RF TEST REPORT

Report No.:FCS202507297W01

Applicant	:	Fujian Iselected E-commerce Co., Ltd.
Product Name	:	2.4GHz & Bluetooth Wireless Keyboard
Brand Name	:	Philips
Model Name	:	SPK8618
Series model	:	SPK8618DTRH,SPK8618HTRH,SPK8618SXRH,SPK8618CTRH, SPK8618UPRH
Test Standard	:	FCC CFR Title 47 Part 15 Subpart C Section 15.247
FCC ID	:	2BMNP-SPK8618
Date of Receipt	:	Jul 09, 2025
Date of Test	:	Jul 11, 2025~Jul 18, 2025
Date of Issue	:	Jul 31, 2025

Tested by : Scott shen

(Scott Shen)

Reviewed by : Duke Qian

(Duke Qian)

Approved by : Jack Wang

(Jack Wang)

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REVISION HISTORY

Rev.	Issue Date	Revisions	Revised by
00	Jul 31, 2025	Initial Release	/

DECLARATION OF REPORT

1. The device has been tested by Flux Compliance, 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 Flux Compliance, this document only be altered or revised by Flux Compliance, 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, Flux Compliance 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 : Fujian Iselected E-commerce Co., Ltd.

Address : 15th Floor, Building A, Aofeng Plaza, No. 2 Aofeng Road, Taijiang District, Fuzhou City, Fujian Province, China

1.2. Manufacturer

Name : MMD (Shanghai) Electronic Technology Co., Ltd.

Address : Room107, Building 17 , No. 525 Yuanjiang Road, Minhang District, Shanghai, China

1.3. Factory

Name : SISUN ELECTRONICS TECHNOLOGY (DG) CO., LTD

Address : Sisun industrial park,Xikeng road, Puxin village,Shipai town,Dongguan,China

1.4. General Information of EUT

General Information	
Equipment Name	2.4GHz & Bluetooth Wireless Keyboard
Brand Name	Philips
Model Name	SPK8618
Series Model	SPK8618DTRH,SPK8618HTRH,SPK8618SXRH,SPK8618CTRH, SPK8618UPRH
Model Difference	only model name and color are different
Antenna Type	Chip Antenna
Antenna Gain	2.71dBi
Sample No:	202507070004001
Power Source	DC 3.7V
Battery	Rated Voltage:3.7V Charge Limit Voltage:4.2V Capacity:4000mAh
Hardware version	V2.0
Software version	V11.1
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	2402MHz - 2480MHz	
Number of Channels	79CH	
Maximum Output Power To Antenna	☑Bluetooth BR(1Mbps):	3.92dBm (2.47mW)
	☐Bluetooth EDR(2Mbps):	N/A
	☐Bluetooth EDR(3Mbps):	N/A
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:	Flux Compliance Service Laboratory
Address:	Room 105 Floor Bao hao Technology Building 1 NO.15 Gong ye West Road Hi-Tech Industrial, Song shan lake Dongguan
Telephone:	+86-0769-27280901
Fax:	+86-0769-27280901
FCC Test Firm Registration Number: 514908 Designation number: CN0127 A2LA accreditation number: 5545.01	

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 C63.10-2020

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**.

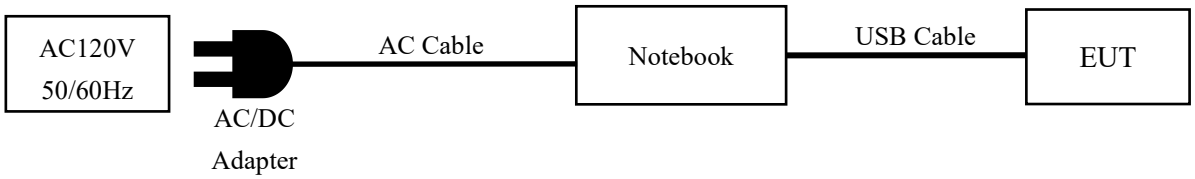
2.2. Test Modes

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

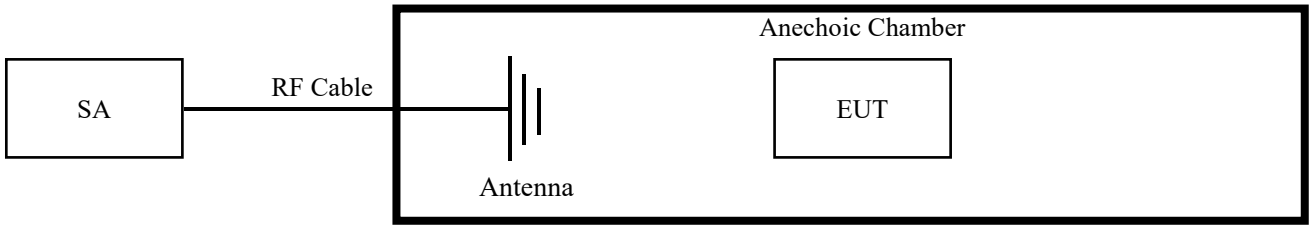
Summary Table of Test Modes			
Test Item	Data Rate / Modulation		
	Bluetooth BR(1Mbps) GFSK	Bluetooth EDR(2Mbps) π/4-DQPSK	Bluetooth EDR(3Mbps) 8-DPSK
For Conducted and Radiated Test	Mode 1: CH00_2402 MHz	N/A	N/A
	Mode 2: CH39_2441 MHz		
	Mode 3: CH78_2480 MHz		
	Mode 4: Hopping		
For AC Power-line Conducted Emission	Mode 1: CH00_2402 MHz		

2.3. Block Diagram of Test System

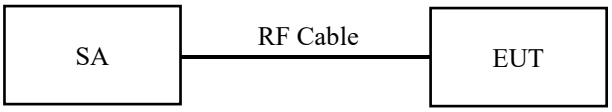
2.3.1. For AC Power-Line Conducted Emission



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 G	2021Ryzen	N/A
2	USB Line	/	/	/

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 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

Kind of Equipment	Manufacturer	Type No.	Company No.	Last calibration	Calibrated until
EMI Test Receiver	R&S	ESPI	FCS-E020	2024.08.28	2025.08.27
LISN	R&S	ENV216	FCS-E007	2024.08.28	2025.08.27
LISN	ETS	3810/2NM	FCS-E009	2024.08.28	2025.08.27
Temperature & Humidity	HTC-1	victor	FCS-E008	2024.08.28	2025.08.27
Testing Software	EZ-EMC(Ver.EMC-CON 3A1.1)				

2.7.2. For Radiated Spurious Emission

Kind of Equipment	Manufacturer	Type No.	Company No.	Last calibration	Calibrated until
EMI Test Receiver	R&S	ESRP 3	FCS-E001	2024.08.28	2025.08.27
Signal Analyzer	R&S	FSV40-N	FCS-E012	2024.08.28	2025.08.27
Active loop Antenna	ZHINAN	ZN30900C	FCS-E013	2024.08.28	2025.08.27
Bilog Antenna	SCHWARZBECK	VULB 9168	FCS-E002	2024.08.28	2025.08.27
Horn Antenna	SCHWARZBECK	BBHA 9120D	FCS-E003	2024.08.28	2025.08.27
SHF-EHF Horn Antenna (18G-40GHz)	A-INFO	LB-180400-KF	FCS-E018	2024.08.28	2025.08.27
Pre-Amplifier(0.1M-3GHz)	EMCI	EM330N	FCS-E004	2024.08.28	2025.08.27
Pre-Amplifier (1G-18GHz)	N/A	TSAMP-0518SE	FCS-E014	2024.08.28	2025.08.27
Pre-Amplifier (18G-40GHz)	TERA-MW	TRLA-0400	FCS-E019	2024.08.28	2025.08.27
Temperature & Humidity	HTC-1	victor	FCS-E005	2024.08.28	2025.08.27
Testing Software	EZ-EMC(Ver.STSLAB 03A1 RE)				

2.7.3. RF Connected Test

Kind of Equipment	Manufacturer	Type No.	Company No.	Last calibration	Calibrated until
MXA SIGNAL Analyzer	Keysight	N9020A	FCS-E015	2024.08.28	2025.08.27
Spectrum Analyzer	Agilent	E4447A	MY50180039	2024.08.28	2025.08.27
Spectrum Analyzer	R&S	FSV-40	101499	2024.08.28	2025.08.27
Power Sensor	Agilent	UX2021XA	FCS-E021	2024.08.28	2025.08.27
Testing Software	EZ-EMC(Ver.STSLAB 03A1 RE)				

Remark: Calibration duration for above equipments is 1 year.

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	±0.71dB
2	Unwanted Emissions, conducted	±2.988 dB
3	Conducted Emission (9KHz-150KHz)	±4.13 dB
4	All emissions radiated (9KHz -30MHz)	±3.1 dB
5	Conducted Emission (150KHz-30MHz)	±4.74 dB
6	All emissions,radiated(<1G) 30MHz-1000MHz	±5.2 dB
7	All emissions,radiated 1GHz -18GHz	±4.66 dB
8	All emissions,radiated 18GHz -40GHz	±4.31 dB
9	Occupied bandwidth	±0.3 dB
10	Power Spectral Density	±0.48 dB

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

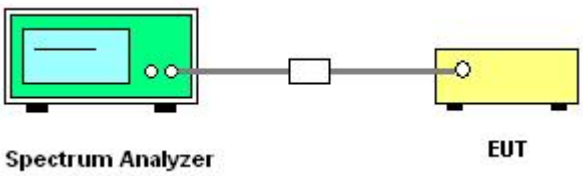
ANSI C63.10-2020 clause 7.8.5: This is an RF-conducted test to evaluate maximum peak output power. Use a direct connection between the antenna port of the unlicensed wireless device and the spectrum analyzer, through suitable attenuation. The hopping shall be disabled for this test:

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 A1

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.

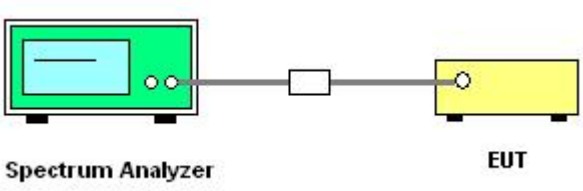
3.2.2. Test Procedure

ANSI C63.10-2020 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 A2

3.3. Duty Cycle and Dwell Time

3.3.1. Limit

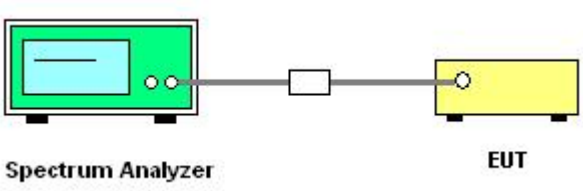
47 CFR 15.247(a)(1)(iii): The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

3.3.2. Test Procedure

ANSI C63.10-2020 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 A3

3.4. 20dB Bandwidth

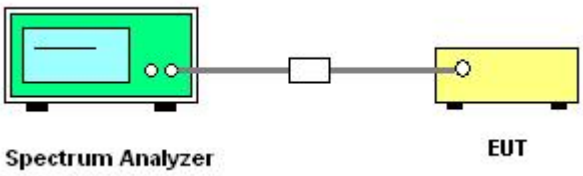
3.4.1. Limit

There is no limit requirement for 20dB Bandwidth.

