TEST REPORT

Applicant	Beskytte Huang & Co. (OreloPlus Co.)
Address	Ryggeveien 96,1528 Moss, Norway

Manufacturer or Supplier	1. MERRY ELECTRONICS (SUZHOU) CO., LTD. 2. MERRY ELECTRONICS (SHENZHEN) CO., LTD.
Address	1. 800, Kang Yuan Road, Xiangcheng Economic Development Zone, Suzhou City, Jiangsu Province, China 2. 48 MeiBao Rd., DaLang, LongHua District, ShenZhen, GuangDong, China 518109
Product	Headband Bluetooth ANC Headphones
Brand Name	Orelo+
Model	Hearing Protector P103
Additional Model & Model Difference	N/A
Date of tests	Nov. 02, 2018 ~ Nov. 28, 2018

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 Tom Chen Project Engineer / EMC Department	Approved by Glyn He Assistant Manager / EMC Department
Tom	Date: Mar. 03, 2020

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RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
RF181102N034-2	Original release	Dec. 12, 2018
RF191226N010-2	Based on the original report RF181102N034-2 updated the EUT Photo, changed the information of applicant/ manufacturer, brand name and FCC ID number, but it doesn't need to be retested after engineer evaluated.	Mar. 03, 2020

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)	Maximum Peak 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	2.70dB
Radiated emissions	9KHz ~ 30MHz	2.90dB
	30MHz ~ 1GMHz	3.76dB
	1GHz ~ 18GHz	4.84dB
	18GHz ~ 40GHz	4.96dB

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	Headband Bluetooth ANC Headphones
MODEL NO.	Hearing Protector P103
ADDITIONAL MODELS	N/A
FCC ID	2AVH3-P103
POWER SUPPLY	DC 3.7V from Li-ion Battery or DC 5V from USB Host Unit
MODULATION TECHNOLOGY	FHSS
MODULATION TYPE	GFSK, π/4 DQPSK, 8DPSK
OPERATING FREQUENCY	2402MHz~2480MHz
NUMBER OF CHANNEL	79
PEAK OUTPUT POWER	7.709mW (Max. Measured)
ANTENNA TYPE	PCB Antenna, 1.0dBi Gain
I/O PORTS	Refer to user's manual
CABLE SUPPLIED	USB Line: Shielded, Detachable 0.5m Aux in: Unshielded, Detachable 1.2m

NOTE:

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.: 191226N010) for detailed product photo.

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, XYZ axis and antenna ports
The worst case was found when positioned on X axis for radiated emission.
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 Fully Battery with BT link
B	√	√	√		Powered by Adapter with BT link

Where **RE<1G:** Radiated Emission below 1GHz **RE≥1G:** Radiated Emission above 1GHz
PLC: Power Line Conducted Emission **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, XYZ 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
B	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, XYZ 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
B	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	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	PACKET TYPE
B	0 to 78	Hopping	FHSS	GFSK	DH5

ANTENNA PORT CONDUCTED MEASUREMENT:

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

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, 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
A	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 (SYSTEM)	TESTED BY
RE<1G	25deg. C, 55%RH	DC 5V from adapter	Tank
RE≥1G	25deg. C, 55%RH	DC 5V from adapter	Tank
PLC	25deg. C, 55%RH	DC 5V from adapter	Dragon
APCM	25deg. C, 60%RH	DC 3.7V from Fully Battery	Sen He

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
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.	FCC ID
1	Adapter	N/A	DC5V 1A	N/A	N/A

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

4 TEST TYPES AND RESULTS

4.1. CONDUCTED EMISSION MEASUREMENT

4.1.1 LIMITS OF CONDUCTED EMISSION MEASUREMENT

FREQUENCY OF EMISSION (MHz)	CONDUCTED LIMIT (dBμV)	
	Quasi-peak	Average
0.15 ~ 0.5	66 to 56	56 to 46
0.5 ~ 5	56	46
5 ~ 30	60	50

NOTE: 1.The lower limit shall apply at the transition frequencies.

2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

3. 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.	Last Cal.	Next Cal.
EMI Test Receiver	Rohde&Schwarz	ESR7	101494	Mar. 21,18	Mar. 20,19
Artificial Mains Network	Rohde&Schwarz	ENV216	101173	Mar. 03,18	Mar. 02,19
Artificial Mains Network	Rohde&Schwarz	ESH3-Z5	100317	Apr. 11,18	Apr. 10,19
Voltage probe	SCHWARZBECK	TK 9421	TK 9421-176	Jan. 17,18	Jan. 16,19
Test software	ADT	ADT_Cond_V7.3.7	N/A	N/A	N/A

NOTE:

1. The test was performed in shielded room 553.
2. The calibration interval of the above test instruments is 12 months. And the calibrations are traceable to CEPREI/CHINA, GRGT/CHINA and NIM/CHINA.

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.

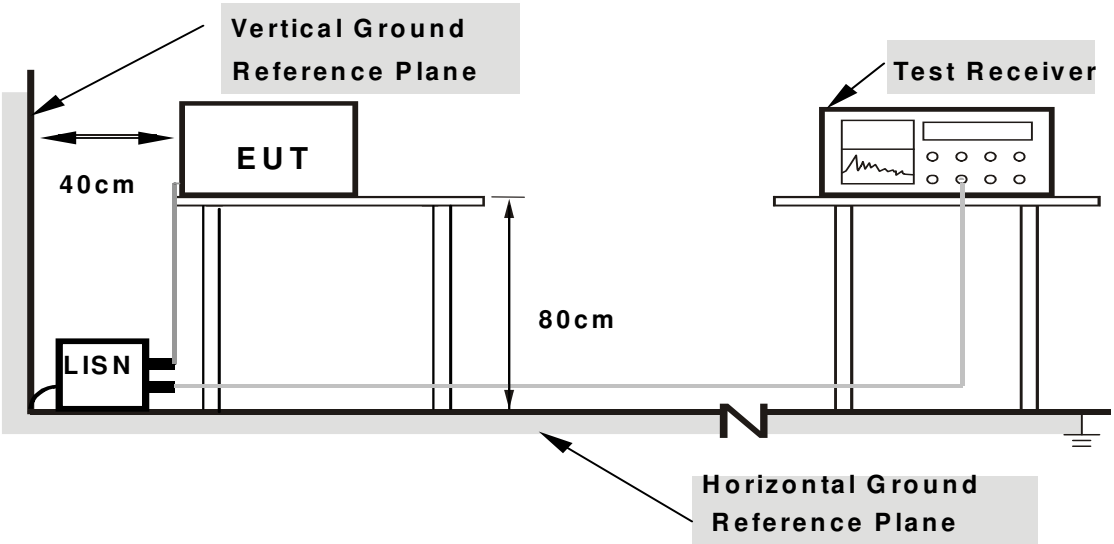
c. The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) was not recorded.

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.

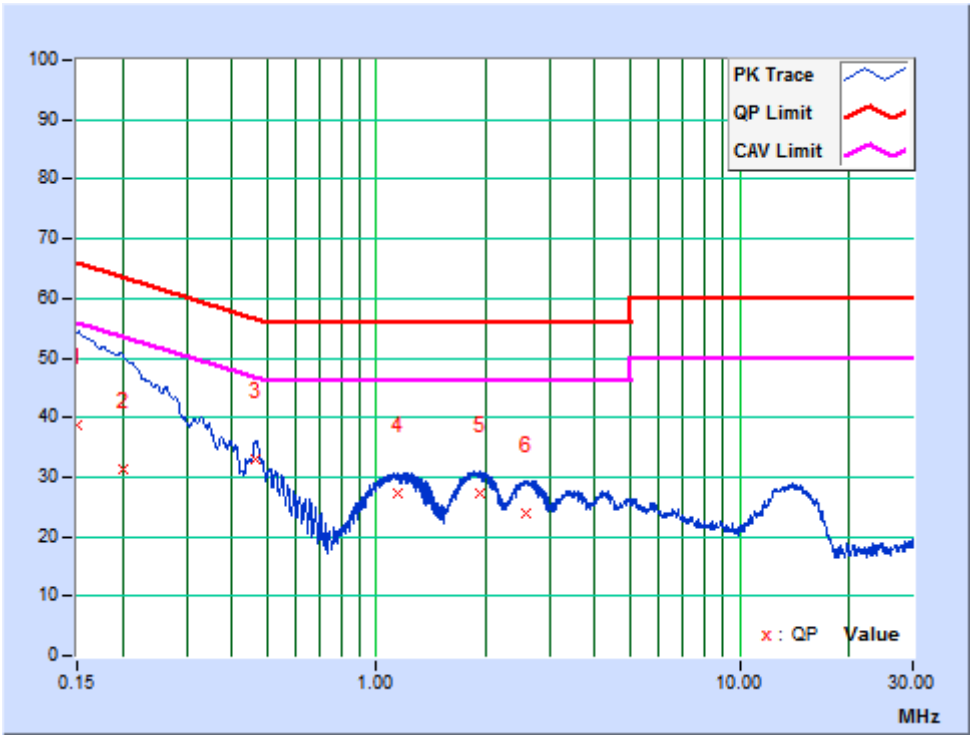
4.1.7 TEST RESULTS

CONDUCTED WORST-CASE DATA:

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	0.15000	9.94	28.82	8.81	38.76	18.75	66.00	56.00	-27.24	-37.25
2	0.20175	10.29	21.02	3.16	31.31	13.45	63.54	53.54	-32.23	-40.09
3	**0.46639**	**10.31**	**22.64**	**14.11**	**32.95**	**24.42**	**56.58**	**46.58**	**-23.63**	**-22.16**
4	1.13849	10.15	17.02	6.49	27.17	16.64	56.00	46.00	-28.83	-29.36
5	1.92750	10.24	17.00	7.42	27.24	17.66	56.00	46.00	-28.76	-28.34
6	2.57550	9.94	13.85	7.39	23.79	17.33	56.00	46.00	-32.21	-28.67

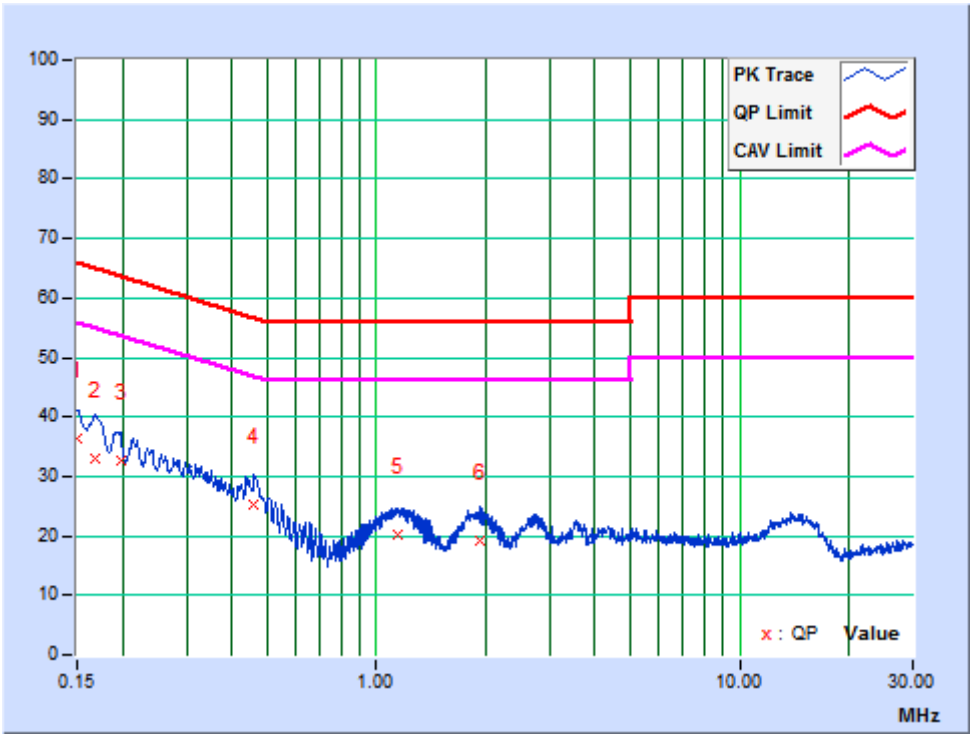
REMARKS: 1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. "-": The Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.
3. The emission levels of other frequencies were very low against the limit.
4. Margin value = Emission level - Limit value
5. Correction factor = Insertion loss + Cable loss
6. Emission Level = Correction Factor + Reading Value.



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	0.15000	9.64	26.87	7.90	36.51	17.54	66.00	56.00	-29.49	-38.46
2	0.16787	10.27	22.84	3.96	33.11	14.23	65.07	55.07	-31.96	-40.84
3	0.19721	9.81	22.82	5.06	32.63	14.87	63.73	53.73	-31.10	-38.86
4	0.46027	9.95	15.47	5.55	25.42	15.50	56.69	46.69	-31.26	-31.18
5	1.14000	9.69	10.67	1.41	20.36	11.10	56.00	46.00	-35.64	-34.90
6	1.92975	10.25	8.85	1.35	19.10	11.60	56.00	46.00	-36.90	-34.40

REMARKS: 1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. "-": The Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.
3. The emission levels of other frequencies were very low against the limit.
4. Margin value = Emission level - Limit value
5. Correction factor = Insertion loss + Cable loss
6. Emission Level = Correction Factor + Reading Value.



