

Variant FCC Test Report

Report No.: RF190226C07A

FCC ID: UK7-DW10

Test Model: DW10E2

Series Model: DW10F1, DW10F2, DW10M1, DW10M2, DW10M3, DW10E1, DW10D1, DW10S1 (Refer to section 3.1 for more details)

Received Date: Sep. 23, 2019

Test Date: Sep. 26, 2019 ~ Oct. 13, 2019

Issued Date: Oct. 16, 2019

Applicant: Fossil Group, Inc.

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Issued By: Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch
Lin Kou Laboratories

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33383, Taiwan

Test Location (2): B2F., No.215, Sec. 3, Beixin Rd., Xindian Dist., New Taipei City 231, Taiwan

FCC Registration / 427177 / TW0011

Designation Number: 788550 / TW0003



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Release Control Record

Issue No.	Description	Date Issued
RF190226C07A	Original Release	Oct. 16, 2019

1 Certificate of Conformity

Product: Smart Watch

Test Model: DW10E2

Series Model: DW10F1, DW10F2, DW10M1, DW10M2, DW10M3, DW10E1, DW10D1, DW10S1
(Refer to section 3.1 for more details)

Sample Status: Identical Prototype

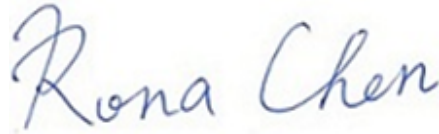
Applicant: Fossil Group, Inc.

Test Date: Sep. 26, 2019 ~ Oct. 13, 2019

Standards: 47 CFR FCC Part 15, Subpart C (Section 15.247)
ANSI C63.10:2013

This report is issued as a supplementary report to BV CPS report no.: RF190226C07 R1. This report shall be used by combining with its original report.

Prepared by :



Date:

Oct. 16, 2019

Rona Chen / Specialist

Approved by :



Date:

Oct. 16, 2019

Dylan Chiou / Project Engineer

2 Summary of Test Results

<Bluetooth EDR>

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 -21.19 dB at 0.15802 MHz.
15.247(a)(1)(iii)	Number of Hopping Frequency Used	N/A	Refer to Note
15.247(a)(1)(iii)	Dwell Time on Each Channel	N/A	Refer to Note
15.247(a)(1)	1. Hopping Channel Separation 2. Spectrum Bandwidth of a Frequency Hopping Sequence Spread Spectrum System	N/A	Refer to Note
15.247(a)(1)	Maximum Peak Output Power	Pass	Meet the requirement of limit.
---	Occupied Bandwidth Measurement	N/A	Refer to Note
15.205 & 209	Radiated Emissions	Pass	Meet the requirement of limit. Minimum passing margin is -11.26 dB at 4960 MHz.
15.247(d)	Band Edge Measurement	N/A	Refer to Note
15.247(d)	Antenna Port Emission	N/A	Refer to Note
15.203	Antenna Requirement	Pass	No antenna connector is used.

Note:

- Only AC Power Conducted Emission, Maximum Peak Output Power, and Radiated Emissions tests were performed for this addendum. Refer to original report for other test data.
- Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

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) (\pm)
Conducted Emissions at mains ports	150 kHz ~ 30 MHz	2.94 dB
Radiated Emissions up to 1 GHz	9 kHz ~ 30 MHz	3.04 dB
	30 MHz ~ 200 MHz	2.0153 dB
	200 MHz ~ 1000 MHz	2.0224 dB
Radiated Emissions above 1 GHz	1 GHz ~ 18 GHz	1.0121 dB
	18 GHz ~ 40 GHz	1.1508 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	Smart Watch	
Test Model	DW10E2	
Series Model	DW10F1, DW10F2, DW10M1, DW10M2, DW10M3, DW10E1, DW10D1, DW10S1	
Status of EUT	Identical Prototype	
Power Supply Rating	5.0 Vdc (Host equipment or Adapter) 3.85 Vdc (Battery)	
Modulation Type	Bluetooth EDR	GFSK, $\pi/4$ -DQPSK, 8DPSK
Transfer Rate	Bluetooth EDR	1/2/3 Mbps
Operating Frequency	Bluetooth EDR	2402 ~ 2480 MHz
Number of Channel	Bluetooth EDR	79
Output Power	Bluetooth EDR	13.996 mW
Antenna Type	Loop antenna	
Antenna Connector	N/A	
Accessory Device	Refer to Note as below	
Data Cable Supplied	Refer to Note as below	

Note:

1. This report is issued as a supplementary report to BV CPS report no: RF190226C07 R1. The difference compared with original report is adding models (DW10F2, DW10M3, DW10E2, DW10S1) with different appearance and antenna. Therefore, only AC Power Conducted Emission, Maximum Peak Output Power, and Radiated Emissions tests were re-tested.
2. All models are listed as below (New model is marked in blue). Model: DW10E2 antenna gain is maximum as a representative for the final test.

Sample	Model	Antenna Gain (dBi)		Description
		WLAN / BT	GPS	
A	DW10F1	-7.45	-6.48	The models have the same layout, circuit, and components, but different in appearance and antenna.
H	DW10F2	-6.11	-3.68	
B	DW10M1	-8.00	-6.36	
C	DW10M2	-6.21	-5.17	
G	DW10M3	-6.86	-4.87	
D	DW10E1	-6.80	-5.47	
I	DW10E2	-5.50	-4.76	
E	DW10D1	-7.15	-5.61	
F	DW10S1	-5.55	-4.78	

3. The EUT's accessories list refers to user manual.
4. The above EUT information is declared by manufacturer and for more detailed features description, please refers to the manufacturer's specifications or User's Manual.

3.2 Description of Test Modes

<Bluetooth EDR>

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

<Bluetooth EDR>

EUT Configure Mode	Applicable To				Description
	RE \geq 1G	RE<1G	PLC	APCM	
-	√	√	√	√	-

Where **RE \geq 1G**: Radiated Emission above 1 GHz
PLC: Power Line Conducted Emission

RE<1G: Radiated Emission below 1 GHz
APCM: Antenna Port Conducted Measurement

Note:

1. The EUT had been pre-tested on the positioned of each 3 axis. The worst case was found when positioned on **Z-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
-	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
-	0 to 78	78	FHSS	8DPSK	3DH5

Power Line Conducted Emission Test:

- ☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, 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
-	0 to 78	78	FHSS	8DPSK	3DH5

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
-	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 \geq 1G	25 deg. C, 65 % RH	120 Vac, 60 Hz	Charles Hsiao
RE<1G	25 deg. C, 65 % RH	120 Vac, 60 Hz	Charles Hsiao
PLC	25 deg. C, 65 % RH	120 Vac, 60 Hz	Jisyong Wang
APCM	25 deg. C, 65 % RH	3.8 Vdc	Wayne Lin

3.3 Description of Support Units

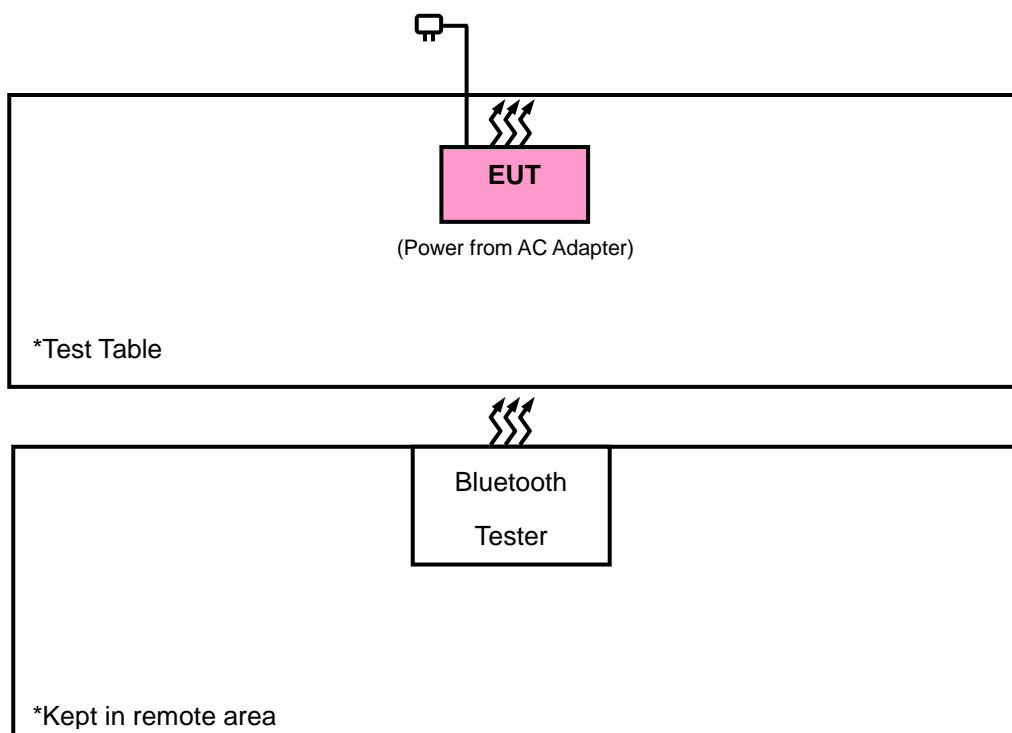
The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

No.	Product	Brand	Model No.	Serial No.	FCC ID
1.	Adapter	SALCOMP	TC U250	N/A	N/A
2.	Cradle	Simula Technology Inc.	CB846E-6040-102	N/A	N/A

