Test Lab
Cert 2951.01

FCC TEST REPORT

(Part 15, Subpart C)

Product: Portable Tablet Computer

Model Name: TB-8704V

FCC ID: O57TB8704V

Applicant: Lenovo(Shanghai) Electronics Technology Co., Ltd.

Address: NO.68 BUILDING, 199 FENJU RD, China (Shanghai) Pilot Free Trade Zone, 200131, CHINA

Manufacturer: Lenovo PC HK Limited

Address: 23/F, Lincoln House, Taikoo Place 979 King's Road, Quarry Bay, Hong Kong

Prepared by: Bureau Veritas Shenzhen Co., Ltd. Dongguan Branch

Lab Location: No. 34, Chenwulu Section, Guantai Rd., Houjie Town, Dongguan City, Guangdong 523942, China

TEL: +86 769 8593 5656

FAX: +86 769 8593 1080

E-MAIL: customerservice.dg@cn.bureauveritas.com

Report No.: RF170330W002-1

Received Date: Mar. 30, 2017

Test Date: Apr. 11, 2017 ~ May 10, 2017

Issued Date: May 11, 2017

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RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
RF170330W002-1	Original release	May 11, 2017

1 CERTIFICATION

PRODUCT: Portable Tablet Computer

BRAND NAME: Lenovo

MODEL NAME: TB-8704V

APPLICANT: Lenovo(Shanghai) Electronics Technology Co., Ltd.

TESTED: Apr. 11, 2017 ~ May 10, 2017

TEST SAMPLE: Production Unit

STANDARDS: **FCC Part 15, Subpart C. Section 15.247**
ANSI C63.10-2013

The above equipment has been tested by **Bureau Veritas Shenzhen Co., Ltd. Dongguan Branch** and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions specified in this report.

PREPARED BY : _____ , **DATE:** May 11, 2017
(Harry Li/ Engineer)

APPROVED BY : _____ , **DATE:** May 11, 2017
(Sam Tung / Manager)

2 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. Minimum passing margin is -15.32dB at 0.154000MHz.
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 Emissions	PASS	Meet the requirement of limit. Minimum passing margin is -6.43dB at 42.61MHz.
15.247(d)	Out of band Measurement	PASS	Meet the requirement of limit.
15.203	Antenna Requirement	PASS	No antenna connector is used.

NOTE: If The Frequency Hopping System operating in 2400-2483.5MHz band and the output power less than 125mW. The hopping channel carrier frequencies separated by a minimum of 25kHz or two-thirds of the 20dB bandwidth of hopping channel whichever is greater.

2.1 MEASUREMENT UNCERTAINTY

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

MEASUREMENT	FREQUENCY	UNCERTAINTY
Conducted emissions	9kHz~30MHz	2.70dB
Radiated emissions	9KHz ~ 30MHz	2.90dB
	30MHz ~ 1GMHz	4.06dB
	1GHz ~ 18GHz	4.58dB
	18GHz ~ 40GHz	1.94dB

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	Portable Tablet Computer
MODEL NAME	TB-8704V
POWER SUPPLY	5.2Vdc (adapter or host equipment) 3.85Vdc (Li-Polymer, battery)
MODULATION TECHNOLOGY	FHSS
MODULATION TYPE	GFSK, 8DPSK, π/4 DQPSK
OPERATING FREQUENCY	2402MHz~2480MHz
NUMBER OF CHANNEL	79
MAX. OUTPUT POWER	6.855mW (Max. Measured)
ANTENNA TYPE	PIFA Antenna with -4dBi gain
HW VERSION	Lenovo Tablet TB-8704V
SW VERSION	TB-8704V_RF01_170504
I/O PORTS	Refer to user's manual
CABLE SUPPLIED	USB cable: non-shielded, detachable, 1.0m

NOTE:

1. For a more detailed features description, please refer to the manufacturer's specifications or the user's manual.
2. There were Sample A and B for this project, the difference is as below:

SAMPLE	EUT CONFIGURATION INFORMATION
A	(LCD+TP)1+ Battery1 + eMMC 1(16G+2G)+Front Camera1+Back Camera1+ USB Cable1 + Adapter 1
B	(LCD+TP)2+ Battery2 + eMMC 1 (16G+2G)+Front Camera2+Back Camera2 + USB Cable2+ Adapter 2

3. For the test results, the EUT had been tested with all conditions. But only the worst case was shown in test report.

List of Accessories:

Accessories	Brand	Model	Manufacturer	Specification
AC Adapter 1	Acbel	C-P35	AcBel	I/P:100-240Vac, 300mA O/P: 5.2Vdc, 2000mA
AC Adapter 2	Huntkey	C-P35	Huntkey	I/P:100-240Vac, 500mA O/P: 5.2Vdc, 2000mA
Battery 1	Sunwoda	L16D1P34	Sunwoda	Rating: 3.85Vdc, 4850mAh
Battery 2	SCUD	L16D1P34	SCUD	Rating: 3.85Vdc, 4850mAh
USB Cable 1	Deren	-	Deren	1.0m non-shielded cable w/o core
USB Cable 2	Saibao	-	Saibao	1.0m non-shielded cable w/o core
LCD+TP Panel 1	o-FILM&INX	MTF-080-2711-04IKA	o-FILM&INX	8"
LCD+TP Panel 2	GIS&BOE	TC080GFL06V.C	GIS&BOE	8"
eMMC 1	Samsung	KMQE10013M-B318	Samsung	16G+2G
eMMC 2	Hynix	H9TQ17ABJTBCUR-KUM	Hynix	16G+2G
Front Camera1	Qtech	F5695AK	Qtech	5M
Front Camera2	AVC	CCBFL05006	AVC	5M
Back Camera1	Qtech	FX219BH	Qtech	8M
Back Camera2	o-FILM	OV8856	o-FILM	8M

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 ONFIGURATION 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	
-	√	√	√	√	-

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
-	0 to 78	78	FHSS	GFSK	DH5

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
-	0 to 78	0, 39, 78	FHSS	GFSK	DH5
-	0 to 78	0, 39, 78	FHSS	8DPSK	DH5

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 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
-	0 to 78	78	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.

AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	PACKET TYPE
0 to 78	0, 39, 78	FHSS	GFSK	DH5
0 to 78	0, 39, 78	FHSS	π/4 DQPSK	DH5
0 to 78	0, 39, 78	FHSS	8DPSK	DH5

TEST CONDITION:

APPLICABLE TO	ENVIRONMENTAL CONDITIONS	TEST VOLTAGE (SYSTEM)	TESTED BY
RE<1G	23deg. C, 66%RH	DC 5.2V from adaptor	Tony Zou
RE≥1G	23deg. C, 66%RH	DC 5.2V from adaptor	Tony Zou
PLC	24deg. C, 55%RH	DC 5.2V from adaptor	Simon Yang
APCM	25deg. C, 60%RH	DC 3.85V from battery	Moon Xiong

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

FCC Public Notice DA 00-705

NOTE: 1. All test items have been performed and recorded as per the above standards.

2. The EUT is also considered as a kind of computer peripheral, because the connection to computer is necessary for typical use. It has been verified to comply with the requirements of FCC Part 15, Subpart B, Class B (DOC). The test report has been issued separately.

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	DC source	LONG WEI	PS-6403D	010934269	N/A
2	PC	HP	A6608CN	3CR83825X3	N/A

NO.	SIGNAL CABLE DESCRIPTION OF THE ABOVE SUPPORT UNITS
1	DC Line: Unshielded, Detachable 1.0m
2	AC Line: Unshielded, Detachable 1.5m

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	Apr. 01,17	Mar. 31,18
Artificial Mains Network	Rohde&Schwarz	ENV216	101173	Feb. 18,17	Feb. 17,18
Artificial Mains Network	Rohde&Schwarz	ESH3-Z5	100317	Apr. 01,17	Mar. 31,18
Voltage probe	SCHWARZBECK	TK 9421	TK 9421-176	Jan. 04,17	Jan. 03,18
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.

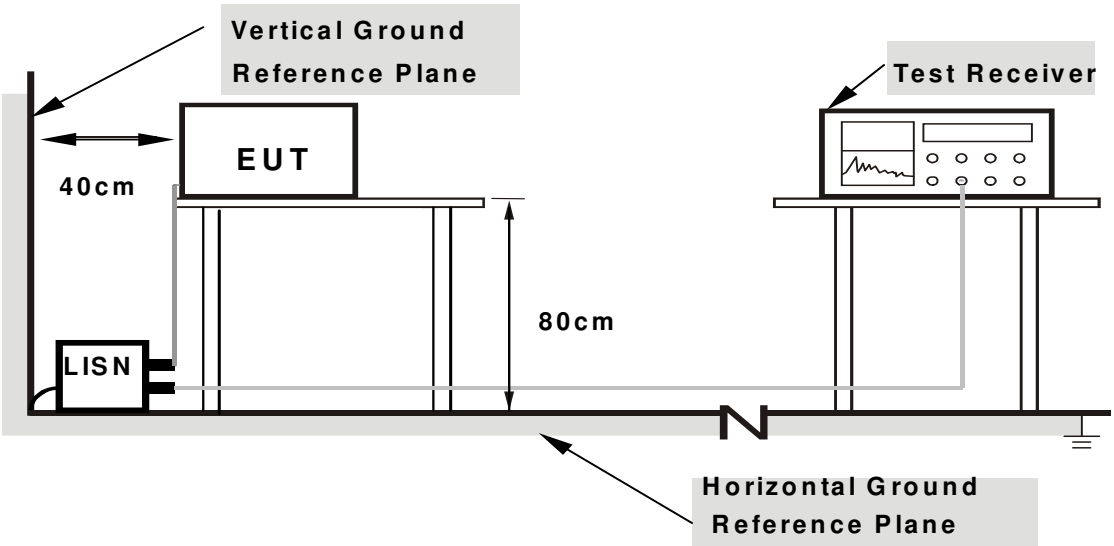
c. The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) was not recorded.

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

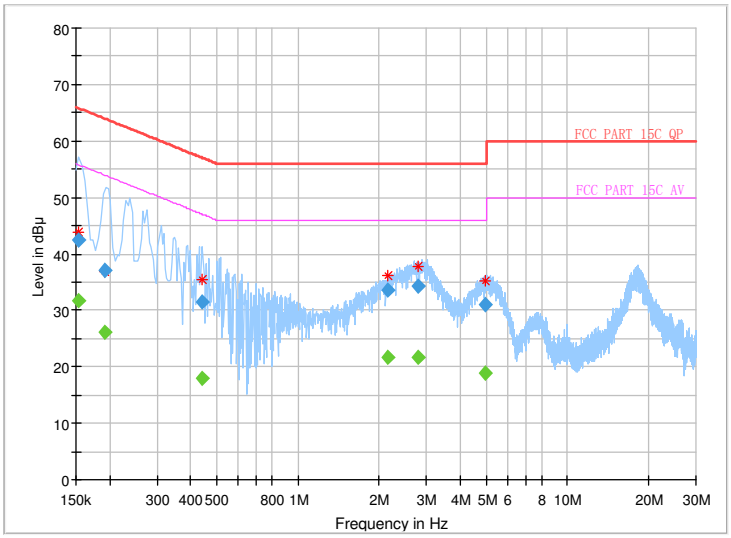
CONDUCTED WORST-CASE DATA:

Frequency Range	150KHz ~ 30MHz	**Detector Function & Resolution Bandwidth**	Quasi-Peak (QP) / Average (AV), 9 kHz
Input Power	120Vac, 60Hz	**Environmental Conditions**	24deg. C, 55RH
Tested By	Simon Yang	**TEST DATE**	2017/05/02

Frequency (MHz)	QuasiPeak (dB¦ÌV)	CAverage (dB¦ÌV)	Limit (dB¦ÌV)	Margin (dB)	Line	Filter	Corr. (dB)
0.154000	---	31.67	55.78	-24.11	L	ON	9.6
0.154000	42.46	---	65.78	-23.32	L	ON	9.6
0.192000	---	26.15	53.95	-27.80	L	ON	9.7
0.192000	37.18	---	63.95	-26.77	L	ON	9.7
0.440000	---	17.88	47.06	-29.18	L	ON	9.7
0.440000	31.39	---	57.06	-25.67	L	ON	9.7
2.156000	---	21.68	46.00	-24.32	L	ON	9.7
2.156000	33.70	---	56.00	-22.30	L	ON	9.7
2.808000	---	21.67	46.00	-24.33	L	ON	9.7
2.808000	34.38	---	56.00	-21.62	L	ON	9.7
4.940000	---	18.83	46.00	-27.17	L	ON	9.7
4.940000	30.92	---	56.00	-25.08	L	ON	9.7

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.

Full Spectrum

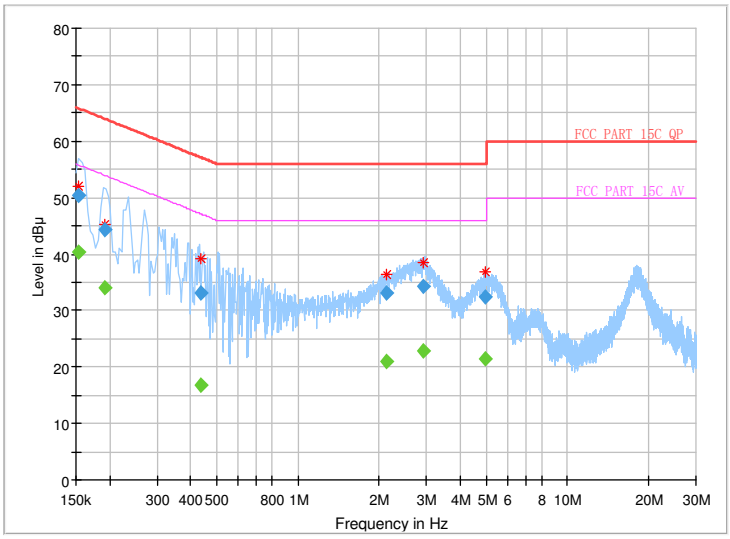


Frequency Range	150KHz ~ 30MHz	**Detector Function & Resolution Bandwidth**	Quasi-Peak (QP) / Average (AV), 9 kHz
Input Power	120Vac, 60Hz	**Environmental Conditions**	24deg. C, 55RH
Tested By	Simon Yang	**TEST DATE**	2017/05/02

Frequency (MHz)	QuasiPeak (dB¦ÌV)	CAverage (dB¦ÌV)	Limit (dB¦ÌV)	Margin (dB)	Line	Filter	Corr. (dB)
0.154000	---	40.31	55.78	-15.47	N	ON	9.9
0.154000	**50.46**	**---**	**65.78**	**-15.32**	**N**	**ON**	**9.9**
0.192000	---	34.03	53.95	-19.92	N	ON	10.0
0.192000	44.22	---	63.95	-19.73	N	ON	10.0
0.436000	---	16.72	47.14	-30.42	N	ON	10.1
0.436000	33.17	---	57.14	-23.97	N	ON	10.1
2.136000	---	21.01	46.00	-24.99	N	ON	9.8
2.136000	33.08	---	56.00	-22.92	N	ON	9.8
2.920000	---	22.89	46.00	-23.11	N	ON	9.8
2.920000	34.32	---	56.00	-21.68	N	ON	9.8
4.948000	---	21.56	46.00	-24.44	N	ON	9.8
4.948000	32.48	---	56.00	-23.52	N	ON	9.8

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.

