FCC Test Report (BT-LE)

Report No.:	RF150126E05K-3
FCC ID:	TLZ-CM2XXNF
Test Model:	AW-CM195NF
Series Model:	AW-CM217NF, AW-CM235NF, AW-CM240NF
Received Date:	Aug. 17, 2018
Test Date:	Oct. 23 to 31, 2018
Issued Date:	Nov. 06, 2018
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:	E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300, Taiwan R.O.C.
FCC Registration / Designation Number:	723255 / TW2022

Testing Laboratory
2022

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Release Control Record

Issue No.	Description	Date Issued
RF150126E05K-3	Original release.	Nov. 06, 2018

1 Certificate of Conformity

Product:	IEEE 802.11 a/b/g/n/ac Wireless LAN and Bluetooth M.2 Combo Module
Brand:	AzureWave
Test Model:	AW-CM195NF
Series Model:	AW-CM217NF, AW-CM235NF, AW-CM240NF
Sample Status:	ENGINEERING SAMPLE
Applicant:	AzureWave Technologies, Inc.
Test Date:	Oct. 23 to 31, 2018
Standards:	47 CFR FCC Part 15, Subpart C (Section 15.247) ANSI C63.10: 2013

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

Prepared by : Phoenix Huang , **Date:** Nov. 06, 2018

Phoenix Huang / Specialist

Approved by : , **Date:** Nov. 06, 2018

May Chen / Manager

2 Summary of Test Results

47 CFR FCC Part 15, Subpart C (Section 15.247)			
FCC Clause	Test Item	Result	Remarks
15.205 / 15.209 / 15.247(d)	Radiated Emissions and Band Edge Measurement	PASS	Meet the requirement of limit. Minimum passing margin is -5.1dB at 2483.50MHz.
15.247(b)	Conducted power	PASS	Meet the requirement of limit.

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	5.33 dB
Radiated Emissions above 1 GHz	1GHz ~ 6GHz	5.10 dB
	6GHz ~ 18GHz	4.85 dB
	18GHz ~ 40GHz	5.24 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT (BT-LE)

Product	IEEE 802.11 a/b/g/n/ac Wireless LAN and Bluetooth M.2 Combo Module
Brand	AzureWave
Test Model	AW-CM195NF
Status of EUT	ENGINEERING SAMPLE
Power Supply Rating	3.3Vdc from host equipment
Modulation Type	GFSK
Modulation Technology	DTS
Transfer Rate	Up to 1Mbps
Operating Frequency	2.402 ~ 2.480GHz
Number of Channel	40
Output Power	7.112mW
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.: RF150126E05C-3 as the following:
   - ◆ Upgraded standard version.
   - ◆ Added six sets of antennas as below table:

Original

Antenna No	Chain No.	Brand	Model	Gain (dBi)	Antenna Type	Connector Type	Frequency range (GHz to GHz)	Cable Length (External only)
1	Chain (0) (Aux)	MAG.LAYERS	MSA-4008-25GC1-A1	2.98	PIFA	i-pex(MHF4)	2.4~2.5	15cm
				5.16			4.9~5.9	
	Chain (1) (Main)	MAG.LAYERS	MSA-4008-25GC1-A1	2.98	PIFA	i-pex(MHF4)	2.4~2.5	15cm
				5.16			4.9~5.9	
2	Chain (0) (Aux)	LUXSHARE ICT	Speedy	1.43	PIFA	i-pex(MHF4)	2.4~2.5	507mm
				-3.12			4.9~5.9	
	Chain (1) (Main)	LUXSHARE ICT	Speedy	-2.46	PIFA	i-pex(MHF4)	2.4~2.5	472mm
				-0.02			4.9~5.9	
3	Chain (0) (Aux)	Amphenol	867-00013	-3.8	PIFA	i-pex(MHF4)	2.4~2.5	70mm
				3.5			4.9~5.9	
	Chain (1) (Main)	Amphenol	867-00014	-5.1	PIFA	i-pex(MHF4)	2.4~2.5	220mm
				0.2			4.9~5.9	

Newly

Antenna Set No	Chain No.	Brand	Model	Gain (dBi) Including cable loss	Cable Loss (dBi)	Antenna Type	Connector Type	Frequency range (GHz to GHz)	Cable Length (External only)
4	Chain (0) (Aux)	TONGDA	T-543-3010450-2	-4.23	0.46	PIFA	i-pex-MFH4	2.4~2.5	79.5mm
				5.15-5.35 GHz:2.13 5.47-5.725 GHz:-1.32 5.725-5.850 GHz:-2.77	0.73			4.9~5.9	
	Chain (1) (Main)	TONGDA	T-543-3010450-1	-4.56	0.28	PIFA	i-pex-MFH4	2.4~2.5	43mm
				5.15-5.35 GHz:-3.53 5.47-5.725 GHz:-1.87 5.725-5.850 GHz:-1.87	0.44			4.9~5.9	

