FCC Test Report

Report No.:	RFBEAD-WTW-P21060534-3
FCC ID:	M82-AIM78S6
Model:	AIM-78S-6
Series Model:	AIM-78H-6, AIM-78H-6XXXXXXXXXXXXXXX, AIM-78S-6XXXXXXXXXXXXXXX (X: maybe 1-9, A-Z, or blank) (refer to item 3.1 for more details)
Received Date:	Jun. 16, 2021
Test Date:	Jul. 26 ~ Aug. 25, 2021
Issued Date:	Dec. 27, 2021
Applicant:	ADVANTECH CO., LTD
Address:	No. 1, Alley 20, Lane 26, Rueiguang Rd, Neihu District, Taipei, Taiwan 114
Issued By:	Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch Lin Kou Laboratories
Lab Address:	No. 47-2, 14th Ling, Chia Pau Vil., Lin Kou Dist., New Taipei City, Taiwan
Test Location(1):	No. 19, Hwa Ya 2nd Rd., Wen Hwa Vil., Kwei Shan Dist., Taoyuan City 33383, Taiwan
FCC Registration / Designation Number(1):	788550 / TW0003
Test Location(2):	B2F., No.215, Sec. 3, Beixin Rd., Xindian Dist., New Taipei City 231, Taiwan
FCC Registration / Designation Number(2):	427177 / TW0011

Testing Laboratory
2021

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Release Control Record

Issue No.	Description	Date Issued
RFBEAD-WTW-P21060534-3	Original release	Dec. 27, 2021

1 Certificate of Conformity

Product:	10.1” Tablet PC
Brand:	ADVANTECH
Model:	AIM-78S-6
Series Model:	AIM-78H-6, AIM-78H-6XXXXXXXXXXXXXXXX, AIM-78S-6XXXXXXXXXXXXXXXX (X: maybe 1-9, A-Z, or blank) (refer to item 3.1 for more details)
Sample Status:	Engineering sample
Applicant:	ADVANTECH CO., LTD
Test Date:	Jul. 26 ~ Aug. 25, 2021
Standards:	47 CFR FCC Part 15, Subpart C (Section 15.247) ANSI C63.10:2013

The above equipment has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, 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 RF characteristics under the conditions specified in this report.

Prepared by : Pettie Chen , **Date:** Dec. 27, 2021

Pettie Chen / Senior Specialist

Approved by : Jeremy . Lin , **Date:** Dec. 27, 2021

Jeremy Lin / Project Engineer

2 Summary of Test Results

47 CFR FCC Part 15, Subpart C (Section 15.247)			
FCC Clause	Test Item	Result	Remarks
15.207	AC Power Conducted Emission	Pass	Meet the requirement of limit. Minimum passing margin is -6.82dB at 0.54830MHz.
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.
15.205 / 15.209 / 15.247(d)	Radiated Emissions and Band Edge Measurement	Pass	Meet the requirement of limit. Minimum passing margin is -7.72dB at 65.1MHz.
15.247(d)	Antenna Port Emission	Pass	Meet the requirement of limit.
15.203	Antenna Requirement	Pass	Antenna connector is I-PEX_IV not a standard connector.

Note:
1. 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.
2. For 2.4G band compliance with rule 15.247(d) of the band-edge items, the test plots were recorded in Annex A. Test Procedures refer to report 4.1.3.
3. Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

2.1 Measurement Uncertainty

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

Measurement	Frequency	Expanded Uncertainty (k=2) (±)
Conducted Emissions at mains ports	150kHz ~ 30MHz	2.79 dB
Radiated Emissions up to 1 GHz	9 kHz ~ 30 MHz	2.44 dB
	30MHz ~ 200MHz	2.0153 dB
	200MHz ~1000MHz	2.0224 dB
Radiated Emissions above 1 GHz	1GHz ~ 18GHz	1.0121 dB
	18GHz ~ 40GHz	1.1508 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	10.1” Tablet PC
Brand	ADVANTECH
Model	AIM-78S-6
Series Model	AIM-78H-6, AIM-78H-6XXXXXXXXXXXXXXXX, AIM-78S-6XXXXXXXXXXXXXXXX (X: maybe 1-9, A-Z, or blank)
Model Difference	Refer to note
Sample Status	Engineering sample
Power Supply Rating	10.8Vdc (Battery) 19Vdc (Adapter)
Modulation Type	GFSK, π/4-DQPSK, 8DPSK
Modulation Technology	FHSS
Transfer Rate	1/2/3Mbps
Operating Frequency	2402~2480MHz
Number of Channel	79
Output Power	11.092mW
Antenna Type	Refer to note
Antenna Connector	Refer to note
Accessory Device	Refer to note
Cable Supplied	Refer to note

Note:

1. The following models are provided to this EUT. The model of the AIM-78S-6 was chosen for final test.

Model	Description
AIM-78S-6, AIM-78H-6, AIM-78H-6XXXXXXXXXXXXXXXX, AIM-78S-6XXXXXXXXXXXXXXXX (X: maybe 1-9, A-Z, or blank)	For marketing purpose

2. The EUT contains following accessory devices.

Product	Brand	Model	Description
Adapter 1	Tamura	XEW1934N	Input: 100-240Vac~1.5A, 50/60Hz Output: 19Vdc / 3.42A Power Line: AC: 1.5m cable without core DC: 1.2m cable without core
Adapter 2 (option)	FSP	FSP065-DBCM1	Input: 100-240Vac~ 2.0-1.0A, 50-60Hz Output: 19Vdc / 3.43A Power Line: AC: 1.5m cable without core DC: 1.5m cable with 1 core
Battery	ADVANTECH	AIM-BAT-10	Rating: 10.8Vdc, 24.84Wh, 2300mAh
WWAN+WLAN module	USI	MS-01 Pro	-
Docking Stations (option)	ADVANTECH	AIM-DOC-0001	Rating: 19Vdc, 3.42A (VESA Dock)

Product	Brand	Model	Description
Docking Stations (option)	ADVANTECH	AIM-VED0	Rating: 9 ~ 32Vdc (Vehicle Dock)
Docking Stations (option)	ADVANTECH	AIM-OFD-0000	Rating: 19Vdc (Office Dock)
Extension Modules-Barcode scanner (20°) (option)	ADVANTECH	AIM-EXT0-0040 (20 degree)	Sensor: 640 x 480 CMOS sensor
Extension Modules-Barcode scanner (70°) (option)	ADVANTECH	AIM-EXT0-0041 (70 degree)	Sensor: 640 x 480 CMOS sensor

3. The EUT uses the following antennas.

Ant. Type	PIFA										
Ant. Connector	I-PEX_IV										
WiFi _Main / BT											
Frequency (MHz)	2400	2410	2420	2430	2440	2450	2460	2470	2480	2490	2500
Peak Gain (dBi)	3.36	3.36	3.15	3.16	3.06	3.25	3.22	3.23	3.32	3.01	3.12
Frequency (MHz)	5150	5250	5350	5450	5550	5650	5750	5850			
Peak Gain (dBi)	4.31	3.23	2.63	1.97	2.33	2.76	2.61	2.71			
WiFi _Aux											
Frequency (MHz)	2400	2410	2420	2430	2440	2450	2460	2470	2480	2490	2500
Peak Gain (dBi)	4.19	4.09	4.25	4.12	4.07	3.95	3.86	3.86	3.71	3.46	3.43
Frequency (MHz)	5150	5250	5350	5450	5550	5650	5750	5850			
Peak Gain (dBi)	0.97	1.81	2.02	1.08	1.63	1.95	0.30	0.41			

* The max. gain was chosen for final tests.
* The above Antenna information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications, the laboratory shall not be held responsible.

4. The device WLAN 2.4GHz, BT and NFC can transmit simultaneously.

   The device WLAN 5GHz, BT and NFC can transmit simultaneously.

5. Spurious emission of the simultaneous operation (WLAN 2.4GHz, BT and NFC or WLAN 5GHz, BT and NFC) has been evaluated and no non-compliance was found.

3.2 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		

3.2.1 Test Mode Applicability and Tested Channel Detail

EUT Configure Mode	Applicable to				Description
	RE≥1G	RE<1G	PLC	APCM	
A	√	√	√	√	EUT + Adapter
B	-	√	√	-	EUT + VESA Dock
C	-	√	√	-	EUT + Vehicle Dock
D	-	√	√	-	EUT + Office Dock

Where RE≥1G: Radiated Emission above 1GHz & Bandedge Measurement RE<1G: Radiated Emission below 1GHz

PLC: Power Line Conducted Emission APCM: Antenna Port Conducted Measurement

Note:

1. The EUT had been pre-tested on the positioned of each 3 axis. The worst case was found when positioned on **Z plane**.
2. For radiated emission (below 1GHz) and power line conducted emission test items chosen the worst maximum fundamental emission level channel.
3. "-": Means no effect.

Radiated Emission Test (Above 1GHz):

☒ 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.

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

Radiated Emission Test (Below 1GHz):

☒ 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.

EUT Configure Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Pakcet Type
A, B, C, D	0 to 78	0	FHSS	8DPSK	3DH5

Power Line Conducted Emission Test:

☒ 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.

EUT Configure Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Pakcet Type
A, B, C, D	0 to 78	0	FHSS	8DPSK	3DH5

Antenna Port Conducted Measurement:

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

☒ 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.

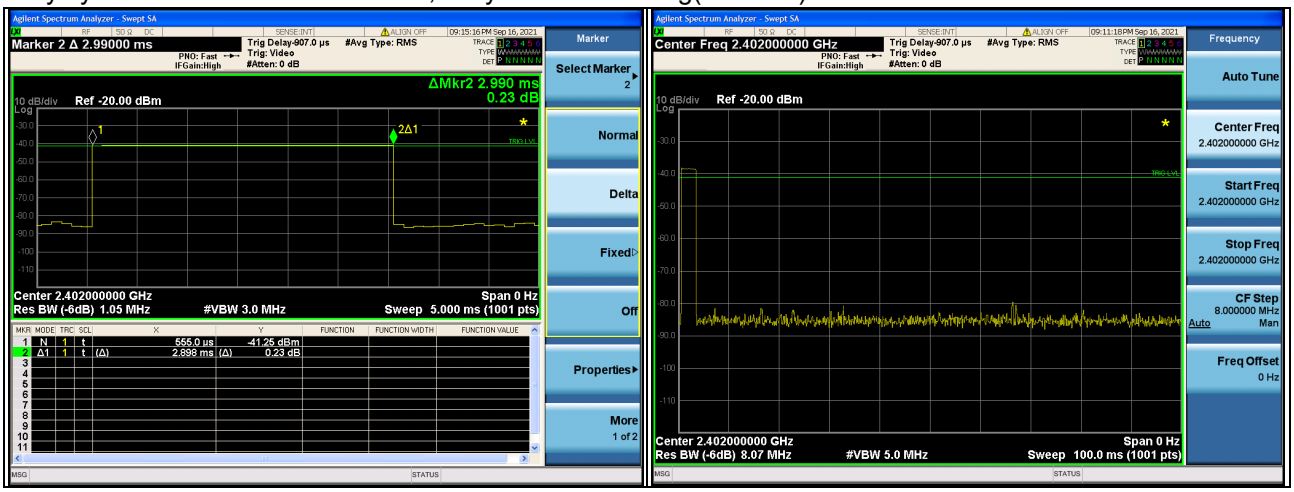
EUT Configure Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Pakcet Type
A	0 to 78	0, 39, 78	FHSS	GFSK	DH5
A	0 to 78	0, 39, 78	FHSS	8DPSK	3DH5

Test Condition:

Applicable to	Environmental Conditions	Input Power	Tested by
RE≥1G	25 deg. C, 75% RH	120Vac, 60Hz	Karl Lee
RE<1G	25 deg. C, 75% RH	120Vac, 60Hz	Karl Lee
PLC	25 deg. C, 75% RH 23 deg. C, 66% RH	120Vac, 60Hz	Edison Lee Cookie Ku
APCM	25 deg. C, 60% RH	120Vac, 60Hz	Jisyong Wang

3.3 Duty Cycle of Test Signal

Duty cycle = 2.898*1/100 = 0.02898, Duty factor = 20 * log(0.02898) = -30.76



3.4 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.

ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	Flash	HP	v250W	05	NA	Type-A
B.	Flash	HP	v250W	03	NA	Type-A
C.	Earphone	APPLE	NA	NA	NA	-
D.	Load	NA	NA	NA	NA	-
E.	Power Supply	TOPWARD	6306D	809760	NA	-
F.	GPS Antenna	CONNECTEC	SP070809-001	3-6004-031R000	NA	Provided by client
G.	Monitor	DELL	SE2416Hc	CN-OWJKMC-641 80-66D-013B-A00	NA	-
H.	Docking Station	ADVANTECH	AIM-DOC-0001	NA	NA	Provided by client
I.	Docking Station	ADVANTECH	AIM-VED0	NA	NA	Provided by client
J.	Docking Station	ADVANTECH	AIM-OFD-0000	NA	NA	Provided by client
K.	Adapter	FSP	FSP065-DBCM1	NA	NA	Provided by client

Note:

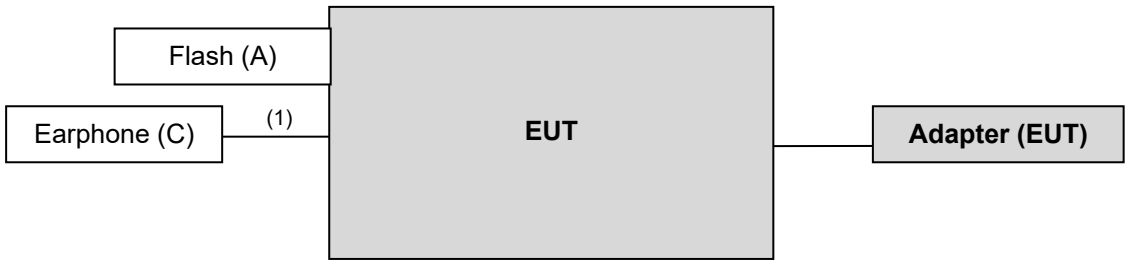
1. All power cords of the above support units are non-shielded (1.8m).

