

TEST REPORT

CERTIFICATE OF CONFORMITY

Standard: 47 CFR FCC Part 15, Subpart C (Section 15.247)
Report No.: RFBEOA-WTW-P25070104
FCC ID: BYG-WR8
Product: AM/FM/BLUETOOTH WOODEN CABINET RADIO
Brand: SANGEAN
Model No.: WR-8
Received Date: 2025/7/4
Test Date: 2025/8/11 ~ 2025/8/20
Issued Date: 2025/9/8
Applicant: Sangean Electronics Inc.
Address: No. 18, Lane 7, Li-De Street, Chung Ho District, New Taipei City, 235, 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
Test Location: No. 47-2, 14th Ling, Chia Pau Vil., Lin Kou Dist., New Taipei City, Taiwan
FCC Registration / 198487 / TW2021
Designation Number:

Approved by: _____

Jeremy Lin

Jeremy Lin / Project Engineer

, Date: _____

2025/9/8

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Prepared by : Jessica Cheng/ Senior Specialist



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Release Control Record

Issue No.	Description	Date Issued
RFBEOA-WTW-P25070104	Original release.	2025/9/8

1 Certificate

Product: AM/FM/BLUETOOTH WOODEN CABINET RADIO

Brand: SANGEAN

Test Model: WR-8

Sample Status: Engineering sample

Applicant: Sangean Electronics Inc.

Test Date: 2025/8/11 ~ 2025/8/20

Standard: 47 CFR FCC Part 15, Subpart C (Section 15.247)

Measurement ANSI C63.10-2020

procedure: KDB 558074 D01 15.247 Meas Guidance v05r02

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.

2 Summary of Test Results

47 CFR FCC Part 15, Subpart C (Section 15.247)			
Standard / Clause	Test Item	Result	Remark
15.247 (a)(1)	RF Output Power	Pass	Meet the requirement of limit.
15.247(a)(1) (iii)	Number of Hopping Frequency Used	Pass	Meet the requirement of limit.
15.247(a)(1) (iii)	Dwell Time on Each Channel	Pass	Meet the requirement of limit.
15.247(a)(1)	Hopping Channel Separation	Pass	Meet the requirement of limit.
15.247(a)(1)	20 dB Bandwidth	-	Refer to Note 1
15.247(d)	Conducted Out of Band Emissions	Pass	Meet the requirement of limit.
15.207	AC Power Conducted Emissions	Pass	Minimum passing margin is -10.90 dB at 0.17738 MHz
15.205 / 15.209 / 15.247(d)	Unwanted Emissions below 1 GHz	Pass	Minimum passing margin is -7.5 dB at 143.49 MHz
15.205 / 15.209 / 15.247(d)	Unwanted Emissions above 1 GHz	Pass	Minimum passing margin is -12.6 dB at 2483.50 MHz
15.203	Antenna Requirement	Pass	No antenna connector is used.

Notes:

1. If the Frequency Hopping System operating in 2400-2483.5 MHz band and the output power less than 125 mW. The hopping channel carrier frequencies separated by a minimum of 25 kHz or two-thirds of the 20 dB bandwidth of hopping channel whichever is greater.
2. Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.
3. The test Result was tested by Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch. The test data, data evaluation, test procedures, and equipment configurations shown in this report were given in ANSI C63.10-2020 and compliance standards.

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	Specification	Expanded Uncertainty (k=2) (±)
RF Output Power	-	1.1 dB
Dwell Time on Each Channel	-	2.18 %
Hopping Channel Separation	-	390 Hz
20 dB Bandwidth	-	960 Hz
Conducted Out of Band Emissions	9 kHz ~ 40 GHz	2.7 dB
AC Power Conducted Emissions	9 kHz ~ 30 MHz	2.9 dB
Unwanted Emissions below 1 GHz	9 kHz ~ 30 MHz	2.55 dB
	30 MHz ~ 1 GHz	5.77 dB
Unwanted Emissions above 1 GHz	1 GHz ~ 6 GHz	4.71 dB
	6 GHz ~ 18 GHz	5.3 dB
	18 GHz ~ 40 GHz	4.98 dB

The other instruments specified are routine verified to remain within the calibrated levels, no measurement uncertainty is required to be calculated.

2.2 Supplementary Information

There is not any deviation from the test standards for the test method, and no modifications required for compliance.

3 General Information

3.1 General Description

Product	AM/FM/BLUETOOTH WOODEN CABINET RADIO
Brand	SANGEAN
Test Model	WR-8
Status of EUT	Engineering sample
Power Supply Rating	DC IN 5V/2.4A Built-in Battery: Rechargeable Lithium-ion ICR18650-1S1P 3350mA/3.6V
Modulation Type	GFSK, $\pi/4$ -DQPSK, 8DPSK
Modulation Technology	FHSS
Transfer Rate	Up to 3 Mbps
Operating Frequency	2.402 GHz ~ 2.48 GHz
Number of Channel	79
Output Power	2.388 mW (3.78 dBm)

Note:

1. The EUT has following accessories:

Item	Specification
Type-C USB cable	Shielded (1.2m)
FM Antenna cable	Non-shielded (1m)

2. The above EUT information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications or User's Manual.

3.2 Antenna Description of EUT

Gain(dBi)	Antenna Type	Connector Type
-0.25	Monopole	none

* Detail antenna specification please refer to antenna datasheet and/or antenna measurement report.

3.3 Channel List

79 channels are provided for BT-EDR:

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (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		

3.4 Test Mode Applicability and Tested Channel Detail

Pre-Scan:	1. For Unwanted Emission below/ above 1 GHz has EUT with internal Battery/ EUT with USB cable(Adapter)/ EUT with USB cable(Laptop) mode of power supply. Pre-scan these modes and find the worst case as a representative test condition.
Worst Case:	1.For Unwanted Emission below/above 1 GHz EUT with USB cable(Laptop) mode is the worst case of power supply.

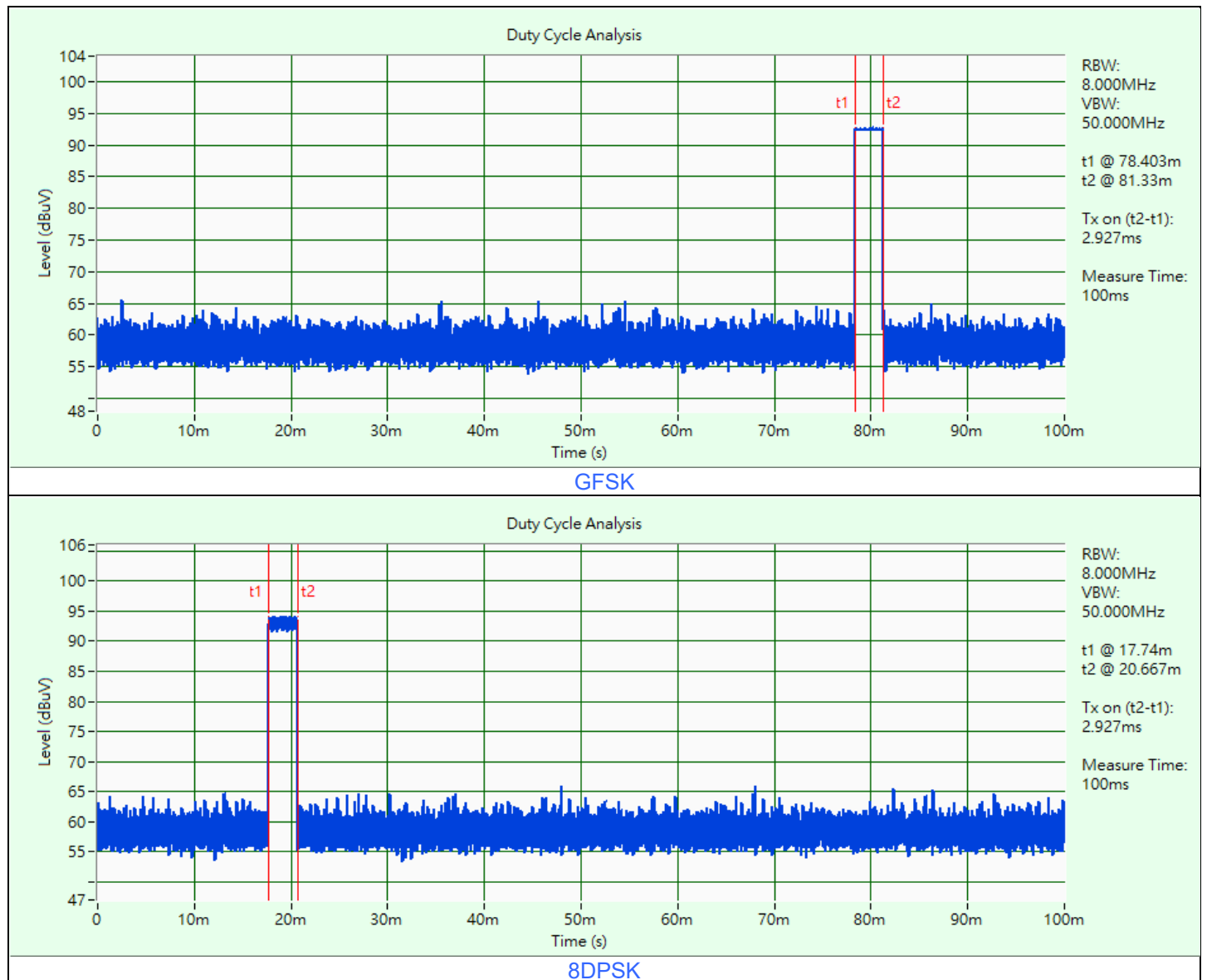
Following channel(s) was (were) selected for the final test as listed below:

Test Item	EUT Configure Mode	Tested Channel	Modulation	Data Rate Parameter
RF Output Power	A	0, 39, 78	GFSK	DH5
			8DPSK	3DH5
Number of Hopping Frequency Used	A	Hopping	GFSK	DH5
			8DPSK	3DH5
Dwell Time on Each Channel	A	Hopping	GFSK	DH1/DH3/DH5
			8DPSK	3DH1/3DH3/3DH5
Hopping Channel Separation / 20 dB Bandwidth	A	0, 39, 78	GFSK	DH5
			8DPSK	3DH5
Conducted Out of Band Emissions	A	Hopping 0, 78	GFSK	DH5
			8DPSK	3DH5
AC Power Conducted Emissions	A	0	GFSK	DH5
	B	0	GFSK	DH5
Unwanted Emissions below 1 GHz	A	0	GFSK	DH5
Unwanted Emissions above 1 GHz	A	0, 39, 78	GFSK	DH5
			8DPSK	3DH5
EUT Configure Mode:	A	EUT with USB cable(Laptop)		
	B	EUT with USB cable(Adapter)		