No.	Signal Cable Description Of The Above Support Units
1.	1m shielded cable

3.3.1 Configuration of System under Test

<Bluetooth EDR>



3.4 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)

KDB 558074 D01 15.247 Meas Guidance v05r02

ANSI C63.10-2013

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

4 Test Types and Results

<BLUETOOTH EDR>

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:

- The lower limit shall apply at the transition frequencies.
- Emission level (dBuV/m) = 20 log Emission level (uV/m).
- 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 & Manufacturer	Model No.	Serial No.	Date Of Calibration	Due Date Of Calibration
Test Receiver Agilent Technologies	N9038A	MY52260177	Aug. 26, 2019	Aug. 25, 2020
Spectrum Analyzer R&S	FSU43	101261	Apr. 15, 2019	Apr. 14, 2020
HORN Antenna ETS-Lindgren	3117	00143293	Nov. 25, 2018	Nov. 24, 2019
BILOG Antenna SCHWARZBECK	VULB 9168	9168-616	Nov. 27, 2018	Nov. 26, 2019
HORN Antenna SCHWARZBECK	BBHA 9170	9170-480	Nov. 25, 2018	Nov. 24, 2019
Fixed Attenuator Mini-Circuits	MDCS18N-10	MDCS18N-10-01	Apr. 15, 2019	Apr. 14, 2020
Bluetooth Tester	CBT	100980	Jul. 14, 2019	Jul. 13, 2020
Loop Antenna	EM-6879	269	Sep. 16, 2019	Sep. 15, 2020
Preamplifier Agilent	310N	187226	Jun. 18, 2019	Jun. 17, 2020
Preamplifier Agilent	83017A	MY39501357	Jun. 18, 2019	Jun. 17, 2020
Power Meter Anritsu	ML2495A	1012010	Sep. 04, 2019	Sep. 03, 2020
Power Sensor Anritsu	MA2411B	1315050	Sep. 04, 2019	Sep. 03, 2020
Preamplifier EMCI	EMC 184045	980116	Oct. 12, 2018	Oct. 11, 2019
			Oct. 08, 2019	Oct. 07, 2020
RF signal cable ETS-LINDGREN	5D-FB	Cable-CH1-01(RFC -SMS-100-SMS-120 +RFC-SMS-100-SM S-400)	Jun. 18, 2019	Jun. 17, 2020
RF signal cable ETS-LINDGREN	8D-FB	Cable-CH1-02(RFC -SMS-100-SMS-24)	Jun. 18, 2019	Jun. 17, 2020
Boresight Antenna Fixture	FBA-01	FBA-SIP01	NA	NA
Software BV ADT	E3 8.130425b	NA	NA	NA
Antenna Tower MF	NA	NA	NA	NA
Turn Table MF	NA	NA	NA	NA
Antenna Tower & Turn Table Controller MF	MF-7802	NA	NA	NA

- 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 test was performed in HsinTien Chamber 1.

4.1.3 Test Procedures

For Radiated Emission below 30 MHz

- 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:

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

For Radiated Emission above 30 MHz

- a. The EUT was placed on the top of a rotating table 0.8 meters (for 30 MHz ~ 1 GHz) / 1.5 meters (for above 1 GHz) 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 detected 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:

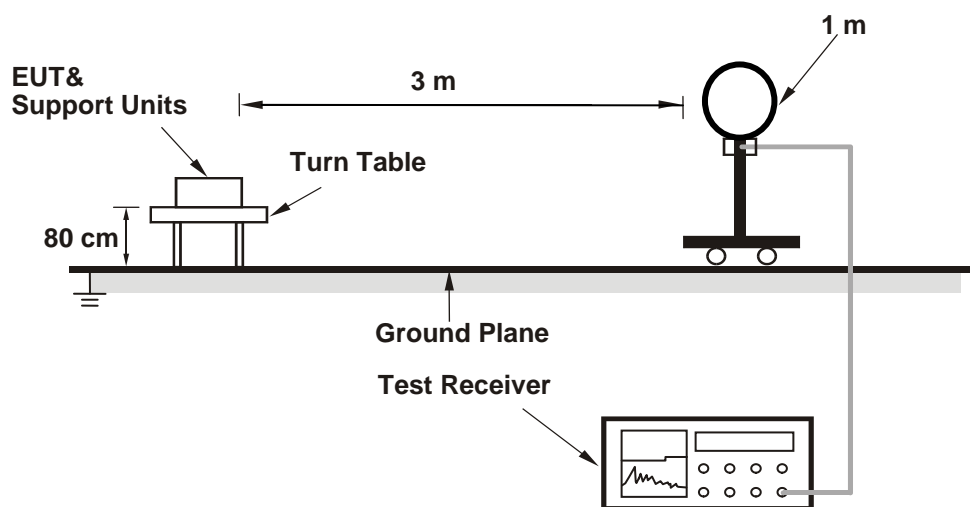
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasi-peak detection (QP) or Peak detection (PK) at frequency below 1 GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK)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

4.1.4 Deviation from Test Standard

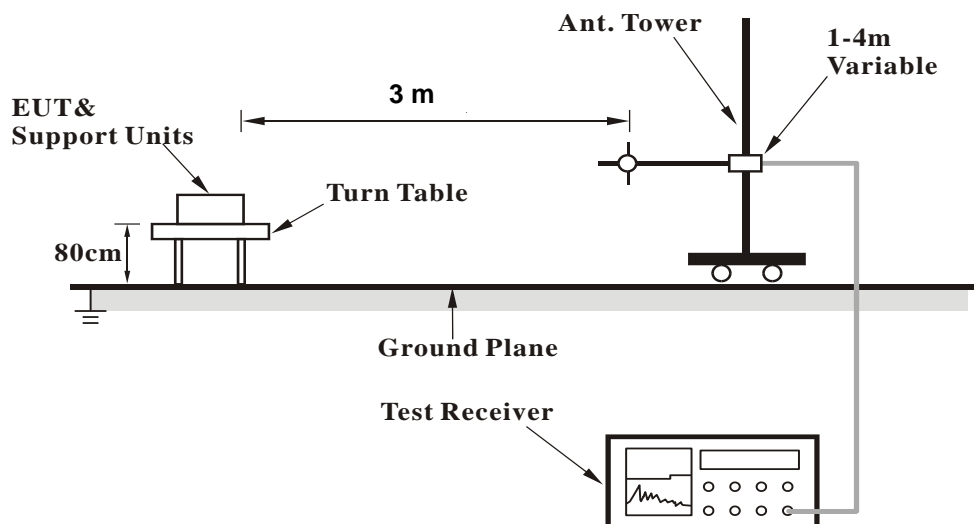
No deviation.

4.1.5 Test Set Up

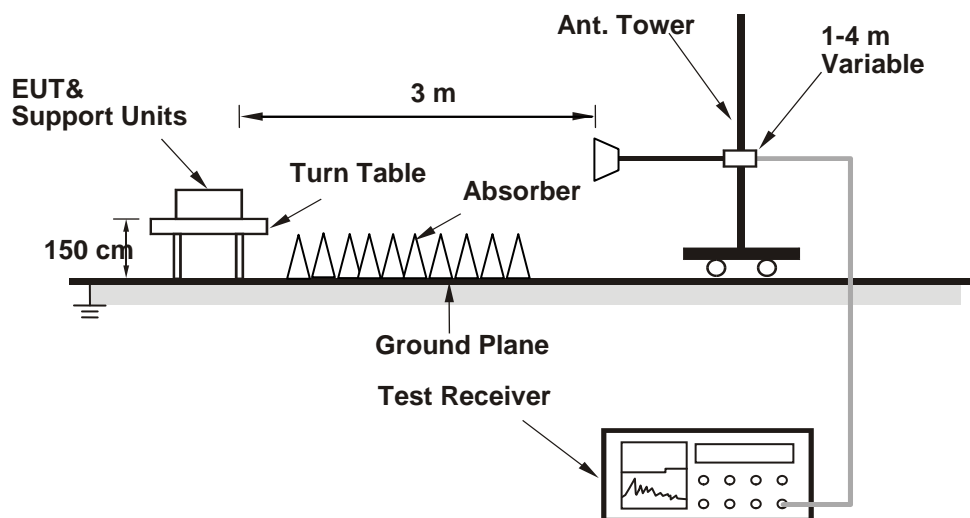
<Radiated Emission below 30 MHz>



<Radiated Emission 30 MHz to 1 GHz>



<Radiated Emission above 1 GHz>



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

4.1.6 EUT Operating Conditions

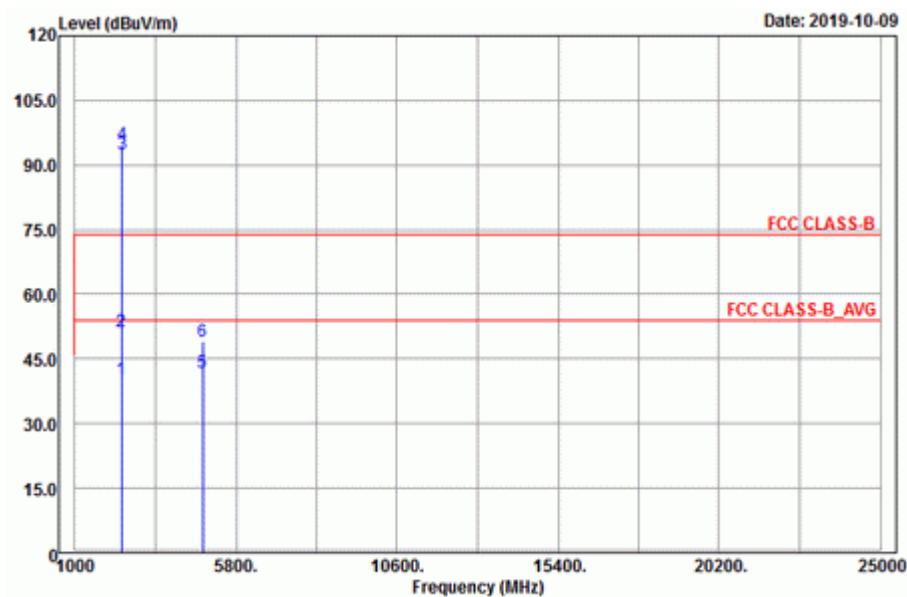
Set the EUT under transmission condition continuously at specific channel frequency.

