FCC Test Report

Report No.:	RF180323C08 R1
FCC ID:	PY7-80664G
Received Date:	Mar. 23, 2018
Test Date:	Mar. 27, 2018 ~ Apr. 25, 2018
Issued Date:	Apr. 27, 2018
Applicant:	Sony Mobile Communications Inc.
Address:	4-12-3, Higashi-Shinagawa, Shinagawa-ku, Tokyo 140-0002 Japan
Issued By:	Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch
Lab Address:	No. 47-2, 14th Ling, Chia Pau Vil., Lin Kou Dist., New Taipei City, Taiwan (R.O.C)
Test Location:	No. 19, Hwa Ya 2nd Rd., Wen Hwa Vil., Kwei Shan Dist., Taoyuan City 33383, TAIWAN (R.O.C.)
FCC Registration / Designation Number:	788550 / TW0003

Cancels and replaces the report No. RF180323C08 dated Apr. 10, 2018

Table of Contents

Release Control Record 4

1 Certificate of Conformity 5

2 Summary of Test Results 6

2.1 Measurement Uncertainty 6
2.2 Modification Record 6

3 General Information 7

3.1 General Description of EUT 7
3.2 Description of Test Modes 8
3.2.1 Test Mode Applicability and Tested Channel Detail 9
3.3 Duty Cycle of Test Signal 10
3.4 Description of Support Units 11
3.4.1 Configuration of System under Test 11
3.5 General Description of Applied Standards 12

4 Test Types and Results 13

4.1 Radiated Emission and Bandedge Measurement 13
4.1.1 Limits of Radiated Emission and Bandedge Measurement 13
4.1.2 Test Instruments 14
4.1.3 Test Procedures 16
4.1.4 Deviation from Test Standard 17
4.1.5 Test Set Up 17
4.1.6 EUT Operating Conditions 18
4.1.7 Test Results 19
4.2 Conducted Emission Measurement 35
4.2.1 Limits of Conducted Emission Measurement 35
4.2.2 Test Instruments 35
4.2.3 Test Procedures 36
4.2.4 Deviation from Test Standard 36
4.2.5 Test Setup 36
4.2.6 EUT Operating Condition 36
4.2.7 Test Results 37
4.3 Number of Hopping Frequency Used 39
4.3.1 Limits of Hopping Frequency Used Measurement 39
4.3.2 Test Setup 39
4.3.3 Test Instruments 39
4.3.4 Test Procedure 39
4.3.5 Deviation fromTest Standard 39
4.3.6 Test Results 40
4.4 Dwell Time on Each Channel 41
4.4.1 Limits of Dwell Time on Each Channel Measurement 41
4.4.2 Test Setup 41
4.4.3 Test Instruments 41
4.4.4 Test Procedures 41
4.4.5 Deviation from Test Standard 41
4.4.6 Test Results 42
4.5 Channel Bandwidth 44
4.5.1 Limits of Channel Bandwidth Measurement 44
4.5.2 Test Setup 44
4.5.3 Test Instruments 44
4.5.4 Test Procedure 44
4.5.5 Deviation from Test Standard 44
4.5.6 EUT Operating Condition 44
4.5.7 Test Results 45
4.6 Occupied Bandwidth Measurement 46

4.6.1 Test Setup 46
4.6.2 Test Instruments 46
4.6.3 Test Procedure 46
4.6.4 Deviation from Test Standard 46
4.6.5 EUT Operating Conditions 46
4.6.6 Test Results 47
4.7 Hopping Channel Separation 48
4.7.1 Limits of Hopping Channel Separation Measurement 48
4.7.2 Test Setup 48
4.7.3 Test Instruments 48
4.7.4 Test Procedure 48
4.7.5 Deviation from Test Standard 48
4.7.6 Test Results 49
4.8 Maximum Output Power 50
4.8.1 Limits of Maximum Output Power Measurement 50
4.8.2 Test Setup 50
4.8.3 Test Instruments 50
4.8.4 Test Procedure 50
4.8.5 Deviation fromTest Standard 50
4.8.6 EUT Operating Condition 50
4.8.7 Test Results 51
4.9 Conducted Out of Band Emission Measurement 52
4.9.1 Limits Of Conducted Out Of Band Emission Measurement 52
4.9.2 Test Instruments 52
4.9.3 Test Procedure 52
4.9.4 Deviation from Test Standard 52
4.9.5 EUT Operating Condition 52
4.9.6 Test Results 52
5 Pictures of Test Arrangements 57
Appendix – Information on the Testing Laboratories 58

Release Control Record

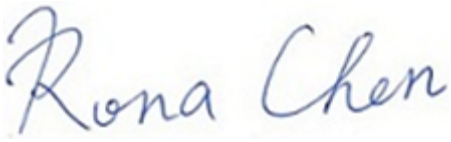
Issue No.	Description	Date Issued
RF180323C08	Original Release	Apr. 10, 2018
RF180323C08 R1	Revise test method	Apr. 27, 2018

Cancels and replaces the report No. RF180323C08 dated Apr. 10, 2018

1 Certificate of Conformity

Product:	Bluetooth Headset
Brand:	Sony
Sample Status:	Identical Prototype
Applicant:	Sony Mobile Communications Inc.
Test Date:	Mar. 27, 2018 ~ Apr. 25, 2018
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 :  , **Date:** Apr. 27, 2018

Rona Chen / Specialist

Approved by :  , **Date:** Apr. 27, 2018

Dylan Chiou / Project Engineer

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 -32.26 dB at 0.66255 MHz.
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.
---	Occupied Bandwidth Measurement	Pass	Reference only
15.205 & 209	Radiated Emissions	Pass	Meet the requirement of limit. Minimum passing margin is -5.2 dB at 4882 MHz.
15.247(d)	Band Edge Measurement	Pass	Meet the requirement of limit.
15.247(d)	Antenna Port Emission	Pass	Meet the requirement of limit.
15.203	Antenna Requirement	Pass	No antenna connector is used.

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

2.1 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT:

The listed uncertainties are the worst case uncertainty for the entire range of measurement. Please note that the uncertainty values are provided for informational purposes only and are not used in determining the PASS/FAIL results.

Measurement	Frequency	Expended Uncertainty (k=2) (±)
Conducted Emissions at mains ports	150 kHz ~ 30 MHz	2.44 dB
Radiated Emissions up to 1 GHz	30MHz ~ 200MHz	3.59 dB
	200MHz ~ 1000MHz	3.60 dB
Radiated Emissions above 1 GHz	1GHz ~ 18GHz	2.29 dB
	18GHz ~ 40GHz	2.29 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	Bluetooth Headset
Brand	Sony
Status of EUT	Identical Prototype
Power Supply Rating	5.0 Vdc (Adapter) 3.7 Vdc (Li-ion battery)
Modulation Type	GFSK, π/4-DQPSK, 8DPSK
Transfer Rate	1/2/3 Mbps
Operating Frequency	2402 ~ 2480 MHz
Number of Channel	79
Output Power	7.78 mW
Antenna Type	Chip antenna with 1.04 dBi gain
Antenna Connector	N/A
Accessory Device	Refer to Note as below
Data Cable Supplied	Refer to Note as below

Note:

1. The EUT contains following accessory devices.

Product	Brand	Model	Description
Type-C Cable	SONY	EC280	1.1 m shielded cable w/o core
USB Cable	SONY	UCB20	0.94 m shielded cable w/o core

2. Following items were provided by client as test support units.

Product	Brand	Model	Description
Adapter	SONY	UCH20	I/P: 100-240 Vac, 50-60 Hz, 200 mA O/P: 5 Vdc, 1500 mA
Cell Phone	SONY	FCC ID: PY7-81775I	--

3. 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 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 Test Mode Applicability and Tested Channel Detail

EUT Configure Mode	Applicable To				Description
	RE≥1G	RE<1G	PLC	APCM	
Tx Mode	√	√	-	√	EUT Only
Charging Mode	-	√	√	-	EUT + USB Cable + Adpater

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

Note:

1. For Radiated emission test, pre-tested GFSK, π/4-DQPSK, 8DPSK modulation type and found GFSK was the worse, therefore chosen for the final test and presented in the test report.
2. The EUT had been pre-tested on the positioned of each 3 axis. The worst case was found when positioned on **X-plane**.

Radiated Emission Test (Above 1 GHz):

☒ 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
Tx Mode	0 to 78	0, 39, 78	FHSS	GFSK	DH5
	0 to 78	0, 39, 78	FHSS	8DPSK	3DH5

Radiated Emission Test (Below 1 GHz):

☒ 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
Tx Mode / Charging Mode	0 to 78	39	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
Charging Mode	N/A	N/A	N/A	N/A	N/A

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.

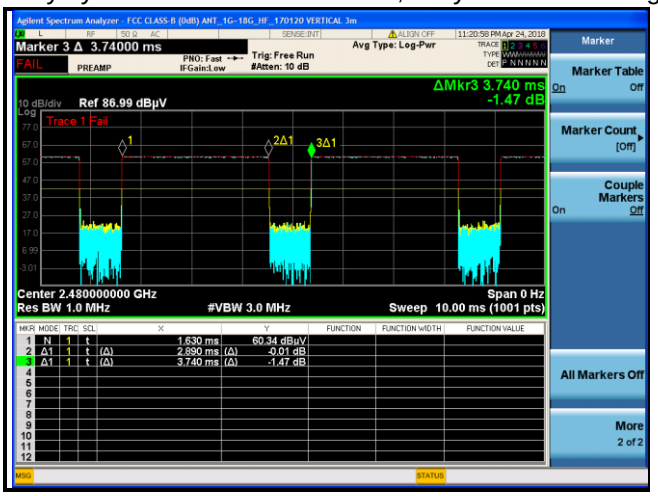
EUT Configure Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Packet Type
Tx Mode	0 to 78	0, 39, 78	FHSS	GFSK	DH5
	0 to 78	0, 39, 78	FHSS	8DPSK	3DH5

Test Condition:

Applicable To	Environmental Conditions	Input Power	Tested by
RE≥1G	25 deg. C, 65 % RH	120 Vac, 60 Hz	Getaz Yang
RE<1G	25 deg. C, 65 % RH	120 Vac, 60 Hz	Getaz Yang
PLC	25 deg. C, 65 % RH	120 Vac, 60 Hz	Getaz Yang
APCM	25 deg. C, 65 % RH	3.7 Vdc	Han Wu

3.3 Duty Cycle of Test Signal

Duty cycle = 2.890/3.740 = 0.773, Duty factor = 10 * log(1/0.773) = 1.12



Cancels and replaces the report No. RF180323C08 dated Apr. 10, 2018

3.4 Description of Support Units

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

No.	Product	Brand	Model No.	Serial No.	FCC ID
1.	Bluetooth Tester	R&S	CBT	100980	N/A
2.	Adapter	Sony	UCH20	N/A	N/A

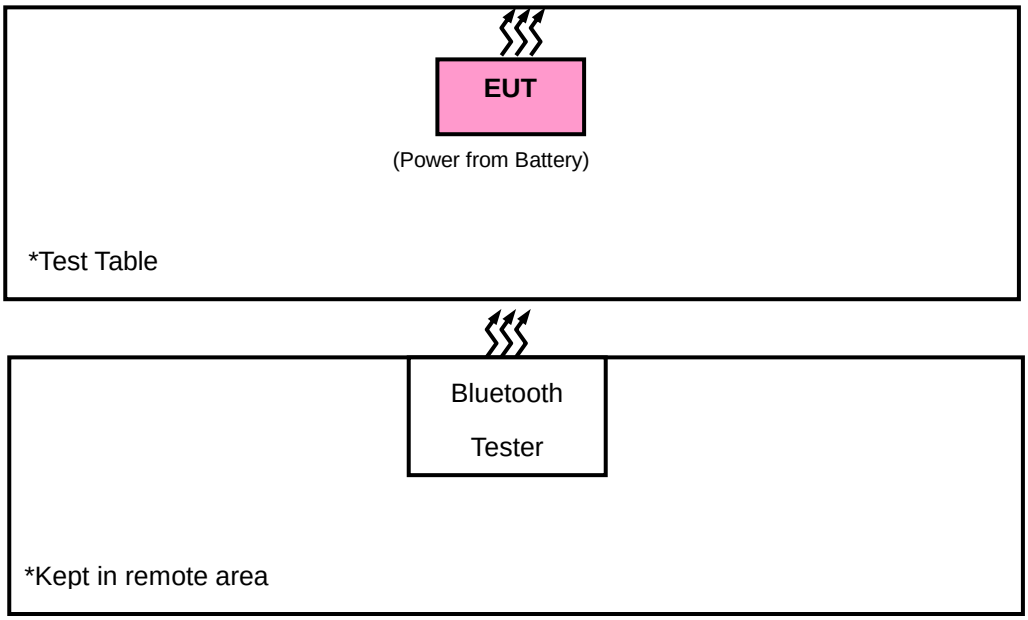
No.	Signal Cable Description Of The Above Support Units
1.	N/A
2.	N/A

Note:

1. All power cords of the above support units are non-shielded (1.8m).
2. Items 1 acted as communication partners to transfer data.

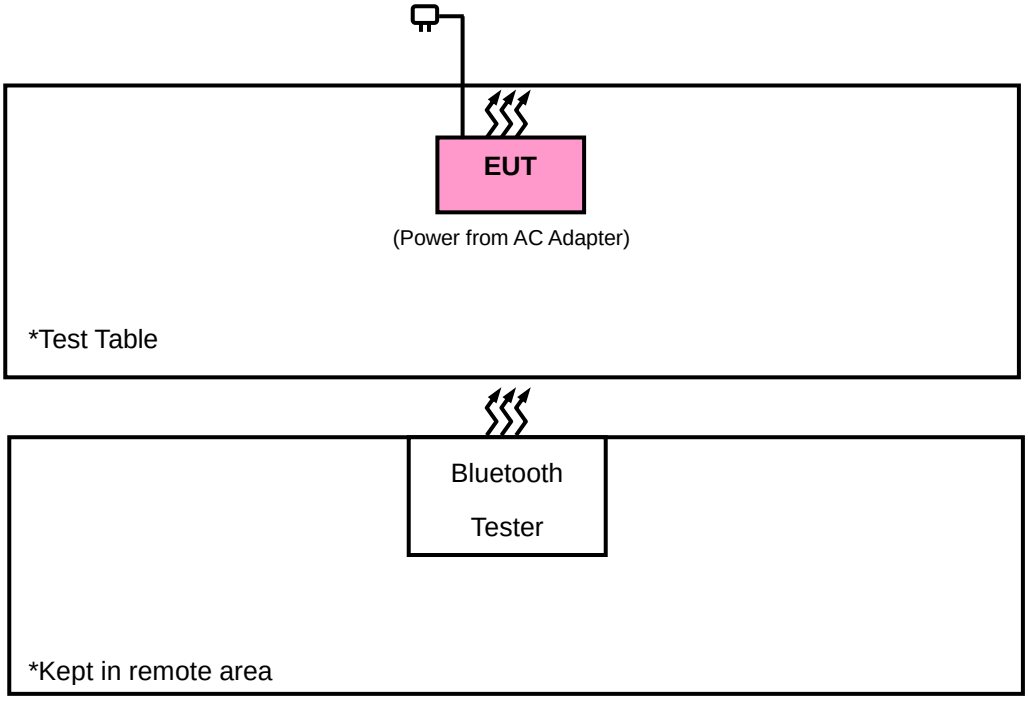
3.4.1 Configuration of System under Test

Tx Mode



Cancels and replaces the report No. RF180323C08 dated Apr. 10, 2018

Charging Mode



3.5 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 (15.247)
FCC Public Notice DA 00-705
ANSI C63.10-2013

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

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 20 dB 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 1000 MHz, 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 20 dB under any condition of modulation.

