

FCC Test Report (BT-EDR)

Report No.: RF160819E01H-1

FCC ID: COF-WMBNBM26A

Test Model: WM-BN-BM-26_A_FF5

Series Model: WM-BN-BM-26_A, WM-BN-BM-26_A_FF2, WM-BN-BM-26_A_FF3,
WM-BN-BM-26_A_FF4

Received Date: Nov. 21, 2019

Test Date: Nov. 30, 2019

Issued Date: Dec. 20, 2019

Applicant: UNIVERSAL GLOBAL SCIENTIFIC INDUSTRIAL CO., LTD.

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Issued By: Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch
Hsin Chu Laboratory

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Taiwan

Test Location: E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300,
Taiwan

FCC Registration / 723255 / TW2022

Designation Number:



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Release Control Record

Issue No.	Description	Date Issued
RF160819E01H-1	Original release.	Dec. 20, 2019

1 Certificate of Conformity

Product: 802.11b/g/n + BT Wireless LAN Module

Brand: USI

Test Model: WM-BN-BM-26_A_FF5

Series Model: WM-BN-BM-26_A, WM-BN-BM-26_A_FF2, WM-BN-BM-26_A_FF3,
WM-BN-BM-26_A_FF4

Sample Status: ENGINEERING SAMPLE

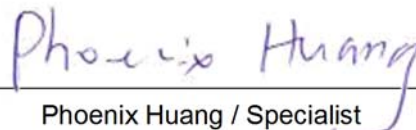
Applicant: UNIVERSAL GLOBAL SCIENTIFIC INDUSTRIAL CO., LTD.

Test Date: Nov. 30, 2019

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 EMC characteristics under the conditions specified in this report.

Prepared by :


Phoenix Huang / Specialist

Date:

Dec. 20, 2019

Approved by :



Clark Lin / Technical Manager

Date:

Dec. 20, 2019

2 Summary of Test Results

47 CFR FCC Part 15, Subpart C (SECTION 15.247)			
FCC Clause	Test Item	Result	Remarks
15.247(b)	Maximum Peak Output Power	PASS	Meet the requirement of limit.
15.205 & 209 & 15.247(d)	Radiated Emissions & Band Edge Measurement	PASS	Meet the requirement of limit. Minimum passing margin is -3.1 dB at 240.23 MHz.
15.203	Antenna Requirement	PASS	No antenna connector is used.

Note:

- 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)
Radiated Emissions up to 1 GHz	9kHz ~ 30MHz	3.0 dB
	30MHz ~ 1GHz	4.9 dB
Radiated Emissions above 1 GHz	1GHz ~ 6GHz	5.1 dB
	6GHz ~ 18GHz	4.9 dB
	18GHz ~ 40GHz	5.2 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT (BT-EDR)

Product	802.11b/g/n + BT Wireless LAN Module
Brand	USI
Test Model	WM-BN-BM-26_A_FF5
Series Model	WM-BN-BM-26_A, WM-BN-BM-26_A_FF2, WM-BN-BM-26_A_FF3, WM-BN-BM-26_A_FF4
Status of EUT	ENGINEERING SAMPLE
Power Supply Rating	3.6Vdc from host equipment
Modulation Type	GFSK, $\pi/4$ -DQPSK, 8DPSK
Modulation Technology	FHSS
Transfer Rate	Up to 3Mbps
Operating Frequency	2.402 ~ 2.480 GHz
Number of Channel	79
Output Power	5.495 mW
Antenna Type	Refer to Note
Antenna Connector	Refer to Note
Accessory Device	NA
Data Cable Supplied	NA

Note:

1. This report is prepared for FCC class II permissive change. The difference compared with the Report No.: RF160819E01G-1 as the following:

- ◆ Added the one new model name to changed the RF matching and layout is same as following table:

Original		
Brand	Model	Difference
USI	WM-BN-BM-26_A	-
	WM-BN-BM-26_A_FF2	1. R30 capacitor 1.8pF change to 2.7pF belongs to part of antenna matching circuit. 2. C46 inductor remove.
	WM-BN-BM-26_A_FF3	1. R30 resistor 0 Ohm change to 3.3nH inductor belongs to part of antenna matching circuit. 2. Add 27pF capacitor on C172.
	WM-BN-BM-26_A_FF4	1. C172 change to Open. 2. R30's Capacitor change to 2.2pF. 3. C46's Inductor change to 1.0nH.
Newly		
Brand	Model	Difference
USI	WM-BN-BM-26_A_FF5	1. R30's Capacitor change to 3.3pF. 2. C46's Inductor change to 1.5nH.

