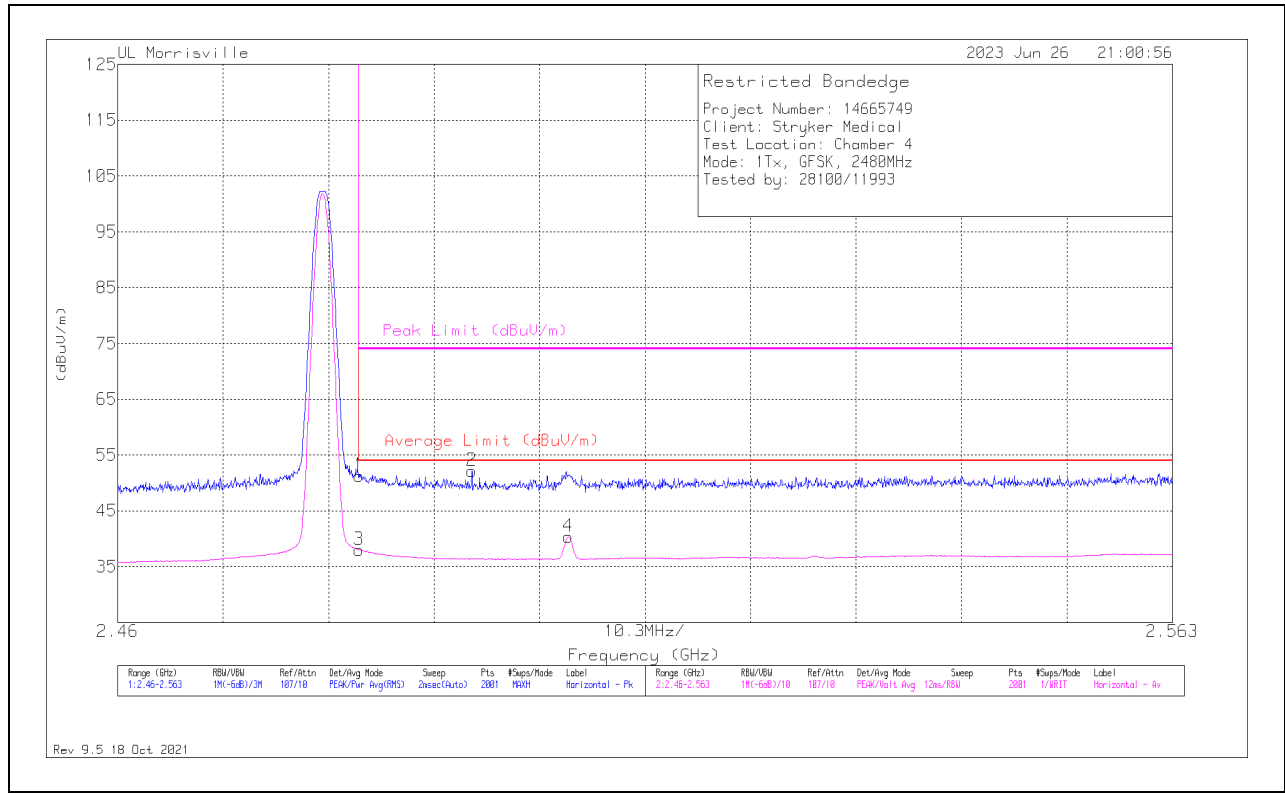


Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	89509 ACF (dB/m)	Gain/Loss (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 2.38996	42.68	Pk	32	-26.4	48.28	-	-	74	-25.72	340	400	V
2	* ** 2.35074	44.74	Pk	31.8	-26.1	50.44	-	-	74	-23.56	340	400	V
3	* ** 2.38996	29.68	VA1T	32	-26.4	35.28	54	-18.72	-	-	340	400	V
4	* ** 2.3614	29.67	VA1T	31.9	-26.1	35.47	54	-18.53	-	-	340	400	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
 ** - indicates frequency in Taiwan NCC LP0002 Restricted Band
 Pk - Peak detector
 VA1T - Linear Voltage Average VB=1/Ton where: Ton is transmit duration

BANDEDGE (HIGH CHANNEL)

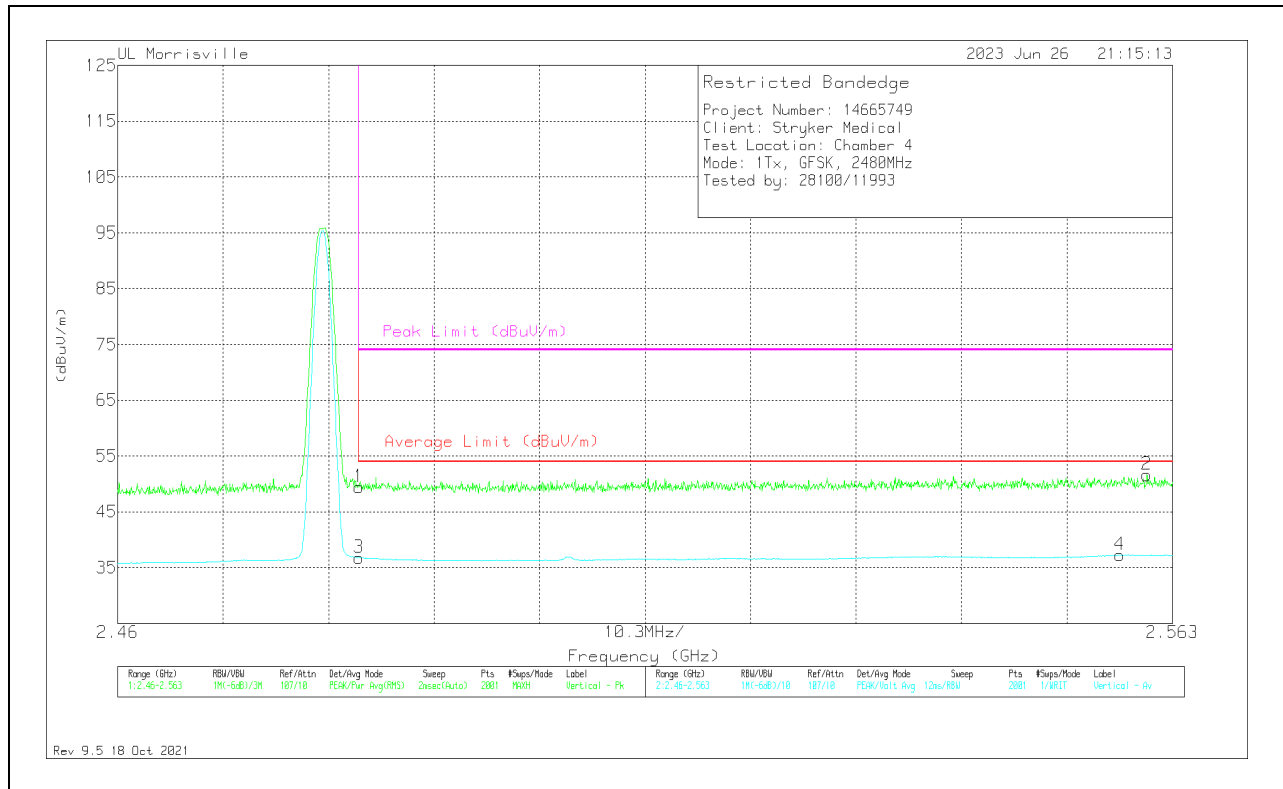
HORIZONTAL RESULT



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	89509 ACF (dB/m)	Gain/Loss (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	31.85	Pk	32.3	-12.9	51.25	-	-	74	-22.75	33	103	H
2	* ** 2.49456	32.84	Pk	32.3	-13	52.14	-	-	74	-21.86	33	103	H
3	* ** 2.48354	18.65	VA1T	32.3	-12.9	38.05	54	-15.95	-	-	33	103	H
4	** 2.50398	21.01	VA1T	32.3	-13	40.31	54	-13.69	-	-	33	103	H

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
 ** - indicates frequency in Taiwan NCC LP0002 Restricted Band
 Pk - Peak detector
 VA1T - Linear Voltage Average VB=1/Ton where: Ton is transmit duration

VERTICAL RESULT

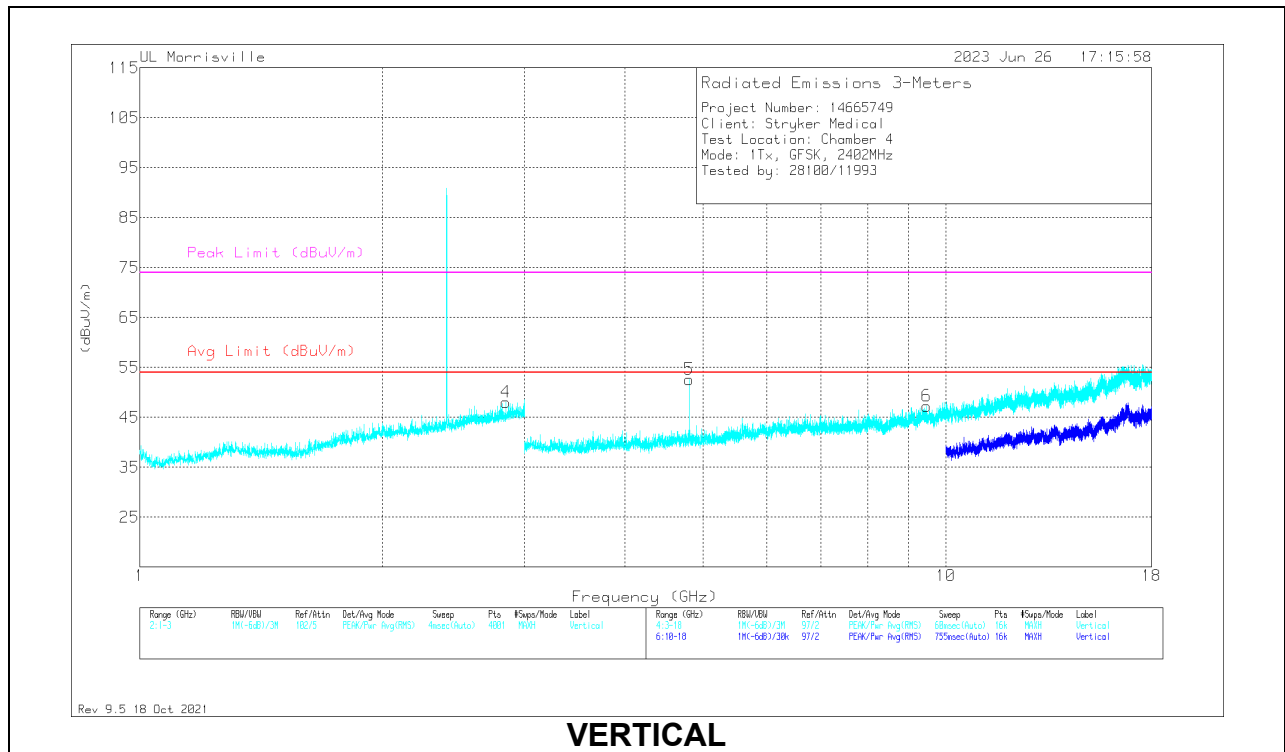
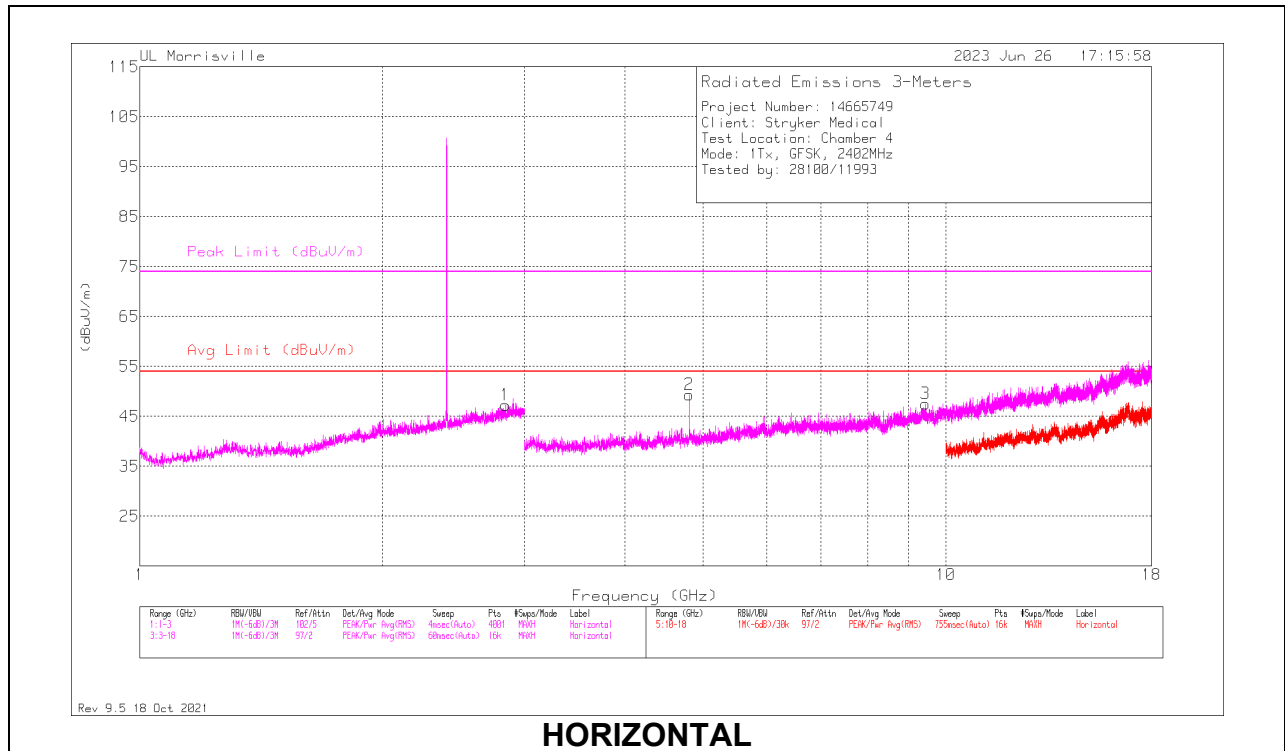


Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	89509 ACF (dB/m)	Gain/Loss (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 2.48354	29.98	Pk	32.3	-12.9	49.38	-	-	74	-24.62	337	369	V
2	** 2.56048	31.9	Pk	32.5	-12.8	51.6	-	-	74	-22.4	337	369	V
3	* ** 2.48354	17.41	VA1T	32.3	-12.9	36.81	54	-17.19	-	-	337	369	V
4	** 2.55785	17.43	VA1T	32.5	-12.7	37.23	54	-16.77	-	-	337	369	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
 ** - indicates frequency in Taiwan NCC LP0002 Restricted Band
 Pk - Peak detector
 VA1T - Linear Voltage Average VB=1/Ton where: Ton is transmit duration

HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL RESULTS



RADIATED EMISSIONS

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	89509 ACF (dB/m)	Gain/Loss (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	*** 2.843	27.03	Pk	32.3	-12.1	47.23	54	-6.77	74	-26.77	0-360	100	H
4	*** 2.84415	27.61	PK2	32.3	-12.1	47.81	-	-	74	-26.19	78	246	V
	*** 2.84797	12.93	V1TV	32.4	-12.2	33.13	54	-20.87	-	-	78	246	V
2	*** 4.80365	50.86	PK2	34.1	-31.7	53.26	-	-	74	-20.74	25	113	H
	*** 4.80404	46.07	V1TV	34.1	-31.7	48.47	54	-5.53	-	-	25	113	H
3	*** 9.4425	36.2	Pk	36.7	-25.4	47.5	54	-6.5	74	-26.5	0-360	100	H
5	*** 4.80369	51.89	PK2	34.1	-31.7	54.29	-	-	74	-19.71	161	190	V
	*** 4.80404	47.45	V1TV	34.1	-31.7	49.85	54	-4.15	-	-	161	190	V
6	*** 9.46875	35.82	Pk	36.7	-25.3	47.22	54	-6.78	74	-26.78	0-360	200	V

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

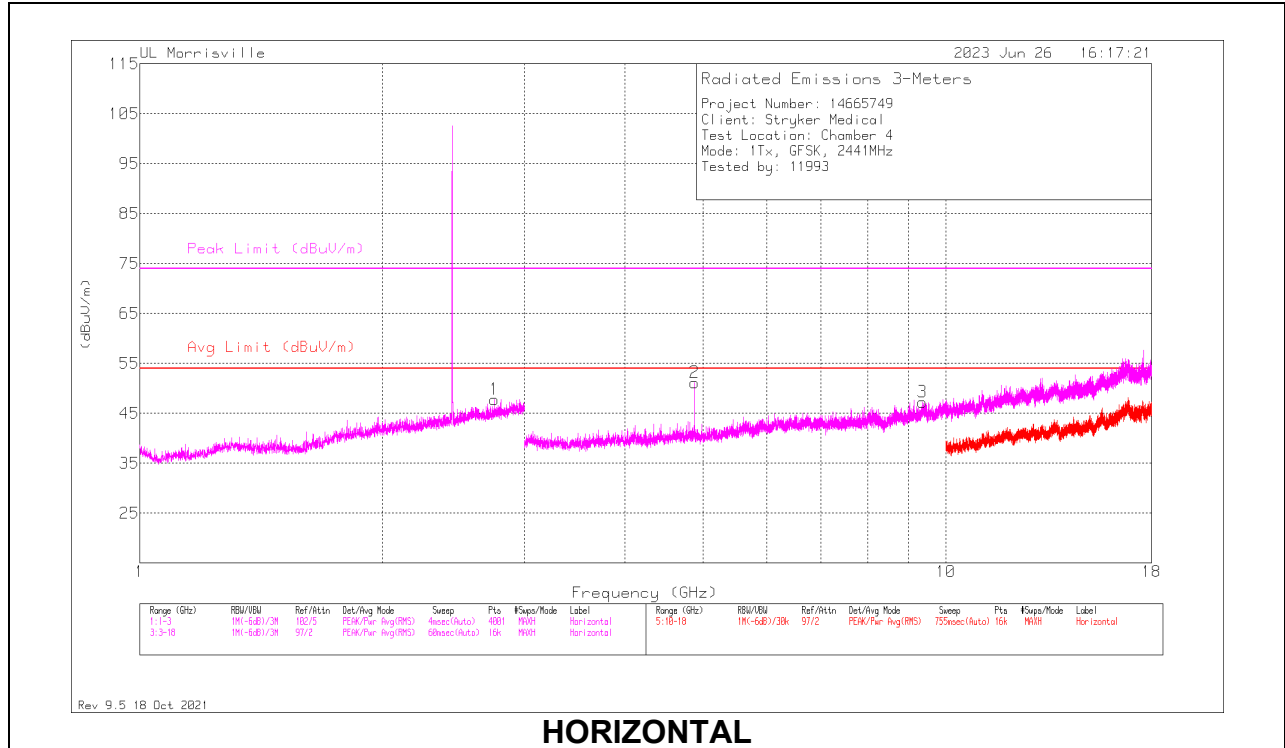
** - indicates frequency in Taiwan NCC LP0002 Restricted Band

Pk - Peak detector

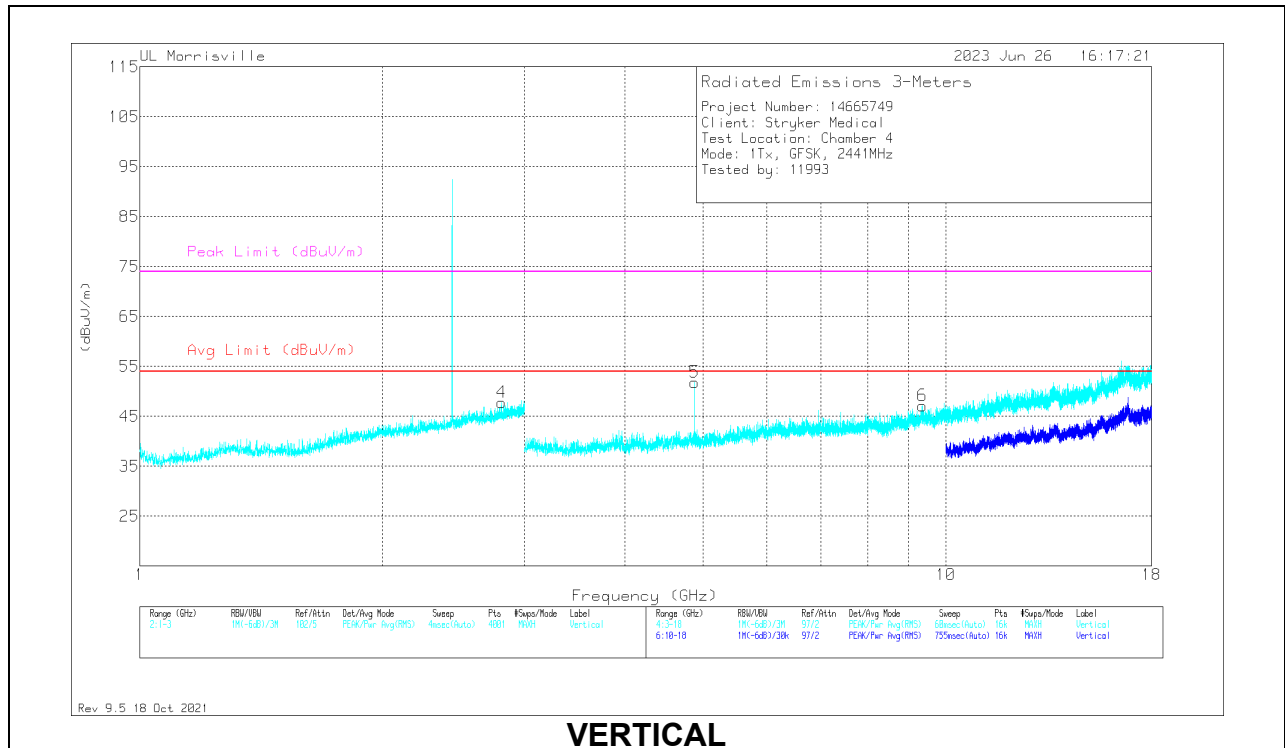
PK2 - Maximum Peak

V1TV - VB=1/Ton, Linear Voltage Average where: Ton is packet duration. VBW is set to 0.010 kHz.

MID CHANNEL RESULTS



HORIZONTAL



VERTICAL

RADIATED EMISSIONS

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	89509 ACF (dB/m)	Gain/Loss (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 2.755	27.64	Pk	32.5	-12.4	47.74	54	-6.26	74	-26.26	0-360	100	H
4	* ** 2.8115	27.58	Pk	32.5	-12.3	47.78	54	-6.22	74	-26.22	0-360	200	V
2	* ** 4.88161	51.26	PK2	34	-31.4	53.86	-	-	74	-20.14	28	400	H
	* ** 4.88203	46.53	V1TV	34	-31.4	49.13	54	-4.87	-	-	28	400	H
3	* ** 9.35719	35.54	Pk	36.5	-24.8	47.24	54	-6.76	74	-26.76	0-360	100	H
5	* ** 4.8824	52.4	PK2	34	-31.4	55	-	-	74	-19	160	196	V
	* ** 4.88205	48.21	V1TV	34	-31.4	50.81	54	-3.19	-	-	160	196	V
6	* ** 9.34969	35.71	Pk	36.5	-25.1	47.11	54	-6.89	74	-26.89	0-360	200	V

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

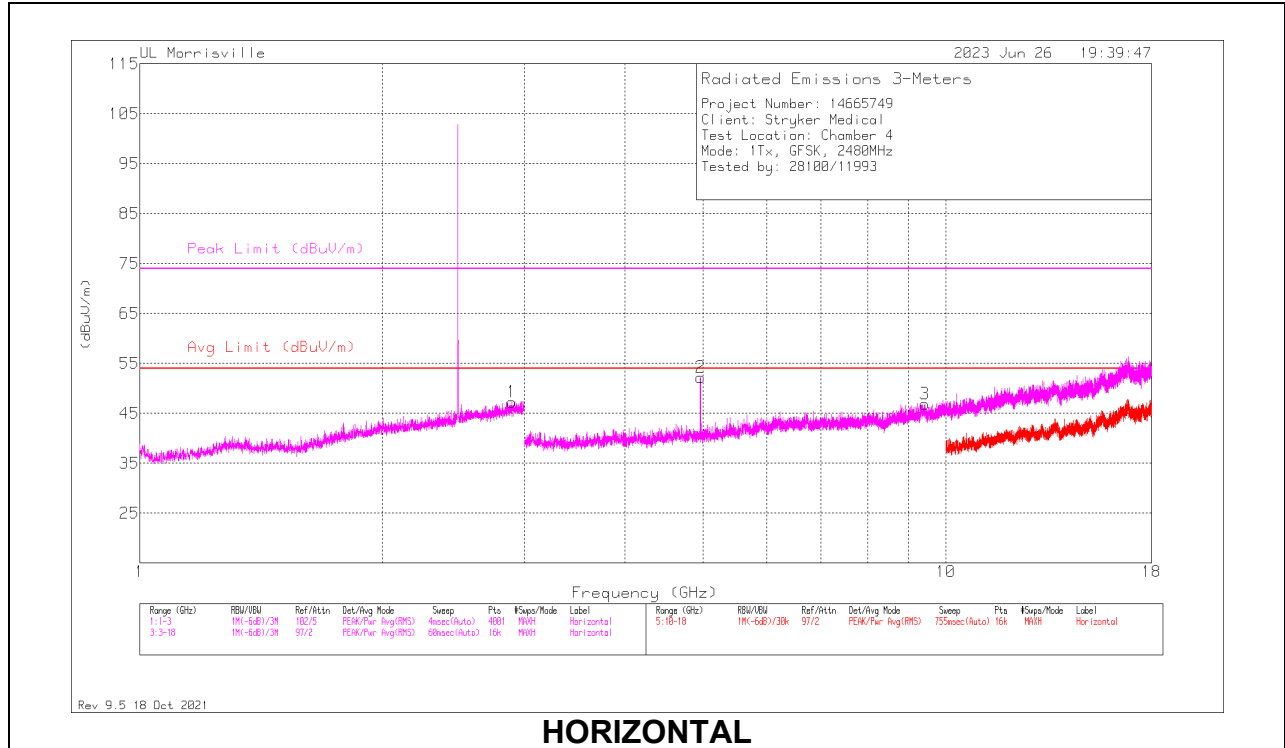
** - indicates frequency in Taiwan NCC LP0002 Restricted Band

