

TEST REPORT

Applicant	Tonly Technology Co., Ltd.
Address	Section 37, Zhongkai High-tech Development Zone, Huizhou City, GuangDong Province, P.R. China

Manufacturer or Supplier	Sony Group Corporation
Address	1-7-1 Konan Minato-ku Tokyo, 108-0075 Japan
Product	WIRELESS SPEAKER
Brand Name	SONY
Model	YY7859E
Additional Models & Model Difference	N/A
Date of tests	Aug. 24, 2024 ~ Sep. 04, 2024

The tests have been carried out according to the requirements of the following standards:

☒ **FCC Part 15, Subpart C, Section 15.247**

CONCLUSION: The submitted sample was found to COMPLY with the test requirement

Tested by Lucas Chen Project Engineer / EMC Department	Approved by Glyn He Assistant Manager / EMC Department
	

Date: Oct. 11, 2024

This report is governed by, and incorporates by reference, the Conditions of Testing as posted at the date of issuance of this report at <http://www.bureauveritas.com/home/about-us/our-business/cps/about-us/terms-conditions/> and is intended for your exclusive use. Any copying or replication of this report to or for any other person or entity, or use of our name or trademark, is permitted only with our prior written permission. This report sets forth our findings solely with respect to the test samples identified herein. The results set forth in this report are not indicative or representative of the quality or characteristics of the lot from which a test sample was taken or any similar or identical product unless specifically and expressly noted. Our report includes all of the tests requested by you and the results thereof based upon the information that you provided to us. Measurement uncertainty is only provided upon request for accredited tests. Statements of conformity are based on simple acceptance criteria without taking measurement uncertainty into account, unless otherwise requested in writing. You have 60 days from date of issuance of this report to notify us of any material error or omission caused by our negligence or if you require measurement uncertainty; provided, however, that such notice shall be in writing and shall specifically address the issue you wish to raise. A failure to raise such issue within the prescribed time shall constitute your unqualified acceptance of the completeness of this report, the tests conducted and the correctness of the report contents

TABLE OF CONTENTS

RELEASE CONTROL RECORD	5
1 SUMMARY OF TEST RESULTS.....	6
2 MEASUREMENT UNCERTAINTY	6
3 GENERAL INFORMATION	7
3.1 GENERAL DESCRIPTION OF EUT.....	7
3.2 DESCRIPTION OF TEST MODES.....	7
3.2.1 CONFIGURATION OF SYSTEM UNDER TEST	9
3.2.2 TEST MODE APPLICABILITY AND TESTED CHANNEL DETAIL.....	9
3.3 GENERAL DESCRIPTION OF APPLIED STANDARDS.....	11
3.4 DESCRIPTION OF SUPPORT UNITS.....	11
3.5 CONFIGURATION OF SYSTEM UNDER TEST	12
4 TEST TYPES AND RESULTS.....	14
4.1. CONDUCTED EMISSION MEASUREMENT	14
4.1.1 LIMITS OF CONDUCTED EMISSION MEASUREMENT	14
4.1.2 TEST INSTRUMENTS.....	14
4.1.3 TEST PROCEDURES	15
4.1.4 DEVIATION FROM TEST STANDARD	15
4.1.5 TEST SETUP	16
4.1.6 EUT OPERATING CONDITIONS	16
4.1.7 TEST RESULTS.....	17
4.2. RADIATED EMISSION AND BANDEDGE MEASUREMENT	19
4.2.1 LIMITS OF RADIATED EMISSION AND BANDEDGE MEASUREMENT	19
4.2.2 TEST INSTRUMENTS.....	20
4.2.3 TEST PROCEDURES	21
4.2.4 DEVIATION FROM TEST STANDARD	22
4.2.5 TEST SETUP	22
4.2.6 EUT OPERATING CONDITIONS	23
4.2.7 TEST RESULTS.....	24
4.3 NUMBER OF HOPPING FREQUENCY USED.....	32
4.3.1 LIMIT OF HOPPING FREQUENCY USED	32
4.3.2 TEST SETUP.....	32
4.3.3 TEST INSTRUMENTS.....	32
4.3.4 TEST PROCEDURES	33
4.3.5 DEVIATION FROM TEST STANDARD	33

4.3.6	TEST RESULTS.....	33
4.4	DWELL TIME ON EACH CHANNEL	36
4.4.1	LIMIT OF DWELL TIME USED	36
4.4.2	TEST SETUP	36
4.4.3	TEST INSTRUMENTS.....	36
4.4.4	TEST PROCEDURES	36
4.4.5	DEVIATION FROM TEST STANDARD	37
4.4.6	TEST RESULTS.....	37
4.5	CHANNEL BANDWIDTH.....	40
4.5.1	LIMITS OF CHANNEL BANDWIDTH	40
4.5.2	TEST SETUP	40
4.5.3	TEST INSTRUMENTS.....	40
4.5.4	TEST PROCEDURE	40
4.5.5	DEVIATION FROM TEST STANDARD	40
4.5.6	EUT OPERATING CONDITION.....	40
4.5.7	TEST RESULTS.....	41
4.6	HOPPING CHANNEL SEPARATION	45
4.6.1	LIMIT OF HOPPING CHANNEL SEPARATION	45
4.6.2	TEST SETUP	45
4.6.3	TEST INSTRUMENTS.....	45
4.6.4	TEST PROCEDURES	45
4.6.5	DEVIATION FROM TEST STANDARD	45
4.6.6	TEST RESULTS.....	46
4.7	CONDUCTED OUTPUT POWER	50
4.7.1	LIMITS OF CONDUCTED OUTPUT POWER MEASUREMENT.....	50
4.7.2	TEST SETUP	50
4.7.3	TEST INSTRUMENTS.....	50
4.7.4	TEST PROCEDURES	51
4.7.5	DEVIATION FROM TEST STANDARD	51
4.7.6	EUT OPERATING CONDITION.....	51
4.7.7	TEST RESULTS.....	52
4.8	OUT OF BAND EMISSION MEASUREMENT	54
4.8.1	LIMITS OF OUT OF BAND EMISSION MEASUREMENT	54
4.8.2	TEST INSTRUMENTS.....	54
4.8.3	TEST PROCEDURE	54
4.8.4	DEVIATION FROM TEST STANDARD	54
4.8.5	EUT OPERATING CONDITION.....	54



Test Report No.: RF2408WDG0131-1

4.8.6	TEST RESULTS.....	54
5	PHOTOGRAPHS OF THE TEST CONFIGURATION	59
6	APPENDIX A - MODIFICATIONS RECORDERS FOR ENGINEERING CHANGES TO THE EUT BY THE LAB	60



Test Report No.: RF2408WDG0131-1

RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
RF2408WDG0131-1	Original release	Oct. 11, 2024

1 SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

APPLIED STANDARD: FCC Part 15, Subpart C			
STANDARD SECTION	TEST TYPE AND LIMIT	RESULT	REMARK
15.207	AC Power Conducted Emission	PASS	Meet the requirement of limit.
15.247(a)(1)(iii)	Number of Hopping Frequency Used	PASS	Meet the requirement of limit.
15.247(a)(1)(iii)	Dwell Time on Each Channel	PASS	Meet the requirement of limit.
15.247(a)(1)	1. Hopping Channel Separation 2. Spectrum Bandwidth of a Frequency Hopping Sequence Spread Spectrum System	PASS	Meet the requirement of limit.
15.247(b)	Conducted Output Power	PASS	Meet the requirement of limit.
15.247(d)&15.209	Transmitter Radiated Emission	PASS	Meet the requirement of limit.
15.247(d)	Out of band Emission Measurement	PASS	Meet the requirement of limit.
15.203	Antenna Requirement	PASS	No antenna connector is used.

2 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	UNCERTAINTY
Conducted emissions	9kHz~30MHz	3.36dB
Radiated emissions	9KHz ~ 30MHz	2.80dB
	30MHz ~ 1GMHz	4.65dB
	1GHz ~ 18GHz	5.01dB
	18GHz ~ 40GHz	4.10dB

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

3 GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

PRODUCT	WIRELESS SPEAKER
MODEL NO.	YY7859E
ADDITIONAL MODELS	N/A
FCC ID	ZVAYY7859E
POWER SUPPLY	Powered by Type-C Port or DC 7.2V from Li-ion Battery (Type-C Input: DC 5V/3A or DC 9V/3A; Type-C Output: DC 5V/1.5A)
MODULATION TECHNOLOGY	FHSS
MODULATION TYPE	GFSK, $\pi/4$ DQPSK, 8DPSK
OPERATING FREQUENCY	2402MHz~2480MHz
NUMBER OF CHANNEL	79
PEAK OUTPUT POWER	7.943mW (Max. Measured)
ANTENNA TYPE	PCB Antenna, 2.73dBi Gain
I/O PORTS	Refer to user's manual
CABLE SUPPLIED	Type-C Cable: Shielded detachable 50cm
ACCESSORY	N/A

NOTES:

1. For a more detailed features description, please refer to the manufacturer's specifications or the user's manual.
2. For the test results, the EUT had been tested with all conditions. But only the worst case was shown in test report.
3. Please refer to the EUT photo document (Reference No.: 2408WDG0131-3) for detailed product photo.
4. This report is for two types of products, one is a mass production product, the other is a demonstration product, they are identical in RF circuitry and appearance. On PCBA, some components and schematic diagram are different, the demo prototype PCBA have components such as U600, R611, R612, R613, R614, C603 and ESD301, but have no R600, R601, however the mass production prototype PCBA have components such as R600, R601, but have no U600, R611, R612, R613, R614, C603 and ESD301. In view of the differences between the two types, all tests were carried out on the mass production prototype, and conduction emission test and radiated emission test were carried out on the demonstration prototype, but only the worst case (mass production prototype) was showed in test report.

3.2 DESCRIPTION OF TEST MODES

79 channels are provided to this EUT:

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

3.2.1 CONFIGURATION OF SYSTEM UNDER TEST

Please see section 5 photograph of the test configuration for reference.

3.2.2 TEST MODE APPLICABILITY AND TESTED CHANNEL DETAIL

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

EUT CONFIGURE MODE	APPLICABLE TO				DESCRIPTION
	RE<1G	RE≥1G	PLC	APCM	
A	√	√	√	-	Powered by adapter with BT link
B	-	-	-	√	Powered by Li-ion Battery with BT link

Where RE<1G: Radiated Emission below 1GHz
PLC: Power Line Conducted Emission

RE≥1G: Radiated Emission above 1GHz
APCM: Antenna Port Conducted Measurement

RADIATED EMISSION TEST (BELOW 1 GHz):

- ☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, X/Y/Z axis, antenna ports (if EUT with antenna diversity architecture) and packet type.
- ☒ 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	39	FHSS	GFSK	DH5

For the test results, only the worst case was shown in test report.

RADIATED EMISSION TEST (ABOVE 1 GHz):

- ☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, X/Y/Z axis, antenna ports (if EUT with antenna diversity architecture) and packet type.
- ☒ 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
	0 to 78	0, 39, 78	FHSS	8DPSK	3DH5

POWER LINE CONDUCTED EMISSION TEST:

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

EUT CONFIGURE MODE	TESTED CONDITION
A	BT Link

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, antenna ports (if EUT with antenna diversity architecture), and packet types.
- ☒ 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
B	0 to 78	0, 39, 78	FHSS	GFSK	DH5
	0 to 78	0, 39, 78	FHSS	8DPSK	3DH5

TEST CONDITION:

APPLICABLE TO	ENVIRONMENTAL CONDITIONS	TEST VOLTAGE	TESTED BY
RE<1G	24deg. C, 58%RH	Powered by Adapter Input AC 120V 60Hz	Ludius
RE≥1G	24deg. C, 58%RH	Powered by Adapter Input AC 120V 60Hz	Ludius
PLC	25deg. C, 56%RH	Powered by Adapter Input AC 120V 60Hz	Miro
APCM	25deg. C, 60%RH	DC 7.2V from Fully Battery	Jeffery

3.3 GENERAL DESCRIPTION OF APPLIED STANDARDS

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

FCC Part 15, Subpart C. Section 15.247

KDB 558074 D01 15.247 Meas Guidance v05r02

ANSI C63.10-2013

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

3.4 DESCRIPTION OF SUPPORT UNITS

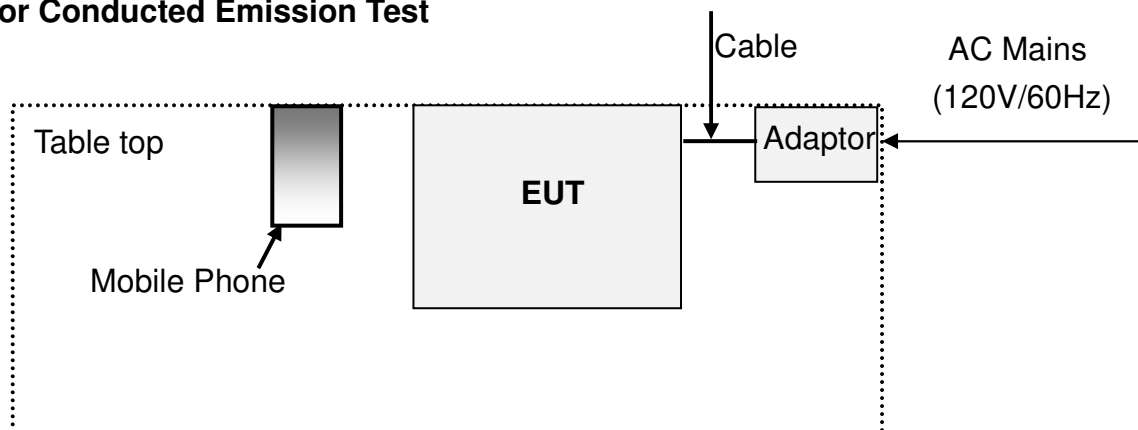
The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

NO.	PRODUCT	BRAND	MODEL NO.	SERIAL NO.	Remark
1	Adaptor	SONY	AC-045AX7T	N/A	N/A
2	Mobile Phone	MEIZU	M3 NOTE	91QEBNJ25CKF	N/A