3.5 Duty Cycle of Test Signal

GFSK: Duty cycle = 2.927 ms / 100 ms x 100% = 2.9%

8DPSK: Duty cycle = 2.927 ms / 100 ms x 100% = 2.9%

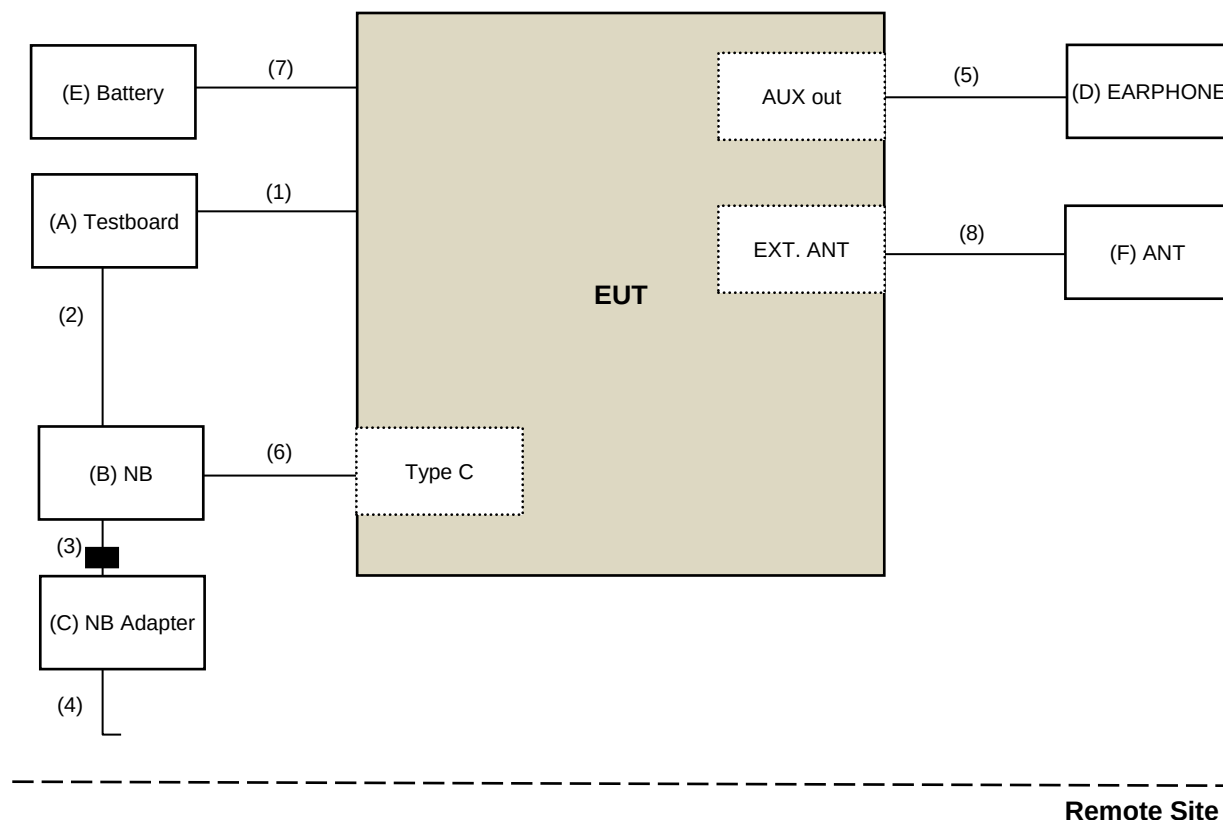


3.6 Test Program Used and Operation Descriptions

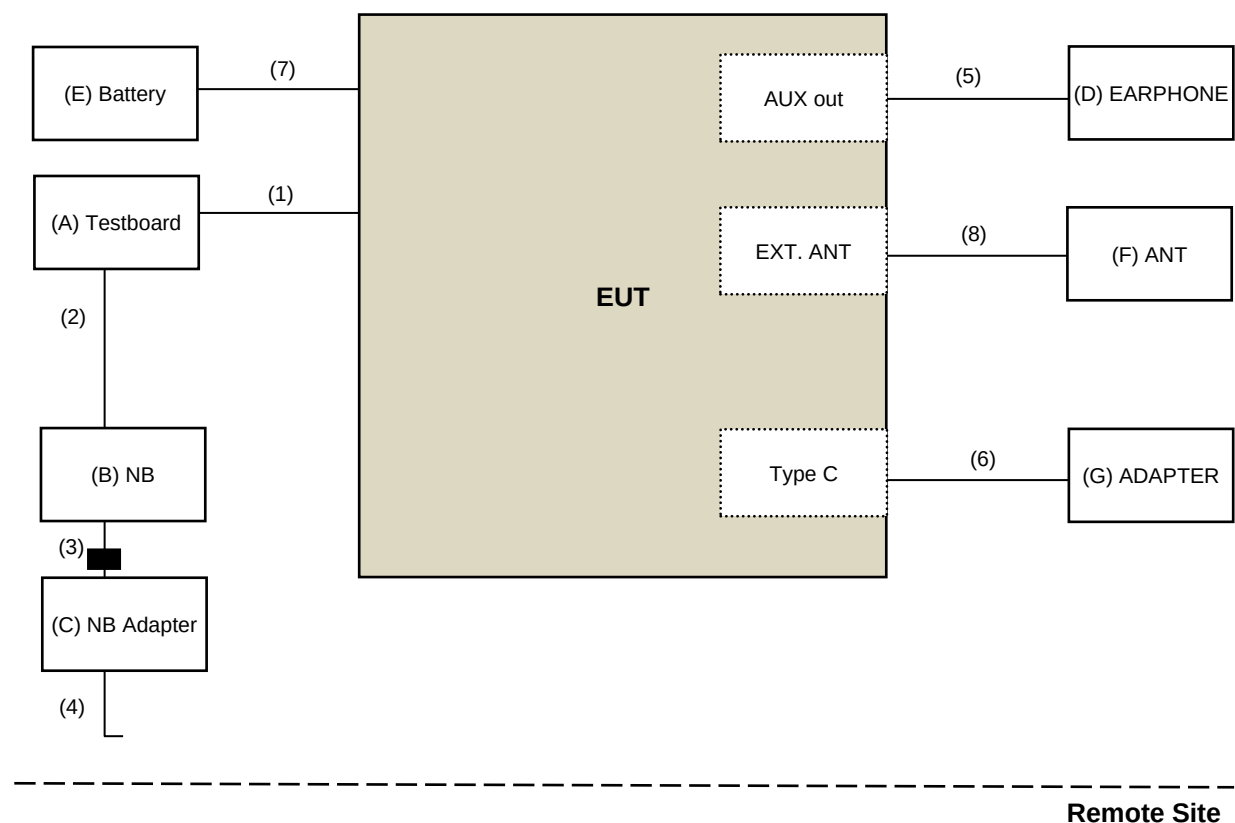
Controlling software (BK32xx RF Test_V1.8.2) has been activated to set the EUT under transmission condition continuously at specific channel frequency.

3.7 Connection Diagram of EUT and Peripheral Devices

Mode A



Mode B



3.8 Configuration of Peripheral Devices and Cable Connections

ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A	Testboard	N/A	N/A	N/A	N/A	Supplied by applicant
B	NB	Dell	P90F	N/A	N/A	Provided by Lab
C	NB Adapter	Dell	LA65NS2-01	N/A	N/A	Provided by Lab
D	EARPHONE	PHILIPS	SBC HL145	N/A	N/A	Provided by Lab
E	Battery	N/A	N/A	N/A	N/A	Supplied by applicant
F	ANT	N/A	N/A	N/A	N/A	Supplied by applicant
G	ADAPTER	Belkin	WCB007dq	N/A	N/A	Provided by Lab

ID	Cable Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1	Testboard cable	1	0.3	N	0	Accessory of EUT
2	USB cable	1	1	Y	0	Provided by Lab
3	NB Adapter DC cable	1	1.9	N	1	Provided by Lab
4	NB Adapter AC cable	1	0.8	N	0	Provided by Lab
5	AUX Cable	1	1.8	N	0	Provided by Lab
6	Type C	1	1.2	Y	0	Supplied by applicant
7	DC cable	1	0.3	N	0	Accessory of EUT
8	ANT Cable	1	1	N	0	Supplied by applicant

4 Test Instruments

The calibration interval of the all test instruments are 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

4.1 RF Output Power

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
Fixed Attenuator Woken	00800A1K01A-20	00800A1K01A-20-02	2025/5/23	2026/5/22
Pulse Power Sensor Anritsu	MA2411B	0738404	2025/5/20	2026/5/19
RF Power Meter Anritsu	ML2495A	0842014	2025/5/20	2026/5/19

Notes:

1. The test was performed in LK - Oven
2. Tested Date: 2025/8/13

4.2 Number of Hopping Frequency Used

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
Fixed Attenuator Woken	00800A1K01A-20	00800A1K01A-20-02	2025/5/23	2026/5/22
PXA Signal Analyzer Keysight	N9030A	MY54490260	2025/7/24	2026/7/23
Signal Analyzer R&S	FSV40	101042	2024/9/12	2025/9/11
Software	ADT_RF Test Software V6.6.5.4	N/A	N/A	N/A

Notes:

1. The test was performed in LK - Oven
2. Tested Date: 2025/8/13

4.3 Dwell Time on Each Channel

Refer to section 4.2 to get the tested date and information of the instruments.

4.4 Hopping Channel Separation

Refer to section 4.2 to get the tested date and information of the instruments.

4.5 20 dB Bandwidth

Refer to section 4.2 to get the tested date and information of the instruments.

4.6 Conducted Out of Band Emissions

Refer to section 4.2 to get the tested date and information of the instruments.

4.7 AC Power Conducted Emissions

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
50 ohm terminal resistance LYNICS	0900510	E1-011284	2024/9/16	2025/9/15
		E1-011285	2024/9/25	2025/9/24
DC LISN R&S	ESH3-Z6	100219	2025/7/10	2026/7/9
		844950/018	2025/7/10	2026/7/9
Diode Pulse Limiter Schwarzbeck	VTSD 9561 F-N	01631	2025/5/2	2026/5/1
EMI Test Receiver R&S	ESR3	102412	2024/12/26	2025/12/25
		102414	2024/12/11	2025/12/10
High Voltage Probe Schwarzbeck	TK9420	00982	2024/12/6	2025/12/5
Highpass filter EMCI	150HPF-ME	114005	2025/5/2	2026/5/1
		114006	2025/5/2	2026/5/1
	150HPF-MF	113009	2025/5/2	2026/5/1
LISN R&S	ENV216	101195	2025/7/18	2026/7/17
		101196	2025/5/19	2026/5/18
		101197	2025/7/4	2026/7/3
LISN Schwarzbeck	NNLK 8121	8121-731	2025/6/10	2026/6/9
		8121-808	2025/4/23	2026/4/22
	NNLK 8129	00624	2024/10/9	2025/10/8
		8129229	2024/10/14	2025/10/13
	NSLK 8128	8128-244	2024/11/11	2025/11/10
Passive Voltage Probe R&S	ESH2-Z3	100073	2025/5/26	2026/5/25
RF Coaxial Cable PEWC	5D-FB	Cable-CO5-01	2025/1/17	2026/1/16
Software BVADT	Cond_V7.4.1.0	N/A	N/A	N/A

Notes:

1. The test was performed in Linkou Conduction 5.
2. Tested Date: 2025/8/15 ~ 2025/8/20

4.8 Unwanted Emissions below 1 GHz

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
Bi_Log Antenna Schwarzbeck	VULB 9168	137	2024/10/9	2025/10/8
Coupling / Decoupling Network Schwarzbeck	CDNE-M2	00097	2025/5/28	2026/5/27
	CDNE-M3	00091	2025/3/20	2026/3/19
Loop Antenna TESEQ	HLA 6121	64095	2024/10/17	2025/10/16
MXE EMI Receiver Agilent	N9038A	MY50010158	2024/10/11	2025/10/10
Preamplifier Agilent	8447D	2944A11064	2025/2/14	2026/2/13
RF Coaxial Cable Pacific	8D-FB	Cable-CH6-02	2025/6/24	2026/6/23
Signal Analyzer R&S	FSV40	101544	2025/7/1	2026/6/30
Software BVADT	Radiated_V8.7.08	N/A	N/A	N/A
Tower ADT	AT100	0306	N/A	N/A
Turn Table ADT	TT100	0306	N/A	N/A

Notes:

1. The test was performed in Linkou 966 Chamber 6 (CH 6).
2. Tested Date: 2025/8/11

4.9 Unwanted Emissions above 1 GHz

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
Boresight antenna tower fixture BV	BAF-02	6	N/A	N/A
High Pass Filter Wainwright	WHK 3.1/18G-10SS	SN 8	2025/5/22	2026/5/21
Horn Antenna EMCO	3115	00028257	2024/11/10	2025/11/9
Horn Antenna ETS-Lindgren	3117-PA	00215857	2024/11/10	2025/11/9
Horn Antenna Schwarzbeck	BBHA 9170	212	2024/10/18	2025/10/17
		BBHA9170190	2024/11/10	2025/11/9
MXE EMI Receiver Agilent	N9038A	MY50010158	2024/10/11	2025/10/10
Notch Filter Micro-Tronics	BRC50703-01	010	2025/5/22	2026/5/21
	BRM17690	005	2025/5/22	2026/5/21
Preamplifier EMCI	EMC0126545	980076	2025/2/14	2026/2/13
		980175	2024/8/25	2025/8/24
		980235	2025/2/14	2026/2/13
Preamplifier HP	8449B	3008A01201	2025/2/14	2026/2/13
RF Coaxial Cable EMCI	EMC104	190801	2025/7/4	2026/7/3
		190804	2025/7/4	2026/7/3
RF Coaxial Cable EMEC	EM102-KMKM-100	02	2025/7/4	2026/7/3
RF Coaxial Cable HUBER+SUHNER	SF-104	Cable-CH6-01	2025/7/4	2026/7/3
Signal Analyzer R&S	FSV40	101042	2024/9/12	2025/9/11
		101544	2025/7/1	2026/6/30
Software BVADT	Radiated_V7.7.1.1.1	N/A	N/A	N/A
Tower ADT	AT100	0306	N/A	N/A
Turn Table ADT	TT100	0306	N/A	N/A

Notes:

1. The test was performed in Linkou 966 Chamber 6 (CH 6).
2. Tested Date: 2025/8/11

5 Limits of Test Items

5.1 RF Output Power

The Maximum Output Power Measurement is 125 mW (21 dBm).

