FCC TEST REPORT

(Part 15, Subpart C)

Applicant:	Quectel Wireless Solutions Co., Ltd.
Address:	Building 5, Shanghai Business Park Phase III (Area B), No.1016 Tianlin Road, Minhang District, Shanghai, China 200233

Manufacturer or Supplier:	Quectel Wireless Solutions Co., Ltd.
Address:	Building 5, Shanghai Business Park Phase III (Area B), No.1016 Tianlin Road, Minhang District, Shanghai, China 200233
Product:	LTE Module
Brand Name:	Quectel
Model Name:	SC66-A
FCC ID:	XMR201908SC66A
Date of tests:	May. 23, 2019 ~ Sep. 07, 2019

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

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

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

Prepared by Alex Chen Engineer / Mobile Department	Approved by Luke Lu Manager / Mobile Department
Alex Date: Sep. 12, 2019	Luke Lu Date: Sep. 12, 2019

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RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
RF190522W005-6	Original release	Sep. 12, 2019

BV 7Layers Communications Technology (Shenzhen) Co. Ltd

No.B102, Dazu Chuangxin Mansion, North of Beihuan Avenue, North Area, Hi-Tech Industrial Park, Nanshan District, Shenzhen, Guangdong, China

Tel: +86 755 8869 6566
Fax: +86 755 8869 6577
Email: customerservice.dg@cn.bureauveritas.com

1 SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

APPLIED STANDARD: FCC Part 15, Subpart C		
STANDARD SECTION	**TEST TYPE AND LIMIT**	**RESULT**
15.207	AC Power Conducted Emission	Compliance
15.247(a)(1) (iii)	Number of Hopping Frequency Used	Compliance
15.247(a)(1) (iii)	Dwell Time on Each Channel	Compliance
15.247(a)(1)	1. Hopping Channel Separation 2. Spectrum Bandwidth of a Frequency Hopping Sequence Spread Spectrum System	Compliance
15.247(b)	Maximum Peak Output Power	Compliance
15.247(d)& 15.209	Transmitter Radiated Emissions	Compliance
15.247(d)	Out of band Measurement	Compliance
15.203	Antenna Requirement	Compliance

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.

1.1 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	UNCERTAINTY
AC Power Conducted emissions	±2.70dB
Radiated emissions (30MHz~1GMHz)	±4.98dB
Radiated emissions (1GMHz ~6GMHz)	±4.70dB
Radiated emissions (6GMHz ~18GMHz)	±4.60dB
Radiated emissions (18GMHz ~40GMHz)	±4.12dB
Conducted emissions	±4.01dB
Occupied Channel Bandwidth	±43.58KHz
Conducted Output power	±2.06dB
Power Spectral Density	±0.85 dB

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

2 GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

PRODUCT	LTE Module
BRAND NAME	Quectel
MODEL NAME	SC66-A
NOMINAL VOLTAGE	DC 4V
MODULATION TECHNOLOGY	FHSS
MODULATION TYPE	GFSK, 8DPSK, π/4 DQPSK
OPERATING FREQUENCY	2402MHz~2480MHz
NUMBER OF CHANNEL	79
MAX. OUTPUT POWER	14.355mW (Max. Measured)
ANTENNA TYPE	PCB Antenna with 5.16dBi gain
HW VERSION	R1.0
SW VERSION	SC66ANAR01A06
I/O PORTS	Refer to user's manual

NOTE:

1. For a more detailed features description, please refer to the manufacturer's specifications or the user's manual.

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

2.2 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		

2.2.1 CONFIGURATION OF SYSTEM UNDER TEST

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

2.2.2 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	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	3DH5

POWER LINE CONDUCTED EMISSION TEST:

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, antenna ports (if EUT with antenna diversity architecture) and packet 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	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	2DH5
0 to 78	0, 39, 78	FHSS	8DPSK	3DH5

TEST CONDITION:

APPLICABLE TO	ENVIRONMENTAL CONDITIONS	TEST VOLTAGE (SYSTEM)	TESTED BY
RE<1G	22deg. C, 54%RH	DC 4V	Star Le
RE≥1G	22deg. C, 54%RH	DC 4V	Star Le
PLC	24deg. C, 55%RH	DC 4V	Jacky Liu
APCM	25deg. C, 60%RH	DC 4V	Walker Ye

2.3 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

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 (sDoC). The test report has been issued separately.

2.4 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

2.5 ANTENNA REQUIREMENT

Per FCC Part 15.203. An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

Conclusion:

The EUT use one PCB Antenna that were permanently attached and the detail information list as below:

ANT Gain	Type	TX/RX	Frequency range
5.16	PCB Antenna	TX & RX	2400-2483.5MHz

3 TEST TYPES AND RESULTS

3.1 CONDUCTED EMISSION MEASUREMENT

3.1.1 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.

3.1.2 TEST INSTRUMENTS

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
EMI Test Receiver	Rohde&Schwarz	ESR3	101900	Feb. 26,19	Feb. 25, 20
EMC32 test software	Rohde&Schwarz	EMC32	NA	NA	NA
LISN network	Rohde&Schwarz	ENV216	101922	Feb. 26,19	Feb. 25, 20

NOTE: 1. The test was performed in CE shielded room.

2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to CEPREI/CHINA, GRGT/CHINA and NIM/CHINA.

3.1.3 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.

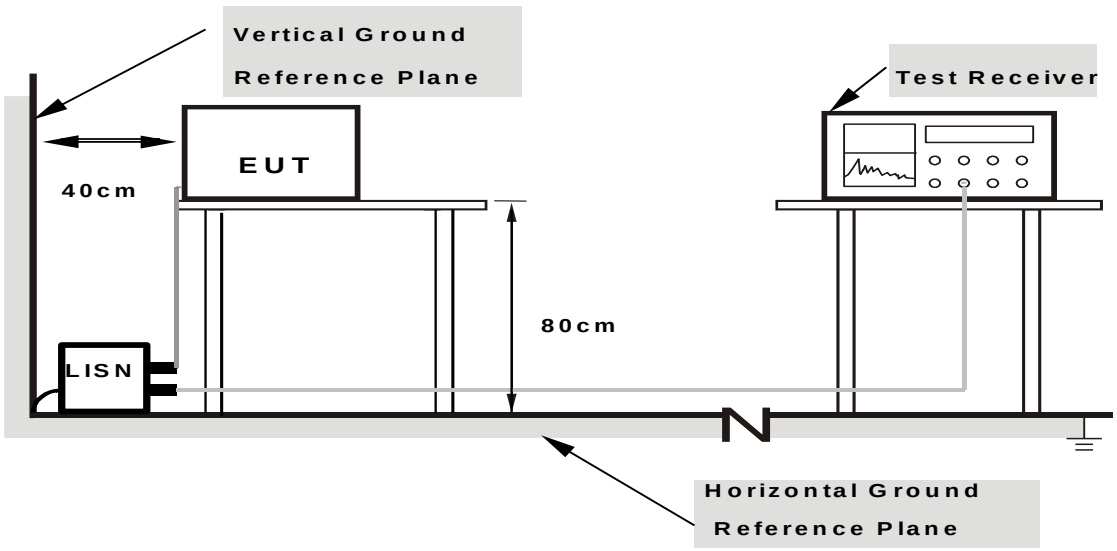
c. The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) was not recorded.

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

3.1.4 DEVIATION FROM TEST STANDARD

No deviation.

3.1.5 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).

3.1.6 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.

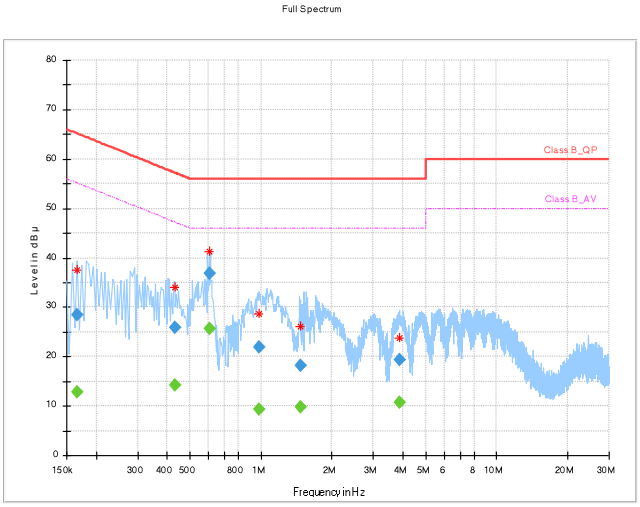
3.1.7 TEST RESULTS

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	25deg. C, 52RH
Tested By	Jimmy Liu		

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Line	Filter	Corr. (dB)
0.166000	---	12.85	55.16	-42.31	L	ON	9.9
0.166000	28.41	---	65.16	-36.75	L	ON	9.9
0.432000	---	14.14	47.21	-33.08	L	ON	10.0
0.432000	25.89	---	57.21	-31.33	L	ON	10.0
0.608000	---	25.60	46.00	-20.40	L	ON	10.0
0.608000	36.91	---	56.00	-19.09	L	ON	10.0
0.980000	---	9.40	46.00	-36.60	L	ON	10.1
0.980000	21.92	---	56.00	-34.08	L	ON	10.1
1.472000	---	9.76	46.00	-36.24	L	ON	10.1
1.472000	18.26	---	56.00	-37.74	L	ON	10.1
3.880000	---	10.68	46.00	-35.32	L	ON	10.2
3.880000	19.36	---	56.00	-36.64	L	ON	10.2

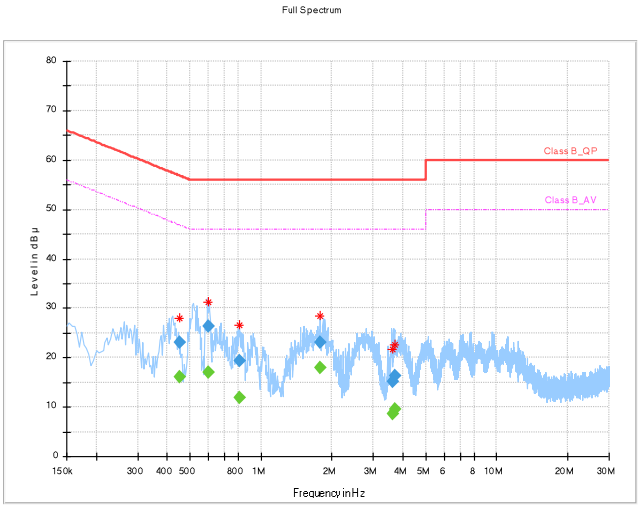
REMARKS: 1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. "-": The Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.
3. The emission levels of other frequencies were very low against the limit.
4. Margin value = Emission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



Frequency Range	150KHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9 kHz
Input Power	120Vac, 60Hz	Environmental Conditions	25deg. C, 52RH
Tested By	Jimmy Liu		

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV))	Limit (dBuV)	Margin (dB)	Line	Filter	Corr. (dB)
0.452000	---	16.05	46.84	-30.79	N	ON	9.9
0.452000	23.17	---	56.84	-33.67	N	ON	9.9
0.600000	---	17.13	46.00	-28.87	N	ON	9.9
0.600000	26.31	---	56.00	-29.69	N	ON	9.9
0.812000	---	11.87	46.00	-34.13	N	ON	9.9
0.812000	19.33	---	56.00	-36.67	N	ON	9.9
1.784000	---	18.07	46.00	-27.93	N	ON	10.0
1.784000	23.19	---	56.00	-32.81	N	ON	10.0
3.624000	---	8.68	46.00	-37.32	N	ON	10.1
3.624000	15.13	---	56.00	-40.87	N	ON	10.1
3.700000	---	9.48	46.00	-36.52	N	ON	10.1
3.700000	16.44	---	56.00	-39.56	N	ON	10.1

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.



3.2 RADIATED EMISSION AND BANDEDGE MEASUREMENT

3.2.1 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.

3.2.2 TEST INSTRUMENTS

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
3m Semi-anechoic Chamber	ETS-LINDGREN	9m*6m*6m	Euroshieldpn-CT0001143-1216	Feb. 26,19	Feb. 25,20
Bilog Antenna	ETS-LINDGREN	3143B	00161965	Feb. 26,19	Feb. 25,20
Horn Antenna	ETS-LINDGREN	3117	00168728	Feb. 26,19	Feb. 25,20
Horn Antenna (18GHz-40GHz)	N/A	QWH-SL-18-40-K-SG/QMS-00361	15433	Nov. 21, 18	Nov. 20, 19
Test Software	E3	V 9.160323	N/A	N/A	N/A
Test Software	ADT	ADT_Radiated_V7.6.15.9.2	N/A	N/A	N/A
10dB Attenuator	JFW/USA	50HF-010-SMA	1505	Jun. 24,19	Jun. 23,20
MXE EMI Receiver	KEYSIGHT	N9038A-544	MY54450026	Feb. 26,19	Feb. 25,20
Signal Pre-Amplifier	EMSI	EMC 9135	980249	Jun. 24,19	Jun. 23,20
Signal Pre-Amplifier	EMSI	EMC 012645B	980257	Jun. 24,19	Jun. 23,20
Signal Pre-Amplifier	EMSI	EMC 184045B	980259	Jun. 24,19	Jun. 23,20

NOTE: 1. The calibration interval of the above test instruments is 12 months or 24 months and the calibrations are traceable to CEPREI/CHINA, GRGT/CHINA and NIM/CHINA.

2. The test was performed in 3m Chamber.

3. The FCC Site Registration No. is 525120; The Designation No. is CN1171.

3.2.3 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:

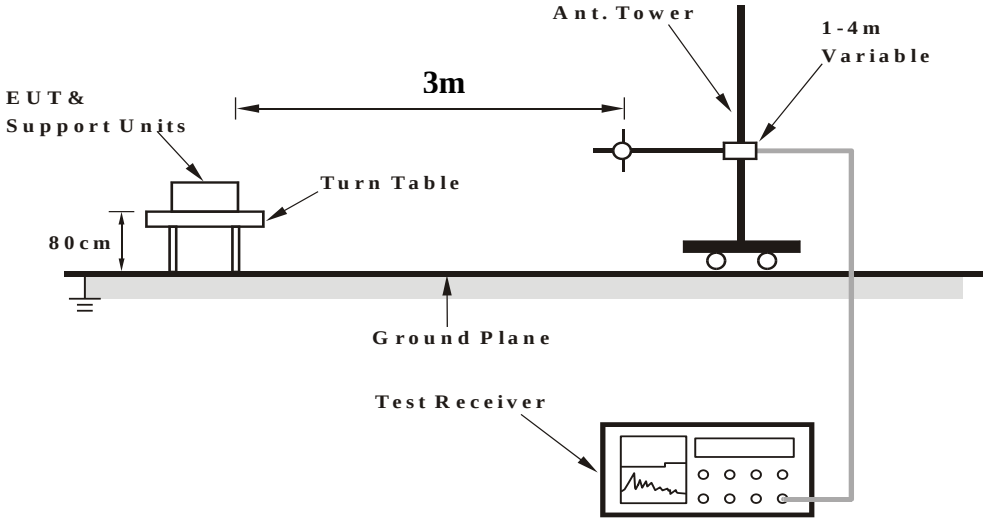
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and video bandwidth is 3MHz for Peak detection at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 10Hz for Average detection (AV) at frequency above 1GHz.
4. 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.

