

TEST REPORT

Report Number: R15626956-E3

Applicant : Garmin International Inc.
1200 East 151st Street
Olathe, KS 66062-3426, USA

Model : A04809

FCC ID : IPH-04809

IC : 1792A-04809

EUT Description : Extremity Worn Digital Transceiver

Test Standard(s) : FCC 47 CFR PART 15 SUBPART C
ISED RSS-247 ISSUE 3
ISED RSS-GEN ISSUE 5 + A1 + A2

Date Of Issue:

2025-08-13

Prepared by:

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REPORT REVISION HISTORY

<u>Rev.</u>	<u>Issue Date</u>	<u>Revisions</u>	<u>Revised By</u>
V1	2025-08-13	Initial Issue	Chandler Stanley

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: Garmin International Inc.
1200 East 151st Street
Olathe, KS 66062-3426, USA

EUT DESCRIPTION: Extremity Worn Digital Transceiver

MODEL: A04809

SERIAL NUMBER: 510595432 / 8U9000023

SAMPLE RECEIPT DATE: 2025-05-07

DATE TESTED: 2025-05-12 To 2025-06-02

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
CFR 47 Part 15 Subpart C	Complies
ISED RSS-247 Issue 3	Complies
ISED RSS-GEN Issue 5 + A1 + 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.

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:



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UL LLC

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Chandler Stanley
Engineer
Consumer, Medical and IT Segment
UL LLC

2. TEST RESULTS SUMMARY

This report contains data provided by the customer which can impact the validity of results. UL LLC is only responsible for correctly integrating customer-provided data with measurements performed by UL LLC.

Below is a list of the data provided by the customer:

- 1) Antenna gain and type (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		ANSI C63.10 Sections 6.9.2 and 6.9.3
15.247 (a)(1)	RSS-247 (5.1) (b)	Hopping Frequency Separation	Compliant	None.
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	Reporting purposes only	Per ANSI C63.10, Section 11.9.2.3.2.
15.247 (d)	RSS-247 (5.5)	Conducted Spurious Emissions	Compliant	None.
15.209, 15.205	RSS-GEN 8.9, 8.10	Radiated Emissions		
15.207	RSS-Gen 8.8	AC Mains Conducted Emissions		

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 C63.10-2020+Cor. 1-2023+C63.10a-2024, KDB 558074 D01 15.247 Meas Guidance v05r02, KDB 414788 D01 Radiated Test Site v01r01, RSS-GEN Issue 5 + A1 + A2, and RSS-247 Issue 3.

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 type="checkbox"/>	Building: 12 Laboratory Dr Durham, NC 27713, USA	US0067	2180C	825374
<input checked="" type="checkbox"/>	Building: 2800 Perimeter Park Dr. Suite B Morrisville, NC 27560, U.S.A		27265	

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:

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

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

MAINS CONDUCTED EMISSIONS

Where relevant, the following sample calculation is provided:

$$\text{Final Voltage (dBuV)} = \text{Measured Voltage (dBuV)} + \text{Cable Loss (dB)} + \text{Limiter Factor (dB)} + \text{LISN Insertion Loss}$$

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

6. EQUIPMENT UNDER TEST

6.1. EUT DESCRIPTION

The EUT is an extremity worn digital transceiver with BT, BLE, ANT/ANT+, 802.11b/g/n 2.4GHz WLAN, NFC, WWAN (NTN, LTE Cat M1), and Global Navigation Satellite System (GNSS) receiver. This report covers full testing on the BT radio.

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	Basic GFSK	11.00	12.59
2402 - 2480	Enhanced DQPSK	13.18	20.80
2402 - 2480	Enhanced 8PSK	14.09	25.64

6.3. DESCRIPTION OF AVAILABLE ANTENNAS

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

The radio utilizes a slot antenna, with a maximum gain of -1.04 dBi.

6.4. SOFTWARE AND FIRMWARE

SW Ver 16.17
HW Rev V5

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 and mode with the highest average 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 EUT was investigated in three orthogonal orientations: X, Y, and Z. The worst-case orientation was determined to be the Y-orientation; therefore, all testing was performed with the EUT in the Y-orientation.

6.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID
AC Adaptor	Garmin/Phihong	AQ27A-59CFA	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	Proprietary	1	4 pin Proprietary	Non-Shielded	<3m	Used for charging only

TEST SETUP

EUT was configured using its own built-in push buttons prior to testing. For final emissions testing, the EUT was connected to AC mains.

SETUP DIAGRAMS

Please refer to R15626956-EP1 for setup diagrams

7. MEASUREMENT METHODS

On Time and Duty Cycle: ANSI C63.10-2020 Section 11.6

Occupied BW (20dB): ANSI C63.10-2020 Section 6.9.2

Occupied BW (99%): ANSI C63.10-2020 Section 6.9.3

Carrier Frequency Separation: ANSI C63.10-2020 Section 7.8.2

Number of Hopping Frequencies: ANSI C63.10-2020 Section 7.8.3

Time of Occupancy (Dwell Time): ANSI C63.10-2020 Section 7.8.4

Output Power: ANSI C63.10-2020 Section 7.8.5

Conducted Spurious Emissions: ANSI C63.10-2020 Section 7.8.7

Conducted Band-Edge: ANSI C63.10-2020 Section 7.8.7.2 and 6.10.4

Radiated Band-edge: ANSI C63.10-2020 Section 6.10.5

Radiated Spurious Emissions: ANSI C63.10-2020 Sections 6.3 to 6.6 and 7.8.8

AC Power Line Conducted Emissions: ANSI C63.10-2020, Section 6.2.

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					
90416	Spectrum Analyzer	Keysight Technologies	N9030A	2024-09-23	2025-09-23
179892	Environmental Meter	Fisher Scientific	15-077-963	2024-08-12	2025-08-12
Pad II	SMA Coaxial 10dB Attenuator 25MHz-18GHz	CentricRF	C18S2-10	2025-05-25	2026-05-25
Pad IV	SMA Coaxial 10dB Attenuator 25MHz-18GHz	CentricRF	C18S2-10	2025-06-06	2025-06-06
SOFTEMI	Antenna Port Software	UL	Version 2022.8.16	NA	NA
211057	Real-Time Peak Power Sensor 50MHz to 8GHz	Boonton	RTP5000	2024-08-01	2025-08-01
Power Software	Boonton Power Analyzer	Boonton	Version 3.0.13.0	NA	NA

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	2025-04-17	2026-04-17
179892	Environmental Meter	Fisher Scientific	15-077-963	2024-08-12	2025-08-12
80391	LISN, 50-ohm/50-uH, 250uH 2- conductor, 25A	Fischer Custom Com.	FCC-LISN-50/250-25-2- 01	2024-08-01	2025-08-01
75141	EMI Test Receiver 9kHz-7GHz	Rohde & Schwarz	ESCI 7	2024-08-01	2025-08-01
52859	Transient Limiter, 0.009- 100MHz	Electro-Metrics	EM-7600	2025-04-17	2026-04-17
236852	AC Power Source	California instruments	NA	NA	NA
SOFTEMI	EMI Software	UL	Version 9.5 (18 Oct 2021)		

Test Equipment Used - Radiated Disturbance Emissions Test Equipment (Morrisville – Chamber 1)

Equip. ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
0.009-30MHz					
135144	Active Loop Antenna	ETS-Lindgren	6502	2024-10-02	2025-10-02
30-1000 MHz					
90629	Hybrid Broadband Antenna	Sunol Sciences Corp.	JB3	2024-01-30	2026-01-30
1-18 GHz					
135143	Double-Ridged Waveguide Horn Antenna, 1 to 18 GHz	ETS Lindgren	3117	2024-02-07	2026-02-07
18-26.5 GHz					
204704	Horn Antenna, 18-26.5GHz	Com-Power	AH-826	2023-07-20	2025-07-20
Gain-Loss Chains					
91974	Gain-loss string: 0.009-30MHz	Various	Various	2024-05-08	2025-05-31
91976	Gain-loss string: 25-1000MHz	Various	Various	2024-05-08	2025-05-31
91979	Gain-loss string: 1-18GHz	Various	Various	2024-05-08	2025-05-31
135999	Gain-loss string: 18-40GHz	Various	Various	2024-05-08	2025-05-31
Receiver & Software					
206496	Spectrum Analyzer	Rohde & Schwarz	ESW44	2024-08-29	2025-08-29
81018	Spectrum Analyzer	Agilent	E4446A	2024-07-31	2025-07-31
SOFTEMI	EMI Software	UL	Version 9.5 (18 Oct 2021)		
Additional Equipment used					
241205	Environmental Meter	Fisher Scientific	15-077-963	2023-09-05	2025-09-05

Note* - All measurement equipment was in calibration at the time of testing.

9. ANTENNA PORT TEST RESULTS

9.1. 20 dB AND 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

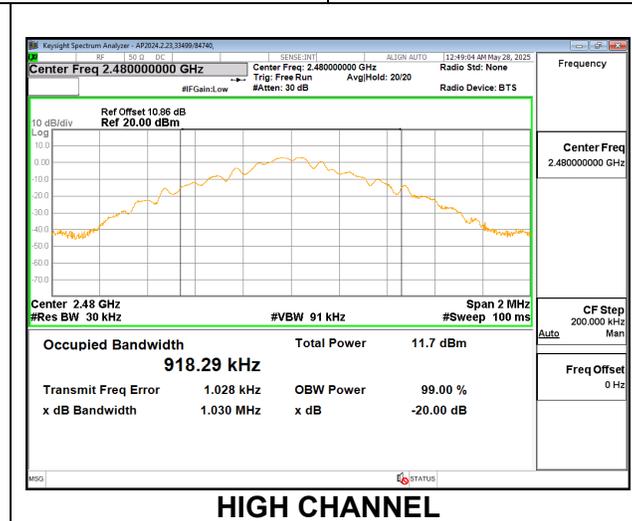
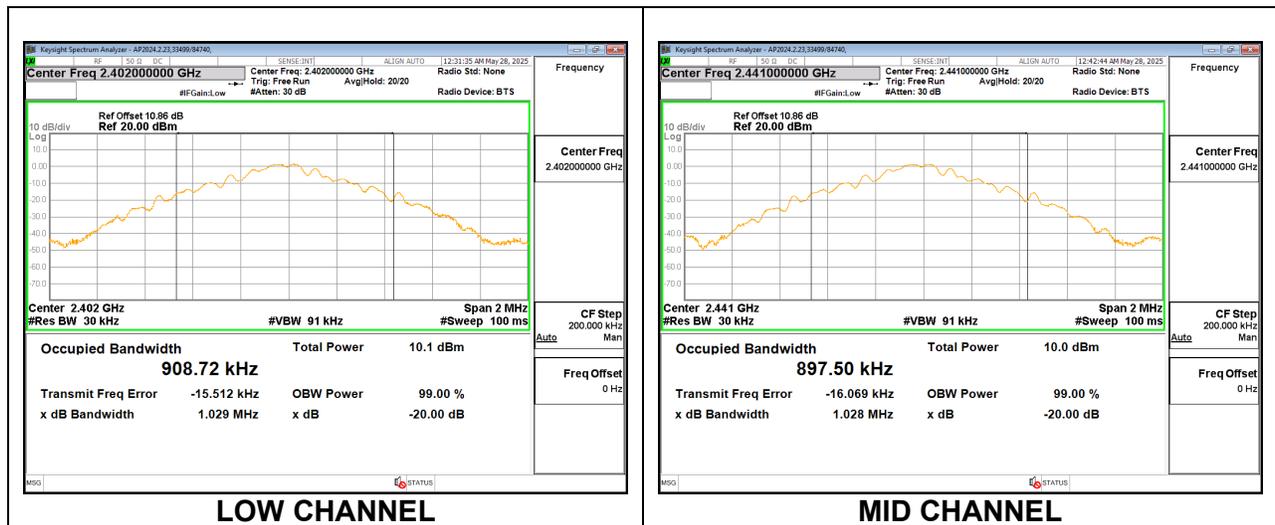
TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The RBW is set to $\geq 1\%$ of the 20 dB bandwidth. The VBW is set to \geq RBW. The sweep time is coupled.

RESULTS

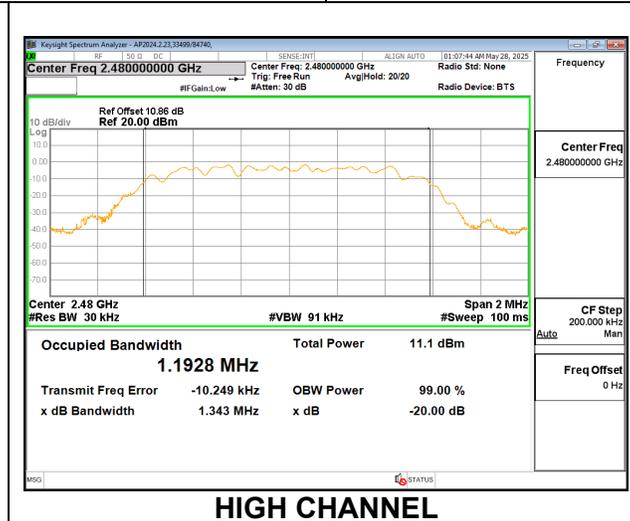
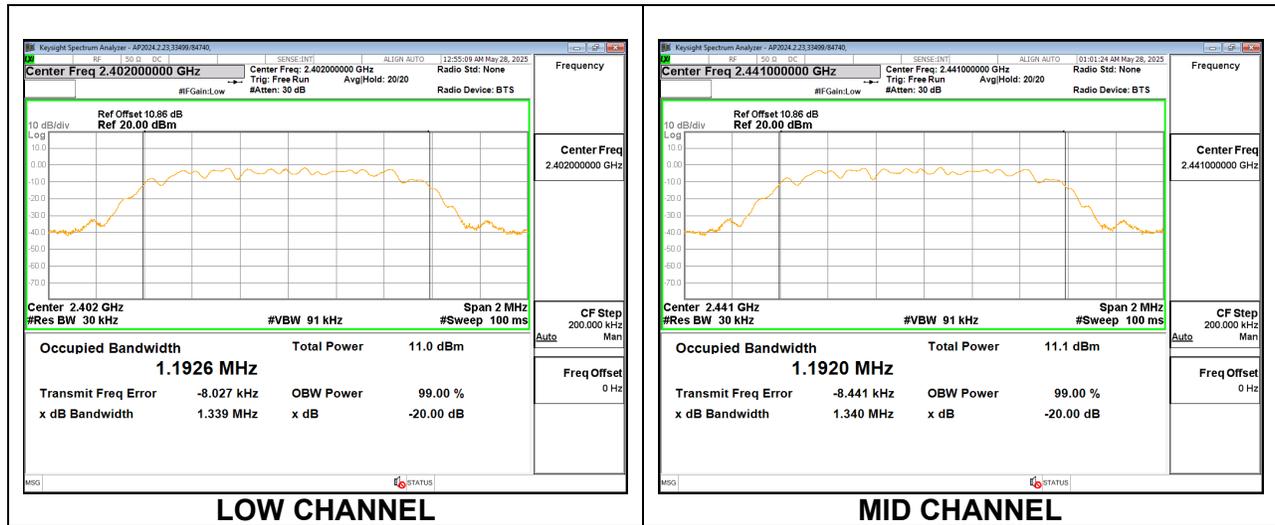
9.1.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION

Channel	Frequency (MHz)	20dB Bandwidth (MHz)	99% Bandwidth (kHz)
Low	2402	1.029	908.72
Mid	2441	1.028	897.50
High	2480	1.030	918.29



9.1.2. BLUETOOTH ENHANCED DATA RATE QPSK MODULATION

Channel	Frequency (MHz)	20dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	2402	1.339	1.1926
Mid	2441	1.340	1.1920
High	2480	1.375	1.2098



9.1.3. BLUETOOTH ENHANCED DATA RATE 8PSK MODULATION

Channel	Frequency (MHz)	20dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	2402	1.352	1.2299
Mid	2441	1.348	1.2272
High	2480	1.350	1.2298



9.2. HOPPING FREQUENCY SEPARATION

LIMITS

FCC §15.247 (a) (1)
 RSS-247 (5.1) (b)

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The RBW is set to 300 kHz and the VBW is set to VBW >= RBW. The sweep time is coupled.

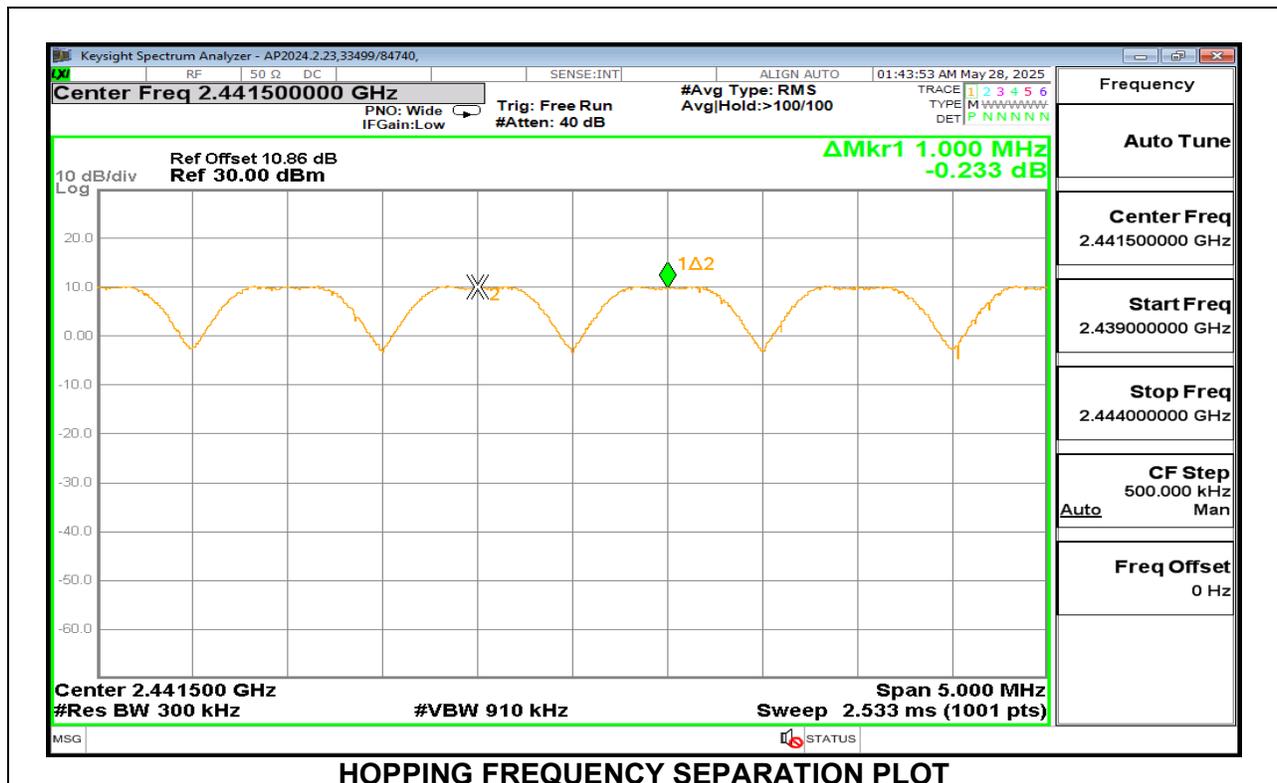
RESULTS

The largest 20 dB BW among all modes was 1.375 MHz.

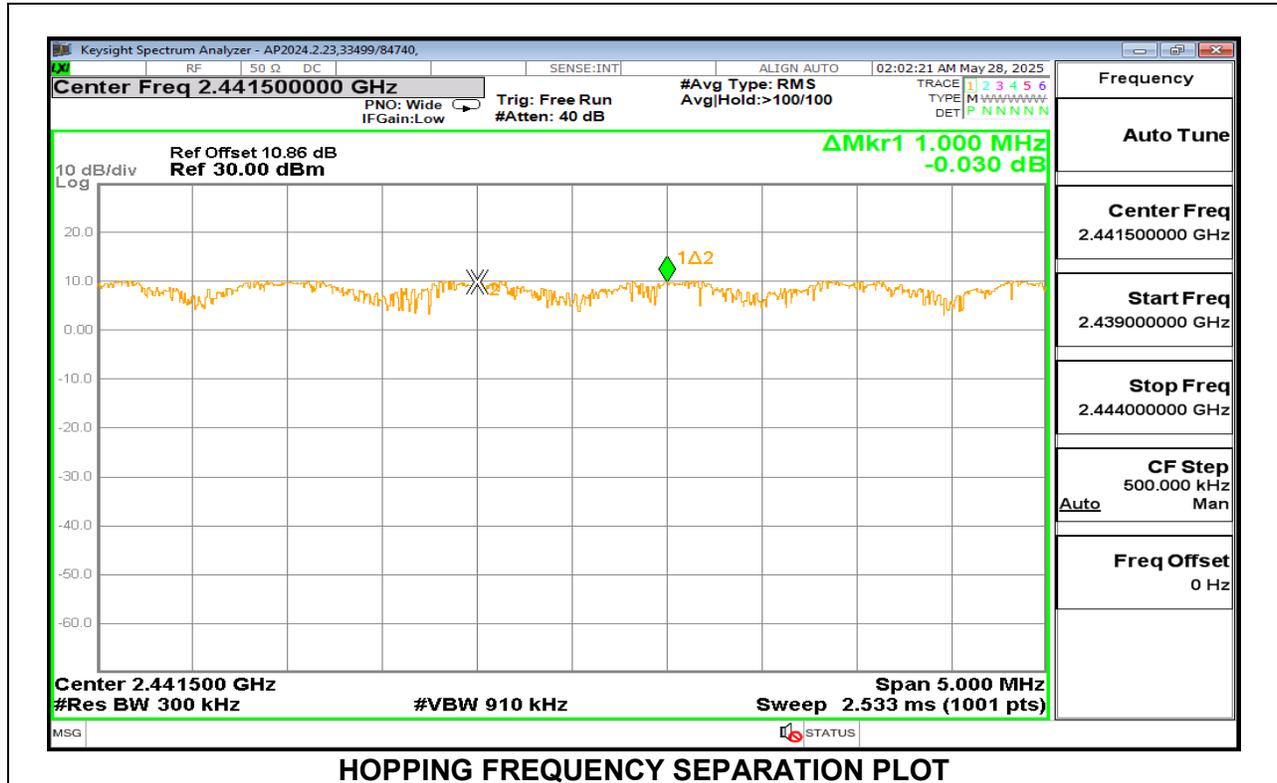
$$1.375 \text{ MHz} \times (2/3) = 0.917 \text{ MHz}$$

Since the separation of 1.000 MHz is greater than 0.917 MHz, the channel separation is compliant.

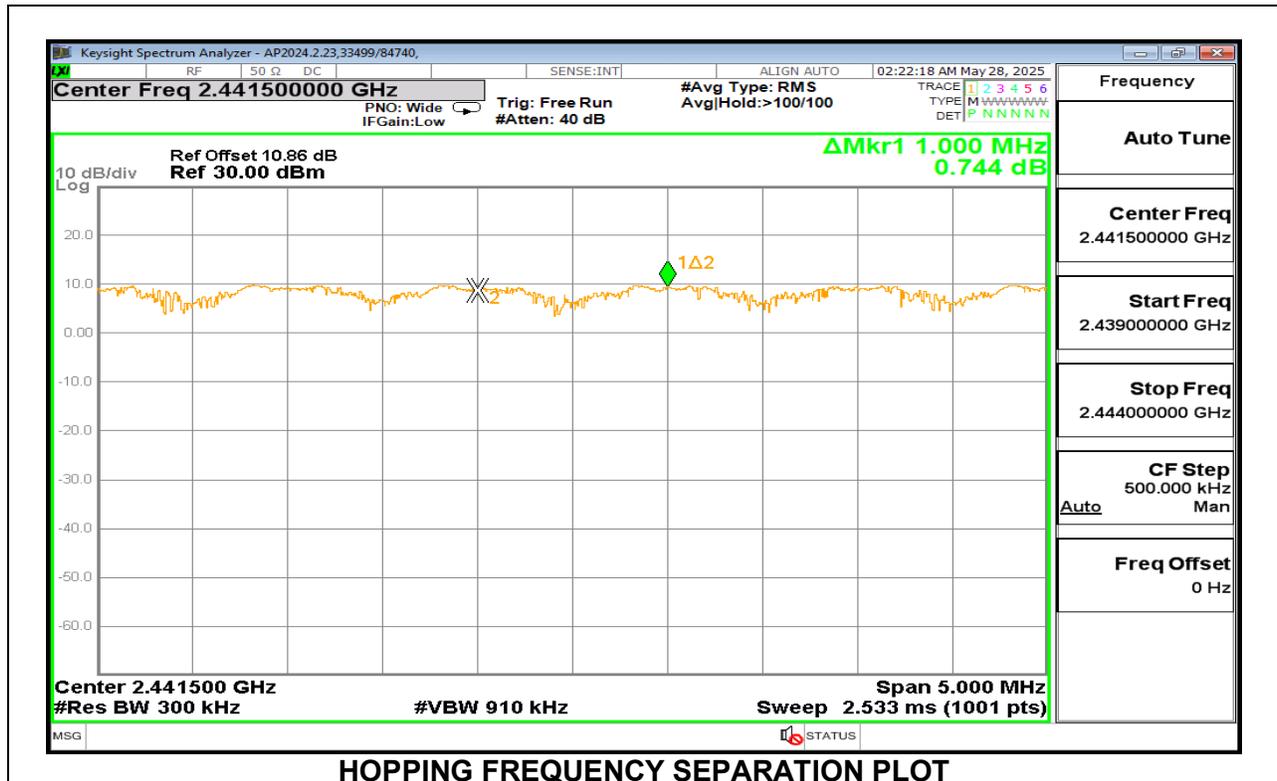
9.2.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION



9.2.2. BLUETOOTH ENHANCED DATA RATE QPSK MODULATION



9.2.3. BLUETOOTH ENHANCED DATA RATE 8PSK MODULATION



9.3. NUMBER OF HOPPING CHANNELS

LIMITS

FCC §15.247 (a) (1) (iii)
RSS-247 (5.1) (d)

Frequency hopping systems in the 2400 – 2483.5 MHz band shall use at least 15 non-overlapping channels.