5.2 Number of Hopping Frequency Used

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

5.3 Dwell Time on Each Channel

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.

5.4 Hopping Channel Separation

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

5.5 20 dB Bandwidth

Maximum bandwidth is not specified.

5.6 Conducted Out of Band Emissions

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

5.7 AC Power Conducted Emissions

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

Notes:

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 0.50 MHz.

5.8 Unwanted Emissions below 1 GHz

Radiated emissions up to 1 GHz which fall in the restricted bands must comply with the radiated emission limits specified as below table. Other emissions shall be at least 20 dB below the highest level of the desired power:

Frequencies (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 ~ 0.490	2400/F(kHz)	300
0.490 ~ 1.705	24000/F(kHz)	30
1.705 ~ 30.0	30	30
30 ~ 88	100	3
88 ~ 216	150	3
216 ~ 960	200	3
Above 960	500	3

Notes:

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).

5.9 Unwanted Emissions above 1 GHz

Radiated emissions above 1 GHz which fall in the restricted bands must comply with the radiated emission limits specified as below table. Other emissions shall be at least 20 dB below the highest level of the desired power:

Frequencies (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
Above 960	500	3

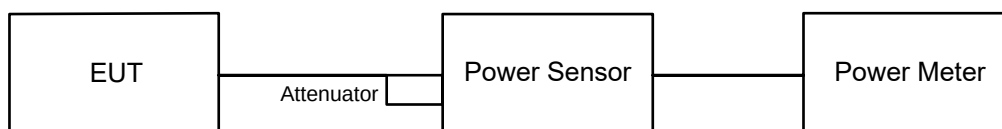
Notes:

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

6 Test Arrangements

6.1 RF Output Power

6.1.1 Test Setup



6.1.2 Test Procedure

Peak Power:

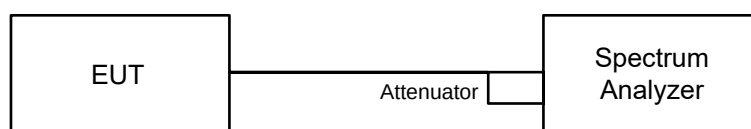
A peak power sensor was used on the output port of the EUT. A power meter was used to read the response of the peak power sensor. Record the power level.

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.

6.2 Number of Hopping Frequency Used

6.2.1 Test Setup

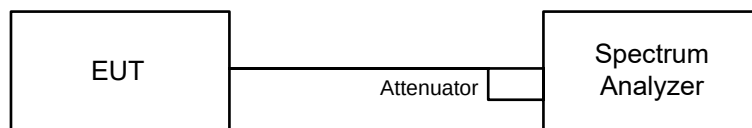


6.2.2 Test Procedure

- Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.
- 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.
- Set the SA Sweep time = Auto, Detector function = Peak.
- Set the SA trace on Max hold mode and then keep the EUT in hopping mode. Record all the signals from each channel until each one has been recorded.
- Set the SA on View mode and then plot the result on SA screen.
- Repeat above procedures until all frequencies measured were complete.

6.3 Dwell Time on Each Channel

6.3.1 Test Setup

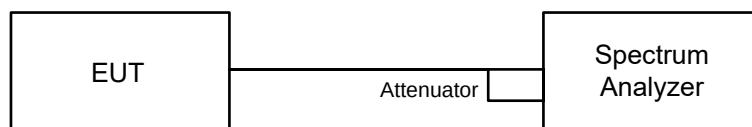


6.3.2 Test Procedure

- Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.
- 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.
- 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.
- Measure the time duration of one transmission on the measured frequency. And then plot the result with time difference of this time duration.
- Repeat above procedures until all different time-slot modes have been completed.

6.4 Hopping Channel Separation

6.4.1 Test Setup

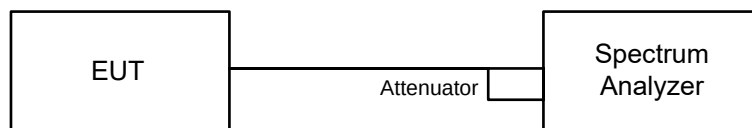


6.4.2 Test Procedure

- Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
- Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range.
- Set the SA Sweep time = Auto, Detector function = Peak.
- Set the SA trace on Max hold mode and record the separation of two adjacent channels.
- Measure the frequency difference of these two adjacent channels by SA marker-delta function. And then plot the result on SA screen.
- Repeat above procedures until all frequencies measured were complete.

6.5 20 dB Bandwidth

6.5.1 Test Setup

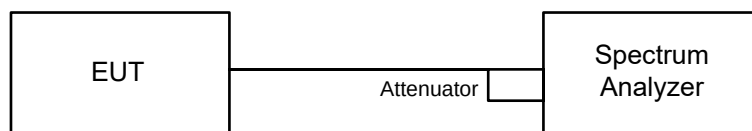


6.5.2 Test Procedure

- Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
- 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.
- Measure the frequency difference of two frequencies that were attenuated 20 dB from the reference level. Record the frequency difference as the emission bandwidth.
- Repeat above procedures until all frequencies measured were complete.

6.6 Conducted Out of Band Emissions

6.6.1 Test Setup



6.6.2 Test Procedure

MEASUREMENT PROCEDURE REF

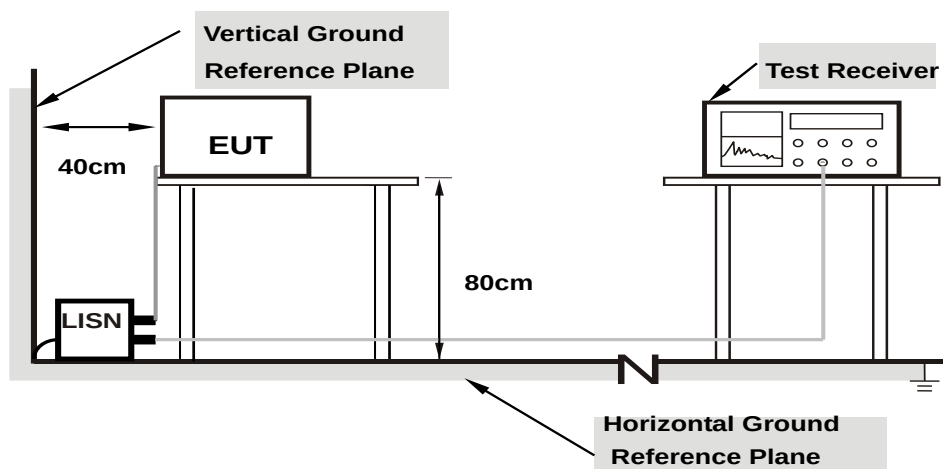
- Set the RBW = 100 kHz.
- Set the VBW $\geq$ 300 kHz.
- Detector = peak.
- Sweep time = auto couple.
- Trace mode = max hold.
- Allow trace to fully stabilize.
- Use the peak marker function to determine the maximum power level in any 100 kHz band segment within the fundamental EBW.

MEASUREMENT PROCEDURE OOB

- Set RBW = 100 kHz.
- Set VBW $\geq$ 300 kHz.
- Detector = peak.
- Sweep = auto couple.
- Trace Mode = max hold.
- Allow trace to fully stabilize.
- Use the peak marker function to determine the maximum amplitude level.

6.7 AC Power Conducted Emissions

6.7.1 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).

6.7.2 Test Procedure

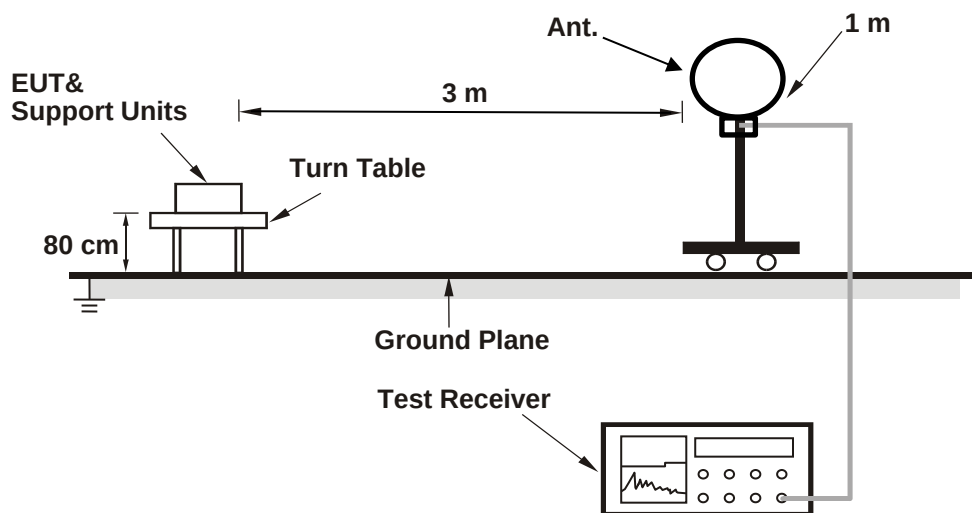
- The EUT was placed on a 0.8 meter to the top of table and placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50 uH of coupling impedance for the measuring instrument.
- Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
- 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.

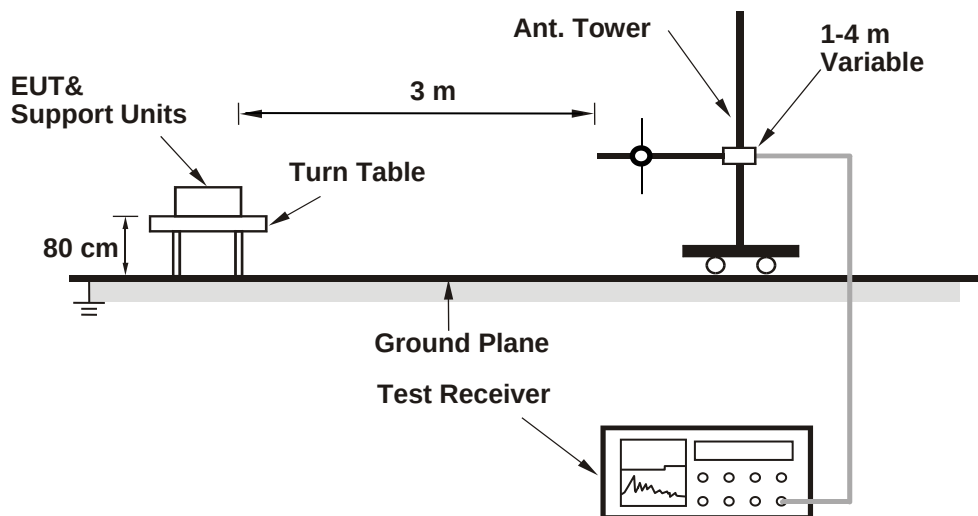
6.8 Unwanted Emissions below 1 GHz

6.8.1 Test Setup

For Radiated emission below 30 MHz



For Radiated emission above 30 MHz



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

6.8.2 Test Procedure

For Radiated emission below 30 MHz

- a. The EUT was placed on the top of a rotating table 0.8 meters 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. 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, except for the frequency band (9 kHz to 90 kHz and 110 kHz to 490 kHz) set to average detect function and peak detect function.