From the above models, new model: WM-BN-BM-26_A_FF5 was selected as representative model for the test and its data was recorded in this report.

2. According to above conditions, only Conducted power and Radiated Emissions need to be performed. And all data were verified to meet the requirements.
3. There are WLAN, BT technology used for the EUT.

4. The antenna provided to the EUT, please refer to the following table:

Brand	Model	Antenna Net Gain(dBi)	Frequency range (GHz to GHz)	Antenna Type	Connector Type
YAGEO	ANT3216LL11R2400A	3.68	2.4~2.4835	Chip	NA

5. WLAN and BT technology cannot transmit at same time.

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

3.2 Description of Test Modes

79 channels are provided for BT-EDR mode:

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

3.2.1 Test Mode Applicability and Tested Channel Detail

EUT CONFIGURE MODE	APPLICABLE TO			DESCRIPTION
	RE \geq 1G	RE<1G	APCM	
-	√	√	√	-

Where **RE \geq 1G**: Radiated Emission above 1GHz

RE<1G: Radiated Emission below 1GHz

PLC: Power Line Conducted Emission

APCM: Antenna Port Conducted Measurement

Note: In the original report, 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 1GHz):

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

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 1GHz):

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

AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	PACKET TYPE
0 to 78	78	FHSS	8DPSK	3DH5

Antenna Port Conducted Measurement:

- ☒ 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.

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:

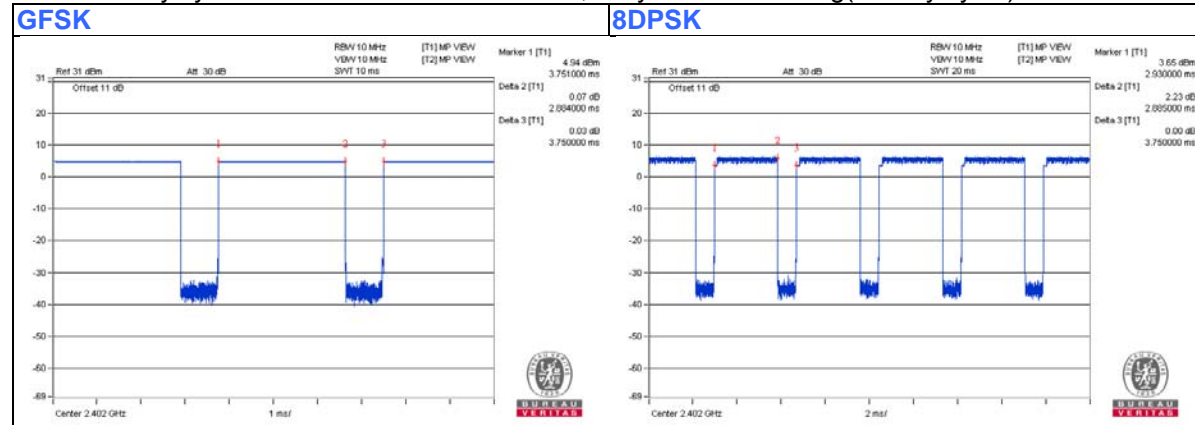
APPLICABLE TO	ENVIRONMENTAL CONDITIONS	INPUT POWER (SYSTEM)	TESTED BY
RE\geq1G	25deg. C, 65%RH	120Vac, 60Hz	Jeff Lee
RE<1G	25deg. C, 65%RH	120Vac, 60Hz	Jeff Lee
APCM	25deg. C, 60%RH	120Vac, 60Hz	Jeff Lee

3.3 Duty Cycle of Test Signal

Duty cycle of test signal is < 98 %, duty factor shall be considered.

GFSK: Duty cycle = 2.884 ms/3.75 ms = 0.769, Duty factor = $10 * \log(1/\text{Duty cycle}) = 1.14$

8DPSK: Duty cycle = 2.885 ms/3.75 ms = 0.769, Duty factor = $10 * \log(1/\text{Duty cycle}) = 1.14$



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.

