FCC Test Report
(BT-EDR)

Report No.:	RFBDYV-WTW-P20080381
FCC ID:	PRDNS1
Test Model:	HSA-A002S
Received Date:	Aug. 20, 2020
Test Date:	Aug. 28 to Sep. 3, 2020
Issued Date:	Sep. 8, 2020
Applicant:	Acrox Technologies Co., Ltd
Address:	4F., No. 89, Minshan St., Neihu Dist., Taipei City 114, Taiwan, R.O.C.
Issued By:	Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch Lin Kou Laboratories
Lab Address:	No. 47-2, 14th Ling, Chia Pau Vil., Lin Kou Dist., New Taipei City, Taiwan
FCC Registration / Designation Number:	198487 / TW2021

Testing Laboratory
2021

Table of Contents

Release Control Record

Issue No.	Description	Date Issued
RFBDYV-WTW-P20080381	Original release.	Sep. 8, 2020

1 Certificate of Conformity

Product:	HP Bluetooth Speaker 360
Brand:	hp
Test Model:	HSA-A002S
Sample Status:	Engineering sample
Applicant:	Acrox Technologies Co., Ltd
Test Date:	Aug. 28 to Sep. 3, 2020
Standards:	47 CFR FCC Part 15, Subpart C (Section 15.247) ANSI C63.10: 2013

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

Prepared by : Jessica Cheng , **Date:** Sep. 8, 2020

Jessica Cheng / Senior Specialist

Approved by : Rex. Lai , **Date:** Sep. 8, 2020

Rex Lai / Associate Technical Manager

2 Summary of Test Results

47 CFR FCC Part 15, Subpart C (Section 15.247)			
FCC Clause	Test Item	Result	Remarks
15.207	AC Power Conducted Emission	Pass	Meet the requirement of limit. Minimum passing margin is -16.78dB at 0.22812MHz.
15.247(a)(1)(iii)	Number of Hopping Frequency Used	Pass	Meet the requirement of limit.
15.247(a)(1)(iii)	Dwell Time on Each Channel	Pass	Meet the requirement of limit.
15.247(a)(1)	1. Hopping Channel Separation 2. Spectrum Bandwidth of a Frequency Hopping Sequence Spread Spectrum System	Pass	Meet the requirement of limit.
15.247(b)	Maximum Peak Output Power	Pass	Meet the requirement of limit.
15.205 & 209 & 15.247(d)	Radiated Emissions & Band Edge Measurement	Pass	Meet the requirement of limit. Minimum passing margin is -1.74dB at 2483.50MHz.
15.247(d)	Antenna Port Emission	Pass	Meet the requirement of limit.
15.203	Antenna Requirement	Pass	No antenna connector is used.

NOTE:

1. Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.
2. 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.
3. For 2.4GHz band compliance with rule 15.247(d) of the band-edge items, the test plots were recorded in Annex A. Test Procedures refer to report 4.1.3.

2.1 Measurement Uncertainty

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

Measurement	Frequency	Expanded Uncertainty (k=2) (±)
Conducted Emissions at mains ports	150kHz ~ 30MHz	3.00 dB
Conducted Emissions	9kHz ~ 40GHz	2.63 dB
Radiated Emissions up to 1 GHz	9kHz ~ 30MHz	2.61 dB
	30MHz ~ 1GHz	5.43 dB
Radiated Emissions above 1 GHz	Above 1GHz	5.42 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	HP Bluetooth Speaker 360
Brand	hp
Test Model	HSA-A002S
Status of EUT	Engineering sample
Power Supply Rating	5Vdc from host equipment or AC adapter or 3.7Vdc from battery
Modulation Type	GFSK, π/4-DQPSK
Modulation Technology	FHSS
Transfer Rate	Up to 2Mbps
Operating Frequency	2402MHz ~ 2480MHz
Number of Channel	79
Output Power	1.875mW
Antenna Type	Printed antenna with -0.58dBi gain
Antenna Connector	N/A
Accessory Device	N/A
Data Cable Supplied	Shielded Type-C to USB-A cable (0.3m)

Note:

1. The EUT uses following battery.

Brand	Pow-Tech Company Limited
Model	PT18650 PCM1200
Rating	3.7Vdc

2. The above Antenna information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications, the laboratory shall not be held responsible.
3. The EUT was pre-tested with the following modes:

- Operating Mode (EUT + Battery)
- Operating + Charging Mode (EUT + Notebook)
- Operating + Charging Mode (EUT + Adapter)

The worst emission level was found when the EUT tested under **Operating + Charging Mode (EUT + Notebook)** therefore, only its test data was recorded in this report.

4. The above EUT information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications or User's Manual.

3.2 Description of Test Modes

79 channels are provided for BT-EDR mode:

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 Test Mode Applicability and Tested Channel Detail

EUT Configure Mode	Applicable To				Description
	RE≥1G	RE<1G	PLC	APCM	
A	√	√	√	√	Operating + Charging Mode (EUT + Notebook)
B	-	-	√	-	Operating + Charging Mode (EUT + Adapter)

Where **RE≥1G:** Radiated Emission above 1GHz **RE<1G:** Radiated Emission below 1GHz
PLC: Power Line Conducted Emission **APCM:** Antenna Port Conducted Measurement

NOTE: The EUT had been pre-tested on the positioned of each 2 axis. The worst case was found when positioned on **Y-plane**.

Radiated Emission Test (Above 1GHz):

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

EUT Configure Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Packet Type
A	0 to 78	0, 39, 78	FHSS	GFSK	DH5
A	0 to 78	0, 39, 78	FHSS	π/4-DQPSK	2DH5

Radiated Emission Test (Below 1GHz):

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

EUT Configure Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Packet Type
A	0 to 78	0	FHSS	GFSK	DH5

Power Line Conducted Emission Test:

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

EUT Configure Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Packet Type
A	0 to 78	0	FHSS	GFSK	DH5
B	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, data rates and antenna ports (if EUT with antenna diversity architecture).
☒ Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Packet Type
A	0 to 78	0, 39, 78	FHSS	GFSK	DH5
A	0 to 78	0, 39, 78	FHSS	π/4-DQPSK	2DH5

Test Condition:

Applicable To	Environmental Conditions	Input Power	Tested By
RE≥1G	23deg. C, 71%RH	120Vac, 60Hz	Ian Chang
RE<1G	24deg. C, 63%RH	120Vac, 60Hz	Ian Chang
PLC	25deg. C, 75%RH	120Vac, 60Hz	Pirar Hsieh
APCM	25deg. C, 76%RH	120Vac, 60Hz	Saxon Lee

3.3 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.

ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	Notebook PC	Lenove	81LG	PF1NF9V2	NA	Provided by Lab
B.	Cassette Recorder	PANASONIC	RQ-L11	JE012031	N/A	Provided by Lab
C.	Adapter	Apple	A1385	NA	NA	Provided by Lab

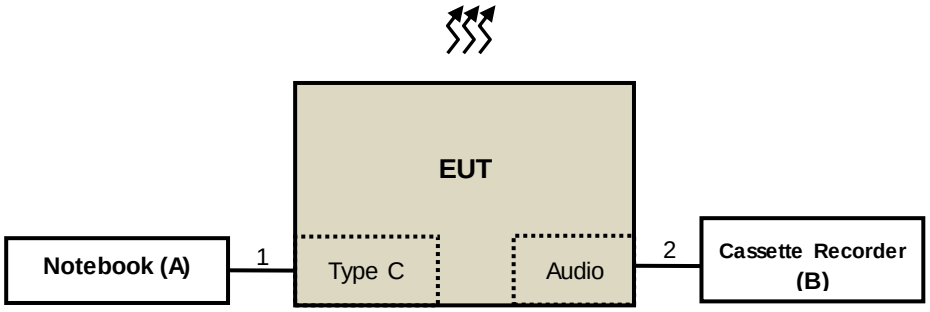
Note: All power cords of the above support units are non-shielded (1.8m).

ID	Cable Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	Type-C to USB-A cable	1	0.3	Y	0	Supplied by client
2.	Audio cable	1	1.2	N	0	Provided by Lab

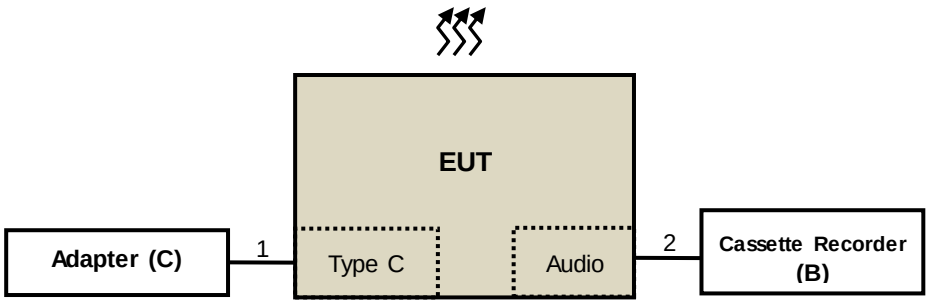
Note: The core(s) is(are) originally attached to the cable(s).

3.3.1 Configuration of System under Test

Operating + Charging Mode (EUT + Notebook):



Operating + Charging Mode (EUT + Adapter):



3.4 General Description of Applied Standards and References

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

Test standard:

FCC Part 15, Subpart C (15.247)
ANSI C63.10-2013

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

References Test Guidance:

KDB 558074 D01 15.247 Meas Guidance v05r02

All test items have been performed as a reference to the above KDB test guidance.

4 Test Types and Results

4.1 Radiated Emission and Bandedge Measurement

4.1.1 Limits of Radiated Emission and Bandedge Measurement

Radiated emissions which fall in the restricted bands must comply with the radiated emission limits specified as below table. 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. 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.

4.1.2 Test Instruments

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
HP Preamplifier	8447D	2432A03504	Feb. 19, 2020	Feb. 18, 2021
HP Preamplifier	8449B	3008A01201	Feb. 20, 2020	Feb. 19, 2021
MITEQ Preamplifier	AMF-6F-260400-33-8P	892164	Feb. 19, 2020	Feb. 18, 2021
Agilent TEST RECEIVER	N9038A	MY51210129	Mar. 18, 2020	Mar. 17, 2021
Schwarzbeck Antenna	VULB 9168	139	Nov. 7, 2019	Nov. 6, 2020
Schwarzbeck Antenna	VHBA 9123	480	Jun. 3, 2019	Jun. 2, 2021
Schwarzbeck Horn Antenna	BBHA-9170	212	Nov. 24, 2019	Nov. 23, 2020
Schwarzbeck Horn Antenna	BBHA 9120-D1	D130	Nov. 24, 2019	Nov. 23, 2020
ADT. Turn Table	TT100	0306	NA	NA
ADT. Tower	AT100	0306	NA	NA
Software	Radiated_V7.6.15.9.5	NA	NA	NA
SUHNER RF cable With 4dB PAD	SF102	Cable-CH6-01	Jul. 9, 2020	Jul. 8, 2021
SUHNER RF cable With 3/4dB PAD	SF102	Cable-CH8-3.6m	Jul. 9, 2020	Jul. 8, 2021
KEYSIGHT MIMO Powermeasurement Test set	U2021XA	U2021XA-001	Jun. 16, 2020	Jun. 15, 2021
KEYSIGHT Spectrum Analyzer	N9030A	MY54490260	Jul. 22, 2020	Jul. 21, 2021
Loop Antenna EMCI	LPA600	270	Aug. 23, 2019	Aug. 22, 2021
EMCO Horn Antenna	3115	00028257	Nov. 24, 2019	Nov. 23, 2020
Highpass filter Wainwright Instruments	WHK 3.1/18G-10SS	SN 8	NA	NA
ROHDE & SCHWARZ Spectrum Analyzer	FSV40	101042	Sep. 23, 2019	Sep. 22, 2020
Anritsu Power Sensor	MA2411B	0738404	Apr. 13, 2020	Apr. 12, 2021
Anritsu Power Meter	ML2495A	0842014	Apr. 13, 2020	Apr. 12, 2021

NOTE: 1. The calibration interval of the above test instruments is 12/24 months. And the calibrations are traceable to NML/ROC and NIST/USA.
2. The horn antenna and HP preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
3. The test was performed in Chamber No. 6.