Pk - Peak detector

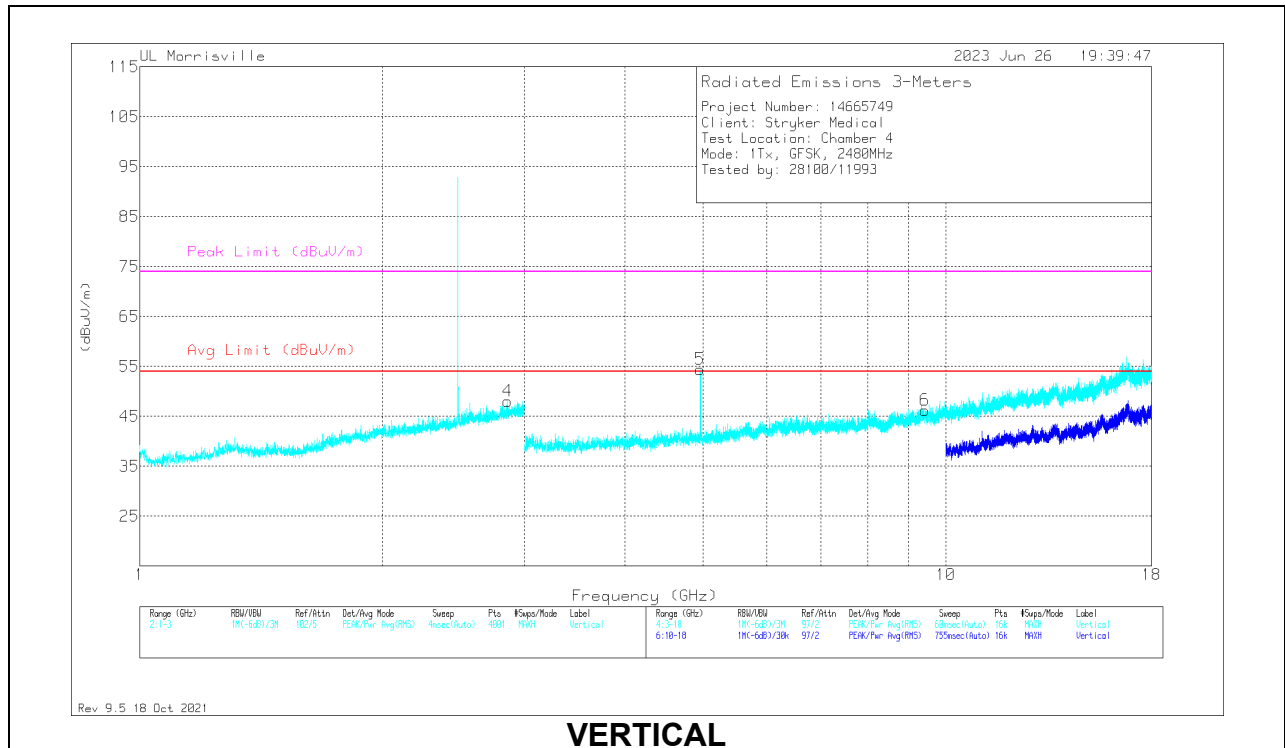
PK2 - Maximum Peak

V1TV - VB=1/Ton, Linear Voltage Average where: Ton is packet duration. VBW is set to 0.010 kHz.

HIGH CHANNEL RESULTS



HORIZONTAL



VERTICAL

RADIATED EMISSIONS

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	89509 ACF (dB/m)	Gain/Loss (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 2.8935	26.97	Pk	32.5	-12.2	47.27	54	-6.73	74	-26.73	0-360	100	H
4	* ** 2.85996	27.79	PK2	32.4	-12	48.19	-	-	74	-25.81	285	155	V
	* ** 2.85862	13	V1TV	32.4	-12.1	33.3	54	-20.7	-	-	285	155	V
2	* ** 4.9605	52.51	PK2	33.9	-31.4	55.01	-	-	74	-18.99	28	103	H
	* ** 4.96003	48.34	V1TV	33.9	-31.4	50.84	54	-3.16	-	-	28	103	H
3	* ** 9.4125	35.84	Pk	36.6	-25.6	46.84	54	-7.16	74	-27.16	0-360	100	H
5	* ** 4.96033	53.5	PK2	33.9	-31.4	56	-	-	74	-18	161	188	V
	* ** 4.96003	49.58	V1TV	33.9	-31.4	52.08	54	-1.92	-	-	161	188	V
6	* ** 9.41438	35.17	Pk	36.6	-25.5	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

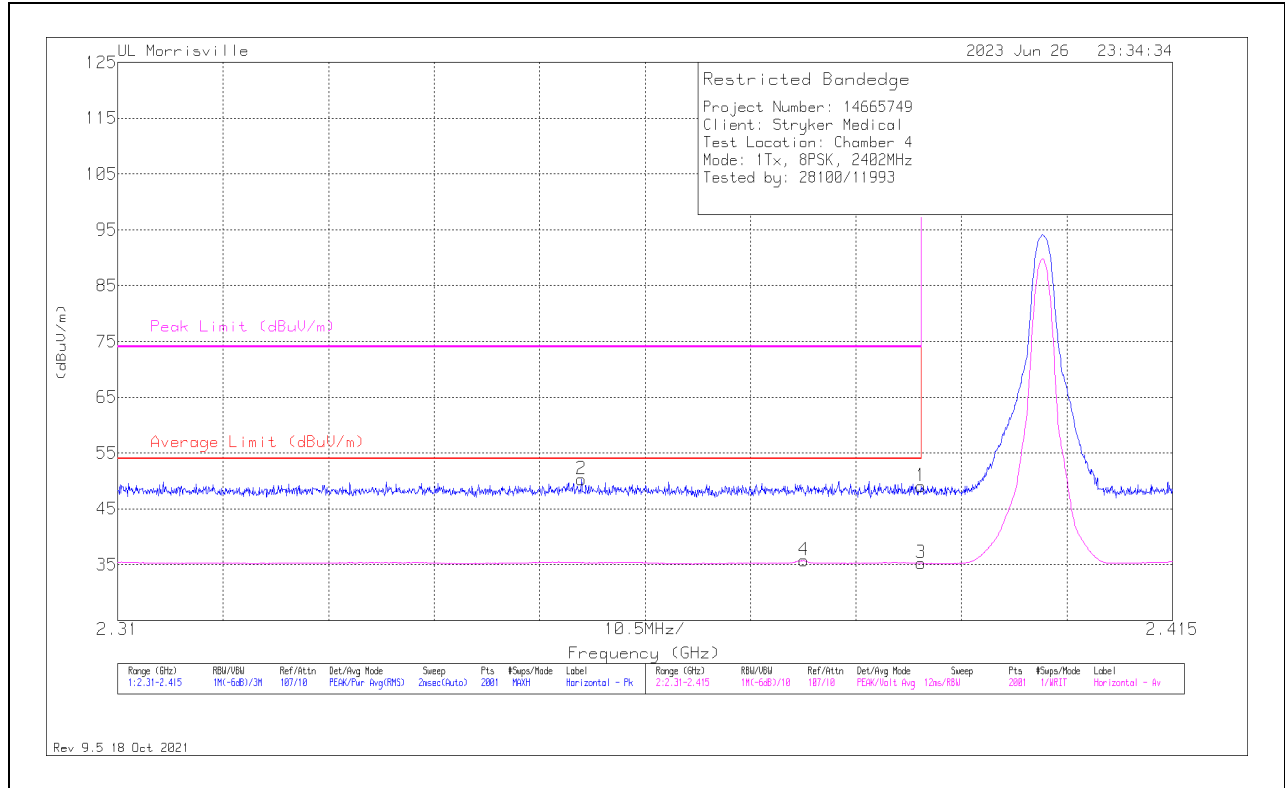
PK2 - Maximum Peak

V1TV - VB=1/Ton, Linear Voltage Average where: Ton is packet duration. VBW is set to 0.010 kHz

10.1.2. BLUETOOTH ENHANCED DATA RATE 8PSK MODULATION

BANDEDGE (LOW CHANNEL)

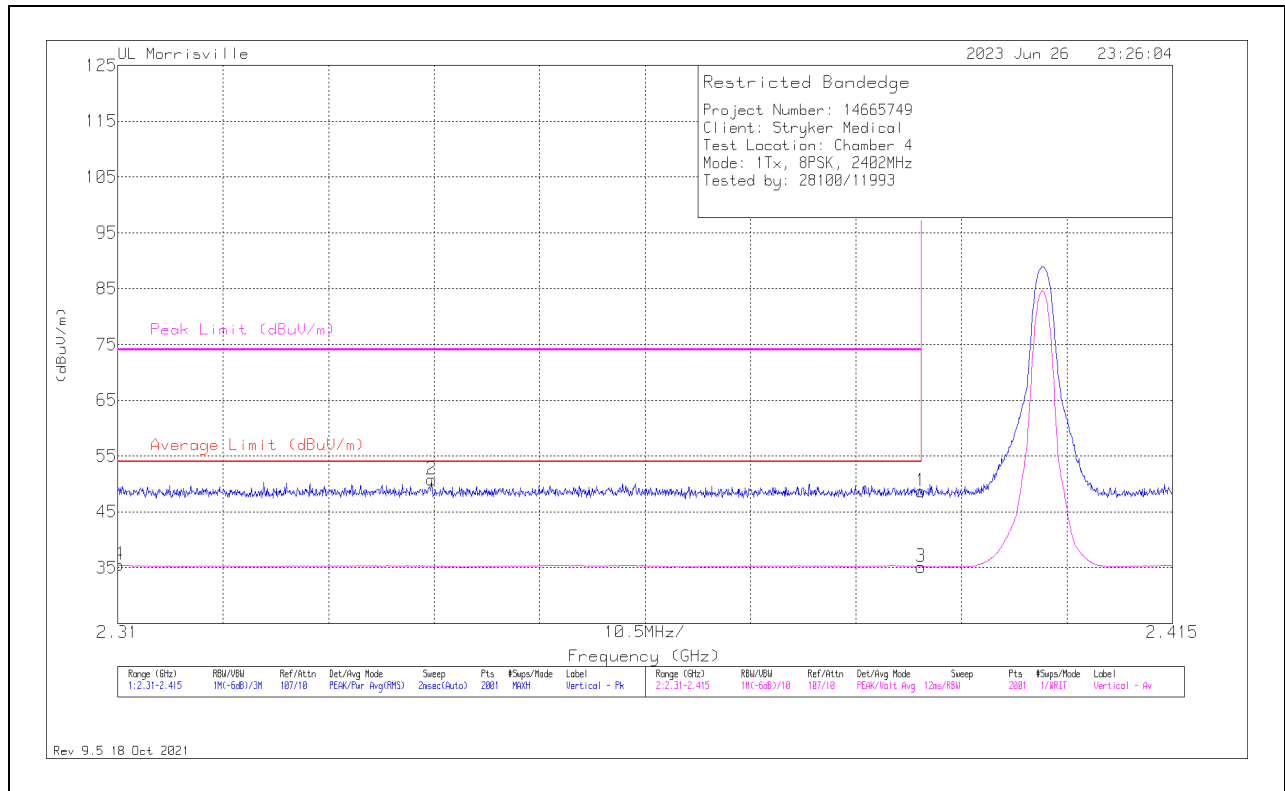
HORIZONTAL RESULT



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	89509 ACF (dB/m)	Gain/Loss (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	43.45	Pk	32	-26.4	49.05	-	-	74	-24.95	26	130	H
2	*** 2.35615	44.54	Pk	31.9	-26.1	50.34	-	-	74	-23.66	26	130	H
3	*** 2.38996	29.67	VA1T	32	-26.4	35.27	54	-18.73	-	-	26	130	H
4	*** 2.3783	30.11	VA1T	32	-26.4	35.71	54	-18.29	-	-	26	130	H