3.2.4 DEVIATION FROM TEST STANDARD

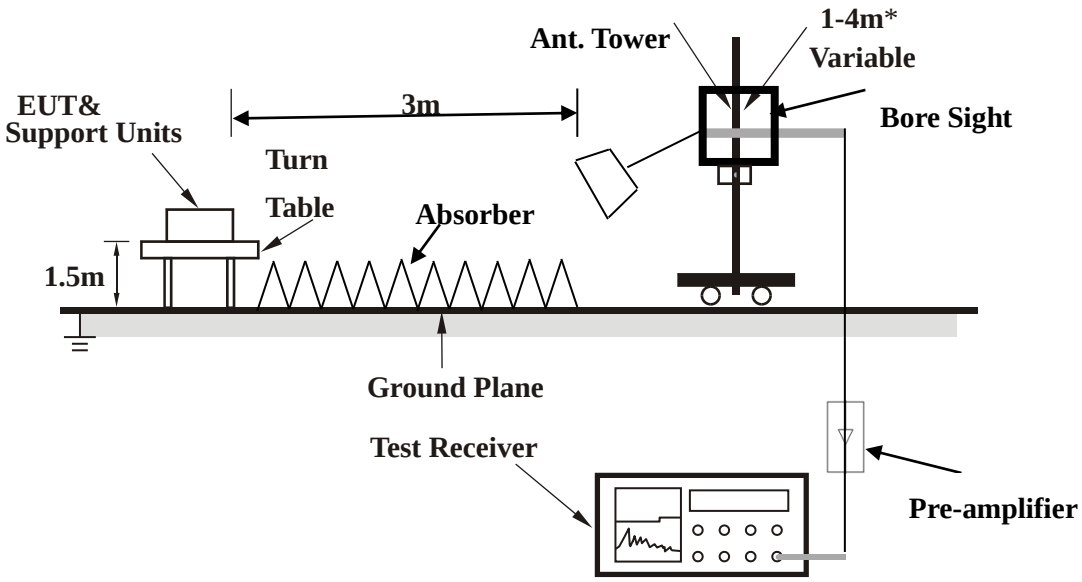
No deviation.

3.2.5 TEST SETUP

< Frequency Range 30MHz~1GHz >



<Frequency Range above 1GHz>



Note: Above 1G is a directional antenna

Depends on the EUT height and the antenna 3dB beamwidth both, refer to section 7.3 of CISPR 16-2-3.

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

3.2.6 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.

3.2.7 TEST RESULTS

BELOW 1GHz WORST-CASE DATA:

30 MHz – 1GHz data:

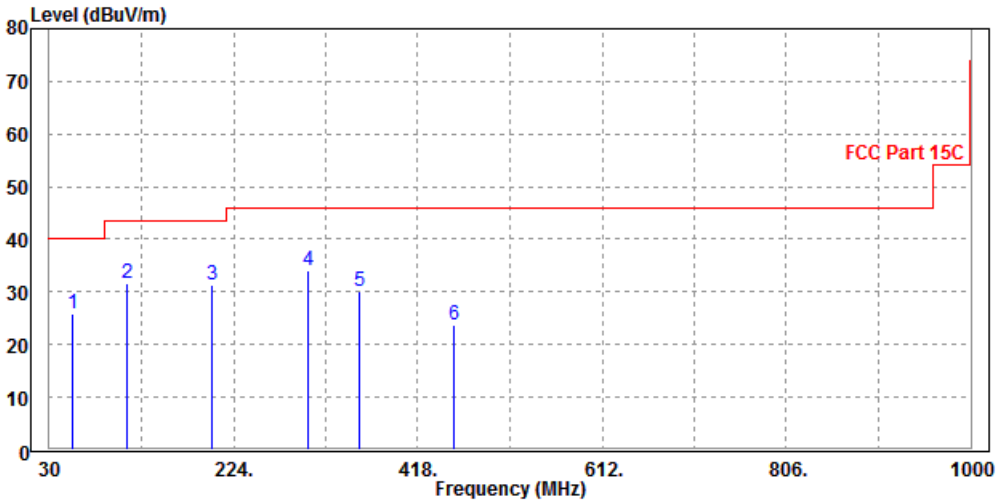
GFSK DH5

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
54.28	25.84	55.12	40	-14.16	7.01	1.03	37.32	100	360	QP
112.36	31.72	58.47	43.5	-11.78	8.96	1.4	37.11	100	360	QP
201.52	31.27	55.15	43.5	-12.23	10.87	1.8	36.55	100	360	QP
302.54	33.93	54.28	46	-12.07	14.18	2.22	36.75	100	360	QP
356.78	30.14	48.64	46	-15.86	15.86	2.44	36.8	100	360	QP
455.58	23.78	39.95	46	-22.22	17.92	2.83	36.92	100	360	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

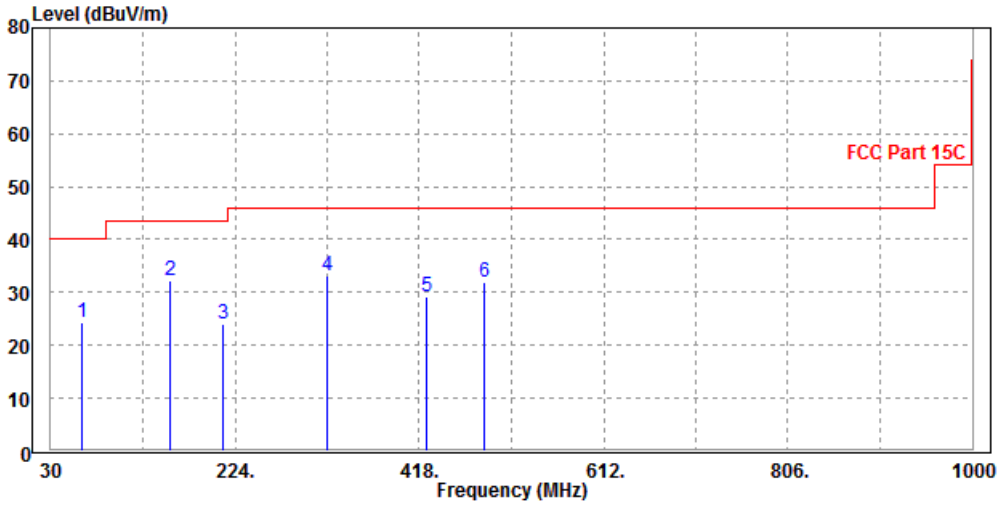


CHANNEL	Channel 0	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	30MHz ~ 1GHz		

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
62.57	24.19	53.41	40	-15.81	7.01	1.1	37.33	100	0	QP
156.34	32.24	57.24	43.5	-11.26	10.14	1.62	36.76	100	0	QP
211.25	24.06	47.44	43.5	-19.44	11.34	1.85	36.57	100	0	QP
321.45	33.09	52.7	46	-12.91	14.86	2.3	36.77	100	0	QP
425.61	29.17	45.67	46	-16.83	17.66	2.71	36.87	100	0	QP
485.63	31.8	47.34	46	-14.2	18.5	2.94	36.98	100	0	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	53.17	61.56	74	-20.83	33.1	4.88	46.37	100	312	Peak
2390	40.15	48.54	54	-13.85	33.1	4.88	46.37	100	312	Average
2402	107.07	115.43			33.12	4.89	46.37	100	312	Peak
2402	104	112.36			33.12	4.89	46.37	100	312	Average
2483.5	52.73	60.85	74	-21.27	33.27	4.98	46.37	100	312	Peak
2483.5	39.36	47.48	54	-14.64	33.27	4.98	46.37	100	312	Average
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	53.04	62.32	74	-20.96	32.21	4.88	46.37	100	326	Peak
2390	39.07	48.35	54	-14.93	32.21	4.88	46.37	100	326	Average
2402	109.52	118.75			32.25	4.89	46.37	100	326	Peak
2402	106.23	115.46			32.25	4.89	46.37	100	326	Average
2483.5	51.65	60.58	74	-22.35	32.46	4.98	46.37	100	326	Peak
2483.5	38.61	47.54	54	-15.39	32.46	4.98	46.37	100	326	Average

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	53.21	61.6	74	-20.79	33.1	4.88	46.37	123	326	Peak
2390	39.48	47.87	54	-14.52	33.1	4.88	46.37	123	326	Average
2441	107.08	115.32			33.19	4.94	46.37	123	326	Peak
2441	104	112.24			33.19	4.94	46.37	123	326	Average
2483.5	53.11	61.23	74	-20.89	33.27	4.98	46.37	100	326	Peak
2483.5	39.72	47.84	54	-14.28	33.27	4.98	46.37	100	326	Average
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	52.08	61.36	74	-21.92	32.21	4.88	46.37	100	325	Peak
2390	39.15	48.43	54	-14.85	32.21	4.88	46.37	100	325	Average
2441	108.8	117.88			32.35	4.94	46.37	100	325	Peak
2441	105.47	114.55			32.35	4.94	46.37	100	325	Average
2483.5	52.39	61.32	74	-21.61	32.46	4.98	46.37	100	325	Peak
2483.5	39.22	48.15	54	-14.78	32.46	4.98	46.37	100	325	Average

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)
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	52.49	60.88	74	-21.51	33.1	4.88	46.37	100	256	Peak
2390	38.77	47.16	54	-15.23	33.1	4.88	46.37	100	256	Average
2480	107.32	115.45			33.26	4.98	46.37	100	256	Peak
2480	104.1	112.23			33.26	4.98	46.37	100	256	Average
2483.5	53.17	61.29	74	-20.83	33.27	4.98	46.37	100	256	Peak
2483.5	39.47	47.59	54	-14.53	33.27	4.98	46.37	100	256	Average
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	52.32	61.6	74	-21.68	32.21	4.88	46.37	100	345	Peak
2390	39.3	48.58	54	-14.7	32.21	4.88	46.37	100	345	Average
2480	109.3	118.24			32.45	4.98	46.37	100	345	Peak
2480	106.52	115.46			32.45	4.98	46.37	100	345	Average
2483.5	53.38	62.31	74	-20.62	32.46	4.98	46.37	100	345	Peak
2483.5	39.22	48.15	54	-14.78	32.46	4.98	46.37	100	345	Average

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	53.37	61.76	74	-20.63	33.1	4.88	46.37	100	325	Peak
2390	39.83	48.22	54	-14.17	33.1	4.88	46.37	100	325	Average
2402	107.01	115.37			33.12	4.89	46.37	100	325	Peak
2402	104.13	112.49			33.12	4.89	46.37	100	325	Average
2483.5	53.4	61.52	74	-20.6	33.27	4.98	46.37	100	325	Peak
2483.5	39.77	47.89	54	-14.23	33.27	4.98	46.37	100	325	Average
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	52.05	61.33	74	-21.95	32.21	4.88	46.37	100	321	Peak
2390	38.94	48.22	54	-15.06	32.21	4.88	46.37	100	321	Average
2402	109.42	118.65			32.25	4.89	46.37	100	321	Peak
2402	107	116.23			32.25	4.89	46.37	100	321	Average
2483.5	51.66	60.59	74	-22.34	32.46	4.98	46.37	100	321	Peak
2483.5	38.6	47.53	54	-15.4	32.46	4.98	46.37	100	321	Average

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)
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	52.85	61.24	74	-21.15	33.1	4.88	46.37	100	248	Peak
2390	39.46	47.85	54	-14.54	33.1	4.88	46.37	100	248	Average
2441	106.28	114.52			33.19	4.94	46.37	100	248	Peak
2441	103.12	111.36			33.19	4.94	46.37	100	248	Average
2483.5	53.22	61.34	74	-20.78	33.27	4.98	46.37	100	248	Peak
2483.5	40.11	48.23	54	-13.89	33.27	4.98	46.37	100	248	Average
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	52.32	61.6	74	-21.68	32.21	4.88	46.37	100	316	Peak
2390	39.35	48.63	54	-14.65	32.21	4.88	46.37	100	316	Average
2441	109.55	118.63			32.35	4.94	46.37	100	316	Peak
2441	106.36	115.44			32.35	4.94	46.37	100	316	Average
2483.5	52.55	61.48	74	-21.45	32.46	4.98	46.37	100	316	Peak
2483.5	39.22	48.15	54	-14.78	32.46	4.98	46.37	100	316	Average

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)
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	53.19	61.58	74	-20.81	33.1	4.88	46.37	100	332	Peak
2390	39.48	47.87	54	-14.52	33.1	4.88	46.37	100	332	Average
2480	106.5	114.63			33.26	4.98	46.37	100	332	Peak
2480	104.32	112.45			33.26	4.98	46.37	100	332	Average
2483.5	53.22	61.34	74	-20.78	33.27	4.98	46.37	100	332	Peak
2483.5	40.13	48.25	54	-13.87	33.27	4.98	46.37	100	332	Average
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	52.08	61.36	74	-21.92	32.21	4.88	46.37	100	285	Peak
2390	38.98	48.26	54	-15.02	32.21	4.88	46.37	100	285	Average
2480	109.68	118.62			32.45	4.98	46.37	100	285	Peak
2480	105.71	114.65			32.45	4.98	46.37	100	285	Average
2483.5	52.61	61.54	74	-21.39	32.46	4.98	46.37	100	285	Peak
2483.5	39.39	48.32	54	-14.61	32.46	4.98	46.37	100	285	Average

REMARKS:

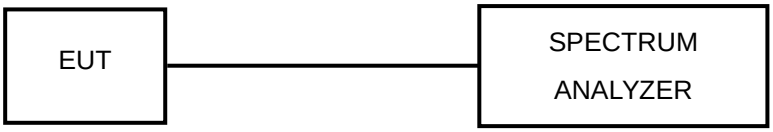
1. Emission Level = Read Level+ Antenna Factor + Cable Loss- Preamp Factor
   Margin value = Emission level – Limit value.
2. 2480MHz: Fundamental frequency.

