FCC Test Report (BT-EDR)

Report No.:	RF140605E01L-2 R1
FCC ID:	TLZ-CB178NF
Test Model:	AW-CB178NF, AW-CB178NF(UART)
Series Model:	AW-CB178NF-ZP
Received Date:	June 19, 2017
Test Date:	July 17 to 18, 2017
Issued Date:	Aug. 01, 2017
Applicant:	AzureWave Technologies, Inc.
Address:	8F., No.94, Baozhong Rd. , Xindian Dist., New Taipei City , Taiwan 231
Issued By:	Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch Hsin Chu Laboratory
Lab Address:	E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300, Taiwan R.O.C.
Test Location (1):	E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300, Taiwan R.O.C.
Test Location (2):	No. 49, Ln. 206, Wende Rd., Shangshan Tsuen, Chiung Lin Hsiang, Hsin Chu Hsien 307, Taiwan R.O.C.

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Release Control Record

Issue No.	Description	Date Issued
RF140605E01L-2	Original release.	July 25, 2017
RF140605E01L-2 R1	Revised the model name of Set 6 Antenna	Aug. 01, 2017

1 Certificate of Conformity

Product:	802.11ac/a/b/g/n 2X2 MIMO WLAN & Bluetooth NGFF module
Brand:	AzureWave
Test Model:	AW-CB178NF, AW-CB178NF(UART)
Series Model:	AW-CB178NF-ZP
Sample Status:	ENGINEERING SAMPLE
Applicant:	AzureWave Technologies, Inc.
Test Date:	July 17 to 18, 2017
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 _____ , **Date:** Aug. 01, 2017

Wendy Wu / Specialist

Approved by : _____ , **Date:** Aug. 01, 2017

May Chen / Manager

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 -4.2dB at 42.42MHz.

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

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) (±)
Radiated Emissions up to 1 GHz	30MHz ~ 1GHz	5.32 dB
Radiated Emissions above 1 GHz	1GHz ~ 6GHz	5.14 dB
	6GHz ~ 18GHz	5.04 dB
	18GHz ~ 40GHz	5.25 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT (BT-EDR)

Product	802.11ac/a/b/g/n 2X2 MIMO WLAN & Bluetooth NGFF module
Brand	AzureWave
Test Model	AW-CB178NF, AW-CB178NF(UART)
Series Model	AW-CB178NF-ZP
Status of EUT	ENGINEERING SAMPLE
Power Supply Rating	3.3Vdc from host equipment
Modulation Type	GFSK, π/4-DQPSK, 8DPSK
Modulation Technology	FHSS
Transfer Rate	Up to 3Mbps
Operating Frequency	2402MHz ~ 2480MHz
Number of Channel	79
Output Power	12.474mW
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 change. The difference compared with the Report No.: RF140605E01D-2 design is as the following:

   ◆ Add two sets of new Dippole antennas (Set 5, Set 6) as below table:

Original Antenna

Set 1 Antenna

Transmitter Circuit	Brand	Model	Ant. Gain (dBi) < Excluding cable loss>	Cable Loss (dB)		Net. Gain (dBi)	Frequency range (MHz to MHz)	Ant. Type	Connecter Type	Cable Length (mm)
				100 mm	180 mm					
Chain (0)	Microsoft	2118433-1	2.18	1	0.54	0.64	2400~2484	PCB	R-SMA	100+180
			2.34	1.3	0.96	0.08	5150~5850			
Chain (1)	Microsoft	2118433-1	2.18	1	0.54	0.64	2400~2484	PCB	R-SMA	100+180
			2.34	1.3	0.96	0.08	5150~5850			

Set 2 Antenna

Transmitter Circuit	Brand	Model	Ant. Gain(dBi) <Including cable loss>	Frequency range (MHz to MHz)	Ant. Type	Connecter Type	Cable Length (mm)
Chain (0)	Walsin	RFPCA310715EML B301	3.06	2400~2500	PIFA	mini - ipex	150
			4.81	5150~5850			
Chain (1)	Walsin	RFPCA310715EML B301	3.06	2400~2500	PIFA	mini - ipex	150
			4.81	5150~5850			

Set 3 Antenna

Transmitter Circuit	Brand	Model	Ant. Gain(dBi) <Including cable loss>	Frequency range (MHz to MHz)	Ant. Type	Connecter Type	Cable Length (mm)
Chain (0)	Wistron NeWeb Corporation	81EAAX15.G12	1.02	2400~2484	PIFA	mini - ipex	254
			-1.03	5150~5850			
Chain (1)	Wistron NeWeb Corporation	81EAAX15.G12	1.02	2400~2484	PIFA	mini - ipex	563
			-1.03	5150~5850			

