



TEST REPORT

Report Number.: 13619076-E2V2

Applicant : DISH TECHNOLOGIES LLC
90 INVERNESS CIRCLE EAST
ENGLEWOOD, CO 80112, UNITED STATES

Model : D45

Brand : DISH

FCC ID : DKNRW33

EUT Description : TV SET TOP BOX

Test Standard(s) : FCC 47 CFR PART 15 SUBPART C

Date of Issue:
May 17, 2021

Prepared by:
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REPORT REVISION HISTORY

Rev.	Issue Date	Revisions	Revised By
V1	3/29/2021	Initial Issue	--
V2	5/17/2021	Switched above 1G front and back photos to address TCB's questions	Tina Chu

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: DISH TECHNOLOGIES LLC
90 INVERNESS CIRCLE EAST
ENGLEWOOD, CO 80112, UNITED STATES

EUT DESCRIPTION: TV SET TOP BOX

MODEL: D45

BRAND: DISH

SERIAL NUMBER: CONDUCTED: E4EXUH00011A
RADIATED: E4EUH00004A

SAMPLE RECEIPT DATE: FEBRUARY 12, 2021

DATE TESTED: FEBRUARY 15 – MARCH 19, 2021

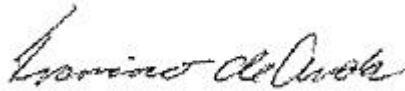
APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
CFR 47 Part 15 Subpart C	Complies

UL Verification Services Inc. 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 Verification Services Inc. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Verification Services Inc. will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of the U.S. government.

Approved & Released For
UL Verification Services Inc. By:



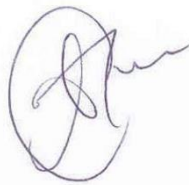
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2. TEST RESULTS SUMMARY

This report contains data provided by the customer which can impact the validity of results. UL Verification Services Inc. is only responsible for the validity of results after the integration of the data provided by the customer.

FCC Clause	Requirement	Result	Comment
See Comment	Duty Cycle	Reporting purposes only	Per ANSI C63.10, Section 11.6.
See Comment	20dB BW/99% OBW	Reporting purposes only	Per ANSI C63.10 Sections 6.9.2 and 6.9.3
15.247 (a)(1)	Hopping Frequency Separation	Complies	None.
15.247 (a)(1)(iii)	Number of Hopping Channels	Complies	None.
15.247 (a)(1)(iii)	Average Time of Occupancy	Complies	None.
15.247 (b)(1)	Output Power	Complies	None.
See Comment	Average Power	Reporting purposes only	Per ANSI C63.10, Section 11.9.2.3.2.
15.247 (d)	Conducted Spurious Emissions	Complies	None.
15.209, 15.205	Radiated Emissions	Complies	None.
15.207	AC Mains Conducted Emissions	Complies	None.

3. TEST METHODOLOGY

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

4. FACILITIES AND ACCREDITATION

UL Verification Services Inc. is accredited by NVLAP, Laboratory Code 200065-0, 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 1: 47173 Benicia Street, Fremont, CA 94538	US0104	2324A	208313
<input type="checkbox"/>	Building 2: 47266 Benicia Street, Fremont, CA 94538	US0104	22541	208313
<input checked="" type="checkbox"/>	Building 4: 47658 Kato Rd, Fremont, CA 94538	US0104	2324B	208313

5. DECISION RULES AND MEASUREMENT UNCERTAINTY

5.1. METROLOGICAL TRACEABILITY

All test and measuring equipment utilized to perform the tests documented in this report are calibrated on a regular basis, with a maximum time between calibrations of one year or the manufacturers' recommendation, whichever is less, and where applicable is traceable to recognized national standards.

5.2. DECISION RULES

The Decision Rule is based on Simple Acceptance in accordance with ISO Guide 98-4:2012 Clause 8.2. (Measurement uncertainty is not taken into account when stating conformity with a specified requirement.)

5.3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

PARAMETER	U _{Lab}
Worst Case Conducted Disturbance, 9KHz to 0.15 MHz	3.78 dB
Worst Case Conducted Disturbance, 0.15 to 30 MHz	3.40 dB
Worst Case Radiated Disturbance, 9KHz to 30 MHz	2.84 dB
Worst Case Radiated Disturbance, 30 to 1000 MHz	6.01 dB
Worst Case Radiated Disturbance, 1000 to 18000 MHz	4.73 dB
Worst Case Radiated Disturbance, 18000 to 26000 MHz	4.51 dB
Worst Case Radiated Disturbance, 26000 to 40000 MHz	5.29 dB

Uncertainty figures are valid to a confidence level of 95%.

5.4. SAMPLE CALCULATION

RADIATED EMISSIONS

Where relevant, the following sample calculation is provided:

Field Strength (dBuV/m) = Measured Voltage (dBuV) + Antenna Factor (dB/m) + Cable Loss (dB) – Preamp Gain (dB)
 $36.5 \text{ dBuV} + 18.7 \text{ dB/m} + 0.6 \text{ dB} - 26.9 \text{ dB} = 28.9 \text{ dBuV/m}$

MAINS CONDUCTED EMISSIONS

Where relevant, the following sample calculation is provided:

Final Voltage (dBuV) = Measured Voltage (dBuV) + Cable Loss (dB) + Limiter Factor (dB) + LISN Insertion Loss.
 $36.5 \text{ dBuV} + 0 \text{ dB} + 10.1 \text{ dB} + 0 \text{ dB} = 46.6 \text{ dBuV}$

6. EQUIPMENT UNDER TEST

6.1. EUT DESCRIPTION

The EUT is a TV Set Top Box with RF4CE Zigbee, BLE (2Mbps), BT and 5GHz 802.11a/n/ac/ax radios.

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	9.70	9.33
	Enhanced DQPSK	8.79	7.57
	Enhanced 8PSK	8.94	7.83

Note: GFSK, DQPSK, 8PSK average Power are all investigated, The GFSK & 8PSK Power are the worst case. Testing is based on these modes to show compliance.

6.3. DESCRIPTION OF AVAILABLE ANTENNAS

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

The radio utilizes a PCB Inverted F antenna, with a maximum gain of 4.2 dBi.

6.4. SOFTWARE AND FIRMWARE

The EUT firmware installed during testing was BCM 02.011.0330.0000.

The test utility software used during testing was cybluetool 0.1.55.1.

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 EUT is a desktop device, therefore, all final radiated testing was performed with the EUT in X orientation.

This EUT supports BLE/BT + Zigbee + WLAN 5GHz simultaneous transmission, radiated emission test was performed, please refer to 13619076-E4 for result.

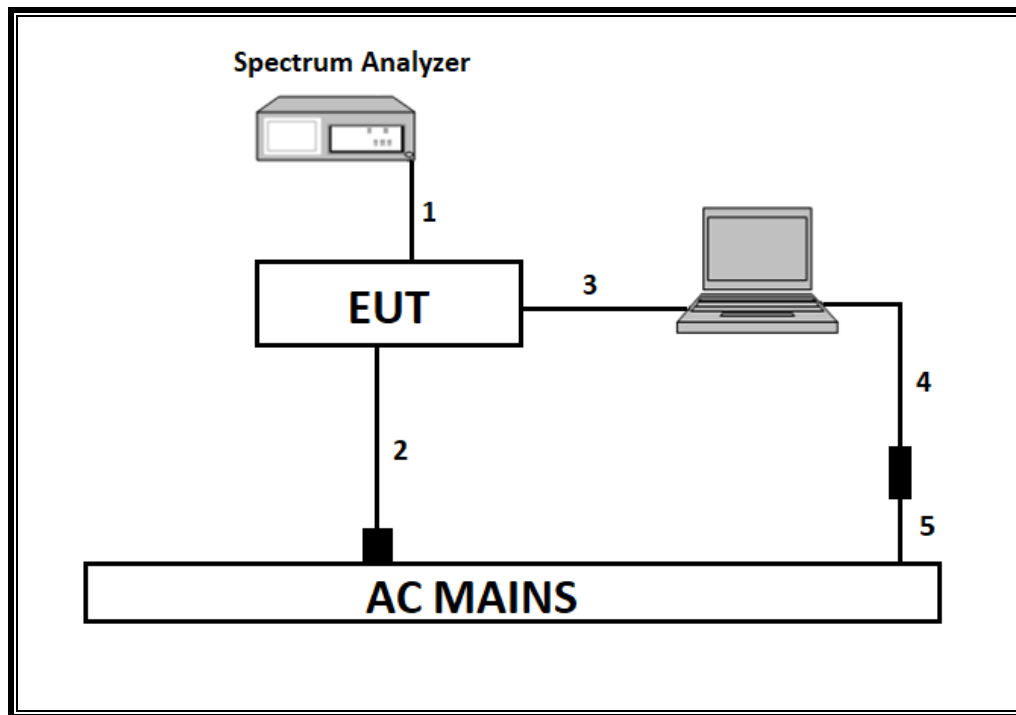
Worst-case data rates as provided by the client were:

GFSK mode: DH5
8PSK mode: 3-DH5

6.6. DESCRIPTION OF TEST SETUP

SUPPORT TEST EQUIPMENT						
Description		Manufacturer	Model	Serial Number		FCC ID/ DoC
AC/DC Adapter (EUT)		NetBit	NBC25A120210VU	-		Doc
Router		D-Link	EBR-2310	F311388010596		Doc
AC/DC Adapter (Router)		D-Link	AF0605-B	-		Doc
Laptop		HP	EliteBook 740	-		DoC
AC/DC Adapter (Laptop)		HP	HSTNN-DA40	-		DoC
USB to UART cable		-	-	-		DoC
Monitor		SCEPTRE	E248W-1920R	J07F248CCD8002		Doc
AC/DC Adapter (Monitor)		BSY	BSYF120250U W	-		Doc
USB Flash Drive		SanDisk	SDCZ60-016G	-		Doc
I/O CABLES (CONDUCTED TEST)						
Cable No.	Port	# of Identical Ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	Antenna	1	RF	Un-shielded	0.2	To spectrum analyzer
2	AC	1	Two Prong	Un-shielded	1	EUT to AC Mains
3	UART	1	USB	Shielded	1.5	EUT to Laptop
4	DC	1	DC	Un-shielded	1	AC Adapter to Laptop
5	AC	1	Two Prong	Un-shielded	1	AC Adapter to AC Mains
I/O CABLES (RADIATED TEST AND AC POWER LINE CONDUCTED TEST)						
Cable No.	Port	# of Identical Ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	AC	1	Two Prong	Un-shielded	1	EUT to AC Mains
2	HDMI	1	HDMI	Un-shielded	2	EUT to Monitor
3	AC	1	Two Prong	Un-shielded	2.5	Monitor to AC Mains
4	RJ45	1	RJ45	Un-shielded	More than 3	EUT to Router
5	AC	1	Two Prong	Un-shielded	2	Router to AC Mains

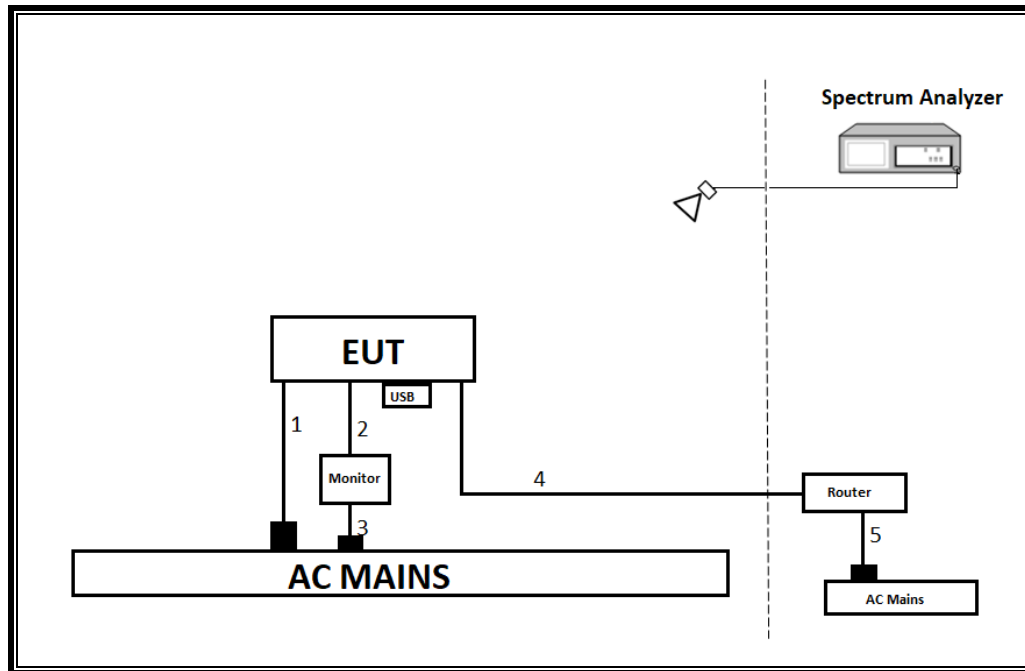
CONDUCTED TEST SETUP DIAGRAM



TEST SETUP

The EUT is connected to a test laptop by USB to UART cable adapter during the tests. Test software exercised the radio card.

RADIATED TEST AND AC POWER LINE CONDUCTED TEST SETUP DIAGRAM



TEST SETUP

The EUT is connected to support equipment and AC powered. Test software exercised the radio card.

7. MEASUREMENT METHODS

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

Occupied BW (20dB): ANSI C63.10-2013 Section 6.9.2

Occupied BW (99%): ANSI C63.10-2013 Section 6.9.3

Carrier Frequency Separation: ANSI C63.10-2013 Section 7.8.2

Number of Hopping Frequencies: ANSI C63.10-2013 Section 7.8.3

Time of Occupancy (Dwell Time): ANSI C63.10-2013 Section 7.8.4

Peak Output Power: ANSI C63.10-2013 Section 7.8.5

Conducted Spurious Emissions: ANSI C63.10-2013 Section 7.8.8

Conducted Band-Edge: ANSI C63.10-2013 Section 6.10.4

Radiated Spurious Emissions Below 30MHz: ANSI C63.10-2013 Section 6.4

Radiated Spurious Emissions 30-1000MHz: ANSI C63.10-2013 Section 6.3 and 6.5

Radiated Spurious Emissions above 1GHz: ANSI C63.10-2013 Section 6.3 and 6.6

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

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

8. TEST AND MEASUREMENT EQUIPMENT

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

TEST EQUIPMENT LIST					
Description	Manufacturer	Model	ID Num	Cal Due	Last Cal
Antenna, Horn 1-18GHz	ETS-Lindgren	3117	PRE0100034	9/15/2021	9/15/2020
Amplifier, 1 to 18GHz, 35dB	AMPLICAL	AMP1G18-35	T1571	8/20/2021	8/20/2020
EMI TEST RECEIVER	Rohde & Schwarz	ESW44	PRE0179522	2/21/2022	2/21/2021
Antenna, Broadband Hybrid, 30MHz to 3GHz	Sunol Sciences Corp.	JB3	T477	9/24/2021	9/24/2020
Amplifier, 10KHz to 1GHz, 32dB	SONOMA INSTRUMENT	310	175953	1/21/2022	1/21/2021
Antenna, Horn 1-18GHz	ETS-Lindgren	3117	T863	8/31/2021	8/31/2020
Amplifier, 100MHz-18GHz	AMPLICAL	AMP0.1G18-47-20	PRE0197319	5/4/2021	5/4/2020
EMI TEST RECEIVER	Rohde & Schwarz	ESW44	PRE0179376	2/21/2022	2/21/2021
Antenna, Passive Loop 30Hz - 1MHz	ELECTRO METRICS	EM-6871	PRE0179466	5/27/2021	5/27/2020
Antenna, Passive Loop 100KHz - 30MHz	ELECTRO METRICS	EM-6872	PRE0179468	5/27/2021	5/27/2020
Antenna, Horn 18 to 26.5GHz	ARA	MWH-1826/B	T447	9/24/2021	9/24/2020
Rf Amplifier, 18-26.5GHz, 60dB gain	AMPLICAL	AMP18G26.5-60	PRE0181238	6/7/2021	6/7/2020
Spectrum Analyzer, PXA, 3Hz to 44GHz	Keysight Technologies Inc	N9030A	T342	1/25/2022	1/25/2021
Power Sensor, P - series, 50MHz to 18GHz, Wideband	Keysight Technologies Inc	N1921A	T143	*2/26/2021	2/26/2020
Power Meter, P-series single channel	Keysight Technologies Inc	N1911A	T1269	1/25/2022	1/25/2021
AC Line Conducted					
Description	Manufacturer	Model	ID Num	Cal Due	Last Cal
LISN	Fischer Custom Communications, Inc	FCC-LISN-50/250-25-2-01-480V	PRE0186446	1/20/2022	1/20/2021
LISN	Fischer Custom Communications, Inc	FCC-LISN-50/250-25-2	T24	1/20/2022	1/20/2021
EMI TEST RECEIVER	Rohde & Schwarz	ESR	T1436	2/19/2022	2/19/2021
Transient Limiter	COM-POWER	LIT-930A	T1457	1/20/2022	1/20/2021
Test Software List					
Description	Manufacturer	Model	Version		
Radiated Software	UL	UL EMC	Rev 9.5, April 30, 2020, , Oct 21, 2019		
Antenna Port Software	UL	UL RF	AP 2021.2.4		
AC Line Conducted Software	UL	UL EMC	Rev 9.5, July 07, 2020		

*Test performed within calibration period.

9. ANTENNA PORT TEST RESULTS

9.1. ON TIME AND DUTY CYCLE

LIMITS

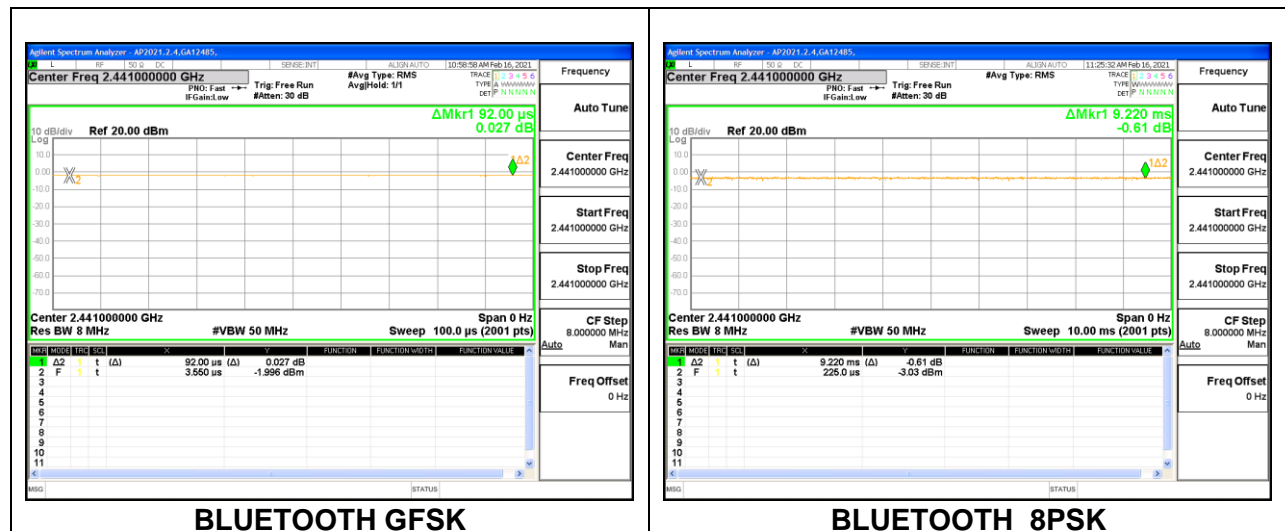
None; for reporting purposes only.

