Test Lab
Cert 2951.01

FCC TEST REPORT

(Bluetooth EDR)

Product:	LTE phone
Model Name:	XP5700
FCC ID:	WYPL23V013AA
Applicant:	Sonim Technologies, Inc.
Address:	1825 S. Grant St., Suite 200., San Mateo, CA, 94402
Manufacturer:	Sonim Technologies (Shenzhen) Limited
Address:	2nd Floor, No. 2 Building Phase B, Daqian Industrial park, Longchang Road, 67 District, Baoan, Shenzhen, P. R. China
Prepared by:	Bureau Veritas Shenzhen Co., Ltd. Dongguan Branch
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Report No.:	RF160524W004-1
Received Date:	May 24, 2016
Test Date:	May 25, 2016 ~ Jun. 20, 2016
Issued Date:	Jun. 22, 2016

This report should not be used by the client to claim product certification, approval, or endorsement by A2LA or any government agencies.

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RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
RF160524W004-1	Original release	Jun. 22, 2016

Bureau Veritas Shenzhen Co., Ltd.
Dongguan Branch

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1 CERTIFICATION

PRODUCT:	LTE phone
BRAND NAME:	Sonim
MODEL NAME:	XP5700
APPLICANT:	Sonim Technologies, Inc.
TESTED:	May 25, 2016 ~ Jun. 20, 2016
TEST SAMPLE:	Identical Prototype
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:** Jun. 22, 2016
(Amyee Qian / Engineer)

APPROVED BY : _____ , **DATE:** Jun. 22, 2016
(William Chung / 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 12.33dB at 1.366000MHz.
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 -7.57dB at 2488.2MHz.
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	2.66dB
Radiated emissions	9KHz ~ 30MHz	2.74dB
	30MHz ~ 1GMHz	3.55dB
	1GHz ~ 18GHz	4.84dB
	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	LTE phone
MODEL NAME	XP5700
TYPE NUMBER	L23V013AA
POWER SUPPLY	5.0Vdc (adapter or host equipment) 3.7Vdc (Li-ion, battery)
MODULATION TECHNOLOGY	FHSS
MODULATION TYPE	GFSK, 8DPSK, π/4 DQPSK
OPERATING FREQUENCY	2402MHz~2480MHz
NUMBER OF CHANNEL	79
MAX. OUTPUT POWER	10.715mW (Max. Measured)
ANTENNA TYPE	PIFA Antenna with 2dBi gain
I/O PORTS	Refer to user's manual
CABLE SUPPLIED	USB cable: shielded, detachable, 1.1m Earphone Cable: 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. The EUT was powered by the following adapter:

ADAPTER	
BRAND:	Sonim
MODEL:	S14C02
INPUT:	AC 100-240V, 200mA
OUTPUT:	DC 5V, 1200mA

3. The EUT matched the following USB cable and Earphone:

USB CABLE	
BRAND:	Sunway
MODEL:	N.A
SIGNAL LINE:	1.1 METER

EARPHONE	
BRAND:	Minami
MODEL:	ME-816B5-E
SIGNAL LINE:	1.2 METER

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

3.2 DESCRIPTION OF TEST MODES

79 channels are provided to this EUT:

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

3.2.1 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	0	FHSS	8DPSK	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
-	0 to 78	0, 39, 78	FHSS	GFSK	DH5
-	0 to 78	0, 39, 78	FHSS	8DPSK	DH5

POWER LINE CONDUCTED EMISSION TEST:

The EUT was tested with the following mode

EUT CONFIGURE MODE	TESTED CONDITION
-	BT Link + USB cable + Adapter + Earphone
-	BT Link + USB cable + USB Link + Earphone

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	22deg. C, 54%RH	DC 5V from adaptor	Alex Chen
RE≥1G	22deg. C, 54%RH	DC 5V from adaptor	Alex Chen
PLC	25deg. C, 60%RH	DC 5V from adaptor	Yuqiang Yin
APCM	25deg. C, 60%RH	DC 3.7V from battery	Yuqiang Yin

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 (Certification). 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	ESCS30	100340	May 11,15	May 10,17
Artificial Mains Network	Rohde&Schwarz	ENV216	101173	Mar. 04,16	Mar. 03,17
Artificial Mains Network	Rohde&Schwarz	ESH3-Z5	100317	Apr. 05,16	Apr. 04,17
Voltage probe	SCHWARZBECK	TK 9421	TK 9421-176	Jan. 08,16	Jan. 07,17
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.

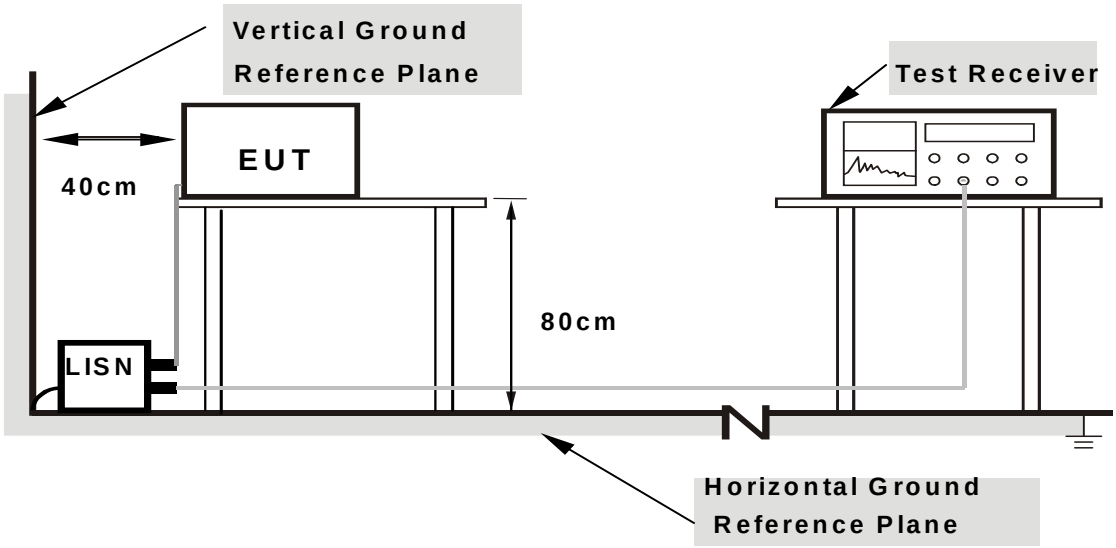
c. The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) was not recorded.

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.

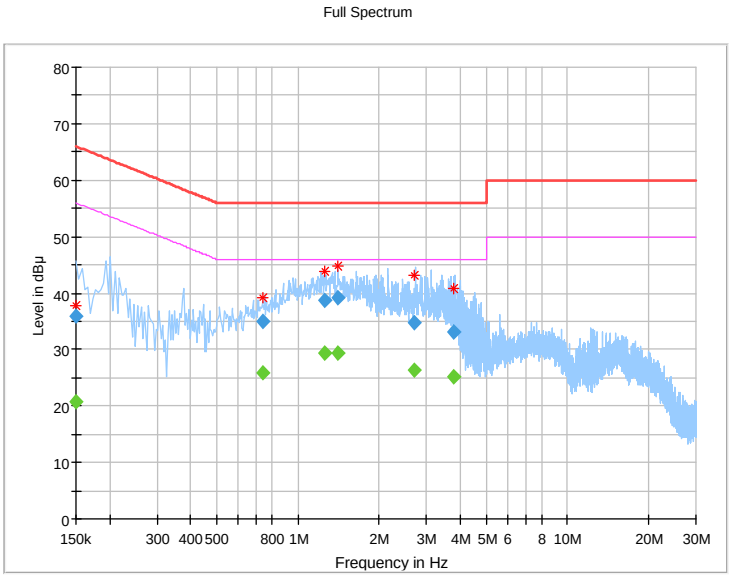
4.1.7 TEST RESULTS

CONDUCTED WORST-CASE DATA:

Phase	Line (L)	Detector Function	Quasi-Peak (QP) / Average (AV)

Frequency (MHz)	QuasiPeak (dB¦ìV)	CAverage (dB¦ìV)	Limit (dB¦ìV)	Margin (dB)	Line	Filter	Corr. (dB)
0.150000	---	20.86	56.00	35.14	L	ON	9.6
0.150000	35.82	---	66.00	30.18	L	ON	9.6
0.744000	---	25.90	46.00	20.10	L	ON	9.7
0.744000	35.02	---	56.00	20.98	L	ON	9.7
1.264000	---	29.33	46.00	16.67	L	ON	9.7
1.264000	38.73	---	56.00	17.27	L	ON	9.7
1.412000	---	29.36	46.00	16.64	L	ON	9.7
1.412000	39.10	---	56.00	16.90	L	ON	9.7
2.708000	---	26.42	46.00	19.58	L	ON	9.7
2.708000	34.74	---	56.00	21.26	L	ON	9.7
3.780000	---	25.11	46.00	20.89	L	ON	9.7
3.780000	33.09	---	56.00	22.91	L	ON	9.7

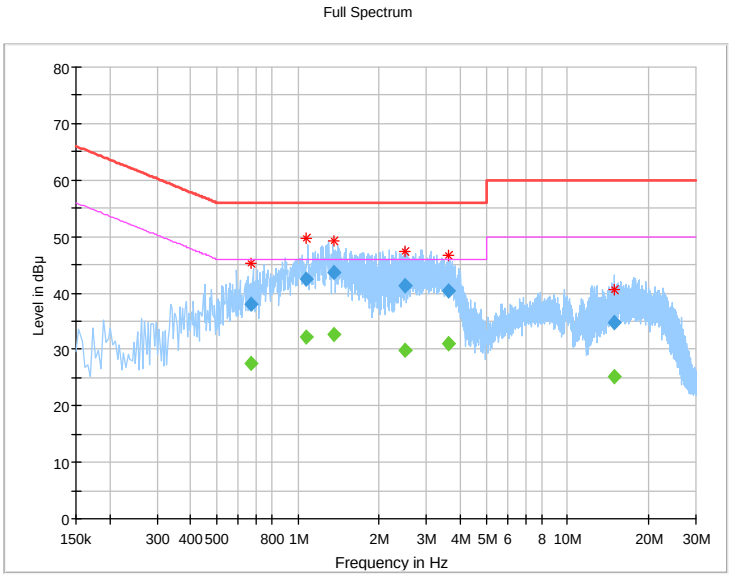
REMARKS: 1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. "-": The Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.
3. The emission levels of other frequencies were very low against the limit.
4. Margin value = Emission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



Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Line	Filter	Corr. (dB)
0.672000	---	27.58	46.00	18.42	N	ON	10.0
0.672000	38.05	---	56.00	17.95	N	ON	10.0
1.076000	---	32.24	46.00	13.76	N	ON	9.9
1.076000	42.42	---	56.00	13.58	N	ON	9.9
1.366000	---	32.64	46.00	13.36	N	ON	9.9
1.366000	**43.67**	**---**	**56.00**	**12.33**	**N**	**ON**	**9.9**
2.496000	---	29.81	46.00	16.19	N	ON	9.8
2.496000	41.26	---	56.00	14.74	N	ON	9.8
3.600000	---	31.08	46.00	14.92	N	ON	9.8
3.600000	40.38	---	56.00	15.62	N	ON	9.8
14.992000	---	25.12	50.00	24.88	N	ON	9.9
14.992000	34.65	---	60.00	25.35	N	ON	9.9

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.

