FCC Part 15, Subpart C
Test Report

FCC ID:	2AAGF-JUNO
Applicant:	Zound Industries International AB
Address:	Centralplan 15 SE-111 20 Stockholm Sweden
Manufacturer:	Zound Industries International AB
Address:	Centralplan 15 SE-111 20 Stockholm Sweden
Product(s):	True Wireless Headphones
Brand(s):	URBANEARS
Test Model(s):	Urbanears Juno
Series Model(s):	N/A
Test Date:	Aug. 30, 2022~ Sep. 15, 2022
Issued Date:	Sep. 26, 2022
Issued By:	Hwa-Hsing (Dongguan) Testing Co., Ltd.
Address:	No.101, Bld N1, Yuyuan 2Rd, Yuyuan Industrial Park, HuangJiang Town, Dongguan, China
Test Firm Registration No.:	915896
Designation No.:	CN1255
Standards:	47 CFR FCC Part 15, Subpart C (Section 15.247) ANSI C63.10:2013

The above equipment has been tested by **Hwa-Hsing (Dongguan) Testing Co., Ltd.**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions specified in this report.

Prepared by : Niny Zhang

Reviewed by : Tank Tan

Approved by : Scott He

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Release Control Record

Issue No.	Description	Date Issued
220818EL08-RF-US-01	Original Release	Sep. 26, 2022

1 Summary of Test Results

47 CFR FCC Part 15, Subpart C (Section 15.247) KDB 558074 D01 15.247 Meas Guidance v05r02 ANSI C63.10:2013;			
FCCClause	Test Item	Result	Remarks
15.207	AC Power Conducted Emission	Pass	Meet the requirement of limit.
15.247(a)(1) (iii)	Number of Hopping Frequency Used	Pass	Meet the requirement of limit.
15.247(a)(1) (iii)	Dwell Time on Each Channel	Pass	Meet the requirement of limit.
15.247(a)(1)	1. Hopping Channel Separation 2. Spectrum Bandwidth of a Frequency Hopping Sequence Spread Spectrum System	Pass	Meet the requirement of limit.
15.247(b)	Maximum Peak Output Power	Pass	Meet the requirement of limit.
---	Occupied Bandwidth Measurement	Pass	Reference only
15.205 & 209	Radiated Emissions	Pass	Meet the requirement of limit.
15.247(d)	Band Edge Measurement	Pass	Meet the requirement of limit.
15.247(d)	Antenna Port Emission	Pass	Meet the requirement of limit.
15.203	Antenna Requirement	Pass	No antenna connector is used.

Note1: If the Frequency Hopping System operating in 2400-2483.5MHz band and the output power less than 125mW. The hopping channel carrier frequencies separated by a minimum of 25kHz or two-thirds of the 20dB bandwidth of hopping channel whichever is greater.

Note2: The EUT has been verified to comply with the requirements of FCC Part 15, Subpart B, Class B (sDoC). The test report has been issued separately.

1.1 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUTas specified in CISPR 16-4-2:

The listed uncertainties are the worst-case uncertainty for the entire range of measurement. Please note that the uncertainty values are provided for informational purposes only and are not used in determining the PASS/FAIL results.

Measurement	Frequency	Expended Uncertainty (k=2) (±)
Conducted Emissions at mains ports	150kHz ~ 30MHz	2.66 dB
Radiated Emissions up to 1 GHz	9KHz ~ 30MHz	2.16 dB
	30MHz ~ 1000MHz	3.47 dB
Radiated Emissions above 1 GHz	1GHz ~ 18GHz	4.84 dB
	18GHz ~ 40GHz	4.67 dB

Note:This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k = 2.

1.2 Modification Record

There were no modifications required for compliance.

2 General Information

2.1 General Description of EUT

Product(s)	True Wireless Headphones
Test Model(s)	Urbanears Juno
Sample No.	HS220819-04-11
Series Model(s)	N/A
Status of EUT	Engineering Prototype
Power Supply Rating	Charge case: Input: DC 5V, 500mA from USB or DC 3.7V from battery; Output: DC 5V, 100mA×2 Each Headphone: Input: DC 5V 100mA from Charge case or DC 3.85V from battery
Modulation Type	GFSK, π/4 DQPSK, 8DPSK for FHSS
Transfer Rate	1Mbps, 2Mbps, 3Mbps
Operating Frequency	2402 ~ 2480MHz
Number of Channel	79
Output Power（Peak）	L: 7.808dBm R: 7.645dBm
Antenna Type	FPC Antenna
Antenna Gain	L: 1.78dBi R: -0.5dBi
Antenna Connector	N/A
Accessory Device	N/A

Note:

1. Please refer to the EUT photo document (Reference No.:220818EL08-01&02) for detailed product photo.
2. The above EUT information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications or User's Manual.

2.2 Description of Test Modes

79 channels are provided to this EUT:

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

2.3 Test Mode Applicability and Tested Channel Detail

EUT Configure Mode	Applicable test items	X-Axis	Y-Axis	Z-Axis	Voltage Supply
Conducted	AC Power Conducted Emission	N/A	N/A	N/A	DC 3.85V from battery
Radiated	Radiated Emissions	√	√	√	
Antenna Port Conducted Measurement	Number of Hopping Frequency Used	N/A	N/A	N/A	
	Dwell Time on Each Channel	N/A	N/A	N/A	
	Band Edge Measurement	N/A	N/A	N/A	
	Antenna Port Emission	N/A	N/A	N/A	
	Conducted power	N/A	N/A	N/A	
	Hopping Channel Separation	N/A	N/A	N/A	
	Spectrum Bandwidth of a Frequency Hopping Sequence Spread Spectrum System	N/A	N/A	N/A	

1. *: The EUT had been pre-tested on the positioned of each 3 Axis. The worst case was found when positioned on **X-plane**.
2. "N/A" means no effect.

Evaluation of difference data rate:

Applicable test items	Modulation Type			The Worst-case modes recording in report
	GFSK	π/4DQPSK	8DPSK	
Radiated Emissions	√	√	√	GFSK& 8DPSK
Antenna Port Conducted Measurement	√	√	√	GFSK& 8DPSK

Test Condition:

Applicable test items	Environmental Conditions	Test Date	Tested by
AC Power Conducted Emission	26.2deg. C, 57%RH	Sep. 07, 2022	King Ye
Radiated Emissions	26.5deg. C, 50%RH	Sep. 07, 2022	King Ye
Antenna Port Conducted Measurement	25deg. C, 58%RH	Sep. 07, 2022	Dragon Long

- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture). Following channel(s) was (were) selected for the final test as listed below.

Radiated Emission Test (Above 1 GHz):

EUT Configure Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Packet Type
-	0 to 78	0, 39, 78	FHSS	GFSK	DH5
-	0 to 78	0, 39, 78	FHSS	8DPSK	3DH5

Radiated Emission Test (Below 1 GHz):

EUT Configure Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Packet Type
-	0 to 78	39	FHSS	GFSK	DH5
-	0 to 78	0, 39, 78	FHSS	8DPSK	3DH5

Power Line Conducted Emission Test:

EUT Configure Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Packet Type
-	0 to 78	39	FHSS	GFSK	DH5

Antenna Port Conducted Measurement:

☒ This item includes all test value of each mode, but only includes spectrum plot of worst value of each mode.

EUT Configure Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Packet Type
-	0 to 78	0, 39, 78	FHSS	GFSK	DH5
-	0 to 78	0, 39, 78	FHSS	8DPSK	3DH5

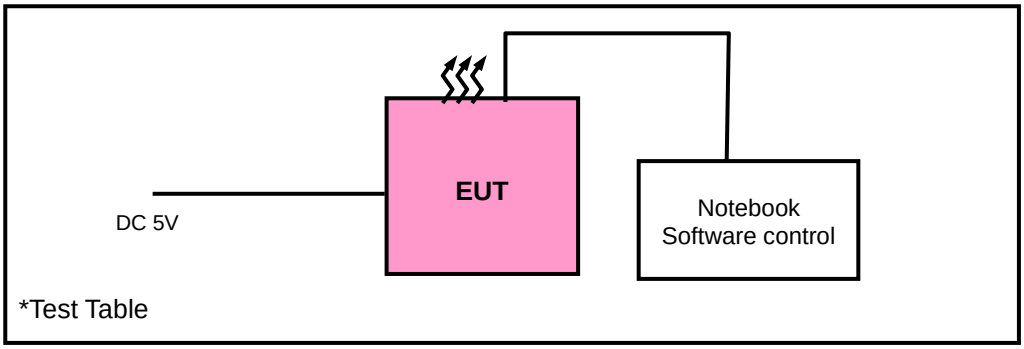
2.4 Description of Support Units

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

No.	Product	Brand	Model No.	Serial No.	FCC ID
1.	Notebook	DELL	Latitude 5300	N/A	N/A

No.	Signal Cable Description of The Above Support Units
1.	USB serial cable Un-shielded1.2m
2.	/

2.4.1 Configuration of System under Test



3 TestTypesand Results

3.1 Radiated Emission andBand-edge Measurement

3.1.1 Limits of Radiated Emission andBand-edge Measurement

Radiated emissions which fall in the restricted bands must comply with the radiated emission limits specified as below table. Other emissions shall be at least 20 dB below the highest level of the desired power:

Frequencies (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
* DTS emissions in non-restricted frequency bands Subclause 11.11 of ANSI C63.10 is applicable. * DTS emissions in restricted frequency bands Subclause 11.12 of ANSI C63.10 is applicable		

Note:

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
3. For frequencies above 1000 MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20 dB under any condition of modulation.

3.1.2 Test Instruments

Radiated emission below 30MHz:

Equipment	Manufacturer	Model No.	Serial No.	Next Cal.
EMI Test Receiver	Rohde&Schwarz	ESR7	100962	2023-01-13
3m Semi-anechoic Chamber	MAORUI	9m*6m*6m	NSEMC003	2023-04-15*
Test software	FARAD	FARAD	EZ_EMCV1.1.4.2	N/A
Loop Antenna	EMCI	HLA 6121	56735	2023-04-15*
Preamplifier	EMCI	EMC001340	980201	2023-01-12
Antenna Tower	MF	MFA-440H	NA	NA
Turn Table	MF	MFT-201SS	NA	NA
Antenna Tower&Turn Table Controller	MF	MF-7802	NA	NA

Frequency Range below 1GHz:

Equipment	Manufacturer	Model No.	Serial No.	Next Cal.
3m Semi-anechoic Chamber	MAORUI	9m*6m*6m	NSEMC003	2023-01-13
EMI Test Receiver	Rohde&Schwarz	ESR7	100962	2023-09-12*
Broadband antenna	Schwarzbeck	VULB 9168	00937	2023-04-15*
Signal Amplifier	Com-power	PAM-103	18020051	2023-08-25
Attenuator	Rohde&Schwarz	TS2GA-6dB	18101101	N/A
Test software	FARAD	FARAD	EZ_EMCV1.1.4.2	N/A

Frequency Range 1-18GHz:

Equipment	Manufacturer	Model No.	Serial No.	Next Cal.
3m Semi-anechoic Chamber	MAORUI	9m*6m*6m	NSEMC003	2023-04-15*
Horn Antenna	Schwarzbeck	BBHA 9120D	01959	2024-05-04
Broadband Coaxial Preamplifier	Com-power	PAM-118A	1804003	2023-08-25
Spectrum	Keysight	N9020A	MY51240612	2023-08-25
Antenna Tower	MF	MFA-440H	NA	NA
Turn Table	MF	MFT-201SS	NA	NA
Antenna Tower&Turn Table Controller	MF	MF-7802	NA	NA

Frequency Range 18-40GHz:

Equipment	Manufacturer	Model No.	Serial No.	Next Cal.
3m Semi-anechoic Chamber	MAORUI	9m*6m*6m	NSEMC003	2023-04-15*
Spectrum Analyzer	Rohde&Schwarz	FSV-40N	101783	2023-01-13
Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170242	2023-04-10*
Pre-Amplifier	EMCI	EMC 184045	980102	2023-01-12
Antenna Tower	MF	MFA-440H	NA	NA
Turn Table	MF	MFT-201SS	NA	NA
Antenna Tower&Turn Table Controller	MF	MF-7802	NA	NA

Note:
1. The calibration interval of the above test instruments is 12 months or 24 months (*).
2. The test was performed in 966

3.1.3 Test Procedures

a. <u>Peak emission levels are measured by setting the instrument as follow:</u>

1) RBW&VBWsetting as a function of frequency:

Frequency	RBW	VBW
9kHz~150kHz	200Hz	600Hz
0.15MHz~30MHz	9kHz	30kHz
30MHz~1000MHz	120kHz	300kHz
>1000MHz	1MHz	3MHz

2) Detector = peak.
3) Sweep time = auto.
4) Trace mode = max hold.
5) Allow sweeps to continue until the trace stabilizes. (Note that the required measurement time may be lengthened for low-duty-cycle applications.)

Note: If the peak-detected amplitude can be shown to comply with the average limit, then it is not necessary to perform a separate average measurement

b. <u>Average emission levels are measured by setting the instrument as follow:</u>

- **Trace averaging with continuous EUT transmission at full power**

If the EUT can be configured or modified to transmit continuously (D ≥ 98%). then the average emission levels shall be measured using the following method (with EUT transmitting continuously):

1) RBW=1 MHz (unless otherwise specified).
2) VBW≥ 3 *RBW.
3) Detector =RMS
4) Sweep time = auto.
5) Perform a trace average of at least 100 traces.

- **Trace averaging across ON and OFF times of the EUT transmissions followed by duty cycle correction**

If continuous transmission of the EUT (D≥98%) cannot be achieved and the duty cycle is constant (duty cycle variations are less than ±2%). then the following procedure shall be used

1) The EUT shall be configured to operate at the maximum achievable duty cycle.
2) Measure the duty cycle D of the transmitter output signal as described in 11.6.
3) RBW=1 MHz (unless otherwise specified).
4) VBW≥ 3 *RBW.
5) Detector =RMS
6) Sweep time = auto.
7) Perform a trace average of at least 100 traces.

A correction factor shall be added to the measurement results prior to comparing with the emission limit to compute the emission level that would have been measured had the test been performed at 100% duty cycle. The correction factor is computed as follows:

*If power averaging (rms) mode was used in step 5). then the applicable correction factor is [10 10g (1/ D)], where D is the duty cycle.

**If linear voltage averaging mode was used in step f). then the applicable correction factor is [20 10g (1/D)], where D is the duty cycle.

***If a specific emission is demonstrated to be continuous (D > 98%) rather than turning ON and OFF with the transmit cycle, then no duty cycle correction is required for that

- **Reduced VBW Averaging across ON and OFF times of the EUT transmissions with max hold**

If continuous transmission of the EUT (D > 98%) cannot be achieved and the duty cycle is not constant (duty cycle variations exceed ±2%), then the following procedure shall be used:

1) RBW = 1 MHz.
2) VBW≥1/T.
3) Detector =peak
4) Sweep time = auto.
5) Trace mode = max hold.
6) Allow max hold to run for at least [50 x (1/ D)] traces

c. The EUT was placed on the top of a rotating table 0.8 meters (below 1GHz) / 1.5 meters (1-18GHz) / 1.5 meters (18-40GHz) above the reference ground. The table was rotated 360 degrees to determine the position of the highest radiation.
d. The EUT was set 3 meters away from the interference-receiving antenna (Below 1GHz) & (Above 1-18GHz), which was mounted on the top of a variable-height antenna tower. The EUT was set 1meters away from the interference-receiving antenna (18-40GHz).
e. The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
f. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
g. The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.

The test-receiver system was set to peak and average detected function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

Note:

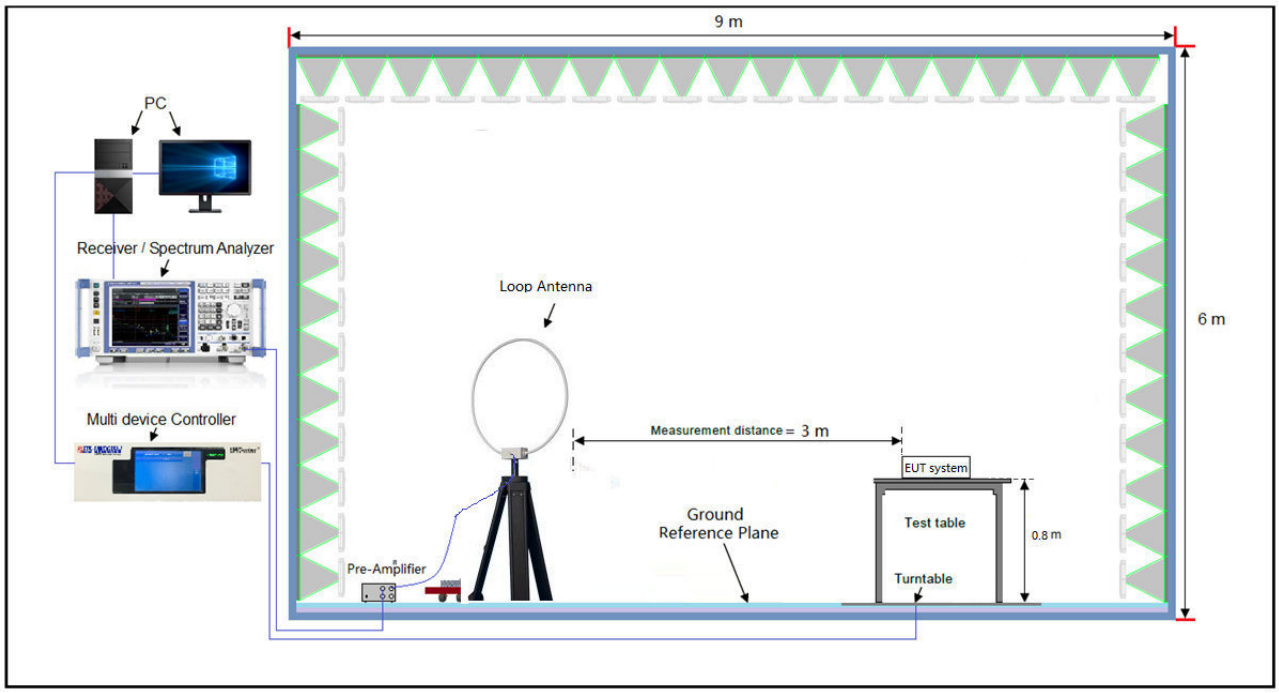
1. Test procedures for measuring FHSS device: The use of a duty cycle correction factor (DCCF) is permitted for calculating average radiated field strength emission levels for an FHSS device in 15.247. This DCCF can be applied when the unwanted emission limit is subject to an average field strength limit (e.g., within a Government Restricted band) and the conditions specified in Section 15.35(c) can be satisfied. The average radiated field strength is calculated by subtracting the DCCF from the maximum radiated field strength level as determined through measurement. The maximum radiated field strength level represents the worst-case (maximum amplitude) RMS measurement of the emission(s) during continuous transmission (i.e., not including any time intervals during which the transmitter is off or is transmitting at a reduced power level). It is also acceptable to apply the DCCF to a measurement performed with a peak detector instead of the specified RMS power averaging detector. Note that Section 15.35(c) specifies that the DCCF shall represent the worst-case (greatest duty cycle) over any 100 msec transmission period. Subclause 7.5 of ANSI C63.10 provides additional measurement guidance applicable to determination of the DCCF.
2. All modes of operation were investigated and the worst-case emissions are reported.

3.1.4 Deviation from Test Standard

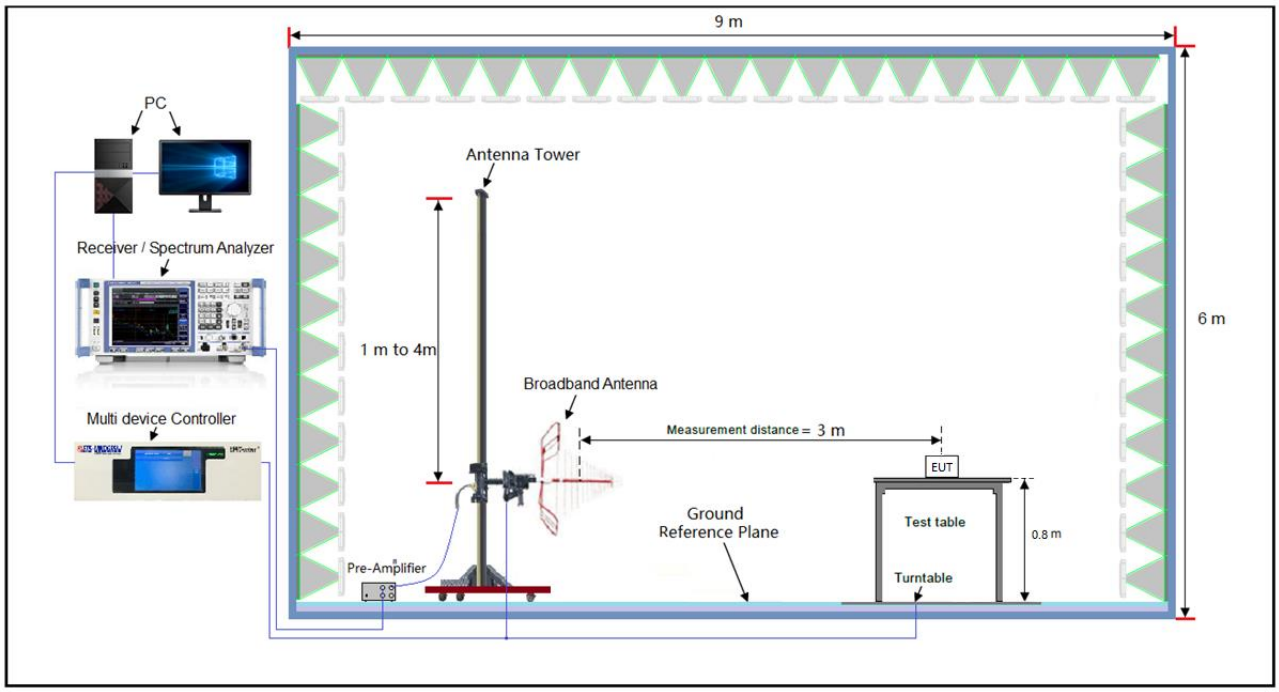
No deviation.

3.1.5 Test Setup

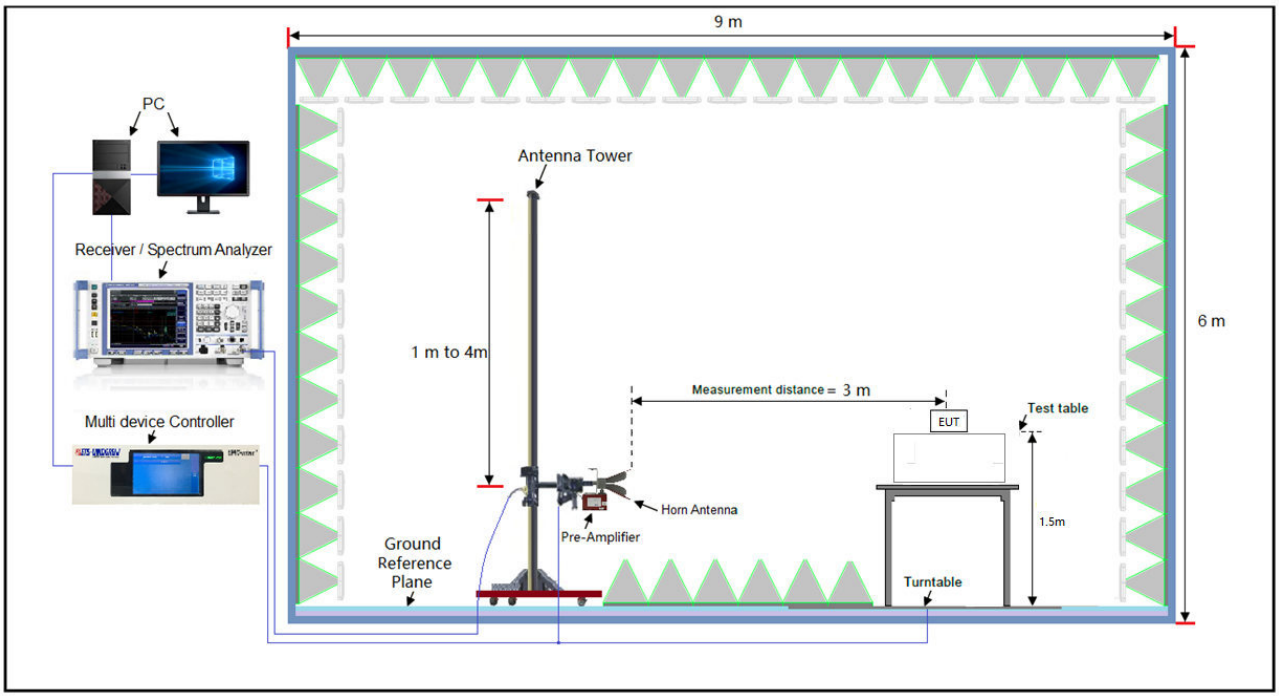
Radiated emission below 30MHz:



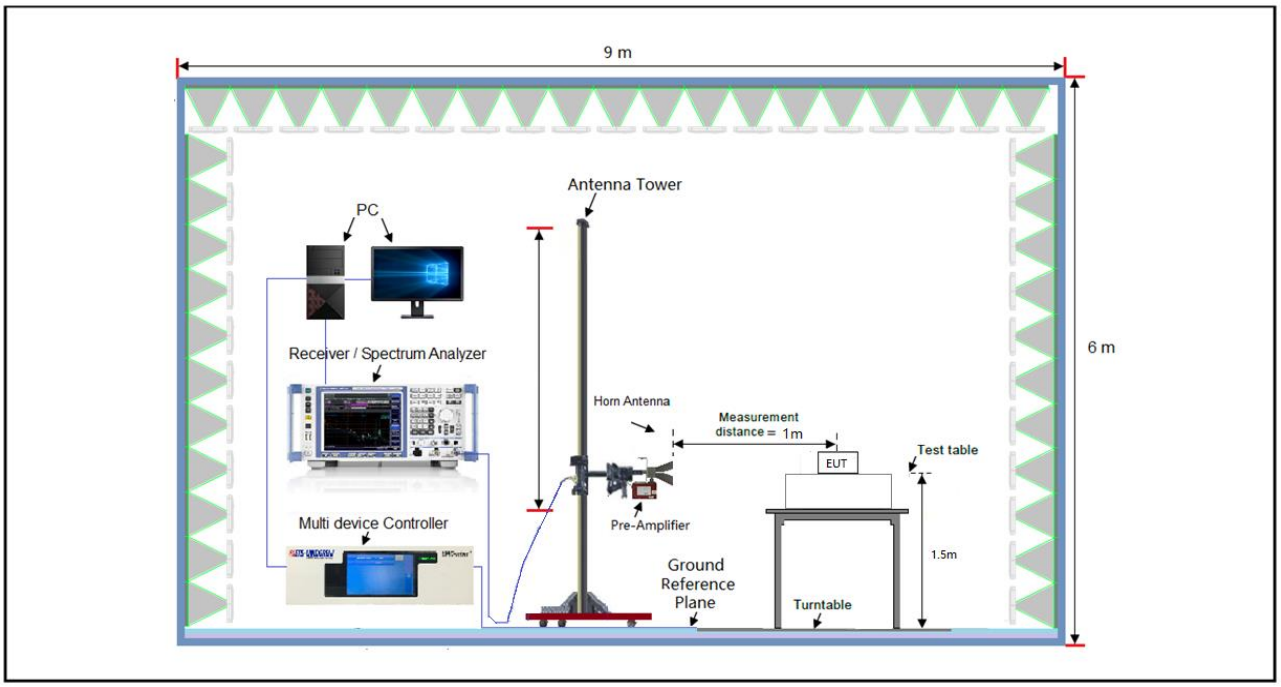
Frequency Range below 1GHz:



Frequency Range above 1GHz:



Frequency Range 18-40GHz:



*For the actual test configuration, please refer to the attached file (Test Setup Photo).