PROCEDURE

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

ON TIME AND DUTY CYCLE RESULTS

Mode	ON Time B (msec)	Period (msec)	Duty Cycle x (linear)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)	1/T Minimum VBW (kHz)
Bluetooth GFSK	0.09	0.09	1.000	100	0.00	0.010
Bluetooth 8PSK	9.22	9.22	1.000	100	0.00	0.010



9.2. 20 dB AND 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

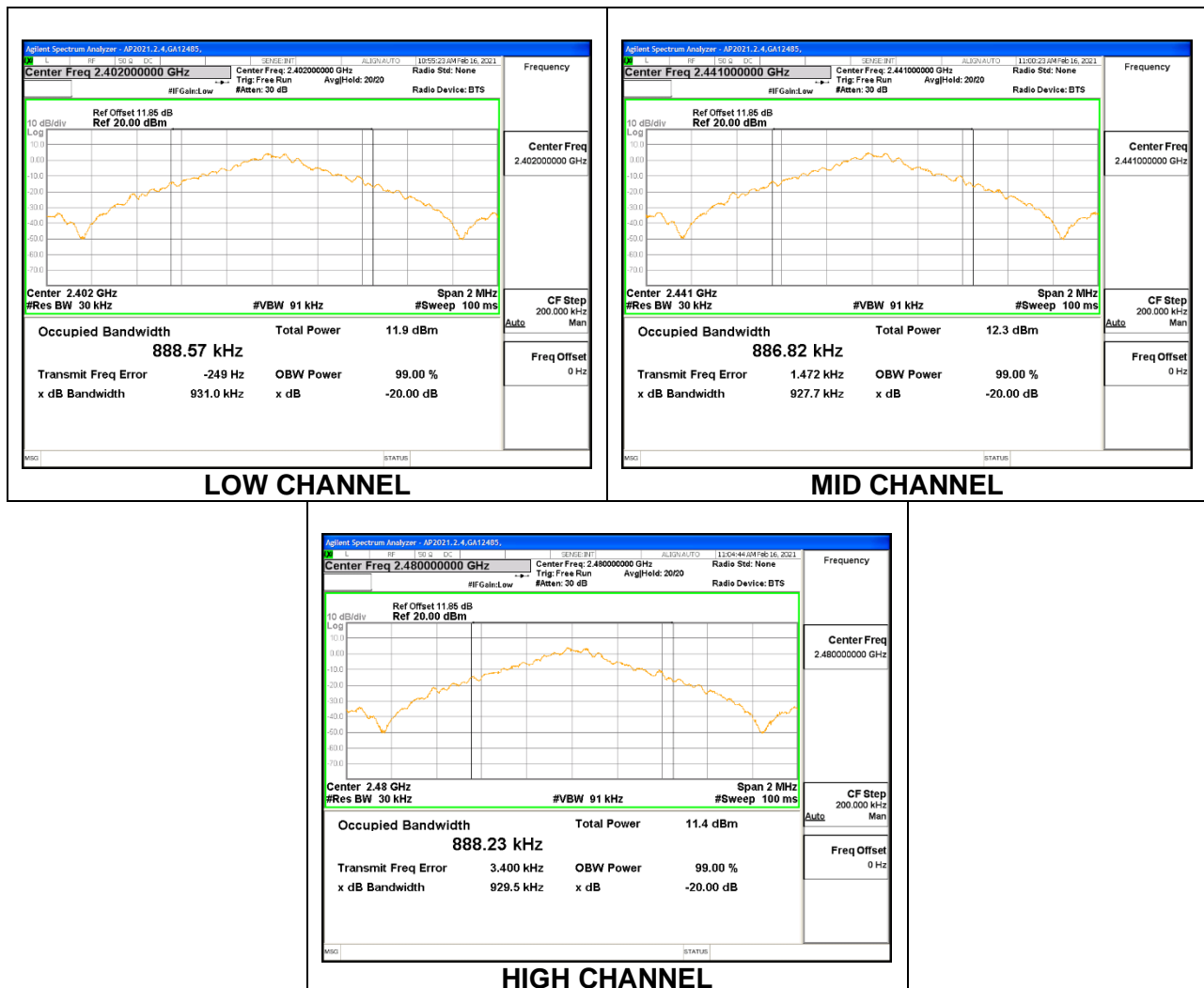
TEST PROCEDURE

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

RESULTS

9.2.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION

Channel	Frequency (MHz)	20dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	2402	0.9310	0.88857
Mid	2441	0.9277	0.88682
High	2480	0.9295	0.88823



9.2.2. BLUETOOTH ENHANCED DATA RATE 8PSK MODULATION

Channel	Frequency (MHz)	20dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	2402	1.389	1.2313
Mid	2441	1.383	1.2298
High	2480	1.385	1.2306



9.3. HOPPING FREQUENCY SEPARATION

LIMITS

FCC §15.247 (a) (1)

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.

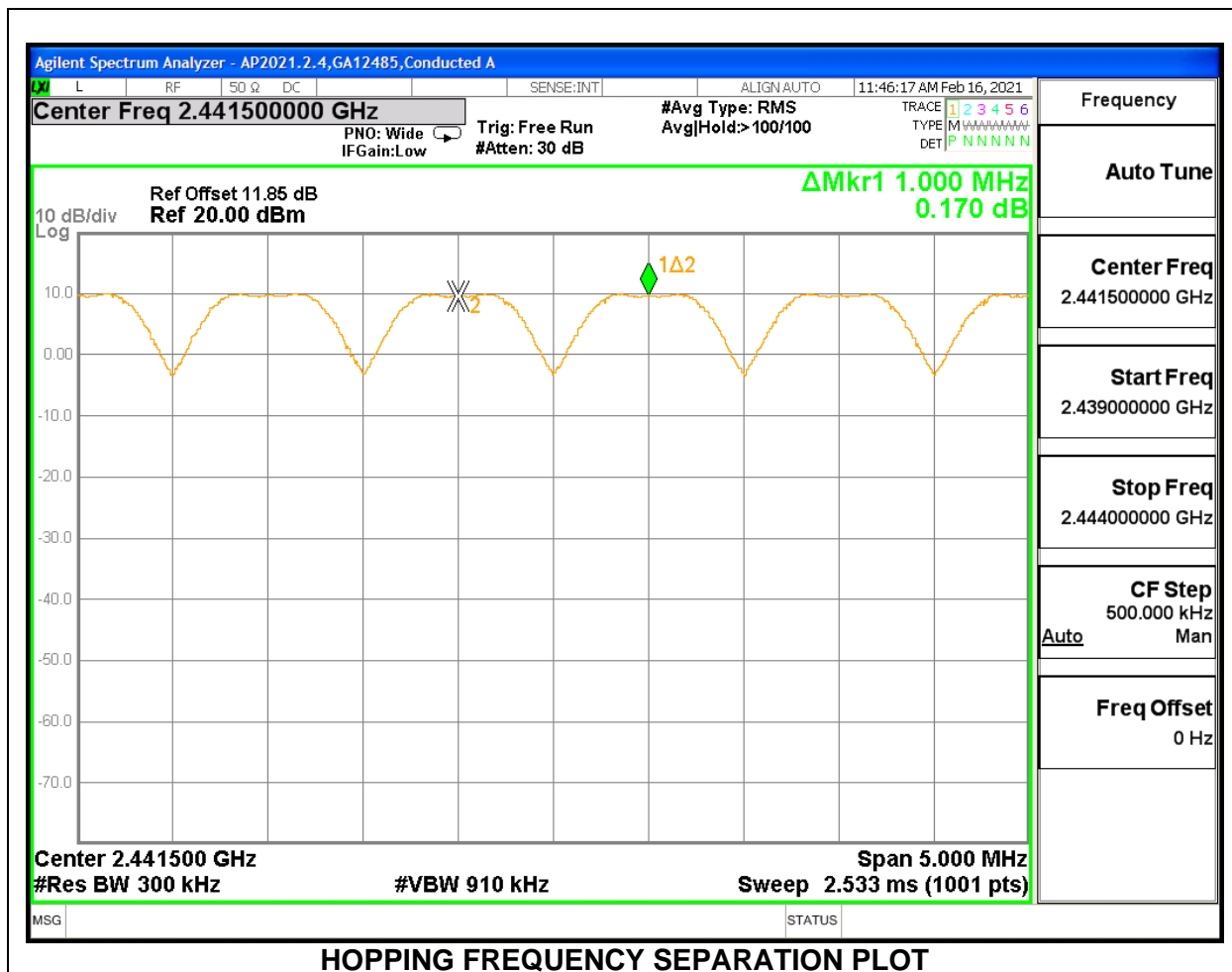
Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than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

TEST PROCEDURE

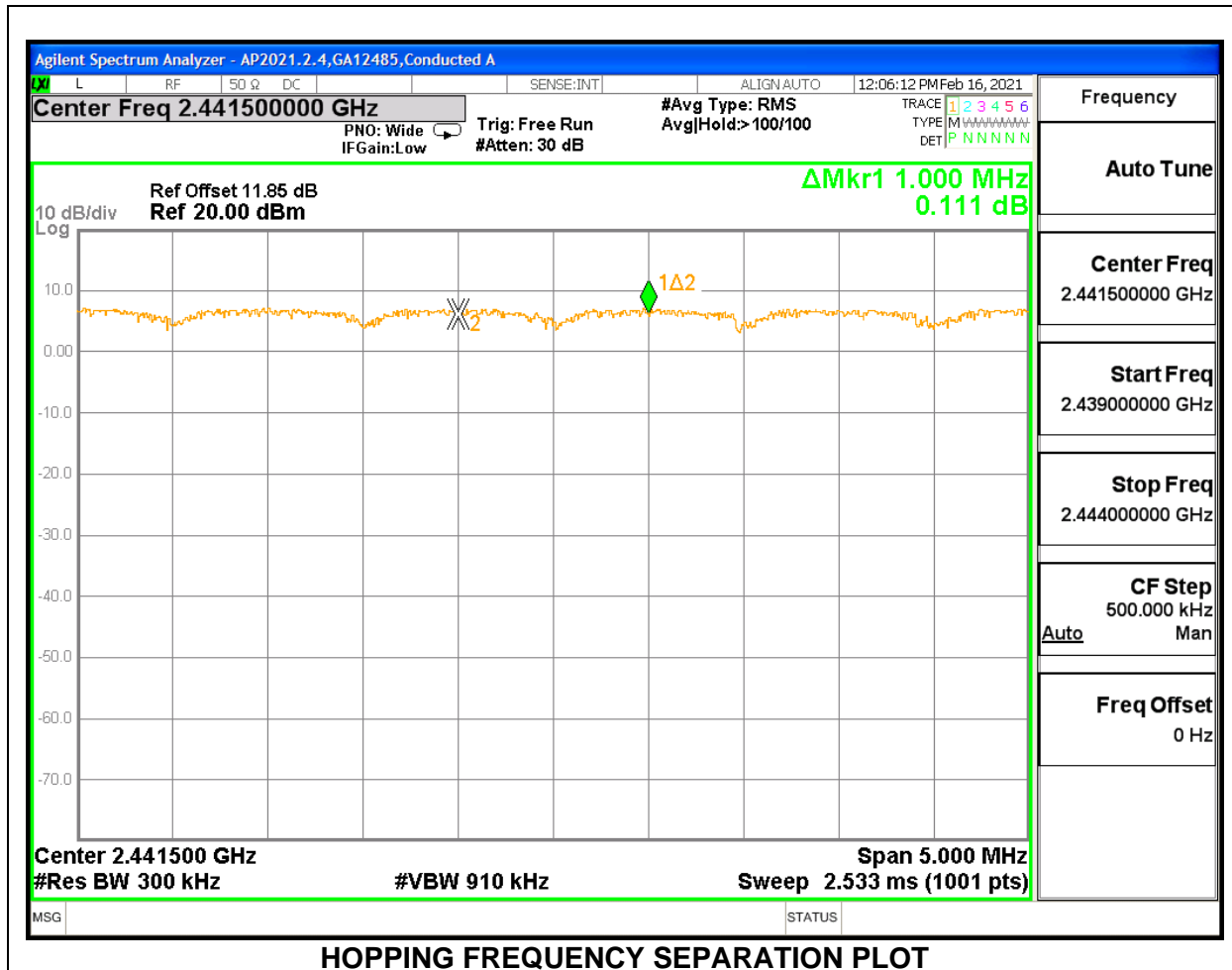
The transmitter output is connected to a spectrum analyzer. The RBW is set to 300 kHz and the VBW is set to $VBW \geq RBW$. The sweep time is coupled.

RESULTS

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)

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

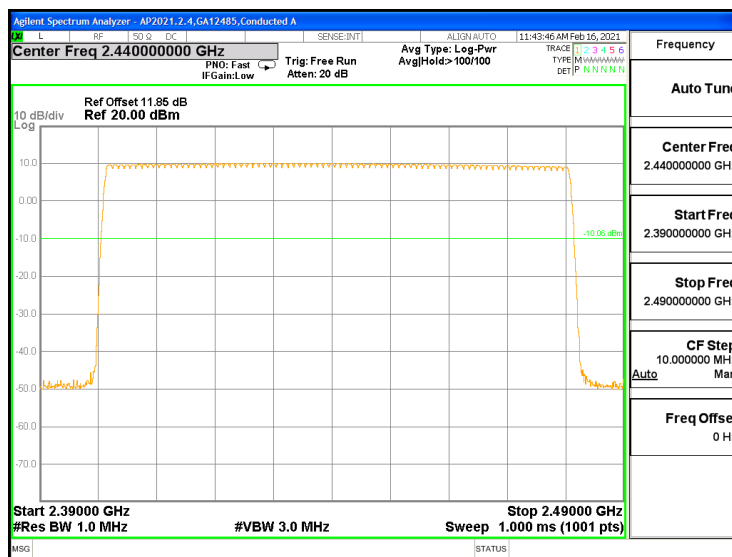
TEST PROCEDURE

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

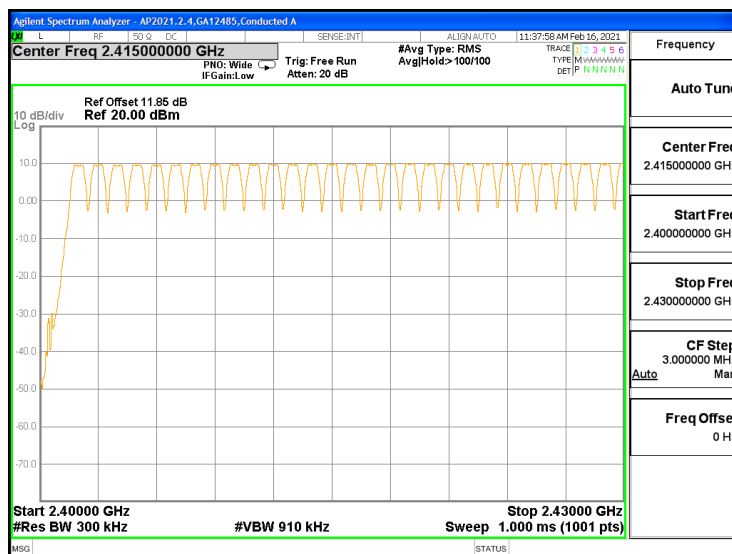
RESULTS

Normal Mode: 79 Channels Observed

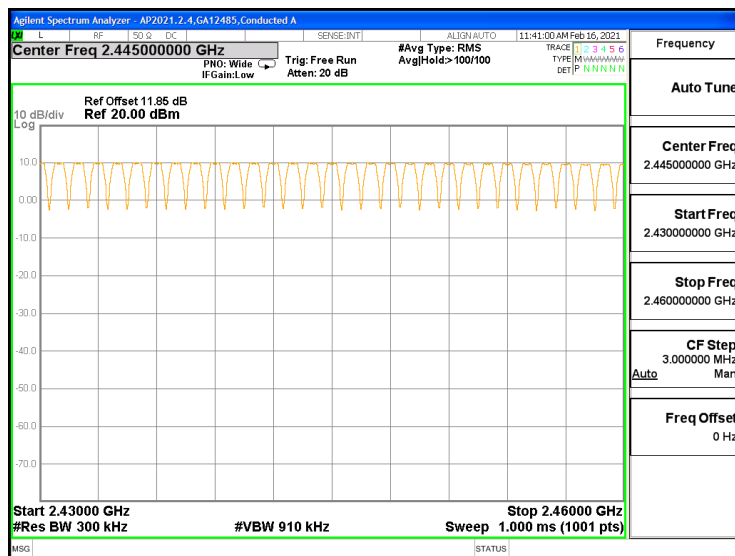
9.4.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION



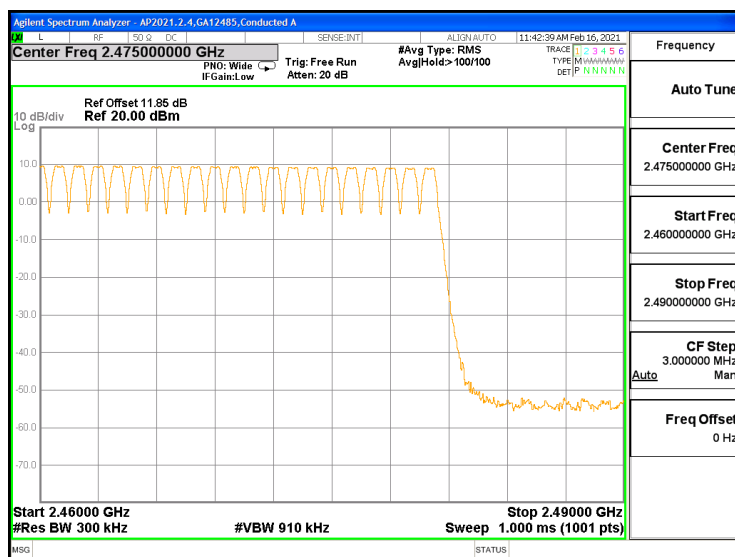
100MHz SPAN



30MHz SPAN, SEGMENT 1 OF 3

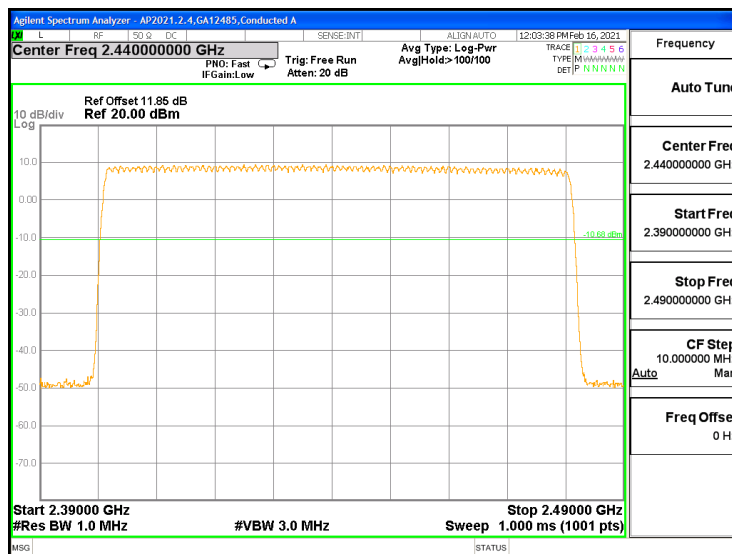


30MHz SPAN, SEGMENT 2 OF 3

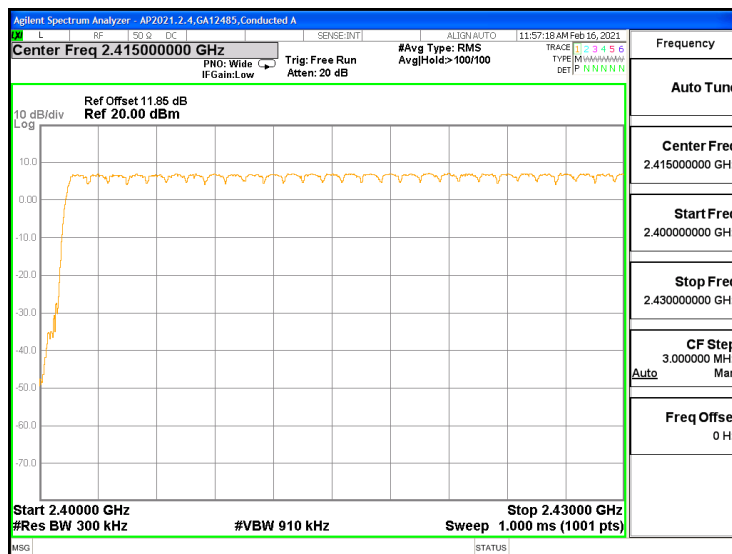


30MHz SPAN, SEGMENT 3 OF 3

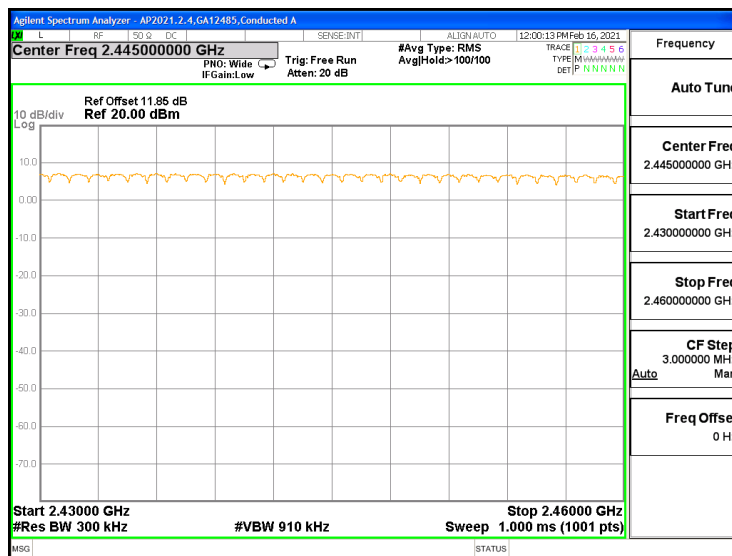
9.4.2. BLUETOOTH ENHANCED DATA RATE 8PSK MODULATION