5	Chain (0) (Aux)	HONGLIN	260-26080	-4.39 5.15-5.35 GHz:1.29 5.47-5.725 GHz:0.41 5.725-5.850 GHz:-3.41	0.46 0.73	PIFA	i-pex-MFH4	2.4~2.5 4.9~5.9	79.5mm
	Chain (1) (Main)	HONGLIN	260-26079	-4.71 5.15-5.35 GHz:-3.73 5.47-5.725 GHz:-2.26 5.725-5.850 GHz:-2.23	0.28 0.44	PIFA	i-pex-MFH4	2.4~2.5 4.9~5.9	43mm
6	Chain 0 (Aux)	Taoglas	GW20.54.0400A.km	2.29 1.73	NA	Dipole	IPEX MHF4L	2400~2500 5150~5850	400mm
	Chain 1 (Main)	Taoglas	GW20.54.0400A.km	2.29 1.73	NA	Dipole	IPEX MHF4L	2400~2500 5150~5850	400mm
7	Chain 0 (Aux)	Taoglas	GW20.54.0180A.km	2.47 2.62	NA	Dipole	IPEX MHF4L	2400~2500 5150~5850	180mm
	Chain 1 (Main)	Taoglas	GW20.54.0180A.km	2.47 2.62	NA	Dipole	IPEX MHF4L	2400~2500 5150~5850	180mm
8	Chain 0 (Aux)	Taoglas	GW20.54.0180A.km	2.47 2.62	NA	Dipole	IPEX MHF4L	2400~2500 5150~5850	180mm
	Chain 1 (Main)	Taoglas	GW20.54.0400A.km	2.29 1.73	NA	Dipole	IPEX MHF4L	2400~2500 5150~5850	400mm
9	Chain 0 (Aux)	Taoglas	GW20.54.0400A.km	2.29 1.73	NA	Dipole	IPEX MHF4L	2400~2500 5150~5850	400mm
	Chain 1 (Main)	Taoglas	GW20.54.0180A.km	2.47 2.62	NA	Dipole	IPEX MHF4L	2400~2500 5150~5850	180mm

Note:
1. For radiated emission (below 1GHz), the Dipole (Antenna Set 7) was selected as representative adapter for the test and its data was recorded in this report.
2. For radiated emission (above 1GHz), the PIFA antenna (Antenna Set 1) and Dipole (Antenna Set 7) were selected as representative adapter for the test and its data was recorded in this report.

2. According to above condition, only Radiated Emissions and Conducted power test items need to be performed. And all data weres verified to meet the requirements.
3. There are Bluetooth technology and WLAN technology used for the EUT.
4. For WLAN, 2.4GHz and 5GHz technology can not transmit at same time.
5. WLAN (5GHz) and Bluetooth technology can transmit at same time.
6. The EUT has four model names which are identical to each other in all aspects except for the following table. These solutions have same RF circuit /parameter and are pin to pin compatible. (Detail information please refer declaration letter by client)

AW model name	Difference. Broadcom solution
AW-CM195NF	BCM43540
AW-CM217NF	BCM4356
AW-CM235NF	BCM4354
AW-CM240NF	BCM4356 (Change the Interface of PCIE+UART)

Note: In original report, from the above models, model: **AW-CM195NF** was selected as representative model for the test and its data was recorded in this report.

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

40 channels are provided to this EUT:

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	2402	10	2422	20	2442	30	2462
1	2404	11	2424	21	2444	31	2464
2	2406	12	2426	22	2446	32	2466
3	2408	13	2428	23	2448	33	2468
4	2410	14	2430	24	2450	34	2470
5	2412	15	2432	25	2452	35	2472
6	2414	16	2434	26	2454	36	2474
7	2416	17	2436	27	2456	37	2476
8	2418	18	2438	28	2458	38	2478
9	2420	19	2440	29	2460	39	2480

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 & Bandedge Measurement **RE<1G:** Radiated Emission below 1GHz

PLC: Power Line Conducted Emission **APCM:** Antenna Port Conducted Measurement

Note:

1. In the original report, the EUT's antenna (PIFA) had been pre-tested on the positioned of each 3 axis. The worst case was found when positioned on **Y-plane**.

Radiated Emission Test (Above 1GHz):

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

☒ Following channel(s) was (were) selected for the final test as listed below.

AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TYPE	DATA RATE (Mbps)
0 to 39	0, 19, 39	GFSK	1

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 TYPE	DATA RATE (Mbps)
0 to 39	39	GFSK	1

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.

