

TEST REPORT

Report Number. : R15191165-E8

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

Model : A04413

FCC ID : IPH-04413

IC : 1792A-04413

EUT Description : Wearable Smart Watch

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:
2024-07-03

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REPORT REVISION HISTORY

Rev.	Issue Date	Revisions	Revised By
V1	2024-05-01	Initial Issue	B. Kiewra
V2	2024-05-06	Revised antenna gain	B. Kiewra
V3	2024-07-03	Updated Firmware Version	Noah Bennett

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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: Wearable Smart Watch

MODEL: A04413

SERIAL NUMBER: 3467745434, 3467745272

SAMPLE RECEIPT DATE: 2024-03-13

DATE TESTED: 2024-03-19 to 2024-03-25

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
CFR 47 Part 15 Subpart C	
ISED RSS-247 Issue 3	Refer to Section 2
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:



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

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Project Engineer
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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 a smartwatch with BT, BLE, ANT+, 802.11b/g/n 2.4GHz WLAN, NFC, and Global Navigation Satellite System (GNSS) receiver. This report covers testing on 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	15.30	33.88
2402 - 2480	Enhanced DQPSK	15.58	36.14
2402 - 2480	Enhanced 8PSK	16.39	43.55

Note: GFSK, DQPSK, 8PSK average Power are all investigated, The GFSK & 8PSK Power are the worst case. Testing is based on these modes to showing compliance. For average power data please refer to section 9.7.

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)
Inverted F	2350-2530	-2.63

6.4. SOFTWARE AND FIRMWARE

The EUT firmware installed during testing was revision 8.00.

6.5. WORST-CASE CONFIGURATION AND MODE

Radiated emissions below 1GHz, above 18GHz, and power line conducted emission were performed with the EUT set to transmit at the channel with highest 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 axes, X, Y, and Z. Worst-case orientation was determined to be the Y-axis. Therefore all testing was performed with the EUT in the Y-axis.

Worst-case packet sized as provided by the client were:
 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
USB-A power supply	Bose	S008AHU0500160	072381Z60770055AE	USB-A power supply

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 R15191165-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 - Radiated Disturbance Emissions Test Equipment (Morrisville – Chamber 2)

Equipment ID	Description	Manufacturer/Brand	Model Number	Last Cal.	Next Cal.
0.009-30MHz					
135144	Active Loop Antenna	ETS-Lindgren	6502	2024-01-24	2025-01-24
30-1000 MHz					
159203	Hybrid Broadband Antenna	Sunol Sciences Corp.	JB3	2024-03-05	2026-03-05
1-18 GHz					
86408	Double-Ridged Waveguide Horn Antenna, 1 to 18 GHz	ETS Lindgren	3117	2023-06-19	2025-06-19
Gain-Loss Chains					
91975	Gain-loss string: 0.009-30MHz	Various	Various	2023-06-06	2024-06-06
91978	Gain-loss string: 25-1000MHz	Various	Various	2023-06-06	2024-06-06
91977	Gain-loss string: 1-18GHz	Various	Various	2023-06-06	2024-06-06
Receiver & Software					
197954	Spectrum Analyzer	Rohde & Schwarz	ESW44	2024-03-05	2025-03-05
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
PS214	AC Power Source	Elgar	CW2501M	NA	NA

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

Equipment ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
1-18 GHz					
206211	Double-Ridged Waveguide Horn Antenna, 1 to 18 GHz	ETS Lindgren	3117	2023-04-06	2024-04-06
18-40 GHz					
204704	Horn Antenna, 18-26.5GHz	Com-Power	AH-826	2023-07-20	2025-07-20
Gain-Loss Chains					
91979	Gain-loss string: 1-18GHz	Various	Various	2023-05-16	2024-05-16
135999	Gain-loss string: 18-40GHz	Various	Various	2023-05-16	2024-05-16
Receiver & Software					
206496	Spectrum Analyzer	Rohde & Schwarz	ESW44	2023-07-19	2024-07-19
72823	Spectrum Analyzer	Agilent	E4446A	2023-06-27	2024-06-30
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 - Wireless Conducted Measurement Equipment

Equipment ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
90410	Spectrum Analyzer	Keysight Technologies	N9030A	2023-06-14	2024-06-14
90778	RF Power Meter	Keysight Technologies	N1911A	2023-10-06	2024-10-31
135125	Peak and Avg Power Sensor, 50MHz to 18GHz	Keysight Technologies	N1921A	2023-08-21	2024-08-21
238710	Environmental Meter	Fisher Scientific	15-077-963	2023-06-27	2024-06-27
SOFTEMI	Antenna Port Software	UL	Version 2022.8.16	NA	NA
Power Software	Boonton Power Analyzer	Boonton	Version 3.0.13.0	NA	NA
211055	Real-Time Peak Power Sensor 50MHz to 8GHz	Boonton	RTP5000	2023-08-01	2024-08-01

Test Equipment Used - Wireless Conducted Attenuators, Cables, and Couplers

Equipment ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
Attenuators					
226563	SMA Coaxial 10dB Attenuator 25MHz-18GHz	CentricRF	C18S2-10	2024-02-29	2025-02-29
Cables					
CBL093	Micro-Coax UTiFLEX Cable Assembly, Low Loss,40Ghz	Carlisle Interconnect Technologies	UFA147A-2-0360-200200	2024-03-01	2025-03-01

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

Equipment ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
CBL087	Coax cable, RG223, N-male to BNC-male, 20-ft.	Pasternack	PE3W06143-240	2023-04-04	2024-04-04
179892	Environmental Meter	Fisher Scientific	15-077-963	2023-07-26	2024-06-31
80391	LISN, 50-ohm/50-uH, 250uH 2-conductor, 25A	Fischer Custom Com.	FCC-LISN-50/250-25-2-01	2023-07-31	2024-07-31
75141	EMI Test Receiver 9kHz-7GHz	Rohde & Schwarz	ESCI 7	2023-08-01	2024-08-01
52859	Transient Limiter, 0.009-100MHz	Electro-Metrics	EM-7600	2023-04-04	2024-04-04
PS214	AC Power Source	Elgar	CW2501M	NA	NA
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

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

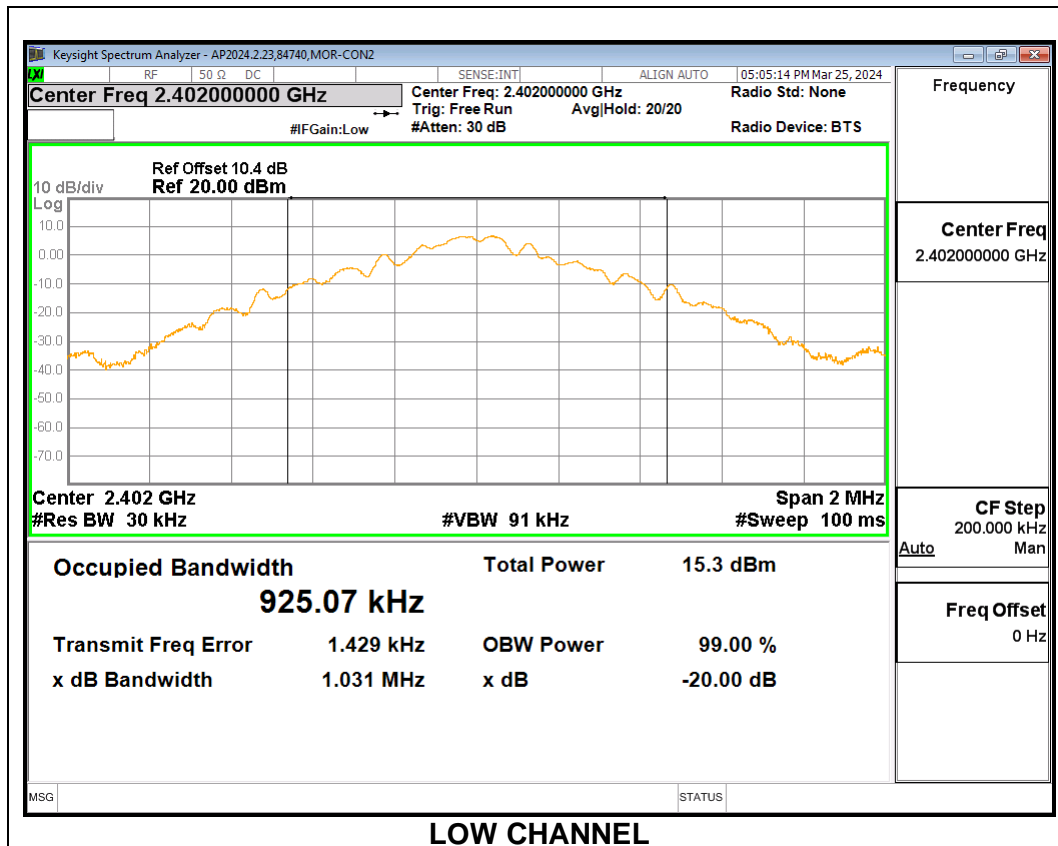
None; for reporting purposes only.

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.

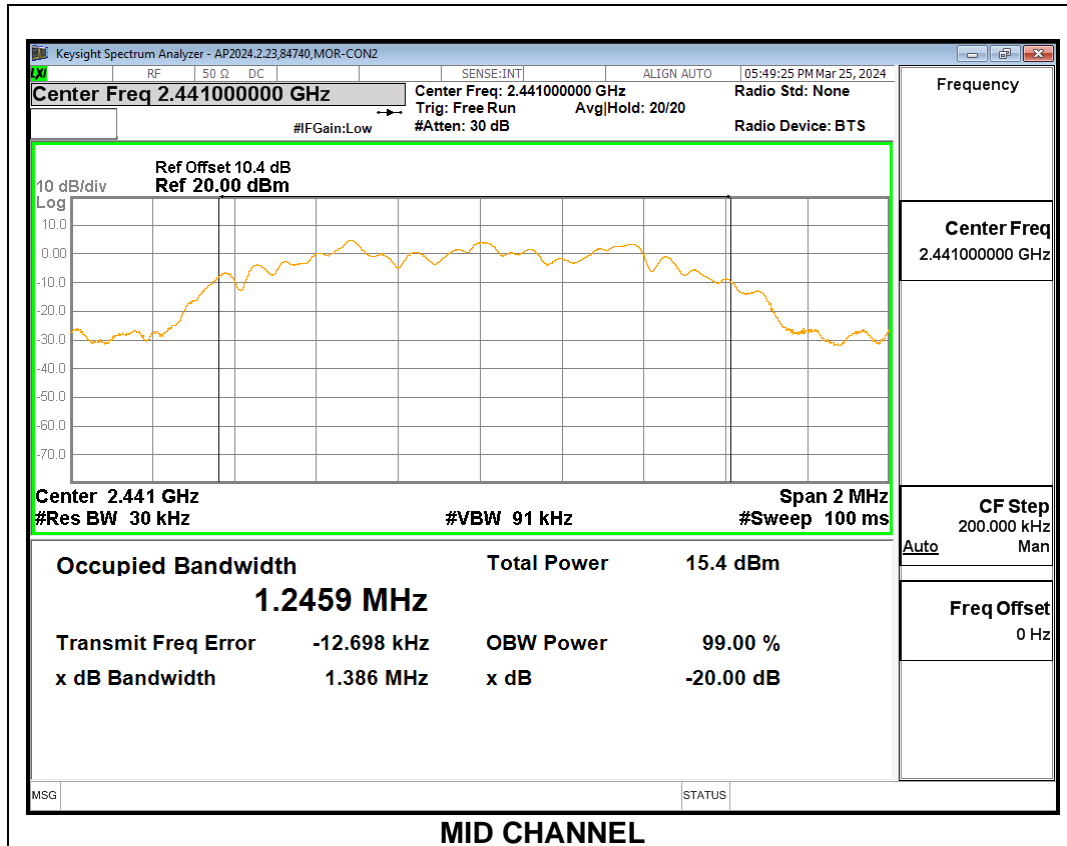
9.1.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION

Channel	Frequency (MHz)	20dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	2402	1.031	0.925
Mid	2441	1.030	0.916
High	2480	1.029	0.917



9.1.2. BLUETOOTH ENHANCED DATA RATE 8PSK MODULATION

Channel	Frequency (MHz)	20dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	2402	1.380	1.242
Mid	2441	1.386	1.246
High	2480	1.380	1.240



9.2. ON TIME AND DUTY CYCLE

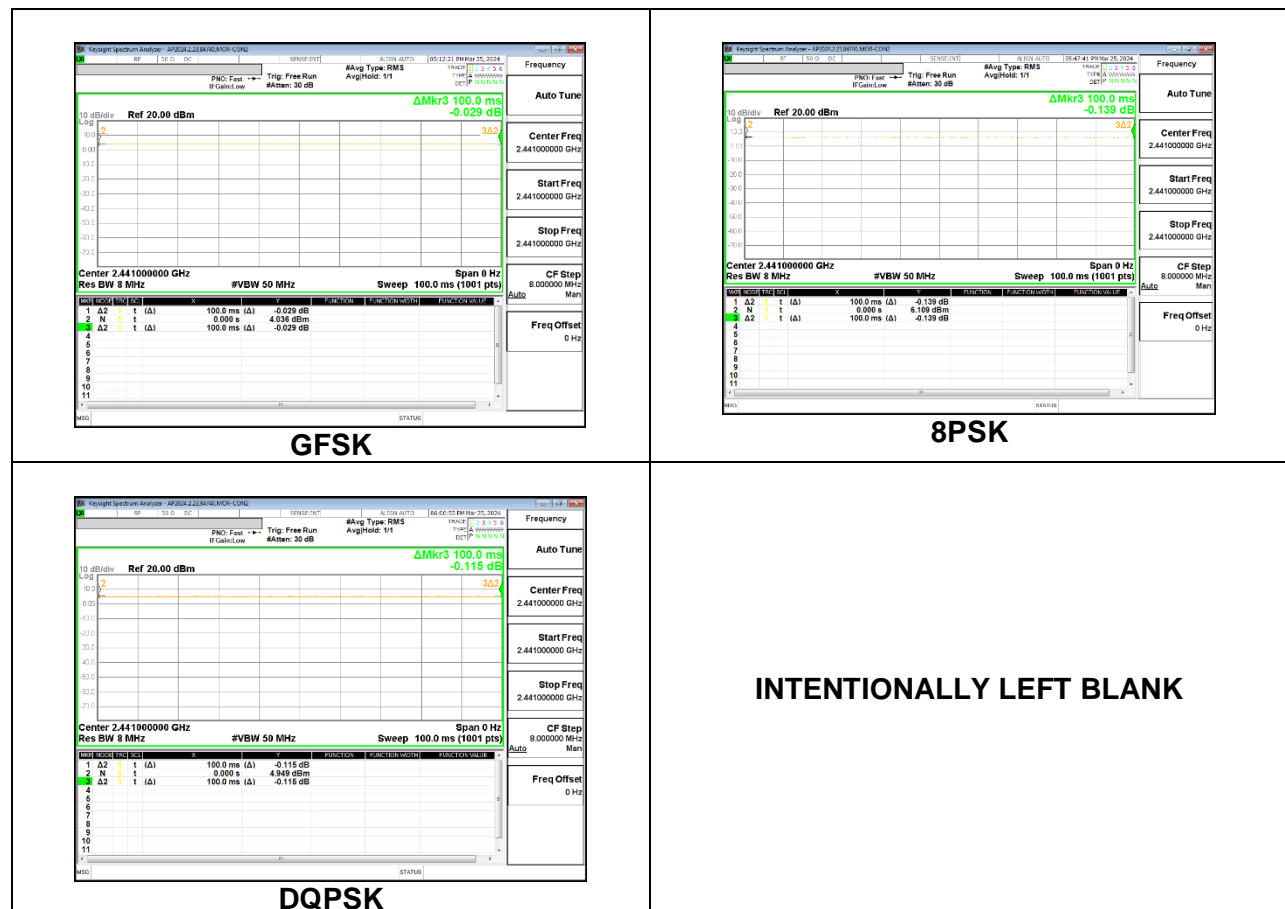
LIMITS

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
DQPSK	100.00	100.00	1.000	100.00	0.00	0.010



Note: The actual DCCF used was calculated based on the worst case on-time when the device transmits DH5 packets and operates on 20 channels (5/1600 s per hop = 3.125 ms per channel). In this mode, the device will have a maximum of 2 hops on a channel in 100ms or 2x 3.125 ms = 6.25 ms on any channel. Therefore, $20 \log(6.25 / 100) = -24 \text{ dB}$.

9.3. HOPPING FREQUENCY SEPARATION

LIMITS

FCC §15.247 (a) (1)
RSS-247 (5.1) (b)

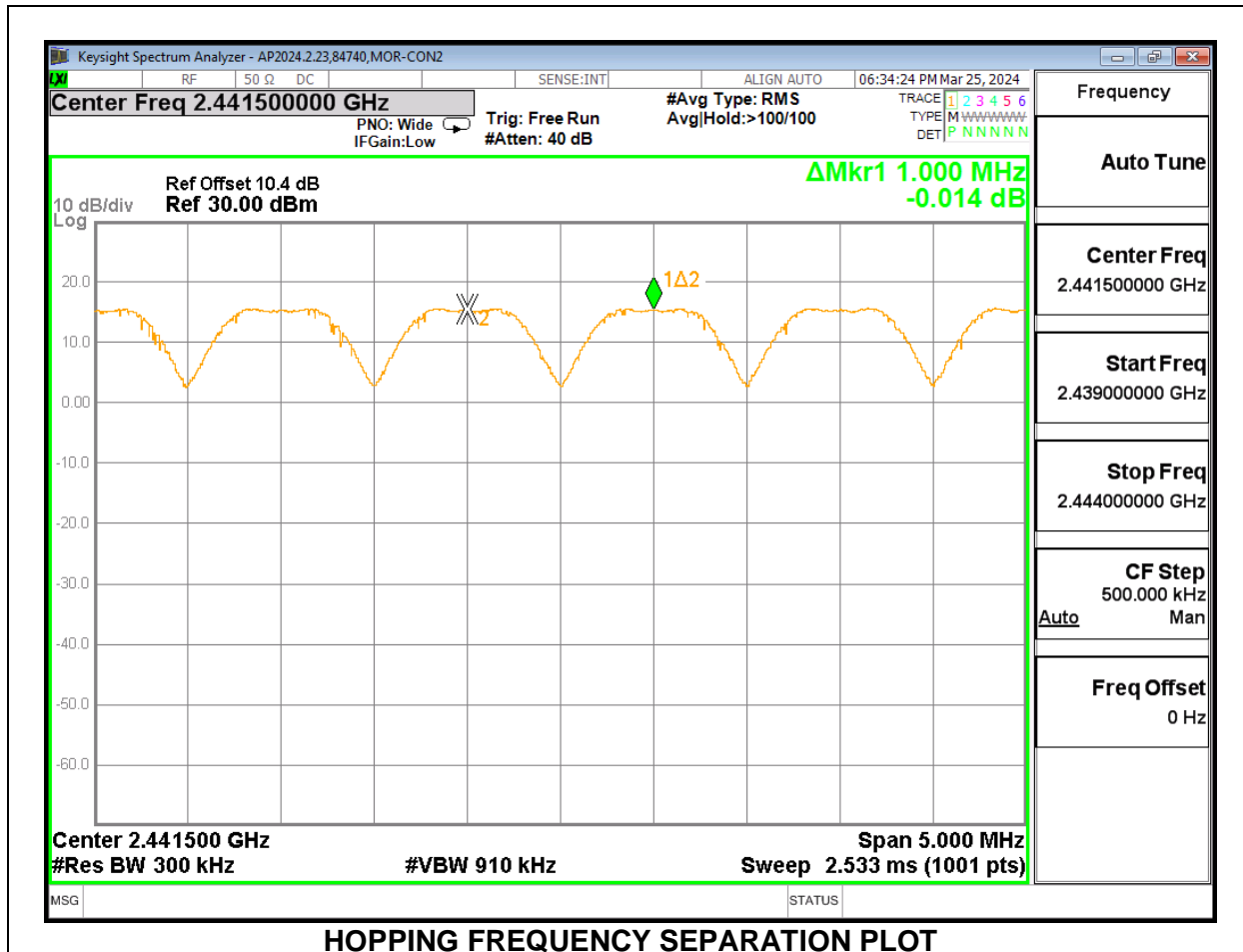
Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

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.

