FCC Test Report
(BT-EDR)

Report No.:	RFBEMI-WTW-P21080520-2
FCC ID:	NOIKBN778K
Test Model:	N778K
Received Date:	2021/8/11
Test Date:	2021/10/7 ~ 2021/10/30
Issued Date:	2021/11/18
Applicant:	NETRONIX, INC.
Address:	No 945, Boai St, Jubei City. Hsinchu, 30265 Taiwan
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
FCC Registration / Designation Number:	198487 / TW2021

Testing Laboratory
2021

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Release Control Record

Issue No.	Description	Date Issued
RFBEMI-WTW-P21080520-2	Original release.	2021/11/18

1 Certificate of Conformity

Product:	Electronic Display Device
Brand:	Rakuten kobo
Test Model:	N778K
Sample Status:	Engineering sample
Applicant:	NETRONIX, INC.
Test Date:	2021/10/7 ~ 2021/10/30
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 : Jessica Cheng , **Date:** 2021/11/18

Jessica Cheng / Senior Specialist

Approved by : Jeremy Lin , **Date:** 2021/11/18

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 -19.22dB at 0.74000MHz.
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 & 209 & 15.247(d)	Radiated Emissions & Band Edge Measurement	Pass	Meet the requirement of limit. Minimum passing margin is -7.36dB at 82.38MHz.
15.247(d)	Antenna Port Emission	Pass	Meet the requirement of limit.
15.203	Antenna Requirement	Pass	No antenna connector is used.

NOTE:

1. Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.
2. 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.
3. For 2.4GHz 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.

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	3.00 dB
Conducted Emissions	9kHz ~ 40GHz	2.63 dB
Radiated Emissions up to 1 GHz	9kHz ~ 30MHz	2.38 dB
	30MHz ~ 1GHz	5.70 dB
Radiated Emissions above 1 GHz	Above 1GHz	5.21 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	Electronic Display Device
Brand	Rakuten kobo
Test Model	N778K
Status of EUT	Engineering sample
Power Supply Rating	3.7Vdc from Battery or 5Vdc from USB interface
Modulation Type	GFSK, π/4-DQPSK, 8DPSK
Modulation Technology	FHSS
Transfer Rate	Up to 3Mbps
Operating Frequency	2402MHz ~ 2480MHz
Number of Channel	79
Output Power	2.999mW
Antenna Type	Refer to note as below
Antenna Connector	Refer to note as below
Accessory Device	N/A
Data Cable Supplied	Shielded USB cable (1.0m)

Note:

1. There are WLAN and Bluetooth technologies used for the EUT.
2. Simultaneously transmission condition.

Condition	Technology	
1	WLAN (2.4GHz)	Bluetooth
2	WLAN (5GHz)	Bluetooth
Note: The emission of the simultaneous operation has been evaluated and no non-compliances was found		

3. Two eMMCs provided to the EUT, please refer to the following table:

No.	Model	Remark
1	EMMC32G-TX29-GA8A	1st source eMMC
2	MKEMF032GZ1E-C	2nd source eMMC
Note: From the above eMMCs the worst case was found in **No. 1.** Therefore only the test data of the mode was recorded in this report.		

4. The following antennas were provided to the EUT.

Brand	Model	Gain (dBi)	Frequency range	Antenna Type	Antenna Connector
INPAQ	ACM3-3216-P1-CC-S	0.6	2.4~2.4835GHz	Chip	None
INPAQ	ACM3-3216-P1-CC-S	2	5.15~5.85GHz	Chip	None

5. 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.
6. The EUT was pre-tested under the following modes:

Pre-test Mode	Test Condition
A	Battery mode,
B	USB Adapter mode
C	Notebook mode
D	**USB Adapter mode with Leather Sheath**
Note: From the above mode, the worst case was found in **Mode D**. Therefore only the test data of the mode was recorded in this report.	

7. 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.

3.2 Description of Test Modes

79 channels are provided for BT-EDR mode:

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	√	√	√	√	USB Adapter mode with Leather Sheath
B	-	-	√	-	Notebook mode with Leather Sheath

Where **RE≥1G:** Radiated Emission above 1GHz **RE<1G:** Radiated Emission below 1GHz
PLC: Power Line Conducted Emission **APCM:** Antenna Port Conducted Measurement

NOTE: The EUT had been pre-tested on the positioned of each 3 axis. The worst case was found when positioned on **X-plane**.

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	Packet 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	Packet Type
A	0 to 78	0	FHSS	GFSK	DH5

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	Packet Type
A & B	0 to 78	0	FHSS	GFSK	DH5

Antenna Port Conducted Measurement:

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

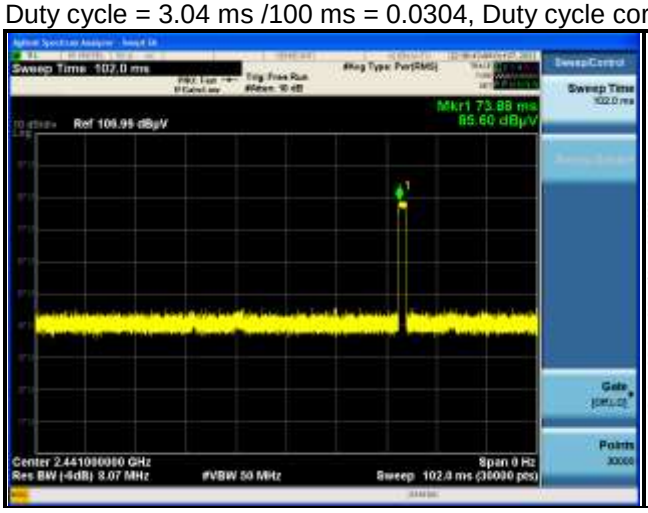
EUT Configure Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Packet Type
A	0 to 78	0, 39, 78	FHSS	GFSK	DH5
A	0 to 78	0, 39, 78	FHSS	8DPSK	3DH5

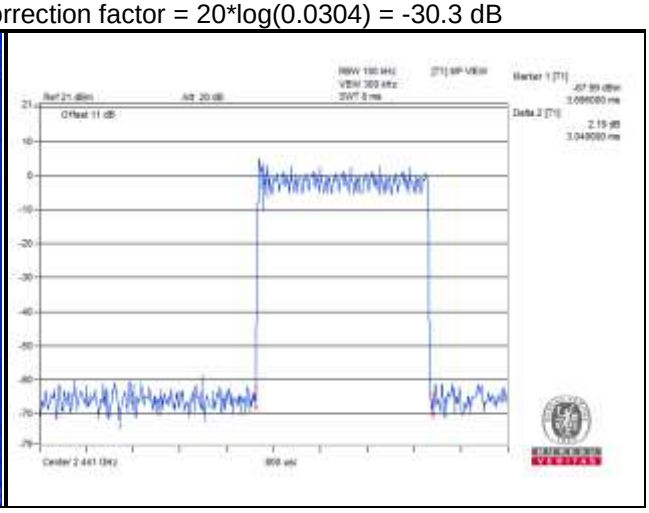
Test Condition:

Applicable To	EUT Configure Mode	Environmental Conditions	Input Power	Tested By
RE≥1G	A	23deg. C, 53%RH	120Vac, 60Hz (Adapter)	Jed Wu
RE<1G	A	30deg. C, 75%RH	120Vac, 60Hz (Adapter)	Ian Chang
PLC	A	25deg. C, 75%RH	120Vac, 60Hz (Adapter)	Starltaly Wu
	B	25deg. C, 75%RH	120Vac, 60Hz (Notebook)	Starltaly Wu
APCM	A	25deg. C, 76%RH	120Vac, 60Hz (Adapter)	Pirar Hsieh

3.3 Duty Cycle of Test Signal

The DCCF was worst case mode as follows:
Duty cycle of test signal is < 98%, Duty cycle correction factor shall be considered.
Duty cycle = 3.04 ms /100 ms = 0.0304, Duty cycle correction factor = 20*log(0.0304) = -30.3 dB





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.

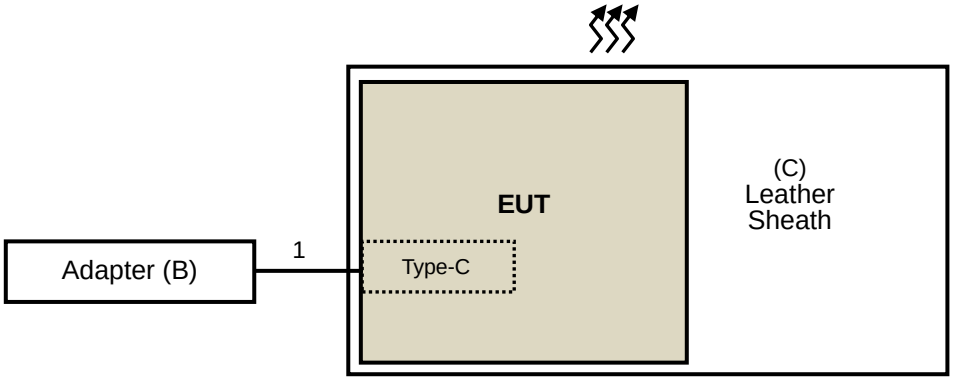
ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	Notebook PC	Lenove	81LG	PF1NF9V2	N/A	Provided by Lab
B.	Adapter	Apple	A1385	N/A	N/A	Provided by Lab
C.	Leather Sheath	Rakuten kobo	N/A	N/A	N/A	Supplied by applicant

ID	Cable Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	USB Type-C cable	1	1	Y	0	Supplied by applicant