3.1.6 EUT Operating Conditions

Set the EUT under transmission condition continuously at specific channel frequency.

3.1.7 Test Results

9 kHz ~ 30 MHz Data:

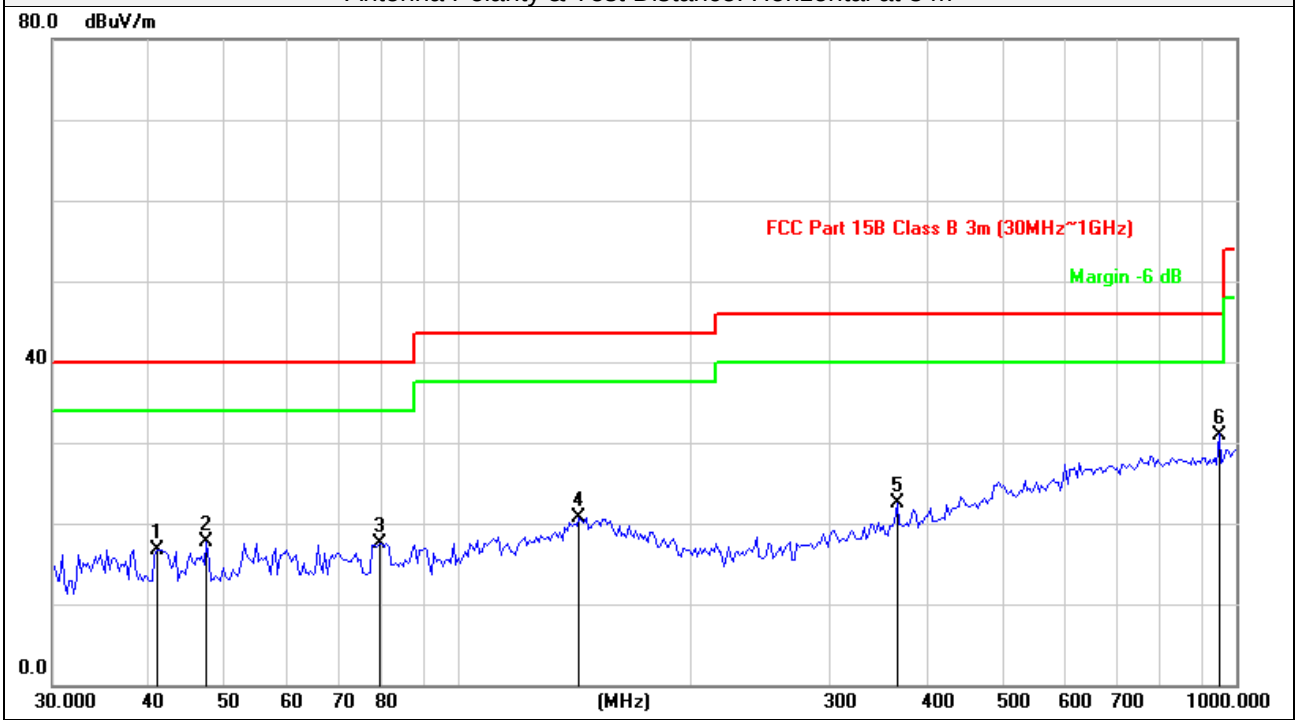
The amplitude of spurious emissions attenuated more than 20 dB below the permissible value is not required to be report.

Left

30 MHz ~ 1GHz Worst-Case Data:

Frequency Range	30MHz ~ 1GHz	Detector Function	Peak (PK) Quasi-peak (QP)
Test Channel	Channel 0		

Antenna Polarity & Test Distance: Horizontal at 3 m



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detecter	Antenna Height (cm)	Table Angle (Degree)
1	40.8700	31.69	-14.89	16.80	40.00	-23.20	peak	300	294
2	47.3688	32.75	-15.03	17.72	40.00	-22.28	peak	300	112
3	79.1184	36.60	-19.04	17.56	40.00	-22.44	peak	200	74
4	142.7692	35.45	-14.76	20.69	43.50	-22.81	peak	200	105
5	366.0865	33.49	-11.02	22.47	46.00	-23.53	peak	200	315
6 *	952.0000	30.74	0.26	31.00	46.00	-15.00	peak	200	281

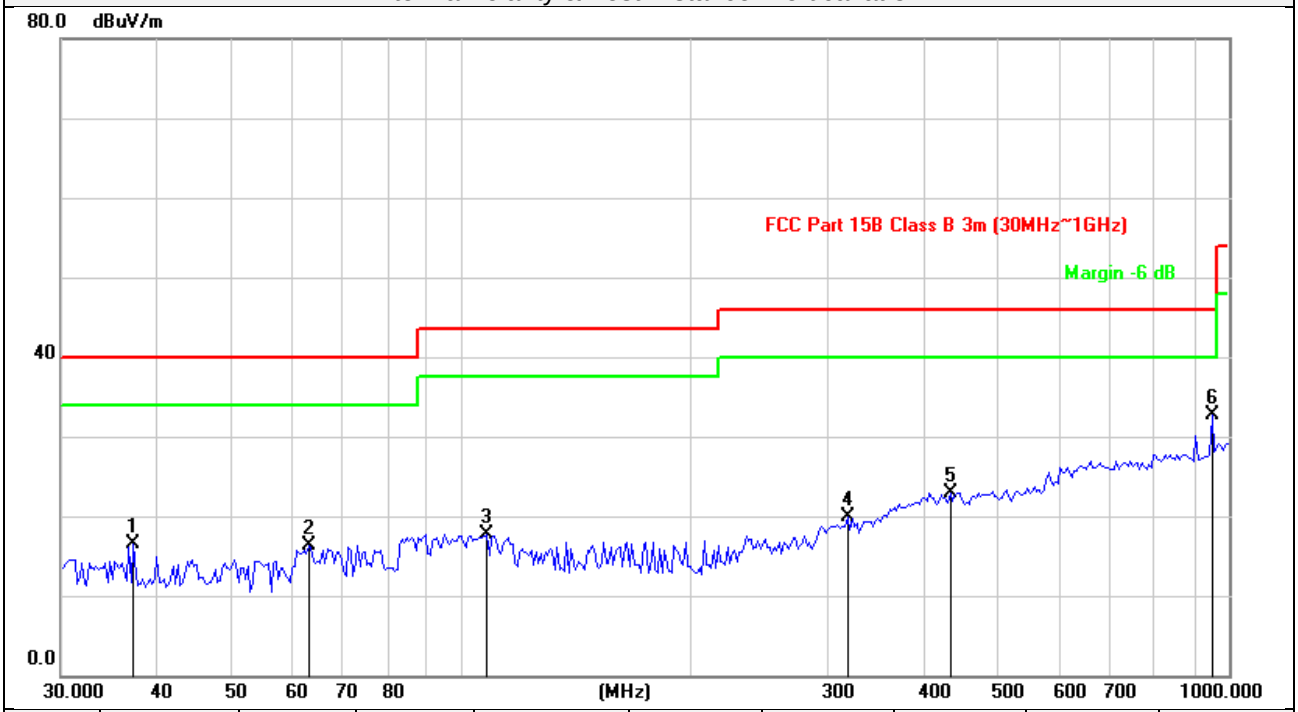
Remarks:

1.Emission Level = Read Level + Factor (Antenna Factor + Cable Loss - Preamp Factor)

2.Margin value = Emission level – Limit value

Frequency Range	30MHz ~ 1GHz	Detector Function	Peak (PK) Quasi-peak (QP)
Test Channel	Channel 39		

Antenna Polarity & Test Distance: Vertical at 3 m



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detecter	Antenna Height (cm)	Table Angle (Degree)
1 *	37.3016	31.65	-15.22	16.43	40.00	-23.57	peak	100	175
2	63.1856	32.74	-16.49	16.25	40.00	-23.75	peak	100	118
3	107.7853	35.05	-17.27	17.78	43.50	-25.72	peak	200	125
4	318.0874	32.32	-12.48	19.84	46.00	-26.16	peak	100	194
5	433.3396	31.78	-8.83	22.95	46.00	-23.05	peak	100	316
6	952.0000	32.46	0.26	32.72	46.00	-13.28	peak	200	205

Remarks:

1.Emission Level = Read Level + Factor (Antenna Factor + Cable Loss - Preamp Factor)

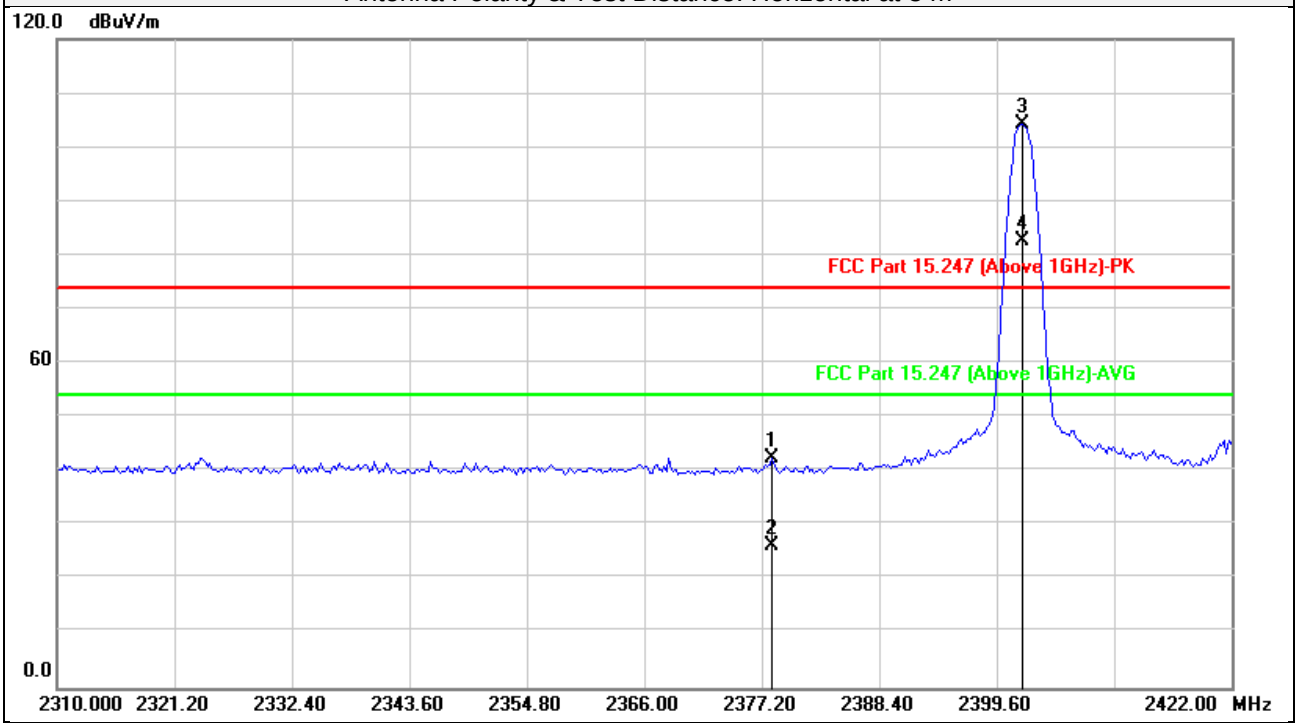
2. Margin value = Emission level – Limit value

Above 1GHz Data:

GFSK

Frequency Range	1GHz ~ 25GHz	Detector Function	Peak (PK) Average (AVG)
Test Channel	Channel 0		

Antenna Polarity & Test Distance: Horizontal at 3 m



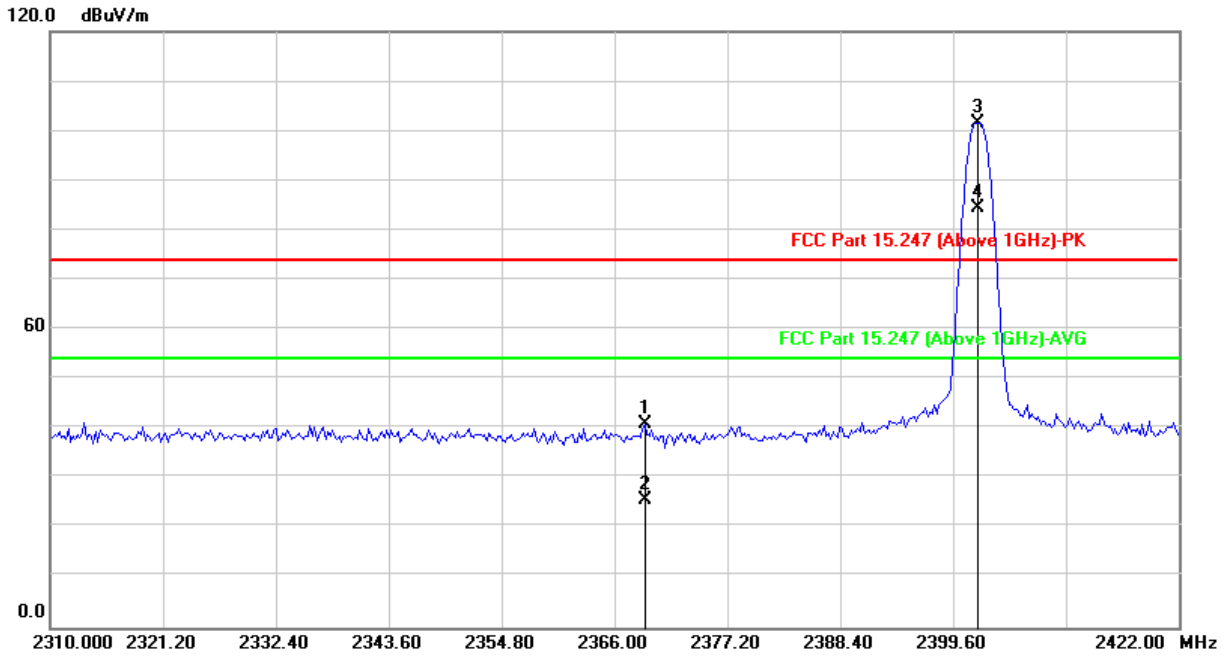
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detecter	Antenna Height (cm)	Table Angle (Degree)
1	2378.233	41.64	0.78	42.42	74.00	-31.58	peak	100	71
2	2378.233	25.41	0.78	26.19	54.00	-27.81	AVG	100	71
3#	2402.024	103.38	0.74	104.12			peak	100	71
4#	2402.024	81.93	0.74	82.67			AVG	100	71
5	4804.000	43.10	7.27	50.37	74.00	-23.63	peak	100	162
6	4804.000	34.35	7.27	41.62	54.00	-12.38	AVG	100	162
7	7206.000	37.16	10.75	47.91	74.00	-26.09	peak	100	122
8	7206.000	24.52	10.75	35.27	54.00	-18.73	AVG	100	122

Remarks:

1. Emission Level = Read Level + Factor (Antenna Factor + Cable Loss - Preamp Factor)
   Margin value = Emission level – Limit value
2. #2402MHz: Fundamental frequency.
3. The amplitude of spurious emissions attenuated more than 20 dB below the permissible value is not required to be report.

Frequency Range	1GHz ~ 25GHz	Detector Function	Peak (PK) Average (AVG)
Test Channel	Channel 0		

Antenna Polarity & Test Distance: Vertical at 3 m



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detecter	Antenna Height (cm)	Table Angle (Degree)
1	2369.030	40.25	0.79	41.04	74.00	-32.96	peak	109	40
2	2369.030	24.91	0.79	25.70	54.00	-28.30	AVG	109	40
3#	2402.024	100.83	0.74	101.57			peak	109	40
4#	2402.024	83.59	0.74	84.33			AVG	109	40
5	4804.000	44.20	7.27	51.47	74.00	-22.53	peak	100	186
6	4804.000	34.01	7.27	41.28	54.00	-12.72	AVG	100	186
7	7206.000	37.61	10.75	48.36	74.00	-25.64	peak	100	147
8	7206.000	26.18	10.75	36.93	54.00	-17.07	AVG	100	147

Remarks:

1.Emission Level = Read Level + Factor (Antenna Factor + Cable Loss - Preamp Factor)
Margin value = Emission level – Limit value

2.#2402MHz: Fundamental frequency.

3.The amplitude of spurious emissions attenuated more than 20 dB below the permissible value is not required to be report.

Frequency Range	1GHz ~ 25GHz	Detector Function	Peak (PK) Average (AVG)
Test Channel	Channel 39		

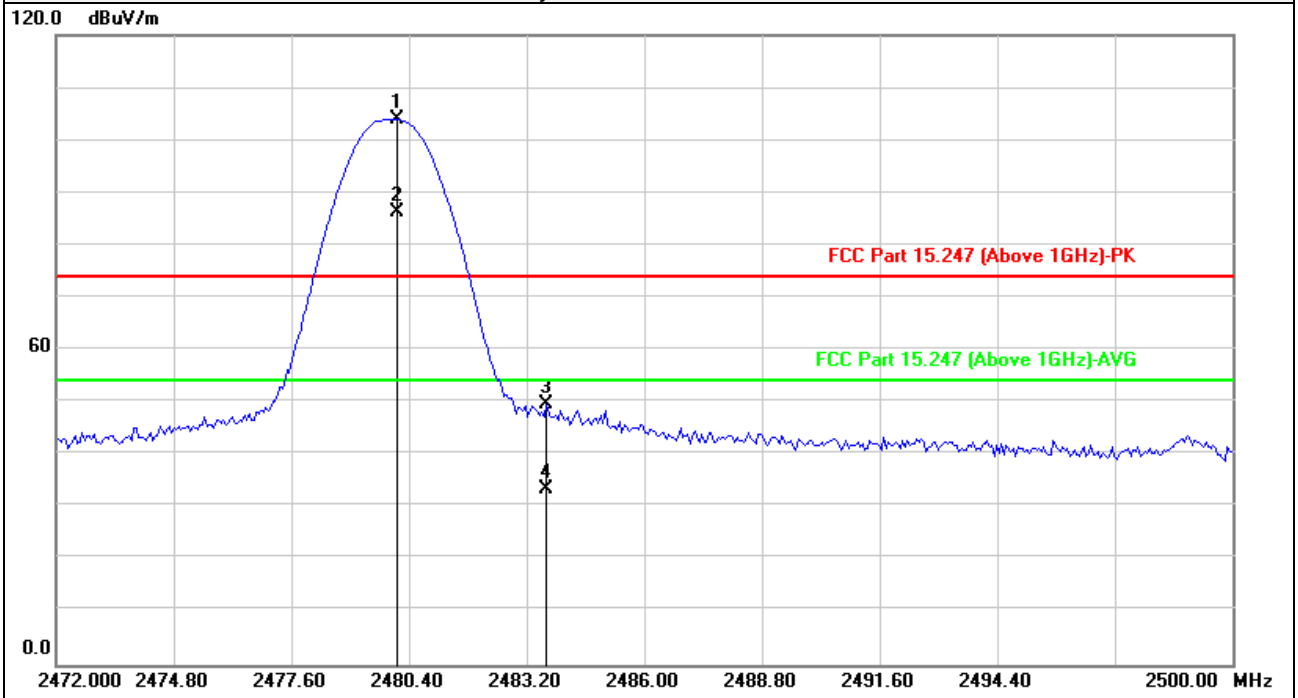
Antenna Polarity & Test Distance: Horizontal at 3 m									
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detecter	Antenna Height (cm)	Table Angle (Degree)
1 #	2441.000	101.88	0.69	102.57			peak	100	189
2 #	2441.000	81.06	0.69	81.75			AVG	100	189
3	4882.000	44.75	7.61	52.36	74.00	-21.64	peak	100	254
4	4882.000	34.56	7.61	42.17	54.00	-11.83	AVG	100	254
5	7323.000	38.39	10.92	49.31	74.00	-24.69	peak	100	126
6	7323.000	24.90	10.92	35.82	54.00	-18.18	AVG	100	126
Antenna Polarity & Test Distance: Vertical at 3 m									
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detecter	Antenna Height (cm)	Table Angle (Degree)
1 #	2441.000	102.85	0.69	103.54			peak	100	264
2 #	2441.000	81.67	0.69	82.36			AVG	100	264
3	4882.000	44.03	7.61	51.64	74.00	-22.36	peak	100	110
4	4882.000	33.67	7.61	41.28	54.00	-12.72	AVG	100	110
5	7323.000	37.77	10.92	48.69	74.00	-25.31	peak	100	261
6	7323.000	24.34	10.92	35.26	54.00	-18.74	AVG	100	261

Remarks:

1. Emission Level = Read Level + Factor (Antenna Factor + Cable Loss - Preamp Factor)
   Margin value = Emission level – Limit value
2. #2441MHz: Fundamental frequency.
3. The amplitude of spurious emissions attenuated more than 20 dB below the permissible value is not required to be report.

Frequency Range	1GHz ~ 25GHz	Detector Function	Peak (PK) Average (AVG)
Test Channel	Channel 78		

Antenna Polarity & Test Distance: Horizontal at 3 m



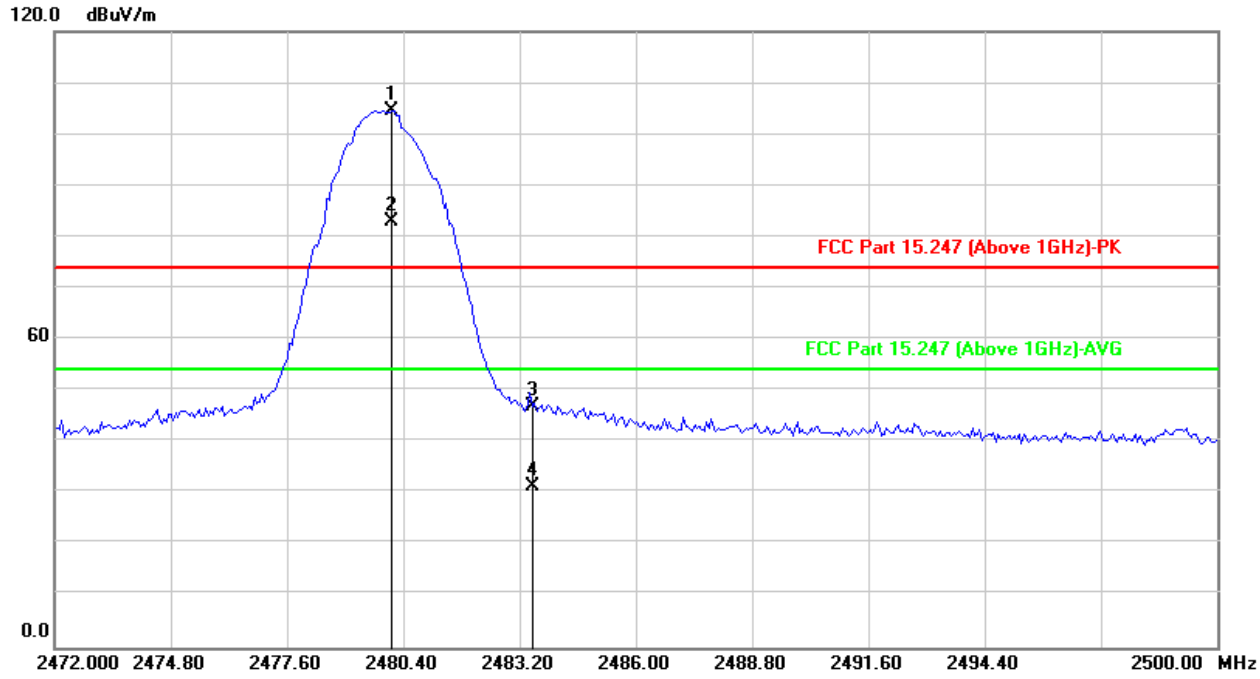
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detecter	Antenna Height (cm)	Table Angle (Degree)
1#	2480.136	103.22	0.64	103.86			peak	100	122
2#	2480.136	85.47	0.64	86.11			AVG	100	122
3	2483.671	49.03	0.63	49.66	74.00	-24.34	peak	100	122
4	2483.671	32.69	0.63	33.32	54.00	-20.68	AVG	100	122
5	4960.000	42.98	7.94	50.92	74.00	-23.08	peak	100	158
6	4960.000	34.69	7.94	42.63	54.00	-11.37	AVG	100	158
7	7440.000	37.24	11.09	48.33	74.00	-25.67	peak	100	120
8	7440.000	25.12	11.09	36.21	54.00	-17.79	AVG	100	120

Remarks:

1. Emission Level = Read Level + Factor (Antenna Factor + Cable Loss - Preamp Factor)
   Margin value = Emission level – Limit value
2. #2480MHz: Fundamental frequency.
3. The amplitude of spurious emissions attenuated more than 20 dB below the permissible value is not required to be report.

