

TEST REPORT

Report Number: R15607055-E2

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

Model : A04909

FCC ID : IPH-04909

IC : 1792A-04909

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:
2025-01-17

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	2025-01-17	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: A04909

SERIAL NUMBER: 3493239303, 3493238982

SAMPLE RECEIPT DATE: 2024-10-21 and 2024-12-04

DATE TESTED: 2024-12-04 to 2024-12-18

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
CFR 47 Part 15 Subpart C	Refer to Section 2
ISED RSS-247 Issue 3	
ISED RSS-GEN Issue 5 + A1 + A2	

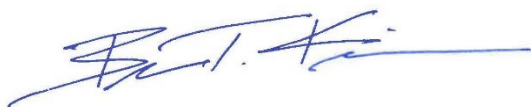
UL LLC tested the above equipment in accordance with the requirements set forth in the above standards. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

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:



Brian Kiewra
Project Engineer
Consumer, Medical and IT Segment
UL LLC



Chandler Stanley
Engineer
Consumer, Medical and IT Segment
UL LLC

2. TEST RESULTS SUMMARY

This report contains info provided by the customer 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.

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

- 1) Antenna gain and type (see section 6.3)
- 2) Worst-case data rates (see section 6.5)

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	Reporting purposes only	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 47 CFR Part 2, FCC 47 CFR Part 15, ANSI C63.10-2020, 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, certification # 0751.06, for all testing performed within the scope of this report. Testing was performed at the locations noted below.

	Address	ISED CABID	ISED Company Number	FCC Registration
<input type="checkbox"/>	Building: 12 Laboratory Dr RTP, NC 27709, U.S.A	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:

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 an extremity worn digital transceiver with BT, BLE, ANT/ANT+, 802.11b/g/n 2.4GHz WLAN, NFC, and Global Navigation Satellite System (GNSS) receiver. This report covers 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	9.17	8.26
2402 - 2480	Enhanced DQPSK	10.66	11.64
2402 - 2480	Enhanced 8PSK	11.02	12.65

6.3. DESCRIPTION OF AVAILABLE ANTENNAS

The antenna(s) gain and type, as provided by the manufacturer' are as follows:
The radio utilizes an antenna with the following type and maximum gain:

Type	Frequency Range (MHz)	Maximum Gain (dBi)
Bezel Antenna	2402-2480	-3.3

6.4. SOFTWARE AND FIRMWARE

The software version installed on radiated units during testing was 3.51.
The software version installed on conducted units during testing was 53.07.

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

8PSK testing will cover DQPSK due to higher power.

Worst-case packet size:
GFSK mode: DH5
8PSK mode: 3-DH5

Note: To reduce size of report only representative plots are included for some conducted testing.

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 R15607055-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 - Wireless Conducted Measurement Equipment

Equipment ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
Common Equipment					
Conducted Room 1					
90410	Spectrum Analyzer	Keysight Technologies	N9030A	2024-06-14	2025-06-14
245765	Environmental Meter	Fisher Scientific	06-662-4	2024-01-24	2025-01-24
211058	Real-Time Peak Power Sensor 50MHz to 8GHz	Boonton	RTP5000	2024-08-01	2025-08-01
SOFTEMI	Antenna Port Software	UL	Version 2024.2.23	NA	NA
Power Software	Boonton Power Analyzer	Boonton	Version 3.0.13.0	NA	NA
Additional Equipment used					
CBL028	SMA Cable	Sucoflex	104PEA	2024-02-16	2025-02-16

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
1-18 GHz					
135143	Double-Ridged Waveguide Horn Antenna, 1 to 18 GHz	ETS Lindgren	3117	2024-02-07	2026-02-07
Gain-Loss Chains					
91974	Gain-loss string: 0.009-30MHz	Various	Various	2024-05-08	2025-05-08
91979	Gain-loss string: 1-18GHz	Various	Various	2024-05-08	2025-05-08
Receiver & Software					
206496	Spectrum Analyzer	Rohde & Schwarz	ESW44	2024-08-29	2025-08-29
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

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

Equip. ID	Description	Manufacturer/Brand	Model Number	Last Cal.	Next Cal.
30-1000 MHz					
159203	Hybrid Broadband Antenna	Sunol Sciences Corp.	JB3	2024-03-05	2026-03-05
Gain-Loss Chains					
91978	Gain-loss string: 25-1000MHz	Various	Various	2024-05-10	2025-05-10
Receiver & Software					
197954	Spectrum Analyzer	Rohde & Schwarz	ESW44	2024-08-29	2025-08-29
SOFTEMI	EMI Software	UL	Version 9.5 (18 Oct 2021)		
Additional Equipment used					
200540	Environmental Meter	Fisher Scientific	15-077-963	2023-07-19	2025-07-19

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

Equip. ID	Description	Manufacturer/Brand	Model Number	Last Cal.	Next Cal.
18-26.5 GHz					
204704	Horn Antenna, 18-26.5GHz	Com-Power	AH-826	2023-07-20	2025-07-20
Gain-Loss Chains					
225795	Gain-loss string: 18-40GHz	Various	Various	2024-05-22	2025-05-22
Receiver & Software					
197955	Spectrum Analyzer	Rohde & Schwarz	ESW44	2024-04-16	2025-04-16
SOFTEMI	EMI Software	UL	Version 9.5 (18 Oct 2021)		
Additional Equipment used					
241204	Environmental Meter	Fisher Scientific	15-077-963	2023-09-05	2025-09-05

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	2024-04-04	2025-04-04
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
70374	EMI Test Receiver 9kHz-7GHz	Rohde & Schwarz	ESCI 7	2024-07-30	2025-07-30
52859	Transient Limiter, 0.009-100MHz	Electro-Metrics	EM-7600	2024-04-04	2025-04-04
PS216	AC Power Source	Elgar	CW2501M	NA	NA
84681	ANSI C63.4 1m extension cable	UL	Per Annex B of ANSI C63.4	2024-04-04	2025-04-04
SOFTEMI	EMI Software	UL	Version 9.5 (18 Oct 2021)		

8. 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.

9. ANTENNA PORT TEST RESULTS

9.1. 20 dB AND 99% BANDWIDTH

LIMITS

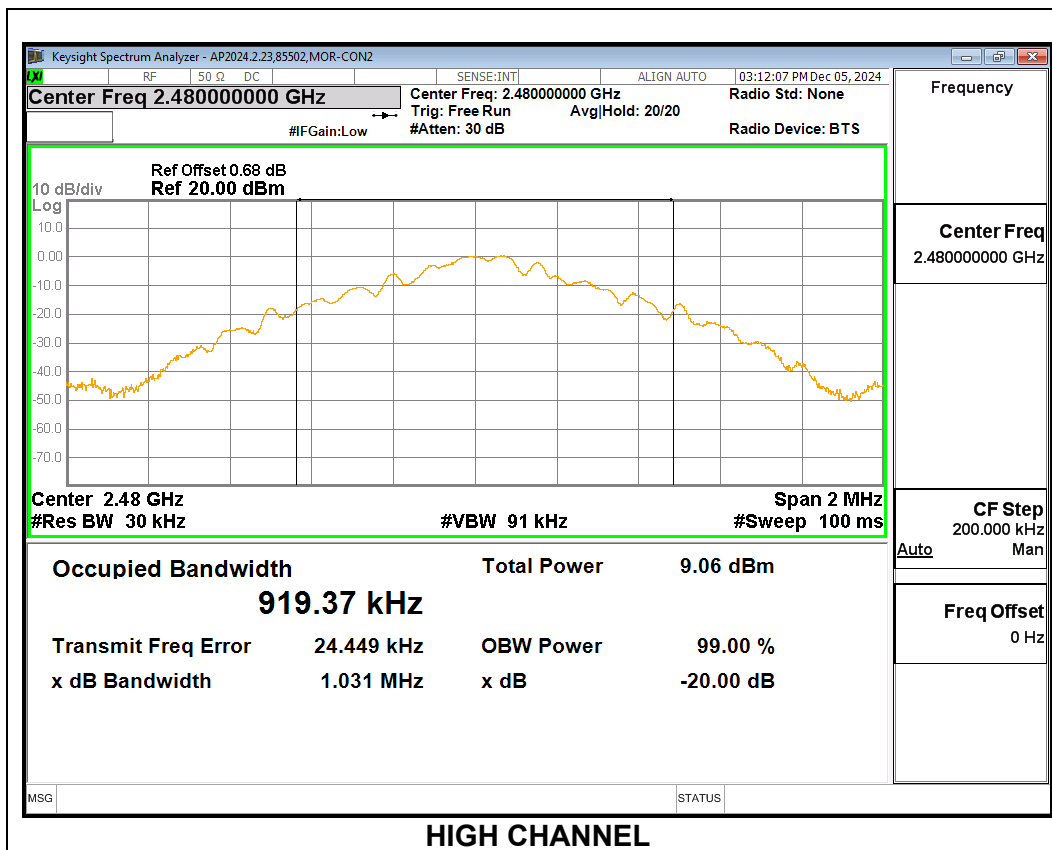
None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The RBW is set to 1-5% of the 20 dB bandwidth. The VBW is set to \geq RBW. The sweep time is coupled.

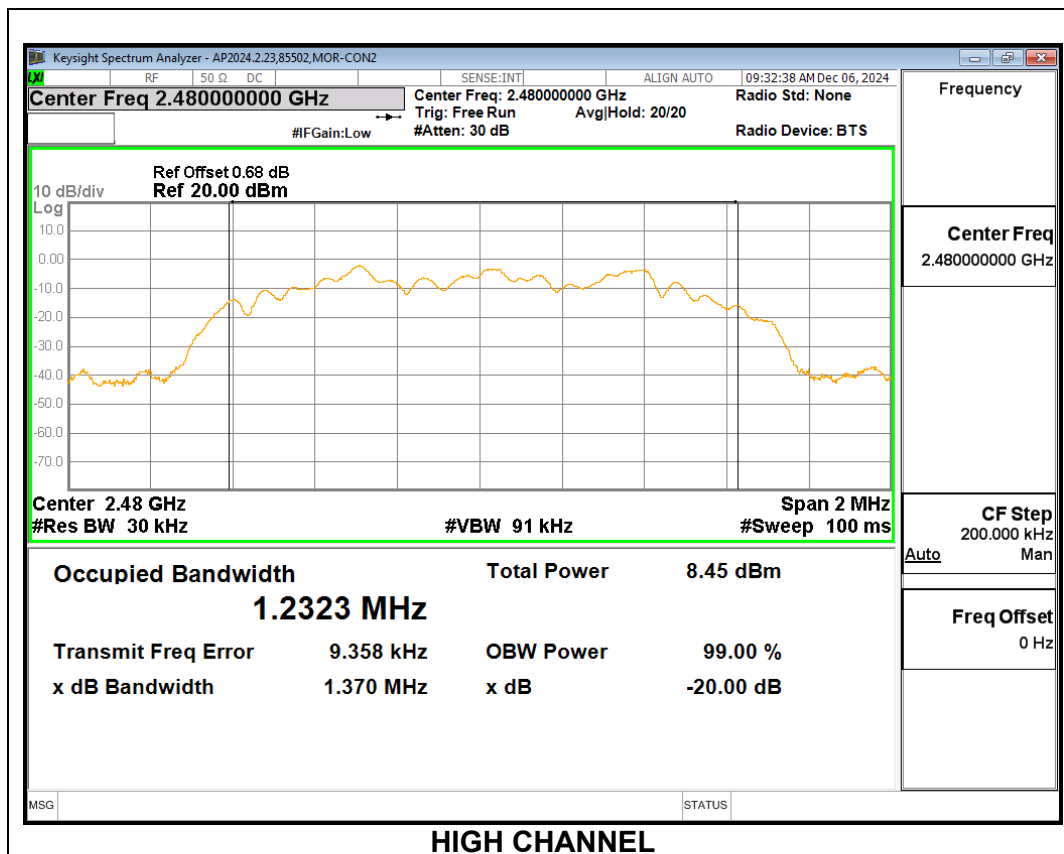
9.1.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION

Channel	Frequency (MHz)	20dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	2402	1.030	0.915
Mid	2441	1.030	0.917
High	2480	1.031	0.919



9.1.2. BLUETOOTH ENHANCED DATA RATE 8PSK MODULATION

Channel	Frequency (MHz)	20dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	2402	1.369	1.2306
Mid	2441	1.373	1.2320
High	2480	1.370	1.2323



9.2. ON TIME AND DUTY CYCLE

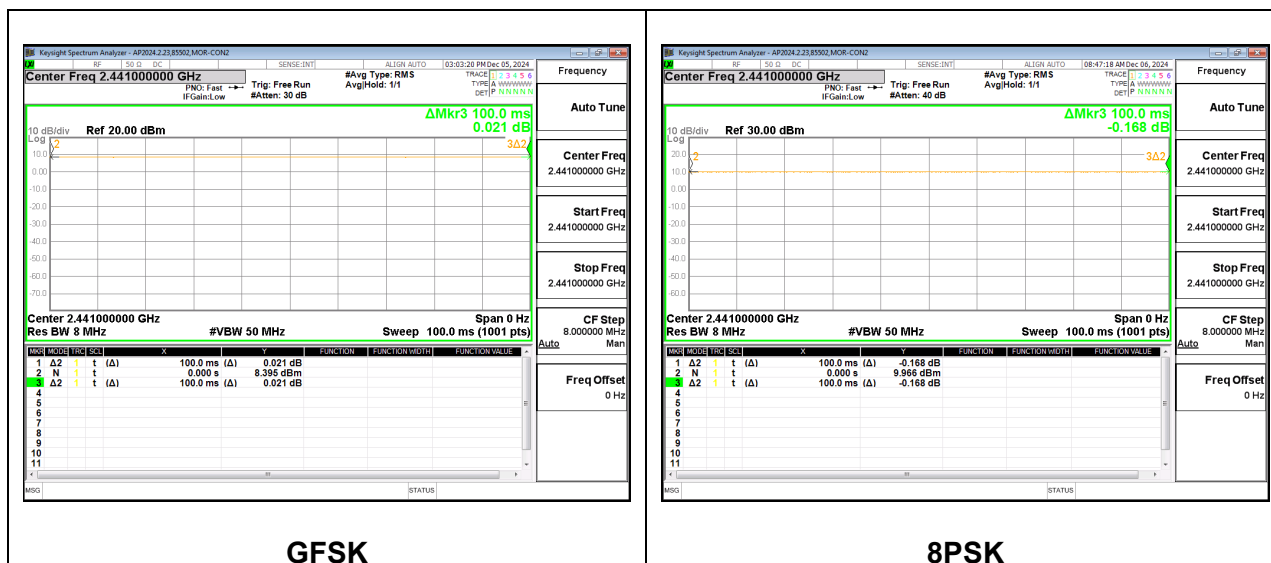
LIMITS

None; for reporting purposes only.

PROCEDURE

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

Mode	ON Time B (ms)	Period (ms)	Duty Cycle x (lineari)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)	1/T Minimum VBW (kHz)
GFSK	100.00	100.00	1.000	100.00	0.00	0.010
8PSK	100.00	100.00	1.000	100.00	0.00	0.010



9.3. HOPPING FREQUENCY SEPARATION

LIMITS

FCC §15.247 (a) (1)
RSS-247 (5.1) (b)

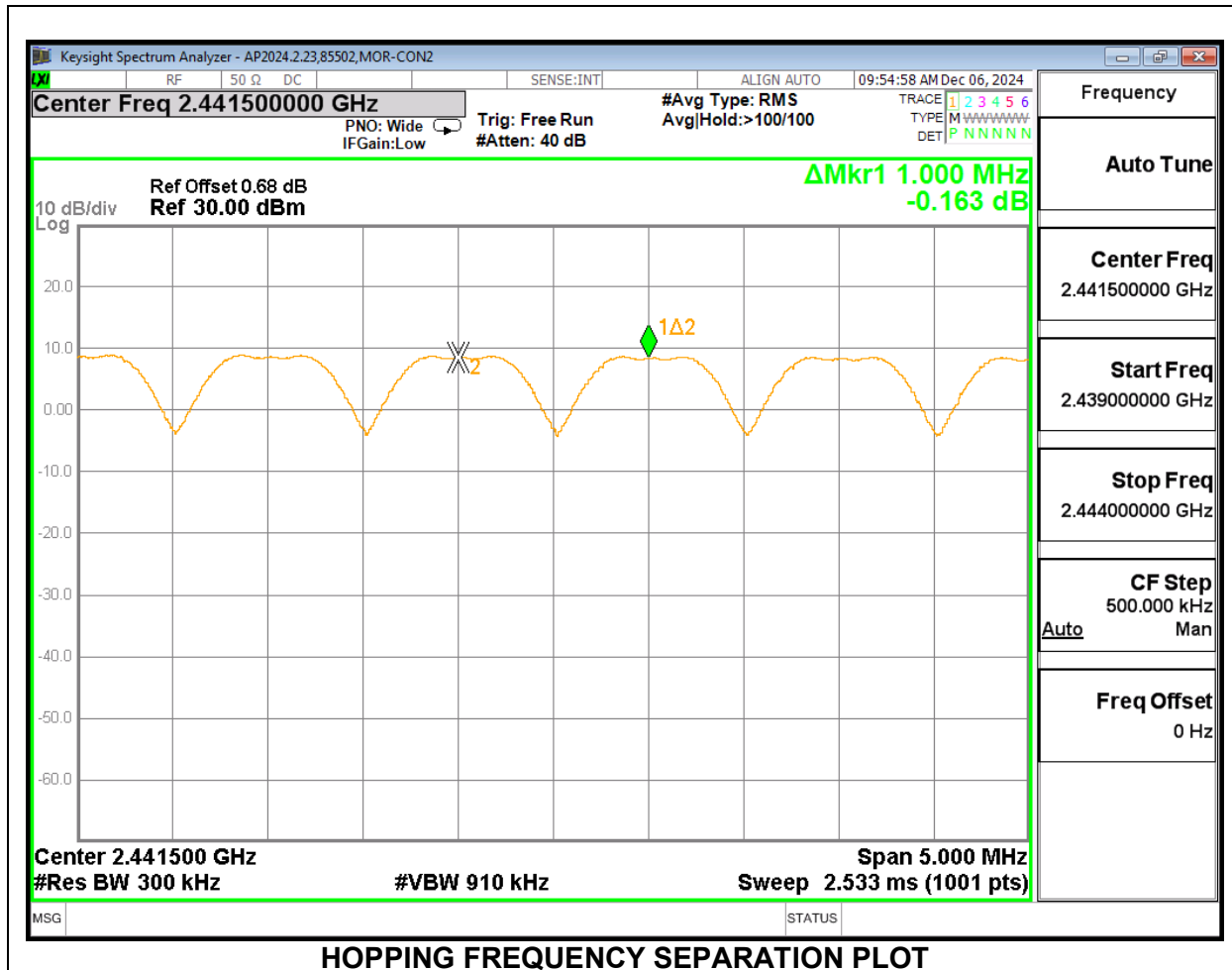
Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

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.