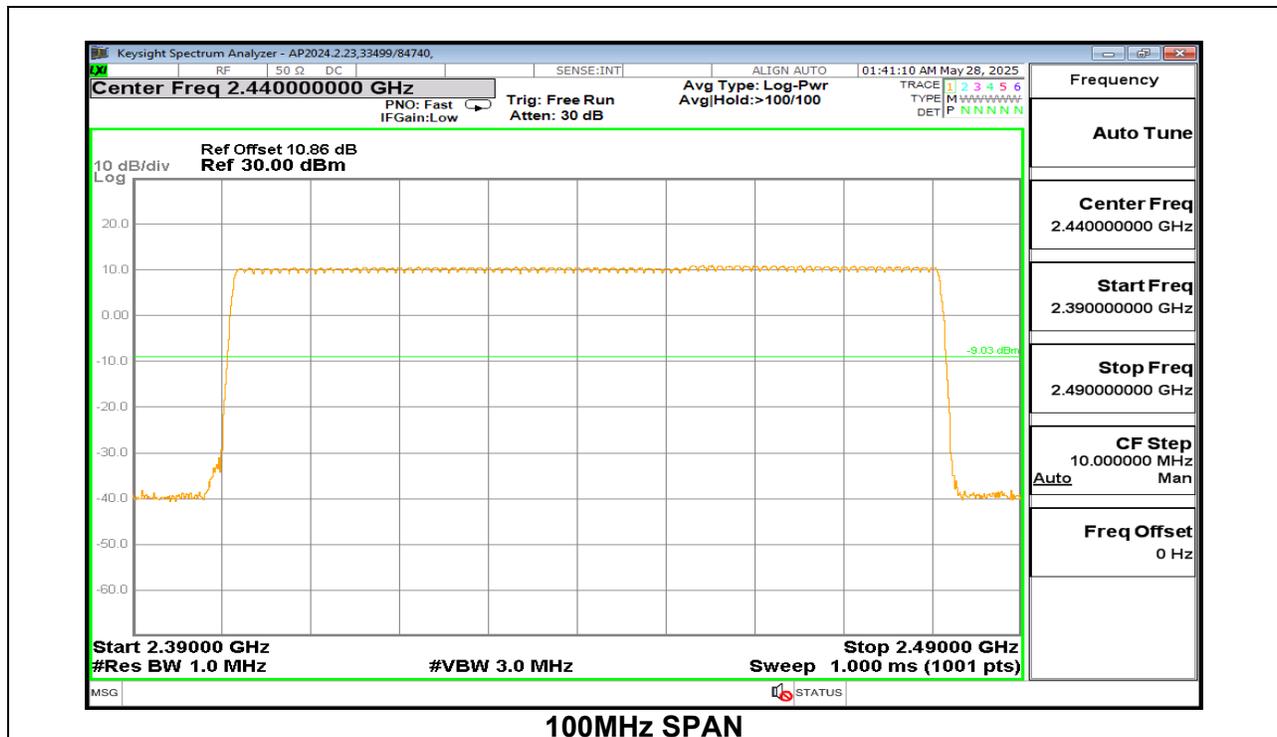
TEST PROCEDURE

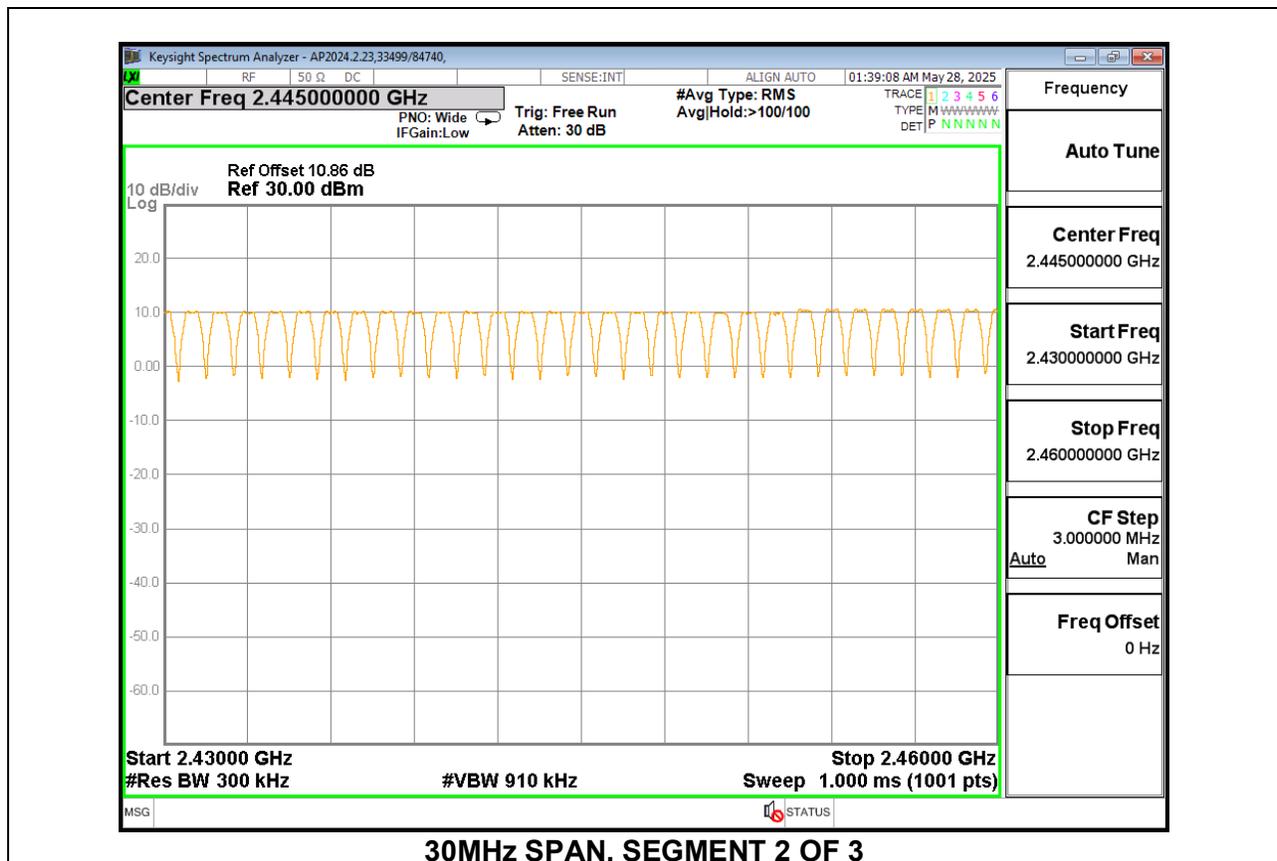
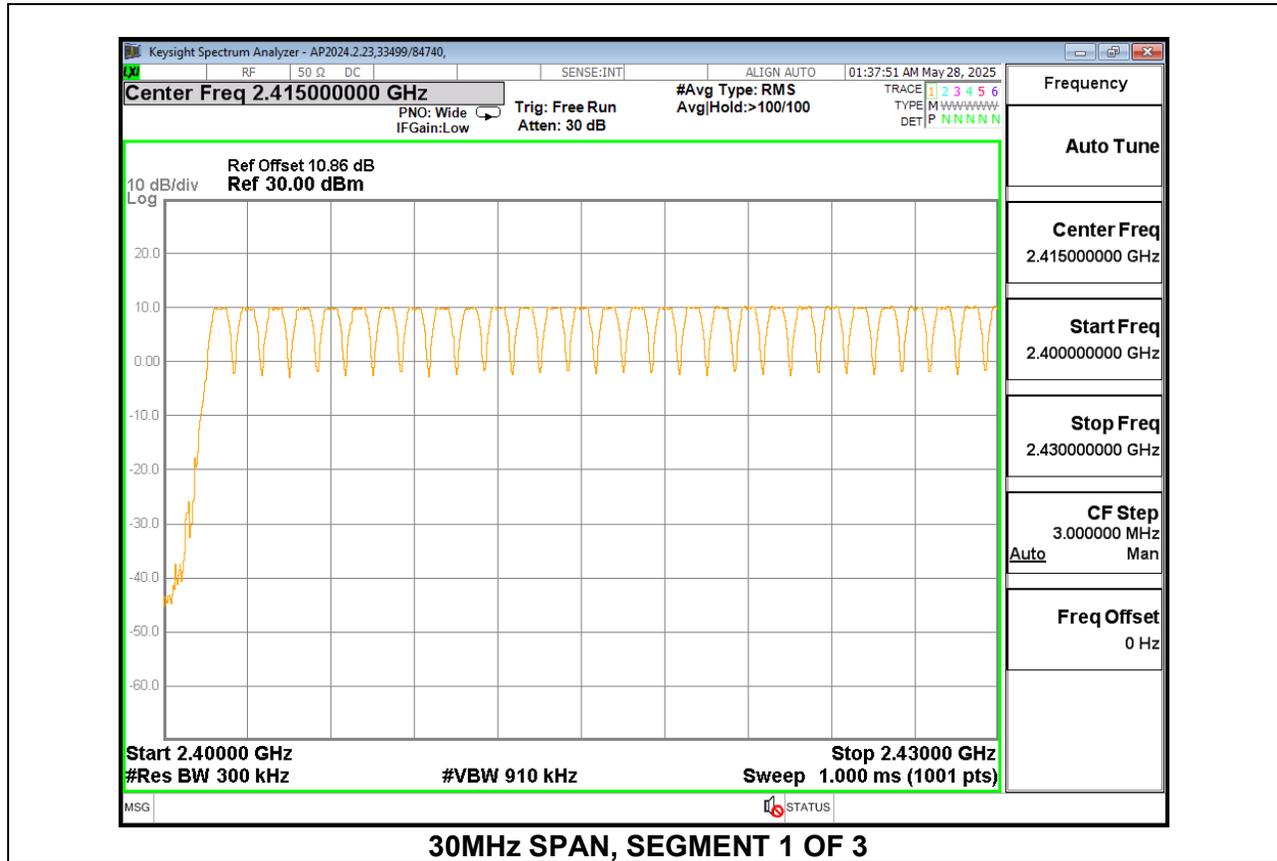
The transmitter output is connected to a spectrum analyzer. The span is set to cover the entire authorized band, in either a single sweep or in multiple contiguous sweeps. The RBW is set to a maximum of 1 % of the span. The analyzer is set to Max Hold.

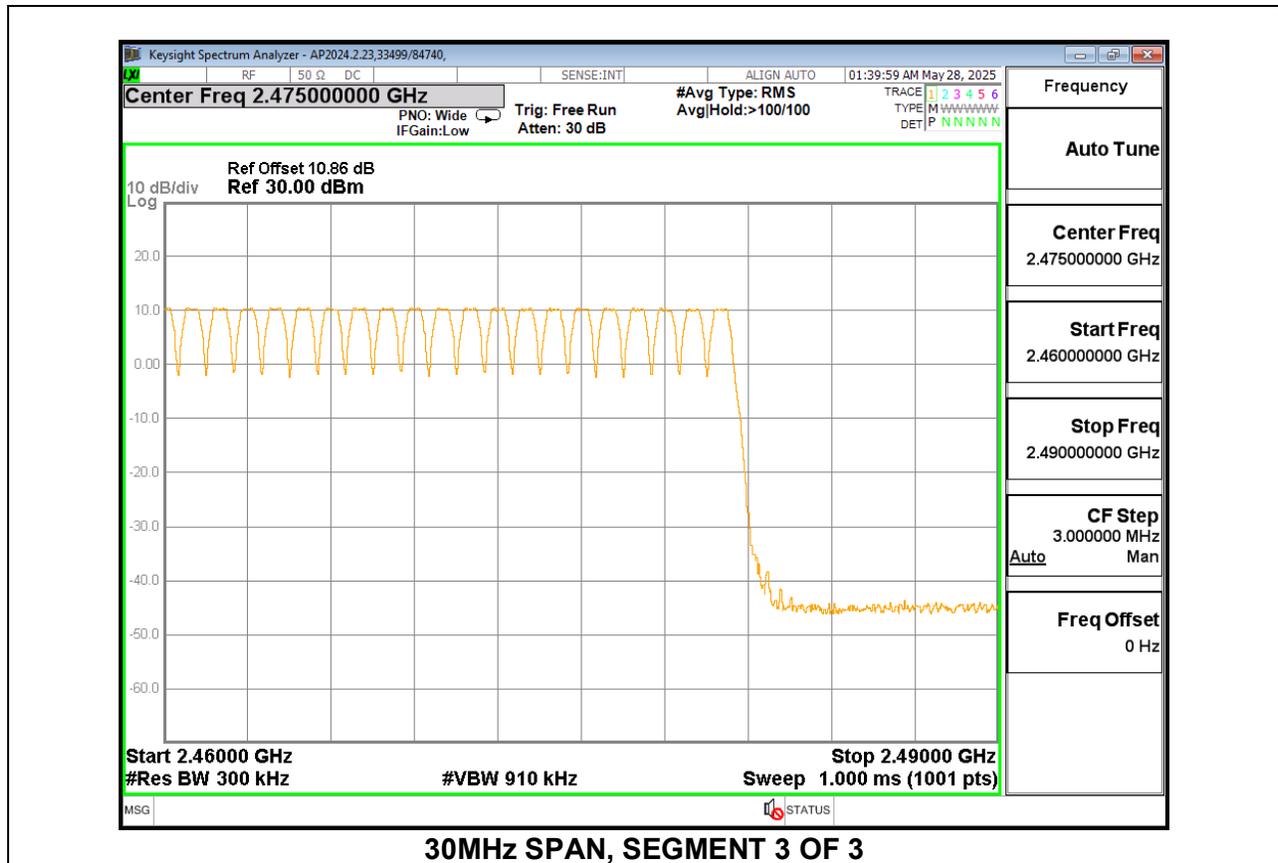
RESULTS

Normal Mode: 79 Channels Observed

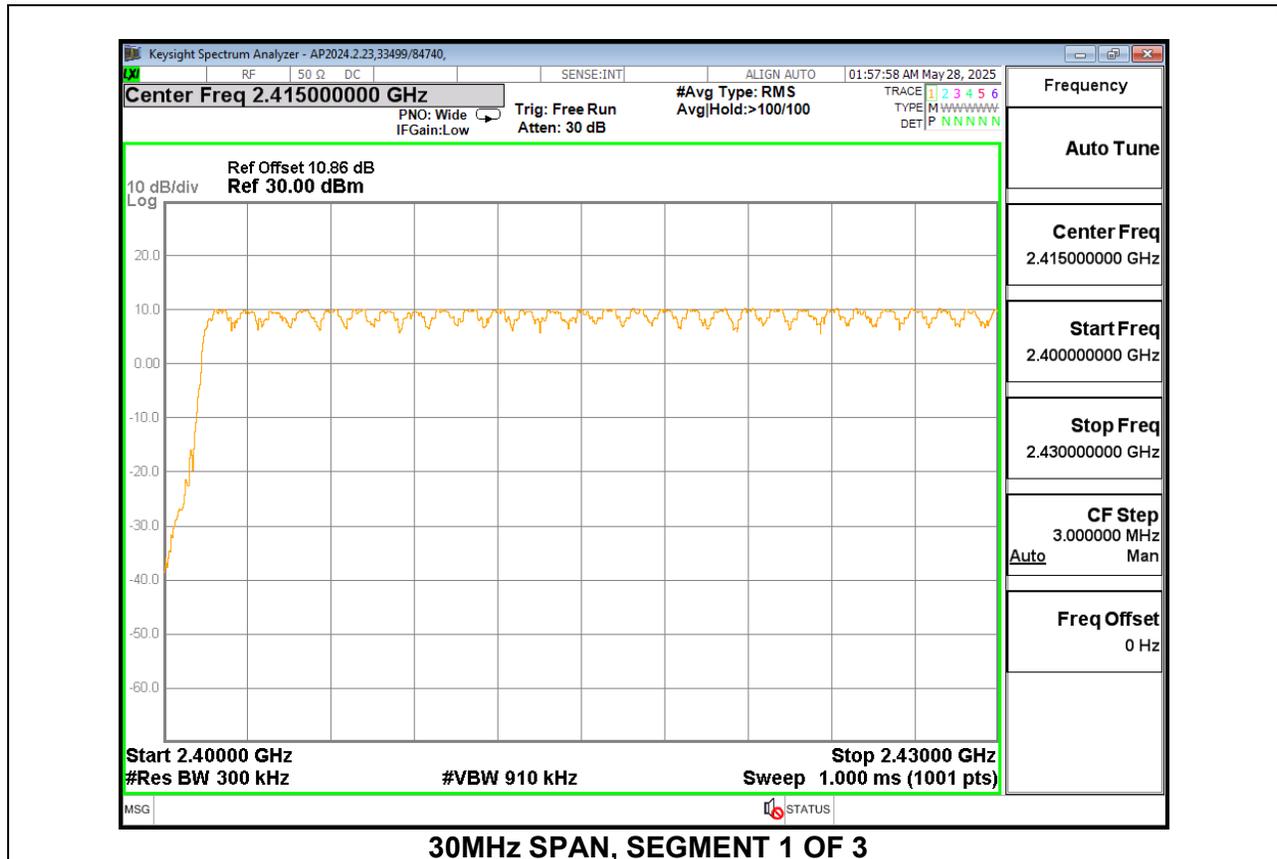
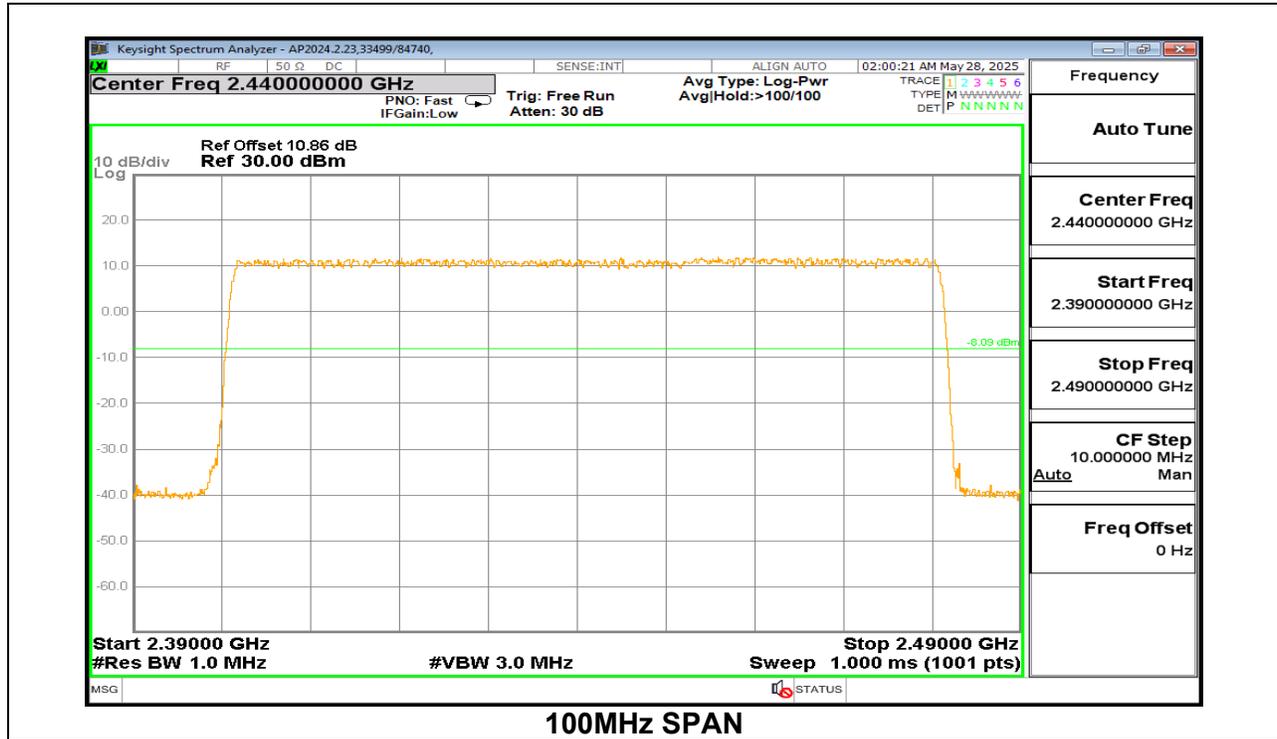
9.3.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION

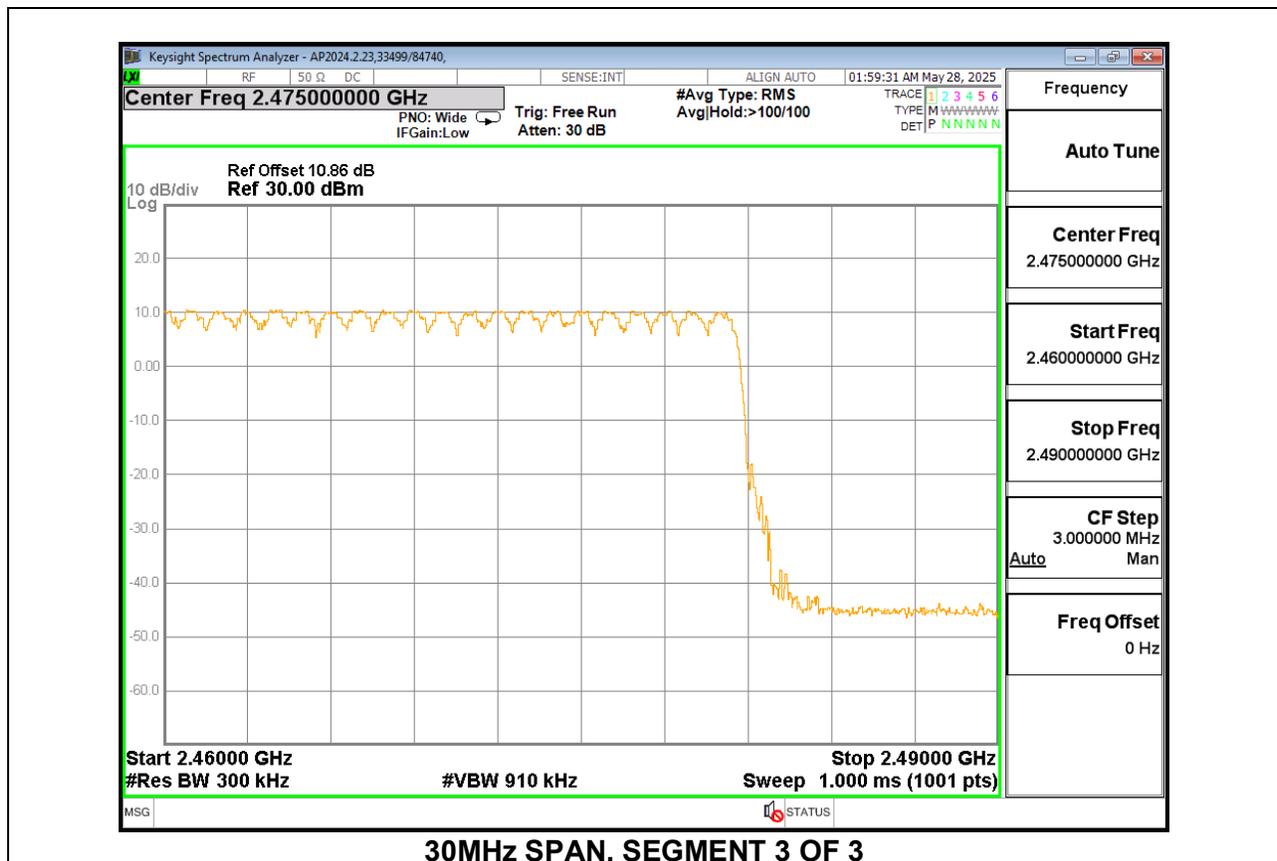
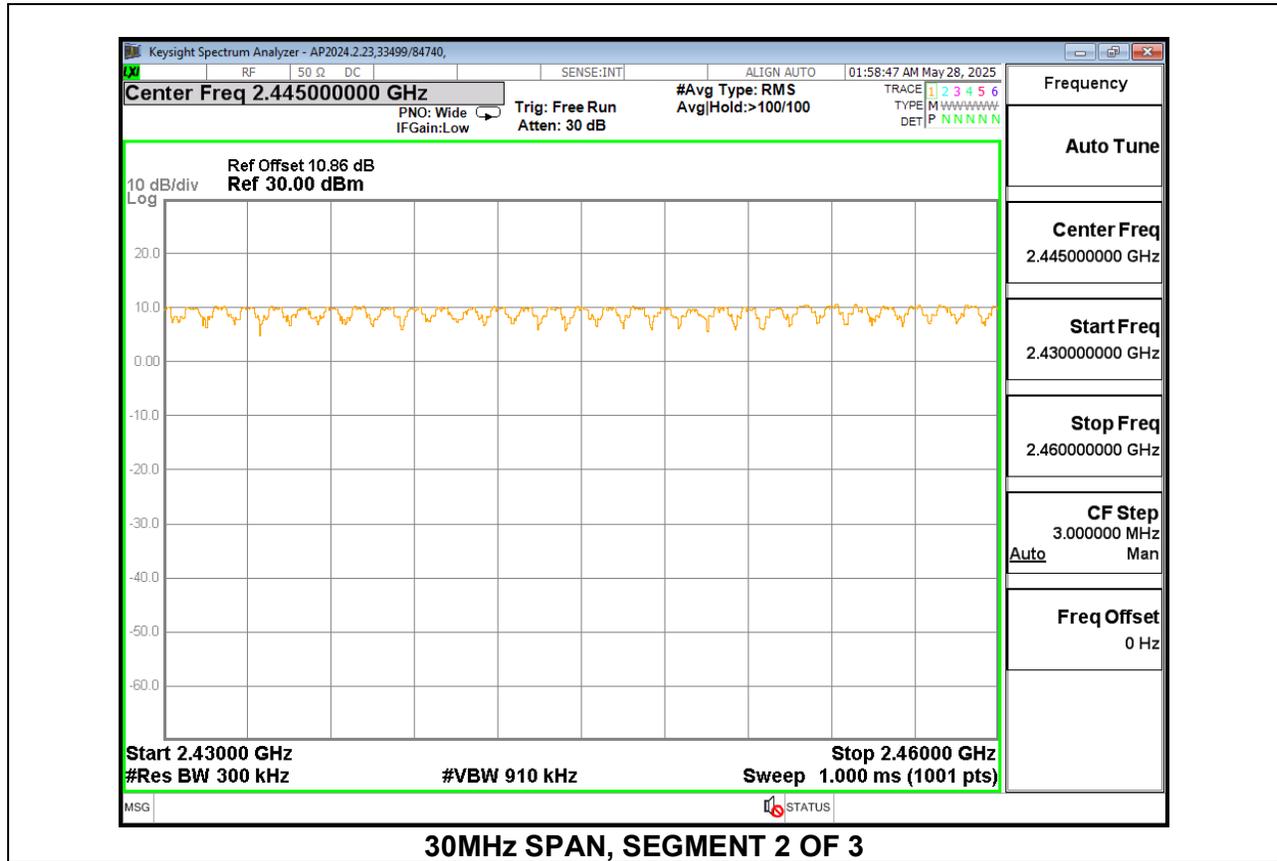




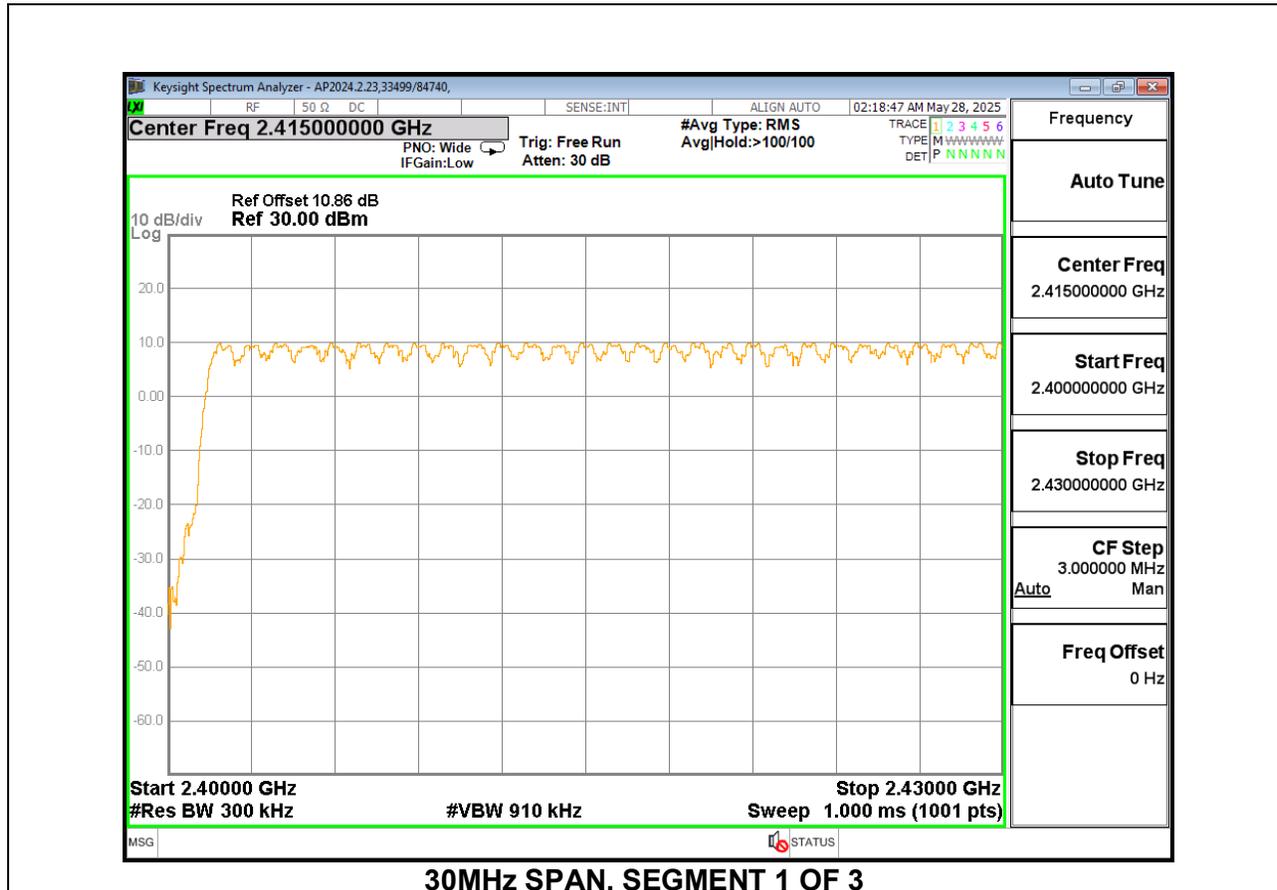
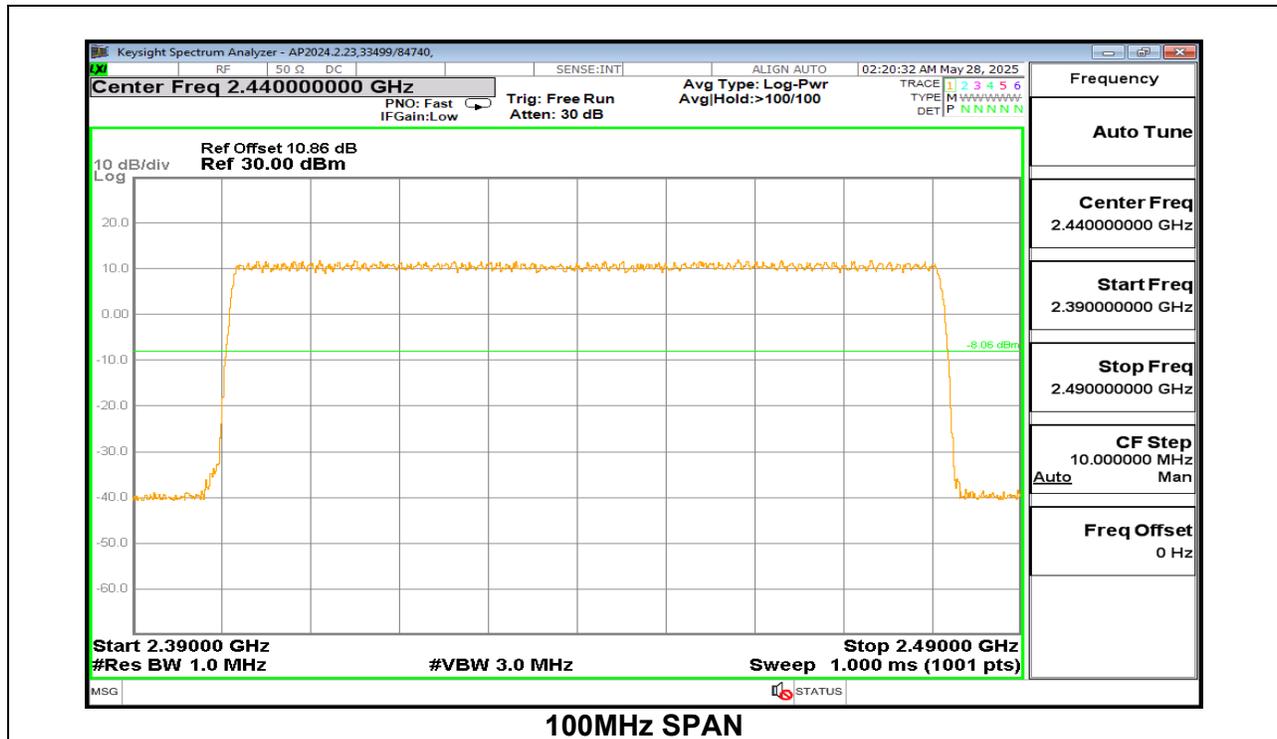