ID	Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	Audio cable	1	1.2	N	0	-
2.	RS232 cable	1	1.5	N	0	-
3.	LAN cable	1	7	N	0	RJ45, Cat.5e
4.	Antenna cable	1	5	N	0	Provided by client
5.	Power cable	1	1	N	0	Provided by client
6.	HDMI cable	1	2.0	Y	0	Provided by Lab. (Brand: Amber, Model: HDMI-AA120)
7.	DC Power cable	1	1.5	N	1	Provided by client
8.	AC Power cable	1	1.5	N	0	Provided by client

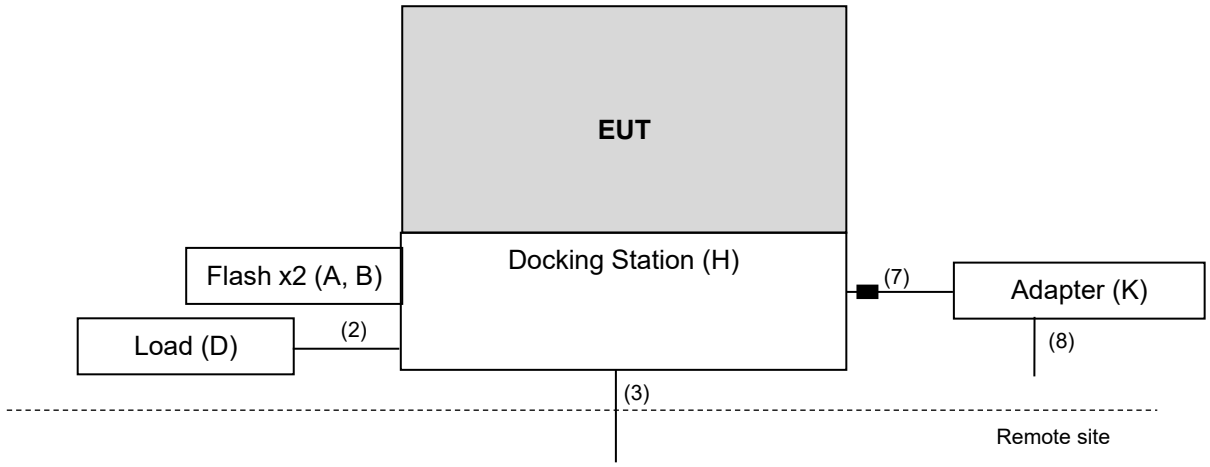
Note: The core(s) is(are) originally attached to the cable(s).

3.4.1 Configuration of System under Test

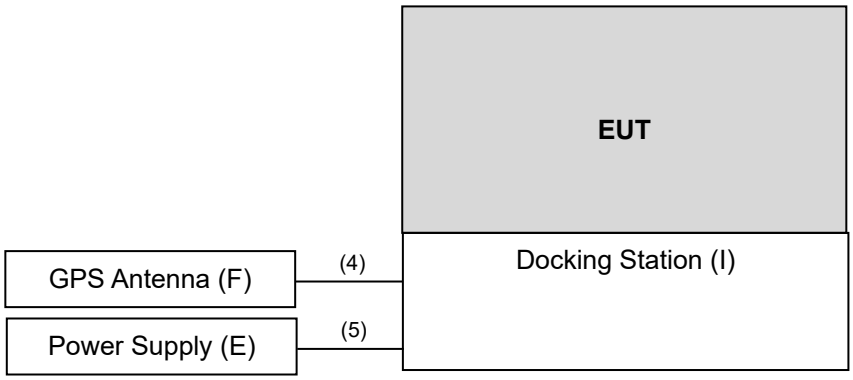
Mode A



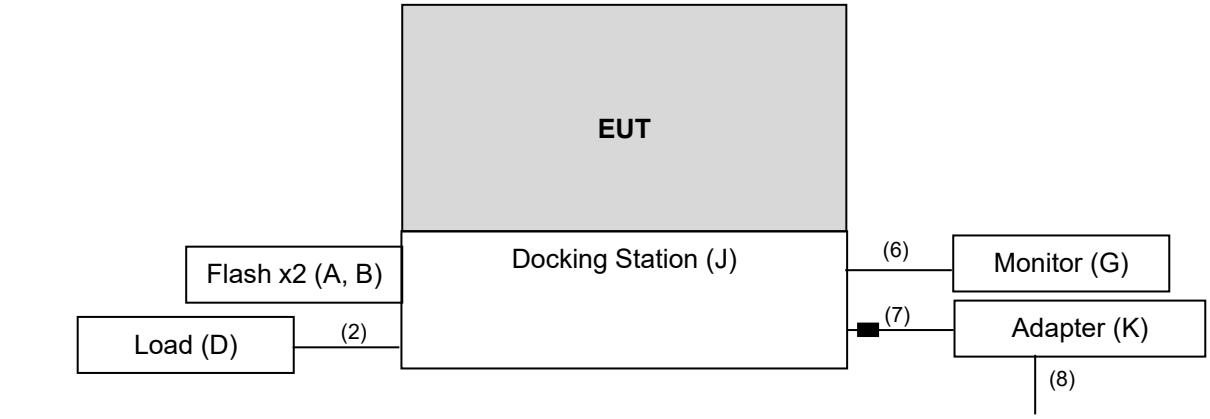
Mode B



Mode C



Mode D



3.5 General Description of Applied Standards and References

The EUT is a RF Product. According to the specifications of the manufacturer, it must comply with the requirements of the following standards and references:

Test Standard:

FCC Part 15, Subpart C (15.247)
ANSI C63.10:2013

All test items have been performed and recorded as per the above standards.

References Test Guidance:
KDB 558074 D01 15.247 Meas Guidance v05r02

All test items have been performed as a reference to the above KDB test guidance.

4 Test Types and Results

4.1 Radiated Emission and Bandedge Measurement

4.1.1 Limits of Radiated Emission and Bandedge 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 20dB 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

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 1000MHz, 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 20dB under any condition of modulation.

4.1.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Test Receiver Agilent Technologies	N9038A	MY55420137	Apr. 09, 2021	Apr. 08, 2022
Spectrum Analyzer ROHDE & SCHWARZ	FSU43	101261	Apr. 12, 2021	Apr. 11, 2022
HORN Antenna ETS-Lindgren	3117	00143293	Nov. 22, 2020	Nov. 21, 2021
BILOG Antenna SCHWARZBECK	VULB 9168	9168-616	Nov. 09, 2020	Nov. 08, 2021
HORN Antenna SCHWARZBECK	BBHA 9170	9170-480	Nov. 22, 2020	Nov. 21, 2021
Fixed Attenuator Mini-Circuits	MDCS18N-10	MDCS18N-10-01	Apr. 13, 2021	Apr. 12, 2022
MXG Vector signal generator Agilent	N5182B	MY53050430	Nov. 25, 2020	Nov. 24, 2021
Preamplifier Agilent	310N	187226	Jun. 17, 2021	Jun. 16, 2022
Preamplifier Agilent	83017A	MY39501357	Jun. 17, 2021	Jun. 16, 2022
Preamplifier EMCI	EMC 184045	980116	Oct. 07, 2020	Oct. 06, 2021
RF signal cable ETS-LINDGREN	5D-FB	Cable-CH1-01(RFC-SMS-100-SMS-120+RFC-SMS-100-SMS-400)	Jun. 17, 2021	Jun. 16, 2022
RF signal cable ETS-LINDGREN	8D-FB	Cable-CH1-02(RFC-SMS-100-SMS-24)	Jun. 17, 2021	Jun. 16, 2022
Boresight Antenna Fixture	FBA-01	FBA-SIP01	NA	NA
Software BV ADT	E3 8.130425b	NA	NA	NA
Antenna Tower MF	NA	NA	NA	NA
Turn Table MF	NA	NA	NA	NA
Antenna Tower &Turn Table Controller MF	MF-7802	NA	NA	NA
Peak Power Analyzer KEYSIGHT	8990B	MY51000485	Jan. 19, 2021	Jan. 18, 2022
Wideband Power Sensor KEYSIGHT	N1923A	MY58020002	Jan. 11, 2021	Jan. 10, 2022

Note: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in Xindian Chamber 6.

4.1.3 Test Procedures

For Radiated emission below 30MHz

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.

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

c. Parallel, perpendicular, and ground-parallel orientations of the antenna are set to make the measurement.

d. For each suspected emission, the EUT was arranged to its worst case and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

e. The test-receiver system was set to Quasi-Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

Note:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 9kHz at frequency below 30MHz.

For Radiated emission above 30MHz

a. The EUT was placed on the top of a rotating table 0.8 meters (for 30MHz ~ 1GHz) / 1.5 meters (for above 1GHz) above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.

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

c. 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.

d. 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.

e. 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.

f. The test-receiver system was set to peak and average detect 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:

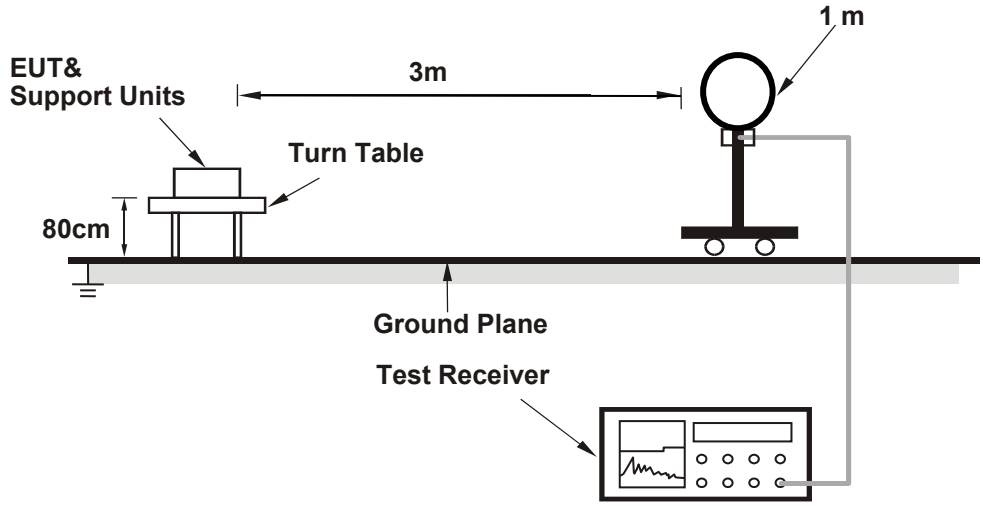
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz. According to ANSI C63.10 section 7.5, the average value = peak value + duty cycle correction factor. The duty cycle correction factor refer to Chapter 3.3 of this report.
3. All modes of operation were investigated and the worst-case emissions are reported.

4.1.4 Deviation from Test Standard

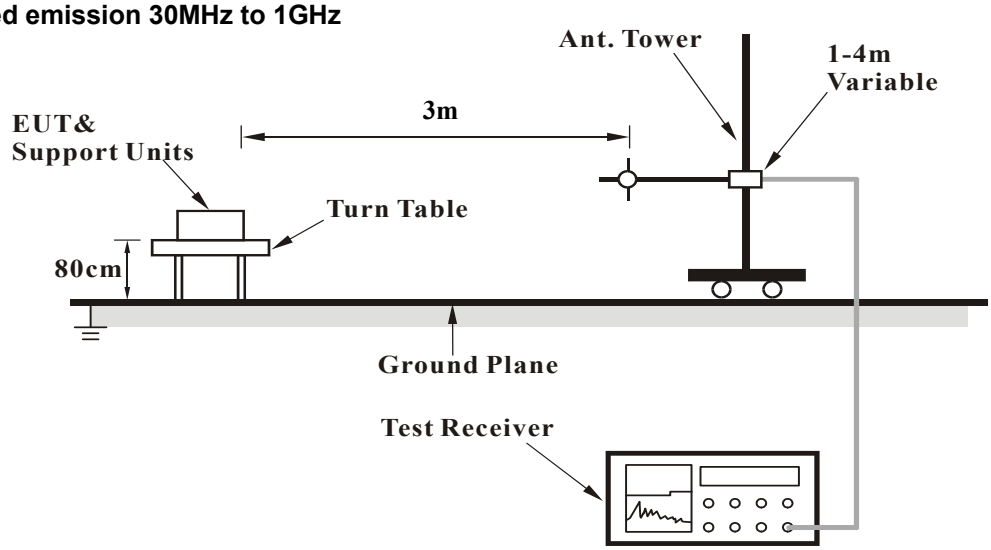
No deviation.

4.1.5 Test Setup

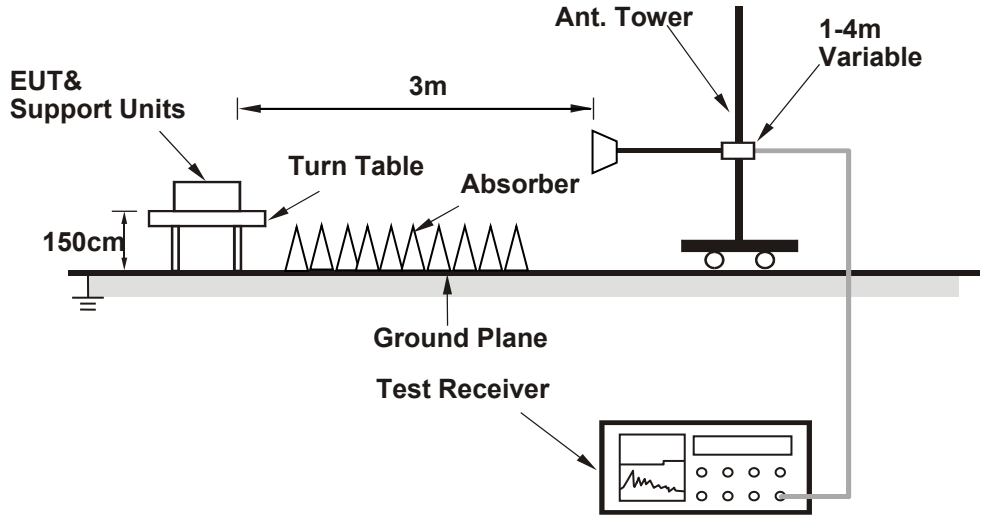
For Radiated emission below 30MHz



For Radiated emission 30MHz to 1GHz



For Radiated emission above 1GHz



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

4.1.6 EUT Operating Conditions

Mode A
a. The EUT powered by adapter.
b. Prepared a notebook to act as a communication partner and placed it outside of testing area.
c. The communication partner connected with EUT via USB cable and ran a test program (provided by manufacturer) to enable EUT under transmission condition continuously at specific channel frequency.

Mode B
a. The EUT powered by cradle.
b. Prepared a notebook to act as a communication partner and placed it outside of testing area.
c. The communication partner connected with EUT via LAN cable and ran a test program (provided by manufacturer) to enable EUT under transmission condition continuously at specific channel frequency.

Mode C
a. The EUT powered by cradle.
b. The EUT under transmission condition continuously at specific channel frequency.

Mode D
a. The EUT powered by cradle.
b. The EUT communicated with monitor via HDMI cables and transmission condition continuously at specific channel frequency.