4.1.3 Test Procedures

For Radiated emission below 30MHz

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter chamber room. 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. Parallel, perpendicular, and ground-parallel orientations of the antenna are set to make the measurement.

d. For each suspected emission, the EUT was arranged to its worst case 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 Quasi-Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

Note: The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 9kHz at frequency below 30MHz.

For Radiated emission above 30MHz

a. The EUT was placed on the top of a rotating table 0.8 meters (for 30MHz ~ 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 height of antenna 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 quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.

f. The test-receiver system was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

Note:

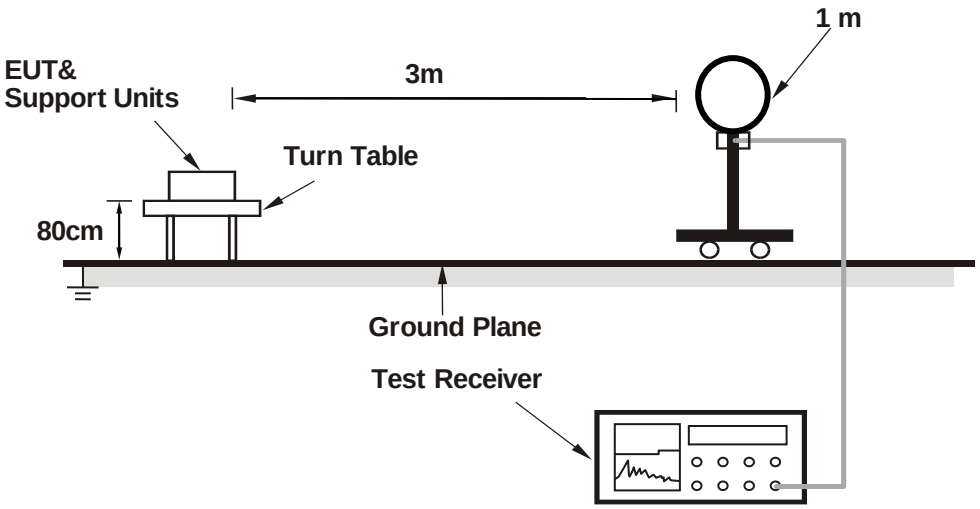
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
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. ((PK) RB=1MHz, VB=3MHz (AV) 1M/3M detector RMS trace AV)
4. All modes of operation were investigated and the worst-case emissions are reported.

4.1.4 Deviation from Test Standard

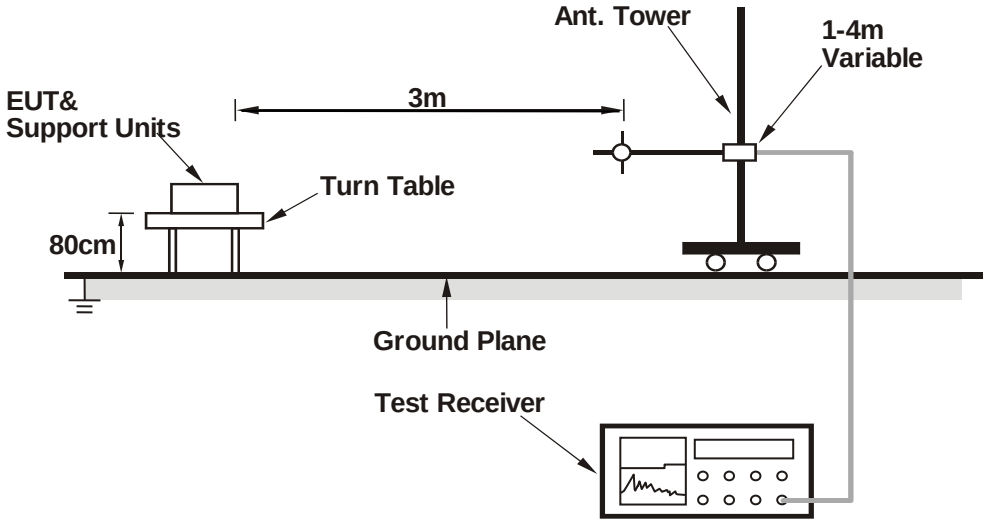
No deviation.

4.1.5 Test Setup

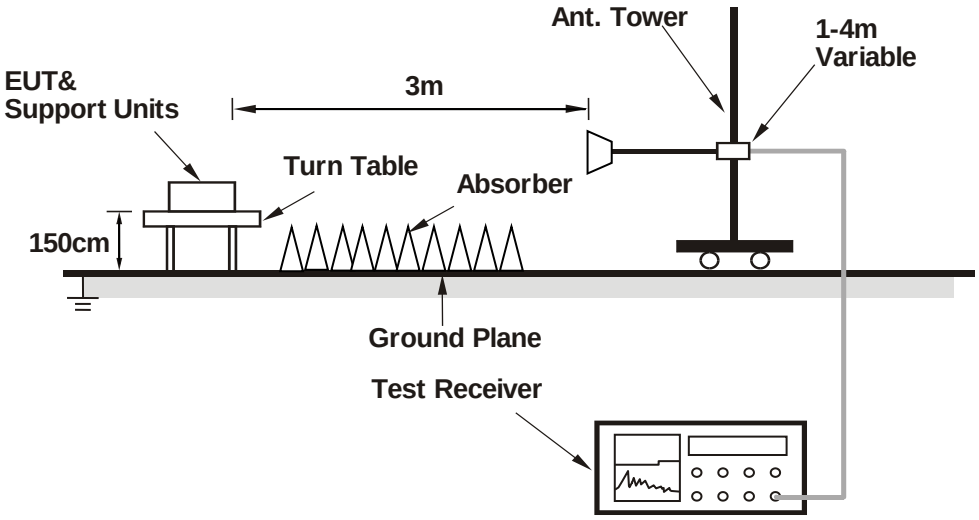
For Radiated emission below 30MHz



For Radiated emission 30MHz to 1GHz



For Radiated emission above 1GHz



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

4.1.6 EUT Operating Conditions

Set the EUT under transmission condition continuously at specific channel frequency continuously.

4.1.7 Test Results

ABOVE 1GHz DATA

Mode A

BT_GFSK

Channel	TX Channel 0	**Detector Function**	Peak (PK) Average (AV)
Frequency Range	1GHz ~ 25GHz		

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	**Frequency (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	47.05 PK	74.00	-26.95	1.49 H	270	45.73	1.32
2	2390.00	36.55 AV	54.00	-17.45	1.49 H	270	35.23	1.32
3	*2402.00	97.32 PK			1.49 H	270	95.94	1.38
4	*2402.00	66.72 AV			1.49 H	270	65.34	1.38
5	4804.00	56.87 PK	74.00	-17.13	1.74 H	109	47.70	9.17
6	4804.00	26.27 AV	54.00	-27.73	1.74 H	109	17.10	9.17
Antenna Polarity & Test Distance : Vertical at 3 m								
No	**Frequency (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	50.05 PK	74.00	-23.95	2.55 V	234	48.73	1.32
2	2390.00	40.60 AV	54.00	-13.40	2.55 V	234	39.28	1.32
3	*2402.00	98.92 PK			2.55 V	234	97.54	1.38
4	*2402.00	68.32 AV			2.55 V	234	66.94	1.38
5	4804.00	54.37 PK	74.00	-19.63	1.42 V	243	45.20	9.17
6	4804.00	23.77 AV	54.00	-30.23	1.42 V	243	14.60	9.17

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. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " * ": Fundamental frequency.
6. The average value of fundamental and harmonic frequency is: Average = Peak value + 20 log(Duty cycle) Where the Duty cycle correction factor is calculated from following formula:
   20 log(Duty cycle) = 20 log(2.966 ms *1 / 100 ms) = -30.6 dB
   Please see page 24 for plotted duty.

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Channel	TX Channel 39	Detector Function	Peak (PK) Average (AV)
Frequency Range	1GHz ~ 25GHz		

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (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	97.70 PK			1.51 H	265	96.23	1.47
2	*2441.00	67.10 AV			1.51 H	265	65.63	1.47
3	4882.00	56.83 PK	74.00	-17.17	1.69 H	111	47.58	9.25
4	4882.00	26.23 AV	54.00	-27.77	1.69 H	111	16.98	9.25
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (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	99.11 PK			3.03 V	241	97.64	1.47
2	*2441.00	68.51 AV			3.03 V	241	67.04	1.47
3	4882.00	54.61 PK	74.00	-19.39	1.51 V	252	45.36	9.25
4	4882.00	24.01 AV	54.00	-29.99	1.51 V	252	14.76	9.25

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. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " * ": Fundamental frequency.
6. The average value of fundamental and harmonic frequency is: Average = Peak value + 20 log(Duty cycle) Where the Duty cycle correction factor is calculated from following formula:
   20 log(Duty cycle) = 20 log(2.966 ms *1 / 100 ms) = -30.6 dB
   Please see page 24 for plotted duty.

Channel	TX Channel 78	Detector Function	Peak (PK) Average (AV)
Frequency Range	1GHz ~ 25GHz		

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2480.00	97.53 PK			1.52 H	265	95.85	1.68
2	*2480.00	66.93 AV			1.52 H	265	65.25	1.68
3	2483.50	56.97 PK	74.00	-17.03	1.52 H	265	55.26	1.71
4	2483.50	50.26 AV	54.00	-3.74	1.52 H	265	48.55	1.71
5	4960.00	56.55 PK	74.00	-17.45	1.69 H	115	47.32	9.23
6	4960.00	25.95 AV	54.00	-28.05	1.69 H	115	16.72	9.23
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2480.00	99.22 PK			2.97 V	240	97.54	1.68
2	*2480.00	68.62 AV			2.97 V	240	66.94	1.68
3	2483.50	59.47 PK	74.00	-14.53	2.97 V	240	57.76	1.71
4	2483.50	51.71 AV	54.00	-2.29	2.97 V	240	50.00	1.71
5	4960.00	54.50 PK	74.00	-19.50	1.41 V	237	45.27	9.23
6	4960.00	23.90 AV	54.00	-30.10	1.41 V	237	14.67	9.23

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. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " * ": Fundamental frequency.
6. The average value of fundamental and harmonic frequency is: Average = Peak value + 20 log(Duty cycle) Where the Duty cycle correction factor is calculated from following formula:
   20 log(Duty cycle) = 20 log(2.966 ms *1 / 100 ms) = -30.6 dB
   Please see page 24 for plotted duty.

Mode A

BT_π/4-DQPSK

Channel	TX Channel 0	Detector Function	Peak (PK) Average (AV)
Frequency Range	1GHz ~ 25GHz		

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (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	46.57 PK	74.00	-27.43	1.51 H	269	45.25	1.32
2	2390.00	37.41 AV	54.00	-16.59	1.51 H	269	36.09	1.32
3	*2402.00	97.80 PK			1.51 H	269	96.42	1.38
4	*2402.00	67.20 AV			1.51 H	269	65.82	1.38
5	4804.00	57.02 PK	74.00	-16.98	1.77 H	115	47.85	9.17
6	4804.00	26.42 AV	54.00	-27.58	1.77 H	115	17.25	9.17
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (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	47.85 PK	74.00	-26.15	2.50 V	231	46.53	1.32
2	2390.00	38.88 AV	54.00	-15.12	2.50 V	231	37.56	1.32
3	*2402.00	99.72 PK			2.50 V	231	98.34	1.38
4	*2402.00	69.12 AV			2.50 V	231	67.74	1.38
5	4804.00	54.50 PK	74.00	-19.50	1.39 V	238	45.33	9.17
6	4804.00	23.90 AV	54.00	-30.10	1.39 V	238	14.73	9.17

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. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " * ": Fundamental frequency.
6. The average value of fundamental and harmonic frequency is: Average = Peak value + 20 log(Duty cycle) Where the Duty cycle correction factor is calculated from following formula:
   20 log(Duty cycle) = 20 log(2.966 ms *1 / 100 ms) = -30.6 dB
   Please see page 24 for plotted duty.