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
 ** - indicates frequency in Taiwan NCC LP0002 Restricted Band
 Pk - Peak detector
 VA1T - Linear Voltage Average VB=1/Ton where: Ton is transmit duration

VERTICAL RESULT

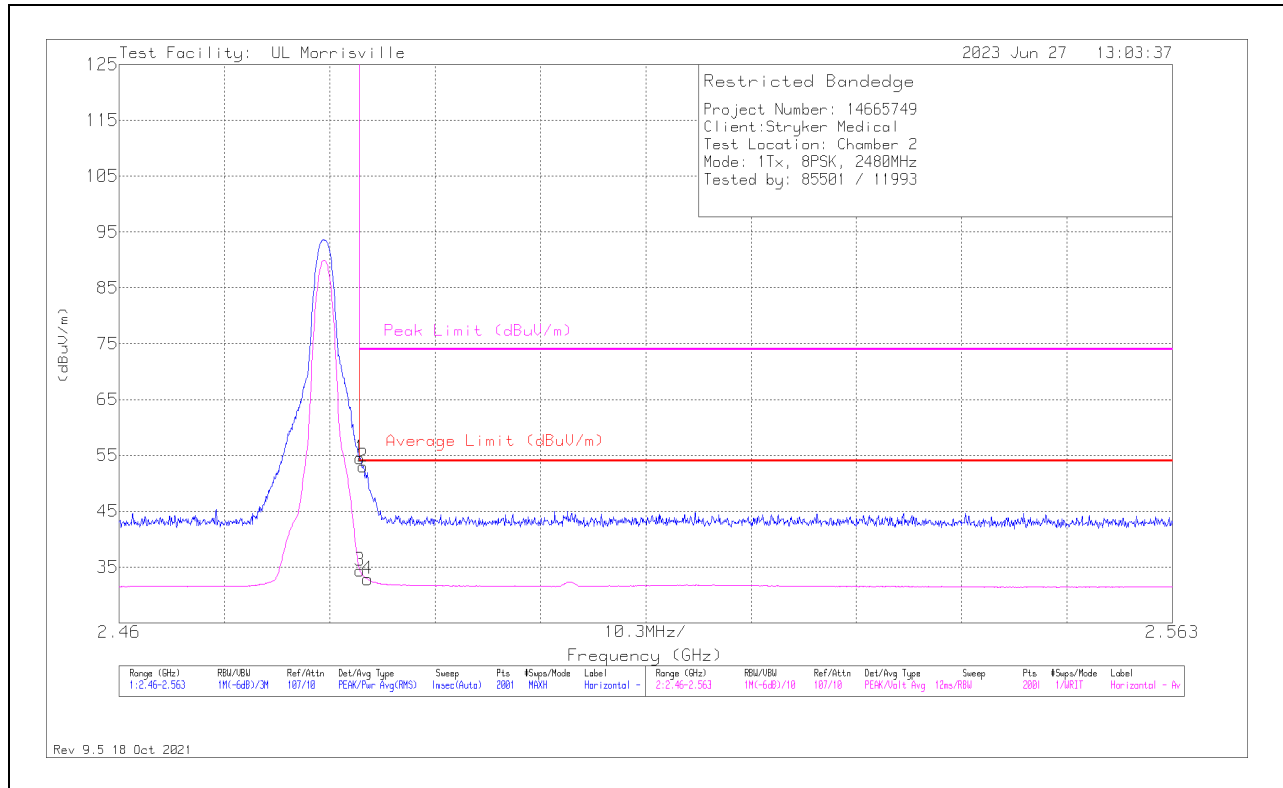


Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	89509 ACF (dB/m)	Gain/Loss (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
4	* ** 2.31011	29.66	VA1T	32	-26.2	35.46	54	-18.54	-	-	158	356	V
2	* ** 2.34124	45.09	Pk	31.9	-26.2	50.79	-	-	74	-23.21	158	356	V
1	* ** 2.38996	43.07	Pk	32	-26.4	48.67	-	-	74	-25.33	158	356	V
3	* ** 2.38996	29.59	VA1T	32	-26.4	35.19	54	-18.81	-	-	158	356	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
 ** - indicates frequency in Taiwan NCC LP0002 Restricted Band
 Pk - Peak detector
 VA1T - Linear Voltage Average VB=1/Ton where: Ton is transmit duration

BANDEDGE (HIGH CHANNEL)

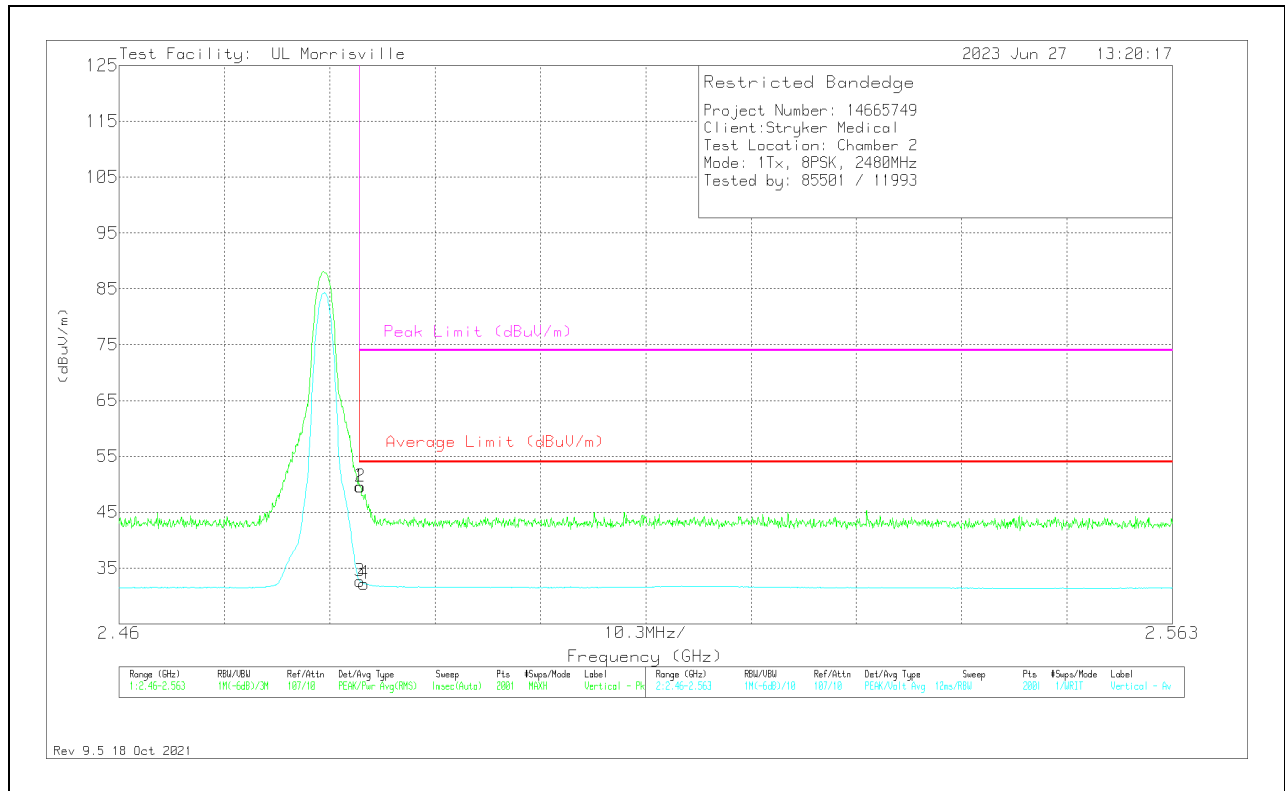
HORIZONTAL RESULT



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	88761 (dB/m)	Gain/Loss (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	46.73	Pk	32.3	-24.5	54.53	-	-	74	-19.47	47	113	H
2	* ** 2.48384	45.21	Pk	32.3	-24.5	53.01	-	-	74	-20.99	47	113	H
3	* ** 2.48354	26.57	VA1T	32.3	-24.5	34.37	54	-19.63	-	-	47	113	H
4	* ** 2.48431	25.06	VA1T	32.3	-24.5	32.86	54	-21.14	-	-	47	113	H

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
 ** - indicates frequency in Taiwan NCC LP0002 Restricted Band
 Pk - Peak detector
 VA1T - Linear Voltage Average VB=1/Ton where: Ton is transmit duration

VERTICAL RESULT

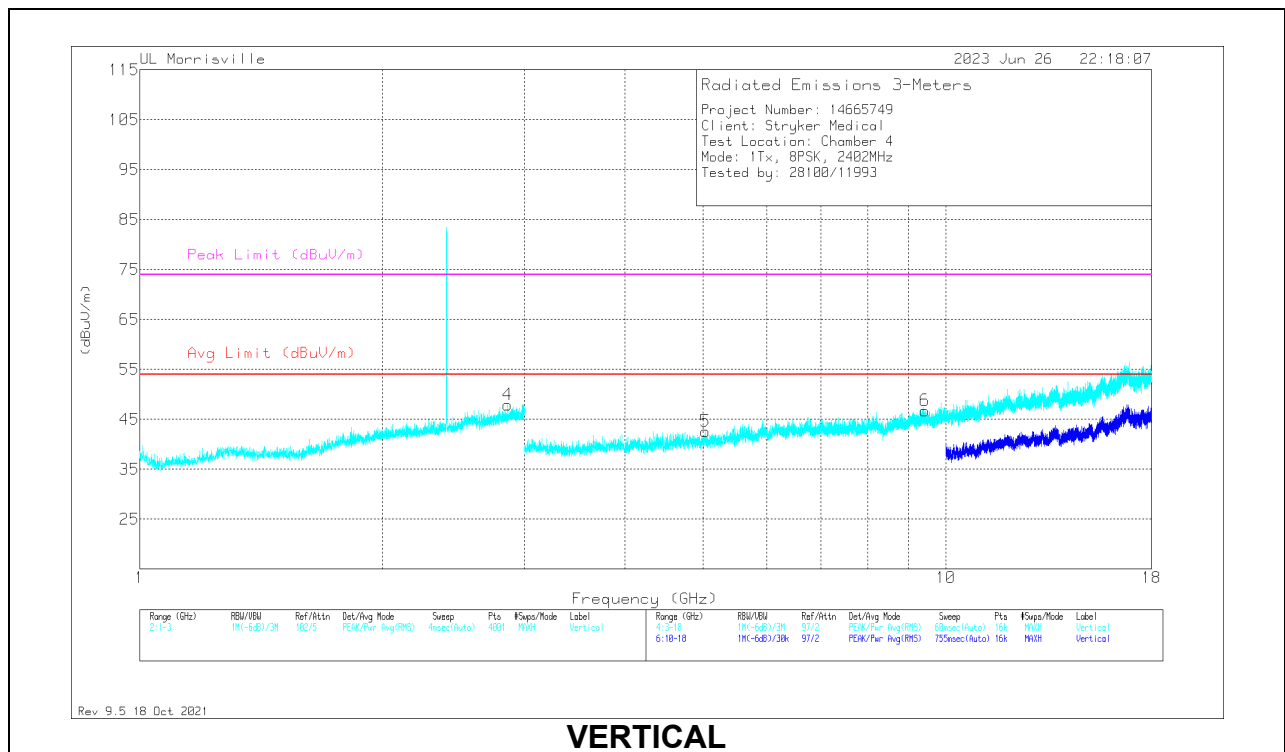
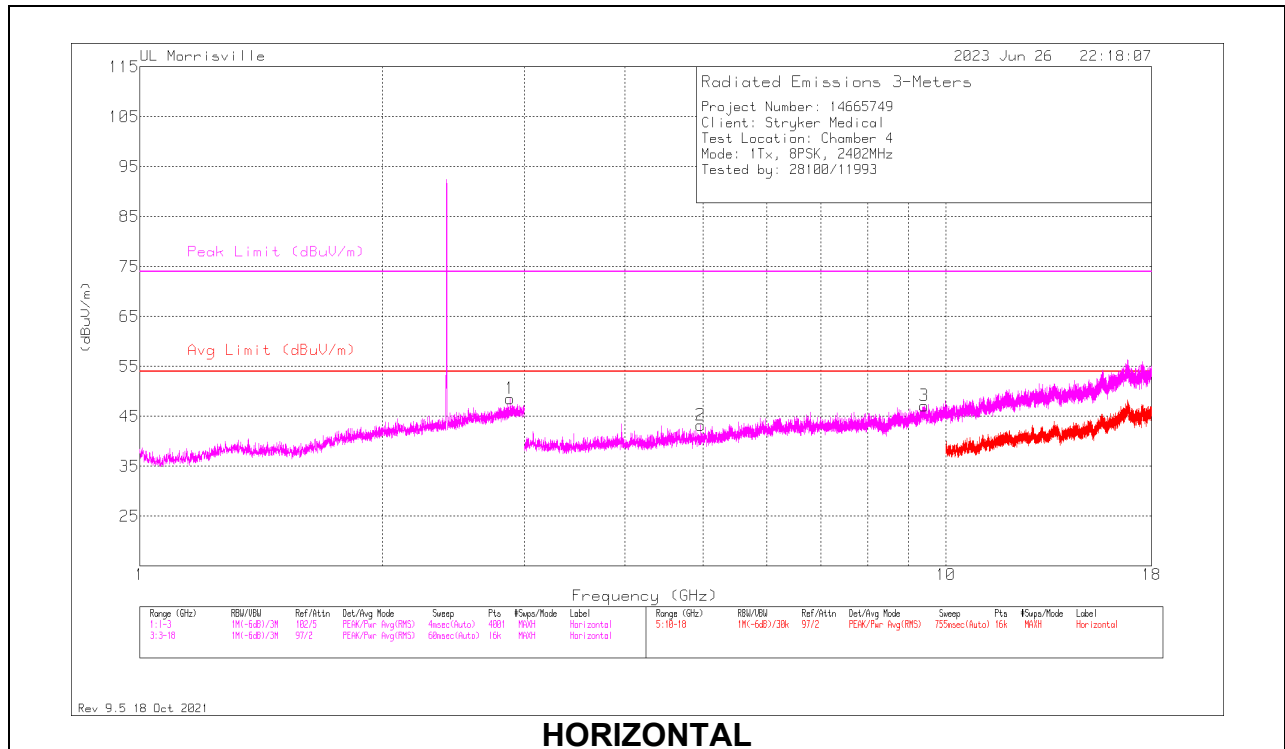


Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	88761 (dB/m)	Gain/Loss (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 2.48354	41.77	Pk	32.3	-24.5	49.57	-	-	74	-24.43	159	387	V
2	* ** 2.48359	41.77	Pk	32.3	-24.5	49.57	-	-	74	-24.43	159	387	V
3	* ** 2.48354	24.86	VA1T	32.3	-24.5	32.66	54	-21.34	-	-	159	387	V
4	* ** 2.48395	24.41	VA1T	32.3	-24.5	32.21	54	-21.79	-	-	159	387	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
 ** - indicates frequency in Taiwan NCC LP0002 Restricted Band
 Pk - Peak detector
 VA1T - Linear Voltage Average VB=1/Ton where: Ton is transmit duration

HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL RESULTS



RADIATED EMISSIONS

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	89509 ACF (dB/m)	Gain/Loss (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 2.88067	13.49	PK2	32.4	-12.1	33.79	-	-	74	-40.21	249	347	H
	* ** 2.8806	13.03	V1TV	32.4	-12.1	33.33	54	-20.67	-	-	249	347	H
4	* ** 2.8615	27.57	Pk	32.4	-12.1	47.87	54	-6.13	74	-26.13	0-360	200	V
2	* ** 4.96125	40.81	Pk	33.9	-31.5	43.21	54	-10.79	74	-30.79	0-360	100	H
3	* ** 9.40219	36.09	Pk	36.6	-25.6	47.09	54	-6.91	74	-26.91	0-360	100	H
5	* ** 5.03438	40.34	Pk	34.1	-31.9	42.54	54	-11.46	74	-31.46	0-360	200	V
6	* ** 9.41531	35.58	Pk	36.6	-25.4	46.78	54	-7.22	74	-27.22	0-360	200	V

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

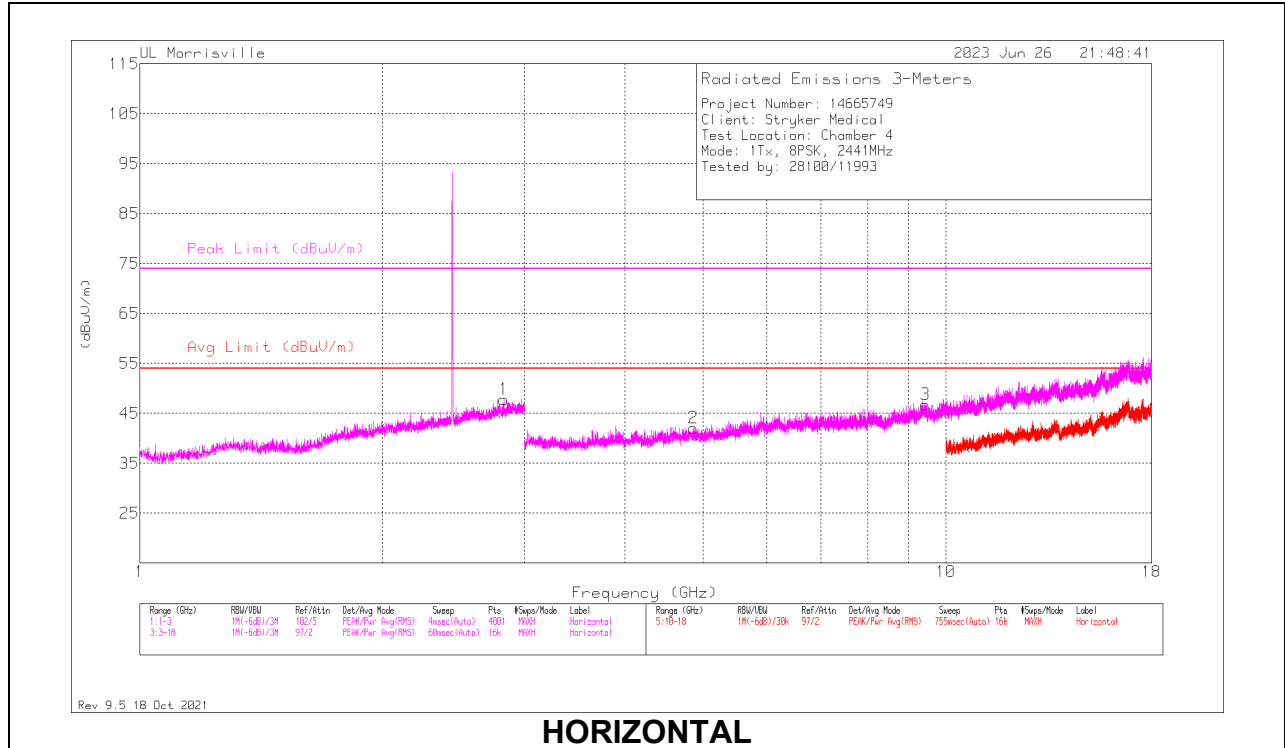
** - indicates frequency in Taiwan NCC LP0002 Restricted Band

Pk - Peak detector

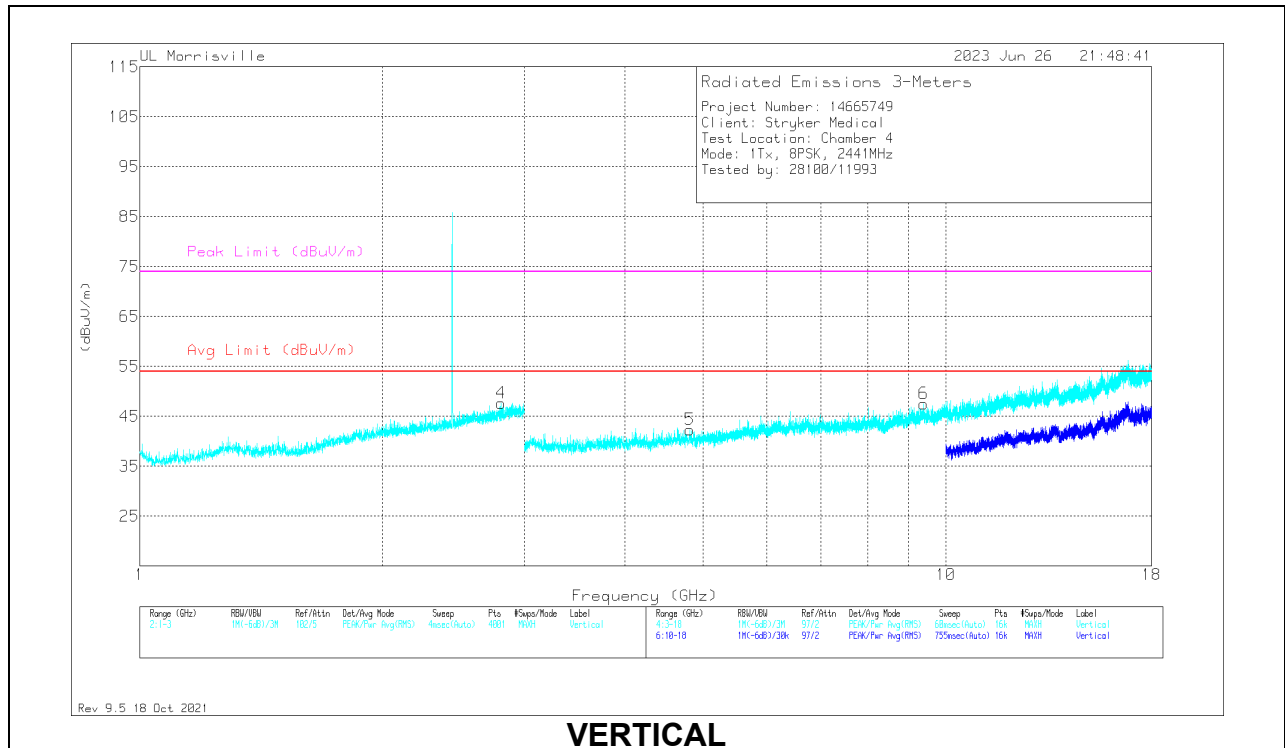
PK2 - Maximum Peak

V1TV - VB=1/Ton, Linear Voltage Average where: Ton is packet duration. VBW is set to 0.010 kHz

MID CHANNEL RESULTS



HORIZONTAL



VERTICAL

RADIATED EMISSIONS

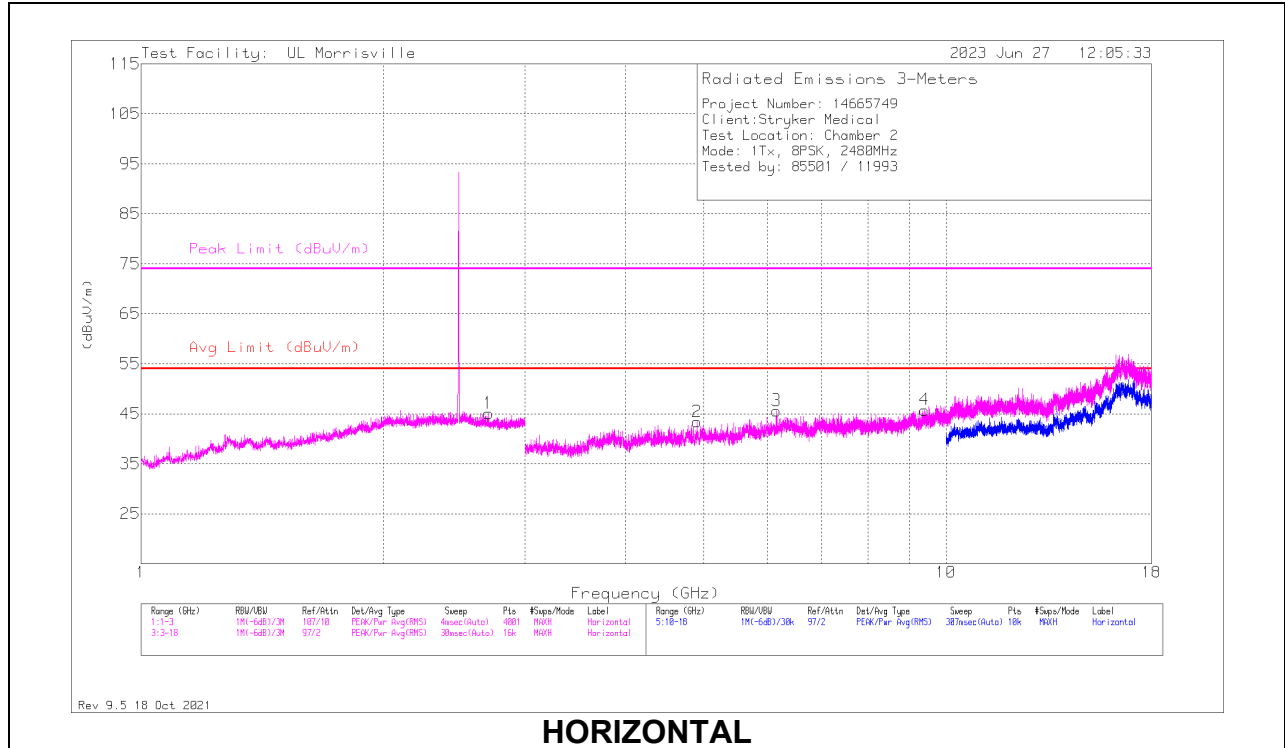
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	89509 ACF (dB/m)	Gain/Loss (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 2.8285	27.67	Pk	32.4	-12.3	47.77	54	-6.23	74	-26.23	0-360	100	H
4	* ** 2.8045	27.38	Pk	32.6	-12.3	47.68	54	-6.32	74	-26.32	0-360	200	V
2	* ** 4.86	39.69	Pk	34.1	-31.7	42.09	54	-11.91	74	-31.91	0-360	100	H
3	* ** 9.43406	35.88	Pk	36.7	-25.8	46.78	54	-7.22	74	-27.22	0-360	100	H
5	* ** 4.81219	39.82	Pk	34.1	-31.6	42.32	54	-11.68	74	-31.68	0-360	200	V
6	* ** 9.38156	35.87	Pk	36.6	-24.9	47.57	54	-6.43	74	-26.43	0-360	200	V