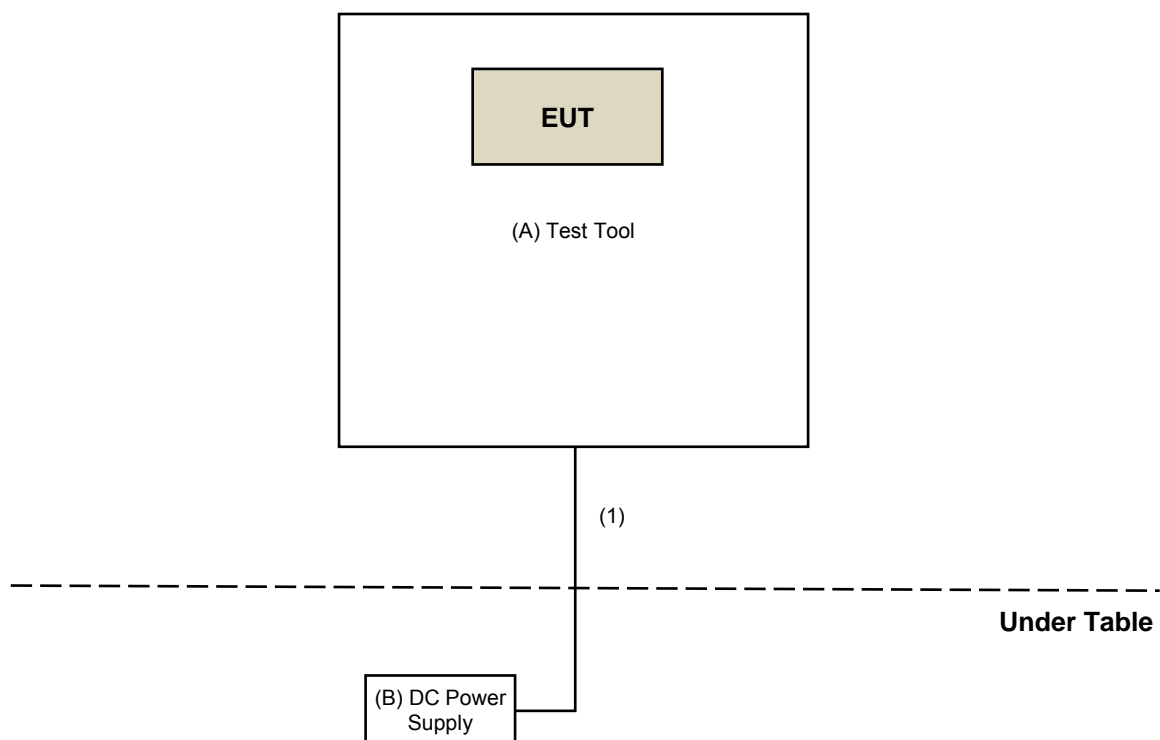
ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	Test Tool	USI	WM-BN-BM-26_A _EVB TDK V1.1	NA	NA	Supplied by client
B.	DC Power Supply	Topward	6603D	795558	NA	Provided by Lab

Note:

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

ID	Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	DC Cable	1	2.5	No	0	Supplied by client

3.4.1 Configuration of System under Test



3.5 General Description of Applied Standards and References

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

Test standard:

FCC Part 15, Subpart C (15.247)

ANSI C63.10-2013

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

References Test Guidance:

KDB 558074 D01 15.247 Meas Guidance v05r02

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

4 Test Types and Results

4.1 Radiated Emission and Bandedge Measurement

4.1.1 Limits of Radiated Emission and Bandedge Measurement

Radiated emissions which fall in the restricted bands must comply with the radiated emission limits specified as below table. Other emissions shall be at least 20dB below the highest level of the desired power:

Frequencies (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 ~ 0.490	2400/F(kHz)	300
0.490 ~ 1.705	24000/F(kHz)	30
1.705 ~ 30.0	30	30
30 ~ 88	100	3
88 ~ 216	150	3
216 ~ 960	200	3
Above 960	500	3

Note:

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
3. For frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20dB under any condition of modulation.

