



Regulatory Test Report

Prepared for Harman International

This report presents detailed information on

BTT55L

Automotive Bluetooth Transmitter

Prepared by

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Engineer II

Approved by

Jason Kanakry

General Manager

Issue date: 04/08/2022

Report No: AH21071501-HAR-127_FCC_TR1 v3

This test result relates only to the described test object.

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- **Test Request Information**

Test Request #:	7700082986
Test Requested By:	Marc Ruskin Harman International Industries, Inc. 30001 Cabot Drive, Novi, MI 48377
Test item Description:	BTT55L
Part Number:	PZ365-60603
DUT Sample Number:	AH21071501-HAR-127-1, AH21071501-HAR-127-7
Hardware Version of DUT:	N/A
Software Version of DUT:	N/A
Component Category of DUT:	N/A
FCC ID:	2AHPN-BE2863
IC:	6434C-BE2863
Type of Test:	FCC/ISED Certification
Test Method:	CFR Title 47 FCC Part 15.247, ISED Canada RSS-247 Issue 2, ISED Canada RSS-Gen Issue 5 and ANSI C63.10-2013
Deviations from standard:	None
Approved Test Plan Number:	N/A
Test Plan Revision:	N/A
Date test sample received:	08/06/2021
Date test started:	08/30/2021
Date test finished:	04/07/2022

- **Test Laboratory Information**

Location of Test Lab:	The radiated and conducted emissions test sites are located at Bureau Veritas 815 N. Opdyke Rd #100, Auburn Hills, MI 48326, Phone: +1-248-836-4700
Key Contact:	Jason Kanakry (General Manager) Jason.Kanakry@BureauVeritas.com Phone: +1-248-836-4747
Laboratory Accreditations:	BUREAU VERITAS CONSUMER PRODUCTS SERVICES, INC is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017 General requirements for the competence of testing and calibration laboratories.
ISO/IEC 17025:2017:	5678.01
FCC Test Site Number:	US1278 (242530)
IC Test Site Number:	US0229 (26240)

• Statement of Conformity

RSS-GEN	RSS 247	Part 15	Comments
6.4		15.15(b)	There are no controls accessible to the user that varies the output power to operate in violation of the regulatory requirements.
		15.19	The label is shown in the label exhibit.
		15.21	Information to the user is shown in the instruction manual exhibit.
		15.27	No special accessories are required for compliance.
3.2		15.31	The EUT was tested in accordance with the measurement standards in this section.
6.13.2		15.33	Frequency range was investigated according to this section, unless noted in specific rule section under which the equipment operates.
6.13.1		15.35	The EUT emissions were measured using the measurement detector and bandwidth specified in this section, unless noted in specific rule section under which the equipment operates.
6.8		15.203	EUT employs a non-detachable internal PCB trace antenna with 1.75dBi gain.
8.10		15.205 15.209	The fundamental is not in a Restricted band and the spurious and harmonic emissions in the Restricted bands comply with the general emission limits of 15.209 or RSS-Gen as applicable
8.8		15.207	N/A. EUT is vehicle battery powered only.

CFR Title 47 FCC Part 15.247, ISED Canada RSS-247 Issue 2

• Conducted Testing

Test Summary

This test report supports an application for certification of Automotive Bluetooth Transmitter operating pursuant to:

CFR Title 47 FCC Part 15.247, ISED Canada RSS-247 Issue 2

The product is the BTT55L Automotive Bluetooth Transmitter, It is a frequency hopping spread spectrum transmitter that operates in the 2402 – 2480 MHz frequency range.

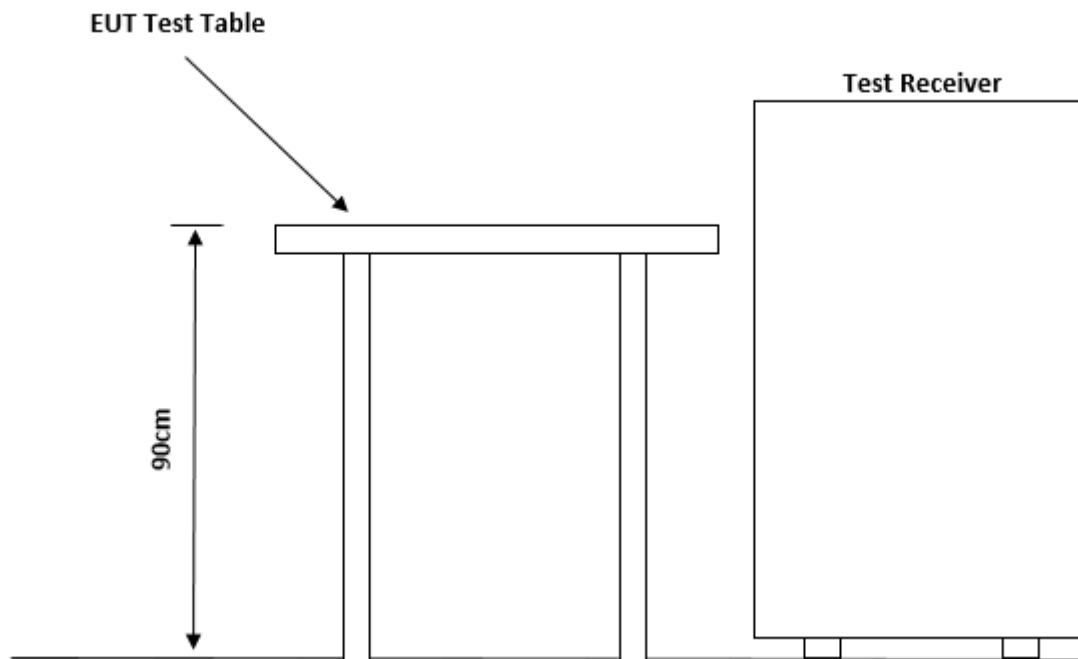
Details	Description
Frequency Range (MHz)	2402 – 2480
Modulation	GFSK, $\pi/4$ DQPSK, 8DPSK
Number of Channels	79
Tested Channels	0,39,78
DUT Antenna Type	Non-detachable PCB trace
DUT Antenna Gain	1.75dBi ☒ Provided by Customer ☐ Not Provided by Customer

DUT S/N	AH21071501-HAR-127-1
DUT Operating Mode	Bluetooth Test Mode
DUT Operating Voltage	12V
Test Item	FCC 15.247 Bluetooth Classic
Comment	Meets Requirements
Start Date	08-30-2021
End Date	04-07-2022
Tested By	Aravind Buddana

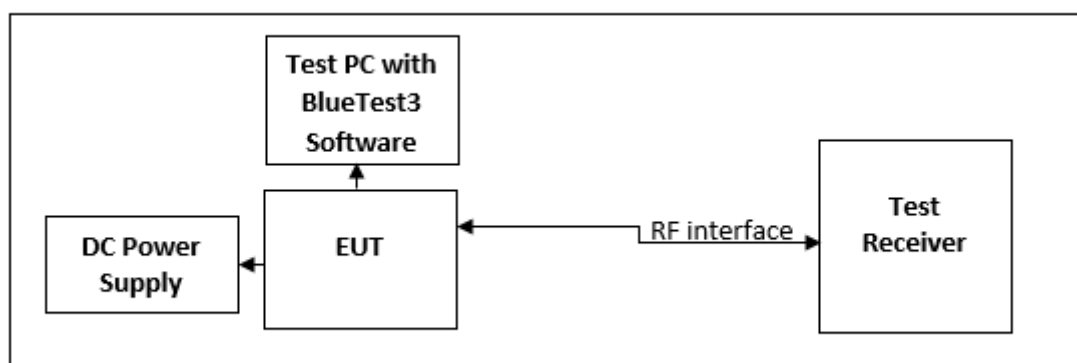
Test Setup

Conducted Test Site Description

The site is accommodated to test tabletop and floor standing test equipment.



TEST SETUP DIAGRAM



Test Equipment Used

ID #	Equipment	Manufacturer	Model #	Serial #	Cal Due
BVD0226	Spectrum Analyzer 10Hz-44GHz	Rohde & Schwarz	FSV3044	101018	1/14/2023
BVD0227	8 port switch unit for Wireless Test system	Rohde & Schwarz	OSP150	101100	12/17/2022
BVD0228	8 port switch unit for Wireless Test system	Rohde & Schwarz	OSP220	101632	12/16/2022
BVD0224	Signal Generator 100kHz-40GHz	Rohde & Schwarz	SMB100A	181741	11/19/2022
BVD0225	Signal Generator 100k-6GHz with GPS simulator	Rohde & Schwarz	SMW200A	107664	11/18/2022
BVD0250	Wireless Connectivity Tester 70M-6GHz	Rohde & Schwarz	CMW270	102113	11/18/2022
BVD0343	DC Regulated Power Supply	Circuit Specialists, INC	CSI3020X	595215	N/A
BVD0321	Fixed Attenuator 2W 20Db -40GHz	Mini-Circuits	BW-K20-2W44+	2103	03/21/2023
BVD0229	Temp and Humidity Meter	Fluke	971	12001009	04/25/2022
BVD0164	Multimeter	Fluke	287	46320236	03/06/2023
N/A	Test-PC	Lenovo ThinkPad	E560	PF0L0N9R	N/A

Notes:- DC power supply verified before use with calibrated Multimeter.

Test Equipment (Software)

ID #	Equipment	Manufacturer	Model	Version No.
N/A	EMC Test Software	Rodhe & Schwarz	EMC32	11.20.00

Customer Supplied Equipment / Software's

ID #	Equipment	Manufacturer	Model	Serial #	Version No.
N/A	BlueTest3 Software	Qualcomm	N/A	N/A	2.6.8
N/A	CSR USB-SPI	CSR	N/A	N/A	N/A

FCC 15.247 Bluetooth Classic

DUT Information

DUT Name:	BTT55L
Manufacturer:	Harman International Industries, Inc.
Serial Number:	AH21071501-HAR-127-1

79 channels are provided for BT mode:

Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)
0	2402	20	2422	40	2442	60	2462
1	2403	21	2423	41	2443	61	2463
2	2404	22	2424	42	2444	62	2464
3	2405	23	2425	43	2445	63	2465
4	2406	24	2426	44	2446	64	2466
5	2407	25	2427	45	2447	65	2467
6	2408	26	2428	46	2448	66	2468
7	2409	27	2429	47	2449	67	2469
8	2410	28	2430	48	2450	68	2470
9	2411	29	2431	49	2451	69	2471
10	2412	30	2432	50	2452	70	2472
11	2413	31	2433	51	2453	71	2473
12	2414	32	2434	52	2454	72	2474
13	2415	33	2435	53	2455	73	2475
14	2416	34	2436	54	2456	74	2476
15	2417	35	2437	55	2457	75	2477
16	2418	36	2438	56	2458	76	2478
17	2419	37	2439	57	2459	77	2479
18	2420	38	2440	58	2460	78	2480
19	2421	39	2441	59	2461		

Notes: The channels 0, 39 and 78 were selected as representative test channels.

Antenna gain	1.75dBi ☒ Provided by Customer ☐ Not Provided by Customer
Number of transmit chains	1
Equipment type	Frequency Hopping Spread Spectrum

Test Results Summary

AH21071501-HAR-127-1

Test	Frequency (MHz)	DH1 Result	DH3 Result	DH5 Result	2-DH1 Result	2-DH3 Result	2-DH5 Result	3-DH1 Result	3-DH3 Result	3-DH5 Result
RF Output Power	--- (hopping)	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
Hopping Frequencies	--- (hopping)	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
Band Edge High	--- (hopping)	--	Pass	--	--	--	Pass	--	--	Pass
Carrier Frequency Separation	2402.000 (hopping)	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
Carrier Frequency Separation	2480.000 (hopping)	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
Time of Channel Occupancy	2402.000 (hopping)	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
Time of Channel Occupancy	2441.000 (hopping)	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
Time of Channel Occupancy	2480.000 (hopping)	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
Emissions Bandwidth 20dB	2402.000 (single)	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
Occupied Channel Bandwidth 99%	2402.000 (single)	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
Band Edge Low	2402.000 (single)	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
Peak Output Power	2402.000 (single)	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
Tx Spurious	2402.000 (single)	--	Pass	--	--	--	--	--	--	--
Emissions Bandwidth 20dB	2441.000 (single)	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
Occupied Channel Bandwidth 99%	2441.000 (single)	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
Peak Output Power	2441.000 (single)	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
Tx Spurious	2441.000 (single)	--	Pass	--	--	--	--	--	--	--
Emissions Bandwidth 20dB	2480.000 (single)	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
Occupied Channel Bandwidth 99%	2480.000 (single)	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
Band Edge High	2480.000 (single)	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
Peak Output Power	2480.000 (single)	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
Tx Spurious	2480.000 (single)	--	Pass	--	--	--	--	--	--	--

RF Output Power (Frequency Independent) – For Reference Only

Test according to FCC title 47 part 15 §15.247(b), KDB 558074 D01 DTS Meas Guidance v05 and ANSI C63.10-2013 11.9.2.3.2.
Not mandatory.

Measurement uncertainty calculated in accordance with ETSI TR 100 028-1. Expanded Combined Uncertainty of absolute Level
Measurement ($K=2$) < 1 dB

All Power measurements performed in hopping mode.

Packet Type	Duty Cycle, %	Gated RMS (dBm)	Limit Max (dBm)
DH1	32.278	7.833	21.0
DH3	66.380	7.898	21.0
DH5	77.533	7.883	21.0
2-DH1	33.189	5.507	21.0
2-DH3	66.674	5.108	21.0
2-DH5	77.730	5.037	21.0
3-DH1	33.192	5.423	21.0
3-DH3	66.594	5.111	21.0
3-DH5	77.756	5.035	21.0

Packet type **DH3** has highest emission.

Number of Hopping Frequencies

Test according to FCC title 47 part 15 §15.247(a),(g), KDB 558074 D01 DTS Meas Guidance v05 9 and ANSI C63.10-2013 7.8.3

Channels

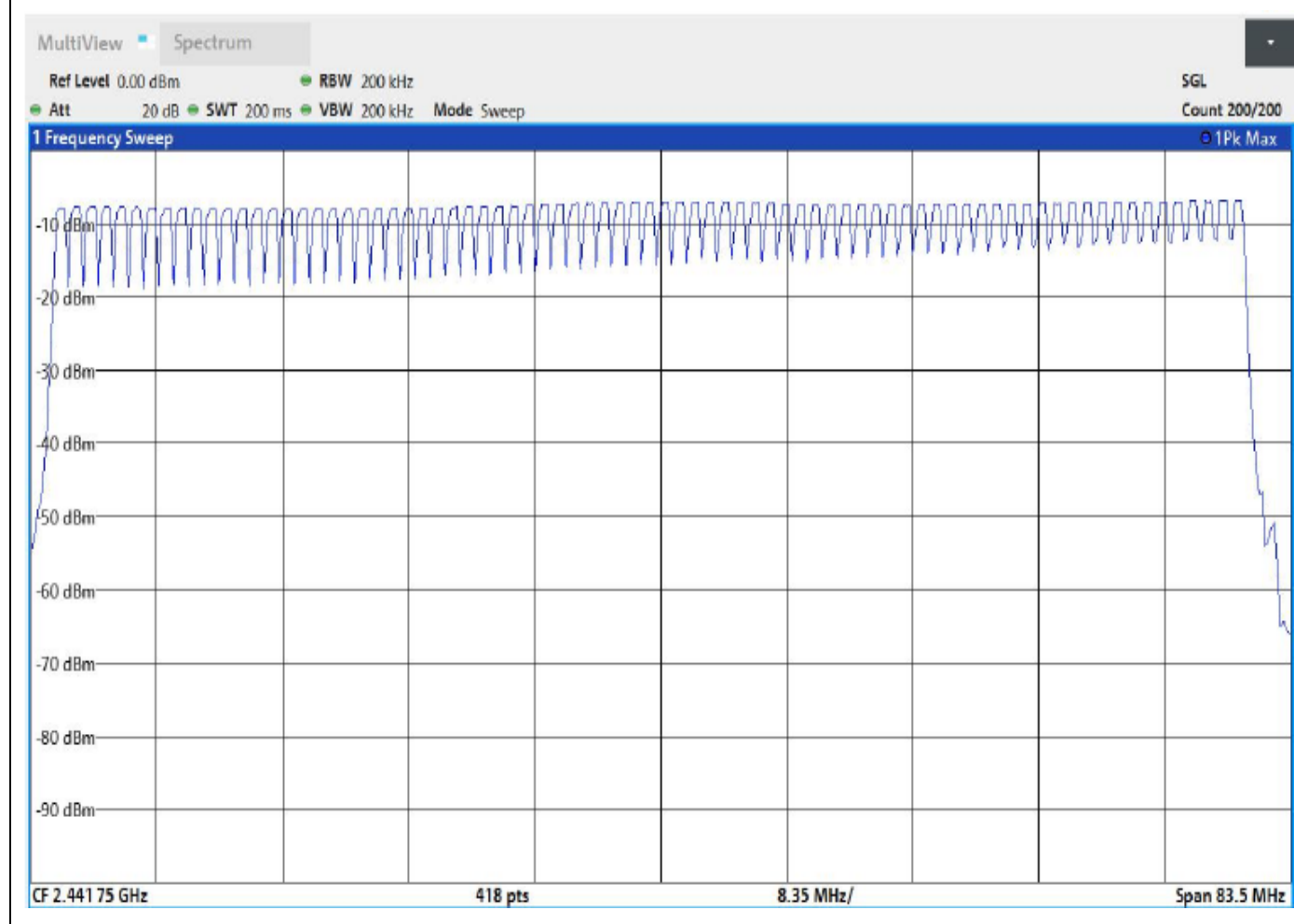
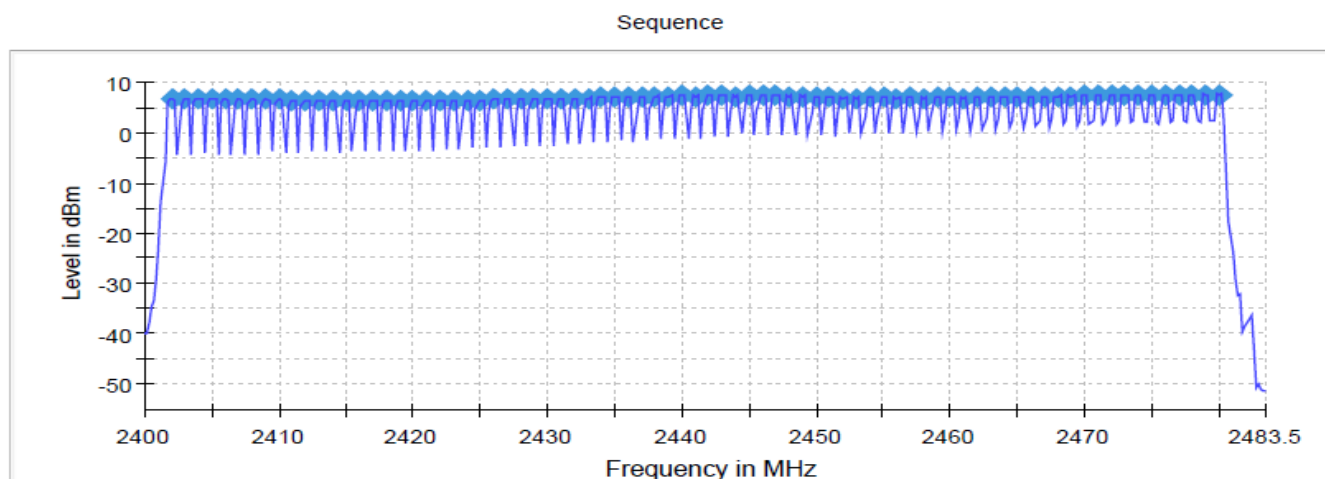
Channels	Limit Min	Result
79	16	PASS

Spectrum Analyzer Settings

Setting	Instrument Value	Target Value
Start Frequency	2.40000 GHz	2.40000 GHz
Stop Frequency	2.48350 GHz	2.48350 GHz
Span	83.500 MHz	83.500 MHz
RBW	200.000 kHz	<= 200.000 kHz
VBW	200.000 kHz	>= 200.000 kHz
SweepPoints	418	~ 418
Sweeptime	200.000 ms	200.000 ms
Reference Level	0.000 dBm	0.000 dBm
Attenuation	20.000 dB	20.000 dB
Detector	MaxPeak	MaxPeak
SweepCount	200	200
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
Sweeptype	Sweep	FFT
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.50 dB	0.50 dB
Run	9 / max. 10	max. 10
Stable	3 / 3	3
Max Stable Difference	0.12 dB	0.50 dB

Plots for DH3 Packet Type

Hopping Frequencies



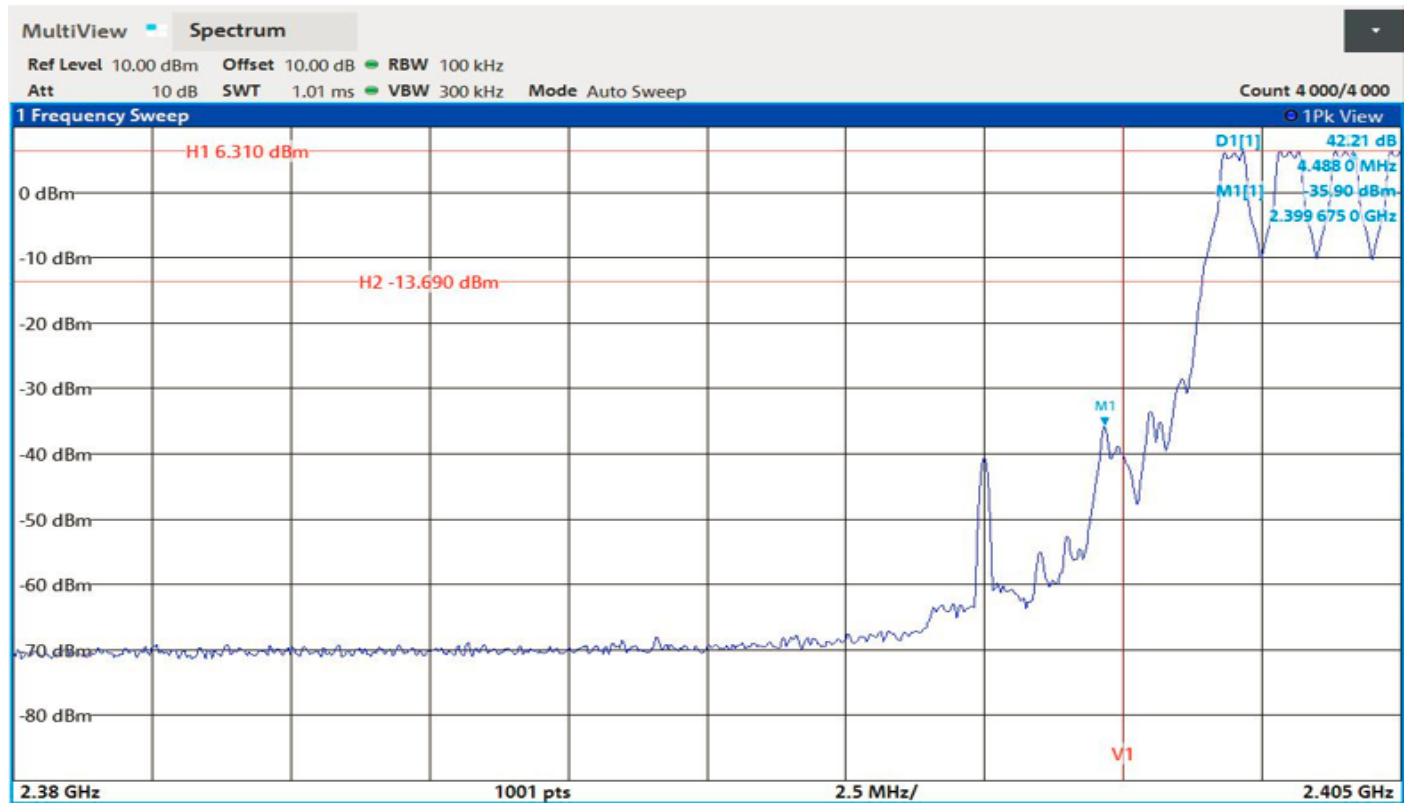
Band Edge (Hopping)

Test according to FCC title 47 part 15 §15.247(d), KDB 558074 D01 DTS Meas Guidance v05 and ANSI C63.10-2013 7.8.6

Measurement uncertainty calculated in accordance with ETSI TR 100 028-1. Expanded Uncertainty (K=2) < 0.8 dB

Packet Type	Frequency (MHz)	Level (dBm)
DH3 –LCH	2399.675000	6.310
DH3-HCH	2483.587700	7.080
2-DH5-LCH	2399.995000	4.130
2-DH5-HCH	2484.359600	5.450
3-DH5-LCH	2399.995000	4.260
3-DH5-HCH	2485.671100	5.480