4.1.7 Test Results

Above 1 GHz Data:

GFSK

EUT Test Condition		Measurement Detail	
Channel	Channel 0	Frequency Range	1 GHz ~ 25 GHz
Input Power	120 Vac, 60 Hz	Detector Function	Peak (PK) Average (AV)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Karl Lee

Antenna Polarity & Test Distance: Horizontal at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2390	41.54	37.04	31.8	54	-12.46	256	115	Average
2390	51.87	47.37	31.8	74	-22.13	256	115	Peak
2402	70.9	66.38	31.8			256	115	Average
2402	101.66	97.14	31.8			256	115	Peak
4804	18.32	7.97	33.96	54	-35.68	182	156	Average
4804	49.08	38.73	33.96	74	-24.92	182	156	Peak
Antenna Polarity & Test Distance: Vertical at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2390	41.95	37.45	31.8	54	-12.05	224	0	Average
2390	52.08	47.58	31.8	74	-21.92	224	0	Peak
2402	68.72	64.2	31.8			224	0	Average
2402	99.48	94.96	31.8			224	0	Peak
4804	18.16	7.81	33.96	54	-35.84	125	73	Average
4804	48.92	38.57	33.96	74	-25.08	125	73	Peak

Remarks:

1. Emission Level = Read Level + Factor
   Margin value = Emission level – Limit value
2. 2402 MHz: Fundamental frequency.
3. The emission levels of other frequencies were very low against the limit.
4. For Fundamental frequency and bandedge & harmonic:
   The average value of fundamental frequency is: average = peak value + 20log(Duty cycle)
   where the duty factor is calculated from following formula:
   20Log(Duty cycle) = 20 log (2.898ms*1/100) = -30.76dB please refer to the plotted duty (see section 3.3)

EUT Test Condition		Measurement Detail	
Channel	Channel 39	Frequency Range	1 GHz ~ 25 GHz
Input Power	120 Vac, 60 Hz	Detector Function	Peak (PK) Average (AV)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Karl Lee

Antenna Polarity & Test Distance: Horizontal at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2390	41.45	36.95	31.8	54	-12.55	256	115	Average
2390	51.97	47.47	31.8	74	-22.03	256	115	Peak
2441	70.71	66.13	31.85			256	115	Average
2441	101.47	96.89	31.85			256	115	Peak
2483.5	21.31	16.65	31.88	54	-32.69	256	115	Average
2483.5	52.07	47.41	31.88	74	-21.93	256	115	Peak
4882	17.84	7.63	33.98	54	-36.16	262	173	Average
4882	48.6	38.39	33.98	74	-25.4	262	173	Peak
Antenna Polarity & Test Distance: Vertical at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2390	41.48	36.98	31.8	54	-12.52	224	0	Average
2390	51.45	46.95	31.8	74	-22.55	224	0	Peak
2441	69.62	65.04	31.85			224	0	Average
2441	100.38	95.8	31.85			224	0	Peak
2483.5	21.57	16.91	31.88	54	-32.43	224	0	Average
2483.5	52.33	47.67	31.88	74	-21.67	224	0	Peak
4882	18.06	7.85	33.98	54	-35.94	203	121	Average
4882	48.82	38.61	33.98	74	-25.18	203	121	Peak

Remarks:

1. Emission Level = Read Level + Factor
   Margin value = Emission level – Limit value
2. 2441 MHz: Fundamental frequency.
3. The emission levels of other frequencies were very low against the limit.
4. For Fundamental frequency and bandedge & harmonic:
   The average value of fundamental frequency is: average = peak value + 20log(Duty cycle)
   where the duty factor is calculated from following formula:
   20Log(Duty cycle) = 20 log (2.898ms*1/100) = -30.76dB please refer to the plotted duty (see section 3.3)

EUT Test Condition		Measurement Detail	
Channel	Channel 78	Frequency Range	1 GHz ~ 25 GHz
Input Power	120 Vac, 60 Hz	Detector Function	Peak (PK) Average (AV)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Karl Lee

Antenna Polarity & Test Distance: Horizontal at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2480	70.22	65.58	31.88			256	115	Average
2480	100.98	96.34	31.88			256	115	Peak
2483.5	22.34	17.68	31.88	54	-31.66	256	115	Average
2483.5	53.1	48.44	31.88	74	-20.9	256	115	Peak
4960	17.52	7.16	33.99	54	-36.48	178	153	Average
4960	48.28	37.92	33.99	74	-25.72	178	153	Peak
Antenna Polarity & Test Distance: Vertical at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2480	68.27	63.63	31.88			224	0	Average
2480	99.03	94.39	31.88			224	0	Peak
2483.5	22.35	17.69	31.88	54	-31.65	224	0	Average
2483.5	53.11	48.45	31.88	74	-20.89	224	0	Peak
4960	18.15	7.79	33.99	54	-35.85	251	107	Average
4960	48.91	38.55	33.99	74	-25.09	251	107	Peak

Remarks:

1. Emission Level = Read Level + Factor
   Margin value = Emission level – Limit value
2. 2480 MHz: Fundamental frequency.
3. The emission levels of other frequencies were very low against the limit.
4. For Fundamental frequency and bandedge & harmonic:
   The average value of fundamental frequency is: average = peak value + 20log(Duty cycle)
   where the duty factor is calculated from following formula:
   20Log(Duty cycle) = 20 log (2.898ms*1/100) = -30.76dB please refer to the plotted duty (see section 3.3)

8DPSK

EUT Test Condition		Measurement Detail	
Channel	Channel 0	Frequency Range	1 GHz ~ 25 GHz
Input Power	120 Vac, 60 Hz	Detector Function	Peak (PK) Average (AV)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Karl Lee

Antenna Polarity & Test Distance: Horizontal at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2390	41.44	36.94	31.8	54	-12.56	256	115	Average
2390	51.71	47.21	31.8	74	-22.29	256	115	Peak
2402	72.53	68.01	31.8			256	115	Average
2402	103.29	98.77	31.8			256	115	Peak
4804	18.07	7.72	33.96	54	-35.93	156	120	Average
4804	48.83	38.48	33.96	74	-25.17	156	120	Peak
Antenna Polarity & Test Distance: Vertical at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2390	41.41	36.91	31.8	54	-12.59	224	0	Average
2390	52.22	47.72	31.8	74	-21.78	224	0	Peak
2402	71.64	67.12	31.8			224	0	Average
2402	102.4	97.88	31.8			224	0	Peak
4804	17.47	7.12	33.96	54	-36.53	231	146	Average
4804	48.23	37.88	33.96	74	-25.77	231	146	Peak

Remarks:

1. Emission Level = Read Level + Factor
   Margin value = Emission level – Limit value
2. 2402 MHz: Fundamental frequency.
3. The emission levels of other frequencies were very low against the limit.
4. For Fundamental frequency and bandedge & harmonic:
   The average value of fundamental frequency is: average = peak value + 20log(Duty cycle)
   where the duty factor is calculated from following formula:
   20Log(Duty cycle) = 20 log (2.898ms*1/100) = -30.76dB please refer to the plotted duty (see section 3.3)

EUT Test Condition		Measurement Detail	
Channel	Channel 39	Frequency Range	1 GHz ~ 25 GHz
Input Power	120 Vac, 60 Hz	Detector Function	Peak (PK) Average (AV)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Karl Lee

Antenna Polarity & Test Distance: Horizontal at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2390	41.53	37.03	31.8	54	-12.47	256	115	Average
2390	51.45	46.95	31.8	74	-22.55	256	115	Peak
2441	72.45	67.87	31.85			256	115	Average
2441	103.21	98.63	31.85			256	115	Peak
2483.5	21.48	16.82	31.88	54	-32.52	256	115	Average
2483.5	52.24	47.58	31.88	74	-21.76	256	115	Peak
4882	17.19	6.98	33.98	54	-36.81	178	131	Average
4882	47.95	37.74	33.98	74	-26.05	178	131	Peak
Antenna Polarity & Test Distance: Vertical at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2390	41.41	36.91	31.8	54	-12.59	224	0	Average
2390	51.54	47.04	31.8	74	-22.46	224	0	Peak
2441	70.67	66.09	31.85			224	0	Average
2441	101.43	96.85	31.85			224	0	Peak
2483.5	21.68	17.02	31.88	54	-32.32	224	0	Average
2483.5	52.44	47.78	31.88	74	-21.56	224	0	Peak
4882	17.56	7.35	33.98	54	-36.44	213	83	Average
4882	48.32	38.11	33.98	74	-25.68	213	83	Peak

Remarks:

1. Emission Level = Read Level + Factor
   Margin value = Emission level – Limit value
2. 2441 MHz: Fundamental frequency.
3. The emission levels of other frequencies were very low against the limit.
4. For Fundamental frequency and bandedge & harmonic:
   The average value of fundamental frequency is: average = peak value + 20log(Duty cycle)
   where the duty factor is calculated from following formula:
   20Log(Duty cycle) = 20 log (2.898ms*1/100) = -30.76dB please refer to the plotted duty (see section 3.3)

EUT Test Condition		Measurement Detail	
Channel	Channel 78	Frequency Range	1 GHz ~ 25 GHz
Input Power	120 Vac, 60 Hz	Detector Function	Peak (PK) Average (AV)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Karl Lee

Antenna Polarity & Test Distance: Horizontal at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2480	71.35	66.71	31.88			256	115	Average
2480	102.11	97.47	31.88			256	115	Peak
2483.5	21.42	16.76	31.88	54	-32.58	256	115	Average
2483.5	52.18	47.52	31.88	74	-21.82	256	115	Peak
4960	17.66	7.3	33.99	54	-36.34	229	108	Average
4960	48.42	38.06	33.99	74	-25.58	229	108	Peak
Antenna Polarity & Test Distance: Vertical at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2480	70.2	65.56	31.88			224	0	Average
2480	100.96	96.32	31.88			224	0	Peak
2483.5	21.73	17.07	31.88	54	-32.27	224	0	Average
2483.5	52.49	47.83	31.88	74	-21.51	224	0	Peak
4960	17.02	6.66	33.99	54	-36.98	182	136	Average
4960	47.78	37.42	33.99	74	-26.22	182	136	Peak

Remarks:

1. Emission Level = Read Level + Factor
   Margin value = Emission level – Limit value
2. 2480 MHz: Fundamental frequency.
3. The emission levels of other frequencies were very low against the limit.
4. For Fundamental frequency and bandedge & harmonic:
   The average value of fundamental frequency is: average = peak value + 20log(Duty cycle)
   where the duty factor is calculated from following formula:
   20Log(Duty cycle) = 20 log (2.898ms*1/100) = -30.76dB please refer to the plotted duty (see section 3.3)

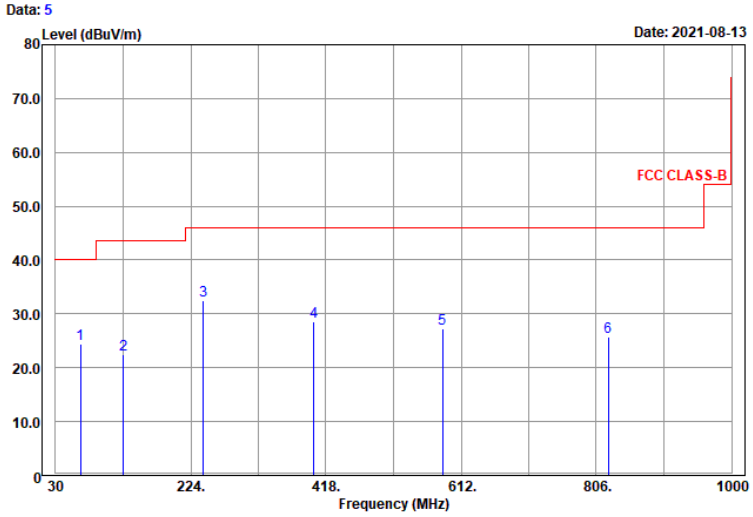
9 kHz ~ 30 MHz Data:

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

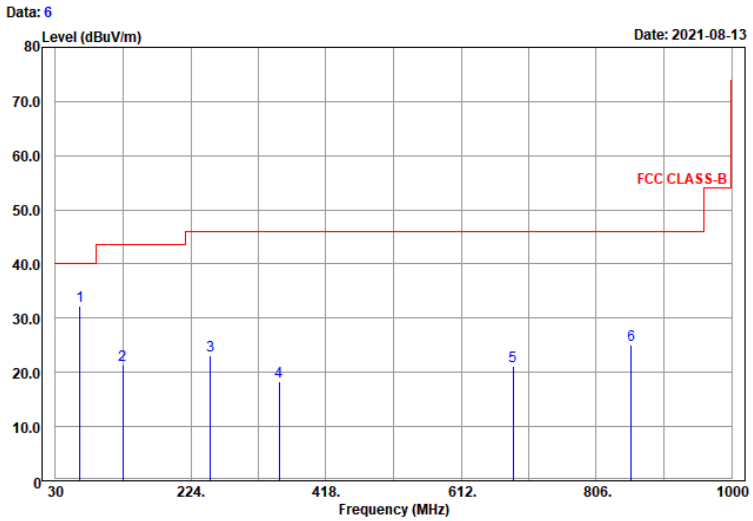
30 MHz ~ 1 GHz Worst-Case Data:

EUT Test Condition		Measurement Detail	
Channel	Channel 0	**Frequency Range**	30 MHz ~ 1 GHz
Input Power	120 Vac, 60 Hz	**Detector Function**	Peak (PK) Quasi-peak (QP)
Environmental Conditions	25 deg. C, 65 % RH	**Tested By**	Karl Lee
Test Mode	A		

Horizontal



Vertical



Antenna Polarity & Test Distance: Horizontal at 3 m								
Frequency (MHz)	**Emission Level (dBuV/m)**	**Read Level (dBuV)**	**Factor (dB/m)**	**Limit (dBuV/m)**	**Margin (dB)**	**Antenna Height (cm)**	**Table Angle (Degree)**	**Remark**
66.18	24.4	42.32	-17.92	40	-15.6	154	112	QP
127.2	22.36	42.55	-20.19	43.5	-21.14	149	125	QP
241.95	32.46	49.45	-16.99	46	-13.54	184	236	QP
400.8	28.65	42.57	-13.92	46	-17.35	251	105	QP
585.6	27.29	38.2	-10.91	46	-18.71	196	281	QP
822.9	25.73	33.03	-7.3	46	-20.27	146	341	QP
Antenna Polarity & Test Distance: Vertical at 3 m								
Frequency (MHz)	**Emission Level (dBuV/m)**	**Read Level (dBuV)**	**Factor (dB/m)**	**Limit (dBuV/m)**	**Margin (dB)**	**Antenna Height (cm)**	**Table Angle (Degree)**	**Remark**
65.1	**32.28**	**49.79**	**-17.51**	**40**	**-7.72**	**195**	**237**	**QP**
126.66	21.45	41.64	-20.19	43.5	-22.05	215	25	QP
252.21	23.01	39.82	-16.81	46	-22.99	174	125	QP
351.1	18.29	33	-14.71	46	-27.71	131	58	QP
686.4	21.09	30.45	-9.36	46	-24.91	263	105	QP
856.5	25.07	31.72	-6.65	46	-20.93	293	152	QP

Remarks:

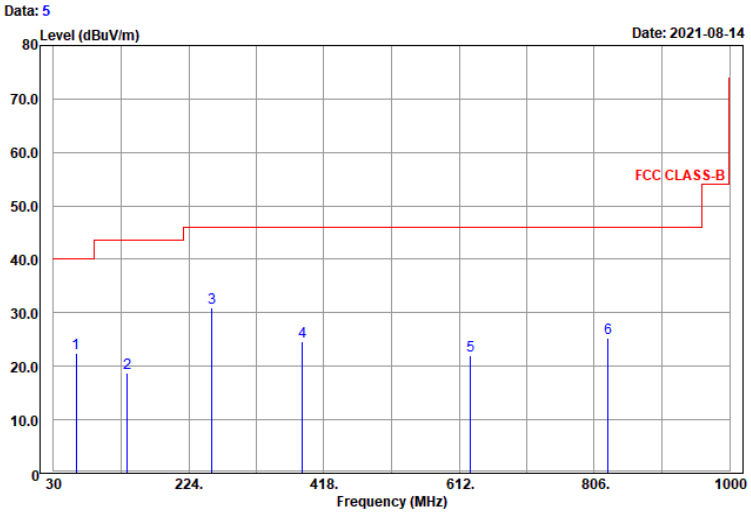
1. Emission Level = Read Level + Factor

   Margin value = Emission level – Limit value.

