TEST REPORT

Report No.: SHATBL2410021W01

Applicant	:	Rapsodo Pte. Ltd.
Product Name	:	MLM2PRO™
Brand Name	:	Rapsodo
Model Name	:	MLM2.0P
FCC ID	:	2AH3O-MLM2PRO
Test Standard	:	47 CFR 15.247
Date of Test	:	2024.10.10~2024.10.31

Report Prepared by : Chris Xu

(Chris Xu)

Report Approved by : Guozheng Li

(Guozheng Li)

Authorized Signatory : Terry Yang

(Terry Yang)

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REVISION HISTORY

Rev.	Issue Date	Revisions	Revised by
A0	2024.11.01	Initial Release	Terry Yang

DECLARATION OF REPORT

1. The device has been tested by ATBL, and the test results show that the equipment under test (EUT) is in compliance with the requirements of 47 CFR 15.247. And it is applicable only to the tested sample identified in the report.

2. This report shall not be reproduced except in full, without the written approval of ATBL, this document only be altered or revised by ATBL, personal only, and shall be noted in the revision of the document.

3. The general information of EUT in this report is provided by the customer or manufacture, ATBL is only responsible for the test data but not for the information provided by the customer or manufacture.

4. The results in this report is only apply to the sample as tested under conditions. The customer or manufacturer is responsible for ensuring that the additional production units of this model have the same electrical and mechanical components.

5. In this report, '☐' indicates that EUT does not support content after '☐', and '☑' indicates that it supports content after '☑'

SUMMARY OF TEST RESULT

Report Section	Standard Section	Test Item	Judgment	Remark
3.1	47 CFR 15.247(b)(1)	Maximum Peak Conducted Output Power	PASS	--
3.2	47 CFR 15.247(a)(1)(iii)	Number of Hopping Frequencies	PASS	--
3.3	47 CFR 15.247(a)(1)(iii)	Duty Cycle and Dwell Time	PASS	--
3.4	47 CFR 15.247(a)(1)	20dB Bandwidth	Report only	--
3.5	47 CFR 15.247(a)(1)	Carrier Frequency Separation	PASS	--
3.6	47 CFR 15.247(d)	Conducted Band Edge	PASS	--
3.7	47 CFR 15.247(d)	Conducted Spurious Emission	PASS	--
3.8	47 CFR 15.247(d)/15.209(a)/15.205(a)	Radiated Spurious Emission and Restricted Band	PASS	--
3.9	47 CFR 15.207(a)	AC Power-Line Conducted Emission	PASS	--
3.10	47 CFR 15.203	Antenna Requirements	PASS	--

1. GENERAL DESCRIPTION

1.1. Applicant

Name : Rapsodo Pte. Ltd.

Address : 20 Ayer Rajah Crescent #08-05 Singapore 139964

1.2. Manufacturer

Name : Rapsodo Pte. Ltd.

Address : 20 Ayer Rajah Crescent #08-05 Singapore 139964

1.3. Factory

Name : Rapsodo Pte. Ltd.

Address : 20 Ayer Rajah Crescent #08-05 Singapore 139964

1.4. General Information of EUT

General Information	
Equipment Name	MLM2PRO™
Brand Name	Rapsodo
Model Name	MLM2.0P
Series Model	N/A
Model Difference	N/A
Antenna Type	FPC
Antenna 0 Gain	5dBi
Sample No:	202409090006001
Battery	Rated Voltage：7.4V Charge Limit Voltage：8.4V Capacity：24.42Wh
Hardware version	G 1.11
Software version	3.0.0
Connecting I/O Port(s)	Refer to the remark below.

Remark：

The above information of EUT was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.

1.5. Equipment Specification

Equipment Specification		
Frequency Range	2400MHz - 2483.5MHz	
Number of Channels	79	
Carrier Frequency of Each Channel	2402 + n*1 MHz; n = 0 ~ 78	
Maximum Output Power To Antenna	☑Bluetooth BR(1Mbps):	7.344dBm (0.005425W)
	☑Bluetooth EDR(2Mbps):	10.589dBm (0.011452W)
	☑Bluetooth EDR(3Mbps):	10.561dBm (0.011378W)
Type of Modulation	☑Bluetooth BR(1Mbps):	GFSK
	☑Bluetooth EDR(2Mbps):	π/4-DQPSK
	☑Bluetooth EDR(3Mbps):	8-DPSK

1.6. Modification of EUT

No modifications are made to the EUT during all test items.

1.7. Laboratory Information

Company Name	:	Shanghai ATBL Technology Co., Ltd.
Address	:	Building 8,No.160 Basheng Road, Waigaoqiao Free Trade Zone, Pudong New Area, Shanghai
Telephone	:	+86(0)21-51298625

1.8. Applicable Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

47 CFR Part 15 Subpart C §15.247

FCC KDB 558074 D01 15.247 Meas Guidance v05r02

ANSI C63.10-2013

Remark:

All test items were verified and recorded according to the standards and without any deviation during the test.

2. TEST CONFIGURATION OF EUT

2.1. Carrier Frequency Channel

Frequency Band	Channel	Frequency MHz	Channel	Frequency MHz	Channel	Frequency MHz
2400 - 2483.5 MHz	**00**	**2402**	27	2429	54	2456
	01	2403	28	2430	55	2457
	02	2404	29	2431	56	2458
	03	2405	30	2432	57	2459
	04	2406	31	2433	58	2460
	05	2407	32	2434	59	2461
	06	2408	33	2435	60	2462
	07	2409	34	2436	61	2463
	08	2410	35	2437	62	2464
	09	2411	36	2438	63	2465
	10	2412	37	2439	64	2466
	11	2413	38	2440	65	2467
	12	2414	**39**	**2441**	66	2468
	13	2415	40	2442	67	2469
	14	2416	41	2443	68	2470
	15	2417	42	2444	69	2471
	16	2418	43	2445	70	2472
	17	2419	44	2446	71	2473
	18	2420	45	2447	72	2474
	19	2421	46	2448	73	2475
	20	2422	47	2449	74	2476
	21	2423	48	2450	75	2477
	22	2424	49	2451	76	2478
	23	2425	50	2452	77	2479
	24	2426	51	2453	**78**	**2480**
	25	2427	52	2454	--	--
	26	2428	53	2455	--	--

Remark:

Low Channel: **CH00_2402 MHz**; Middle Channel: **CH39_2441 MHz**; High Channel: **CH78_2480 MHz**.

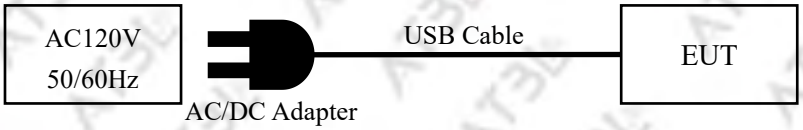
2.2. Test Modes

The table below is showing all test modes to demonstrate in compliance with the standard.

Summary Table of Test Modes			
Test Item	Data Rate / Modulation		
	Bluetooth BR(1Mbps) GFSK	Bluetooth EDR(2Mbps) π/4-DQPSK	Bluetooth EDR(3Mbps) 8-DPSK
For Conducted and Radiated Test	Mode 1: CH00_2402 MHz	Mode 2: CH00_2402 MHz	Mode 3: CH00_2402 MHz
	Mode 4: CH39_2441 MHz	Mode 5: CH39_2441 MHz	Mode 6: CH39_2441 MHz
	Mode 7: CH78_2480 MHz	Mode 8: CH78_2480 MHz	Mode 9: CH78_2480 MHz
	Mode 10: Hopping	Mode 11: Hopping	Mode 12: Hopping
For AC Power-line Conducted Emission	Mode 13: Keep Bluetooth link under the maximum output power		

2.3. Block Diagram of Test System

2.3.1. For AC Power-Line Conducted Emission



2.3.2. For Radiated Spurious Emission

2.3.3. For Conducted Test

2.4. Description of Support Units

NO.	Unit	Brand	Model	Description
1	PC	Redmi	Redmi G	/
2	USB Line	ZL	24AWG	/

2.5. Test Software and Power Level

During the test, the channel and power control software provided by the customer is used to control the operation channel and output power level.

2.6. EUT Operating Conditions

For AC power-line conducted emission, the EUT was connected under the large package sizes transmission.

For radiated spurious emission and conducted test, the engineering test program was provided and make the EUT to continuous transmit/receive.

2.7. Equipment List

2.7.1. For AC Power-Line Conducted Emission

Equipment Name	Manufacturer	Model	Serial No.	Equipment No.	Calibration Until
Test Receiver	R&S	ESPI	101679	SHATBL-E012	2025.05.21
LISN	R&S	ENV216	100300	SHATBL-E013	2025.05.21
LISN	R&S	ENV216	100333	SHATBL-E041	2025.05.21
Thermometer	DeLi	N/A	N/A	SHATBL-E016	2025.09.21
Test Software	FALA	EZ-EMC	N/A	SHATBL-E046	N/A

2.7.2. For Radiated Spurious Emission

Equipment Name	Manufacturer	Model	Serial No.	Equipment No.	Calibration Until
Signal analyzer	Agilent	N9020A	MY50200811	SHATBL-E017	2025.05.21
Amplifier	JPT	JPA0118-55-303A	1910001800055000	SHATBL-E006	2025.05.21
Amplifier	JPT	JPA-10M1G32	21010100035001	SHATBL-E005	2025.05.21
Antenna/Turn table Controller	Brilliant	N/A	N/A	SHATBL-E007	N/A
Loop Antenna	Daze	ZN30900C	20077	SHATBL-E042	2025.05.21
Bilog Antenna	SCHWARZBECK	VULB 9168	01174	SHATBL-E008	2025.05.21
Broad-band Horn Antenna	SCHWARZBECK	BBHA 9120D	02334	SHATBL-E009	2025.05.21
Horn Antenna	COM-POWER	AH-1840	10100008	SHATBL-E043	2025.05.21
Thermometer	DeLi	N/A	N/A	SHATBL-E015	2025.09.21
Test Software	FALA	EMC-RI	N/A	SHATBL-E046	N/A

2.7.3. For Conducted Test

Equipment Name	Manufacturer	Model	Serial No.	Equipment No.	Calibration Until
Power meter	Anritsu	ML2496A	1935001	SHATBL-W030	2025.09.28
Power sensor	Anritsu	MA2411B	1911006	SHATBL-W031	2025.09.28
Power sensor	DARE	RPR3006W	16I00054SN016	SHATBL-W008	2025.09.28
Power sensor	DARE	RPR3006W	RPR6W-2001005	SHATBL-W032	2025.09.28
Power sensor	Rediteq	RPR3006W	RPR6W-2201002	SHATBL-W033	2024.11.15
Power sensor	Rediteq	RPR3006W	RPR6W-2201003	SHATBL-W034	2024.11.15
Power sensor	Keysight	U2021XA	MY59120004	SHATBL-W035	2025.08.13
Adjustable Attenuator	Agilent	8494B	MY42144015	SHATBL-W009	2025.09.28
Adjustable Attenuator	Agilent	8496B	MY42143776	SHATBL-W010	2025.09.28
Environmental Test Chamber	KSON	THS-B6C-150	9159K	SHATBL-W019	2025.01.17
Signal analyzer	Keysight	N9020A	MY50510136	SHATBL-W003	2025.09.28
Vector signal generator	Keysight	N5182B	MY57300196	SHATBL-W005	2025.09.28
Vector signal generator	Agilent	N5182A	MY50143555	SHATBL-W037	2025.07.17
Analog signal generator	Keysight	N5173B	MY60403026	SHATBL-W038	2025.07.17
Wideband radio communication tester	R&S	CMW500	101331	SHATBL-W007	2025.09.28
Spectrum analyzer	R&S	FSV40-N	101761	SHATBL-W036	2025.08.22
Switch Box	N/A	RFSW3003328	RFSW201019	SHATBL-W029	N/A
Thermometer	DeLi	N/A	N/A	SHATBL-W012	2025.09.21
Test Software	FALA	LZ-RF	N/A	SHATBL-W020	N/A

2.8. Measurement Uncertainty

The reported uncertainty of measurement y±U, where expended uncertainty U is based on a standard uncertainty multiplied by a coverage factor of *k*=2, providing a level of confidence of approximately 95 %.

No.	Item	Uncertainty
1	RF output power, conducted	±0.958dB
2	Conducted spurious emissions(9KHz~30MHz)	±2.988dB
	All emissions, radiated 9KHz~30MHz	±0.89dB
3	All emissions, radiated 30MHz-1GHz	±2.50dB
4	All emissions, radiated 1GHz-18GHz	±3.51dB
5	Occupied bandwidth	±23.20Hz
6	Power spectral density	±0.886dB

3. TEST RESULT

3.1. Maximum Peak Conducted Output Power

3.1.1. Limit

47 CFR 15.247(b)(1): For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts.

3.1.2. Test Procedure

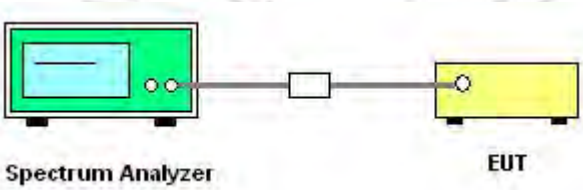
ANSI C63.10-2013 clause 7.8.5: This is an RF-conducted test to evaluate maximum peak output power. Use a direct connection between the antenna port of the unlicensed wireless device and the spectrum analyzer, through suitable attenuation. The hopping shall be disabled for this test:

1. Use the following spectrum analyzer settings:
   ① Span: Approximately five times the 20 dB bandwidth, centered on a hopping channel.
   ② RBW > 20 dB bandwidth of the emission being measured.
   ③ VBW ≥ RBW.
   ④ Sweep: Auto.
   ⑤ Detector function: Peak.
   ⑥ Trace: Max hold.
2. Allow trace to stabilize.
3. Use the marker-to-peak function to set the marker to the peak of the emission.
4. The indicated level is the peak output power, after any corrections for external attenuators and cables.
5. A plot of the test results and setup description shall be included in the test report.

Remark:

A peak responding power meter may be used, where the power meter and sensor system video bandwidth is greater than the occupied bandwidth of the unlicensed wireless device, rather than a spectrum analyzer.

3.1.3. Test Setup



3.1.4. Test Result of Maximum Peak Conducted Output Power

Please refer to the Appendix A

3.2. Number of Hopping Frequencies

3.2.1. Limit

47 CFR 15.247(a)(1)(iii): Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels.

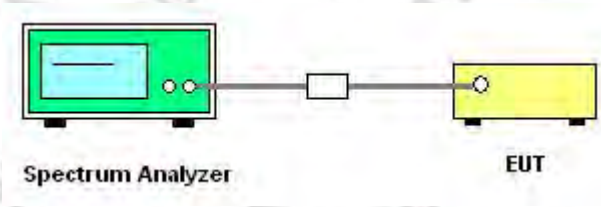
3.2.2. Test Procedure

ANSI C63.10-2013 clause 7.8.3: The EUT shall have its hopping function enabled. Use the following spectrum analyzer settings:

1. Span: The frequency band of operation. Depending on the number of channels the device supports, it may be necessary to divide the frequency range of operation across multiple spans, to allow the individual channels to be clearly seen.
2. RBW: To identify clearly the individual channels, set the RBW to less than 30% of the channel spacing or the 20 dB bandwidth, whichever is smaller.
3. VBW ≥ RBW.
4. Sweep: Auto.
5. Detector function: Peak.
6. Trace: Max hold.
7. Allow the trace to stabilize.

It might prove necessary to break the span up into sub ranges to show clearly all of the hopping frequencies. Compliance of an EUT with the appropriate regulatory limit shall be determined for the number of hopping channels. A plot of the data shall be included in the test report.

3.2.3. Test Setup



3.2.4. Test Result of Number of Hopping Frequencies

Please refer to the Appendix A

3.3. Duty Cycle and Dwell Time

3.3.1. Limit

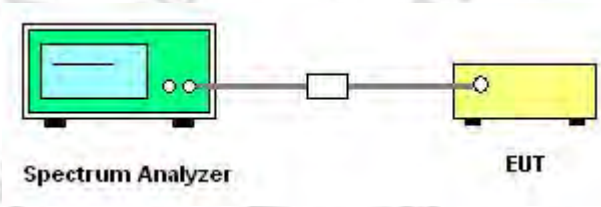
47 CFR 15.247(a)(1)(iii): The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

3.3.2. Test Procedure

ANSI C63.10-2013 clause 7.8.4: The EUT shall have its hopping function enabled. Use the following spectrum analyzer settings:

1. Span: Zero span, centered on a hopping channel.
2. RBW shall be ≤ channel spacing and where possible RBW should be set >> 1 / T, where T is the expected dwell time per channel.
3. Sweep: As necessary to capture the entire dwell time per hopping channel; where possible use a video trigger and trigger delay so that the transmitted signal starts a little to the right of the start of the plot. The trigger level might need slight adjustment to prevent triggering when the system hops on an adjacent channel; a second plot might be needed with a longer sweep time to show two successive hops on a channel.
4. Detector function: Peak.
5. Trace: Max hold.
6. Use the marker-delta function to determine the transmit time per hop.
7. The average time of occupancy is calculated from the transmit time per hop multiplied by the number of hops in the period specified in the requirements.

3.3.3. Test Setup



3.3.4. Test Result of Duty Cycle and Dwell Time

Please refer to the Appendix A

3.4. 20dB Bandwidth

3.4.1. Limit

There is no limit requirement for 20dB Bandwidth.

3.4.2. Test Procedure

1. The testing follows *ANSI C63.10-2013 clause 6.9.2 and 6.9.3*.

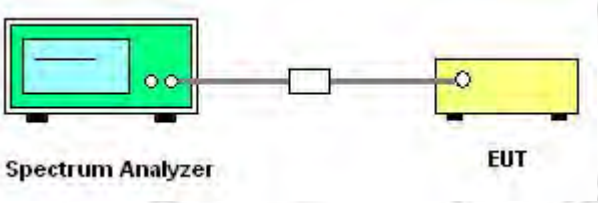
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.

3. Set to the maximum power setting and enable the EUT transmit continuously.

4. Use the following spectrum analyzer settings for 20dB Bandwidth measurement. Span = approximately 2 to 3 times the 20 dB bandwidth, centered on a hopping channel; RBW ≥ 1% of the 20 dB bandwidth; VBW ≥ RBW; Sweep = auto; Detector function = peak; Trace = max hold.

5. Measure and record the results in the test report.

3.4.3. Test Setup



3.4.4. Test Result of 20dB Bandwidth

Please refer to the Appendix A

3.5. Carrier Frequency Separation

3.5.1. Limit

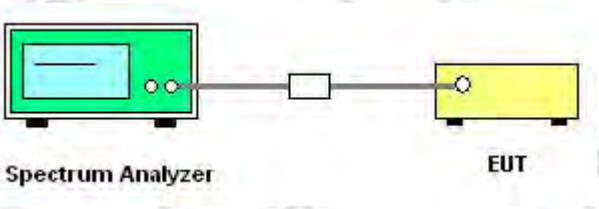
47 CFR 15.247(a)(1): Frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater.

3.5.2. Test Procedure

ANSI C63.10-2013 clause 7.8.2: The EUT shall have its hopping function enabled. Use the following spectrum analyzer settings:

1. Span: Wide enough to capture the peaks of two adjacent channels.
2. RBW: Start with the RBW set to approximately 30% of the channel spacing; adjust as necessary to best identify the center of each individual channel.
3. VBW ≥ RBW.
4. Sweep: Auto.
5. Detector function: Peak.
6. Trace: Max hold.
7. Allow the trace to stabilize.
8. Use the marker-delta function to determine the separation between the peaks of the adjacent channels. A plot of the data shall be included in the test report.

3.5.3. Test Setup



3.5.4. Test Result of Carrier Frequency Separation

Please refer to the Appendix A

3.6. Conducted Band Edge

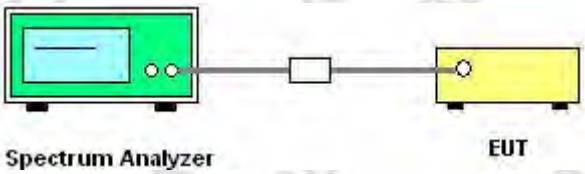
3.6.1. Limit

47 CFR 15.247(d): In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits.

3.6.2. Test Procedure

1. The testing follows *ANSI C63.10-2013 clause 11.13*.
2. Set to the maximum power setting and enable the EUT transmit continuously.
3. Set RBW = 100 kHz, VBW=300 kHz, Peak Detector. Conducted Band Edge measured in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 20 dB relative to the 100 kHz bandwidth within the band that contains the highest level of the desired power when maximum peak conducted output power procedure is used. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, the attenuation required under this paragraph shall be 30 dB instead of 20 dB.
4. Measure and record the results in the test report.
5. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.

3.6.3. Test Setup



3.6.4. Test Result of Conducted Band Edge

Please refer to the Appendix A

3.7. Conducted Spurious Emission

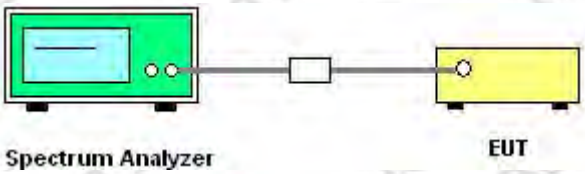
3.7.1. Limit

47 CFR 15.247(d): In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits.

3.7.2. Test Procedure

1. The testing follows *ANSI C63.10-2013 clause 7.8.8*.
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Set RBW = 100 kHz, VBW = 300kHz, scan up through 10th harmonic. All harmonics / spurs must be at least 20 dB down from the highest emission level within the authorized band as measured with a 100 kHz RBW.
5. Measure and record the results in the test report.
6. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.

3.7.3. Test Setup



3.7.4. Test Result of Conducted Spurious Emission

Please refer to the Appendix A

3.8. Radiated Spurious Emission and Restricted Band

3.8.1. Limit

47 CFR 15.247(d): In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits.

47 CFR 15.205(a): Only spurious emissions are permitted in any of the frequency bands listed below:

Frequency (MHz)	Frequency (MHz)	Frequency (MHz)	Frequency (MHz)	Frequency (MHz)
0.090-0.110	12.29-12.293	149.9-150.05	1660-1710	8.025-8.5
0.495-0.505	12.51975-12.52025	156.52475-156.52525	1718.8-1722.2	9.0-9.2
2.1735-2.1905	12.57675-12.57725	156.7-156.9	2200-2300	9.3-9.5
4.125-4.128	13.36-13.41	162.0125-167.17	2310-2390	10.6-12.7
4.17725-4.17775	16.42-16.423	167.72-173.2	2483.5-2500	13.25-13.4
4.20725-4.20775	16.69475-16.69525	240-285	2690-2900	14.47-14.5
6.215-6.218	16.80425-16.80475	322-335.4	3260-3267	15.35-16.2
6.26775-6.26825	25.5-25.67	399.9-410	3332-3339	17.7-21.4
6.31175-6.31225	37.5-38.25	608-614	3345.8-3358	22.01-23.12
8.291-8.294	73-74.6	960-1240	3600-4400	23.6-24.0
8.362-8.366	74.8-75.2	1300-1427	4500-5150	31.2-31.8
8.37625-8.38675	108-121.94	1435-1626.5	5350-5460	36.43-36.5
8.41425-8.41475	123-138	1645.5-1646.5	7250-7750	Above 38.6

47 CFR 15.209(a): The emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

3.8.2. Test Procedure

1. The EUT was placed on a turntable with 0.8 meter for frequency below 1GHz and 1.5 meter for frequency above 1GHz respectively above ground.

2. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.

3. For each suspected emission, the EUT was arranged to its worst case and then tune the Antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level to comply with the guidelines.

4. Set to the maximum power setting and enable the EUT transmit continuously.

5. Use the following spectrum analyzer settings:

① Span shall wide enough to fully capture the emission being measured;

② Set RBW=100 kHz for f < 1 GHz, RBW=1MHz for f>1GHz ; VBW ≥ RBW; Sweep = auto; Detector function = peak; Trace = max hold for peak;

③ For average measurement: use duty cycle correction factor method per 15.35(c).

Duty cycle = On time/100 milliseconds

On time = N1*L1+N2*L2+...+Nn-1*LNn-1+Nn*Ln

Where N1 is number of type 1 pulses, L1 is length of type 1 pulses, etc.

Average Emission Level = Peak Emission Level + 20*log(Duty cycle)

6. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Pre-amp Factor = Level

7. For testing below 1GHz, if the emission level of the EUT in peak mode was 3 dB lower than the limit specified, then peak values of EUT will be reported, otherwise, the emissions will be repeated one by one using the CISPR quasi-peak method and reported.

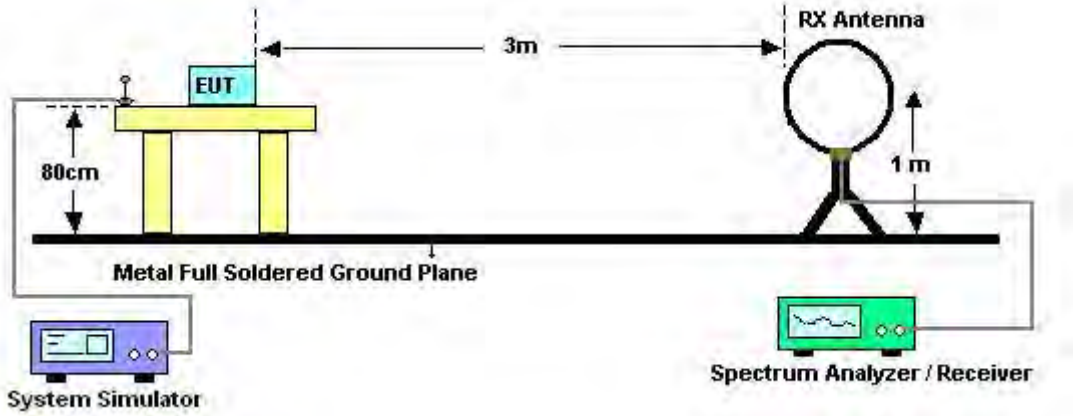
8. For testing above 1GHz, the emission level of the EUT in peak mode was 20dB lower than peak limit (that means the emission level in average mode also complies with the limit in average mode), then peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.