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

NOTE:

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.	Last Cal.	Next Cal.
EMI Test Receiver	Rohde&Schwarz	ESU40	100449	Mar. 21,18	Mar. 20,19
Signal and Spectrum Analyzer	Rohde&Schwarz	FSV7	102331	Nov. 04,18	Nov. 03,19
Active Loop Antenna (9KHz -30MHz)	SCHWARZBECK	FMZB 1519B	1519B-045	May 04,18	May 03,19
Amplifier (9KHz -1GHz)	Burgeon	BPA-530	100210	Apr. 18,18	Apr. 18,19
Bilog Antenna (20MHz -2GHz)	Teseq	CBL 6111D	30643	Aug. 11, 18	Aug. 10, 19
Horn Antenna (1GHz -18GHz)	ETS -Lindgren	3117	00062558	Jul. 21, 18	Jul. 20, 19
Horn Antenna (18GHz -40GHz)	SCHWARZBECK	BBHA 9170	BBHA9170242	May 05,18	May 04,19
3m Semi-anechoic Chamber	ETS-LINDGREN	9m*6m*6m	NSEMC003	Feb. 10,18	Feb. 09,19
Test Software	ADT	ADT_Radiated _V7.6.15.9.2	N/A	N/A	N/A
Broadband Preamplifier (1GHz~18GHz)	SCHWARZBECK	BBV9718	305	Apr. 18,18	Apr. 18,19
Pre-Amplifier (18GHz-40GHz)	EMCI	EMC 184045	980102	Nov. 08,18	Nov. 07,19
Test Software	ADT	ADT_Radiated _V7.6.15.9.2	N/A	N/A	N/A
BLUETOOTH TESTER	Rohde&Schwarz	CBT32	100811	Jul. 06, 18	Jul. 05, 19

NOTE:

1. The test was performed in 966 Chamber.
2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to CEPREI/CHINA, GRGT/CHINA and NIM/CHINA.
3. The horn antenna is used only for the measurement of emission frequency above1GHz if tested.
4. The FCC Site Registration No. is 749762.

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. And the centre of the loop 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.

NOTE:

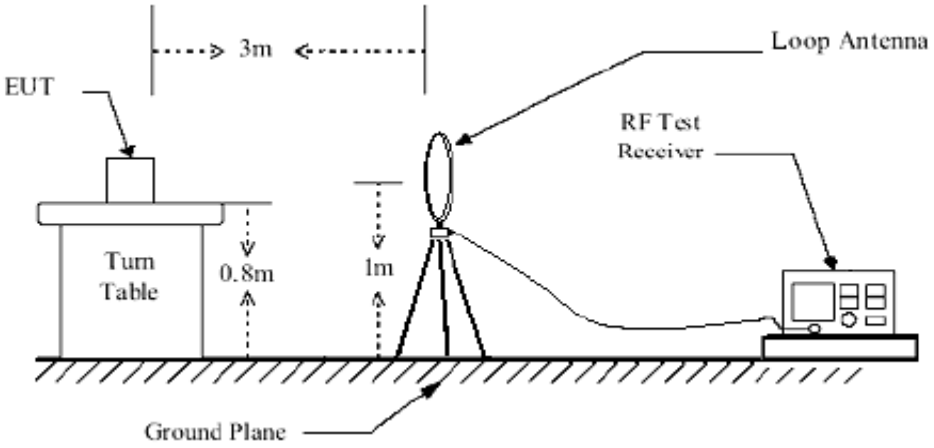
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and video bandwidth is 3MHz for Peak detection at frequency above 1GHz.
3. Bluetooth duty factor correction is not correct as it is based on 79 channels, worst case would be with AFH enabled and device using the minimum of 20 channels. Channel hop rate = 800 hops/second (AFH Mode), Adjusted channel hop rate for DH5 mode = 133.33 hops/second, Time per channel hop = 1 / 133.33 hops/second = 7.5 ms, Time to cycle through all channels = 7.5 x 20 channels = 150 ms, Number of times transmitter hits on one channel = 100 ms / 150 ms = 1 time(s), Worst case dwell time = 7.5 ms, Duty cycle connection factor = 20log10(7.5ms / 100ms) = -22.5 dB. Average value = peak reading + 20log(duty cycle).
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

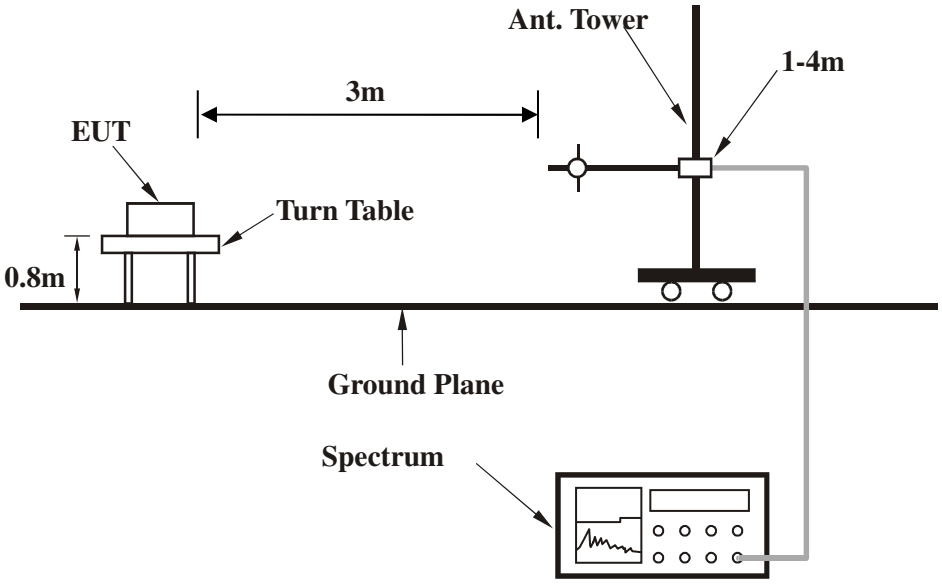
No deviation.

4.2.5 TEST SETUP

Below 30MHz test setup

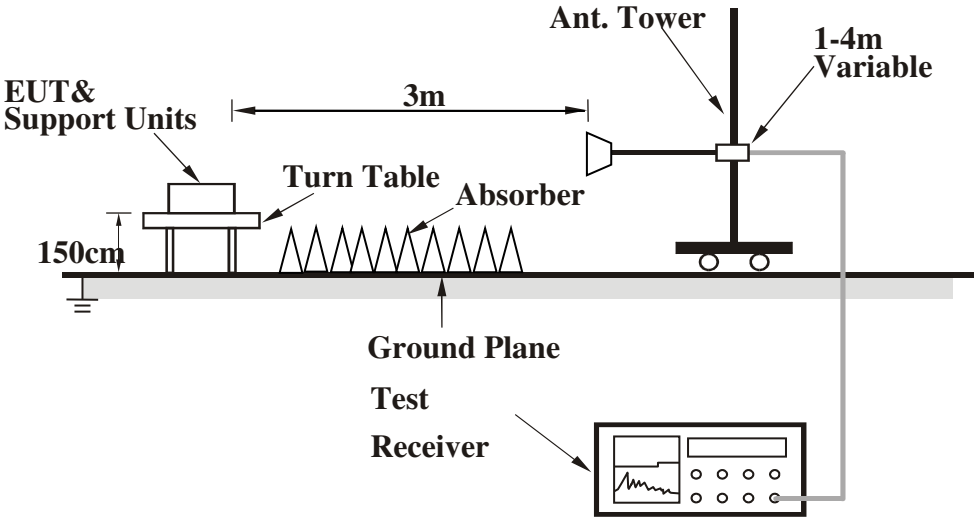


Below 1GHz test setup



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

a. Set the EUT under full load condition and placed them on a testing table.

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

c. The necessary accessories enable the EUT in full functions.

4.2.7 TEST RESULTS

BELOW 1GHz WORST-CASE DATA:

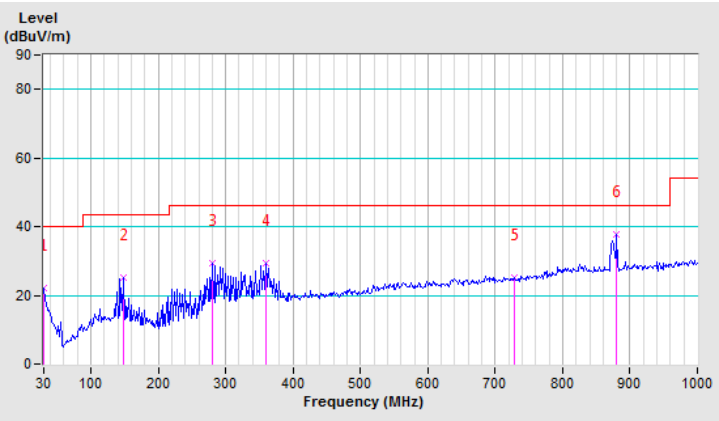
GFSK DH5

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)**	**CORRECTION FACTOR (dB/m)**
1	30.00	21.99 QP	40.00	-18.01	1.00 H	235	32.12	-10.13
2	148.14	25.23 QP	43.50	-18.27	1.00 H	48	41.40	-16.17
3	280.27	29.38 QP	46.00	-16.62	1.00 H	125	43.07	-13.69
4	359.55	29.21 QP	46.00	-16.79	1.00 H	85	39.60	-10.39
5	727.96	25.29 QP	46.00	-20.71	1.00 H	325	29.03	-3.74
6	**880.30**	**37.86 QP**	**46.00**	**-8.14**	**1.00 H**	**178**	**38.64**	**-0.78**

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 less than 20dB margin against the limit.
4. Margin value = Emission level – Limit value.

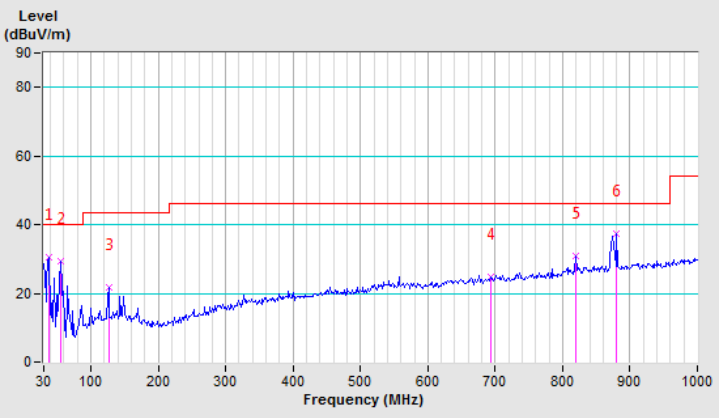


CHANNEL	Channel 39	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	9KHz ~ 1GHz		

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)	CORRECTION FACTOR (dB/m)
1	37.77	30.65 QP	40.00	-9.35	1.00 V	77	45.32	-14.67
2	54.87	29.36 QP	40.00	-10.64	1.00 V	69	51.82	-22.46
3	126.38	21.79 QP	43.50	-21.71	1.00 V	125	38.12	-16.33
4	693.77	24.76 QP	46.00	-21.24	1.00 V	158	28.83	-4.07
5	819.68	30.88 QP	46.00	-15.12	1.00 V	226	32.58	-1.70
6	880.30	37.49 QP	46.00	-8.51	1.00 V	234	38.27	-0.78

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 less than 20dB margin against the limit.
4. 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	43.20 PK	74.00	-30.80	1.56 H	47	41.15	2.05
2	2390.00	20.70 AV	54.00	-33.30	1.56 H	47	18.65	2.05
3	*2402.00	106.21 PK			1.56 H	47	104.07	2.14
4	*2402.00	83.71 AV			1.56 H	47	81.57	2.14
5	4804.00	49.21 PK	74.00	-24.79	1.44 H	102	44.39	4.82
6	4804.00	26.71 AV	54.00	-27.29	1.44 H	102	21.89	4.82
7	#7206.00	50.07 PK	74.00	-23.93	1.12 H	39	41.44	8.63
8	#7206.00	27.57 AV	54.00	-26.43	1.12 H	39	18.94	8.63
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	44.37 PK	74.00	-29.63	1.05 V	214	42.32	2.05
2	2390.00	21.87 AV	54.00	-32.13	1.05 V	214	19.82	2.05
3	*2402.00	103.78 PK			1.05 V	214	101.64	2.14
4	*2402.00	81.28 AV			1.05 V	214	79.14	2.14
5	4804.00	51.13 PK	74.00	-22.87	1.52 V	208	46.31	4.82
6	4804.00	28.63 AV	54.00	-25.37	1.52 V	208	23.81	4.82
7	#7206.00	51.33 PK	74.00	-22.67	1.05 V	99	42.70	8.63
8	#7206.00	28.83 AV	54.00	-25.17	1.05 V	99	20.20	8.63

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 less than 20dB margin against the limit.
4. Margin value = Emission level – Limit value.
5. " * ": Fundamental frequency.
6. " # ": The radiated frequency is out of the restricted band.

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

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	106.87 PK			1.33 H	48	104.46	2.41
2	*2441.00	84.37 AV			1.33 H	48	81.96	2.41
3	4882.00	50.19 PK	74.00	-23.81	1.26 H	301	45.20	4.99
4	4882.00	27.69 AV	54.00	-26.31	1.26 H	301	22.70	4.99
5	7323.00	52.03 PK	74.00	-21.97	1.17 H	208	43.26	8.77
6	7323.00	29.53 AV	54.00	-24.47	1.17 H	208	20.76	8.77
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	103.21 PK			1.07 V	214	100.80	2.41
2	*2441.00	80.71 AV			1.07 V	214	78.30	2.41
3	4882.00	49.32 PK	74.00	-24.68	1.36 V	99	44.33	4.99
4	4882.00	26.82 AV	54.00	-27.18	1.36 V	99	21.83	4.99
5	7323.00	51.02 PK	74.00	-22.98	1.09 V	121	42.25	8.77
6	7323.00	28.52 AV	54.00	-25.48	1.09 V	121	19.75	8.77

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 less than 20dB margin against the limit.
4. Margin value = Emission level – Limit value.
5. " * ": Fundamental frequency.