Channel	TX Channel 39	Detector Function	Peak (PK) Average (AV)
Frequency Range	1GHz ~ 25GHz		

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (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	96.56 PK			1.53 H	278	95.09	1.47
2	*2441.00	65.96 AV			1.53 H	278	64.49	1.47
3	4882.00	56.50 PK	74.00	-17.50	1.68 H	124	47.25	9.25
4	4882.00	25.90 AV	54.00	-28.10	1.68 H	124	16.65	9.25
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (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	99.34 PK			3.01 V	239	97.87	1.47
2	*2441.00	68.74 AV			3.01 V	239	67.27	1.47
3	4882.00	54.94 PK	74.00	-19.06	1.42 V	248	45.69	9.25
4	4882.00	24.34 AV	54.00	-29.66	1.42 V	248	15.09	9.25

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. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " * ": Fundamental frequency.
6. The average value of fundamental and harmonic frequency is: Average = Peak value + 20 log(Duty cycle) Where the Duty cycle correction factor is calculated from following formula:
   20 log(Duty cycle) = 20 log(2.966 ms *1 / 100 ms) = -30.6 dB
   Please see page 24 for plotted duty.

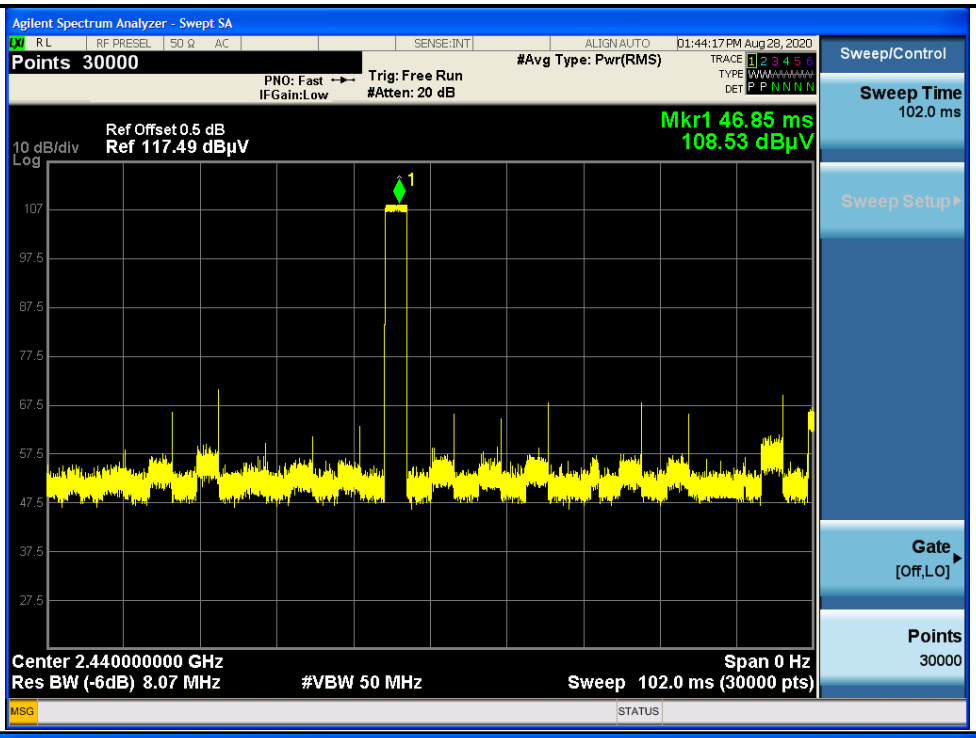
Channel	TX Channel 78	Detector Function	Peak (PK) Average (AV)
Frequency Range	1GHz ~ 25GHz		

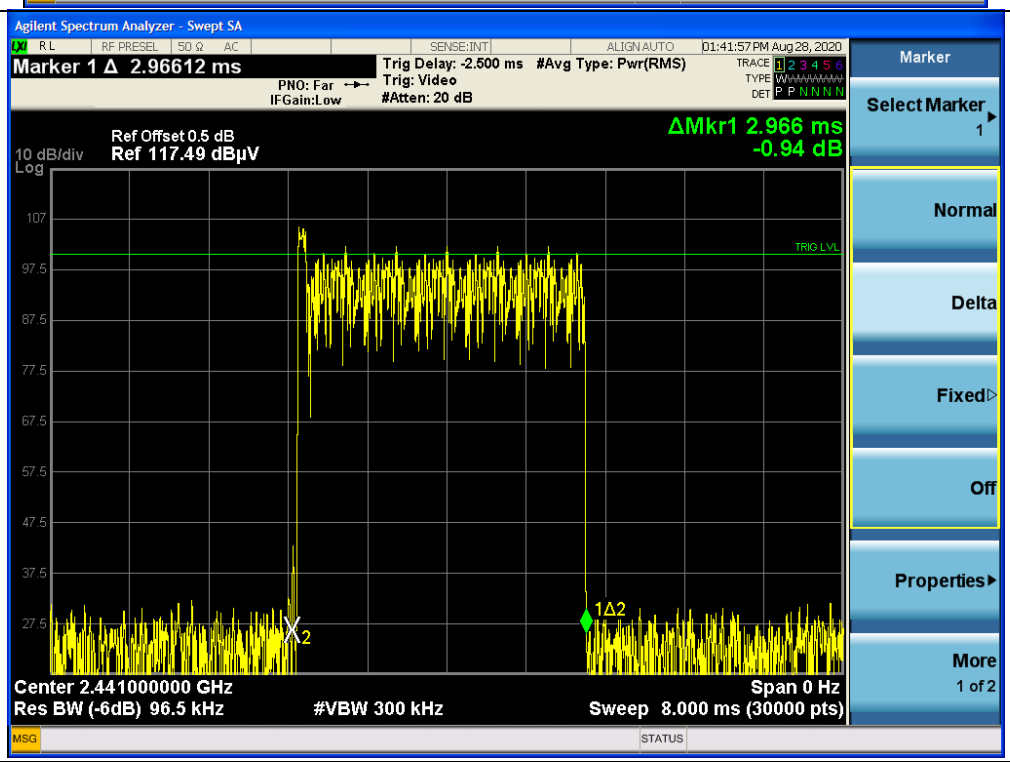
Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2480.00	96.84 PK			1.54 H	277	95.16	1.68
2	*2480.00	66.24 AV			1.54 H	277	64.56	1.68
3	2483.50	57.00 PK	74.00	-17.00	1.54 H	277	55.29	1.71
4	2483.50	50.36 AV	54.00	-3.64	1.54 H	277	48.65	1.71
5	4960.00	56.92 PK	74.00	-17.08	1.69 H	125	47.69	9.23
6	4960.00	26.32 AV	54.00	-27.68	1.69 H	125	17.09	9.23
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2480.00	99.60 PK			2.96 V	240	97.92	1.68
2	*2480.00	69.00 AV			2.96 V	240	67.32	1.68
3	2483.50	59.62 PK	74.00	-14.38	2.96 V	240	57.91	1.71
4	**2483.50**	**52.26 AV**	**54.00**	**-1.74**	**2.96 V**	**240**	**50.55**	**1.71**
5	4960.00	54.80 PK	74.00	-19.20	1.47 V	228	45.57	9.23
6	4960.00	24.20 AV	54.00	-29.80	1.47 V	228	14.97	9.23

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. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " * ": Fundamental frequency.
6. The average value of fundamental and harmonic frequency is: Average = Peak value + 20 log(Duty cycle) Where the Duty cycle correction factor is calculated from following formula:
   20 log(Duty cycle) = 20 log(2.966 ms *1 / 100 ms) = -30.6 dB
   Please see page 24 for plotted duty.

Duty Cycle





Duty cycle = (2.966*1)/100ms=0.02966,
Duty cycle correction factor (dB) = 20 * log(0.02966) = -30.6

BELOW 1GHz WORST-CASE DATA

Mode A

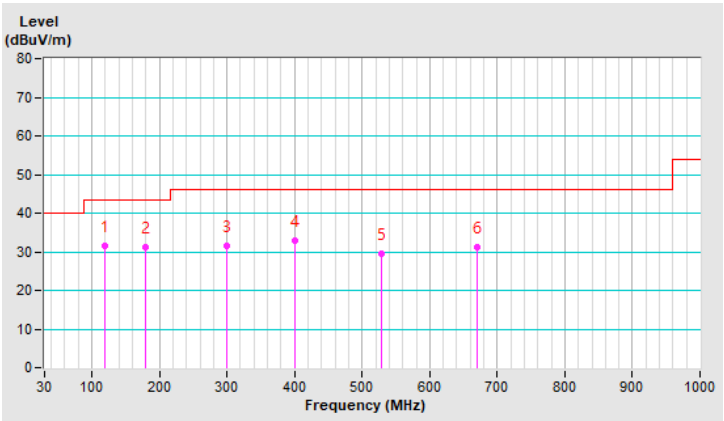
BT_GFSK

Channel	TX Channel 0	**Detector Function**	Quasi-Peak (QP)
Frequency Range	9kHz ~ 1GHz		

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	**Frequency (MHz)**	**Emission Level (dBuV/m)**	**Limit (dBuV/m)**	**Margin (dB)**	**Antenna Height (m)**	**Table Angle (Degree)**	**Raw Value (dBuV)**	**Correction Factor (dB/m)**
1	120.02	31.65 QP	43.50	-11.85	1.64 H	91	40.62	-8.97
2	179.91	31.15 QP	43.50	-12.35	1.27 H	262	38.80	-7.65
3	300.14	31.58 QP	46.00	-14.42	1.27 H	12	35.92	-4.34
4	400.01	32.86 QP	46.00	-13.14	1.85 H	279	35.09	-2.23
5	528.05	29.65 QP	46.00	-16.35	1.29 H	265	29.20	0.45
6	670.30	31.27 QP	46.00	-14.73	1.64 H	298	27.80	3.47

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. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit of frequency range 30MHz~1000MHz.
5. The emission levels were very low against the limit of frequency range 9kHz~30MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.

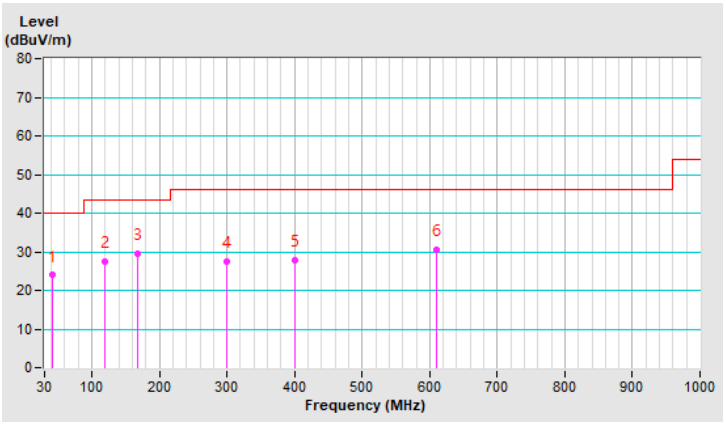


Channel	TX Channel 0	Detector Function	Quasi-Peak (QP)
Frequency Range	9kHz ~ 1GHz		

Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	41.35	23.95 QP	40.00	-16.05	1.34 V	166	31.38	-7.43
2	120.02	27.53 QP	43.50	-15.97	1.05 V	207	36.50	-8.97
3	167.98	29.42 QP	43.50	-14.08	1.17 V	126	35.84	-6.42
4	299.85	27.39 QP	46.00	-18.61	1.25 V	197	31.73	-4.34
5	400.01	27.90 QP	46.00	-18.10	1.39 V	116	30.13	-2.23
6	609.09	30.61 QP	46.00	-15.39	2.02 V	264	28.13	2.48

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. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit of frequency range 30MHz~1000MHz.
5. The emission levels were very low against the limit of frequency range 9kHz~30MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.



4.2 Conducted Emission Measurement

4.2.1 Limits of Conducted Emission Measurement

Frequency (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15 - 0.5	66 - 56	56 - 46
0.50 - 5.0	56	46
5.0 - 30.0	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.