3.4.2. Test Procedure

1. The testing follows *ANSI C63.10-2020 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 A4

3.5. Carrier Frequency Separation

3.5.1. Limit

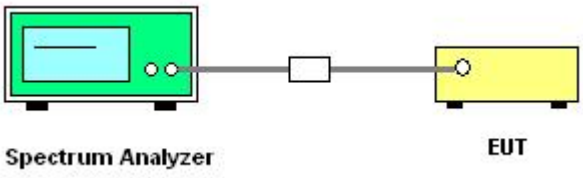
47 CFR 15.247(a)(1): Frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater.

3.5.2. Test Procedure

ANSI C63.10-2020 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 A5

3.6. Conducted Band Edge

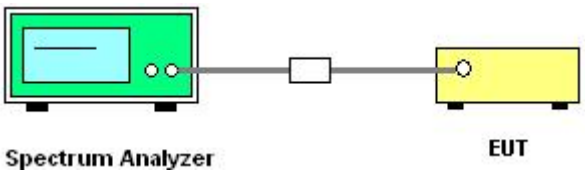
3.6.1. Limit

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 C63.10-2020 clause 11.12*.
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 A6

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 C63.10-2020 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 A6

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.

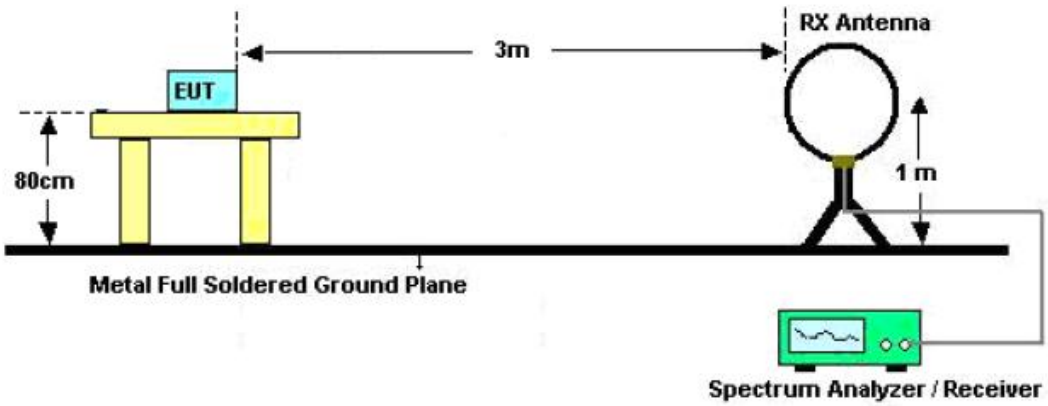
8. For testing above 1GHz, the emission level of the EUT in peak mode was 20dB lower than peak limit (that means the emission level in average mode also complies with the limit in average mode), then peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again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

Remark:

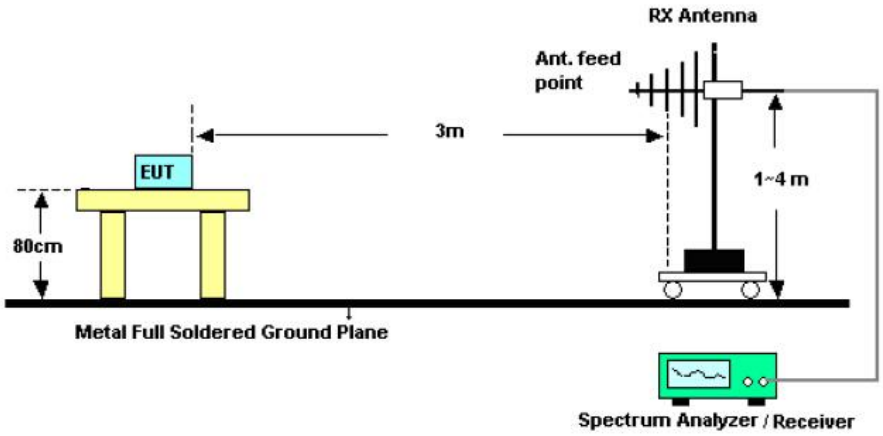
The average levels were calculated from the peak level corrected with duty cycle correction factor (-24.70dB) derived from 20log (dwell time/100ms). This correction is only for signals that hop with the fundamental signal, such as band-edge and harmonic. Other spurious signals that are independent of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

3.8.3. Test Setup

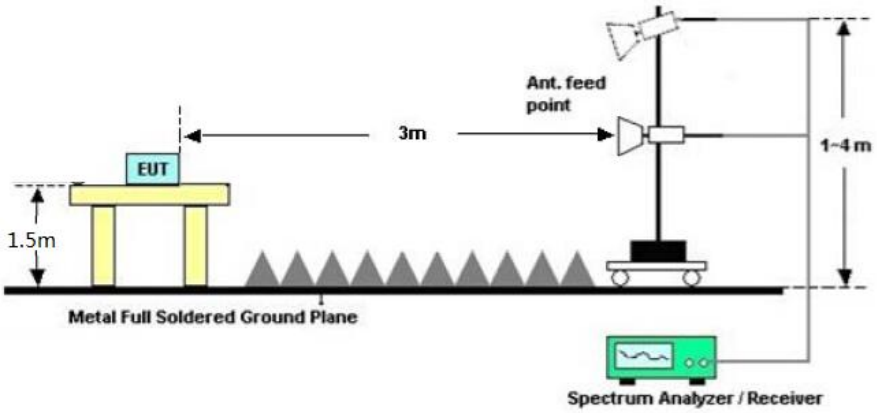
3.8.3.1. For radiated emissions below 30MHz



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

Note:

Please refer to the Appendix A7

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:

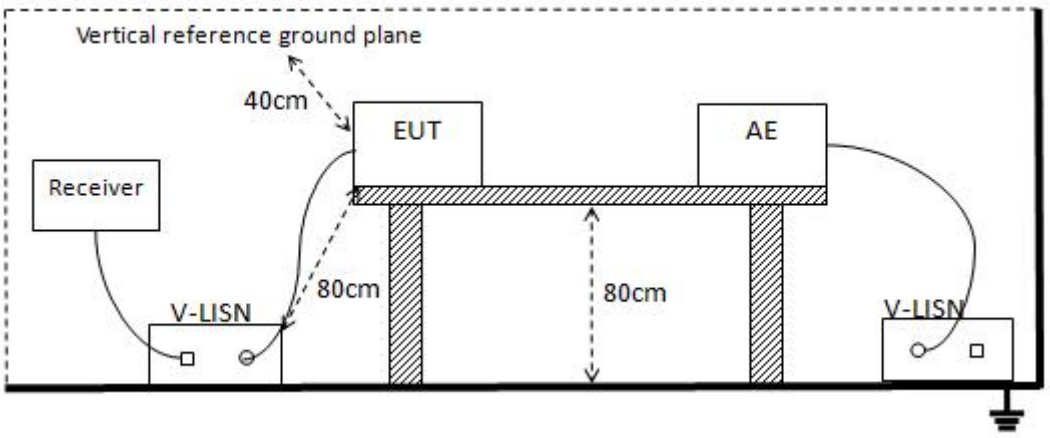
Frequency of emission (MHz)	Conducted limit (dBμV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

*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 A8

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 Chip antenna, which meets the antenna requirements.

4.TEST SETUP PHOTOGRAPHS

Please refer to the Appendix F.

5.EXTERNAL AND INTERNAL PHOTOS OF THE EUT

External Please refer to the Appendix G.
Internal Please refer to the Appendix H.

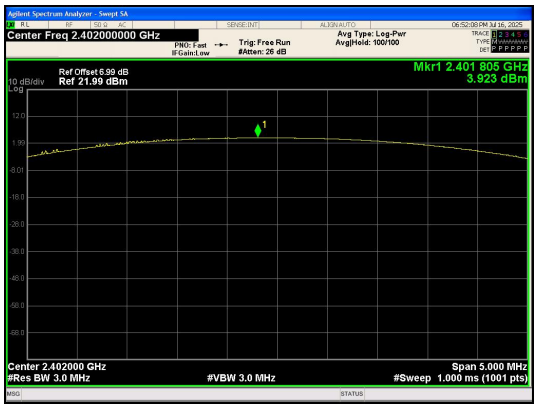
6.Appendix A of data

A1.Conducted Peak Output Power

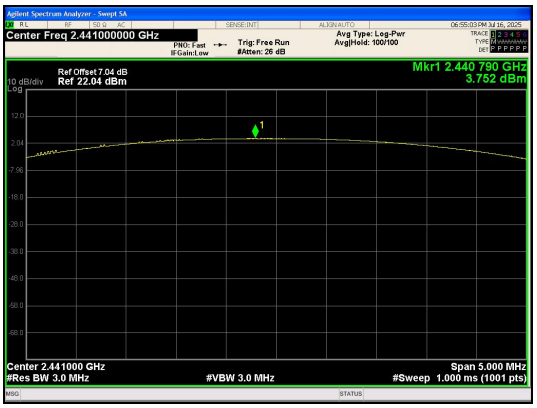
Test Result

Modulation	Packet Type	Channel	Peak Output Power (dBm)	Peak Output Power (mW)	Limit (dBm)	Result
GFSK	DH5	0	**3.92**	**2.47**	≤21	PASS
		39	3.75	2.37		PASS
		78	3.01	2.00		PASS

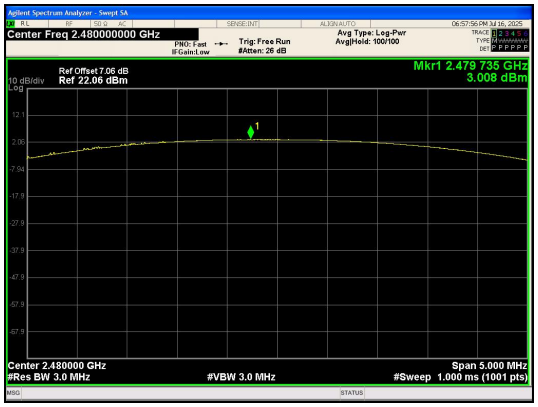
Test Graphs



Peak Output Power
GFSK_Channel 0



Peak Output Power
GFSK_Channel 39



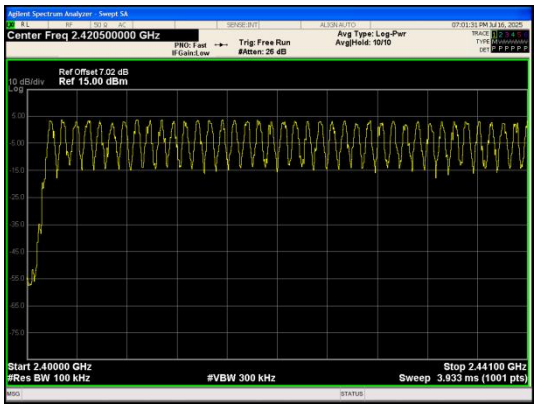
Peak Output Power
GFSK_Channel 78

A2.Number of Hopping Frequencies

Test Result

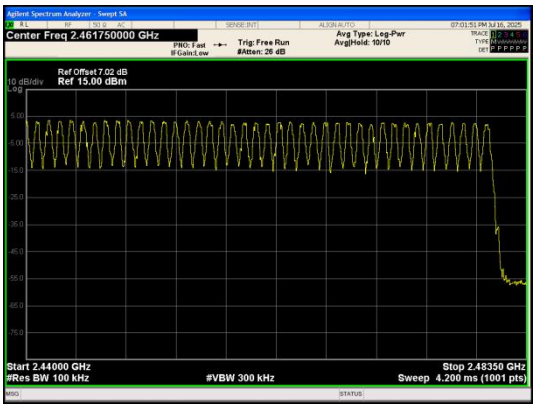
Modulation	Packet	Number of Hopping Channel	Limit	Result
GFSK	DH5	79	15	PASS

