FCC Part 15, Subpart C
Test Report

FCC ID:	2BBBFDLE0101A
Applicant:	Minami Acoustics Limited
Address:	No.13, Maonan Road, Torch Development District, Zhongshan City, Guangdong Province, P.R. China
Manufacturer:	Minami Acoustics Limited
Address:	No.66, Baokuang Road, Shangou Industrial Park, Yudu County, Ganzhou City, Jiangxi Province, P.R. China
Product(s):	Easy LE Adapter
Brand(s):	MINAMI
Test Model(s):	DLE0101A
Series Model(s):	N/A
Test Date:	Nov. 28, 2023 ~ Feb. 28, 2024
Issued Date:	Jul. 23, 2024
Issued By:	Hwa-Hsing (Dongguan) Testing Co., Ltd.
Address:	No.101, Building N1, Yuyuan 2 Road, Yuyuan Industrial Park, HuangJiang Town, Dongguan City, People's Republic of 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 : Nature Lee — *Nature Lee*

Reviewed by : Dragon Long — *Dragon Long*

Approved by : Scott He — *Scott He*

HWA-HSING (DONGGUAN) TESTING CO., LTD. LYNS-TCi

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Release Control Record

Issue No.	Description	Date Issued
24011703-RF-US-01	Original Release	Jul. 23, 2024

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
15.247(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) (±)
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)	Easy LE Adapter
Test Model(s)	DLE0101A
Sample No.	HS2401220007
Series Model(s)	N/A
Status of EUT	Engineering Prototype
Power Supply Rating	DC 5V or 9V from USB
Modulation Type	GFSK
Modulation Technology	FHSS
Transfer Rate	1Mbps, 2Mbps
Operating Frequency	GFSK 1M: 2402MHz ~ 2480MHz GFSK 2M: 2404MHz ~ 2478MHz
Number of Channel	GFSK 1M: 40 GFSK 2M: 37
Output Power（Peak）	9.05dBm
Antenna Type and Antenna Gain	PCB Antenna; 1.7dBi Gain
Antenna Connector	N/A
Accessory Device	N/A

Note:

1. Please refer to the EUT photo document (Reference No.: 24011703-01&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.
3. For the test results, the EUT had been tested with all conditions, and only the worst case was shown in the test report.

2.2 Description of Test Modes

These are GFSK 1M 40 channels are provided to this EUT:

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	**2402**	10	2422	20	2442	30	2462
1	2404	11	2424	21	2444	31	2464
2	2406	12	2426	22	2446	32	2466
3	2408	13	2428	23	2448	33	2468
4	2410	14	2430	24	2450	34	2470
5	2412	15	2432	25	2452	35	2472
6	2414	16	2434	26	2454	36	2474
7	2416	17	2436	27	2456	37	2476
8	2418	18	2438	28	2458	38	2478
9	2420	**19**	**2440**	29	2460	**39**	**2480**

These are GFSK 2M 37 channels are provided to this EUT:

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
		10	2422	20	2442	30	2462
1	**2404**	11	2424	21	2444	31	2464
2	2406			22	2446	32	2466
3	2408	13	2428	23	2448	33	2468
4	2410	14	2430	24	2450	34	2470
5	2412	15	2432	25	2452	35	2472
6	2414	16	2434	26	2454	36	2474
7	2416	17	2436	27	2456	37	2476
8	2418	18	2438	28	2458	**38**	**2478**
9	2420	**19**	**2440**	29	2460		

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 5V from USB
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 1M	GFSK 2M	
Radiated Emissions	√	√	GFSK 1M & GFSK 2M
Antenna Port Conducted Measurement	√	√	GFSK 1M & GFSK 2M

Test Condition:

Applicable test items	Environmental Conditions	Test Date	Tested by
Radiated Emissions	25.1deg. C, 56%RH	Feb. 28, 2024	Hua
Antenna Port Conducted Measurement	23.8deg. C, 55%RH	Feb. 25, 2024	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 39	0, 19, 39	FHSS	GFSK	GFSK 1M
-	1 to 38	1, 19, 38	FHSS	GFSK	GFSK 2M

Radiated Emission Test (Below 1 GHz):

EUT Configure Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Packet Type
-	0 to 39	0, 19, 39	FHSS	GFSK	GFSK 1M
-	1 to 38	1, 19, 38	FHSS	GFSK	GFSK 2M

Power Line Conducted Emission Test:

EUT Configure Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Packet Type
-	0 to 39	39	FHSS	GFSK	GFSK 1M

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 39	0, 19, 39	FHSS	GFSK	GFSK 1M
-	1 to 38	1, 19, 38	FHSS	GFSK	GFSK 2M

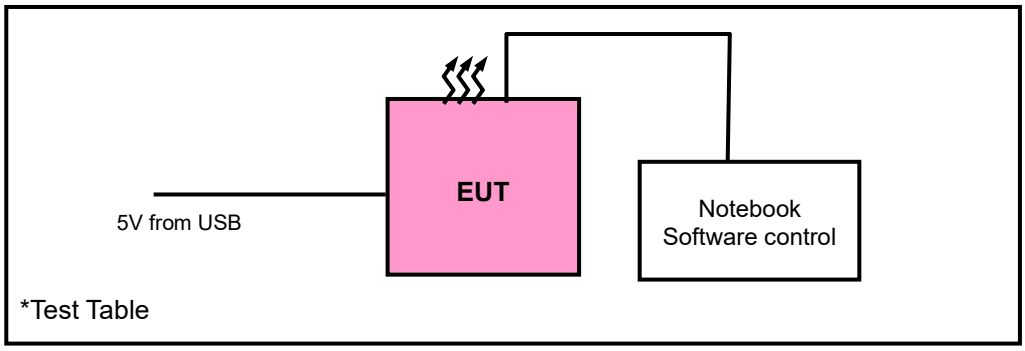
2.4 Description of Support Units

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	HUAWEI	NbD-WFH9	EUEPM21725002655	N/A

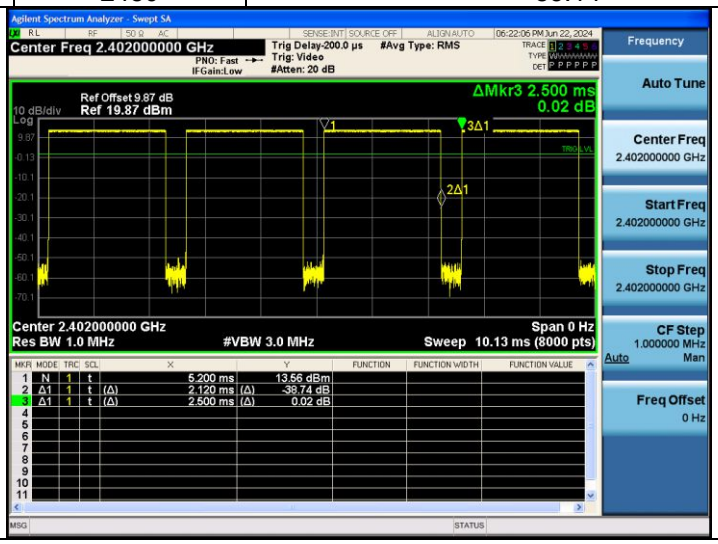
No.	Signal Cable Description of The Above Support Units
1	USB extension cord: Unshielded, Detachable 1.2m;

2.5 Configuration of System under Test

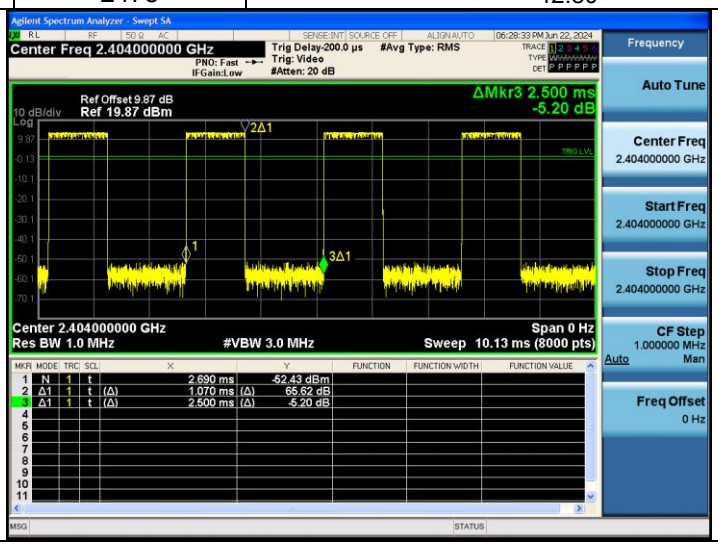


2.6 Duty Cycle of Test Signal

Test Mode	Channel	Duty Cycle [%]
GFSK-1MHz	2402	84.80
	2440	84.86
	2480	85.14



Test Mode	Channel	Duty Cycle [%]
GGFSK 2M	2404	42.80
	2440	42.80
	2478	42.80



3 Test Types and Results

3.1 Radiated Emission and Band-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	2024-12-26
3m Semi-anechoic Chamber	MAORUI	9m*6m*6m	NSEMC003	2026-03-12**
Test software	FARAD	FARAD	EZ_EMCV1.1.4.2	N/A
Loop Antenna	EMCI	HLA 6121	56735	2024-05-04*
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	2026-03-12**
EMI Test Receiver	Rohde&Schwarz	ESPI 7	101978	2024-12-26
Broadband antenna	Schwarzbeck	VULB 9168	00937	2024-08-18
Signal Amplifier	Com-power	PAM-103	18020051	2024-08-06
Attenuator	Rohde&Schwarz	TS2GA-6dB	18101101	N/A
Test software	FARAD	FARAD	EZ_EMCV1.1.4.2	N/A

Frequency Range above 1GHz:

Equipment	Manufacturer	Model No.	Serial No.	Next Cal.
3m Semi-anechoic Chamber	MAORUI	9m*6m*6m	NSEMC003	2026-03-12**
Horn Antenna	Schwarzbeck	BBHA 9120D	02202	2024-08-27*
Broadband Coaxial Preamplifier	Schwarzbeck	BBV 9718	25	2024-08-06
Spectrum	Keysight	N9020A	MY51240612	2024-08-06
Pre-Amplifier	EMCI	EMC 184045SE	9870709	2024-12-26
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 (*) or 36 months (**).
2. The test was performed in 966.

3.1.3 Test Procedures

a. Peak emission levels are measured by setting the instrument as follow:

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. Average emission levels are measured by setting the instrument as follow:

- **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 (Above 1GHz) 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 1GHz), which was mounted on the top of a variable-height antenna tower.
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.
h. 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.

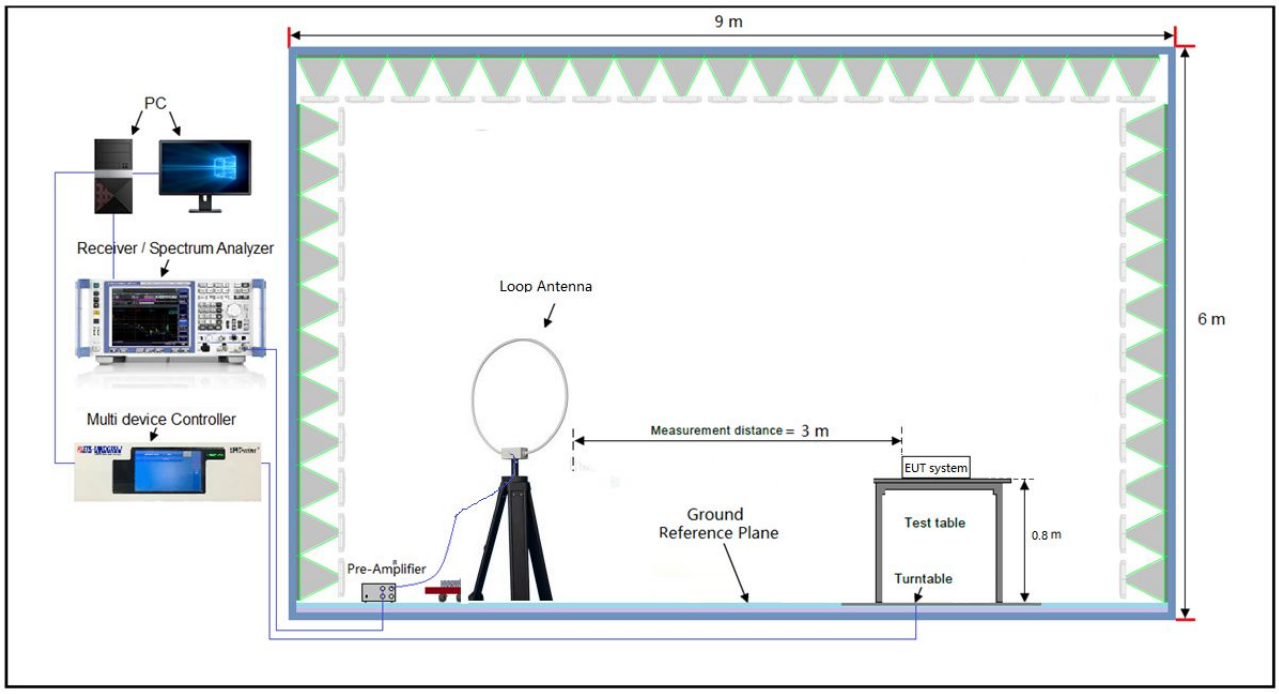
Note:
1. Test procedures for measuring FHSS device: The use of a duty cycle correction factor (DCCF) is permitted for calculating average radiated field strength emission levels for an FHSS device in 15.247. This DCCF can be applied when the unwanted emission limit is subject to an average field strength 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

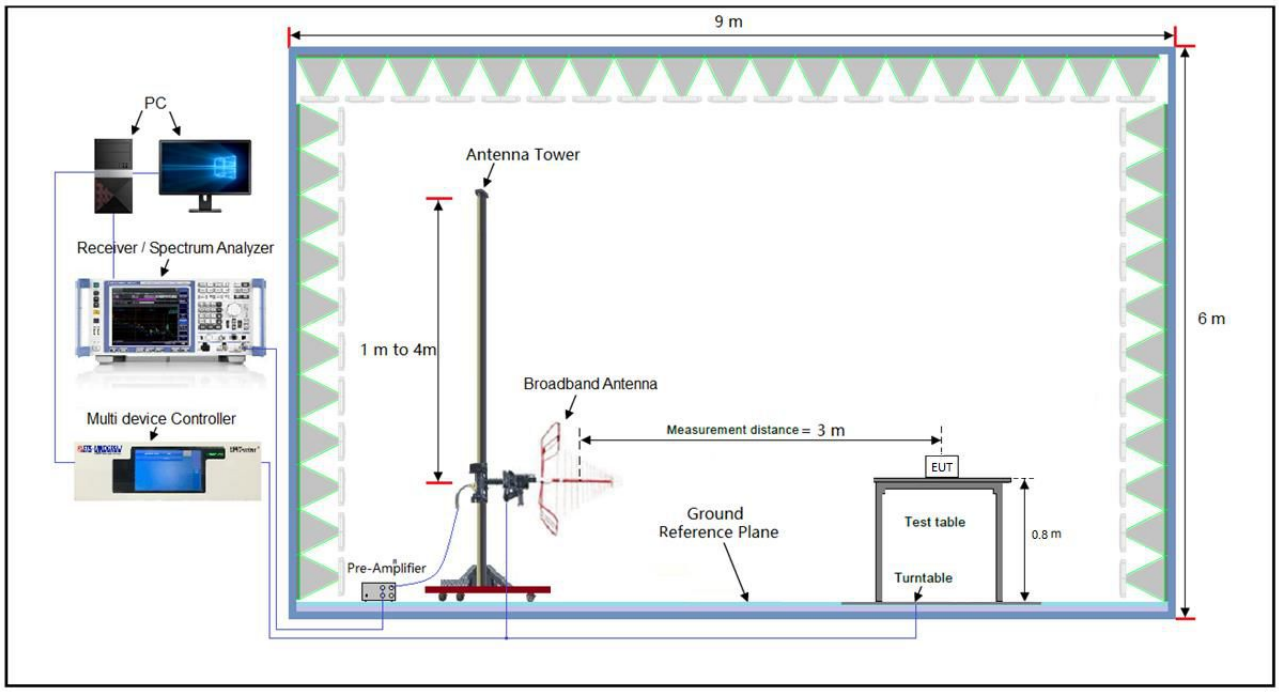
No deviation.