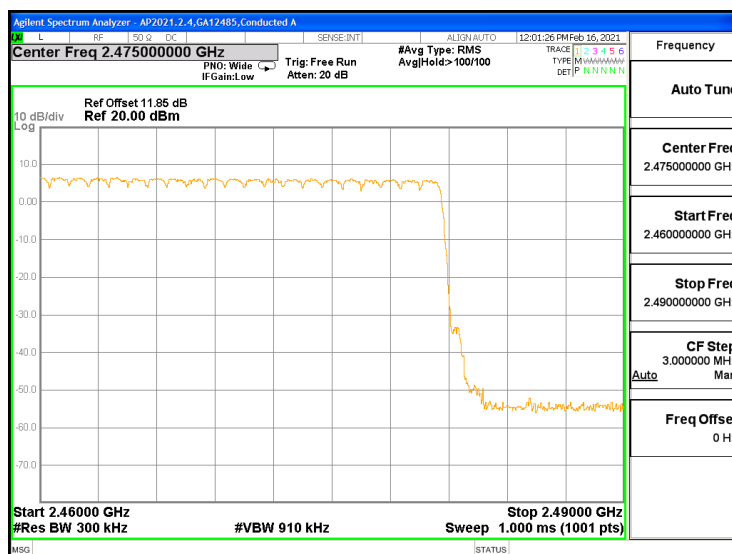
100MHz SPAN



30MHz SPAN, SEGMENT 1 OF 3



30MHZ SPAN, SEGMENT 2 OF 3



30MHZ SPAN, SEGMENT 3 OF 3

9.5. AVERAGE TIME OF OCCUPANCY

LIMITS

FCC §15.247 (a) (1) (iii)

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

TEST PROCEDURE

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

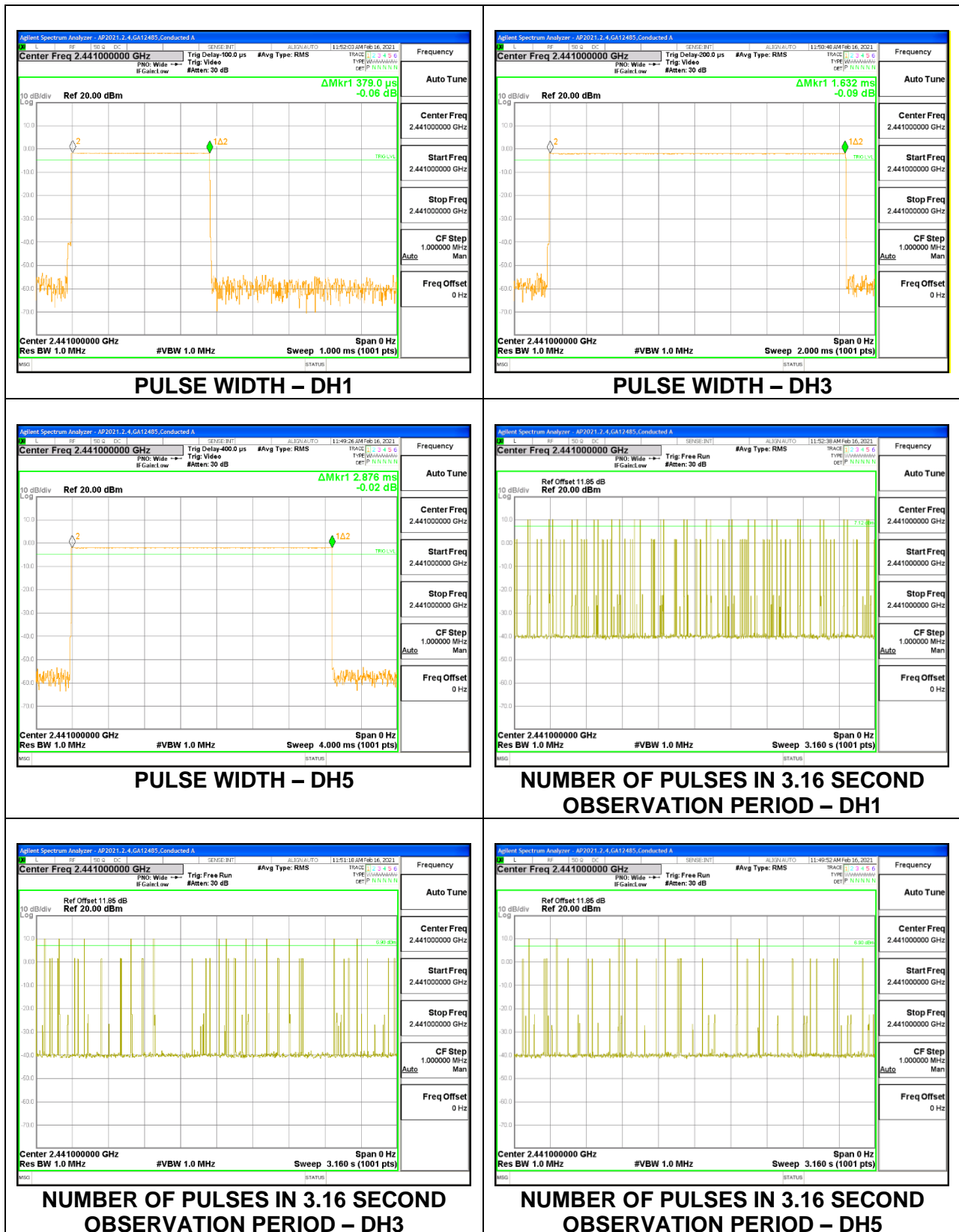
The average time of occupancy in the specified 3.16 second period (79 channels * 0.4 s) is equal to $10 * (\# \text{ of pulses in } 3.16 \text{ s}) * \text{pulse width}$.

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

RESULTS

9.5.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION

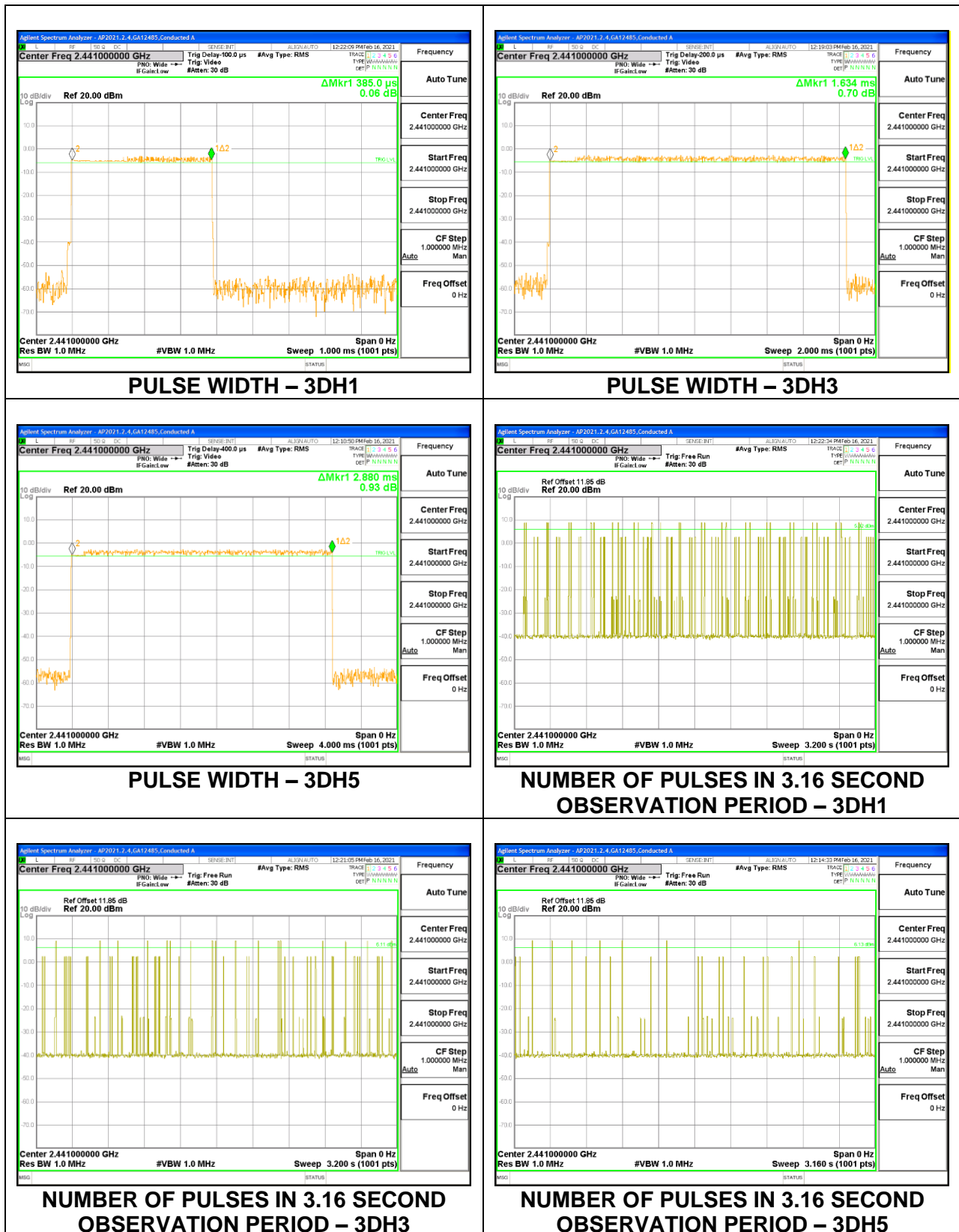
DH Packet	Pulse Width (msec)	Number of Pulses in 3.16 seconds	Average Time of Occupancy (sec)	Limit (sec)	Margin (sec)
GFSK Normal Mode					
DH1	0.379	32	0.1213	0.4	-0.2787
DH3	1.632	13	0.2122	0.4	-0.1878
DH5	2.876	7	0.2013	0.4	-0.1987
DH Packet	Pulse Width (sec)	Number of Pulses in 0.8 seconds	Average Time of Occupancy (sec)	Limit (sec)	Margin (sec)
GFSK AFH Mode					
DH1	0.379	8	0.03032	0.4	-0.3697
DH3	1.632	3.25	0.05304	0.4	-0.3470
DH5	2.876	1.75	0.05033	0.4	-0.3497



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	0.385	32	0.1232	0.4	-0.2768
3DH3	1.634	17	0.2778	0.4	-0.12222
3DH5	2.88	7	0.2016	0.4	-0.1984

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.



9.6. OUTPUT POWER

LIMITS

§15.247 (b) (1)

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 RF 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 peak power sensor. Peak output power was read directly from the power meter.

RESULTS

9.6.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION

Tested By:	19480 BS
Date:	2/15/2021

Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2402	9.46	21	-11.54
Middle	2441	9.70	21	-11.3
High	2480	9.00	21	-12

9.6.2. BLUETOOTH ENHANCED DATA RATE DQPSK MODULATION

Tested By:	19480 BS
Date:	2/15/2021

Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2402	8.52	21	-12.48
Middle	2441	8.79	21	-12.21
High	2480	7.83	21	-13.17

9.6.3. BLUETOOTH ENHANCED DATA RATE 8PSK MODULATION

Tested By:	19480 BS
Date:	2/15/2021

Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2402	8.63	21	-12.37
Middle	2441	8.94	21	-12.06
High	2480	7.98	21	-13.02

9.7. AVERAGE POWER

LIMITS

None; for reporting purposes only

TEST PROCEDURE

Measurements perform using a wideband RF 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 average power sensor. Gated average output power was read directly from power meter.

RESULTS

9.7.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION

Tested By:	19480 BS
Date	2/15/2021

Channel	Frequency (MHz)	Average Power (dBm)
Low	2402	9.35
Middle	2441	9.6
High	2480	8.86

9.7.2. BLUETOOTH ENHANCED DATA RATE DQPSK MODULATION

Tested By:	19480 BS
Date	2/15/2021

Channel	Frequency (MHz)	Average Power (dBm)
Low	2402	5.92
Middle	2441	6.15
High	2480	5.17

9.7.3. BLUETOOTH ENHANCED DATA RATE 8PSK MODULATION

Tested By:	19480 BS
Date	2/15/2021

Channel	Frequency (MHz)	Average Power (dBm)
Low	2402	5.93
Middle	2441	6.16
High	2480	5.15

9.8. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

Limit = -20 dBc

TEST PROCEDURE

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

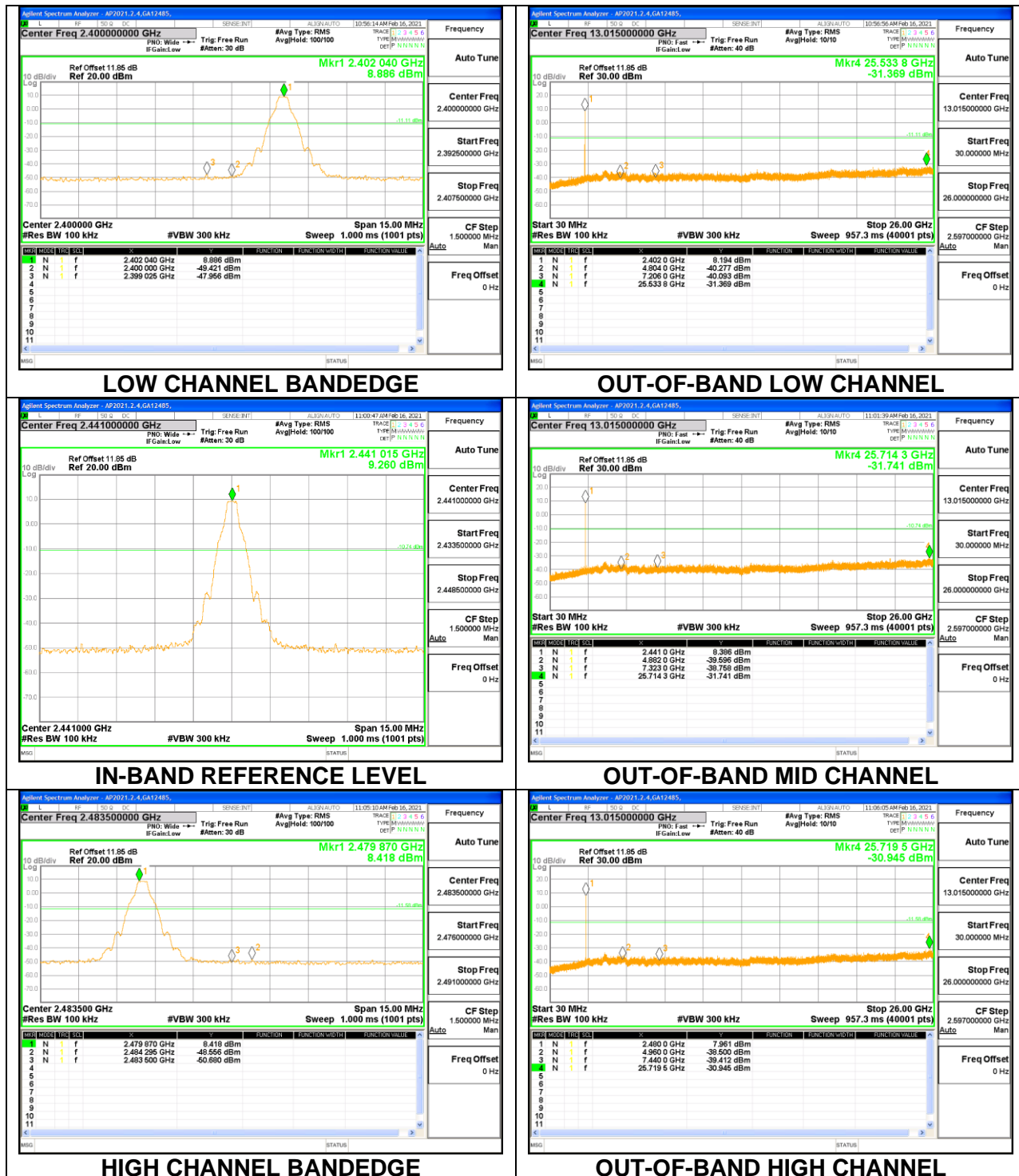
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