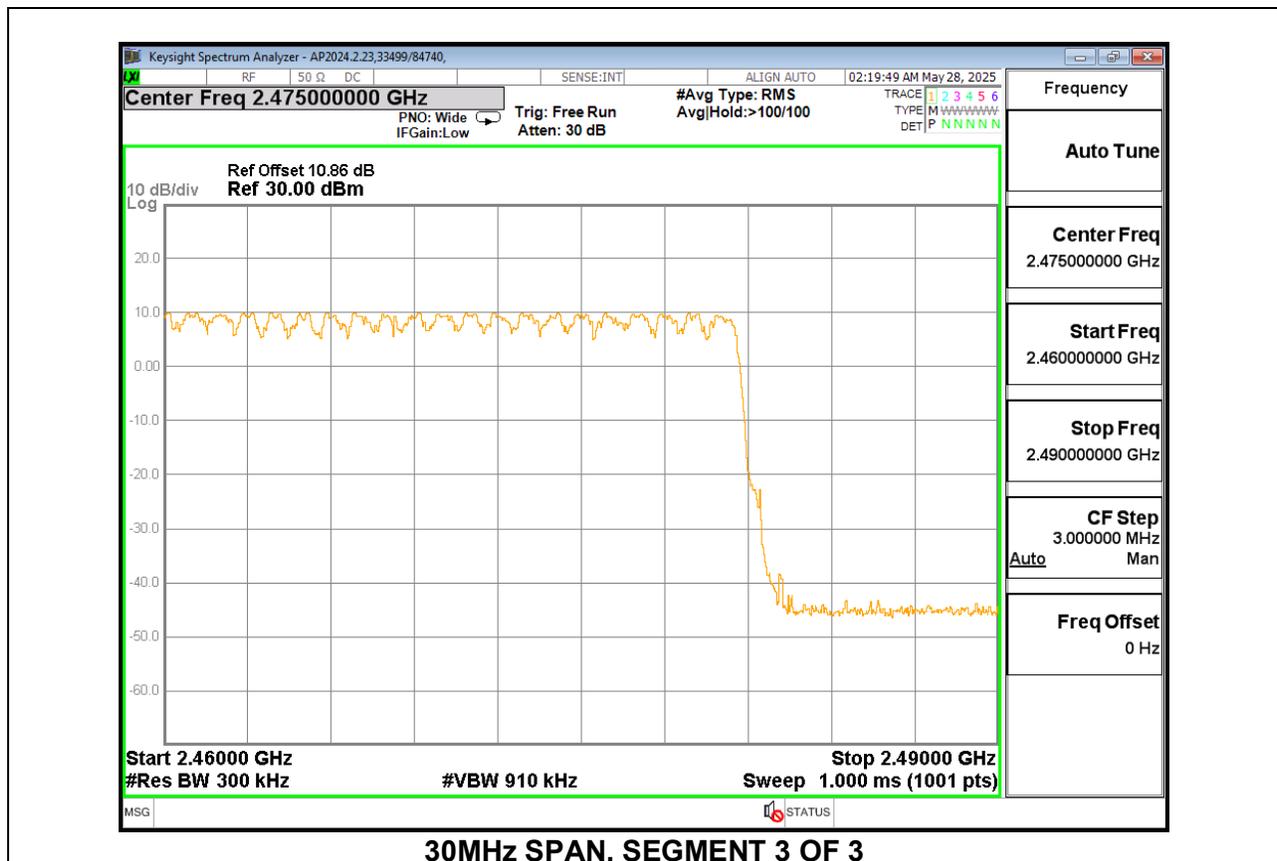
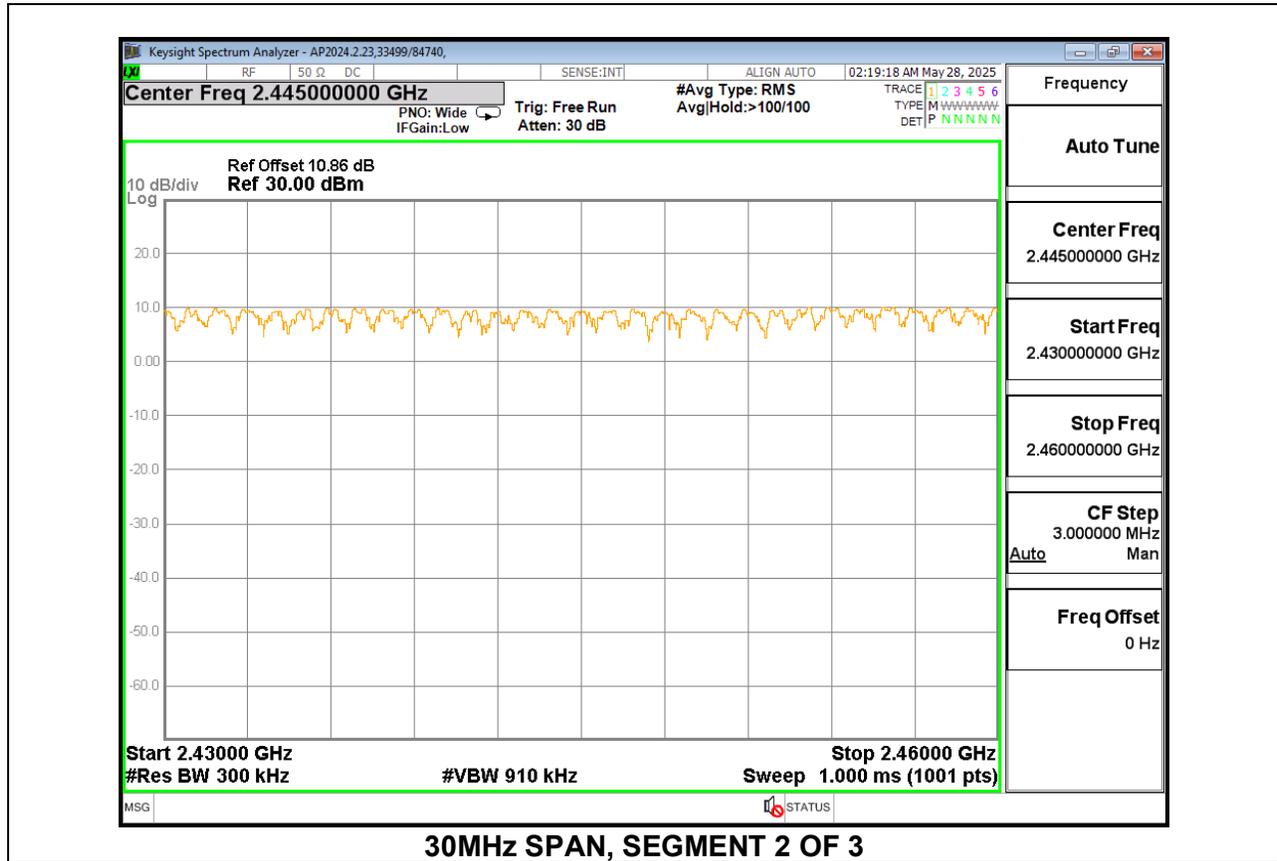
9.3.2. BLUETOOTH BASIC DATA RATE QPSK MODULATION





9.3.3. BLUETOOTH ENHANCED DATA RATE 8PSK MODULATION





9.4. AVERAGE TIME OF OCCUPANCY

LIMITS

FCC §15.247 (a) (1) (iii)
 RSS-247 (5.1) (d)

The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The span is set to 0 Hz, centered on a single, selected hopping channel. The width of a single pulse is measured in a fast scan. The number of pulses is measured in a 3.16-second scan, to enable resolution of each occurrence.

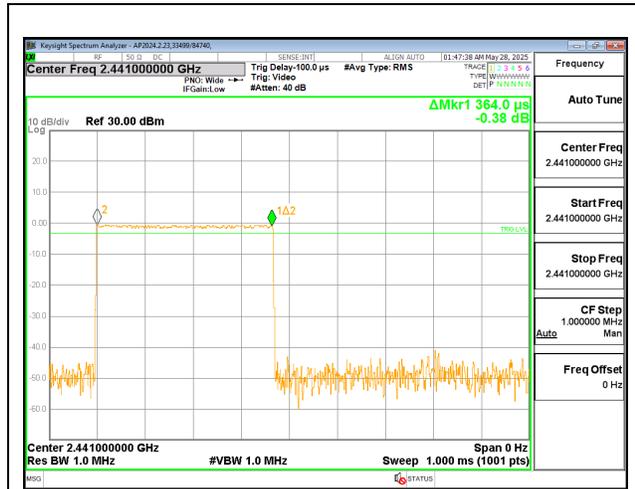
The average time of occupancy in the specified 3.16 second period (79 channels * 0.4 s) is equal to $10 * (\# \text{ of pulses in } 3.16 \text{ s}) * \text{ pulse width}$.

For AFH mode, the average time of occupancy in the specified 8 second period (20 channels * 0.4 seconds) is equal to $10 * (\# \text{ of pulses in } 0.8 \text{ s}) * \text{ pulse width}$.

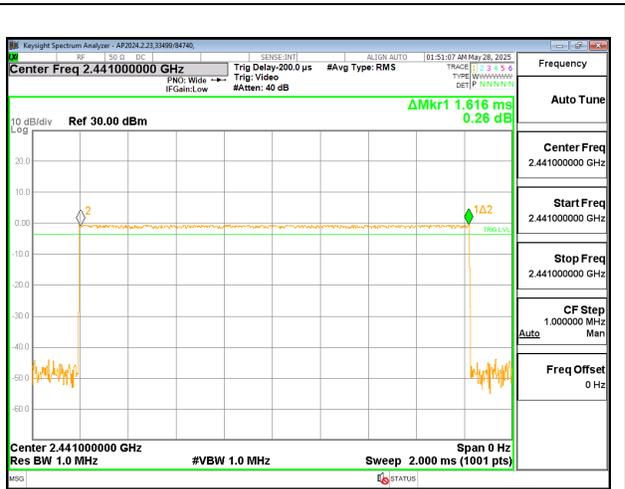
RESULTS

9.4.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION

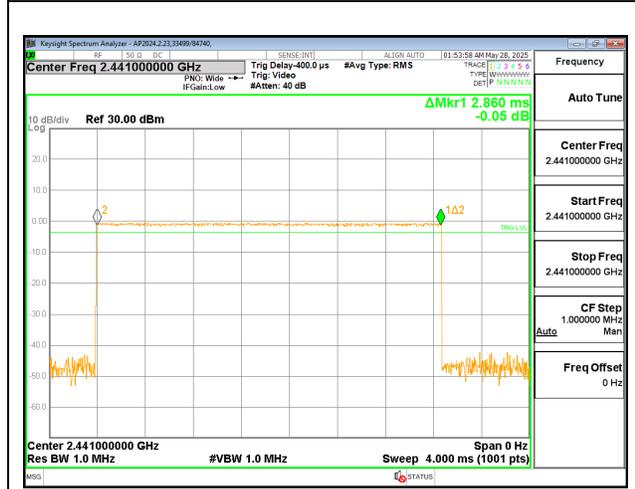
DH Packet	Pulse Width (msec)	Number of Pulses in 3.16 seconds	Average Time of Occupancy (sec)	Limit (sec)	Margin (sec)
GFSK Normal Mode					
DH1	0.364	31	0.1128	0.4	-0.2872
DH3	1.616	17	0.2747	0.4	-0.1253
DH5	2.860	7	0.2002	0.4	-0.1998
GFSK AFH Mode					
DH Packet	Pulse Width (sec)	Number of Pulses in 0.8 seconds	Average Time of Occupancy (sec)	Limit (sec)	Margin (sec)
DH1	0.364	7.75	0.02821	0.4	-0.3718
DH3	1.616	4.25	0.06868	0.4	-0.3313
DH5	2.86	1.75	0.05005	0.4	-0.3500



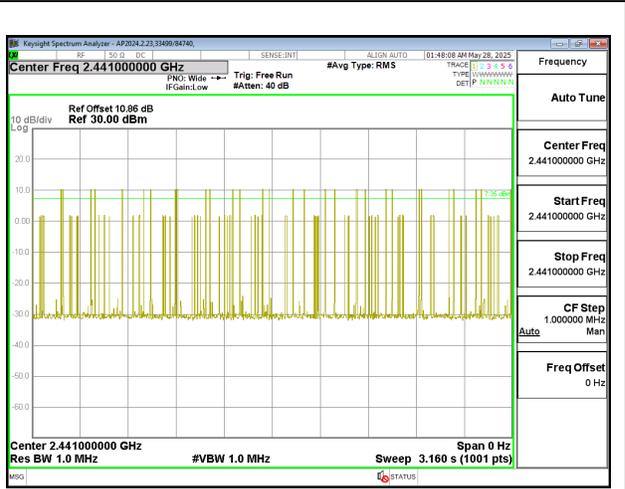
PULSE WIDTH – DH1



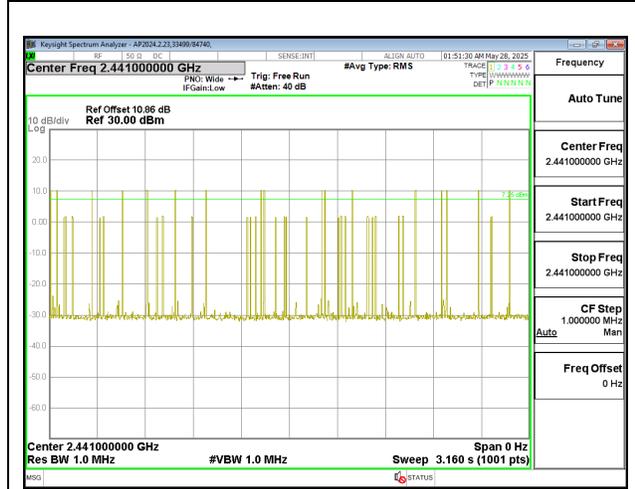
PULSE WIDTH – DH3



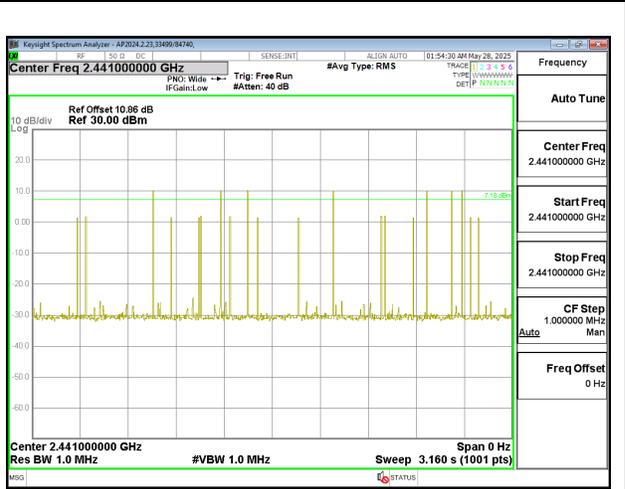
PULSE WIDTH – DH5



**NUMBER OF PULSES IN 3.16 SECOND
OBSERVATION PERIOD – DH1**



**NUMBER OF PULSES IN 3.16 SECOND
OBSERVATION PERIOD – DH3**

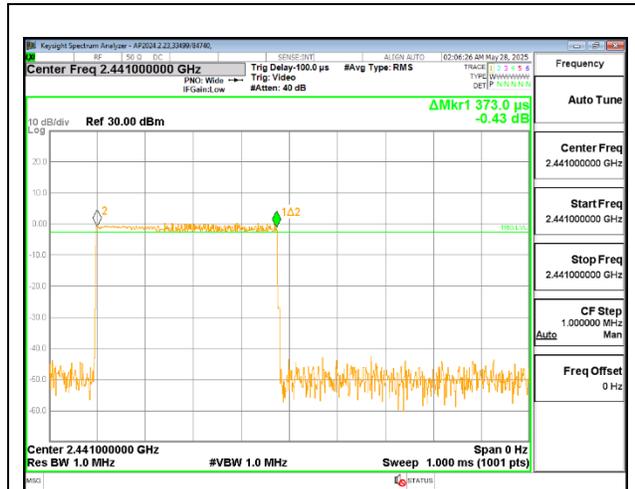


**NUMBER OF PULSES IN 3.16 SECOND
OBSERVATION PERIOD – DH5**

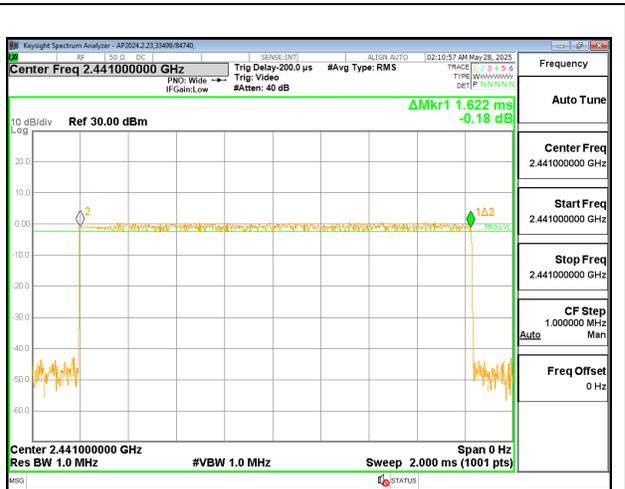
9.4.2. BLUETOOTH ENHANCED DATA RATE QPSK MODULATION

DH Packet	Pulse Width (msec)	Number of Pulses in 3.16 seconds	Average Time of Occupancy (sec)	Limit (sec)	Margin (sec)
QPSK Normal Mode					
3DH1	0.373	32	0.11936	0.4	-0.28064
3DH3	1.622	18	0.29196	0.4	-0.10804
3DH5	2.864	11	0.31504	0.4	-0.08496

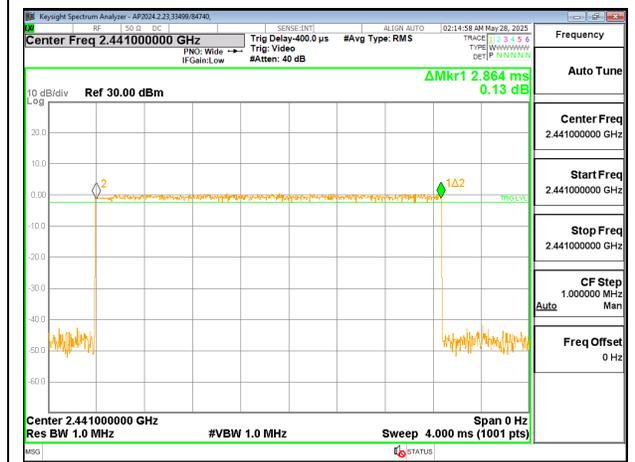
Note: for AFH(QPSK) mode, please refer to the results of AFH(GFSK) mode; the channel selection and hopping rate are the same for both EDR and Basic Rate operation, data for Basic Rate demonstrates compliance with channel occupancy when AFH is employed.



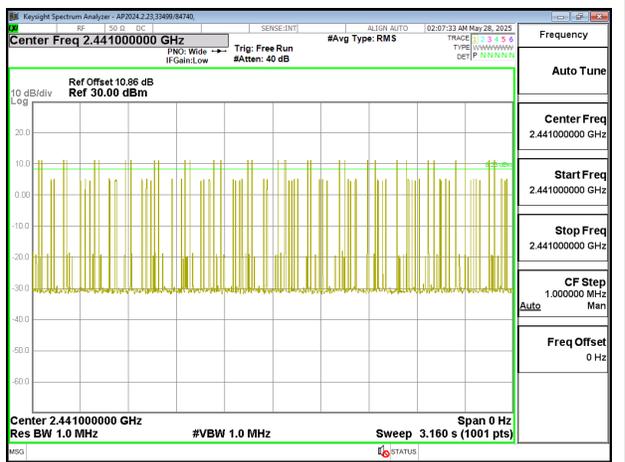
PULSE WIDTH – 3DH1



PULSE WIDTH – 3DH3



PULSE WIDTH – 3DH5



**NUMBER OF PULSES IN 3.16 SECOND
 OBSERVATION PERIOD – 3DH1**



**NUMBER OF PULSES IN 3.16 SECOND
 OBSERVATION PERIOD – 3DH3**

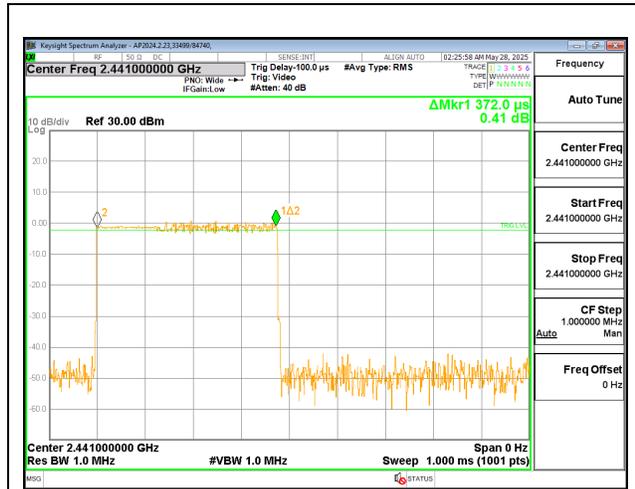


**NUMBER OF PULSES IN 3.16 SECOND
 OBSERVATION PERIOD – 3DH5**

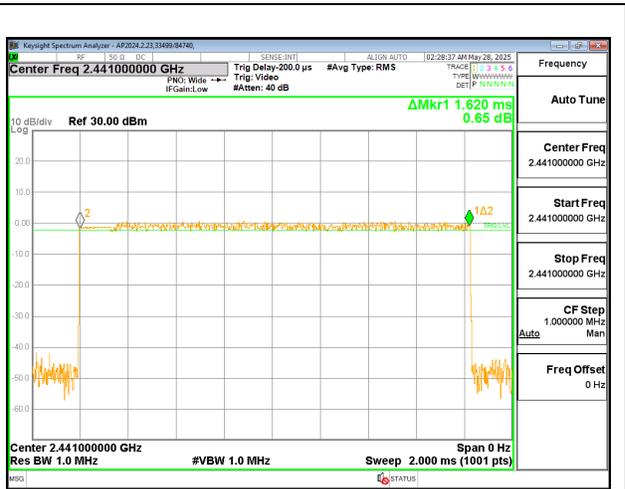
9.4.3. BLUETOOTH ENHANCED DATA RATE 8PSK MODULATION

DH Packet	Pulse Width (msec)	Number of Pulses in 3.16 seconds	Average Time of Occupancy (sec)	Limit (sec)	Margin (sec)
8PSK Normal Mode					
3DH1	0.372	33	0.12276	0.4	-0.27724
3DH3	1.620	15	0.243	0.4	-0.157
3DH5	2.864	11	0.31504	0.4	-0.08496

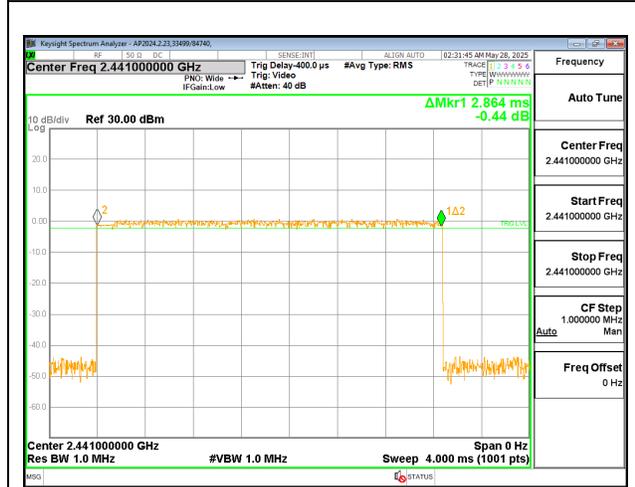
Note: for AFH(8PSK) mode, please refer to the results of AFH(GFSK) mode; the channel selection and hopping rate are the same for both EDR and Basic Rate operation, data for Basic Rate demonstrates compliance with channel occupancy when AFH is employed.



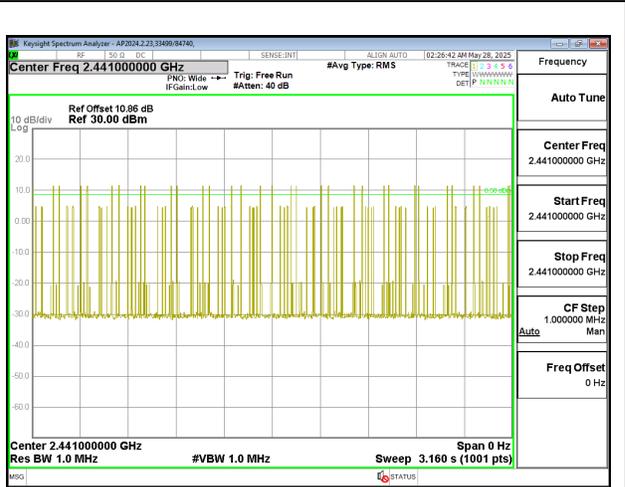
PULSE WIDTH – 3DH1



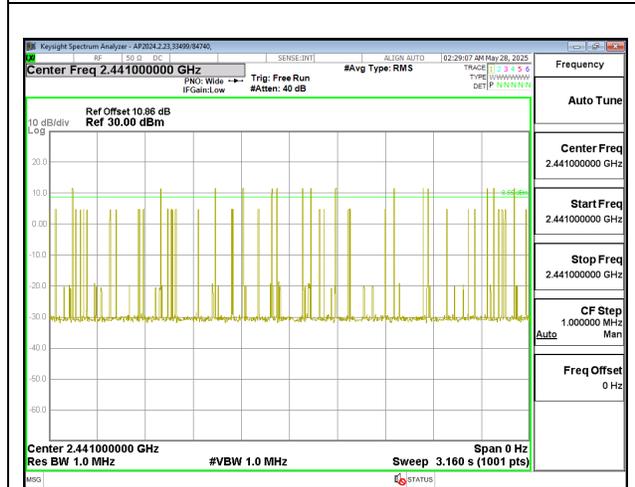
PULSE WIDTH – 3DH3



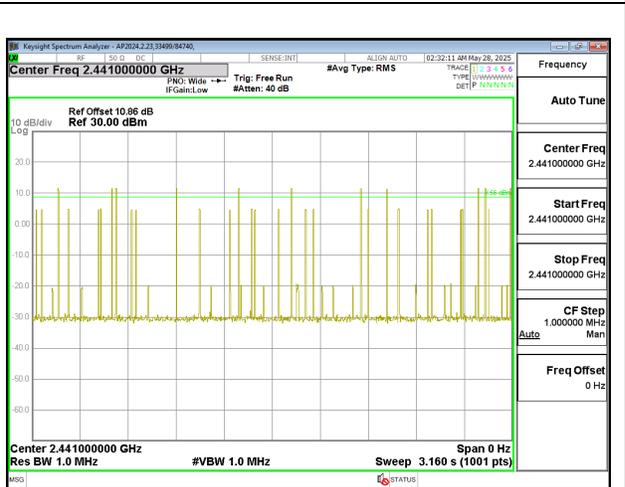
PULSE WIDTH – 3DH5



**NUMBER OF PULSES IN 3.16 SECOND
 OBSERVATION PERIOD – 3DH1**



**NUMBER OF PULSES IN 3.16 SECOND
 OBSERVATION PERIOD – 3DH3**



**NUMBER OF PULSES IN 3.16 SECOND
 OBSERVATION PERIOD – 3DH5**

9.5. OUTPUT POWER

LIMITS

§15.247 (b) (1)
RSS-247 (5.4) (b)

The maximum antenna gain is less than 6 dBi, therefore the limit is 30 dBm. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts

TEST PROCEDURE

Measurements are performed using a wideband gated RF power meter.

The cable assembly insertion loss of 10.35 dB (including 0.69 dB cable and a 9.66 dB pad) was entered as an offset in the power meter.

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

RESULTS

9.5.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION

Tested By:	105900/84740
Date:	2025-05-12

Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2402	10.93	21	-10.07
Middle	2441	10.94	21	-10.06
High	2480	11.00	21	-10.00

9.5.2. BLUETOOTH ENHANCED DATA RATE QPSK MODULATION

Tested By:	105900/84740
Date:	2025-05-12

Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2402	13.18	21	-7.82
Middle	2441	12.86	21	-8.14
High	2480	12.93	21	-8.07

9.5.3. BLUETOOTH ENHANCED DATA RATE 8PSK MODULATION

Tested By:	105900/84740
Date:	2025-05-12

Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2402	14.09	21	-6.91
Middle	2441	12.98	21	-8.02
High	2480	12.88	21	-8.12

9.6. AVERAGE POWER

LIMITS

None; for reporting purposes only

TEST PROCEDURE

Measurements are performed using a wideband gated RF power meter.

The cable assembly insertion loss of 10.35 dB (including 0.69 dB cable and a 9.66 dB pad) was entered as an offset in the power meter.

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

RESULTS

9.6.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION

Tested By:	105900/84740
Date	2025-05-12

Channel	Frequency (MHz)	Average Power (dBm)
Low	2402	10.063
Middle	2441	10.054
High	2480	10.156

9.6.1. BLUETOOTH ENHANCED DATA RATE QPSK MODULATION

Tested By:	105900/84740
Date	2025-05-12

Channel	Frequency (MHz)	Average Power (dBm)
Low	2402	9.989
Middle	2441	9.578
High	2480	9.671

9.6.2. BLUETOOTH ENHANCED DATA RATE 8PSK MODULATION

Tested By:	105900/84740
Date	2025-05-12

Channel	Frequency (MHz)	Average Power (dBm)
Low	2402	9.874
Middle	2441	9.880
High	2480	9.785

9.7. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)
RSS-247 5.5
Limit = -20 dBc

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

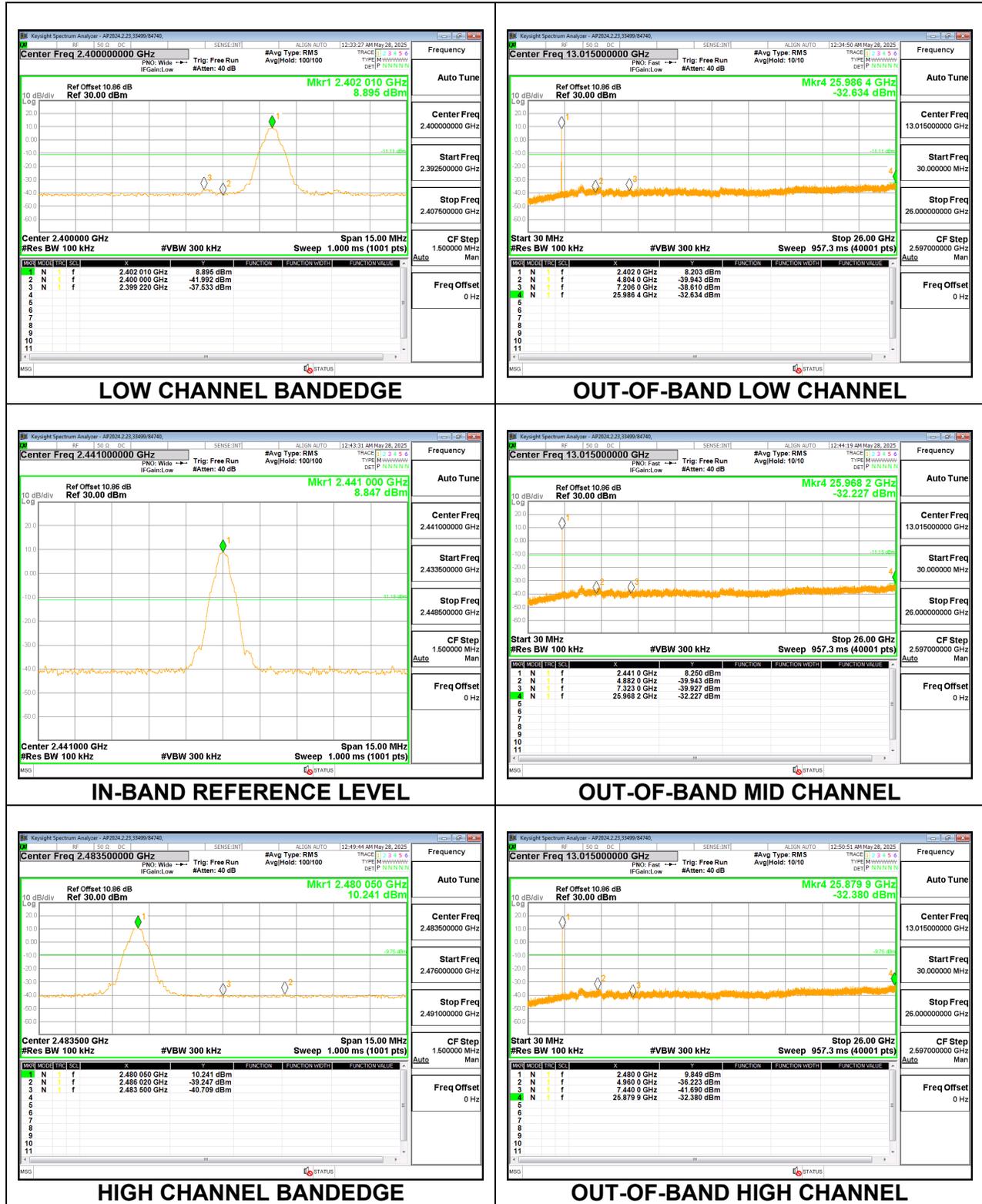
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

The bandedges at 2.4 and 2.4835 GHz are investigated with the transmitter set to the normal hopping mode.