4.1.2 Test Instruments

Description & Manaufacturer	Model No.	Serial No.	Date of Calibration	Due Date of Calibration
Test Receiver Agilent	N9038A	MY52260177	Jul. 05, 2017	Jul. 04, 2018
Spectrum Analyzer Agilent	N9010A	MY52220314	Nov. 24, 2017	Nov. 23, 2018
Spectrum Analyzer ROHDE & SCHWARZ	FSU43	100115	Nov. 23, 2017	Nov. 22, 2018
Double Ridge Guide Horn Antenna EMCO	3115	5619	Nov. 30, 2017	Nov. 29, 2018
BILOG Antenna SCHWARZBECK	VULB 9168	9168-153	Dec. 06, 2017	Dec. 05, 2018
RF signal cable ETS-LINDGREN	5D-FB	Cable-CH1-01(RFC-SMS-100-SMS-120+RFC-SMS-100-SMS-400)	Jun. 23, 2017	Jun. 22, 2018
Fixed Attenuator Mini-Circuits	BW-N4W5+	1301	Aug. 14, 2017	Aug. 13, 2018
Loop Antenna	EM-6879	269	Aug. 11, 2017	Aug. 10, 2018
Preamplifier EMCI	EMC001340	980201	Nov. 01, 2017	Oct. 30, 2018
Preamplifier EMCI	EMC 012645	980115	Oct. 20, 2017	Oct. 19, 2018
Preamplifier EMCI	EMC 184045	980116	Oct. 20, 2017	Oct. 19, 2018
Preamplifier EMCI	EMC 330H	980112	Oct. 13, 2017	Oct. 12, 2018
Power Meter Anritsu	ML2495A	1012010	Aug. 15, 2017	Aug. 14, 2018
Power Sensor Anritsu	MA2411B	1315050	Aug. 15, 2017	Aug. 14, 2018
RF Coaxial Cable HUBER+SUHNNER	EMC104-SM-SM-8000&3000	140811+170717	Oct. 20, 2017	Oct. 19, 2018
RF Coaxial Cable HUBER+SUHNNER	SUCOFLEX 104	EMC104-SM-SM-1000(140807)	Oct. 20, 2017	Oct. 19, 2018
RF Coaxial Cable Worken	8D-FB	Cable-Ch10-01	Oct. 20, 2017	Oct. 19, 2018
Software BV ADT	E3 6.120103	NA	NA	NA
Antenna Tower MF	MFA-440H	NA	NA	NA
Turn Table MF	MFT-201SS	NA	NA	NA
Antenna Tower &Turn Table Controller MF	MF-7802	NA	NA	NA
Temperature & Humidity Chamber	GTH-120-40-CP-AR	MAA1306-019	Sep. 08, 2017	Sep. 07, 2018
DC Power Supply Topward	33010D	807748	Oct. 25, 2016	Oct. 24, 2018
Digital Multimeter Fluke	87-III	70360742	Jun. 30, 2017	Jun. 29, 2018
HORN Antenna Schwarzbeck	BBHA 9170	9170-480	Dec. 01, 2017	Nov. 30, 2018

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 HwaYa Chamber 10.

3. The horn antenna and preamplifier (model: EMC 184045) are used only for the measurement of emission frequency above 1 GHz if tested.

4. The IC Site Registration No. is IC7450F-10.

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 10 meter chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.
b. The EUT was set 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
c. Both X and Y axes 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:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 9 kHz at frequency below 30 MHz.
2. There is a comparison data of both open-field test site and semi-Anechoic chamber, and the result came out very similar.

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:

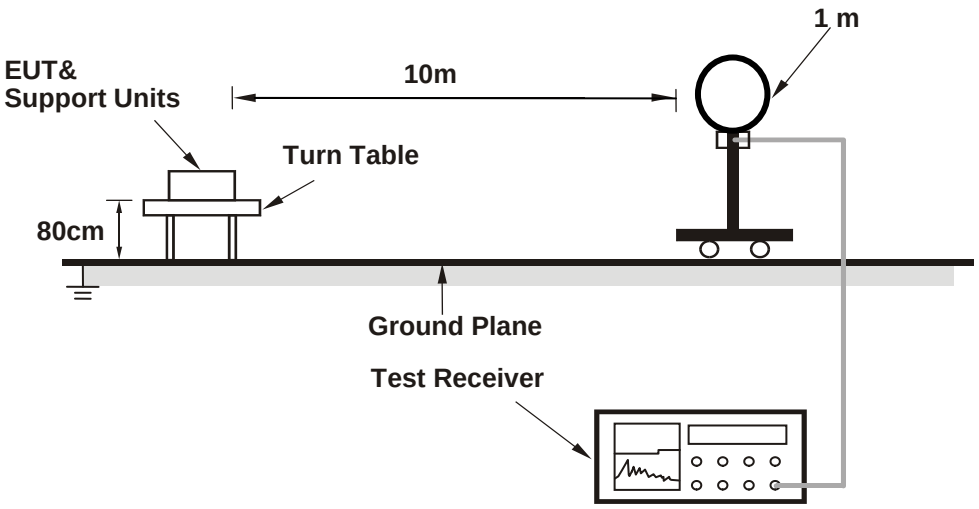
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasi-peak detection (QP) at frequency below 1 GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1 GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is ≥ 1/T (Duty cycle < 98%) or 10Hz (Duty cycle ≥ 98%) for Average detection (AV) at frequency above 1 GHz (RBW= 1MHz, VBW= 1kHz). Please see page 10 for plotted duty.
4. All modes of operation were investigated and the worst-case emissions are reported.

4.1.4 Deviation from Test Standard

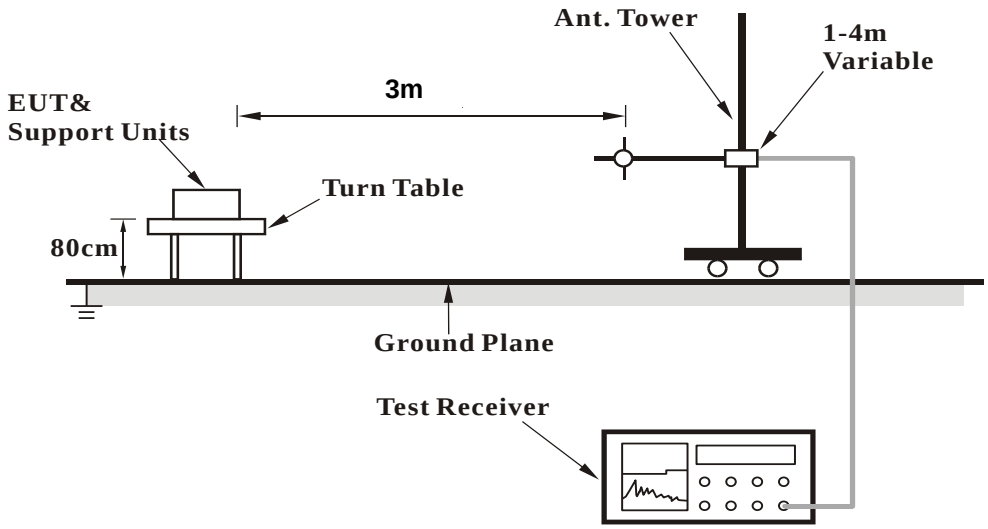
No deviation.

4.1.5 Test Set Up

<Radiated emission below 30 MHz>

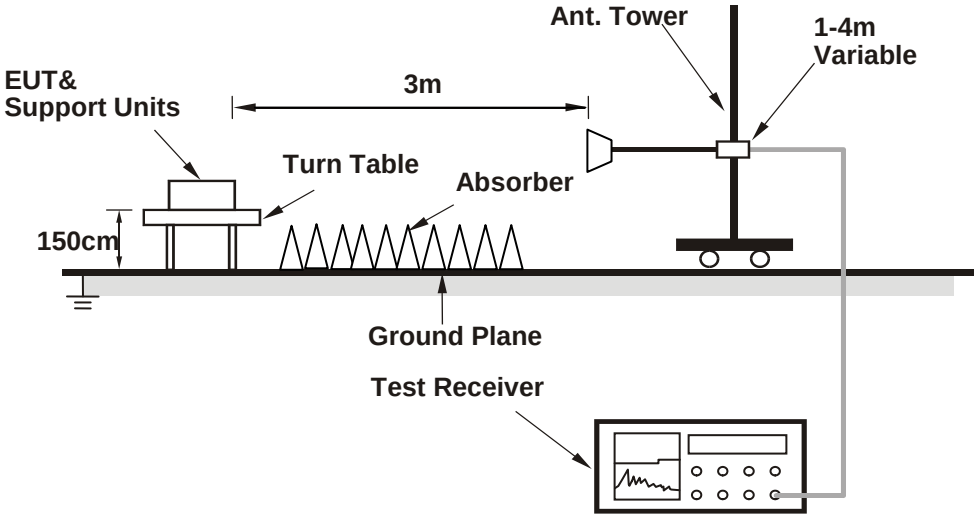


<Frequency Range below 1 GHz>



Cancels and replaces the report No. RF180323C08 dated Apr. 10, 2018

<Frequency Range above 1 GHz>



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.

4.1.7 Test Results

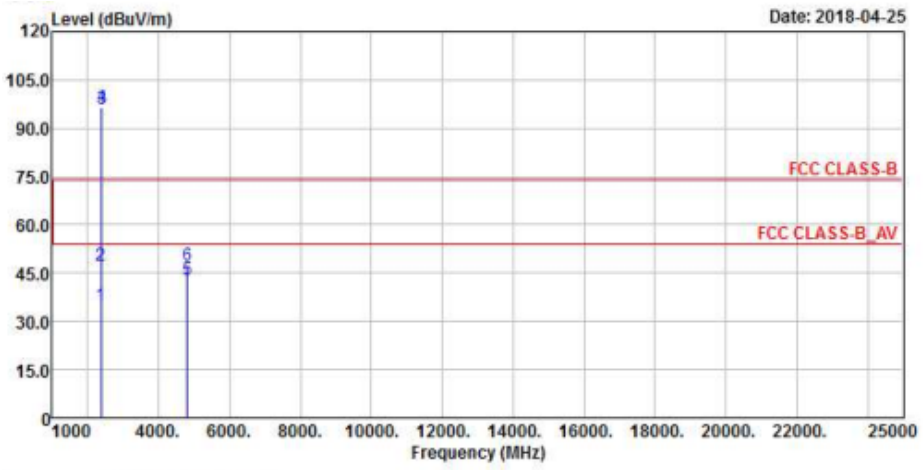
Above 1 GHz Data:

TX Mode

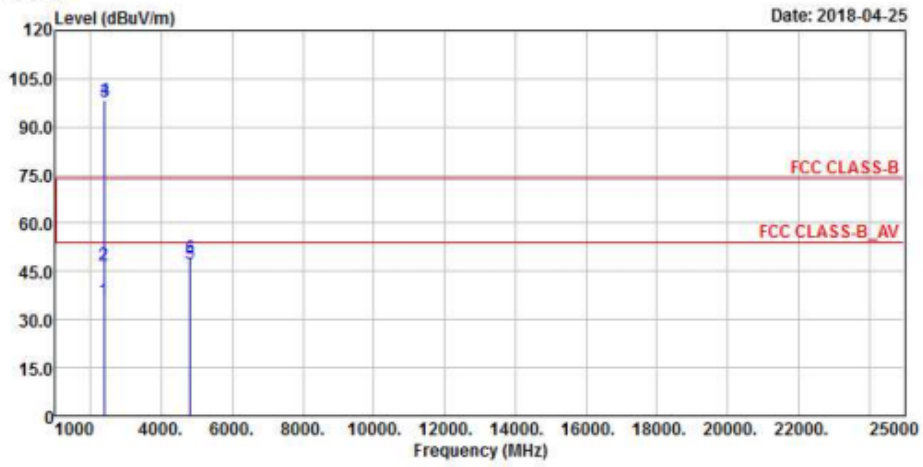
GFSK

EUT Test Condition		Measurement Detail	
Channel	Channel 0	**Frequency Range**	1 GHz ~ 25 GHz
Input Power	110 Vac, 60 Hz	**Detector Function**	Peak (PK) RBW=1MHz,VBW=3MHz Average (AV) RBW=1MHz,VBW=1kHz
Environmental Conditions	25 deg. C, 65 % RH	**Tested By**	Getaz Yang