4.2.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
ROHDE & SCHWARZ TEST RECEIVER	ESR3	102414	Jan. 13, 2020	Jan. 12, 2021
ROHDE & SCHWARZ Artificial Mains Network (for EUT)	ENV216	101197	Jun. 10, 2020	Jun. 9, 2021
LISN With Adapter (for EUT)	101197	NA	Jun. 10, 2020	Jun. 9, 2021
ROHDE & SCHWARZ Artificial Mains Network (for peripherals)	ESH3-Z5	100218	Nov. 24, 2019	Nov. 23, 2020
SCHWARZBECK Artificial Mains Network (For EUT)	NNLK8129	8129229	May 14, 2020	May 13, 2021
SCHWARZBECK Artificial Mains Network (for EUT)	NNLK 8121	8121-808	Apr. 10, 2020	Apr. 9, 2021
Software	Cond_V7.3.7.4	NA	NA	NA
RF cable (JYEBAO) With 10dB PAD	5D-FB	Cable-C10.01	Feb. 12, 2020	Feb. 11, 2021
LYNICS Terminator (For ROHDE & SCHWARZ LISN)	0900510	E1-011484	May 26, 2020	May 25, 2021

Note: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in Shielded Room No. 10. (Conduction 10)
3. The VCCI Site Registration No. C-11852.

4.2.3 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.

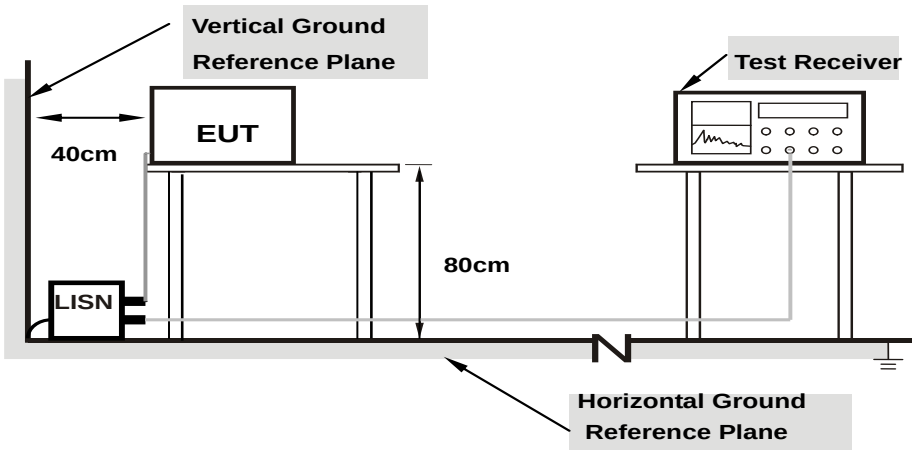
c. The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) was not recorded.

NOTE: The resolution bandwidth and video bandwidth of test receiver is 9kHz for quasi-peak detection (QP) and average detection (AV) at frequency 0.15MHz-30MHz.

4.2.4 Deviation From Test Standard

No deviation.

4.2.5 Test Setup



Note: 1.Support units were connected to second LISN.

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

4.2.6 EUT Operating Condition

a. Connected the EUT to Adapter or Notebook.

b. Set the EUT under charging condition and under transmission condition continuously at specific channel frequency continuously.

4.2.7 Test Results

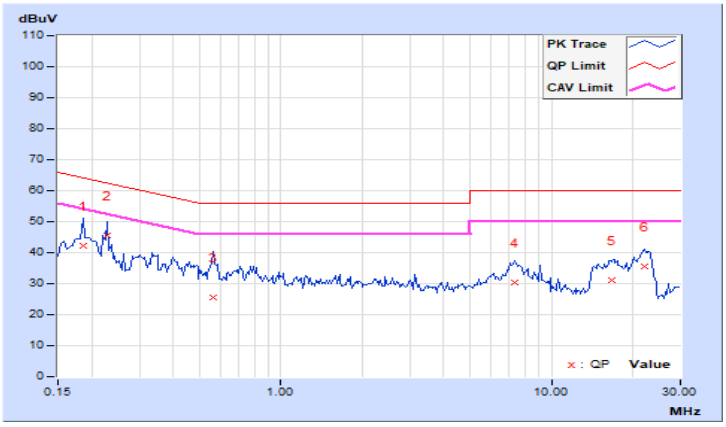
Mode A

Frequency Range	150kHz ~ 30MHz	Detector Function	Quasi-Peak (QP) / Average (AV)

Phase Of Power : Line (L)										
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.18516	9.78	32.60	13.43	42.38	23.21	64.25	54.25	-21.87	-31.04
2	**0.22812**	**9.80**	**35.94**	**11.83**	**45.74**	**21.63**	**62.52**	**52.52**	**-16.78**	**-30.89**
3	0.56016	9.86	15.63	5.25	25.49	15.11	56.00	46.00	-30.51	-30.89
4	7.33203	10.20	20.28	11.26	30.48	21.46	60.00	50.00	-29.52	-28.54
5	16.73438	10.39	20.86	14.66	31.25	25.05	60.00	50.00	-28.75	-24.95
6	22.00781	10.51	24.99	17.28	35.50	27.79	60.00	50.00	-24.50	-22.21

Remarks:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level – Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value

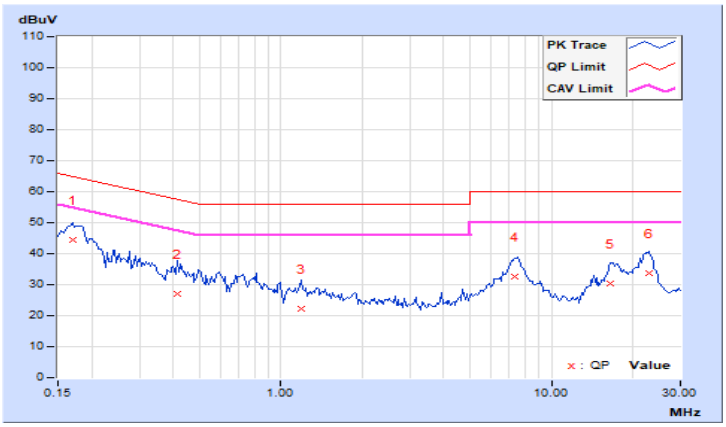


Frequency Range	150kHz ~ 30MHz	Detector Function	Quasi-Peak (QP) / Average (AV)

Phase Of Power : Neutral (N)										
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.16953	9.77	34.76	16.66	44.53	26.43	64.98	54.98	-20.45	-28.55
2	0.41563	9.81	17.40	3.89	27.21	13.70	57.54	47.54	-30.33	-33.84
3	1.18750	9.95	12.14	2.38	22.09	12.33	56.00	46.00	-33.91	-33.67
4	7.30078	10.22	22.32	10.28	32.54	20.50	60.00	50.00	-27.46	-29.50
5	16.53906	10.43	20.09	12.46	30.52	22.89	60.00	50.00	-29.48	-27.11
6	22.94531	10.55	23.09	15.72	33.64	26.27	60.00	50.00	-26.36	-23.73

Remarks:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level – Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value



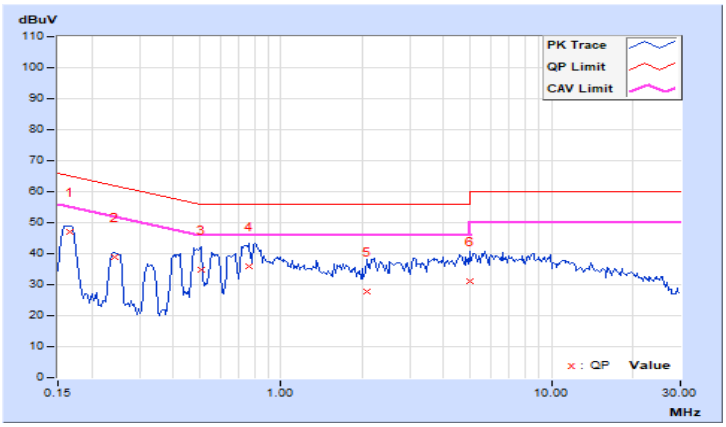
Mode B

Frequency Range	150kHz ~ 30MHz	Detector Function	Quasi-Peak (QP) / Average (AV)

Phase Of Power : Line (L)										
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.16562	9.77	37.09	26.40	46.86	36.17	65.18	55.18	-18.32	-19.01
2	0.24375	9.80	28.94	17.94	38.74	27.74	61.97	51.97	-23.23	-24.23
3	0.50938	9.85	25.13	7.43	34.98	17.28	56.00	46.00	-21.02	-28.72
4	0.76328	9.89	25.90	10.93	35.79	20.82	56.00	46.00	-20.21	-25.18
5	2.08984	10.04	17.60	8.77	27.64	18.81	56.00	46.00	-28.36	-27.19
6	4.97656	10.14	20.92	12.91	31.06	23.05	56.00	46.00	-24.94	-22.95

Remarks:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level – Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value

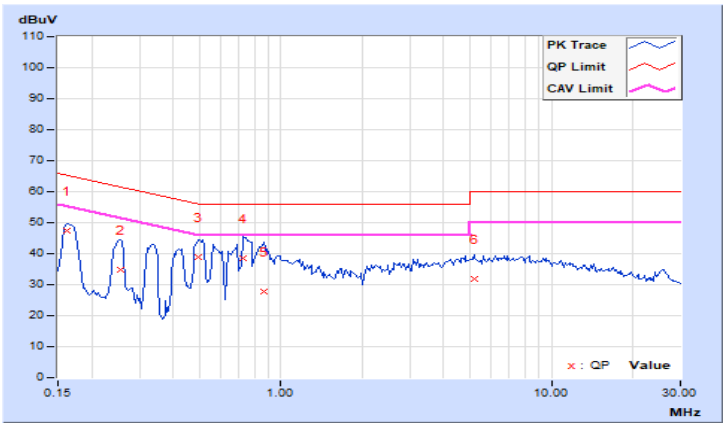


Frequency Range	150kHz ~ 30MHz	Detector Function	Quasi-Peak (QP) / Average (AV)

Phase Of Power : Neutral (N)										
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.16172	9.76	37.65	25.92	47.41	35.68	65.38	55.38	-17.97	-19.70
2	0.25547	9.80	24.98	7.51	34.78	17.31	61.58	51.58	-26.80	-34.27
3	0.49375	9.83	28.90	16.99	38.73	26.82	56.10	46.10	-17.37	-19.28
4	0.72422	9.87	28.75	15.43	38.62	25.30	56.00	46.00	-17.38	-20.70
5	0.86484	9.90	17.86	6.37	27.76	16.27	56.00	46.00	-28.24	-29.73
6	5.17188	10.16	21.72	13.14	31.88	23.30	60.00	50.00	-28.12	-26.70

Remarks:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level – Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value

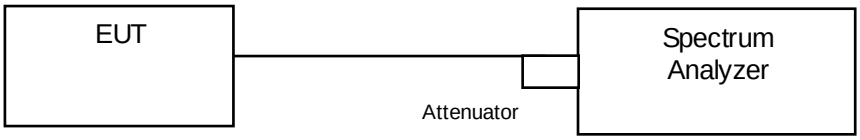


4.3 Number of Hopping Frequency Used

4.3.1 Limits of Hopping Frequency Used Measurement

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

4.3.2 Test Setup



4.3.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.3.4 Test Procedure

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 complete.

4.3.5 Deviation from Test Standard

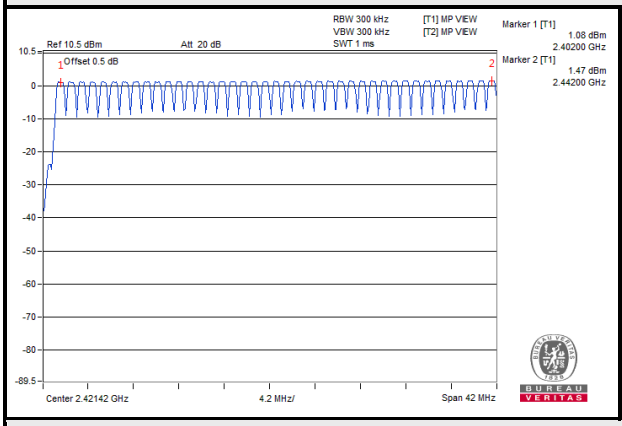
No deviation.

