TEST REPORT

Applicant	ONANOFF LIMITED
Address	RM 424, Sino Ind. Plaza, 9 Kai Cheung Road, Kowloon Bay, Kowloon, Hong Kong SAR.

Manufacturer or Supplier	ONANOFF LIMITED
Address	RM 424, Sino Ind. Plaza, 9 Kai Cheung Road, Kowloon Bay, Kowloon, Hong Kong SAR.
Product	BuddyPhones Play
Additional Product	BuddyPhones Playtime, BuddyPhones Wave
Brand Name	BuddyPhones, Onanoff
Model	BT-BP-PLAY
Additional Model & Model Difference	BT-BP-WV
Date of tests	Aug. 14, 2020 ~ Aug. 28, 2020

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

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

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

Tested by Evans He Project Engineer / EMC Department	Approved by David Huang Assistant Manager / EMC Department
Evans He	David Huang Date: Aug. 31, 2020

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RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
RF200812S005	Original release	Aug. 31, 2020

1 SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

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

2 MEASUREMENT UNCERTAINTY

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

MEASUREMENT	FREQUENCY	UNCERTAINTY
Conducted emissions	9kHz~30MHz	±2.70dB
Radiated emissions	9KHz ~ 30MHz	±2.16dB
	30MHz ~ 1GMHz	±3.74dB
	1GHz ~ 18GHz	±4.66dB
	18GHz ~ 40GHz	±4.67dB

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	BuddyPhones Play
ADDITIONAL PRODUCT	BuddyPhones Playtime, BuddyPhones Wave
MODEL NO.	BT-BP-PLAY
ADDITIONAL MODEL	BT-BP-WV
FCC ID	2AN2MBUDDYPHONESWV
POWER SUPPLY	DC 3.7V From Li-ion Battery or DC 5V From USB Host Unit
MODULATION TECHNOLOGY	FHSS
MODULATION TYPE	GFSK, π/4 DQPSK
OPERATING FREQUENCY	2402MHz~2480MHz
NUMBER OF CHANNEL	79
PEAK OUTPUT POWER	4.285mW (Max. Measured)
ANTENNA TYPE	PCB Antenna, -0.68dBi Gain
I/O PORTS	Refer to user's manual
CABLE SUPPLIED	USB Line: Unshielded, Detachable, 0.2m 3.5mm audio cable, 1m

NOTE:

1. For a more detailed features description, please refer to the manufacturer's specifications or the user's manual.
2. For the test results, the EUT had been tested with all conditions. But only the worst case was shown in test report.
3. Please refer to the EUT photo document (Reference No.: 200812S005) for detailed product photo.
4. Additional models (see about table) are identical with the test model BT-BP-PLAY except the color of the appearance and model name for trading purpose.
5. When the EUT charging that wireless function cann't working.

3.2 DESCRIPTION OF TEST MODES

79 channels are provided to this EUT:

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

3.2.1. CONFIGURATION OF SYSTEM UNDER TEST

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

3.2.2. TEST MODE APPLICABILITY AND TESTED CHANNEL DETAIL

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates, XYZ axis and antenna ports
The worst case was found when positioned on X axis for radiated emission.
Following channel(s) was (were) selected for the final test as listed below:

EUT CONFIGURE MODE	APPLICABLE TO				DESCRIPTION
	RE<1G	RE≥1G	PLC	APCM	
A	√	√	√	√	DC 3.7 V from li-ion battery

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	39	FHSS	GFSK	DH5

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

RADIATED EMISSION TEST (ABOVE 1 GHz):

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

EUT CONFIGURE MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	PACKET TYPE
-	0 to 78	0, 39, 78	FHSS	GFSK	DH5
	0 to 78	0, 39, 78	FHSS	π/4 DQPSK	2DH5

POWER LINE CONDUCTED EMISSION TEST:

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, antenna ports (if EUT with antenna diversity architecture), and packet types.

☒ Following channel(s) was (were) selected for the final test as listed below.

EUT CONFIGURE MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	PACKET TYPE
-	0 to 78	Hopping	FHSS	GFSK	DH5

ANTENNA PORT CONDUCTED MEASUREMENT:

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

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, antenna ports (if EUT with antenna diversity architecture), and packet types.

☒ Following channel(s) was (were) selected for the final test as listed below.

EUT CONFIGURE MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	PACKET TYPE
-	0 to 78	0, 39, 78	FHSS	GFSK	DH5
	0 to 78	0, 39, 78	FHSS	π/4 DQPSK	2DH5

TEST CONDITION:

APPLICABLE TO	ENVIRONMENTAL CONDITIONS	TEST VOLTAGE (SYSTEM)	TESTED BY
RE<1G	25deg. C, 55%RH	DC 3.7 V from li-ion battery	Aaron Liang
RE≥1G	25deg. C, 55%RH	DC 3.7 V from li-ion battery	Aaron Liang
PLC	25deg. C, 60%RH	DC 3.7 V from li-ion battery	Aaron Liang
APCM	20deg. C, 55%RH	DC 3.7 V from li-ion battery	Aaron Liang

3.3 GENERAL DESCRIPTION OF APPLIED STANDARDS

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

FCC Part 15, Subpart C. Section 15.247

KDB 558074 D01 15.247 Meas Guidance v05r02
ANSI C63.10-2013

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

3.4 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested as an independent unit without any other necessary accessory or support units.

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	8471241027	Mar. 24, 20	Mar. 24, 21
Artificial Mains Network	SCHWARZBECK	8127	8127713	Mar. 24, 20	Mar. 24, 21
ISN	Com-Power	ISN T800	34373	Mar. 24, 20	Mar. 24, 21
Test software	EZ-EMC	ICP-03A1	N/A	N/A	N/A

NOTE:

1. The test was performed in 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.

4.1.3 TEST PROCEDURES

a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance for the measuring instrument.

b. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.

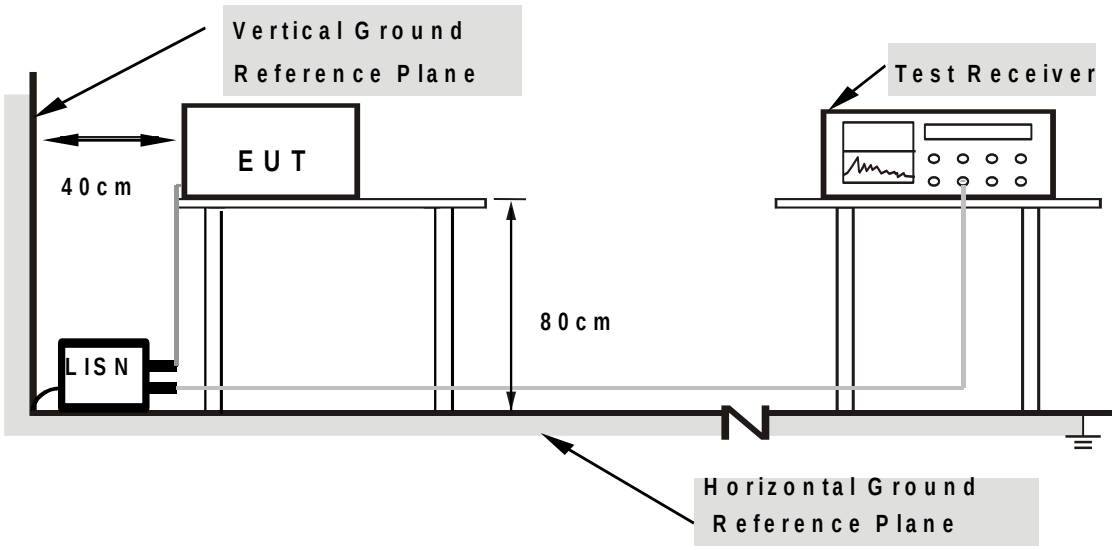
c. The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) was not recorded.

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

4.1.4 DEVIATION FROM TEST STANDARD

No deviation.

4.1.5 TEST SETUP



Note: 1.Support units were connected to second LISN.
2.Both of LISNs (AMN) are 80 cm from EUT and at least 80 from other units and other metal planes

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

4.1.6 EUT OPERATING CONDITIONS

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

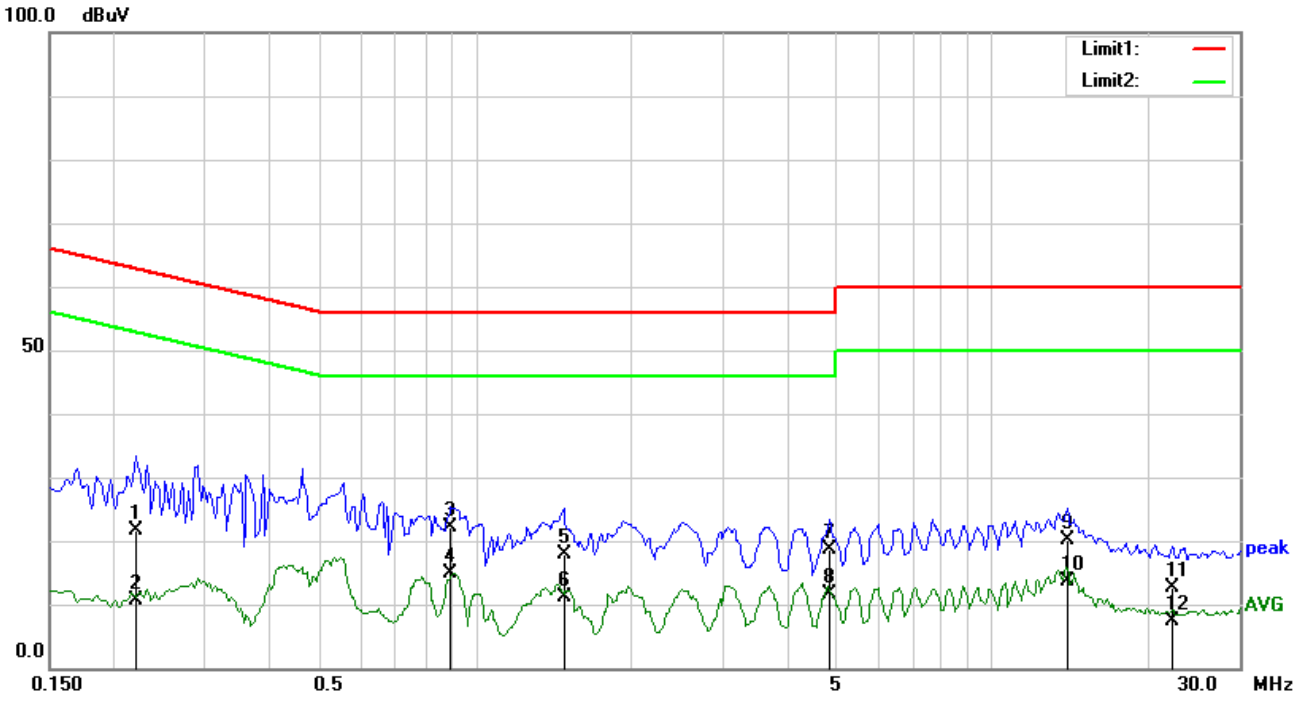
4.1.7 TEST RESULTS

CONDUCTED WORST-CASE DATA:

PHASE	Line	6dB BANDWIDTH	9kHz

NO.	P/L	FREQUENCY (MHZ)	READING (DBUV)	DETECTOR	CORRECTED (DB}	RESULT (DBUV)	LIMIT (DBUV)	MARGIN (DB)
1	L1	0.2202	11.64	QP	10.11	21.75	62.81	-41.06
2	L1	0.2202	0.64	AVG	10.11	10.75	52.81	-42.06
3	L1	0.8949	11.93	QP	10.12	22.05	56.00	-33.95
4	L1	0.8949	4.69	AVG	10.12	14.81	46.00	-31.19
5	L1	1.4799	7.82	QP	10.14	17.96	56.00	-38.04
6	L1	1.4799	0.89	AVG	10.14	11.03	46.00	-34.97
7	L1	4.8291	8.41	QP	10.20	18.61	56.00	-37.39
8	L1	4.8291	1.52	AVG	10.20	11.72	46.00	-34.28
9	L1	13.9161	9.85	QP	10.31	20.16	60.00	-39.84
10	L1	13.9161	3.36	AVG	10.31	13.67	50.00	-36.33
11	L1	22.2777	2.17	QP	10.46	12.63	60.00	-47.37
12	L1	22.2777	-3.02	AVG	10.46	7.44	50.00	-42.56

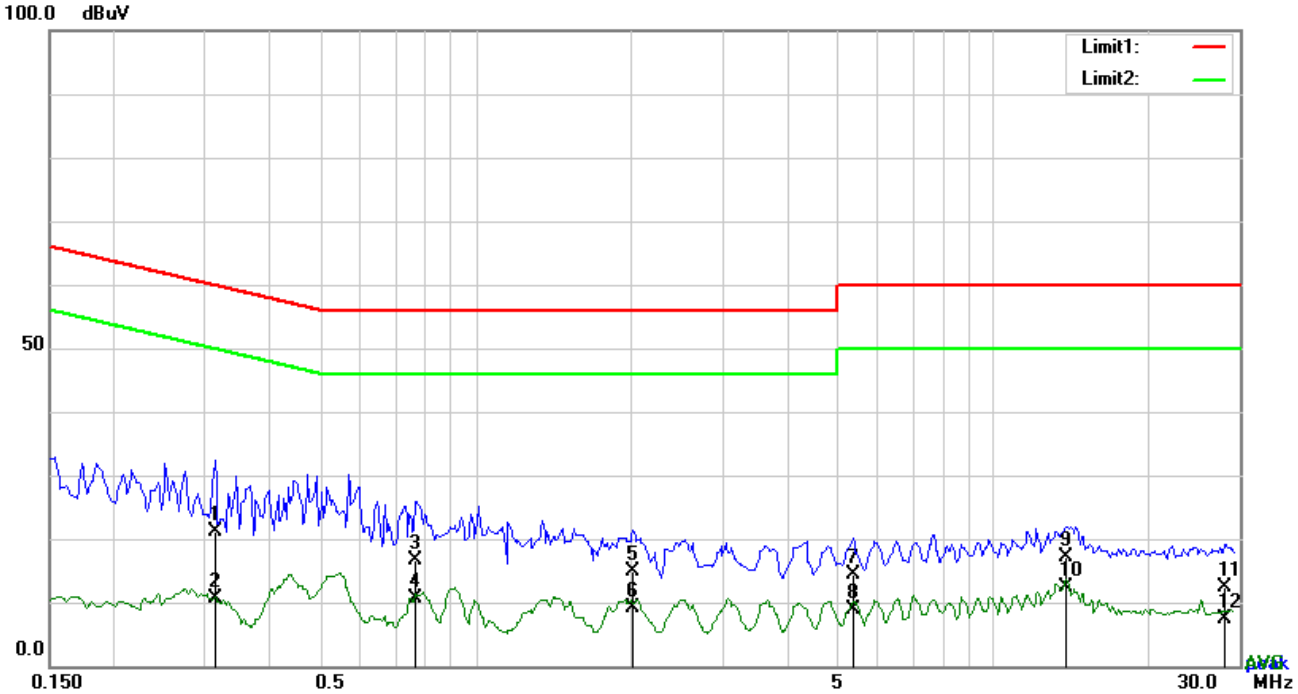
REMARKS: 1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. "-": The Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.
3. The emission levels of other frequencies were very low against the limit.
4. Margin value = Emission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