Horizontal



Vertical



Cancels and replaces the report No. RF180323C08 dated Apr. 10, 2018

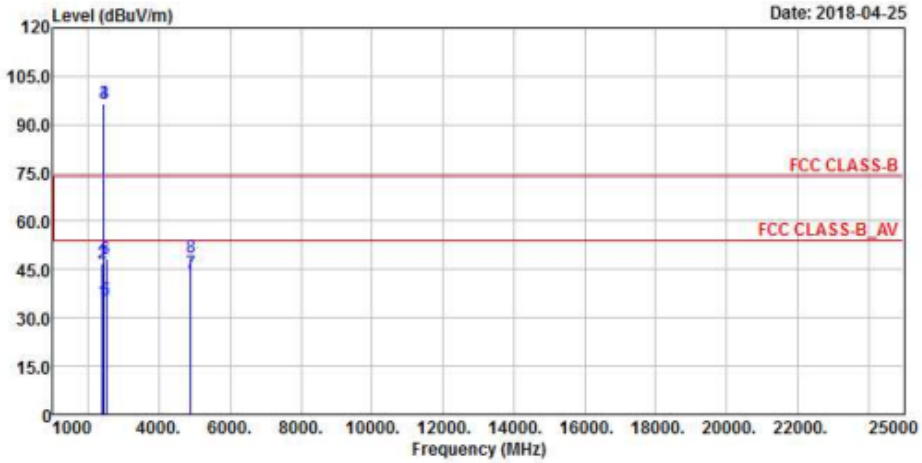
Antenna Polarity & Test Distance: Horizontal at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2375.52	35.09	41.17	54	-18.91	27.08	4.34	37.5	208	10	Average
2375.52	47.18	53.26	74	-26.82	27.08	4.34	37.5	208	10	Peak
2402	95.95	101.94			27.16	4.37	37.52	208	10	Average
2402	96.4	102.39			27.16	4.37	37.52	208	10	Peak
4804	42.83	57.8	54	-11.17	31.14	6.79	52.9	107	260	Average
4804	47.49	62.46	74	-26.51	31.14	6.79	52.9	107	260	Peak
Antenna Polarity & Test Distance: Vertical at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2376.22	35.79	41.87	54	-18.21	27.08	4.34	37.5	173	228	Average
2376.22	47.12	53.27	74	-26.88	27.01	4.33	37.49	173	228	Peak
2402	97.9	103.89			27.16	4.37	37.52	173	228	Average
2402	98.17	104.16			27.16	4.37	37.52	173	228	Peak
4804	47.26	62.23	54	-6.74	31.14	6.79	52.9	174	185	Average
4804	49.1	64.07	74	-24.9	31.14	6.79	52.9	174	185	Peak

Remarks:

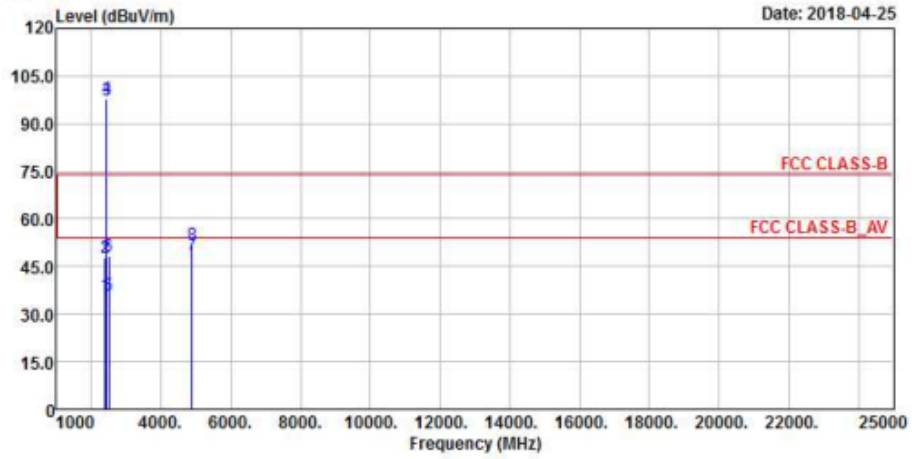
1. Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor
   Margin Value = Emission Level – Limit value
2. 2402 MHz: Fundamental Frequency
3. The other emission levels were very low against the limit.

EUT Test Condition		Measurement Detail	
Channel	Channel 39	**Frequency Range**	1 GHz ~ 25 GHz
Input Power	110 Vac, 60 Hz	**Detector Function**	Peak (PK) RBW=1MHz,VBW=3MHz Average (AV) RBW=1MHz,VBW=1kHz
Environmental Conditions	25 deg. C, 65 % RH	**Tested By**	Getaz Yang

Horizontal



Vertical



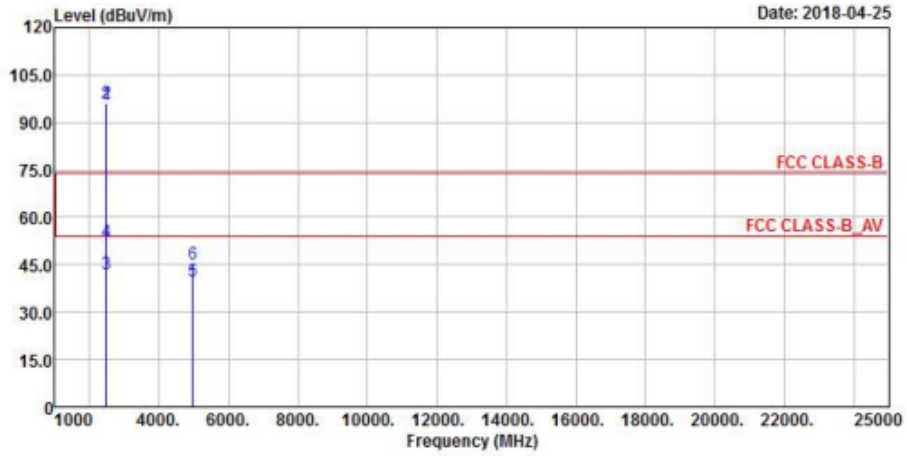
Antenna Polarity & Test Distance: Horizontal at 3 m										
Frequency (MHz)	**Emission Level (dBuV/m)**	**Read Level (dBuV)**	**Limit (dBuV/m)**	**Margin (dB)**	**Antenna Factor (dB/m)**	**Cable Loss (dB)**	**Preamp Factor (dB)**	**Antenna Height (cm)**	**Table Angle (Degree)**	**Remark**
2388.96	35.07	41.05	54	-18.93	27.16	4.36	37.5	204	5	Average
2388.96	46.93	53	74	-27.07	27.08	4.35	37.5	204	5	Peak
2441	96.33	101.94			27.38	4.4	37.39	204	5	Average
2441	96.34	101.95			27.38	4.4	37.39	204	5	Peak
2496.4	35.55	40.76	54	-18.45	27.61	4.43	37.25	204	5	Average
2496.4	48.2	53.4	74	-25.8	27.61	4.44	37.25	204	5	Peak
4882	43.75	58.5	54	-10.25	31.25	6.86	52.86	104	260	Average
4882	48.75	63.5	74	-25.25	31.25	6.86	52.86	104	260	Peak
Antenna Polarity & Test Distance: Vertical at 3 m										
Frequency (MHz)	**Emission Level (dBuV/m)**	**Read Level (dBuV)**	**Limit (dBuV/m)**	**Margin (dB)**	**Antenna Factor (dB/m)**	**Cable Loss (dB)**	**Preamp Factor (dB)**	**Antenna Height (cm)**	**Table Angle (Degree)**	**Remark**
2388.96	35.89	41.87	54	-18.11	27.16	4.36	37.5	170	231	Average
2388.96	47.77	54.01	74	-26.23	26.93	4.3	37.47	170	231	Peak
2441	97.46	103.07			27.38	4.4	37.39	170	231	Average
2441	97.86	103.47			27.38	4.4	37.39	170	231	Peak
2493.24	36.01	41.21	54	-17.99	27.61	4.44	37.25	170	231	Average
2493.24	48.05	53.25	74	-25.95	27.61	4.44	37.25	170	231	Peak
4882	**48.8**	**63.55**	**54**	**-5.2**	**31.25**	**6.86**	**52.86**	**169**	**179**	**Average**
4882	51.77	66.52	74	-22.23	31.25	6.86	52.86	169	179	Peak

Remarks:

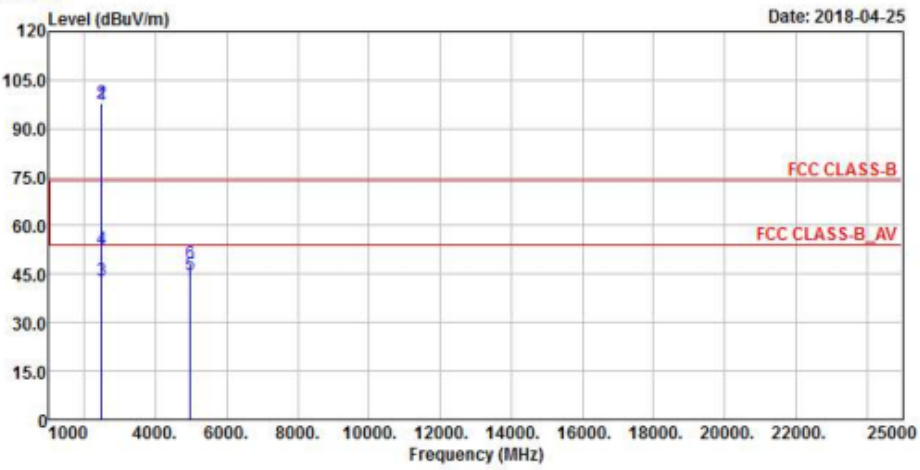
1. Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor
   Margin Value = Emission Level – Limit value
2. 2441 MHz: Fundamental Frequency
3. The other emission levels were very low against the limit.

EUT Test Condition		Measurement Detail	
Channel	Channel 78	**Frequency Range**	1 GHz ~ 25 GHz
Input Power	110 Vac, 60 Hz	**Detector Function**	Peak (PK) RBW=1MHz,VBW=3MHz Average (AV) RBW=1MHz,VBW=1kHz
Environmental Conditions	25 deg. C, 65 % RH	**Tested By**	Getaz Yang

Horizontal



Vertical



Cancels and replaces the report No. RF180323C08 dated Apr. 10, 2018

Antenna Polarity & Test Distance: Horizontal at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2480	95.61	100.97			27.53	4.43	37.32	202	13	Average
2480	96	101.36			27.53	4.43	37.32	202	13	Peak
2483.52	41.95	47.31	54	-12.05	27.53	4.43	37.32	202	13	Average
2483.52	52.4	57.76	74	-21.6	27.53	4.43	37.32	202	13	Peak
4960	39.78	54.4	54	-14.22	31.4	6.9	52.92	106	264	Average
4960	45.31	59.93	74	-28.69	31.4	6.9	52.92	106	264	Peak
Antenna Polarity & Test Distance: Vertical at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2480	97.28	102.64			27.53	4.43	37.32	176	254	Average
2480	97.72	103.08			27.53	4.43	37.32	176	254	Peak
2483.52	43.14	48.5	54	-10.86	27.53	4.43	37.32	176	254	Average
2483.52	52.77	58.13	74	-21.23	27.53	4.43	37.32	176	254	Peak
4960	44.71	59.33	54	-9.29	31.4	6.9	52.92	150	176	Average
4960	48.32	62.94	74	-25.68	31.4	6.9	52.92	150	176	Peak

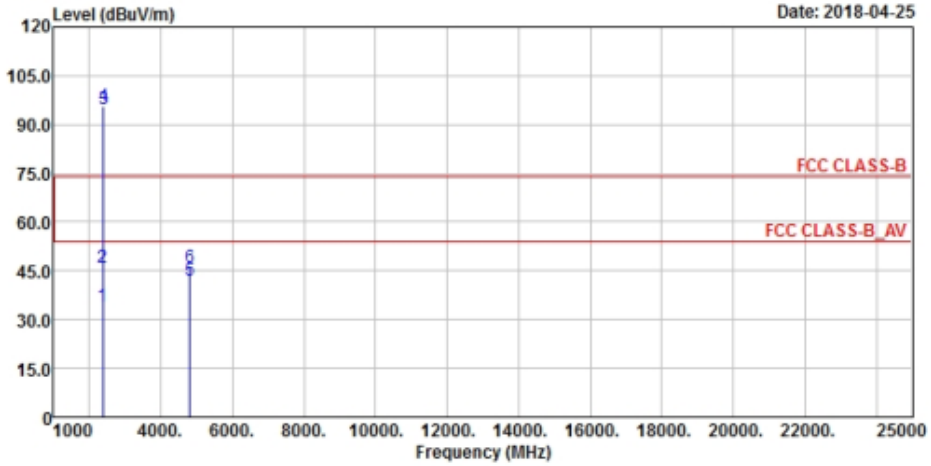
Remarks:

1. Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor
   Margin Value = Emission Level – Limit value
2. 2480 MHz: Fundamental Frequency
3. The other emission levels were very low against the limit.

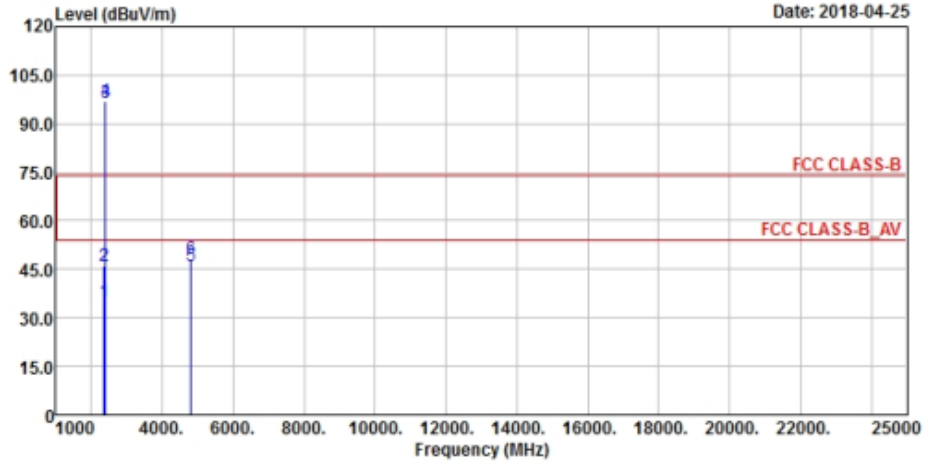
8DPSK

EUT Test Condition		Measurement Detail	
Channel	Channel 0	**Frequency Range**	1 GHz ~ 25 GHz
Input Power	110 Vac, 60 Hz	**Detector Function**	Peak (PK) RBW=1MHz,VBW=3MHz Average (AV) RBW=1MHz,VBW=1kHz
Environmental Conditions	25 deg. C, 65 % RH	**Tested By**	Getaz Yang