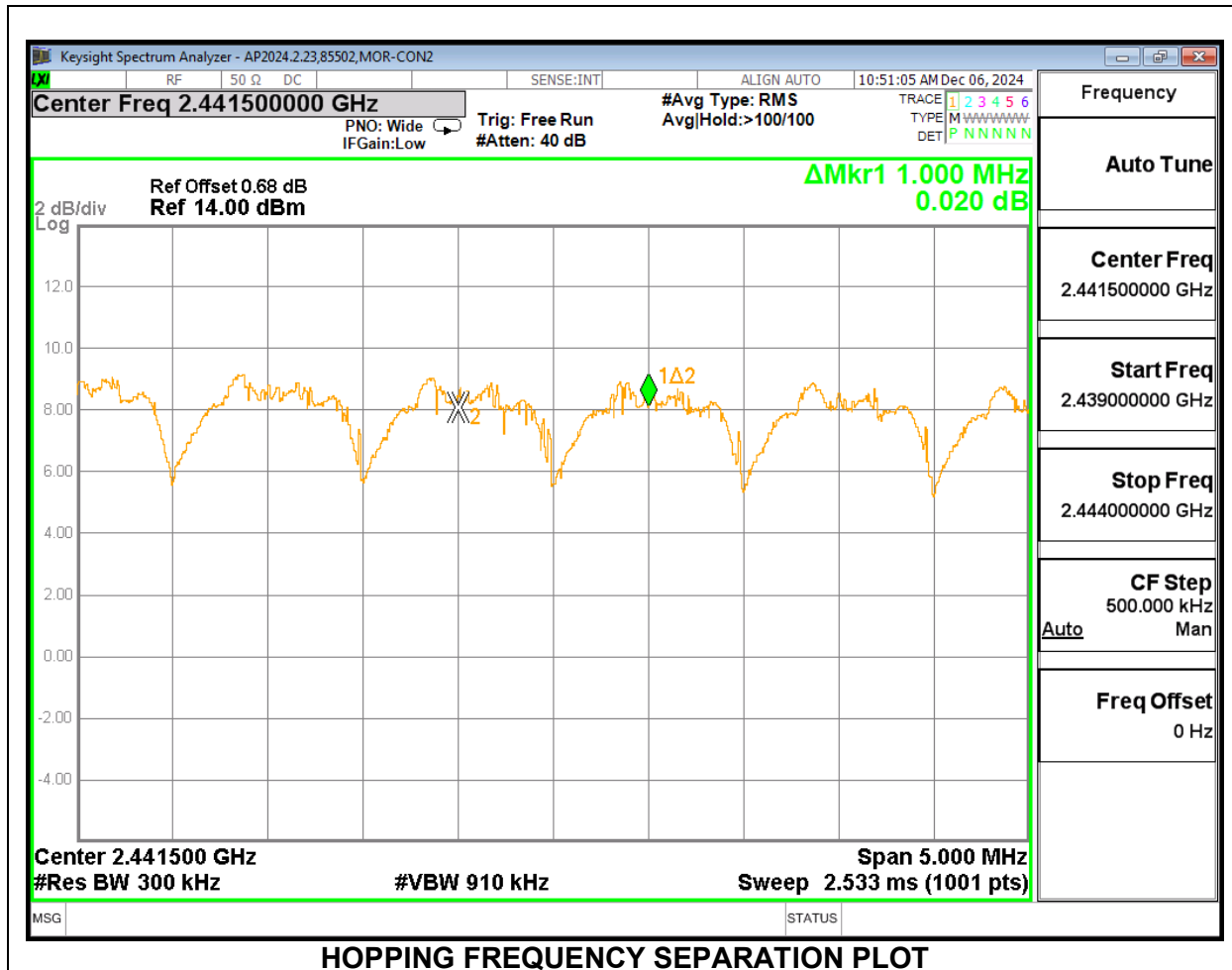
TEST PROCEDURE

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

9.3.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION



9.3.2. BLUETOOTH ENHANCED DATA RATE 8PSK MODULATION



$$(20\text{dB BW}) \times (2/3) = (1.373 \text{ MHz}) \times (2/3) = 0.9153 \text{ MHz}$$

$$0.9153 \text{ MHz} < 1 \text{ MHz}$$

9.4. NUMBER OF HOPPING CHANNELS

LIMITS

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

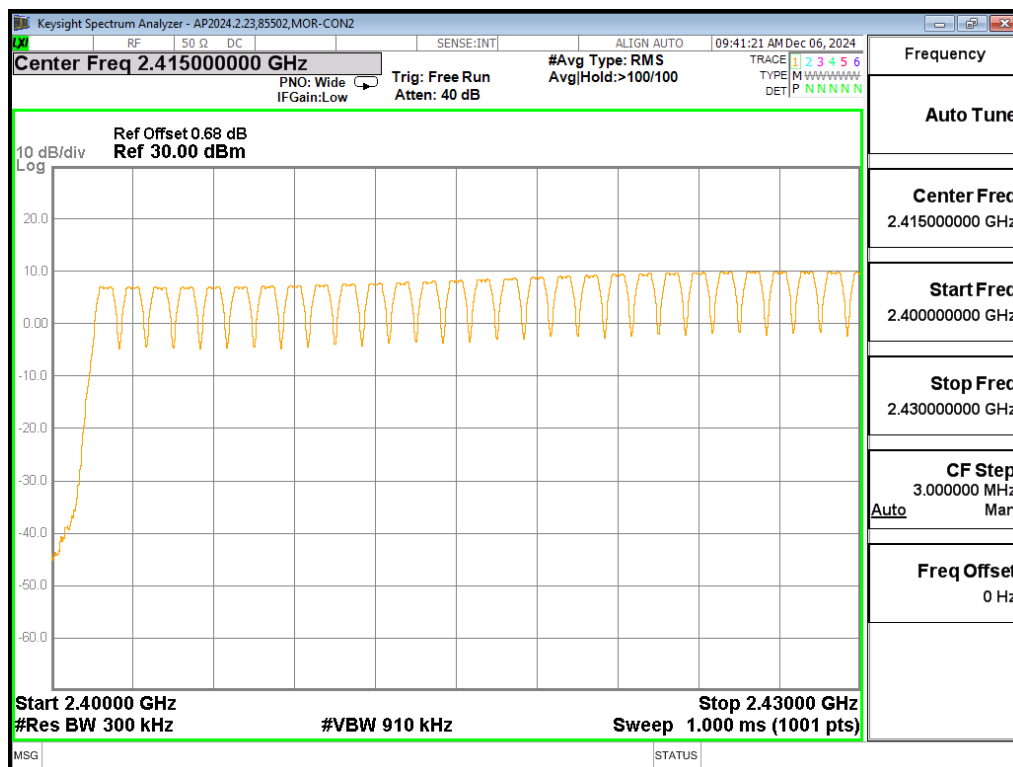
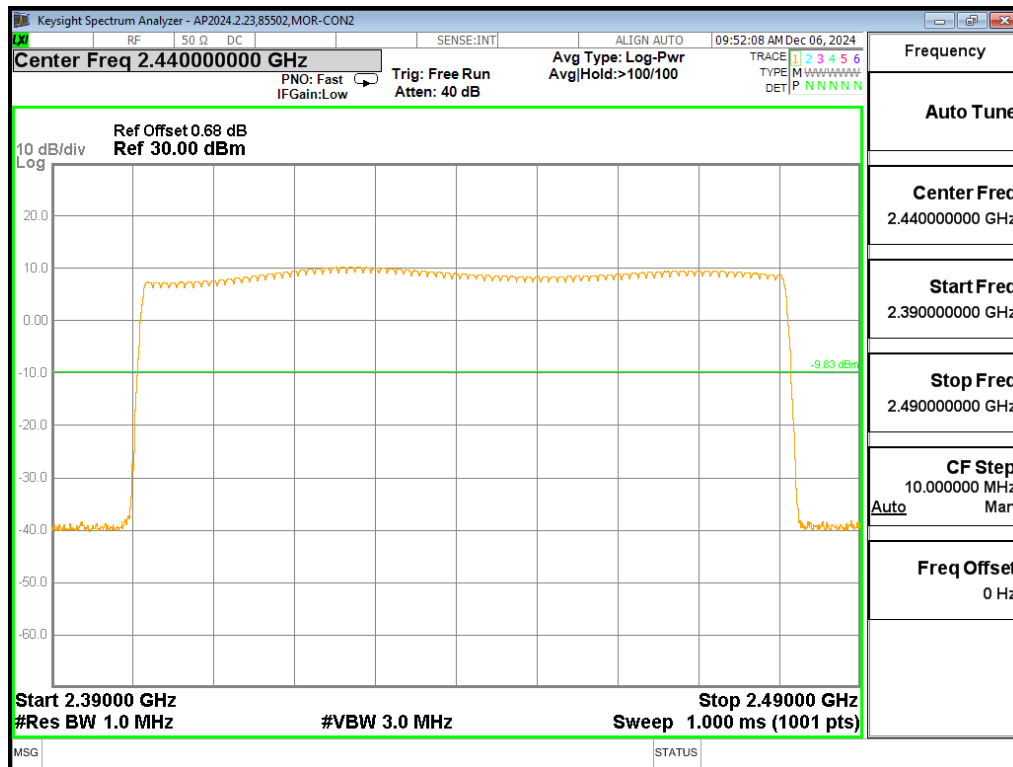
Frequency hopping systems in the 2400 – 2483.5 MHz band shall use at least 15 non-overlapping channels.

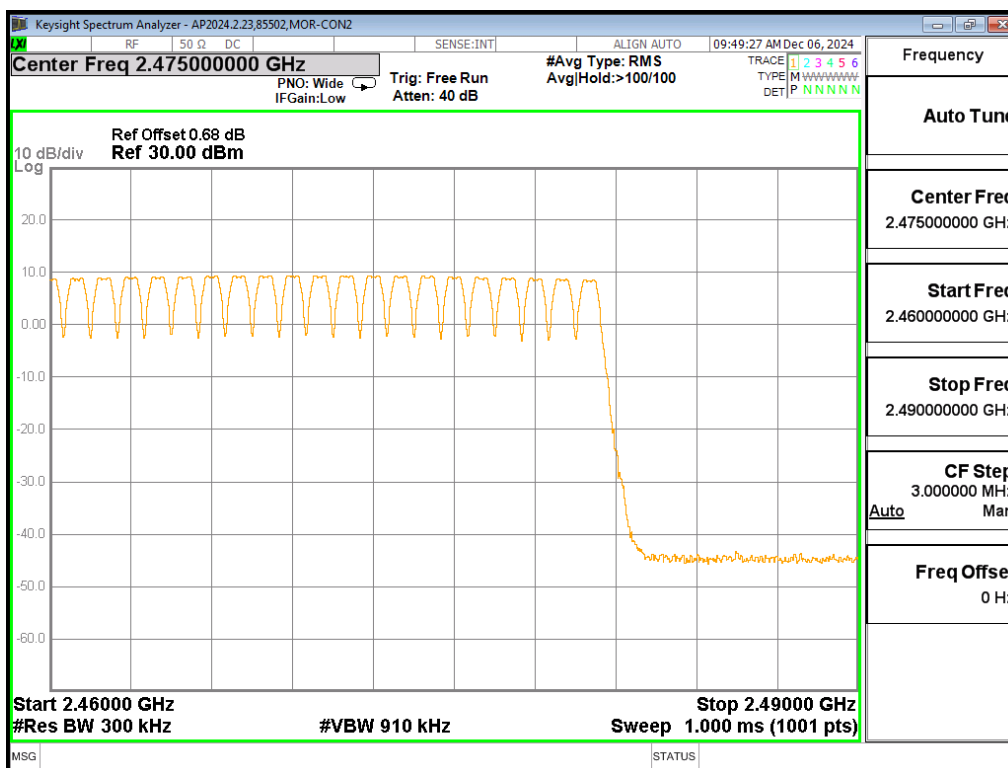
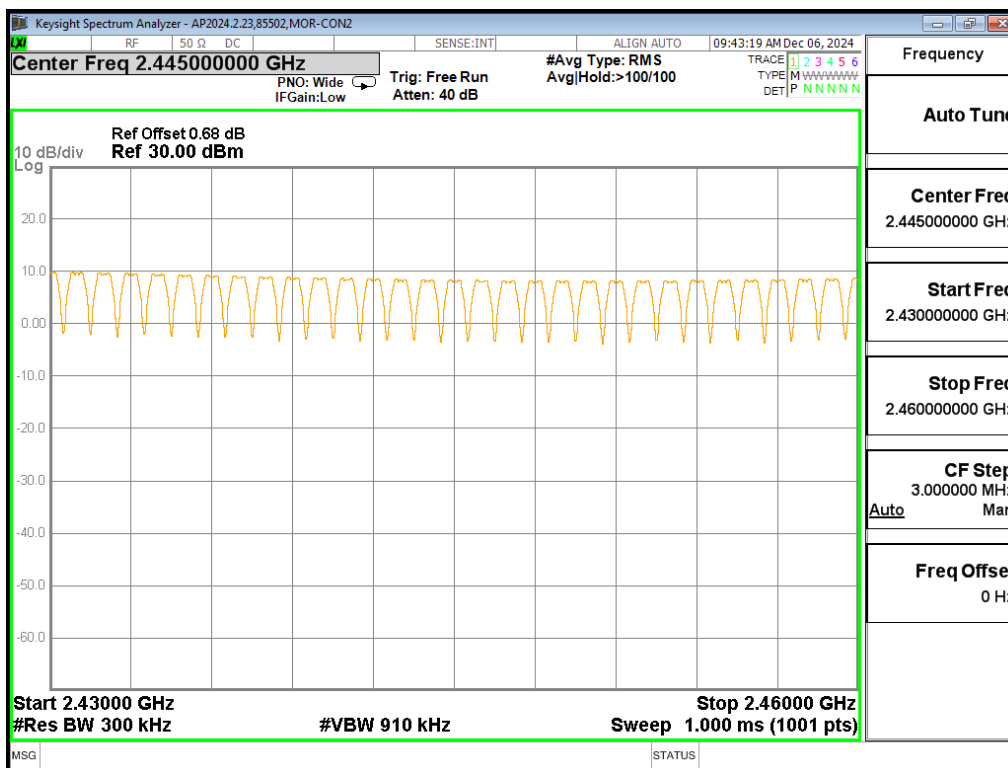
TEST PROCEDURE

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.

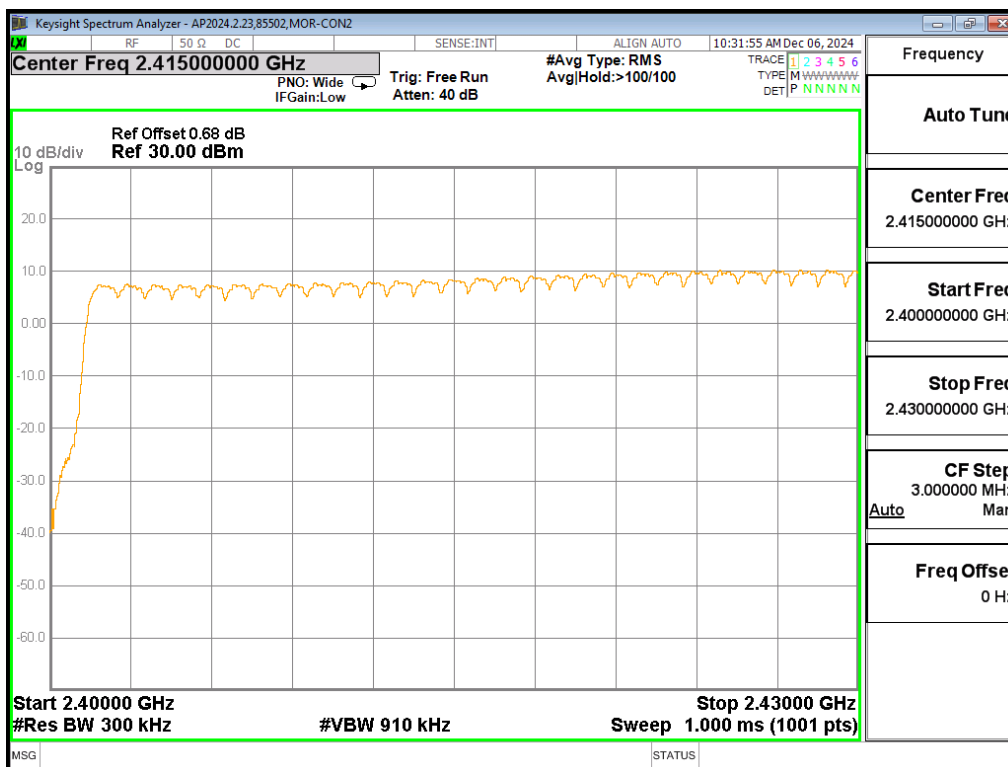
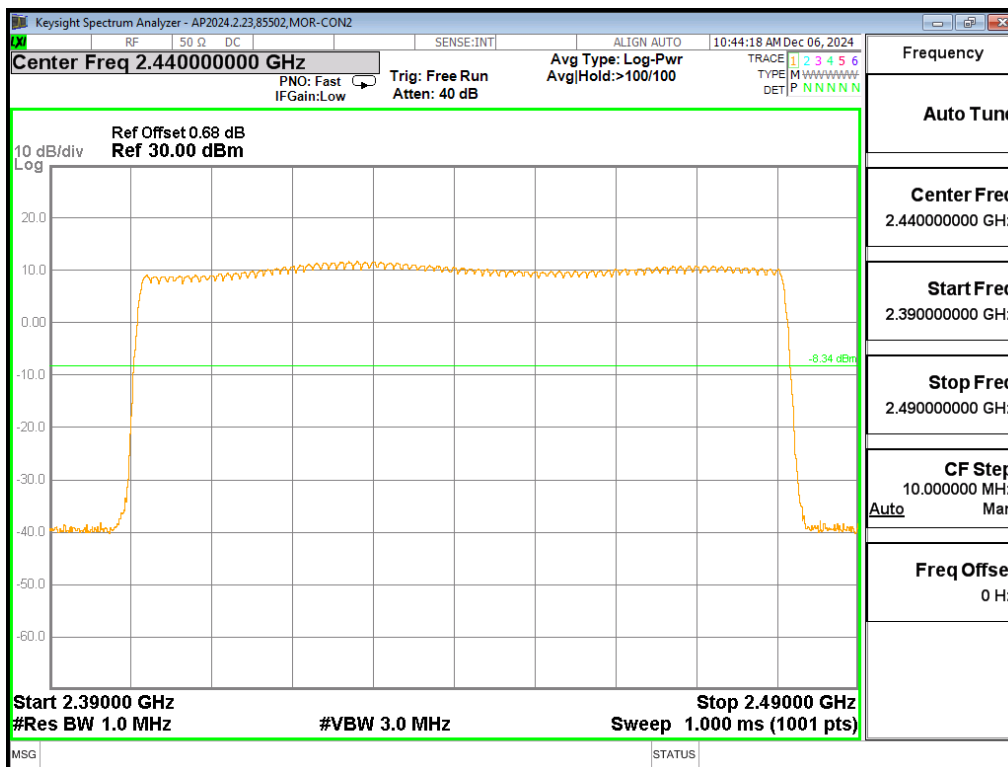
Normal Mode: 79 Channels Observed

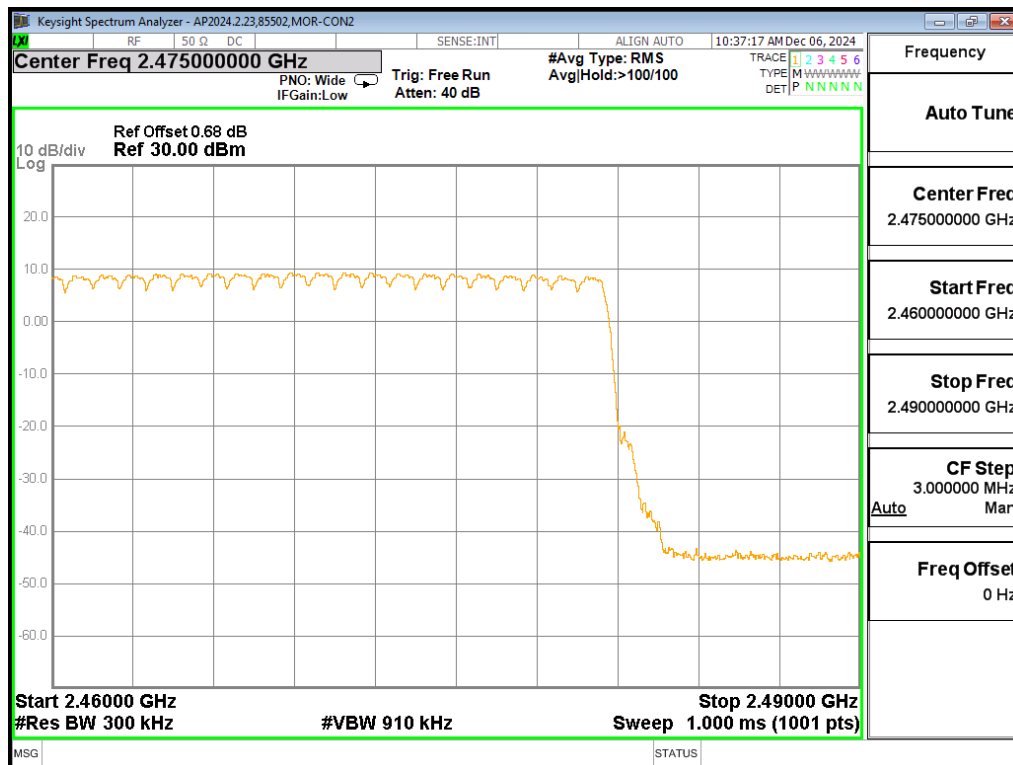
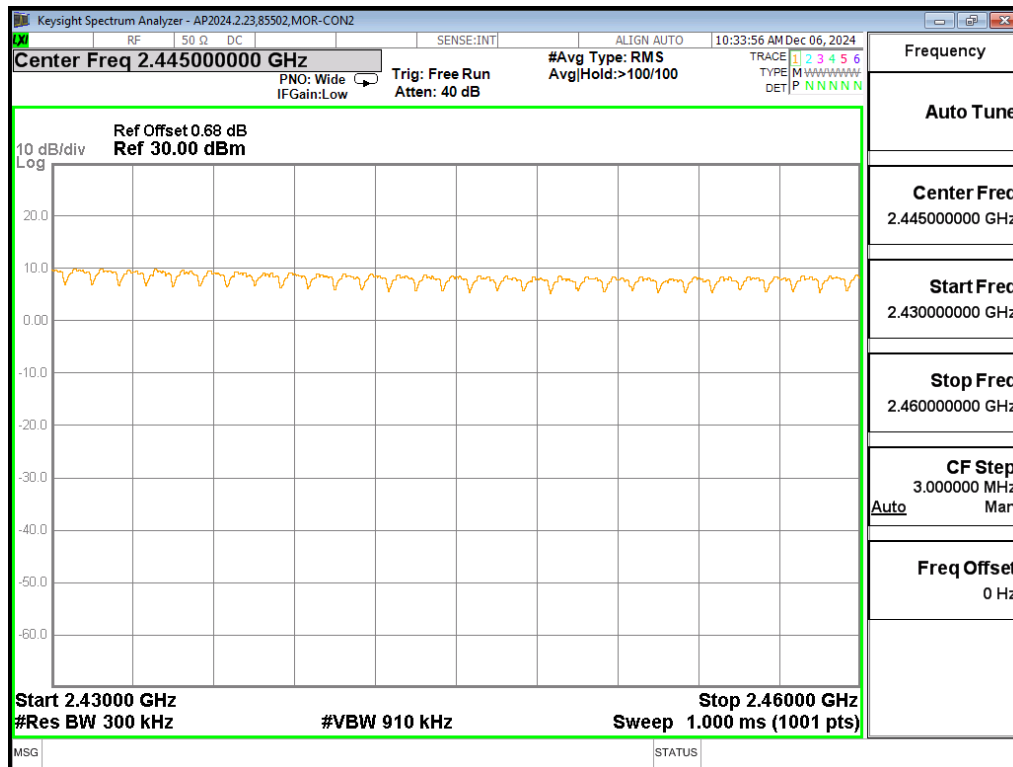
9.4.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION





9.4.2. BLUETOOTH ENHANCED DATA RATE 8PSK MODULATION





9.5. 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

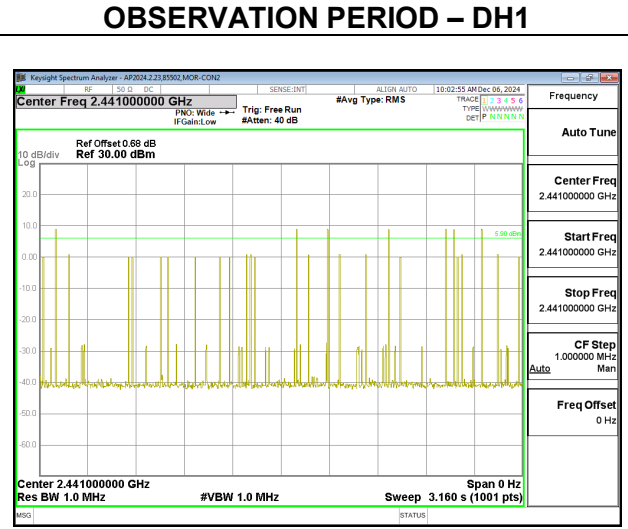
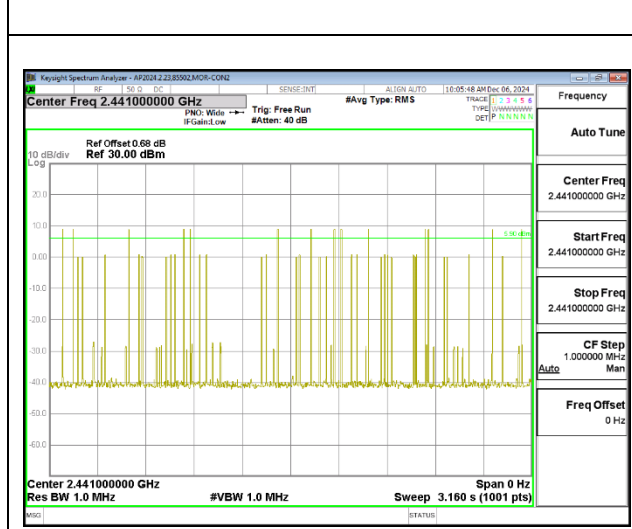
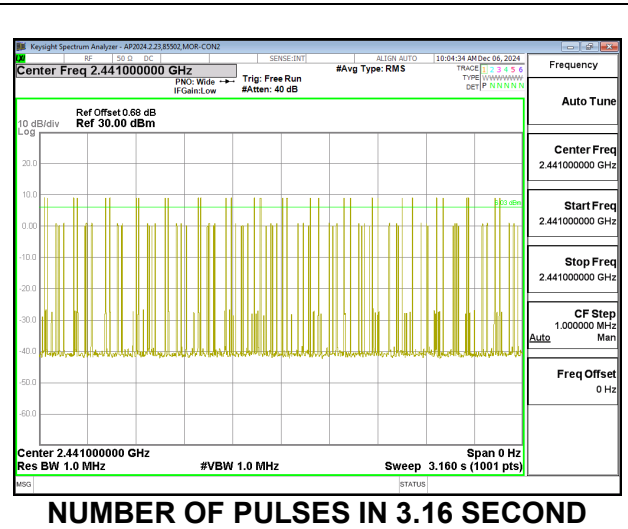
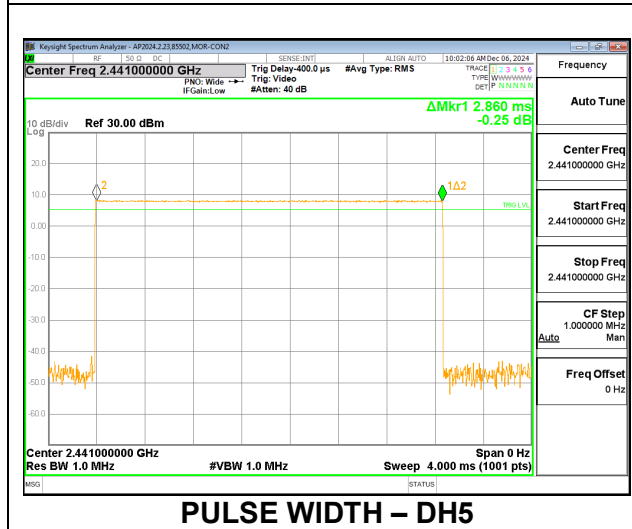
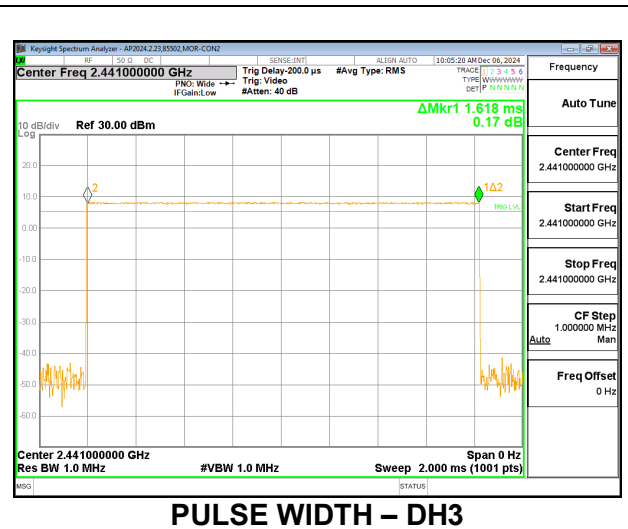
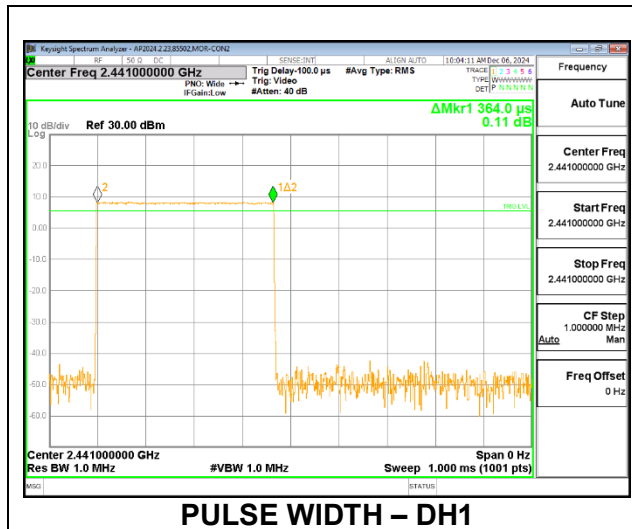
The transmitter output is connected to a spectrum analyzer. The span is set to 0 Hz, centered on a single, selected hopping channel. The width of a single pulse is measured in a fast scan. The number of pulses is measured in a 3.16 second scan, to enable resolution of each occurrence.

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 $10 * (\# \text{ of pulses in } 0.8 \text{ s}) * \text{pulse width}$.

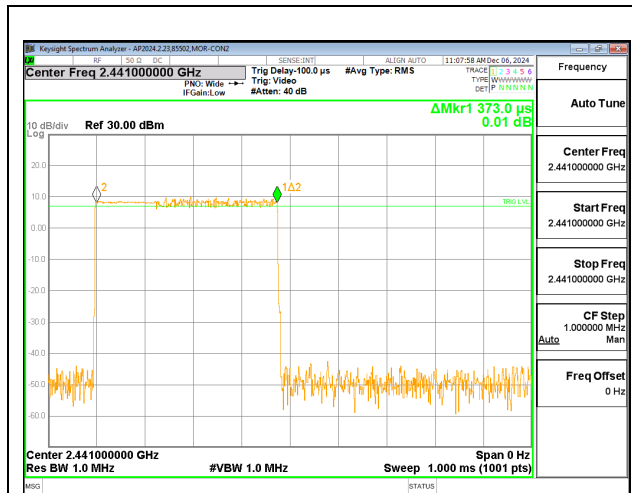
9.5.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION

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	1.618	14	0.2265	0.4	-0.1735
DH5	2.86	7	0.2002	0.4	-0.1998
DH Packet	Pulse Width (sec)	Number of Pulses in 0.8 seconds	Average Time of Occupancy (sec)	Limit (sec)	Margin (sec)
GFSK AFH Mode					
DH1	0.364	7.75	0.02821	0.4	-0.3718
DH3	1.618	3.5	0.05663	0.4	-0.3434
DH5	2.86	1.75	0.05005	0.4	-0.3500

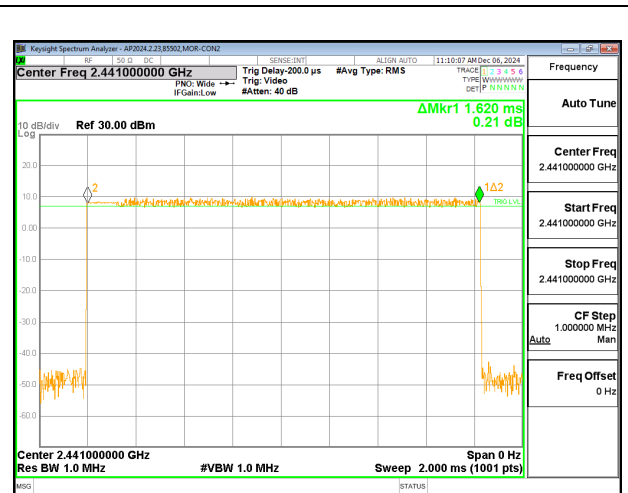


9.5.2. BLUETOOTH ENHANCED DATA RATE 8PSK MODULATION

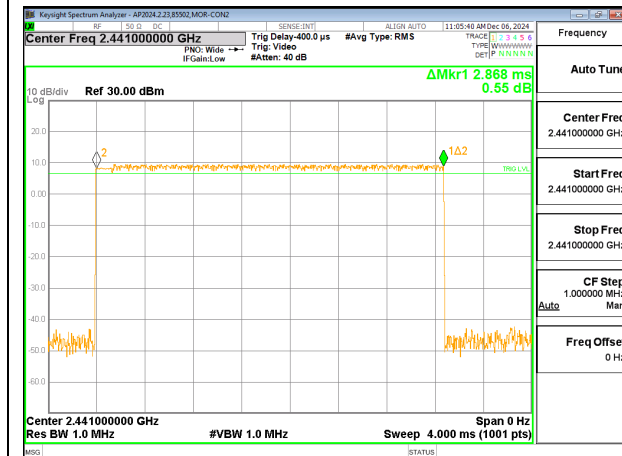
DH Packet	Pulse Width (msec)	Number of Pulses in 3.16 seconds	Average Time of Occupancy (sec)	Limit (sec)	Margin (sec)
8PSK Normal Mode					
DH1	0.373	32	0.1194	0.4	-0.2806
DH3	1.62	16	0.2592	0.4	-0.1408
DH5	2.868	8	0.2294	0.4	-0.1706
DH Packet	Pulse Width (sec)	Number of Pulses in 0.8 seconds	Average Time of Occupancy (sec)	Limit (sec)	Margin (sec)
8PSK AFH Mode					
DH1	0.373	8	0.02984	0.4	-0.3702
DH3	1.62	4	0.06480	0.4	-0.3352
DH5	2.868	2	0.05736	0.4	-0.3426



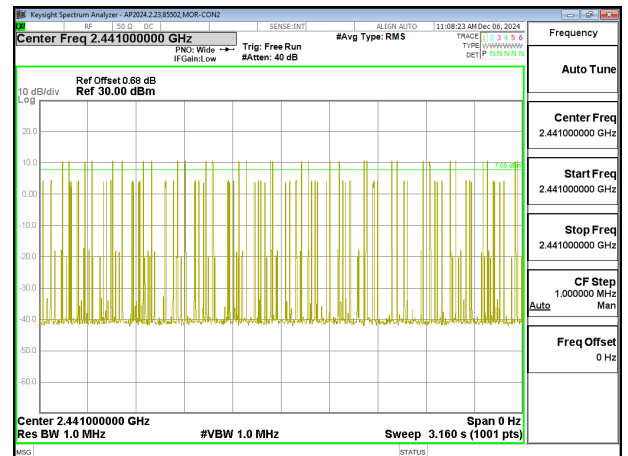
PULSE WIDTH – DH1



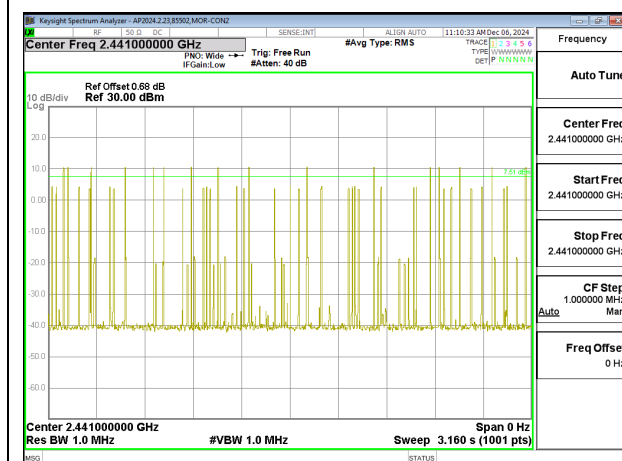
PULSE WIDTH – DH3



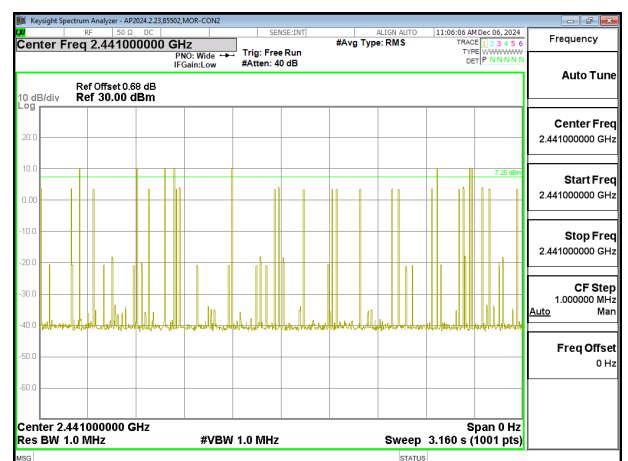
PULSE WIDTH – DH5



**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**

9.6. 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 performed using a wideband gated RF power meter.

The cable assembly insertion loss of 0.68 dB (including 0.68 dB cable) was entered as an offset in the power meter.

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

9.6.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION

Tested By:	85502
Date:	2024-12-04

Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2402	7.57	30	-22.43
Middle	2441	9.17	30	-20.83
High	2480	8.95	30	-21.05

9.6.2. BLUETOOTH ENHANCED DATA RATE DQPSK MODULATION

Tested By:	85502
Date:	2024-12-04

Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2402	8.92	30	-21.08
Middle	2441	10.66	30	-19.34
High	2480	10.46	30	-19.54

9.6.3. BLUETOOTH ENHANCED DATA RATE 8PSK MODULATION

Tested By:	85502
Date:	2024-12-04

Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2402	9.35	20.969	-11.619
Middle	2441	11.02	20.969	-9.949
High	2480	10.67	20.969	-10.299

9.7. AVERAGE POWER

LIMITS

None; for reporting purposes only

TEST PROCEDURE

Measurements performed using a wideband gated RF power meter.

The cable assembly insertion loss of 0.68 dB (including 0.68 dB cable) was entered as an offset in the power meter.

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

9.7.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION

Tested By:	85502
Date	2024-12-04

Channel	Frequency (MHz)	Average Power (dBm)
Low	2402	6.98
Middle	2441	8.59
High	2480	8.44

9.7.2. BLUETOOTH ENHANCED DATA RATE DQPSK MODULATION

Tested By:	85502
Date	2024-12-04

Channel	Frequency (MHz)	Average Power (dBm)
Low	2402	5.91
Middle	2441	7.71
High	2480	7.51

9.7.3. BLUETOOTH ENHANCED DATA RATE 8PSK MODULATION

Tested By:	85502
Date	2024-12-04

Channel	Frequency (MHz)	Average Power (dBm)
Low	2402	6.48
Middle	2441	8.18
High	2480	7.79

9.8. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)
RSS-247 5.5

Limit = -20 dBc

TEST PROCEDURE

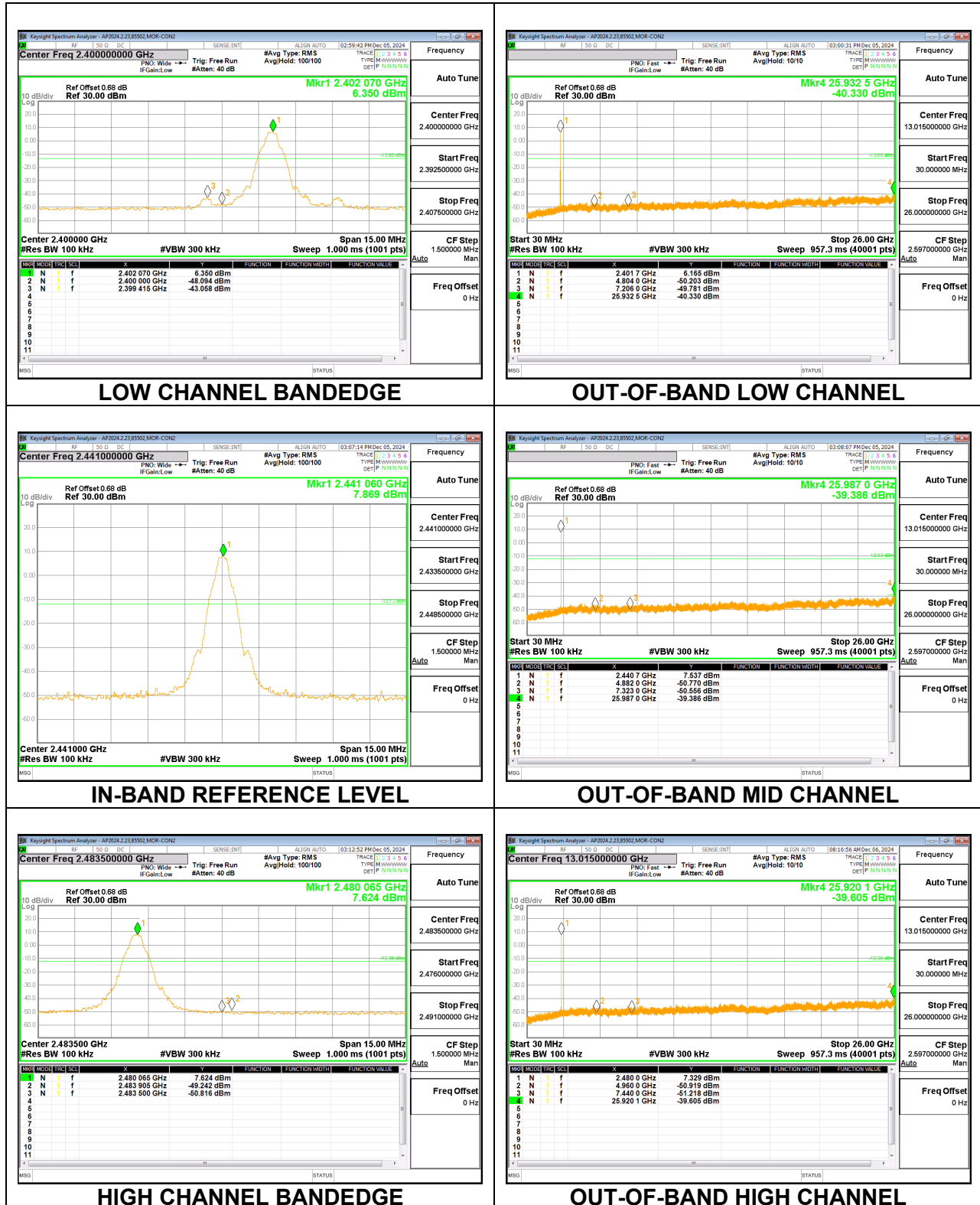
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

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

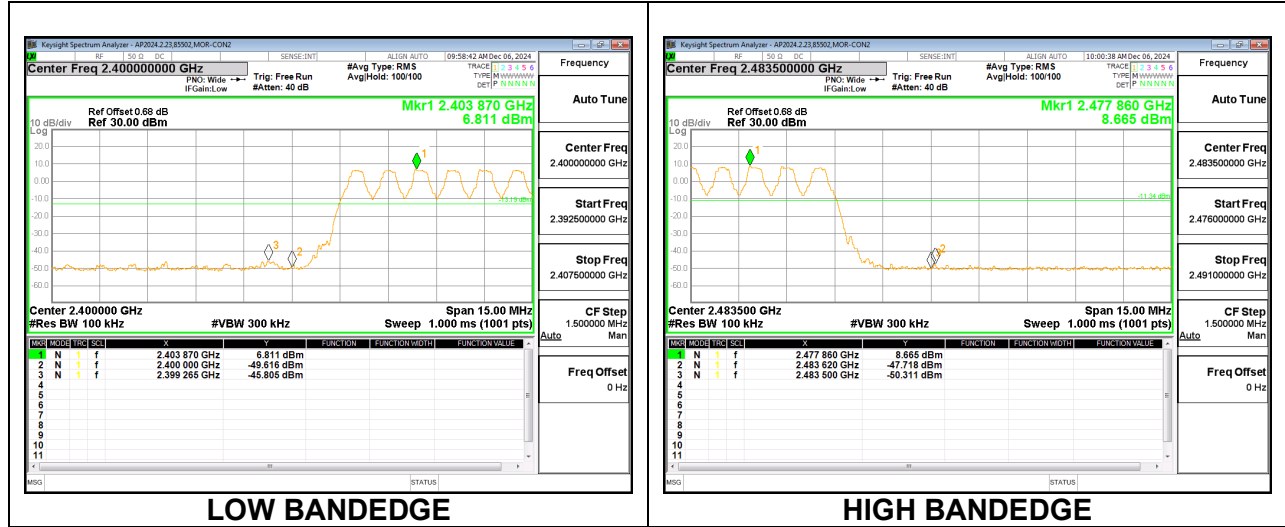
The bandedges at 2.4 and 2.4835 GHz are investigated with the transmitter set to the normal hopping and hopping modes.