4.1.7 Test Results

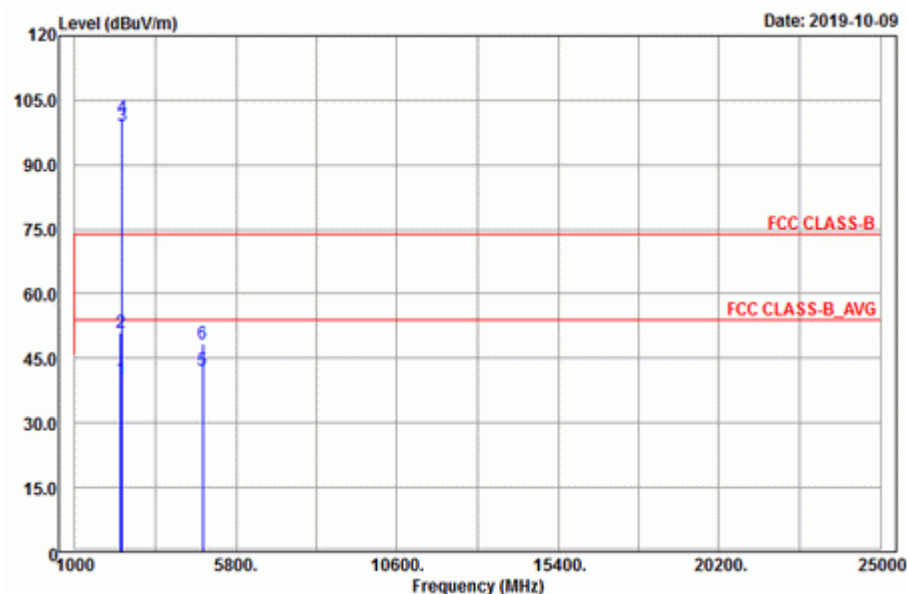
Above 1 GHz Data: GFSK

EUT Test Condition		Measurement Detail	
Channel	Channel 0	Frequency Range	1 GHz ~ 25 GHz
Input Power	120 Vac, 60 Hz	Detector Function	Peak (PK) Average (AV)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Charles Hsiao

Horizontal



Vertical



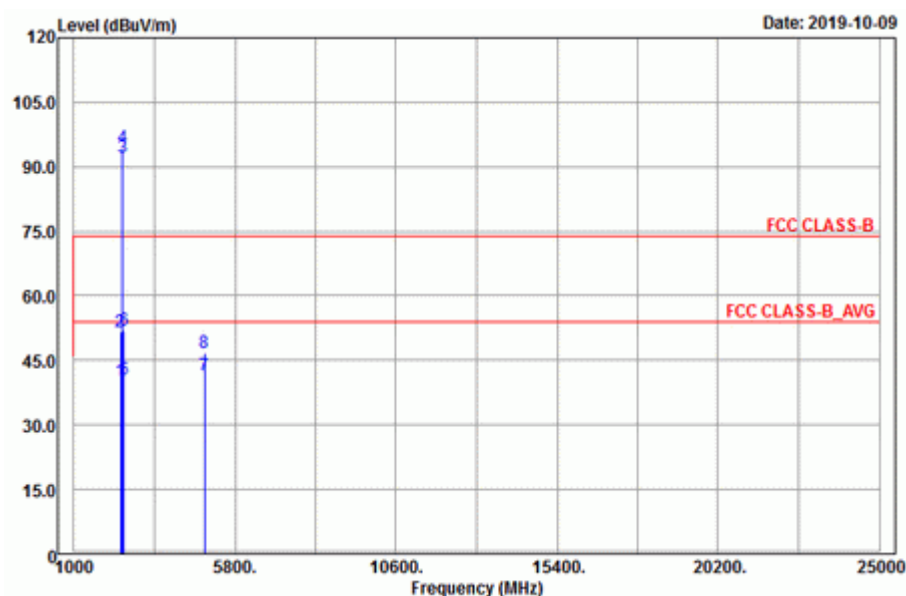
Antenna Polarity & Test Distance: Horizontal at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2387.94	40.2	35.71	4.49	54	-13.8	163	165	Average
2387.94	51.42	46.93	4.49	74	-22.58	163	165	Peak
2402	92.44	87.92	4.52			163	165	Average
2402	94.79	90.27	4.52			163	165	Peak
4804	41.99	31.64	10.35	54	-12.01	154	4	Average
4804	49.03	38.68	10.35	74	-24.97	154	4	Peak
Antenna Polarity & Test Distance: Vertical at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2371.83	40.21	35.76	4.45	54	-13.79	147	7	Average
2371.83	51.15	46.7	4.45	74	-22.85	147	7	Peak
2402	99.22	94.7	4.52			147	7	Average
2402	101.18	96.66	4.52			147	7	Peak
4804	42.15	31.8	10.35	54	-11.85	141	187	Average
4804	48.41	38.06	10.35	74	-25.59	141	187	Peak

Remarks:

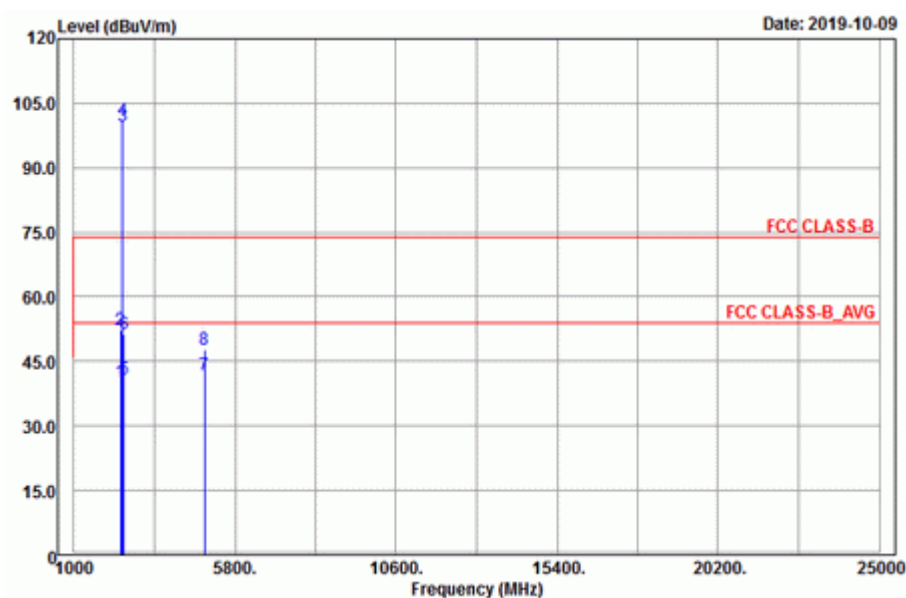
1. Emission Level = Read Level + Factor
Margin value = Emission level – Limit value
2. 2402 MHz: Fundamental frequency.
3. The emission levels of other frequencies were very low against the limit.

EUT Test Condition		Measurement Detail	
Channel	Channel 39	Frequency Range	1 GHz ~ 25 GHz
Input Power	120 Vac, 60 Hz	Detector Function	Peak (PK) Average (AV)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Charles Hsiao