Horizontal



Vertical



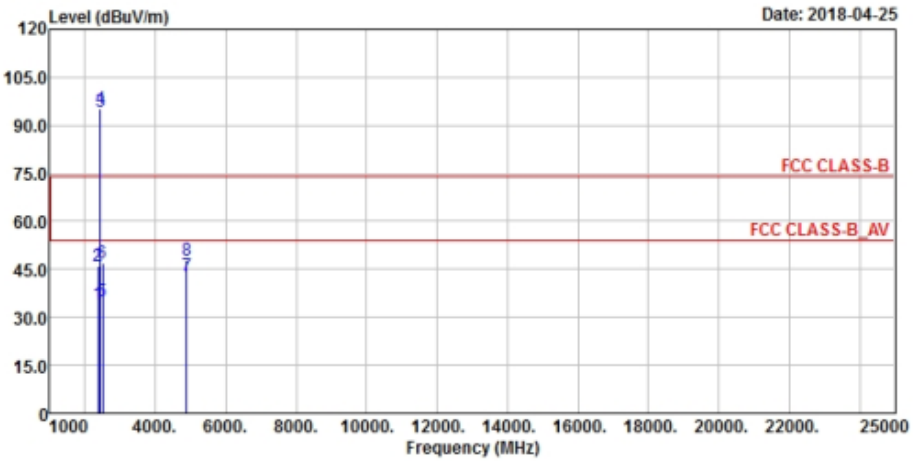
Antenna Polarity & Test Distance: Horizontal at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2376.1	33.94	40.02	54	-20.06	27.08	4.34	37.5	111	158	Average
2376.1	46.04	52.12	74	-27.96	27.08	4.34	37.5	111	158	Peak
2402	94.86	100.85			27.16	4.37	37.52	111	158	Average
2402	95.66	101.65			27.16	4.37	37.52	111	158	Peak
4804	41.88	56.85	54	-12.12	31.14	6.79	52.9	125	142	Average
4804	46.15	61.12	74	-27.85	31.14	6.79	52.9	125	142	Peak
Antenna Polarity & Test Distance: Vertical at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2359.52	34.83	40.98	54	-19.17	27.01	4.33	37.49	163	125	Average
2359.52	45.96	52.11	74	-28.04	27.01	4.33	37.49	163	125	Peak
2402	96.53	102.52			27.16	4.37	37.52	163	125	Average
2402	97.02	103.01			27.16	4.37	37.52	163	125	Peak
4804	46.05	61.02	54	-7.95	31.14	6.79	52.9	111	165	Average
4804	48.15	63.12	74	-25.85	31.14	6.79	52.9	111	165	Peak

Remarks:

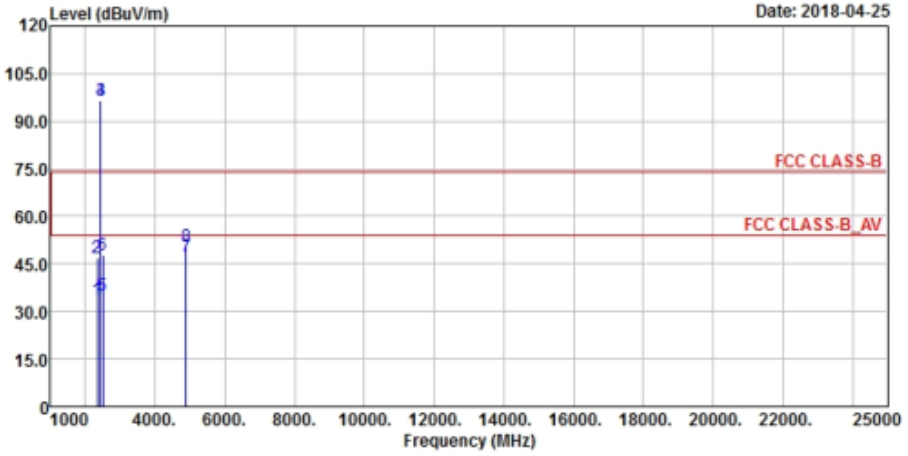
1. Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor
   Margin Value = Emission Level – Limit value
2. 2402 MHz: Fundamental Frequency
3. The other emission levels were very low against the limit.

EUT Test Condition		Measurement Detail	
Channel	Channel 39	**Frequency Range**	1 GHz ~ 25 GHz
Input Power	110 Vac, 60 Hz	**Detector Function**	Peak (PK) RBW=1MHz,VBW=3MHz Average (AV) RBW=1MHz,VBW=1kHz
Environmental Conditions	25 deg. C, 65 % RH	**Tested By**	Getaz Yang

Horizontal



Vertical



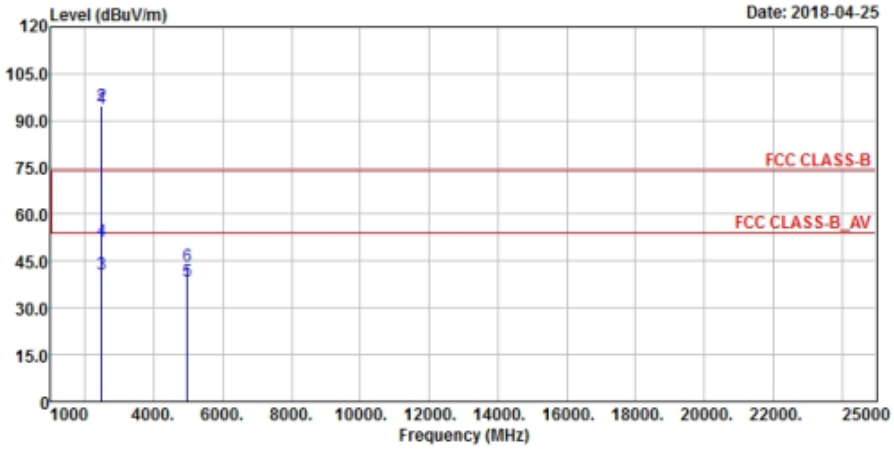
Antenna Polarity & Test Distance: Horizontal at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2379.1	33.93	40	54	-20.07	27.08	4.35	37.5	202	121	Average
2379.1	45.95	52.02	74	-28.05	27.08	4.35	37.5	202	121	Peak
2441	94.4	100.01			27.38	4.4	37.39	202	121	Average
2441	95.38	100.99			27.38	4.4	37.39	202	121	Peak
2499.1	34.81	40.01	54	-19.19	27.61	4.44	37.25	202	121	Average
2499.1	46.91	52.11	74	-27.09	27.61	4.44	37.25	202	121	Peak
4882	42.94	57.69	54	-11.06	31.25	6.86	52.86	152	121	Average
4882	47.84	62.59	74	-26.16	31.25	6.86	52.86	152	121	Peak
Antenna Polarity & Test Distance: Vertical at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2341.5	33.76	40.01	54	-20.24	26.93	4.31	37.49	165	251	Average
2341.5	46.75	53	74	-27.25	26.93	4.31	37.49	165	251	Peak
2441	96.4	102.01			27.38	4.4	37.39	165	251	Average
2441	96.5	102.11			27.38	4.4	37.39	165	251	Peak
2494.5	34.82	40.02	54	-19.18	27.61	4.44	37.25	165	251	Average
2494.5	47.64	52.84	74	-26.36	27.61	4.44	37.25	165	251	Peak
4882	47.37	62.12	54	-6.63	31.25	6.86	52.86	111	185	Average
4882	50.38	65.13	74	-23.62	31.25	6.86	52.86	111	185	Peak

Remarks:

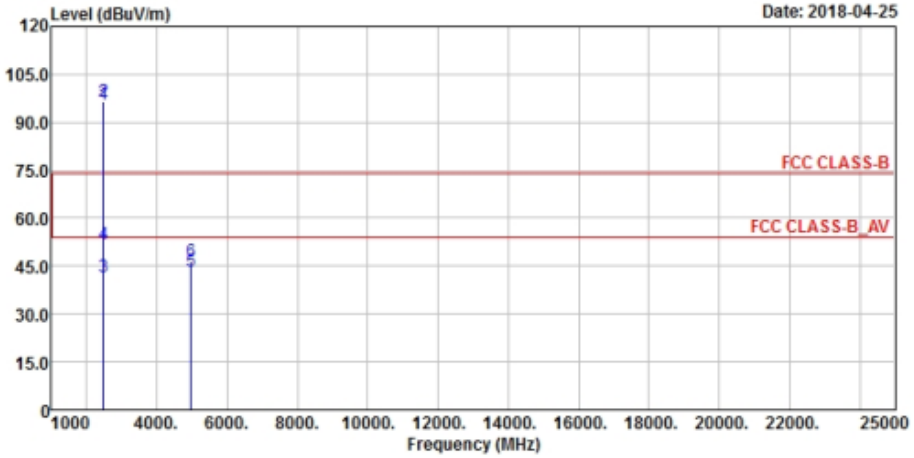
1. Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor
   Margin Value = Emission Level – Limit value
2. 2441 MHz: Fundamental Frequency
3. The other emission levels were very low against the limit.

EUT Test Condition		Measurement Detail	
Channel	Channel 78	**Frequency Range**	1 GHz ~ 25 GHz
Input Power	110 Vac, 60 Hz	**Detector Function**	Peak (PK) RBW=1MHz,VBW=3MHz Average (AV) RBW=1MHz,VBW=1kHz
Environmental Conditions	25 deg. C, 65 % RH	**Tested By**	Getaz Yang

Horizontal



Vertical



Cancels and replaces the report No. RF180323C08 dated Apr. 10, 2018

Antenna Polarity & Test Distance: Horizontal at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2480	93.75	99.11			27.53	4.43	37.32	111	165	Average
2480	94.76	100.12			27.53	4.43	37.32	111	165	Peak
2483.51	40.78	46.14	54	-13.22	27.53	4.43	37.32	111	165	Average
2483.51	51.49	56.85	74	-22.51	27.53	4.43	37.32	111	165	Peak
4960	38.49	53.11	54	-15.51	31.4	6.9	52.92	102	256	Average
4960	43.49	58.11	74	-30.51	31.4	6.9	52.92	102	256	Peak
Antenna Polarity & Test Distance: Vertical at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2480	95.76	101.12			27.53	4.43	37.32	196	254	Average
2480	96.75	102.11			27.53	4.43	37.32	196	254	Peak
2483.51	41.77	47.13	54	-12.23	27.53	4.43	37.32	196	254	Average
2483.51	51.65	57.01	74	-22.35	27.53	4.43	37.32	196	254	Peak
4960	43.5	58.12	54	-10.5	31.4	6.9	52.92	102	231	Average
4960	46.38	61	74	-27.62	31.4	6.9	52.92	102	231	Peak

Remarks:

1. Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor
   Margin Value = Emission Level – Limit value
2. 2480 MHz: Fundamental Frequency
3. The other emission levels were very low against the limit.

9 kHz ~ 30 MHz Data:

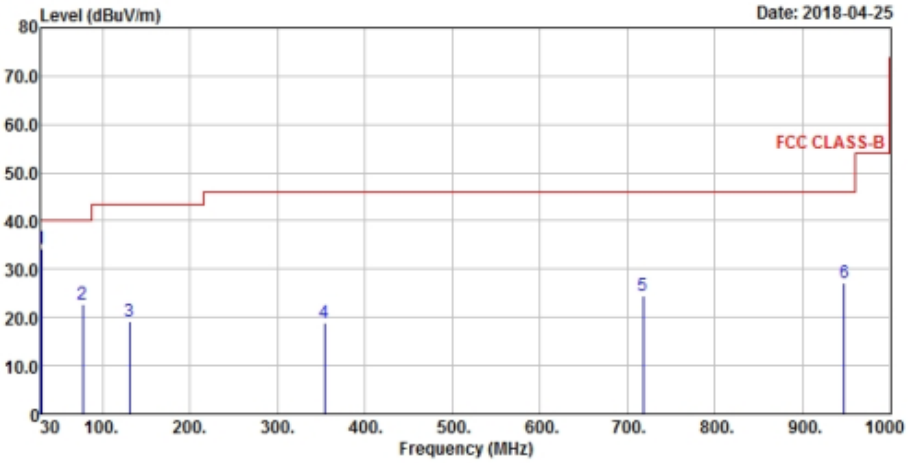
The amplitude of spurious emissions attenuated more than 20 dB below the permissible value is not required to be report.

30 MHz ~ 1 GHz Worst-Case Data:

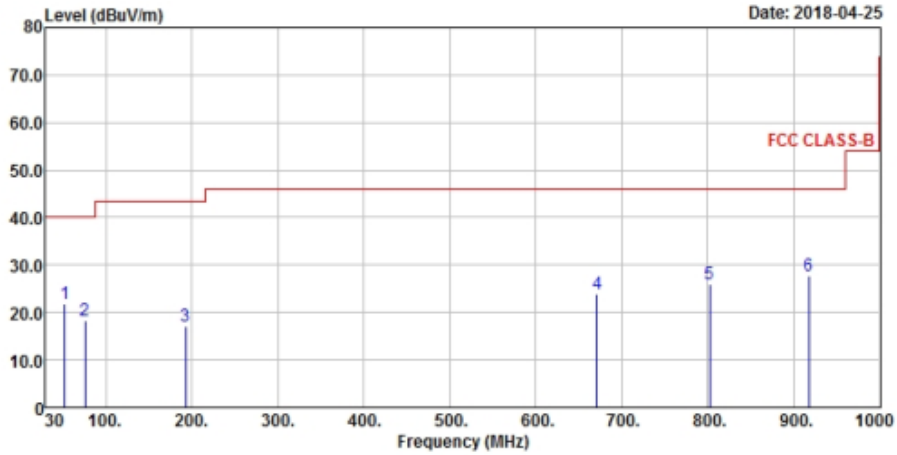
TX Mode

EUT Test Condition		Measurement Detail	
Channel	Channel 39	**Frequency Range**	30 MHz ~ 1 GHz
Input Power	110 Vac, 60 Hz	**Detector Function**	Peak (PK) Quask-Peak (QP)
Environmental Conditions	25 deg. C, 65 % RH	**Tested By**	Getaz Yang

Horizontal



Vertical



Cancels and replaces the report No. RF180323C08 dated Apr. 10, 2018

Antenna Polarity & Test Distance: Horizontal at 10 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
30	34.36	53.08	40	-5.64	11.98	0.44	31.14	111	123	Peak
77.53	22.63	44.71	40	-17.37	8.85	0.66	31.59	152	265	Peak
130.88	19.12	38.34	43.5	-24.38	11.75	0.89	31.86	174	185	Peak
353.98	18.85	34.6	46	-27.15	14.24	1.9	31.89	132	265	Peak
717.73	24.61	31.83	46	-21.39	21.07	3.39	31.68	195	256	Peak
947.62	27.22	31.06	46	-18.78	23.78	4.22	31.84	185	241	Peak
Antenna Polarity & Test Distance: Vertical at 10 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
52.31	21.88	39.9	40	-18.12	12.76	0.54	31.32	102	256	Peak
75.59	18.35	40.01	40	-21.65	9.33	0.66	31.65	111	132	Peak
192.96	17.21	37.88	43.5	-26.29	9.84	1.19	31.7	185	246	Peak
671.17	23.89	32.05	46	-22.11	20.47	3.18	31.81	195	256	Peak
802.12	26.01	31.51	46	-19.99	22.25	3.68	31.43	174	152	Peak
917.55	27.78	32.07	46	-18.22	23.61	4.11	32.01	201	235	Peak

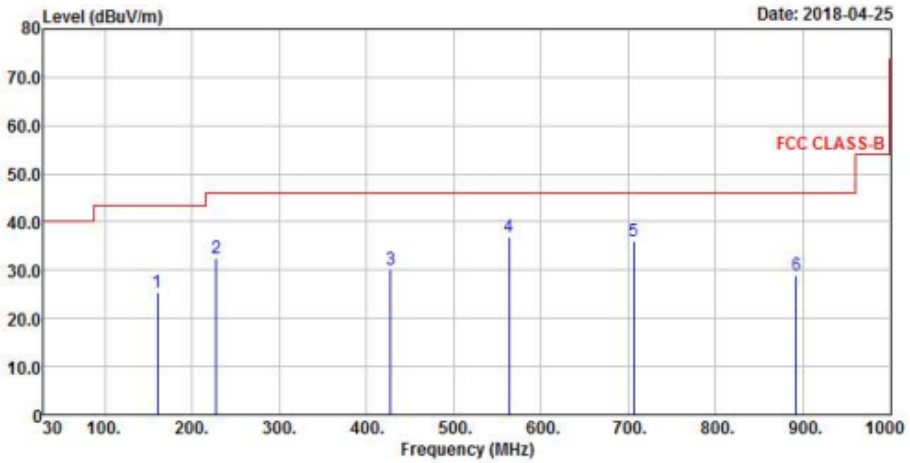
Remarks:

1. Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor
   Margin Value = Emission Level – Limit value
2. The other emission levels were very low against the limit.