Frequency Range	1GHz ~ 25GHz	Detector Function	Peak (PK) Average (AVG)
Test Channel	Channel 78		

Antenna Polarity & Test Distance: Vertical at 3 m



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detecter	Antenna Height (cm)	Table Angle (Degree)
1#	2480.136	103.90	0.64	104.54			peak	100	101
2#	2480.136	82.45	0.64	83.09			AVG	100	101
3	2483.500	46.44	0.63	47.07	74.00	-26.93	peak	100	101
4	2483.500	30.85	0.63	31.48	54.00	-22.52	AVG	100	101
5	4960.000	43.28	7.94	51.22	74.00	-22.78	peak	100	165
6	4960.000	35.84	7.94	43.78	54.00	-10.22	AVG	100	165
7	7440.000	37.22	11.09	48.31	74.00	-25.69	peak	100	132
8	7440.000	24.73	11.09	35.82	54.00	-18.18	AVG	100	132

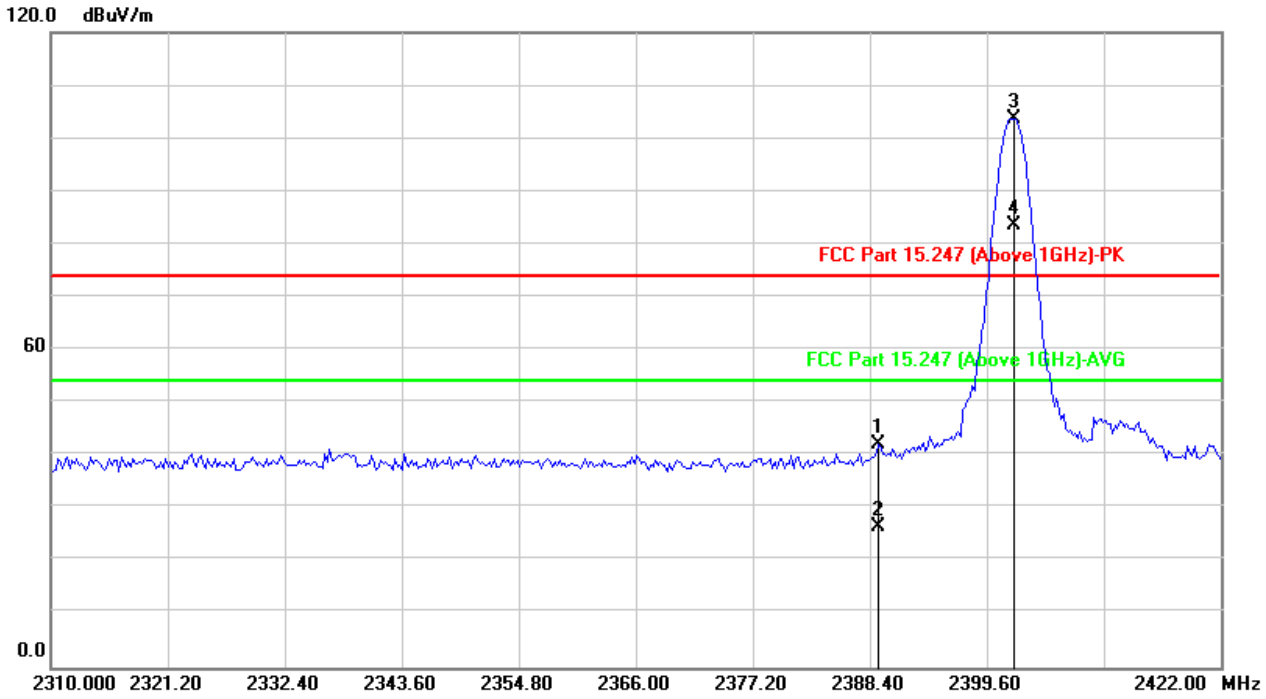
Remarks:

1. Emission Level = Read Level + Factor (Antenna Factor + Cable Loss - Preamp Factor)
   Margin value = Emission level – Limit value
2. #2480MHz: Fundamental frequency.
3. The amplitude of spurious emissions attenuated more than 20 dB below the permissible value is not required to be report.

8DPSK

Frequency Range	1GHz ~ 25GHz	Detector Function	Peak (PK) Average (AVG)
Test Channel	Channel 0		

Antenna Polarity & Test Distance: Horizontal at 3 m



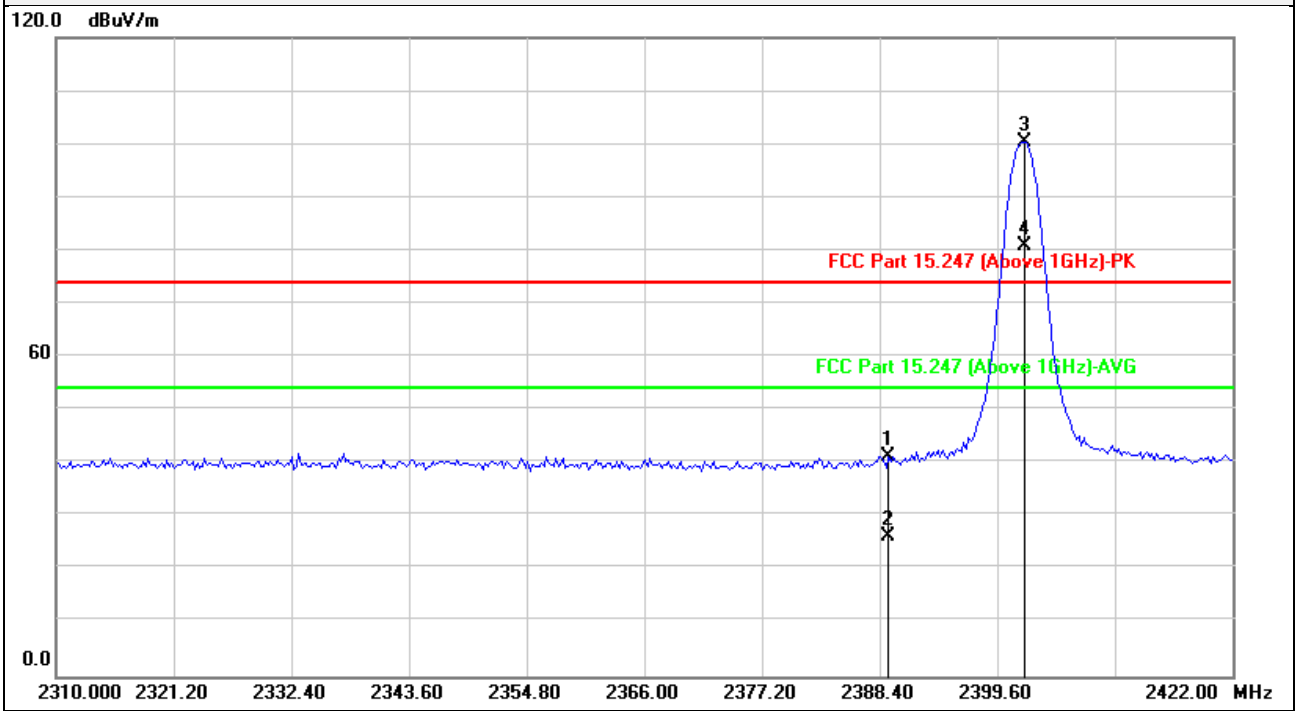
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detecter	Antenna Height (cm)	Table Angle (Degree)
1	2389.231	41.52	0.77	42.29	74.00	-31.71	peak	100	59
2	2389.231	25.85	0.77	26.62	54.00	-27.38	AVG	100	59
3#	2402.249	102.89	0.74	103.63			peak	100	59
4#	2402.249	82.83	0.74	83.57			AVG	100	59
5	4804.000	43.20	7.27	50.47	74.00	-23.53	peak	100	162
6	4804.000	36.29	7.27	43.56	54.00	-10.44	AVG	100	162
7	7206.000	36.60	10.75	47.35	74.00	-26.65	peak	100	111
8	7206.000	24.12	10.75	34.87	54.00	-19.13	AVG	100	111

Remarks:

1. Emission Level = Read Level + Factor (Antenna Factor + Cable Loss - Preamp Factor)
   Margin value = Emission level – Limit value
2. #2402MHz: Fundamental frequency.
3. The amplitude of spurious emissions attenuated more than 20 dB below the permissible value is not required to be report.

Frequency Range	1GHz ~ 25GHz	Detector Function	Peak (PK) Average (AVG)
Test Channel	Channel 0		

Antenna Polarity & Test Distance: Vertical at 3 m



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detecter	Antenna Height (cm)	Table Angle (Degree)
1	2389.231	40.45	0.77	41.22	74.00	-32.78	peak	100	37
2	2389.231	25.60	0.77	26.37	54.00	-27.63	AVG	100	37
3#	2402.249	99.63	0.74	100.37			peak	100	37
4#	2402.249	80.25	0.74	80.99			AVG	100	37
5	4804.000	43.62	7.27	50.89	74.00	-23.11	peak	100	166
6	4804.000	35.95	7.27	43.22	54.00	-10.78	AVG	100	166
7	7206.000	37.22	10.75	47.97	74.00	-26.03	peak	100	108
8	7206.000	25.09	10.75	35.84	54.00	-18.16	AVG	100	108

Remarks:

1. Emission Level = Read Level + Factor (Antenna Factor + Cable Loss - Preamp Factor)
   Margin value = Emission level – Limit value
2. #2402MHz: Fundamental frequency.
3. The amplitude of spurious emissions attenuated more than 20 dB below the permissible value is not required to be report.

Frequency Range	1GHz ~ 25GHz	Detector Function	Peak (PK) Average (AVG)
Test Channel	Channel 39		

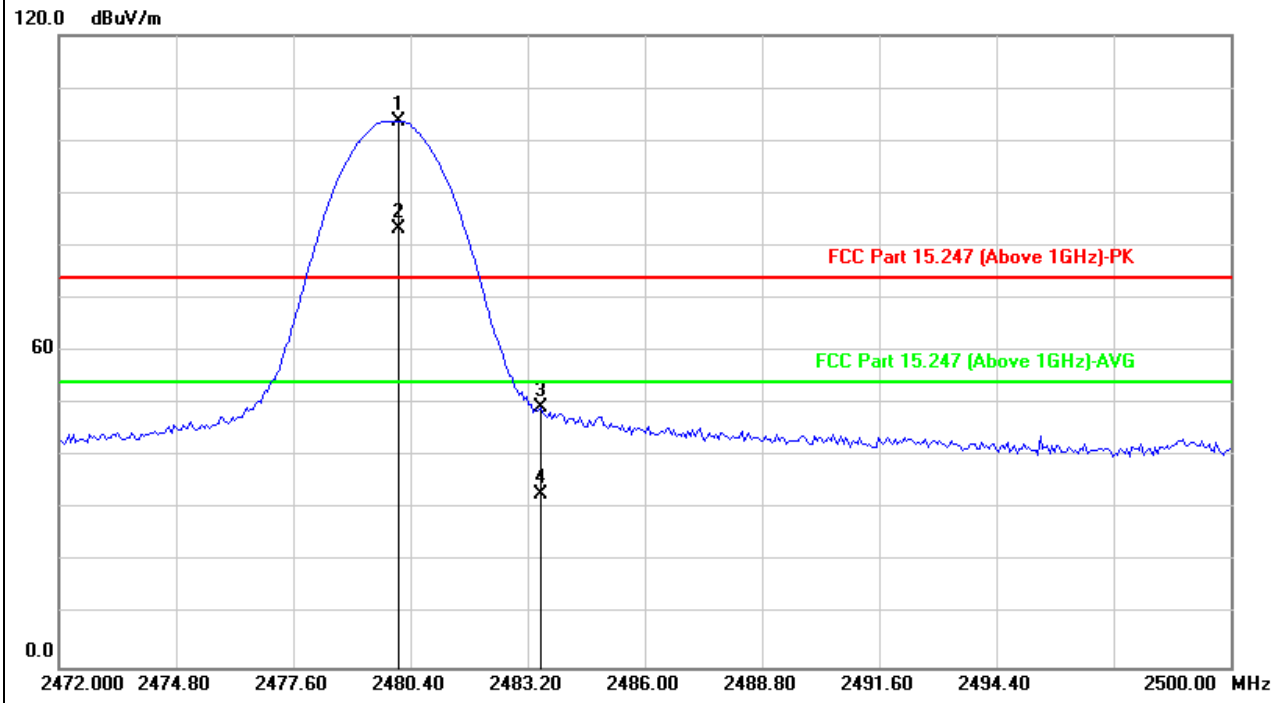
Antenna Polarity & Test Distance: Horizontal at 3 m									
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detecte r	Antenna Height (cm)	Table Angle (Degree)
1#	2441.000	99.89	0.69	100.58			peak	100	78
2#	2441.000	79.95	0.69	80.64			AVG	100	78
3	4882.000	44.56	7.61	52.17	74.00	-21.83	peak	100	194
4	4882.000	33.77	7.61	41.38	54.00	-12.62	AVG	100	194
5	7323.000	37.84	10.92	48.76	74.00	-25.24	peak	100	215
6	7323.000	25.36	10.92	36.28	54.00	-17.72	AVG	100	215
Antenna Polarity & Test Distance: Vertical at 3 m									
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detecte r	Antenna Height (cm)	Table Angle (Degree)
1#	2441.000	101.78	0.69	102.47			peak	100	166
2#	2441.000	81.65	0.69	82.34			AVG	100	166
3	4882.000	45.20	7.61	52.81	74.00	-21.19	peak	100	245
4	4882.000	34.75	7.61	42.36	54.00	-11.64	AVG	100	245
5	7323.000	37.02	10.92	47.94	74.00	-26.06	peak	100	147
6	7323.000	24.19	10.92	35.11	54.00	-18.89	AVG	100	147

Remarks:

1. Emission Level = Read Level + Factor (Antenna Factor + Cable Loss - Preamp Factor)
   Margin value = Emission level – Limit value
2. #2441MHz: Fundamental frequency.
3. The amplitude of spurious emissions attenuated more than 20 dB below the permissible value is not required to be report.

Frequency Range	1GHz ~ 25GHz	Detector Function	Peak (PK) Average (AVG)
Test Channel	Channel 78		

Antenna Polarity & Test Distance: Horizontal at 3 m



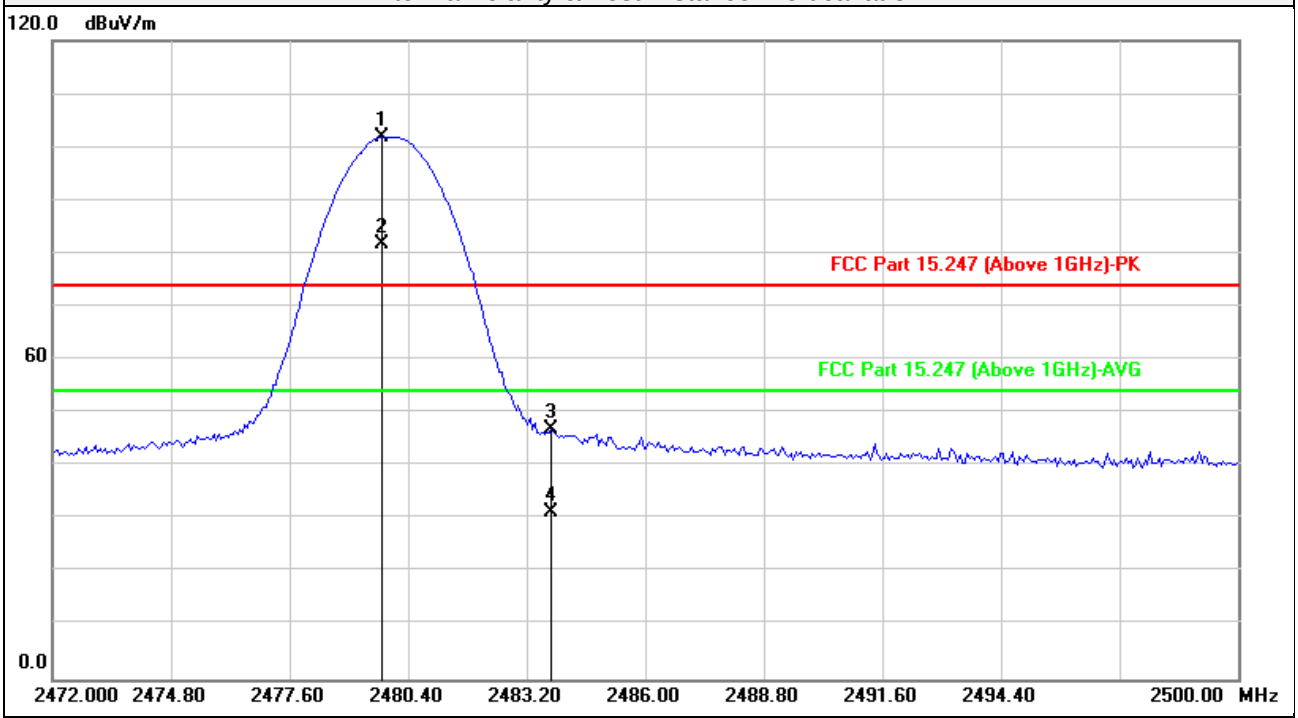
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detecter	Antenna Height (cm)	Table Angle (Degree)
1#	2480.136	103.02	0.64	103.66			peak	100	122
2#	2480.136	82.48	0.64	83.12			AVG	100	122
3	2483.500	48.58	0.63	49.21	74.00	-24.79	peak	100	122
4	2483.500	32.14	0.63	32.77	54.00	-21.23	AVG	100	122
5	4960.000	43.98	7.94	51.92	74.00	-22.08	peak	100	171
6	4960.000	36.37	7.94	44.31	54.00	-9.69	AVG	100	171
7	7440.000	36.59	11.09	47.68	74.00	-26.32	peak	100	132
8	7440.000	24.10	11.09	35.19	54.00	-18.81	AVG	100	132

Remarks:

1. Emission Level = Read Level + Factor (Antenna Factor + Cable Loss - Preamp Factor)
   Margin value = Emission level – Limit value
2. #2480MHz: Fundamental frequency.
3. The amplitude of spurious emissions attenuated more than 20 dB below the permissible value is not required to be report.

Frequency Range	1GHz ~ 25GHz	Detector Function	Peak (PK) Average (AVG)
Test Channel	Channel 78		

Antenna Polarity & Test Distance: Vertical at 3 m



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detecter	Antenna Height (cm)	Table Angle (Degree)
1#	2479.800	101.16	0.64	101.80			peak	100	104
2#	2479.800	81.04	0.64	81.68			AVG	100	104
3	2483.784	46.30	0.63	46.93	74.00	-27.07	peak	100	104
4	2483.784	30.62	0.63	31.25	54.00	-22.75	AVG	100	104
5	4960.000	42.70	7.94	50.64	74.00	-23.36	peak	100	169
6	4960.000	35.31	7.94	43.25	54.00	-10.75	AVG	100	169
7	7440.000	36.27	11.09	47.36	74.00	-26.64	peak	100	127
8	7440.000	24.10	11.09	35.19	54.00	-18.81	AVG	100	127

Remarks:

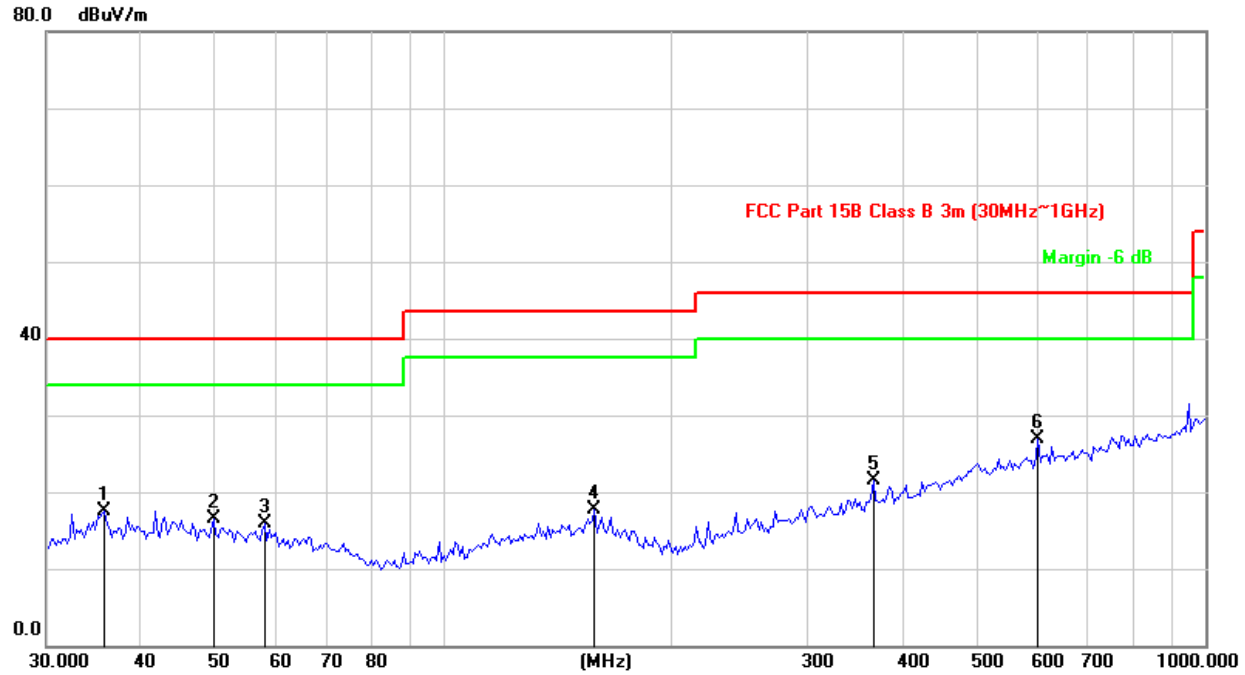
1. Emission Level = Read Level + Factor (Antenna Factor + Cable Loss - Preamp Factor)
   Margin value = Emission level – Limit value
2. #2480MHz: Fundamental frequency.
3. The amplitude of spurious emissions attenuated more than 20 dB below the permissible value is not required to be report.

Right

30 MHz ~ 1GHz Worst-Case Data:

Frequency Range	30MHz ~ 1GHz	Detector Function	Peak (PK) Quasi-peak (QP)
Test Channel	Channel 0		

Antenna Polarity & Test Distance: Horizontal at 3 m



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detecter	Antenna Height (cm)	Table Angle (Degree)
1	35.7617	33.02	-15.43	17.59	40.00	-22.41	peak	200	227
2	49.7571	31.51	-15.08	16.43	40.00	-23.57	peak	200	64
3	58.0759	31.86	-15.95	15.91	40.00	-24.09	peak	300	315
4	157.5290	31.86	-14.14	17.72	43.50	-25.78	peak	300	169
5	366.0866	32.49	-11.02	21.47	46.00	-24.53	peak	200	189
6 *	602.9287	31.85	-5.04	26.81	46.00	-19.19	peak	200	160

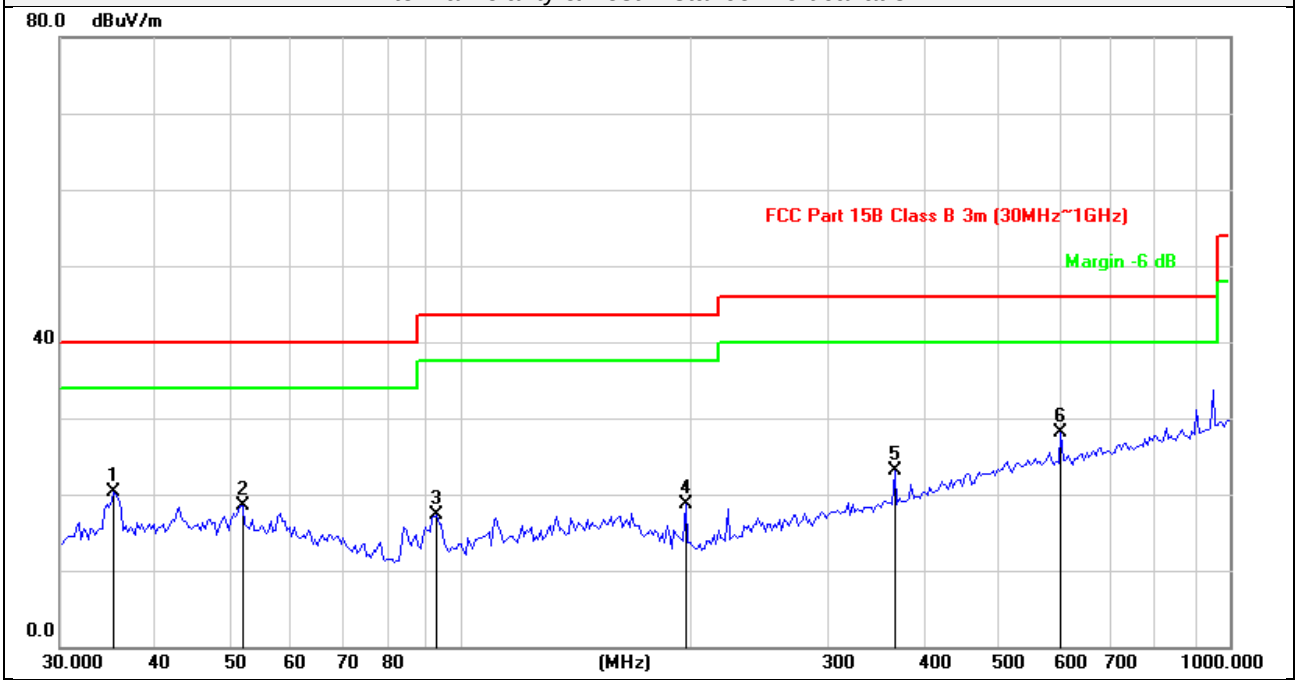
Remarks:

1.Emission Level = Read Level + Factor (Antenna Factor + Cable Loss - Preamp Factor)

2.Margin value = Emission level – Limit value

Frequency Range	30MHz ~ 1GHz	Detector Function	Peak (PK) Quasi-peak (QP)
Test Channel	Channel 39		

Antenna Polarity & Test Distance: Vertical at 3 m



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detecter	Antenna Height (cm)	Table Angle (Degree)
1	35.2626	35.86	-15.49	20.37	40.00	-19.63	peak	200	317
2	51.8998	33.88	-15.29	18.59	40.00	-21.41	peak	200	47
3	92.9974	36.22	-19.00	17.22	43.50	-26.28	peak	100	206
4	195.8701	35.53	-16.92	18.61	43.50	-24.89	peak	100	147
5	366.0866	34.14	-11.02	23.12	46.00	-22.88	peak	100	91
6 *	602.9287	33.20	-5.04	28.16	46.00	-17.84	peak	100	127