Notes:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 200 Hz at frequency below 150 kHz.
2. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 9 kHz or 10 kHz at frequency (150 kHz to 30 MHz).
3. All modes of operation were investigated and the worst-case emissions are reported.

For Radiated emission above 30 MHz

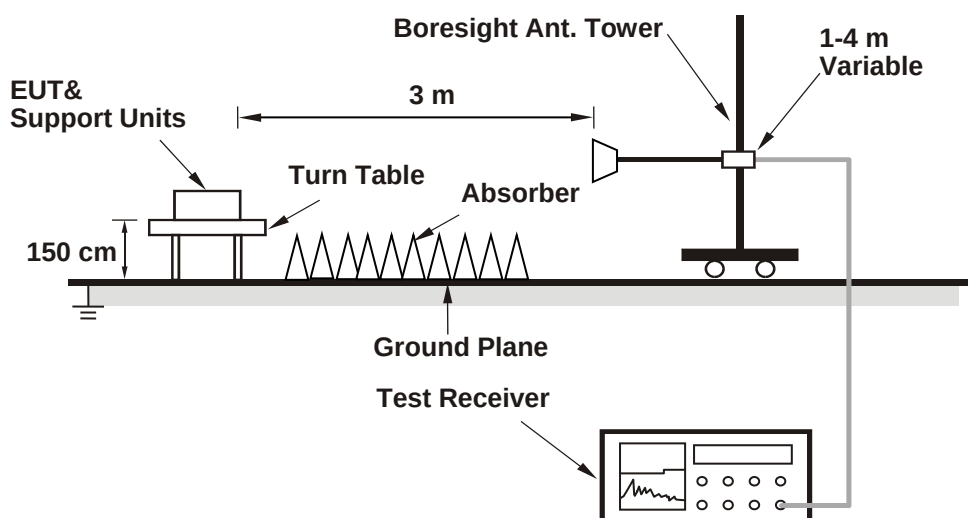
- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the 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.

Notes:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasi-peak detection (QP) at frequency below 1 GHz.
2. All modes of operation were investigated and the worst-case emissions are reported.

6.9 Unwanted Emissions above 1 GHz

6.9.1 Test Setup



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

6.9.2 Test Procedure

- The EUT was placed on the top of a rotating table 1.5 meters above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
- The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- 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.
- 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.
- The test-receiver system was set to peak and average detects 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.

Notes:

- 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 (AV) at frequency above 1 GHz.
- According to ANSI C63.10 section 6.6.4 and 4.1.4.2.2. For fundamental and harmonic signal measurement, according to ANSI C63.10 section 7.5, the average value = peak value + duty cycle correction factor. For duty cycle correction factor values, see the Test Signal Duty Cycle section in this report.
- All modes of operation were investigated and the worst-case emissions are reported.

7 Test Results of Test Item

7.1 RF Output Power

Input Power:	120 Vac, 60 Hz	Environmental Conditions:	25°C, 76% RH	Tested By:	Dalen Dai
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For Peak Power

GFSK

Chan.	Chan. Freq. (MHz)	Peak Power (mW)	Peak Power (dBm)	Power Limit (dBm)	Test Result
0	2402	2.388	3.78	21	Pass
39	2441	2.36	3.73	21	Pass
78	2480	2.296	3.61	21	Pass

Note: The antenna gain is -0.25 dBi <= 6 dBi, so the output power limit shall not be reduced.

8DPSK

Chan.	Chan. Freq. (MHz)	Peak Power (mW)	Peak Power (dBm)	Power Limit (dBm)	Test Result
0	2402	2.382	3.77	21	Pass
39	2441	2.344	3.70	21	Pass
78	2480	2.275	3.57	21	Pass

Note: The antenna gain is -0.25 dBi <= 6 dBi, so the output power limit shall not be reduced.

For Average Power

GFSK

Chan.	Chan. Freq. (MHz)	Average Power (mW)	Average Power (dBm)
0	2402	2.27	3.56
39	2441	2.259	3.54
78	2480	2.173	3.37

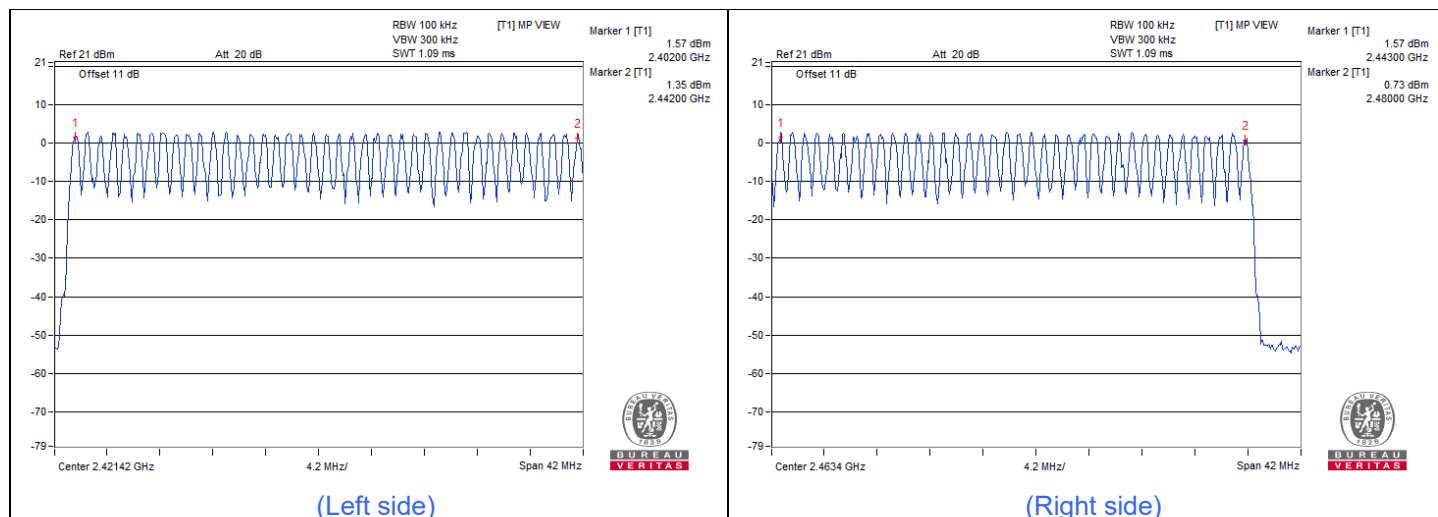
8DPSK

Chan.	Chan. Freq. (MHz)	Average Power (mW)	Average Power (dBm)
0	2402	2.265	3.55
39	2441	2.228	3.48
78	2480	2.133	3.29

7.2 Number of Hopping Frequency Used

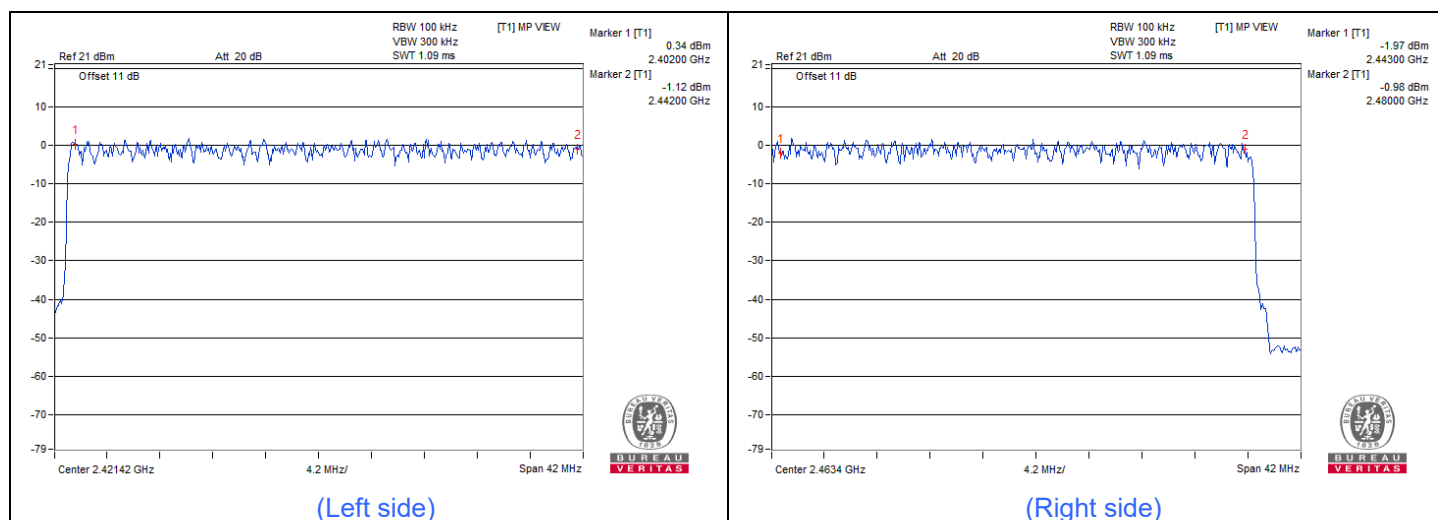
Input Power:	120 Vac, 60 Hz	Environmental Conditions:	25°C, 76% RH	Tested By:	Dalen Dai
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GFSK



Note: There are 79 hopping frequencies in the hopping mode. On the plots, it shows that the hopping frequencies are equally spaced.

8DPSK



Note: There are 79 hopping frequencies in the hopping mode. On the plots, it shows that the hopping frequencies are equally spaced.

7.3 Dwell Time on Each Channel

Input Power:	120 Vac, 60 Hz	Environmental Conditions:	25°C, 76% RH	Tested By:	Dalen Dai
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GFSK

Mode	Number of transmission in 31.6 sec	Length of transmission time (msec)	Dwell Time (msec)	Limit (msec)	Test Result
DH1	49 (times / 5 sec) * 6.32 = 310 times	0.438	135.78	400	Pass
DH3	25 (times / 5 sec) * 6.32 = 158 times	1.74	274.92	400	Pass
DH5	16 (times / 5 sec) * 6.32 = 102 times	3.04	310.08	400	Pass

Spectrum plots of Dwell Time



8DPSK

Mode	Number of transmission in 31.6 sec	Length of transmission time (msec)	Dwell Time (msec)	Limit (msec)	Test Result
3DH1	49 (times / 5 sec) * 6.32 = 310 times	0.408	126.48	400	Pass
3DH3	25 (times / 5 sec) * 6.32 = 158 times	1.74	274.92	400	Pass
3DH5	16 (times / 5 sec) * 6.32 = 102 times	3.056	311.71	400	Pass

Spectrum plots of Dwell Time



7.4 Hopping Channel Separation

Input Power:	120 Vac, 60 Hz	Environmental Conditions:	25°C, 76% RH	Tested By:	Dalen Dai
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GFSK

Channel	Frequency (MHz)	Hopping Channel Separation (MHz)	Minimum Limit (MHz)	Test Result
0	2402	1.01	0.66	Pass
39	2441	1.01	0.66	Pass
78	2480	1.00	0.66	Pass

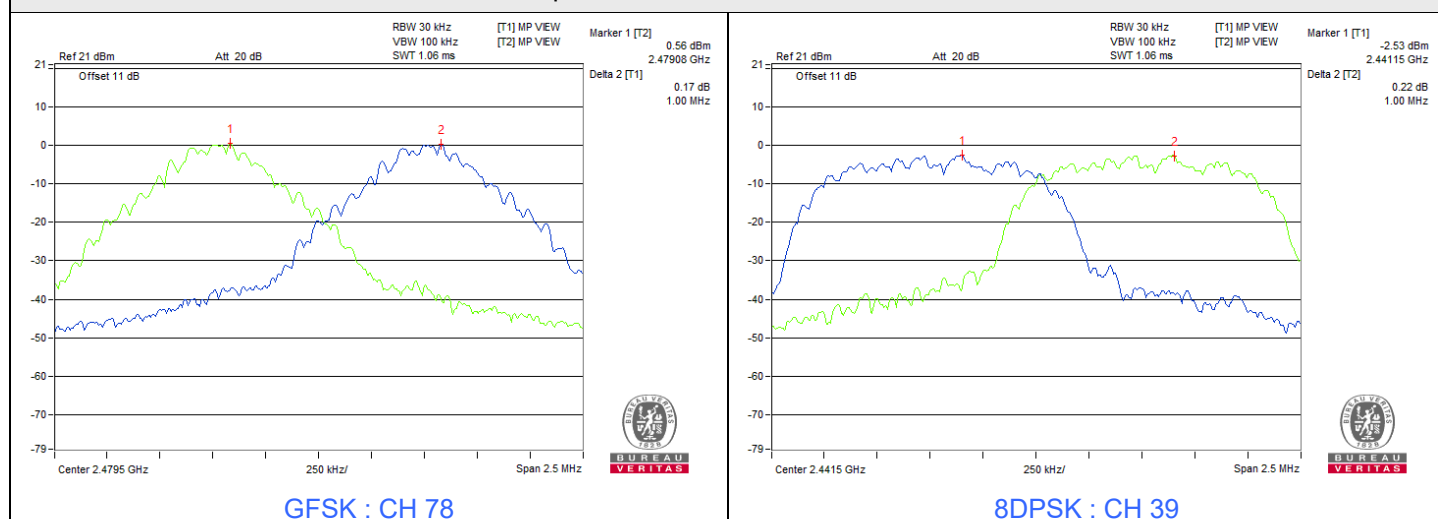
Note: The minimum limit is two-third 20dB bandwidth.