9.8.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION

SPURIOUS EMISSIONS, NON-HOPPING

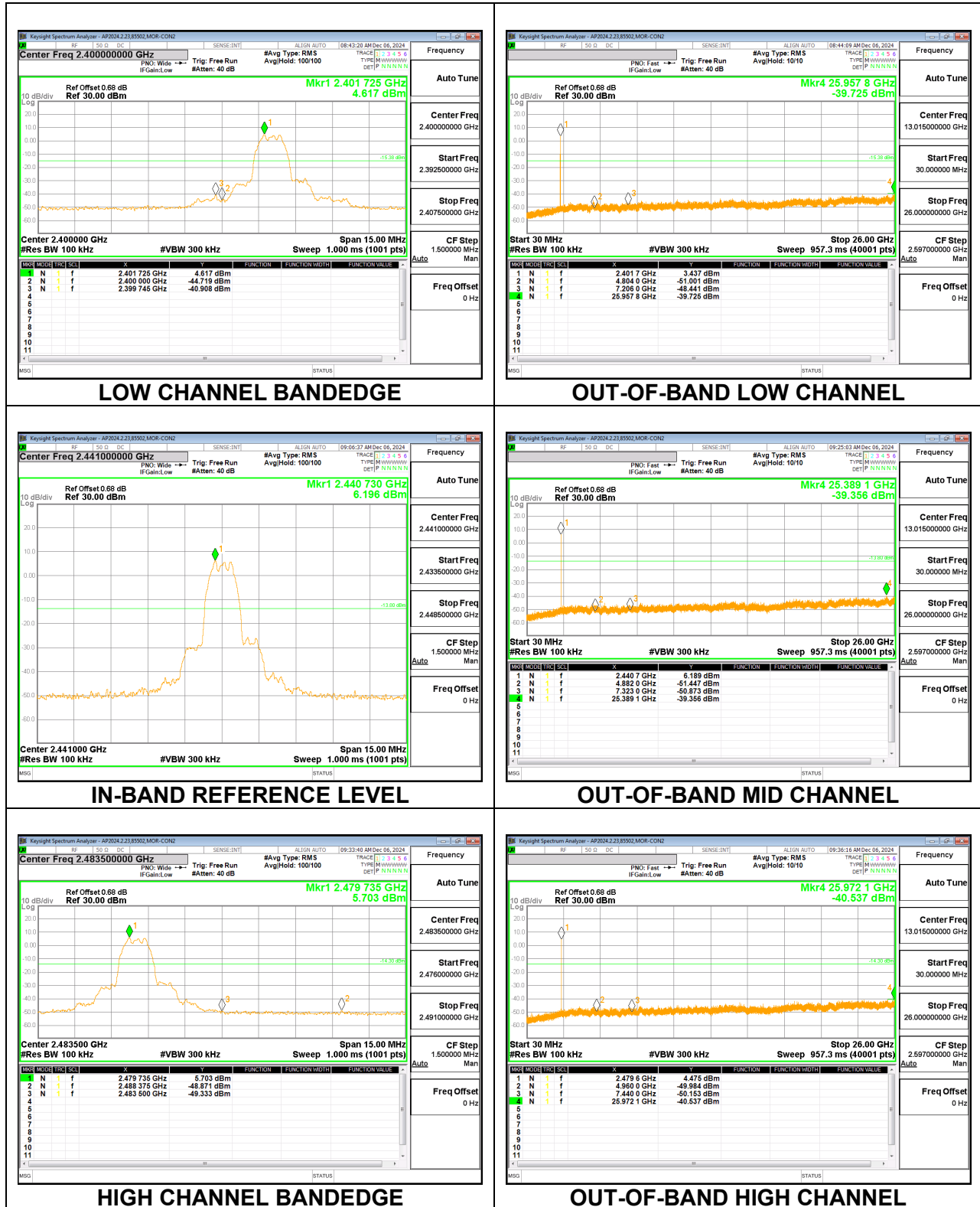


SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON

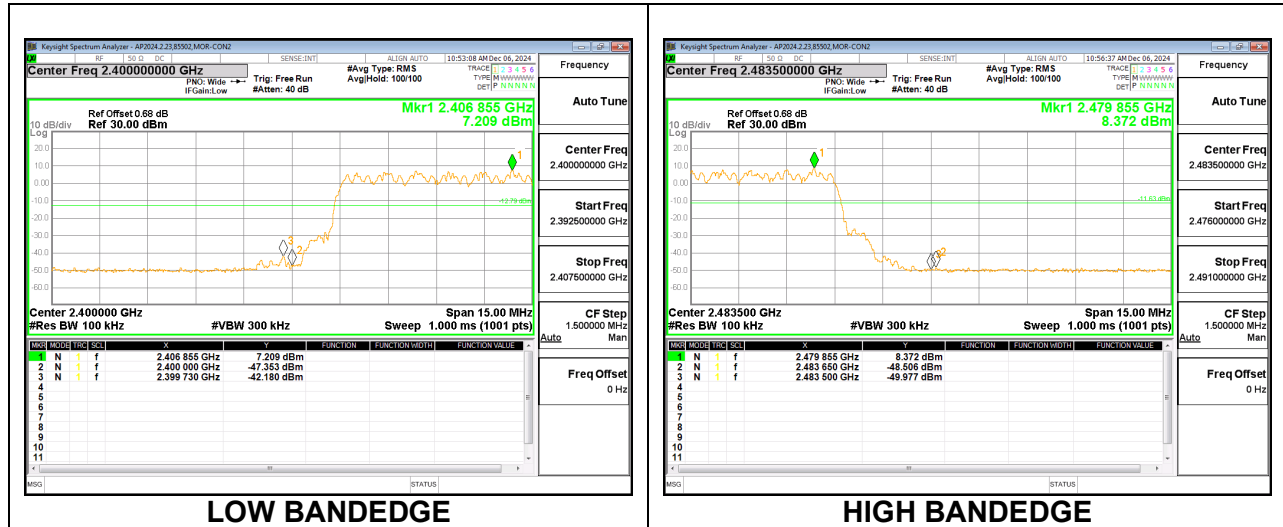


9.8.2. BLUETOOTH ENHANCED DATA RATE 8PSK MODULATION

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

IC 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 3MHz 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. Average measurements are calculated based on KDB 558074 D01 15.247 Meas Guidance v05r02.

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

The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized in both the vertical and the horizontal positions.

3D antenna use - For below 30MHz testing, investigation was done on three antenna orientations (parallel, perpendicular, and ground-parallel).

Base on FCC 15.31 (f) (2): measurements may be performed at a distance closer than that specified in the regulations; however, an attempt should be made to avoid making measurements in the near field.

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

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

KDB 558074 D01 15.247 Meas Guidance v05r02

Use of a duty cycle correction factor (DCCF) is permitted for calculating average radiated field strength emission levels for an FHSS device in 15.247. This DCCF can be applied when the field strength limit (e.g., within a Government Restricted band) and the conditions specified in Section 15.35(c) can be satisfied. The average radiated field strength is calculated by subtracting the DCCF from the maximum radiated field strength level as determined through measurement. The maximum radiated field strength level represents the worst-case (maximum amplitude) RMS measurement of the emission(s) during continuous transmission (i.e., not including any time intervals during which the transmitter is off or is transmitting at a reduced power level). It is also acceptable to apply the DCCF to a measurement performed with a peak detector instead of the specified RMS power averaging detector.

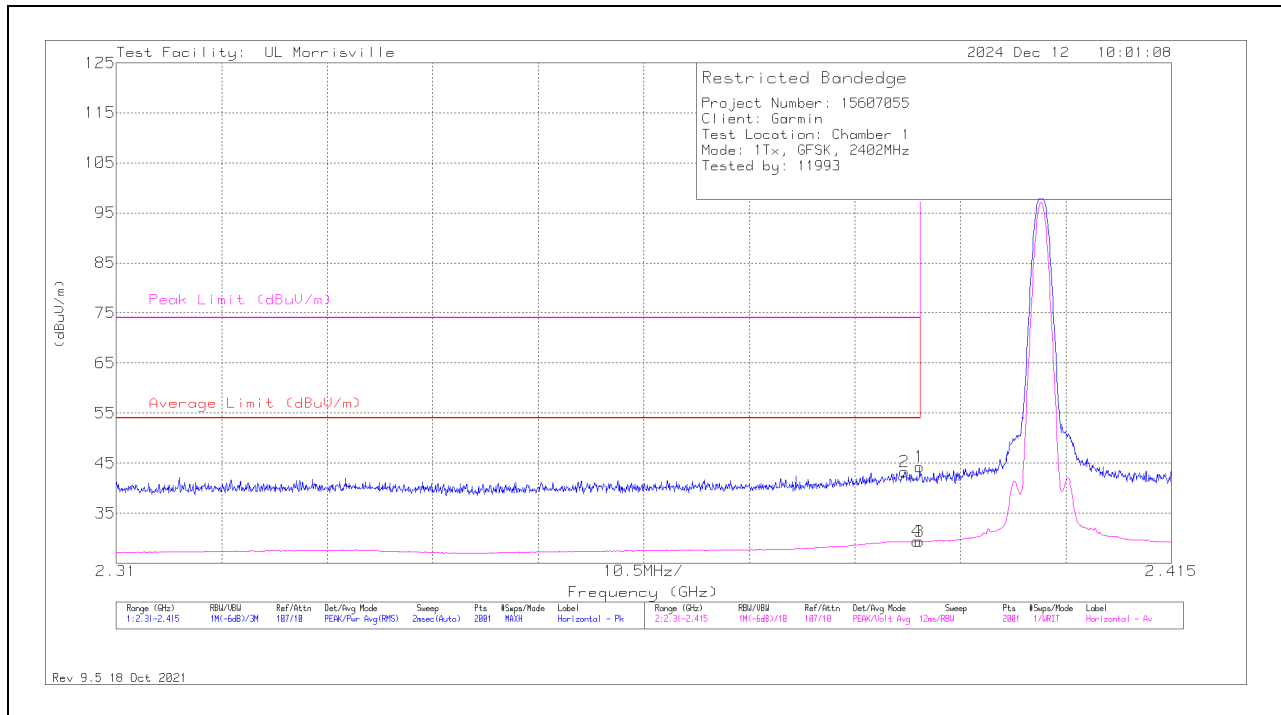
Note that Section 15.35(c) specifies that the DCCF shall represent the worst-case (greatest duty cycle) over any 100 msec transmission period.

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	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	36.39	Pk	31.9	-24	44.29	-	-	74	-29.71	259	101	H
2	*** 2.38844	35.39	Pk	31.9	-24	43.29	-	-	74	-30.71	259	101	H
3	** 2.38996	21.42	VA1T	31.9	-24	29.32	54	-24.68	-	-	259	101	H
4	** 2.3897	21.49	VA1T	31.9	-24	29.39	54	-24.61	-	-	259	101	H

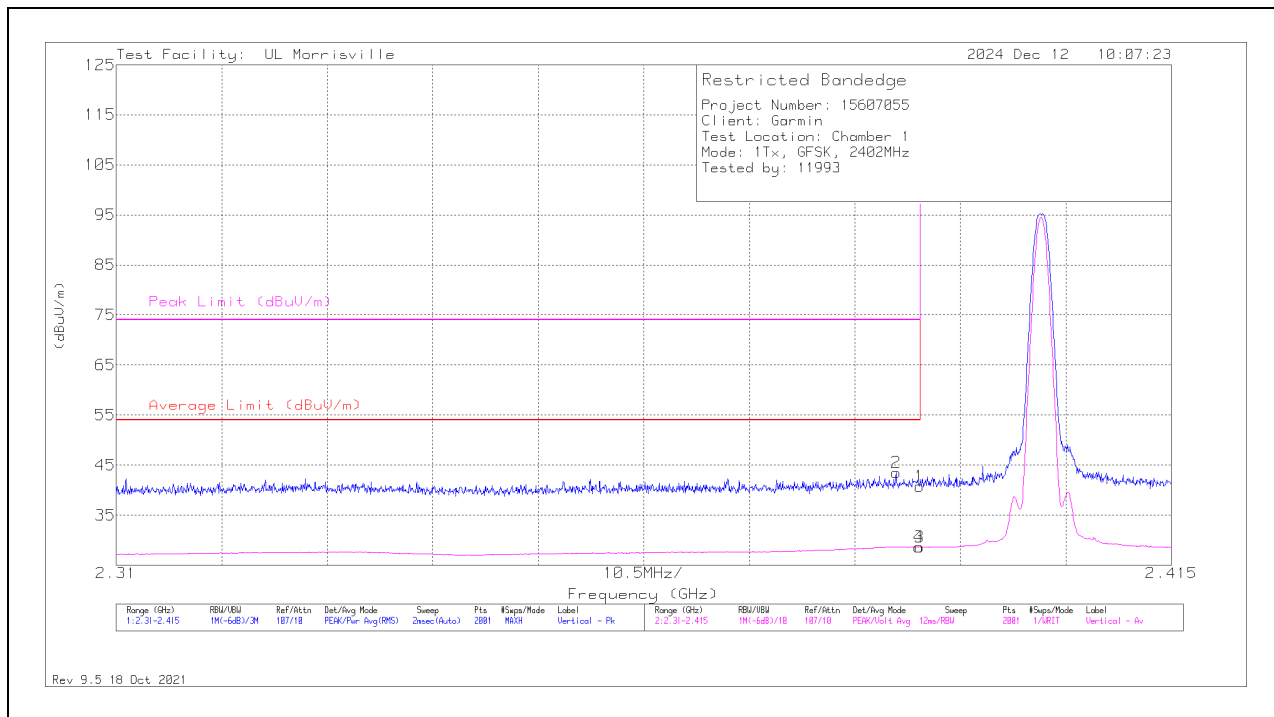
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

** - 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	32.88	Pk	31.9	-24	40.78	-	-	74	-33.22	313	101	V
2	* ** 2.3876	35.55	Pk	31.9	-23.9	43.55	-	-	74	-30.45	313	101	V
3	* ** 2.38996	20.71	VA1T	31.9	-24	28.61	54	-25.39	-	-	313	101	V
4	* ** 2.38985	20.74	VA1T	31.9	-24	28.64	54	-25.36	-	-	313	101	V

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

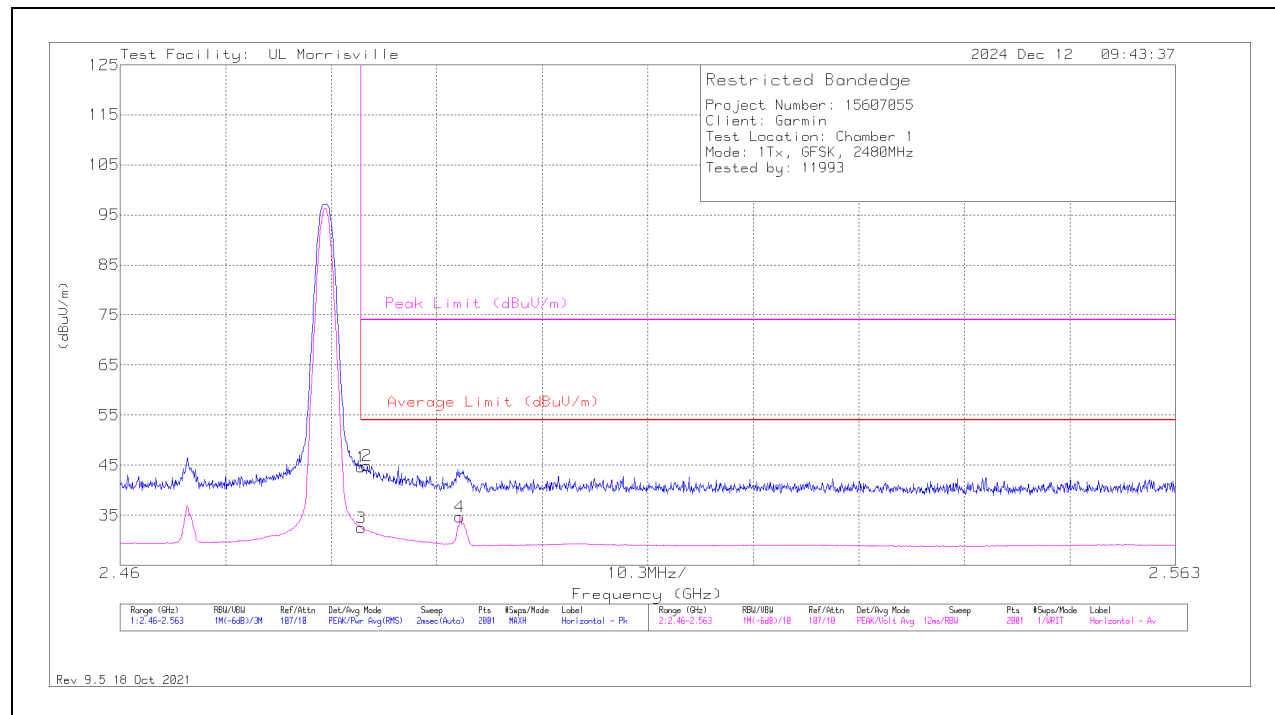
** - indicates frequency in Taiwan NCC LP0002 Restricted Band

Pk - Peak detector

VA1T - Linear Voltage Average $V_B = 1/T_{on}$ where: T_{on} 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	36.09	Pk	32.2	-23.7	44.59	-	-	74	-29.41	109	111	H
2	*** 2.4841	36.51	Pk	32.2	-23.8	44.91	-	-	74	-29.09	109	111	H
3	*** 2.48354	23.95	VA1T	32.2	-23.7	32.45	54	-21.55	-	-	109	111	H
4	*** 2.49317	26.77	VA1T	32.3	-24.4	34.67	54	-19.33	-	-	109	111	H

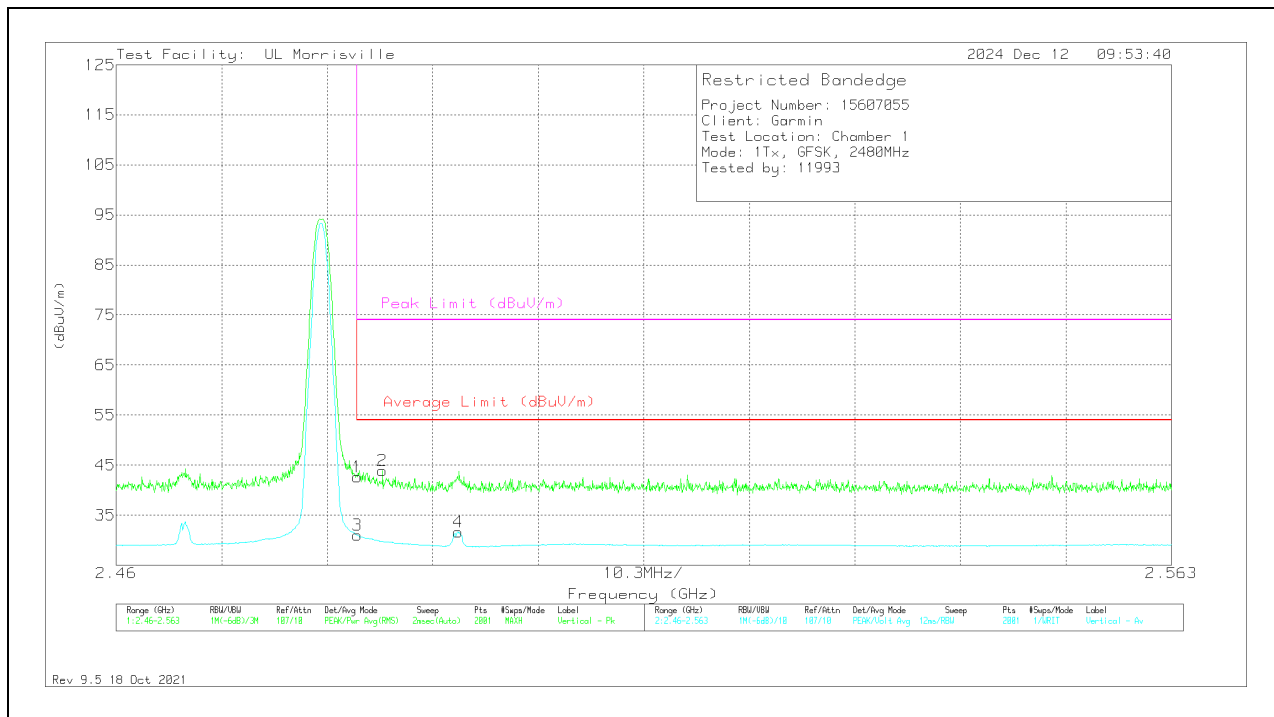
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