Full Spectrum



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	ESR7	101494	Apr. 01,17	Mar. 31,18
Signal and Spectrum Analyzer	Rohde&Schwarz	FSV7	102331	Nov. 04,16	Nov. 03,17
Bilog Antenna	Teseq	CBL 6111D	30643	Jul. 14, 16	Jul. 13, 17
Loop antenna	Daze	ZN30900A	0708	Nov. 28,16	Nov. 27,17
Horn Antenna (1GHz -18GHz)	ETS -Lindgren	3117	00062558	May 18,16	May 17,17
10m Semi-anechoic Chamber	CHANGLING	21.4m*12.1m*8.8m	NSEMC006	Mar. 12,16	Mar. 11,18
Test Software	E3	V 9.160323	N/A	N/A	N/A
Horn Antenna (15GHz-40GHz)	SCHWARZBECK	BBHA 9170	BBHA9170242	Mar. 02,17	Mar. 01,18
Amplifier (9kHz-1GHz)	SONOMA	310D	186955	Feb. 10,17	Feb. 09,18
Pre-Amplifier(1-18G)	HP	8449B	3008A00409	Apr. 16,17	Apr. 15,18
Pre-Amplifier (18GHz-40GHz)	EMCI	EMC 184045	980102	Nov. 04,16	Nov. 03,17
BLUETOOTH TESTER	Rohde&Schwarz	CBT32	100811	Aug. 08,16	Aug. 07,17

NOTE:

1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to CEPREI/CHINA, GRGT/CHINA and NIM/CHINA.
2. The test was performed in 10m Chamber.
3. The FCC Site Registration No. is 502831.

4.2.3 TEST PROCEDURES

a. The EUT was placed on the top of a rotating table 0.8 meters (for below 1GHz) / 1.5 meters (for above 1GHz) above the ground at 10 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.

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

c. The antenna is a broadband 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. 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:

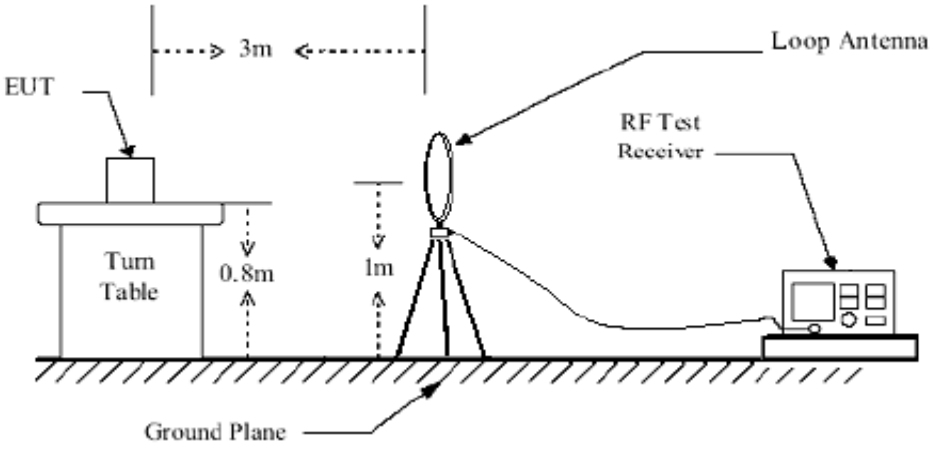
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and video bandwidth is 3MHz for Peak detection at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 10Hz for Average detection (AV) at frequency above 1GHz.
4. If the dwell time per channel of the hopping signal is less than 100 ms, then the reading obtained with the 10 Hz VBW may be further adjusted by a “duty cycle correction factor”, derived from 20log(dwell time/100 ms), in an effort to demonstrate compliance with the 15.209 limit.
5. All modes of operation were investigated and the worst-case emissions are reported.

4.2.4 DEVIATION FROM TEST STANDARD

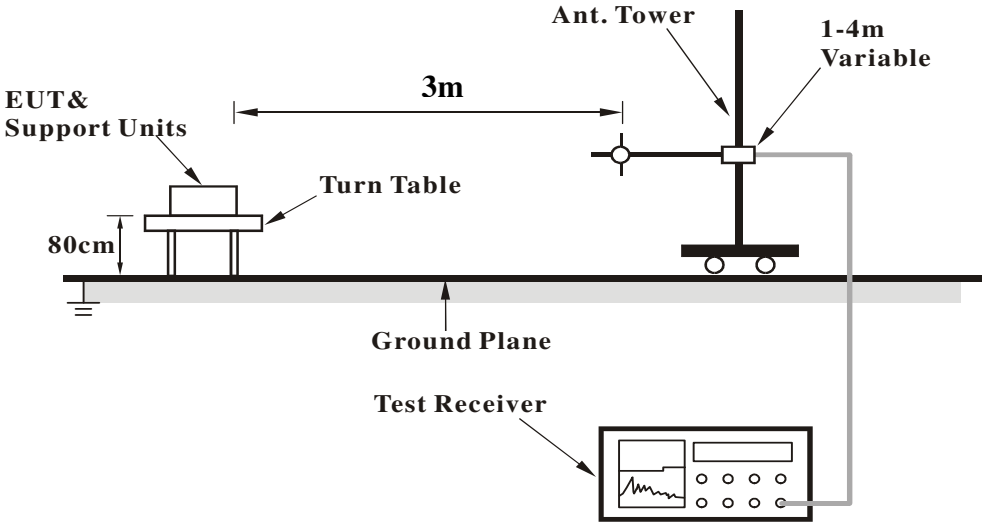
No deviation.

4.2.5 TEST SETUP

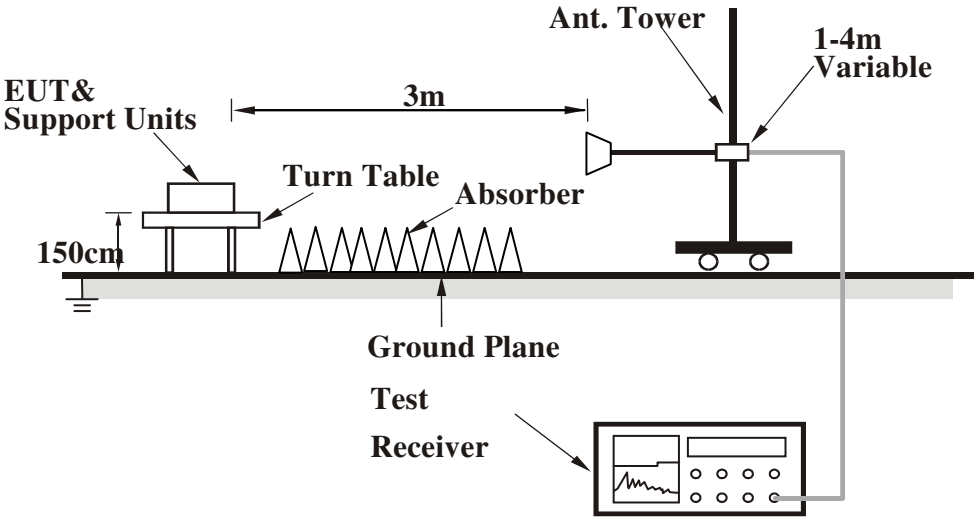
< Frequency Range below 30MHz >



< Frequency Range 30MHz~1GHz >



<Frequency Range above 1GHz>



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:

9 KHz – 30 KHz data: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value is not required in the report.

30 MHz – 1GHz data:

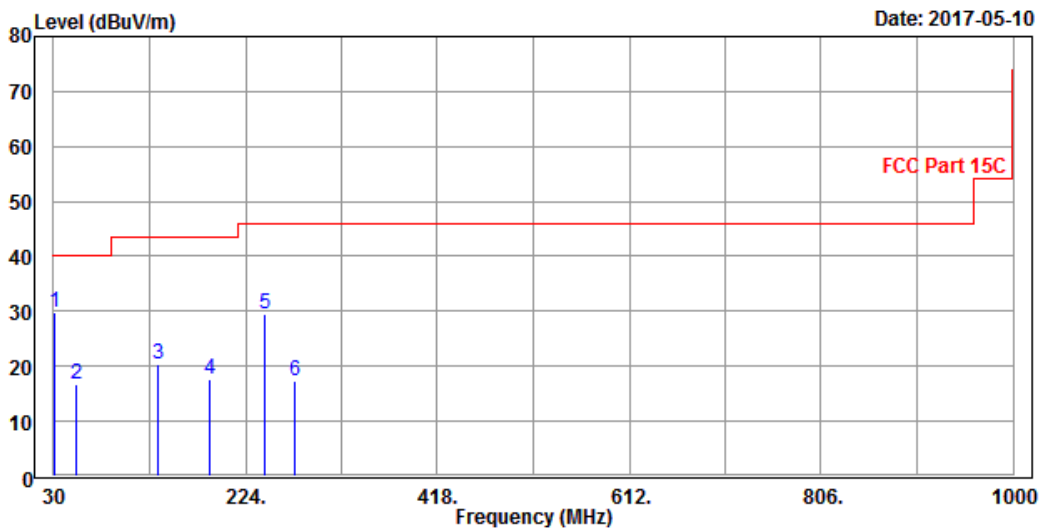
GFSK DH5

CHANNEL	Channel 78	**DETECTOR FUNCTION**	Quasi-Peak (QP)
FREQUENCY RANGE	30MHz ~ 1GHz		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB /m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
30.97	29.76	50.08	40	-10.24	16.43	0.8	37.55	100	30	QP
53.28	16.77	46.55	40	-23.23	6.47	1.11	37.36	100	64	QP
134.76	20.49	47.79	43.5	-23.01	7.79	1.78	36.87	100	80	QP
188.11	17.65	42.2	43.5	-25.85	9.98	2.1	36.63	100	246	QP
243.4	29.59	51.6	46	-16.41	12.1	2.41	36.52	100	120	QP
274.44	17.45	38.69	46	-28.55	12.69	2.58	36.51	100	36	QP

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value

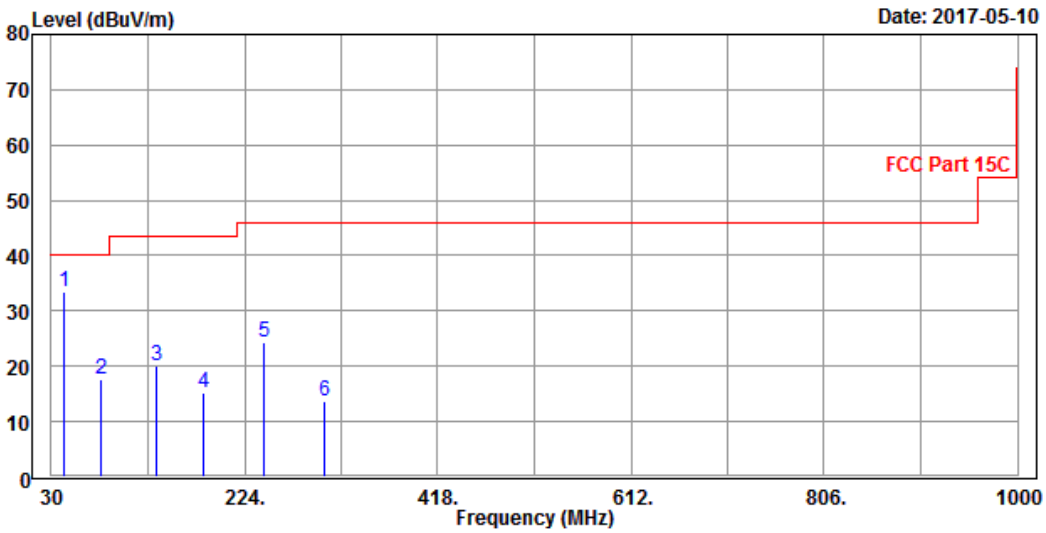


CHANNEL	Channel 78	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	30MHz ~ 1GHz		

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB /m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
42.61	**33.57**	**60.82**	**40**	**-6.43**	**9.23**	**0.98**	**37.46**	**100**	**28**	QP
80.44	17.75	46.91	40	-22.25	6.61	1.38	37.15	100	40	QP
135.73	20.06	47.3	43.5	-23.44	7.83	1.79	36.86	100	125	QP
183.26	15.32	39.98	43.5	-28.18	9.93	2.08	36.67	100	240	QP
243.4	24.23	46.24	46	-21.77	12.1	2.41	36.52	100	96	QP
303.54	13.57	34.19	46	-32.43	13.15	2.74	36.51	100	140	QP

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value



ABOVE 1GHz WORST-CASE DATA:

Note: For higher frequency, the emission is too low to be detected.

GFSK DH5

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M										
FREQ. (MHz)	**EMISSION LEVEL (dBuV/m)**	**READ LEVEL (dBuV)**	**LIMIT (dBuV/m)**	**MARGIN (dB)**	**ANTENNA FACTOR (dB /m)**	**CABLE LOSS (dB)**	**PREAMP FACTOR (dB)**	**ANTENNA HEIGHT (cm)**	**TABLE ANGLE (Degree)**	**REMARK**
2390	44.71	52.58	54	-9.29	32.29	8.15	48.31	245	320	Average
2390	56.88	64.75	74	-17.12	32.29	8.15	48.31	245	320	Peak
2402	103.54	111.38			32.3	8.17	48.31	245	320	Average
2402	109.97	117.81			32.3	8.17	48.31	245	320	Peak
2483.5	44.94	52.54	54	-9.06	32.38	8.32	48.3	245	320	Average
2483.5	57.29	64.89	74	-16.71	32.38	8.32	48.3	245	320	Peak
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M										
FREQ. (MHz)	**EMISSION LEVEL (dBuV/m)**	**READ LEVEL (dBuV)**	**LIMIT (dBuV/m)**	**MARGIN (dB)**	**ANTENNA FACTOR (dB /m)**	**CABLE LOSS (dB)**	**PREAMP FACTOR (dB)**	**ANTENNA HEIGHT (cm)**	**TABLE ANGLE (Degree)**	**REMARK**
2390	44.73	52.6	54	-9.27	32.29	8.15	48.31	102	310	Average
2390	58.2	66.07	74	-15.8	32.29	8.15	48.31	102	310	Peak
2402	101.58	109.42			32.3	8.17	48.31	102	310	Average
2402	107.8	115.64			32.3	8.17	48.31	102	310	Peak
2483.5	44.96	52.56	54	-9.04	32.38	8.32	48.3	102	310	Average
2483.5	56.7	64.3	74	-17.3	32.38	8.32	48.3	102	310	Peak

REMARKS:

1. Emission Level = Read Level+ Antenna Factor + Cable Loss- Preamp Factor
   Margin value = Emission level – Limit value.
2. 2402MHz: Fundamental frequency.