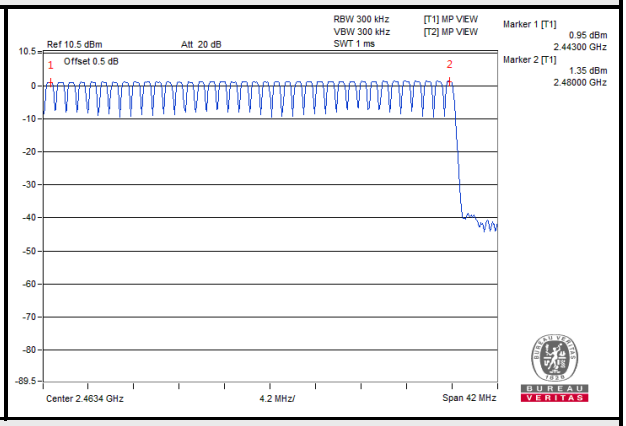
4.3.6 Test Results

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

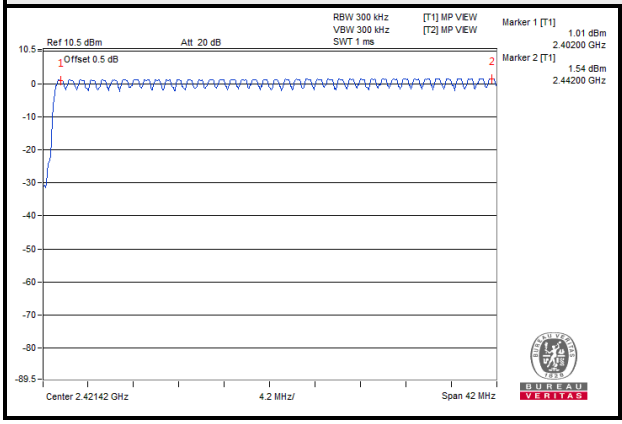
Mode A

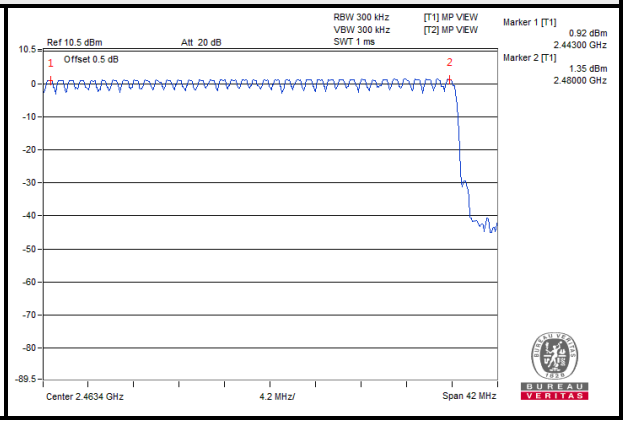
GFSK





π/4-DQPSK



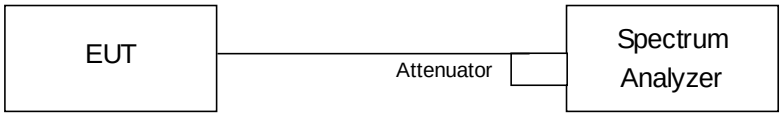


4.4 Dwell Time on Each Channel

4.4.1 Limits of Dwell Time on Each Channel Measurement

The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

4.4.2 Test Setup



4.4.3 Test Instruments

Refer to section 4.1.2 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

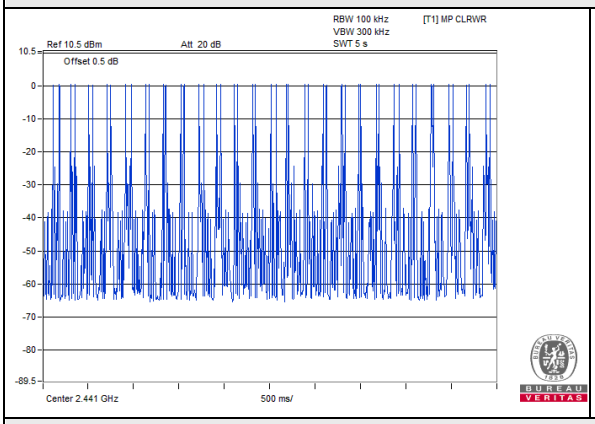
Mode A

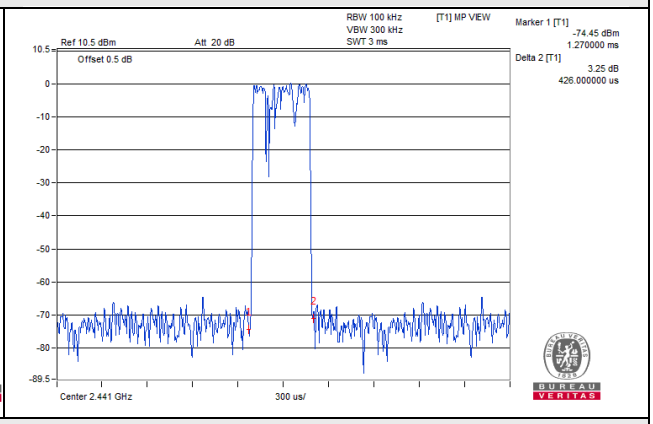
GFSK

Mode	Number of transmission in a 31.6 (79Hopping*0.4)	Length of transmission time (msec)	Result (msec)	Limit (msec)
DH1	50 (times / 5 sec) * 6.32 = 316.00 times	0.426	134.6	400
DH3	25 (times / 5 sec) * 6.32 = 158.00 times	1.696	268	400
DH5	17 (times / 5 sec) * 6.32 = 107.44 times	2.966	318.7	400

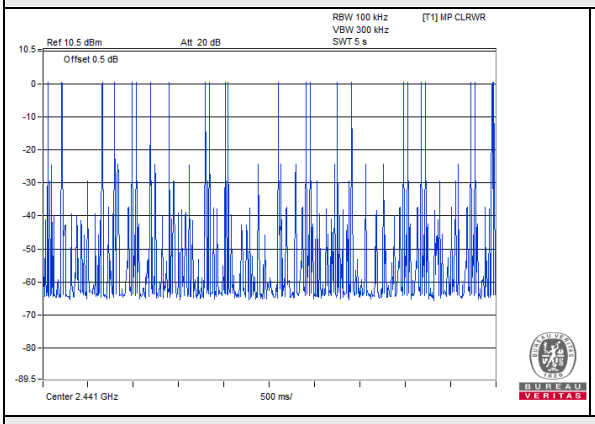
NOTE: Test plots of the transmitting time slot are shown as follows.

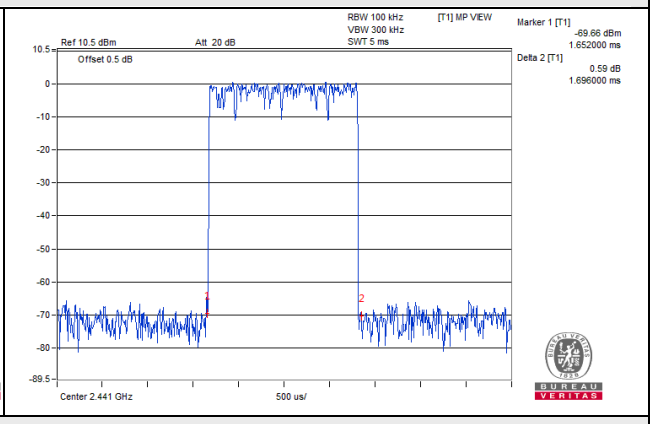
DH1



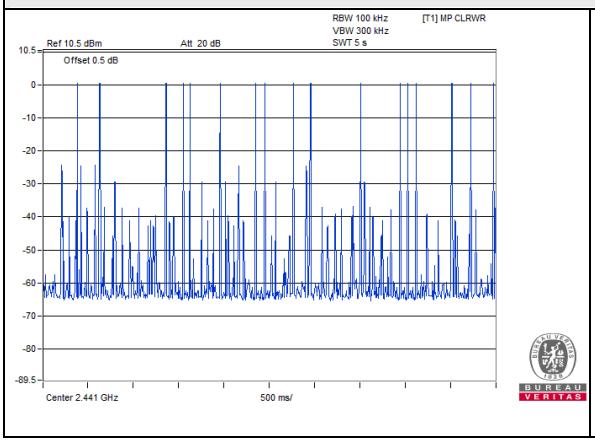


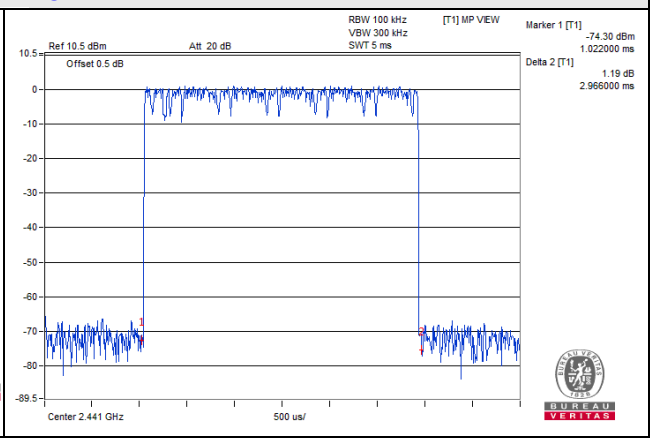
DH3





DH5



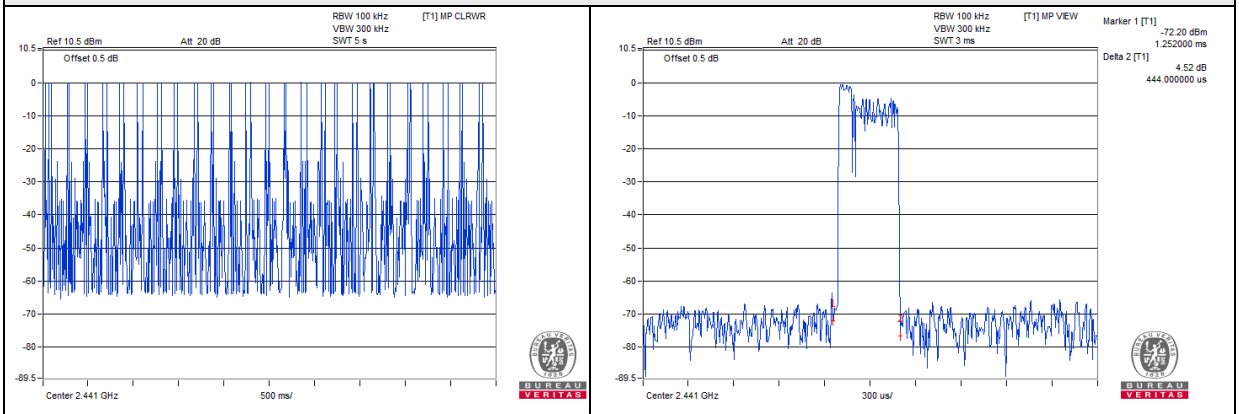


π /4-DQPSK

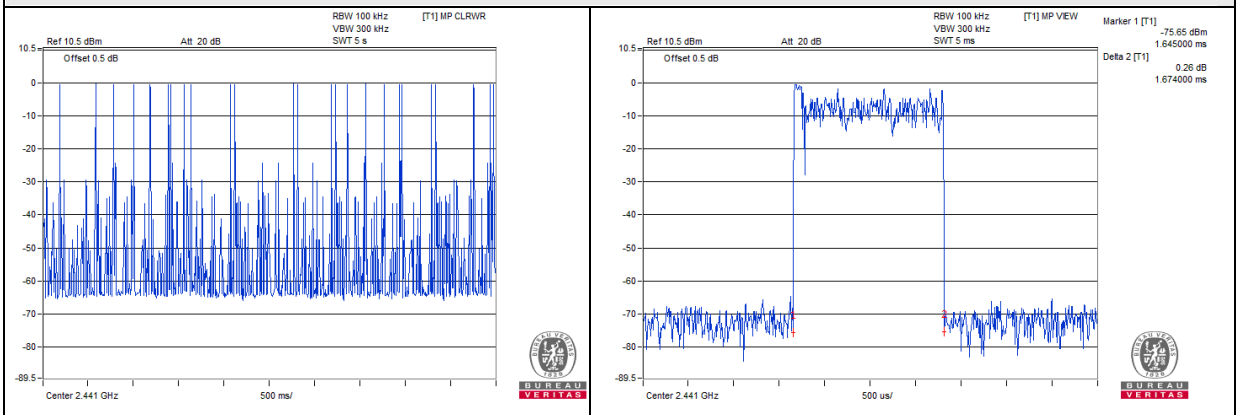
Mode	Number of transmission in a 31.6 (79Hopping*0.4)	Length of transmission time (msec)	Result (msec)	Limit (msec)
2DH1	50 (times / 5 sec) * 6.32 = 316.00 times	0.444	140.3	400
2DH3	25 (times / 5 sec) * 6.32 = 158.00 times	1.674	264.5	400
2DH5	17 (times / 5 sec) * 6.32 = 107.44 times	2.92	313.7	400

NOTE: Test plots of the transmitting time slot are shown as follows.