Test Graphs



Low End Spectrum Channel Hopping Plot

GFSK



High End Spectrum Channel Hopping Plot

GFSK

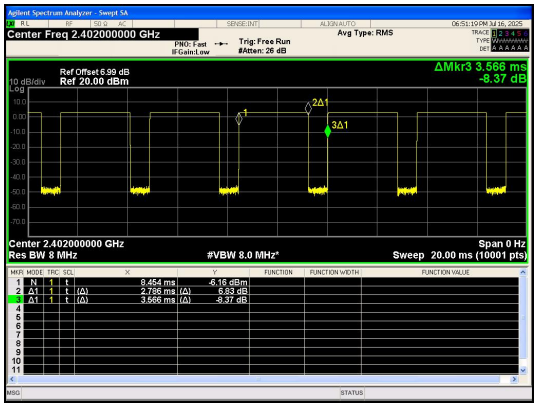
A3.Duty Cycle and Dwell Time

Test Result

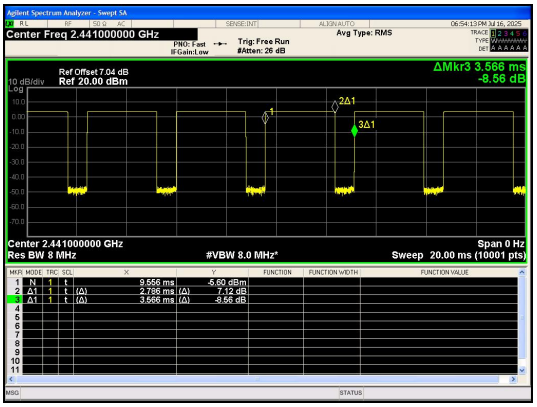
Duty Cycle

Modulation	Packets	Channel	On Time (ms)	Period (ms)	Duty Cycle (%)	Duty Cycle (linear)	Duty Cycle Factor (dB)
GFSK	DH5	0	2.786	3.566	78.13	0.7813	1.0718
		39	2.786	3.566	78.13	0.7813	1.0718
		78	2.786	3.568	78.08	0.7808	1.0746

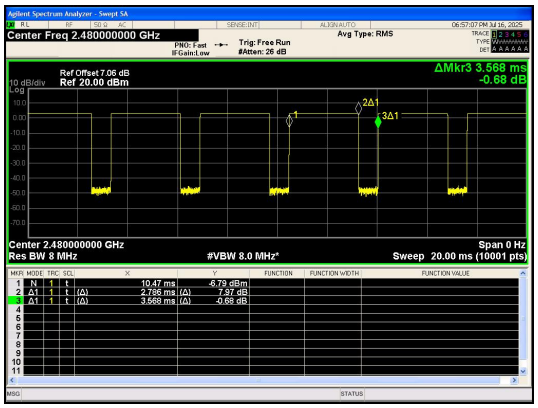
Test Graphs



GFSK(DH5)_Channel 0



GFSK(DH5)_Channel 39

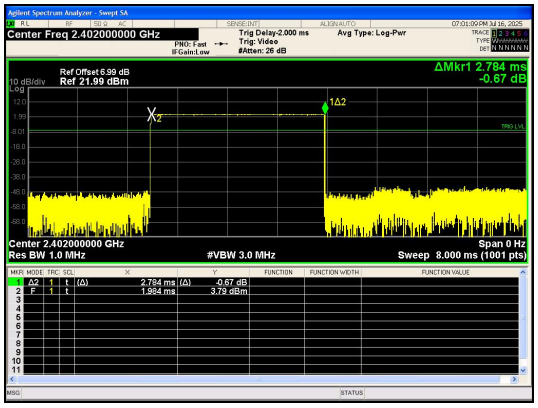


GFSK(DH5)_Channel 78

Dwell Time

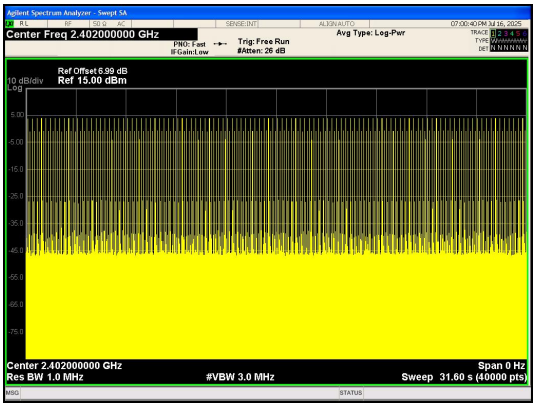
Modulation	Packet	Channel	Pulse Width (ms)	Number of Pulses in 31.6 seconds	Dwell Time (ms)	Limit (ms)	Result
GFSK	DH5	CH0 (2402MHz)	2.784	110	306.24	< 400	PASS

Test Graphs



Pulse Width

GFSK_DH5



Number of Pulses in 31.6 seconds

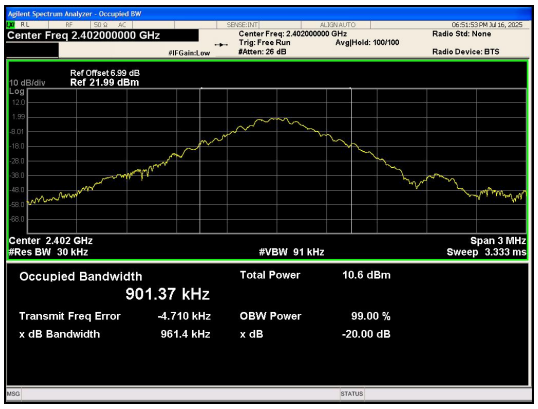
GFSK_DH5

A4.20dB Bandwidth

Test Result

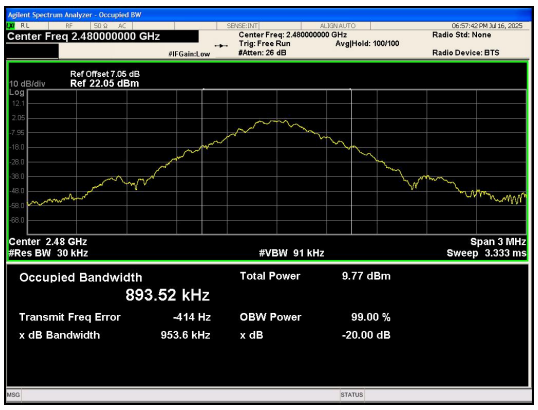
Modulation	Channel	Center Frequency (MHz)	20 dB Bandwidth (MHz)
GFSK	0	2402 MHz	0.9600
	39	2441 MHz	0.9500
	78	2480 MHz	0.9500

Test Graphs



GFSK_DH5_Channel 0

GFSK_DH5_Channel 39



GFSK_DH5_Channel 78

A5.Carrier Frequency Separation

Test Result

Modulation	Packet	Left Center frequency (MHz)	Right Center frequency (MHz)	Hopping Frequency Separation (MHz)	Minimum Limit (MHz)	Result
GFSK	DH5	2440.0408	2441.0456	1	0.703	PASS

Test Graphs

GFSK

A6.Conducted Band Edge and Spurious 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	-48.270	-16.69	-31.580	PASS
			4804.26	-64.076	-16.69	-47.386	PASS
			7205.75	-53.863	-16.69	-37.173	PASS
			9608.49	-69.213	-16.69	-52.523	PASS
		39	4882.30	-68.843	-16.87	-51.973	PASS
			7322.49	-54.205	-16.87	-37.335	PASS
			9763.31	-70.783	-16.87	-53.913	PASS
			24895.1	-54.153	-16.87	-37.283	PASS
		78	2483.50	-55.590	-17.65	-37.940	PASS
			4960.33	-69.880	-17.65	-52.230	PASS
			7439.85	-55.311	-17.65	-37.661	PASS
			9919.37	-69.017	-17.65	-51.367	PASS
			24945.7	-53.971	-17.65	-36.321	PASS

Hopping

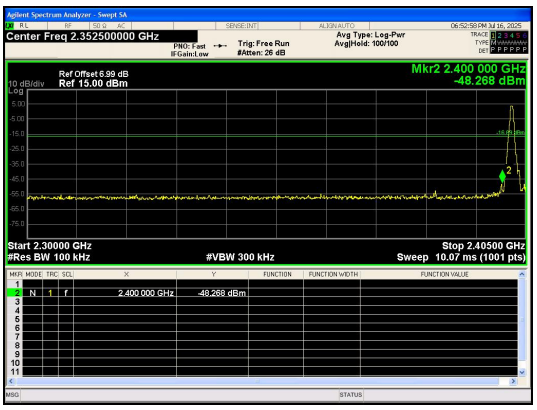
Modulation	Packet	Channel	OOB Emission Frequency (MHz)	OOB Emission Level (dBm)	Limit (dBm)	Over Limit (dB)	Result
GFSK	DH5	Hopping	2400.00	-50.900	-16.37	-34.530	PASS
			2483.50	-54.770	-17.09	-37.680	PASS