RESULTS

9.7.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION

SPURIOUS EMISSIONS, NON-HOPPING

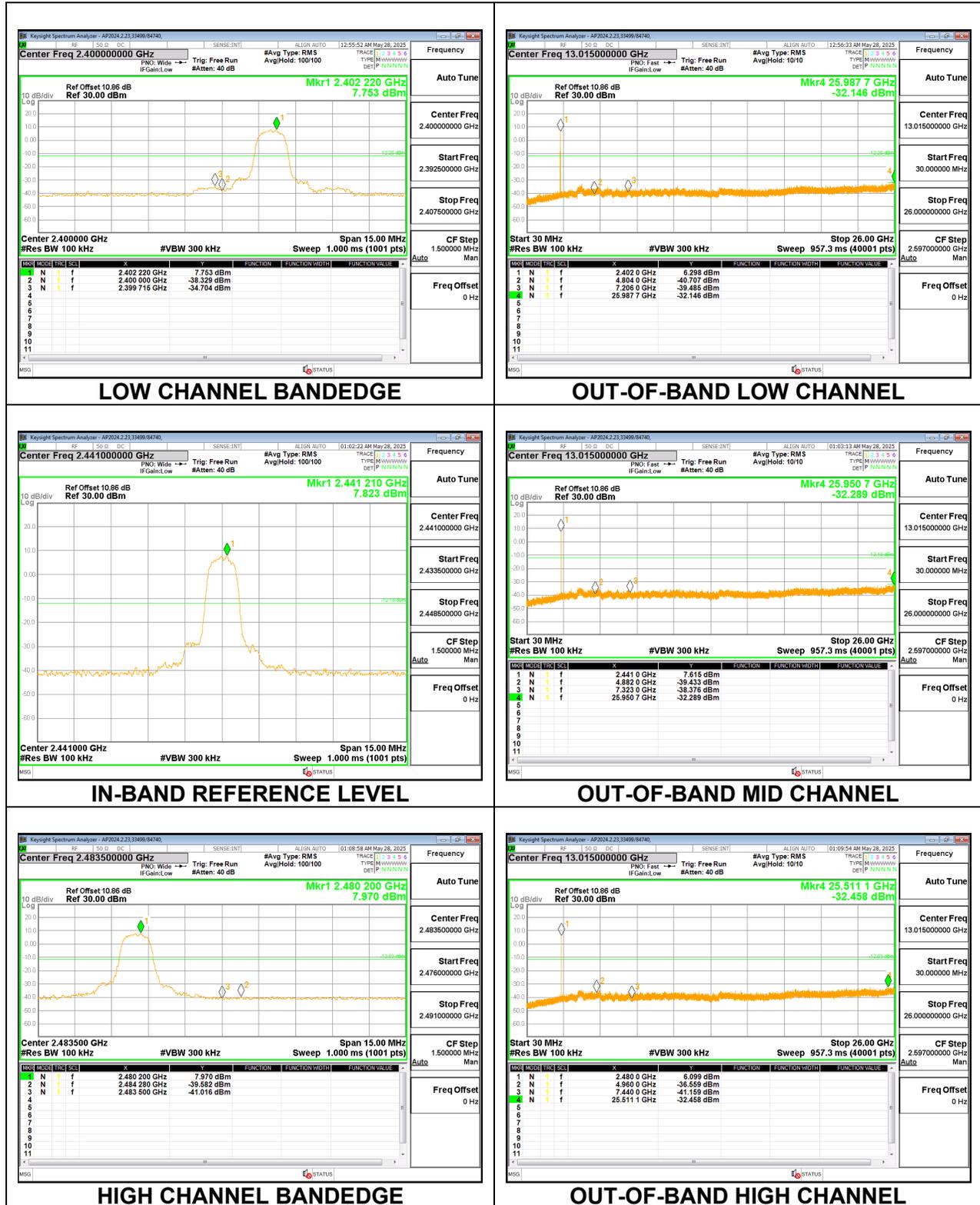


SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON

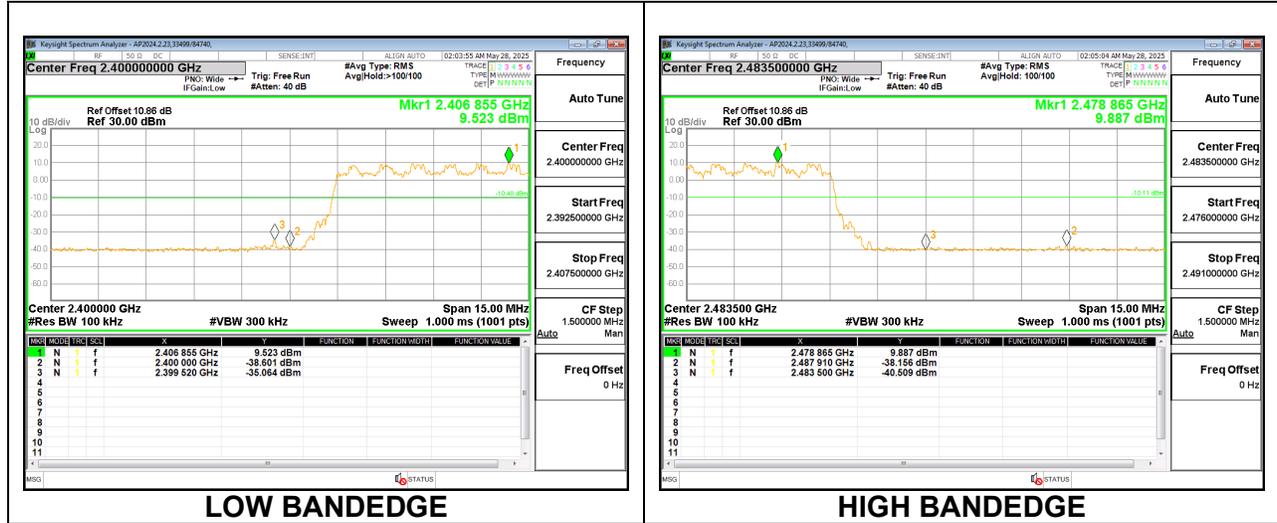


9.7.2. BLUETOOTH ENHANCED DATA RATE QPSK MODULATION

SPURIOUS EMISSIONS, NON-HOPPING

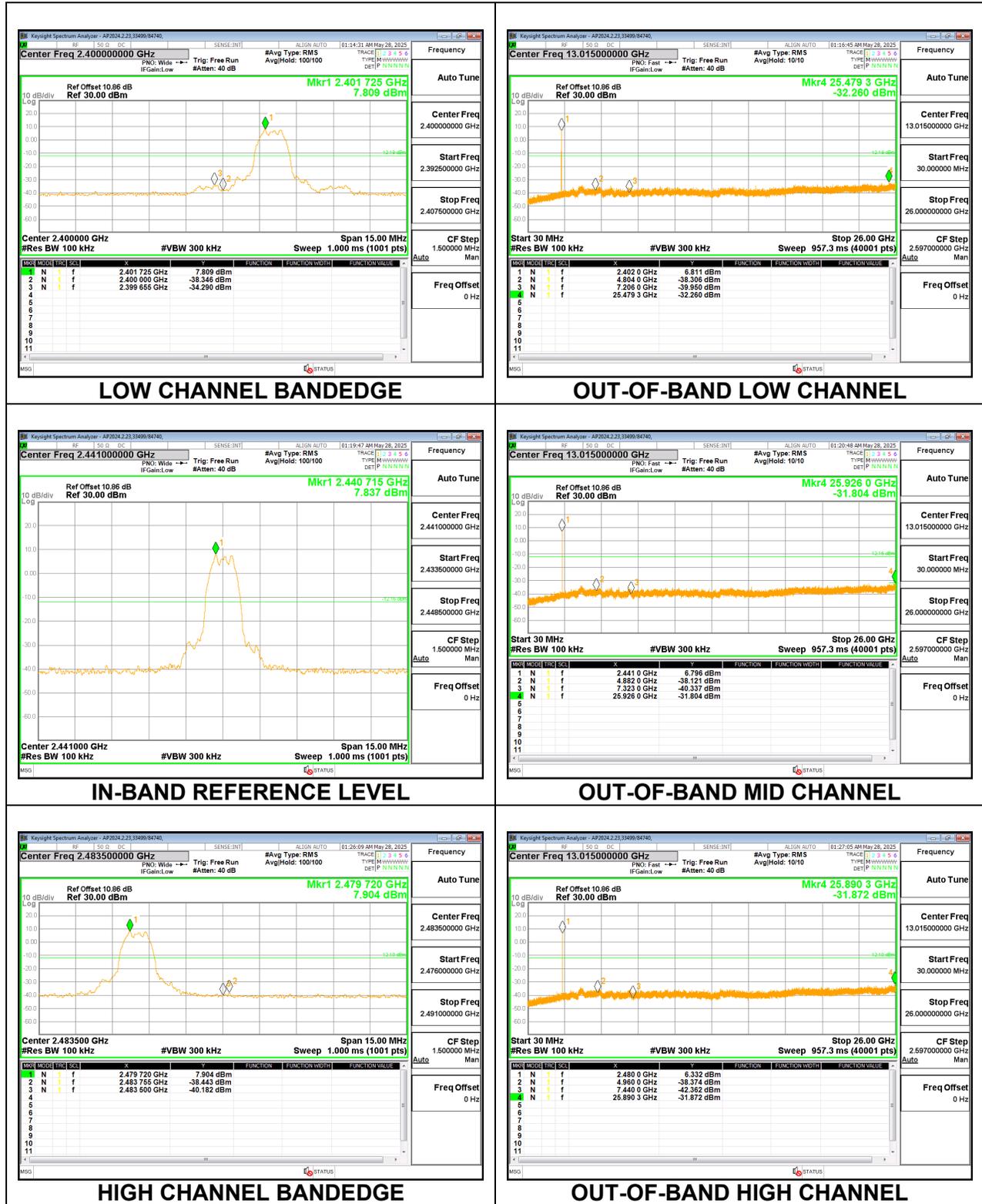


SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON



9.7.3. BLUETOOTH ENHANCED DATA RATE 8PSK MODULATION

SPURIOUS EMISSIONS, NON-HOPPING



SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON



10. RADIATED TEST RESULTS

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 Clause 8.9 and 8.10

Frequency Range (kHz)	Field Strength Limit (uA/m) at 3 m	Field Strength Limit (dBuV/m) at 3 m
0.009-0.490	6.37/F(kHz) @ 300 m	-
0.490-1.705	63.7/F(kHz) @ 30 m	-
1.705 - 30	0.08 @ 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 30 KHz for peak measurements.

For final measurements above 1 GHz the resolution bandwidth is set to 1 MHz; the video bandwidth is set to 3 MHz for peak measurements and as applicable for average measurements.

The spectrum from 1 GHz to 18 GHz is investigated with the transmitter set to low, middle, and high channels in each applicable band. Below 1GHz and above 18GHz emissions, the channel with the highest PSD 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. ON TIME AND DUTY CYCLE

LIMITS

None; for reporting purposes only.

PROCEDURE

ANSI C63.10, Section 11.6: Zero-Span Spectrum Analyzer Method.

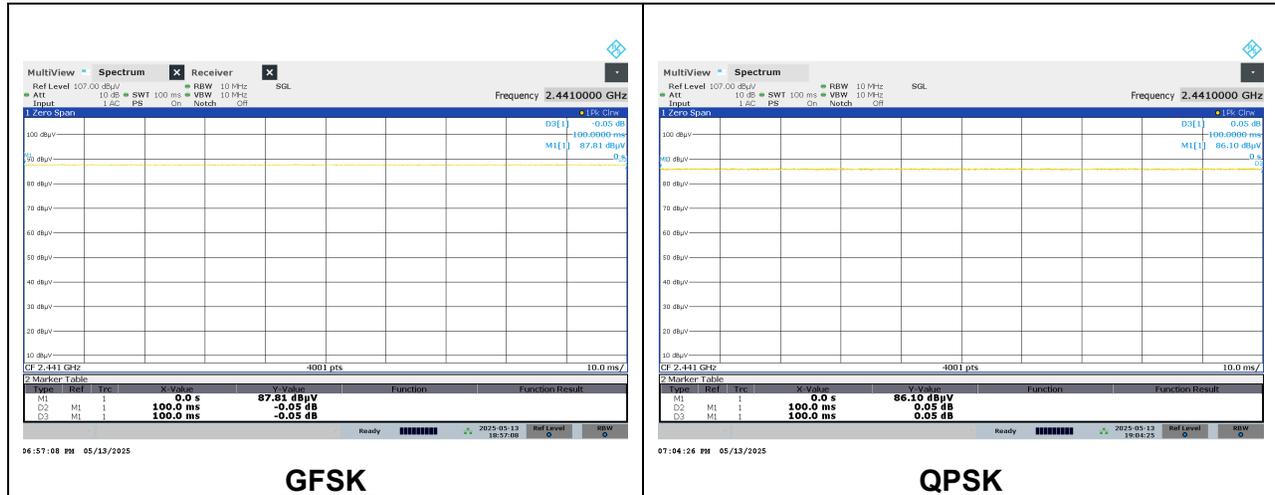
ON TIME AND DUTY CYCLE RESULTS

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	100.000	100.000	1.000	100	0.00	0.010
Bluetooth QPSK	100.000	100.000	1.000	100	0.00	0.010
Bluetooth 8PSK	100.000	100.000	1.000	100	0.00	0.010

DUTY CYCLE PLOTS

Tested By: 85501

Test Location: Chamber 1

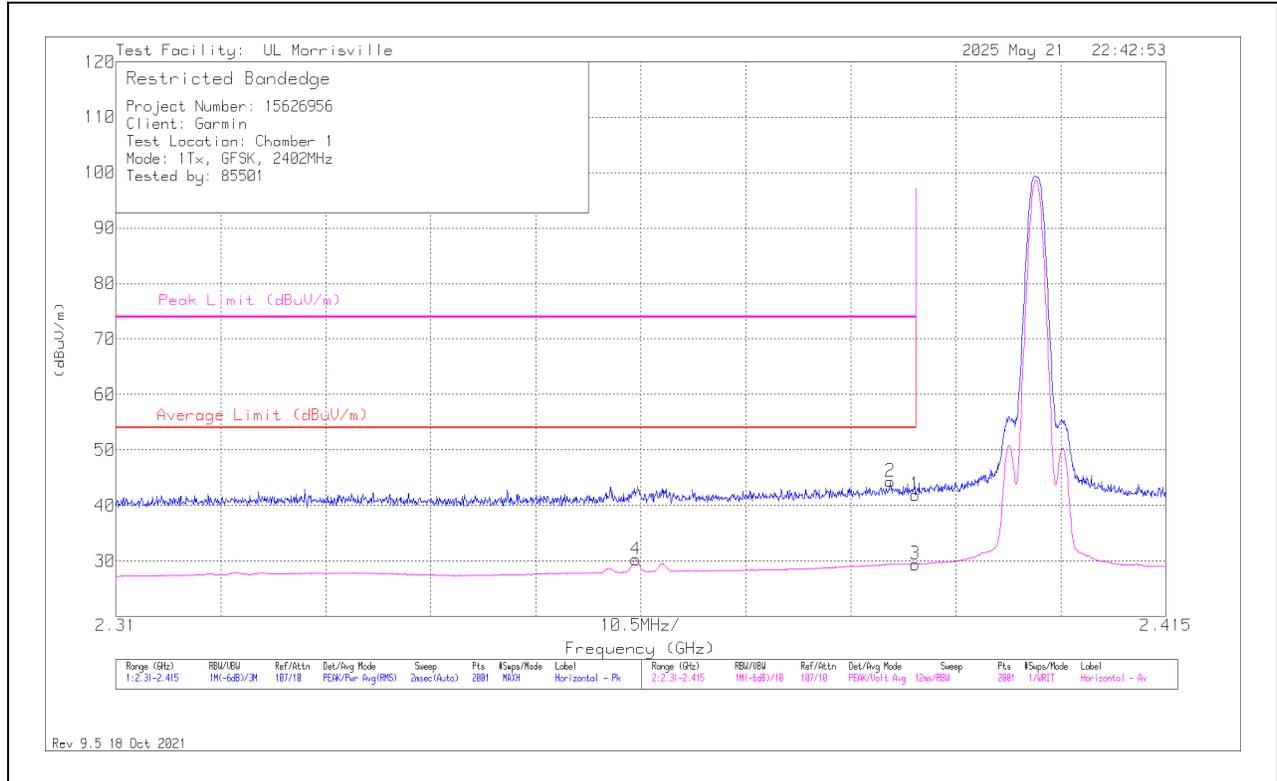


8PSK

10.1.2. BLUETOOTH BASIC DATA RATE GFSK MODULATION

BANDEDGE (LOW CHANNEL)

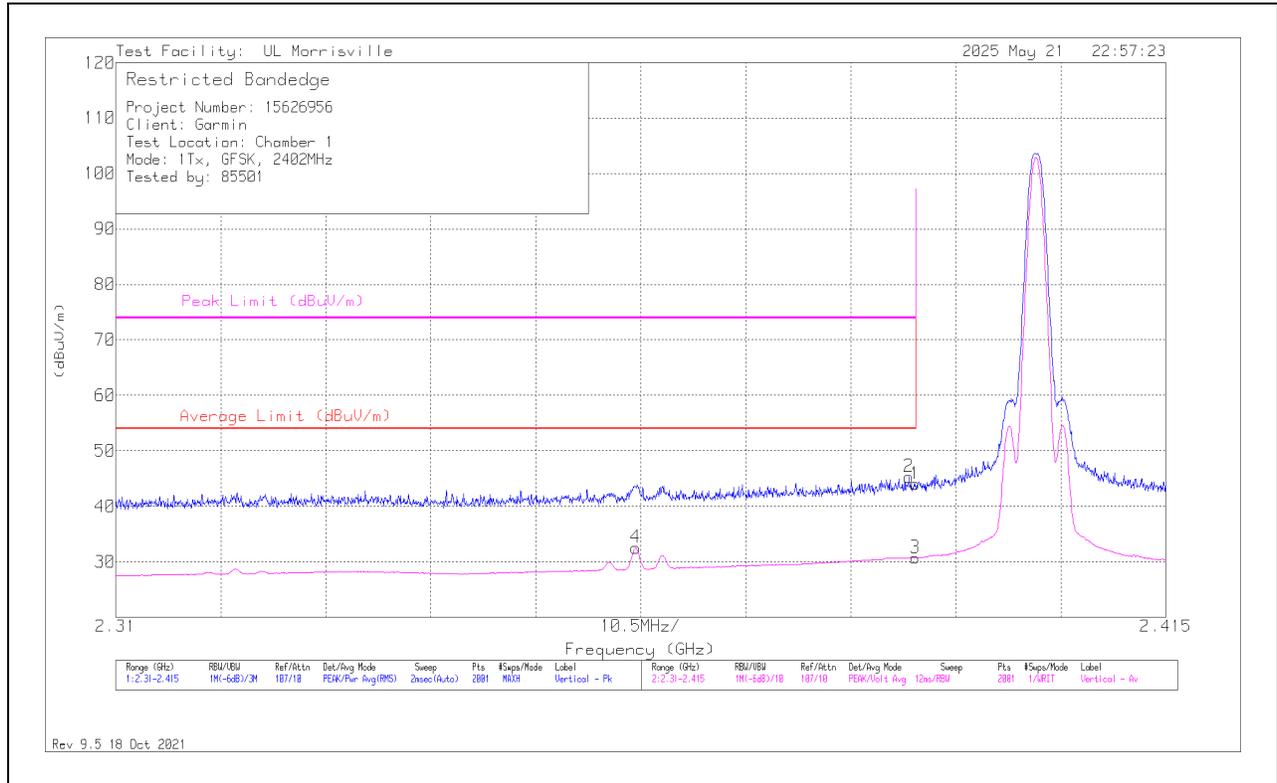
HORIZONTAL RESULT



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	135143 (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	34.05	Pk	31.9	-24	41.95	-	-	74	-32.05	251	101	H
2	* ** 2.38744	36.33	Pk	31.9	-23.9	44.33	-	-	74	-29.67	251	101	H
3	* ** 2.38996	21.5	VA1T	31.9	-24	29.4	54	-24.6	-	-	251	101	H
4	* ** 2.36198	22.7	VA1T	31.9	-24.4	30.2	54	-23.8	-	-	251	101	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

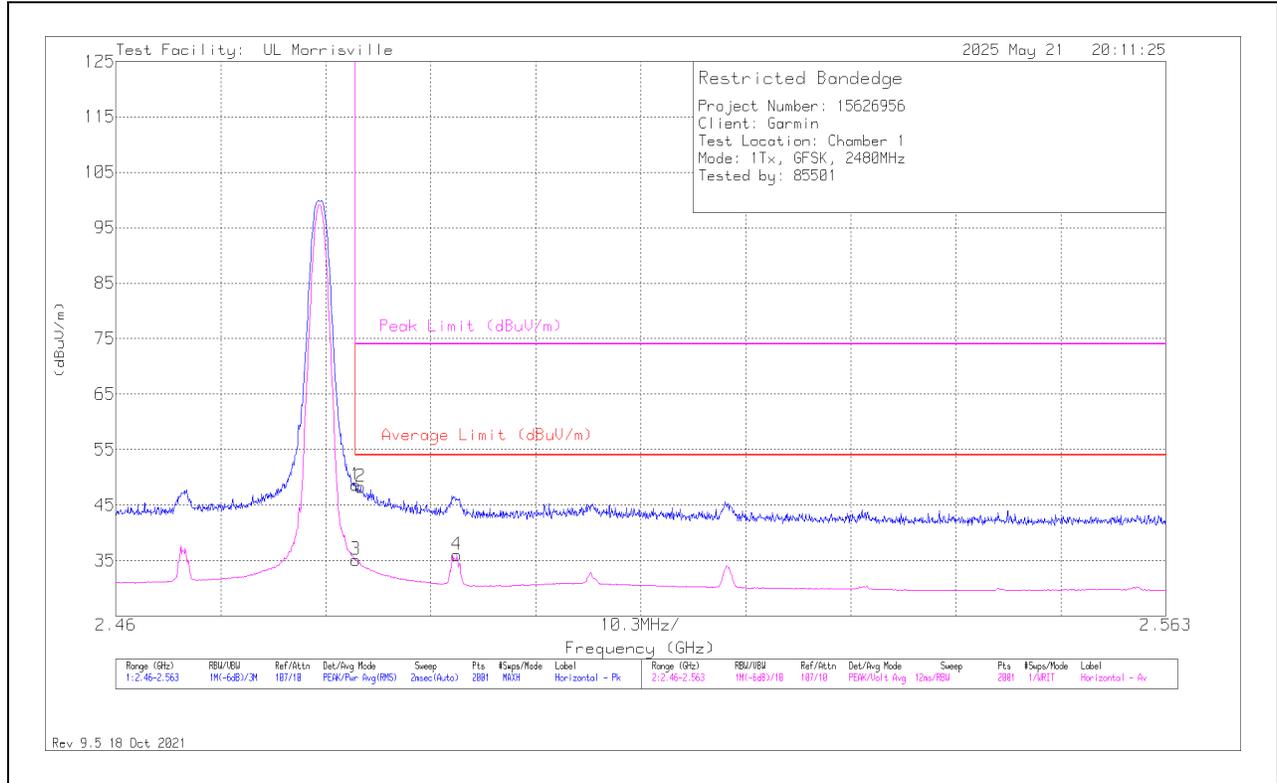


Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	135143 (dB/m)	Gain/Loss (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	*** 2.38996	36.07	Pk	31.9	-24	43.97	-	-	74	-30.03	328	114	V
2	*** 2.38933	37.35	Pk	31.9	-24	45.25	-	-	74	-28.75	328	114	V
3	*** 2.38996	22.79	VA1T	31.9	-24	30.69	54	-23.31	-	-	328	114	V
4	*** 2.36198	24.96	VA1T	31.9	-24.4	32.46	54	-21.54	-	-	328	114	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

BANDEGE (HIGH CHANNEL)

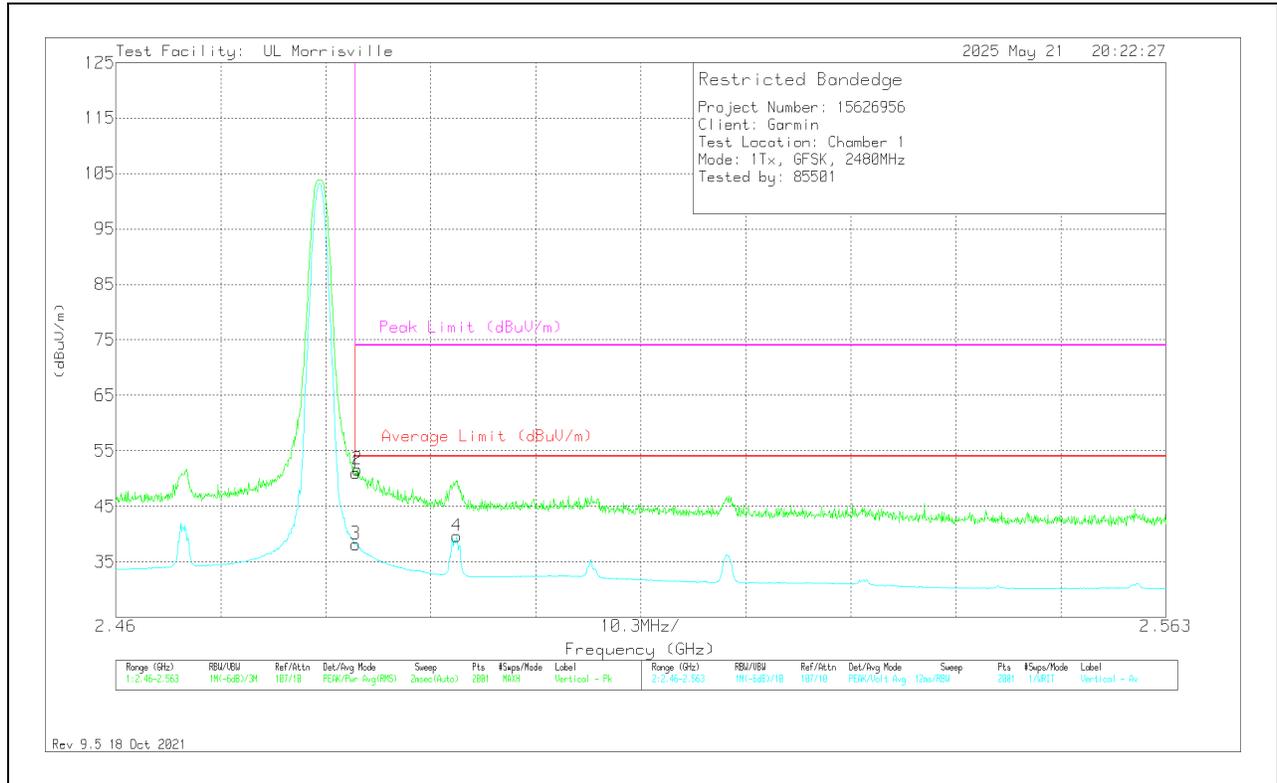
HORIZONTAL RESULT



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	135143 (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	40.09	Pk	32.2	-23.7	48.59	-	-	74	-25.41	248	116	H
2	*** 2.48405	39.92	Pk	32.2	-23.8	48.32	-	-	74	-25.68	248	116	H
3	*** 2.48354	26.64	VA1T	32.2	-23.7	35.14	54	-18.86	-	-	248	116	H
4	** 2.49342	28.11	VA1T	32.3	-24.4	36.01	54	-17.99	-	-	248	116	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