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB /m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
2390	44.68	52.55	54	-9.32	32.29	8.15	48.31	220	320	Average
2390	56.93	64.8	74	-17.07	32.29	8.15	48.31	220	320	Peak
2441	105.42	113.15			32.34	8.24	48.31	220	320	Average
2441	111.76	119.49			32.34	8.24	48.31	220	320	Peak
2483.5	44.88	52.48	54	-9.12	32.38	8.32	48.3	220	320	Average
2483.5	56.76	64.36	74	-17.24	32.38	8.32	48.3	220	320	Peak
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB /m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
2390	44.68	52.55	54	-9.32	32.29	8.15	48.31	135	292	Average
2390	56.22	64.09	74	-17.78	32.29	8.15	48.31	135	292	Peak
2441	104.57	112.3			32.34	8.24	48.31	135	292	Average
2441	110.81	118.54			32.34	8.24	48.31	135	292	Peak
2483.5	44.87	52.47	54	-9.13	32.38	8.32	48.3	135	292	Average
2483.5	57.55	65.15	74	-16.45	32.38	8.32	48.3	135	292	Peak

REMARKS:

1. Emission Level = Read Level+ Antenna Factor + Cable Loss- Preamp Factor
   Margin value = Emission level – Limit value.
2. 2441MHz: Fundamental frequency.

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M										
FREQ. (MHz)	**EMISSION LEVEL (dBuV/m)**	**READ LEVEL (dBuV)**	**LIMIT (dBuV/m)**	**MARGIN (dB)**	**ANTENNA FACTOR (dB /m)**	**CABLE LOSS (dB)**	**PREAMP FACTOR (dB)**	**ANTENNA HEIGHT (cm)**	**TABLE ANGLE (Degree)**	**REMARK**
2390	44.57	52.44	54	-9.43	32.29	8.15	48.31	240	315	Average
2390	57.5	65.37	74	-16.5	32.29	8.15	48.31	240	315	Peak
2480	104.17	111.78			32.38	8.31	48.3	240	315	Average
2480	110.85	118.46			32.38	8.31	48.3	240	315	Peak
2483.5	45.36	52.96	54	-8.64	32.38	8.32	48.3	240	315	Average
2483.5	57.11	64.71	74	-16.89	32.38	8.32	48.3	240	315	Peak
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M										
FREQ. (MHz)	**EMISSION LEVEL (dBuV/m)**	**READ LEVEL (dBuV)**	**LIMIT (dBuV/m)**	**MARGIN (dB)**	**ANTENNA FACTOR (dB /m)**	**CABLE LOSS (dB)**	**PREAMP FACTOR (dB)**	**ANTENNA HEIGHT (cm)**	**TABLE ANGLE (Degree)**	**REMARK**
2390	44.69	52.56	54	-9.31	32.29	8.15	48.31	100	295	Average
2390	56.5	64.37	74	-17.5	32.29	8.15	48.31	100	295	Peak
2480	101.83	109.44			32.38	8.31	48.3	100	295	Average
2480	108.31	115.92			32.38	8.31	48.3	100	295	Peak
2483.5	45.24	52.84	54	-8.76	32.38	8.32	48.3	100	295	Average
2483.5	58.07	65.67	74	-15.93	32.38	8.32	48.3	100	295	Peak

REMARKS:

1. Emission Level = Read Level+ Antenna Factor + Cable Loss- Preamp Factor
   Margin value = Emission level – Limit value.
2. 2480MHz: 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										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB /m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
2390	44.58	52.45	54	-9.42	32.29	8.15	48.31	245	315	Average
2390	56.45	64.32	74	-17.55	32.29	8.15	48.31	245	315	Peak
2402	101.14	108.98			32.3	8.17	48.31	245	315	Average
2402	110.08	117.92			32.3	8.17	48.31	245	315	Peak
2483.5	44.78	52.38	54	-9.22	32.38	8.32	48.3	245	315	Average
2483.5	56.93	64.53	74	-17.07	32.38	8.32	48.3	245	315	Peak
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB /m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
2390	44.58	52.45	54	-9.42	32.29	8.15	48.31	102	310	Average
2390	56.2	64.07	74	-17.8	32.29	8.15	48.31	102	310	Peak
2402	97.75	105.59			32.3	8.17	48.31	102	310	Average
2402	106.65	114.49			32.3	8.17	48.31	102	310	Peak
2483.5	44.77	52.37	54	-9.23	32.38	8.32	48.3	102	310	Average
2483.5	57.37	64.97	74	-16.63	32.38	8.32	48.3	102	310	Peak

REMARKS:

1. Emission Level = Read Level+ Antenna Factor + Cable Loss- Preamp Factor
   Margin value = Emission level – Limit value.
2. 2402MHz: Fundamental frequency.

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB /m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
2390	44.54	52.41	54	-9.46	32.29	8.15	48.31	240	315	Average
2390	57.18	65.05	74	-16.82	32.29	8.15	48.31	240	315	Peak
2441	103.47	111.2			32.34	8.24	48.31	240	315	Average
2441	112.31	120.04			32.34	8.24	48.31	240	315	Peak
2483.5	44.73	52.33	54	-9.27	32.38	8.32	48.3	240	315	Average
2483.5	57.38	64.98	74	-16.62	32.38	8.32	48.3	240	315	Peak
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB /m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
2390	44.53	52.4	54	-9.47	32.29	8.15	48.31	135	290	Average
2390	55.66	63.53	74	-18.34	32.29	8.15	48.31	135	290	Peak
2441	101.13	108.86			32.34	8.24	48.31	135	290	Average
2441	110.09	117.82			32.34	8.24	48.31	135	290	Peak
2483.5	44.72	52.32	54	-9.28	32.38	8.32	48.3	135	290	Average
2483.5	57.42	65.02	74	-16.58	32.38	8.32	48.3	135	290	Peak

REMARKS:

1. Emission Level = Read Level+ Antenna Factor + Cable Loss- Preamp Factor
   Margin value = Emission level – Limit value.
2. 2441MHz: Fundamental frequency.

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB /m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
2390	44.59	52.46	54	-9.41	32.29	8.15	48.31	240	315	Average
2390	56.54	64.41	74	-17.46	32.29	8.15	48.31	240	315	Peak
2480	100.53	108.14			32.38	8.31	48.3	240	315	Average
2480	109.78	117.39			32.38	8.31	48.3	240	315	Peak
2483.5	45.27	52.87	54	-8.73	32.38	8.32	48.3	240	315	Average
2483.5	58.32	65.92	74	-15.68	32.38	8.32	48.3	240	315	Peak
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB /m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
2390	44.58	52.45	54	-9.42	32.29	8.15	48.31	132	290	Average
2390	56.44	64.31	74	-17.56	32.29	8.15	48.31	132	290	Peak
2480	98.26	105.87			32.38	8.31	48.3	132	290	Average
2480	107.46	115.07			32.38	8.31	48.3	132	290	Peak
2483.5	45.11	52.71	54	-8.89	32.38	8.32	48.3	132	290	Average
2483.5	56.97	64.57	74	-17.03	32.38	8.32	48.3	132	290	Peak

REMARKS:

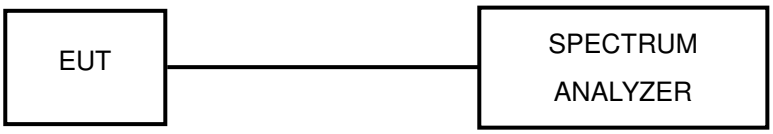
1. Emission Level = Read Level+ Antenna Factor + Cable Loss- Preamp Factor
   Margin value = Emission level – Limit value.
2. 2480MHz: Fundamental frequency.

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	Apr. 15, 17	Apr. 14, 18
Power Sensor	Keysight	U2021XA	MY55060018	Apr. 15, 17	Apr. 14, 18
10dB Attenuator	JFW/USA	50HF-010-SMA	1505	Jul. 27, 16	Jul. 26, 17
Digital Multimeter	FLUKE	15B	A1220010DG	Oct. 13, 16	Oct.12, 17
Humid & Temp Programmable Tester	Haida	HD-2257	110807201	Sep.05,16	Sep. 04,17
Oscilloscope	Agilent	DSO9254A	MY51260160	Nov. 04,16	Nov. 03,17
Signal Analyzer	Rohde & Schwarz	FSV7	102331	Nov. 04,16	Nov. 03,17
Signal Generator	Agilent	N5183A	MY50140980	Nov. 04,16	Nov. 03,17
Agile Signal Generator	Agilent	8645A	Agilent	Aug.08, 16	Aug.07, 17
ESG Vector Signal Generator	Agilent	E4438C	MY49072505	Apr. 15, 17	Apr. 14, 18
BLUETOOTH TESTER	Rohde&Schwarz	CBT32	100811	Aug.08, 16	Aug. 07, 17

NOTE:

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

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.

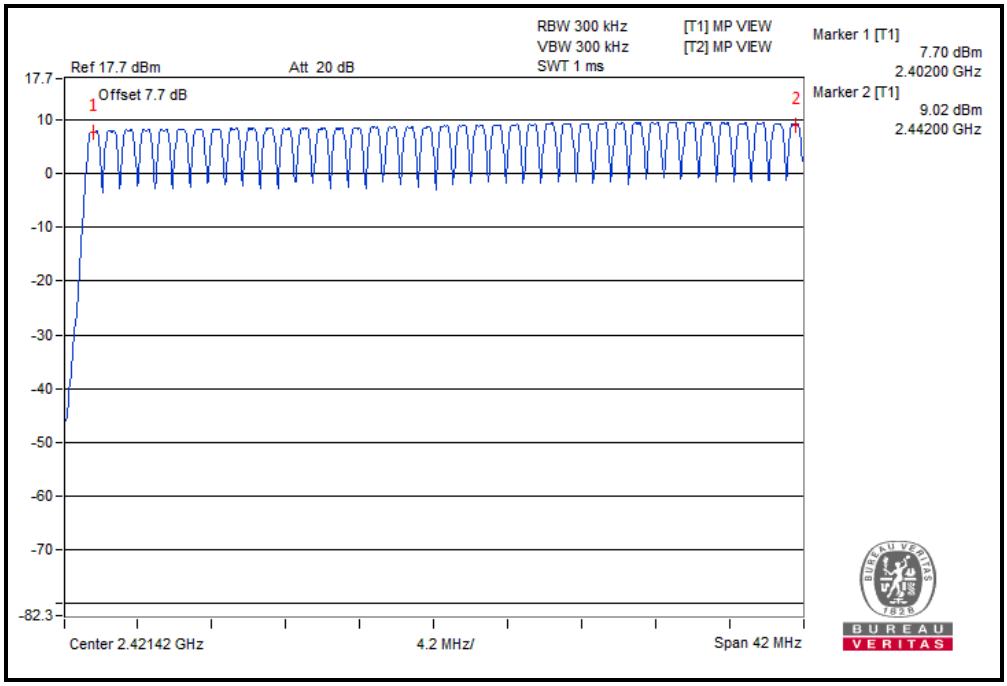
4.3.5 DEVIATION FROM TEST STANDARD

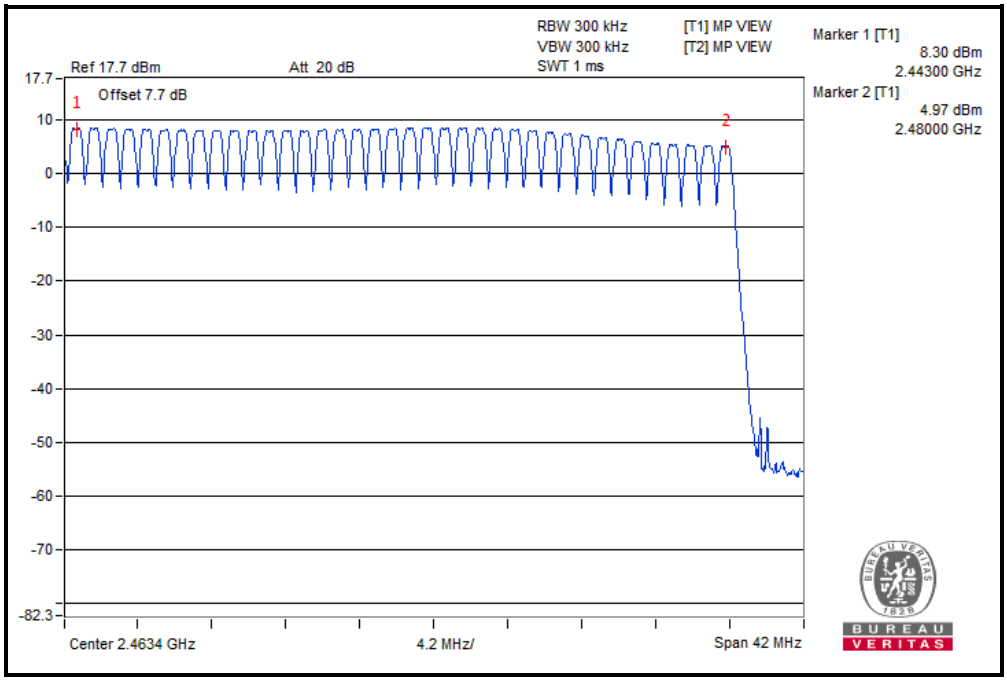
No deviation.

4.3.6 TEST RESULTS

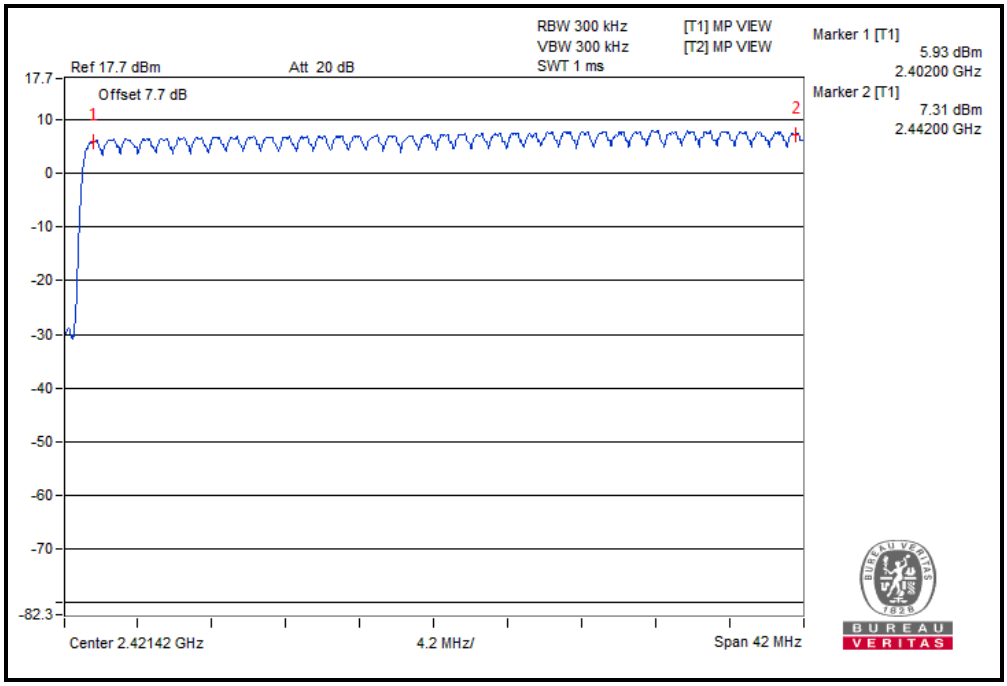
There are 79 hopping frequencies in the hopping mode. Please refer to next two pages for the test result. On the plots, it shows that the hopping frequencies are equally spaced.