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

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	107.16 PK			1.17 H	94	104.48	2.68
2	*2480.00	84.66 AV			1.17 H	94	81.98	2.68
3	2483.50	65.38 PK	74.00	-8.62	1.17 H	94	62.68	2.70
4	2483.50	42.88 AV	54.00	-11.12	1.17 H	94	40.18	2.70
5	4960.00	50.12 PK	74.00	-23.88	1.09 H	337	44.95	5.17
6	4960.00	27.62 AV	54.00	-26.38	1.09 H	337	22.45	5.17
7	7440.00	51.03 PK	74.00	-22.97	1.92 H	66	42.13	8.90
8	7440.00	28.53 AV	54.00	-25.47	1.92 H	66	19.63	8.90
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	104.32 PK			1.29 V	171	101.64	2.68
2	*2480.00	81.82 AV			1.29 V	171	79.14	2.68
3	2483.50	62.62 PK	74.00	-11.38	1.29 V	171	59.92	2.70
4	2483.50	40.12 AV	54.00	-13.88	1.29 V	171	37.42	2.70
5	4960.00	49.97 PK	74.00	-24.03	1.05 V	88	44.80	5.17
6	4960.00	27.47 AV	54.00	-26.53	1.05 V	88	22.30	5.17
7	7440.00	51.89 PK	74.00	-22.11	1.32 V	67	42.99	8.90
8	7440.00	29.39 AV	54.00	-24.61	1.32 V	67	20.49	8.90

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 less than 20dB margin against the limit.
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	44.38 PK	74.00	-29.62	1.03 H	42	42.33	2.05
2	2390.00	21.88 AV	54.00	-32.12	1.03 H	42	19.83	2.05
3	*2402.00	104.33 PK			1.03 H	42	102.19	2.14
4	*2402.00	81.83 AV			1.03 H	42	79.69	2.14
5	4804.00	49.21 PK	74.00	-24.79	1.27 H	191	44.39	4.82
6	4804.00	26.71 AV	54.00	-27.29	1.27 H	191	21.89	4.82
7	#7206.00	51.64 PK	74.00	-22.36	1.17 H	92	43.01	8.63
8	#7206.00	29.14 AV	54.00	-24.86	1.17 H	92	20.51	8.63
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	42.96 PK	74.00	-31.04	1.08 V	215	40.91	2.05
2	2390.00	20.46 AV	54.00	-33.54	1.08 V	215	18.41	2.05
3	*2402.00	101.78 PK			1.08 V	215	99.64	2.14
4	*2402.00	79.28 AV			1.08 V	215	77.14	2.14
5	4804.00	49.26 PK	74.00	-24.74	1.05 V	119	44.44	4.82
6	4804.00	26.76 AV	54.00	-27.24	1.05 V	119	21.94	4.82
7	#7206.00	50.81 PK	74.00	-23.19	1.17 V	49	42.18	8.63
8	#7206.00	28.31 AV	54.00	-25.69	1.17 V	49	19.68	8.63

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 less than 20dB margin against the limit.
4. Margin value = Emission level – Limit value.
5. " * ": Fundamental frequency.
6. " # ": The radiated frequency is out of the restricted band.

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

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	105.41 PK			1.52 H	44	103.00	2.41
2	*2441.00	82.94 AV			1.52 H	44	80.53	2.41
3	4882.00	49.98 PK	74.00	-24.02	1.22 H	97	44.99	4.99
4	4882.00	27.48 AV	54.00	-26.52	1.22 H	97	22.49	4.99
5	7323.00	50.67 PK	74.00	-23.33	1.07 H	89	41.90	8.77
6	7323.00	28.17 AV	54.00	-25.83	1.07 H	89	19.40	8.77
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	101.74 PK			1.20 V	214	99.33	2.41
2	*2441.00	79.24 AV			1.20 V	214	76.83	2.41
3	4882.00	50.32 PK	74.00	-23.68	1.05 V	173	45.33	4.99
4	4882.00	27.82 AV	54.00	-26.18	1.05 V	173	22.83	4.99
5	7323.00	51.67 PK	74.00	-22.33	1.71 V	65	42.90	8.77
6	7323.00	29.17 AV	54.00	-24.83	1.71 V	65	20.40	8.77

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 less than 20dB margin against the limit.
4. Margin value = Emission level – Limit value.
5. " * ": Fundamental frequency.

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

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	106.44 PK			1.03 H	90	103.76	2.68
2	*2480.00	83.94 AV			1.03 H	90	81.26	2.68
3	2483.50	64.34 PK	74.00	-9.66	1.03 H	90	61.64	2.70
4	2483.50	41.84 AV	54.00	-12.16	1.03 H	90	39.14	2.70
5	4960.00	50.22 PK	74.00	-23.78	1.09 H	24	45.05	5.17
6	4960.00	27.72 AV	54.00	-26.28	1.09 H	24	22.55	5.17
7	7440.00	51.52 PK	74.00	-22.48	1.37 H	126	42.62	8.90
8	7440.00	29.02 AV	54.00	-24.98	1.37 H	126	20.12	8.90
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	103.40 PK			1.21 V	154	100.72	2.68
2	*2480.00	80.90 AV			1.21 V	154	78.22	2.68
3	2483.50	61.69 PK	74.00	-12.31	1.21 V	154	58.99	2.70
4	2483.50	39.19 AV	54.00	-14.81	1.21 V	154	36.49	2.70
5	4960.00	49.82 PK	74.00	-24.18	1.01 V	338	44.65	5.17
6	4960.00	27.32 AV	54.00	-26.68	1.01 V	338	22.15	5.17
7	7440.00	51.17 PK	74.00	-22.83	1.27 V	88	42.27	8.90
8	7440.00	28.67 AV	54.00	-25.33	1.27 V	88	19.77	8.90

REMARKS:

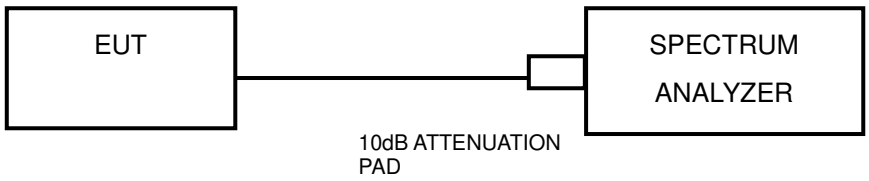
1. Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB/m).
2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB).
3. The emission levels of other frequencies were less than 20dB margin against the limit.
4. Margin value = Emission level – Limit value.
5. " * ": Fundamental 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.	Last Cal.	Next Cal.
Power Sensor	Keysight	U2021XA	MY55060016	Jun. 13,18	Jun. 12,19
Power Sensor	Keysight	U2021XA	MY55060018	Jun. 13,18	Jun. 12,19
Power Meter	Anritsu	ML2495A	1139001	Apr. 13,18	Apr. 13,19
Power Sensor	Anritsu	MA2411B	1531155	Apr. 13,18	Apr. 13,19
Digital Multimeter	FLUKE	15B	A1220010DG	Oct. 21, 18	Oct.20, 19
Humid & Temp Programmable Tester	Haida	HD-2257	110807201	Sep.05,18	Sep. 04,19
Oscilloscope	Agilent	DSO9254A	MY51260160	Nov. 08,18	Nov. 07,19
Signal Analyzer	Rohde & Schwarz	FSV7	102331	Nov. 04,18	Nov. 03,19
Signal Generator	Agilent	N5183A	MY50140980	Jan. 02,18	Jan. 01,19
Agile Signal Generator	Agilent	8645A	Agilent	Sep.01, 18	Aug.31, 19
Spectrum Analyzer	Keysight	N9020A	MY55400499	Mar. 21,18	Mar. 20,19
MXG-B RF Vector Signal Generator	Keysight	N5182B	MY56200288	Jan. 02,18	Jan. 01,19
BLUETOOTH TESTER	Rohde&Schwarz	CBT32	100811	Jul.06, 18	Jul. 05, 19
Attenuator	MINI	BW-S10W2+	S130129FGE2	N/A	N/A
DC Source	Keysight	E3642A	MY56146098	N/A	N/A

NOTE:

1. The test was performed in RF Oven room.
2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to CEPREI/CHINA, GRGT/CHINA and NIM/CHINA.

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.

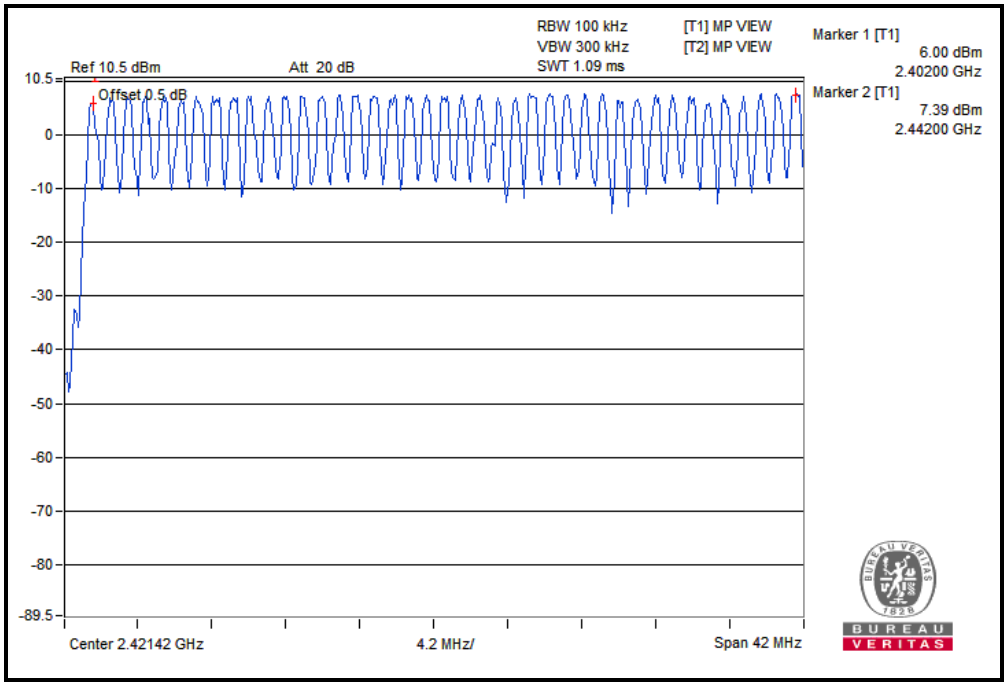
4.3.5 DEVIATION FROM TEST STANDARD

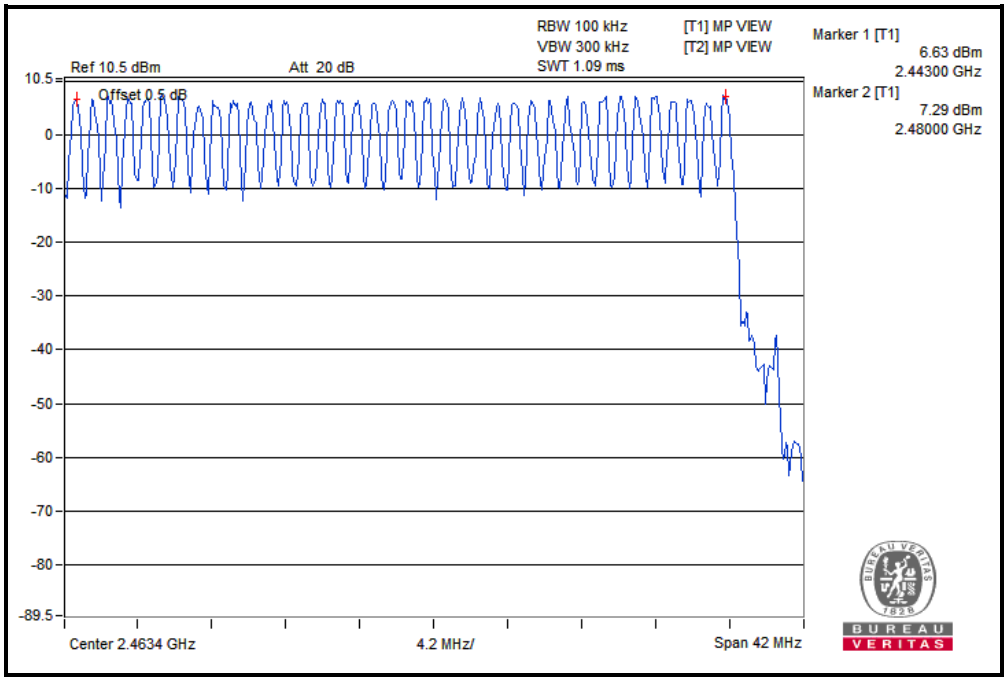
No deviation.