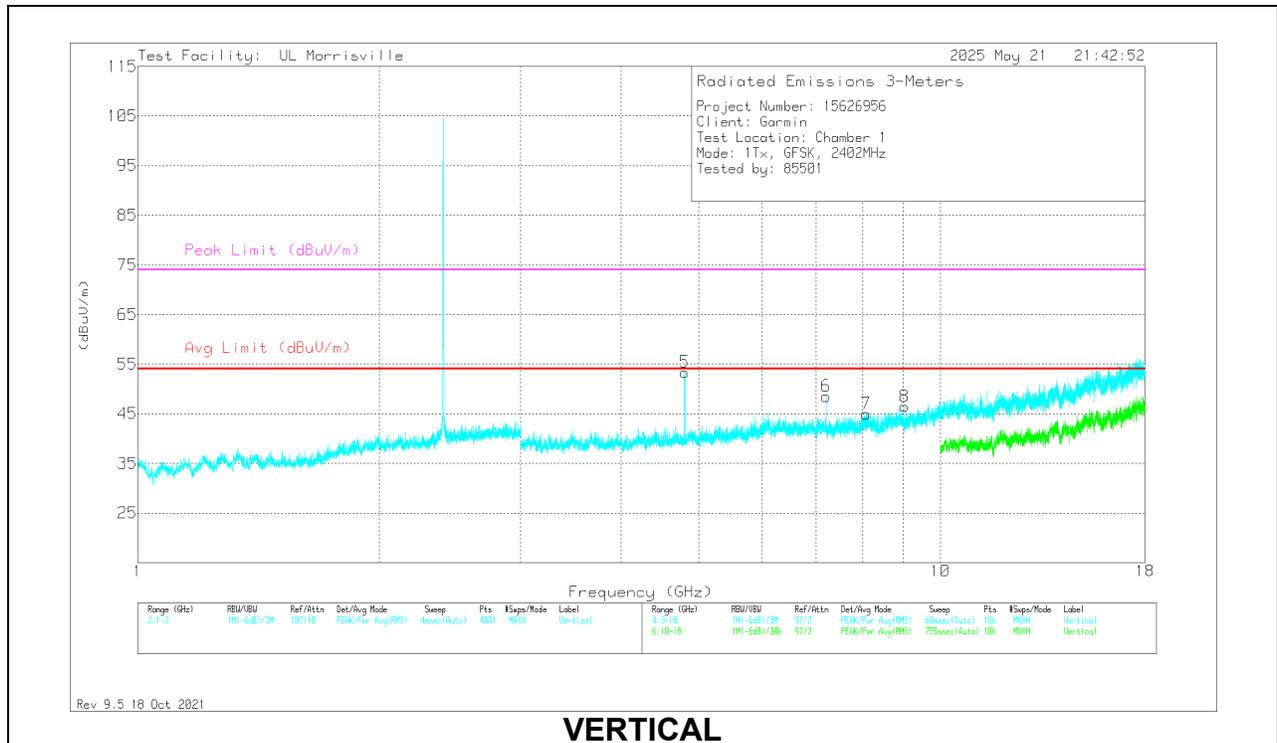
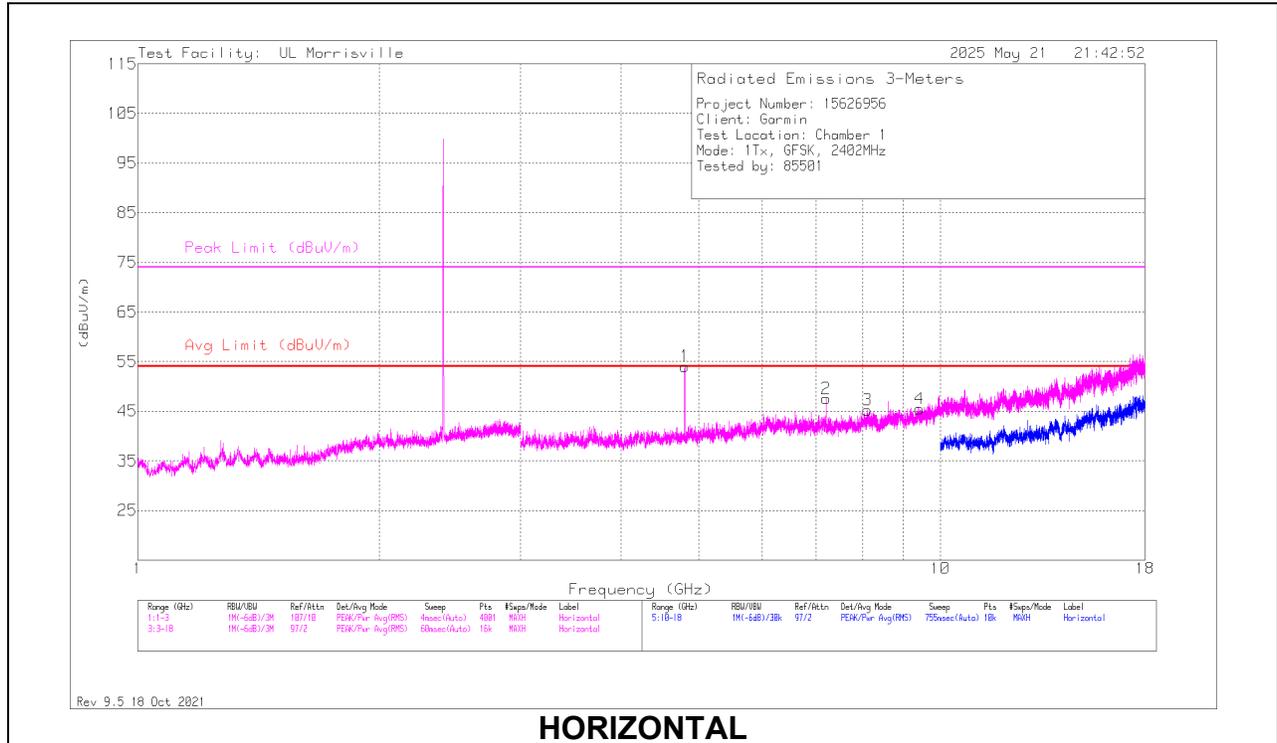


Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	135143 (dB/m)	Gain/Loss (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 2.48354	42.57	Pk	32.2	-23.7	51.07	-	-	74	-22.93	158	205	V
2	* ** 2.48369	43.17	Pk	32.2	-23.7	51.67	-	-	74	-22.33	158	205	V
3	* ** 2.48354	29.6	VA1T	32.2	-23.7	38.1	54	-15.9	-	-	158	205	V
4	* ** 2.49342	31.68	VA1T	32.3	-24.4	39.58	54	-14.42	-	-	158	205	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	135143 (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	* ** 4.80424	69.13	PK2	33.9	-45.6	57.43	-	-	74	-16.57	335	106	H
	* ** 4.80398	56.28	V1TV	33.9	-45.6	44.58	54	-9.42	-	-	335	106	H
3	* ** 8.11406	50.48	Pk	35.9	-41.2	45.18	54	-8.82	74	-28.82	0-360	200	H
4	* ** 9.42281	49.34	Pk	36.3	-40.2	45.44	54	-8.56	74	-28.56	0-360	200	H
5	* ** 4.80423	67.82	PK2	33.9	-45.6	56.12	-	-	74	-17.88	138	106	V
	* ** 4.80397	56.13	V1TV	33.9	-45.6	44.43	54	-9.57	-	-	138	106	V
7	* ** 8.08125	50.88	Pk	35.9	-41.8	44.98	54	-9.02	74	-29.02	0-360	200	V
8	* ** 9.03188	50.07	Pk	35.8	-39.4	46.47	54	-7.53	74	-27.53	0-360	101	V
2	7.20563	54.32	Pk	35.4	-42.2	47.52	-	-	-	-	0-360	200	H
6	7.20563	55.28	Pk	35.4	-42.2	48.48	-	-	-	-	0-360	200	V

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

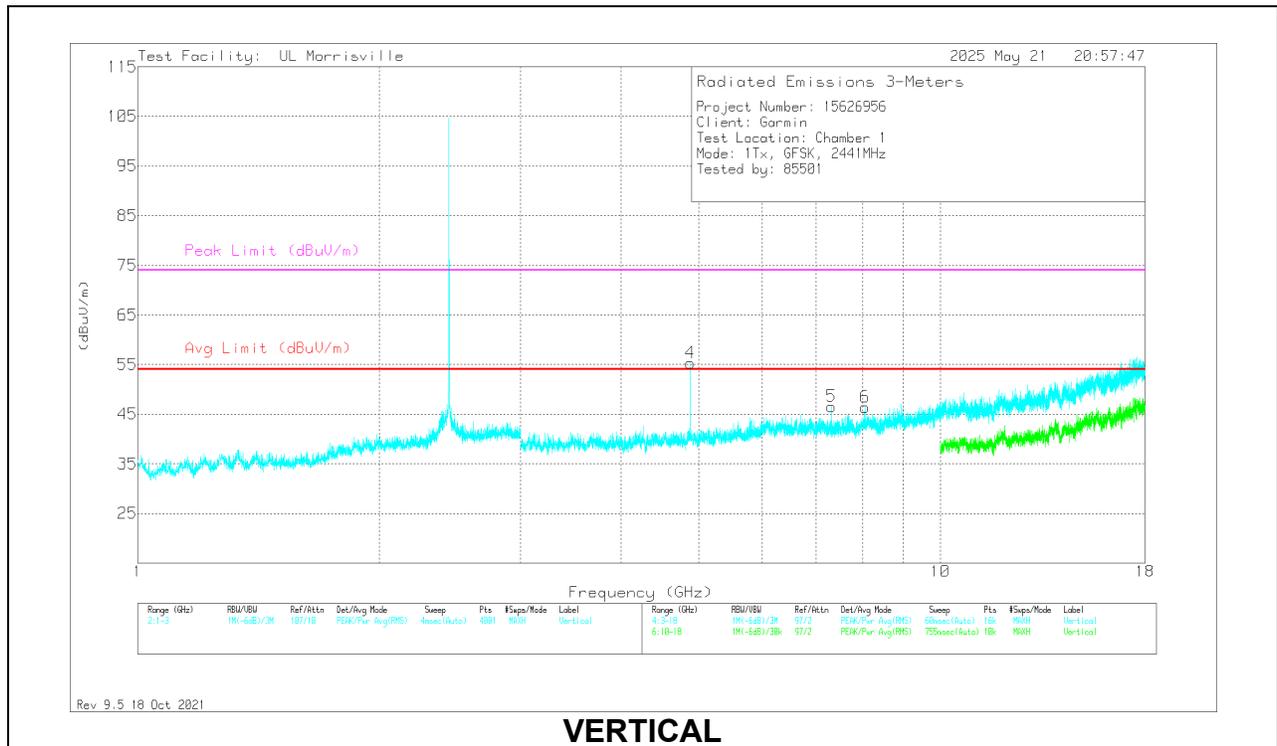
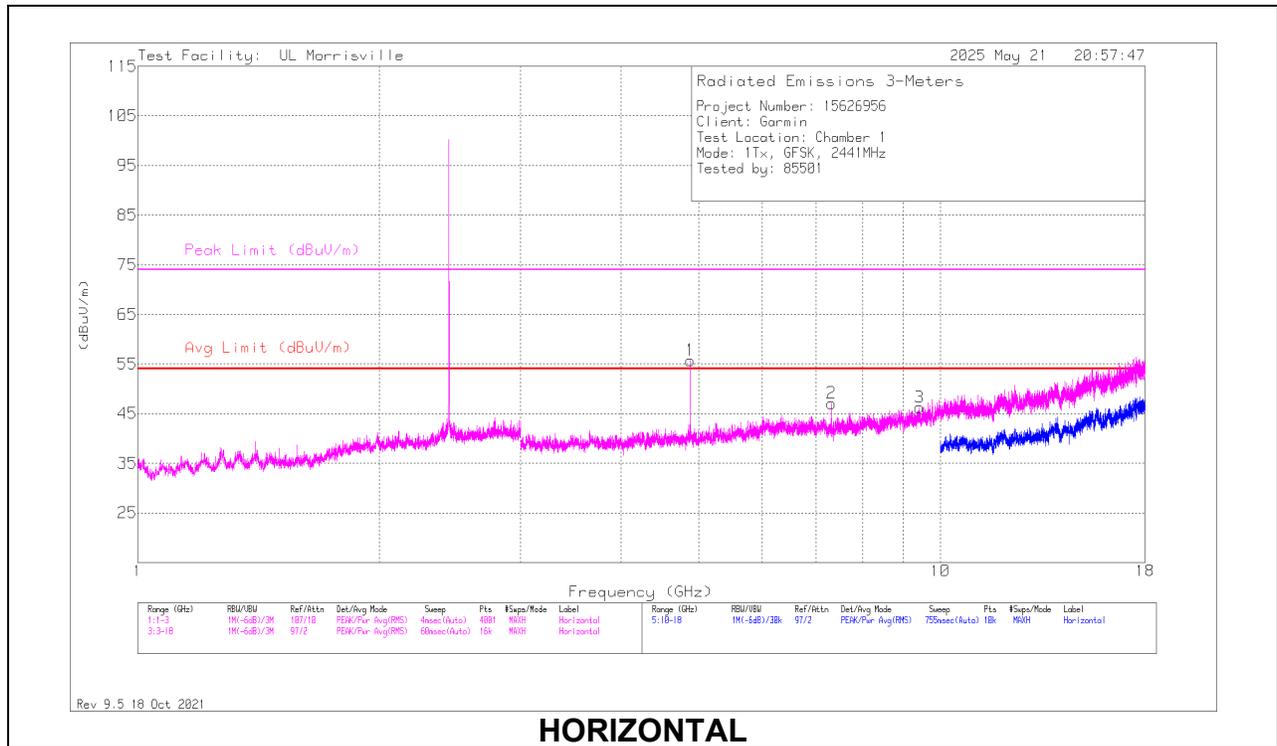
** - indicates frequency in Taiwan NCC LP0002 Restricted Band

Pk - Peak detector

PK2 - Maximum Peak

V1TV - $V_B=1/T_{on}$, Linear Voltage Average where: T_{on} is packet duration

MID CHANNEL RESULTS



RADIATED EMISSIONS

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	135143 (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	*** 4.88191	70.97	PK2	34	-44.7	60.27	-	-	74	-13.73	34	104	H
	*** 4.88199	58.64	V1TV	34	-44.7	47.94	54	-6.06	-	-	34	104	H
2	*** 7.32281	53.55	Pk	35.4	-41.9	47.05	54	-6.95	74	-26.95	0-360	200	H
3	*** 9.41625	49.52	Pk	36.3	-39.6	46.22	54	-7.78	74	-27.78	0-360	101	H
4	*** 4.88163	69.83	PK2	34	-44.7	59.13	-	-	74	-14.87	117	131	V
	*** 4.88197	57.6	V1TV	34	-44.7	46.9	54	-7.1	-	-	117	131	V
5	*** 7.32375	53.12	Pk	35.4	-42	46.52	54	-7.48	74	-27.48	0-360	101	V
6	*** 8.05406	51.16	Pk	35.9	-40.6	46.46	54	-7.54	74	-27.54	0-360	200	V

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

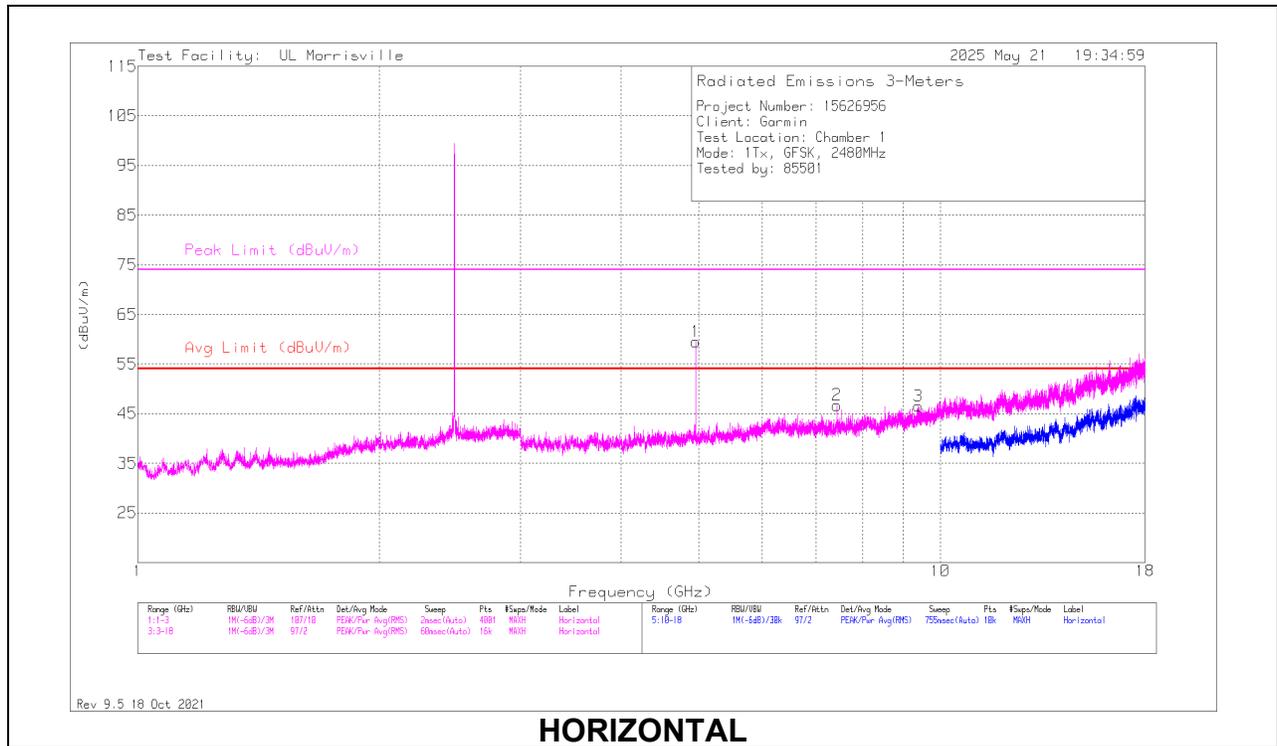
** - indicates frequency in Taiwan NCC LP0002 Restricted Band

Pk - Peak detector

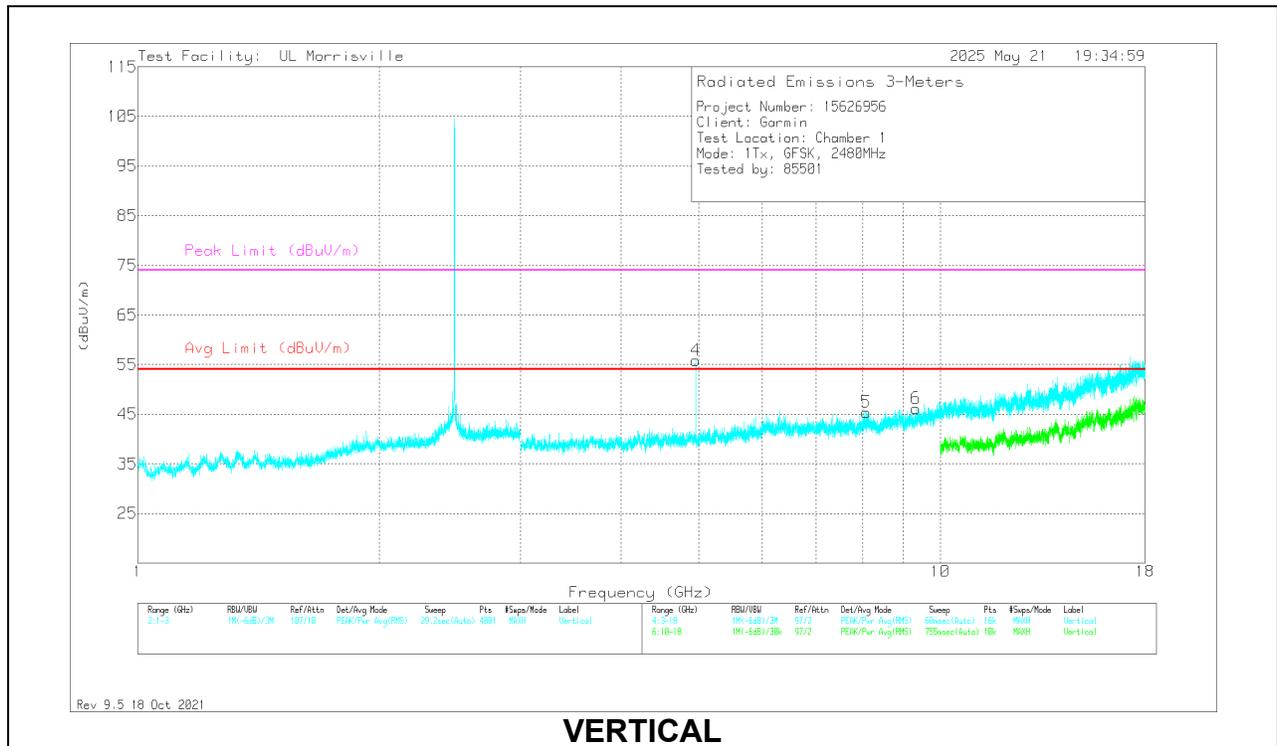
PK2 - Maximum Peak

V1TV - VB=1/Ton, Linear Voltage Average where: Ton is packet duration

HIGH CHANNEL RESULTS



HORIZONTAL



VERTICAL

RADIATED EMISSIONS

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	135143 (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	*** 4.95954	43.05	PK2	34.2	-44.8	32.45	-	-	74	-41.55	146	128	H
	*** 4.95995	58.44	V1TV	34.2	-44.8	47.84	54	-6.16	-	-	146	128	H
2	*** 7.43906	52.32	Pk	35.4	-41	46.72	54	-7.28	74	-27.28	0-360	200	H
3	*** 9.39188	50.28	Pk	36.3	-40.1	46.48	54	-7.52	74	-27.52	0-360	200	H
4	*** 4.95976	70.15	PK2	34.2	-44.8	59.55	-	-	74	-14.45	121	131	V
	*** 4.95996	57.87	V1TV	34.2	-44.8	47.27	54	-6.73	-	-	121	131	V
5	*** 8.08875	51.32	Pk	35.9	-41.9	45.32	54	-8.68	74	-28.68	0-360	200	V
6	*** 9.32344	50.46	Pk	36.2	-40.5	46.16	54	-7.84	74	-27.84	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

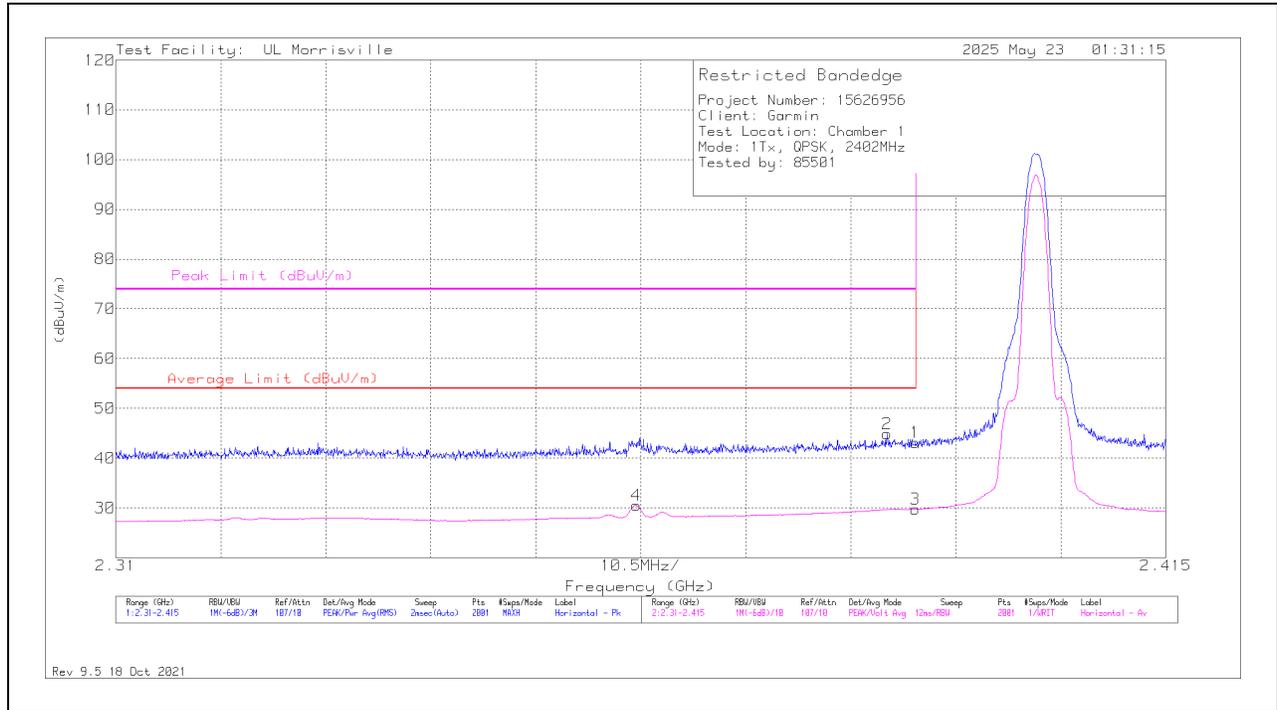
PK2 - Maximum Peak

V1TV - VB=1/Ton, Linear Voltage Average where: Ton is packet duration

10.1.3. BLUETOOTH ENHANCED DATA RATE QPSK MODULATION

BANDEDGE (LOW CHANNEL)

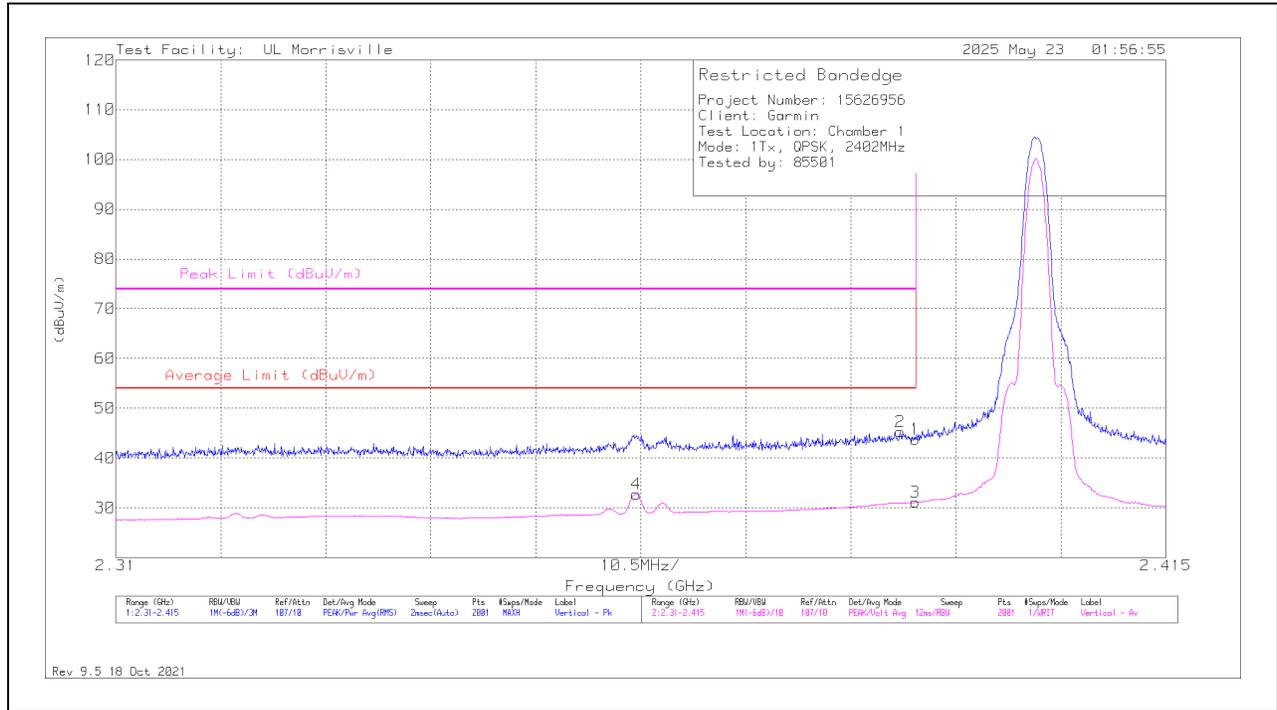
HORIZONTAL RESULT



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	135143 (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	35.2	Pk	31.9	-24	43.1	-	-	74	-30.9	290	101	H
2	*** 2.38712	36.88	Pk	31.9	-23.9	44.88	-	-	74	-29.12	290	101	H
3	*** 2.38996	21.85	VA1T	31.9	-24	29.75	54	-24.25	-	-	290	101	H
4	*** 2.36203	22.99	VA1T	31.9	-24.4	30.49	54	-23.51	-	-	290	101	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

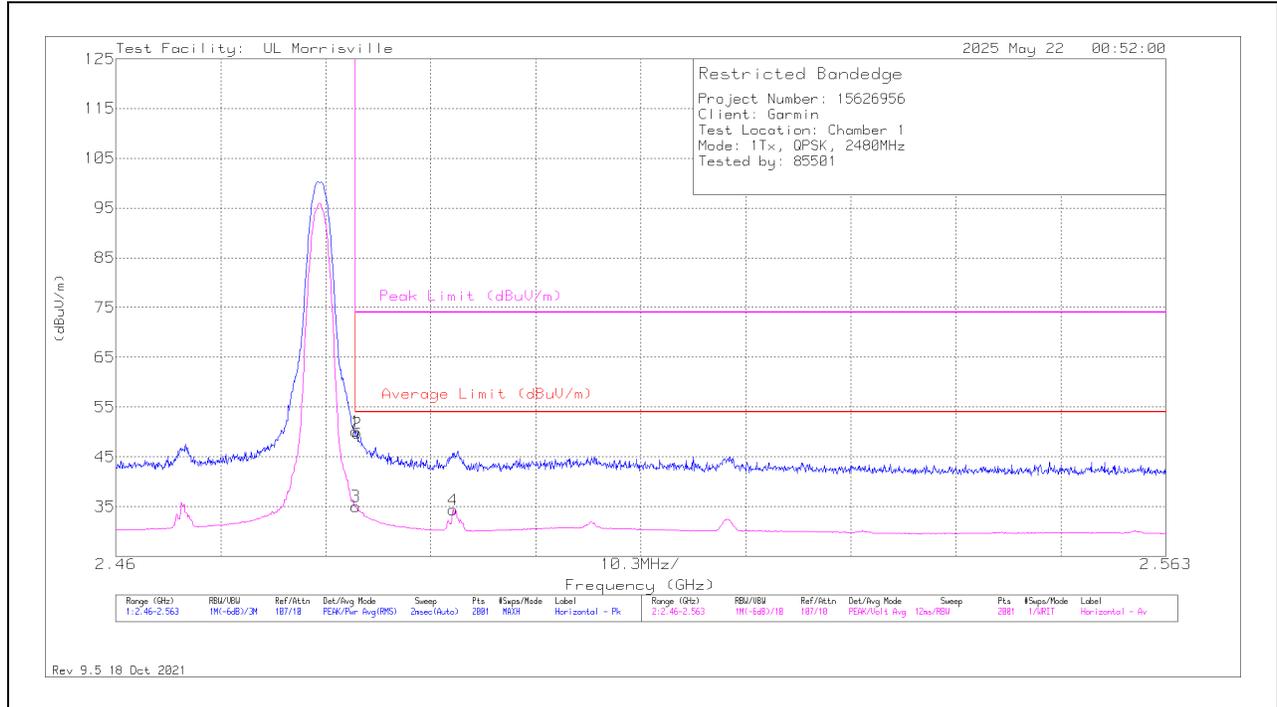


Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	135143 (dB/m)	Gain/Loss (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	*** 2.38996	35.89	Pk	31.9	-24	43.79	-	-	74	-30.21	153	161	V
2	*** 2.38844	37.35	Pk	31.9	-24	45.25	-	-	74	-28.75	153	161	V
3	*** 2.38996	23.21	VA1T	31.9	-24	31.11	54	-22.89	-	-	153	161	V
4	*** 2.36203	25.29	VA1T	31.9	-24.4	32.79	54	-21.21	-	-	153	161	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)