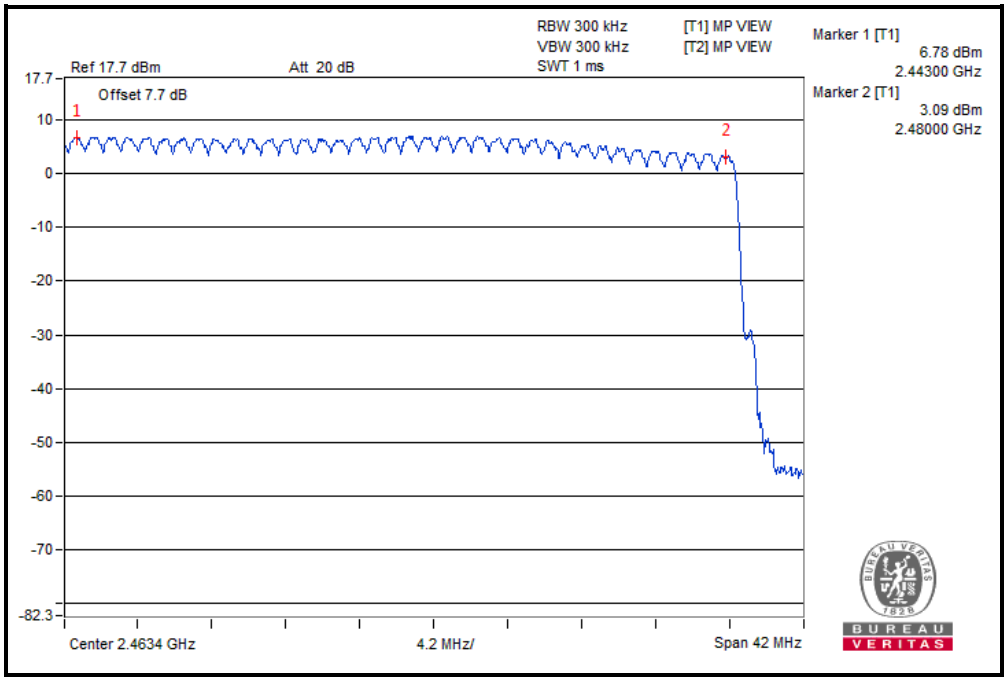
GFSK


RBW 300 kHz
VBW 300 kHz
SWT 1 ms
[T1] MP VIEW
[T2] MP VIEW
Marker 1 [T1]
7.70 dBm
2.40200 GHz
Marker 2 [T1]
9.02 dBm
2.44200 GHz
Ref 17.7 dBm
Att 20 dB
Offset 7.7 dB
17.7
10
0
-10
-20
-30
-40
-50
-60
-70
-82.3
Center 2.42142 GHz
4.2 MHz/
Span 42 MHz


RBW 300 kHz
VBW 300 kHz
SWT 1 ms
[T1] MP VIEW
[T2] MP VIEW
Marker 1 [T1]
8.30 dBm
2.44300 GHz
Marker 2 [T1]
4.97 dBm
2.48000 GHz
Ref 17.7 dBm
Att 20 dB
Offset 7.7 dB
17.7
10
0
-10
-20
-30
-40
-50
-60
-70
-82.3
Center 2.4634 GHz
4.2 MHz/
Span 42 MHz

8DPSK


RBW 300 kHz
VBW 300 kHz
SWT 1 ms
[T1] MP VIEW
[T2] MP VIEW
Marker 1 [T1]
5.93 dBm
2.40200 GHz
Marker 2 [T1]
7.31 dBm
2.44200 GHz
Ref 17.7 dBm
Att 20 dB
Offset 7.7 dB
17.7
10
0
-10
-20
-30
-40
-50
-60
-70
-82.3
Center 2.42142 GHz
4.2 MHz/
Span 42 MHz

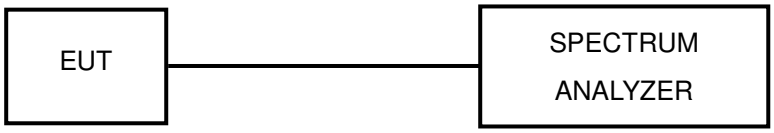

RBW 300 kHz
VBW 300 kHz
SWT 1 ms
[T1] MP VIEW
[T2] MP VIEW
Marker 1 [T1]
6.78 dBm
2.44300 GHz
Marker 2 [T1]
3.09 dBm
2.48000 GHz
Ref 17.7 dBm
Att 20 dB
Offset 7.7 dB
17.7
10
0
-10
-20
-30
-40
-50
-60
-70
-82.3
Center 2.4634 GHz
4.2 MHz/
Span 42 MHz

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

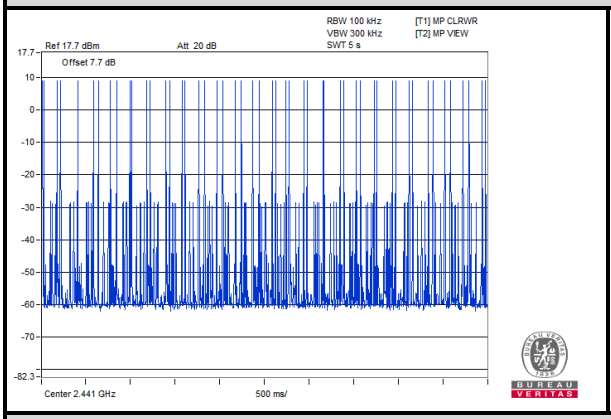
GFSK

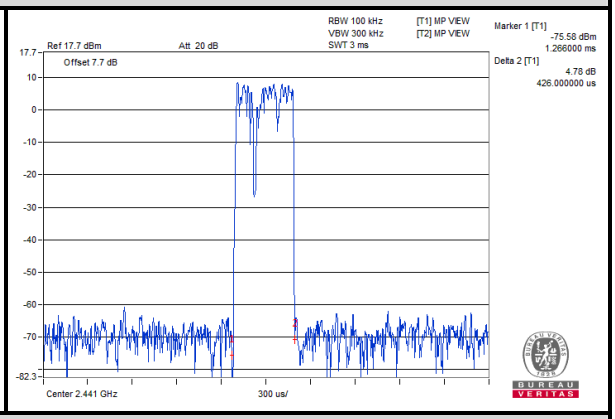
Mode	Number of Hopping Channel	Number of transmission in a period(channel number*0.4 sec)				Length of transmission time (msec)	Result (msec)	Limit (msec)	PASS / FAIL
		period (sec)	sweep time (sec)	times in a sweep	times in a period				
DH1	79	31.6	5	50	316	0.426	134.62	400	PASS
DH3	79	31.6	5	26	164.32	1.695	278.52	400	PASS
DH5	79	31.6	5	18	113.76	2.925	332.75	400	PASS

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

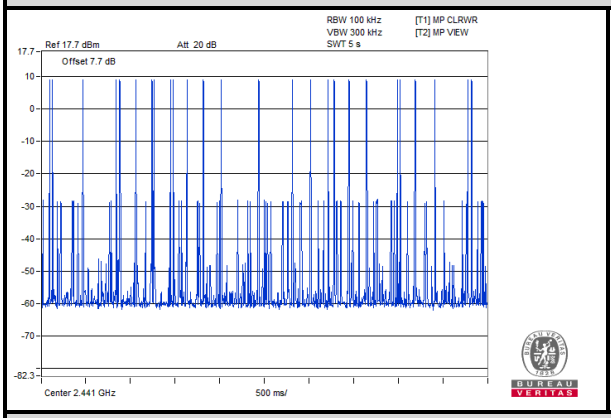
GFSK

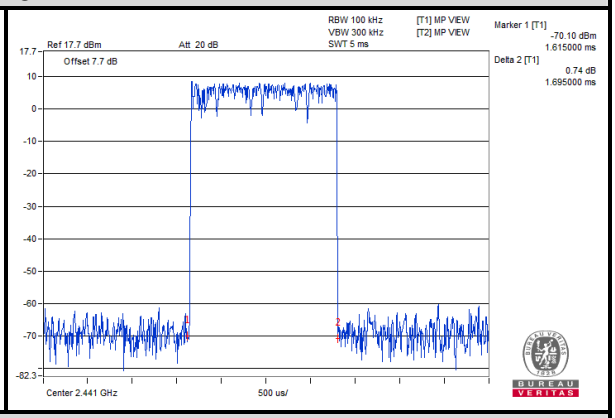
DH1



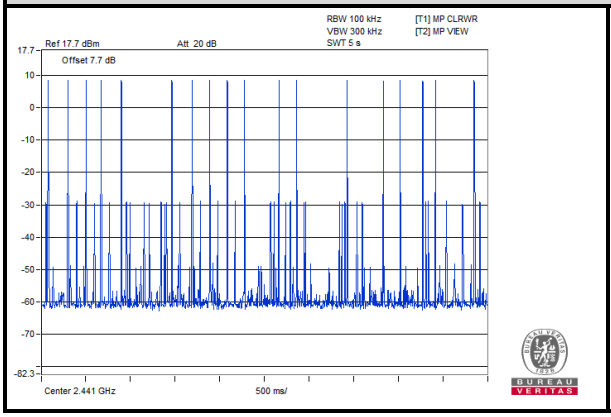


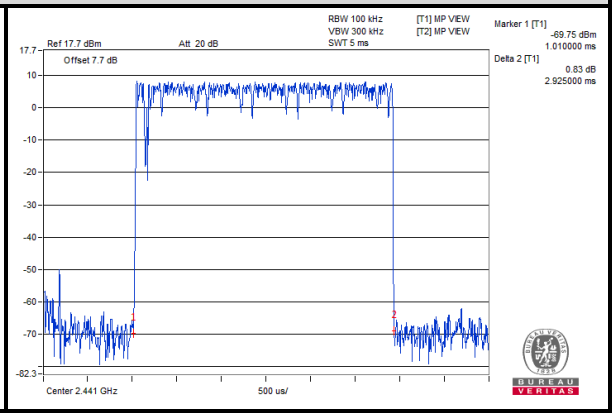
DH3





DH5





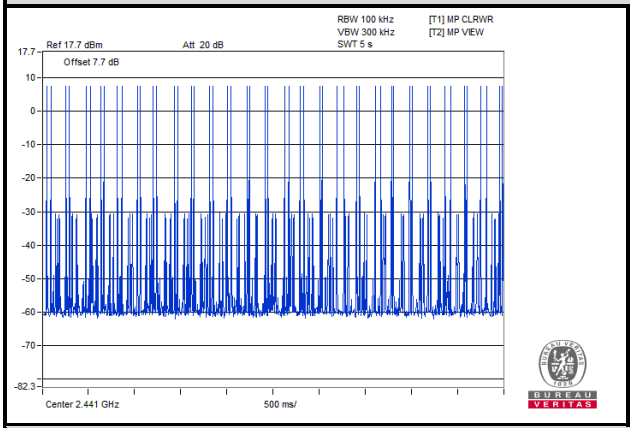
8DPSK

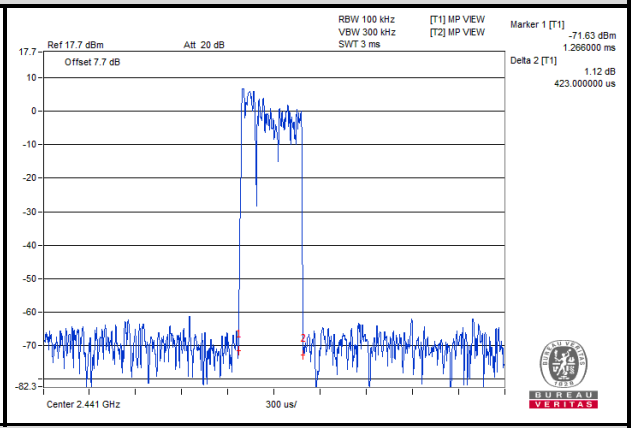
Mode	Number of Hopping Channel	Number of transmission in a period(channel number*0.4 sec)				Length of transmission time (msec)	Result (msec)	Limit (msec)	PASS / FAIL
		period (sec)	sweep time (sec)	times in a sweep	times in a period				
DH1	79	31.6	5	52	328.64	0.423	139.01	400	PASS
DH3	79	31.6	5	25	158	1.695	267.81	400	PASS
DH5	79	31.6	5	17	107.44	2.955	317.49	400	PASS