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

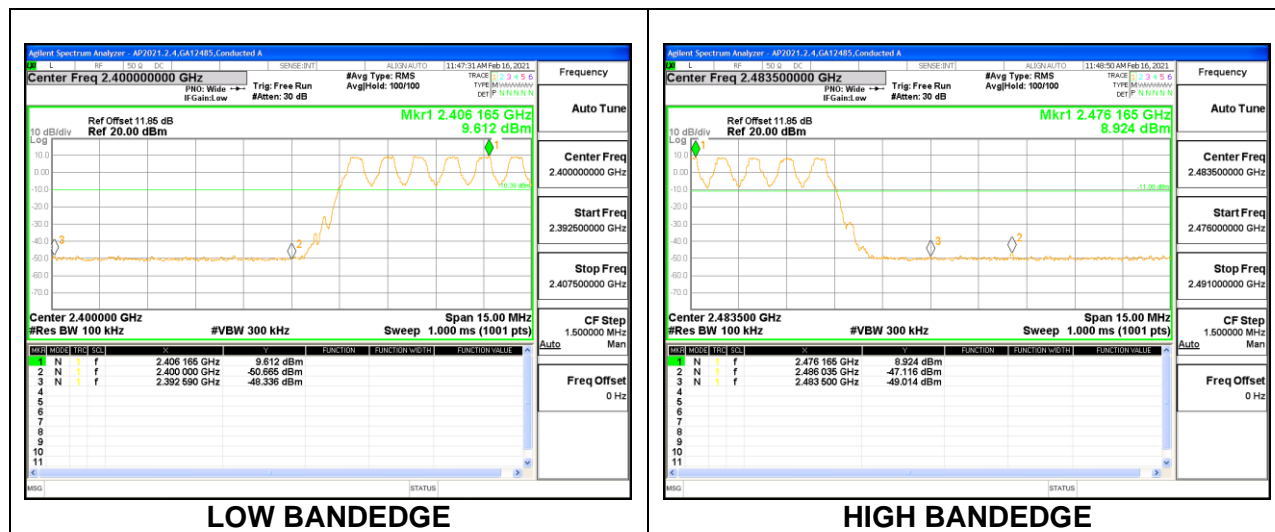
RESULTS

9.8.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION

Antenna 1 SPURIOUS EMISSIONS, NON-HOPPING

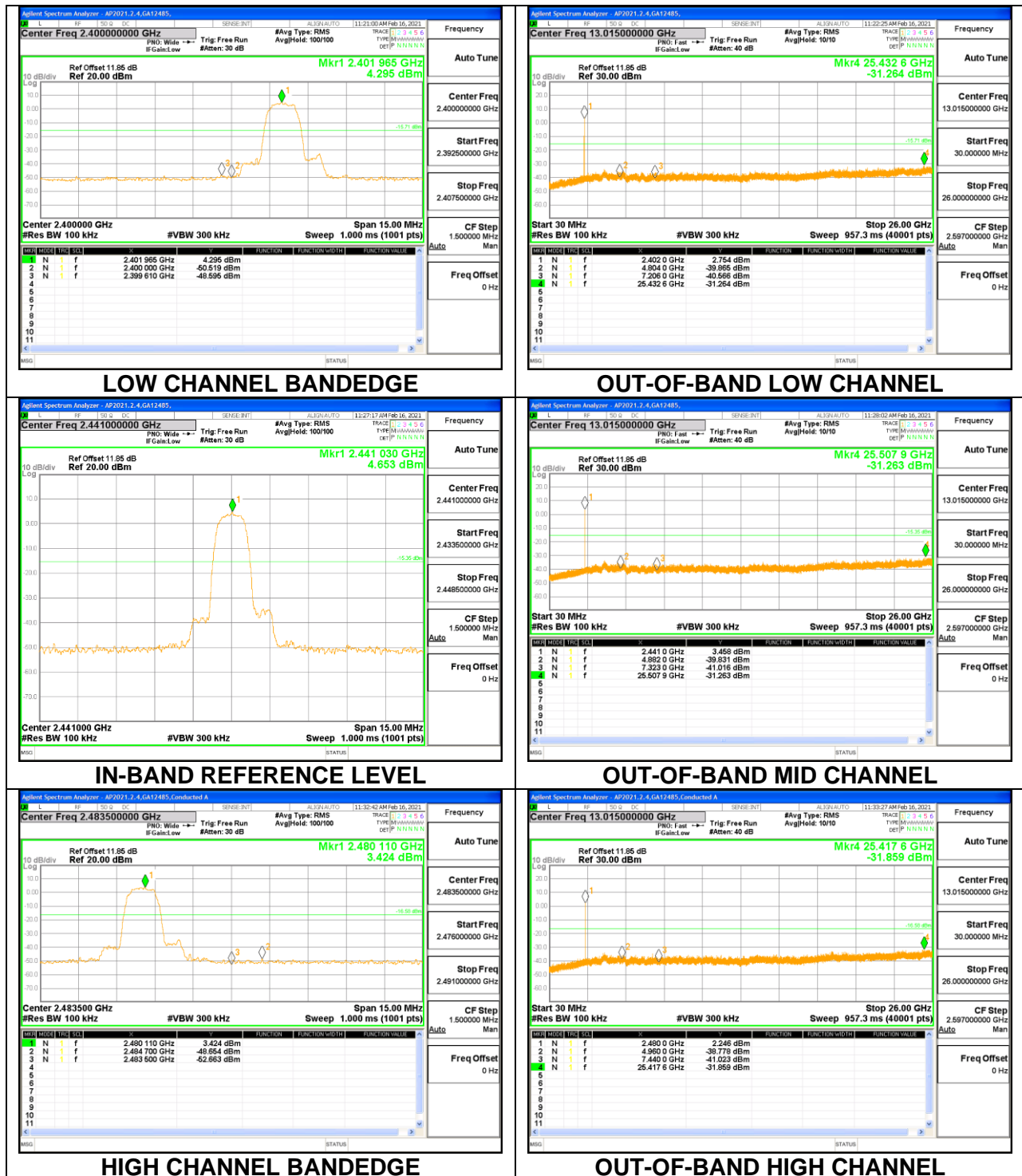


Antenna 1 SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON

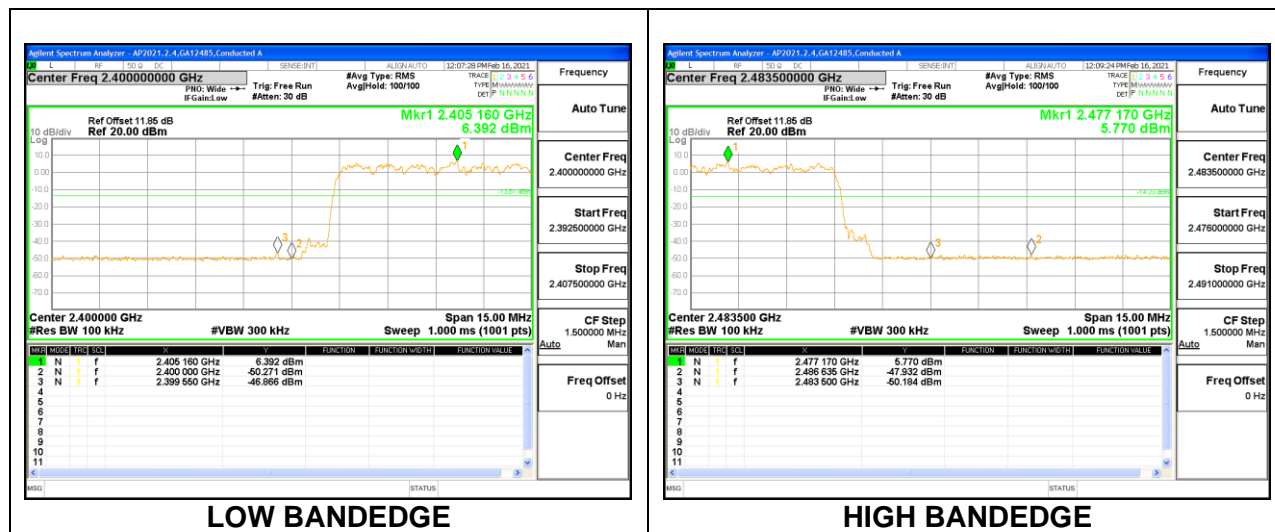


9.8.2. BLUETOOTH ENHANCED DATA RATE 8PSK MODULATION

Antenna 1 SPURIOUS EMISSIONS, NON-HOPPING



Antenna 1 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

TEST PROCEDURE

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

For measurements below 1 GHz the resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements in the 30-1000MHz range, 9kHz for peak and/or quasi-peak detection measurements in the 0.15-30MHz range and 200Hz for peak and/or quasi-peak detection measurements in the 9 to 150kHz range. Peak detection is used unless otherwise noted as quasi-peak or average (9-90kHz and 110-490kHz).

For pre-scans above 1 GHz the resolution bandwidth is set to 1 MHz; the video bandwidth is set to 30 KHz for peak measurements.

For final measurements above 1 GHz the resolution bandwidth is set to 1 MHz; the video bandwidth is set to 3 MHz for peak measurements and 1 MHz resolution bandwidth with 1/T video bandwidth with peak detector for average measurements.

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

2D antenna use - For below 30MHz testing, investigation was done on three antenna orientations (parallel, perpendicular, and ground-parallel), parallel and perpendicular are the worst orientations, therefore testing was performed on these two orientations only. Blue color trace on plots: Parallel orientation. Green color trace on plots: Perpendicular orientation.

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

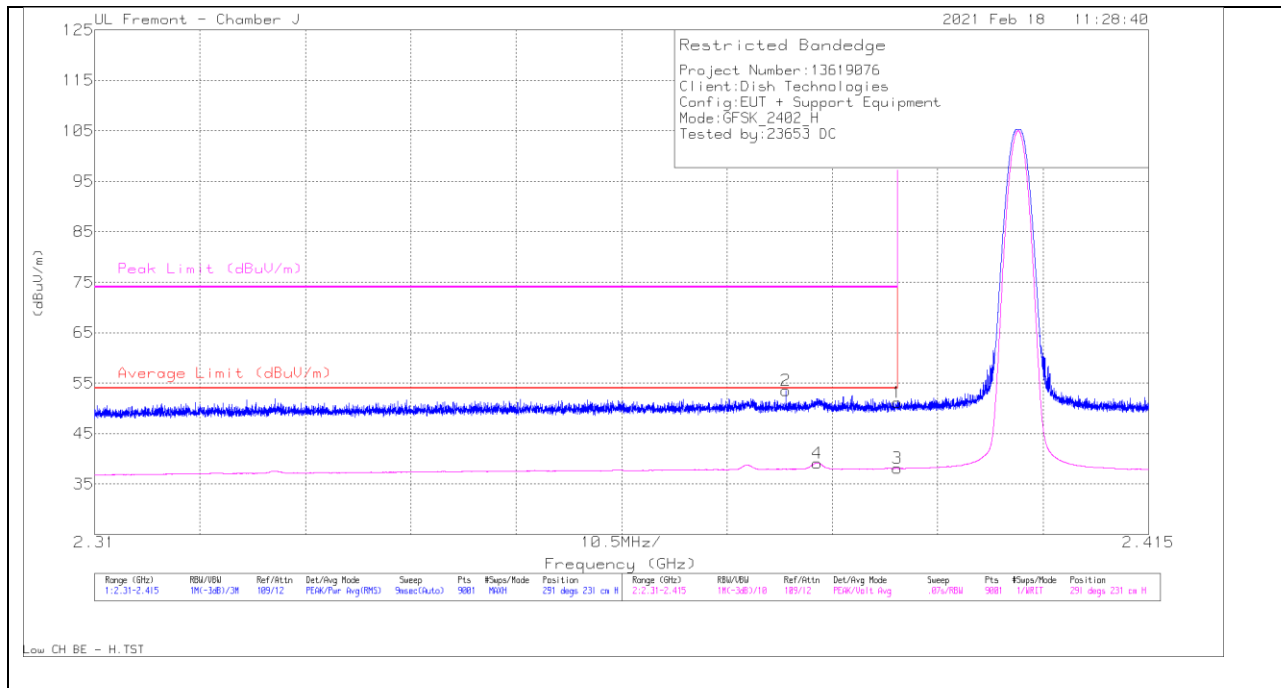
Use of a duty cycle correction factor (DCCF) is permitted for calculating average radiated field strength emission levels for an FHSS device in 15.247. This DCCF can be applied when the field strength limit (e.g., within a Government Restricted band) and the conditions specified in Section 15.35(c) can 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



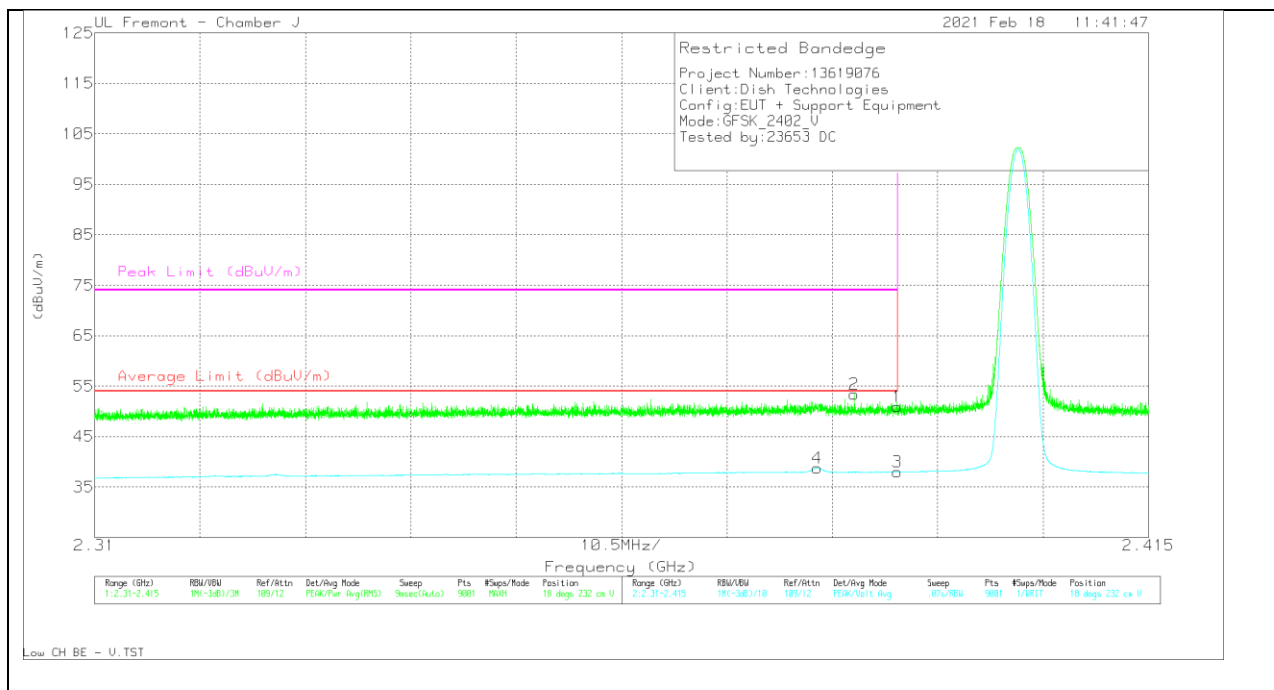
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF PRE0100034 (dB/m)	Amp/Cb/Fitr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.38999	33.26	Pk	32.1	-14.2	51.16	-	-	74	-22.84	291	231	H
2	* 2.37888	35.63	Pk	32.1	-14.2	53.53	-	-	74	-20.47	291	231	H
3	* 2.38999	20.19	VA1T	32.1	-14.2	38.09	54	-15.91	-	-	291	231	H
4	* 2.38199	21.27	VA1T	32.1	-14.2	39.17	54	-14.83	-	-	291	231	H

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

Pk - Peak detector

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

VERTICAL RESULT



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF PRE0100034 (dB/m)	Amp/Cb/Filtr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.38999	33.04	Pk	32.1	-14.2	50.94	-	-	74	-23.06	18	232	V
2	* 2.3857	35.54	Pk	32.1	-14.2	53.44	-	-	74	-20.56	18	232	V
3	* 2.38999	20.06	VA1T	32.1	-14.2	37.96	54	-16.04	-	-	18	232	V
4	* 2.38197	20.88	VA1T	32.1	-14.2	38.78	54	-15.22	-	-	18	232	V

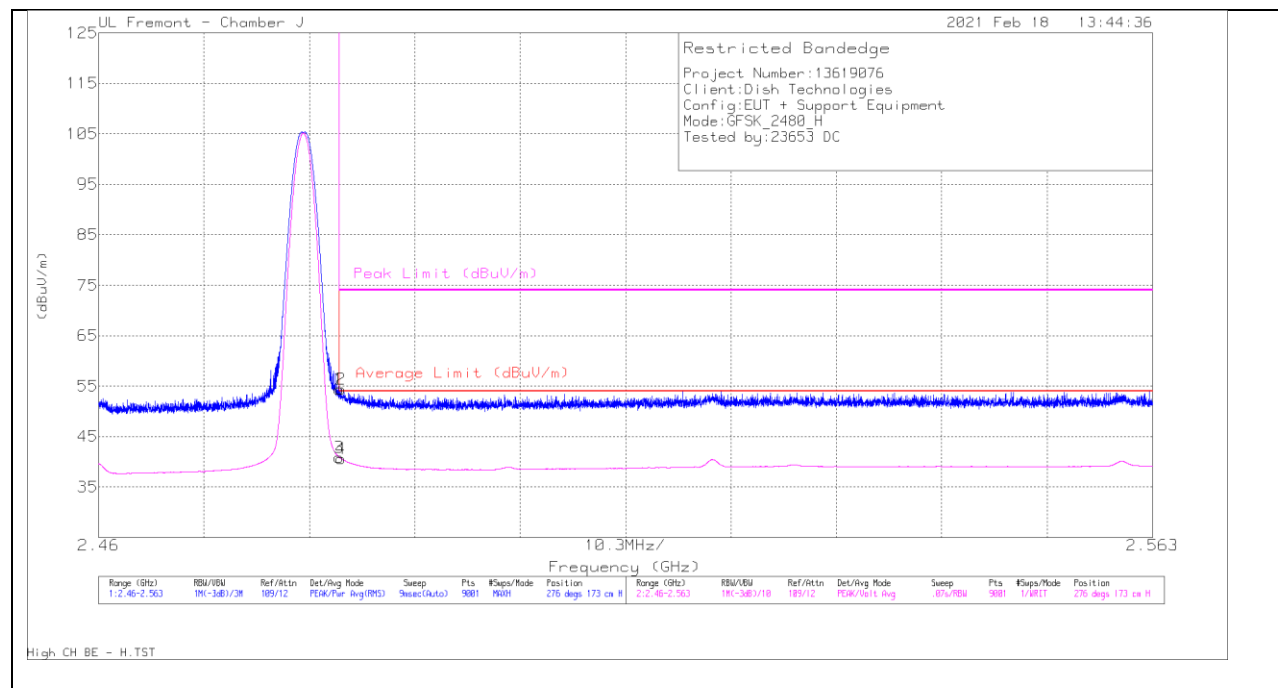
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

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

BANDEDGE (HIGH CHANNEL)

HORIZONTAL RESULT



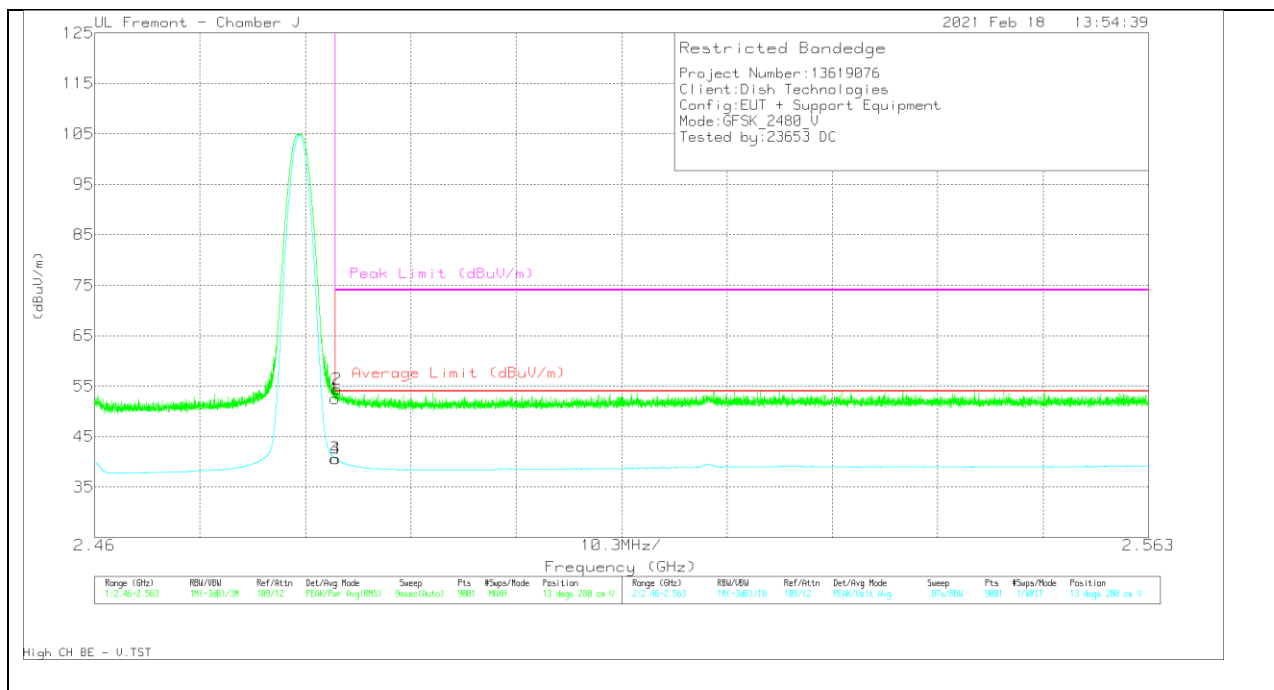
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF PRE0100034 (dB/m)	Amp/Cb/Fitr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.48351	36.04	Pk	32.5	-14.2	54.34	-	-	74	-19.66	276	173	H
2	* 2.48369	36.09	Pk	32.5	-14.2	54.39	-	-	74	-19.61	276	173	H
3	* 2.48351	22.58	VA1T	32.5	-14.2	40.88	54	-13.12	-	-	276	173	H
4	* 2.48367	22.35	VA1T	32.5	-14.2	40.65	54	-13.35	-	-	276	173	H

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

Pk - Peak detector

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

VERTICAL RESULT



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF PRE0100034 (dB/m)	Amp/Cb/Filtr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.48351	34.2	Pk	32.5	-14.2	52.5	-	-	74	-21.5	13	280	V
2	* 2.48365	36.14	Pk	32.5	-14.2	54.44	-	-	74	-19.56	13	280	V
3	* 2.48351	22.37	VA1T	32.5	-14.2	40.67	54	-13.33	-	-	13	280	V
4	* 2.48357	22.28	VA1T	32.5	-14.2	40.58	54	-13.42	-	-	13	280	V