Remarks:

1.Emission Level = Read Level + Factor (Antenna Factor + Cable Loss - Preamp Factor)

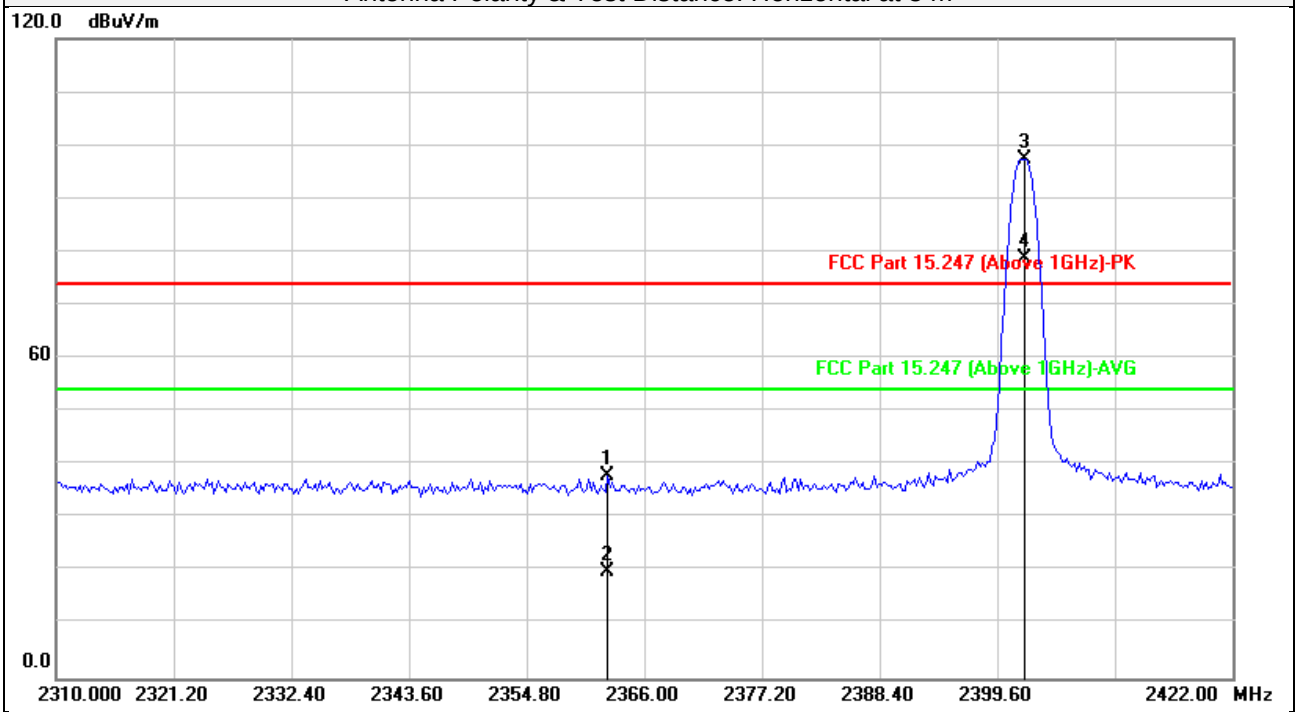
2. Margin value = Emission level – Limit value

Above 1GHz Data:

GFSK

Frequency Range	1GHz ~ 25GHz	Detector Function	Peak (PK) Average (AVG)
Test Channel	Channel 0		

Antenna Polarity & Test Distance: Horizontal at 3 m



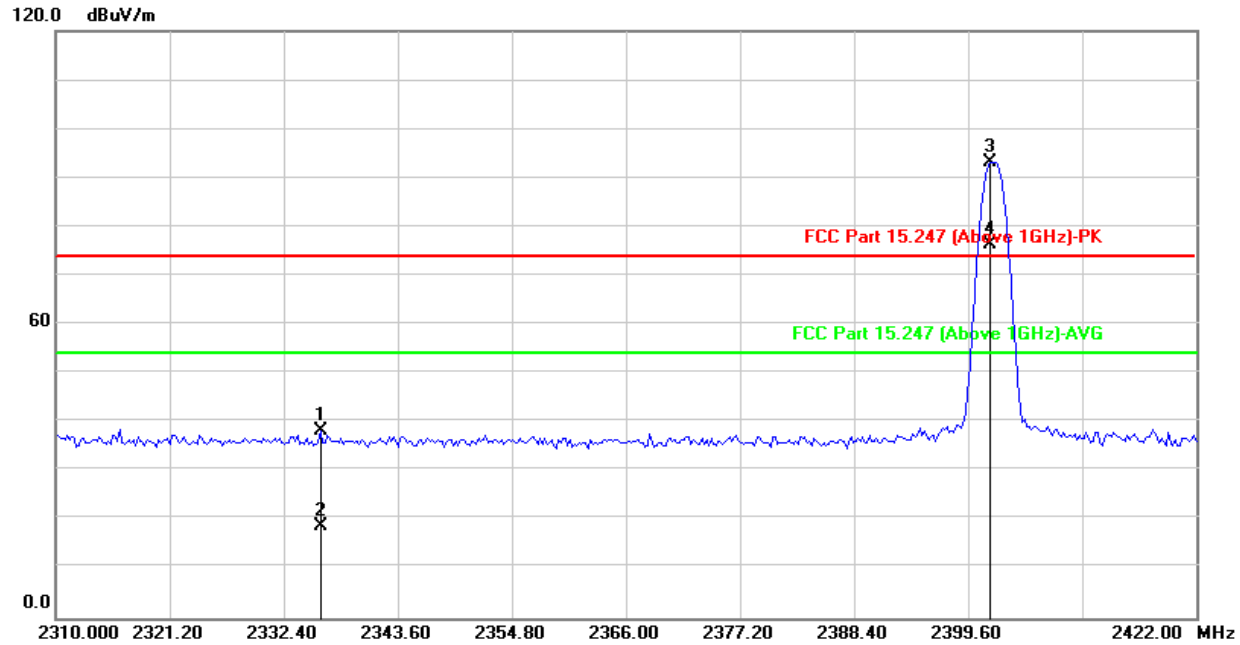
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detecter	Antenna Height (cm)	Table Angle (Degree)
1	2362.521	46.84	-8.87	37.97	74.00	-36.03	peak	309	76
2	2362.521	28.81	-8.87	19.94	54.00	-34.06	AVG	309	76
3#	2402.249	106.26	-8.87	97.39			peak	309	76
4#	2402.249	87.76	-8.87	78.89			AVG	309	76
5	4804.000	46.80	7.27	54.07	74.00	-19.93	peak	100	278
6	4804.000	38.34	7.27	45.61	54.00	-8.39	AVG	100	278
7	7206.000	33.41	10.75	44.16	74.00	-29.84	peak	100	128
8	7206.000	23.09	10.75	33.84	54.00	-20.16	AVG	100	128

Remarks:

4. Emission Level = Read Level + Factor (Antenna Factor + Cable Loss - Preamp Factor)
   Margin value = Emission level – Limit value
5. #2402MHz: Fundamental frequency.
6. The amplitude of spurious emissions attenuated more than 20 dB below the permissible value is not required to be report.

Frequency Range	1GHz ~ 25GHz	Detector Function	Peak (PK) Average (AVG)
Test Channel	Channel 0		

Antenna Polarity & Test Distance: Vertical at 3 m



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detecter	Antenna Height (cm)	Table Angle (Degree)
1	2336.036	47.04	-8.87	38.17	74.00	-35.83	peak	342	347
2	2336.036	27.68	-8.87	18.81	54.00	-35.19	AVG	342	347
3#	2401.800	102.08	-8.87	93.21			peak	342	347
4#	2401.800	85.08	-8.87	76.21			AVG	342	347
5	4804.000	47.97	7.27	55.24	74.00	-18.76	peak	113	198
6	4804.000	40.87	7.27	48.14	54.00	-5.86	AVG	113	198
7	7206.000	33.61	10.75	44.36	74.00	-29.64	peak	100	216
8	7206.000	22.76	10.75	33.51	54.00	-20.49	AVG	100	216

Remarks:

1.Emission Level = Read Level + Factor (Antenna Factor + Cable Loss - Preamp Factor)
Margin value = Emission level – Limit value

2.#2402MHz: Fundamental frequency.

3.The amplitude of spurious emissions attenuated more than 20 dB below the permissible value is not required to be report.

Frequency Range	1GHz ~ 25GHz	Detector Function	Peak (PK) Average (AVG)
Test Channel	Channel 39		

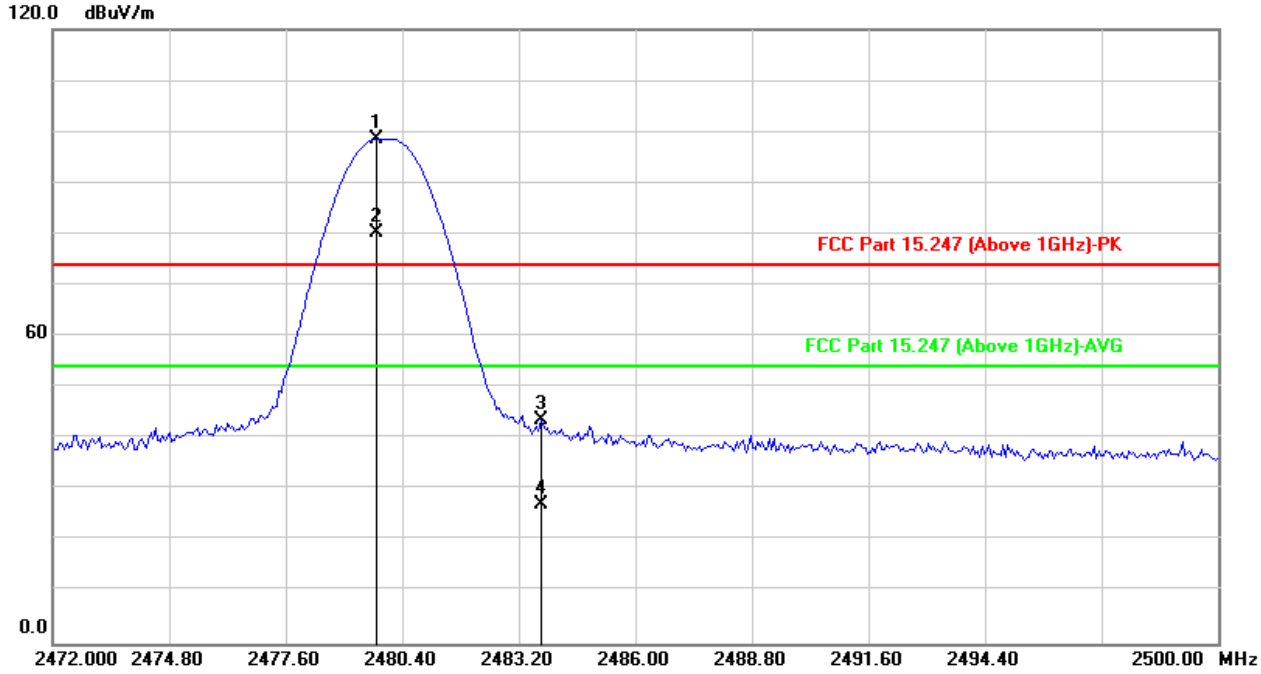
Antenna Polarity & Test Distance: Horizontal at 3 m									
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detecter	Antenna Height (cm)	Table Angle (Degree)
1 #	2441.000	97.05	0.69	97.74			peak	100	114
2 #	2441.000	76.49	0.69	77.18			AVG	100	114
3	4882.000	48.12	7.61	55.73	74.00	-18.27	peak	100	126
4	4882.000	40.42	7.61	48.03	54.00	-5.97	AVG	100	126
5	7323.000	35.27	10.92	46.19	74.00	-27.81	peak	100	211
6	7323.000	24.30	10.92	35.22	54.00	-18.78	AVG	100	211
Antenna Polarity & Test Distance: Vertical at 3 m									
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detecter	Antenna Height (cm)	Table Angle (Degree)
1 #	2441.000	93.52	0.69	94.21			peak	100	147
2 #	2441.000	75.51	0.69	76.20			AVG	100	147
3	4882.000	47.66	7.61	55.27	74.00	-18.73	peak	100	204
4	4882.000	39.68	7.61	47.29	54.00	-6.71	AVG	100	204
5	7323.000	34.22	10.92	45.14	74.00	-28.86	peak	100	114
6	7323.000	24.35	10.92	35.27	54.00	-18.73	AVG	100	114

Remarks:

1. Emission Level = Read Level + Factor (Antenna Factor + Cable Loss - Preamp Factor)
   Margin value = Emission level – Limit value
2. #2441MHz: Fundamental frequency.
3. The amplitude of spurious emissions attenuated more than 20 dB below the permissible value is not required to be report.

Frequency Range	1GHz ~ 25GHz	Detector Function	Peak (PK) Average (AVG)
Test Channel	Channel 78		

Antenna Polarity & Test Distance: Horizontal at 3 m



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detecter	Antenna Height (cm)	Table Angle (Degree)
1#	2479.800	107.37	-8.88	98.49			peak	257	56
2#	2479.800	89.18	-8.88	80.30			AVG	257	56
3	2483.727	52.52	-8.89	43.63	74.00	-30.37	peak	257	56
4	2483.727	36.05	-8.89	27.16	54.00	-26.84	AVG	257	56
5	4960.000	48.96	7.94	56.90	74.00	-17.10	peak	115	275
6	4960.000	40.94	7.94	48.88	54.00	-5.12	AVG	115	275
7	7440.000	33.08	11.09	44.17	74.00	-29.83	peak	100	172
8	7440.000	22.24	11.09	33.33	54.00	-20.67	AVG	100	172

Remarks:

1.Emission Level = Read Level + Factor (Antenna Factor + Cable Loss - Preamp Factor)

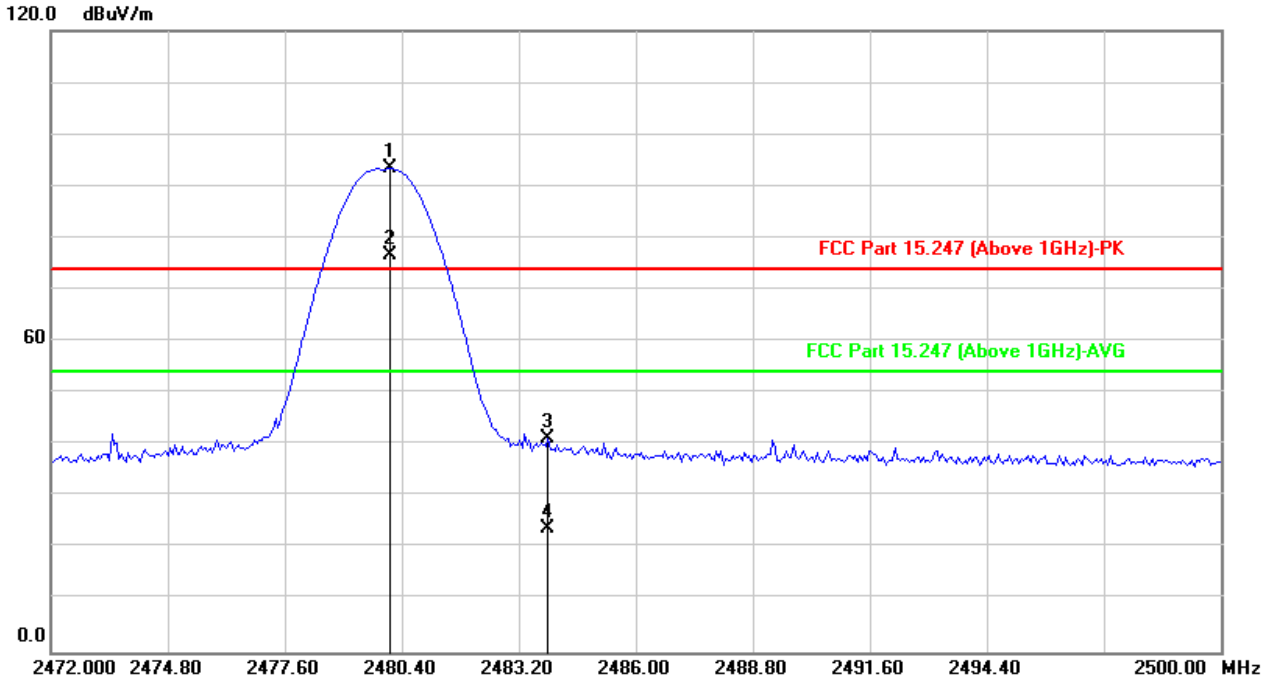
Margin value = Emission level – Limit value

2.#2480MHz: Fundamental frequency.

3.The amplitude of spurious emissions attenuated more than 20 dB below the permissible value is not required to be report.

Frequency Range	1GHz ~ 25GHz	Detector Function	Peak (PK) Average (AVG)
Test Channel	Channel 78		

Antenna Polarity & Test Distance: Vertical at 3 m



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detecter	Antenna Height (cm)	Table Angle (Degree)
1#	2480.136	102.20	-8.88	93.32			peak	318	355
2#	2480.136	85.44	-8.88	76.56			AVG	318	355
3	2483.896	50.18	-8.89	41.29	74.00	-32.71	peak	318	355
4	2483.896	32.70	-8.89	23.81	54.00	-30.19	AVG	318	355
5	4960.000	47.37	7.94	55.31	74.00	-18.69	peak	100	262
6	4960.000	39.22	7.94	47.16	54.00	-6.84	AVG	100	262
7	7440.000	34.19	11.09	45.28	74.00	-28.72	peak	100	211
8	7440.000	23.52	11.09	34.61	54.00	-19.39	AVG	100	211

Remarks:

1.Emission Level = Read Level + Factor (Antenna Factor + Cable Loss - Preamp Factor)

Margin value = Emission level – Limit value

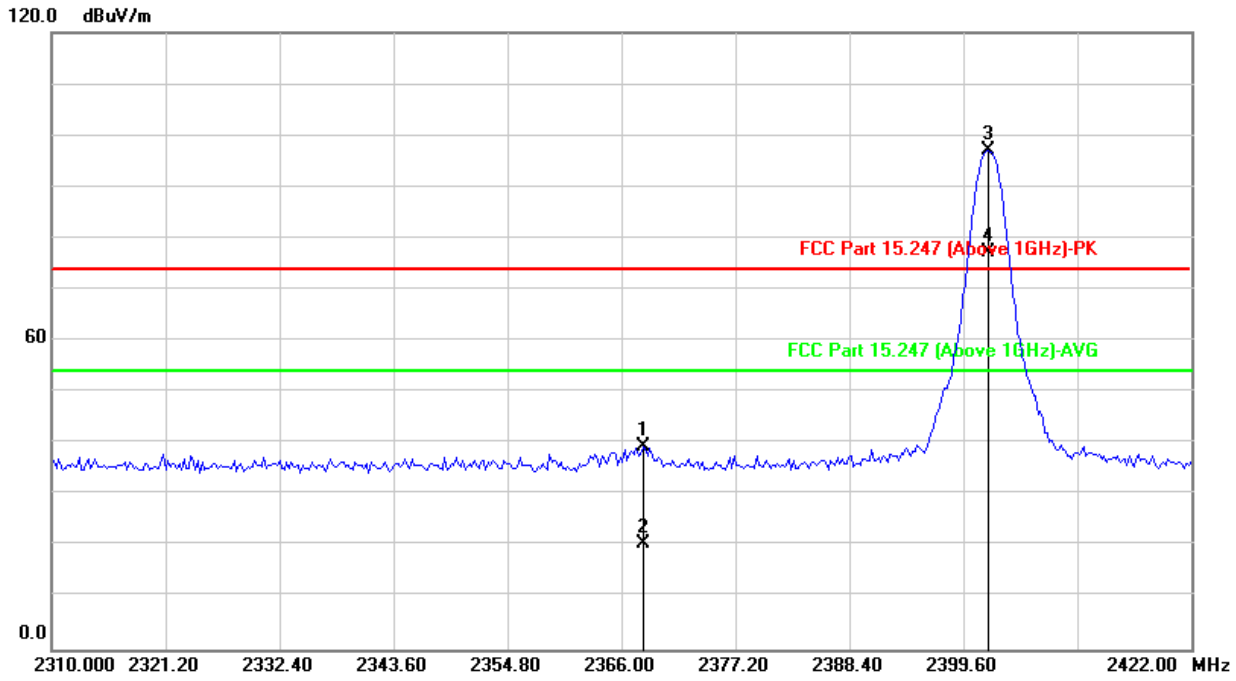
2.#2480MHz: Fundamental frequency.

3.The amplitude of spurious emissions attenuated more than 20 dB below the permissible value is not required to be report.

8DPSK

Frequency Range	1GHz ~ 25GHz	Detector Function	Peak (PK) Average (AVG)
Test Channel	Channel 0		

Antenna Polarity & Test Distance: Horizontal at 3 m



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detecter	Antenna Height (cm)	Table Angle (Degree)
1	2368.132	48.25	-8.87	39.38	74.00	-34.62	peak	309	82
2	2368.132	29.50	-8.87	20.63	54.00	-33.37	AVG	309	82
3#	2402.024	105.77	-8.87	96.90			peak	309	82
4#	2402.024	86.17	-8.87	77.30			AVG	309	82
5	4804.000	43.79	7.27	51.06	74.00	-22.94	peak	100	337
6	4804.000	37.58	7.27	44.85	54.00	-9.15	AVG	100	337
7	7206.000	34.52	10.75	45.27	74.00	-28.73	peak	100	201
8	7206.000	23.88	10.75	34.63	54.00	-19.37	AVG	100	201

Remarks:

1.Emission Level = Read Level + Factor (Antenna Factor + Cable Loss - Preamp Factor)

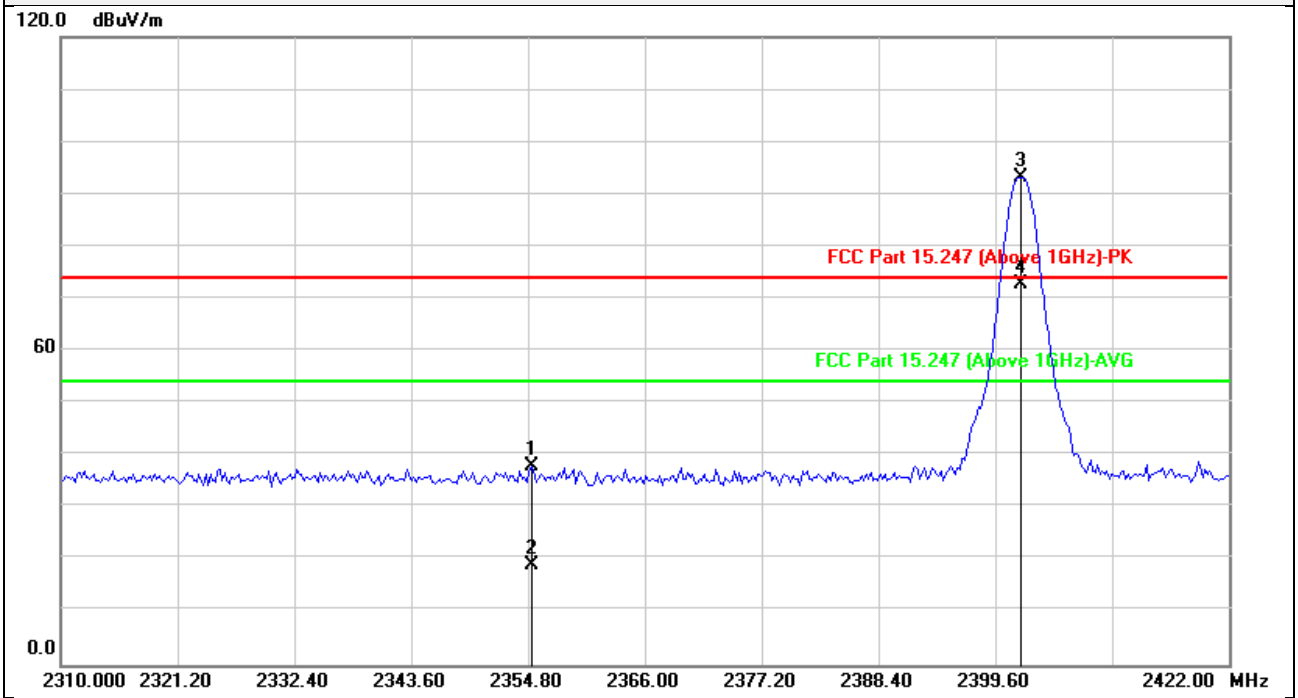
Margin value = Emission level – Limit value

2.#2402MHz: Fundamental frequency.

3.The amplitude of spurious emissions attenuated more than 20 dB below the permissible value is not required to be report.

Frequency Range	1GHz ~ 25GHz	Detector Function	Peak (PK) Average (AVG)
Test Channel	Channel 0		

Antenna Polarity & Test Distance: Vertical at 3 m



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detecter	Antenna Height (cm)	Table Angle (Degree)
1	2355.114	46.86	-8.87	37.99	74.00	-36.01	peak	341	345
2	2355.114	28.02	-8.87	19.15	54.00	-34.85	AVG	341	345
3#	2402.024	102.17	-8.87	93.30			peak	341	345
4#	2402.024	81.49	-8.87	72.62			AVG	341	345
5	4804.000	46.38	7.27	53.65	74.00	-20.35	peak	100	198
6	4804.000	39.92	7.27	47.19	54.00	-6.81	AVG	100	198
7	7206.000	34.64	10.75	45.39	74.00	-28.61	peak	100	201
8	7206.000	23.53	10.75	34.28	54.00	-19.72	AVG	100	201

Remarks:

1.Emission Level = Read Level + Factor (Antenna Factor + Cable Loss - Preamp Factor)

Margin value = Emission level – Limit value

2.#2402MHz: Fundamental frequency.

3.The amplitude of spurious emissions attenuated more than 20 dB below the permissible value is not required to be report.