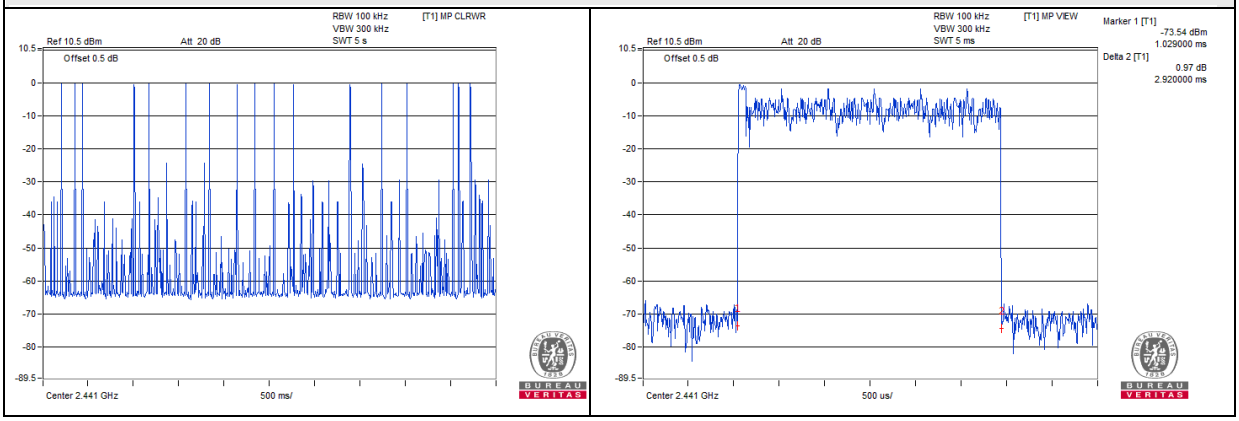
2DH1



2DH3



2DH5

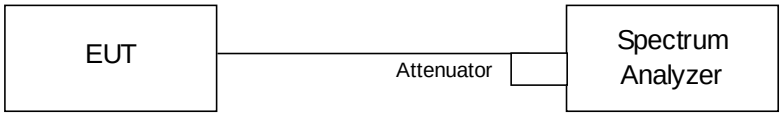


4.5 Channel Bandwidth

4.5.1 Limits of Channel Bandwidth Measurement

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 4.1.2 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 enabled the EUT to transmit and receive data at lowest, middle and highest channel frequencies individually.

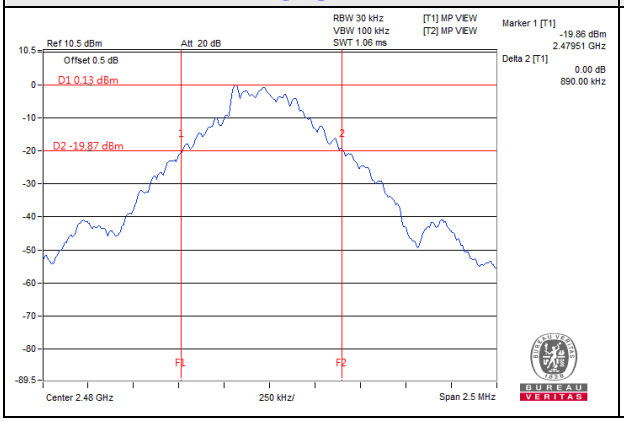
4.5.7 Test Results

Mode A

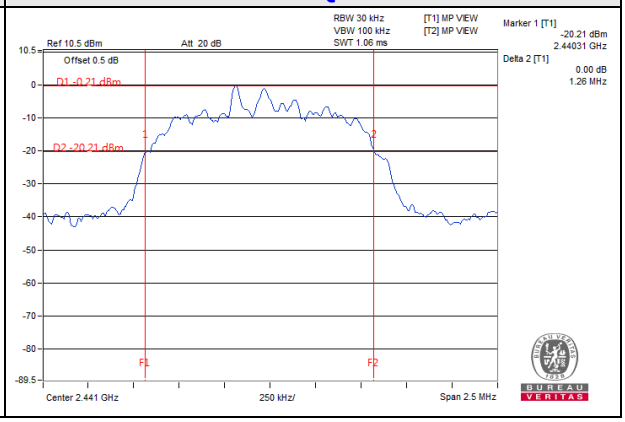
Channel	Frequency (MHz)	20dB Bandwidth (MHz)	
		GFSK	π/4-DQPSK
0	2402	0.88	1.24
39	2441	0.88	1.26
78	2480	0.89	1.26

Spectrum Plot of Worst Value

GFSK



π /4-DQPSK

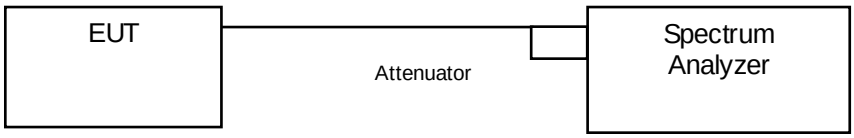


4.6 Hopping Channel Separation

4.6.1 Limits of Hopping Channel Separation Measurement

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 4.1.2 to get information of above instrument.

4.6.4 Test Procedure

Measurement Procedure REF

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.
c. By using the MaxHold function record the separation of two adjacent channels.
d. Measure the frequency difference of these two adjacent channels by SA MARK function. And then plot the result on SA screen.
e. Repeat above procedures until all frequencies measured were complete.

4.6.5 Deviation from Test Standard

No deviation.

4.6.6 Test Results

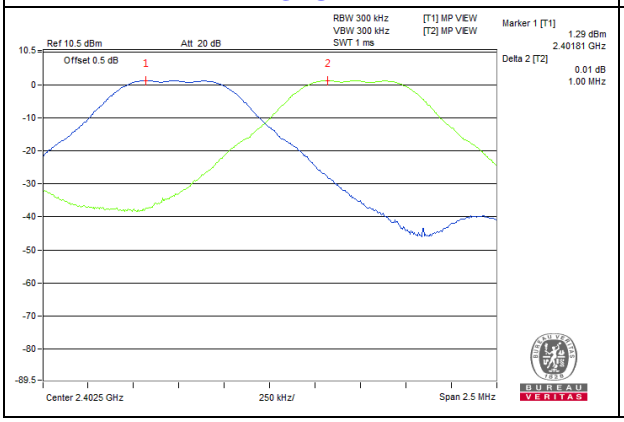
Mode A

Channel	Frequency (MHz)	Adjacent Channel Separation (MHz)		20dB Bandwidth (MHz)		Minimum Limit (MHz)		Pass / Fail
		GFSK	π/4-DQPSK	GFSK	π/4-DQPSK	GFSK	π/4-DQPSK	
0	2402	1.00	1.00	0.88	1.24	0.59	0.83	Pass
39	2441	1.00	1.00	0.88	1.26	0.59	0.84	Pass
78	2480	1.00	1.00	0.89	1.26	0.60	0.84	Pass

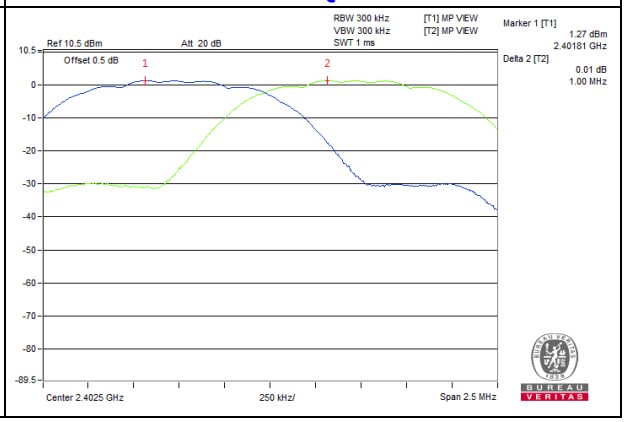
NOTE: The minimum limit is two-third 20dB bandwidth.

Spectrum Plot of Worst Value

GFSK



π /4-DQPSK

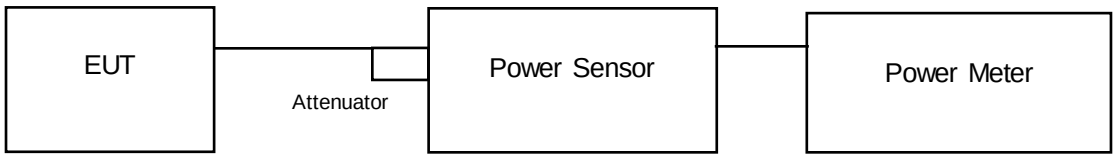


4.7 Maximum Output Power Measurement

4.7.1 Limits of Maximum Output Power Measurement

The Maximum Output Power Measurement is 125mW.

4.7.2 Test Setup



4.7.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.7.4 Test Procedure

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.

Average power sensor was used to perform output power measurement, trigger and gating function of wide band power meter is enabled to measure max output power of TX on burst. Duty factor is not added to measured value.

4.7.5 Deviation from Test Standard

No deviation.

4.7.6 EUT Operating Condition

The software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel frequencies individually.

4.7.7 Test Results

Mode A

FOR PEAK POWER

Channel	Frequency (MHZ)	Output Power (mW)		Output Power (dBm)		Power Limit (mW)	Pass / Fail
		GFSK	π/4-DQPSK	GFSK	π/4-DQPSK		
0	2402	1.791	1.849	2.53	2.67	125	Pass
39	2441	1.782	1.875	2.51	**2.73**	125	Pass
78	2480	1.687	1.837	2.27	2.64	125	Pass

FOR AVERAGE POWER

Channel	Frequency (MHZ)	Output Power (mW)		Output Power (dBm)	
		GFSK	π/4-DQPSK	GFSK	π/4-DQPSK
0	2402	1.581	1.614	1.99	2.08
39	2441	1.57	1.626	1.96	2.11
78	2480	1.486	1.611	1.72	2.07

4.8 Conducted Out of Band Emission Measurement

4.8.1 Limits of Conducted Out of Band Emission Measurement

Below –20dB of the highest emission level of operating band (in 100kHz Resolution Bandwidth).

4.8.2 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.8.3 Test Procedure

The transmitter output was connected to the spectrum analyzer via a low lose cable. Set both RBW and VBW of spectrum analyzer to 100 kHz and 300 kHz with suitable frequency span including 100 MHz bandwidth from band edge. 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 enabled the EUT to transmit and receive data at lowest, middle and highest channel frequencies individually.

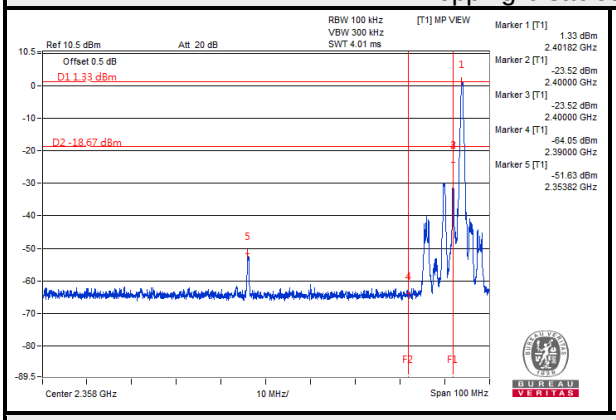
4.8.6 Test Results

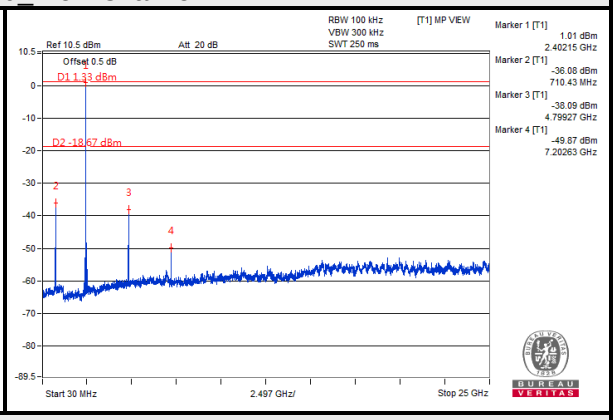
The spectrum plots are attached on the following images. D1 line indicates the highest level, D2 line indicates the 20dB offset below D1. It shows compliance with the requirement.