4.1.2 Test Instruments

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Test Receiver ESR7 R&S	ESR7	102026	Apr. 24, 2019	Apr. 23, 2020
Spectrum Analyzer Keysight	N9030B	MY57141948	May 25, 2019	May 24, 2020
Pre-Amplifier EMCI	EMC001340	980142	May 30, 2019	May 29, 2020
Loop Antenna Electro-Metrics	EM-6879	264	Jan. 22, 2019	Jan. 21, 2020
RF Cable	NA	LOOPCAB-001	Jan. 14, 2019	Jan. 13, 2020
RF Cable	NA	LOOPCAB-002	Jan. 14, 2019	Jan. 13, 2020
Pre-Amplifier EMCI	EMC330N	980538	Apr. 30, 2019	Apr. 29, 2020
Trilog Broadband Antenna SCHWARZBECK	VULB9168	9168-0842	Nov. 08, 2019	Nov. 07, 2020
RF Cable	8D	966-5-1	May 03, 2019	May 02, 2020
RF Cable	8D	966-5-2	May 03, 2019	May 02, 2020
RF Cable	8D	966-5-3	May 03, 2019	May 02, 2020
Fixed attenuator Mini-Circuits	UNAT-5+	PAD-ATT5-02	Jan. 28, 2019	Jan. 27, 2020
Horn Antenna SCHWARZBECK	BBHA 9120D	9120D-1819	Nov. 24, 2019	Nov. 23, 2020
Pre-Amplifier EMCI	EMC12630SE	980509	May 03, 2019	May 02, 2020
RF Cable EMCI	EMC104-SM-SM-1500	180503	May 03, 2019	May 02, 2020
RF Cable EMCI	EMC104-SM-SM-2000	180501	May 03, 2019	May 02, 2020
RF Cable EMCI	EMC104-SM-SM-6000	180505	May 03, 2019	May 02, 2020
Pre-Amplifier EMCI	EMC184045SE	980387	Jan. 28, 2019	Jan. 27, 2020
Horn Antenna SCHWARZBECK	BBHA 9170	BBHA9170519	Nov. 24, 2019	Nov. 23, 2020
RF Cable	EMC102-KM-KM-1200	160924	Jan. 28, 2019	Jan. 27, 2020
RF Cable	EMC102-KM-KM-1200	160925	Jan. 28, 2019	Jan. 27, 2020
Software	ADT_Radiated_V8.7.08	NA	NA	NA
Boresight Antenna Tower & Turn Table Max-Full	MF-7802BS	MF780208530	NA	NA
Spectrum Analyzer R&S	FSV40	100964	June 04, 2019	June 03, 2020
Power meter Anritsu	ML2495A	1014008	May 13, 2019	May 12, 2020
Power sensor Anritsu	MA2411B	0917122	May 13, 2019	May 12, 2020
Fixed Attenuator Mini-Circuits	MDCS18N-10	MDCS18N-10-01	Apr. 15, 2019	Apr. 14, 2020

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 966 Chamber No. 5.
3. Loop antenna was used for all emissions below 30 MHz.
4. Tested Date: Nov. 30, 2019

4.1.3 Test Procedures

For Radiated emission below 30MHz

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. Parallel, perpendicular, and ground-parallel orientations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to Quasi-Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

Note:

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

For Radiated emission above 30MHz

- a. The EUT was placed on the top of a rotating table 0.8 meters (for 30MHz ~ 1GHz) / 1.5 meters (for above 1GHz) above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.
- f. The test-receiver system was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

Note:

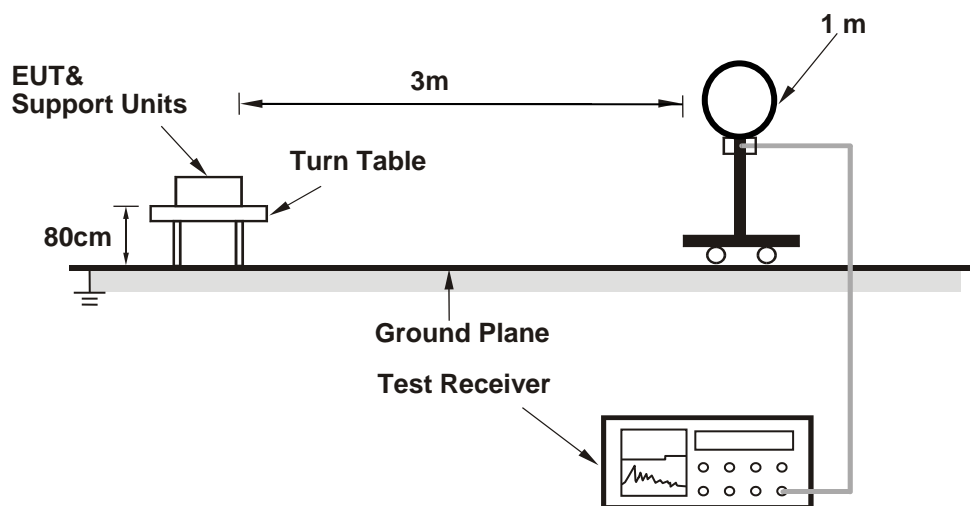
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.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

