Regulatory Test Report

Prepared for Harman International

This report presents detailed information on

FPDM MY22

Prepared by

Aravind Buddana

Engineer II

Approved by

Jason Kanakry

General Manager

Issue date: 06/17/2021

Report No: AH20090801-HAR-243-TR1 v2.3

Contents

- # Test Request Information

Test Request #:	7700028922
Test Requested By:	Anthony Yousif Harman International Industries, Inc. 30001 Cabot Drive, Novi, MI 48377
Test item Description:	FPDM MY22
Part Number:	WL LHD, WS
DUT Sample Number:	AH20090801-HAR-243 #1, AH20090801-HAR-243 #2, AH20090801-HAR-243 #4
Hardware Version of DUT:	WL LHD, WS
Software Version of DUT:	N/A
Component Category of DUT:	N/A
FCC ID:	2AHPN-BE2853
IC:	6434C-BE2853
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:	04/28/2021
Date test started:	05/04/2021
Date test finished:	06/08/2021

- # 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 5.0dBi 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 a transmitter operating pursuant to:

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

The product is the FPDM MY22. 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, π/4 DQPSK, 8DPSK
Number of Channels	79
Tested Channels	0,39,78
DUT Antenna Type	Non-detachable PCB trace
DUT Antenna Gain	-2.55dBi

DUT S/N	AH20090801-HAR-243 #1
DUT Operating Mode	Bluetooth Test Mode
DUT Operating Voltage	12V
Test Item	FCC 15.247 Bluetooth Classic
Comment	Meets Requirements
Start Date	05-04-2021
End Date	06-08-2021
Tested By	Aravind Buddana

DUT S/N	AH20090801-HAR-243 #4 (WS Spot Check)
DUT Operating Mode	Bluetooth Test Mode
DUT Operating Voltage	12V
Test Item	FCC 15.247 Bluetooth Classic
Comment	Meets Requirements
Start Date	05-04-2021
End Date	06-08-2021
Tested By	Aravind Buddana

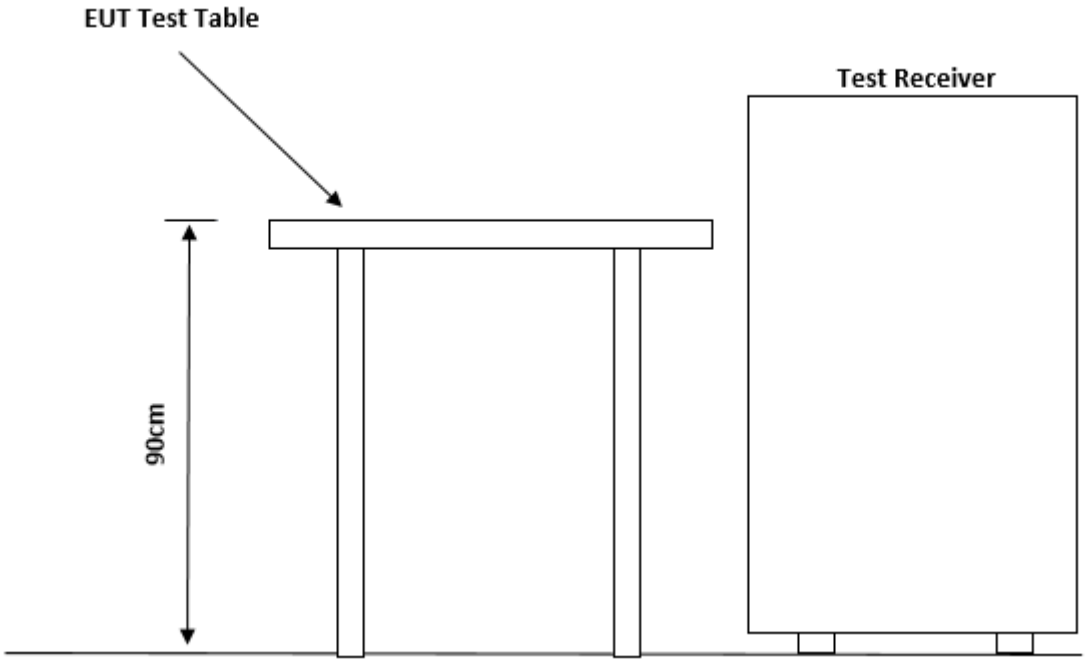
Notes: AH20090801-HAR-243 #4 is WS Sample for spot check

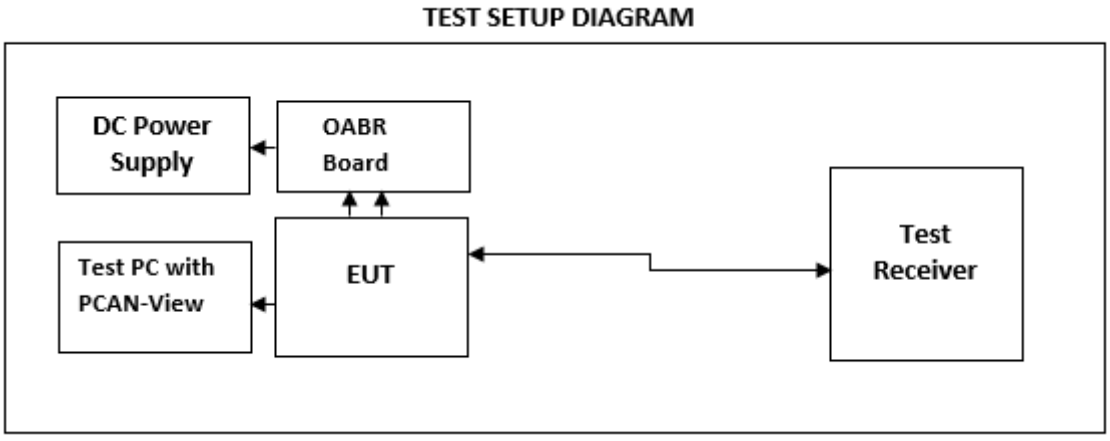
Spot checks are conducted on Data rate with highest Power obtained during AH20090801-HAR-243 #4 testing.

Test Setup

Conducted Test Site Description

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





Test Equipment Used

ID #	Equipment	Manufacturer	Model #	Serial #	Cal Due
BVD0226	Spectrum Analyzer 10Hz-44GHz	Rohde & Schwarz	FSV3044	101018	1/14/2022
BVD0227	8 port switch unit for Wireless Test system	Rohde & Schwarz	OSP150	101100	N/A
BVD0228	8 port switch unit for Wireless Test system	Rohde & Schwarz	OSP220	101632	N/A
BVD0224	Signal Generator 100kHz-40GHz	Rohde & Schwarz	SMB100A	181741	11/19/2021
BVD0225	Signal Generator 100k-6GHz with GPS simulator	Rohde & Schwarz	SMW200 A	107664	11/18/2021
BVD0250	Wireless Connectivity Tester 70M-6GHz	Rohde & Schwarz	CMW270	102113	11/18/2021
BVD0343	DC Regulated Power Supply	Circuit Specialists, INC	CSI3020X	595215	N/A
BVD0321	Fixed Attenuator 2W 20dB - 40GHz	Mini-Circuits	BW-K20-2W44+	2103	N/A
BVD0229	Temp and Humidity Meter	Fluke	971	12001009	3/26/2022
N/A	Test-PC	Lenovo Thinkpad	E560	PF0L0N9R	N/A

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	LAN Cable	Harman	N/A	N/A	N/A
N/A	FPDM Harness	Harman	N/A	N/A	N/A
N/A	OABR Board (Ethernet Converter)	Harman	B365_9900_12KK 3662772	N/A	N/A
N/A	USB to CAN adapter	GridConnect	N/A	IPEH-002021-316421	N/A
N/A	USB2.0 to Fast Ethernet Adapter	Trendnet	TU2-ET100	RA0JU56004698	N/A
N/A	PCAN-View	PEAK-System	N/A	N/A	4.3.4.615

Notes: PCAN-View software is installed on Test-PC (Test-PC is not provided by customer and any windows PC should be compatible to run this software), the test PC with PCAN-View software is connected to DUT.
The PCAN-view is configured with customer provided configurations as shows below. The following are the minimum required CAN messages that need to be simulated using a CAN simulation tool to power on the module. Note that the CAN bus speed must be set to 125Kbps.

MsgID	Len	Data Byte(s)	Period
356	8	00 00 40 00 00 00 00 00	250
3E0	8	03 00 00 00 00 00 00 00	500
401	8	FE FF 3F FF FF FF FF FF	150
46C	8	00 80 FF FF C0 00 00 00	500
5B5	8	00 FF 00 00 00 00 00 00	1000
5B6	8	00 00 00 00 00 00 00 00	1000
641	8	00 00 00 00 00 00 00 00	500
75C	2	00 00	1000
760	6	00 00 00 00 00 00	1000
1E340000	6	FD 02 04 0F 00 00	1000

FCC 15.247 Bluetooth Classic

DUT Information

DUT Name:	FPDM MY22
Manufacturer:	Harman International Industries, Inc.
Serial Number:	AH20090801-HAR-243 #1 , AH20090801-HAR-243 #4 (WS Spot Check)

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	-2.55dBi
Number of transmit chains	1
Equipment type	Frequency Hopping Spread Spectrum

Test Results Summary

AH20090801-HAR-243 #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	Pass	Pass	Pass	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	Pass	Pass	Pass	Pass	Pass	Pass	Pass	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	Pass	Pass	Pass	Pass	Pass	Pass	Pass	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	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass

AH20090801-HAR-243 #4 (WS Spot Check Sample)

Spot checks are conducted on Data rate with highest Power (i.e., DH1 as per AH20090801-HAR-243 #4 results)

DH1

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

AH20090801-HAR-243 #1

Packet Type	Duty Cycle, %	Gated RMS (dBm)	Limit Max (dBm)
DH1	31.650	6.457	21.0
DH3	66.063	6.516	21.0
DH5	77.324	6.709	21.0
2-DH1	32.588	5.458	21.0
2-DH3	66.374	5.233	21.0
2-DH5	77.526	5.179	21.0
3-DH1	32.578	5.370	21.0
3-DH3	66.291	5.205	21.0
3-DH5	77.554	5.119	21.0

AH20090801-HAR-243 #4 (WS Spot Check Sample)

Packet Type	Duty Cycle, %	Gated RMS (dBm)	Limit Max (dBm)
DH1	31.651	7.490	21.0

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

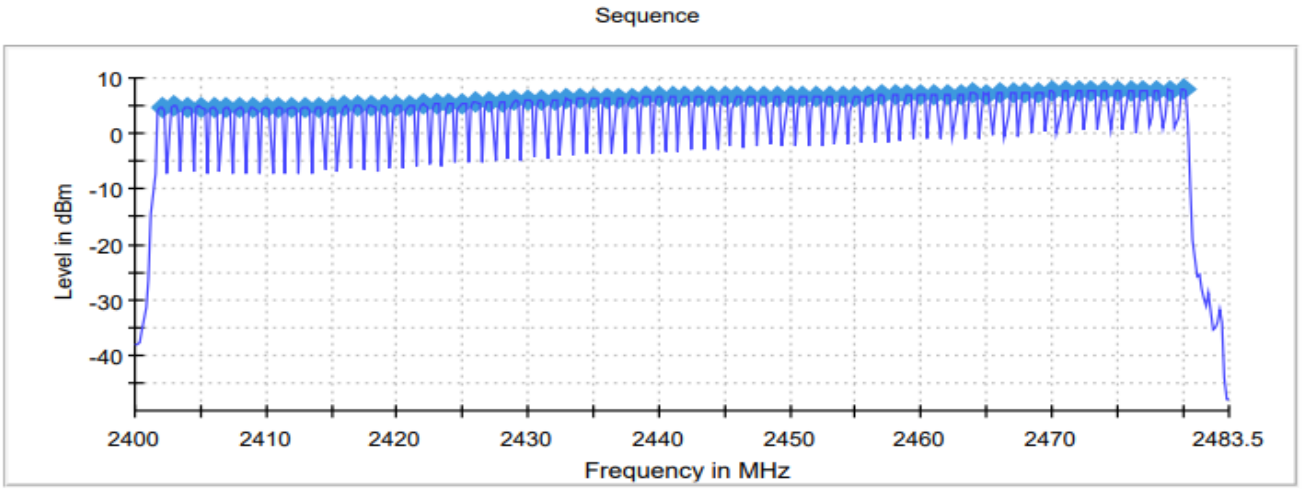
AH20090801-HAR-243 #1

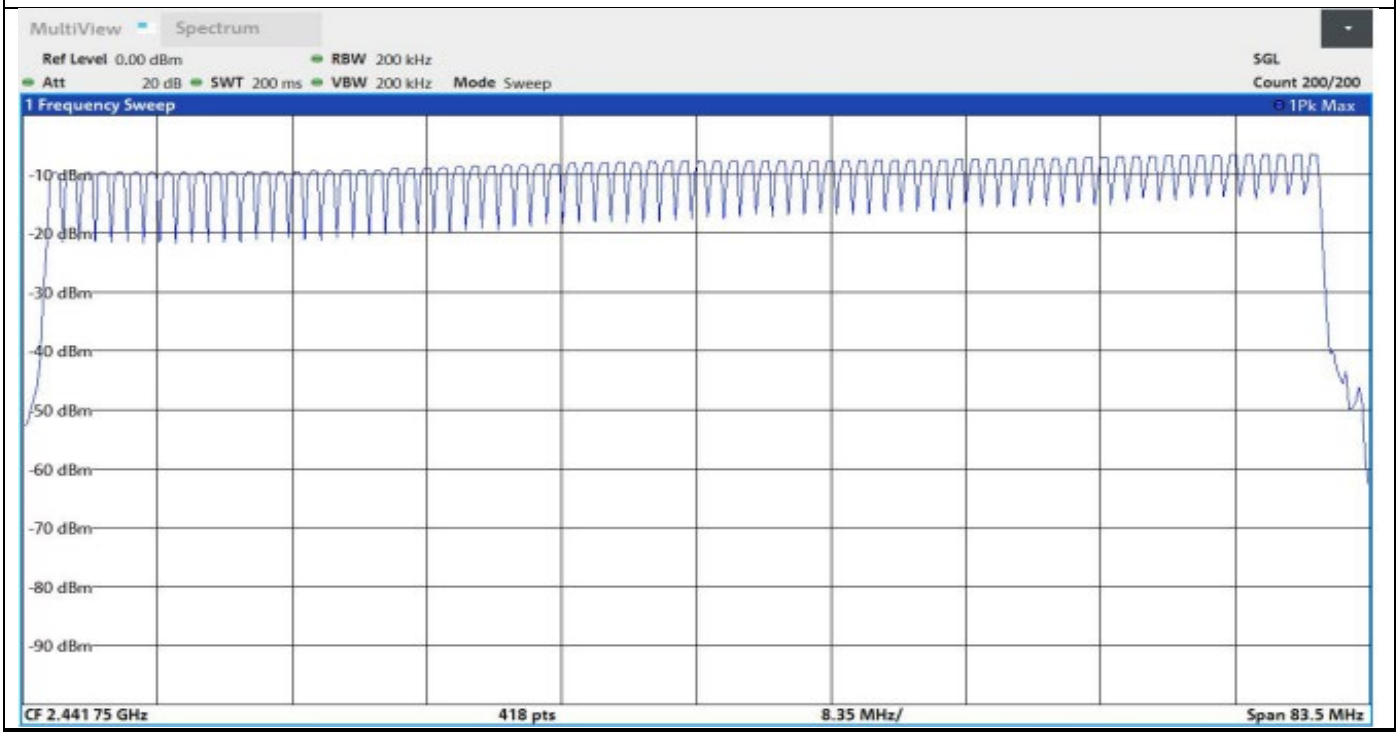
Channels

Channels	Limit Min	Result
79	15	PASS

Plot for packet type DH1 shown below.

Hopping Frequencies





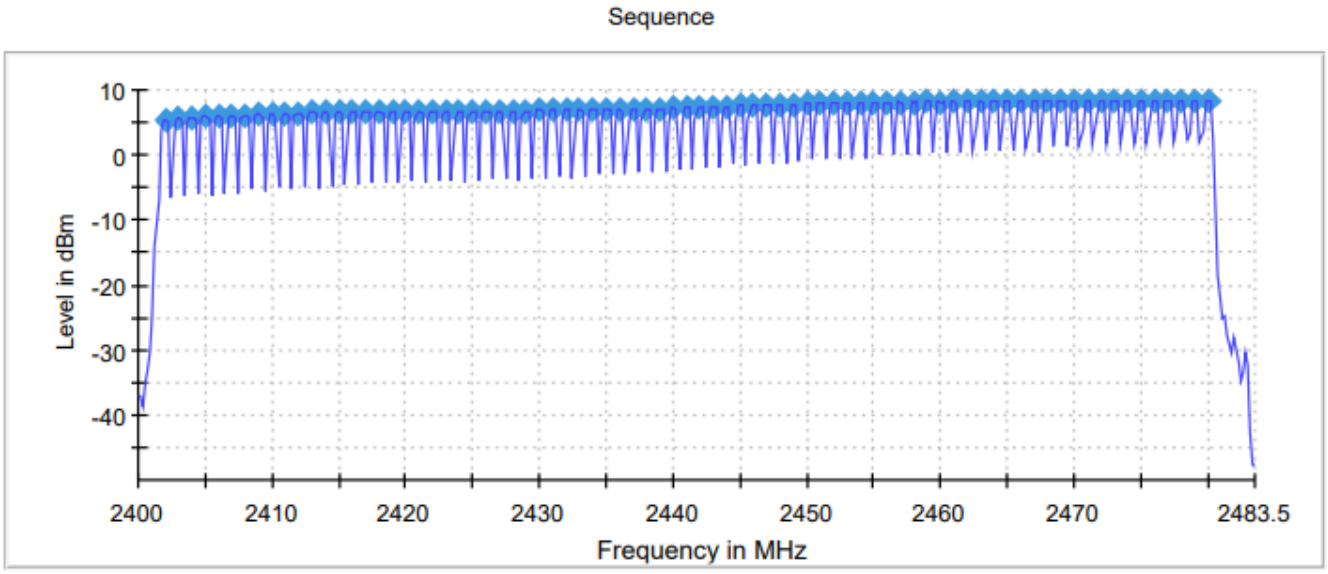
AH20090801-HAR-243 #4 (WS Spot Check Sample)

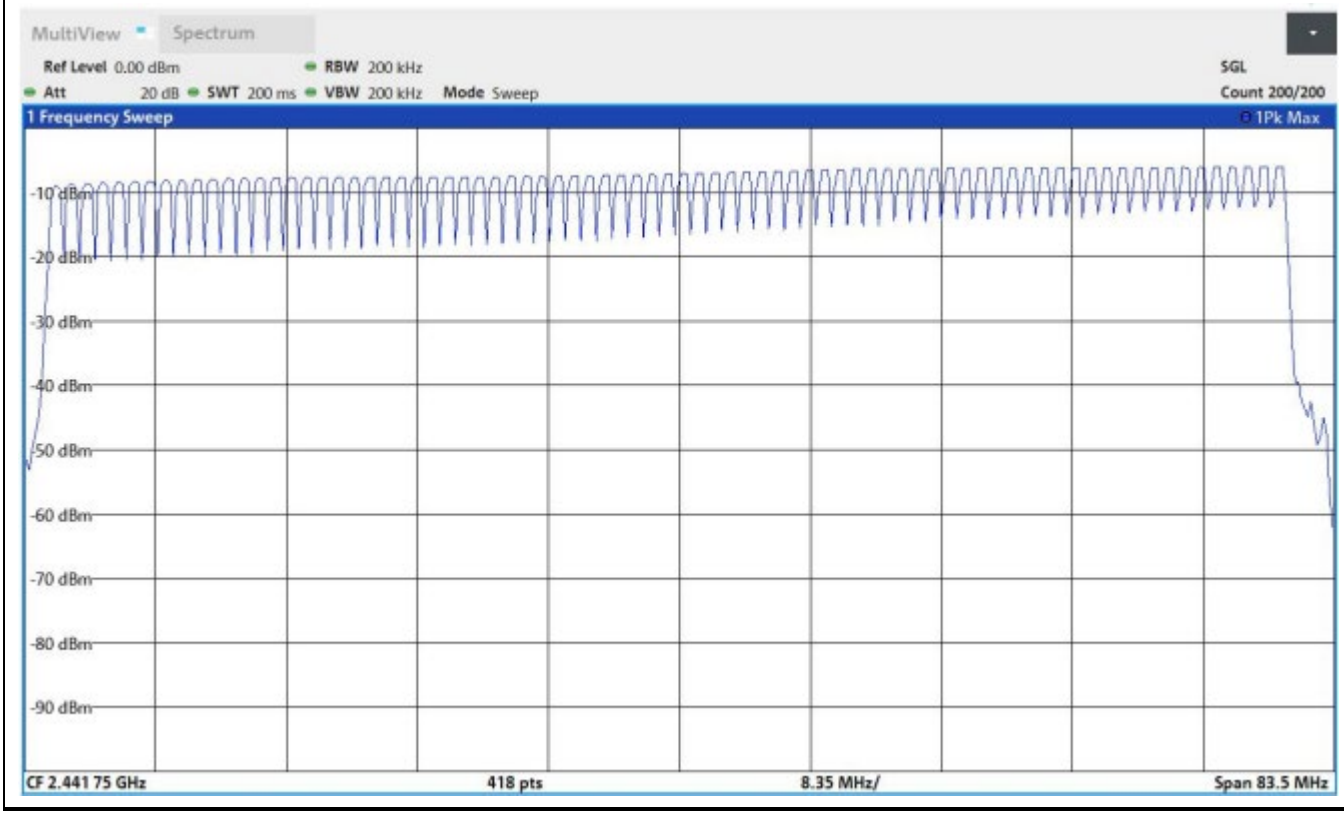
Channels

Channels	Limit Min	Result
79	15	PASS

Plot for packet type DH1 shown below.

Hopping Frequencies





Band Edge (Hopping)

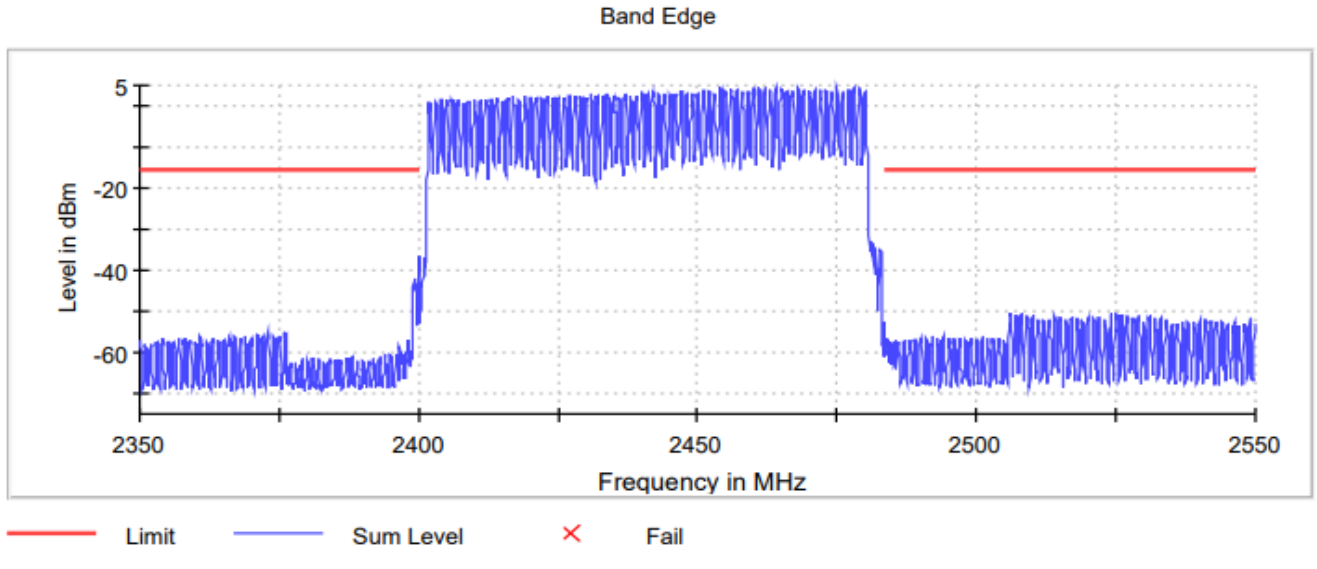
Test according to FCC title 47 part 15 §15.247(d), KDB 558074 D01 DTS Meas Guidance v05 and ANSI C63.10-2013 7.8.6

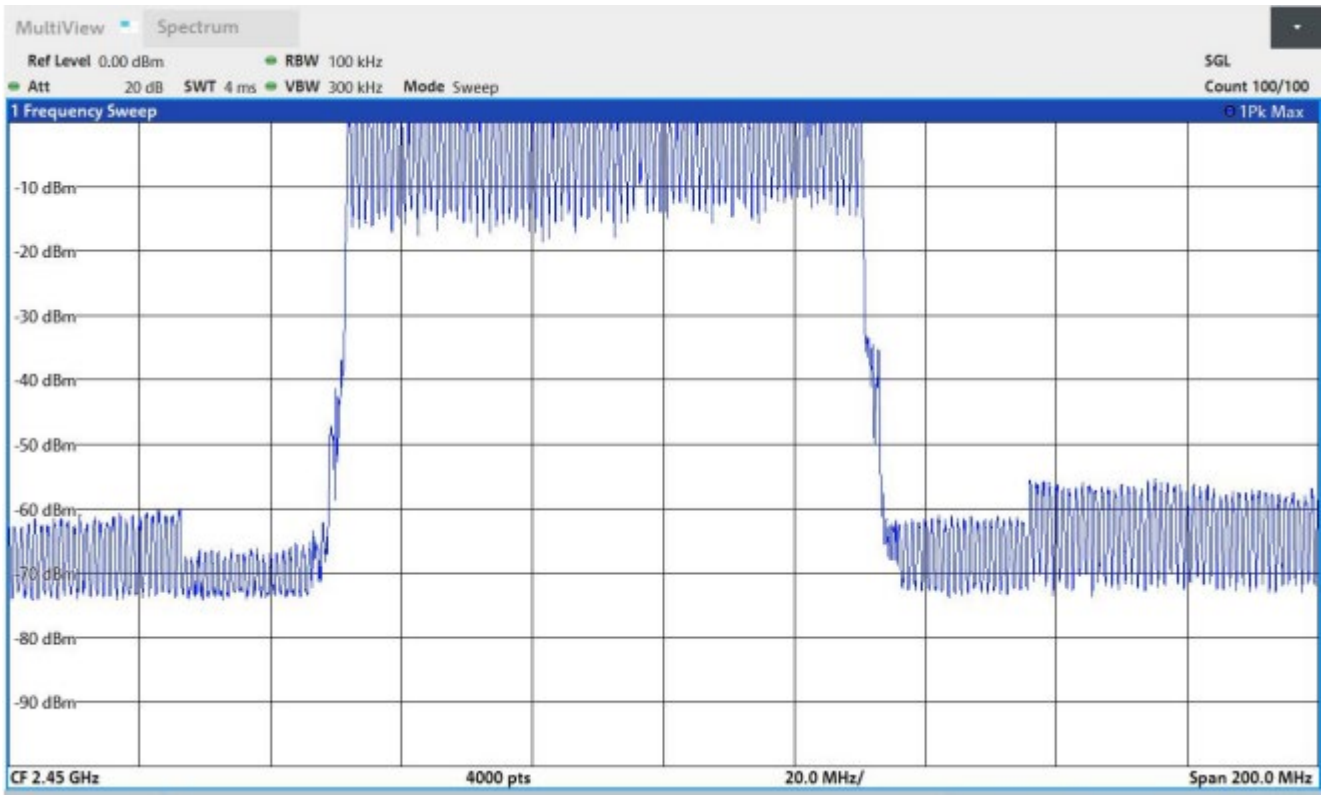
Measurement uncertainty calculated in accordance with ETSI TR 100 028-1. Expanded Uncertainty (K=2) < 0.8 dB

AH20090801-HAR-243 #1

Data Rate	Frequency (MHz)	Level (dBm)
DH1	2459.975000	4.4
DH3	2462.975000	4.4
DH5	2457.975000	4.6
2-DH1	2457.975000	3.9
2-DH3	2463.975000	3.8
2-DH5	2457.975000	3.8
3-DH1	2455.025000	3.8
3-DH3	2455.975000	3.8
3-DH5	2453.975000	3.7

Plots for packet type DH1 shown below



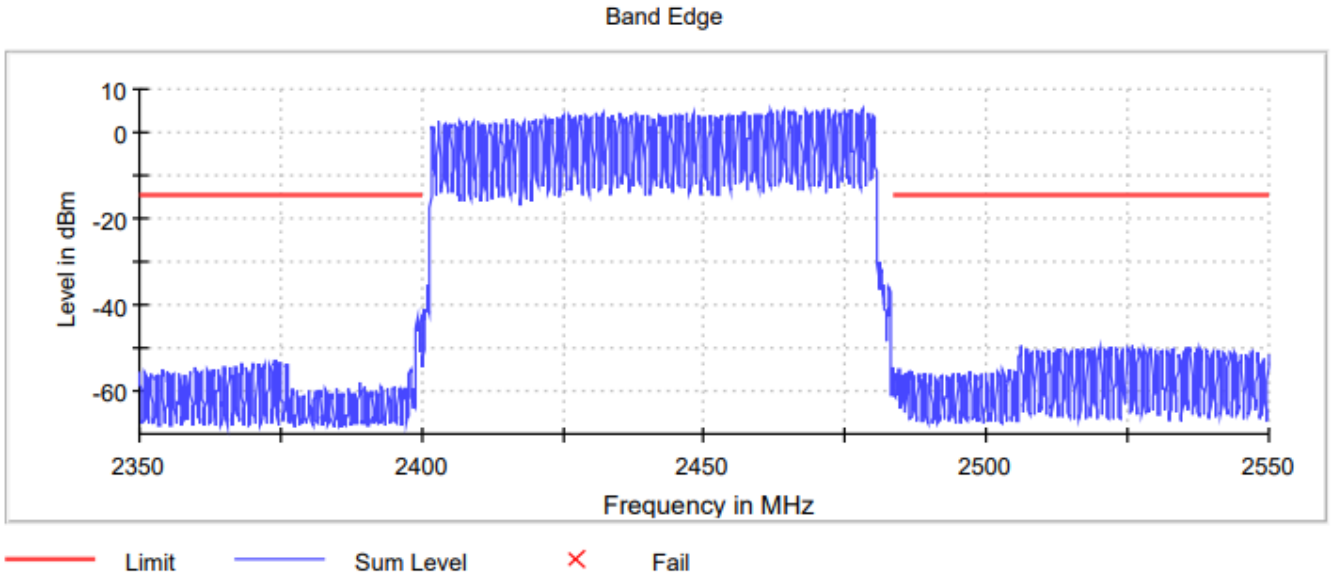

MultiView
Spectrum
Ref Level 0.00 dBm
RBW 100 kHz
SGL
Att 20 dB
SWT 4 ms
VBW 300 kHz
Mode Sweep
Count 100/100
1 Frequency Sweep
1Pk Max
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
-80 dBm
-90 dBm
CF 2.45 GHz
4000 pts
20.0 MHz/
Span 200.0 MHz

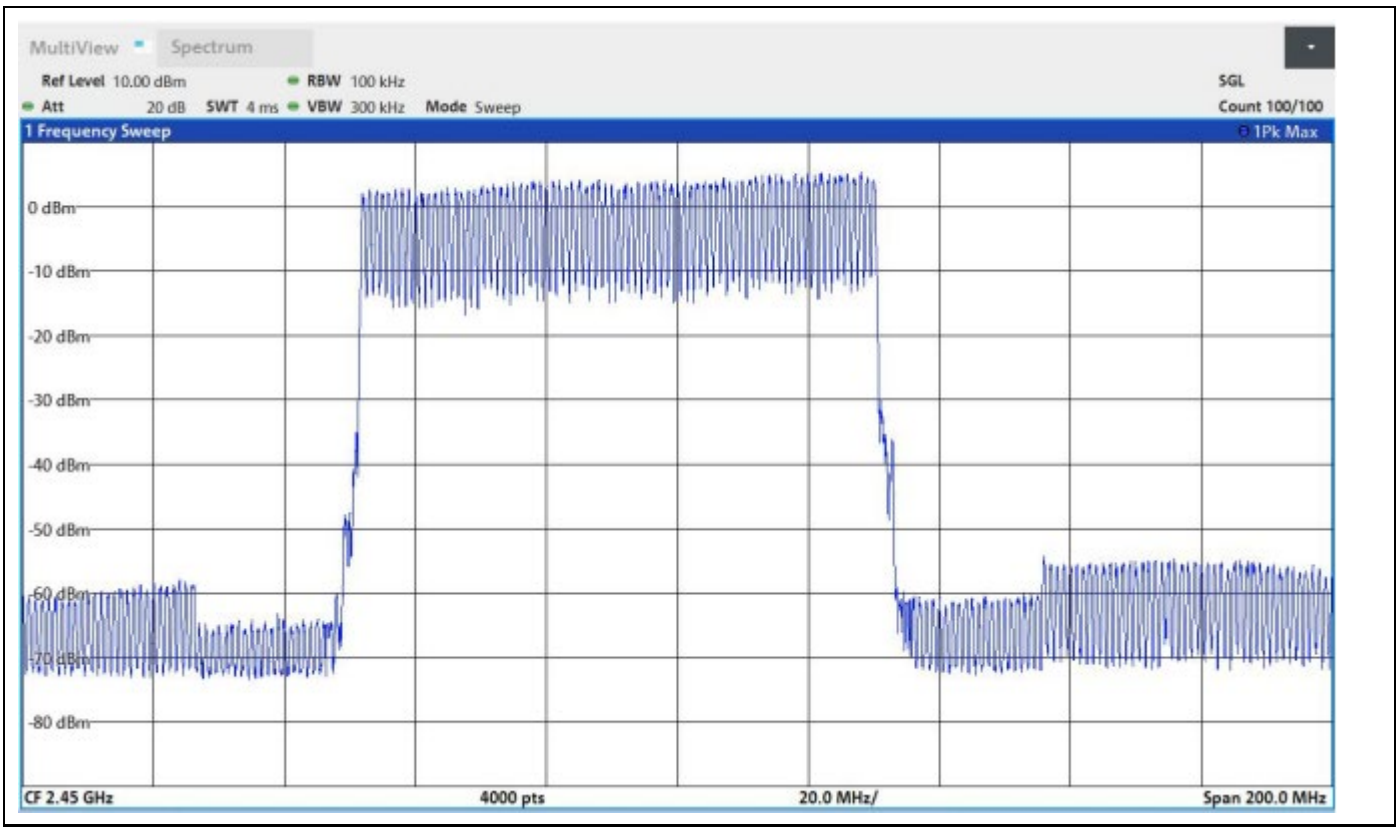
AH20090801-HAR-243 #4 (WS Spot Check Sample)

Plot for packet type DH1 shown below.

Data Rate	Frequency (MHz)	Level (dBm)
DH1	2478.025000	5.4
DH3	2467.975000	5.1
DH5	2478.175000	5.4
2-DH1	2471.025000	4.4
2-DH3	2472.975000	4.3
2-DH5	2474.025000	4.4
3-DH1	2473.825000	4.5
3-DH3	2474.975000	4.3
3-DH5	2468.025000	4.3

Plots for packet type DH1 shown below




MultiView
Spectrum
Ref Level 10.00 dBm
RBW 100 kHz
SGL
Att 20 dB
SWT 4 ms
VBW 300 kHz
Mode Sweep
Count 100/100
1 Frequency Sweep
1Pk Max
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
-80 dBm
CF 2.45 GHz
4000 pts
20.0 MHz/
Span 200.0 MHz

Carrier Frequency Separation

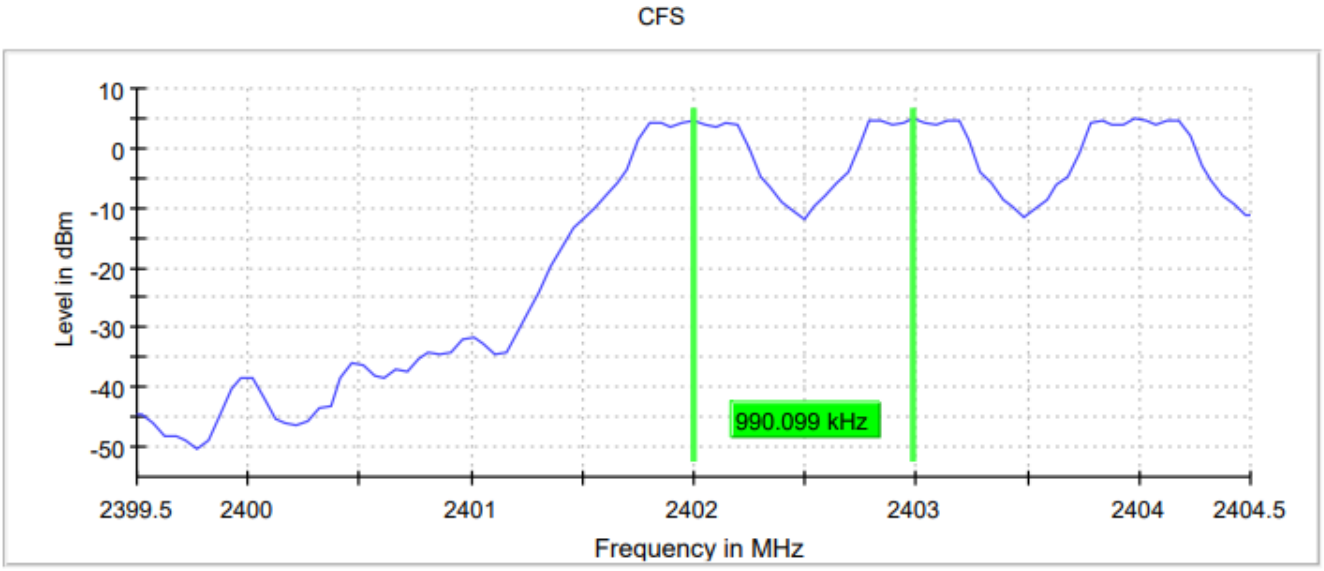
Test according to FCC title 47 part 15 §15.247(a), KDB 558074 D01 DTS Meas Guidance v05 9 and ANSI C63.10-2013 7.8.2

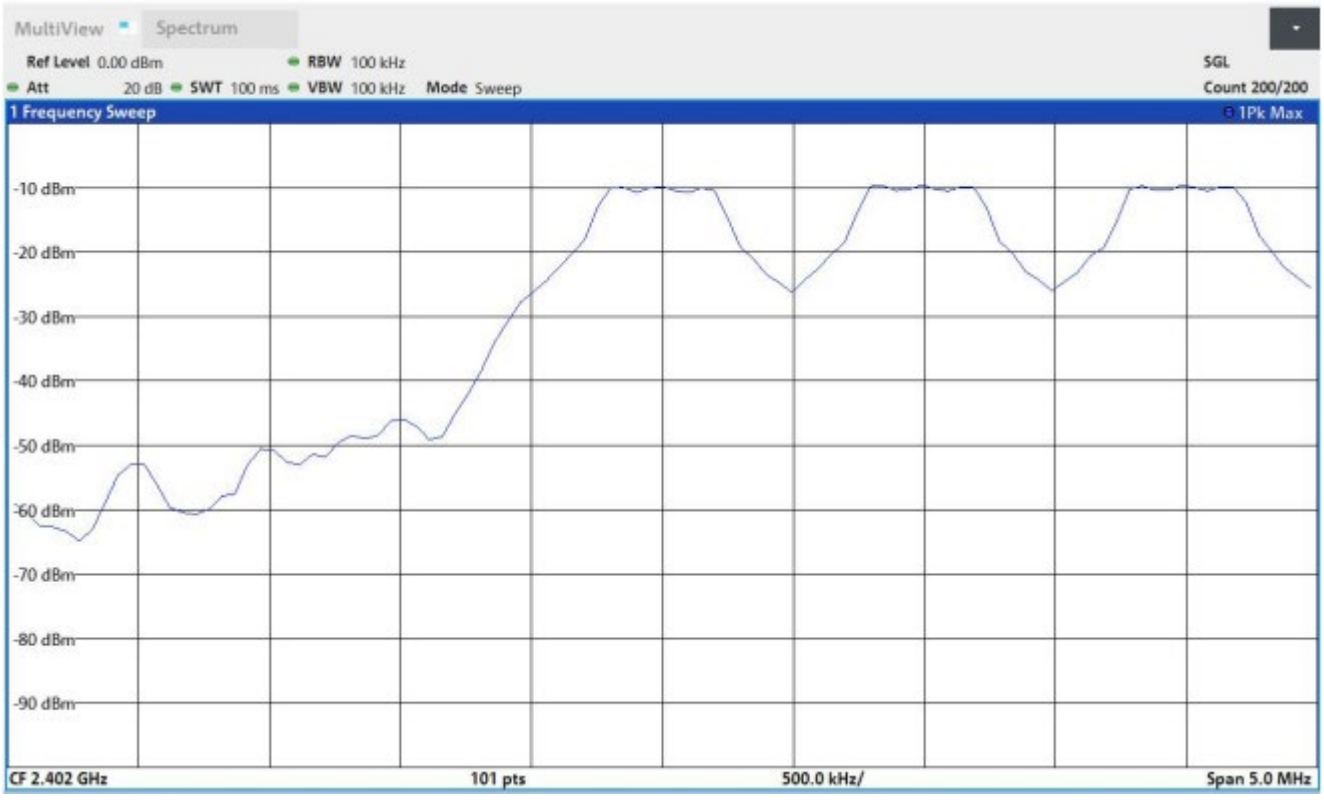
Measurement uncertainty calculated in accordance with ETSI TR 100 028-1. Expanded Uncertainty (k = 2) < 1%

AH20090801-HAR-243 #1

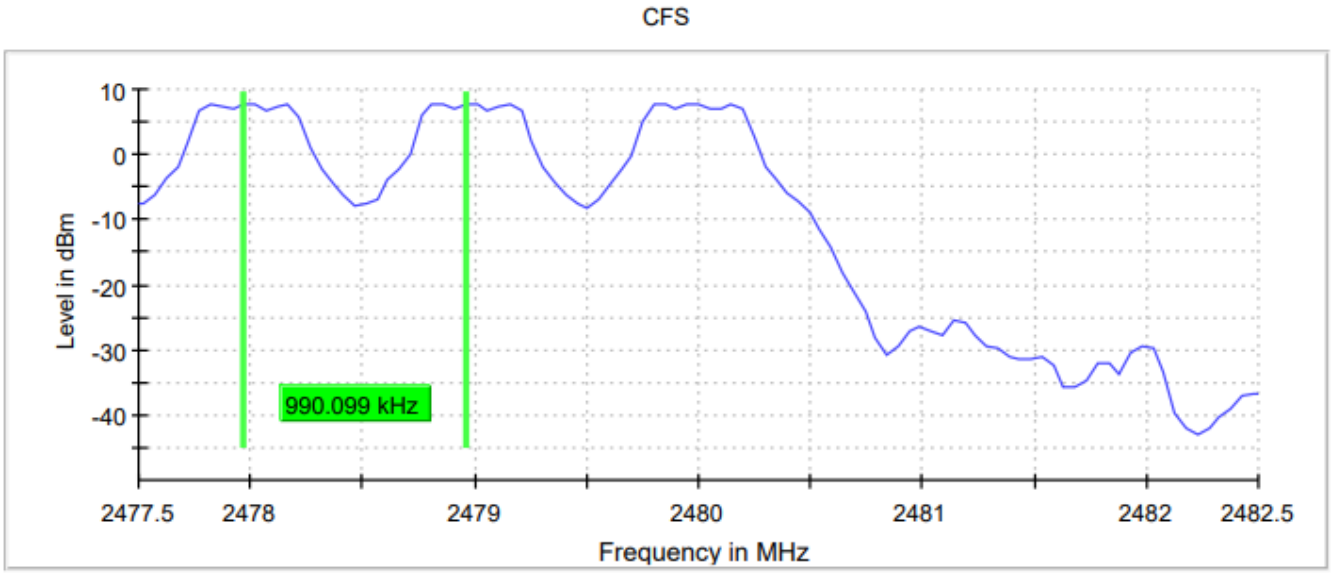
Hopping Mode				
Packet Type	2402MHz		2480MHz	
	Frequency Separation (MHz)	Minimum Limit (MHz)	Frequency Separation (MHz)	Minimum Limit (MHz)
DH1	0.990099	0.666667	0.990099	0.666667
DH3	0.990099	0.666667	0.990099	0.666667
DH5	0.990099	0.666667	0.990099	0.666667
2-DH1	0.990099	0.666667	0.990099	0.666667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