3.3 NUMBER OF HOPPING FREQUENCY USED

3.3.1 LIMIT OF HOPPING FREQUENCY USED

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

3.3.2 TEST SETUP



3.3.3 TEST INSTRUMENTS

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
Power Meter	ANRITSU	ML2495A	1506002	Feb. 26,19	Feb. 25,20
EXA Signal Analyzer	KEYSIGHT	N9010A-526	MY54510322	Feb. 26,19	Feb. 25,20
EXA Signal Analyzer	KEYSIGHT	N9010A-544	MY54510355	Feb. 26,19	Feb. 25,20
Power Sensor	ANRITSU	MA2411B	1339352	Feb. 26,19	Feb. 25,20
CBT32 BLUETOOTH TESTER 4HU	Rohde&Schwarz	CBT32	101176	Feb. 26,19	Feb. 25,20

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.

3.3.4 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.

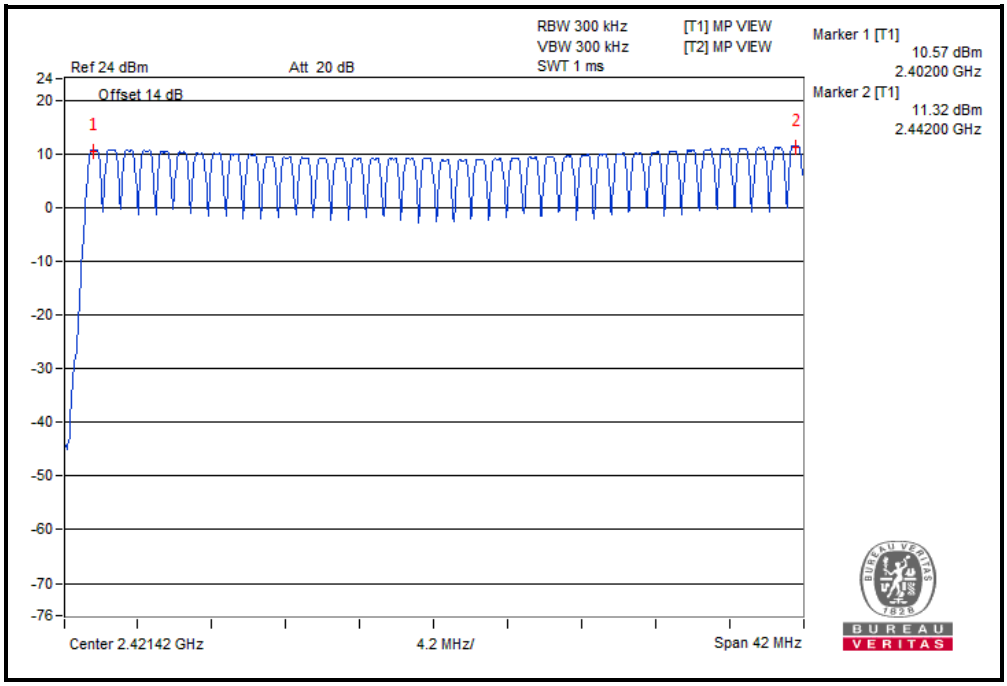
3.3.5 DEVIATION FROM TEST STANDARD

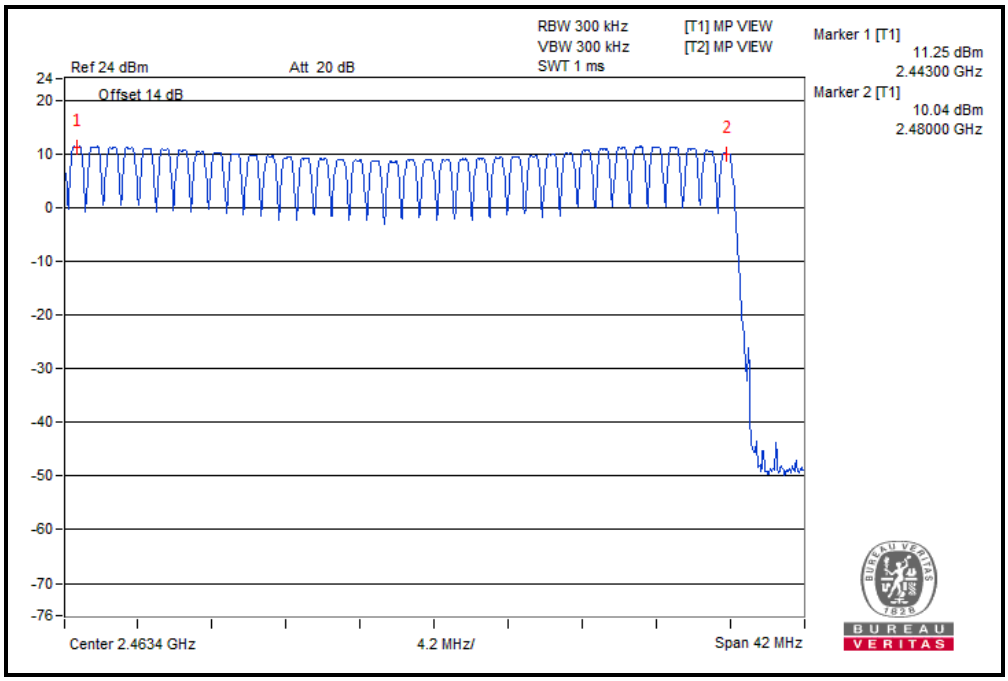
No deviation.

3.3.6 TEST RESULTS

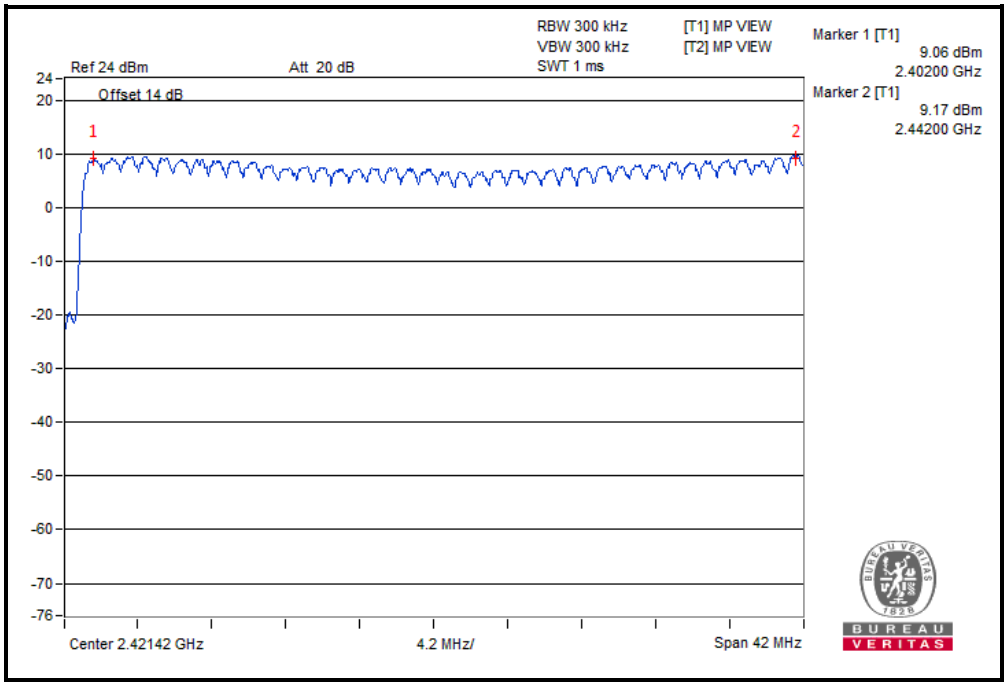
There are 79 hopping frequencies in the hopping mode. Please refer to next two pages for the test result. On the plots, it shows that the hopping frequencies are equally spaced.

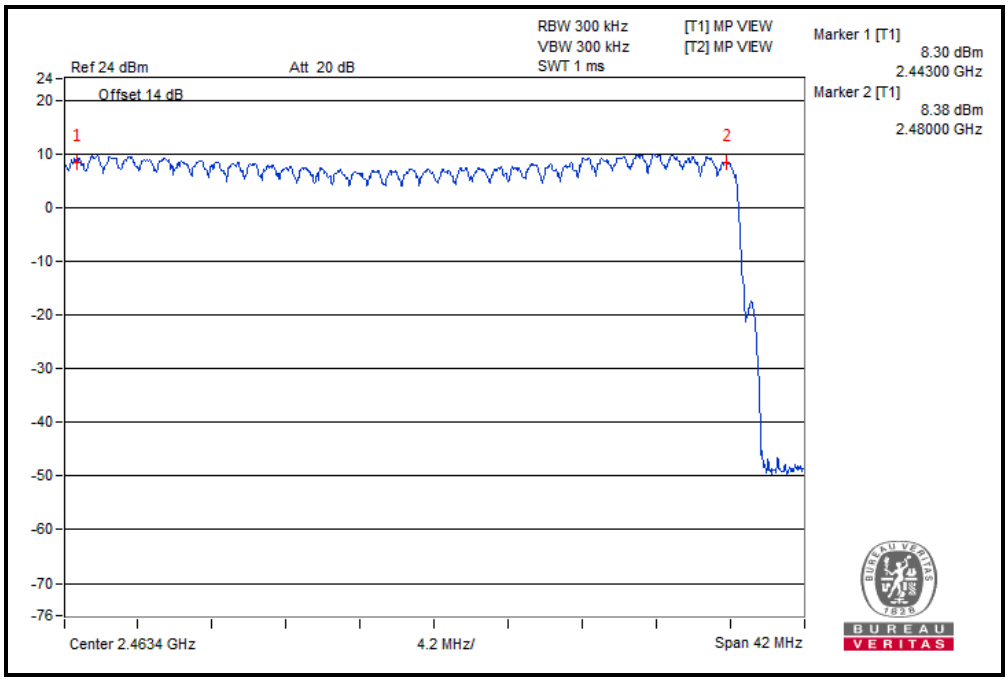
GFSK


RBW 300 kHz
VBW 300 kHz
SWT 1 ms
[T1] MP VIEW
[T2] MP VIEW
Marker 1 [T1]
10.57 dBm
2.40200 GHz
Marker 2 [T1]
11.32 dBm
2.44200 GHz
Ref 24 dBm
Att 20 dB
Offset 14 dB
24
20
10
0
-10
-20
-30
-40
-50
-60
-70
-76
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]
11.25 dBm
2.44300 GHz
Marker 2 [T1]
10.04 dBm
2.48000 GHz
Ref 24 dBm
Att 20 dB
Offset 14 dB
24
20
10
0
-10
-20
-30
-40
-50
-60
-70
-76
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]
9.06 dBm
2.40200 GHz
Marker 2 [T1]
9.17 dBm
2.44200 GHz
Ref 24 dBm
Att 20 dB
Offset 14 dB
24
20
10
0
-10
-20
-30
-40
-50
-60
-70
-76
1
2
Center 2.42142 GHz
4.2 MHz/
Span 42 MHz
BUREAU VERITAS

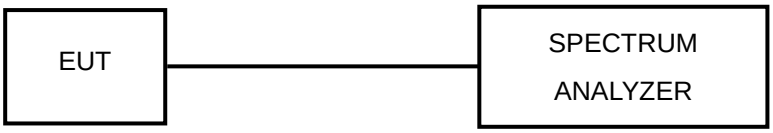

RBW 300 kHz
VBW 300 kHz
SWT 1 ms
[T1] MP VIEW
[T2] MP VIEW
Marker 1 [T1]
8.30 dBm
2.44300 GHz
Marker 2 [T1]
8.38 dBm
2.48000 GHz
Ref 24 dBm
Att 20 dB
Offset 14 dB
24
20
10
0
-10
-20
-30
-40
-50
-60
-70
-76
1
2
Center 2.4634 GHz
4.2 MHz/
Span 42 MHz
BUREAU VERITAS

3.4 DWELL TIME ON EACH CHANNEL

3.4.1 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.

3.4.2 TEST SETUP



3.4.3 TEST INSTRUMENTS

Refer to section 3.3.3 to get information of above instrument.

3.4.4 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.

3.4.5 DEVIATION FROM TEST STANDARD

No deviation.