Frequency Range	1GHz ~ 25GHz	Detector Function	Peak (PK) Average (AVG)
Test Channel	Channel 39		

Antenna Polarity & Test Distance: Horizontal at 3 m									
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detecter	Antenna Height (cm)	Table Angle (Degree)
1#	2441.000	95.05	0.69	95.74			peak	100	317
2#	2441.000	73.47	0.69	74.16			AVG	100	317
3	4882.000	47.34	7.61	54.95	74.00	-19.05	peak	100	262
4	4882.000	39.57	7.61	47.18	54.00	-6.82	AVG	100	262
5	7323.000	34.36	10.92	45.28	74.00	-28.72	peak	100	106
6	7323.000	24.19	10.92	35.11	54.00	-18.89	AVG	100	106
Antenna Polarity & Test Distance: Vertical at 3 m									
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detecter	Antenna Height (cm)	Table Angle (Degree)
1#	2441.000	92.75	0.69	93.44			peak	100	214
2#	2441.000	71.89	0.69	72.58			AVG	100	214
3	4882.000	45.57	7.61	53.18	74.00	-20.82	peak	100	206
4	4882.000	38.67	7.61	46.28	54.00	-7.72	AVG	100	206
5	7323.000	34.03	10.92	44.95	74.00	-29.05	peak	100	133
6	7323.000	24.30	10.92	35.22	54.00	-18.78	AVG	100	133

Remarks:

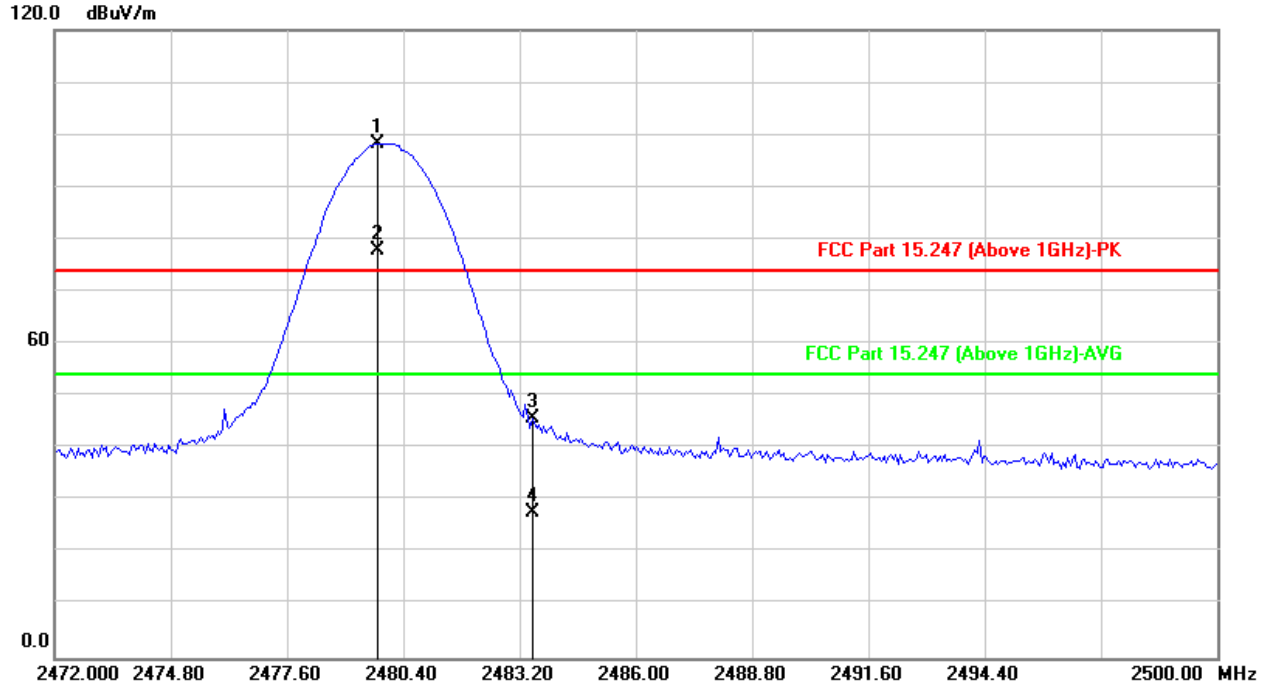
1.Emission Level = Read Level + Factor (Antenna Factor + Cable Loss - Preamp Factor)
Margin value = Emission level – Limit value

2.#2441MHz: Fundamental frequency.

3.The amplitude of spurious emissions attenuated more than 20 dB below the permissible value is not required to be report.

Frequency Range	1GHz ~ 25GHz	Detector Function	Peak (PK) Average (AVG)
Test Channel	Channel 78		

Antenna Polarity & Test Distance: Horizontal at 3 m



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detecter	Antenna Height (cm)	Table Angle (Degree)
1#	2479.800	107.04	-8.88	98.16			peak	100	55
2#	2479.800	86.62	-8.88	77.74			AVG	100	55
3	2483.500	54.59	-8.89	45.70	74.00	-28.30	peak	100	55
4	2483.500	36.61	-8.89	27.72	54.00	-26.28	AVG	100	55
5	4960.000	49.26	7.94	57.20	74.00	-16.80	peak	100	263
6	4960.000	40.42	7.94	48.36	54.00	-5.64	AVG	100	263
7	7440.000	33.72	11.09	44.81	74.00	-29.19	peak	100	231
8	7440.000	22.38	11.09	33.47	54.00	-20.53	AVG	100	231

Remarks:

1.Emission Level = Read Level + Factor (Antenna Factor + Cable Loss - Preamp Factor)

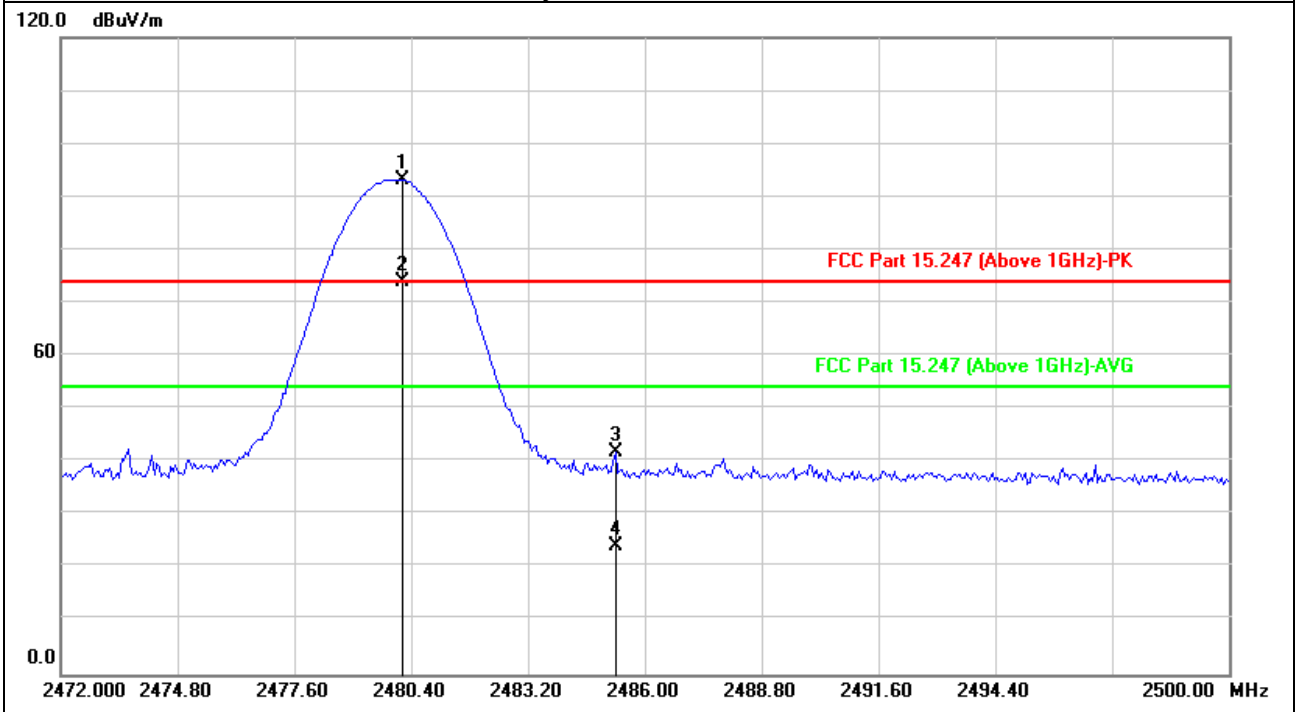
Margin value = Emission level – Limit value

2.#2480MHz: Fundamental frequency.

3.The amplitude of spurious emissions attenuated more than 20 dB below the permissible value is not required to be report.

Frequency Range	1GHz ~ 25GHz	Detector Function	Peak (PK) Average (AVG)
Test Channel	Channel 78		

Antenna Polarity & Test Distance: Vertical at 3 m



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detecter	Antenna Height (cm)	Table Angle (Degree)
1#	2480.192	102.01	-8.88	93.13			peak	321	356
2#	2480.192	82.70	-8.88	73.82			AVG	321	356
3	2485.299	50.72	-8.88	41.84	74.00	-32.16	peak	321	356
4	2485.299	33.11	-8.88	24.23	54.00	-29.77	AVG	321	356
5	4960.000	47.67	7.94	55.61	74.00	-18.39	peak	100	262
6	4960.000	39.45	7.94	47.39	54.00	-6.61	AVG	100	262
7	7440.000	34.08	11.09	45.17	74.00	-28.83	peak	100	136
8	7440.000	23.24	11.09	34.33	54.00	-19.67	AVG	100	136

Remarks:

1.Emission Level = Read Level + Factor (Antenna Factor + Cable Loss - Preamp Factor)

Margin value = Emission level – Limit value

2.#2480MHz: Fundamental frequency.

3.The amplitude of spurious emissions attenuated more than 20 dB below the permissible value is not required to be report.

3.2 Conducted Emission Measurement

3.2.1 Limits of Conducted Emission Measurement

Frequency (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15 - 0.5	66 - 56	56 - 46
0.50 - 5.0	56	46
5.0 - 30.0	60	50

Note: 1. The lower limit shall apply at the transition frequencies.
2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

3.2.2 Test Instruments

Description	Manufacturer	Model No.	Serial No.	Due Date of Calibration
EMI Test Receiver	Rohde&Schwarz	ESR 7	101961	2023-01-13
Artificial Mains Network	Rohde&Schwarz	ENV216	3560.6550.15	2023-01-12
Test software	FARAD	EZ_EMC V1.1.4.2	N/A	N/A

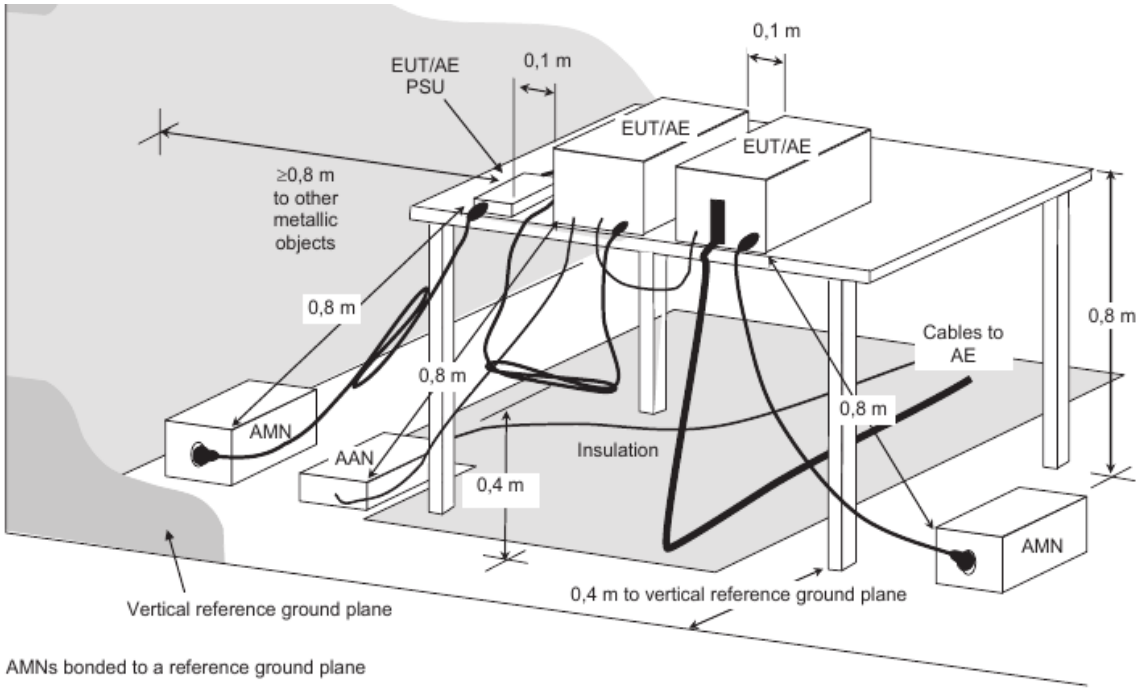
Note: 1. The calibration interval of the above test instruments is 12 months.
2. The test was performed in Shielded Room 1.

3.2.3 Test Procedures

a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance for the measuring instrument.
b. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
c. The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit – 20dB)was not recorded.

Note: All modes of operation were investigated and the worst-case emissions are reported.

3.2.4 Test Setup



For the actual test configuration, please refer to the attached file (Test Setup Photo).

3.2.5 EUT Operating Condition

Set the EUT under transmission condition continuously at specific channel frequency.

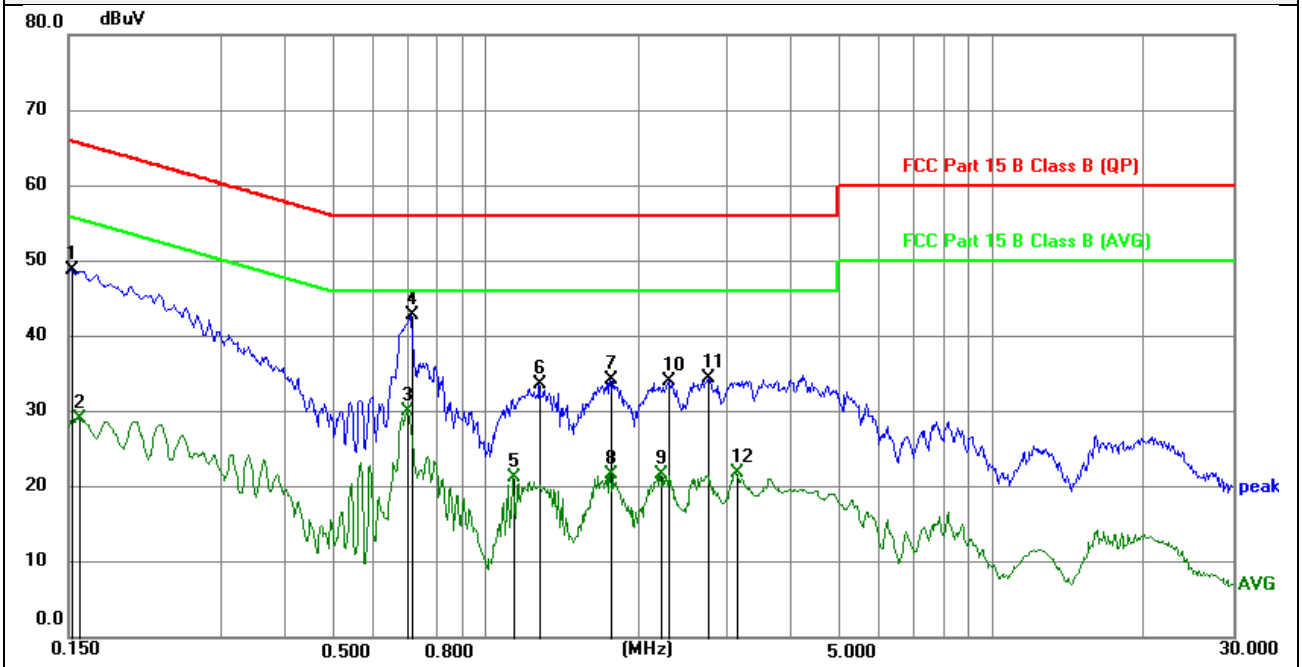
3.2.6 Deviation from Test Standard

No deviation.

3.2.7 Test Results

Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution andwidth	Quasi-Peak (QP) / Average (AV), 9kHz

Phase of Power: Line (L)



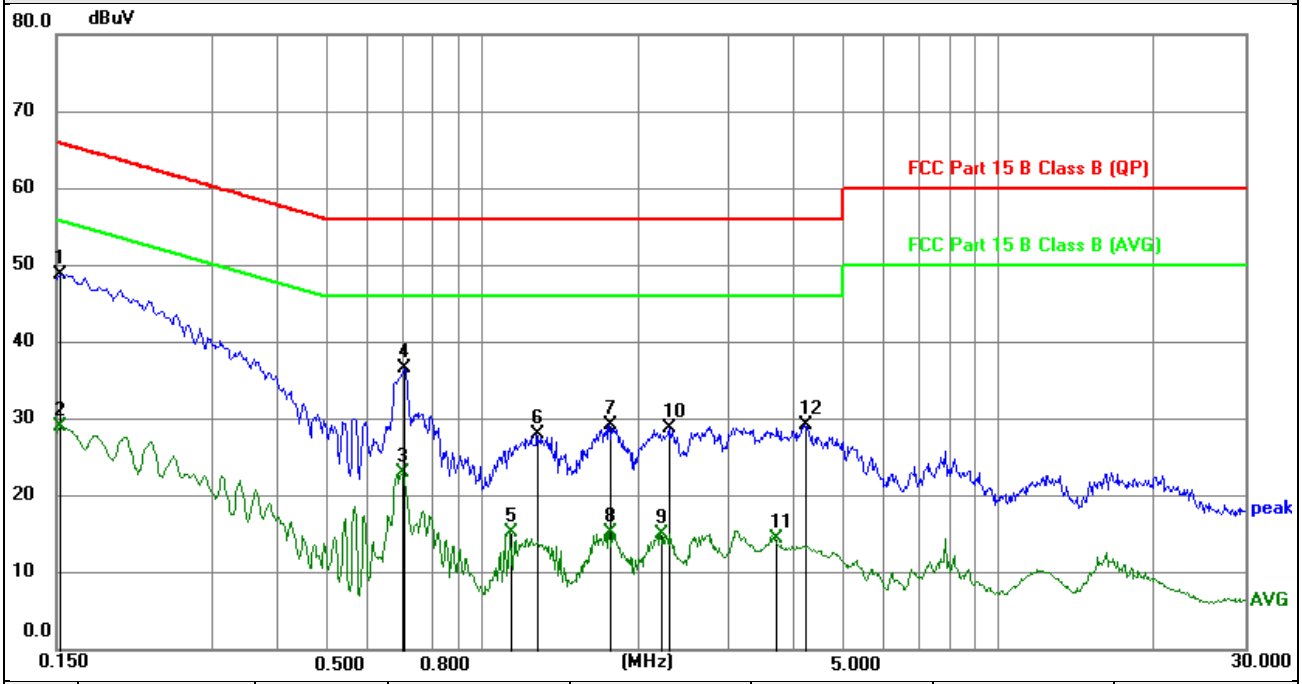
No.	Frequency	Reading	Correcttion Factor	Emission Level	Limit	Margin	Remark
	(MHz)	(dBuV)	dB	(dBuV)	(dBuV)	(dB)	Detecter
1	0.1522	38.63	10.18	48.81	65.88	-17.07	peak
2	0.1568	18.92	10.17	29.09	55.63	-26.54	AVG
3	0.7056	19.96	10.11	30.07	46.00	-15.93	AVG
4	0.7125	32.65	10.11	42.76	56.00	-13.24	peak
5	1.1355	11.18	10.05	21.23	46.00	-24.77	AVG
6	1.2818	23.47	10.05	33.52	56.00	-22.48	peak
7	1.7633	24.16	10.08	34.24	56.00	-21.76	peak
8	1.7633	11.52	10.08	21.60	46.00	-24.40	AVG
9	2.2177	11.60	10.09	21.69	46.00	-24.31	AVG
10	2.3055	23.99	10.09	34.08	56.00	-21.92	peak
11	2.7623	24.23	10.09	34.32	56.00	-21.68	peak
12	3.1245	11.76	10.09	21.85	46.00	-24.15	AVG

Remarks:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level - Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value.

Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution andwidth	Quasi-Peak (QP) / Average (AV), 9kHz

Phase of Power: Neutral (N)



No.	Frequency	Reading	Correct Factor	Emission Level	Limit	Margin	Remark
	(MHz)	(dBuV)	dB	(dBuV)	(dBuV)	(dB)	Detecter
1	0.1522	38.69	10.18	48.87	65.88	-17.01	peak
2	0.1522	18.81	10.18	28.99	55.88	-26.89	AVG
3	0.7056	12.95	10.10	23.05	46.00	-22.95	AVG
4	0.7102	26.42	10.10	36.52	56.00	-19.48	peak
5	1.1355	5.15	10.06	15.21	46.00	-30.79	AVG
6	1.2818	17.94	10.06	28.00	56.00	-28.00	peak
7	1.7633	19.09	10.09	29.18	56.00	-26.82	peak
8	1.7633	5.22	10.09	15.31	46.00	-30.69	AVG
9	2.2177	5.01	10.10	15.11	46.00	-30.89	AVG
10	2.3055	18.66	10.10	28.76	56.00	-27.24	peak
11	3.6938	4.30	10.10	14.40	46.00	-31.60	AVG
12	4.2135	19.05	10.08	29.13	56.00	-26.87	peak

Remarks:

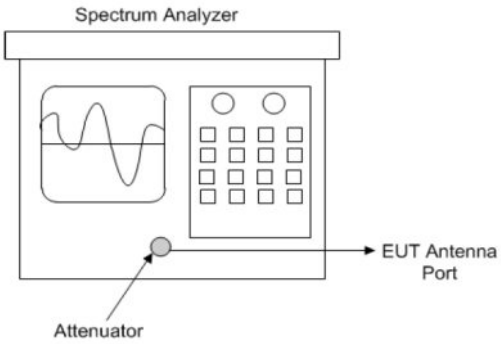
1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level - Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value.

3.3 Number of Hopping Frequency Used

3.3.1 Limits of Hopping Frequency Used Measurement

At least 15 channels frequencies, and should be equally spaced.

3.3.2 Test Setup



Spectrum analyzer test configuration

3.3.3 Test Instruments

Refer to section 5 to get information of above instrument.

3.3.4 Test Procedure

a. Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.
b. Turn on the EUT and connect its antenna terminal to measurement via a low loss cable. Then set it to any one measured frequency within its operating range and make sure the instrument is operated in its linear range.
c. Set the SA on MaxHold Mode, and then keep the EUT in hopping mode. Record all the signals from each channel until each one has been recorded.
d. Set the SA on View mode and then plot the result on SA screen.
e. Repeat above procedures until all frequencies measured were complete.

3.3.5 Deviation fromTest Standard

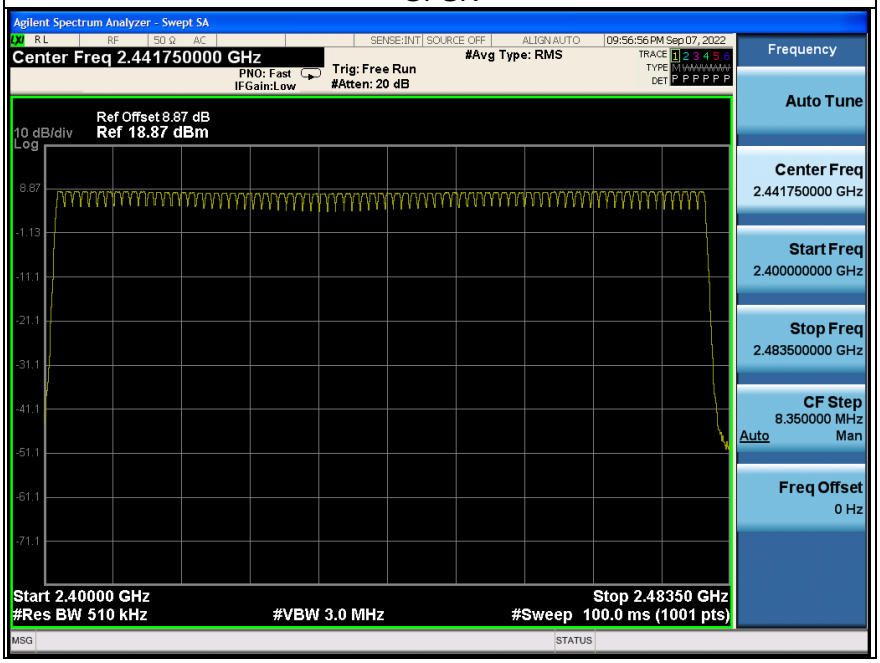
No deviation.

3.3.6 Test Results

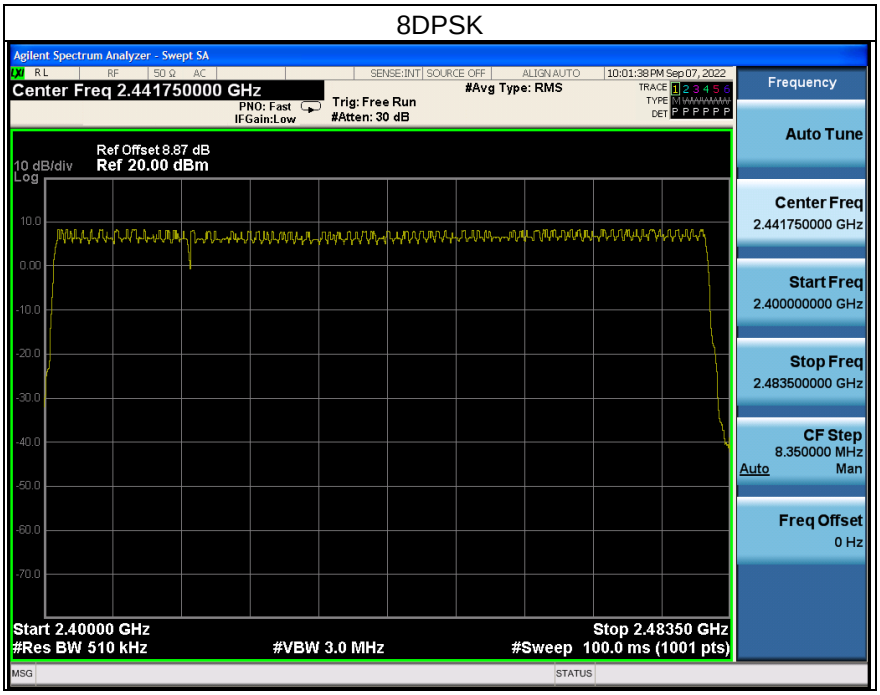
Left

There are 79 hopping frequencies in the hopping mode. Please refer to next page for the test result. On the plots, it shows that the hopping frequencies are equally spaced.