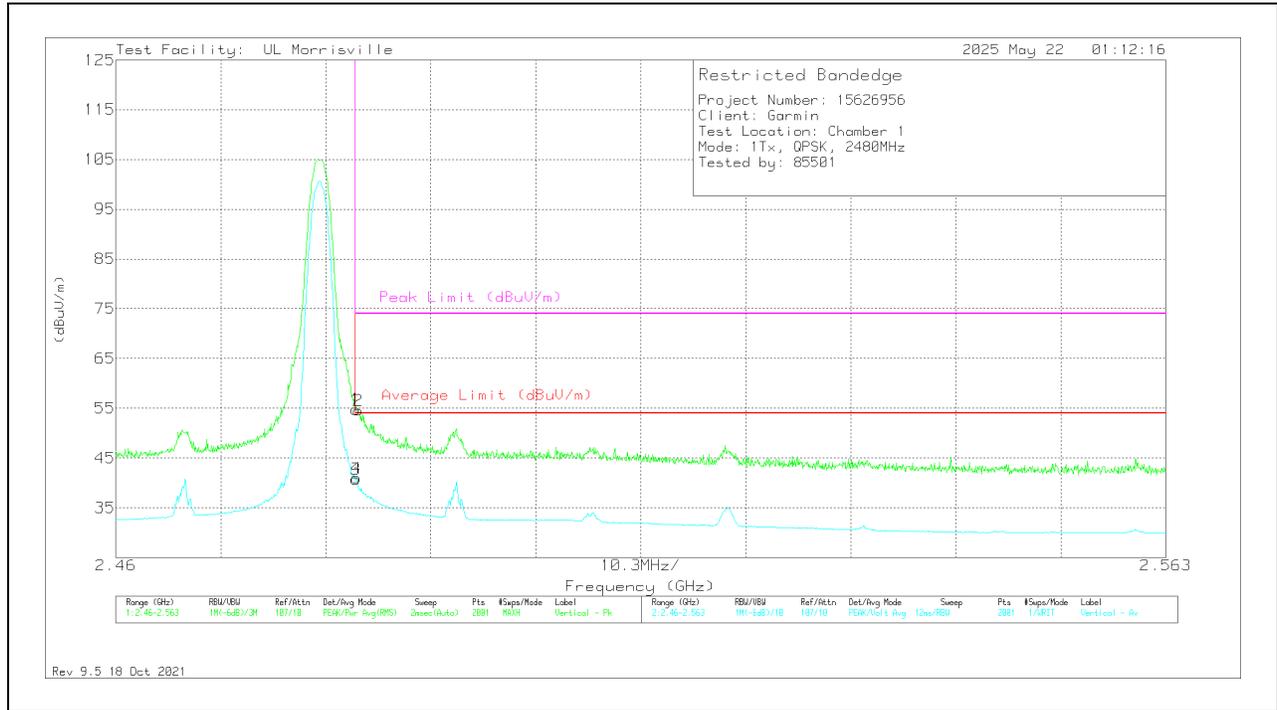
HORIZONTAL RESULT



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	135143 (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	41.59	Pk	32.2	-23.7	50.09	-	-	74	-23.91	254	155	H
2	*** 2.48369	41.22	Pk	32.2	-23.7	49.72	-	-	74	-24.28	254	155	H
3	*** 2.48354	26.54	VA1T	32.2	-23.7	35.04	54	-18.96	-	-	254	155	H
4	*** 2.49306	26.42	VA1T	32.3	-24.4	34.32	54	-19.68	-	-	254	155	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

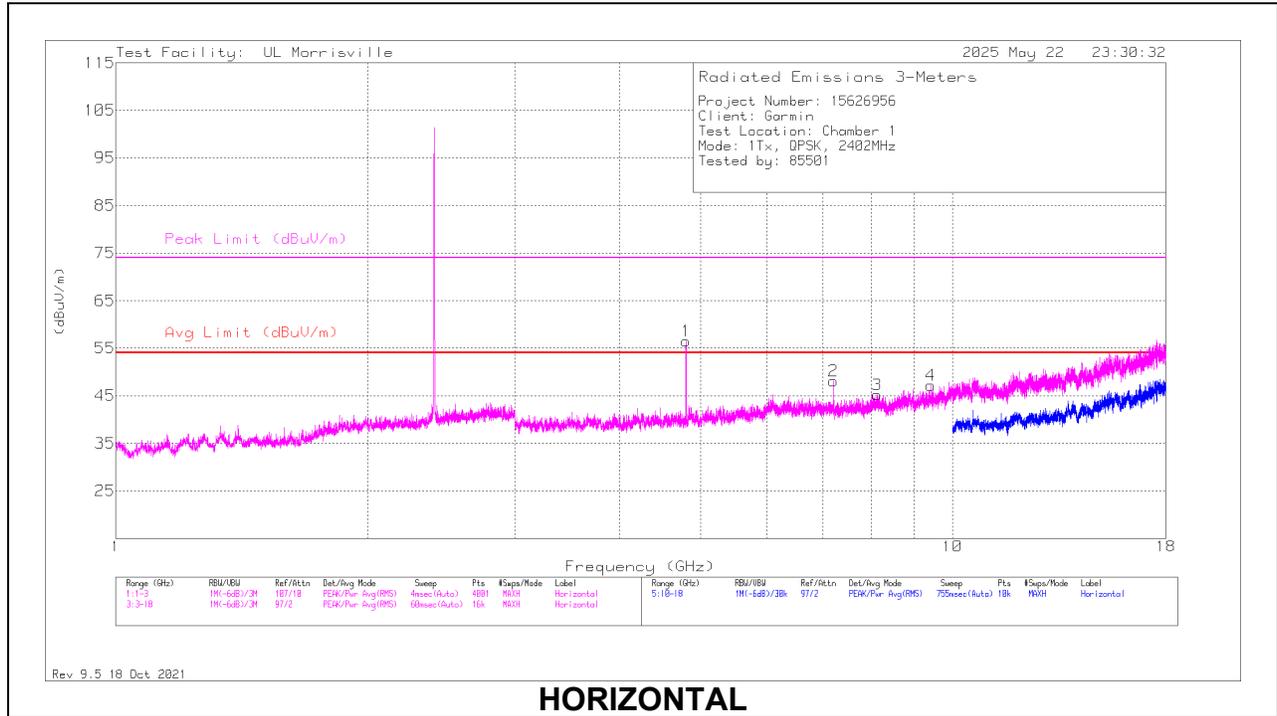


Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	135143 (dB/m)	Gain/Loss (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	*** 2.48354	46.29	Pk	32.2	-23.7	54.79	-	-	74	-19.21	157	291	V
2	*** 2.48379	46.09	Pk	32.2	-23.7	54.59	-	-	74	-19.41	157	291	V
3	*** 2.48354	32.3	VA1T	32.2	-23.7	40.8	54	-13.2	-	-	157	291	V
4	*** 2.48359	32.46	VA1T	32.2	-23.7	40.96	54	-13.04	-	-	157	291	V

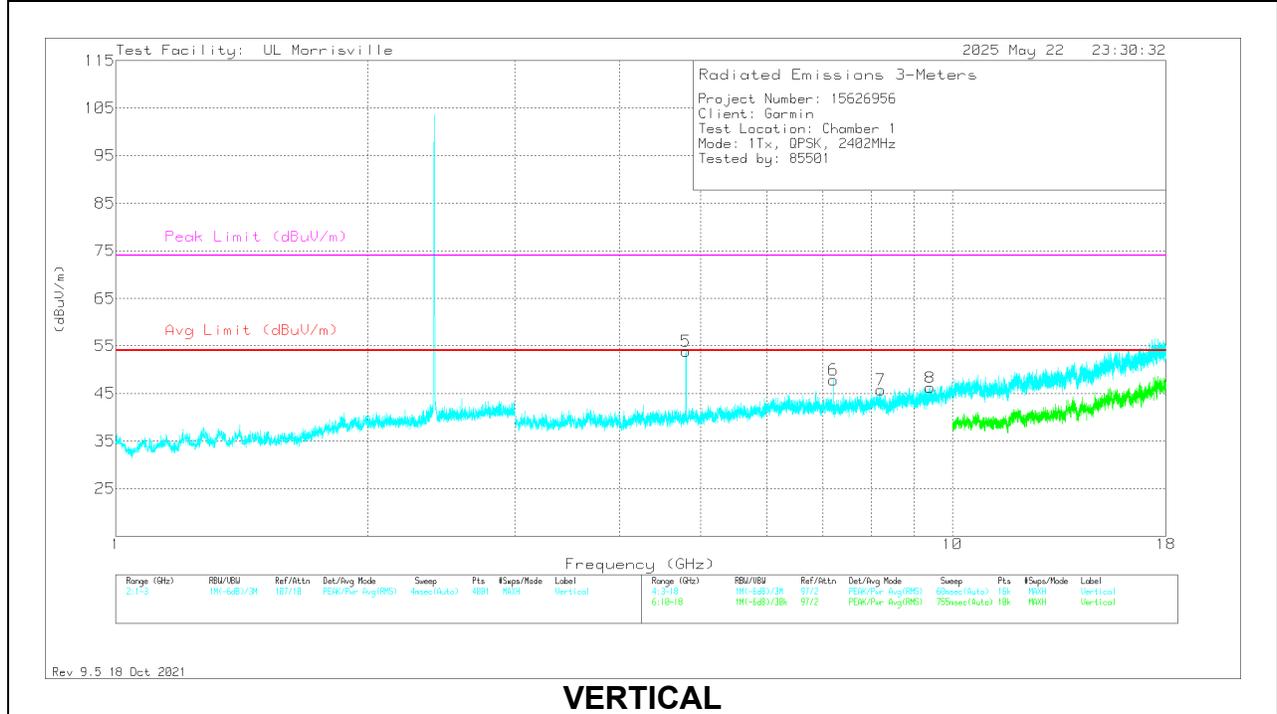
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
 ** - indicates frequency in Taiwan NCC LP0002 Restricted Band
 Pk - Peak detector
 VA1T - Linear Voltage Average VB=1/Ton where: Ton is transmit duration

HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL RESULTS



HORIZONTAL



VERTICAL

RADIATED EMISSIONS

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	135143 (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	*** 4.80365	71.34	PK2	33.9	-45.6	59.64	-	-	74	-14.36	242	101	H
	*** 4.80399	54.64	V1TV	33.9	-45.6	42.94	54	-11.06	-	-	242	101	H
3	*** 8.13	50.48	Pk	35.9	-41.2	45.18	54	-8.82	74	-28.82	0-360	200	H
4	*** 9.41719	50.62	Pk	36.3	-39.7	47.22	54	-6.78	74	-26.78	0-360	200	H
5	*** 4.80362	69.38	PK2	33.9	-45.6	57.68	-	-	74	-16.32	70	105	V
	*** 4.80395	53.13	V1TV	33.9	-45.6	41.43	54	-12.57	-	-	70	105	V
7	*** 8.21719	50.71	Pk	35.9	-40.9	45.71	54	-8.29	74	-28.29	0-360	101	V
8	*** 9.41344	49.92	Pk	36.3	-40	46.22	54	-7.78	74	-27.78	0-360	101	V
2	7.20563	54.95	Pk	35.4	-42.2	48.15	-	-	-	-	0-360	200	H
6	7.20656	54.64	Pk	35.4	-42.2	47.84	-	-	-	-	0-360	101	V

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

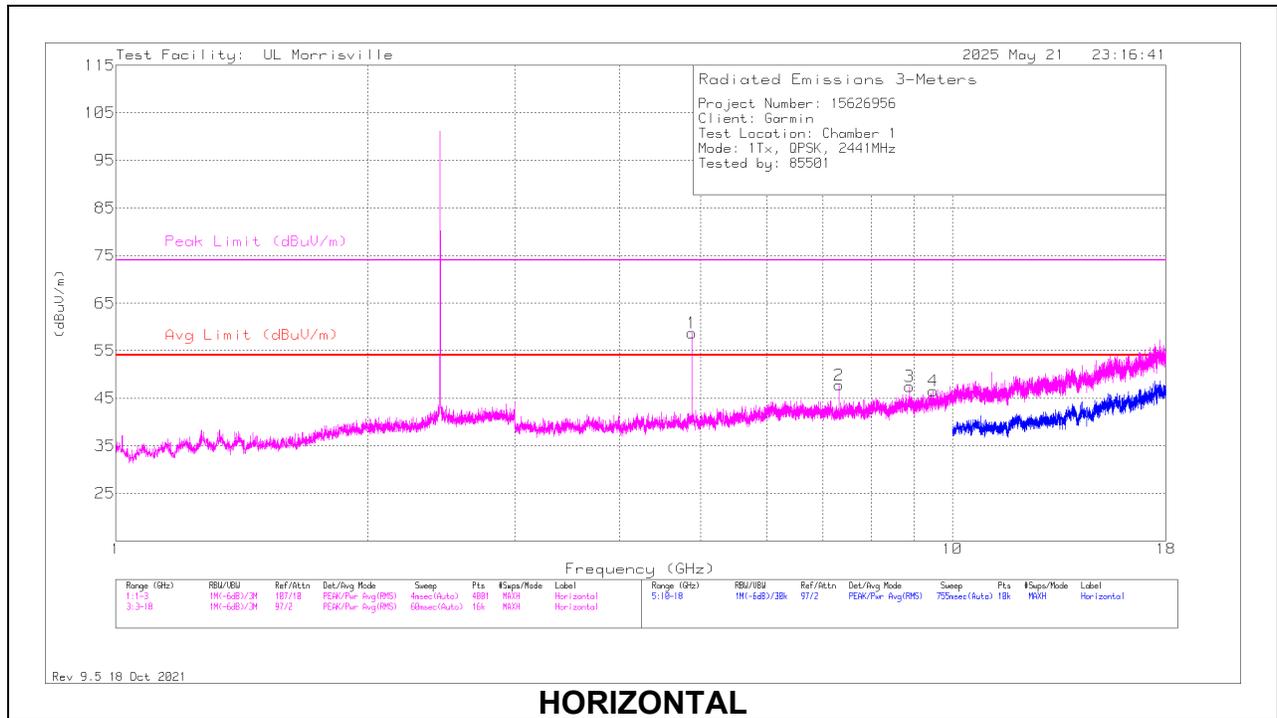
** - indicates frequency in Taiwan NCC LP0002 Restricted Band

Pk - Peak detector

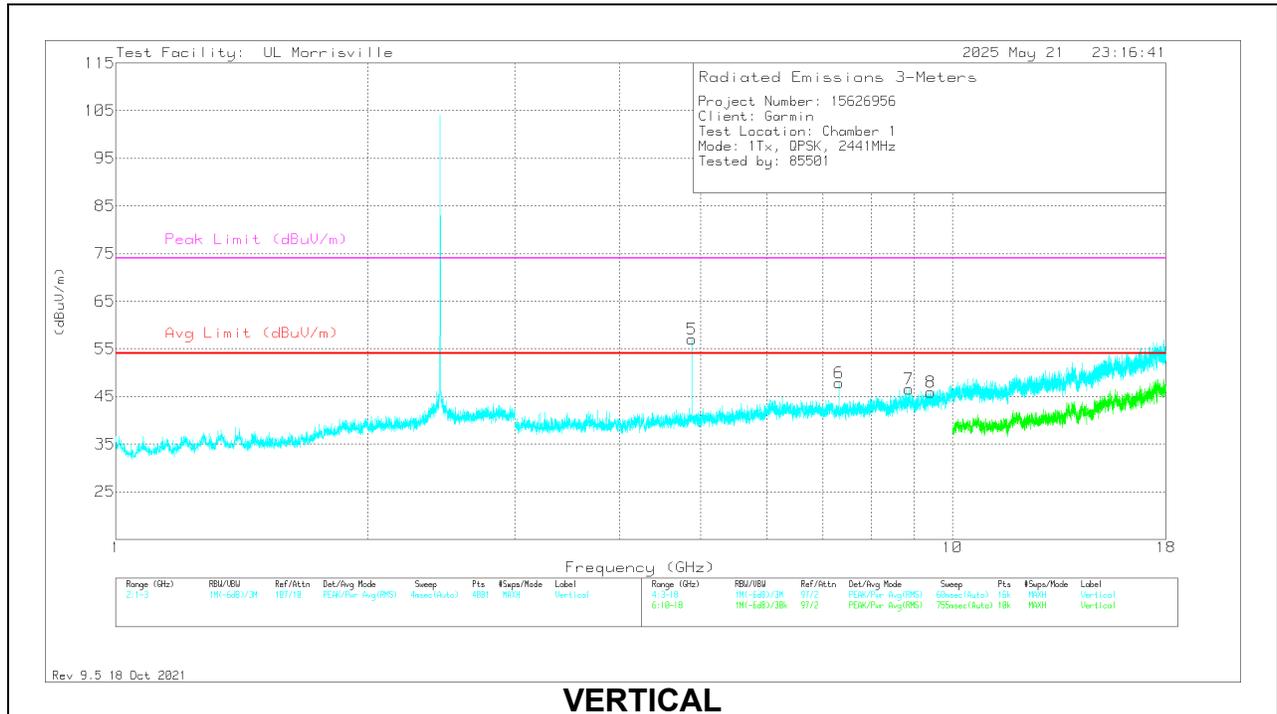
PK2 - Maximum Peak

V1TV - $V_B=1/T_{on}$, Linear Voltage Average where: T_{on} is packet duration

MID CHANNEL RESULTS



HORIZONTAL



VERTICAL

RADIATED EMISSIONS

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	135143 (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	* ** 4.88205	45.89	PK2	34	-44.7	35.19	-	-	74	-38.81	237	101	H
	* ** 4.88197	55.66	V1TV	34	-44.7	44.96	54	-9.04	-	-	237	101	H
2	* ** 7.32375	54.38	Pk	35.4	-42	47.78	54	-6.22	74	-26.22	0-360	101	H
4	* ** 9.49313	50.5	Pk	36.4	-40.4	46.5	54	-7.5	74	-27.5	0-360	200	H
5	* ** 4.88216	69.96	PK2	34	-44.7	59.26	-	-	74	-14.74	138	381	V
	* ** 4.88198	53.01	V1TV	34	-44.7	42.31	54	-11.69	-	-	138	381	V
6	* ** 7.32281	54.36	Pk	35.4	-41.9	47.86	54	-6.14	74	-26.14	0-360	200	V
8	* ** 9.41625	49.24	Pk	36.3	-39.6	45.94	54	-8.06	74	-28.06	0-360	200	V
7	8.87813	50.65	Pk	35.8	-39.9	46.55	-	-	-	-	0-360	101	V
3	8.8875	51.23	Pk	35.8	-39.6	47.43	-	-	-	-	0-360	101	H

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

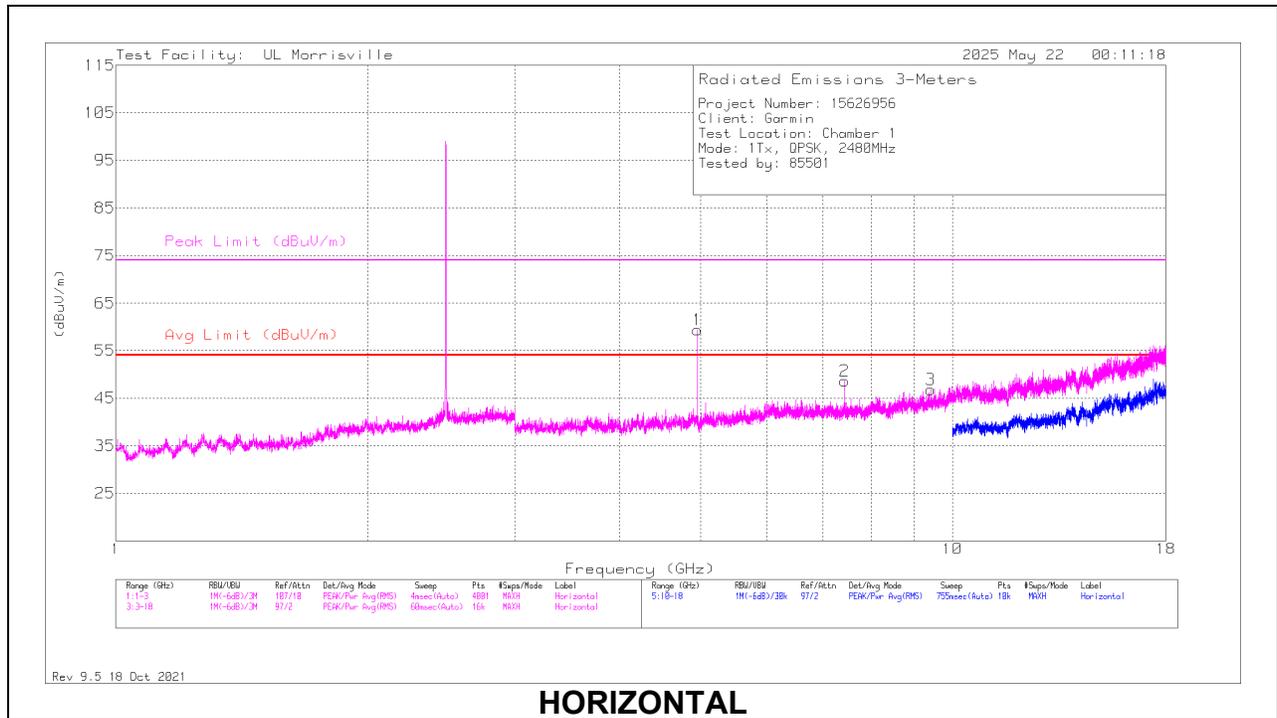
** - indicates frequency in Taiwan NCC LP0002 Restricted Band

Pk - Peak detector

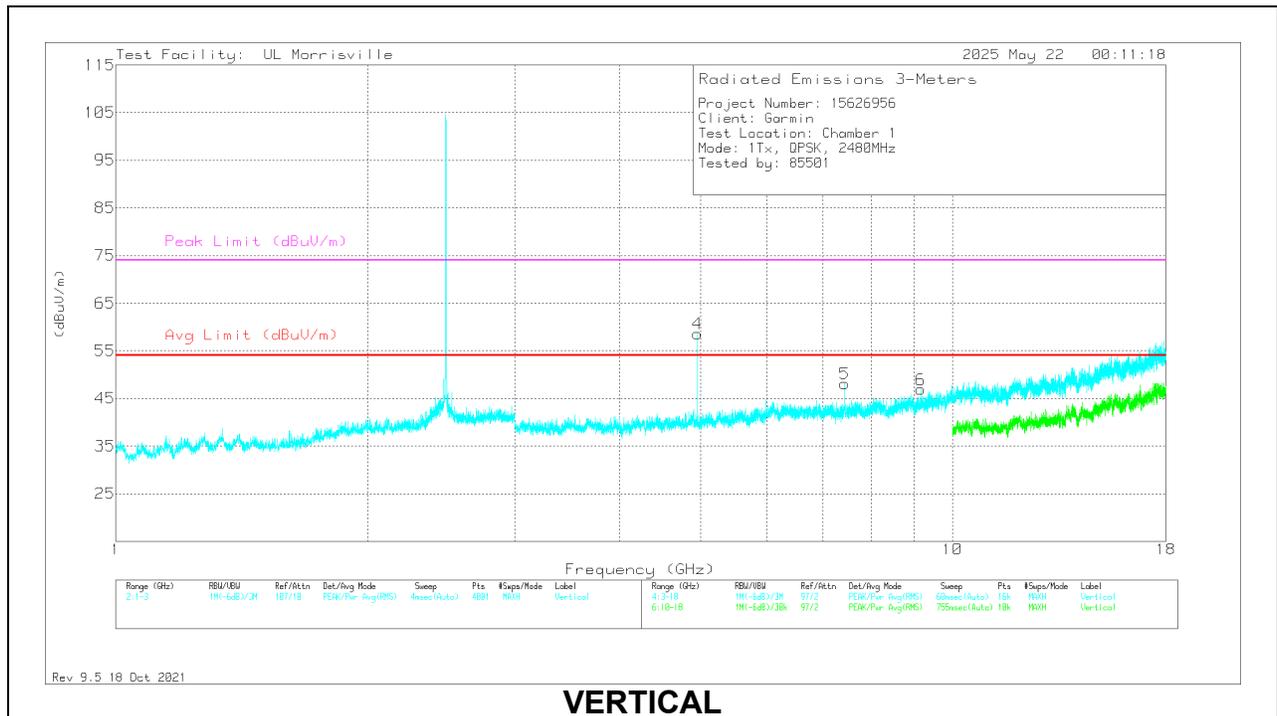
PK2 - Maximum Peak

V1TV - VB=1/Ton, Linear Voltage Average where: Ton is packet duration

HIGH CHANNEL RESULTS



HORIZONTAL



VERTICAL

RADIATED EMISSIONS

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	135143 (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	*** 4.95957	73.56	PK2	34.2	-44.8	62.96	-	-	74	-11.04	269	106	H
	*** 4.95997	56.26	V1TV	34.2	-44.8	45.66	54	-8.34	-	-	269	106	H
2	*** 7.43964	56.52	PK2	35.4	-41.1	50.82	-	-	74	-23.18	55	132	H
	*** 7.43995	42.61	V1TV	35.4	-41.1	36.91	54	-17.09	-	-	55	132	H
3	*** 9.41625	50.13	PK	36.3	-39.6	46.83	54	-7.17	74	-27.17	0-360	101	H
4	*** 4.95965	72.94	PK2	34.2	-44.8	62.34	-	-	74	-11.66	121	120	V
	*** 4.95995	55.6	V1TV	34.2	-44.8	45	54	-9	-	-	121	120	V
5	*** 7.43961	56.45	PK2	35.4	-41.1	50.75	-	-	74	-23.25	174	110	V
	*** 7.43998	42.35	V1TV	35.4	-41.1	36.65	54	-17.35	-	-	174	110	V
6	*** 9.16875	51.07	PK	36	-40.2	46.87	54	-7.13	74	-27.13	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

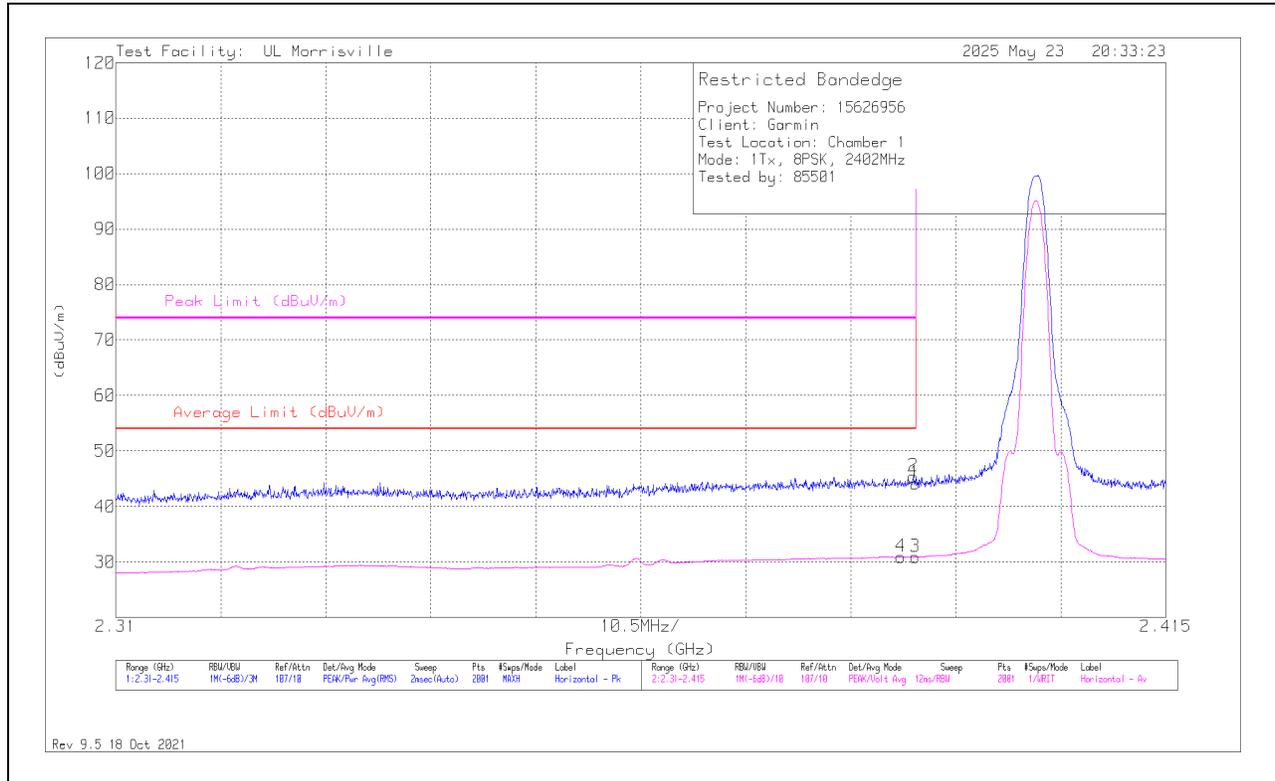
PK2 - Maximum Peak

V1TV - VB=1/Ton, Linear Voltage Average where: Ton is packet duration

10.1.4. BLUETOOTH ENHANCED DATA RATE 8PSK MODULATION

BANDEDGE (LOW CHANNEL)

HORIZONTAL RESULT



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	135143 (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	36.24	Pk	31.9	-24	44.14	-	-	74	-29.86	203	131	H
2	*** 2.38975	37.46	Pk	31.9	-24	45.36	-	-	74	-28.64	203	131	H
3	*** 2.38996	22.95	VA1T	31.9	-24	30.85	54	-23.15	-	-	203	131	H
4	*** 2.38849	22.98	VA1T	31.9	-24	30.88	54	-23.12	-	-	203	131	H

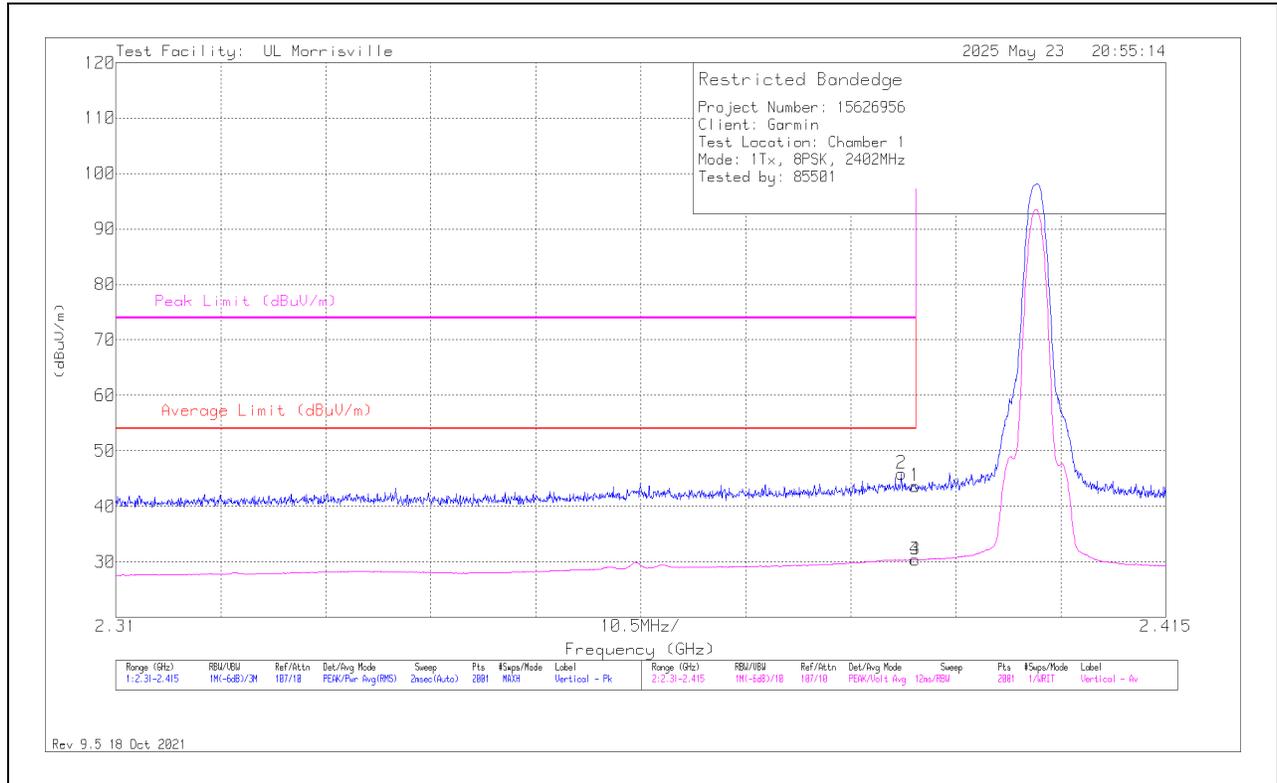
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