4.3.6 TEST RESULTS

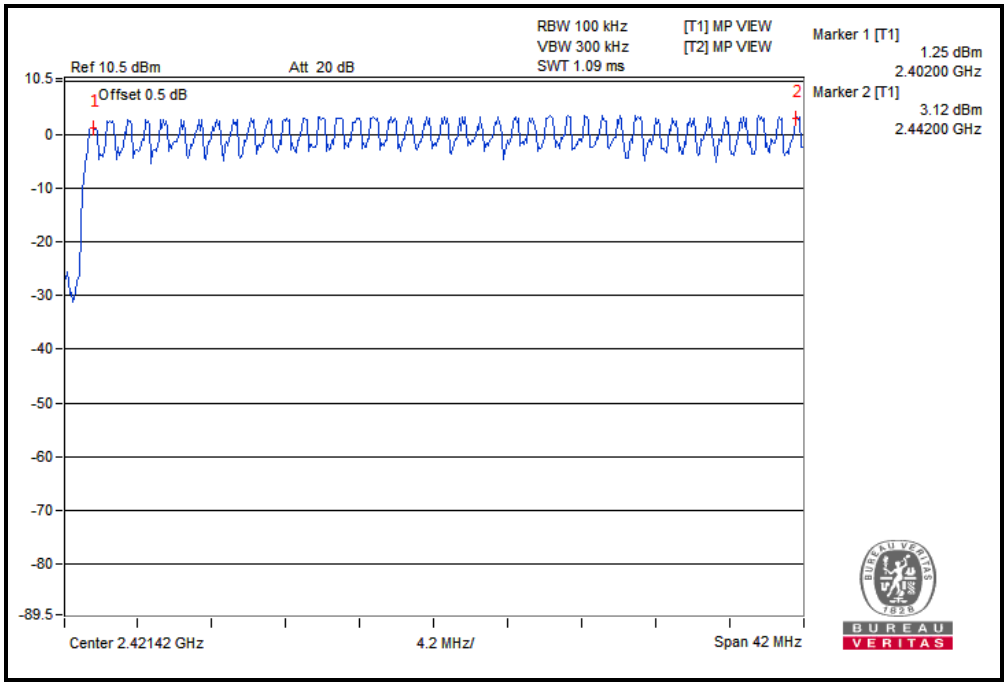
There are 79 hopping frequencies in the hopping mode. Please refer to next two pages for the test result. On the plots, it shows that the hopping frequencies are equally spaced.

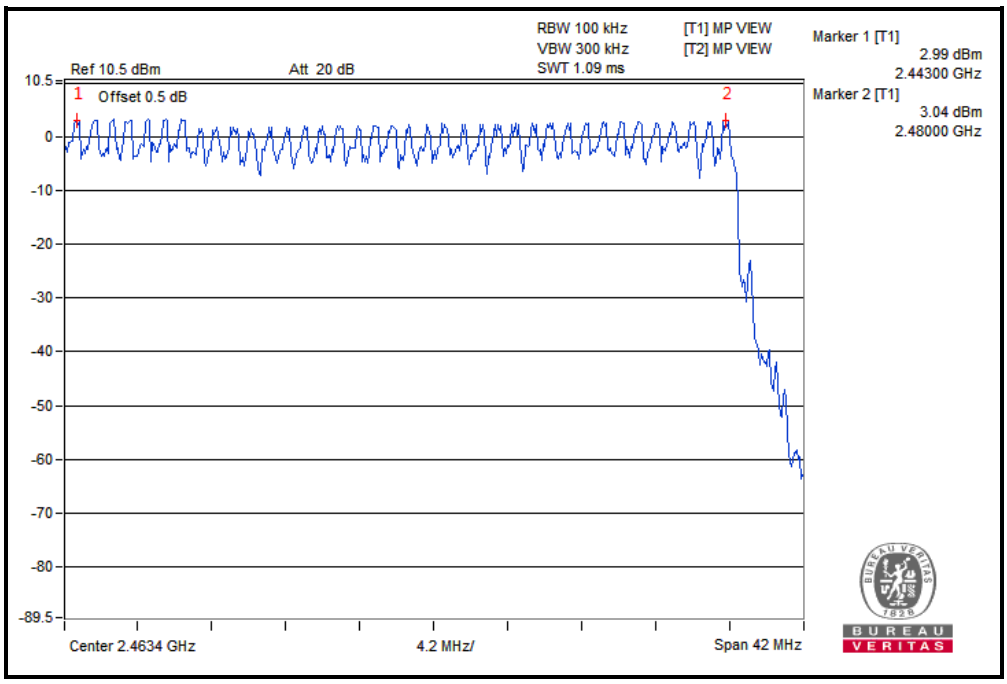
GFSK


RBW 100 kHz
VBW 300 kHz
SWT 1.09 ms
[T1] MP VIEW
[T2] MP VIEW
Marker 1 [T1]
6.00 dBm
2.40200 GHz
Marker 2 [T1]
7.39 dBm
2.44200 GHz
Ref 10.5 dBm
Att 20 dB
Offset 0.5 dB
10.5
0
-10
-20
-30
-40
-50
-60
-70
-80
-89.5
Center 2.42142 GHz
4.2 MHz/
Span 42 MHz


RBW 100 kHz
VBW 300 kHz
SWT 1.09 ms
[T1] MP VIEW
[T2] MP VIEW
Marker 1 [T1]
6.63 dBm
2.44300 GHz
Marker 2 [T1]
7.29 dBm
2.48000 GHz
Ref 10.5 dBm
Att 20 dB
Offset 0.5 dB
10.5
0
-10
-20
-30
-40
-50
-60
-70
-80
-89.5
Center 2.4634 GHz
4.2 MHz/
Span 42 MHz

8DPSK


RBW 100 kHz
VBW 300 kHz
SWT 1.09 ms
[T1] MP VIEW
[T2] MP VIEW
Marker 1 [T1]
1.25 dBm
2.40200 GHz
Marker 2 [T1]
3.12 dBm
2.44200 GHz
Ref 10.5 dBm
Att 20 dB
Offset 0.5 dB
10.5
0
-10
-20
-30
-40
-50
-60
-70
-80
-89.5
Center 2.42142 GHz
4.2 MHz/
Span 42 MHz

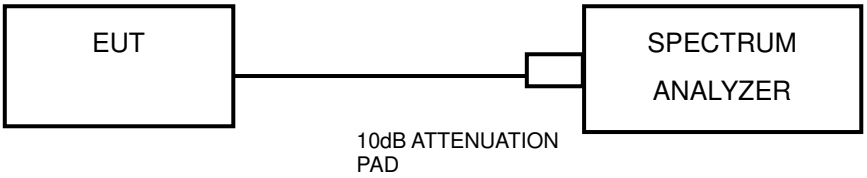

RBW 100 kHz
VBW 300 kHz
SWT 1.09 ms
[T1] MP VIEW
[T2] MP VIEW
Marker 1 [T1]
2.99 dBm
2.44300 GHz
Marker 2 [T1]
3.04 dBm
2.48000 GHz
Ref 10.5 dBm
Att 20 dB
Offset 0.5 dB
10.5
0
-10
-20
-30
-40
-50
-60
-70
-80
-89.5
Center 2.4634 GHz
4.2 MHz/
Span 42 MHz

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	0.48	151.68	400	PASS
DH3	79	31.6	5	25	158	1.77	279.66	400	PASS
DH5	79	31.6	5	17	107.44	3.056	328.34	400	PASS

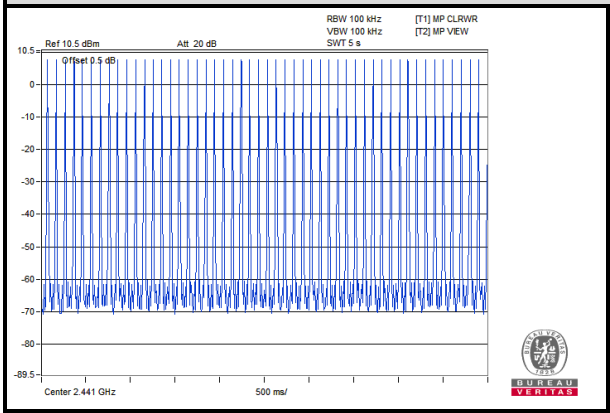
8DPSK

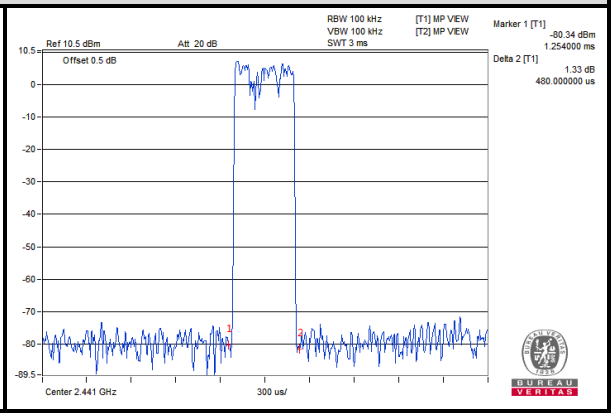
Mode	Number of Hopping Channel	Number of transmission in a period(channel number*0.4 sec)				Length of transmission time (msec)	Result (msec)	Limit (msec)	PASS / FAIL
		period (sec)	sweep time (sec)	times in a sweep	times in a period				
3DH1	79	31.6	5	50	316	0.462	145.99	400	PASS
3DH3	79	31.6	5	25	158	1.71	270.18	400	PASS
3DH5	79	31.6	5	17	107.44	3.04	326.62	400	PASS