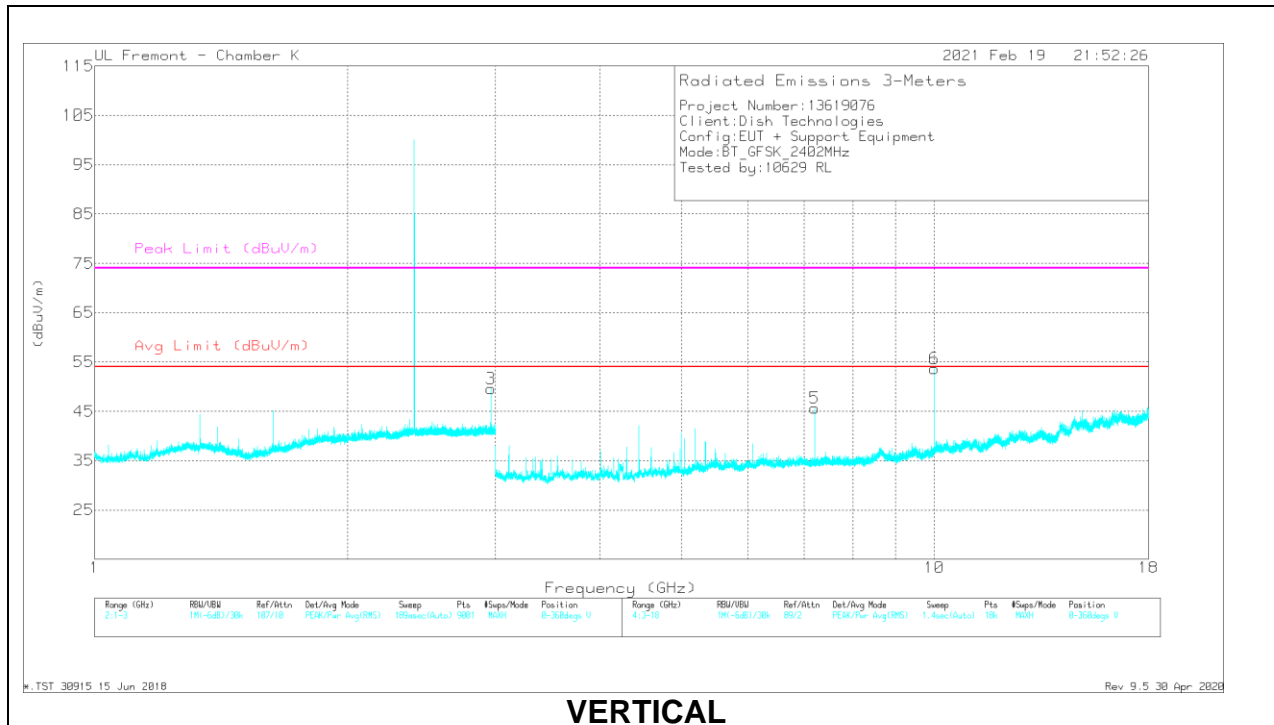
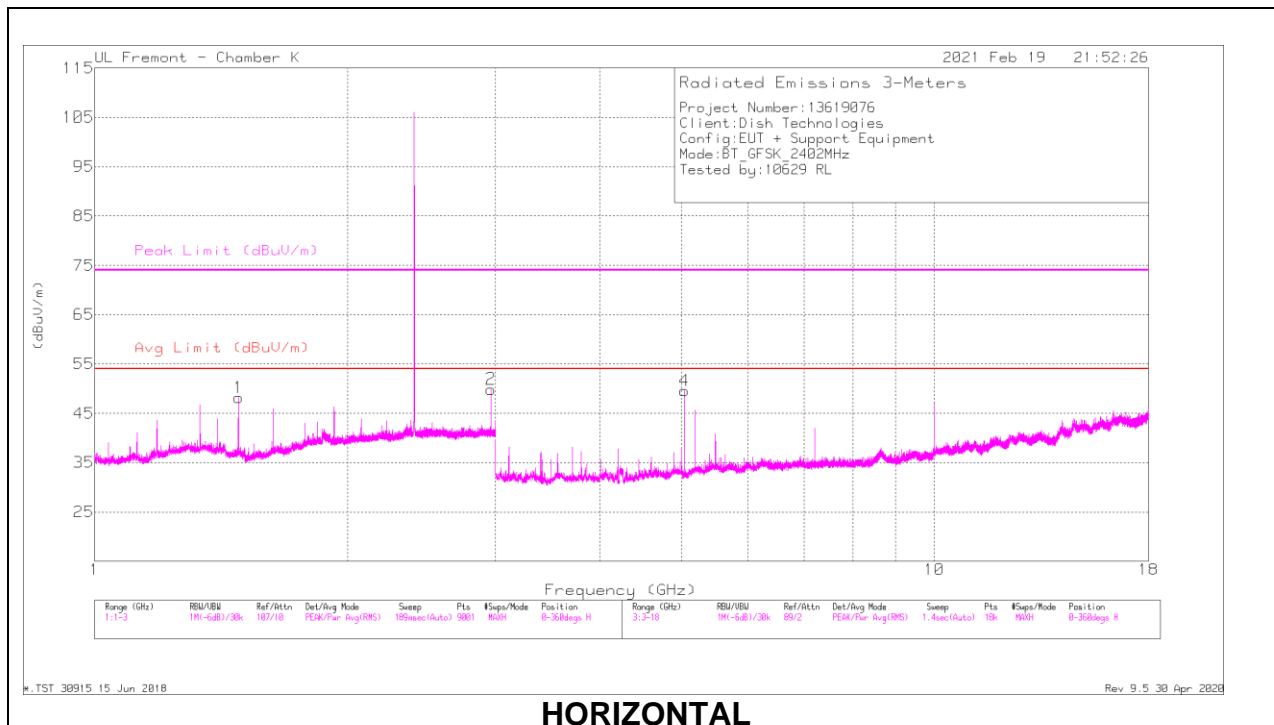
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

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

HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL RESULTS



Radiated Emissions

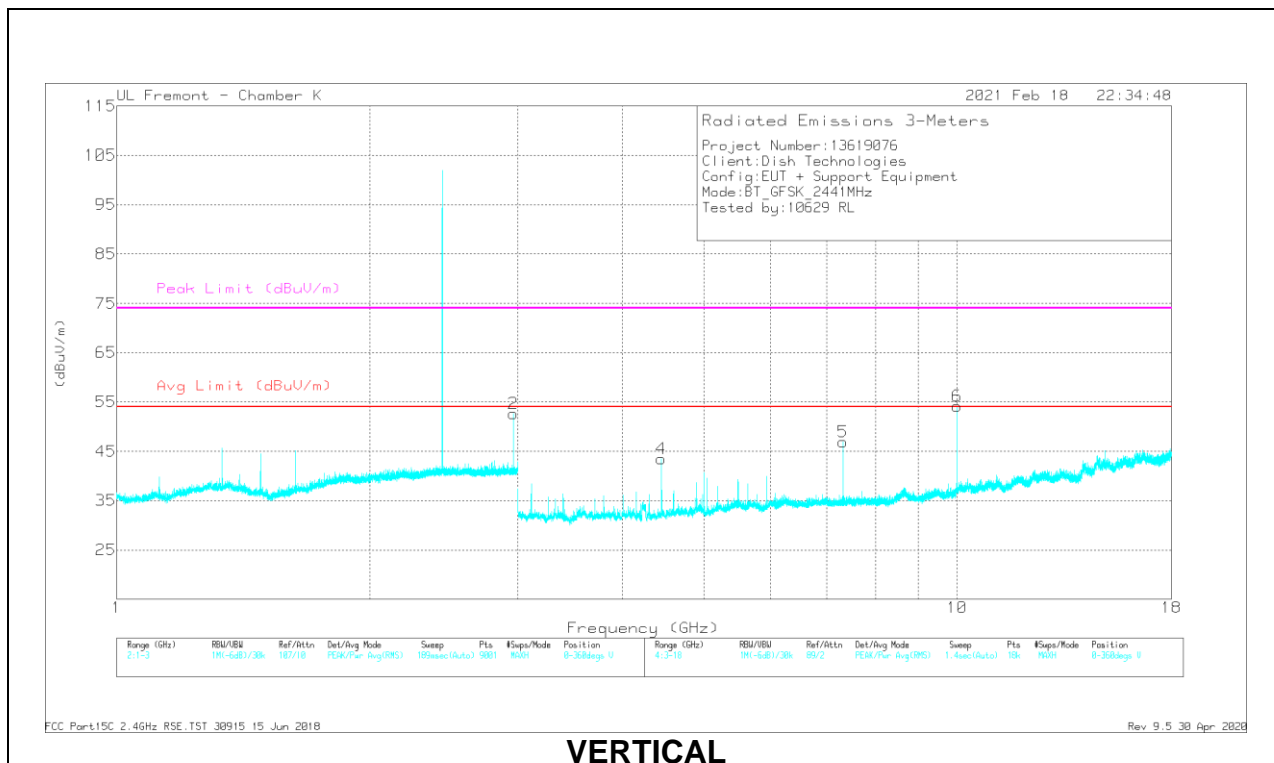
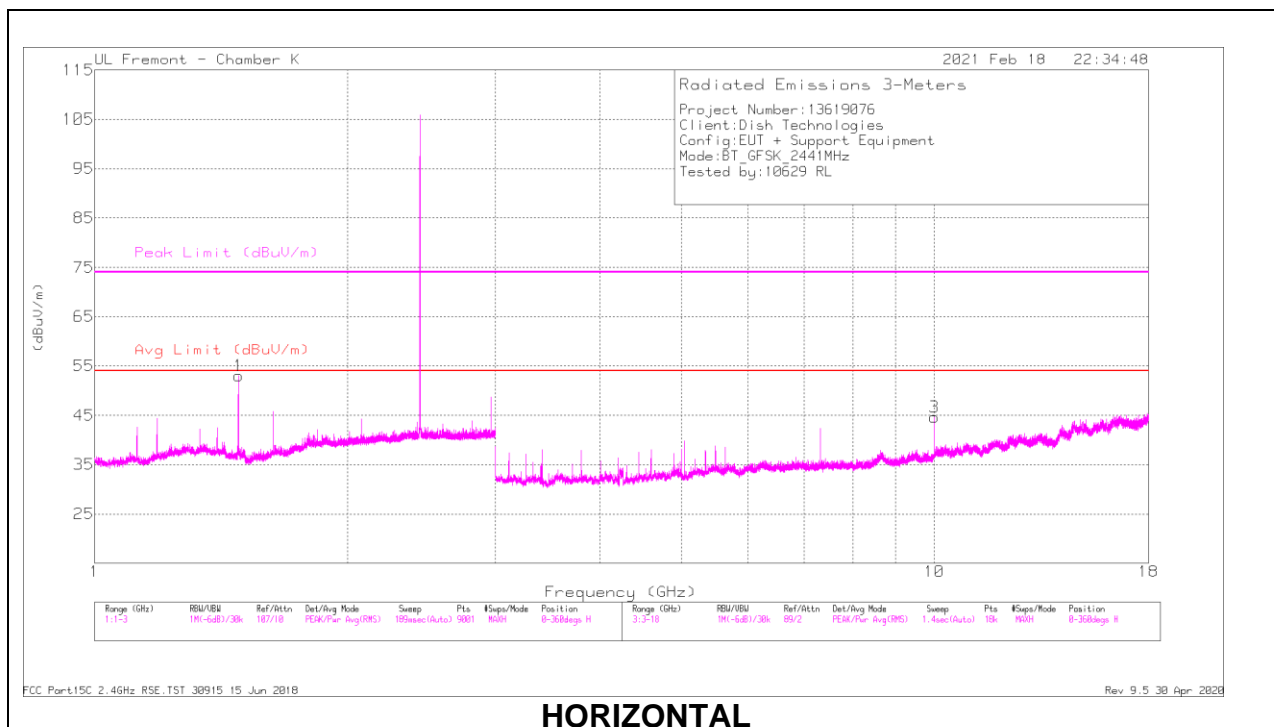
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T863 (dB/m)	Amp/Cbl/Filtr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 1.48367	60.95	PKFH	27.9	-36.5	52.35	-	-	74	-21.65	88	195	H
	* 1.48361	51.48	VA1T	27.9	-36.5	42.88	54	-11.12	-	-	88	195	H
2	2.9672	56.02	PKFH	32.8	-33.3	55.52	-	-	-	-	305	103	H
3	2.96703	57.91	PKFH	32.8	-33.3	57.41	-	-	-	-	324	100	V
4	* 5.044	58.66	PKFH	34.4	-40.4	52.66	-	-	74	-21.34	269	104	H
	* 5.04398	48.06	VA1T	34.4	-40.4	42.06	54	-11.94	-	-	269	104	H
5	7.20563	54.27	PKFH	36	-38.6	51.67	-	-	-	-	223	96	V
6	10.00015	56.15	PKFH	37.1	-36.7	56.55	-	-	-	-	292	225	V

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

PKFH FHSS/BT RB=100k for Frequencies<1GHz / RB=1MHz for Frequencies>1GHz, VB=3 x RB, Peak

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

MID CHANNEL RESULTS



Radiated Emissions

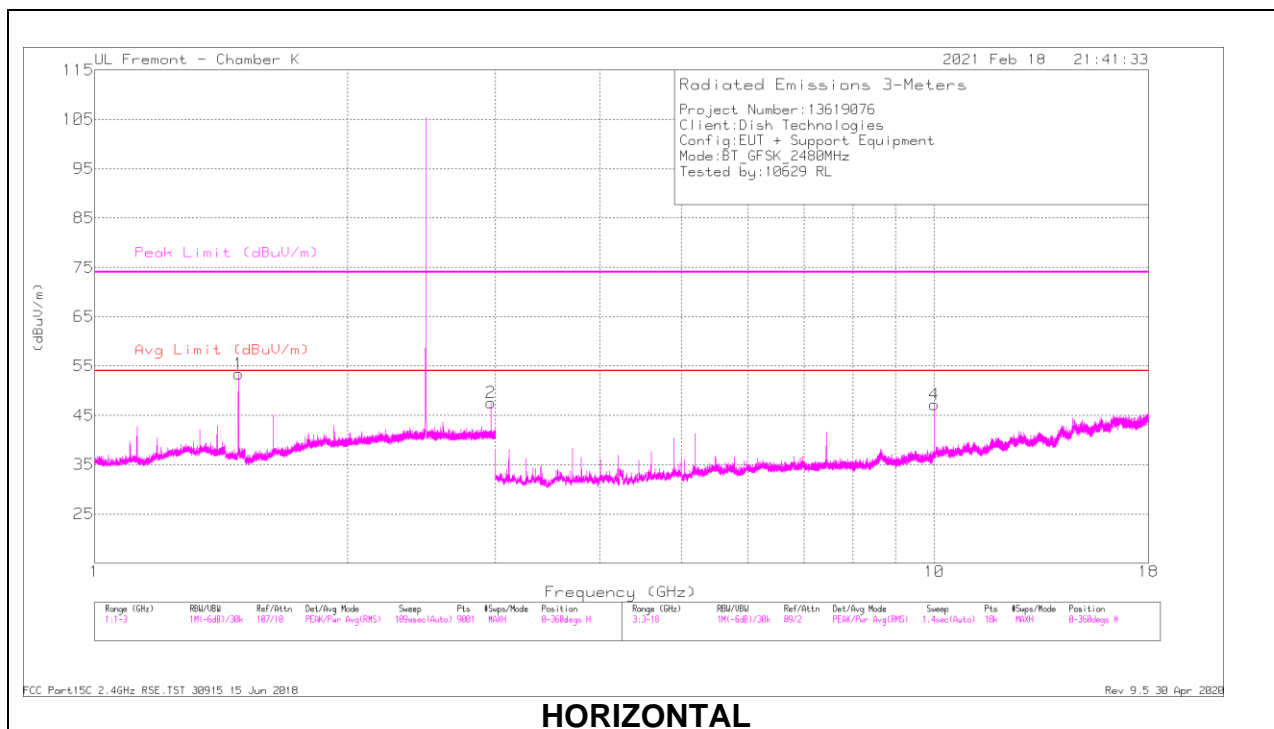
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T863 (dB/m)	Amp/Cbl/Filtr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 1.48351	63.29	PKFH	27.9	-36.5	54.69	-	-	74	-19.31	10	172	H
	* 1.48352	54.56	VA1T	27.9	-36.5	45.96	54	-8.04	-	-	10	172	H
2	2.96693	57.47	PKFH	32.8	-33.3	56.97	-	-	-	-	299	96	V
3	9.99993	51.16	PKFH	37.1	-36.7	51.56	-	-	-	-	253	383	H
4	4.45042	56.48	PKFH	34	-41.7	48.78	-	-	-	-	8	115	V
5	* 7.32251	53.51	PKFH	36.1	-38.2	51.41	-	-	74	-22.59	93	98	V
	* 7.32301	47.23	VA1T	36.1	-38.2	45.13	54	-8.87	-	-	93	98	V
6	9.99995	56.29	PKFH	37.1	-36.7	56.69	-	-	-	-	292	108	V

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

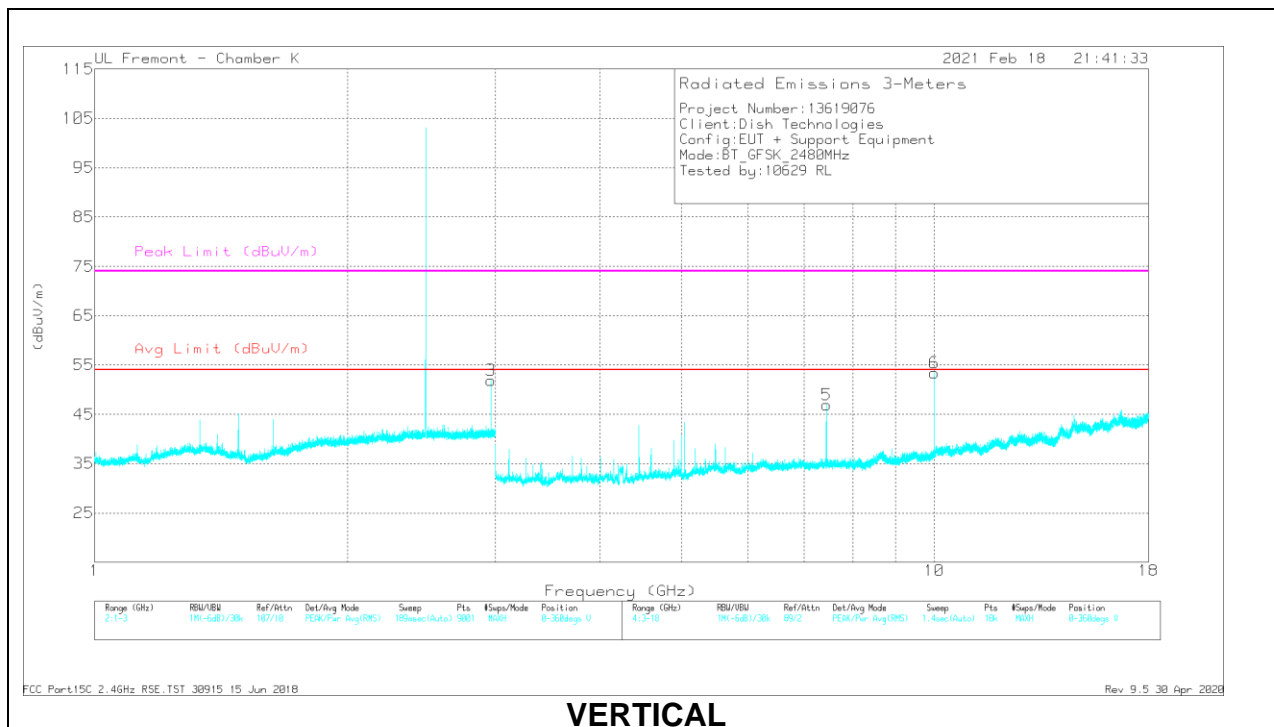
PKFH FHSS/BT RB=100k for Frequencies<1GHz / RB=1MHz for Frequencies>1GHz, VB=3 x RB, Peak

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

HIGH CHANNEL RESULTS



HORIZONTAL



VERTICAL

Radiated Emissions

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF (dB/m) T863	Amp/Cbl/Fitr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 1.48332	62.77	PKFH	27.9	-36.5	54.17	-	-	74	-19.83	15	105	H
	* 1.48351	53.85	VA1T	27.9	-36.5	45.25	54	-8.75	-	-	15	105	H
2	2.96711	54.23	PKFH	32.8	-33.3	53.73	-	-	-	-	181	170	H
3	2.96701	55.67	PKFH	32.8	-33.3	55.17	-	-	-	-	123	197	V
4	9.99999	50.58	PKFH	37.1	-36.7	50.98	-	-	-	-	252	222	H
5	* 7.43972	53.13	PKFH	36.1	-38	51.23	-	-	74	-22.77	95	97	V
	* 7.44003	46.65	VA1T	36.1	-38	44.75	54	-9.25	-	-	95	97	V
6	10.00005	55.85	PKFH	37.1	-36.7	56.25	-	-	-	-	291	99	V