BE Hopping DH3 LCH



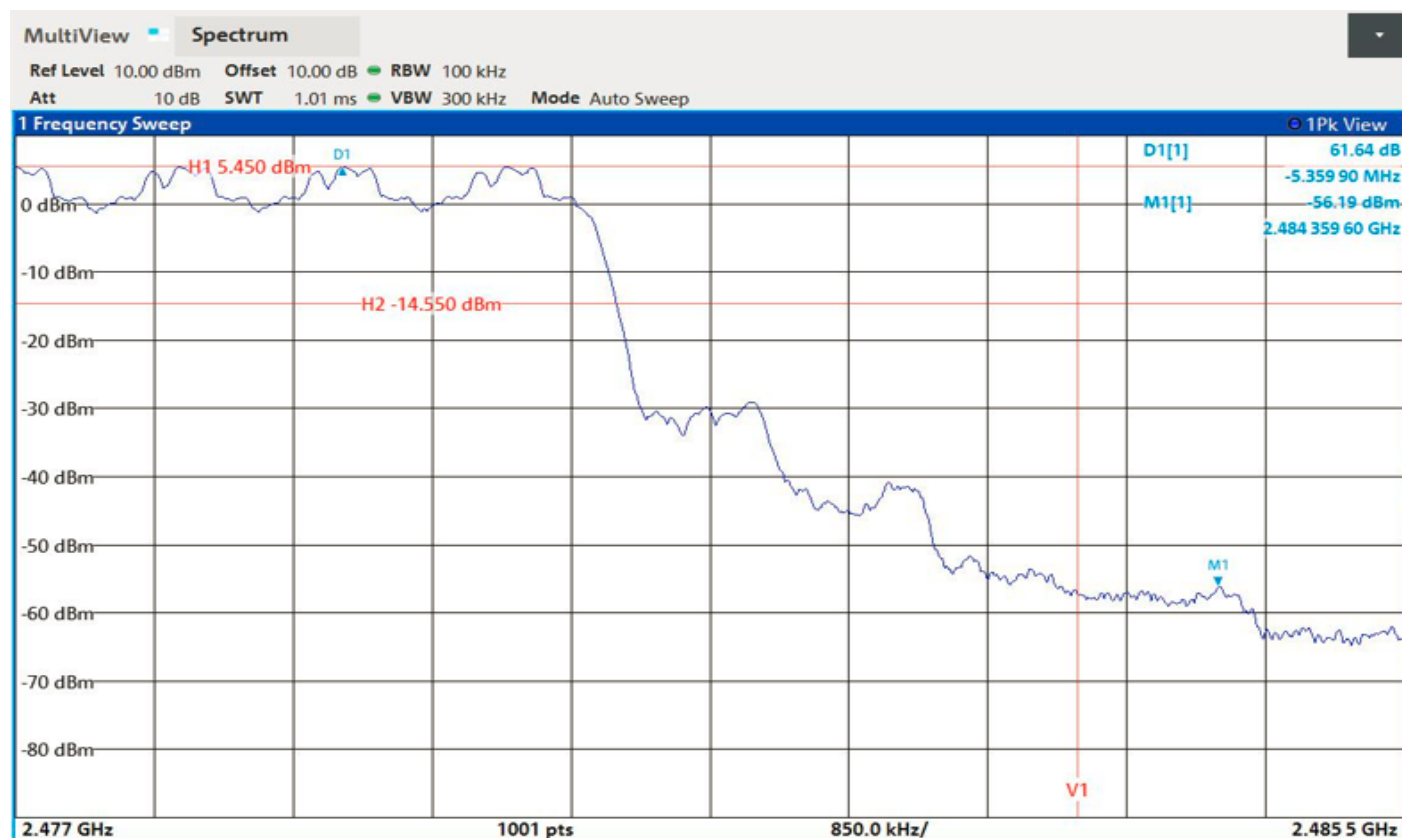
BE Hopping DH3 HCH



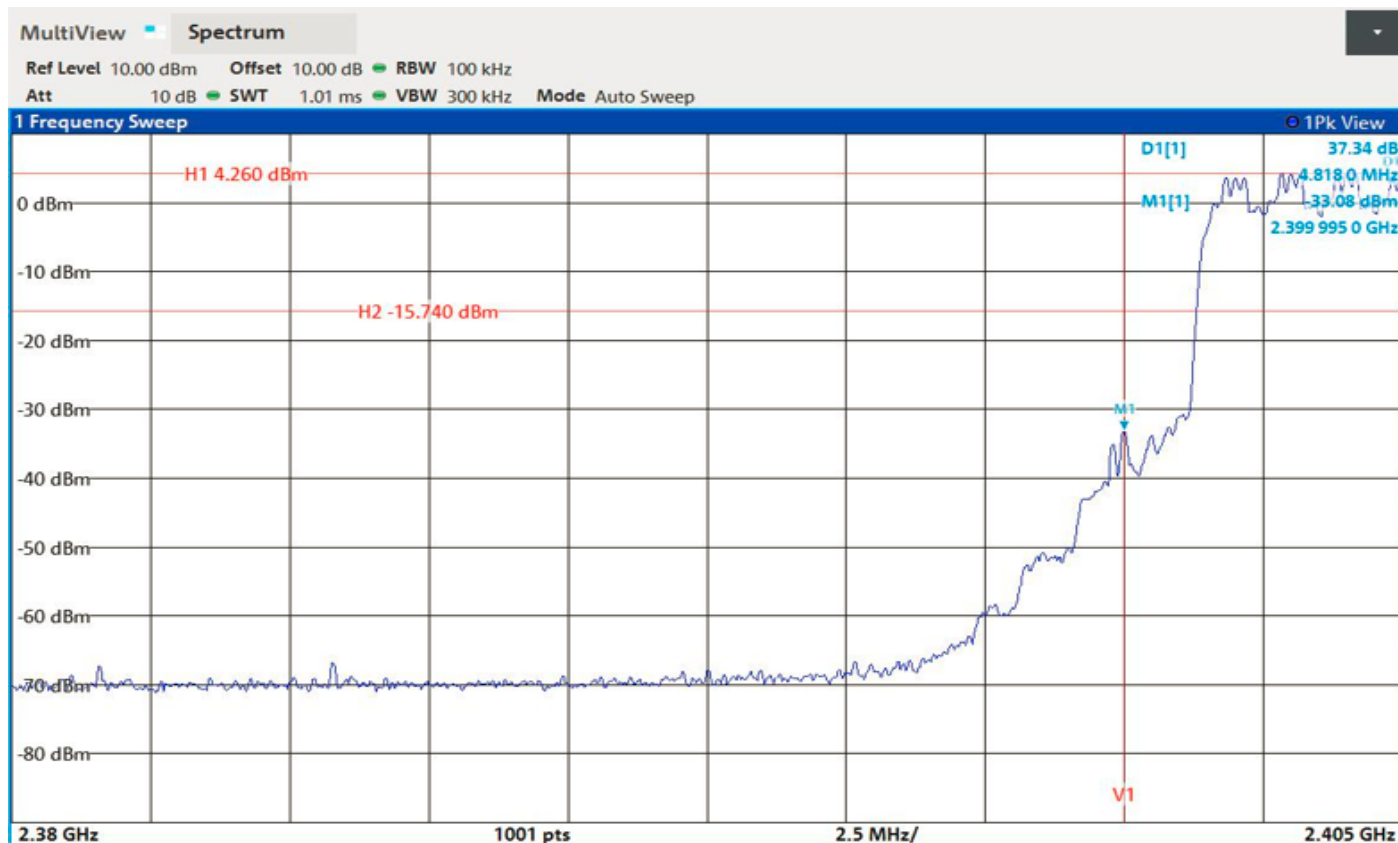
BE Hopping 2-DH5 LCH



BE Hopping 2-DH5 HCH



BE Hopping 3-DH5 LCH



BE Hopping 3-DH5 HCH



Carrier Frequency Separation

Test according to FCC title 47 part 15 §15.247(a), KDB 558074 D01 DTS Meas Guidance v05 9 and ANSI C63.10-2013 7.8.2

Measurement uncertainty calculated in accordance with ETSI TR 100 028-1. Expanded Uncertainty ($k = 2$) < 1%

Hopping Mode				
Packet Type	2402MHz		2480MHz	
	Frequency Separation (MHz)	Minimum Limit (MHz)	Frequency Separation (MHz)	Minimum Limit (MHz)
DH1	0.990099	0.666667	0.990099	0.666667
DH3	0.990099	0.666667	0.990099	0.666667
DH5	0.990099	0.666667	0.990099	0.666667
2-DH1	0.990099	0.666667	0.990099	0.666667
2-DH3	0.990099	0.666667	0.990099	0.666667
2-DH5	0.990099	0.666667	0.990099	0.666667
3-DH1	0.990099	0.666667	0.990099	0.666667
3-DH3	0.990099	0.666667	0.990099	0.666667
3-DH5	0.990099	0.666667	0.990099	0.666667

Spectrum Analyzer Settings for DH3 Packet Type

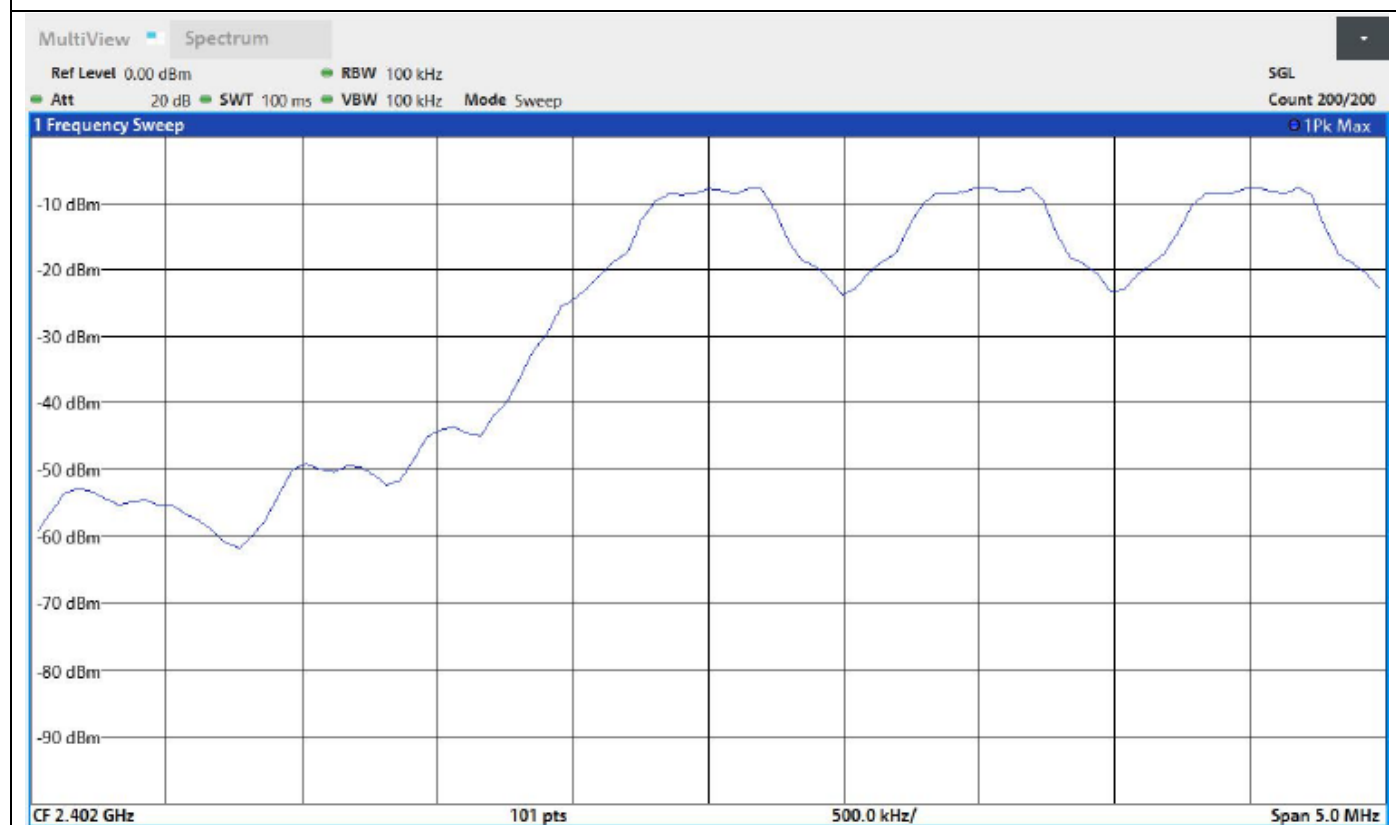
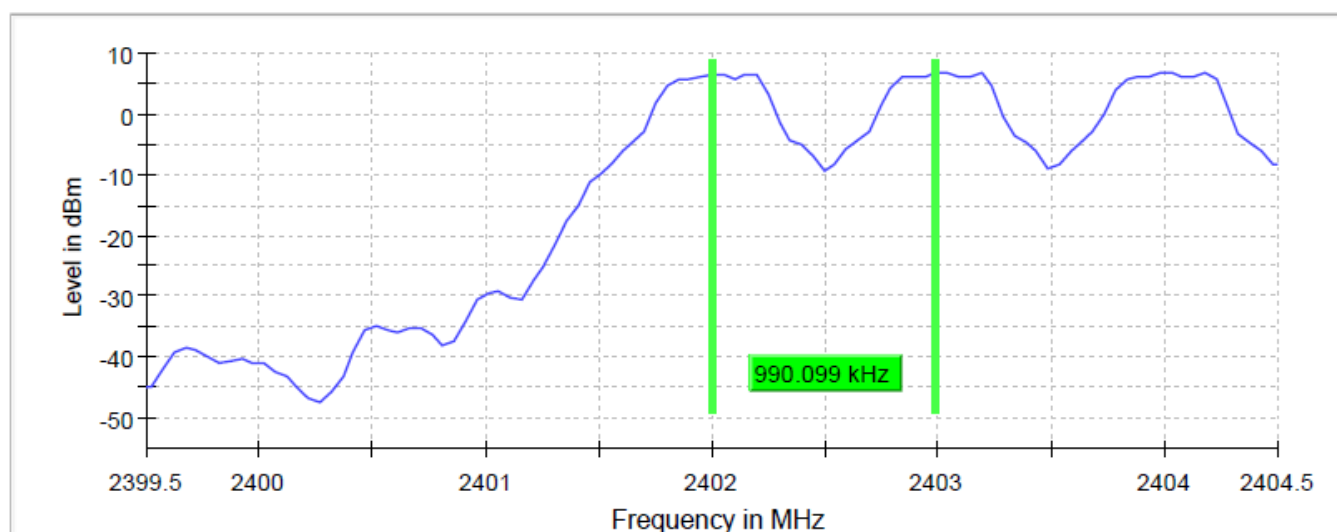
Setting	Instrument Value	Target Value
Start Frequency	2.39950 GHz	2.39950 GHz
Stop Frequency	2.40450 GHz	2.40450 GHz
Span	5.000 MHz	5.000 MHz
RBW	100.000 kHz	<= 100.000 kHz
VBW	100.000 kHz	>= 100.000 kHz
SweepPoints	101	~ 50
SweepTime	100.000 ms	100.000 ms
Reference Level	0.000 dBm	0.000 dBm
Attenuation	20.000 dB	20.000 dB
Detector	MaxPeak	MaxPeak
SweepCount	200	200
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
SweepType	Sweep	FFT
Preamp	off	off
Stablemode	Trace	Trace

Stablevalue	0.50 dB	0.50 dB
Run	18 / max. 50	max. 50
Stable	10 / 10	10
Max Stable Difference	0.24 dB	0.50 dB

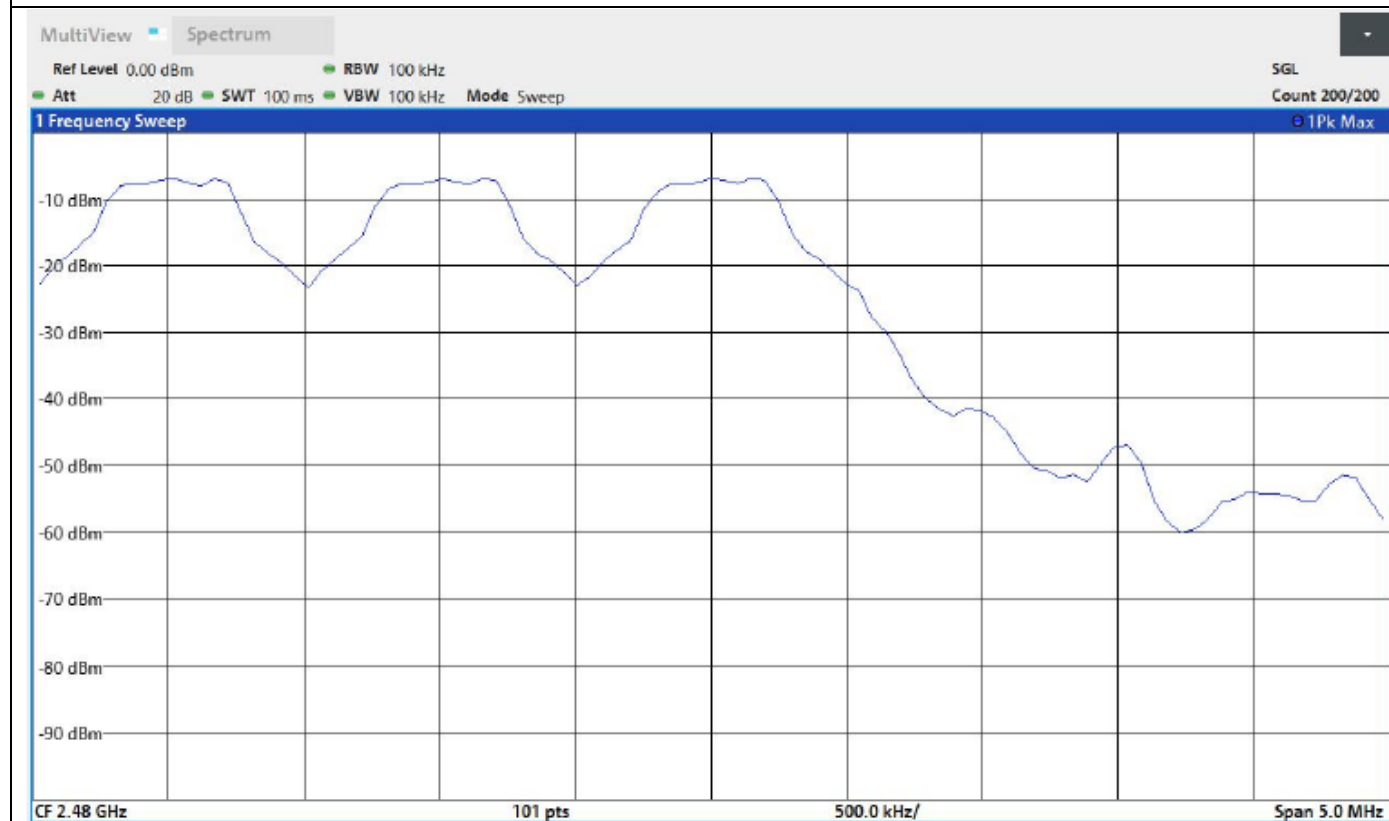
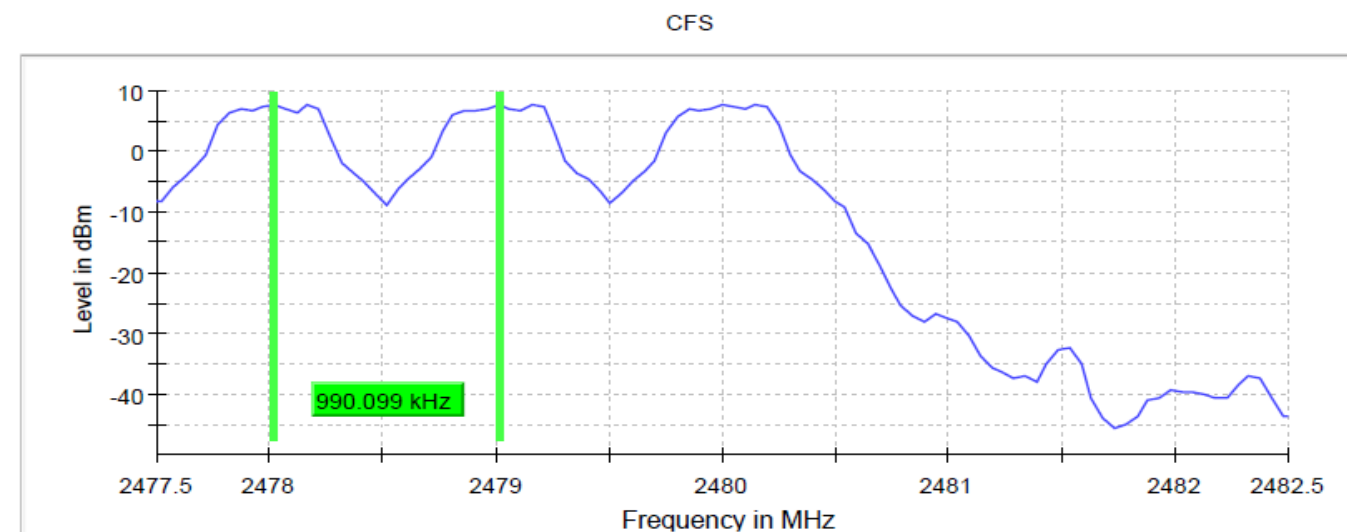
Plots for DH3 Packet Type

2402MHz – DH3

CFS



2480MHz- DH3



Time of Channel Occupancy

Test according to FCC title 47 part 15 §15.247(a), KDB 558074 D01 DTS Meas Guidance v05 and ANSI C63.10-2013 7.8.4

Measurement uncertainty calculated in accordance with ETSI TR 100 028-1. Expanded Uncertainty (K=2) < 1%

2402MHz			
Packet Type	Time (ms)	Limit Max (ms)	Result
DH1	131.780	400.000	PASS
DH3	266.750	400.000	PASS
DH5	282.790	400.000	PASS
2-DH1	133.910	400.000	PASS
2-DH3	250.020	400.000	PASS
2-DH5	348.800	400.000	PASS
3-DH1	135.410	400.000	PASS
3-DH3	272.490	400.000	PASS
3-DH5	321.430	400.000	PASS

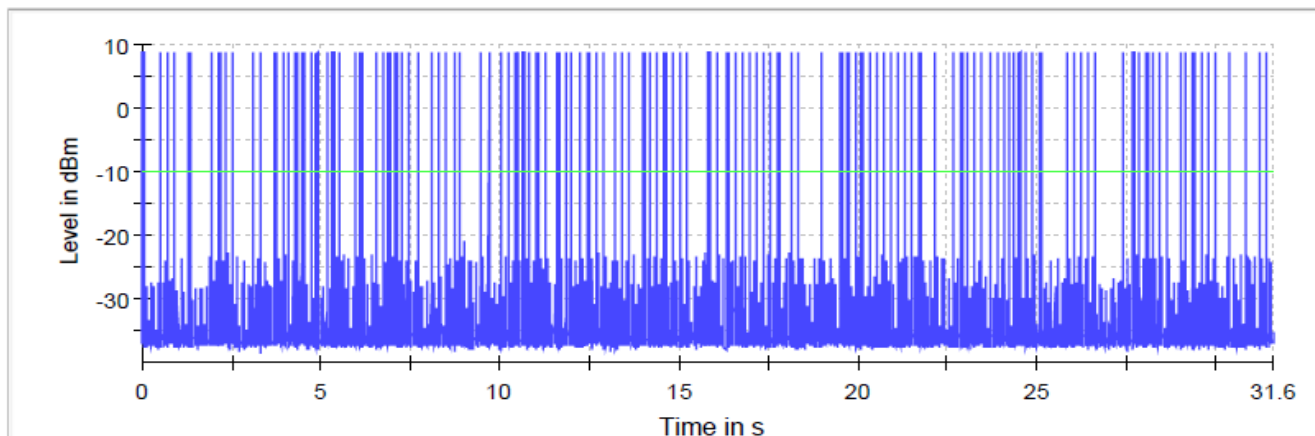
Spectrum Analyzer Settings for 2402MHz

Setting	Instrument Value	Target Value
Center Frequency	2.40200 GHz	2.40200 GHz
Span	ZeroSpan	ZeroSpan
RBW	500.000 kHz	~ 500.000 kHz
VBW	1.000 MHz	~ 1.500 MHz
SweepPoints	30001	~ 30001
Sweeptime	31.600 s	31.600 s
Reference Level	0.000 dBm	0.000 dBm
Attenuation	20.000 dB	20.000 dB
Detector	MaxPeak	MaxPeak
SweepCount	1	1
Filter	Channel	Channel
Trace Mode	Clear Write	Clear Write
Sweeptype	Sweep	AUTO
Preamplifier	off	off
Trigger	External	External
Trigger Offset	0.000 s	0.000 s

Plots for 2402MHz

2402MHz – DH3

Time of Channel Occupancy



Trace Threshold

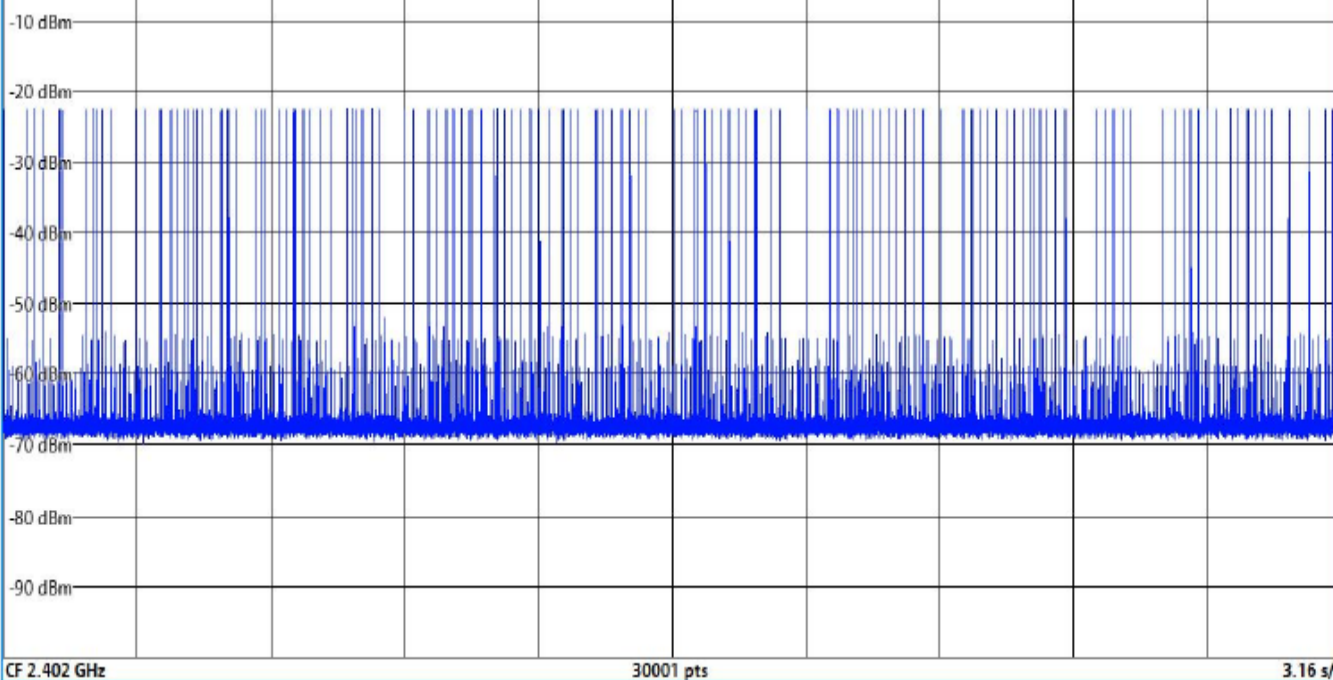
MultiView Spectrum

Ref Level 0.00 dBm RBW (CHAN) 500 kHz
Att 20 dB SWT 31.6 s VBW 1 MHz

5GL
Count 1/1

1 Zero Span

1Pk Clrw



CF 2.402 GHz

30001 pts

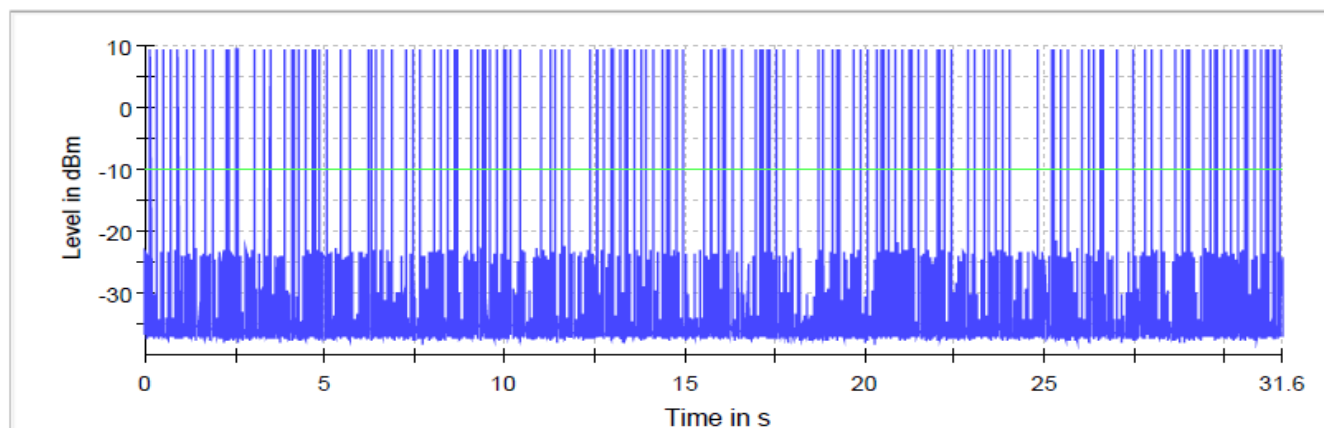
3.16 s/

2441MHz

Packet Type	Time (ms)	Limit Max (ms)	Result
DH1	131.850	400.000	PASS
DH3	276.840	400.000	PASS
DH5	341.240	400.000	PASS
2-DH1	134.730	400.000	PASS
2-DH3	258.850	400.000	PASS
2-DH5	294.290	400.000	PASS
3-DH1	135.380	400.000	PASS
3-DH3	271.030	400.000	PASS
3-DH5	342.130	400.000	PASS

Plots for 2441MHz – DH3

Time of Channel Occupancy



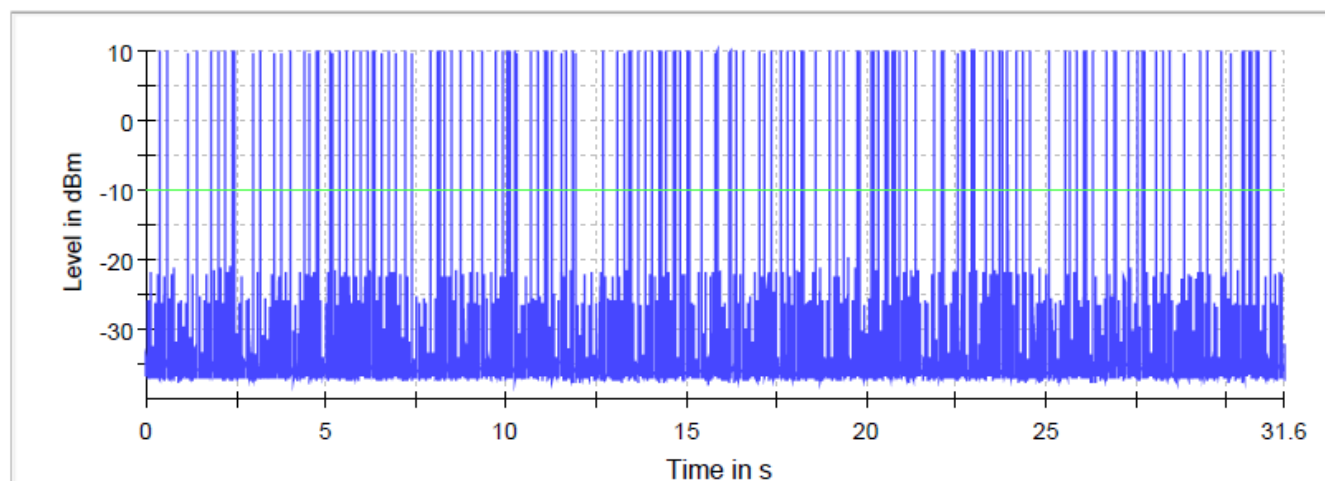
Trace Threshold

2480MHz

Packet Type	Time (ms)	Limit Max (ms)	Result
DH1	131.870	400.000	PASS
DH3	258.540	400.000	PASS
DH5	317.850	400.000	PASS
2-DH1	135.430	400.000	PASS
2-DH3	251.050	400.000	PASS
2-DH5	309.300	400.000	PASS
3-DH1	135.460	400.000	PASS
3-DH3	256.110	400.000	PASS
3-DH5	312.920	400.000	PASS