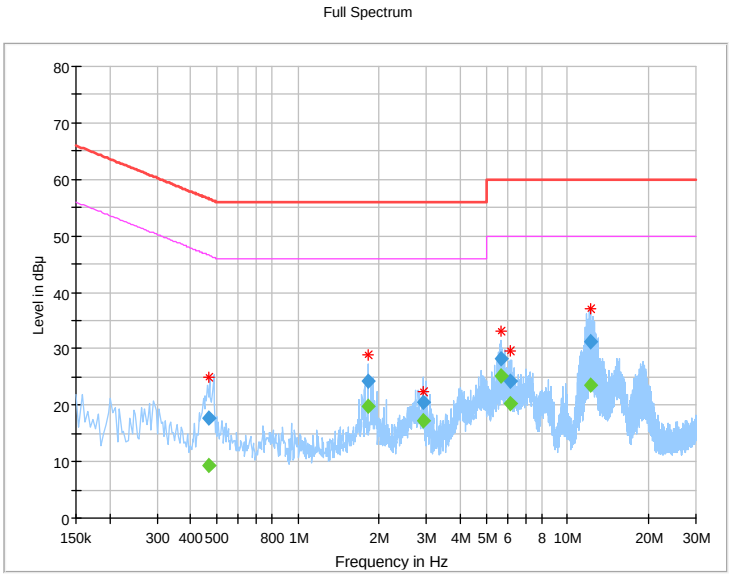


POWER LINE EMISSION DATA:

Phase	Line (L)	Detector Function	Quasi-Peak (QP) / Average (AV)

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Line	Filter	Corr. (dB)
0.468000	---	9.36	46.55	37.19	L1	ON	9.7
0.468000	17.83	---	56.55	38.72	L1	ON	9.7
1.820000	---	19.91	46.00	26.09	L1	ON	9.7
1.820000	24.15	---	56.00	31.85	L1	ON	9.7
2.924000	---	17.29	46.00	28.71	L1	ON	9.7
2.924000	20.59	---	56.00	35.41	L1	ON	9.7
5.692000	---	25.17	50.00	24.83	L1	ON	9.8
5.692000	28.22	---	60.00	31.78	L1	ON	9.8
6.148000	---	20.34	50.00	29.66	L1	ON	9.8
6.148000	24.14	---	60.00	35.86	L1	ON	9.8
12.148000	---	23.66	50.00	26.34	L1	ON	9.9
12.148000	31.20	---	60.00	28.80	L1	ON	9.9

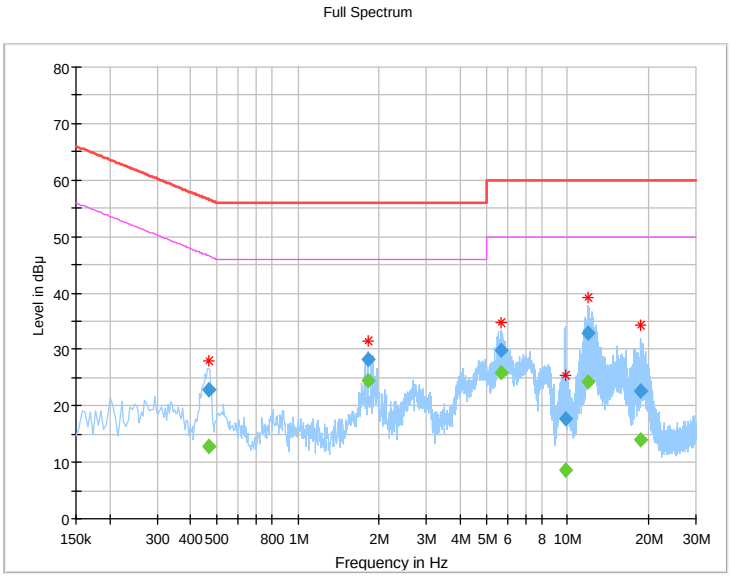
REMARKS: 1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. "-": The Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.
3. The emission levels of other frequencies were very low against the limit.
4. Margin value = Emission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



Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Line	Filter	Corr. (dB)
0.468000	---	12.87	46.55	33.68	N	ON	10.1
0.468000	22.96	---	56.55	33.59	N	ON	10.1
1.820000	---	24.53	46.00	21.47	N	ON	9.8
1.820000	28.21	---	56.00	27.79	N	ON	9.8
5.692000	---	25.87	50.00	24.13	N	ON	9.8
5.692000	29.91	---	60.00	30.09	N	ON	9.8
9.796000	---	8.65	50.00	41.35	N	ON	9.9
9.796000	17.76	---	60.00	42.24	N	ON	9.9
11.916000	---	24.16	50.00	25.84	N	ON	9.9
11.916000	32.90	---	60.00	27.10	N	ON	9.9
18.708000	---	14.11	50.00	35.89	N	ON	10.0
18.708000	22.74	---	60.00	37.26	N	ON	10.0

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	ESR7	101494	Apr. 05,16	Apr. 04,17
Bilog Antenna	Teseq	CBL 6111D	30643	Jul. 16, 15	Jul. 15, 16
Loop Antenna	Daze	ZN30900A	0708	Dec. 30, 15	Dec. 29, 16
Horn Antenna (1GHz -18GHz)	ETS -Lindgren	3117	00062558	May 30, 14	May 29, 17
Amplifier	Burgeon	BPA-530	100220	Apr. 05,16	Apr. 04,17
Pre-Amplifier (18GHz-40GHz)	EMCI	EMC 184045	980102	Nov. 20,15	Nov. 19,17
Pre-Amplifier	HP	8449B	3008A00409	Apr. 25,15	Apr. 24,17
GPS Generator+ Antenna	TOJOIN	GNSS-5000A	E1-010119	Aug. 08, 14	Aug. 07, 16
3m Semi-anechoic Chamber	ETS-LINDGREN	9m*6m*6m	NSEMC003	Mar. 12,16	Mar. 11,18
Test Software	ADT	ADT_Radiated _V7.6.15.9.2	N/A	N/A	N/A

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 966 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 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.

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

c. The 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:

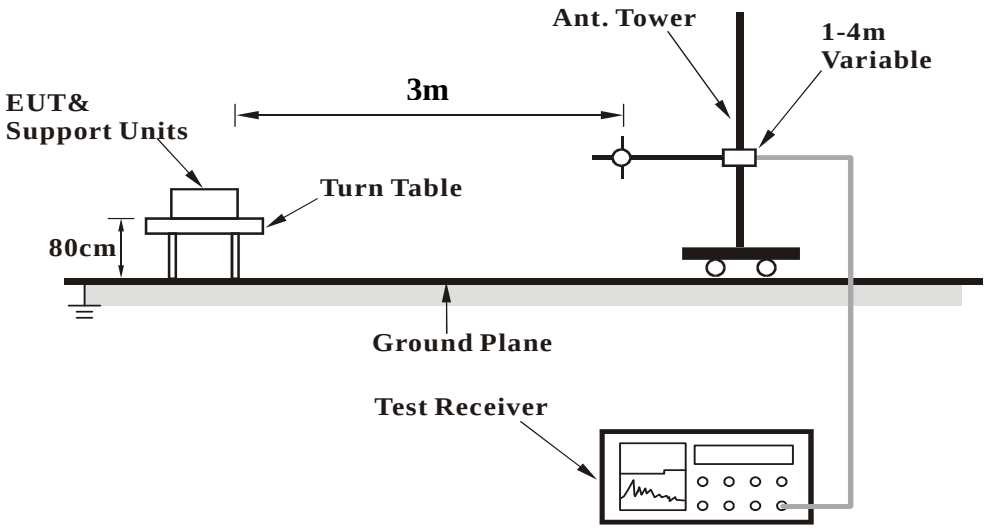
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and video bandwidth is 3MHz for Peak detection at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 10Hz for Average detection (AV) at frequency above 1GHz.
4. All modes of operation were investigated and the worst-case emissions are reported.

4.2.4 DEVIATION FROM TEST STANDARD

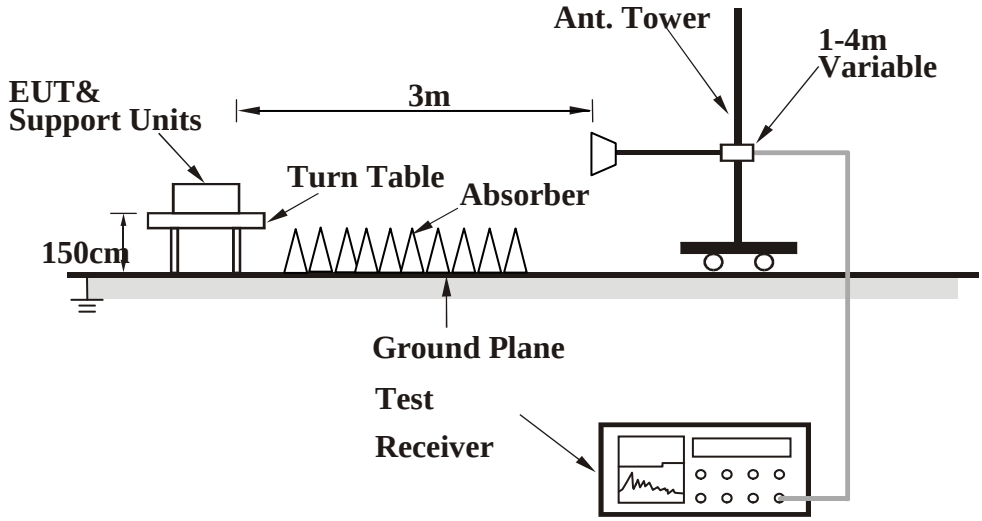
No deviation.

4.2.5 TEST SETUP

<Frequency Range below 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:

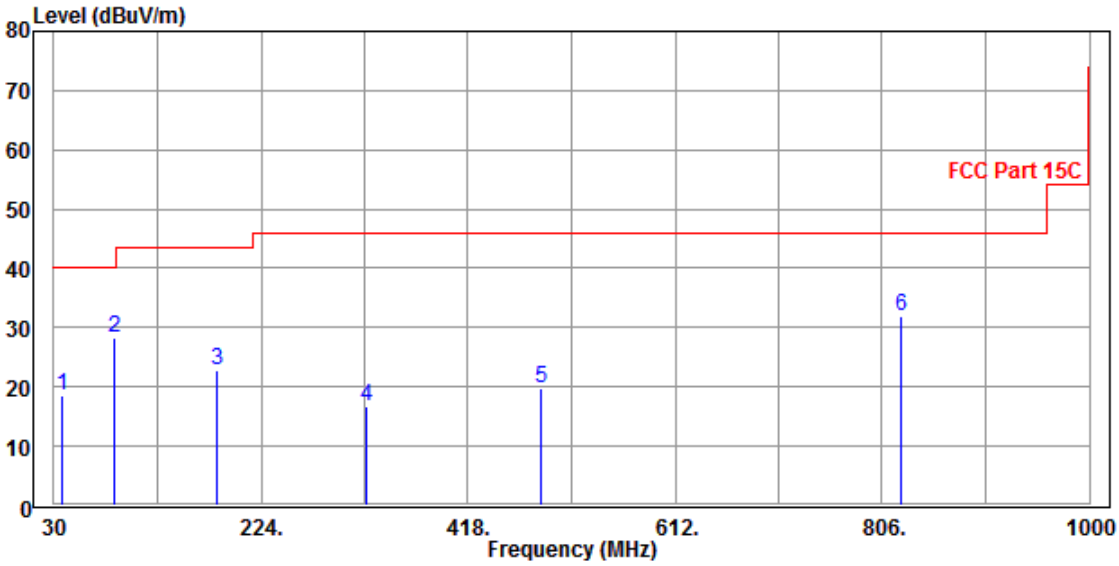
8DPSK DH5

CHANNEL	Channel 0	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
37.76	18.48	43.32	40.00	-21.52	11.75	0.91	37.50	101	180	QP
87.23	28.18	56.99	40.00	-11.82	6.82	1.44	37.07	101	160	QP
183.26	22.79	47.45	43.50	-20.71	9.93	2.08	36.67	101	110	QP
321.97	16.81	36.63	46.00	-29.19	13.92	2.81	36.55	101	102	QP
486.87	19.81	35.08	46.00	-26.19	18.24	3.42	36.93	101	180	QP
824.43	32.01	41.88	46.00	-13.99	23.00	4.75	37.62	101	180	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

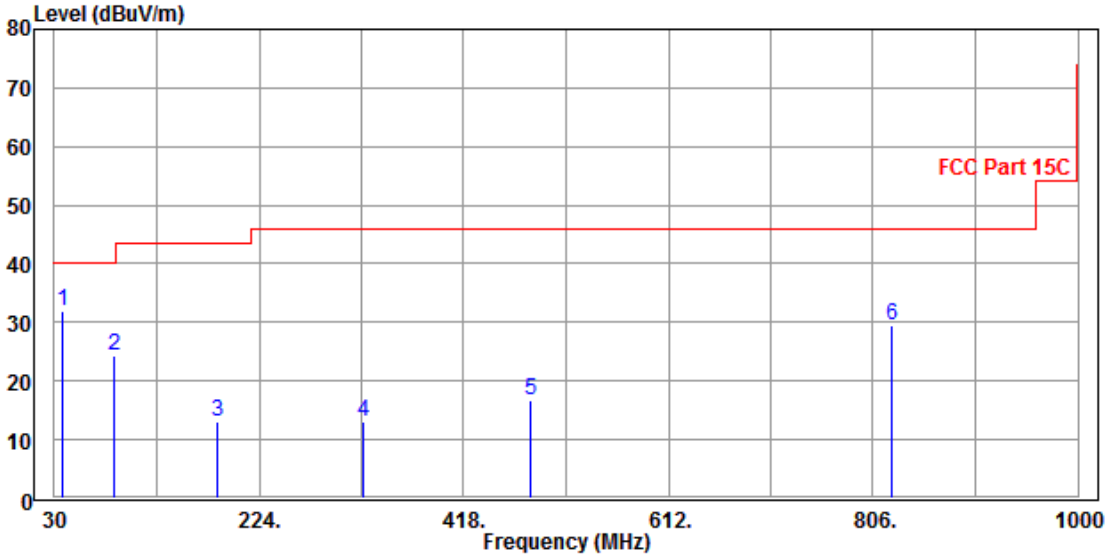


CHANNEL	Channel 0	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	30MHz ~ 1GHz		

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
37.76	31.89	56.73	40.00	-8.11	11.75	0.91	37.50	101	100	QP
87.23	24.46	53.27	40.00	-15.54	6.82	1.44	37.07	101	45	QP
185.20	12.99	37.60	43.50	-30.51	9.95	2.09	36.65	101	89	QP
322.94	13.17	32.94	46.00	-32.83	13.96	2.82	36.55	101	126	QP
482.02	16.73	32.07	46.00	-29.27	18.18	3.40	36.92	101	150	QP
824.43	29.43	39.30	46.00	-16.57	23.00	4.75	37.62	101	133	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:

GFSK DH5

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	39.48	47.35	54.00	-14.52	32.29	8.15	48.31	145	20	Average
2390	65.22	73.09	74.00	-8.78	32.29	8.15	48.31	145	20	Peak
*2402	101.32	109.16			32.30	8.17	48.31	145	20	Average
*2402	108.00	115.84			32.30	8.17	48.31	145	20	Peak
2490	38.08	45.66	54.00	-15.92	32.39	8.33	48.30	145	20	Average
2490	50.36	57.94	74.00	-23.64	32.39	8.33	48.30	145	20	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	36.91	44.78	54.00	-17.09	32.29	8.15	48.31	100	305	Average
2390	54.29	62.16	74.00	-19.71	32.29	8.15	48.31	100	305	Peak
*2402	97.43	105.27			32.30	8.17	48.31	100	305	Average
*2402	103.74	111.58			32.30	8.17	48.31	100	305	Peak
2500	34.18	41.73	54.00	-19.82	32.40	8.35	48.30	100	305	Average
2500	43.59	51.14	74.00	-30.41	32.40	8.35	48.30	100	305	Peak

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
5. " * ": 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	35.72	43.59	54.00	-18.28	32.29	8.15	48.31	148	18	Average
2390	43.55	51.42	74.00	-30.45	32.29	8.15	48.31	148	18	Peak
*2441	103.93	111.66			32.34	8.24	48.31	148	18	Average
*2441	110.16	117.89			32.34	8.24	48.31	148	18	Peak
2489	34.53	42.11	54.00	-19.47	32.39	8.33	48.30	148	18	Average
2489	44.34	51.92	74.00	-29.66	32.39	8.33	48.30	148	18	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	33.87	41.74	54.00	-20.13	32.29	8.15	48.31	100	260	Average
2390	43.25	51.12	74.00	-30.75	32.29	8.15	48.31	100	260	Peak
*2441	97.53	105.26			32.34	8.24	48.31	100	260	Average
*2441	104.38	112.11			32.34	8.24	48.31	100	260	Peak
2489	34.25	41.83	54.00	-19.75	32.39	8.33	48.30	100	260	Average
2489	46.04	53.62	74.00	-27.96	32.39	8.33	48.30	100	260	Peak

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
5. " * ": Fundamental frequency.