Set 4 Antenna										
Transmitter Circuit	Brand	Model	Antenna Gain(dBi) Including 1285mm cable loss Excluding 60mm cable loss	Cable Loss (dB)		Net. Gain (dBi)	Frequency range (MHz to MHz)	Ant. Type	Connecter Type	Cable Length (mm)
				1285 mm	60 mm					
Chain (0)	TE	2118406-3	0.38	NA	-0.35	0.03	2300~3800	PCB	R-SMA	1285 +60
			-0.18	NA	-0.73	-0.91	5150~5875			
Chain (1)	TE	2118406-3	0.38	NA	-0.35	0.03	2300~3800	PCB	R-SMA	1285 +60
			-0.18	NA	-0.73	-0.91	5150~5875			

Newly Antenna

Set 5 Antenna							
Transmitter Circuit	Brand	Model	Ant. Gain(dBi) <Including cable loss>	Frequency range (MHz to MHz)	Ant. Type	Connecter Type	Cable Length (mm)
Chain (0)	Ventev	Main Antenna: 593861-MWAS-2382-5.50	2.4	2400~2500	Dipole	N Plug	140 +/- 10
			3.55	4900~5825			
Chain (1)	Ventev	Aux Antenna:593861-MWAS-2382-9.00	2.4	2400~2500	Dipole	N Plug	230 +/- 10
			3.55	4900~5825			

Set 6 Antenna							
Transmitter Circuit	Brand	Model	Antenna Gain(dBi) Including Cable loss	Frequency range (MHz to MHz)	Ant. Type	Connecter Type	Cable Length (mm)
Chain (0)	Cortec	AN2450-74L02BRS+ SMASFR8-3200B-40X00I	1.5	2400~2500	Dipole	SMA Male Reverse/ SMA Female Reverse	200 +/- 3
			2.0	5150~5850			
Chain (1)	Cortec	AN2450-74L02BRS+ SMASFR8-3200B-40X00I	1.5	2400~2500	Dipole	SMA Male Reverse/ SMA Female Reverse	200 +/- 3
			2.0	5150~5850			

Note: 1. From the above 1TX configuration mode, the worst case was found in transmission circuit on Chain (1).
2. For BT mode will fix transmission on Chain (0).
3. From the above antenna sets, Set 1, Set 2 and Set 5 Antenna were selected as representative antenna for the test and its data was recorded in this report.

2. According to above conditions, only Output Power and Radiated Emissions test items of the newly antenna need to be performed. And all data was verified to meet the requirements.
3. The EUT has three model names, which are identical to each other in all aspects except for the following:

Brand	Model	Description
AzureWave	AW-CB178NF(UART)	With UART interface
	AW-CB178NF	Without UART interface
	AW-CB178NF-ZP	With UART interface

From the model names, the radiated emission worst case was found in model No.: **AW-CB178NF**. Therefore only the test data of the mode was recorded in this report.

4. There are Bluetooth 4.0 technology and WLAN (2.4GHz and 5GHz) technology used for the EUT.
5. For WLAN: 2.4GHz and 5GHz technology cannot transmit at same time.

6. WLAN/BT coexistence mode:

Condition	Technology	
1	WLAN(2.4GHz) 1TX only	BT
2	WLAN(5GHz) 1TX only	BT

From above coexistence mode, radiated emission of the simultaneous operation has been evaluated and no non-compliance was found.

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

3.2 Description of Test Modes

79 channels are provided for BT-EDR mode:

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

3.2.1 Test Mode Applicability and Tested Channel Detail

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

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

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	0	FHSS	GFSK	DH5

Antenna Port Conducted Measurement:

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

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≥1G	24deg. C, 70%RH	120Vac, 60Hz	Weiwei Lo
RE<1G	25deg. C, 65%RH	120Vac, 60Hz	Weiwei Lo
APCM	25deg. C, 60%RH	120Vac, 60Hz	Anderson Chen