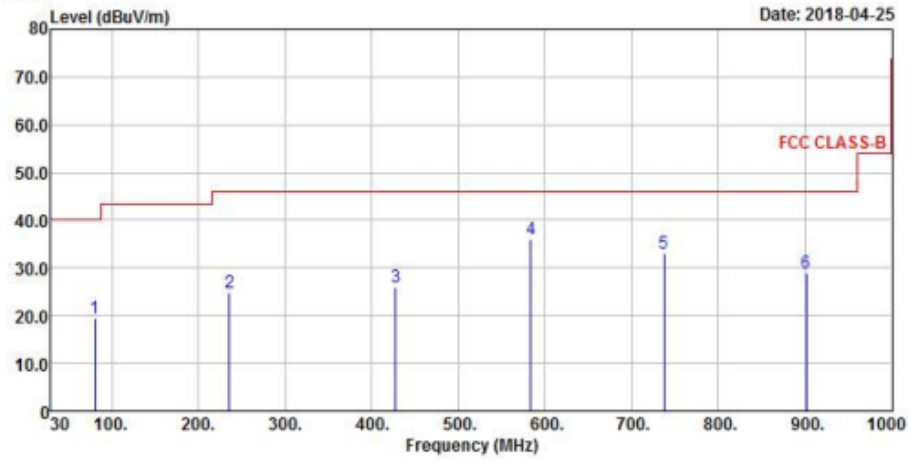
Charging Mode

EUT Test Condition		Measurement Detail	
Channel	Channel 39	**Frequency Range**	30 MHz ~ 1 GHz
Input Power	110 Vac, 60 Hz	**Detector Function**	Peak (PK) Quask-Peak (QP)
Environmental Conditions	25 deg. C, 65 % RH	**Tested By**	Getaz Yang

Horizontal



Vertical



Antenna Polarity & Test Distance: Horizontal at 10 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
159.98	25.52	43.65	43.5	-17.98	12.73	1.02	31.88	126	117	Peak
227.88	32.36	52.28	46	-13.64	10.54	1.37	31.83	107	14	Peak
427.7	30.15	44.1	46	-15.85	15.89	2.18	32.02	110	150	Peak
563.5	36.91	47.46	46	-9.09	18.77	2.75	32.07	136	33	Peak
706.09	36.03	43.55	46	-9.97	20.9	3.34	31.76	134	283	Peak
892.33	28.88	33.46	46	-17.12	23.41	4	31.99	102	259	Peak
Antenna Polarity & Test Distance: Vertical at 10 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
80.44	19.34	42.05	40	-20.66	8.13	0.67	31.51	122	213	Peak
235.64	24.82	44.34	46	-21.18	10.87	1.42	31.81	129	310	Peak
427.7	26.02	39.97	46	-19.98	15.89	2.18	32.02	149	202	Peak
583.87	35.99	46.05	46	-10.01	19.23	2.84	32.13	141	332	Peak
737.13	33.09	39.8	46	-12.91	21.34	3.46	31.51	150	179	Peak
901.06	29.04	33.5	46	-16.96	23.52	4.03	32.01	100	186	Peak

Remarks:

1. Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor
   Margin Value = Emission Level – Limit value
2. The other emission levels were very low against the limit.

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 0.50 MHz.

4.2.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Date Of Calibration	Due Date Of Calibration
Test Receiver ROHDE & SCHWARZ	ESCI	100613	Nov. 23, 2017	Nov. 22, 2018
RF signal cable (with 10dB PAD) Woken	5D-FB	Cable-cond1-01	Sep. 05, 2017	Sep. 04, 2018
LISN/AMN ROHDE & SCHWARZ (EUT)	ESH3-Z5	835239/001	Mar. 06, 2018	Mar. 05, 2019
LISN/AMN ROHDE & SCHWARZ (Peripheral)	ESH3-Z5	100311	Aug. 15, 2017	Aug. 14, 2018
Software ADT	BV ADT_Cond_ V7.3.7.3	NA	NA	NA

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 HwaYa Shielded Room 1.
3. The VCCI Site Registration No. is C-2040.

4.2.3 Test Procedures

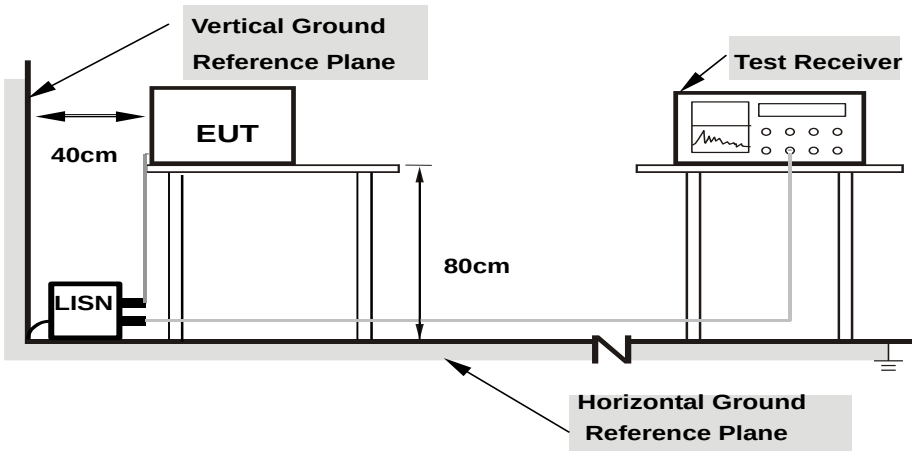
a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50 uH of coupling 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 150 kHz to 30 MHz was searched. Emission levels under (Limit – 20 dB) was not recorded.

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

4.2.4 Deviation from Test Standard

No deviation.

4.2.5 Test Setup



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).

4.2.6 EUT Operating Condition

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

4.2.7 Test Results

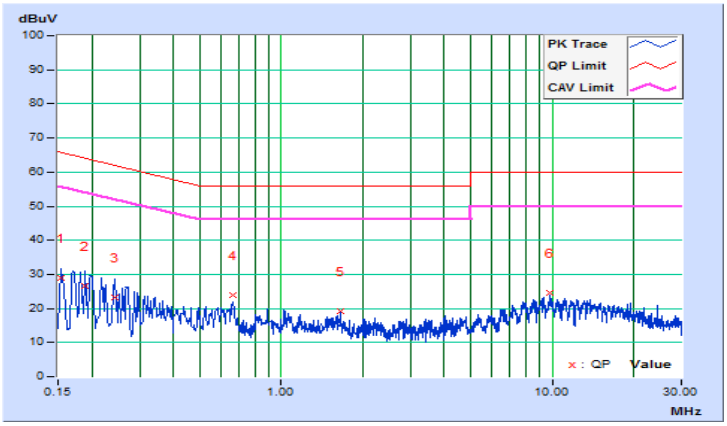
CONDUCTED WORST-CASE DATA：GFSK

Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	120Vac, 60Hz	Environmental Conditions	25℃, 65%RH
Tested by	Getaz Yang	Test Date	2018/4/18

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	0.15391	10.10	19.01	4.86	29.11	14.96	65.79	55.79	-36.68	-40.83
2	0.18910	10.10	16.50	3.52	26.60	13.62	64.08	54.08	-37.48	-40.46
3	0.24384	10.11	13.09	1.71	23.20	11.82	61.96	51.96	-38.76	-40.14
4	**0.66255**	**10.13**	**13.61**	**3.00**	**23.74**	**13.13**	**56.00**	**46.00**	**-32.26**	**-32.87**
5	1.65144	10.17	9.15	-1.63	19.32	8.54	56.00	46.00	-36.68	-37.46
6	9.85071	10.61	13.95	2.61	24.56	13.22	60.00	50.00	-35.44	-36.78

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



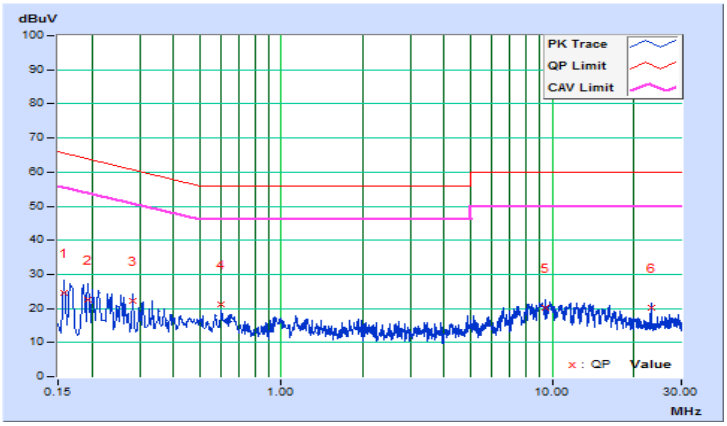
Cancels and replaces the report No. RF180323C08 dated Apr. 10, 2018

Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	120Vac, 60Hz	Environmental Conditions	25℃, 65%RH
Tested by	Getaz Yang	Test Date	2018/4/18

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	0.15782	10.10	14.50	1.64	24.60	11.74	65.58	55.58	-40.98	-43.84
2	0.19305	10.10	12.57	0.83	22.67	10.93	63.90	53.90	-41.23	-42.97
3	0.28288	10.11	12.12	-1.04	22.23	9.07	60.73	50.73	-38.50	-41.66
4	0.59965	10.12	11.13	0.15	21.25	10.27	56.00	46.00	-34.75	-35.73
5	9.49490	10.50	9.66	-1.21	20.16	9.29	60.00	50.00	-39.84	-40.71
6	23.12907	10.98	9.34	-1.10	20.32	9.88	60.00	50.00	-39.68	-40.12

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



Cancels and replaces the report No. RF180323C08 dated Apr. 10, 2018

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.

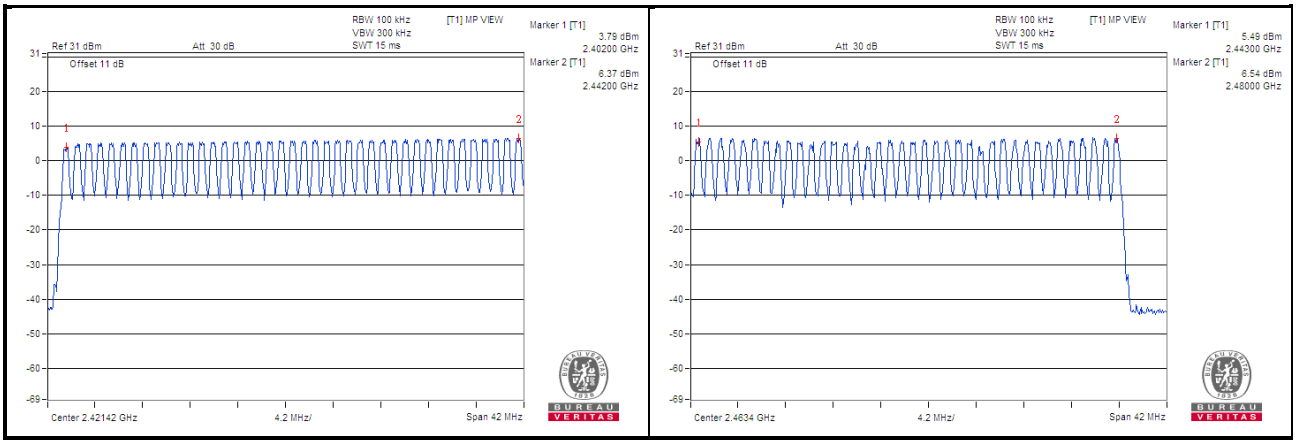
4.3.5 Deviation fromTest Standard

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.

GFSK



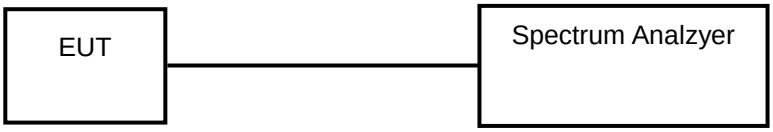
Cancels and replaces the report No. RF180323C08 dated Apr. 10, 2018

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.