3.4.1 Configuration of System under Test

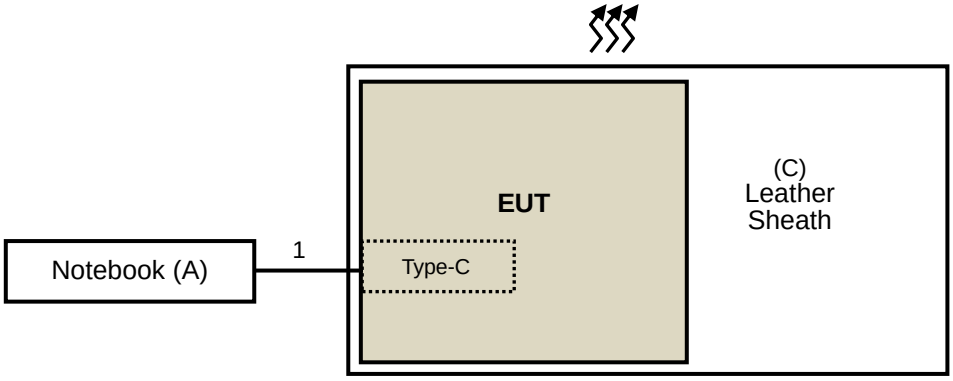
Mode A

Powered from Adaptere with Leather Sheath



Mode B

Powered from Notebooke with Leather Sheath



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.	Calibrated Date	Calibrated Until
Test Receiver Agilent	N9038A	MY51210129	2021/3/12	2022/3/11
Software BVADT	ADT_Radiated_V8.7.08	NA	NA	NA
Software BVADT	ADT_RF Test Software V6.6.5.4	NA	NA	NA
Auto Control System(Antenna Tower, Table, Controller) ADT	SC100+AT100+TT100	0306	NA	NA
Pre_Amplifier EMCI	EMC001340	980269	2021/6/29	2022/6/28
LOOP ANTENNA EMCI	LPA600	270	2021/9/2	2023/9/1
RF Coaxial Cable Pacific	8D-FB	Cable-CH6-02	2021/7/13	2022/7/12
Pre_Amplifier HP	8447D	2432A03504	2021/2/18	2022/2/17
Bi-log Broadband Antenna Schwarzbeck	VULB9168	139	2020/11/6	2021/11/5
Attenuator Mini-Circuits	UNAT-5+	PAD-CH6-01	2021/7/13	2022/7/12
RF Coaxial Cable Pacific	8D-FB	Cable-CH6-02	2021/7/13	2022/7/12
Antenna(Horn) EMCO	3115	00028257	2020/11/22	2021/11/21
Test Receiver Agilent	N9038A	MY51210129	2021/3/12	2022/3/11
Pre-amplifier HP	8449B	3008A01201	2021/2/19	2022/2/18
RF Coaxial Cable NEAT BAR PROER SUHNER	SF-102	Cable-CH6-01	2021/7/8	2022/7/7
Highpass filter Wainwright Instruments	WHK 3.1/18G-10SS	SN 8	2021/5/28	2022/5/27
Fix tool for Boresight	BAF-01	5	NA	NA
Pre_Amplifier MITEQ	AMF-6F-260400-33-8P	892164	2021/2/19	2022/2/18
Antenna(Horn) Schwarzbeck	BBHA-9170	BBHA9170190	2020/11/22	2021/11/21
Spectrum Analyzer R&S	FSV40	101544	2021/5/24	2022/5/23
RF Coaxial Cable WOKEN	WC01	Cable-CH10-03	2021/7/8	2022/7/7
RF Coaxial Cable Rosnol	K1K50-UP0279-K1K50-3000	Cable-CH10(3m)-04	2021/7/8	2022/7/7
Highpass filter SUHNER	11SH10-7000/T18000-O/OP	SN 4	2021/5/28	2022/5/27

NOTE: 1. The calibration interval of the above test instruments is 12/24 months. And the calibrations are traceable to NML/ROC and NIST/USA.
2. The horn antenna and HP preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
3. The test was performed in LK - 966 chamber 1.
4. Tested Date: 2021/10/7

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: 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:

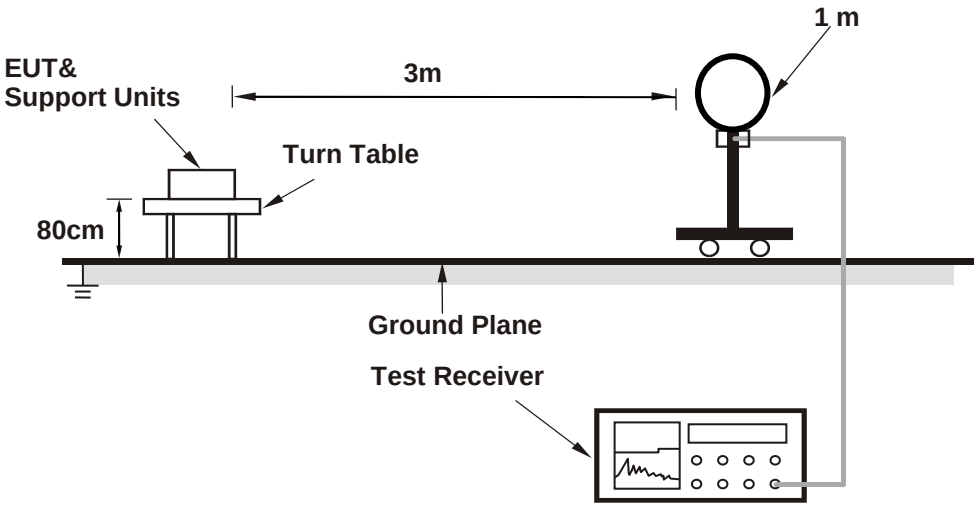
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) and Average detection at frequency above 1GHz. For fundamental and harmonic signal measurement, 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

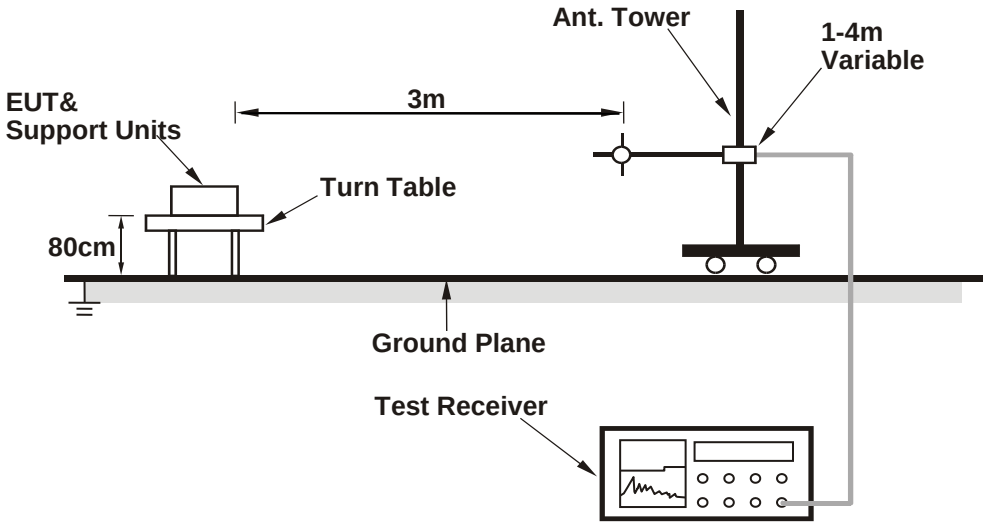
No deviation.

4.1.5 Test Setup

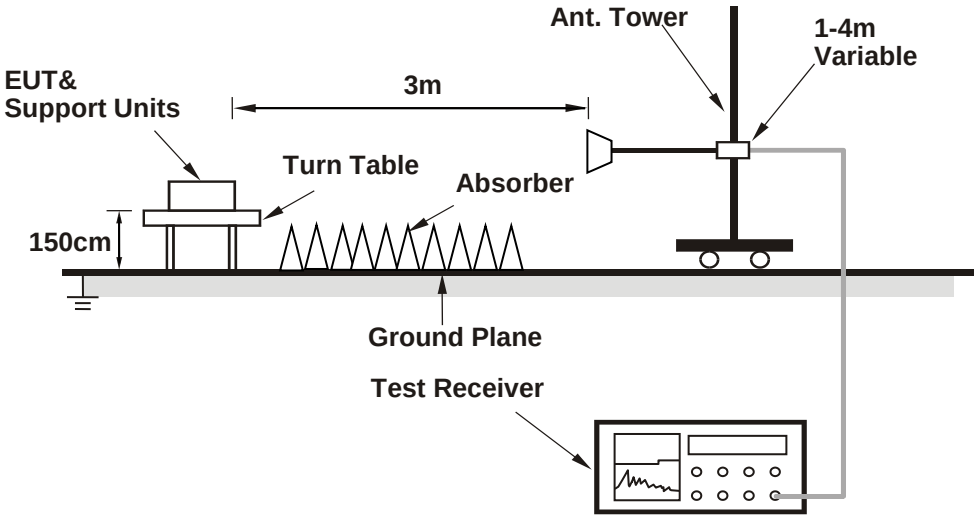
For Radiated emission below 30MHz



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

a. Connected the EUT to Adapter.
b. Set the EUT under transmission condition continuously at specific channel frequency continuously.

4.1.7 Test Results

ABOVE 1GHz DATA

Mode A

RF Mode	TX BT_GFSK	**Channel**	CH 0：2402 MHz
Frequency Range	1GHz ~ 25GHz	**Detector Function**	Peak (PK) Average (AV)

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	**Frequency (MHz)**	**Emission Level (dBuV/m)**	**Limit (dBuV/m)**	**Margin (dB)**	**Antenna Height (m)**	**Table Angle (Degree)**	**Raw Value (dBuV)**	**Correction Factor (dB/m)**
1	2390.00	51.85 PK	74.00	-22.15	1.80 H	206	54.13	-2.28
2	2390.00	41.95 AV	54.00	-12.05	1.80 H	206	44.23	-2.28
3	*2402.00	109.84 PK			1.80 H	206	112.06	-2.22
4	*2402.00	79.54 AV			1.80 H	206	81.76	-2.22
5	4804.00	48.92 PK	74.00	-25.08	1.39 H	334	43.26	5.66
6	4804.00	18.62 AV	54.00	-35.38	1.39 H	334	12.96	5.66
Antenna Polarity & Test Distance : Vertical at 3 m								
No	**Frequency (MHz)**	**Emission Level (dBuV/m)**	**Limit (dBuV/m)**	**Margin (dB)**	**Antenna Height (m)**	**Table Angle (Degree)**	**Raw Value (dBuV)**	**Correction Factor (dB/m)**
1	2390.00	51.88 PK	74.00	-22.12	3.68 V	16	54.16	-2.28
2	2390.00	40.93 AV	54.00	-13.07	3.68 V	16	43.21	-2.28
3	*2402.00	108.49 PK			3.68 V	16	110.71	-2.22
4	*2402.00	78.19 AV			3.68 V	16	80.41	-2.22
5	4804.00	48.77 PK	74.00	-25.23	2.30 V	52	43.11	5.66
6	4804.00	18.47 AV	54.00	-35.53	2.30 V	52	12.81	5.66

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " * ": Fundamental frequency.
6. The average value of fundamental and harmonic frequency is: Average value = Peak value + 20 log(Duty cycle) Where the Duty cycle correction factor is calculated from following formula:
   20 log(Duty cycle) = 20 log(3.04 ms / 100 ms) = -30.3 dB
   Please refer to the plotted duty (see section 3.3)

RF Mode	TX BT_GFSK	Channel	CH 39：2441 MHz
Frequency Range	1GHz ~ 25GHz	Detector Function	Peak (PK) Average (AV)

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2441.00	107.08 PK			1.21 H	267	109.22	-2.14
2	*2441.00	76.78 AV			1.21 H	267	78.92	-2.14
3	4882.00	48.92 PK	74.00	-25.08	1.42 H	326	43.23	5.69
4	4882.00	18.62 AV	54.00	-35.38	1.42 H	326	12.93	5.69
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2441.00	104.87 PK			2.62 V	26	107.01	-2.14
2	*2441.00	74.57 AV			2.62 V	26	76.71	-2.14
3	4882.00	48.79 PK	74.00	-25.21	2.27 V	58	43.10	5.69
4	4882.00	18.49 AV	54.00	-35.51	2.27 V	58	12.80	5.69