3.3 Description of Support Units

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

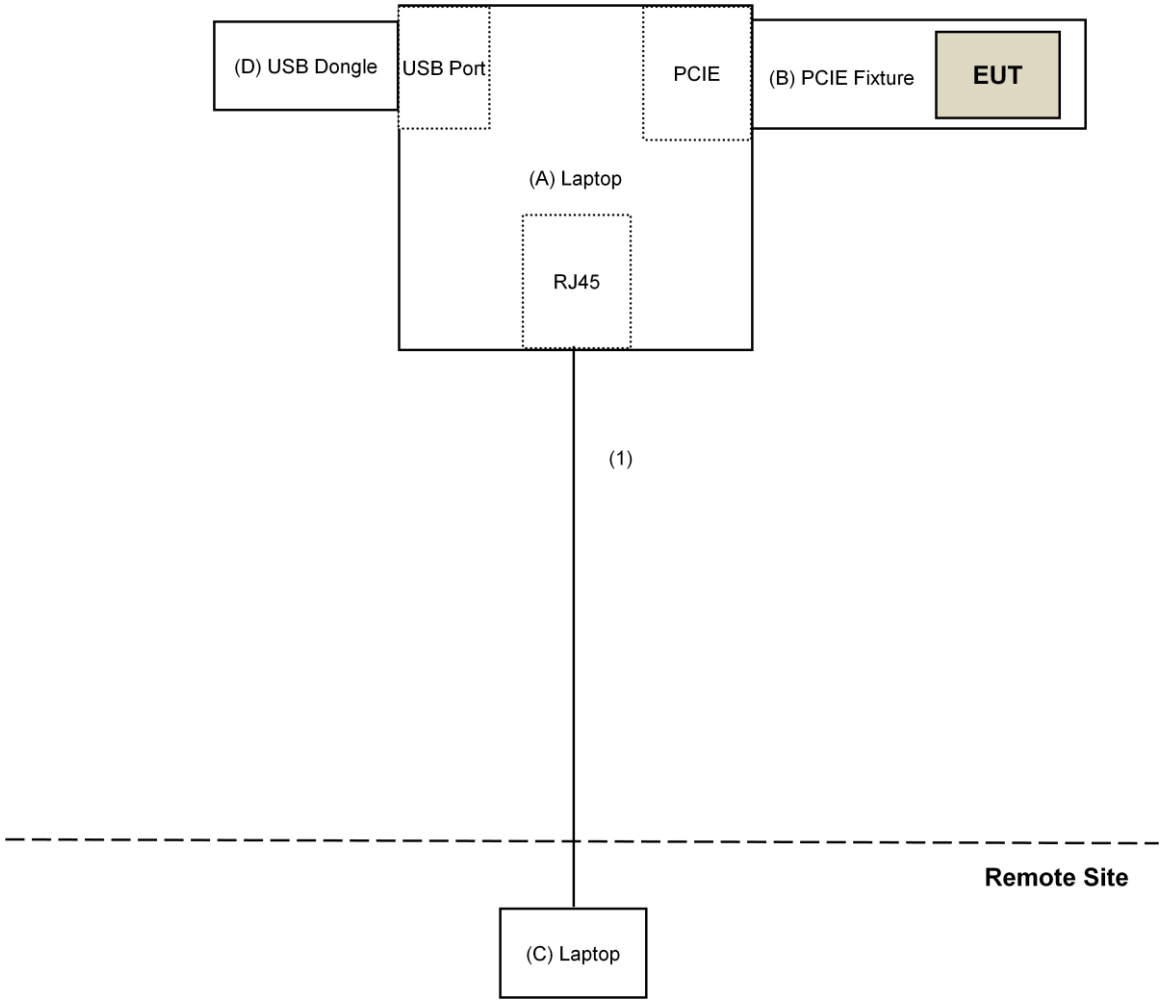
ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	Laptop	DELL	E6420	B92T3R1	FCC DoC	Provided by Lab
B.	PCIE Fixture	NA	NA	NA	NA	Supplied by client
C.	Laptop	DELL	E6440	F9LYQ32	FCC DoC	Provided by Lab
D.	USB Dongle	NA	NA	NA	NA	Provided by Lab

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.	RJ-45 Cable	1	10	No	0	Provided by Lab