8DPSK

Channel	Frequency (MHz)	Hopping Channel Separation (MHz)	Minimum Limit (MHz)	Test Result
0	2402	1.01	0.91	Pass
39	2441	1.00	0.9	Pass
78	2480	1.00	0.9	Pass

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

Spectrum Plot of Minimum Value



7.5 20 dB Bandwidth

Input Power:	120 Vac, 60 Hz	Environmental Conditions:	25°C, 76% RH	Tested By:	Dalen Dai
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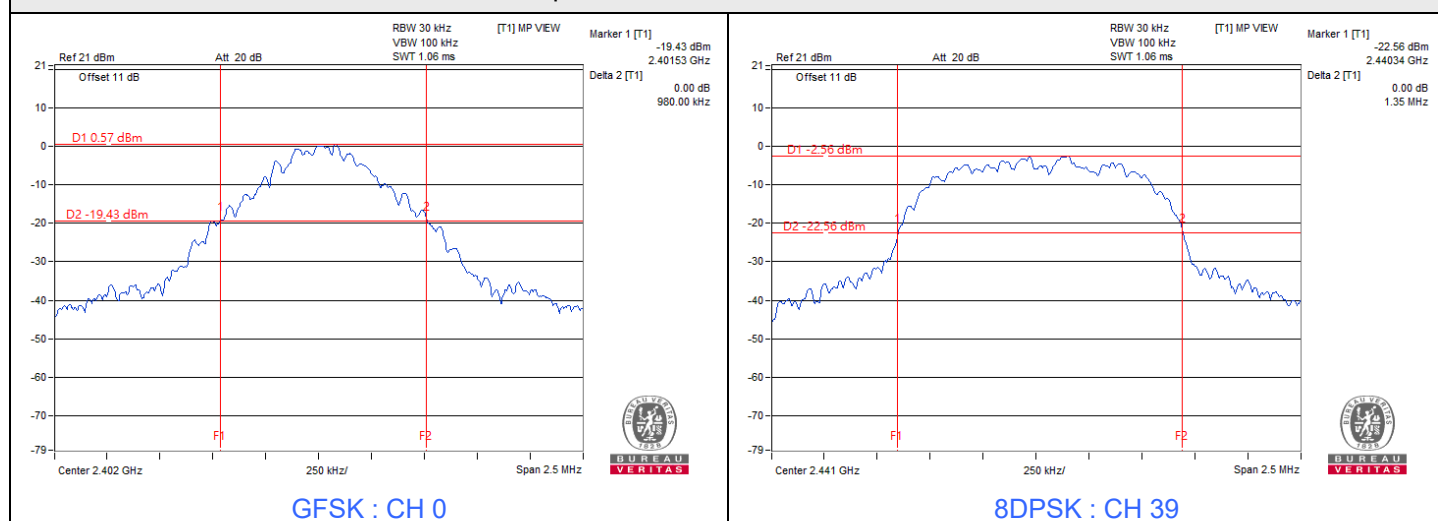
GFSK

Channel	Frequency (MHz)	20dB Bandwidth (MHz)
0	2402	0.98
39	2441	0.99
78	2480	0.99

8DPSK

Channel	Frequency (MHz)	20dB Bandwidth (MHz)
0	2402	1.36
39	2441	1.35
78	2480	1.35

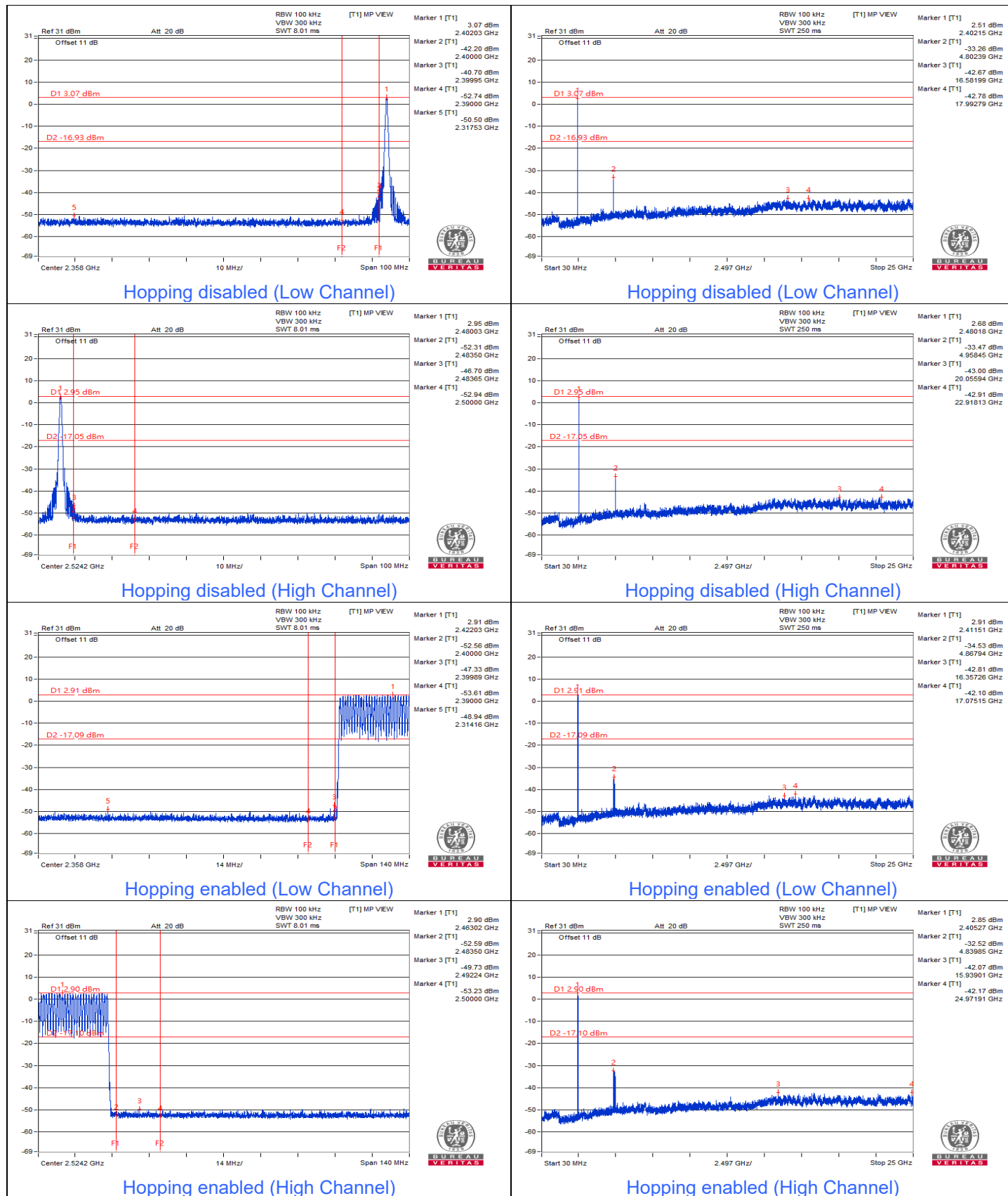
Spectrum Plot of Minimum Value



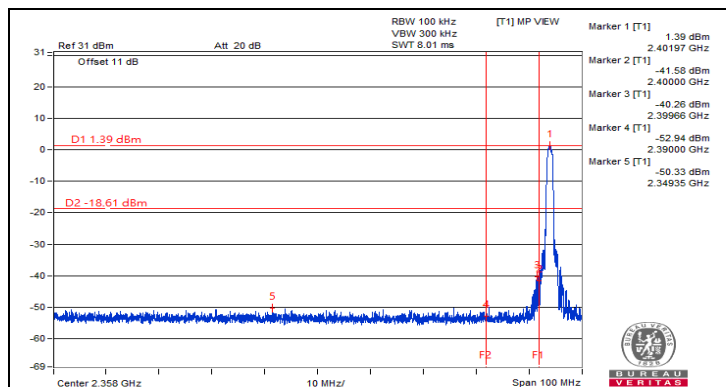
7.6 Conducted Out of Band Emissions

Input Power:	120 Vac, 60 Hz	Environmental Conditions:	25°C, 76% RH	Tested By:	Dalen Dai
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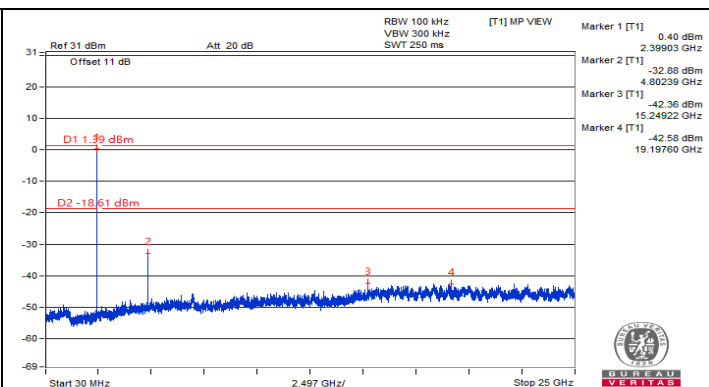
GFSK



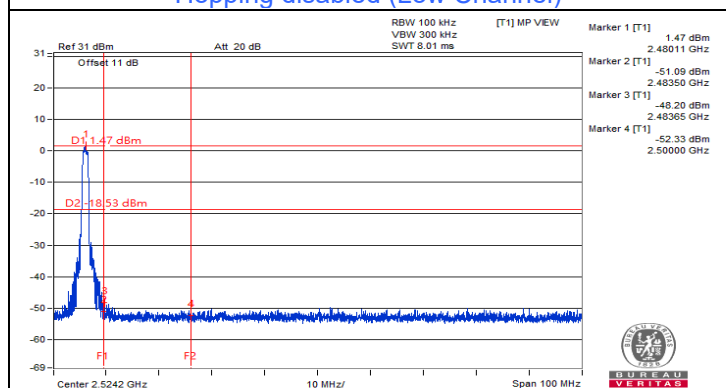
8DPSK



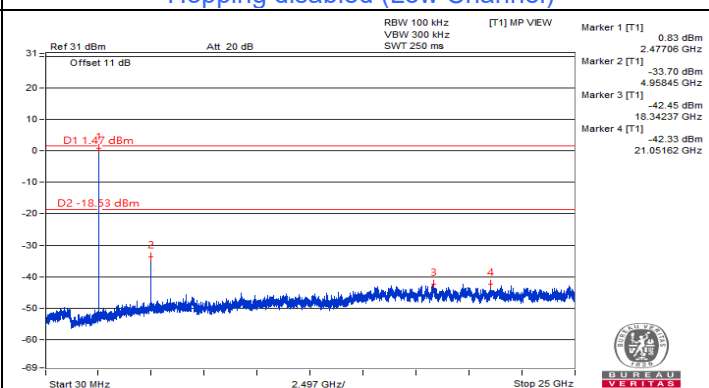
Hopping disabled (Low Channel)