Mode A

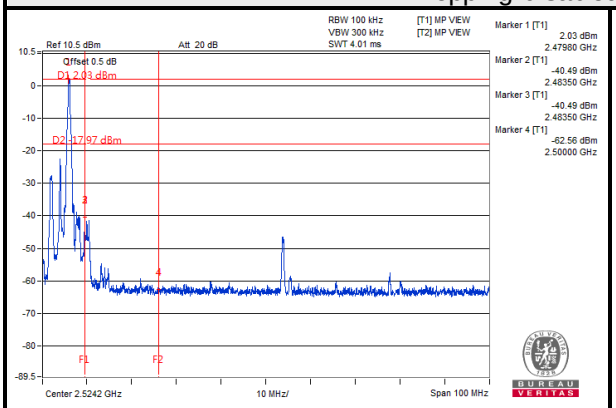
BT_GFSK

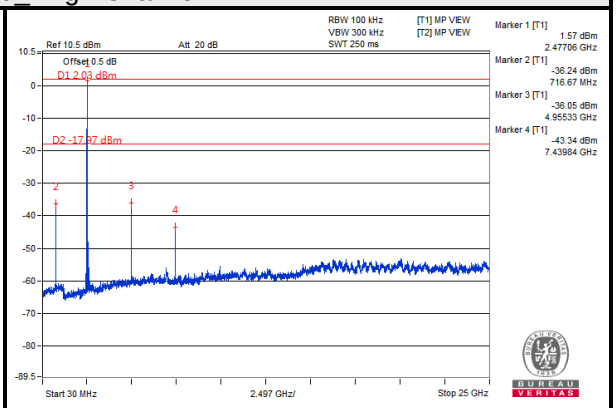
Hopping disabled_ Low Channel



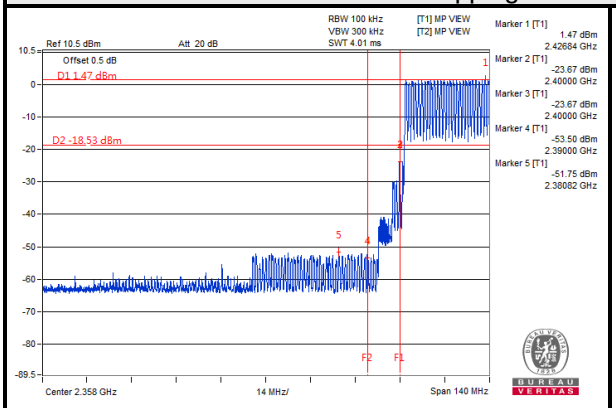


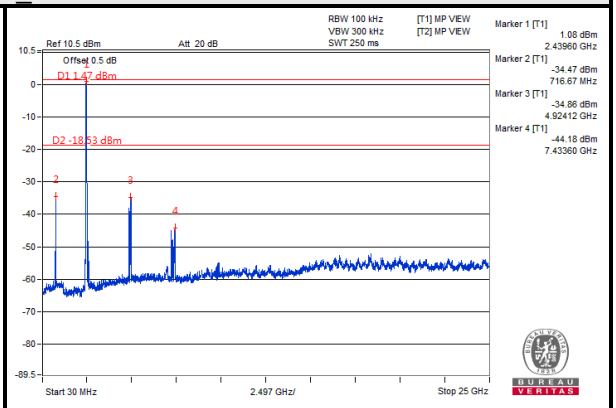
Hopping disabled_ High Channel



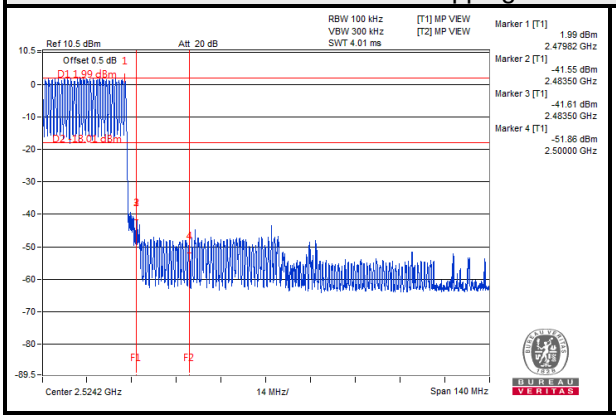


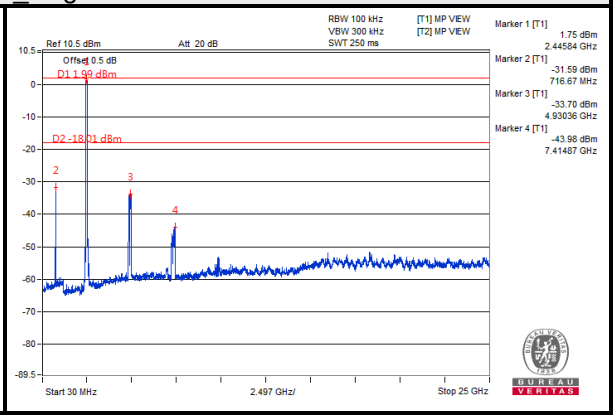
Hopping enabled_ Low Channel





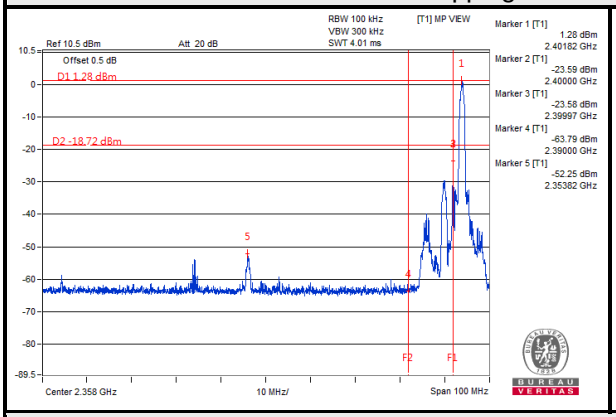
Hopping enabled_ High Channel

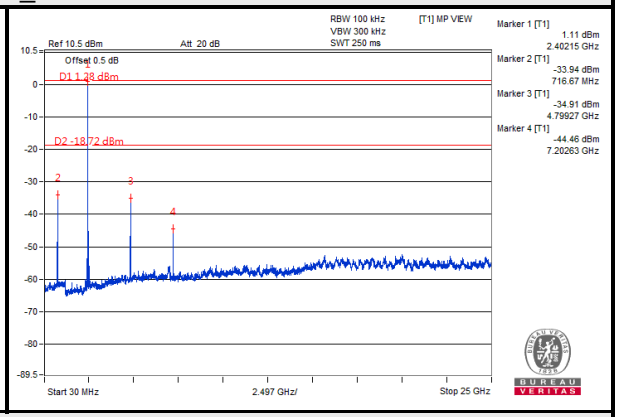




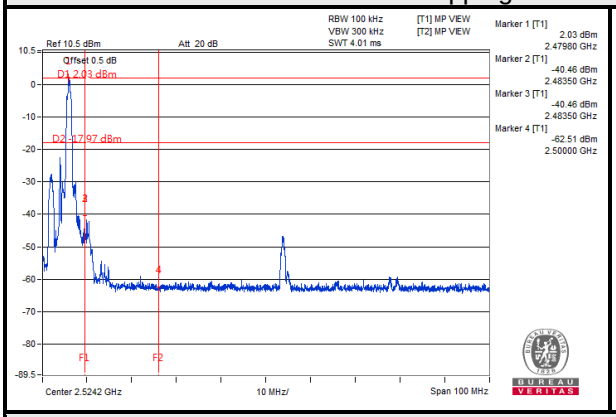
BT_π/4-DQPSK

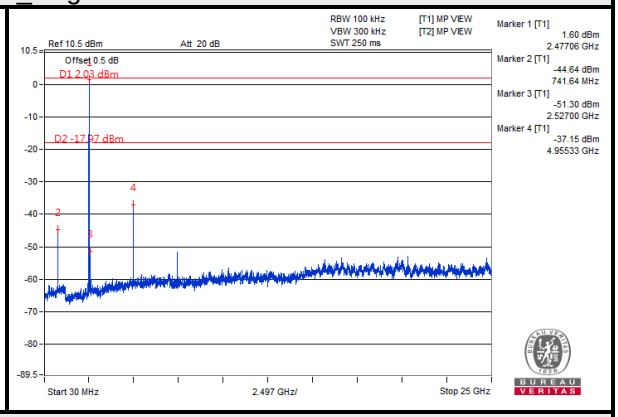
Hopping disabled_ Low Channel



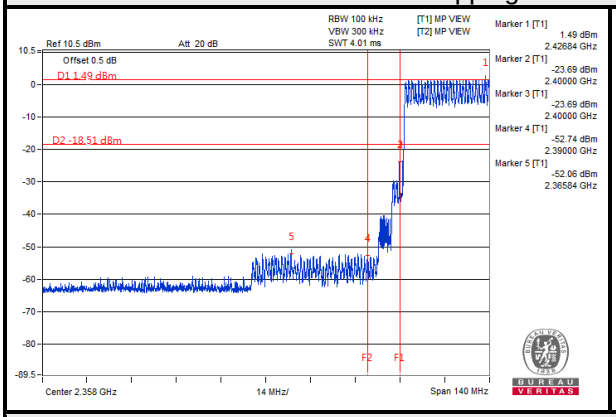


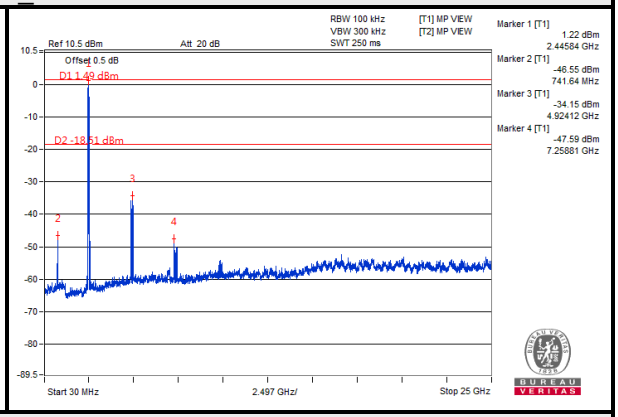
Hopping disabled_ High Channel



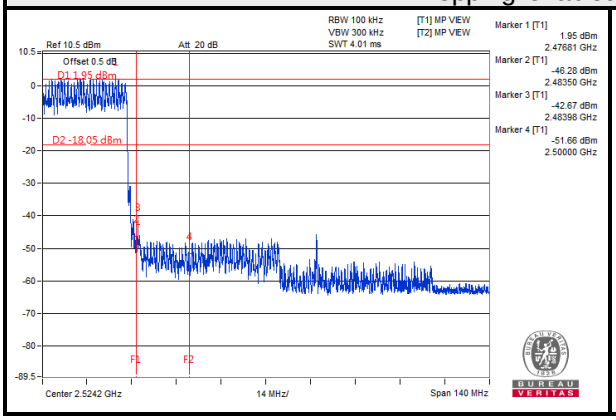


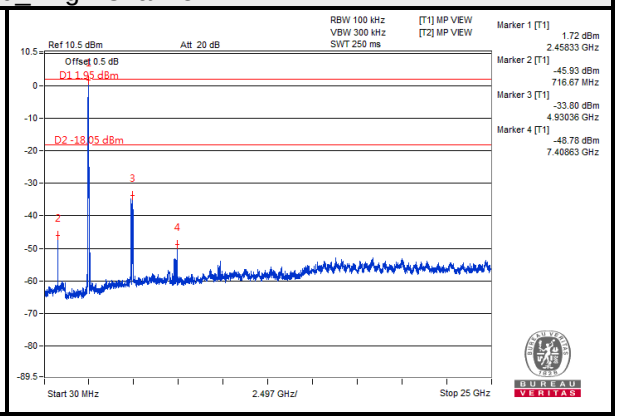
Hopping enabled_ Low Channel





Hopping enabled_ High Channel





5 Pictures of Test Arrangements

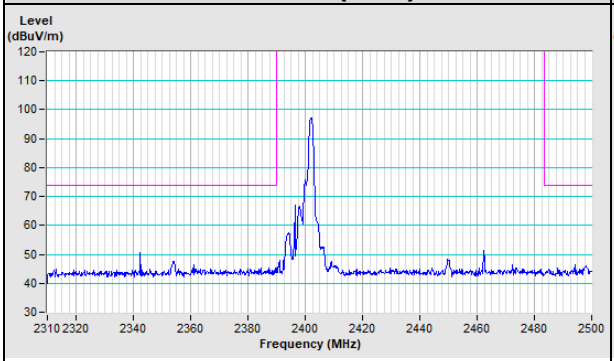
Please refer to the attached file (Test Setup Photo).