GFSK



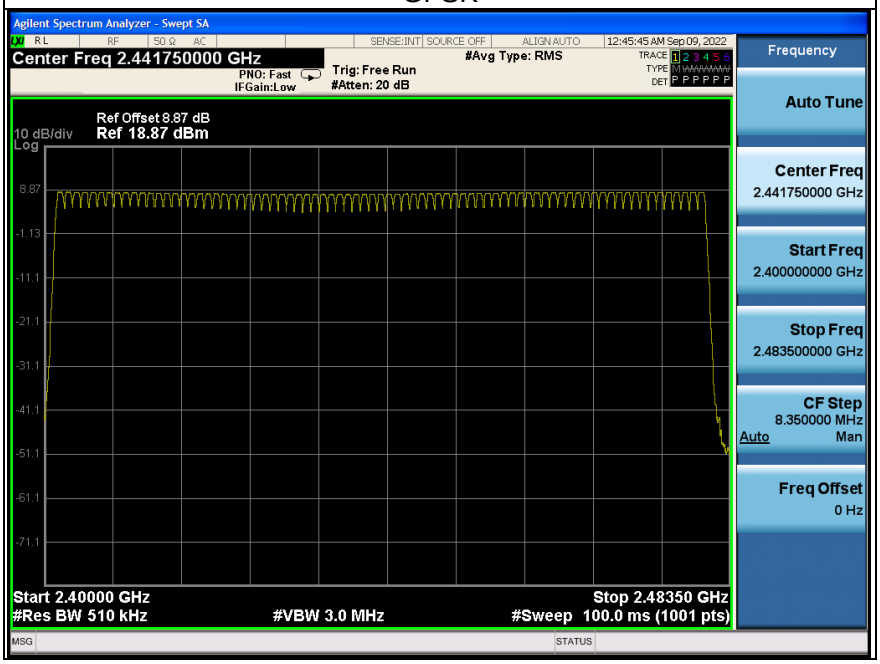
8DPSK



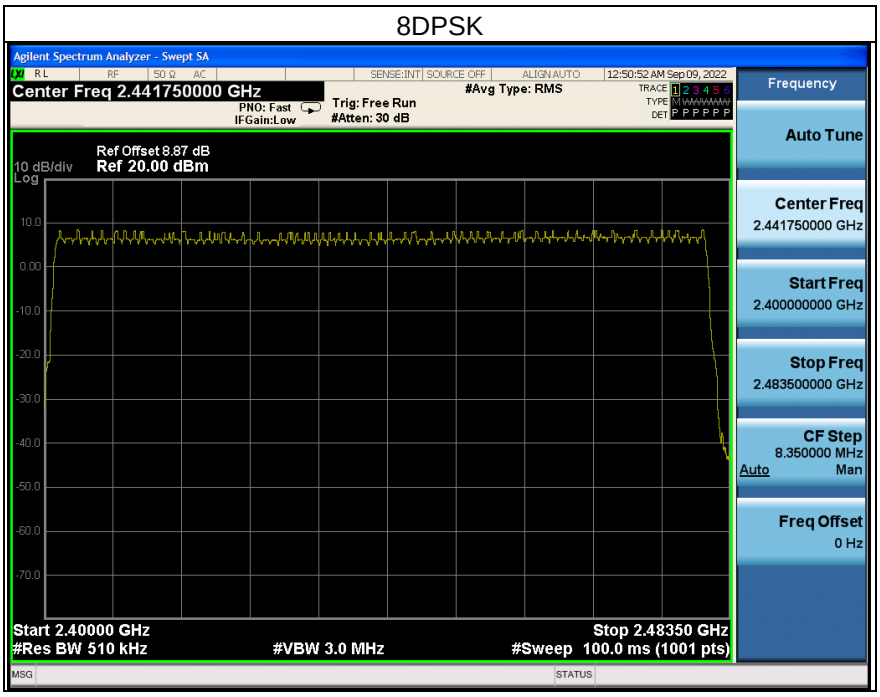
Right

There are 79 hopping frequencies in the hopping mode. Please refer to next page for the test result. On the plots, it shows that the hopping frequencies are equally spaced.

GFSK



8DPSK

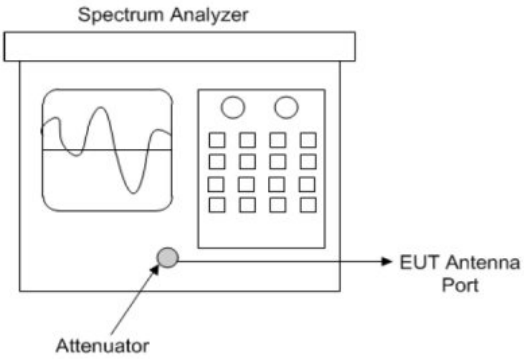


3.4 Dwell Time on Each Channel

3.4.1 Limits of Dwell Time on Each Channel Measurement

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.

3.4.2 Test Setup



Spectrum analyzer test configuration

3.4.3 Test Instruments

Refer to section 5 to get information of above instrument.

3.4.4 Test Procedures

a. Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.
b. Turn on the EUT and connect its antenna terminal to measurement via a low loss cable. Then set it to any one measured frequency within its operating range and make sure the instrument is operated in its linear range.
c. Adjust the center frequency of SA on any frequency be measured and set SA to zero span mode. And then, set RBW and VBW of spectrum analyzer to proper value.
d. Measure the time duration of one transmission on the measured frequency. And then plot the result with time difference of this time duration.
e. Repeat above procedures until all different time-slot modes have been completed.

3.4.5 Deviation from Test Standard

No deviation.

3.4.6 Test Results

Left

GFSK

Mode	Number of Hopping Channel	Number of transmision in a period (channel number*0.4 sec)				Length of transmission time (msec)	Result (msec)	Limit (msec)	Verdict
		Period (sec)	Sweep time (sec)	times in a sweep	times in a period				
DH1	79	31.6	3.16	32	320	0.375	120.00	400	Pass
DH3	79	31.6	3.16	16	160	1.631	260.96	400	Pass
DH5	79	31.6	3.16	11	110	2.879	316.69	400	Pass

Note: Test plots of the transmitting time slot are shown as below.

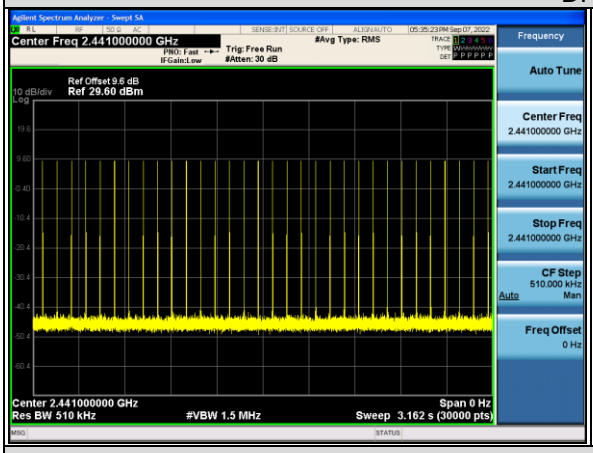
8DPSK

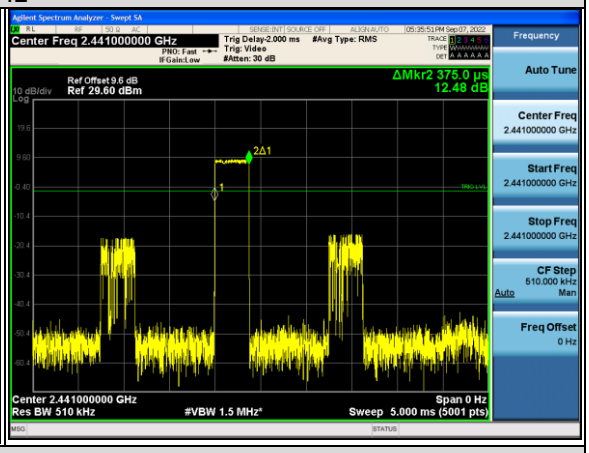
Mode	Number of Hopping Channel	Number of transmision in a period (channel number*0.4 sec)				Length of transmission time (msec)	Result (msec)	Limit (msec)	Verdict
		Period (sec)	Sweep time (sec)	times in a sweep	times in a period				
3DH1	79	31.6	3.16	32	320	0.378	120.96	400	Pass
3DH3	79	31.6	3.16	16	160	1.628	260.48	400	Pass
3DH5	79	31.6	3.16	11	110	2.881	316.91	400	Pass

Note: Test plots of the transmitting time slot are shown as below.

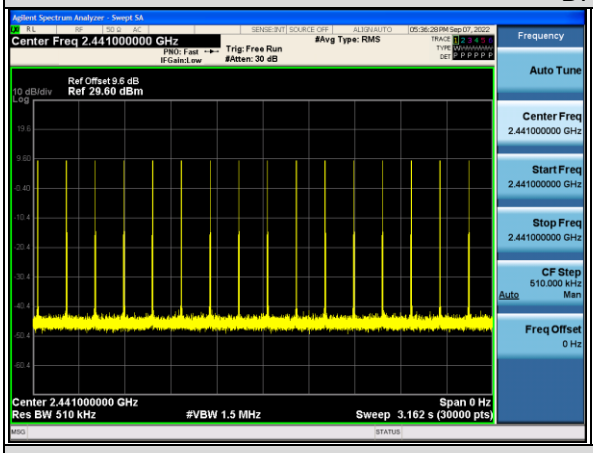
GFSK

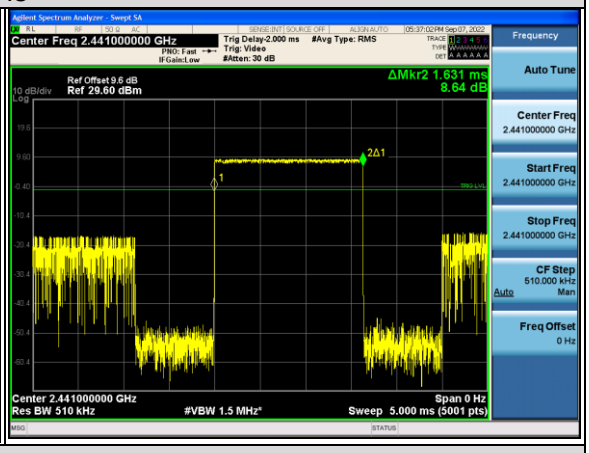
DH1



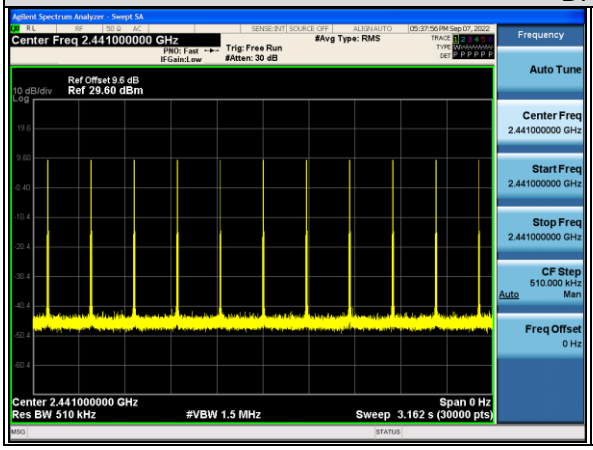


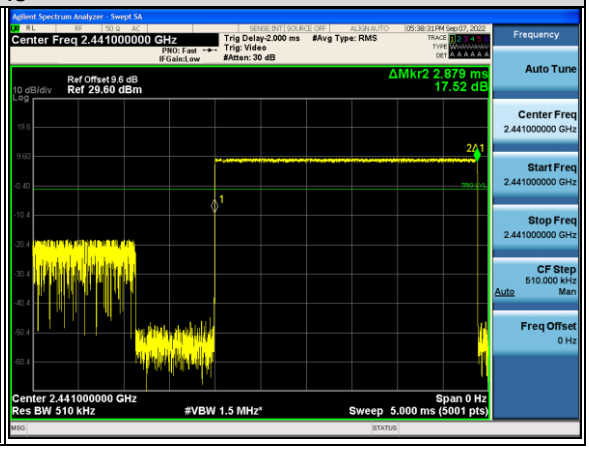
DH3

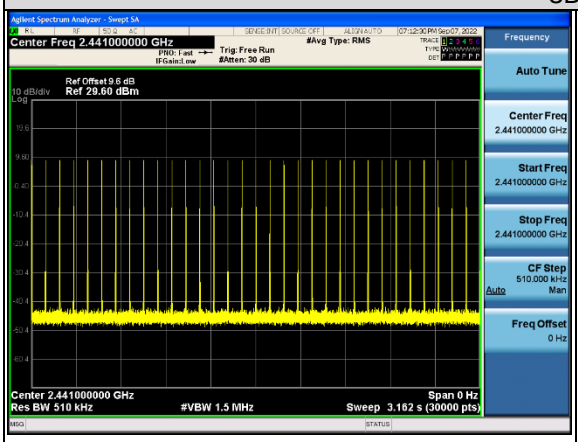
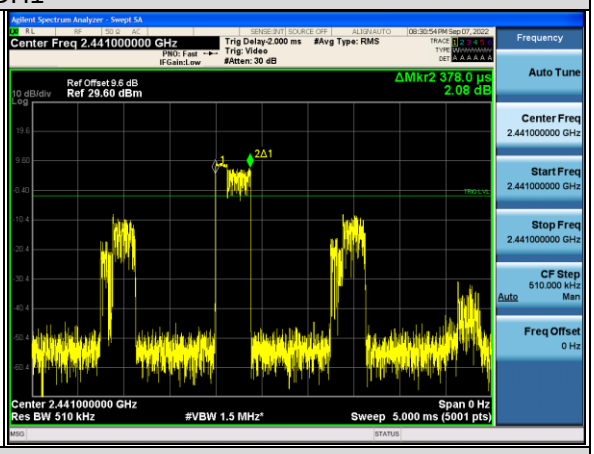
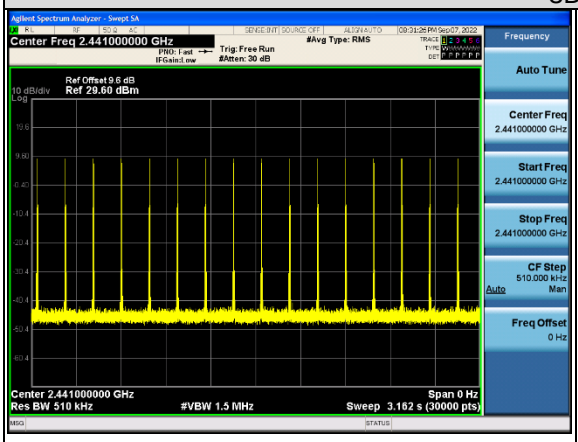
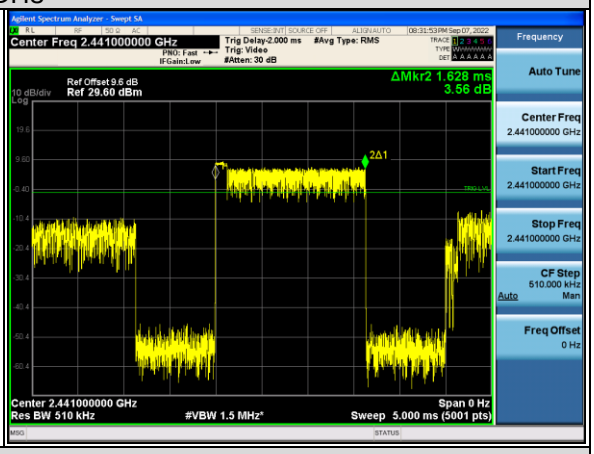
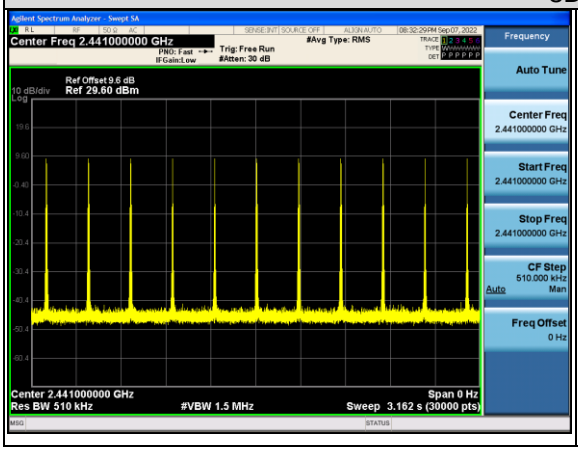
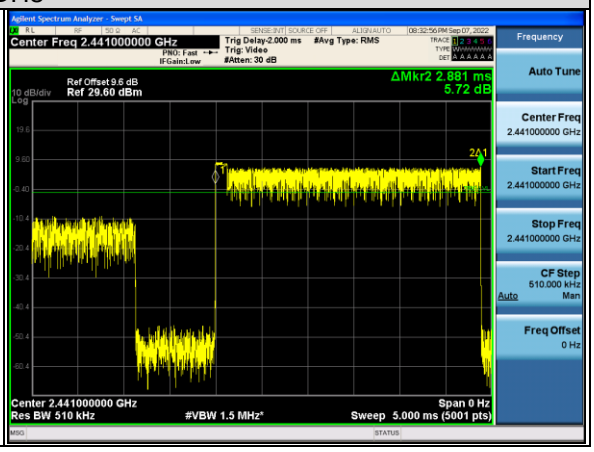




DH5





8DPSK	
3DH1	
	
3DH3	
	
3DH5	
	

Right

GFSK

Mode	Number of Hopping Channel	Number of transmision in a period (channel number*0.4 sec)				Length of transmission time (msec)	Result (msec)	Limit (msec)	Verdict
		Period (sec)	Sweep time (sec)	times in a sweep	times in a period				
DH1	79	31.6	3.16	32	320	0.375	120.00	400	Pass
DH3	79	31.6	3.16	16	160	1.631	260.96	400	Pass
DH5	79	31.6	3.16	11	110	2.879	316.69	400	Pass

Note: Test plots of the transmitting time slot are shown as below.

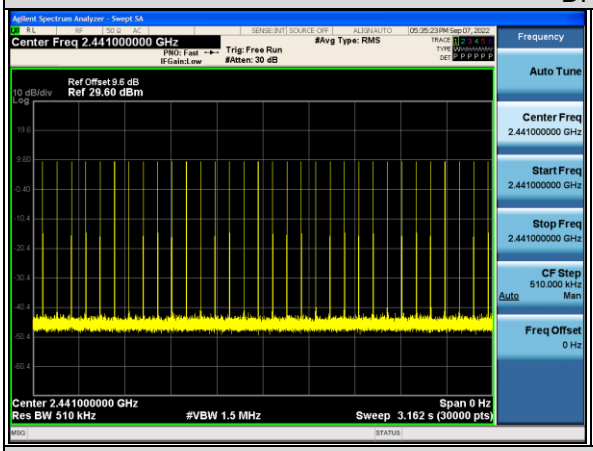
8DPSK

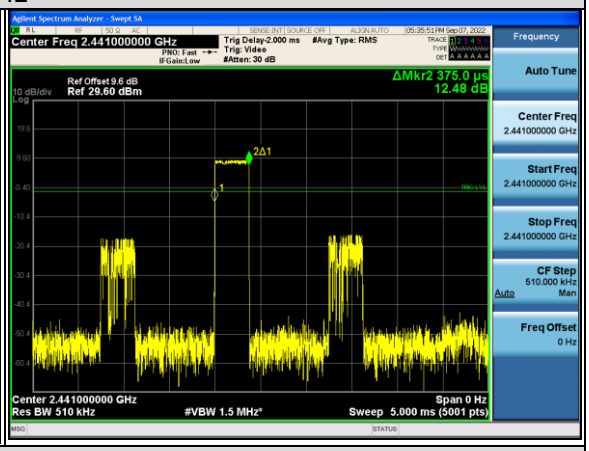
Mode	Number of Hopping Channel	Number of transmision in a period (channel number*0.4 sec)				Length of transmission time (msec)	Result (msec)	Limit (msec)	Verdict
		Period (sec)	Sweep time (sec)	times in a sweep	times in a period				
3DH1	79	31.6	3.16	32	320	0.378	120.96	400	Pass
3DH3	79	31.6	3.16	16	160	1.628	260.48	400	Pass
3DH5	79	31.6	3.16	11	110	2.881	316.91	400	Pass

Note: Test plots of the transmitting time slot are shown as below.