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

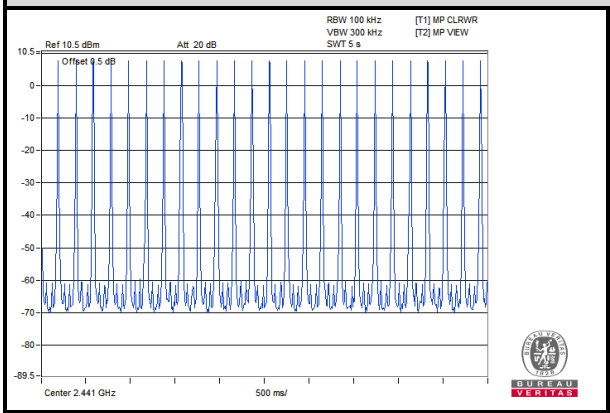
GFSK

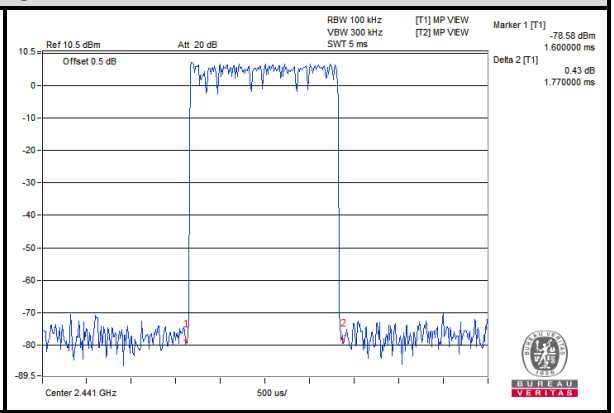
DH1



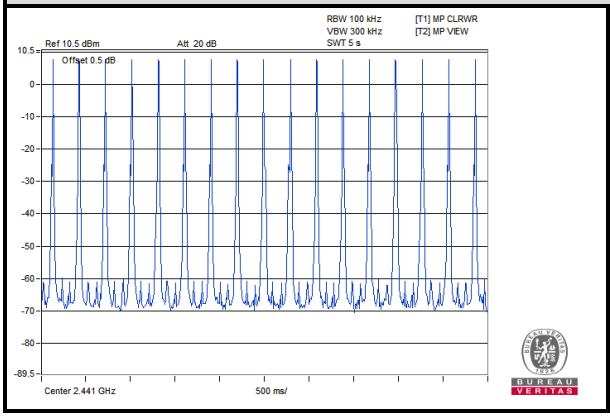


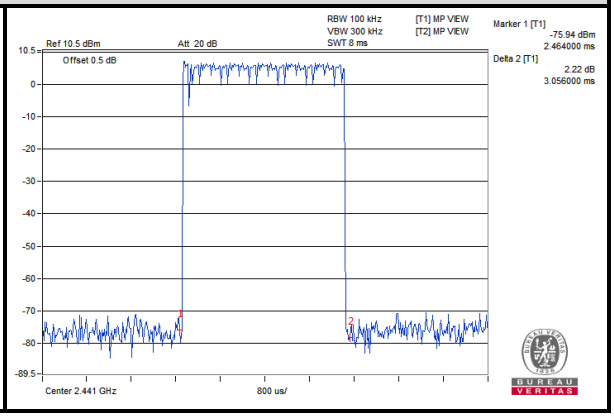
DH3





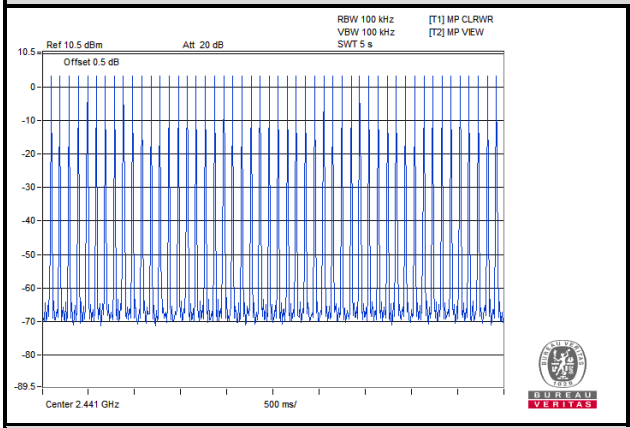
DH5

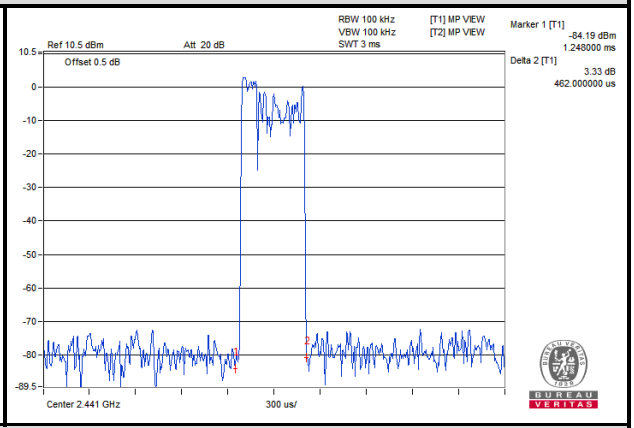




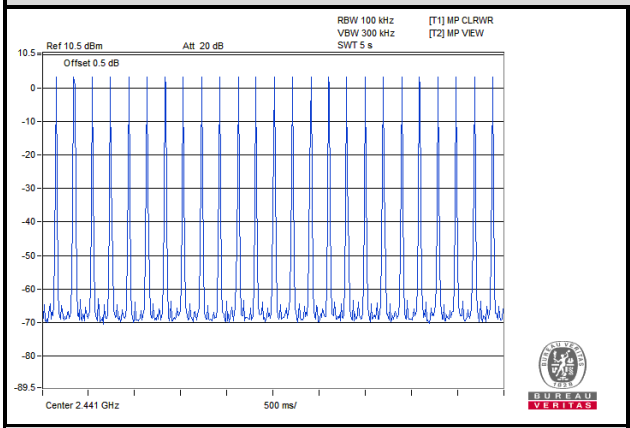
8DPSK

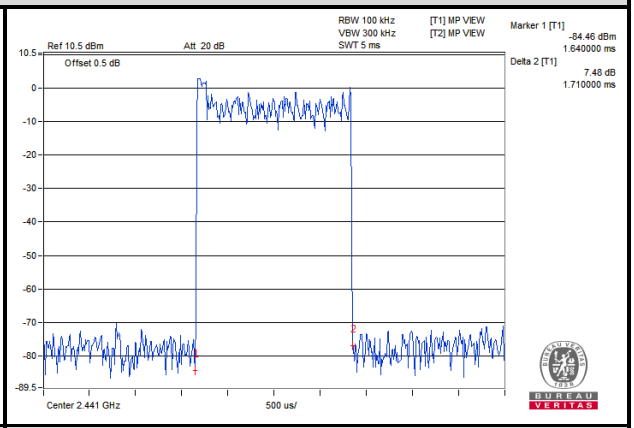
3DH1



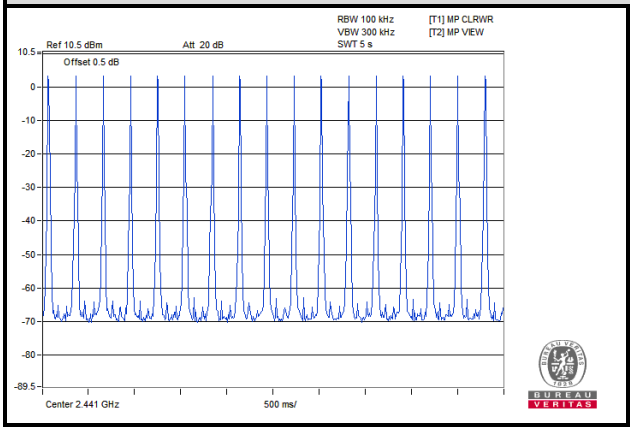


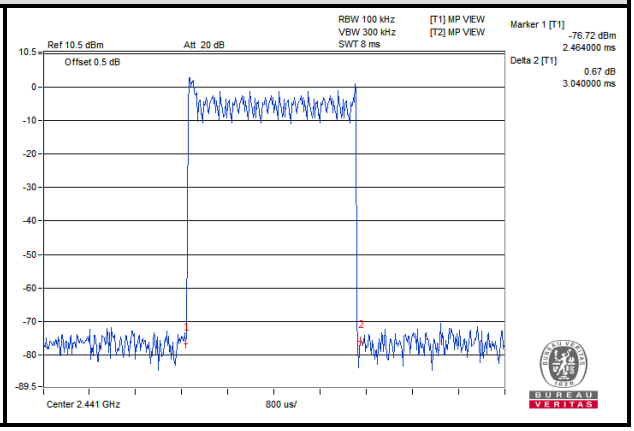
3DH3





3DH5



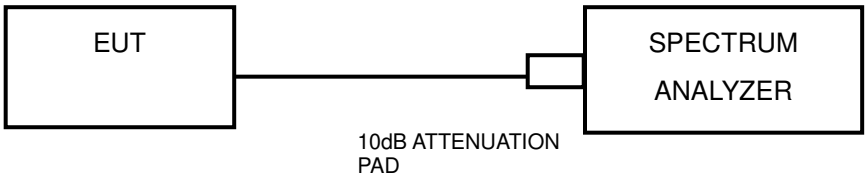


4.5 CHANNEL BANDWIDTH

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 20dBbandwidth of hopping channel shell be a minimum limit for the hopping channel separation.

4.5.2 TEST SETUP



4.5.3 TEST INSTRUMENTS

Refer to section 4.3.3 to get information of above instrument.

4.5.4 TEST PROCEDURE

a. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.

b. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.

c. Measure the frequency difference of two frequencies that were attenuated 20dB from the reference level. Record the frequency difference as the emission bandwidth.

d. Repeat above procedures until all frequencies measured were complete.

4.5.5 DEVIATION FROM TEST STANDARD

No deviation.

4.5.6 EUT OPERATING CONDITION

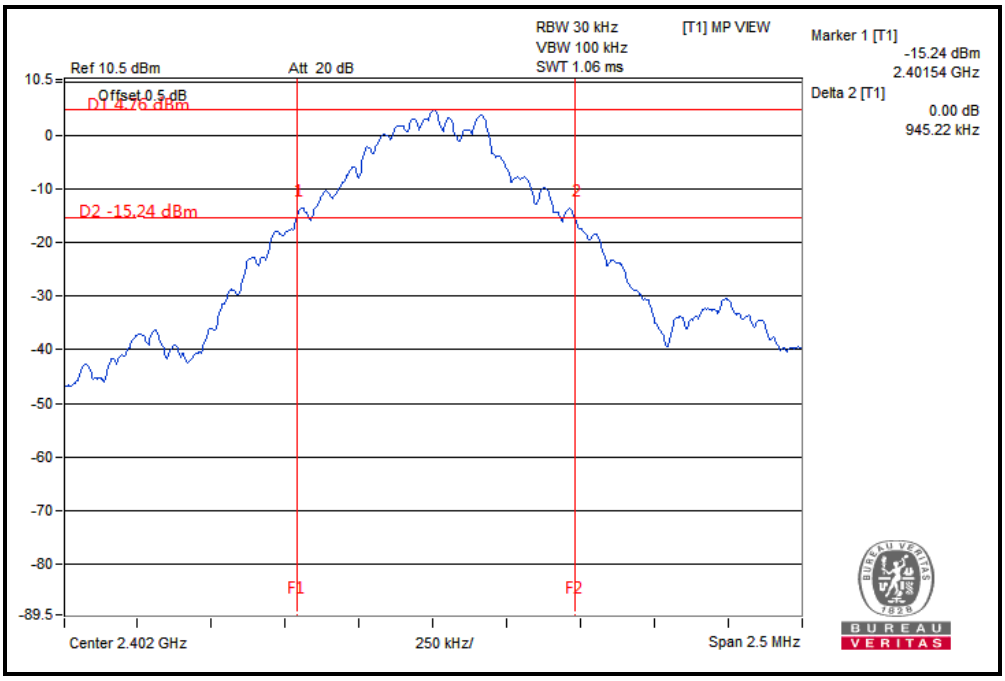
The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.

4.5.7 TEST RESULTS

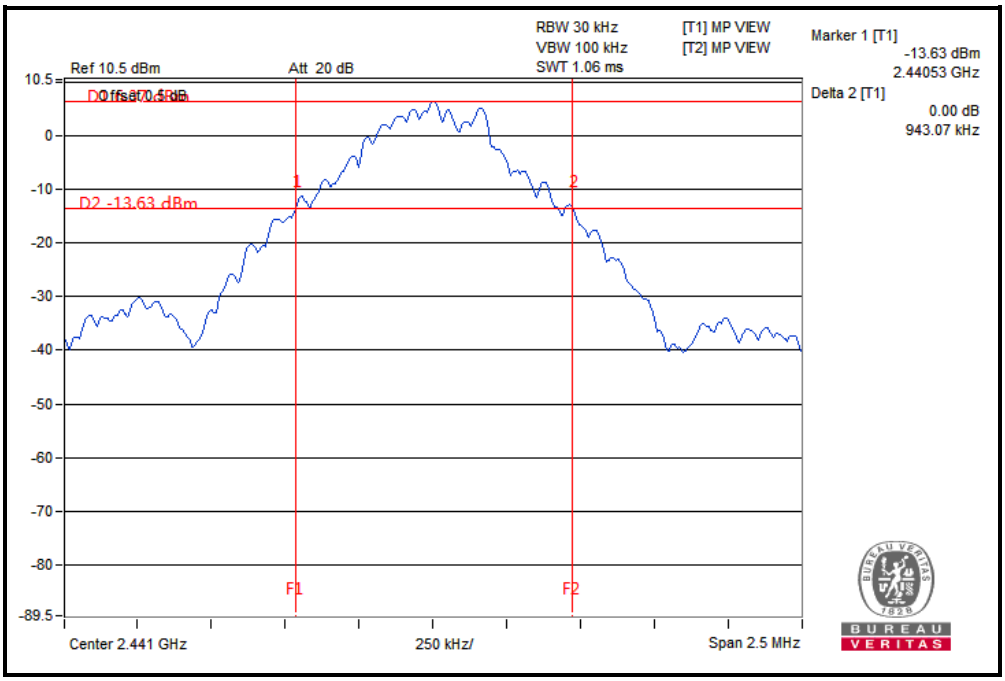
GFSK

CHANNEL	CHANNEL FREQUENCY (MHz)	20dB BANDWIDTH (MHz)
0	2402	0.945
39	2441	0.943
78	2480	0.945

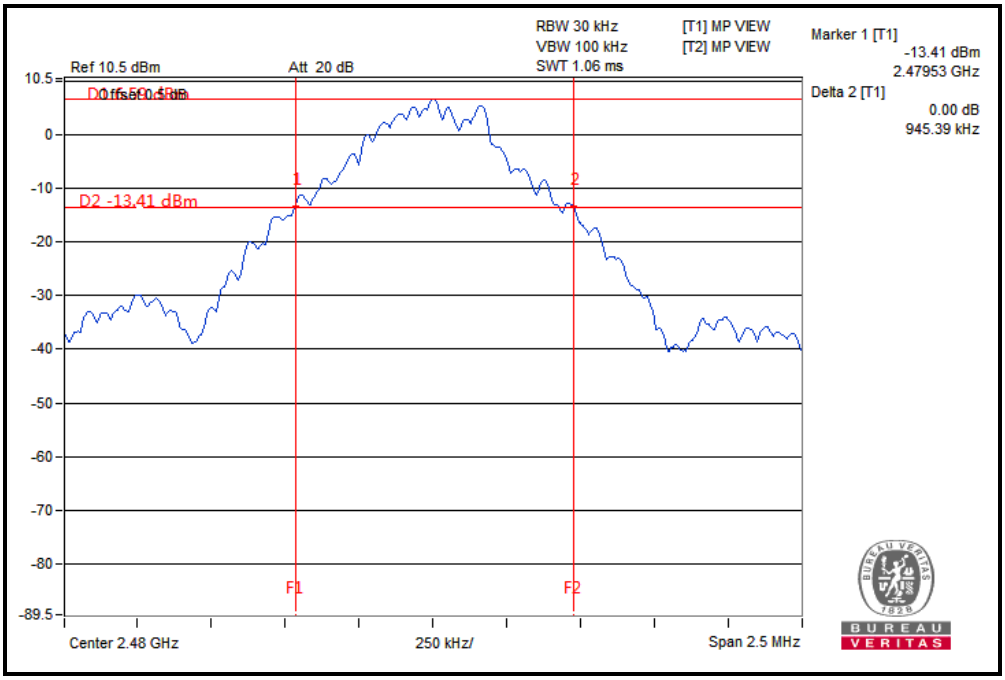
CH 0



CH 39


RBW 30 kHz
VBW 100 kHz
SWT 1.06 ms
[T1] MP VIEW
[T2] MP VIEW
Marker 1 [T1]
-13.63 dBm
2.44053 GHz
Delta 2 [T1]
0.00 dB
943.07 kHz
Ref 10.5 dBm
Att 20 dB
D2 -13.63 dBm
F1
F2
Center 2.441 GHz
250 kHz/
Span 2.5 MHz