PHASE	Neutral	6dB BANDWIDTH	9kHz

NO.	P/L	FREQUENCY (MHZ)	READING (DBUV)	DETECTOR	CORRECTED (DB}	RESULT (DBUV)	LIMIT (DBUV)	MARGIN (DB)
1	N	0.3138	10.95	QP	10.13	21.08	59.87	-38.79
2	N	0.3138	0.44	AVG	10.13	10.57	49.87	-39.30
3	N	0.7662	6.61	QP	10.13	16.74	56.00	-39.26
4	N	0.7662	0.59	AVG	10.13	10.72	46.00	-35.28
5	N	2.0181	4.80	QP	10.17	14.97	56.00	-41.03
6	N	2.0181	-0.98	AVG	10.17	9.19	46.00	-36.81
7	N	5.3673	4.06	QP	10.21	14.27	60.00	-45.73
8	N	5.3673	-1.38	AVG	10.21	8.83	50.00	-41.17
9	N	13.8459	6.82	QP	10.30	17.12	60.00	-42.88
10	N	13.8459	2.19	AVG	10.30	12.49	50.00	-37.51
11	N	28.1004	1.89	QP	10.53	12.42	60.00	-47.58
12	N	28.1004	-3.17	AVG	10.53	7.36	50.00	-42.64

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	ESL6	1300.5001K06 -100262-eQ	Mar. 24, 20	Mar. 24, 21
Bilog Antenna	Sunol Sciences	JB6	A110712	Jul. 21, 20	Jul. 21, 21
Active Antenna	CMO-POWER	AL-130	121031	Jun. 30, 20	Jun. 30, 21
Signal Amplifier	HP	8447E	443008	Mar. 24, 20	Mar. 24, 21
3m Semi-anechoic Chamber	SAEMC	9m*6m*6m	N/A	Oct. 18, 18	Oct. 17, 21
Test Software	EZ-EMC	ICP-03A1	N/A	N/A	N/A
Signal and Spectrum Analyzer	R&S	FSV40	101094	Mar. 19, 20	Mar. 19, 21
MXA signal analyzer	Agilent	N9020A	MY49100060	Mar. 24, 20	Mar. 24, 21
Horn Antenna	COM-POWER	AH-118	71259	Apr. 17, 20	Apr. 17, 21
Horn Antenna	COM-POWER	AH-118	71283	Jul. 21, 20	Jul. 21, 21
SHF-EHF Horn	Schwarzbeck	BBHA9170	BBHA9170147	May 10, 20	May 10, 21
SHF-EHF Horn	Schwarzbeck	BBHA9170	BBHA9170242	May 10, 20	May 10, 21
AMPLIFIER	EM Electornic Corporation	EM01G26G	60613	Mar. 24, 20	Mar. 24, 21
Pre-amplifier	Rohde&Schwarz	SCU40	100437	Oct. 17, 19	Oct. 16, 20
EMI Test Receiver	Rohde&Schwarz	ESL6	1300.5001K06 -100262-eQ	Mar. 24, 20	Mar. 24, 21
Bilog Antenna	Sunol Sciences	JB6	A110712	Jul. 21, 20	Jul. 21, 21

NOTE:

1. The test was performed in 966 Chamber.
2. The calibration interval of the above test instruments is 12 months (except 3m Semi-anechoic Chamber) and the calibrations are traceable to CEPREI/CHINA, GRGT/CHINA and NIM/CHINA.
3. The horn antenna is used only for the measurement of emission frequency above1GHz if tested.
4. The FCC Site Registration No. is 535293.

4.2.3 TEST PROCEDURES

a. The EUT was placed on the top of a rotating table 1.5 meters(above 1GHz) and 0.8 meters(below 1GHz) above the ground at a 3 meters semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.

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

c. For below 1GHz was used bilog antenna, and above 1GHz was used horn antenna, and its height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

f. For below 30MHz, a loop antenna with its vertical plane is place 3m from the EUT and rotated about its vertical axis for maximum response at each azimuth about the EUT. And the centre of the loop shall be 1m above the ground.

g. During the test, each emission was maximized by: having the EUT continuously working, investigated all operating modes, rotated about all 3 axis (X, Y & Z) and considered typical configuration to obtain worst position, manipulating interconnecting cables, For battery operated equipment, the equipment tests shall be perform using fresh batteries. The turntable was rotated to maximize the emission level.

NOTE:

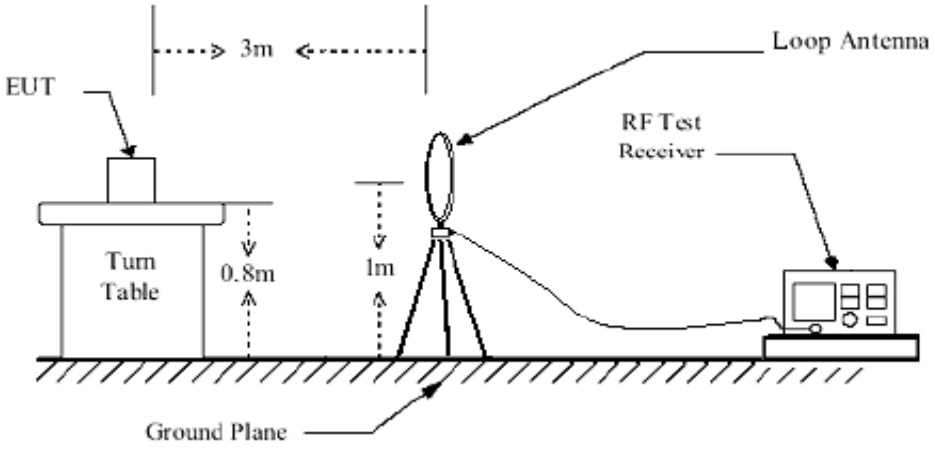
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and video bandwidth is 3MHz for Peak detection at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is ≥ 1/T (Duty cycle < 98%) or 10Hz(Duty cycle > 98%) for Average detection (AV) at frequency above 1GHz.
4. All modes of operation were investigated and the worst-case emissions are reported.
5. The testing of the EUT was performed on all 3 orthogonal axes; the worst-case test configuration was reported on the file test setup photo.

4.2.4 DEVIATION FROM TEST STANDARD

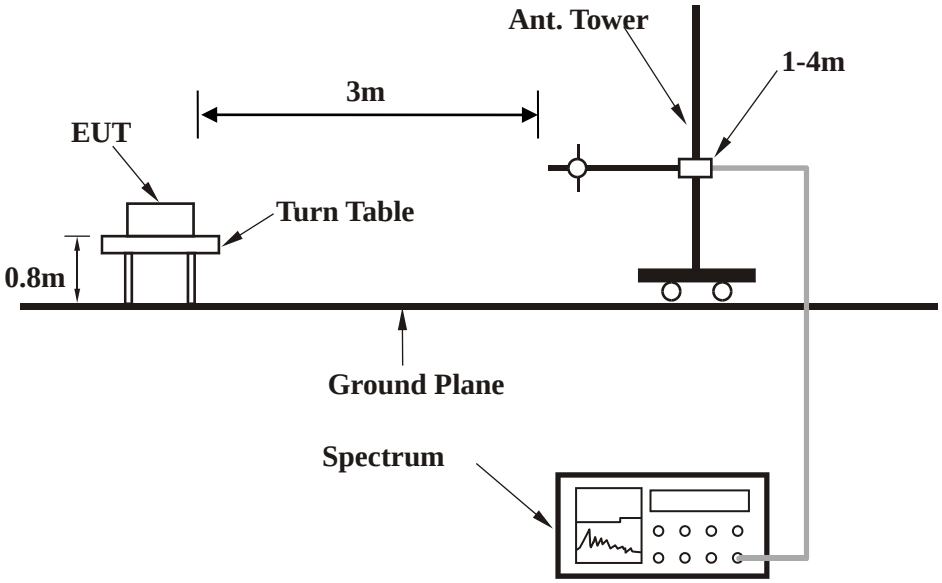
No deviation.

4.2.5 TEST SETUP

Below 30MHz test setup

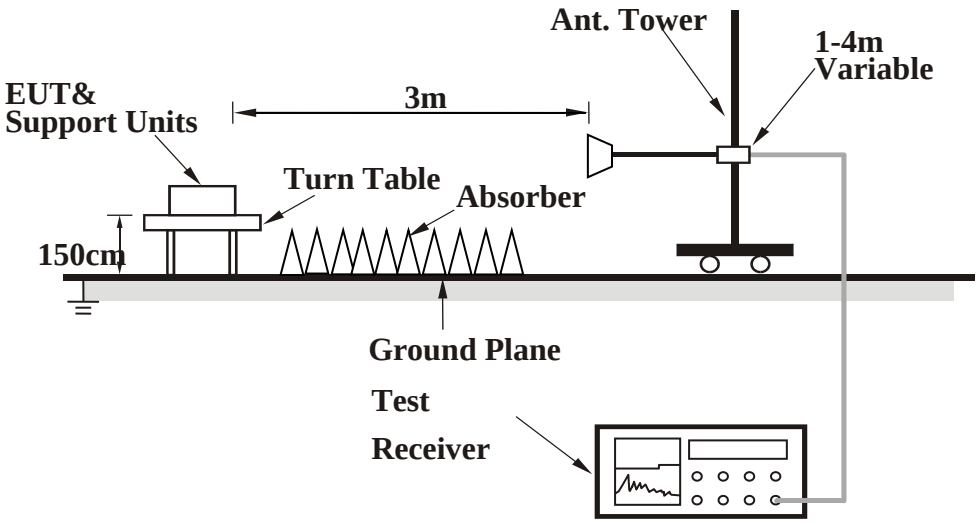


Below 1GHz test setup



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

Above 1GHz test setup



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

4.2.6 EUT OPERATING CONDITIONS

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

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

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

4.2.7 TEST RESULTS

BELOW 1GHz WORST-CASE DATA:

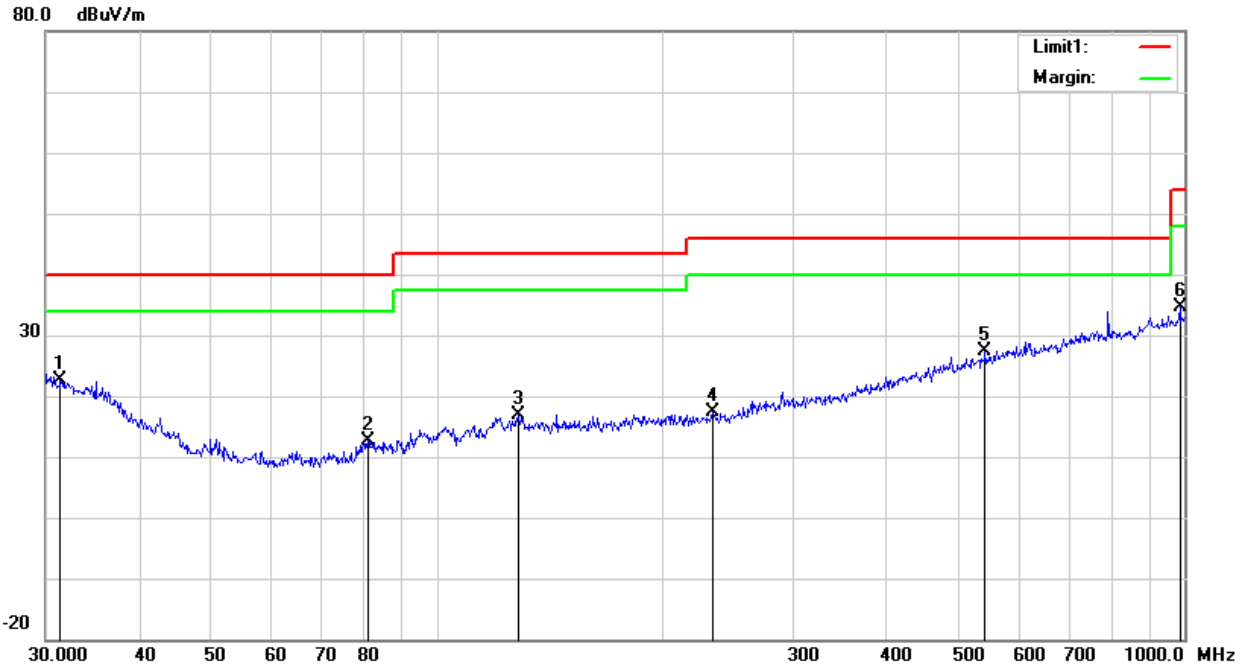
GFSK DH5

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M										
NO.	Freq. (MHz)	Reading (dBuV/m)	Ant-F (dB/m)	PA-G (dB)	Cab-L (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (°)
1	31.3992	25.56	19.20	22.27	0.14	22.63	40.00	-17.37	100	320
2	80.9275	27.77	6.79	22.41	0.55	12.70	40.00	-27.30	100	45
3	128.5630	26.58	11.59	22.38	1.06	16.85	43.50	-26.65	100	168
4	234.1684	26.42	11.58	22.32	1.59	17.27	46.00	-28.73	100	198
5	541.3725	27.48	19.27	21.71	2.25	27.29	46.00	-18.71	100	333
6	986.0717	28.55	24.01	20.72	2.74	34.58	54.00	-19.42	100	272