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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	36.17	44.04	54.00	-17.83	32.29	8.15	48.31	145	5	Average
2390	45.64	53.51	74.00	-28.36	32.29	8.15	48.31	145	5	Peak
*2480	101.55	109.16			32.38	8.31	48.30	145	5	Average
*2480	107.98	115.59			32.38	8.31	48.30	145	5	Peak
2483.5	38.98	46.58	54.00	-15.02	32.38	8.32	48.30	145	5	Average
2483.5	64.19	71.79	74.00	-9.81	32.38	8.32	48.30	145	5	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
2358	35.02	42.98	54.00	-18.98	32.26	8.09	48.31	100	295	Average
2358	47.79	55.75	74.00	-26.21	32.26	8.09	48.31	100	295	Peak
*2480	96.78	104.39			32.38	8.31	48.30	100	295	Average
*2480	103.70	111.31			32.38	8.31	48.30	100	295	Peak
2483.5	42.56	50.16	54.00	-11.44	32.38	8.32	48.30	100	295	Average
2483.5	54.56	62.16	74.00	-19.44	32.38	8.32	48.30	100	295	Peak

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
5. " * ": Fundamental frequency.

BT_8DPSK

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	37.81	45.68	54.00	-16.19	32.29	8.15	48.31	145	22	Average
2390	63.01	70.88	74.00	-10.99	32.29	8.15	48.31	145	22	Peak
*2402	98.64	106.48			32.30	8.17	48.31	145	22	Average
*2402	107.67	115.51			32.30	8.17	48.31	145	22	Peak
2488.7	36.94	44.52	54.00	-17.06	32.39	8.33	48.30	145	22	Average
2488.7	49.60	57.18	74.00	-24.40	32.39	8.33	48.30	145	22	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	34.30	42.17	54.00	-19.70	32.29	8.15	48.31	100	260	Average
2390	59.58	67.45	74.00	-14.42	32.29	8.15	48.31	100	260	Peak
*2402	94.71	102.55			32.30	8.17	48.31	100	260	Average
*2402	103.87	111.71			32.30	8.17	48.31	100	260	Peak
2486	34.04	41.63	54.00	-19.96	32.39	8.32	48.30	100	260	Average
2486	43.64	51.23	74.00	-30.36	32.39	8.32	48.30	100	260	Peak

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
5. " * ": 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	37.91	45.78	54.00	-16.09	32.29	8.15	48.31	146	16	Average
2390	48.42	56.29	74.00	-25.58	32.29	8.15	48.31	146	16	Peak
*2441	101.07	108.80			32.34	8.24	48.31	146	16	Average
*2441	109.99	117.72			32.34	8.24	48.31	146	16	Peak
2486.8	38.08	45.66	54.00	-15.92	32.39	8.33	48.30	146	16	Average
2486.8	50.33	57.91	74.00	-23.67	32.39	8.33	48.30	146	16	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
2388	33.86	41.73	54.00	-20.14	32.29	8.15	48.31	108	268	Average
2388	43.28	51.15	74.00	-30.72	32.29	8.15	48.31	108	268	Peak
*2441	95.80	103.53			32.34	8.24	48.31	108	268	Average
*2441	104.90	112.63			32.34	8.24	48.31	108	268	Peak
2494.3	34.28	41.85	54.00	-19.72	32.39	8.34	48.30	108	268	Average
2494.3	46.68	54.25	74.00	-27.32	32.39	8.34	48.30	108	268	Peak

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
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										
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
2386	33.74	41.62	54.00	-20.26	32.29	8.14	48.31	148	23	Average
2386	43.59	51.47	74.00	-30.41	32.29	8.14	48.31	148	23	Peak
*2480	99.12	106.73			32.38	8.31	48.30	148	23	Average
*2480	108.18	115.79			32.38	8.31	48.30	148	23	Peak
2488.2	37.93	45.51	54.00	-16.07	32.39	8.33	48.30	148	23	Average
2488.2	**66.43**	**74.01**	**74.00**	**-7.57**	**32.39**	**8.33**	**48.30**	**148**	**23**	**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	34.23	42.10	54.00	-19.77	32.29	8.15	48.31	100	296	Average
2390	46.26	54.13	74.00	-27.74	32.29	8.15	48.31	100	296	Peak
*2480	93.79	101.40			32.38	8.31	48.30	100	296	Average
*2480	103.21	110.82			32.38	8.31	48.30	100	296	Peak
2488.2	36.31	43.89	54.00	-17.69	32.39	8.33	48.30	100	296	Average
2488.2	61.51	69.09	74.00	-12.49	32.39	8.33	48.30	100	296	Peak

REMARKS:

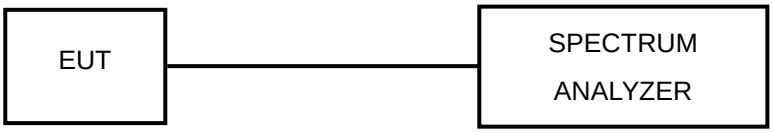
1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.

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.
Spectrum Analyzer (10Hz–40GHz)	Rohde&Schwarz	FSV40	101003	Apr. 05,16	Apr. 04,17
Power Meter	Anritsu	ML2495A	1139001	Feb.19,16	Feb. 18,17
Power Sensor	Anritsu	MA2411B	1126068	Feb.19,16	Feb. 18,17
Power Sensor	Keysight	U2021XA	MY55060016	May 27,15	May 26,17
Power Sensor	Keysight	U2021XA	MY55060018	May 27,15	May 26,17
Digital Multimeter	FLUKE	15B	A1220010DG	Oct. 12, 15	Oct.11, 16

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.

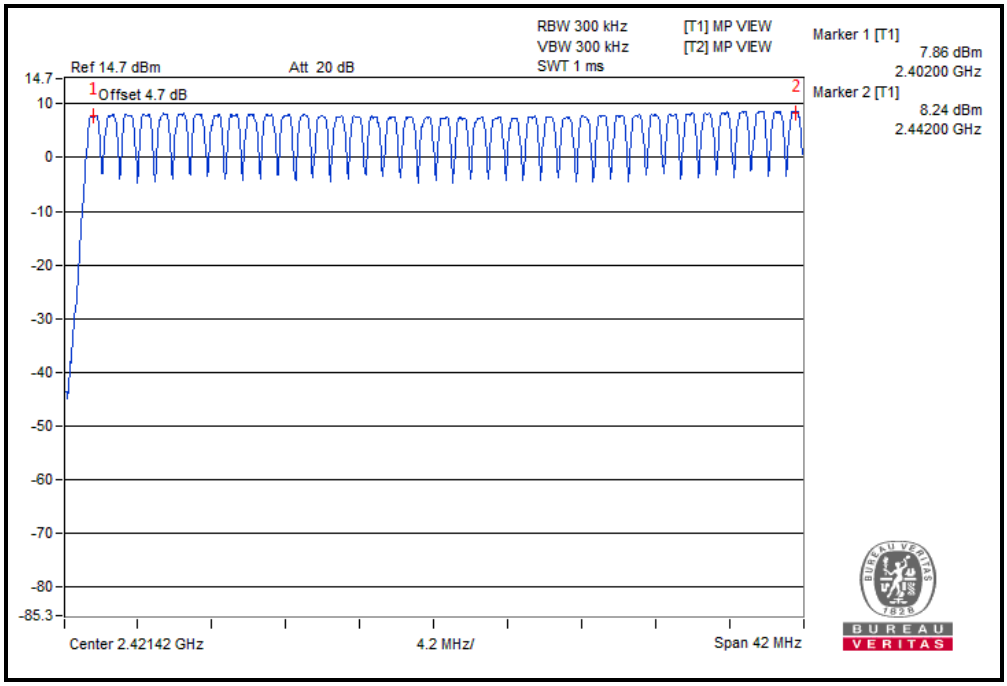
4.3.5 DEVIATION FROM TEST STANDARD

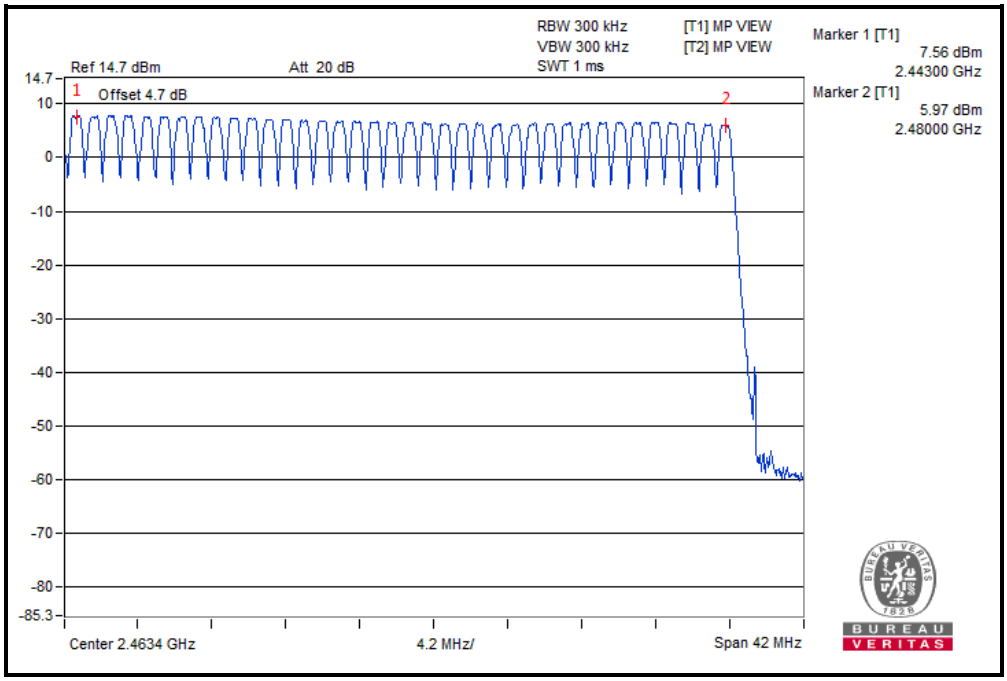
No deviation.

4.3.6 TEST RESULTS

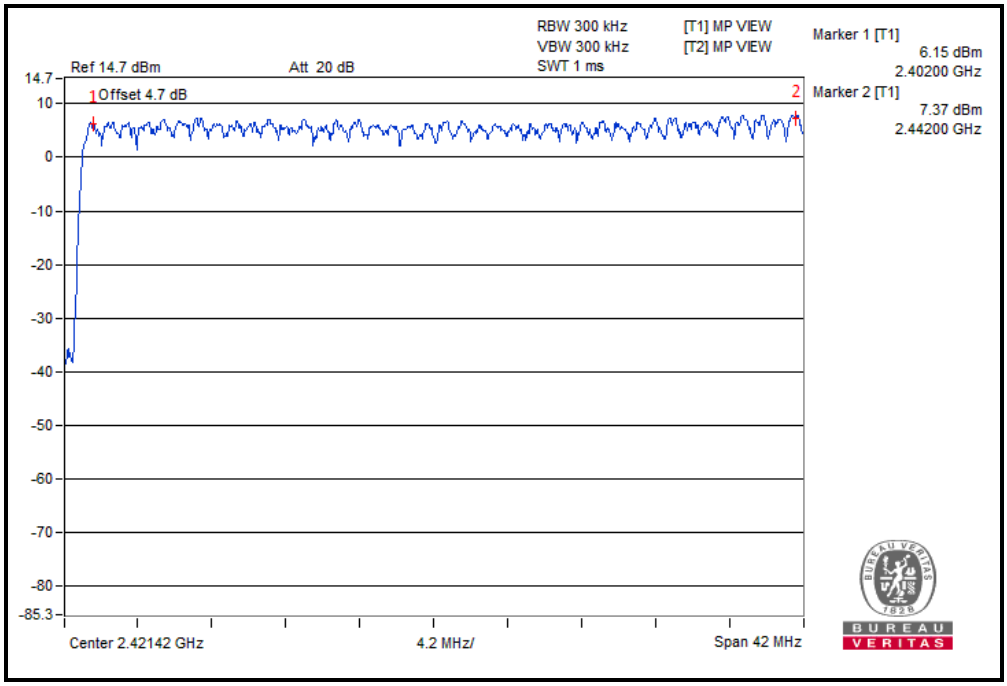
There are 79 hopping frequencies in the hopping mode. Please refer to next two pages for the test result. On the plots, it shows that the hopping frequencies are equally spaced.