4.1.4 Deviation from Test Standard

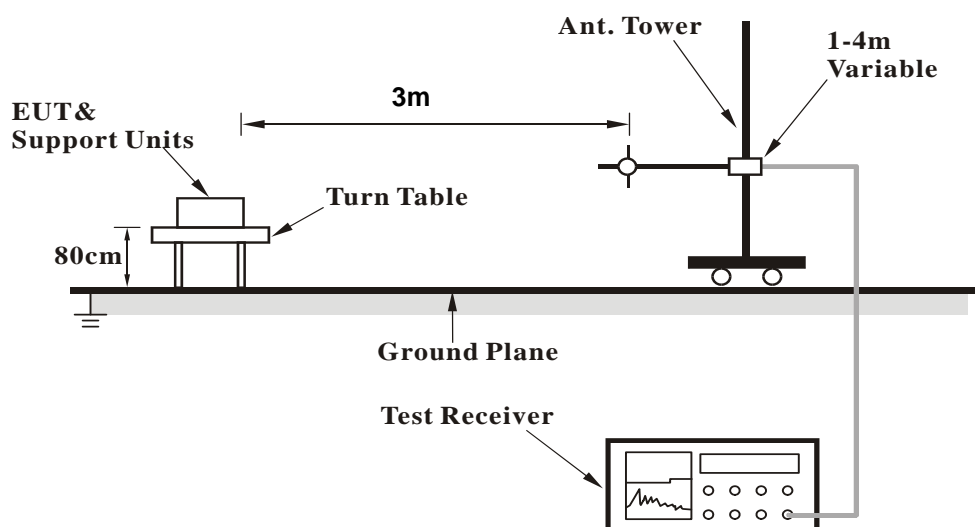
No deviation.

4.1.5 Test Setup

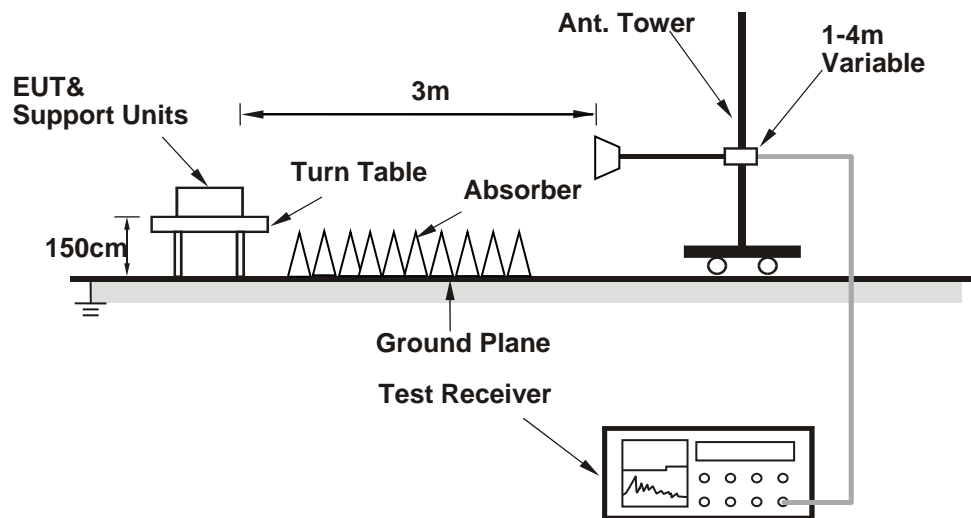
For Radiated emission below 30MHz



For Radiated emission 30MHz to 1GHz



For Radiated emission above 1GHz



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

4.1.6 EUT Operating Conditions

- Placed the EUT on the testing table.
- Controlling software (sh use Test scripts.sh) has been activated to set the EUT under transmission condition continuously at specific channel frequency.