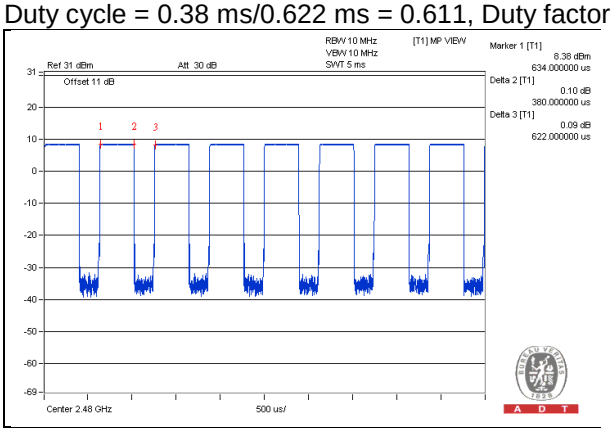
AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TYPE	DATA RATE (Mbps)
0 to 39	0, 19, 39	GFSK	1

Test Condition:

APPLICABLE TO	ENVIRONMENTAL CONDITIONS	INPUT POWER	TESTED BY
RE≥1G	24deg. C, 68%RH	120Vac, 60Hz (System)	Steven Chiang
	21deg. C, 63%RH	120Vac, 60Hz (System)	Steven Chiang
RE<1G	23deg. C, 65%RH	120Vac, 60Hz (System)	Steven Chiang
APCM	25deg. C, 60%RH	3.3Vdc	Weiwei Lo

3.3 Duty Cycle of Test Signal

Duty cycle of test signal is < 98 %, duty factor shall be considered.
Duty cycle = 0.38 ms/0.622 ms = 0.611, Duty factor = 10 * log(1/Duty cycle) = 2.1



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.

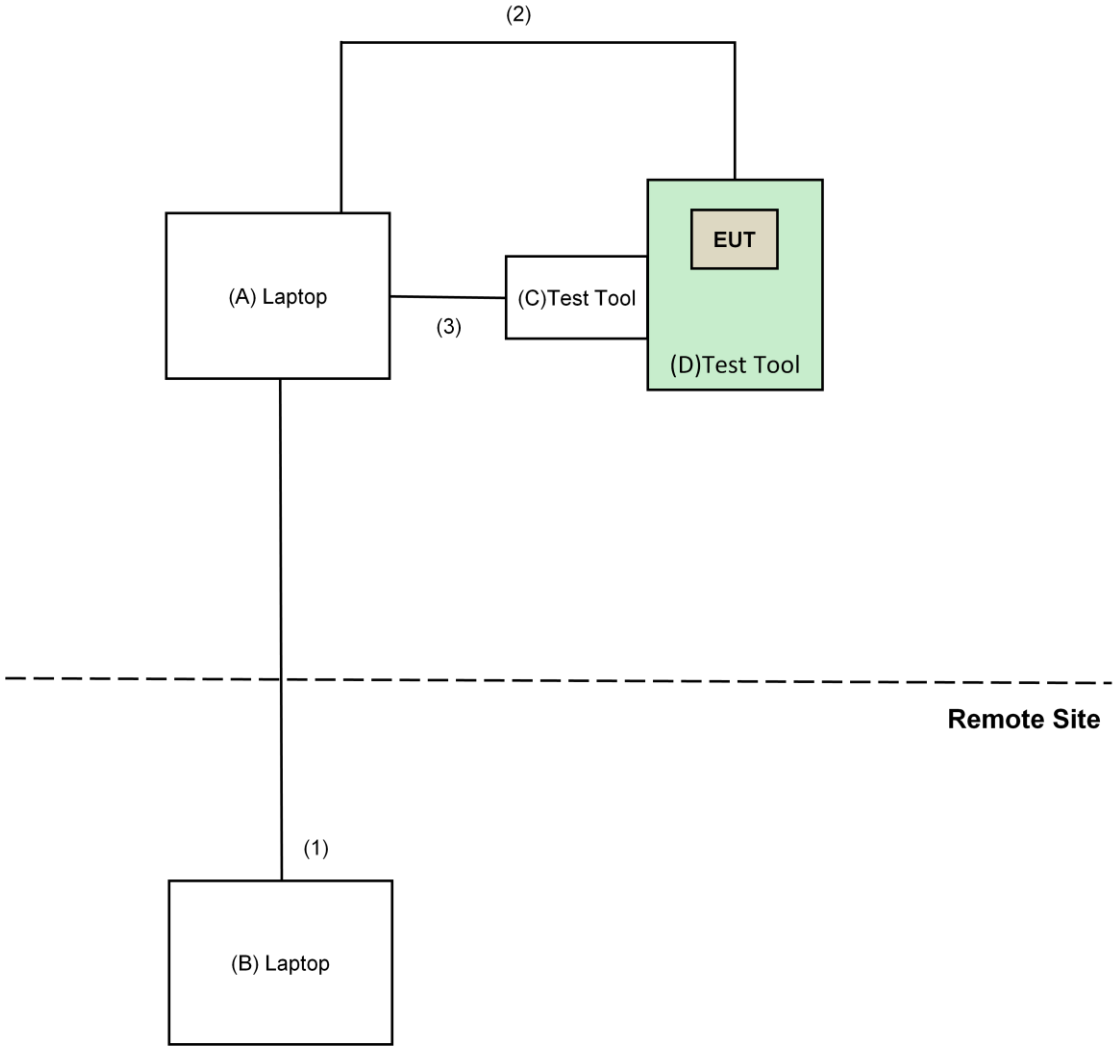
ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	Laptop	HP	Pavilion 14-ab023TU	5CD5340WXZ	NA	Provided by Lab
B.	Laptop	ASUS	AA2SJ.AVBoW202	NA	NA	Supplied by client
C.	Test Tool	AzureWave	9027-V01	NA	NA	Supplied by client
D.	Test Tool	AzureWave	2218-17	NA	NA	Supplied by client