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " * ": Fundamental frequency.
6. The average value of fundamental and harmonic frequency is: Average value = Peak value + 20 log(Duty cycle) Where the Duty cycle correction factor is calculated from following formula:
   20 log(Duty cycle) = 20 log(3.04 ms / 100 ms) = -30.3 dB
   Please refer to the plotted duty (see section 3.3)

RF Mode	TX BT_GFSK	Channel	CH 78：2480 MHz
Frequency Range	1GHz ~ 25GHz	Detector Function	Peak (PK) Average (AV)

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2480.00	108.20 PK			1.06 H	293	110.16	-1.96
2	*2480.00	77.90 AV			1.06 H	293	79.86	-1.96
3	2483.50	58.69 PK	74.00	-15.31	1.06 H	293	60.63	-1.94
4	2483.50	28.39 AV	54.00	-25.61	1.06 H	293	30.33	-1.94
5	4960.00	49.34 PK	74.00	-24.66	1.57 H	319	43.48	5.86
6	4960.00	19.04 AV	54.00	-34.96	1.57 H	319	13.18	5.86
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2480.00	105.66 PK			2.56 V	24	107.62	-1.96
2	*2480.00	75.36 AV			2.56 V	24	77.32	-1.96
3	2483.50	57.53 PK	74.00	-16.47	2.56 V	24	59.47	-1.94
4	2483.50	27.23 AV	54.00	-26.77	2.56 V	24	29.17	-1.94
5	4960.00	48.64 PK	74.00	-25.36	2.16 V	79	42.78	5.86
6	4960.00	18.34 AV	54.00	-35.66	2.16 V	79	12.48	5.86

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " * ": Fundamental frequency.
6. The average value of fundamental and harmonic frequency is: Average value = Peak value + 20 log(Duty cycle) Where the Duty cycle correction factor is calculated from following formula:
   20 log(Duty cycle) = 20 log(3.04 ms / 100 ms) = -30.3 dB
   Please refer to the plotted duty (see section 3.3)

RF Mode	TX BT_8DPSK	Channel	CH 0：2402 MHz
Frequency Range	1GHz ~ 25GHz	Detector Function	Peak (PK) Average (AV)

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2390.00	51.67 PK	74.00	-22.33	1.63 H	203	53.95	-2.28
2	2390.00	40.84 AV	54.00	-13.16	1.63 H	203	43.12	-2.28
3	*2402.00	106.51 PK			1.63 H	203	108.73	-2.22
4	*2402.00	76.21 AV			1.63 H	203	78.43	-2.22
5	4804.00	49.44 PK	74.00	-24.56	1.53 H	319	43.78	5.66
6	4804.00	19.14 AV	54.00	-34.86	1.53 H	319	13.48	5.66
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2390.00	52.07 PK	74.00	-21.93	3.73 V	23	54.35	-2.28
2	2390.00	40.47 AV	54.00	-13.53	3.73 V	23	42.75	-2.28
3	*2402.00	103.99 PK			3.73 V	23	106.21	-2.22
4	*2402.00	73.69 AV			3.73 V	23	75.91	-2.22
5	4804.00	48.88 PK	74.00	-25.12	2.10 V	69	43.22	5.66
6	4804.00	18.58 AV	54.00	-35.42	2.10 V	69	12.92	5.66

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " * ": Fundamental frequency.
6. The average value of fundamental and harmonic frequency is: Average value = Peak value + 20 log(Duty cycle) Where the Duty cycle correction factor is calculated from following formula:
   20 log(Duty cycle) = 20 log(3.04 ms / 100 ms) = -30.3 dB
   Please refer to the plotted duty (see section 3.3)

RF Mode	TX BT_8DPSK	Channel	CH 39：2441 MHz
Frequency Range	1GHz ~ 25GHz	Detector Function	Peak (PK) Average (AV)

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2441.00	107.53 PK			1.23 H	283	109.67	-2.14
2	*2441.00	77.23 AV			1.23 H	283	79.37	-2.14
3	4882.00	49.51 PK	74.00	-24.49	1.49 H	336	43.82	5.69
4	4882.00	19.21 AV	54.00	-34.79	1.49 H	336	13.52	5.69
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2441.00	105.82 PK			3.23 V	8	107.96	-2.14
2	*2441.00	75.52 AV			3.23 V	8	77.66	-2.14
3	4882.00	49.15 PK	74.00	-24.85	2.31 V	44	43.46	5.69
4	4882.00	18.85 AV	54.00	-35.15	2.31 V	44	13.16	5.69

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " * ": Fundamental frequency.
6. The average value of fundamental and harmonic frequency is: Average value = Peak value + 20 log(Duty cycle) Where the Duty cycle correction factor is calculated from following formula:
   20 log(Duty cycle) = 20 log(3.04 ms / 100 ms) = -30.3 dB
   Please refer to the plotted duty (see section 3.3)

RF Mode	TX BT_8DPSK	Channel	CH 78：2480 MHz
Frequency Range	1GHz ~ 25GHz	Detector Function	Peak (PK) Average (AV)

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2480.00	106.60 PK			1.06 H	293	108.56	-1.96
2	*2480.00	76.30 AV			1.06 H	293	78.26	-1.96
3	2483.50	58.38 PK	74.00	-15.62	1.06 H	293	60.32	-1.94
4	2483.50	28.08 AV	54.00	-25.92	1.06 H	293	30.02	-1.94
5	4960.00	49.43 PK	74.00	-24.57	1.66 H	308	43.57	5.86
6	4960.00	19.13 AV	54.00	-34.87	1.66 H	308	13.27	5.86
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2480.00	104.54 PK			3.19 V	18	106.50	-1.96
2	*2480.00	74.24 AV			3.19 V	18	76.20	-1.96
3	2483.50	55.81 PK	74.00	-18.19	3.19 V	18	57.75	-1.94
4	2483.50	25.51 AV	54.00	-28.49	3.19 V	18	27.45	-1.94
5	4960.00	49.17 PK	74.00	-24.83	2.35 V	88	43.31	5.86
6	4960.00	18.87 AV	54.00	-35.13	2.35 V	88	13.01	5.86

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " * ": Fundamental frequency.
6. The average value of fundamental and harmonic frequency is: Average value = Peak value + 20 log(Duty cycle) Where the Duty cycle correction factor is calculated from following formula:
   20 log(Duty cycle) = 20 log(3.04 ms / 100 ms) = -30.3 dB
   Please refer to the plotted duty (see section 3.3)

BELOW 1GHz WORST-CASE DATA

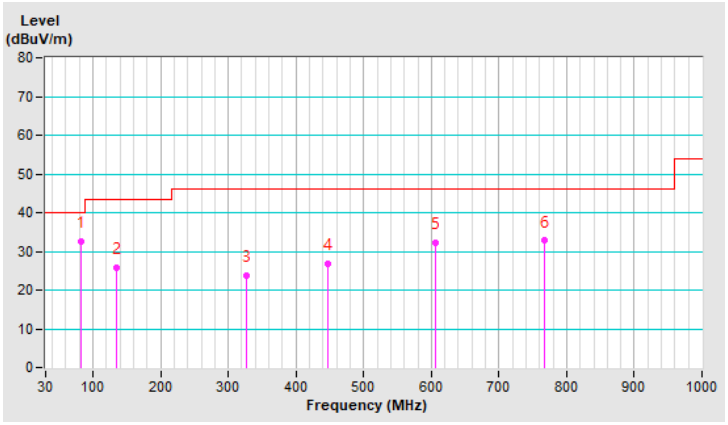
Mode A

RF Mode	TX BT_GFSK	Channel	CH 0：2402 MHz
Frequency Range	9kHz ~ 1GHz	Detector Function	Quasi-Peak (QP)

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	**82.38**	**32.64 QP**	**40.00**	**-7.36**	**2.30 H**	**174**	**44.44**	**-11.80**
2	134.76	25.85 QP	43.50	-17.65	2.01 H	202	33.07	-7.22
3	326.82	23.68 QP	46.00	-22.32	2.69 H	135	27.03	-3.35
4	447.10	26.86 QP	46.00	-19.14	2.92 H	112	27.75	-0.89
5	606.18	32.16 QP	46.00	-13.84	3.23 H	82	29.80	2.36
6	766.23	32.73 QP	46.00	-13.27	3.63 H	42	27.05	5.68

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit of frequency range 30MHz~1000MHz.
5. The emission levels were very low against the limit of frequency range 9kHz~30MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.

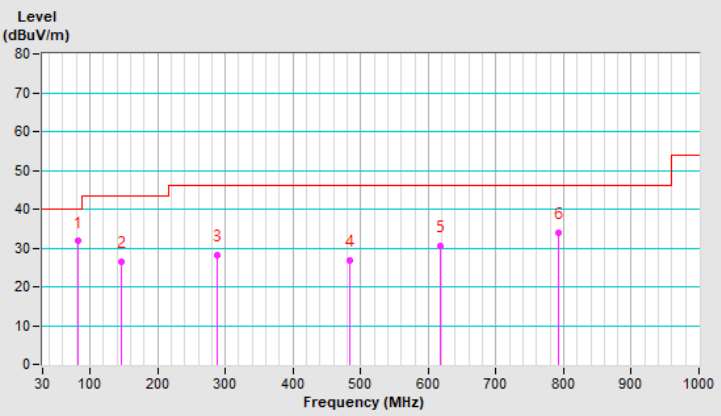


RF Mode	TX BT_GFSK	Channel	CH 0：2402 MHz
Frequency Range	9kHz ~ 1GHz	Detector Function	Quasi-Peak (QP)

Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	82.38	31.75 QP	40.00	-8.25	2.65 V	213	43.55	-11.80
2	145.43	26.42 QP	43.50	-17.08	2.27 V	251	32.88	-6.46
3	287.05	28.18 QP	46.00	-17.82	2.08 V	270	32.67	-4.49
4	483.96	26.74 QP	46.00	-19.26	1.82 V	296	26.97	-0.23
5	618.79	30.57 QP	46.00	-15.43	1.59 V	318	27.85	2.72
6	792.42	34.02 QP	46.00	-11.98	1.33 V	344	28.02	6.00

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit of frequency range 30MHz~1000MHz.
5. The emission levels were very low against the limit of frequency range 9kHz~30MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.



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

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.