4.1.7 Test Results

Above 1GHz Data:

BT_GFSK

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	55.3 PK	74.0	-18.7	2.29 H	355	58.4	-3.1
2	2390.00	43.6 AV	54.0	-10.4	2.29 H	355	46.7	-3.1
3	*2402.00	97.6 PK			2.29 H	355	100.7	-3.1
4	*2402.00	97.1 AV			2.29 H	355	100.2	-3.1
5	4804.00	38.0 PK	74.0	-36.0	3.00 H	283	36.8	1.2
6	4804.00	25.2 AV	54.0	-28.8	3.00 H	283	24.0	1.2
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	56.1 PK	74.0	-17.9	3.75 V	54	59.2	-3.1
2	2390.00	42.5 AV	54.0	-11.5	3.75 V	54	45.6	-3.1
3	*2402.00	93.5 PK			3.75 V	54	96.6	-3.1
4	*2402.00	93.2 AV			3.75 V	54	96.3	-3.1
5	4804.00	39.3 PK	74.0	-34.7	3.26 V	48	38.1	1.2
6	4804.00	25.9 AV	54.0	-28.1	3.26 V	48	24.7	1.2

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " * ": Fundamental frequency.

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2441.00	99.6 PK			2.57 H	356	102.7	-3.1
2	*2441.00	99.2 AV			2.57 H	356	102.3	-3.1
3	4882.00	38.7 PK	74.0	-35.3	3.05 H	259	37.6	1.1
4	4882.00	25.8 AV	54.0	-28.2	3.05 H	259	24.7	1.1
5	7323.00	44.3 PK	74.0	-29.7	2.59 H	35	37.0	7.3
6	7323.00	32.1 AV	54.0	-21.9	2.59 H	35	24.8	7.3
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2441.00	95.4 PK			3.74 V	63	98.5	-3.1
2	*2441.00	95.1 AV			3.74 V	63	98.2	-3.1
3	4882.00	39.1 PK	74.0	-34.9	3.32 V	40	38.0	1.1
4	4882.00	26.1 AV	54.0	-27.9	3.32 V	40	25.0	1.1
5	7323.00	43.7 PK	74.0	-30.3	1.85 V	234	36.4	7.3
6	7323.00	31.9 AV	54.0	-22.1	1.85 V	234	24.6	7.3

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " * ": Fundamental frequency.

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2480.00	101.4 PK			1.22 H	351	104.5	-3.1
2	*2480.00	101.0 AV			1.22 H	351	104.1	-3.1
3	2483.50	56.1 PK	74.0	-17.9	1.22 H	351	59.2	-3.1
4	2483.50	43.0 AV	54.0	-11.0	1.22 H	351	46.1	-3.1
5	4960.00	38.6 PK	74.0	-35.4	3.09 H	274	37.3	1.3
6	4960.00	26.0 AV	54.0	-28.0	3.09 H	274	24.7	1.3
7	7440.00	44.8 PK	74.0	-29.2	2.64 H	24	37.4	7.4
8	7440.00	32.3 AV	54.0	-21.7	2.64 H	24	24.9	7.4
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2480.00	97.3 PK			3.78 V	58	100.4	-3.1
2	*2480.00	96.9 AV			3.78 V	58	100.0	-3.1
3	2483.50	56.0 PK	74.0	-18.0	3.78 V	58	59.1	-3.1
4	2483.50	43.0 AV	54.0	-11.0	3.78 V	58	46.1	-3.1
5	4960.00	39.4 PK	74.0	-34.6	3.27 V	37	38.1	1.3
6	4960.00	26.3 AV	54.0	-27.7	3.27 V	37	25.0	1.3
7	7440.00	43.6 PK	74.0	-30.4	1.84 V	223	36.2	7.4
8	7440.00	31.9 AV	54.0	-22.1	1.84 V	223	24.5	7.4

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " * ": Fundamental frequency.