Horizontal



Vertical



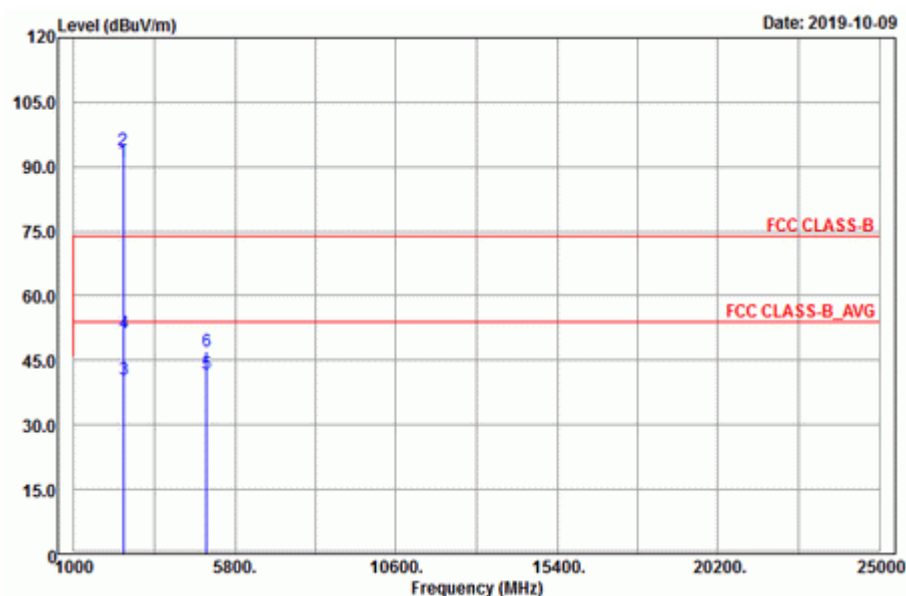
Antenna Polarity & Test Distance: Horizontal at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2385.33	40.07	35.6	4.47	54	-13.93	163	165	Average
2385.33	51.79	47.32	4.47	74	-22.21	163	165	Peak
2441	92.28	87.7	4.58			163	165	Average
2441	94.39	89.81	4.58			163	165	Peak
2488.72	40.66	35.98	4.68	54	-13.34	163	165	Average
2488.72	51.98	47.3	4.68	74	-22.02	163	165	Peak
4882	41.64	31.43	10.21	54	-12.36	104	11	Average
4882	46.89	36.68	10.21	74	-27.11	104	11	Peak
Antenna Polarity & Test Distance: Vertical at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2384.88	40.12	35.65	4.47	54	-13.88	147	7	Average
2384.88	52.31	47.84	4.47	74	-21.69	147	7	Peak
2441	99.69	95.11	4.58			147	7	Average
2441	101.19	96.61	4.58			147	7	Peak
2497.24	40.78	36.11	4.67	54	-13.22	147	7	Average
2497.24	51.37	46.7	4.67	74	-22.63	147	7	Peak
4882	41.84	31.63	10.21	54	-12.16	134	315	Average
4882	47.74	37.53	10.21	74	-26.26	134	315	Peak

Remarks:

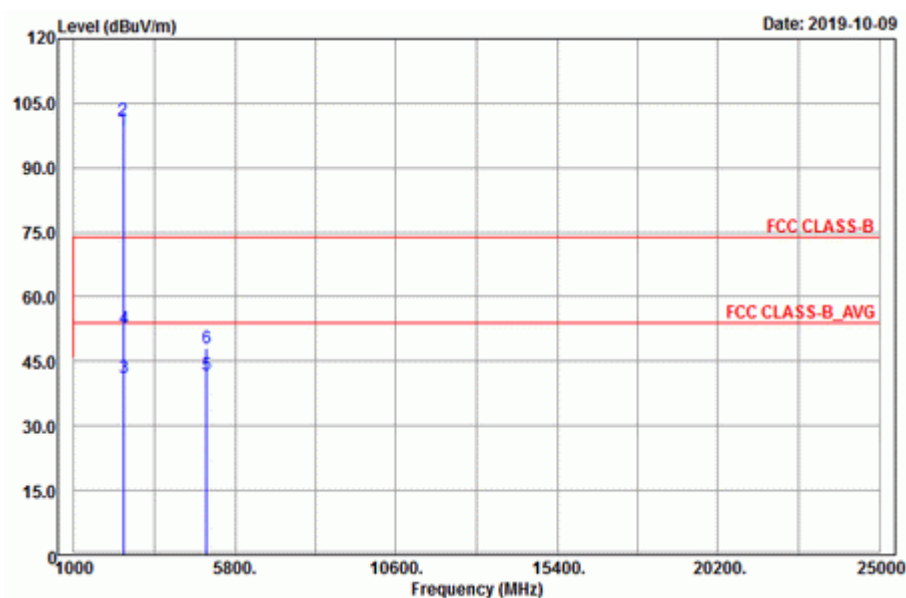
1. Emission Level = Read Level + Factor
Margin value = Emission level – Limit value
2. 2441 MHz: Fundamental frequency.
3. The emission levels of other frequencies were very low against the limit.

EUT Test Condition		Measurement Detail	
Channel	Channel 78	Frequency Range	1 GHz ~ 25 GHz
Input Power	120 Vac, 60 Hz	Detector Function	Peak (PK) Average (AV)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Charles Hsiao

Horizontal



Vertical



Antenna Polarity & Test Distance: Horizontal at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2480	91.37	86.73	4.64			163	165	Average
2480	93.81	89.17	4.64			163	165	Peak
2497.2	40.59	35.92	4.67	54	-13.41	163	165	Average
2497.2	51.43	46.76	4.67	74	-22.57	163	165	Peak
4960	41.84	31.48	10.36	54	-12.16	110	210	Average
4960	47.1	36.74	10.36	74	-26.9	110	210	Peak
Antenna Polarity & Test Distance: Vertical at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2480	98.74	94.1	4.64			147	7	Average
2480	100.9	96.26	4.64			147	7	Peak
2483.8	41.04	36.38	4.66	54	-12.96	147	7	Average
2483.8	52.7	48.04	4.66	74	-21.3	147	7	Peak
4960	41.87	31.51	10.36	54	-12.13	148	326	Average
4960	48.03	37.67	10.36	74	-25.97	148	326	Peak

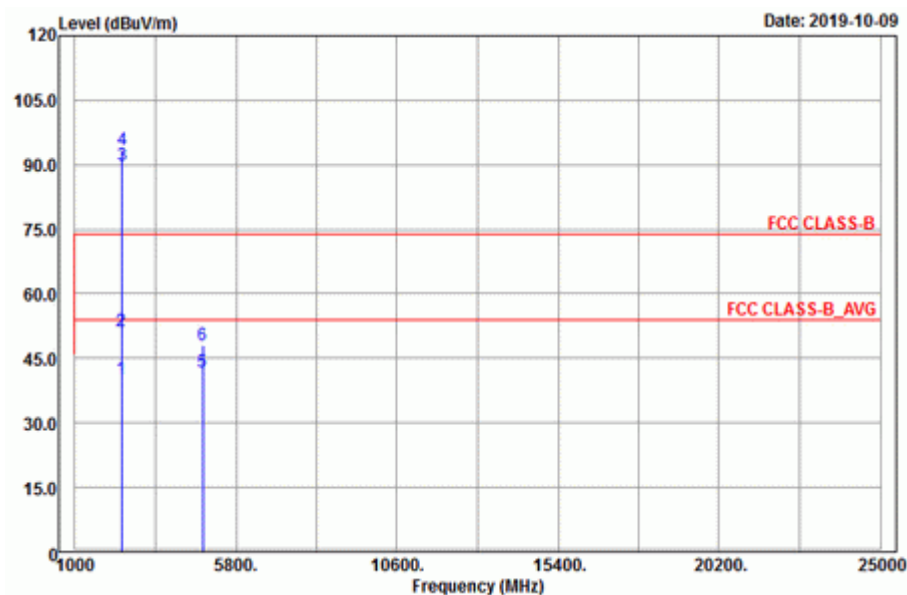
Remarks:

1. Emission Level = Read Level + Factor
Margin value = Emission level – Limit value
2. 2480 MHz: Fundamental frequency.
3. The emission levels of other frequencies were very low against the limit.

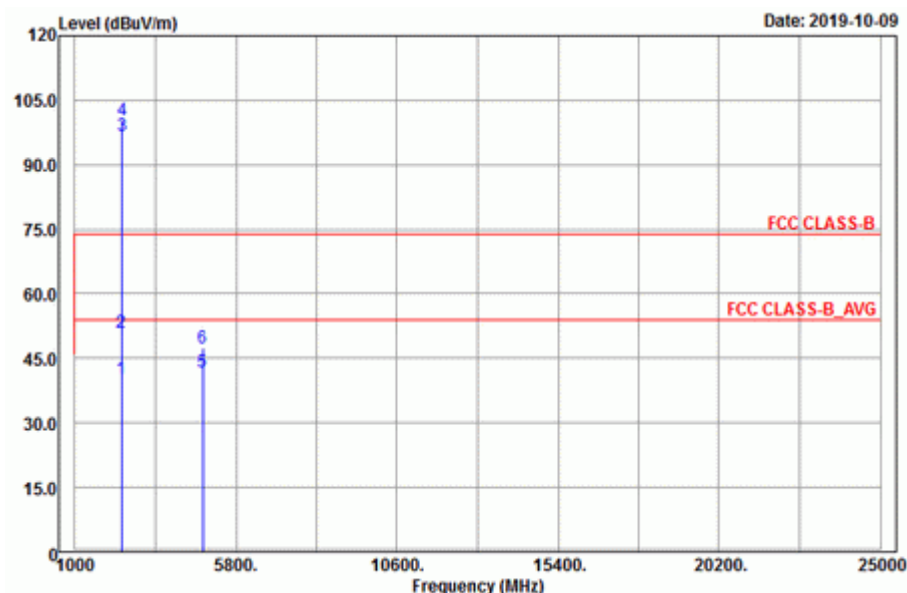
8DPSK

EUT Test Condition		Measurement Detail	
Channel	Channel 0	Frequency Range	1 GHz ~ 25 GHz
Input Power	120 Vac, 60 Hz	Detector Function	Peak (PK) Average (AV)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Charles Hsiao