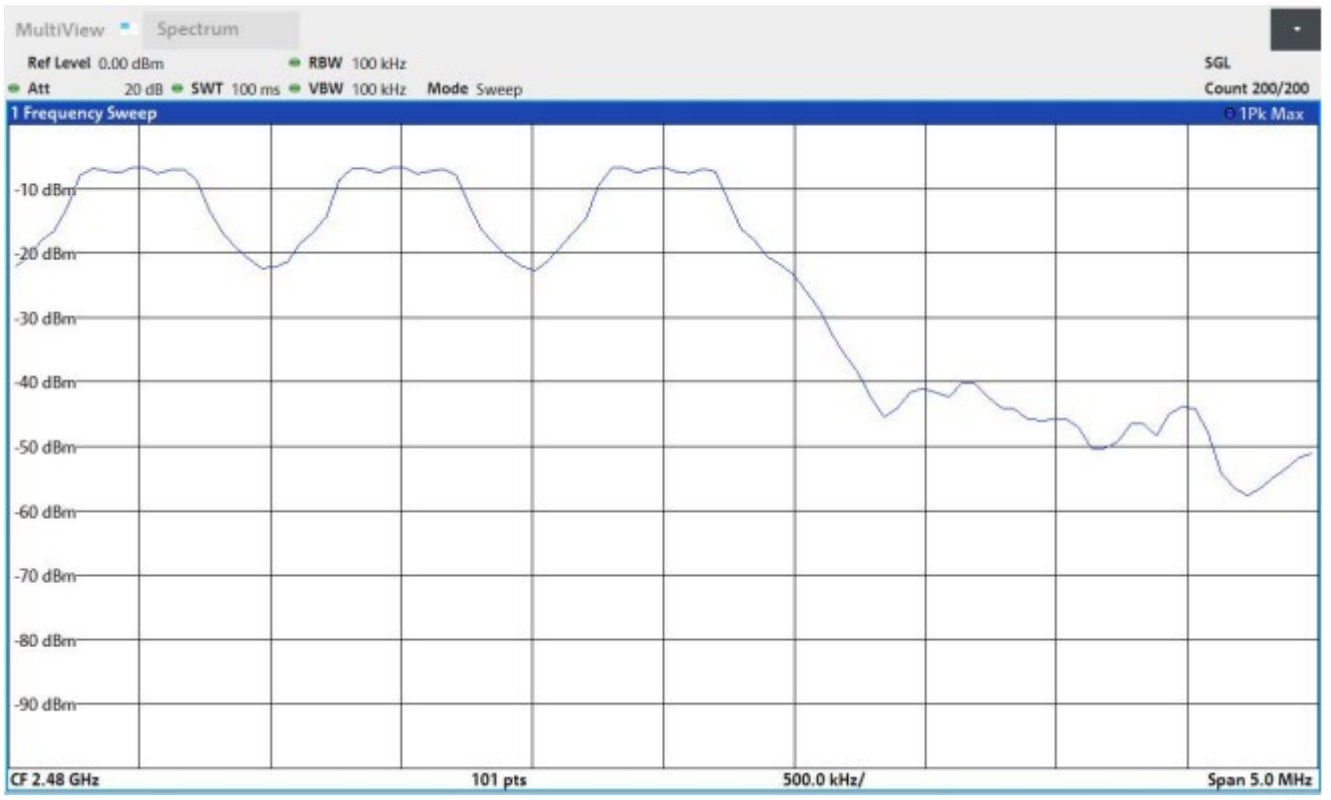
2402MHz DH1


CFS
10
0
-10
-20
-30
-40
-50
Level in dBm
990.099 kHz
2399.5
2400
2401
2402
2403
2404
2404.5
Frequency in MHz


MultiView
Spectrum
Ref Level 0.00 dBm
RBW 100 kHz
SGL
Att 20 dB SWT 100 ms VBW 100 kHz Mode Sweep
Count 200/200
1 Frequency Sweep
1Pk Max
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
-80 dBm
-90 dBm
CF 2.402 GHz
101 pts
500.0 kHz/
Span 5.0 MHz

2480MHz DH1


CFS
10
0
-10
-20
-30
-40
Level in dBm
990.099 kHz
2477.5
2478
2479
2480
2481
2482
2482.5
Frequency in MHz

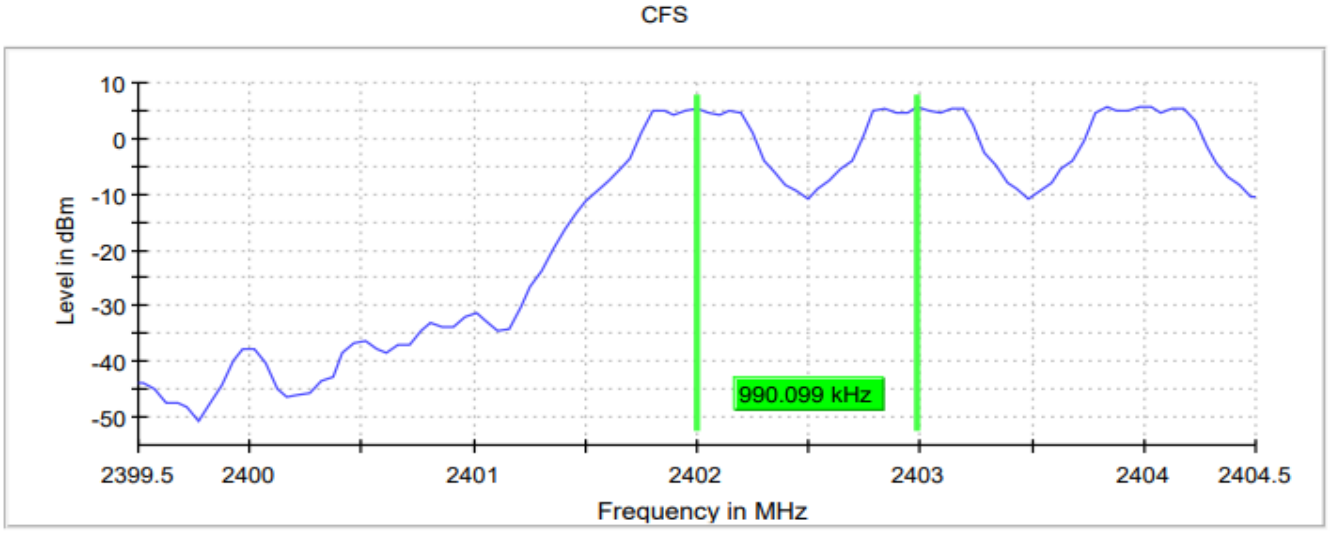

MultiView
Spectrum
Ref Level 0.00 dBm
RBW 100 kHz
SGL
Att 20 dB SWT 100 ms VBW 100 kHz Mode Sweep
Count 200/200
1 Frequency Sweep
1Pk Max
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
-80 dBm
-90 dBm
CF 2.48 GHz
101 pts
500.0 kHz/
Span 5.0 MHz

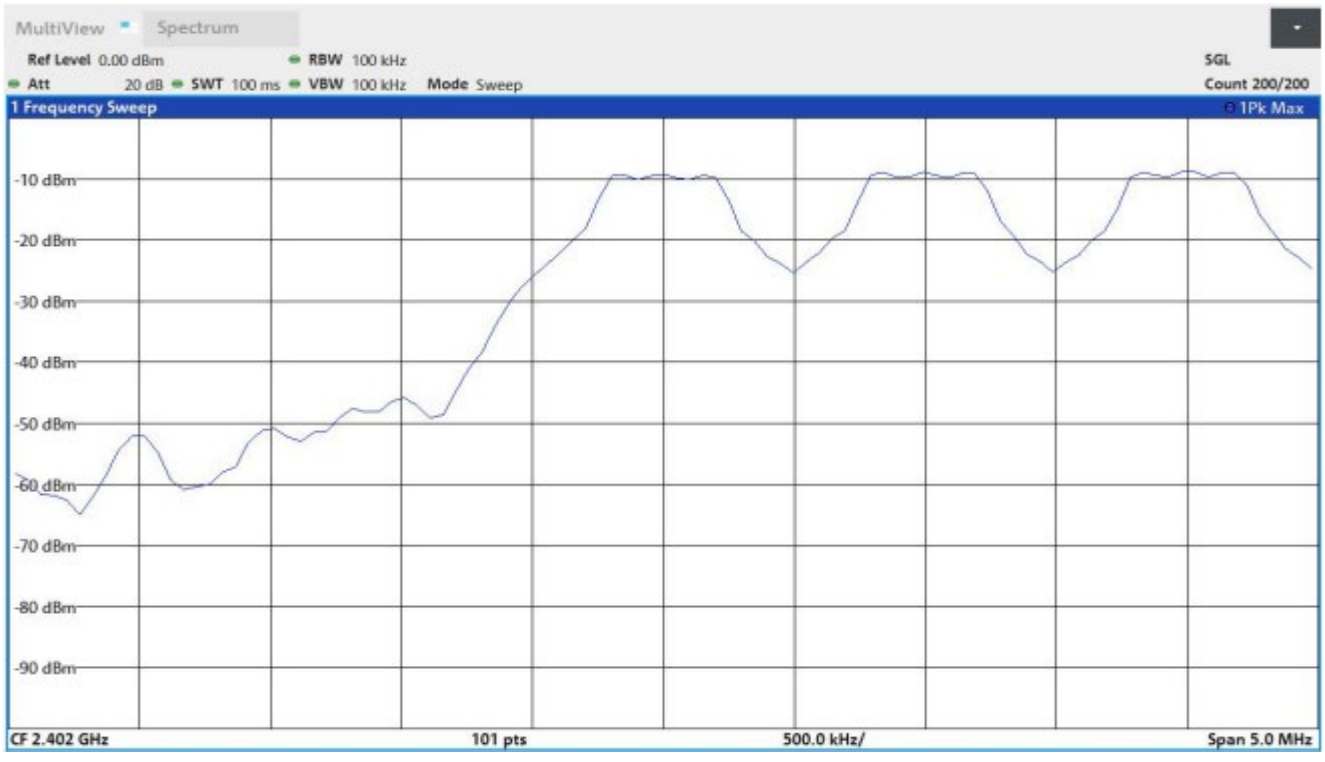
AH20090801-HAR-243 #4 (WS Spot Check Sample)

Plot for packet type DH1 shown below.

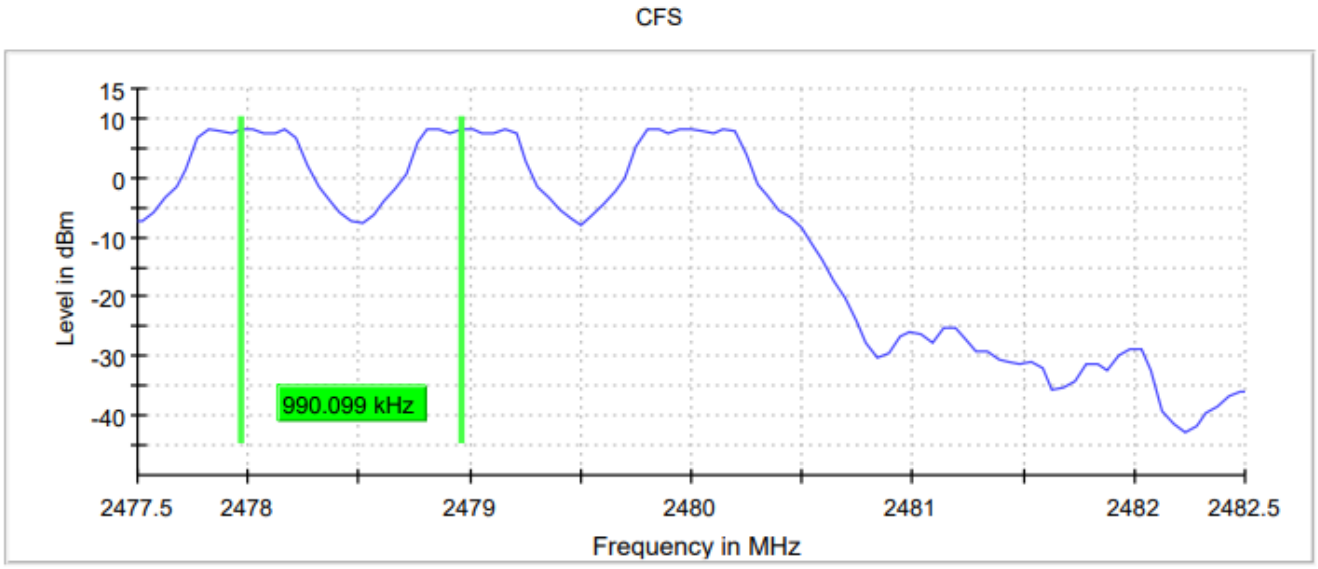
Hopping Mode				
Packet Type	2402MHz		2480MHz	
	Frequency Separation (MHz)	Minimum Limit (MHz)	Frequency Separation (MHz)	Minimum Limit (MHz)
DH1	0.990099	0.666667	0.990099	0.666667

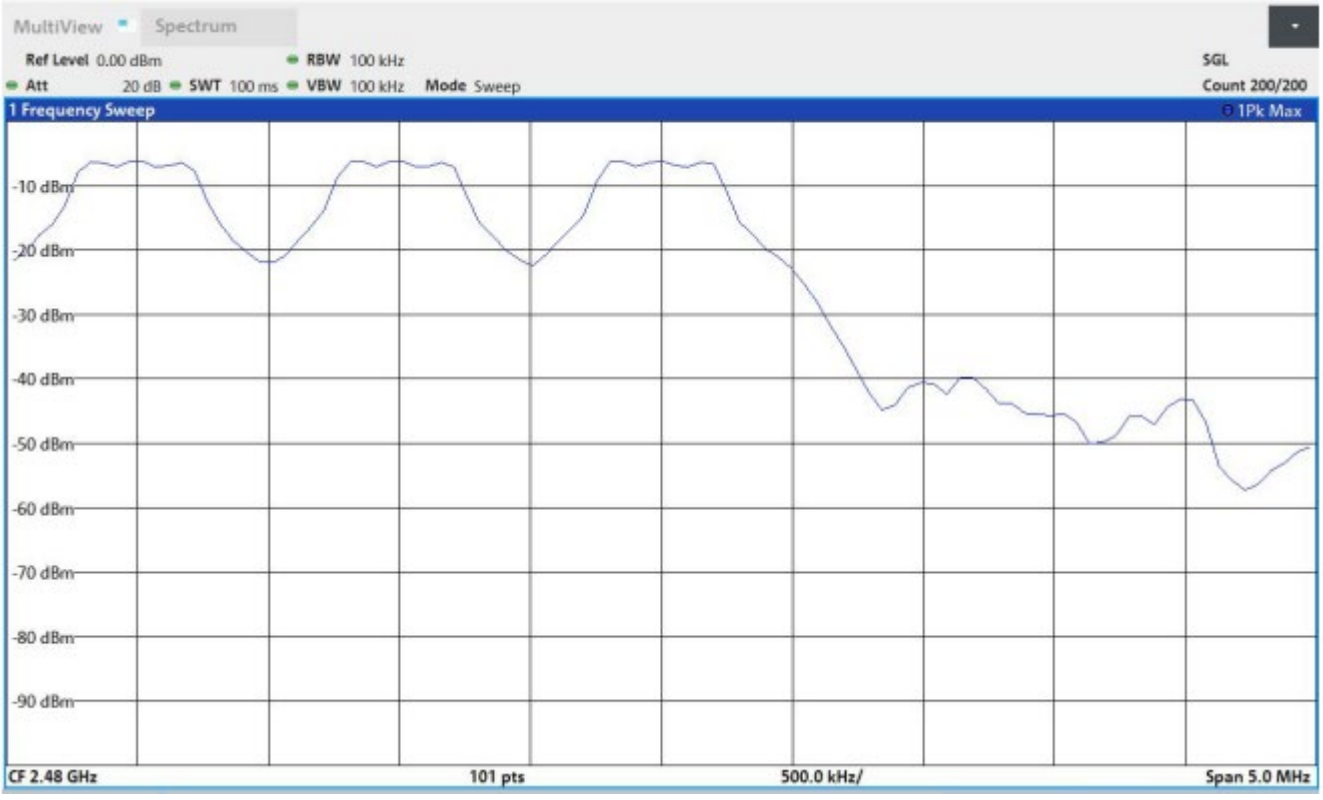
2402MHz DH1





2480MHz DH1


CFS
15
10
0
-10
-20
-30
-40
Level in dBm
990.099 kHz
2477.5
2478
2479
2480
2481
2482
2482.5
Frequency in MHz


MultiView
Spectrum
Ref Level 0.00 dBm
RBW 100 kHz
SGL
Att 20 dB SWT 100 ms VBW 100 kHz Mode Sweep
Count 200/200
1 Frequency Sweep
1Pk Max
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
-80 dBm
-90 dBm
CF 2.48 GHz
101 pts
500.0 kHz/
Span 5.0 MHz

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

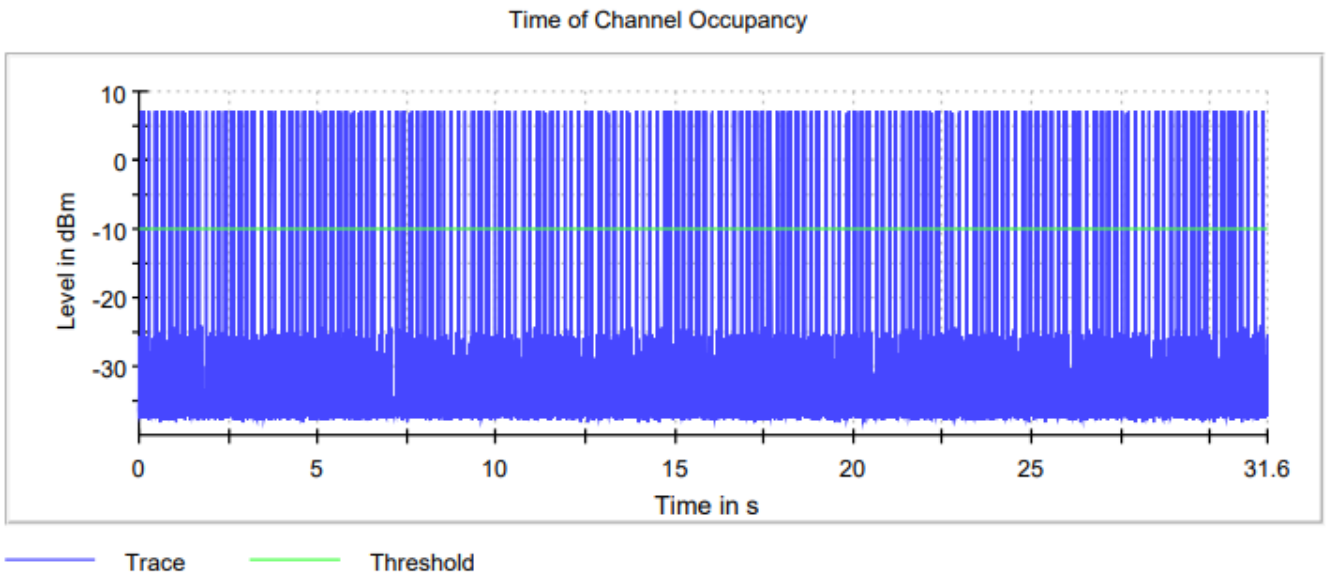
Measurement uncertainty calculated in accordance with ETSI TR 100 028-1. Expanded Uncertainty (K=2) < 1%

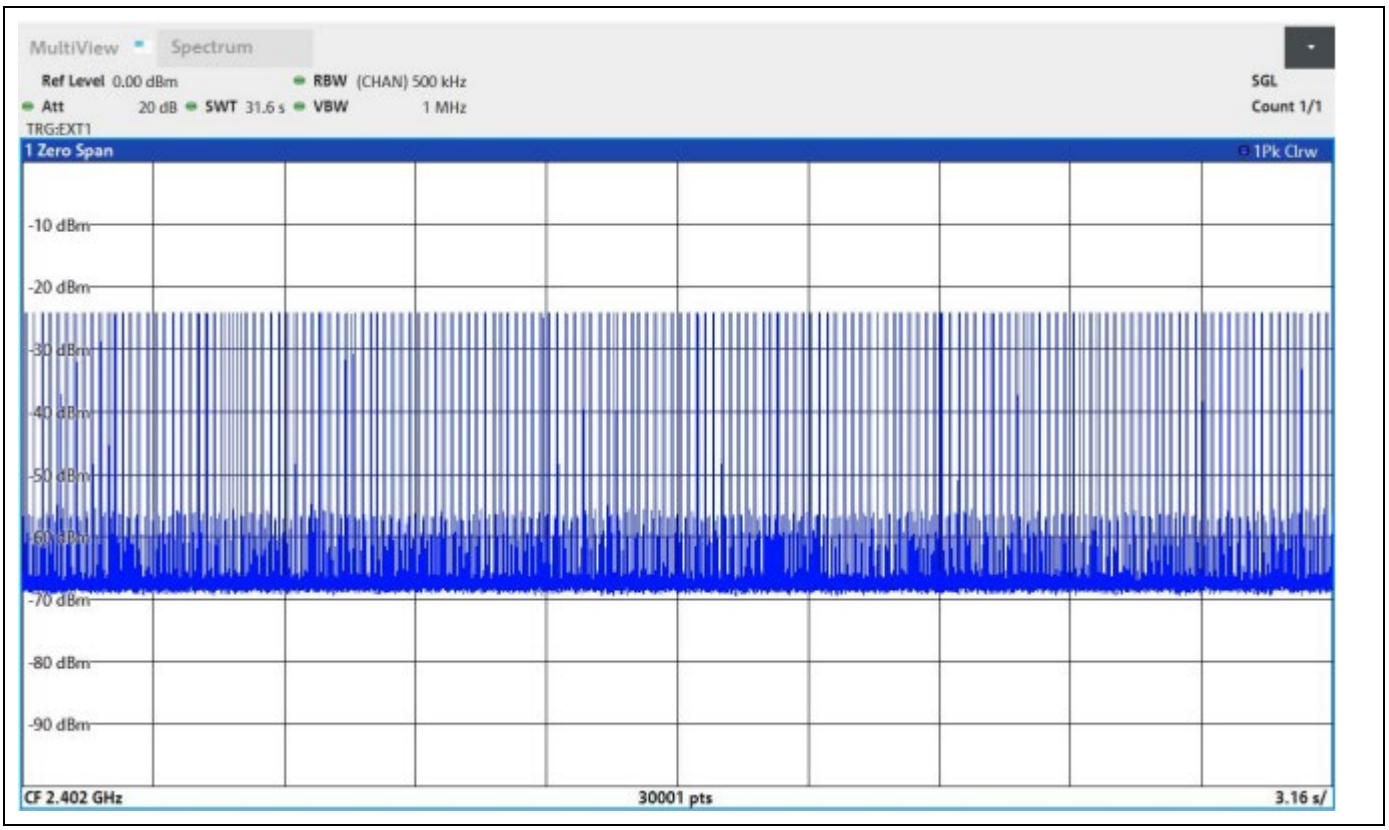
AH20090801-HAR-243 #1

2402MHz

Data Rate	Time (ms)	Limit Max (ms)	Result
DH1	129.040	400.000	PASS
DH3	270.450	400.000	PASS
DH5	331.430	400.000	PASS
2-DH1	131.420	400.000	PASS
2-DH3	261.790	400.000	PASS
2-DH5	318.540	400.000	PASS
3-DH1	132.550	400.000	PASS
3-DH3	276.010	400.000	PASS
3-DH5	288.150	400.000	PASS

2402MHz DH1

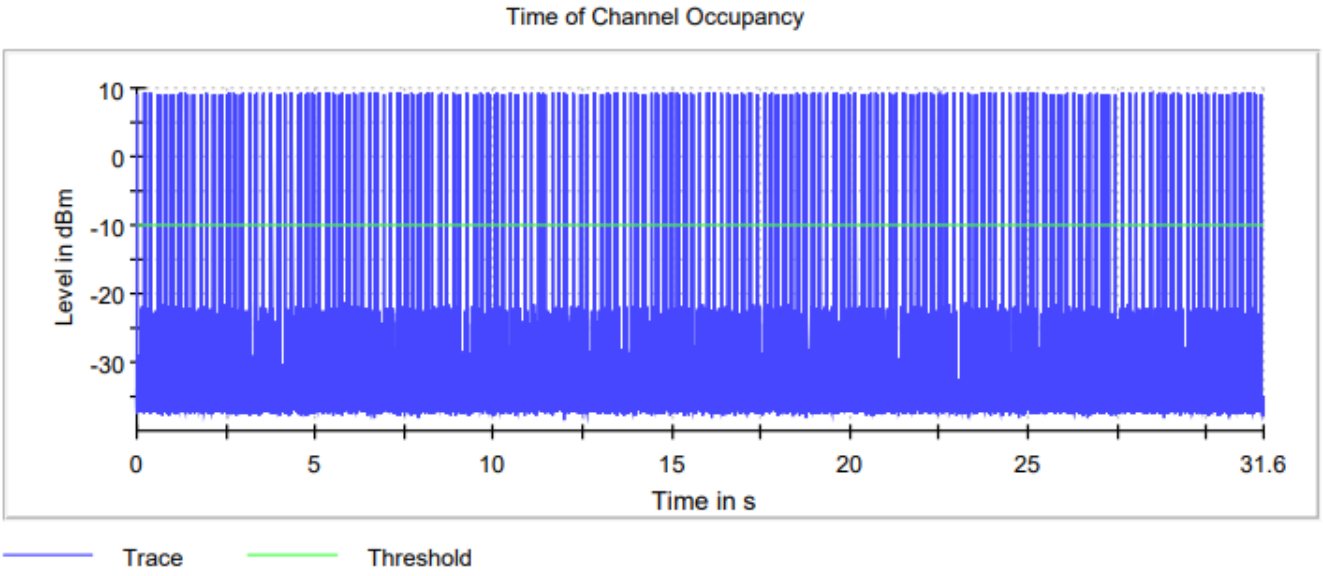



MultiView
Spectrum
Ref Level 0.00 dBm
RBW (CHAN) 500 kHz
Att 20 dB SWT 31.6 s VBW 1 MHz
SGL
Count 1/1
TRG:EXT1
1 Zero Span
1Pk Clrw
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
-80 dBm
-90 dBm
CF 2.402 GHz
30001 pts
3.16 s/

2441MHz

Data Rate	Time (ms)	Limit Max (ms)	Result
DH1	129.380	400.000	PASS
DH3	275.950	400.000	PASS
DH5	279.120	400.000	PASS
2-DH1	132.730	400.000	PASS
2-DH3	283.270	400.000	PASS
2-DH5	303.030	400.000	PASS
3-DH1	133.050	400.000	PASS
3-DH3	258.150	400.000	PASS
3-DH5	300.450	400.000	PASS

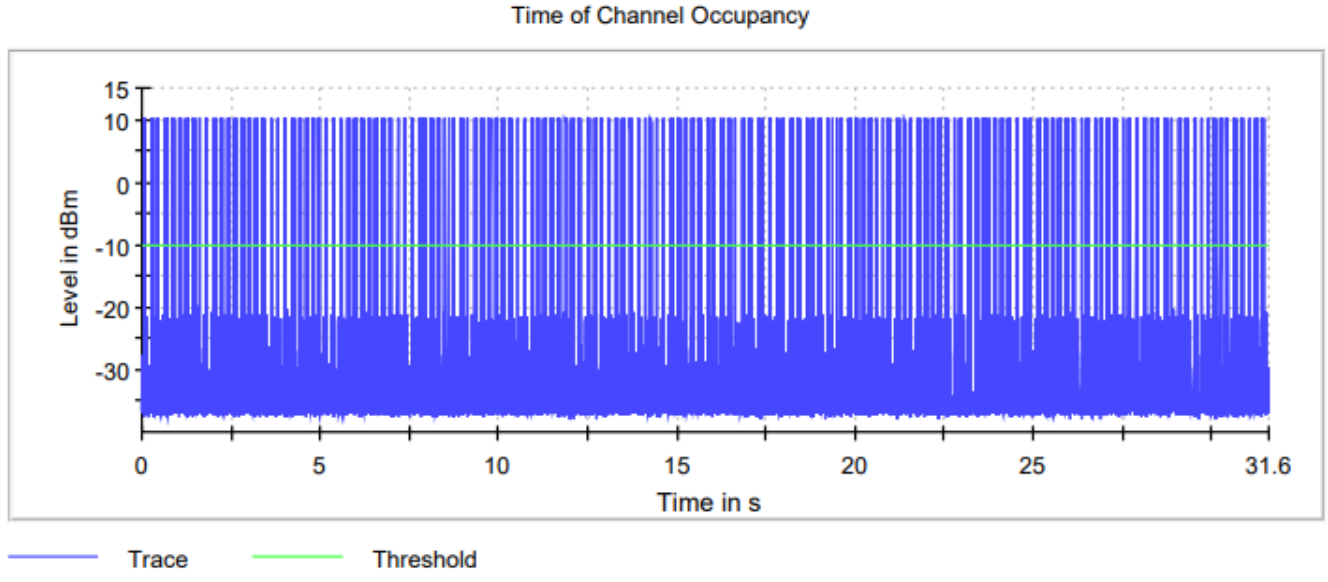
2441MHz DH1



2480MHz

Data Rate	Time (ms)	Limit Max (ms)	Result
DH1	129.280	400.000	PASS
DH3	270.650	400.000	PASS
DH5	314.020	400.000	PASS
2-DH1	132.820	400.000	PASS
2-DH3	275.100	400.000	PASS
2-DH5	323.650	400.000	PASS
3-DH1	132.950	400.000	PASS
3-DH3	261.540	400.000	PASS
3-DH5	326.660	400.000	PASS

2480MHz DH1



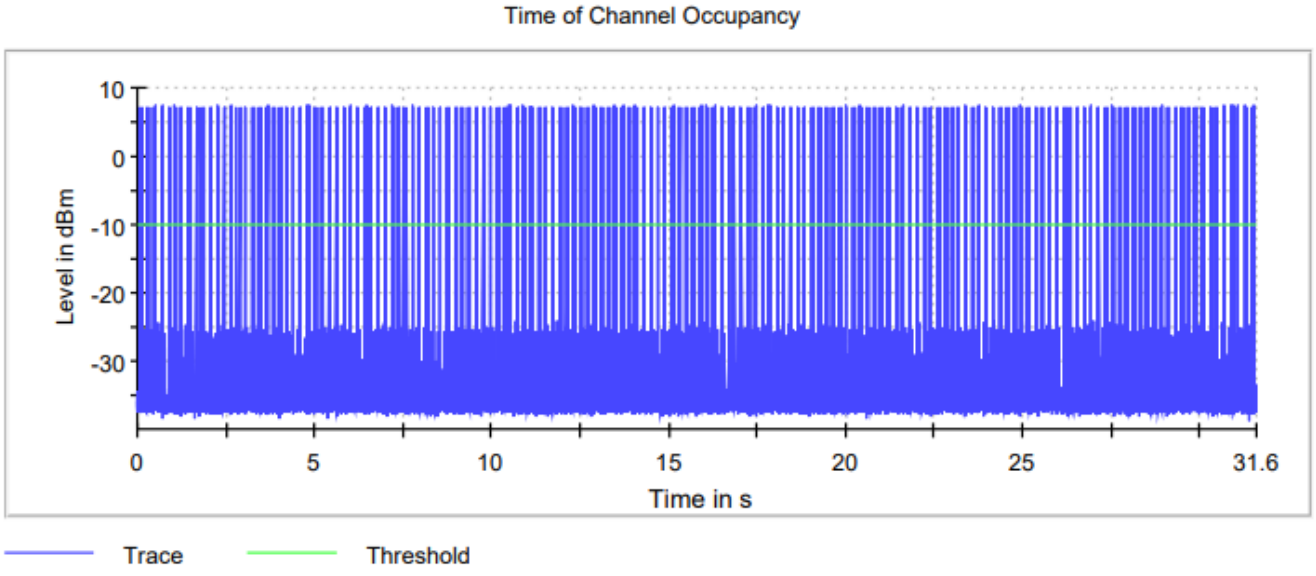
AH20090801-HAR-243 #4 (WS Spot Check Sample)

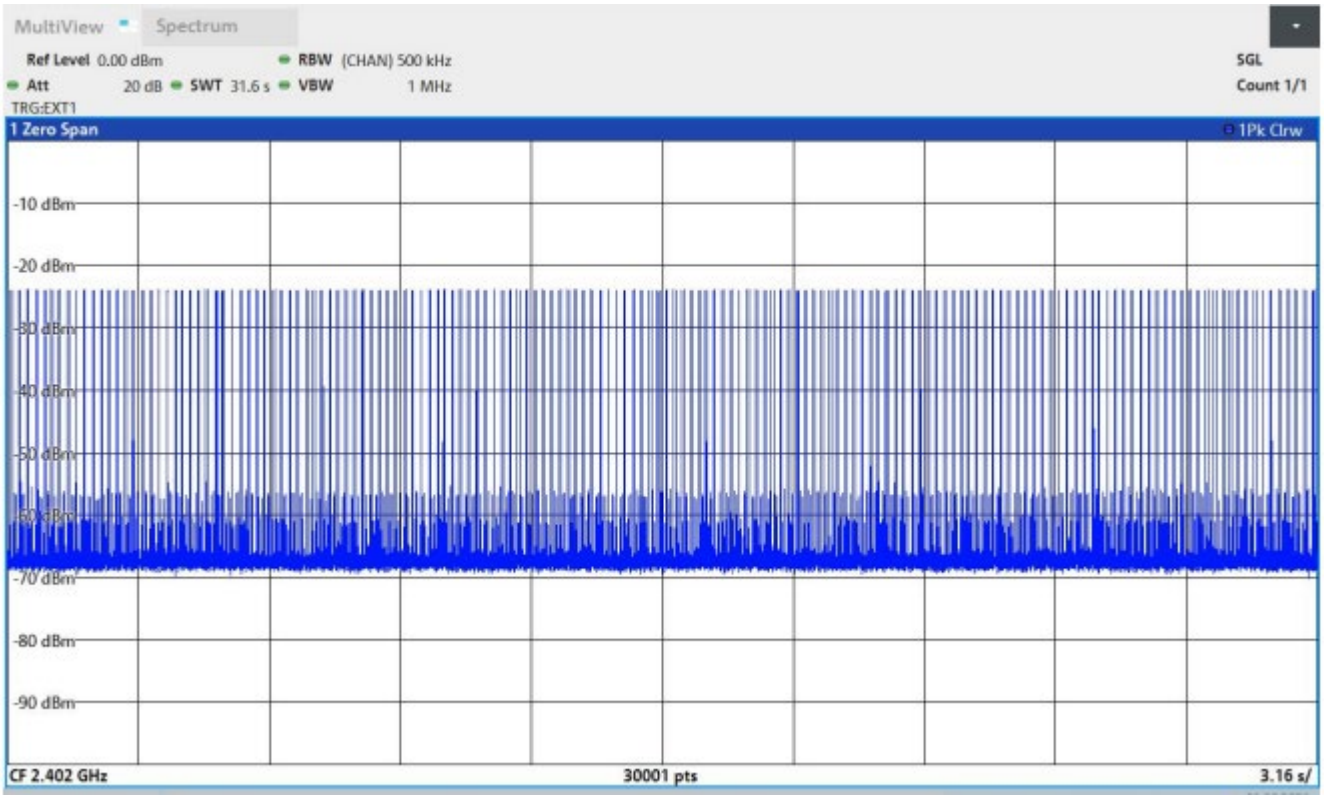
Plot for packet type DH1 shown below.

2402MHz

Data Rate	Time (ms)	Limit Max (ms)	Result
DH1	129.090	400.000	PASS

2402MHz DH1

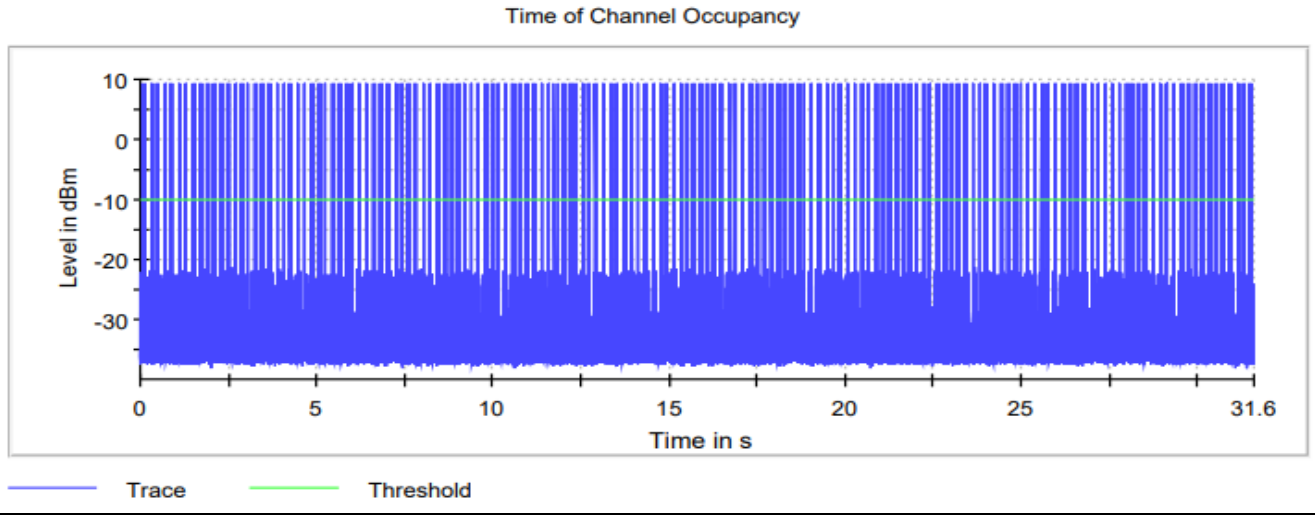




2441MHz

Data Rate	Time (ms)	Limit Max (ms)	Result
DH1	129.350	400.000	PASS

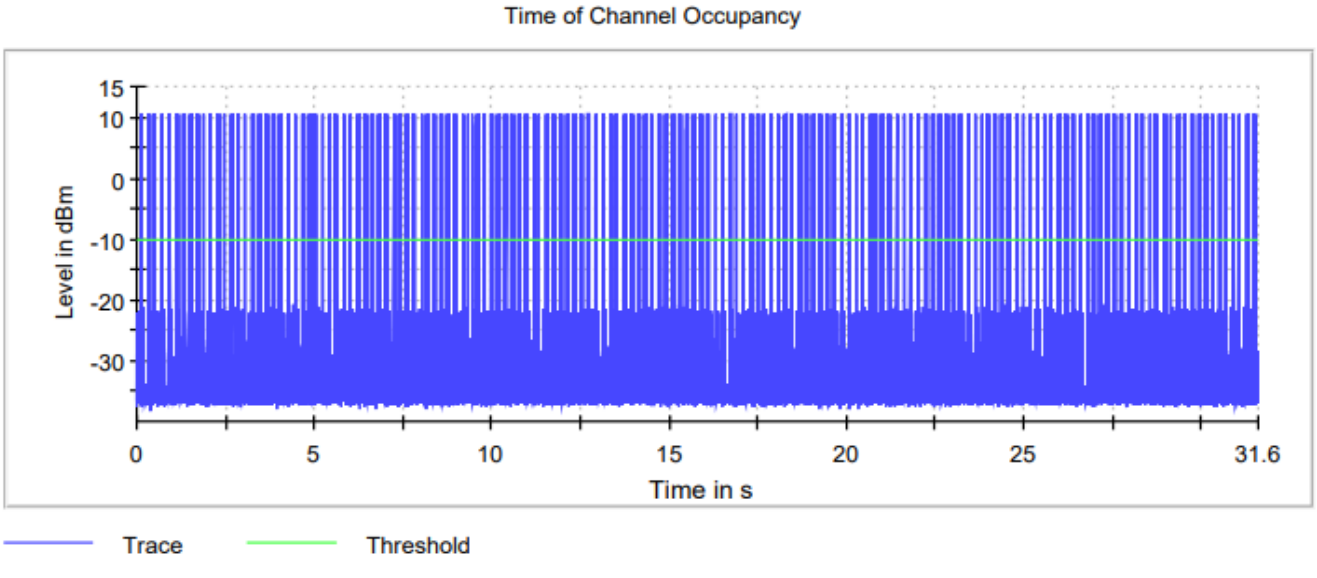
2441MHz DH1



2480MHz

Data Rate	Time (ms)	Limit Max (ms)	Result
DH1	129.330	400.000	PASS

2480MHz DH1



Peak Output Power

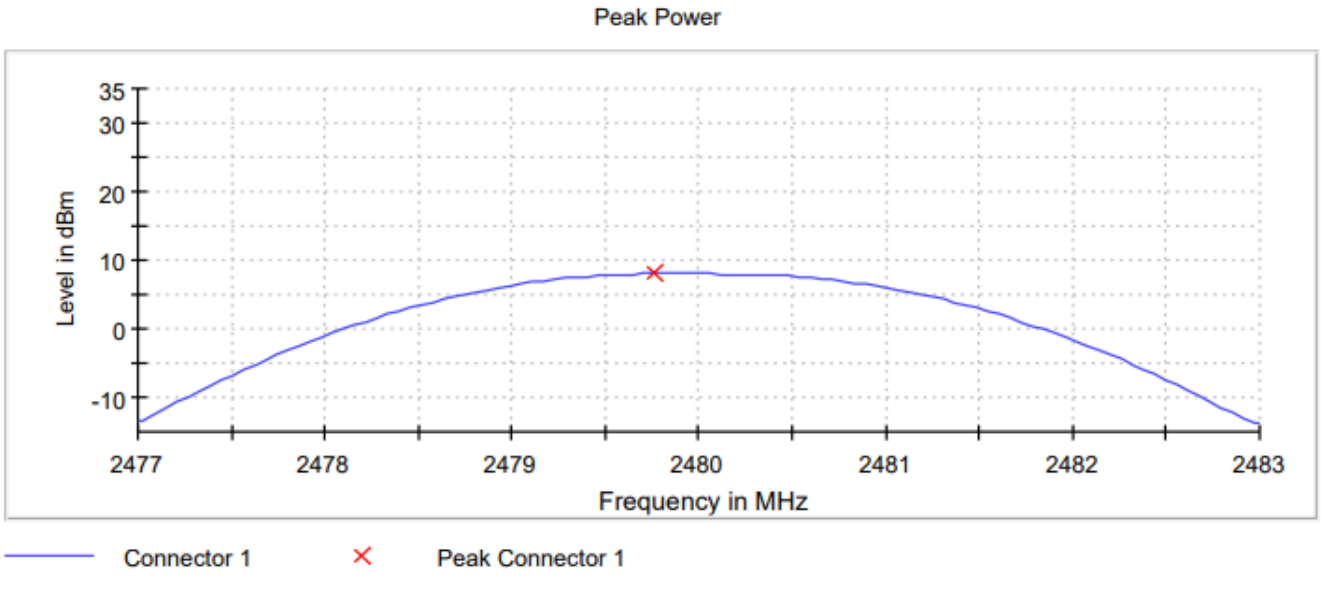
Test according to FCC title 47 part 15 §15.247(b), KDB 558074 D01 DTS Meas Guidance v05 and ANSI C63.10-2013 7.8.5