REMARKS:

1. Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB/m).
2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB).
3. The emission levels of other frequencies were greater than 20dB margin.
4. 9KHz~30MHz have been test and test data more than 20dB margin.
5. Margin value = Emission level – Limit value

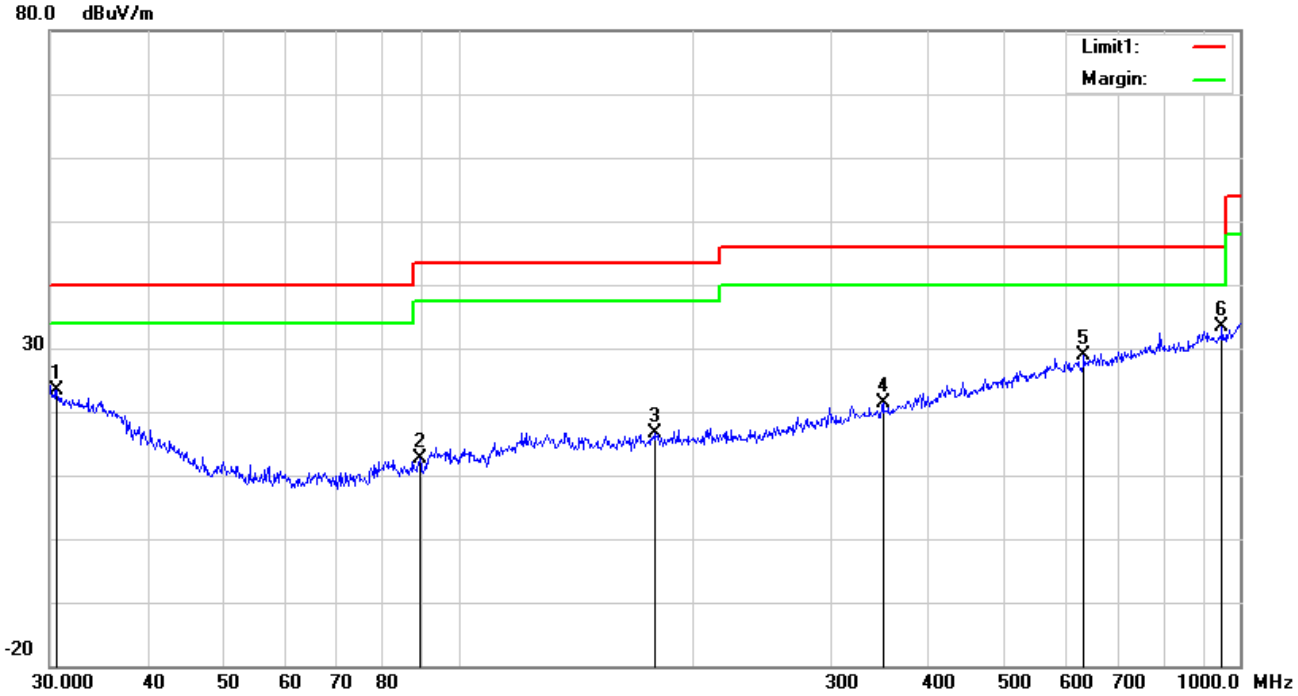


CHANNEL	Channel 39	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	9KHz ~ 1GHz		

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M										
NO.	Freq. (MHz)	Reading (dBuV/m)	Ant-F (dB/m)	PA-G (dB)	Cab-L (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (°)
1	30.6379	25.81	19.69	22.28	0.13	23.35	40.00	-16.65	100	270
2	89.2764	26.78	7.63	22.33	0.62	12.70	43.50	-30.80	100	337
3	178.7584	26.18	11.25	22.25	1.45	16.63	43.50	-26.87	100	2
4	349.2500	27.11	14.68	22.15	1.85	21.49	46.00	-24.51	100	279
5	631.6884	27.65	20.43	21.51	2.34	28.91	46.00	-17.09	100	96
6	**948.7610**	**27.69**	**23.69**	**20.79**	**2.70**	**33.29**	**46.00**	**-12.71**	**200**	**253**

REMARKS:

1. Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB/m).
2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB).
3. The emission levels of other frequencies were greater than 20dB margin.
4. 9KHz~30MHz have been test and test data more than 20dB margin.
5. Margin value = Emission level – Limit value



ABOVE 1GHz DATA

BT_GFSK

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	64.12 PK	74.00	-9.88	169	359	75.5	-11.38
2	2390.00	41.62 AV	54.00	-12.38	169	359	53	-11.38
3	*2402.00	103.84 PK			164	22	115.22	-11.38
4	*2402.00	81.34 AV			164	22	92.72	-11.38
5	4804.00	61.04 PK	74.00	-12.96	156	127	67.11	-6.07
6	4804.00	38.54 AV	54.00	-15.46	156	127	44.61	-6.07
7	**#7206.00**	**68.99 PK**	**74.00**	**-5.01**	**159**	**83**	**68.7**	**0.29**
8	#7206.00	46.49 AV	54.00	-7.51	159	83	46.2	0.29
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	58.06 PK	74.00	-15.94	143	48	69.44	-11.38
2	2390.00	35.56 AV	54.00	-18.44	143	48	46.94	-11.38
3	*2402.00	95.88 PK			160	322	107.26	-11.38
4	*2402.00	73.38 AV			160	322	84.76	-11.38
5	4804.00	53.71 PK	74.00	-20.29	135	61	59.78	-6.07
6	4804.00	31.21 AV	54.00	-22.79	135	61	37.28	-6.07
7	#7206.00	64.81 PK	74.00	-9.19	137	38	64.52	0.29
8	#7206.00	42.31 AV	54.00	-11.69	137	38	42.02	0.29

REMARKS:

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

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2441.00	102.76 PK			133	275	114.14	-11.38
2	*2441.00	80.26 AV			133	275	91.64	-11.38
3	4882.00	60.82 PK	74.00	-13.18	144	219	66.89	-6.07
4	4882.00	38.32 AV	54.00	-15.68	144	219	44.39	-6.07
5	#7323.00	68.44 PK	74.00	-5.56	164	141	68.15	0.29
6	#7323.00	45.94 AV	54.00	-8.06	164	141	45.65	0.29
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2441.00	93.84 PK			134	271	105.22	-11.38
2	*2441.00	71.34 AV			134	271	82.72	-11.38
3	4882.00	56.77 PK	74.00	-17.23	169	24	62.84	-6.07
4	4882.00	34.27 AV	54.00	-19.73	169	24	40.34	-6.07
5	#7323.00	62.12 PK	74.00	-11.88	164	240	61.83	0.29
6	#7323.00	39.62 AV	54.00	-14.38	164	240	39.33	0.29

REMARKS:

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

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2488.10	55.15 PK	74.00	-18.85	138	241	66.53	-11.38
2	*2488.10	32.65 AV	54.00	-21.35	138	241	44.03	-11.38
3	2480.00	103.19 PK			131	360	114.57	-11.38
4	2480.00	80.69 AV			131	360	92.07	-11.38
5	4960.00	60.51 PK	74.00	-13.49	148	273	66.58	-6.07
6	4960.00	38.01 AV	54.00	-15.99	148	273	44.08	-6.07
7	#7440.00	65.41 PK	74.00	-8.59	139	234	65.12	0.29
8	#7440.00	42.91 AV	54.00	-11.09	139	234	42.62	0.29
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2495.70	53.27 PK	74.00	-20.73	130	51	64.65	-11.38
2	*2495.70	30.77 AV	54.00	-23.23	130	51	42.15	-11.38
3	2480.00	96.78 PK			145	269	108.16	-11.38
4	2480.00	74.28 AV			145	269	85.66	-11.38
5	4960.00	55.52 PK	74.00	-18.48	163	290	61.59	-6.07
6	4960.00	33.02 AV	54.00	-20.98	163	290	39.09	-6.07
7	#7440.00	62.60 PK	74.00	-11.40	170	152	62.31	0.29
8	#7440.00	40.10 AV	54.00	-13.90	170	152	39.81	0.29

REMARKS:

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

BT_π/4 DQPSK

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	63.86 PK	74.00	-10.14	162	222	75.24	-11.38
2	2390.00	41.36 AV	54.00	-12.64	162	222	52.74	-11.38
3	*2402.00	103.83 PK			143	23	115.21	-11.38
4	*2402.00	81.33 AV			143	23	92.71	-11.38
5	4804.00	60.50 PK	74.00	-13.50	132	64	66.57	-6.07
6	4804.00	38.00 AV	54.00	-16.00	132	64	44.07	-6.07
7	#7206.00	68.84 PK	74.00	-5.16	165	244	68.55	0.29
8	#7206.00	46.34 AV	54.00	-7.66	165	244	46.05	0.29
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	56.44 PK	74.00	-17.56	140	202	67.82	-11.38
2	2390.00	33.94 AV	54.00	-20.06	140	202	45.32	-11.38
3	*2402.00	95.42 PK			139	178	106.8	-11.38
4	*2402.00	72.92 AV			139	178	84.30	-11.38
5	4804.00	52.62 PK	74.00	-21.38	142	241	58.69	-6.07
6	4804.00	30.12 AV	54.00	-23.88	142	241	36.19	-6.07
7	#7206.00	65.56 PK	74.00	-8.44	148	138	65.27	0.29
8	#7206.00	43.06 AV	54.00	-10.94	148	138	42.77	0.29

REMARKS:

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

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2441.00	101.98 PK			135	129	113.36	-11.38
2	*2441.00	96.37 AV			135	129	107.75	-11.38
3	4882.00	60.27 PK	74.00	-13.73	164	87	66.34	-6.07
4	4882.00	37.77 AV	54.00	-16.23	164	87	43.84	-6.07
5	**7323.00**	**68.87 PK**	**74.00**	**-5.13**	**161**	**261**	**68.58**	**0.29**
6	7323.00	46.37 AV	54.00	-7.63	161	261	46.08	0.29
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2441.00	94.22 PK			166	21	105.6	-11.38
2	*2441.00	94.19 AV			166	21	105.57	-11.38
3	4882.00	56.17 PK	74.00	-17.83	159	62	62.24	-6.07
4	4882.00	33.67 AV	54.00	-20.33	159	62	39.74	-6.07
5	7323.00	62.11 PK	74.00	-11.89	148	330	61.82	0.29
6	7323.00	39.61 AV	54.00	-14.39	148	330	39.32	0.29

REMARKS:

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

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2487.20	54.92 PK	74.00	-19.08	163	77	66.3	-11.38
2	*2487.20	32.42 AV	54.00	-21.58	163	77	43.8	-11.38
3	2480.00	103.51 PK			167	340	114.89	-11.38
4	2480.00	81.01 AV			167	340	92.39	-11.38
5	4960.00	59.46 PK	74.00	-14.54	139	123	65.53	-6.07
6	4960.00	36.96 AV	54.00	-17.04	139	123	43.03	-6.07
7	7440.00	65.75 PK	74.00	-8.25	166	147	65.46	0.29
8	7440.00	43.25 AV	54.00	-10.75	166	147	42.96	0.29
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2491.90	54.42 PK	74.00	-19.58	153	345	65.80	-11.38
2	*2491.90	31.92 AV	54.00	-22.08	153	345	43.30	-11.38
3	2480.00	97.38 PK			139	234	108.76	-11.38
4	2480.00	74.88 AV			139	234	86.26	-11.38
5	4960.00	55.04 PK	74.00	-18.96	141	84	61.11	-6.07
6	4960.00	32.54 AV	54.00	-21.46	141	84	38.61	-6.07
7	7440.00	62.02 PK	74.00	-11.98	151	268	61.73	0.29
8	7440.00	39.52 AV	54.00	-14.48	151	268	39.23	0.29

REMARKS:

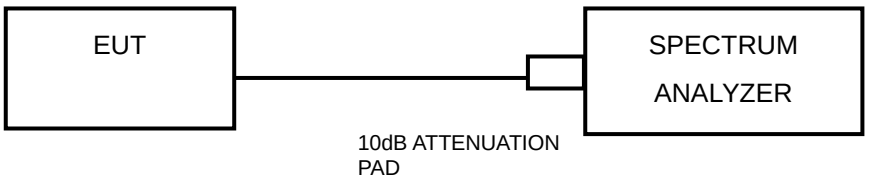
1. Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB/m).
2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB).
3. The emission levels of other frequencies were greater than 20dB margin.
4. Margin value = Emission level – Limit value.
5. " * ": Fundamental frequency.

4.3 NUMBER OF HOPPING FREQUENCY USED

4.3.1 LIMIT OF HOPPING FREQUENCY USED

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

4.3.2 TEST SETUP



4.3.3 TEST INSTRUMENTS

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
Wireless Connectivity Tester	R&S	CMW270	1201.0002K75	Dec. 18, 19	Dec. 17, 20
MXA VEXTOR SIGNAL	Agilent	n5182a	MY50140530	Mar. 24, 20	Mar. 24, 21
MXA signal analyzer	Agilent	n9020a	MY49100060	Mar. 24, 20	Mar. 24, 21
RF Control Unit	Tonscend	JS0806-2	188060112	Mar. 24, 20	Mar. 24, 21
Signal Generation	Agilent	E4421B	US40051152	Dec. 18, 19	Dec. 17, 20
DC Power Supply	Agilent	E3640A	MY40004013	Mar. 30, 20	Mar. 30, 21
Programmable Temperature & Humidity Chamber	Hongjin	HYC-TH-225 DH	DG-180746	Mar. 24, 20	Mar. 24, 21
Test System	Tonscend	JS 1120-3	N/A	N/A	N/A
Power Splitter	Weinschel	1580-1	TL177	Mar. 27, 20	Mar. 27, 21

NOTE:

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

4.3.4 TEST PROCEDURES

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

b. Turn on the EUT and connect its antenna terminal to measurement via a low loss cable. Then set it to any one measured frequency within its operating range and make sure the instrument is operated in its linear range.

c. Set the SA on MaxHold Mode, and then keep the EUT in hopping mode. Record all the signals from each channel until each one has been recorded.

d. Set the SA on View mode and then plot the result on SA screen.

e. Repeat above procedures until all frequencies measured were completed.