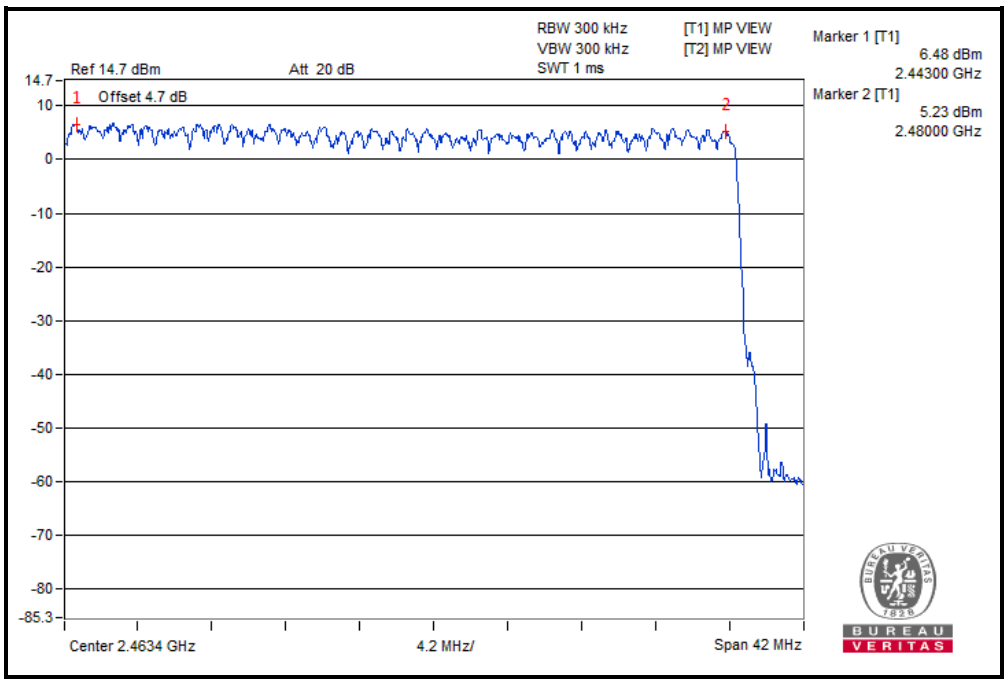
GFSK


RBW 300 kHz
VBW 300 kHz
SWT 1 ms
[T1] MP VIEW
[T2] MP VIEW
Marker 1 [T1]
7.86 dBm
2.40200 GHz
Marker 2 [T1]
8.24 dBm
2.44200 GHz
Ref 14.7 dBm
Att 20 dB
Offset 4.7 dB
14.7
10
0
-10
-20
-30
-40
-50
-60
-70
-80
-85.3
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]
7.56 dBm
2.44300 GHz
Marker 2 [T1]
5.97 dBm
2.48000 GHz
Ref 14.7 dBm
Att 20 dB
Offset 4.7 dB
14.7
10
0
-10
-20
-30
-40
-50
-60
-70
-80
-85.3
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]
6.15 dBm
2.40200 GHz
Marker 2 [T1]
7.37 dBm
2.44200 GHz
Ref 14.7 dBm
Att 20 dB
Offset 4.7 dB
14.7
10
0
-10
-20
-30
-40
-50
-60
-70
-80
-85.3
Center 2.42142 GHz
4.2 MHz/
Span 42 MHz

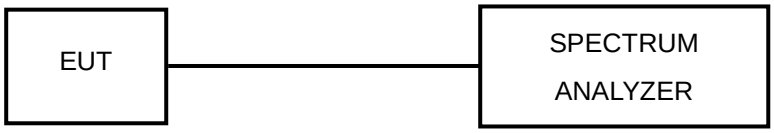

RBW 300 kHz
VBW 300 kHz
SWT 1 ms
[T1] MP VIEW
[T2] MP VIEW
Marker 1 [T1]
6.48 dBm
2.44300 GHz
Marker 2 [T1]
5.23 dBm
2.48000 GHz
Ref 14.7 dBm
Att 20 dB
Offset 4.7 dB
14.7
10
0
-10
-20
-30
-40
-50
-60
-70
-80
-85.3
Center 2.4634 GHz
4.2 MHz/
Span 42 MHz

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

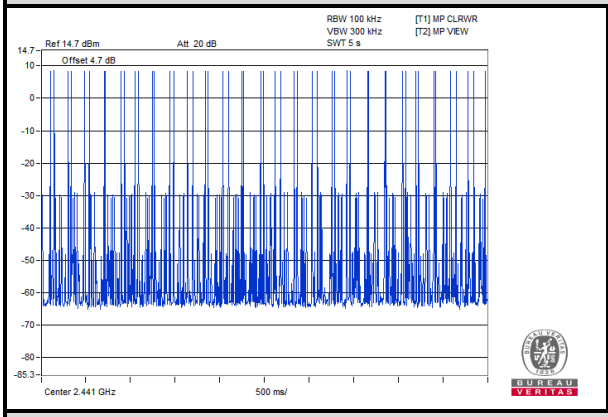
GFSK

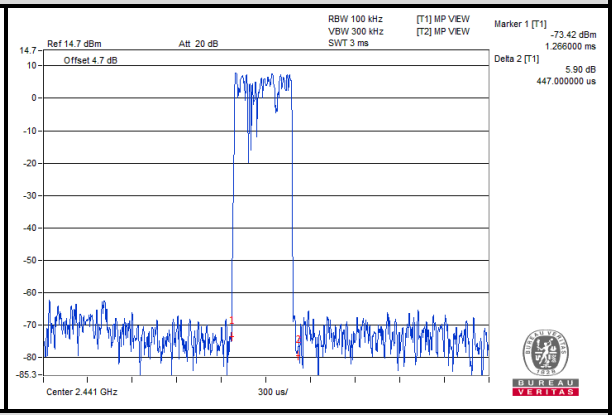
Mode	Number of Hopping Channel	Number of transmission in a period(channel number*0.4 sec)				Length of transmission time (msec)	Result (msec)	Limit (msec)	PASS / FAIL
		period (sec)	sweep time (sec)	times in a sweep	times in a period				
DH1	79	31.6	5	47	297.04	0.447	132.78	400	PASS
DH3	79	31.6	5	27	170.64	1.68	286.68	400	PASS
DH5	79	31.6	5	18	113.76	2.935	333.89	400	PASS

NOTE: Test plots of the transmitting time slot are shown on next 3 pages.

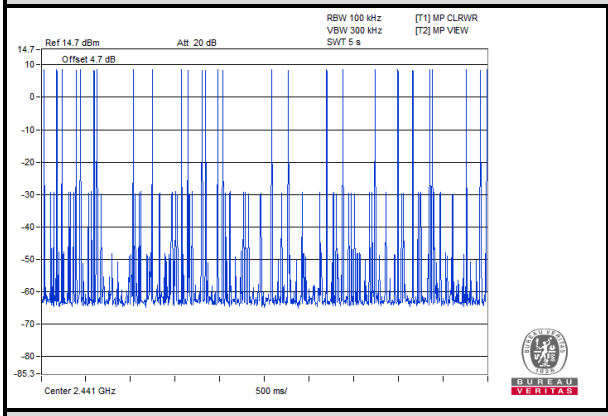
GFSK

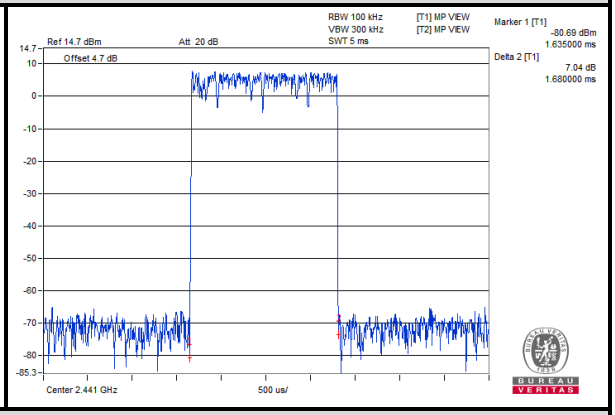
DH1



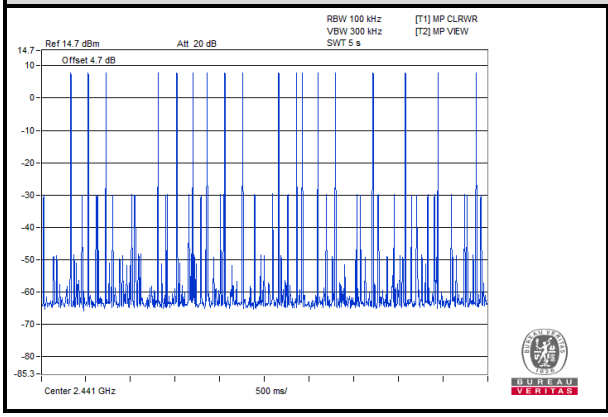


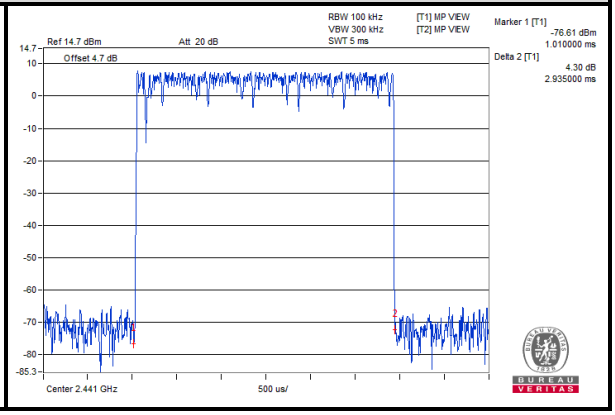
DH3





DH5



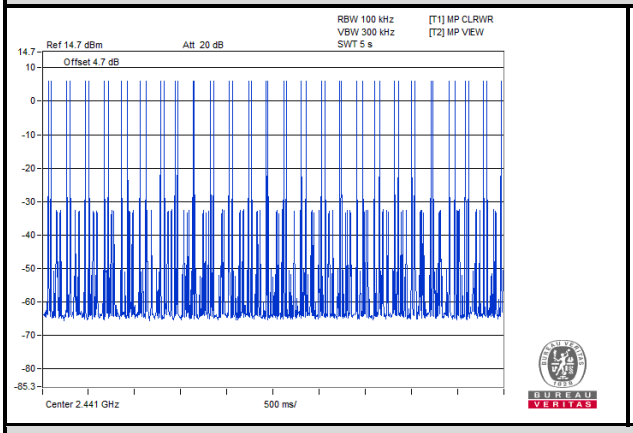
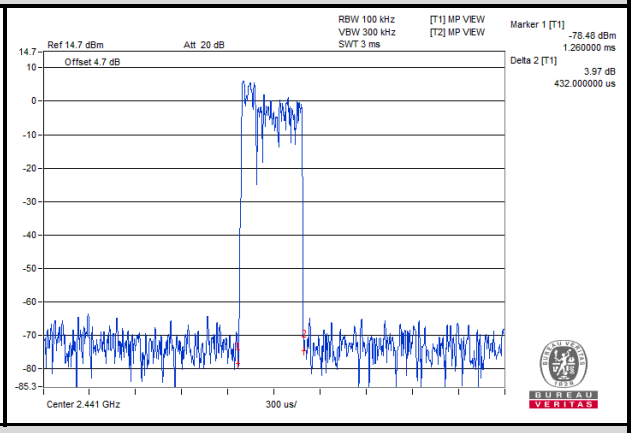
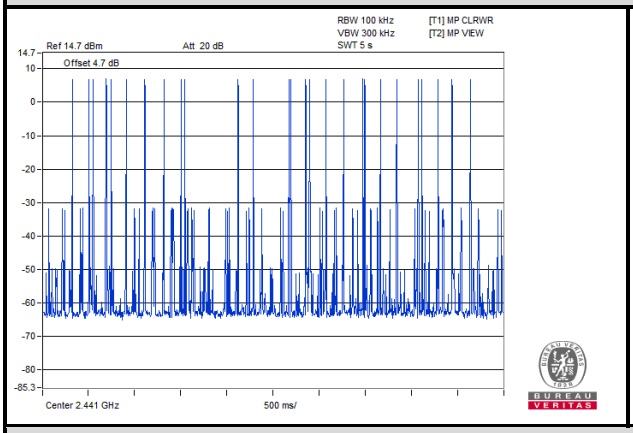
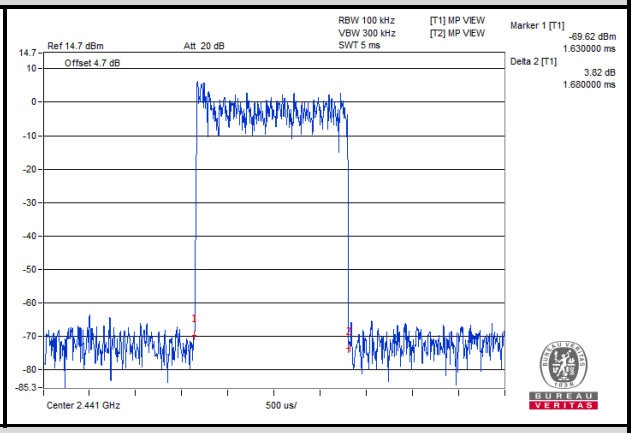
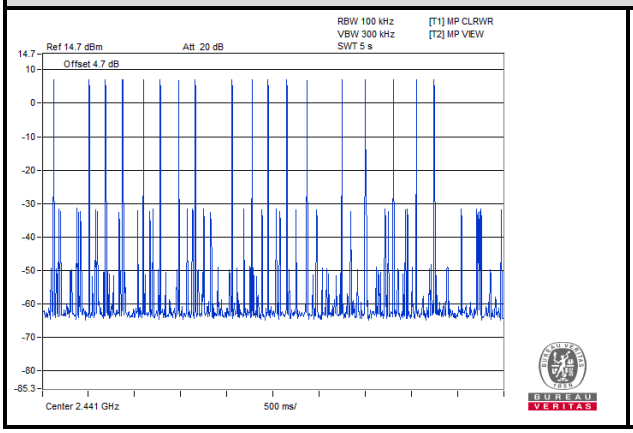
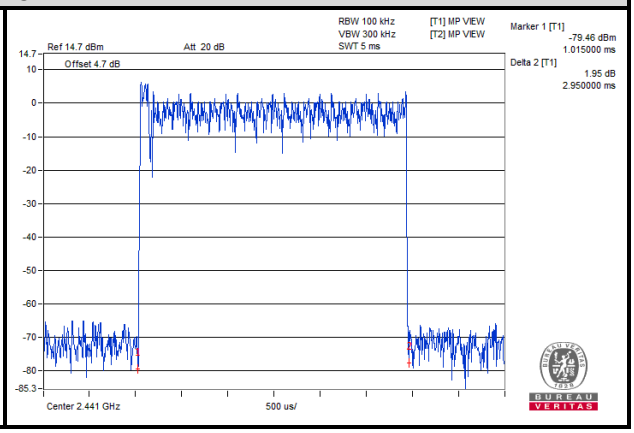