Plots for 2480MHz – DH3

Time of Channel Occupancy



Trace Threshold

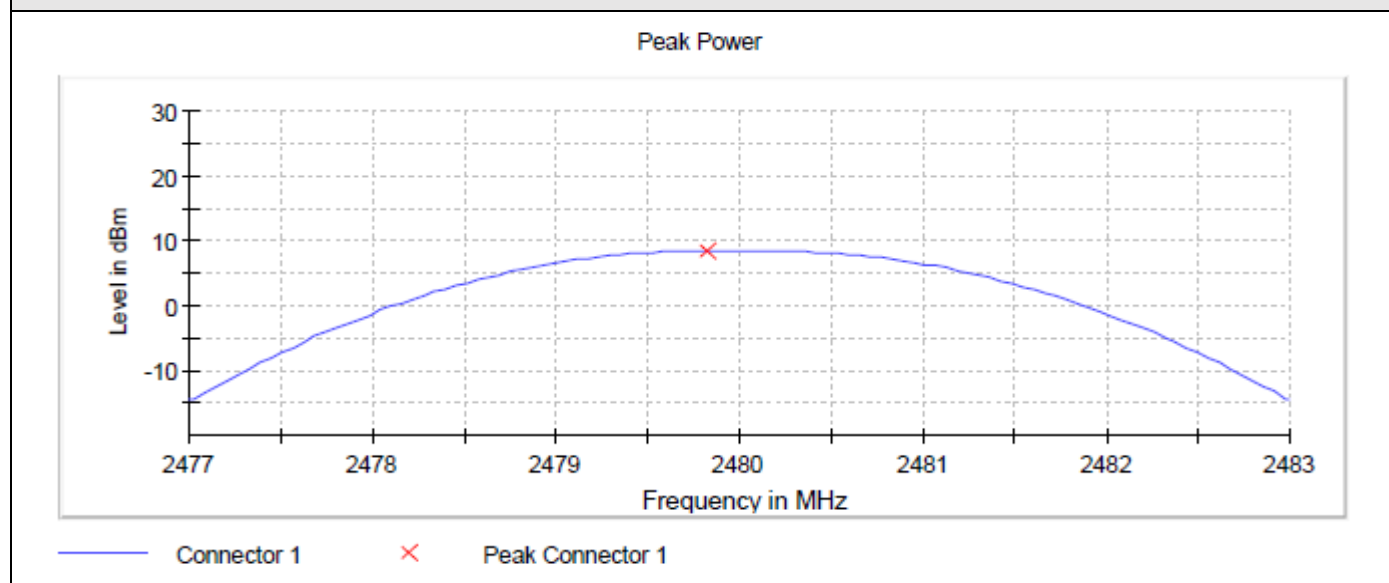
Peak Output Power

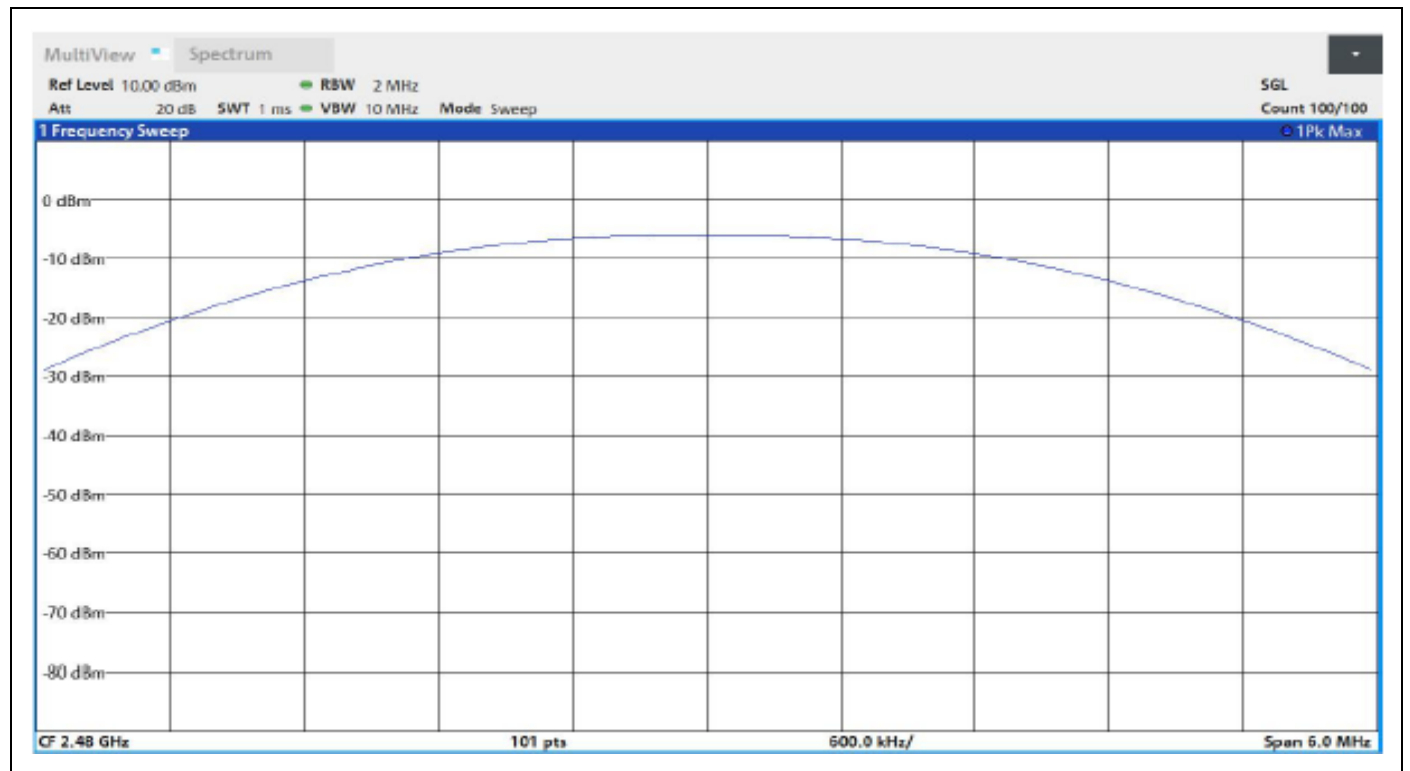
Test according to FCC title 47 part 15 §15.247(b), KDB 558074 D01 DTS Meas Guidance v05 and ANSI C63.10-2013 7.8.5

Measurement uncertainty calculated in accordance with ETSI TR 100 028-1. Expanded Combined Uncertainty of absolute Level Measurement (K=2) < 1 dB

Packet Type	2402 MHz	2441 MHz	2480 MHz	Limit dBm
DH1	7.509	8.143	8.439	21.0
DH3	7.541	8.165	8.458	21.0
DH5	7.505	8.142	8.433	21.0
2-DH1	5.760	6.841	7.366	21.0
2-DH3	5.905	6.906	7.440	21.0
2-DH5	5.886	6.914	7.452	21.0
3-DH1	6.149	7.140	7.625	21.0
3-DH3	6.216	7.217	7.695	21.0
3-DH5	6.209	7.191	7.677	21.0

2480MHz DH3 Plots are shown below





Emission Bandwidth 20dB

Test according to FCC title 47 part 15 §15.247(a), KDB 558074 D01 DTS Meas Guidance v05 and ANSI C63.10-2013 7.8.7

Measurement uncertainty calculated in accordance with ETSI TR 100 028-1. Expanded Uncertainty (K=2) < 2%

Measurements for 2402MHz

Packet Type	Bandwidth (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)	Result
DH1	0.950496	2401.524752	2402.475248	PASS
DH3	0.980198	2401.524752	2402.504950	PASS
DH5	0.980198	2401.524752	2402.504950	PASS
2-DH1	1.306930	2401.346535	2402.653465	PASS
2-DH3	1.336633	2401.346535	2402.683168	PASS
2-DH5	1.306930	2401.346535	2402.653465	PASS
3-DH1	1.277227	2401.376238	2402.653465	PASS
3-DH3	1.306930	2401.346535	2402.653465	PASS
3-DH5	1.336633	2401.316832	2402.653465	PASS

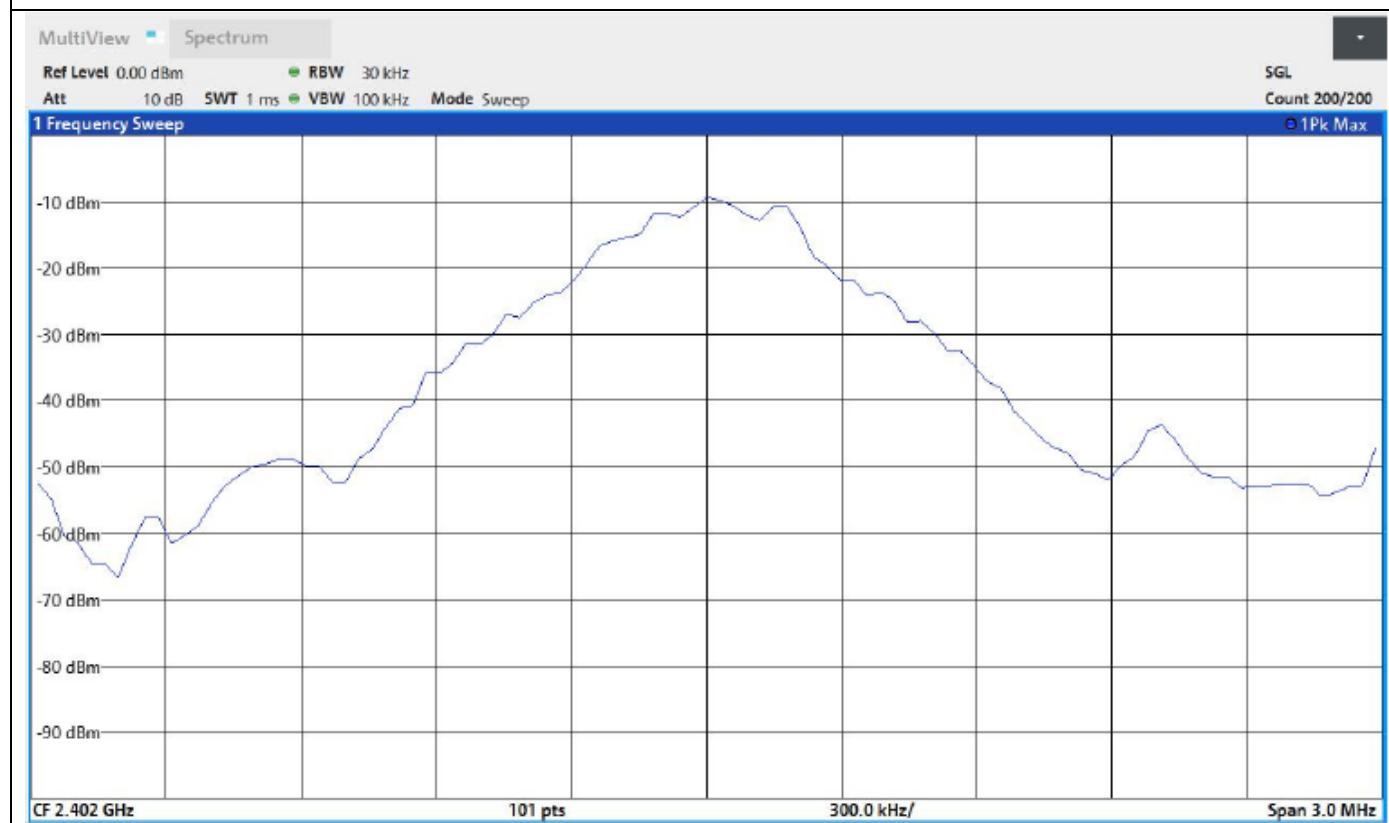
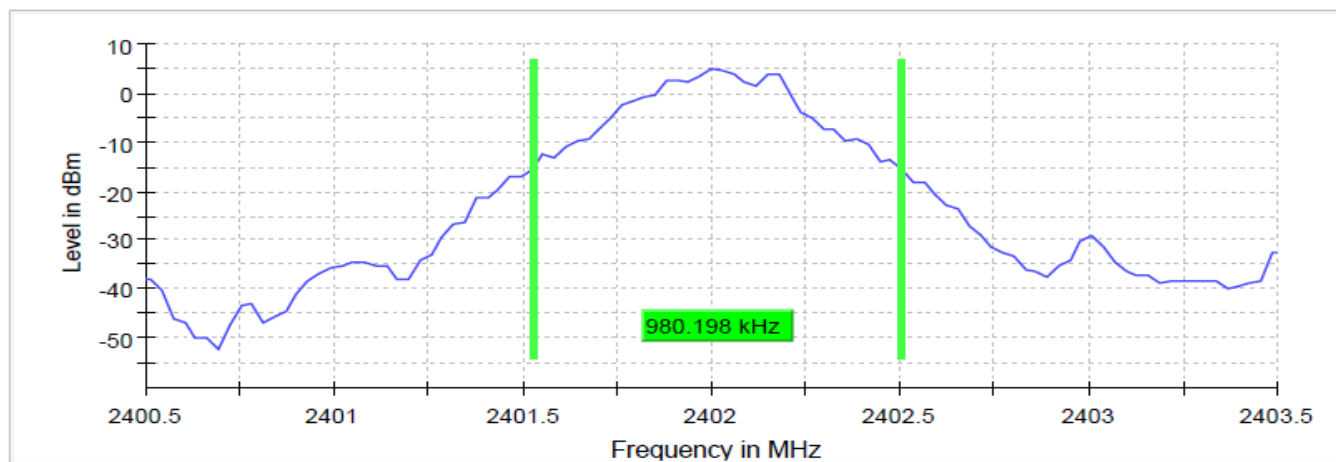
Spectrum Analyzer Settings for 2402MHz

Setting	Instrument Value	Target Value
Start Frequency	2.40050 GHz	2.40050 GHz
Stop Frequency	2.40350 GHz	2.40350 GHz
Span	3.000 MHz	3.000 MHz
RBW	30.000 kHz	>= 30.000 kHz
VBW	100.000 kHz	>= 90.000 kHz
SweepPoints	101	~ 101
SweepTime	1.000 ms	AUTO
Reference Level	0.000 dBm	0.000 dBm
Attenuation	10.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	200	200
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
SweepType	Sweep	AUTO
Preamplifier	off	off
Stablemode	Trace	Trace
Stablevalue	0.50 dB	0.50 dB
Run	9 / max. 150	max. 150
Stable	5 / 5	5
Max Stable Difference	0.00 dB	0.50 dB

Plots for 2402MHz

2402MHz- DH3

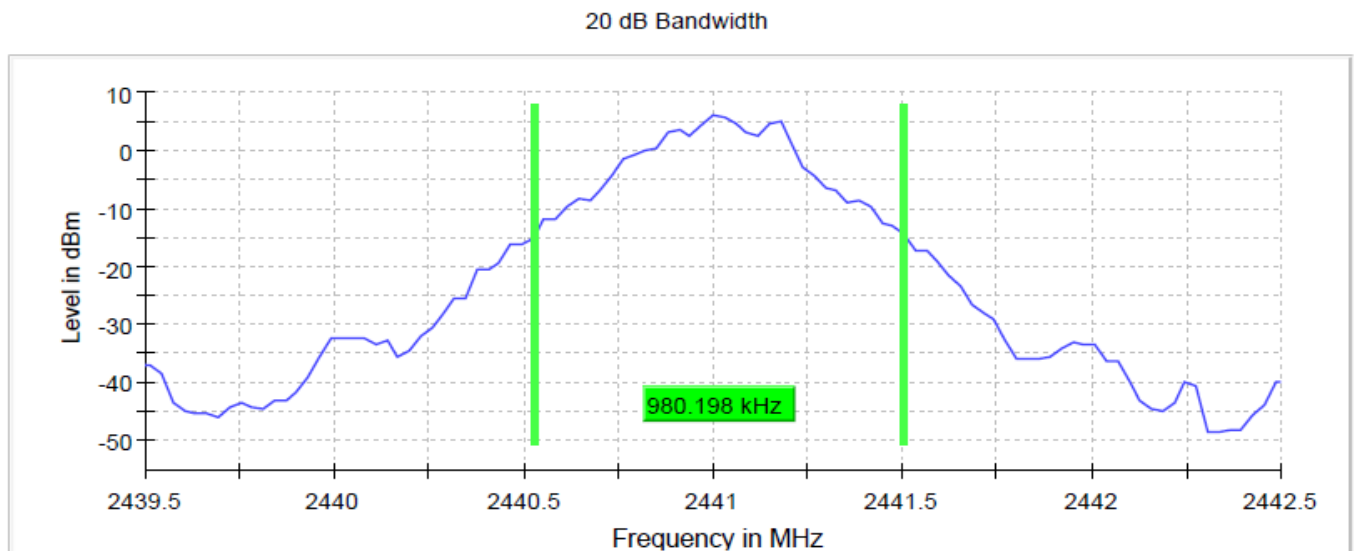
20 dB Bandwidth



Measurements for 2441MHz

Packet Type	Bandwidth (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)	Result
DH1	0.950496	2440.524752	2441.475248	PASS
DH3	0.980198	2440.524752	2441.504950	PASS
DH5	0.980198	2440.524752	2441.504950	PASS
2-DH1	1.277227	2440.346535	2441.623762	PASS
2-DH3	1.336633	2440.346535	2441.683168	PASS
2-DH5	1.306930	2440.346535	2441.653465	PASS
3-DH1	1.277227	2440.376238	2441.653465	PASS
3-DH3	1.306930	2440.346535	2441.653465	PASS
3-DH5	1.306930	2440.346535	2441.653465	PASS

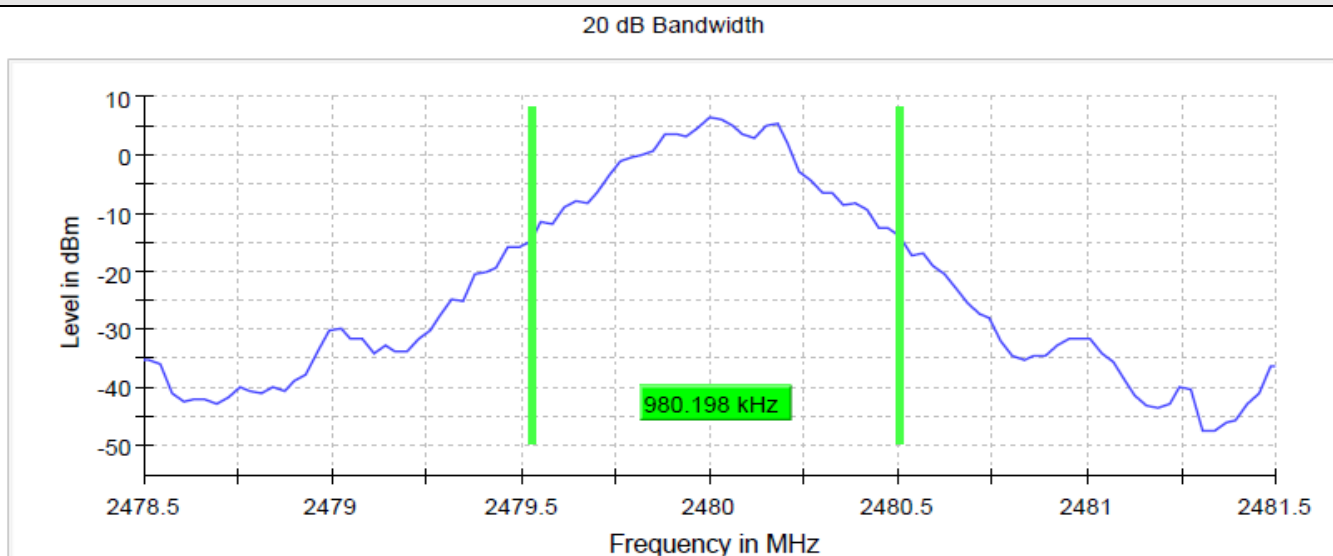
Plots for 2441MHz –DH3



Measurements for 2480MHz

Packet Type	Bandwidth (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)	Result
DH1	0.950496	2479.524752	2480.475248	PASS
DH3	0.980198	2479.524752	2480.504950	PASS
DH5	0.980198	2479.524752	2480.504950	PASS
2-DH1	1.277227	2479.346535	2480.623762	PASS
2-DH3	1.336633	2479.346535	2480.683168	PASS
2-DH5	1.336633	2479.346535	2480.683168	PASS
3-DH1	1.277227	2479.376238	2480.653465	PASS
3-DH3	1.306930	2479.346535	2480.653465	PASS
3-DH5	1.366336	2479.316832	2480.683168	PASS

Plots for 2480MHz –DH3



Occupied Channel Bandwidth 99%

Test according to FCC title 47 part 15 §15.247(a), KDB 558074 D01 DTS Meas Guidance v05 and ANSI C63.10-2013 7.8.7

Measurement uncertainty calculated in accordance with ETSI TR 100 028-1. Expanded Uncertainty (K=2) < 2%

Measurements for 2402MHz

Packet Type	Bandwidth (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)	Result
DH1	0.850000	2401.587500	2402.437500	PASS
DH3	0.865000	2401.572500	2402.437500	PASS
DH5	0.870000	2401.567500	2402.437500	PASS
2-DH1	1.150000	2401.422500	2402.572500	PASS
2-DH3	1.170000	2401.417500	2402.587500	PASS
2-DH5	1.165000	2401.417500	2402.582500	PASS
3-DH1	1.145000	2401.437500	2402.582500	PASS
3-DH3	1.175000	2401.407500	2402.582500	PASS
3-DH5	1.185000	2401.402500	2402.587500	PASS

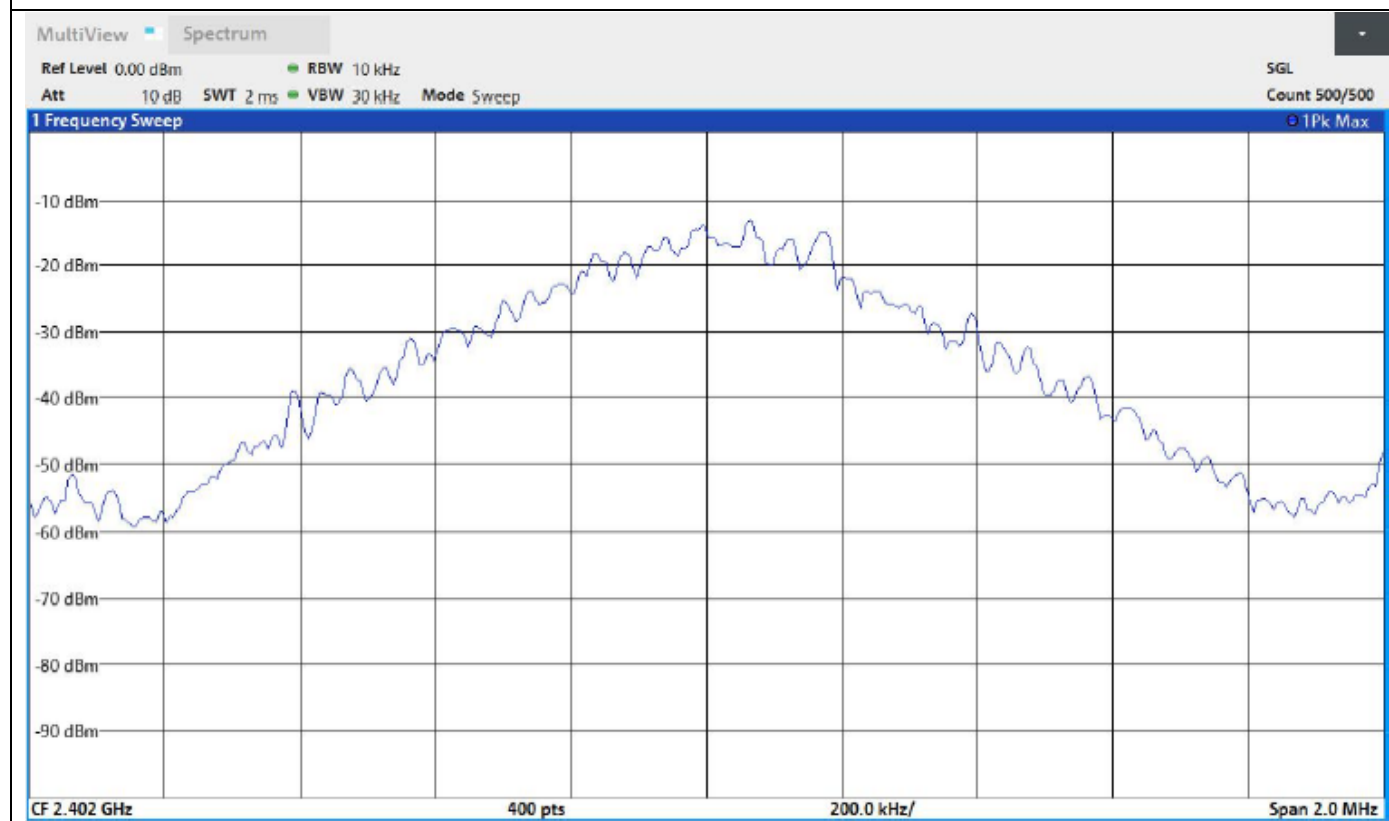
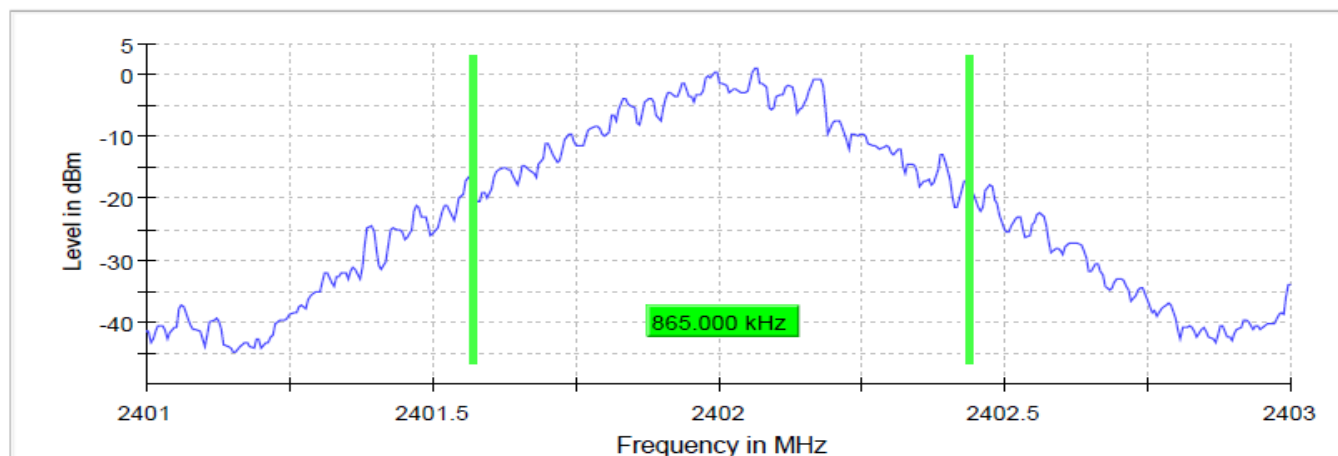
Spectrum Analyzer Settings for 2402MHz