3.1.5 Test Setup

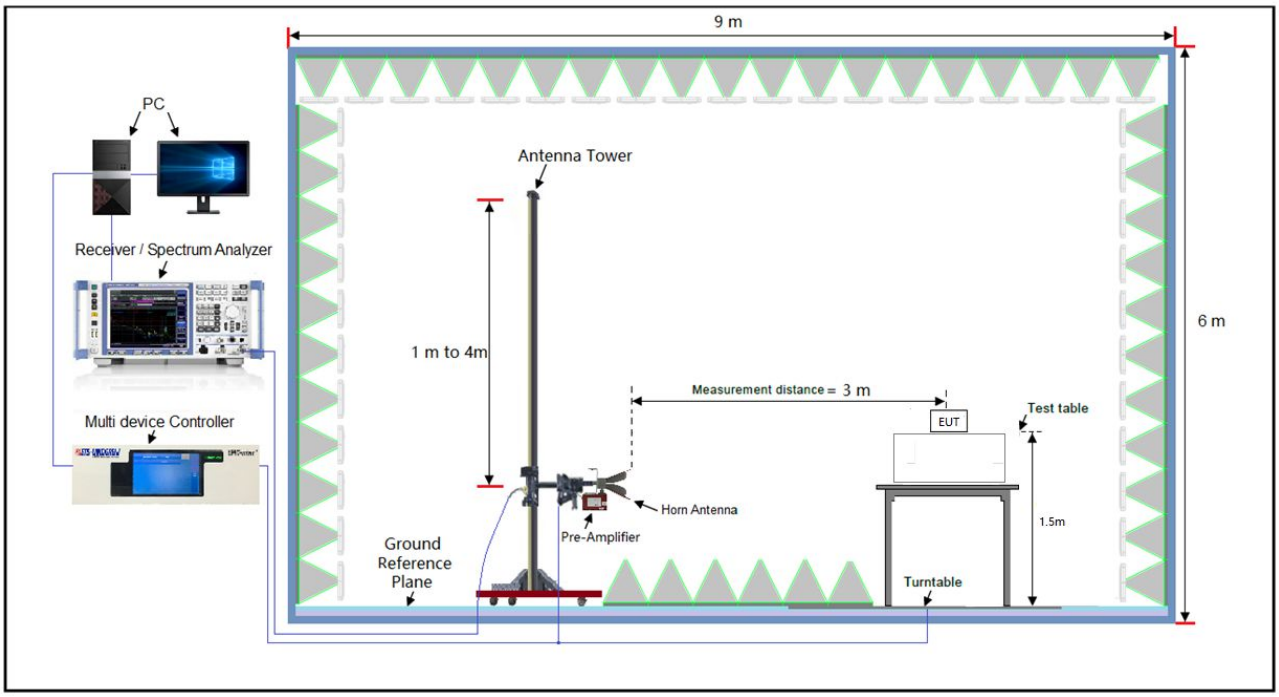
Radiated emission below 30MHz:



Frequency Range below 1GHz:



Frequency Range above 1GHz:



*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

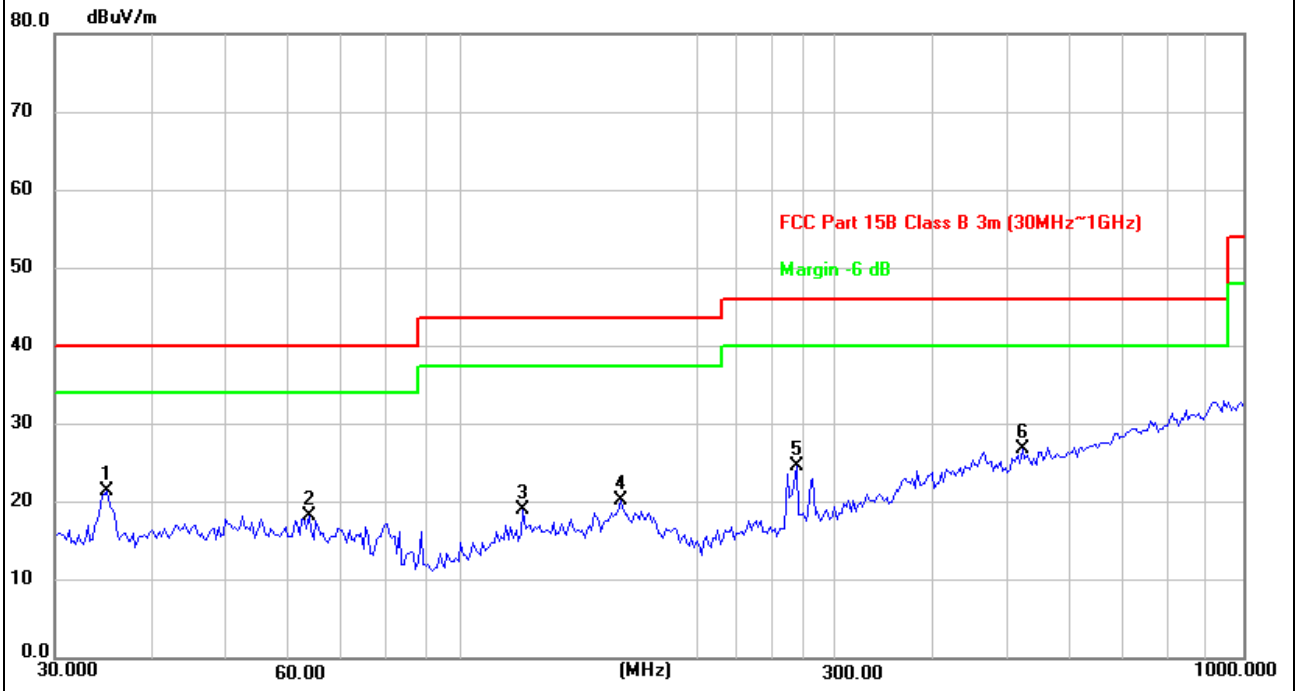
9 kHz ~ 30 MHz Data:

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

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	35.0048	38.80	-17.26	21.54	40.00	-18.46	peak	200	123
2	63.5356	33.82	-15.52	18.30	40.00	-21.70	peak	230	44
3	119.4361	34.48	-15.40	19.08	43.50	-24.42	peak	100	89
4	159.2251	33.32	-13.13	20.19	43.50	-23.31	peak	150	56
5	267.5455	38.24	-13.69	24.55	46.00	-21.45	peak	230	215
6	520.8882	32.92	-6.04	26.88	46.00	-19.12	peak	114	136

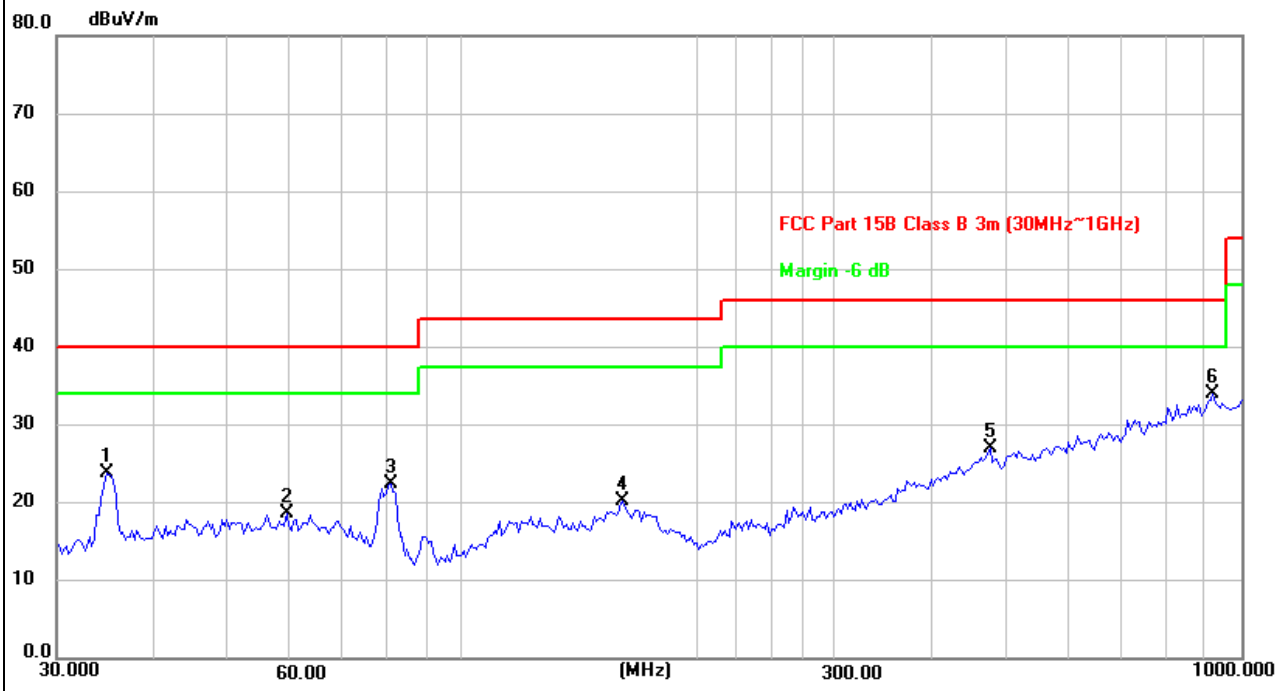
Remarks:

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 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	34.7602	41.24	-17.31	23.93	40.00	-16.07	peak	100	360
2	59.2325	33.87	-15.21	18.66	40.00	-21.34	peak	300	244
3	80.6442	40.97	-18.52	22.45	40.00	-17.55	peak	120	210
4	160.3456	33.35	-13.09	20.26	43.50	-23.24	peak	200	46
5	475.4991	34.57	-7.62	26.95	46.00	-19.05	peak	152	245
6	919.2866	32.32	1.71	34.03	46.00	-11.97	peak	133	231

Remarks:

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

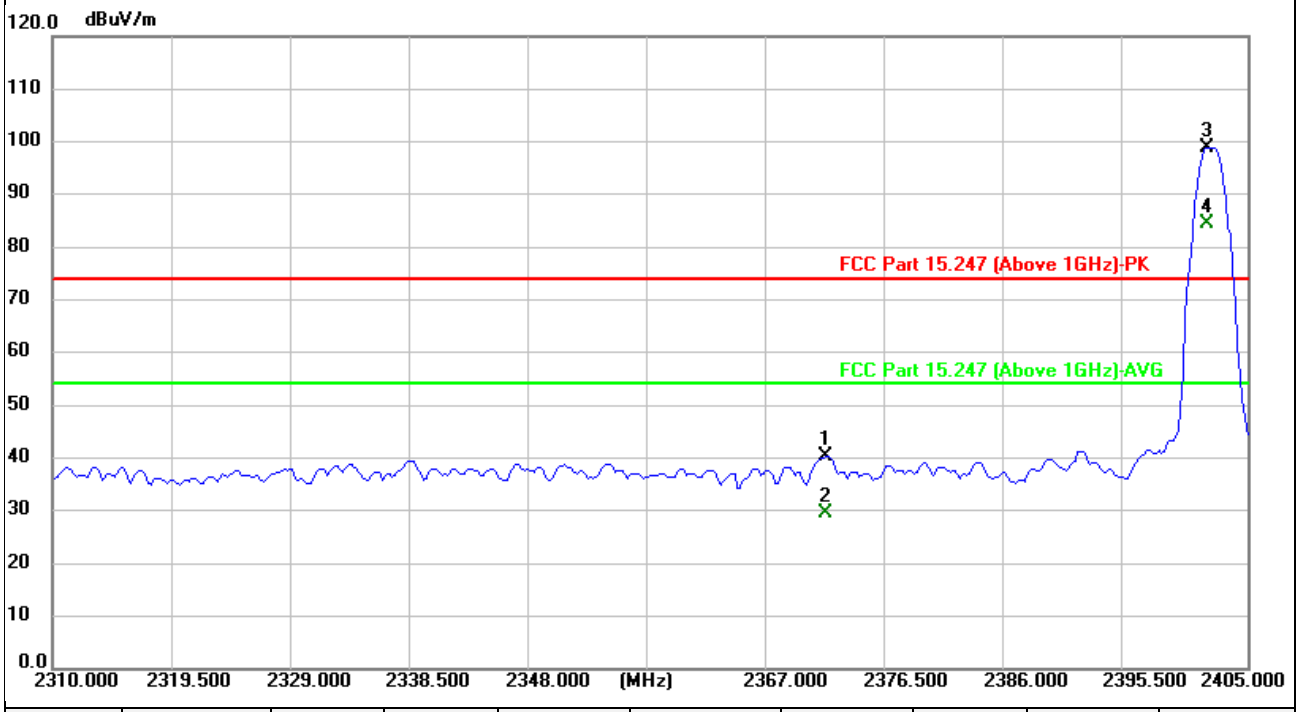
2. Margin value = Emission level – Limit value

Above 1GHz Data:

GFSK 1M

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

Antenna Polarity & Test Distance: Horizontal at 3 m



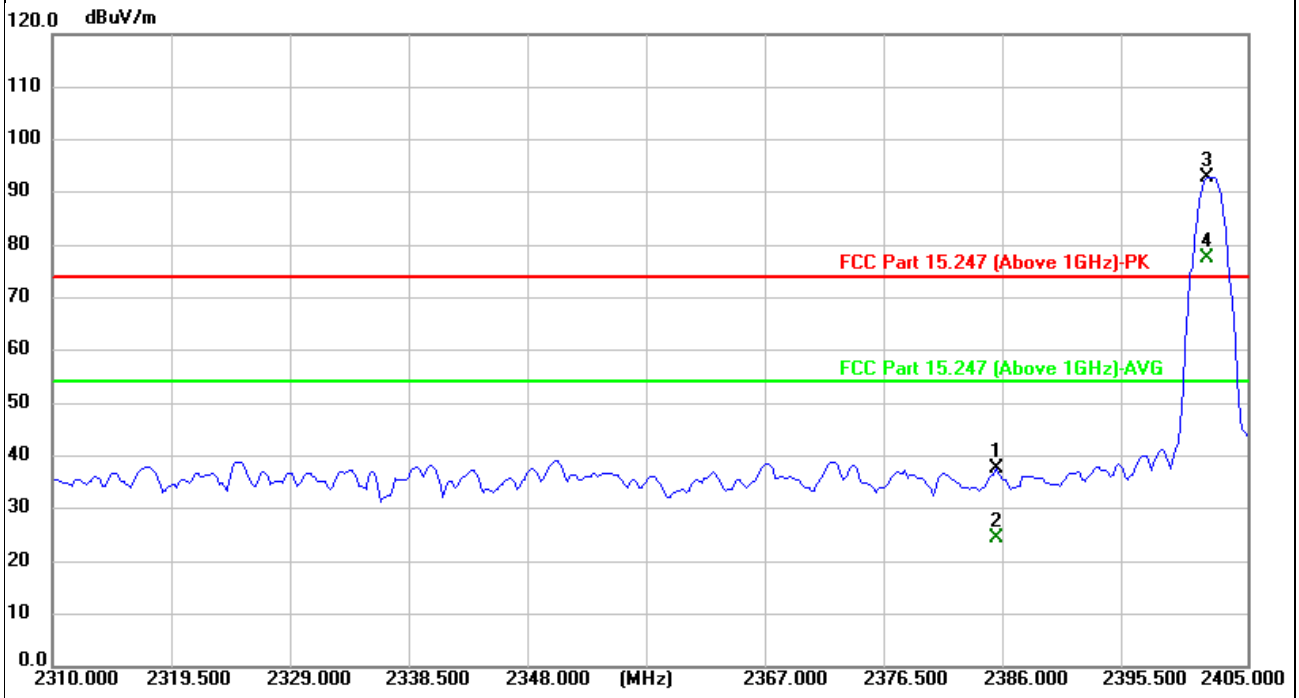
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detecter	Antenna Height (cm)	Table Angle (Degree)
1	2371.493	40.73	-0.46	40.27	74.00	-33.73	peak	120	166
2	2371.493	29.96	-0.46	29.50	54.00	-24.50	AVG	120	166
3#	2401.764	99.31	-0.39	98.92			peak	120	166
4#	2401.764	84.89	-0.39	84.50			AVG	120	166
5	4804.000	47.91	5.30	53.21	74.00	-20.79	peak	150	250
6	4804.000	38.88	5.30	44.18	54.00	-9.82	AVG	150	250
7	7206.000	41.59	12.40	53.99	74.00	-20.01	peak	230	188
8	7206.000	31.48	12.40	43.88	54.00	-10.12	AVG	230	188

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	2385.010	38.20	-0.42	37.78	74.00	-36.22	peak	200	120
2	2385.010	24.92	-0.42	24.50	54.00	-29.50	AVG	200	120
3#	2401.764	93.20	-0.39	92.81			peak	200	120
4#	2401.764	77.89	-0.39	77.50			AVG	200	120
5	4804.000	50.30	5.30	55.60	74.00	-18.40	peak	170	52
6	4804.000	38.60	5.30	43.90	54.00	-10.10	AVG	170	52
7	7206.000	41.50	12.40	53.90	74.00	-20.10	peak	106	302
8	7206.000	30.80	12.40	43.20	54.00	-10.80	AVG	106	302

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 19		

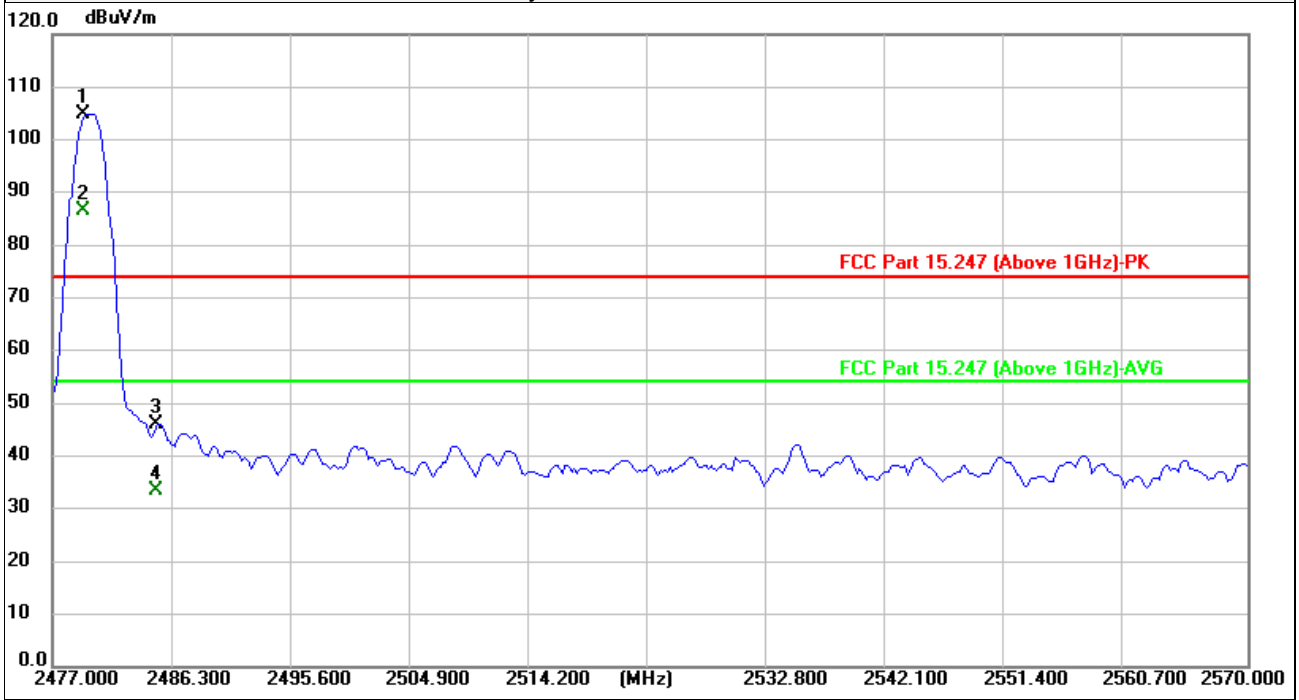
Antenna Polarity & Test Distance: Horizontal at 3 m									
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detecter	Antenna Height (cm)	Table Angle (Degree)
1 #	2440.000	103.53	-0.31	103.22			peak	100	198
2 #	2440.000	90.61	-0.31	90.30			AVG	100	198
3	4880.000	47.25	6.25	53.50	74.00	-20.50	peak	123	300
4	4880.000	42.87	6.25	49.12	54.00	-4.88	AVG	123	300
5	7320.000	39.95	12.65	52.60	74.00	-21.40	peak	300	155
6	7320.000	30.90	12.65	43.55	54.00	-10.45	AVG	300	155
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 #	2440.000	91.86	-0.31	91.55			peak	260	315
2 #	2440.000	78.81	-0.31	78.50			AVG	260	315
3	4880.000	46.08	6.25	52.33	74.00	-21.67	peak	228	87
4	4880.000	32.95	6.25	39.20	54.00	-14.80	AVG	228	87
5	7320.000	41.55	12.65	54.20	74.00	-19.80	peak	160	299
6	7320.000	30.34	12.65	42.99	54.00	-11.01	AVG	160	299

Remarks:

1. Emission Level = Read Level + Factor (Antenna Factor + Cable Loss - Preamp Factor)
   Margin value = Emission level – Limit value
2. #2440MHz: 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



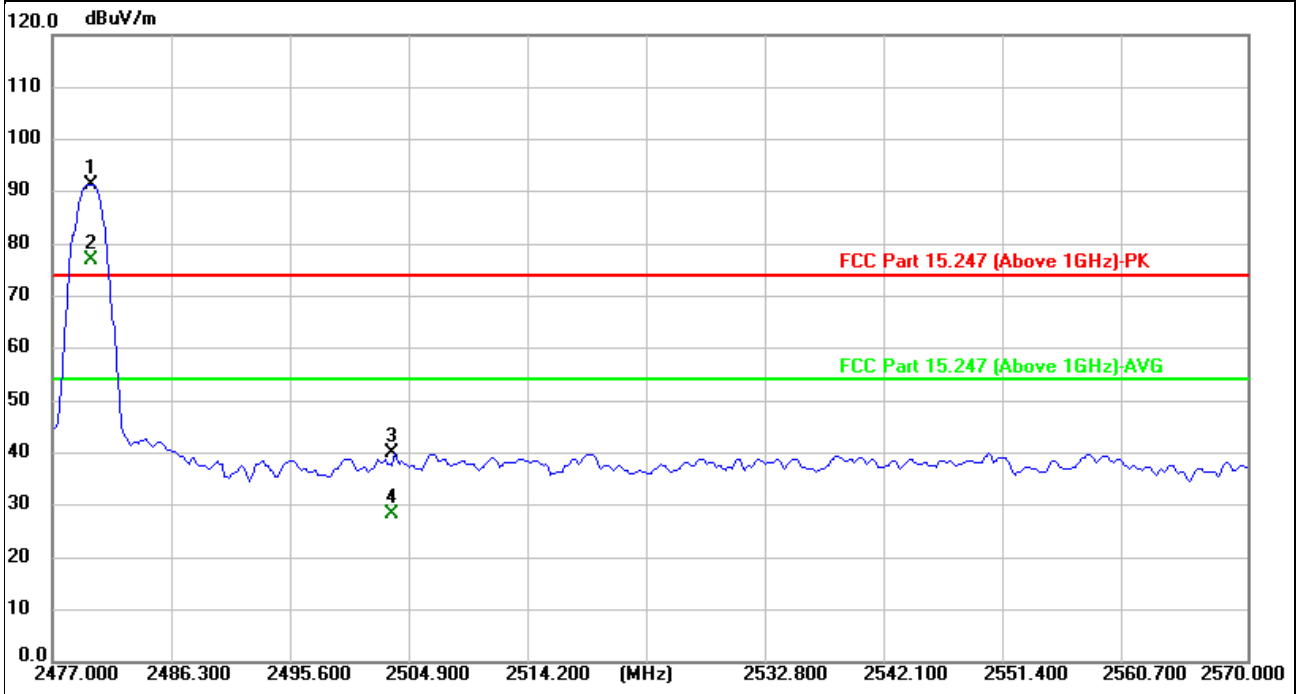
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detecter	Antenna Height (cm)	Table Angle (Degree)
1#	2479.609	105.01	-0.21	104.80			peak	150	269
2#	2479.609	86.71	-0.21	86.50			AVG	150	269
3	2485.200	46.36	-0.19	46.17	74.00	-27.83	peak	150	269
4	2485.200	33.69	-0.19	33.50	54.00	-20.50	AVG	150	269
5	4960.000	49.44	6.16	55.60	74.00	-18.40	peak	130	65
6	4960.000	39.48	6.16	45.64	54.00	-8.36	AVG	130	65
7	7440.000	40.19	12.91	53.10	74.00	-20.90	peak	221	107
8	7440.000	30.69	12.91	43.60	54.00	-10.40	AVG	221	107

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 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#	2480.168	91.54	-0.21	91.33			peak	100	215
2#	2480.168	77.19	-0.21	76.98			AVG	100	215
3	2503.651	40.25	-0.16	40.09	74.00	-33.91	peak	100	215
4	2503.651	28.66	-0.16	28.50	54.00	-25.50	AVG	100	215
5	4960.000	48.74	6.16	54.90	74.00	-19.10	peak	100	46
6	4960.000	39.64	6.16	45.80	54.00	-8.20	AVG	100	46
7	7440.000	40.29	12.91	53.20	74.00	-20.80	peak	155	136
8	7440.000	30.69	12.91	43.60	54.00	-10.40	AVG	155	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.

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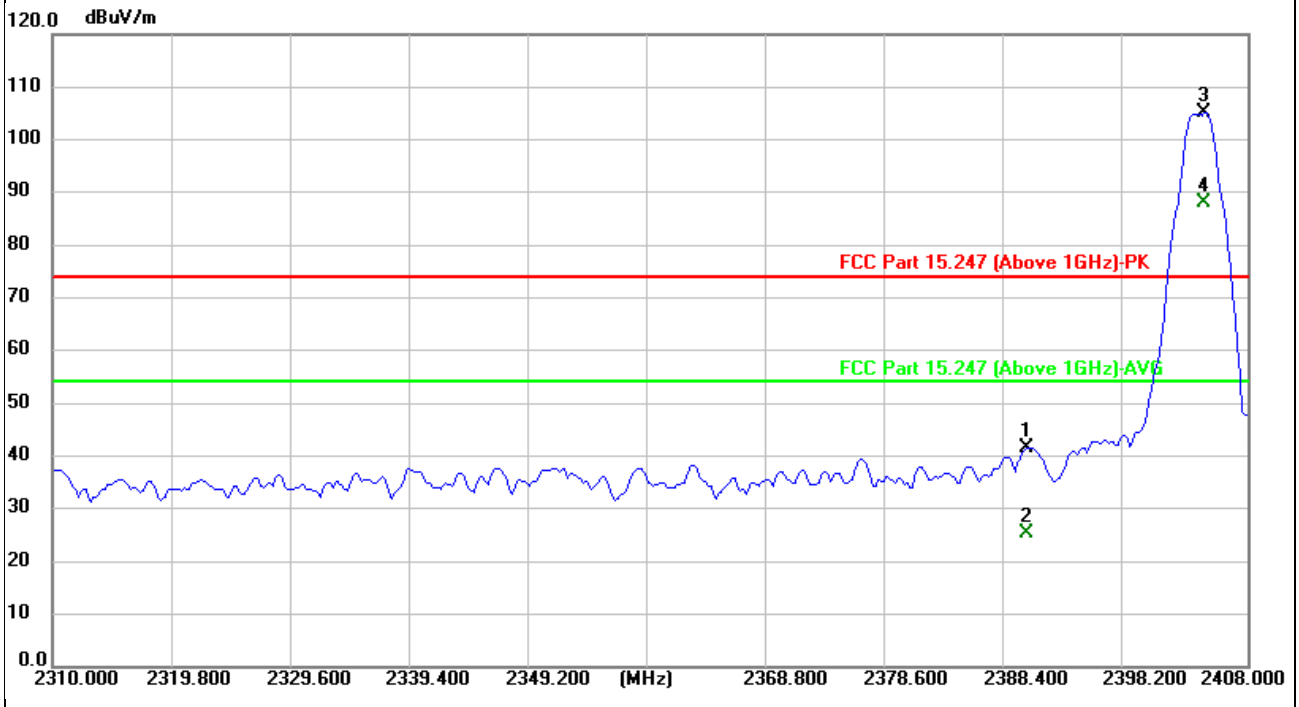
Frequency Range	1GHz ~ 25GHz	Detector Function	Peak (PK) Average (AVG)
Test Channel	Channel 1		