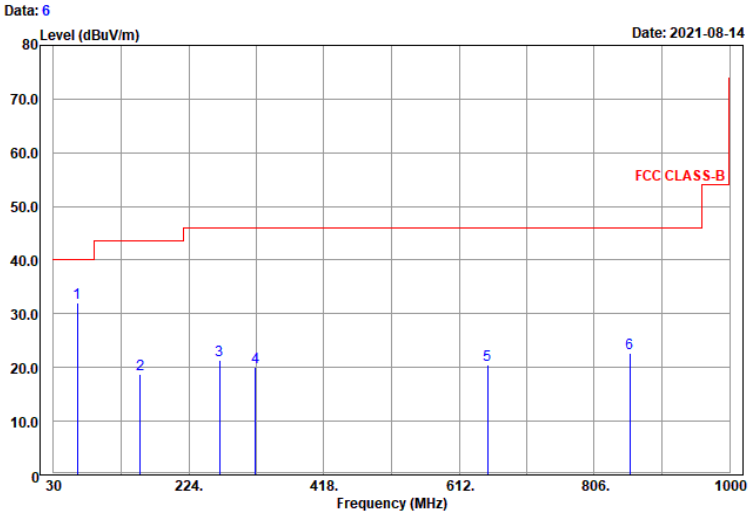
2. The emission levels of other frequencies were very low against the limit.

EUT Test Condition		Measurement Detail	
Channel	Channel 0	**Frequency Range**	30 MHz ~ 1 GHz
Input Power	120 Vac, 60 Hz	**Detector Function**	Peak (PK) Quasi-peak (QP)
Environmental Conditions	25 deg. C, 65 % RH	**Tested By**	Karl Lee
Test Mode	B		

Horizontal



Vertical



Antenna Polarity & Test Distance: Horizontal at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
62.83	22.47	39.44	-16.97	40	-17.53	139	224	QP
136.27	18.79	39.62	-20.83	43.5	-24.71	206	178	QP
257.26	30.85	47.56	-16.71	46	-15.15	163	184	QP
387.16	24.56	38.7	-14.14	46	-21.44	204	28	QP
628.47	21.93	32.33	-10.4	46	-24.07	196	25	QP
826.17	25.36	32.56	-7.2	46	-20.64	145	127	QP
Antenna Polarity & Test Distance: Vertical at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
64.28	32.14	49.38	-17.24	40	-7.86	129	354	QP
154.32	18.65	39.48	-20.83	43.5	-24.85	169	222	QP
268.36	21.47	38.01	-16.54	46	-24.53	161	82	QP
319.56	20.08	35.65	-15.57	46	-25.92	155	19	QP
652.58	20.49	30.5	-10.01	46	-25.51	241	46	QP
857.23	22.64	29.27	-6.63	46	-23.36	157	203	QP

Remarks:

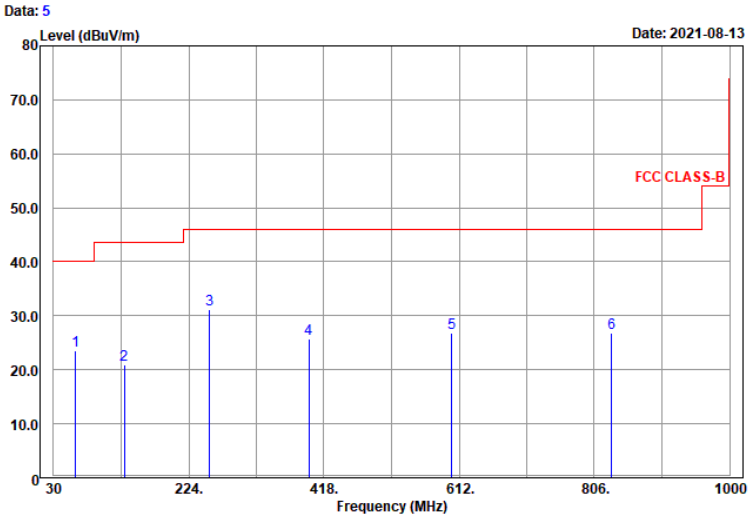
1. Emission Level = Read Level + Factor

   Margin value = Emission level – Limit value.

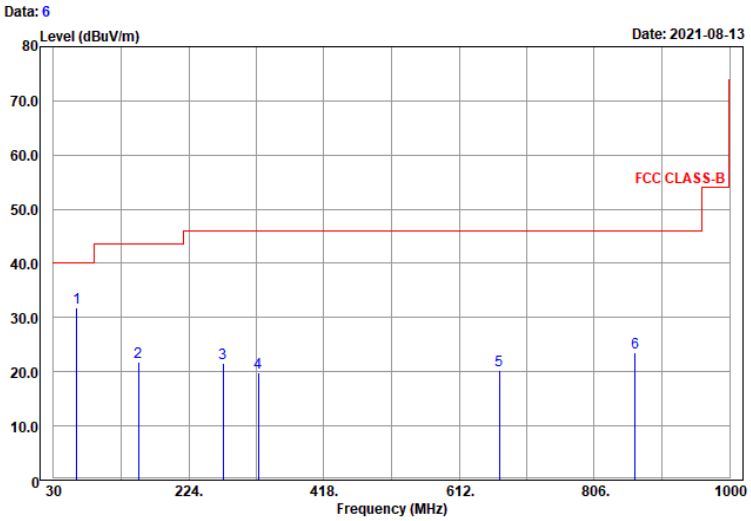
2. The emission levels of other frequencies were very low against the limit.

EUT Test Condition		Measurement Detail	
Channel	Channel 0	**Frequency Range**	30 MHz ~ 1 GHz
Input Power	120 Vac, 60 Hz	**Detector Function**	Peak (PK) Quasi-peak (QP)
Environmental Conditions	25 deg. C, 65 % RH	**Tested By**	Karl Lee
Test Mode	C		

Horizontal



Vertical



Antenna Polarity & Test Distance: Horizontal at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
61.74	23.54	40.23	-16.69	40	-16.46	182	107	QP
131.36	20.89	41.39	-20.5	43.5	-22.61	215	176	QP
253.83	31.09	47.87	-16.78	46	-14.91	151	7	QP
396.29	25.79	39.8	-14.01	46	-20.21	220	42	QP
601.15	26.86	37.4	-10.54	46	-19.14	204	116	QP
831.26	26.81	33.85	-7.04	46	-19.19	162	310	QP
Antenna Polarity & Test Distance: Vertical at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
63.08	31.87	48.84	-16.97	40	-8.13	223	70	QP
152.28	21.79	42.69	-20.9	43.5	-21.71	206	117	QP
273.26	21.64	38.11	-16.47	46	-24.36	138	75	QP
323.62	19.74	35.21	-15.47	46	-26.26	216	291	QP
669.36	20.25	29.89	-9.64	46	-25.75	258	124	QP
864.82	23.49	29.96	-6.47	46	-22.51	126	287	QP

Remarks:

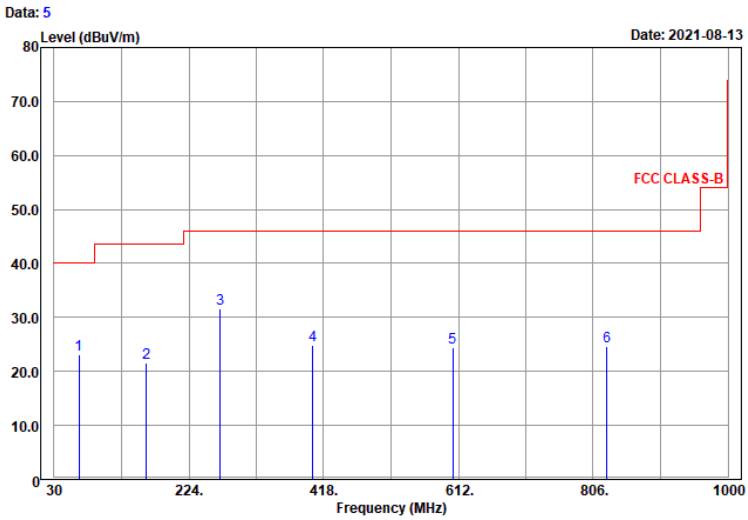
1. Emission Level = Read Level + Factor

   Margin value = Emission level – Limit value.

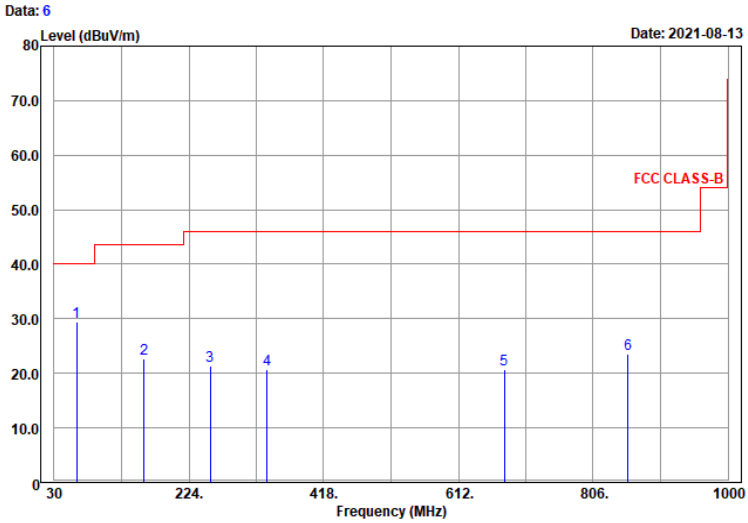
2. The emission levels of other frequencies were very low against the limit.

EUT Test Condition		Measurement Detail	
Channel	Channel 0	**Frequency Range**	30 MHz ~ 1 GHz
Input Power	120 Vac, 60 Hz	**Detector Function**	Peak (PK) Quasi-peak (QP)
Environmental Conditions	25 deg. C, 65 % RH	**Tested By**	Karl Lee
Test Mode	D		

Horizontal



Vertical



Antenna Polarity & Test Distance: Horizontal at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
65.77	23.16	41.08	-17.92	40	-16.84	253	180	QP
162.43	21.62	42.15	-20.53	43.5	-21.88	217	131	QP
269.26	31.71	48.24	-16.53	46	-14.29	162	23	QP
402.26	24.77	38.66	-13.89	46	-21.23	126	283	QP
604.29	24.36	34.87	-10.51	46	-21.64	136	233	QP
825.62	24.73	31.96	-7.23	46	-21.27	123	192	QP
Antenna Polarity & Test Distance: Vertical at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
62.23	29.45	46.14	-16.69	40	-10.55	206	182	QP
159.36	22.74	43.37	-20.63	43.5	-20.76	194	28	QP
254.78	21.36	38.1	-16.74	46	-24.64	117	268	QP
336.78	20.78	35.86	-15.08	46	-25.22	142	94	QP
678.12	20.65	30.18	-9.53	46	-25.35	225	193	QP
856.47	23.54	30.19	-6.65	46	-22.46	131	258	QP

Remarks:

1. Emission Level = Read Level + Factor

   Margin value = Emission level – Limit value.

2. The emission levels of other frequencies were very low against the limit.

4.2 Conducted Emission Measurement

4.2.1 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

4.2.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Test Receiver ROHDE & SCHWARZ	ESCI	100613	Dec. 04, 2020	Dec. 03, 2021
RF signal cable Woken	5D-FB	Cable-cond1-01	Jan. 16, 2021	Jan. 15, 2022
LISN ROHDE & SCHWARZ (EUT)	ENV216	101826	Feb. 25, 2021	Feb. 24, 2022
V-LISN ROHDE & SCHWARZ (Peripheral)	ESH3-Z5	100311	Aug. 28, 2020	Aug. 27, 2021
Software ADT	BV ADT_Cond_ V7.3.7.4	NA	NA	NA

Note: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in HwaYa Shielded Room 1 (Conduction 1).
3. The VCCI Site Registration No. is C-12040.

4.2.3 Test Procedures

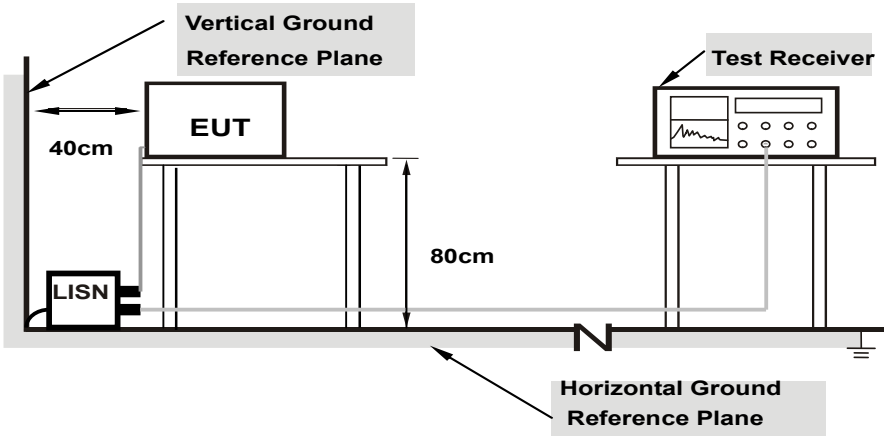
a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/50 uH of coupling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

Note: The resolution bandwidth and video bandwidth of test receiver is 9 kHz for quasi-peak detection (QP) and average detection (AV) at frequency 0.15 MHz – 30 MHz.

4.2.4 Deviation from Test Standard

No deviation.

4.2.5 Test Setup



Note: 1.Support units were connected to second LISN.

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

4.2.6 EUT Operating Conditions

Same as 4.1.6.