4.3.5 DEVIATION FROM TEST STANDARD

No deviation.

4.3.6 TEST RESULTS

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

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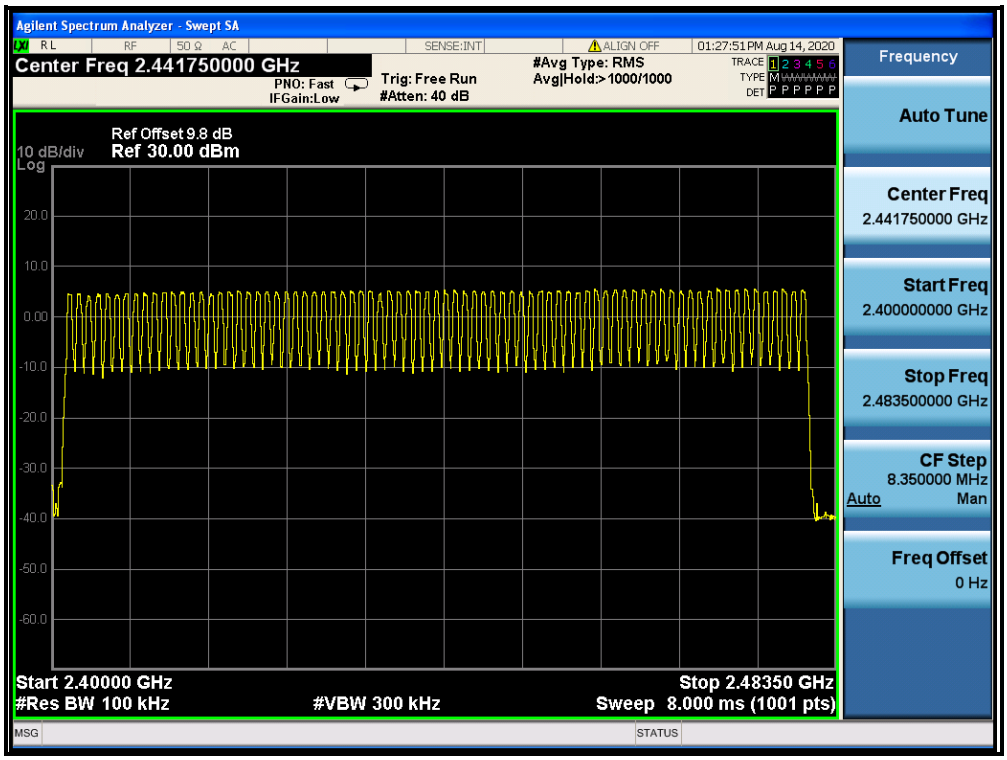
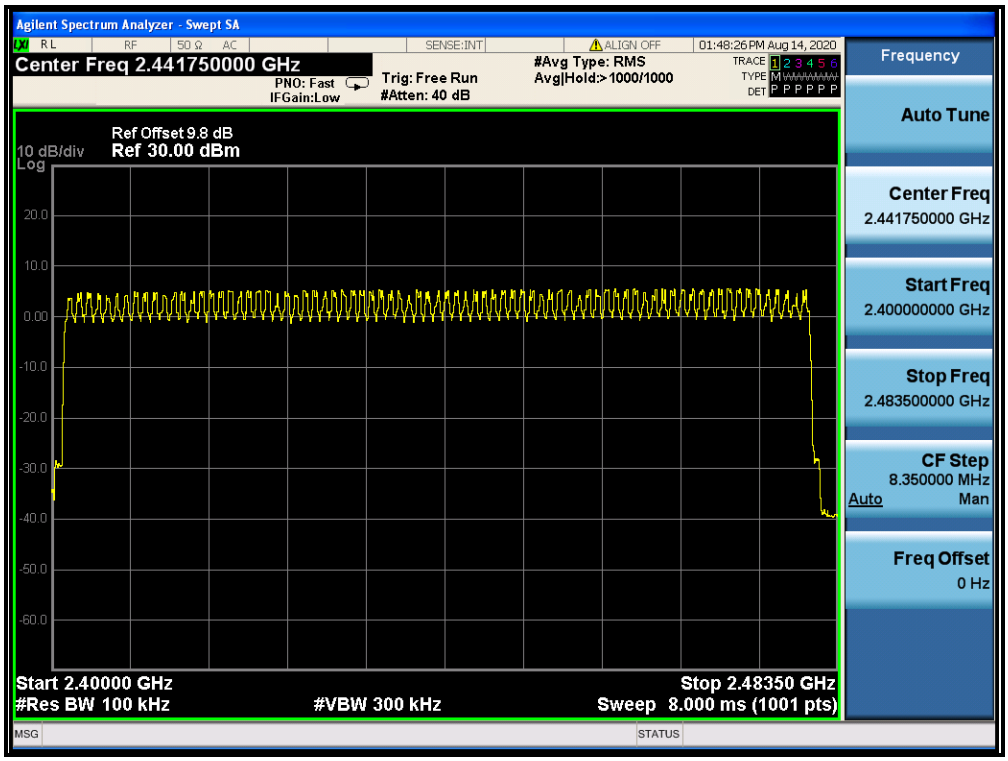


π /4 DQPSK

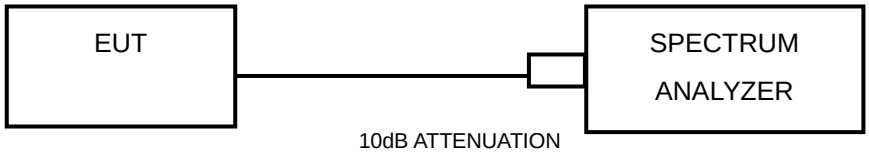


4.4 DWELL TIME ON EACH CHANNEL

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



10dB ATTENUATION PAD

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	3.16	30	300	0.377	113.1	400	PASS
DH3	79	31.6	3.16	11	110	1.633	179.63	400	PASS
DH5	79	31.6	3.16	7	70	2.881	201.67	400	PASS

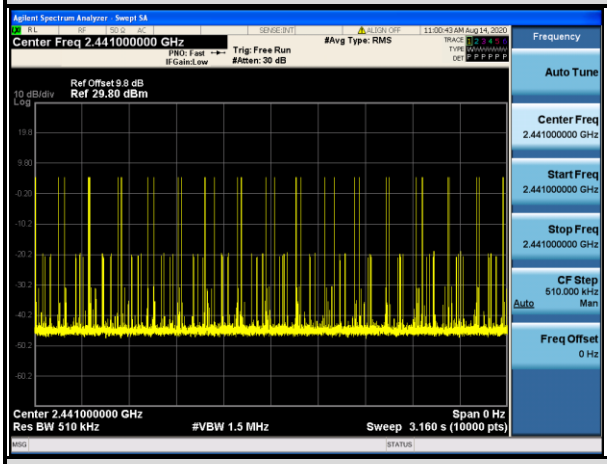
π /4 DQPSK

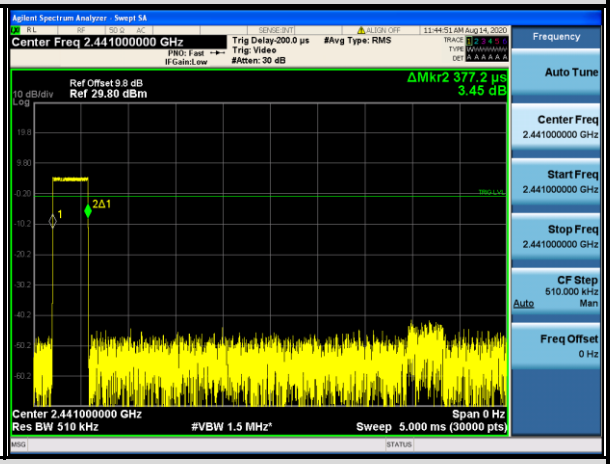
Mode	Number of Hopping Channel	Number of transmission in a period(channel number*0.4 sec)				Length of transmission time (msec)	Result (msec)	Limit (msec)	PASS / FAIL
		period (sec)	sweep time (sec)	times in a sweep	times in a period				
2DH1	79	31.6	3.16	32	320	0.387	123.84	400	PASS
2DH3	79	31.6	3.16	14	140	1.639	229.46	400	PASS
2DH5	79	31.6	3.16	9	90	1.639	147.51	400	PASS