3.3.1 Configuration of System under Test



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)
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 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.	DATE OF CALIBRATION	DUE DATE OF CALIBRATION
Test Receiver Agilent	N9038A	MY50010156	Aug. 18, 2016	Aug. 17, 2017
Pre-Amplifier(*) EMCI	EMC001340	980142	Jan. 20, 2016	Jan. 19, 2018
Loop Antenna(*) Electro-Metrics	EM-6879	264	Dec. 16, 2016	Dec. 15, 2018
RF Cable	NA	LOOPCAB-001 LOOPCAB-002	Jan. 17, 2017	Jan. 16, 2018
Pre-Amplifier Mini-Circuits	ZFL-1000VH2B	AMP-ZFL-05	May 06, 2017	May 05, 2018
Trilog Broadband Antenna SCHWARZBECK	VULB 9168	9168-361	Dec. 29, 2016	Dec. 28, 2017
RF Cable	8D	966-3-1 966-3-2 966-3-3	Apr. 01, 2017	Mar. 31, 2018
Fixed attenuator Mini-Circuits	UNAT-5+	PAD-3m-3-01	Oct. 05, 2016	Oct. 04, 2017
Horn_Antenna SCHWARZBECK	BBHA9120-D	9120D-406	Dec. 28, 2016	Dec. 27, 2017
Pre-Amplifier EMCI	EMC12630SE	980384	Feb. 02, 2017	Feb. 01, 2018
RF Cable	EMC104-SM-SM-1200 EMC104-SM-SM-2000 EMC104-SM-SM-5000	160922 150317 150322	Feb. 02, 2017 Mar. 29, 2017 Mar. 29, 2017	Feb. 01, 2018 Mar. 28, 2018 Mar. 28, 2018
Spectrum Analyzer Keysight	N9030A	MY54490520	July 29, 2016	July 28, 2017
Pre-Amplifier EMCI	EMC184045SE	980386	Feb. 02, 2017	Feb. 01, 2018
Horn_Antenna SCHWARZBECK	BBHA 9170	BBHA9170608	Dec. 15, 2016	Dec. 14, 2017
RF Cable	SUCOFLEX 102	36432/2 36433/2	Jan. 15, 2017	Jan. 14, 2018
Software	ADT_Radiated_V8.7.08	NA	NA	NA
Antenna Tower & Turn Table Max-Full	MF-7802	MF780208406	NA	NA
Boresight Antenna Fixture	FBA-01	FBA-SIP01	NA	NA
Spectrum Analyzer R&S	FSv40	100964	July 1, 2017	June 30, 2018
Power meter Anritsu	ML2495A	1014008	May 11, 2017	May 10, 2018
Power sensor Anritsu	MA2411B	0917122	May 11, 2017	May 10, 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 calibration interval of the above test instruments is 24 months and the calibrations are traceable to NML/ROC and NIST/USA.
3. The test was performed in 966 Chamber No. 3.
4. The CANADA Site Registration No. is 20331-1
5. Loop antenna was used for all emissions below 30 MHz.
6. Tested Date: July 17, 2017.

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. 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 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:

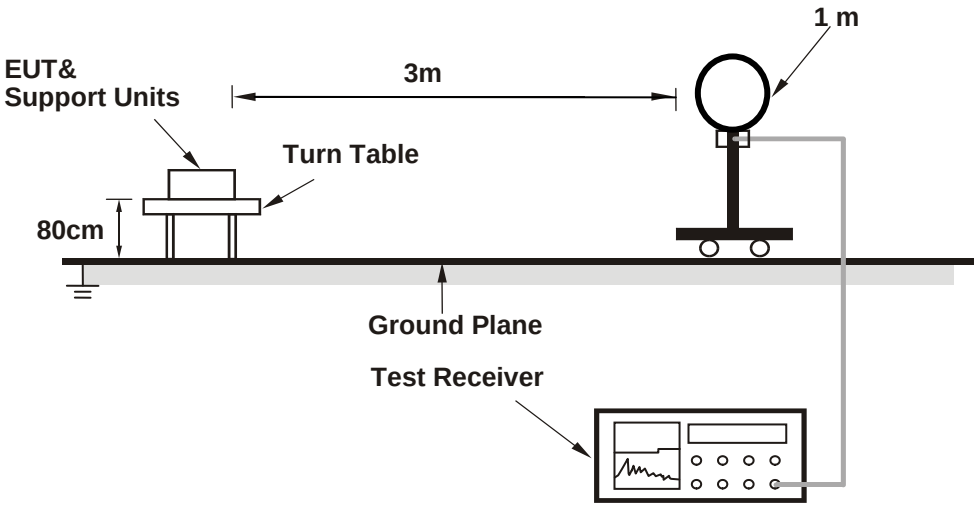
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz 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