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

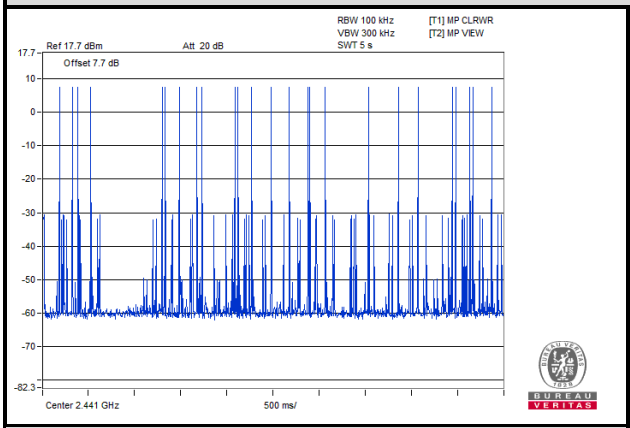
8DPSK

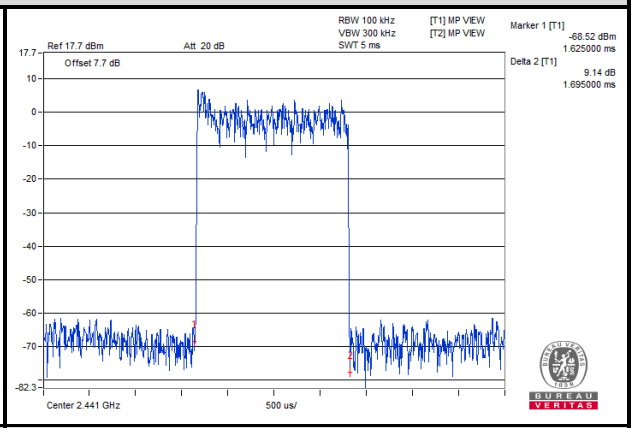
DH1



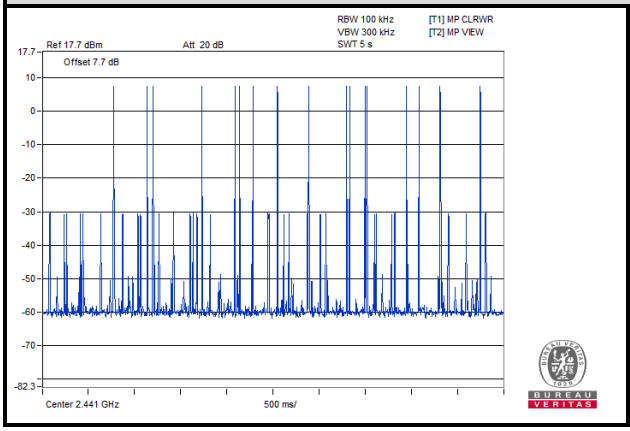


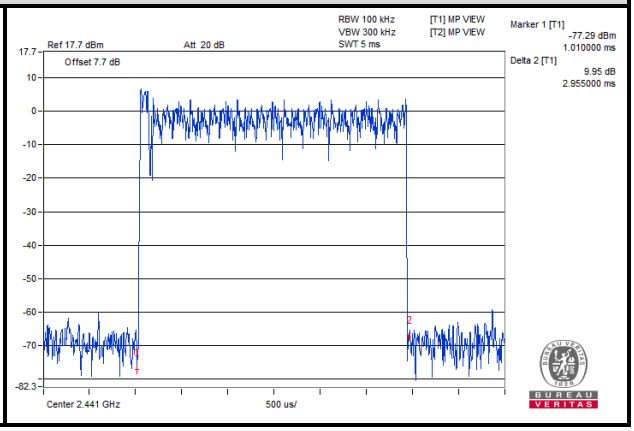
DH3





DH5



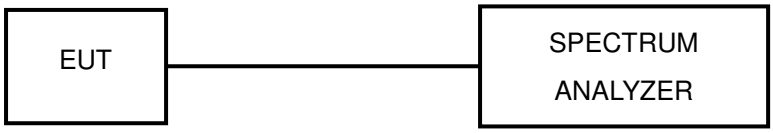


4.5 CHANNEL BANDWIDTH

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

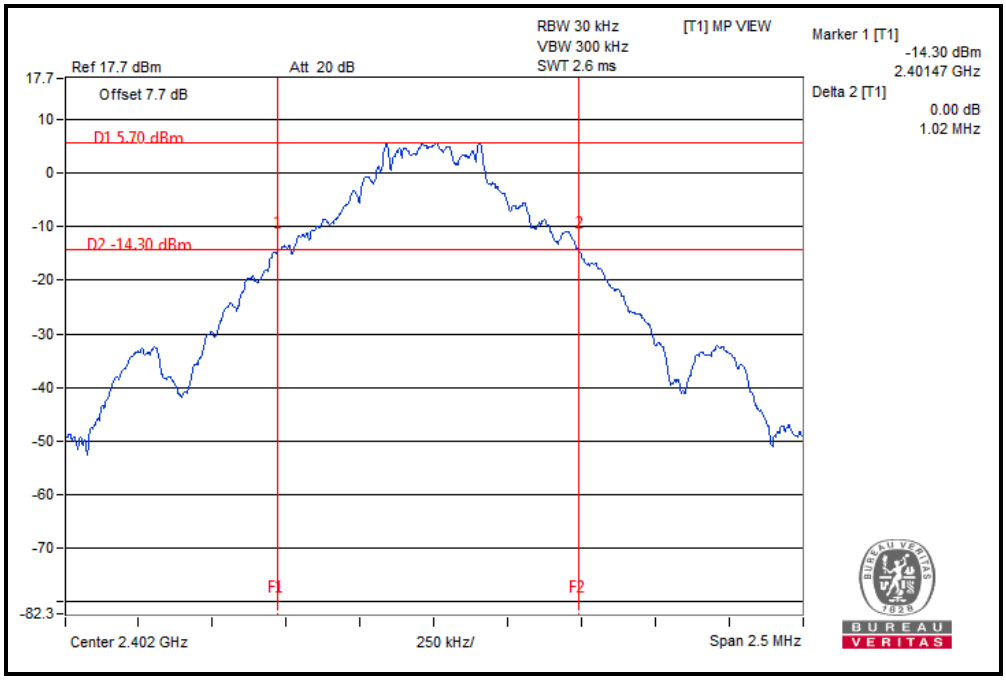
The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.

4.5.7 TEST RESULTS

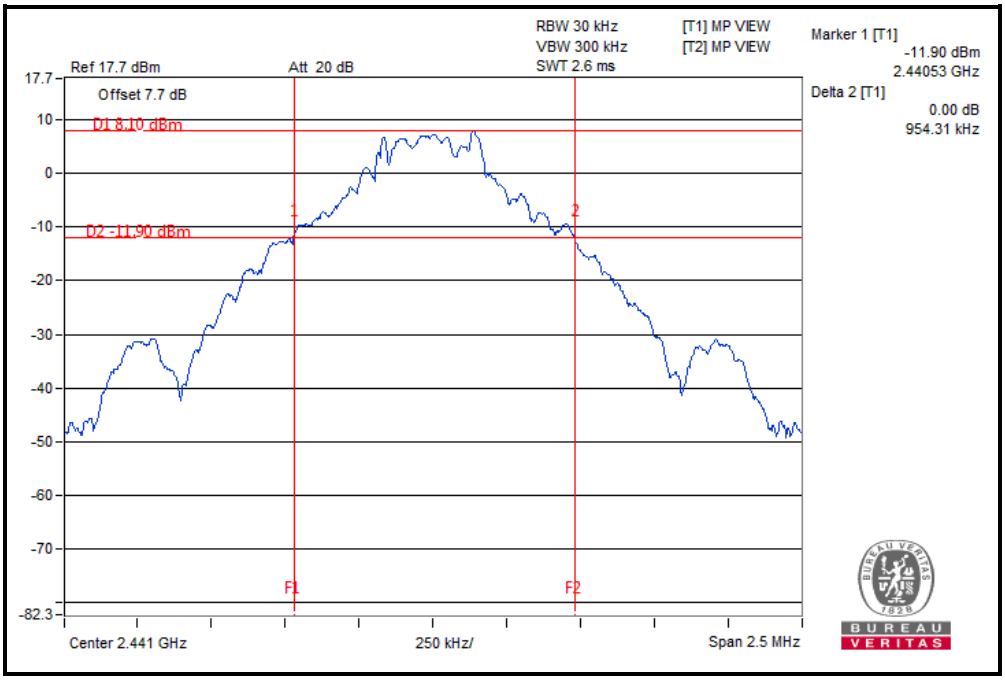
GFSK

CHANNEL	CHANNEL FREQUENCY (MHz)	20dB BANDWIDTH (MHz)
0	2402	1.02
39	2441	0.95
78	2480	1.02

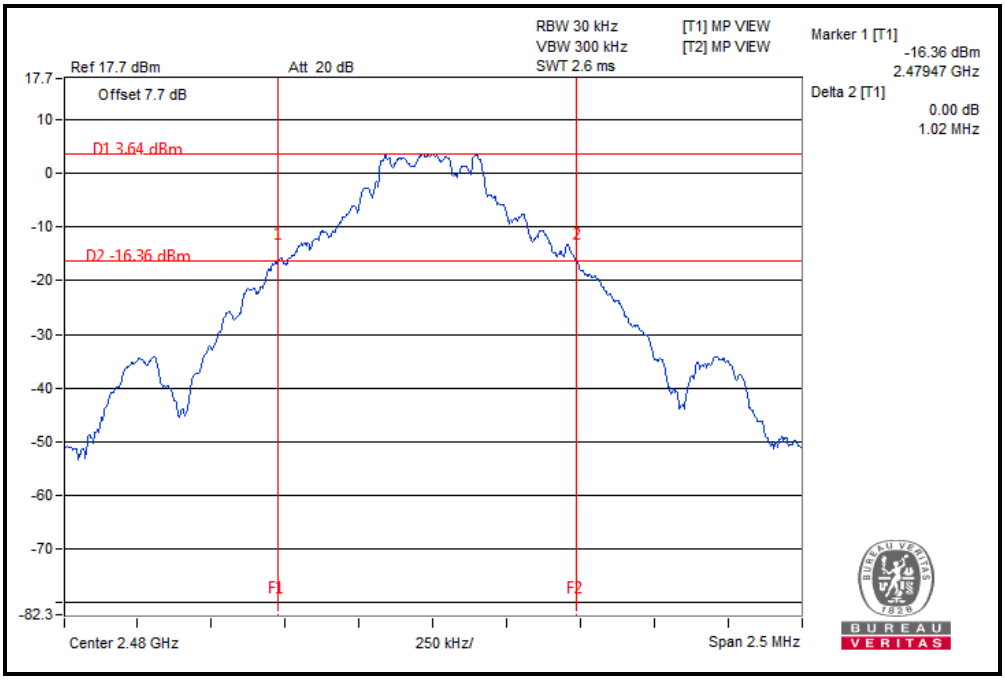
CH 0



CH 39


RBW 30 kHz
VBW 300 kHz
SWT 2.6 ms
[T1] MP VIEW
[T2] MP VIEW
Marker 1 [T1]
-11.90 dBm
2.44053 GHz
Delta 2 [T1]
0.00 dB
954.31 kHz
Ref 17.7 dBm
Att 20 dB
Offset 7.7 dB
D1 8.10 dBm
D2 -11.90 dBm
17.7
10
0
-10
-20
-30
-40
-50
-60
-70
-82.3
F1
F2
Center 2.441 GHz
250 kHz/
Span 2.5 MHz

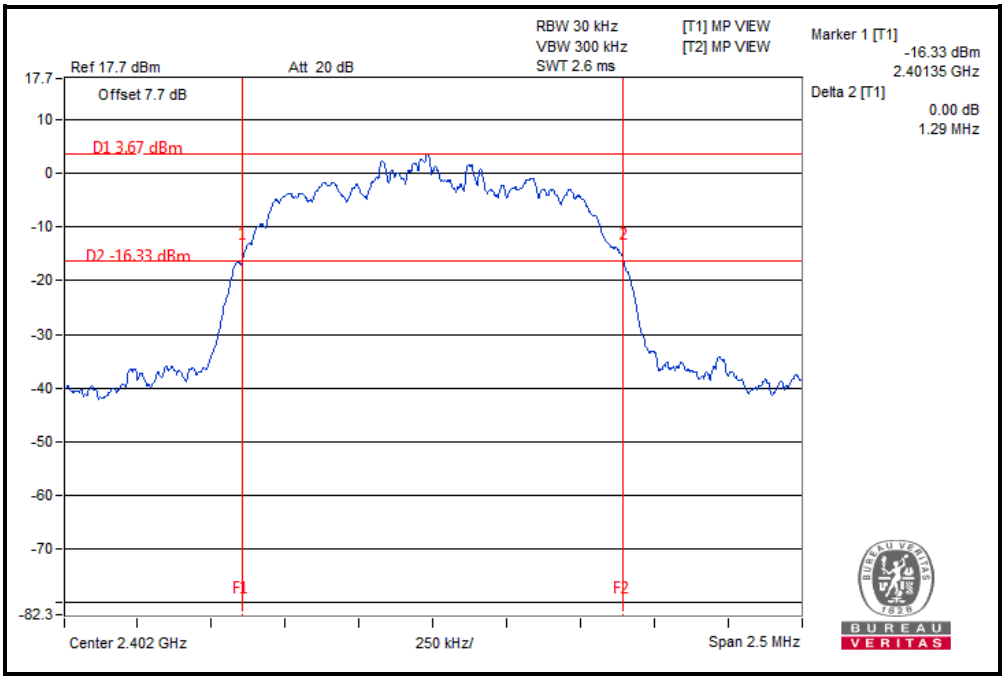
CH 78


RBW 30 kHz
VBW 300 kHz
SWT 2.6 ms
[T1] MP VIEW
[T2] MP VIEW
Marker 1 [T1]
-16.36 dBm
2.47947 GHz
Delta 2 [T1]
0.00 dB
1.02 MHz
Ref 17.7 dBm
Att 20 dB
Offset 7.7 dB
D1 3.64 dBm
D2 -16.36 dBm
17.7
10
0
-10
-20
-30
-40
-50
-60
-70
-82.3
F1
F2
Center 2.48 GHz
250 kHz/
Span 2.5 MHz