** - 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	34.18	Pk	32.2	-23.7	42.68	-	-	74	-31.32	295	106	V
2	*** 2.48601	35.6	Pk	32.2	-23.9	43.9	-	-	74	-30.1	295	106	V
3	*** 2.48354	22.46	VA1T	32.2	-23.7	30.96	54	-23.04	-	-	295	106	V
4	*** 2.49337	23.74	VA1T	32.3	-24.4	31.64	54	-22.36	-	-	295	106	V

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

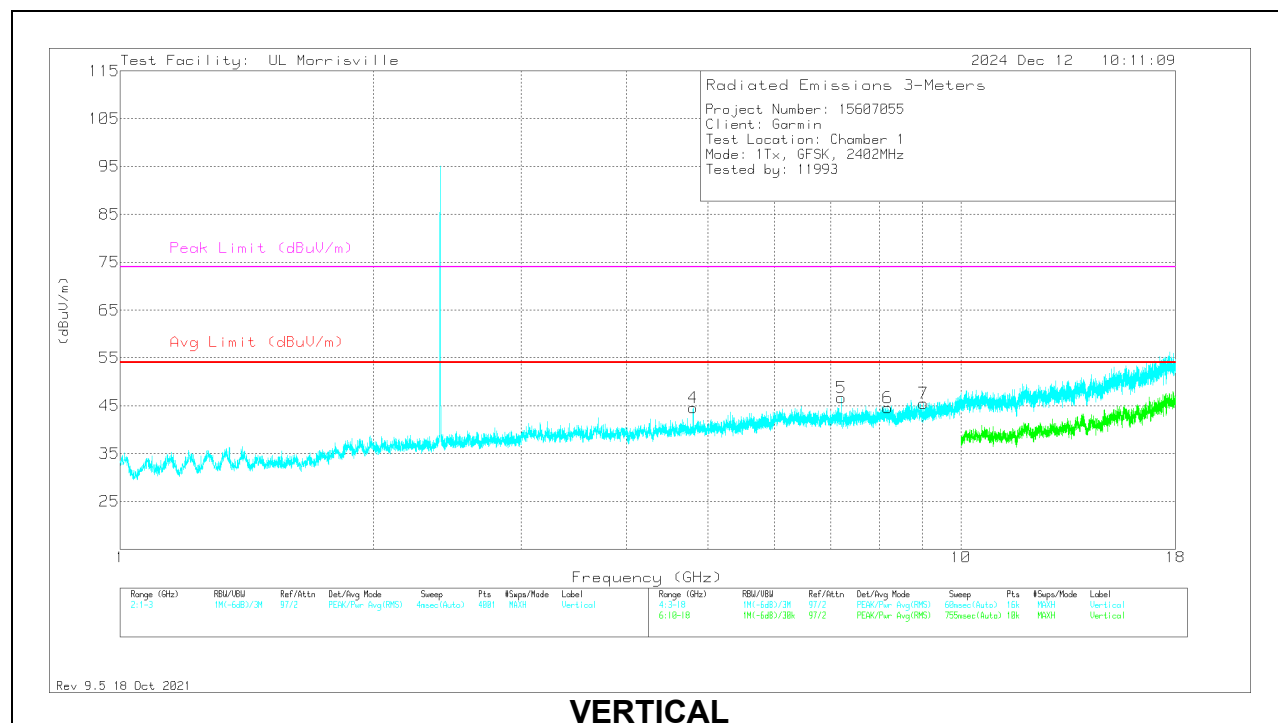
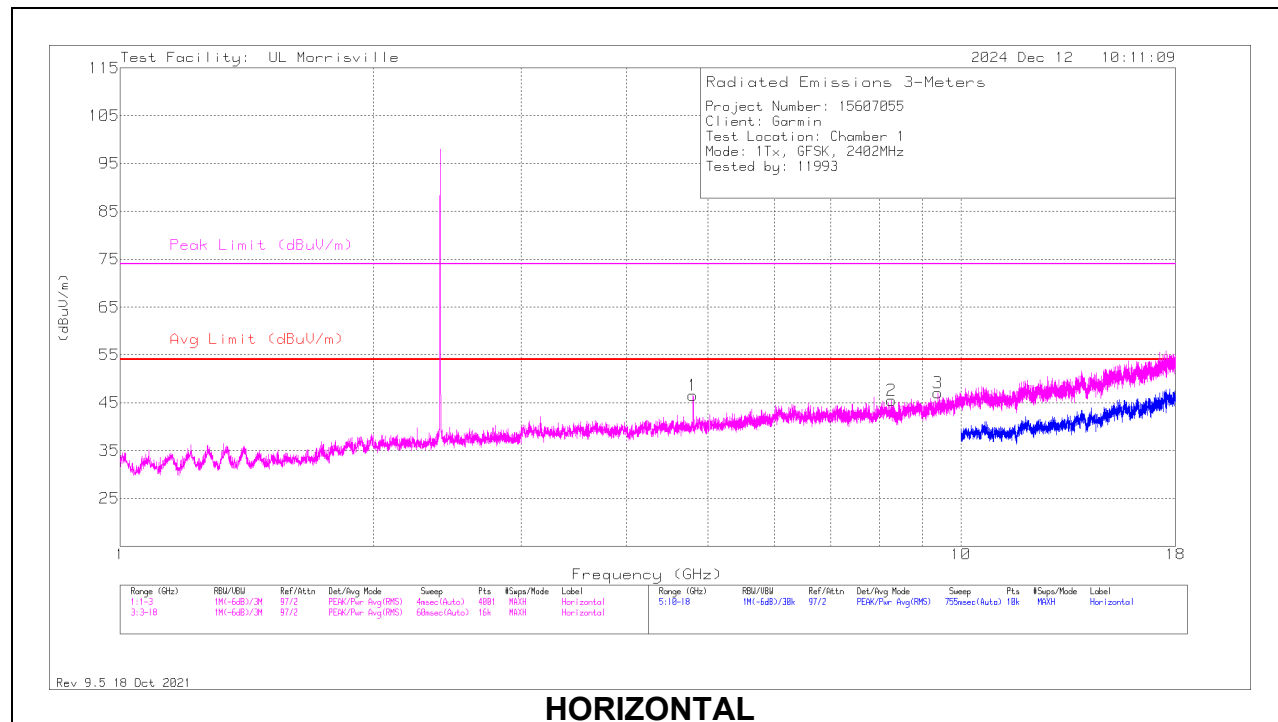
** - indicates frequency in Taiwan NCC LP0002 Restricted Band

Pk - Peak detector

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

HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL RESULTS



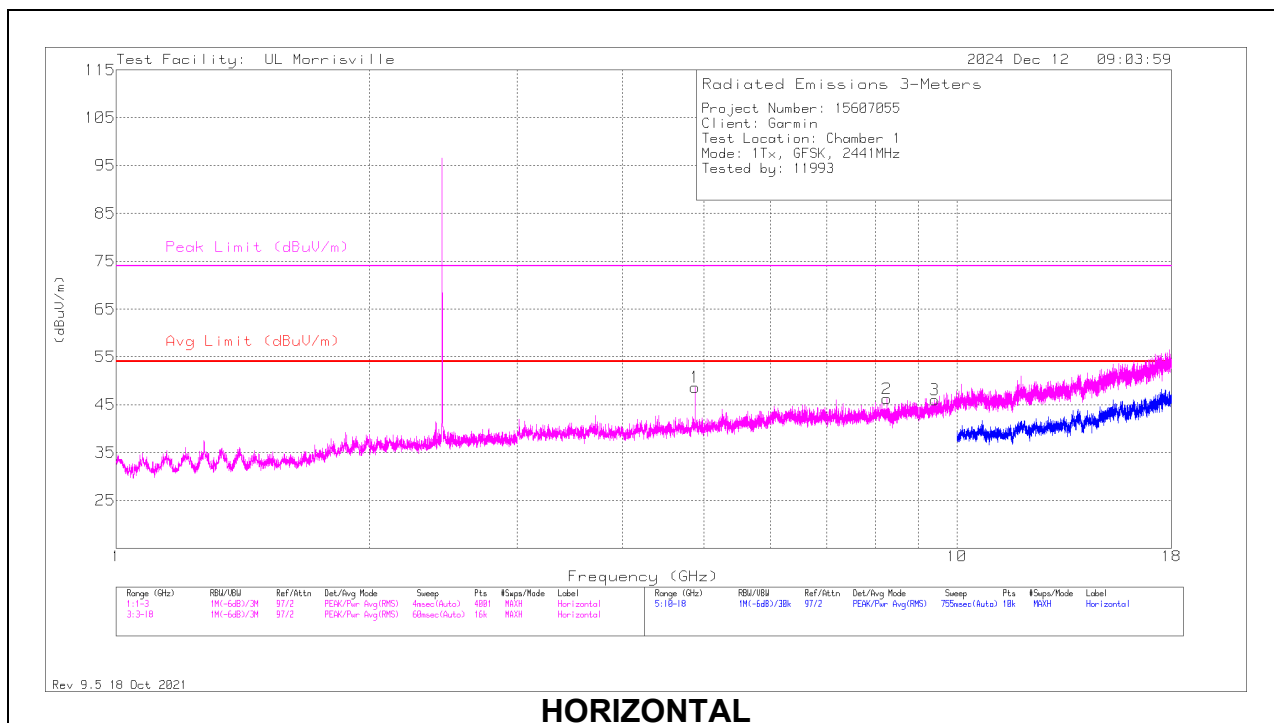
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	135143 (dB/m)	Gain/Loss (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 4.80281	58.26	Pk	33.9	-45.6	46.56	54	-7.44	74	-27.44	0-360	101	H
2	* ** 8.27344	50.27	Pk	35.9	-40.7	45.47	54	-8.53	74	-28.53	0-360	200	H
3	* ** 9.39188	50.88	Pk	36.3	-40.1	47.08	54	-6.92	74	-26.92	0-360	200	H
4	* ** 4.80375	56.23	Pk	33.9	-45.6	44.53	54	-9.47	74	-29.47	0-360	101	V
6	* ** 8.18531	49.54	Pk	35.9	-40.9	44.54	54	-9.46	74	-29.46	0-360	200	V
7	* ** 9.03188	49.15	Pk	35.8	-39.4	45.55	54	-8.45	74	-28.45	0-360	101	V
5	7.20563	53.51	Pk	35.4	-42.2	46.71	-	-	-	-	0-360	200	V

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

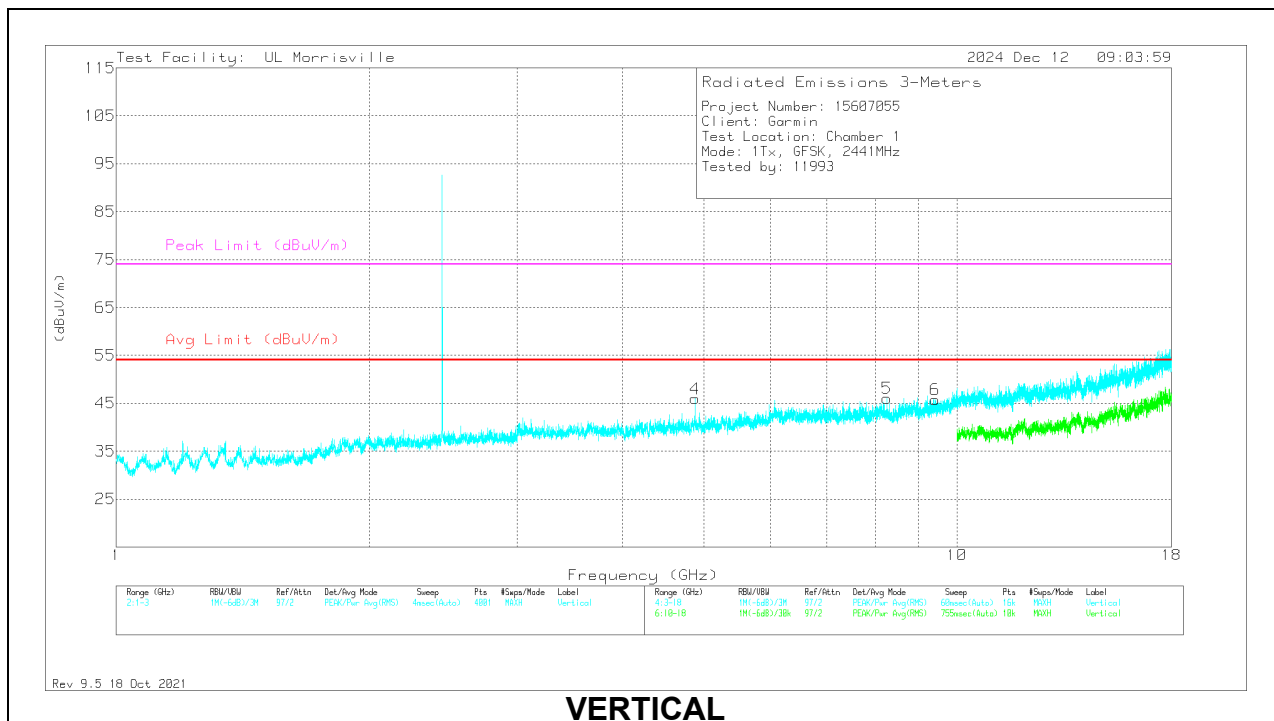
** - indicates frequency in Taiwan NCC LP0002 Restricted Band

Pk - Peak detector

MID CHANNEL RESULTS



HORIZONTAL



VERTICAL

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	* ** 4.88176	62.2	PK2	34	-44.7	51.5	-	-	74	-22.5	185	113	H
	* ** 4.88201	56.71	V1TV	34	-44.7	46.01	54	-7.99			185	113	H
2	* ** 8.26125	50.92	Pk	35.9	-40.6	46.22	54	-7.78	74	-27.78	0-360	101	H
3	* ** 9.41438	49.49	Pk	36.3	-39.8	45.99	54	-8.01	74	-28.01	0-360	101	H
4	* ** 4.88156	56.65	Pk	34	-44.7	45.95	54	-8.05	74	-28.05	0-360	200	V
5	* ** 8.26031	50.85	Pk	35.9	-40.7	46.05	54	-7.95	74	-27.95	0-360	101	V
6	* ** 9.42469	49.83	Pk	36.3	-40.4	45.73	54	-8.27	74	-28.27	0-360	200	V

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

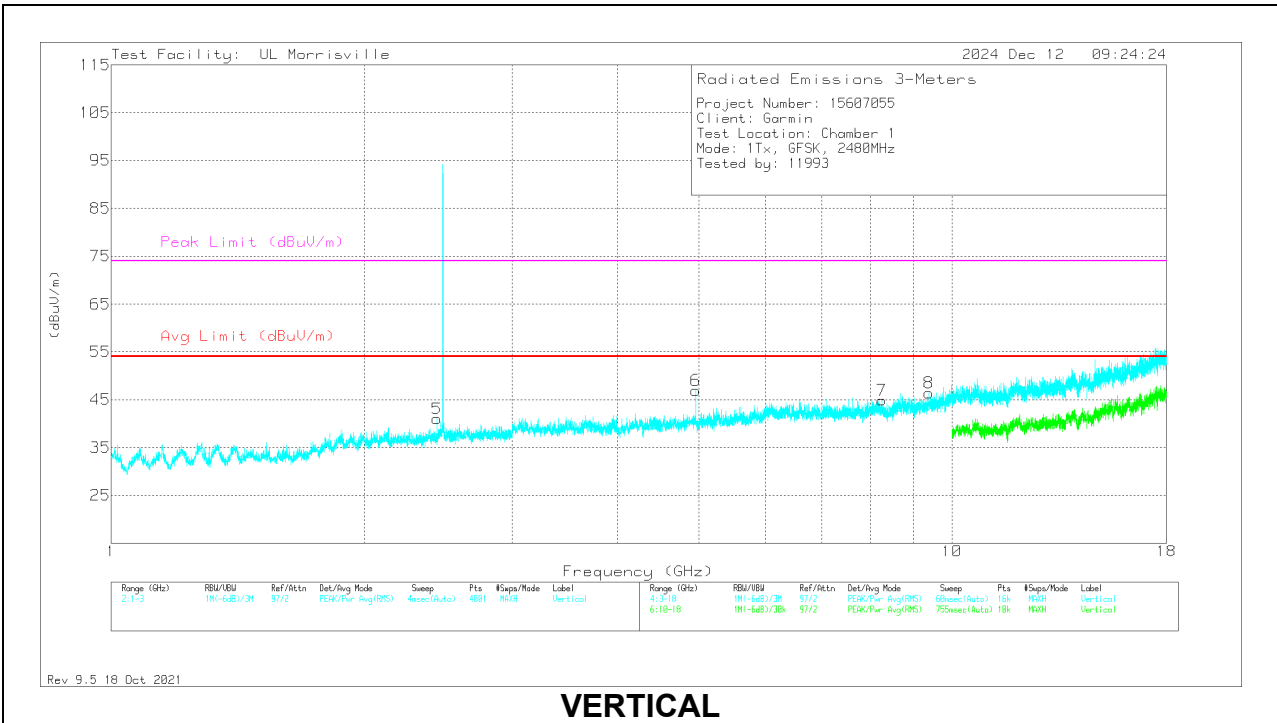
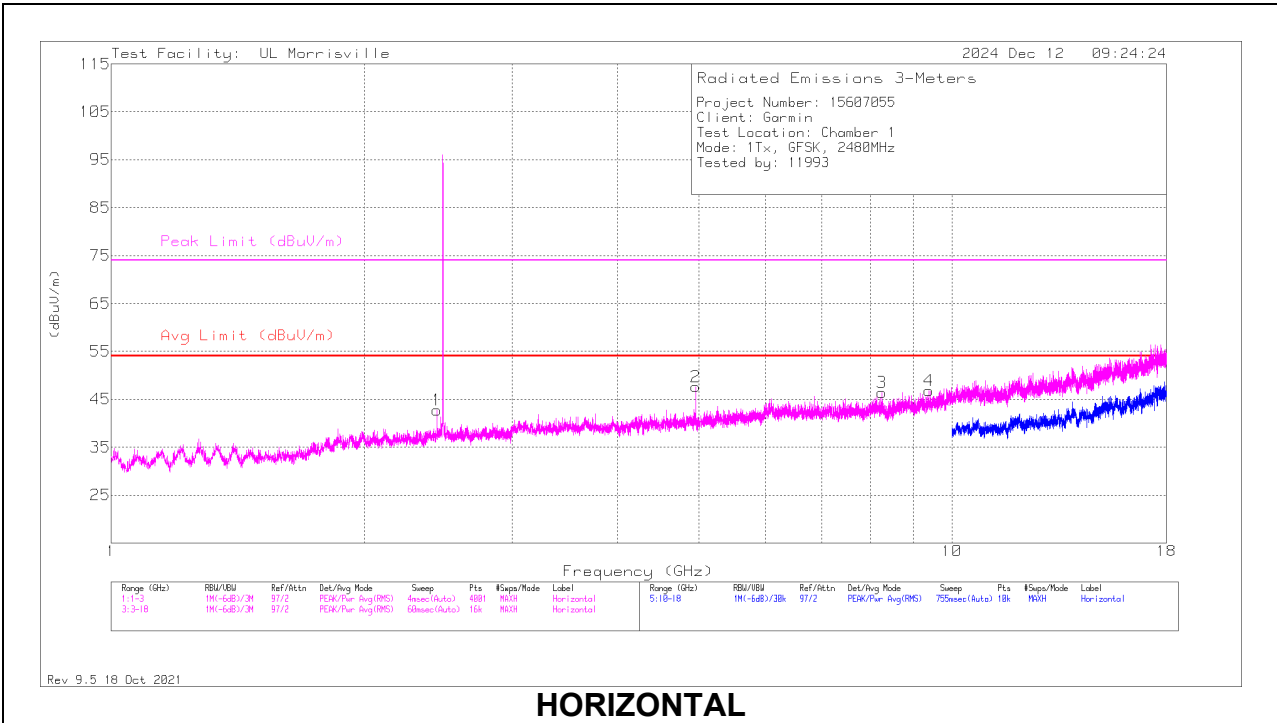
** - indicates frequency in Taiwan NCC LP0002 Restricted Band

Pk - Peak detector

PK2 - Maximum Peak

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

HIGH CHANNEL RESULTS



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
2	* ** 4.96031	58.25	Pk	34.2	-44.8	47.65	54	-6.35	74	-26.35	0-360	101	H
3	* ** 8.26031	51.17	Pk	35.9	-40.7	46.37	54	-7.63	74	-27.63	0-360	101	H
4	* ** 9.39	50.81	Pk	36.2	-40.2	46.81	54	-7.19	74	-27.19	0-360	199	H
6	* ** 4.96031	57.53	Pk	34.2	-44.8	46.93	54	-7.07	74	-27.07	0-360	101	V
7	* ** 8.26125	49.6	Pk	35.9	-40.6	44.9	54	-9.1	74	-29.1	0-360	101	V
8	* ** 9.38719	50.51	Pk	36.2	-40.3	46.41	54	-7.59	74	-27.59	0-360	101	V
1	2.44	35.2	Pk	32.1	-24.5	42.8	-	-	-	-	0-360	101	H
5	2.4405	33.39	Pk	32.1	-24.5	40.99	-	-	-	-	0-360	200	V