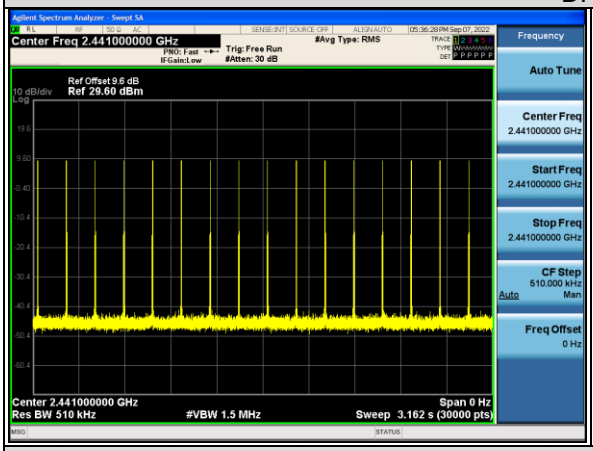
GFSK

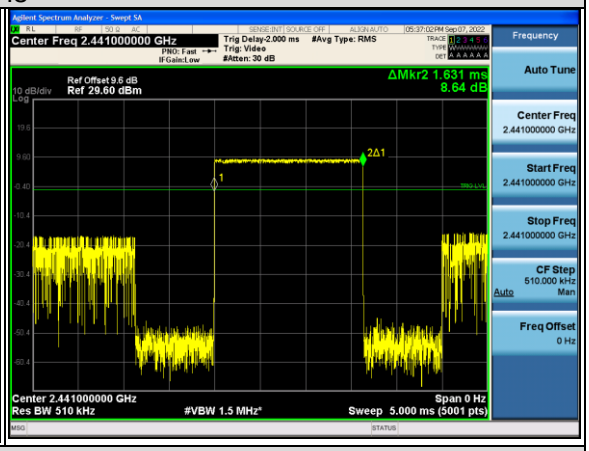
DH1



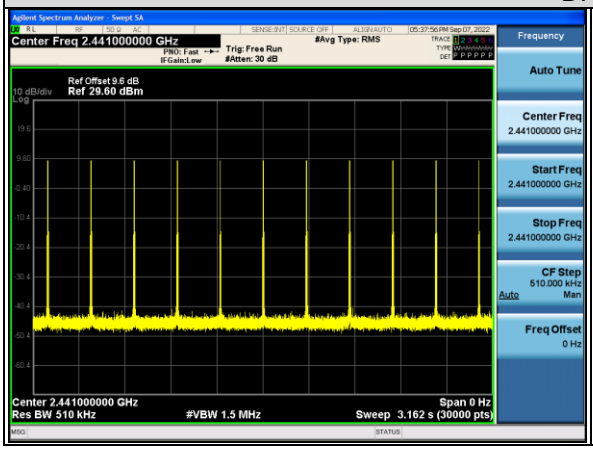


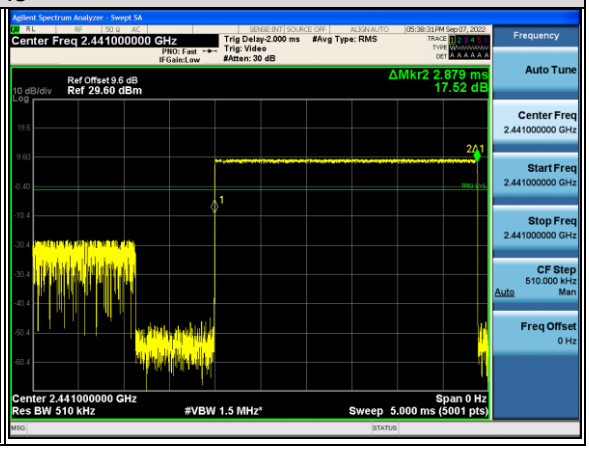
DH3





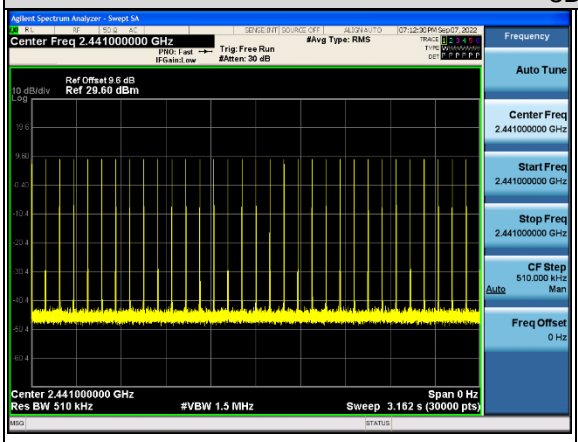
DH5

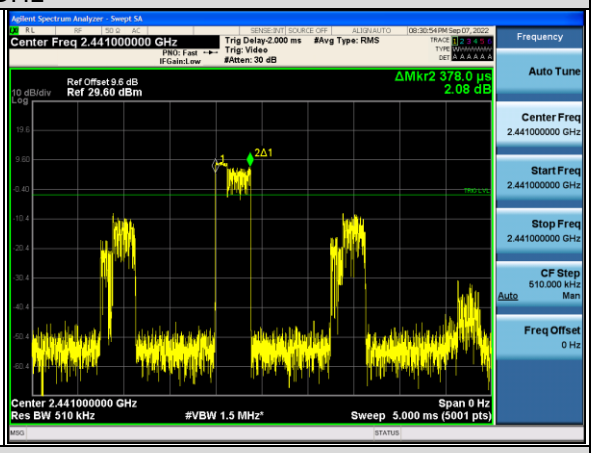




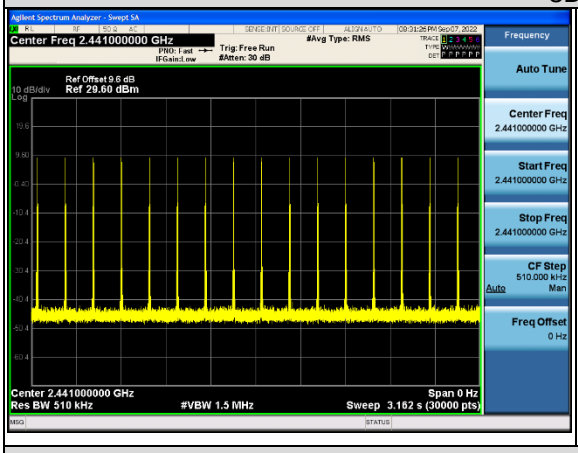
8DPSK

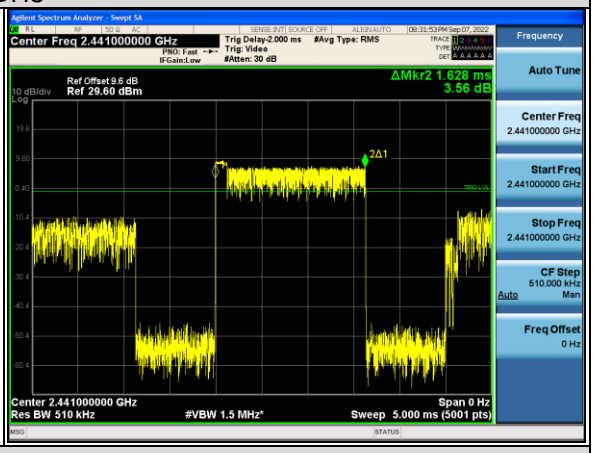
3DH1



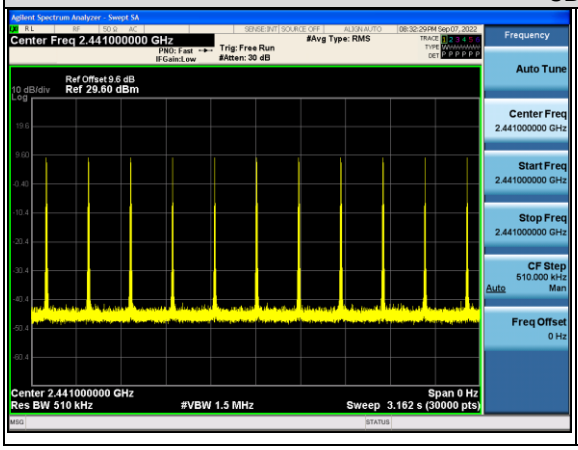


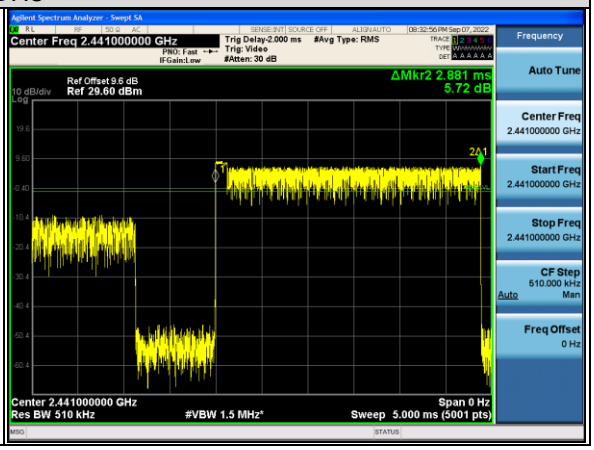
3DH3





3DH5



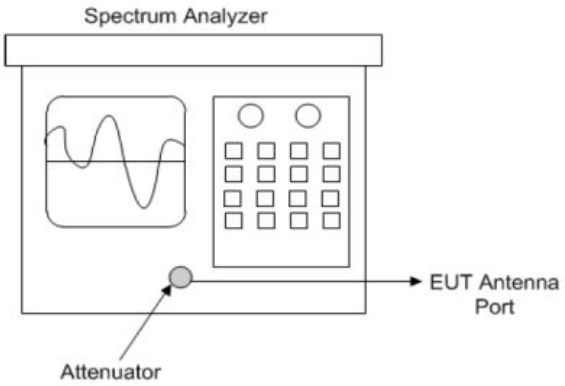


3.5 Channel Bandwidth

3.5.1 Limits of Channel Bandwidth Measurement

For frequency hopping system operating in the 2400-2483.5 MHz, if the 20 dB bandwidth of hopping channel is greater than 25 kHz, two-thirds 20 dB bandwidth of hopping channel shell be a minimum limit for the hopping channel separation.

3.5.2 Test Setup



Spectrum analyzer test configuration

3.5.3 Test Instruments

Refer to section 5 to get information of above instrument.

3.5.4 Test Procedure

a. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
b. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the instrument equal to the highest peak value.
c. Measure the frequency difference of two frequencies that were attenuated 20 dB from the reference level. Record the frequency difference as the emission bandwidth.
d. Repeat above procedures until all frequencies measured were complete.

3.5.5 Deviation from Test Standard

No deviation.

3.5.6 EUT Operating Condition

The software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel frequencies individually.

3.5.7 Test Results

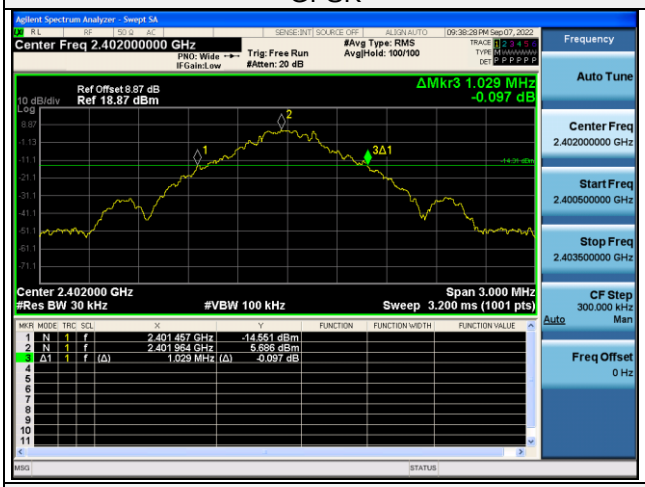
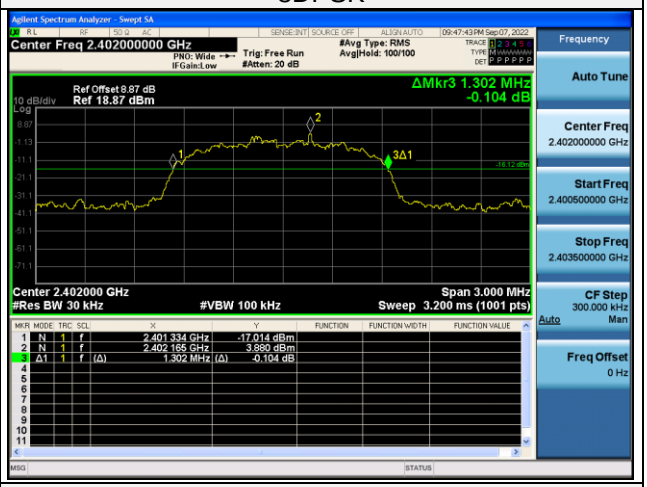
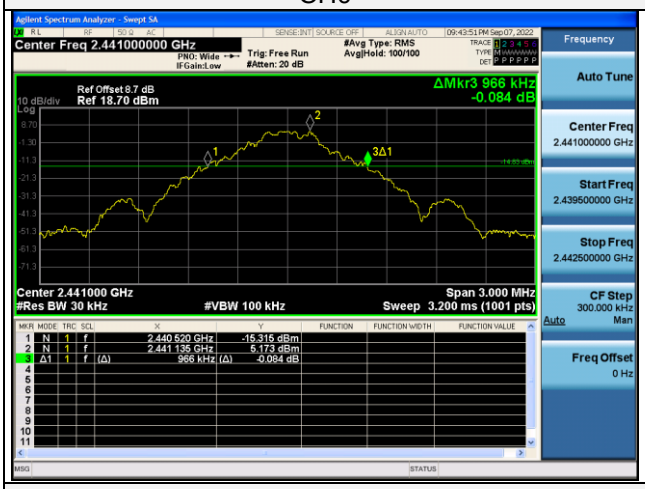
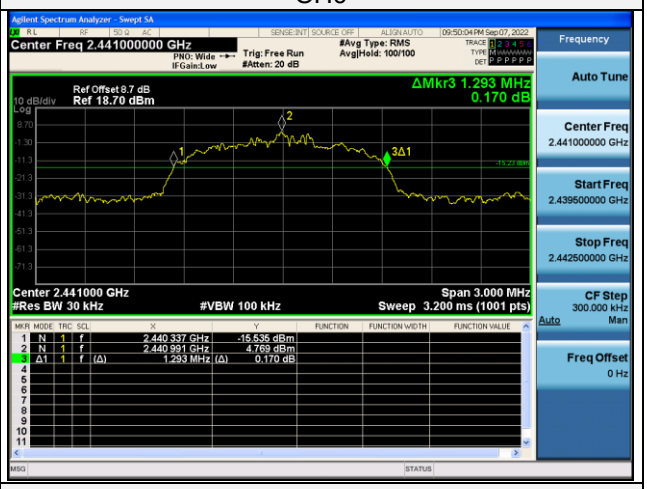
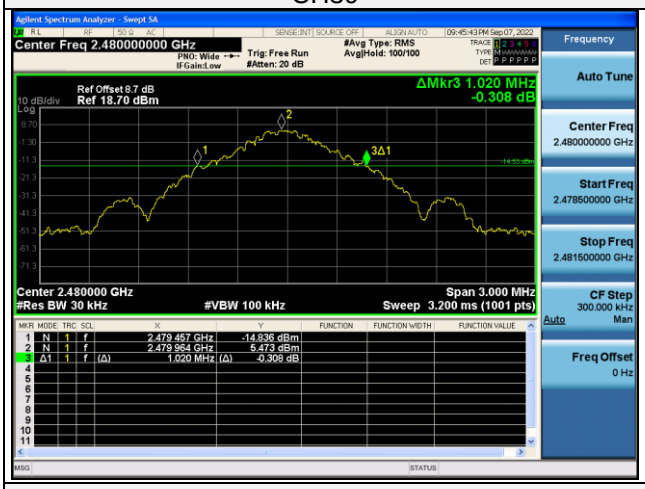
Left

Channel	Frequency (MHz)	20dB Bandwidth (MHz)	
		GFSK	8DPSK
0	2402	1.029	1.302
39	2441	0.966	1.293
78	2480	1.020	1.299

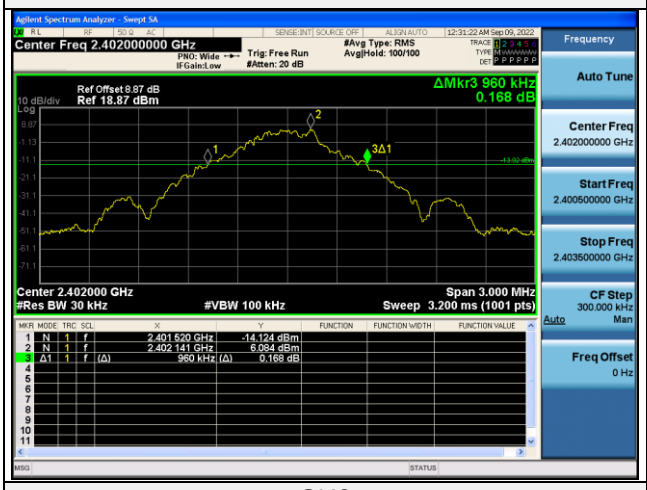
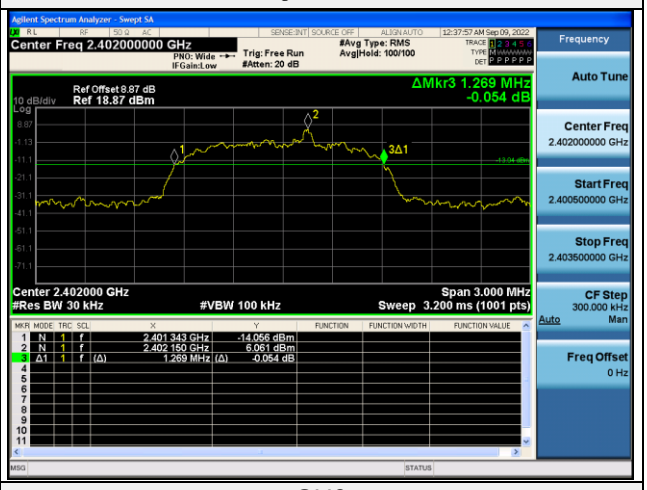
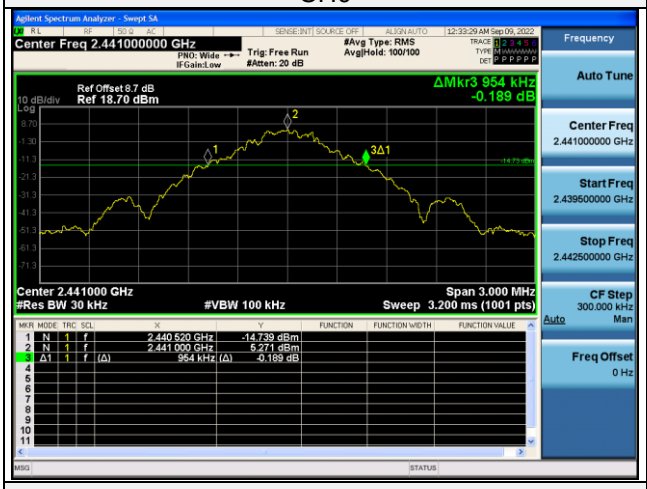
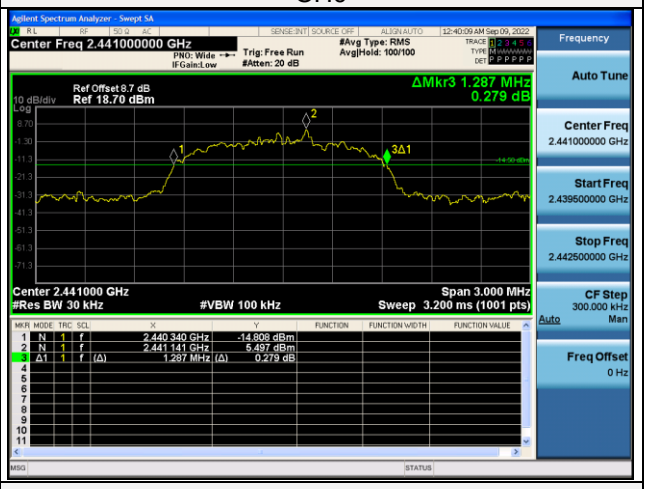
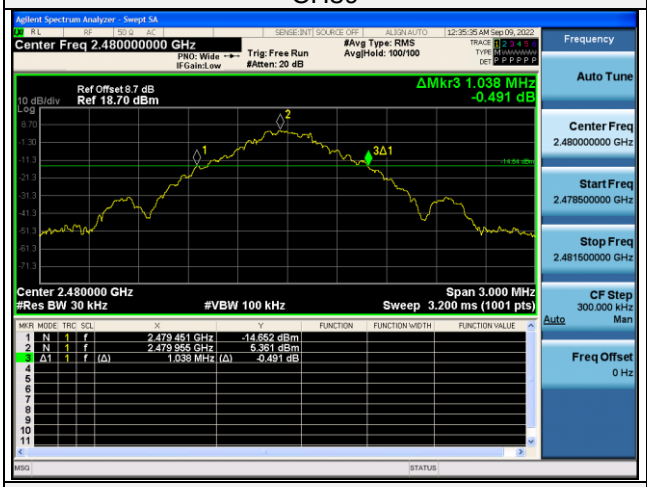
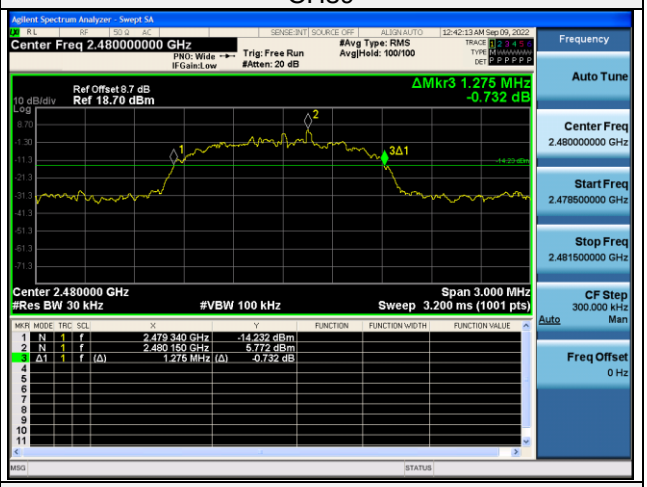
Right

Channel	Frequency (MHz)	20dB Bandwidth (MHz)	
		GFSK	8DPSK
0	2402	0.960	1.269
39	2441	0.954	1.287
78	2480	1.038	1.275

Left

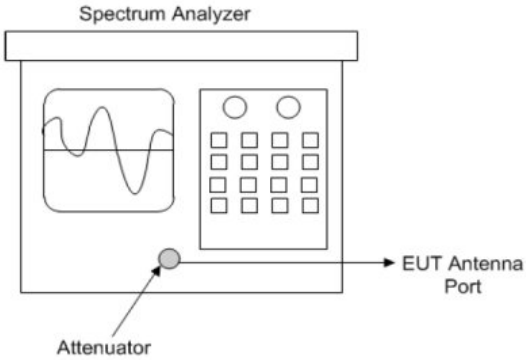
GFSK	8DPSK
	
CH0	CH0
	
CH39	CH39
	
CH78	CH78

Right

GFSK	8DPSK
	
CH0	CH0
	
CH39	CH39
	
CH78	CH78

3.6 Occupied Bandwidth Measurement

3.6.1 Test Setup



Spectrum analyzer test configuration

3.6.2 Test Instruments

Refer to section 5 to get information of above instrument

3.6.3 Test Procedure

The transmitter output was connected to the spectrum analyzer through an attenuator. The bandwidth of the fundamental frequency was measured by spectrum analyzer with resolution bandwidth in the range of 1% to 5% of the anticipated emission bandwidth, and a video bandwidth at least 3x the resolution bandwidth and set the detector to PEAK. The width of a frequency band such that, below the lower and above the upper frequency limits, the mean powers emitted are each equal to a specified percentage 0.5%of the total mean power of a given emission.

3.6.4 Deviation from Test Standard

No deviation.

3.6.5 EUT Operating Conditions

The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.

3.6.6 Test Results

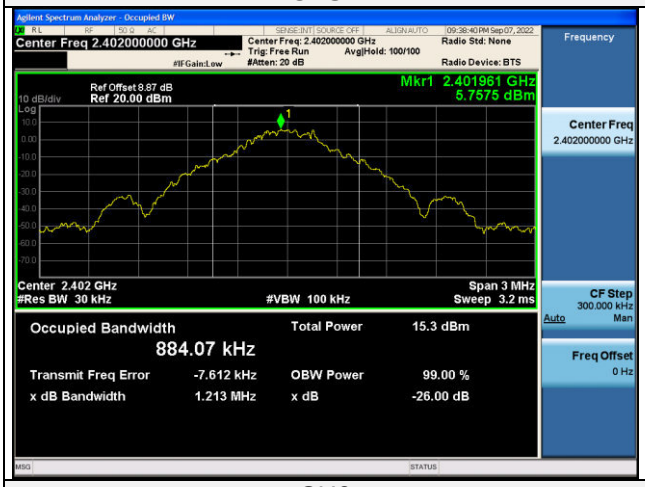
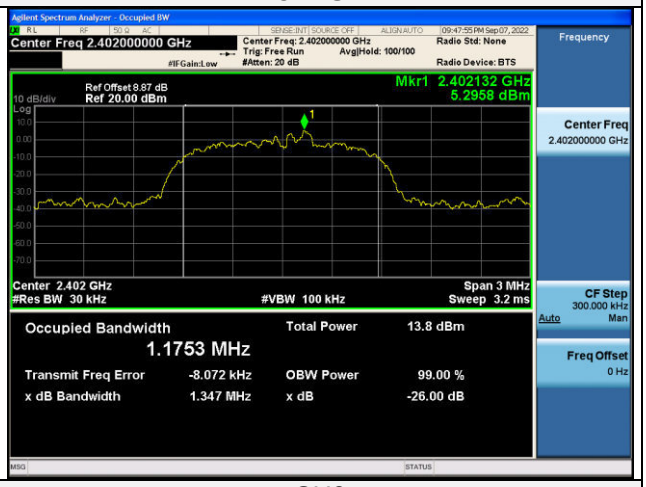
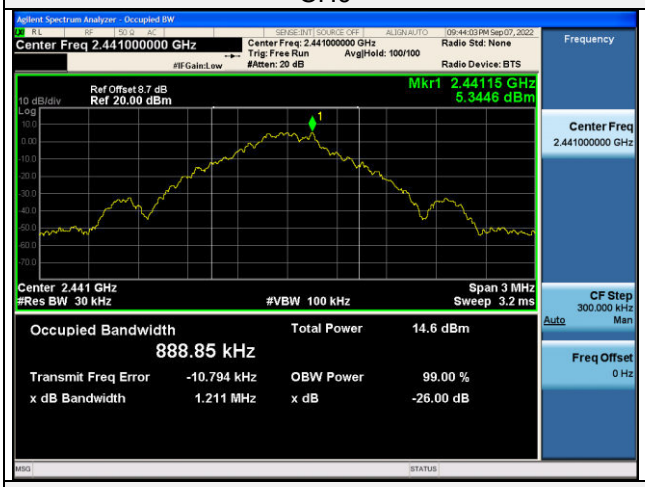
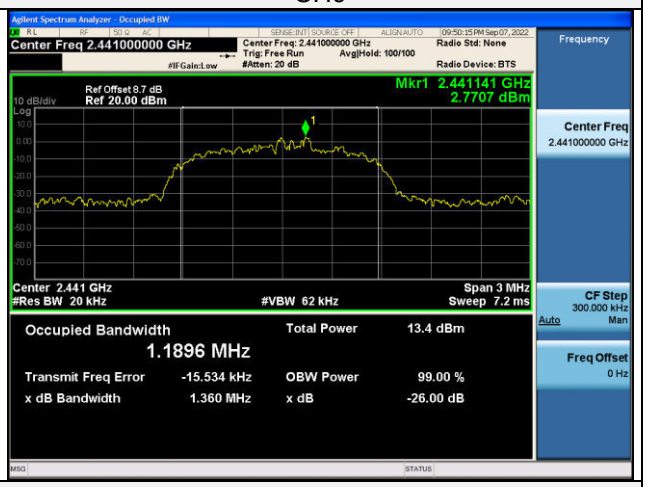
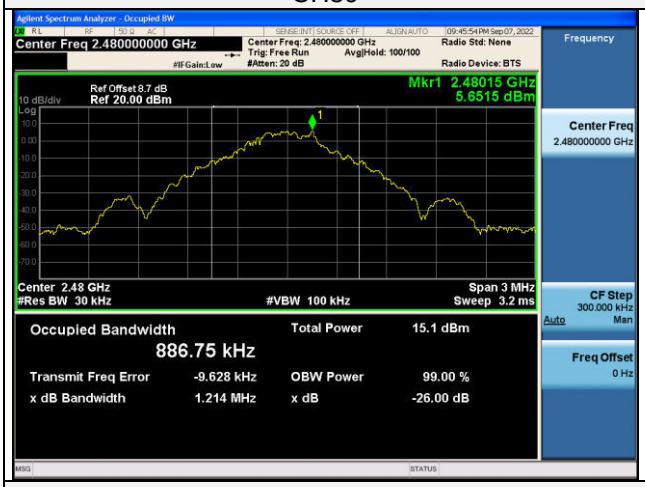
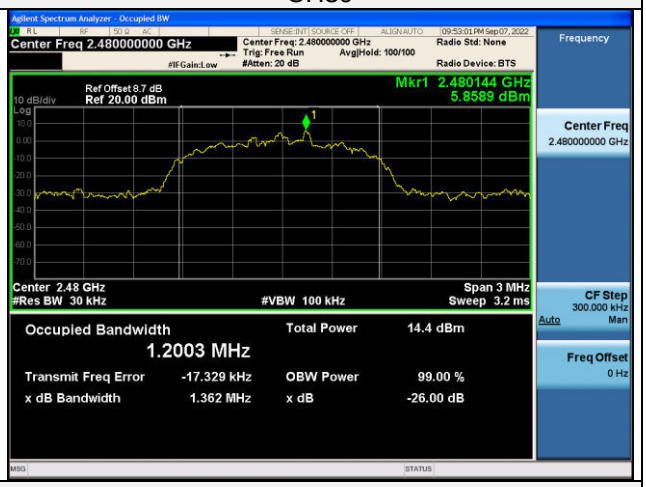
Left

Channel	Frequency (MHz)	Occupied Bandwidth (MHz)	
		GFSK	8DPSK
0	2402	0.884	1.175
39	2441	0.888	1.189
78	2480	0.886	1.200

Right

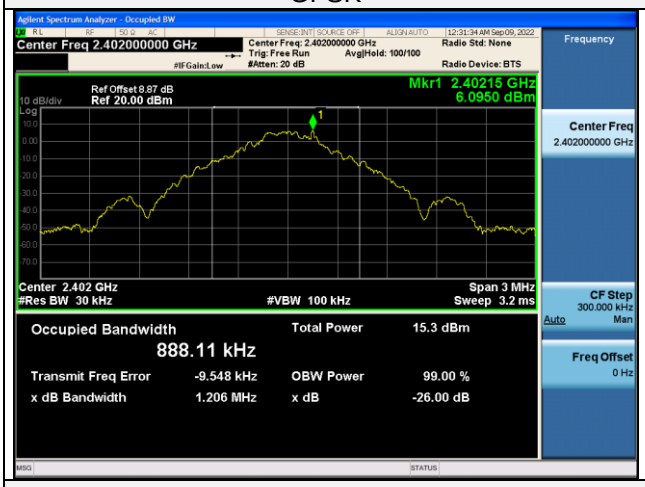
Channel	Frequency (MHz)	Occupied Bandwidth (MHz)	
		GFSK	8DPSK
0	2402	0.888	1.210
39	2441	0.876	1.197
78	2480	0.884	1.204