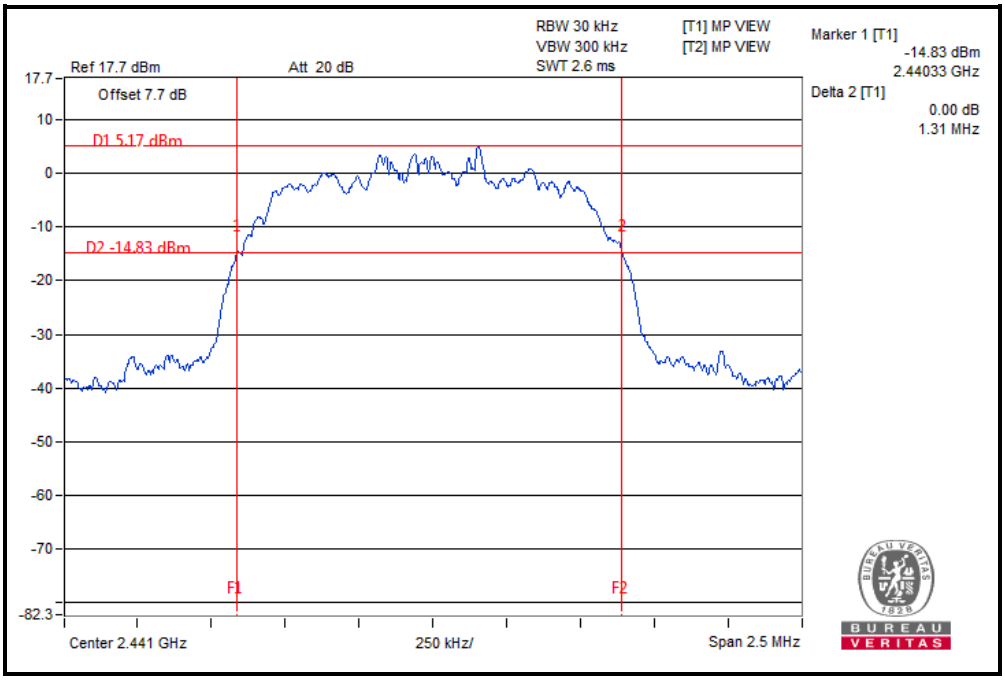
π /4 DQPSK

CHANNEL	CHANNEL FREQUENCY (MHz)	20dB BANDWIDTH (MHz)
0	2402	1.29
39	2441	1.31
78	2480	1.28

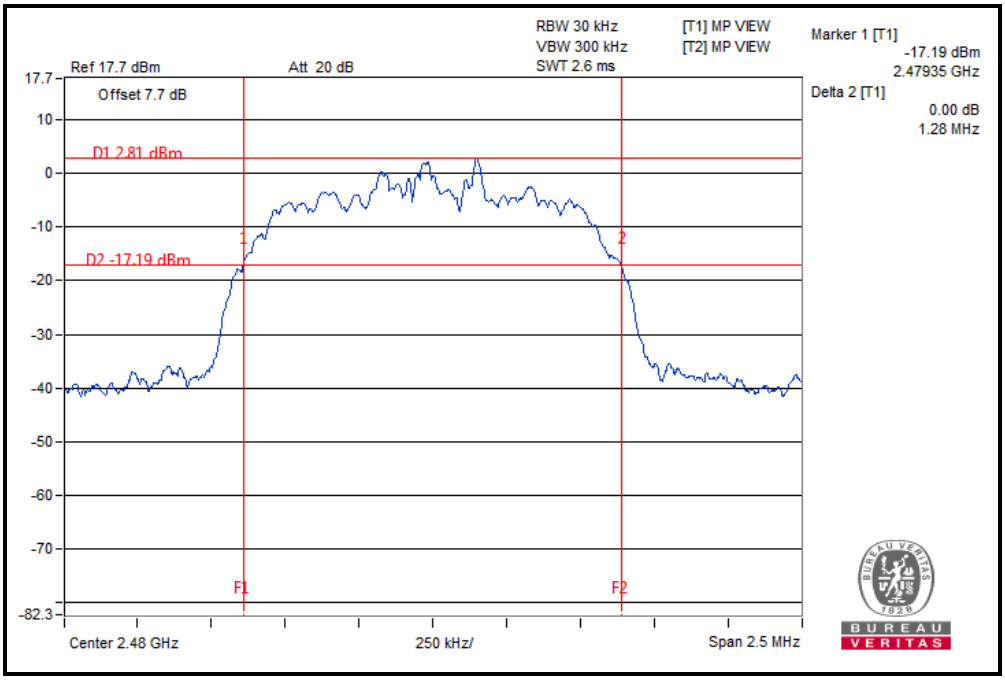
CH 0



CH 39


RBW 30 kHz
VBW 300 kHz
SWT 2.6 ms
[T1] MP VIEW
[T2] MP VIEW
Marker 1 [T1]
-14.83 dBm
2.44033 GHz
Delta 2 [T1]
0.00 dB
1.31 MHz
Ref 17.7 dBm
Att 20 dB
Offset 7.7 dB
D1 5.17 dBm
D2 -14.83 dBm
17.7
10
0
-10
-20
-30
-40
-50
-60
-70
-82.3
F1
F2
Center 2.441 GHz
250 kHz/
Span 2.5 MHz

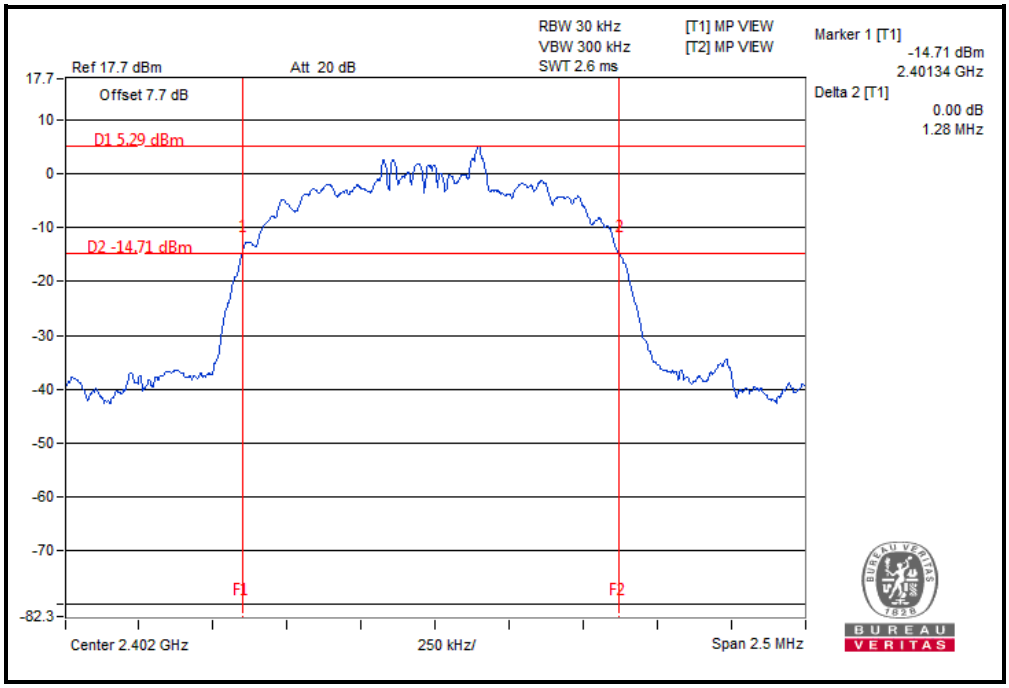
CH 78


RBW 30 kHz
VBW 300 kHz
SWT 2.6 ms
[T1] MP VIEW
[T2] MP VIEW
Marker 1 [T1]
-17.19 dBm
2.47935 GHz
Delta 2 [T1]
0.00 dB
1.28 MHz
Ref 17.7 dBm
Att 20 dB
Offset 7.7 dB
D1 2.81 dBm
D2 -17.19 dBm
17.7
10
0
-10
-20
-30
-40
-50
-60
-70
-82.3
F1
F2
Center 2.48 GHz
250 kHz/
Span 2.5 MHz

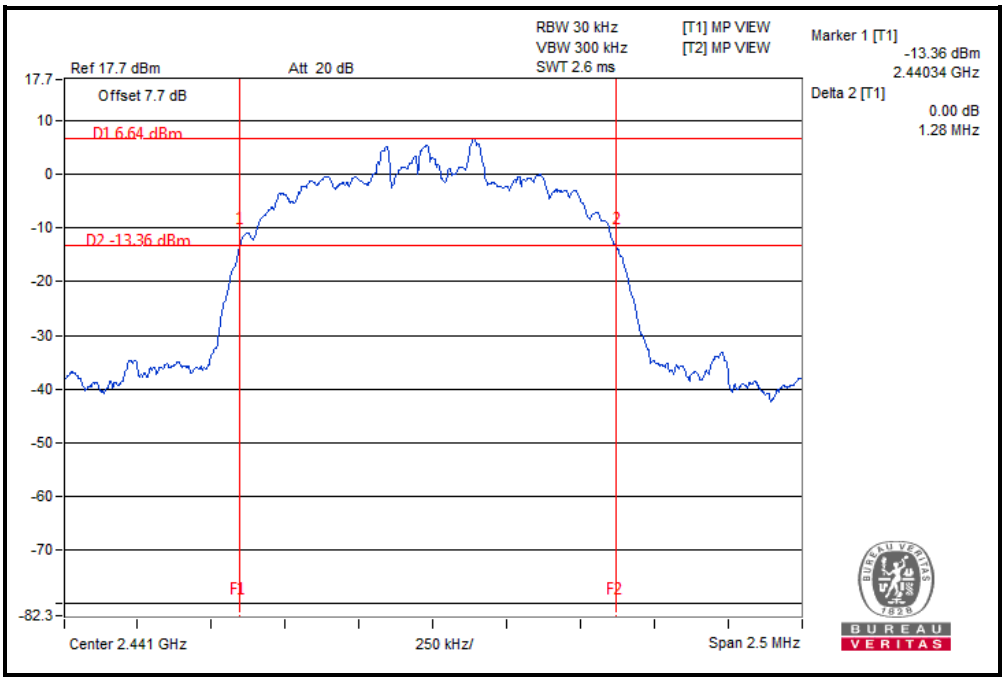
8DPSK

CHANNEL	CHANNEL FREQUENCY (MHz)	20dB BANDWIDTH (MHz)
0	2402	1.28
39	2441	1.28
78	2480	1.30

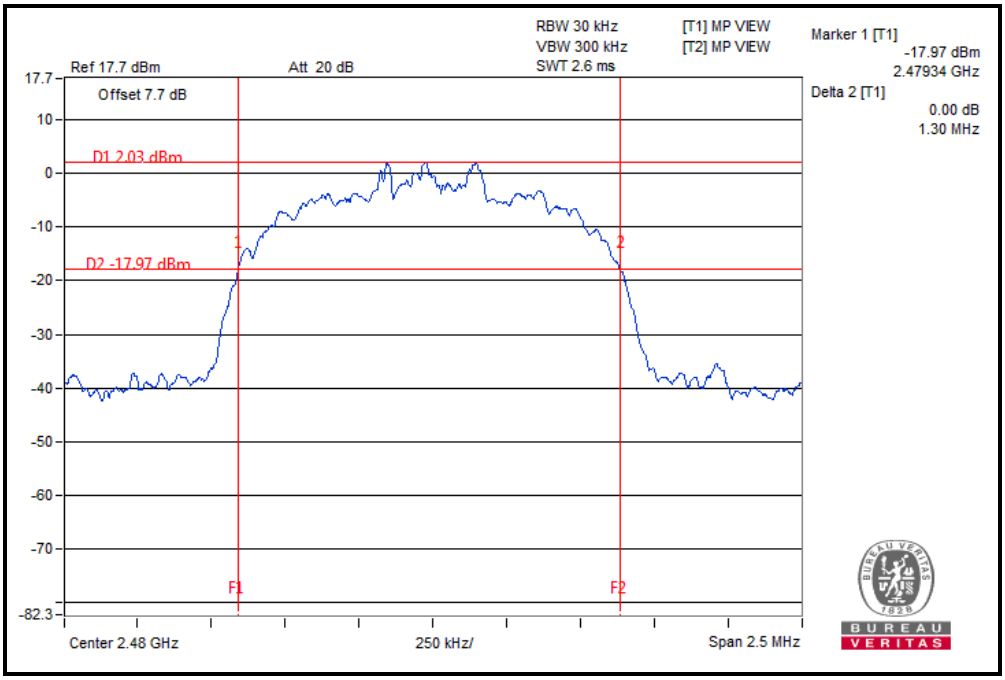
CH 0



CH 39


RBW 30 kHz
VBW 300 kHz
SWT 2.6 ms
[T1] MP VIEW
[T2] MP VIEW
Marker 1 [T1]
-13.36 dBm
2.44034 GHz
Delta 2 [T1]
0.00 dB
1.28 MHz
Ref 17.7 dBm
Att 20 dB
Offset 7.7 dB
D1 6.64 dBm
D2 -13.36 dBm
17.7
10
0
-10
-20
-30
-40
-50
-60
-70
-82.3
F1
F2
Center 2.441 GHz
250 kHz/
Span 2.5 MHz

CH 78

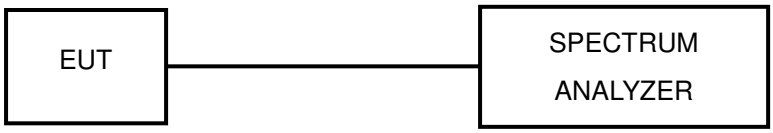

RBW 30 kHz
VBW 300 kHz
SWT 2.6 ms
[T1] MP VIEW
[T2] MP VIEW
Marker 1 [T1]
-17.97 dBm
2.47934 GHz
Delta 2 [T1]
0.00 dB
1.30 MHz
Ref 17.7 dBm
Att 20 dB
Offset 7.7 dB
D1 2.03 dBm
D2 -17.97 dBm
17.7
10
0
-10
-20
-30
-40
-50
-60
-70
-82.3
F1
F2
Center 2.48 GHz
250 kHz/
Span 2.5 MHz

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.