Horizontal



Vertical



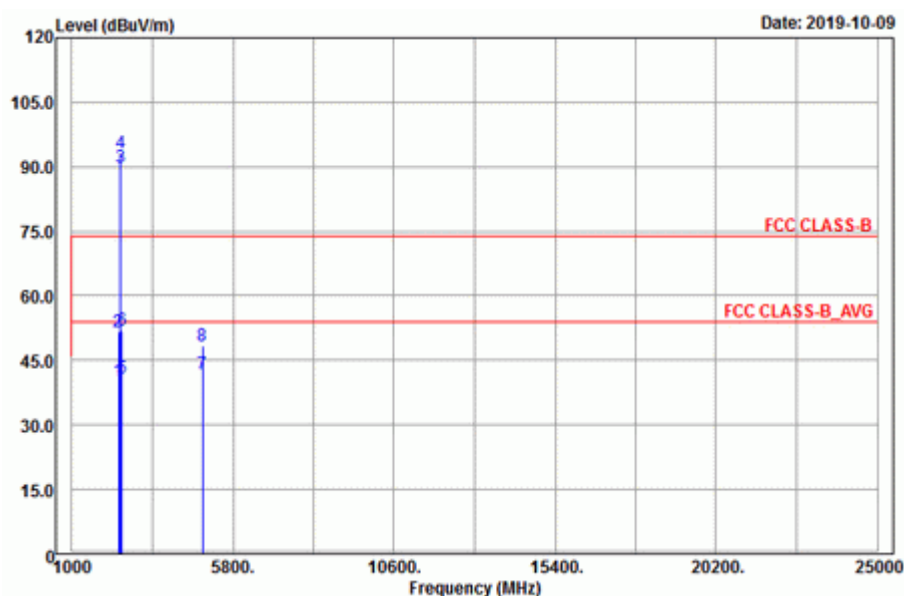
Antenna Polarity & Test Distance: Horizontal at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2383.89	40.21	35.74	4.47	54	-13.79	163	165	Average
2383.89	51.32	46.85	4.47	74	-22.68	163	165	Peak
2402	89.81	85.29	4.52			163	165	Average
2402	93.46	88.94	4.52			163	165	Peak
4804	41.85	31.5	10.35	54	-12.15	165	255	Average
4804	48.07	37.72	10.35	74	-25.93	165	255	Peak
Antenna Polarity & Test Distance: Vertical at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2387.85	40.37	35.88	4.49	54	-13.63	147	7	Average
2387.85	51.11	46.62	4.49	74	-22.89	147	7	Peak
2402	96.7	92.18	4.52			147	7	Average
2402	100.28	95.76	4.52			147	7	Peak
4804	41.89	31.54	10.35	54	-12.11	151	11	Average
4804	47.4	37.05	10.35	74	-26.6	151	11	Peak

Remarks:

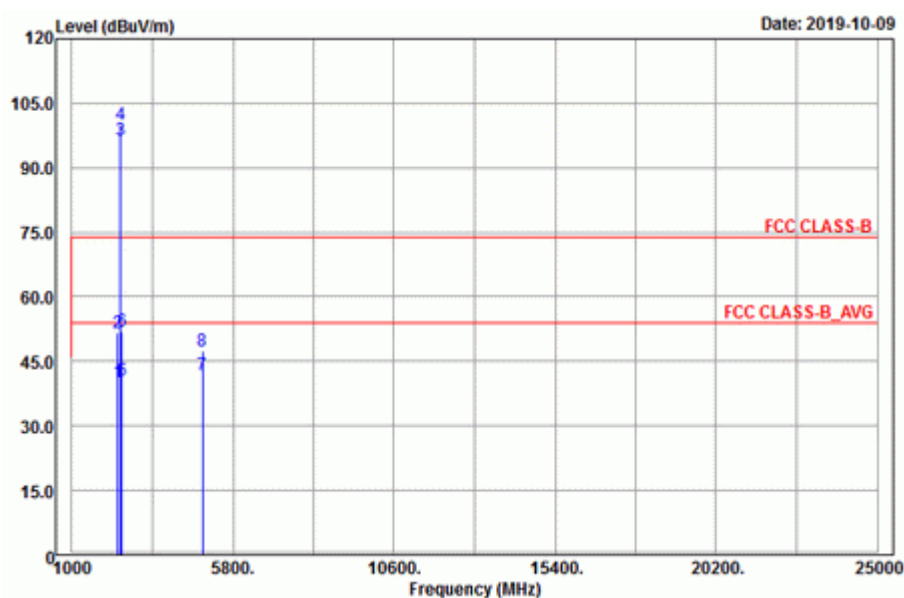
1. Emission Level = Read Level + Factor
Margin value = Emission level – Limit value
2. 2402 MHz: Fundamental frequency.
3. The emission levels of other frequencies were very low against the limit.

EUT Test Condition		Measurement Detail	
Channel	Channel 39	Frequency Range	1 GHz ~ 25 GHz
Input Power	120 Vac, 60 Hz	Detector Function	Peak (PK) Average (AV)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Charles Hsiao

Horizontal



Vertical



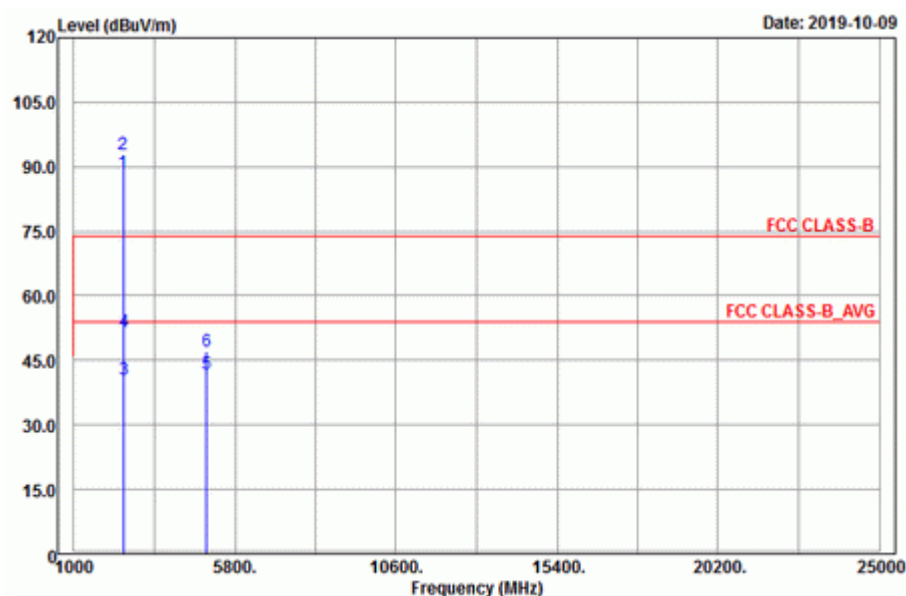
Antenna Polarity & Test Distance: Horizontal at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2389.92	40.12	35.62	4.5	54	-13.88	163	165	Average
2389.92	51.55	47.05	4.5	74	-22.45	163	165	Peak
2441	89.84	85.26	4.58			163	165	Average
2441	93.24	88.66	4.58			163	165	Peak
2498.56	40.74	36.07	4.67	54	-13.26	163	165	Average
2498.56	51.92	47.25	4.67	74	-22.08	163	165	Peak
4882	41.84	31.63	10.21	54	-12.16	199	208	Average
4882	48.4	38.19	10.21	74	-25.6	199	208	Peak
Antenna Polarity & Test Distance: Vertical at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2373.27	40.1	35.65	4.45	54	-13.9	147	7	Average
2373.27	51.6	47.15	4.45	74	-22.4	147	7	Peak
2441	96.49	91.91	4.58			147	7	Average
2441	100	95.42	4.58			147	7	Peak
2489.8	40.65	35.97	4.68	54	-13.35	147	7	Average
2489.8	52.01	47.33	4.68	74	-21.99	147	7	Peak
4882	41.75	31.54	10.21	54	-12.25	165	78	Average
4882	47.38	37.17	10.21	74	-26.62	165	78	Peak

Remarks:

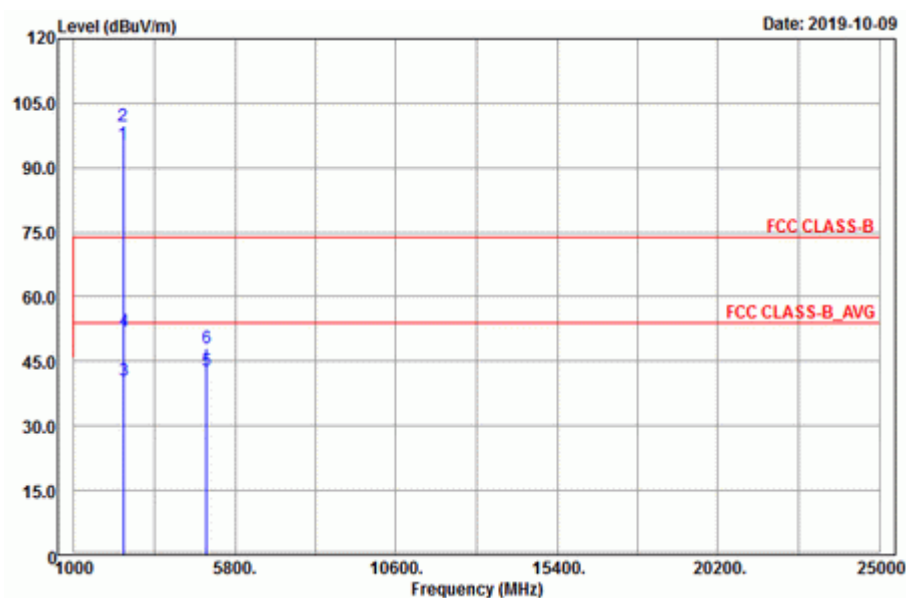
1. Emission Level = Read Level + Factor
Margin value = Emission level – Limit value
2. 2441 MHz: Fundamental frequency.
3. The emission levels of other frequencies were very low against the limit.