8DPSK

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	50	316	0.432	136.51	400	PASS
DH3	79	31.6	5	27	170.64	1.68	286.68	400	PASS
DH5	79	31.6	5	18	113.76	2.95	335.59	400	PASS

NOTE: Test plots of the transmitting time slot are shown on next 3 pages.

8DPSK

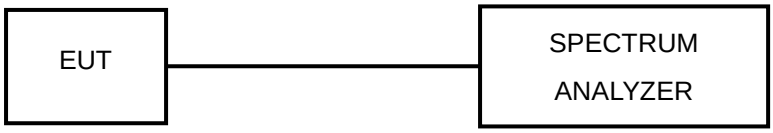
DH1	
	
DH3	
	
DH5	
	

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

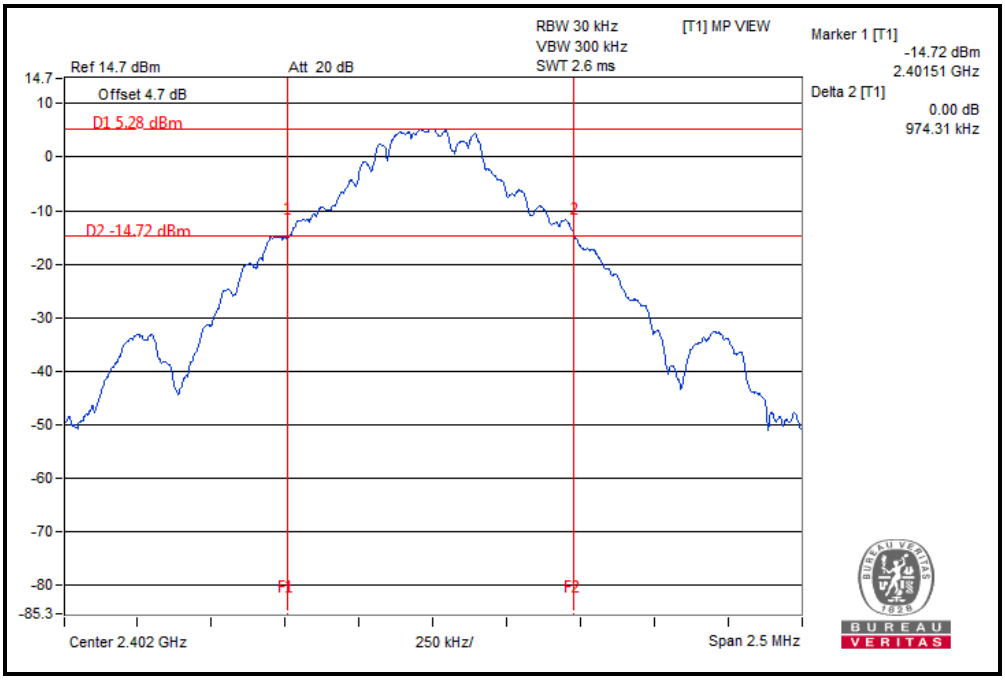
The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.

4.5.7 TEST RESULTS

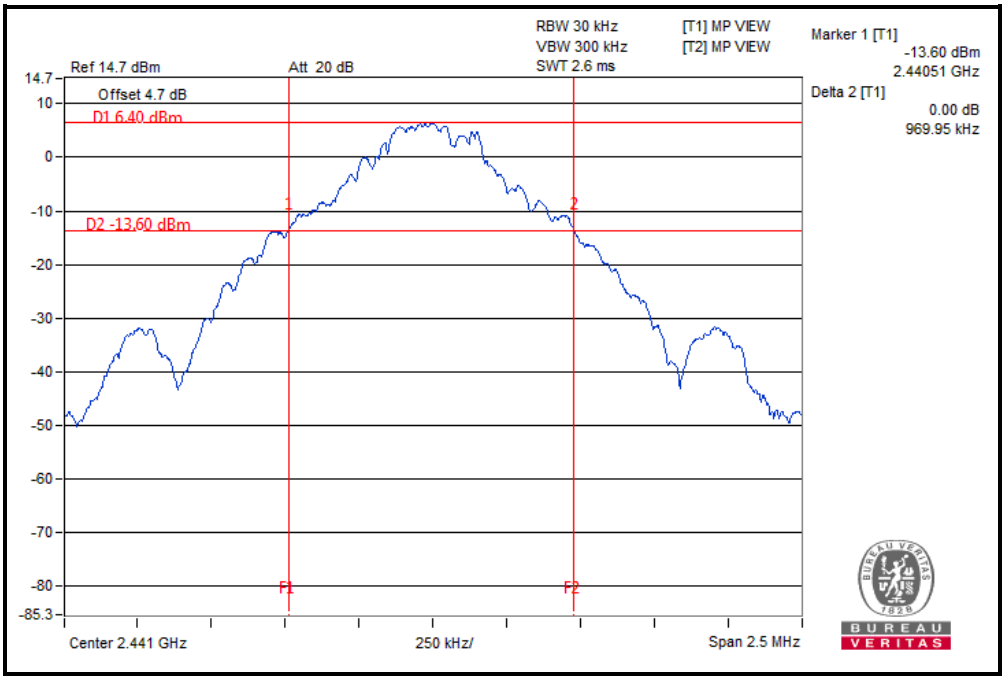
GFSK

CHANNEL	CHANNEL FREQUENCY (MHz)	20dB BANDWIDTH (MHz)
0	2402	0.97
39	2441	0.97
78	2480	0.97

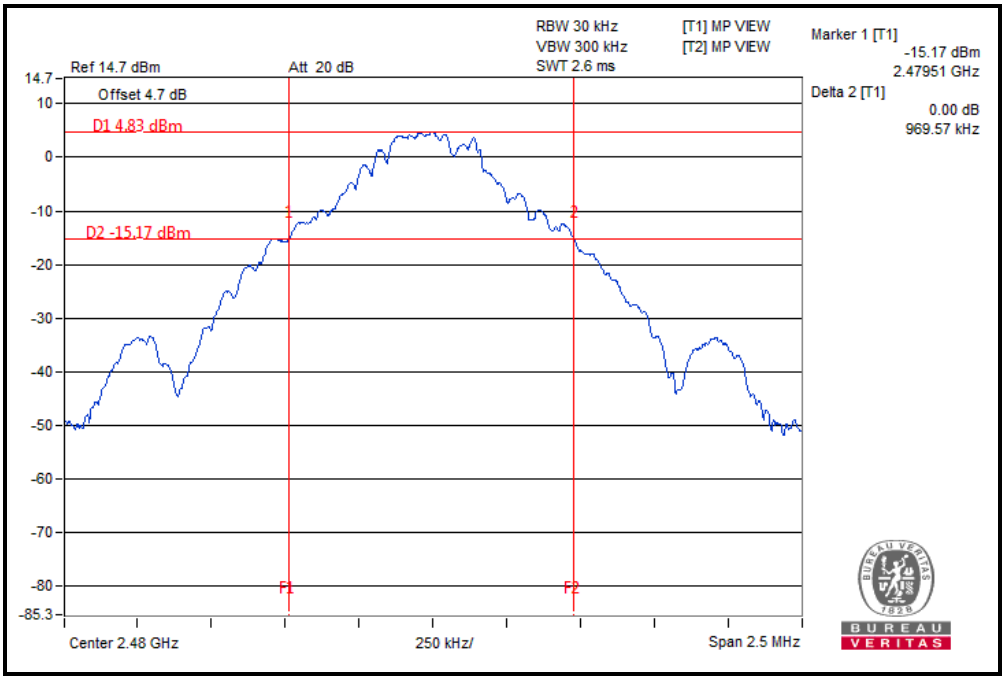
CH 0



CH 39

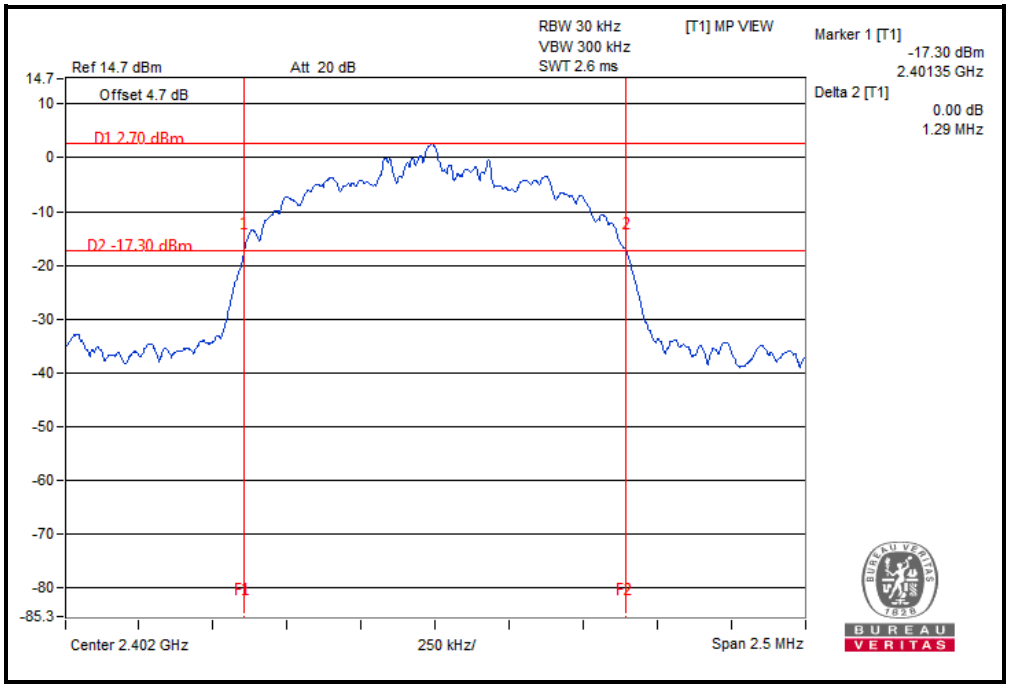

RBW 30 kHz
VBW 300 kHz
SWT 2.6 ms
[T1] MP VIEW
[T2] MP VIEW
Marker 1 [T1]
-13.60 dBm
2.44051 GHz
Delta 2 [T1]
0.00 dB
969.95 kHz
Ref 14.7 dBm
Att 20 dB
Offset 4.7 dB
D1 6.40 dBm
D2 -13.60 dBm
14.7
10
0
-10
-20
-30
-40
-50
-60
-70
-80
-85.3
F1
F2
Center 2.441 GHz
250 kHz/
Span 2.5 MHz