NO.	DESCRIPTION OF THE ABOVE SUPPORT UNITS
1	N/A
2	N/A

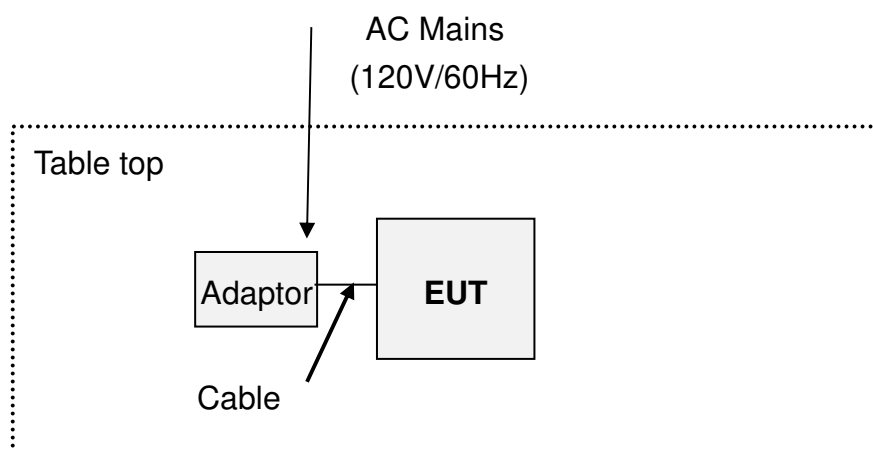
3.5 CONFIGURATION OF SYSTEM UNDER TEST

For Conducted Emission Test



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

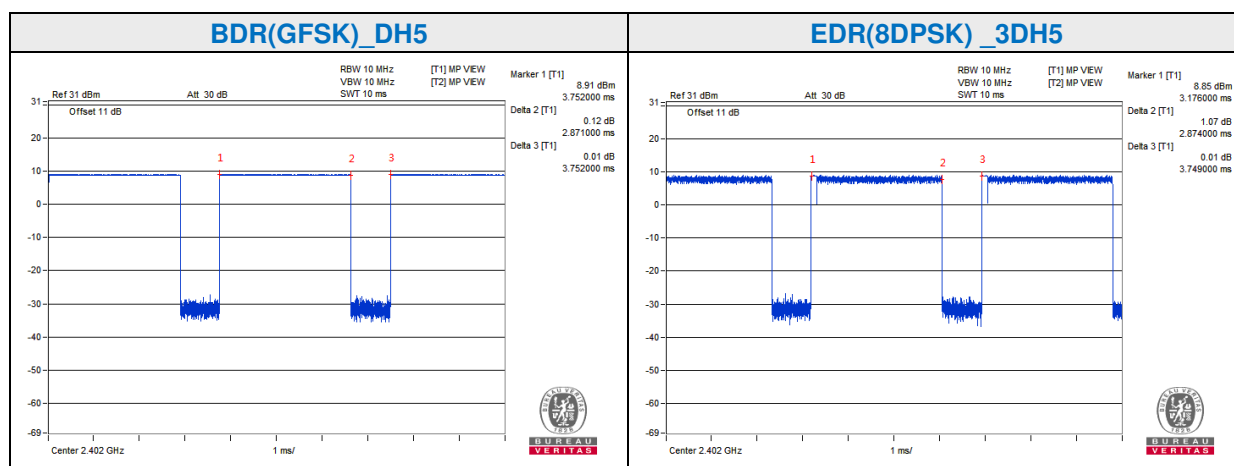
For Radiated Emission Test



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

3.6 DUTY CYCLE OF TESET SIGNAL

Test Mode	Packet Type	On Time (ms)	Period (ms)	Duty Cycle (%)	1/T Min. VBW (KHz)	VBW Setting
BDR(GFSK)	DH5	2.871	3.752	76.5	0.348	500Hz
EDR(8DPSK)	3DH5	2.874	3.749	76.7	0.348	500Hz



4 TEST TYPES AND RESULTS

4.1. CONDUCTED EMISSION MEASUREMENT

4.1.1 LIMITS OF CONDUCTED EMISSION MEASUREMENT

FREQUENCY OF EMISSION (MHz)	CONDUCTED LIMIT (dB μ V)	
	Quasi-peak	Average
0.15 ~ 0.5	66 to 56	56 to 46
0.5 ~ 5	56	46
5 ~ 30	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 0.50MHz.
 3. All emanations from a class A/B digital device or system, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strengths specified above.

4.1.2 TEST INSTRUMENTS

Equipment	Manufacturer	Model No.	Serial No.	Next Cal.
EMI Test Receiver	Rohde&Schwarz	ESR7	101494	Jan. 02, 25
Artificial Mains Network	Rohde&Schwarz	ENV216	101173	Jan. 03, 25
Artificial Mains Network	Rohde&Schwarz	ESH3-Z5	100317	Jan. 02, 25
Artificial Mains Network	SCHWARZBECK	NSLK 8122	8122-05001	Apr. 09, 25
V-LISN (CISPR 25)	SCHWARZBECK	NNBM 8124-200	8124-200 05857	Apr. 09, 25
V-LISN (CISPR 25)	SCHWARZBECK	NNBM 8124-200	8124-200 05858	Apr. 09, 25
Voltage probe	SCHWARZBECK	TK 9421	TK 9421-176	Jul. 10, 25
Coaxial RF Cable	SUHNER	RG 223/U-CE	C2310066DG	Jun. 23, 25
Test software	ADT	ADT_Cond_V7.3.7	N/A	N/A

- NOTES:** 1. The test was performed at Shielded Room 553.
 2. Equipment are calibrated by calibration laboratory accredited to ISO/IEC 17025 by a mutually recognized Accreditation.

4.1.3 TEST PROCEDURES

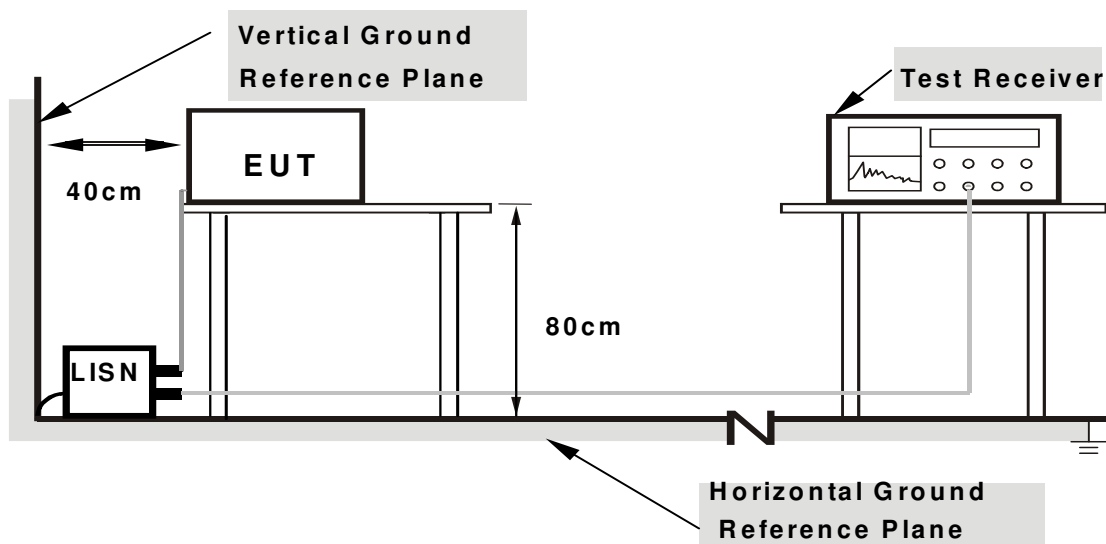
- a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling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

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

4.1.4 DEVIATION FROM TEST STANDARD

No deviation.

4.1.5 TEST SETUP



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

2. Both of LISNs (AMN) are 80 cm from EUT and at least 80 from other units and other metal planes

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

4.1.6 EUT OPERATING CONDITIONS

- a. Turned on the power and connected of all equipment.
- b. EUT was operated according to the type used was description in manufacturer's specifications or the User's Manual.

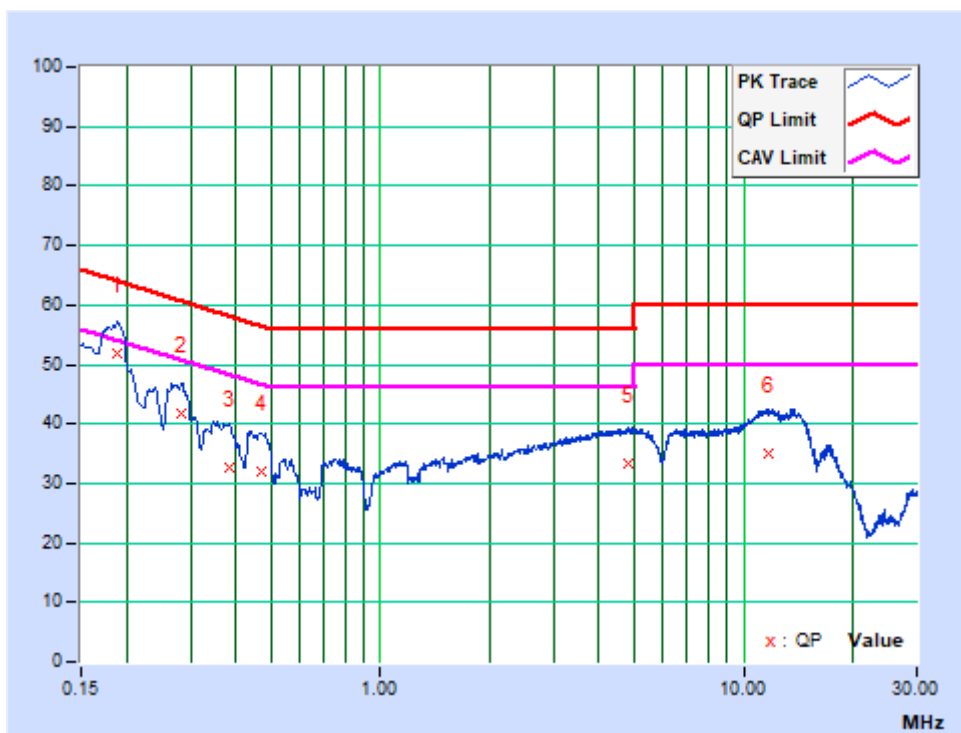
4.1.7 TEST RESULTS

CONDUCTED WORST-CASE DATA: BT Link

PHASE	Line	6dB BANDWIDTH	9kHz
-------	------	---------------	------

No	Freq. [MHz]	Corr. Factor (dB)	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.18856	9.62	42.22	24.04	51.84	33.66	64.10	54.10	-12.26	-20.44
2	0.28241	9.67	32.07	13.13	41.74	22.80	60.74	50.74	-19.00	-27.94
3	0.38400	9.68	22.94	10.11	32.62	19.79	58.19	48.19	-25.57	-28.40
4	0.47134	9.70	22.44	11.74	32.14	21.44	56.49	46.49	-24.35	-25.05
5	4.80300	9.94	23.35	12.57	33.29	22.51	56.00	46.00	-22.71	-23.49
6	11.65875	10.30	24.55	16.26	34.85	26.56	60.00	50.00	-25.15	-23.44

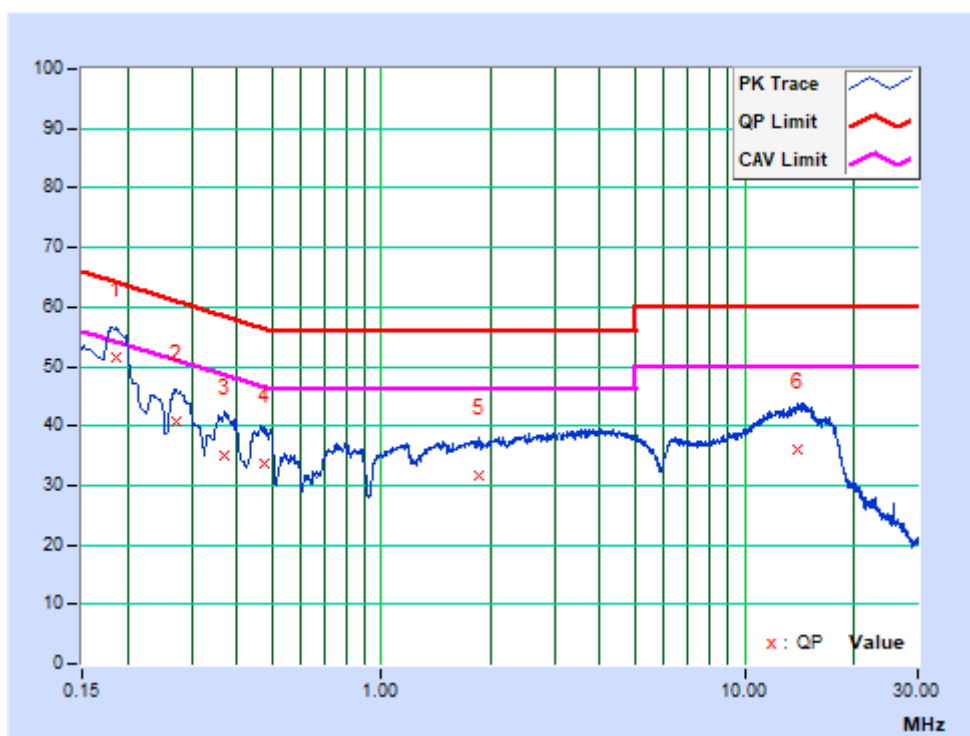
REMARKS: The emission levels of other frequencies were very low against the limit.



PHASE	Neutral	6dB BANDWIDTH	9kHz
-------	---------	---------------	------

No	Freq. [MHz]	Corr. Factor (dB)	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.18559	9.31	42.10	25.35	51.41	34.66	64.23	54.23	-12.82	-19.57
2	0.27144	9.30	31.32	14.59	40.62	23.89	61.07	51.07	-20.45	-27.18
3	0.37067	9.30	25.64	14.18	34.94	23.48	58.49	48.49	-23.54	-25.00
4	0.47400	9.32	24.41	15.84	33.73	25.16	56.44	46.44	-22.71	-21.28
5	1.86450	9.44	22.06	7.68	31.50	17.12	56.00	46.00	-24.50	-28.88
6	13.97400	9.98	26.20	18.40	36.18	28.38	60.00	50.00	-23.82	-21.62

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



4.2. RADIATED EMISSION AND BANDEDGE MEASUREMENT

4.2.1 LIMITS OF RADIATED EMISSION AND BANDEDGE MEASUREMENT

Radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a). 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

NOTES:

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
3. As shown in 15.35(b), 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.