EUT Test Condition		Measurement Detail	
Channel	Channel 78	Frequency Range	1 GHz ~ 25 GHz
Input Power	120 Vac, 60 Hz	Detector Function	Peak (PK) Average (AV)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Charles Hsiao

Horizontal



Vertical



Antenna Polarity & Test Distance: Horizontal at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2480	88.47	83.83	4.64			163	165	Average
2480	92.96	88.32	4.64			163	165	Peak
2498.48	40.56	35.89	4.67	54	-13.44	163	165	Average
2498.48	51.71	47.04	4.67	74	-22.29	163	165	Peak
4960	41.76	31.4	10.36	54	-12.24	154	15	Average
4960	47.01	36.65	10.36	74	-26.99	154	15	Peak
Antenna Polarity & Test Distance: Vertical at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2480	95.64	91	4.64			147	7	Average
2480	99.79	95.15	4.64			147	7	Peak
2483.56	40.67	36.01	4.66	54	-13.33	147	7	Average
2483.56	52.09	47.43	4.66	74	-21.91	147	7	Peak
4960	42.74	32.38	10.36	54	-11.26	165	55	Average
4960	47.93	37.57	10.36	74	-26.07	165	55	Peak

Remarks:

- Emission Level = Read Level + Factor
Margin value = Emission level – Limit value
- 2480 MHz: Fundamental frequency.
- The emission levels of other frequencies were very low against the limit.

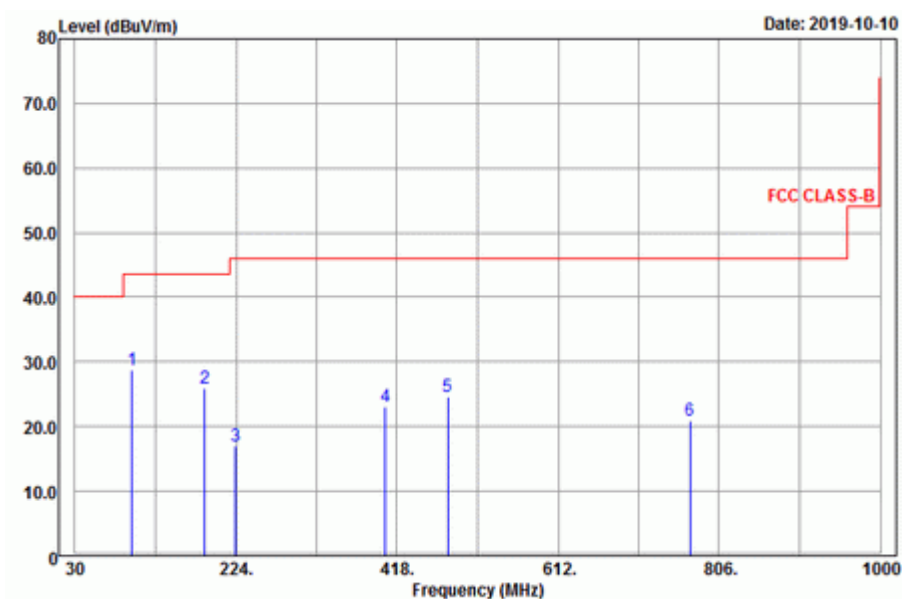
9 kHz ~ 30 MHz Data:

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

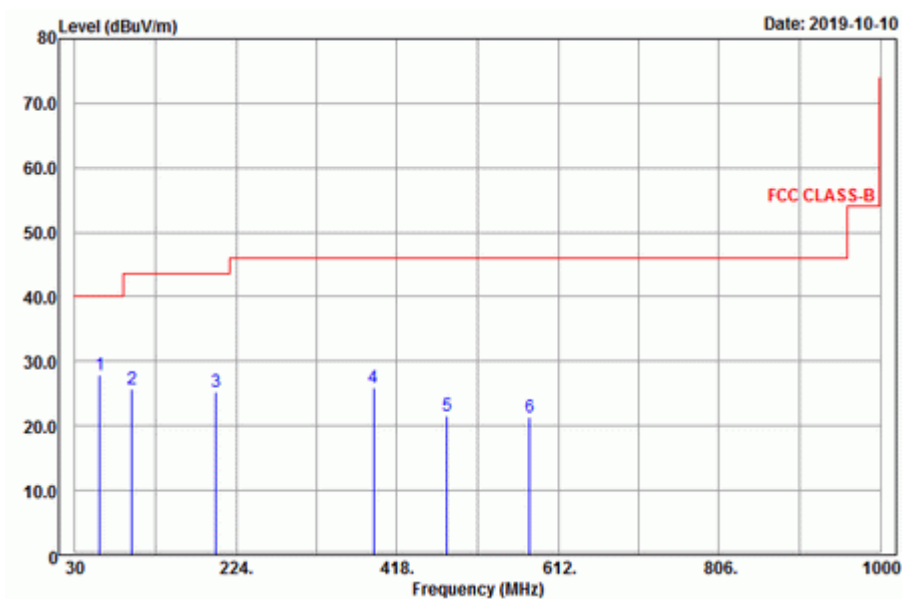
30 MHz ~ 1 GHz Worst-Case Data:

EUT Test Condition		Measurement Detail	
Channel	Channel 78	Frequency Range	30 MHz ~ 1 GHz
Input Power	120 Vac, 60 Hz	Detector Function	Peak (PK) Quasi-peak (QP)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Charles Hsiao

Horizontal



Vertical



Antenna Polarity & Test Distance: Horizontal at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
98.58	28.87	46.2	-17.33	43.5	-14.63	159	198	Peak
186.33	25.89	44.96	-19.07	43.5	-17.61	164	156	Peak
223.59	17.02	34.68	-17.66	46	-28.98	100	144	Peak
404.3	23.07	36.92	-13.85	46	-22.93	180	240	Peak
479.2	24.56	37.28	-12.72	46	-21.44	156	255	Peak
771.1	21.02	29.26	-8.24	46	-24.98	171	124	Peak
Antenna Polarity & Test Distance: Vertical at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
60.24	27.93	44.07	-16.14	40	-12.07	160	255	Peak
99.12	25.75	43.08	-17.33	43.5	-17.75	187	199	Peak
199.56	25.21	43.46	-18.25	43.5	-18.29	105	110	Peak
389.6	25.89	39.99	-14.1	46	-20.11	164	256	Peak
478.5	21.48	34.22	-12.74	46	-24.52	180	156	Peak
577.9	21.42	32.4	-10.98	46	-24.58	164	44	Peak

Remarks:

- Emission Level = Read Level + Factor
Margin value = Emission level – Limit value
- The emission levels of other frequencies 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	Dec. 10, 2018	Dec. 09, 2019
RF signal cable Woken	5D-FB	Cable-cond1-01	Sep. 05, 2019	Sep. 04, 2020
LISN ROHDE & SCHWARZ (EUT)	ENV216	101826	Feb. 21, 2019	Feb. 20, 2020
LISN ROHDE & SCHWARZ (Peripheral)	ESH3-Z5	100311	Aug. 22, 2019	Aug. 21, 2020
Software ADT	BV ADT_Cond_ V7.3.7.4	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-12040.

4.2.3 Test Procedures

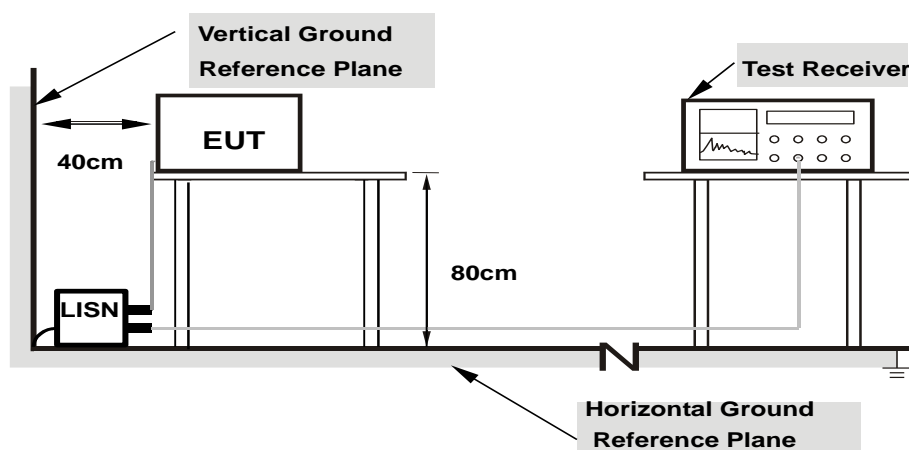
- The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50 uH of coupling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

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

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 cm 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

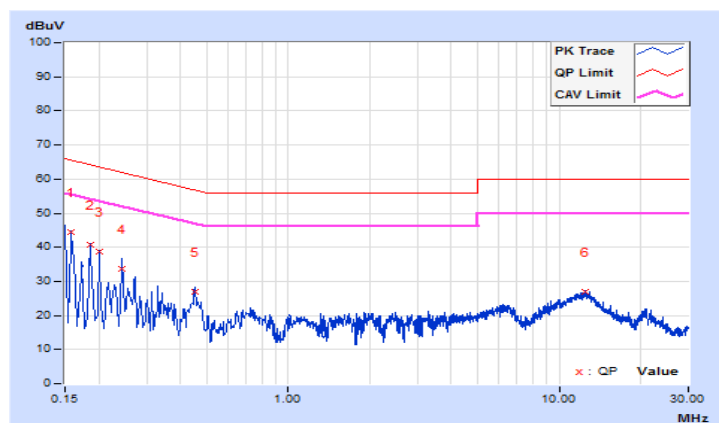
CONDUCTED WORST-CASE DATA : 8DPSK

Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	120Vac, 60Hz	Environmental Conditions	25°C, 65%RH
Tested by	Jisyong Wang	Test Date	2019/10/13