Remark:

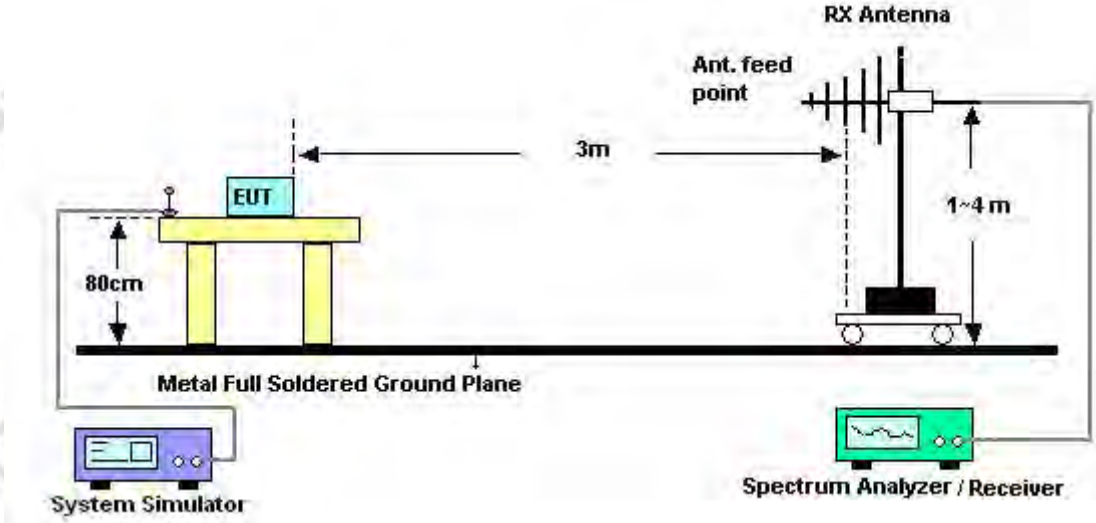
The average levels were calculated from the peak level corrected with duty cycle correction factor (-24.70dB) derived from 20log (dwell time/100ms). This correction is only for signals that hop with the fundamental signal, such as band-edge and harmonic. Other spurious signals that are independent of the hopping signal would not use this correction.

3.8.3. Test Setup

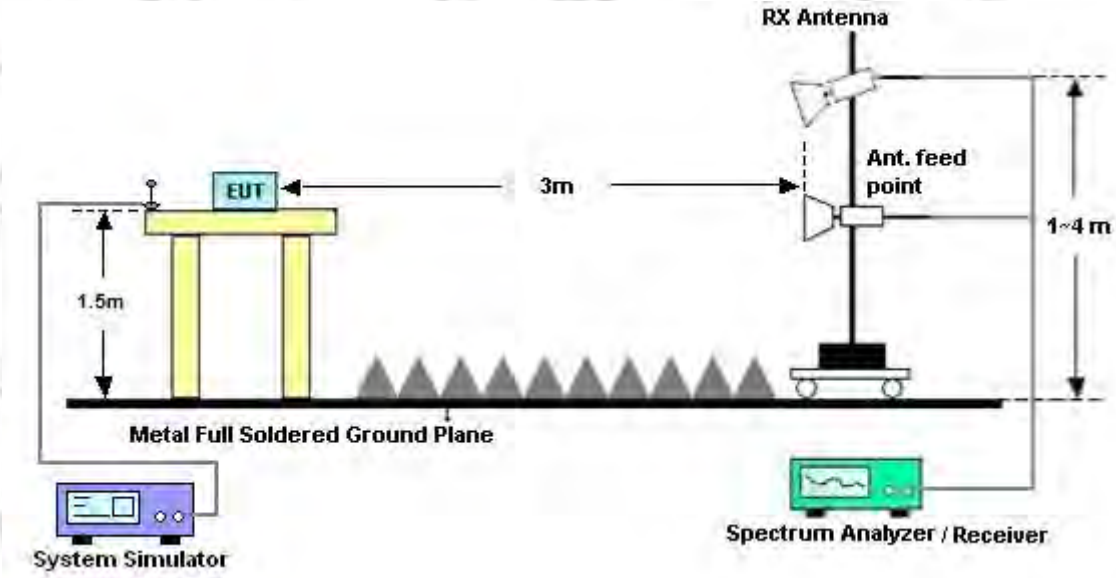
3.8.3.1. For radiated emissions below 30MHz



3.8.3.2. For radiated emissions from 30MHz to 1GHz



3.8.3.3. For radiated emissions above 1GHz



3.8.4. Test Result of Radiated Spurious Emission

For 9 kHz ~ 30 MHz

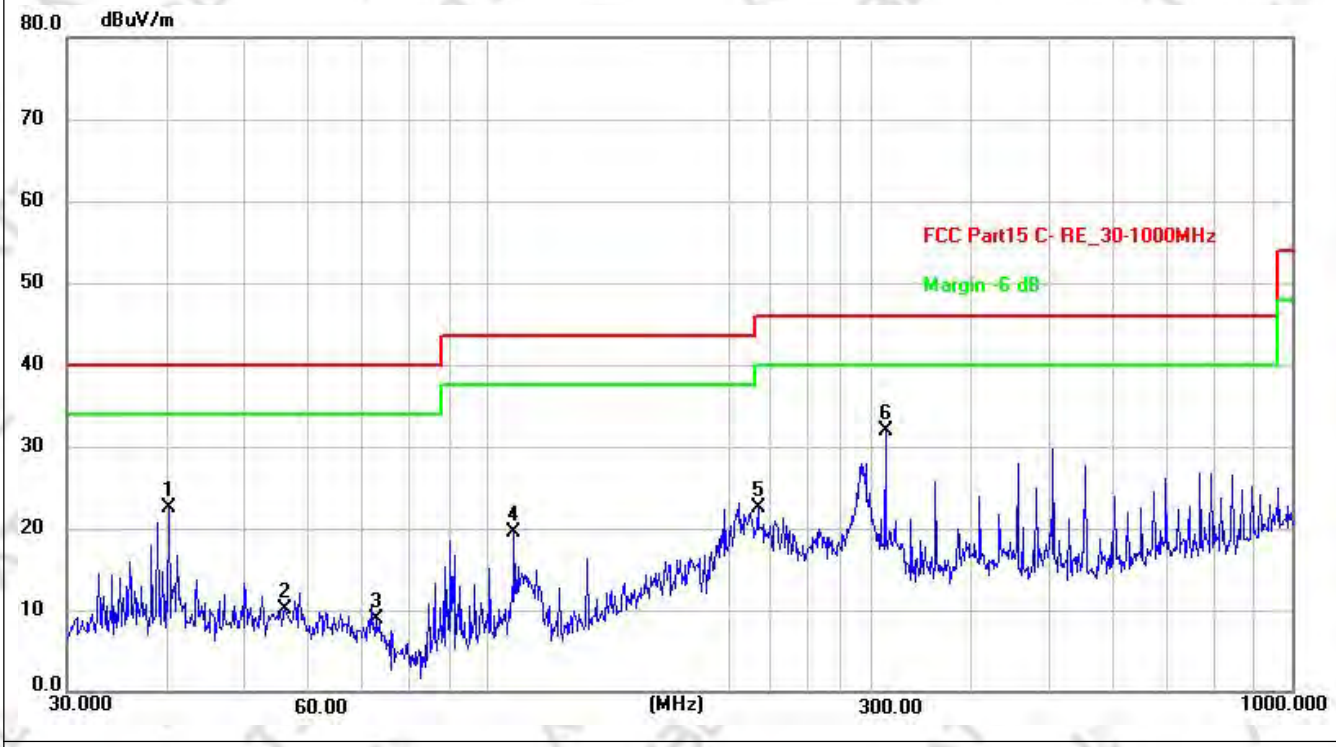
The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line was not reported.

For 30 MHz ~ 1 GHz:

Note:

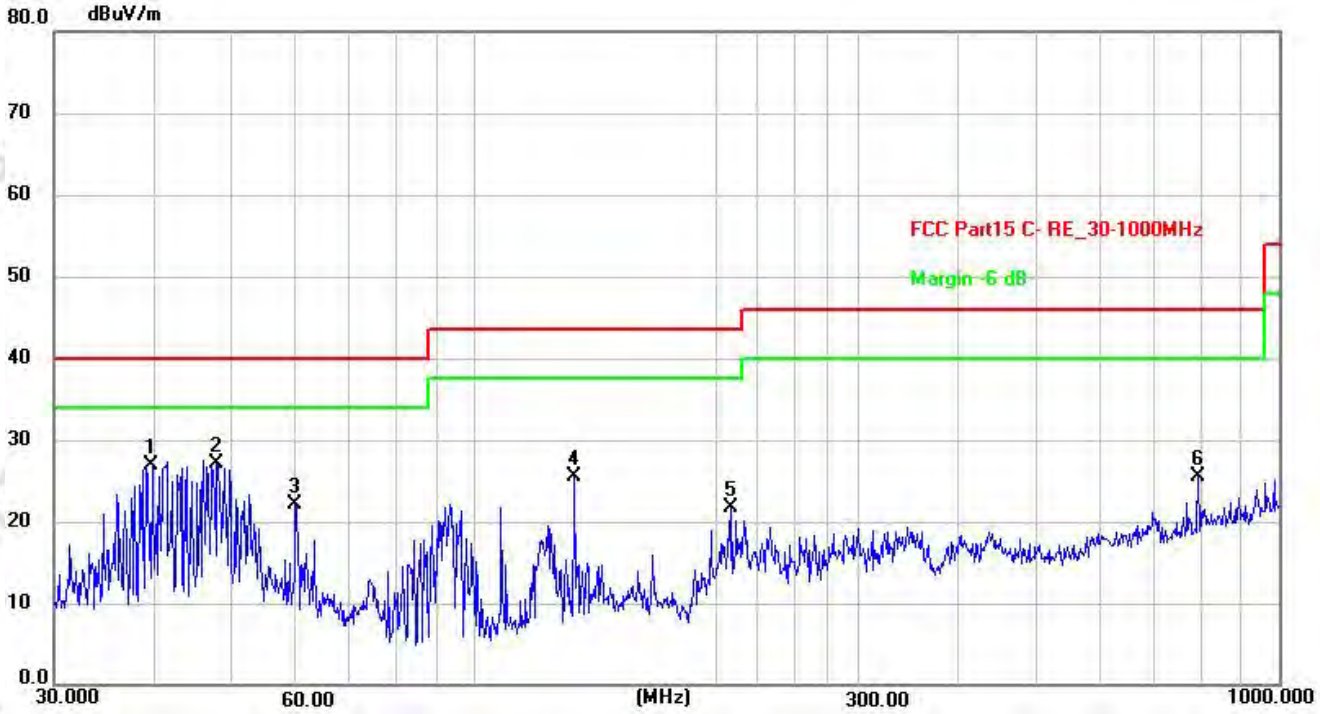
All modes have been tested, only worst case(DH5_2402MHz)mode was recorded in the test report if no any others.

Polarization	Horizontal	Mode	DH5_2402



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)
1	40.1347	51.89	-29.36	22.53	40.00	-17.47	peak	150
2	56.0007	38.92	-28.83	10.09	40.00	-29.91	peak	150
3	72.5916	40.73	-31.87	8.86	40.00	-31.14	peak	150
4	107.8877	51.90	-32.48	19.42	43.50	-24.08	peak	150
5	216.7828	55.43	-32.83	22.60	46.00	-23.40	peak	150
6 *	312.1794	59.98	-28.16	31.82	46.00	-14.18	peak	150

Polarization	Vertical	Mode	DH5_2402



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)
1	39.7146	56.21	-29.40	26.81	40.00	-13.19	peak	150
2 *	47.8260	56.10	-28.99	27.11	40.00	-12.89	peak	150
3	59.8588	51.55	-29.36	22.19	40.00	-17.81	peak	150
4	133.1511	56.10	-30.67	25.43	43.50	-18.07	peak	150
5	208.5803	54.56	-32.84	21.72	43.50	-21.78	peak	150
6	793.3960	43.38	-17.85	25.53	46.00	-20.47	peak	150

For 1 GHz ~ 18GHz:

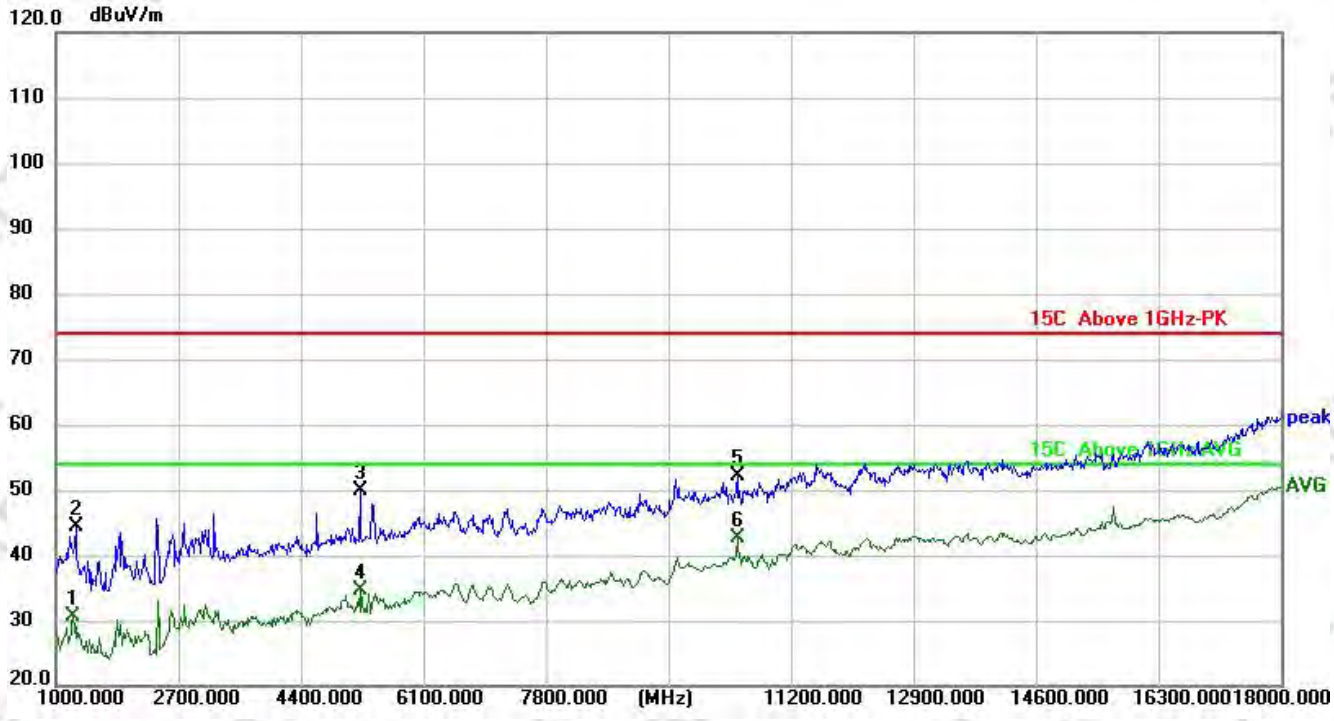
Note:

1.The all data rate modes had been test, but only worse test data was recorded in the test report.

2.In frequency ranges 18 ~25GHz no any other harmonic emissions detected which are tested to compliance with the limit. No recording in the test report. No any other emissions level which are attenuated less than 20dB below the limit. No recording in the test report.

3.We used the filter to test and the main frequency was filtered out.

Polarization	Horizontal	Mode	DH5_2402

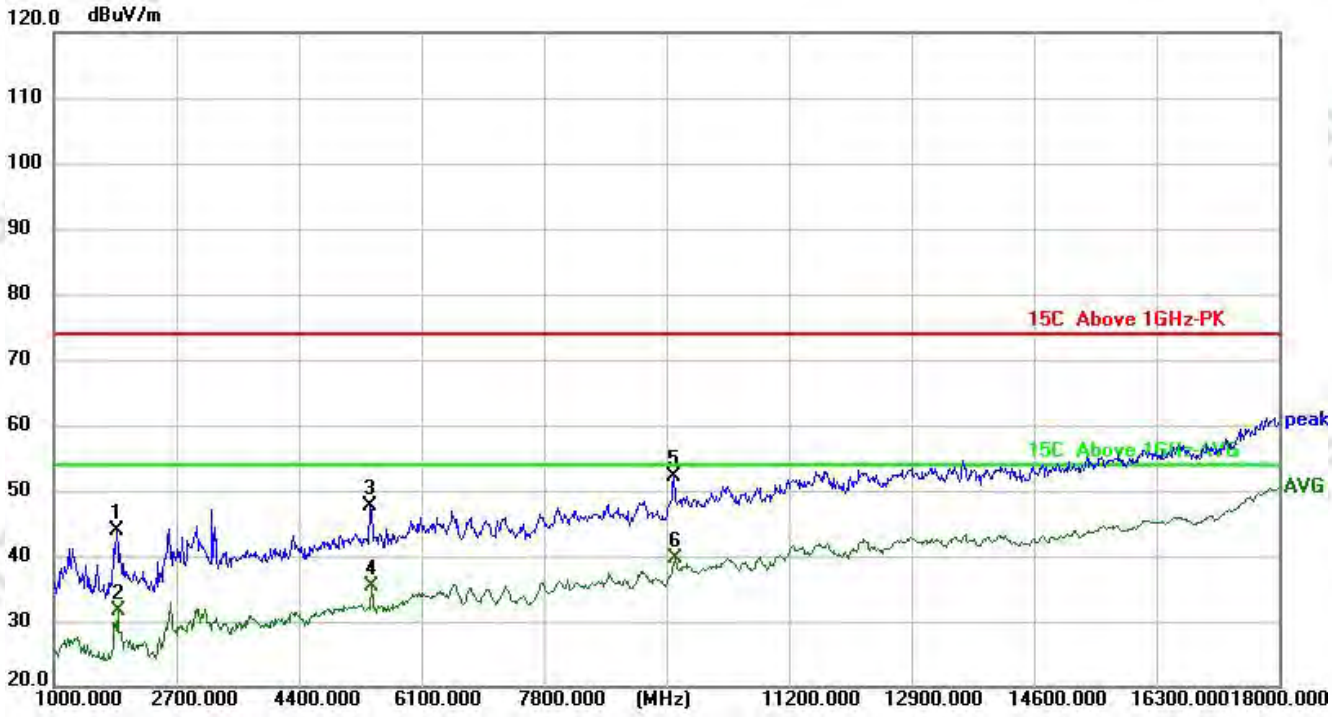


No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	1238.000	50.97	-20.22	30.75	54.00	-23.25	AVG
2	1272.000	64.44	-20.13	44.31	74.00	-29.69	peak
3	5216.000	54.58	-4.71	49.87	74.00	-24.13	peak
4	5233.000	39.41	-4.67	34.74	54.00	-19.26	AVG
5	10452.000	46.28	5.91	52.19	74.00	-21.81	peak
6 *	10452.000	36.61	5.91	42.52	54.00	-11.48	AVG

Polarization	Vertical	Mode	DH5_2402

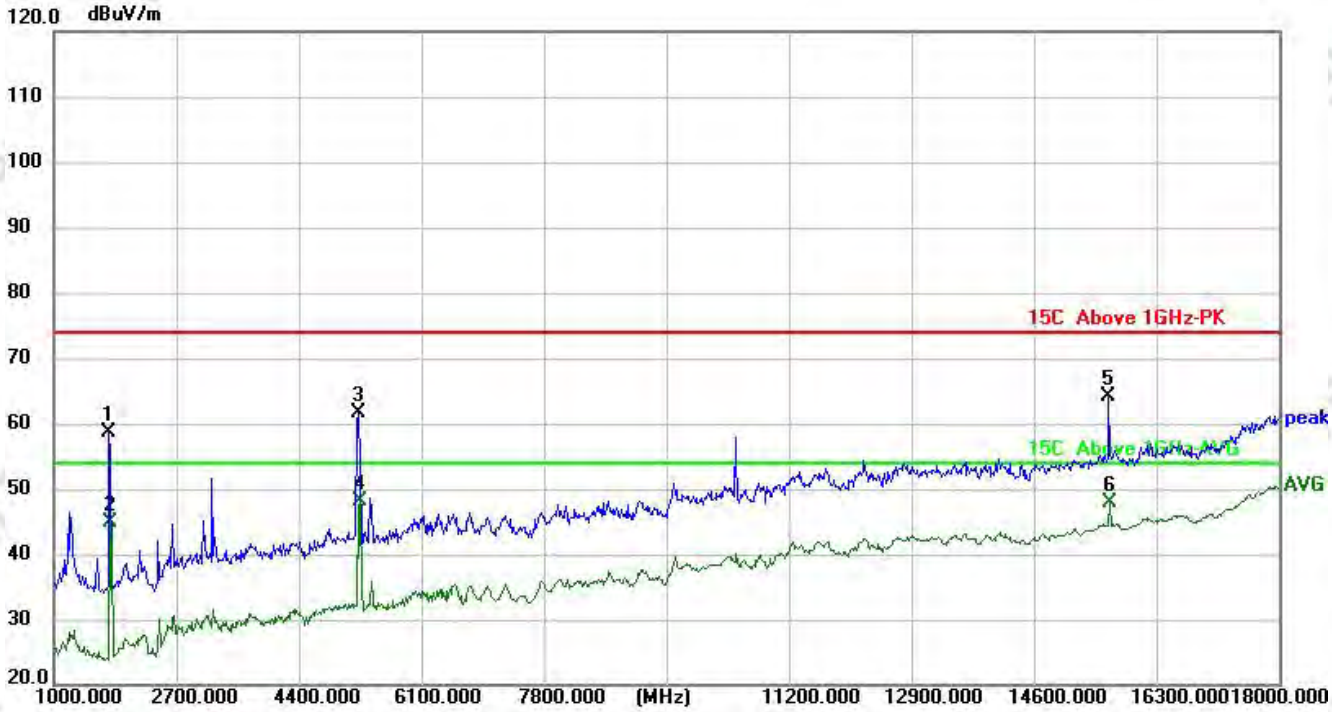
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)
1	3193.000	73.36	-11.78	61.58	74.00	-12.42	peak	150
2	3210.000	50.03	-11.76	38.27	54.00	-15.73	AVG	150
3	5386.000	53.04	-4.41	48.63	74.00	-25.37	peak	150
4	5403.000	41.00	-4.39	36.61	54.00	-17.39	AVG	150
5	11608.000	45.57	8.06	53.63	74.00	-20.37	peak	150
6 *	11727.000	33.83	8.14	41.97	54.00	-12.03	AVG	150

Polarization	Horizontal	Mode	DH5_2441



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)
1	1867.000	62.50	-18.71	43.79	74.00	-30.21	peak	150
2	1884.000	50.15	-18.51	31.64	54.00	-22.36	AVG	150
3	5386.000	51.93	-4.41	47.52	74.00	-26.48	peak	150
4	5403.000	39.75	-4.39	35.36	54.00	-18.64	AVG	150
5	9602.000	47.87	4.38	52.25	74.00	-21.75	peak	150
6 *	9619.000	35.26	4.41	39.67	54.00	-14.33	AVG	150