Antenna Polarity & Test Distance: Horizontal at 3 m



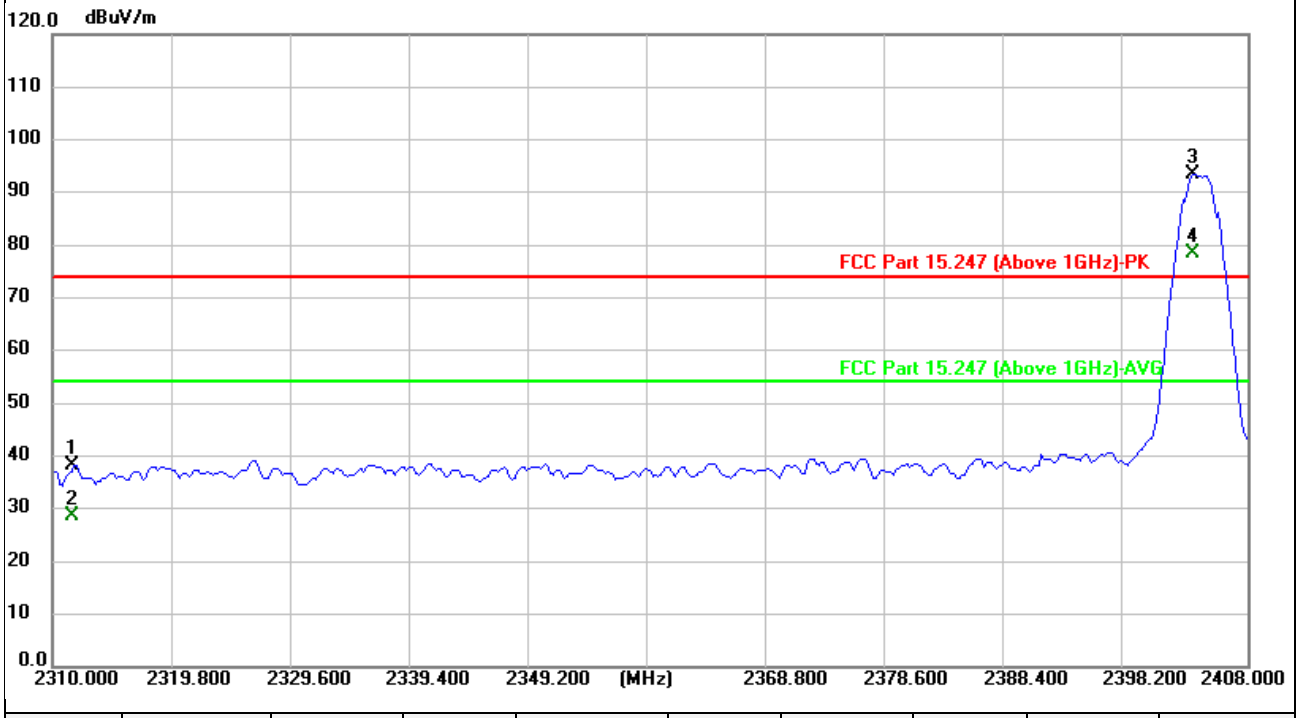
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detecter	Antenna Height (cm)	Table Angle (Degree)
1	2390.128	42.05	-0.41	41.64	74.00	-32.36	peak	100	36
2	2390.128	25.71	-0.41	25.30	54.00	-28.70	AVG	100	36
3#	2404.465	105.51	-0.37	105.14			peak	100	36
4#	2404.465	88.57	-0.37	88.20			AVG	100	36
5	4808.000	48.31	5.35	53.66	74.00	-20.34	peak	100	45
6	4808.000	39.30	5.35	44.65	54.00	-9.35	AVG	100	45
7	7212.000	42.13	12.42	54.55	74.00	-19.45	peak	100	233
8	7212.000	30.48	12.42	42.90	54.00	-11.10	AVG	100	233

Remarks:

1. Emission Level = Read Level + Factor (Antenna Factor + Cable Loss - Preamp Factor)
   Margin value = Emission level – Limit value
2. #2404MHz: 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 1		

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	2311.767	38.73	-0.58	38.15	74.00	-35.85	peak	199	15
2	2311.767	29.18	-0.58	28.60	54.00	-25.40	AVG	199	15
3#	2403.483	93.72	-0.38	93.34			peak	199	15
4#	2403.483	78.88	-0.38	78.50			AVG	199	15
5	4808.000	47.87	5.35	53.22	74.00	-20.78	peak	100	133
6	4808.000	35.31	5.35	40.66	54.00	-13.34	AVG	100	133
7	7212.000	41.88	12.42	54.30	74.00	-19.70	peak	100	125
8	7212.000	31.18	12.42	43.60	54.00	-10.40	AVG	100	125

Remarks:

1. Emission Level = Read Level + Factor (Antenna Factor + Cable Loss - Preamp Factor)
   Margin value = Emission level – Limit value
2. #2404MHz: 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 19		

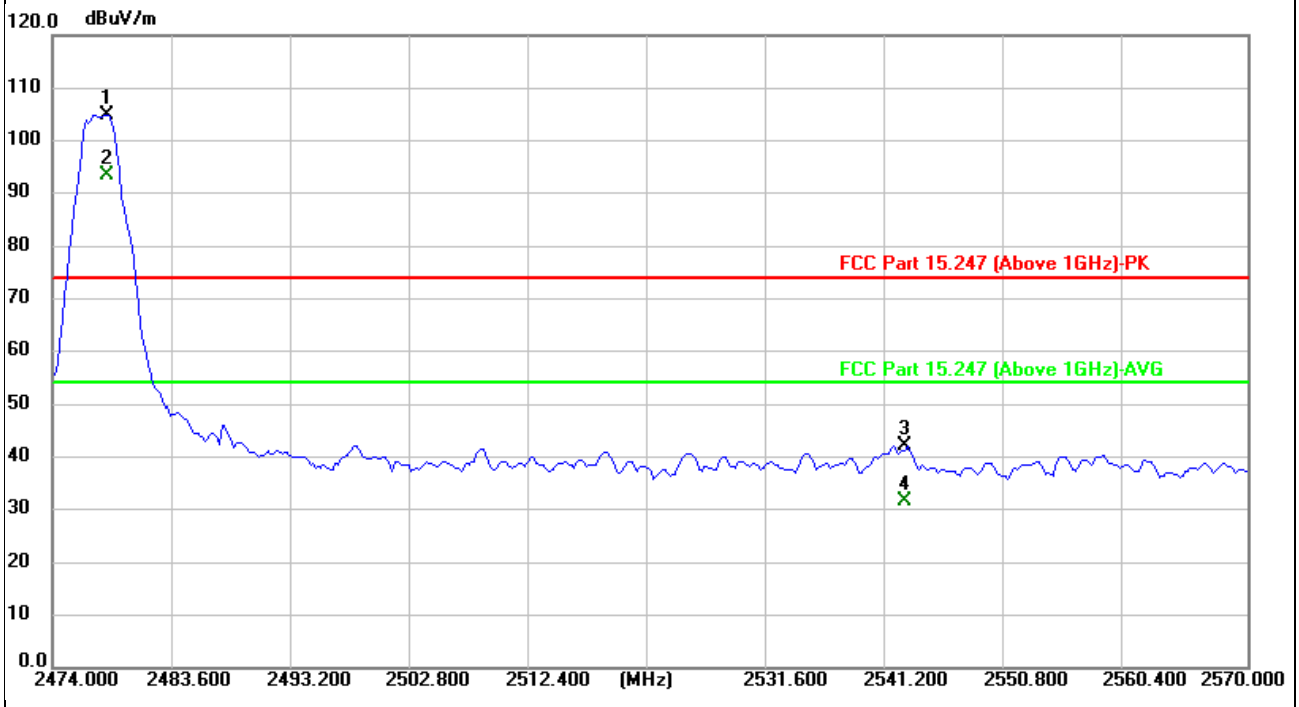
Antenna Polarity & Test Distance: Horizontal at 3 m									
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detecte r	Antenna Height (cm)	Table Angle (Degree)
1#	2440.000	102.86	-0.31	102.55			peak	100	255
2#	2440.000	75.96	-0.31	75.65			AVG	100	255
3	4880.000	48.65	6.25	54.90	74.00	-19.10	peak	166	209
4	4880.000	44.11	6.25	50.36	54.00	-3.64	AVG	166	209
5	7320.000	40.85	12.65	53.50	74.00	-20.50	peak	233	168
6	7320.000	30.95	12.65	43.60	54.00	-10.40	AVG	233	168
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#	2440.000	91.86	-0.31	91.55			peak	200	55
2#	2440.000	73.81	-0.31	73.50			AVG	200	55
3	4880.000	46.05	6.25	52.30	74.00	-21.70	peak	100	320
4	4880.000	36.35	6.25	42.60	54.00	-11.40	AVG	100	320
5	7320.000	41.90	12.65	54.55	74.00	-19.45	peak	266	44
6	7320.000	31.95	12.65	44.60	54.00	-9.40	AVG	266	44

Remarks:

1. Emission Level = Read Level + Factor (Antenna Factor + Cable Loss - Preamp Factor)
   Margin value = Emission level – Limit value
2. #2440MHz: 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 38		

Antenna Polarity & Test Distance: Horizontal at 3 m



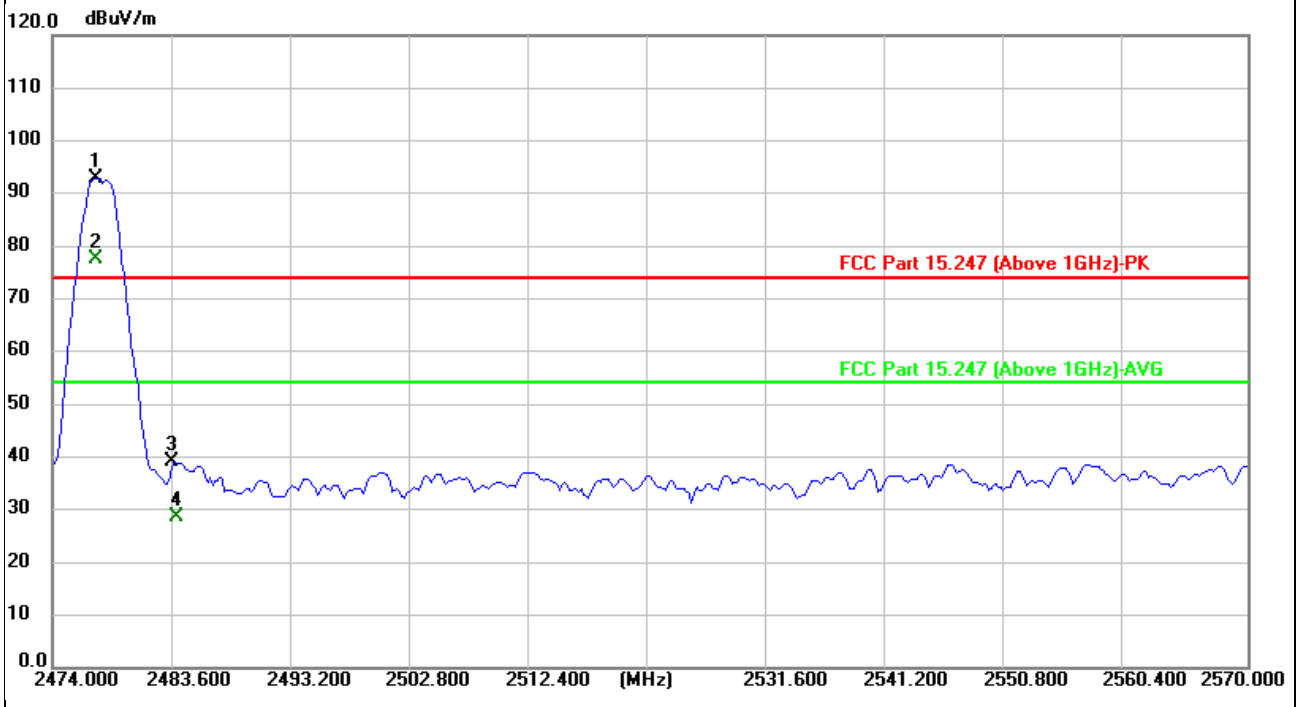
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detecter	Antenna Height (cm)	Table Angle (Degree)
1#	2478.425	105.16	-0.21	104.95			peak	100	125
2#	2478.425	93.71	-0.21	93.50			AVG	100	125
3	2542.681	42.18	-0.07	42.11	74.00	-31.89	peak	100	125
4	2542.681	31.67	-0.07	31.60	54.00	-22.40	AVG	100	125
5	4956.000	47.36	6.19	53.55	74.00	-20.45	peak	120	233
6	4956.000	39.36	6.19	45.55	54.00	-8.45	AVG	120	233
7	7434.000	40.76	12.90	53.66	74.00	-20.34	peak	155	188
8	7434.000	29.40	12.90	42.30	54.00	-11.70	AVG	155	188

Remarks:

1. Emission Level = Read Level + Factor (Antenna Factor + Cable Loss - Preamp Factor)
   Margin value = Emission level – Limit value
2. #2478MHz: 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 38		

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#	2477.463	93.14	-0.22	92.92			peak	133	136
2#	2477.463	77.72	-0.22	77.50			AVG	133	136
3	2483.811	39.21	-0.20	39.01	74.00	-34.99	peak	133	136
4	2484.196	28.85	-0.20	28.65	54.00	-25.35	AVG	133	136
5	4956.000	47.47	6.19	53.66	74.00	-20.34	peak	200	132
6	4956.000	36.41	6.19	42.60	54.00	-11.40	AVG	200	132
7	7434.000	40.76	12.90	53.66	74.00	-20.34	peak	190	155
8	7434.000	30.20	12.90	43.10	54.00	-10.90	AVG	190	155

Remarks:

1. Emission Level = Read Level + Factor (Antenna Factor + Cable Loss - Preamp Factor)
   Margin value = Emission level – Limit value
2. #2478MHz: 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

Equipment	Manufacturer	Model No.	Serial No.	Next Cal.
EMI Test Receiver	Rohde&Schwarz	ESR 7	101962	2024-12-26
Artificial Mains Network	Rohde&Schwarz	ENV216	3560.6550.15	2024-12-26
Test software	FARAD	EZ_EMC V1.1.4.2	N/A	N/A
Broadcast test system	R&S	SFU	100410	2024-08-06

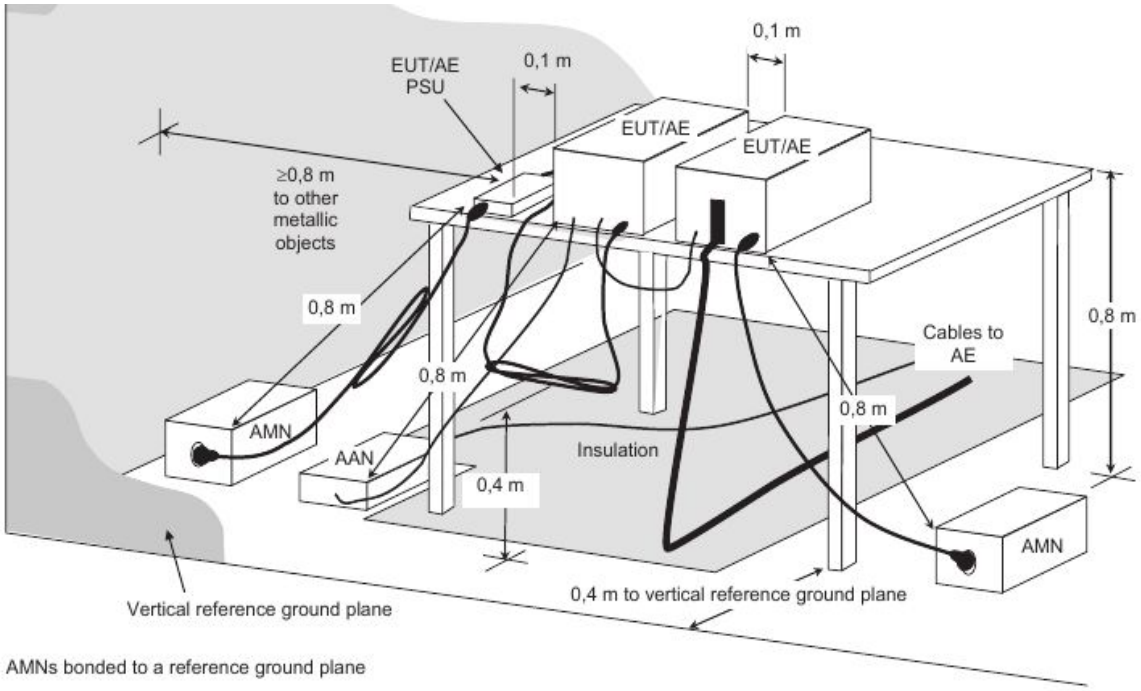
Note: 1. The calibration interval of the above test instruments is 12 months.
2. The test was performed in Shielded Room.