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	0.15802	9.67	34.71	17.20	44.38	26.87	65.57	55.57	-21.19	-28.70
2	0.18519	9.66	31.01	15.33	40.67	24.99	64.25	54.25	-23.58	-29.26
3	0.20084	9.66	28.98	14.37	38.64	24.03	63.58	53.58	-24.94	-29.55
4	0.24384	9.67	24.07	9.35	33.74	19.02	61.96	51.96	-28.22	-32.94
5	0.45498	9.69	17.36	1.60	27.05	11.29	56.78	46.78	-29.73	-35.49
6	12.50560	9.95	17.00	1.45	26.95	11.40	60.00	50.00	-33.05	-38.60

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

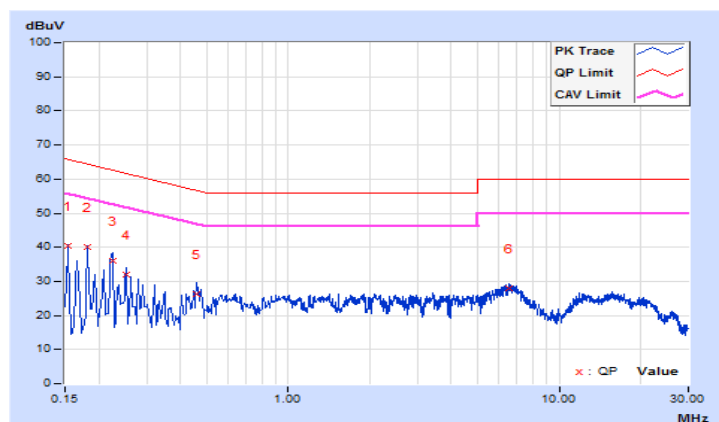


Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	120Vac, 60Hz	Environmental Conditions	25°C, 65%RH
Tested by	Jisyong Wang	Test Date	2019/10/13

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	0.15391	9.64	30.88	13.31	40.52	22.95	65.79	55.79	-25.27	-32.84
2	0.18122	9.64	30.53	15.76	40.17	25.40	64.43	54.43	-24.26	-29.03
3	0.22429	9.64	26.29	13.65	35.93	23.29	62.66	52.66	-26.73	-29.37
4	0.25166	9.65	22.47	3.41	32.12	13.06	61.70	51.70	-29.58	-38.64
5	0.45889	9.66	16.44	1.61	26.10	11.27	56.71	46.71	-30.61	-35.44
6	6.56240	9.85	17.99	1.70	27.84	11.55	60.00	50.00	-32.16	-38.45

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

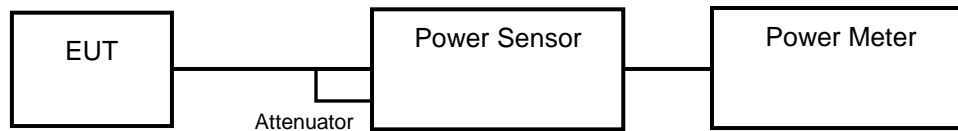


4.3 Maximum Output Power

4.3.1 Limits of Maximum Output Power Measurement

Refer to Regulation 15.247 (a)(1), the Maximum Output Power Measurement is 125 mW.

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 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.

4.3.5 Deviation from Test Standard

No deviation.

4.3.6 EUT Operating Condition

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

4.3.7 Test Results

<GFSK>

Channel	Freq. (MHz)	Peak Power (mW)	Peak Power (dBm)	Power Limit (mW)	Pass / Fail
0	2402	12.503	10.97	125	Pass
39	2441	12.56	10.99	125	Pass
78	2480	12.162	10.85	125	Pass

<8DPSK>

Channel	Freq. (MHz)	Peak Power (mW)	Peak Power (dBm)	Power Limit (mW)	Pass / Fail
0	2402	13.274	11.23	125	Pass
39	2441	13.996	11.46	125	Pass
78	2480	13.092	11.17	125	Pass

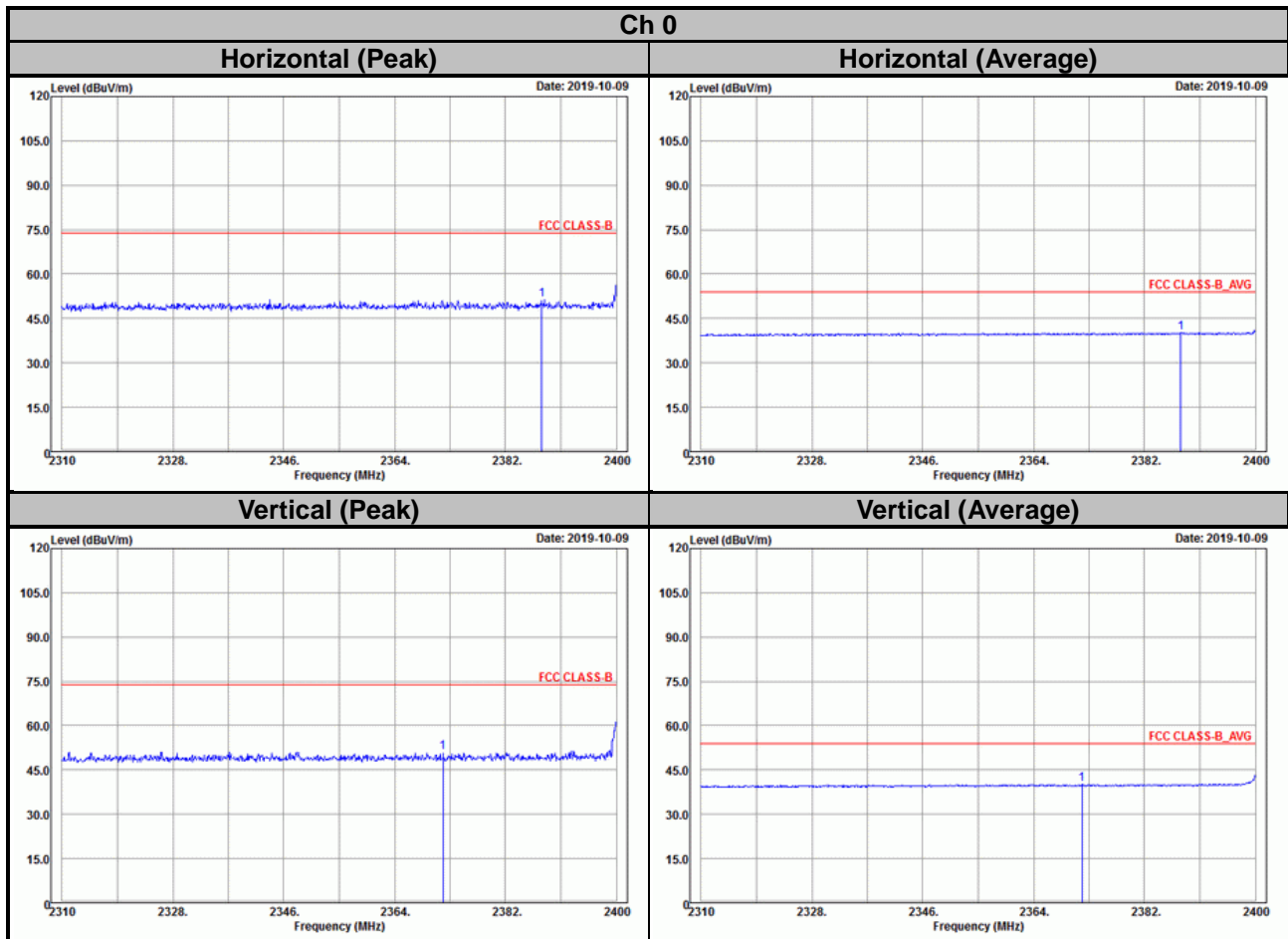
5 Pictures of Test Arrangements

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

Annex A- Band-edge measurement

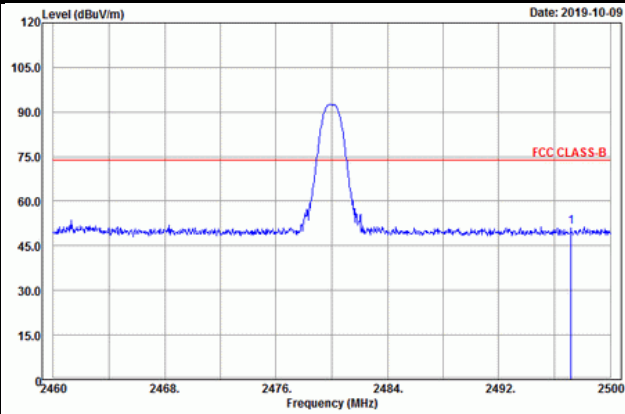
<Bluetooth EDR>

GFSK

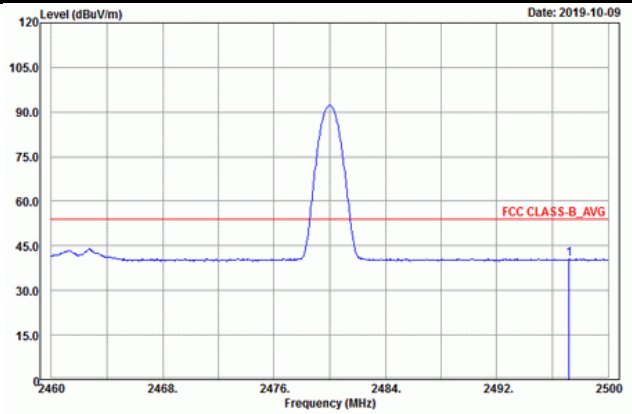


Ch 78

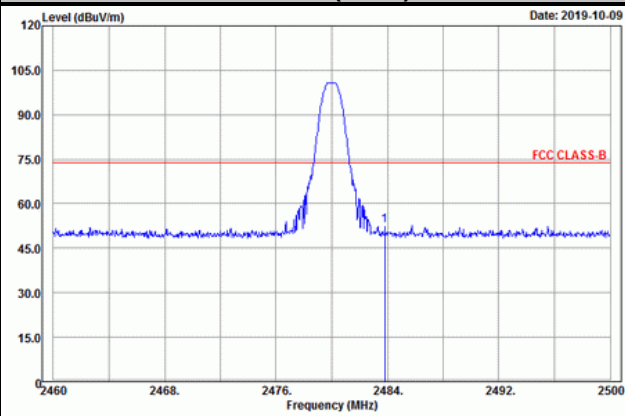
Horizontal (Peak)