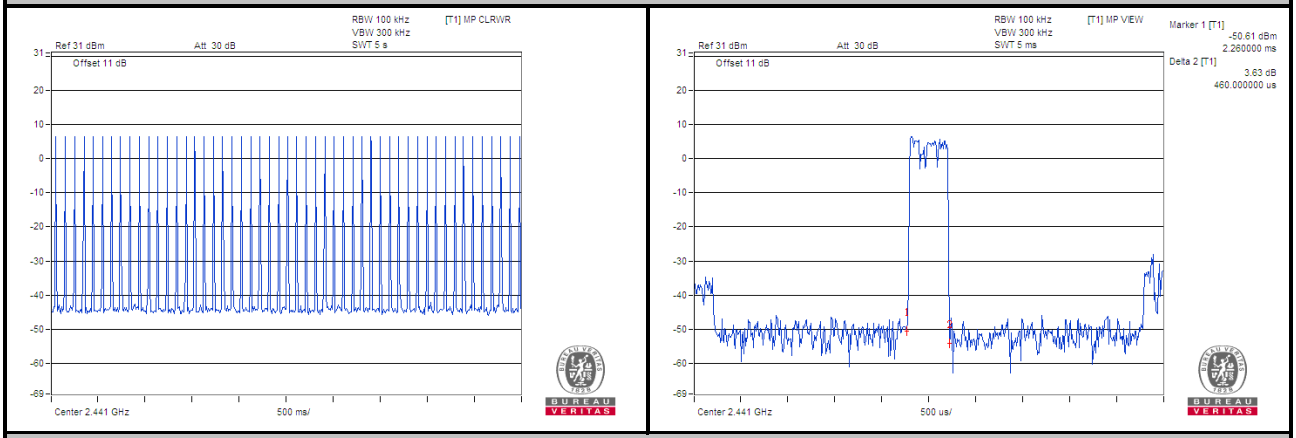
4.4.6 Test Results

GFSK

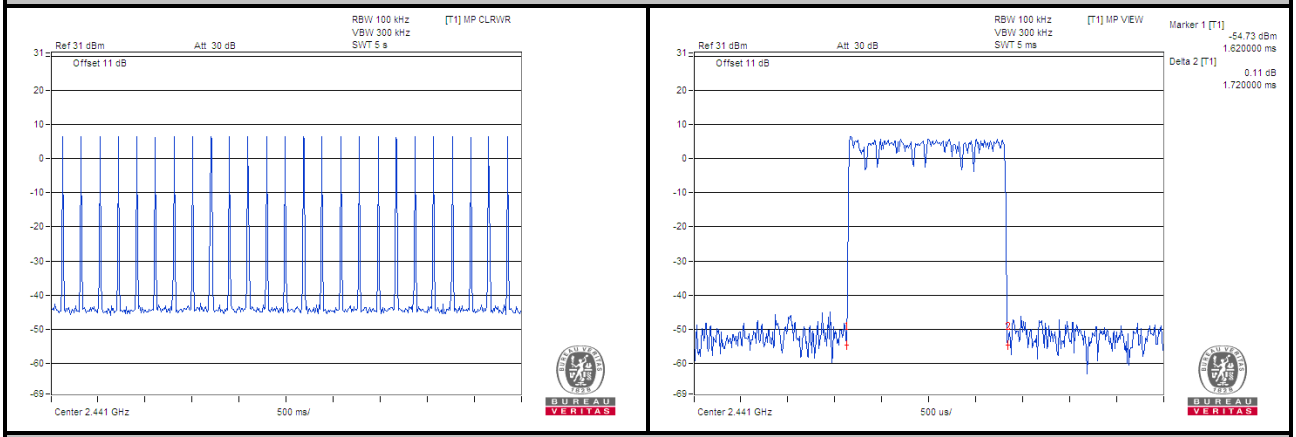
Mode	Number of transmission in a 31.6 (79 Hopping*0.4)	Length of transmission time (msec)	Result (msec)	Limit (sec)
DH1	51 (times / 5 sec) * 6.32 = 322.32 times	0.46	148.3	0.4
DH3	25 (times / 5 sec) * 6.32 = 158 times	1.72	271.8	0.4
DH5	17 (times / 5 sec) * 6.32 = 107.44 times	2.97	319.1	0.4

Note: Test plots of the transmitting time slot are shown as below.

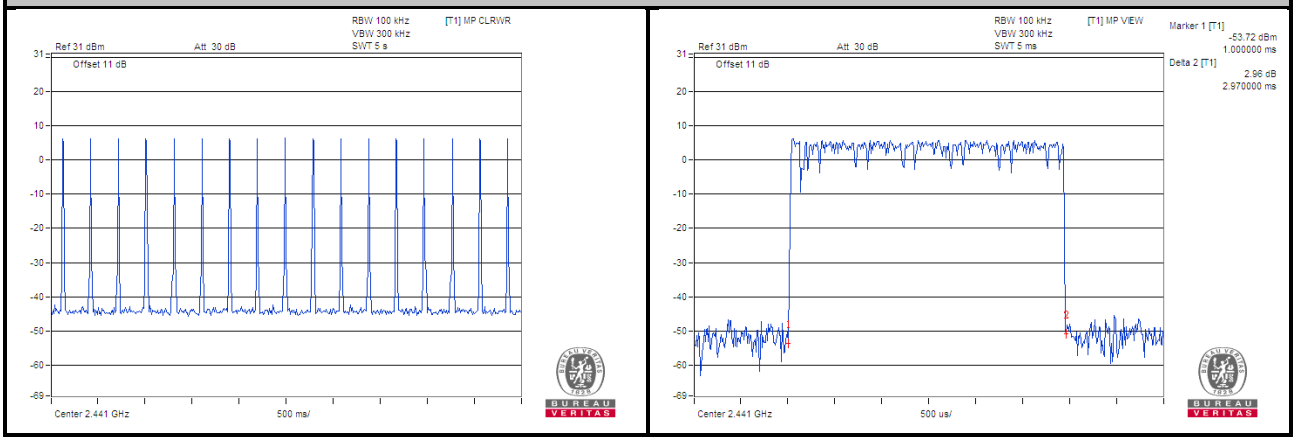
DH1



DH3



DH5



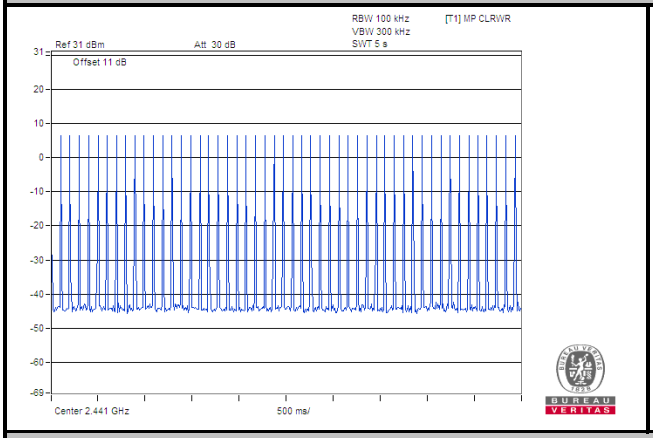
Cancels and replaces the report No. RF180323C08 dated Apr. 10, 2018

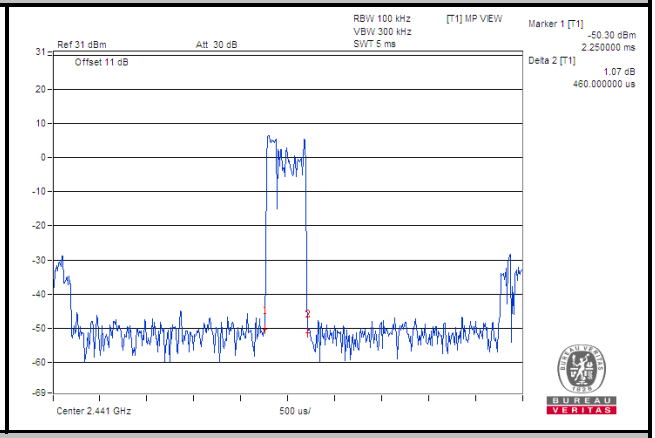
8DPSK

Mode	Number of transmission in a 31.6 (79 Hopping*0.4)	Length of transmission time (msec)	Result (msec)	Limit (sec)
3DH1	50 (times / 5 sec) * 6.32 = 316 times	0.46	145.4	0.4
3DH3	25 (times / 5 sec) * 6.32 = 158 times	1.73	273.3	0.4
3DH5	16 (times / 5 sec) * 6.32 = 101.12 times	3	303.4	0.4

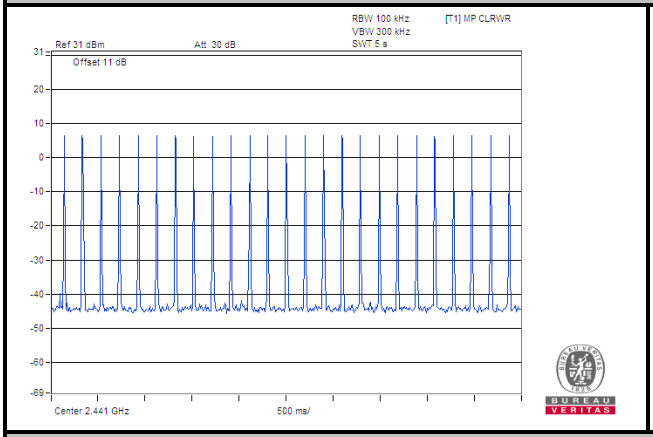
Note: Test plots of the transmitting time slot are shown as below.

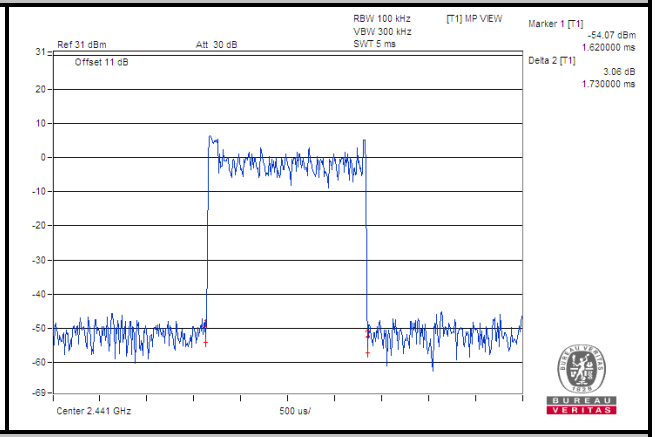
3DH1



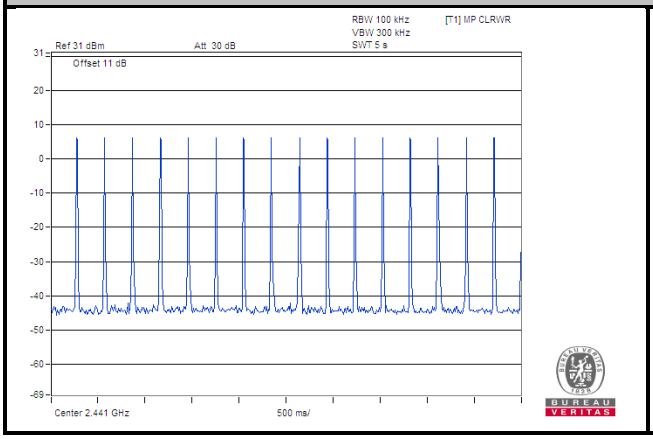


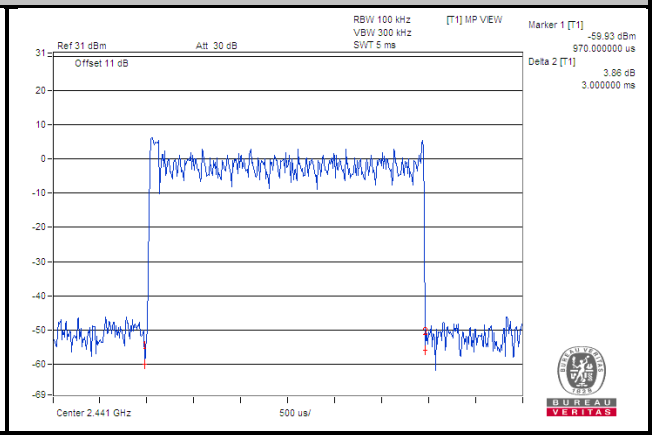
3DH3





3DH5



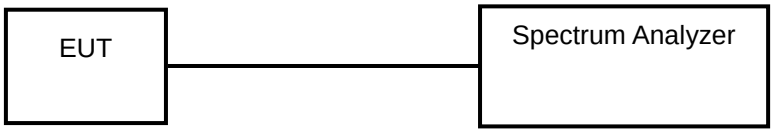


4.5 Channel Bandwidth

4.5.1 Limits of Channel Bandwidth Measurement

For frequency hopping system operating in the 2400-2483.5 MHz, if the 20 dB bandwidth of hopping channel is greater than 25 kHz, two-thirds 20 dB bandwidth 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 20 dB 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.

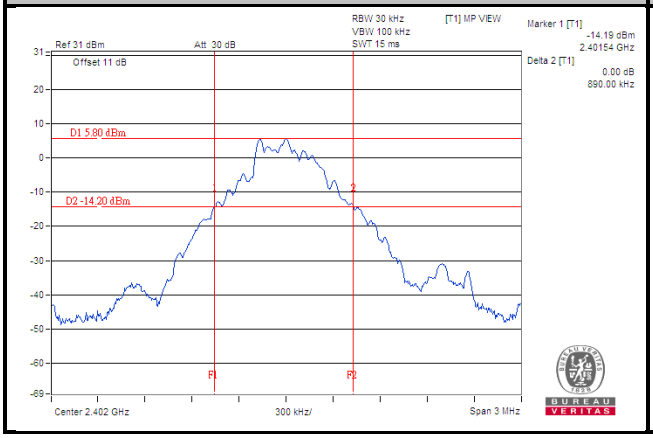
4.5.6 EUT Operating Condition

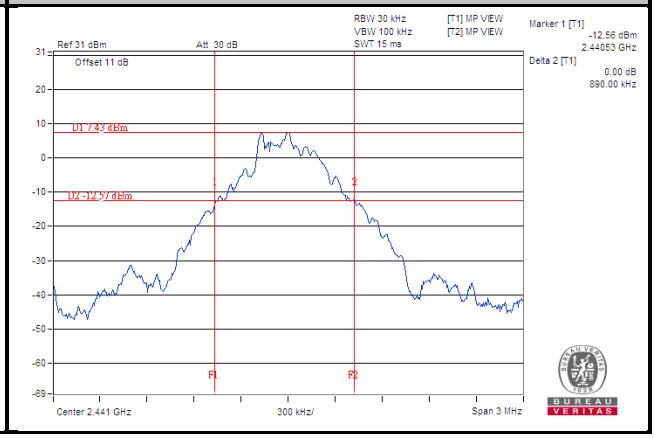
The software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel frequencies individually.