4.2.7 Test Results

Worst-case data:

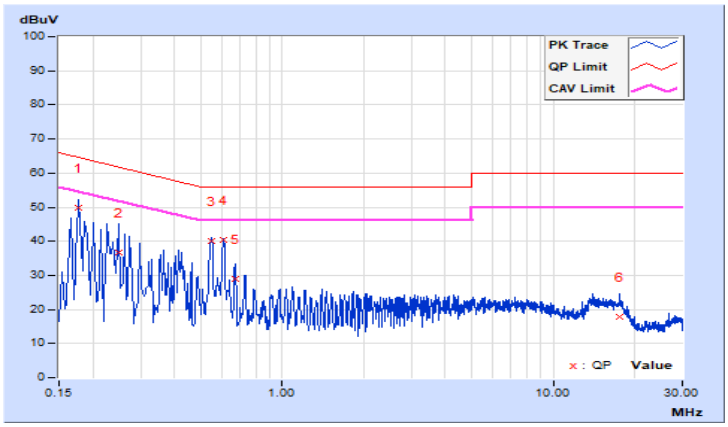
8DPSK

Phase	Line (L)	Detector Function	Quasi-Peak (QP) / Average (AV)
Test Mode	A		

No	Freq.	Corr. Factor	Reading Value		Emission Level		Limit		Margin	
			[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.17800	9.71	39.96	21.36	49.67	31.07	64.58	54.58	-14.91	-23.51
2	0.25000	9.72	26.82	13.01	36.54	22.73	61.76	51.76	-25.22	-29.03
3	0.54600	9.74	30.29	28.13	40.03	37.87	56.00	46.00	-15.97	-8.13
4	0.60600	9.74	30.56	28.92	40.30	38.66	56.00	46.00	-15.70	-7.34
5	0.67339	9.74	19.29	12.83	29.03	22.57	56.00	46.00	-26.97	-23.43
6	17.55400	9.82	8.10	2.77	17.92	12.59	60.00	50.00	-42.08	-37.41

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.

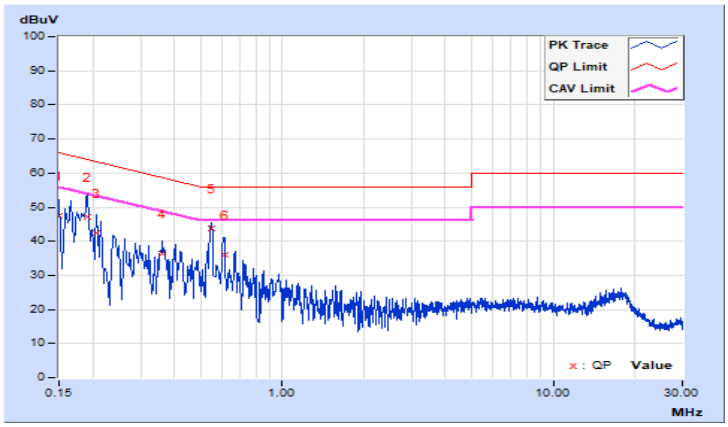


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)
Test Mode	A		

No	Freq.	Corr. Factor	Reading Value		Emission Level		Limit		Margin	
			[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15000	9.76	37.76	12.69	47.52	22.45	66.00	56.00	-18.48	-33.55
2	0.19000	9.77	37.26	18.00	47.03	27.77	64.04	54.04	-17.01	-26.27
3	0.20600	9.77	32.53	9.87	42.30	19.64	63.37	53.37	-21.07	-33.73
4	0.36200	9.79	26.68	17.12	36.47	26.91	58.68	48.68	-22.21	-21.77
5	**0.54830**	**9.80**	**33.93**	**29.38**	**43.73**	**39.18**	**56.00**	**46.00**	**-12.27**	**-6.82**
6	0.61400	9.80	26.38	17.12	36.18	26.92	56.00	46.00	-19.82	-19.08

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.

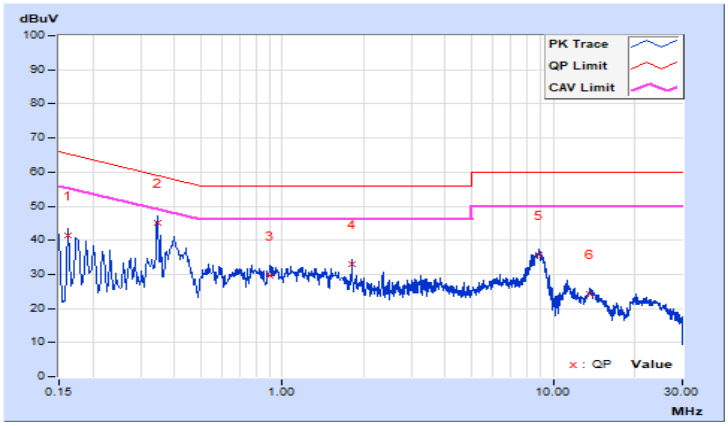


Phase	Line (L)	Detector Function	Quasi-Peak (QP) / Average (AV)
Test Mode	B		

No	Freq.	Corr. Factor	Reading Value		Emission Level		Limit		Margin	
			[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.16173	9.71	31.83	20.29	41.54	30.00	65.37	55.37	-23.83	-25.37
2	0.34550	9.72	35.36	16.89	45.08	26.61	59.07	49.07	-13.99	-22.46
3	0.90463	9.76	19.91	13.99	29.67	23.75	56.00	46.00	-26.33	-22.25
4	1.80393	9.77	23.22	9.63	32.99	19.40	56.00	46.00	-23.01	-26.60
5	8.86930	9.85	25.98	19.06	35.83	28.91	60.00	50.00	-24.17	-21.09
6	13.62777	9.84	14.29	6.07	24.13	15.91	60.00	50.00	-35.87	-34.09

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.

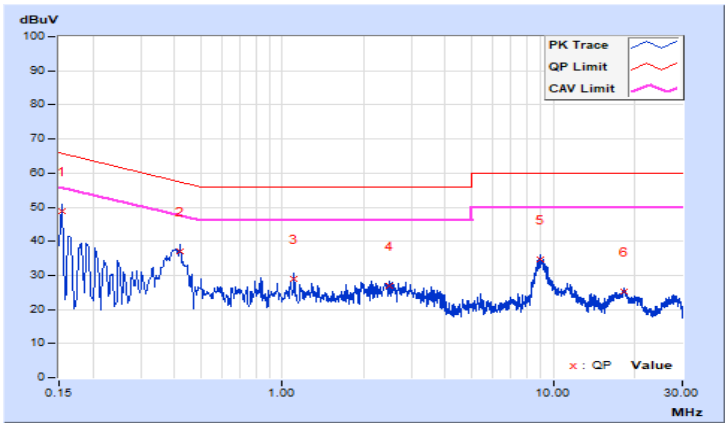


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)
Test Mode	B		

No	Freq.	Corr. Factor	Reading Value		Emission Level		Limit		Margin	
			[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15391	9.77	38.90	14.91	48.67	24.68	65.79	55.79	-17.12	-31.11
2	0.41979	9.79	27.20	18.88	36.99	28.67	57.45	47.45	-20.46	-18.78
3	1.10404	9.82	19.12	7.16	28.94	16.98	56.00	46.00	-27.06	-29.02
4	2.49209	9.83	17.08	8.65	26.91	18.48	56.00	46.00	-29.09	-27.52
5	8.97487	9.92	24.60	16.53	34.52	26.45	60.00	50.00	-25.48	-23.55
6	18.31586	9.98	15.24	7.79	25.22	17.77	60.00	50.00	-34.78	-32.23

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.

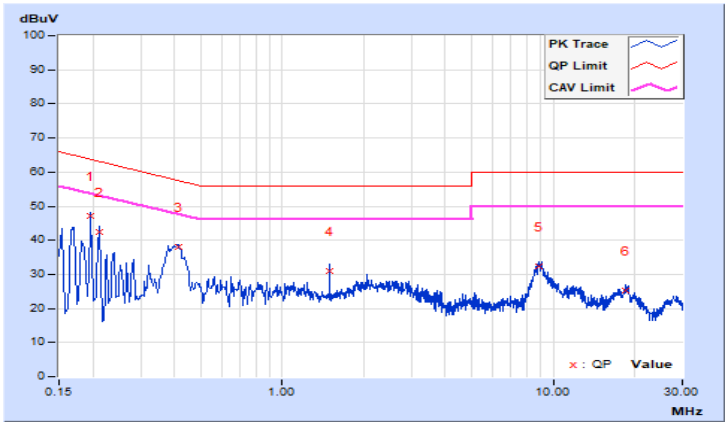


Phase	Line (L)	Detector Function	Quasi-Peak (QP) / Average (AV)
Test Mode	C		

No	Freq.	Corr. Factor	Reading Value		Emission Level		Limit		Margin	
			[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.19692	9.71	37.36	12.67	47.07	22.38	63.74	53.74	-16.67	-31.36
2	0.21256	9.71	32.88	9.92	42.59	19.63	63.10	53.10	-20.51	-33.47
3	0.41197	9.73	28.20	20.59	37.93	30.32	57.61	47.61	-19.68	-17.29
4	1.49113	9.76	21.09	5.82	30.85	15.58	56.00	46.00	-25.15	-30.42
5	8.86930	9.85	22.51	15.41	32.36	25.26	60.00	50.00	-27.64	-24.74
6	18.56610	9.82	15.27	7.55	25.09	17.37	60.00	50.00	-34.91	-32.63

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.

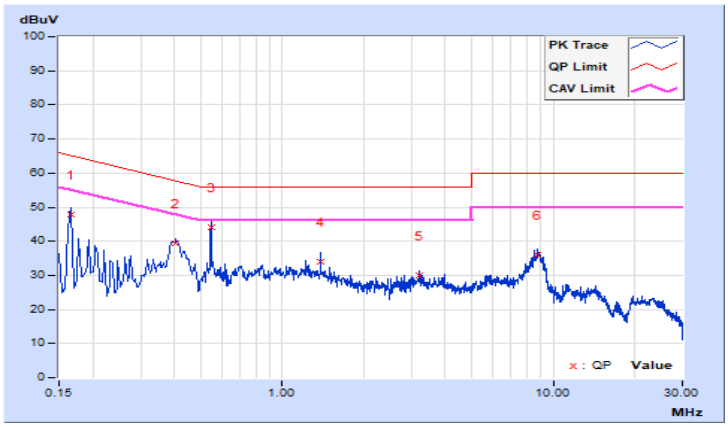


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)
Test Mode	C		

No	Freq.	Corr. Factor	Reading Value		Emission Level		Limit		Margin	
			[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.16564	9.77	38.13	17.11	47.90	26.88	65.18	55.18	-17.28	-28.30
2	0.40373	9.79	29.57	22.37	39.36	32.16	57.78	47.78	-18.42	-15.62
3	0.54491	9.80	34.38	12.96	44.18	22.76	56.00	46.00	-11.82	-23.24
4	1.38556	9.82	24.02	12.51	33.84	22.33	56.00	46.00	-22.16	-23.67
5	3.21544	9.84	20.27	11.23	30.11	21.07	56.00	46.00	-25.89	-24.93
6	8.75591	9.91	26.14	18.08	36.05	27.99	60.00	50.00	-23.95	-22.01

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.

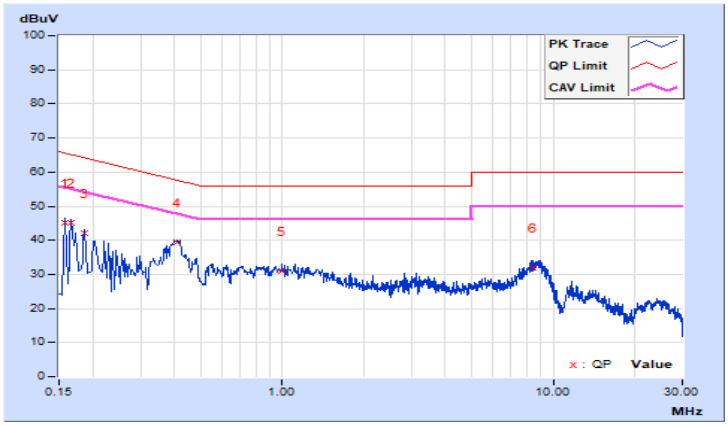


Phase	Line (L)	Detector Function	Quasi-Peak (QP) / Average (AV)
Test Mode	D		

No	Freq.	Corr. Factor	Reading Value		Emission Level		Limit		Margin	
			[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15782	9.71	35.28	20.39	44.99	30.10	65.58	55.58	-20.59	-25.48
2	0.16564	9.71	35.33	18.70	45.04	28.41	65.18	55.18	-20.14	-26.77
3	0.18519	9.71	32.41	18.35	42.12	28.06	64.25	54.25	-22.13	-26.19
4	0.40693	9.73	29.57	21.92	39.30	31.65	57.71	47.71	-18.41	-16.06
5	1.00238	9.76	21.30	12.89	31.06	22.65	56.00	46.00	-24.94	-23.35
6	8.43529	9.84	22.31	15.16	32.15	25.00	60.00	50.00	-27.85	-25.00

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.

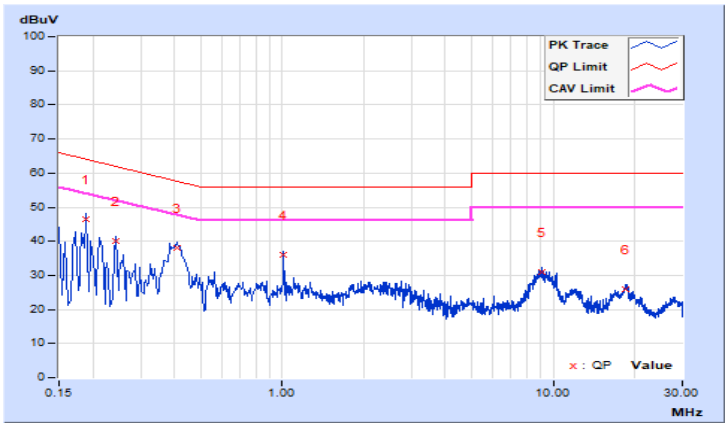


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)
Test Mode	D		

No	Freq.	Corr. Factor	Reading Value		Emission Level		Limit		Margin	
			[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.18910	9.77	36.84	15.06	46.61	24.83	64.08	54.08	-17.47	-29.25
2	0.24384	9.77	30.35	10.16	40.12	19.93	61.96	51.96	-21.84	-32.03
3	0.40800	9.79	28.27	21.08	38.06	30.87	57.69	47.69	-19.63	-16.82
4	1.01411	9.82	26.11	6.30	35.93	16.12	56.00	46.00	-20.07	-29.88
5	9.14300	9.92	21.13	13.03	31.05	22.95	60.00	50.00	-28.95	-27.05
6	18.56219	9.98	16.09	9.10	26.07	19.08	60.00	50.00	-33.93	-30.92

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.