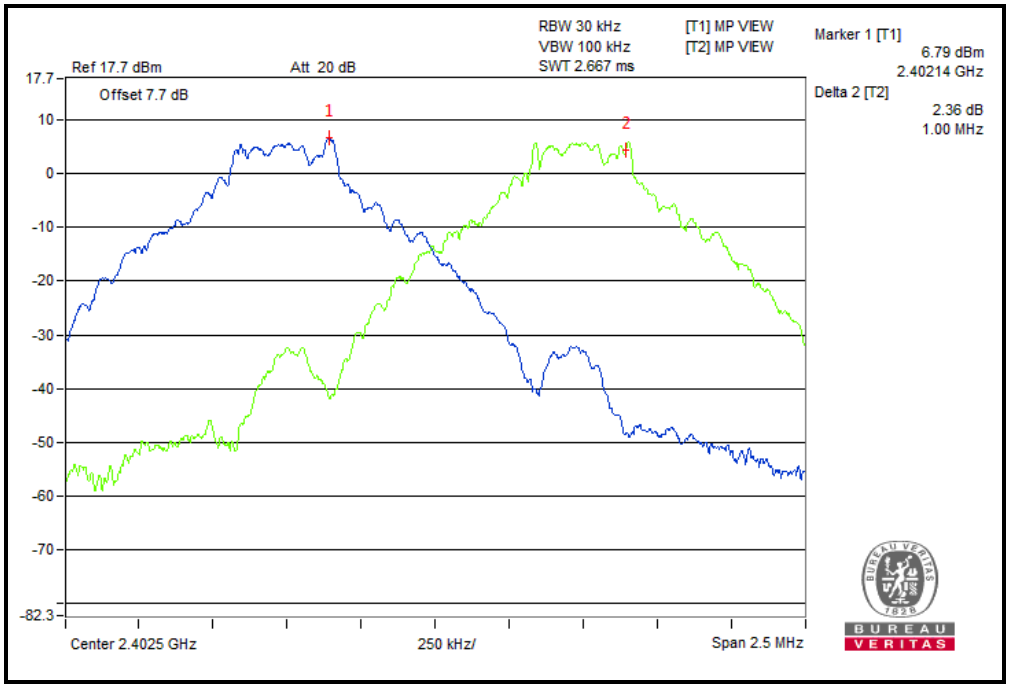
4.6.6 TEST RESULTS

GFSK

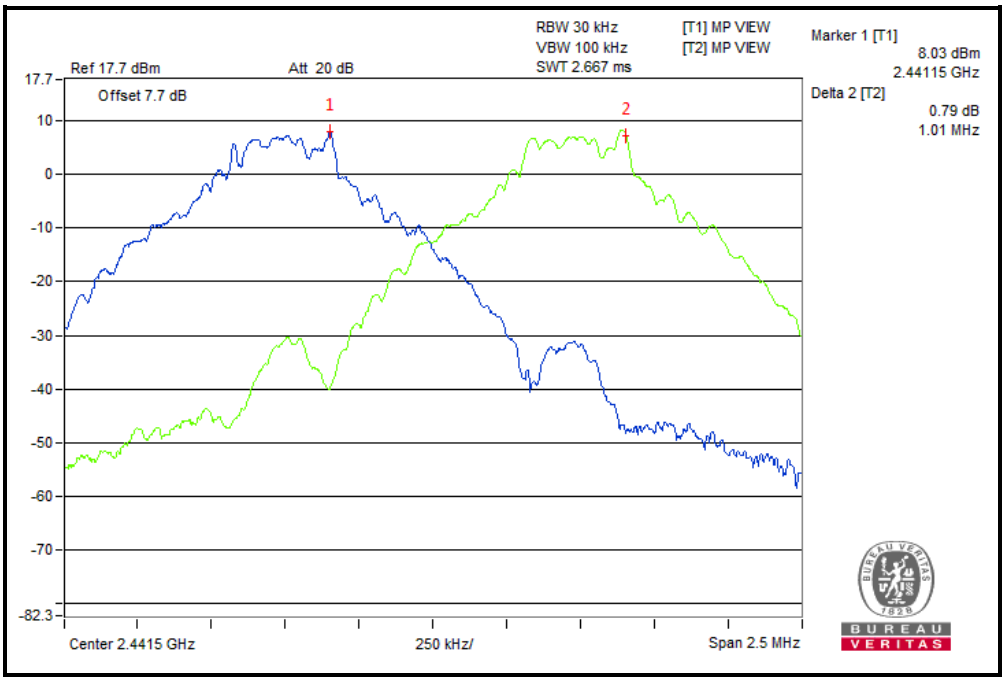
CHANNEL	FREQUENCY (MHz)	ADJACENT CHANNEL SEPARATION (MHz)	20dB BANDWIDTH (MHz)	MINIMUM LIMIT (MHz)	PASS / FAIL
0	2402	1.00	1.02	0.68	PASS
39	2441	1.01	0.95	0.64	PASS
78	2480	1.00	1.02	0.68	PASS

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

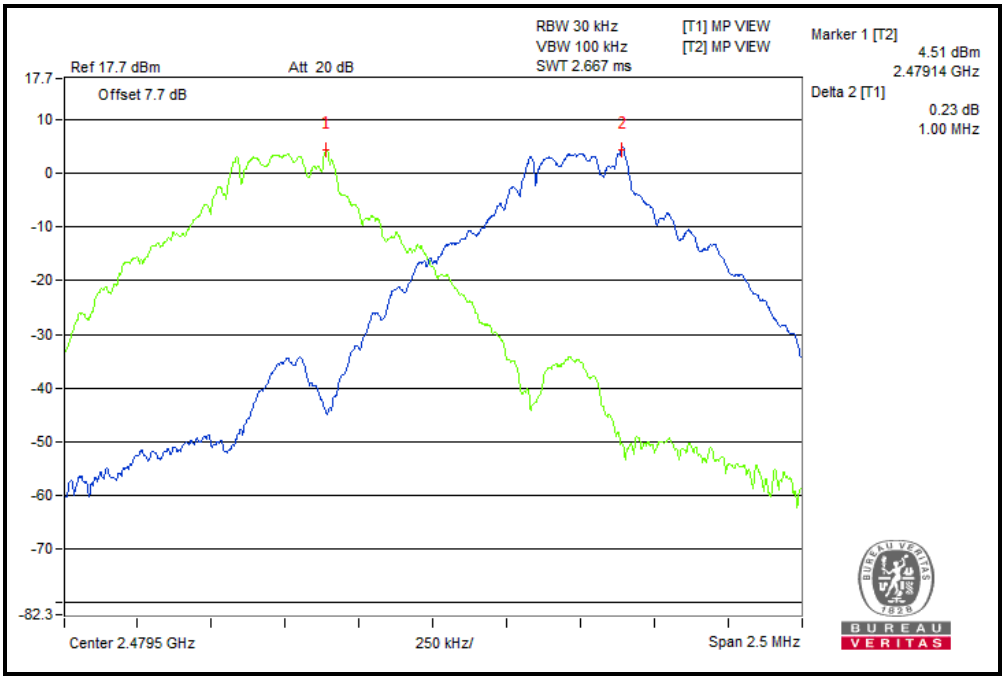
CH 0



CH 39


RBW 30 kHz
VBW 100 kHz
SWT 2.667 ms
[T1] MP VIEW
[T2] MP VIEW
Marker 1 [T1]
8.03 dBm
2.44115 GHz
Delta 2 [T2]
0.79 dB
1.01 MHz
Ref 17.7 dBm
Att 20 dB
Offset 7.7 dB
17.7
10
0
-10
-20
-30
-40
-50
-60
-70
-82.3
1
2
Center 2.4415 GHz
250 kHz/
Span 2.5 MHz

CH 78

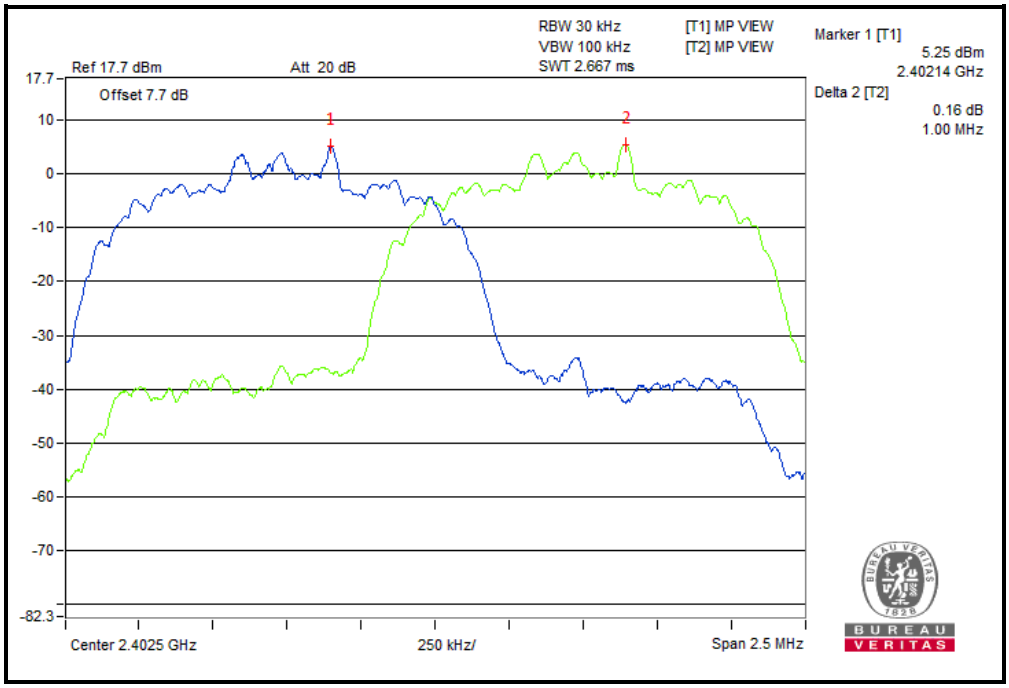

RBW 30 kHz
VBW 100 kHz
SWT 2.667 ms
[T1] MP VIEW
[T2] MP VIEW
Marker 1 [T2]
4.51 dBm
2.47914 GHz
Delta 2 [T1]
0.23 dB
1.00 MHz
Ref 17.7 dBm
Att 20 dB
Offset 7.7 dB
17.7
10
0
-10
-20
-30
-40
-50
-60
-70
-82.3
1
2
Center 2.4795 GHz
250 kHz/
Span 2.5 MHz

8DPSK

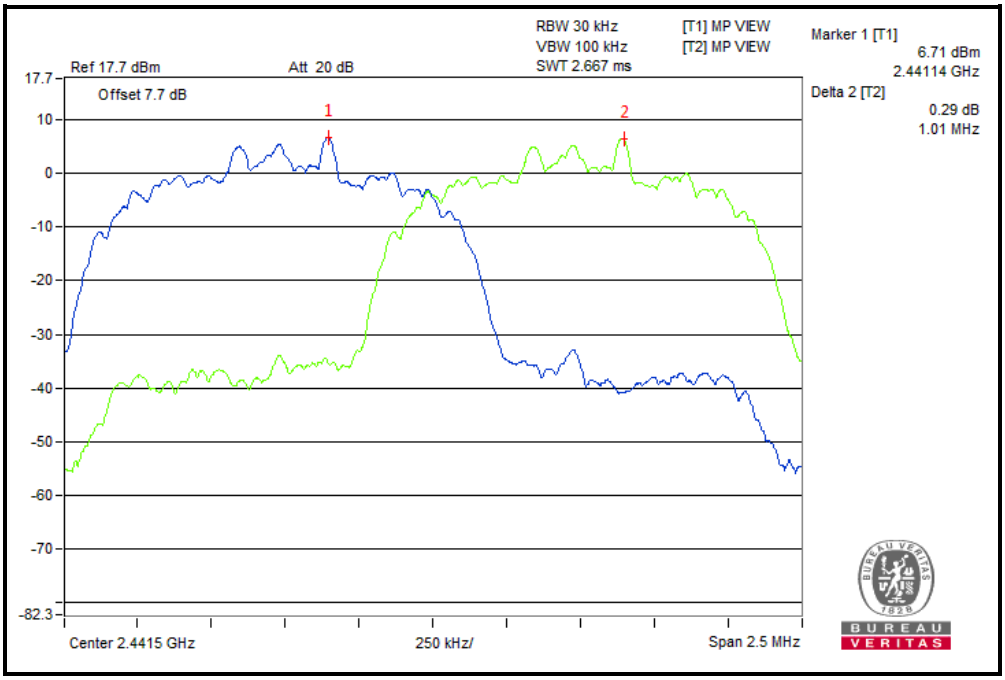
CHANNEL	FREQUENCY (MHz)	ADJACENT CHANNEL SEPARATION (MHz)	20dB BANDWIDTH (MHz)	MINIMUM LIMIT (MHz)	PASS / FAIL
0	2402	1.00	1.28	0.85	PASS
39	2441	1.01	1.28	0.85	PASS
78	2480	1.00	1.30	0.87	PASS

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

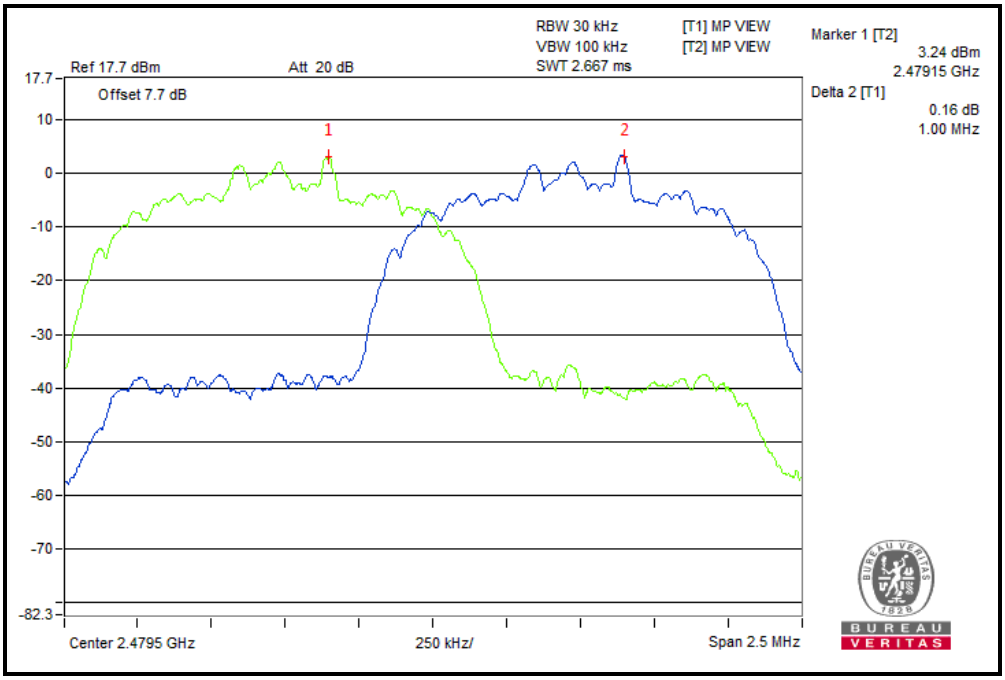
CH 0



CH 39


RBW 30 kHz
VBW 100 kHz
SWT 2.667 ms
[T1] MP VIEW
[T2] MP VIEW
Marker 1 [T1]
6.71 dBm
2.44114 GHz
Delta 2 [T2]
0.29 dB
1.01 MHz
Ref 17.7 dBm
Att 20 dB
Offset 7.7 dB
17.7
10
0
-10
-20
-30
-40
-50
-60
-70
-82.3
1
2
Center 2.4415 GHz
250 kHz/
Span 2.5 MHz

CH 78

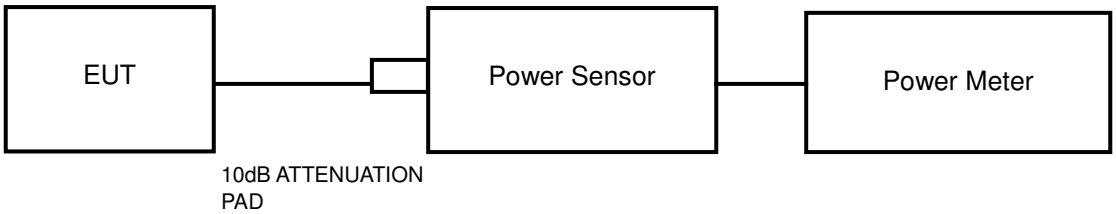

RBW 30 kHz
VBW 100 kHz
SWT 2.667 ms
[T1] MP VIEW
[T2] MP VIEW
Marker 1 [T2]
3.24 dBm
2.47915 GHz
Delta 2 [T1]
0.16 dB
1.00 MHz
Ref 17.7 dBm
Att 20 dB
Offset 7.7 dB
17.7
10
0
-10
-20
-30
-40
-50
-60
-70
-82.3
1
2
Center 2.4795 GHz
250 kHz/
Span 2.5 MHz

4.7 MAXIMUM OUTPUT POWER

4.7.1 LIMITS OF MAXIMUM OUTPUT POWER MEASUREMENT

The Maximum Output Power Measurement is 125mW.