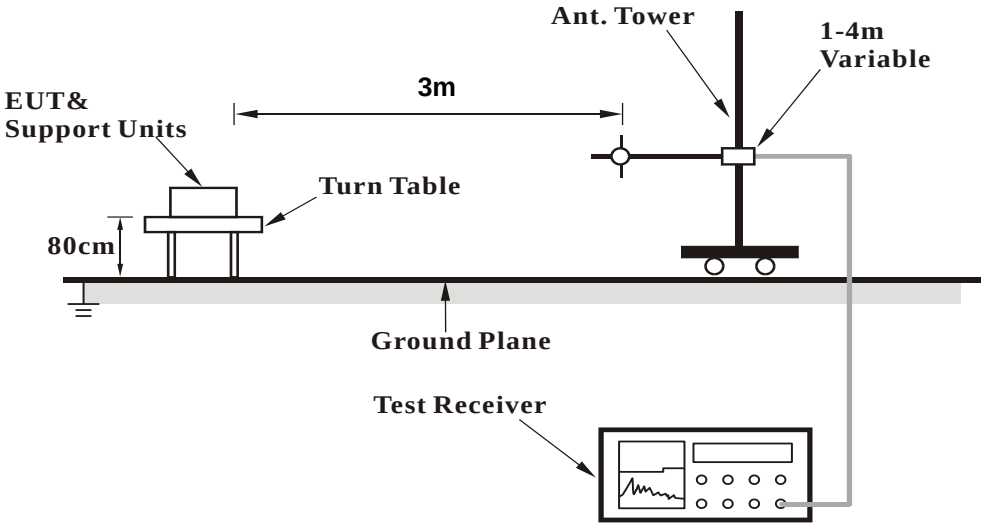
No deviation.

4.1.5 Test Setup

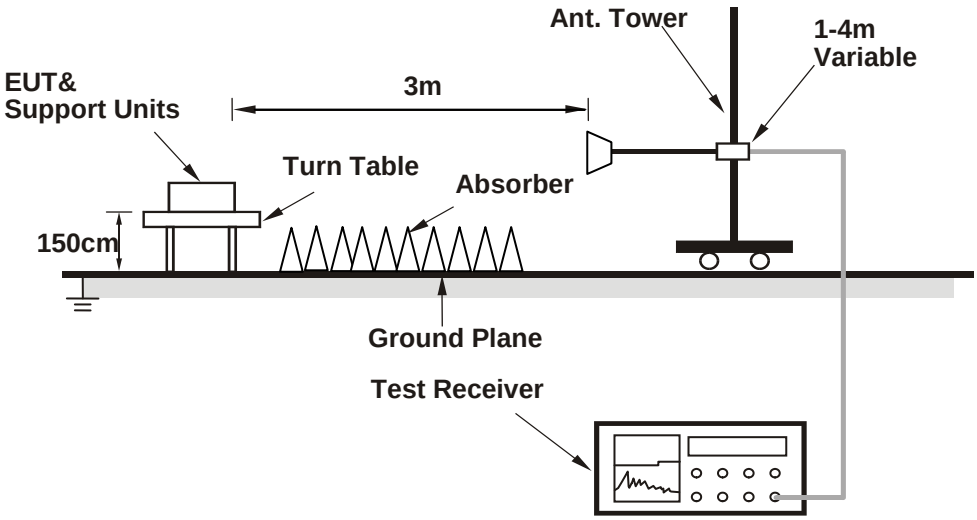
For Radiated emission below 30MHz



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

a. Connected the EUT with the Laptop.
b. Contorlling software (DutApiMimoBtFmBrdigeEth.exe [Labtool v2.0.0.43]) has been activated to set the EUT on specific status.

4.1.7 Test Results

Above 1GHz Data:

BT_GFSK

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	**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	55.1 PK	74.0	-18.9	1.47 H	168	56.7	-1.6
2	2390.00	41.7 AV	54.0	-12.3	1.47 H	168	43.3	-1.6
3	*2402.00	95.9 PK			1.47 H	168	97.4	-1.5
4	*2402.00	65.8 AV			1.47 H	168	67.3	-1.5
5	4804.00	37.5 PK	74.0	-36.5	1.25 H	233	34.5	3.0
6	4804.00	7.4 AV	54.0	-46.6	1.25 H	233	4.4	3.0
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	56.3 PK	74.0	-17.7	2.57 V	277	57.9	-1.6
2	2390.00	43.6 AV	54.0	-10.4	2.57 V	277	45.2	-1.6
3	*2402.00	107.3 PK			2.57 V	277	108.8	-1.5
4	*2402.00	77.2 AV			2.57 V	277	78.7	-1.5
5	4804.00	42.9 PK	74.0	-31.1	2.97 V	53	39.9	3.0
6	4804.00	12.8 AV	54.0	-41.2	2.97 V	53	9.8	3.0