Setting	Instrument Value	Target Value
Start Frequency	2.40100 GHz	2.40100 GHz
Stop Frequency	2.40300 GHz	2.40300 GHz
Span	2.000 MHz	2.000 MHz
RBW	10.000 kHz	>= 10.000 kHz
VBW	30.000 kHz	>= 30.000 kHz
SweepPoints	400	~ 400
Sweeptime	2.000 ms	AUTO
Reference Level	0.000 dBm	0.000 dBm
Attenuation	10.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	500	500
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
SweepType	Sweep	AUTO
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.30 dB	0.30 dB
Run	7 / max. 150	max. 150
Stable	3 / 3	3
Max Stable Difference	0.21 dB	0.30 dB

Plots for 2402MHz

2402MHz- DH3

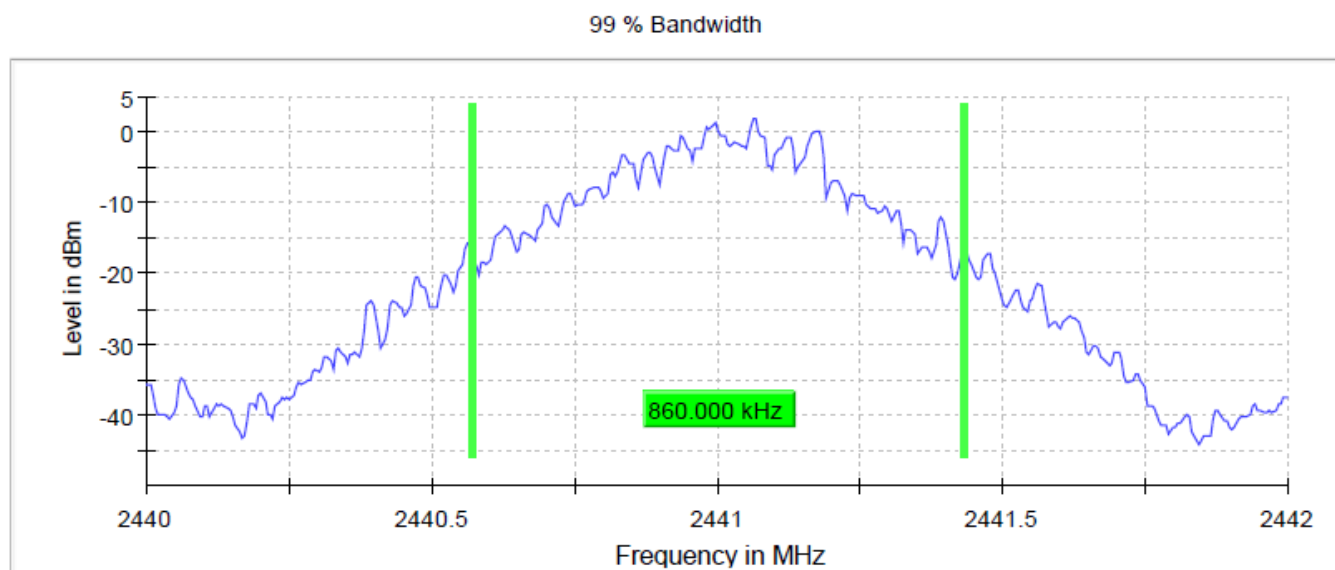
99 % Bandwidth



Measurements for 2441MHz

Packet Type	Bandwidth (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)	Result
DH1	0.850000	2440.587500	2441.437500	PASS
DH3	0.860000	2440.572500	2441.432500	PASS
DH5	0.870000	2440.567500	2441.437500	PASS
2-DH1	1.155000	2440.417500	2441.572500	PASS
2-DH3	1.175000	2440.417500	2441.592500	PASS
2-DH5	1.170000	2440.417500	2441.587500	PASS
3-DH1	1.155000	2440.432500	2441.587500	PASS
3-DH3	1.185000	2440.402500	2441.587500	PASS
3-DH5	1.190000	2440.402500	2441.592500	PASS

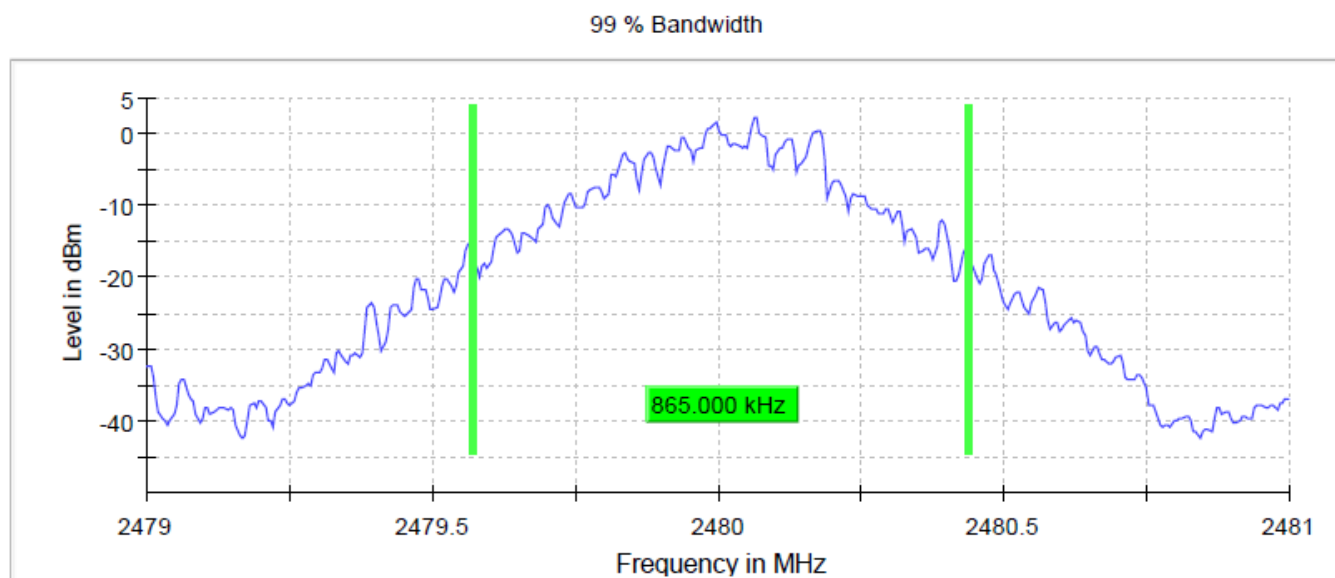
Plots for 2441MHz-DH3



Measurements for 2480MHz

Packet Type	Bandwidth (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)	Result
DH1	0.850000	2479.587500	2480.437500	PASS
DH3	0.865000	2479.572500	2480.437500	PASS
DH5	0.870000	2479.567500	2480.437500	PASS
2-DH1	1.165000	2479.412500	2480.577500	PASS
2-DH3	1.185000	2479.412500	2480.597500	PASS
2-DH5	1.180000	2479.412500	2480.592500	PASS
3-DH1	1.160000	2479.432500	2480.592500	PASS
3-DH3	1.195000	2479.397500	2480.592500	PASS
3-DH5	1.195000	2479.397500	2480.592500	PASS

Plots for 2480MHz-DH3



Band Edge Low (2402 MHz)

Test according to FCC title 47 part 15 §15.247(d), KDB 558074 D01 DTS Meas Guidance v05 and ANSI C63.10-2013 7.8.6

Measurement uncertainty calculated in accordance with ETSI TR 100 028-1. Expanded Uncertainty (K=2) < 0.8 dB

Packet Type	Frequency(MHz)	Level(dBm)
DH1	2402.025000	8.0
DH3	2402.175000	8.0
DH5	2402.025000	8.0
2-DH1	2402.025000	5.6
2-DH3	2402.025000	5.6
2-DH5	2402.025000	5.6
3-DH1	2402.025000	5.8
3-DH3	2402.025000	5.9
3-DH5	2402.025000	5.9

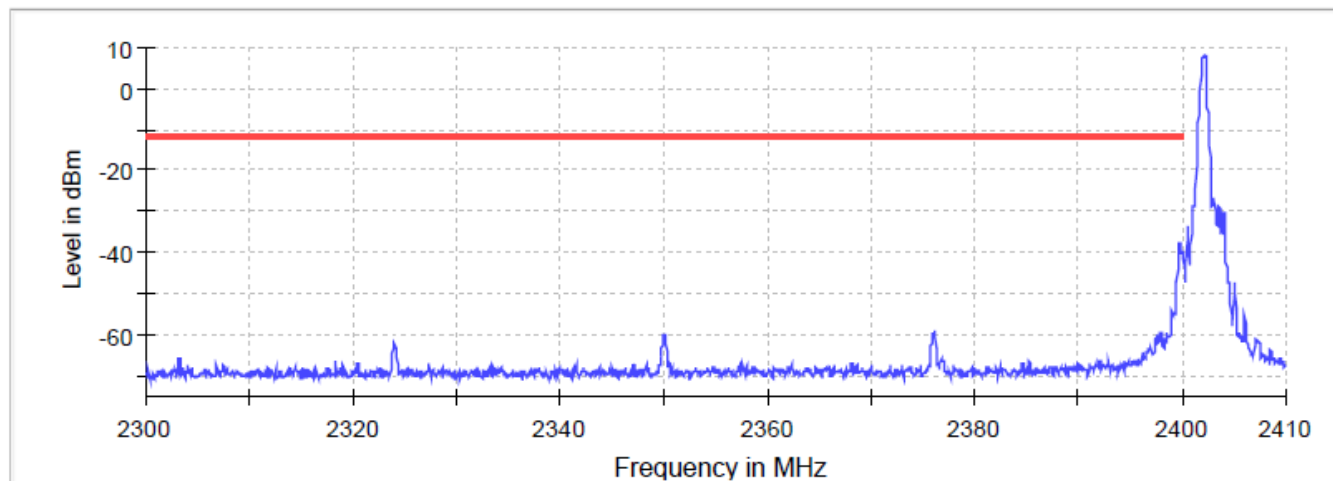
Spectrum Analyzer Settings

Setting	Instrument Value	Target Value
Start Frequency	2.30000 GHz	2.30000 GHz
Stop Frequency	2.41000 GHz	2.41000 GHz
Span	110.000 MHz	110.000 MHz
RBW	100.000 kHz	<= 100.000 kHz
VBW	300.000 kHz	>= 300.000 kHz
SweepPoints	2200	~ 2200
Sweptime	2.200 ms	AUTO
Reference Level	0.000 dBm	0.000 dBm
Attenuation	20.000 dB	20.000 dB
Detector	MaxPeak	MaxPeak
SweepCount	100	100
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
SweepType	Sweep	AUTO
Preamplifier	off	off
Stablemode	Trace	Trace
Stablevalue	0.50 dB	0.50 dB
Run	6 / max. 30	max. 30
Stable	3 / 3	3
Max Stable Difference	0.10 dB	0.50 dB

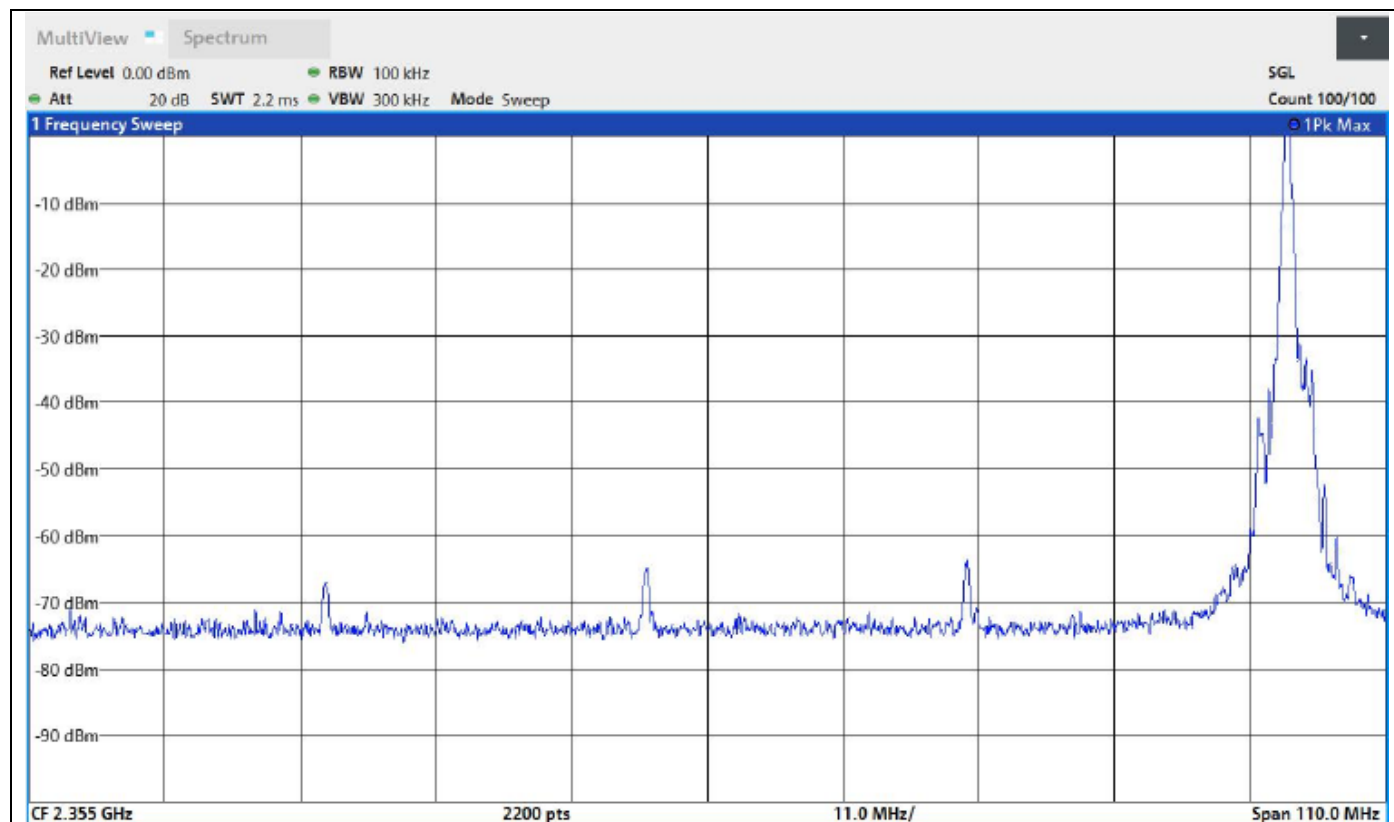
Measurements and Plots for 2402MHz-DH3

Frequency (MHz)	Level (dBm)	Margin (dB)	Limit (dBm)	Result
2399.675000	-37.7	25.7	-12.0	PASS
2399.725000	-37.7	25.7	-12.0	PASS
2399.625000	-38.9	26.9	-12.0	PASS
2399.775000	-38.9	26.9	-12.0	PASS
2399.925000	-40.0	28.0	-12.0	PASS
2399.975000	-40.0	28.0	-12.0	PASS
2399.875000	-40.1	28.1	-12.0	PASS
2399.825000	-40.4	28.5	-12.0	PASS
2399.575000	-41.7	29.8	-12.0	PASS
2399.525000	-44.4	32.4	-12.0	PASS
2399.475000	-47.4	35.4	-12.0	PASS
2399.425000	-50.6	38.6	-12.0	PASS
2399.375000	-53.4	41.4	-12.0	PASS
2399.025000	-54.1	42.2	-12.0	PASS
2398.975000	-54.2	42.2	-12.0	PASS

Band Edge



— Limit — Sum Level × Fail



Band Edge High (2480 MHz)

Test according to FCC title 47 part 15 §15.247(d), KDB 558074 D01 DTS Meas Guidance v05 and ANSI C63.10-2013 7.8.6

Measurement uncertainty calculated in accordance with ETSI TR 100 028-1. Expanded Uncertainty (K=2) < 0.8 dB

Packet Type	Frequency(MHz)	Level(dBm)
DH1	2480.025000	7.3
DH3	2480.175000	7.3
DH5	2480.025000	7.2
2-DH1	2480.025000	6.0
2-DH3	2480.025000	6.0
2-DH5	2480.025000	6.0
3-DH1	2479.875000	6.2
3-DH3	2480.175000	6.2
3-DH5	2480.025000	6.2

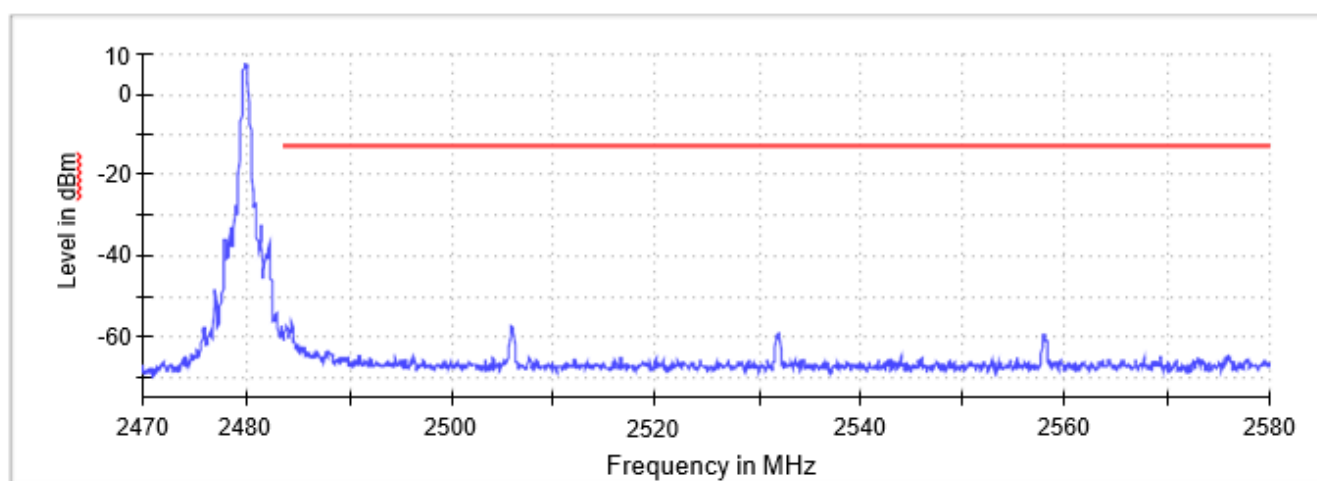
Spectrum Analyzer Settings

Setting	Instrument Value	Target Value
Start Frequency	2.47000 GHz	2.47000 GHz
Stop Frequency	2.58000 GHz	2.58000 GHz
Span	110.000 MHz	110.000 MHz
RBW	100.000 kHz	<= 100.000 kHz
VBW	300.000 kHz	>= 300.000 kHz
SweepPoints	2200	~ 2200
Sweptime	2.200 ms	AUTO
Reference Level	10.000 dBm	10.000 dBm
Attenuation	20.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	100	100
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
SweepType	Sweep	AUTO
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.50 dB	0.50 dB
Run	8 / max. 30	max. 30
Stable	3 / 3	3
Max Stable Difference	0.04 dB	0.50 dB

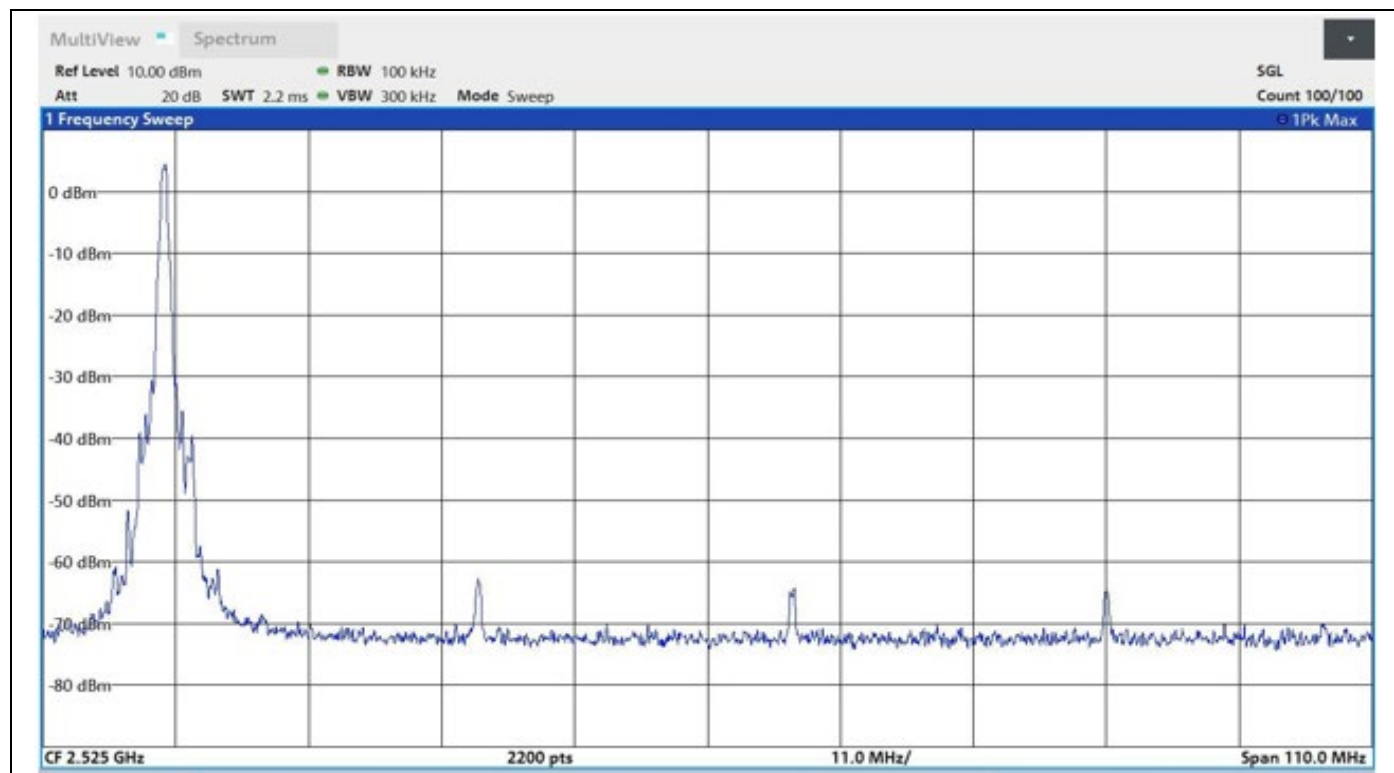
Measurements and Plots for 2480MHz-DH3

Frequency (MHz)	Level (dBm)	Margin (dB)	Limit (dBm)	Result
2484.475000	-56.3	43.7	-12.7	PASS
2484.525000	-56.3	43.7	-12.7	PASS
2483.525000	-57.6	45.0	-12.7	PASS
2484.075000	-57.7	45.0	-12.7	PASS
2484.025000	-57.7	45.0	-12.7	PASS
2506.025000	-57.7	45.0	-12.7	PASS
2483.575000	-57.8	45.1	-12.7	PASS
2484.575000	-57.8	45.2	-12.7	PASS
2484.425000	-58.0	45.4	-12.7	PASS
2505.975000	-58.2	45.5	-12.7	PASS
2506.075000	-58.2	45.6	-12.7	PASS
2484.125000	-58.3	45.6	-12.7	PASS
2483.975000	-58.4	45.7	-12.7	PASS
2506.125000	-58.4	45.8	-12.7	PASS
2506.175000	-58.7	46.0	-12.7	PASS

Band Edge



— Limit — Sum Level × Fail



Tx Spurious Emission

Test according to FCC title 47 part 15 §15.247(d), KDB 558074 D01 DTS Meas Guidance v05 7.8.8 and ANSI C63.10-2013

Measurement uncertainty calculated in accordance with ETSI TR 100 028-1. Expanded Uncertainty (K=2) < 1.8 dB

2402 MHz DH3

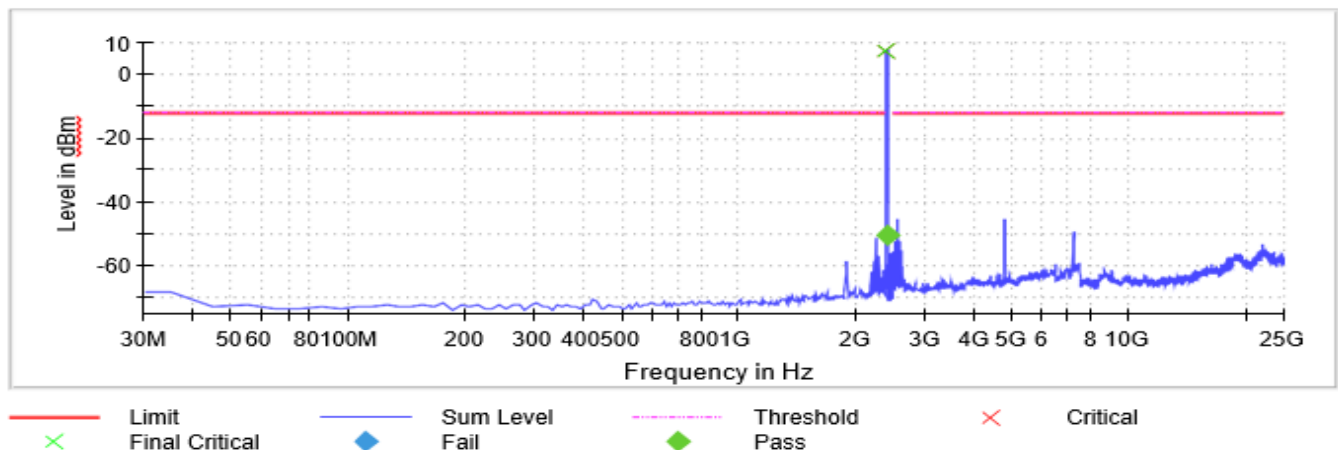
Final Measurement

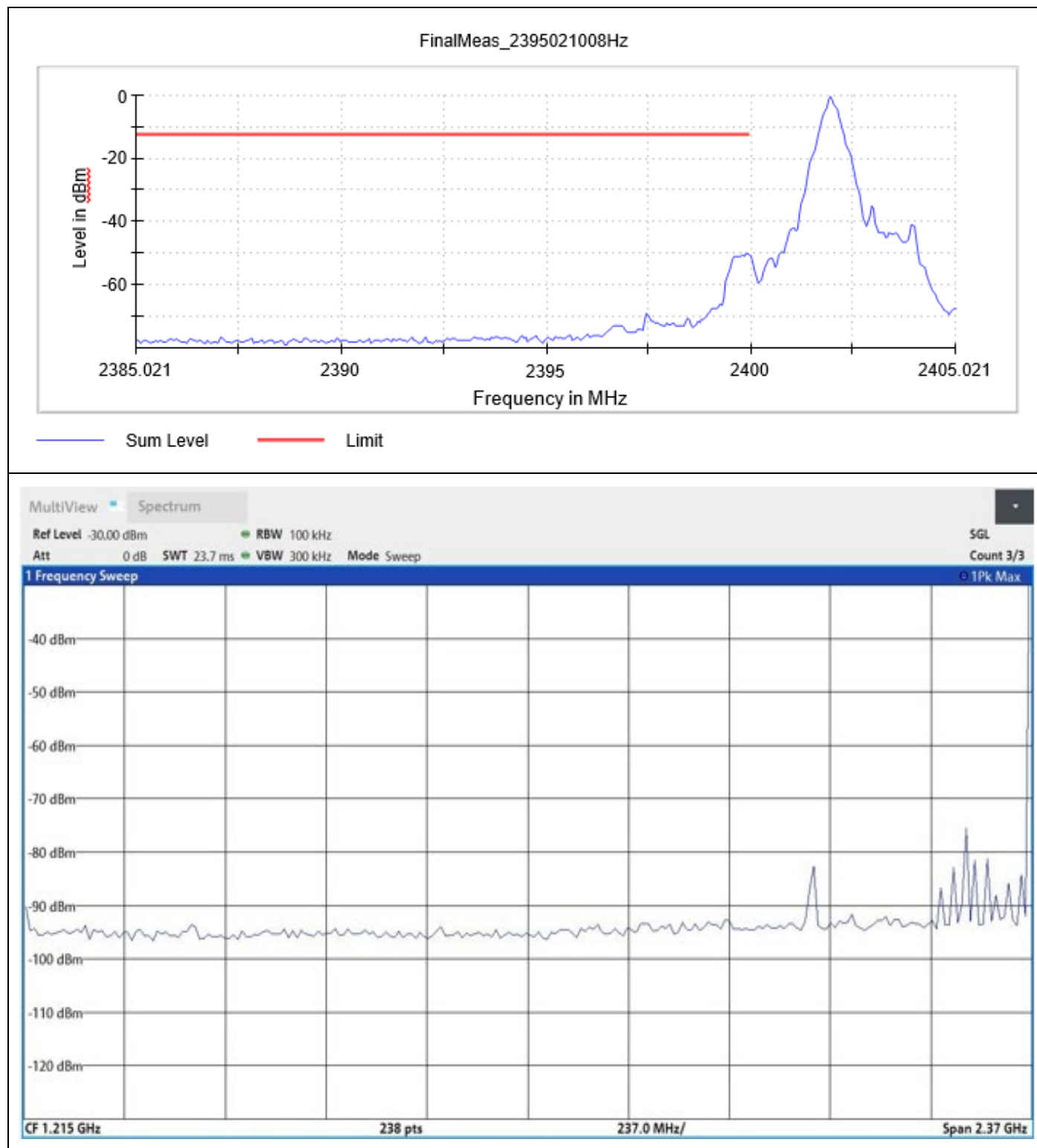
Frequency (MHz)	Level Pre Measurement (dBm)	Level (dBm)	Margin (dB)	Limit (dBm)
2399.908789	7.3	-50.2	37.9	-12.3