Polarization	Vertical	Mode	DH5_2441

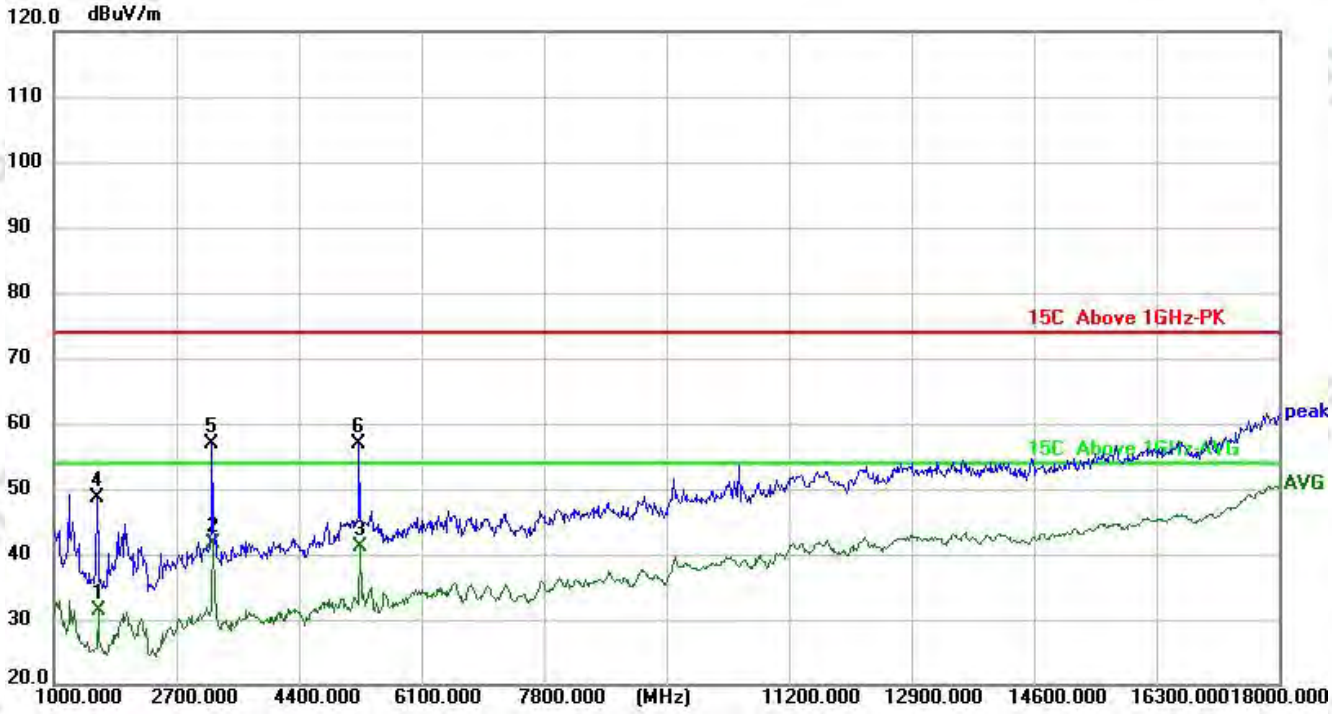


No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)
1	1765.000	78.15	-19.51	58.64	74.00	-15.36	peak	150
2	1782.000	64.34	-19.48	44.86	54.00	-9.14	AVG	150
3	5233.000	66.40	-4.67	61.73	74.00	-12.27	peak	150
4 *	5250.000	52.84	-4.64	48.20	54.00	-5.80	AVG	150
5	15637.000	52.36	11.87	64.23	74.00	-9.77	peak	150
6	15654.000	36.05	11.86	47.91	54.00	-6.09	AVG	150

Polarization	Horizontal	Mode	DH5_2480

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	2768.000	56.71	-14.13	42.58	74.00	-31.42	peak
2	2785.000	45.25	-14.09	31.16	54.00	-22.84	AVG
3	5233.000	54.92	-4.67	50.25	74.00	-23.75	peak
4	5335.000	40.32	-4.49	35.83	54.00	-18.17	AVG
5	11727.000	45.58	8.14	53.72	74.00	-20.28	peak
6 *	11744.000	33.86	8.15	42.01	54.00	-11.99	AVG

Polarization	Vertical	Mode	DH5_2480

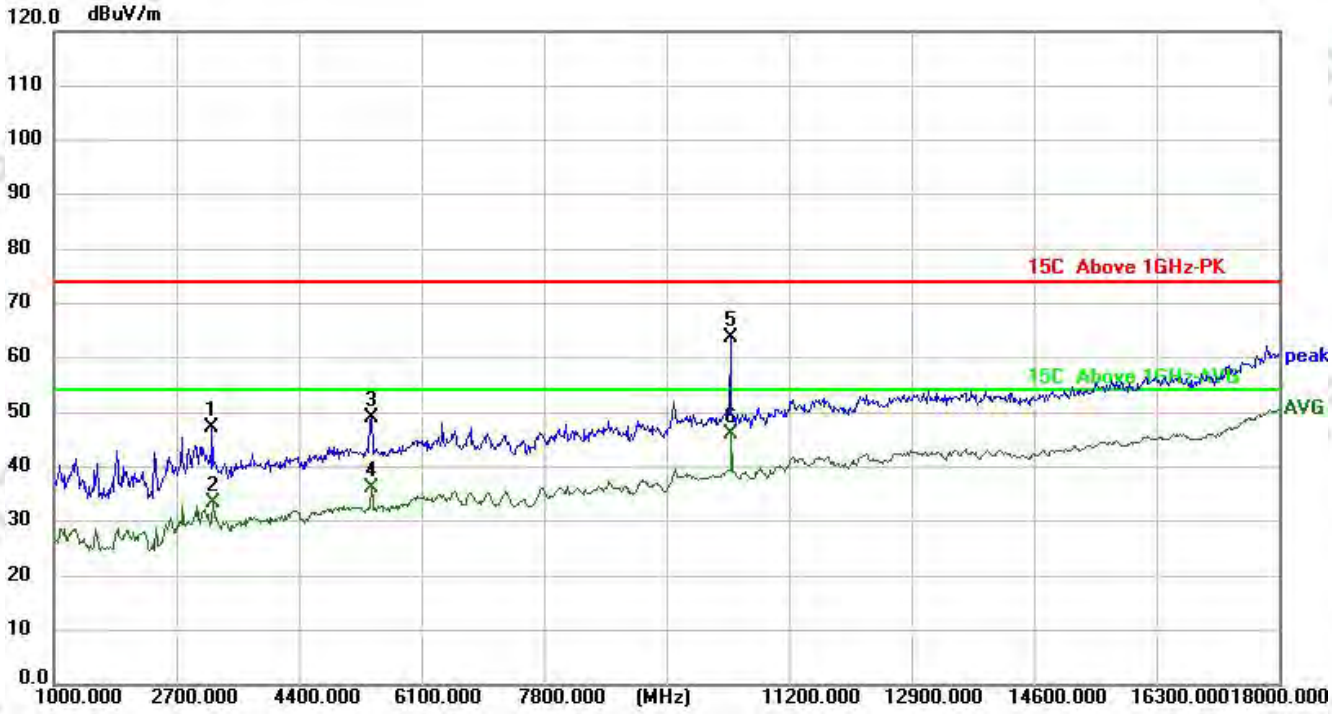


No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	1612.000	51.06	-19.80	31.26	54.00	-22.74	AVG
2 *	3210.000	53.28	-11.76	41.52	54.00	-12.48	AVG
3	5250.000	45.77	-4.64	41.13	54.00	-12.87	AVG
4	1595.000	68.44	-19.82	48.62	74.00	-25.38	peak
5	3193.000	68.69	-11.78	56.91	74.00	-17.09	peak
6	5233.000	61.61	-4.67	56.94	74.00	-17.06	peak

Polarization	Horizontal	Mode	2DH5_2402

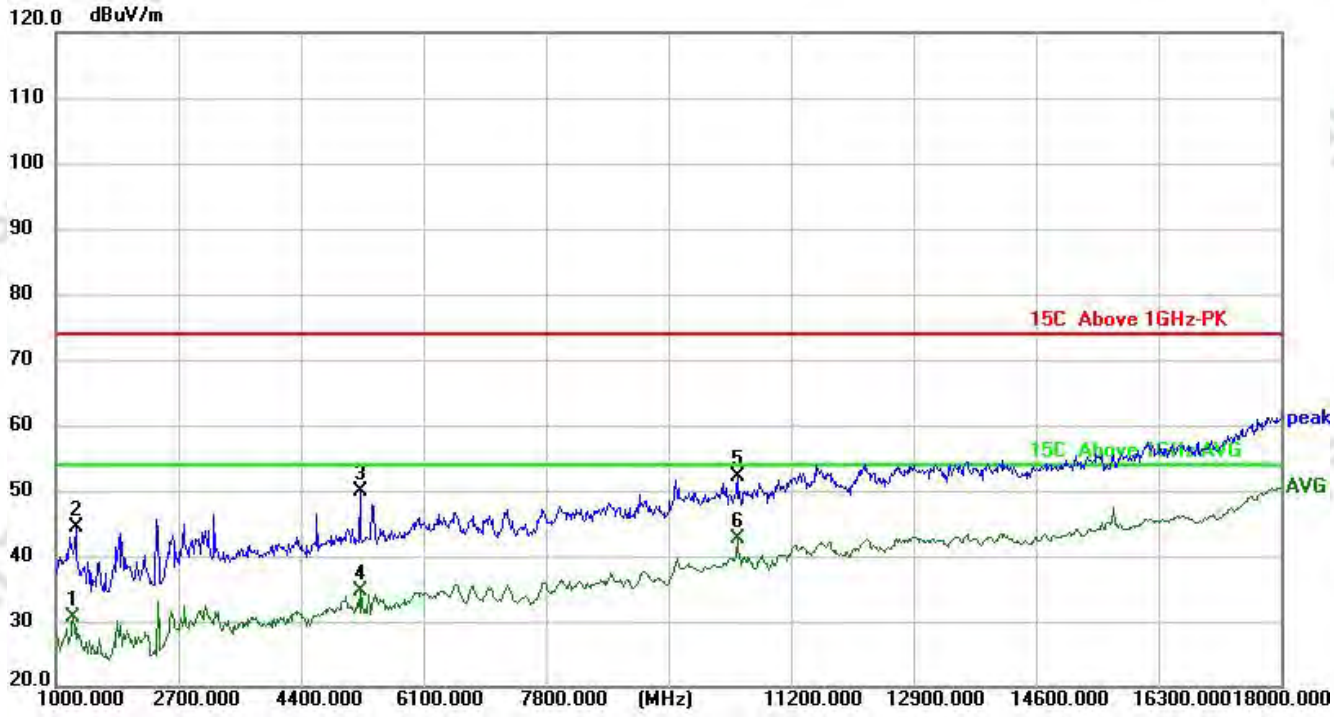
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	1595.000	61.77	-19.82	41.95	74.00	-32.05	peak
2	1612.000	50.29	-19.80	30.49	54.00	-23.51	AVG
3	3193.000	59.31	-11.78	47.53	74.00	-26.47	peak
4	3210.000	44.73	-11.76	32.97	54.00	-21.03	AVG
5	5182.000	54.65	-4.78	49.87	74.00	-24.13	peak
6 *	5199.000	43.51	-4.74	38.77	54.00	-15.23	AVG

Polarization	Vertical	Mode	2DH5_2402



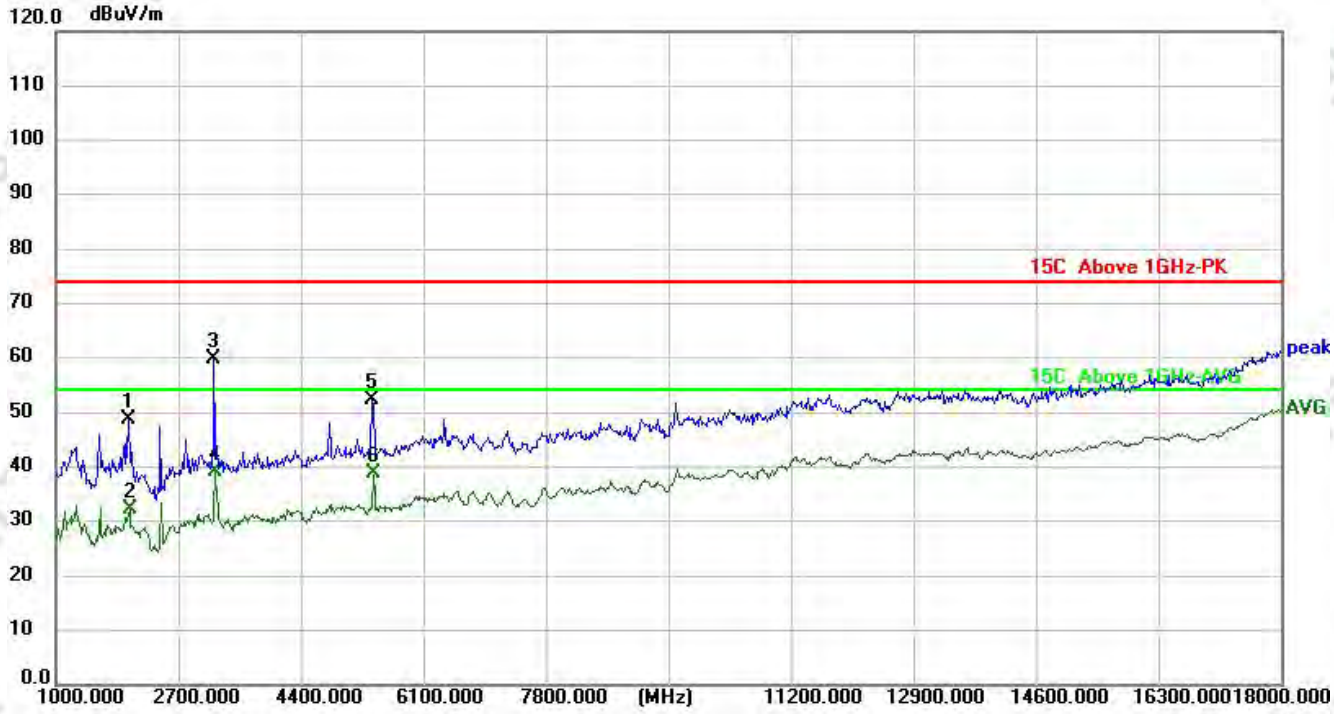
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	3193.000	58.98	-11.78	47.20	74.00	-26.80	peak
2	3210.000	45.21	-11.76	33.45	54.00	-20.55	AVG
3	5403.000	53.47	-4.39	49.08	74.00	-24.92	peak
4	5403.000	40.54	-4.39	36.15	54.00	-17.85	AVG
5	10384.000	58.01	5.78	63.79	74.00	-10.21	peak
6 *	10401.000	40.25	5.82	46.07	54.00	-7.93	AVG

Polarization	Horizontal	Mode	2DH5_2441



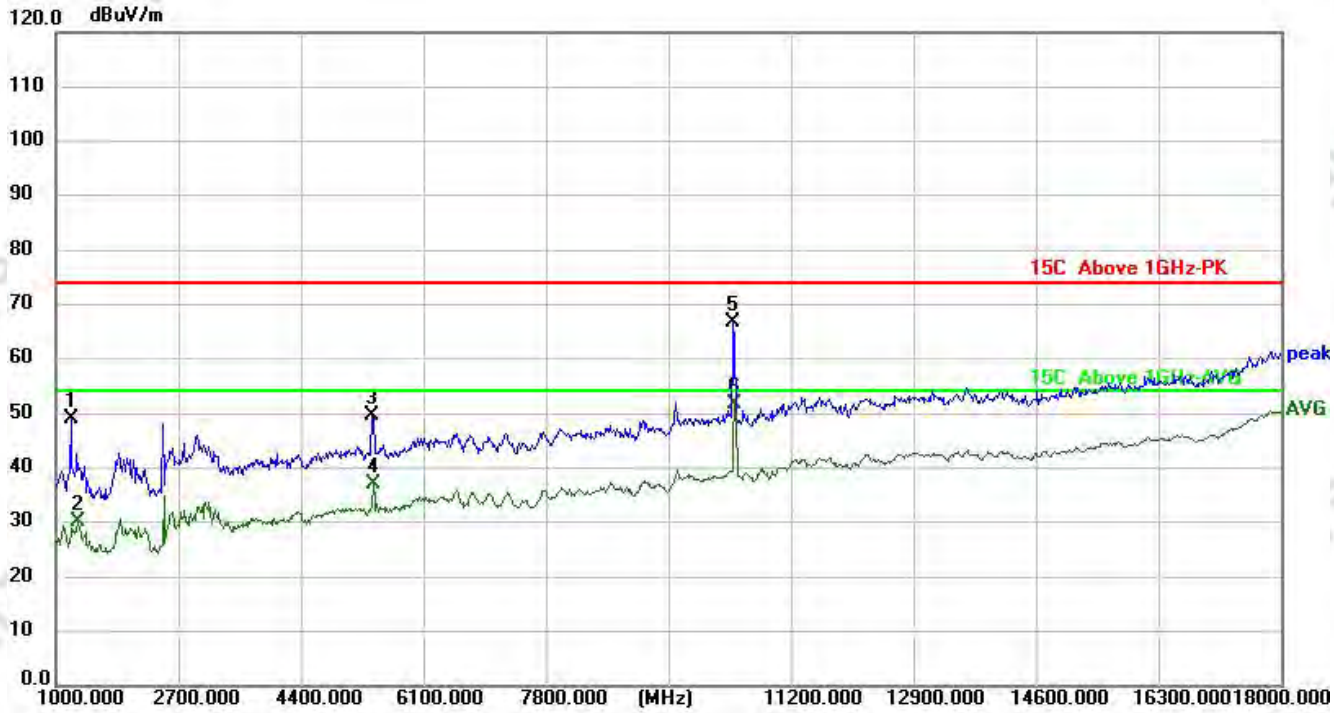
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	1238.000	50.97	-20.22	30.75	54.00	-23.25	AVG
2	1272.000	64.44	-20.13	44.31	74.00	-29.69	peak
3	5216.000	54.58	-4.71	49.87	74.00	-24.13	peak
4	5233.000	39.41	-4.67	34.74	54.00	-19.26	AVG
5	10452.000	46.28	5.91	52.19	74.00	-21.81	peak
6 *	10452.000	36.61	5.91	42.52	54.00	-11.48	AVG

Polarization	Vertical	Mode	2DH5_2441



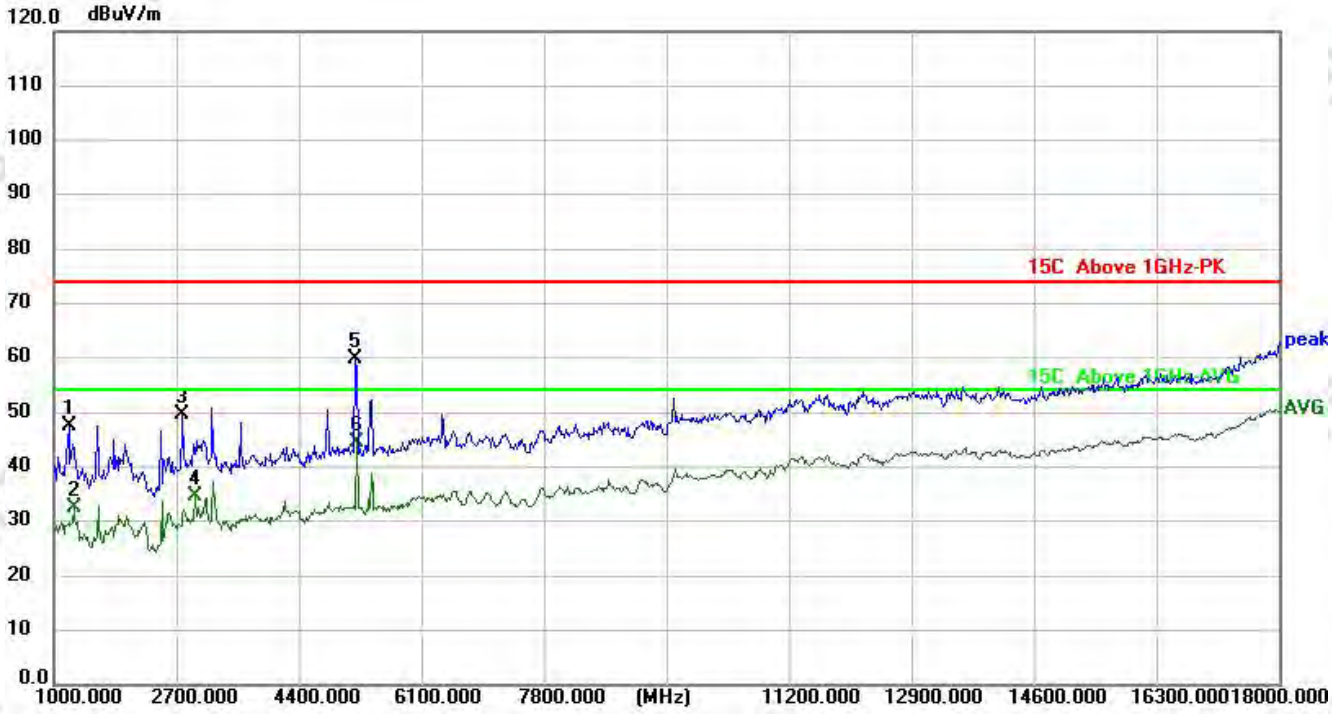
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	2003.000	65.97	-17.21	48.76	74.00	-25.24	peak
2	2020.000	49.38	-17.15	32.23	54.00	-21.77	AVG
3 *	3193.000	71.67	-11.78	59.89	74.00	-14.11	peak
4	3210.000	50.82	-11.76	39.06	54.00	-14.94	AVG
5	5386.000	56.74	-4.41	52.33	74.00	-21.67	peak
6	5403.000	43.09	-4.39	38.70	54.00	-15.30	AVG

Polarization	Horizontal	Mode	2DH5_2480



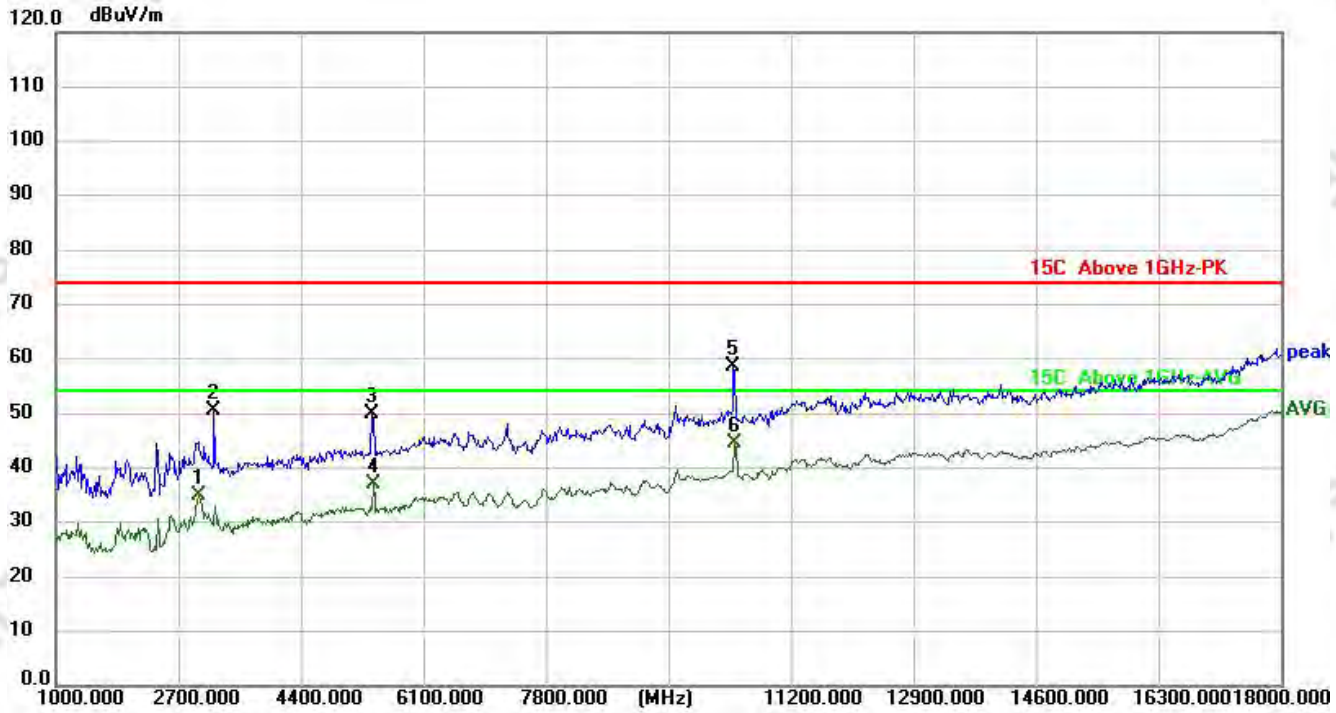
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	1204.000	69.42	-20.31	49.11	74.00	-24.89	peak
2	1306.000	50.07	-20.04	30.03	54.00	-23.97	AVG
3	5386.000	53.96	-4.41	49.55	74.00	-24.45	peak
4	5403.000	41.56	-4.39	37.17	54.00	-16.83	AVG
5	10401.000	60.88	5.82	66.70	74.00	-7.30	peak
6 *	10418.000	46.02	5.86	51.88	54.00	-2.12	AVG