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. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.
6. The DH5 packet was the worse case duty cycle for a transmit dwell time on a channel, based upon bluetooth theory the transmitter is on 0.625 * 5 per 296.25 ms per channel. Therefore, the duty cycle correlation factor be equal to: 20log(3.125 / 100)= -30.1 dB
7. The average value of fundamental and harmonic frequency is: Average = Peak value + 20 log(Duty cycle)

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2441.00	95.7 PK			1.47 H	159	97.2	-1.5
2	*2441.00	65.6 AV			1.47 H	159	67.1	-1.5
3	4882.00	37.9 PK	74.0	-36.1	1.23 H	238	34.7	3.2
4	4882.00	7.8 AV	54.0	-46.2	1.23 H	238	4.6	3.2
5	7323.00	53.1 PK	74.0	-20.9	1.96 H	172	44.2	8.9
6	7323.00	23.0 AV	54.0	-31.0	1.96 H	172	14.1	8.9
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	107.2 PK			2.51 V	278	108.7	-1.5
2	*2441.00	77.1 AV			2.51 V	278	78.6	-1.5
3	4882.00	42.8 PK	74.0	-31.2	2.99 V	42	39.6	3.2
4	4882.00	12.7 AV	54.0	-41.3	2.99 V	42	9.5	3.2
5	7323.00	51.4 PK	74.0	-22.6	2.14 V	281	42.5	8.9
6	7323.00	21.3 AV	54.0	-32.7	2.14 V	281	12.4	8.9

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. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.
6. The DH5 packet was the worse case duty cycle for a transmit dwell time on a channel, based upon bluetooth theory the transmitter is on 0.625 * 5 per 296.25 ms per channel. Therefore, the duty cycle correlation factor be equal to: 20log(3.125 / 100)= -30.1 dB
7. The average value of fundamental and harmonic frequency is: Average = Peak value + 20 log(Duty cycle)

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2480.00	95.3 PK			1.52 H	151	96.7	-1.4
2	*2480.00	65.2 AV			1.52 H	151	66.6	-1.4
3	2483.50	54.1 PK	74.0	-19.9	1.52 H	151	55.5	-1.4
4	2483.50	24.0 AV	54.0	-30.0	1.52 H	151	25.4	-1.4
5	4960.00	38.5 PK	74.0	-35.5	1.33 H	227	35.3	3.2
6	4960.00	8.4 AV	54.0	-45.6	1.33 H	227	5.2	3.2
7	7440.00	53.6 PK	74.0	-20.4	1.98 H	168	44.4	9.2
8	7440.00	23.5 AV	54.0	-30.5	1.98 H	168	14.3	9.2
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	*2480.00	106.7 PK			2.55 V	266	108.1	-1.4
2	*2480.00	76.6 AV			2.55 V	266	78.0	-1.4
3	2483.50	55.9 PK	74.0	-18.1	2.55 V	266	57.3	-1.4
4	2483.50	25.8 AV	54.0	-28.2	2.55 V	266	27.2	-1.4
5	4960.00	42.6 PK	74.0	-31.4	3.02 V	16	39.4	3.2
6	4960.00	12.5 AV	54.0	-41.5	3.02 V	16	9.3	3.2
7	7440.00	51.6 PK	74.0	-22.4	2.08 V	289	42.4	9.2
8	7440.00	21.5 AV	54.0	-32.5	2.08 V	289	12.3	9.2

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. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.
6. The DH5 packet was the worse case duty cycle for a transmit dwell time on a channel, based upon bluetooth theory the transmitter is on 0.625 * 5 per 296.25 ms per channel. Therefore, the duty cycle correlation factor be equal to: 20log(3.125 / 100)= -30.1 dB
7. The average value of fundamental and harmonic frequency is: Average = Peak value + 20 log(Duty cycle)