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.

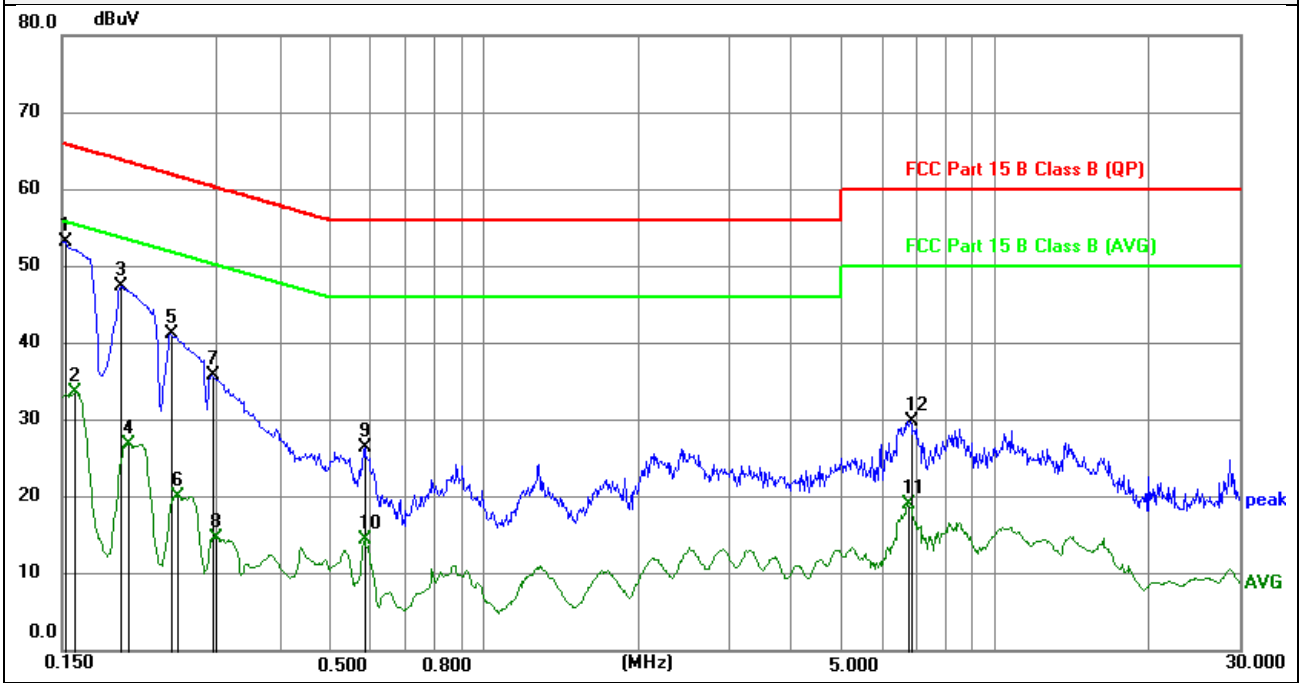
3.2.6 Deviation from Test Standard

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)



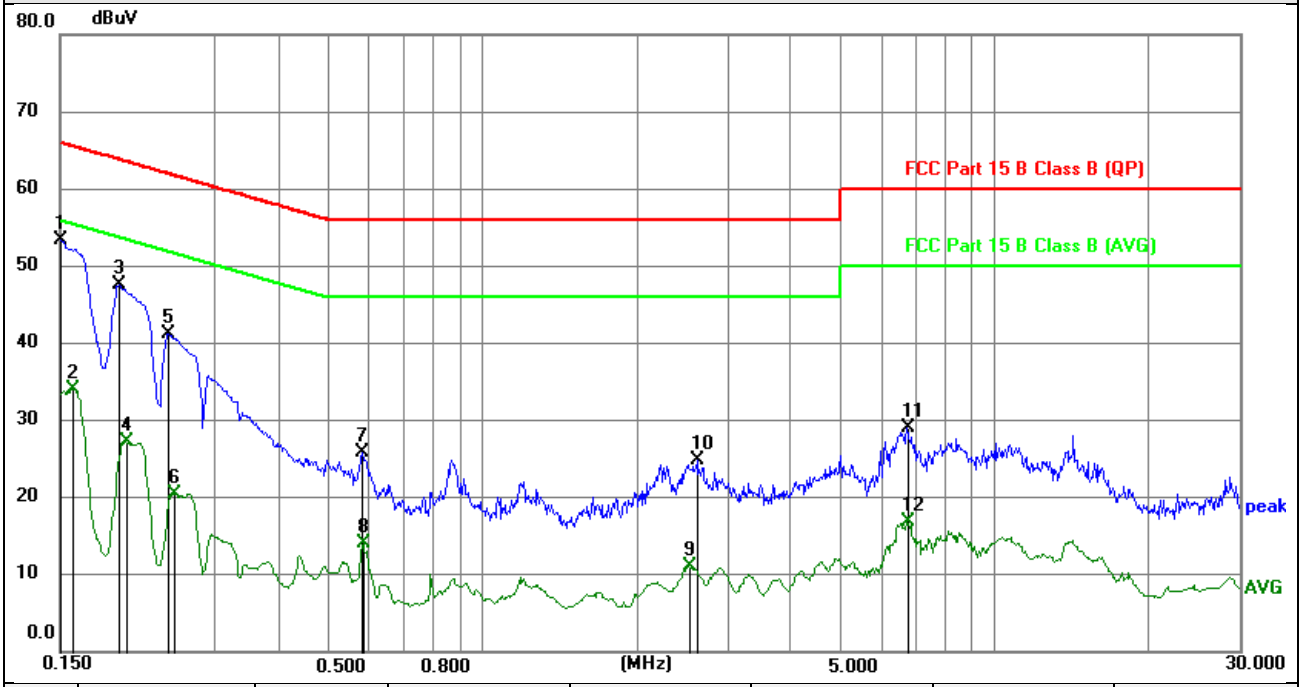
No.	Frequency	Reading	Correcttion Factor	Emission Level	Limit	Margin	Remark
	(MHz)	(dBuV)	dB	(dBuV)	(dBuV)	(dB)	Detecter
1	0.1522	43.05	10.18	53.23	65.88	-12.65	peak
2	0.1590	23.43	10.17	33.60	55.52	-21.92	AVG
3	0.1949	37.31	10.14	47.45	63.83	-16.38	peak
4	0.2017	16.75	10.14	26.89	53.54	-26.65	AVG
5	0.2445	30.99	10.17	41.16	61.94	-20.78	peak
6	0.2513	9.92	10.17	20.09	51.71	-31.62	AVG
7	0.2940	25.63	10.20	35.83	60.41	-24.58	peak
8	0.2985	4.46	10.20	14.66	50.28	-35.62	AVG
9	0.5865	16.26	10.10	26.36	56.00	-29.64	peak
10	0.5865	4.41	10.10	14.51	46.00	-31.49	AVG
11	6.7628	9.03	10.02	19.05	50.00	-30.95	AVG
12	6.8393	19.82	10.02	29.84	60.00	-30.16	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.

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	0.1500	43.25	10.19	53.44	66.00	-12.56	peak
2	0.1590	23.89	10.17	34.06	55.52	-21.46	AVG
3	0.1949	37.35	10.14	47.49	63.83	-16.34	peak
4	0.2017	17.02	10.14	27.16	53.54	-26.38	AVG
5	0.2423	31.12	10.16	41.28	62.02	-20.74	peak
6	0.2490	10.34	10.16	20.50	51.79	-31.29	AVG
7	0.5842	15.68	10.10	25.78	56.00	-30.22	peak
8	0.5865	4.02	10.10	14.12	46.00	-31.88	AVG
9	2.5305	1.02	10.09	11.11	46.00	-34.89	AVG
10	2.6228	14.73	10.09	24.82	56.00	-31.18	peak
11	6.7628	19.00	10.03	29.03	60.00	-30.97	peak
12	6.7628	6.73	10.03	16.76	50.00	-33.24	AVG

Remarks:

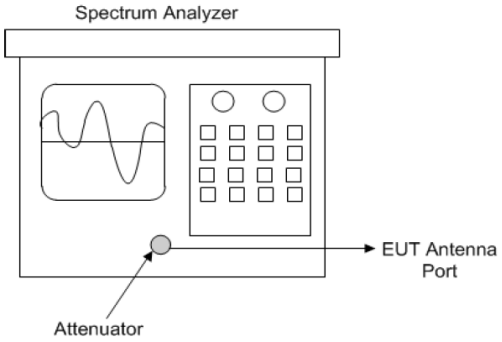
1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level - Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value.

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.

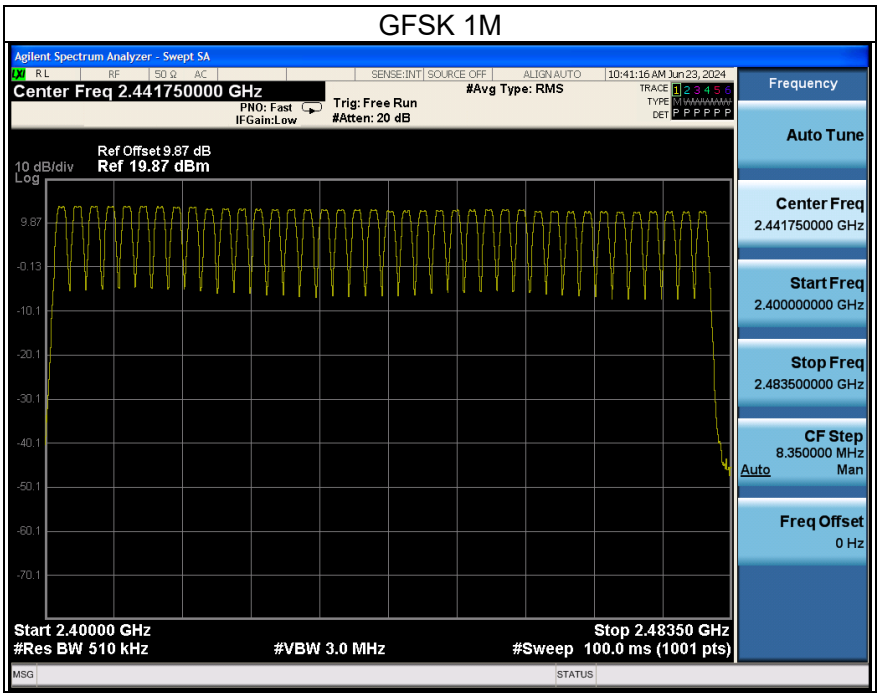
3.3.5 Deviation fromTest Standard

No deviation.

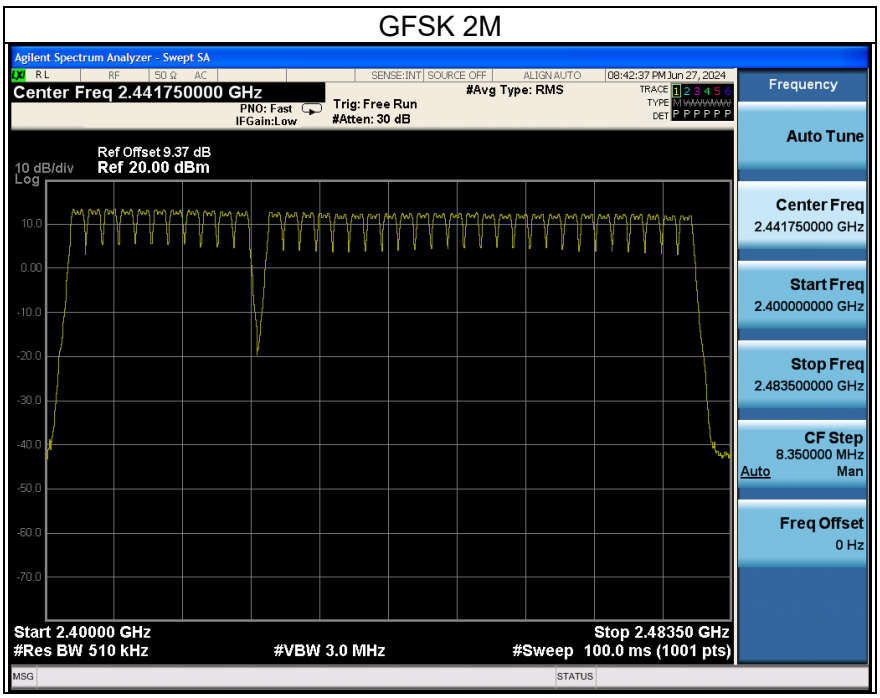
3.3.6 Test Results

There are GFSK 1M 40/GFSK 2M 37 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 1M



GFSK 2M

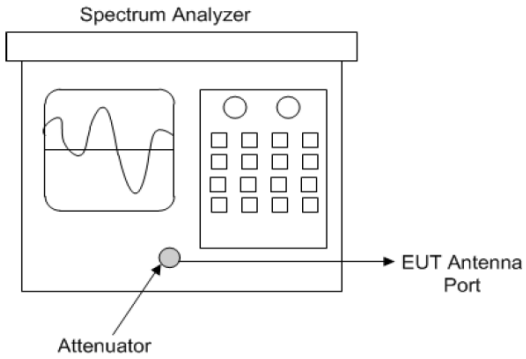


3.4 Dwell Time on Each Channel

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

GFSK 1M

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				
GFSK 1M	40	16	1.6	17	170	2.122	360.740	400	Pass

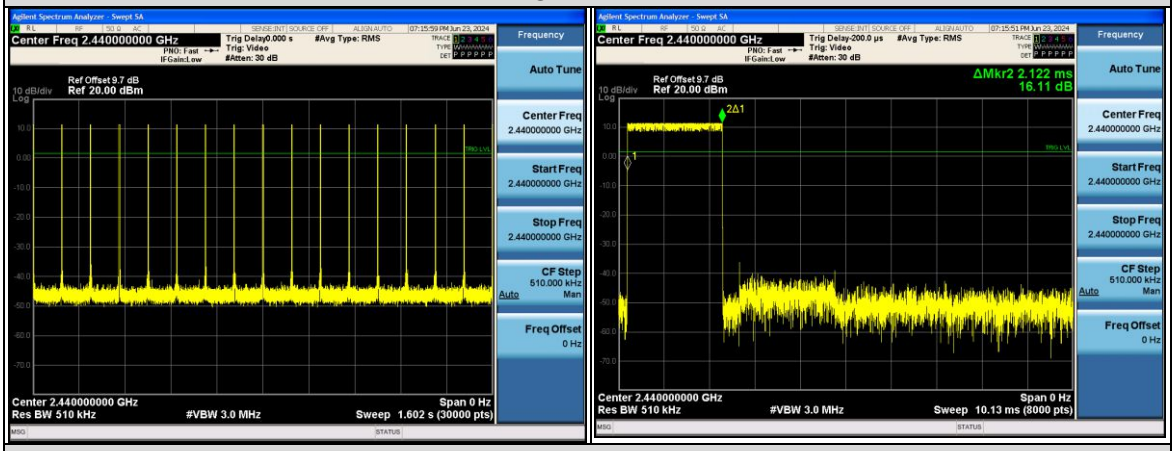
Note: Test plots of the transmitting time slot are shown as below.