4.7.2 TEST SETUP



4.7.3 TEST INSTRUMENTS

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 power meter was used to read the response of the peak power sensor. 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

GFSK

CHANNEL	CHANNEL FREQUENCY (MHz)	POWER OUTPUT (dBm)	POWER OUTPUT (mW)	POWER LIMIT (mW)	PASS/FAIL
0	2402	6.65	4.624	125	PASS
39	2441	8.29	6.745	125	PASS
78	2480	4.71	2.958	125	PASS

π/4 DQPSK

CHANNEL	CHANNEL FREQUENCY (MHz)	POWER OUTPUT (dBm)	POWER OUTPUT (mW)	POWER LIMIT (mW)	PASS/FAIL
0	2402	6.76	4.742	125	PASS
39	2441	8.33	6.808	125	PASS
78	2480	4.77	2.999	125	PASS

8DPSK

CHANNEL	CHANNEL FREQUENCY (MHz)	POWER OUTPUT (dBm)	POWER OUTPUT (mW)	POWER LIMIT (mW)	PASS/FAIL
0	2402	6.76	4.742	125	PASS
39	2441	8.36	**6.855**	125	PASS
78	2480	4.99	3.155	125	PASS

4.8 OUT OF BAND MEASUREMENT

4.8.1 LIMITS OF OUT OF BAND 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. 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

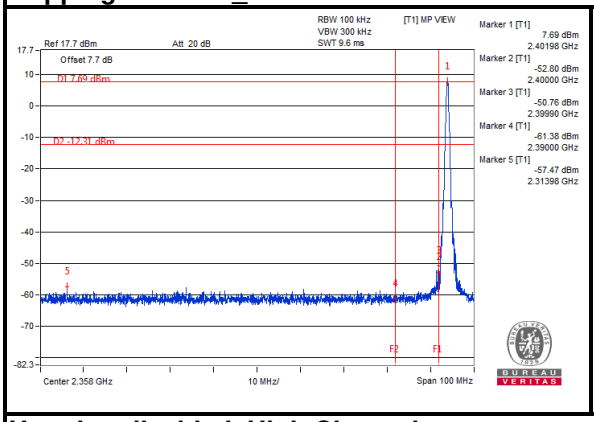
The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.

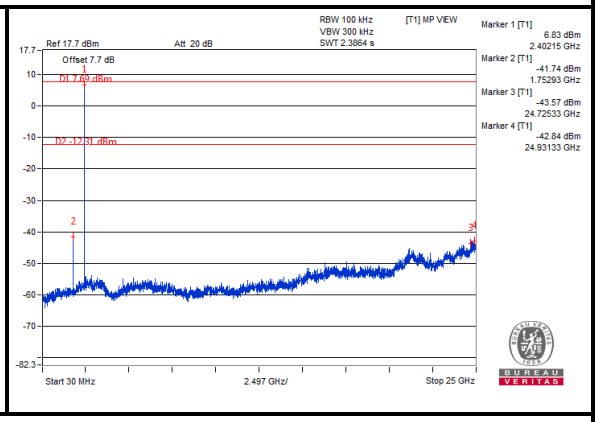
4.8.6 TEST RESULTS

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.

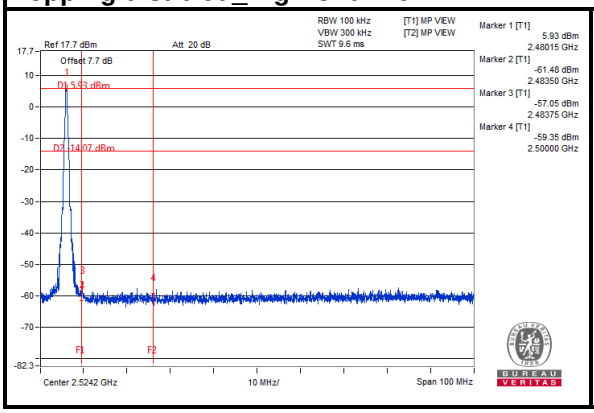
GFSK

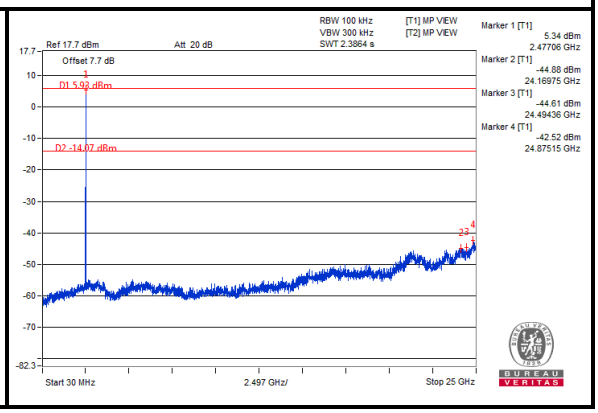
Hopping disabled_Low Channel



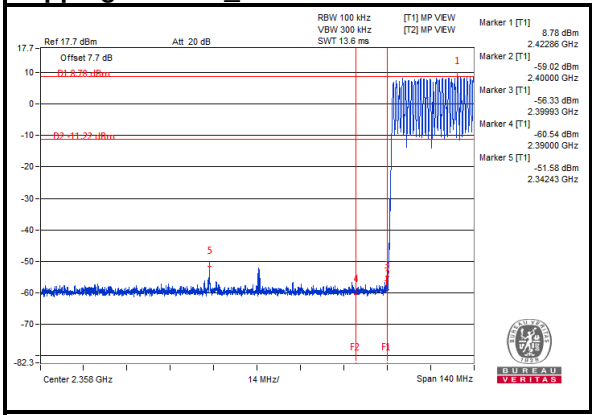


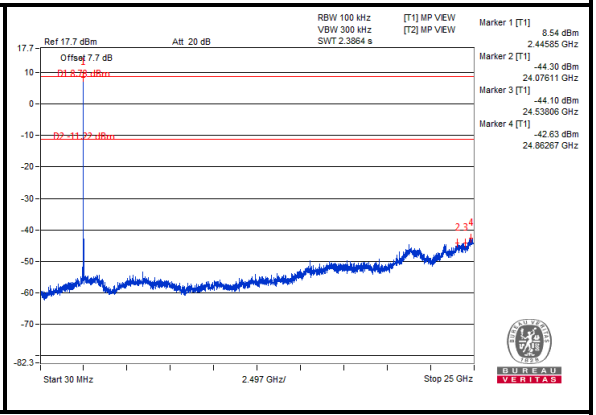
Hopping disabled_High Channel



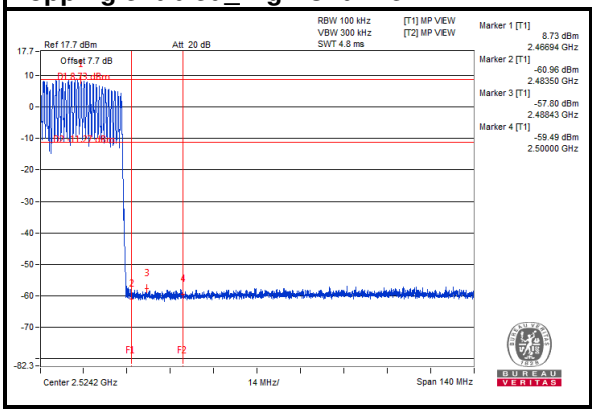


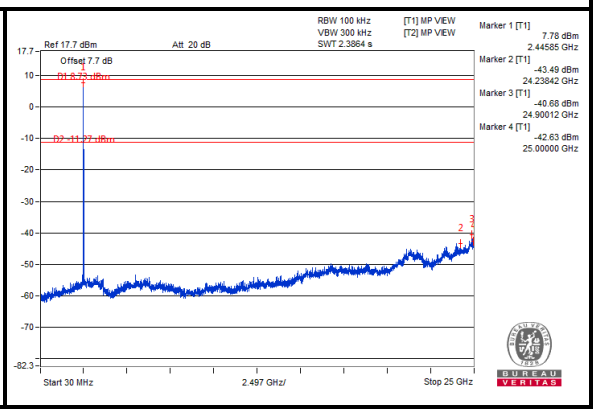
Hopping enabled_Low Channel





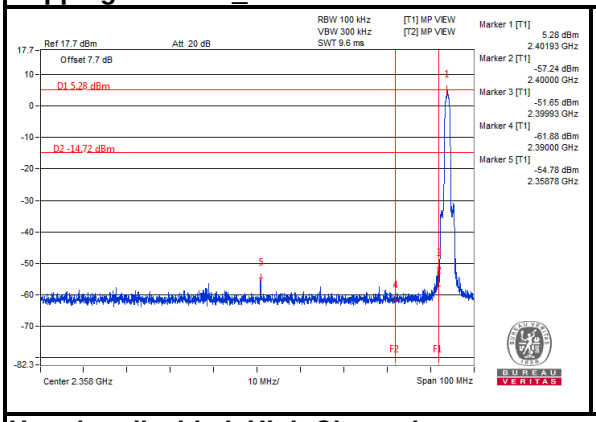
Hopping enabled_High Channel

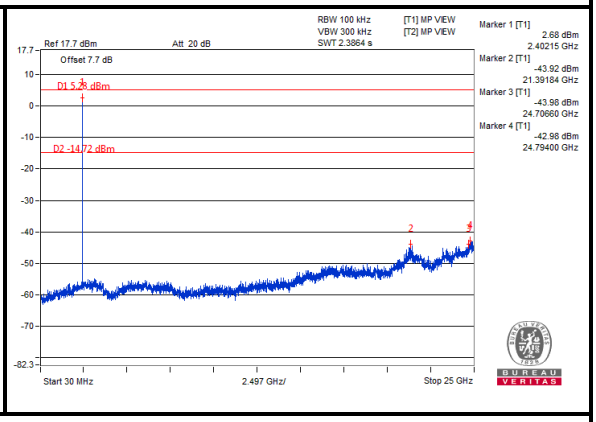




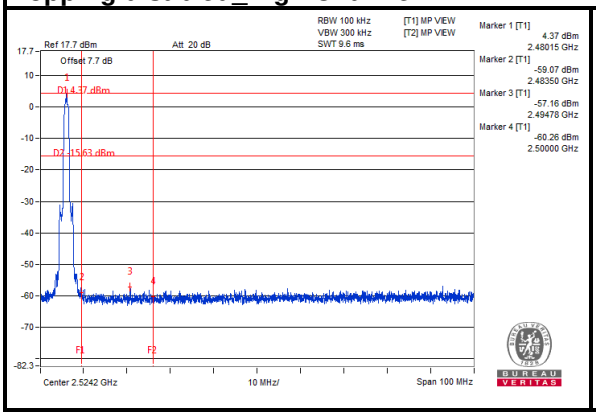
8DPSK

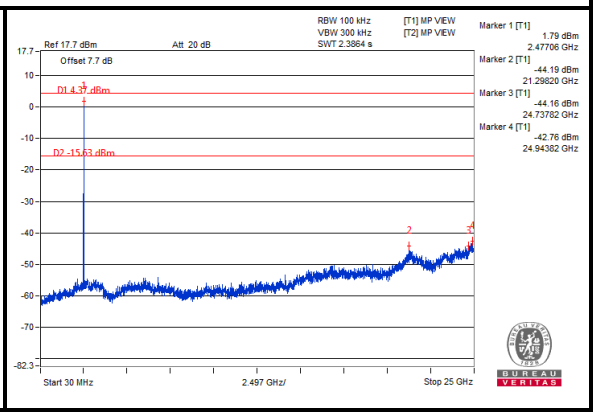
Hopping disabled_Low Channel



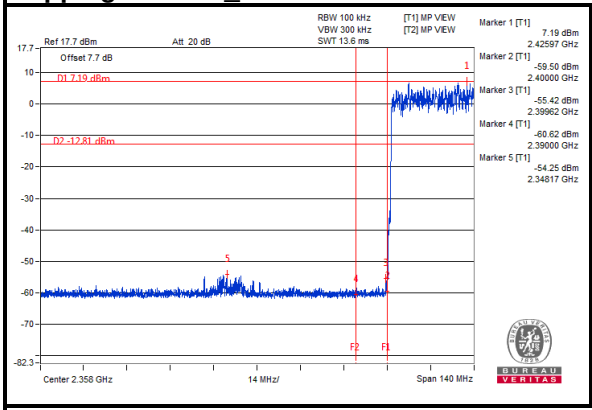


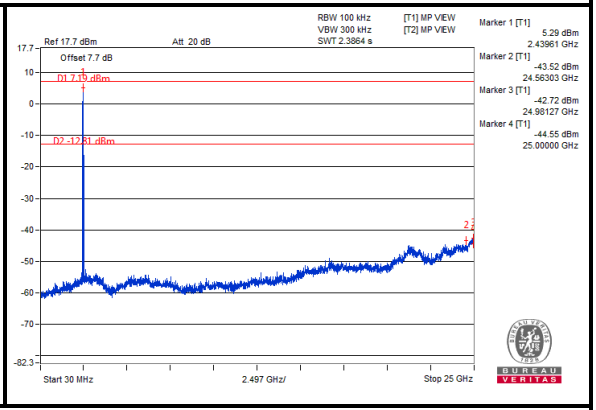
Hopping disabled_High Channel



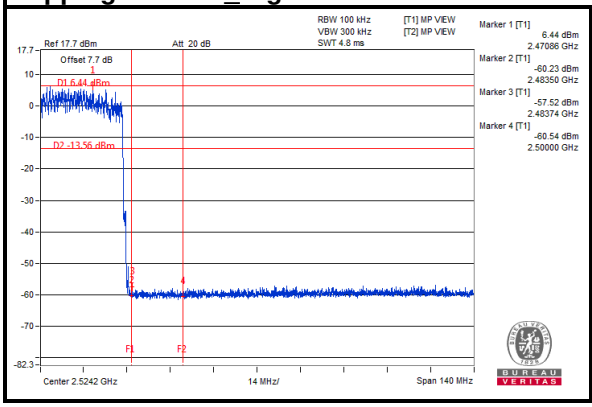


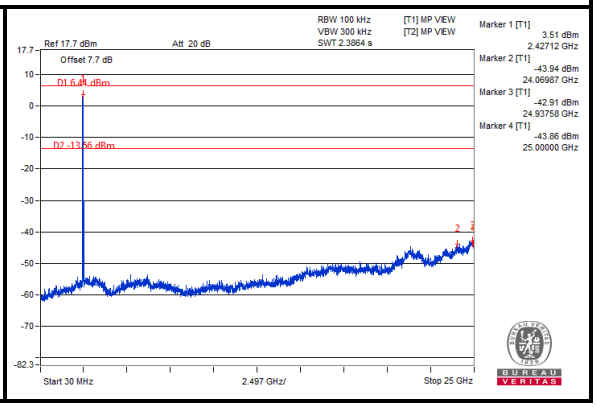
Hopping enabled_Low Channel





Hopping enabled_High Channel





5 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---