Test Graphs

Non-Hopping

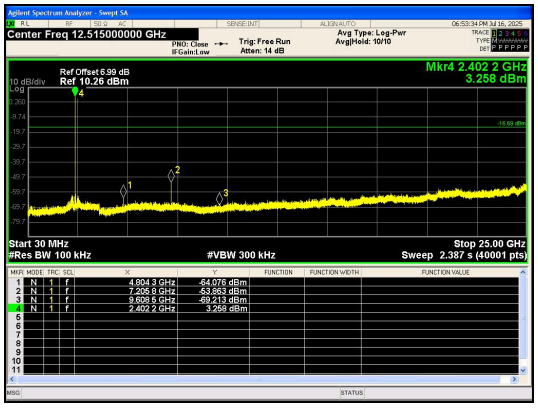
In-Band Reference Level

GFSK_DH5_Channel 0



Out Of Band Emission

GFSK_DH5_Channel 0

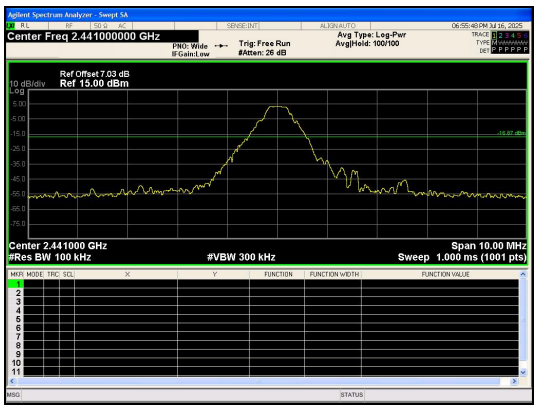


30.0 MHz - 25000.0 MHz

GFSK_DH5_Channel 0

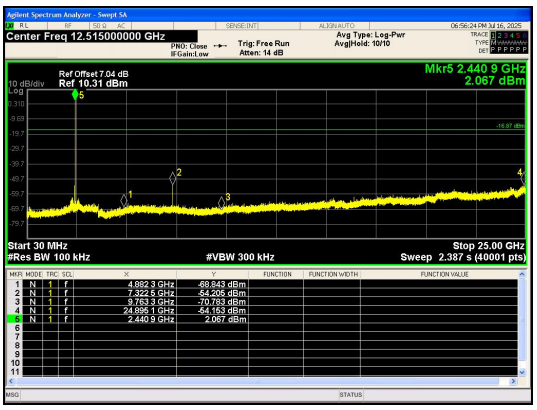
In-Band Reference Level

GFSK_DH5_Channel 39



Out Of Band Emission

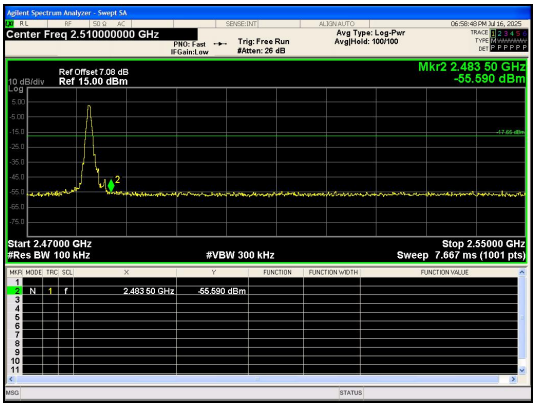
GFSK_DH5_Channel 39



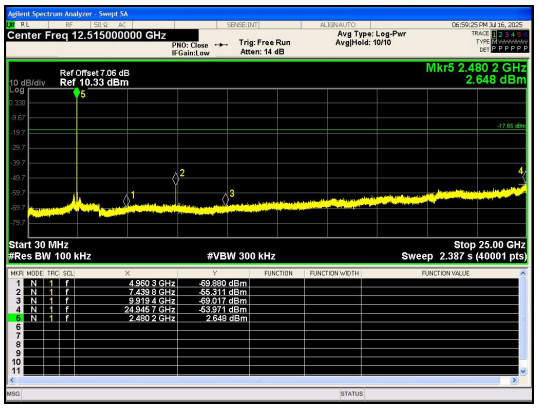
30.0 MHz - 25000.0 MHz

GFSK_DH5_Channel 39

In-Band Reference Level
GFSK_DH5_Channel 78

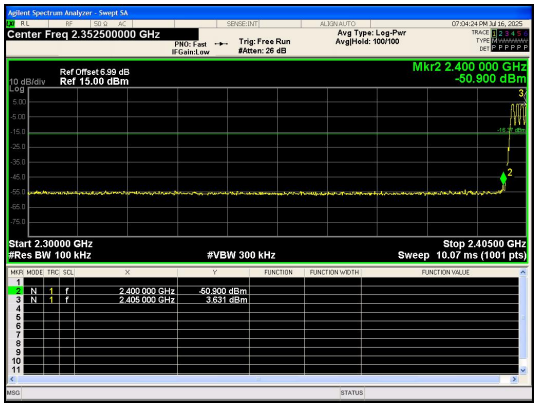


Out Of Band Emission
GFSK_DH5_Channel 78

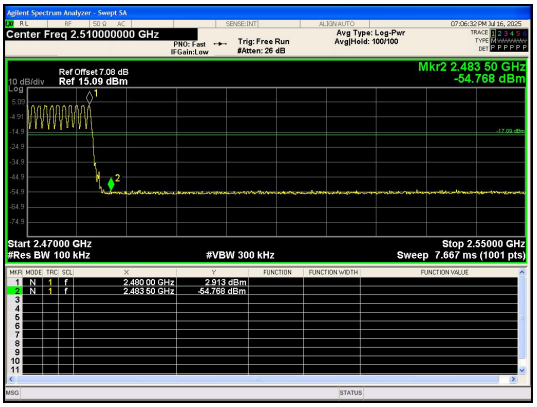


30.0 MHz - 25000.0 MHz
GFSK_DH5_Channel 78

Hopping



Out Of Band Emission(Left)
GFSK_DH5_Channel Hopping



Out Of Band Emission(Right)
GFSK_DH5_Channel Hopping

A7.Radiated Spurious Emission and Restricted Band

Test Result for Radiated Spurious Emission:

For 9 kHz ~ 30 MHz

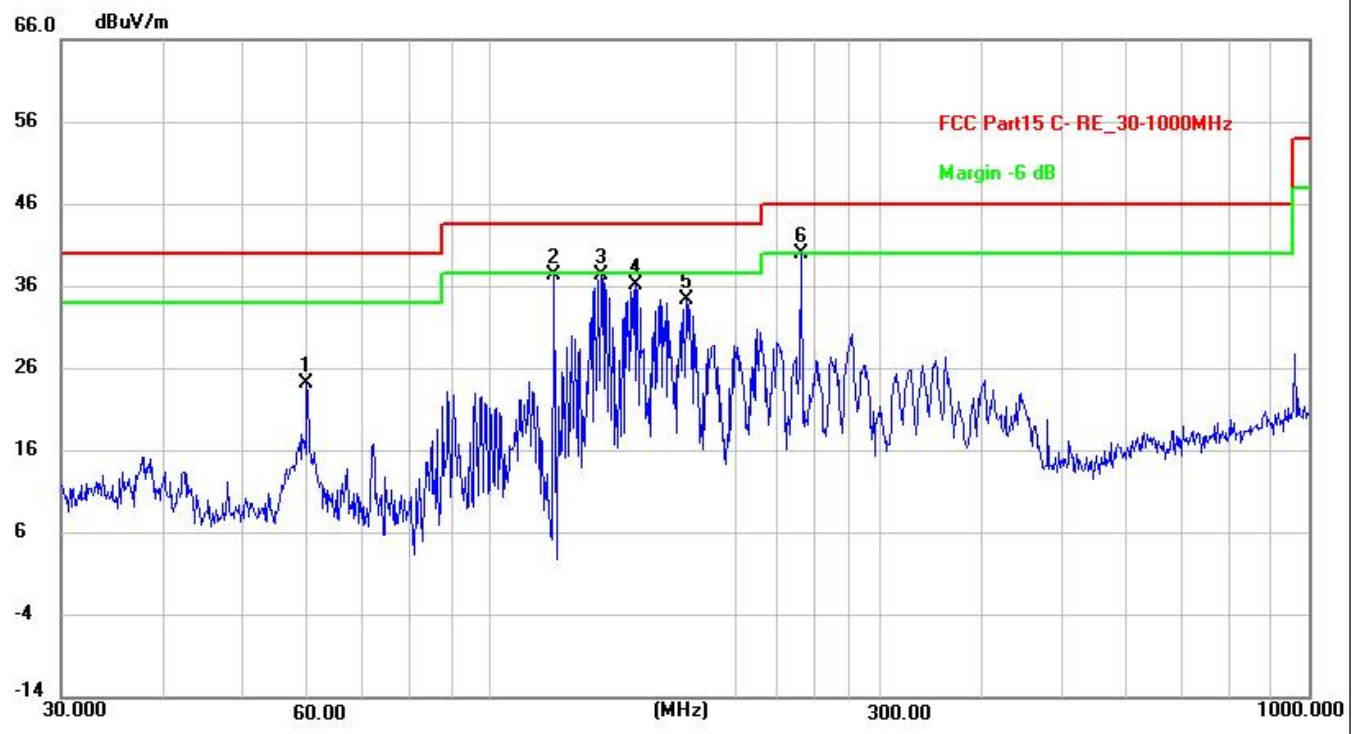
The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line was not reported.

For 30 MHz ~ 1 GHz:

Note:

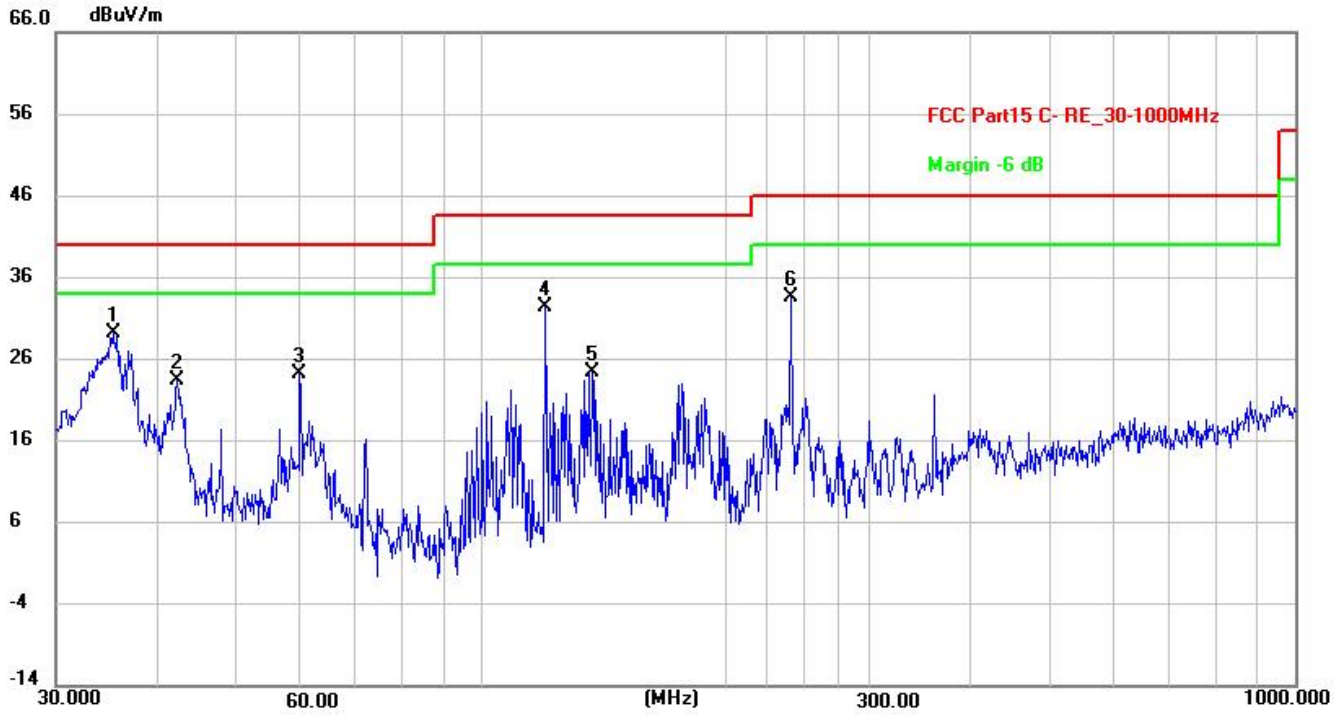
1. All modes have been tested, only worst case(DH5_2402MHz)mode was recorded in the test report.
2. Emission Level (dBuV/m) = Reading Value (dBuV) + Correction Factor (dB/m).
3. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB)-Amplifier Gain.
4. The emission levels of other frequencies were less than 20dB margin against the limit.
5. Margin value = Emission level-Limit value.