GFSK 2M

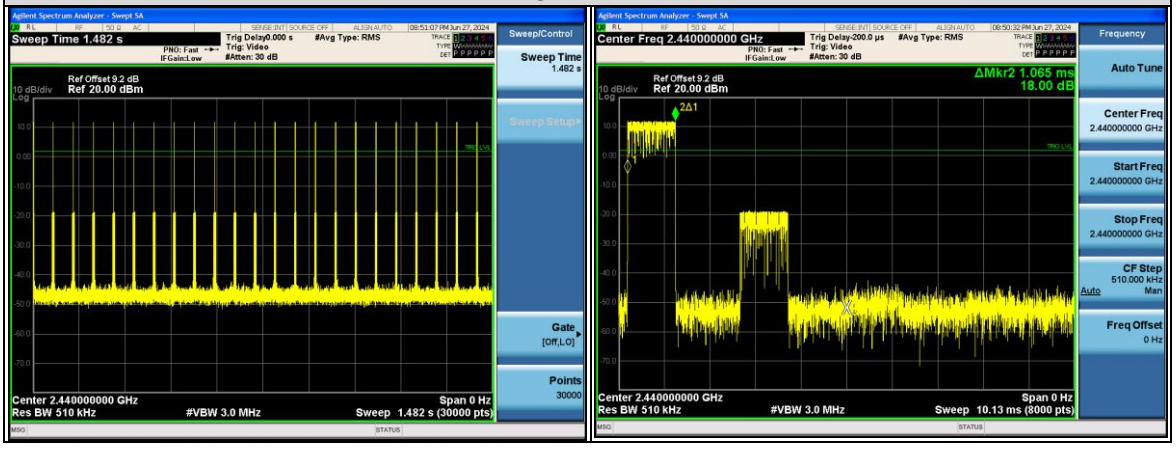
Mode	Number of Hopping Channel	Number of transmision in a period (channel number*0.4 sec)				Length of transmission time (msec)	Result (msec)	Limit (msec)	Verdict
		Period (sec)	Sweep time (sec)	times in a sweep	times in a period				
GFSK 2M	37	14.8	1.48	23	230	1.067	245.410	400	Pass

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

GFSK 1M



GFSK 2M

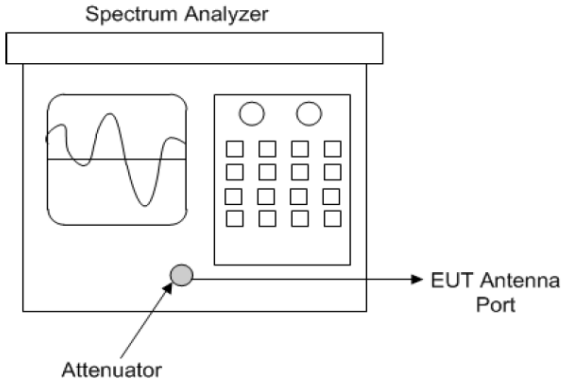


3.5 Channel Bandwidth

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

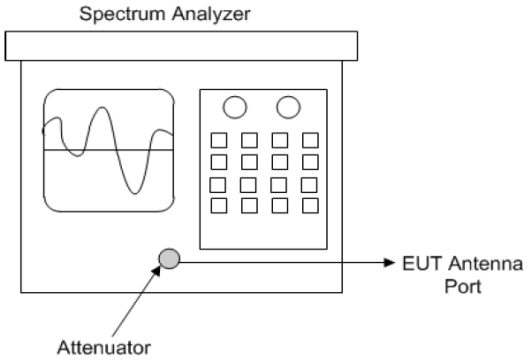
Channel	Frequency (MHz)	20dB Bandwidth (MHz)
		GFSK 1M
0	2402	1.170
19	2440	1.179
39	2480	1.203

Channel	Frequency (MHz)	20dB Bandwidth (MHz)
		GFSK 2M
1	2404	2.376
19	2440	2.382
38	2478	2.370

1Mbps	2Mbps
	
CH0	CH1
	
CH19	CH19
	
CH39	CH38

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.

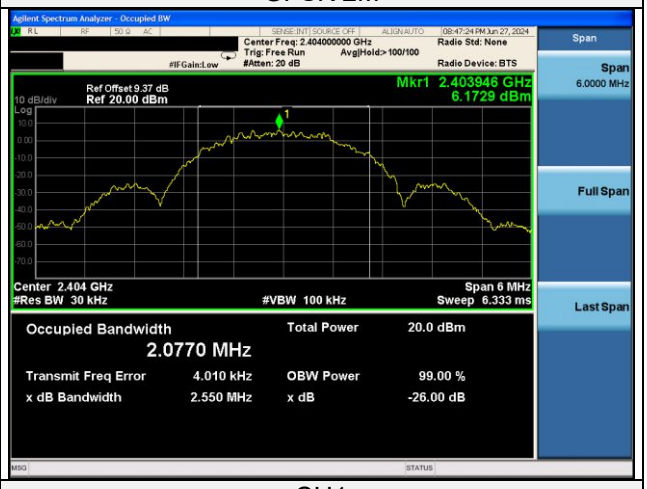
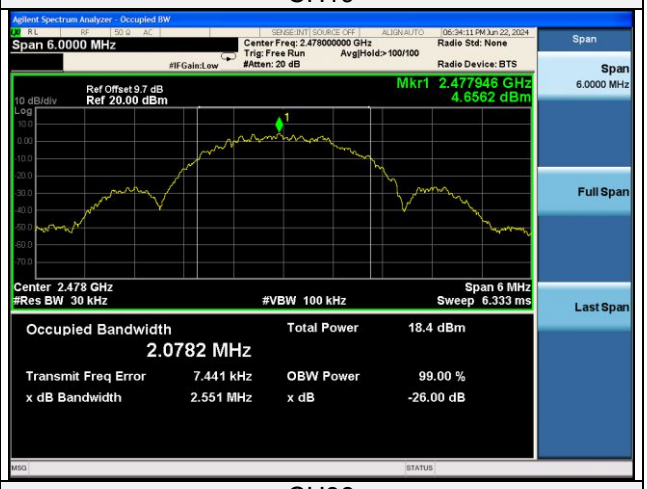
3.6.5 EUT Operating Conditions

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

Channel	Frequency (MHz)	Occupied Bandwidth (MHz)
		GFSK 1M
0	2402	1.0443
19	2440	1.0408
39	2480	1.0441

Channel	Frequency (MHz)	Occupied Bandwidth (MHz)
		GFSK 2M
1	2404	2.0770
19	2440	2.0813
38	2478	2.0782

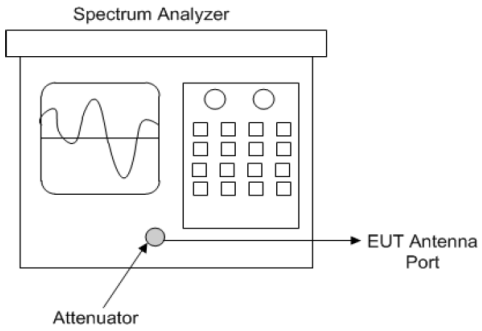
FSK 1M	GFSK 2M
	
CH0	CH1
	
CH19	CH19
	
CH39	CH38

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

GFSK 1M

Channel No.	Frequency (MHz)	Adjacent Channel Separation (MHz)	Minimum Limit (MHz)	Pass / Fail
0	2402	2.004	0.780	Pass
19	2440	1.998	0.786	Pass
39	2480	2.004	0.802	Pass

GFSK 2M

Channel No.	Frequency (MHz)	Adjacent Channel Separation (MHz)	Minimum Limit (MHz)	Pass / Fail
1	2404	2.000	1.584	Pass
19	2440	1.992	1.564	Pass
38	2478	1.992	1.580	Pass

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

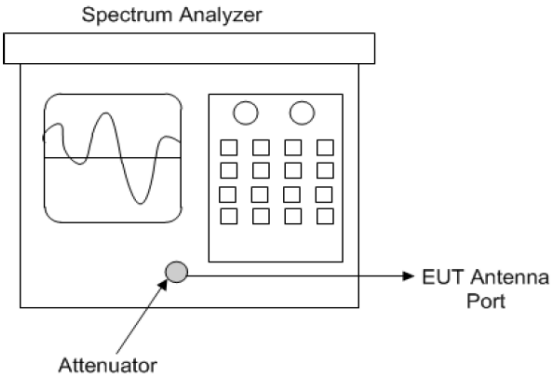
GFSK 1M	GFSK 2M
	
CH0	CH1
	
CH19	CH19
	
CH39	CH38

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：

The proper test method is selected based on the following criteria:

a) **Method AVGSA-1 or method AVGSA-1A (alternative)** shall be applied if either of the following conditions can be satisfied:
1) The EUT transmits continuously (or with a D> 98%).
2) Sweep triggering can be implemented in such a way that the device transmits at the maximum power control level throughout the duration of each of the instrument sweeps to be averaged. This condition can generally be achieved by triggering the instrument's sweep if the duration of the sweep (with the instrument configured as in method AVGSA-1) is equal to or shorter than the duration T of each transmission from the EUT, and if those transmissions exhibit full power throughout their durations.

b) **Method AVGSA-2 or method AVGSA-2A (alternative)** shall be applied if the conditions of the preceding item a) cannot be achieved and the transmissions exhibit a constant duty cycle during the measurement duration. Duty cycle will be considered to be constant if variations are less than +2%.

c) **Method AVGSA-3 or method AVGSA-3A** (alternative) shall be applied if the conditions of the preceding item a) and item b) cannot be achieved.

☒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(Method AVGSA-2):

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

Peak power

GFSK 1M

Channel No.	Freq. (MHz)	Output Power (dBm)	Output Power (mW)	Power Limit (mW)	Pass / Fail
0	2402	9.05	8.035	125	Pass
19	2440	7.76	5.970	125	Pass
39	2480	7.23	5.284	125	Pass

GFSK 2M

Channel No.	Freq. (MHz)	Output Power (dBm)	Output Power (mW)	Power Limit (mW)	Pass / Fail
1	2404	8.98	7.907	125	Pass
19	2440	7.66	5.834	125	Pass
38	2478	7.12	5.152	125	Pass

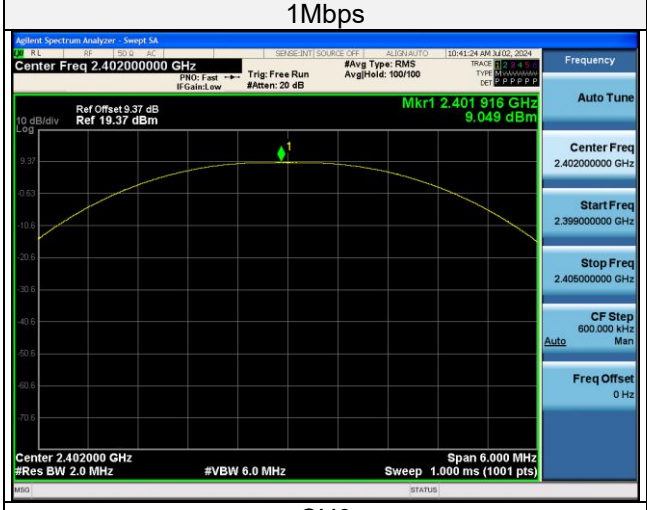
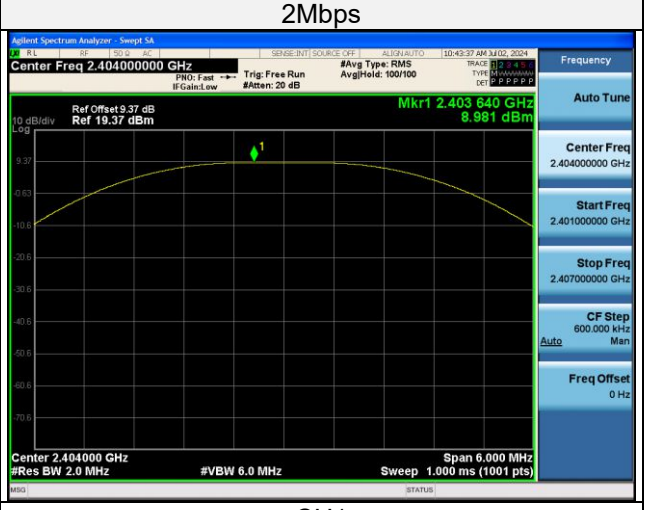
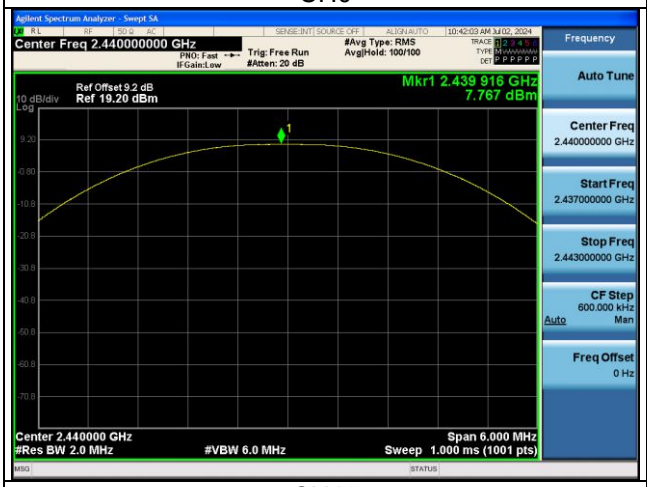
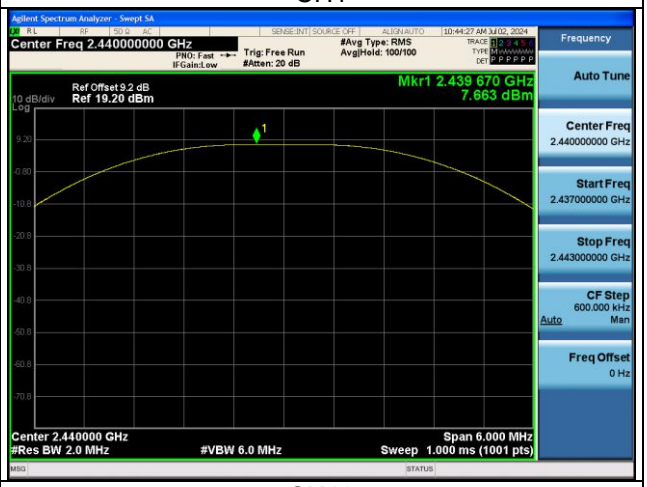
Average power