4.3 Number of Hopping Frequency Used

4.3.1 Limits of Hopping Frequency Used Measurement

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

4.3.2 Test Setup

4.3.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.3.4 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.

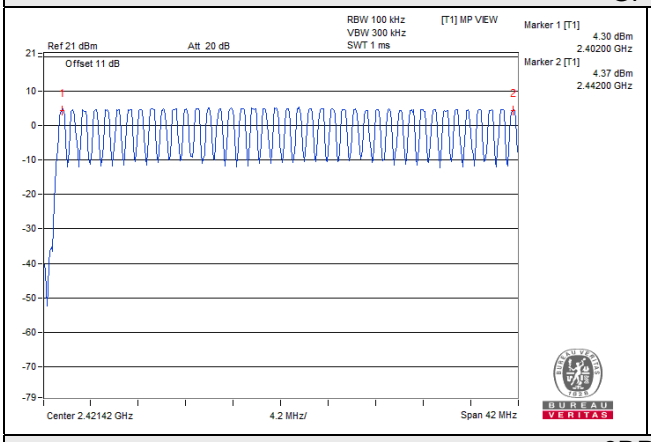
4.3.5 Deviation fromTest Standard

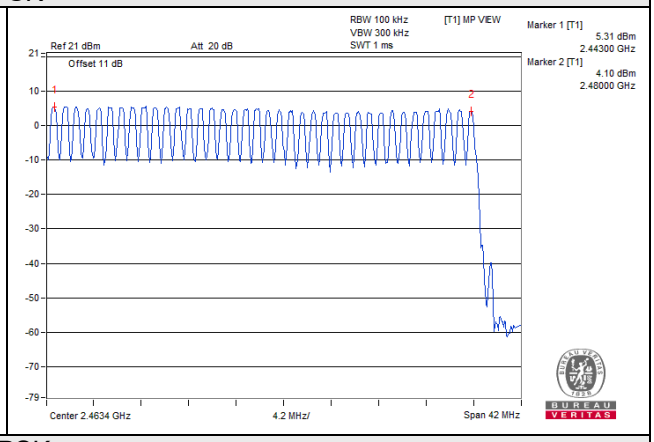
No deviation.

4.3.6 Test Results

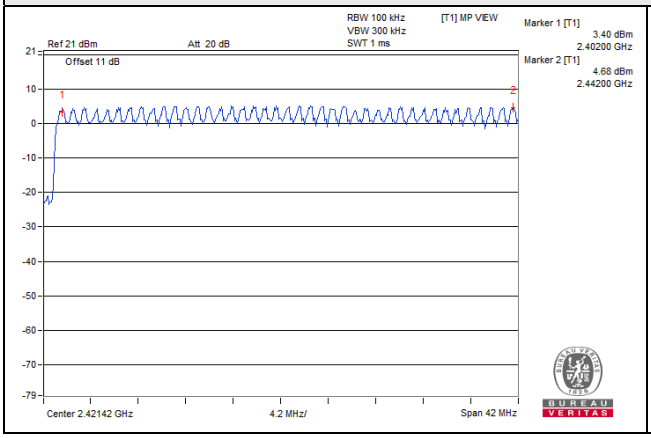
There are 79 hopping frequencies in the hopping mode. Please refer to next page for the test result. On the plots, it shows that the hopping frequencies are equally spaced.

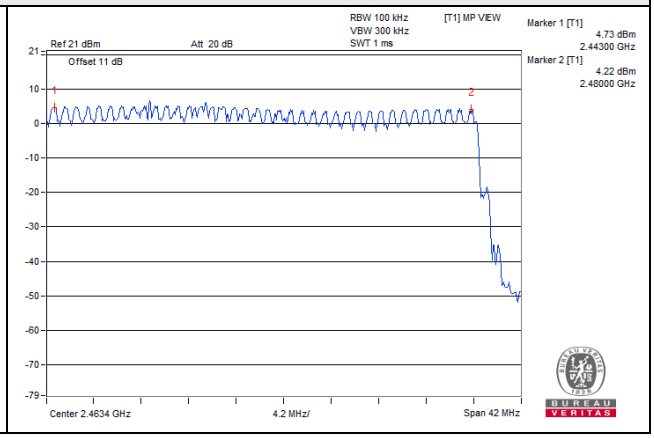
GFSK





8DPSK





4.4 Dwell Time on Each Channel

4.4.1 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.

4.4.2 Test Setup

4.4.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.4.4 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.

4.4.5 Deviation from Test Standard

No deviation.

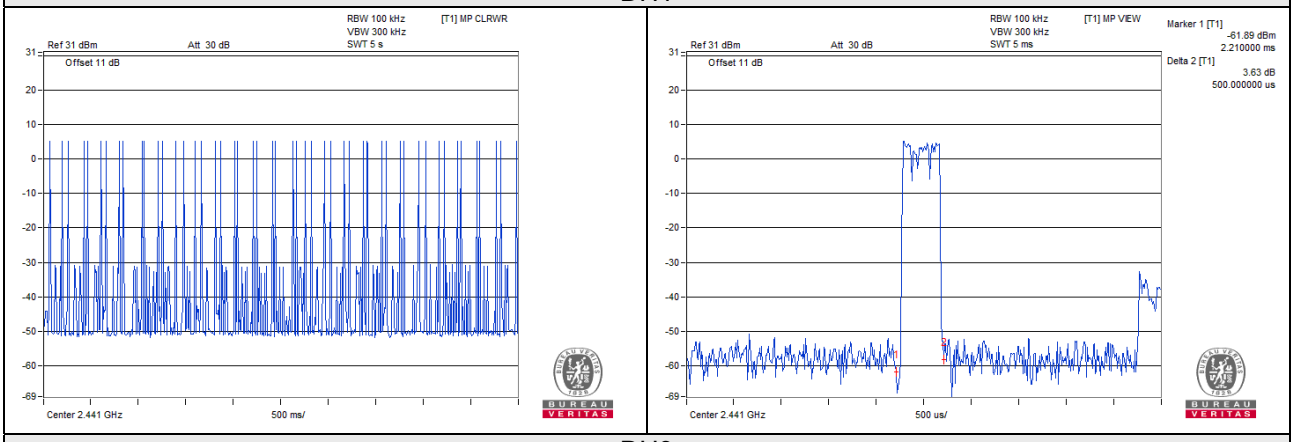
4.4.6 Test Results

GFSK

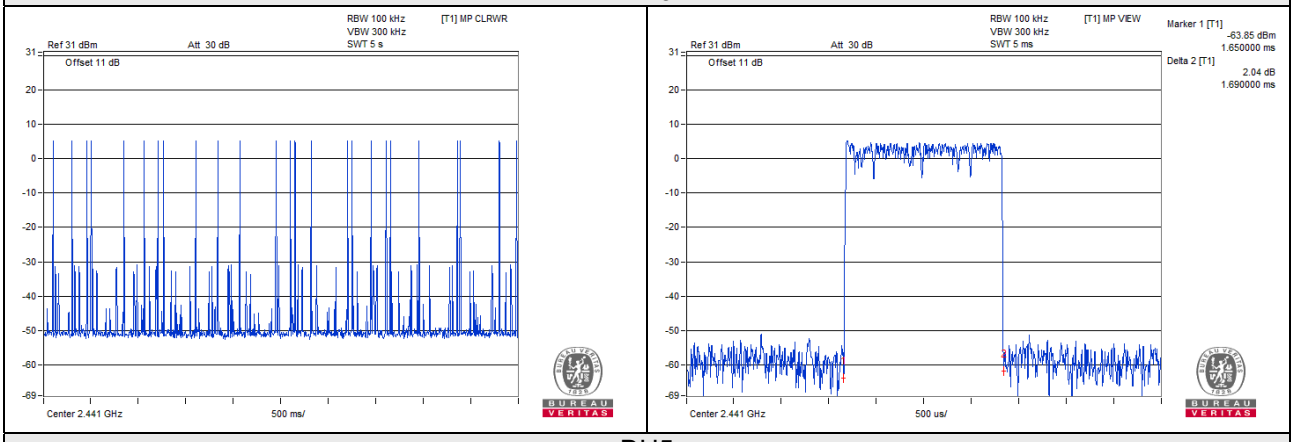
Mode	Number of transmission in a 31.6 (79Hopping*0.4)	Length of transmission time (msec)	Result (msec)	Limit (msec)
DH1	50 (times / 5 sec) * 6.32 = 316 times	0.500	158.00	400
DH3	25 (times / 5 sec) * 6.32 = 158 times	1.690	267.02	400
DH5	18 (times / 5 sec) * 6.32 = 114 times	2.935	334.59	400

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

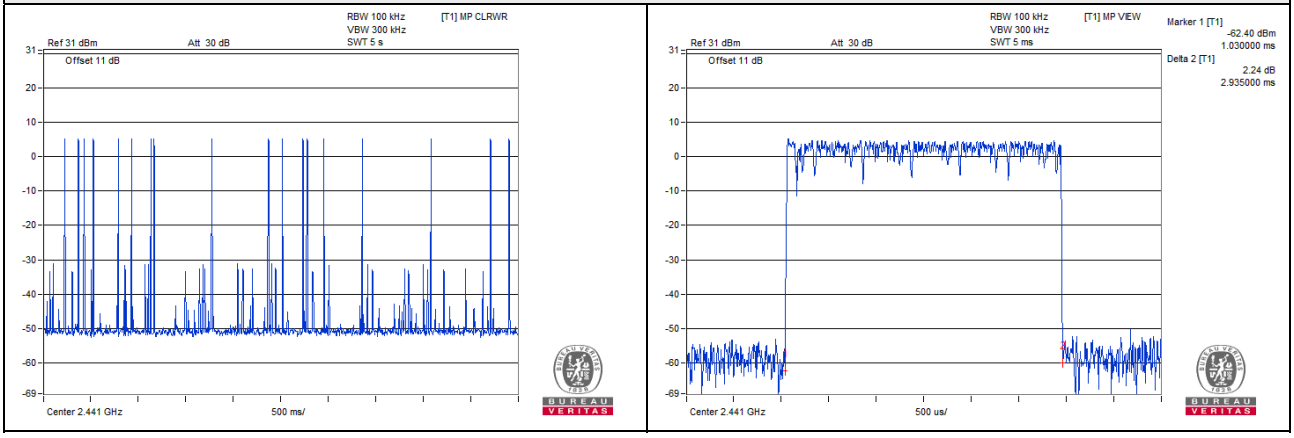
DH1



DH3



DH5

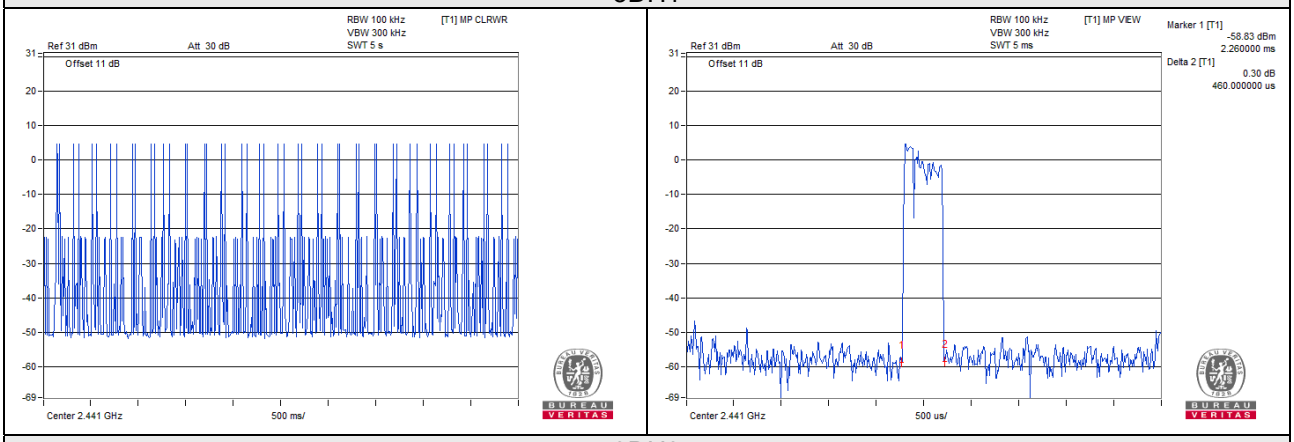


8DPSK

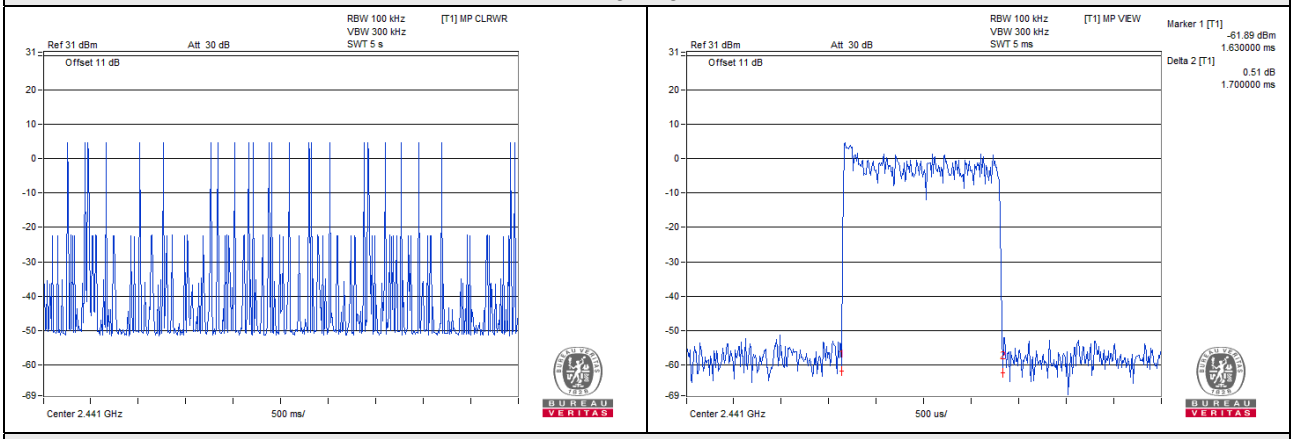
Mode	Number of transmission in a 31.6 (79Hopping*0.4)	Length of transmission time (msec)	Result (msec)	Limit (msec)
3DH1	50 (times / 5 sec) * 6.32 = 316 times	0.460	145.36	400
3DH3	25 (times / 5 sec) * 6.32 = 158 times	1.700	268.60	400
3DH5	17 (times / 5 sec) * 6.32 = 108 times	2.935	316.98	400

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

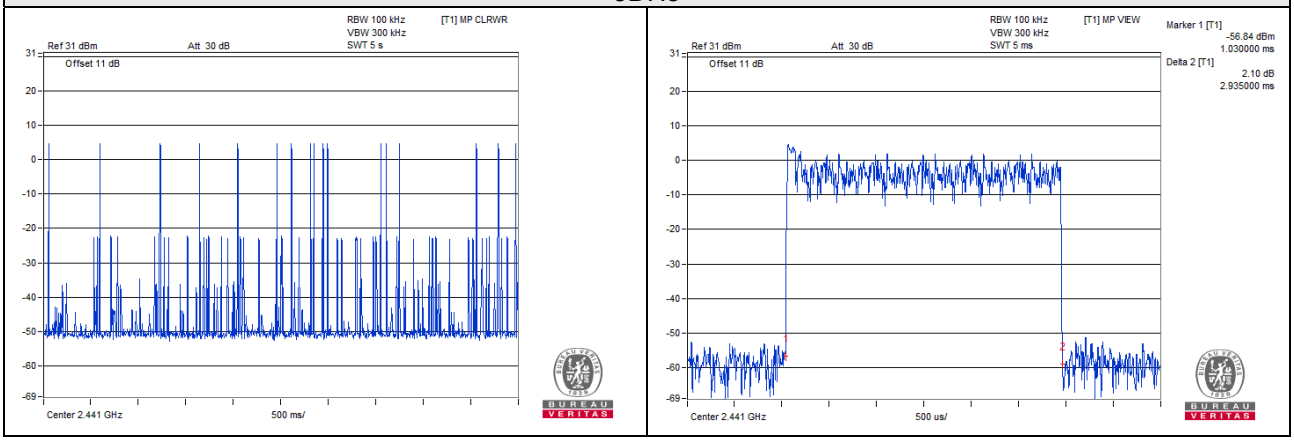
3DH1



3DH3



3DH5



4.5 Channel Bandwidth

4.5.1 Limits of Channel Bandwidth Measurement

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

4.5.2 Test Setup

4.5.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.5.4 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 measuring instrument equal to the highest peak value.
c. Measure the frequency difference of two frequencies that were attenuated 20dB from the reference level. Record the frequency difference as the emission bandwidth.
d. Repeat above procedures until all frequencies measured were complete.