3.4.6 TEST RESULTS

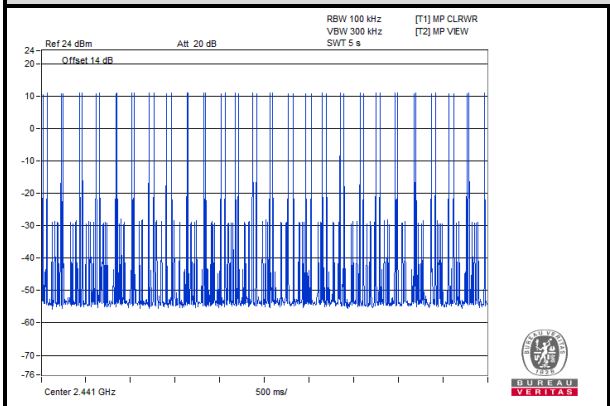
GFSK

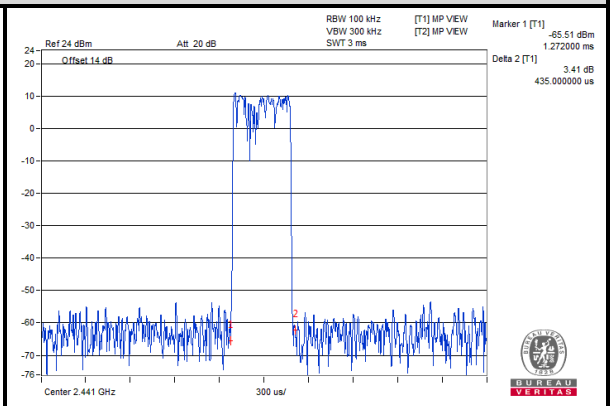
Mode	Number of Hopping Channel	Number of transmission in a period(channel number*0.4 sec)				Length of transmission time (msec)	Result (msec)	Limit (msec)	PASS / FAIL
		period (sec)	sweep time (sec)	times in a sweep	times in a period				
DH1	79	31.6	5	49	309.68	0.435	134.71	400	PASS
DH3	79	31.6	5	25	158	1.7	268.6	400	PASS
DH5	79	31.6	5	16	101.12	2.935	296.79	400	PASS

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

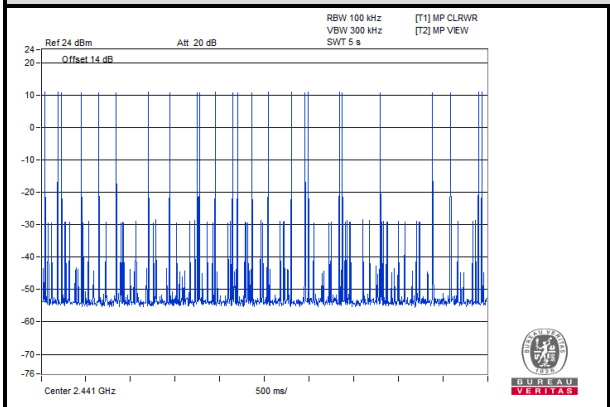
GFSK

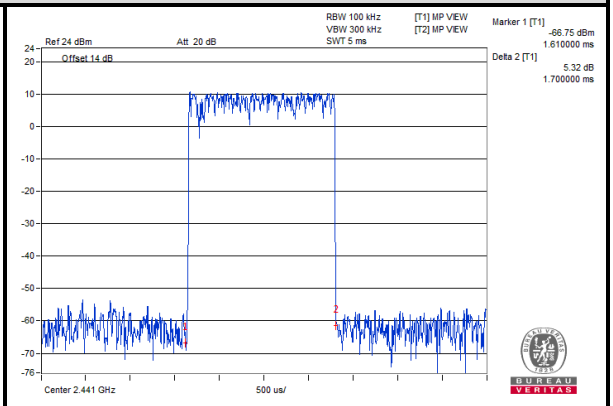
DH1



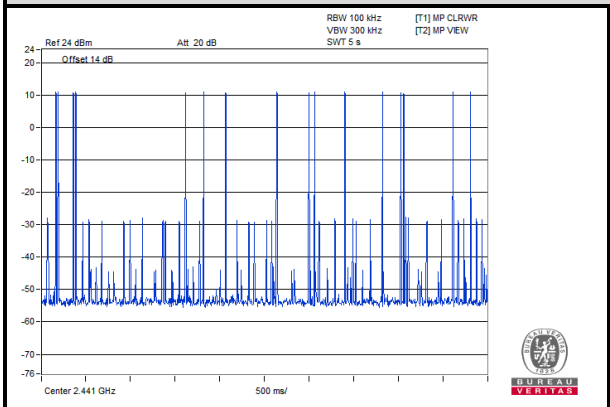


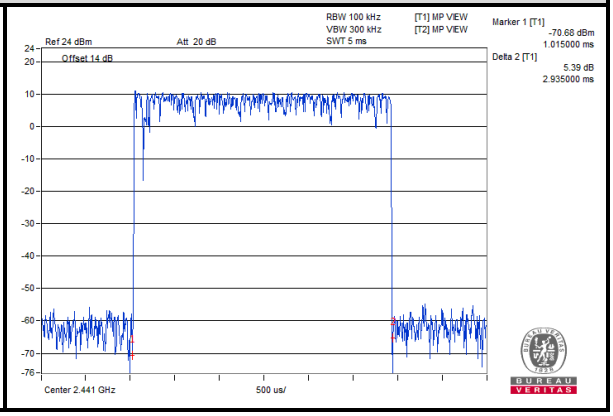
DH3





DH5





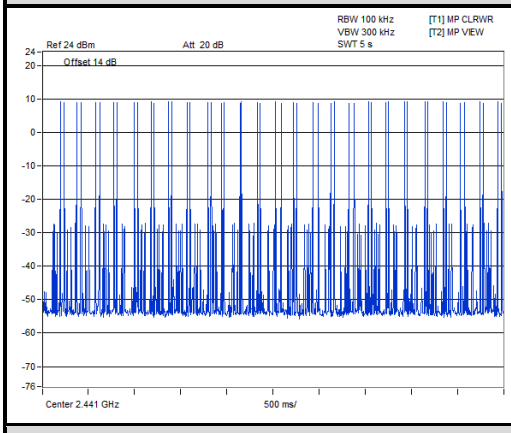
8DPSK

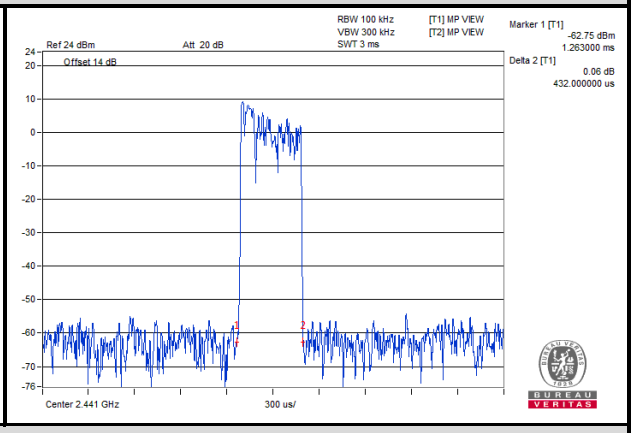
Mode	Number of Hopping Channel	Number of transmission in a period(channel number*0.4 sec)				Length of transmission time (msec)	Result (msec)	Limit (msec)	PASS / FAIL
		period (sec)	sweep time (sec)	times in a sweep	times in a period				
3DH1	79	31.6	5	49	309.68	0.432	133.78	400	PASS
3DH3	79	31.6	5	27	170.64	1.69	288.38	400	PASS
3DH5	79	31.6	5	16	101.12	2.95	298.3	400	PASS

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

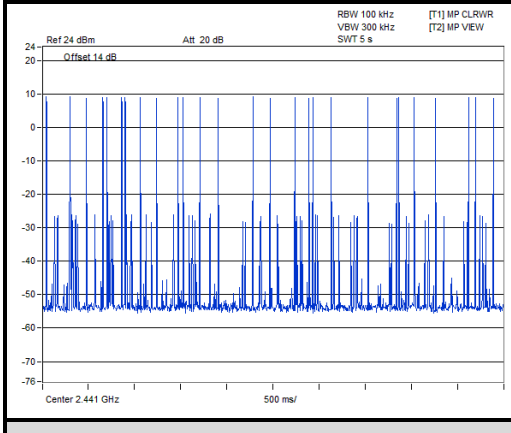
8DPSK

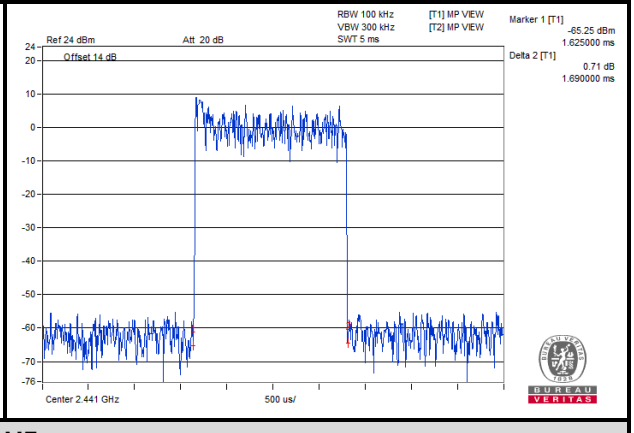
3DH1



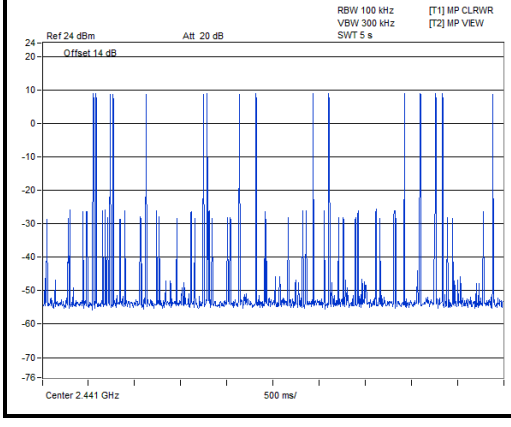


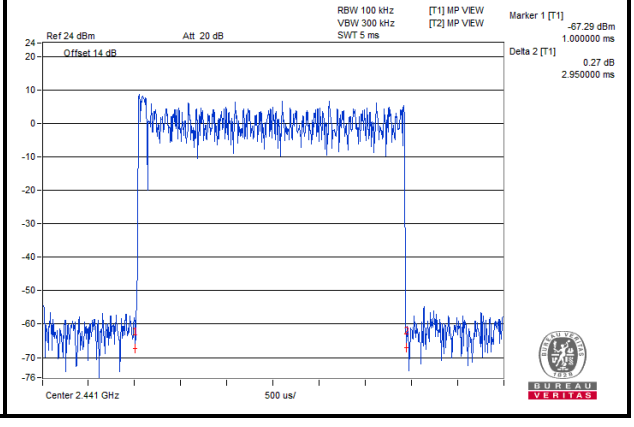
3DH3





3DH5



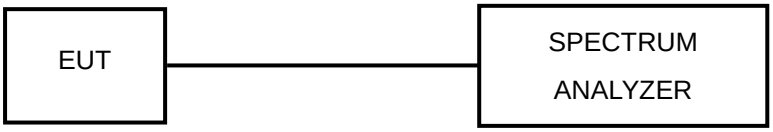


3.5 CHANNEL BANDWIDTH

3.5.1 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.

3.5.2 TEST SETUP



3.5.3 TEST INSTRUMENTS

Refer to section 3.3.3 to get information of above instrument.

3.5.4 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.

3.5.5 DEVIATION FROM TEST STANDARD

No deviation.

3.5.6 EUT OPERATING CONDITION

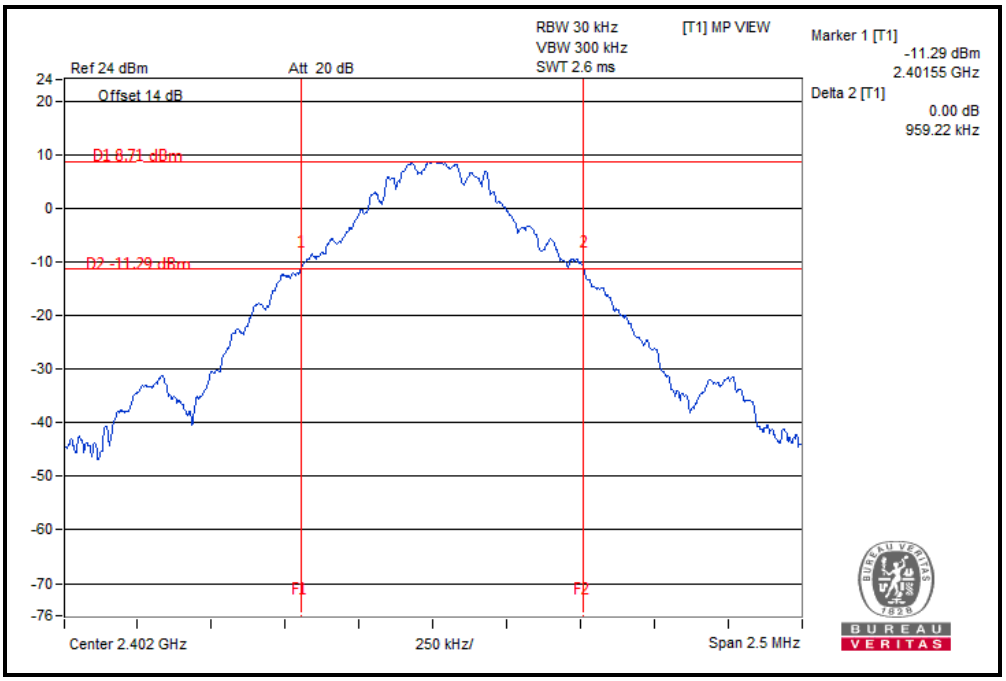
The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.