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

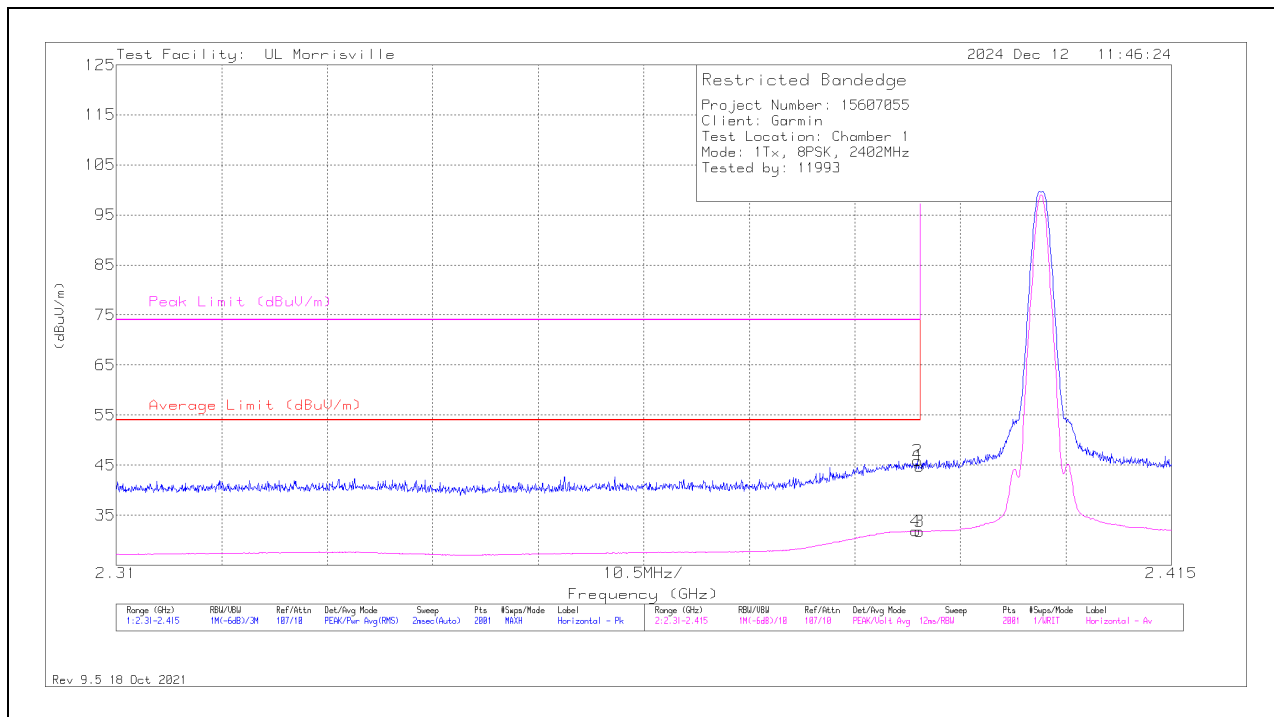
** - indicates frequency in Taiwan NCC LP0002 Restricted Band

Pk - Peak detector

10.1.2. 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	36.91	Pk	31.9	-24	44.81	-	-	74	-29.19	300	101	H
2	*** 2.38975	37.98	Pk	31.9	-24	45.88	-	-	74	-28.12	300	101	H
3	* ** 2.38996	23.89	VA1T	31.9	-24	31.79	54	-22.21	-	-	300	101	H
4	* ** 2.38954	23.91	VA1T	31.9	-24	31.81	54	-22.19	-	-	300	101	H

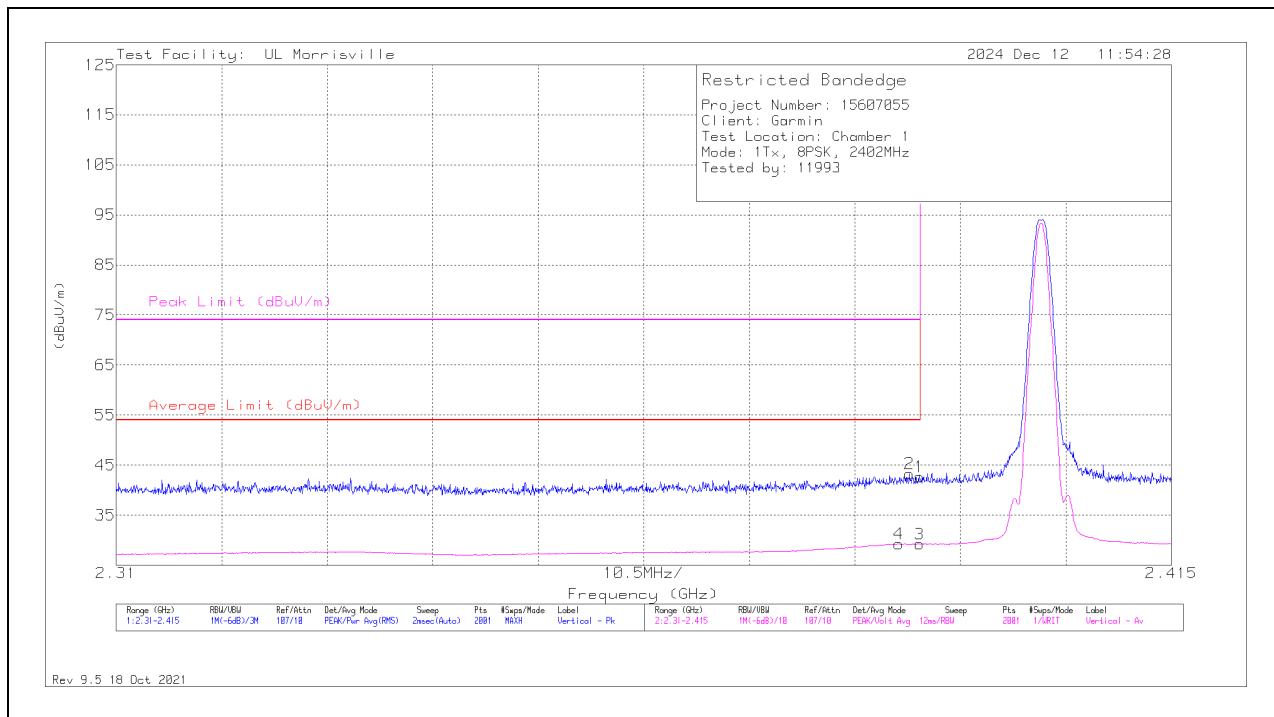
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

** - 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	34.77	Pk	31.9	-24	42.67	-	-	74	-31.33	302	101	V
2	*** 2.38891	35.41	Pk	31.9	-24	43.31	-	-	74	-30.69	302	101	V
3	*** 2.38996	21.29	VA1T	31.9	-24	29.19	54	-24.81	-	-	302	101	V
4	*** 2.38786	21.24	VA1T	31.9	-23.9	29.24	54	-24.76	-	-	302	101	V

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

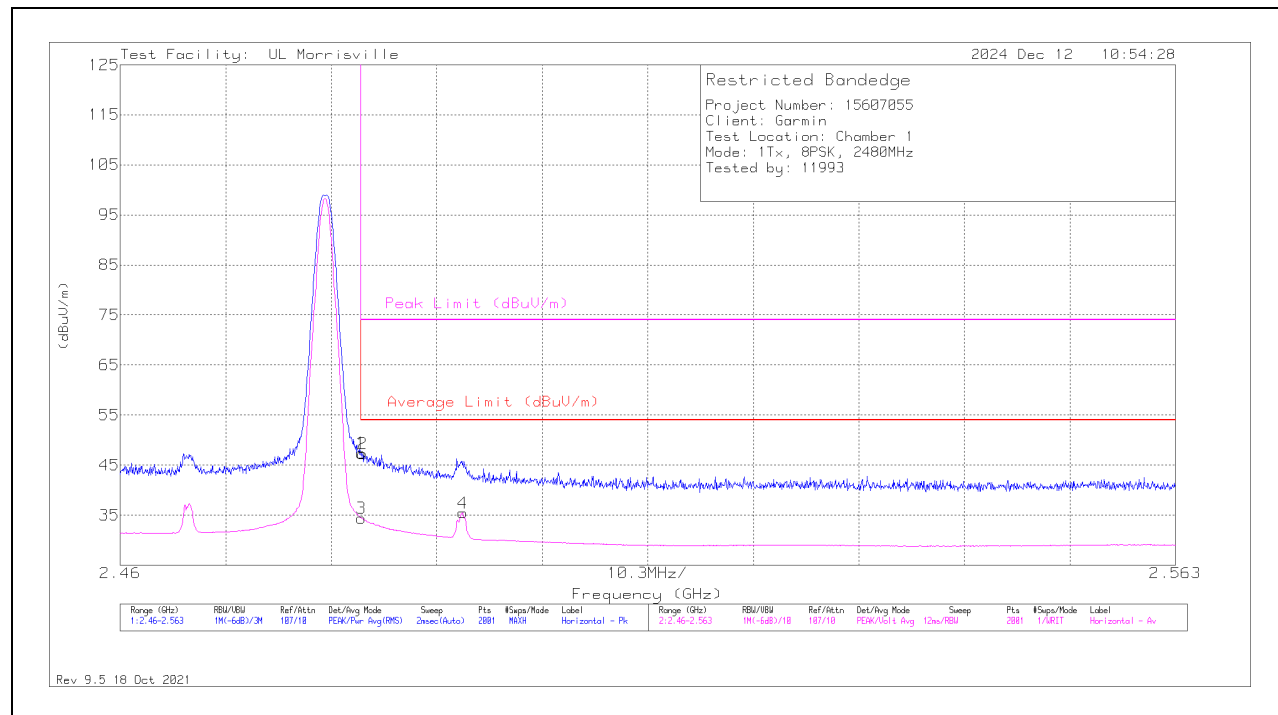
** - indicates frequency in Taiwan NCC LP0002 Restricted Band

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	38.85	Pk	32.2	-23.7	47.35	-	-	74	-26.65	348	140	H
2	*** 2.48364	38.77	Pk	32.2	-23.7	47.27	-	-	74	-26.73	348	140	H
3	*** 2.48354	25.92	VA1T	32.2	-23.7	34.42	54	-19.58	-	-	348	140	H
4	*** 2.49342	27.54	VA1T	32.3	-24.4	35.44	54	-18.56	-	-	348	140	H

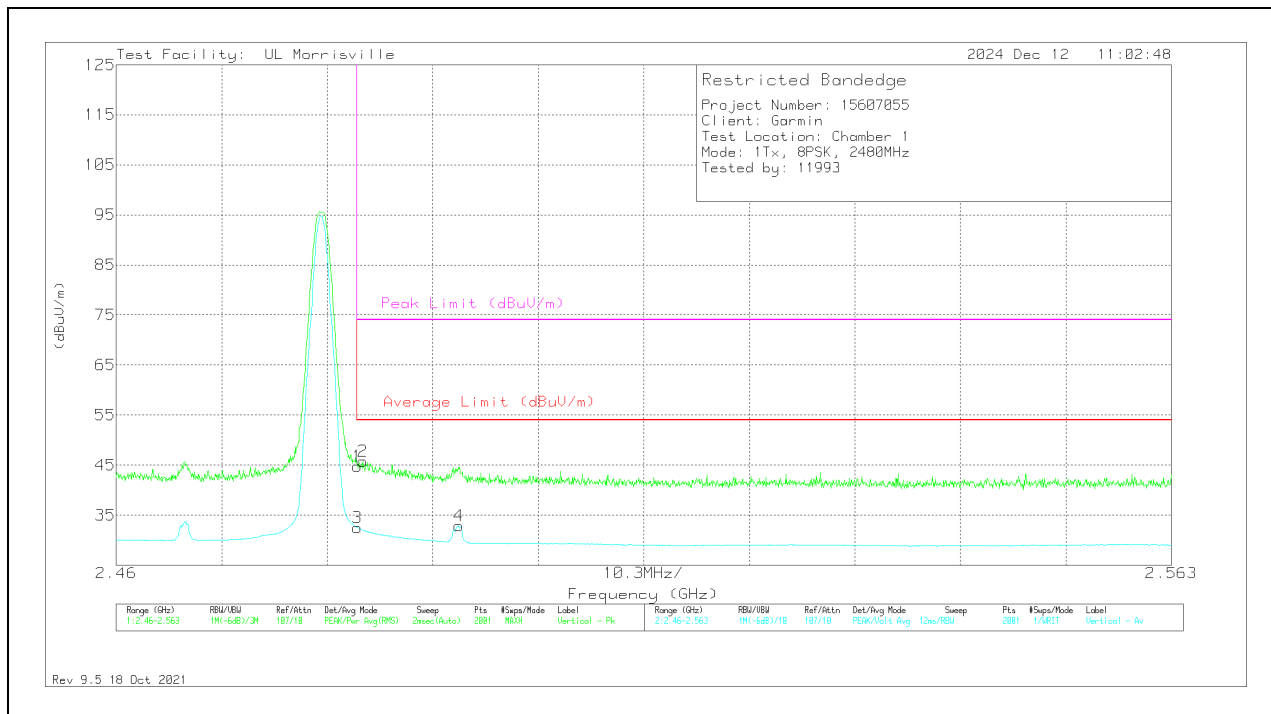
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

** - 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	36.3	Pk	32.2	-23.7	44.8	-	-	74	-29.2	340	141	V
2	*** 2.4841	37.38	Pk	32.2	-23.8	45.78	-	-	74	-28.22	340	141	V
3	*** 2.48354	24.01	VA1T	32.2	-23.7	32.51	54	-21.49	-	-	340	141	V
4	*** 2.49342	24.94	VA1T	32.3	-24.4	32.84	54	-21.16	-	-	340	141	V

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

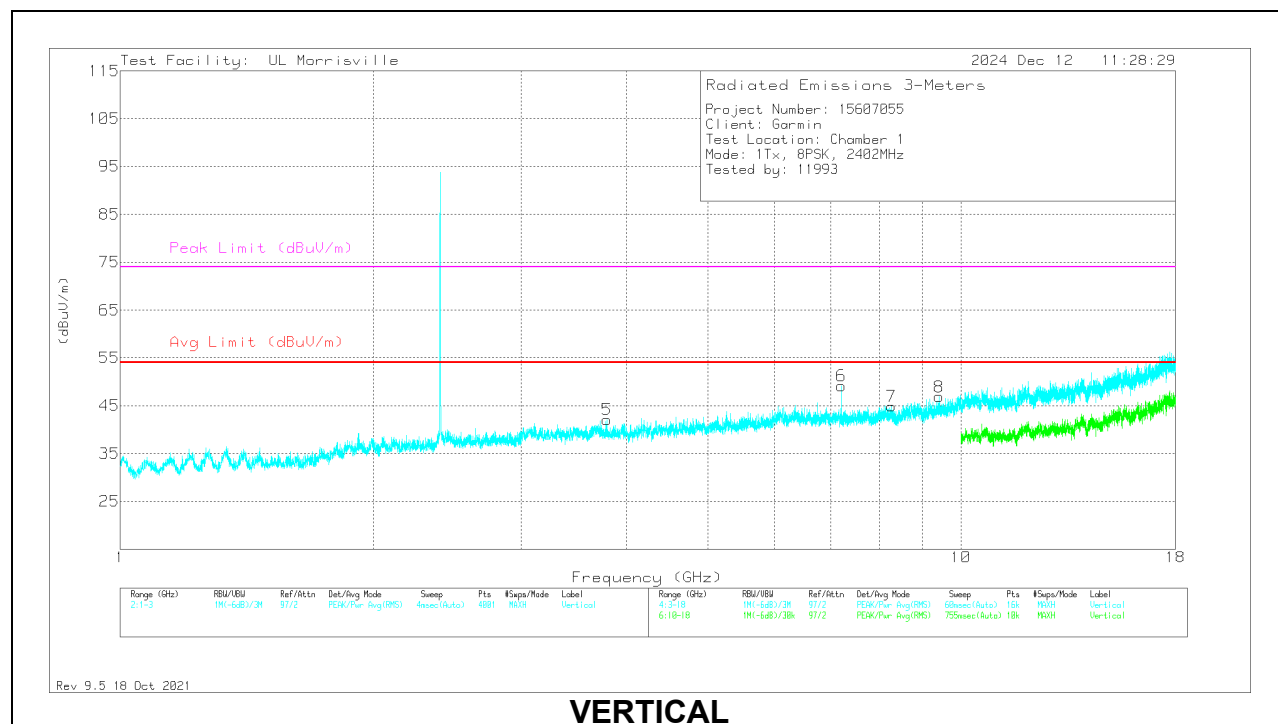
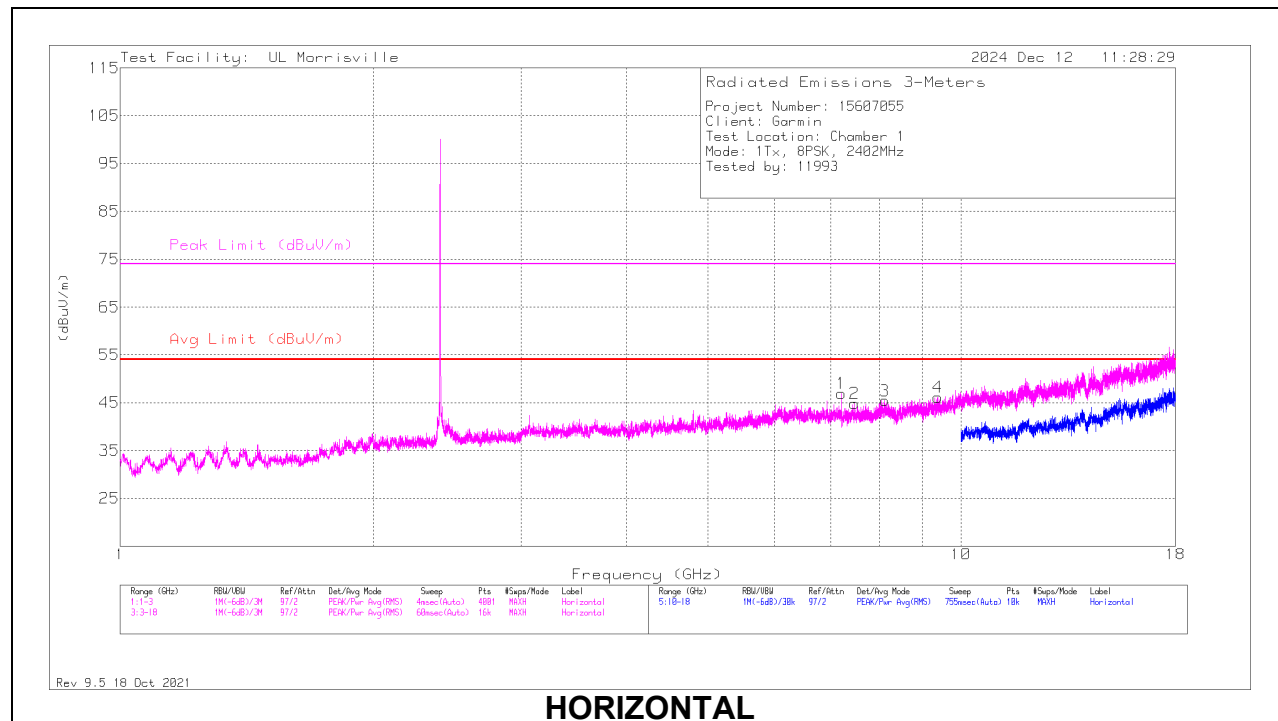
** - indicates frequency in Taiwan NCC LP0002 Restricted Band