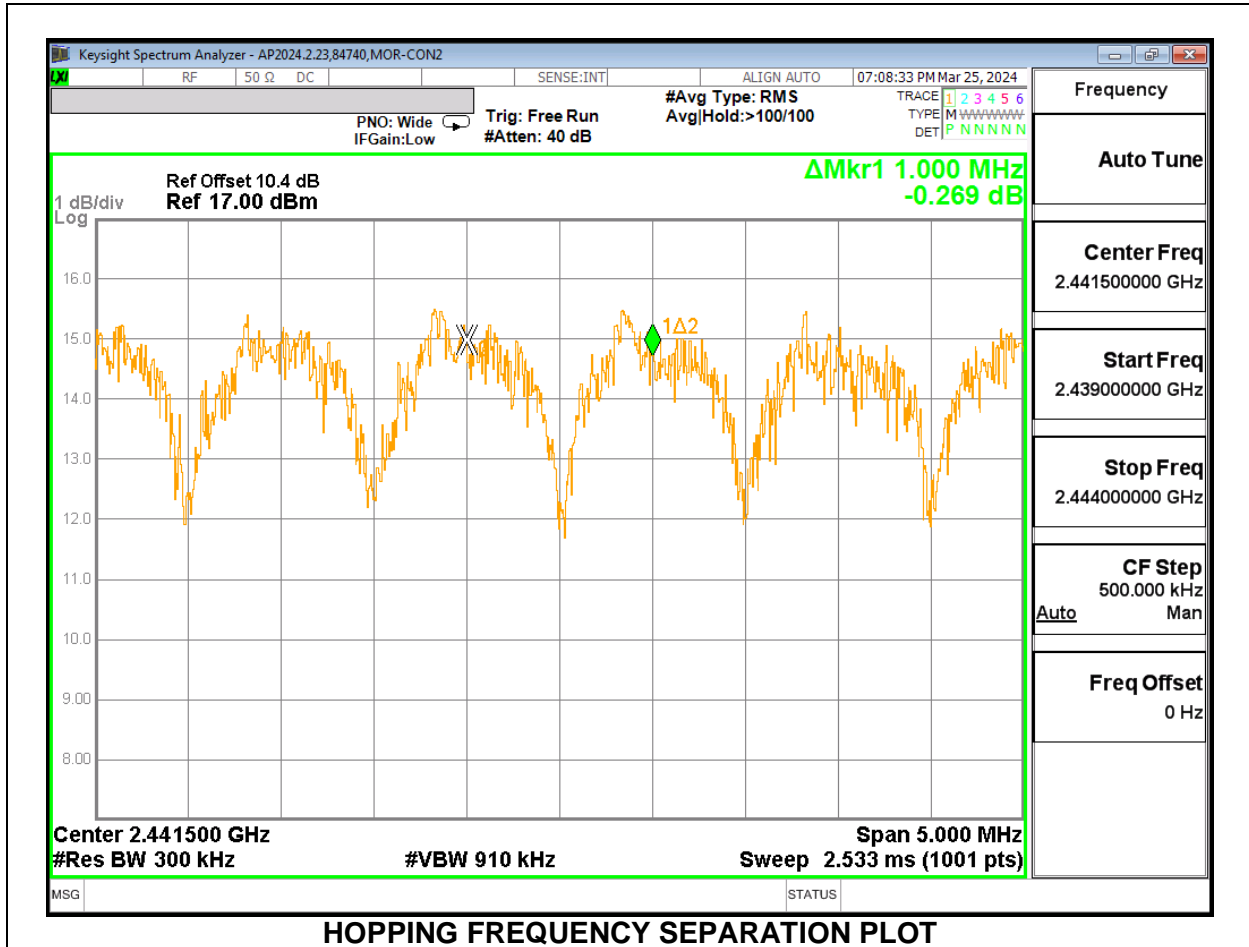
TEST PROCEDURE

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



9.4. NUMBER OF HOPPING CHANNELS

LIMITS

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

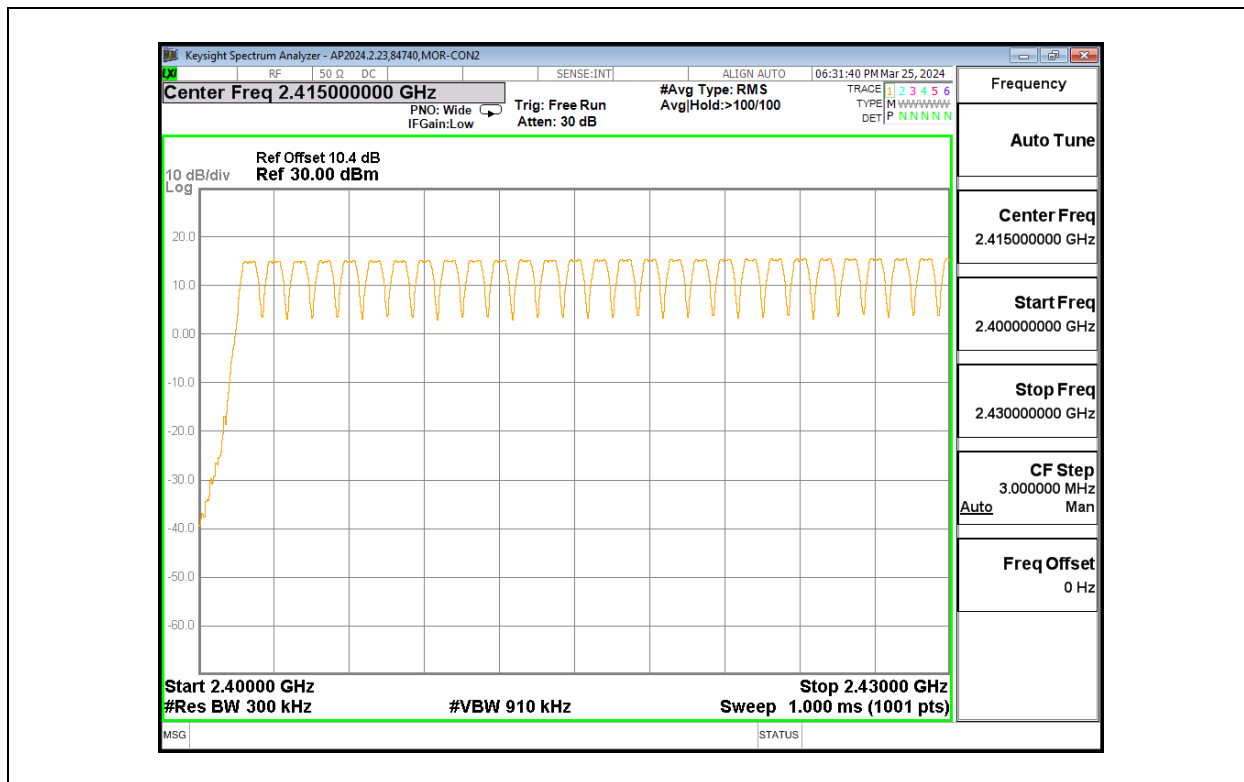
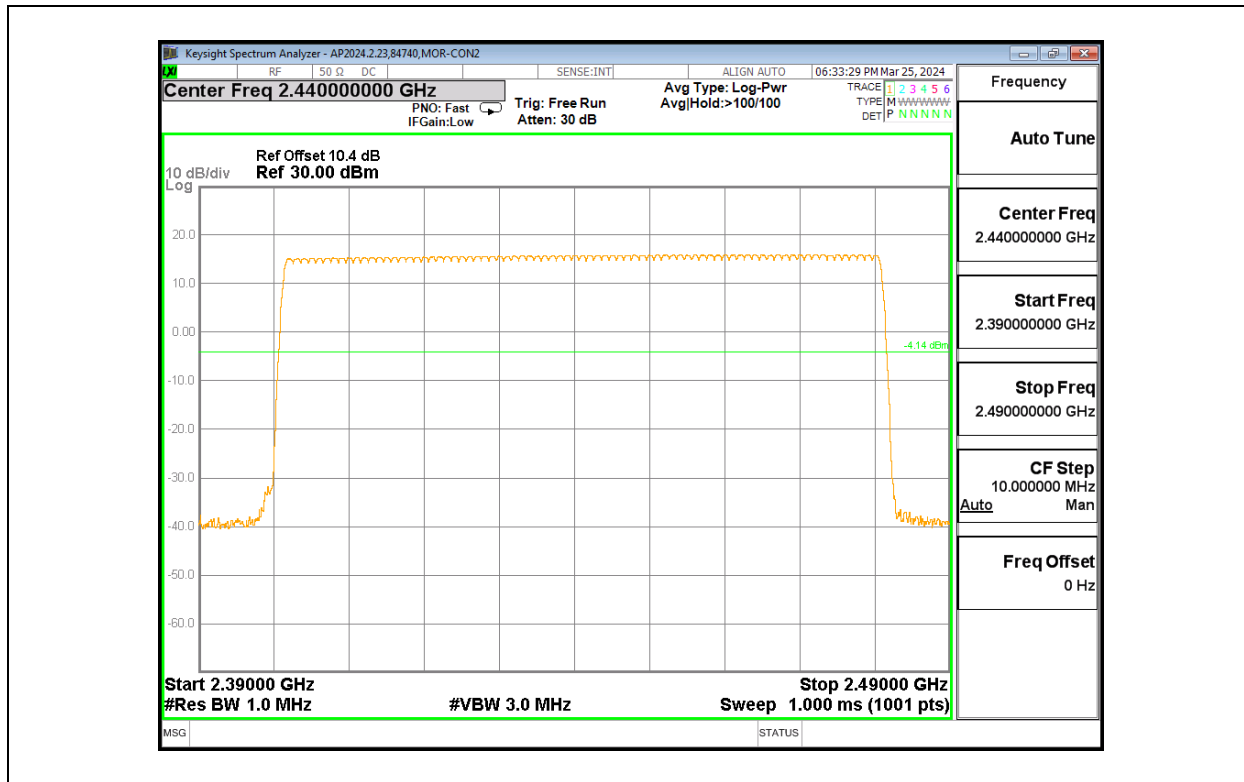
Frequency hopping systems in the 2400 – 2483.5 MHz band shall use at least 15 non-overlapping channels.

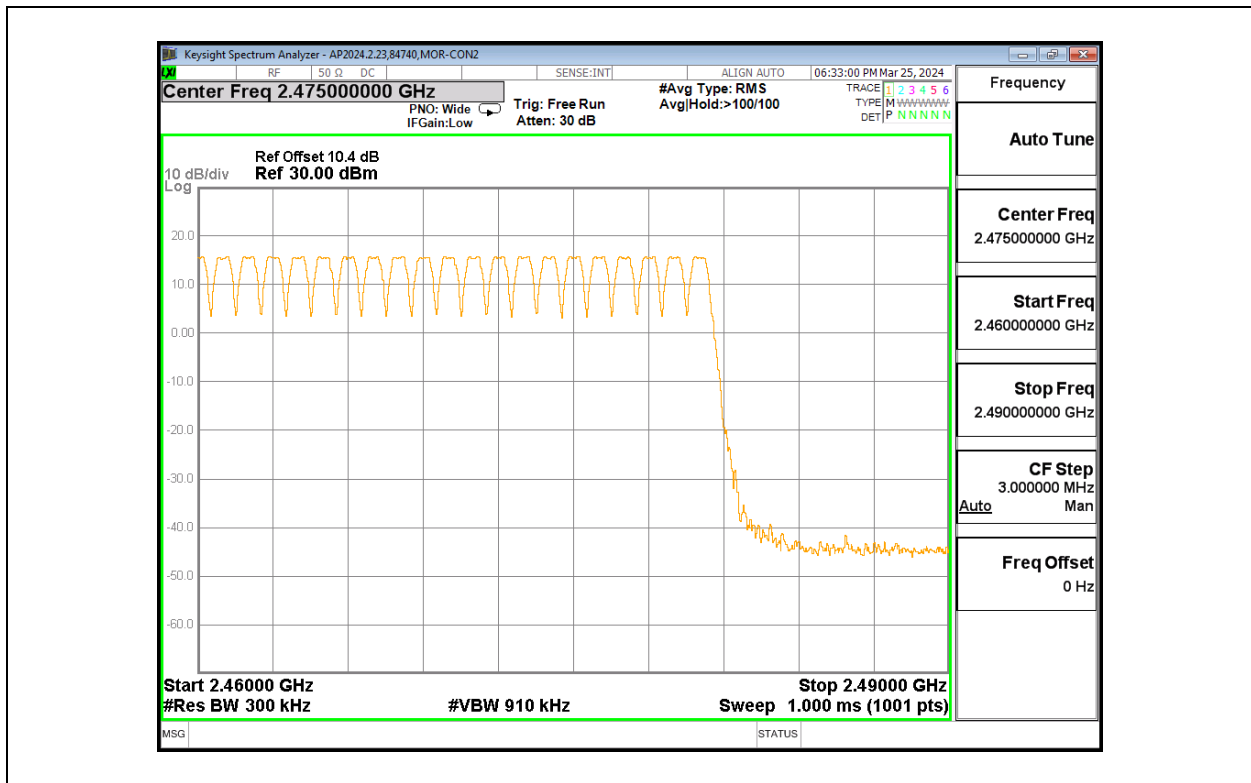
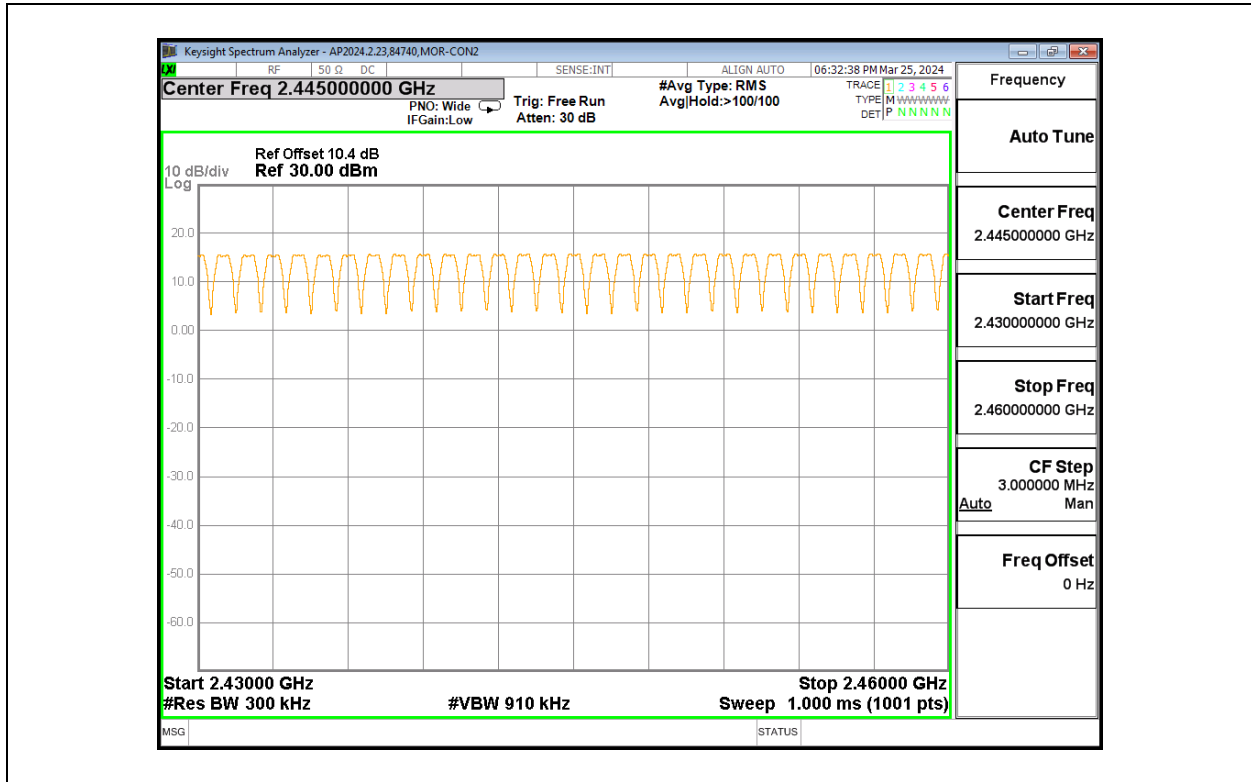
TEST PROCEDURE

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.

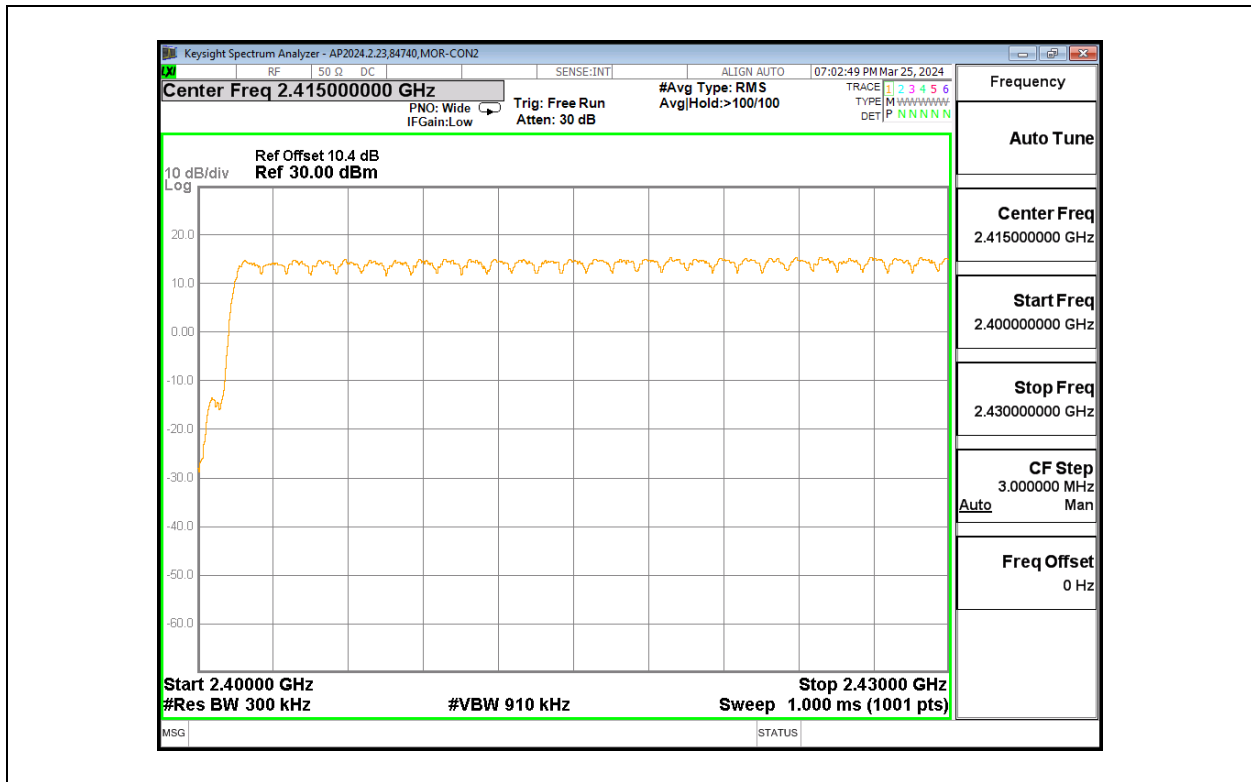
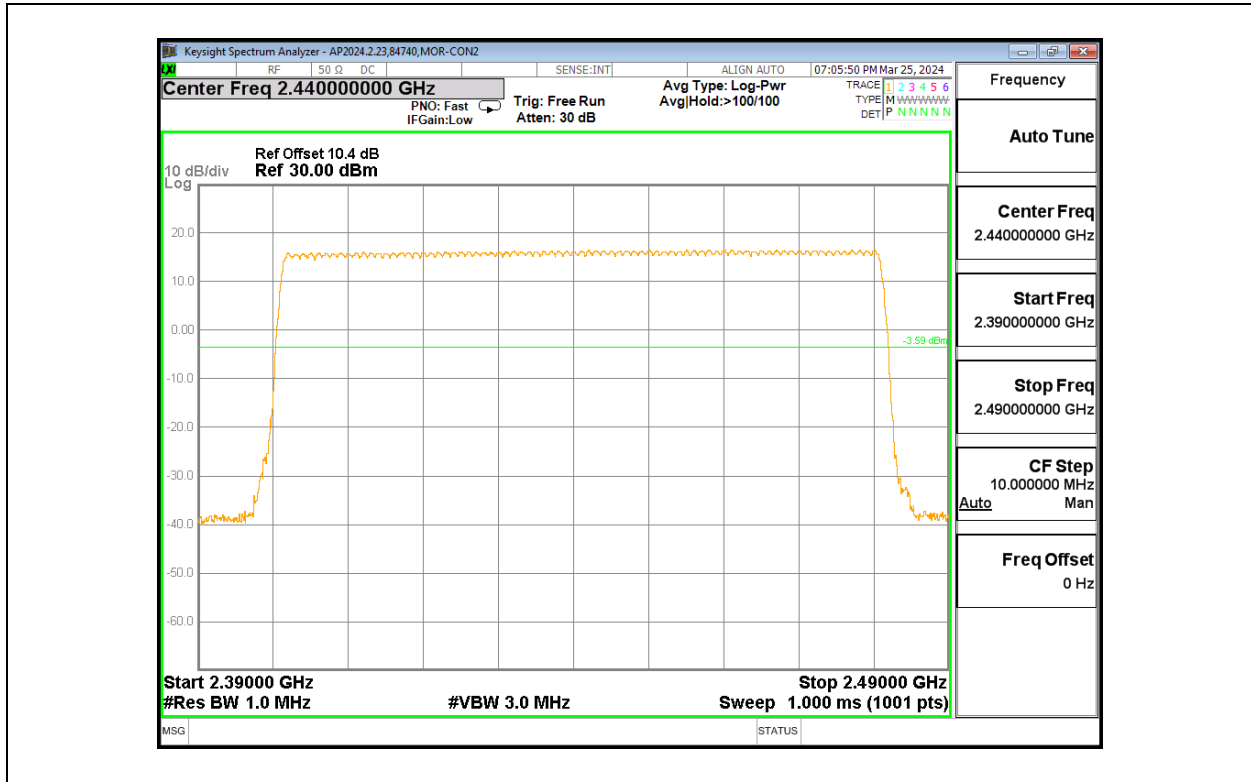
Normal Mode: 79 Channels Observed

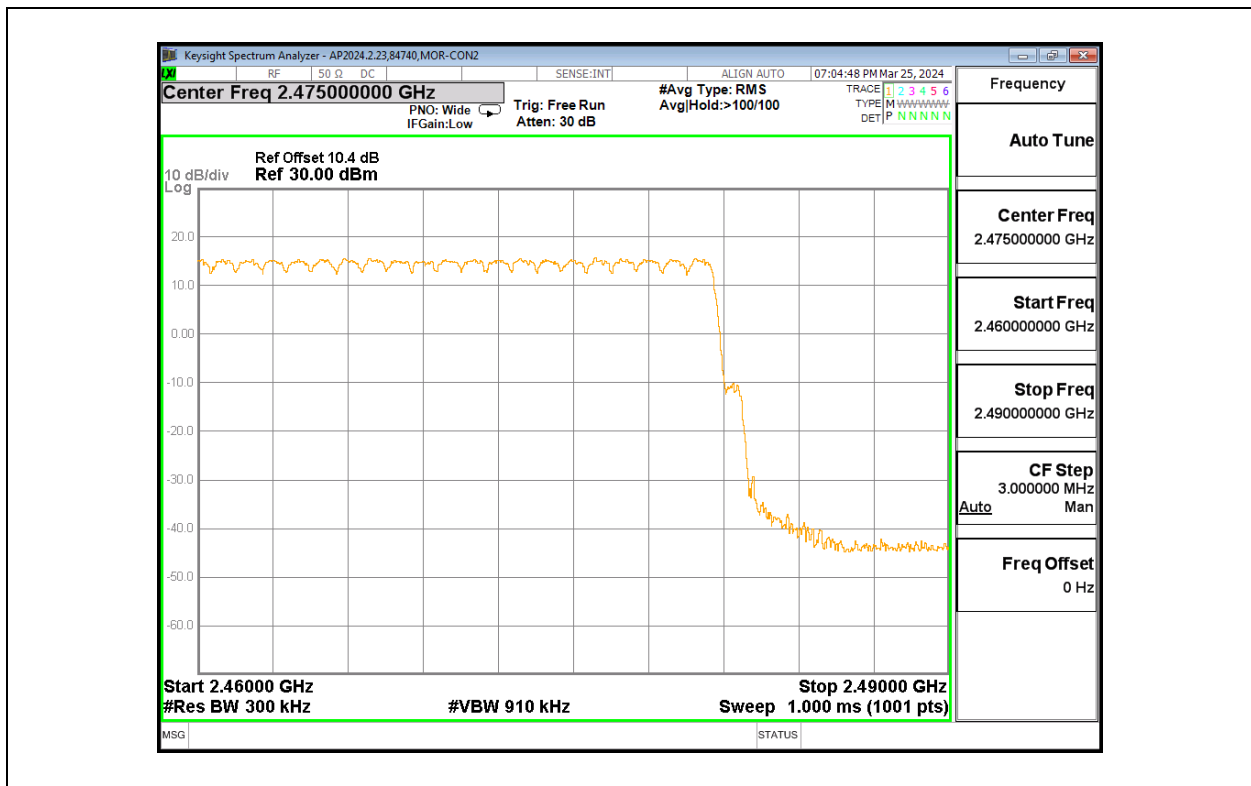
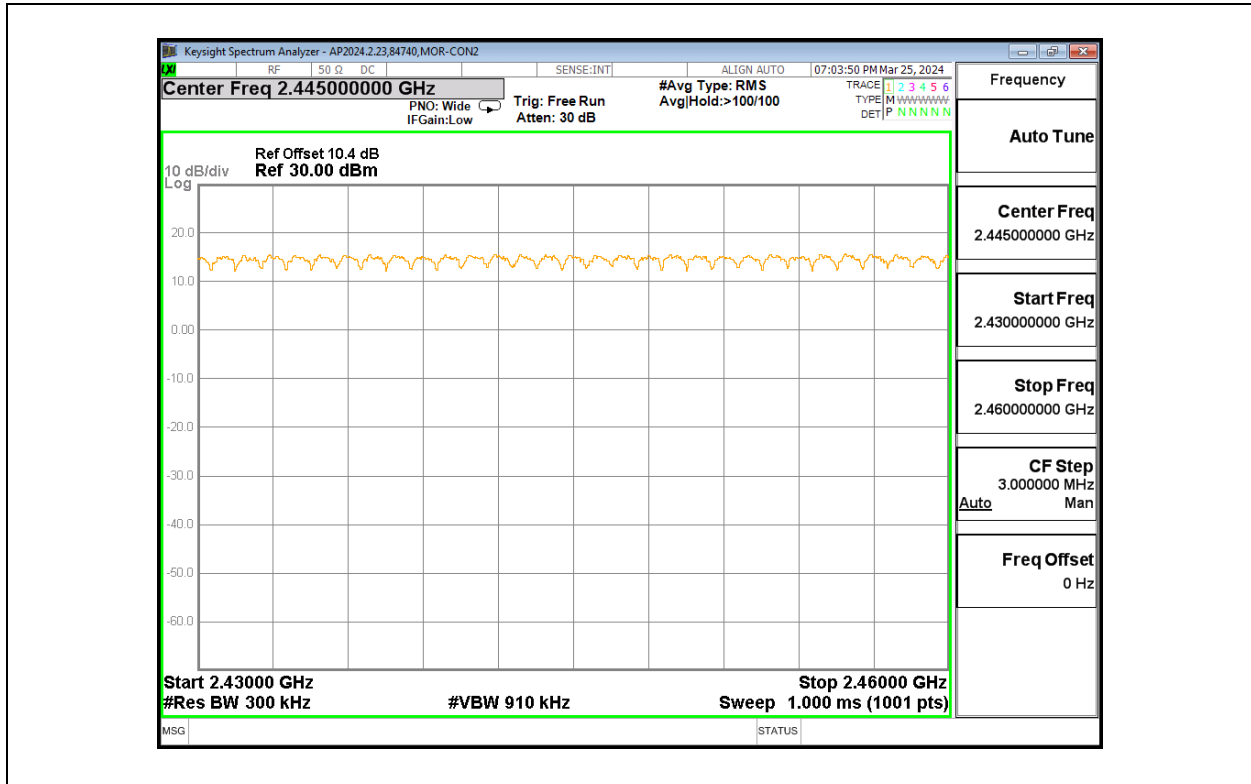
9.4.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION





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

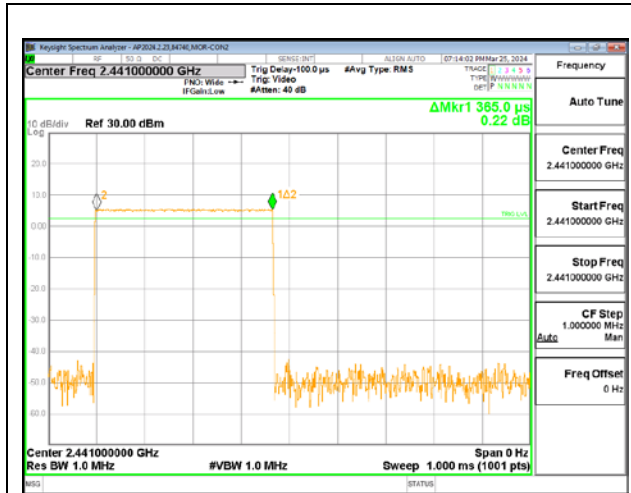
The transmitter output is connected to a spectrum analyzer. The span is set to 0 Hz, centered on a single, selected hopping channel. The width of a single pulse is measured in a fast scan. The number of pulses is measured in a 3.16 second scan, to enable resolution of each occurrence.

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

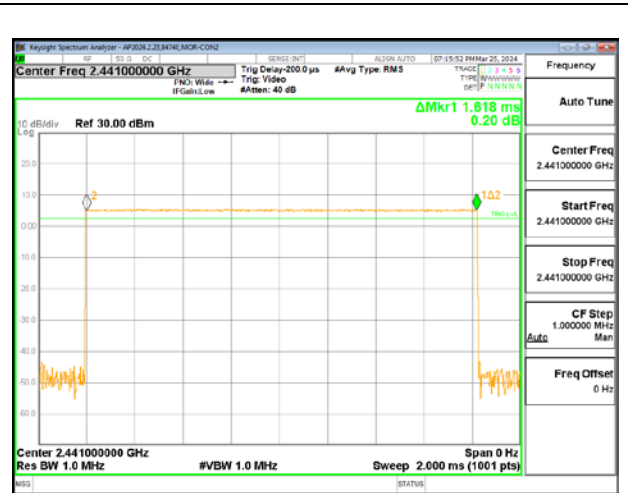
For AFH mode, the average time of occupancy in the specified 8 second period (20 channels * 0.4 seconds) is equal to $10 * (\# \text{ of pulses in } 0.8 \text{ s}) * \text{ pulse width}$.

9.5.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION

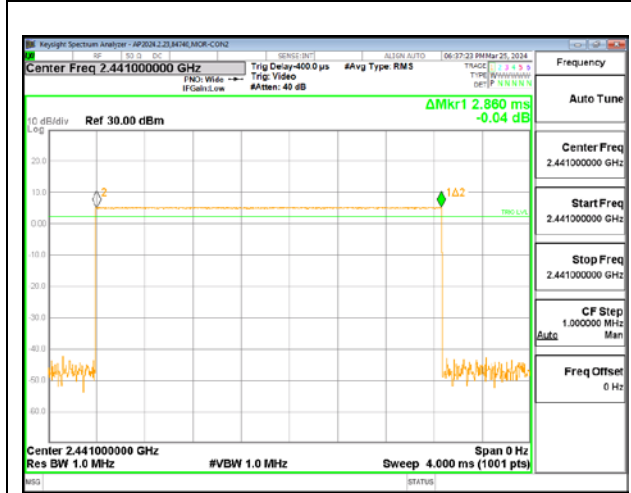
DH Packet	Pulse Width (msec)	Number of Pulses in 3.16 seconds	Average Time of Occupancy (sec)	Limit (sec)	Margin (sec)
GFSK Normal Mode					
DH1	0.365	32	0.1168	0.4	-0.2832
DH3	1.618	16	0.2589	0.4	-0.1411
DH5	2.86	12	0.3432	0.4	-0.0568
GFSK AFH Mode					
DH Packet	Pulse Width (sec)	Number of Pulses in 0.8 seconds	Average Time of Occupancy (sec)	Limit (sec)	Margin (sec)
DH1	0.365	8	0.02920	0.4	-0.3708
DH3	1.618	4	0.06472	0.4	-0.3353
DH5	2.86	3	0.08580	0.4	-0.3142



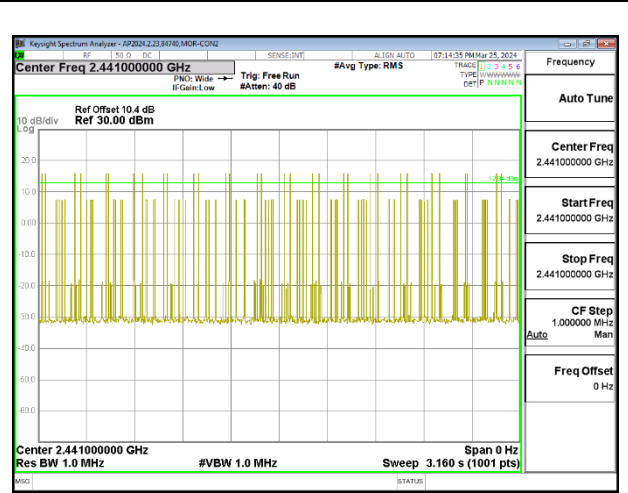
PULSE WIDTH – DH1



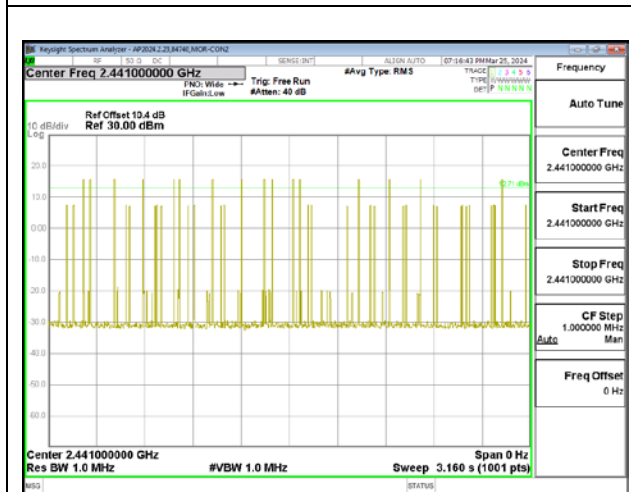
PULSE WIDTH – DH3



PULSE WIDTH – DH5



NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH1



NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH3

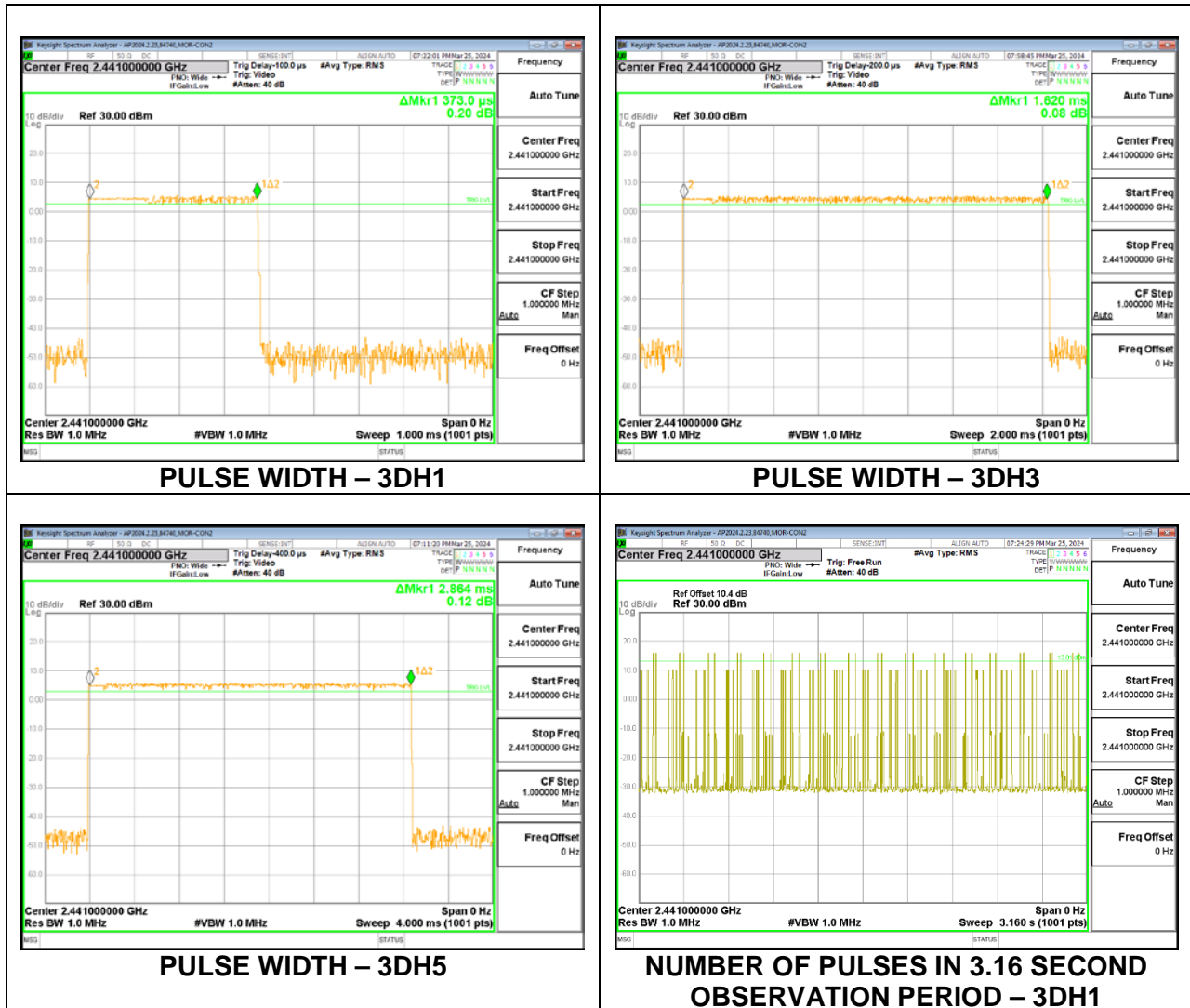


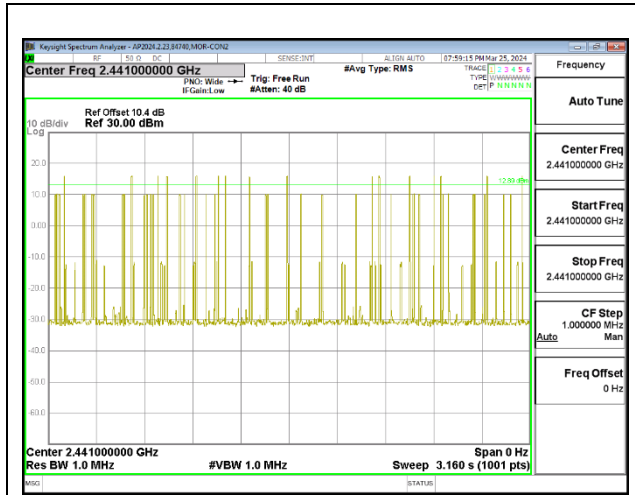
NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH5

9.5.2. BLUETOOTH ENHANCED DATA RATE 8PSK MODULATION

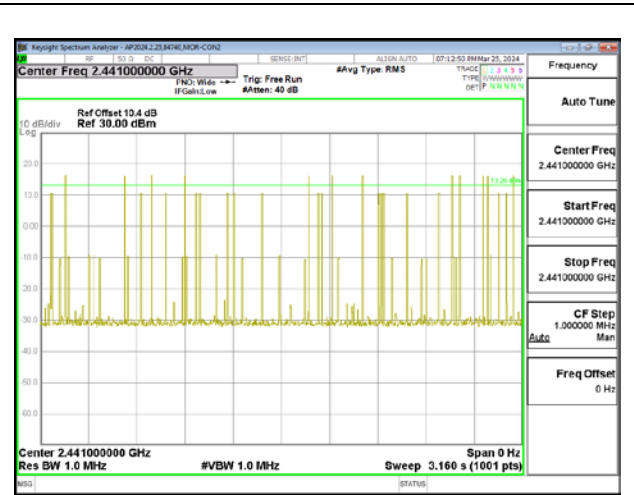
DH Packet	Pulse Width (msec)	Number of Pulses in 3.16 seconds	Average Time of Occupancy (sec)	Limit (sec)	Margin (sec)
8PSK Normal Mode					
3DH1	0.373	32	0.11936	0.4	-0.2806
3DH3	1.620	15	0.243	0.4	-0.157
3DH5	2.864	12	0.34368	0.4	-0.0563

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.





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



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

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 perform using a wideband gated RF power meter.

The cable assembly insertion loss of 10.40 dB (including 9.68 dB pad and 0.72 dB cable) was entered as an offset in the power meter.

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

9.6.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION

Tested By:	85502
Date:	2024-03-20

Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2402	15.3	30	-14.7
Middle	2441	14.61	30	-15.39
High	2480	14.89	30	-15.11

9.6.2. BLUETOOTH ENHANCED DATA RATE DQPSK MODULATION

Tested By:	85502
Date:	2024-03-20

Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2402	13.98	30	-16.02
Middle	2441	15.31	30	-14.69
High	2480	15.58	30	-14.42

9.6.3. BLUETOOTH ENHANCED DATA RATE 8PSK MODULATION

Tested By:	85502
Date:	2024-03-20

Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2402	15.71	30	-14.29
Middle	2441	16.21	30	-13.79
High	2480	16.39	30	-13.61

9.7. AVERAGE POWER

LIMITS

None; for reporting purposes only

TEST PROCEDURE

Measurements perform using a wideband gated RF power meter.

The cable assembly insertion loss of 10.40 dB (including 9.68 dB pad and 0.72 dB cable) was entered as an offset in the power meter.

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

9.7.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION

Tested By:	85502
Date	2024-03-20

Channel	Frequency (MHz)	Average Power (dBm)
Low	2402	14.83
Middle	2441	14.23
High	2480	14.52

9.7.2. BLUETOOTH ENHANCED DATA RATE DQPSK MODULATION

Tested By:	85502
Date	2024-03-20

Channel	Frequency (MHz)	Average Power (dBm)
Low	2402	13.61
Middle	2441	13.6
High	2480	13.89

9.7.3. BLUETOOTH ENHANCED DATA RATE 8PSK MODULATION

Tested By:	85502
Date	2024-02-20

Channel	Frequency (MHz)	Average Power (dBm)
Low	2402	13.40
Middle	2441	14.12
High	2480	13.34

9.8. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)
RSS-247 5.5

Limit = -20 dBc

TEST PROCEDURE

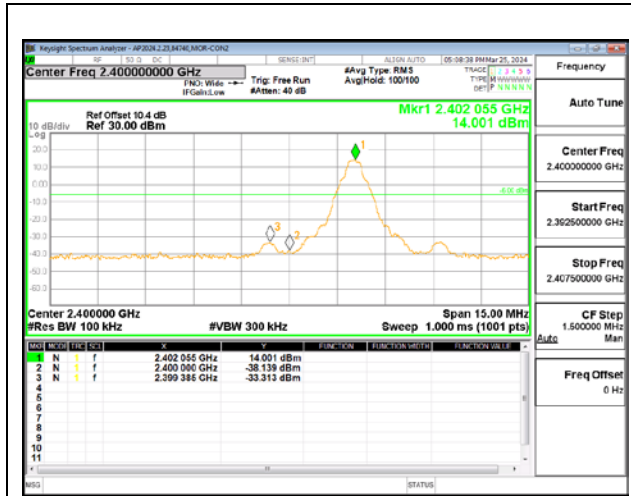
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

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

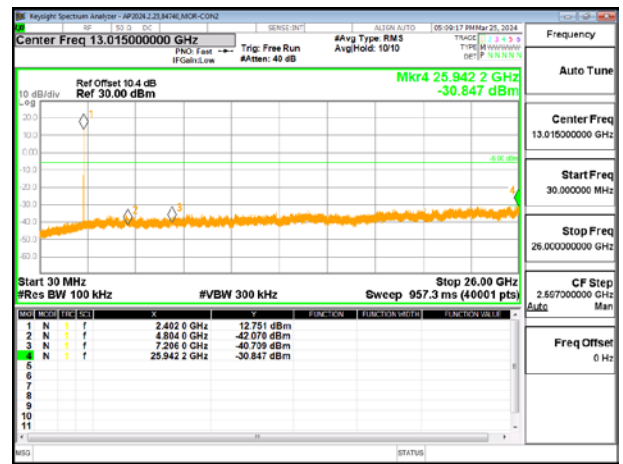
The bandedges at 2.4 and 2.4835 GHz are investigated with the transmitter set to the normal hopping and hopping modes.