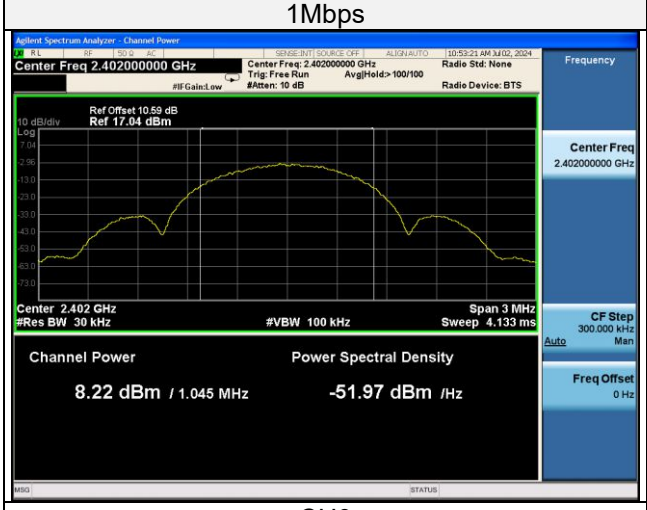
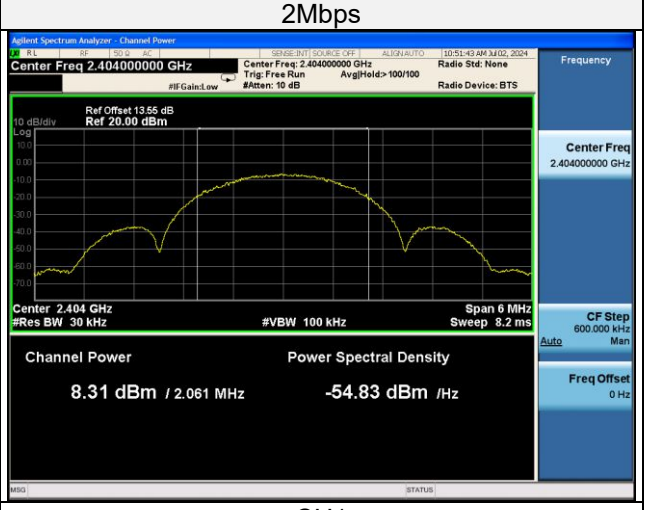
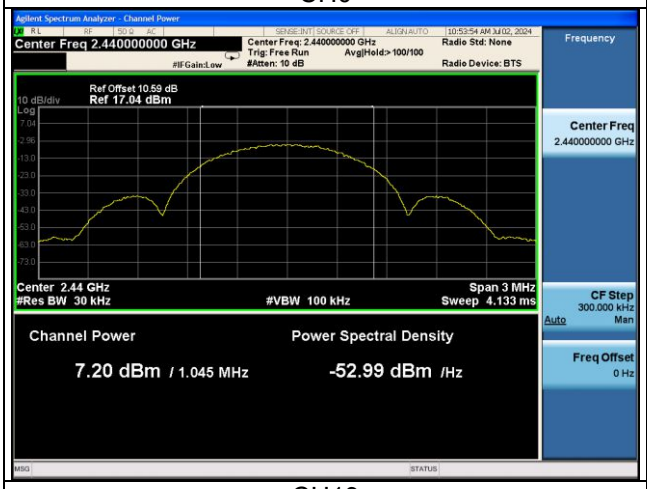
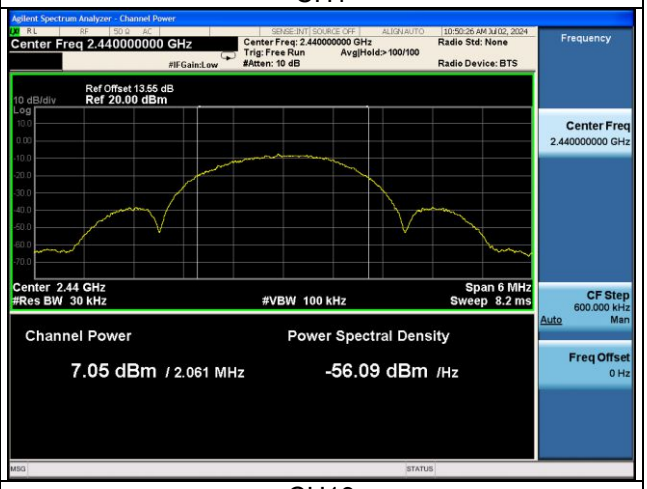
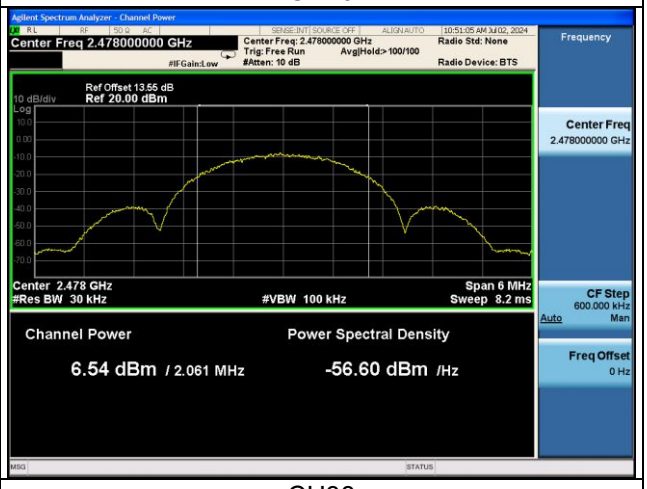
GFSK 1M

Channel No.	Freq. (MHz)	Output Power (dBm)	Output Power (mW)	Power Limit (mW)	Pass / Fail
0	2402	8.22	6.637	125	Pass
19	2440	7.2	5.248	125	Pass
39	2480	6.62	4.592	125	Pass

GFSK 2M

Channel No.	Freq. (MHz)	Output Power (dBm)	Output Power (mW)	Power Limit (mW)	Pass / Fail
1	2404	8.31	6.776	125	Pass
19	2440	7.05	5.070	125	Pass
38	2478	6.54	4.508	125	Pass

Peak Power Spectrum Plot	
1Mbps	2Mbps
	
CH0	CH1
	
CH19	CH19
	
CH39	CH38

Average Power Spectrum Plot	
1Mbps	2Mbps
	
CH0	CH1
	
CH19	CH19
	
CH39	CH38

3.9 Conducted Out of Band Emission Measurement

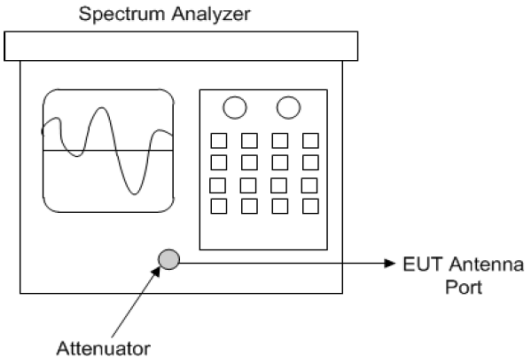
3.9.1 Limits of Conducted Out of Band Emission Measurement

a. **If the maximum peak conducted output power procedure was used to determine compliance as described in 11.9.1**, then the peak output power measured in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 20 dB relative to the maximum in-band peak PSD level in 100 kHz (i.e., 20 dBc).

b. If maximum conducted (average) output power was used to determine compliance as described in 11.9.2. then the peak power in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 30 dB relative to the maximum in-band peak PSD level in 100 kHz (i.e., 30 dBc)

3.9.2 Test Setup

- 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.



Spectrum analyzer test configuration

3.9.3 Test Instruments

Refer to section 5 to get information of above instrument.

3.9.4 Test Procedure

a. Establish a reference level by using the following procedure:

1) Set instrument center frequency to DTS channel center frequency.
2) Set the span to 21.5 times the DTS bandwidth)
3) Set the RBW= 100 kHz)
4) Set the VBW ≥3 x RBW
5) Detector = peak
6) Sweep time = auto coupling
7) Trace mode =max hold
8) Allow trace to fully stabilize
9) Use the peak marker function to determine the maximum PSD level.

Note that the channel found to contain the maximum PSD level can be used to establish the reference level.

b. Establish an emission level by using the following procedure:

1) Set the center frequency and span to encompass frequency range to be measured.
2) Set the RBW = 100 kHz
3) Set the VBW ≥ 300 kHz.
4) Detector = peak.
5) Sweep time = auto couple.
6) Trace mode = max hold.
7) Allow trace to fully stabilize.
8) Use the peak marker function to determine the maximum power level in any 100 kHz band segment within the fundamental EBW.

3.9.5 Deviation from Test Standard

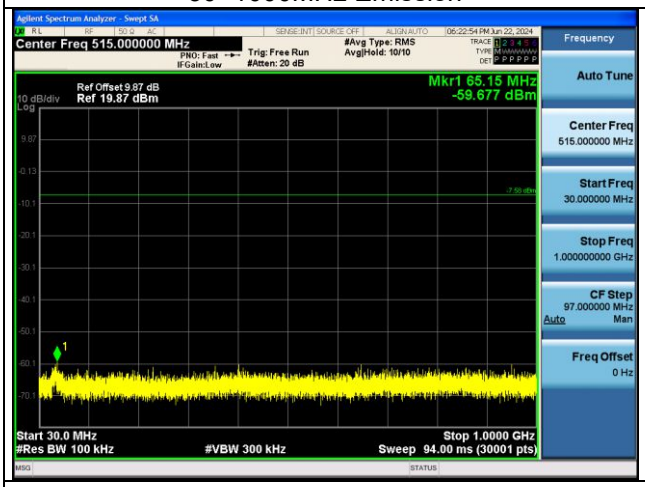
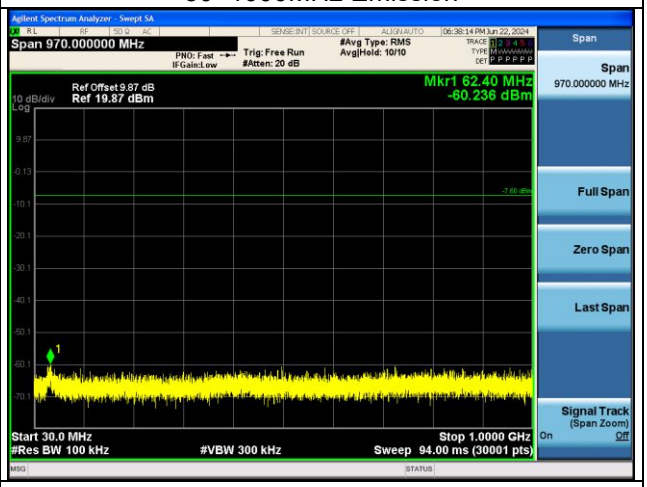
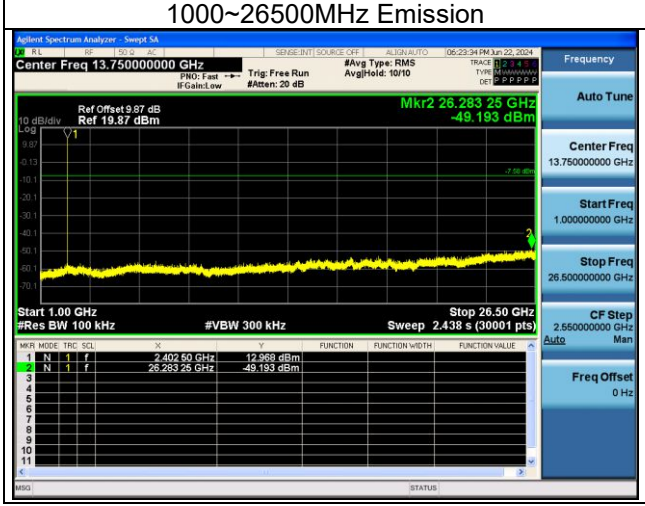
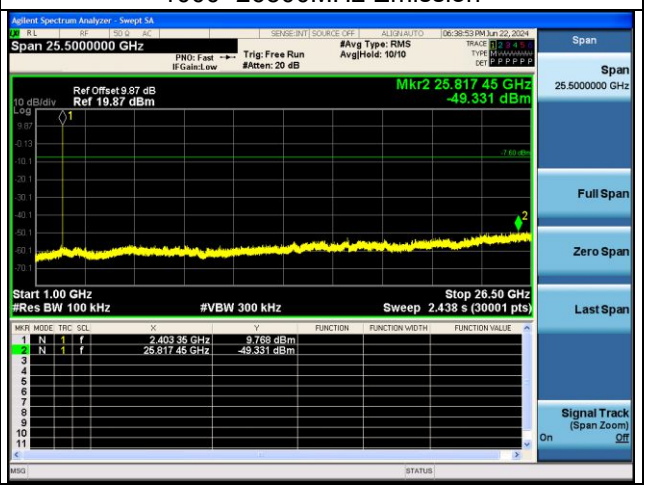
No deviation.