4.2.2 TEST INSTRUMENTS

Equipment	Manufacturer	Model No.	Serial No.	Next Cal.
EMI Test Receiver	Rohde&Schwarz	ESU40	100449	Jan. 02, 25
Signal and Spectrum Analyzer	Rohde&Schwarz	FSV7	102331	Apr. 07, 25
Active Loop Antenna (9KHz -30MHz)	SCHWARZBECK	FMZB 1519B	1519B-045	Apr. 13, 25
Amplifier (9KHz -1GHz)	Burgeon	BPA-530	100210	Feb. 21, 25
Trilog-Broadband Antenna	SCHWARZBECK	VULB 9168	9168-554	Dec. 25, 25
Horn Antenna (1GHz -18GHz)	ETS -Lindgren	3117	00085519	Oct. 12, 24
Horn Antenna (18GHz -40GHz)	SCHWARZBECK	BBHA 9170	BBHA9170242	Oct. 12, 24
3m Semi-anechoic Chamber	ETS-LINDGREN	9m*6m*6m	NSEMC003	May. 20, 25
Test Software	ADT	ADT_Radiated_V7.6.15.9.2	N/A	N/A
Broadband Preamplifier (1GHz~18GHz)	SCHWARZBECK	BBV9718	305	Apr. 24, 25
Pre-Amplifier (18GHz-40GHz)	EMCI	EMC 184045	980102	Jan. 02, 25
BLUETOOTH TESTER	Rohde&Schwarz	CBT32	100811	N/A

NOTES:

1. The test was performed in 966 Chamber.
2. Equipment are calibrated by calibration laboratory accredited to ISO/IEC 17025 by a mutually recognized Accreditation.
3. The horn antenna is used only for the measurement of emission frequency above 1GHz if tested.
4. The FCC Site registration No. is 749762, and the designation number is CN1174.

4.2.3 TEST PROCEDURES

- a. The EUT was placed on the top of a rotating table 1.5 meters (above 1GHz) and 0.8 meters (below 1GHz) above the ground at a 3 meters semi-anechoic chamber. 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. For below 1GHz was used bilog antenna, and above 1GHz was used horn antenna, and its height 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 Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- f. For below 30MHz, a loop antenna with its vertical plane is place 3m from the EUT and rotated about its vertical axis for maximum response at each azimuth about the EUT, the lowest height of the magnetic antenna shall be 1m above the ground.
- g. During the test, each emission was maximized by having the EUT continuously working, investigated all operating modes, rotated about all 3 axis (X, Y & Z) and considered typical configuration to obtain worst position, manipulating interconnecting cables, for battery operated equipment, the equipment tests shall be perform using fresh batteries. The turntable was rotated to maximize the emission level.

NOTES:

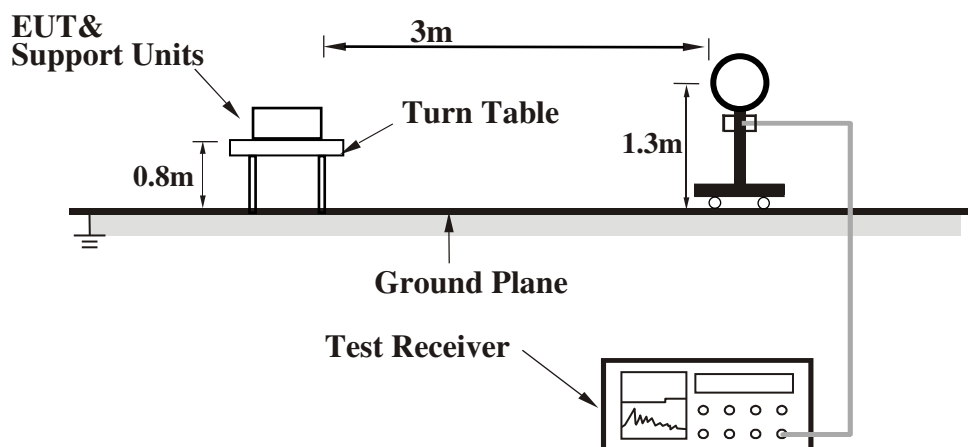
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and video bandwidth is 3MHz for Peak detection at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is $\geq 1/T$ (Duty cycle < 98%) for Average detection (AV) at frequency above 1GHz.
4. All modes of operation were investigated, and the worst-case emissions are reported.
5. The testing of the EUT was performed on all 3 orthogonal axes; the worst-case test configuration was reported on the file test setup photo.

4.2.4 DEVIATION FROM TEST STANDARD

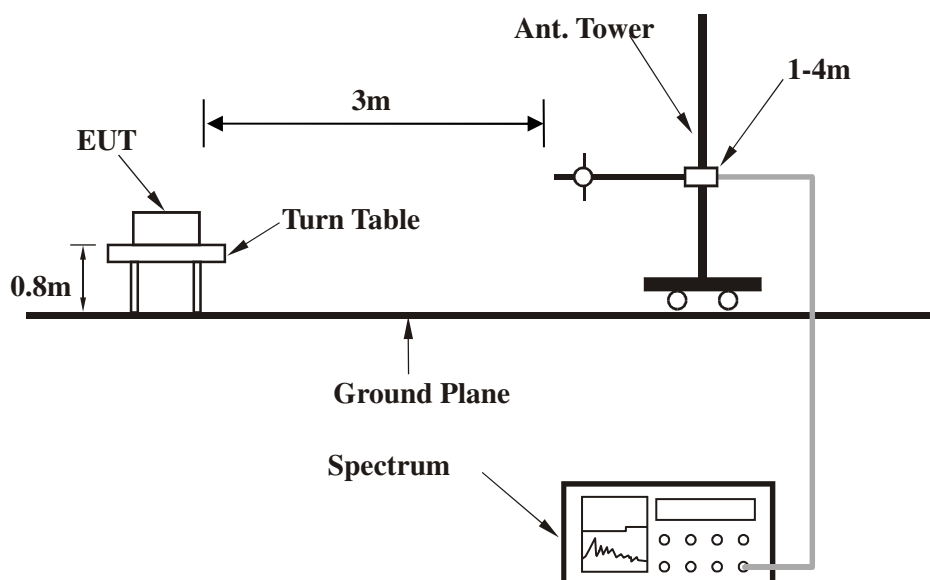
No deviation.

4.2.5 TEST SETUP

Below 30MHz test setup

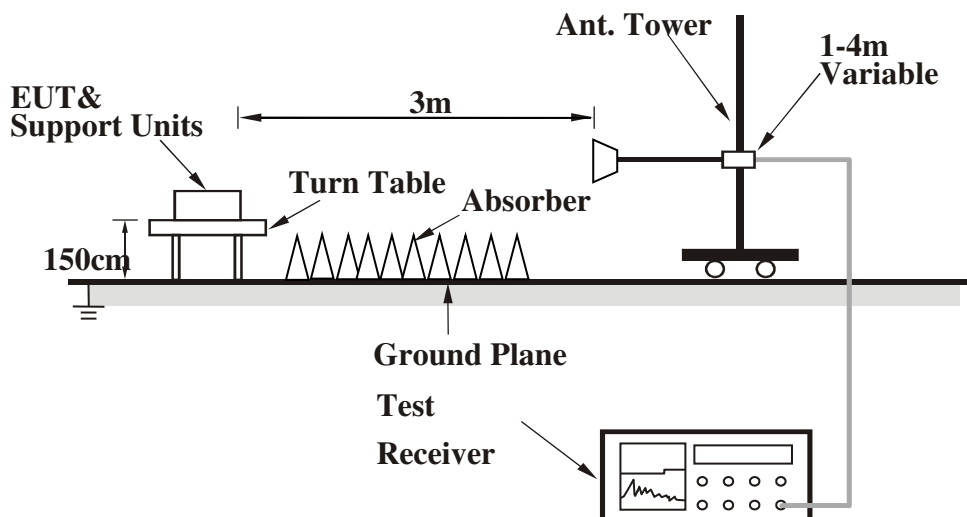


Below 1GHz test setup



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

Above 1GHz test setup



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

4.2.6 EUT OPERATING CONDITIONS

- Set the EUT under full load condition and placed them on a testing table.
- Set the transmitter part of EUT under transmission condition continuously at specific channel frequency.
- The necessary accessories enable the EUT in full functions.

4.2.7 TEST RESULTS

BELOW 1GHz WORST-CASE DATA:

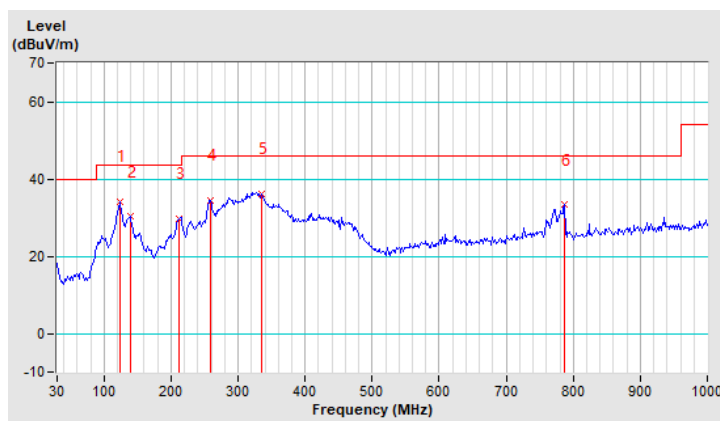
GFSK DH5

CHANNEL	Channel 39	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	9KHz ~ 1GHz		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTIO N FACTOR (dB/m)
1	123.27	34.07 QP	43.50	-9.43	1.69 H	83	53.46	-19.39
2	138.81	30.19 QP	43.50	-13.31	3.02 H	215	47.66	-17.47
3	211.87	29.75 QP	43.50	-13.75	2.24 H	138	48.88	-19.13
4	258.51	34.57 QP	46.00	-11.43	1.96 H	110	51.56	-16.99
5	334.68	36.06 QP	46.00	-9.94	3.60 H	272	50.63	-14.57
6	787.04	33.26 QP	46.00	-12.74	3.85 H	297	37.82	-4.56

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).
3. The emission levels of other frequencies were greater than 20dB margin.
4. 9KHz~30MHz have been test and test data more than 20dB margin.
5. Margin value = Emission level – Limit value

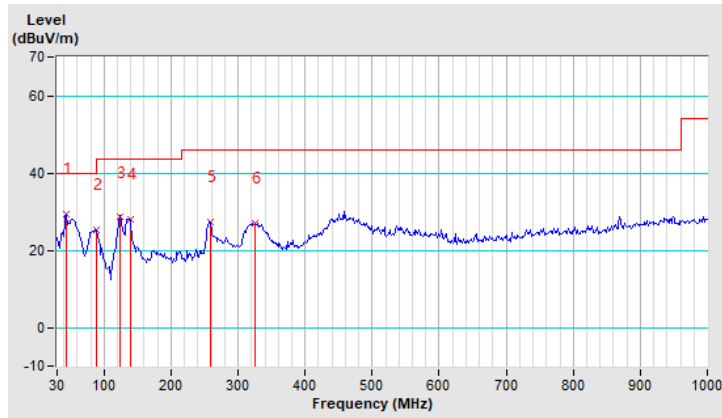


CHANNEL	Channel 39	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	9KHz ~ 1GHz		

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTIO N FACTOR (dB/m)
1	43.99	29.46 QP	40.00	-10.54	1.42 V	303	47.56	-18.10
2	89.07	25.23 QP	43.50	-18.27	2.00 V	246	48.35	-23.12
3	124.82	28.50 QP	43.50	-15.00	1.62 V	283	47.67	-19.17
4	138.81	28.06 QP	43.50	-15.44	2.26 V	220	45.53	-17.47
5	258.51	27.25 QP	46.00	-18.75	2.44 V	202	44.24	-16.99
6	325.35	27.02 QP	46.00	-18.98	2.72 V	174	41.81	-14.79

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).
3. The emission levels of other frequencies were greater than 20dB margin.
4. 9KHz~30MHz have been test and test data more than 20dB margin.
5. Margin value = Emission level – Limit value



ABOVE 1GHz DATA

BT_GFSK

CHANNEL	TX Channel 0	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz		Average (AV)

ANTENNA POLARITY & TEST DISTANCE : HORIZONTAL AT 3 M								
NO.	FREQ. (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	48.31 PK	74.00	-25.69	1.31 H	279	44.22	4.09
2	2390.00	38.79 AV	54.00	-15.21	1.31 H	279	34.70	4.09
3	*2402.00	101.72 PK			1.72 H	209	97.64	4.08
4	*2402.00	101.09 AV			1.72 H	209	97.01	4.08
5	4804.00	52.51 PK	74.00	-21.49	1.51 H	233	45.56	6.95
6	4804.00	40.33 AV	54.00	-13.67	1.51 H	233	33.38	6.95
7	7206.00	54.87 PK	74.00	-19.13	1.87 H	267	43.29	11.58
8	7206.00	43.67 AV	54.00	-10.33	1.87 H	267	32.09	11.58
ANTENNA POLARITY & TEST DISTANCE : VERTICAL AT 3 M								
NO.	FREQ. (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	48.34 PK	74.00	-25.66	1.34 V	143	44.25	4.09
2	2390.00	38.43 AV	54.00	-15.57	1.34 V	143	34.34	4.09
3	*2402.00	104.69 PK			1.41 V	69	100.61	4.08
4	*2402.00	103.96 AV			1.41 V	69	99.88	4.08
5	4804.00	52.58 PK	74.00	-21.42	1.58 V	227	45.63	6.95
6	4804.00	40.27 AV	54.00	-13.73	1.58 V	227	33.32	6.95
7	7206.00	55.10 PK	74.00	-18.90	1.10 V	164	43.52	11.58
8	7206.00	43.64 AV	54.00	-10.36	1.10 V	164	32.06	11.58

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).
3. The emission levels of other frequencies were greater than 20dB margin.
4. Margin value = Emission level – Limit value.
5. " * " : Fundamental frequency.

CHANNEL	TX Channel 39	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz		Average (AV)

ANTENNA POLARITY & TEST DISTANCE : HORIZONTAL AT 3 M								
NO.	FREQ. (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	99.45 PK			1.45 H	261	95.39	4.06
2	*2441.00	98.62 AV			1.45 H	261	94.56	4.06
3	4882.00	51.52 PK	74.00	-22.48	1.52 H	123	44.34	7.18
4	4882.00	40.20 AV	54.00	-13.80	1.52 H	123	33.02	7.18
5	7323.00	55.24 PK	74.00	-18.76	1.24 H	263	43.37	11.87
6	7323.00	44.62 AV	54.00	-9.38	1.24 H	263	32.75	11.87
ANTENNA POLARITY & TEST DISTANCE : VERTICAL AT 3 M								
NO.	FREQ. (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	102.89 PK			1.89 V	215	98.83	4.06
2	*2441.00	102.15 AV			1.89 V	215	98.09	4.06
3	4882.00	51.56 PK	74.00	-22.44	1.56 V	114	44.38	7.18
4	4882.00	40.14 AV	54.00	-13.86	1.56 V	114	32.96	7.18
5	7323.00	55.57 PK	74.00	-18.43	1.57 V	171	43.70	11.87
6	7323.00	44.71 AV	54.00	-9.29	1.57 V	171	32.84	11.87

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).
3. The emission levels of other frequencies were greater than 20dB margin.
4. Margin value = Emission level – Limit value.
5. " * " : Fundamental frequency.