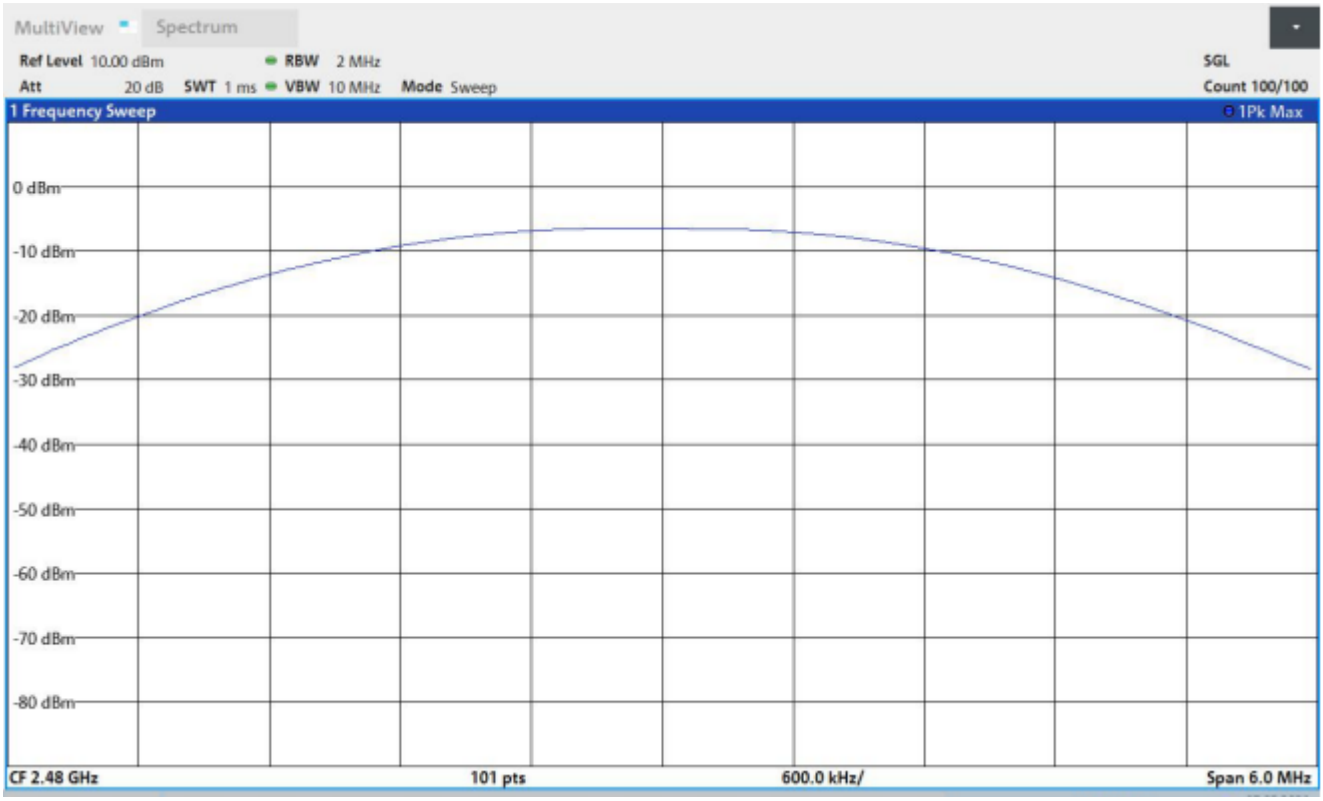
Measurement uncertainty calculated in accordance with ETSI TR 100 028-1. Expanded Combined Uncertainty of absolute Level Measurement (K=2) < 1 dB

AH20090801-HAR-243 #1

Data Rate	2402 MHz	2441 MHz	2480 MHz	Limit dBm
DH1	4.701	6.680	7.941	21.0
DH3	4.663	6.707	7.822	21.0
DH5	4.853	6.909	**8.013**	21.0
2-DH1	4.237	6.503	7.427	21.0
2-DH3	4.230	6.478	7.408	21.0
2-DH5	4.218	6.482	7.414	21.0
3-DH1	4.381	6.586	7.565	21.0
3-DH3	4.407	6.598	7.561	21.0
3-DH5	4.429	6.589	7.593	21.0

2480MHz DH5



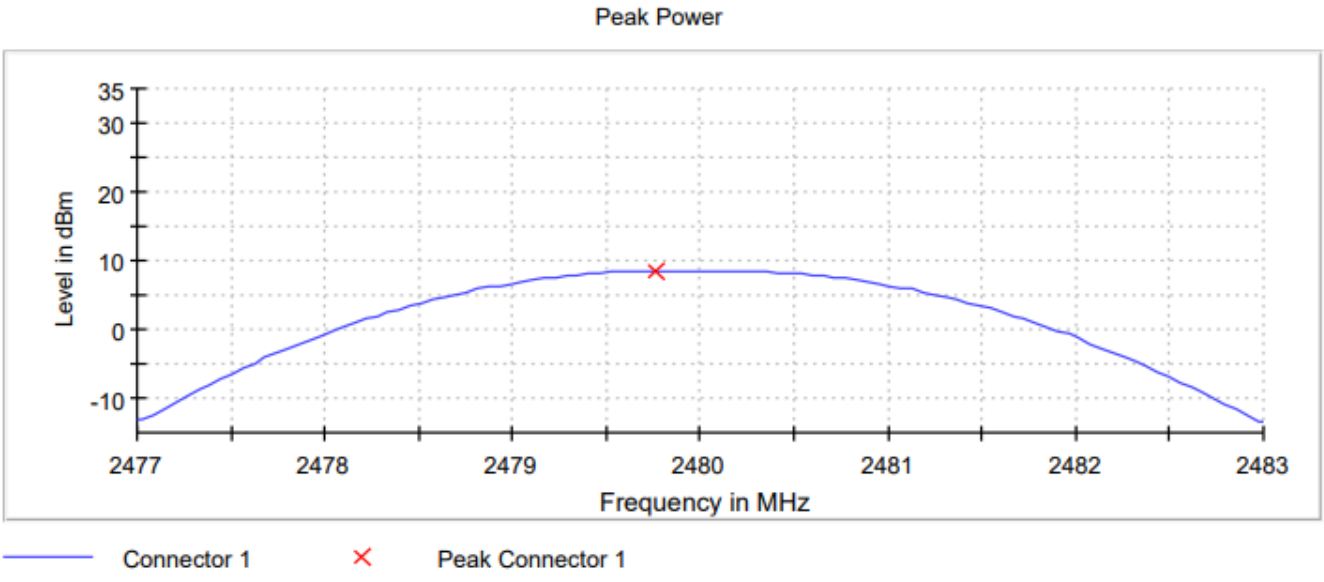

MultiView
Spectrum
Ref Level 10.00 dBm
RBW 2 MHz
SGL
Att 20 dB
SWT 1 ms
VBW 10 MHz
Mode Sweep
Count 100/100
1 Frequency Sweep
1Pk Max
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
-80 dBm
CF 2.48 GHz
101 pts
600.0 kHz/
Span 6.0 MHz

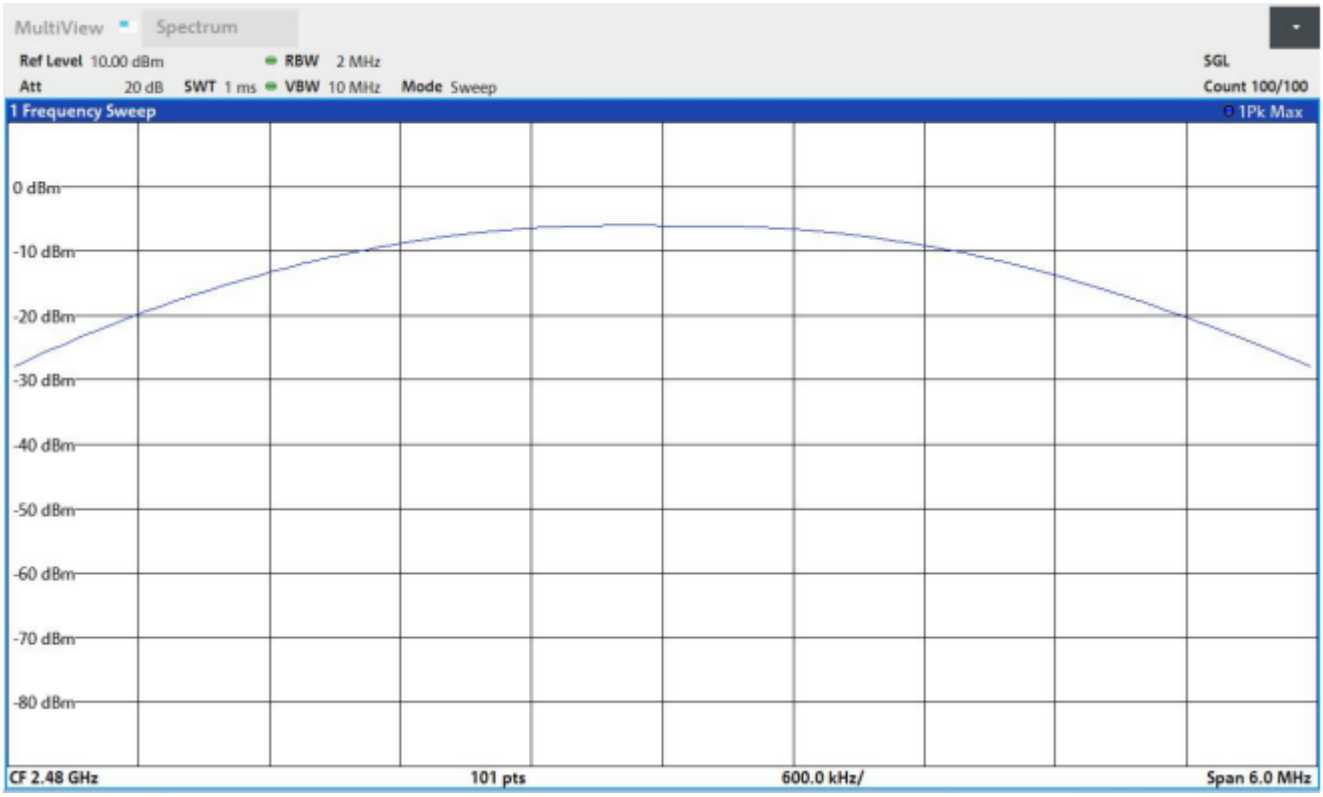
AH20090801-HAR-243 #4 (WS Spot Check Sample)

Plot for packet type DH1 shown below.

Data Rate	2402 MHz	2441 MHz	2480 MHz	Limit dBm
DH1	5.425	7.153	**8.459**	21.0
DH3	5.460	7.092	8.318	21.0
DH5	5.457	7.042	8.259	21.0
2-DH1	4.778	6.632	7.725	21.0
2-DH3	4.810	6.611	7.710	21.0
2-DH5	4.784	6.605	7.716	21.0
3-DH1	4.917	6.694	7.844	21.0
3-DH3	4.971	6.698	7.840	21.0
3-DH5	4.948	6.734	7.849	21.0

2480MHz DH1




MultiView
Spectrum
Ref Level 10.00 dBm
RBW 2 MHz
SGL
Att 20 dB
SWT 1 ms
VBW 10 MHz
Mode Sweep
Count 100/100
1 Frequency Sweep
1Pk Max
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
-80 dBm
CF 2.48 GHz
101 pts
600.0 kHz/
Span 6.0 MHz

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

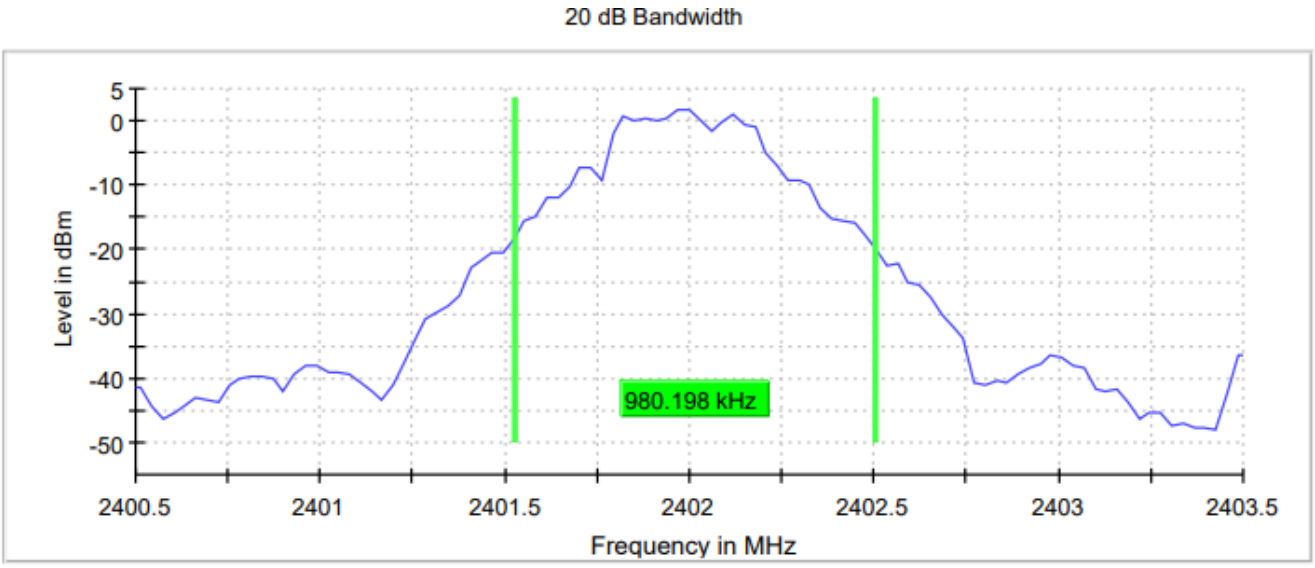
Measurement uncertainty calculated in accordance with ETSI TR 100 028-1. Expanded Uncertainty (K=2) < 2%

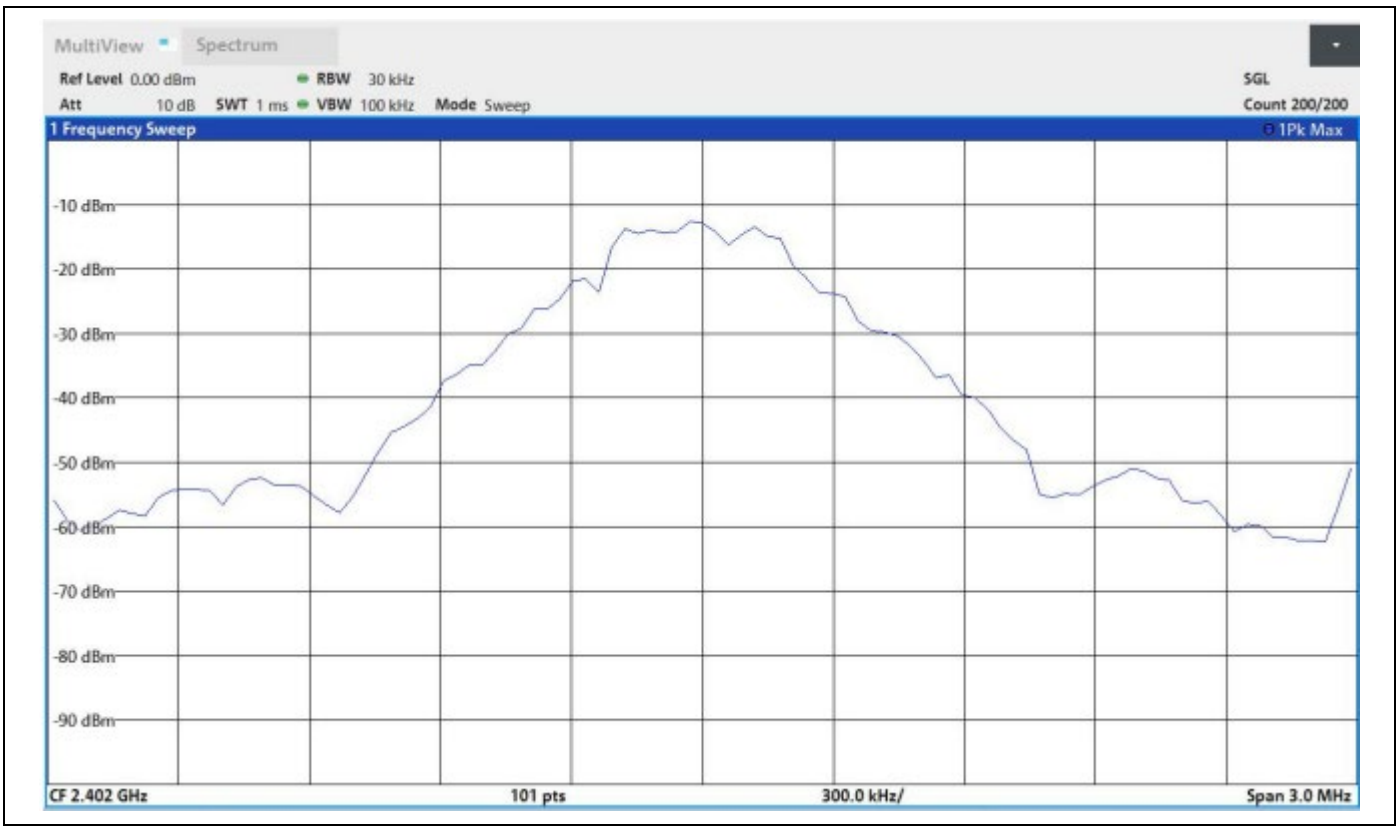
AH20090801-HAR-243 #1

2402MHz DH1

Data Rate	Bandwidth (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)	Result
DH1	0.980198	2401.524752	2402.504950	PASS
DH3	1.009900	2401.495050	2402.504950	PASS
DH5	1.009900	2401.495050	2402.504950	PASS
2-DH1	1.366336	2401.287129	2402.653465	PASS
2-DH3	1.396039	2401.287129	2402.683168	PASS
2-DH5	1.396039	2401.287129	2402.683168	PASS
3-DH1	1.306930	2401.346535	2402.653465	PASS
3-DH3	1.336633	2401.316832	2402.653465	PASS
3-DH5	1.396039	2401.287129	2402.683168	PASS

DH1

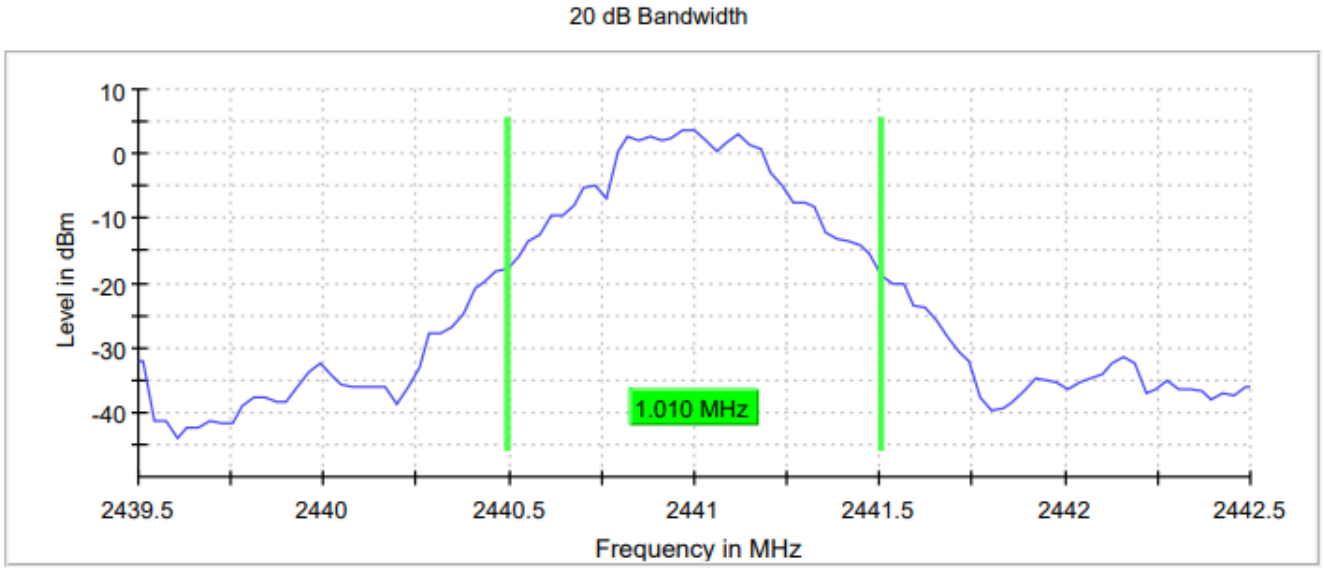



MultiView
Spectrum
Ref Level 0.00 dBm
RBW 30 kHz
SGL
Att 10 dB
SWT 1 ms
VBW 100 kHz
Mode Sweep
Count 200/200
1 Frequency Sweep
1Pk Max
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
-80 dBm
-90 dBm
CF 2.402 GHz
101 pts
300.0 kHz/
Span 3.0 MHz

2441MHz

Data Rate	Bandwidth (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)	Result
DH1	1.009900	2440.495050	2441.504950	PASS
DH3	1.009900	2440.495050	2441.504950	PASS
DH5	1.039603	2440.465347	2441.504950	PASS
2-DH1	1.396039	2440.287129	2441.683168	PASS
2-DH3	1.425742	2440.287129	2441.712871	PASS
2-DH5	1.425742	2440.287129	2441.712871	PASS
3-DH1	1.306930	2440.346535	2441.653465	PASS
3-DH3	1.396039	2440.287129	2441.683168	PASS
3-DH5	1.396039	2440.287129	2441.683168	PASS

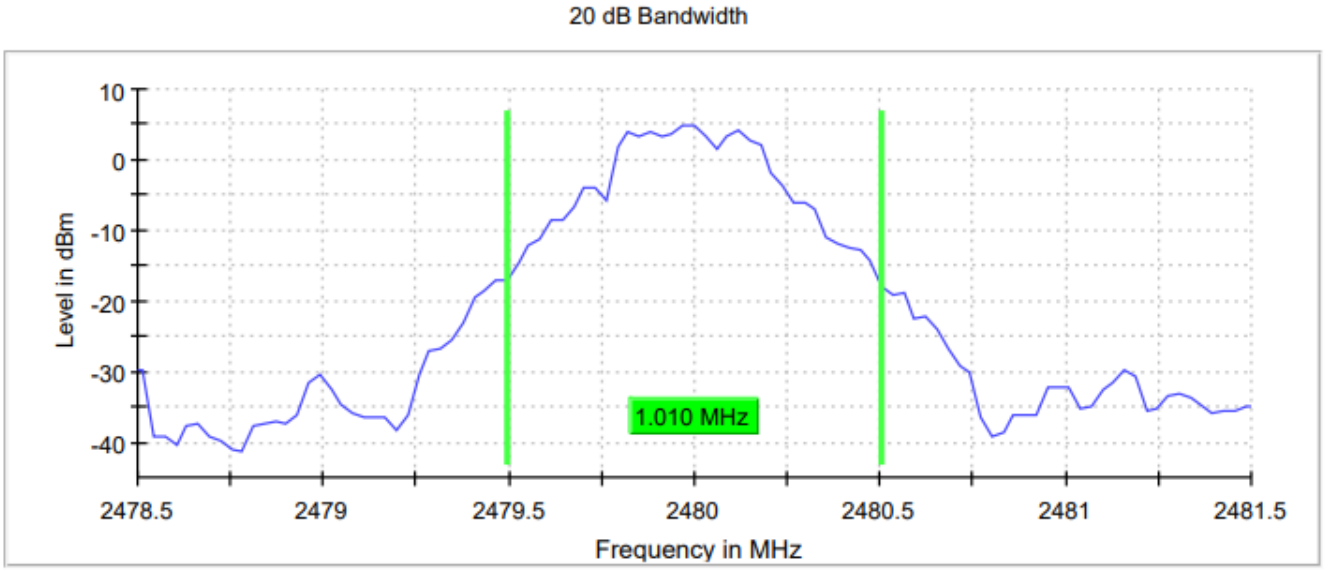
DH1



2480MHz

Data Rate	Bandwidth (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)	Result
DH1	1.009900	2479.495050	2480.504950	PASS
DH3	1.009900	2479.495050	2480.504950	PASS
DH5	1.039603	2479.465347	2480.504950	PASS
2-DH1	1.366336	2479.287129	2480.653465	PASS
2-DH3	1.396039	2479.287129	2480.683168	PASS
2-DH5	1.396039	2479.287129	2480.683168	PASS
3-DH1	1.306930	2479.346535	2480.653465	PASS
3-DH3	1.396039	2479.287129	2480.683168	PASS
3-DH5	1.396039	2479.287129	2480.683168	PASS

DH1



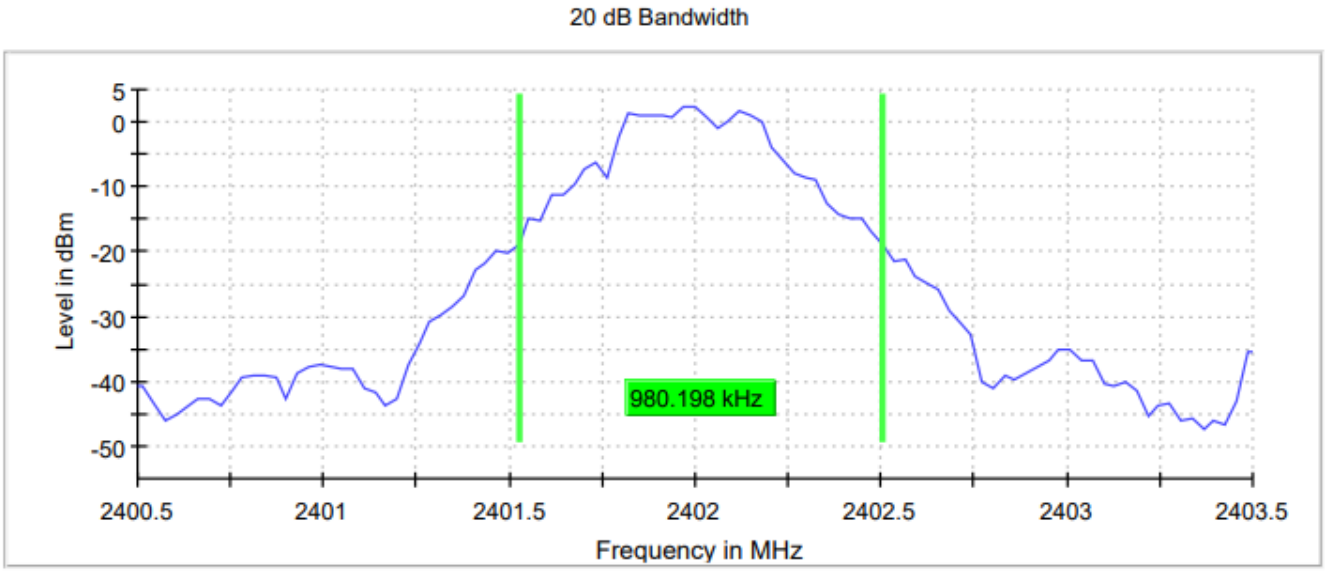
AH20090801-HAR-243 #4 (WS Spot Check Sample)

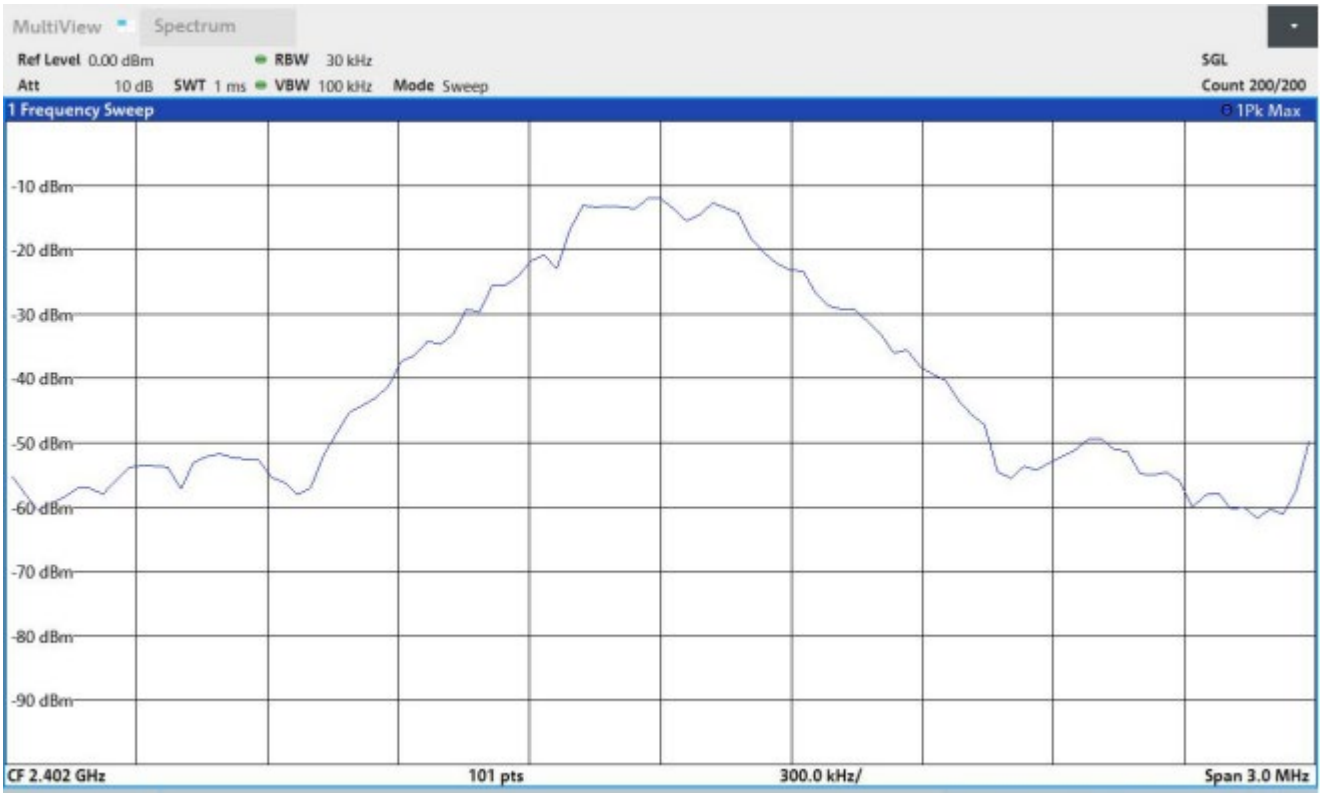
Plot for packet type DH1 shown below.

2402MHz

Data Rate	Bandwidth (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)	Result
DH1	0.980198	2401.524752	2402.504950	PASS

2402MHz DH1

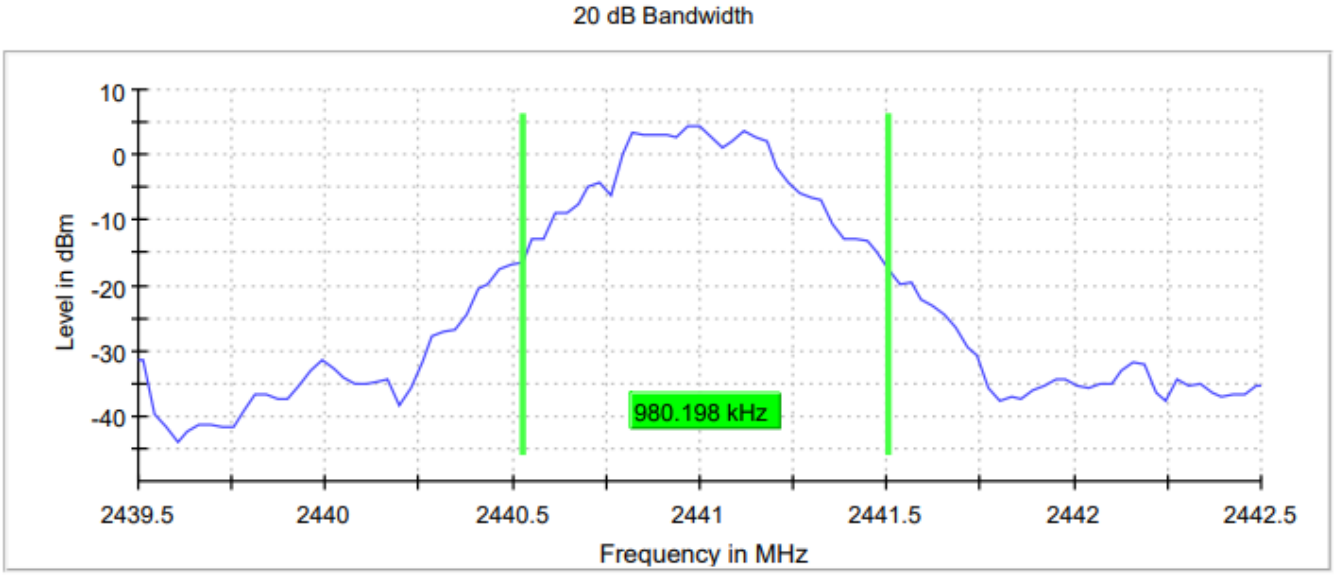




2441MHz

Data Rate	Bandwidth (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)	Result
DH1	0.980198	2440.524752	2441.504950	PASS

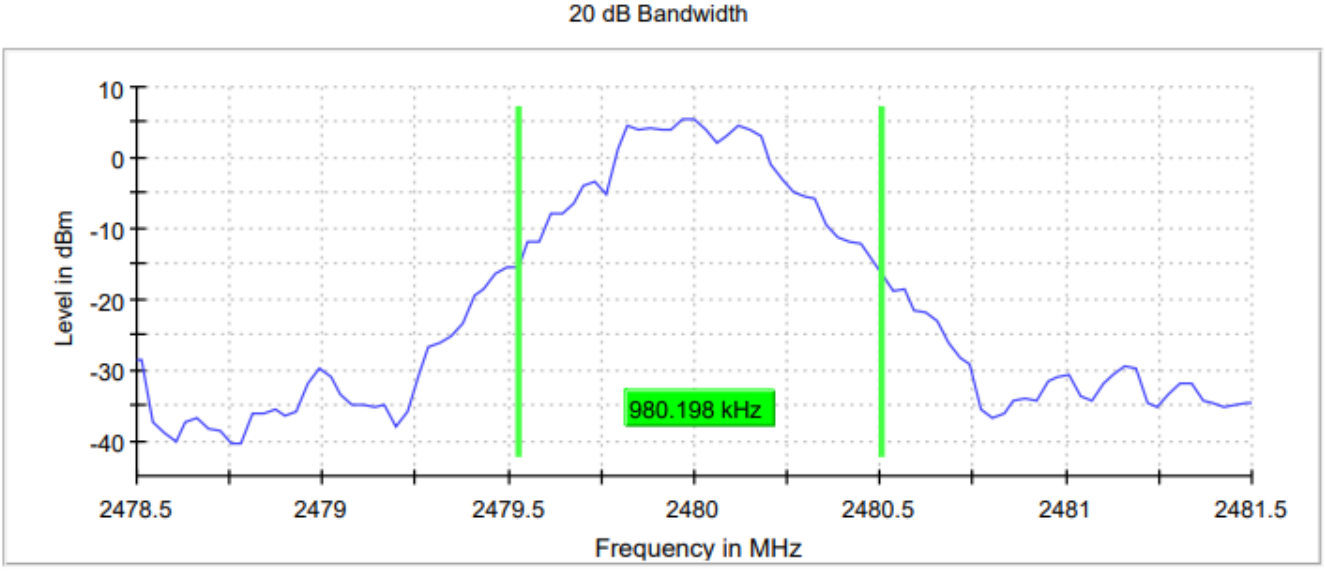
2441MHz DH1



2480MHz

Data Rate	Bandwidth (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)	Result
DH1	0.980198	2479.524752	2480.504950	PASS

2480MHz DH1



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

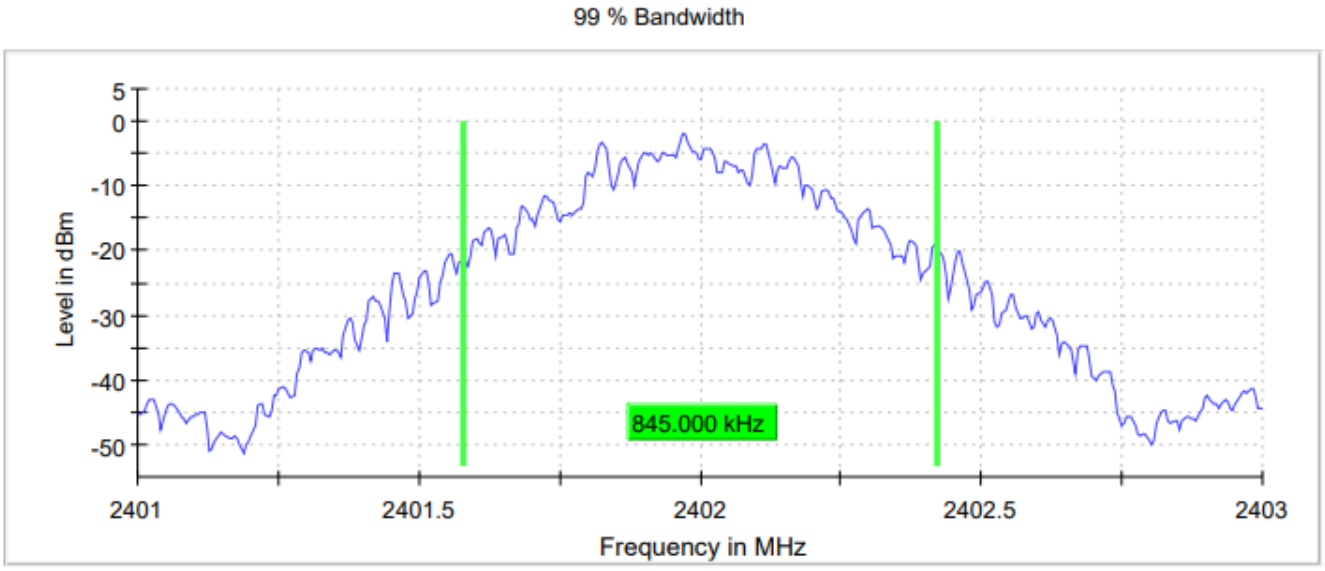
Measurement uncertainty calculated in accordance with ETSI TR 100 028-1. Expanded Uncertainty (K=2) < 2%

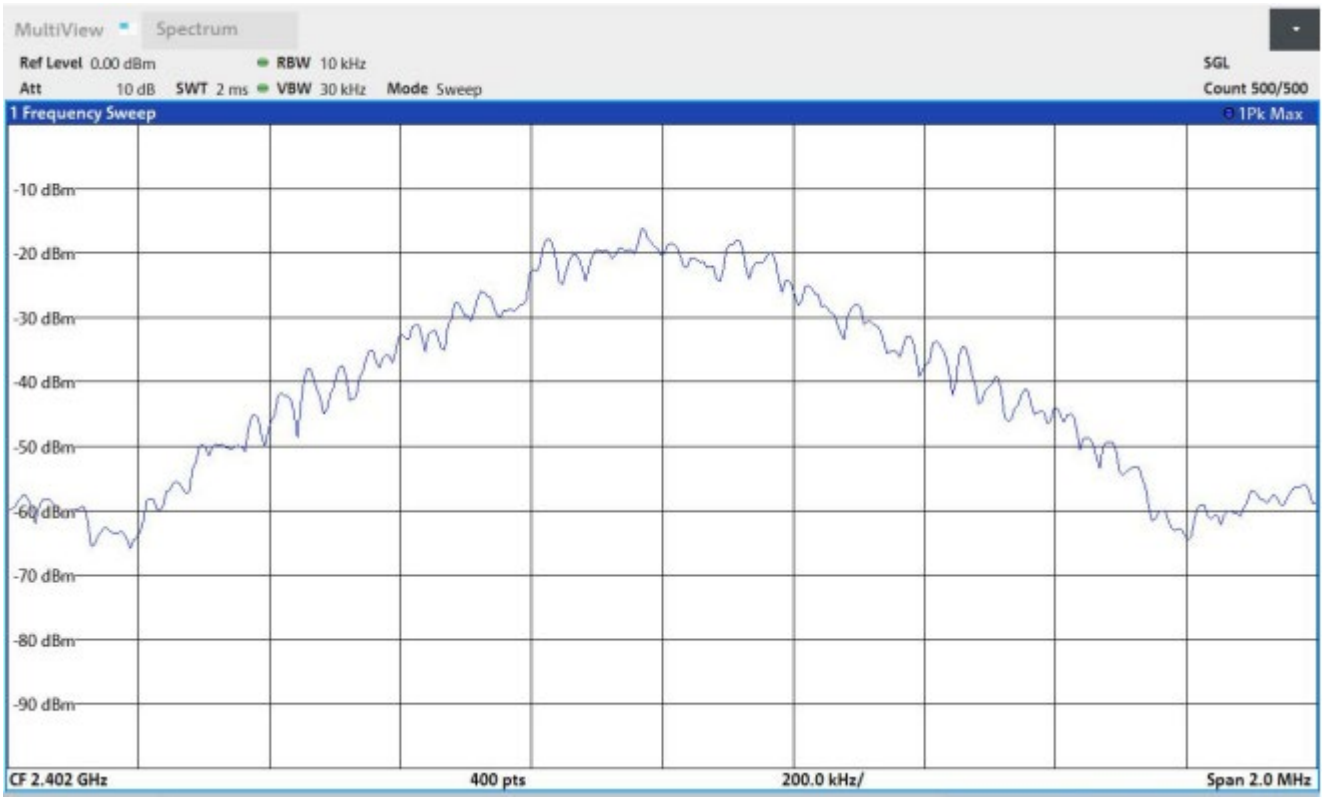
AH20090801-HAR-243 #1

2402MHz

Data Rate	Bandwidth (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)	Result
DH1	0.845000	2401.577500	2402.422500	PASS
DH3	0.860000	2401.562500	2402.422500	PASS
DH5	0.865000	2401.557500	2402.422500	PASS
2-DH1	1.170000	2401.392500	2402.562500	PASS
2-DH3	1.195000	2401.392500	2402.587500	PASS
2-DH5	1.185000	2401.397500	2402.582500	PASS
3-DH1	1.160000	2401.417500	2402.577500	PASS
3-DH3	1.200000	2401.382500	2402.582500	PASS
3-DH5	1.205000	2401.377500	2402.582500	PASS

2402MHz DH1

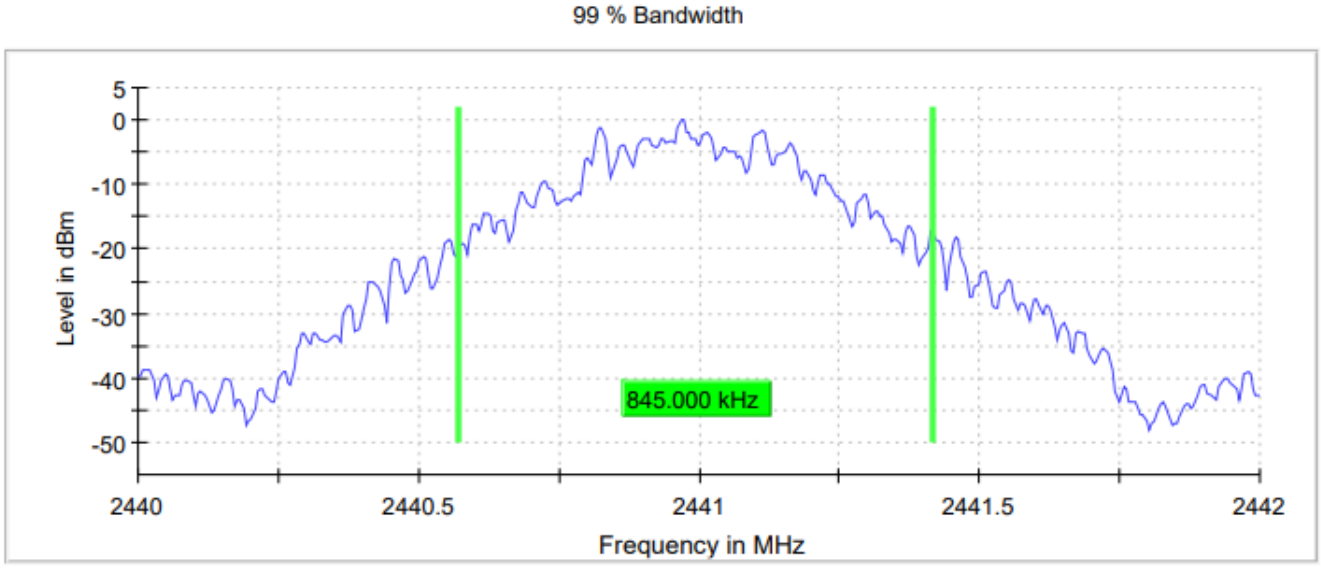



MultiView
Spectrum
Ref Level 0.00 dBm
RBW 10 kHz
SGL
Att 10 dB SWT 2 ms VBW 30 kHz Mode Sweep
Count 500/500
1 Frequency Sweep
1Pk Max
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
-80 dBm
-90 dBm
CF 2.402 GHz
400 pts
200.0 kHz/
Span 2.0 MHz