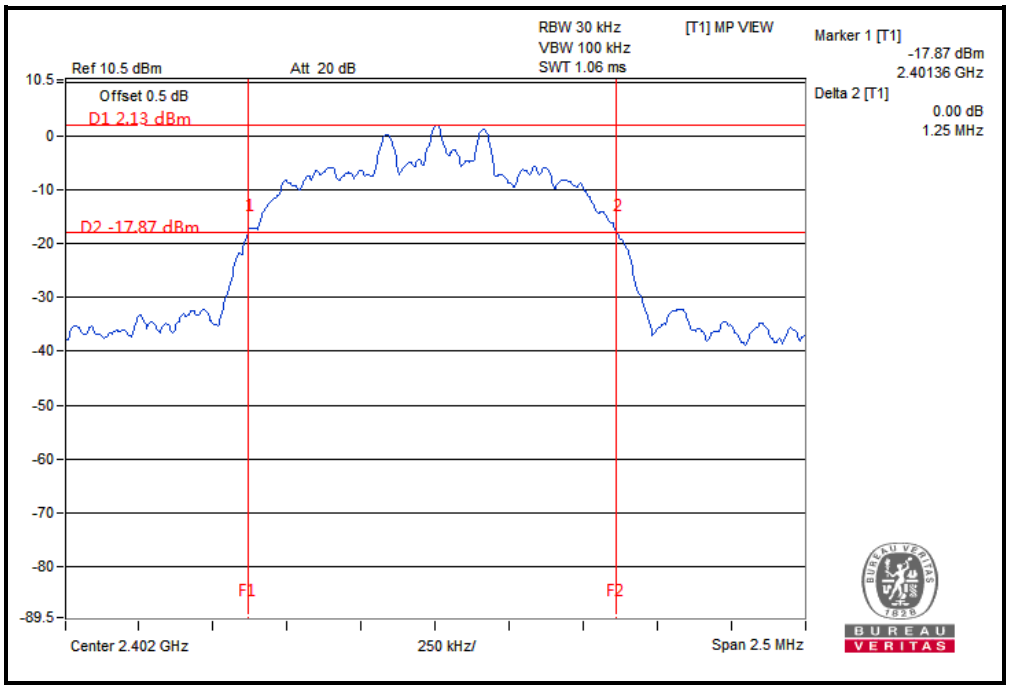
CH 78


RBW 30 kHz
VBW 100 kHz
SWT 1.06 ms
[T1] MP VIEW
[T2] MP VIEW
Marker 1 [T1]
-13.41 dBm
2.47953 GHz
Delta 2 [T1]
0.00 dB
945.39 kHz
Ref 10.5 dBm
Att 20 dB
D2 -13.41 dBm
F1
F2
Center 2.48 GHz
250 kHz/
Span 2.5 MHz

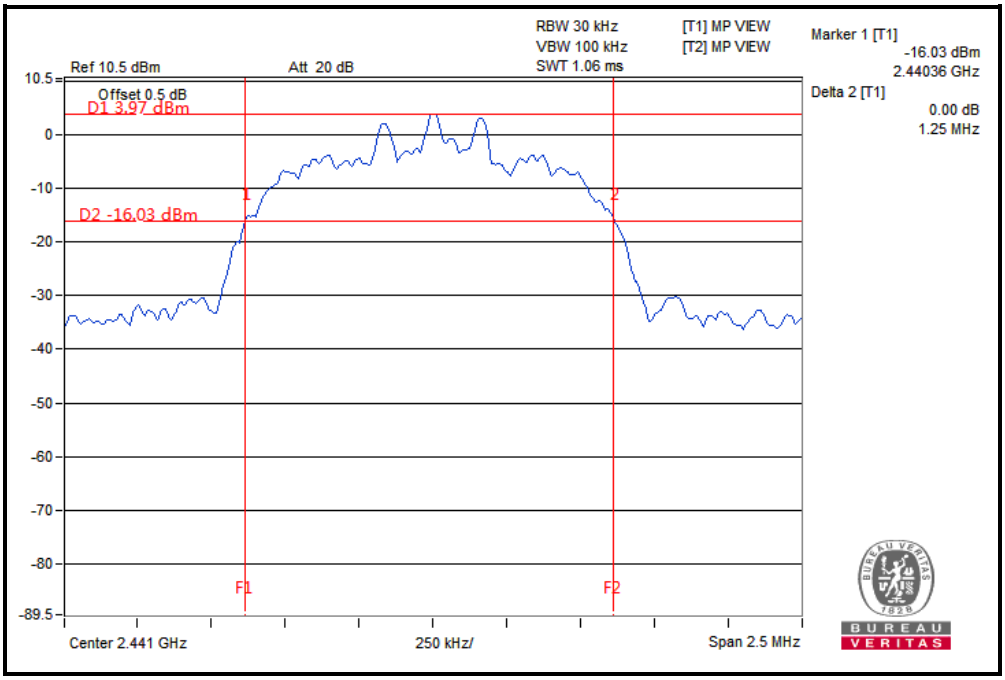
8DPSK

CHANNEL	CHANNEL FREQUENCY (MHz)	20dB BANDWIDTH (MHz)
0	2402	1.25
39	2441	1.25
78	2480	1.25

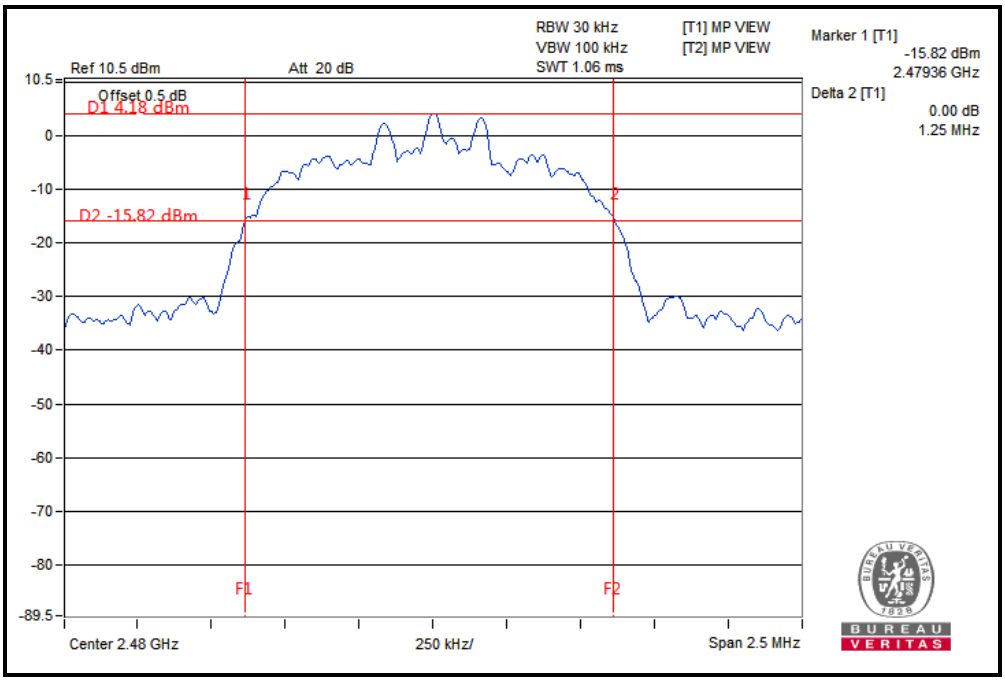
CH 0



CH 39


RBW 30 kHz
VBW 100 kHz
SWT 1.06 ms
[T1] MP VIEW
[T2] MP VIEW
Marker 1 [T1]
-16.03 dBm
2.44036 GHz
Delta 2 [T1]
0.00 dB
1.25 MHz
Ref 10.5 dBm
Att 20 dB
Offset 0.5 dB
D1 3.97 dBm
D2 -16.03 dBm
10.5
0
-10
-20
-30
-40
-50
-60
-70
-80
-89.5
F1
F2
Center 2.441 GHz
250 kHz/
Span 2.5 MHz

CH 78

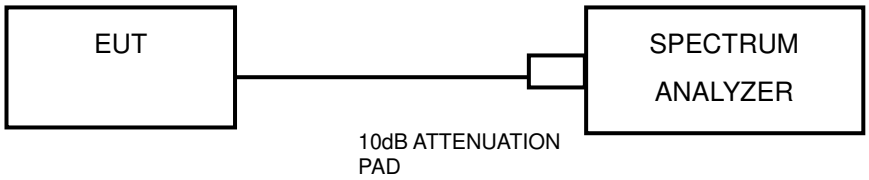

RBW 30 kHz
VBW 100 kHz
SWT 1.06 ms
[T1] MP VIEW
[T2] MP VIEW
Marker 1 [T1]
-15.82 dBm
2.47936 GHz
Delta 2 [T1]
0.00 dB
1.25 MHz
Ref 10.5 dBm
Att 20 dB
Offset 0.5 dB
D1 4.18 dBm
D2 -15.82 dBm
10.5
0
-10
-20
-30
-40
-50
-60
-70
-80
-89.5
F1
F2
Center 2.48 GHz
250 kHz/
Span 2.5 MHz

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.

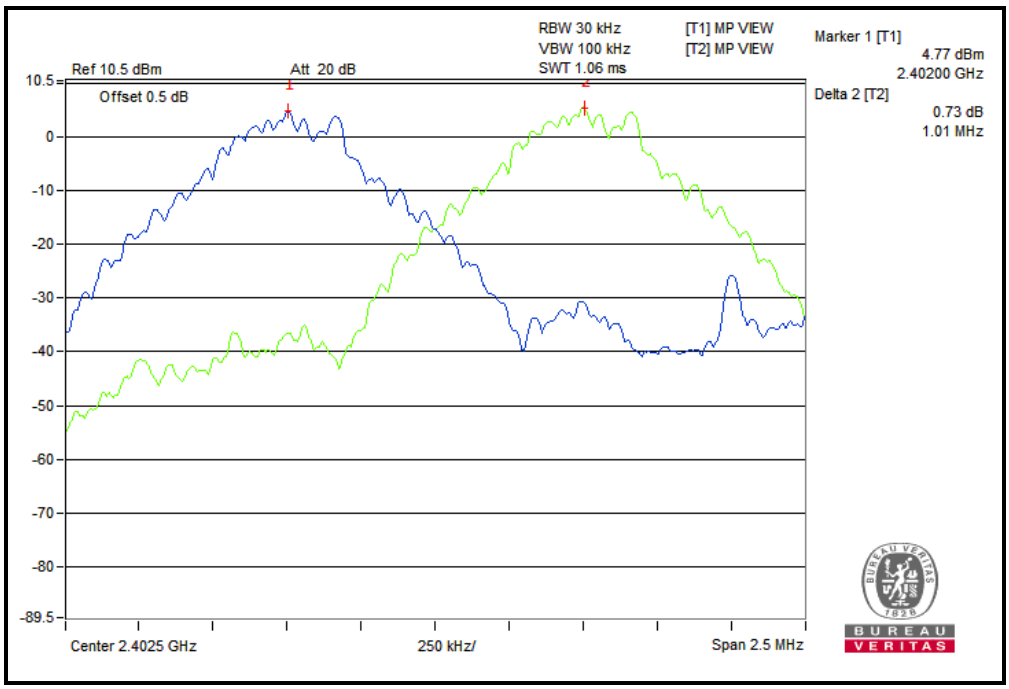
4.6.6 TEST RESULTS

GFSK

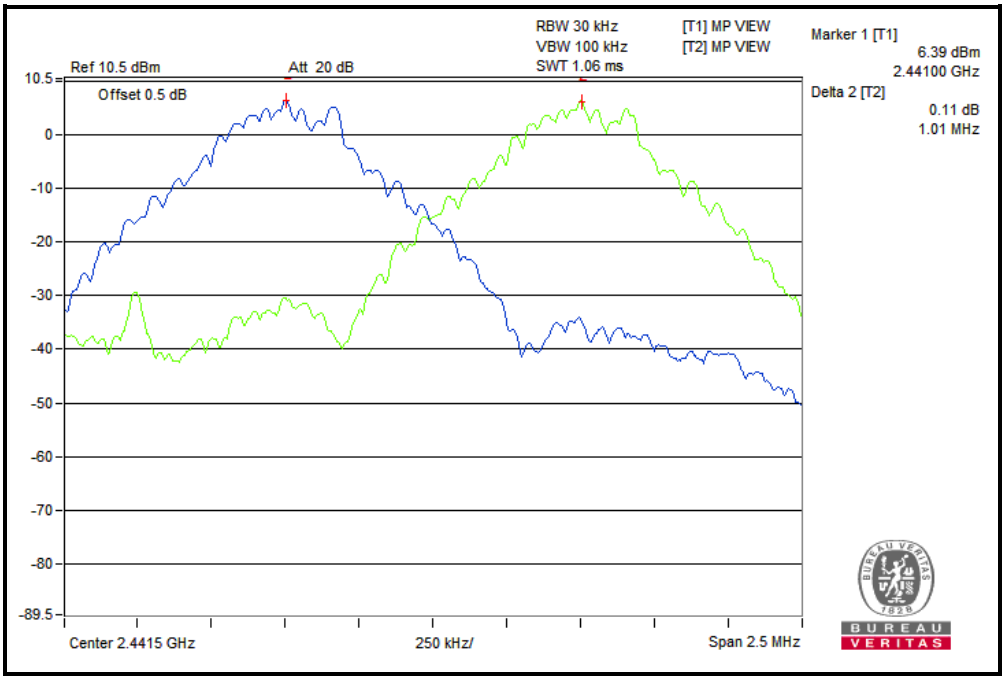
CHANNEL	FREQUENCY (MHz)	ADJACENT CHANNEL SEPARATION (MHz)	20dB BANDWIDTH (MHz)	MINIMUM LIMIT (MHz)	PASS / FAIL
0	2402	1.01	0.945	0.63	PASS
39	2441	1.01	0.943	0.63	PASS
78	2480	1.01	0.945	0.63	PASS