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

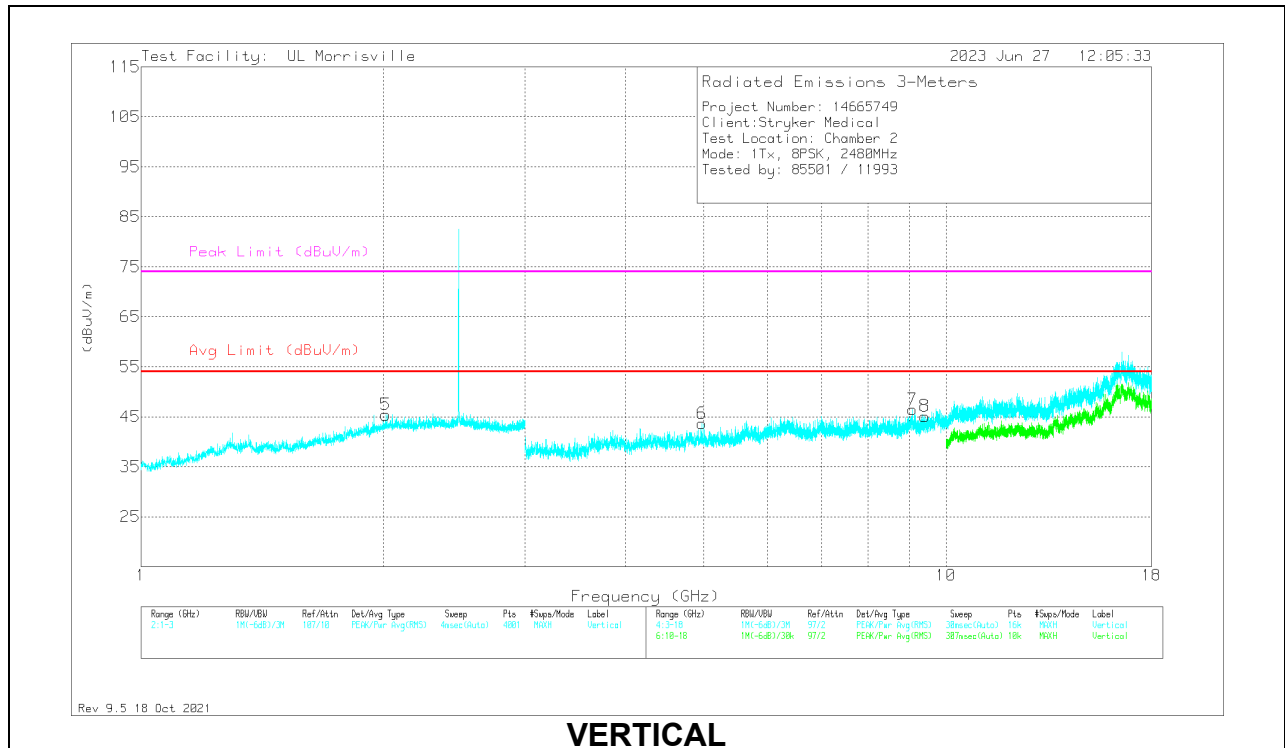
** - indicates frequency in Taiwan NCC LP0002 Restricted Band

Pk - Peak detector

HIGH CHANNEL RESULTS



HORIZONTAL



VERTICAL

RADIATED EMISSIONS

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	88761 (dB/m)	Gain/Loss (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 2.7015	38.57	Pk	32.2	-25.7	45.07	54	-8.93	74	-28.93	0-360	200	H
5	** 2.013	36.6	Pk	31.4	-22.6	45.4	54	-8.6	74	-28.6	0-360	101	V
2	* ** 4.90875	39.38	Pk	34	-30	43.38	54	-10.62	74	-30.62	0-360	101	H
4	* ** 9.405	34.36	Pk	36.6	-25.2	45.76	54	-8.24	74	-28.24	0-360	199	H
6	* ** 4.97438	40.05	Pk	33.9	-30.3	43.65	54	-10.35	74	-30.35	0-360	101	V
7	* ** 9.08063	35.43	Pk	36.2	-25.2	46.43	54	-7.57	74	-27.57	0-360	199	V
8	* ** 9.41156	33.79	Pk	36.6	-25.3	45.09	54	-8.91	74	-28.91	0-360	199	V
3	6.15469	38.87	Pk	35.5	-28.8	45.57	54	-8.43	74	-28.43	0-360	199	H

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

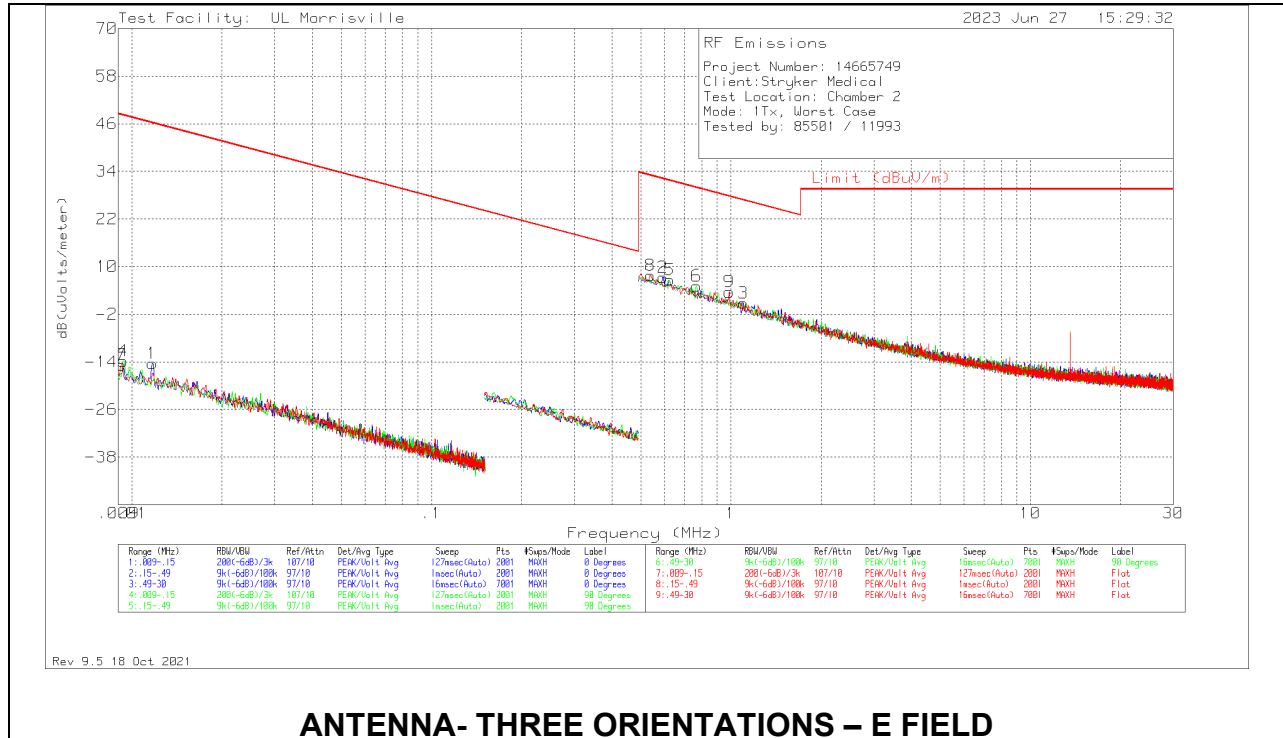
** - indicates frequency in Taiwan NCC LP0002 Restricted Band

Pk - Peak detector

10.2. WORST CASE BELOW 30MHZ

SPURIOUS EMISSIONS BELOW 30 MHz (WORST-CASE CONFIGURATION)

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

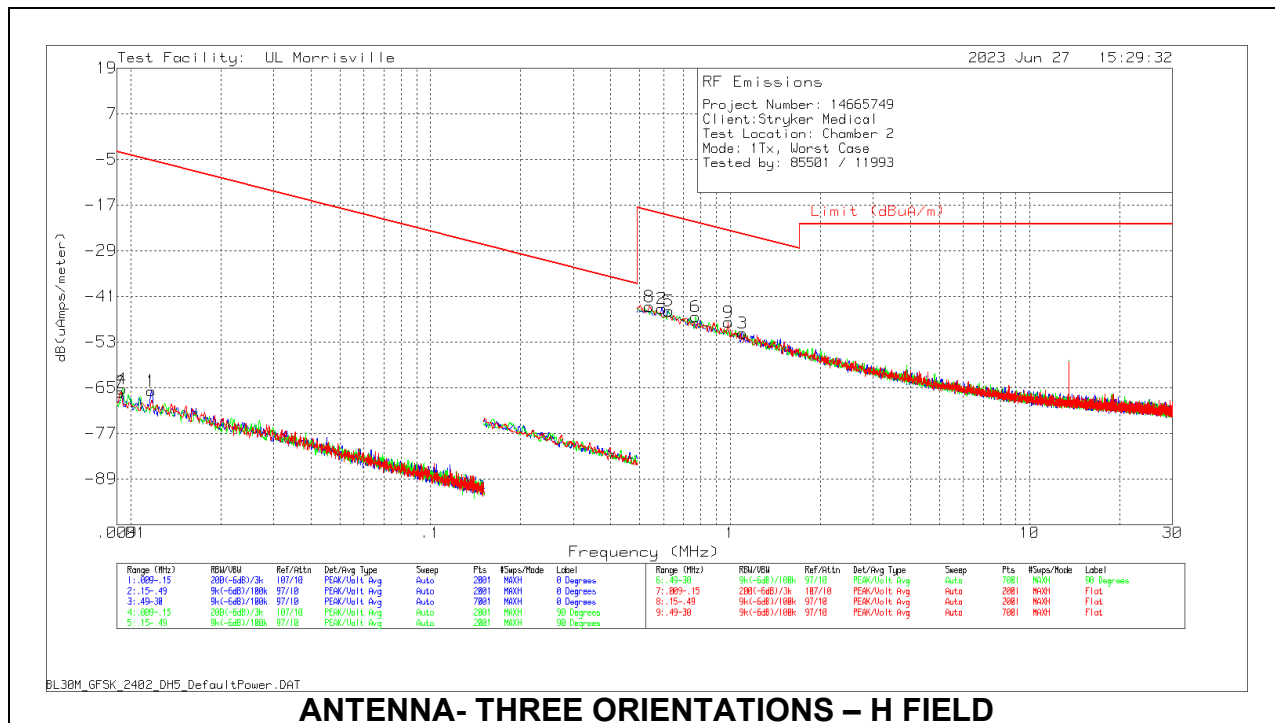


ANTENNA- THREE ORIENTATIONS – E FIELD

Below 30MHz Data E FIELD

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	135144 (dB/m)	Gain/Loss (dB)	Dist. Corr. Factor (dB)	Corrected Reading dB(uVolts/meter)	QP/AV Limit (dBuV/m)	PK Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Loop Angle
7	.00921	45.26	Pk	19.9	.1	-80	-14.74	48.32	68.32	-63.06	0-360	Flat
4	.00936	46.29	Pk	19.8	.1	-80	-13.81	48.18	68.18	-61.99	0-360	90 degs
1	.0117	46.88	Pk	18.6	.1	-80	-14.42	46.24	66.24	-60.66	0-360	0 degs
8	.53848	35.46	Pk	12.2	.1	-40	7.76	32.98	-	-25.22	0-360	Flat
2	.59329	34.98	Pk	12.2	.1	-40	7.28	32.14	-	-24.86	0-360	0 degs
5	.62491	34.33	Pk	12.2	.1	-40	6.63	31.69	-	-25.06	0-360	90 degs
6	.76826	32.81	Pk	12.2	.1	-40	5.11	29.89	-	-24.78	0-360	90 degs
9	.98749	31.22	Pk	12.2	.2	-40	3.62	27.71	-	-24.09	0-360	Flat
3	1.10132	28.38	Pk	12.2	.2	-40	.78	26.77	-	-25.99	0-360	0 degs