3.5.7 TEST RESULTS

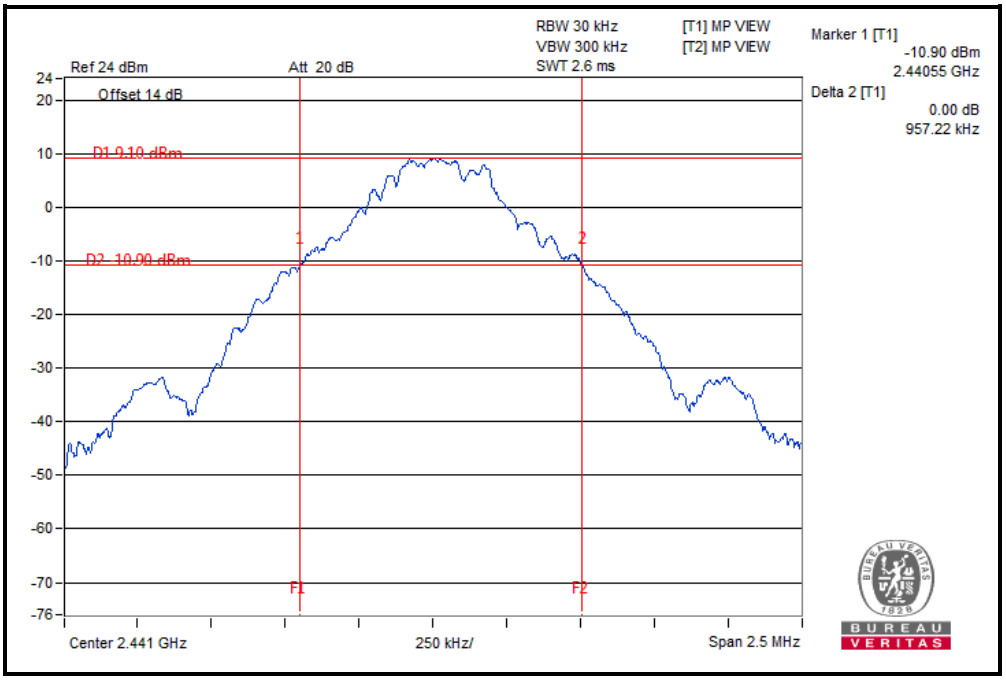
GFSK

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

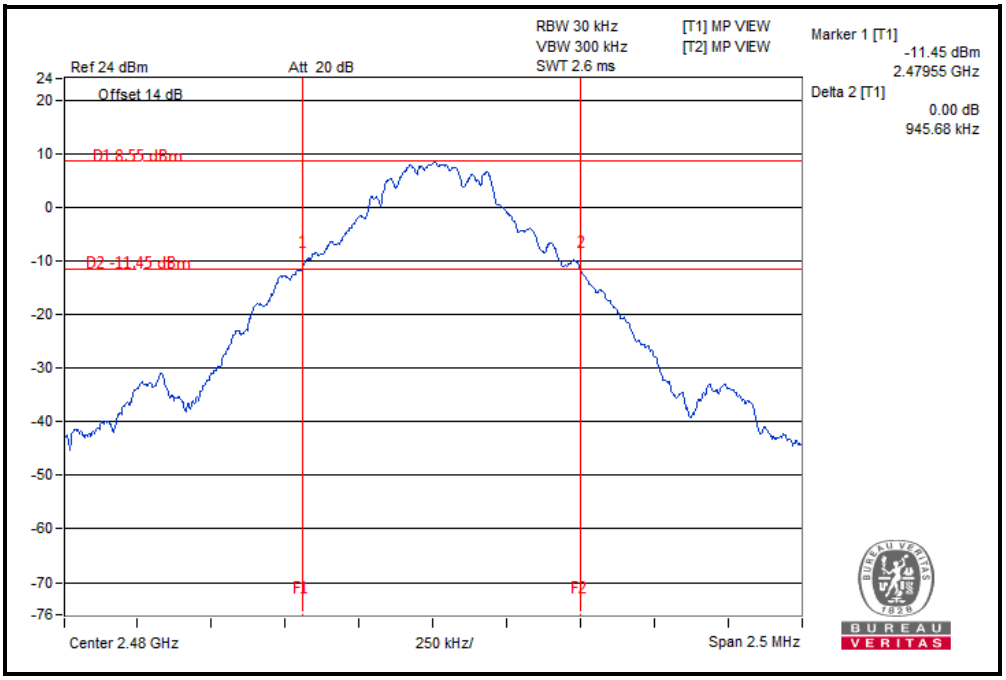
CH 0



CH 39


RBW 30 kHz
VBW 300 kHz
SWT 2.6 ms
[T1] MP VIEW
[T2] MP VIEW
Marker 1 [T1]
-10.90 dBm
2.44055 GHz
Delta 2 [T1]
0.00 dB
957.22 kHz
Ref 24 dBm
Att 20 dB
Offset 14 dB
D1 9.10 dBm
D2 -10.90 dBm
Center 2.441 GHz
250 kHz/
Span 2.5 MHz

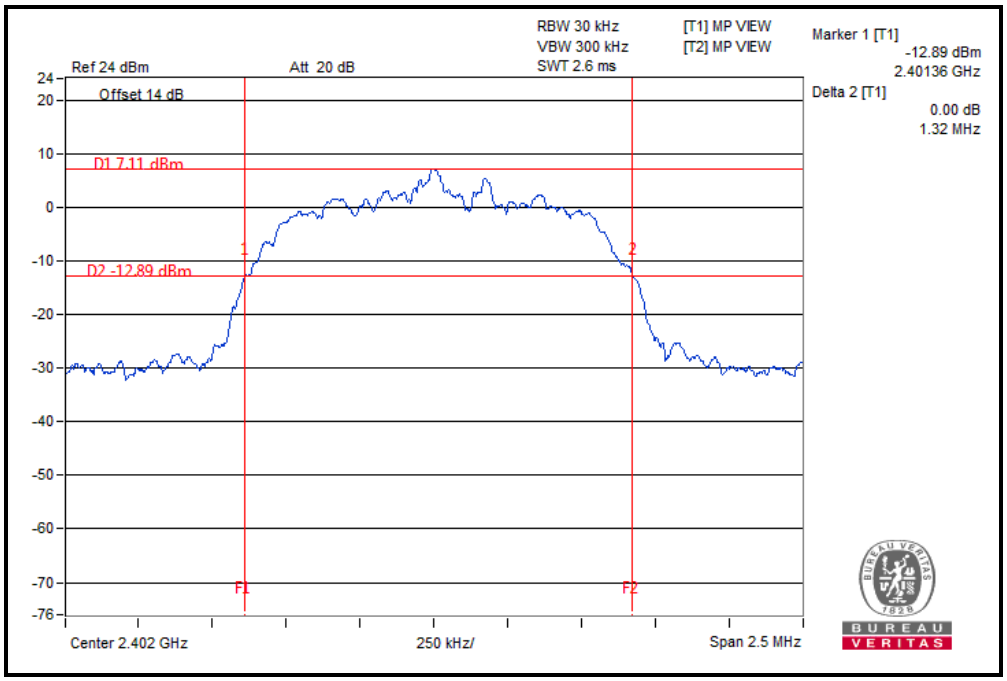
CH 78


RBW 30 kHz
VBW 300 kHz
SWT 2.6 ms
[T1] MP VIEW
[T2] MP VIEW
Marker 1 [T1]
-11.45 dBm
2.47955 GHz
Delta 2 [T1]
0.00 dB
945.68 kHz
Ref 24 dBm
Att 20 dB
Offset 14 dB
D1 8.55 dBm
D2 -11.45 dBm
Center 2.48 GHz
250 kHz/
Span 2.5 MHz

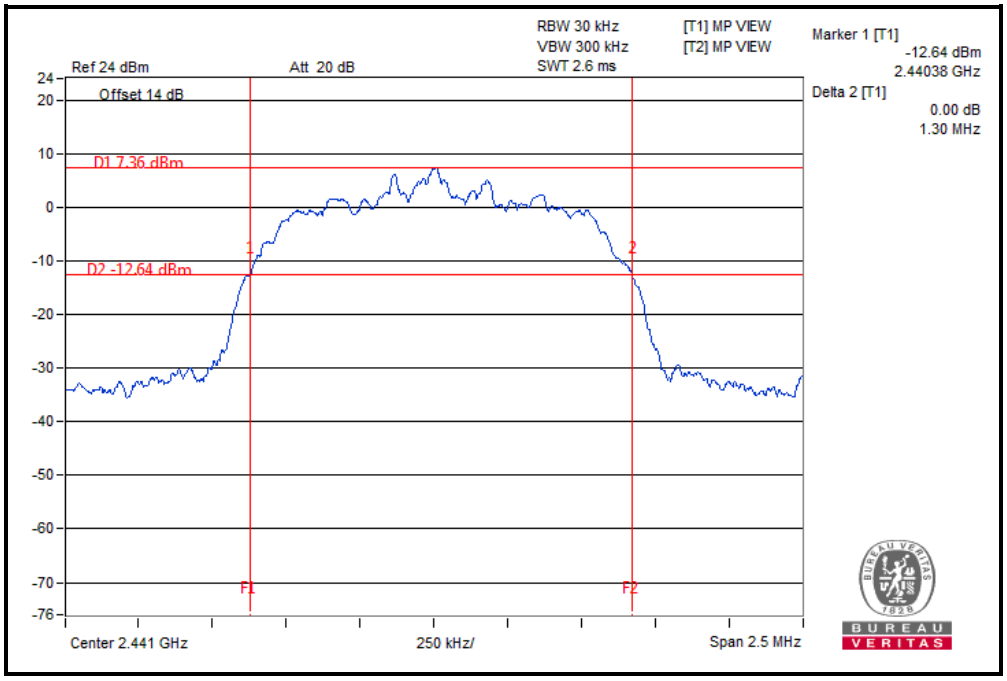
π/4 DQPSK

CHANNEL	CHANNEL FREQUENCY (MHz)	20dB BANDWIDTH (MHz)
0	2402	1.32
39	2441	1.30
78	2480	1.33

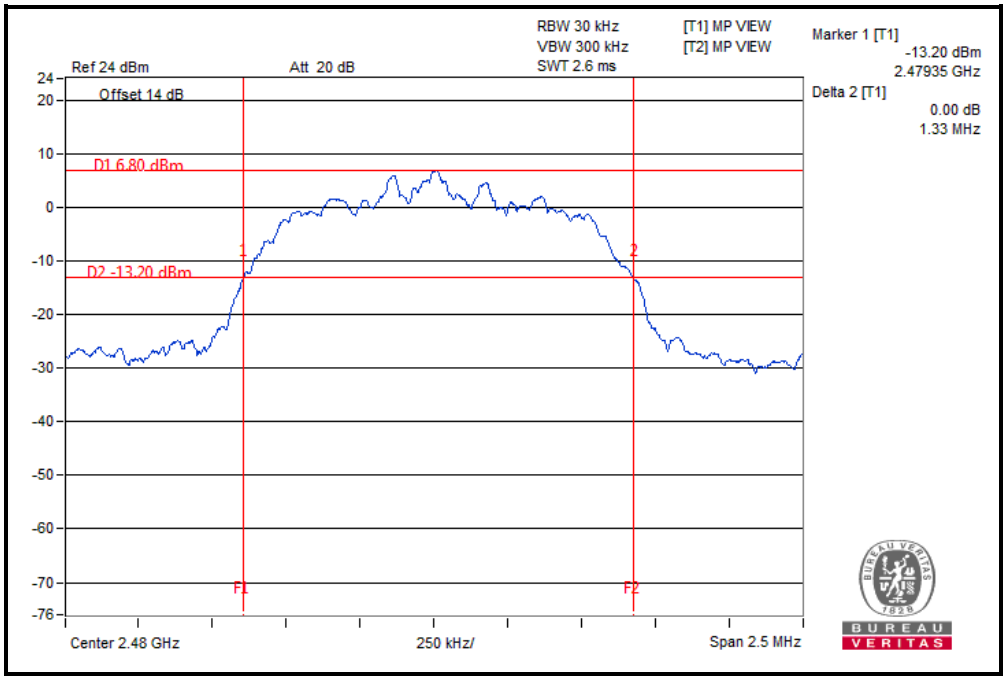
CH 0



CH 39


RBW 30 kHz
VBW 300 kHz
SWT 2.6 ms
[T1] MP VIEW
[T2] MP VIEW
Marker 1 [T1]
-12.64 dBm
2.44038 GHz
Delta 2 [T1]
0.00 dB
1.30 MHz
Ref 24 dBm
Att 20 dB
Offset 14 dB
D1 7.36 dBm
D2 -12.64 dBm
Center 2.441 GHz
250 kHz/
Span 2.5 MHz

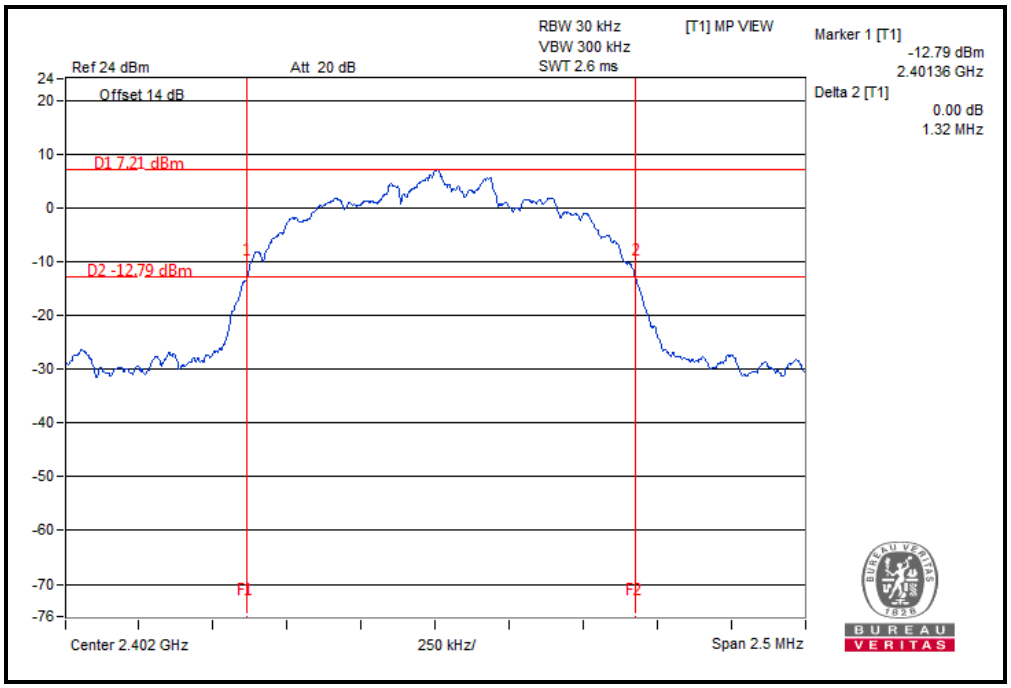
CH 78


RBW 30 kHz
VBW 300 kHz
SWT 2.6 ms
[T1] MP VIEW
[T2] MP VIEW
Marker 1 [T1]
-13.20 dBm
2.47935 GHz
Delta 2 [T1]
0.00 dB
1.33 MHz
Ref 24 dBm
Att 20 dB
Offset 14 dB
D1 6.80 dBm
D2 -13.20 dBm
Center 2.48 GHz
250 kHz/
Span 2.5 MHz