Polarization	Vertical	Mode	2DH5_2480



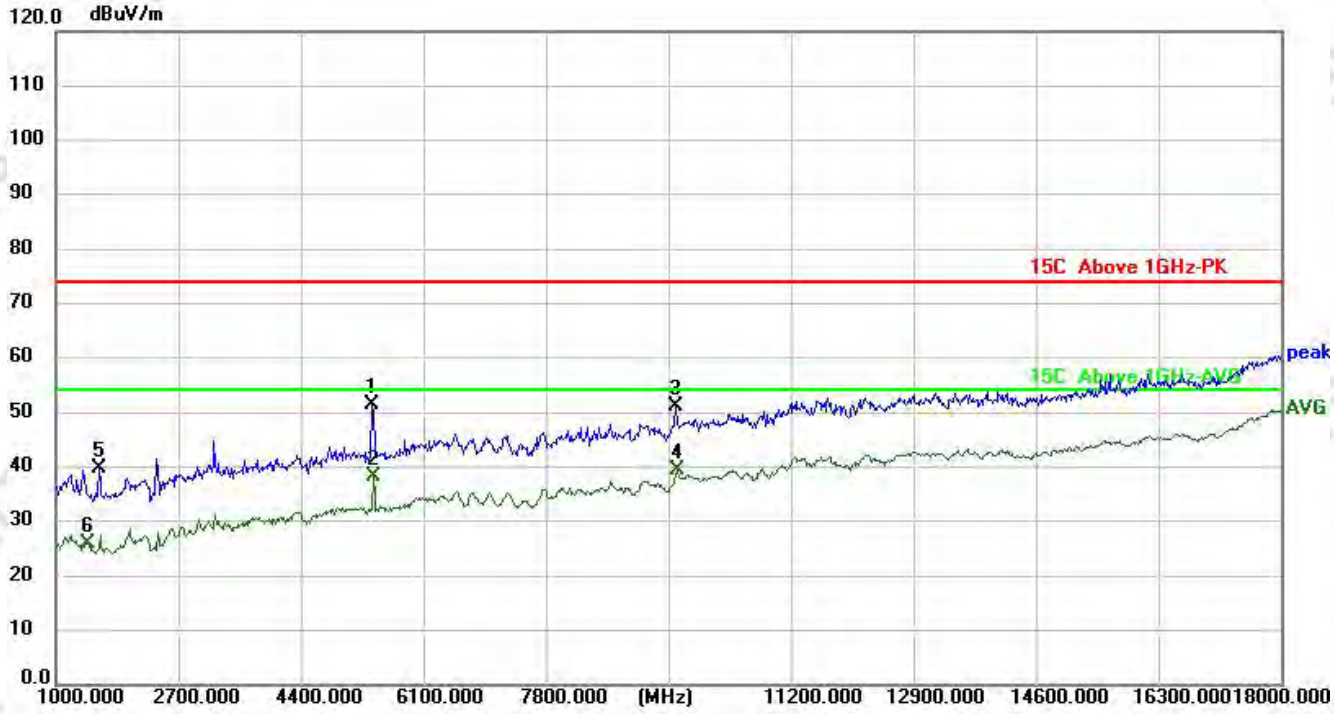
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	1204.000	67.84	-20.31	47.53	74.00	-26.47	peak
2	1272.000	52.60	-20.13	32.47	54.00	-21.53	AVG
3	2785.000	63.89	-14.09	49.80	74.00	-24.20	peak
4	2955.000	47.37	-12.80	34.57	54.00	-19.43	AVG
5	5182.000	64.55	-4.78	59.77	74.00	-14.23	peak
6 *	5199.000	49.33	-4.74	44.59	54.00	-9.41	AVG

Polarization	Horizontal	Mode	3DH5_2402



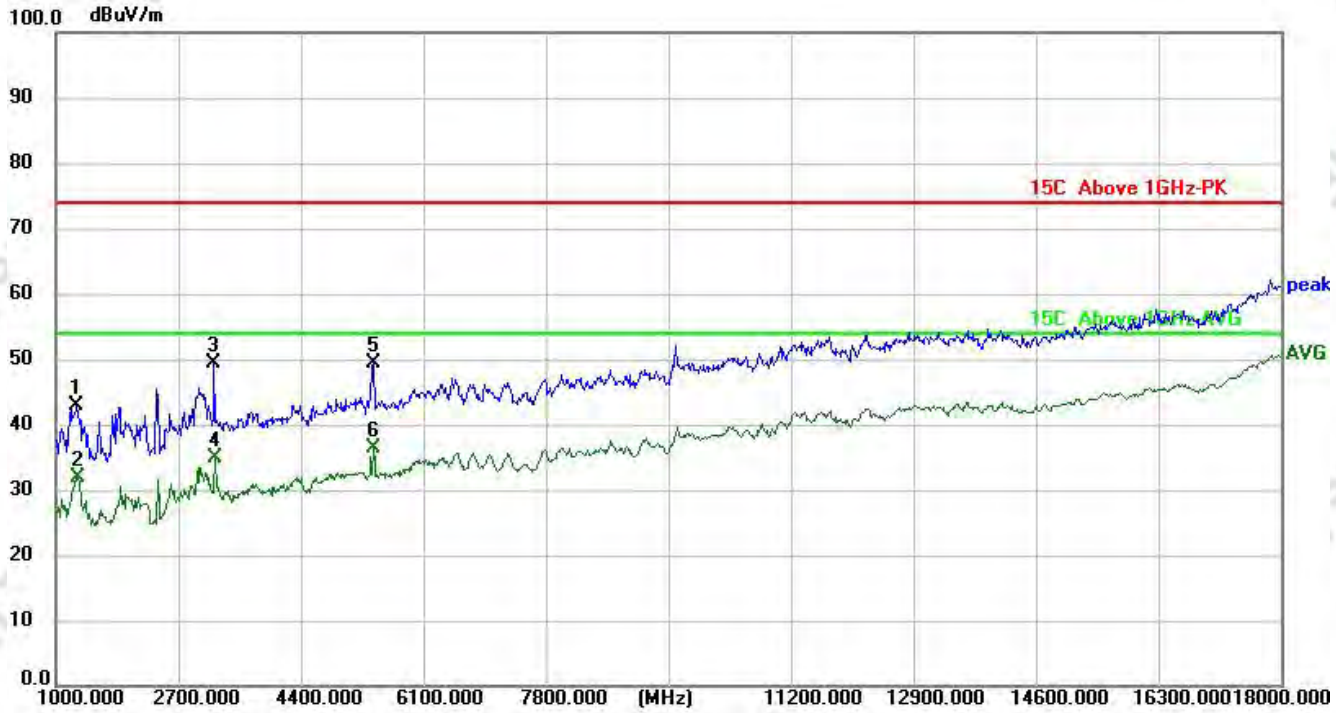
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	2989.000	47.53	-12.53	35.00	54.00	-19.00	AVG
2	3193.000	62.21	-11.78	50.43	74.00	-23.57	peak
3	5386.000	54.40	-4.41	49.99	74.00	-24.01	peak
4	5403.000	41.48	-4.39	37.09	54.00	-16.91	AVG
5	10401.000	52.76	5.82	58.58	74.00	-15.42	peak
6 *	10418.000	38.67	5.86	44.53	54.00	-9.47	AVG

Polarization	Vertical	Mode	3DH5_2402



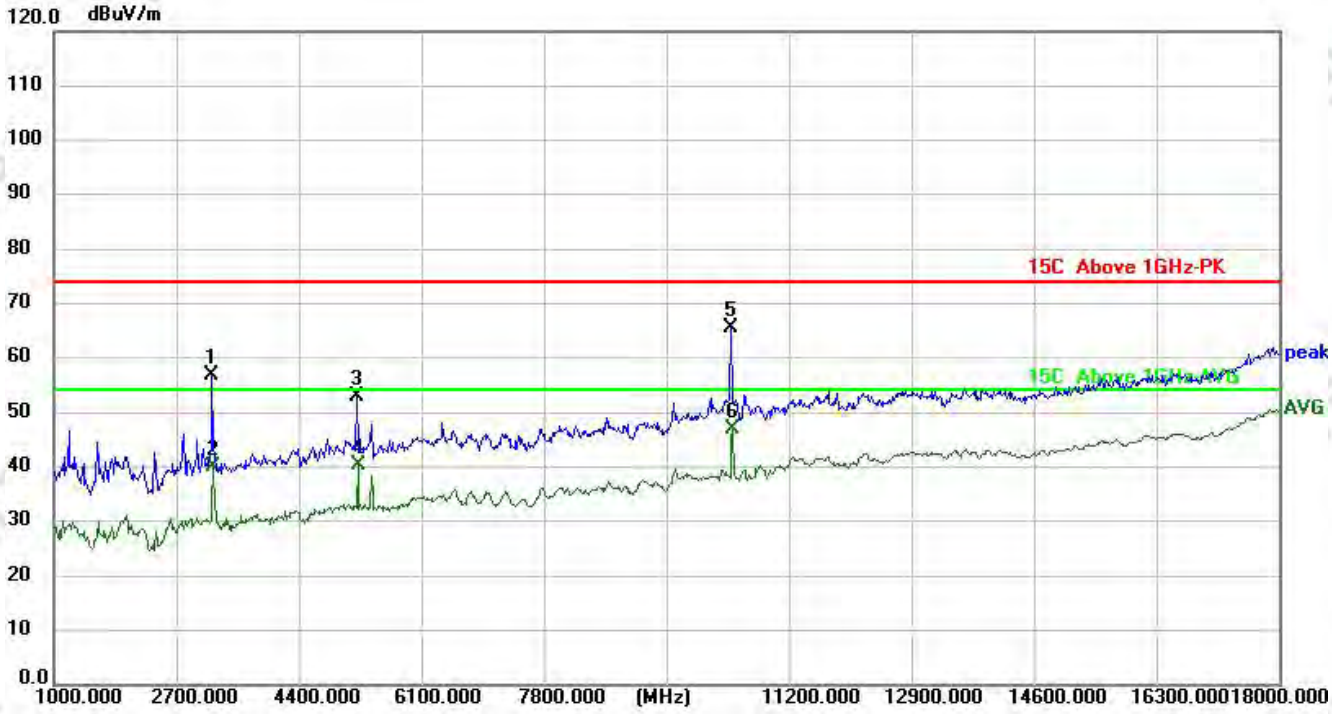
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	5386.000	55.73	-4.41	51.32	74.00	-22.68	peak
2	5403.000	42.59	-4.39	38.20	54.00	-15.80	AVG
3	9602.000	46.71	4.38	51.09	74.00	-22.91	peak
4 *	9619.000	35.02	4.41	39.43	54.00	-14.57	AVG
5	1595.000	59.72	-19.82	39.90	74.00	-34.10	peak
6	1442.000	45.67	-19.79	25.88	54.00	-28.12	AVG

Polarization	Horizontal	Mode	3DH5_2441



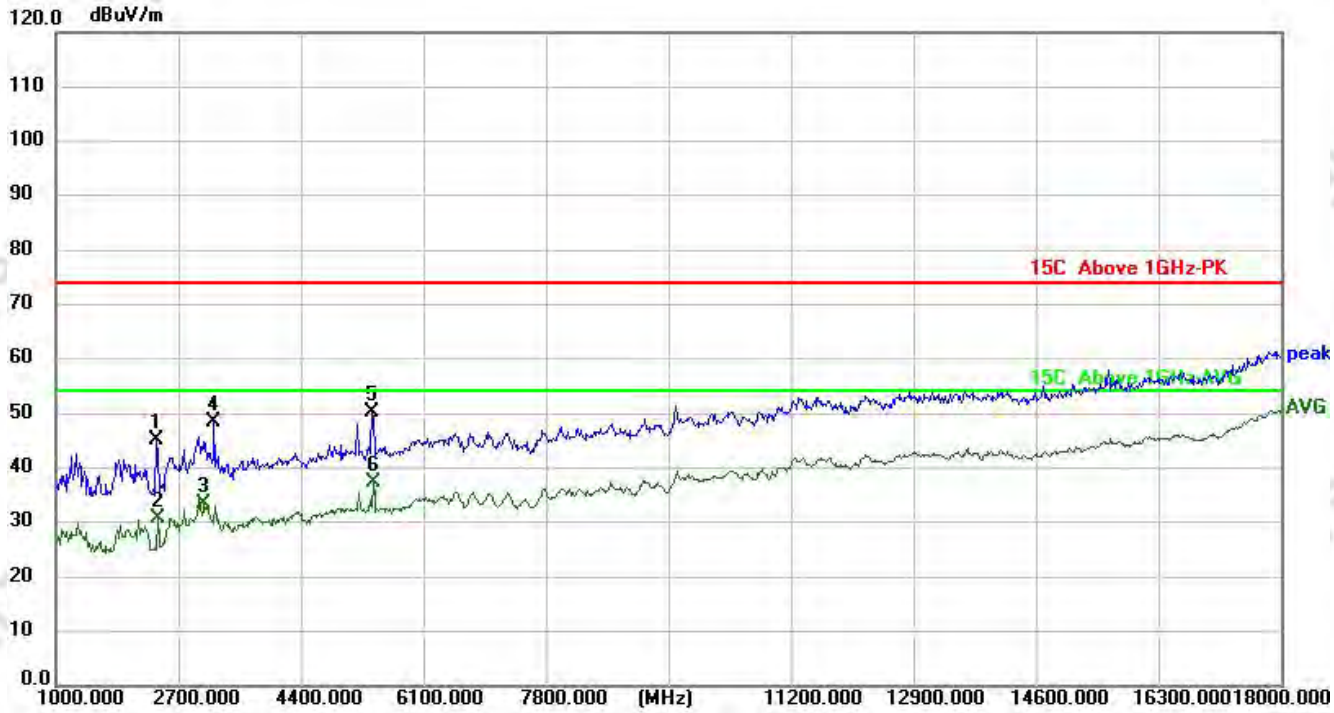
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	1289.000	62.89	-20.09	42.80	74.00	-31.20	peak
2	1306.000	51.91	-20.04	31.87	54.00	-22.13	AVG
3	3193.000	61.12	-11.78	49.34	74.00	-24.66	peak
4	3210.000	46.60	-11.76	34.84	54.00	-19.16	AVG
5	5403.000	53.73	-4.39	49.34	74.00	-24.66	peak
6 *	5403.000	40.69	-4.39	36.30	54.00	-17.70	AVG

Polarization	Vertical	Mode	3DH5_2441



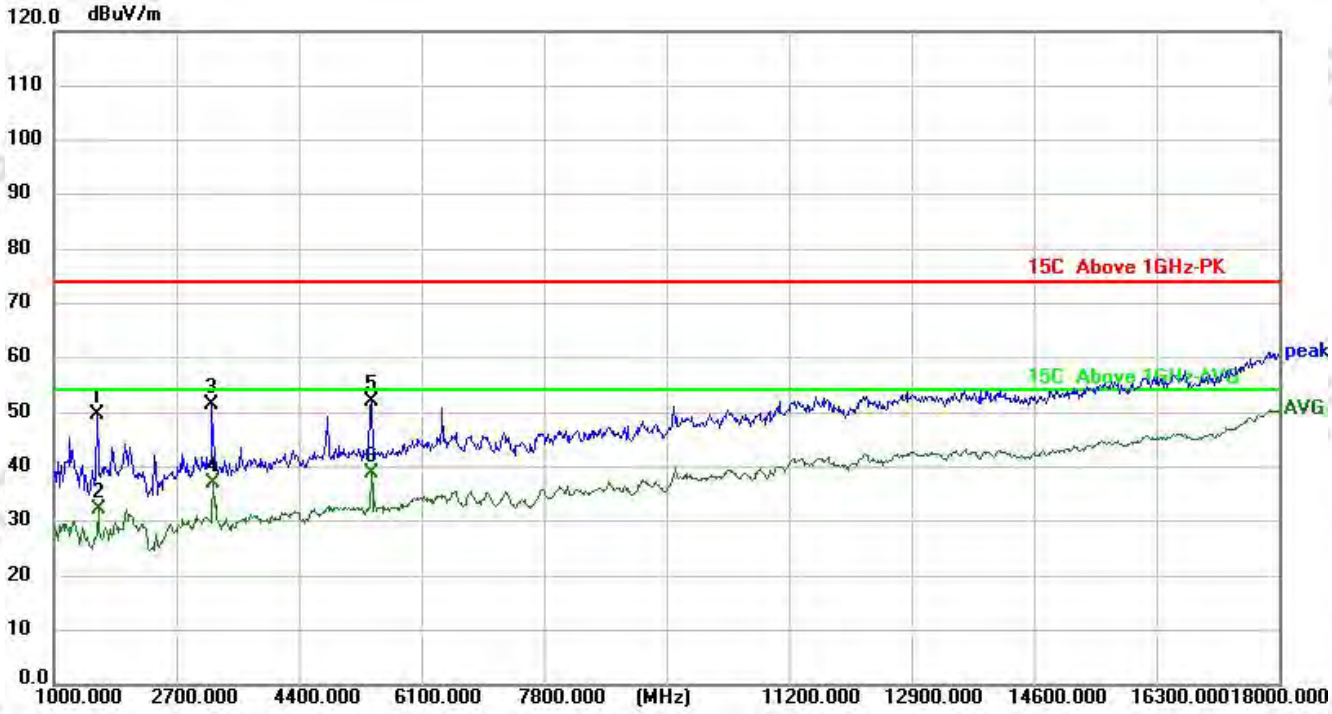
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	3193.000	68.53	-11.78	56.75	74.00	-17.25	peak
2	3210.000	51.94	-11.76	40.18	54.00	-13.82	AVG
3	5199.000	57.72	-4.74	52.98	74.00	-21.02	peak
4	5216.000	45.13	-4.71	40.42	54.00	-13.58	AVG
5	10384.000	59.85	5.78	65.63	74.00	-8.37	peak
6 *	10418.000	41.00	5.86	46.86	54.00	-7.14	AVG

Polarization	Horizontal	Mode	3DH5_2480



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	2394.000	61.06	-15.87	45.19	74.00	-28.81	peak
2	2411.000	46.50	-15.78	30.72	54.00	-23.28	AVG
3	3057.000	45.75	-12.24	33.51	54.00	-20.49	AVG
4	3193.000	60.35	-11.78	48.57	74.00	-25.43	peak
5	5386.000	54.55	-4.41	50.14	74.00	-23.86	peak
6 *	5403.000	41.67	-4.39	37.28	54.00	-16.72	AVG

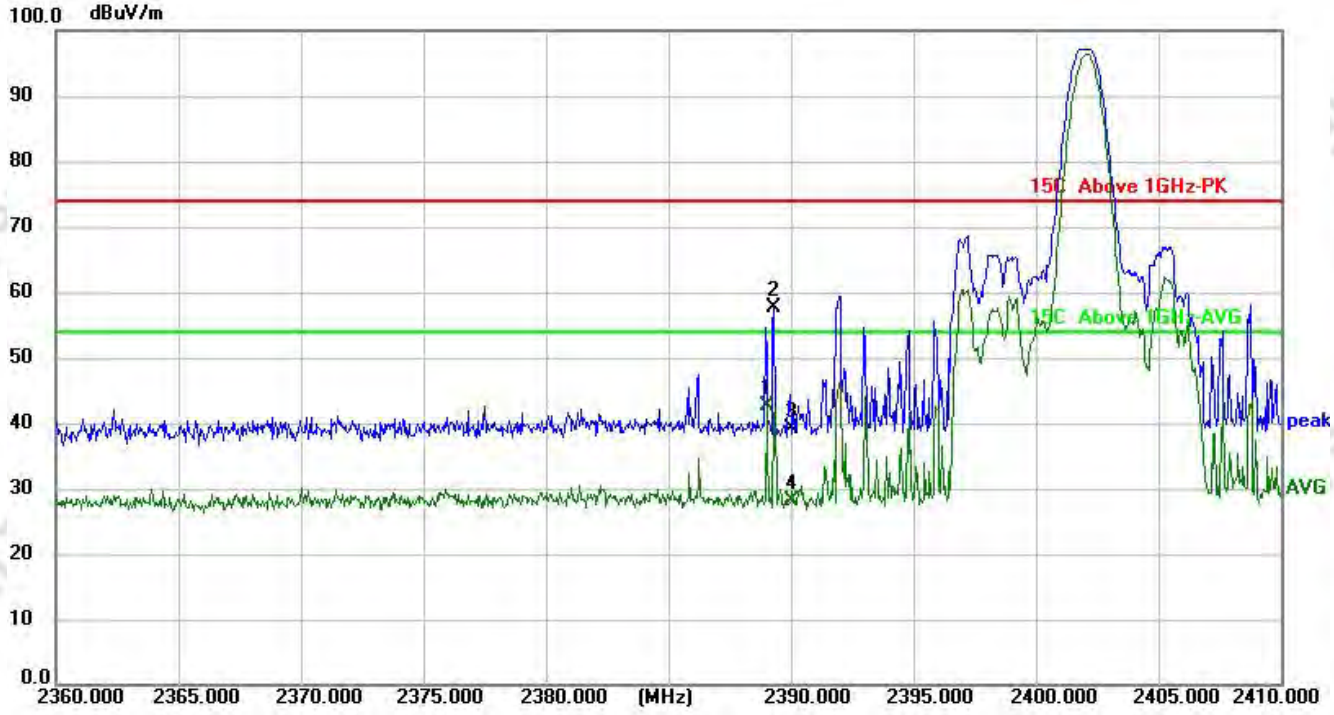
Polarization	Vertical	Mode	3DH5_2480



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	1595.000	69.61	-19.82	49.79	74.00	-24.21	peak
2	1612.000	52.10	-19.80	32.30	54.00	-21.70	AVG
3	3193.000	63.30	-11.78	51.52	74.00	-22.48	peak
4	3210.000	48.84	-11.76	37.08	54.00	-16.92	AVG
5	5403.000	56.33	-4.39	51.94	74.00	-22.06	peak
6 *	5403.000	43.14	-4.39	38.75	54.00	-15.25	AVG

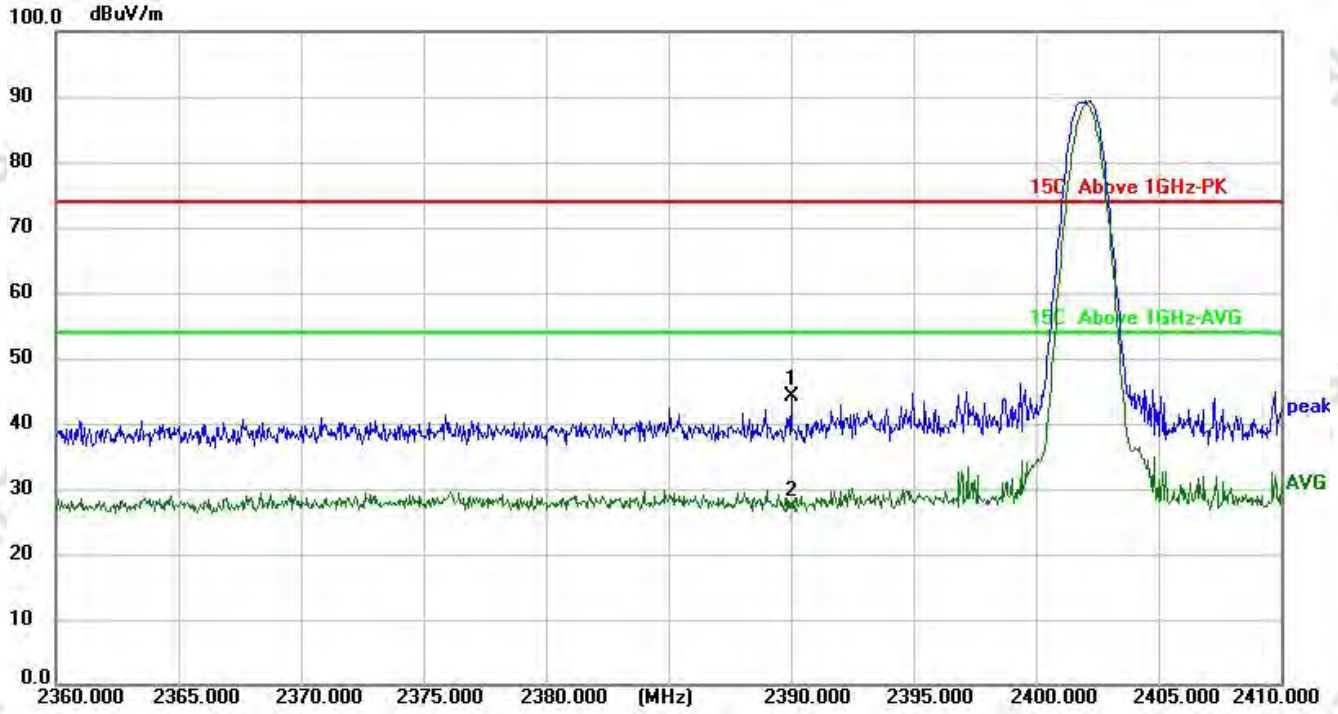
3.8.5. Test Result of Restricted Band

Polarization	Horizontal	Mode	DH5_2402



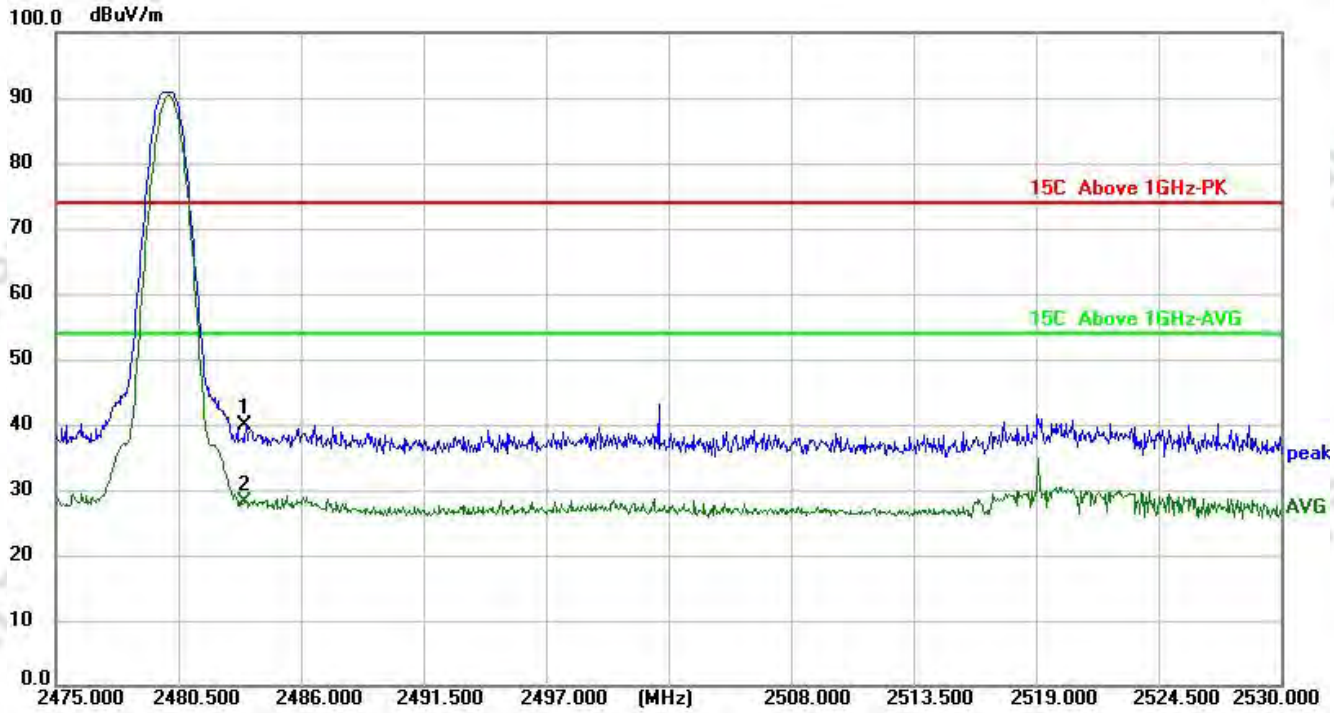
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1 *	2389.000	58.44	-15.88	42.56	54.00	-11.44	AVG
2	2389.300	73.58	-15.88	57.70	74.00	-16.30	peak
3	2390.000	55.13	-15.88	39.25	74.00	-34.75	peak
4	2390.000	43.96	-15.88	28.08	54.00	-25.92	AVG