Pk - Peak detector



ANTENNA- THREE ORIENTATIONS – H FIELD

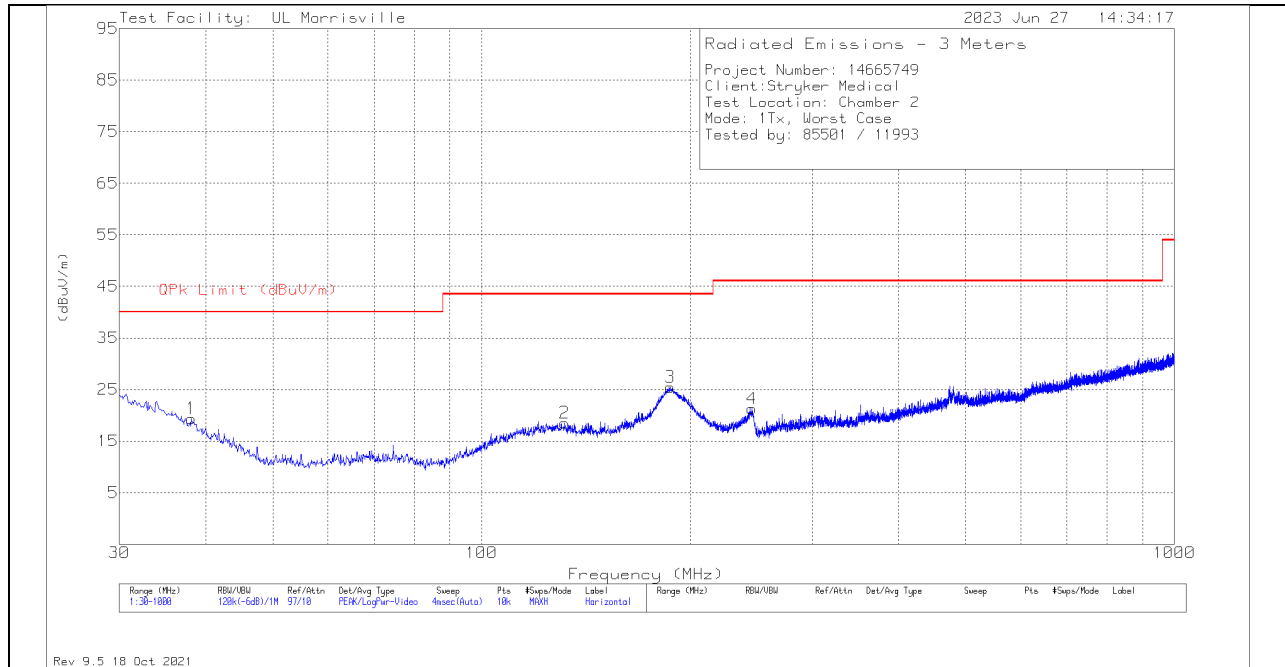
Below 30MHz Data H FIELD

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	135144 (dB/m)	Gain/Loss (dB)	Dist. Corr. Factor (dB)	Corrected Reading dB(uAmps/meter)	QP/AV Limit (dBuA/m)	PK Limit (dBuA/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Loop Angle
7	.00921	45.26	Pk	-31.6	.1	-80	-66.24	-3.18	16.82	-63.06	0-360	401	Flat
4	.00936	46.29	Pk	-31.7	.1	-80	-65.31	-3.32	16.68	-61.99	0-360	401	90 degs
1	.0117	46.88	Pk	-32.9	.1	-80	-65.92	-5.26	14.74	-60.66	0-360	102	0 degs
8	.53848	35.46	Pk	-39.3	.1	-40	-43.74	-18.52	-	-25.22	0-360	401	Flat
2	.59329	34.98	Pk	-39.3	.1	-40	-44.22	-19.36	-	-24.86	0-360	102	0 degs
5	.62491	34.33	Pk	-39.3	.1	-40	-44.87	-19.81	-	-25.06	0-360	401	90 degs
6	.76826	32.81	Pk	-39.3	.1	-40	-46.39	-21.61	-	-24.78	0-360	401	90 degs
9	.98749	31.22	Pk	-39.3	.2	-40	-47.88	-23.79	-	-24.09	0-360	401	Flat
3	1.10132	28.38	Pk	-39.3	.2	-40	-50.72	-24.73	-	-25.99	0-360	102	0 degs

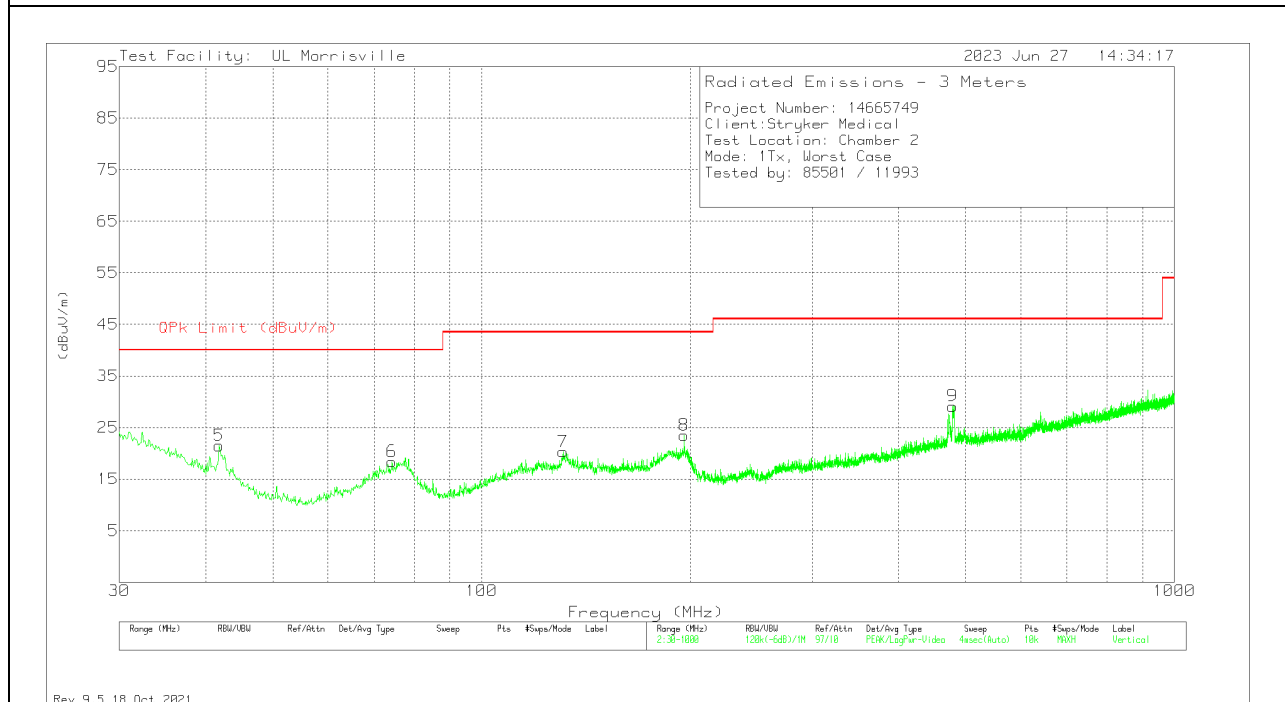
Pk - Peak detector

10.3. TRANSMITTER BELOW 1 GHZ

LOW CHANNEL RESULTS



HORIZONTAL



VERTICAL

RADIATED EMISSIONS

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	90627 (dB/m)	Gain/Loss (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	*** 38.148	29.79	Pk	21.3	-31.7	19.39	40	-20.61	0-360	299	H
2	*** 131.85	29.31	Pk	19.9	-30.7	18.51	43.52	-25.01	0-360	299	H
4	*** 245.825	33.47	Pk	17.7	-29.9	21.27	46.02	-24.75	0-360	101	H
6	*** 74.232	35.18	Pk	14.3	-31.1	18.38	40	-21.62	0-360	199	V
7	*** 131.171	31.19	Pk	19.9	-30.8	20.29	43.52	-23.23	0-360	101	V
5	41.834	34.4	Pk	18.6	-31.5	21.5	40	-18.5	0-360	101	V
3	187.14	38.07	Pk	17.6	-30.2	25.47	43.52	-18.05	0-360	101	H
8	196.064	35.1	Pk	18.8	-30.4	23.5	43.52	-20.02	0-360	199	V
9	478.722	33.84	Pk	23.8	-28.5	29.14	46.02	-16.88	0-360	199	V

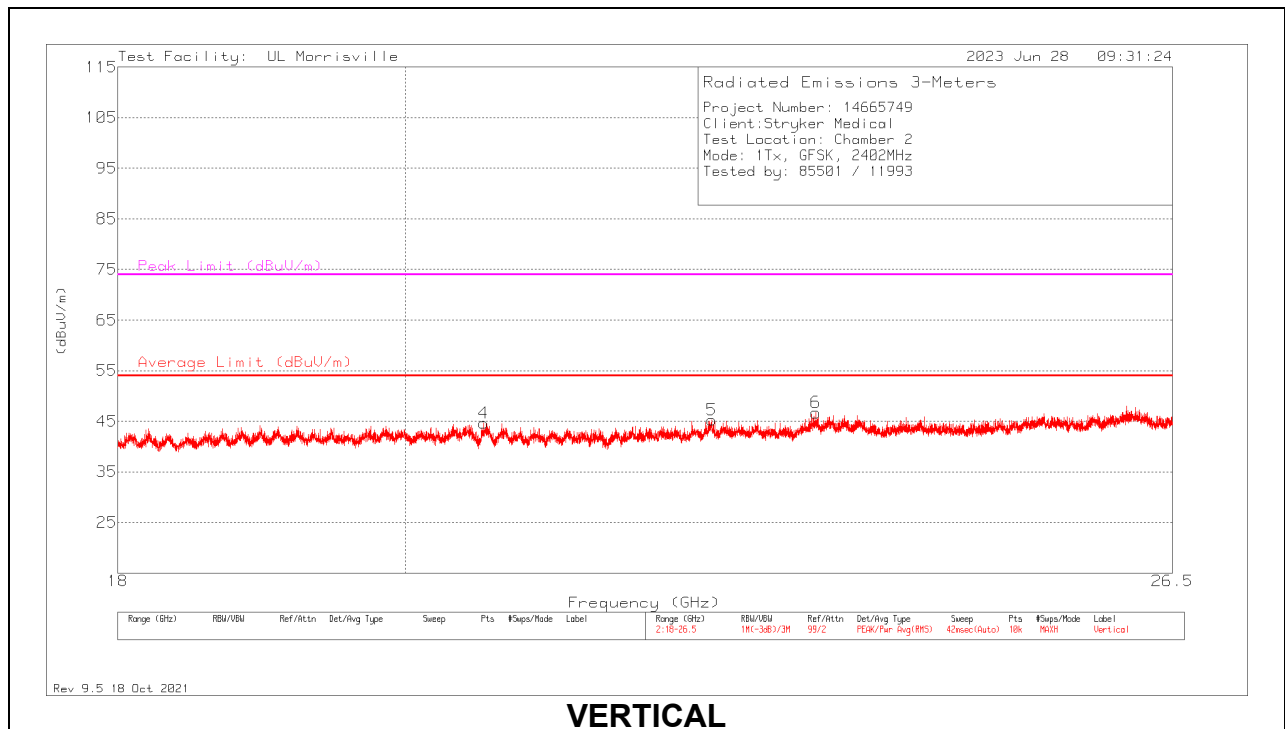
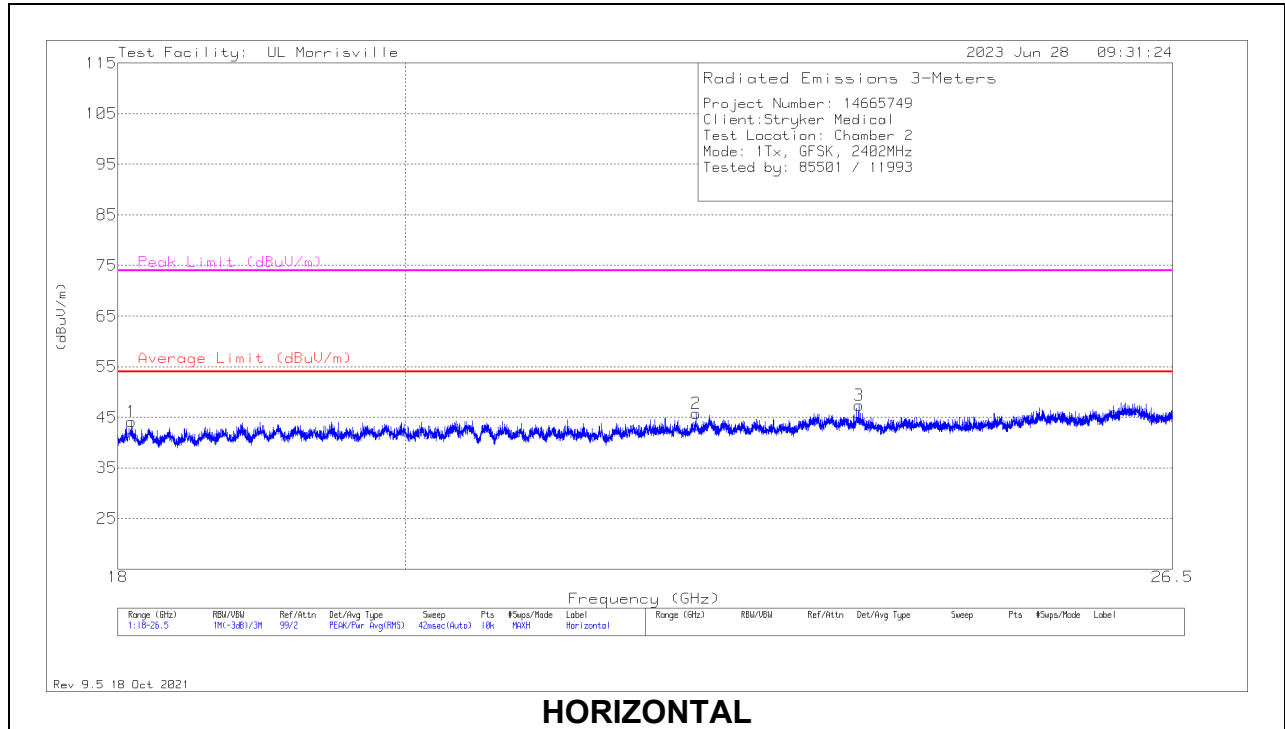
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