** - 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	135143 (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	35.8	Pk	31.9	-24	43.7	-	-	74	-30.3	119	177	V
2	*** 2.38854	38.01	Pk	31.9	-24	45.91	-	-	74	-28.09	119	177	V
3	*** 2.38996	22.43	VA1T	31.9	-24	30.33	54	-23.67	-	-	119	177	V
4	*** 2.38991	22.45	VA1T	31.9	-24	30.35	54	-23.65	-	-	119	177	V

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

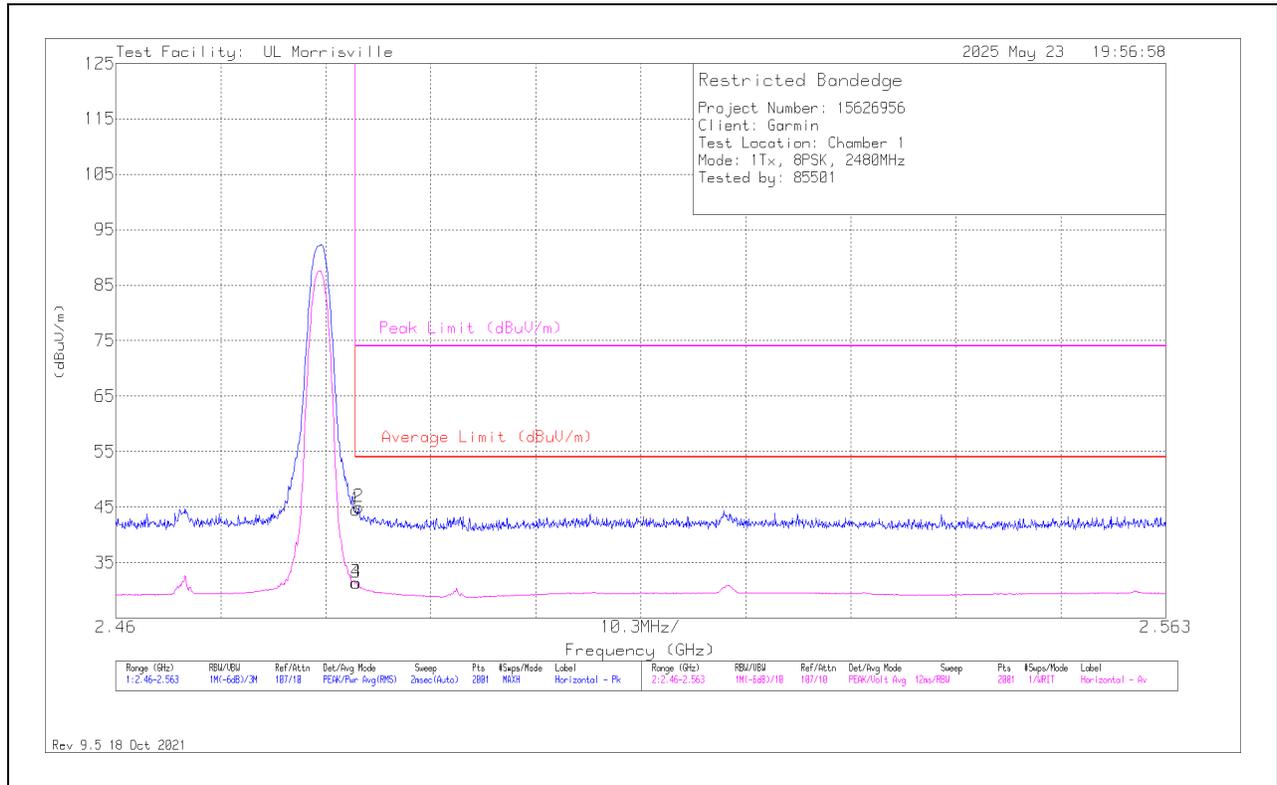
** - indicates frequency in Taiwan NCC LP0002 Restricted Band

Pk - Peak detector

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

BANDEDGE (HIGH CHANNEL)

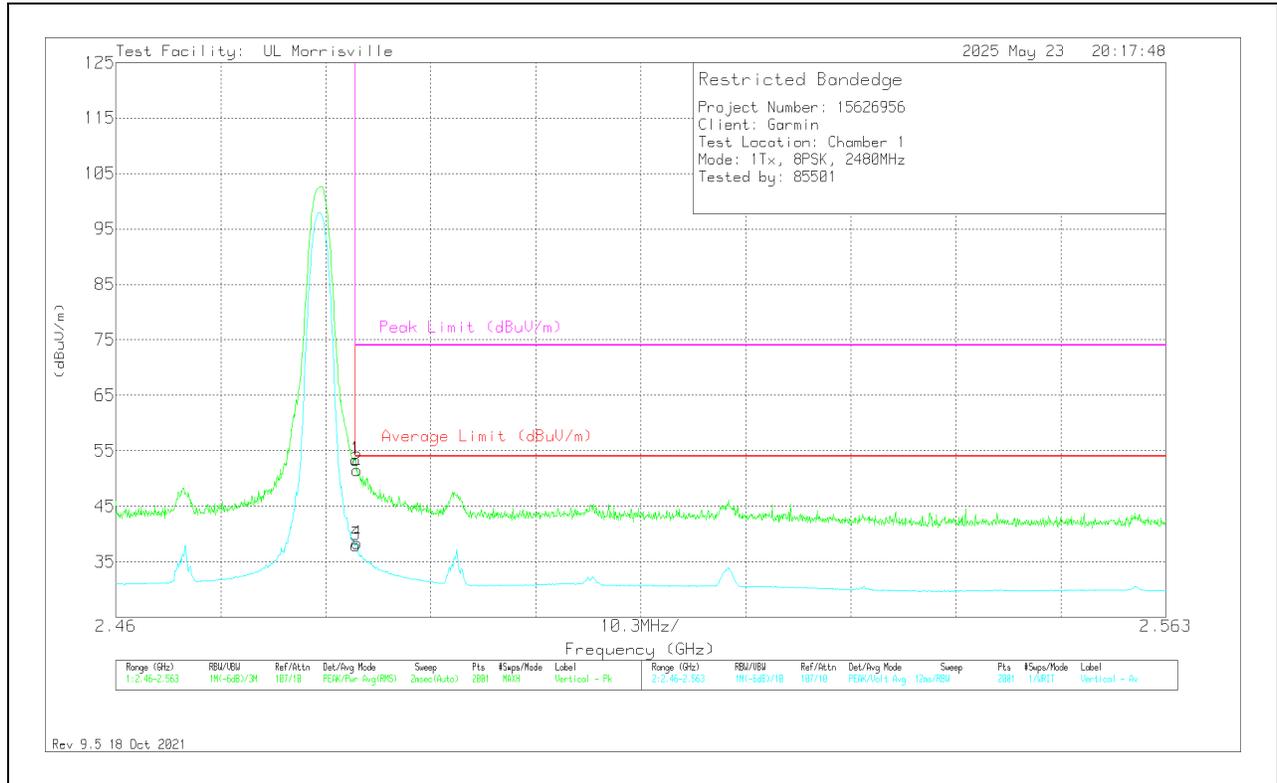
HORIZONTAL RESULT



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	135143 (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	35.98	Pk	32.2	-23.7	44.48	-	-	74	-29.52	242	299	H
2	*** 2.48384	36.51	Pk	32.2	-23.7	45.01	-	-	74	-28.99	242	299	H
3	*** 2.48354	22.84	VA1T	32.2	-23.7	31.34	54	-22.66	-	-	242	299	H
4	*** 2.48359	22.91	VA1T	32.2	-23.7	31.41	54	-22.59	-	-	242	299	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

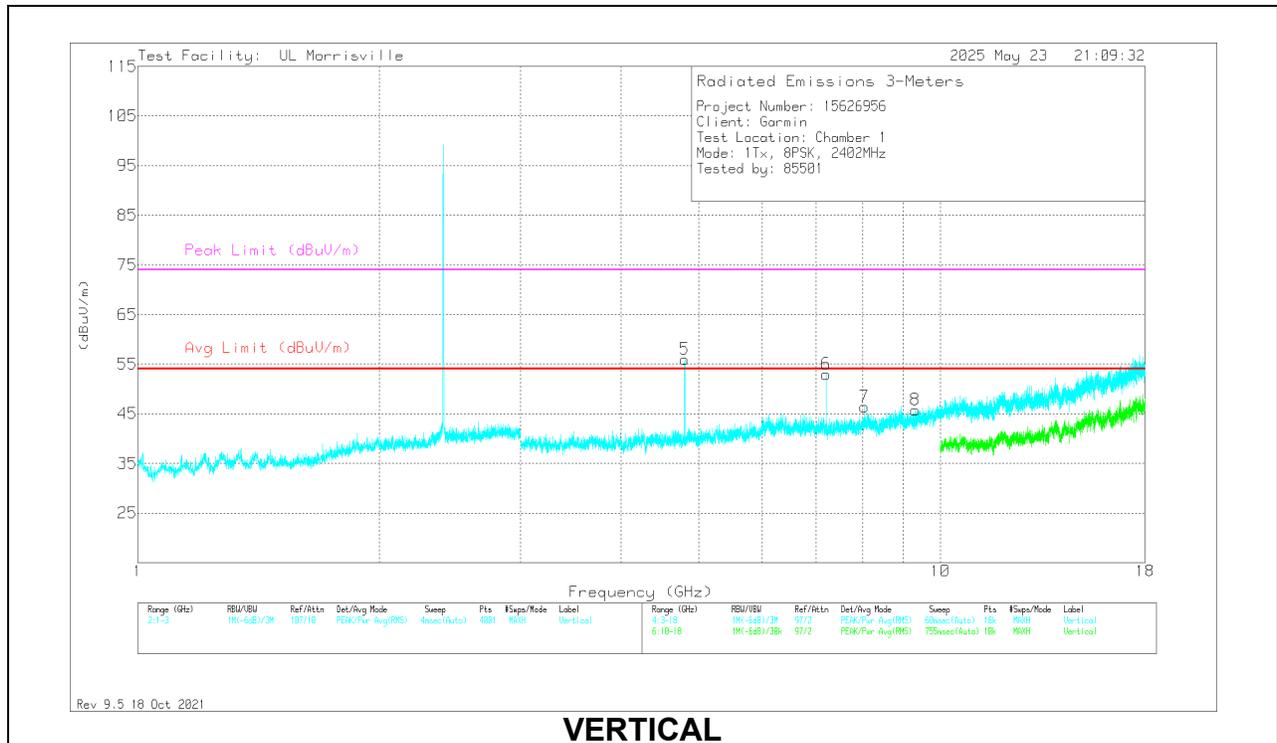
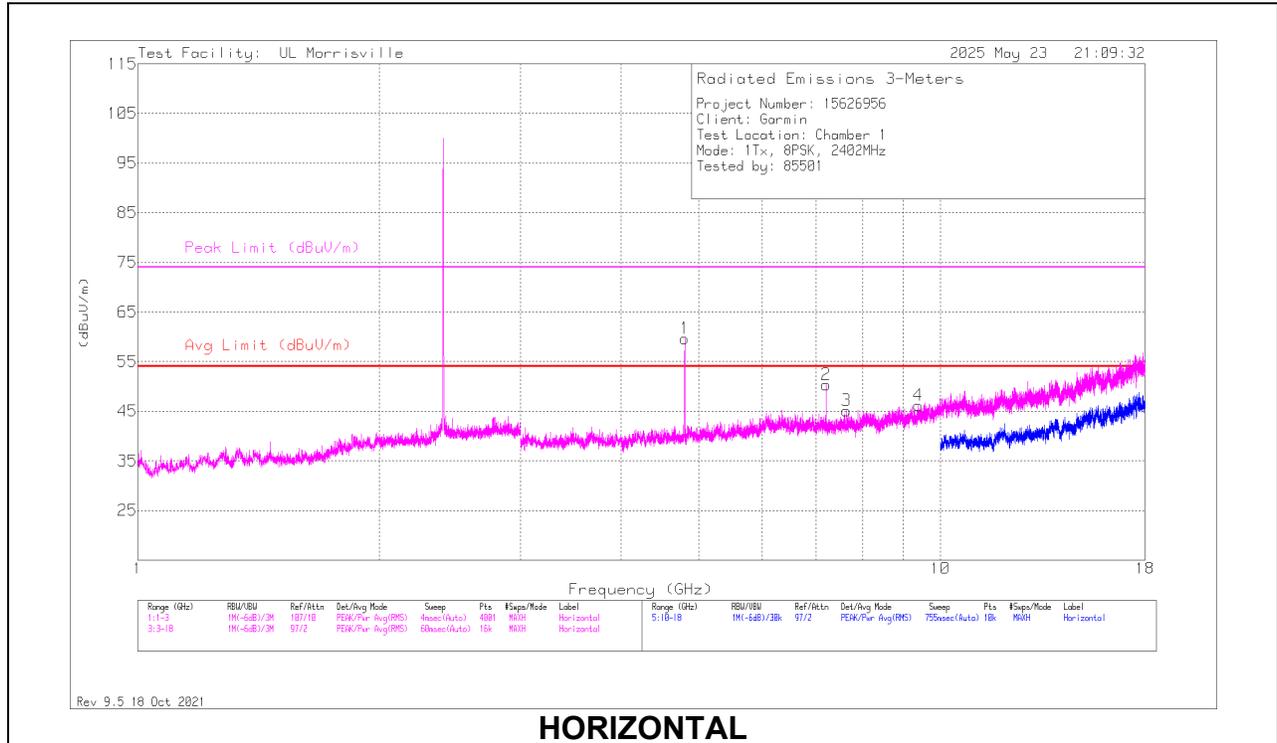


Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	135143 (dB/m)	Gain/Loss (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	*** 2.48354	44.87	Pk	32.2	-23.7	53.37	-	-	74	-20.63	100	274	V
2	*** 2.48364	43.05	Pk	32.2	-23.7	51.55	-	-	74	-22.45	100	274	V
3	*** 2.48354	29.51	VA1T	32.2	-23.7	38.01	54	-15.99	-	-	100	274	V
4	*** 2.48364	29.83	VA1T	32.2	-23.7	38.33	54	-15.67	-	-	100	274	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	135143 (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	*** 4.8041	53.29	PK2	33.9	-45.6	41.59	-	-	74	-32.41	300	126	H
	*** 4.80398	57.38	V1TV	33.9	-45.6	45.68	54	-8.32	-	-	300	126	H
3	*** 7.64344	50.95	Pk	35.6	-41.4	45.15	54	-8.85	74	-28.85	0-360	199	H
4	*** 9.39	50.12	Pk	36.2	-40.2	46.12	54	-7.88	74	-27.88	0-360	101	H
5	*** 4.80402	71.37	PK2	33.9	-45.6	59.67	-	-	74	-14.33	259	106	V
	*** 4.80398	53.23	V1TV	33.9	-45.6	41.53	54	-12.47	-	-	259	106	V
7	*** 8.0475	51.43	Pk	35.9	-40.9	46.43	54	-7.57	74	-27.57	0-360	200	V
8	*** 9.31406	49.91	Pk	36.1	-40.2	45.81	54	-8.19	74	-28.19	0-360	101	V
2	7.20563	57.13	Pk	35.4	-42.2	50.33	-	-	-	-	0-360	199	H
6	7.20563	59.73	Pk	35.4	-42.2	52.93	-	-	-	-	0-360	200	V

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

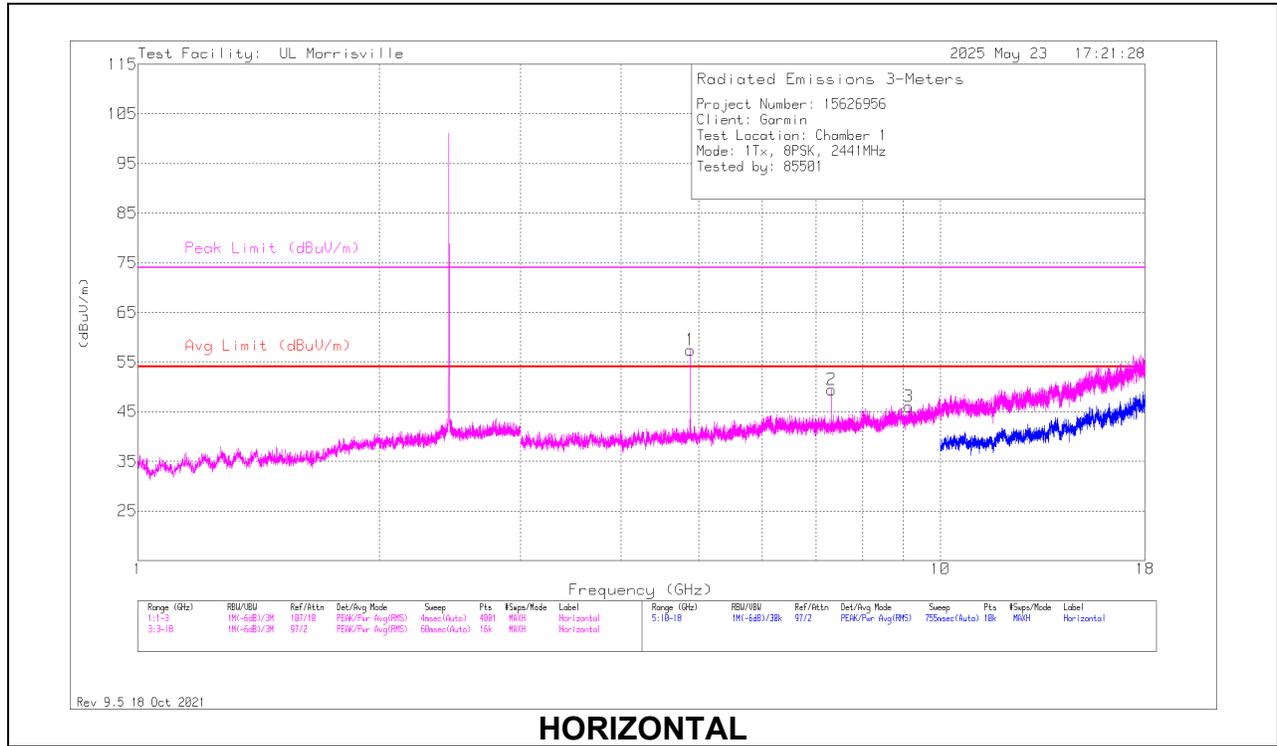
** - indicates frequency in Taiwan NCC LP0002 Restricted Band

Pk - Peak detector

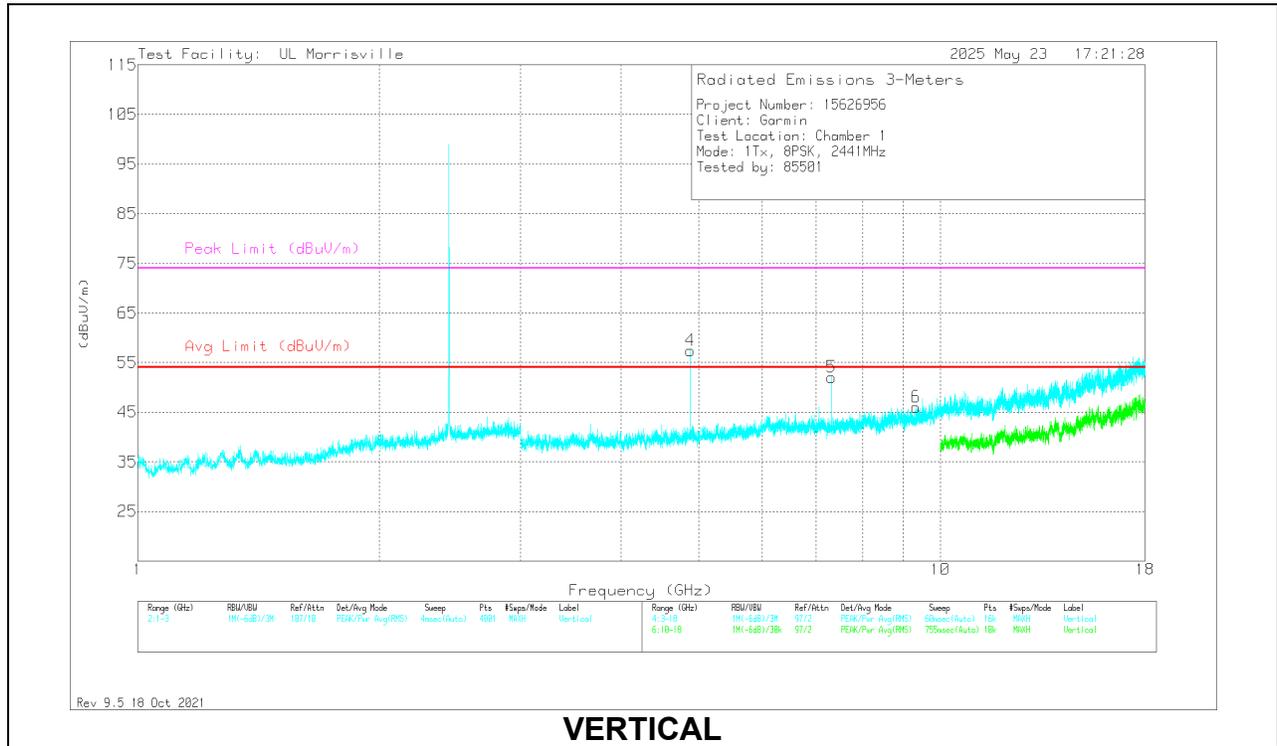
PK2 - Maximum Peak

V1TV - $V_B=1/T_{on}$, Linear Voltage Average where: T_{on} is packet duration

MID CHANNEL RESULTS



HORIZONTAL



VERTICAL

RADIATED EMISSIONS

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	135143 (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	* ** 4.882	73.97	PK2	34	-44.7	63.27	-	-	74	-10.73	310	121	H
	* ** 4.88195	55.85	V1TV	34	-44.7	45.15	54	-8.85	-	-	310	121	H
2	* ** 7.32358	58.21	PK2	35.4	-42	51.61	-	-	74	-22.39	150	159	H
	* ** 7.32298	43.48	V1TV	35.4	-41.9	36.98	54	-17.02	-	-	150	159	H
3	* ** 9.14344	50.61	Pk	35.9	-40.5	46.01	54	-7.99	74	-27.99	0-360	101	H
4	* ** 4.88222	71.36	PK2	34	-44.7	60.66	-	-	74	-13.34	123	214	V
	* ** 4.88195	54	V1TV	34	-44.7	43.3	54	-10.7	-	-	123	214	V
5	* ** 7.3234	60.84	PK2	35.4	-42	54.24	-	-	74	-19.76	110	127	V
	* ** 7.32299	46.01	V1TV	35.4	-41.9	39.51	54	-14.49	-	-	110	127	V
6	* ** 9.33375	50.27	Pk	36.2	-40.5	45.97	54	-8.03	74	-28.03	0-360	101	V

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

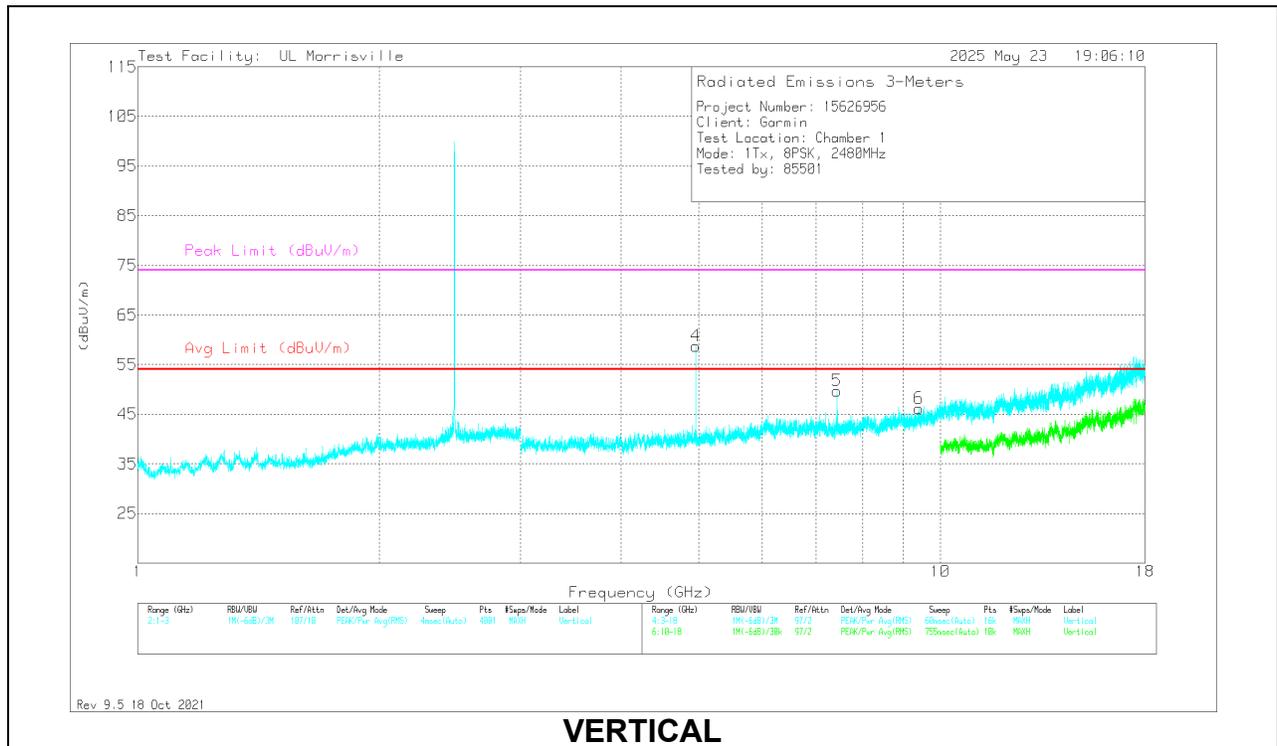
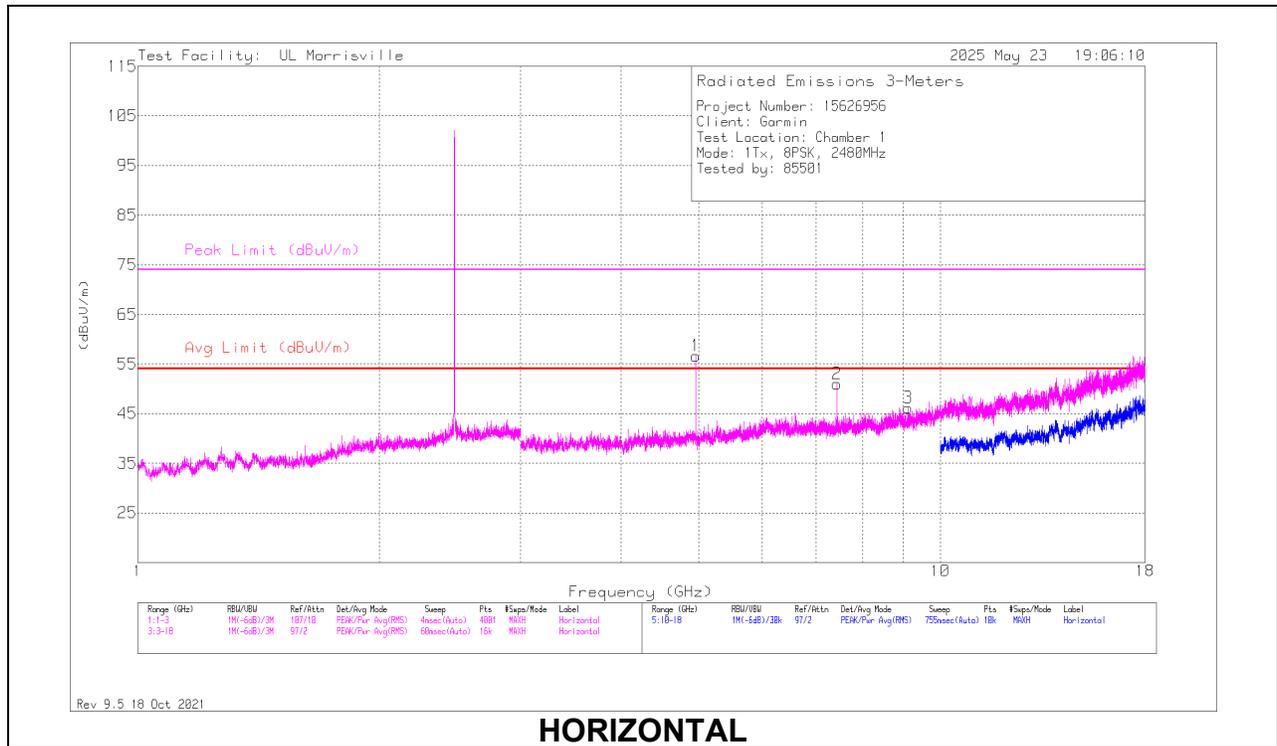
** - indicates frequency in Taiwan NCC LP0002 Restricted Band

Pk - Peak detector

PK2 - Maximum Peak

V1TV - $V_B=1/T_{on}$, Linear Voltage Average where: T_{on} is packet duration

HIGH CHANNEL RESULTS



RADIATED EMISSIONS

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	135143 (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	*** 4.96024	74.3	PK2	34.2	-44.8	63.7	-	-	74	-10.3	293	125	H
	*** 4.95997	55.83	V1TV	34.2	-44.8	45.23	54	-8.77	-	-	293	125	H
2	*** 7.44053	58.79	PK2	35.4	-41.1	53.09	-	-	74	-20.91	132	107	H
	*** 7.43996	44.15	V1TV	35.4	-41.1	38.45	54	-15.55	-	-	132	107	H
3	*** 9.12	50.56	Pk	35.9	-40.3	46.16	54	-7.84	74	-27.84	0-360	101	H
4	*** 4.95994	73.68	PK2	34.2	-44.8	63.08	-	-	74	-10.92	240	107	V
	*** 4.95997	55.24	V1TV	34.2	-44.8	44.64	54	-9.36	-	-	240	107	V
5	*** 7.44	58.65	PK2	35.4	-41.1	52.95	-	-	74	-21.05	90	129	V
	*** 7.43996	43.89	V1TV	35.4	-41.1	38.19	54	-15.81	-	-	90	129	V
6	*** 9.39938	50.23	Pk	36.3	-40.4	46.13	54	-7.87	74	-27.87	0-360	101	V