Left

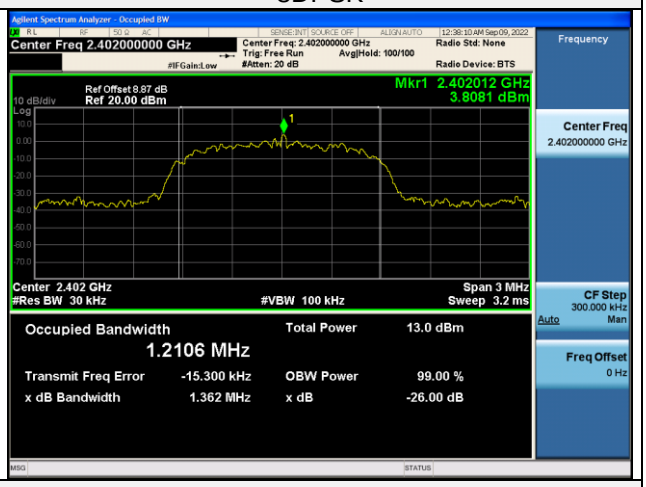
GFSK	8DPSK
	
CH0	CH0
	
CH39	CH39
	
CH78	CH78

Right

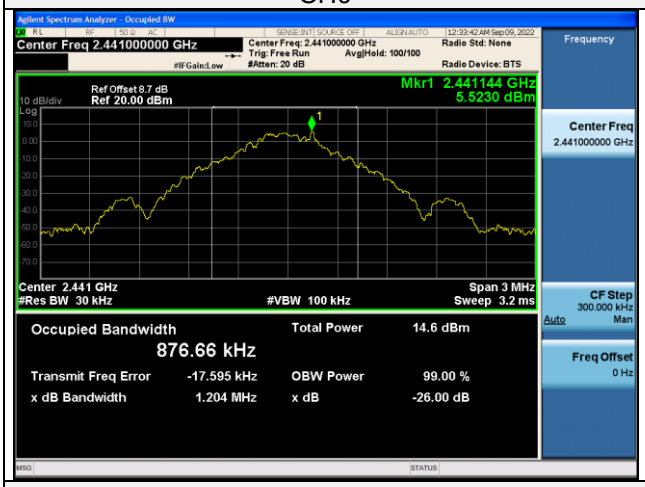
GFSK



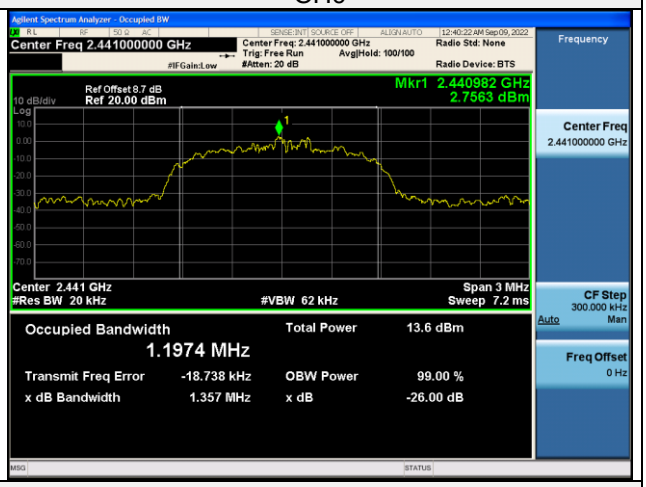
8DPSK



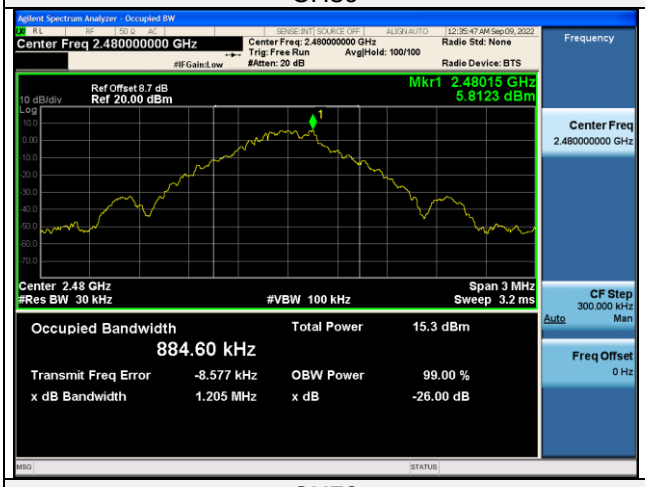
CH0



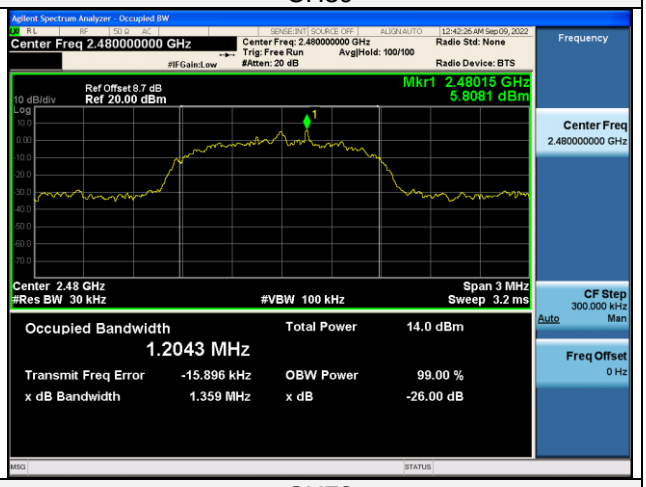
CH0



CH39



CH39



CH78

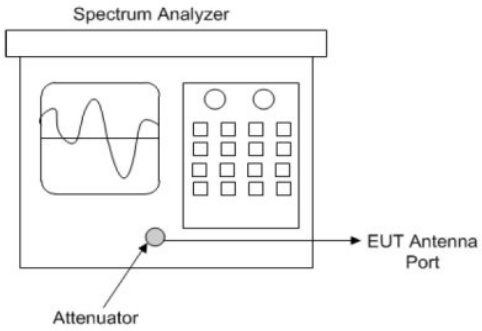
CH78

3.7 Hopping Channel Separation

3.7.1 Limits of Hopping Channel Separation Measurement

At least 25 kHz or two-third of 20 dB hopping channel bandwidth (whichever is greater).

3.7.2 Test Setup



3.7.3 Test Instruments

Refer to section 5 to get information of above instrument.

3.7.4 Test Procedure

a. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
b. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range.
c. By using the MaxHold function record the separation of two adjacent channels.
d. Measure the frequency difference of these two adjacent channels by SA MARK function. And then plot the result on SA screen.
e. Repeat above procedures until all frequencies measured were complete.

3.7.5 Deviation from Test Standard

No deviation.

3.7.6 Test Results

Left

Channel No.	Frequency (MHz)	Adjacent Channel Separation (MHz)		Minimum Limit (MHz)		Pass / Fail
		GFSK	8DPSK	GFSK	8DPSK	
0	2402	1.002	1.005	0.686	0.868	Pass
39	2441	0.996	0.999	0.644	0.862	Pass
78	2480	0.999	1.002	0.680	0.866	Pass

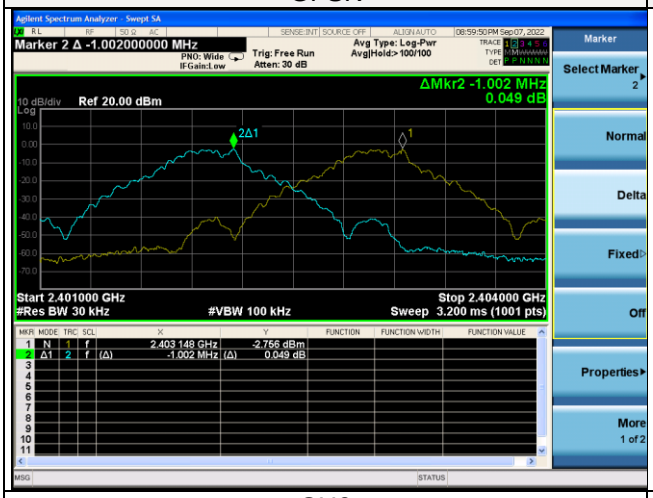
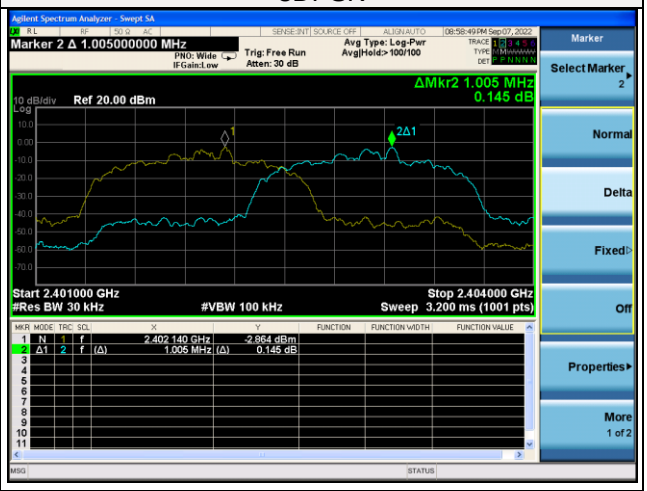
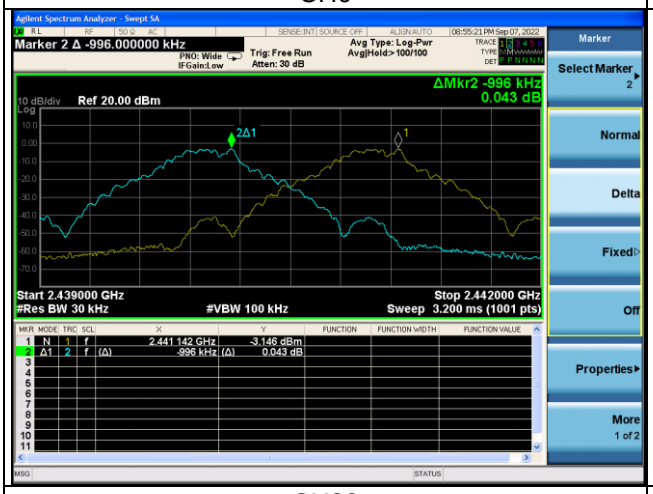
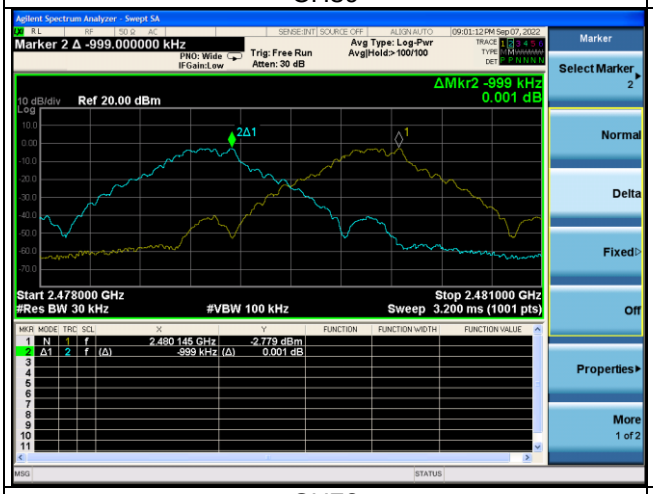
Note: The minimum limit is two-third 20 dB bandwidth.

Right

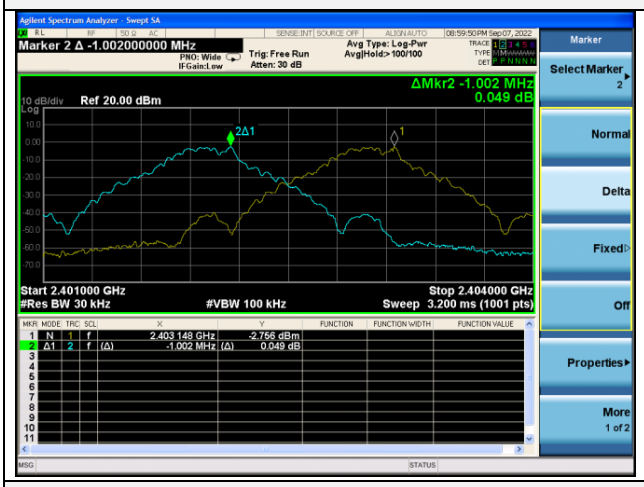
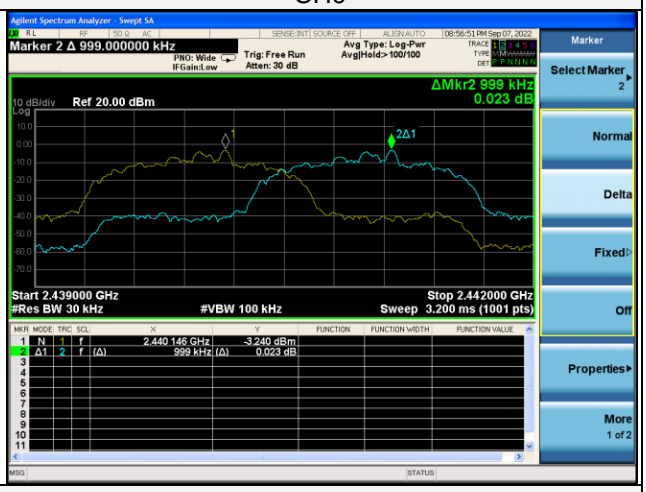
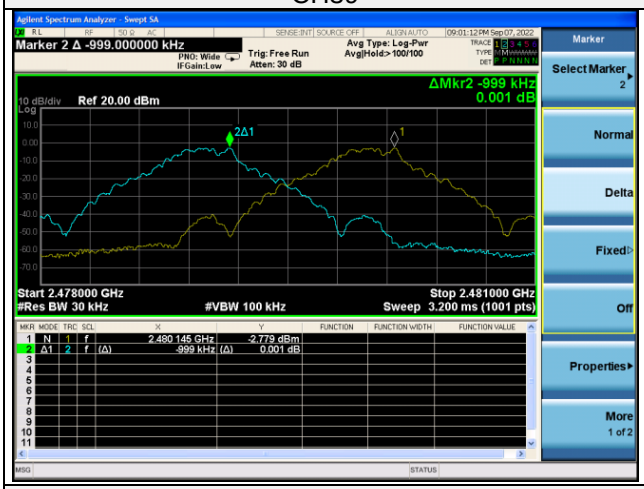
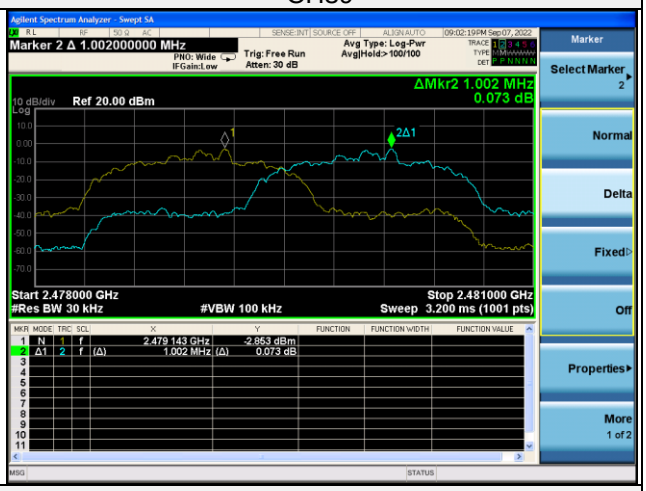
Channel No.	Frequency (MHz)	Adjacent Channel Separation (MHz)		Minimum Limit (MHz)		Pass / Fail
		GFSK	8DPSK	GFSK	8DPSK	
0	2402	1.002	1.005	0.640	0.846	Pass
39	2441	0.996	0.999	0.636	0.858	Pass
78	2480	0.999	1.002	0.426	0.850	Pass

Note: The minimum limit is two-third 20 dB bandwidth.

Left

GFSK	8DPSK
	
CH0	CH0
	
CH39	CH39
	
CH78	CH78

Right

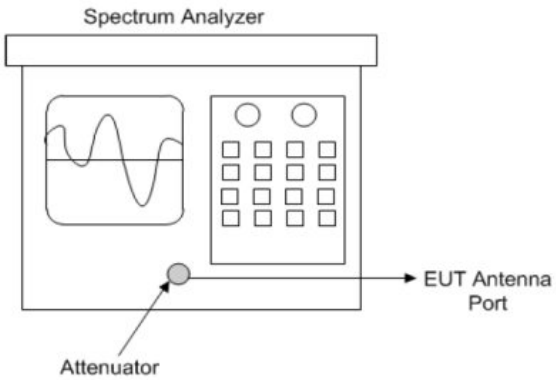
GFSK	8DPSK
	
CH0	CH0
	
CH39	CH39
	
CH78	CH78

3.8 Maximum Output Power

3.8.1 Limits of Maximum Output Power Measurement

The Maximum Output Power Measurement is 125mW.

3.8.2 Test Setup



Spectrum analyzer test configuration

3.8.3 Test Instruments

Refer to section 5 to get information of above instrument.

3.8.4 Test Procedure

☒Measurement using a spectrum analyzer (SA)，Selection of test method：

☒Maximum peak conducted output power

The following procedure shall be used when an instrument with a resolution bandwidth that is greater than the DTS bandwidth is available to perform the measurement:

a) Set the RBW > DTS bandwidth.

b) Set VBW> [3 x RBW]

c) Set span > [3 x RBW]

d) Sweep time = auto couple.

e) Detector = peak

f) Trace mode = max hold.

g) Allow trace to fully stabilize.

h) Use peak marker function to determine the peak amplitude level.

☒Maximum conducted (average) output power

a) Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.

b) Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.

c) SA Setting:

1)* Set span to at least 1.5 times the OBW

2)* Set sweep trigger to "free run."

3)* Set RBW= 1% to 5% of the OBW. not to exceed 1MHz.

4)* Set VBW ≥ 3 x RBW

5)* Number of points in sweep≥ 2 x span /RBW. (This gives bin-to-bin spacing ≤ RBW / 2. so that narrowband signals are not lost between frequency bins).

6)* Sweep time ≤ (number of points in sweep) x T. where T is defined in 11.6. If this gives a sweep time less than the auto sweep time of the instrument. then method AVGSA-3 shall not be used (use AVGSA-3A). The purpose of this step is so that the averaging time in each bin is less than or equal to the minimum time of a transmission.

7)* Detector =RMS (power averaging).

8)* Trace mode =Max hold.

9)* Allow max hold to run for at least 60 s or longer as needed to allow the trace to stabilize.

10)* Compute power by integrating the spectrum across the OBW of the signal using the instrument's band power measurement function with band limits set equal to the OBW band edges. If the instrument does not have a band power function. then sum the spectrum levels (in power units) at intervals equal to the RBW extending across the entire OBW.

d. Measure the captured power within the band and recording the plot.

e. Repeat above procedures until all frequencies required were complete.

3.8.5 Deviation fromTest Standard

No deviation.

3.8.6 EUT Operating Condition

The software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel frequencies individually.

3.8.7 Test Results

Left

Peak power

Channel No.	Freq. (MHz)	Output Power (dBm)		Output Power (mW)		Power Limit (mW)	Pass / Fail
		GFSK	8DPSK	GFSK	8DPSK		
0	2402	7.523	7.311	5.653	5.384	125	Pass
39	2441	7.330	7.409	5.408	5.507	125	Pass
78	2480	7.648	**7.808**	5.818	6.037	125	Pass

Average power

Channel No.	Freq. (MHz)	Output Power (dBm)		Output Power (mW)		Power Limit (mW)	Pass / Fail
		GFSK	8DPSK	GFSK	8DPSK		
0	2402	3.228	2.153	2.103	1.642	125	Pass
39	2441	3.195	1.644	2.087	1.460	125	Pass
78	2480	3.523	1.899	2.251	1.548	125	Pass

Right

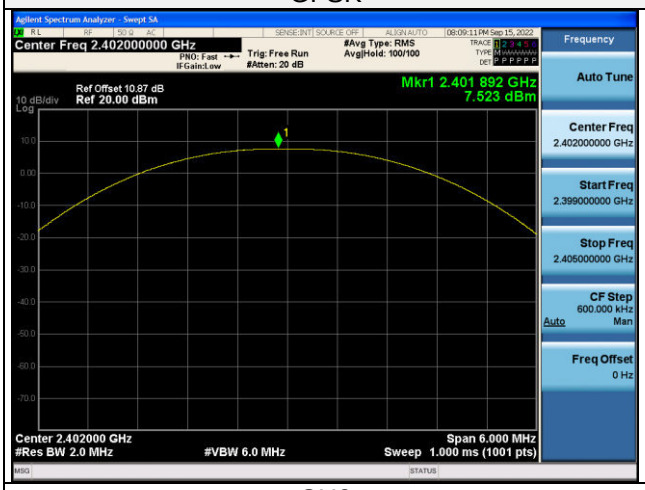
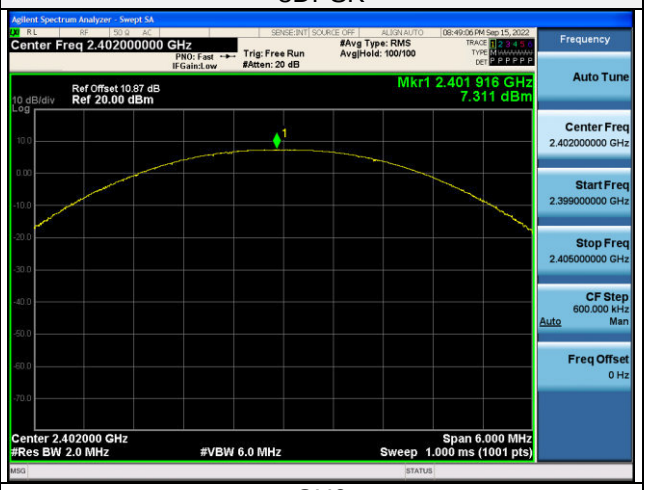
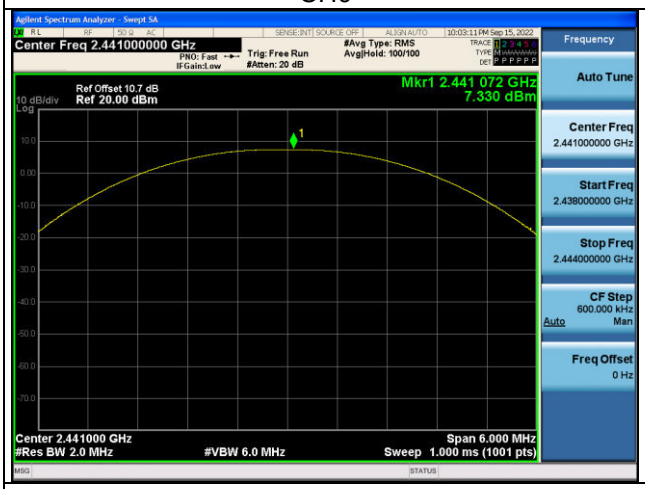
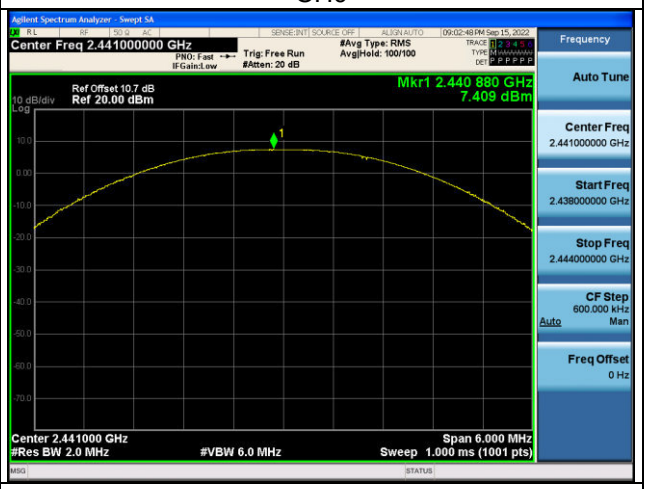
Peak power

Channel No.	Freq. (MHz)	Output Power (dBm)		Output Power (mW)		Power Limit (mW)	Pass / Fail
		GFSK	8DPSK	GFSK	8DPSK		
0	2402	6.859	6.960	4.852	4.966	125	Pass
39	2441	6.863	6.938	4.856	4.941	125	Pass
78	2480	7.645	6.868	5.814	4.862	125	Pass

Average power

Channel No.	Freq. (MHz)	Output Power (dBm)		Output Power (mW)		Power Limit (mW)	Pass / Fail
		GFSK	8DPSK	GFSK	8DPSK		
0	2402	4.134	4.104	2.591	2.573	125	Pass
39	2441	4.133	4.126	2.590	2.586	125	Pass
78	2480	4.926	4.018	3.109	2.522	125	Pass

Left

Peak Power Spectrum Plot	
GFSK	8DPSK
	
CH0	CH0
	
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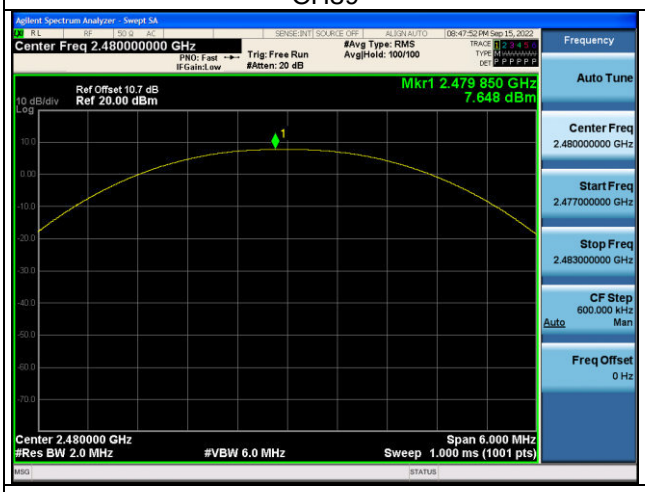	
CH78	CH78