4.2.2 Test Instruments

Description & Manufacturer	Model no.	Serial No.	Calibrated Date	Calibrated Until
Test Receiver ESR3 R&S	ESR3	102412	2021/1/29	2022/1/28
LISN SCHWARZBECK	NSLK 8128	8128-244	2020/11/19	2021/11/18
LISN SCHWARZBECK	NNLK8129	8129229	2021/5/20	2022/5/19
DC LISN SCHWARZBECK	NNLK 8121	8121-808	2021/4/18	2022/4/17
LISN SCHWARZBECK	NNLK 8121	8121-731	2021/4/28	2022/4/27
LISN R&S	ENV216	101196	2021/4/26	2022/4/25
LISN R&S	ESH3-Z5	100220	2020/12/1	2021/11/30
LISN R&S	ESH3-Z6	844950/018	2021/7/25	2022/7/24
DC LISN R&S	ESH3-Z6	100219	2021/7/25	2022/7/24
High Voltage Probe Schwarzbeck	TK9420	00982	2021/1/8	2022/1/7
RF Coaxial Cable Commate	5D-FB	Cable-CO5-01	2021/1/29	2022/1/28
Attenuator STI	STI02-2200-10	NO.4	2021/9/3	2022/9/2
50 Ohms Terminator LYNICS	0900510	E1-01-305	2021/2/17	2022/2/16
Isolation Transformer Erika Fiedler	D-65396	017	2021/9/9	2022/9/8
Software BVADT	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 Linkou Conduction05
3. The VCCI Site Registration No. C-11093.
4. Tested Date: 2021/10/9

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/ 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.

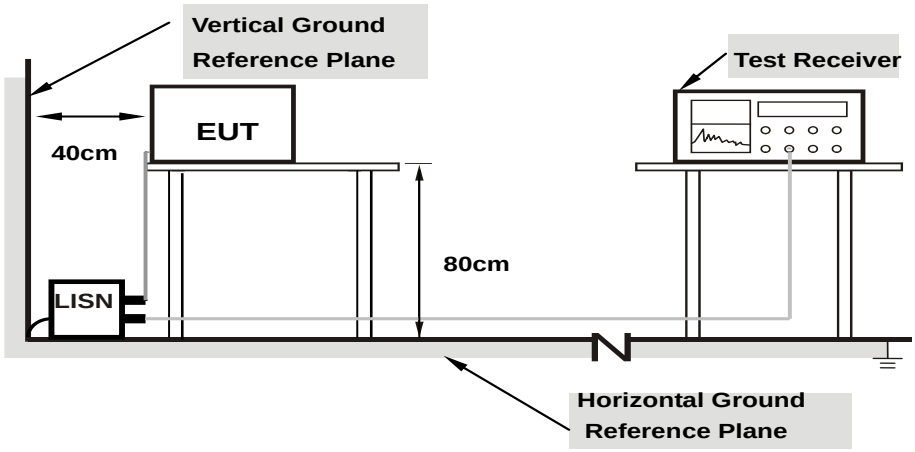
c. The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) was not recorded.

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

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 Condition

a. Connected the EUT to Notebook PC or Adapter.

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

4.2.7 Test Results

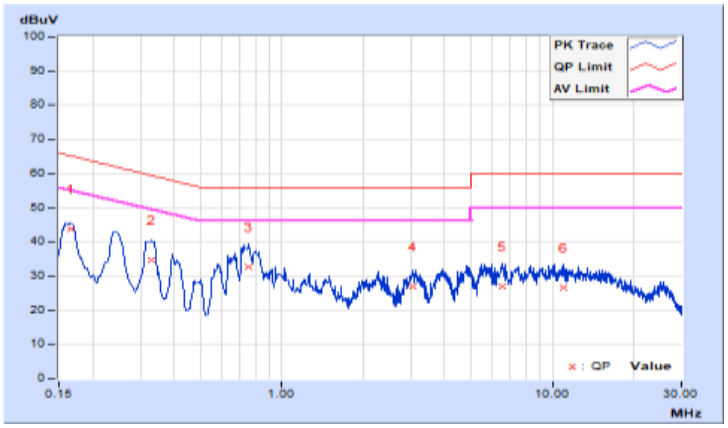
Mode A

RF Mode	TX BT_GFSK	**Channel**	CH 0：2402 MHz
Frequency Range	150kHz ~ 30MHz	**Detector Function & Resolution Bandwidth**	Quasi-Peak (QP) / Average (AV), 9kHz

Phase Of Power : Line (L)										
No	**Frequency (MHz)**	**Correction Factor (dB)**	**Reading Value (dBuV)**		**Emission Level (dBuV)**		**Limit (dBuV)**		**Margin (dB)**	
			Q.P.	**AV.**	**Q.P.**	**AV.**	**Q.P.**	**AV.**	**Q.P.**	**AV.**
1	0.16535	9.89	33.87	15.11	43.76	25.00	65.19	55.19	-21.43	-30.19
2	0.32975	9.90	24.89	7.58	34.79	17.48	59.46	49.46	-24.67	-31.98
3	0.75600	9.95	22.64	11.51	32.59	21.46	56.00	46.00	-23.41	-24.54
4	3.06400	10.08	17.01	10.11	27.09	20.19	56.00	46.00	-28.91	-25.81
5	6.52400	10.24	16.82	10.76	27.06	21.00	60.00	50.00	-32.94	-29.00
6	11.01200	10.42	16.04	9.47	26.46	19.89	60.00	50.00	-33.54	-30.11

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

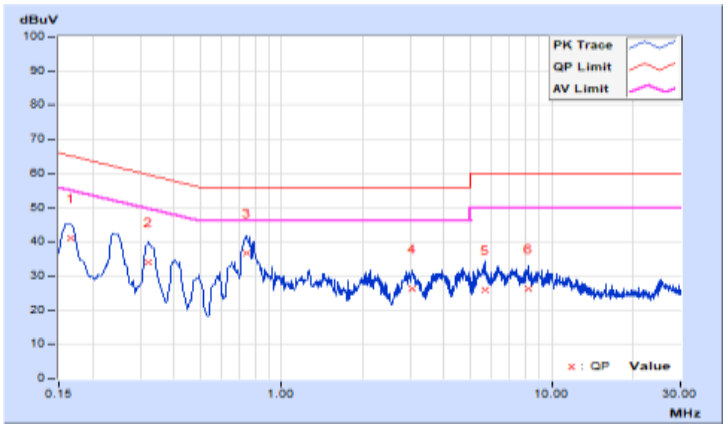


RF Mode	TX BT_GFSK	Channel	CH 0：2402 MHz
Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz

Phase Of Power : Neutral (N)										
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.16600	9.91	31.13	13.47	41.04	23.38	65.16	55.16	-24.12	-31.78
2	0.32200	9.92	23.97	8.62	33.89	18.54	59.66	49.66	-25.77	-31.12
3	**0.74000**	**9.96**	**26.82**	**15.58**	**36.78**	**25.54**	**56.00**	**46.00**	**-19.22**	**-20.46**
4	3.04400	10.10	16.01	9.35	26.11	19.45	56.00	46.00	-29.89	-26.55
5	5.67600	10.21	15.63	7.84	25.84	18.05	60.00	50.00	-34.16	-31.95
6	8.18000	10.31	16.07	9.06	26.38	19.37	60.00	50.00	-33.62	-30.63

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



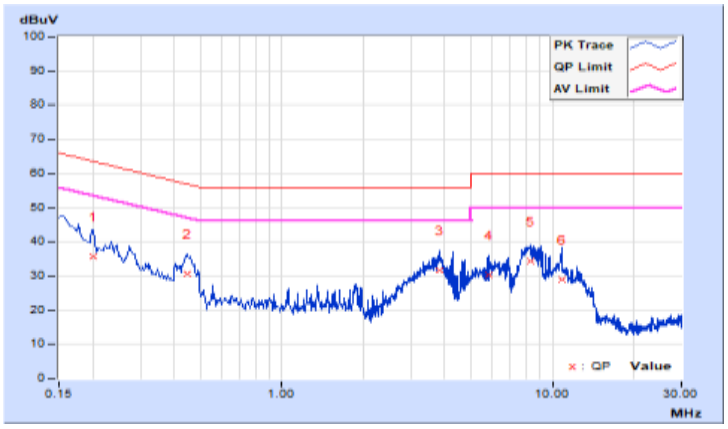
Mode B

RF Mode	TX BT_GFSK	Channel	CH 0：2402 MHz
Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz

Phase Of Power : Line (L)										
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.19989	9.89	25.70	11.43	35.59	21.32	63.62	53.62	-28.03	-32.30
2	0.44527	9.92	20.78	9.71	30.70	19.63	56.96	46.96	-26.26	-27.33
3	3.84400	10.13	21.54	13.50	31.67	23.63	56.00	46.00	-24.33	-22.37
4	5.83600	10.21	20.02	12.67	30.23	22.88	60.00	50.00	-29.77	-27.12
5	8.28800	10.31	24.11	18.41	34.42	28.72	60.00	50.00	-25.58	-21.28
6	10.78800	10.41	18.41	13.42	28.82	23.83	60.00	50.00	-31.18	-26.17

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

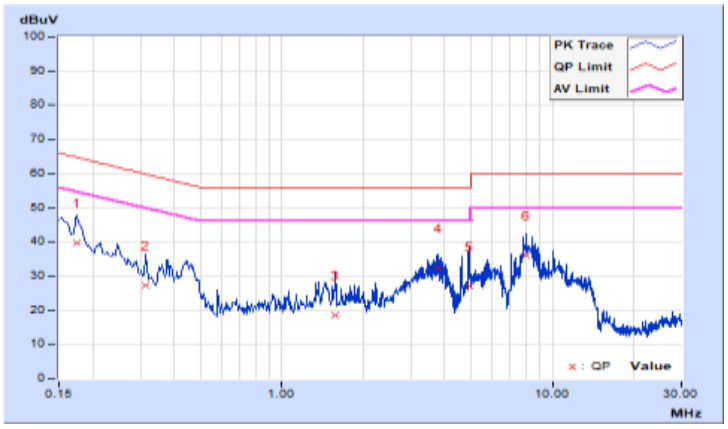


RF Mode	TX BT_GFSK	Channel	CH 0：2402 MHz
Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz

Phase Of Power : Neutral (N)										
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.17400	9.91	29.78	12.27	39.69	22.18	64.77	54.77	-25.08	-32.59
2	0.31400	9.92	17.41	3.67	27.33	13.59	59.86	49.86	-32.53	-36.27
3	1.57600	10.02	8.64	1.86	18.66	11.88	56.00	46.00	-37.34	-34.12
4	3.78800	10.14	22.19	13.04	32.33	23.18	56.00	46.00	-23.67	-22.82
5	4.91600	10.19	16.68	10.29	26.87	20.48	56.00	46.00	-29.13	-25.52
6	7.97200	10.30	25.57	19.89	35.87	30.19	60.00	50.00	-24.13	-19.81