Pk - Peak detector

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

HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL RESULTS



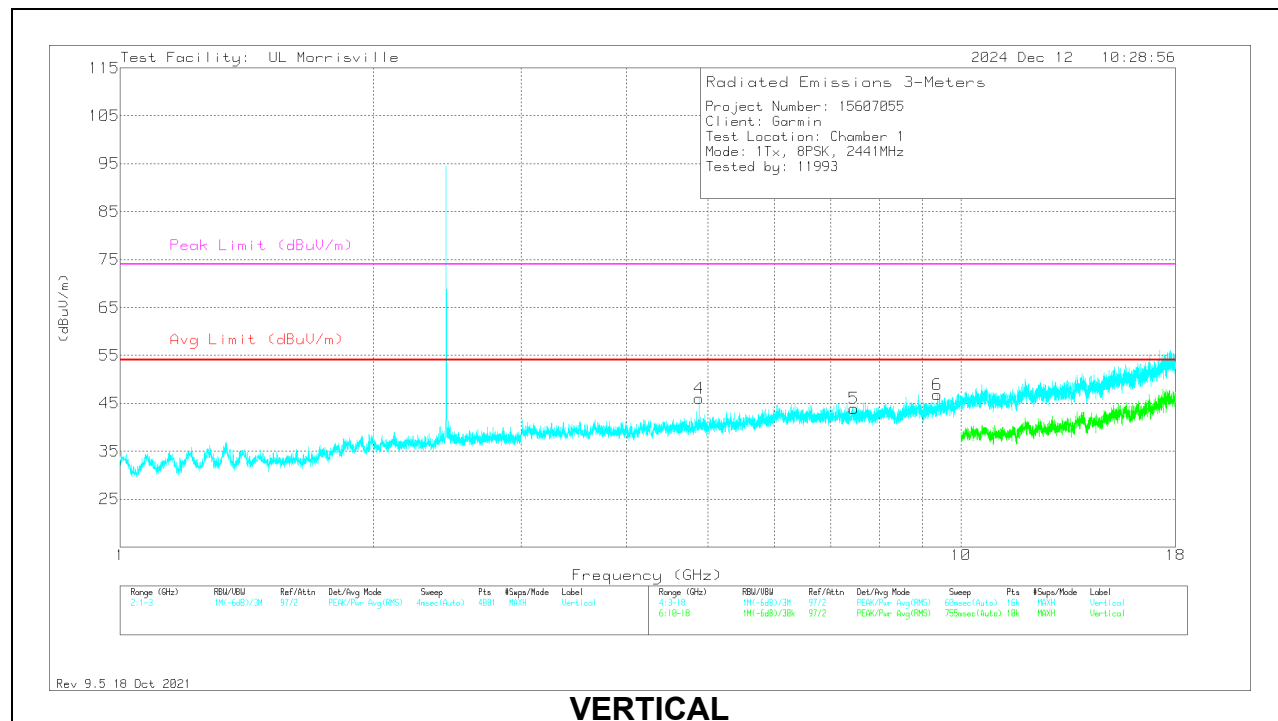
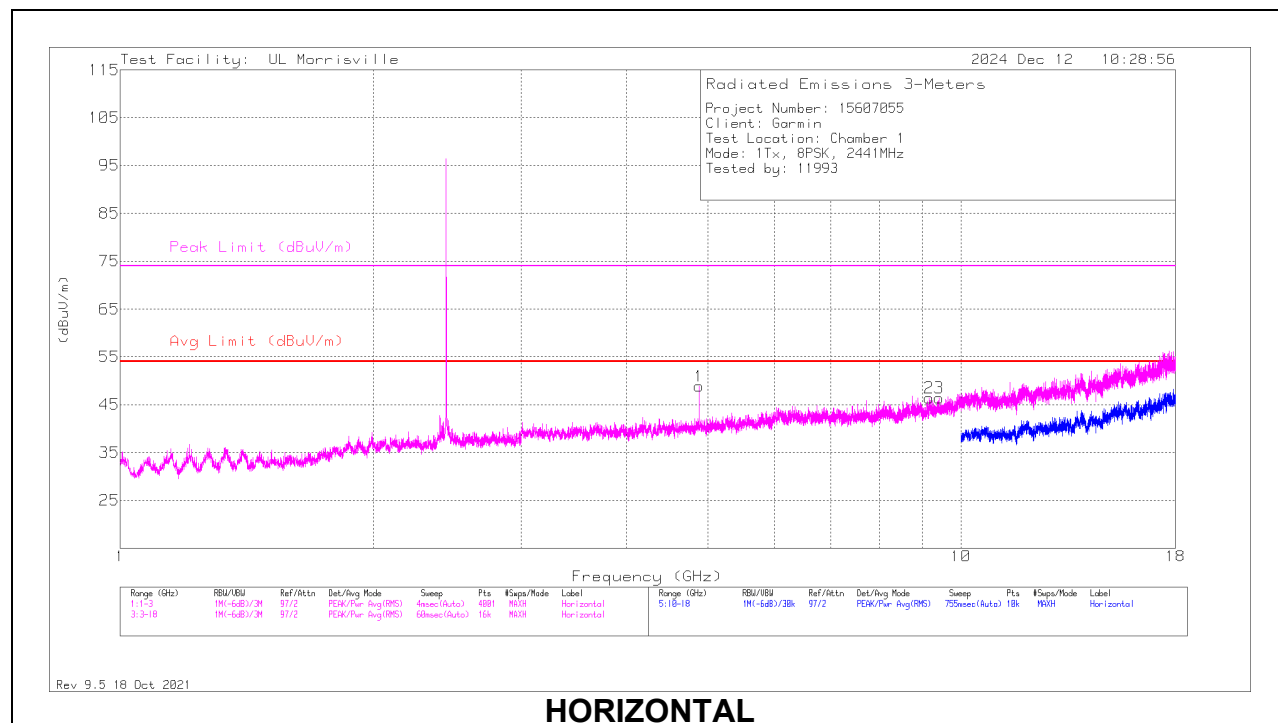
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	135143 (dB/m)	Gain/Loss (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
2	* ** 7.47656	50.59	Pk	35.5	-41.2	44.89	54	-9.11	74	-29.11	0-360	200	H
3	* ** 8.1225	50.83	Pk	35.9	-41.3	45.43	54	-8.57	74	-28.57	0-360	200	H
4	* ** 9.39281	49.93	Pk	36.3	-40.1	46.13	54	-7.87	74	-27.87	0-360	101	H
5	* ** 3.79313	52.8	Pk	33.1	-43.8	42.1	54	-11.9	74	-31.9	0-360	101	V
7	* ** 8.26406	49.5	Pk	35.9	-40.5	44.9	54	-9.1	74	-29.1	0-360	101	V
8	* ** 9.41531	50.27	Pk	36.3	-39.7	46.87	54	-7.13	74	-27.13	0-360	101	V
1	7.20563	53.72	Pk	35.4	-42.2	46.92	-	-	-	-	0-360	200	H
6	7.20563	55.91	Pk	35.4	-42.2	49.11	-	-	-	-	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

MID CHANNEL RESULTS



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	* ** 4.8824	58.42	PK2	34	-44.8	47.62	-	-	74	-26.38	181	117	H
	* ** 4.88202	56.5	V1TV	34	-44.7	45.8	54	-8.2	-	-	181	117	H
2	* ** 9.17438	50.54	Pk	36	-40.1	46.44	54	-7.56	74	-27.56	0-360	101	H
3	* ** 9.41906	49.99	Pk	36.3	-39.9	46.39	54	-7.61	74	-27.61	0-360	101	H
4	* ** 4.88156	56.77	Pk	34	-44.7	46.07	54	-7.93	74	-27.93	0-360	101	V
5	* ** 7.46625	49.68	Pk	35.5	-41.3	43.88	54	-10.12	74	-30.12	0-360	200	V
6	* ** 9.37219	50.92	Pk	36.2	-40.3	46.82	54	-7.18	74	-27.18	0-360	200	V

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

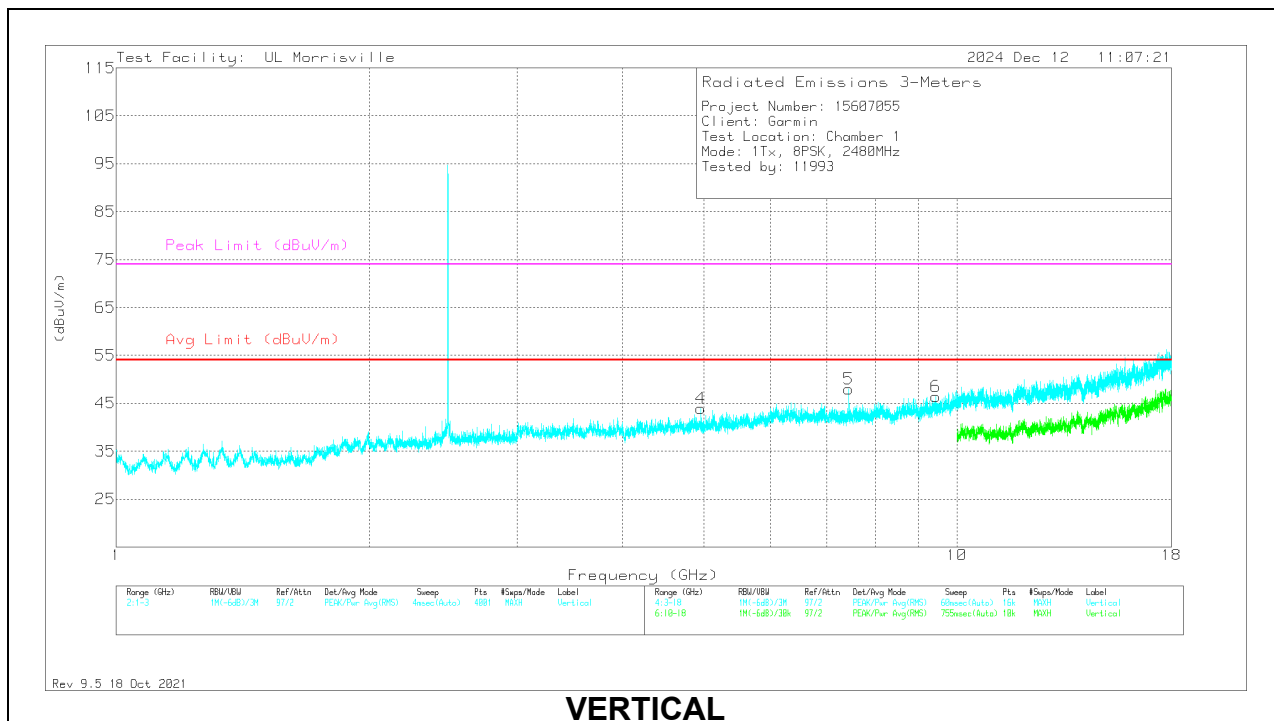
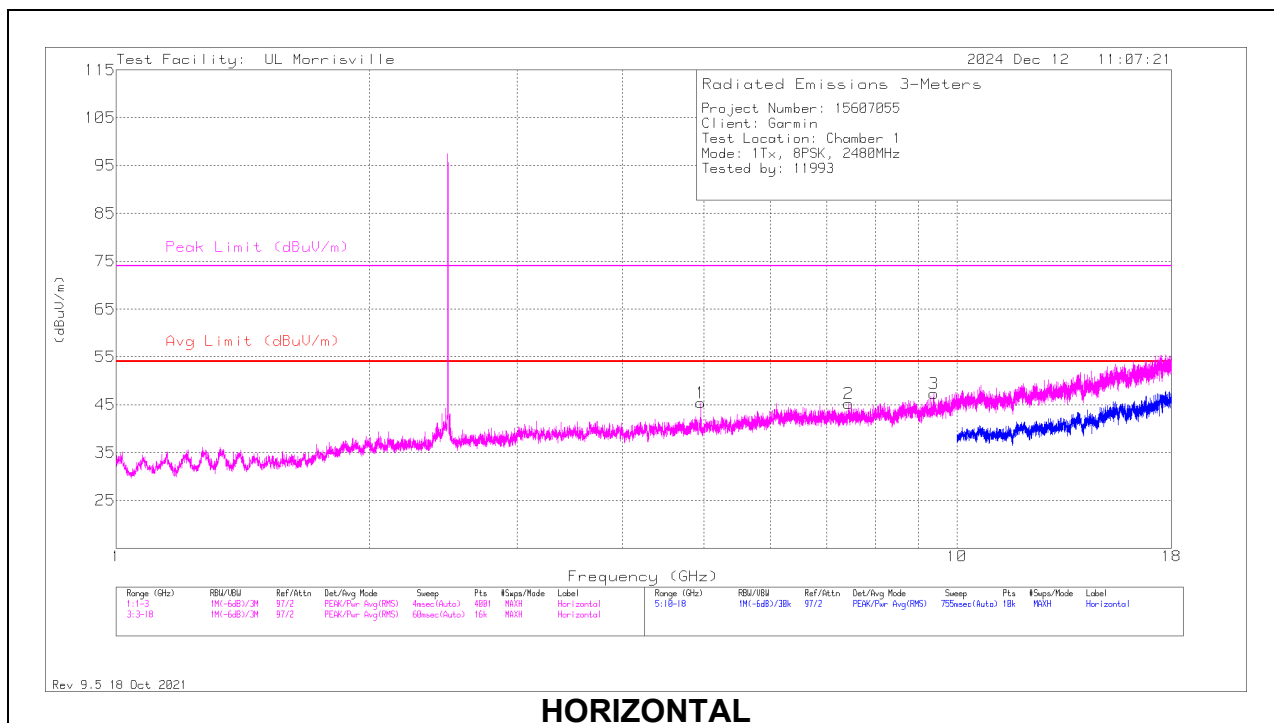
** - indicates frequency in Taiwan NCC LP0002 Restricted Band

Pk - Peak detector

PK2 - Maximum Peak

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

HIGH CHANNEL RESULTS



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	* ** 4.95938	56.02	Pk	34.2	-44.8	45.42	54	-8.58	74	-28.58	0-360	101	H
2	* ** 7.43906	50.88	Pk	35.4	-41	45.28	54	-8.72	74	-28.72	0-360	200	H
3	* ** 9.39469	51.02	Pk	36.3	-40	47.32	54	-6.68	74	-26.68	0-360	200	H
4	* ** 4.96031	54.55	Pk	34.2	-44.8	43.95	54	-10.05	74	-30.05	0-360	101	V
5	* ** 7.43951	50.59	PK2	35.4	-41	44.99	-	-	74	-29.01	190	165	V
	* ** 7.44	47.59	V1TV	35.4	-41.1	41.89	54	-12.11	-	-	190	165	V
6	* ** 9.43125	50.54	Pk	36.3	-40.4	46.44	54	-7.56	74	-27.56	0-360	200	V

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

** - indicates frequency in Taiwan NCC LP0002 Restricted Band

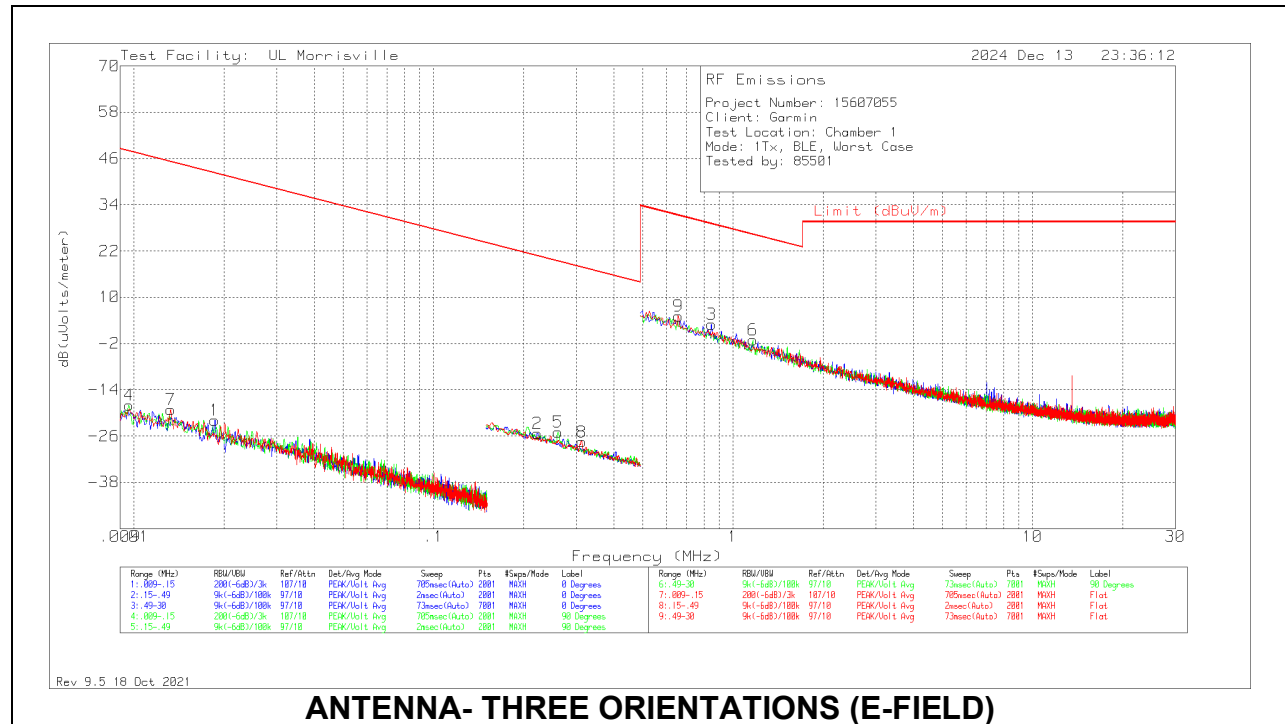
Pk - Peak detector

PK2 - Maximum Peak

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

10.2. WORST CASE SPURIOUS BELOW 30MHZ

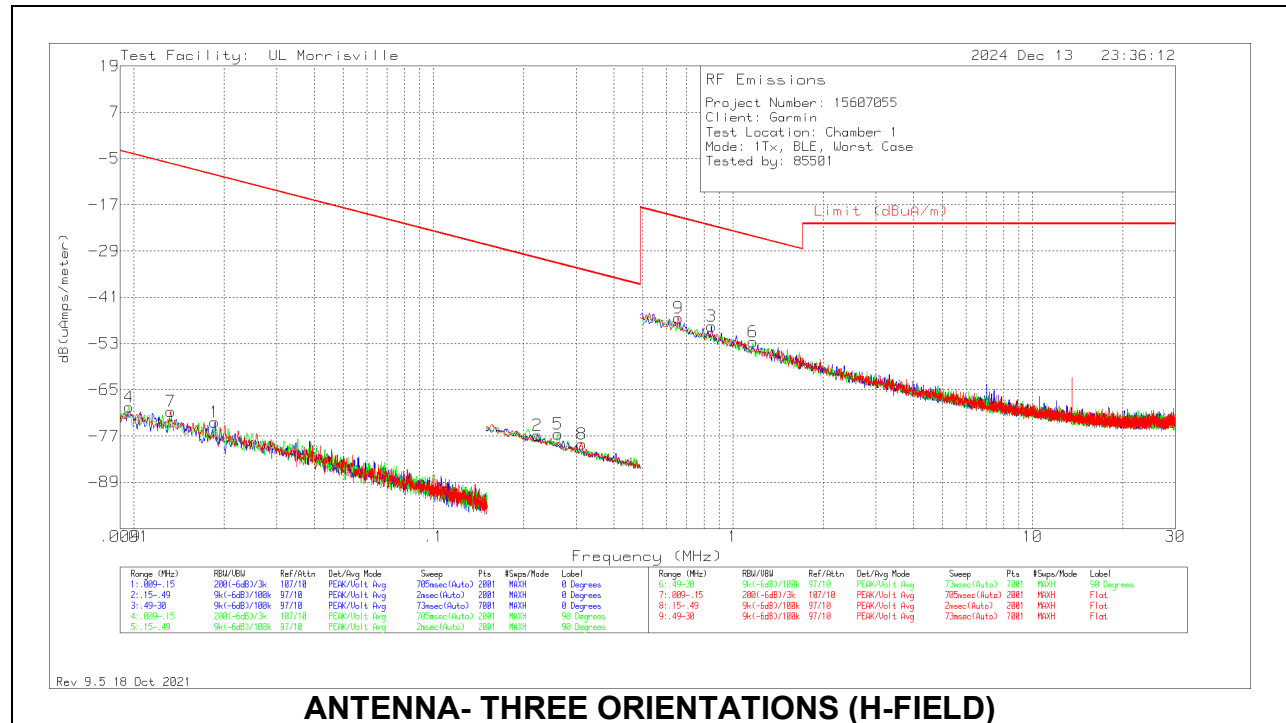
Note: All measurements were made at a test distance of 3 m. The measured data was extrapolated from the test distance (3m) to the specification distance (300 m from 9-490 kHz and 30 m from 490 kHz – 30 MHz) to clearly show the relative levels of fundamental and spurious emissions and demonstrate compliance 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	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)	Height (cm)	Loop Angle
4	.00964	43.44	Pk	18.5	.1	-80	-17.96	47.92	67.92	-65.88	0-360	401	90 degs
7	.01326	43.92	Pk	16.8	.1	-80	-19.18	45.15	65.15	-64.33	0-360	401	Flat
1	.01859	43.56	Pk	14.5	.1	-80	-21.84	42.22	62.22	-64.06	0-360	401	0 degs
2	.22259	43.72	Pk	10.9	.1	-80	-25.28	20.65	40.65	-45.93	0-360	401	0 degs
5	.26033	43.99	Pk	10.9	.1	-80	-25.01	19.29	39.29	-44.3	0-360	401	90 degs
8	.31286	41.48	Pk	10.9	.1	-80	-27.52	17.7	37.7	-45.22	0-360	401	Flat
9	.65864	34.06	Pk	11	.1	-40	5.16	31.23	-	-26.07	0-360	401	Flat
3	.84836	31.95	Pk	11	.1	-40	3.05	29.03	-	-25.98	0-360	401	0 degs
6	1.16456	27.74	Pk	11	.2	-40	-1.06	26.28	-	-27.34	0-360	401	90 degs