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

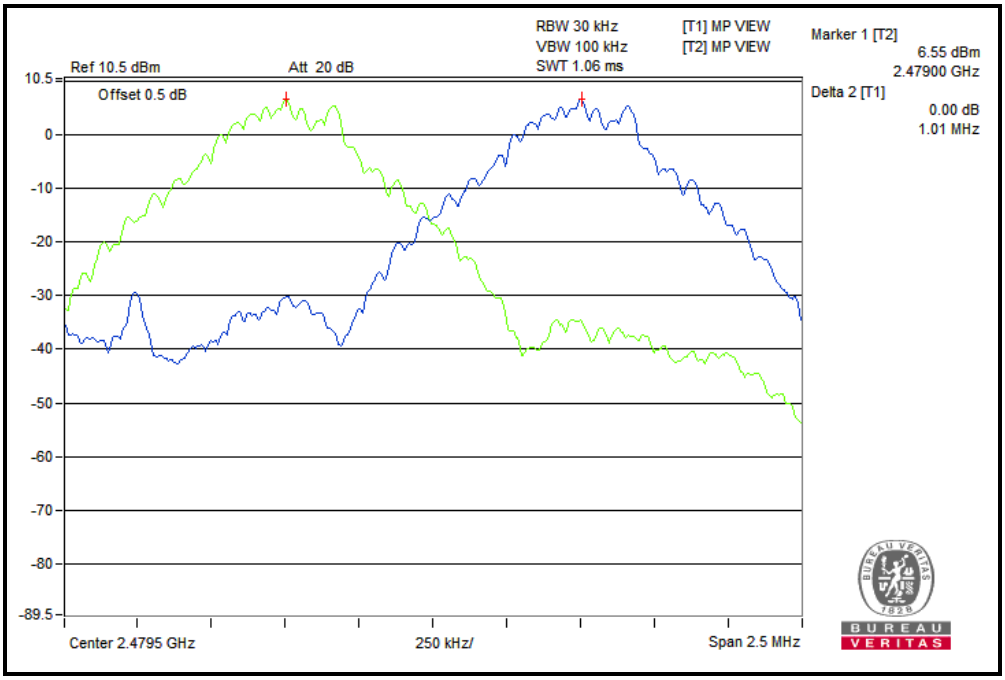
CH 0



CH 39


RBW 30 kHz
VBW 100 kHz
SWT 1.06 ms
[T1] MP VIEW
[T2] MP VIEW
Marker 1 [T1]
6.39 dBm
2.44100 GHz
Delta 2 [T2]
0.11 dB
1.01 MHz
Ref 10.5 dBm
Att 20 dB
Offset 0.5 dB
10.5
0
-10
-20
-30
-40
-50
-60
-70
-80
-89.5
Center 2.4415 GHz
250 kHz/
Span 2.5 MHz

CH 78

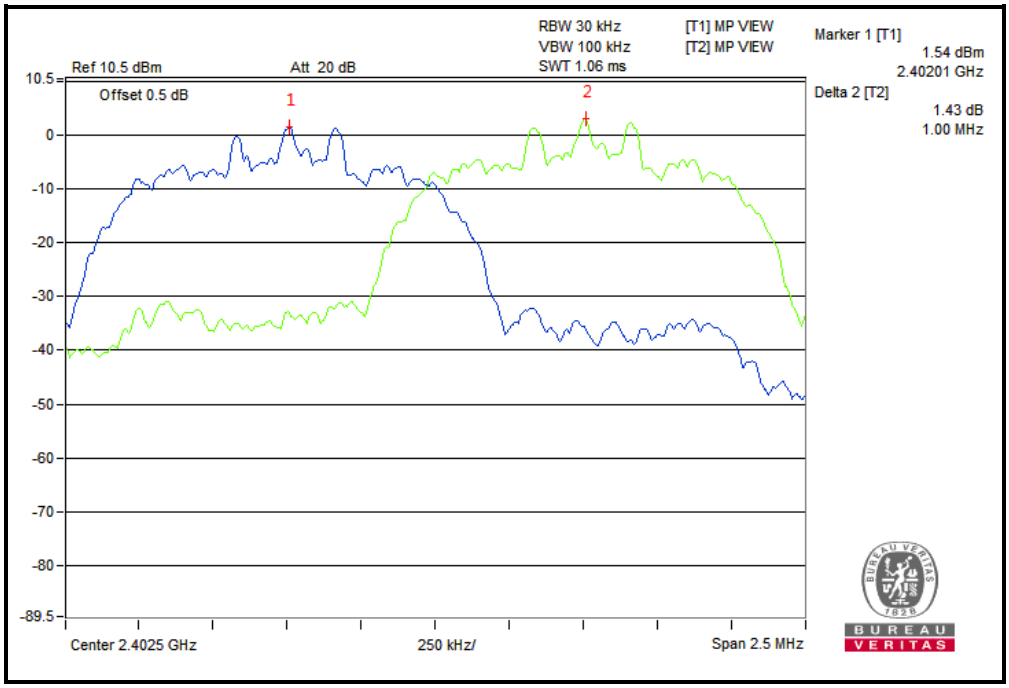

RBW 30 kHz
VBW 100 kHz
SWT 1.06 ms
[T1] MP VIEW
[T2] MP VIEW
Marker 1 [T2]
6.55 dBm
2.47900 GHz
Delta 2 [T1]
0.00 dB
1.01 MHz
Ref 10.5 dBm
Att 20 dB
Offset 0.5 dB
10.5
0
-10
-20
-30
-40
-50
-60
-70
-80
-89.5
Center 2.4795 GHz
250 kHz/
Span 2.5 MHz

8DPSK

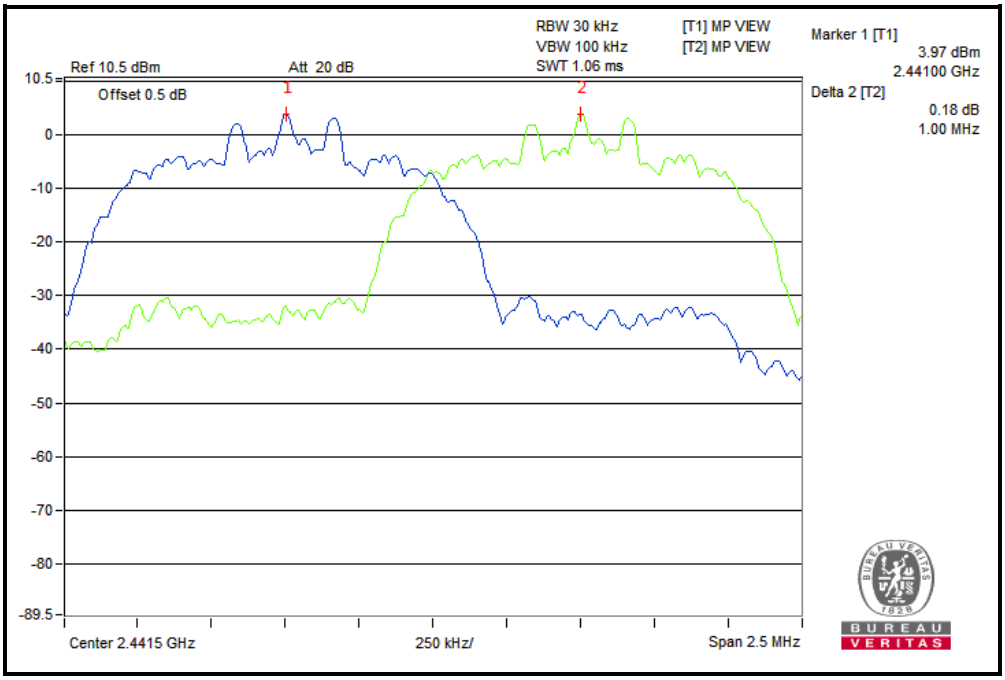
CHANNEL	FREQUENCY (MHz)	ADJACENT CHANNEL SEPARATION (MHz)	20dB BANDWIDTH (MHz)	MINIMUM LIMIT (MHz)	PASS / FAIL
0	2402	1.00	1.25	0.83	PASS
39	2441	1.00	1.25	0.83	PASS
78	2480	1.01	1.25	0.83	PASS

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

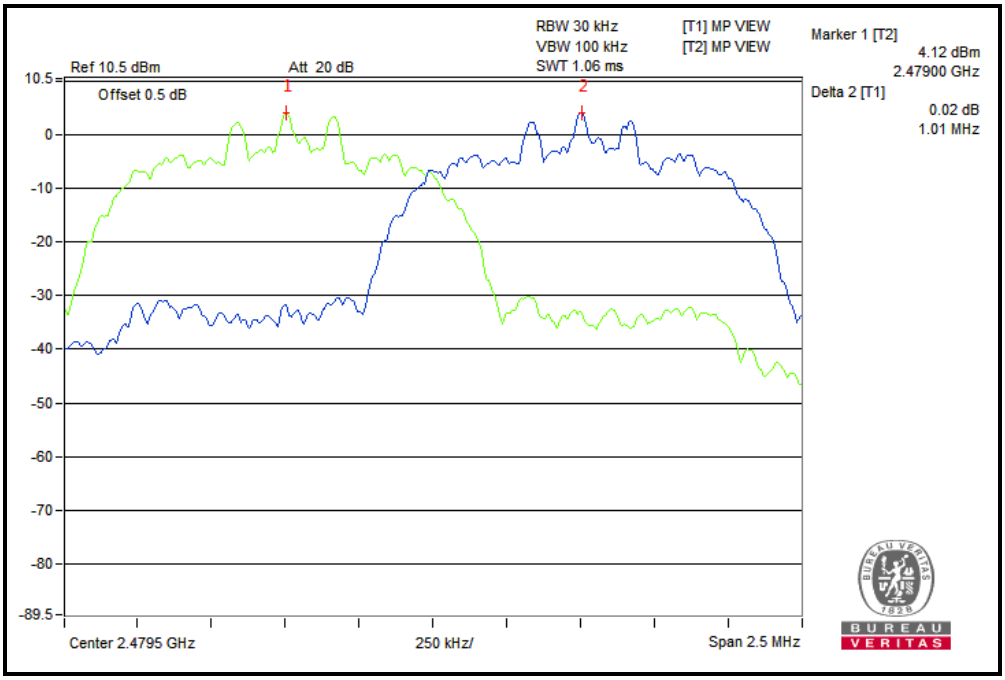
CH 0



CH 39


RBW 30 kHz
VBW 100 kHz
SWT 1.06 ms
[T1] MP VIEW
[T2] MP VIEW
Marker 1 [T1]
3.97 dBm
2.44100 GHz
Delta 2 [T2]
0.18 dB
1.00 MHz
Ref 10.5 dBm
Att 20 dB
Offset 0.5 dB
10.5
0
-10
-20
-30
-40
-50
-60
-70
-80
-89.5
Center 2.4415 GHz
250 kHz/
Span 2.5 MHz

CH 78

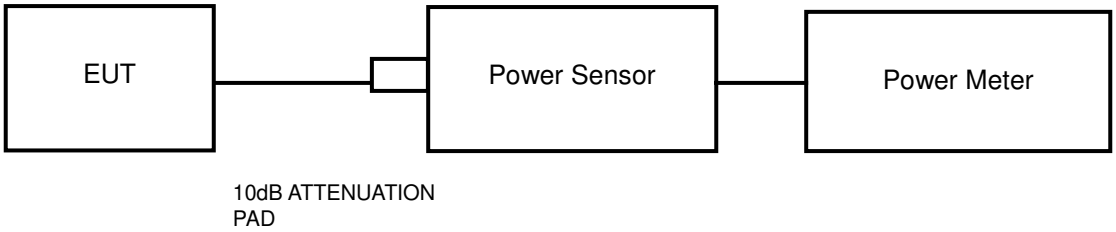

RBW 30 kHz
VBW 100 kHz
SWT 1.06 ms
[T1] MP VIEW
[T2] MP VIEW
Marker 1 [T2]
4.12 dBm
2.47900 GHz
Delta 2 [T1]
0.02 dB
1.01 MHz
Ref 10.5 dBm
Att 20 dB
Offset 0.5 dB
10.5
0
-10
-20
-30
-40
-50
-60
-70
-80
-89.5
Center 2.4795 GHz
250 kHz/
Span 2.5 MHz

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



4.7.3 TEST INSTRUMENTS

Refer to section 4.3.3 to get information of above instrument.

4.7.4 TEST PROCEDURES

A peak power sensor was used on the output port of the EUT. A peak power meter was used to read the response of the peak power sensor. Record the peak 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)	PEAK POWER LIMIT (mW)	PASS/FAIL
0	2402	8.04	6.368	125	PASS
39	2441	8.82	7.621	125	PASS
78	2480	**8.87**	**7.709**	125	PASS

8DPSK

CHANNEL	CHANNEL FREQUENCY (MHz)	PEAK POWER (dBm)	PEAK POWER (mW)	PEAK POWER LIMIT (mW)	PASS/FAIL
0	2402	6.47	4.436	125	PASS
39	2441	7.23	5.284	125	PASS
78	2480	7.20	5.248	125	PASS

AVERAGE OUTPUT POWER(FOR REFERENCE)

GFSK

CHANNEL	CHANNEL FREQUENCY (MHz)	AVERAGE POWER (dBm)	AVERAGE POWER (mW)
0	2402	6.73	4.710
39	2441	7.55	5.689
78	2480	**7.64**	**5.808**

8DPSK

CHANNEL	CHANNEL FREQUENCY (MHz)	AVERAGE POWER (dBm)	AVERAGE POWER (mW)
0	2402	3.48	2.228
39	2441	**4.39**	**2.748**
78	2480	4.25	2.661

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 was measured and recorded.