CHANNEL	TX Channel 78	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz		Average (AV)

ANTENNA POLARITY & TEST DISTANCE : HORIZONTAL AT 3 M								
NO.	FREQ. (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	98.31 PK			1.31 H	265	94.29	4.02
2	*2480.00	97.51 AV			1.31 H	265	93.49	4.02
3	2483.50	56.82 PK	74.00	-17.18	1.96 H	85	52.79	4.03
4	2483.50	43.81 AV	54.00	-10.19	1.96 H	85	39.78	4.03
5	4960.00	51.29 PK	74.00	-22.71	1.29 H	181	43.90	7.39
6	4960.00	39.81 AV	54.00	-14.19	1.29 H	181	32.42	7.39
7	7440.00	55.47 PK	74.00	-18.53	1.47 H	269	43.29	12.18
8	7440.00	44.46 AV	54.00	-9.54	1.47 H	269	32.28	12.18
ANTENNA POLARITY & TEST DISTANCE : VERTICAL AT 3 M								
NO.	FREQ. (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	100.80 PK			1.81 V	241	96.78	4.02
2	*2480.00	100.40 AV			1.81 V	241	96.38	4.02
3	2483.50	58.15 PK	74.00	-15.85	1.15 V	36	54.12	4.03
4	2483.50	45.62 AV	54.00	-8.38	1.15 V	36	41.59	4.03
5	4960.00	51.34 PK	74.00	-22.66	1.34 V	192	43.95	7.39
6	4960.00	39.90 AV	54.00	-14.10	1.34 V	192	32.51	7.39
7	7440.00	55.59 PK	74.00	-18.41	1.59 V	151	43.41	12.18
8	7440.00	44.51 AV	54.00	-9.49	1.59 V	151	32.33	12.18

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).
3. The emission levels of other frequencies were greater than 20dB margin.
4. Margin value = Emission level – Limit value.
5. " * ": Fundamental frequency.

BT_8DPSK

CHANNEL	TX Channel 0	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz		Average (AV)

ANTENNA POLARITY & TEST DISTANCE : HORIZONTAL AT 3 M								
NO.	FREQ. (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	48.09 PK	74.00	-25.91	1.09 H	297	44.00	4.09
2	2390.00	37.97 AV	54.00	-16.03	1.09 H	297	33.88	4.09
3	*2402.00	101.38 PK			1.38 H	201	97.30	4.08
4	*2402.00	97.04 AV			1.38 H	201	92.96	4.08
5	4804.00	51.25 PK	74.00	-22.75	1.25 H	110	44.30	6.95
6	4804.00	40.10 AV	54.00	-13.90	1.25 H	110	33.15	6.95
7	7206.00	54.41 PK	74.00	-19.59	1.54 H	196	42.83	11.58
8	7206.00	43.96 AV	54.00	-10.04	1.54 H	196	32.38	11.58
ANTENNA POLARITY & TEST DISTANCE : VERTICAL AT 3 M								
NO.	FREQ. (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	48.62 PK	74.00	-25.38	1.62 V	229	44.53	4.09
2	2390.00	38.29 AV	54.00	-15.71	1.62 V	229	34.20	4.09
3	*2402.00	104.91 PK			1.91 V	153	100.83	4.08
4	*2402.00	100.53 AV			1.91 V	153	96.45	4.08
5	4804.00	50.34 PK	74.00	-23.66	1.34 V	156	43.39	6.95
6	4804.00	40.41 AV	54.00	-13.59	1.34 V	156	33.46	6.95
7	7206.00	53.96 PK	74.00	-20.04	1.96 V	293	42.38	11.58
8	7206.00	43.93 AV	54.00	-10.07	1.96 V	293	32.35	11.58

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).
3. The emission levels of other frequencies were greater than 20dB margin.
4. Margin value = Emission level – Limit value.
5. " * ": Fundamental frequency.

CHANNEL	TX Channel 39	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz		Average (AV)

ANTENNA POLARITY & TEST DISTANCE : HORIZONTAL AT 3 M								
NO.	FREQ. (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	99.97 PK			1.86 H	52	95.91	4.06
2	*2441.00	95.07 AV			1.86 H	52	91.01	4.06
3	4882.00	51.06 PK	74.00	-22.94	1.20 H	193	43.88	7.18
4	4882.00	39.92 AV	54.00	-14.08	1.20 H	193	32.74	7.18
5	7323.00	55.00 PK	74.00	-19.00	1.96 H	41	43.13	11.87
6	7323.00	44.42 AV	54.00	-9.58	1.96 H	41	32.55	11.87
ANTENNA POLARITY & TEST DISTANCE : VERTICAL AT 3 M								
NO.	FREQ. (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	101.57 PK			1.57 V	193	97.51	4.06
2	*2441.00	96.93 AV			1.57 V	193	92.87	4.06
3	4882.00	50.13 PK	74.00	-23.87	1.11 V	174	42.95	7.18
4	4882.00	39.74 AV	54.00	-14.26	1.11 V	174	32.56	7.18
5	7323.00	55.01 PK	74.00	-18.99	1.01 V	239	43.14	11.87
6	7323.00	44.37 AV	54.00	-9.63	1.01 V	239	32.50	11.87

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).
3. The emission levels of other frequencies were greater than 20dB margin.
4. Margin value = Emission level – Limit value.
5. " * " : Fundamental frequency.

CHANNEL	TX Channel 78	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz		Average (AV)

ANTENNA POLARITY & TEST DISTANCE : HORIZONTAL AT 3 M								
NO.	FREQ. (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	99.20 PK			1.20 H	123	95.18	4.02
2	*2480.00	94.23 AV			1.20 H	123	90.21	4.02
3	2483.50	57.77 PK	74.00	-16.23	1.77 H	157	53.74	4.03
4	2483.50	44.57 AV	54.00	-9.43	1.77 H	157	40.54	4.03
5	4960.00	51.88 PK	74.00	-22.12	1.88 H	139	44.49	7.39
6	4960.00	40.39 AV	54.00	-13.61	1.88 H	139	33.00	7.39
7	7440.00	56.02 PK	74.00	-17.98	1.01 H	150	43.84	12.18
8	7440.00	45.52 AV	54.00	-8.48	1.01 H	150	33.34	12.18
ANTENNA POLARITY & TEST DISTANCE : VERTICAL AT 3 M								
NO.	FREQ. (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	102.24 PK			1.24 V	191	98.22	4.02
2	*2480.00	97.91 AV			1.24 V	191	93.89	4.02
3	2483.50	60.42 PK	74.00	-13.58	1.42 V	117	56.39	4.03
4	2483.50	45.17 AV	54.00	-8.83	1.42 V	117	41.14	4.03
5	4960.00	51.69 PK	74.00	-22.31	1.69 V	236	44.30	7.39
6	4960.00	40.36 AV	54.00	-13.64	1.69 V	236	32.97	7.39
7	7440.00	55.76 PK	74.00	-18.24	1.76 V	246	43.58	12.18
8	7440.00	45.49 AV	54.00	-8.51	1.76 V	246	33.31	12.18

REMARKS:

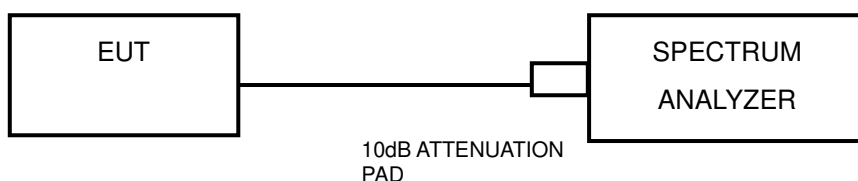
1. Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB/m).
2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB).
3. The emission levels of other frequencies were greater than 20dB margin.
4. Margin value = Emission level – Limit value.
5. " * " : Fundamental frequency.

4.3 NUMBER OF HOPPING FREQUENCY USED

4.3.1 LIMIT OF HOPPING FREQUENCY USED

At least 15 channels frequencies and should be equally spaced.

4.3.2 TEST SETUP



4.3.3 TEST INSTRUMENTS

Equipment	Manufacturer	Model No.	Serial No.	Next Cal.
Power Sensor	Keysight	U2021XA	MY57320002	Apr. 07, 25
Digital Multimeter	FLUKE	15B	A1220010DG	N/A
Humid & Temp Programmable Tester	Haida	HD-225T	110807201	Oct. 15, 24
Oscilloscope	Agilent	DSO9254A	MY51260160	Jul. 07, 25
Signal and Spectrum Analyzer	Rohde&Schwarz	FSV40	101094	Jan. 01, 25
Signal Generator	Agilent	N5183A	MY50140980	Jul. 11, 25
MXG-B RF Vector Signal Generator	Keysight	N5182B	MY56200288	Jul. 11, 25
BLUETOOTH TESTER	Rohde&Schwarz	CBT32	100811	N/A
Attenuator	MINI	BW-S10W2+	S130129FGE2	N/A
DC Source	Keysight	E3642A	MY56146098	N/A
Test software	ADT	ADT_RF Test Software V6.6.5.3	N/A	N/A

NOTES:

1. The test was performed in RF Test Shielded Room.
2. Equipment are calibrated by calibration laboratory accredited to ISO/IEC 17025 by a mutually recognized Accreditation.

4.3.4 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. 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 completed.

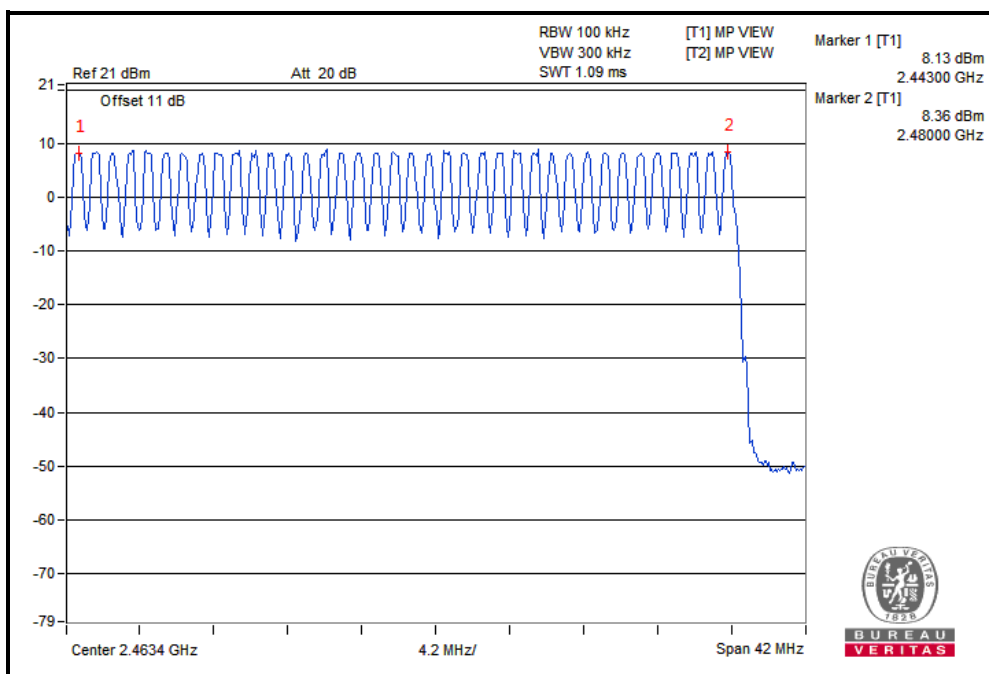
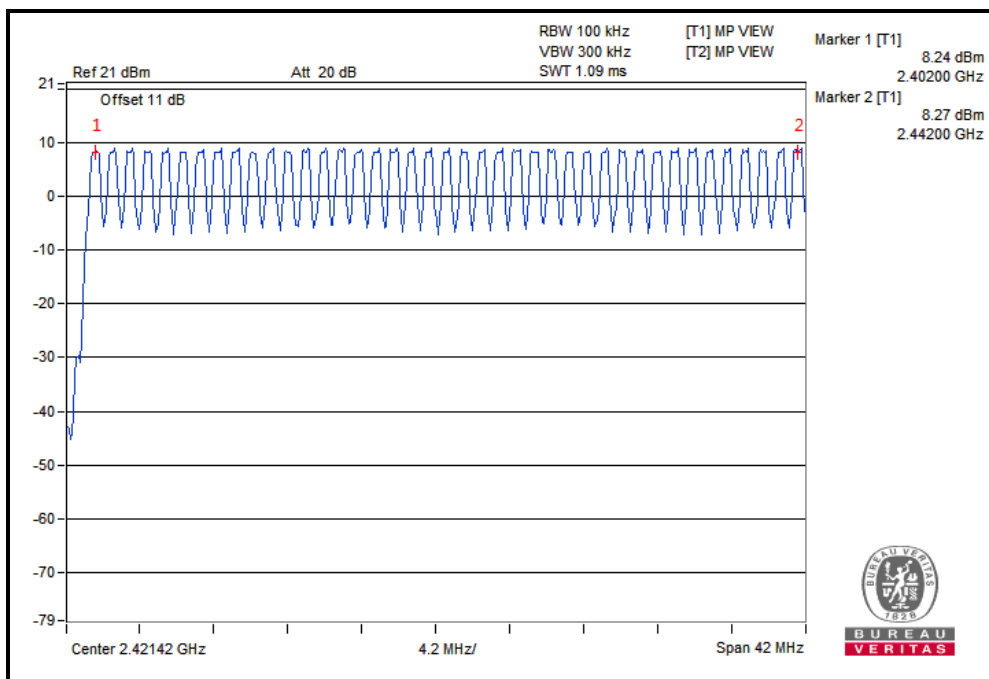
4.3.5 DEVIATION FROM TEST STANDARD

No deviation.