2441MHz

Data Rate	Bandwidth (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)	Result
DH1	0.845000	2440.572500	2441.417500	PASS
DH3	0.860000	2440.557500	2441.417500	PASS
DH5	0.870000	2440.552500	2441.422500	PASS
2-DH1	1.205000	2440.372500	2441.577500	PASS
2-DH3	1.240000	2440.367500	2441.607500	PASS
2-DH5	1.230000	2440.372500	2441.602500	PASS
3-DH1	1.180000	2440.407500	2441.587500	PASS
3-DH3	1.225000	2440.367500	2441.592500	PASS
3-DH5	1.225000	2440.367500	2441.592500	PASS

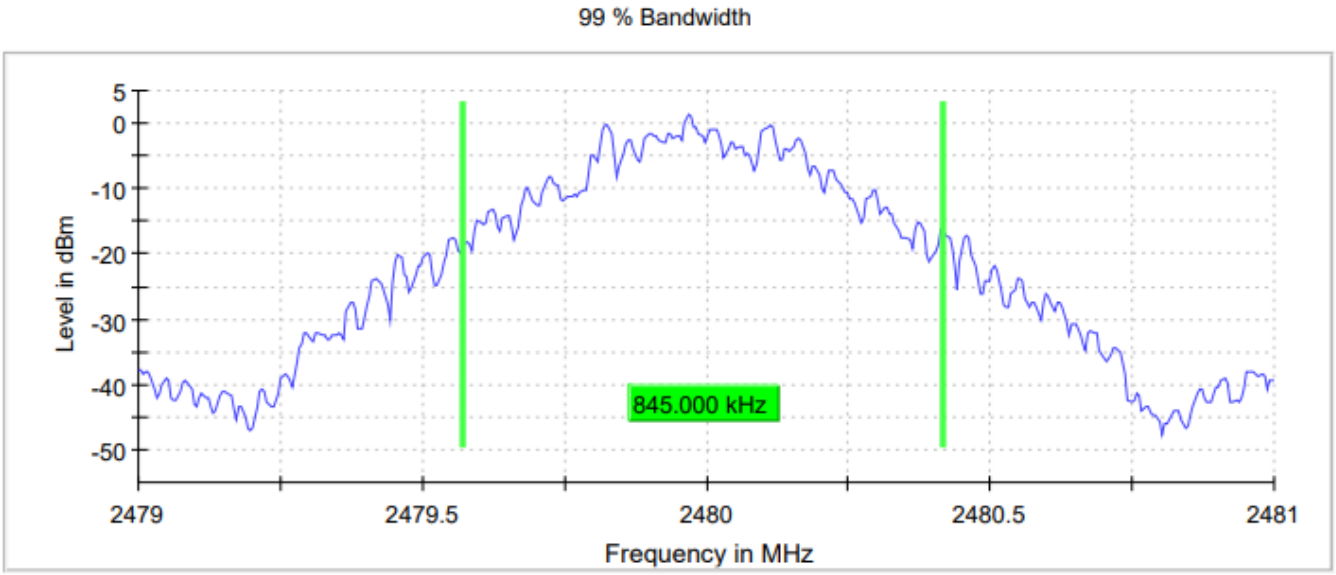
2441MHz DH1



2480MHz

Data Rate	Bandwidth (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)	Result
DH1	0.845000	2479.572500	2480.417500	PASS
DH3	0.860000	2479.557500	2480.417500	PASS
DH5	0.870000	2479.552500	2480.422500	PASS
2-DH1	1.185000	2479.382500	2480.567500	PASS
2-DH3	1.210000	2479.382500	2480.592500	PASS
2-DH5	1.200000	2479.387500	2480.587500	PASS
3-DH1	1.170000	2479.412500	2480.582500	PASS
3-DH3	1.210000	2479.372500	2480.582500	PASS
3-DH5	1.210000	2479.372500	2480.582500	PASS

2480MHz DH1



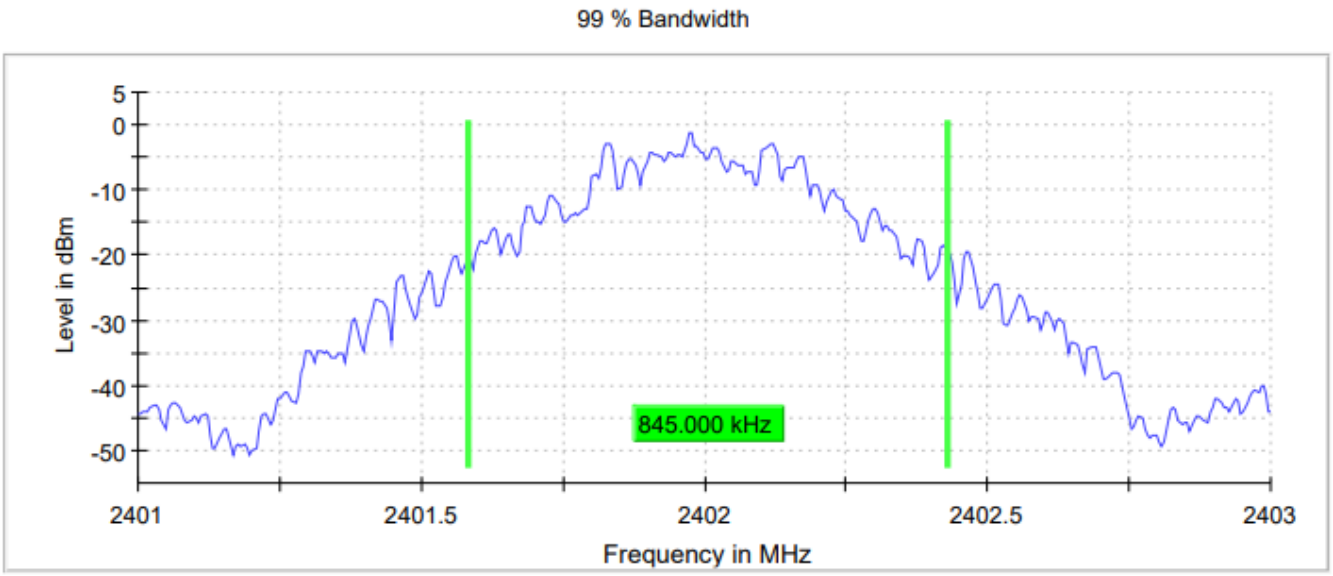
AH20090801-HAR-243 #4 (WS Spot Check Sample)

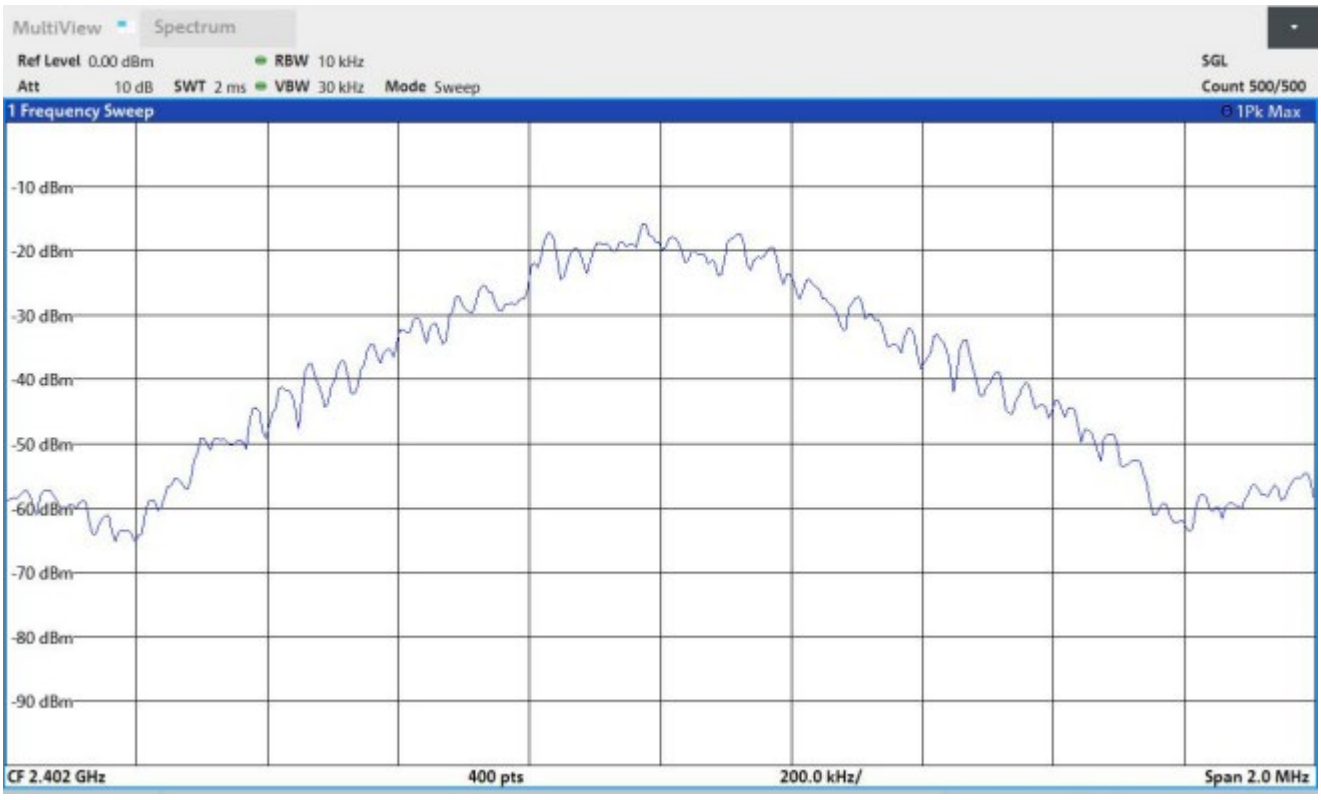
Plot for packet type DH1 shown below.

2402MHz

Data Rate	Bandwidth (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)	Result
DH1	0.845000	2401.582500	2402.427500	PASS

2402MHz DH1

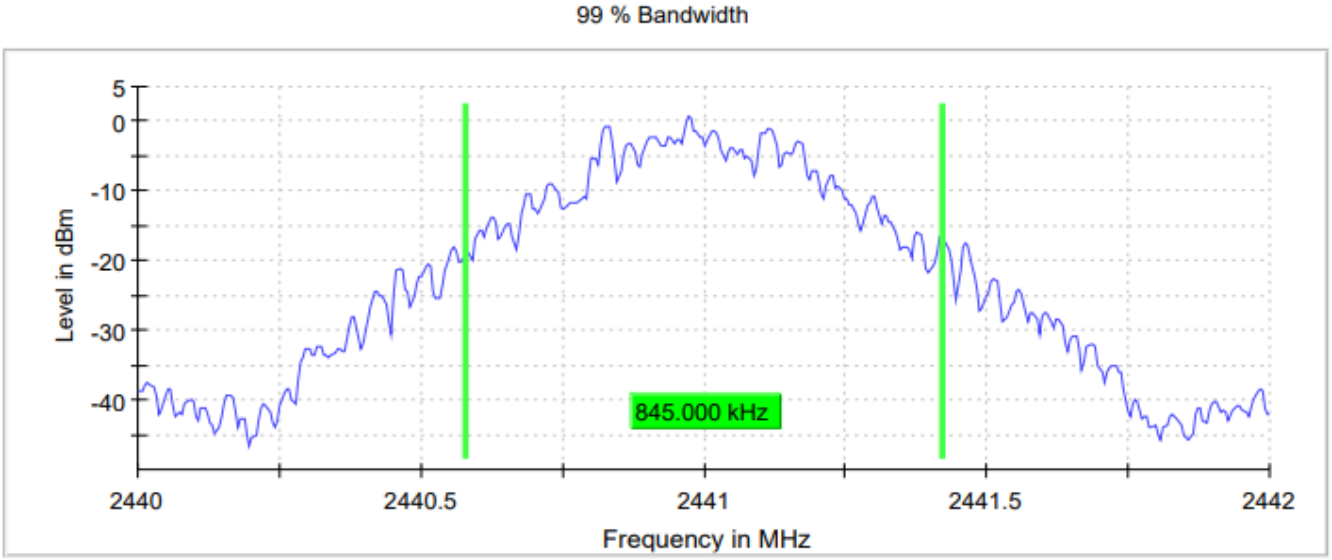




2441MHz

Data Rate	Bandwidth (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)	Result
DH1	0.845000	2440.577500	2441.422500	PASS

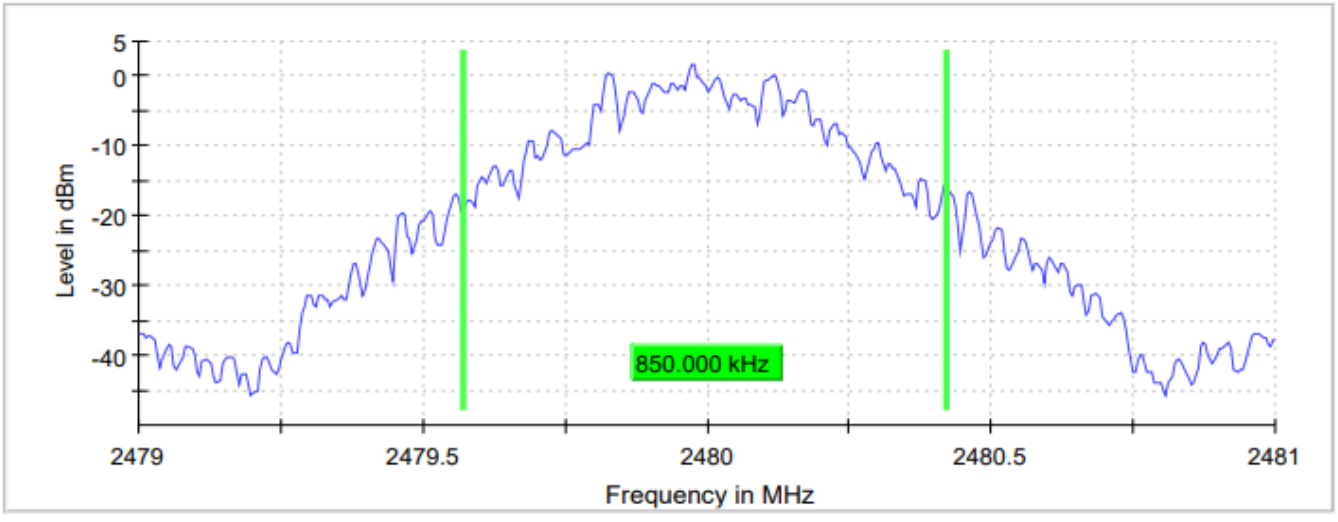
2441MHz DH1



2480MHz

Data Rate	Bandwidth (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)	Result
DH1	0.850000	2479.572500	2480.422500	PASS

2480MHz DH1



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

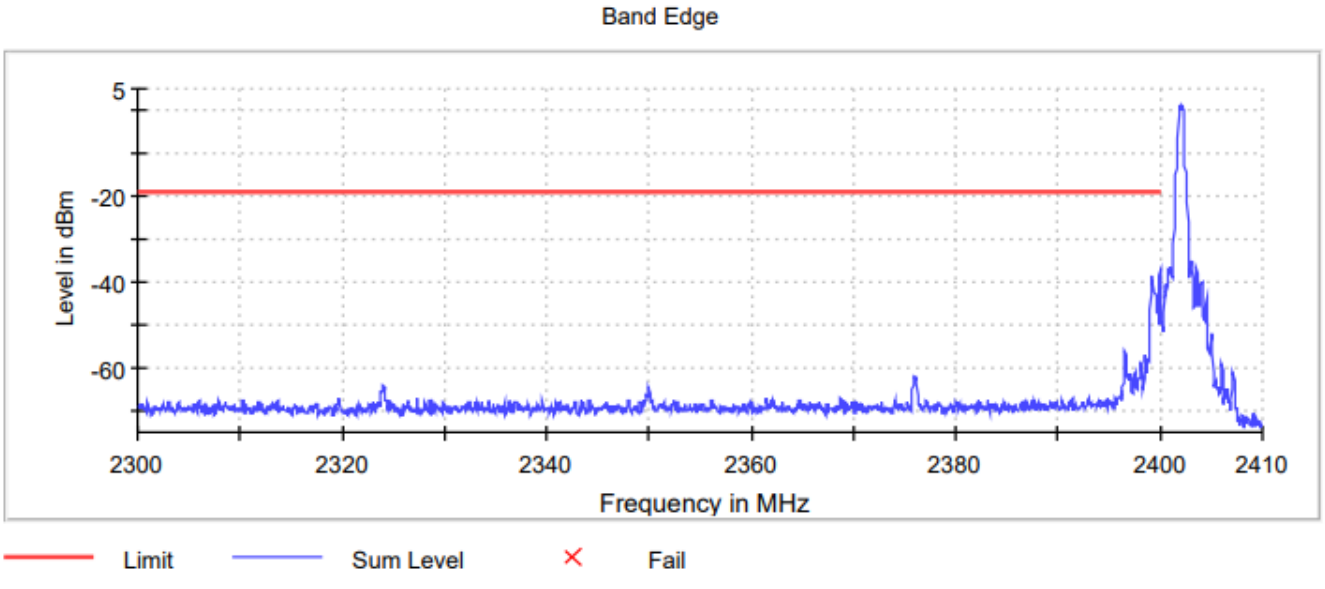
Measurement uncertainty calculated in accordance with ETSI TR 100 028-1. Expanded Uncertainty (K=2) < 0.8 dB

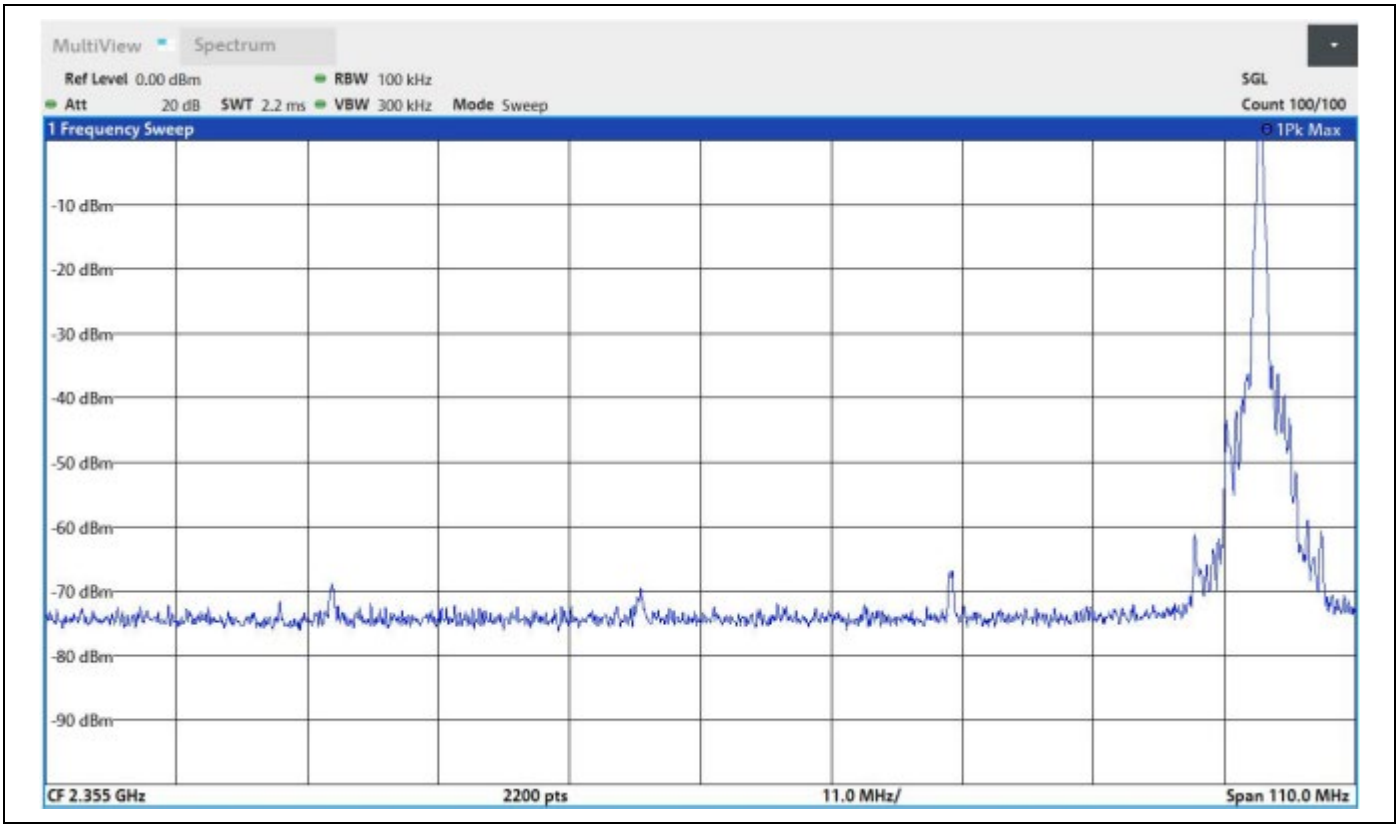
AH20090801-HAR-243 #1

Data Rate	Frequency (MHz)	Level(dBm)
DH1	2401.975000	1.0
DH3	2402.000000	1.1
DH5	2402.175000	1.3
2-DH1	2401.975000	0.2
2-DH3	2401.975000	0.2
2-DH5	2402.025000	0.2
3-DH1	2401.975000	0.2
3-DH3	2401.975000	0.2
3-DH5	2401.975000	0.1

2402MHz DH1

Frequency (MHz)	Level (dBm)	Margin (dB)	Limit (dBm)	Result
2399.975000	-37.0	18.0	-19.0	PASS
2399.175000	-38.5	19.5	-19.0	PASS
2399.925000	-38.5	19.6	-19.0	PASS
2399.225000	-38.8	19.8	-19.0	PASS
2399.125000	-39.8	20.8	-19.0	PASS
2399.275000	-42.2	23.2	-19.0	PASS
2399.325000	-42.5	23.5	-19.0	PASS
2399.425000	-42.6	23.6	-19.0	PASS
2399.475000	-42.6	23.6	-19.0	PASS
2399.375000	-42.6	23.7	-19.0	PASS
2399.875000	-42.9	23.9	-19.0	PASS
2399.525000	-43.0	24.0	-19.0	PASS
2399.075000	-43.0	24.1	-19.0	PASS
2399.575000	-43.4	24.4	-19.0	PASS
2399.625000	-45.3	26.3	-19.0	PASS




MultiView
Spectrum
Ref Level 0.00 dBm
RBW 100 kHz
SGL
Att 20 dB
SWT 2.2 ms
VBW 300 kHz
Mode Sweep
Count 100/100
1 Frequency Sweep
1Pk Max
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
-80 dBm
-90 dBm
CF 2.355 GHz
2200 pts
11.0 MHz/
Span 110.0 MHz

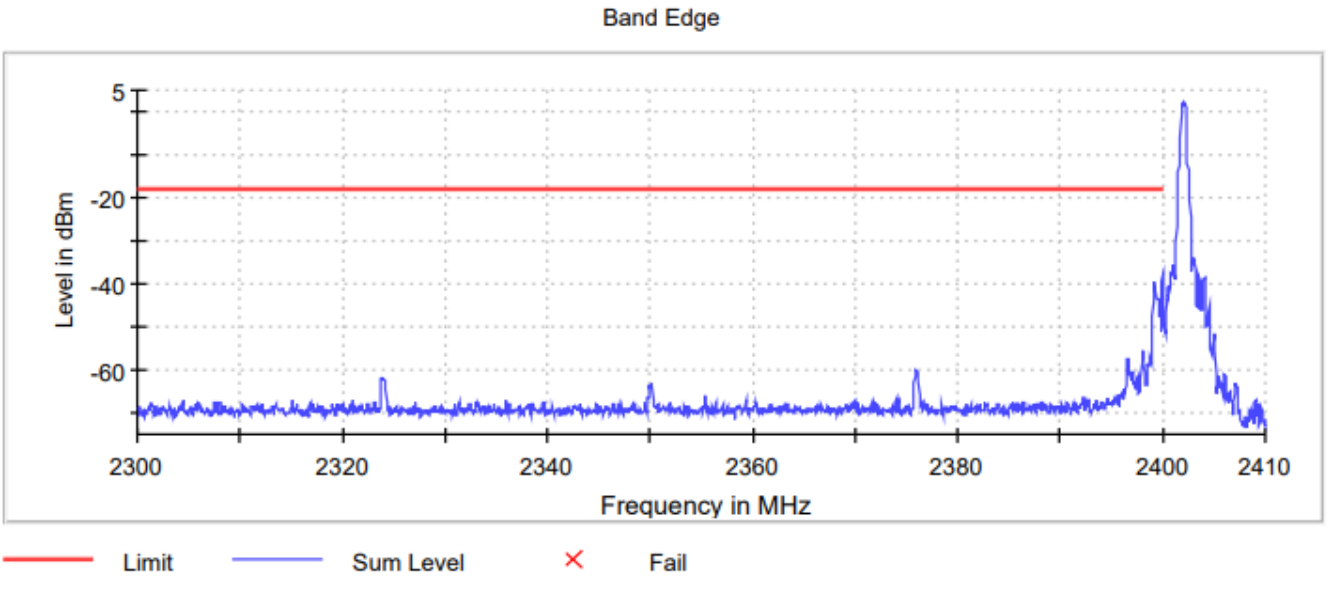
AH20090801-HAR-243 #4 (WS Spot Check Sample)

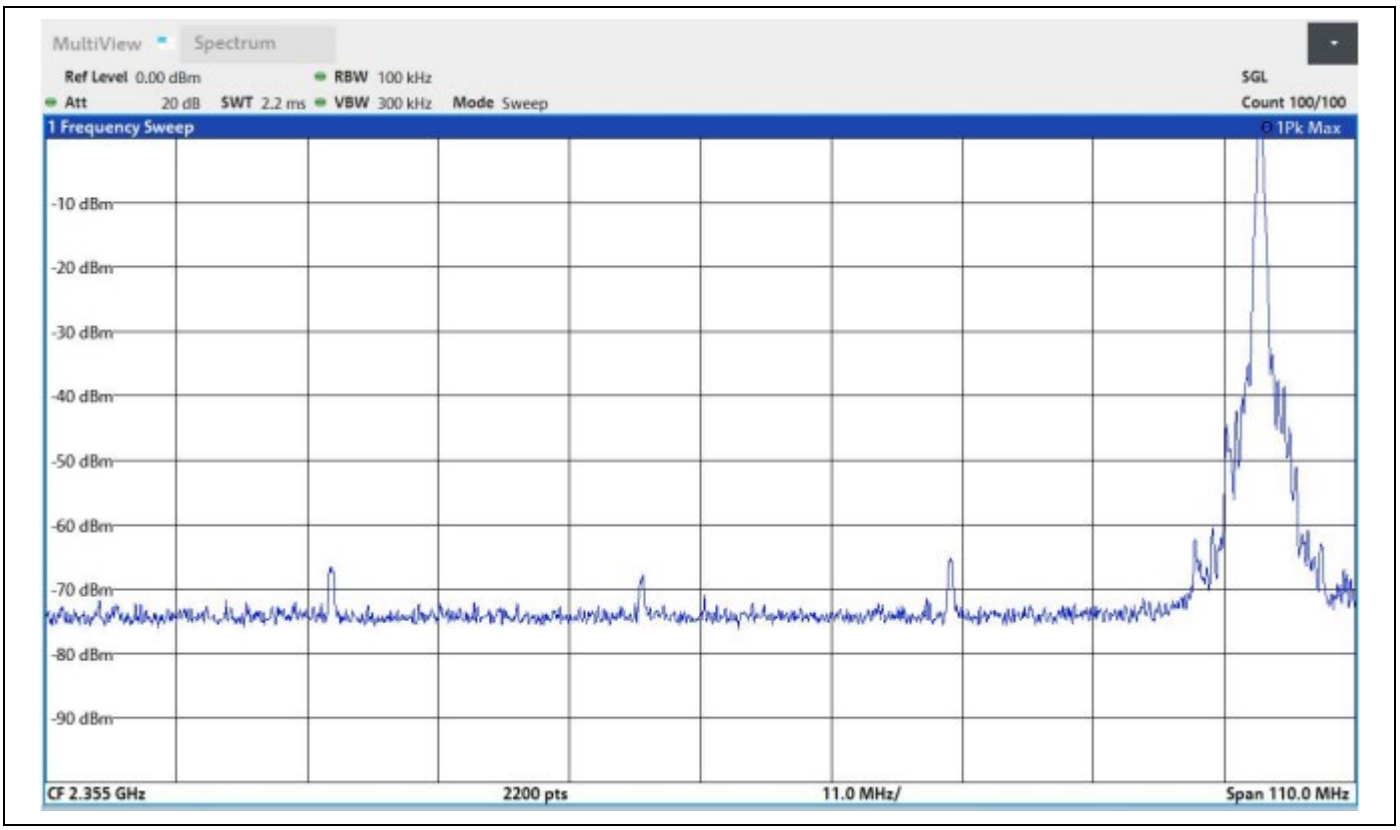
Plot for packet type DH1 shown below.

Data Rate	Frequency (MHz)	Level(dBm)
DH1	2402.025000	2.0

2402MHz DH1

Frequency (MHz)	Level (dBm)	Margin (dB)	Limit (dBm)	Result
2399.975000	-37.4	19.5	-18.0	PASS
2399.925000	-39.3	21.3	-18.0	PASS
2399.175000	-39.6	21.6	-18.0	PASS
2399.225000	-39.8	21.9	-18.0	PASS
2399.125000	-40.8	22.8	-18.0	PASS
2399.275000	-42.9	25.0	-18.0	PASS
2399.425000	-43.3	25.3	-18.0	PASS
2399.475000	-43.3	25.4	-18.0	PASS
2399.525000	-43.5	25.6	-18.0	PASS
2399.375000	-43.6	25.6	-18.0	PASS
2399.325000	-43.7	25.7	-18.0	PASS
2399.075000	-44.2	26.3	-18.0	PASS
2399.575000	-44.5	26.5	-18.0	PASS
2399.875000	-44.5	26.6	-18.0	PASS
2399.625000	-45.6	27.6	-18.0	PASS




MultiView
Spectrum
Ref Level 0.00 dBm
RBW 100 kHz
SGL
Att 20 dB SWT 2.2 ms VBW 300 kHz Mode Sweep
Count 100/100
1 Frequency Sweep
1Pk Max
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
-80 dBm
-90 dBm
CF 2.355 GHz
2200 pts
11.0 MHz/
Span 110.0 MHz

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

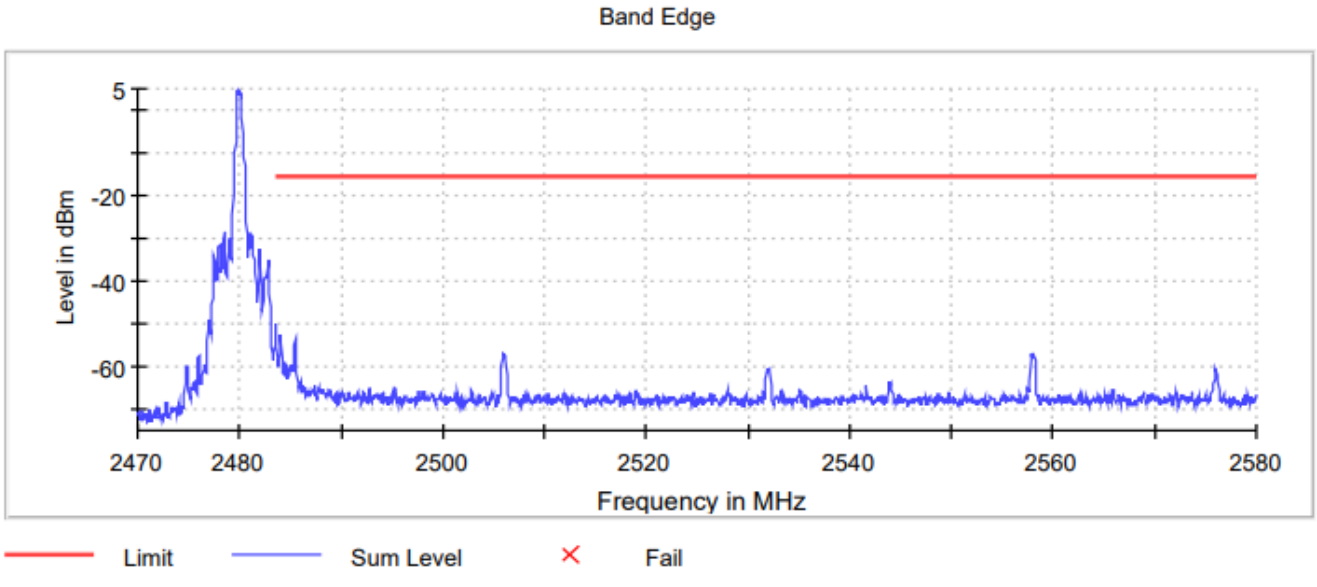
Measurement uncertainty calculated in accordance with ETSI TR 100 028-1. Expanded Uncertainty (K=2) < 0.8 dB

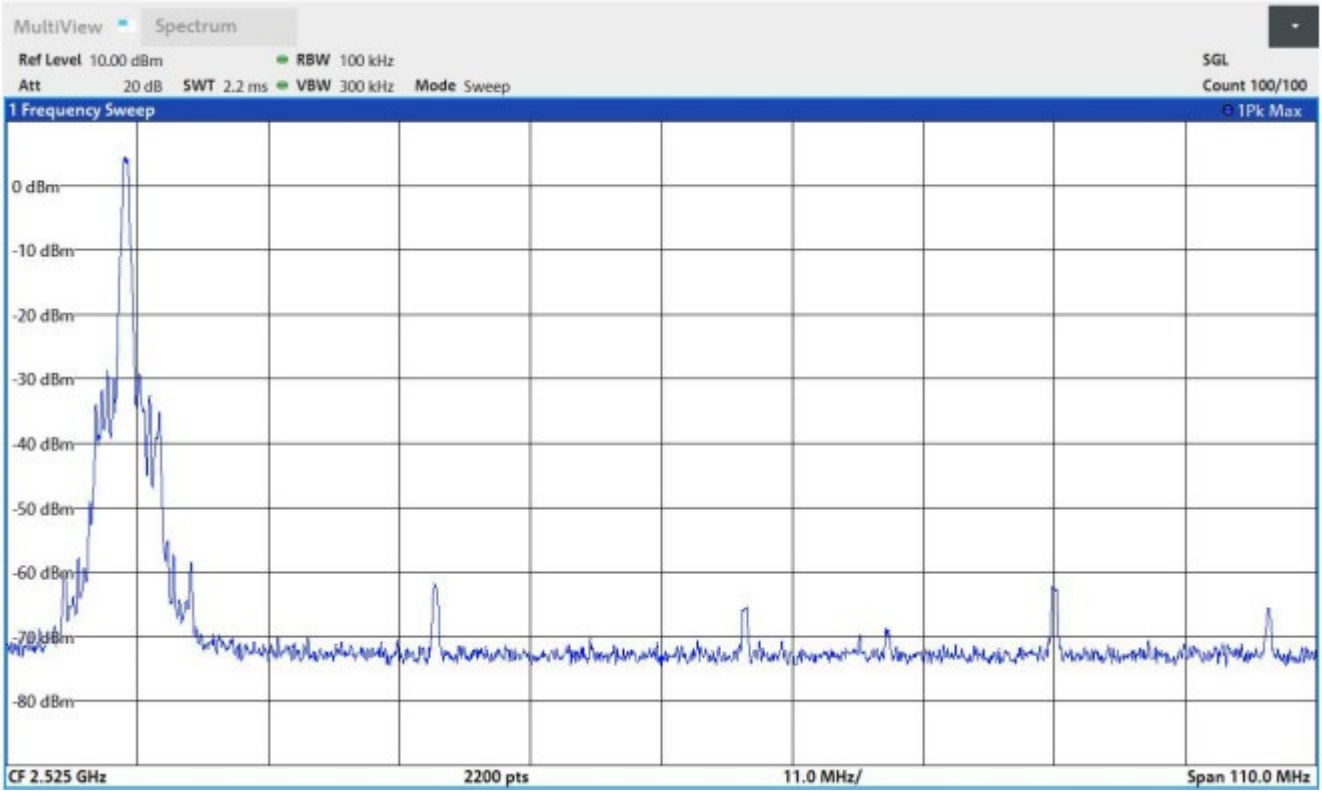
AH20090801-HAR-243 #1

Data Rate	Frequency (MHz)	Level(dBm)
DH1	2479.975000	4.4
DH3	2479.975000	4.3
DH5	2479.975000	4.4
2-DH1	2479.975000	3.6
2-DH3	2479.975000	3.5
2-DH5	2479.975000	3.5
3-DH1	2479.825000	3.5
3-DH3	2479.975000	3.5
3-DH5	2480.175000	3.5

2480MHz DH1

Frequency (MHz)	Level (dBm)	Margin (dB)	Limit (dBm)	Result
2483.525000	-50.2	34.6	-15.6	PASS
2484.025000	-52.3	36.7	-15.6	PASS
2483.975000	-52.8	37.2	-15.6	PASS
2483.575000	-53.0	37.4	-15.6	PASS
2484.075000	-53.0	37.5	-15.6	PASS
2485.475000	-53.5	37.9	-15.6	PASS
2485.525000	-53.6	38.0	-15.6	PASS
2483.625000	-55.0	39.4	-15.6	PASS
2485.425000	-55.0	39.4	-15.6	PASS
2485.575000	-56.6	41.0	-15.6	PASS
2505.925000	-56.8	41.2	-15.6	PASS
2483.925000	-56.8	41.3	-15.6	PASS
2506.025000	-56.9	41.4	-15.6	PASS
2505.975000	-57.0	41.4	-15.6	PASS
2557.825000	-57.2	41.6	-15.6	PASS




MultiView
Spectrum
Ref Level 10.00 dBm
RBW 100 kHz
SGL
Att 20 dB
SWT 2.2 ms
VBW 300 kHz
Mode Sweep
Count 100/100
1 Frequency Sweep
1Pk Max
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
-80 dBm
CF 2.525 GHz
2200 pts
11.0 MHz/
Span 110.0 MHz

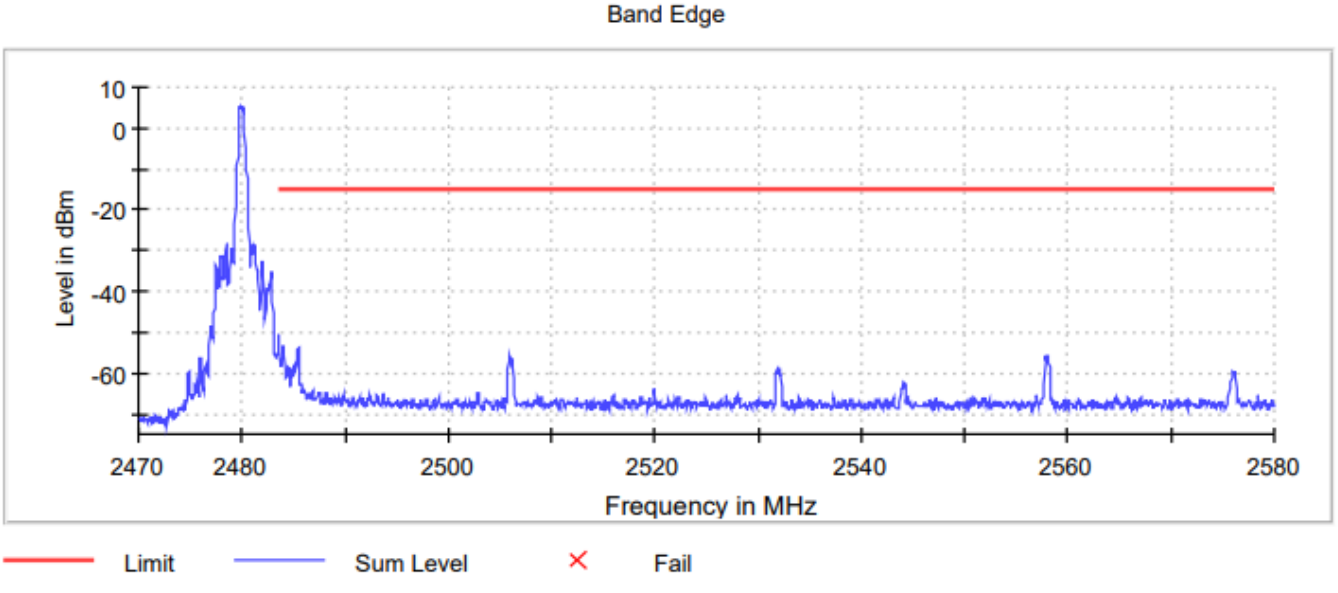
AH20090801-HAR-243 #4 (WS Spot Check Sample)

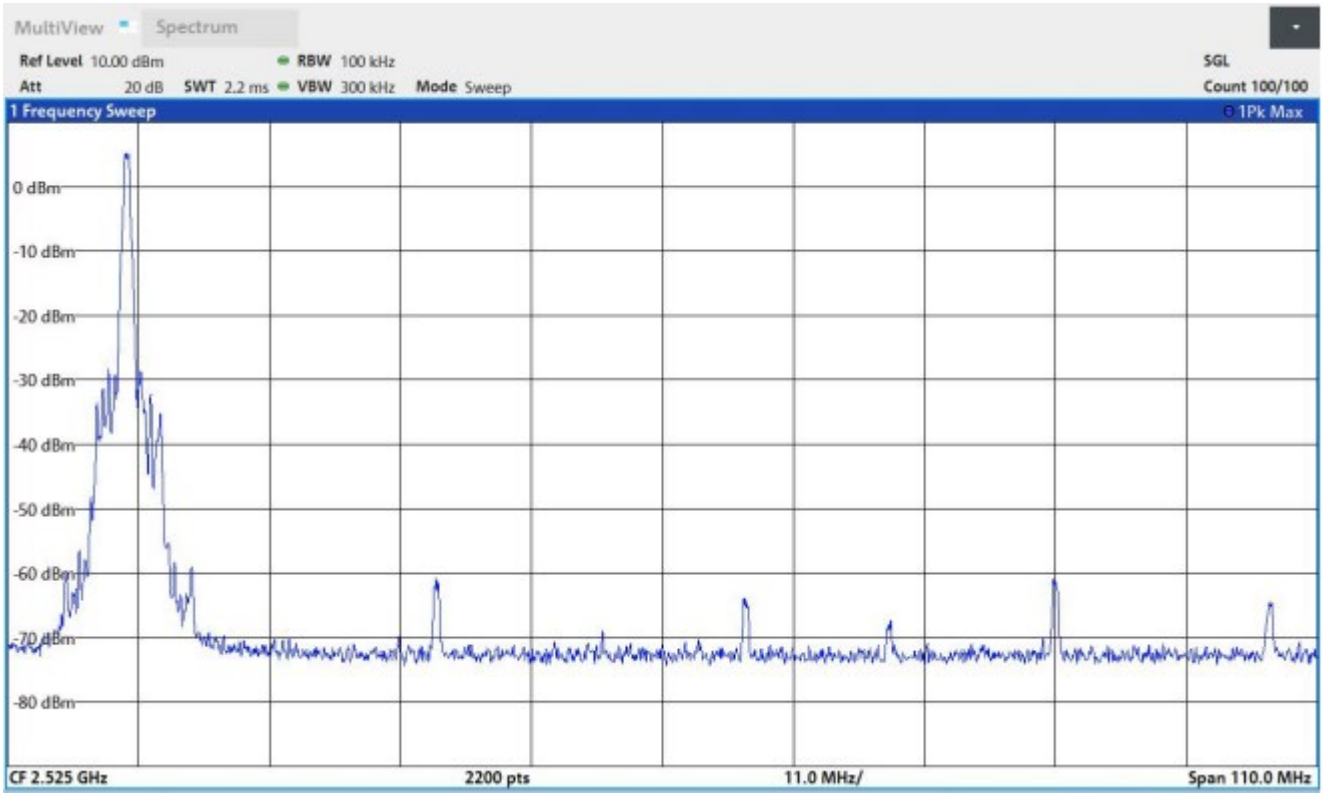
Plot for packet type DH1 shown below.