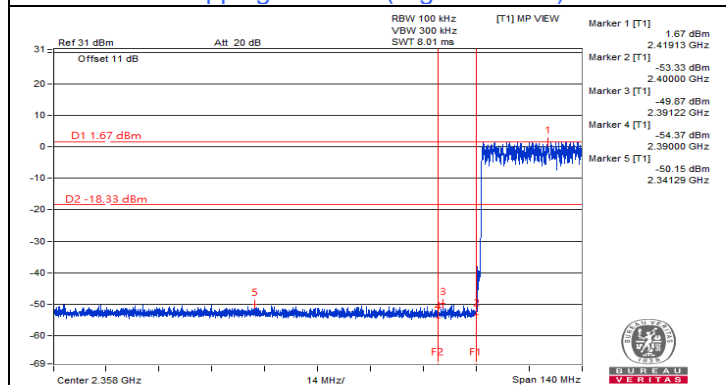
Hopping disabled (Low Channel)



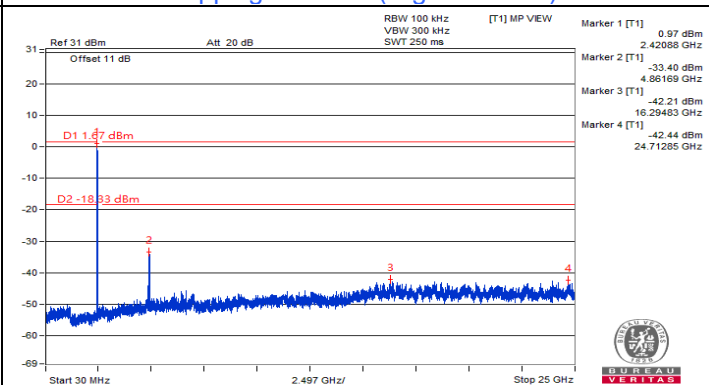
Hopping disabled (High Channel)



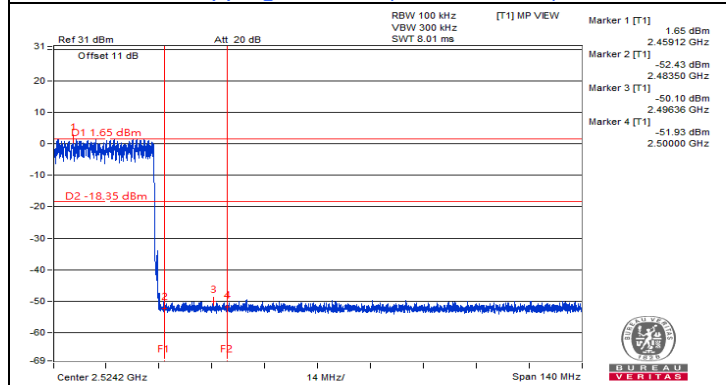
Hopping disabled (High Channel)



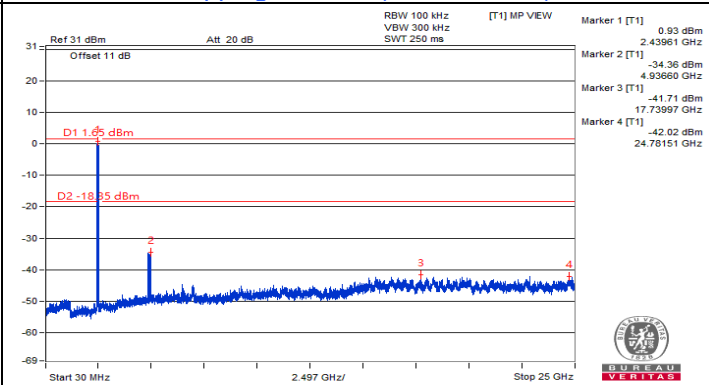
Hopping enabled (Low Channel)



Hopping enabled (Low Channel)



Hopping enabled (High Channel)



Hopping enabled (High Channel)

7.7 AC Power Conducted Emissions

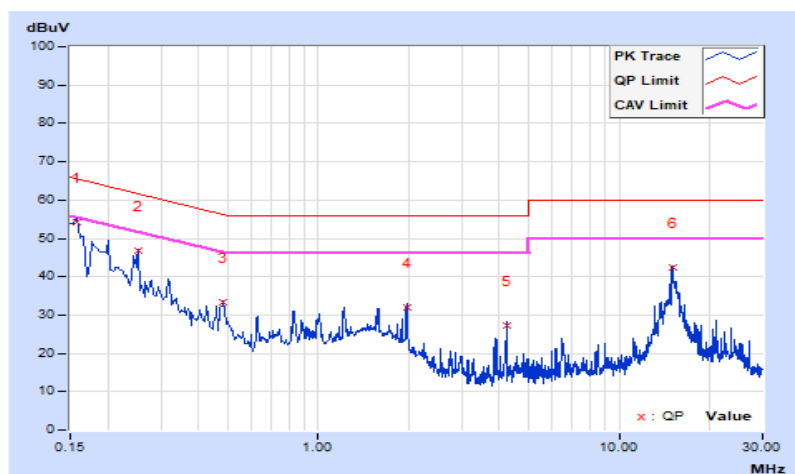
Mode A

RF Mode	BT GFSK	Channel	CH 0 : 2402 MHz
Frequency Range	150 kHz ~ 30 MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9 kHz
Input Power	120 Vac, 60 Hz	Environmental Conditions	25 °C, 75% RH
Tested By	Jed Wu		

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	0.15719	10.05	44.08	25.52	54.13	35.57	65.61	55.61	-11.48	-20.04
2	0.25169	10.05	36.71	21.64	46.76	31.69	61.70	51.70	-14.94	-20.01
3	0.48244	10.07	23.14	12.10	33.21	22.17	56.30	46.30	-23.09	-24.13
4	1.96663	10.15	21.99	14.45	32.14	24.60	56.00	46.00	-23.86	-21.40
5	4.22536	10.19	17.03	8.65	27.22	18.84	56.00	46.00	-28.78	-27.16
6	15.03563	10.48	31.80	24.97	42.28	35.45	60.00	50.00	-17.72	-14.55

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

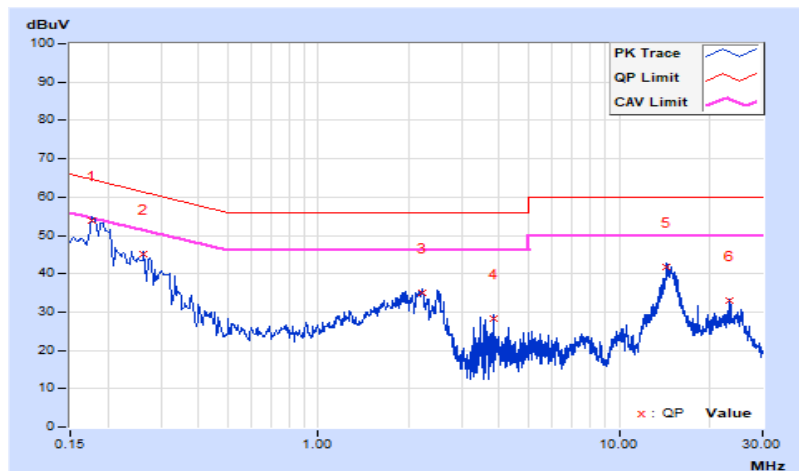


RF Mode	BT GFSK	Channel	CH 0 : 2402 MHz
Frequency Range	150 kHz ~ 30 MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9 kHz
Input Power	120 Vac, 60 Hz	Environmental Conditions	25 °C, 75% RH
Tested By	Jed Wu		

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	0.17738	10.04	43.67	23.26	53.71	33.30	64.61	54.61	-10.90	-21.31
2	0.26342	10.04	35.10	17.10	45.14	27.14	61.32	51.32	-16.18	-24.18
3	2.22293	10.16	24.76	16.32	34.92	26.48	56.00	46.00	-21.08	-19.52
4	3.84599	10.20	18.08	6.98	28.28	17.18	56.00	46.00	-27.72	-28.82
5	14.42942	10.46	31.42	25.41	41.88	35.87	60.00	50.00	-18.12	-14.13
6	23.19397	10.57	22.52	13.45	33.09	24.02	60.00	50.00	-26.91	-25.98

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



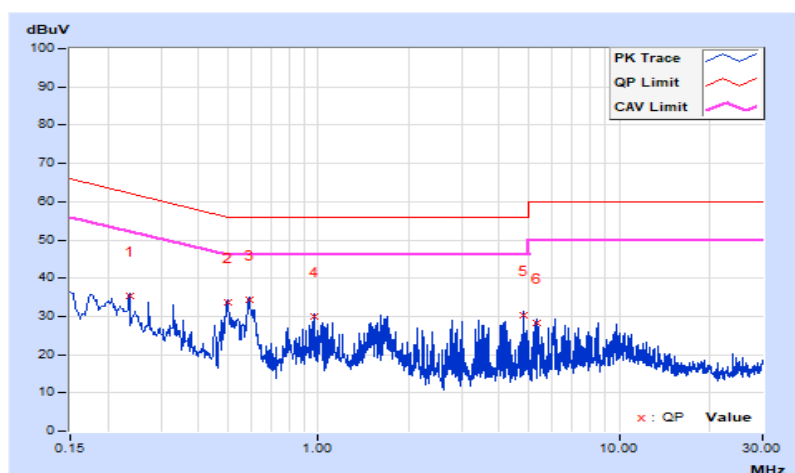
Mode B

RF Mode	BT GFSK	Channel	CH 0 : 2402 MHz
Frequency Range	150 kHz ~ 30 MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9 kHz
Input Power	120 Vac, 60 Hz	Environmental Conditions	25 °C, 75% RH
Tested By	Jed Wu		

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	0.23550	10.05	25.23	16.15	35.28	26.20	62.25	52.25	-26.97	-26.05
2	0.50225	10.07	23.63	15.53	33.70	25.60	56.00	46.00	-22.30	-20.40
3	0.59225	10.08	24.10	18.26	34.18	28.34	56.00	46.00	-21.82	-17.66
4	0.96800	10.11	19.97	14.19	30.08	24.30	56.00	46.00	-25.92	-21.70
5	4.78550	10.20	20.09	4.99	30.29	15.19	56.00	46.00	-25.71	-30.81
6	5.36225	10.22	18.17	4.26	28.39	14.48	60.00	50.00	-31.61	-35.52

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

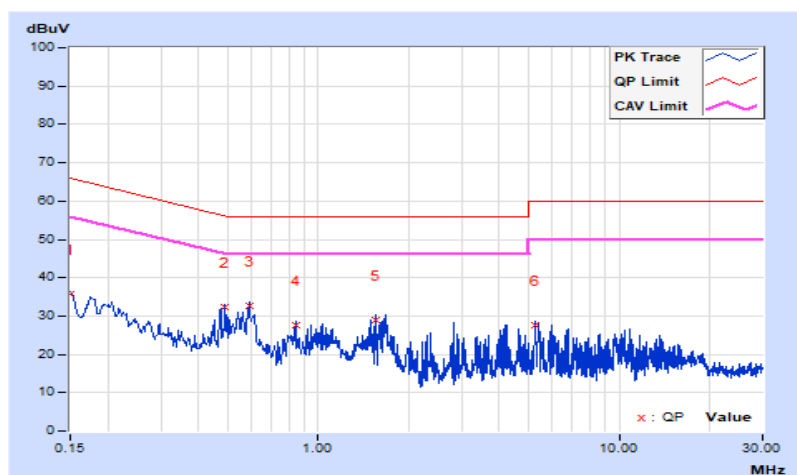


RF Mode	BT GFSK	Channel	CH 0 : 2402 MHz
Frequency Range	150 kHz ~ 30 MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9 kHz
Input Power	120 Vac, 60 Hz	Environmental Conditions	25 °C, 75% RH
Tested By	Jed Wu		