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

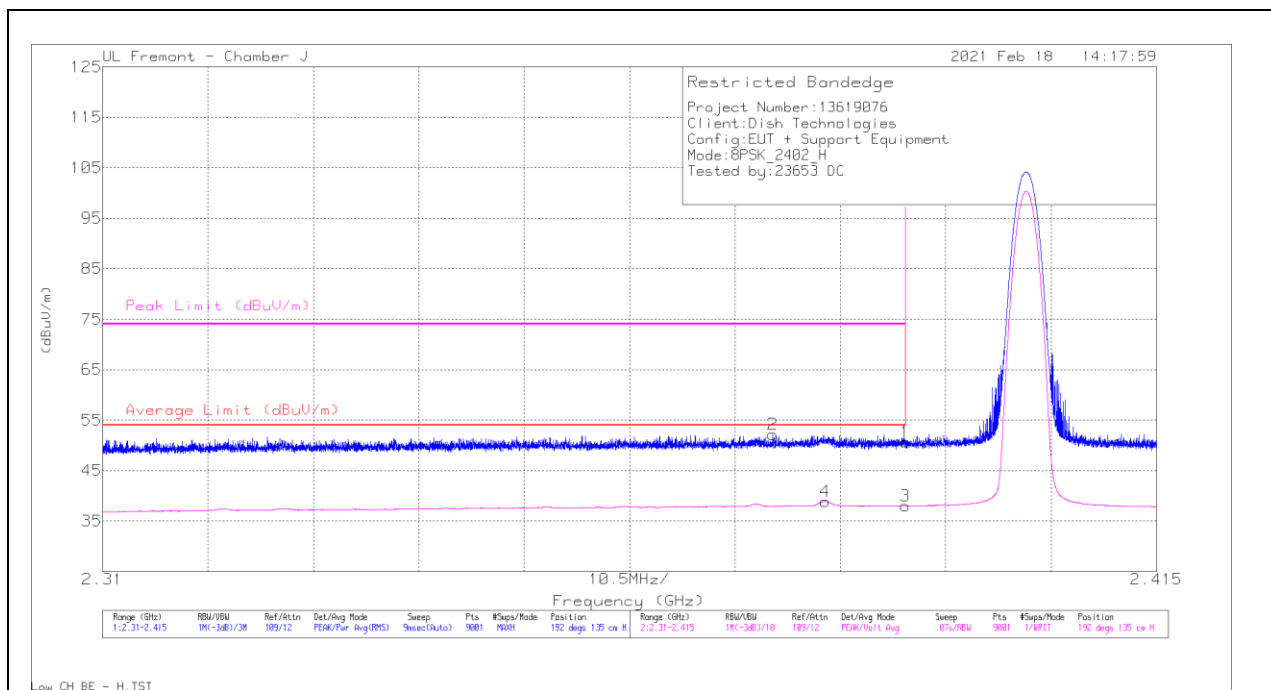
PKFH FHSS/BT RB=100k for Frequencies<1GHz / RB=1MHz for Frequencies>1GHz, VB=3 x RB, Peak

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

10.1.2. BLUETOOTH ENHANCED DATA RATE 8PSK MODULATION

BANDEDGE (LOW CHANNEL)

HORIZONTAL RESULT



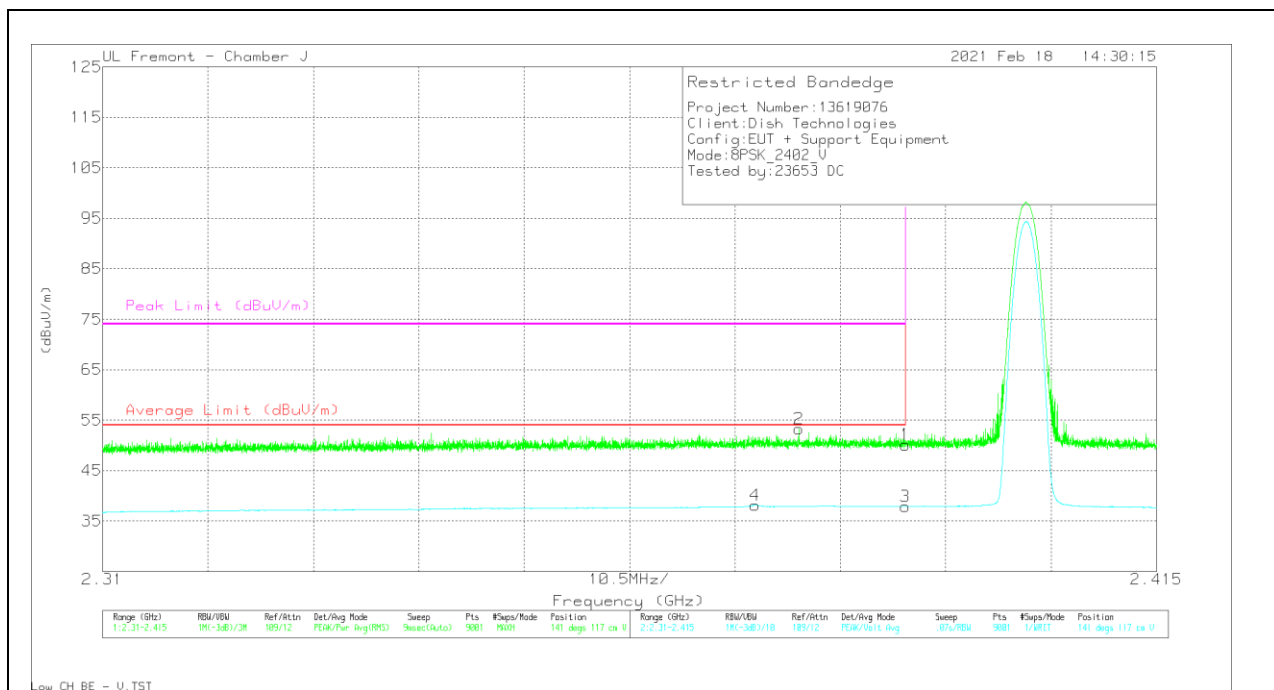
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF PRE0100034 (dB/m)	Amp/Cb/Filtr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.38999	32.72	Pk	32.1	-14.2	50.62	-	-	74	-23.38	192	135	H
2	* 2.37678	34.39	Pk	32.1	-14.3	52.19	-	-	74	-21.81	192	135	H
3	* 2.38999	20.08	VA1T	32.1	-14.2	37.98	54	-16.02	-	-	192	135	H
4	* 2.382	20.96	VA1T	32.1	-14.2	38.86	54	-15.14	-	-	192	135	H

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

Pk - Peak detector

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

VERTICAL RESULT



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF PRE0100034 (dB/m)	Amp/Cb/Filtr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.38999	32.21	Pk	32.1	-14.2	50.11	-	-	74	-23.89	141	117	V
2	* 2.37938	35.42	Pk	32.1	-14.2	53.32	-	-	74	-20.68	141	117	V
3	* 2.38999	19.95	VA1T	32.1	-14.2	37.85	54	-16.15	-	-	141	117	V
4	* 2.375	20.34	VA1T	32.1	-14.3	38.14	54	-15.86	-	-	141	117	V

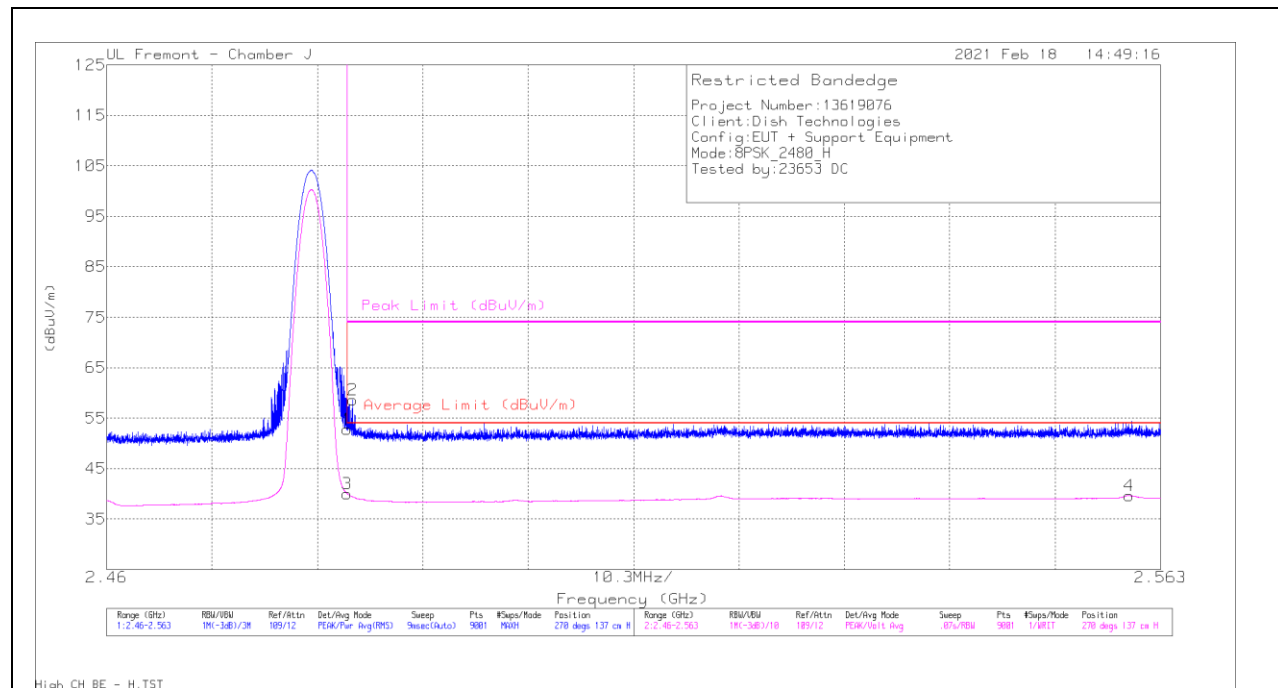
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

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

BANDEDGE (HIGH CHANNEL)

HORIZONTAL RESULT



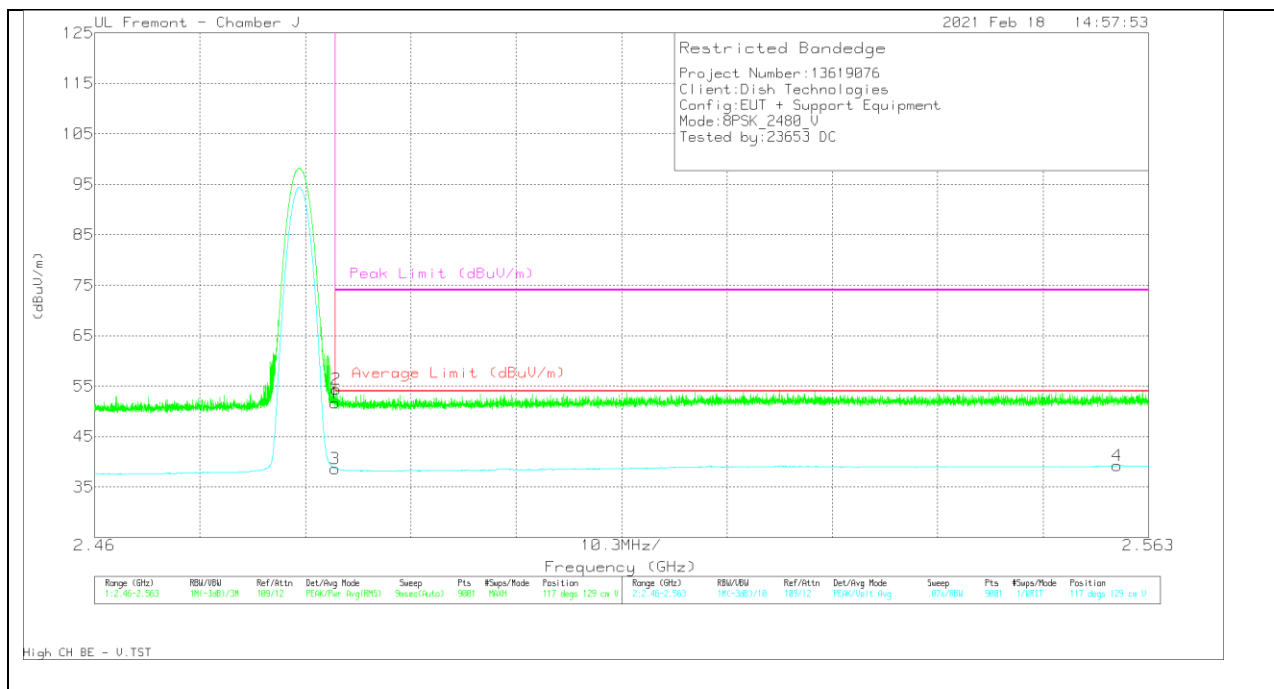
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF PRE0100034 (dB/m)	Amp/Cb/Fitr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.48351	34.51	Pk	32.5	-14.2	52.81	-	-	74	-21.19	270	137	H
2	* 2.48402	40.33	Pk	32.5	-14.2	58.63	-	-	74	-15.37	270	137	H
3	* 2.48351	21.68	VA1T	32.5	-14.2	39.98	54	-14.02	-	-	270	137	H
4	2.55995	20.93	VA1T	32.6	-13.9	39.63	54	-14.37	-	-	270	137	H

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

Pk - Peak detector

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

VERTICAL RESULT



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF PRE0100034 (dB/m)	Amp/Cb/Ftr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.48351	33.39	Pk	32.5	-14.2	51.69	-	-	74	-22.31	117	129	V
2	* 2.4836	36.06	Pk	32.5	-14.2	54.36	-	-	74	-19.64	117	129	V
3	* 2.48351	20.37	VA1T	32.5	-14.2	38.67	54	-15.33	-	-	117	129	V
4	2.55993	20.53	VA1T	32.6	-13.9	39.23	54	-14.77	-	-	117	129	V

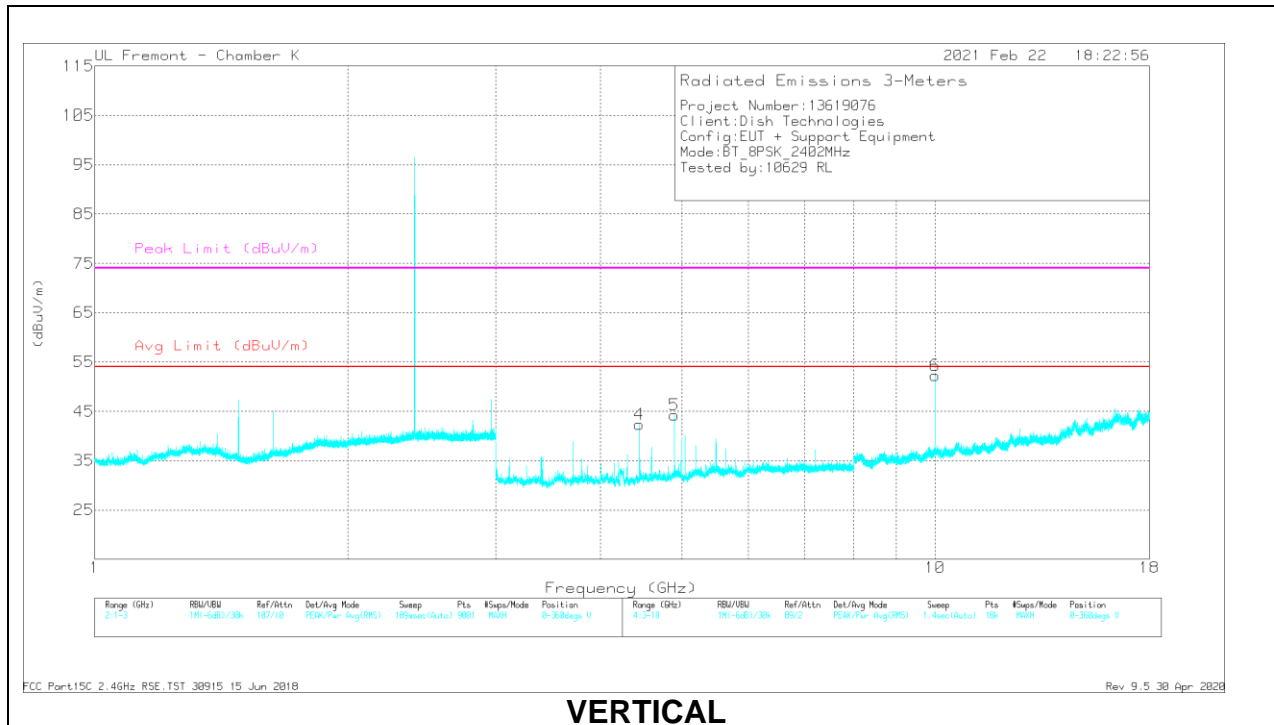
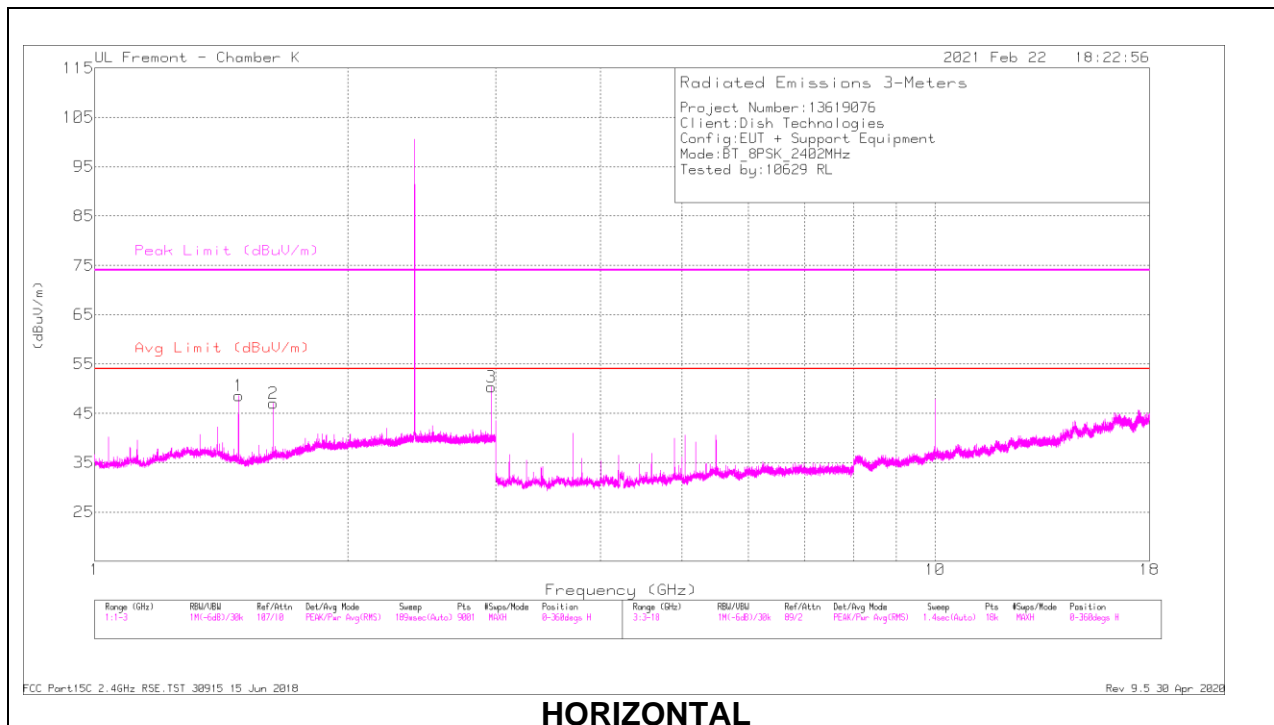
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

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

HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL RESULTS



Radiated Emissions

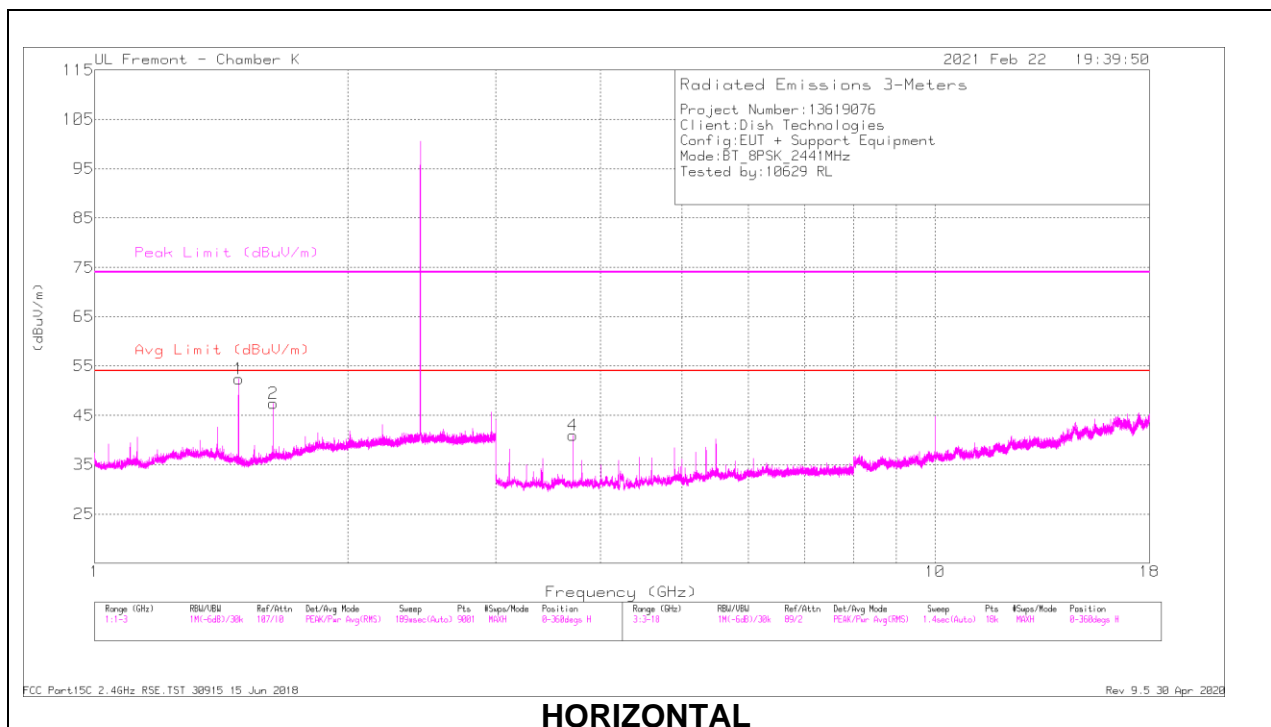
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T863 (dB/m)	Amp/Cbl/Filtr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 1.4835	65.04	PKFH	27.9	-36.5	56.44	-	-	74	-17.56	58	212	H
	* 1.48353	56.38	VA1T	27.9	-36.5	47.78	54	-6.22	-	-	58	212	H
2	1.63184	60.06	PKFH	28.9	-36.6	52.36	-	-	-	-	91	108	H
3	2.96706	54.16	PKFH	32.8	-33.3	53.66	-	-	-	-	347	104	H
4	4.4507	55.02	PKFH	34	-41.7	47.32	-	-	-	-	96	259	V
5	* 4.89573	52.89	PKFH	34.4	-40.5	46.79	-	-	74	-27.21	333	116	V
	* 4.89563	39.52	VA1T	34.4	-40.5	33.42	54	-20.58	-	-	333	116	V
6	9.99977	55.92	PKFH	37.1	-36.7	56.32	-	-	-	-	294	111	V