CH 78


RBW 30 kHz
VBW 300 kHz
SWT 2.6 ms
[T1] MP VIEW
[T2] MP VIEW
Marker 1 [T1]
-15.17 dBm
2.47951 GHz
Delta 2 [T1]
0.00 dB
969.57 kHz
Ref 14.7 dBm
Att 20 dB
Offset 4.7 dB
D1 4.83 dBm
D2 -15.17 dBm
14.7
10
0
-10
-20
-30
-40
-50
-60
-70
-80
-85.3
F1
F2
Center 2.48 GHz
250 kHz/
Span 2.5 MHz

π/4 DQPSK

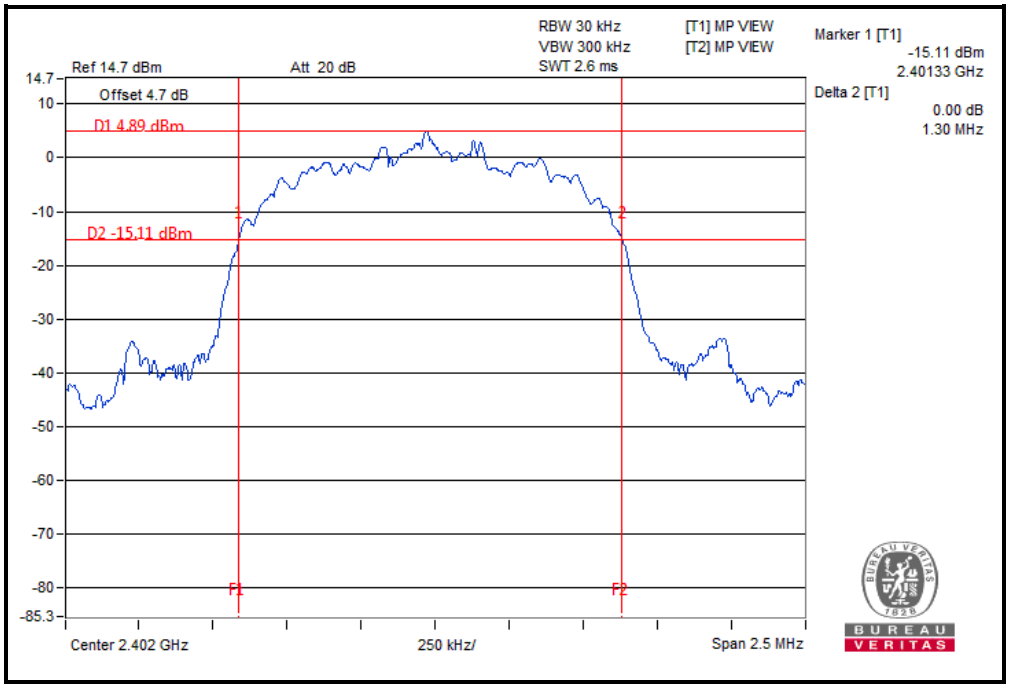
CHANNEL	CHANNEL FREQUENCY (MHz)	20dB BANDWIDTH (MHz)
0	2402	1.29
39	2441	1.29
78	2480	1.29



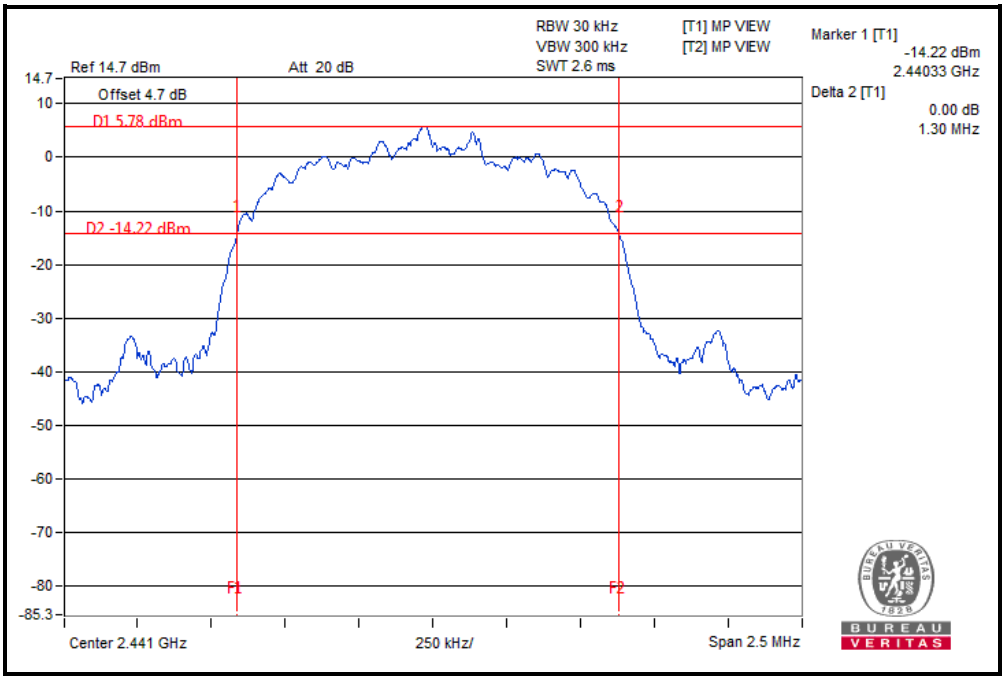
8DPSK

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

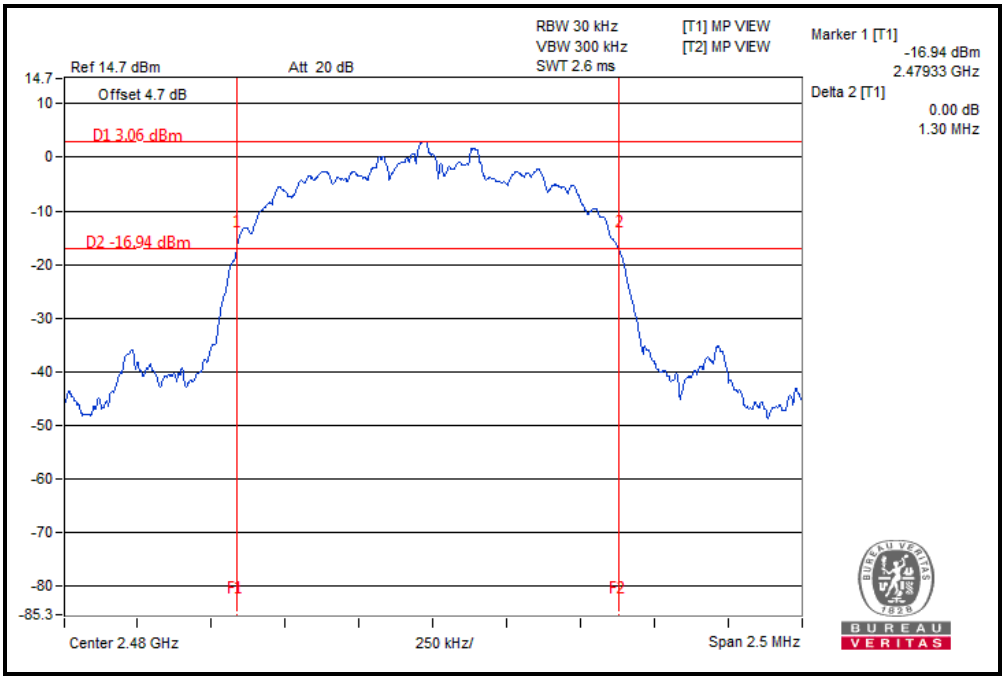
CH 0



CH 39


RBW 30 kHz
VBW 300 kHz
SWT 2.6 ms
[T1] MP VIEW
[T2] MP VIEW
Marker 1 [T1]
-14.22 dBm
2.44033 GHz
Delta 2 [T1]
0.00 dB
1.30 MHz
Ref 14.7 dBm
Att 20 dB
Offset 4.7 dB
D1 5.78 dBm
D2 -14.22 dBm
14.7
10
0
-10
-20
-30
-40
-50
-60
-70
-80
-85.3
F1
F2
Center 2.441 GHz
250 kHz/
Span 2.5 MHz

CH 78

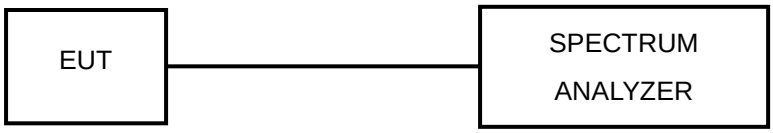

RBW 30 kHz
VBW 300 kHz
SWT 2.6 ms
[T1] MP VIEW
[T2] MP VIEW
Marker 1 [T1]
-16.94 dBm
2.47933 GHz
Delta 2 [T1]
0.00 dB
1.30 MHz
Ref 14.7 dBm
Att 20 dB
Offset 4.7 dB
D1 3.06 dBm
D2 -16.94 dBm
14.7
10
0
-10
-20
-30
-40
-50
-60
-70
-80
-85.3
F1
F2
Center 2.48 GHz
250 kHz/
Span 2.5 MHz

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.

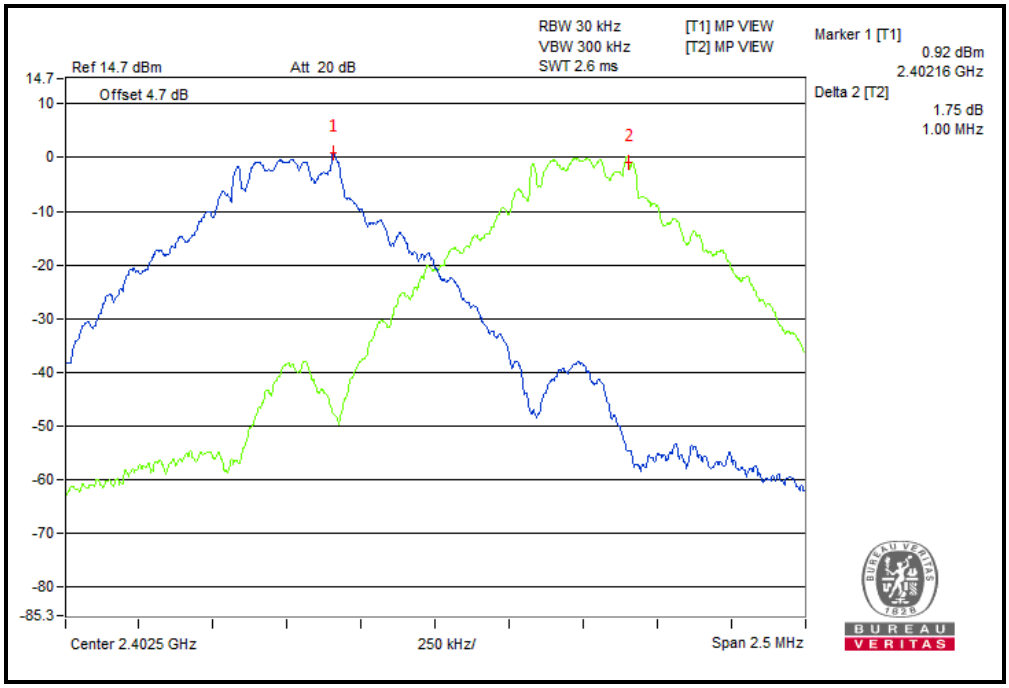
4.6.6 TEST RESULTS

GFSK

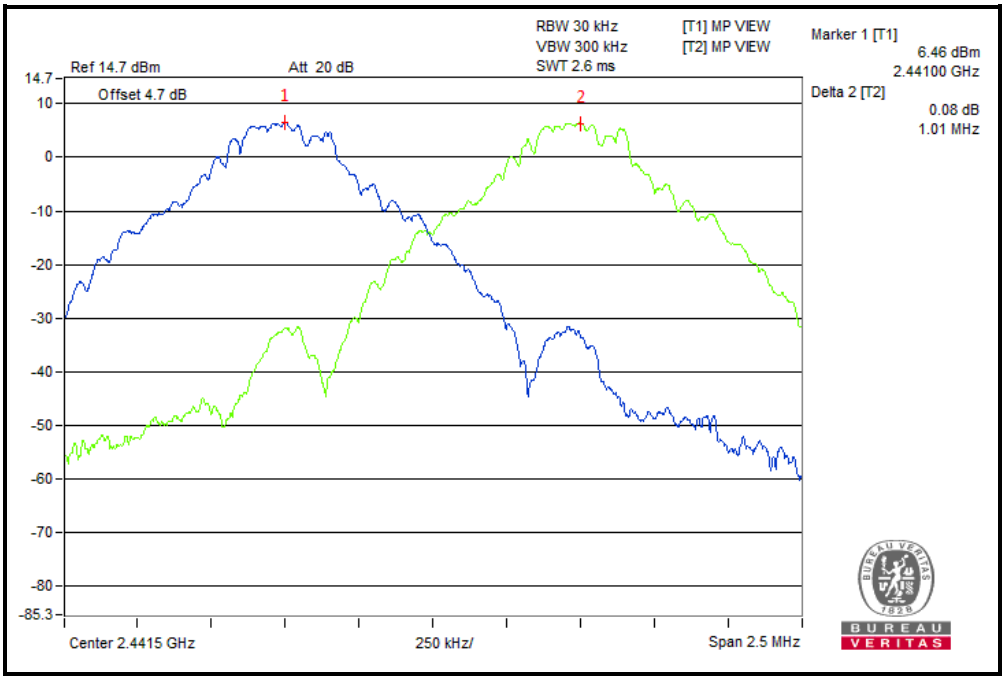
CHANNEL	FREQUENCY (MHz)	ADJACENT CHANNEL SEPARATION (MHz)	20dB BANDWIDTH (MHz)	MINIMUM LIMIT (MHz)	PASS / FAIL
0	2402	1.00	0.97	0.65	PASS
39	2441	1.01	0.97	0.65	PASS
78	2480	1.00	0.97	0.65	PASS