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

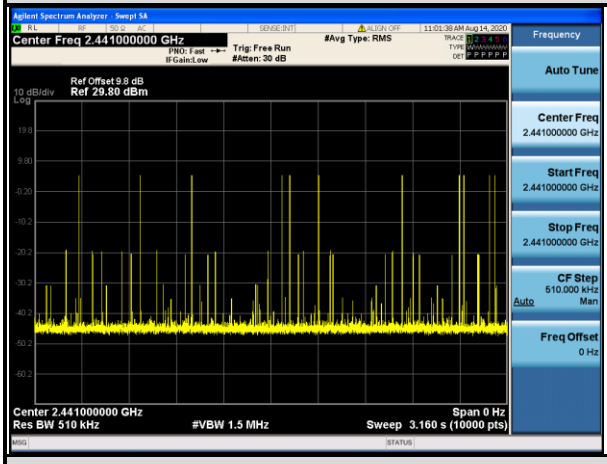
GFSK

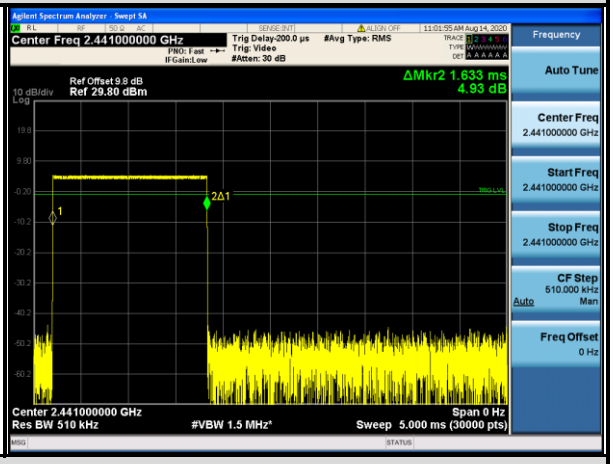
DH1



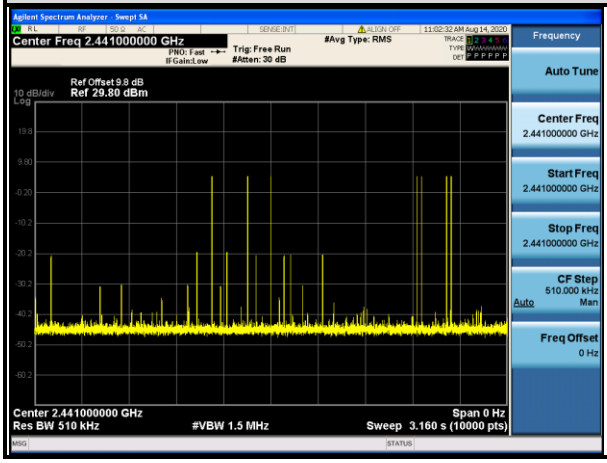


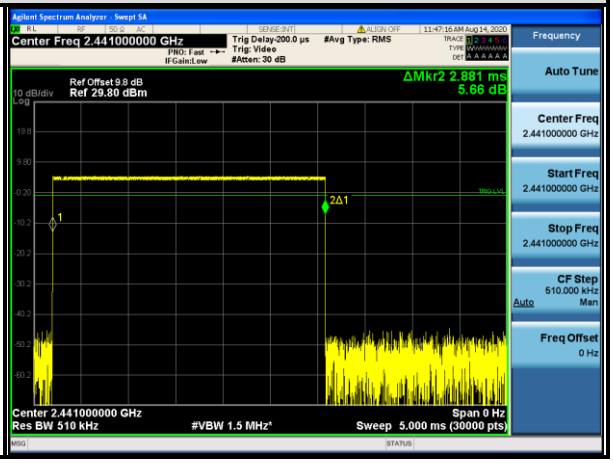
DH3





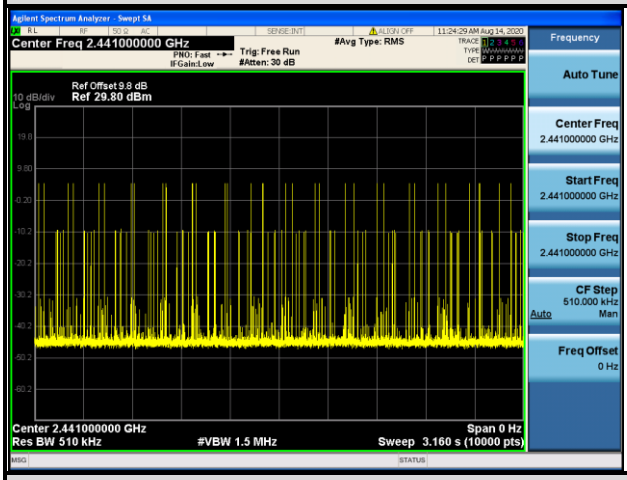
DH5

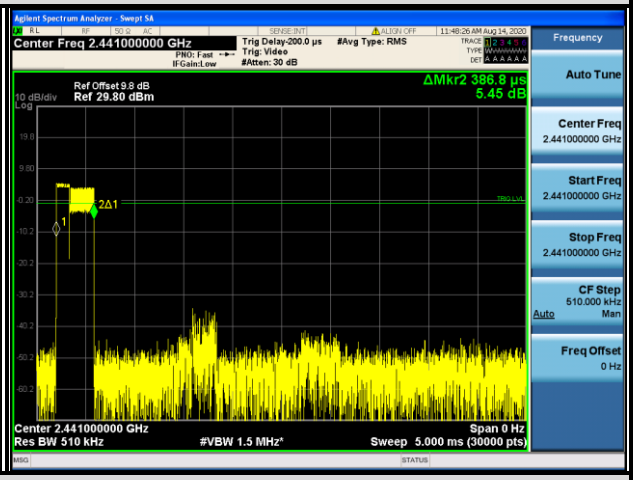




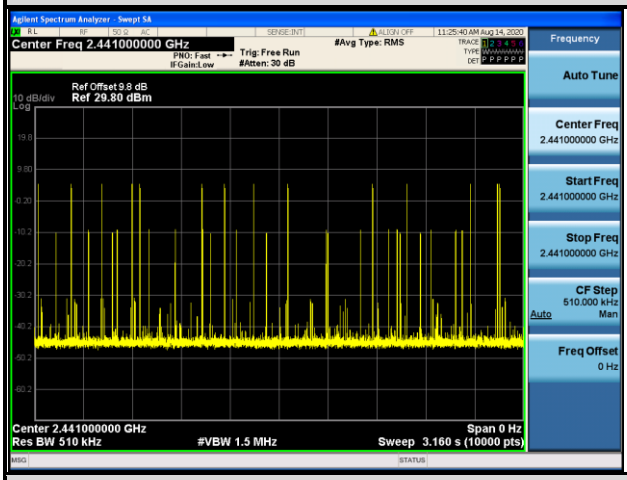
Π/4 DQPSK

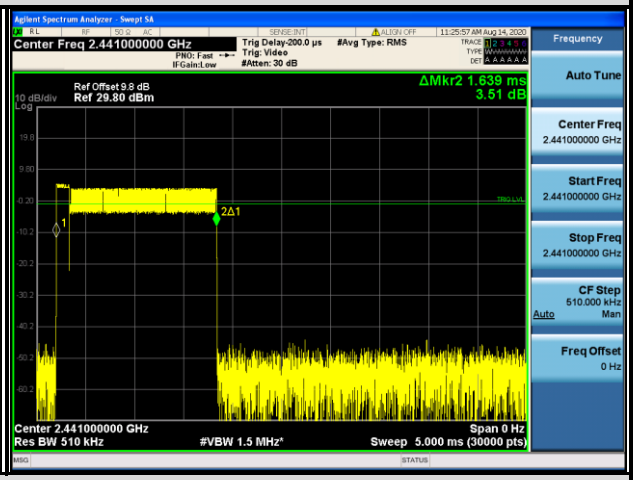
2DH1



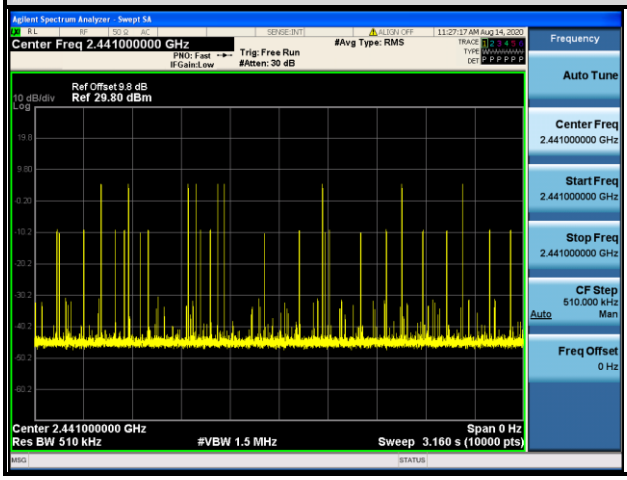


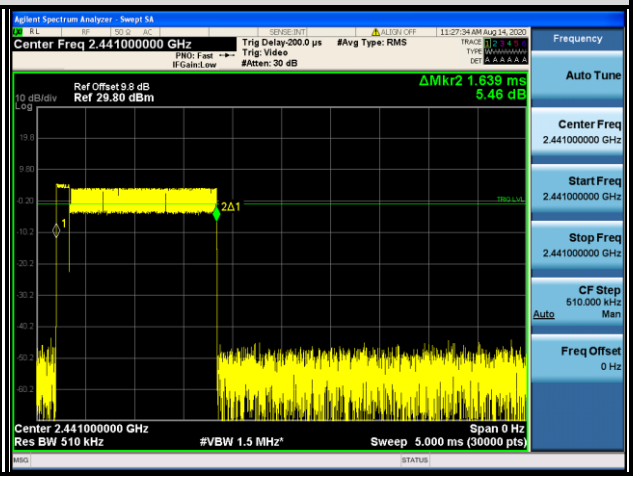
2DH3





2DH5



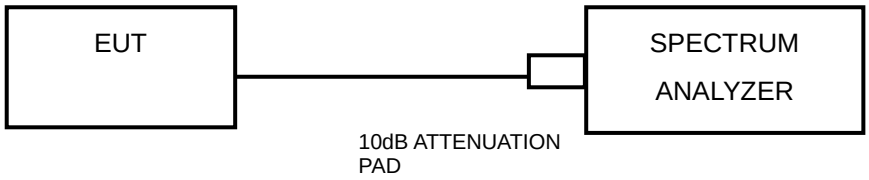


4.5 CHANNEL BANDWIDTH

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	0.894
39	2441	0.888
78	2480	0.894

CH 0

CH 39


Agilent Spectrum Analyzer - Swept SA
Center Freq 2.441000000 GHz
PNO: Wide
IFGain:Low
Trig: Free Run
#Atten: 40 dB
#Avg Type: RMS
Avg|Hold: 100/100
09:50:25 AM Aug 17, 2020
Ref Offset 9.8 dB
10 dB/div
Ref 30.00 dBm
ΔMkr3 888 kHz
0.006 dB
-17.89 dBm
Center 2.441000 GHz
#Res BW 20 kHz
#VBW 62 kHz
Span 3.000 MHz
Sweep 7.200 ms (1001 pts)
1 N 1 f 2.440 541 GHz -18.044 dBm
2 N 1 f 2.440 997 GHz 2.111 dBm
3 Δ1 1 f (Δ) 888 kHz (Δ) 0.006 dB
Frequency
Auto Tune
Center Freq
2.441000000 GHz
Start Freq
2.439500000 GHz
Stop Freq
2.442500000 GHz
CF Step
300.000 kHz
Auto
Man
Freq Offset
0 Hz

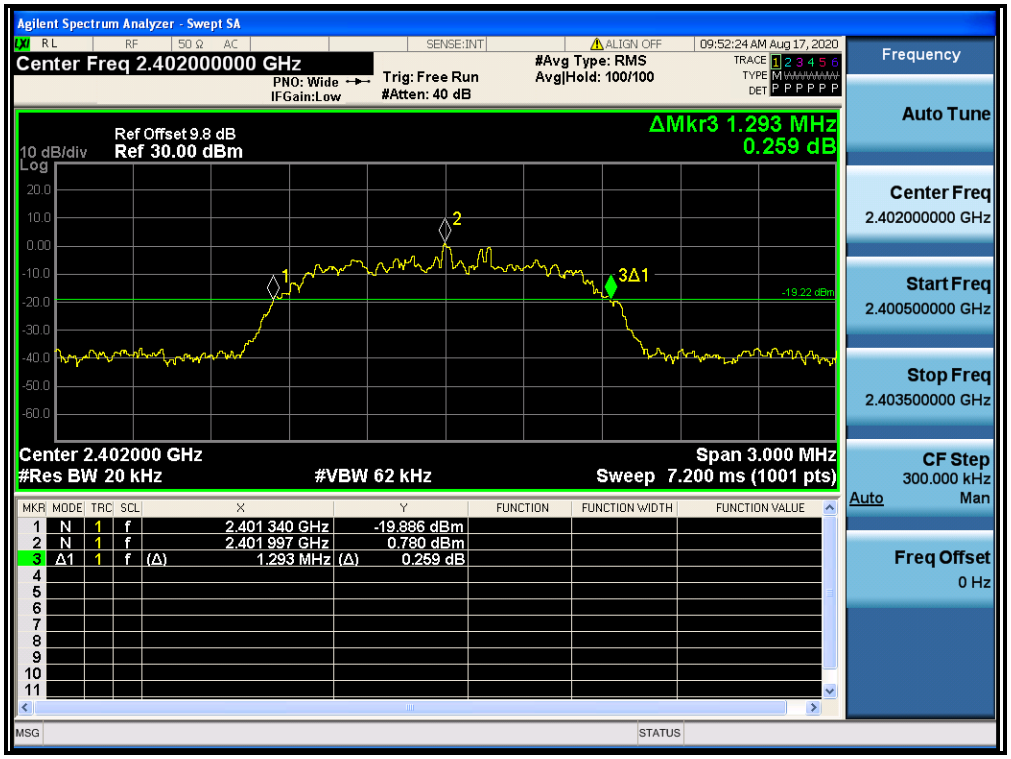
CH 78


Agilent Spectrum Analyzer - Swept SA
Center Freq 2.480000000 GHz
PNO: Wide
IFGain:Low
Trig: Free Run
#Atten: 40 dB
#Avg Type: RMS
Avg|Hold: 100/100
09:51:43 AM Aug 17, 2020
Ref Offset 9.8 dB
10 dB/div
Ref 30.00 dBm
ΔMkr3 894 kHz
0.783 dB
-17.87 dBm
Center 2.480000 GHz
#Res BW 20 kHz
#VBW 62 kHz
Span 3.000 MHz
Sweep 7.200 ms (1001 pts)
1 N 1 f 2.479 538 GHz -19.250 dBm
2 N 1 f 2.480 057 GHz 2.127 dBm
3 Δ1 1 f (Δ) 894 kHz (Δ) 0.783 dB
Frequency
Auto Tune
Center Freq
2.480000000 GHz
Start Freq
2.478500000 GHz
Stop Freq
2.481500000 GHz
CF Step
300.000 kHz
Auto
Man
Freq Offset
0 Hz

π /4 DQPSK

CHANNEL	CHANNEL FREQUENCY (MHz)	20dB BANDWIDTH (MHz)
0	2402	1.293
39	2441	1.317
78	2480	1.281

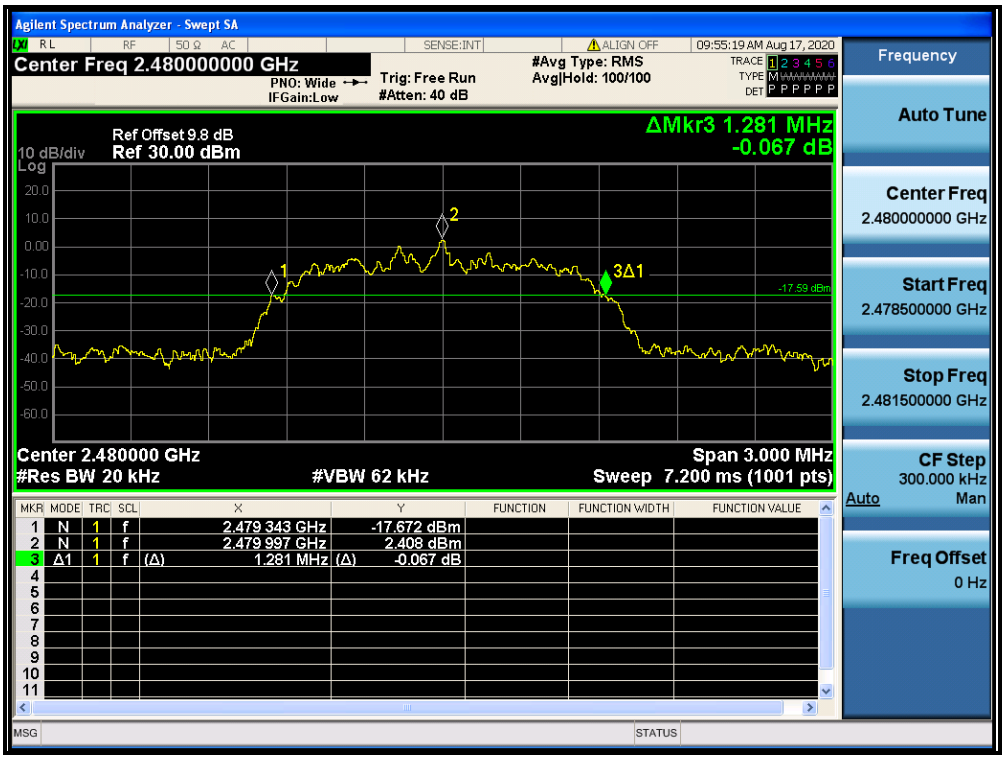
CH 0



CH 39


Agilent Spectrum Analyzer - Swept SA
Center Freq 2.441000000 GHz
PNO: Wide
IFGain:Low
Trig: Free Run
#Atten: 40 dB
#Avg Type: RMS
Avg|Hold: 100/100
09:53:32 AM Aug 17, 2020
Ref Offset 9.8 dB
10 dB/div
Log
Ref 30.00 dBm
ΔMkr3 1.317 MHz
-0.264 dB
-18.72 dBm
Center 2.441000 GHz
#Res BW 20 kHz
#VBW 62 kHz
Span 3.000 MHz
Sweep 7.200 ms (1001 pts)
1 N 1 f 2.440 340 GHz -18.796 dBm
2 N 1 f 2.440 997 GHz 1.285 dBm
3 Δ1 1 f (Δ) 1.317 MHz (Δ) -0.264 dB
Frequency
Auto Tune
Center Freq
2.441000000 GHz
Start Freq
2.439500000 GHz
Stop Freq
2.442500000 GHz
CF Step
300.000 kHz
Auto
Man
Freq Offset
0 Hz