Polarization	Vertical	Mode	DH5_2402



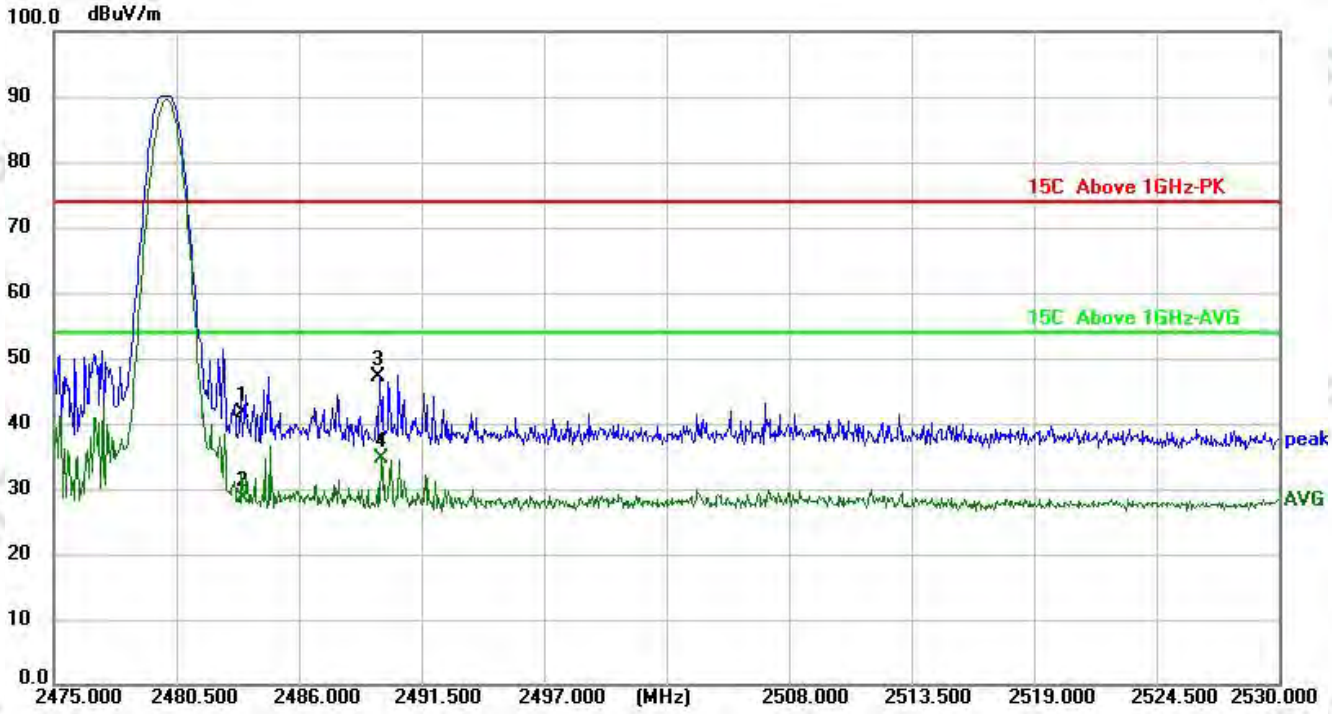
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	2390.000	59.95	-15.88	44.07	74.00	-29.93	peak
2 *	2390.000	43.01	-15.88	27.13	54.00	-26.87	AVG

Polarization	Horizontal	Mode	DH5_2480



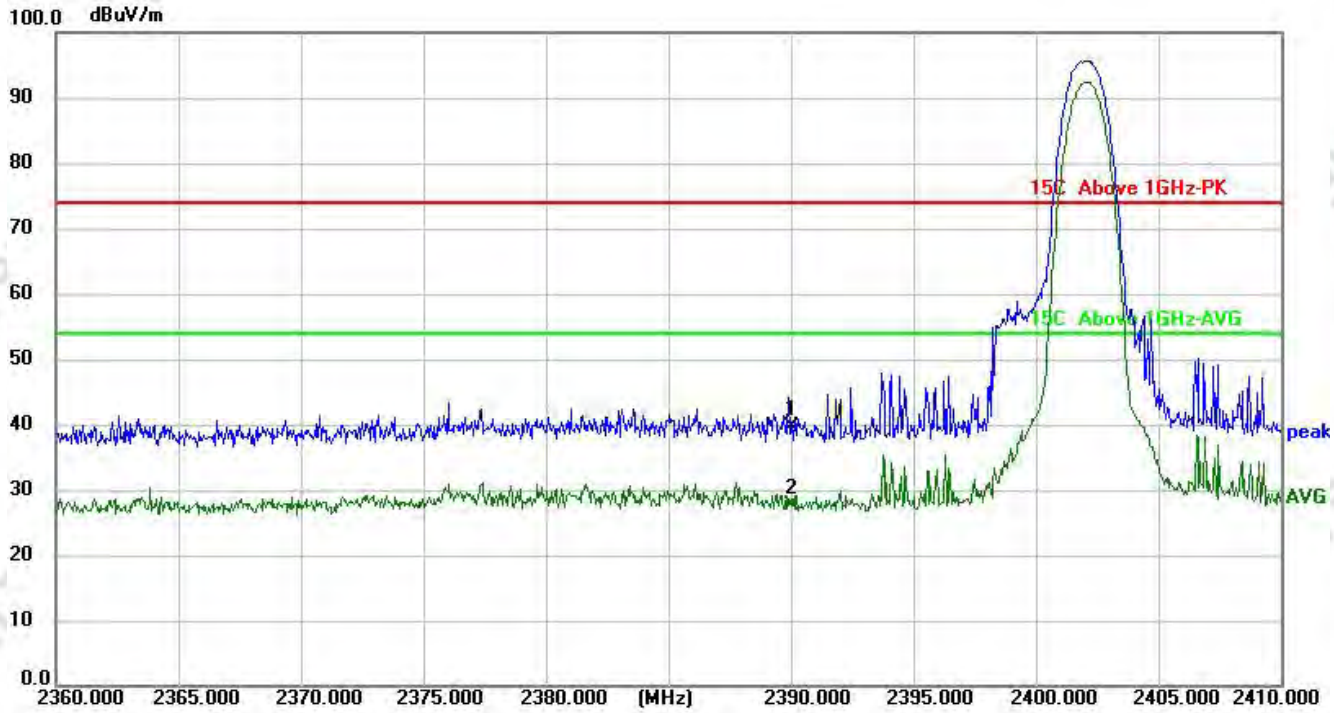
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	2483.500	55.16	-15.30	39.86	74.00	-34.14	peak
2 *	2483.500	43.46	-15.30	28.16	54.00	-25.84	AVG

Polarization	Vertical	Mode	DH5_2480



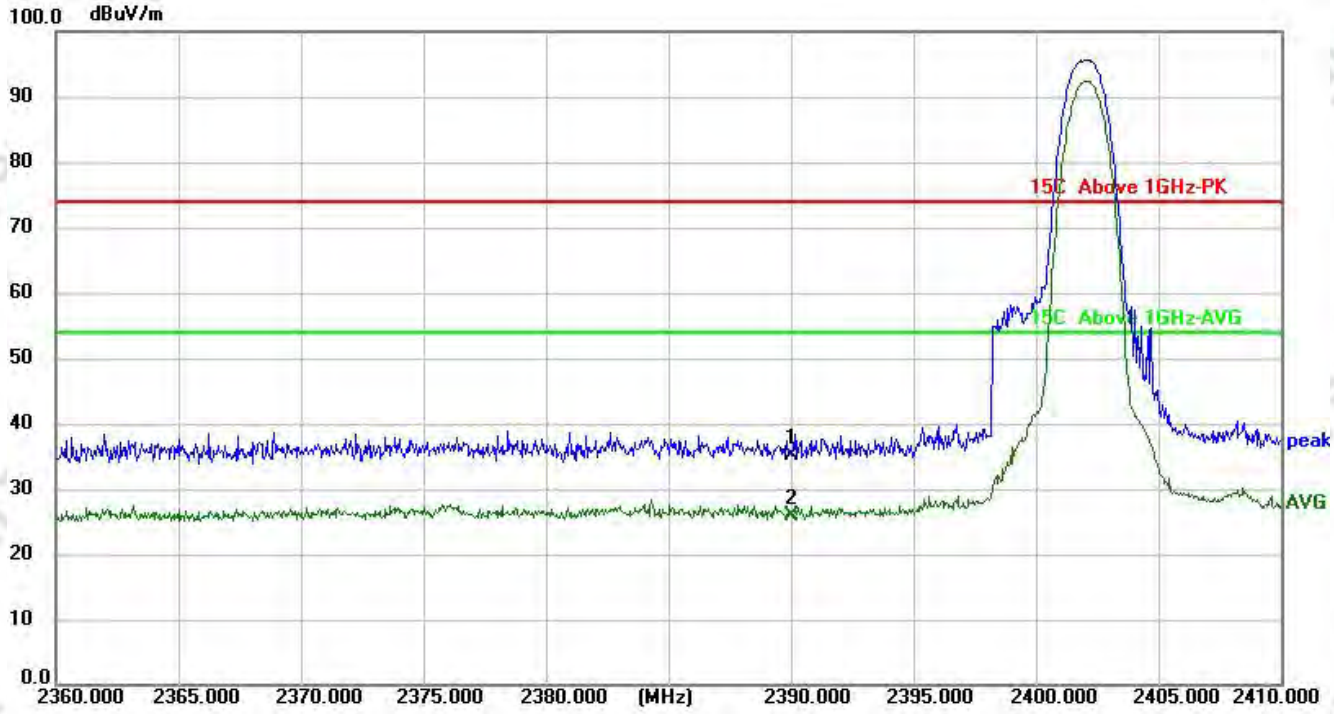
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	2483.500	56.99	-15.30	41.69	74.00	-32.31	peak
2	2483.500	43.83	-15.30	28.53	54.00	-25.47	AVG
3	2489.630	62.33	-15.26	47.07	74.00	-26.93	peak
4 *	2489.685	49.88	-15.26	34.62	54.00	-19.38	AVG

Polarization	Horizontal	Mode	2DH5_2402



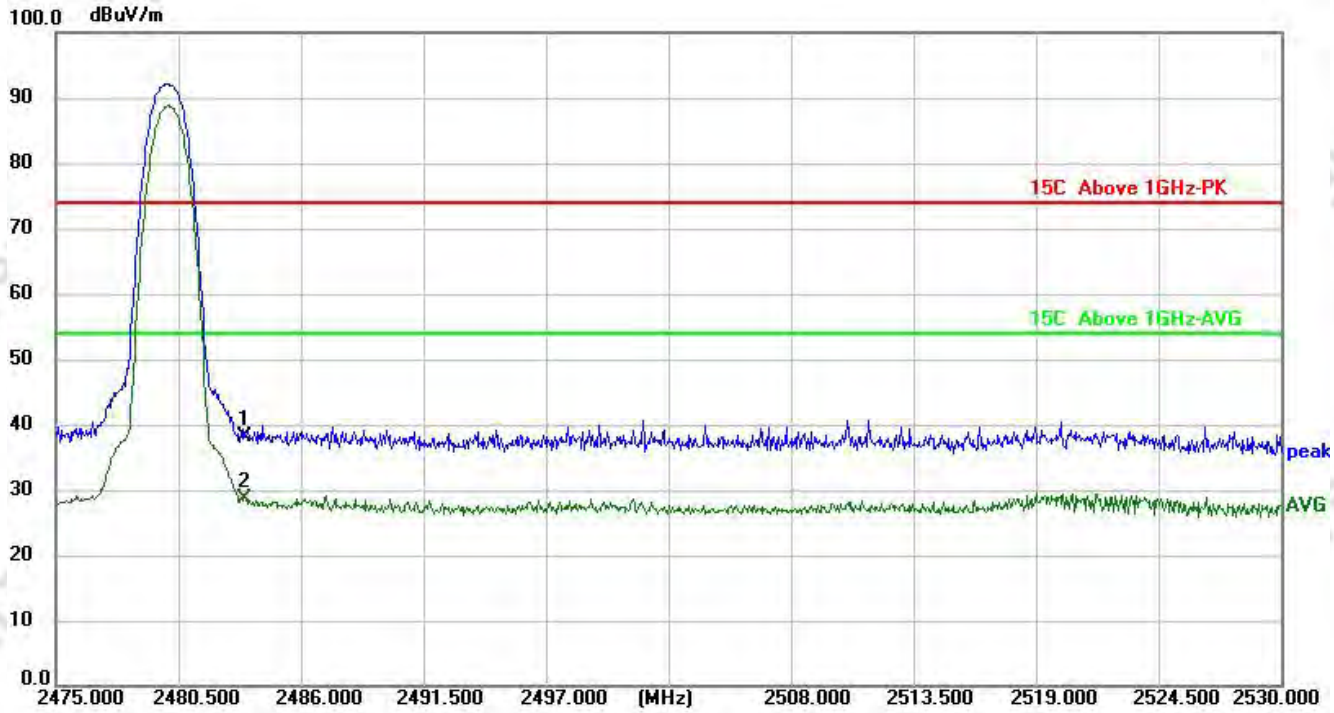
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	2390.000	55.41	-15.88	39.53	74.00	-34.47	peak
2 *	2390.000	43.45	-15.88	27.57	54.00	-26.43	AVG

Polarization	Vertical	Mode	2DH5_2402



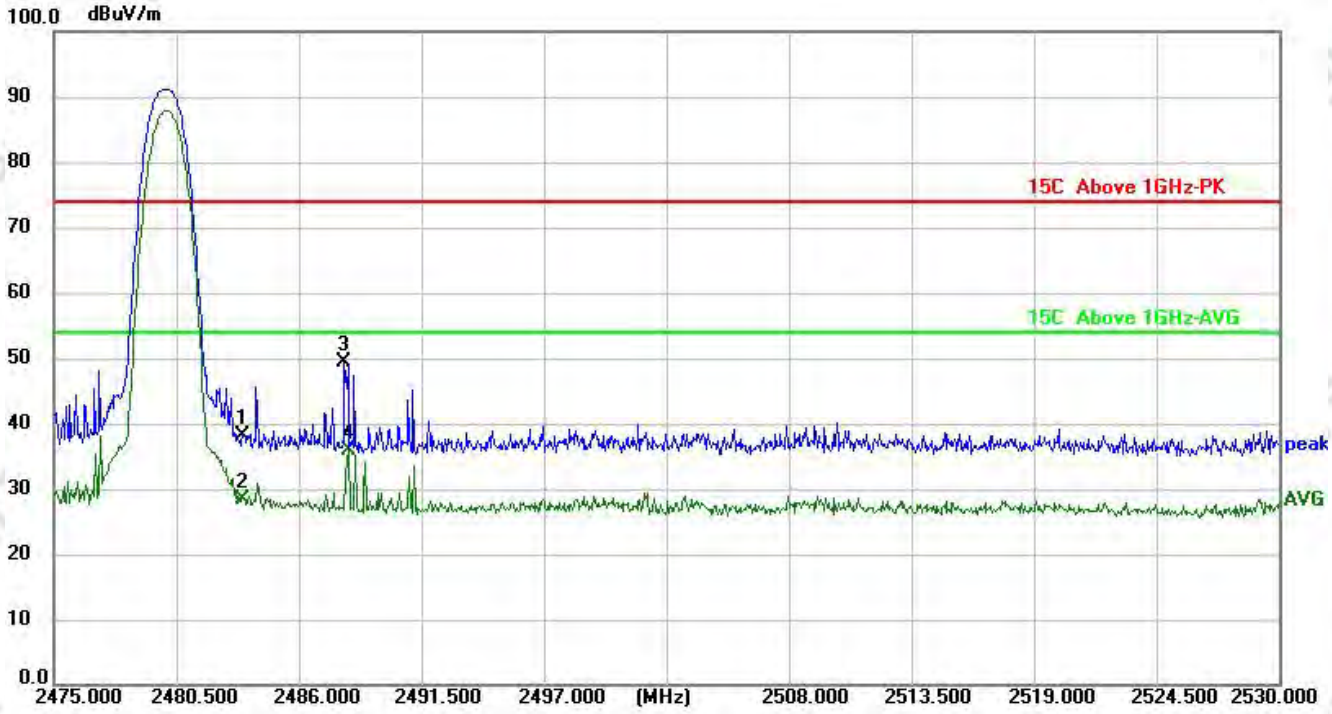
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	2390.000	50.89	-15.88	35.01	74.00	-38.99	peak
2 *	2390.000	41.71	-15.88	25.83	54.00	-28.17	AVG

Polarization	Horizontal	Mode	2DH5_2480



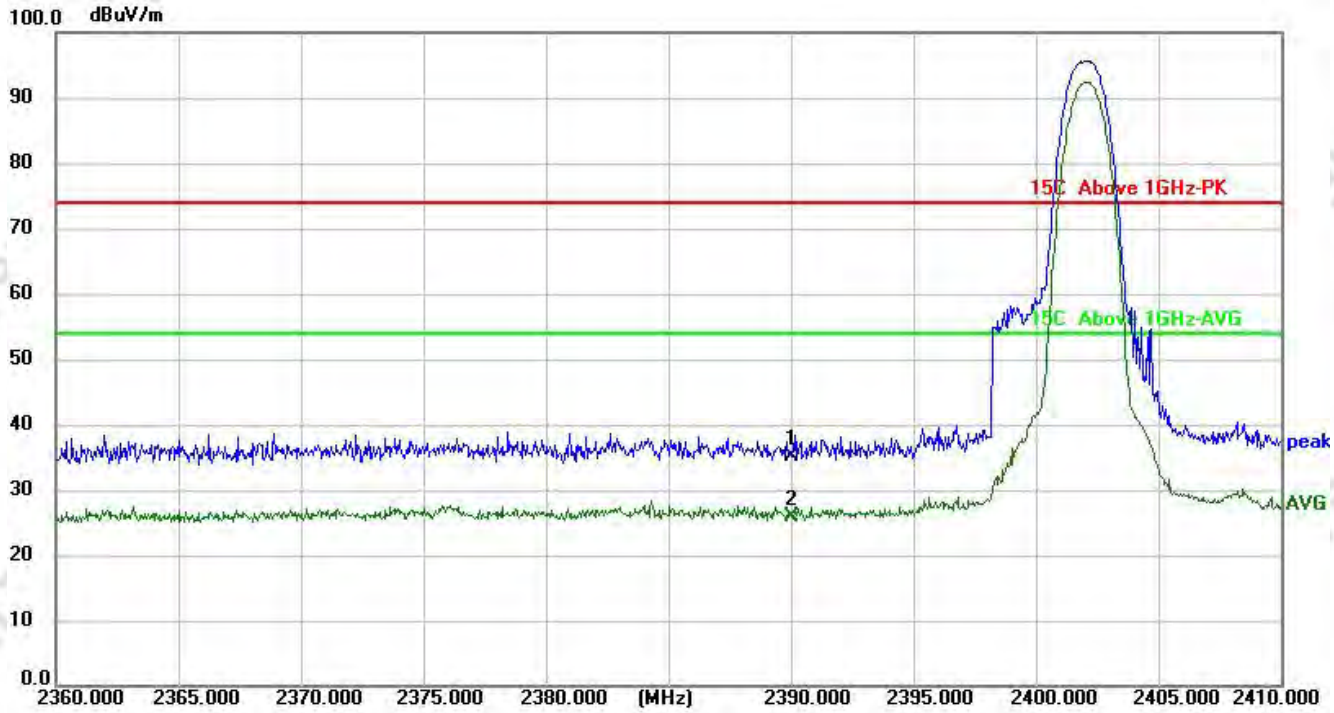
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	2483.500	53.52	-15.30	38.22	74.00	-35.78	peak
2 *	2483.500	44.03	-15.30	28.73	54.00	-25.27	AVG

Polarization	Vertical	Mode	2DH5_2480



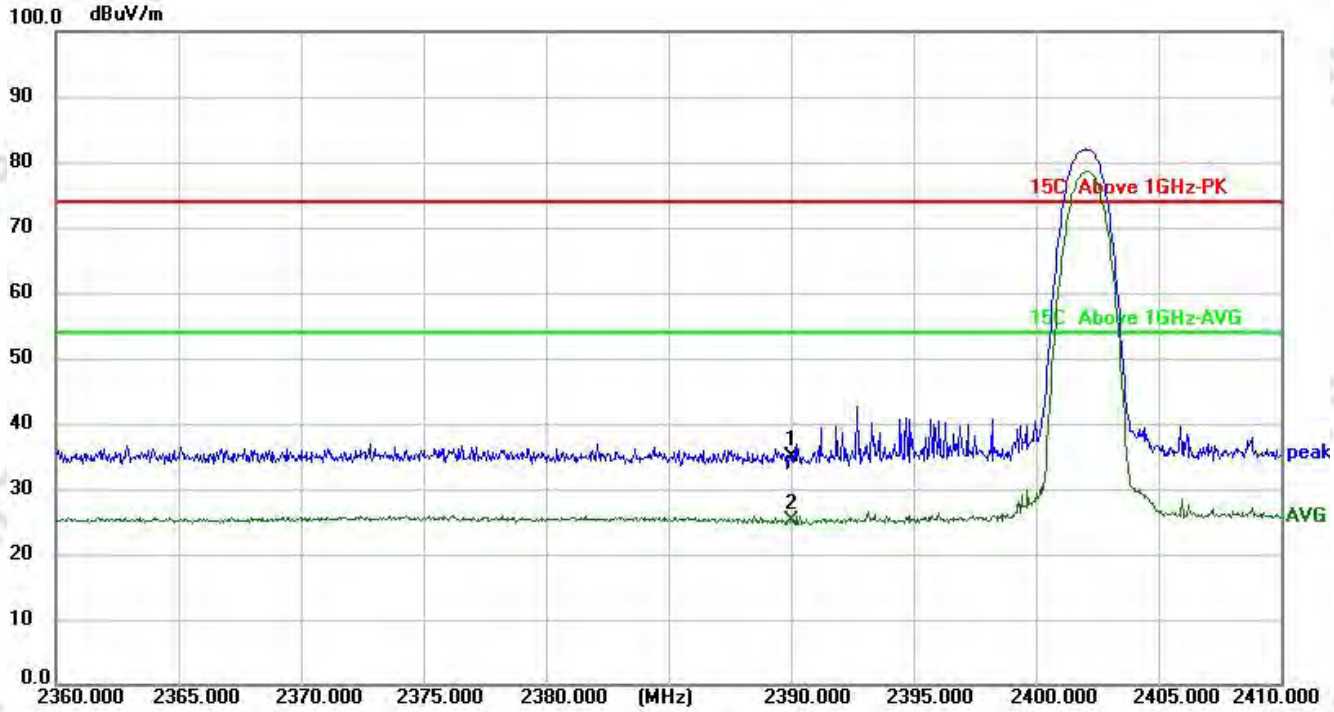
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	2483.500	53.44	-15.30	38.14	74.00	-35.86	peak
2	2483.500	43.63	-15.30	28.33	54.00	-25.67	AVG
3	2488.035	64.68	-15.27	49.41	74.00	-24.59	peak
4 *	2488.255	51.08	-15.27	35.81	54.00	-18.19	AVG