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

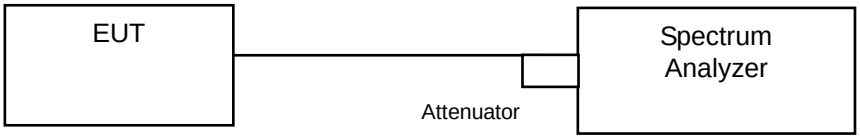


4.3 Number of Hopping Frequency Used

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

Description & Manufacturer	Model no.	Serial No.	Calibrated Date	Calibrated Until
Spectrum Analyzer R&S	FSV40	101042	2021/9/9	2022/9/8

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 LK - Oven
3. Tested Date: 2021/10/30

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 from Test Standard

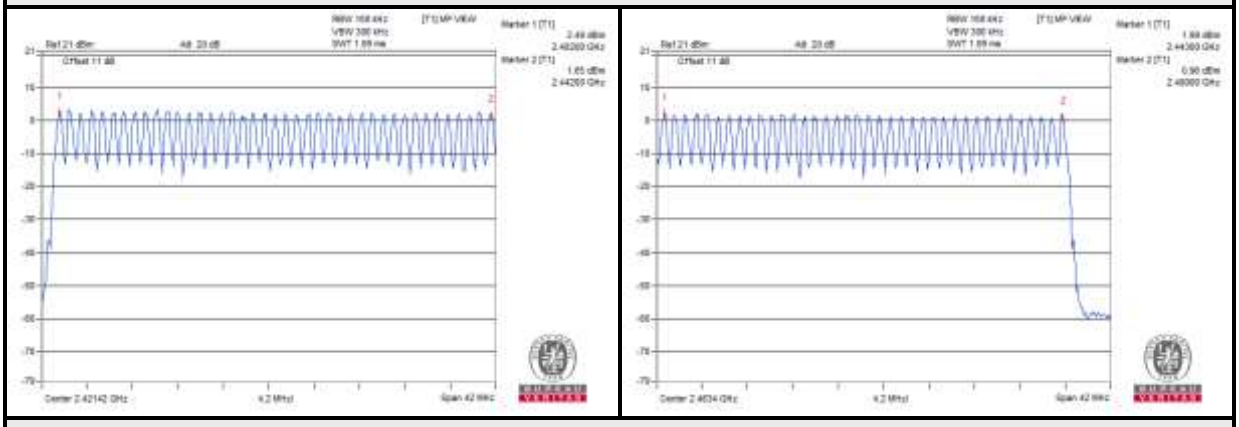
No deviation.

4.3.6 Test Results

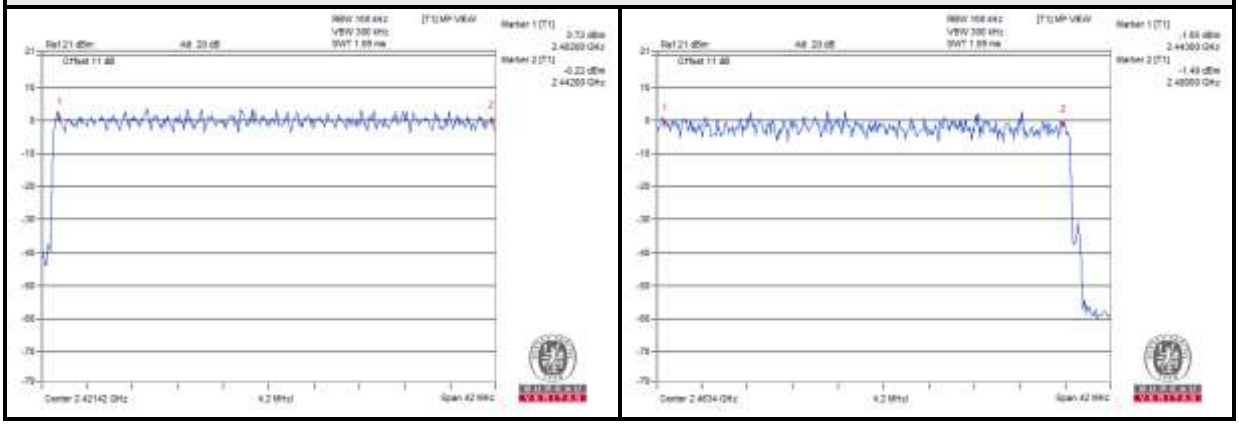
Mode A

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

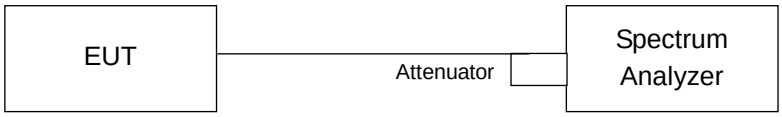


4.4 Dwell Time on Each Channel

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 4.3.3 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

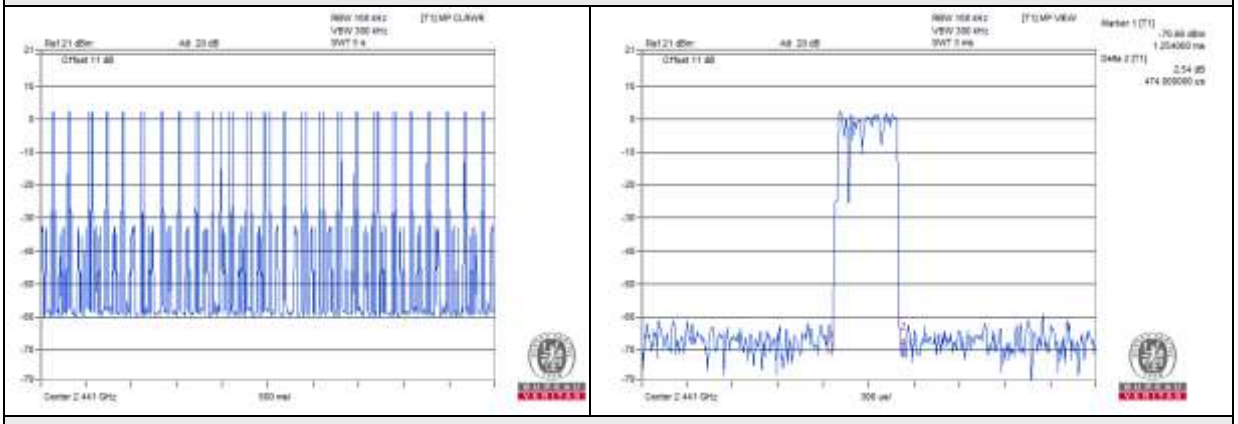
Mode A

GFSK

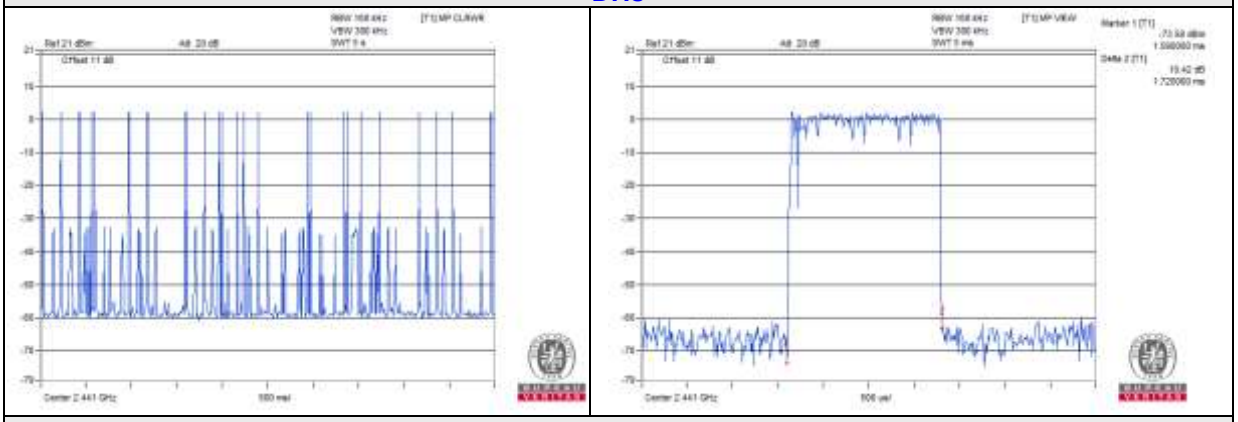
Mode	Number of transmission in a 31.6 (79Hopping*0.4)	Length of transmission time (msec)	Result (msec)	Limit (msec)
DH1	50 (times / 5 sec) * 6.32 = 316 times	0.474	149.78	400
DH3	25 (times / 5 sec) * 6.32 = 158 times	1.72	271.76	400
DH5	17 (times / 5 sec) * 6.32 = 108 times	3.024	326.59	400

NOTE: Test plots of the transmitting time slot are shown as follows.