9.8.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION

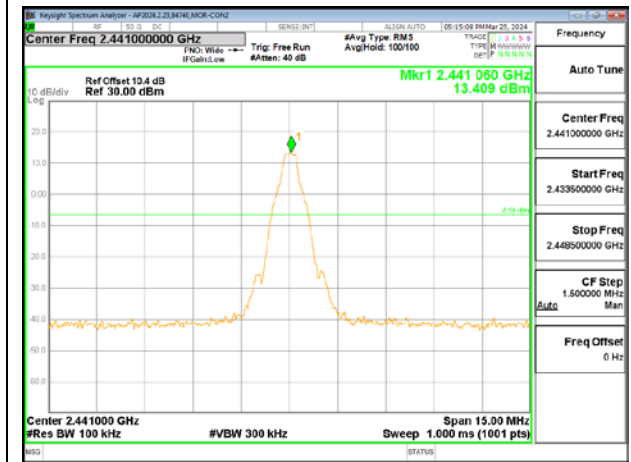
SPURIOUS EMISSIONS, NON-HOPPING



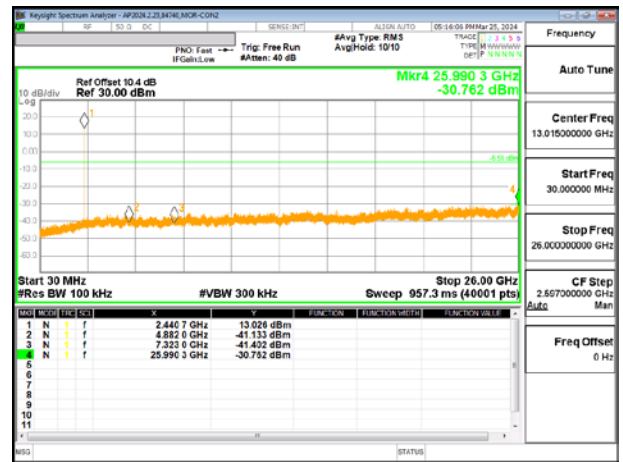
LOW CHANNEL BANDEDGE



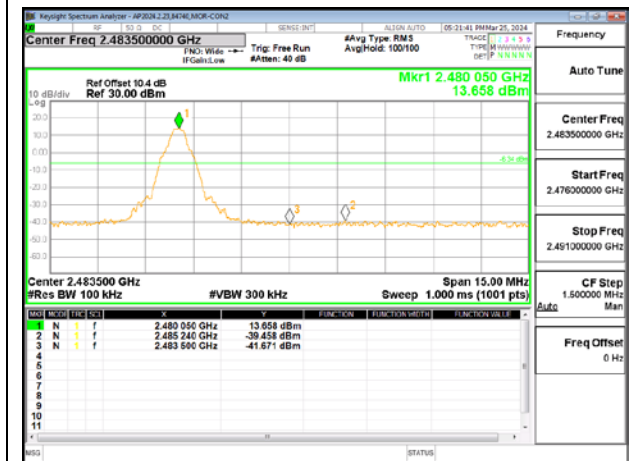
OUT-OF-BAND LOW CHANNEL



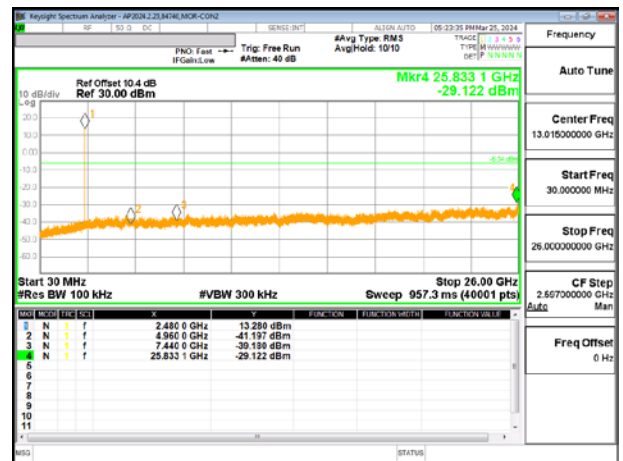
IN-BAND REFERENCE LEVEL



OUT-OF-BAND MID CHANNEL

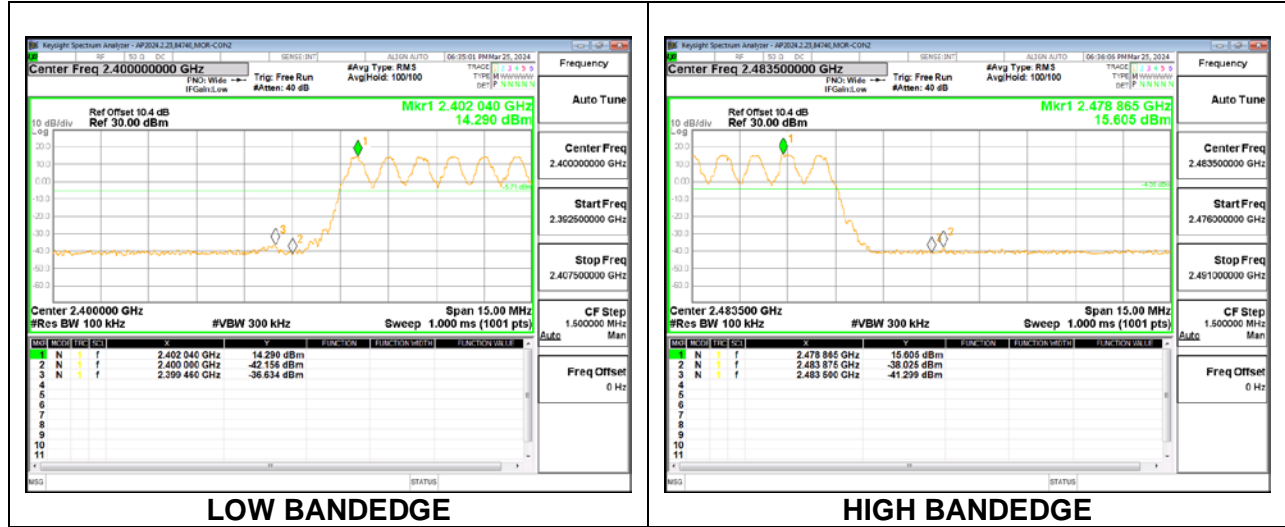


HIGH CHANNEL BANDEDGE



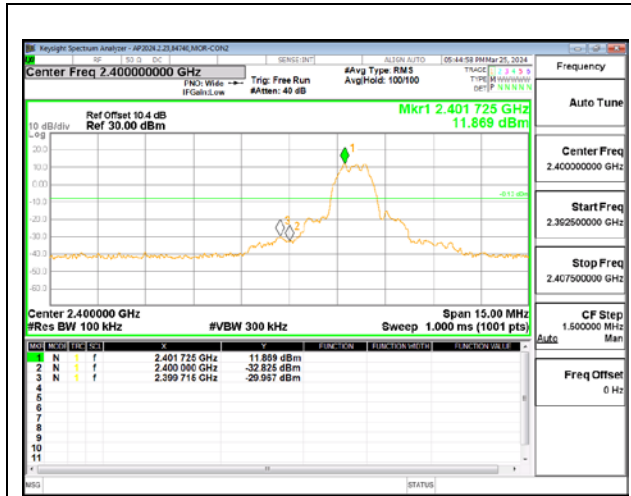
OUT-OF-BAND HIGH CHANNEL

SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON

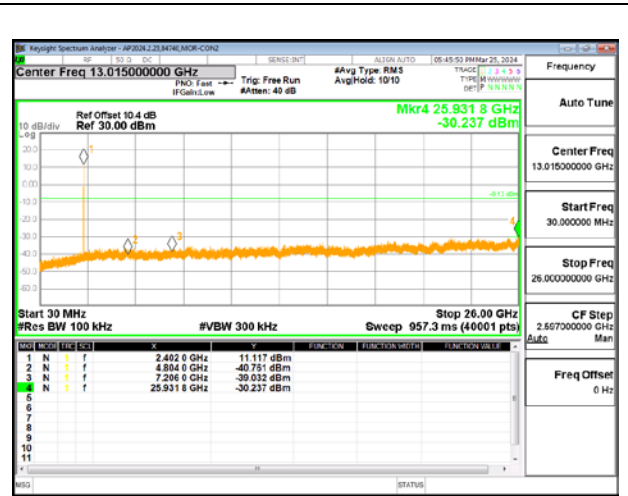


9.8.2. BLUETOOTH ENHANCED DATA RATE 8PSK MODULATION

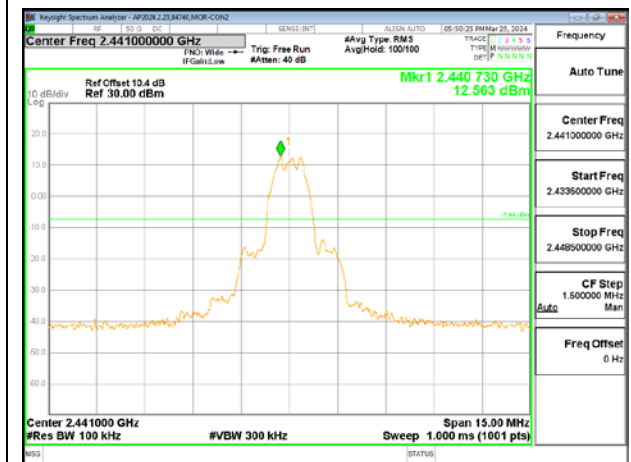
SPURIOUS EMISSIONS, NON-HOPPING



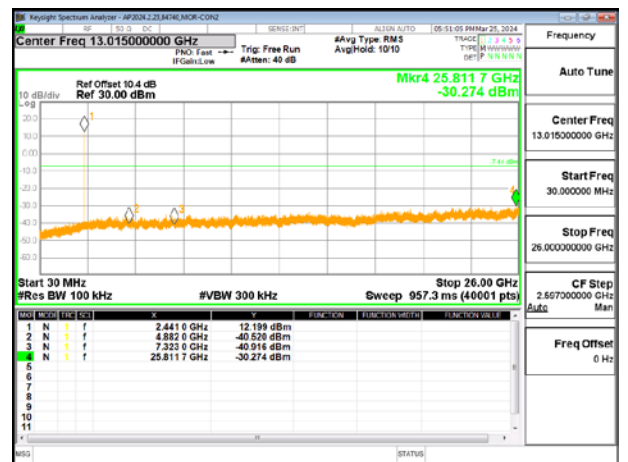
LOW CHANNEL BANDEDGE



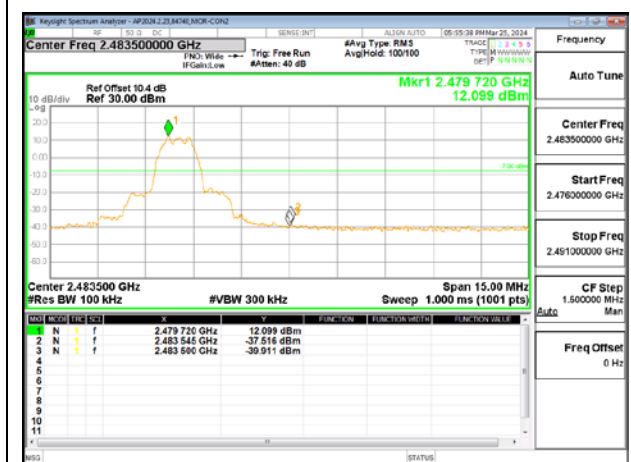
OUT-OF-BAND LOW CHANNEL



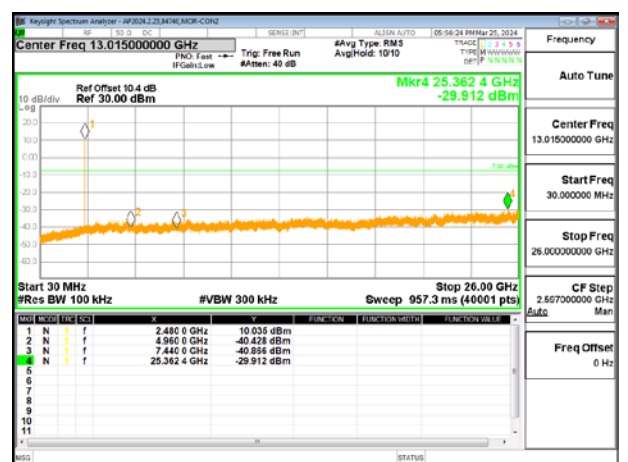
IN-BAND REFERENCE LEVEL



OUT-OF-BAND MID CHANNEL

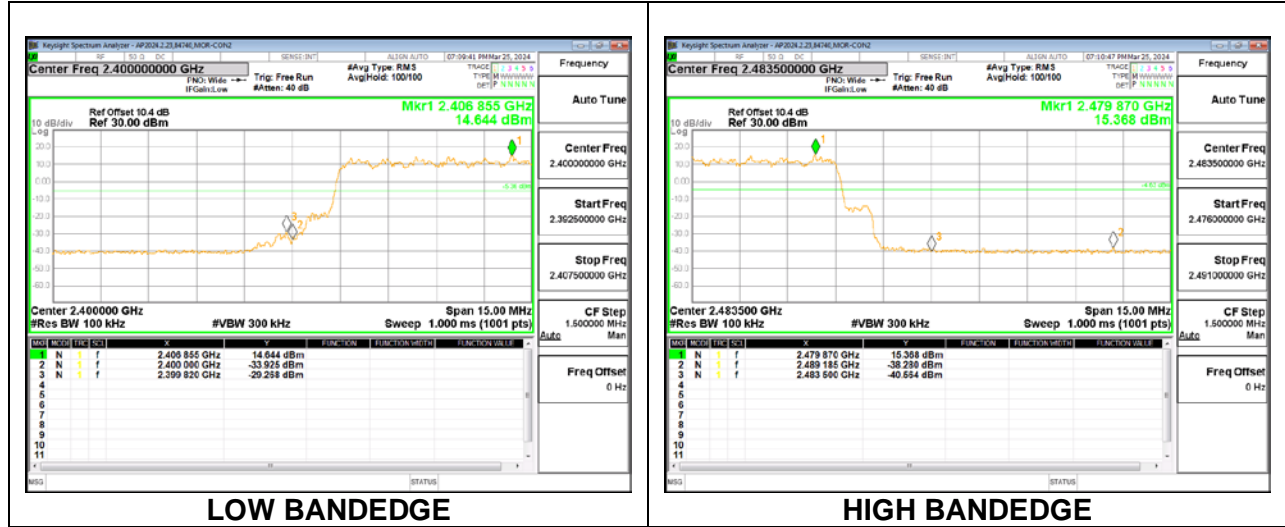


HIGH CHANNEL BANDEDGE



OUT-OF-BAND HIGH CHANNEL

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.

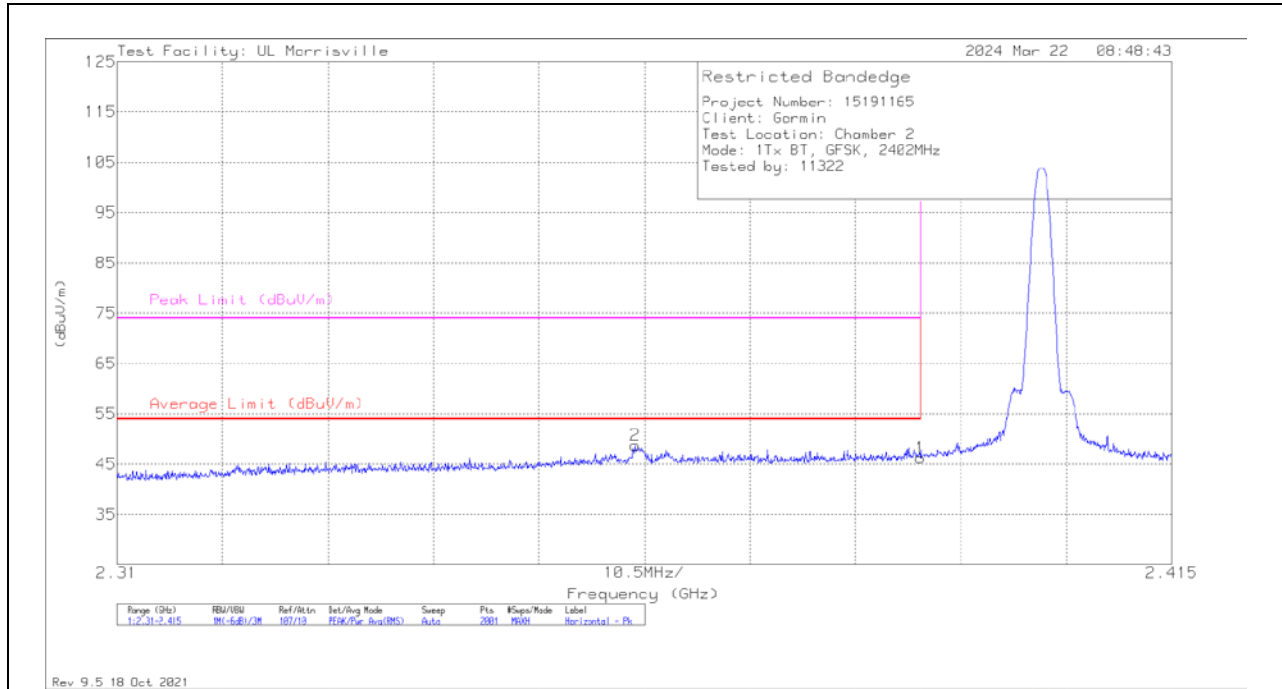
Note that Section 15.35(c) specifies that the DCCF shall represent the worst-case (greatest duty cycle) over any 100 msec transmission period.

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	86408 (dB/m)	Gain/Loss (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 2.38996	38.1	Pk	32.3	-24.2	-	46.2	-	-	74	-27.8	239	179	H
2	* ** 2.36161	40.62	Pk	32.1	-24	-	48.72	-	-	74	-25.28	239	179	H
	* ** 2.38996	38.1	Pk	32.3	-24.2	-24	22.2	54	-31.8	-	-	239	179	H
	* ** 2.36161	40.62	Pk	32.1	-24	-24	24.72	54	-29.28	-	-	239	179	H

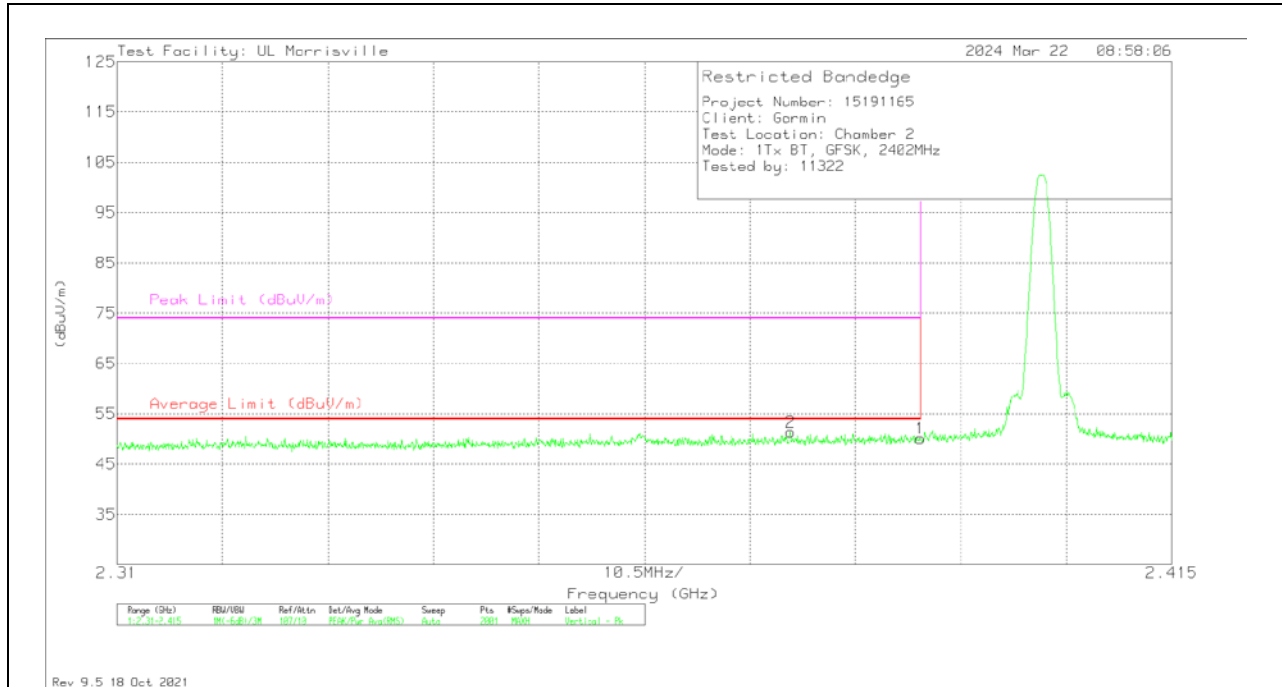
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

** - indicates frequency in Taiwan NCC LP0002 Restricted Band

Pk - Peak detector

Note: Average detection is calculated using a -24dB duty cycle correction factor from the PK measurement. Refer to section 9.2 for details on the duty cycle correction factor

VERTICAL RESULT



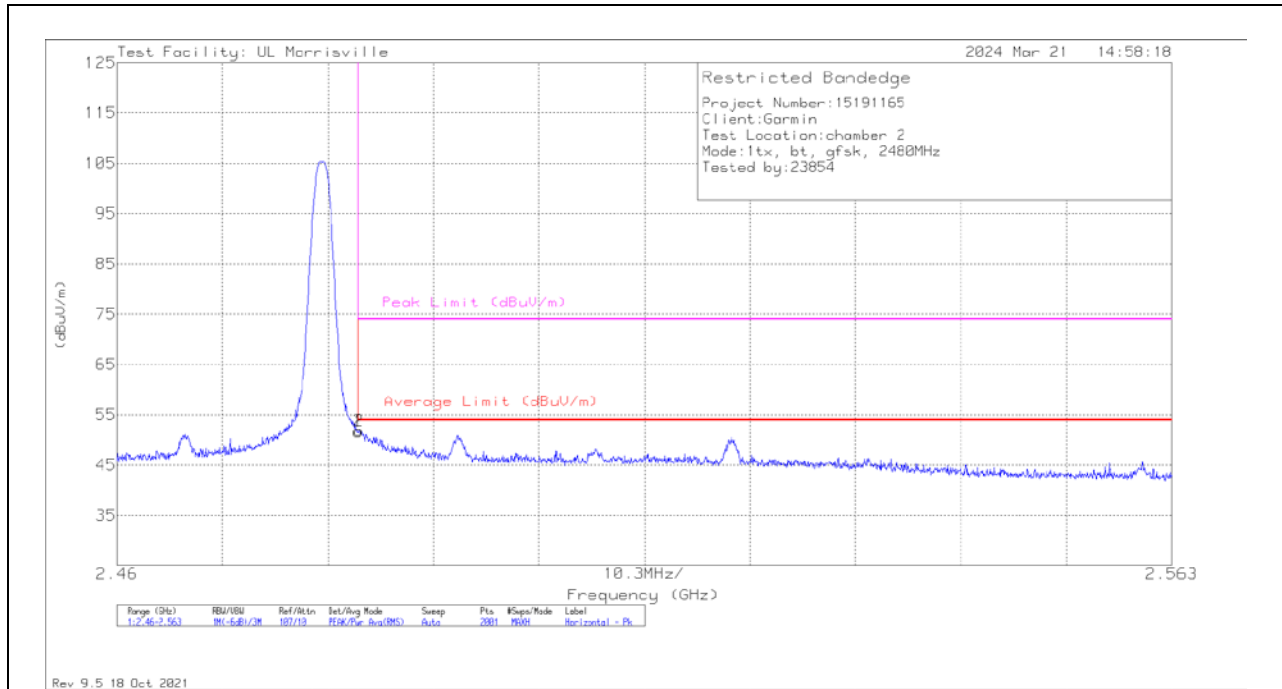
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	86408 (dB/m)	Gain/Loss (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 2.38996	41.84	Pk	32.3	-24	50.14	-	-	74	-23.86	166	172	V
2	* ** 2.37704	43.13	Pk	32.2	-24	51.33	-	-	74	-22.67	166	172	V
	* ** 2.38996	41.84	Pk	32.3	-24	-24	26.14	54	-	-	166	172	V
	* ** 2.37704	43.13	Pk	32.2	-24	-24	27.33	54	-	-	166	172	V

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

Note: Average detection is calculated using a -24dB duty cycle correction factor from the PK measurement. Refer to section 9.2 for details on the duty cycle correction factor

BANDEDGE (HIGH CHANNEL)