Pk - Peak detector

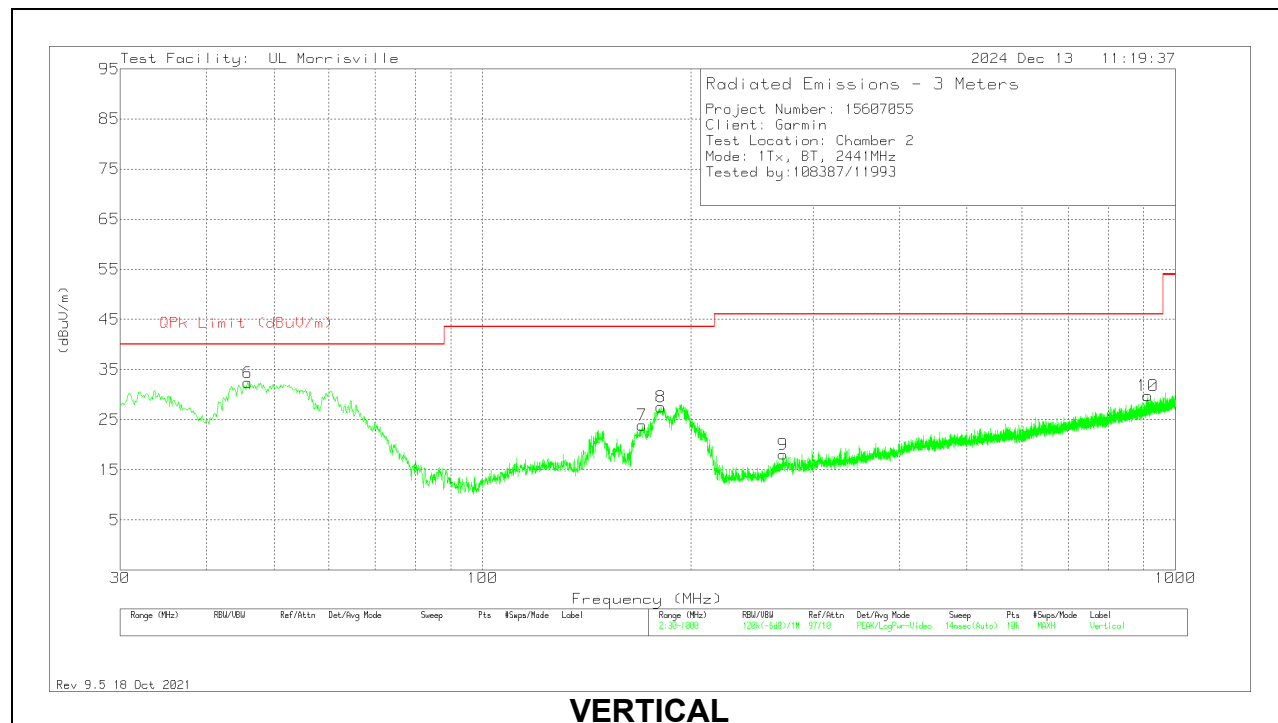
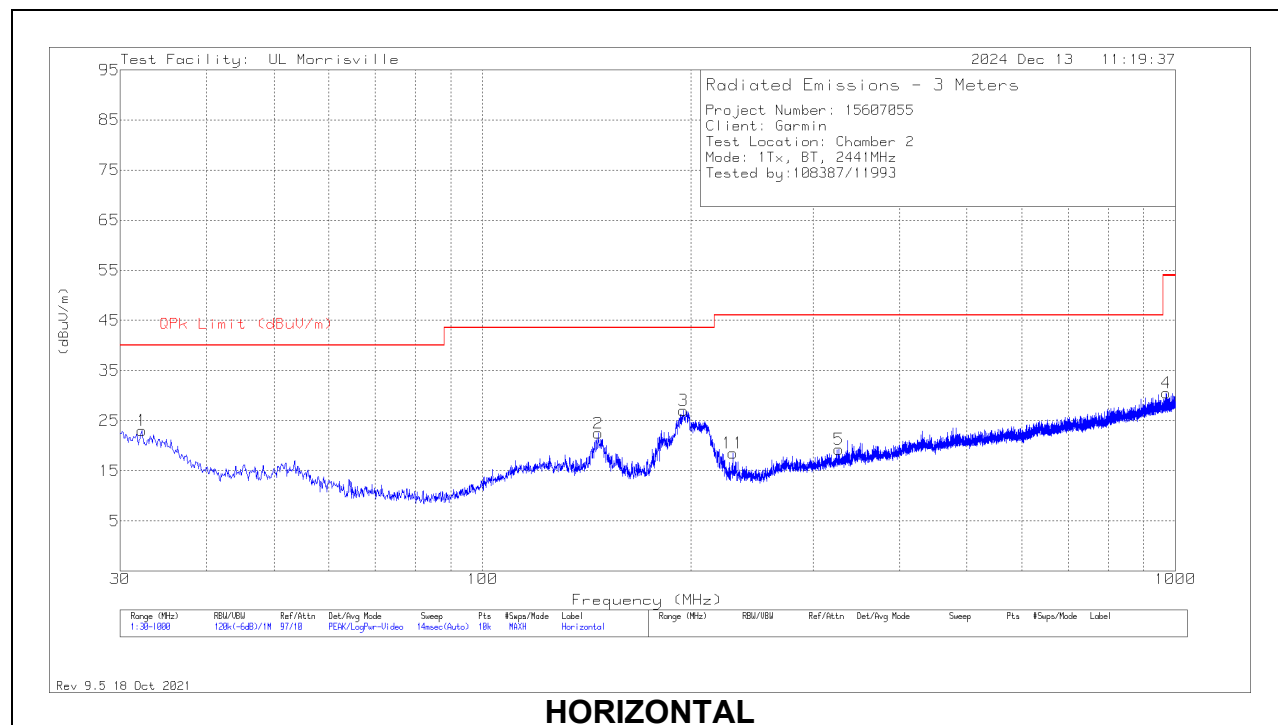


ANTENNA- THREE ORIENTATIONS (H-FIELD)

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
4	.00964	43.44	Pk	-33	.1	-80	-69.46	-3.58	16.42	-65.88	0-360	401	90 degs
7	.01326	43.92	Pk	-34.7	.1	-80	-70.68	-6.35	13.65	-64.33	0-360	401	Flat
1	.01859	43.56	Pk	-37	.1	-80	-73.34	-9.28	10.72	-64.06	0-360	401	0 degs
2	.22259	43.72	Pk	-40.6	.1	-80	-76.78	-30.85	-10.85	-45.93	0-360	401	0 degs
5	.26033	43.99	Pk	-40.6	.1	-80	-76.51	-32.21	-12.21	-44.3	0-360	401	90 degs
8	.31286	41.48	Pk	-40.6	.1	-80	-79.02	-33.8	-13.8	-45.22	0-360	401	Flat
9	.65864	34.06	Pk	-40.5	.1	-40	-46.34	-20.27	-	-26.07	0-360	401	Flat
3	.84836	31.95	Pk	-40.5	.1	-40	-48.45	-22.47	-	-25.98	0-360	401	0 degs
6	1.16456	27.74	Pk	-40.5	.2	-40	-52.56	-25.22	-	-27.34	0-360	401	90 degs

Pk - Peak detector

10.3. WORST CASE SPURIOUS 30-1000MHZ



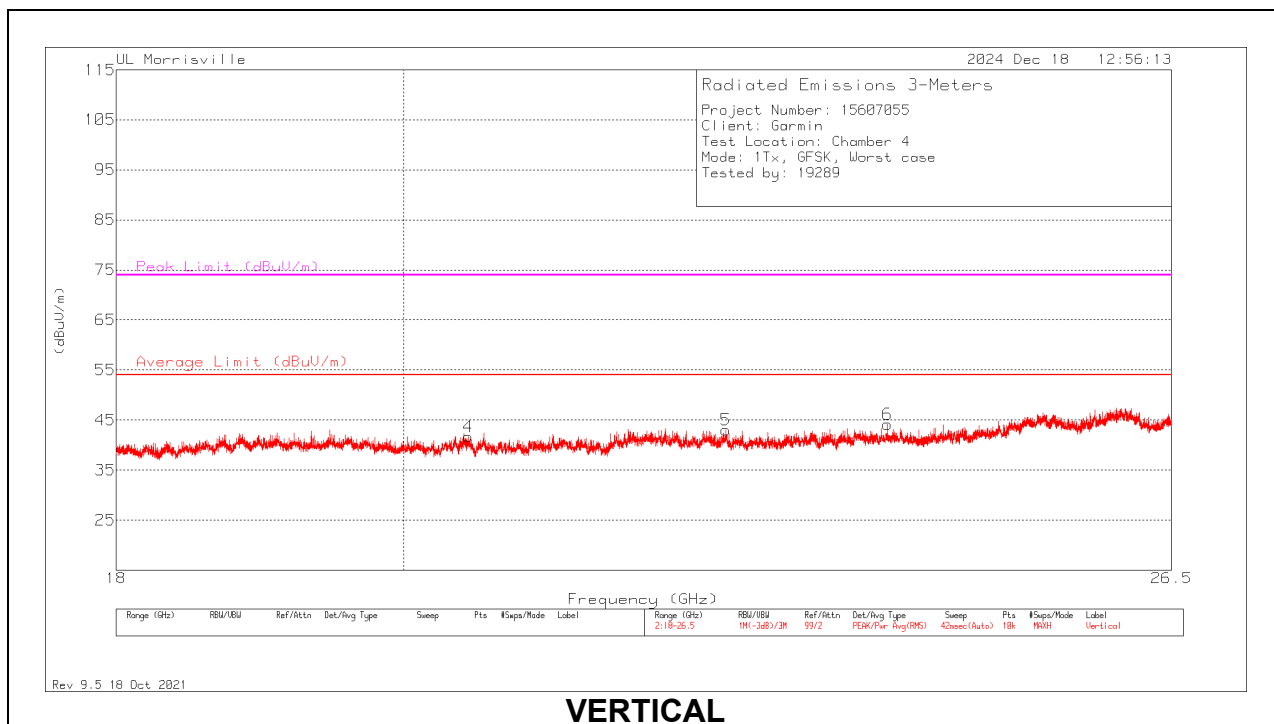
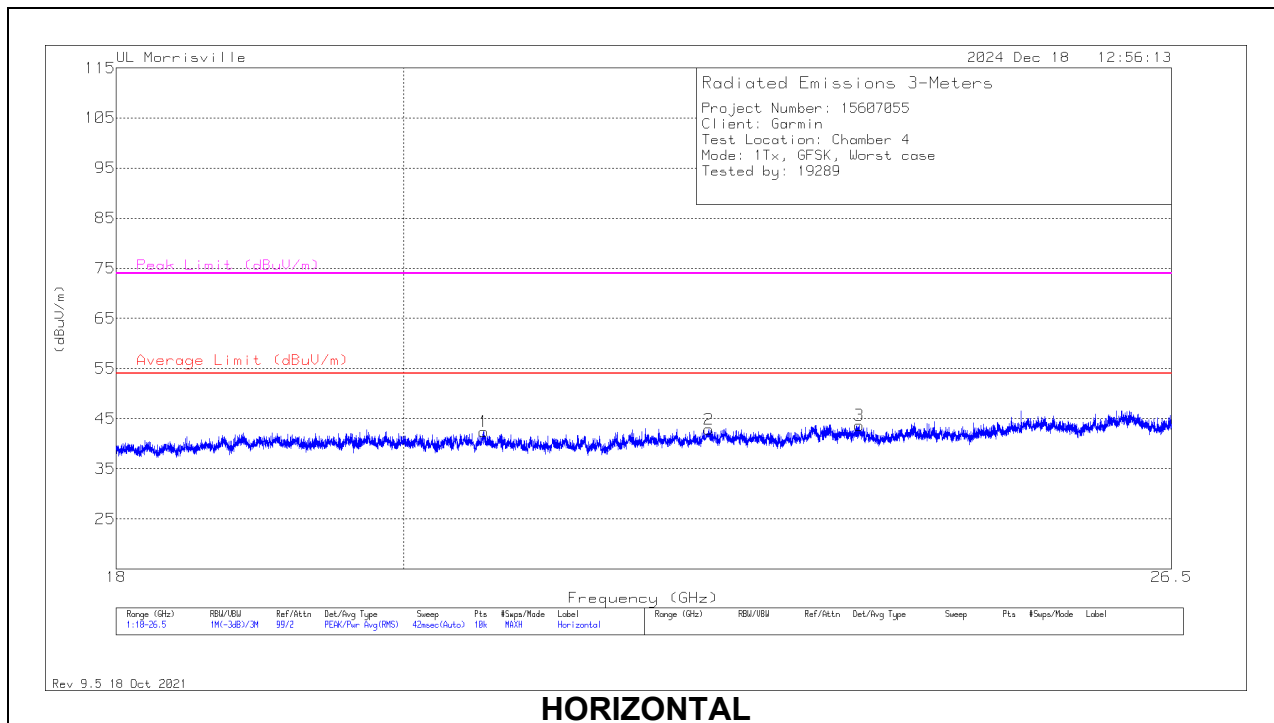
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	159203 (dB/m)	Gain/Loss (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
4	* ** 970.124	26.27	Pk	29.7	-25.4	30.57	53.97	-23.4	0-360	199	H
5	* ** 326.529	27.95	Pk	20.5	-29.2	19.25	46.02	-26.77	0-360	199	H
7	* ** 170.068	35.94	Pk	18.3	-30.3	23.94	43.52	-19.58	0-360	101	V
9	* ** 271.627	27.88	Pk	19.8	-29.6	18.08	46.02	-27.94	0-360	101	V
10	** 912.215	26.92	Pk	29	-26.1	29.82	46.02	-16.2	0-360	199	V
1	32.231	28.77	Pk	25.9	-31.6	23.07	40	-16.93	0-360	101	H
6	45.811	47.56	Pk	16.3	-31.5	32.36	40	-7.64	0-360	101	V
2	146.885	33.77	Pk	19.1	-30.4	22.47	43.52	-21.05	0-360	199	H
8	181.029	39.86	Pk	17.8	-30.1	27.56	43.52	-15.96	0-360	101	V
3	195.094	38.82	Pk	18.3	-30.1	27.02	43.52	-16.5	0-360	101	H
11	229.723	30.58	Pk	17.6	-29.7	18.48	46.02	-27.54	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

10.4. WORST CASE SPURIOUS 18-26GHz



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	* ** 20.59819	48.89	Pk	33.7	-40.2	42.39	54	-11.61	74	-31.61	0-360	100	H
2	* ** 22.36941	49.05	Pk	34.1	-40.3	42.85	54	-11.15	74	-31.15	0-360	100	H
3	* ** 23.63579	47.51	Pk	34.6	-38.4	43.71	54	-10.29	74	-30.29	0-360	150	H
4	* ** 20.47835	49.11	Pk	33.7	-41.1	41.71	54	-12.29	74	-32.29	0-360	300	V
5	* ** 22.5054	48.31	Pk	34.2	-39.5	43.01	54	-10.99	74	-30.99	0-360	200	V
6	* ** 23.87971	48.12	Pk	34.4	-38.4	44.12	54	-9.88	74	-29.88	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

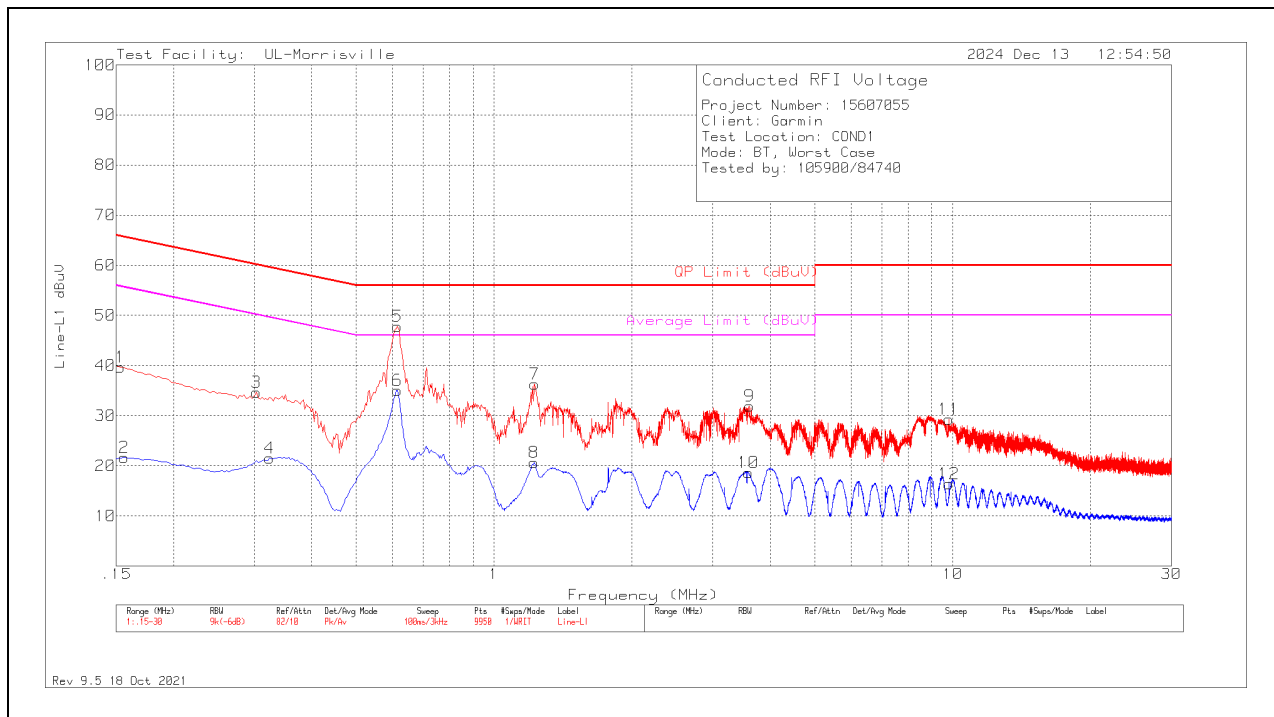
The EUT is placed on a non-conducting table 40 cm from the vertical ground plane and 80 cm above the horizontal ground plane. The EUT is configured in accordance with ANSI C63.10.

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 lines.

11.1. AC POWER LINE

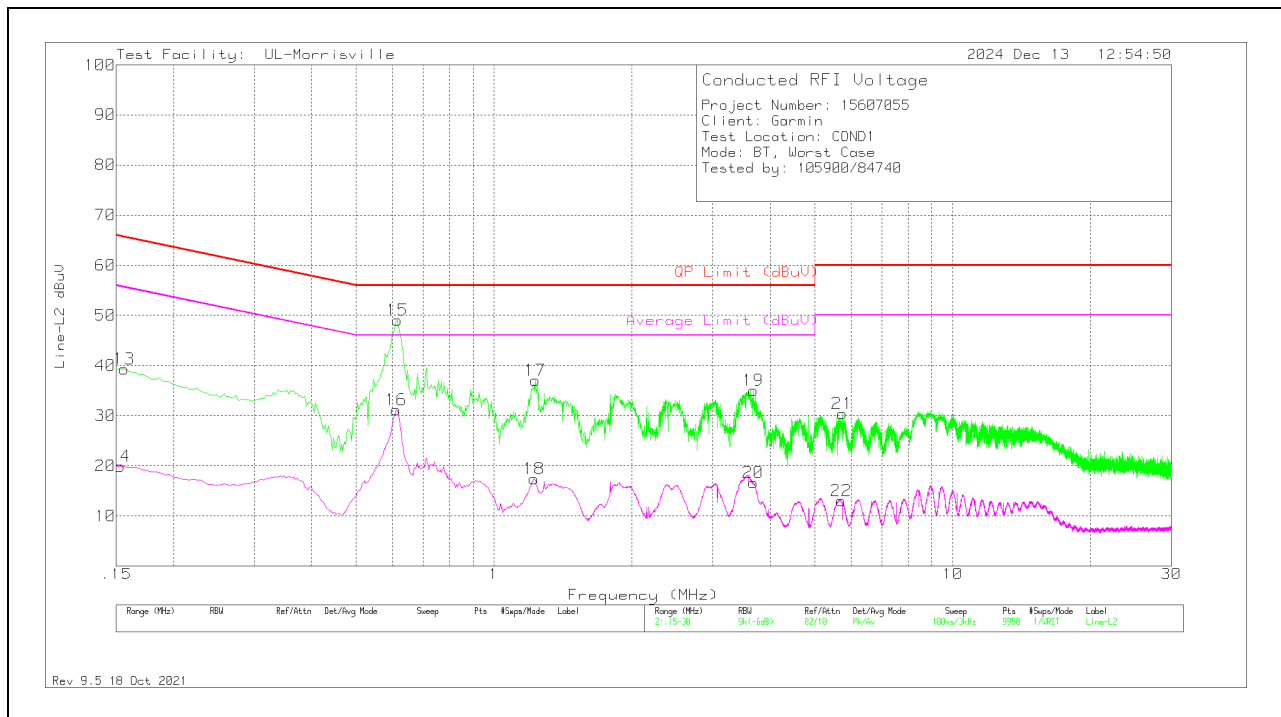
LINE 1 RESULTS



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)
1	.153	29.67	Pk	.2	9.8	39.67	65.84	-26.17	-	-
2	.156	11.65	Av	.2	9.8	21.65	-	-	55.67	-34.02
3	.303	24.74	Pk	.1	9.8	34.64	60.16	-25.52	-	-
4	.324	11.59	Av	.1	9.8	21.49	-	-	49.6	-28.11
5	.615	37.99	Pk	0	9.8	47.79	56	-8.21	-	-
6	.615	25.25	Av	0	9.8	35.05	-	-	46	-10.95
7	1.227	26.52	Pk	0	9.8	36.32	56	-19.68	-	-
8	1.221	10.83	Av	0	9.8	20.63	-	-	46	-25.37
9	3.609	21.98	Pk	0	9.9	31.88	56	-24.12	-	-
10	3.582	8.79	Av	0	9.9	18.69	-	-	46	-27.31
11	9.816	19.21	Pk	.1	10	29.31	60	-30.69	-	-
12	9.816	6.25	Av	.1	10	16.35	-	-	50	-33.65

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	.156	29.34	Pk	.2	9.8	39.34	65.67	-26.33	-	-
14	.153	9.86	Av	.2	9.8	19.86	-	-	55.84	-35.98
15	.615	39.22	Pk	0	9.8	49.02	56	-6.98	-	-
16	.612	21.38	Av	0	9.8	31.18	-	-	46	-14.82
17	1.23	27.27	Pk	0	9.8	37.07	56	-18.93	-	-
18	1.224	7.57	Av	0	9.8	17.37	-	-	46	-28.63
19	3.672	25.1	Pk	0	9.9	35	56	-21	-	-
20	3.672	6.74	Av	0	9.9	16.64	-	-	46	-29.36
21	5.748	20.41	Pk	.1	9.9	30.41	60	-29.59	-	-
22	5.721	2.97	Av	.1	9.9	12.97	-	-	50	-37.03

Pk - Peak detector
Av - Average detection

12. SETUP PHOTOS

Please refer to R15607055-EP1 for setup photos.

END OF TEST REPORT