4.5.5 Deviation from Test Standard

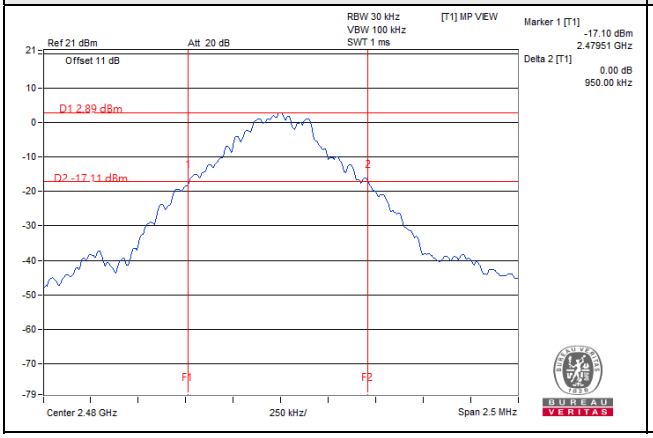
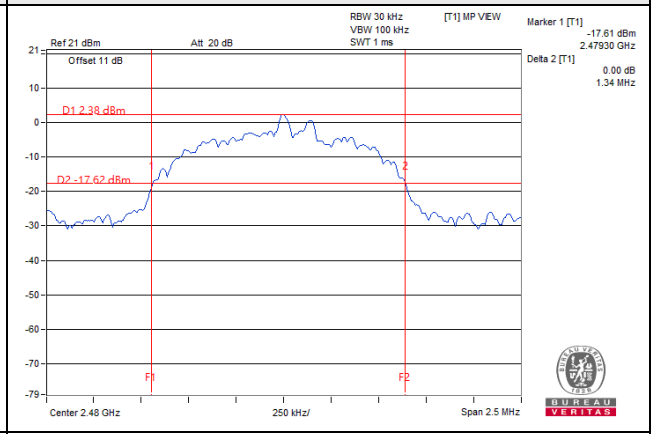
No deviation.

4.5.6 EUT Operating Condition

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

4.5.7 Test Results

Channel	Frequency (MHz)	20dB Bandwidth (MHz)	
		GFSK	8DPSK
0	2402	0.94	1.33
39	2441	0.95	1.33
78	2480	0.95	1.34

Spectrum Plot of Worst Value	
GFSK	8DPSK
	

4.6 Hopping Channel Separation

4.6.1 Limits of Hopping Channel Separation Measurement

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

4.6.2 Test Setup

4.6.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.6.4 Test Procedure

Measurement Procedure REF

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.

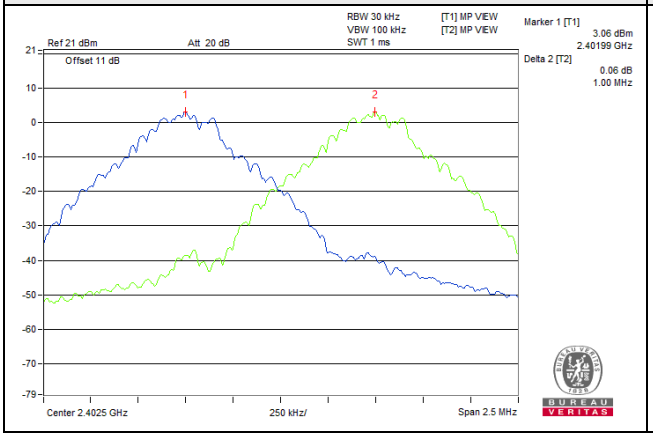
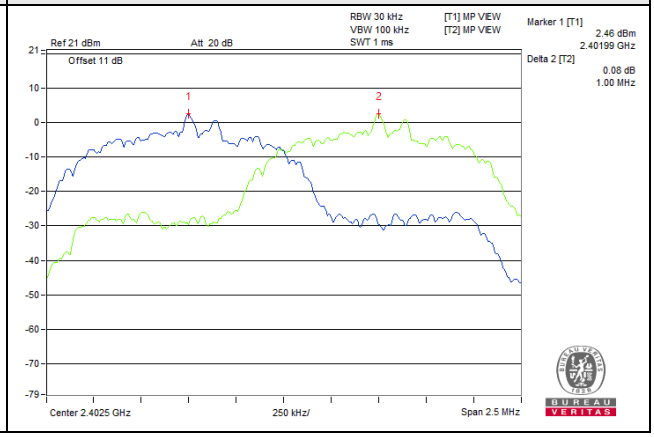
4.6.5 Deviation from Test Standard

No deviation.

4.6.6 Test Results

Channel	Frequency (MHz)	Adjacent Channel Separation (MHz)		20dB Bandwidth (MHz)		Minimum Limit (MHz)		Pass / Fail
		GFSK	8DPSK	GFSK	8DPSK	GFSK	8DPSK	
0	2402	1.00	1.00	0.94	1.33	0.63	0.89	Pass
39	2441	1.00	1.00	0.95	1.33	0.64	0.89	Pass
78	2480	1.00	1.00	0.95	1.34	0.64	0.90	Pass

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

Spectrum Plot of Worst Value	
GFSK	8DPSK
	

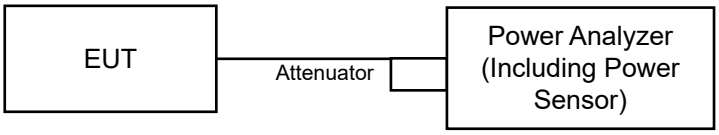
4.7 Maximum Output Power

4.7.1 Limits of Maximum Output Power Measurement

For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels: 1 watt.

For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts.

4.7.2 Test Setup



4.7.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.7.4 Test Procedure

For Peak Power
A peak power sensor was used on the output port of the EUT. A power meter was used to read the response of the peak power sensor. Record the power level.

For Average Power
Average power sensor was used to perform output power measurement, trigger and gating function of wide band power meter is enabled to measure max output power of TX on burst. Duty factor is not added to measured value.

4.7.5 Deviation fromTest Standard

No deviation.

4.7.6 EUT Operating Condition

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

4.7.7 Test Results

For Peak Power

Channel	Frequency (MHz)	Peak Power (mW)		Peak Power (dBm)		Power Limit (mW)	Pass / Fail
		GFSK	8DPSK	GFSK	8DPSK		
0	2402	3.027	7.980	4.81	9.02	125 / 1000 Note	Pass
39	2441	3.443	9.863	5.37	9.94	125 / 1000 Note	Pass
78	2480	3.013	**11.092**	4.79	10.45	125 / 1000 Note	Pass

Note: RF Output Power limit depends on the operating channel numbers, please refer to section 3.2 of the results.

For Average Power

Channel	Frequency (MHz)	Average Power (mW)		Average Power (dBm)	
		GFSK	8DPSK	GFSK	8DPSK
0	2402	2.286	3.083	3.59	4.89
39	2441	2.594	3.597	4.14	5.56
78	2480	2.265	4.256	3.55	6.29

4.8 Conducted Out of Band Emission Measurement

4.8.1 Limits Of Conducted Out Of Band Emission Measurement

Below -20dB of the highest emission level of operating band (in 100kHz RBW).

4.8.2 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.8.3 Test Procedure

The transmitter output was connected to the spectrum analyzer via a low lose cable. Set both RBW and VBW of spectrum analyzer to 100 kHz and 300 kHz with suitable frequency span including 100 MHz bandwidth from band edge. The band edges was measured and recorded.

4.8.4 Deviation from Test Standard

No deviation.

4.8.5 EUT Operating Condition

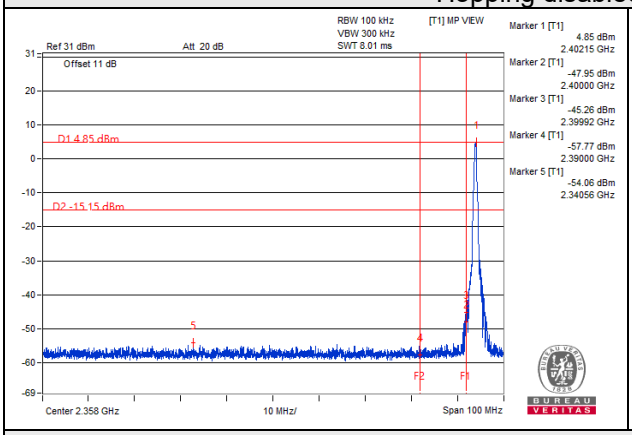
The software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel frequencies individually.

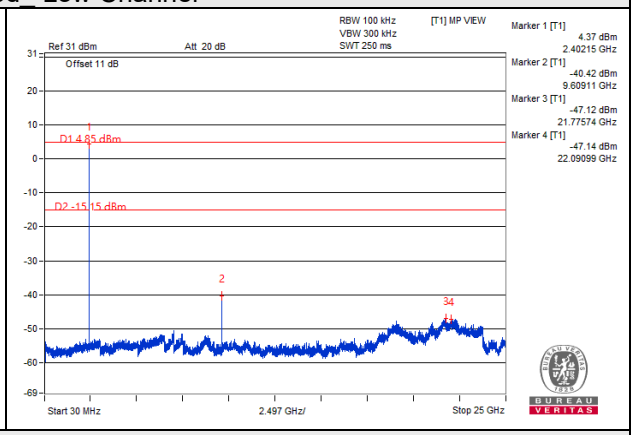
4.8.6 Test Results

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.