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

** - indicates frequency in Taiwan NCC LP0002 Restricted Band

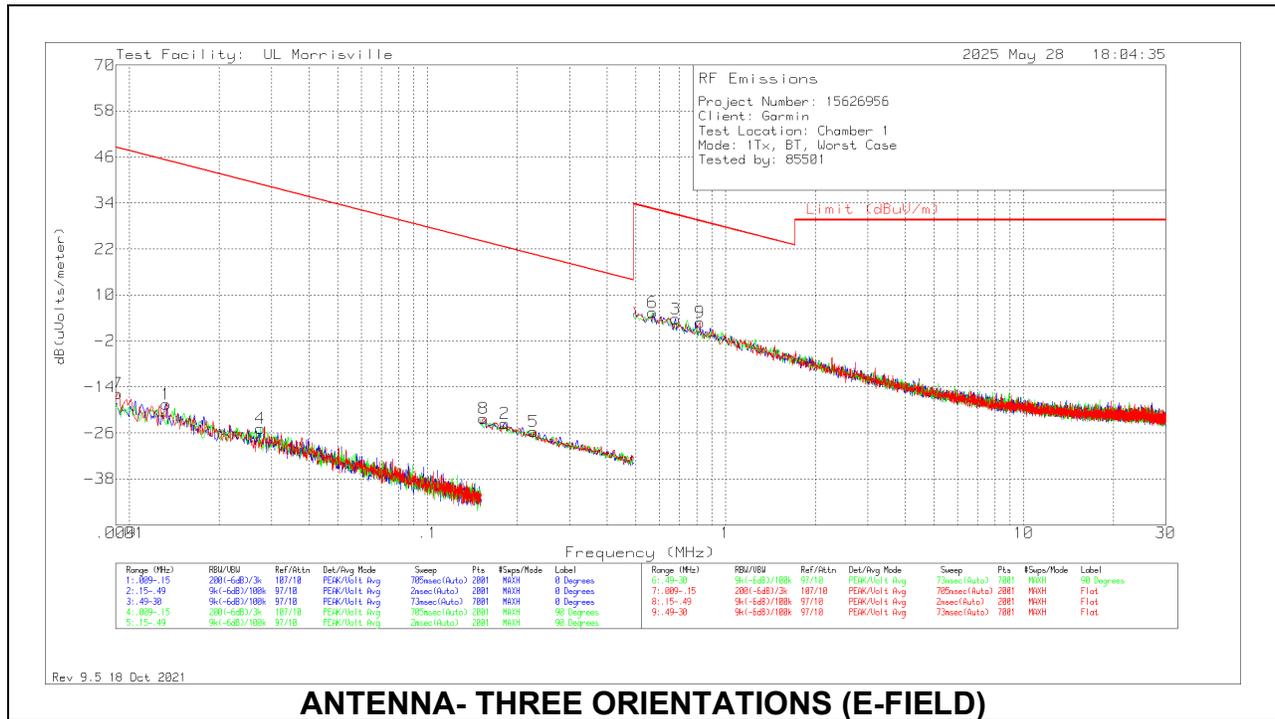
Pk - Peak detector

PK2 - Maximum Peak

V1TV - $V_B=1/T_{on}$, Linear Voltage Average where: T_{on} is packet duration

10.2. WORST CASE SPURIOUS BELOW 30MHZ

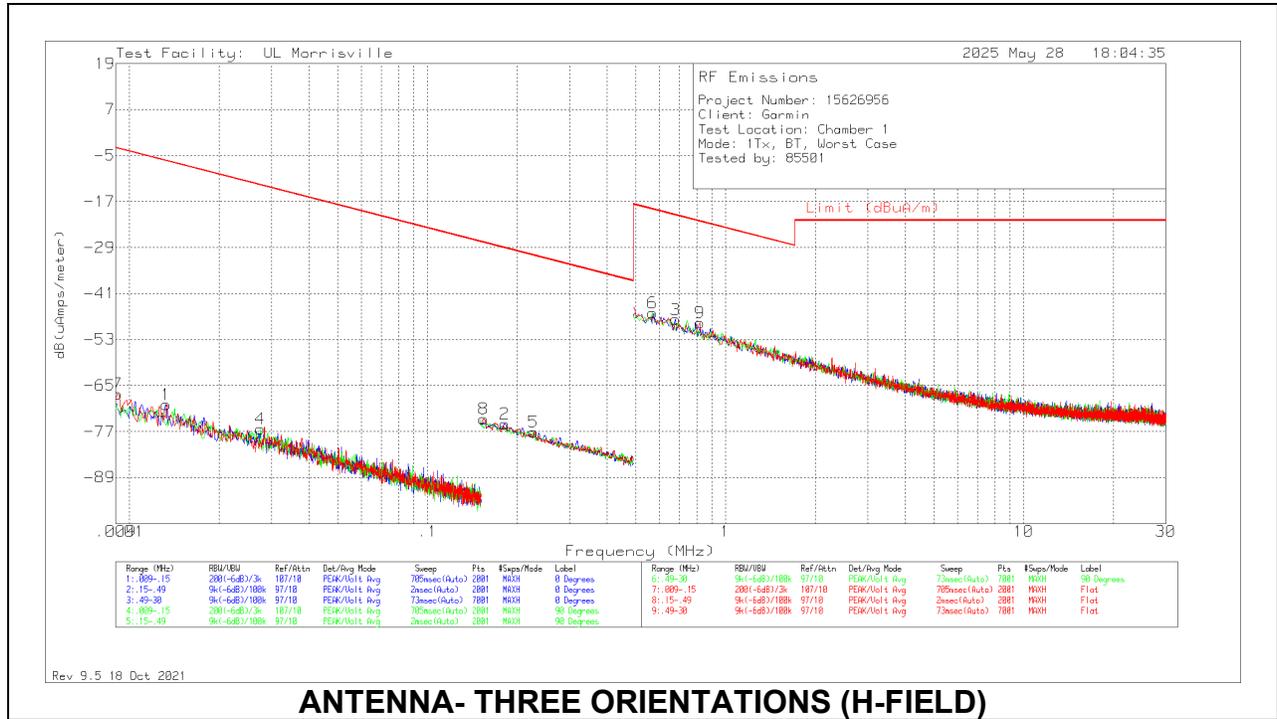
Note: All measurements were made at a test distance of 3 m. The measured data was extrapolated from the test distance (3m) to the specification distance (300 m from 9-490 kHz and 30 m from 490 kHz – 30 MHz) to clearly show the relative levels of fundamental and spurious emissions and demonstrate compliance 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).



ANTENNA- THREE ORIENTATIONS (E-FIELD)

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	ANT (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	.00914	44.64	Pk	19.6	.1	-80	-15.66	48.38	68.38	-64.04	0-360	Flat
1	.01326	44.13	Pk	17.3	.1	-80	-18.47	45.15	65.15	-63.62	0-360	0 degs
4	.02753	41.75	Pk	13.3	.1	-80	-24.85	38.81	58.81	-63.66	0-360	90 degs
8	.15451	46.65	Pk	11	.1	-80	-22.25	23.83	43.83	-46.08	0-360	Flat
2	.18179	45.4	Pk	11	.1	-80	-23.5	22.41	42.41	-45.91	0-360	0 degs
5	.22684	43.31	Pk	10.9	.1	-80	-25.69	20.49	40.49	-46.18	0-360	90 degs
6	.5701	34.32	Pk	11	.1	-40	5.42	32.48	-	-27.06	0-360	90 degs
3	.67972	32.63	Pk	11	.1	-40	3.73	30.96	-	-27.23	0-360	0 degs
9	.81885	31.74	Pk	11	.1	-40	2.84	29.34	-	-26.5	0-360	Flat

Pk - Peak detector

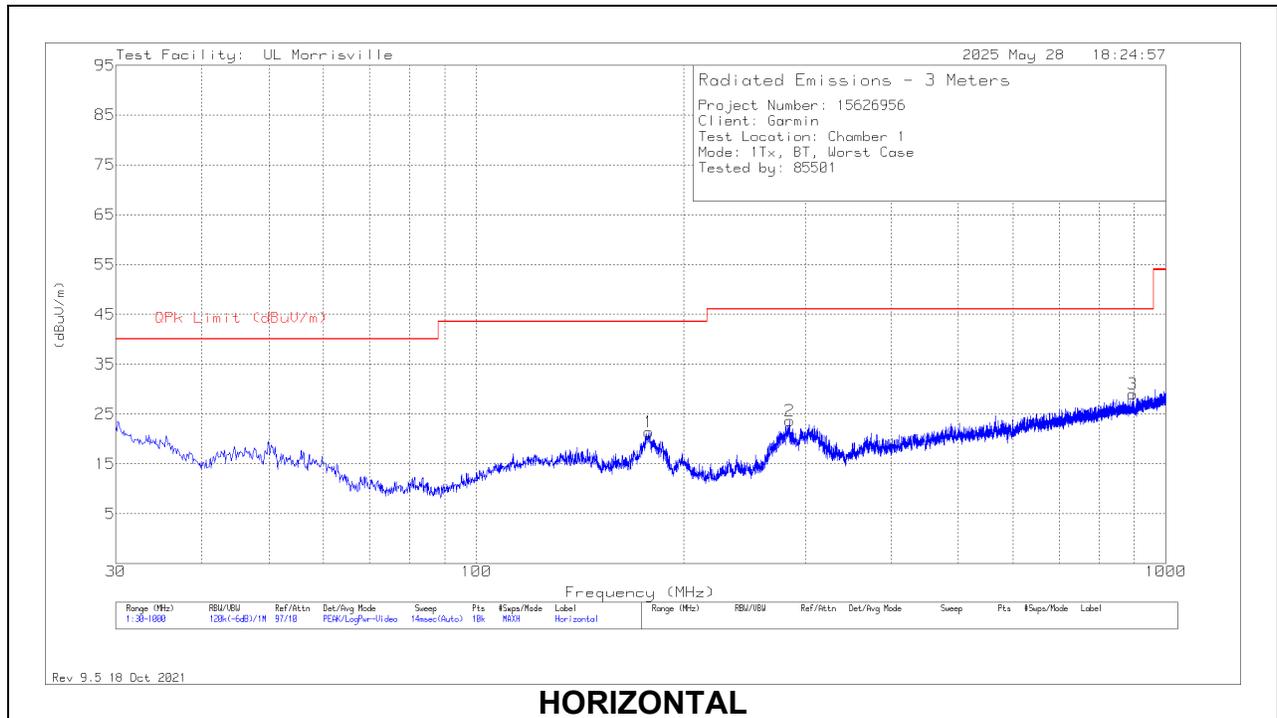


ANTENNA- THREE ORIENTATIONS (H-FIELD)

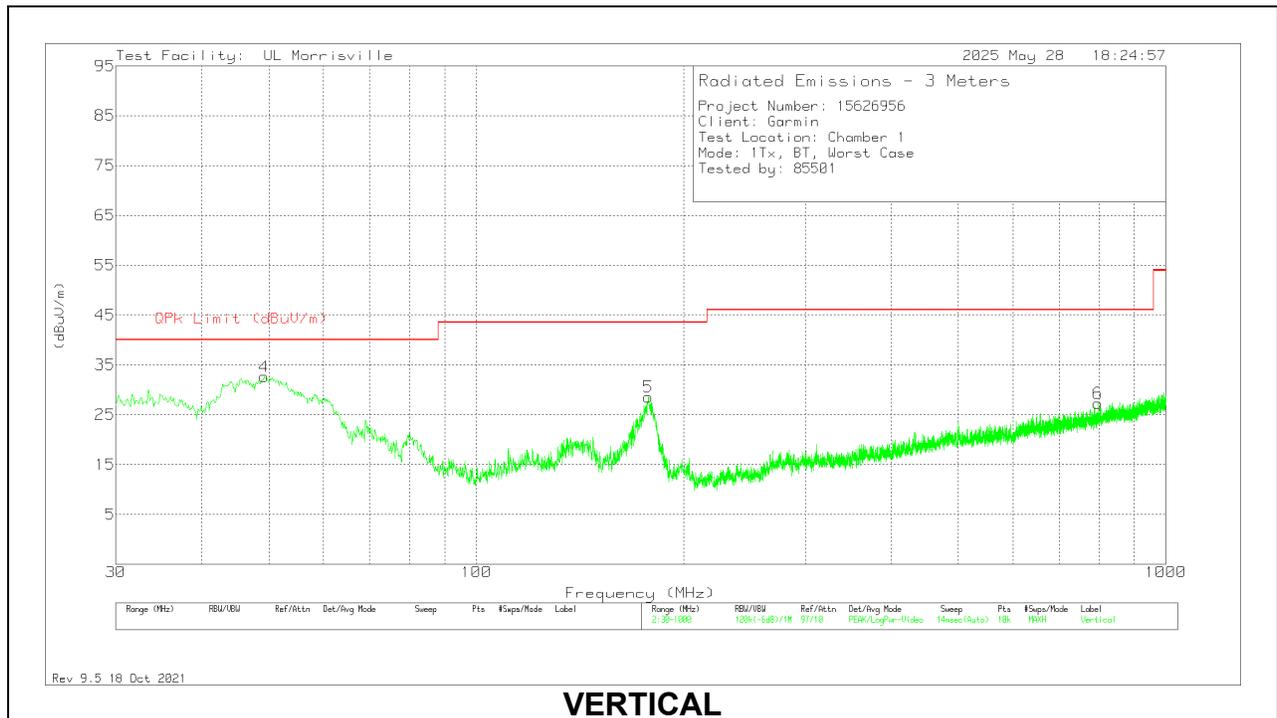
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	ANT (dB/m)	Gain/Loss (dB)	Dist. Corr. Factor (dB)	Corrected Reading dB(uAmps/meter)	QP/AV Limit (dBuA/m)	PK Limit (dBuA/m)	Margin (dB)	Azimuth (Degs)	Loop Angle
7	.00914	44.64	Pk	-31.9	.1	-80	-67.16	-3.12	16.88	-64.04	0-360	Flat
1	.01326	44.13	PK	-34.2	.1	-80	-69.97	-6.35	13.65	-63.62	0-360	0 degs
4	.02753	41.75	Pk	-38.2	.1	-80	-76.35	-12.69	7.31	-63.66	0-360	90 degs
8	.15451	46.65	Pk	-40.5	.1	-80	-73.75	-27.67	-7.67	-46.08	0-360	Flat
2	.18179	45.4	PK	-40.5	.1	-80	-75	-29.09	-9.09	-45.91	0-360	0 degs
5	.22684	43.31	Pk	-40.6	.1	-80	-77.19	-31.01	-11.01	-46.18	0-360	90 degs
6	.5701	34.32	Pk	-40.5	.1	-40	-46.08	-19.02	-	-27.06	0-360	90 degs
3	.67972	32.63	Pk	-40.5	.1	-40	-47.77	-20.54	-	-27.23	0-360	0 degs
9	.81885	31.74	Pk	-40.5	.1	-40	-48.66	-22.16	-	-26.5	0-360	Flat

Pk - Peak detector

10.3. WORST CASE SPURIOUS 30-1000MHZ



HORIZONTAL

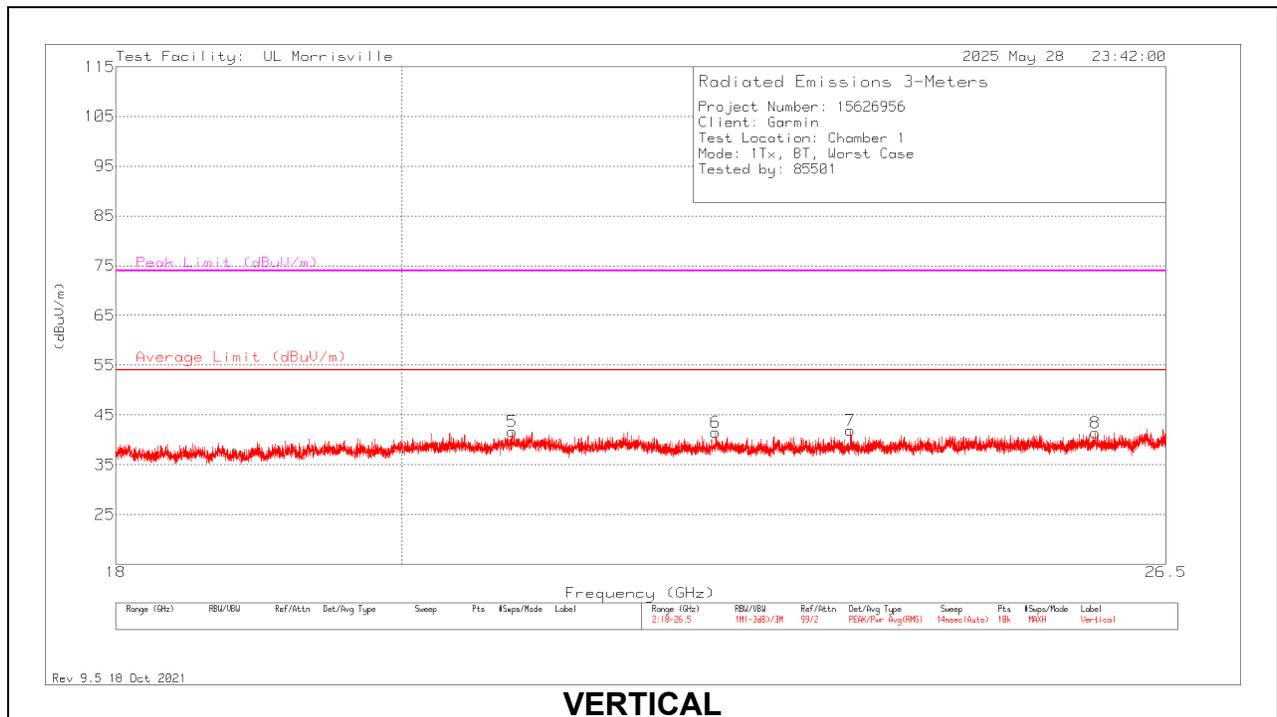
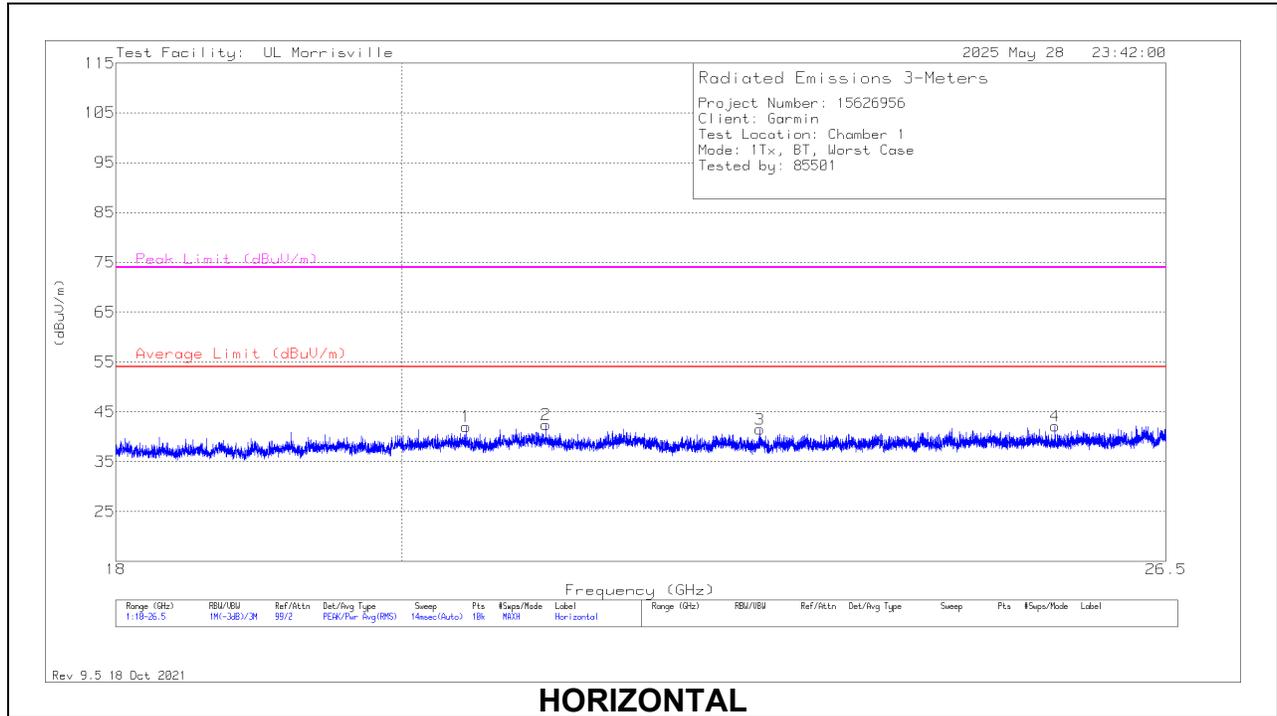


VERTICAL

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	90629 (dB/m)	Gain/Loss (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
4	49.206	49.71	Pk	14.3	-31.4	32.61	40	-7.39	0-360	100	V
5	177.634	41.09	Pk	17.6	-30.1	28.59	43.52	-14.93	0-360	100	V
1	177.828	34	Pk	17.6	-30.2	21.4	43.52	-22.12	0-360	200	H
2	284.625	33.84	Pk	19.5	-29.7	23.64	46.02	-22.38	0-360	99	H
6	797.27	27.17	Pk	27.5	-27.4	27.27	46.02	-18.75	0-360	100	V
3	895.337	27.54	Pk	28.2	-26.7	29.04	46.02	-16.98	0-360	299	H

Pk - Peak detector

10.4. WORST CASE SPURIOUS 18-26GHz



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	Horn (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	* ** 20.47715	49.32	Pk	32.8	-40.1	42.02	54	-11.98	74	-31.98	0-360	200	H
2	* ** 21.09006	49.59	Pk	32.8	-40	42.39	54	-11.61	74	-31.61	0-360	101	H
3	* ** 22.81658	48.17	Pk	33.5	-40.2	41.47	54	-12.53	74	-32.53	0-360	149	H
5	* ** 20.83078	48.94	Pk	32.7	-40	41.64	54	-12.36	74	-32.36	0-360	101	V
6	* ** 22.4519	48.43	Pk	33.3	-40.2	41.53	54	-12.47	74	-32.47	0-360	150	V
7	23.59271	48.14	Pk	33.8	-40	41.94	54	-12.06	74	-32.06	0-360	101	V
4	25.44079	47	Pk	34.1	-39	42.1	54	-11.9	74	-31.9	0-360	149	H
8	25.81908	45.82	Pk	34.3	-38.7	41.42	54	-12.58	74	-32.58	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

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 C63.4.

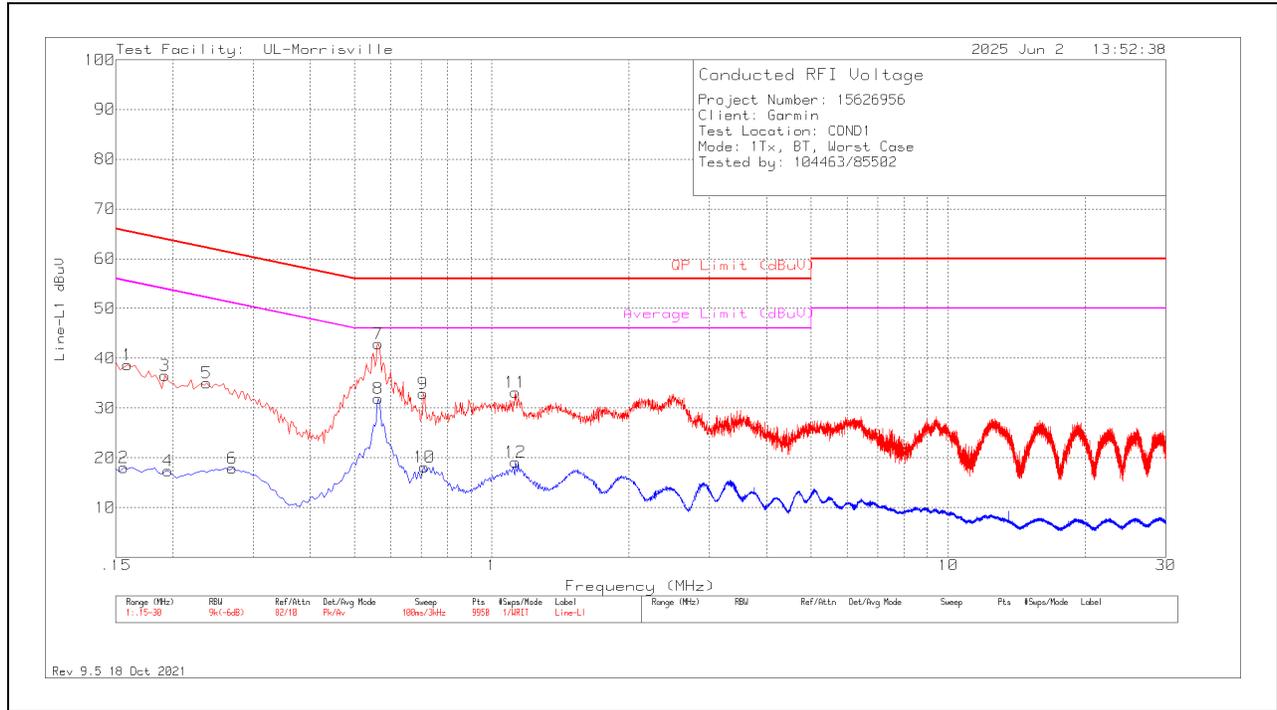
The receiver is set to a resolution bandwidth of 9 kHz. Peak detection is used unless otherwise noted as quasi-peak or average.

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

RESULTS

11.1. AC POWER LINE

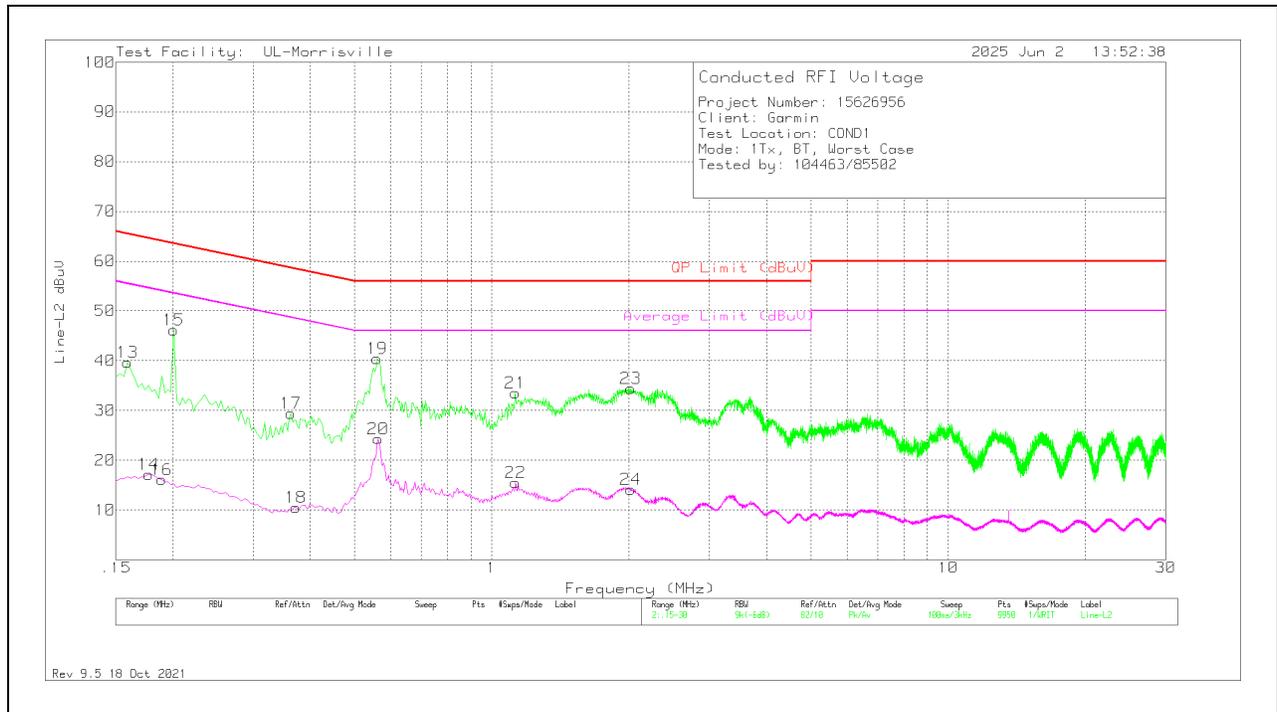
LINE 1 RESULTS



Range 1: Line-L1 .15 - 30MHz										
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	LISN VDF (dB)	Cbl/Limiter (dB)	Corrected Reading dBuV	QP Limit (dBuV)	Margin (dB)	Average Limit (dBuV)	Margin (dB)
2	.156	8.16	Av	.2	9.7	18.06	-	-	55.67	-37.61
1	.159	28.8	Pk	.2	9.7	38.7	65.52	-26.82	-	-
3	.192	26.6	Pk	.2	9.7	36.5	63.95	-27.45	-	-
4	.195	7.5	Av	.2	9.7	17.4	-	-	53.82	-36.42
5	.237	25.26	Pk	.1	9.7	35.06	62.2	-27.14	-	-
6	.27	8.06	Av	.1	9.7	17.86	-	-	51.12	-33.26
7	.564	33.23	Pk	0	9.7	42.93	56	-13.07	-	-
8	.564	22.19	Av	0	9.7	31.89	-	-	46	-14.11
9	.708	23.21	Pk	0	9.7	32.91	56	-23.09	-	-
10	.711	8.45	Av	0	9.7	18.15	-	-	46	-27.85
11	1.125	23.46	Pk	0	9.7	33.16	56	-22.84	-	-
12	1.128	9.45	Av	0	9.7	19.15	-	-	46	-26.85

Pk - Peak detector
 Av - Average detection

LINE 2 RESULTS



Range 2: Line-L2 .15 - 30MHz										
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	LISN VDF (dB)	Cbl/Limiter (dB)	Corrected Reading dBuV	QP Limit (dBuV)	Margin (dB)	Average Limit (dBuV)	Margin (dB)
13	.159	29.75	Pk	.2	9.7	39.65	65.52	-25.87	-	-
14	.177	7.22	Av	.2	9.7	17.12	-	-	54.63	-37.51
16	.189	6.18	Av	.2	9.7	16.08	-	-	54.08	-38
15	.201	36.37	Pk	.1	9.7	46.17	63.57	-17.4	-	-
17	.363	19.57	Pk	.1	9.7	29.37	58.66	-29.29	-	-
18	.372	.69	Av	.1	9.7	10.49	-	-	48.46	-37.97
19	.561	30.69	Pk	0	9.7	40.39	56	-15.61	-	-
20	.564	14.63	Av	0	9.7	24.33	-	-	46	-21.67
21	1.125	23.81	Pk	0	9.7	33.51	56	-22.49	-	-
22	1.128	5.85	Av	0	9.7	15.55	-	-	46	-30.45
23	2.016	24.67	Pk	0	9.7	34.37	56	-21.63	-	-
24	2.016	4.45	Av	0	9.7	14.15	-	-	46	-31.85

Pk - Peak detector
 Av - Average detection

12. SETUP PHOTOS

Please refer to R15626956-EP1 for setup photos

END OF TEST REPORT