BT_8DPSK

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	**FREQ. (MHz)**	**EMISSION LEVEL (dBuV/m)**	**LIMIT (dBuV/m)**	**MARGIN (dB)**	**ANTENNA HEIGHT (m)**	**TABLE ANGLE (Degree)**	**RAW VALUE (dBuV)**	**CORRECTION FACTOR (dB/m)**
1	2390.00	55.2 PK	74.0	-18.8	1.44 H	162	56.8	-1.6
2	2390.00	40.9 AV	54.0	-13.1	1.44 H	162	42.5	-1.6
3	*2402.00	96.3 PK			1.44 H	162	97.8	-1.5
4	*2402.00	66.2 AV			1.44 H	162	67.7	-1.5
5	4804.00	38.4 PK	74.0	-35.6	1.28 H	237	35.4	3.0
6	4804.00	8.3 AV	54.0	-45.7	1.28 H	237	5.3	3.0
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	55.7 PK	74.0	-18.3	2.88 V	115	57.3	-1.6
2	2390.00	41.2 AV	54.0	-12.8	2.88 V	115	42.8	-1.6
3	*2402.00	105.5 PK			2.88 V	115	107.0	-1.5
4	*2402.00	75.4 AV			2.88 V	115	76.9	-1.5
5	4804.00	42.6 PK	74.0	-31.4	3.00 V	14	39.6	3.0
6	4804.00	12.5 AV	54.0	-41.5	3.00 V	14	9.5	3.0

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. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.
6. The DH5 packet was the worse case duty cycle for a transmit dwell time on a channel, based upon bluetooth theory the transmitter is on 0.625 * 5 per 296.25 ms per channel. Therefore, the duty cycle correlation factor be equal to: 20log(3.125 / 100)= -30.1 dB
7. The average value of fundamental and harmonic frequency is: Average = Peak value + 20 log(Duty cycle)

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2441.00	95.7 PK			1.45 H	154	97.2	-1.5
2	*2441.00	65.6 AV			1.45 H	154	67.1	-1.5
3	4882.00	38.7 PK	74.0	-35.3	1.28 H	229	35.5	3.2
4	4882.00	8.6 AV	54.0	-45.4	1.28 H	229	5.4	3.2
5	7323.00	53.3 PK	74.0	-20.7	1.98 H	175	44.4	8.9
6	7323.00	23.2 AV	54.0	-30.8	1.98 H	175	14.3	8.9
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	105.8 PK			2.83 V	113	107.3	-1.5
2	*2441.00	75.7 AV			2.83 V	113	77.2	-1.5
3	4882.00	42.7 PK	74.0	-31.3	3.02 V	28	39.5	3.2
4	4882.00	12.6 AV	54.0	-41.4	3.02 V	28	9.4	3.2
5	7323.00	51.0 PK	74.0	-23.0	2.08 V	296	42.1	8.9
6	7323.00	20.9 AV	54.0	-33.1	2.08 V	296	12.0	8.9

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. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.
6. The DH5 packet was the worse case duty cycle for a transmit dwell time on a channel, based upon bluetooth theory the transmitter is on 0.625 * 5 per 296.25 ms per channel. Therefore, the duty cycle correlation factor be equal to: 20log(3.125 / 100)= -30.1 dB
7. The average value of fundamental and harmonic frequency is: Average = Peak value + 20 log(Duty cycle)

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2480.00	95.3 PK			1.51 H	151	96.7	-1.4
2	*2480.00	65.2 AV			1.51 H	151	66.6	-1.4
3	2483.50	54.8 PK	74.0	-19.2	1.51 H	151	56.2	-1.4
4	2483.50	24.7 AV	54.0	-29.3	1.51 H	151	26.1	-1.4
5	4960.00	38.5 PK	74.0	-35.5	1.23 H	224	35.3	3.2
6	4960.00	8.4 AV	54.0	-45.6	1.23 H	224	5.2	3.2
7	7440.00	53.7 PK	74.0	-20.3	2.03 H	180	44.5	9.2
8	7440.00	23.6 AV	54.0	-30.4	2.03 H	180	14.4	9.2
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	*2480.00	106.2 PK			2.81 V	122	107.6	-1.4
2	*2480.00	76.1 AV			2.81 V	122	77.5	-1.4
3	2483.50	55.1 PK	74.0	-18.9	2.81 V	122	56.5	-1.4
4	2483.50	25.0 AV	54.0	-29.0	2.81 V	122	26.4	-1.4
5	4960.00	42.0 PK	74.0	-32.0	3.01 V	39	38.8	3.2
6	4960.00	11.9 AV	54.0	-42.1	3.01 V	39	8.7	3.2
7	7440.00	51.1 PK	74.0	-22.9	2.03 V	290	41.9	9.2
8	7440.00	21.0 AV	54.0	-33.0	2.03 V	290	11.8	9.2