Polarization	Horizontal	Mode	DH5_2402MHz



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Det.
1	59.8588	53.48	-29.36	24.12	40.00	-15.88	peak
2	119.8556	69.30	-32.00	37.30	43.50	-6.20	peak
3	136.9391	67.42	-30.08	37.34	43.50	-6.16	peak
4	151.0666	65.12	-29.00	36.12	43.50	-7.38	peak
5	173.8135	64.69	-30.33	34.36	43.50	-9.14	peak
6	239.9874	70.64	-30.71	39.93	46.00	-6.07	peak

Polarization	Vertical	Mode	DH5_2402MHz



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Det.
1	35.2511	58.69	-29.52	29.17	40.00	-10.83	peak
2	42.3022	52.76	-29.27	23.49	40.00	-16.51	peak
3	59.8588	53.60	-29.36	24.24	40.00	-15.76	peak
4	119.8556	64.37	-32.00	32.37	43.50	-11.13	peak
5	136.9391	54.57	-30.08	24.49	43.50	-19.01	peak
6	239.9873	64.29	-30.71	33.58	46.00	-12.42	peak

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.

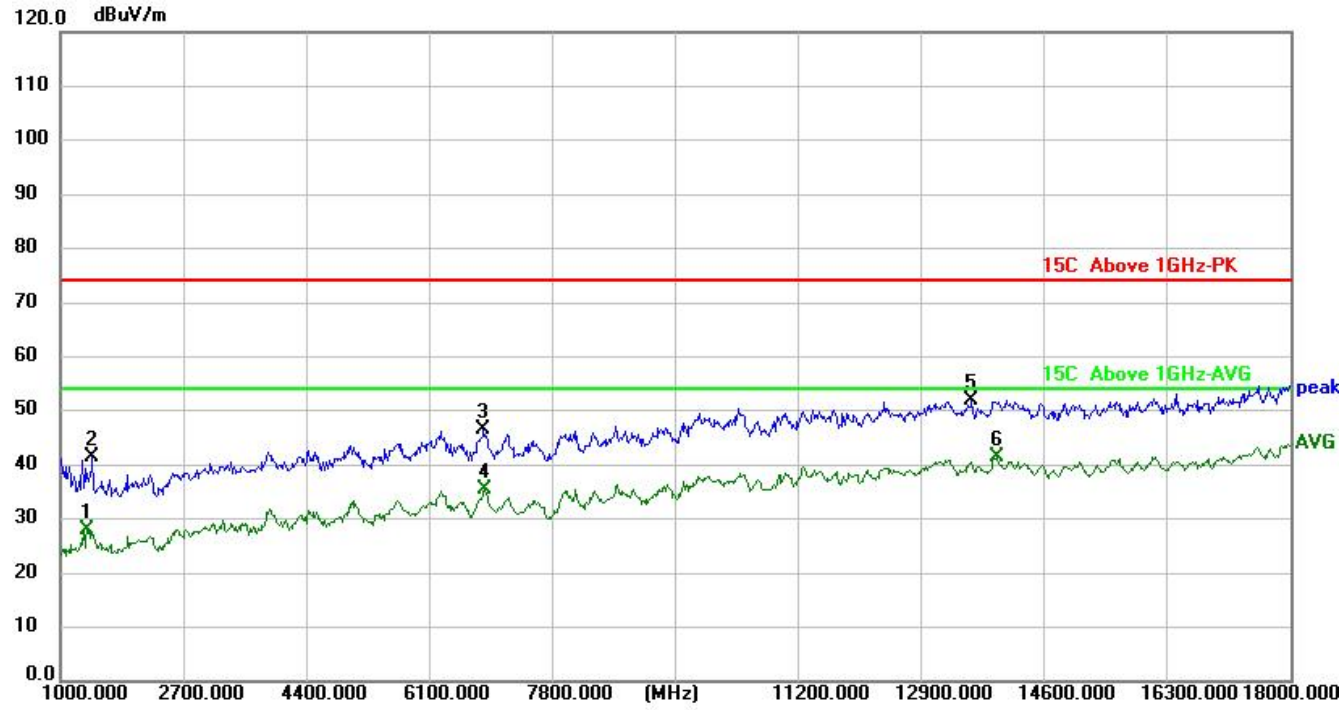
4.Emission Level (dBuV/m) = Reading Value (dBuV) + Correction Factor (dB/m).

5. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB)-Amplifier Gain.

6. The emission levels of other frequencies were less than 20dB margin against the limit.

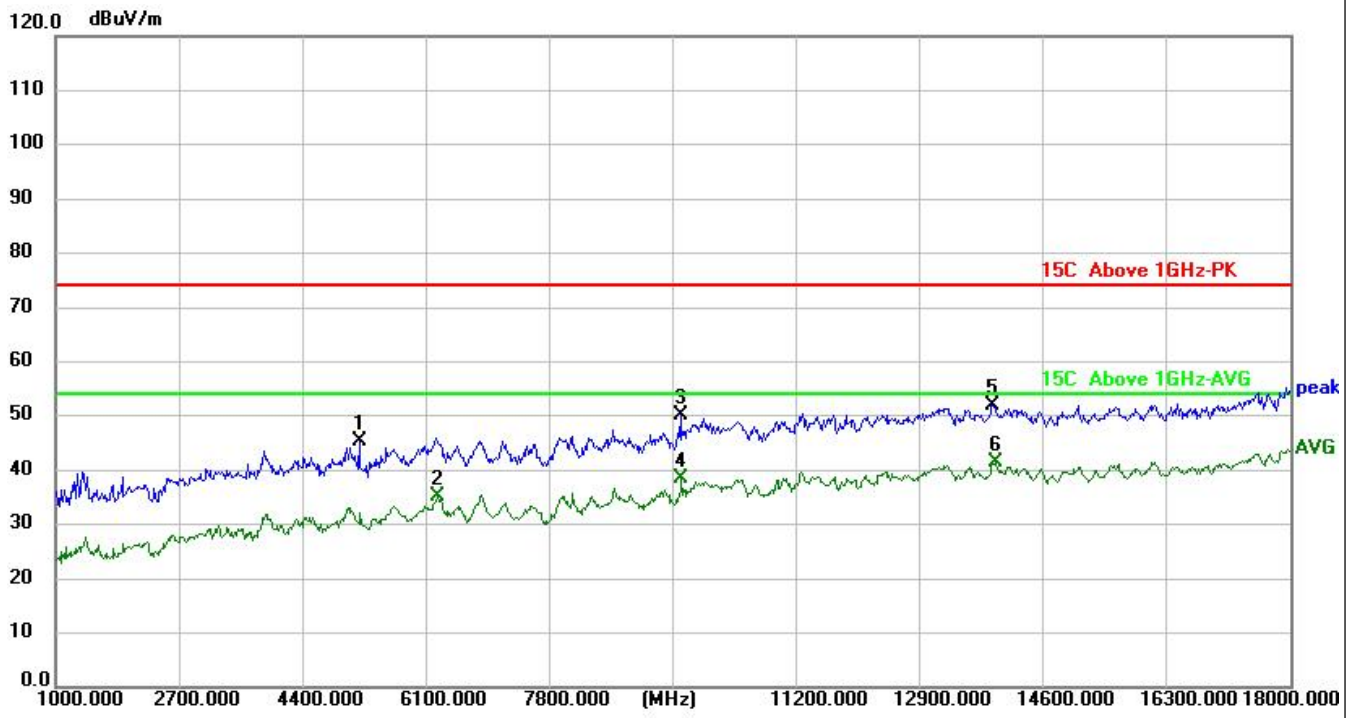
7. Margin value = Emission level-Limit value.

Polarization	Horizontal	Mode	DH5_2402MHz



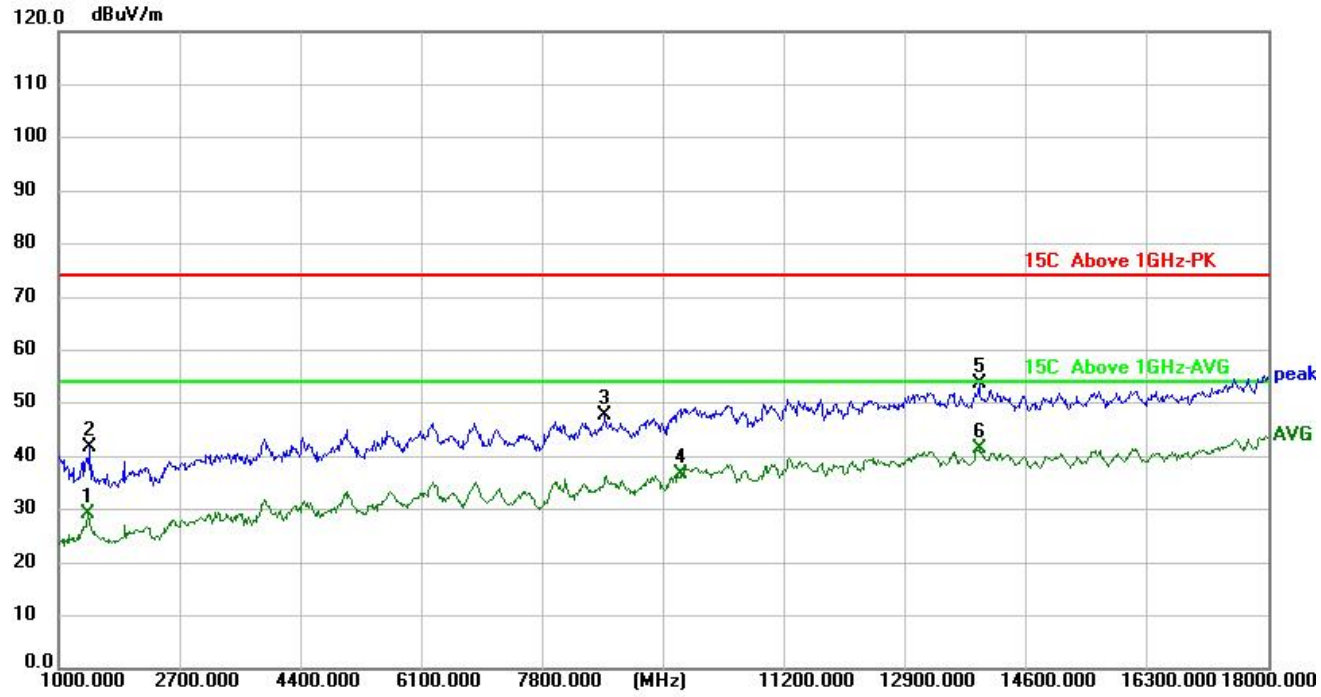
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Det.
1	1374.000	47.93	-19.86	28.07	54.00	-25.93	AVG
2	1442.000	61.25	-19.79	41.46	74.00	-32.54	peak
3	6848.000	47.03	-0.47	46.56	74.00	-27.44	peak
4	6865.000	35.78	-0.44	35.34	54.00	-18.66	AVG
5	13597.000	41.72	10.24	51.96	74.00	-22.04	peak
6	13937.000	30.86	10.55	41.41	54.00	-12.59	AVG