Data Rate	Frequency (MHz)	Level(dBm)
DH1	2480.025000	5.3

2480MHz DH1

Frequency (MHz)	Level (dBm)	Margin (dB)	Limit (dBm)	Result
2483.525000	-50.4	35.7	-14.7	PASS
2483.575000	-51.5	36.8	-14.7	PASS
2484.025000	-53.4	38.7	-14.7	PASS
2483.975000	-53.5	38.8	-14.7	PASS
2485.475000	-54.0	39.3	-14.7	PASS
2485.425000	-54.2	39.5	-14.7	PASS
2484.075000	-54.3	39.6	-14.7	PASS
2483.625000	-54.8	40.1	-14.7	PASS
2485.525000	-54.9	40.1	-14.7	PASS
2483.925000	-55.2	40.4	-14.7	PASS
2557.825000	-55.8	41.1	-14.7	PASS
2505.975000	-55.8	41.1	-14.7	PASS
2506.025000	-55.9	41.1	-14.7	PASS
2557.875000	-56.0	41.3	-14.7	PASS
2558.025000	-56.0	41.3	-14.7	PASS




MultiView
Spectrum
Ref Level 10.00 dBm
RBW 100 kHz
SGL
Att 20 dB
SWT 2.2 ms
VBW 300 kHz
Mode Sweep
Count 100/100
1 Frequency Sweep
1Pk Max
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
-80 dBm
CF 2.525 GHz
2200 pts
11.0 MHz/
Span 110.0 MHz

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

AH20090801-HAR-243 #1

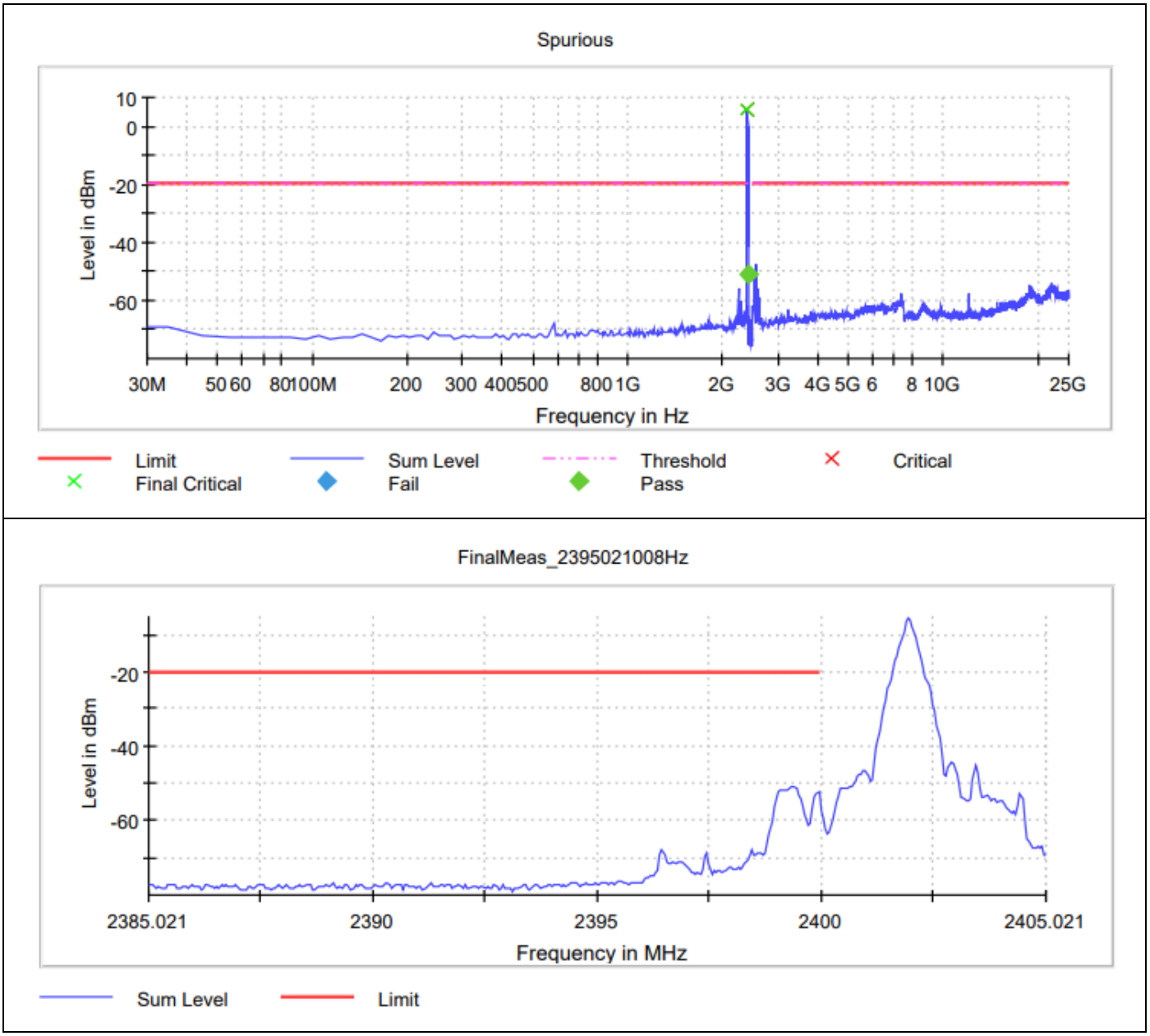
2402 MHz

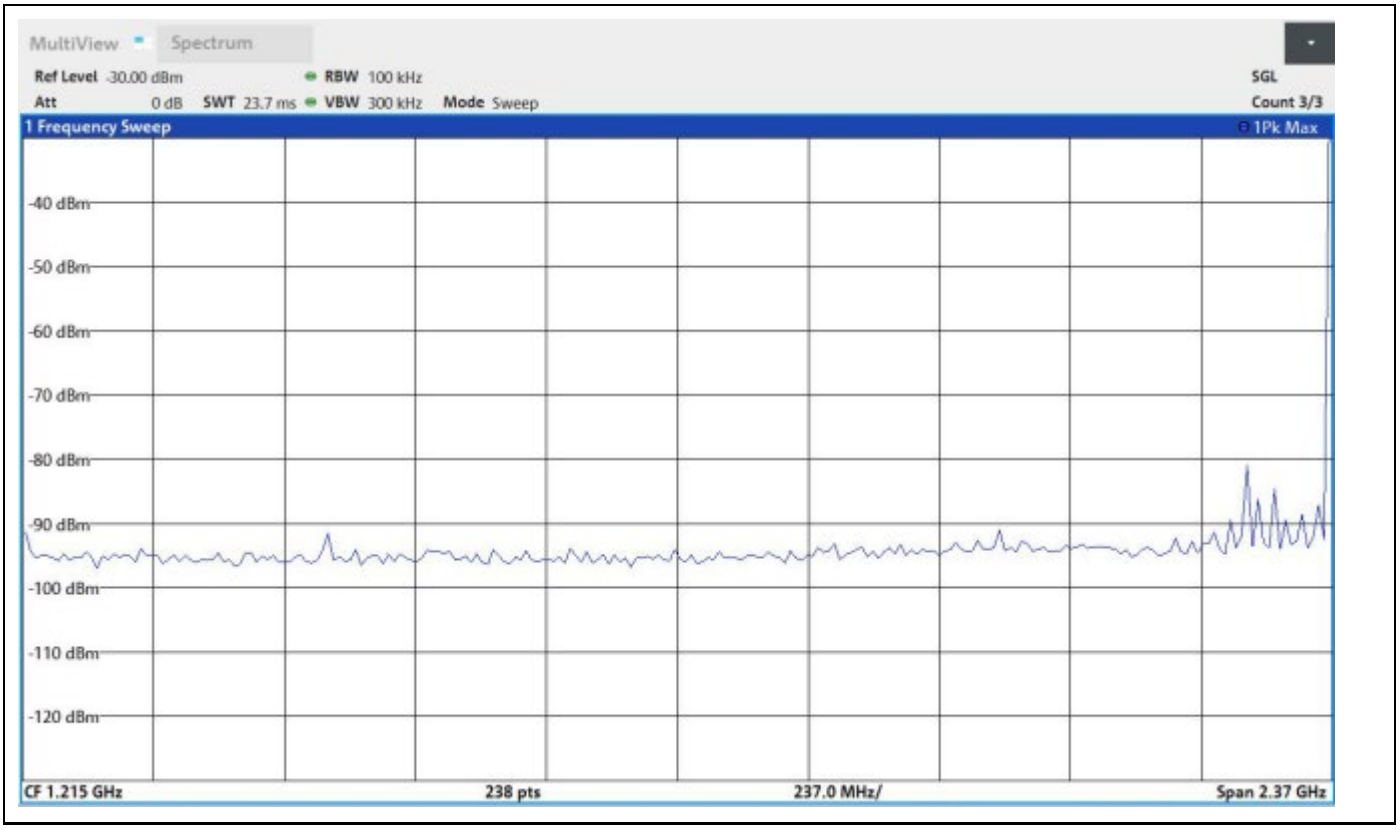
Final Measurement

Frequency (MHz)	Level Pre Measurement (dBm)	Level (dBm)	Margin (dB)	Limit (dBm)
2399.410035	0.8	-50.9	31.0	-19.8

Pre Measurement

Frequency (MHz)	Level (dBm)	Margin (dB)	Limit (dBm)
2395.021008	5.5	-25.3	-19.8
2558.455060	-47.4	27.6	-19.8
2508.485020	-50.3	30.5	-19.8
2528.473036	-53.6	33.7	-19.8
22116.728695	-54.3	34.5	-19.8
22096.740679	-54.7	34.8	-19.8
22266.638815	-54.8	35.0	-19.8
22076.752663	-54.9	35.1	-19.8
18728.759987	-54.9	35.1	-19.8
22536.477031	-55.0	35.1	-19.8
22106.734687	-55.2	35.4	-19.8
22126.722703	-55.3	35.4	-19.8
21866.878495	-55.3	35.5	-19.8
22086.746671	-55.4	35.5	-19.8
22686.387150	-55.4	35.6	-19.8

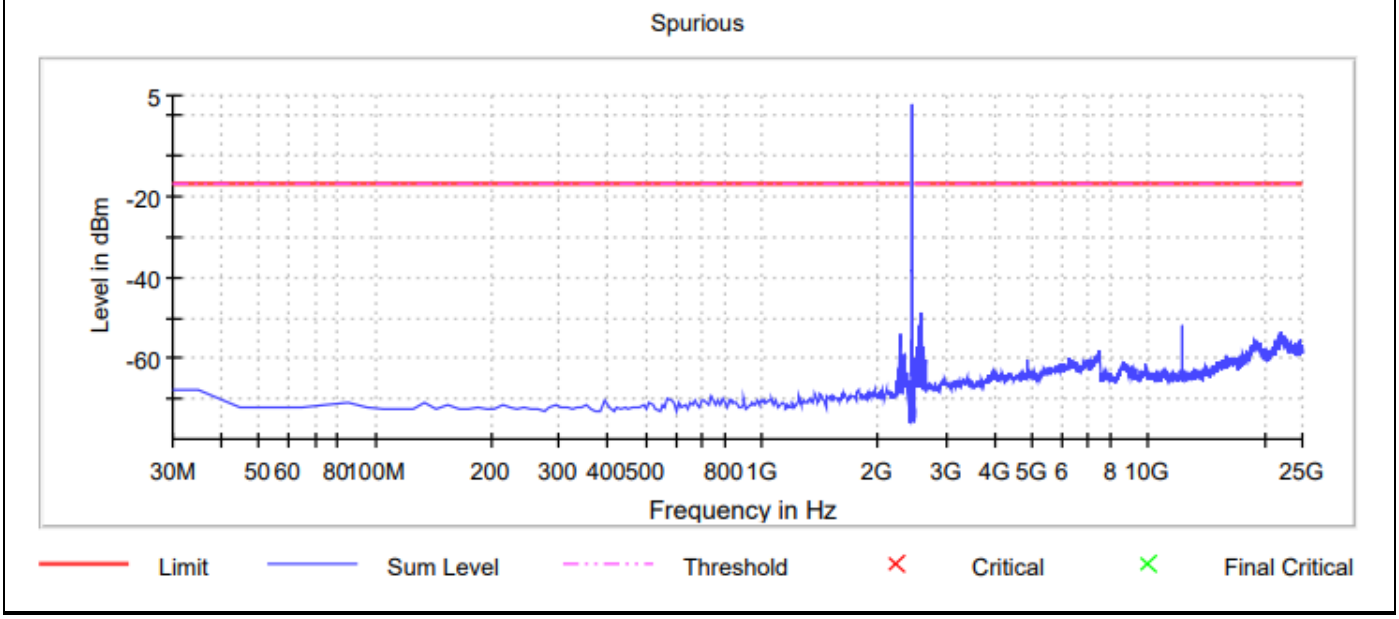

Spurious
10
0
-20
-40
-60
Level in dBm
30M
50 60
80 100M
200
300 400 500
800 1G
2G
3G
4G 5G 6
8 10G
25G
Frequency in Hz
Limit
Sum Level
Threshold
Critical
Final Critical
Fail
Pass
FinalMeas_2395021008Hz
-20
-40
-60
Level in dBm
2385.021
2390
2395
2400
2405.021
Frequency in MHz
Sum Level
Limit


MultiView
Spectrum
Ref Level -30.00 dBm
RBW 100 kHz
SGL
Att 0 dB
SWT 23.7 ms
VBW 300 kHz
Mode Sweep
Count 3/3
1 Frequency Sweep
1Pk Max
-40 dBm
-50 dBm
-60 dBm
-70 dBm
-80 dBm
-90 dBm
-100 dBm
-110 dBm
-120 dBm
CF 1.215 GHz
238 pts
237.0 MHz/
Span 2.37 GHz

2441 MHz

Pre Measurement

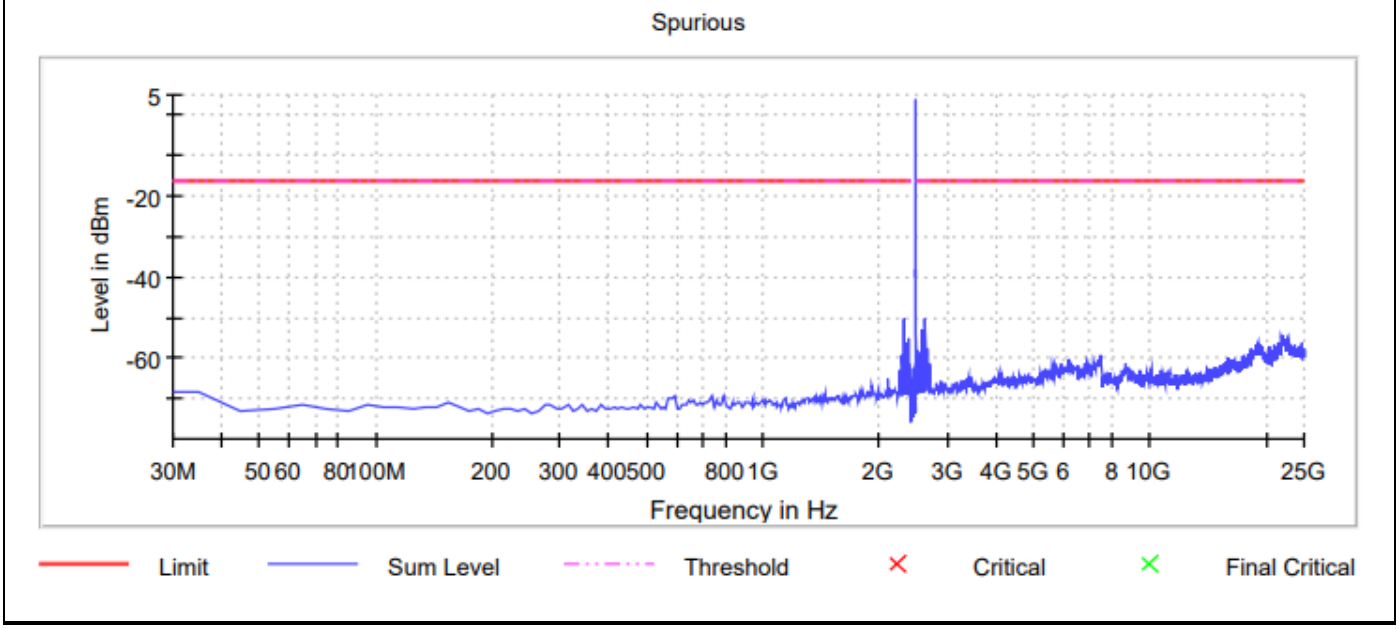
Frequency (MHz)	Level (dBm)	Margin (dB)	Limit (dBm)
2598.431092	-48.8	31.9	-16.9
12202.672770	-51.6	34.7	-16.9
2548.461052	-51.9	34.9	-16.9
22096.740679	-53.2	36.3	-16.9
22156.704727	-53.7	36.7	-16.9
2275.525210	-53.8	36.9	-16.9
2568.449068	-53.9	37.0	-16.9
22046.770639	-54.4	37.4	-16.9
21976.812583	-54.4	37.5	-16.9
22326.602863	-54.5	37.6	-16.9
21906.854527	-54.6	37.6	-16.9
22116.728695	-54.6	37.7	-16.9
21936.836551	-54.6	37.7	-16.9
22056.764647	-54.6	37.7	-16.9
21866.878495	-54.6	37.7	-16.9



2480 MHz

Pre Measurement

Frequency (MHz)	Level (dBm)	Margin (dB)	Limit (dBm)
2638.407124	-50.0	33.7	-16.3
2315.357143	-50.2	34.0	-16.3
2588.437084	-52.9	36.6	-16.3
2488.497004	-54.0	37.8	-16.3
22086.746671	-54.6	38.4	-16.3
2608.425100	-54.7	38.5	-16.3
21936.836551	-54.7	38.5	-16.3
2375.105042	-54.8	38.5	-16.3
21986.806591	-55.0	38.7	-16.3
22116.728695	-55.0	38.7	-16.3
22136.716711	-55.0	38.8	-16.3
22196.680759	-55.1	38.8	-16.3
22556.465047	-55.1	38.9	-16.3
22016.788615	-55.2	39.0	-16.3
22566.459055	-55.3	39.1	-16.3



AH20090801-HAR-243 #4 (WS Spot Check Sample)

Plot for packet type DH1 shown below.

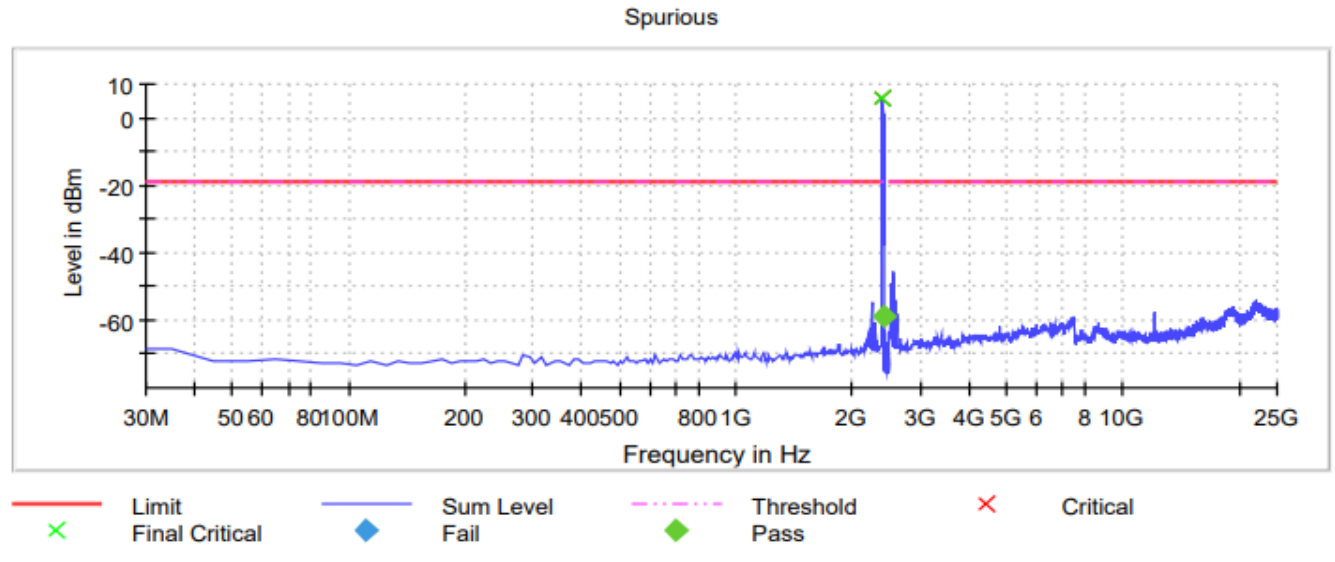
2402 MHz –DH1

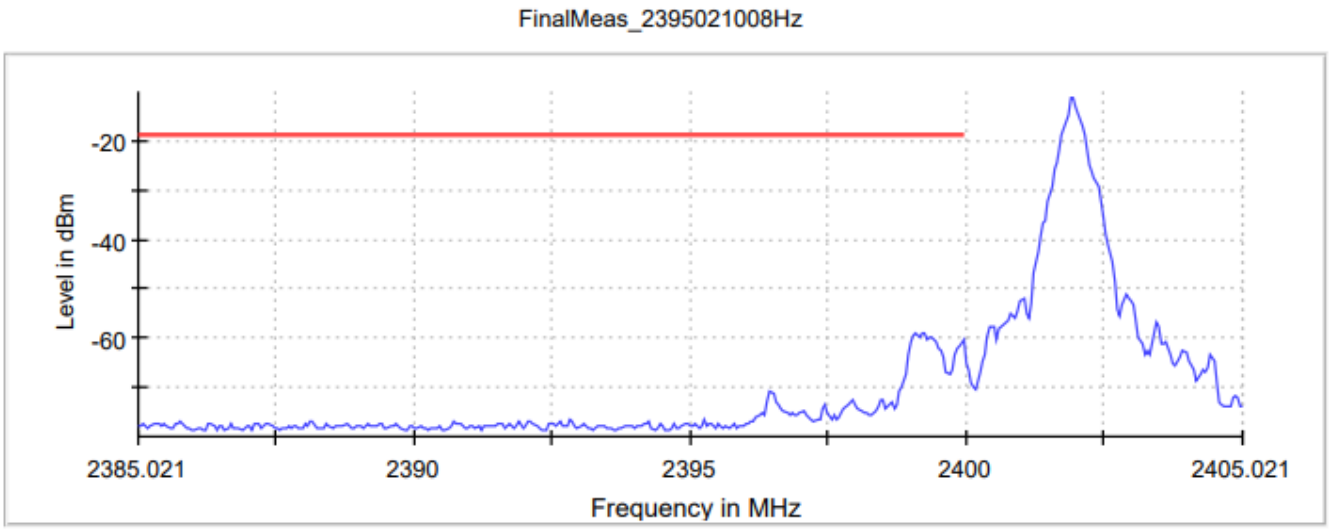
Final Measurement

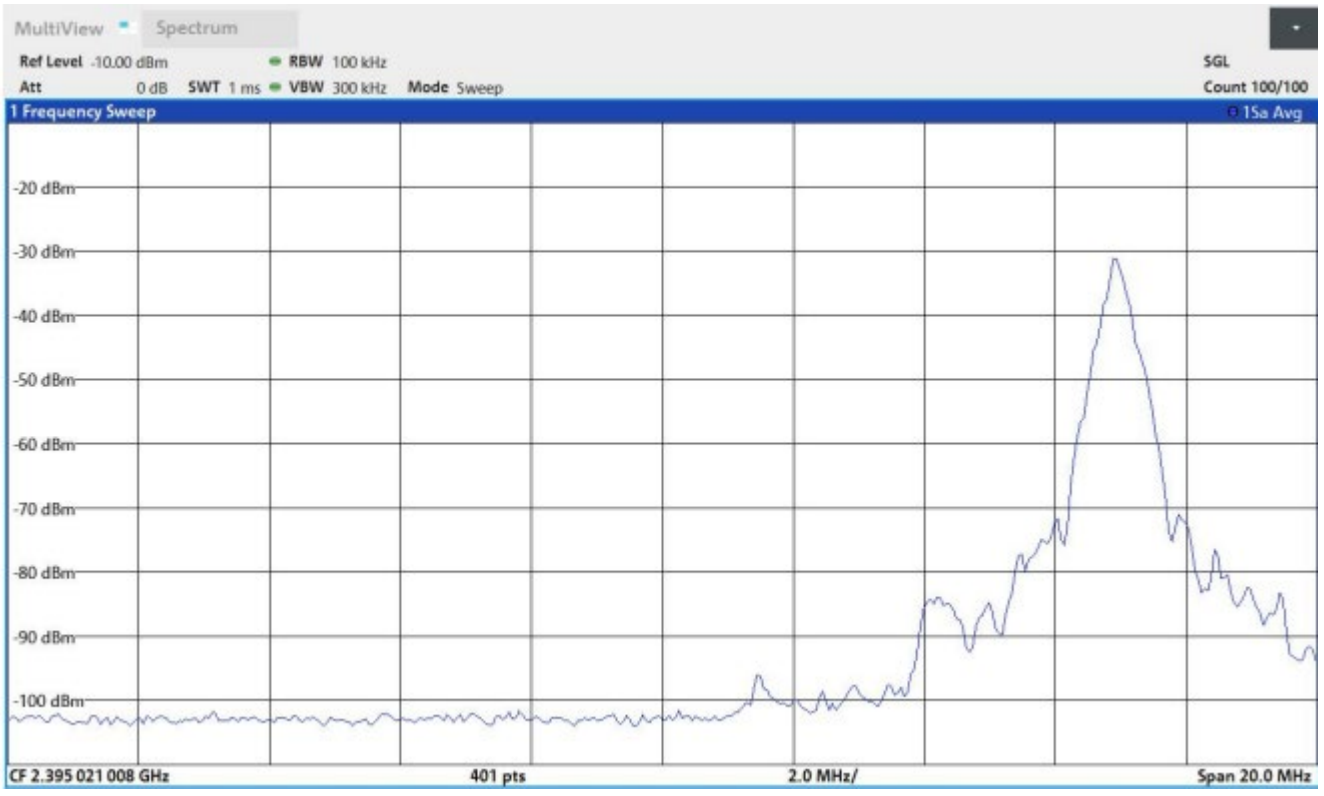
Frequency (MHz)	Level Pre Measurement (dBm)	Level (dBm)	Margin (dB)	Limit (dBm)
2399.210534	1.0	-58.9	40.1	-18.8

Pre Measurement

Frequency (MHz)	Level (dBm)	Margin (dB)	Limit (dBm)
2395.021008	5.5	-24.3	-18.8
2558.455060	-45.6	26.8	-18.8
2508.485020	-49.3	30.5	-18.8
2528.473036	-52.9	34.0	-18.8
2588.437084	-53.9	35.0	-18.8
22086.746671	-54.2	35.3	-18.8
2245.651261	-54.5	35.7	-18.8
22156.704727	-54.5	35.7	-18.8
21916.848535	-54.7	35.9	-18.8
22016.788615	-55.0	36.1	-18.8
22106.734687	-55.1	36.2	-18.8
21986.806591	-55.1	36.3	-18.8
22126.722703	-55.2	36.3	-18.8
22506.495007	-55.2	36.4	-18.8
22116.728695	-55.2	36.4	-18.8



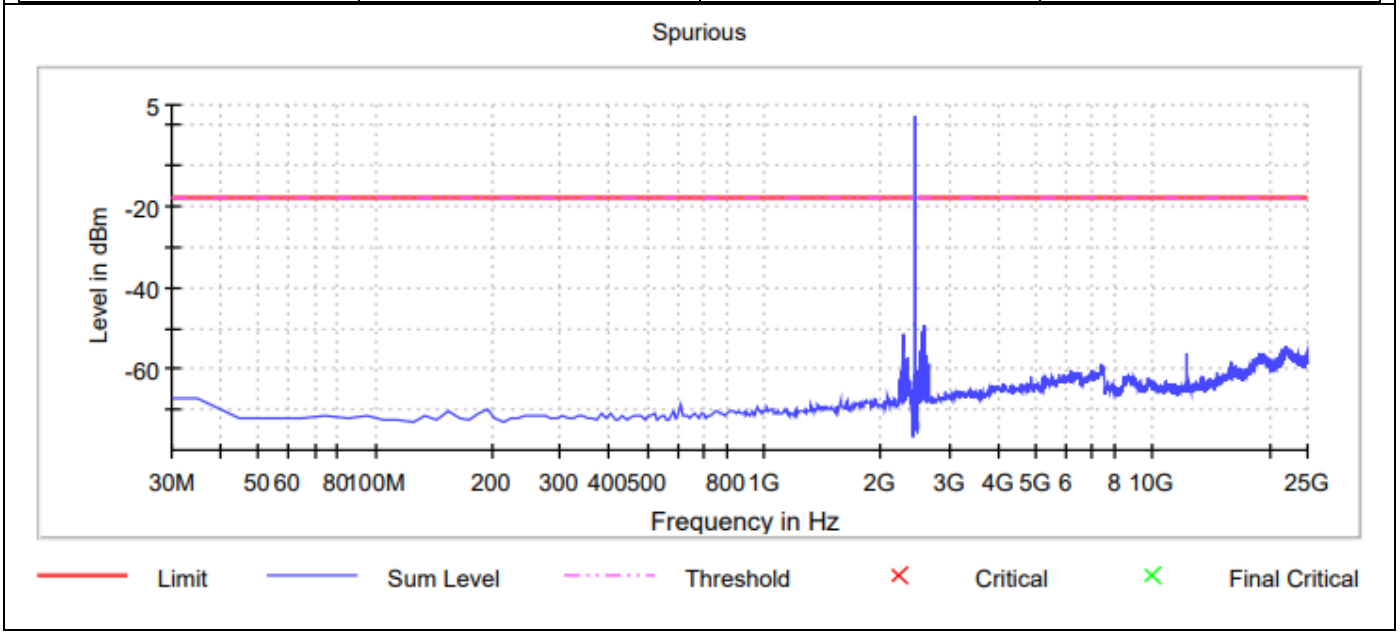

FinalMeas_2395021008Hz
-20
-40
-60
Level in dBm
2385.021
2390
2395
2400
2405.021
Frequency in MHz
Sum Level
Limit


MultiView
Spectrum
Ref Level -10.00 dBm
RBW 100 kHz
SGL
Att 0 dB
SWT 1 ms
VBW 300 kHz
Mode Sweep
Count 100/100
1 Frequency Sweep
1Sa Avg
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
-80 dBm
-90 dBm
-100 dBm
CF 2.395 021 008 GHz
401 pts
2.0 MHz/
Span 20.0 MHz

2441 MHz –DH1

Pre Measurement

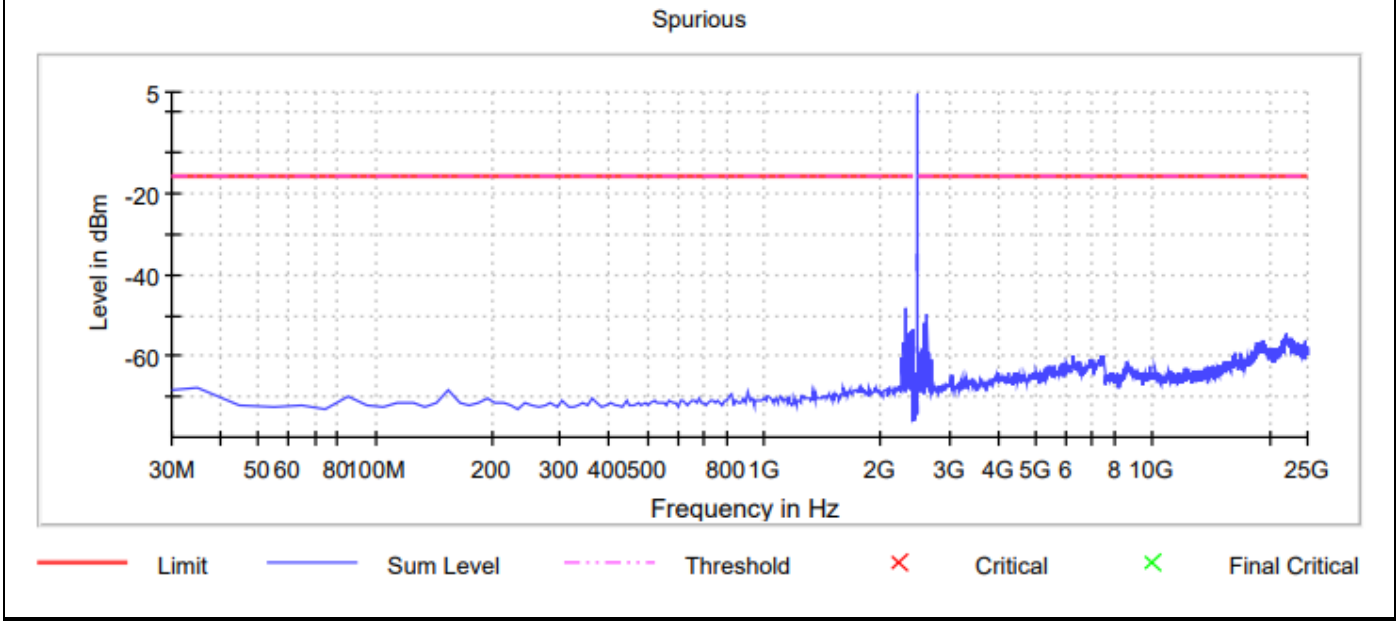
Frequency (MHz)	Level (dBm)	Margin (dB)	Limit (dBm)
2598.431092	-49.1	31.5	-17.6
2548.461052	-51.0	33.4	-17.6
2275.525210	-51.4	33.8	-17.6
2568.449068	-53.5	35.9	-17.6
22096.740679	-54.4	36.8	-17.6
22006.794607	-54.6	37.0	-17.6
22146.710719	-54.7	37.1	-17.6
22176.692743	-54.7	37.1	-17.6
22046.770639	-54.8	37.2	-17.6
22436.536951	-54.9	37.2	-17.6
21806.914447	-54.9	37.2	-17.6
22086.746671	-54.9	37.3	-17.6
22056.764647	-54.9	37.3	-17.6
22226.662783	-54.9	37.3	-17.6
22076.752663	-54.9	37.3	-17.6



2480 MHz –DH1

Pre Measurement

Frequency (MHz)	Level (dBm)	Margin (dB)	Limit (dBm)
2315.357143	-48.2	32.6	-15.6
2638.407124	-49.5	33.9	-15.6
2588.437084	-51.9	36.3	-15.6
2608.425100	-53.8	38.2	-15.6
2375.105042	-54.0	38.4	-15.6
2345.231092	-54.3	38.7	-15.6
22106.734687	-54.4	38.8	-15.6
22076.752663	-54.6	39.0	-15.6
22116.728695	-54.9	39.3	-15.6
22026.782623	-55.2	39.6	-15.6
21956.824567	-55.2	39.6	-15.6
22156.704727	-55.2	39.6	-15.6
21876.872503	-55.4	39.8	-15.6
22096.740679	-55.5	39.9	-15.6
22006.794607	-55.6	40.1	-15.6



- **Radiated Testing**

Test Summary

Start: 6/2/2021	End: 6/8/2021	Temperature: 23.2°C Humidity: 47.2%	Tester: Ryan Phillips

DUT S/N	AH20090801-HAR-243 #002	DUT Operating Mode	Bluetooth Test Mode/DH1/Band 78
Comment	Above 30MHz measurements were made at 2m only.		

Antenna	Frequency Range	Polarization	Result Over/Under Limit	Notes
Loop	9kHz-30MHz	Parallel	☐Over ☒Under	Note 1
		Perpendicular	☐Over ☒Under	Note 1
		Ground Parallel	☐Over ☒Under	Note 1
Log Periodic	30MHz-1GHz	Horizontal	☐Over ☒Under	√
		Vertical	☐Over ☒Under	√
Horn	1GHz-18GHz	Horizontal	☐Over ☒Under	√
		Vertical	☐Over ☒Under	√
Horn	18GHz-27.5GHz	Horizontal	☐Over ☒Under	√
		Vertical	☐Over ☒Under	√

DUT S/N	AH20090801-HAR-243 #004	DUT Operating Mode	Bluetooth Test Mode/DH1/Band 0
Comment			

Antenna	Frequency Range	Polarization	Result Over/Under Limit	Notes
Loop	9kHz-30MHz	Parallel	☐Over ☒Under	Note 1
		Perpendicular	☐Over ☒Under	Note 1
		Ground Parallel	☐Over ☒Under	Note 1
Log Periodic	30MHz-1GHz	Horizontal	☐Over ☒Under	√
		Vertical	☐Over ☒Under	√
Horn	1GHz-18GHz	Horizontal	☐Over ☒Under	√
		Vertical	☐Over ☒Under	√
Horn	18GHz-27.5GHz	Horizontal	☐Over ☒Under	√
		Vertical	☐Over ☒Under	√

DUT S/N	AH20090801-HAR-243 #004	DUT Operating Mode	Bluetooth Test Mode/DH1/Band 39
Comment			

Antenna	Frequency Range	Polarization	Result Over/Under Limit	Notes
Loop	9kHz-30MHz	Parallel	☐Over ☒Under	Note 1
		Perpendicular	☐Over ☒Under	Note 1
		Ground Parallel	☐Over ☒Under	Note 1
Log Periodic	30MHz-1GHz	Horizontal	☐Over ☒Under	√
		Vertical	☐Over ☒Under	√
Horn	1GHz-18GHz	Horizontal	☐Over ☒Under	√
		Vertical	☐Over ☒Under	√
Horn	18GHz-27.5GHz	Horizontal	☐Over ☒Under	√
		Vertical	☐Over ☒Under	√

DUT S/N	AH20090801-HAR-243 #004	DUT Operating Mode	Bluetooth Test Mode/DH1/Band 78
Comment			

Antenna	Frequency Range	Polarization	Result Over/Under Limit	Notes
Loop	9kHz-30MHz	Parallel	☐Over ☒Under	Note 1
		Perpendicular	☐Over ☒Under	Note 1
		Ground Parallel	☐Over ☒Under	Note 1
Log Periodic	30MHz-1GHz	Horizontal	☐Over ☒Under	√
		Vertical	☐Over ☒Under	√
Horn	1GHz-18GHz	Horizontal	☐Over ☒Under	√
		Vertical	☐Over ☒Under	√
Horn	18GHz-27.5GHz	Horizontal	☐Over ☒Under	√
		Vertical	☐Over ☒Under	√

Notes: √ meets the requirements of the acceptance criteria.

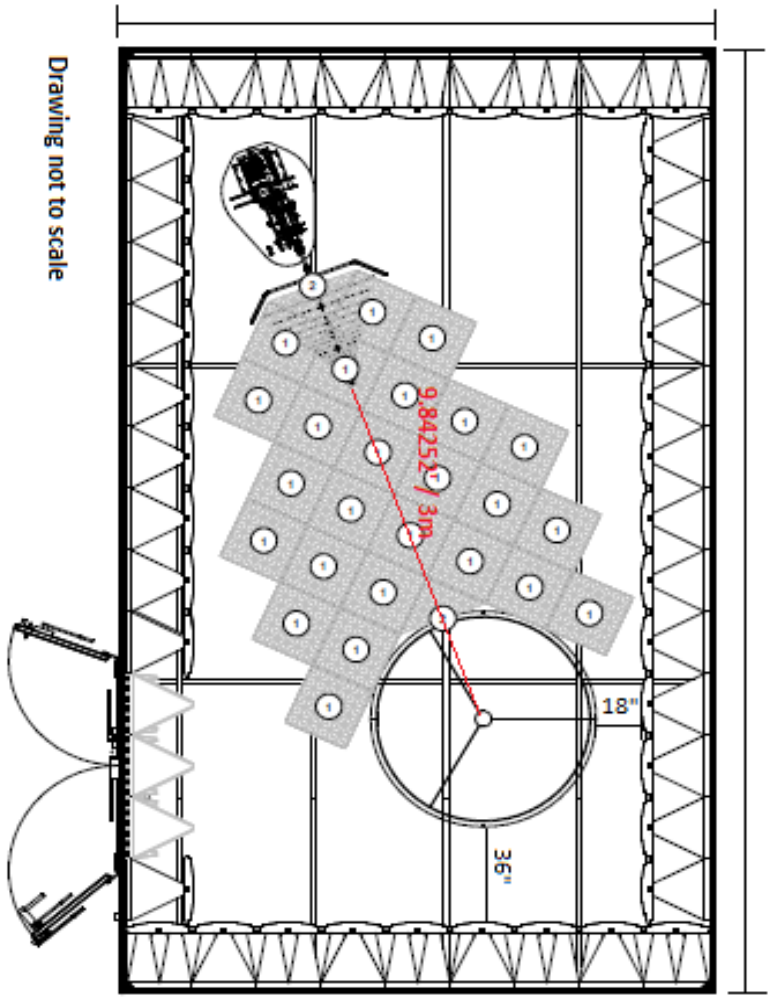
1. All emissions were greater than 20dB below the limit.