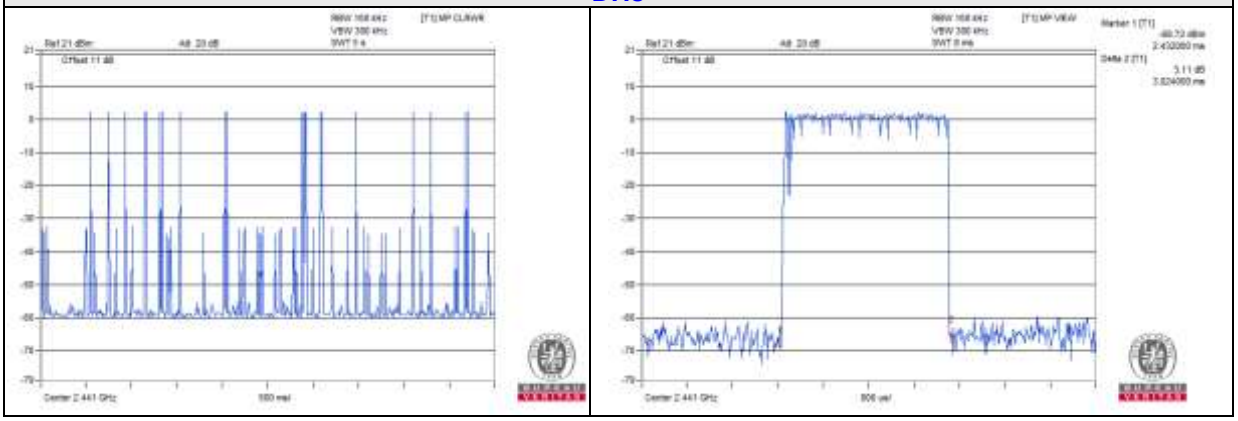
DH1



DH3



DH5

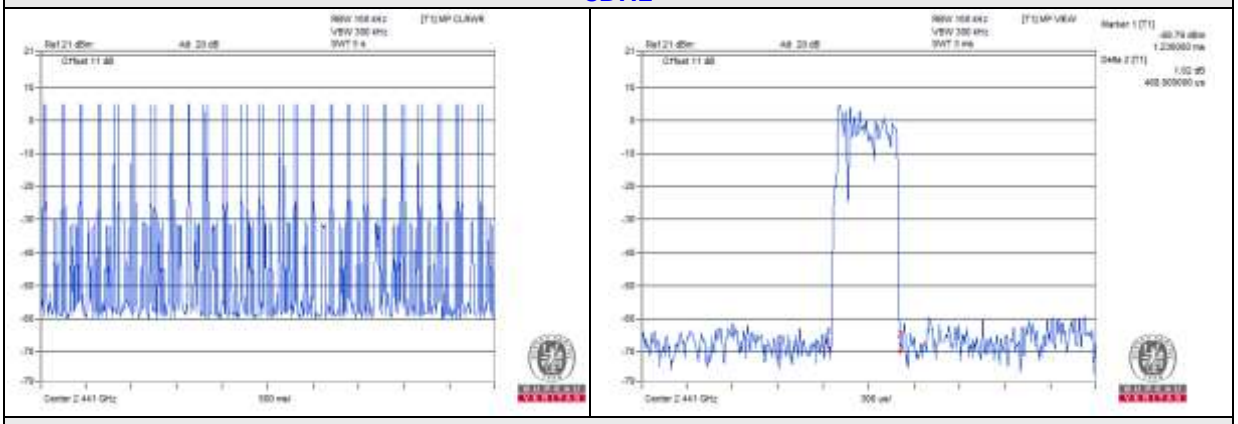


8DPSK

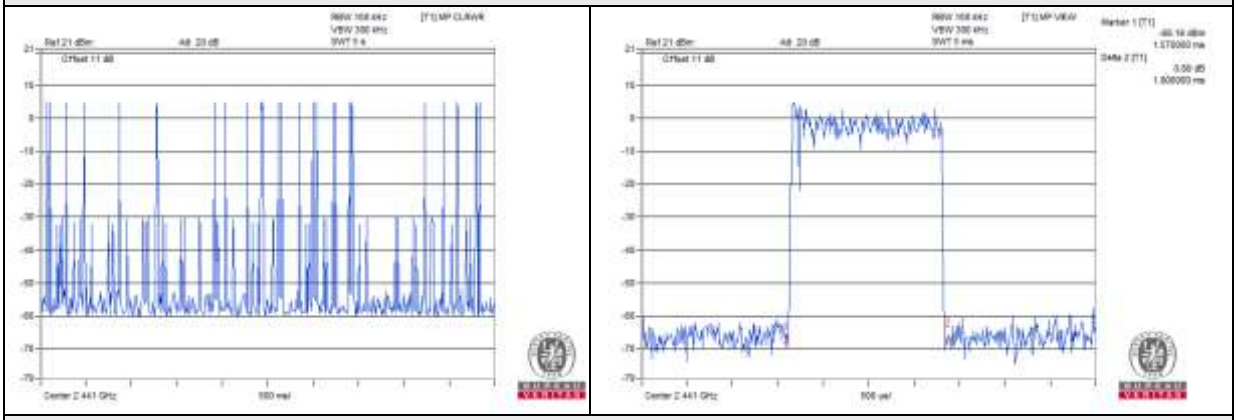
Mode	Number of transmission in a 31.6 (79Hopping*0.4)	Length of transmission time (msec)	Result (msec)	Limit (msec)
3DH1	50 (times / 5 sec) * 6.32 = 316 times	0.468	147.89	400
3DH3	25 (times / 5 sec) * 6.32 = 158 times	1.8	284.4	400
3DH5	17 (times / 5 sec) * 6.32 = 108 times	3.04	328.32	400

NOTE: Test plots of the transmitting time slot are shown as follows.

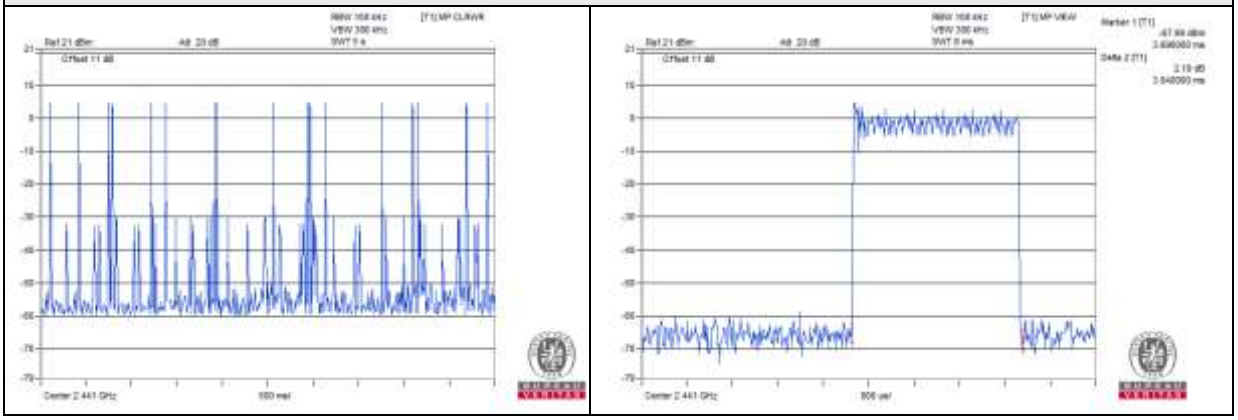
3DH1



3DH3



3DH5

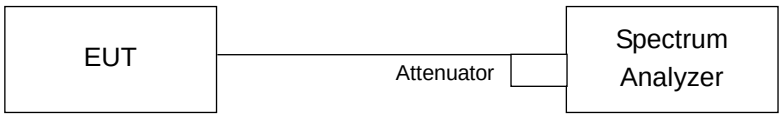


4.5 Channel Bandwidth

4.5.1 Limits of Channel Bandwidth Measurement

The 20 dB bandwidth test value is the reference value for the measurement of the frequency hopping channel interval.

4.5.2 Test Setup



4.5.3 Test Instruments

Refer to section 4.3.3 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.

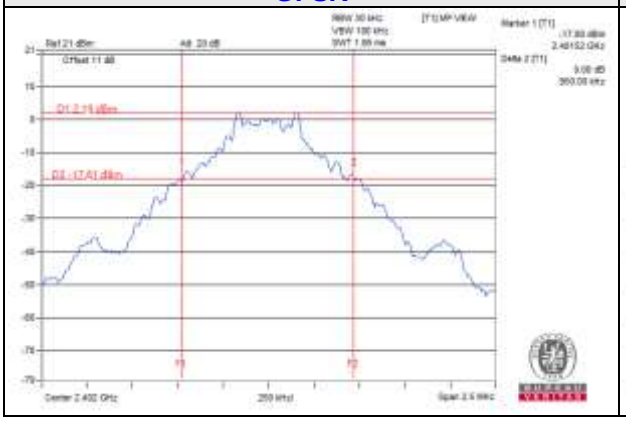
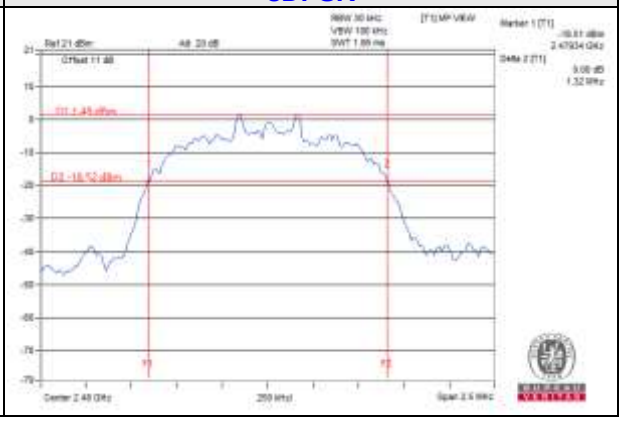
4.5.6 EUT Operating Condition

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

Mode A

Channel	Frequency (MHz)	20dB Bandwidth (MHz)	
		GFSK	8DPSK
0	2402	0.95	1.31
39	2441	0.94	1.31
78	2480	0.95	1.32

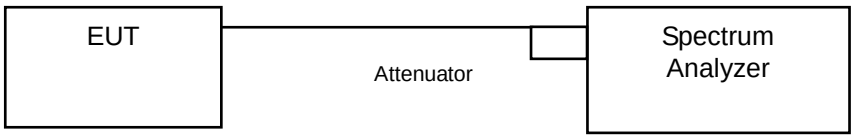
Spectrum Plot of Worst Value	
GFSK	8DPSK
	

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 4.3.3 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

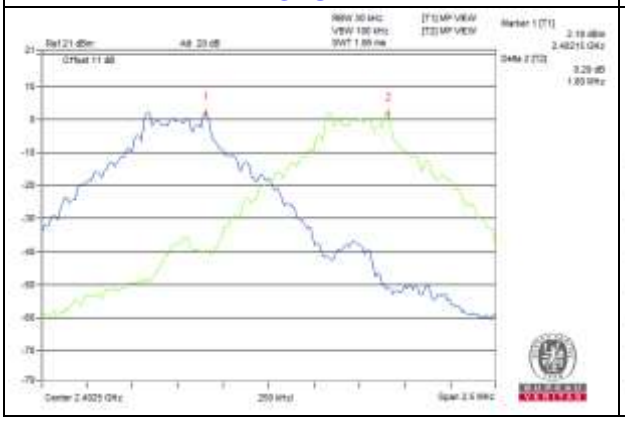
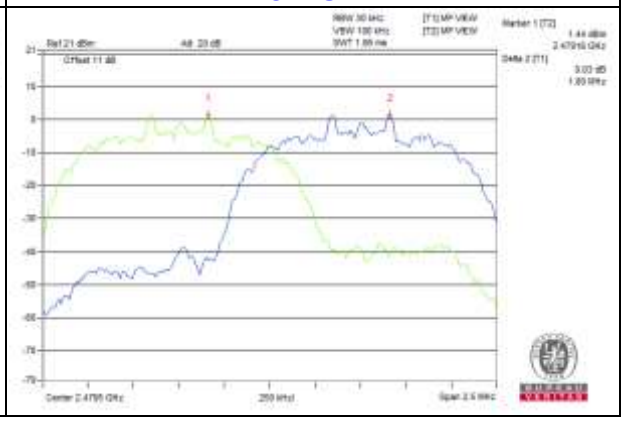
No deviation.