** - indicates frequency in Taiwan NCC LP0002 Restricted Band

Pk - Peak detector

10.1. WORST CASE 18-26 GHZ

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



18 – 26GHz Data

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	204704 (dB/m)	Gain/Loss (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 18.08924	49.3	Pk	33.4	-38.6	44.1	54	-9.9	74	-29.9	0-360	149	H
2	* ** 22.25297	49.1	Pk	34.5	-37.9	45.7	54	-8.3	74	-28.3	0-360	101	H
3	* ** 23.62049	49.32	Pk	35.2	-37.2	47.32	54	-6.68	74	-26.68	0-360	199	H
4	* ** 20.58459	48.48	Pk	34.1	-37.9	44.68	54	-9.32	74	-29.32	0-360	200	V
5	* ** 22.37961	48.52	Pk	34.5	-37.8	45.22	54	-8.78	74	-28.78	0-360	250	V
6	23.25162	49.19	Pk	34.9	-37.4	46.69	54	-7.31	74	-27.31	0-360	150	V

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

** - indicates frequency in Taiwan NCC LP0002 Restricted Band

Pk - Peak detector

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.

TEST PROCEDURE

The EUT is placed on a non-conducting table 40 cm from the vertical ground plane and 80 cm above the horizontal ground plane. The EUT is configured in accordance with ANSI C63.10.

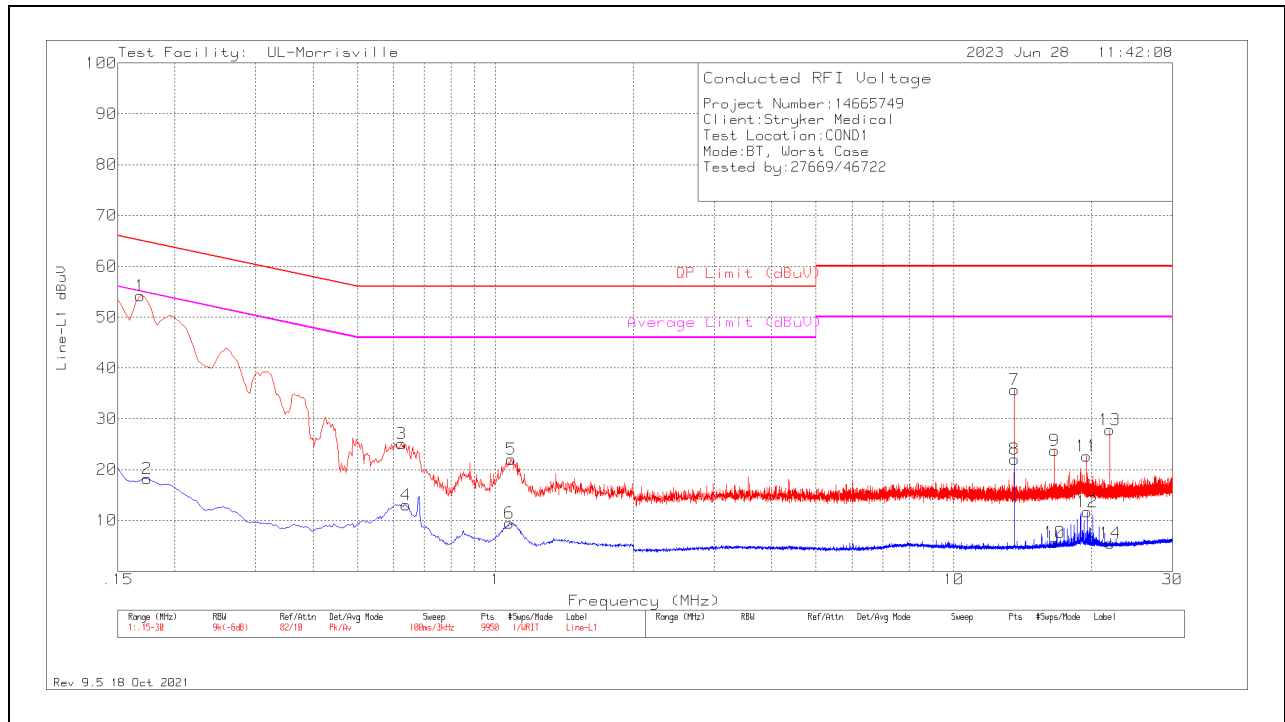
The receiver is set to a resolution bandwidth of 9 kHz. Peak detection is used unless otherwise noted as quasi-peak or average.

Line conducted data is recorded for both NEUTRAL and HOT lines.

RESULTS

11.1.1. AC Power Line Norm

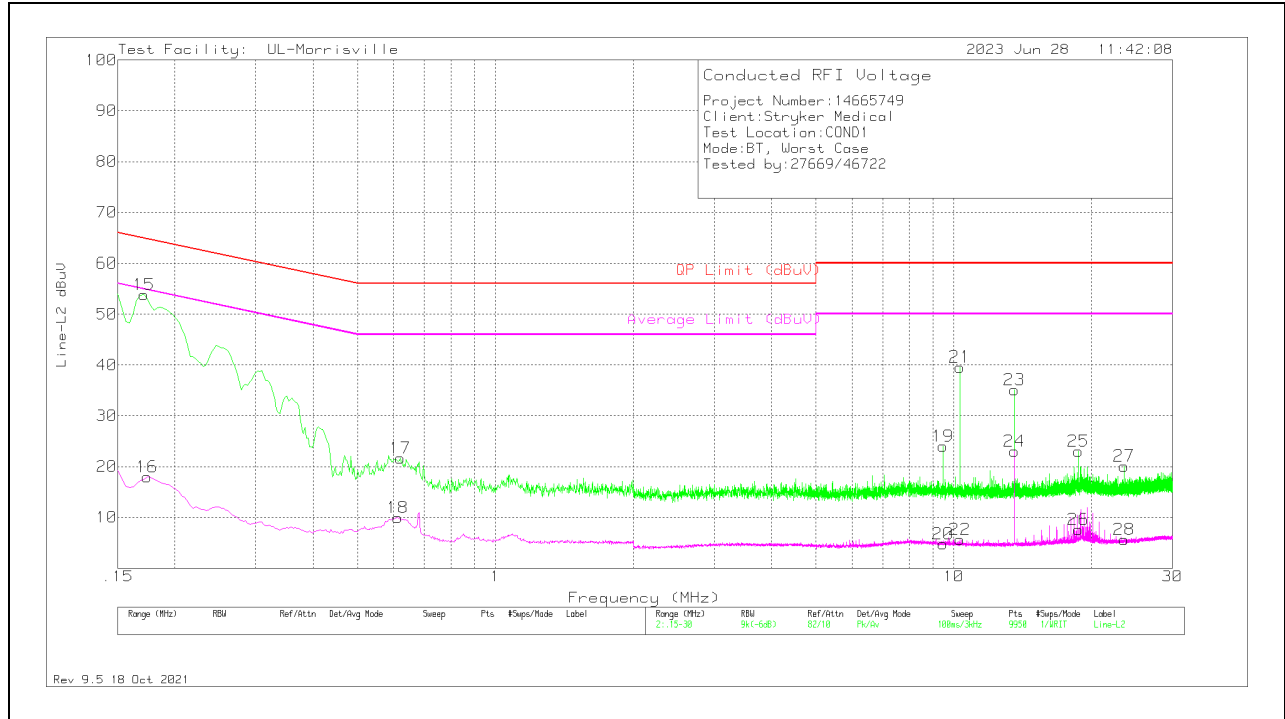
LINE 1 RESULTS



Range 1: Line-L1 .15 - 30MHz										
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	LISN VCF (dB)	Cbl/Limiter (dB)	Corrected Reading dBuV	QP Limit (dBuV)	Margin (dB)	Average Limit (dBuV)	Margin (dB)
1	.168	44.14	Pk	.2	9.8	54.14	65.06	-10.92	-	-
2	.174	8.22	Av	.2	9.8	18.22	-	-	54.77	-36.55
3	.624	15.31	Pk	0	9.8	25.11	56	-30.89	-	-
4	.639	3.29	Av	0	9.8	13.09	-	-	46	-32.91
6	1.074	-32	Av	0	9.8	9.48	-	-	46	-36.52
5	1.083	12.28	Pk	0	9.8	22.08	56	-33.92	-	-
7	13.56	25.61	Pk	.1	10	35.71	60	-24.29	-	-
8	13.56	11.89	Av	.1	10	21.99	-	-	50	-28.01
10	16.578	-4.53	Av	.1	10.1	5.67	-	-	50	-44.33
9	16.599	13.52	Pk	.1	10.1	23.72	60	-36.28	-	-
11	19.494	12.32	Pk	.2	10.1	22.62	60	-37.38	-	-
12	19.524	1.36	Av	.2	10.1	11.66	-	-	50	-38.34
13	21.924	17.45	Pk	.2	10.2	27.85	60	-32.15	-	-
14	21.948	-4.84	Av	.2	10.2	5.56	-	-	50	-44.44

Pk - Peak detector
 Av - Average detection

LINE 2 RESULTS



Range 2: Line-L2 .15 - 30MHz										
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	LISN VCF (dB)	Cbl/Limiter (dB)	Corrected Reading dBuV	QP Limit (dBuV)	Margin (dB)	Average Limit (dBuV)	Margin (dB)
15	.171	43.83	Pk	.2	9.8	53.83	64.91	-11.08	-	-
16	.174	7.92	Av	.2	9.8	17.92	-	-	54.77	-36.85
18	.612	.16	Av	0	9.8	9.96	-	-	46	-36.04
17	.621	11.88	Pk	0	9.8	21.68	56	-34.32	-	-
20	9.468	-5.27	Av	.1	10	4.83	-	-	50	-45.17
19	9.483	13.89	Pk	.1	10	23.99	60	-36.01	-	-
21	10.32	29.49	Pk	.1	10	39.59	60	-20.41	-	-
22	10.32	-4.5	Av	.1	10	5.6	-	-	50	-44.4
24	13.56	12.97	Av	.1	10	23.07	-	-	50	-26.93
23	13.563	25.03	Pk	.1	10	35.13	60	-24.87	-	-
26	18.705	-2.6	Av	.1	10.1	7.6	-	-	50	-42.4
25	18.72	12.8	Pk	.1	10.1	23	60	-37	-	-
27	23.535	9.72	Pk	.2	10.2	20.12	60	-39.88	-	-
28	23.535	-4.7	Av	.2	10.2	5.7	-	-	50	-44.3

Pk - Peak detector
 Av - Average detection

12. SETUP PHOTOS

Please refer to R14665749-EP1 for setup photos

END OF TEST REPORT