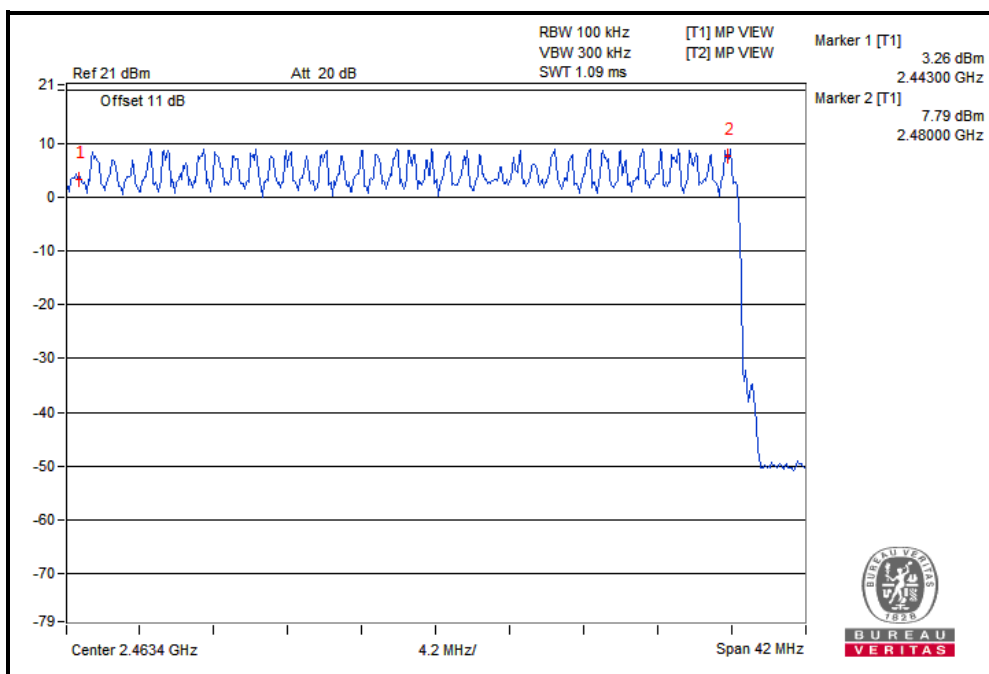
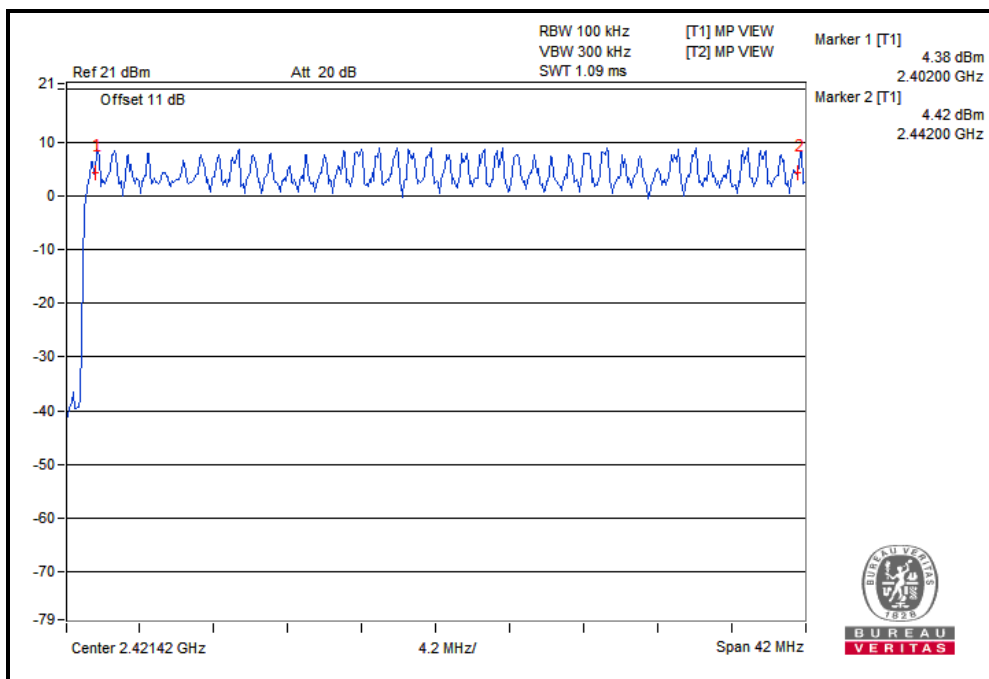
4.3.6 TEST RESULTS

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

GFSK



8DPSK

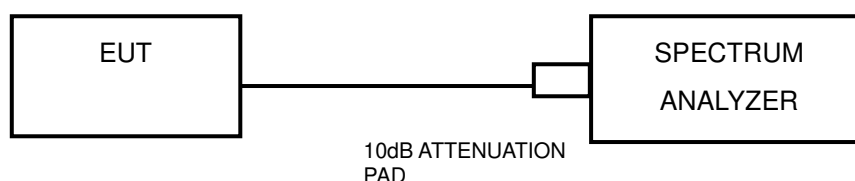


4.4 DWELL TIME ON EACH CHANNEL

4.4.1 LIMIT OF DWELL TIME USED

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

GFSK

Mode	Number of Hopping Channel	Number of transmission in a period(channel number*0.4 sec)				Length of transmission time (msec)	Result (msec)	Limit (msec)	PASS / FAIL
		period (sec)	sweep time (sec)	times in a sweep	times in a period				
DH1	79	31.6	5	50	316.00	0.426	134.62	400	PASS
DH3	79	31.6	5	26	164.32	1.740	285.92	400	PASS
DH5	79	31.6	5	17	107.44	2.928	314.58	400	PASS

8DPSK

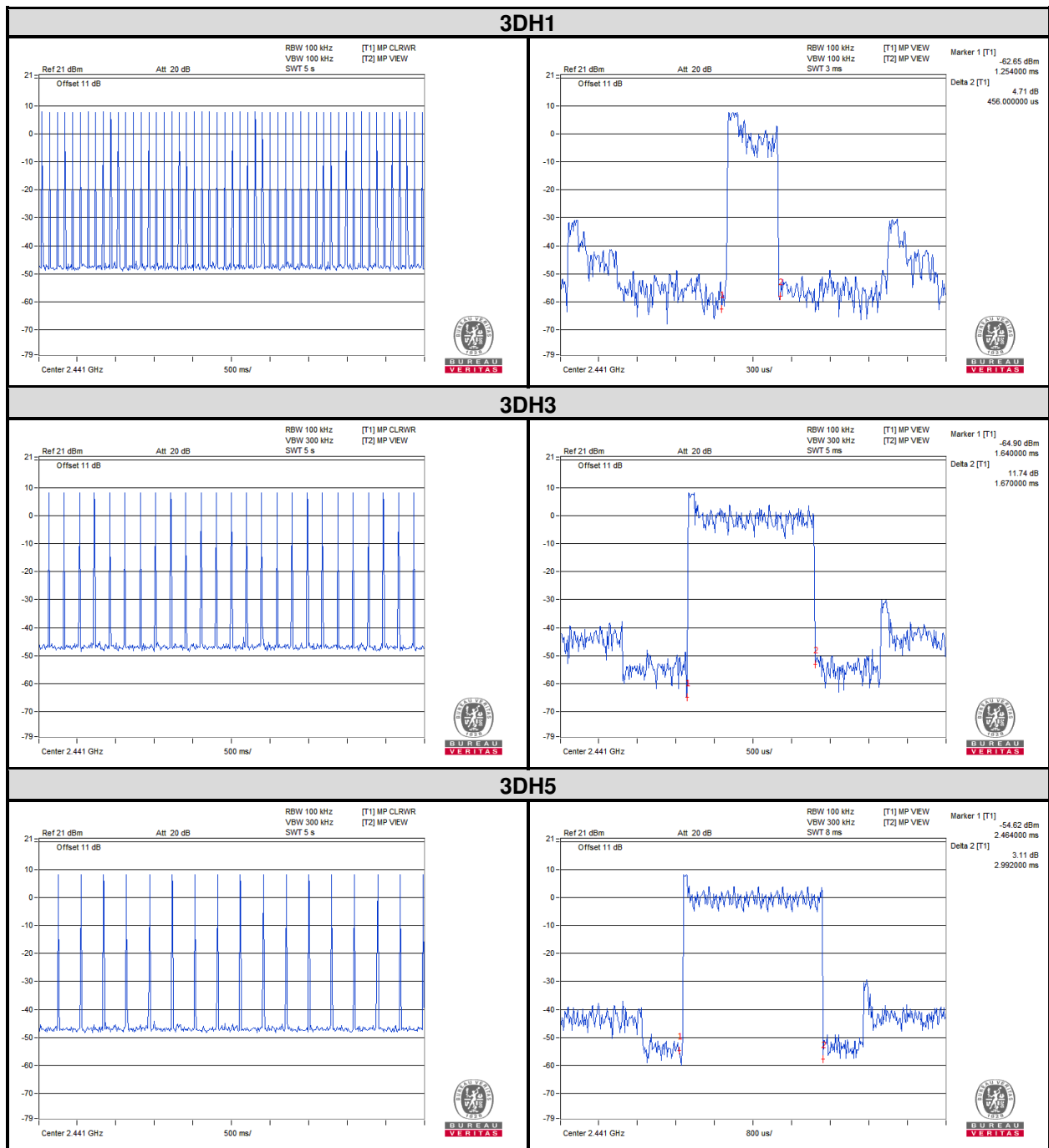
Mode	Number of Hopping Channel	Number of transmission in a period(channel number*0.4 sec)				Length of transmission time (msec)	Result (msec)	Limit (msec)	PASS / FAIL
		period (sec)	sweep time (sec)	times in a sweep	times in a period				
3DH1	79	31.6	5	51	322.32	0.456	146.98	400	PASS
3DH3	79	31.6	5	25	158.00	1.670	263.86	400	PASS
3DH5	79	31.6	5	17	107.44	2.992	321.46	400	PASS

NOTE: Test plots of the transmitting time slot are shown on next page.

GFSK



8DPSK

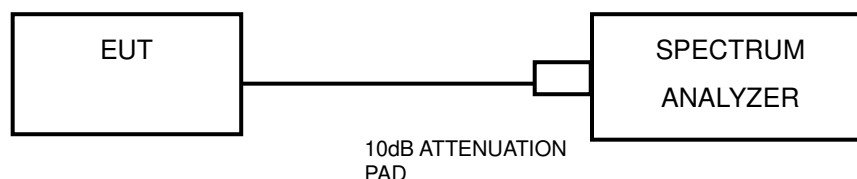


4.5 CHANNEL BANDWIDTH

4.5.1 LIMITS OF CHANNEL BANDWIDTH

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

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

- 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 20dB from the reference level. Record the frequency difference as the emission bandwidth.
- Repeat above procedures until all frequencies measured were complete.

4.5.5 DEVIATION FROM TEST STANDARD

No deviation.

4.5.6 EUT OPERATING CONDITION

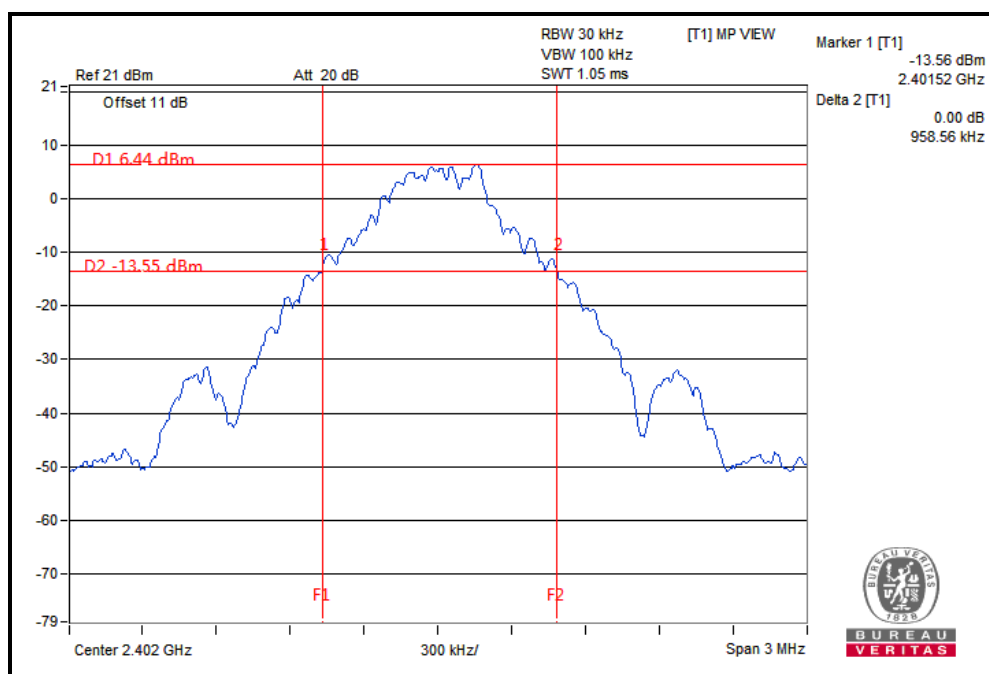
The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.