Annex A - Bandedge Measurement

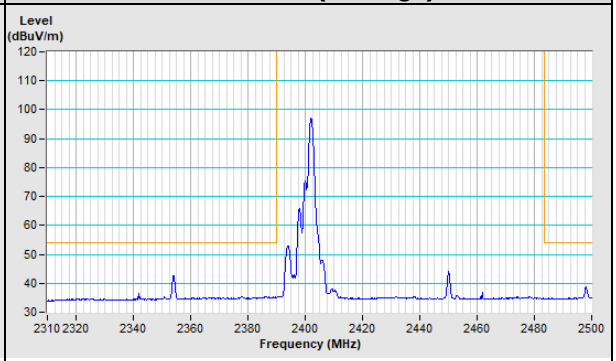
BT_GFSK

Channel 0

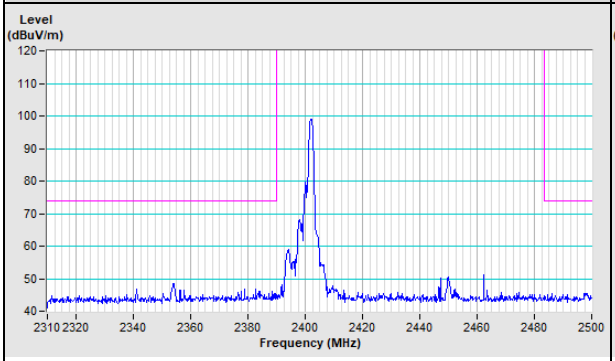
Horizontal (Peak)



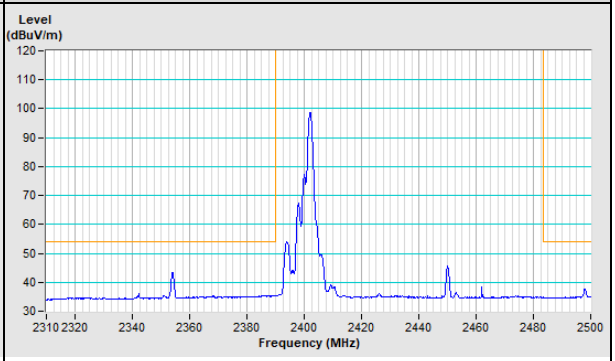
Horizontal (Average)



Vertical (Peak)

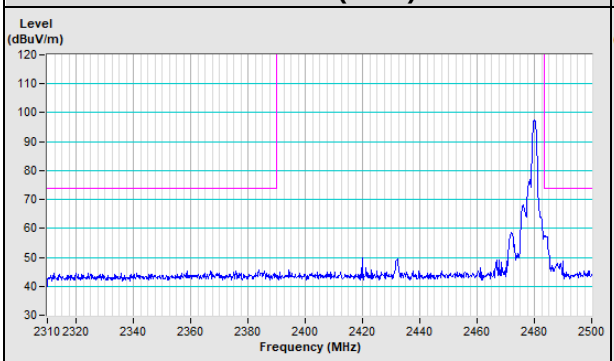


Vertical (Average)

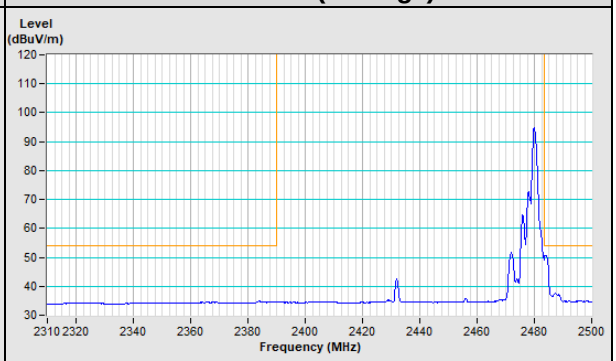


Channel 78

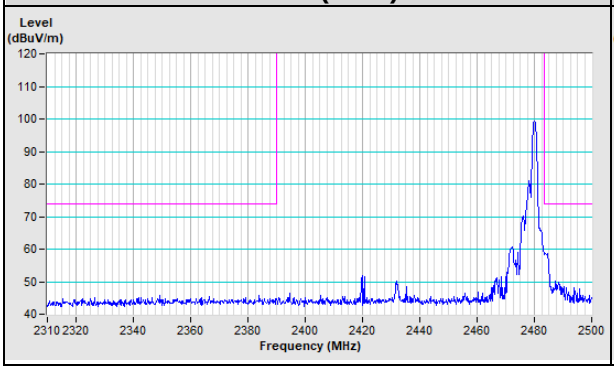
Horizontal (Peak)



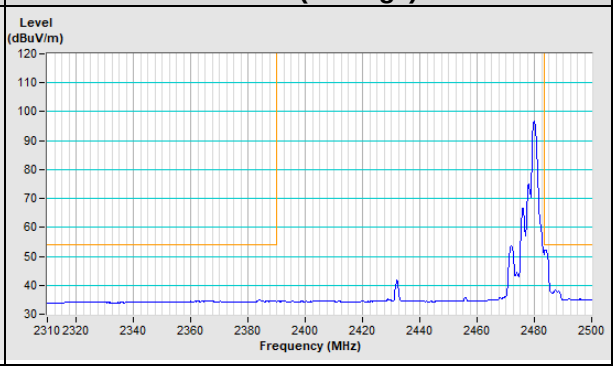
Horizontal (Average)



Vertical (Peak)



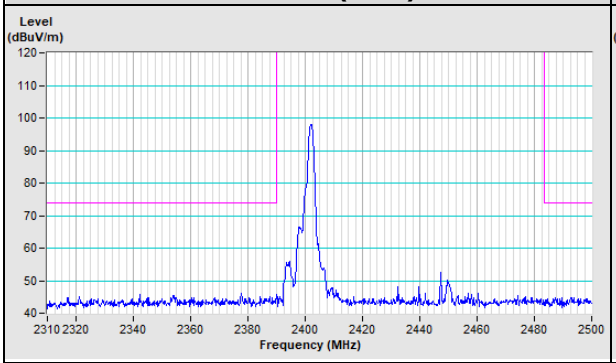
Vertical (Average)



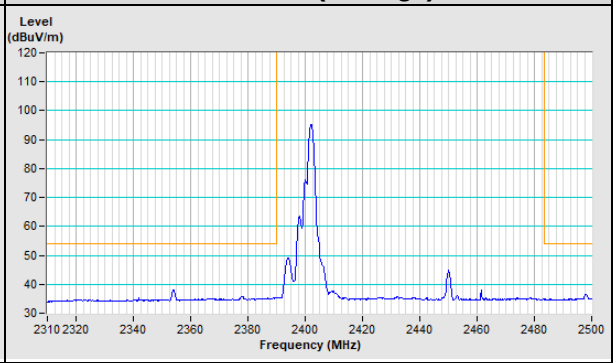
BT_π/4-DQPSK

Channel 0

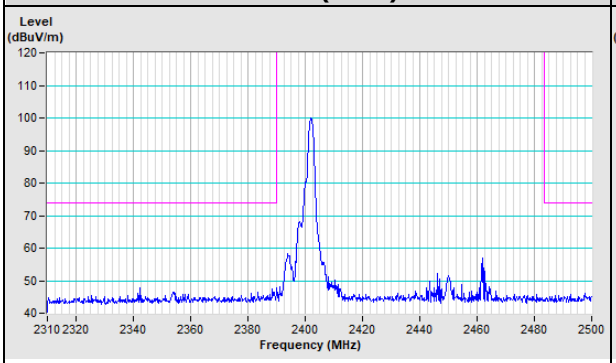
Horizontal (Peak)



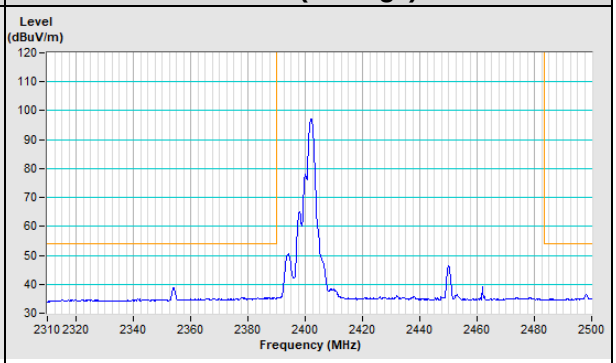
Horizontal (Average)



Vertical (Peak)

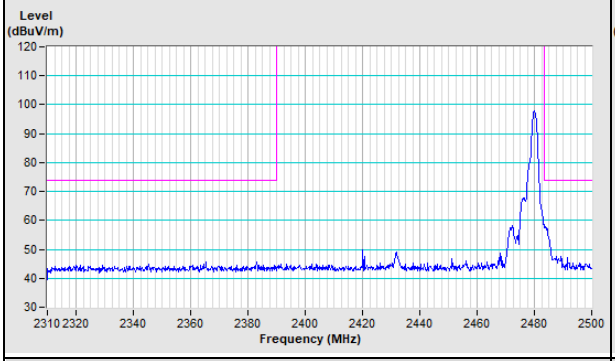


Vertical (Average)



Channel 78

Horizontal (Peak)



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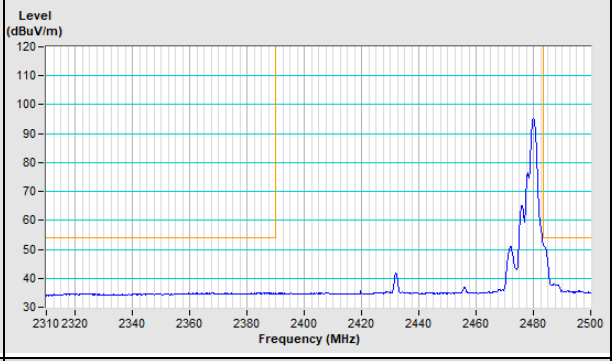
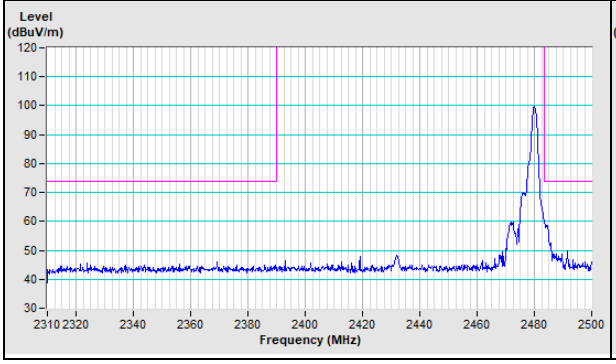


Vertical (Peak)



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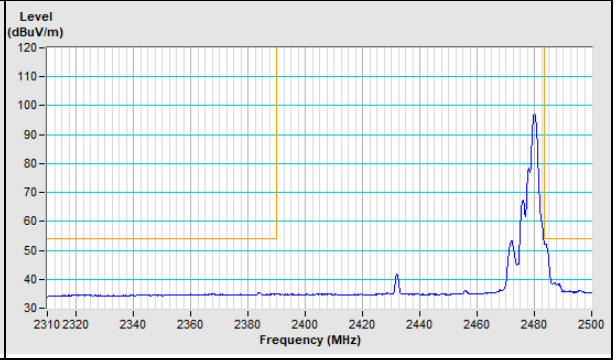

Appendix – Information of the Testing Laboratories

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are FCC recognized accredited test firms and accredited according to ISO/IEC 17025.

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The address and road map of all our labs can be found in our web site also.

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