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	0.15000	10.05	25.61	15.45	35.66	25.50	66.00	56.00	-30.34	-30.50
2	0.48750	10.05	22.28	13.25	32.33	23.30	56.21	46.21	-23.88	-22.91
3	0.59000	10.06	22.71	16.12	32.77	26.18	56.00	46.00	-23.23	-19.82
4	0.83975	10.08	17.44	13.97	27.52	24.05	56.00	46.00	-28.48	-21.95
5	1.54850	10.13	18.72	9.25	28.85	19.38	56.00	46.00	-27.15	-26.62
6	5.29025	10.24	17.43	6.37	27.67	16.61	60.00	50.00	-32.33	-33.39

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



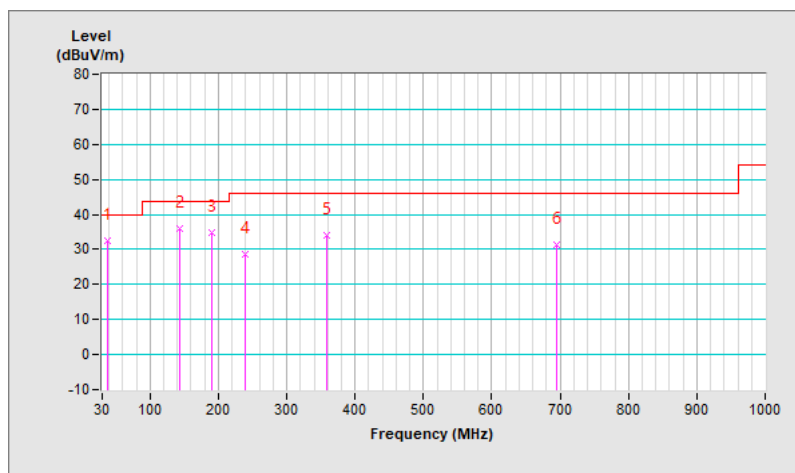
7.8 Unwanted Emissions below 1 GHz

RF Mode	BT GFSK	Channel	CH 0 : 2402 MHz
Frequency Range	30 MHz ~ 1 GHz	Detector Function & Bandwidth	QP: RB=120 kHz, DET=Quasi-Peak
Input Power	120 Vac, 60 Hz	Environmental Conditions	24 °C, 70% RH
Tested By	Dalen Dai		

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	37.76	32.4 QP	40.0	-7.6	1.56 H	345	42.0	-9.6
2	143.49	36.0 QP	43.5	-7.5	1.74 H	182	44.1	-8.1
3	191.02	35.0 QP	43.5	-8.5	1.35 H	168	44.9	-9.9
4	239.52	28.7 QP	46.0	-17.3	1.86 H	60	37.0	-8.3
5	358.83	34.1 QP	46.0	-11.9	2.17 H	341	38.5	-4.4
6	694.45	31.4 QP	46.0	-14.6	1.22 H	319	28.5	2.9

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 30 MHz ~ 1 GHz.
5. The frequency range 9 kHz ~ 30 MHz: all emissions are more than 20 dB below the limit, therefore do not be recorded in this report.

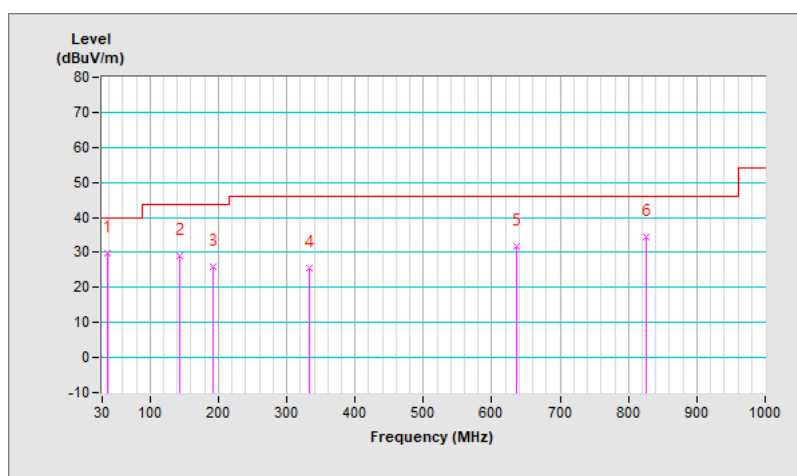


RF Mode	BT GFSK	Channel	CH 0 : 2402 MHz
Frequency Range	30 MHz ~ 1 GHz	Detector Function & Bandwidth	QP: RB=120 kHz, DET=Quasi-Peak
Input Power	120 Vac, 60 Hz	Environmental Conditions	24 °C, 70% RH
Tested By	Dalen Dai		

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	37.76	29.7 QP	40.0	-10.3	1.53 V	60	39.3	-9.6
2	143.49	29.0 QP	43.5	-14.5	1.27 V	19	37.1	-8.1
3	192.96	26.0 QP	43.5	-17.5	1.72 V	15	36.1	-10.1
4	333.61	25.7 QP	46.0	-20.3	1.59 V	360	30.3	-4.6
5	637.22	31.9 QP	46.0	-14.1	2.03 V	313	29.6	2.3
6	825.40	34.6 QP	46.0	-11.4	1.07 V	162	28.5	6.1

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 30 MHz ~ 1 GHz.
5. The frequency range 9 kHz ~ 30 MHz: all emissions are more than 20 dB below the limit, therefore do not be recorded in this report.



7.9 Unwanted Emissions above 1 GHz

RF Mode	BT GFSK	Channel	CH 0 : 2402 MHz
Frequency Range	1 GHz ~ 25 GHz	Detector Function & Bandwidth	PK: RB=1 MHz, VB=3 MHz, DET=Peak AV: RB=1 MHz, VB=3 MHz, DET=RMS
Input Power	120 Vac, 60 Hz	Environmental Conditions	24 °C, 70% RH
Tested By	Dalen Dai		

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	52.3 PK	74.0	-21.7	3.96 H	354	53.0	-0.7
2	2390.00	40.4 AV	54.0	-13.6	3.96 H	354	41.1	-0.7
3	*2402.00	90.8 PK			3.96 H	354	91.4	-0.6
4	*2402.00	60.1 AV			3.96 H	354	60.7	-0.6
5	4804.00	60.6 PK	74.0	-13.4	2.27 H	239	53.5	7.1
6	4804.00	29.9 AV	54.0	-24.1	2.27 H	239	22.8	7.1
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	52.7 PK	74.0	-21.3	2.85 V	249	53.4	-0.7
2	2390.00	40.8 AV	54.0	-13.2	2.85 V	249	41.5	-0.7
3	*2402.00	93.7 PK			2.85 V	249	94.3	-0.6
4	*2402.00	63.0 AV			2.85 V	249	63.6	-0.6
5	4804.00	60.3 PK	74.0	-13.7	3.66 V	345	53.2	7.1
6	4804.00	29.6 AV	54.0	-24.4	3.66 V	345	22.5	7.1

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, the limit was restricted at the RF Output Power.
6. The average value of fundamental and harmonic frequency is: Average = Peak value + 20 log(Duty cycle) Where the duty cycle correction factor is calculated from following formula:

$$20 \log(\text{Duty cycle}) = 20 \log(2.927 \text{ ms} / 100 \text{ ms}) = -30.7 \text{ dB}$$

RF Mode	BT GFSK	Channel	CH 39 : 2441 MHz
Frequency Range	1 GHz ~ 25 GHz	Detector Function & Bandwidth	PK: RB=1 MHz, VB=3 MHz, DET=Peak AV: RB=1 MHz, VB=3 MHz, DET=RMS
Input Power	120 Vac, 60 Hz	Environmental Conditions	24 °C, 70% RH
Tested By	Dalen Dai		

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	90.6 PK			3.93 H	356	91.0	-0.4
2	*2441.00	59.9 AV			3.93 H	356	60.3	-0.4
3	4882.00	60.4 PK	74.0	-13.6	2.29 H	242	52.9	7.5
4	4882.00	29.7 AV	54.0	-24.3	2.29 H	242	22.2	7.5
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	93.5 PK			2.88 V	251	93.9	-0.4
2	*2441.00	62.8 AV			2.88 V	251	63.2	-0.4
3	4882.00	60.7 PK	74.0	-13.3	3.68 V	344	53.2	7.5
4	4882.00	30.0 AV	54.0	-24.0	3.68 V	344	22.5	7.5

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, the limit was restricted at the RF Output Power.
6. The average value of fundamental and harmonic frequency is: Average = Peak value + 20 log(Duty cycle) Where the duty cycle correction factor is calculated from following formula:

$$20 \log(\text{Duty cycle}) = 20 \log(2.927 \text{ ms} / 100 \text{ ms}) = -30.7 \text{ dB}$$

RF Mode	BT GFSK	Channel	CH 78 : 2480 MHz
Frequency Range	1 GHz ~ 25 GHz	Detector Function & Bandwidth	PK: RB=1 MHz, VB=3 MHz, DET=Peak AV: RB=1 MHz, VB=3 MHz, DET=RMS
Input Power	120 Vac, 60 Hz	Environmental Conditions	24 °C, 70% RH
Tested By	Dalen Dai		

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	90.9 PK			3.96 H	355	91.0	-0.1
2	*2480.00	60.2 AV			3.96 H	355	60.3	-0.1
3	2483.50	56.7 PK	74.0	-17.3	3.96 H	355	56.8	-0.1
4	2483.50	26.0 AV	54.0	-28.0	3.96 H	355	26.1	-0.1
5	4960.00	60.8 PK	74.0	-13.2	2.27 H	240	53.3	7.5
6	4960.00	30.1 AV	54.0	-23.9	2.27 H	240	22.6	7.5
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	92.7 PK			2.99 V	246	92.8	-0.1
2	*2480.00	62.0 AV			2.99 V	246	62.1	-0.1
3	2483.50	60.2 PK	74.0	-13.8	2.99 V	246	60.3	-0.1
4	2483.50	29.5 AV	54.0	-24.5	2.99 V	246	29.6	-0.1
5	4960.00	61.0 PK	74.0	-13.0	3.88 V	342	53.5	7.5
6	4960.00	30.3 AV	54.0	-23.7	3.88 V	342	22.8	7.5

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, the limit was restricted at the RF Output Power.
6. The average value of fundamental and harmonic frequency is: Average = Peak value + 20 log(Duty cycle) Where the duty cycle correction factor is calculated from following formula:
 $20 \log(\text{Duty cycle}) = 20 \log(2.927 \text{ ms} / 100 \text{ ms}) = -30.7 \text{ dB}$

RF Mode	BT 8DPSK	Channel	CH 0 : 2402 MHz
Frequency Range	1 GHz ~ 25 GHz	Detector Function & Bandwidth	PK: RB=1 MHz, VB=3 MHz, DET=Peak AV: RB=1 MHz, VB=3 MHz, DET=RMS
Input Power	120 Vac, 60 Hz	Environmental Conditions	24 °C, 70% RH
Tested By	Dalen Dai		

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	52.2 PK	74.0	-21.8	3.94 H	353	52.9	-0.7
2	2390.00	40.3 AV	54.0	-13.7	3.94 H	353	41.0	-0.7
3	*2402.00	91.8 PK			3.94 H	353	92.4	-0.6
4	*2402.00	61.1 AV			3.94 H	353	61.7	-0.6
5	4804.00	59.7 PK	74.0	-14.3	2.29 H	241	52.6	7.1
6	4804.00	29.0 AV	54.0	-25.0	2.29 H	241	21.9	7.1
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	52.5 PK	74.0	-21.5	2.90 V	250	53.2	-0.7
2	2390.00	40.7 AV	54.0	-13.3	2.90 V	250	41.4	-0.7
3	*2402.00	95.2 PK			2.90 V	250	95.8	-0.6
4	*2402.00	64.5 AV			2.90 V	250	65.1	-0.6
5	4804.00	60.1 PK	74.0	-13.9	3.72 V	345	53.0	7.1
6	4804.00	29.4 AV	54.0	-24.6	3.72 V	345	22.3	7.1

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, the limit was restricted at the RF Output Power.
6. The average value of fundamental and harmonic frequency is: Average = Peak value + 20 log(Duty cycle) Where the duty cycle correction factor is calculated from following formula:

$$20 \log(\text{Duty cycle}) = 20 \log(2.927 \text{ ms} / 100 \text{ ms}) = -30.7 \text{ dB}$$