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

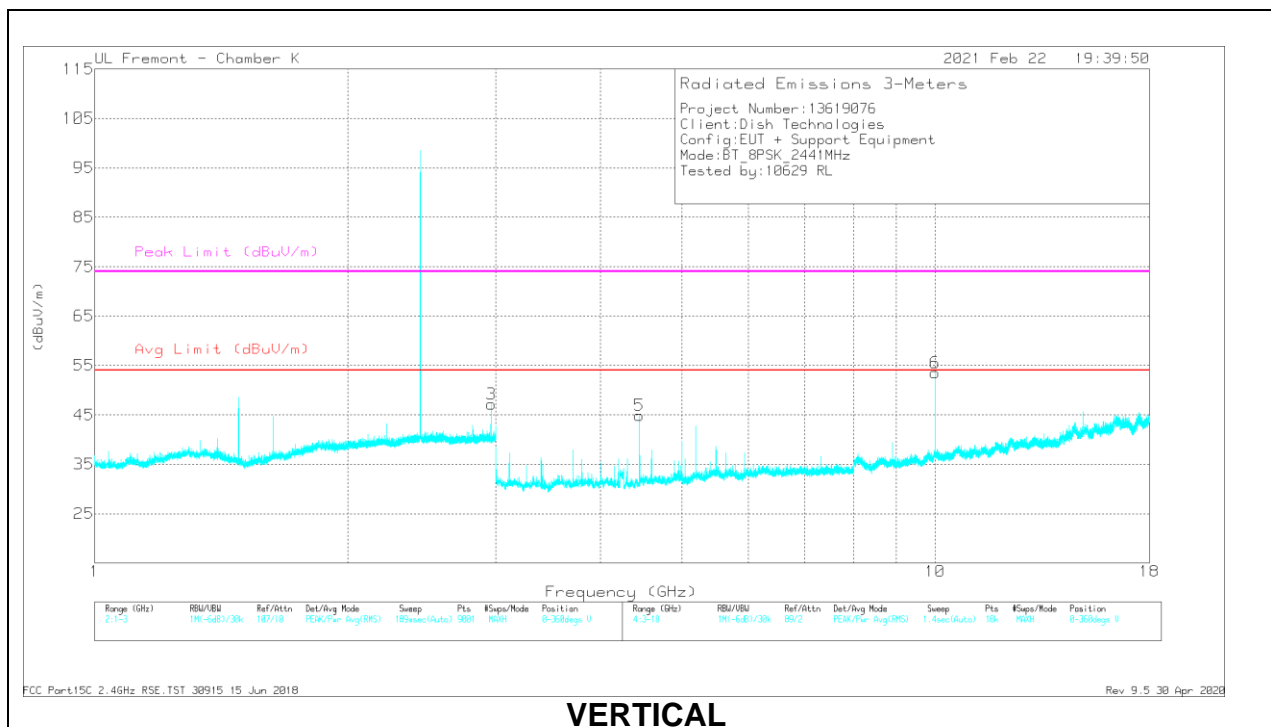
PKFH FHSS/BT RB=100k for Frequencies<1GHz / RB=1MHz for Frequencies>1GHz, VB=3 x RB, Peak

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

MID CHANNEL RESULTS



HORIZONTAL



VERTICAL

Radiated Emissions

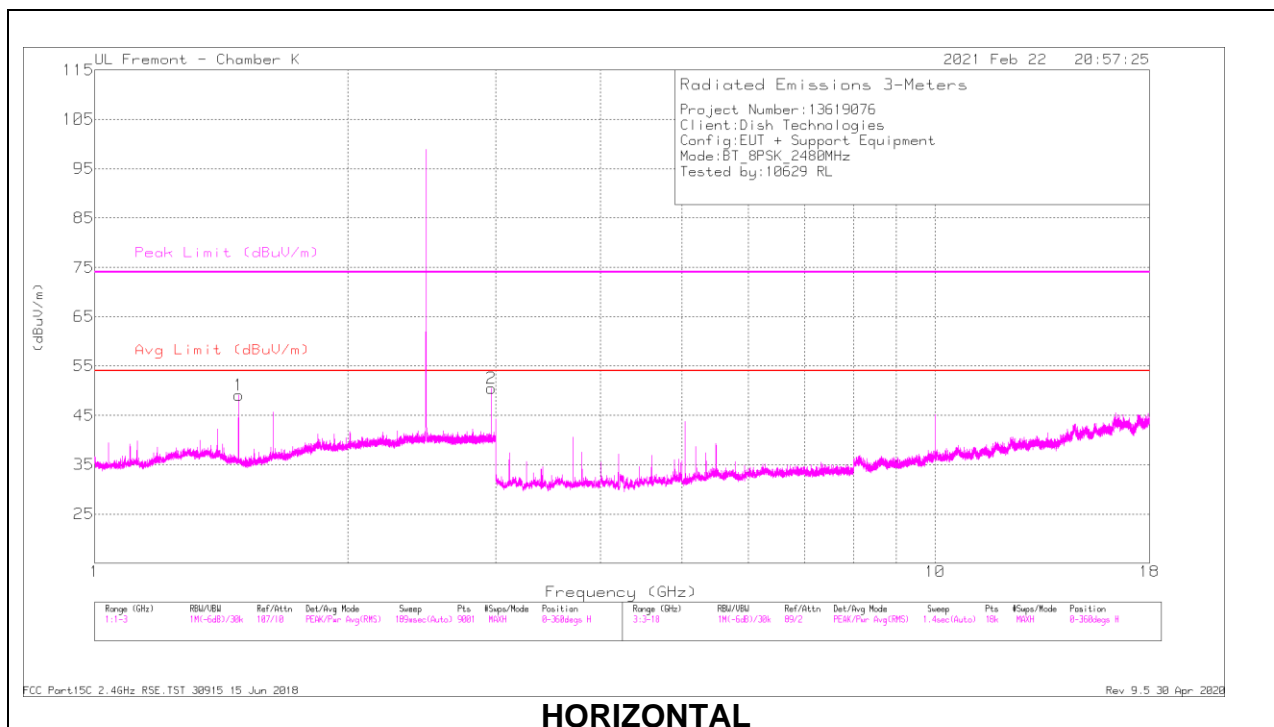
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T863 (dB/m)	Amp/Cbl/Filtr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 1.48348	63.81	PKFH	27.9	-36.5	55.21	-	-	74	-18.79	63	204	H
	* 1.48351	54.45	VA1T	27.9	-36.5	45.85	54	-8.15	-	-	63	204	H
2	1.63189	58.87	PKFH	28.9	-36.6	51.17	-	-	-	-	92	107	H
3	2.96699	55.14	PKFH	32.8	-33.3	54.64	-	-	-	-	127	121	V
4	* 3.709	54.92	PKFH	33.6	-41.5	47.02	-	-	74	-26.98	333	279	H
	* 3.70877	50.01	VA1T	33.6	-41.5	42.11	54	-11.89	-	-	333	279	H
5	4.45044	55.4	PKFH	34	-41.7	47.7	-	-	-	-	103	256	V
6	9.99995	55.71	PKFH	37.1	-36.7	56.11	-	-	-	-	293	111	V

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

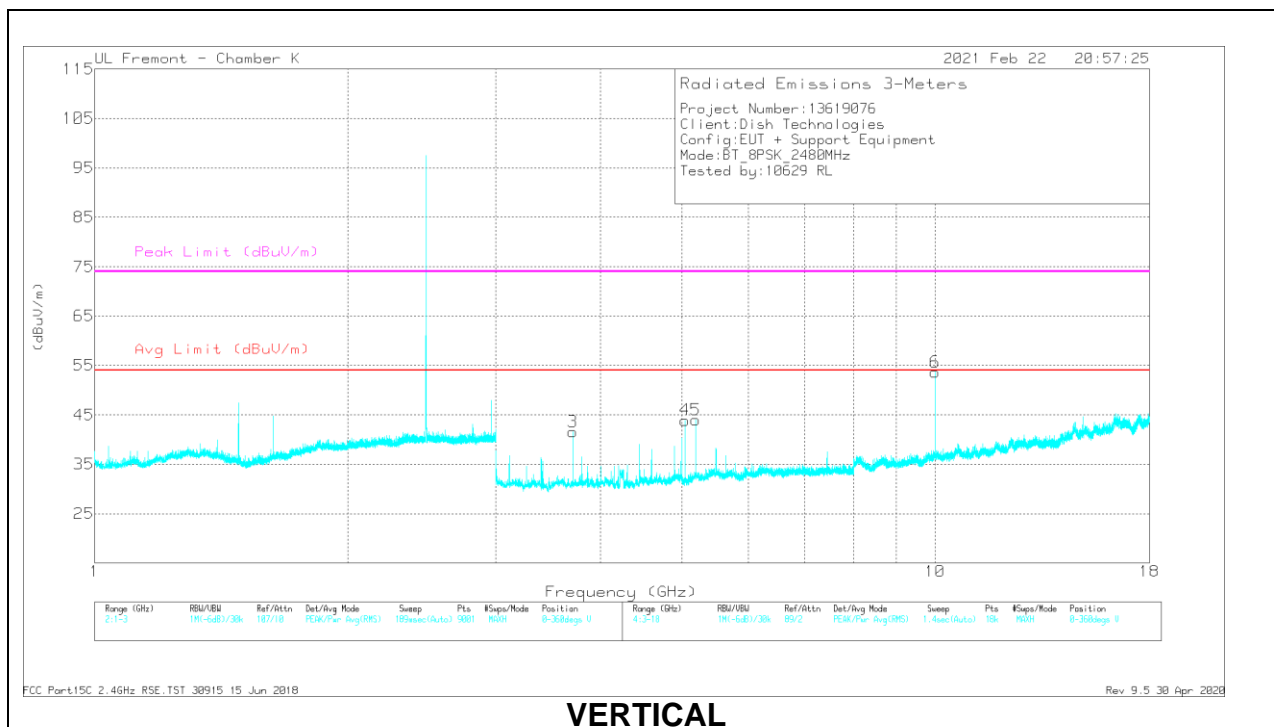
PKFH FHSS/BT RB=100k for Frequencies<1GHz / RB=1MHz for Frequencies>1GHz, VB=3 x RB, Peak

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

HIGH CHANNEL RESULTS



HORIZONTAL



VERTICAL

Radiated Emissions

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T863 (dB/m)	Amp/Cbl/Fitr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 1.48348	66.07	PKFH	27.9	-36.5	57.47	-	-	74	-16.53	130	149	H
	* 1.48353	57.51	VA1T	27.9	-36.5	48.91	54	-5.09	-	-	130	149	H
2	2.96695	54.94	PKFH	32.8	-33.3	54.44	-	-	-	-	345	142	H
3	* 3.70873	52.46	PKFH	33.6	-41.5	44.56	-	-	74	-29.44	313	220	V
	* 3.70878	42.68	VA1T	33.6	-41.5	34.78	54	-19.22	-	-	313	220	V
4	* 5.04394	53.76	PKFH	34.4	-40.4	47.76	-	-	74	-26.24	336	98	V
	* 5.04398	39.08	VA1T	34.4	-40.4	33.08	54	-20.92	-	-	336	98	V
5	5.19239	52.74	PKFH	34.6	-40.3	47.04	-	-	-	-	345	124	V
6	10.00013	56.02	PKFH	37.1	-36.7	56.42	-	-	-	-	294	111	V

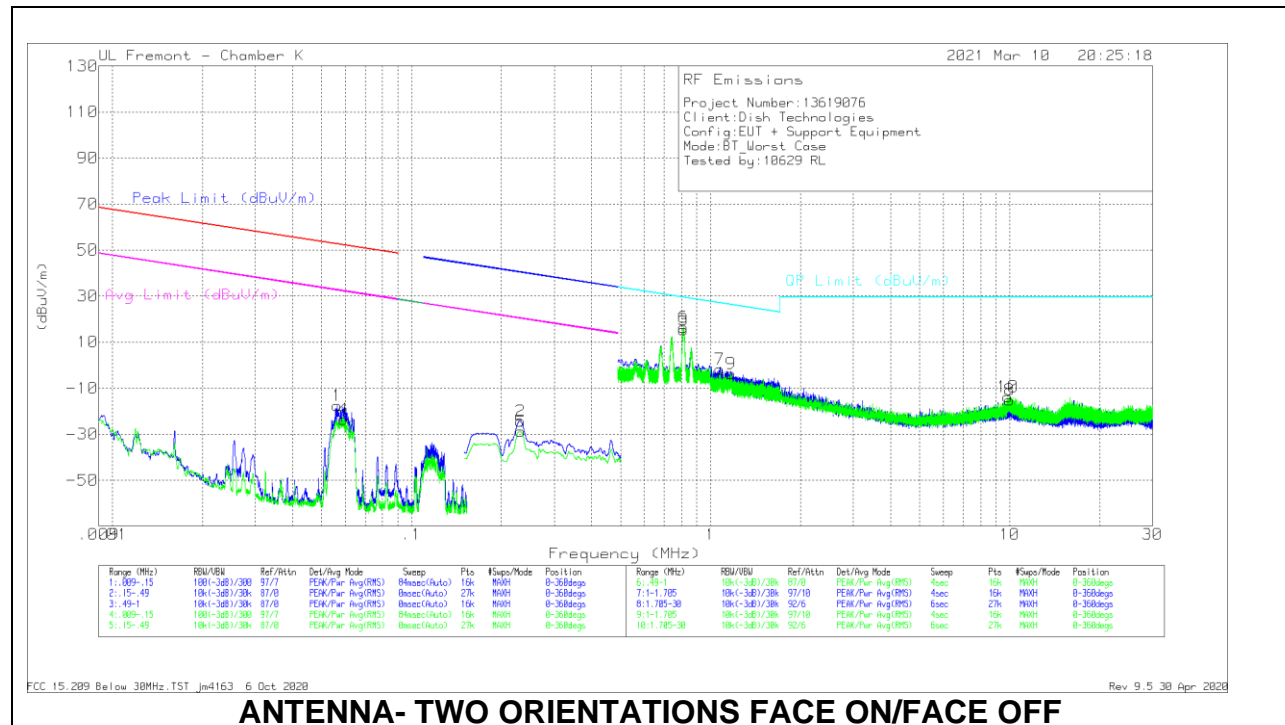
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

PKFH FHSS/BT RB=100k for Frequencies<1GHz / RB=1MHz for Frequencies>1GHz, VB=3 x RB, Peak

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

10.2. WORST CASE BELOW 30MHz

SPURIOUS EMISSIONS BELOW 30 MHz (WORST-CASE CONFIGURATION)



ANTENNA- TWO ORIENTATIONS FACE ON/FACE OFF

Below 30MHz Data

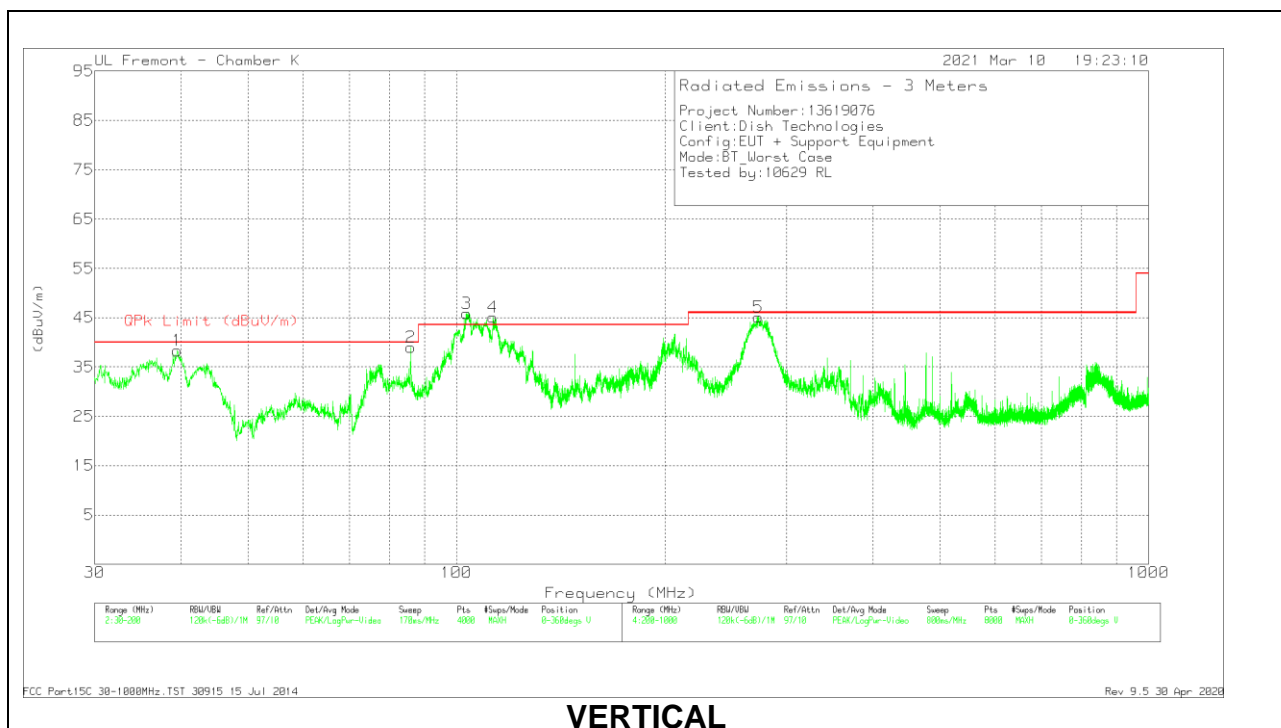
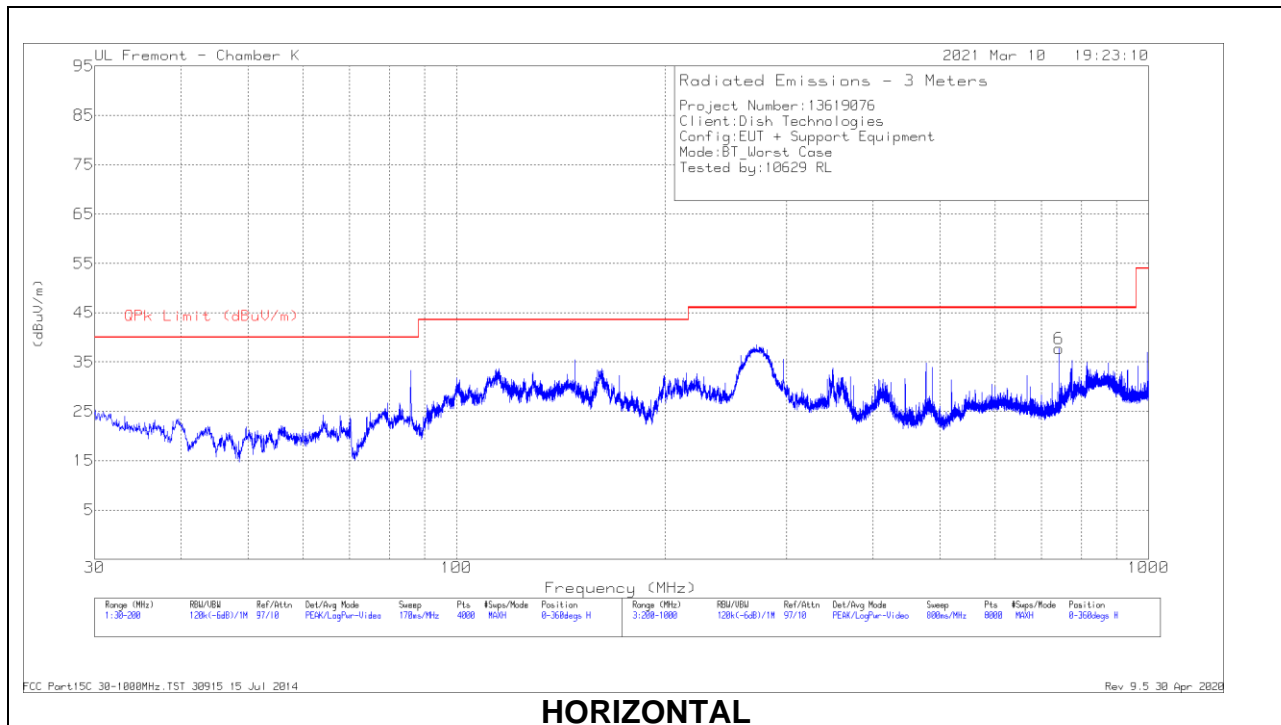
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Loop Antenna (E ACF)	Amp/Cbl (dB)	Dist Corr 300m	Corrected Reading (dBuV/m)	Peak Limit (dBuV/m)	Margin (dB)	Avg Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
1	.05636	38.11	Pk	56.5	-32.3	-80	-17.69	52.57	-70.26	32.57	-50.26	0-360
2	.2317	31.55	Pk	56.3	-32.2	-80	-24.35	40.32	-64.67	20.32	-44.67	0-360
4	.05914	32.52	Pk	56.3	-32.3	-80	-23.48	52.15	-75.63	32.15	-55.63	0-360
5	.23171	27.02	Pk	56.3	-32.2	-80	-28.88	40.32	-69.2	20.32	-49.2	0-360