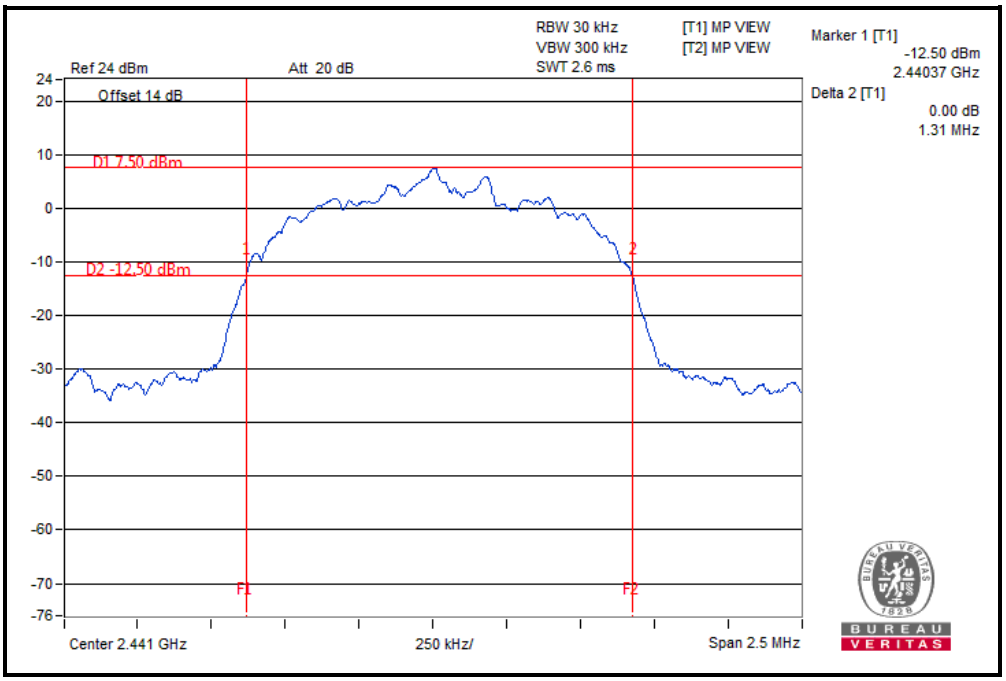
8DPSK

CHANNEL	CHANNEL FREQUENCY (MHz)	20dB BANDWIDTH (MHz)
0	2402	1.32
39	2441	1.31
78	2480	1.31

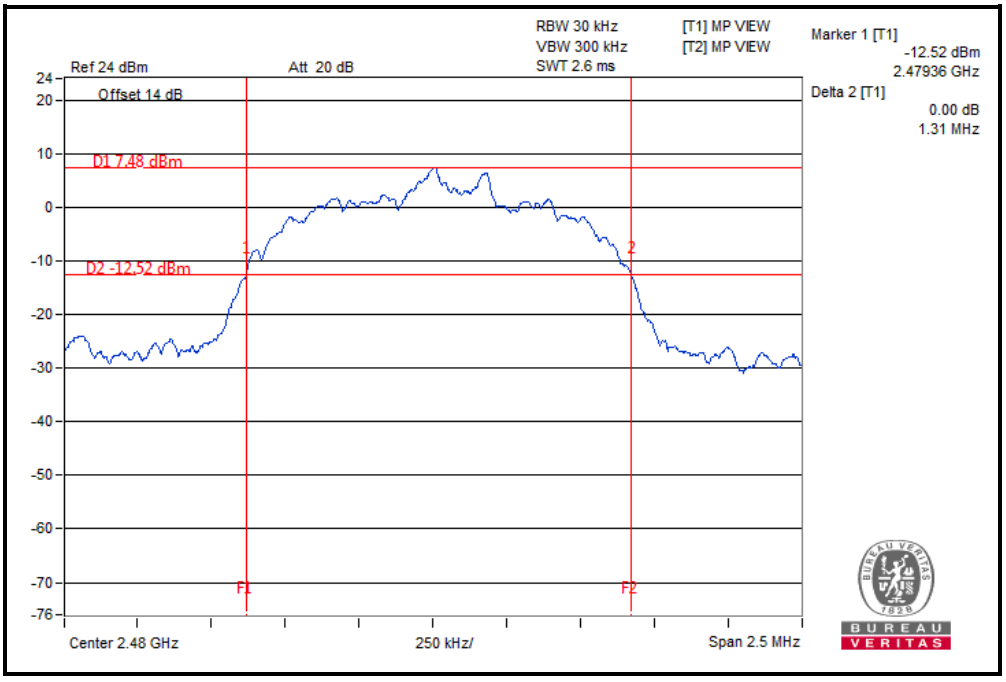
CH 0



CH 39


RBW 30 kHz
VBW 300 kHz
SWT 2.6 ms
[T1] MP VIEW
[T2] MP VIEW
Marker 1 [T1]
-12.50 dBm
2.44037 GHz
Delta 2 [T1]
0.00 dB
1.31 MHz
Ref 24 dBm
Att 20 dB
Offset 14 dB
D1 7.50 dBm
D2 -12.50 dBm
Center 2.441 GHz
250 kHz/
Span 2.5 MHz

CH 78

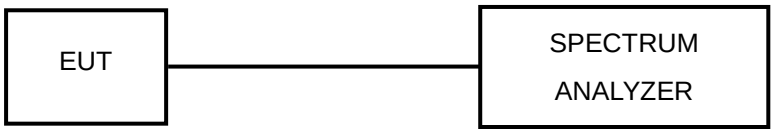

RBW 30 kHz
VBW 300 kHz
SWT 2.6 ms
[T1] MP VIEW
[T2] MP VIEW
Marker 1 [T1]
-12.52 dBm
2.47936 GHz
Delta 2 [T1]
0.00 dB
1.31 MHz
Ref 24 dBm
Att 20 dB
Offset 14 dB
D1 7.48 dBm
D2 -12.52 dBm
Center 2.48 GHz
250 kHz/
Span 2.5 MHz

3.6 HOPPING CHANNEL SEPARATION

3.6.1 LIMIT OF HOPPING CHANNEL SEPARATION

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

3.6.2 TEST SETUP



3.6.3 TEST INSTRUMENTS

Refer to section 3.3.3 to get information of above instrument.

3.6.4 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.

3.6.5 DEVIATION FROM TEST STANDARD

No deviation.

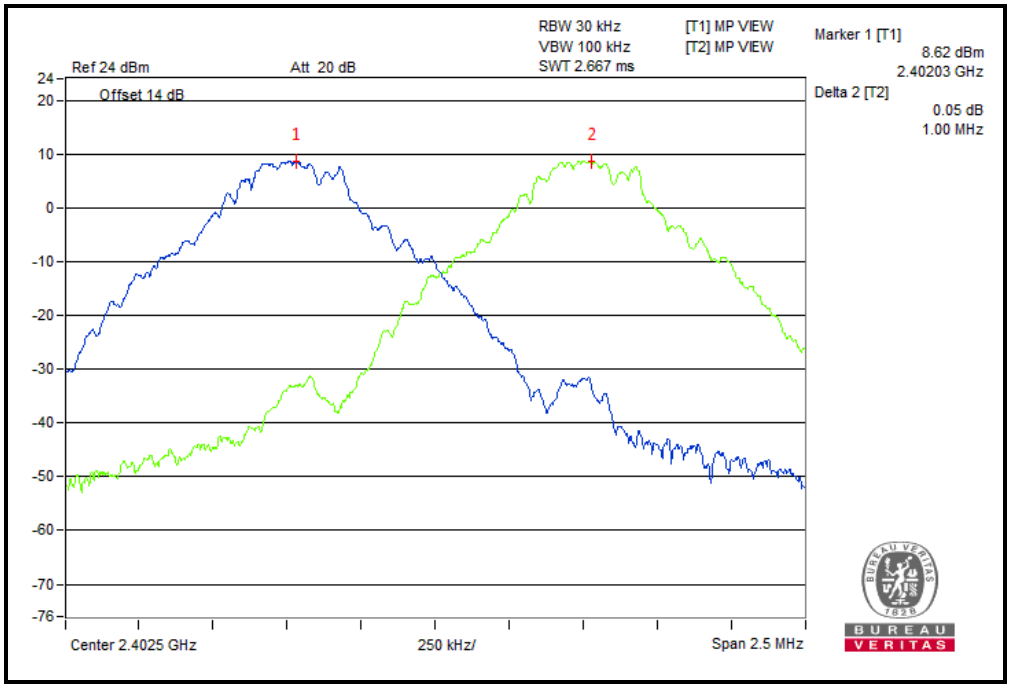
3.6.6 TEST RESULTS

GFSK

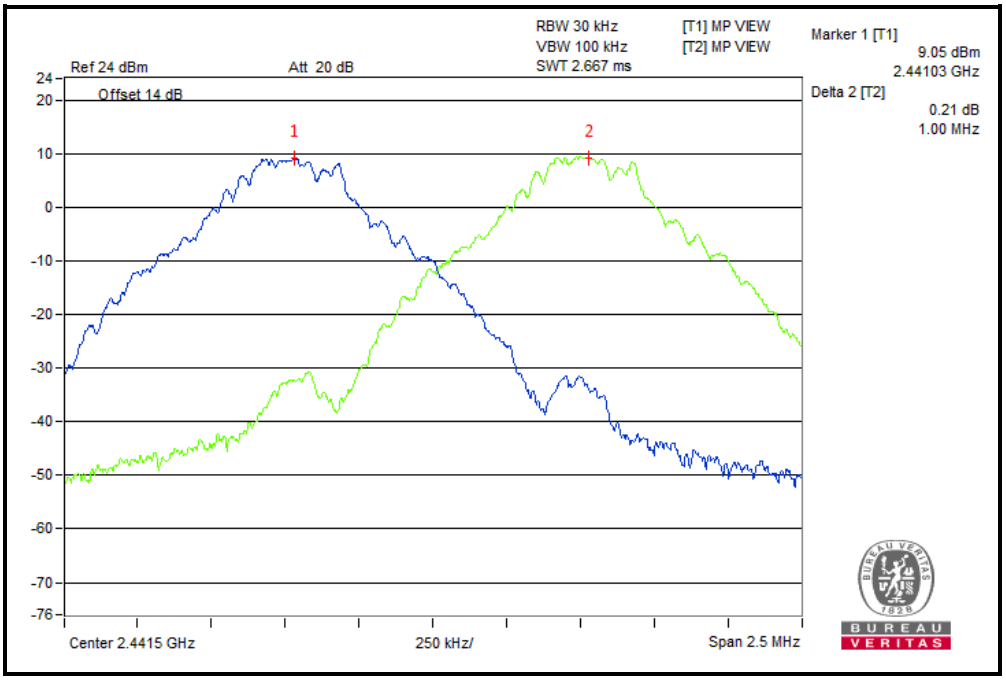
CHANNEL	FREQUENCY (MHz)	ADJACENT CHANNEL SEPARATION (MHz)	20dB BANDWIDTH (MHz)	MINIMUM LIMIT (MHz)	PASS / FAIL
0	2402	1.00	0.96	0.64	PASS
39	2441	1.00	0.96	0.64	PASS
78	2480	1.00	0.95	0.63	PASS

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

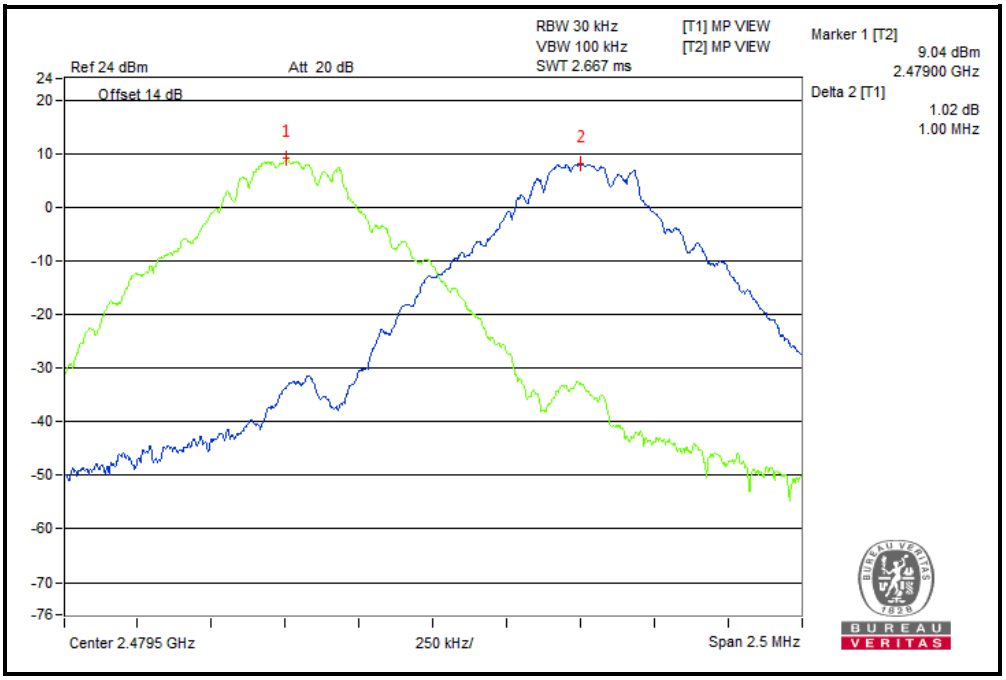
CH 0



CH 39


RBW 30 kHz
VBW 100 kHz
SWT 2.667 ms
[T1] MP VIEW
[T2] MP VIEW
Marker 1 [T1]
9.05 dBm
2.44103 GHz
Delta 2 [T2]
0.21 dB
1.00 MHz
Ref 24 dBm
Att 20 dB
Offset 14 dB
24
20
10
0
-10
-20
-30
-40
-50
-60
-70
-76
Center 2.4415 GHz
250 kHz/
Span 2.5 MHz

CH 78

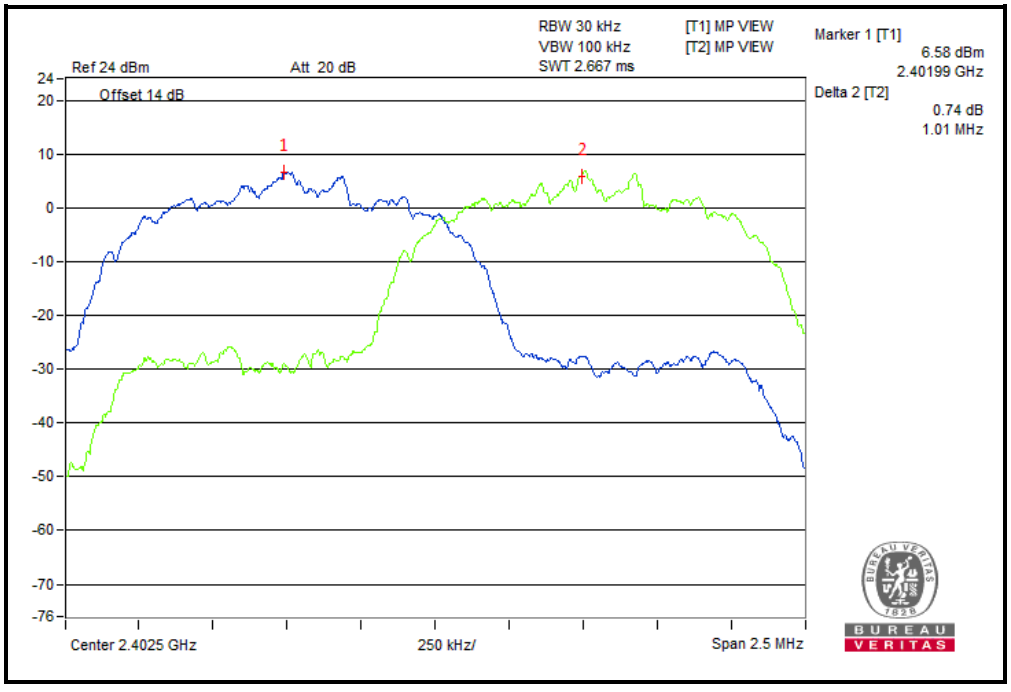

RBW 30 kHz
VBW 100 kHz
SWT 2.667 ms
[T1] MP VIEW
[T2] MP VIEW
Marker 1 [T2]
9.04 dBm
2.47900 GHz
Delta 2 [T1]
1.02 dB
1.00 MHz
Ref 24 dBm
Att 20 dB
Offset 14 dB
24
20
10
0
-10
-20
-30
-40
-50
-60
-70
-76
Center 2.4795 GHz
250 kHz/
Span 2.5 MHz