Polarization	Horizontal	Mode	3DH5_2402



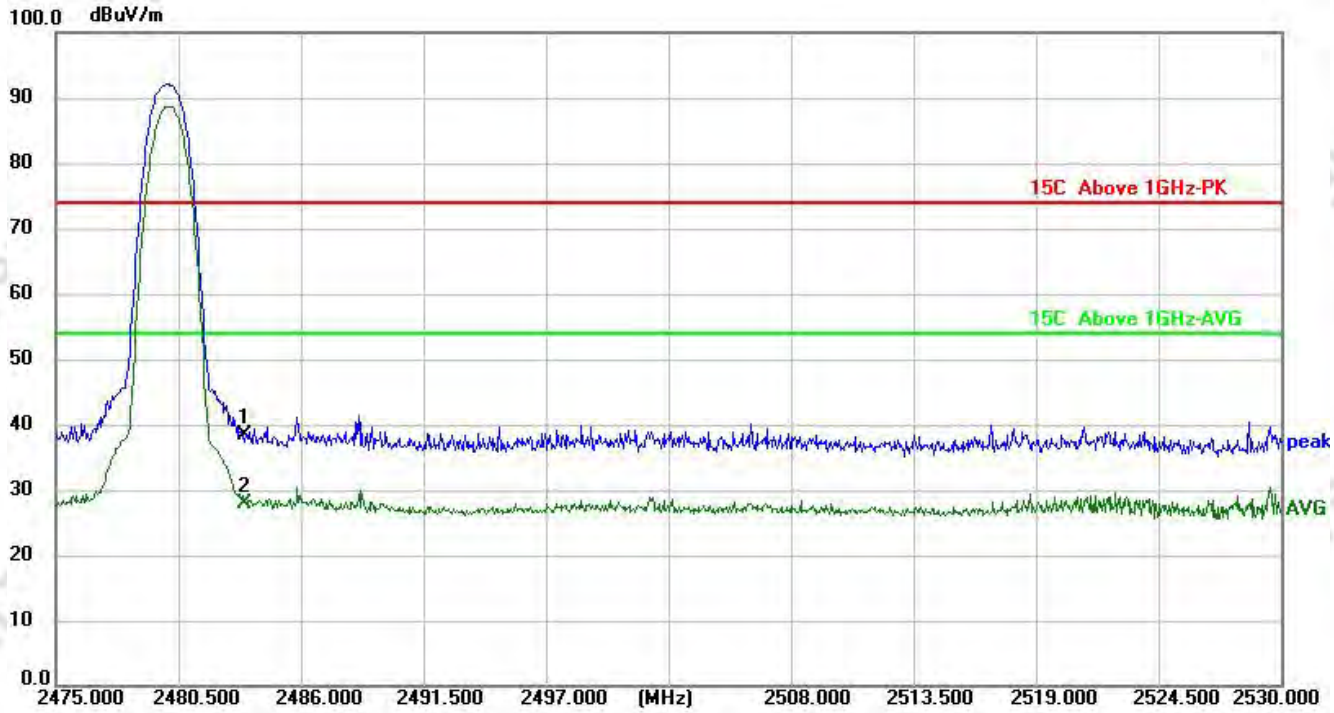
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	2390.000	50.89	-15.88	35.01	74.00	-38.99	peak
2 *	2390.000	41.71	-15.88	25.83	54.00	-28.17	AVG

Polarization	Vertical	Mode	3DH5_2402



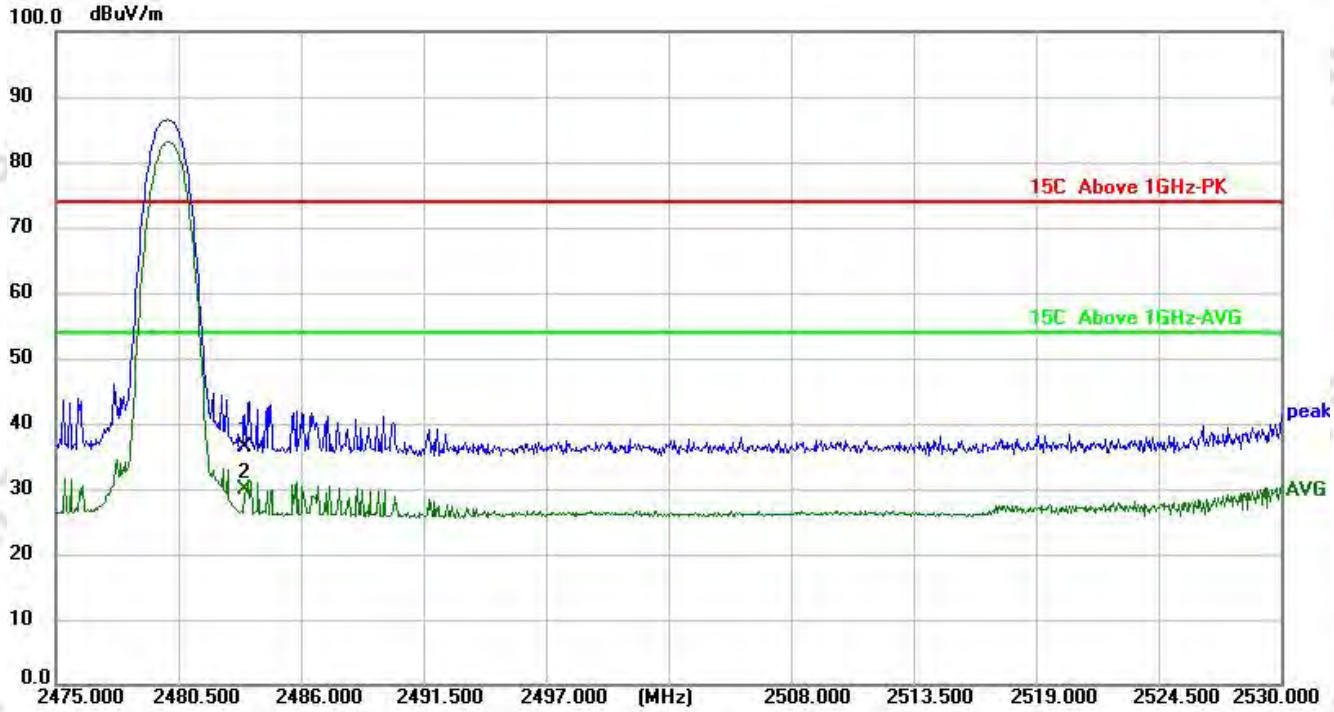
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	2390.000	50.76	-15.88	34.88	74.00	-39.12	peak
2 *	2390.000	40.98	-15.88	25.10	54.00	-28.90	AVG

Polarization	Horizontal	Mode	3DH5_2480



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	2483.500	53.56	-15.30	38.26	74.00	-35.74	peak
2 *	2483.500	43.27	-15.30	27.97	54.00	-26.03	AVG

Polarization	Vertical	Mode	3DH5_2480



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	2483.500	51.56	-15.30	36.26	74.00	-37.74	peak
2 *	2483.500	45.11	-15.30	29.81	54.00	-24.19	AVG

3.9. AC Power-Line Conducted Emission

3.9.1. Limit

47 CFR 15.207(a): For an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table:

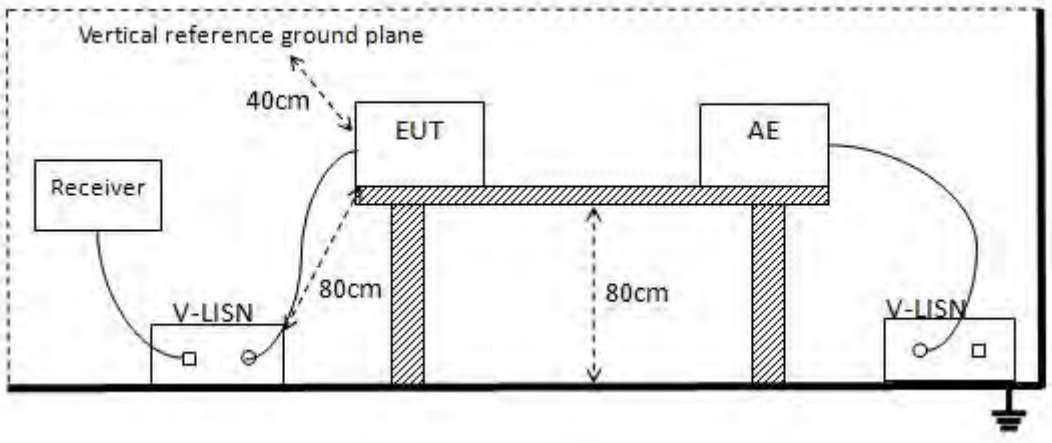
Frequency of emission (MHz)	Conducted limit (dBμV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

*Decreases with the logarithm of the frequency.

3.9.2. Test Procedure

1. The EUT was placed 0.4 meter from the conducting wall of the shielding room was kept at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connecting to the other LISN.
4. The LISN provides 50 ohm coupling impedance for the measuring instrument.
5. The FCC states that a 50 ohm, 50 microhenry LISN should be used.
6. Both sides of AC line were checked for maximum conducted interference.
7. The frequency range from 150 kHz to 30 MHz was searched.
8. Set the test-receiver system to Peak Detect Function and specified bandwidth (IF Bandwidth = 9 kHz) with Maximum Hold Mode. Then measurement is also conducted by Average Detector and Quasi-Peak Detector Function respectively.

3.9.3. Test Setup



3.9.4. Test Result of AC Power-Line Conducted Emission

Note:

Please refer to the Appendix A

3.10. Antenna Requirement

3.10.1. Standard Requirement

According to *47 CFR 15.203*, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

3.10.2. EUT Antenna

The antenna used for the EUT is FPC antenna, which meets the antenna requirements.

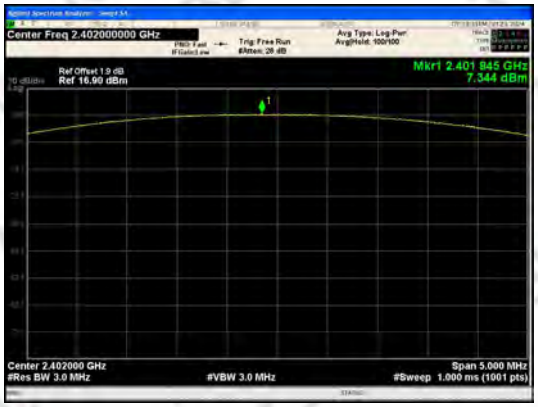
4. Appendix A of data

Conducted Output Power

Test Result

Modulation	Packet Type	Channel	Peak Output Power (dBm)	Peak Output Power (mW)	Limit (dBm)	Result
GFSK	DH5	0	7.344	5.425	⩽30	PASS
		39	7.021	5.036		PASS
		78	5.927	3.915		PASS
π/4DQPSK	2-DH5	0	10.589	11.452	⩽20.97	PASS
		39	10.305	10.728		PASS
		78	9.203	8.323		PASS
8DPSK	3-DH5	0	10.561	11.379		PASS
		39	10.215	10.508		PASS
		78	9.118	8.162		PASS

Test Graphs

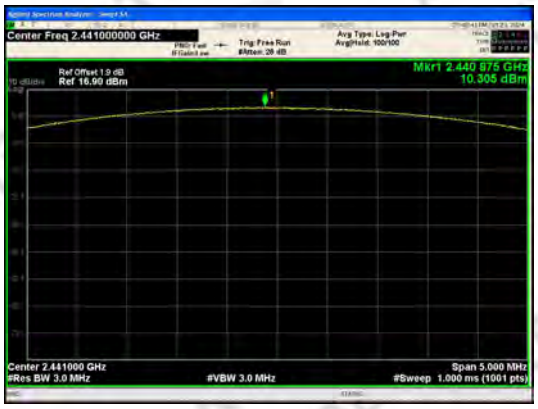


Peak Output Power
GFSK_Channel 0

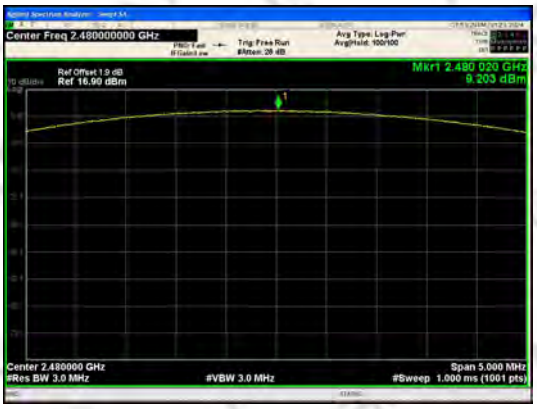
Peak Output Power
GFSK_Channel 39

Peak Output Power
GFSK_Channel 78

Peak Output Power
π/4DQPSK_Channel 0



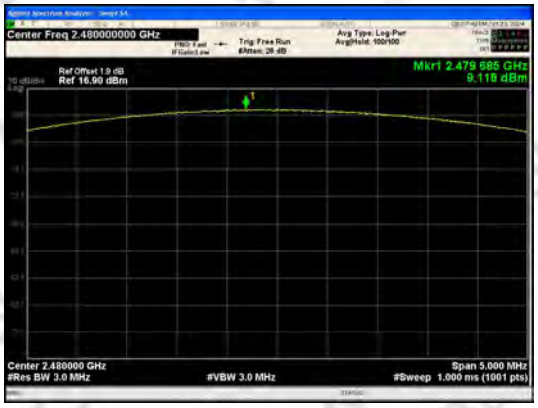
Peak Output Power
π/4DQPSK_Channel 39



Peak Output Power
π/4DQPSK_Channel 78

Peak Output Power
8DPSK_Channel 0

Peak Output Power
8DPSK_Channel 39



Peak Output Power
8DPSK_Channel 78

99% Bandwidth

Test Result

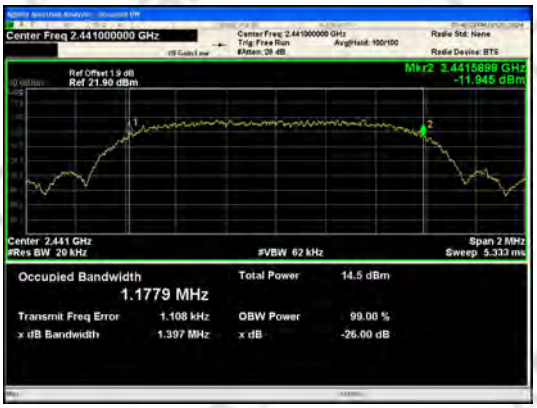
Modulation	Channel	Center Frequency (MHz)	99% BW (MHz)
GFSK	0	2402	0.88094
	39	2441	0.87199
	78	2480	0.87521
π/4DQPSK	0	2402	1.1903
	39	2441	1.1779
	78	2480	1.1937
8DPSK	0	2402	1.1973
	39	2441	1.1908
	78	2480	1.1894

Test Graphs

GFSK_DH5_Channel 0

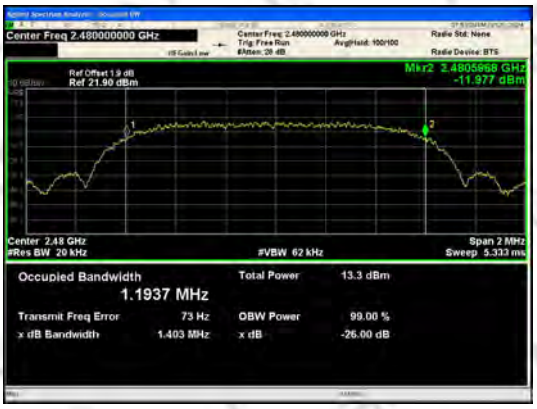
π/4DQPSK_2-DH5_Channel 0

GFSK_DH5_Channel 39



π/4DQPSK_2-DH5_Channel 39

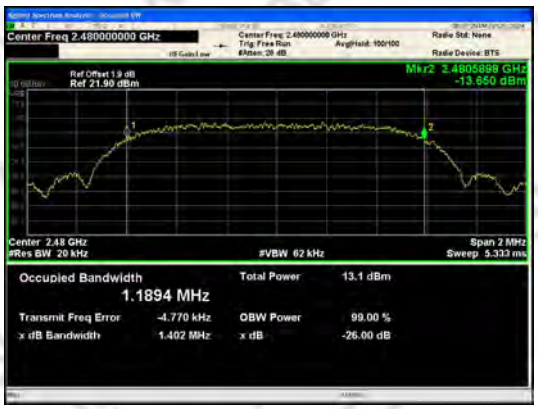
GFSK_DH5_Channel 78



π/4DQPSK_2-DH5_Channel 78

8DPSK_3-DH5_Channel 0

8DPSK_3-DH5_Channel 39



8DPSK_3-DH5_Channel 78

20dB Bandwidth

Test Result

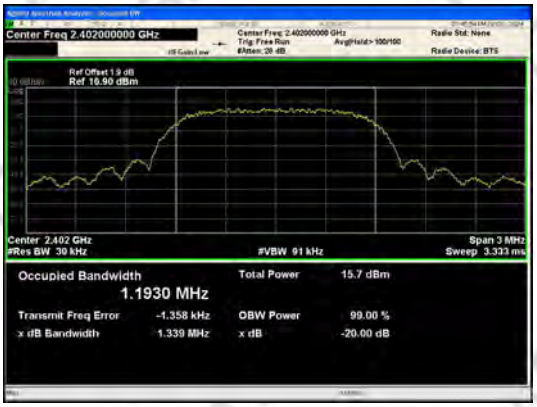
Modulation	Channel	Center Frequency (MHz)	20 dB Bandwidth (MHz)
GFSK	0	2402 MHz	0.9596
	39	2441 MHz	0.9584
	78	2480 MHz	0.9572
π/4DQPSK	0	2402 MHz	1.339
	39	2441 MHz	1.352
	78	2480 MHz	1.358
8DPSK	0	2402 MHz	1.342
	39	2441 MHz	1.355
	78	2480 MHz	1.347

Test Graphs

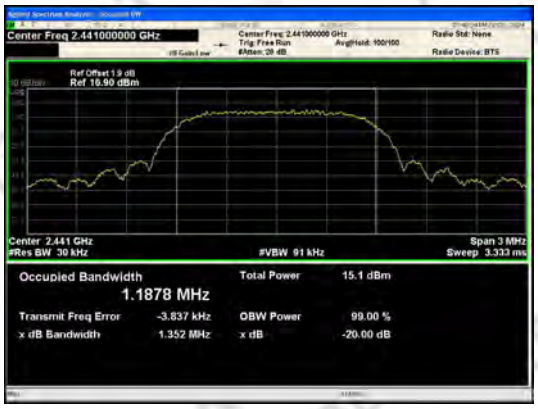
GFSK_DH5_Channel 0

GFSK_DH5_Channel 39

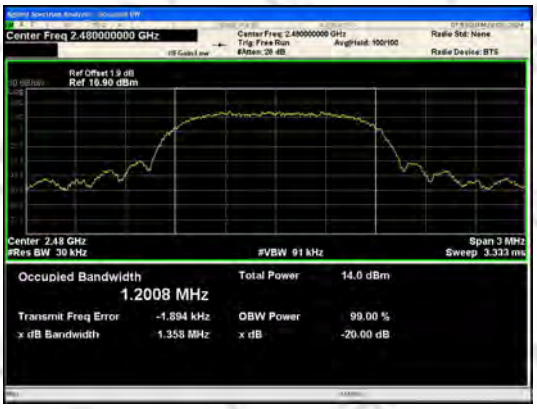
GFSK_DH5_Channel 78



π/4DQPSK_2-DH5_Channel 0

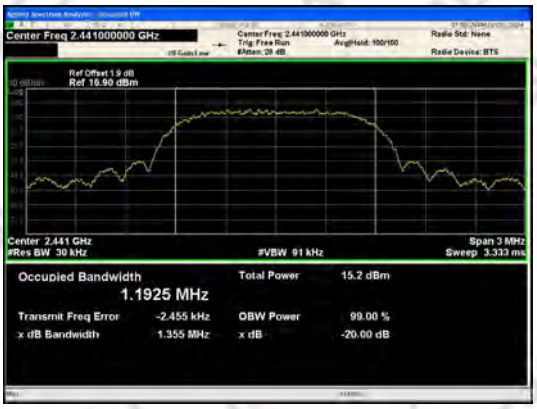


π/4DQPSK_2-DH5_Channel 39

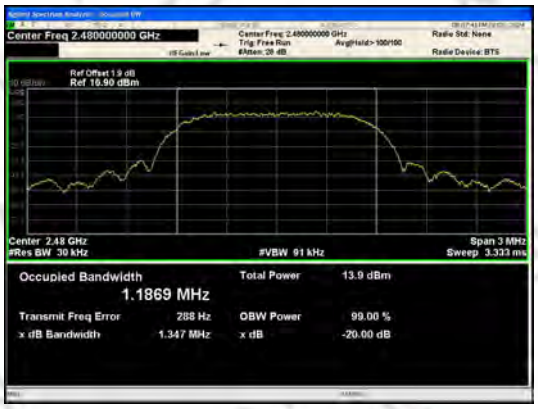


π/4DQPSK_2-DH5_Channel 78

8DPSK_3-DH5_Channel 0



8DPSK_3-DH5_Channel 39



8DPSK_3-DH5_Channel 78

Carrier Frequencies Separation

Test Result

Modulation	Packet	Left Center frequency (MHz)	Right Center frequency (MHz)	Hopping Frequency Separation (MHz)	Limit (MHz)	Result
GFSK	DH5	2439.9823	2440.8452	1	0.64	PASS
π/4DQPSK	2-DH5	2439.8248	2440.9955	1.1707	0.893	PASS
8DPSK	3-DH5	2439.8386	2441.0045	1.1659	0.895	PASS

Test Graphs

GFSK

π/4DQPSK

8DPSK

Conducted Out Of Band Emission

Test Result

Non-Hopping

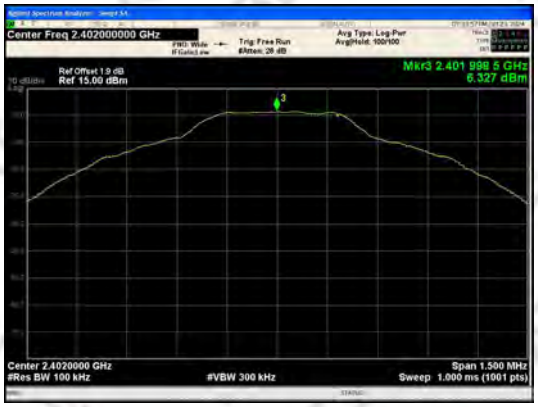
Modulation	Packet	Channel	OOB Emission Frequency (MHz)	OOB Emission Level (dBm)	Limit (dBm)	Over Limit (dB)	Result
GFSK	DH5	0	2400.00	-44.919	-13.67	-31.249	PASS
			4803.64	-62.999	-13.67	-49.329	PASS
			7205.75	-65.848	-13.67	-52.178	PASS
			9607.87	-64.478	-13.67	-50.808	PASS
			24911.4	-49.936	-13.67	-36.266	PASS
		78	2483.50	-57.975	-14.81	-43.165	PASS
			4960.33	-63.858	-14.81	-49.048	PASS
			7440.47	-64.549	-14.81	-49.739	PASS
			9920.62	-63.539	-14.81	-48.729	PASS
			24918.8	-49.561	-14.81	-34.751	PASS
π/4DQPSK	2-DH5	0	2400.00	-46.268	-13.57	-32.698	PASS
			4804.26	-61.742	-13.57	-48.172	PASS
			7205.13	-64.365	-13.57	-50.795	PASS
			9607.87	-62.952	-13.57	-49.382	PASS
			24896.4	-49.705	-13.57	-36.135	PASS
		78	2483.50	-58.611	-14.83	-43.781	PASS
			4959.70	-63.771	-14.83	-48.941	PASS
			5235.62	-45.248	-14.83	-30.418	PASS
			7439.85	-63.750	-14.83	-48.920	PASS
			9919.37	-64.913	-14.83	-50.083	PASS
8DPSK	3-DH5	0	2400.00	-45.815	-13.37	-32.445	PASS
			4803.02	-63.794	-13.37	-50.425	PASS
			7206.38	-63.703	-13.37	-50.333	PASS
			9607.87	-63.639	-13.37	-50.270	PASS
			24842.1	-49.600	-13.37	-36.230	PASS
		78	2483.50	-58.651	-15.23	-43.421	PASS
			4960.33	-63.715	-15.23	-48.485	PASS
			7439.85	-62.753	-15.23	-47.523	PASS
			9920.62	-64.229	-15.23	-48.999	PASS
			24810.8	-49.457	-15.23	-34.227	PASS

Hopping

Modulation	Packet	Channel	OOB Emission Frequency (MHz)	OOB Emission Level (dBm)	Limit (dBm)	Over Limit (dB)	Result

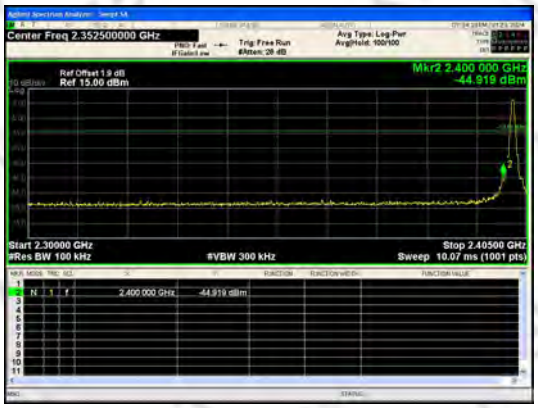
GFSK	DH5	Hopping	2400.00	-44.027	-11.07	-32.957	PASS
			2483.50	-60.351	-12.39	-47.961	PASS
π/4DQPSK	2-DH5		2400.00	-45.632	-10.03	-35.602	PASS
			2483.50	-58.607	-11.31	-47.297	PASS
8DPSK	3-DH5		2400.00	-44.813	-11.05	-33.763	PASS
			2483.50	-60.195	-12.3	-47.895	PASS