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
2.	USB Cable	1	1.8	No	0	Provided by Lab
3.	USB Cable	1	1	No	0	Supplied by client

3.4.1 Configuration of System under Test



3.5 General Description of Applied Standards

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

FCC Part 15, Subpart C (15.247)
KDB 558074 D01 15.247 Meas Guidance v05
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.	CALIBRATED DATE	CALIBRATED UNTIL
Test Receiver Keysight	N9038A	MY54450088	July 05, 2018	July 04, 2019
Pre-Amplifier EMCI	EMC001340	980142	Feb. 09, 2018	Feb. 08, 2019
Loop Antenna(*) Electro-Metrics	EM-6879	264	Dec. 16, 2016	Dec. 15, 2018
RF Cable	NA	LOOPCAB-001	Jan. 15, 2018	Jan. 14, 2019
RF Cable	NA	LOOPCAB-002	Jan. 15, 2018	Jan. 14, 2019
Pre-Amplifier Mini-Circuits	ZFL-1000VH2B	AMP-ZFL-01	Nov. 09, 2017	Nov. 08, 2018
Trilog Broadband Antenna SCHWARZBECK	VULB 9168	9168-406	Nov. 29, 2017	Nov. 28, 2018
RF Cable	8D	966-4-1	Mar. 21, 2018	Mar. 20, 2019
RF Cable	8D	966-4-2	Mar. 21, 2018	Mar. 20, 2019
RF Cable	8D	966-4-3	Mar. 21, 2018	Mar. 20, 2019
Fixed attenuator Mini-Circuits	UNAT-5+	PAD-3m-4-01	Sep. 27, 2018	Sep. 26, 2019
Horn_Antenna SCHWARZBECK	BBHA 9120D	9120D-783	Dec. 12, 2017	Dec. 11, 2018
Pre-Amplifier Mini-Circuits	ZVA-183-S+	AMP-ZVA-03	May 10, 2018	May 09, 2019
RF Cable	EMC104-SM-SM-1200	160923	Jan. 29, 2018	Jan. 28, 2019
RF Cable	EMC104-SM-SM-2000	150318	Jan. 29, 2018	Jan. 28, 2019
RF Cable	EMC104-SM-SM-5000	150321	Jan. 29, 2018	Jan. 28, 2019
Pre-Amplifier EMCI	EMC184045SE	980387	Jan. 29, 2018	Jan. 28, 2019
Horn_Antenna SCHWARZBECK	BBHA 9170	BBHA9170608	Dec. 14, 2017	Dec. 13, 2018
RF Cable	EMC102-KM-KM-1200	160925	Jan. 29, 2018	Jan. 28, 2019
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 20, 2018	June 19, 2019
Power meter Anritsu	ML2495A	1014008	May 09, 2018	May 08, 2019
Power sensor Anritsu	MA2411B	0917122	May 09, 2018	May 08, 2019

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. 4.
4. The CANADA Site Registration No. is 20331-2
5. Loop antenna was used for all emissions below 30 MHz.
6. Tested Date: Oct. 23 to 31, 2018

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 detects function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

Note:

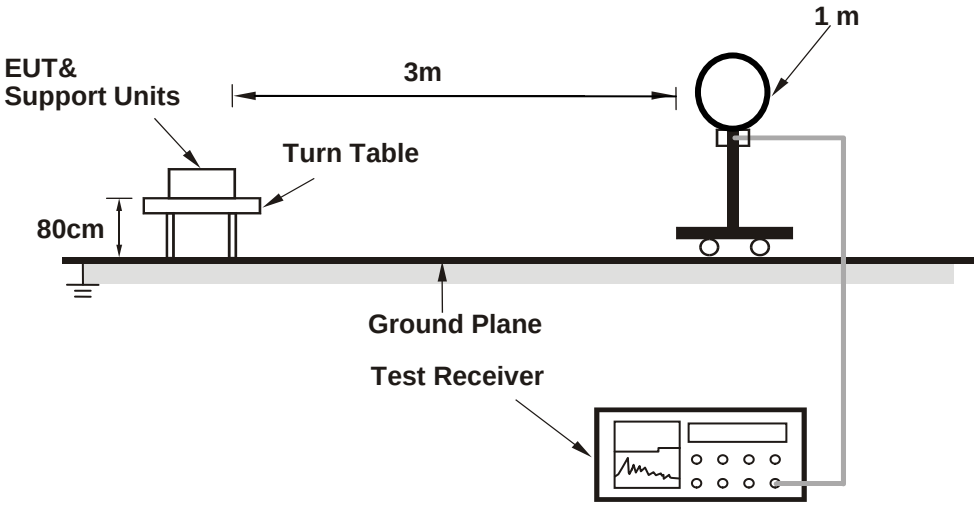
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.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

4.1.4 Deviation from Test Standard

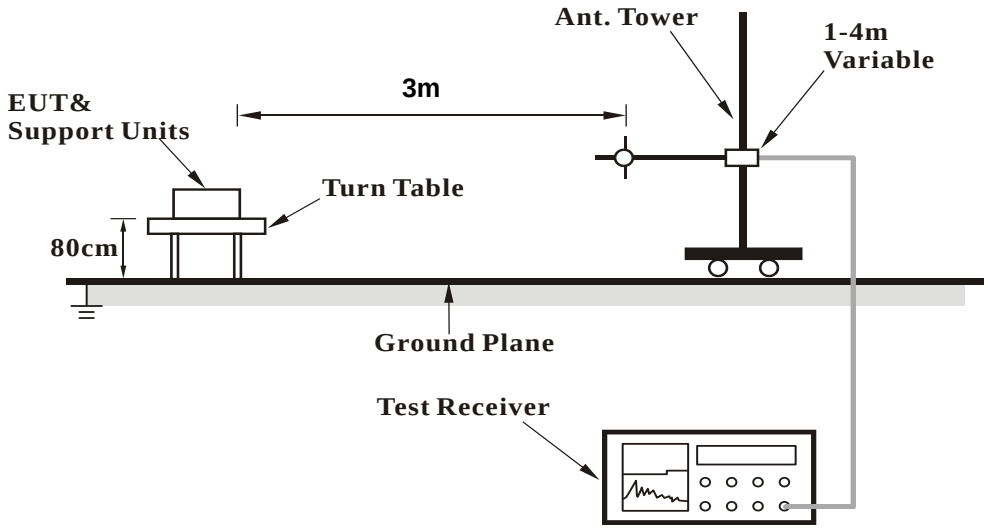
No deviation.

4.1.5 Test Setup

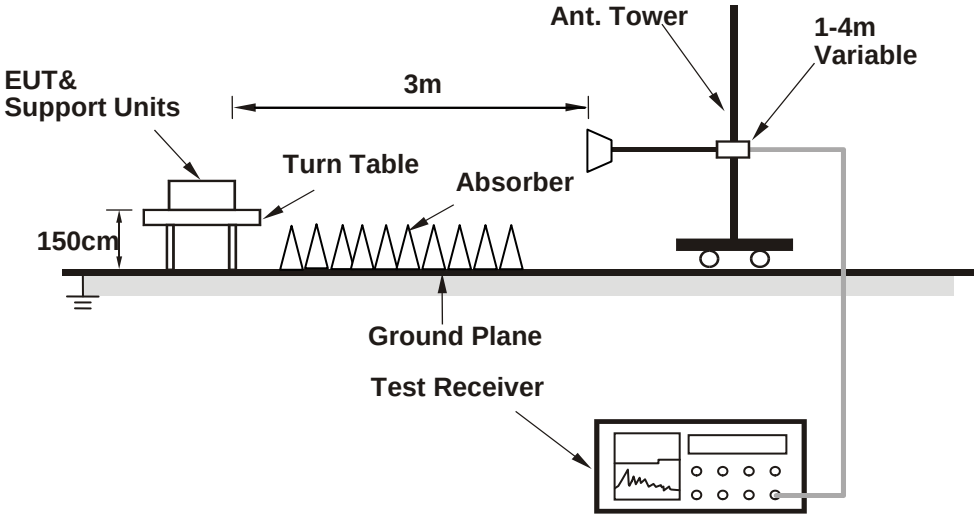
For Radiated emission below 30MHz



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 which is placed on the testing table.
b. Controlling software (wl.exe[paste XXX.sh command]) has been activated to set the EUT on specific status.