4.5.7 Test Results

Channel	Frequency (MHz)	20 dB Bandwidth (MHz)	
		GFSK	8DPSK
0	2402	0.89	0.88
39	2441	0.88	0.89
78	2480	0.89	0.88

Spectrum Plot of Worst Value	
GFSK	8DPSK

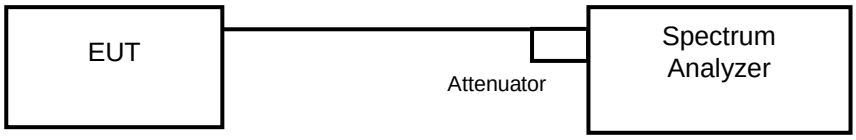




Cancels and replaces the report No. RF180323C08 dated Apr. 10, 2018

4.6 Occupied Bandwidth Measurement

4.6.1 Test Setup



4.6.2 Test Instruments

Refer to section 4.1.2 to get information of above instrument

4.6.3 Test Procedure

The transmitter output was connected to the spectrum analyzer through an attenuator. The bandwidth of the fundamental frequency was measured by spectrum analyzer with resolution bandwidth in the range of 1 % to 5 % of the anticipated emission bandwidth, and a video bandwidth at least 3x the resolution bandwidth and set the detector to PEAK. The width of a frequency band such that, below the lower and above the upper frequency limits, the mean powers emitted are each equal to a specified percentage 0.5 % of the total mean power of a given emission.

4.6.4 Deviation from Test Standard

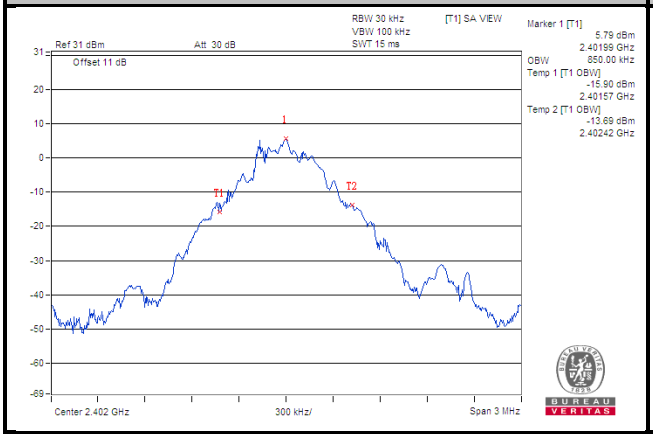
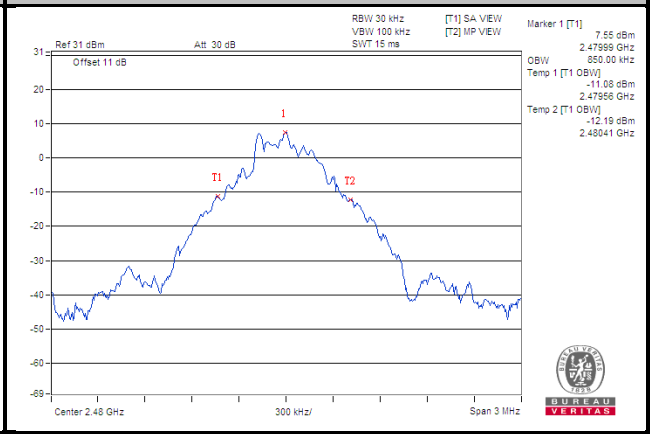
No deviation.

4.6.5 EUT Operating Conditions

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

4.6.6 Test Results

Channel	Frequency (MHz)	Occupied Bandwidth (MHz)	
		GFSK	8DPSK
0	2402	0.85	0.83
39	2441	0.85	0.85
78	2480	0.85	0.85

Spectrum Plot of Worst Value	
GFSK	8DPSK
	

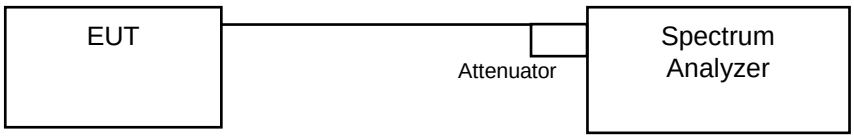
Cancels and replaces the report No. RF180323C08 dated Apr. 10, 2018

4.7 Hopping Channel Separation

4.7.1 Limits of Hopping Channel Separation Measurement

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

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

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.

4.7.5 Deviation from Test Standard

No deviation.

4.7.6 Test Results

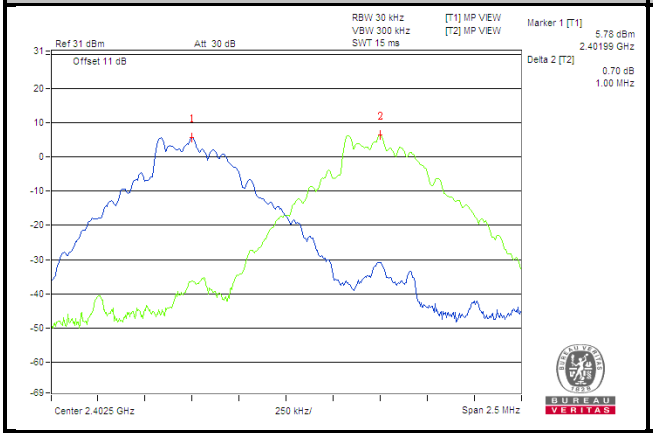
Channel	Freq. (MHz)	Adjacent Channel Separation (MHz)		20 dB Bandwidth (MHz)		Minimum Limit (MHz)		Pass / Fail
		GFSK	8DPSK	GFSK	8DPSK	GFSK	8DPSK	
0	2402	1.00	1.00	0.89	0.88	0.60	0.59	Pass
39	2441	1.00	1.00	0.88	0.89	0.59	0.60	Pass
78	2480	1.00	1.00	0.89	0.88	0.60	0.59	Pass

Note:

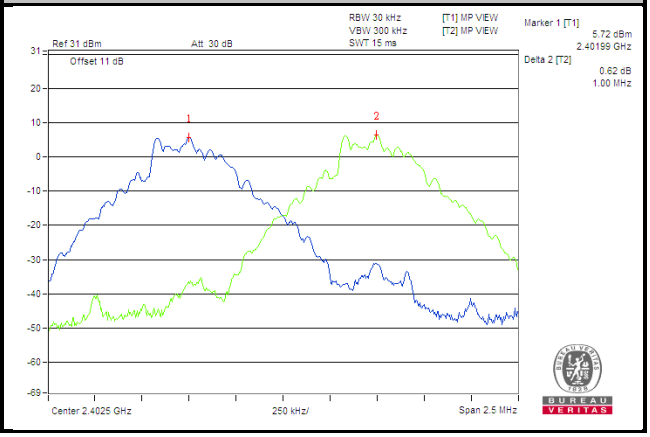
1. The minimum limit is two-third 20 dB bandwidth.

Spectrum Plot of Worst Value

GFSK



8DPSK

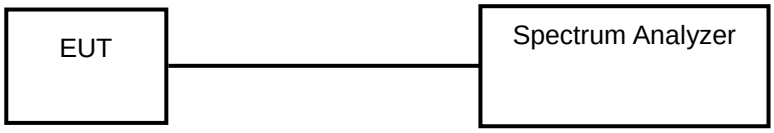


4.8 Maximum Output Power

4.8.1 Limits of Maximum Output Power Measurement

The Maximum Output Power Measurement is 125 mW.

4.8.2 Test Setup



4.8.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.8.4 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. The center frequency of the spectrum analyzer is set to the fundamental frequency and using 3 MHz RBW and 10 MHz VBW.
d. Measure the captured power within the band and recording the plot.
e. Repeat above procedures until all frequencies required were complete.

4.8.5 Deviation fromTest Standard

No deviation.

4.8.6 EUT Operating Condition

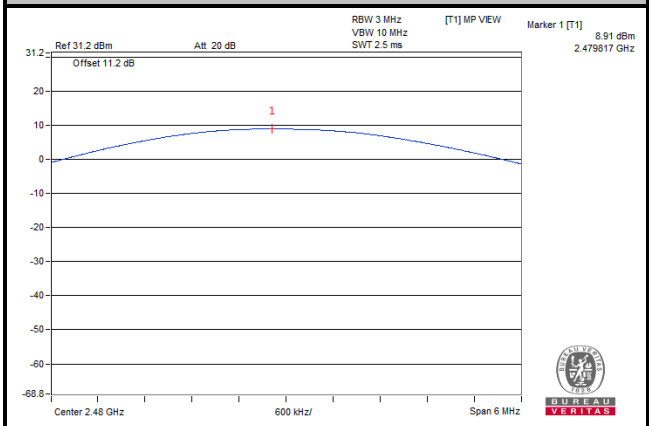
The software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel frequencies individually.

4.8.7 Test Results

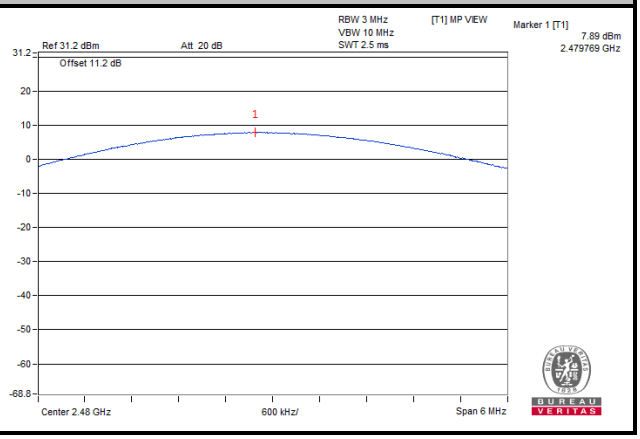
Channel	Freq. (MHz)	Output Power (mW)		Output Power (dBm)		Power Limit (mW)	Pass / Fail
		GFSK	8DPSK	GFSK	8DPSK		
0	2402	5.458	3.819	7.37	5.82	125	Pass
39	2441	7.464	5.916	8.73	7.72	125	Pass
78	2480	7.78	6.152	8.91	7.89	125	Pass

Spectrum Plot of Worst Value

GFSK



8DPSK



4.9 Conducted Out of Band Emission Measurement

4.9.1 Limits Of Conducted Out Of Band Emission Measurement

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

4.9.2 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.9.3 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.

4.9.4 Deviation from Test Standard

No deviation.

4.9.5 EUT Operating Condition

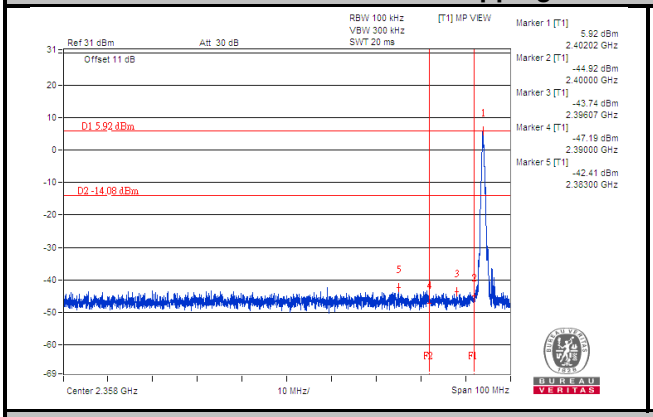
The software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel frequencies individually.