Pre Measurement

Frequency (MHz)	Level (dBm)	Margin (dB)	Limit (dBm)
2395.021008	7.3	-19.6	-12.3
4807.106858	-45.1	32.7	-12.3
2558.455060	-45.3	33.0	-12.3
7205.668775	-49.3	36.9	-12.3
2245.651261	-50.9	38.6	-12.3
2528.473036	-51.9	39.6	-12.3
2588.437084	-52.3	40.0	-12.3
22126.722703	-53.5	41.2	-12.3
2508.485020	-54.1	41.7	-12.3
22106.734687	-54.8	42.5	-12.3
21976.812583	-54.8	42.5	-12.3
22046.770639	-54.8	42.5	-12.3
22096.740679	-54.8	42.5	-12.3
2608.425100	-54.8	42.5	-12.3
22246.650799	-54.9	42.5	-12.3

Spurious



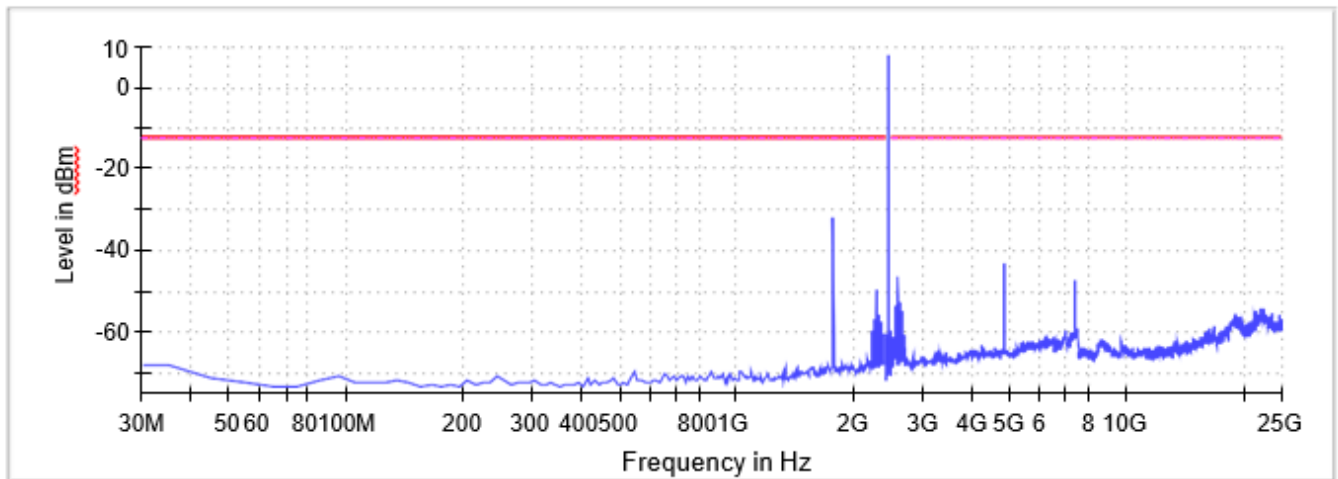


2441 MHz DH3

Pre Measurement

Frequency (MHz)	Level (dBm)	Margin (dB)	Limit (dBm)
1767.668067	-31.9	19.6	-12.4
4887.058921	-42.9	30.5	-12.4
4877.064913	-44.6	32.3	-12.4
2598.431092	-46.5	34.2	-12.4
1757.710084	-47.5	35.1	-12.4
7325.596871	-47.6	35.2	-12.4
2275.525210	-49.6	37.3	-12.4
2618.419108	-52.7	40.3	-12.4
2568.449068	-53.4	41.0	-12.4
2548.461052	-53.6	41.2	-12.4
22106.734687	-54.4	42.0	-12.4
22506.495007	-54.5	42.1	-12.4
22486.506991	-54.7	42.3	-12.4
22026.782623	-54.7	42.3	-12.4
21537.076232	-54.7	42.3	-12.4

Spurious

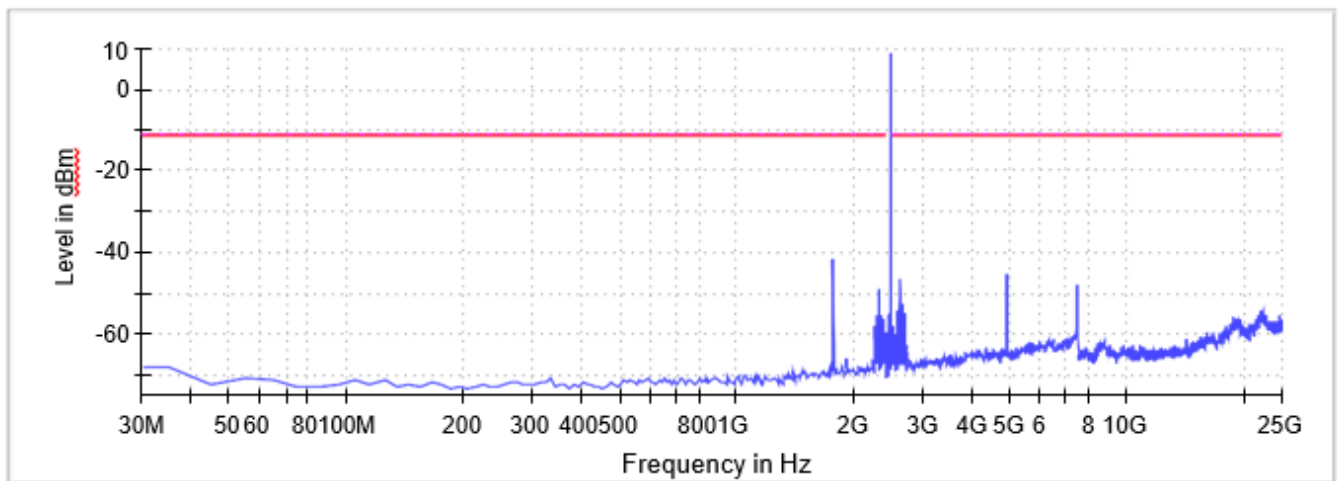


2480 MHz DH3

Pre Measurement

Frequency (MHz)	Level (dBm)	Margin (dB)	Limit (dBm)
1757.710084	-41.5	30.4	-11.1
1767.668067	-43.0	32.0	-11.1
4957.016977	-45.2	34.1	-11.1
2638.407124	-46.5	35.4	-11.1
7435.530959	-47.9	36.8	-11.1
2315.357143	-48.8	37.7	-11.1
7445.524967	-49.0	37.9	-11.1
2608.425100	-52.4	41.3	-11.1
2658.395140	-52.5	41.4	-11.1
2588.437084	-54.1	43.0	-11.1
22066.758655	-54.1	43.1	-11.1
22246.650799	-54.4	43.4	-11.1
22106.734687	-54.7	43.7	-11.1
2688.377164	-54.7	43.7	-11.1
22116.728695	-54.9	43.9	-11.1

Spurious



• Radiated Testing

Test Summary

Start: 10/8/2021	End: 10/13/2021	Temperature: 22.9°C Humidity: 48.6%	Initials: RP
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DUT S/N	AH21071501-HAR-127-7		DUT Operating Mode	Bluetooth Test Mode
Comment	Bluetooth Channels 0, 38,78			
Antenna	Frequency Range	Polarization	Result Over/Under Limit	Notes
Loop	9kHz-30MHz	Parallel	☐ Over ☒ Under	√
		Perpendicular	☐ Over ☒ Under	√
		Ground Parallel	☐ Over ☒ Under	√
Log Periodic	30MHz-1GHz	Horizontal	☐ Over ☒ Under	√
		Vertical	☐ Over ☒ Under	√
Horn	1-18GHz	Horizontal	☐ Over ☒ Under	√
		Vertical	☐ Over ☒ Under	√
Horn	18-27.5GHz	Horizontal	☐ Over ☒ Under	√
		Vertical	☐ Over ☒ Under	√

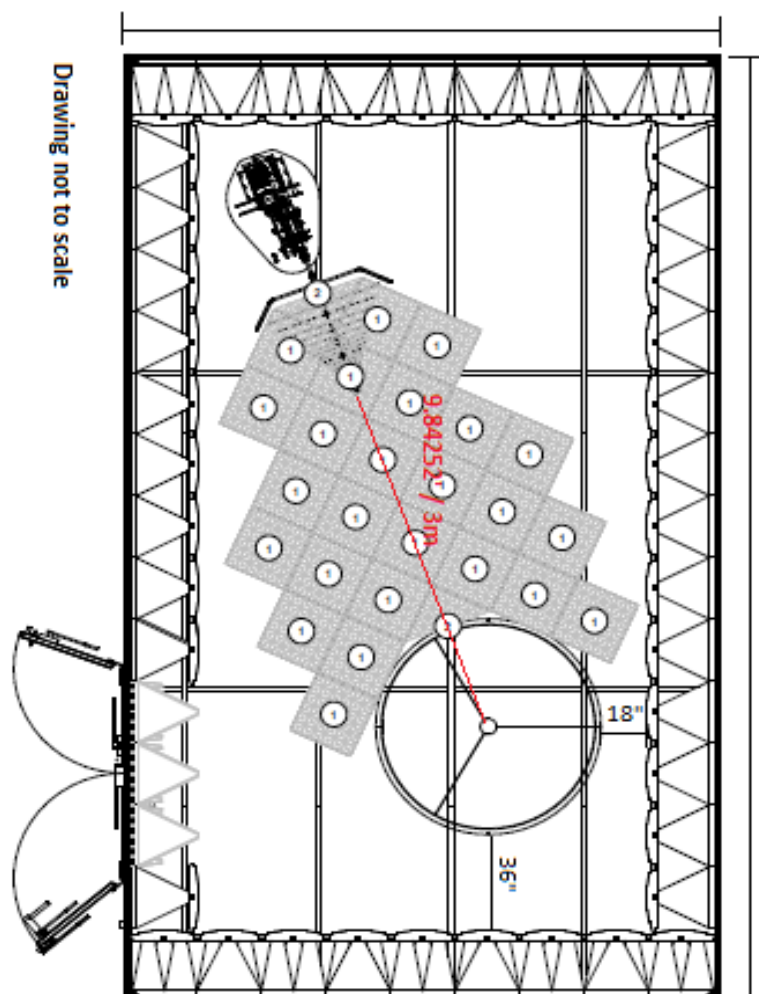
Notes: √ meets the requirements of the acceptance criteria.

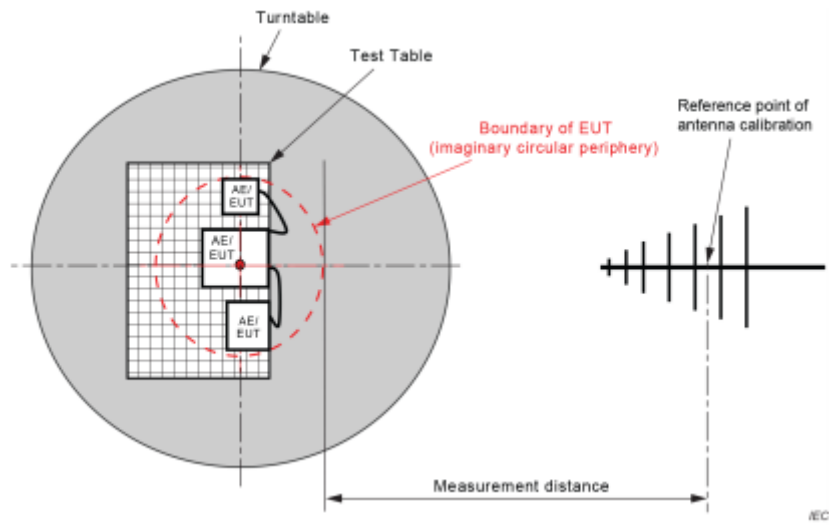
Test Setup

Semi-Anechoic Chamber Test Site-3 meter

Chamber Location	815 N Opdyke Rd Auburn Hills, Michigan 48326
Chamber Manufacturer:	ETS-Lindgren
Chamber Type	Semi-Anechoic
Model	FACT™ 3-2.0 Plus
Chamber Dimensions (L x W x H)	18'x18'x30'
Quiet Zone Diameter	2.0 meters
Quiet Zone Test Heights	1 & 2 meters (front only)
Test Distance	3.0 meters
Test Frequency Range	1-40 GHz
Measured Performance	4.87 dB Site sVSWR
Test Completion	December 18 th , 2019

Chamber Dimensions





Test Equipment Used

ID #	Equipment	Manufacturer	Model	Serial #	Cal Due
BVD0217	Receiver 2Hz-44GHz	Rohde & Schwarz	ESW44	101871	4/16/2022
BVD0398	Double Shielded N-Type Cable 2 Meter	Rohde & Schwarz	N-Type	N/A	12/29/2022
BVD0407	Double Shielded N-Type Cable 410mm (For PreAmp)	Rohde & Schwarz	N-Type	N/A	8/5/2022
BVD0394	Double Shielded N-Type Cable 6.9 Meter	Rohde & Schwarz	N-Type	N/A	12/29/2022
BVD0184	Preamplifier 29dB 1-18GHz	Rohde & Schwarz	TS-PR18	101646	4/26/2022
BVD0480	Band Reject Filter 50dB from 2400 to 2500MHz	Micro-Tronics	BRM50702	G482	5/27/2022
BVD0267	Double Ridge Waveguide 800MHz-18GHz	Rohde & Schwarz	HF907	102832	9/9/2022
BVD0486	Sucoflex K-Type Coaxial Cable 5 Meter	Huber+Suhner, inc	K-Type Coaxial	474343	3/7/2023
BVD0185	Preamplifier 45dB 18-40GHz	Rohde & Schwarz	TS-PR1840	100064	3/2/2022
BVD0320	18-40GHz Horn Antenna	L3 Narda ATM	PNR 180-442-KF	136164-01	3/8/2022
BVD0187	Preamplifier 25dB cal to 100kHz-1GHz	Rohde & Schwarz	TS-PR1	102080	12/07/2022
BVD0404	Double Shielded N-Type Cable 440mm (For PreAmp)	Rohde & Schwarz	N-Type	N/A	8/10/2022
BVD0021	UltraLog Antenna 30-6000 MHz	Rohde & Schwarz	HL562E	101113	7/23/2022
BVD0118	Antenna Mast Position Controller	ETS	7006-001	00214778/0 0214648	N/A
BVD0112	Equipment Chamber for 3 Meter Chamber	ETS	N/A	N/A	N/A
BVD0111	3 Meter Anechoic Chamber	ETS	N/A	N/A	10/16/2022
BVD0247	Turn Table	ETS	920250	N/A	N/A
BVD0323	Foam Test Table For 3 Meter Chamber	ETS-Lindgren	LDT-1.5	N/A	N/A
BVD0069	Bore Sight Tower	ETS	2171B	226732	N/A
BVD0258	Optima 12V Blue top Marine battery	Optima	D34M	N/A	N/A
BVD0011	Loop Antenna 9kHz-30MHz	Rohde & Schwarz	FMZB1519B	145	3/23/2022

Equipment List (Software)

Equipment	Manufacturer	Model	Version No.
EMC Test Software	Nexio	BAT-EMC	3.21.0.18
Programmer Software	CSR Host Tools	Blue Test 3	2.6.8.1467

Customer Supplied Equipment

ID #	Equipment	Manufacturer	Model	Serial #	Version No.
N/A	Harness	Harman	1.7m	N/A	N/A
N/A	Programmer	CSR	USB-SPI	N/A	N/A

Test Plots

Uncertainty

Radiated Emissions (30MHz to 18GHz)

Test Engineer: Ryan Phillips

The test is to measure the radiated emissions of the EUT. Some error sources that can contribute to the total uncertainty:

- Uncertainty of the receiver
- Uncertainty of the antenna
- Uncertainty of cables
- Uncertainty due to the mismatches
- NSA Calibration
- Etc., details see the below table

30MHz to 1GHZ

Source of Uncertainty	Value(dB)	Probability Distribution	Division	Sensitivity Coefficient	Expanded Uncertainty
Receiver Reading	0.12	Rectangular	1.732	1	0.069284
Cable Insertion Loss	0.21	Normal	2	1	0.105
Filter Insertion Loss	0.25	Normal	2	1	0.125
Antenna Factor	0.65	Normal	2	1	0.325
Receiver CW accuracy	0.5	Rectangular	1.732	1	0.2886836
Pulse Amplitude Response	1.5	Rectangular	1.732	1	0.86605081
PRF Response	1.5	Rectangular	1.732	1	0.86605081
Mismatch Filter – Receiver	0.25	U-Shape	2.449	1	0.1768033
NSA Calibration	4.0	Triangular	1.414	1	1.633332
ETS Foam Table (LDT-1.5)	1.8	Rectangular	1.732	1	1.039261
Combined Standard Uncertainty (square root of the sum of the squares)					2.113781
Expanded Uncertainty (K=2)					4.227562

The total derived measurement uncertainty is +/- 4.228 dB

1GHz to 40GHz

Source of Uncertainty	Value (dB)	Probability Distribution	Division	Sensitivity Coefficient	Expanded Uncertainty
Receiver Reading	0.12	Rectangular	1.732	1	0.069284
Cable Insertion Loss	0.21	Normal	2	1	0.105000
Filter Insertion Loss	0.25	Normal	2	1	0.125000
Antenna Factor	0.65	Normal	2	1	0.325000
Receiver CW accuracy	0.5	Rectangular	1.732	1	0.2886836
Pulse Amplitude Response	1.5	Rectangular	1.732	1	0.866051
PRF Response	1.5	Rectangular	1.732	1	0.866051
Mismatch Filter – Receiver	0.25	U-Shape	1.414	1	0.176803
VSWR Calibration	2.0	Triangular	2.449	1	0.816659
ETS Foam Table (LDT-1.5)	1.8	Rectangular	1.732	1	1.039261
Combined Standard Uncertainty (square root of the sum of the squares)					1.869213
Expanded Uncertainty (K=2)					3.738426

The total derived measurement uncertainty is +/- 3.738 dB.

Remarks:

1. Level Peak Reading (dBμV) = Raw Peak Level + Correction Factor
2. Correction Factor (dB) = Antenna Factor + Cable Loss – Preamplifier Gain
3. Margin = Level Peak Reading – Limit

Remarks:

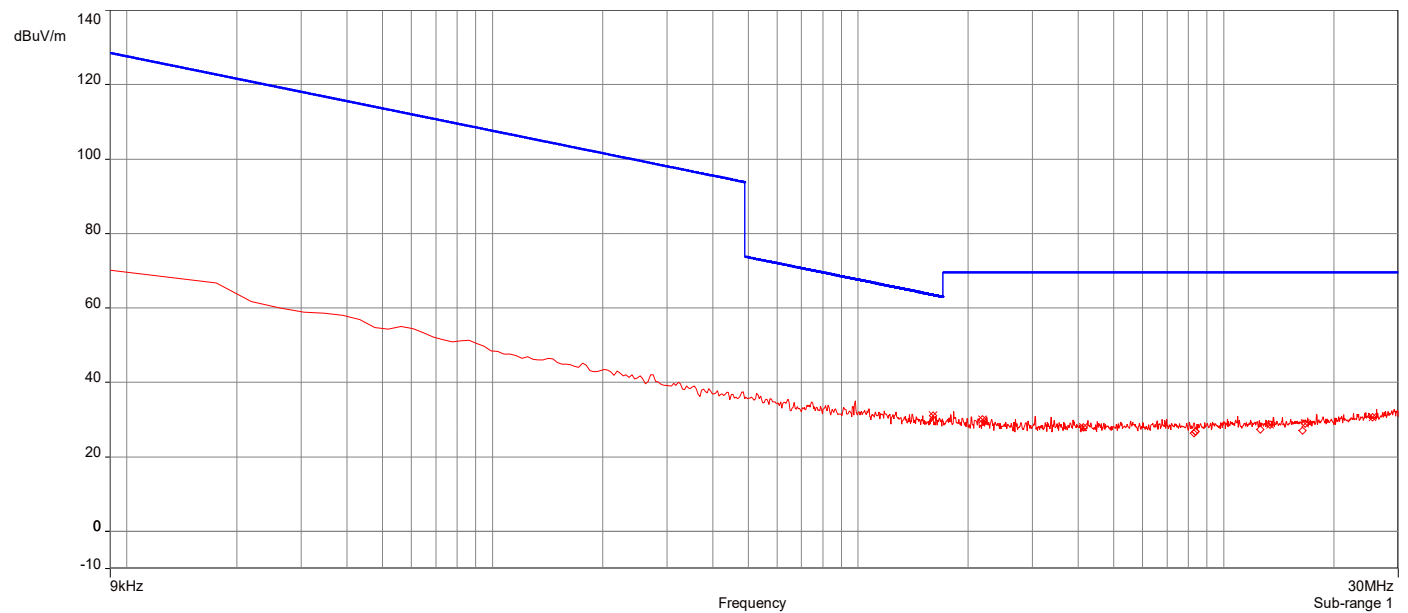
1. Level Average Reading (dBμV) = Raw Average Level + Correction Factor
2. Correction Factor (dB) = Antenna Factor + Cable Loss – Preamplifier Gain
3. Margin = Level Average Reading – Limit

AH21071501-HAR-127#007_GFSK DH3 CH-38_9kHz-30MHz_Ground-Parallel

10/13/2021 2:15:10 PM

No	Frequency (MHz)	Level Q-Peak Reading (dBμV/m)	Correction Factor (dB)	Limit dBuV/m	Margin (dB)	Height (m)	Angle (°)	Polarization	Judgement
1.	1.603035MHz	31.12	19.13	63.51	-32.39	1.00	110.90	H/V	Passed
2.	2.185801MHz	30.07	19.09	69.54	-39.47	1.00	47.40	H/V	Passed
3.	4.126924MHz	27.95	19.21	69.54	-41.60	1.00	83.80	H/V	Passed
4.	13.378327MHz	28.60	19.62	69.54	-40.95	1.00	171.20	H/V	Passed
5.	16.694949MHz	28.98	19.68	69.54	-40.57	1.00	331.40	H/V	Passed
6.	25.526417MHz	30.60	20.72	69.54	-38.94	1.00	231.30	H/V	Passed

Overall Graphs:

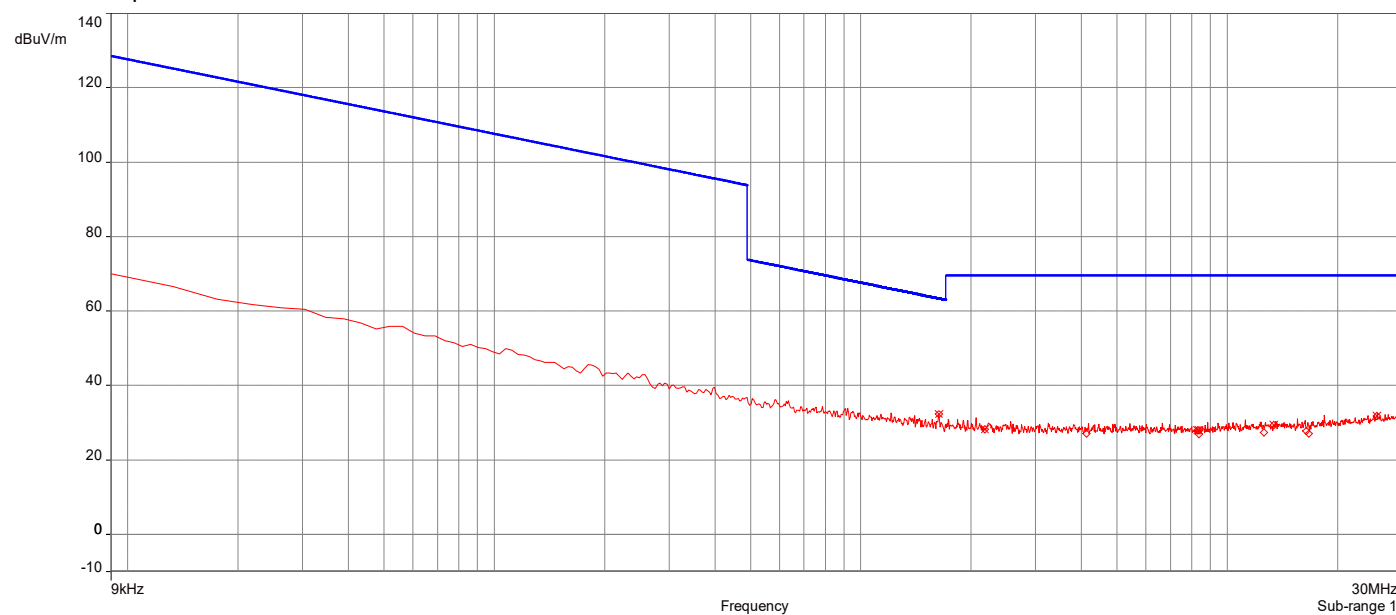


AH21071501-HAR-127#007_GFSK DH3 CH-38_9kHz-30MHz_Parallel

10/13/2021 11:55:08 AM

No	Frequency (MHz)	Level Q-Peak Reading (dBuV/m)	Correction Factor (dB)	Limit dBuV/m	Margin (dB)	Height (m)	Angle (°)	Polarization	Judgement
1.	1.63303MHz	32.41	19.13	63.34	-30.94	1.00	236.10	H/V	Passed
2.	2.177231MHz	28.26	19.09	69.54	-41.28	1.00	212.00	H/V	Passed
3.	8.291984MHz	27.97	19.14	69.54	-41.58	1.00	324.00	H/V	Passed
4.	8.38197MHz	28.01	19.14	69.54	-41.54	1.00	245.10	H/V	Passed
5.	13.404037MHz	29.30	19.62	69.54	-40.24	1.00	311.50	H/V	Passed
6.	25.612118MHz	31.77	20.72	69.54	-37.77	1.00	221.10	H/V	Passed

Overall Graphs:

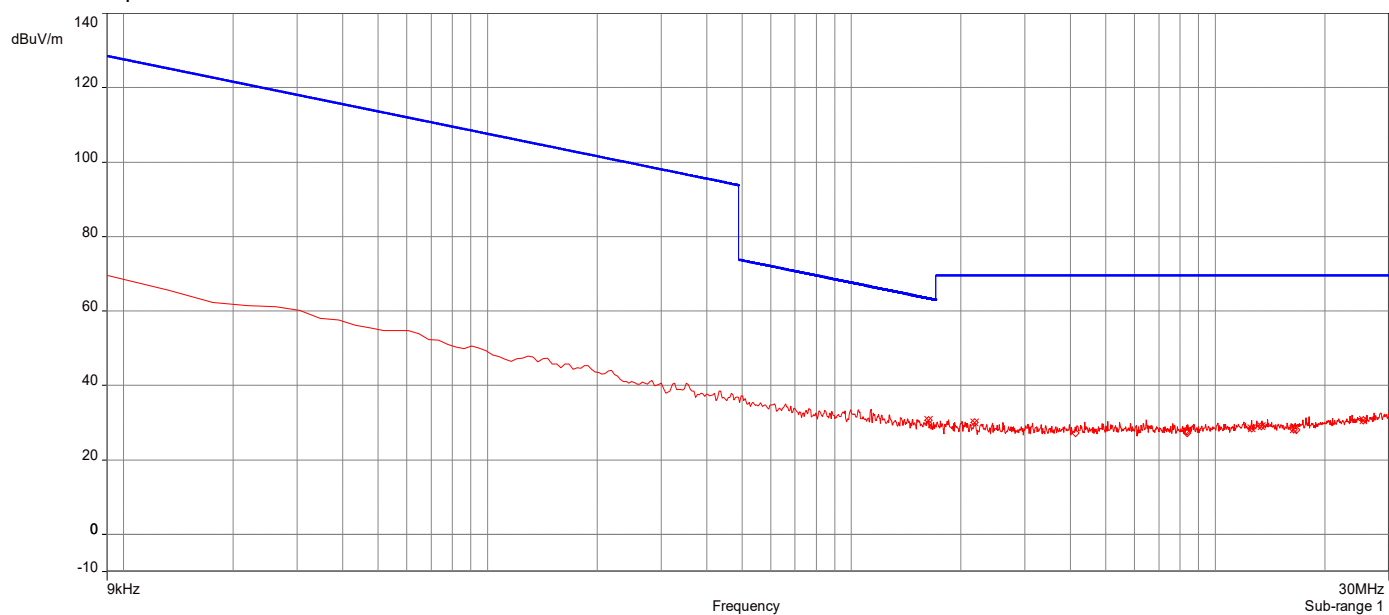


AH21071501-HAR-127#007_GFSK DH3 CH-38_9kHz-30MHz_Perpendicular

10/13/2021 1:36:17 PM

No	Frequency (MHz)	Level Q- Peak Reading (dBuV/m)	Correction Factor (dB)	Limit dBuV/m	Margin (dB)	Height (m)	Angle (°)	Polarizatio n	Judgement
1.	1.628745MHz	30.62	19.13	63.37	-32.75	1.00	303.40	H/V	Passed
2.	2.177231MHz	30.10	19.09	69.54	-39.44	1.00	100.50	H/V	Passed
3.	12.577024MHz	28.51	19.58	69.54	-41.03	1.00	180.00	H/V	Passed
4.	13.395467MHz	29.04	19.62	69.54	-40.50	1.00	183.10	H/V	Passed
5.	16.420706MHz	28.27	19.68	69.54	-41.27	1.00	358.30	H/V	Passed
6.	25.513562MHz	30.60	20.72	69.54	-38.94	1.00	132.40	H/V	Passed

Overall Graphs:

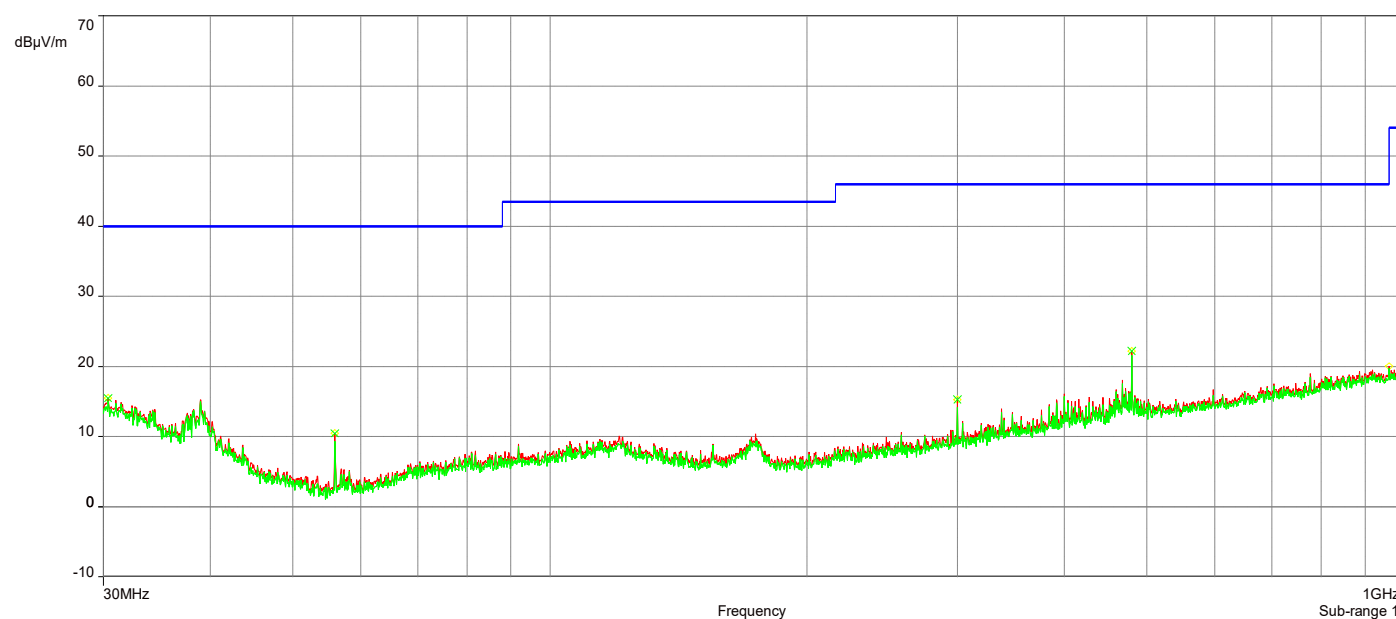


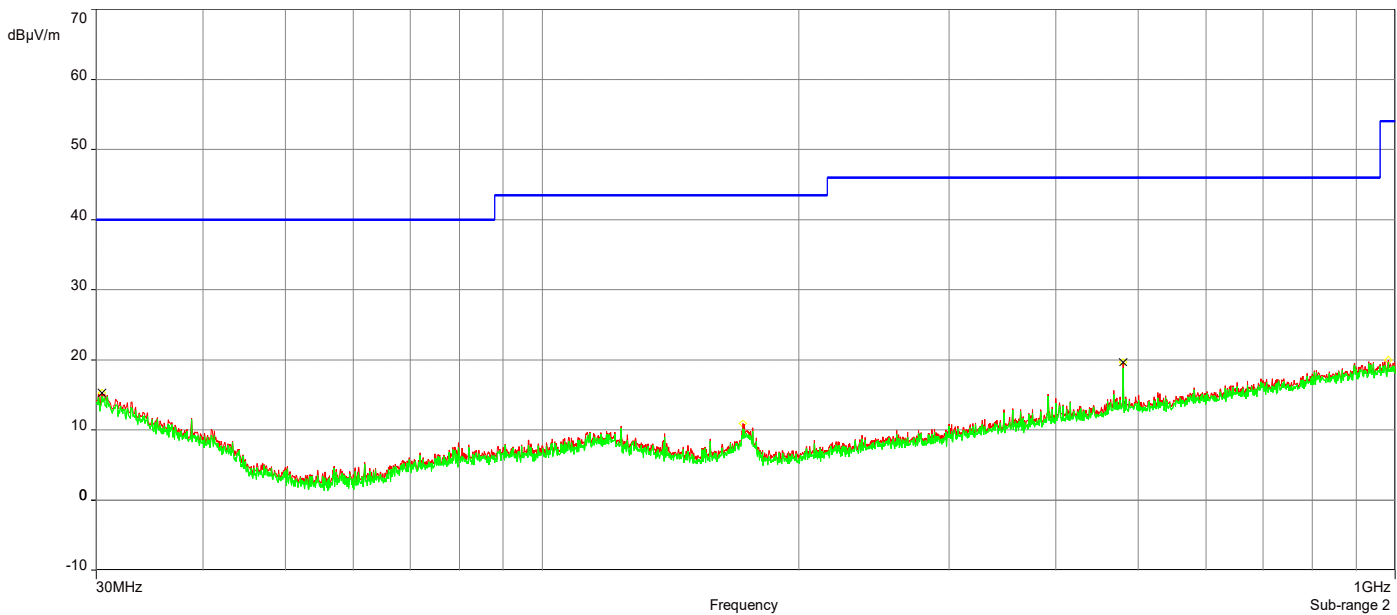
AH21071501-HAR-127#007_GFSK DH3 CH-0_30MHz-1GHz

10/13/2021 7:52:38 AM

No	Frequency (MHz)	Level Q-Peak Reading (dBμV/m)	Correction Factor (dB)	Limit dBμV/m	Margin (dB)	Height (m)	Angle (°)	Polarization	Judgement
1.	30.399435MHz	15.45	-8.91	40.00	-24.55	1.50	264.70	Vertical	Passed
2.	56.020354MHz	10.50	-22.22	40.00	-29.50	1.50	340.70	Vertical	Passed
3.	300.01824MHz	15.24	-15.81	46.00	-30.76	2.50	168.70	Vertical	Passed
4.	479.99235MHz	22.20	-11.83	46.00	-23.80	1.00	46.80	Vertical	Passed
5.	30.456497MHz	15.24	-8.92	40.00	-24.76	4.00	308.00	Horizontal	Passed
6.	479.99235MHz	19.63	-11.83	46.00	-26.37	2.50	320.50	Horizontal	Passed

Overall Graphs:



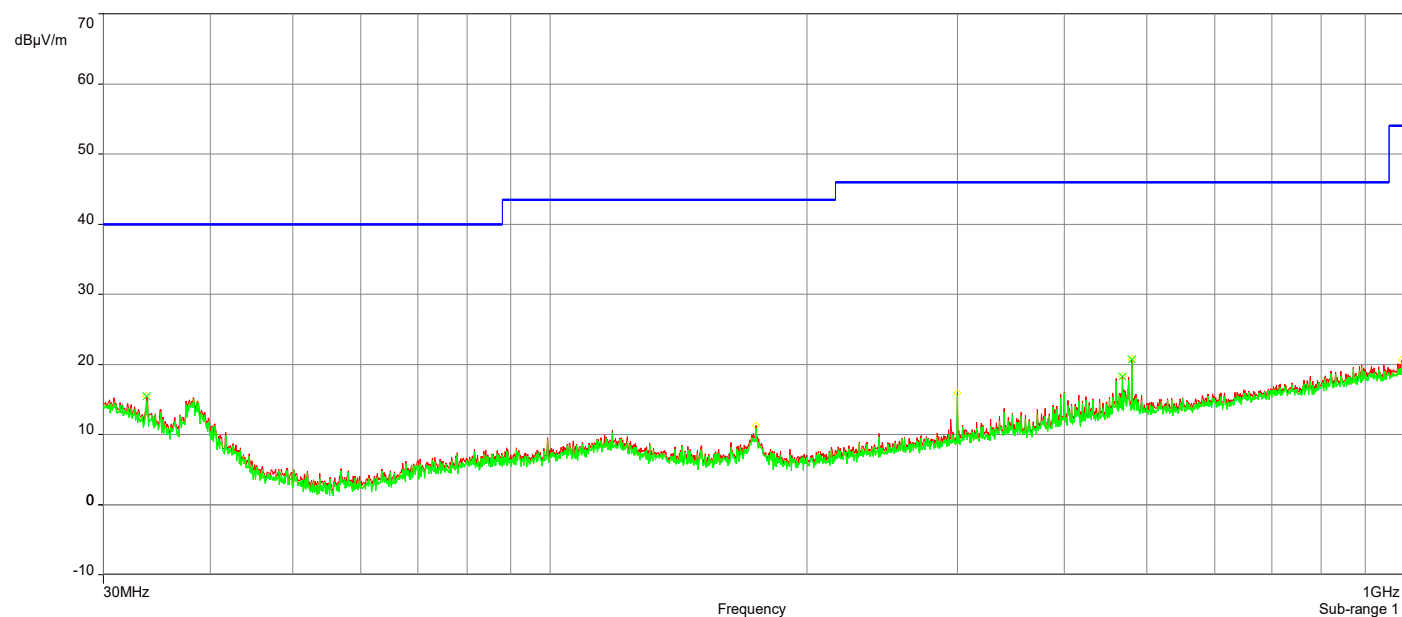


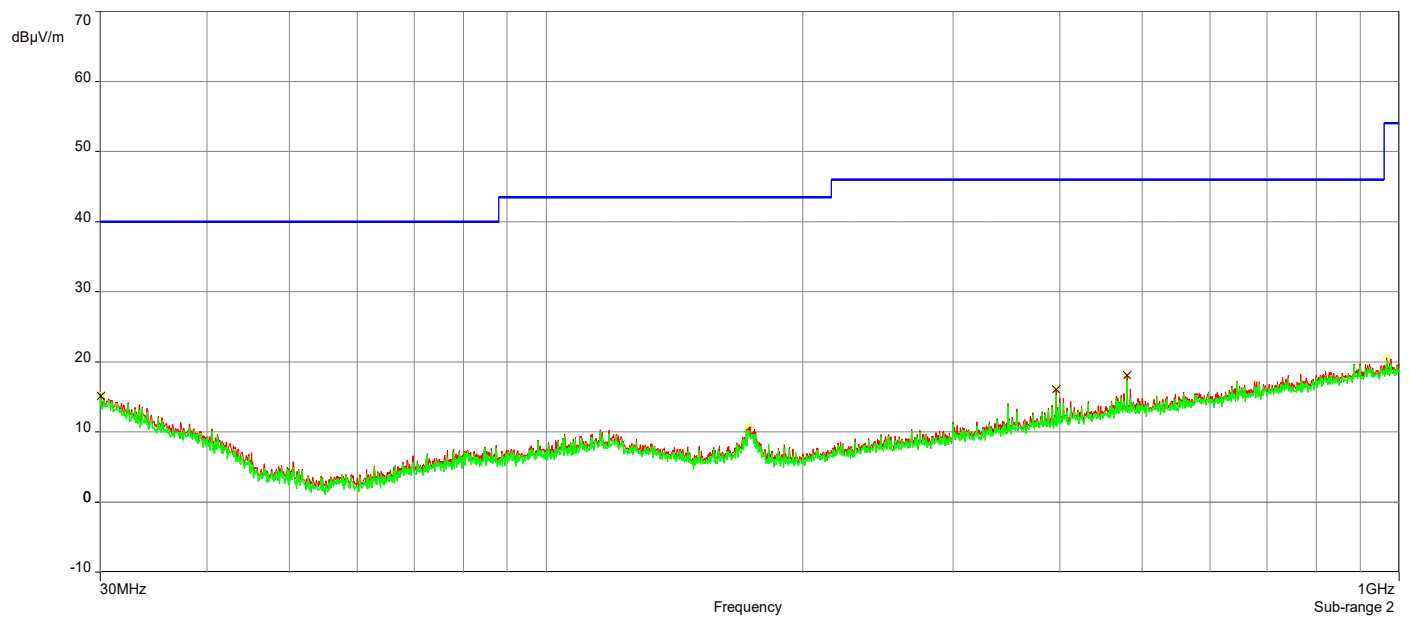
AH21071501-HAR-127#007_GFSK DH3 CH-38_30MHz-1GHz

10/13/2021 9:56:49 AM

No	Frequency (MHz)	Level Q-Peak Reading (dBμV/m)	Correction Factor (dB)	Limit dBμV/m	Margin (dB)	Height (m)	Angle (°)	Polarization	Judgement
1.	33.709042MHz	15.45	-10.30	40.00	-24.55	1.00	302.10	Vertical	Passed
2.	468.0093MHz	18.29	-11.93	46.00	-27.71	1.00	1.10	Vertical	Passed
3.	480.04942MHz	20.73	-11.83	46.00	-25.27	1.00	23.00	Vertical	Passed
4.	30.057062MHz	15.09	-8.79	40.00	-24.91	1.00	64.80	Horizontal	Passed
5.	396.05389MHz	16.08	-13.52	46.00	-29.92	1.00	97.10	Horizontal	Passed
6.	480.04942MHz	18.10	-11.83	46.00	-27.90	2.50	298.80	Horizontal	Passed

Overall Graphs:



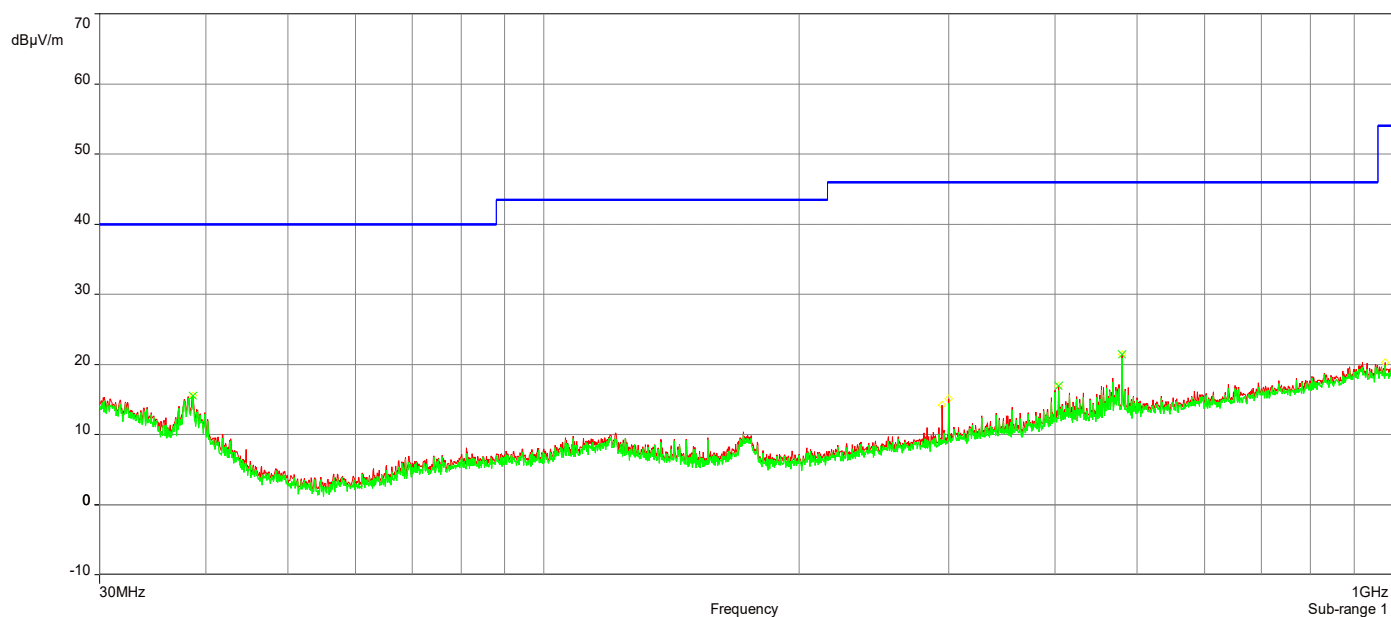


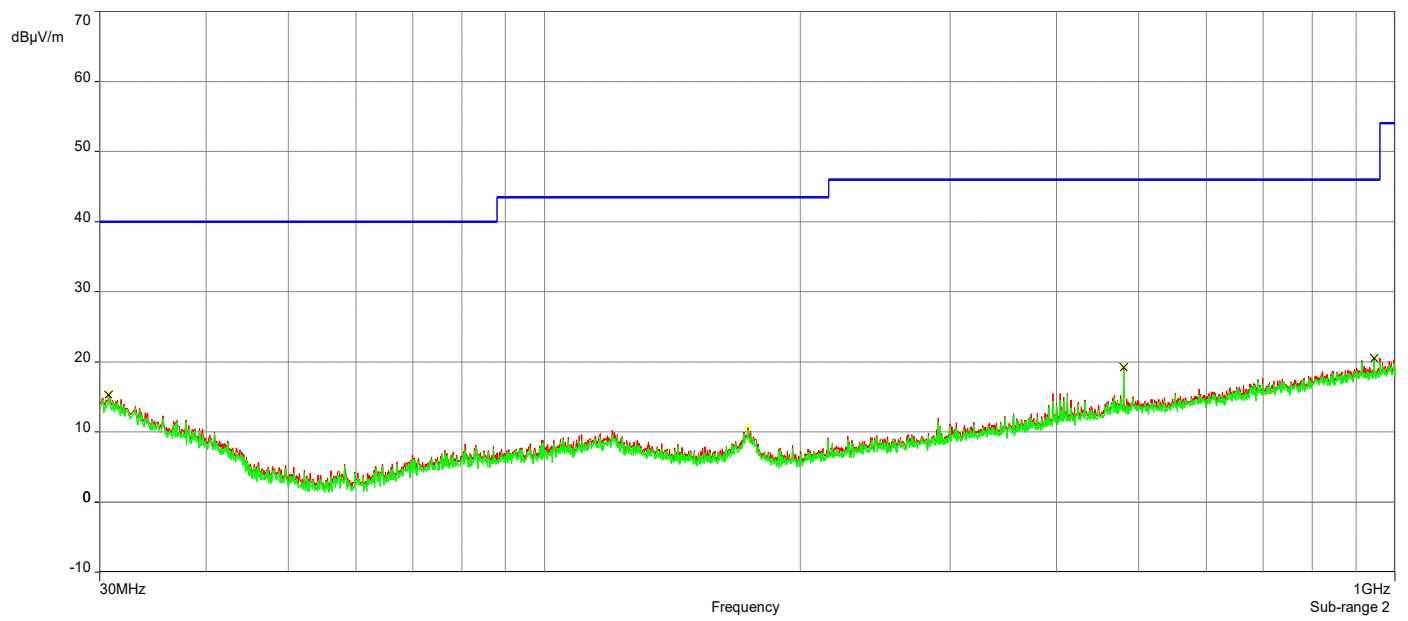
AH21071501-HAR-127#007_GFSK DH3 CH-78_30MHz-1GHz

10/13/2021 10:26:12 AM

No	Frequency (MHz)	Level Q-Peak Reading (dBμV/m)	Correction Factor (dB)	Limit dBμV/m	Margin (dB)	Height (m)	Angle (°)	Polarization	Judgement
1.	38.616389MHz	15.58	-12.39	40.00	-24.42	1.00	278.10	Vertical	Passed
2.	403.98553MHz	16.89	-13.32	46.00	-29.11	2.00	346.70	Vertical	Passed
3.	479.99235MHz	21.38	-11.83	46.00	-24.62	1.00	0.10	Vertical	Passed
4.	30.741808MHz	15.34	-9.03	40.00	-24.66	3.50	79.20	Horizontal	Passed
5.	479.99235MHz	19.24	-11.83	46.00	-26.76	3.00	87.00	Horizontal	Passed
6.	945.56268MHz	20.52	-5.69	46.00	-25.48	1.00	308.90	Horizontal	Passed

Overall Graphs:





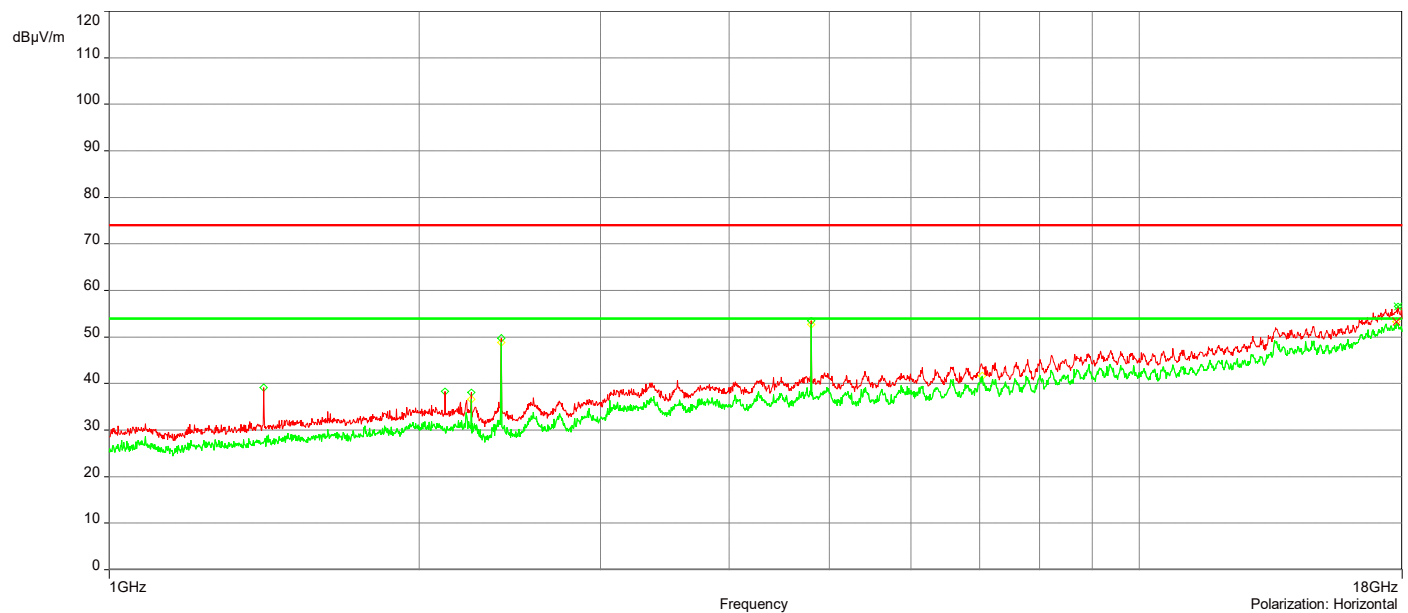
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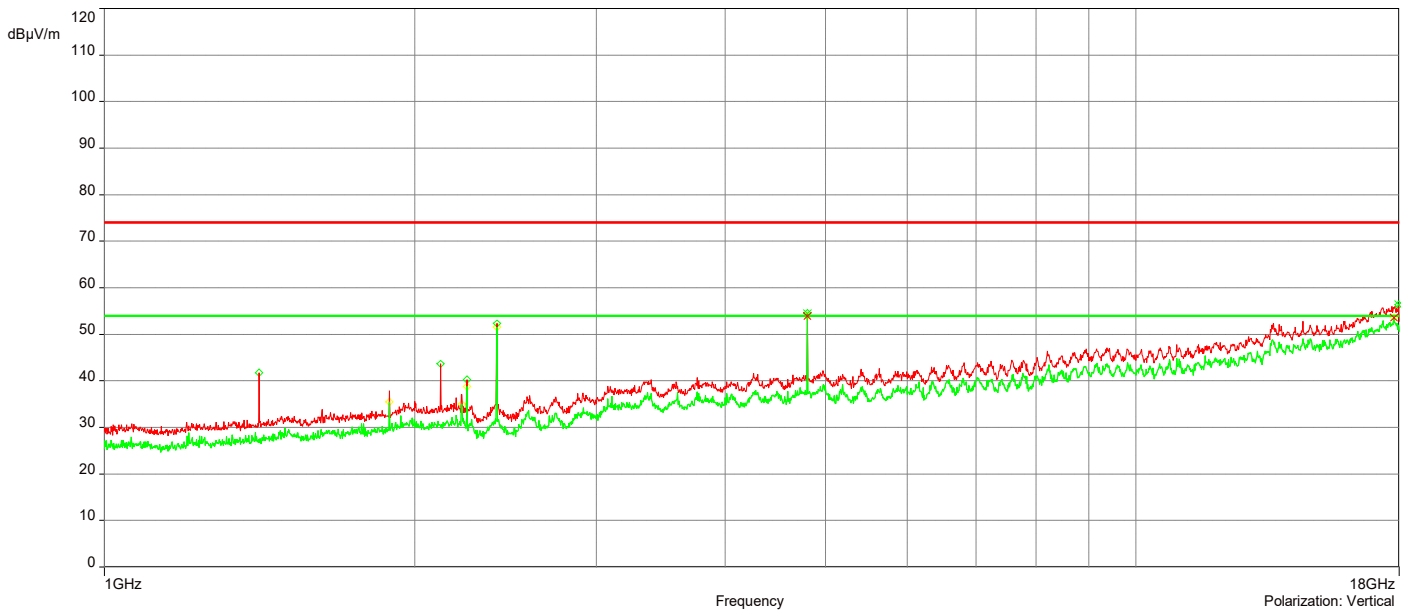
10/7/2021 1:57:50 PM

No	Frequency (MHz)	Level Peak Reading (dBμV/m)	Correction Factor (dB)	Limit dBμV/m	Margin (dB)	Height (m)	Angle (°)	Polarization	Judgement
1.	4.8036119GHz	54.56	4.10	74.00	-19.44	1.02	89.90	Vertical	Passed
2.	17.9835GHz	56.41	18.57	74.00	-17.59	3.79	0.10	Vertical	Passed
3.	17.832995GHz	56.63	18.28	74.00	-17.37	3.78	89.90	Horizontal	Passed

No	Frequency (MHz)	Level Average Reading (dBμV/m)	Correction Factor (dB)	Limit dBμV/m	Margin (dB)	Height (m)	Angle (°)	Polarization	Judgment
1.	17.775493GHz	53.23	18.25	54.00	-0.77	1.25	314.90	Horizontal	Passed
2.	17.794494GHz	53.67	18.32	54.00	-0.33	1.73	202.40	Vertical	Passed
3.	4.8036119GHz	53.94	4.10	54.00	-0.06	1.02	89.90	Vertical	Passed