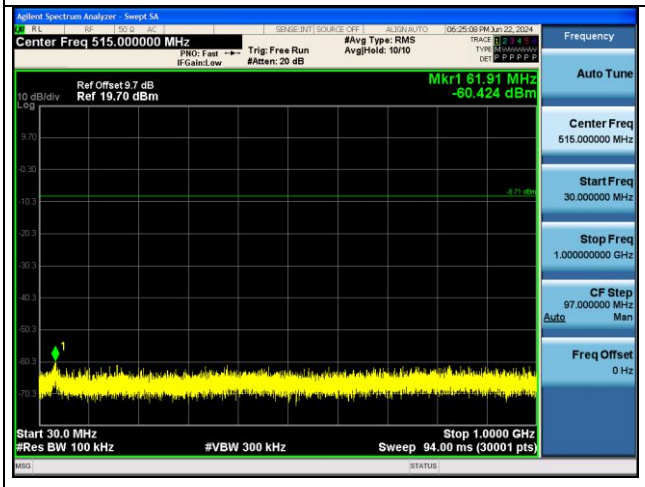
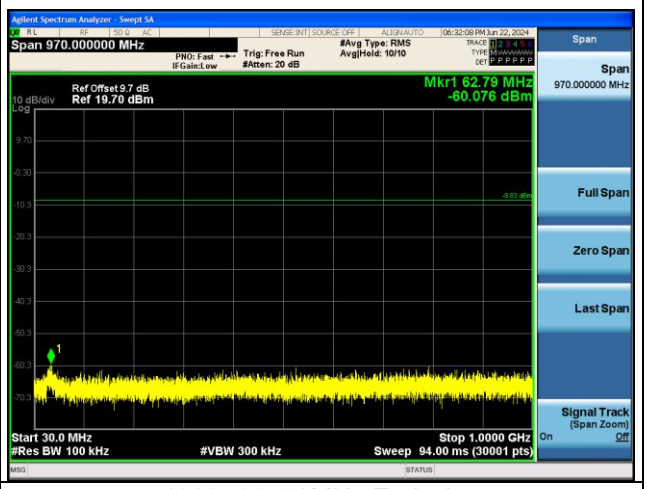
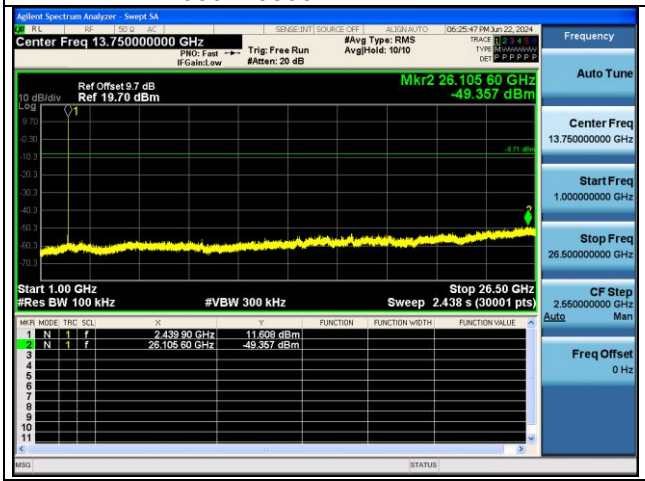
3.9.6 EUT Operating Condition

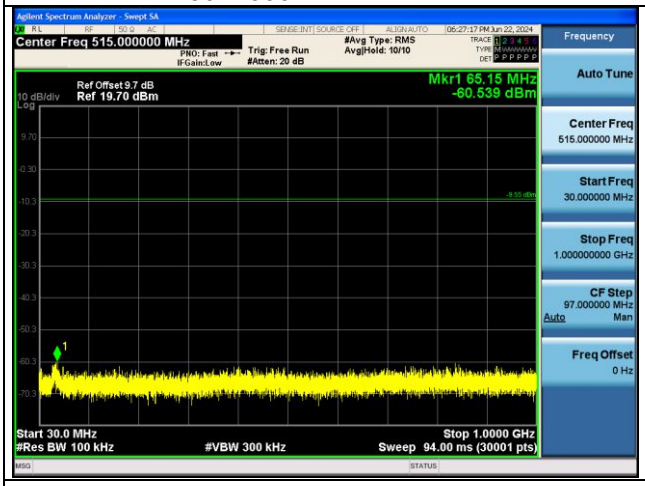
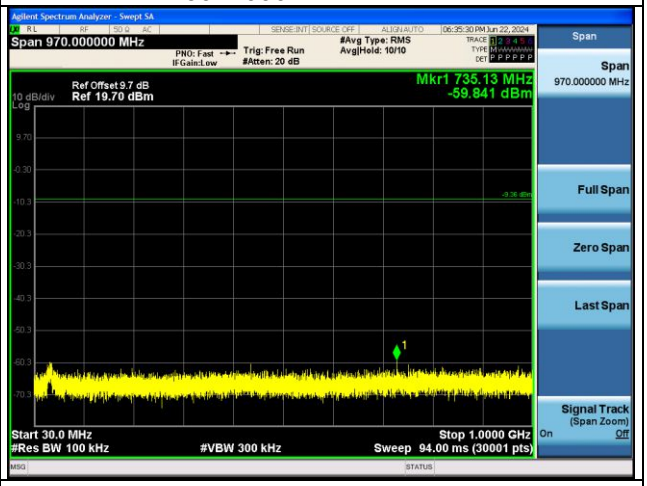
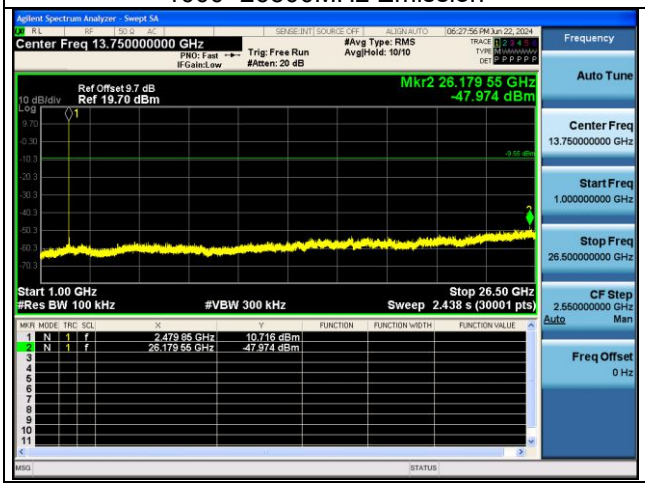
The software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel frequencies individually.

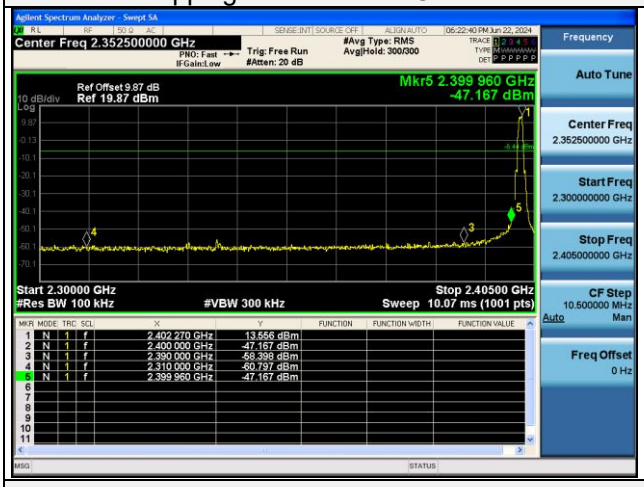
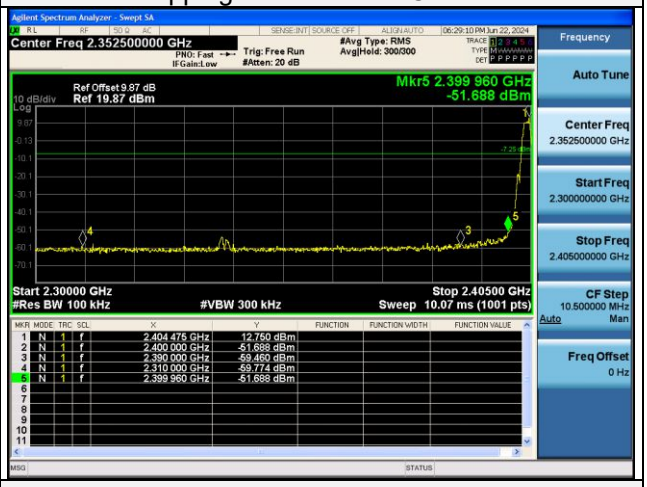
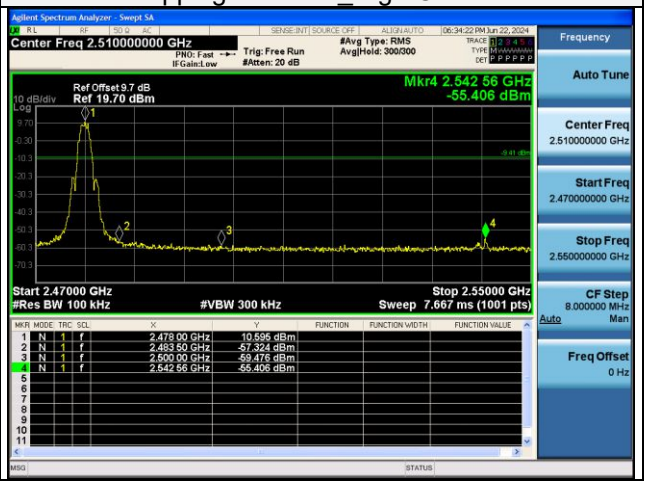
3.9.7 Test Results

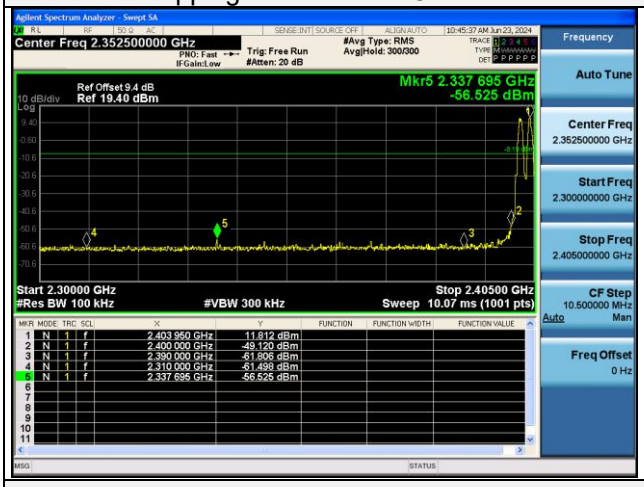
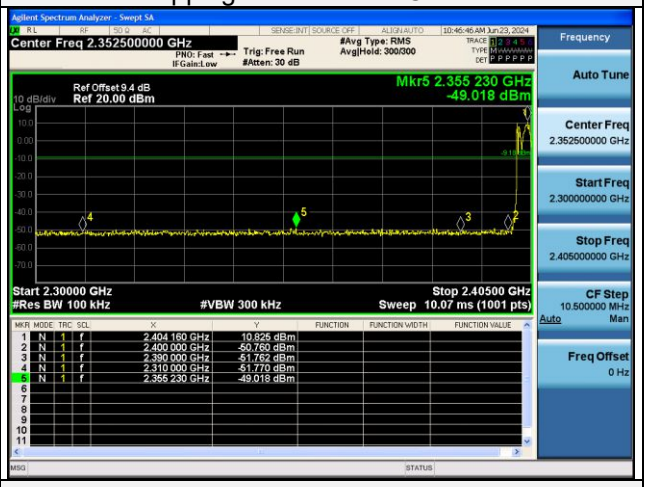
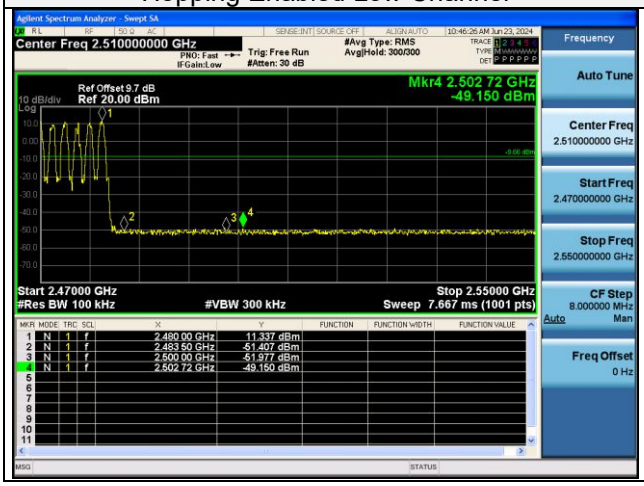
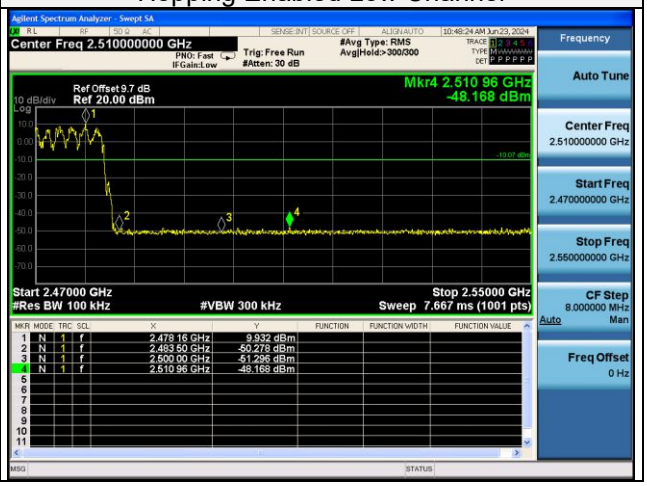
The spectrum plots are attached on the following images. D1 line indicates the highest level, D2 line indicates the 20dB offset below D1. It shows compliance with the requirement.

1Mbps	2Mbps
Hopping Disabled Low Channel	Hopping Disabled Low Channel
Reference Level	Reference Level
	
30~1000MHz Emission	30~1000MHz Emission
	
1000~26500MHz Emission	1000~26500MHz Emission
	

1Mbps	2Mbps
Hopping Disabled Middle Channel	Hopping Disabled Middle Channel
Reference Level	Reference Level
	
30~1000MHz Emission	30~1000MHz Emission
	
1000~26500MHz Emission	1000~26500MHz Emission
	

1Mbps	2Mbps
Hopping Disabled High Channel	Hopping Disabled High Channel
Reference Level	Reference Level
	
30~1000MHz Emission	30~1000MHz Emission
	
1000~26500MHz Emission	1000~26500MHz Emission
	

Bandedge	
1Mbps	2Mbps
Hopping Disabled Low Channel	Hopping Disabled Low Channel
	
Hopping Disabled_High Channel	Hopping Disabled_High Channel
	

Bandedge	
1Mbps	2Mbps
Hopping Enabled Low Channel	Hopping Enabled Low Channel
	
Hopping Enabled Low Channel	Hopping Enabled Low Channel
	

4 Pictures of Test Arrangements

Please refer to the attached file (Test Setup Photo).

5 Test Instruments

Equipment	Manufacturer	Model No.	Serial No.	Next Cal.Date
Spectrum	Keysight	N9020A	MY51240612	2024-08-06
Spectrum Analyzer	Rohde&Schwarz	FSV-40N	101783	2024-12-26
Power Meter 10Hz~18GHz	Tonscend	JS0806-2	188060126	2024-08-06
Signal generator	Keysight	E4421B	GB40051020	2024-03-15
Universal Switch Control Unit	Rohde&Schwarz	CMW500	12010002k50	2024-12-26
Test Software	Tonscend	JS0806-2	NA	NA
Humidity tester	Jingchuang	GSP-8A	CMA22B000592	2025-01-14

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

Appendix – Information on the Testing Laboratories

We, Hwa-Hsing (Dongguan) Testing Co., Ltd.,A global provider of TESTING and CERTIFICATION services for consumer products, electronic products and wireless information technology products. Adhering to the core values “HONEST and TRUSTWORTHY, OBJECTIVE and IMPARTIALITY, RIGOROUS and AFFICIENT”, commitment to provide professional, perfect and efficient comprehensive ONE-STOP solution of TESTING and CERTIFICATION services for Manufacturers, Buyers, Traders, Brands, Retailers. Assist client to better manage risk, protect their brands, reduce costs and cut time to over 150 markets in global. Our laboratories are FCC recognized accredited test firms and accredited and approved according to ISO/IEC 17025.

If you have any comments, please feel free to contact us at the following:

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Email: Customerservice.dg@hwa-hsing.com
Web Site: www.hwa-hsing.com

The address and road map of all our labs can be found in our web site also.

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