4.1.7 Test Results (PIFA Antenna)

Above 1GHz Data:

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	47.5 PK	74.0	-26.5	1.38 H	312	49.7	-2.2
2	2390.00	35.9 AV	54.0	-18.1	1.38 H	312	38.1	-2.2
3	*2402.00	102.6 PK			1.38 H	312	104.9	-2.3
4	*2402.00	101.3 AV			1.38 H	312	103.6	-2.3
5	4804.00	47.2 PK	74.0	-26.8	1.41 H	210	45.4	1.8
6	4804.00	38.7 AV	54.0	-15.3	1.41 H	210	36.9	1.8
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	48.0 PK	74.0	-26.0	1.00 V	147	50.2	-2.2
2	2390.00	35.7 AV	54.0	-18.3	1.00 V	147	37.9	-2.2
3	*2402.00	100.1 PK			1.72 V	155	102.4	-2.3
4	*2402.00	98.9 AV			1.72 V	155	101.2	-2.3
5	4804.00	50.1 PK	74.0	-23.9	1.39 V	142	48.3	1.8
6	4804.00	40.5 AV	54.0	-13.5	1.39 V	142	38.7	1.8

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.

CHANNEL	TX Channel 19	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	46.5 PK	74.0	-27.5	1.37 H	320	48.7	-2.2
2	2390.00	38.0 AV	54.0	-16.0	1.37 H	320	40.2	-2.2
3	*2440.00	103.4 PK			1.37 H	320	106.0	-2.6
4	*2440.00	102.5 AV			1.37 H	320	105.1	-2.6
5	2483.50	49.3 PK	74.0	-24.7	1.37 H	320	51.7	-2.4
6	2483.50	37.2 AV	54.0	-16.8	1.37 H	320	39.6	-2.4
7	4880.00	47.0 PK	74.0	-27.0	1.41 H	200	45.0	2.0
8	4880.00	38.5 AV	54.0	-15.5	1.41 H	200	36.5	2.0
9	7320.00	53.9 PK	74.0	-20.1	1.27 H	142	45.5	8.4
10	7320.00	40.4 AV	54.0	-13.6	1.27 H	142	32.0	8.4
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	2390.00	48.3 PK	74.0	-25.7	1.70 V	166	50.5	-2.2
2	2390.00	36.1 AV	54.0	-17.9	1.70 V	166	38.3	-2.2
3	*2440.00	100.9 PK			1.70 V	166	103.5	-2.6
4	*2440.00	99.3 AV			1.70 V	166	101.9	-2.6
5	2483.50	47.5 PK	74.0	-26.5	1.70 V	166	49.9	-2.4
6	2483.50	35.6 AV	54.0	-18.4	1.70 V	166	38.0	-2.4
7	4880.00	50.2 PK	74.0	-23.8	1.34 V	128	48.2	2.0
8	4880.00	40.5 AV	54.0	-13.5	1.34 V	128	38.5	2.0
9	7320.00	56.5 PK	74.0	-17.5	1.10 V	102	48.1	8.4
10	7320.00	42.0 AV	54.0	-12.0	1.10 V	102	33.6	8.4

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. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.

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	*2480.00	105.7 PK			1.34 H	299	108.3	-2.6
2	*2480.00	104.5 AV			1.34 H	299	107.1	-2.6
3	2483.50	49.2 PK	74.0	-24.8	1.34 H	299	51.6	-2.4
4	2483.50	39.1 AV	54.0	-14.9	1.34 H	299	41.5	-2.4
5	4960.00	46.3 PK	74.0	-27.7	1.41 H	198	44.2	2.1
6	4960.00	38.3 AV	54.0	-15.7	1.41 H	198	36.2	2.1
7	7440.00	54.2 PK	74.0	-19.8	1.33 H	141	45.4	8.8
8	7440.00	40.5 AV	54.0	-13.5	1.33 H	141	31.7	8.8
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	100.7 PK			1.66 V	170	103.3	-2.6
2	*2480.00	99.7 AV			1.66 V	170	102.3	-2.6
3	2483.50	48.0 PK	74.0	-26.0	1.66 V	170	50.4	-2.4
4	2483.50	35.7 AV	54.0	-18.3	1.66 V	170	38.1	-2.4
5	4960.00	49.3 PK	74.0	-24.7	1.43 V	151	47.2	2.1
6	4960.00	40.3 AV	54.0	-13.7	1.43 V	151	38.2	2.1
7	7440.00	55.9 PK	74.0	-18.1	1.11 V	102	47.1	8.8
8	7440.00	41.6 AV	54.0	-12.4	1.11 V	102	32.8	8.8

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.