4.6.6 Test Results

Mode A

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	0.95	1.31	0.64	0.88	Pass
39	2441	1.00	1.00	0.94	1.31	0.63	0.88	Pass
78	2480	1.00	1.00	0.95	1.32	0.64	0.88	Pass

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

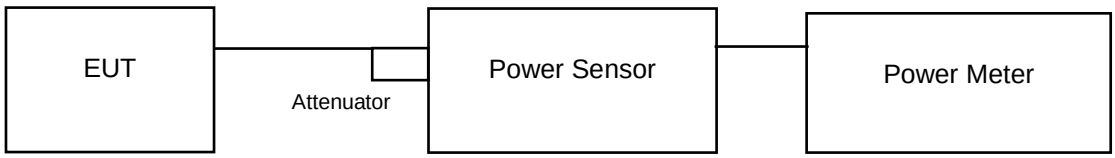
Spectrum Plot of Worst Value	
GFSK	**8DPSK**
	

4.7 Maximum Output Power Measurement

4.7.1 Limits of Maximum Output Power Measurement

The Maximum Output Power Measurement is 125mW.

4.7.2 Test Setup



4.7.3 Test Instruments

Description & Manufacturer	Model no.	Serial No.	Calibrated Date	Calibrated Until
Pulse Power Sensor Anritsu	MA2411B	0738404	2021/4/15	2022/4/14
Peak Power meter Anritsu	ML2495A	0842014	2021/4/15	2022/4/14

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 LK - Oven
3. Tested Date: 2021/10/30

4.7.4 Test Procedure

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.

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 from Test 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

Mode A

FOR PEAK POWER

Channel	Frequency (MHZ)	Output Power (mW)		Output Power (dBm)		Power Limit (mW)	Pass / Fail
		GFSK	8DPSK	GFSK	8DPSK		
0	2402	**2.999**	2.992	4.77	4.76	125	Pass
39	2441	2.78	2.786	4.44	4.45	125	Pass
78	2480	2.679	2.679	4.28	4.28	125	Pass

FOR AVERAGE POWER

Channel	Frequency (MHZ)	Output Power (mW)		Output Power (dBm)	
		GFSK	8DPSK	GFSK	8DPSK
0	2402	2.884	2.884	4.60	4.60
39	2441	2.692	2.692	4.30	4.30
78	2480	2.57	2.57	4.10	4.10

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 Resolution Bandwidth).

4.8.2 Test Instruments

Refer to section 4.3.3 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

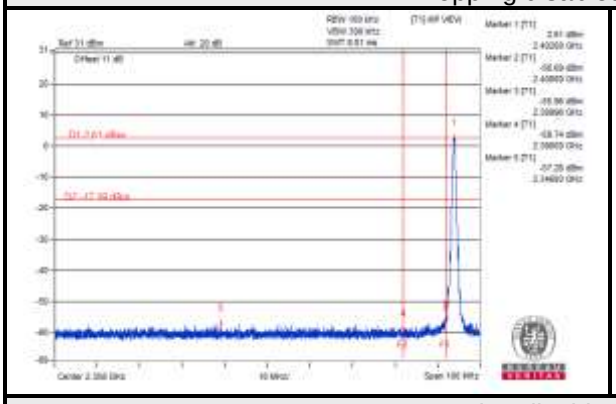
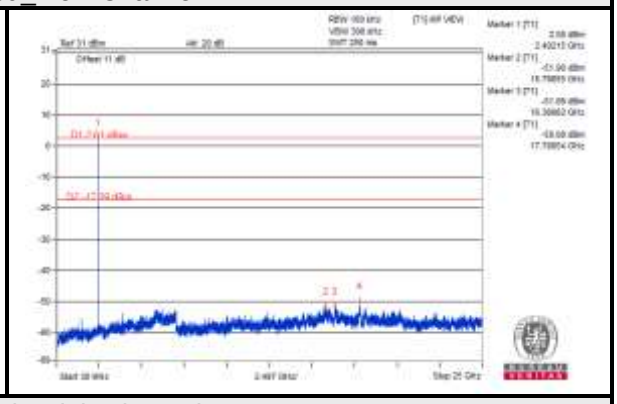
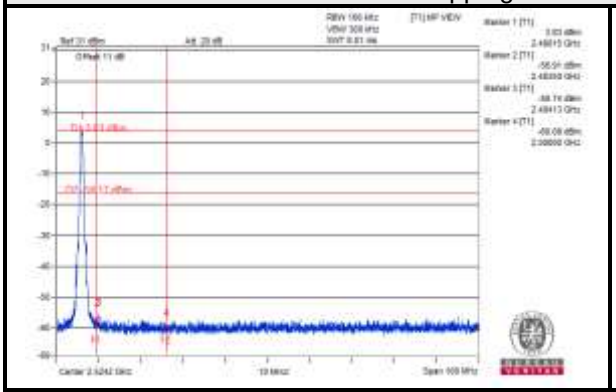
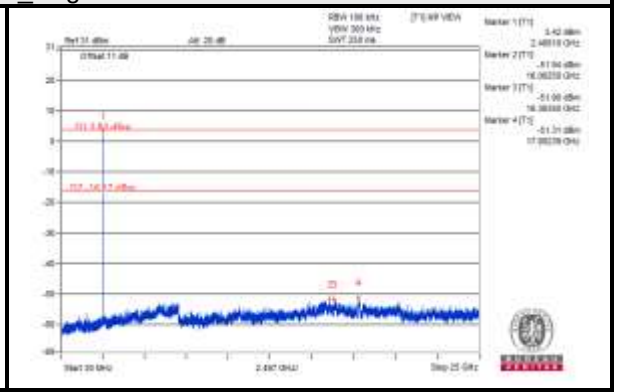
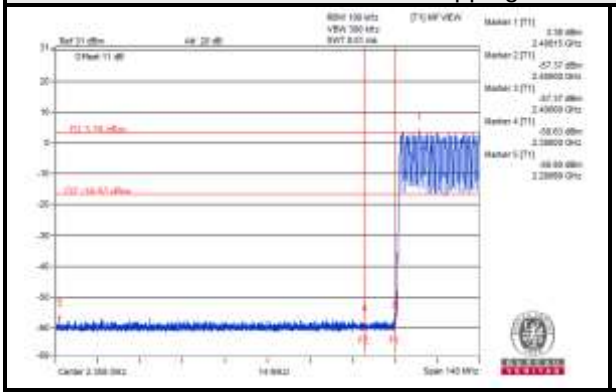
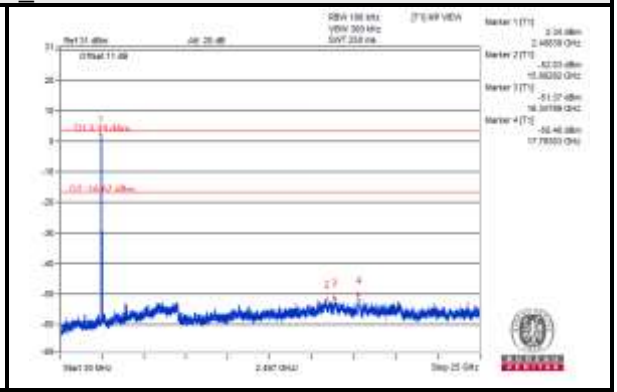
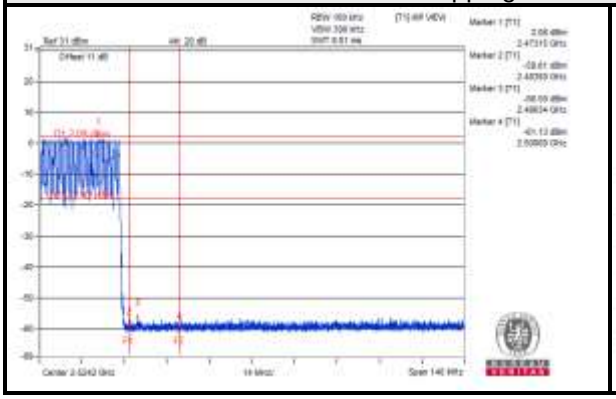
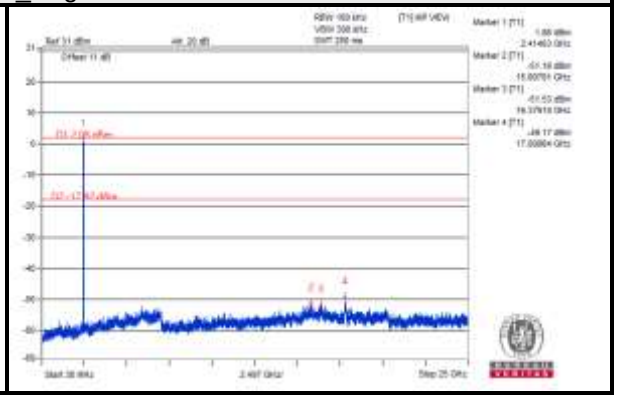
The software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel frequencies individually.