Polarization	Vertical	Mode	DH5_2402MHz



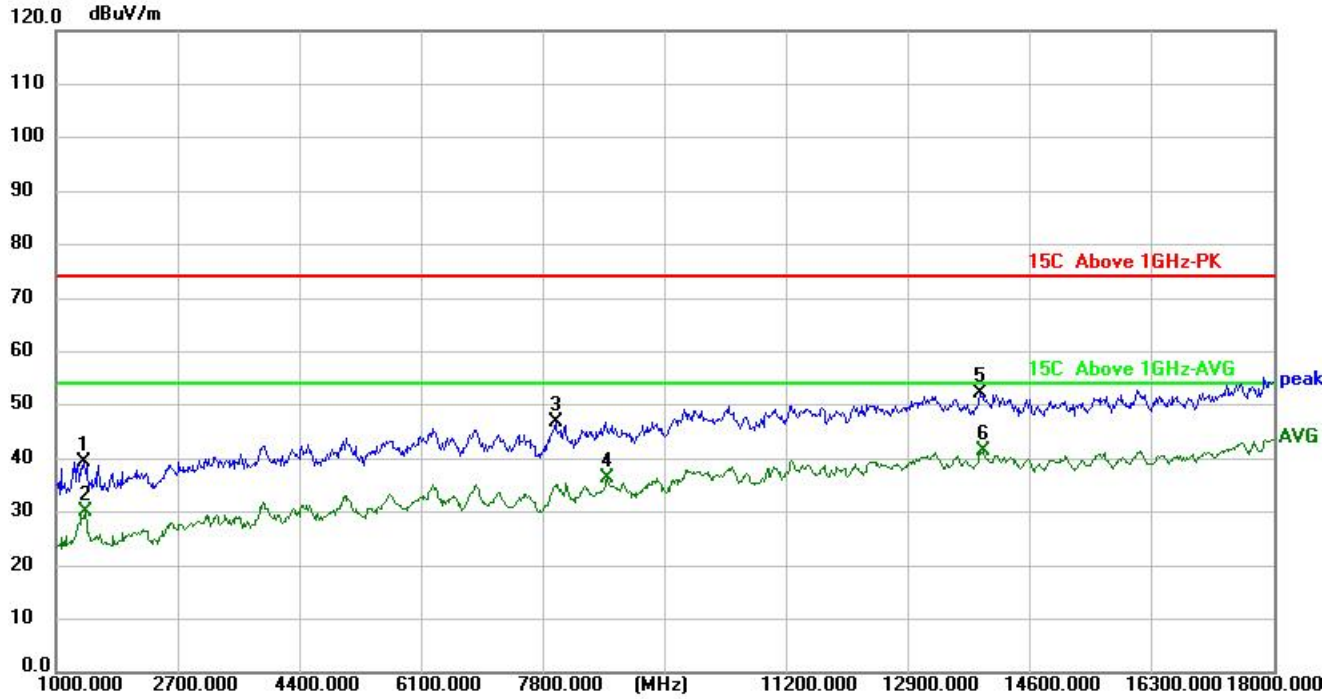
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Det.
1	5182.000	50.08	-4.78	45.30	74.00	-28.70	peak
2	6270.000	36.86	-1.75	35.11	54.00	-18.89	AVG
3	9602.000	45.74	4.38	50.12	74.00	-23.88	peak
4	9619.000	34.06	4.41	38.47	54.00	-15.53	AVG
5	13903.000	41.46	10.51	51.97	74.00	-22.03	peak
6	13937.000	30.77	10.55	41.32	54.00	-12.68	AVG

Polarization	Horizontal	Mode	DH5_2441MHz



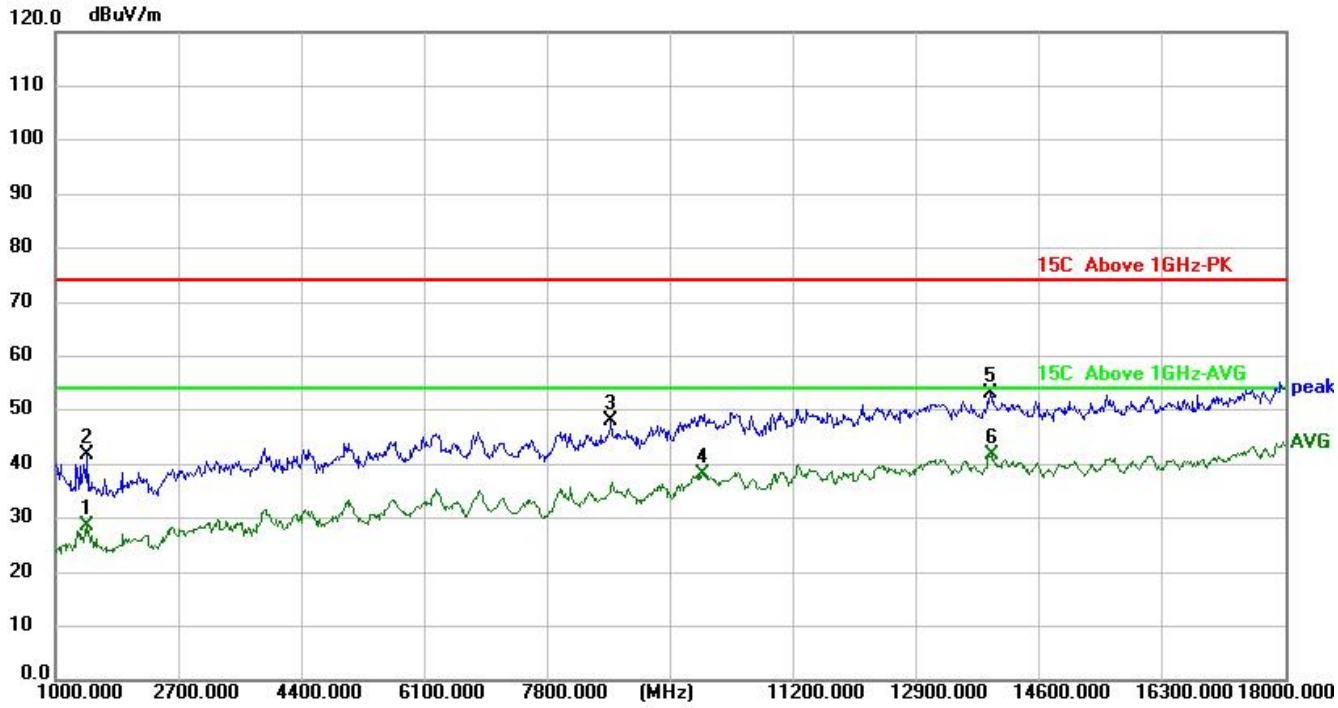
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Det.
1	1408.000	49.06	-19.79	29.27	54.00	-24.73	AVG
2	1442.000	61.42	-19.79	41.63	74.00	-32.37	peak
3	8684.000	44.84	2.78	47.62	74.00	-26.38	peak
4	9755.000	31.84	4.67	36.51	54.00	-17.49	AVG
5	13937.000	43.02	10.55	53.57	74.00	-20.43	peak
6	13937.000	31.04	10.55	41.59	54.00	-12.41	AVG

Polarization	Vertical	Mode	DH5_2441MHz



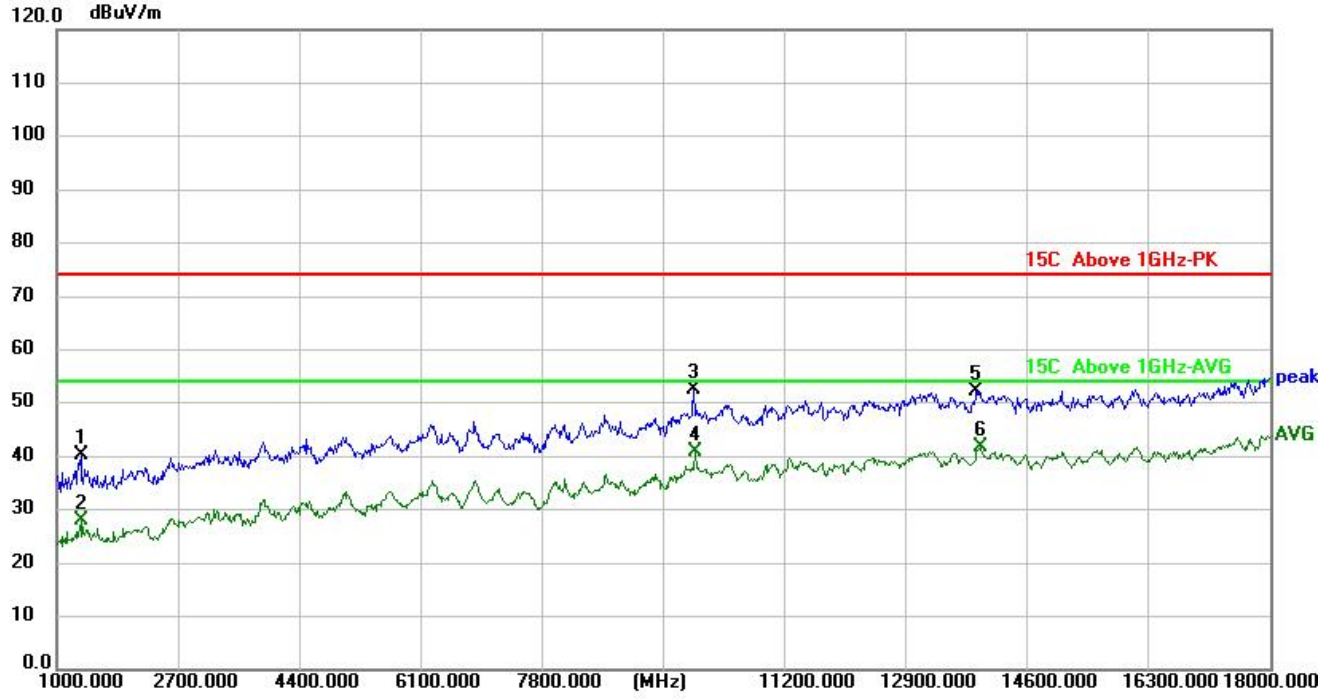
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Det.
1	1391.000	59.07	-19.81	39.26	74.00	-34.74	peak
2	1408.000	49.96	-19.79	30.17	54.00	-23.83	AVG
3	7970.000	45.25	1.66	46.91	74.00	-27.09	peak
4	8701.000	33.55	2.82	36.37	54.00	-17.63	AVG
5	13903.000	41.77	10.51	52.28	74.00	-21.72	peak
6	13937.000	30.83	10.55	41.38	54.00	-12.62	AVG

Polarization	Horizontal	Mode	DH5_2480MHz



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Det.
1	1425.000	48.22	-19.79	28.43	54.00	-25.57	AVG
2	1442.000	61.49	-19.79	41.70	74.00	-32.30	peak
3	8684.000	45.18	2.78	47.96	74.00	-26.04	peak
4	9942.000	33.23	5.00	38.23	54.00	-15.77	AVG
5	13920.000	42.54	10.52	53.06	74.00	-20.94	peak
6	13937.000	31.31	10.55	41.86	54.00	-12.14	AVG