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Loop Antenna (E ACF)	Amp/Cbl (dB)	Dist Corr 30m (dB) 40Log	Corrected Reading (dBuV/m)	QP Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
3	.81139	31.22	Pk	56.3	-32.2	-40	15.32	29.43	-14.11	0-360
6	.81186	32.45	Pk	56.3	-32.2	-40	16.55	29.43	-12.88	0-360
7	1.07128	23.79	Pk	46.5	-32.1	-40	-1.81	27.03	-28.84	0-360
8	10.00516	21.95	Pk	34.6	-31.8	-40	-15.25	29.5	-44.75	0-360
9	1.1701	22.42	Pk	46	-32.1	-40	-3.68	26.26	-29.94	0-360
10	9.86158	23.51	Pk	34.6	-31.8	-40	-13.69	29.5	-43.19	0-360

Pk - Peak detector

10.3. WORST CASE BELOW 1 GHz

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



Below 1GHz Data

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AF T477 (dB/m)	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	38.9149	49.23	Pk	21.2	-31.5	38.93	-	-	3	95	V
	38.9149	44.87	Qp	21.2	-31.5	34.57	40	-5.43	3	95	V
2	85.9274	58.15	Pk	13.4	-31	40.55	-	-	325	105	V
	85.9274	54.78	Qp	13.4	-31	37.18	40	-2.82	325	105	V
3	100.956	58.96	Pk	16.5	-30.9	44.56	-	-	42	103	V
	100.956	55.39	Qp	16.5	-30.9	40.99	43.52	-2.53	42	103	V
4	* 110.791	57.34	Pk	18.8	-30.8	45.34	-	-	357	101	V
	* 110.791	53.34	Qp	18.8	-30.8	41.34	43.52	-2.18	357	101	V
6	741.7642	40.5	Pk	27	-28.4	39.1	-	-	148	191	H
	741.7642	38.4	Qp	27	-28.4	37	46.02	-9.02	148	191	H
5	* 273.4285	56.16	Pk	19.6	-29.9	45.86	-	-	266	95	V
	* 273.4285	53.32	Qp	19.6	-29.9	43.02	46.02	-3	266	95	V

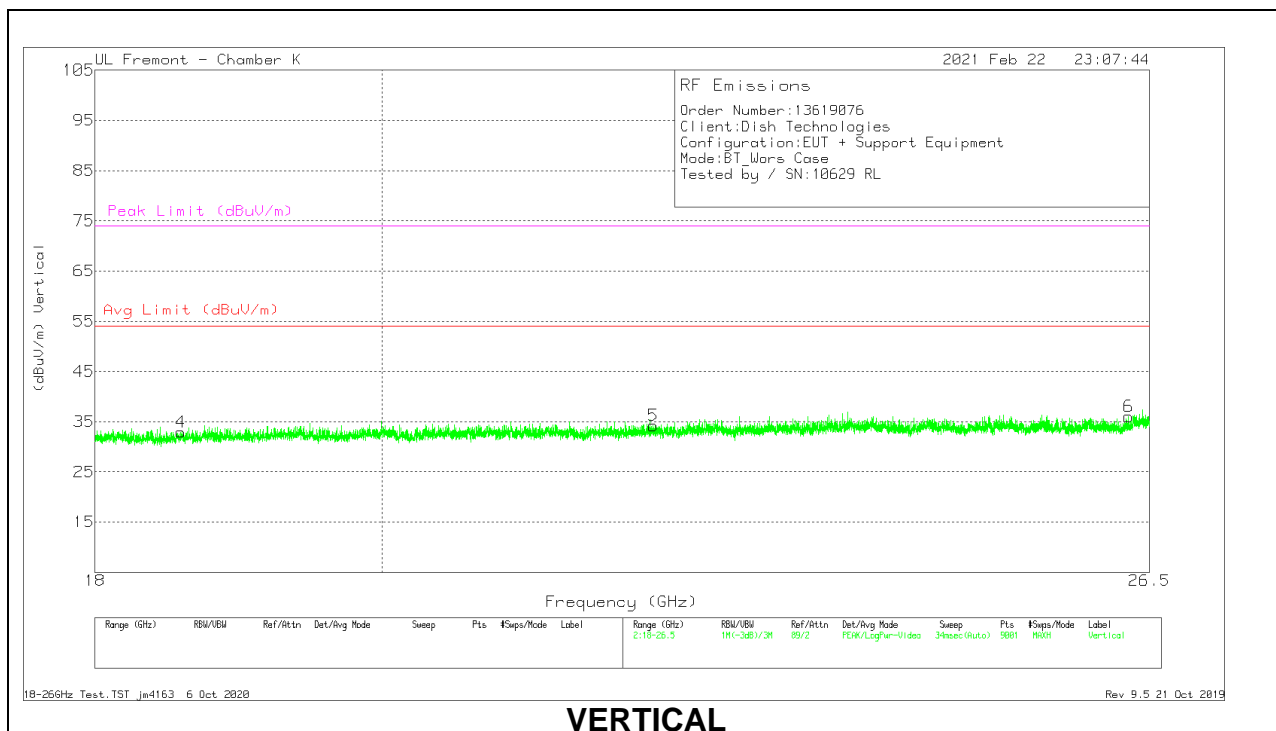
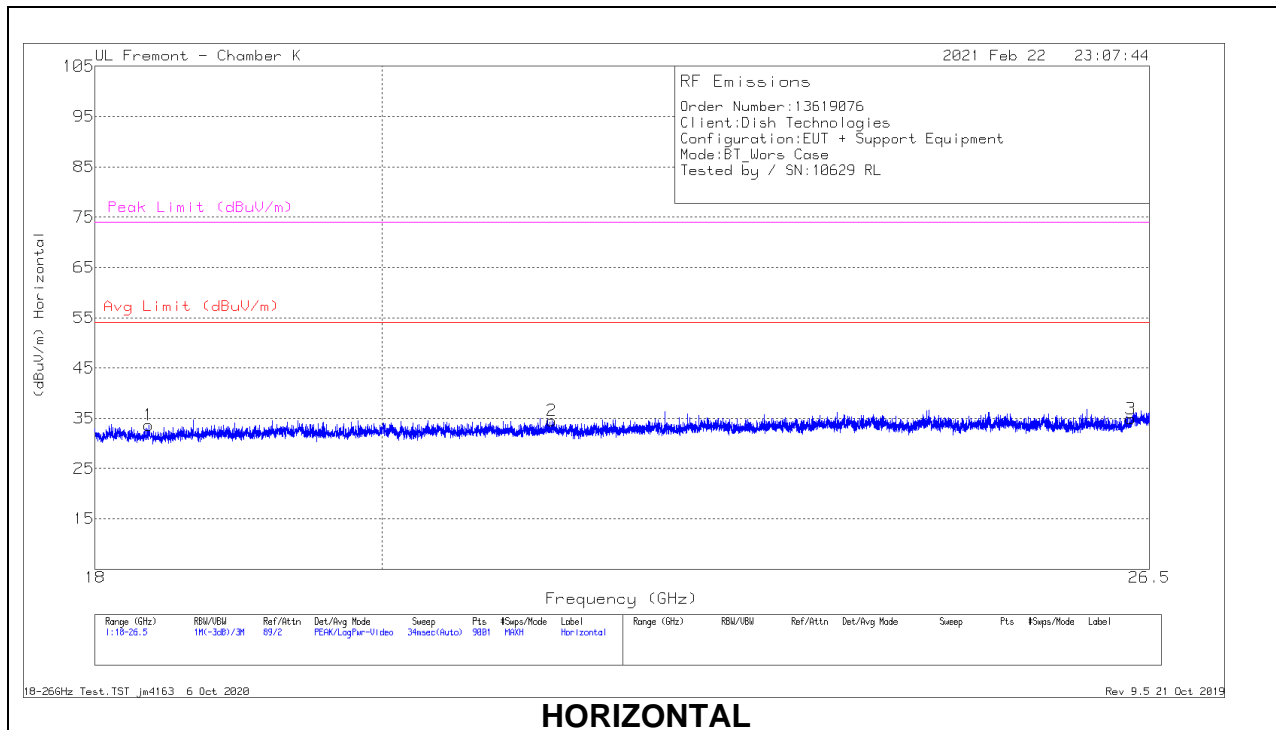
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

Qp - Quasi-Peak detector

10.4. WORST CASE 18-26 GHz

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



18 – 26GHz DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	T447 AF (dB/m)	Amp/Cbl (dB)	Dist Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)
1	18.357	70.14	Pk	32.3	-59.3	-9.5	33.64	54	-20.36	74	-40.36
2	21.28289	68.24	Pk	33.1	-57.3	-9.5	34.54	54	-19.46	74	-39.46
3	26.31772	64.81	Pk	34.6	-55	-9.5	34.91	54	-19.09	74	-39.09
4	18.57517	69.02	Pk	32.4	-59	-9.5	32.92	54	-21.08	74	-41.08
5	22.08944	67.9	Pk	33.5	-57.7	-9.5	34.2	54	-19.8	74	-39.8
6	26.29789	65.62	Pk	34.6	-54.7	-9.5	36.02	54	-17.98	74	-37.98

Pk - Peak detector

11. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

FCC §15.207 (a)

Frequency of Emission (MHz)	Conducted Limit (dB μ V)	
	Quasi-peak	Average
0.15-0.5	66 to 56 *	56 to 46 *
0.5-5	56	46
5-30	60	50

*Decreases with the logarithm of the frequency.

TEST PROCEDURE

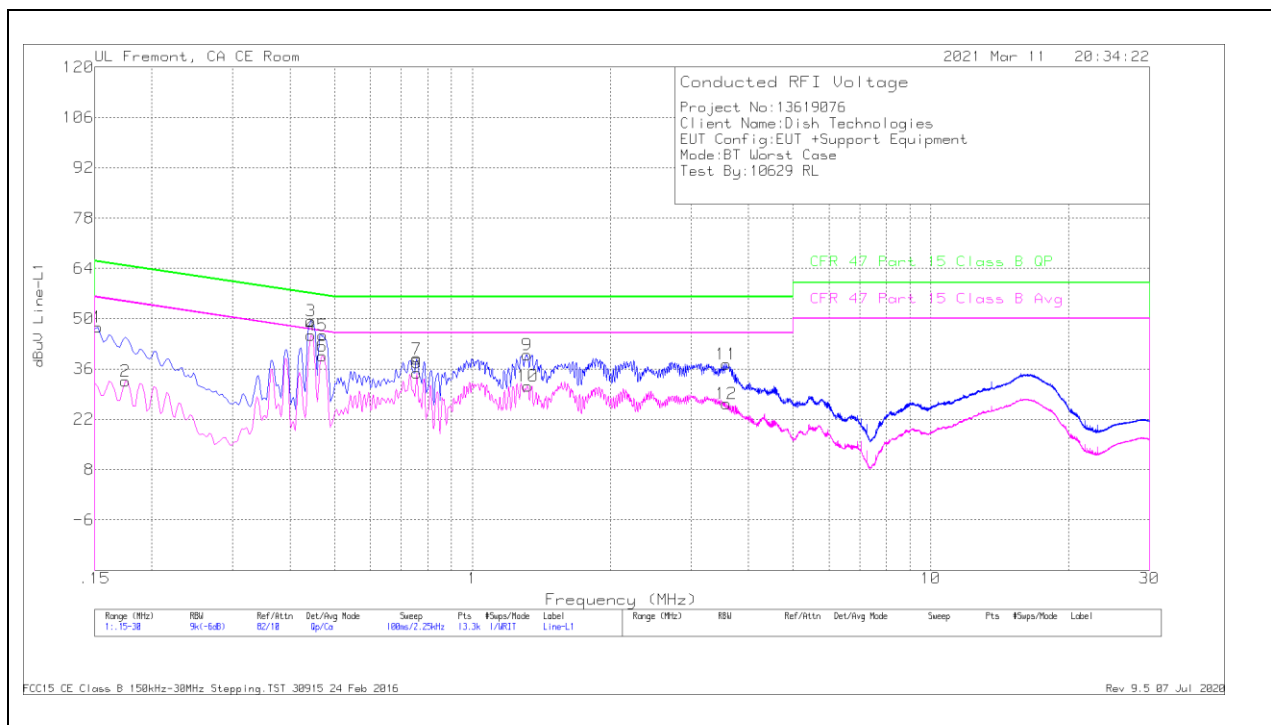
The EUT is placed on a non-conducting table 40 cm from the vertical ground plane and 80 cm above the horizontal ground plane. The EUT is configured in accordance with ANSI C63.10.

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

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

RESULTS

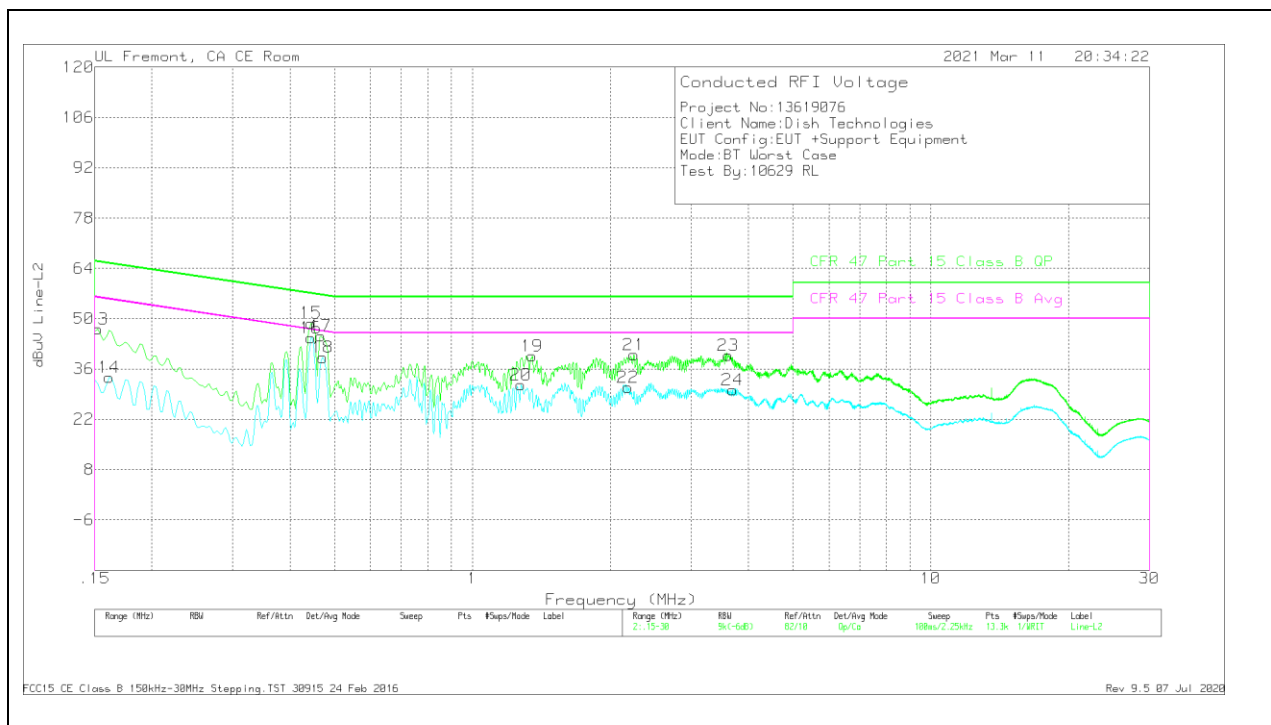
LINE 1 RESULTS



Range 1: Line-L1 .15 - 30MHz											
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	PRE0186446 LISN L1	LC Cables C1&C3 dB	Limiter (dB)	Corrected Reading dBuV	CFR 47 Part 15 Class B QP	QP Margin (dB)	CFR 47 Part 15 Class B Avg	Av(CISPR)Margin (dB)
1	.15225	37.43	Qp	.1	0	10.1	47.63	65.88	-18.25	-	-
2	.17475	22.47	Ca	0	0	10.1	32.57	-	-	54.73	-22.16
3	.44475	39.27	Qp	0	0	10.1	49.37	56.97	-7.6	-	-
4	.44475	35.33	Ca	0	0	10.1	45.43	-	-	46.97	-1.54
5	.47175	35.23	Qp	0	0	10.1	45.33	56.48	-11.15	-	-
6	.4695	29.55	Ca	0	0	10.1	39.65	-	-	46.52	-6.87
7	.75525	28.58	Qp	0	.1	10.1	38.78	56	-17.22	-	-
8	.75525	24.7	Ca	0	.1	10.1	34.9	-	-	46	-11.1
9	1.3155	29.78	Qp	0	.1	10.1	39.98	56	-16.02	-	-
10	1.31888	21.08	Ca	0	.1	10.1	31.28	-	-	46	-14.72
11	3.5835	26.97	Qp	0	.1	10.2	37.27	56	-18.73	-	-
12	3.5835	16.02	Ca	0	.1	10.2	26.32	-	-	46	-19.68

Qp - Quasi-Peak detector
Ca - CISPR average detection

LINE 2 RESULTS



Range 2: Line-L2 .15 - 30MHz											
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	PRE0186446 LISN L2	LC Cables C2&C3 dB	Limiter (dB)	Corrected Reading dBuV	CFR 47 Part 15 Class B QP	QP Margin (dB)	CFR 47 Part 15 Class B Avg	Av(CISPR)Margin (dB)
13	.15225	37	Qp	0	0	10.1	47.1	65.88	-18.78	-	-
14	.16125	23.5	Ca	0	0	10.1	33.6	-	-	55.4	-21.8
15	.44475	38.67	Qp	0	0	10.1	48.77	56.97	-8.2	-	-
16	.44475	34.62	Ca	0	0	10.1	44.72	-	-	46.97	-2.25
17	.46725	35.11	Qp	0	0	10.1	45.21	56.56	-11.35	-	-
18	.47175	29.08	Ca	0	0	10.1	39.18	-	-	46.48	-7.3
19	1.3515	29.41	Qp	0	.1	10.1	39.61	56	-16.39	-	-
20	1.27725	21.44	Ca	0	.1	10.1	31.64	-	-	46	-14.36
21	2.2515	29.81	Qp	0	.1	10.1	40.01	56	-15.99	-	-
22	2.18625	20.71	Ca	0	.1	10.1	30.91	-	-	46	-15.09
23	3.61725	29.5	Qp	0	.1	10.2	39.8	56	-16.2	-	-
24	3.6915	19.88	Ca	0	.1	10.2	30.18	-	-	46	-15.82

Qp - Quasi-Peak detector
Ca - CISPR average detection