BT_8DPSK

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	56.4 PK	74.0	-17.6	2.63 H	357	59.5	-3.1
2	2390.00	43.8 AV	54.0	-10.2	2.63 H	357	46.9	-3.1
3	*2402.00	99.4 PK			2.63 H	357	102.5	-3.1
4	*2402.00	95.5 AV			2.63 H	357	98.6	-3.1
5	4804.00	38.6 PK	74.0	-35.4	3.00 H	266	37.4	1.2
6	4804.00	25.6 AV	54.0	-28.4	3.00 H	266	24.4	1.2
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	56.4 PK	74.0	-17.6	3.82 V	66	59.5	-3.1
2	2390.00	42.9 AV	54.0	-11.1	3.82 V	66	46.0	-3.1
3	*2402.00	95.4 PK			3.82 V	66	98.5	-3.1
4	*2402.00	91.7 AV			3.82 V	66	94.8	-3.1
5	4804.00	39.2 PK	74.0	-34.8	3.27 V	39	38.0	1.2
6	4804.00	26.2 AV	54.0	-27.8	3.27 V	39	25.0	1.2

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " * ": Fundamental frequency.

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2441.00	102.4 PK			2.55 H	356	105.5	-3.1
2	*2441.00	98.4 AV			2.55 H	356	101.5	-3.1
3	4882.00	38.9 PK	74.0	-35.1	3.07 H	270	37.8	1.1
4	4882.00	26.4 AV	54.0	-27.6	3.07 H	270	25.3	1.1
5	7323.00	45.0 PK	74.0	-29.0	2.60 H	30	37.7	7.3
6	7323.00	32.6 AV	54.0	-21.4	2.60 H	30	25.3	7.3
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2441.00	98.1 PK			3.79 V	65	101.2	-3.1
2	*2441.00	93.9 AV			3.79 V	65	97.0	-3.1
3	4882.00	39.5 PK	74.0	-34.5	3.24 V	40	38.4	1.1
4	4882.00	26.5 AV	54.0	-27.5	3.24 V	40	25.4	1.1
5	7323.00	43.9 PK	74.0	-30.1	1.86 V	238	36.6	7.3
6	7323.00	32.2 AV	54.0	-21.8	1.86 V	238	24.9	7.3

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " * ": Fundamental frequency.

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2480.00	104.1 PK			1.87 H	36	107.2	-3.1
2	*2480.00	100.3 AV			1.87 H	36	103.4	-3.1
3	2483.50	56.2 PK	74.0	-17.8	1.87 H	36	59.3	-3.1
4	2483.50	43.1 AV	54.0	-10.9	1.87 H	36	46.2	-3.1
5	4960.00	38.4 PK	74.0	-35.6	3.06 H	271	37.1	1.3
6	4960.00	25.5 AV	54.0	-28.5	3.06 H	271	24.2	1.3
7	7440.00	44.9 PK	74.0	-29.1	2.63 H	27	37.5	7.4
8	7440.00	32.3 AV	54.0	-21.7	2.63 H	27	24.9	7.4
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2480.00	100.0 PK			3.85 V	58	103.1	-3.1
2	*2480.00	96.2 AV			3.85 V	58	99.3	-3.1
3	2483.50	56.0 PK	74.0	-18.0	3.85 V	58	59.1	-3.1
4	2483.50	42.8 AV	54.0	-11.2	3.85 V	58	45.9	-3.1
5	4960.00	39.0 PK	74.0	-35.0	3.23 V	46	37.7	1.3
6	4960.00	25.9 AV	54.0	-28.1	3.23 V	46	24.6	1.3
7	7440.00	43.5 PK	74.0	-30.5	1.80 V	219	36.1	7.4
8	7440.00	31.7 AV	54.0	-22.3	1.80 V	219	24.3	7.4

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " * ": Fundamental frequency.

Below 1GHz Data:

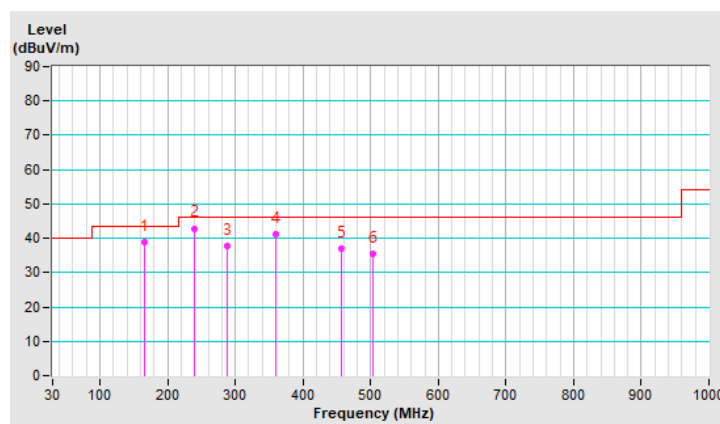
BT_8DPSK

CHANNEL	TX Channel 78	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	9kHz ~ 1GHz		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	166.38	38.9 QP	43.5	-4.6	2.50 H	94	51.9	-13.0
2	240.23	42.9 QP	46.0	-3.1	1.75 H	99	57.2	-14.3
3	288.22	37.6 QP	46.0	-8.4	1.50 H	217	50.1	-12.5
4	360.23	41.0 QP	46.0	-5.0	1.50 H	93	51.7	-10.7
5	456.25	37.1 QP	46.0	-8.9	1.25 H	154	45.1	-8.0
6	504.16	35.4 QP	46.0	-10.6	2.50 H	204	42.7	-7.3

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit of frequency range 30MHz~1000MHz.
5. The emission levels were very low against the limit of frequency range 9kHz~30MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.

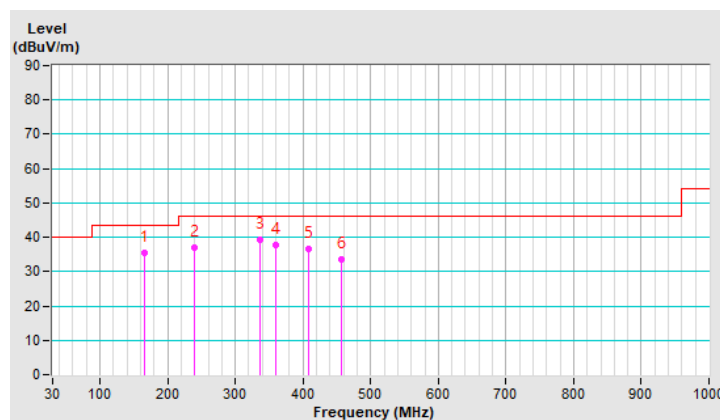


CHANNEL	TX Channel 78	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	9kHz ~ 1GHz		

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	166.71	35.4 QP	43.5	-8.1	1.50 V	18	48.5	-13.1
2	240.17	36.9 QP	46.0	-9.1	1.50 V	126	51.2	-14.3
3	336.15	39.1 QP	46.0	-6.9	1.50 V	19	50.2	-11.1
4	360.21	37.6 QP	46.0	-8.4	1.50 V	238	48.3	-10.7
5	408.21	36.4 QP	46.0	-9.6	1.25 V	132	46.0	-9.6
6	456.23	33.7 QP	46.0	-12.3	2.00 V	194	41.7	-8.0

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit of frequency range 30MHz~1000MHz.
5. The emission levels were very low against the limit of frequency range 9kHz~30MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.

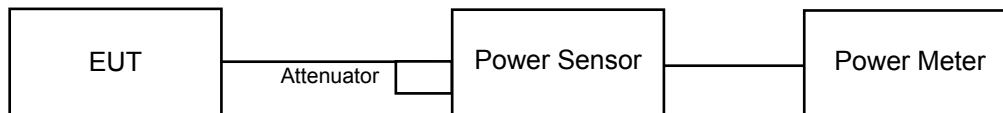


4.2 Maximum Output Power

4.2.1 Limits of Maximum Output Power Measurement

The Maximum Output Power Measurement is 125 mW.

4.2.2 Test Setup



4.2.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.2.4 Test Procedure

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

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

4.2.5 Deviation from Test Standard

No deviation.

4.2.6 EUT Operating Condition

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

4.2.7 Test Results

FOR PEAK POWER

Channel	Frequency (MHz)	GFSK		8DPSK		Power Limit (mW)	Pass / Fail
		Output Power (mW)	Output Power (dBm)	Output Power (mW)	Output Power (dBm)		
0	2402	1.866	2.71	4.624	6.65	125	Pass
39	2441	1.986	2.98	5.495	7.40	125	Pass
78	2480	1.854	2.68	5.483	7.39	125	Pass

FOR AVERAGE POWER

Channel	Frequency (MHz)	GFSK		8DPSK	
		Average Power (mW)	Average Power (dBm)	Average Power (mW)	Average Power (dBm)
0	2402	1.854	2.68	2.812	4.49
39	2441	1.936	2.87	3.034	4.82
78	2480	1.82	2.60	3.076	4.88

5 Pictures of Test Arrangements

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

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:

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Web Site: www.bureauveritas-adt.com

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

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