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

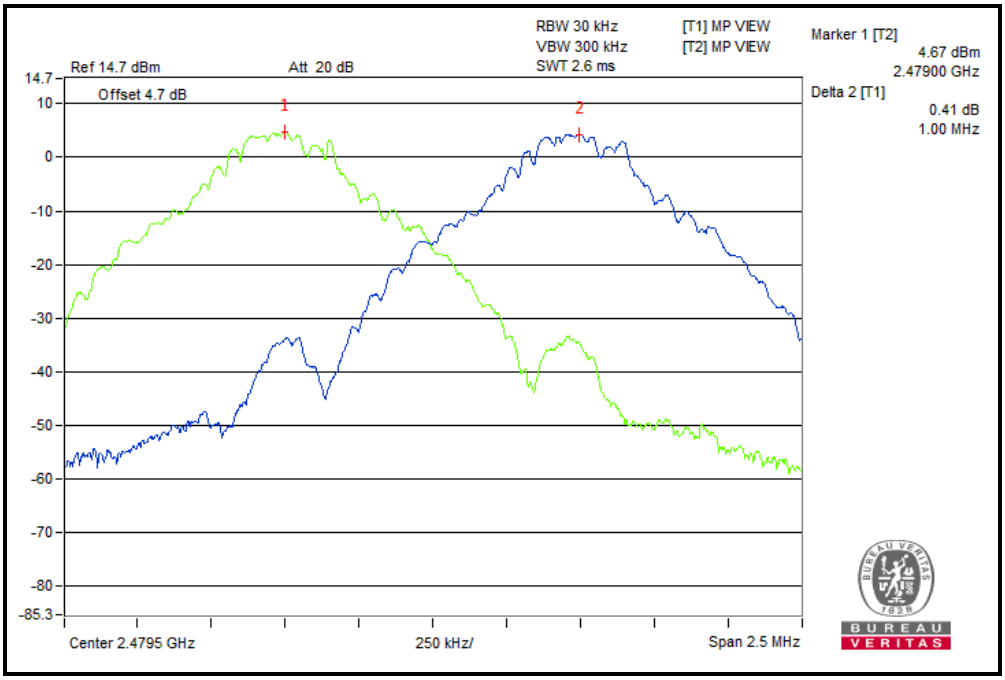
CH 0



CH 39


RBW 30 kHz
VBW 300 kHz
SWT 2.6 ms
[T1] MP VIEW
[T2] MP VIEW
Marker 1 [T1]
6.46 dBm
2.44100 GHz
Delta 2 [T2]
0.08 dB
1.01 MHz
Ref 14.7 dBm
Att 20 dB
Offset 4.7 dB
14.7
10
0
-10
-20
-30
-40
-50
-60
-70
-80
-85.3
Center 2.4415 GHz
250 kHz/
Span 2.5 MHz

CH 78

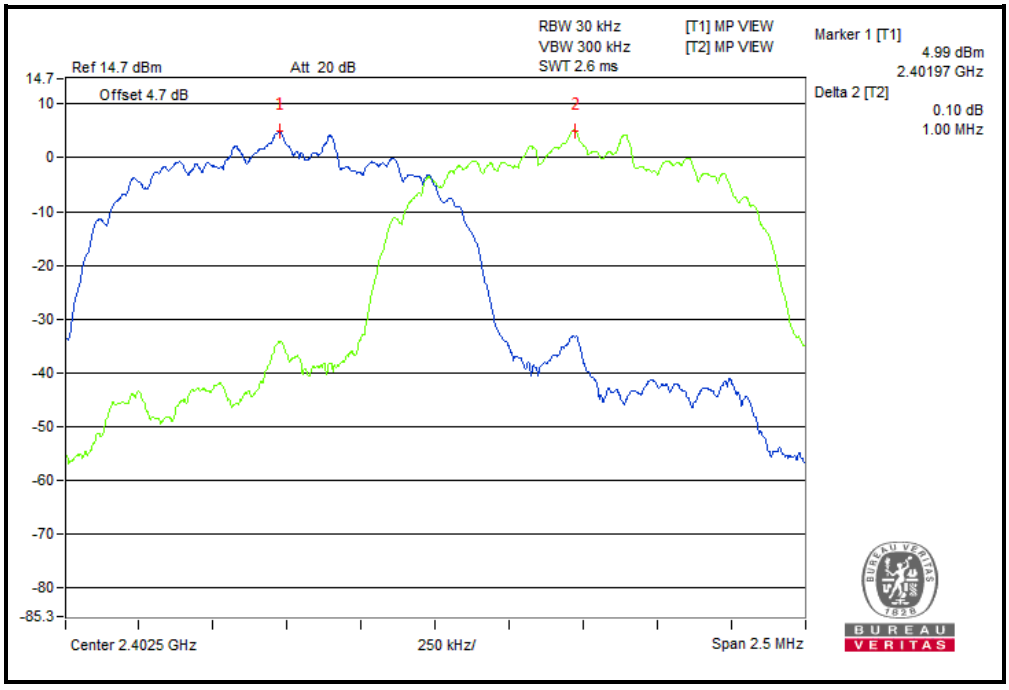

RBW 30 kHz
VBW 300 kHz
SWT 2.6 ms
[T1] MP VIEW
[T2] MP VIEW
Marker 1 [T2]
4.67 dBm
2.47900 GHz
Delta 2 [T1]
0.41 dB
1.00 MHz
Ref 14.7 dBm
Att 20 dB
Offset 4.7 dB
14.7
10
0
-10
-20
-30
-40
-50
-60
-70
-80
-85.3
Center 2.4795 GHz
250 kHz/
Span 2.5 MHz

8DPSK

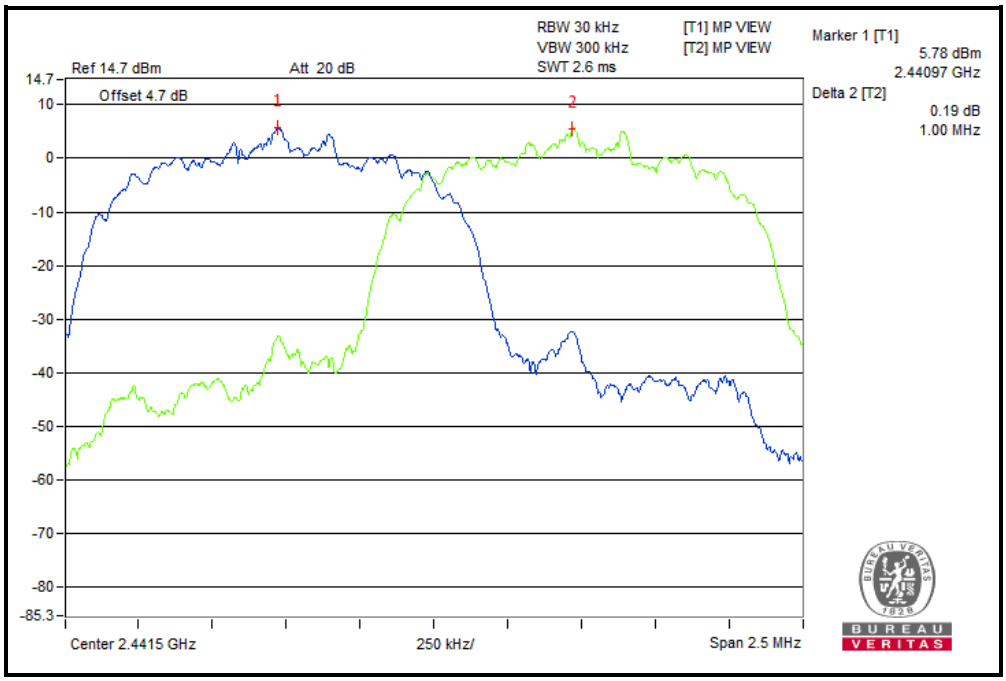
CHANNEL	FREQUENCY (MHz)	ADJACENT CHANNEL SEPARATION (MHz)	20dB BANDWIDTH (MHz)	MINIMUM LIMIT (MHz)	PASS / FAIL
0	2402	1.00	1.30	0.87	PASS
39	2441	1.00	1.30	0.87	PASS
78	2480	1.00	1.30	0.87	PASS

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

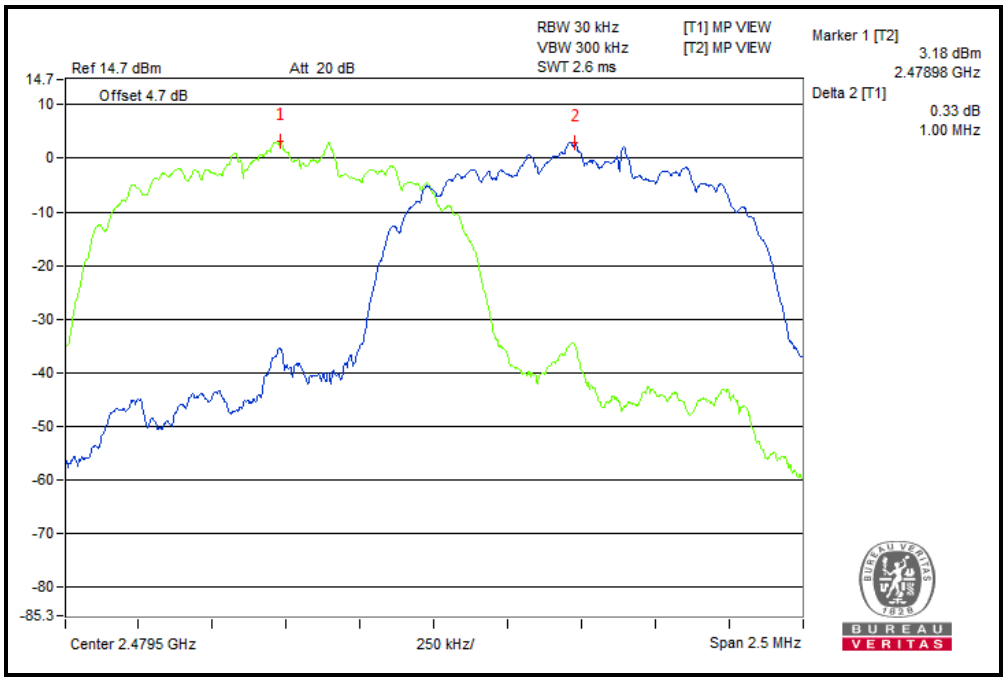
CH 0



CH 39


RBW 30 kHz
VBW 300 kHz
SWT 2.6 ms
[T1] MP VIEW
[T2] MP VIEW
Marker 1 [T1]
5.78 dBm
2.44097 GHz
Delta 2 [T2]
0.19 dB
1.00 MHz
Ref 14.7 dBm
Att 20 dB
Offset 4.7 dB
14.7
10
0
-10
-20
-30
-40
-50
-60
-70
-80
-85.3
Center 2.4415 GHz
250 kHz/
Span 2.5 MHz

CH 78

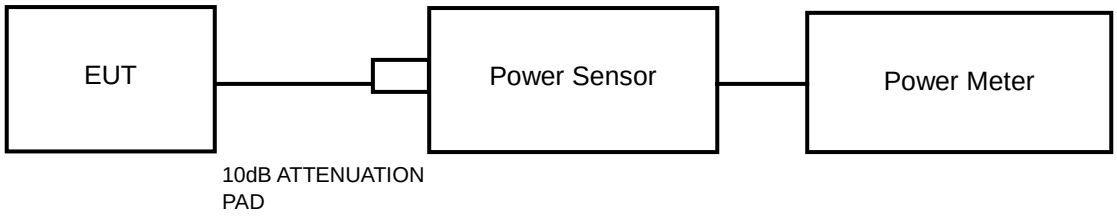

RBW 30 kHz
VBW 300 kHz
SWT 2.6 ms
[T1] MP VIEW
[T2] MP VIEW
Marker 1 [T2]
3.18 dBm
2.47898 GHz
Delta 2 [T1]
0.33 dB
1.00 MHz
Ref 14.7 dBm
Att 20 dB
Offset 4.7 dB
14.7
10
0
-10
-20
-30
-40
-50
-60
-70
-80
-85.3
Center 2.4795 GHz
250 kHz/
Span 2.5 MHz

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 power sensor was used on the output port of the EUT. A power meter was used to read the response of the 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	9.49	8.892	125	PASS
39	2441	10.30	**10.715**	125	PASS
78	2480	8.74	7.482	125	PASS

π/4 DQPSK

CHANNEL	CHANNEL FREQUENCY (MHz)	POWER OUTPUT (dBm)	POWER OUTPUT (mW)	POWER LIMIT (mW)	PASS/FAIL
0	2402	8.47	7.031	125	PASS
39	2441	9.15	8.222	125	PASS
78	2480	7.68	5.861	125	PASS

8DPSK

CHANNEL	CHANNEL FREQUENCY (MHz)	POWER OUTPUT (dBm)	POWER OUTPUT (mW)	POWER LIMIT (mW)	PASS/FAIL
0	2402	8.54	7.145	125	PASS
39	2441	9.36	8.630	125	PASS
78	2480	7.71	5.902	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. of Spectrum Analyzer was set RBW to 100 kHz and VBW to 100 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

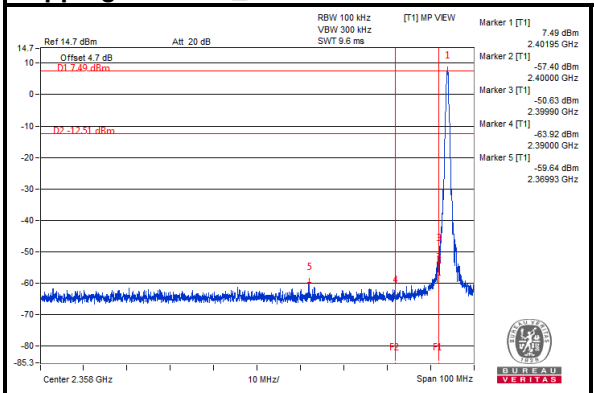
The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.