CH 78

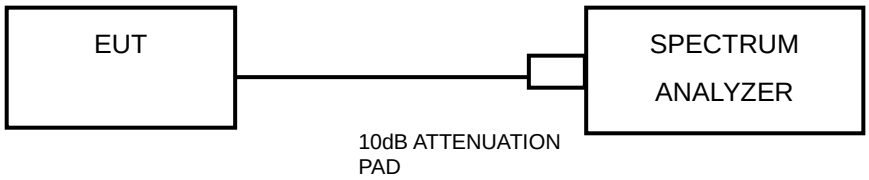

Agilent Spectrum Analyzer - Swept SA
Center Freq 2.480000000 GHz
PNO: Wide
IFGain:Low
Trig: Free Run
#Atten: 40 dB
#Avg Type: RMS
Avg|Hold: 100/100
09:55:19 AM Aug 17, 2020
Ref Offset 9.8 dB
10 dB/div
Log
Ref 30.00 dBm
ΔMkr3 1.281 MHz
-0.067 dB
-17.59 dBm
Center 2.480000 GHz
#Res BW 20 kHz
#VBW 62 kHz
Span 3.000 MHz
Sweep 7.200 ms (1001 pts)
1 N 1 f 2.479 343 GHz -17.672 dBm
2 N 1 f 2.479 997 GHz 2.408 dBm
3 Δ1 1 f (Δ) 1.281 MHz (Δ) -0.067 dB
Frequency
Auto Tune
Center Freq
2.480000000 GHz
Start Freq
2.478500000 GHz
Stop Freq
2.481500000 GHz
CF Step
300.000 kHz
Auto
Man
Freq Offset
0 Hz

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

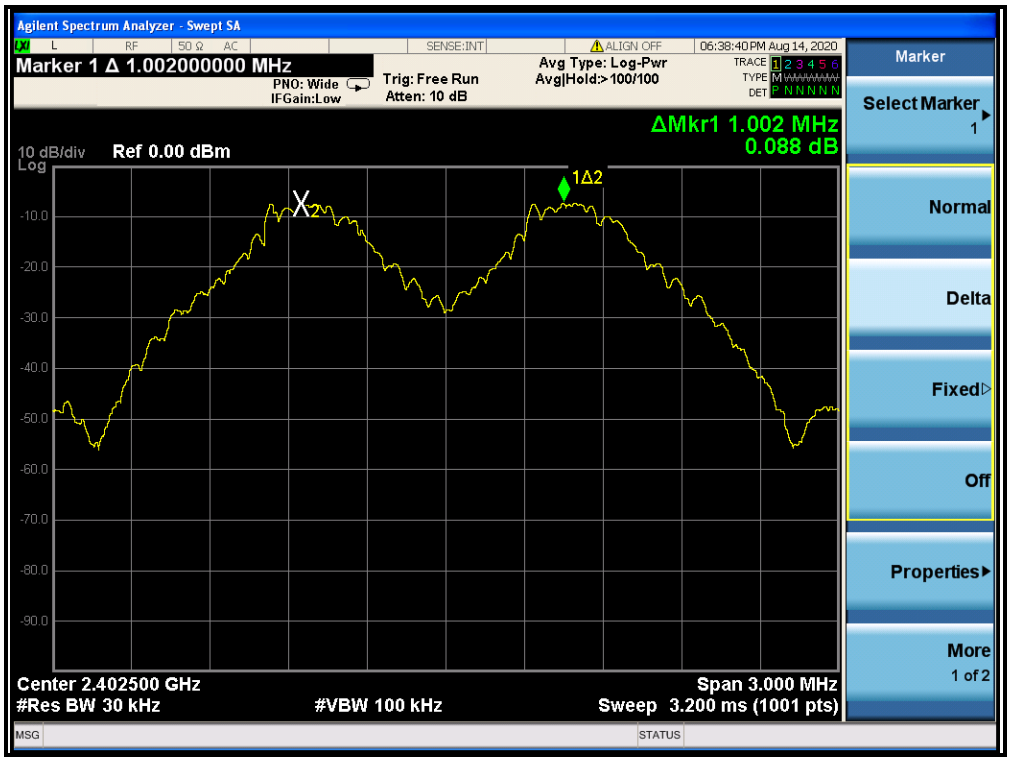
No deviation.

4.6.6 TEST RESULTS

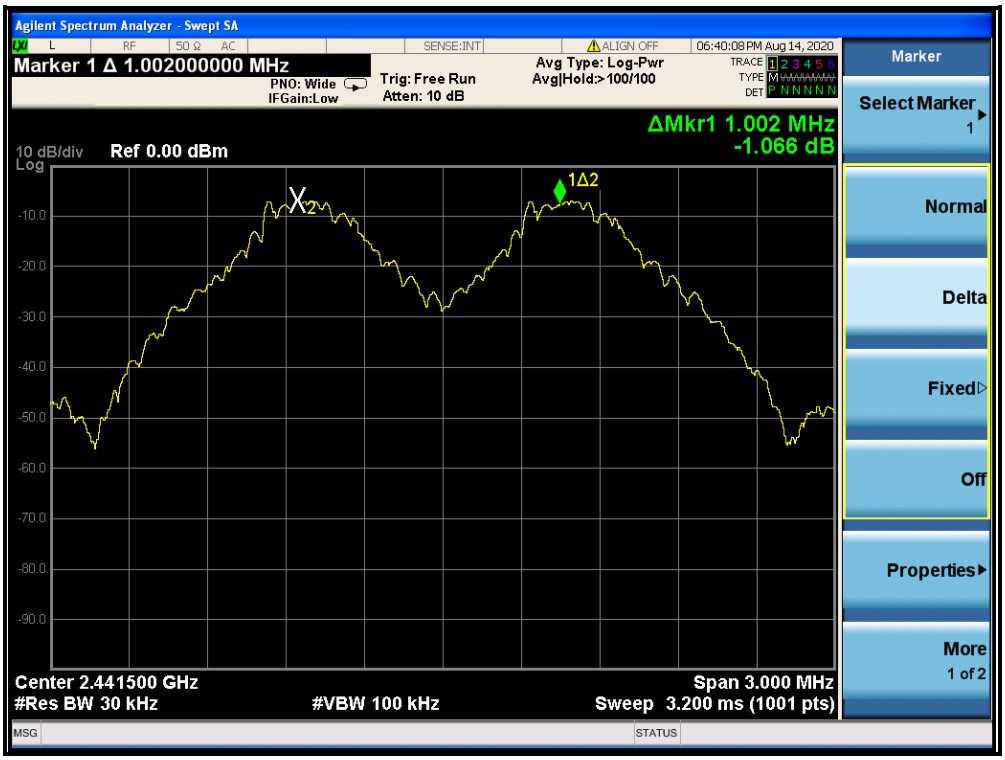
GFSK

CHANNEL	FREQUENCY (MHz)	ADJACENT CHANNEL SEPARATION (MHz)	20dB BANDWIDTH (MHz)	MINIMUM LIMIT (MHz)	PASS / FAIL
0	2402	1.002	0.894	0.894	PASS
39	2441	1.002	0.888	0.888	PASS
78	2480	1.002	0.894	0.894	PASS

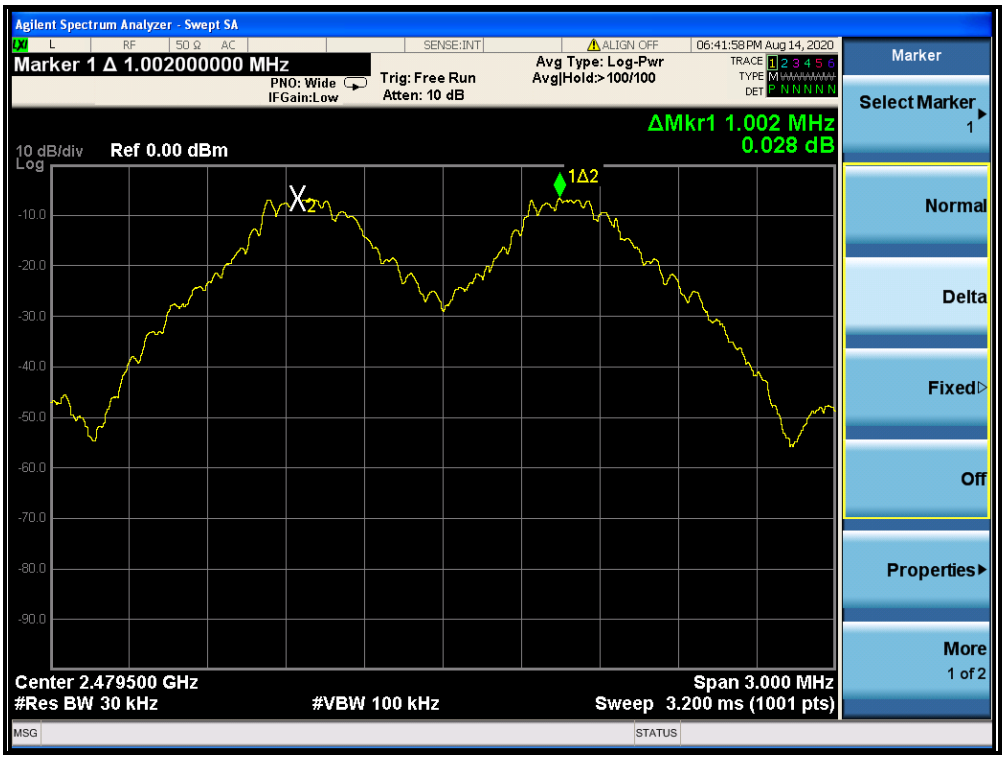
CH 0



CH 39


Agilent Spectrum Analyzer - Swept SA
Marker 1 Δ 1.002000000 MHz
PNO: Wide
IFGain:Low
Trig: Free Run
Atten: 10 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
06:40:08 PM Aug 14, 2020
ΔMkr1 1.002 MHz
-1.066 dB
10 dB/div
Log
Ref 0.00 dBm
Center 2.441500 GHz
#Res BW 30 kHz
#VBW 100 kHz
Span 3.000 MHz
Sweep 3.200 ms (1001 pts)
Marker
Select Marker
Normal
Delta
Fixed
Off
Properties
More
1 of 2
MSG
STATUS

CH 78

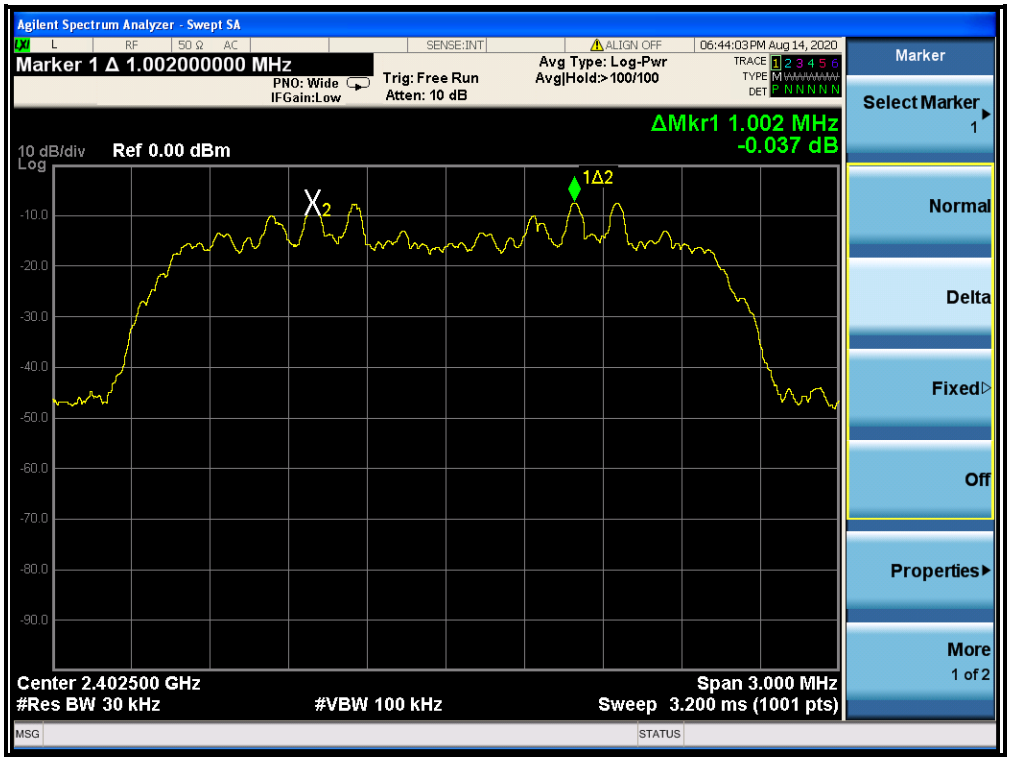

Agilent Spectrum Analyzer - Swept SA
Marker 1 Δ 1.002000000 MHz
PNO: Wide
IFGain:Low
Trig: Free Run
Atten: 10 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
06:41:58 PM Aug 14, 2020
ΔMkr1 1.002 MHz
0.028 dB
10 dB/div
Log
Ref 0.00 dBm
Center 2.479500 GHz
#Res BW 30 kHz
#VBW 100 kHz
Span 3.000 MHz
Sweep 3.200 ms (1001 pts)
Marker
Select Marker
Normal
Delta
Fixed
Off
Properties
More
1 of 2
MSG
STATUS