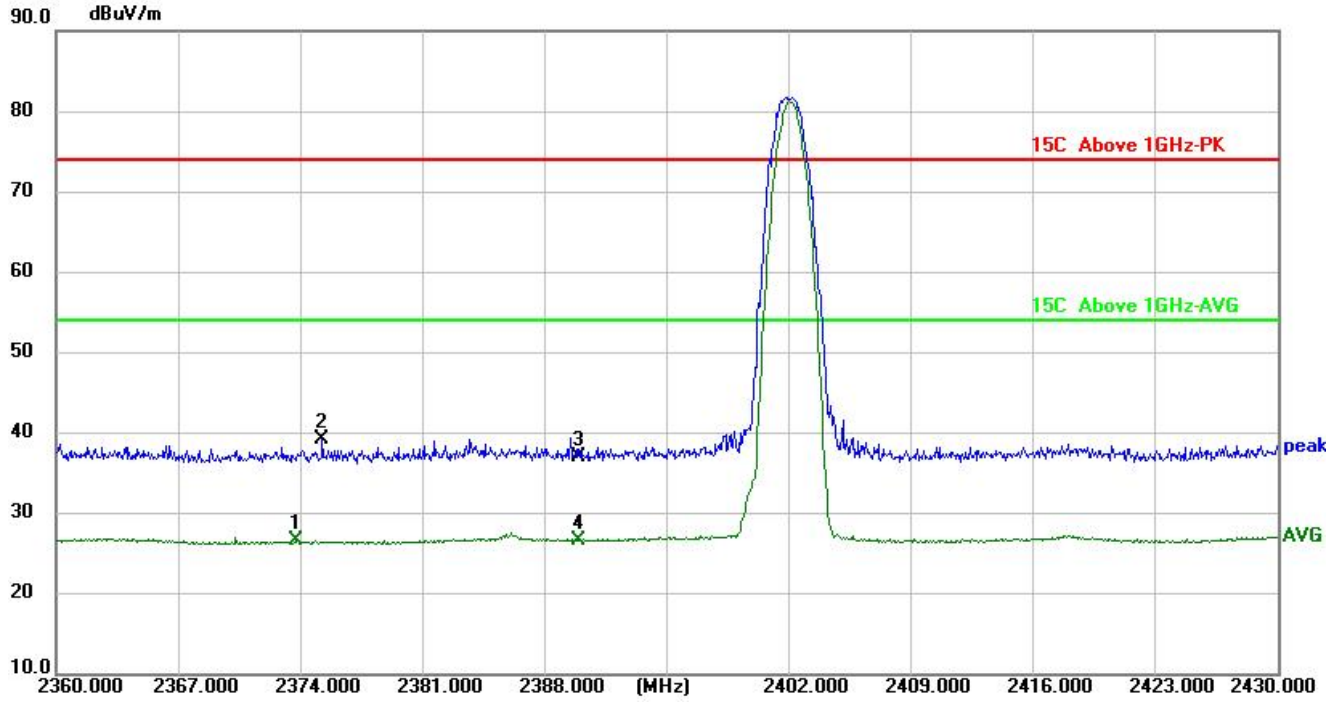
Polarization	Vertical	Mode	DH5_2480MHz



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Det.
1	1340.000	60.19	-19.95	40.24	74.00	-33.76	peak
2	1357.000	47.95	-19.90	28.05	54.00	-25.95	AVG
3	9925.000	47.64	4.97	52.61	74.00	-21.39	peak
4	9942.000	35.79	5.00	40.79	54.00	-13.21	AVG
5	13886.000	41.79	10.50	52.29	74.00	-21.71	peak
6	13937.000	31.07	10.55	41.62	54.00	-12.38	AVG

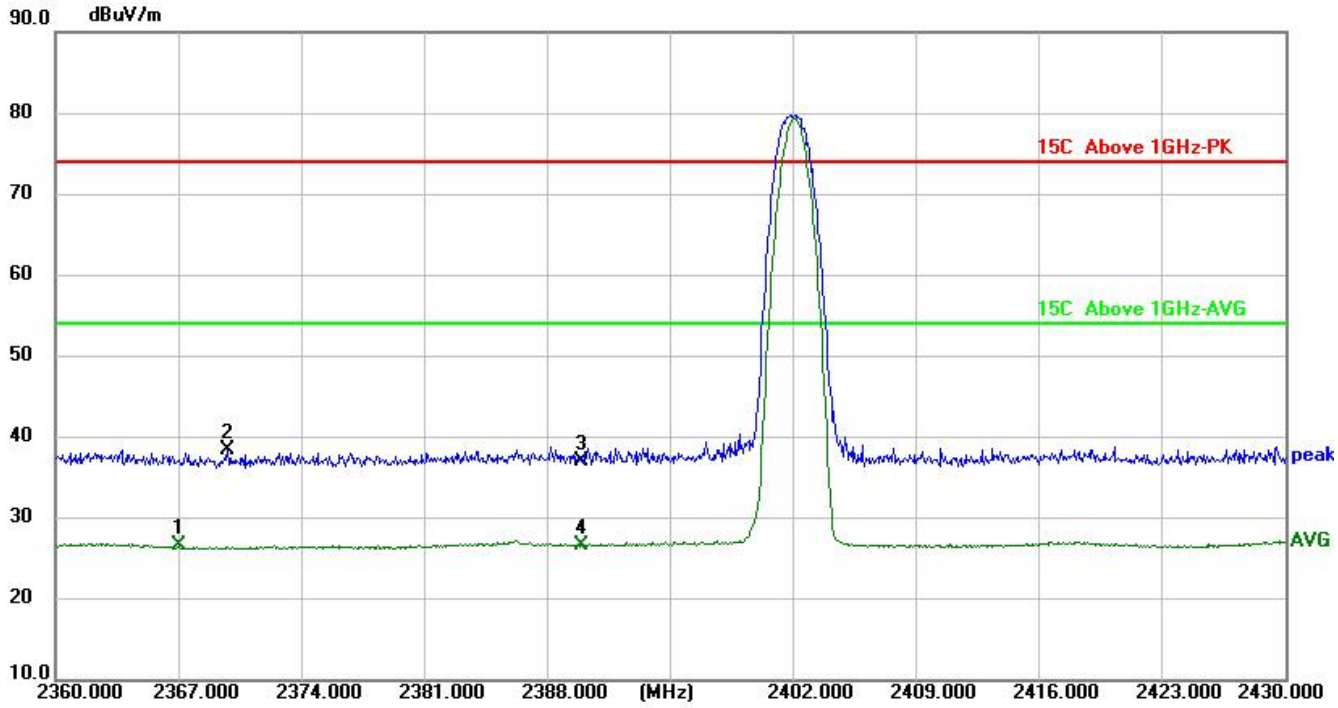
Test Result of Restricted Band:

Polarization	Horizontal	Mode	DH5_2402MHz



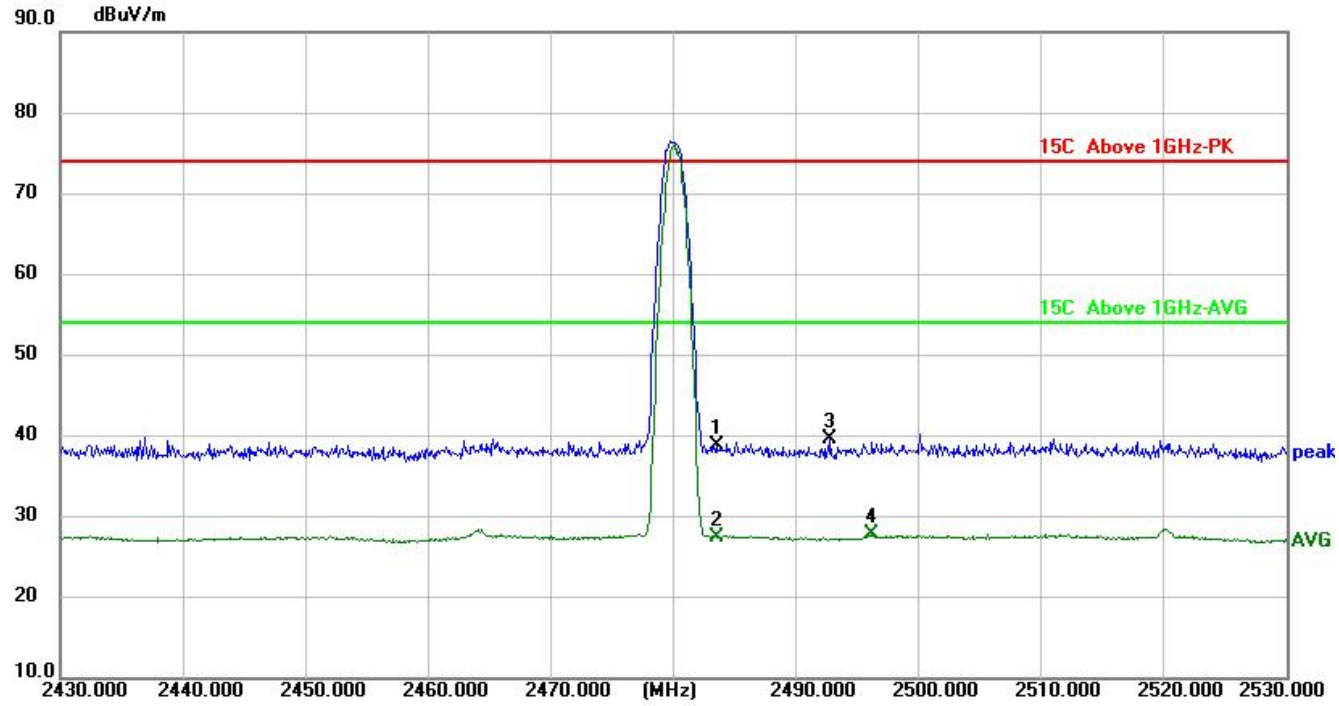
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Det.
1	2373.790	42.64	-15.92	26.72	54.00	-27.28	AVG
2	2375.260	55.04	-15.91	39.13	74.00	-34.87	peak
3	2390.000	52.96	-15.88	37.08	74.00	-36.92	peak
4	2390.000	42.53	-15.88	26.65	54.00	-27.35	AVG

Polarization	Vertical	Mode	DH5_2402MHz



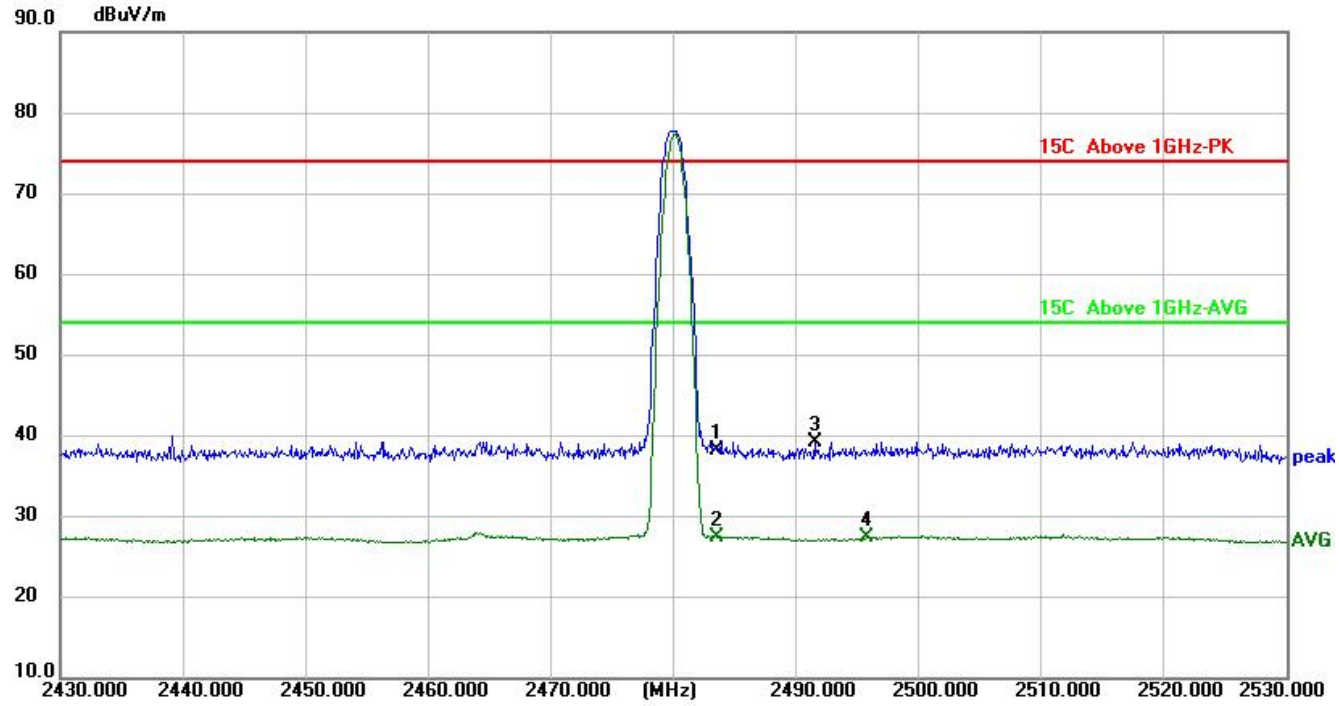
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Det.
1	2367.000	42.54	-15.94	26.60	54.00	-27.40	AVG
2	2369.800	54.37	-15.93	38.44	74.00	-35.56	peak
3	2390.000	52.93	-15.88	37.05	74.00	-36.95	peak
4	2390.000	42.44	-15.88	26.56	54.00	-27.44	AVG