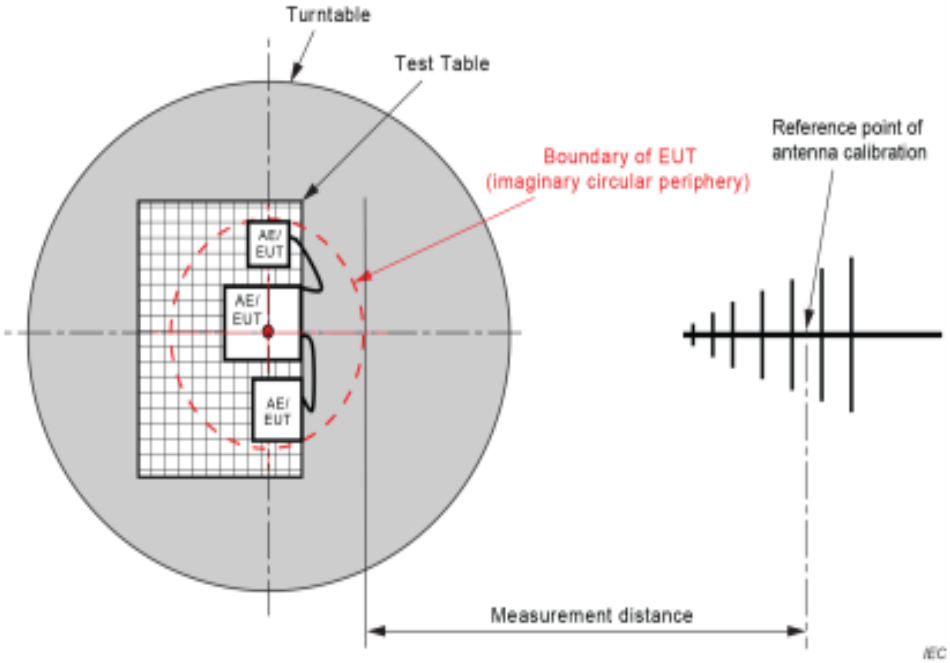
Test Setup

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 *s*VSWR
Test Completion	December 18th, 2019

Chamber Dimensions




Turntable
Test Table
Boundary of EUT
(imaginary circular periphery)
Reference point of
antenna calibration
AE/
EUT
AE/
EUT
AE/
EUT
Measurement distance
IEC

Test Equipment Used

ID #	Equipment	Manufacturer	Model	Serial #	Cal Due
BVD0218	Receiver 2Hz-44GHz	Rohde & Schwarz	ESW44	101870	9/25/2021
BVD0398	Double Shielded N-Type Cable 2 Meter	Rohde & Schwarz	N-Type	N/A	12/29/2022
BVD0186	Preamplifier 25dB cal to 100kHz-1GHz	Rohde & Schwarz	TS-PR1	102079	3/5/2022
BVD0394	Double Shielded N-Type Cable 6.9 Meter	Rohde & Schwarz	N-Type	N/A	12/29/2022
BVD0021	UltraLog Antenna 30-6000 MHz	Rohde & Schwarz	HL562E	101113	6/22/2021
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
BVD0267	Double Ridge Waveguide 800MHz-18GHz	Rohde & Schwarz	HF907	102832	7/28/2021
BVD0407	Double Shielded N-Type Cable 410mm (For PreAmp)	Rohde & Schwarz	N-Type	N/A	8/5/2022
BVD0184	Preamplifier 29dB 1-18GHz	Rohde & Schwarz	TS-PR18	101646	4/26/2022
BVD0011	Loop Antenna 9kHz-30MHz	Rohde & Schwarz	FMZB1519B	145	3/23/2022
BVD0165	Multimeter	Fluke	287	46320228	2/26/2022
BVD0118	Antenna Mast Position Controller	ETS	7006-001	00214778/00214648	N/A
BVD0111	3 Meter Anechoic Chamber	ETS	N/A	N/A	10/16/2022
BVD0069	Bore Sight Tower	ETS	2171B	226732	N/A
BVD0258	Optima 12V Blue top Marine battery	Optima	D34M	N/A	N/A
BVD0323	Foam Test Table For 3 Meter Chamber	ETS-Lindgren	LDT-1.5	N/A	N/A
BVD0247	Turn Table	ETS	920250	N/A	N/A
BVD0301	DC power supply 1-15VDC 60A 110/220 11.5A max input	BK Precision	1693	257F17179	N/A
BVD0280	High Speed CAN Optical Transceiver	SonTec	OPTOCAN 2000	CAN20/104HS	N/A
BVD0278	High Speed CAN Optical Transceiver	SonTec	OPTOCAN 2000	CAN20/102HS	N/A
N/A	Support Laptop	Lenovo	E560	LW10USAUH01ABUD	N/A

Test Equipment (Software)

Equipment	Manufacturer	Model	Version No.
EMC Test Software	Nexio	BAT-EMC	3.20.0.21

Customer Supplied Equipment

ID #	Equipment	Manufacturer	Model	Serial #	Version No.
N/A	Harness	Harman	1.7m	N/A	N/A
N/A	Ethernet Converter	Harman	B365_990_12KK	N/A	N/A
N/A	USB/CAN Adapter	Gridconnect	Peak	IPEH-002021-316416	
N/A	Ethernet Adapter	Trendnet	TU2-ET100	RA0JU56004466	6.0R

Radiated Emissions

Radiated emissions were maximized by rotating the EUT and its external antenna around Horizontal and vertical Polarizations.

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. Raw Peak Level (dBuV/m) = Level Peak Reading - Correction Factor
2. Correction Factor (dB) = Antenna Factor + Cable Loss – Preamplifier Gain
3. Margin = Level Q Peak Reading – Limit

AH20090801-HAR-243#004_WS_DH1_Band 0_9kHz-30MHz_Ground-Parallel

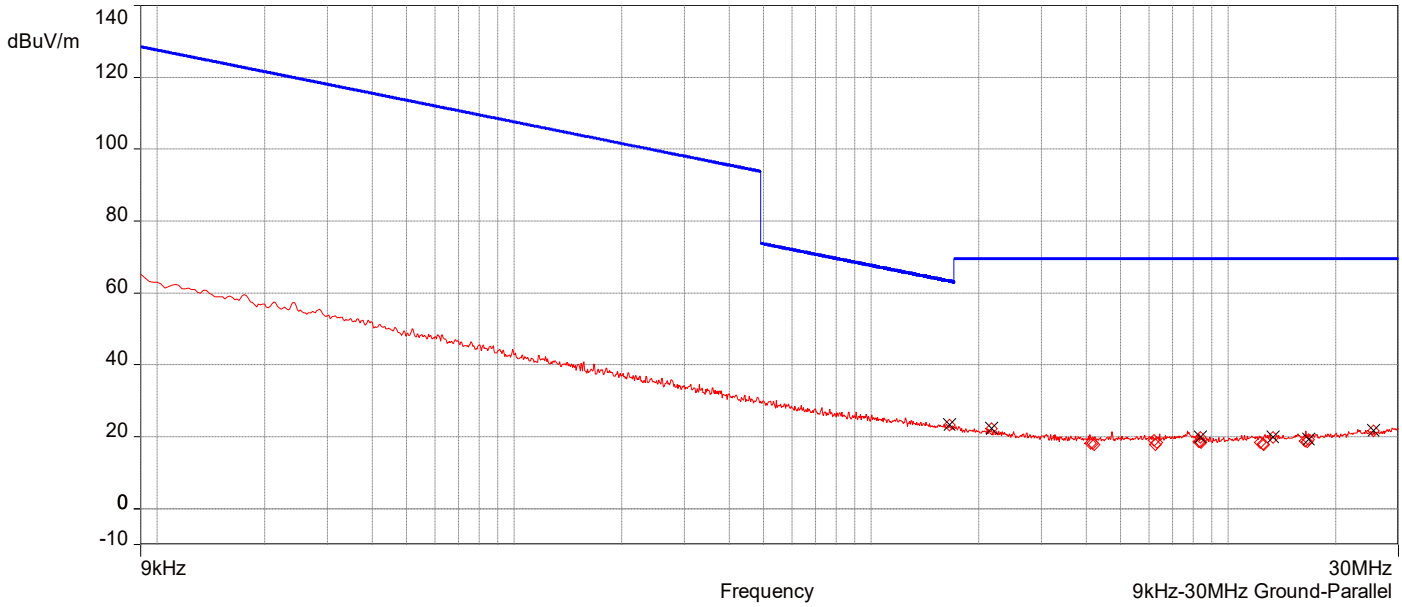
6/7/2021 1:03:45 PM

No	Frequency (MHz)	Level Q-Peak Reading (dBuV/m)	Correction Factor (dB)	Limit dBuV/m	Margin (dB)	Height (m)	Angle (°)	Polarization	Judgement
1	1.66MHz	23.30	19.13	63.20	-39.91	1.00	0.10	H/V	Passed
2	2.17475MHz	22.14	19.10	69.54	-47.40	1.00	120.00	H/V	Passed
3	8.379MHz	19.72	19.14	69.54	-49.82	1.00	300.10	H/V	Passed
4	13.3705MHz	19.71	19.61	69.54	-49.83	1.00	120.00	H/V	Passed
5	16.8045MHz	19.15	19.70	69.54	-50.40	1.00	240.10	H/V	Passed
6	25.5445MHz	21.62	20.69	69.54	-47.92	1.00	270.10	H/V	Passed

Remarks:

1. Emission Level (dBuV/m) = Level Q-Peak Reading - Correction Factor
2. Correction Factor (dB) = Antenna Factor + Cable Loss – Preamplifier Gain
3. Margin = Level Q Peak Reading – Limit

Overall Graphs:



AH20090801-HAR-243#004_WS_DH1_Band 0_9kHz-30MHz_Parallel

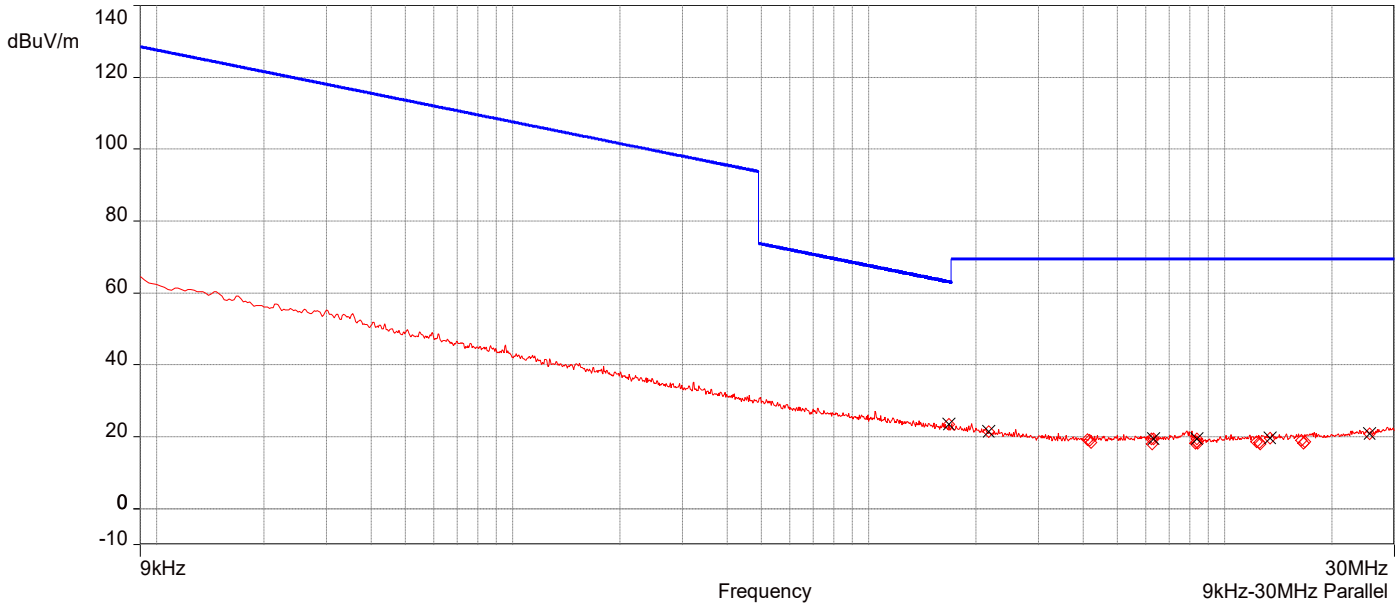
6/7/2021 10:28:07 AM

No	Frequency (MHz)	Level Q-Peak Reading (dBuV/m)	Correction Factor (dB)	Limit dBuV/m	Margin (dB)	Height (m)	Angle (°)	Polarization	Judgement
1	1.6805MHz	23.55	19.13	63.10	-39.54	1.00	329.90	H/V	Passed
2	2.17725MHz	21.51	19.10	69.54	-48.03	1.00	120.10	H/V	Passed
3	6.312MHz	19.40	19.23	69.54	-50.14	1.00	210.10	H/V	Passed
4	8.37625MHz	19.47	19.14	69.54	-50.07	1.00	180.10	H/V	Passed
5	13.396MHz	19.68	19.62	69.54	-49.86	1.00	30.00	H/V	Passed
6	25.59375MHz	20.88	20.70	69.54	-48.66	1.00	60.20	H/V	Passed

Remarks:

1. Emission Level (dBuV/m) = Level Q-Peak Reading - Correction Factor
2. Correction Factor (dB) = Antenna Factor + Cable Loss – Preamplifier Gain
3. Margin = Level Q-Peak Reading – Limit

Overall Graphs:



AH20090801-HAR-243#004_WS_DH1_Band 0_9kHz-30MHz_Perpendicular

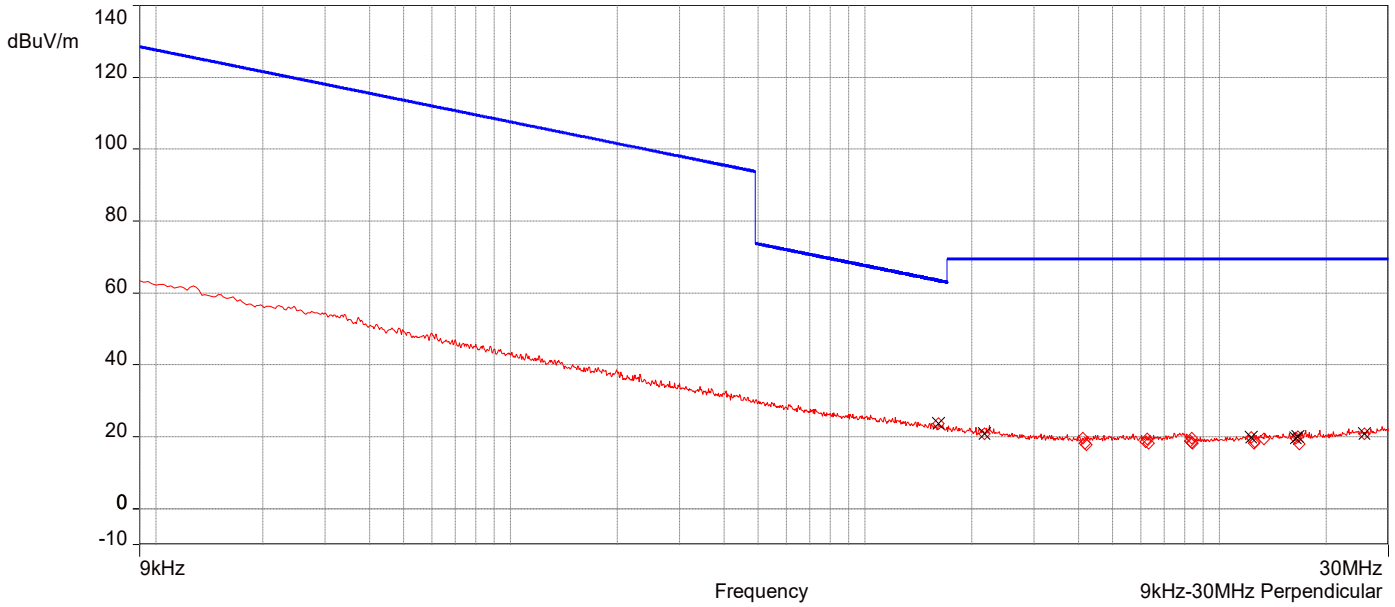
6/7/2021 11:11:54 AM

No	Frequency (MHz)	Level Q-Peak Reading (dBuV/m)	Correction Factor (dB)	Limit dBuV/m	Margin (dB)	Height (m)	Angle (°)	Polarization	Judgement
1	1.6145MHz	23.61	19.14	63.44	-39.83	1.00	119.90	H/V	Passed
2	2.17475MHz	20.91	19.10	69.54	-48.63	1.00	269.90	H/V	Passed
3	12.29075MHz	19.78	19.57	69.54	-49.76	1.00	269.90	H/V	Passed
4	16.42175MHz	19.66	19.70	69.54	-49.89	1.00	269.90	H/V	Passed
5	16.69525MHz	20.01	19.70	69.54	-49.54	1.00	239.90	H/V	Passed
6	25.6685MHz	20.77	20.71	69.54	-48.77	1.00	89.90	H/V	Passed

Remarks:

1. Emission Level (dBuV/m) = Level Q-Peak Reading - Correction Factor
2. Correction Factor (dB) = Antenna Factor + Cable Loss – Preamplifier Gain
3. Margin = Level Q-Peak Reading – Limit

Overall Graphs:



AH20090801-HAR-243#004_WS_DH1_Band 39_9kHz-30MHz_Ground-Parallel

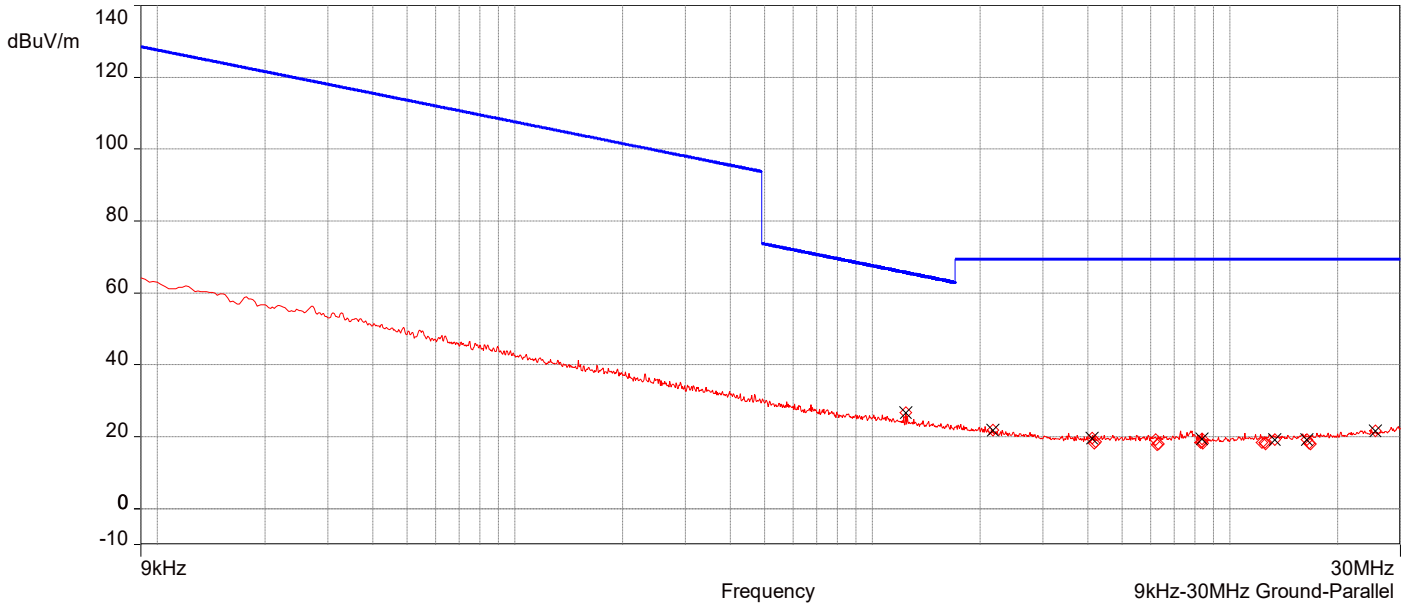
6/7/2021 12:53:10 PM

No	Frequency (MHz)	Level Q-Peak Reading (dBuV/m)	Correction Factor (dB)	Limit dBuV/m	Margin (dB)	Height (m)	Angle (°)	Polarization	Judgement
1	1.2395MHz	26.73	19.17	65.74	-39.01	1.00	269.90	H/V	Passed
2	2.17475MHz	21.82	19.10	69.54	-47.73	1.00	269.90	H/V	Passed
3	4.12675MHz	19.64	19.21	69.54	-49.91	1.00	179.90	H/V	Passed
4	8.37675MHz	19.35	19.14	69.54	-50.19	1.00	29.90	H/V	Passed
5	13.37675MHz	19.27	19.61	69.54	-50.27	1.00	59.90	H/V	Passed
6	16.4205MHz	19.21	19.70	69.54	-50.33	1.00	179.90	H/V	Passed
1	25.5755MHz	21.55	20.70	69.54	-47.99	1.00	329.90	H/V	Passed

Remarks:

1. Emission Level (dBuV/m) = Level Q-Peak Reading - Correction Factor
2. Correction Factor (dB) = Antenna Factor + Cable Loss – Preamplifier Gain
3. Margin = Level Q-Peak Reading – Limit

Overall Graphs:



AH20090801-HAR-243#004_WS_DH1_Band 39_9kHz-30MHz_Perpendicular

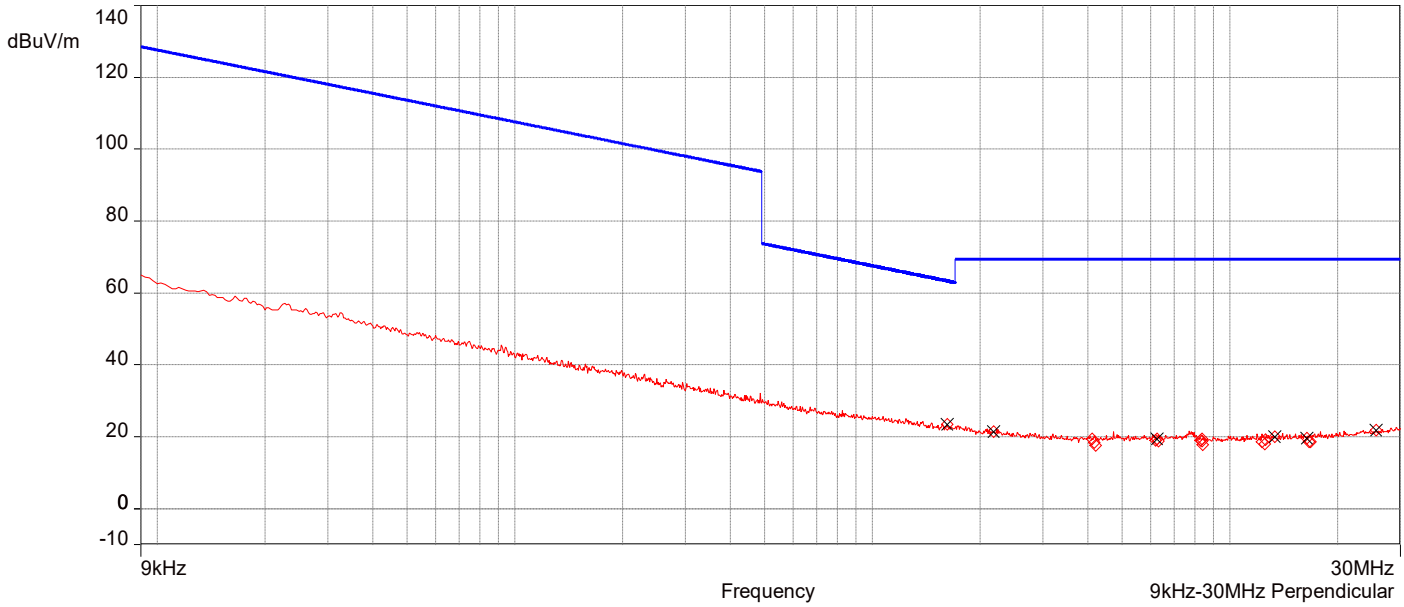
6/7/2021 11:23:37 AM

No	Frequency (MHz)	Level Q-Peak Reading (dBuV/m)	Correction Factor (dB)	Limit dBuV/m	Margin (dB)	Height (m)	Angle (°)	Polarization	Judgement
1	1.6175MHz	23.37	19.14	63.43	-40.06	1.00	120.00	H/V	Passed
2	2.18375MHz	21.33	19.10	69.54	-48.21	1.00	329.90	H/V	Passed
3	6.26775MHz	19.46	19.23	69.54	-50.09	1.00	329.90	H/V	Passed
4	13.36225MHz	19.92	19.61	69.54	-49.62	1.00	30.20	H/V	Passed
5	16.421MHz	19.62	19.70	69.54	-49.92	1.00	30.20	H/V	Passed
6	25.66575MHz	21.82	20.71	69.54	-47.72	1.00	30.20	H/V	Passed

Remarks:

1. Emission Level (dBuV/m) = Level Q-Peak Reading - Correction Factor
2. Correction Factor (dB) = Antenna Factor + Cable Loss – Preamplifier Gain
3. Margin = Level Q-Peak Reading – Limit

Overall Graphs:



AH20090801-HAR-243#004_WS_DH1_Band 39_9kHz-30MHz_Parallel

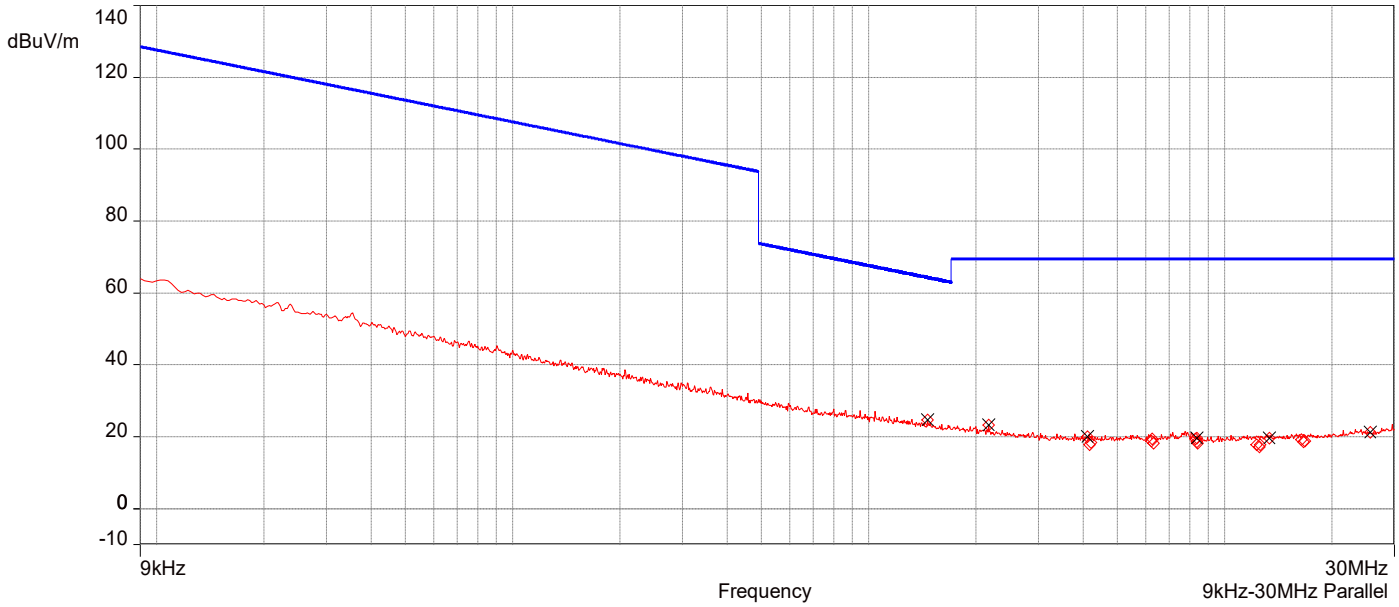
6/7/2021 11:31:32 AM

No	Frequency (MHz)	Level Q-Peak Reading (dBuV/m)	Correction Factor (dB)	Limit dBuV/m	Margin (dB)	Height (m)	Angle (°)	Polarization	Judgement
1	1.467MHz	24.64	19.15	64.28	-39.63	1.00	119.90	H/V	Passed
2	2.1755MHz	23.31	19.10	69.54	-46.23	1.00	299.90	H/V	Passed
3	4.12675MHz	19.92	19.21	69.54	-49.62	1.00	209.90	H/V	Passed
4	8.3775MHz	19.70	19.14	69.54	-49.84	1.00	299.90	H/V	Passed
5	13.3775MHz	19.55	19.61	69.54	-49.99	1.00	179.90	H/V	Passed
6	25.61675MHz	21.29	20.70	69.54	-48.25	1.00	59.90	H/V	Passed

Remarks:

1. Emission Level (dBuV/m) = Level Q-Peak Reading - Correction Factor
2. Correction Factor (dB) = Antenna Factor + Cable Loss – Preamplifier Gain
3. Margin = Level Q-Peak Reading – Limit

Overall Graphs:



AH20090801-HAR-243#004_WS_DH1_Band 78_9kHz-30MHz_Parallel

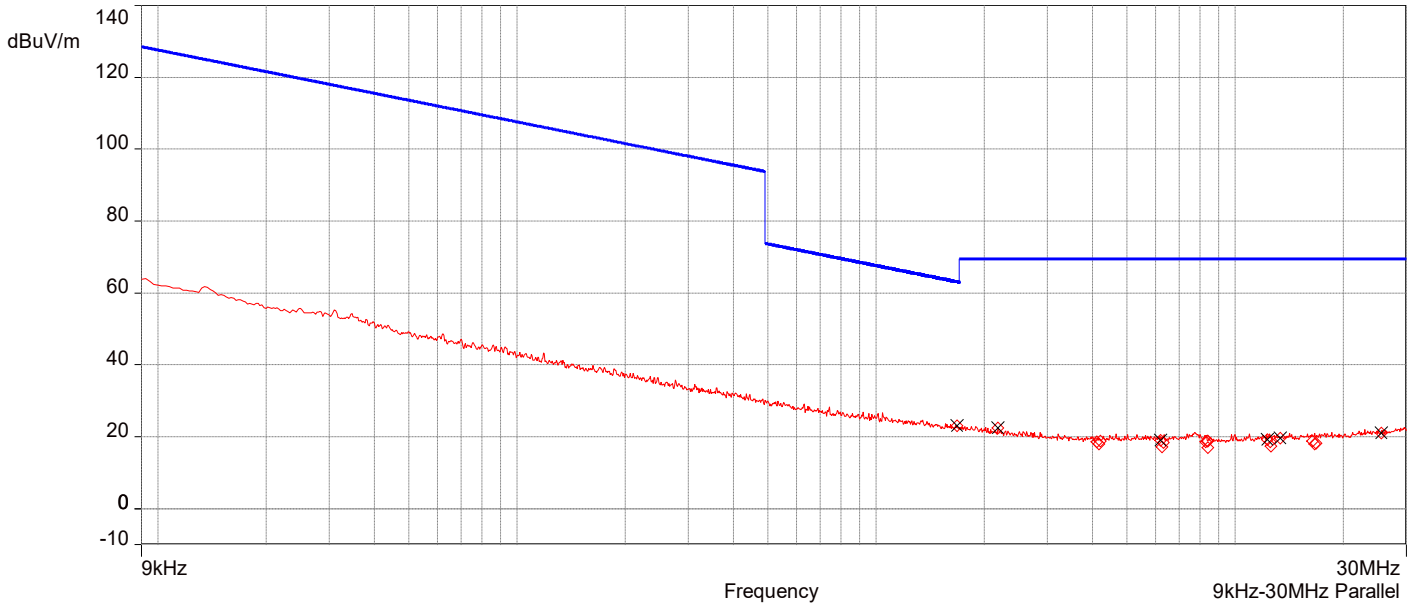
6/7/2021 11:41:45 AM

No	Frequency (MHz)	Level Q-Peak Reading (dBuV/m)	Correction Factor (dB)	Limit dBuV/m	Margin (dB)	Height (m)	Angle (°)	Polarization	Judgement
1	1.68475MHz	23.13	19.13	63.07	-39.94	1.00	150.00	H/V	Passed
2	2.18525MHz	22.38	19.10	69.54	-47.16	1.00	180.10	H/V	Passed
3	6.21525MHz	18.98	19.23	69.54	-50.56	1.00	270.10	H/V	Passed
4	12.29225MHz	19.24	19.57	69.54	-50.30	1.00	0.10	H/V	Passed
5	13.37175MHz	19.61	19.61	69.54	-49.93	1.00	0.10	H/V	Passed
6	25.51275MHz	20.98	20.69	69.54	-48.57	1.00	60.00	H/V	Passed

Remarks:

1. Emission Level (dBuV/m) = Level Q-Peak Reading - Correction Factor
2. Correction Factor (dB) = Antenna Factor + Cable Loss – Preamplifier Gain
3. Margin = Level Q-Peak Reading – Limit

Overall Graphs:



AH20090801-HAR-243#004_WS_DH1_Band 78_9kHz-30MHz_Perpendicular

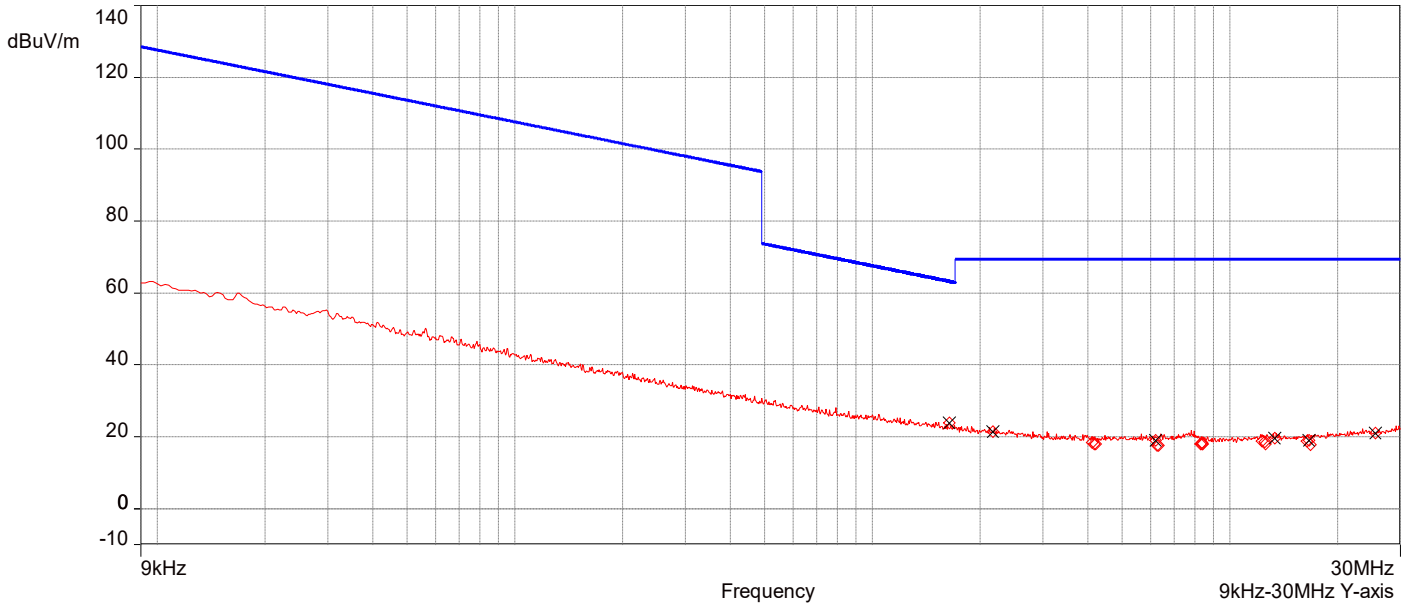
6/7/2021 11:48:04 AM

No	Frequency (MHz)	Level Q-Peak Reading (dBuV/m)	Correction Factor (dB)	Limit dBuV/m	Margin (dB)	Height (m)	Angle (°)	Polarization	Judgement
1	1.64425MHz	23.83	19.13	63.28	-39.45	1.00	209.90	H/V	Passed
2	2.17475MHz	21.53	19.10	69.54	-48.02	1.00	119.90	H/V	Passed
3	6.21625MHz	18.90	19.23	69.54	-50.64	1.00	119.90	H/V	Passed
4	13.3835MHz	19.60	19.61	69.54	-49.94	1.00	179.90	H/V	Passed
5	16.69475MHz	19.01	19.70	69.54	-50.53	1.00	29.90	H/V	Passed
6	25.54025MHz	21.12	20.69	69.54	-48.42	1.00	209.90	H/V	Passed

Remarks:

1. Emission Level (dBuV/m) = Level Q-Peak Reading - Correction Factor
2. Correction Factor (dB) = Antenna Factor + Cable Loss – Preamplifier Gain
3. Margin = Level Q-Peak Reading – Limit

Overall Graphs:



AH20090801-HAR-243#004_WS_DH1_Band 78_9kHz-30MHz_Ground-Parallel

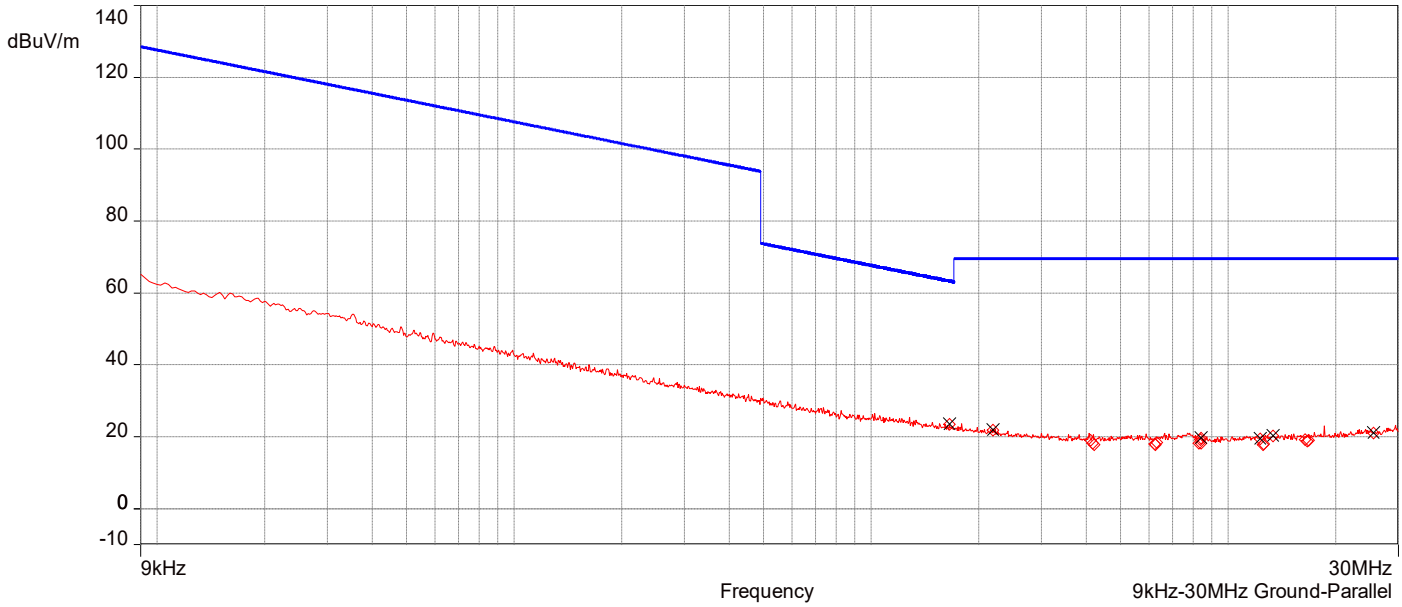
6/7/2021 12:01:28 PM

No	Frequency (MHz)	Level Q-Peak Reading (dBuV/m)	Correction Factor (dB)	Limit dBuV/m	Margin (dB)	Height (m)	Angle (°)	Polarization	Judgement
1	1.657MHz	23.51	19.13	63.22	-39.71	1.00	60.10	H/V	Passed
2	2.19025MHz	21.92	19.10	69.54	-47.62	1.00	120.10	H/V	Passed
3	8.386MHz	19.60	19.14	69.54	-49.95	1.00	30.20	H/V	Passed
4	12.29075MHz	19.46	19.57	69.54	-50.08	1.00	150.10	H/V	Passed
5	13.38525MHz	20.22	19.62	69.54	-49.33	1.00	329.90	H/V	Passed
6	25.556MHz	20.97	20.69	69.54	-48.57	1.00	180.10	H/V	Passed

Remarks:

1. Emission Level (dBuV/m) = Level Q-Peak Reading - Correction Factor
2. Correction Factor (dB) = Antenna Factor + Cable Loss – Preamplifier Gain
3. Margin = Level Q-Peak Reading – Limit

Overall Graphs:



AH20090801-HAR-243#002_WL_DH1_Band 78_9kHz-30MHz_Ground-Parallel

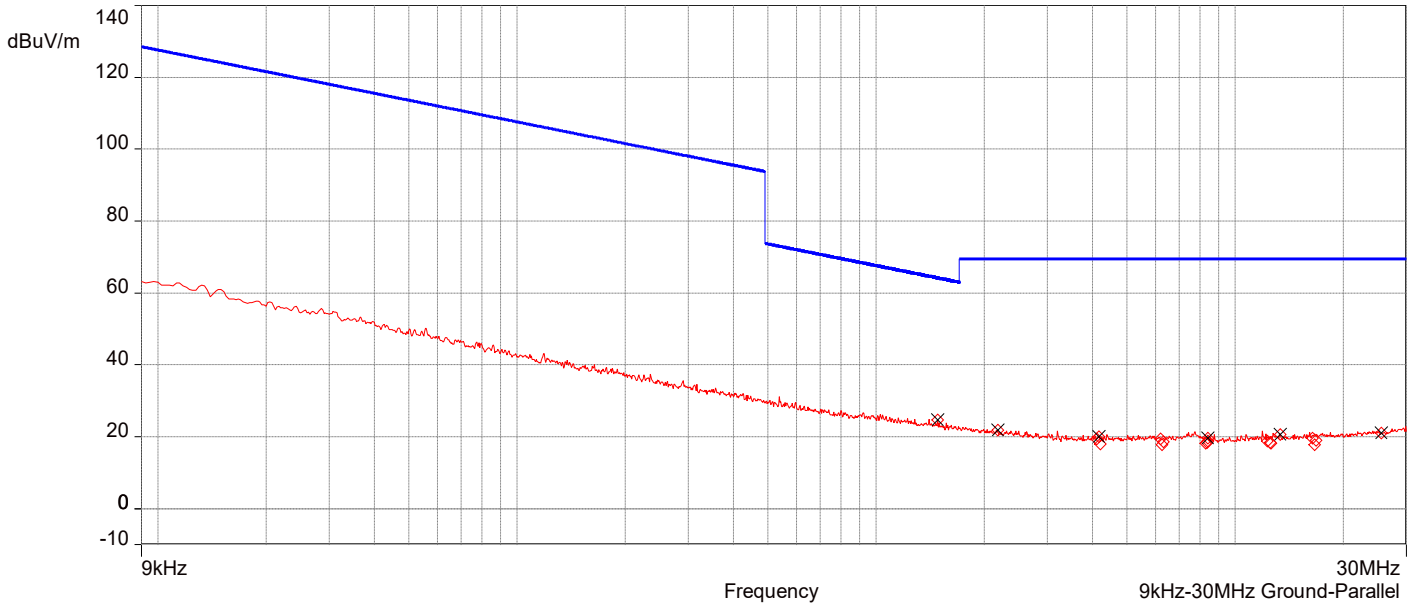
6/7/2021 1:14:13 PM

No	Frequency (MHz)	Level Q-Peak Reading (dBuV/m)	Correction Factor (dB)	Limit dBuV/m	Margin (dB)	Height (m)	Angle (°)	Polarization	Judgement
1	1.48225MHz	24.69	19.15	64.19	-39.50	1.00	329.90	H/V	Passed
2	2.189MHz	21.78	19.10	69.54	-47.76	1.00	209.90	H/V	Passed
3	4.17725MHz	20.04	19.21	69.54	-49.51	1.00	89.90	H/V	Passed
4	8.3825MHz	19.64	19.14	69.54	-49.90	1.00	299.90	H/V	Passed
5	13.37175MHz	20.69	19.61	69.54	-48.85	1.00	329.90	H/V	Passed
6	25.58375MHz	21.07	20.70	69.54	-48.48	1.00	239.90	H/V	Passed

Remarks:

1. Emission Level (dBuV/m) = Level Q-Peak Reading - Correction Factor
2. Correction Factor (dB) = Antenna Factor + Cable Loss – Preamplifier Gain
3. Margin = Level Q-Peak Reading – Limit

Overall Graphs:



AH20090801-HAR-243#002_WL_DH1_Band 78_9kHz-30MHz_Parallel

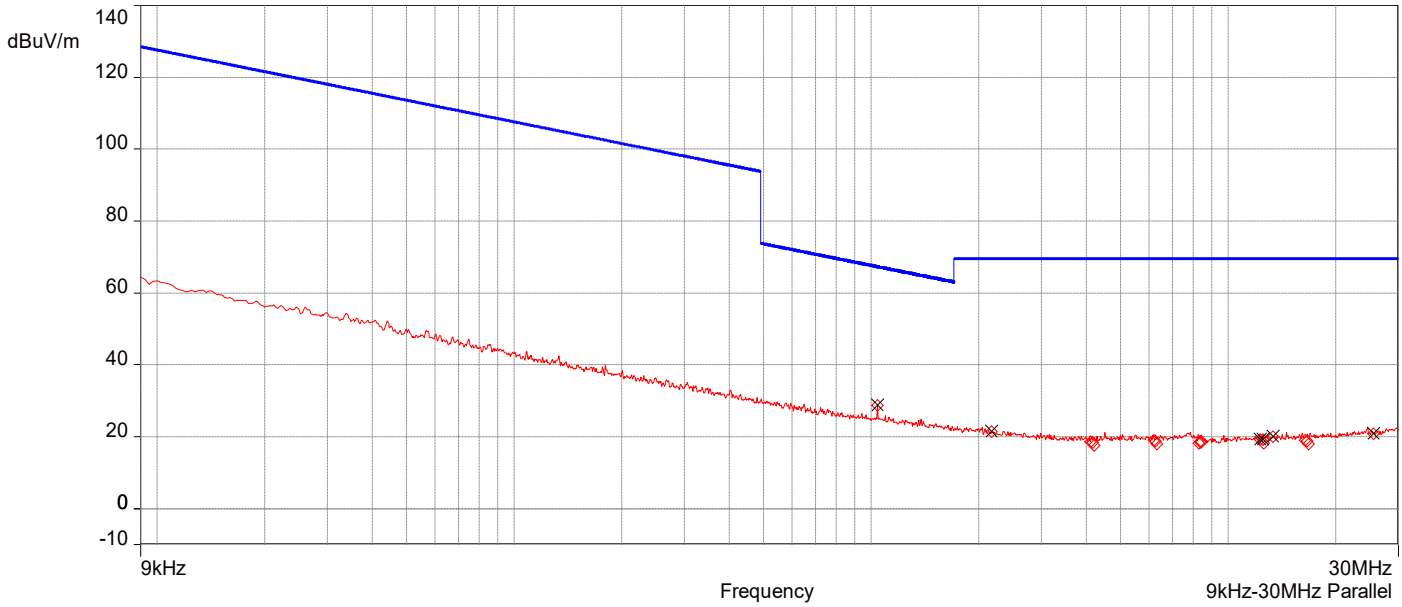
6/7/2021 1:32:24 PM

No	Frequency (MHz)	Level Q-Peak Reading (dBuV/m)	Correction Factor (dB)	Limit dBuV/m	Margin (dB)	Height (m)	Angle (°)	Polarization	Judgement
1	1.04375MHz	28.73	19.19	67.23	-38.50	1.00	59.90	H/V	Passed
2	2.17575MHz	21.33	19.10	69.54	-48.21	1.00	329.90	H/V	Passed
3	12.29MHz	19.20	19.57	69.54	-50.34	1.00	89.90	H/V	Passed
4	12.52025MHz	19.24	19.57	69.54	-50.30	1.00	239.90	H/V	Passed
5	13.39025MHz	20.05	19.62	69.54	-49.49	1.00	149.90	H/V	Passed
6	25.56575MHz	20.81	20.69	69.54	-48.74	1.00	269.90	H/V	Passed

Remarks:

1. Emission Level (dBuV/m) = Level Q-Peak Reading - Correction Factor
2. Correction Factor (dB) = Antenna Factor + Cable Loss – Preamplifier Gain
3. Margin = Level Q-Peak Reading – Limit

Overall Graphs:



AH20090801-HAR-243#002_WL_DH1_Band 78_9kHz-30MHz_Perpendicular

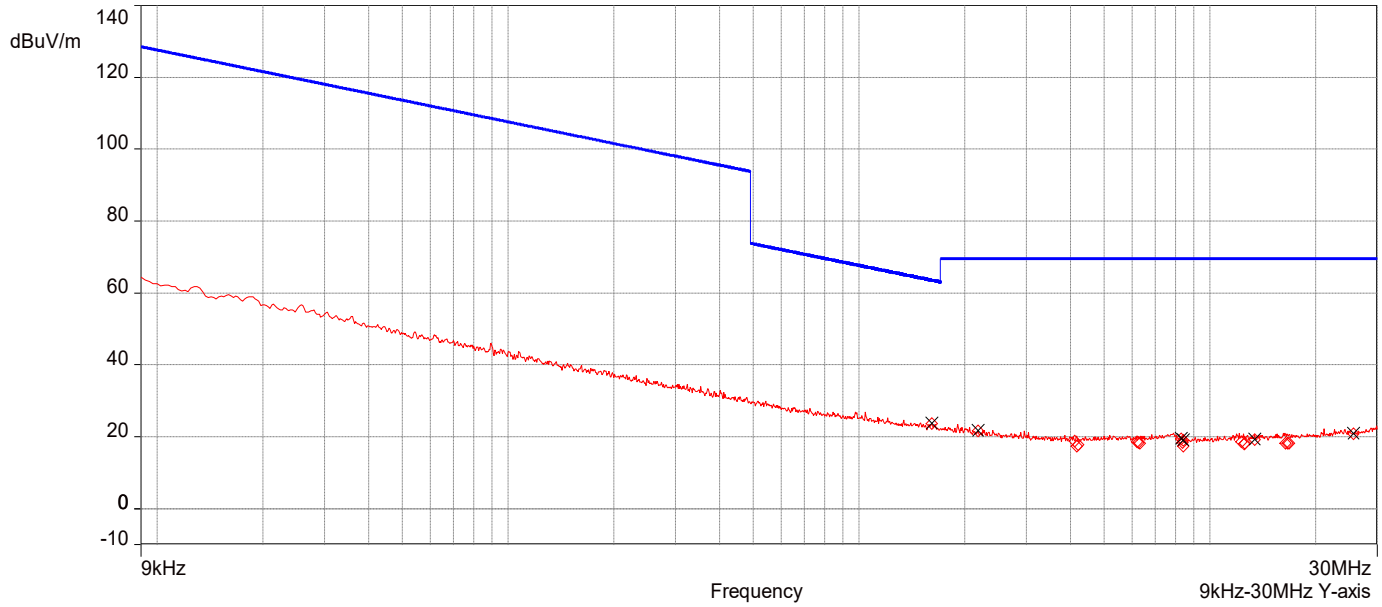
6/7/2021 1:40:34 PM

No	Frequency (MHz)	Level Q-Peak Reading (dBuV/m)	Correction Factor (dB)	Limit dBuV/m	Margin (dB)	Height (m)	Angle (°)	Polarization	Judgement
1	1.61425MHz	23.67	19.14	63.44	-39.77	1.00	240.10	H/V	Passed
2	2.18425MHz	21.54	19.10	69.54	-48.00	1.00	60.10	H/V	Passed
3	8.2925MHz	19.35	19.14	69.54	-50.19	1.00	270.10	H/V	Passed
4	8.3825MHz	18.95	19.14	69.54	-50.60	1.00	180.20	H/V	Passed
5	13.40825MHz	19.18	19.62	69.54	-50.36	1.00	240.10	H/V	Passed
6	25.669MHz	20.88	20.71	69.54	-48.66	1.00	210.10	H/V	Passed

Remarks:

1. Emission Level (dBuV/m) = Level Q-Peak Reading - Correction Factor
2. Correction Factor (dB) = Antenna Factor + Cable Loss – Preamplifier Gain
3. Margin = Level Q-Peak Reading – Limit

Overall Graphs:



AH20090801-HAR-243#002_WL_DH1_Band 78_30M-1GHz_2m Only

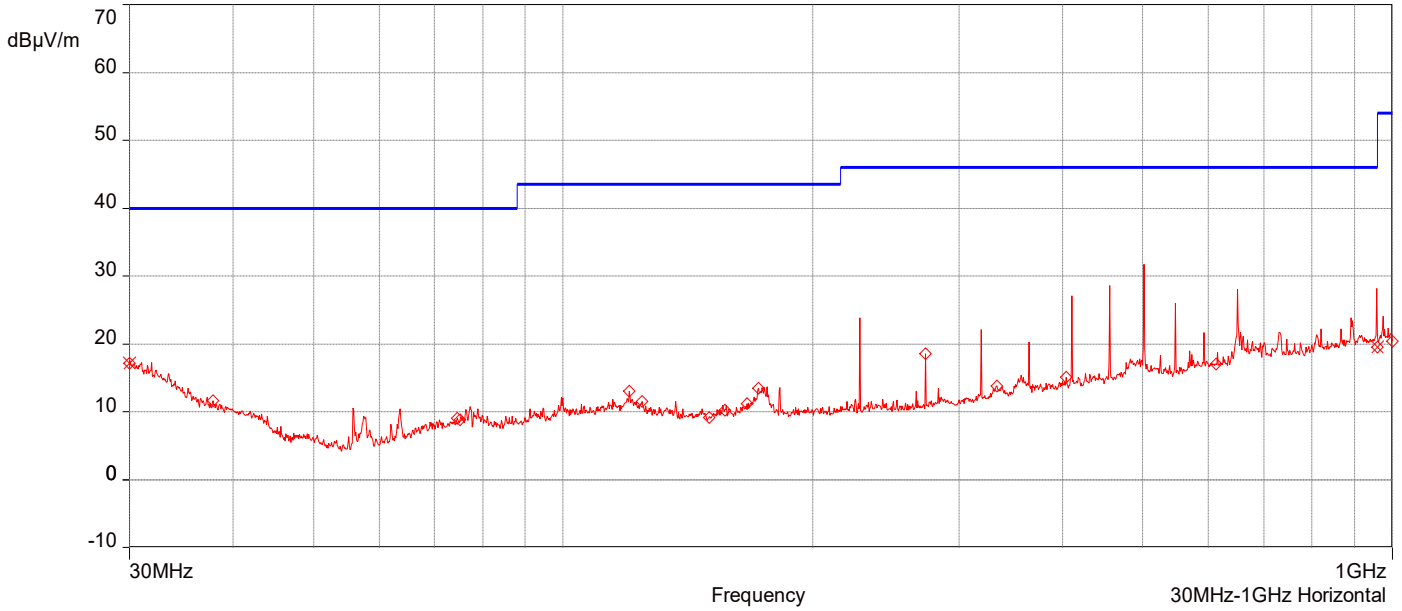
6/4/2021 2:07:23 PM

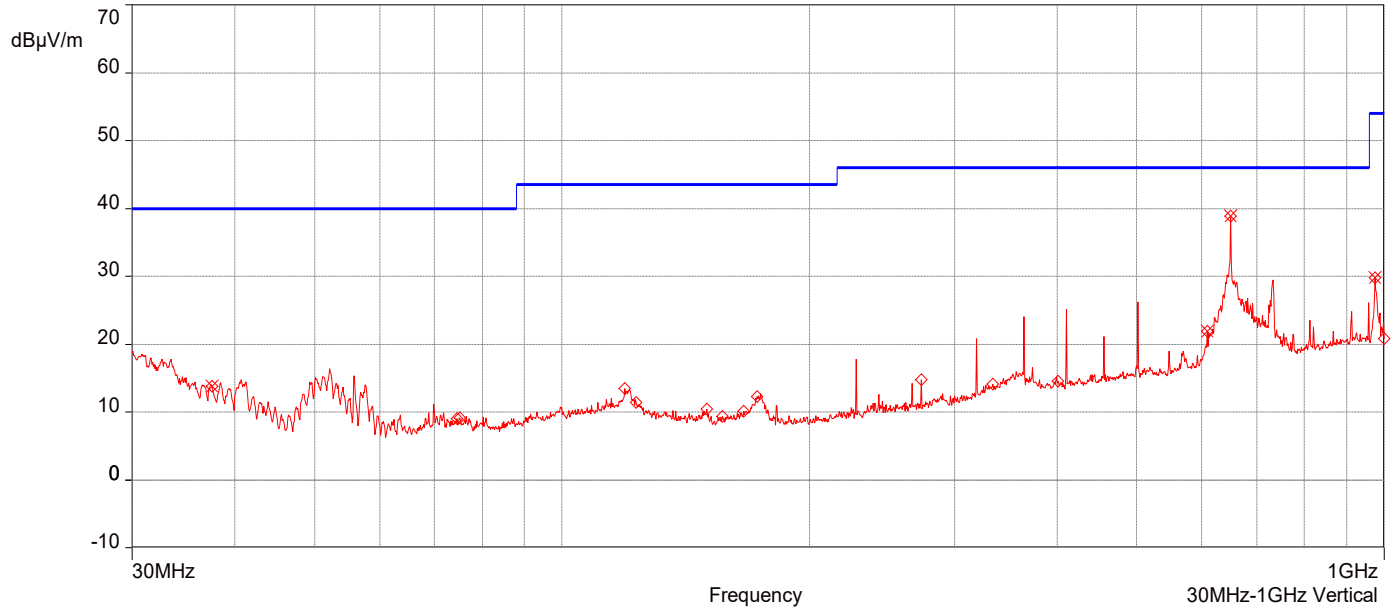
No	Frequency (MHz)	Level Q-Peak Reading (dBuV/m)	Correction Factor (dB)	Limit dBµV/m	Margin (dB)	Height (m)	Angle (°)	Polarization	Judgement
1	30MHz	17.14	-8.55	40.00	-12.36	2.00	59.90	Horizontal	Passed
2	960MHz	19.47	-4.98	46.00	-26.53	2.00	269.90	Horizontal	Passed
3	37.53MHz	13.82	-11.85	40.00	-26.18	2.00	179.90	Vertical	Passed
4	608.88MHz	21.86	-9.38	46.00	-24.14	2.00	179.90	Vertical	Passed
5	649.98MHz	38.85	-8.36	46.00	-7.15	2.00	179.90	Vertical	Passed
6	975MHz	29.79	-4.80	54.00	-24.21	2.00	329.90	Vertical	Passed

Remarks:

1. Emission Level (dBuV/m) = Level Q-Peak Reading - Correction Factor
2. Correction Factor (dB) = Antenna Factor + Cable Loss – Preamplifier Gain
3. Margin = Level Q-Peak Reading – Limit

Overall Graphs:





AH20090801-HAR-243#004_WS_DH1_Band 0_30M-1GHz

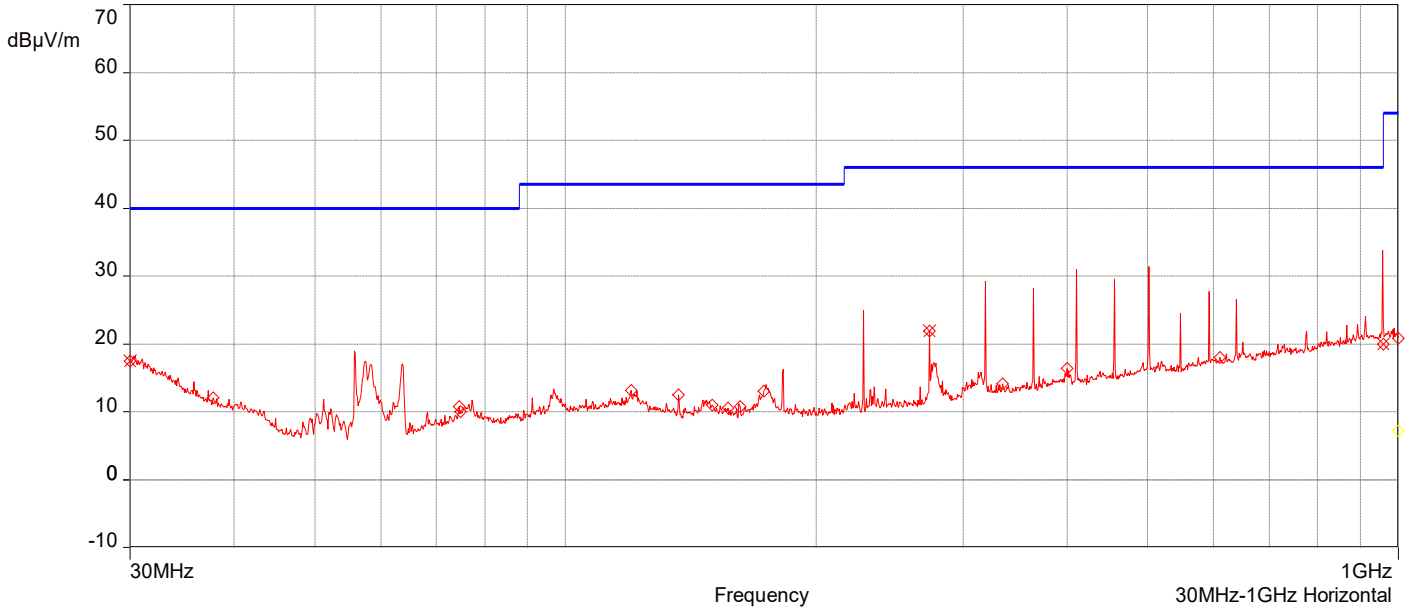
6/4/2021 12:10:58 PM

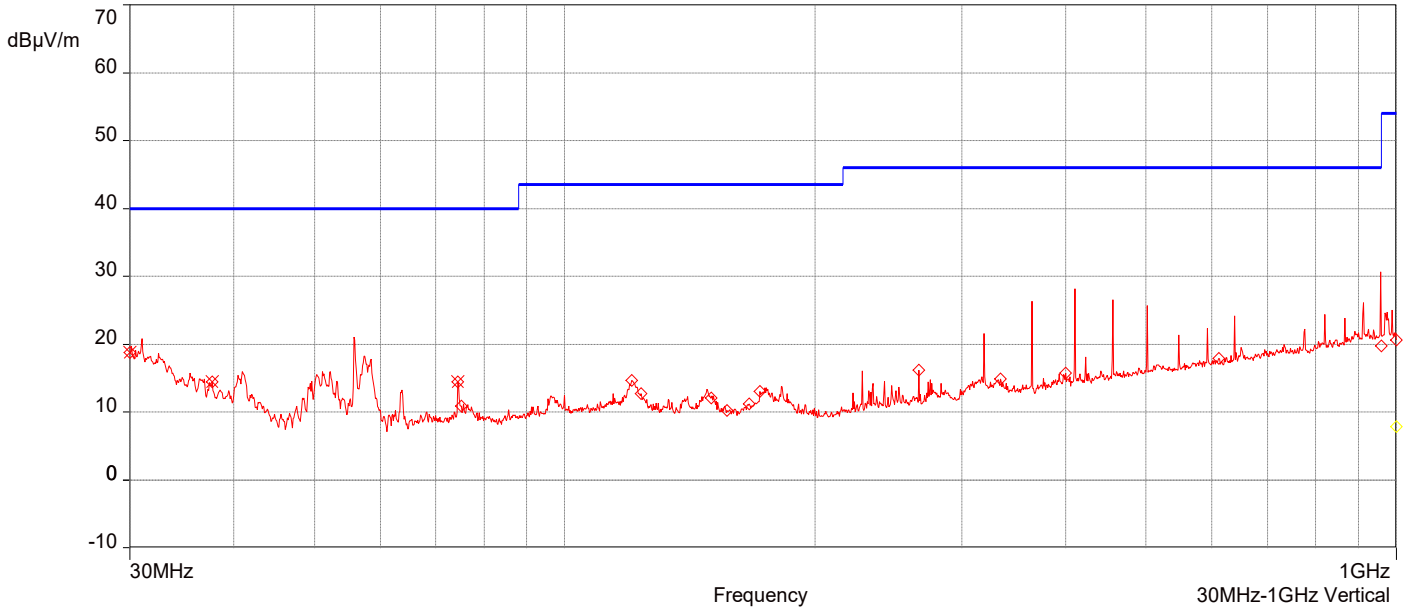
No	Frequency (MHz)	Level Q-Peak Reading (dBuV/m)	Correction Factor (dB)	Limit dBµV/m	Margin (dB)	Height (m)	Angle (°)	Polarization	Judgement
1	30MHz	17.47	-8.55	40.00	-12.03	1.50	60.20	Horizontal	Passed
2	273.6MHz	21.90	-16.24	46.00	-24.10	1.00	29.90	Horizontal	Passed
3	960MHz	19.91	-4.98	46.00	-26.09	2.00	299.90	Horizontal	Passed
4	30MHz	18.75	-8.55	40.00	-10.75	1.00	59.90	Vertical	Passed
5	37.68MHz	14.47	-11.92	40.00	-25.53	1.00	119.90	Vertical	Passed
6	74.43MHz	14.41	-17.84	40.00	-25.59	1.00	29.90	Vertical	Passed

Remarks:

1. Emission Level (dBuV/m) = Level Q-Peak Reading - Correction Factor
2. Correction Factor (dB) = Antenna Factor + Cable Loss – Preamplifier Gain
3. Margin = Level Q-Peak Reading – Limit

Overall Graphs:





AH20090801-HAR-243#004_WS_DH1_Band 39_30M-1GHz

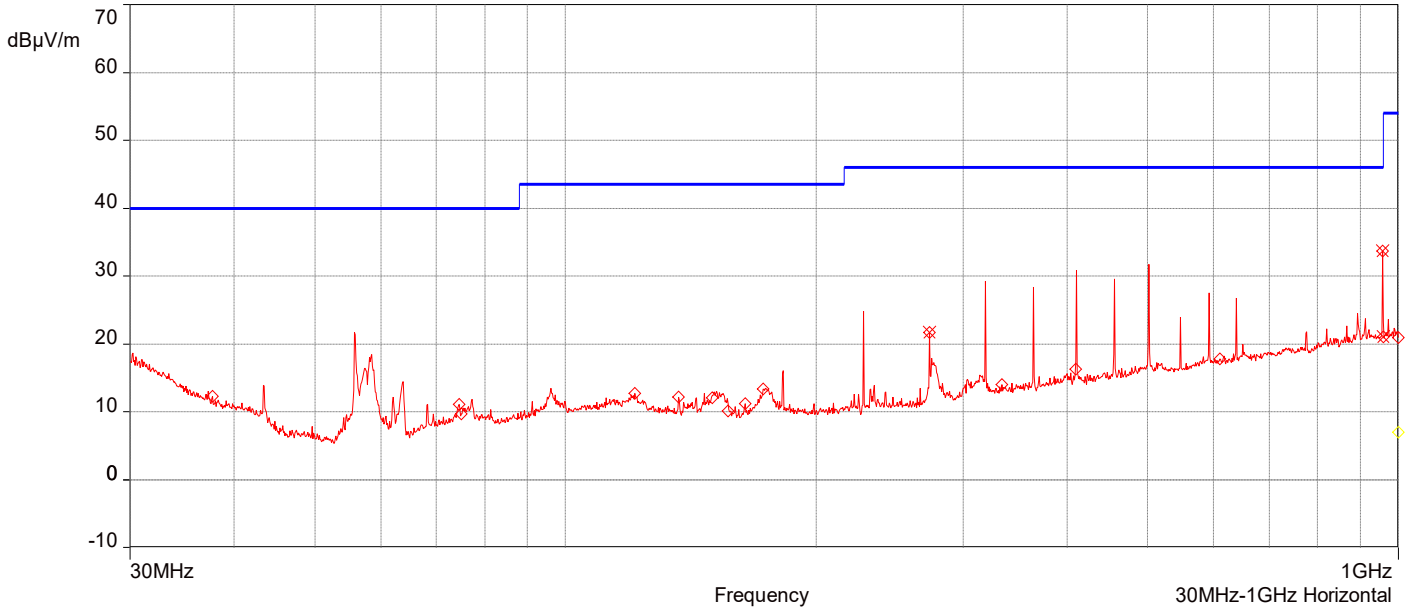
6/4/2021 10:47:28 AM

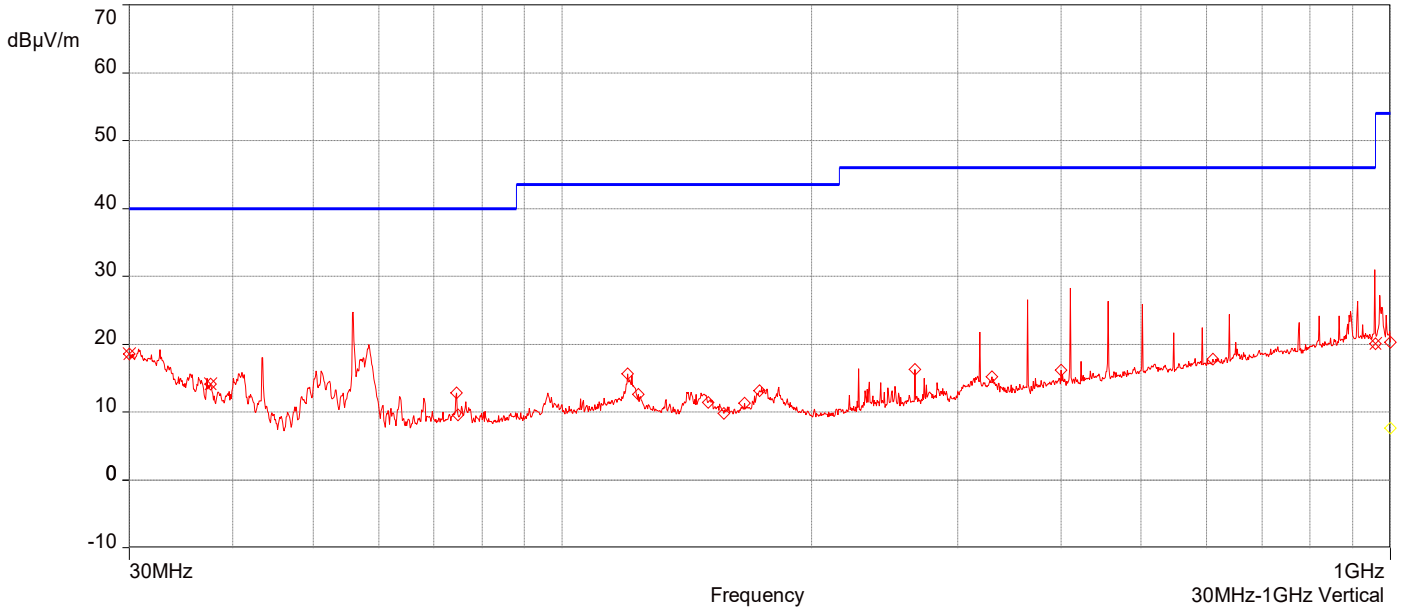
No	Frequency (MHz)	Level Q-Peak Reading (dBuV/m)	Correction Factor (dB)	Limit dBµV/m	Margin (dB)	Height (m)	Angle (°)	Polarization	Judgement
1	273.6MHz	21.66	-16.24	46.00	-24.34	1.00	29.90	Horizontal	Passed
2	957.6MHz	33.66	-5.03	46.00	-12.34	1.50	30.00	Horizontal	Passed
3	960MHz	21.06	-4.98	46.00	-24.94	2.00	329.90	Horizontal	Passed
4	30MHz	18.51	-8.55	40.00	-10.99	2.00	209.90	Vertical	Passed
5	37.59MHz	14.09	-11.88	40.00	-25.91	1.50	240.10	Vertical	Passed
6	960MHz	20.11	-4.98	46.00	-25.89	2.00	0.20	Vertical	Passed

Remarks:

1. Emission Level (dBuV/m) = Level Q-Peak Reading - Correction Factor
2. Correction Factor (dB) = Antenna Factor + Cable Loss – Preamplifier Gain
3. Margin = Level Q-Peak Reading – Limit

Overall Graphs:





AH20090801-HAR-243#004_WS_DH1_Band 78_30M-1GHz

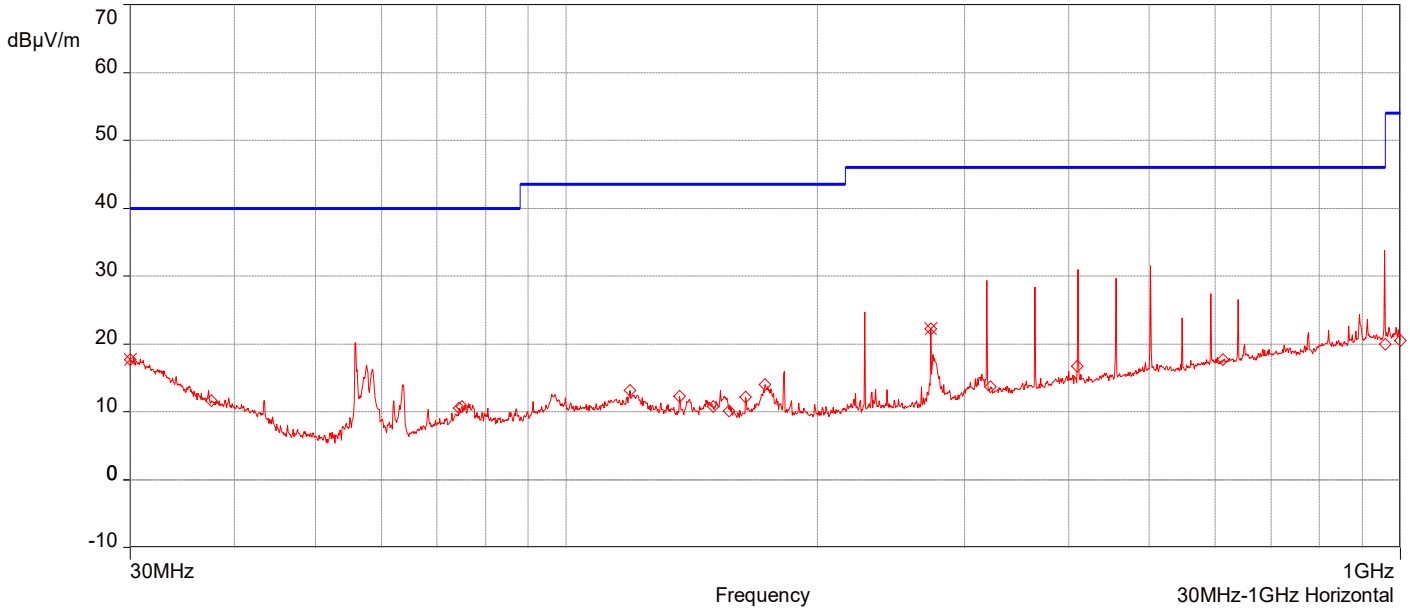
6/8/2021 8:08:08 AM

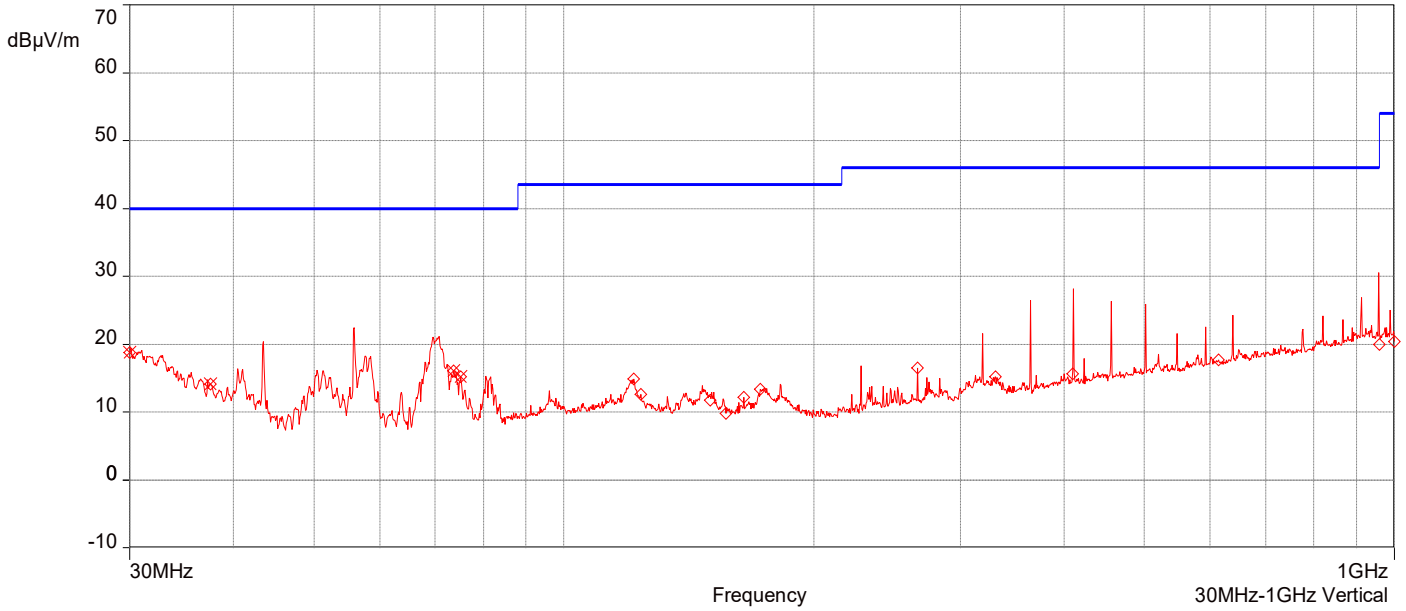
No	Frequency (MHz)	Level Q-Peak Reading (dBuV/m)	Correction Factor (dB)	Limit dBµV/m	Margin (dB)	Height (m)	Angle (°)	Polarization	Judgement
1	30MHz	17.71	-8.55	40.00	-11.79	2.00	269.90	Horizontal	Passed
2	273.6MHz	22.27	-16.24	46.00	-23.73	1.00	29.90	Horizontal	Passed
3	30MHz	18.76	-8.55	40.00	-10.74	2.00	179.90	Vertical	Passed
4	37.56MHz	14.09	-11.86	40.00	-25.91	1.00	149.90	Vertical	Passed
5	73.65MHz	16.04	-17.97	40.00	-23.96	2.00	29.90	Vertical	Passed
6	75.15MHz	15.23	-17.72	40.00	-24.77	2.00	29.90	Vertical	Passed

Remarks:

1. Emission Level (dBuV/m) = Level Q-Peak Reading - Correction Factor
2. Correction Factor (dB) = Antenna Factor + Cable Loss – Preamplifier Gain
3. Margin = Level Q-Peak Reading – Limit

Overall Graphs:





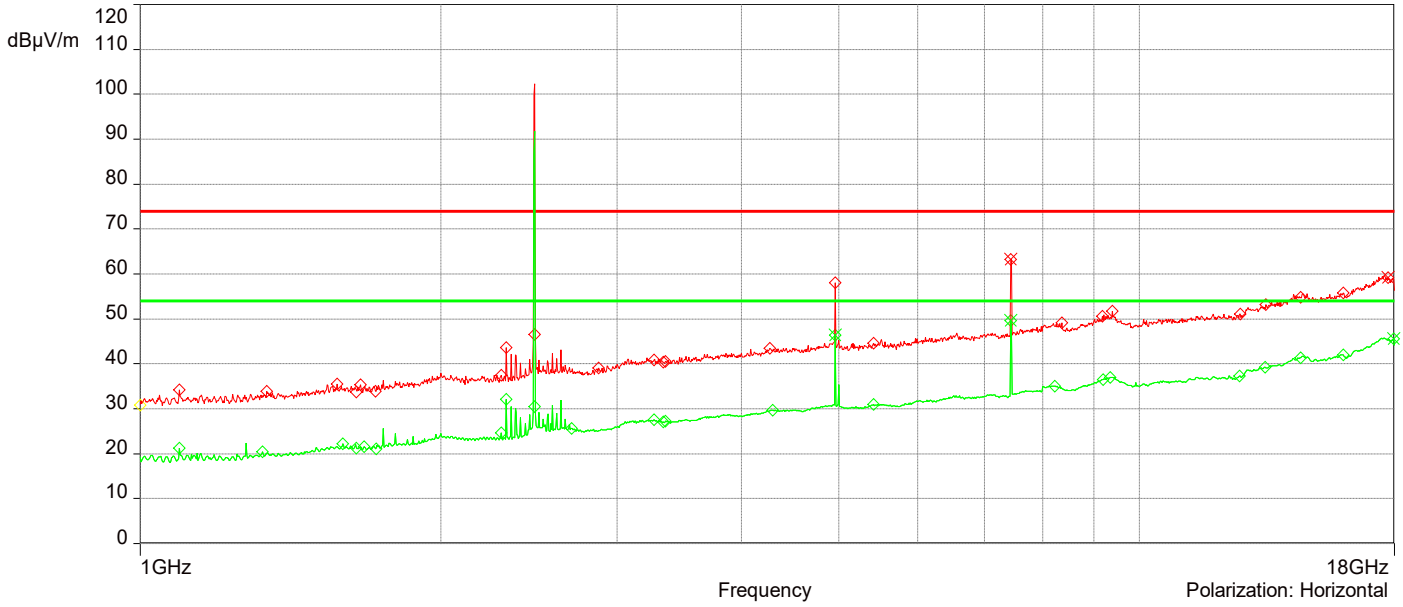
AH20090801-HAR-243#002_WL_DH1_Band 78_1-18GHz_2m Only

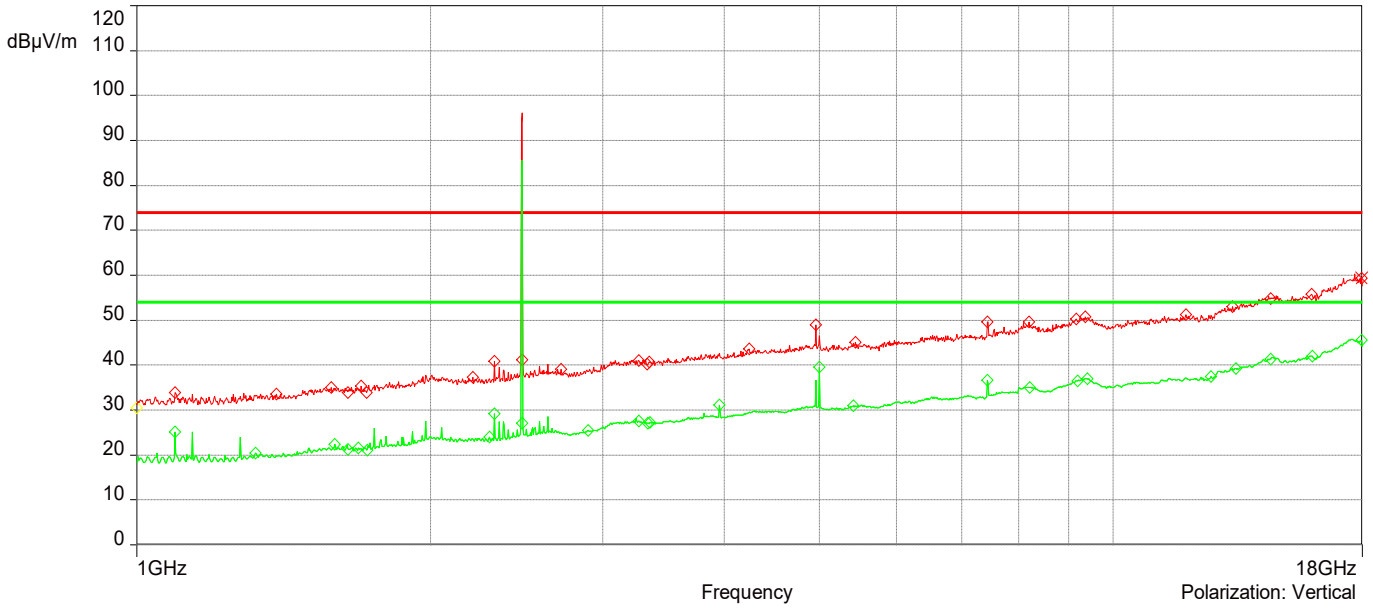
6/7/2021 2:15:53 PM

No	Frequency (MHz)	Level Peak Reading (dBuV/m)	Correction Factor (dB)	Limit dBµV/m	Margin (dB)	Height (m)	Angle (°)	Polarization	Judgement
1	17.97975GHz	59.38	19.85	74.00	-14.62	2.00	119.00	Vertical	Passed
2	7.4395GHz	63.29	7.40	74.00	-10.71	2.00	29.10	Horizontal	Passed
3	17.731GHz	59.24	19.60	74.00	-14.76	2.00	329.10	Horizontal	Passed

No	Frequency (MHz)	Level Average Reading (dBuV/m)	Correction Factor (dB)	Limit dBµV/m	Margin (dB)	Height (m)	Angle (°)	Polarization	Judgment
1	4.96GHz	46.36	4.84	54.00	-7.64	2.00	29.10	Horizontal	Passed
2	7.44GHz	49.70	7.40	54.00	-4.30	2.00	29.10	Horizontal	Passed
3	17.977GHz	45.65	19.84	54.00	-8.35	2.00	269.10	Horizontal	Passed

Overall Graphs:




dBµV/m
120
110
100
90
80
70
60
50
40
30
20
10
0
1GHz
Frequency
18GHz
Polarization: Vertical

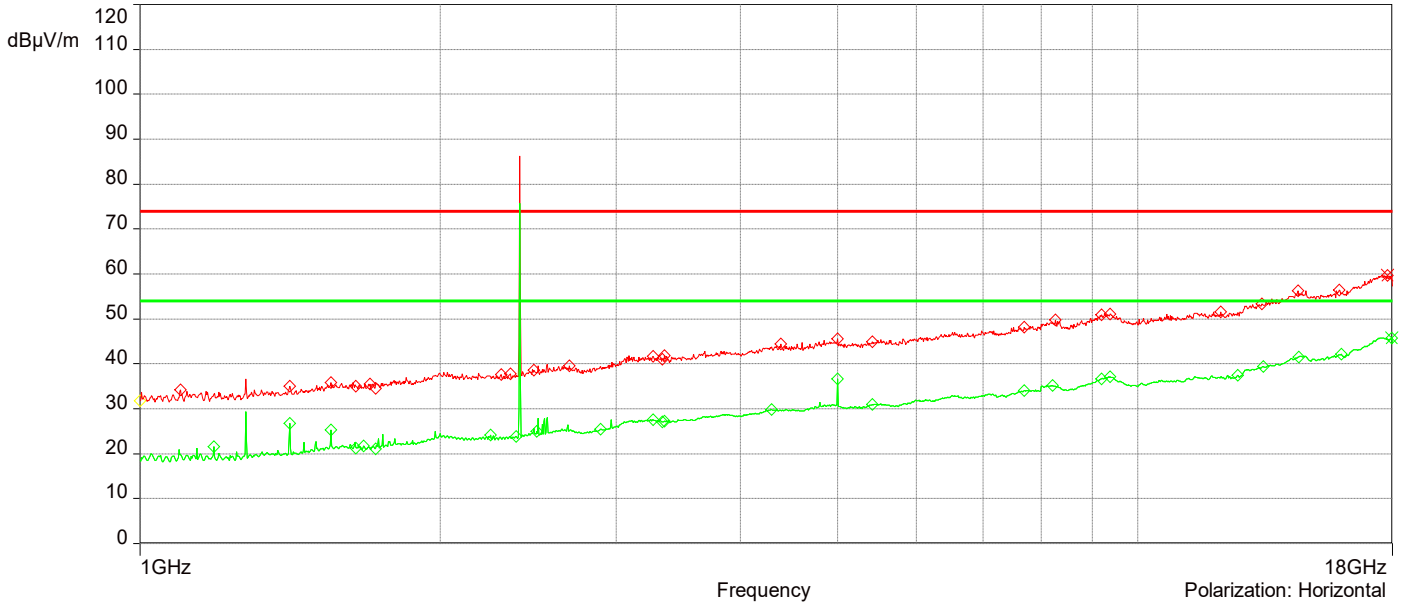
AH20090801-HAR-243#004_WS_DH1_Band 0_1-18GHz