π /4 DQPSK

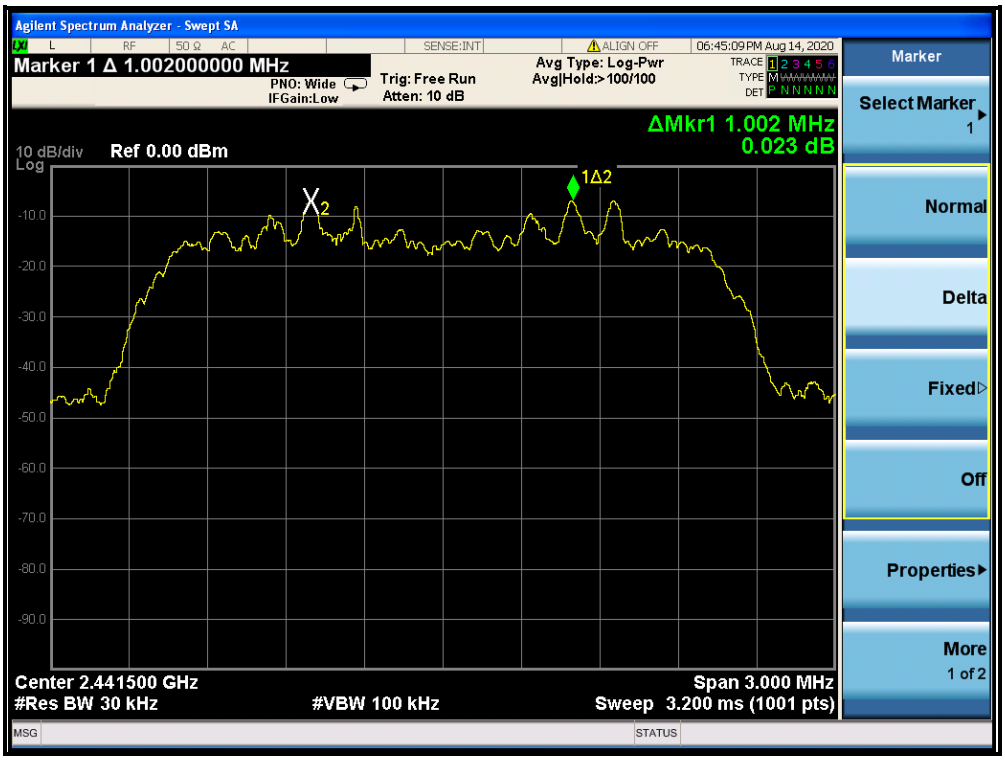
CHANNEL	FREQUENCY (MHz)	ADJACENT CHANNEL SEPARATION (MHz)	20dB BANDWIDTH (MHz)	MINIMUM LIMIT (MHz)	PASS / FAIL
0	2402	1.002	1.293	0.86	PASS
39	2441	1.002	1.317	0.88	PASS
78	2480	1.002	1.281	0.85	PASS

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

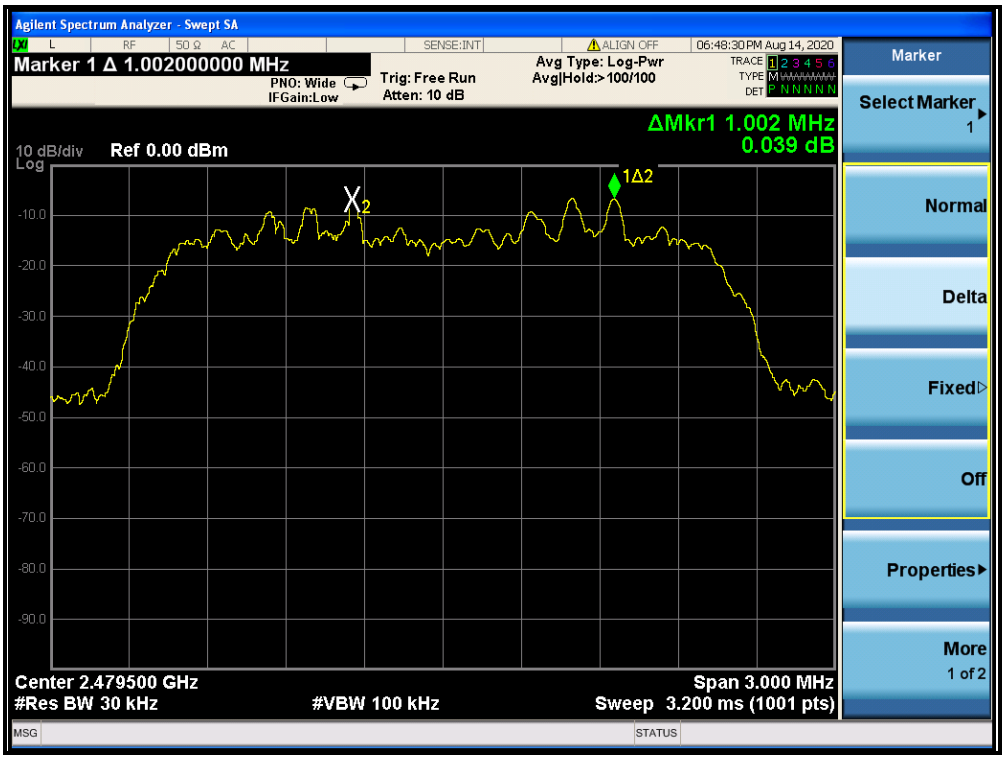
CH 0



CH 39


Agilent Spectrum Analyzer - Swept SA
Marker 1 Δ 1.002000000 MHz
PNO: Wide
IFGain:Low
Trig: Free Run
Atten: 10 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
06:45:09 PM Aug 14, 2020
ΔMkr1 1.002 MHz
0.023 dB
10 dB/div
Log
Ref 0.00 dBm
Center 2.441500 GHz
#Res BW 30 kHz
#VBW 100 kHz
Span 3.000 MHz
Sweep 3.200 ms (1001 pts)
Marker
Select Marker
Normal
Delta
Fixed
Off
Properties
More
1 of 2
MSG
STATUS

CH 78

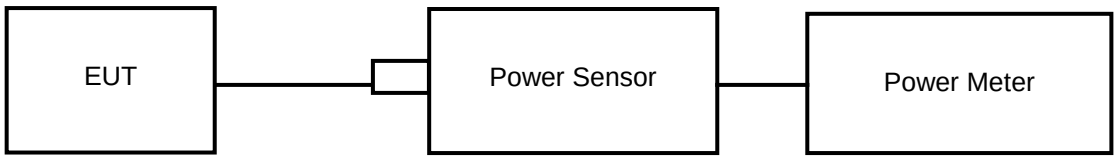

Agilent Spectrum Analyzer - Swept SA
Marker 1 Δ 1.002000000 MHz
PNO: Wide
IFGain:Low
Trig: Free Run
Atten: 10 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
06:48:30 PM Aug 14, 2020
ΔMkr1 1.002 MHz
0.039 dB
10 dB/div
Log
Ref 0.00 dBm
Center 2.479500 GHz
#Res BW 30 kHz
#VBW 100 kHz
Span 3.000 MHz
Sweep 3.200 ms (1001 pts)
Marker
Select Marker
Normal
Delta
Fixed
Off
Properties
More
1 of 2
MSG
STATUS

4.7 CONDUCTED OUTPUT POWER

4.7.1 LIMITS OF CONDUCTED OUTPUT POWER MEASUREMENT

The Maximum Output Power Measurement is 125mW.

4.7.2 TEST SETUP



10dB ATTENUATION
PAD

4.7.3 TEST INSTRUMENTS

Refer to section 4.3.3 to get information of above instrument.

4.7.4 TEST PROCEDURES

A peak power sensor was used on the output port of the EUT. A peak power meter was used to read the response of the peak power sensor. Record the peak power level.

4.7.5 DEVIATION FROM TEST STANDARD

No deviation.

4.7.6 EUT OPERATING CONDITION

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

4.7.7 TEST RESULTS

MAXIMUM PEAK OUTPUT POWER

GFSK

CHANNEL	CHANNEL FREQUENCY (MHz)	PEAK POWER (dBm)	PEAK POWER (mW)	PEAK POWER LIMIT (mW)	PASS/FAIL
0	2402	5.08	3.221	1000	PASS
39	2441	5.55	3.589	1000	PASS
78	2480	5.77	3.776	1000	PASS

π /4 DQPSK

CHANNEL	CHANNEL FREQUENCY (MHz)	PEAK POWER (dBm)	PEAK POWER (mW)	PEAK POWER LIMIT (mW)	PASS/FAIL
0	2402	5.67	3.690	125	PASS
39	2441	6.07	4.046	125	PASS
78	2480	6.32	4.285	125	PASS

AVERAGE OUTPUT POWER(FOR REFERENCE)

GFSK

CHANNEL	CHANNEL FREQUENCY (MHz)	AVERAGE POWER (dBm)	AVERAGE POWER (mW)
0	2402	4.60	2.884
39	2441	5.04	3.192
78	2480	5.23	3.334

π /4 DQPSK

CHANNEL	CHANNEL FREQUENCY (MHz)	AVERAGE POWER (dBm)	AVERAGE POWER (mW)
0	2402	2.74	1.879
39	2441	3.10	2.042
78	2480	3.50	2.239

4.8 OUT OF BAND EMISSION MEASUREMENT

4.8.1 LIMITS OF OUT OF BAND EMISSION MEASUREMENT

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

4.8.2 TEST INSTRUMENTS

Refer to section 4.3.3 to get information of above instrument.

4.8.3 TEST PROCEDURE

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

4.8.4 DEVIATION FROM TEST STANDARD

No deviation.

4.8.5 EUT OPERATING CONDITION

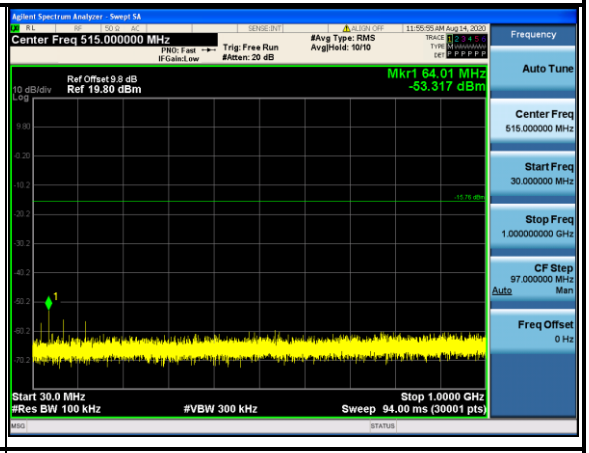
The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.