4.5.7 TEST RESULTS

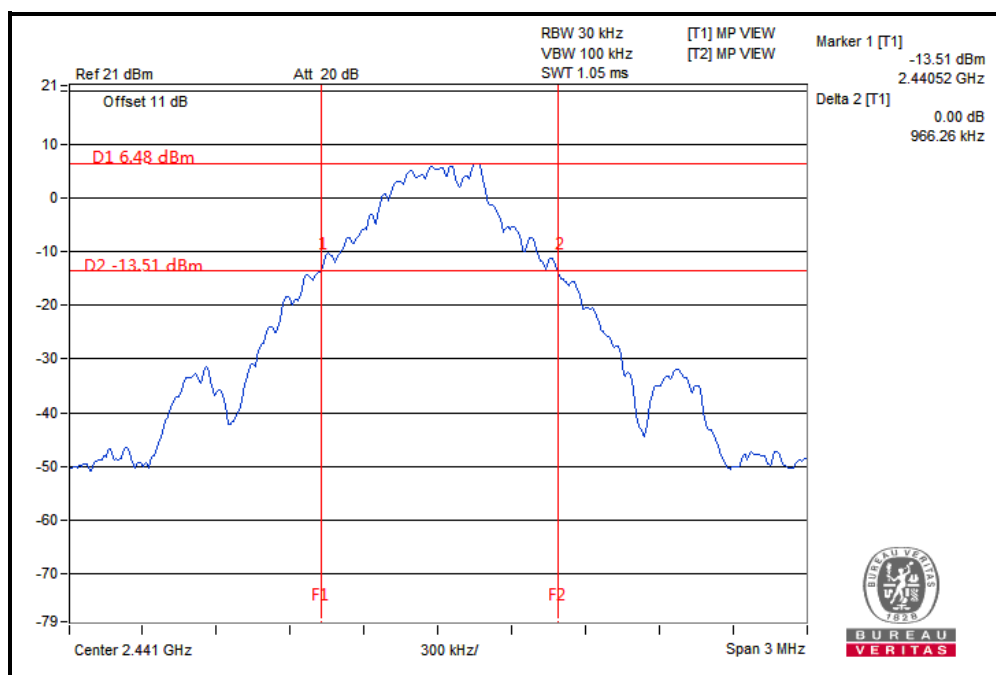
GFSK

CHANNEL	CHANNEL FREQUENCY (MHz)	20dB BANDWIDTH (MHz)
0	2402	0.95
39	2441	0.96
78	2480	0.96

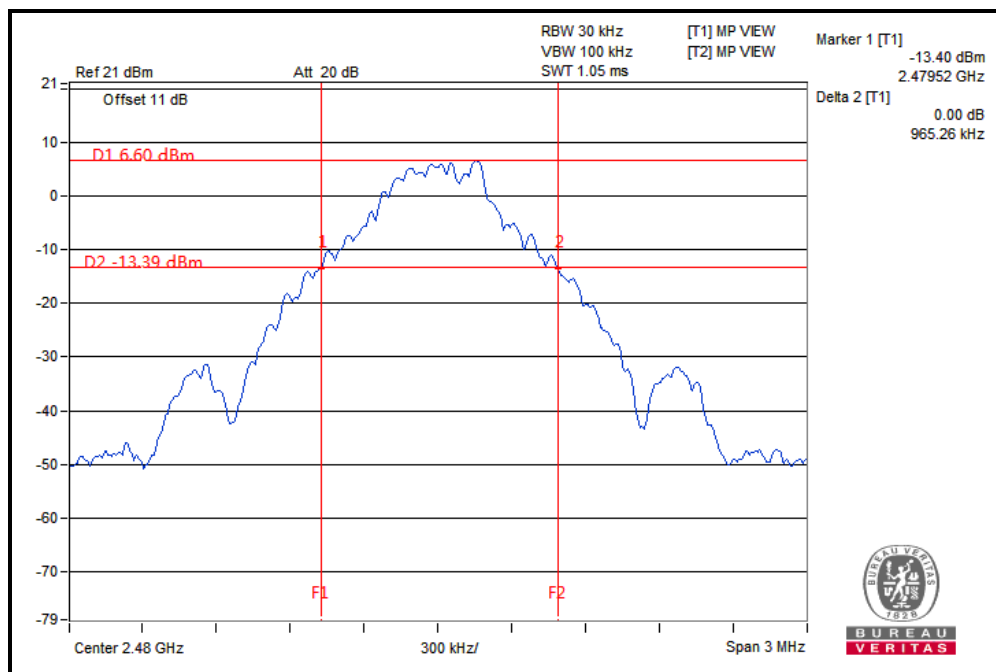
CH 0



CH 39



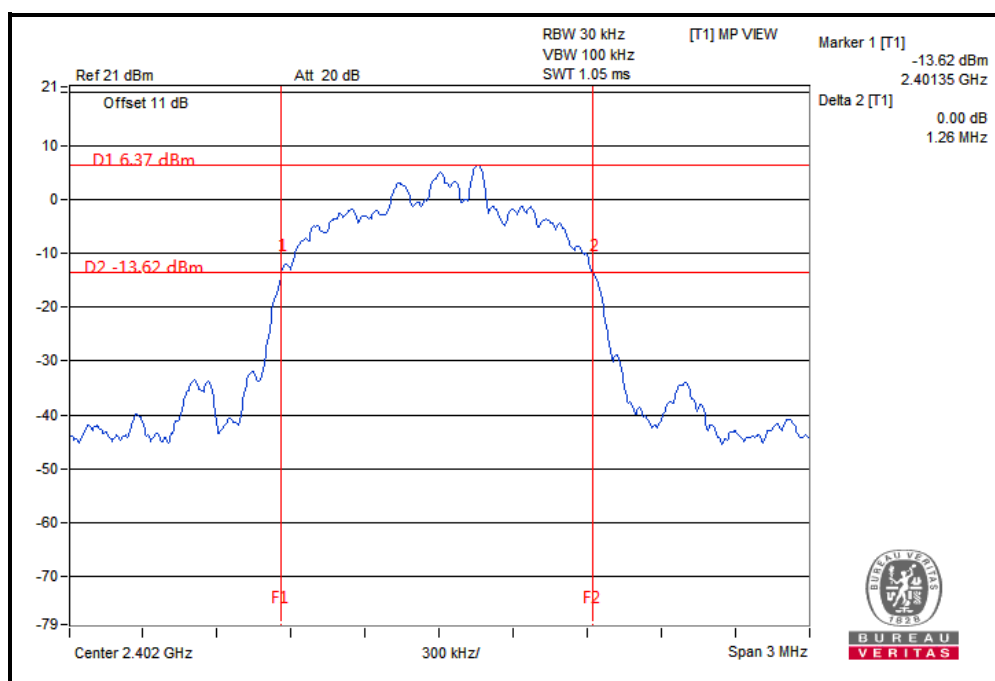
CH 78



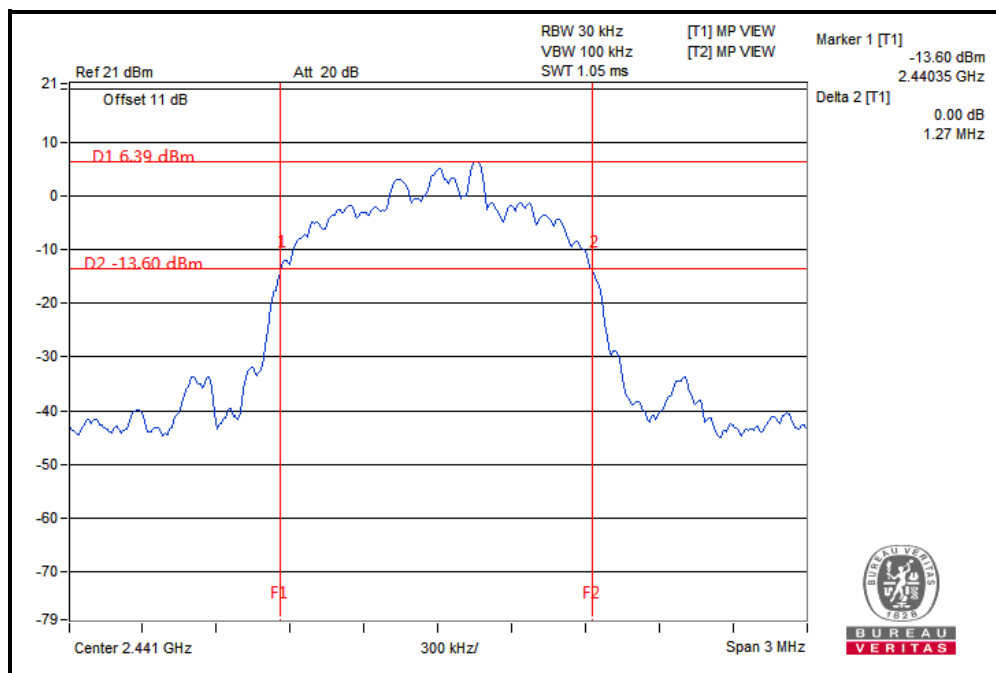
8DPSK

CHANNEL	CHANNEL FREQUENCY (MHz)	20dB BANDWIDTH (MHz)
0	2402	1.26
39	2441	1.27
78	2480	1.27

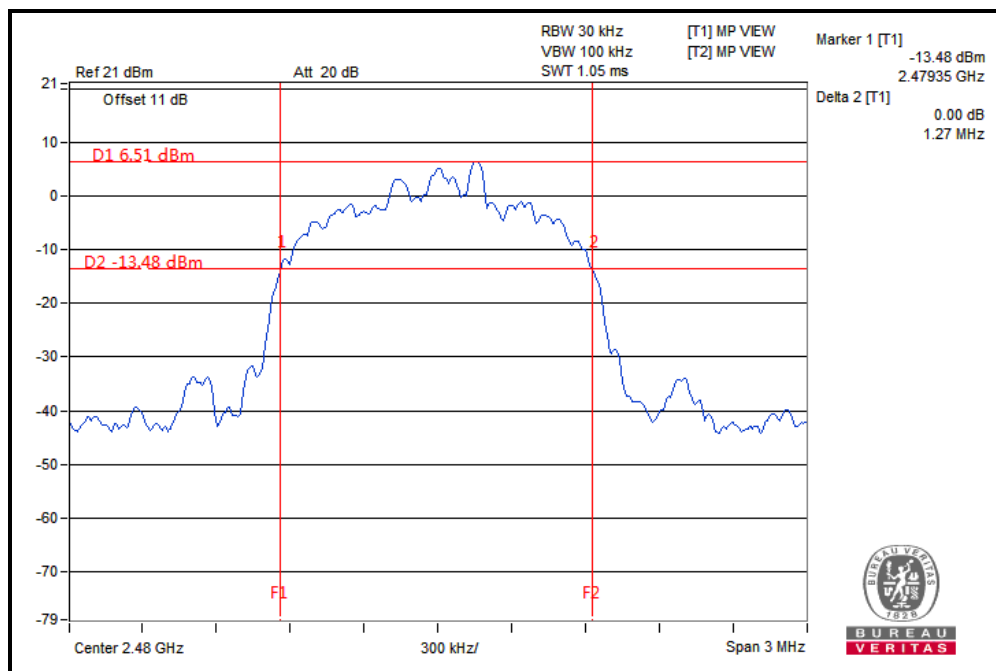
CH 0



CH 39



CH 78

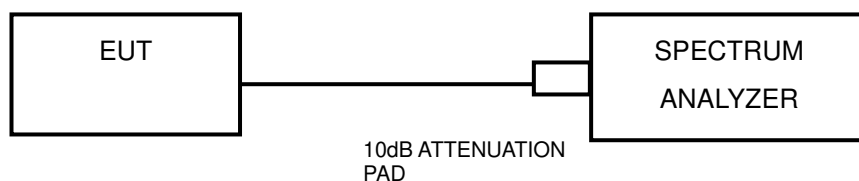


4.6 HOPPING CHANNEL SEPARATION

4.6.1 LIMIT OF HOPPING CHANNEL SEPARATION

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 PROCEDURES

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

4.6.5 DEVIATION FROM TEST STANDARD

No deviation.



GFSK

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

Ref 21 dBm Att 20 dB RBW 30 kHz [T1] MP VIEW
 VBW 100 kHz [T2] MP VIEW
 SWT 1.06 ms