8DPSK

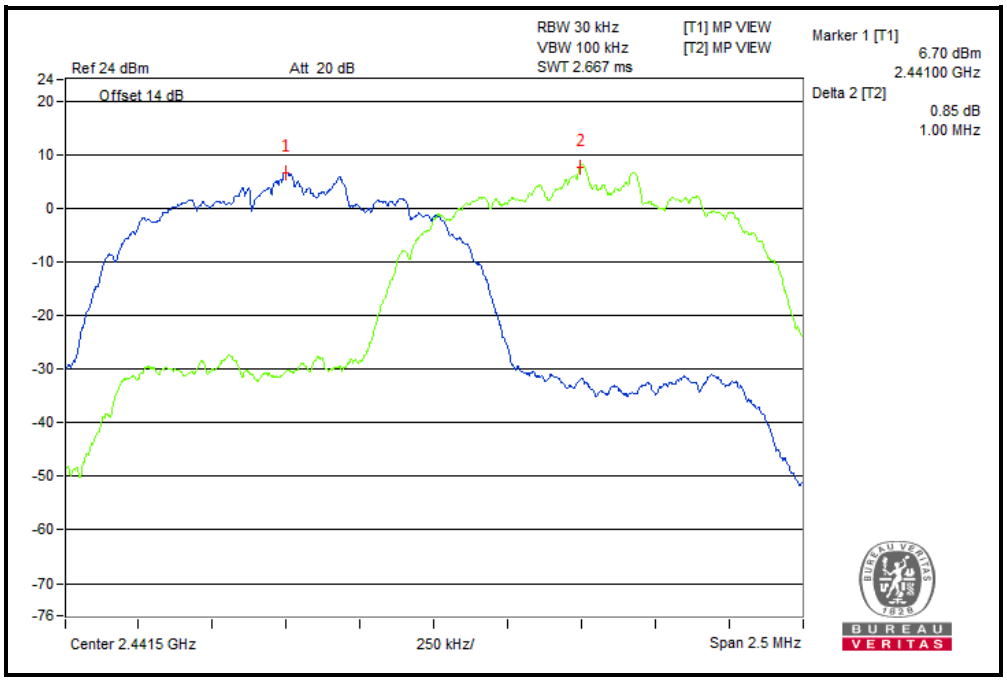
CHANNEL	FREQUENCY (MHz)	ADJACENT CHANNEL SEPARATION (MHz)	20dB BANDWIDTH (MHz)	MINIMUM LIMIT (MHz)	PASS / FAIL
0	2402	1.01	1.32	0.88	PASS
39	2441	1.00	1.31	0.87	PASS
78	2480	1.00	1.31	0.87	PASS

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

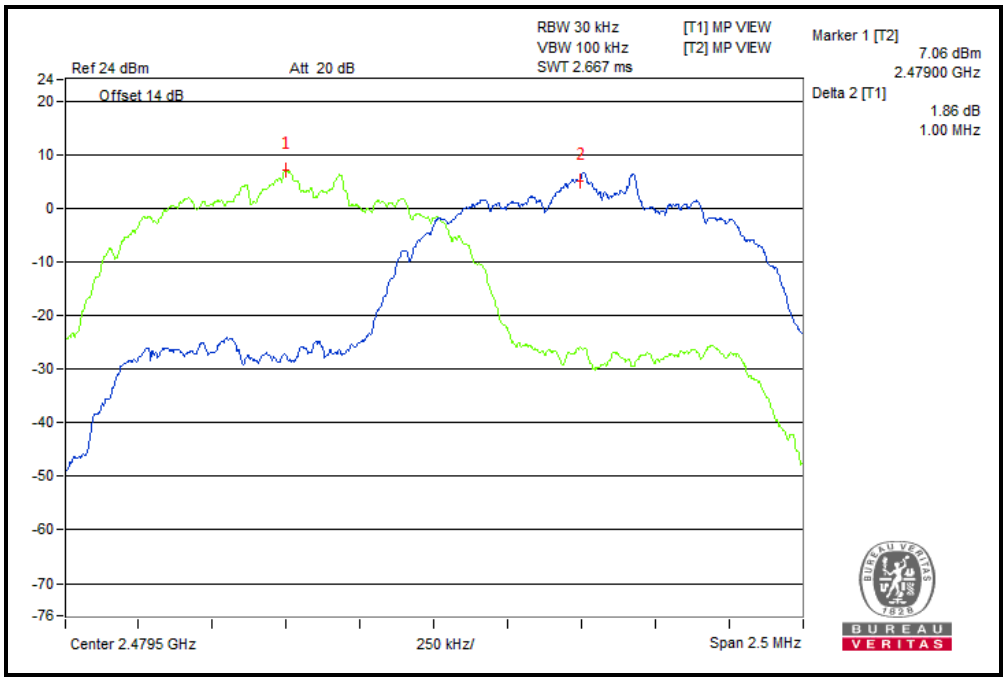
CH 0



CH 39


RBW 30 kHz
VBW 100 kHz
SWT 2.667 ms
[T1] MP VIEW
[T2] MP VIEW
Marker 1 [T1]
6.70 dBm
2.44100 GHz
Delta 2 [T2]
0.85 dB
1.00 MHz
Ref 24 dBm
Att 20 dB
Offset 14 dB
24
20
10
0
-10
-20
-30
-40
-50
-60
-70
-76
Center 2.4415 GHz
250 kHz/
Span 2.5 MHz

CH 78

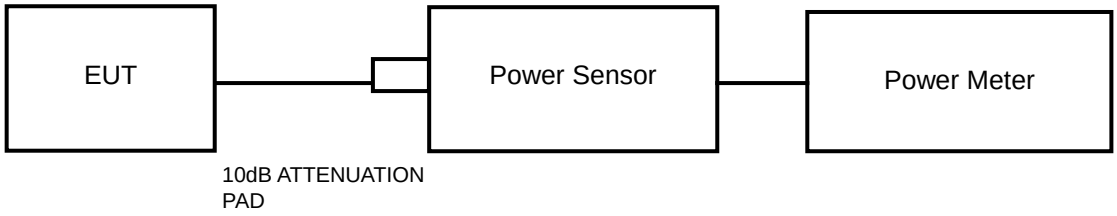

RBW 30 kHz
VBW 100 kHz
SWT 2.667 ms
[T1] MP VIEW
[T2] MP VIEW
Marker 1 [T2]
7.06 dBm
2.47900 GHz
Delta 2 [T1]
1.86 dB
1.00 MHz
Ref 24 dBm
Att 20 dB
Offset 14 dB
24
20
10
0
-10
-20
-30
-40
-50
-60
-70
-76
Center 2.4795 GHz
250 kHz/
Span 2.5 MHz

3.7 MAXIMUM OUTPUT POWER

3.7.1 LIMITS OF MAXIMUM OUTPUT POWER MEASUREMENT

The Maximum Output Power Measurement is 125mW.

3.7.2 TEST SETUP



3.7.3 TEST INSTRUMENTS

Refer to section 3.3.3 to get information of above instrument.

3.7.4 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.

3.7.5 DEVIATION FROM TEST STANDARD

No deviation.

3.7.6 EUT OPERATING CONDITION

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

3.7.7 TEST RESULTS

3.7.7.1 MAXIMUM PEAK OUTPUT POWER

GFSK

CHANNEL	CHANNEL FREQUENCY (MHz)	POWER OUTPUT (dBm)	POWER OUTPUT (mW)	POWER LIMIT (mW)	PASS/FAIL
0	2402	11.18	13.122	125	PASS
39	2441	11.57	**14.355**	125	PASS
78	2480	10.41	10.990	125	PASS

π/4 DQPSK

CHANNEL	CHANNEL FREQUENCY (MHz)	POWER OUTPUT (dBm)	POWER OUTPUT (mW)	POWER LIMIT (mW)	PASS/FAIL
0	2402	10.83	12.106	125	PASS
39	2441	11.08	12.823	125	PASS
78	2480	10.16	10.375	125	PASS

8DPSK

CHANNEL	CHANNEL FREQUENCY (MHz)	POWER OUTPUT (dBm)	POWER OUTPUT (mW)	POWER LIMIT (mW)	PASS/FAIL
0	2402	11.01	12.618	125	PASS
39	2441	11.27	13.397	125	PASS
78	2480	10.22	10.520	125	PASS

3.8 OUT OF BAND MEASUREMENT

3.8.1 LIMITS OF OUT OF BAND MEASUREMENT

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

3.8.2 TEST INSTRUMENTS

Refer to section 3.3.3 to get information of above instrument.

3.8.3 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.

3.8.4 DEVIATION FROM TEST STANDARD

No deviation.

3.8.5 EUT OPERATING CONDITION

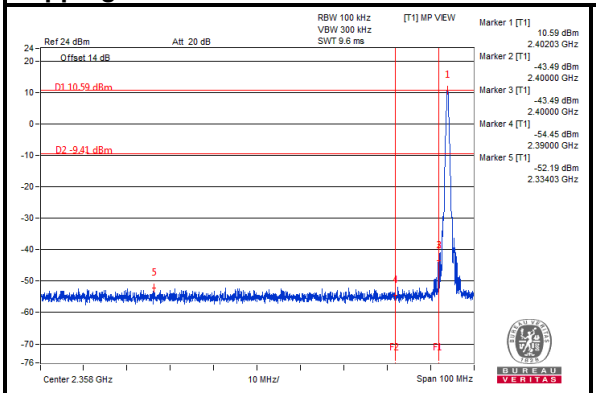
The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.

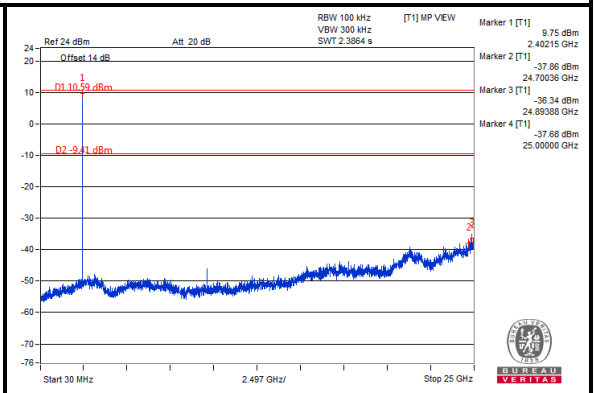
3.8.6 TEST RESULTS

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.