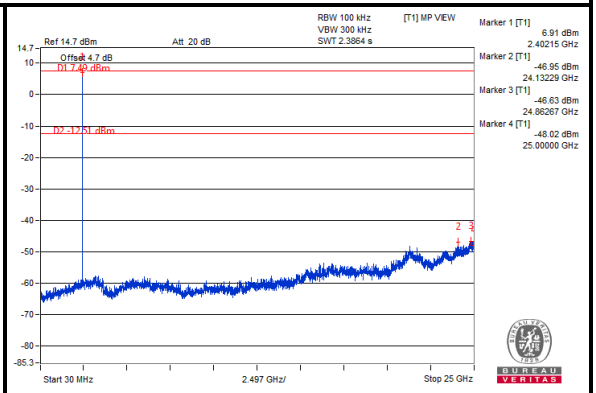
4.8.6 TEST RESULTS

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.

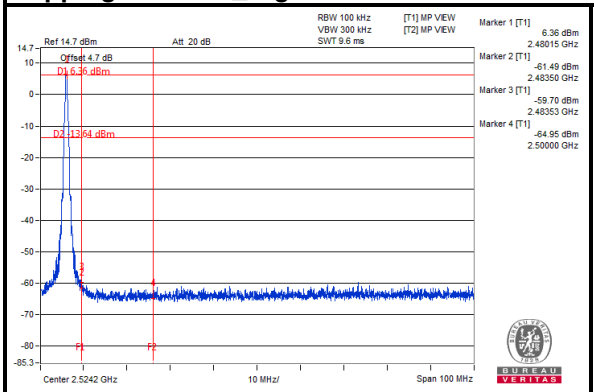
GFSK

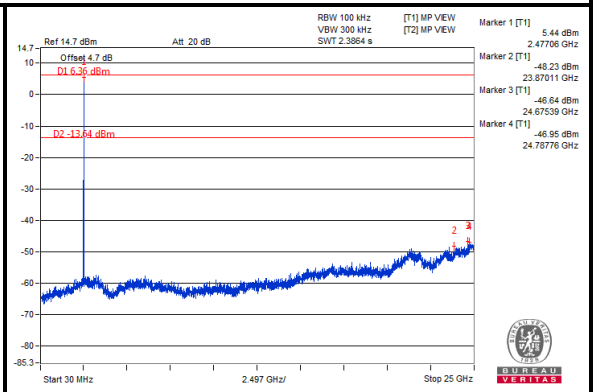
Hopping disabled_Low Channel



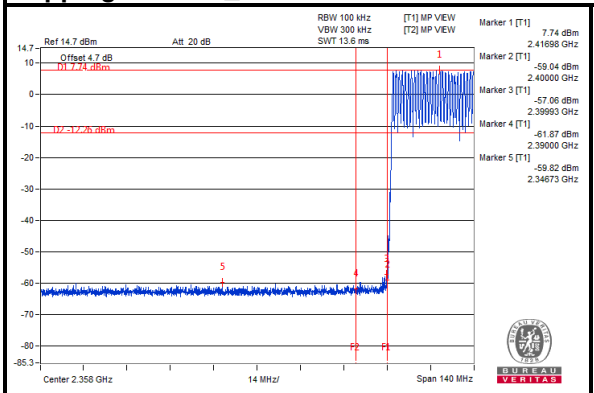


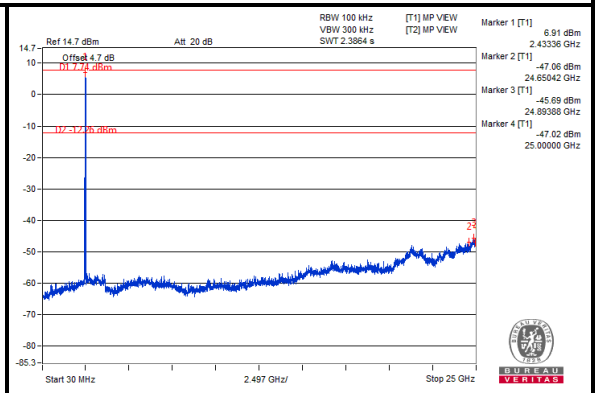
Hopping disabled_High Channel



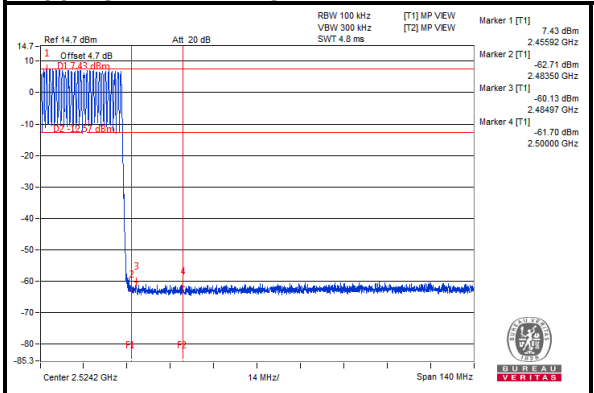


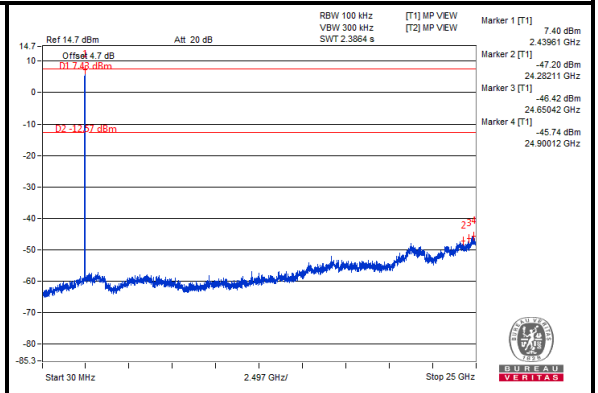
Hopping enabled_Low Channel





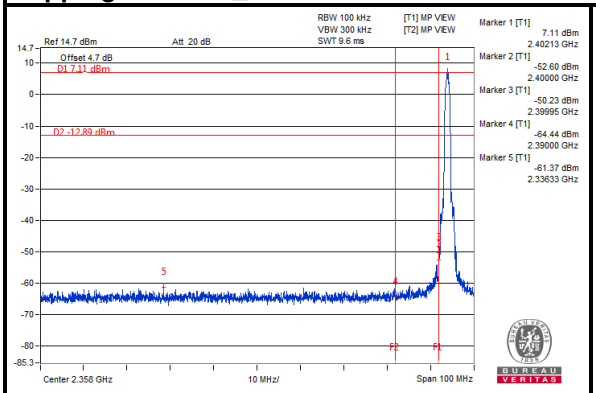
Hopping enabled_High Channel

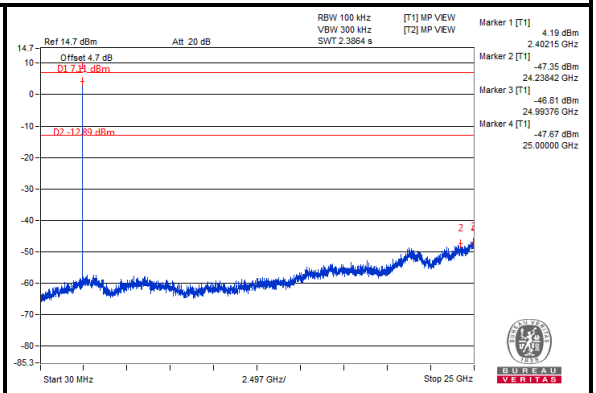




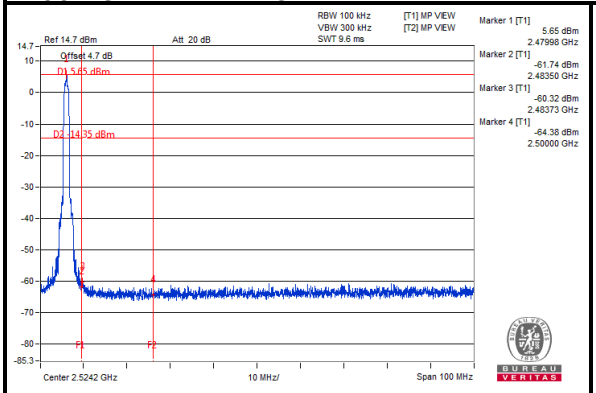
8DPSK

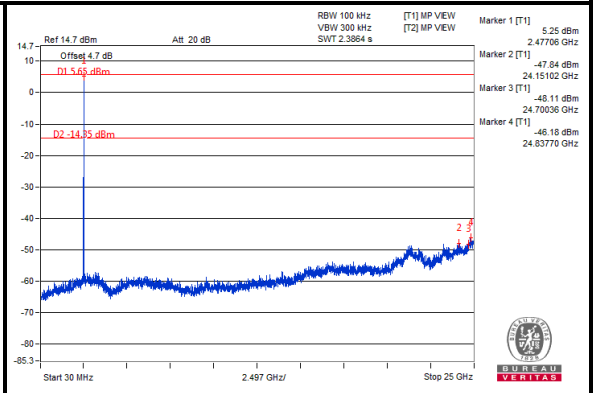
Hopping disabled_Low Channel



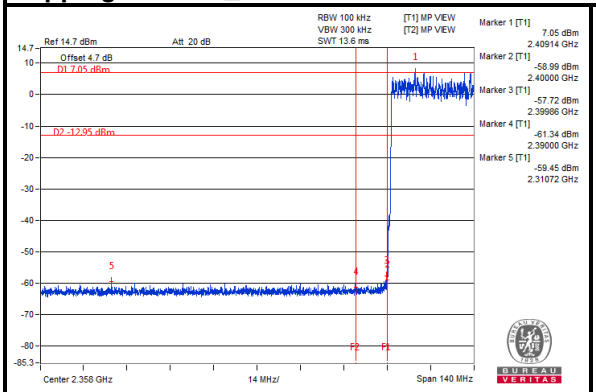


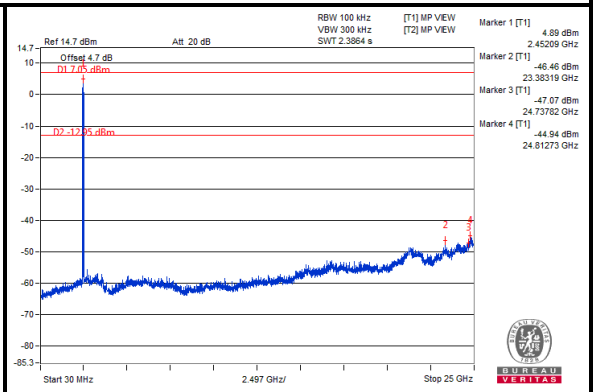
Hopping disabled_High Channel



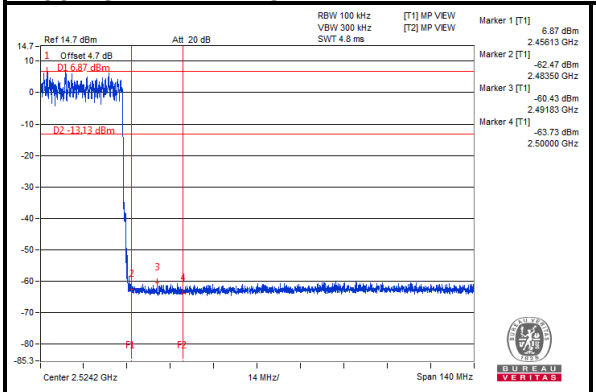


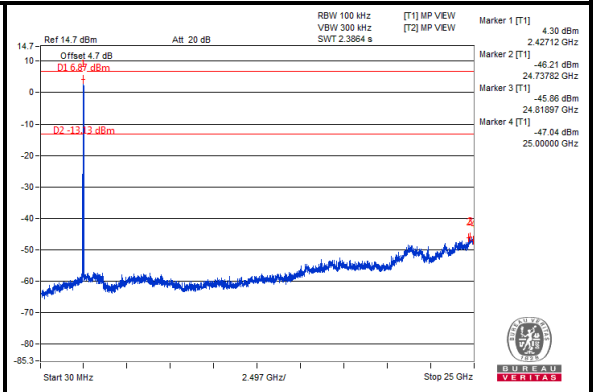
Hopping enabled_Low Channel





Hopping enabled_High Channel





5 PHOTOGRAPHS OF THE TEST CONFIGURATION

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

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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.

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