Offset 11 dB

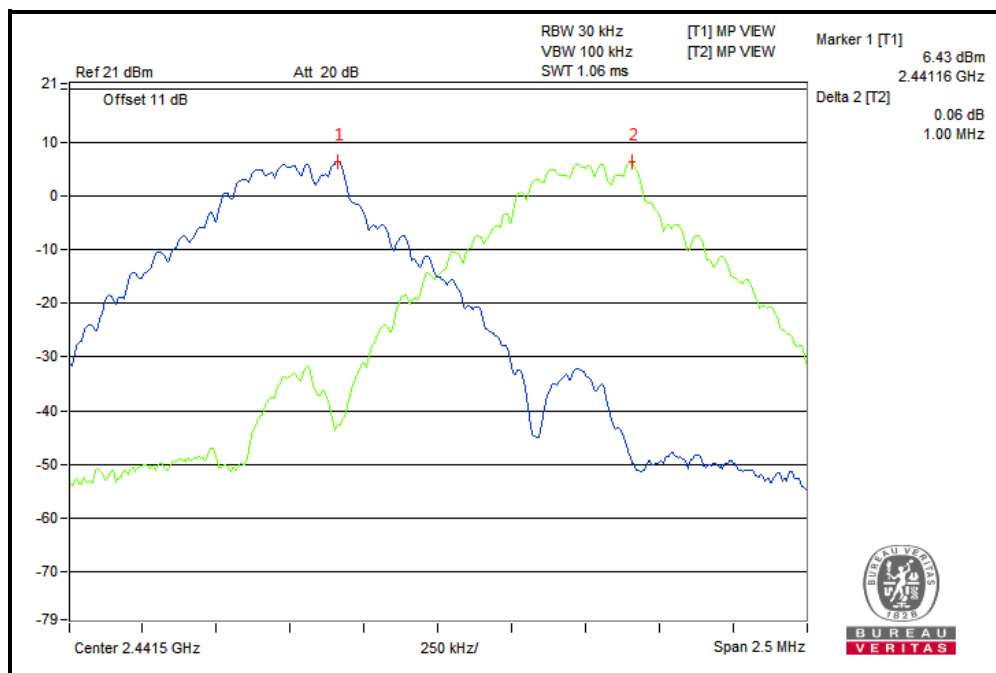
Marker 1 [T1] 6.47 dBm
 2.40215 GHz

Delta 2 [T2] 1.65 dB
 1.00 MHz

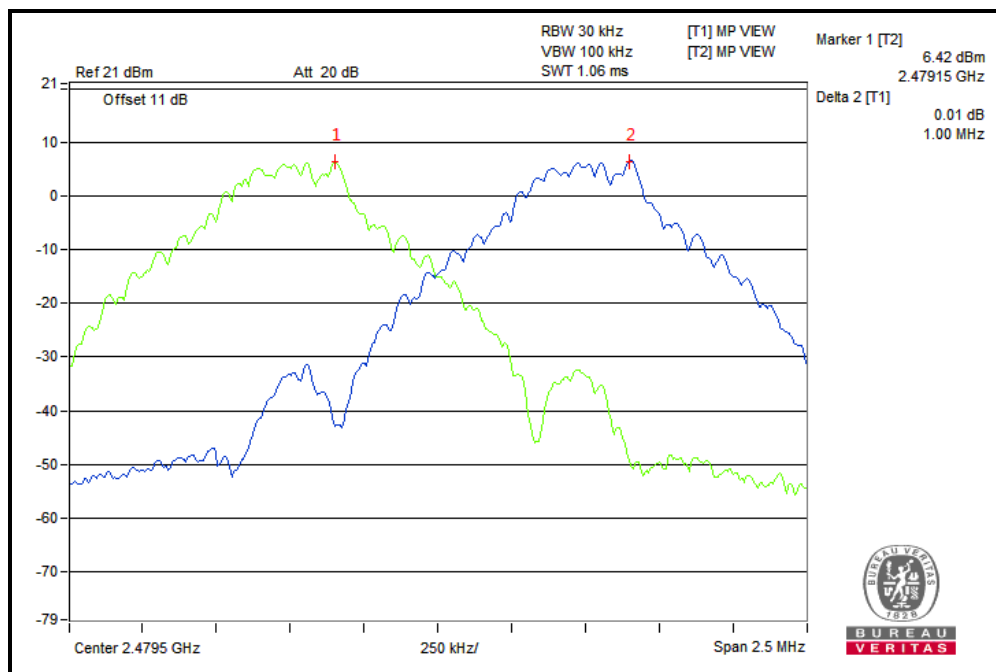
Center 2.4025 GHz 250 kHz/ Span 2.5 MHz

BUREAU VERITAS

CH 39



CH 78

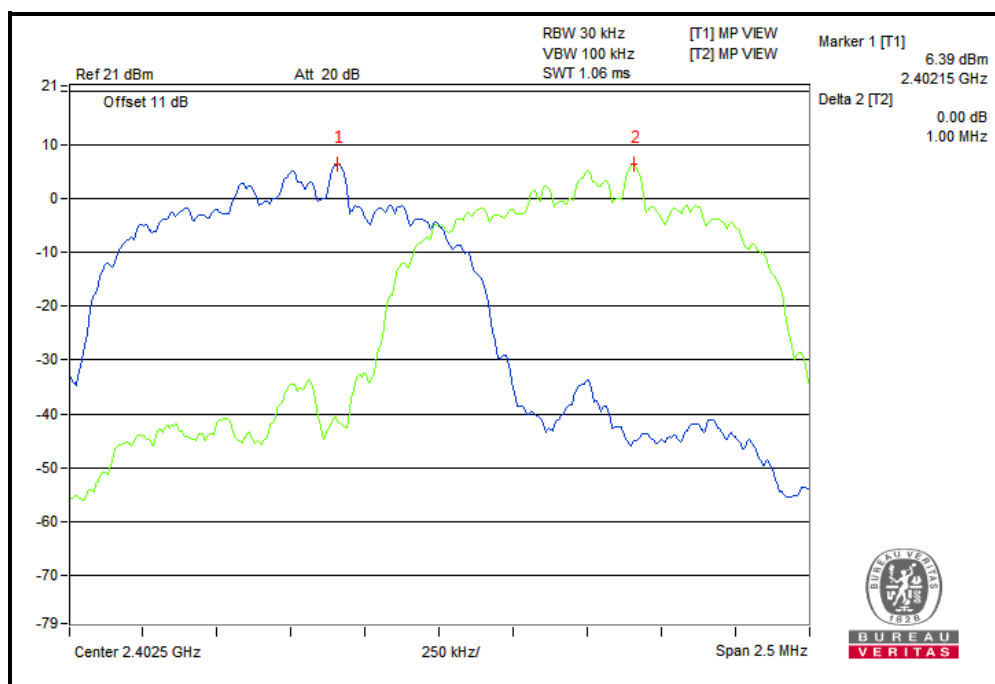


8DPSK

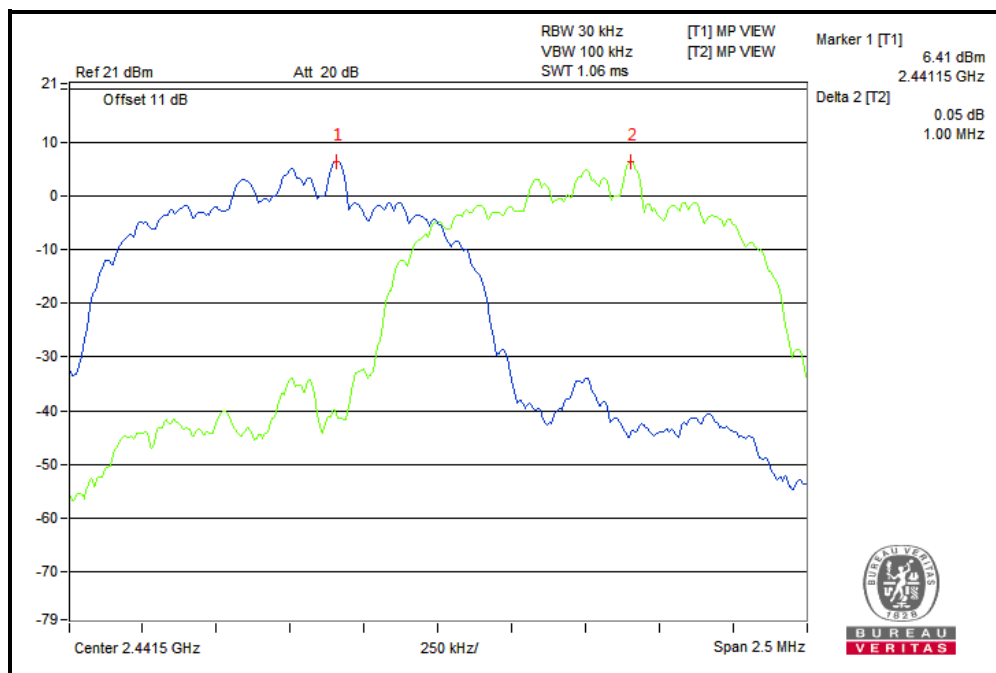
CHANNEL	FREQUENCY (MHz)	ADJACENT CHANNEL SEPARATION (MHz)	20dB BANDWIDTH (MHz)	MINIMUM LIMIT (MHz)	PASS / FAIL
0	2402	1.00	1.26	0.84	PASS
39	2441	1.00	1.27	0.85	PASS
78	2480	1.00	1.27	0.85	PASS

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

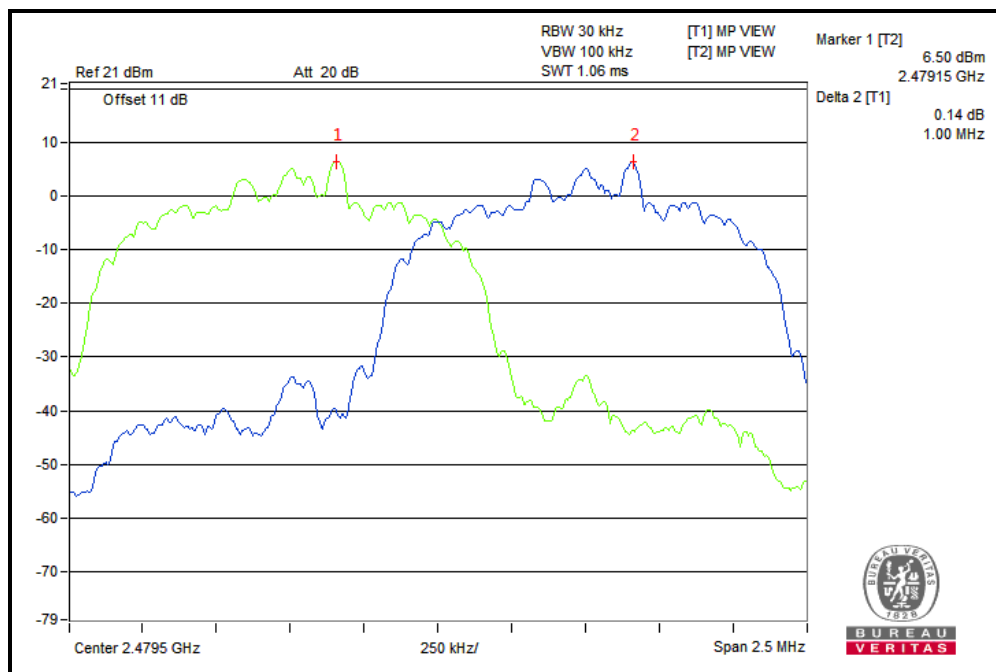
CH 0



CH 39



CH 78



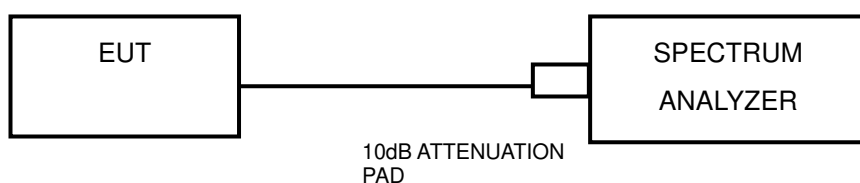
4.7 CONDUCTED OUTPUT POWER

4.7.1 LIMITS OF CONDUCTED OUTPUT POWER MEASUREMENT

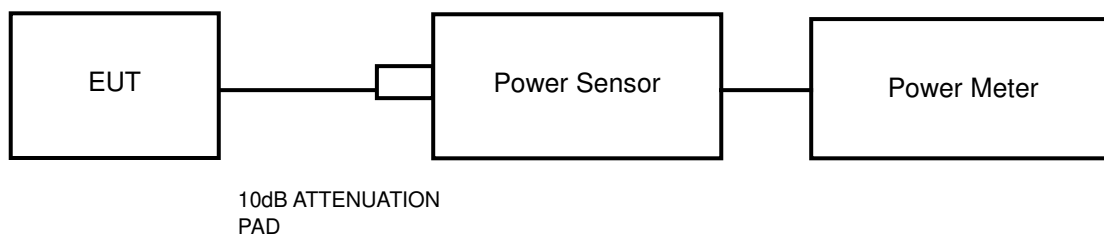
The Maximum Output Power Measurement is 125mW.

4.7.2 TEST SETUP

MAXIMUM PEAK OUTPUT POWER :



AVERAGE OUTPUT POWER:



4.7.3 TEST INSTRUMENTS

Refer to section 4.3.3 to get information of above instrument.

4.7.4 TEST PROCEDURES

MAXIMUM PEAK OUTPUT POWER:

- a. Set the span to approximately five times the 20 dB bandwidth, centered on a hopping channel.
- b. Set the RBW = 3 MHz, VBW $\geq 3 \times$ RBW, Detector = peak.
- c. Sweep time = auto couple, Trace mode = max hold, allow trace to fully stabilize.

AVERAGE OUTPUT POWER:

Use the peak marker function to determine the maximum amplitude level. An average power sensor was used on the output port of the EUT. A power meter was used to read the response of the average power sensor and set the detector to AVERAGE. Record the power level.

4.7.5 DEVIATION FROM TEST STANDARD

No deviation.

4.7.6 EUT OPERATING CONDITION

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

4.7.7 TEST RESULTS

MAXIMUM PEAK OUTPUT POWER

GFSK

CHANNEL	CHANNEL FREQUENCY (MHz)	PEAK POWER (dBm)	PEAK POWER (mW)	EIRP (mW)	PEAK POWER LIMIT (W)	EIRP LIMIT (W)	PASS/FAIL
0	2402	8.85	7.674	14.388	0.125	/	PASS
39	2441	8.88	7.727	14.488	0.125	/	PASS
78	2480	8.99	7.925	14.859	0.125	/	PASS

Note: EIRP=Conducted output power + Ant gain(2.73dBi)

8DPSK

CHANNEL	CHANNEL FREQUENCY (MHz)	PEAK POWER (dBm)	PEAK POWER (mW)	EIRP (mW)	PEAK POWER LIMIT (W)	EIRP LIMIT (W)	PASS/FAIL
0	2402	8.89	7.745	14.521	0.125	/	PASS
39	2441	8.90	7.762	14.555	0.125	/	PASS
78	2480	9.00	7.943	14.894	0.125	/	PASS

Note: EIRP=Conducted output power + Ant gain(2.73dBi)

AVERAGE OUTPUT POWER (FOR REFERENCE)

GFSK

CHANNEL	CHANNEL FREQUENCY (MHz)	AVERAGE POWER (dBm)	AVERAGE POWER (mW)
0	2402	8.46	7.015
39	2441	8.51	7.096
78	2480	8.53	7.129

8DPSK

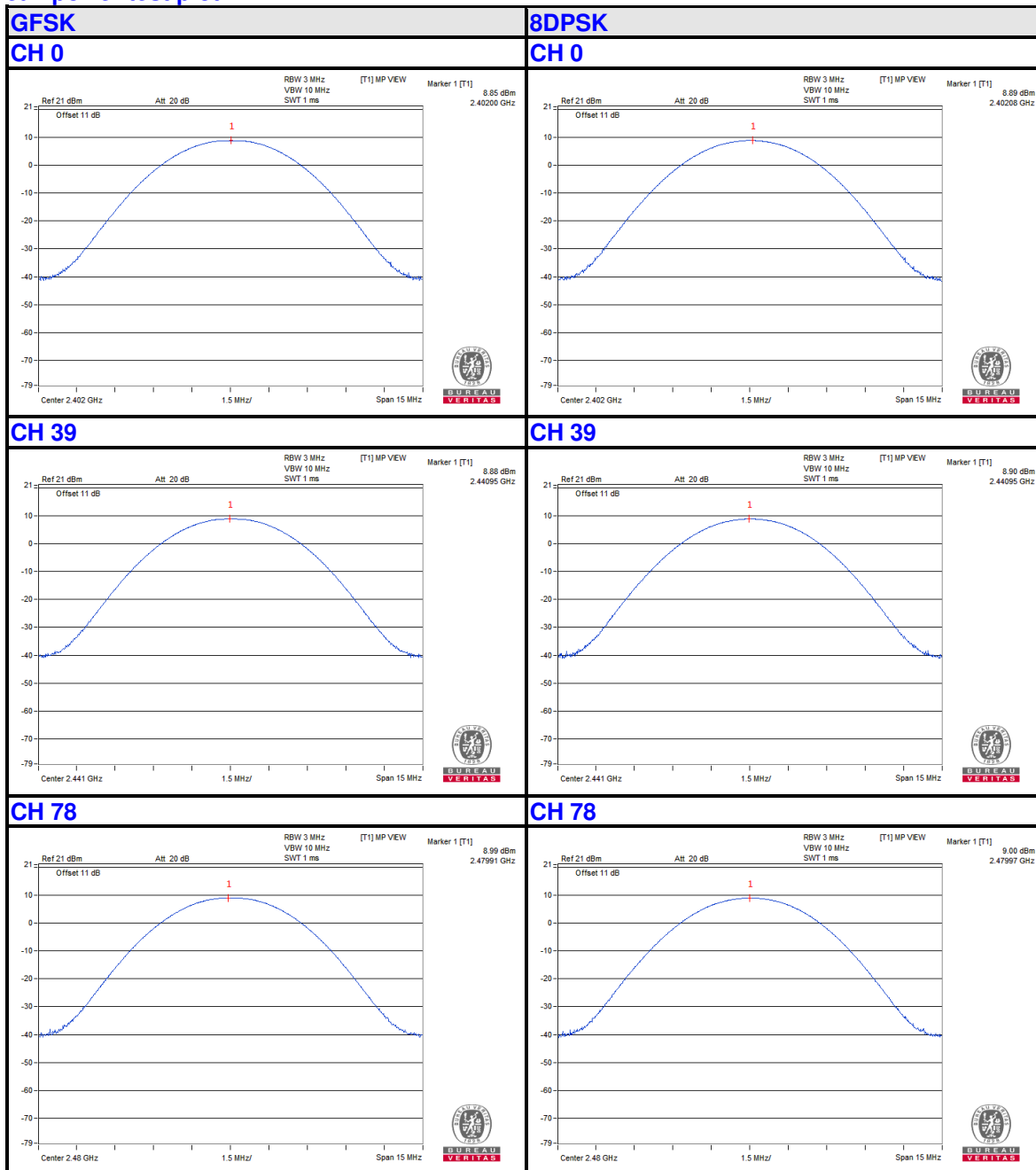
CHANNEL	CHANNEL FREQUENCY (MHz)	AVERAGE POWER (dBm)	AVERAGE POWER (mW)
0	2402	8.77	7.534
39	2441	8.75	7.499
78	2480	8.63	7.295



BUREAU
VERITAS

Test Report No.: RF2408WDG0131-1

Peak power test plot



Bureau Veritas Shenzhen Co., Ltd.
Dongguan Branch

No. 96, Guantai Road (Houjie Section), Houjie
Town, Dongguan City, Guangdong Province.
523942. People's Republic of China.