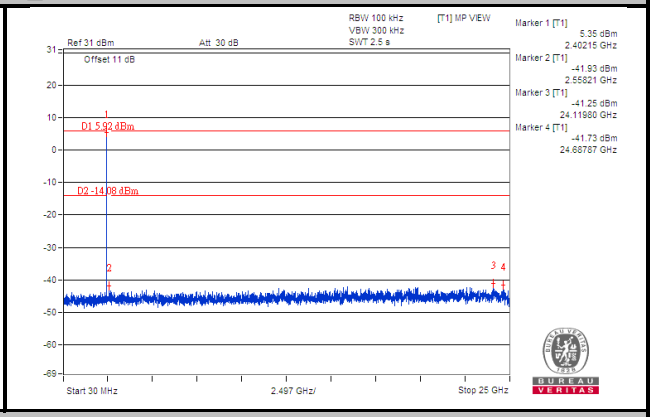
4.9.6 Test Results

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

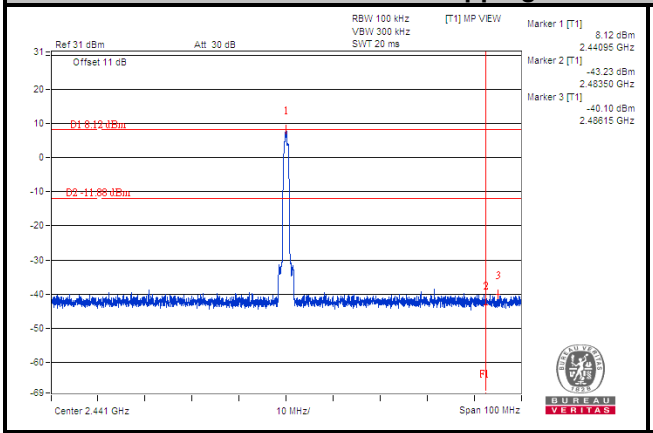
GFSK

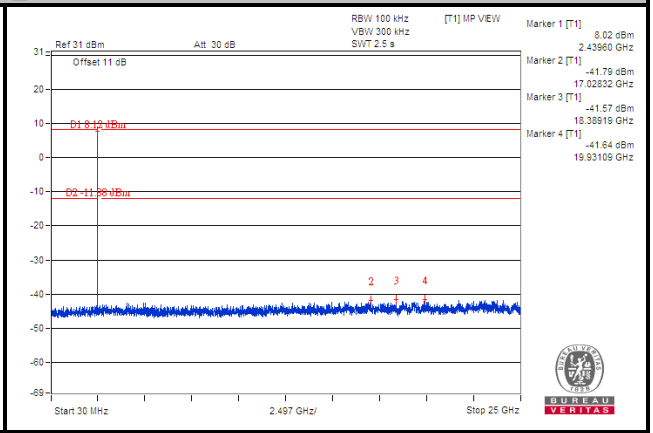
Hopping Disabled_Low Channel



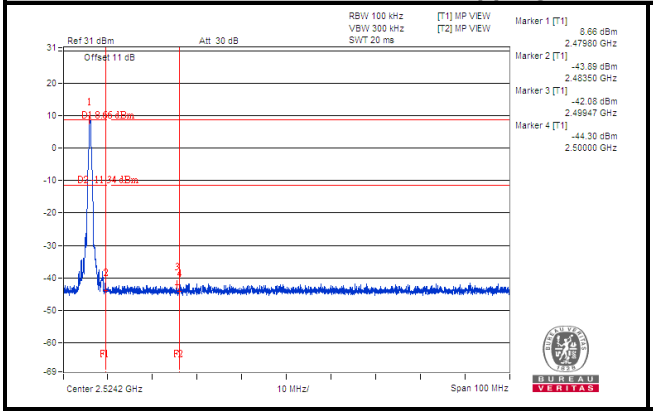


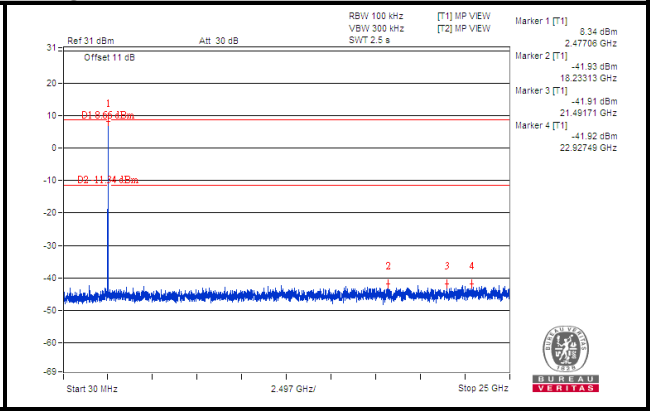
Hopping Disabled_Middle Channel





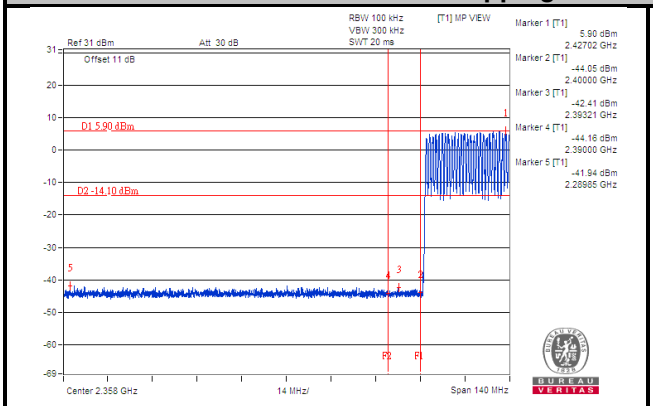
Hopping Disabled_High Channel

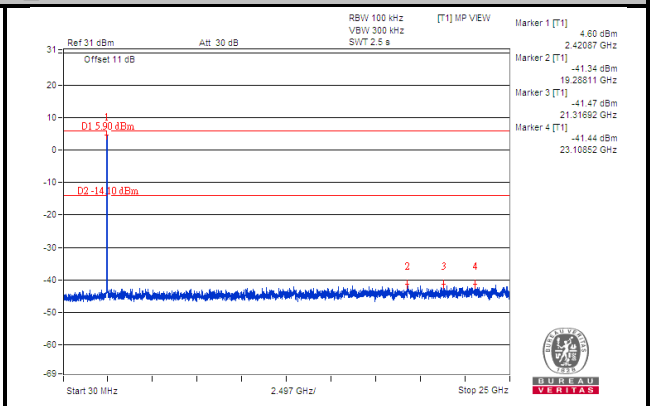




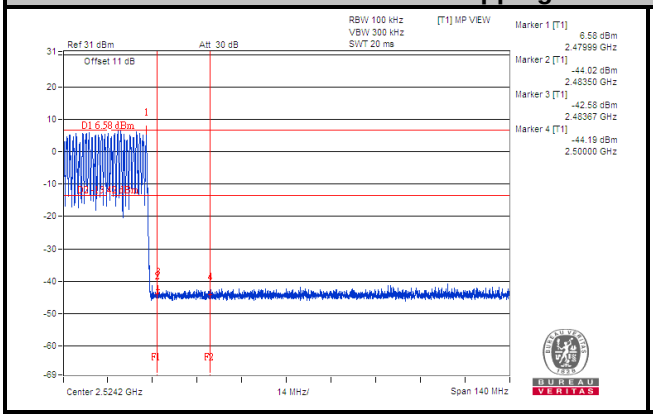
Cancels and replaces the report No. RF180323C08 dated Apr. 10, 2018

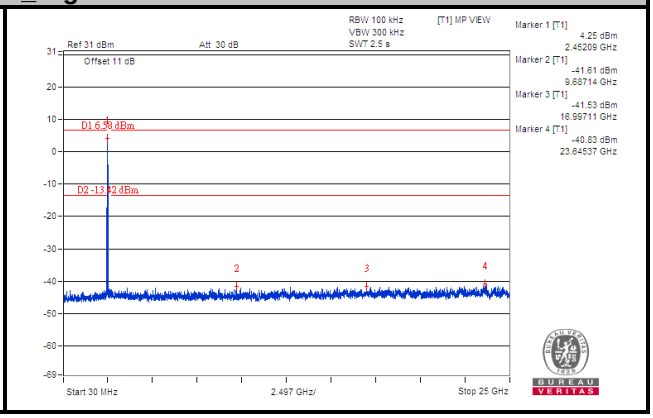
Hopping Enabled_Low Channel





Hopping Enabled_High Channel

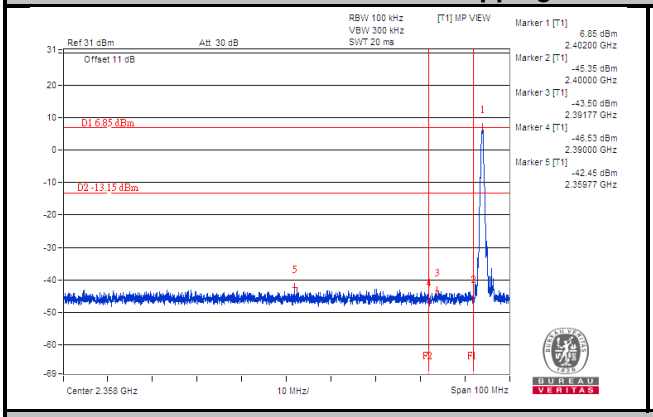


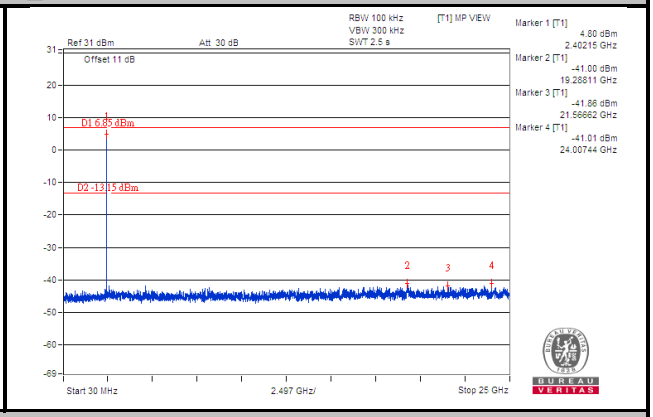


Cancels and replaces the report No. RF180323C08 dated Apr. 10, 2018

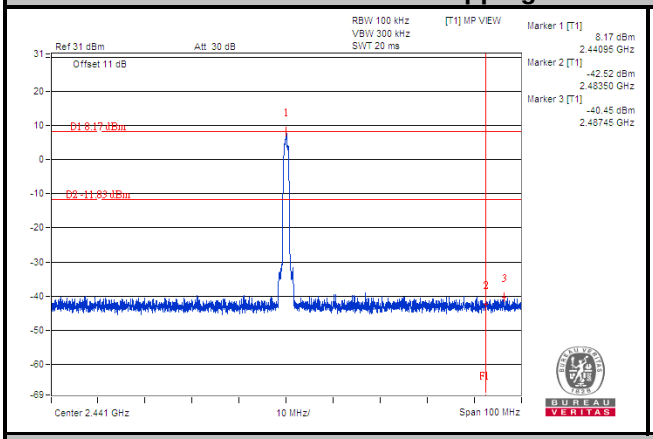
8DPSK

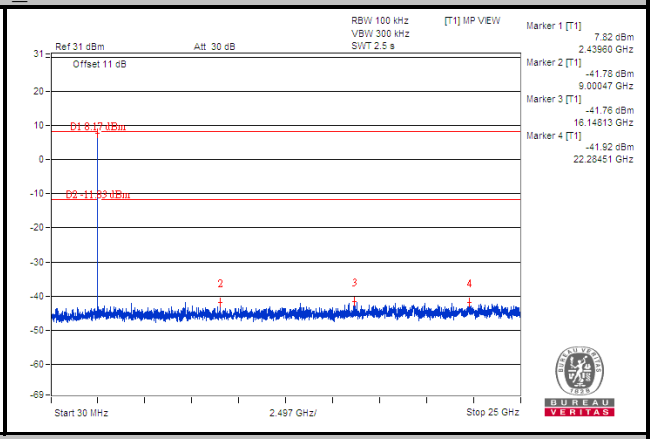
Hopping Disabled_Low Channel



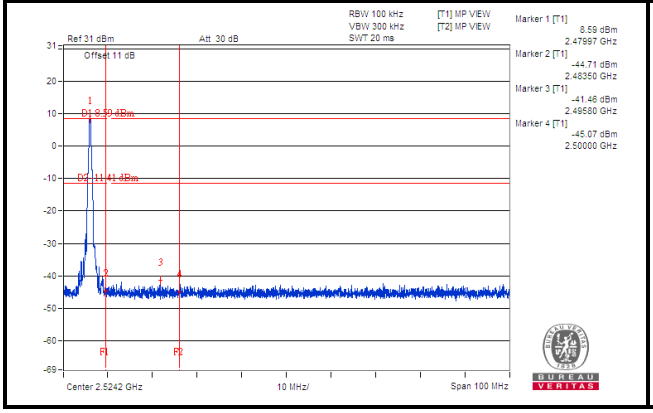


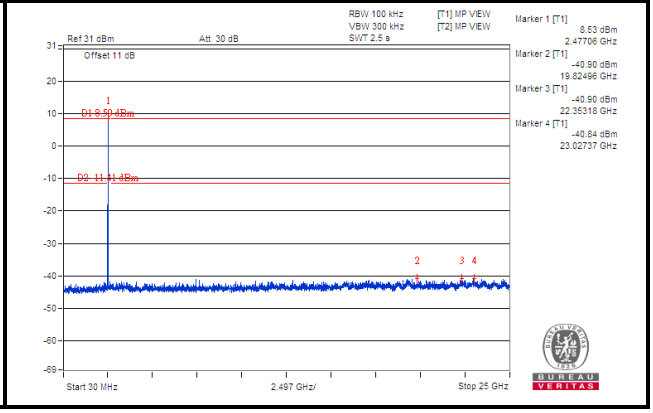
Hopping Disabled_Middle Channel





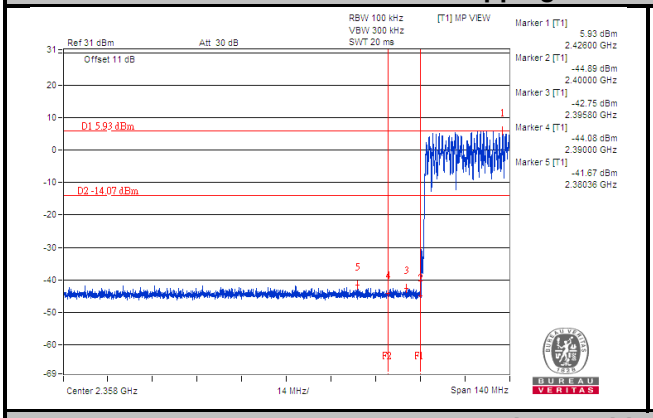
Hopping Disabled_High Channel

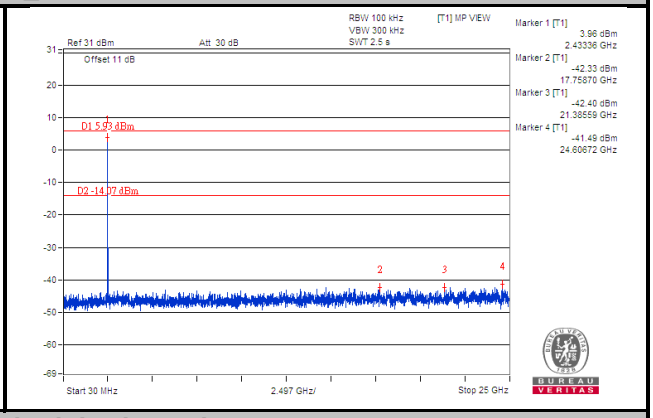




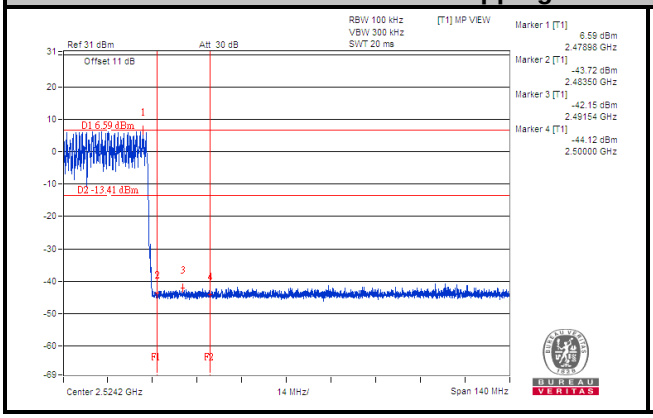
Cancels and replaces the report No. RF180323C08 dated Apr. 10, 2018

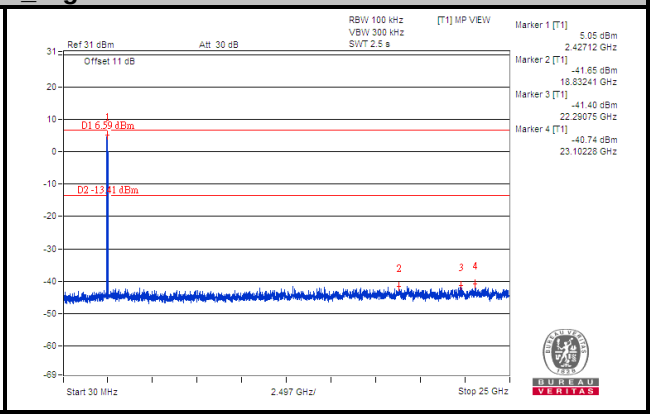
Hopping Enabled_Low Channel





Hopping Enabled_High Channel





Cancels and replaces the report No. RF180323C08 dated Apr. 10, 2018

5 Pictures of Test Arrangements

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

Appendix – Information on 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.

If you have any comments, please feel free to contact us at the following:

Linko EMC/RF Lab
Tel: 886-2-26052180
Fax: 886-2-26051924

Hsin Chu EMC/RF/Telecom Lab
Tel: 886-3-6668565
Fax: 886-3-6668323

Hwa Ya EMC/RF/Safety
Tel: 886-3-3183232
Fax: 886-3-3270892

Email: service.adt@tw.bureauveritas.com
Web Site: www.bureauveritas-adt.com

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

--- END ---