Overall Graphs:





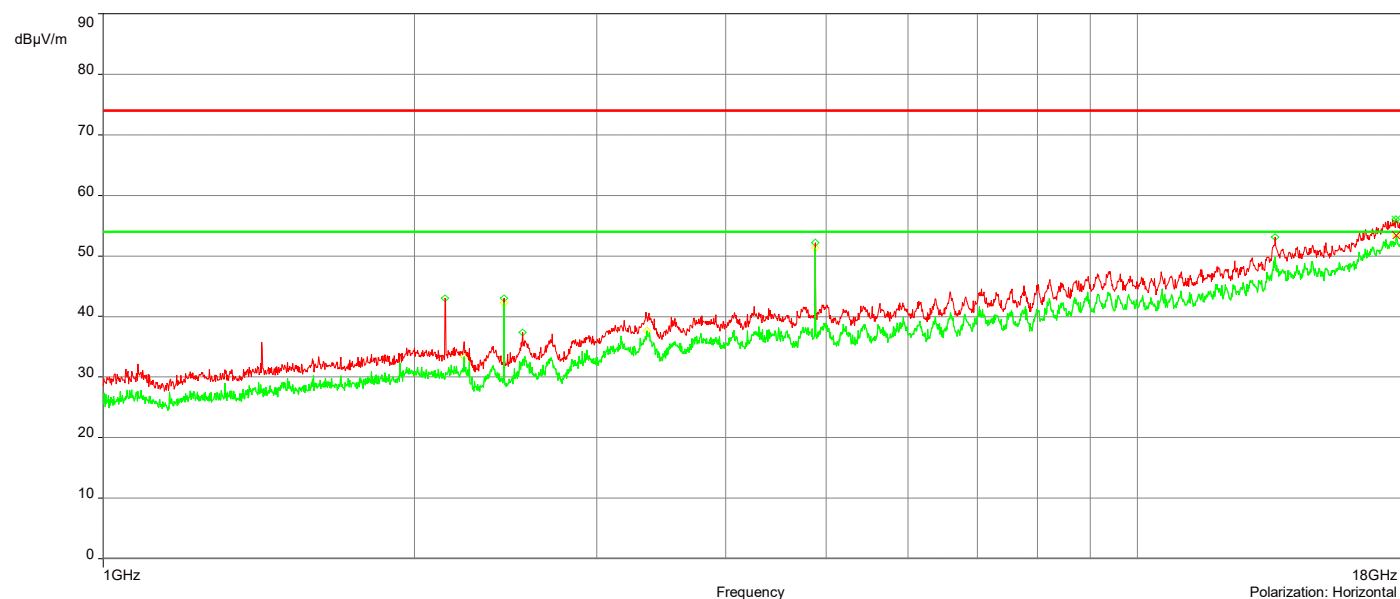
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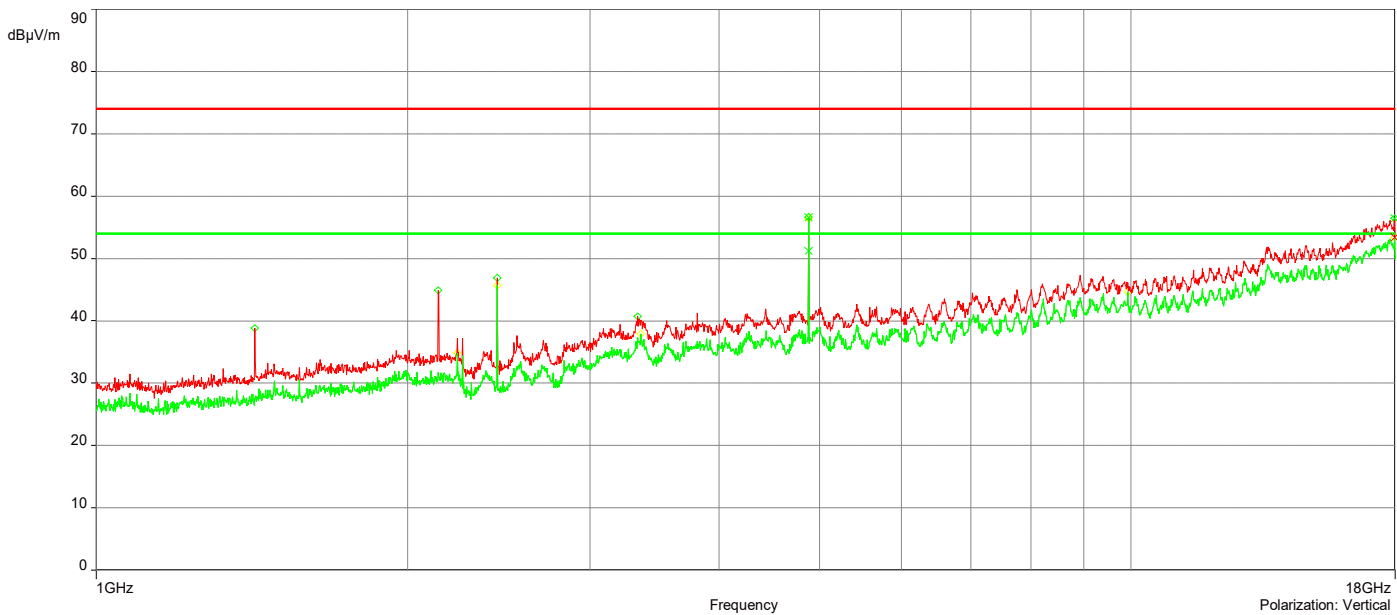
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No	Frequency (MHz)	Level Peak Reading (dBμV/m)	Correction Factor (dB)	Limit dBμV/m	Margin (dB)	Height (m)	Angle (°)	Polarization	Judgement
1.	17.778493GHz	56.06	18.26	74.00	-17.94	2.86	134.90	Horizontal	Passed
2.	17.977999GHz	56.46	18.56	74.00	-17.54	1.00	202.40	Vertical	Passed
3.	4.8816142GHz	56.67	4.41	74.00	-17.33	1.02	314.90	Vertical	Passed

No	Frequency (MHz)	Level Average Reading (dBμV/m)	Correction Factor (dB)	Limit dBμV/m	Margin (dB)	Height (m)	Angle (°)	Polarization	Judgment
1.	4.8821142GHz	51.24	4.41	54.00	-2.76	1.02	315.10	Vertical	Passed
2.	17.791994GHz	53.39	18.28	54.00	-0.61	1.74	44.90	Horizontal	Passed
3.	17.977999GHz	53.41	18.56	54.00	-0.59	1.00	202.40	Vertical	Passed

Overall Graphs:





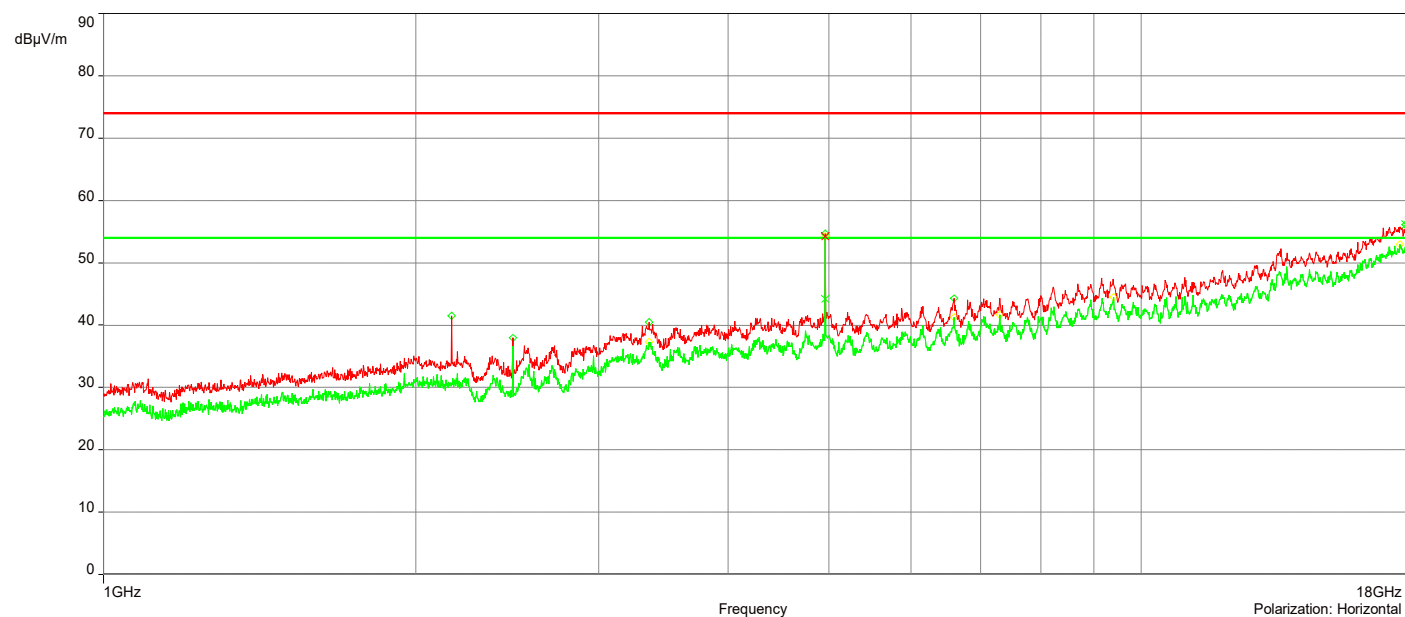
AH21071501-HAR-127#007_GFSK DH3 CH-78_1-18GHz

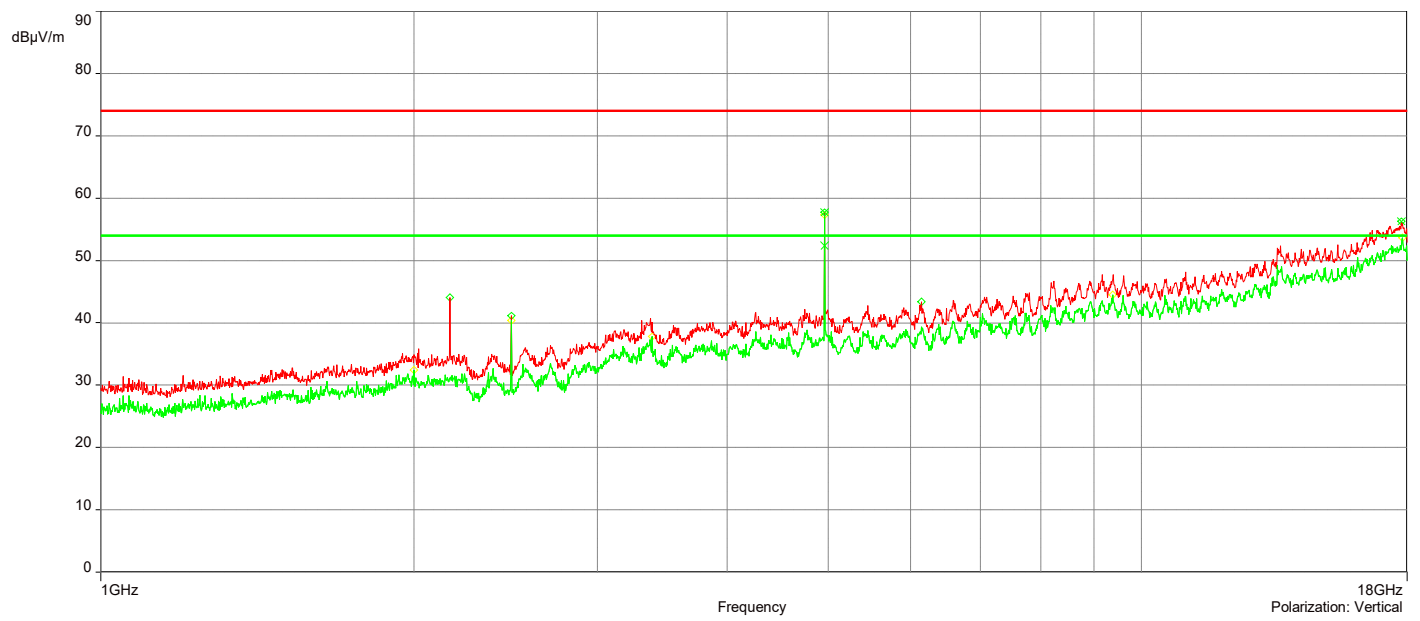
10/8/2021 7:20:58 AM

No	Frequency (MHz)	Level Peak Reading (dBμV/m)	Correction Factor (dB)	Limit dBμV/m	Margin (dB)	Height (m)	Angle (°)	Polarization	Judgement
1.	17.982499GHz	56.16	18.52	74.00	-17.84	2.52	337.40	Horizontal	Passed
2.	17.774493GHz	56.32	18.29	74.00	-17.68	2.56	0	Vertical	Passed
3.	4.9596165GHz	57.72	4.34	74.00	-16.28	1.00	315.10	Vertical	Passed

No	Frequency (MHz)	Level Average Reading (dBμV/m)	Correction Factor (dB)	Limit dBμV/m	Margin (dB)	Height (m)	Angle (°)	Polarization	Judgment
1.	4.9601165GHz	52.35	4.34	54.00	-1.65	1.00	314.90	Vertical	Passed
2.	4.9601165GHz	54.29	4.34	54.00	-9.79	1.00	23.10	Horizontal	Passed

Overall Graphs:





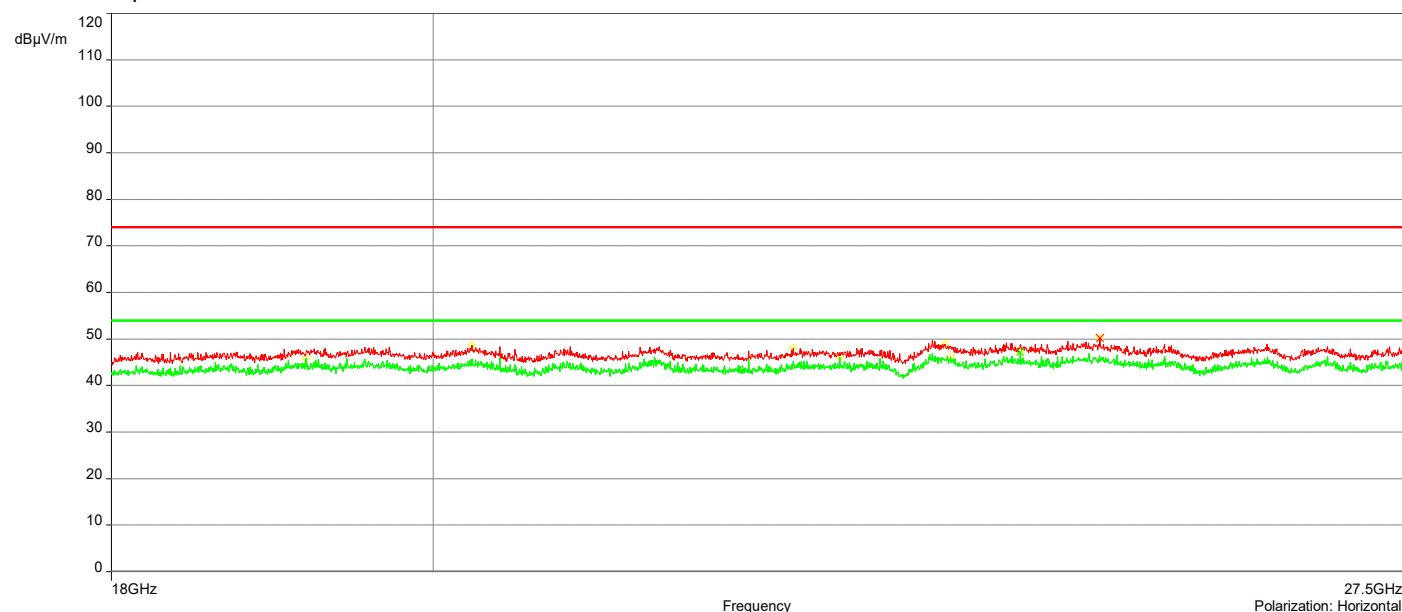
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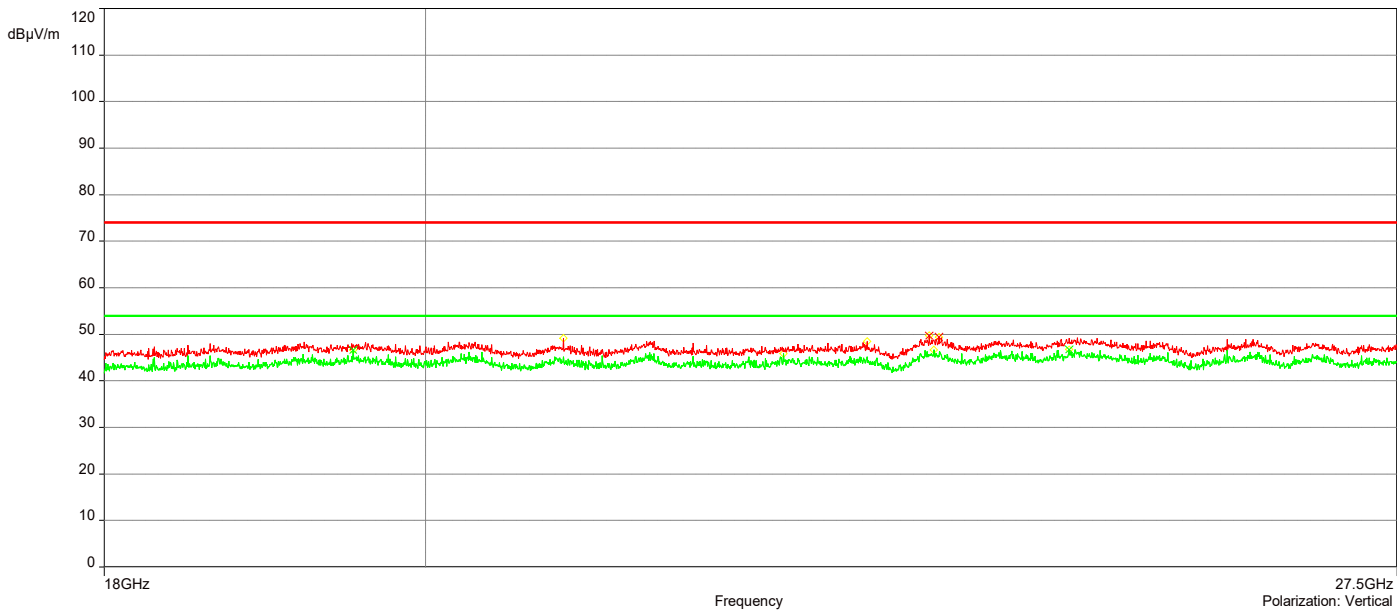
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No	Frequency (MHz)	Level Peak Reading (dBμV/m)	Correction Factor (dB)	Limit dBμV/m	Margin (dB)	Height (m)	Angle (°)	Polarization	Judgement
1.	23.663553GHz	49.38	1.91	74.00	-24.62	2.44	150.10	Vertical	Passed
2.	23.589709GHz	49.78	2.10	74.00	-24.22	2.45	30.10	Vertical	Passed
3.	24.877881GHz	50.24	2.77	74.00	-23.76	3.18	300.10	Horizontal	Passed

No	Frequency (MHz)	Level Average Reading (dBμV/m)	Correction Factor (dB)	Limit dBμV/m	Margin (dB)	Height (m)	Angle (°)	Polarization	Judgment
1.	19.530865GHz	46.68	-0.64	54.00	-7.32	2.87	240.10	Vertical	Passed
2.	24.697373GHz	46.83	2.79	54.00	-7.17	2.02	90.10	Vertical	Passed
3.	24.238329GHz	47.18	1.89	54.00	-6.82	3.34	210.10	Horizontal	Passed

Overall Graphs:





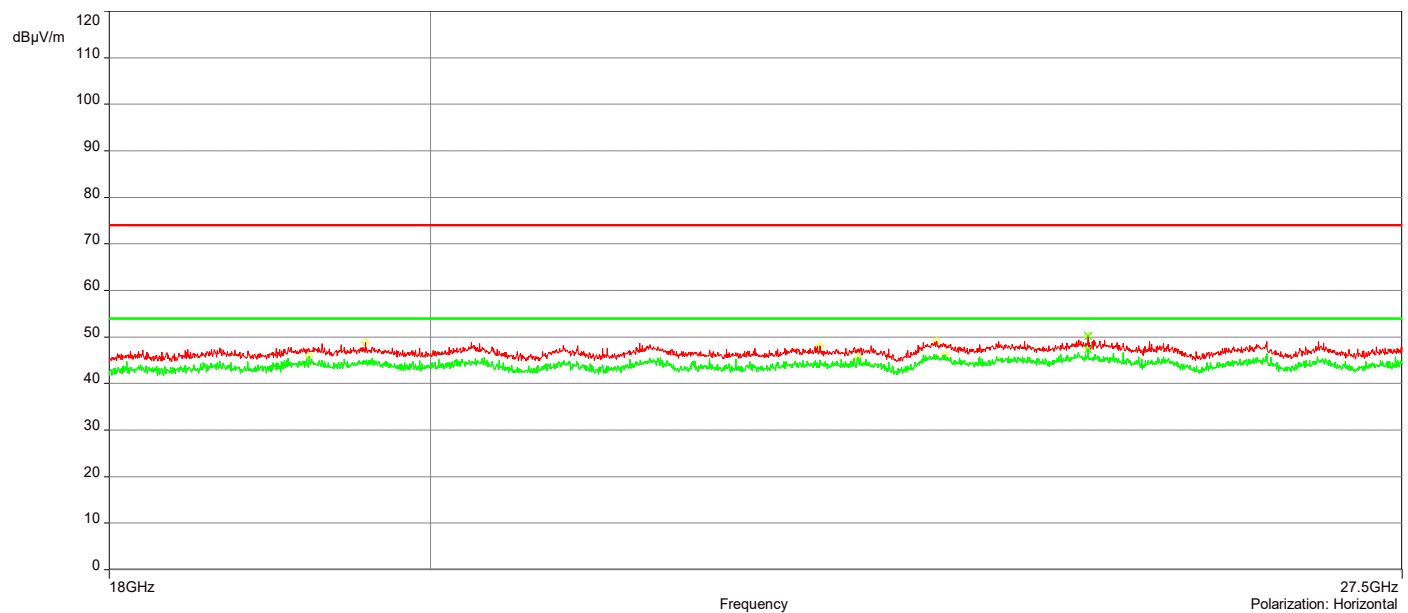
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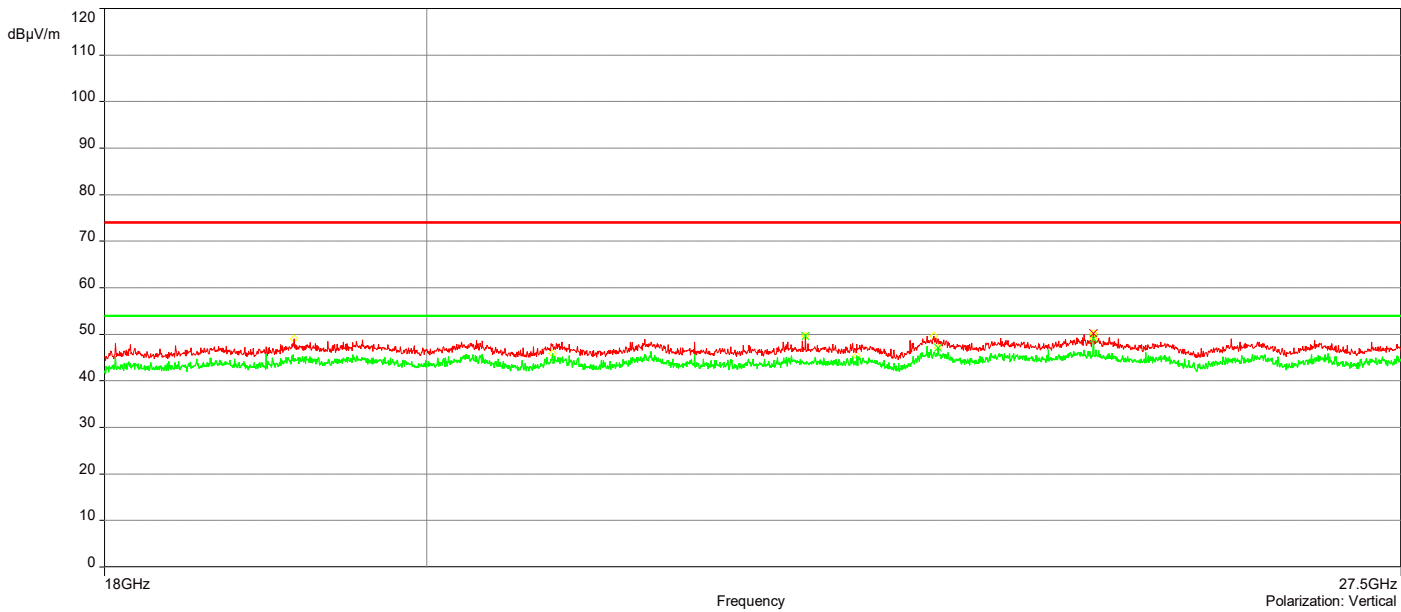
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No	Frequency (MHz)	Level Peak Reading (dBμV/m)	Correction Factor (dB)	Limit dBμV/m	Margin (dB)	Height (m)	Angle (°)	Polarization	Judgement
1.	22.635347GHz	49.66	0.79	74.00	-24.34	1.12	329.90	Vertical	Passed
2.	24.868812GHz	50.20	2.78	74.00	-23.80	2.29	0	Vertical	Passed
3.	24.808355GHz	50.15	2.81	74.00	-23.85	2.31	89.90	Horizontal	Passed

No	Frequency (MHz)	Level Average Reading (dBμV/m)	Correction Factor (dB)	Limit dBμV/m	Margin (dB)	Height (m)	Angle (°)	Polarization	Judgment
1.	23.635483GHz	47.10	1.98	54.00	-6.90	2.90	179.90	Vertical	Passed
2.	24.808355GHz	47.39	2.81	54.00	-6.61	2.31	89.90	Horizontal	Passed
3.	24.868812GHz	49.02	2.78	54.00	-4.98	2.29	0	Vertical	Passed

Overall Graphs:





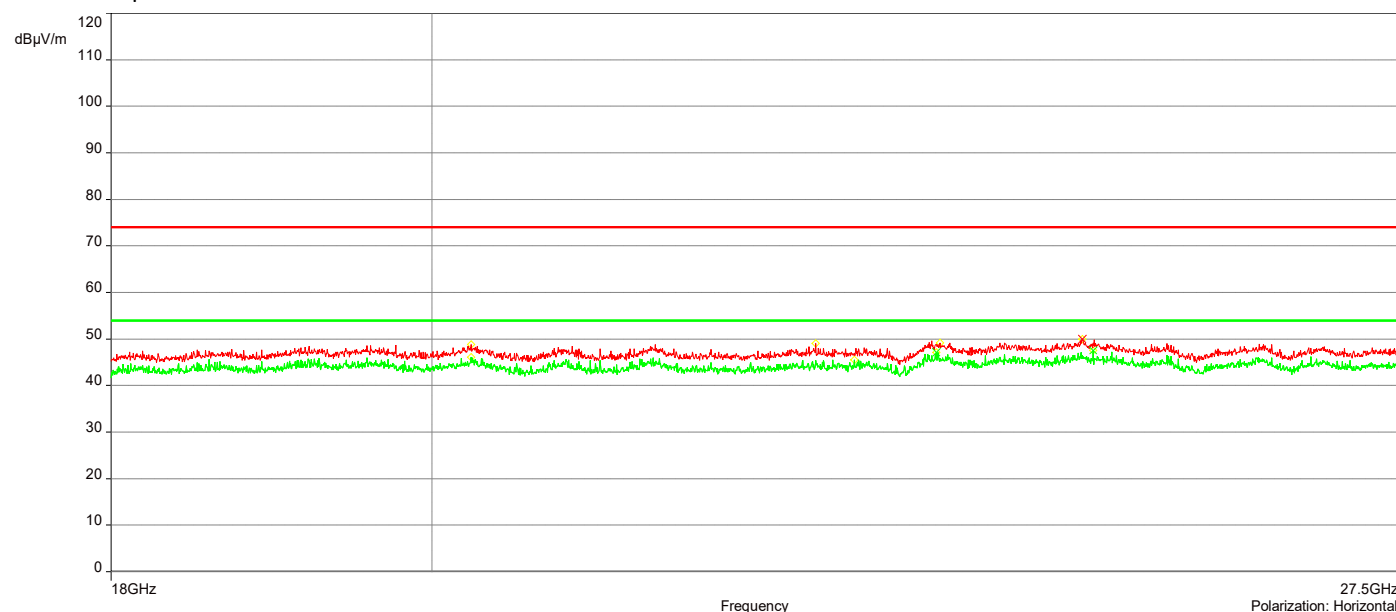
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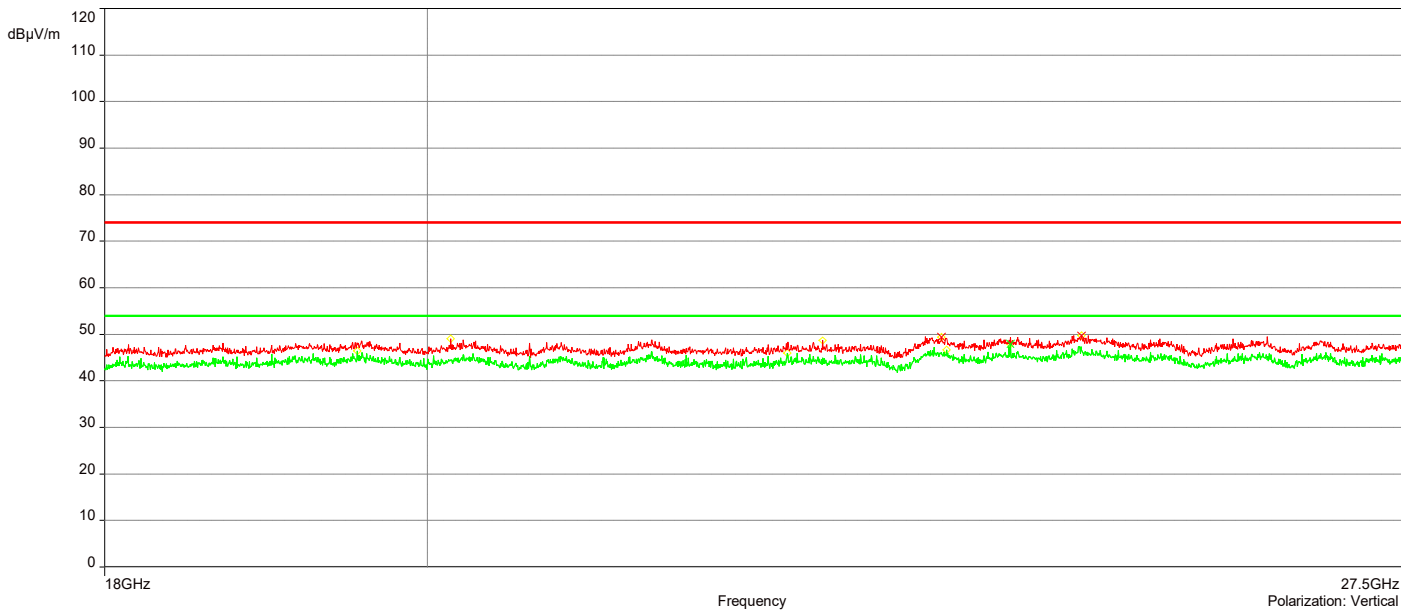
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No	Frequency (MHz)	Level Peak Reading (dBμV/m)	Correction Factor (dB)	Limit dBμV/m	Margin (dB)	Height (m)	Angle (°)	Polarization	Judgement
1.	23.652757GHz	49.35	1.94	74.00	-24.65	3.04	299.90	Vertical	Passed
2.	24.761285GHz	49.79	2.92	74.00	-24.21	1.30	179.90	Vertical	Passed
3.	24.758694GHz	49.96	2.95	74.00	-24.04	3.19	179.90	Horizontal	Passed

No	Frequency (MHz)	Level Average Reading (dBμV/m)	Correction Factor (dB)	Limit dBμV/m	Margin (dB)	Height (m)	Angle (°)	Polarization	Judgment
1.	23.601368GHz	47.11	2.04	54.00	-6.89	1.02	209.90	Horizontal	Passed
2.	24.847222GHz	47.62	2.78	54.00	-6.38	1.97	239.90	Horizontal	Passed
3.	24.192554GHz	47.95	1.96	54.00	-6.05	1.72	29.90	Vertical	Passed

Overall Graphs:





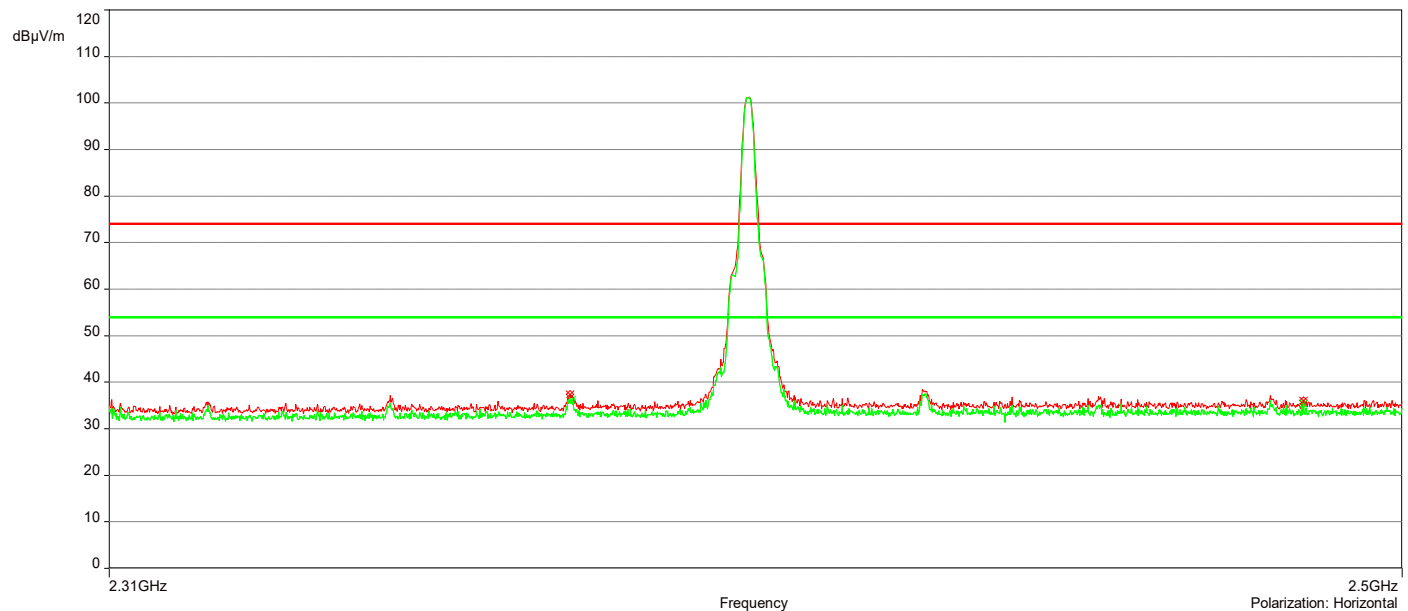
AH21071501-HAR-127#007_Restricted Bandedge_GFSK DH3 CH-0

10/11/2021 8:14:38 AM

No	Frequency (MHz)	Level Peak Reading (dBuV/m)	Correction Factor (dB)	Limit dBuV/m	Margin (dB)	Height (m)	Angle (°)	Polarization	Judgement
1.	2.4849825GHz	36.10	-2.39	74.00	-37.90	1.02	337.40	Horizontal	Passed
2.	2.4958179GHz	36.28	-2.46	74.00	-37.72	2.49	134.90	Vertical	Passed
3.	2.375963GHz	37.43	-3.01	74.00	-36.57	1.94	337.40	Horizontal	Passed
4.	2.3762481GHz	39.63	-2.95	74.00	-34.37	1.00	292.40	Vertical	Passed

No	Frequency (MHz)	Level Average Reading (dBuV/m)	Correction Factor (dB)	Limit dBuV/m	Margin (dB)	Height (m)	Angle (°)	Polarization	Judgment
1.	2.4964832GHz	34.91	-2.46	54.00	-19.09	1.90	22.40	Vertical	Passed
2.	2.4849825GHz	35.37	-2.39	54.00	-18.63	1.02	337.40	Horizontal	Passed
3.	2.3762481GHz	36.29	-3.01	54.00	-17.71	1.02	337.40	Horizontal	Passed
4.	2.3762481GHz	39.03	-2.95	54.00	-14.97	1.00	292.40	Vertical	Passed

Overall Graphs:





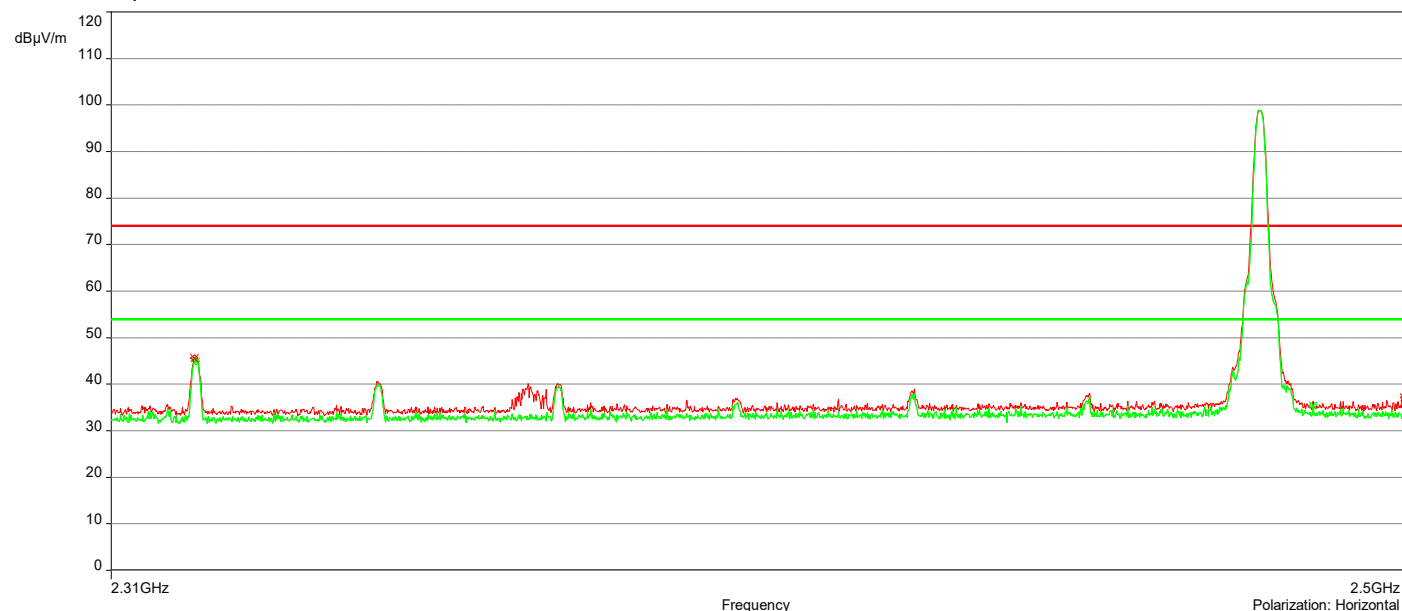
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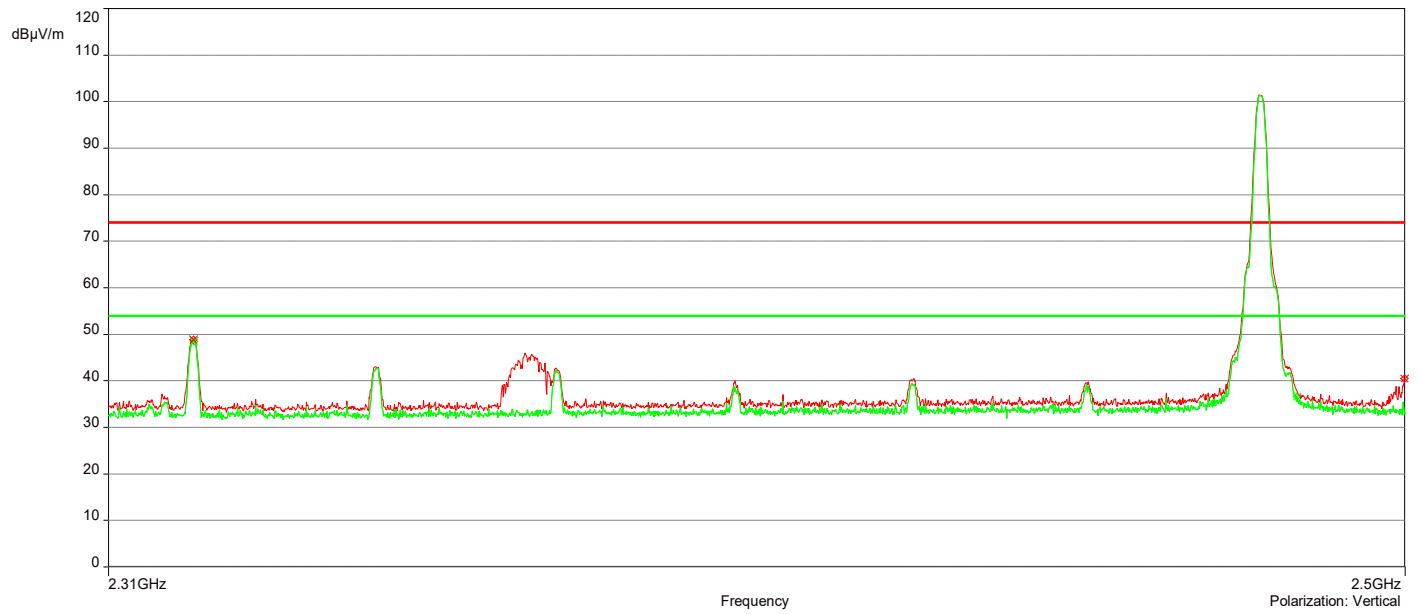
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No	Frequency (MHz)	Level Peak Reading (dBuV/m)	Correction Factor (dB)	Limit dBuV/m	Margin (dB)	Height (m)	Angle (°)	Polarization	Judgement
1.	2.5GHz	37.19	-2.35	74.00	-36.81	3.97	224.90	Horizontal	Passed
2.	2.499905GHz	40.48	-2.46	74.00	-33.52	3.97	292.40	Vertical	Passed
3.	2.3217859GHz	45.65	-3.27	74.00	-28.35	1.69	337.40	Horizontal	Passed
4.	2.321976GHz	48.79	-3.24	74.00	-25.21	1.70	269.90	Vertical	Passed

No	Frequency (MHz)	Level Average Reading (dBuV/m)	Correction Factor (dB)	Limit dBuV/m	Margin (dB)	Height (m)	Angle (°)	Polarization	Judgment
1.	2.4861231GHz	35.45	-2.39	54.00	-18.55	4.00	22.40	Horizontal	Passed
2.	2.4835568GHz	36.66	-2.37	54.00	-17.34	1.00	292.40	Vertical	Passed
3.	2.321976GHz	45.00	-3.27	54.00	-9.00	1.58	337.40	Horizontal	Passed
4.	2.322071GHz	48.54	-3.24	54.00	-5.46	1.70	269.90	Vertical	Passed

Overall Graphs:



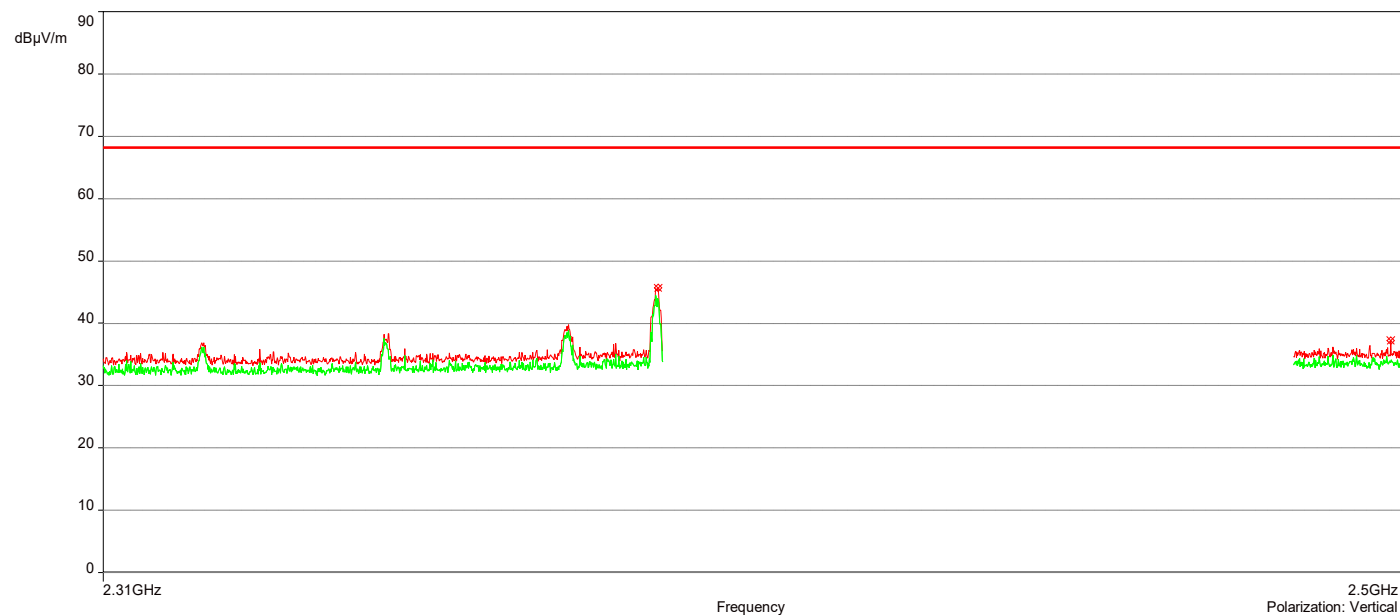
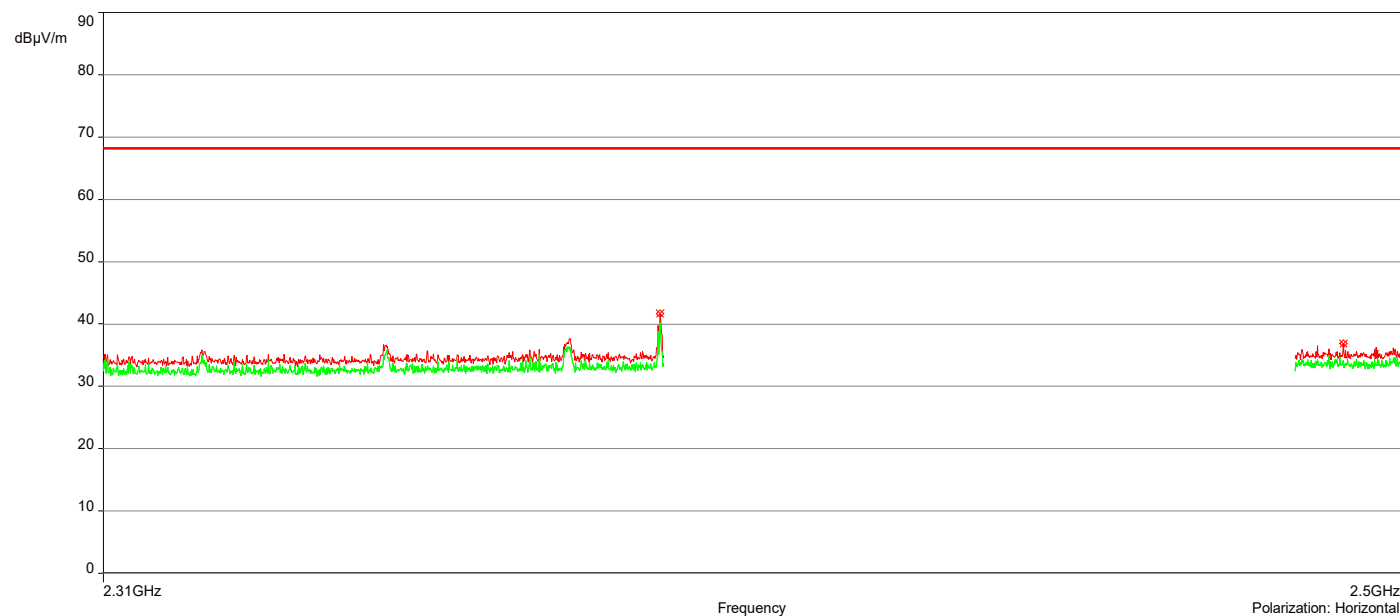


AH21071501-HAR-127#007_Unrestricted Bandedge_GFSK DH3 CH-0

10/11/2021 8:59:00 AM

No	Frequency (MHz)	Level Peak Reading (dBuV/m)	Correction Factor (dB)	Limit dBuV/m	Margin (dB)	Height (m)	Angle (°)	Polarization	Judgement
1.	2.3893594GHz	45.65	-2.91	68.23	-22.58	1.02	270.10	Vertical	Passed
2.	2.3895195GHz	41.66	-3.00	68.23	-26.57	2.15	315.10	Horizontal	Passed
3.	2.4982658GHz	37.22	-2.46	68.23	-31.01	1.80	202.50	Vertical	Passed
4.	2.4908168GHz	36.84	-2.38	68.23	-31.39	3.34	0.10	Horizontal	Passed

Overall Graphs:

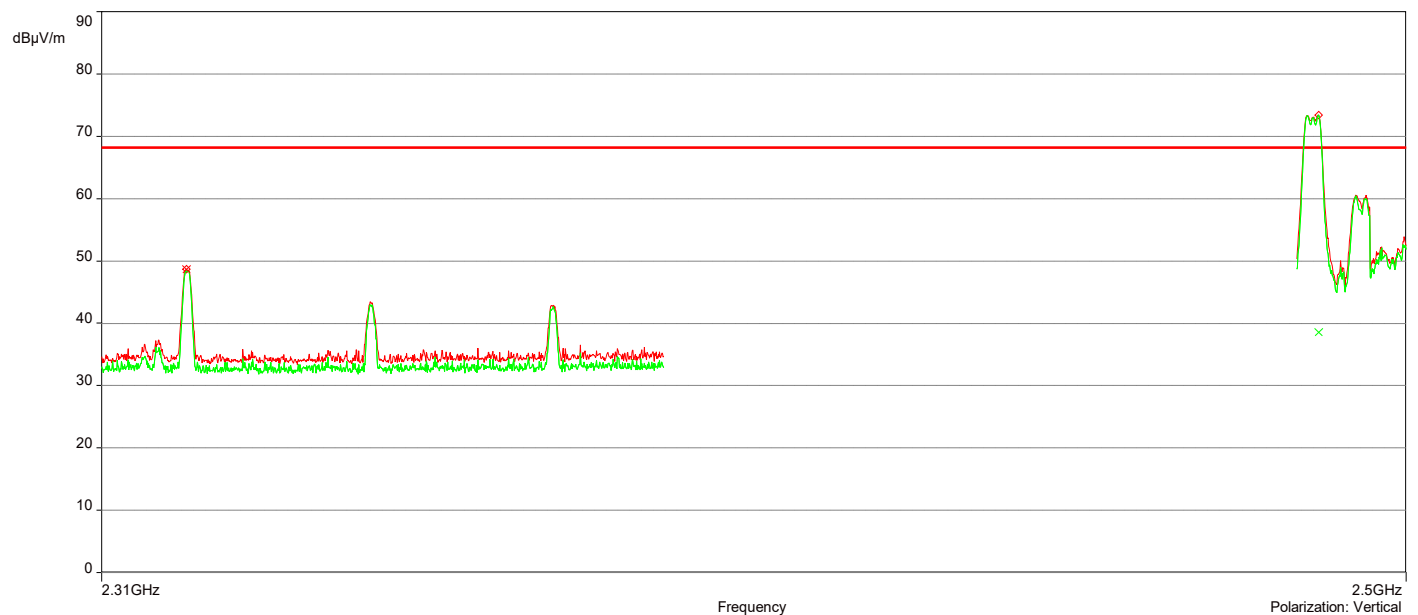
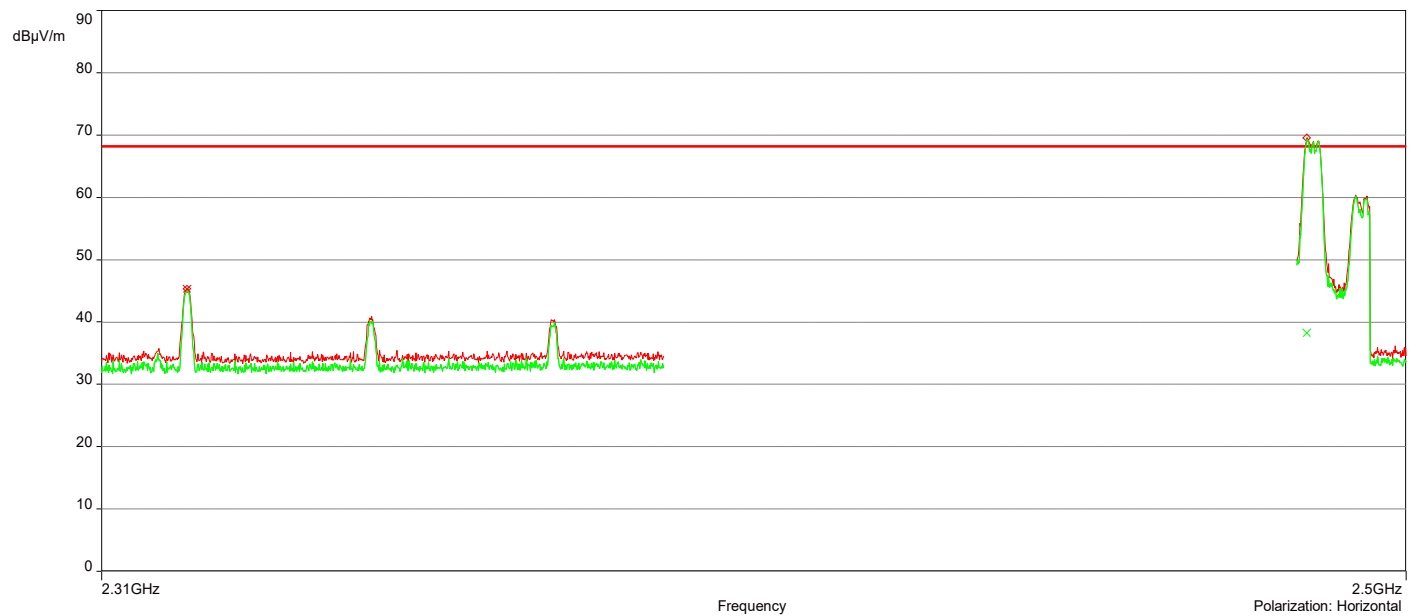


AH21071501-HAR-127#007_Unrestricted Bandedge_GFSK DH3 CH-78

10/11/2021 10:16:06 AM

No	Frequency (MHz)	Level Peak Reading (dBuV/m)	Correction Factor (dB)	Limit dBuV/m	Margin (dB)	Height (m)	Angle (°)	Polarization	Judgement
1.	2.3219319GHz	48.70	-3.24	68.23	-19.53	1.70	270.10	Vertical	Passed
2.	2.322012GHz	45.34	-3.27	68.23	-22.89	1.59	337.40	Horizontal	Passed
3.	2.4868033GHz	38.59	-2.42	68.23	-29.64	1.00	292.90	Vertical	Passed
4.	2.4849865GHz	38.22	-2.39	68.23	-30.01	1.91	336.90	Horizontal	Passed

Overall Graphs:



Document Revisions

Version	Date	Modifier	Changes
1.0	10/22/2021	Aravind Buddana Ryan Philips	Initial Release
2.0	03/14/2022	Aravind Buddana	- Updated Raw Plots along with Instrument settings for all tests - Updated Test Equipment Used data - Corrected Test start/End dates - Added Band Edge tabular data - Updated Peak Output power data - Updated Band edge tabular data
3.0	04/08/2022	Aravind Buddana Ryan Philips	- Updated Conducted Band Edge Hopping Test data - Updated Radiated setup Equipment Data - Updated Radiated Remarks sample Equation

End of Report