4.1.8 Test Results (Dipole Antenna)

Above 1GHz Data:

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	57.0 PK	74.0	-17.0	1.11 H	153	59.2	-2.2
2	2390.00	44.9 AV	54.0	-9.1	1.11 H	153	47.1	-2.2
3	*2402.00	92.2 PK			1.11 H	153	94.5	-2.3
4	*2402.00	91.3 AV			1.11 H	153	93.6	-2.3
5	4804.00	46.5 PK	74.0	-27.5	1.09 H	12	44.7	1.8
6	4804.00	38.2 AV	54.0	-15.8	1.09 H	12	36.4	1.8
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	57.1 PK	74.0	-16.9	1.40 V	291	59.3	-2.2
2	2390.00	45.3 AV	54.0	-8.7	1.40 V	291	47.5	-2.2
3	*2402.00	102.1 PK			1.40 V	294	104.4	-2.3
4	*2402.00	100.8 AV			1.40 V	294	103.1	-2.3
5	4804.00	49.5 PK	74.0	-24.5	1.04 V	215	47.7	1.8
6	4804.00	40.5 AV	54.0	-13.5	1.04 V	215	38.7	1.8

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.

CHANNEL	TX Channel 19	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	*2440.00	94.9 PK			1.08 H	135	97.5	-2.6
2	*2440.00	94.0 AV			1.08 H	135	96.6	-2.6
3	4880.00	47.0 PK	74.0	-27.0	1.06 H	23	45.0	2.0
4	4880.00	38.4 AV	54.0	-15.6	1.06 H	23	36.4	2.0
5	7320.00	53.6 PK	74.0	-20.4	1.07 H	83	45.2	8.4
6	7320.00	39.9 AV	54.0	-14.1	1.07 H	83	31.5	8.4
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	*2440.00	104.3 PK			1.38 V	290	106.9	-2.6
2	*2440.00	103.0 AV			1.38 V	290	105.6	-2.6
3	4880.00	49.5 PK	74.0	-24.5	1.01 V	214	47.5	2.0
4	4880.00	40.2 AV	54.0	-13.8	1.01 V	214	38.2	2.0
5	7320.00	56.0 PK	74.0	-18.0	1.30 V	142	47.6	8.4
6	7320.00	41.5 AV	54.0	-12.5	1.30 V	142	33.1	8.4

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. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.

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	*2480.00	95.8 PK			1.10 H	137	98.4	-2.6
2	*2480.00	94.7 AV			1.10 H	137	97.3	-2.6
3	2483.50	57.3 PK	74.0	-16.7	1.10 H	137	59.7	-2.4
4	2483.50	45.2 AV	54.0	-8.8	1.10 H	137	47.6	-2.4
5	4960.00	46.3 PK	74.0	-27.7	1.07 H	22	44.2	2.1
6	4960.00	37.9 AV	54.0	-16.1	1.07 H	22	35.8	2.1
7	7440.00	53.6 PK	74.0	-20.4	1.06 H	91	44.8	8.8
8	7440.00	40.1 AV	54.0	-13.9	1.06 H	91	31.3	8.8
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	105.4 PK			1.31 V	296	108.0	-2.6
2	*2480.00	104.4 AV			1.31 V	296	107.0	-2.6
3	2483.50	59.1 PK	74.0	-14.9	1.36 V	308	61.5	-2.4
4	**2483.50**	**48.9 AV**	**54.0**	**-5.1**	**1.36 V**	**308**	**51.3**	**-2.4**
5	4960.00	49.4 PK	74.0	-24.6	1.00 V	202	47.3	2.1
6	4960.00	40.2 AV	54.0	-13.8	1.00 V	202	38.1	2.1
7	7440.00	55.5 PK	74.0	-18.5	1.32 V	148	46.7	8.8
8	7440.00	41.3 AV	54.0	-12.7	1.32 V	148	32.5	8.8

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.