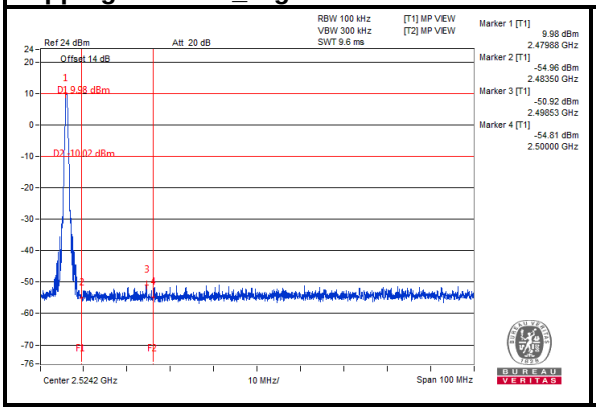
GFSK

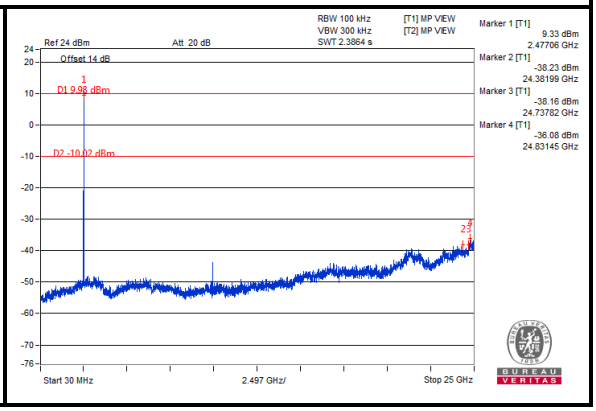
Hopping disabled Low Channel



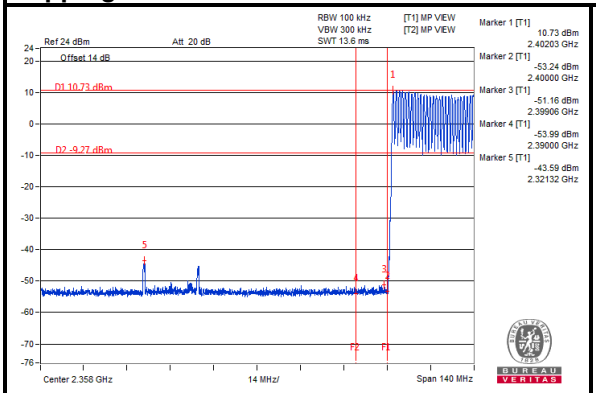


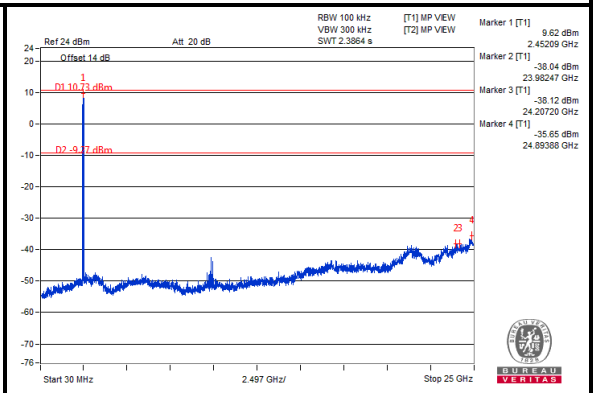
Hopping disabled_High Channel



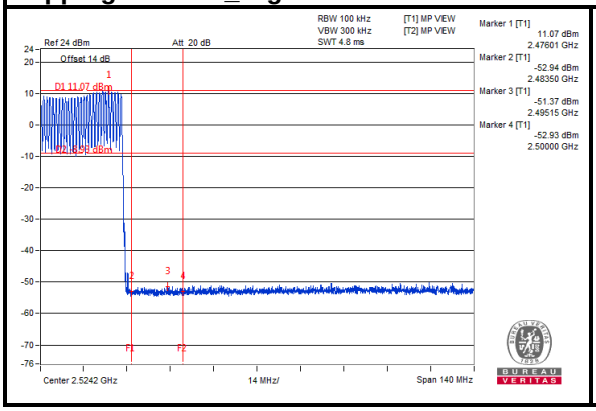


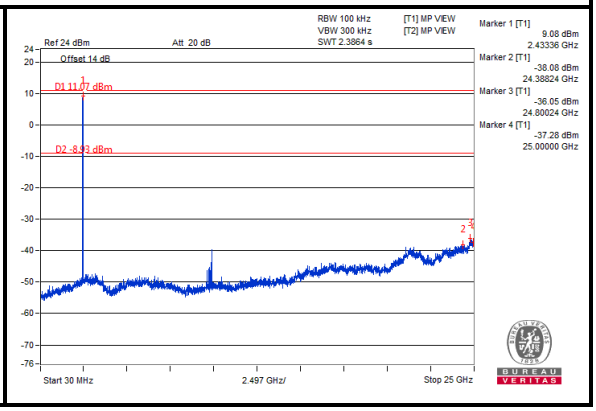
Hopping enabled Low Channel





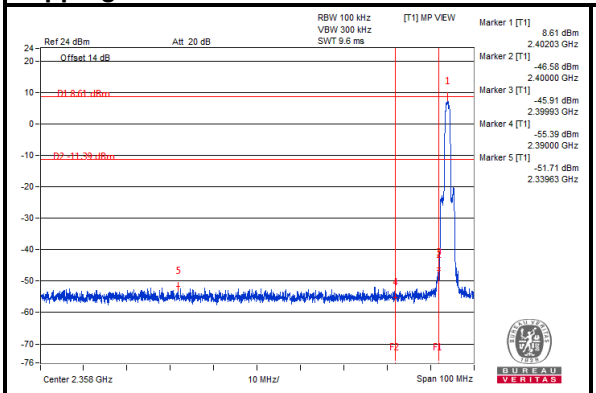
Hopping enabled_High Channel

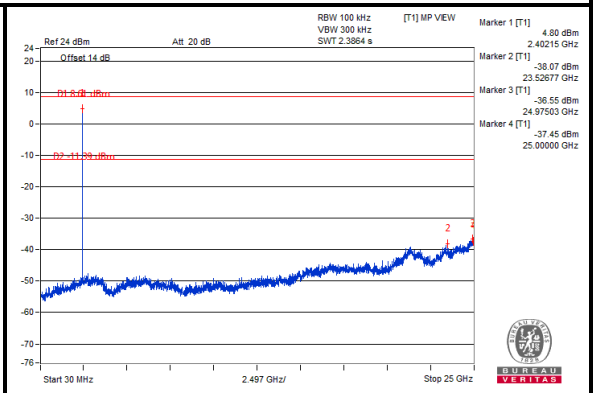




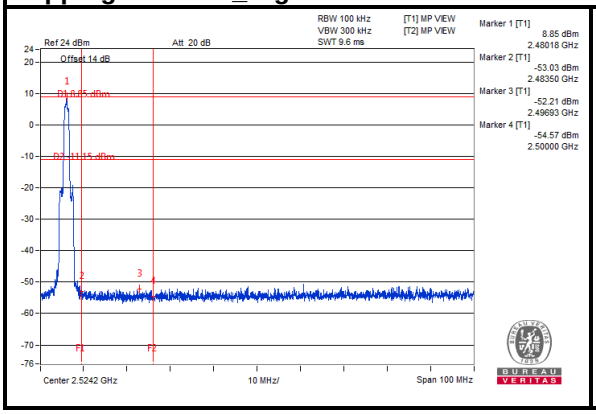
8DPSK

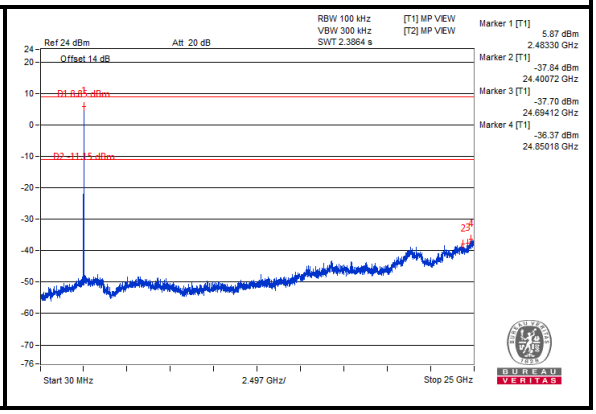
Hopping disabled Low Channel





Hopping disabled_High Channel





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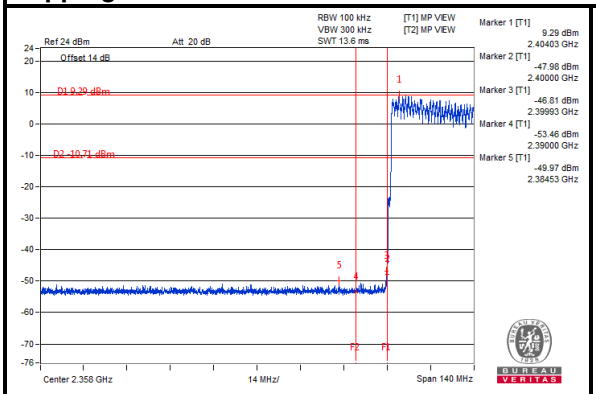

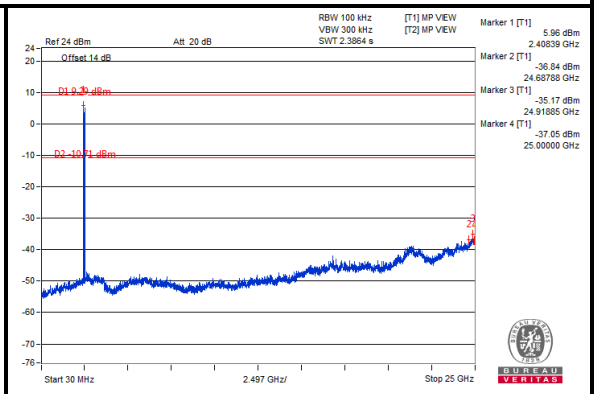

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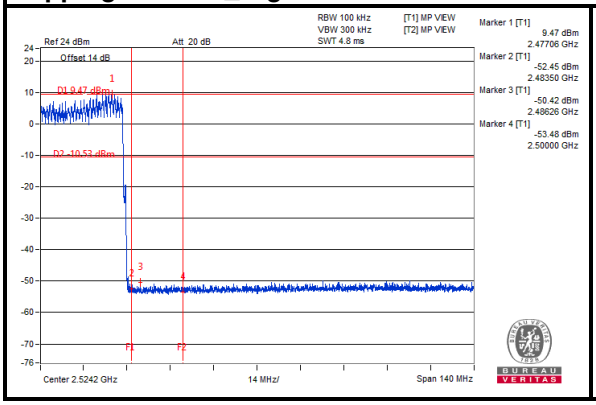

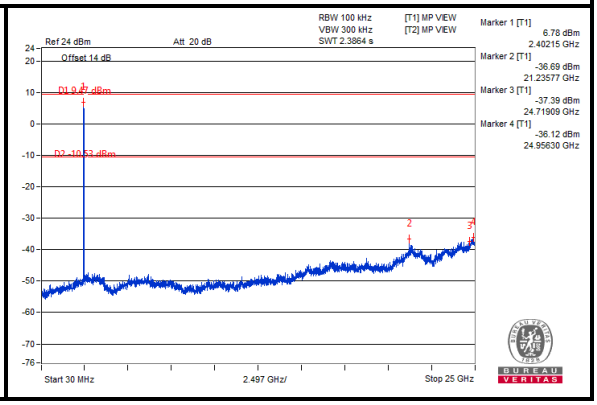

π/4DQPSK

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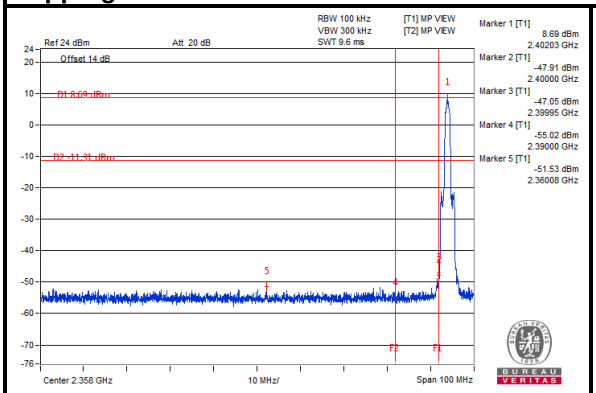

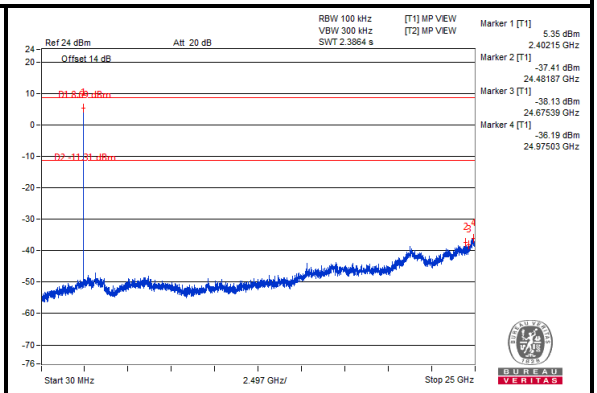

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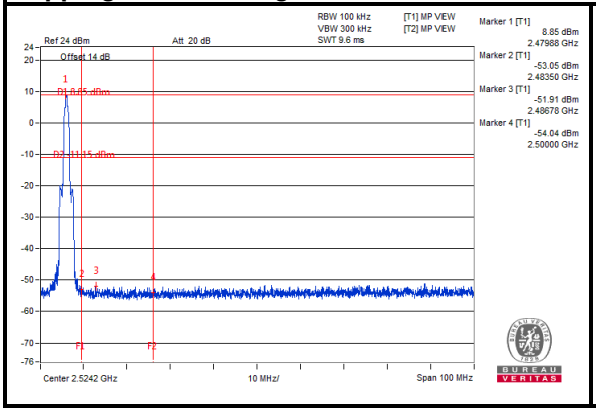

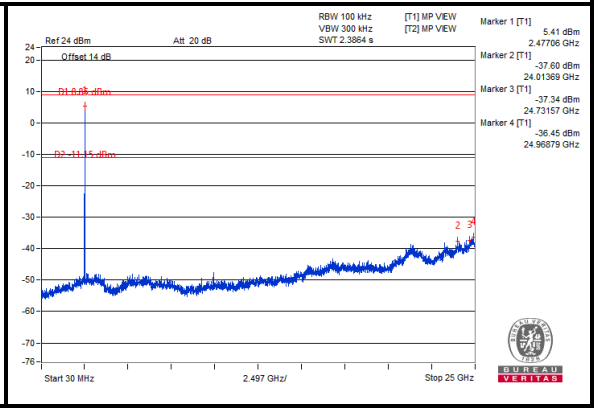

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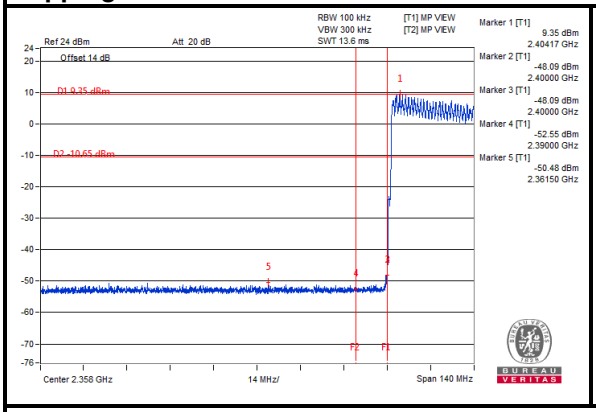

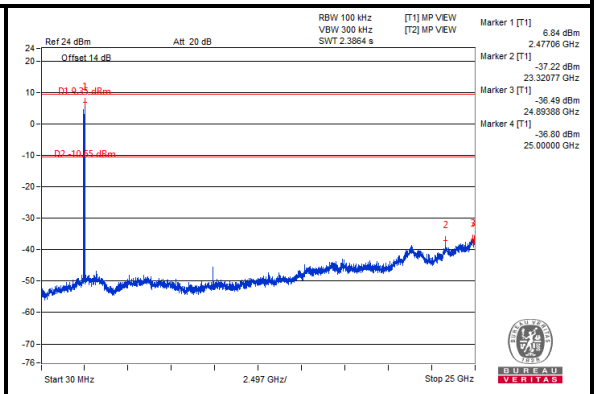

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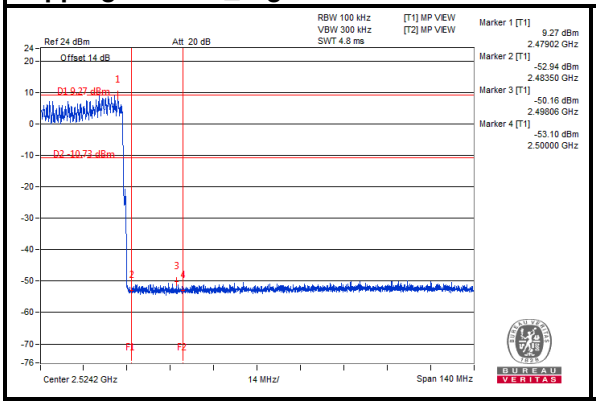

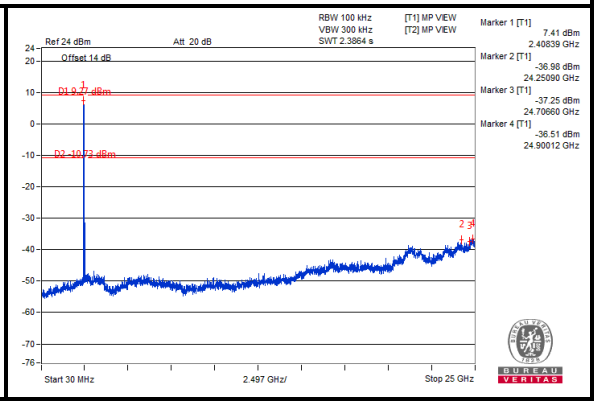

4 PHOTOGRAPHS OF THE TEST CONFIGURATION

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

5 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---