Test Graphs

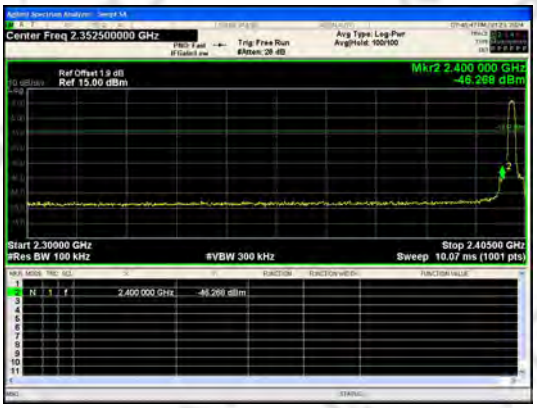


In-Band Reference Level
GFSK_DH5_Channel 0

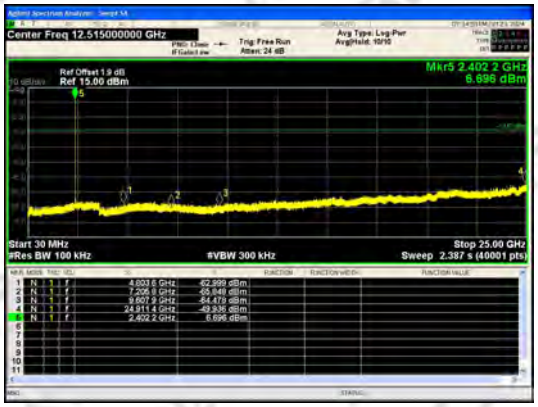
In-Band Reference Level
π/4DQPSK_2-DH5_Channel 0



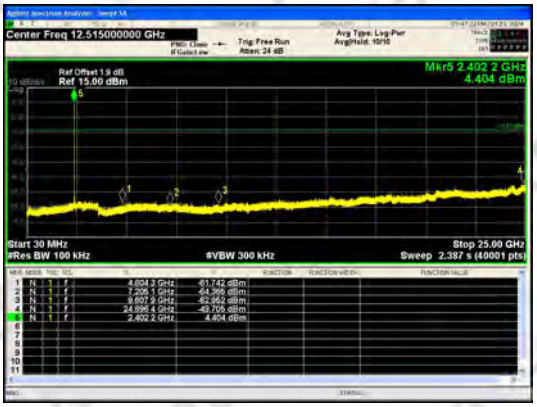
Out Of Band Emission
GFSK_DH5_Channel 0



Out Of Band Emission
π/4DQPSK_2-DH5_Channel 0



30.0 MHz - 25000.0 MHz
GFSK_DH5_Channel 0

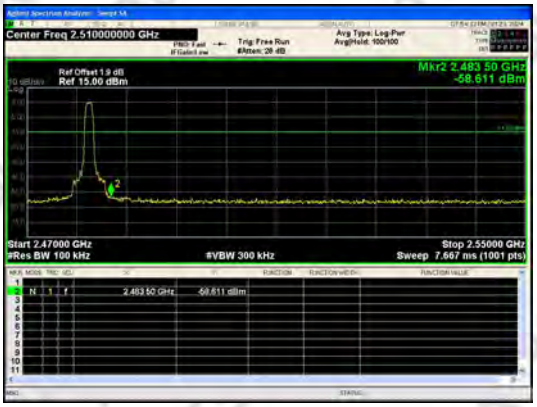


30.0 MHz - 25000.0 MHz
π/4DQPSK_2-DH5_Channel 0

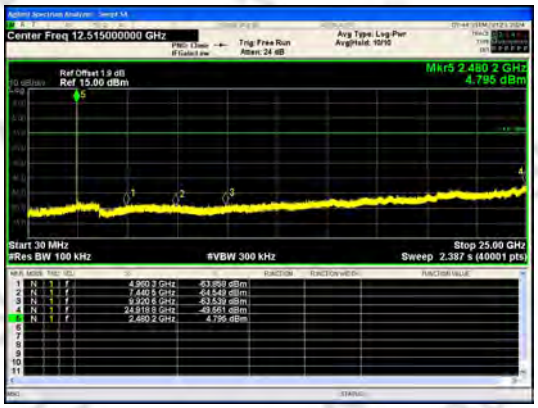
In-Band Reference Level
GFSK_DH5_Channel 78

In-Band Reference Level
π/4DQPSK_2-DH5_Channel 78

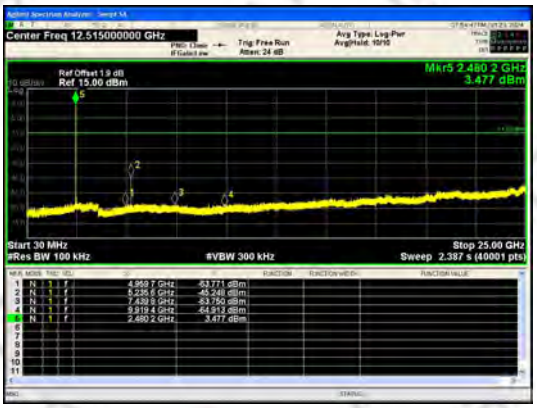
Out Of Band Emission
GFSK_DH5_Channel 78



Out Of Band Emission
π/4DQPSK_2-DH5_Channel 78

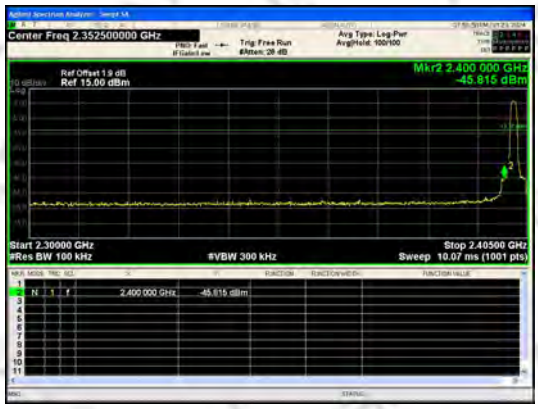


30.0 MHz - 25000.0 MHz
GFSK_DH5_Channel 78



30.0 MHz - 25000.0 MHz
π/4DQPSK_2-DH5_Channel 78

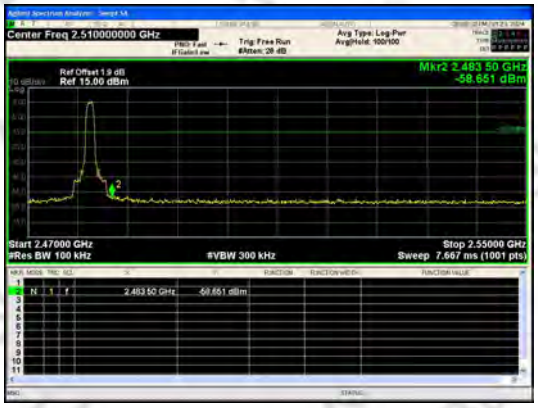
In-Band Reference Level
8DPSK_3-DH5_Channel 0



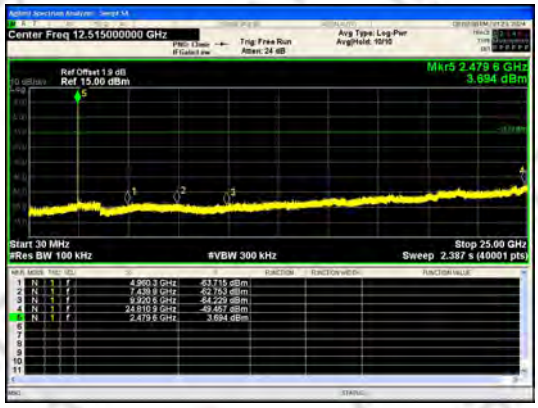
Out Of Band Emission
8DPSK_3-DH5_Channel 0

30.0 MHz - 25000.0 MHz
8DPSK_3-DH5_Channel 0

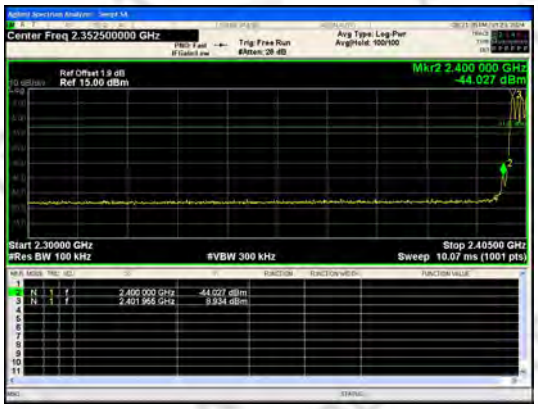
In-Band Reference Level
8DPSK_3-DH5_Channel 78



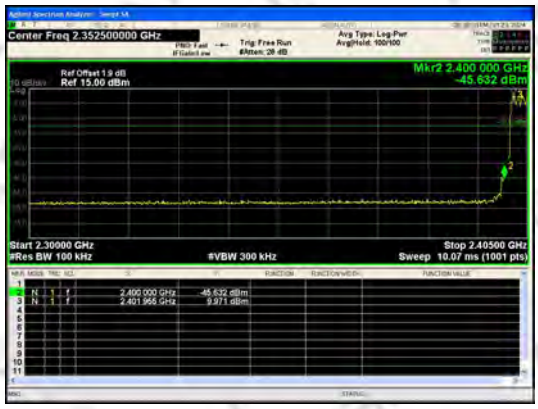
Out Of Band Emission
8DPSK_3-DH5_Channel 78



30.0 MHz - 25000.0 MHz
8DPSK_3-DH5_Channel 78



Out Of Band Emission(Left)
GFSK_DH5_Channel Hopping



Out Of Band Emission(Left)
π/4DQPSK_2-DH5_Channel Hopping

Out Of Band Emission(Right)
GFSK_DH5_Channel Hopping

Out Of Band Emission(Right)
π/4DQPSK_2-DH5_Channel Hopping

Out Of Band Emission(Left)
8DPSK_3-DH5_Channel Hopping

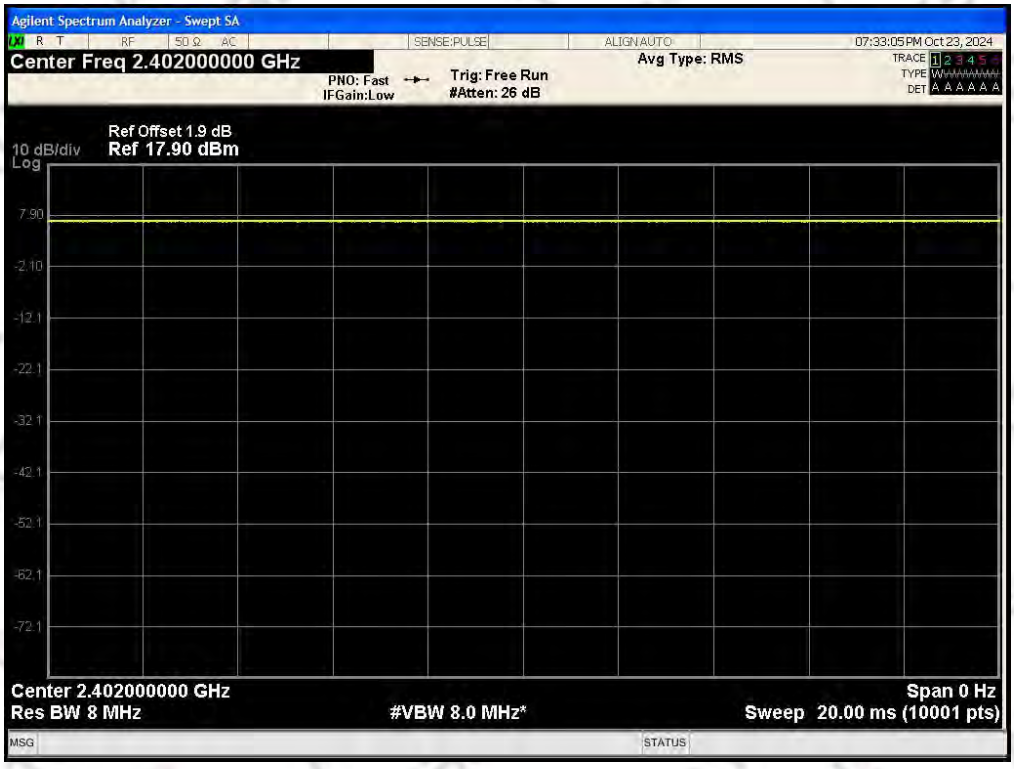
Out Of Band Emission(Right)
8DPSK_3-DH5_Channel Hopping

Duty Cycle

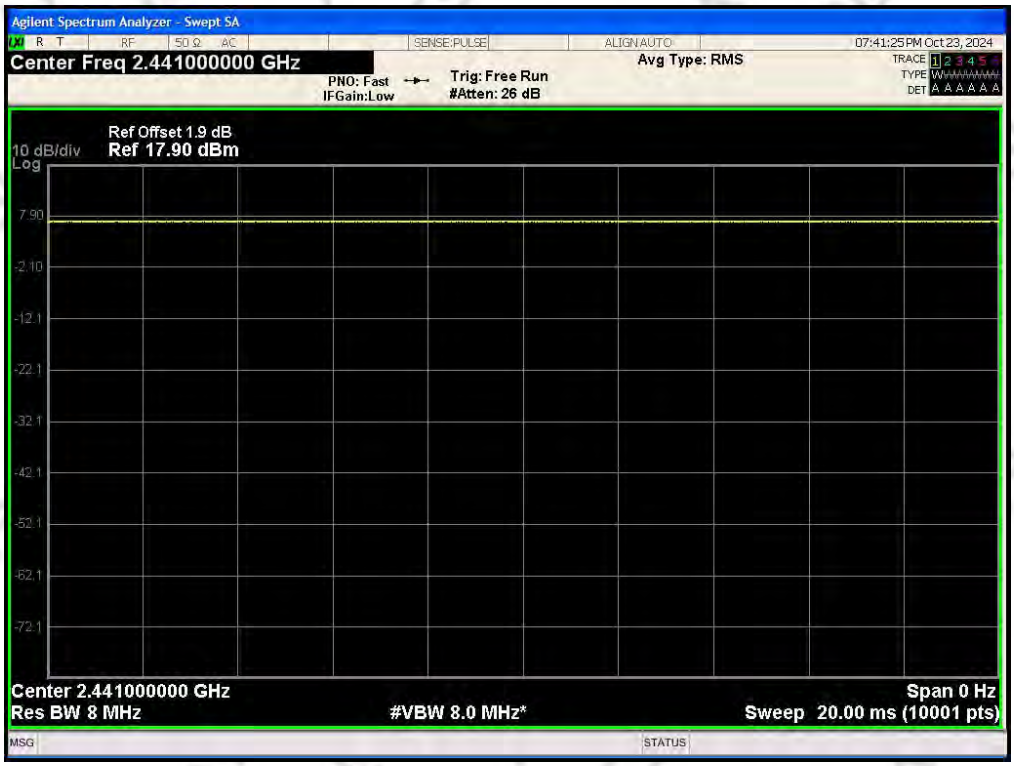
Test Result

Modulation	Packets	Channel	On Time (ms)	Period (ms)	Duty Cycle (%)
GFSK	DH5	0	20.000	20.000	100
		39	20.000	20.000	100
		78	20.000	20.000	100
π/4DQPSK	2-DH5	0	20.000	20.000	100
		39	20.000	20.000	100
		78	20.000	20.000	100
8DPSK	3-DH5	0	20.000	20.000	100
		39	20.000	20.000	100
		78	20.000	20.000	100