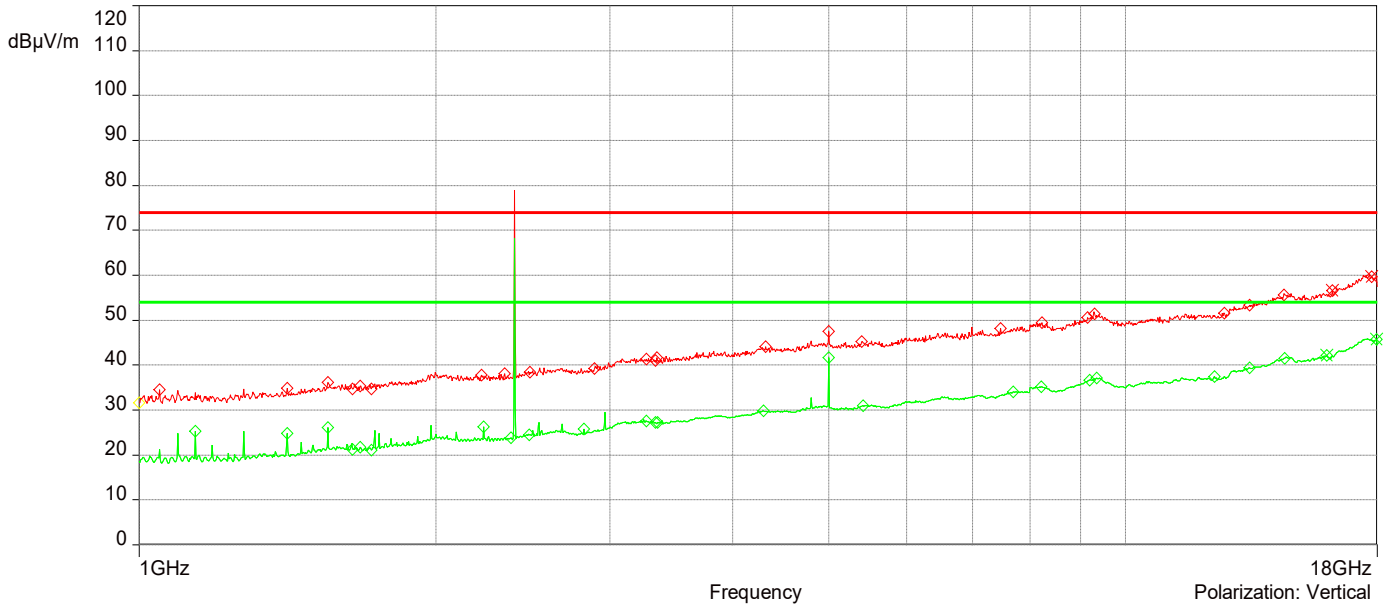
6/2/2021 4:04:08 PM

No	Frequency (MHz)	Level Peak Reading (dBuV/m)	Correction Factor (dB)	Limit dBµV/m	Margin (dB)	Height (m)	Angle (°)	Polarization	Judgement
1	16.19775GHz	56.56	16.21	74.00	-17.44	2.00	59.90	Vertical	Passed
2	17.7785GHz	59.69	19.59	74.00	-14.31	1.50	30.10	Vertical	Passed
3	17.798GHz	59.69	19.60	74.00	-14.31	2.00	149.90	Horizontal	Passed

No	Frequency (MHz)	Level Average Reading (dBuV/m)	Correction Factor (dB)	Limit dBµV/m	Margin (dB)	Height (m)	Angle (°)	Polarization	Judgment
1	15.998GHz	42.21	16.01	54.00	-11.79	1.00	0.10	Vertical	Passed
2	17.978GHz	45.74	19.84	54.00	-8.26	1.00	29.90	Vertical	Passed
3	17.97675GHz	45.73	19.84	54.00	-8.27	1.00	59.90	Horizontal	Passed

Overall Graphs:




dBµV/m
120
110
100
90
80
70
60
50
40
30
20
10
0
1GHz
Frequency
18GHz
Polarization: Vertical

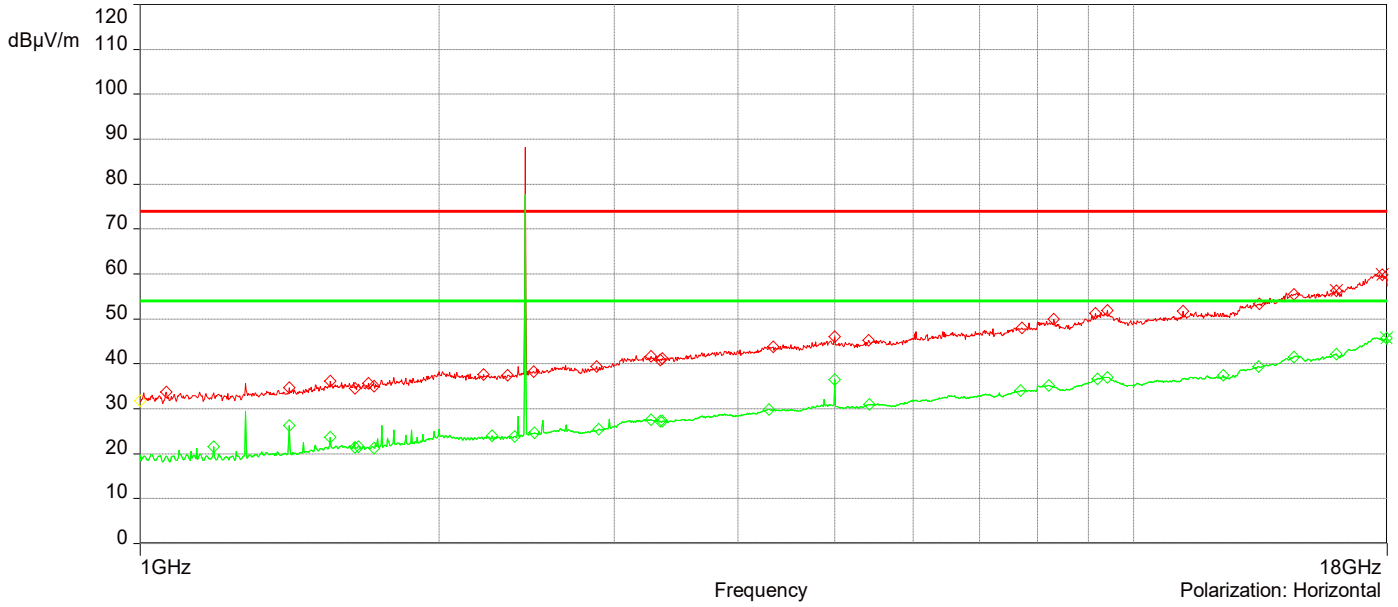
AH20090801-HAR-243#004_WS_DH1_Band 39_1-18GHz

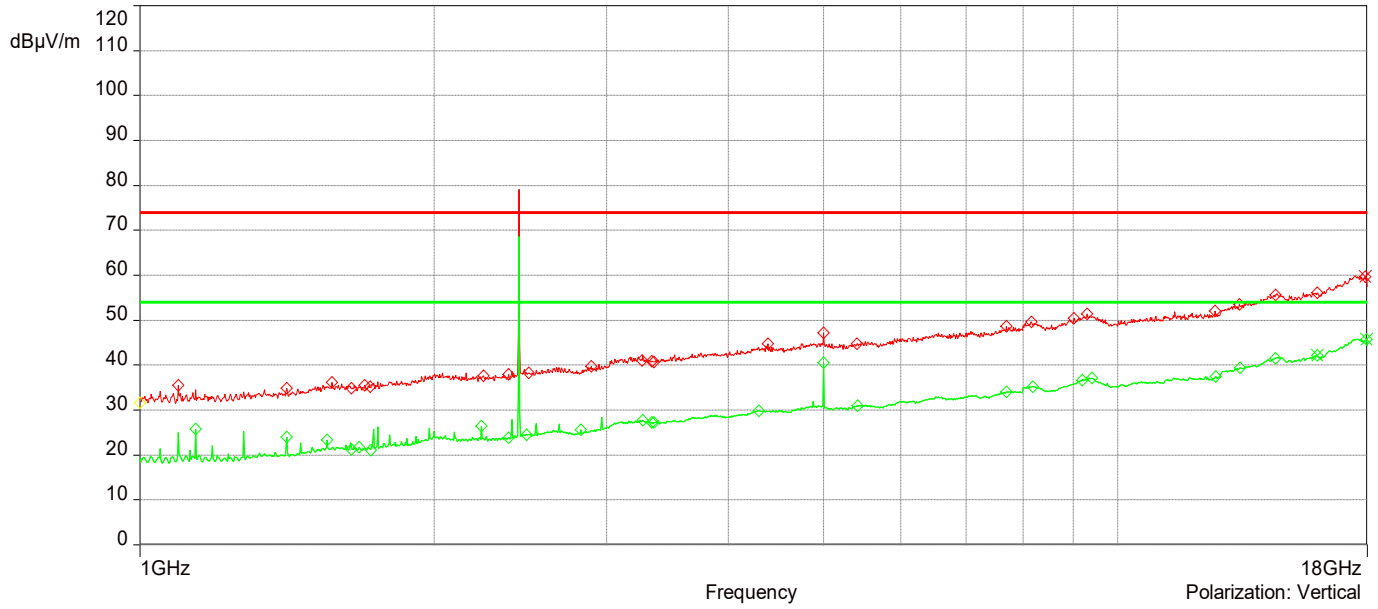
6/3/2021 8:25:56 AM

No	Frequency (MHz)	Level Peak Reading (dBuV/m)	Correction Factor (dB)	Limit dBµV/m	Margin (dB)	Height (m)	Angle (°)	Polarization	Judgement
1	17.91625GHz	59.65	19.71	74.00	-14.35	3.50	239.90	Vertical	Passed
2	15.99625GHz	56.31	16.00	74.00	-17.69	2.50	299.90	Horizontal	Passed
3	17.7895GHz	59.87	19.59	74.00	-14.13	1.00	90.00	Horizontal	Passed

No	Frequency (MHz)	Level Average Reading (dBuV/m)	Correction Factor (dB)	Limit dBµV/m	Margin (dB)	Height (m)	Angle (°)	Polarization	Judgment
1	15.998GHz	42.16	16.01	54.00	-11.84	3.50	239.90	Vertical	Passed
2	17.97575GHz	45.72	19.83	54.00	-8.28	2.00	30.20	Vertical	Passed
3	17.97575GHz	45.70	19.83	54.00	-8.30	2.00	180.10	Horizontal	Passed

Overall Graphs:




dBµV/m
120
110
100
90
80
70
60
50
40
30
20
10
0
1GHz
Frequency
18GHz
Polarization: Vertical

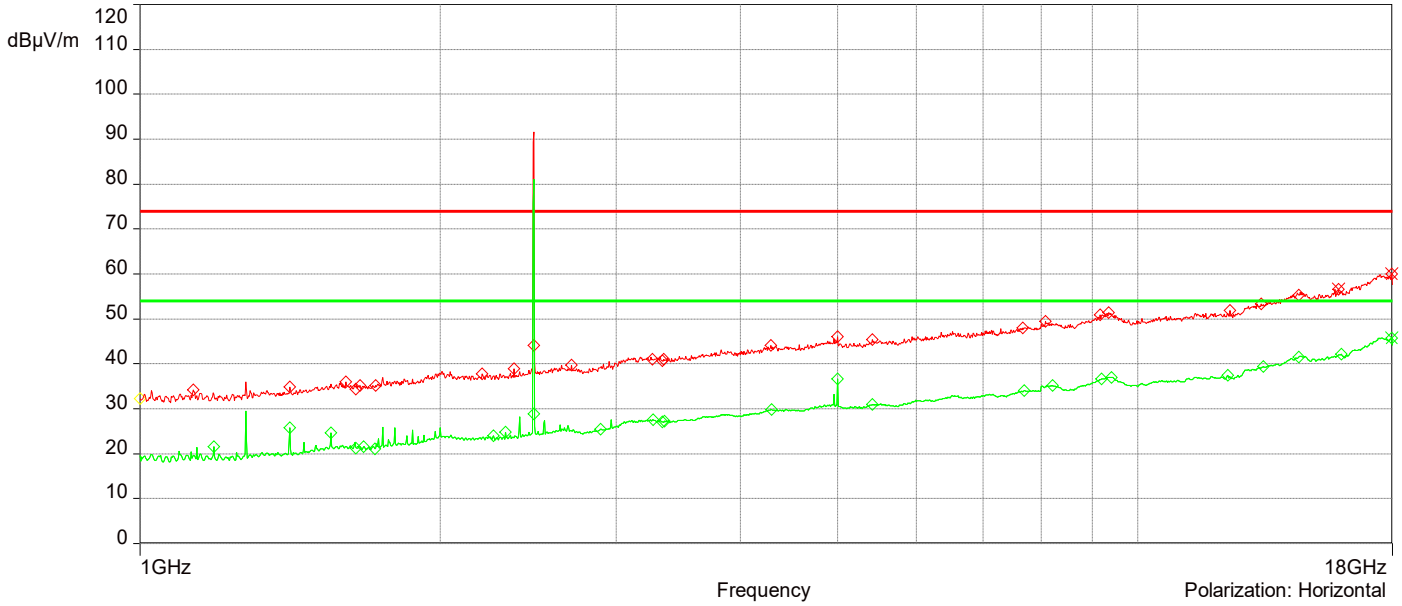
AH20090801-HAR-243#004_WS_DH1_Band 78_1-18GHz

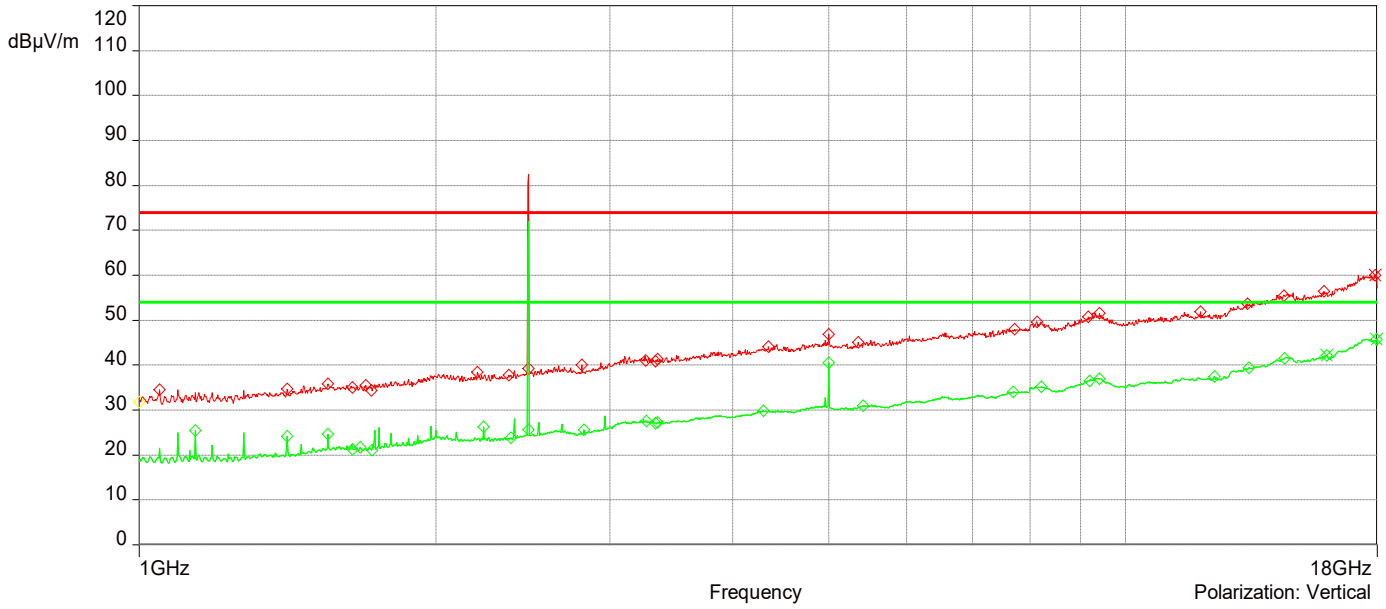
6/3/2021 9:46:16 AM

No	Frequency (MHz)	Level Peak Reading (dBuV/m)	Correction Factor (dB)	Limit dBµV/m	Margin (dB)	Height (m)	Angle (°)	Polarization	Judgement
1	17.91975GHz	59.99	19.72	74.00	-14.01	3.00	269.90	Vertical	Passed
2	15.8975GHz	56.56	15.88	74.00	-17.44	1.50	270.10	Horizontal	Passed
3	17.9575GHz	60.01	19.78	74.00	-13.99	2.00	239.90	Horizontal	Passed

No	Frequency (MHz)	Level Average Reading (dBuV/m)	Correction Factor (dB)	Limit dBµV/m	Margin (dB)	Height (m)	Angle (°)	Polarization	Judgment
1	15.99775GHz	42.15	16.00	54.00	-11.85	4.00	59.90	Vertical	Passed
2	17.977GHz	45.70	19.84	54.00	-8.30	3.00	209.90	Vertical	Passed
3	17.977GHz	45.71	19.84	54.00	-8.29	1.50	0.10	Horizontal	Passed

Overall Graphs:




dBµV/m
120
110
100
90
80
70
60
50
40
30
20
10
0
1GHz
18GHz
Frequency
Polarization: Vertical

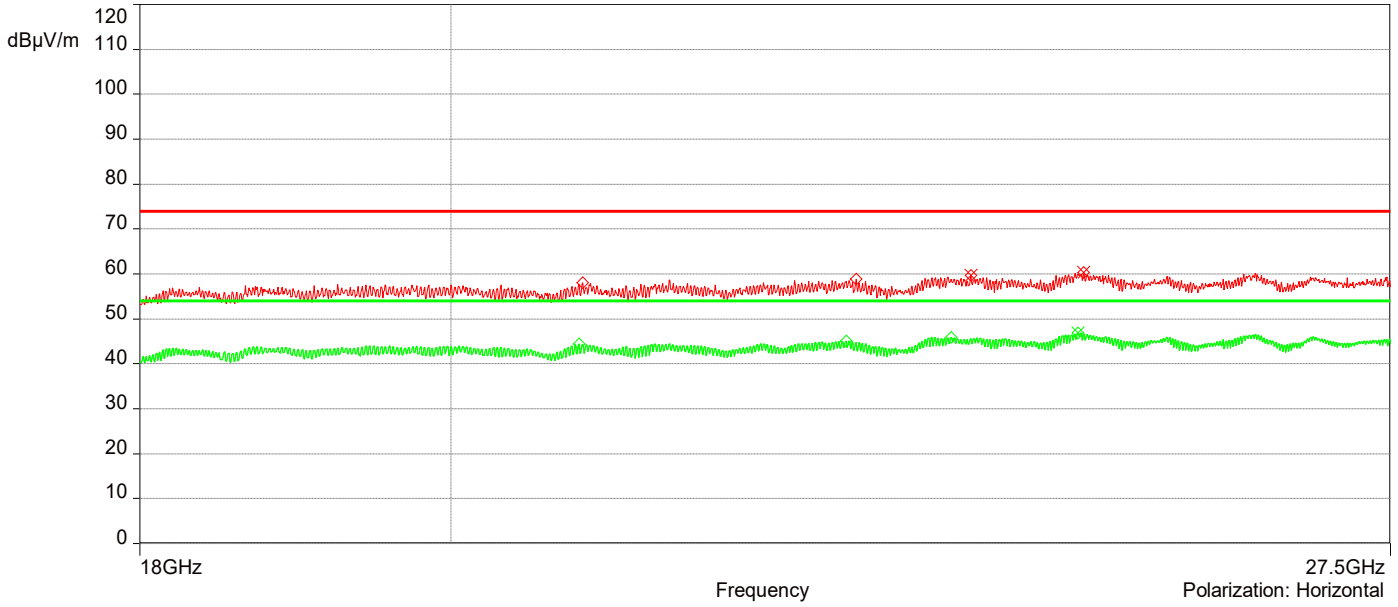
AH20090801-HAR-243#002_WL_DH1_Band 78_18-27.5GHz_2m Only

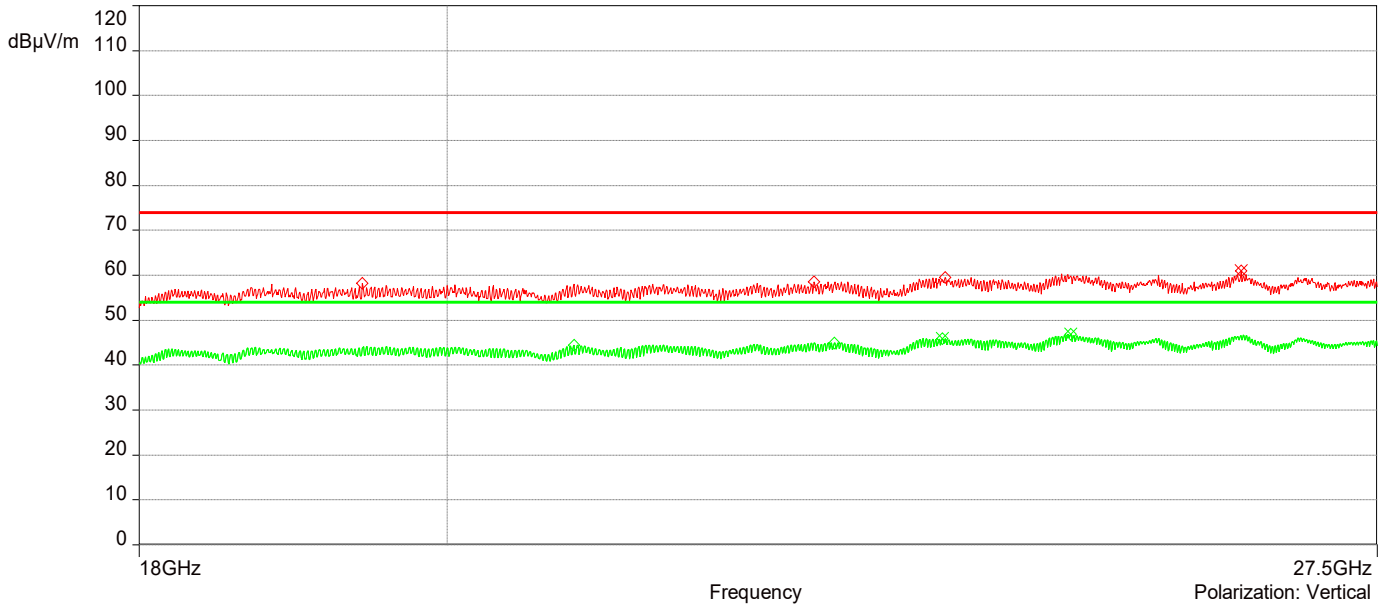
6/3/2021 12:36:52 PM

No	Frequency (MHz)	Level Peak Reading (dBuV/m)	Correction Factor (dB)	Limit dBµV /m	Margin (dB)	Height (m)	Angle (°)	Polarization	Judgement
1	26.2465GHz	61.03	3.61	74.00	-12.97	2.00	119.90	Vertical	Passed
2	23.854GHz	59.64	1.74	74.00	-14.36	2.00	29.90	Horizontal	Passed
3	24.78375GHz	60.26	2.87	74.00	-13.74	2.00	29.90	Horizontal	Passed

No	Frequency (MHz)	Level Average Reading (dBuV/m)	Correction Factor (dB)	Limit dBµV /m	Margin (dB)	Height (m)	Angle (°)	Polarization	Judgment
1	23.69625GHz	45.83	1.84	54.00	-8.17	2.00	0.10	Vertical	Passed
2	24.7615GHz	46.90	2.92	54.00	-7.10	2.00	0.10	Vertical	Passed
3	24.7365GHz	46.87	2.94	54.00	-7.13	2.00	29.90	Horizontal	Passed

Overall Graphs:




dBµV/m
120
110
100
90
80
70
60
50
40
30
20
10
0
18GHz
27.5GHz
Frequency
Polarization: Vertical

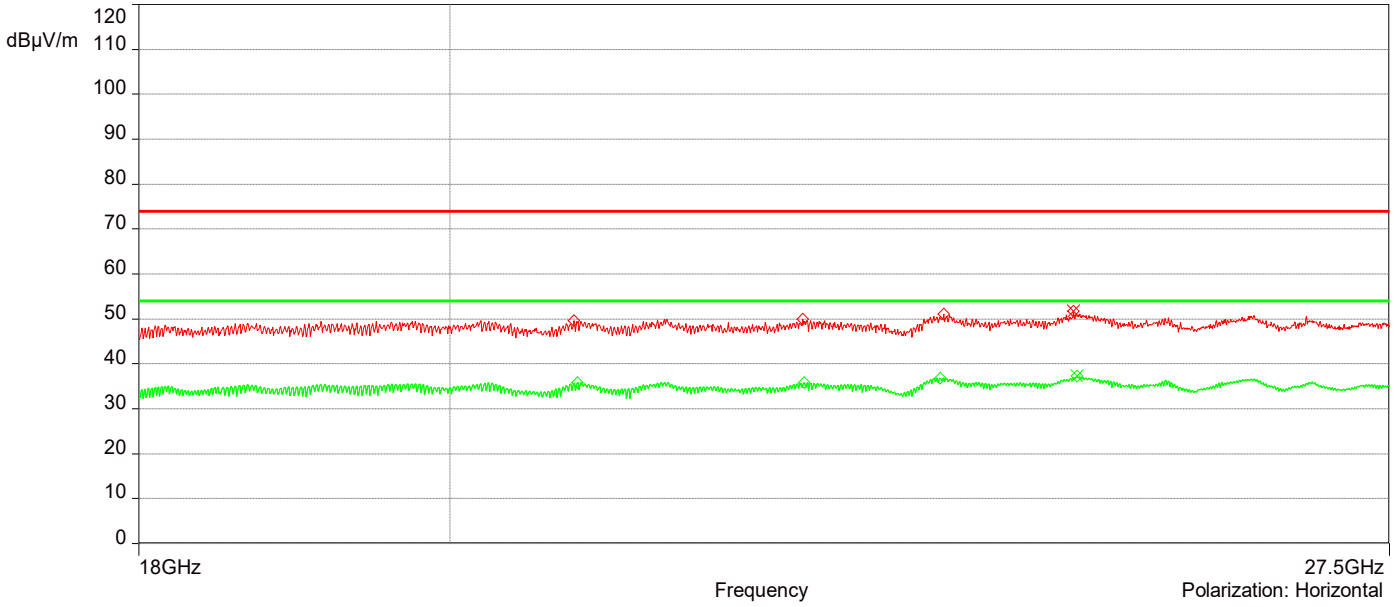
AH20090801-HAR-243#004_WS_DH1_Band 0_18-27.5GHz

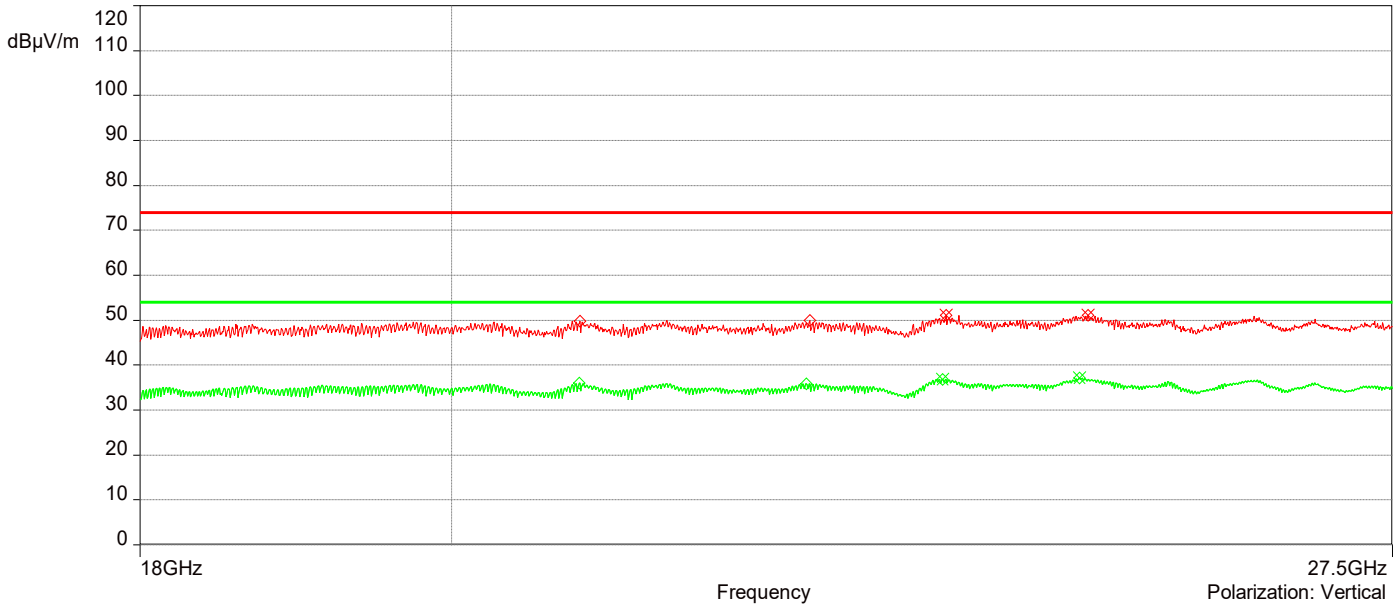
6/3/2021 1:00:04 PM

No	Frequency (MHz)	Level Peak Reading (dBuV/m)	Correction Factor (dB)	Limit dBµV/m	Margin (dB)	Height (m)	Angle (°)	Polarization	Judgement
1	23.64375GHz	51.06	1.96	74.00	-22.94	1.00	299.10	Vertical	Passed
2	24.8095GHz	51.14	2.78	74.00	-22.86	1.00	209.10	Vertical	Passed
3	24.70525GHz	51.68	2.83	74.00	-22.32	1.00	119.00	Horizontal	Passed

No	Frequency (MHz)	Level Average Reading (dBuV/m)	Correction Factor (dB)	Limit dBµV/m	Margin (dB)	Height (m)	Angle (°)	Polarization	Judgment
1	23.61675GHz	36.89	2.02	54.00	-17.11	1.00	358.90	Vertical	Passed
2	24.73575GHz	37.17	2.92	54.00	-16.83	1.00	329.10	Vertical	Passed
3	24.735GHz	37.25	2.94	54.00	-16.75	1.00	358.90	Horizontal	Passed

Overall Graphs:




dBµV/m
120
110
100
90
80
70
60
50
40
30
20
10
0
18GHz
27.5GHz
Frequency
Polarization: Vertical

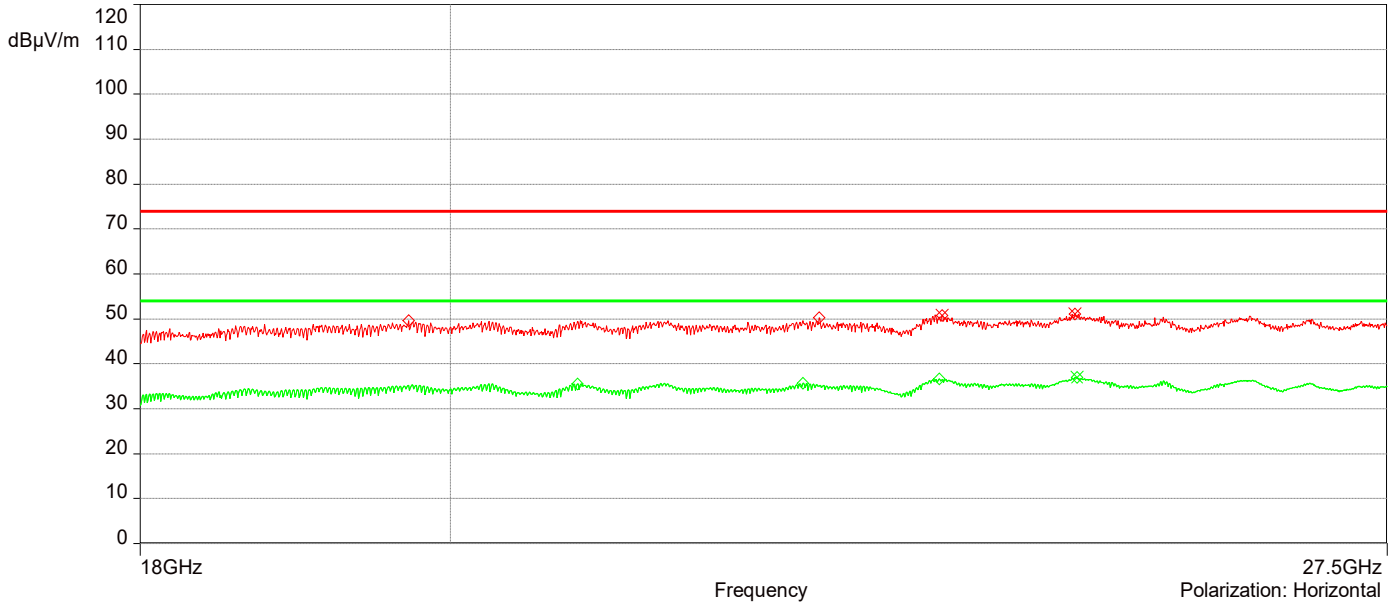
AH20090801-HAR-243#004_WS_DH1_Band 39_18-27.5GHz

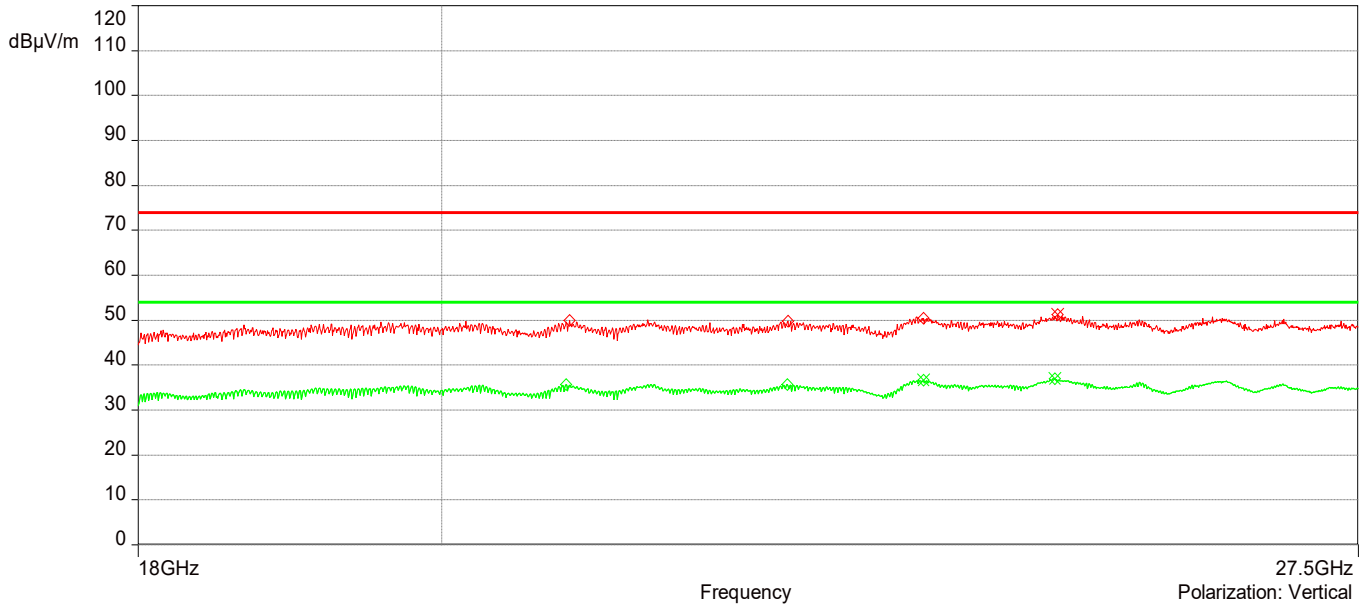
6/7/2021 2:28:00 PM

No	Frequency (MHz)	Level Peak Reading (dBuV/m)	Correction Factor (dB)	Limit dBµV/m	Margin (dB)	Height (m)	Angle (°)	Polarization	Judgement
1	24.7745GHz	51.33	2.88	74.00	-22.67	3.50	299.10	Vertical	Passed
2	23.64025GHz	50.83	1.96	74.00	-23.17	2.50	149.10	Horizontal	Passed
3	24.73025GHz	51.11	2.92	74.00	-22.89	1.50	239.10	Horizontal	Passed

No	Frequency (MHz)	Level Average Reading (dBuV/m)	Correction Factor (dB)	Limit dBµV/m	Margin (dB)	Height (m)	Angle (°)	Polarization	Judgment
1	23.6435GHz	36.59	1.96	54.00	-17.41	1.50	149.20	Vertical	Passed
2	24.74775GHz	36.94	2.96	54.00	-17.06	1.50	149.20	Vertical	Passed
3	24.74775GHz	36.96	2.98	54.00	-17.04	1.50	269.10	Horizontal	Passed

Overall Graphs:




dBµV/m
120
110
100
90
80
70
60
50
40
30
20
10
0
18GHz
Frequency
27.5GHz
Polarization: Vertical

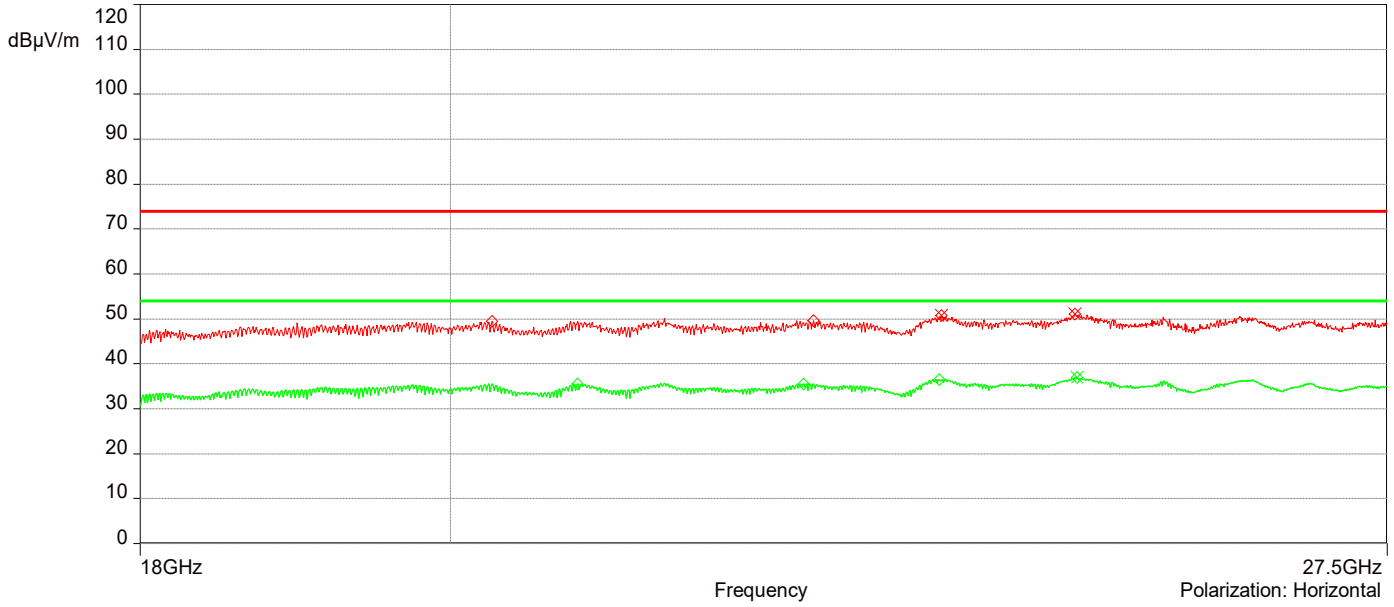
AH20090801-HAR-243#004_WS_DH1_Band 78_18-27.5GHz

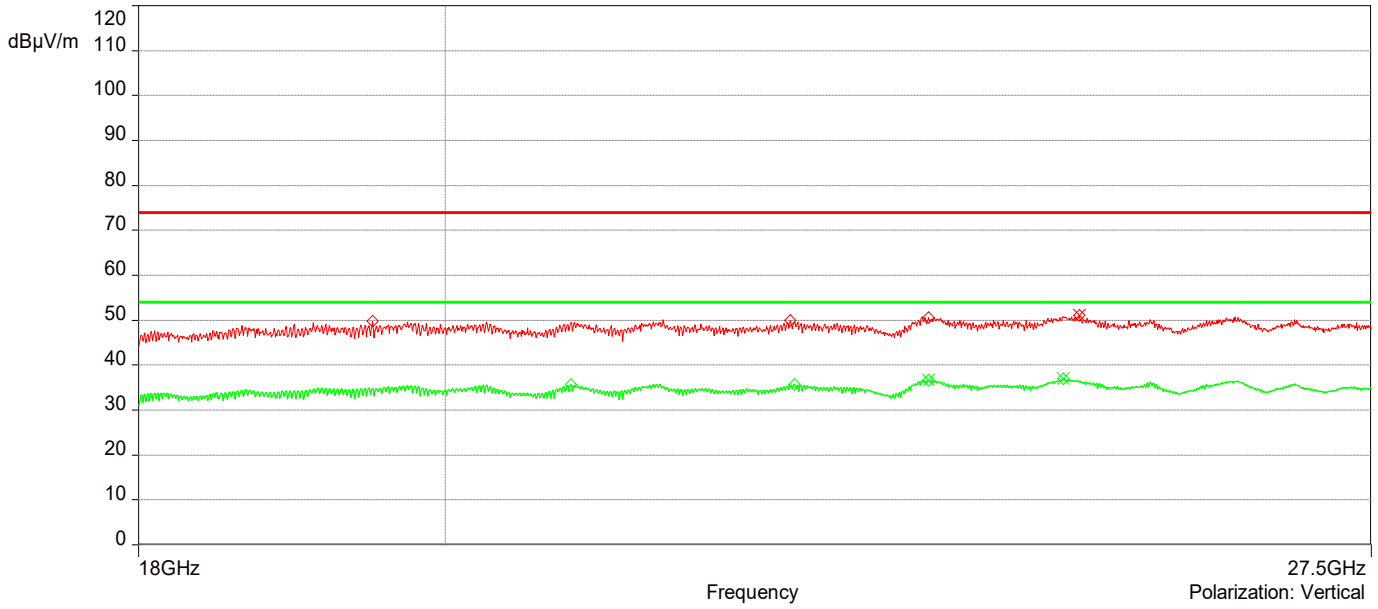
6/3/2021 3:26:28 PM

No	Frequency (MHz)	Level Peak Reading (dBuV/m)	Correction Factor (dB)	Limit dBµV/m	Margin (dB)	Height (m)	Angle (°)	Polarization	Judgement
1	24.8755GHz	51.17	2.78	74.00	-22.83	4.00	239.10	Vertical	Passed
2	23.63275GHz	50.75	1.97	74.00	-23.25	1.01	149.10	Horizontal	Passed
3	24.73225GHz	51.04	2.93	74.00	-22.96	3.50	299.90	Horizontal	Passed

No	Frequency (MHz)	Level Average Reading (dBuV/m)	Correction Factor (dB)	Limit dBµV/m	Margin (dB)	Height (m)	Angle (°)	Polarization	Judgment
1	23.61475GHz	36.59	2.03	54.00	-17.41	2.50	329.90	Vertical	Passed
2	24.73475GHz	36.93	2.92	54.00	-17.07	1.50	149.90	Vertical	Passed
3	24.74775GHz	36.97	2.98	54.00	-17.03	3.50	269.90	Horizontal	Passed

Overall Graphs:




dBµV/m
120
110
100
90
80
70
60
50
40
30
20
10
0
18GHz
Frequency
27.5GHz
Polarization: Vertical

Document Revisions

Version	Date	Modifier	Changes
1.0	05/14/2021	Aravind Buddana	• Initial Release
1.1	05/17/2021	Aravind Buddana	• Updated Product Name
2.0	06/08/2021	Aravind Buddana	• Updated WS Peak Power, Band Edge tests • Updated Time of channel occupancy tests • Updated Radiated low, mid , high channel tests
2.1	6/16/2021	Ryan Phillips	• Modified equation in remarks for test plots
2.2	6/16/2021	Ryan Phillips	• Added below 30MHz Plots • Added additional notes for customer provided software.
2.3	6/17/2021	Ryan Phillip	• Modified Equation and Limits for tabular data

End of Report