HORIZONTAL RESULT

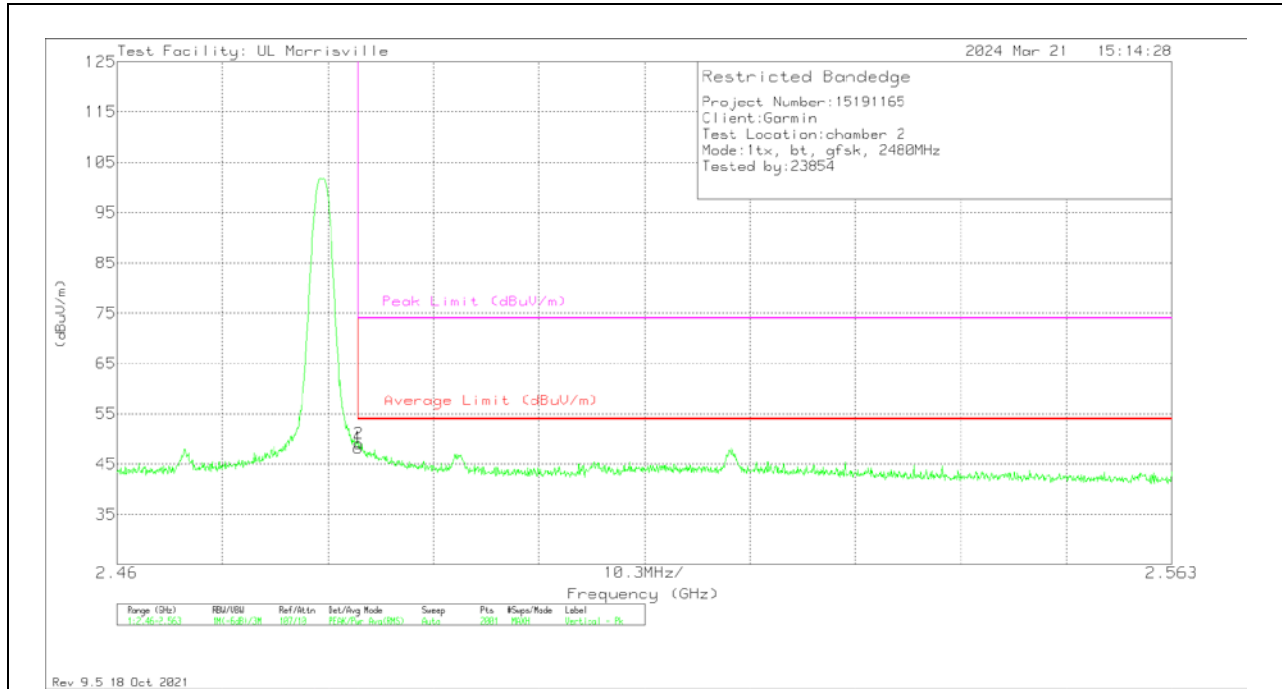


Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	86408 (dB/m)	Gain/Loss (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	*** 2.48354	43.66	Pk	32.5	-24.5	-	51.66	-	-	74	-22.34	218	151	H
2	*** 2.48364	43.79	Pk	32.5	-24.5	-	51.79	-	-	74	-22.21	218	151	H
	*** 2.48354	43.66	Pk	32.5	-24.5	-24	27.66	54	-26.34	-	-	218	151	H
	*** 2.48364	43.79	Pk	32.5	-24.5	-24	27.79	54	-26.21	-	-	218	151	H

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

Note: Average detection is calculated using a -24dB duty cycle correction factor from the PK measurement. Refer to section 9.2 for details on the duty cycle correction factor

VERTICAL RESULT



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	86408 (dB/m)	Gain/Loss (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	*** 2.48354	40.26	Pk	32.5	-24.5	-	48.26	-	-	74	-25.74	190	135	V
2	*** 2.48364	41.12	Pk	32.5	-24.5	-	49.12	-	-	74	-24.88	190	135	V
	*** 2.48354	40.26	Pk	32.5	-24.5	-24	24.26	54	-29.74	-	-	190	135	V
	*** 2.48364	41.12	Pk	32.5	-24.5	-24	25.12	54	-28.88	-	-	190	135	V

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

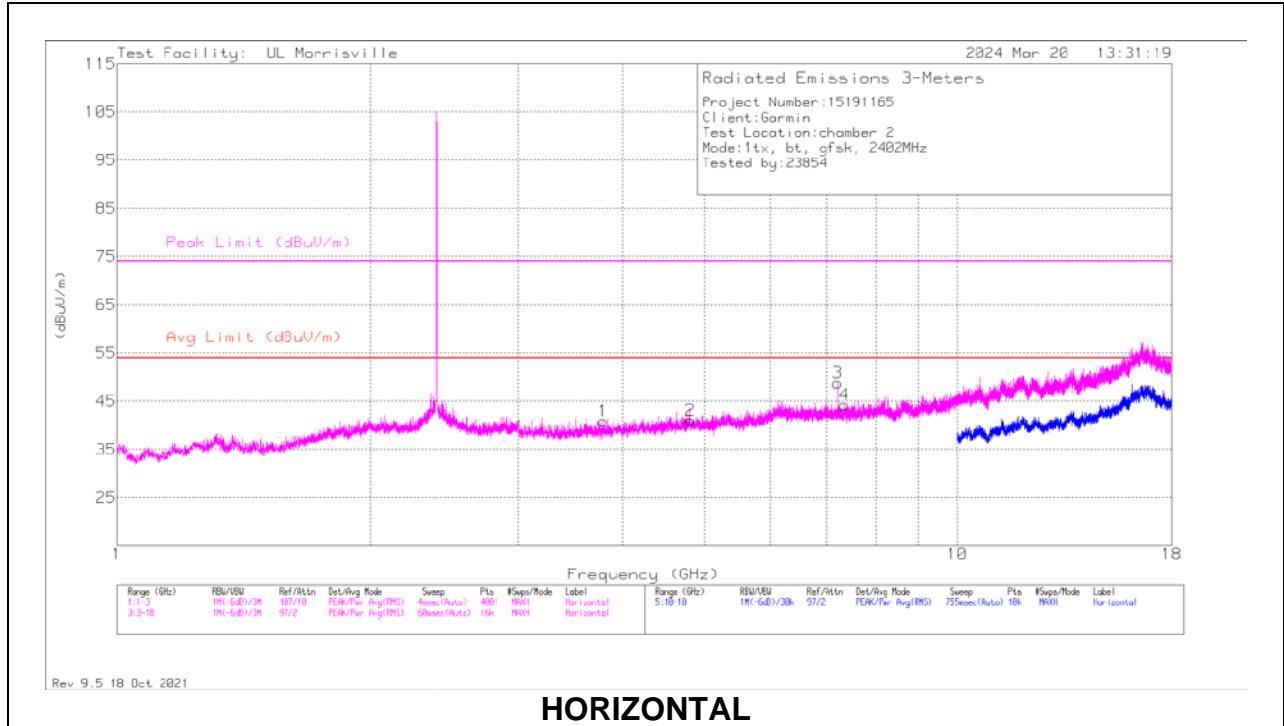
** - indicates frequency in Taiwan NCC LP0002 Restricted Band

Pk - Peak detector

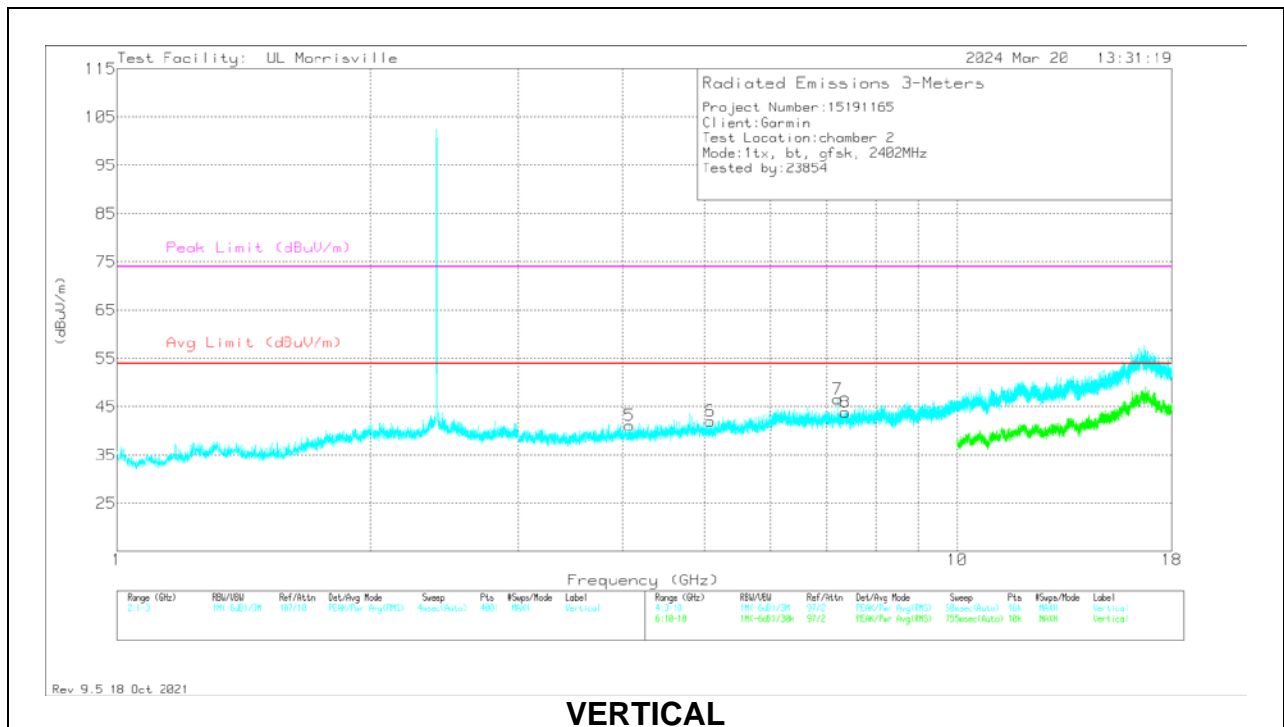
Note: Average detection is calculated using a -24dB duty cycle correction factor from the PK measurement. Refer to section 9.2 for details on the duty cycle correction factor

HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL RESULTS



HORIZONTAL



VERTICAL

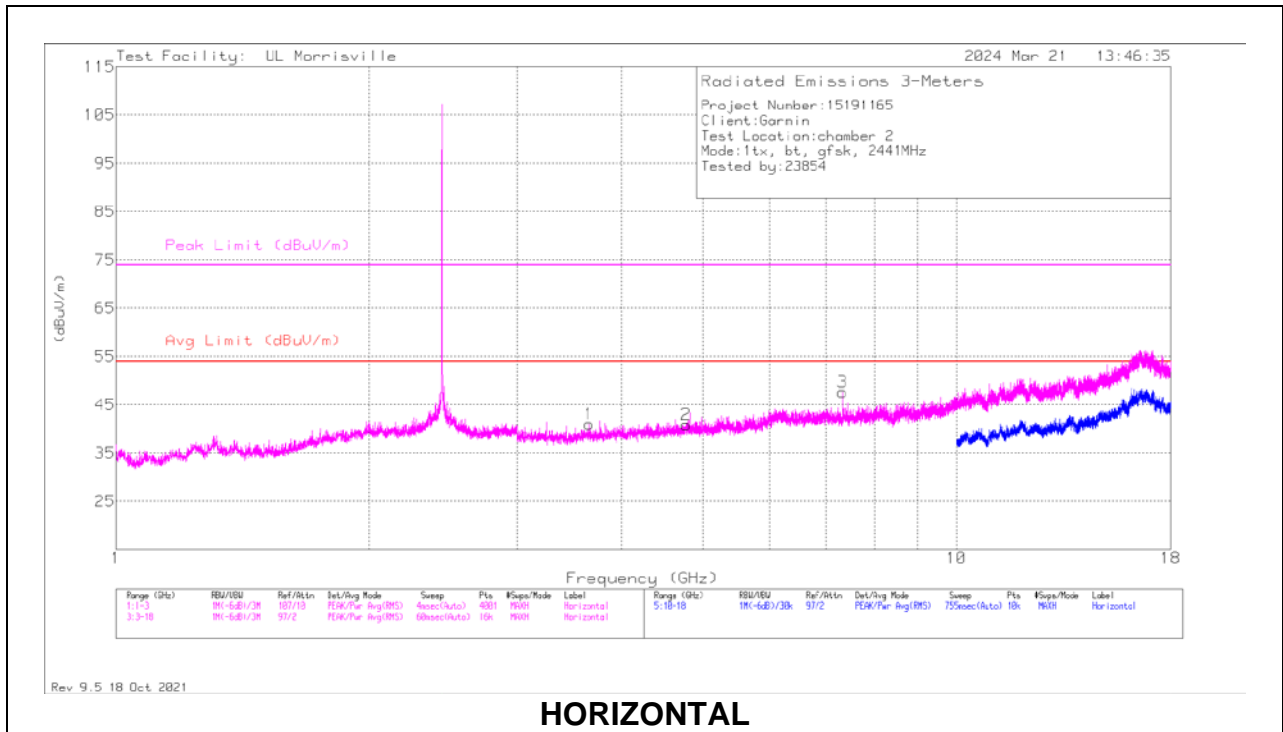
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	86408 (dB/m)	Gain/Loss (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 3.78938	39.85	Pk	33.3	-32.3	40.85	54	-13.15	74	-33.15	0-360	200	H
2	* ** 4.81125	36.97	Pk	34.2	-30.1	41.07	54	-12.93	74	-32.93	0-360	200	H
4	* ** 7.33781	34.94	Pk	35.6	-26.3	44.24	54	-9.76	74	-29.76	0-360	200	H
5	* ** 4.07625	39.64	Pk	33.4	-31.9	41.14	54	-12.86	74	-32.86	0-360	200	V
6	* ** 5.08781	38.52	Pk	34.1	-30.5	42.12	54	-11.88	74	-31.88	0-360	200	V
8	* ** 7.35	34.55	Pk	35.6	-26.3	43.85	54	-10.15	74	-30.15	0-360	101	V
3	7.20656	40.26	Pk	35.6	-27.1	48.76	-	-	-	-	0-360	200	H
7	7.20656	38.05	Pk	35.6	-27.1	46.55	-	-	-	-	0-360	200	V

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

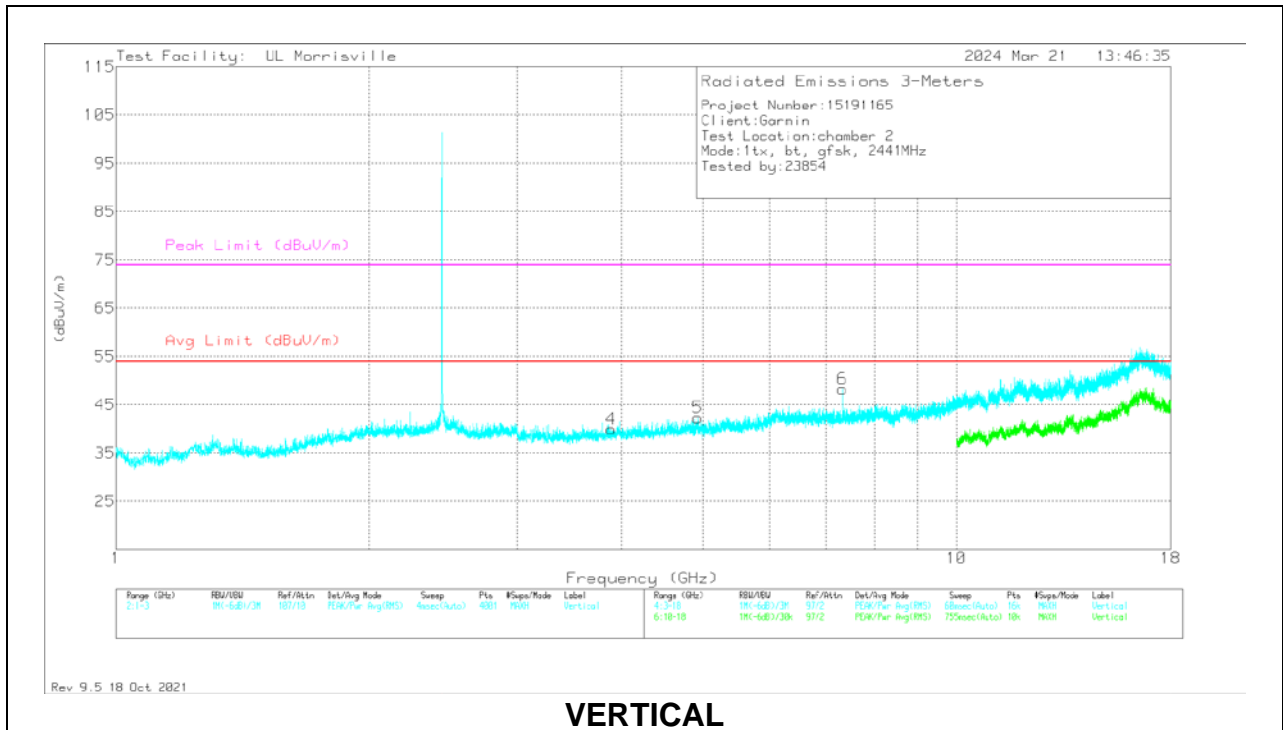
** - indicates frequency in Taiwan NCC LP0002 Restricted Band

Pk - Peak detector

MID CHANNEL RESULTS



HORIZONTAL



VERTICAL

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	86408 (dB/m)	Gain/Loss (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	*** 3.65813	39.81	Pk	33.1	-31.9	0	41.01	54	-12.99	74	-32.99	0-360	199	H
2	*** 4.76813	37.4	Pk	34.2	-30.7	0	40.9	54	-13.1	74	-33.1	0-360	199	H
3	*** 7.32281	38.69	Pk	35.6	-26.7	0	47.59	54	-6.41	74	-26.41	0-360	101	H
4	*** 3.88031	38.18	Pk	33.4	-31.6	0	39.98	54	-14.02	74	-34.02	0-360	199	V
5	*** 4.92281	38.54	Pk	34.1	-30.3	0	42.34	54	-11.66	74	-31.66	0-360	101	V
6	*** 7.32339	41.32	PK2	35.6	-26.6	0	50.32	-	-	74	-23.68	277	160	V
	*** 7.32339	41.32	PK2	35.6	-26.6	-24	36.32	54	-27.68	-	-	277	160	V

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

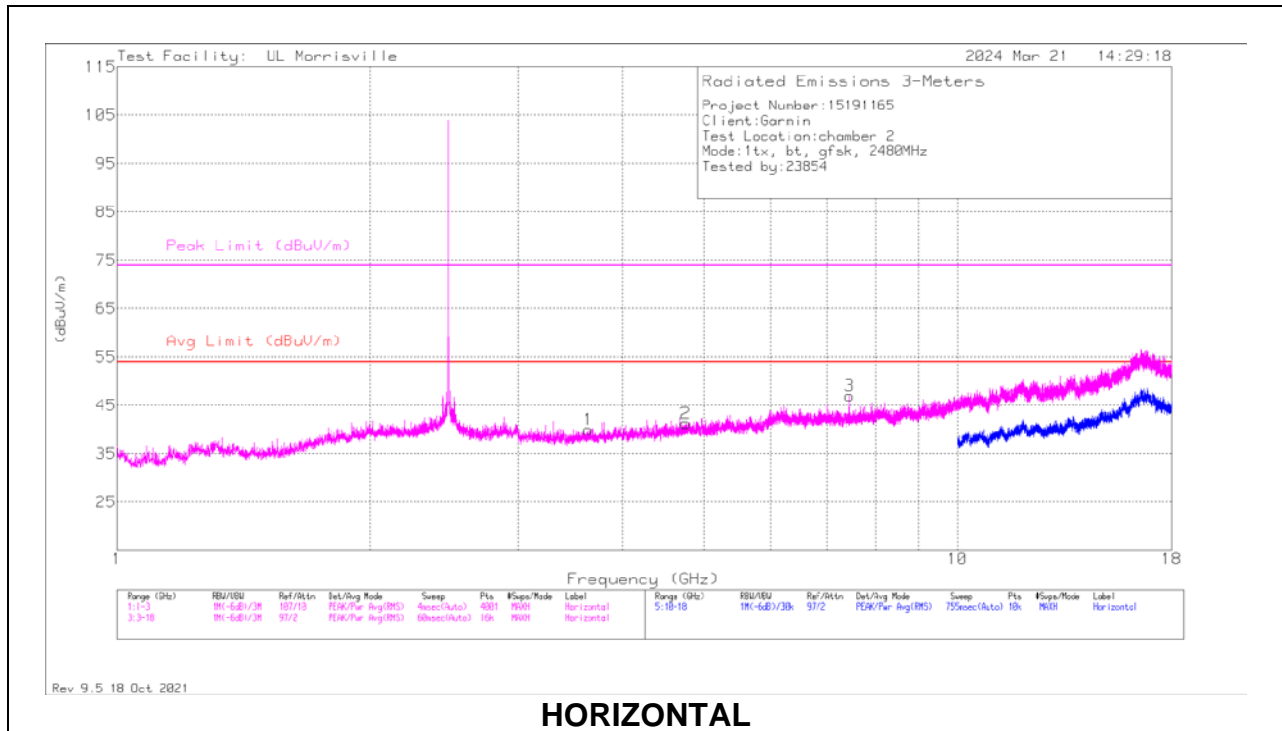
** - indicates frequency in Taiwan NCC LP0002 Restricted Band

Pk - Peak detector

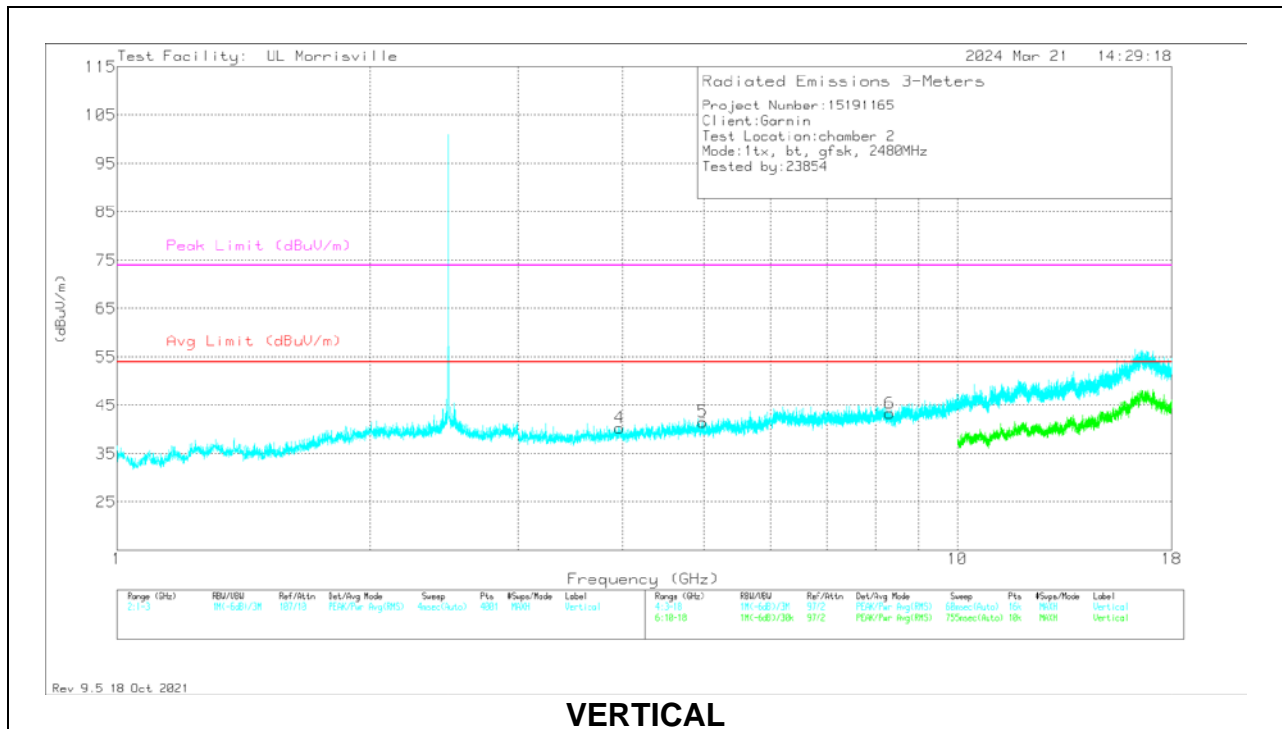
PK2 - Maximum Peak

Note: Average detection is calculated using a -24dB duty cycle correction factor from the PK measurement. Refer to section 9.2 for details on the duty cycle correction factor