Tel: +86 769 8998 2098
Fax: +86 769 8593 1080
Email: customerservice.dg@bureauveritas.com

4.8 OUT OF BAND EMISSION MEASUREMENT

4.8.1 LIMITS OF OUT OF BAND EMISSION MEASUREMENT

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

4.8.2 TEST INSTRUMENTS

Refer to section 4.3.3 to get information of above instrument.

4.8.3 TEST PROCEDURE

The transmitter output was connected to the spectrum analyzer via a low loss cable. of Spectrum Analyzer was set RBW to 100 kHz and VBW to 300 kHz with suitable frequency span including 100 MHz bandwidth from band edge. Detector = PEAK and Trace mode = Max Hold. The band edges were measured and recorded.

4.8.4 DEVIATION FROM TEST STANDARD

No deviation.

4.8.5 EUT OPERATING CONDITION

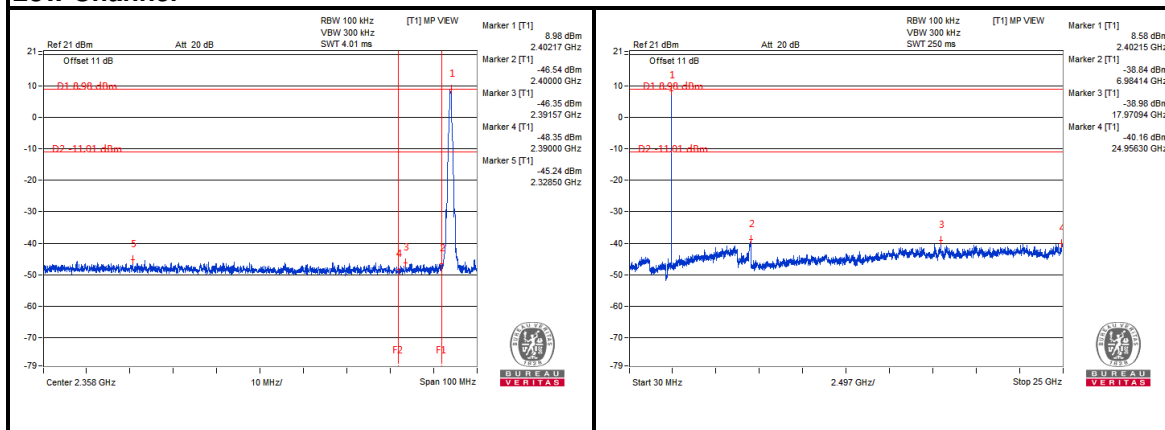
The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.

4.8.6 TEST RESULTS

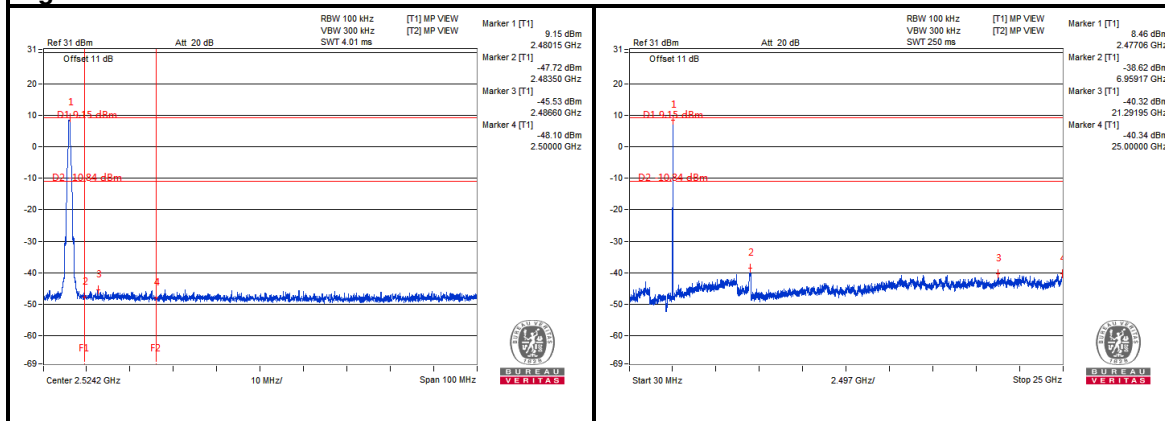
The spectrum plots are attached on the following images. D1 line indicates the highest level. D2 line indicates the 20dB offset below D1. It shows compliance to the requirement.

GFSK

Low Channel

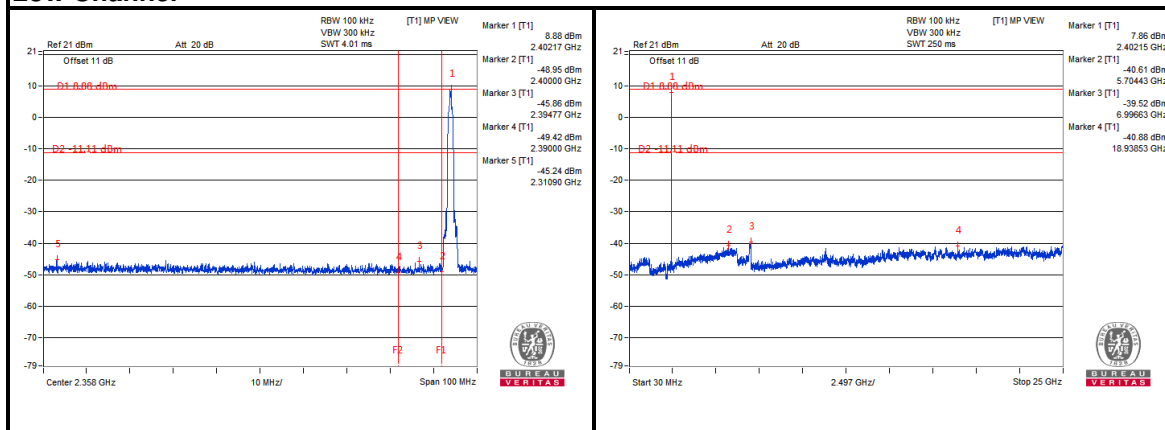


High Channel

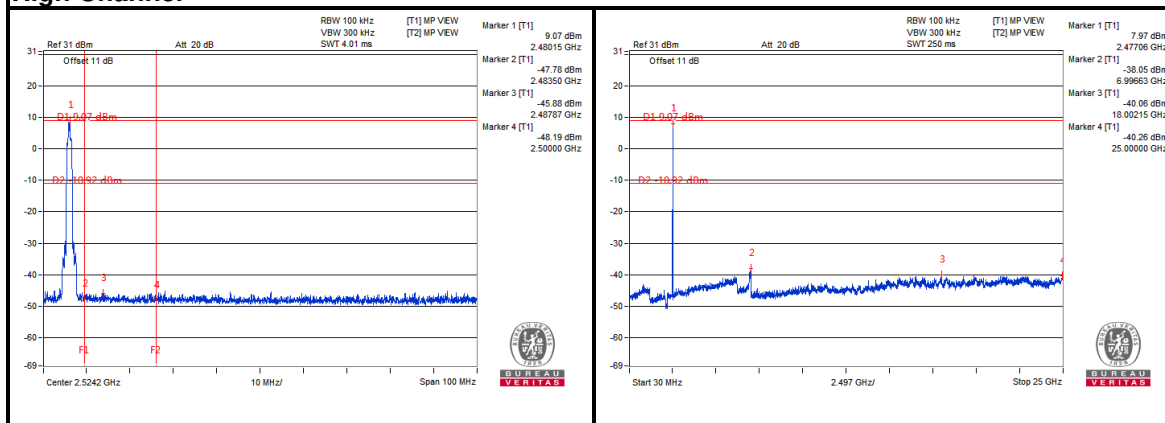


8DPSK

Low Channel

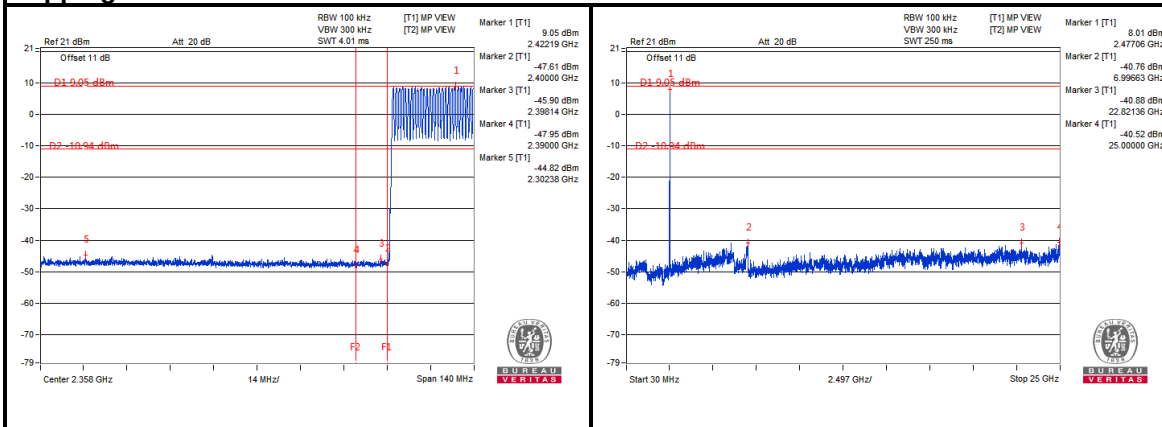


High Channel

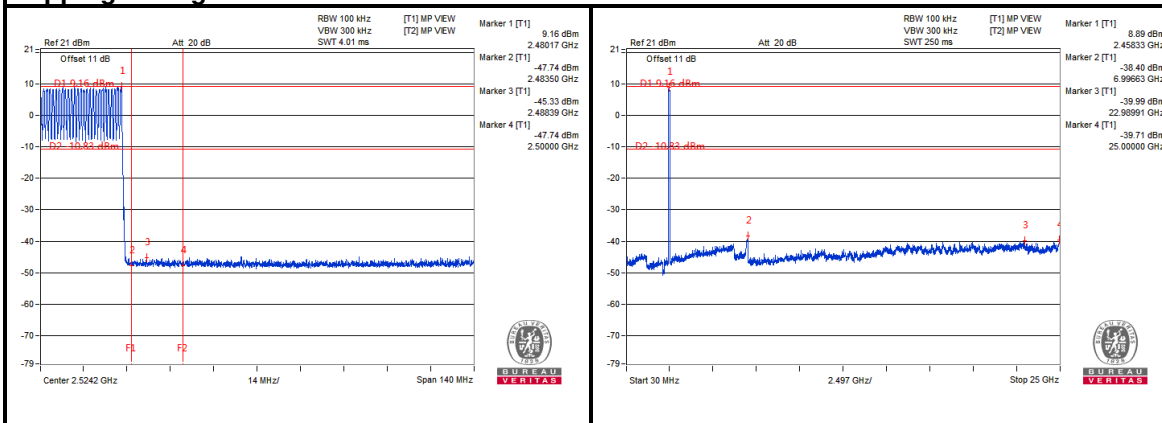


GFSK

Hopping on Low Channel

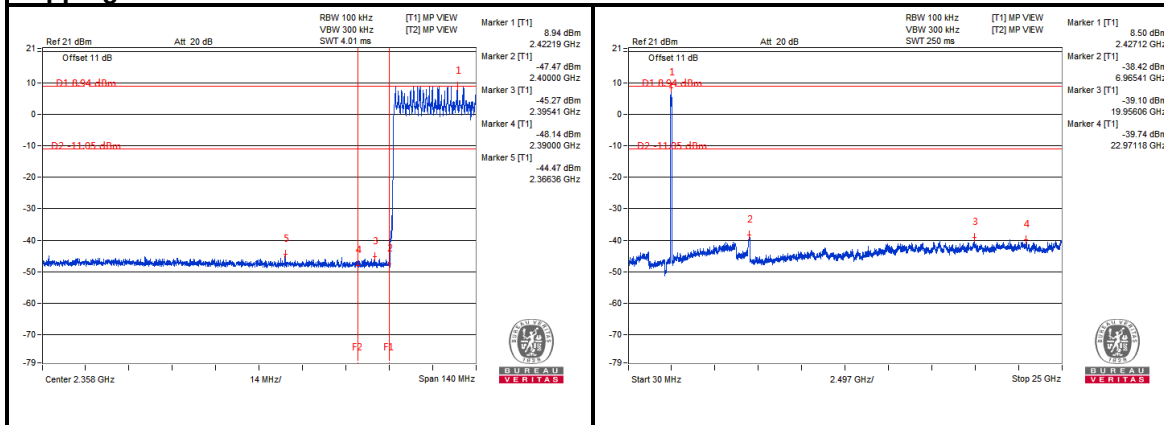


Hopping on High Channel

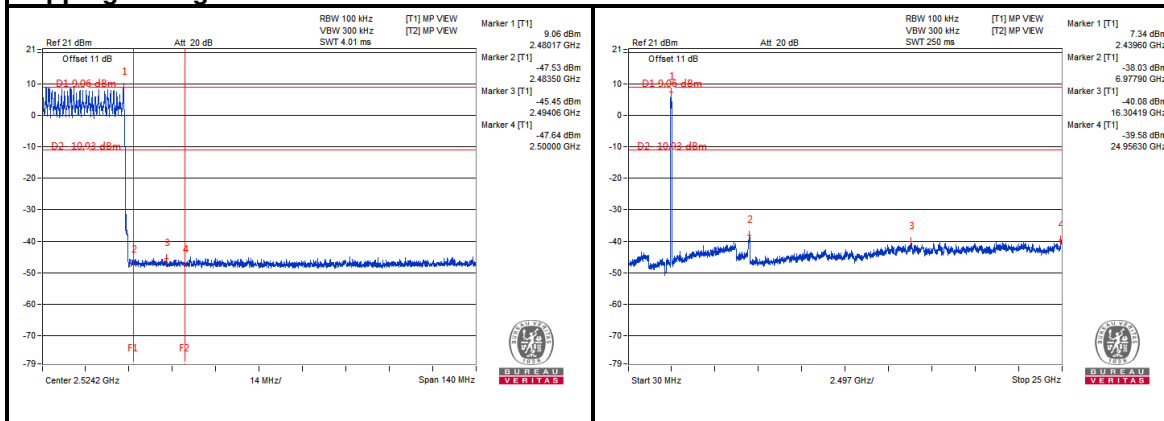


8DPSK

Hopping on Low Channel



Hopping on High Channel





Test Report No.: RF2408WDG0131-1

5 PHOTOGRAPHS OF THE TEST CONFIGURATION

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

6 APPENDIX A - MODIFICATIONS RECORDERS FOR ENGINEERING CHANGES TO THE EUT BY THE LAB

No modifications are made to the EUT by the lab during the test.

---END---