RF Mode	BT 8DPSK	Channel	CH 39 : 2441 MHz
Frequency Range	1 GHz ~ 25 GHz	Detector Function & Bandwidth	PK: RB=1 MHz, VB=3 MHz, DET=Peak AV: RB=1 MHz, VB=3 MHz, DET=RMS
Input Power	120 Vac, 60 Hz	Environmental Conditions	24 °C, 70% RH
Tested By	Dalen Dai		

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	91.5 PK			3.98 H	355	91.9	-0.4
2	*2441.00	60.8 AV			3.98 H	355	61.2	-0.4
3	4882.00	59.4 PK	74.0	-14.6	2.30 H	240	51.9	7.5
4	4882.00	28.7 AV	54.0	-25.3	2.30 H	240	21.2	7.5
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	94.9 PK			2.86 V	249	95.3	-0.4
2	*2441.00	64.2 AV			2.86 V	249	64.6	-0.4
3	4882.00	59.9 PK	74.0	-14.1	3.65 V	341	52.4	7.5
4	4882.00	29.2 AV	54.0	-24.8	3.65 V	341	21.7	7.5

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, the limit was restricted at the RF Output Power.
6. The average value of fundamental and harmonic frequency is: Average = Peak value + 20 log(Duty cycle) Where the duty cycle correction factor is calculated from following formula:

$$20 \log(\text{Duty cycle}) = 20 \log(2.927 \text{ ms} / 100 \text{ ms}) = -30.7 \text{ dB}$$

RF Mode	BT 8DPSK	Channel	CH 78 : 2480 MHz
Frequency Range	1 GHz ~ 25 GHz	Detector Function & Bandwidth	PK: RB=1 MHz, VB=3 MHz, DET=Peak AV: RB=1 MHz, VB=3 MHz, DET=RMS
Input Power	120 Vac, 60 Hz	Environmental Conditions	24 °C, 70% RH
Tested By	Dalen Dai		

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	91.5 PK			3.94 H	351	91.6	-0.1
2	*2480.00	60.8 AV			3.94 H	351	60.9	-0.1
3	2483.50	57.7 PK	74.0	-16.3	3.94 H	351	57.8	-0.1
4	2483.50	27.0 AV	54.0	-27.0	3.94 H	351	27.1	-0.1
5	4960.00	58.9 PK	74.0	-15.1	2.32 H	237	51.4	7.5
6	4960.00	28.2 AV	54.0	-25.8	2.32 H	237	20.7	7.5
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	94.0 PK			2.93 V	243	94.1	-0.1
2	*2480.00	63.3 AV			2.93 V	243	63.4	-0.1
3	2483.50	61.4 PK	74.0	-12.6	2.93 V	243	61.5	-0.1
4	2483.50	30.7 AV	54.0	-23.3	2.93 V	243	30.8	-0.1
5	4960.00	59.5 PK	74.0	-14.5	3.77 V	346	52.0	7.5
6	4960.00	28.8 AV	54.0	-25.2	3.77 V	346	21.3	7.5

Remarks:

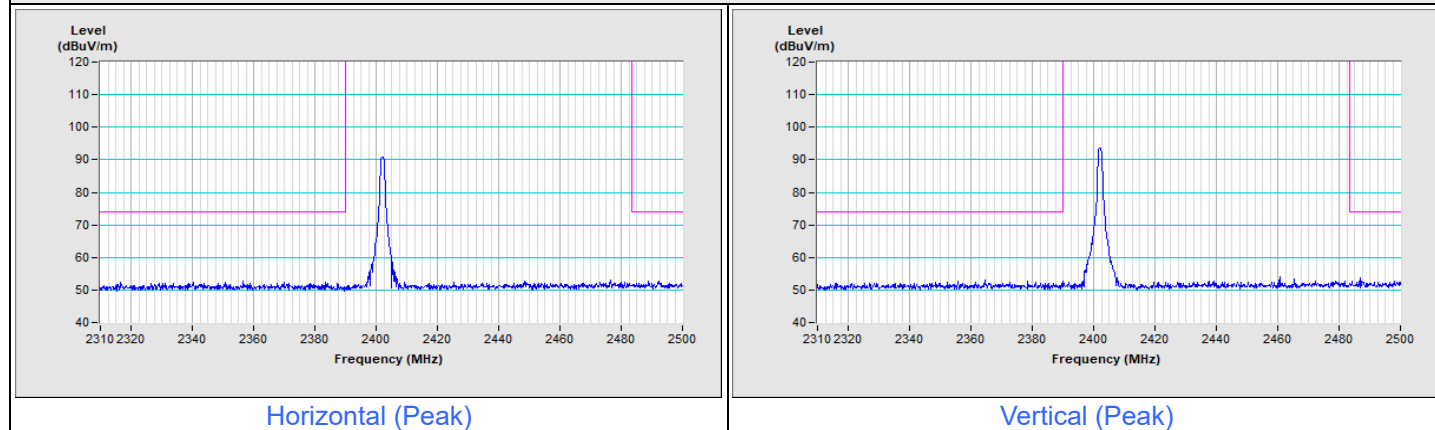
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2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " * ": Fundamental frequency, the limit was restricted at the RF Output Power.
6. The average value of fundamental and harmonic frequency is: Average = Peak value + 20 log(Duty cycle) Where the duty cycle correction factor is calculated from following formula:

$$20 \log(\text{Duty cycle}) = 20 \log(2.927 \text{ ms} / 100 \text{ ms}) = -30.7 \text{ dB}$$

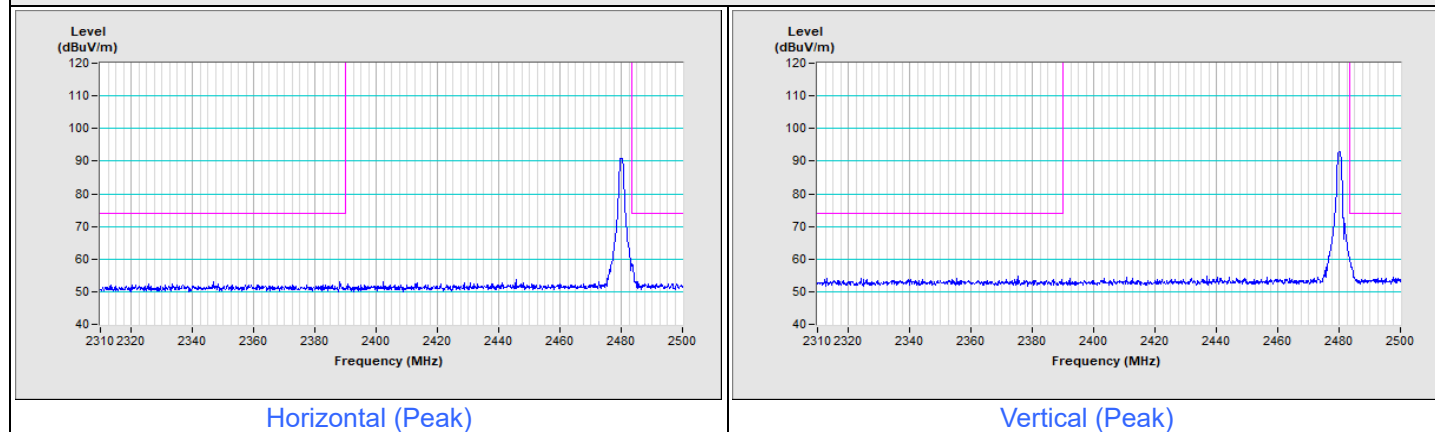
Plot of Band Edge

Frequency Range	2.31 GHz ~ 2.5 GHz	Detector Function & Bandwidth	PK: RB=1 MHz, VB=3 MHz, DET=Peak
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BT GFSK Channel 0

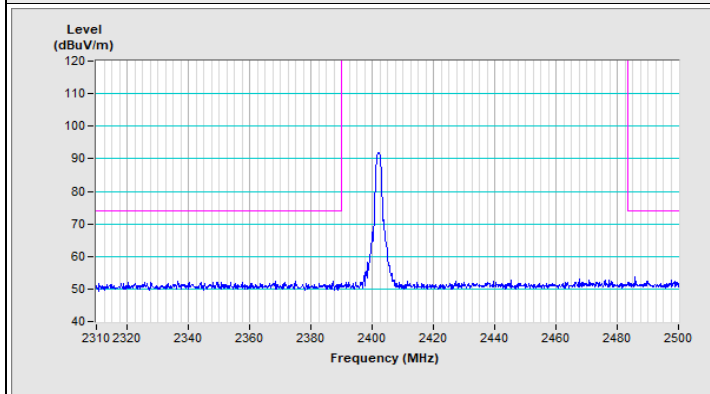


BT GFSK Channel 78

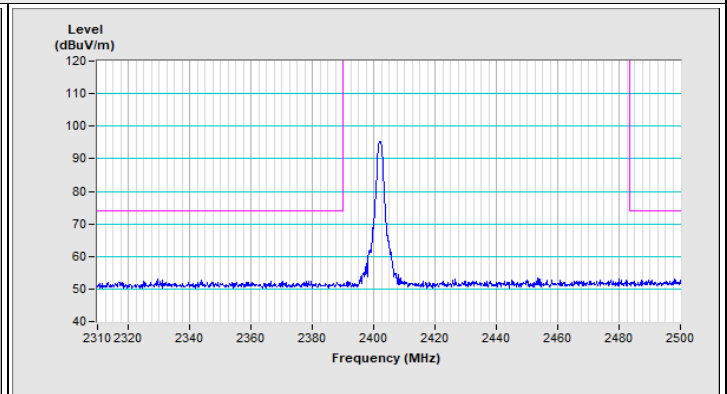


Frequency Range	2.31 GHz ~ 2.5 GHz	Detector Function & Bandwidth	PK: RB=1 MHz, VB=3 MHz, DET=Peak
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BT 8DPSK Channel 0

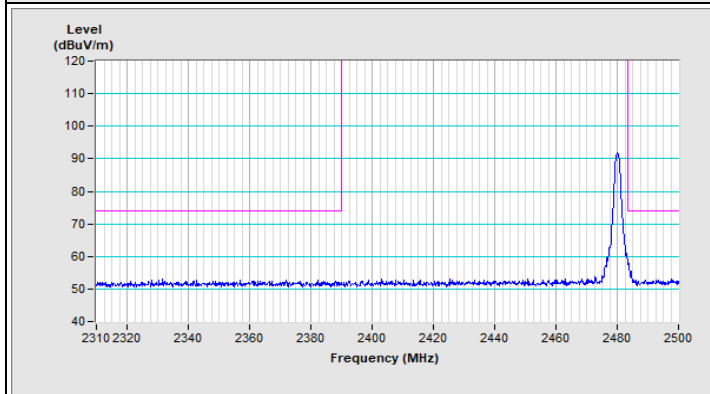


Horizontal (Peak)

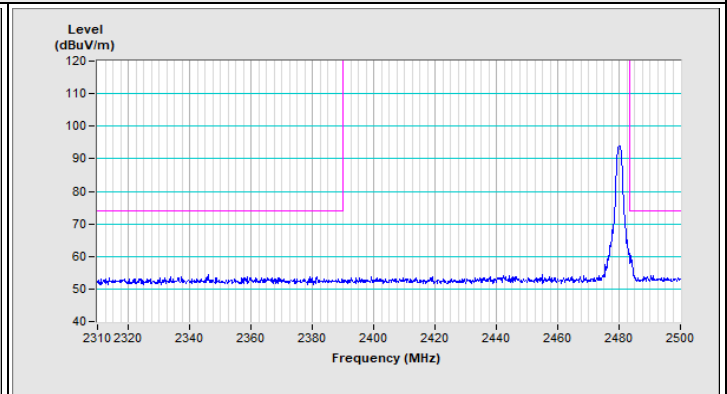


Vertical (Peak)

BT 8DPSK Channel 78



Horizontal (Peak)



Vertical (Peak)

8 Pictures of Test Arrangements

Please refer to the attached file (Test Setup Photo)

9 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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Email: service.adt@bureauveritas.com

Web Site: <http://ee.bureauveritas.com.tw>

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

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