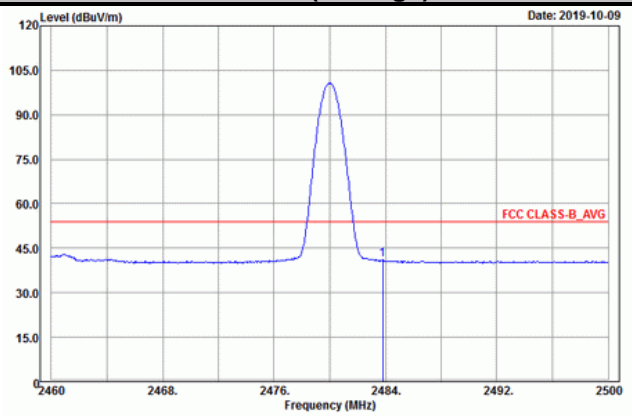
Horizontal (Average)



Vertical (Peak)



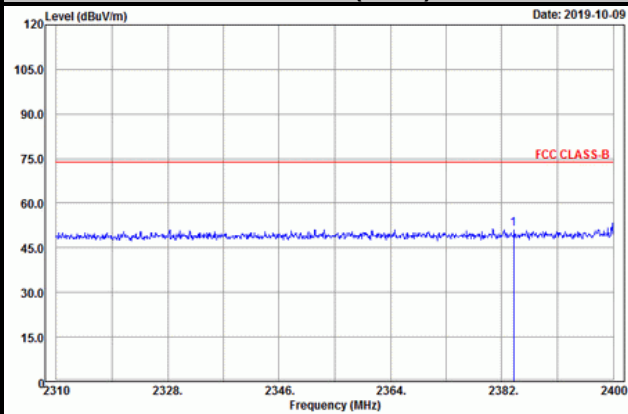
Vertical (Average)



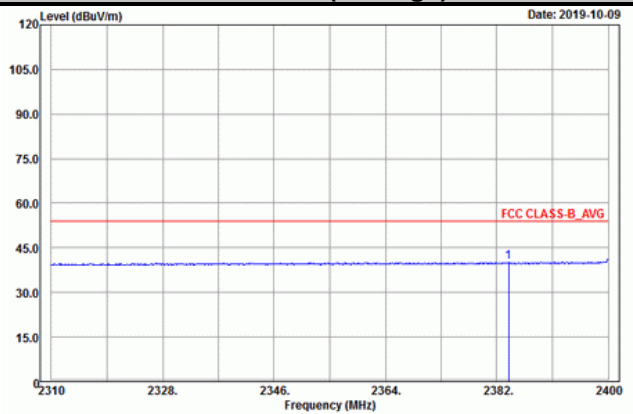
8DPSK

Ch 0

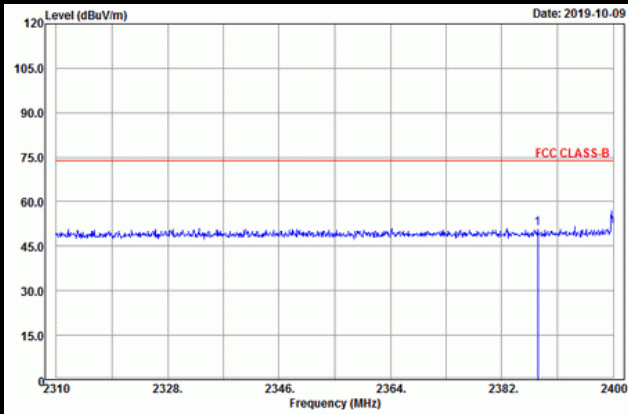
Horizontal (Peak)



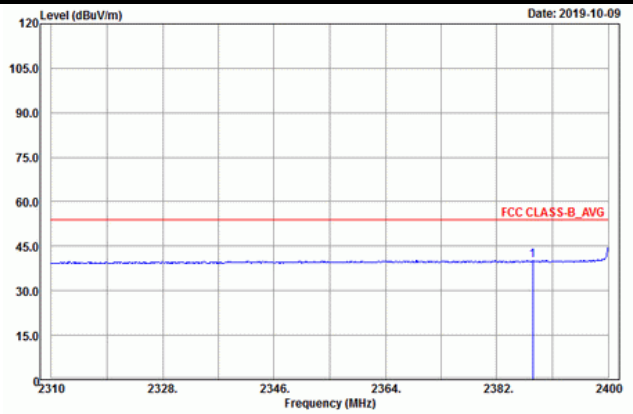
Horizontal (Average)



Vertical (Peak)

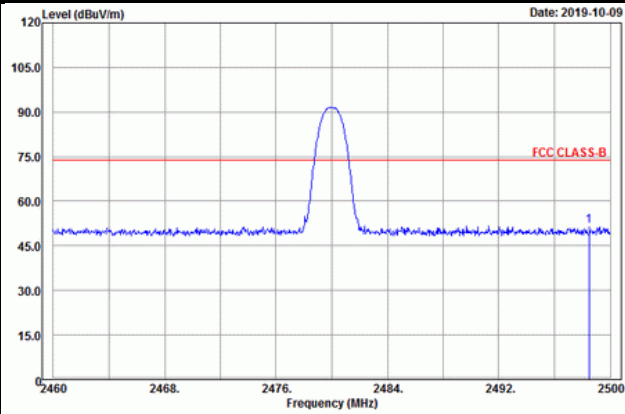


Vertical (Average)

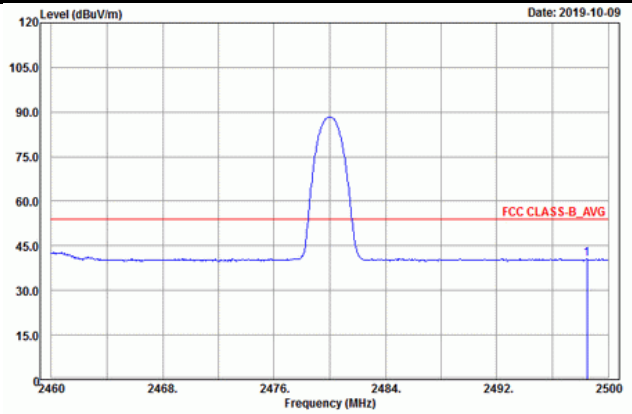


Ch 78

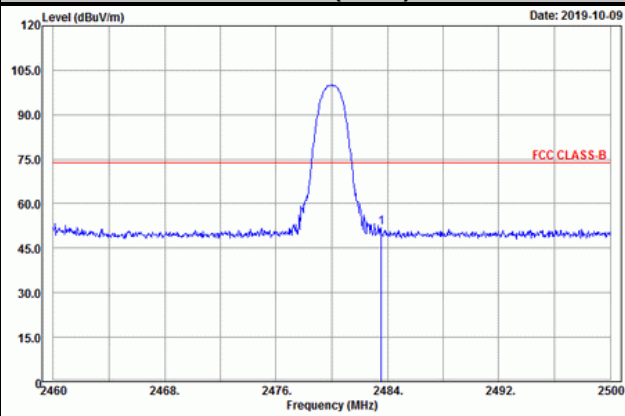
Horizontal (Peak)



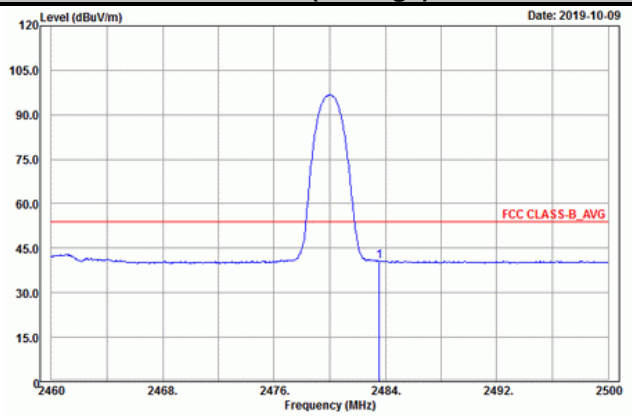
Horizontal (Average)



Vertical (Peak)



Vertical (Average)



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.

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

Lin Kou EMC/RF Lab

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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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