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. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.
6. The DH5 packet was the worse case duty cycle for a transmit dwell time on a channel, based upon bluetooth theory the transmitter is on 0.625 * 5 per 296.25 ms per channel. Therefore, the duty cycle correlation factor be equal to: 20log(3.125 / 100)= -30.1 dB
7. The average value of fundamental and harmonic frequency is: Average = Peak value + 20 log(Duty cycle)

Below 1GHz Data:

BT_GFSK

CHANNEL	TX Channel 0	**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	100.02	32.8 QP	43.5	-10.7	2.33 H	312	45.4	-12.6
2	224.43	39.9 QP	46.0	-6.1	1.60 H	276	50.9	-11.0
3	496.90	27.2 QP	46.0	-18.8	1.15 H	111	30.3	-3.1
4	609.45	30.6 QP	46.0	-15.4	1.06 H	240	31.4	-0.8
5	667.31	33.1 QP	46.0	-12.9	1.04 H	226	33.2	-0.1
6	779.29	33.6 QP	46.0	-12.4	1.25 H	103	31.5	2.1
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	**42.42**	**35.8 QP**	**40.0**	**-4.2**	**1.40 V**	**300**	**44.3**	**-8.5**
2	248.54	30.5 QP	46.0	-15.5	1.06 V	224	40.1	-9.6
3	434.36	27.0 QP	46.0	-19.0	2.40 V	355	31.1	-4.1
4	537.85	29.8 QP	46.0	-16.2	1.07 V	58	32.2	-2.4
5	726.69	28.6 QP	46.0	-17.4	1.40 V	70	27.9	0.7
6	818.31	32.3 QP	46.0	-13.7	1.87 V	264	30.1	2.2

REMARKS:

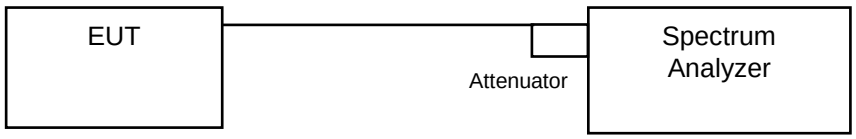
1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value

4.2 Maximum Output Power

4.2.1 Limits of Maximum Output Power Measurement

The Maximum Output Power Measurement is 125mW.

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. 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 3MHz 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.

4.2.5 Deviation from Test Standard

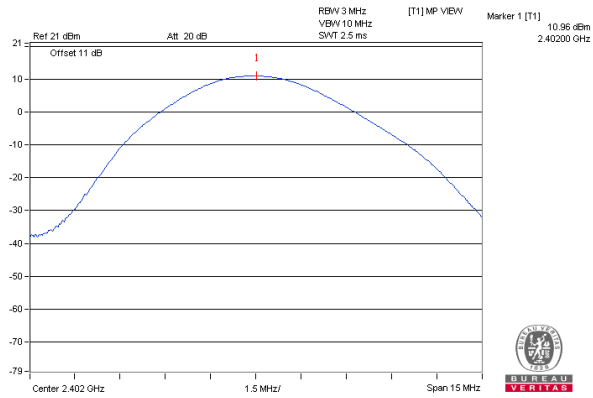
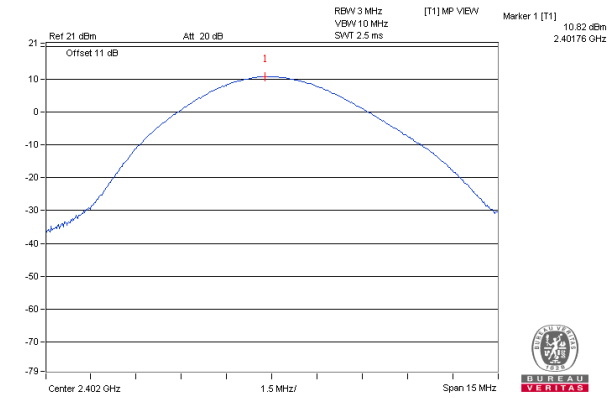
No deviation.

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

Channel	Frequency (MHZ)	Output Power (mW)		Output Power (dBm)		Power Limit (mW)	Pass / Fail
		GFSK	8DPSK	GFSK	8DPSK		
0	2402	12.474	12.078	10.96	10.82	125	Pass
39	2441	11.169	11.35	10.48	10.55	125	Pass
78	2480	10.399	9.931	10.17	9.97	125	Pass

Spectrum Plot of Worst Value	
GFSK / CH0	8DPSK / CH0
	

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 accredited and approved according to ISO/IEC 17025.

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

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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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