HIGH CHANNEL RESULTS



HORIZONTAL



VERTICAL

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	86408 (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	* ** 3.63656	38.34	Pk	33.1	-31.4	40.04	54	-13.96	74	-33.96	0-360	101	H
2	* ** 4.75125	37.66	Pk	34.2	-30.6	41.26	54	-12.74	74	-32.74	0-360	200	H
3	* ** 7.44	38.29	Pk	35.6	-26.9	46.99	54	-7.01	74	-27.01	0-360	101	H
4	* ** 3.96656	37.83	Pk	33.4	-30.9	40.33	54	-13.67	74	-33.67	0-360	200	V
5	* ** 4.97719	38.01	Pk	34	-30.4	41.61	54	-12.39	74	-32.39	0-360	200	V
6	* ** 8.31	34.21	Pk	35.8	-26.6	43.41	54	-10.59	74	-30.59	0-360	200	V

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

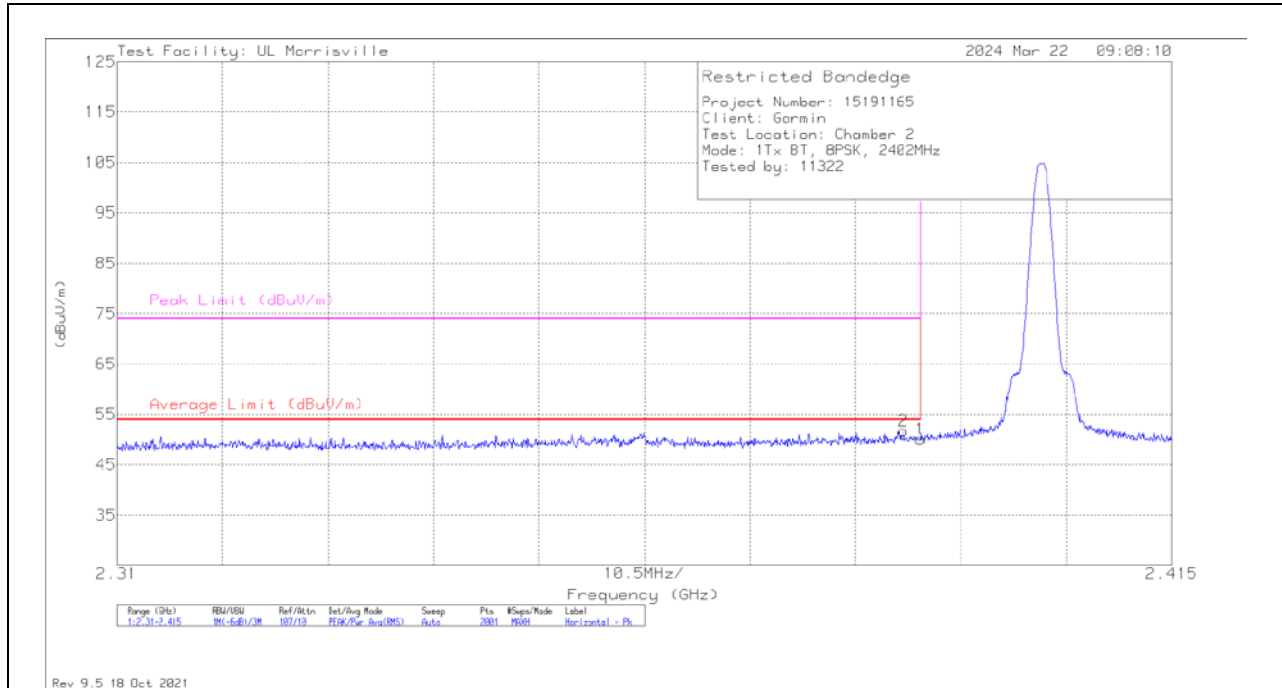
** - indicates frequency in Taiwan NCC LP0002 Restricted Band

Pk - Peak detector

10.1.2. BLUETOOTH ENHANCED DATA RATE 8PSK MODULATION

BANDEDGE (LOW CHANNEL)

HORIZONTAL RESULT



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	86408 (dB/m)	Gain/Loss (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 2.38996	41.76	Pk	32.3	-24	-	50.06	-	-	74	-23.94	233	231	H
2	* ** 2.38828	43.4	Pk	32.3	-24	-	51.7	-	-	74	-22.3	233	231	H
	* ** 2.38996	41.76	Pk	32.3	-24	-24	26.06	54	-27.94	-	-	233	231	H
	* ** 2.38828	43.4	Pk	32.3	-24	-24	27.7	54	-26.3	-	-	233	231	H

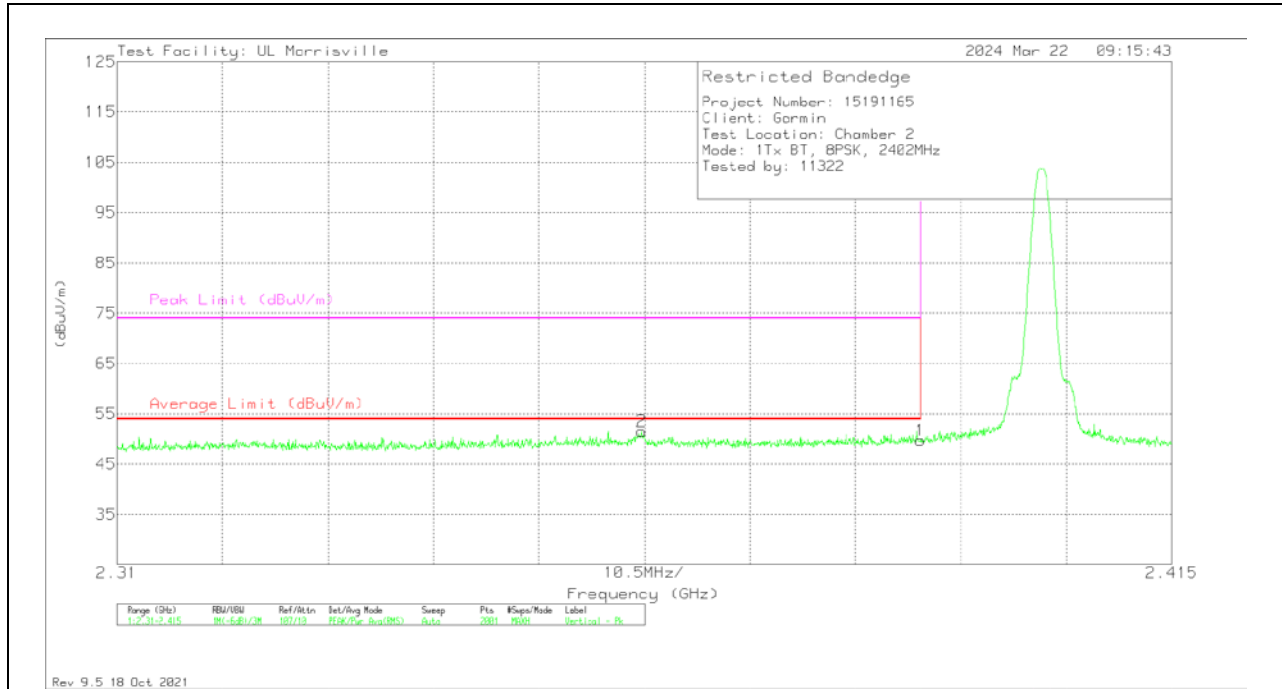
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

** - indicates frequency in Taiwan NCC LP0002 Restricted Band

Pk - Peak detector

Note: Average detection is calculated using a -24dB duty cycle correction factor from the PK measurement. Refer to section 9.2 for details on the duty cycle correction factor

VERTICAL RESULT



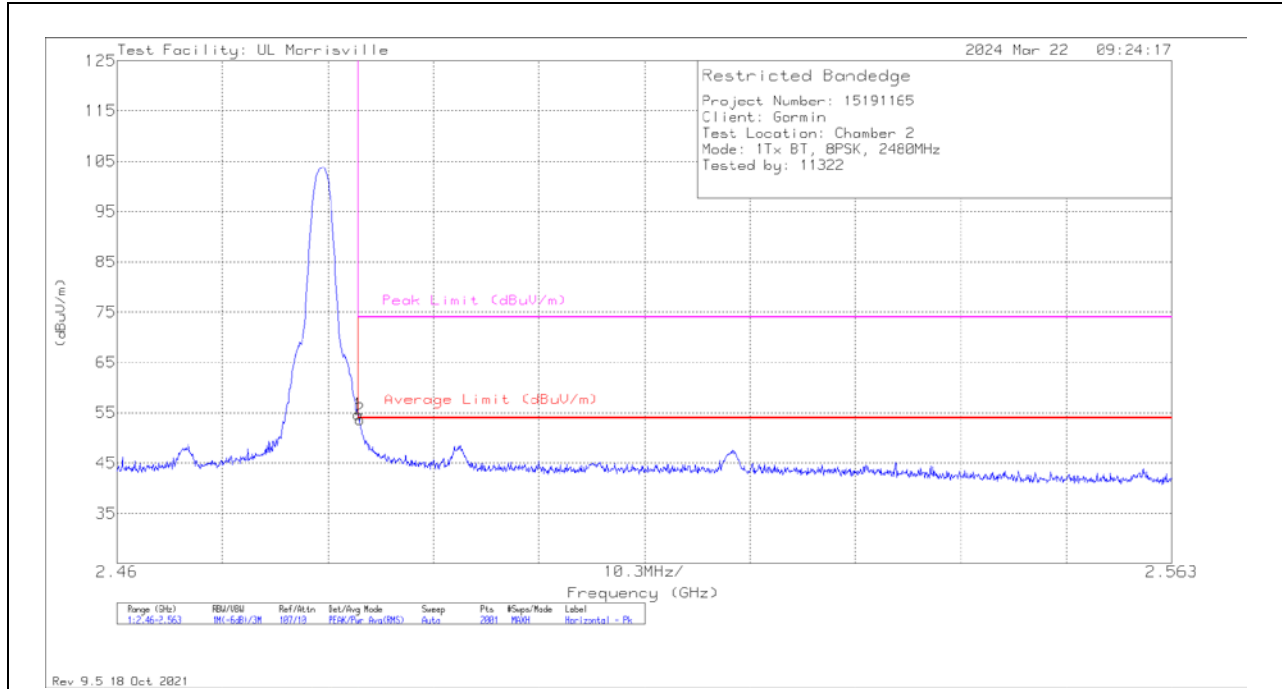
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	86408 (dB/m)	Gain/Loss (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 2.38996	41.39	Pk	32.3	-24	-	49.69	-	-	74	-24.31	171	325	V
2	* ** 2.36224	43.43	Pk	32.1	-24	-	51.53	-	-	74	-22.47	171	325	V
	* ** 2.38996	41.39	Pk	32.3	-24	-24	25.69	54	-28.31	-	-	171	325	V
	* ** 2.36224	43.43	Pk	32.1	-24	-24	27.53	54	-26.47	-	-	171	325	V

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

Note: Average detection is calculated using a -24dB duty cycle correction factor from the PK measurement. Refer to section 9.2 for details on the duty cycle correction factor

BANDEDGE (HIGH CHANNEL)

HORIZONTAL RESULT



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	86408 (dB/m)	Gain/Loss (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	*** 2.48354	46.75	Pk	32.5	-24.5	-	54.75	-	-	74	-19.25	253	364	H
2	*** 2.48374	45.68	Pk	32.5	-24.5	-	53.68	-	-	74	-20.32	253	364	H
	*** 2.48354	46.75	Pk	32.5	-24.5	-24	30.75	54	-23.25	-	-	253	364	H
	*** 2.48374	45.68	Pk	32.5	-24.5	-24	29.68	54	-24.32	-	-	253	364	H

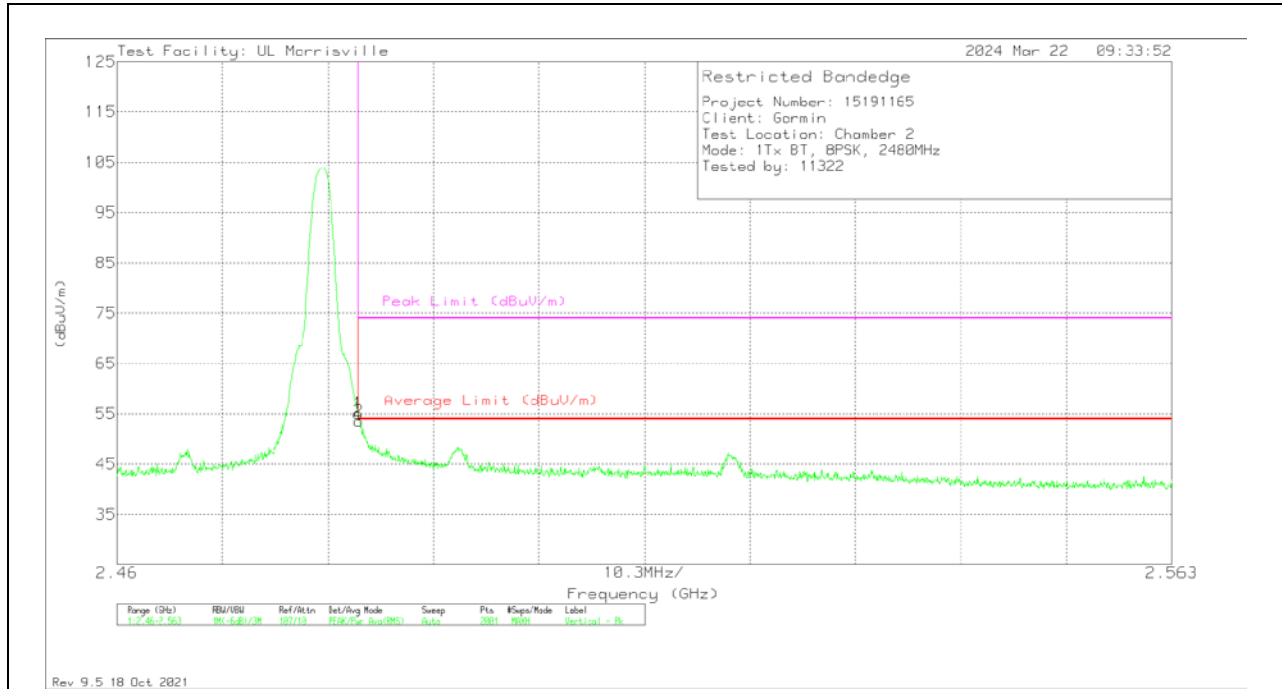
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

** - indicates frequency in Taiwan NCC LP0002 Restricted Band

Pk - Peak detector

Note: Average detection is calculated using a -24dB duty cycle correction factor from the PK measurement. Refer to section 9.2 for details on the duty cycle correction factor

VERTICAL RESULT



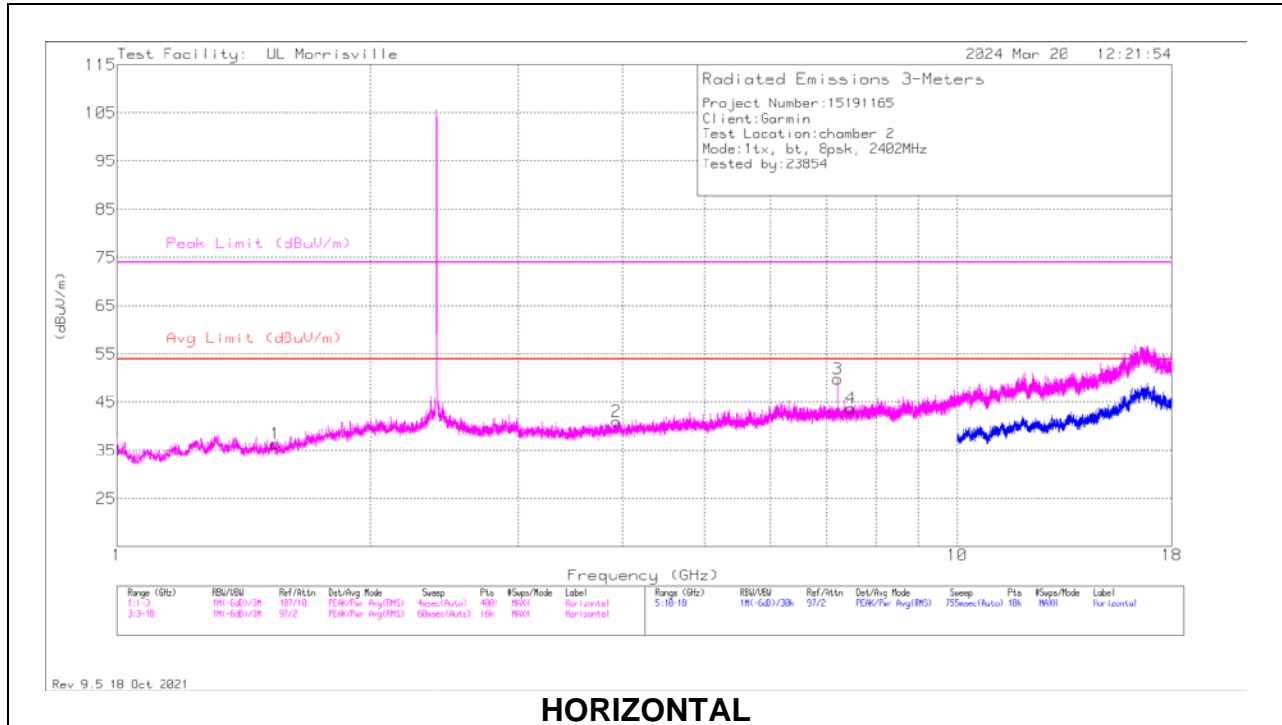
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	86408 (dB/m)	Gain/Loss (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 2.48354	47.12	Pk	32.5	-24.5	-	55.12	-	-	74	-18.88	323	363	V
2	* ** 2.48364	45.59	Pk	32.5	-24.5	-	53.59	-	-	74	-20.41	323	363	V
	* ** 2.48354	47.12	Pk	32.5	-24.5	-24	31.12	54	-22.88	-	-	323	363	V
	* ** 2.48364	45.59	Pk	32.5	-24.5	-24	29.59	54	-24.41	-	-	323	363	V

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

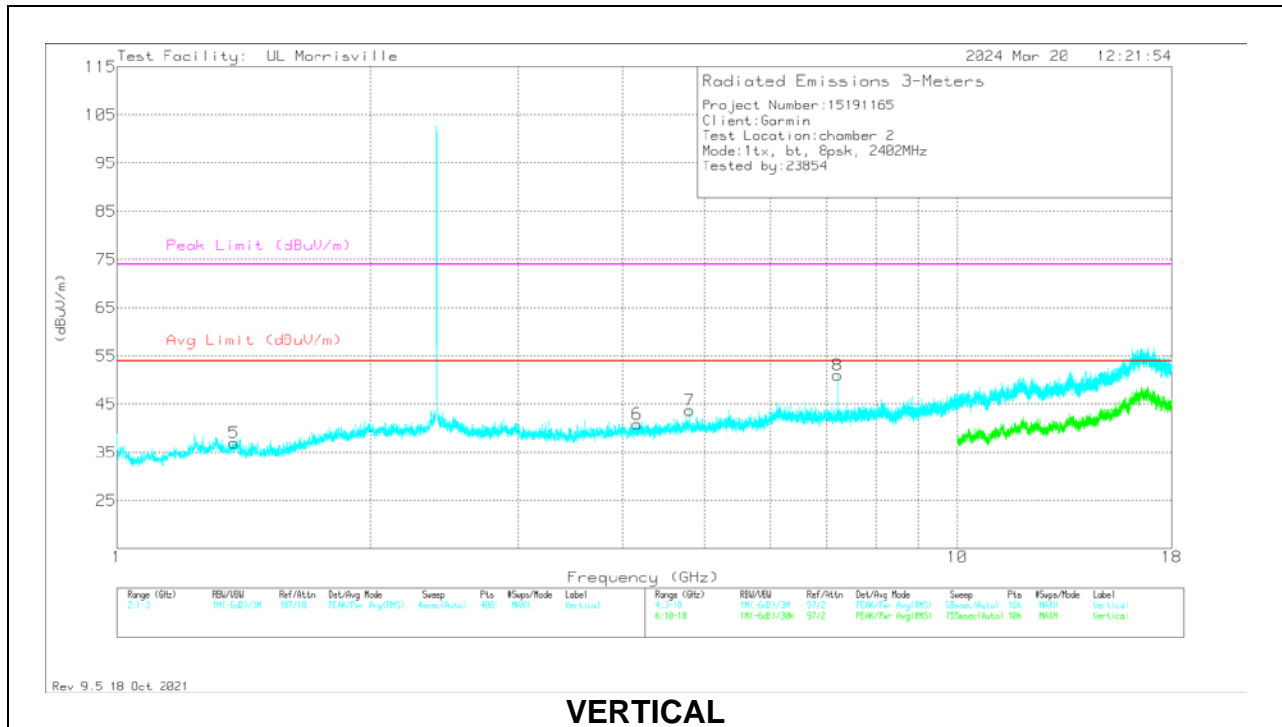
Note: Average detection is calculated using a -24dB duty cycle correction factor from the PK measurement. Refer to section 9.2 for details on the duty cycle correction factor

HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL RESULTS



HORIZONTAL

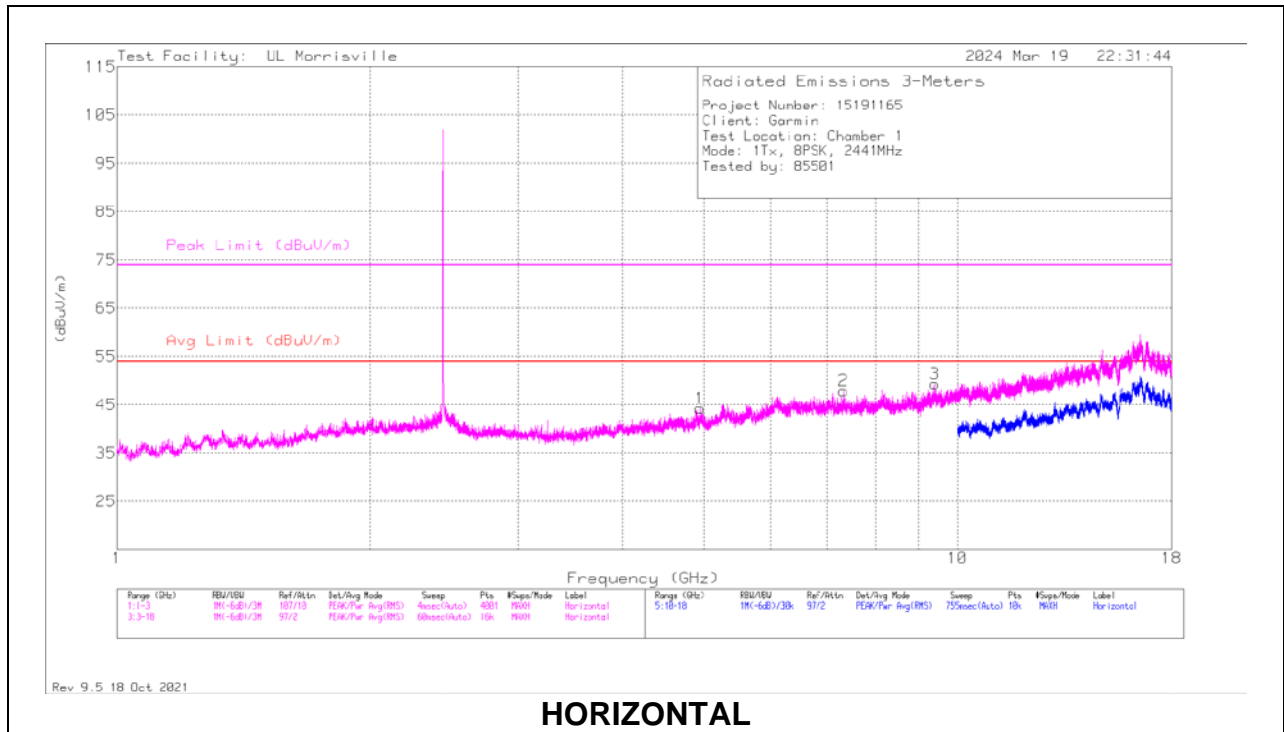


VERTICAL

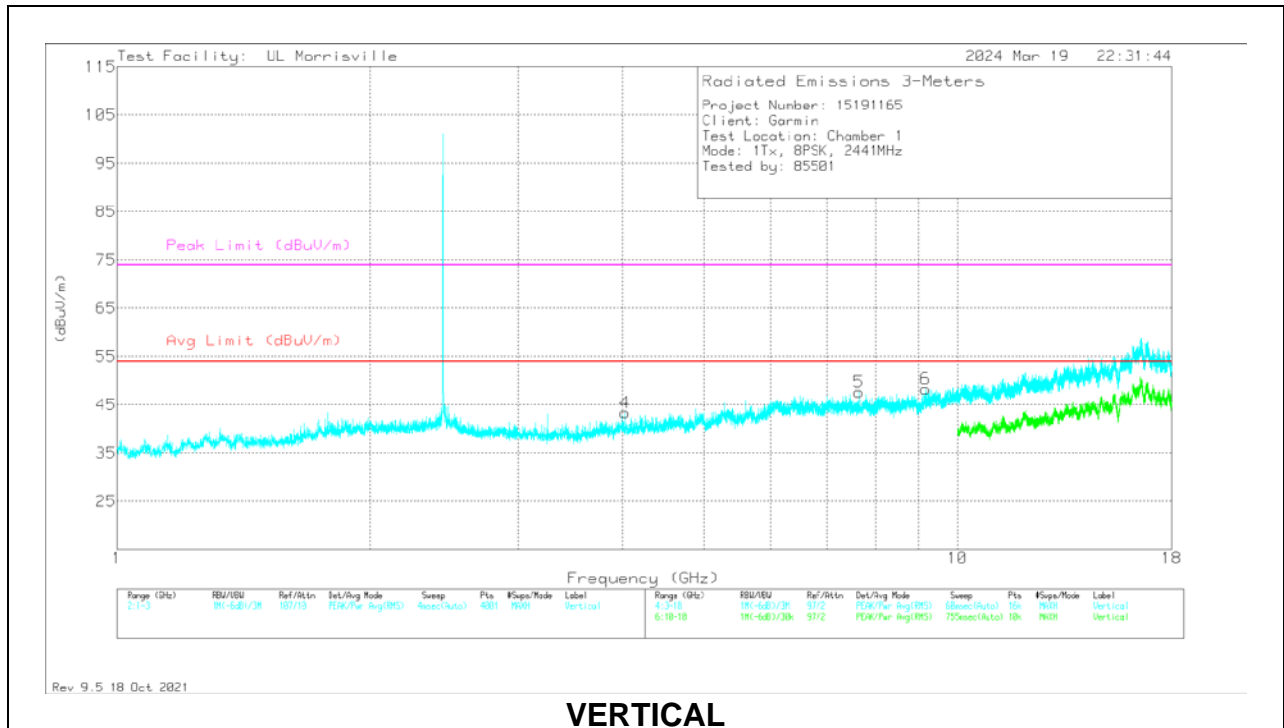
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	86408 (dB/m)	Gain/Loss (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	*** 1.5445	31.12	Pk	27.9	-22.7	36.32	54	-17.68	74	-37.68	0-360	200	H
5	*** 1.379	31.51	Pk	28.8	-23.3	37.01	54	-16.99	74	-36.99	0-360	101	V
2	*** 3.92906	38.92	Pk	33.4	-31.3	41.02	54	-12.98	74	-32.98	0-360	101	H
4	*** 7.46438	35.4	Pk	35.6	-27.2	43.8	54	-10.2	74	-30.2	0-360	199	H
6	*** 4.15781	38.66	Pk	33.4	-31.2	40.86	54	-13.14	74	-33.14	0-360	199	V
7	*** 4.80281	39.66	Pk	34.2	-30.1	43.76	54	-10.24	74	-30.24	0-360	101	V
3	7.20563	41.41	Pk	35.6	-27.1	49.91	-	-	-	-	0-360	199	H
8	7.20563	42.48	Pk	35.6	-27.1	50.98	-	-	-	-	0-360	199	V

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

MID CHANNEL RESULTS



HORIZONTAL



VERTICAL

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	206211 (dB/m)	Gain/Loss (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	*** 4.93594	40.72	Pk	34	-30.5	-	44.22	54	-9.78	74	-29.78	0-360	199	H
2	*** 7.32375	38.9	Pk	35.6	-26.6	-	47.9	54	-6.1	74	-26.1	0-360	101	H
3	*** 9.40975	38.91	PK2	36.4	-25.2	-	50.11	-	-	74	-23.89	293	251	H
	*** 9.40975	38.91	PK2	36.4	-25.2	-24	26.11	54	-27.89	-	-	293	251	H
4	*** 4.02375	41.58	Pk	33.4	-31.6	-	43.38	54	-10.62	74	-30.62	0-360	200	V
5	*** 7.64156	38.41	Pk	35.8	-26.6	-	47.61	54	-6.39	74	-26.39	0-360	200	V
6	*** 9.1696	37.93	PK2	36	-25.5	-	48.43	-	-	74	-25.57	360	304	V
	*** 9.1696	37.93	PK2	36	-25.5	-24	24.43	54	-29.57	-	-	360	304	V

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

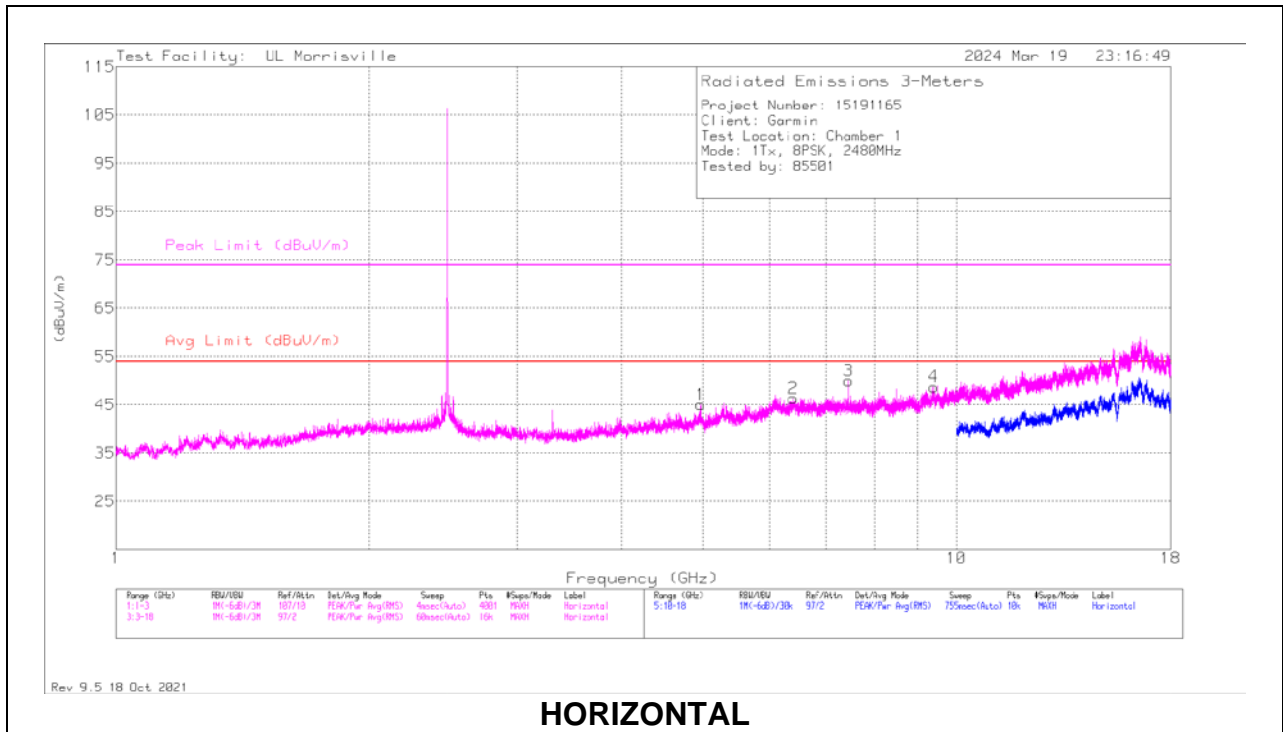
** - indicates frequency in Taiwan NCC LP0002 Restricted Band

Pk - Peak detector

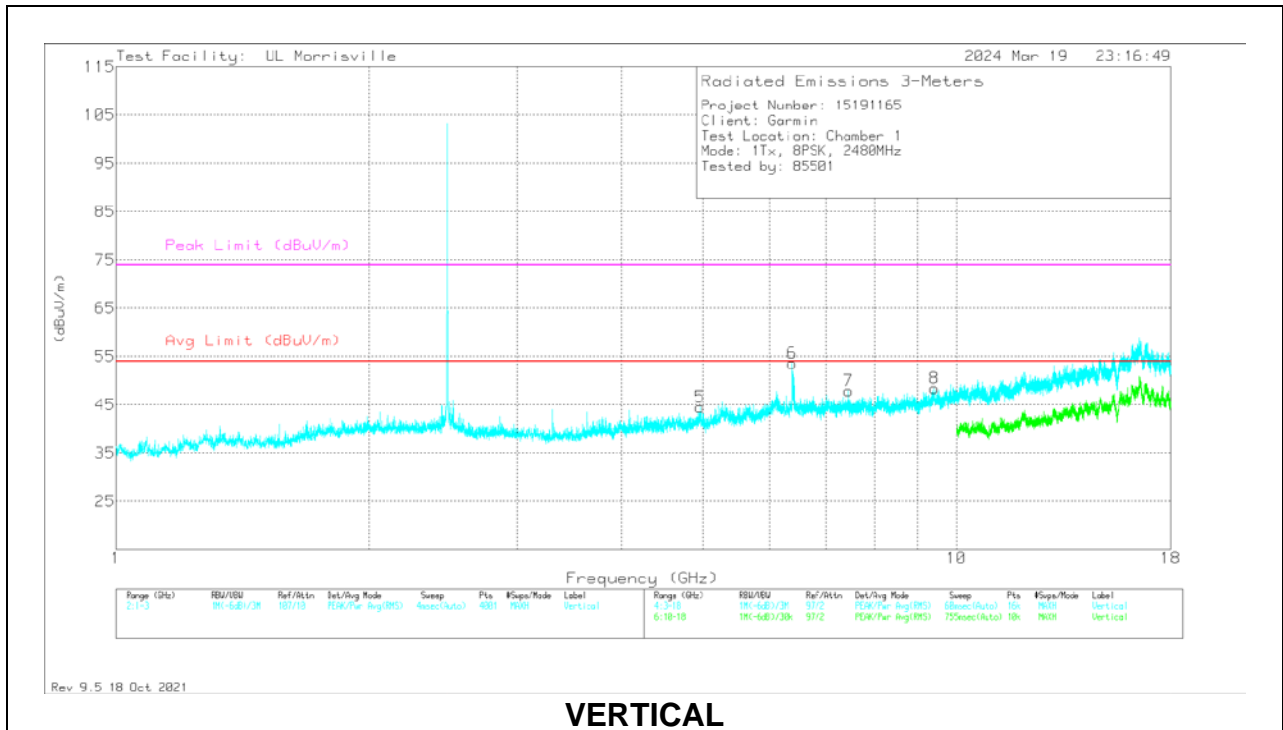
PK2 - Maximum Peak

Note: Average detection is calculated using a -24dB duty cycle correction factor from the PK measurement. Refer to section 9.2 for details on the duty cycle correction factor

HIGH CHANNEL RESULTS



HORIZONTAL



VERTICAL

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	206211 (dB/m)	Gain/Loss (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 4.96031	41.3	Pk	34	-30.3	-	45	54	-9	74	-29	0-360	101	H
3	* ** 7.43951	44.22	PK2	35.7	-26.9	-	53.02	-	-	74	-20.98	192	382	H
	* ** 7.43951	44.22	PK2	35.7	-26.9	-24	29.02	54	-24.98	-	-	192	382	H
4	* ** 9.40663	38.45	PK2	36.4	-25.2	-	49.65	-	-	74	-24.35	12	351	H
	* ** 9.40663	38.45	PK2	36.4	-25.2	-24	25.65	54	-28.35	-	-	12	351	H
5	* ** 4.95938	40.83	Pk	34	-30.3	-	44.53	54	-9.47	74	-29.47	0-360	101	V
7	* ** 7.43906	39.08	Pk	35.7	-26.9	-	47.88	54	-6.12	74	-26.12	0-360	101	V
8	* ** 9.41906	38.73	PK2	36.4	-25.4	-	49.73	-	-	74	-24.27	268	308	V
	* ** 9.41906	38.73	PK2	36.4	-25.4	-24	25.73	54	-28.27	-	-	268	308	V
6	6.38063	45.73	Pk	35.5	-27.6	-	53.63	-	-	-	-	0-360	101	V
2	6.40125	38.59	Pk	35.4	-27.6	-	46.39	-	-	-	-	0-360	101	H

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

** - indicates frequency in Taiwan NCC LP0002 Restricted Band

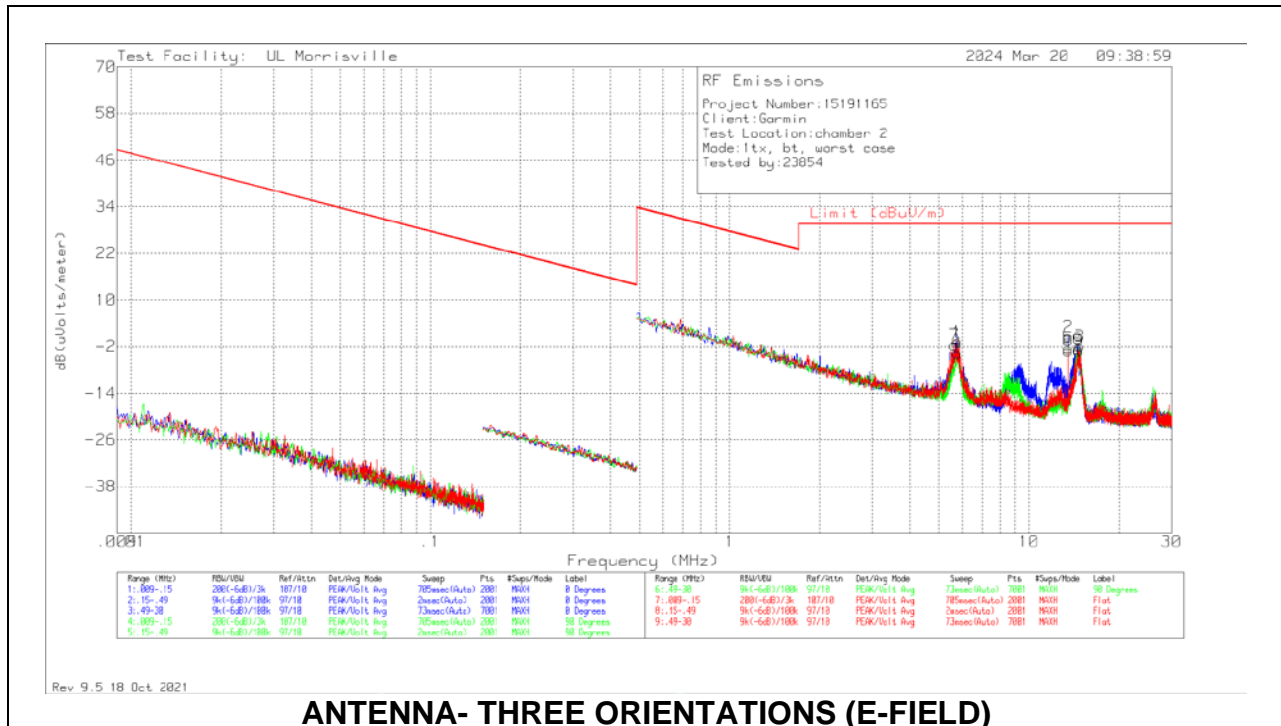
Pk - Peak detector

PK2 - Maximum Peak

Note: Average detection is calculated using a -24dB duty cycle correction factor from the PK measurement. Refer to section 9.2 for details on the duty cycle correction factor

10.2. WORST CASE SPURIOUS BELOW 30MHZ

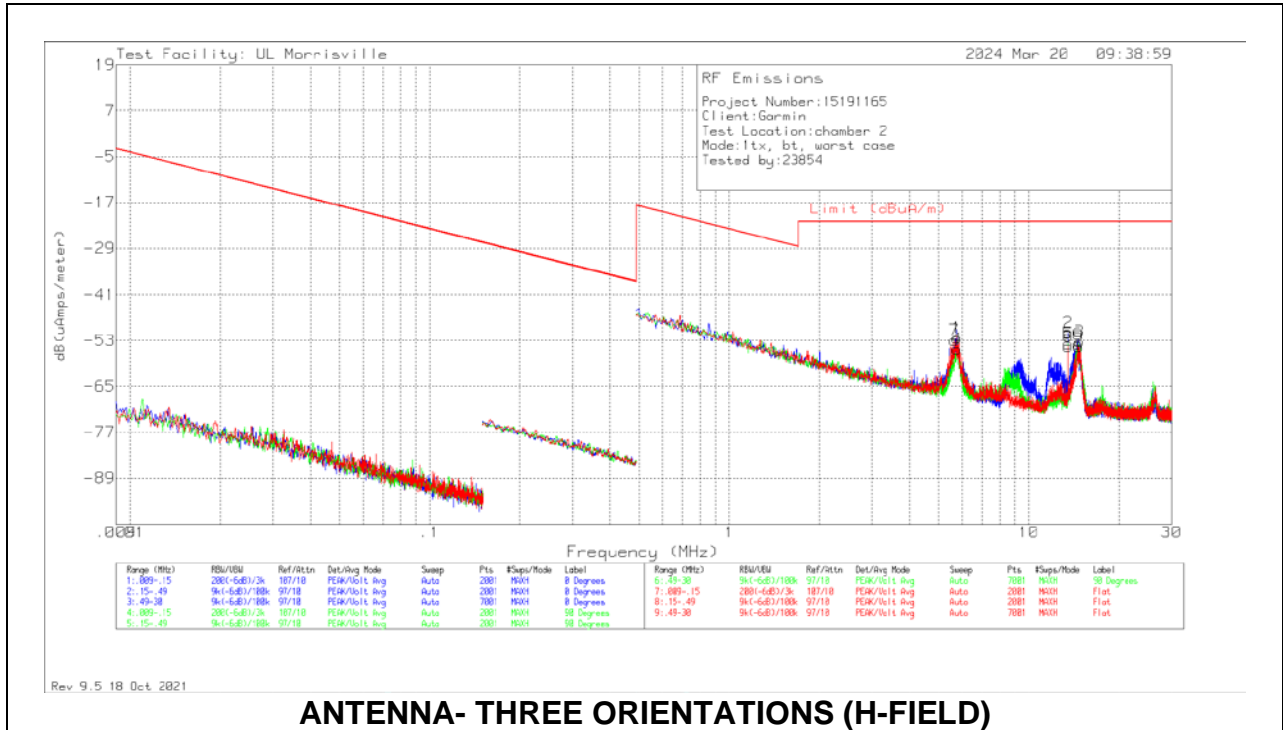
Note: All measurements were made at a test distance of 3 m. The measured data was extrapolated from the test distance (3m) to the specification distance (300 m from 9-490 kHz and 30 m from 490 kHz – 30 MHz) to clearly show the relative levels of fundamental and spurious emissions and demonstrate compliance 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 $40 \cdot \log(\text{test distance} / \text{specification distance})$.