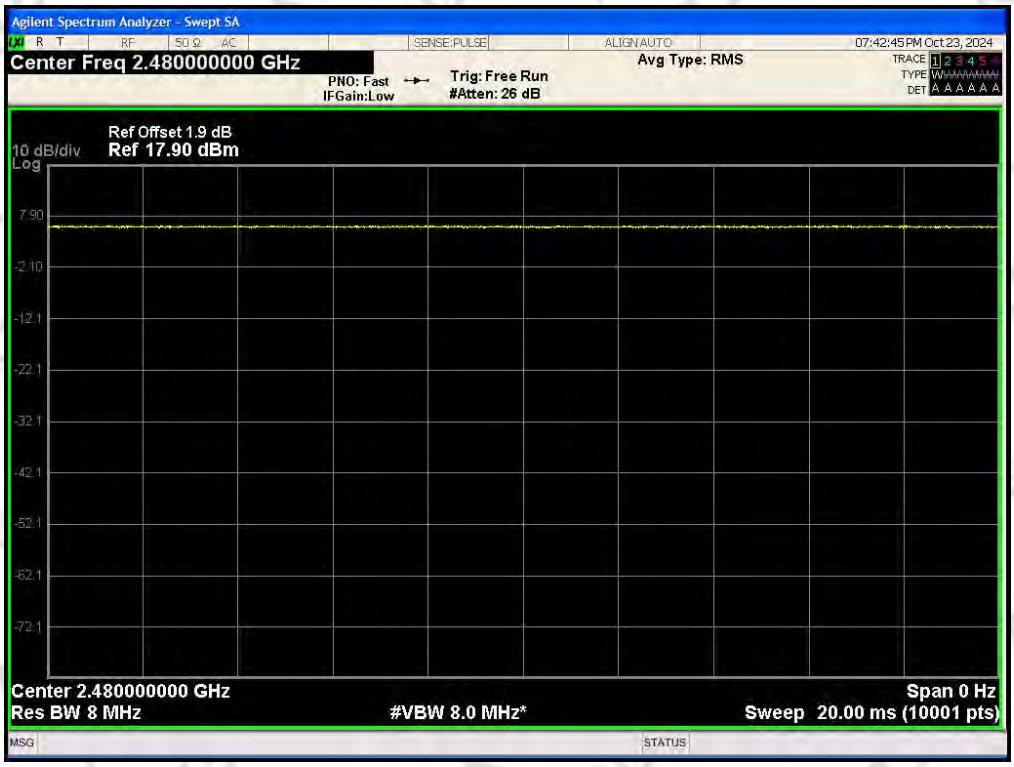
Test Graphs



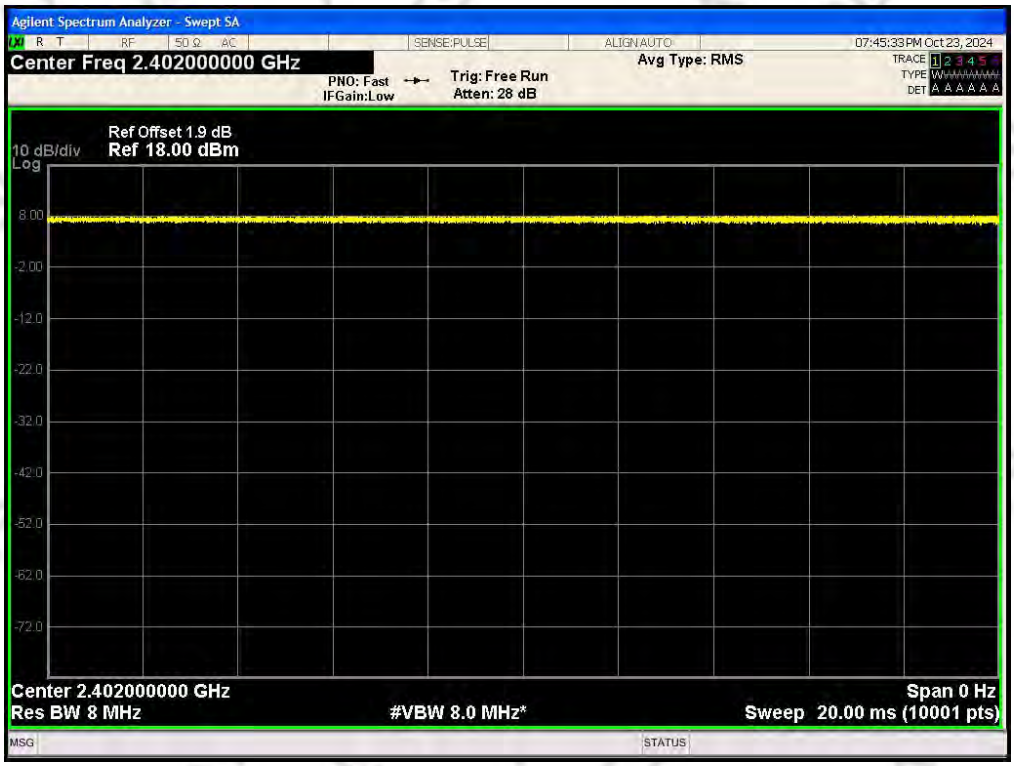
GFSK(DH5)_Channel 0



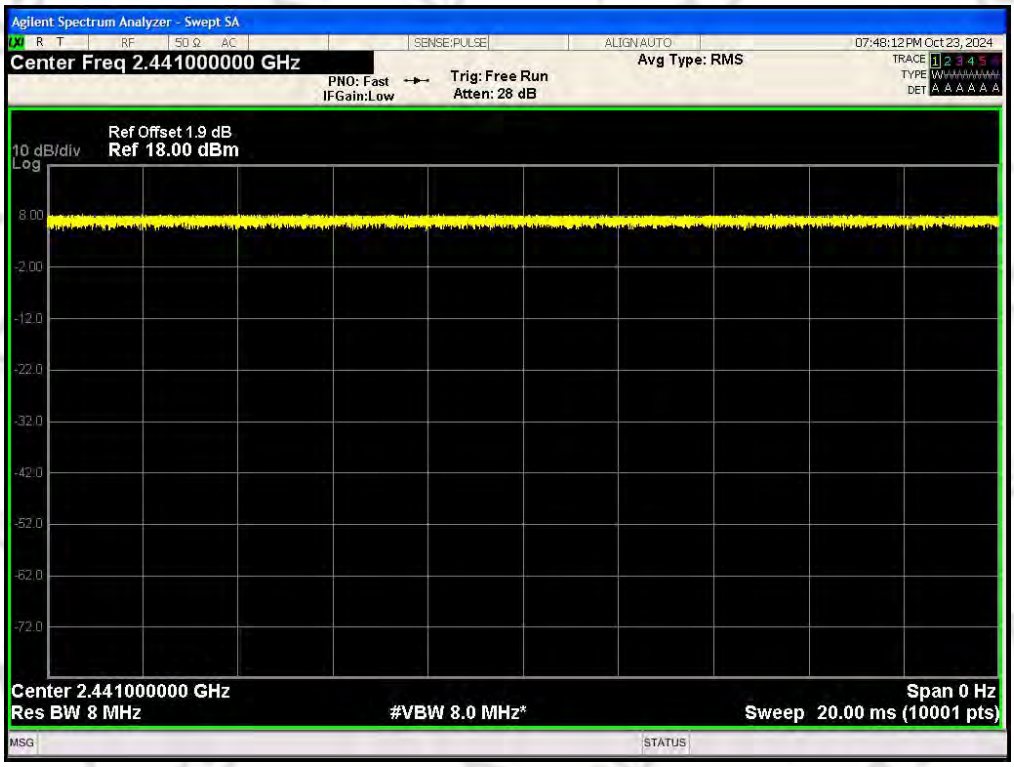
GFSK(DH5)_Channel 39



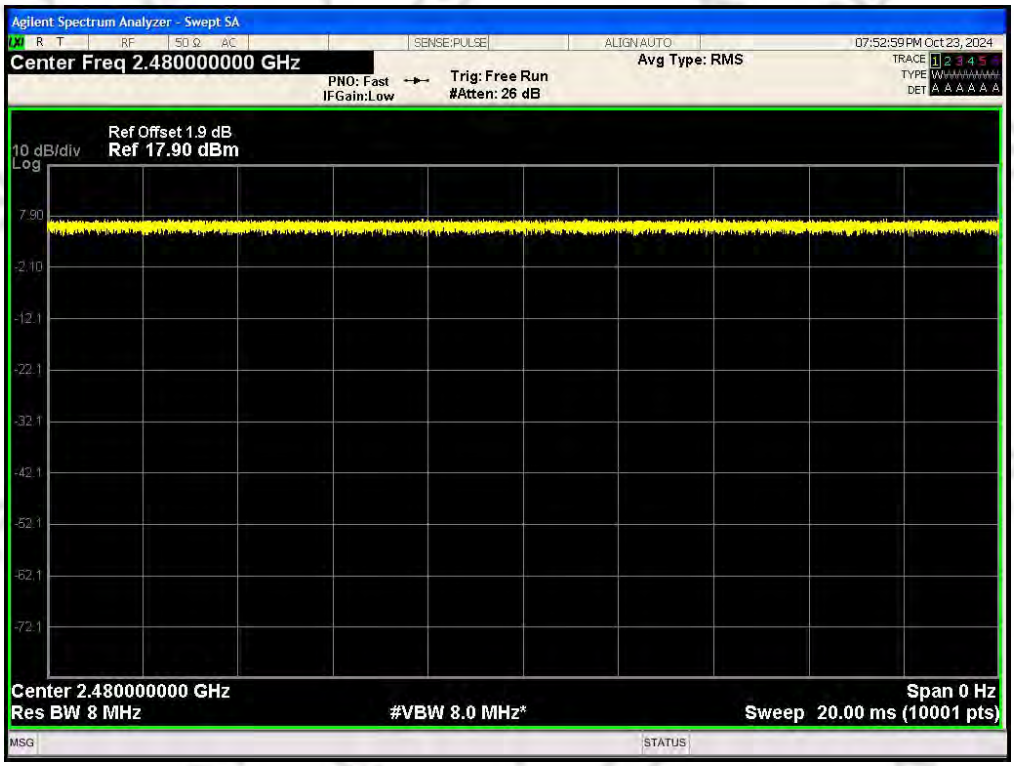
GFSK(DH5)_Channel 78



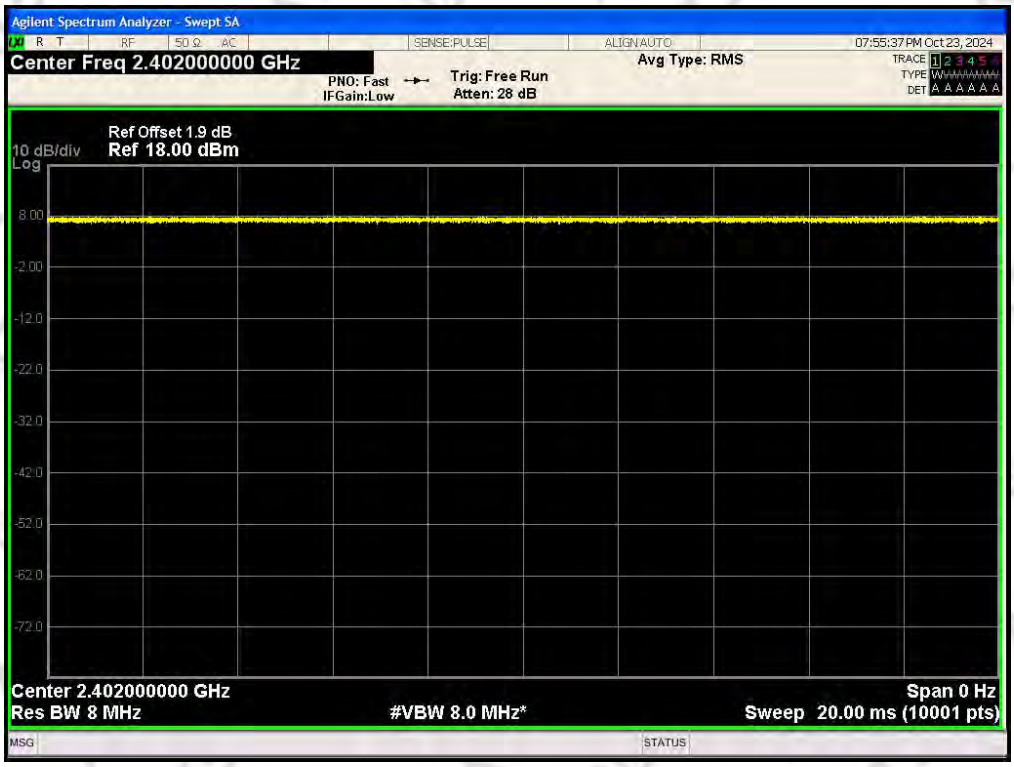
π/4DQPSK(2-DH5)_Channel 0



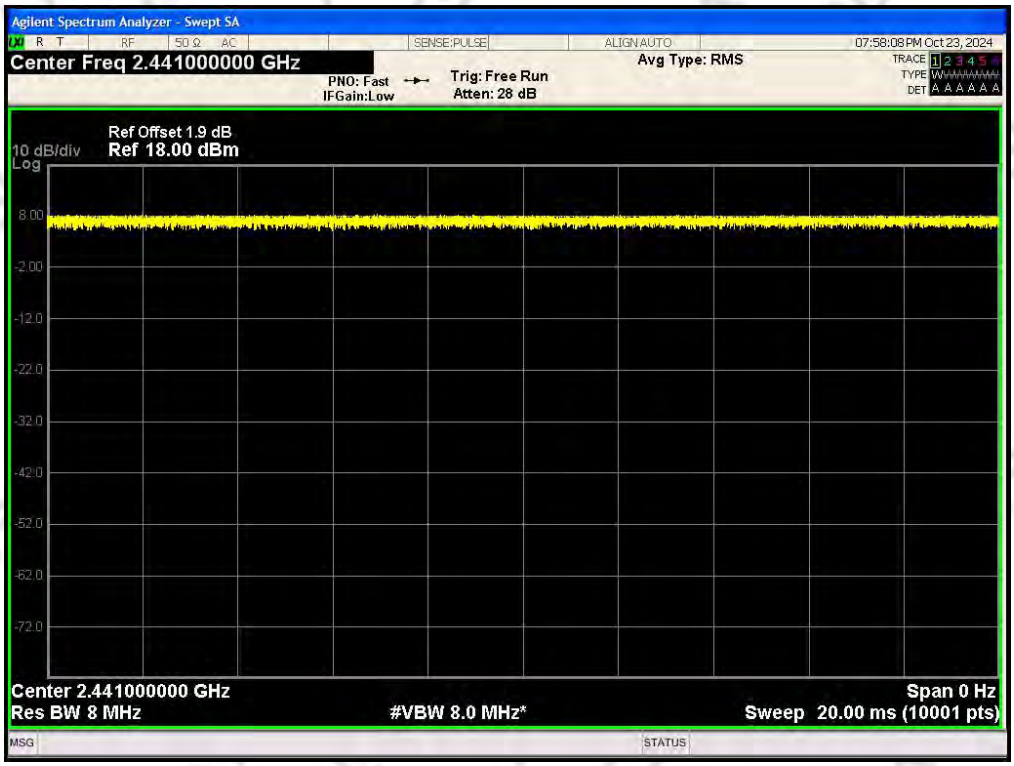
π/4DQPSK(2-DH5)_Channel 39



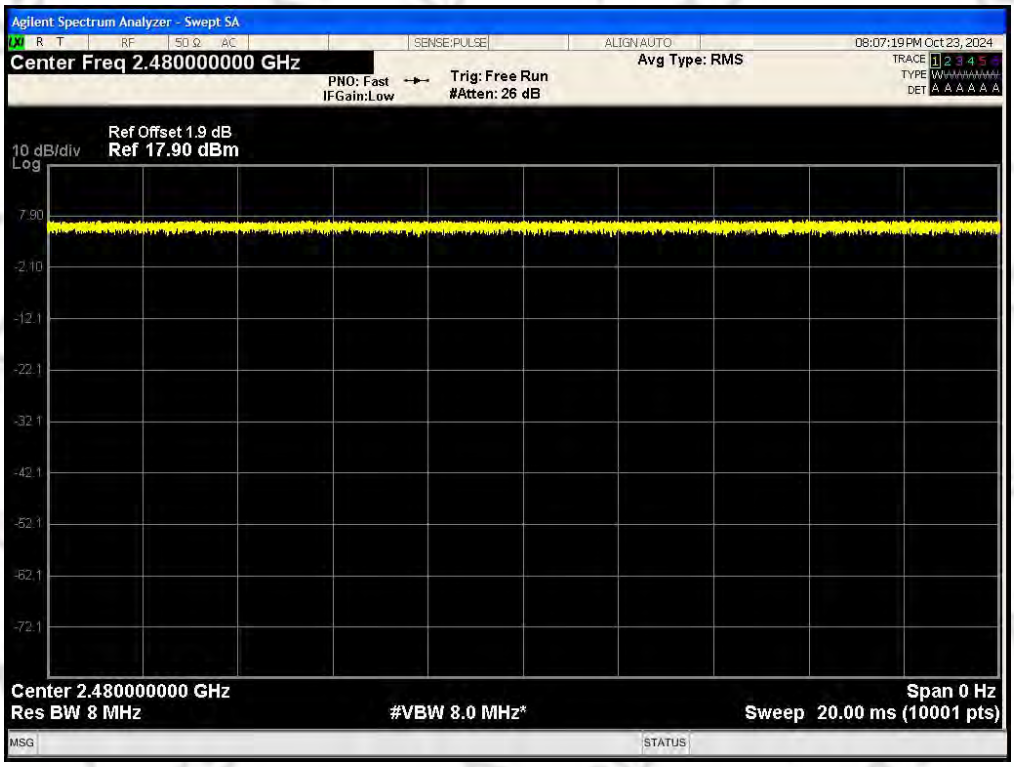
π/4DQPSK(2-DH5)_Channel 78



8DPSK(3-DH5)_Channel 0



8DPSK(3-DH5)_Channel 39



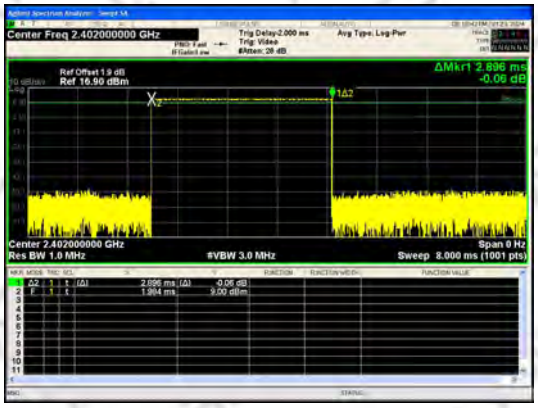
8DPSK(3-DH5)_Channel 78

Dwell Time

Test Result

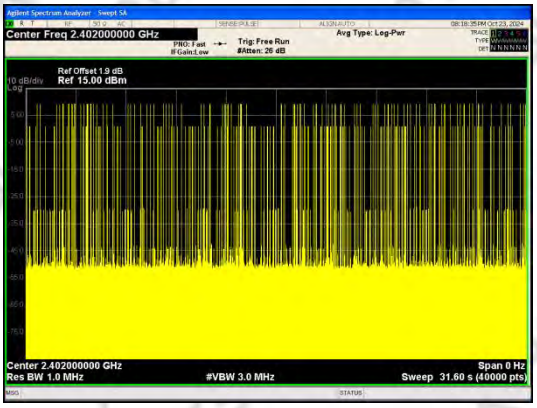
Modulation	Packet	Channel	Pulse Width (ms)	Number of Pulses in 31.6 seconds	Dwell Time (ms)	Limit (ms)	Result
GFSK	DH5	CH0 (2402MHz)	2.896	103	298.29	< 400	PASS
π/4DQPSK	2-DH5		0.4000	320	128.00		PASS
8DPSK	3-DH5		2.896	101	292.50		PASS

Test Graphs



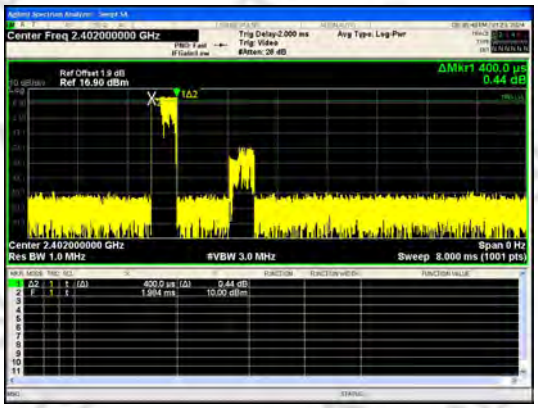
Pulse Width

GFSK_DH5



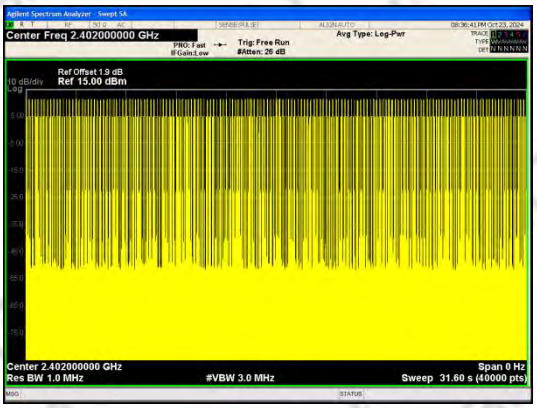
Number of Pulses in 31.6 seconds

GFSK_DH5



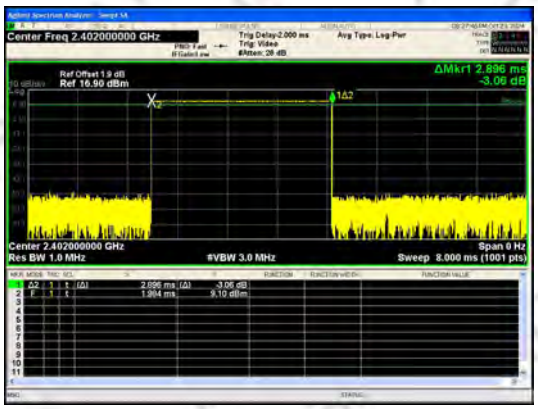
Pulse Width

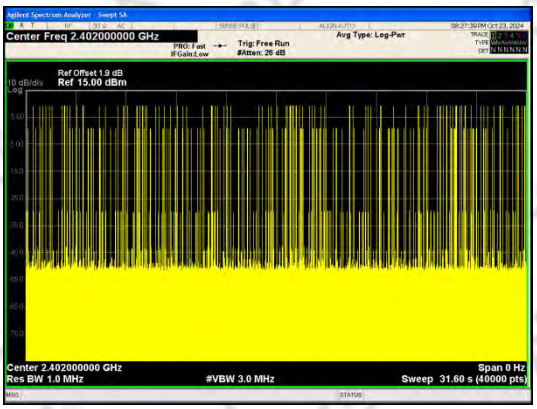
π/4DQPSK_2-DH5



Number of Pulses in 31.6 seconds

π/4DQPSK_2-DH5





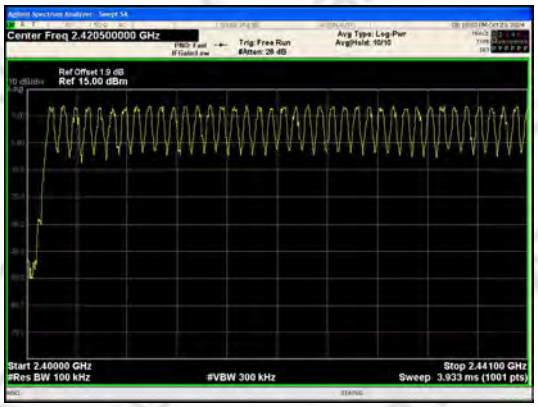
Pulse Width	Number of Pulses in 31.6 seconds
8DPSK_3-DH5	8DPSK_3-DH5

Number Of Hopping Channel

Test Result

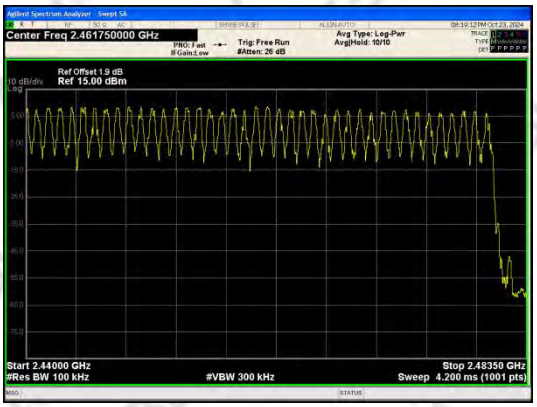
Modulation	Packet	Number of Hopping Channel	Limit	Result
GFSK	DH5	79	15	PASS
8DPSK	3-DH5	79	15	PASS

Test Graphs



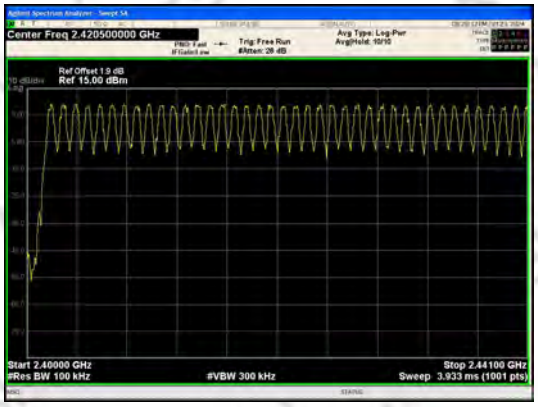
Low End Spectrum Channel Hopping Plot

GFSK



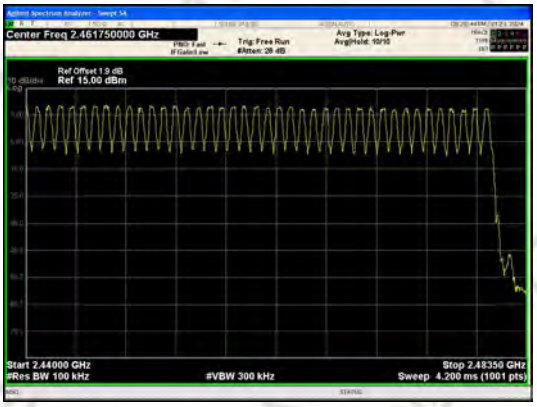
High End Spectrum Channel Hopping Plot

GFSK



Low End Spectrum Channel Hopping Plot

8DPSK



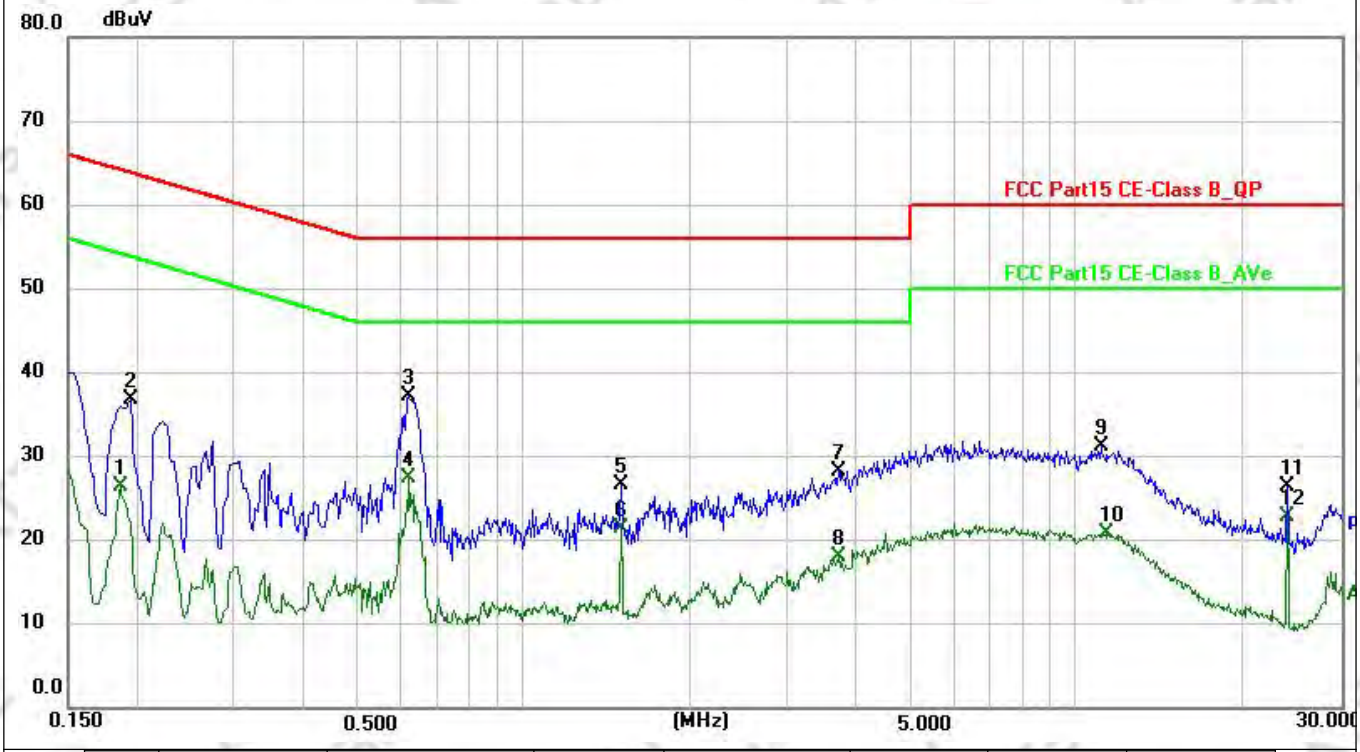
High End Spectrum Channel Hopping Plot

8DPSK

AC Power-Line Conducted Emission

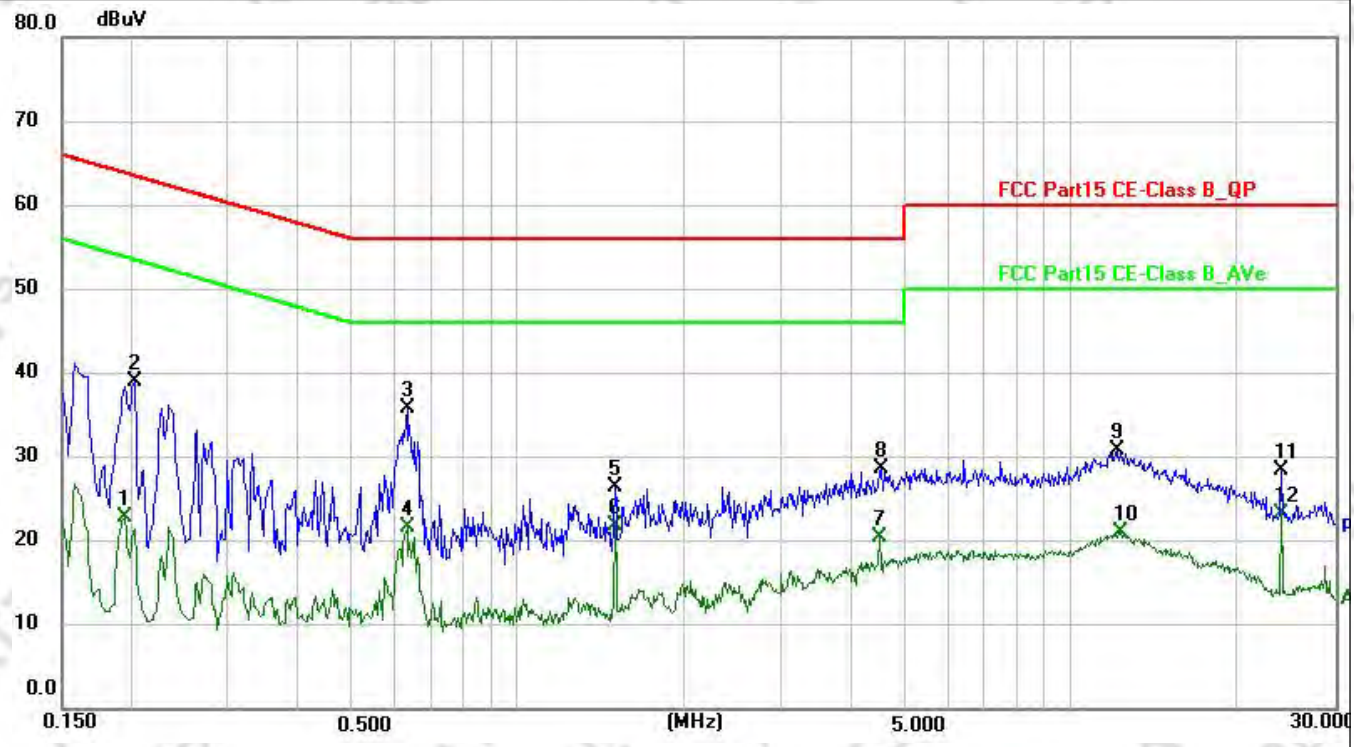
only worst case (DH5) mode was recorded in the test report if no any others.

Polarization	N	Mode	TX Channel 78



No.	Frequency (MHz)	Reading Level(dBuV)	Factor (dB)	Measure-ment(dBuV)	Limit (dBuV)	Margin (dB)	Detector
1	0.1860	7.10	19.33	26.43	54.21	-27.78	AVG
2	0.1940	17.39	19.32	36.71	63.86	-27.15	peak
3	0.6180	17.71	19.40	37.11	56.00	-18.89	peak
4 *	0.6220	8.12	19.40	27.52	46.00	-18.48	AVG
5	1.5020	7.27	19.46	26.73	56.00	-29.27	peak
6	1.5020	1.99	19.46	21.45	46.00	-24.55	AVG
7	3.7100	8.82	19.47	28.29	56.00	-27.71	peak
8	3.7100	-1.51	19.47	17.96	46.00	-28.04	AVG
9	11.0700	11.57	19.57	31.14	60.00	-28.86	peak
10	11.3020	1.28	19.56	20.84	50.00	-29.16	AVG
11	24.0020	6.80	19.60	26.40	60.00	-33.60	peak
12	24.0020	3.27	19.60	22.87	50.00	-27.13	AVG

Polarization	L	Mode	TX Channel 78



No.	Frequency (MHz)	Reading Level(dBuV)	Factor (dB)	Measure-ment(dBuV)	Limit (dBuV)	Margin (dB)	Detector
1	0.1940	3.44	19.32	22.76	53.86	-31.10	AVG
2	0.2020	19.66	19.32	38.98	63.53	-24.55	peak
3 *	0.6300	16.43	19.40	35.83	56.00	-20.17	peak
4	0.6300	2.27	19.40	21.67	46.00	-24.33	AVG
5	1.5020	6.94	19.40	26.34	56.00	-29.66	peak
6	1.5020	2.38	19.40	21.78	46.00	-24.22	AVG
7	4.5020	0.93	19.49	20.42	46.00	-25.58	AVG
8	4.5300	9.15	19.50	28.65	56.00	-27.35	peak
9	12.1540	11.17	19.60	30.77	60.00	-29.23	peak
10	12.3060	1.43	19.59	21.02	50.00	-28.98	AVG
11	24.0020	8.71	19.63	28.34	60.00	-31.66	peak
12	24.0020	3.69	19.63	23.32	50.00	-26.68	AVG

5.TEST SETUP PHOTOGRAPHS

Please refer to the Appendix F.

6.EXTERNAL AND INTERNAL PHOTOS OF THE EUT

Please refer to the Appendix G.

※※※※※END OF THE REPORT※※※※※