4.8.4 DEVIATION FROM TEST STANDARD

No deviation.

4.8.5 EUT OPERATING CONDITION

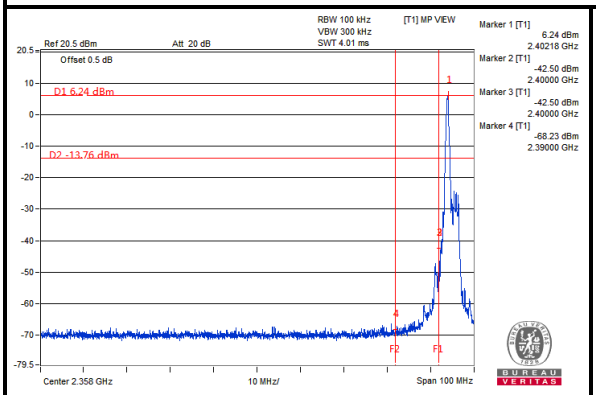
The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.

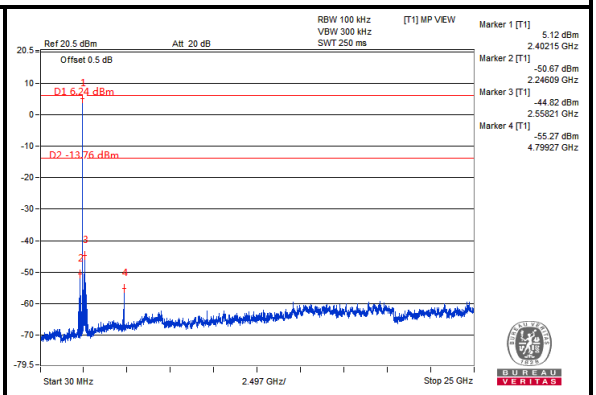
4.8.6 TEST RESULTS

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.

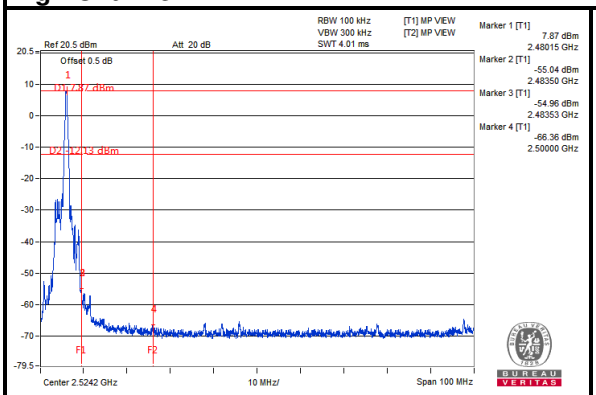
GFSK

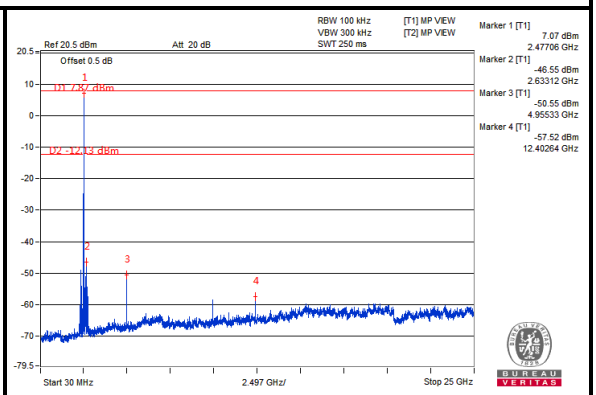
Low Channel





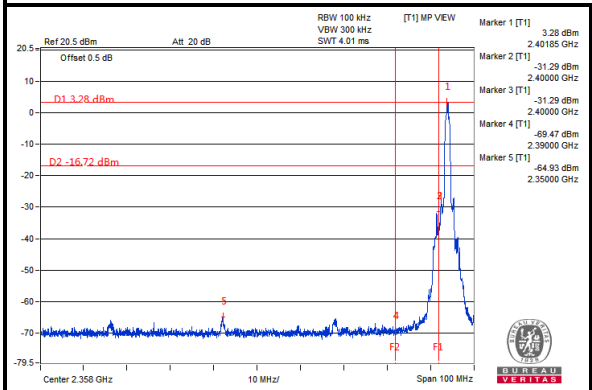
High Channel

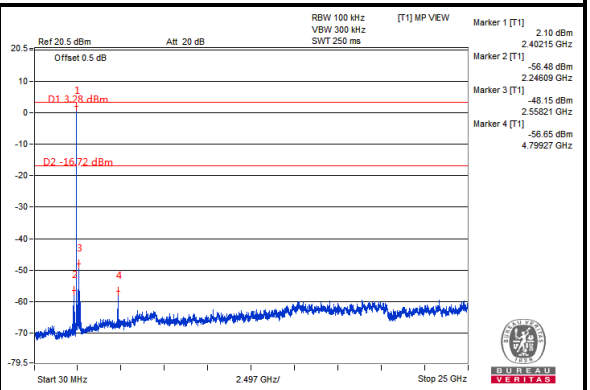




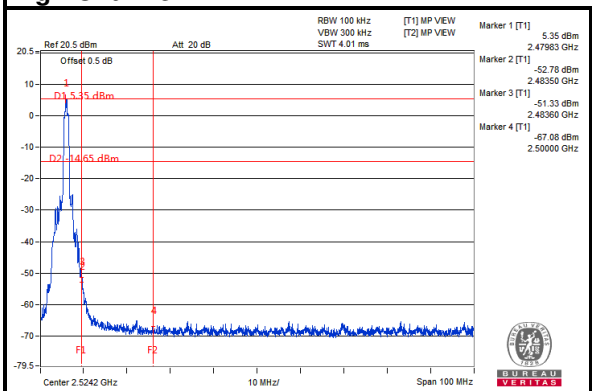
8DPSK

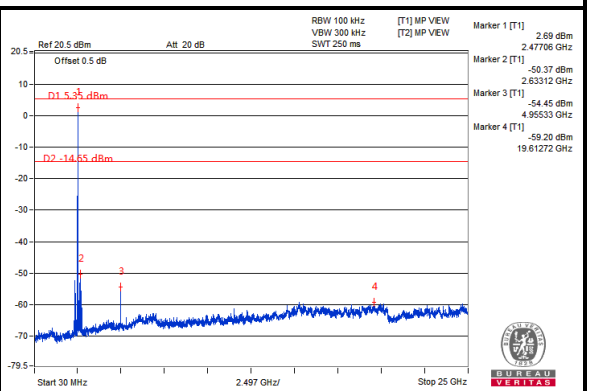
Low Channel





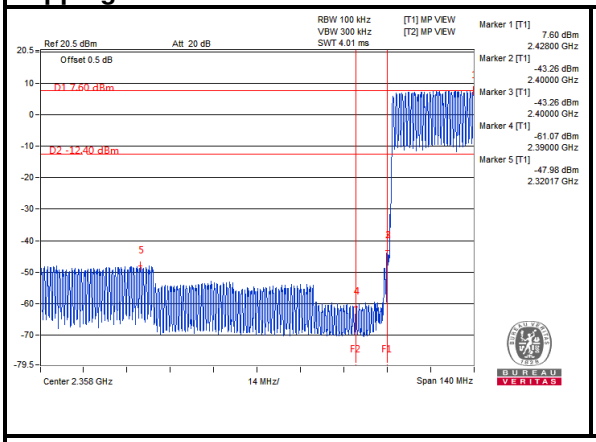
High Channel

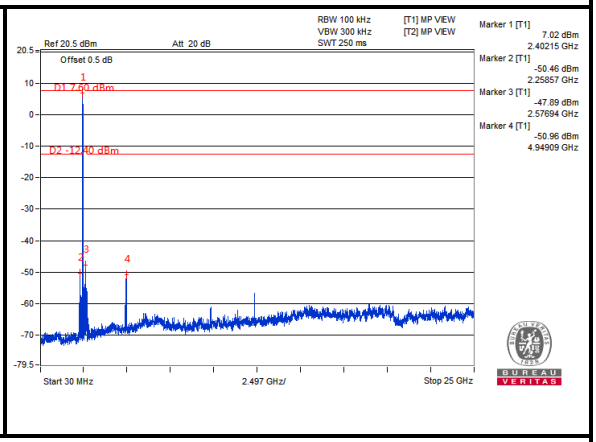




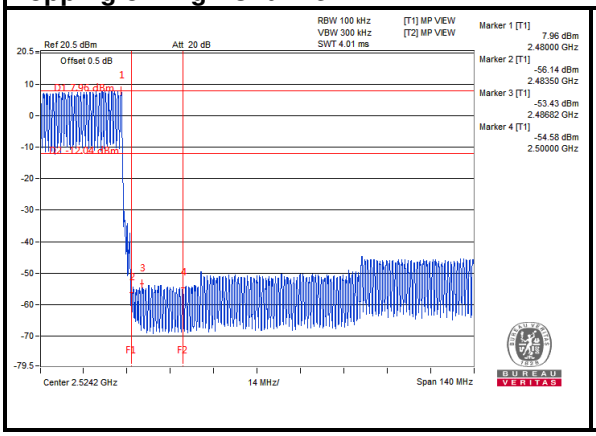
GFSK

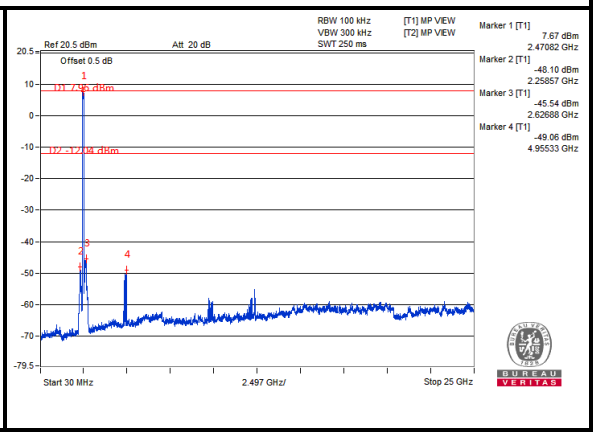
Hopping on Low Channel





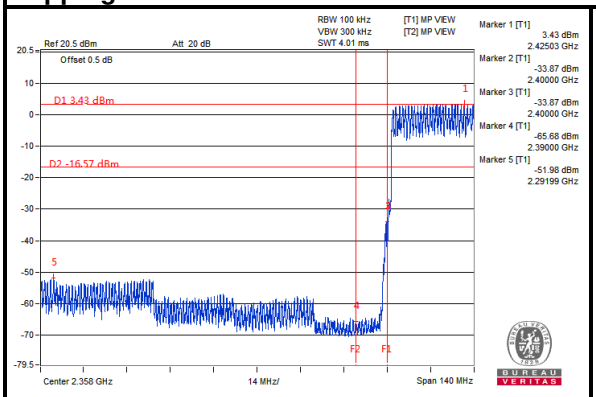
Hopping on High Channel

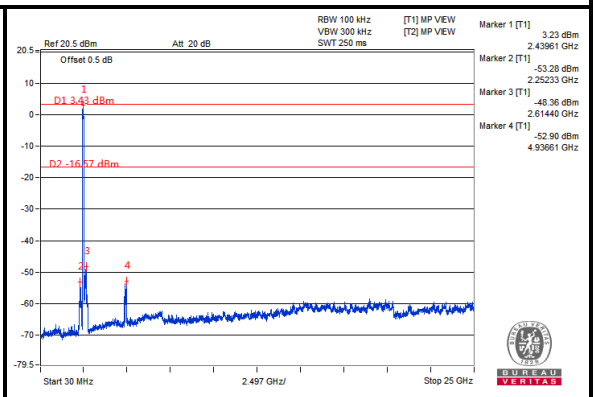




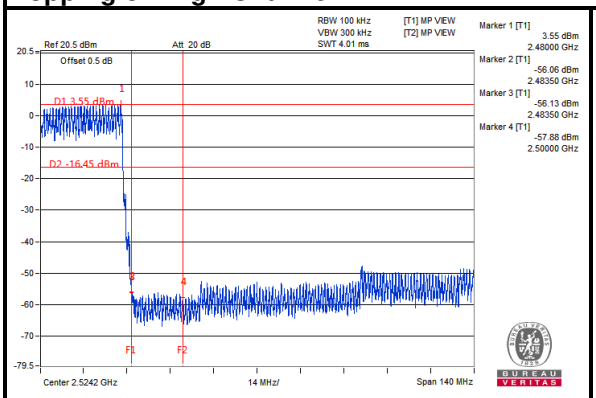
8DPSK

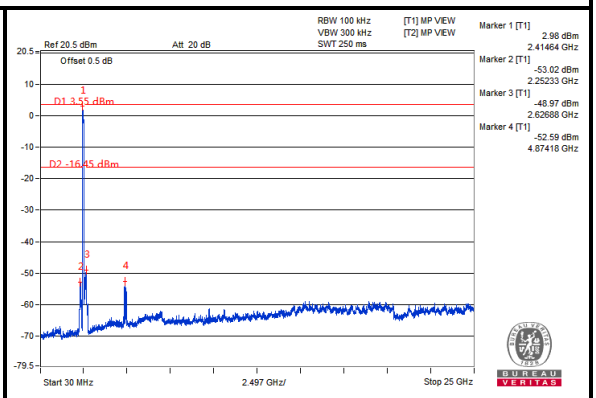
Hopping on Low Channel





Hopping on High Channel





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 any modifications are made to the EUT by the lab during the test.

---END---