ANTENNA- THREE ORIENTATIONS (E-FIELD)

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	135144 (dBuV/m)	Gain/Loss (dB)	Dist. Corr. Factor (dB)	Corrected Reading dB(uVolts/meter)	Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Loop Angle
7	5.67146	26.87	Pk	11.2	.4	-40	-1.53	29.54	-31.07	0-360	Flat
1	5.76843	27.59	Pk	11.2	.4	-40	-.81	29.54	-30.35	0-360	0 degs
4	5.77686	24.67	Pk	11.2	.4	-40	-3.73	29.54	-33.27	0-360	90 degs
2	13.5596	29.2	Pk	10.7	.6	-40	.5	29.54	-29.04	0-360	0 degs
5	13.5596	26.33	Pk	10.7	.6	-40	-2.37	29.54	-31.91	0-360	90 degs
8	13.5596	25.62	Pk	10.7	.6	-40	-3.08	29.54	-32.62	0-360	Flat
6	14.60938	26.08	Pk	10.7	.7	-40	-2.52	29.54	-32.06	0-360	90 degs
9	14.66841	25.48	Pk	10.7	.7	-40	-3.12	29.54	-32.66	0-360	Flat
3	14.74851	26.74	Pk	10.7	.7	-40	-1.86	29.54	-31.4	0-360	0 degs

Pk - Peak detector

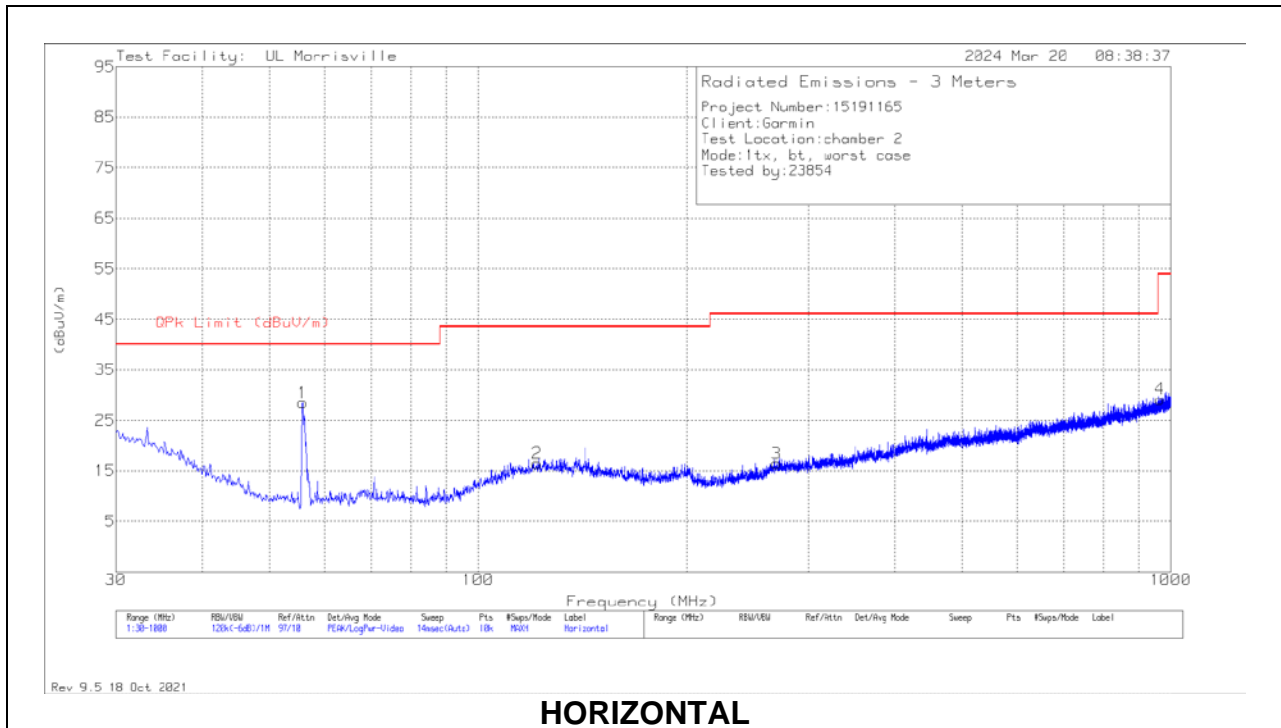


ANTENNA- THREE ORIENTATIONS (H-FIELD)

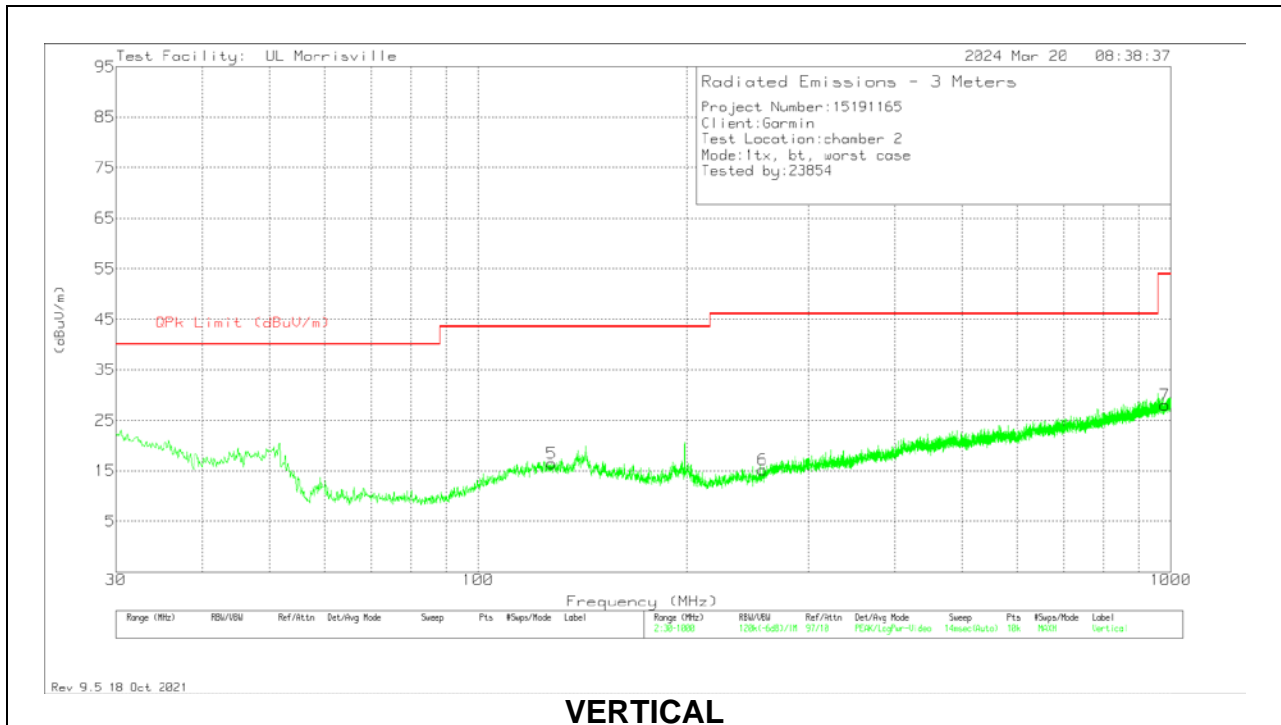
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	135144 (dBuV/m)	Gain/Loss (dB)	Dist. Corr. Factor (dB)	Corrected Reading dB(uAmps/meter)	Limit (dBuA/m)	Margin (dB)	Azimuth (Degs)	Loop Angle
7	5.67146	26.87	Pk	-40.3	.4	-40	-53.03	-21.96	-31.07	0-360	Flat
1	5.76843	27.59	Pk	-40.3	.4	-40	-52.31	-21.96	-30.35	0-360	0 degs
4	5.77686	24.67	Pk	-40.3	.4	-40	-55.23	-21.96	-33.27	0-360	90 degs
2	13.5596	29.2	Pk	-40.8	.6	-40	-51	-21.96	-29.04	0-360	0 degs
5	13.5596	26.33	Pk	-40.8	.6	-40	-53.87	-21.96	-31.91	0-360	90 degs
8	13.5596	25.62	Pk	-40.8	.6	-40	-54.58	-21.96	-32.62	0-360	Flat
6	14.60938	26.08	Pk	-40.8	.7	-40	-54.02	-21.96	-32.06	0-360	90 degs
9	14.66841	25.48	Pk	-40.8	.7	-40	-54.62	-21.96	-32.66	0-360	Flat
3	14.74851	26.74	Pk	-40.8	.7	-40	-53.36	-21.96	-31.4	0-360	0 degs

Pk - Peak detector

10.1. WORST CASE SPURIOUS 30-1000MHZ



HORIZONTAL



VERTICAL

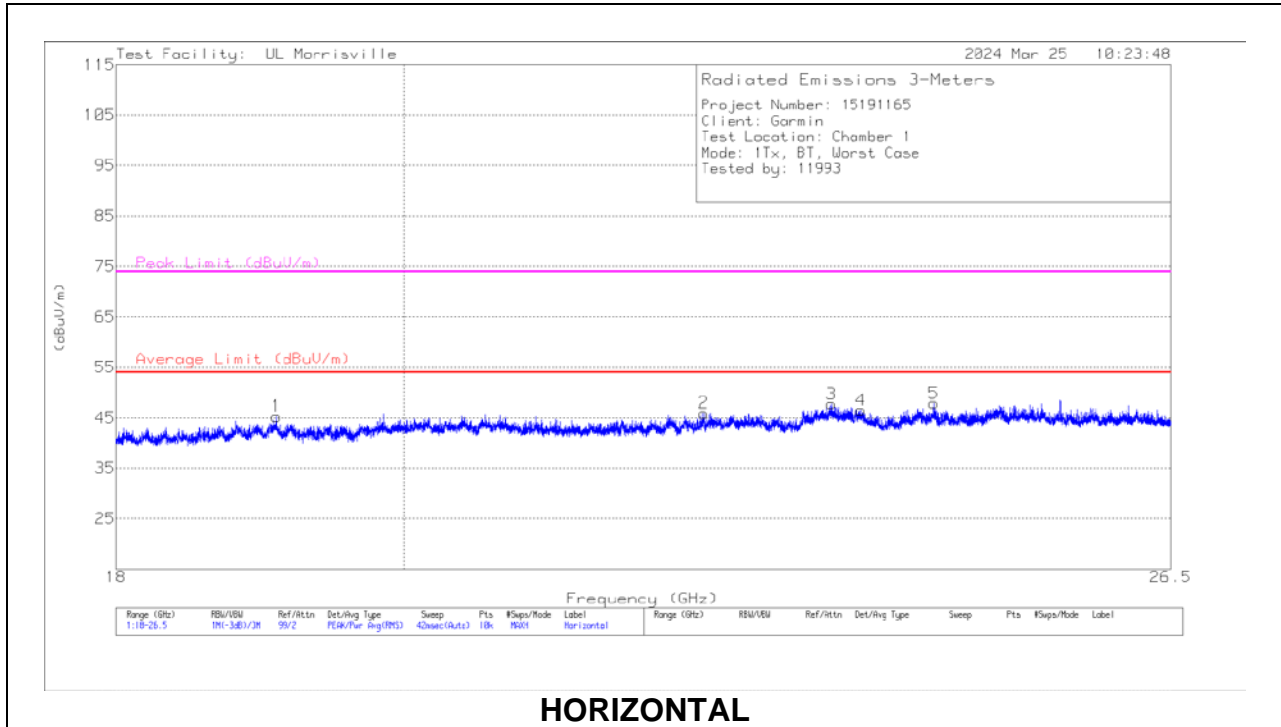
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	159203 (dB/m)	Gain/Loss (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
2	* ** 121.665	27.1	Pk	20.2	-30.8	16.5	43.52	-27.02	0-360	99	H
3	* ** 269.59	26.49	Pk	19.7	-29.7	16.49	46.02	-29.53	0-360	99	H
4	* ** 964.692	24.97	Pk	29.6	-25.4	29.17	53.97	-24.8	0-360	399	H
5	* ** 127.582	26.7	Pk	20.3	-30.6	16.4	43.52	-27.12	0-360	299	V
6	* ** 257.465	26.65	Pk	18.3	-29.8	15.15	46.02	-30.87	0-360	299	V
7	* ** 981.085	23.19	Pk	29.8	-25	27.99	53.97	-25.98	0-360	199	V
1	55.802	46.14	Pk	13.7	-31.4	28.44	40	-11.56	0-360	99	H

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

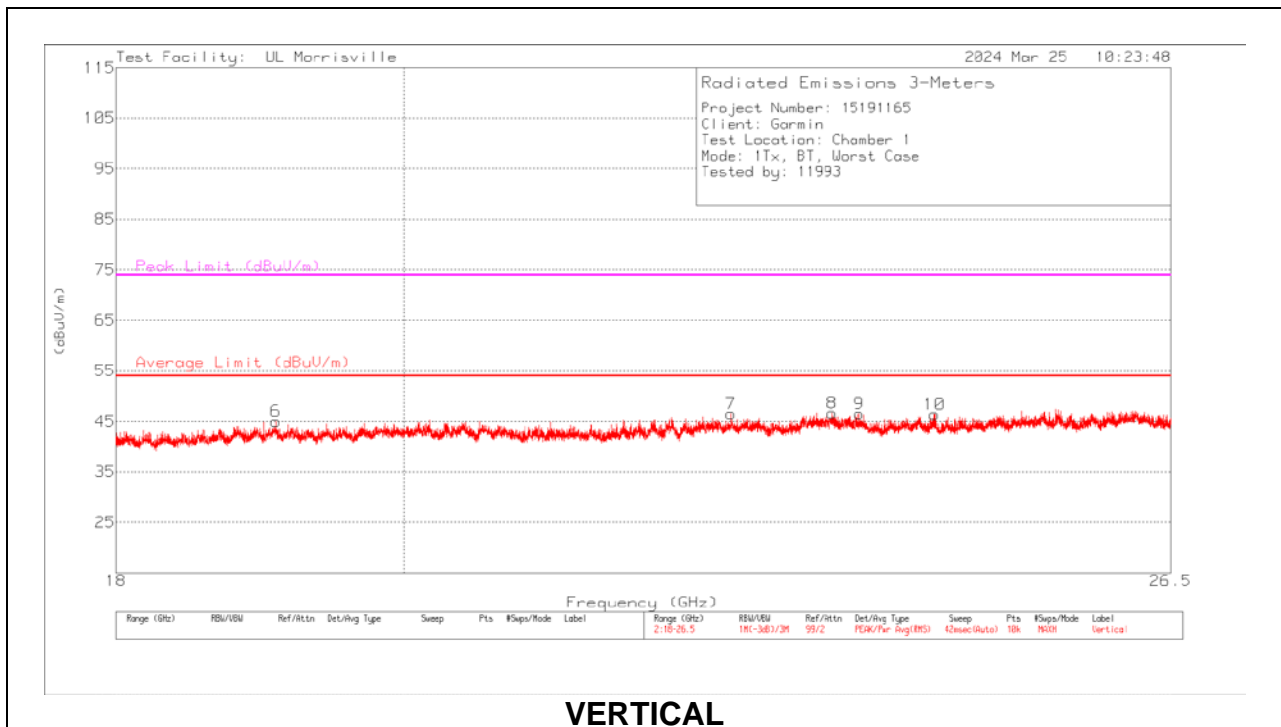
** - indicates frequency in Taiwan NCC LP0002 Restricted Band

Pk - Peak detector

10.2. WORST CASE SPURIOUS 18-26GHz



HORIZONTAL



VERTICAL

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	* ** 19.08874	49.62	Pk	33.7	-38	45.32	54	-8.68	74	-28.68	0-360	249	H
2	* ** 22.33202	49.74	Pk	34.2	-38	45.94	54	-8.06	74	-28.06	0-360	249	H
4	* ** 23.65448	49.29	Pk	34.5	-37.3	46.49	54	-7.51	74	-27.51	0-360	150	H
6	* ** 19.08534	49.19	Pk	33.7	-37.9	44.99	54	-9.01	74	-29.01	0-360	299	V
7	* ** 22.55044	50.13	Pk	34.3	-37.9	46.53	54	-7.47	74	-27.47	0-360	299	V
9	* ** 23.63919	49.37	Pk	34.6	-37.5	46.47	54	-7.53	74	-27.53	0-360	299	V
3	23.40376	50.45	Pk	34.6	-37.3	47.75	-	-	-	-	0-360	101	H
8	23.40886	49.39	Pk	34.6	-37.4	46.59	-	-	-	-	0-360	250	V
5	24.29447	50.28	Pk	34.5	-36.9	47.88	-	-	-	-	0-360	101	H
10	24.29787	48.82	Pk	34.5	-36.9	46.42	-	-	-	-	0-360	299	V

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

** - indicates frequency in Taiwan NCC LP0002 Restricted Band

Pk - Peak detector

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

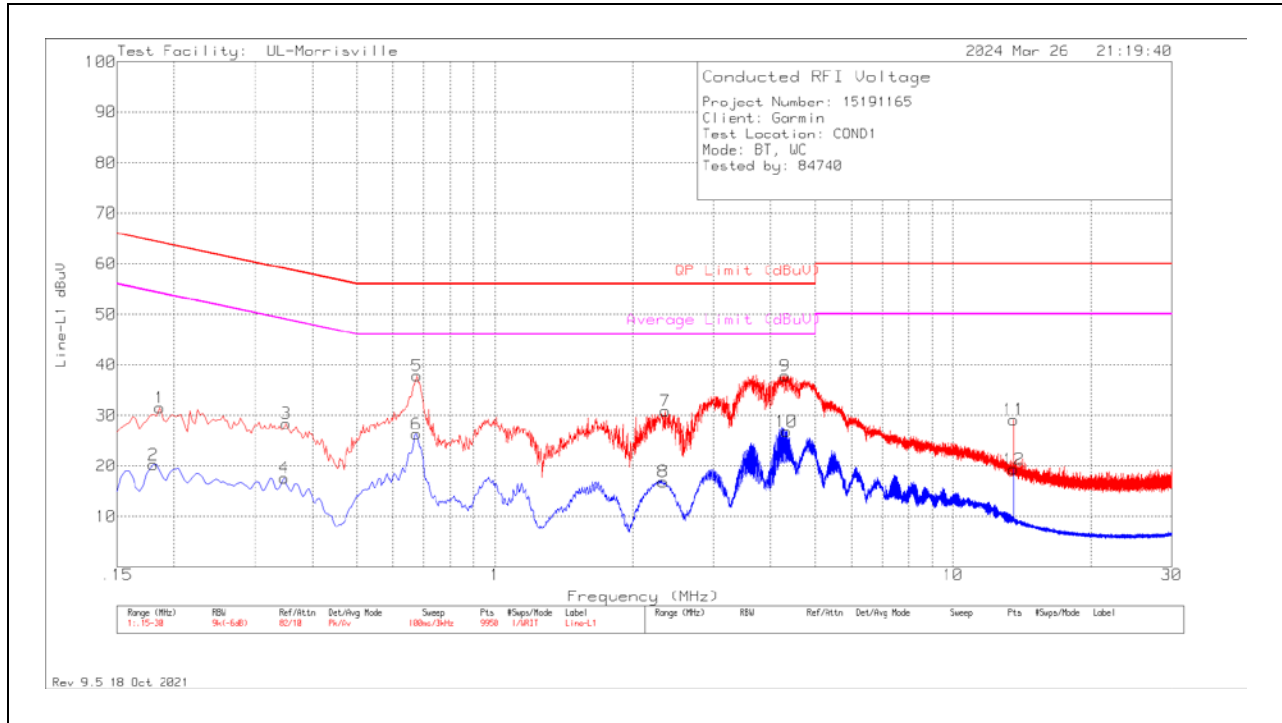
The EUT is placed on a non-conducting table 40 cm from the vertical ground plane and 80 cm above the horizontal ground plane. The EUT is configured in accordance with ANSI C63.10.

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

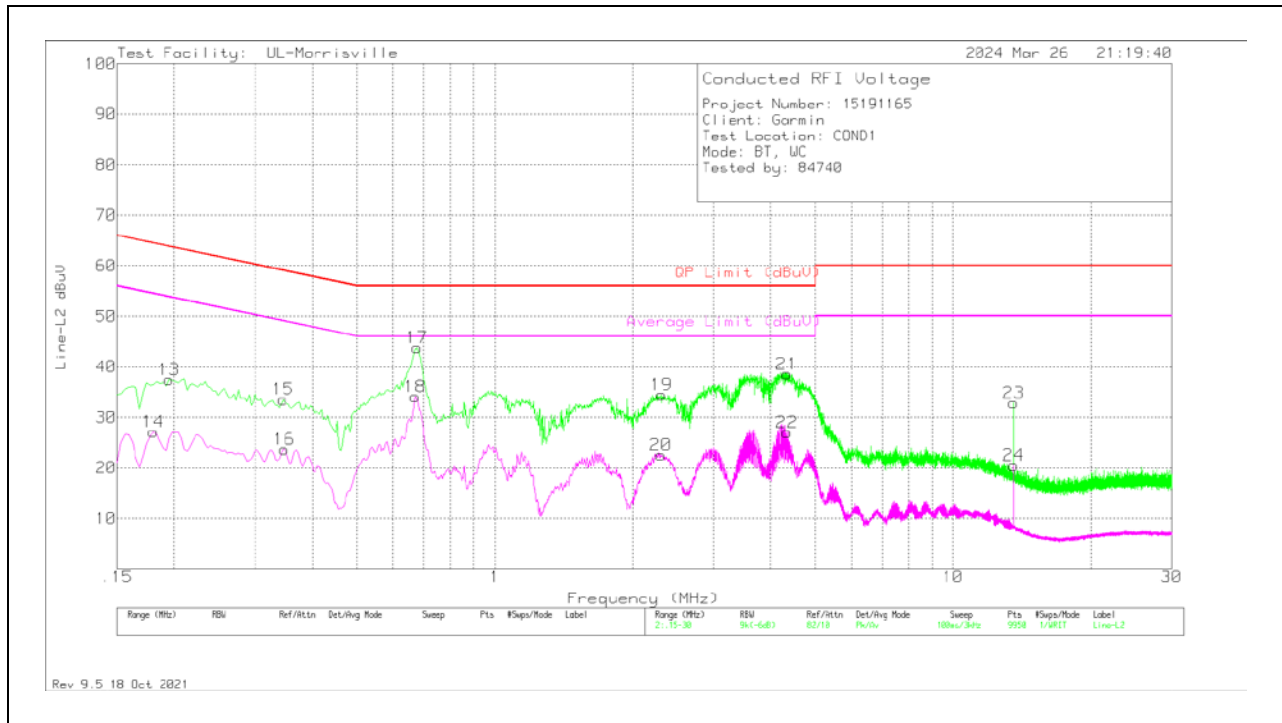
LINE 1 RESULTS



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	.186	21.53	Pk	.2	9.8	31.53	64.21	-32.68	-	-
2	.18	10.06	Av	.3	9.8	20.16	-	-	54.49	-34.33
3	.351	18.47	Pk	.1	9.8	28.37	58.94	-30.57	-	-
4	.348	7.68	Av	.1	9.8	17.58	-	-	49.01	-31.43
5	.678	27.94	Pk	.1	9.8	37.84	56	-18.16	-	-
6	.675	16.38	Av	.1	9.8	26.28	-	-	46	-19.72
7	2.355	20.97	Pk	.1	9.8	30.87	56	-25.13	-	-
8	2.331	6.95	Av	.1	9.8	16.85	-	-	46	-29.15
9	4.299	27.88	Pk	.1	9.9	37.88	56	-18.12	-	-
10	4.323	16.83	Av	.1	9.9	26.83	-	-	46	-19.17
11	13.56	18.93	Pk	.2	10	29.13	60	-30.87	-	-
12	13.56	9.17	Av	.2	10	19.37	-	-	50	-30.63

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	.195	27.42	Pk	.2	9.8	37.42	63.82	-26.4	-	-
14	.18	17.1	Av	.3	9.8	27.2	-	-	54.49	-27.29
15	.345	23.65	Pk	.1	9.8	33.55	59.08	-25.53	-	-
16	.348	13.82	Av	.1	9.8	23.72	-	-	49.01	-25.29
17	.678	33.85	Pk	.1	9.8	43.75	56	-12.25	-	-
18	.672	24.23	Av	.1	9.8	34.13	-	-	46	-11.87
19	2.313	24.53	Pk	.1	9.8	34.43	56	-21.57	-	-
20	2.307	12.62	Av	.1	9.8	22.52	-	-	46	-23.48
21	4.3425	28.53	Pk	.1	9.9	38.53	56	-17.47	-	-
22	4.341	16.99	Av	.1	9.9	26.99	-	-	46	-19.01
23	13.563	22.66	Pk	.2	10	32.86	60	-27.14	-	-
24	13.56	10.31	Av	.2	10	20.51	-	-	50	-29.49

Pk - Peak detector
 Av - Average detection

12. SETUP PHOTOS

Please refer to R14896020-EP1 for setup photos

END OF TEST REPORT