Polarization	Horizontal	Mode	DH5_2480MHz



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Det.
1	2483.500	54.20	-15.30	38.90	74.00	-35.10	peak
2	2483.500	42.82	-15.30	27.52	54.00	-26.48	AVG
3	2492.800	54.90	-15.23	39.67	74.00	-34.33	peak
4	2496.200	43.08	-15.21	27.87	54.00	-26.13	AVG

Polarization	Vertical	Mode	DH5_2480MHz



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Det.
1	2483.500	53.57	-15.30	38.27	74.00	-35.73	peak
2	2483.500	42.75	-15.30	27.45	54.00	-26.55	AVG
3	2491.500	54.55	-15.23	39.32	74.00	-34.68	peak
4	2495.800	42.67	-15.21	27.46	54.00	-26.54	AVG

REMARKS:

1.Emission Level (dBuV/m) = Reading Value (dBuV) + Correction Factor (dB/m).

2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB)-Amplifier Gain.

3. The emission levels of other frequencies were less than 20dB margin against the limit.

4. Margin value = Emission level-Limit value.

A8.AC Power-Line Conducted Emission

Note:

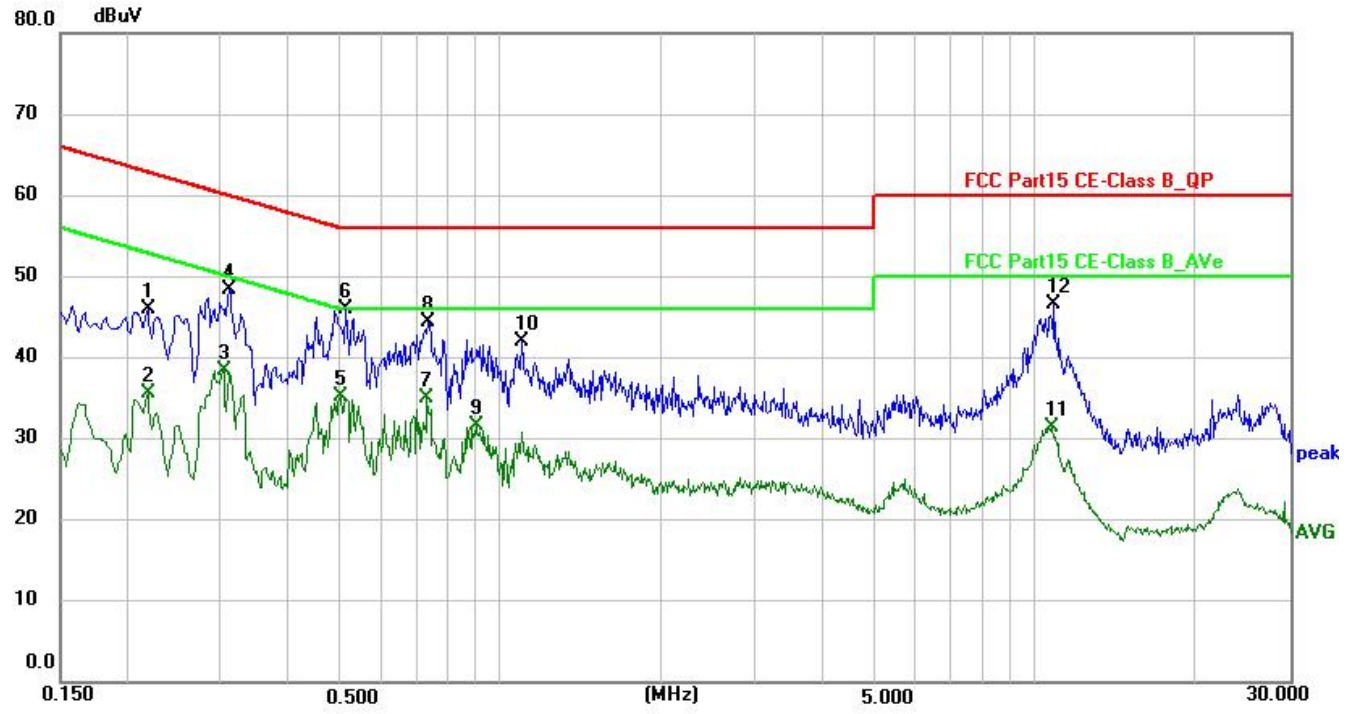
1.All modes have been tested, only worst case(DH5_2402MHz)mode was recorded in the test report.

2.Emission Level (dBuV/m) = Reading Value (dBuV) + Correction Factor (dB/m).

3. The emission levels of other frequencies were less than 20dB margin against the limit.

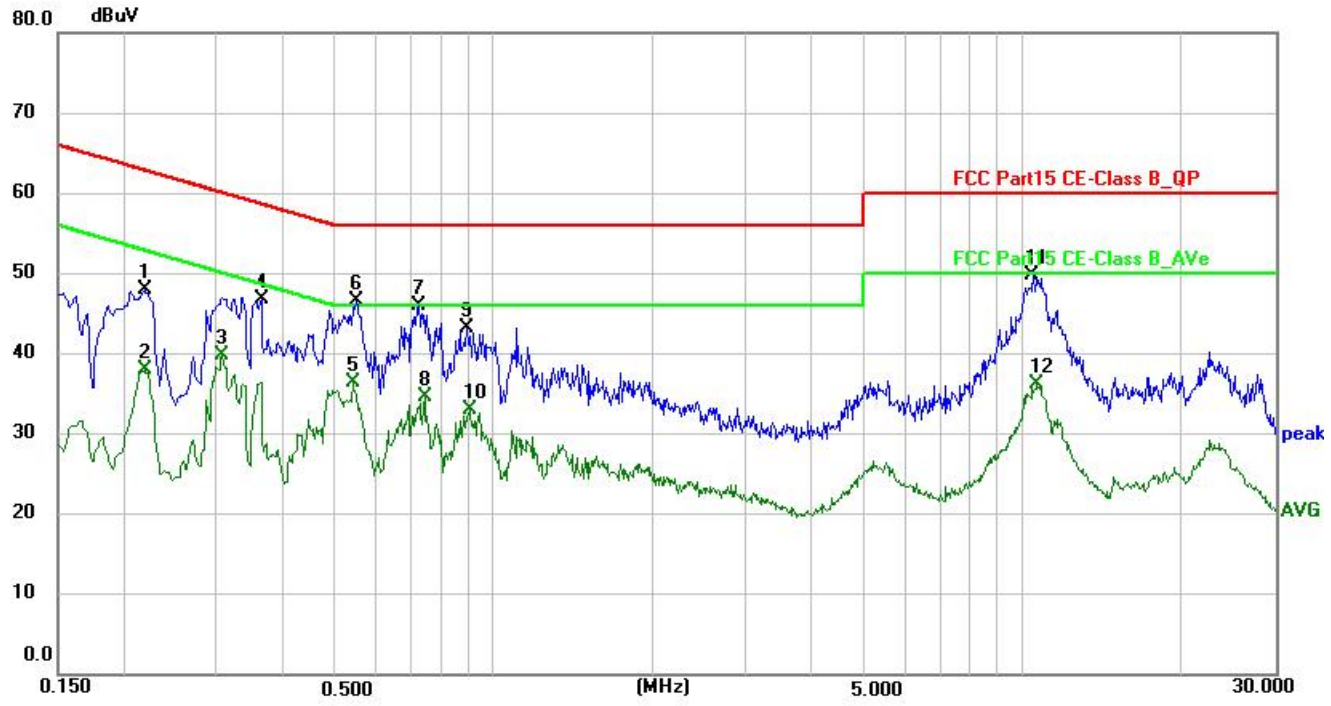
4. Margin value = Emission level-Limit value.

Polarization	L	Mode	TX Channel 0



No.	Frequency (MHz)	Reading Level(dBuV)	Factor (dB)	Measure-ment(dBuV)	Limit (dBuV)	Margin (dB)	Detector
1	0.2180	26.47	19.43	45.90	62.89	-16.99	QP
2	0.2180	16.16	19.43	35.59	52.89	-17.30	AVG
3	0.3020	19.02	19.44	38.46	50.19	-11.73	AVG
4	0.3100	29.01	19.44	48.45	59.97	-11.52	QP
5	0.5020	15.76	19.47	35.23	46.00	-10.77	AVG
6	0.5140	26.44	19.48	45.92	56.00	-10.08	QP
7	0.7300	15.42	19.52	34.94	46.00	-11.06	AVG
8	0.7340	24.90	19.52	44.42	56.00	-11.58	QP
9	0.9020	12.12	19.55	31.67	46.00	-14.33	AVG
10	1.0940	22.46	19.53	41.99	56.00	-14.01	QP
11	10.7540	10.95	20.41	31.36	50.00	-18.64	AVG
12	10.8540	26.16	20.42	46.58	60.00	-13.42	QP

Polarization	N	Mode	TX Channel 0



No.	Frequency (MHz)	Reading Level(dBuV)	Factor (dB)	Measure-ment(dBuV)	Limit (dBuV)	Margin (dB)	Detector
1	0.2180	28.46	19.43	47.89	62.89	-15.00	QP
2	0.2180	18.50	19.43	37.93	52.89	-14.96	AVG
3	0.3060	20.44	19.44	39.88	50.08	-10.20	AVG
4	0.3620	27.29	19.47	46.76	58.68	-11.92	QP
5	0.5420	16.94	19.50	36.44	46.00	-9.56	AVG
6	0.5500	27.04	19.51	46.55	56.00	-9.45	QP
7	0.7220	26.57	19.51	46.08	56.00	-9.92	QP
8	0.7420	15.15	19.52	34.67	46.00	-11.33	AVG
9	0.8940	23.61	19.55	43.16	56.00	-12.84	QP
10	0.9020	13.41	19.55	32.96	46.00	-13.04	AVG
11	10.4819	29.32	20.37	49.69	60.00	-10.31	QP
12	10.6380	15.79	20.39	36.18	50.00	-13.82	AVG

※※※※※END OF THE REPORT※※※※※