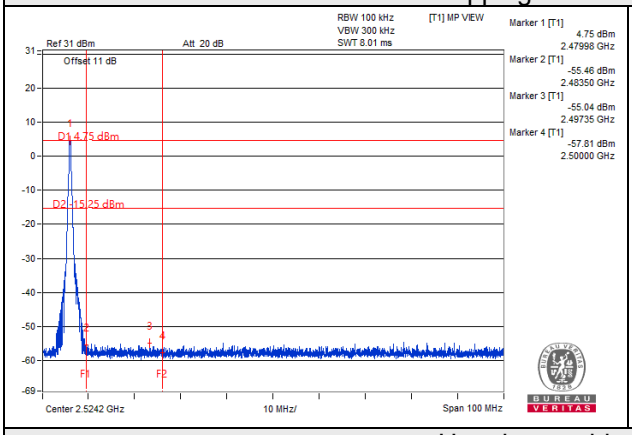
GFSK

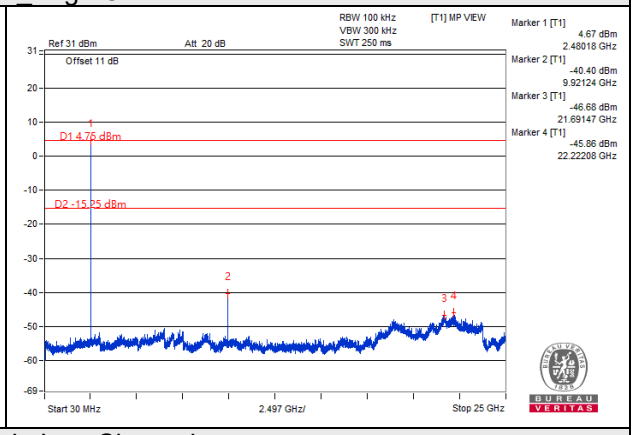
Hopping disabled_ Low Channel



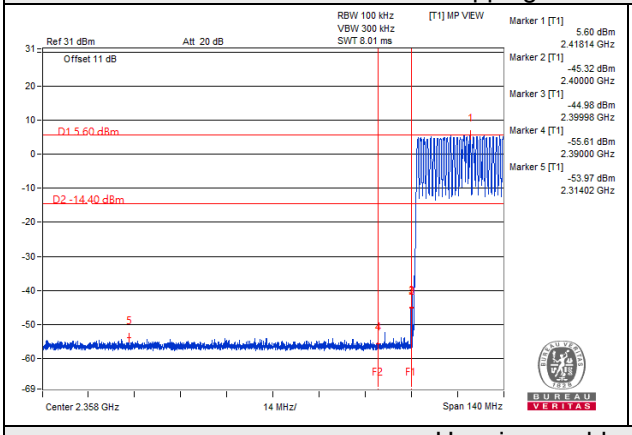


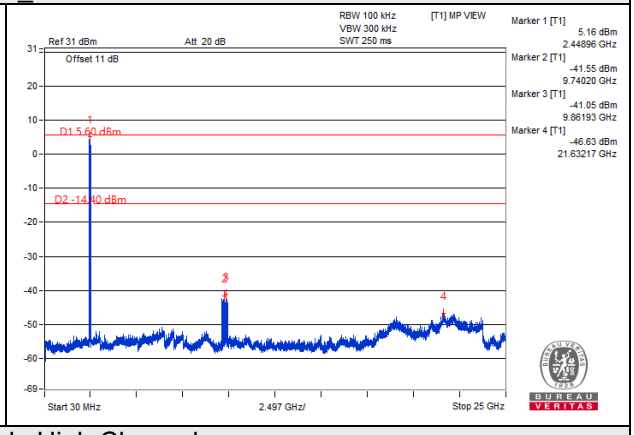
Hopping disabled_ High Channel



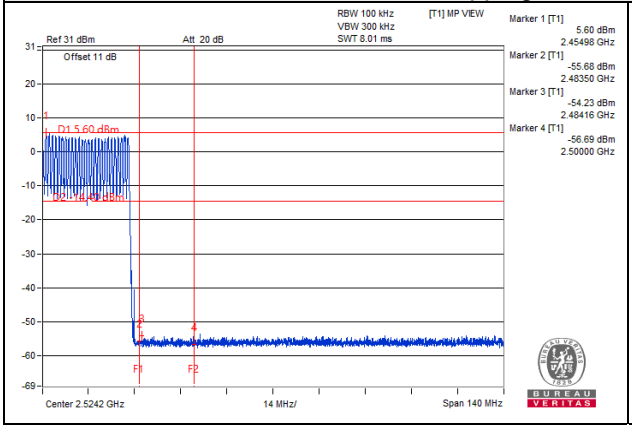


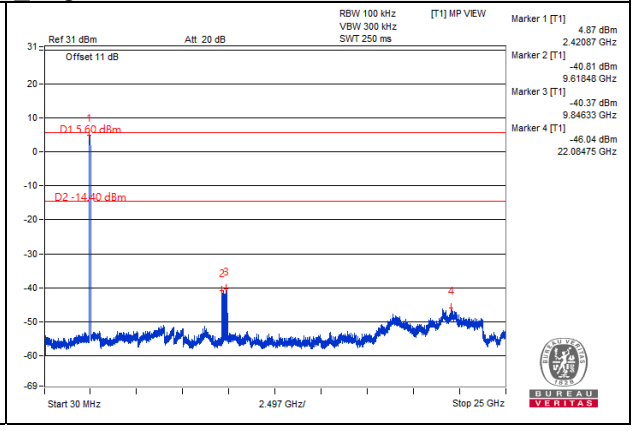
Hopping enabled_ Low Channel





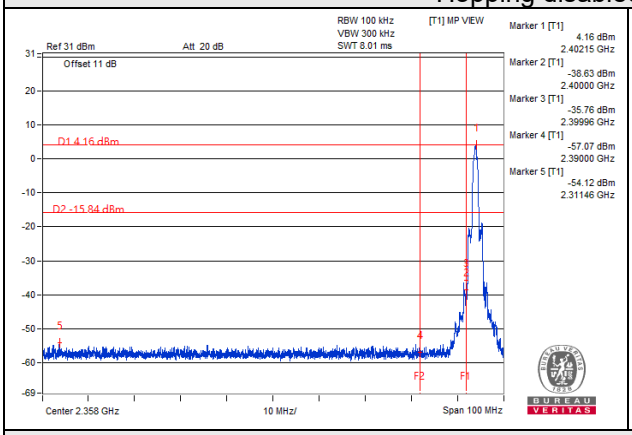
Hopping enabled_ High Channel

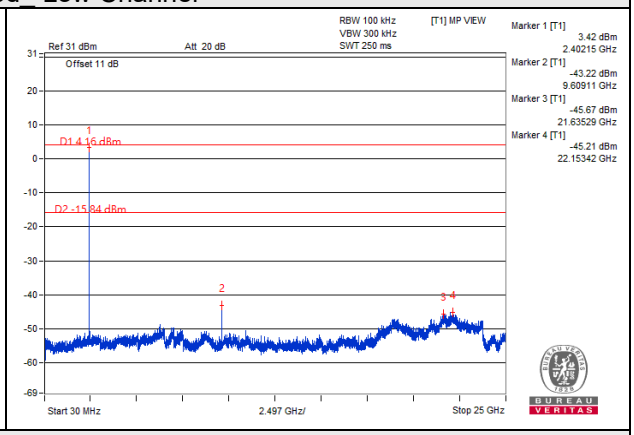




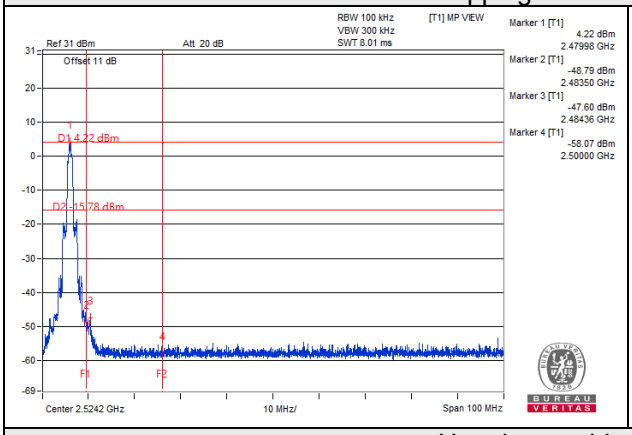
8DPSK

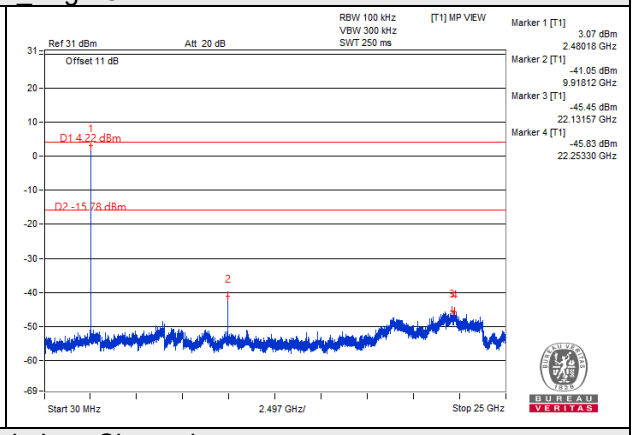
Hopping disabled_ Low Channel



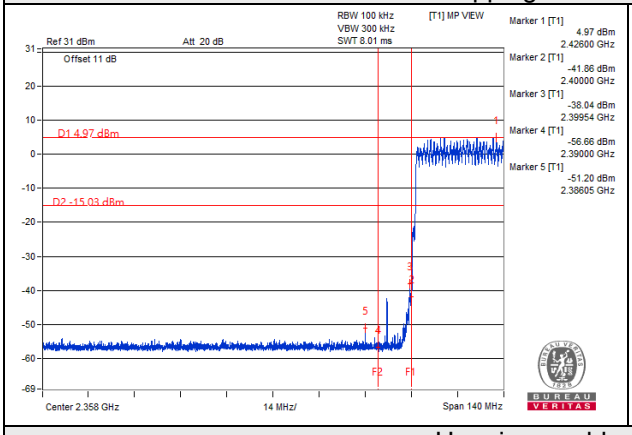


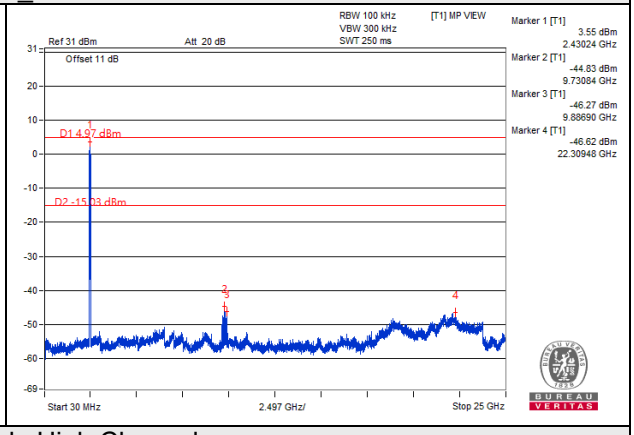
Hopping disabled_ High Channel



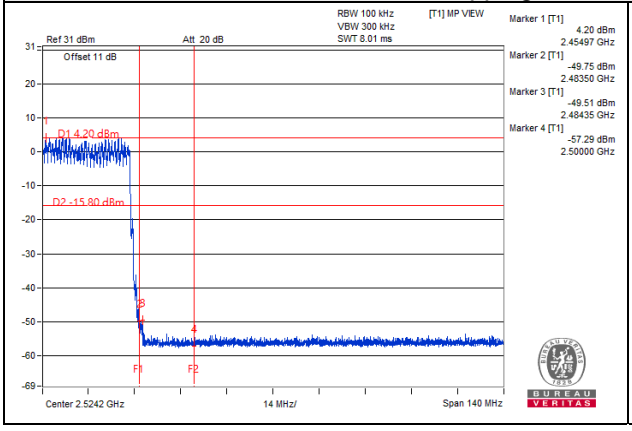


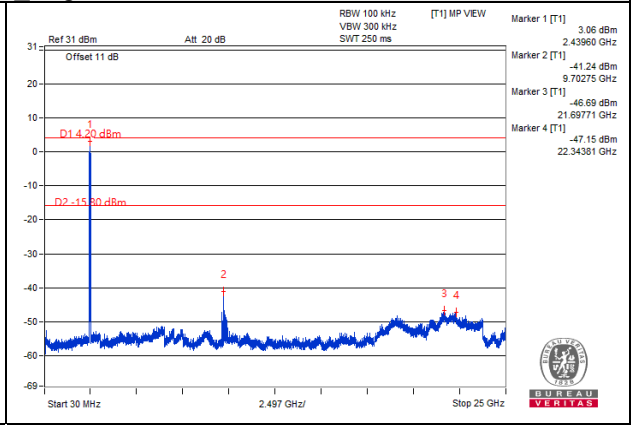
Hopping enabled_ Low Channel





Hopping enabled_ High Channel

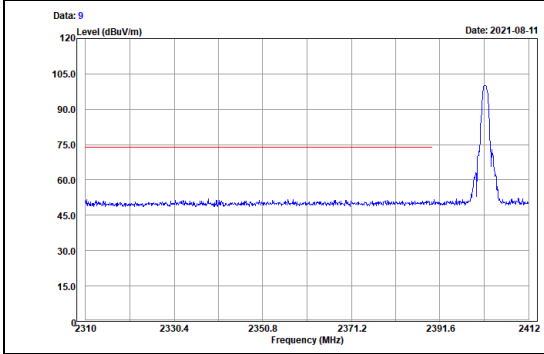
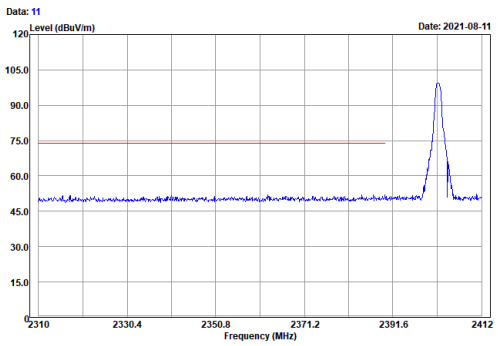
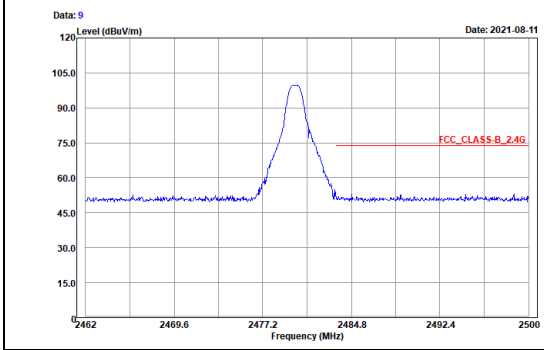
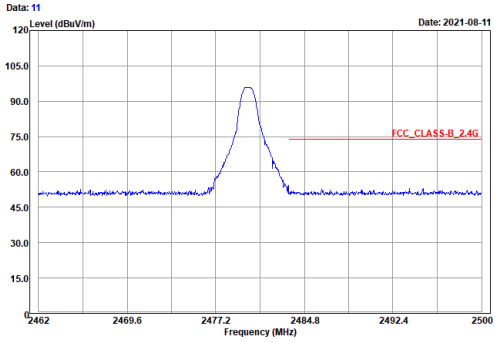
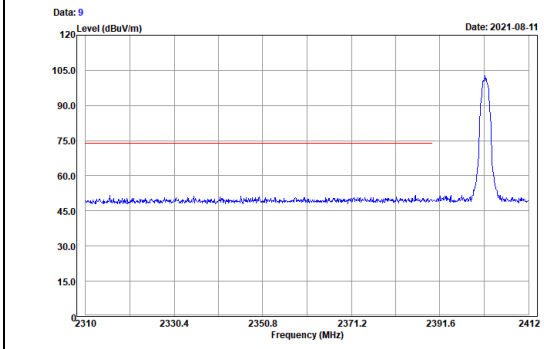
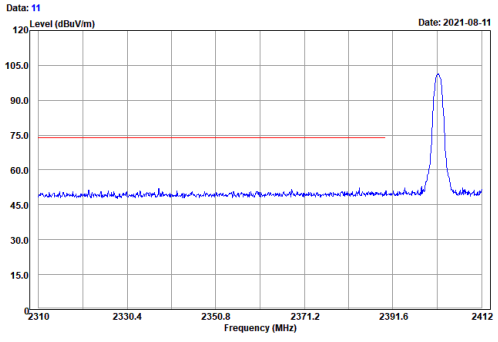
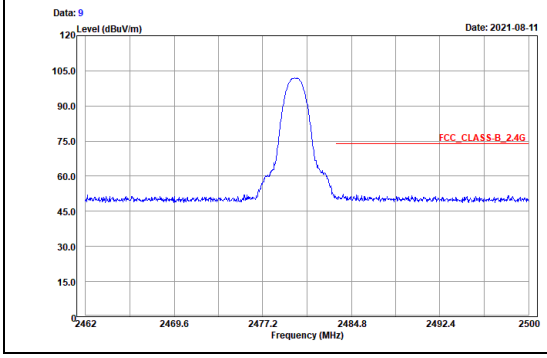
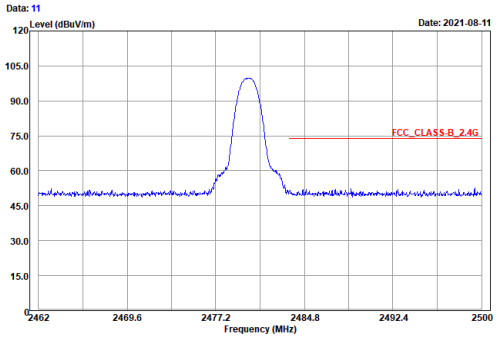




5 Pictures of Test Arrangements

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

Annex A- Band Edge Measurement

BT_GFSK Channel 0	
Horizontal (Peak)	Vertical (Peak)
	
BT_GFSK Channel 78	
Horizontal (Peak)	Vertical (Peak)
	
BT_8DPSK Channel 0	
Horizontal (Peak)	Vertical (Peak)
	
BT_8DPSK Channel 78	
Horizontal (Peak)	Vertical (Peak)
	

Appendix – Information of the Testing Laboratories

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. 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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The address and road map of all our labs can be found in our web site also.

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