4.8.6 Test Results

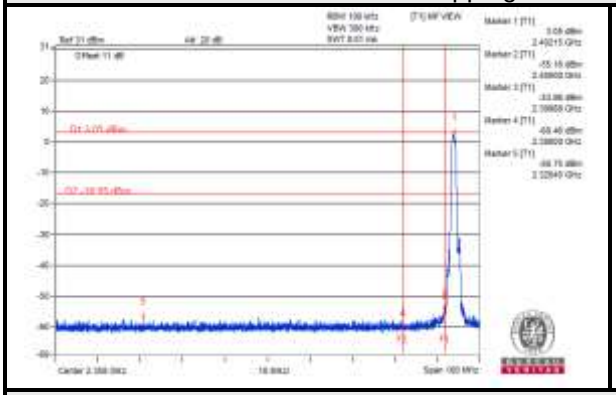
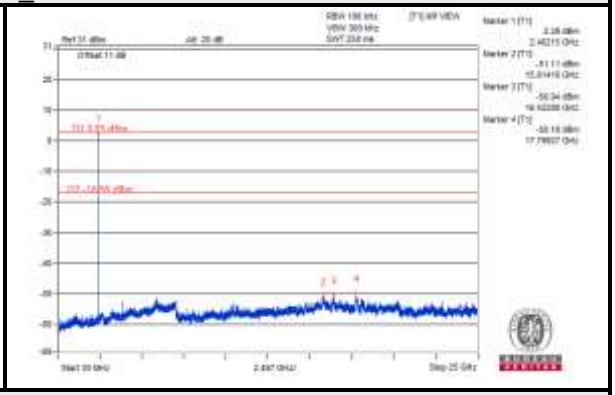
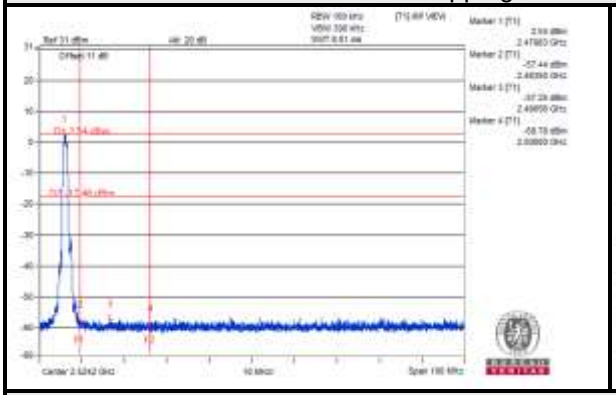
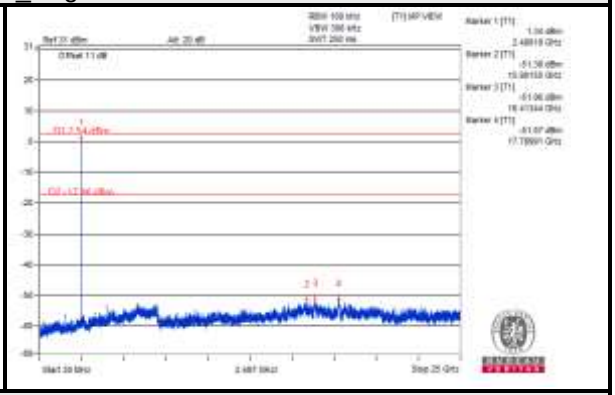
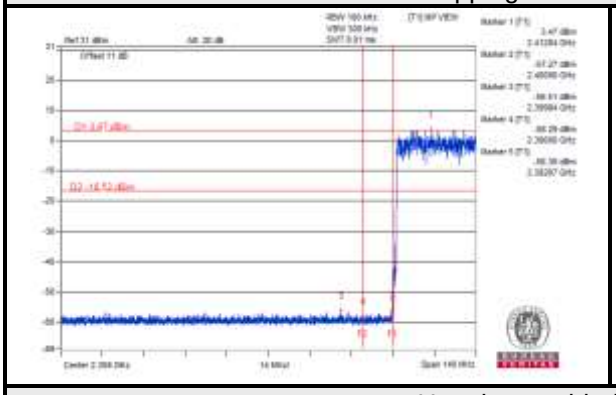
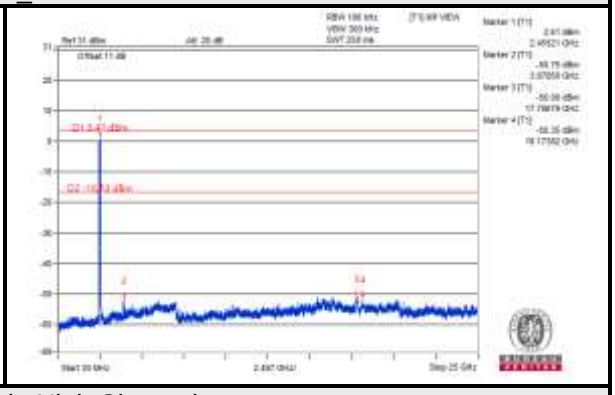
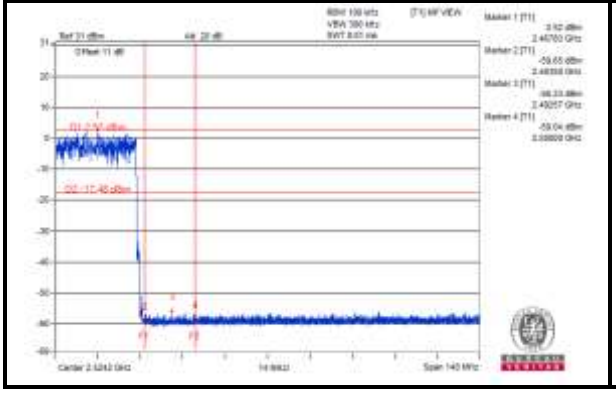
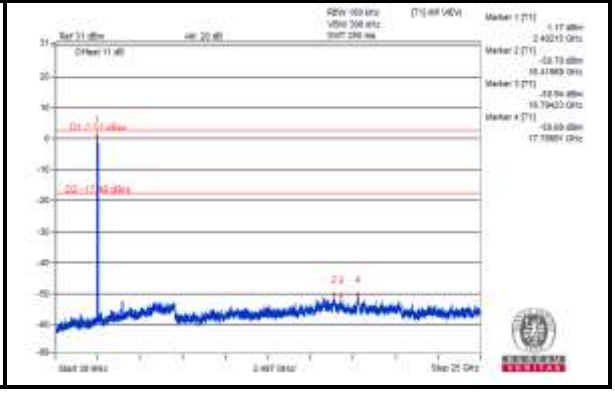
The spectrum plots are attached on the following images. D1 line indicates the highest level, D2 line indicates the 20dB offset below D1. It shows compliance with the requirement.

Mode A

GFSK

Hopping disabled_ Low Channel	
	
Hopping disabled_ High Channel	
	
Hopping enabled_ Low Channel	
	
Hopping enabled_ High Channel	
	

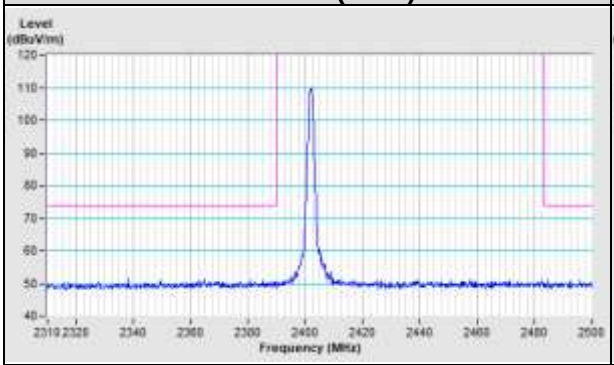
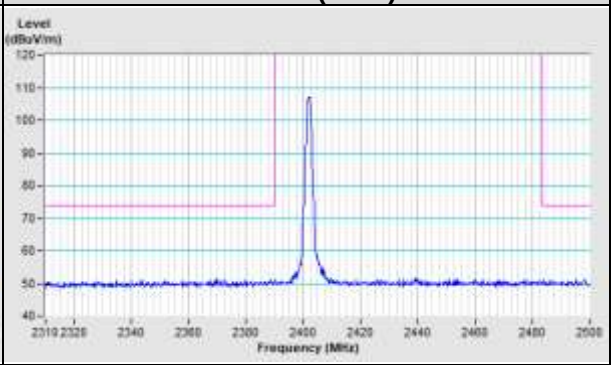
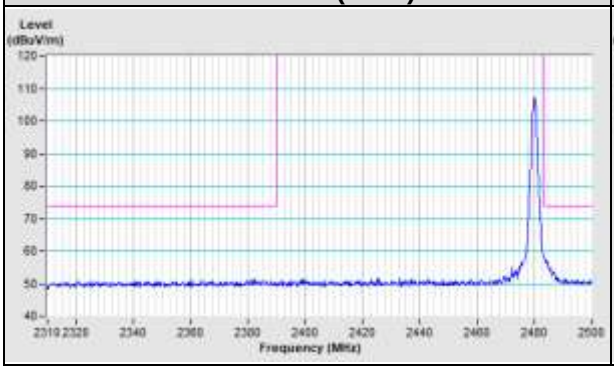
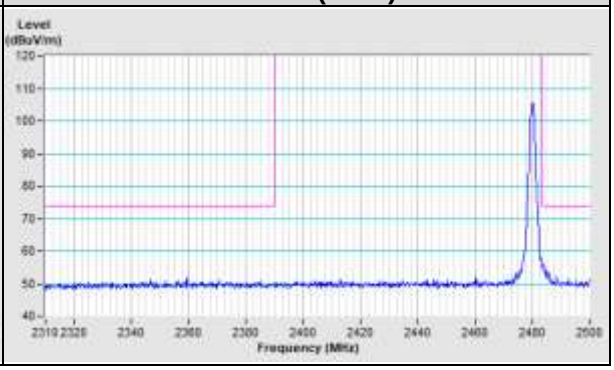
8DPSK

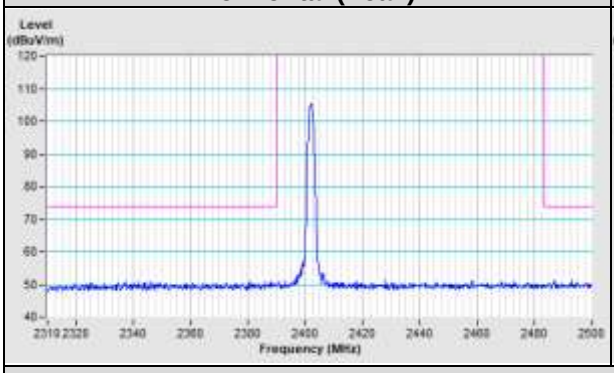
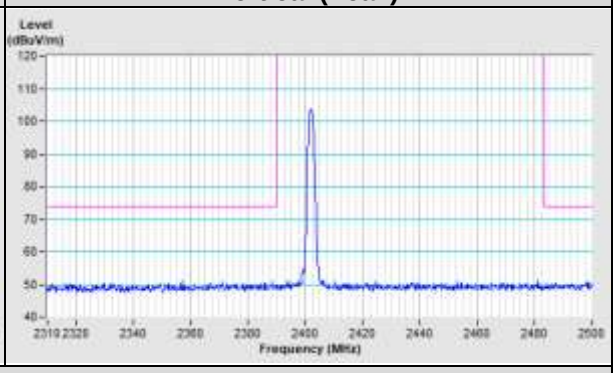
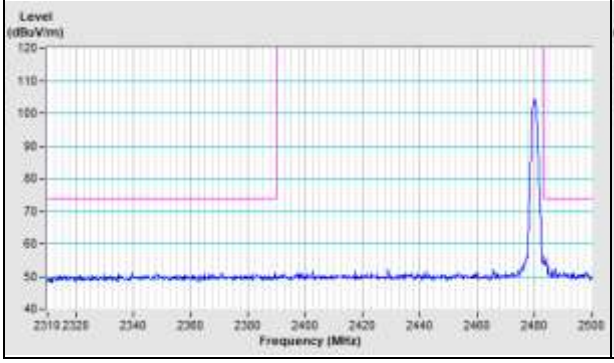
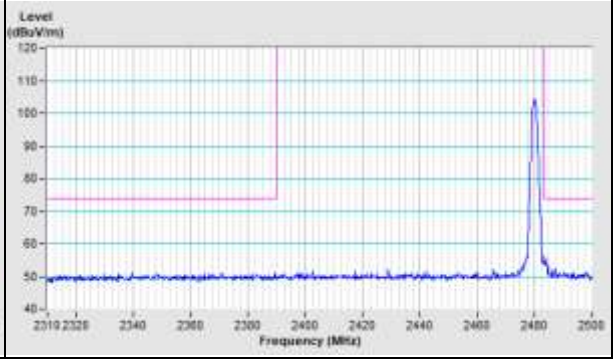
Hopping disabled_ Low Channel	
	
Hopping disabled_ High Channel	
	
Hopping enabled_ Low Channel	
	
Hopping enabled_ High Channel	
	

5 Pictures of Test Arrangements

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

Annex A - Bandedge 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 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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