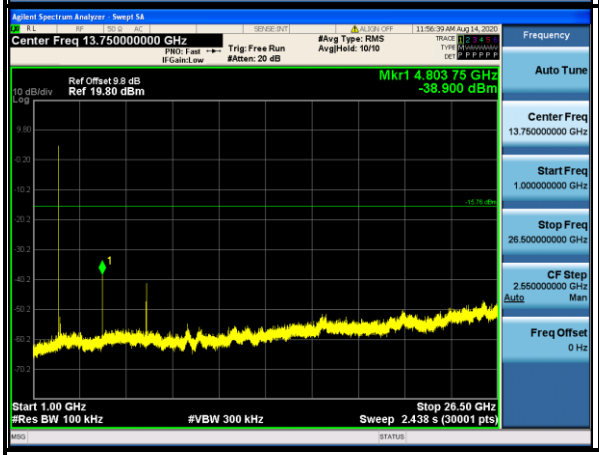
4.8.6 TEST RESULTS

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

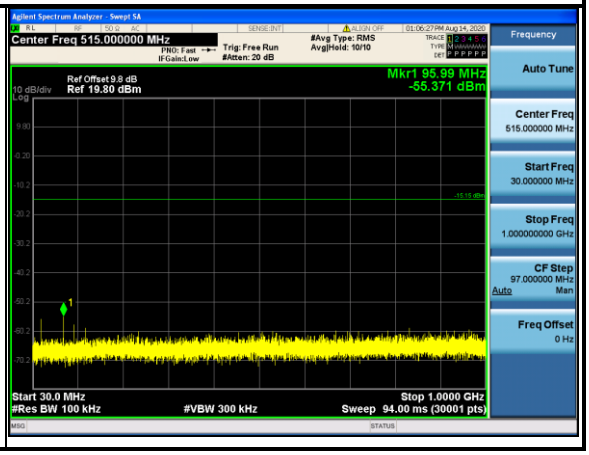
GFSK

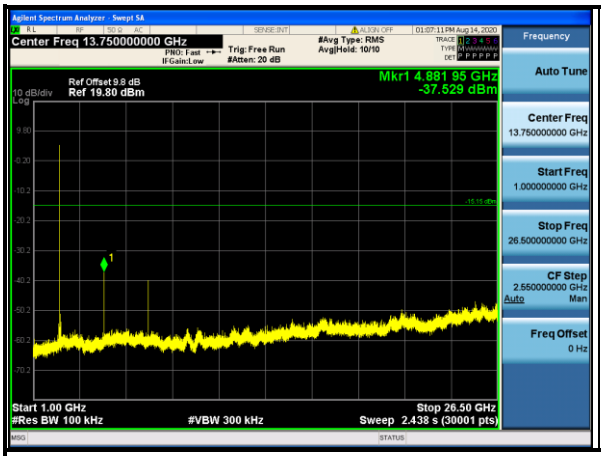
Low Channel



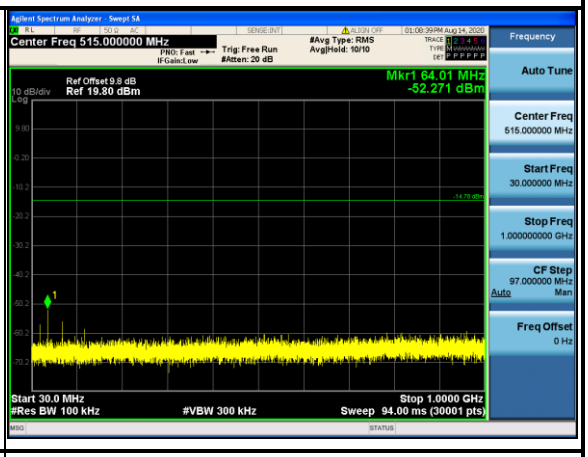


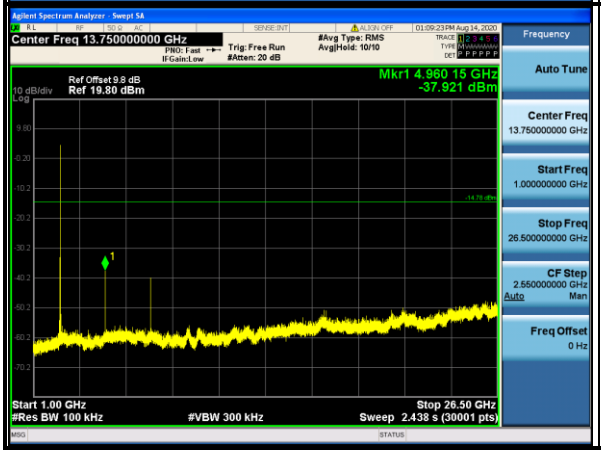
Middle Channel





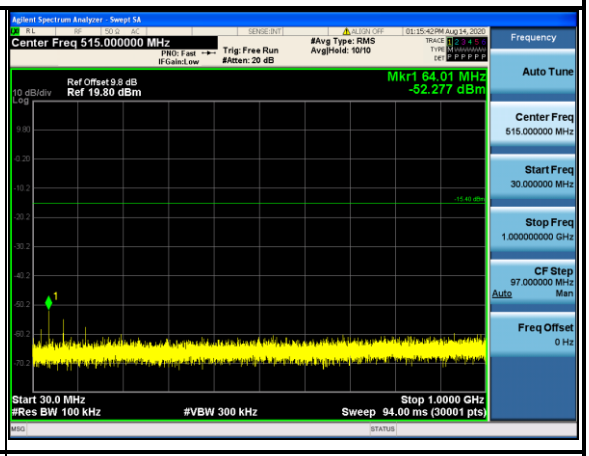
High Channel

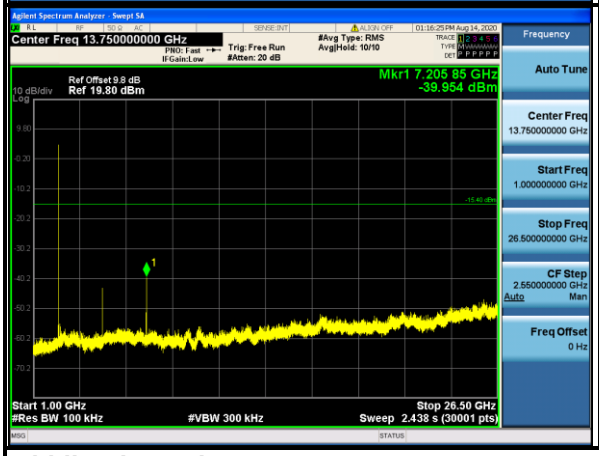




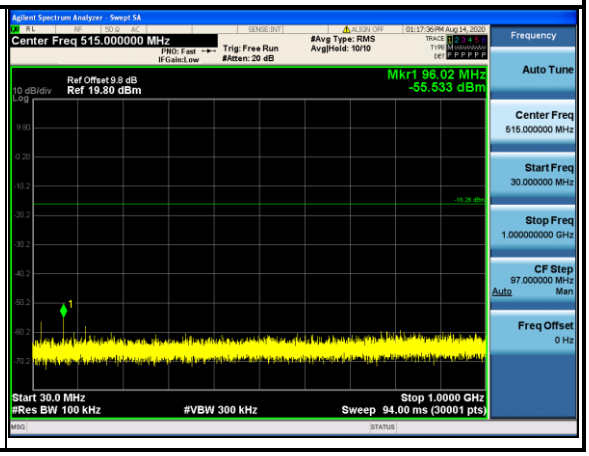
π /4 DQPSK

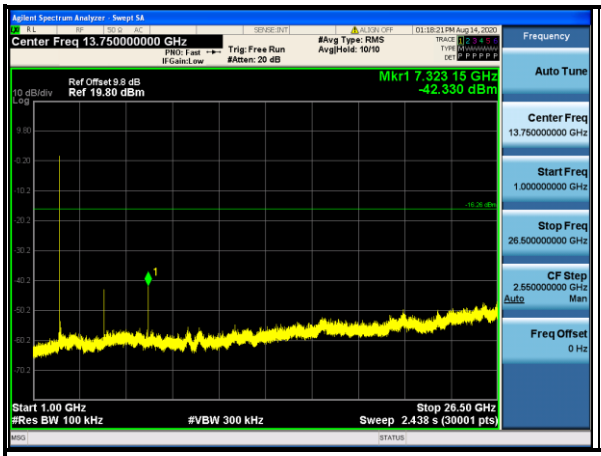
Low Channel



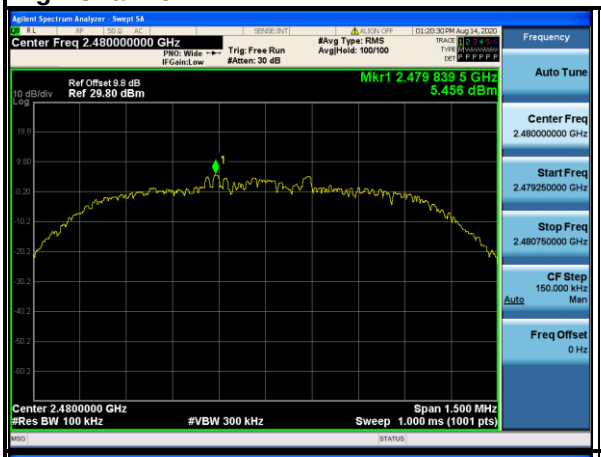


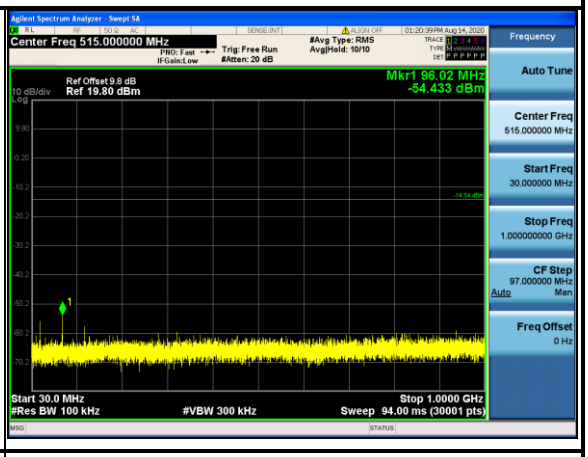
Middle Channel

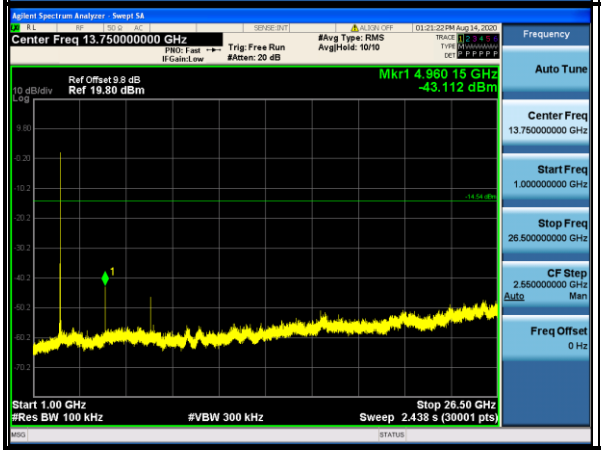




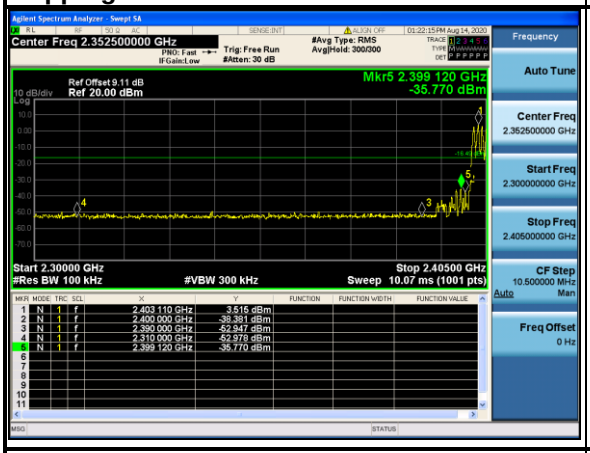
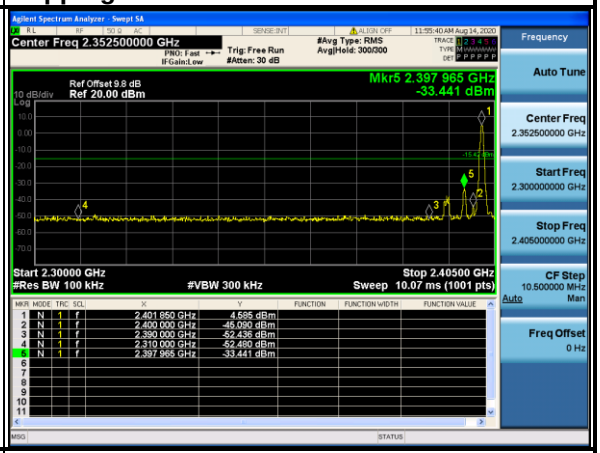
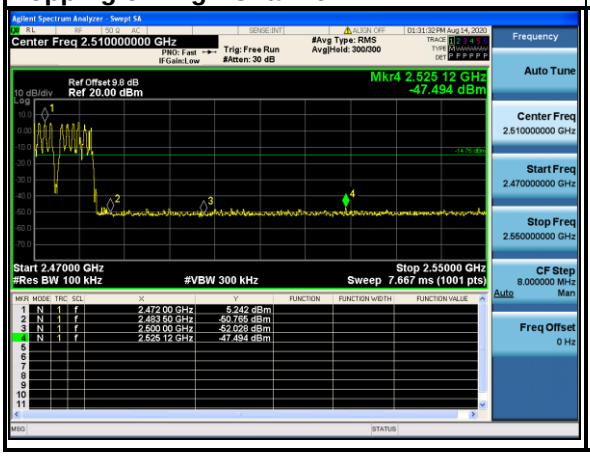
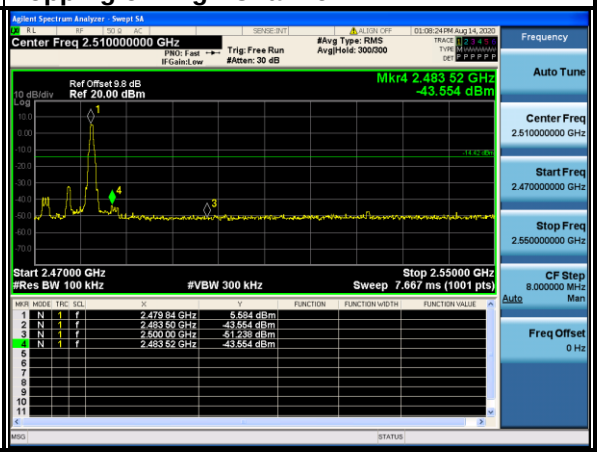
High Channel



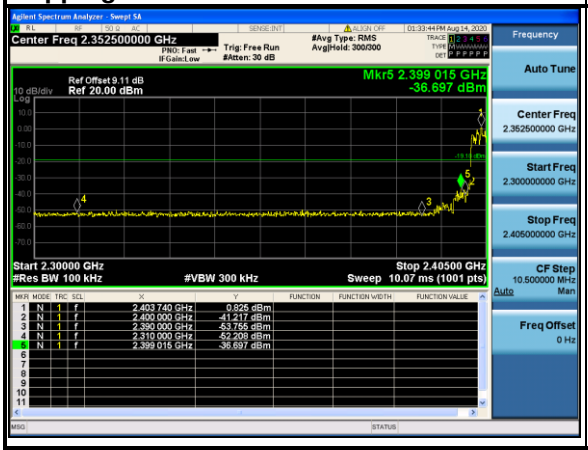
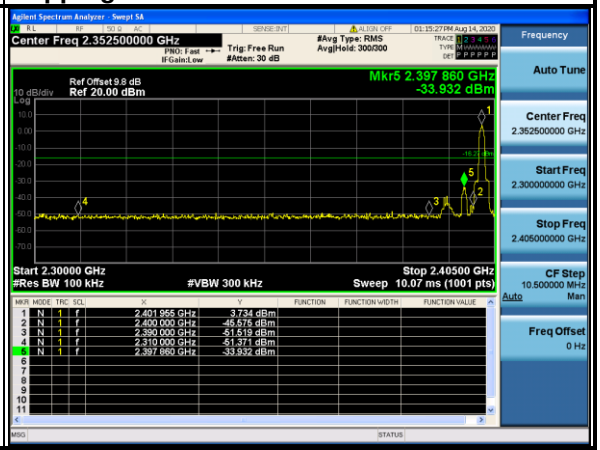
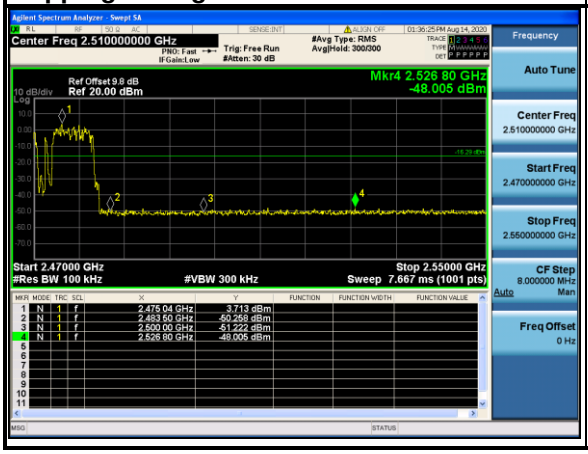
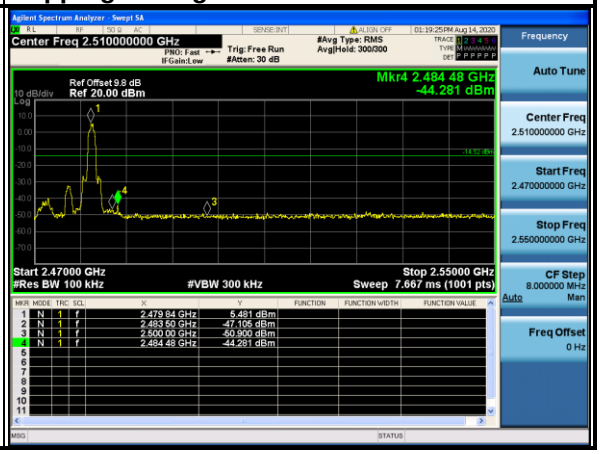




GFSK

Hopping on Low Channel	Hopping off Low Channel
	
Hopping on High Channel	**Hopping off High Channel**
	

π /4 DQPSK

Hopping on Low Channel	Hopping off Low Channel
	
Hopping on High Channel	**Hopping off High Channel**
	

5 PHOTOGRAPHS OF THE TEST CONFIGURATION

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

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

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

---END---