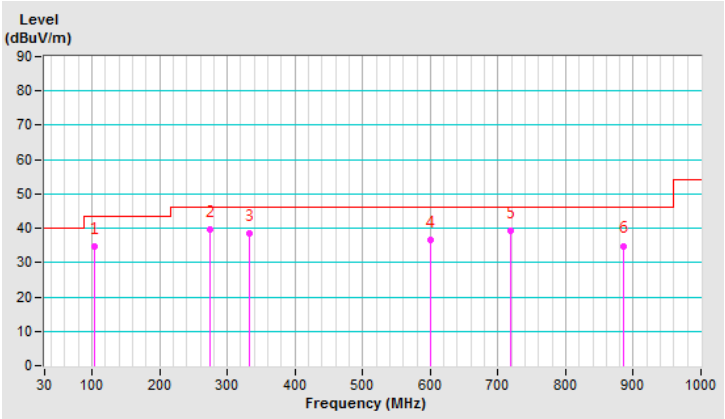
Below 1GHz Data:

CHANNEL	TX Channel 39	**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	103.72	34.7 QP	43.5	-8.8	1.50 H	2	46.4	-11.7
2	273.95	39.7 QP	46.0	-6.3	1.00 H	139	47.5	-7.8
3	333.10	38.5 QP	46.0	-7.5	1.00 H	128	44.6	-6.1
4	600.02	36.4 QP	46.0	-9.6	1.50 H	28	35.6	0.8
5	718.92	39.1 QP	46.0	-6.9	1.00 H	34	37.1	2.0
6	886.17	34.9 QP	46.0	-11.1	1.50 H	37	29.7	5.2

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 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.

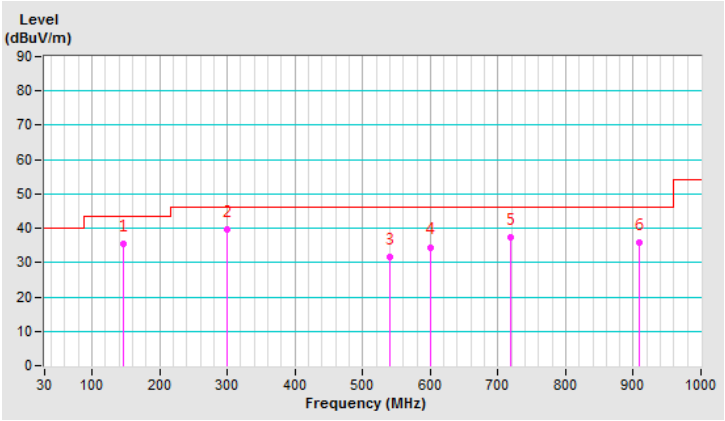


CHANNEL	TX Channel 39	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	9kHz ~ 1GHz		

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	145.58	35.6 QP	43.5	-7.9	1.50 V	360	43.5	-7.9
2	299.51	39.5 QP	46.0	-6.5	1.00 V	58	46.6	-7.1
3	540.73	31.5 QP	46.0	-14.5	1.00 V	73	32.5	-1.0
4	600.02	34.5 QP	46.0	-11.5	1.00 V	202	33.7	0.8
5	718.89	37.3 QP	46.0	-8.7	1.00 V	318	35.3	2.0
6	907.92	35.9 QP	46.0	-10.1	1.50 V	66	30.4	5.5

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 emission levels were very low against the limit of frequency range 9kHz~30MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.

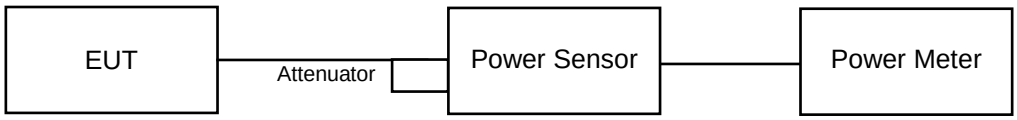


4.2 Conducted Output Power Measurement

4.2.1 Limits of Conducted Output Power Measurement

For systems using digital modulation in the 2400–2483.5 MHz bands: 1 Watt (30dBm)

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 Procedures

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 Conditions

Same as Item 4.3.6.

4.2.7 Test Results

FOR PEAK POWER

Channel	Frequency (MHz)	Peak Power (mW)	Peak Power (dBm)	Limit (dBm)	Pass/Fail
0	2402	3.776	5.77	30	Pass
19	2440	5.408	7.33	30	Pass
39	2480	7.112	8.52	30	Pass

FOR AVERAGE POWER

Channel	Frequency (MHz)	Average Power (mW)	Average Power (dBm)
0	2402	3.475	5.41
19	2440	5.152	7.12
39	2480	6.839	8.35

5 Pictures of Test Arrangements

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

Appendix – Information on the Testing Laboratories

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

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

Linkou EMC/RF Lab
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Fax: 886-2-26051924

Hsin Chu EMC/RF/Telecom Lab
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Hwa Ya EMC/RF/Safety Lab
Tel: 886-3-3183232
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Email: service.adt@tw.bureauveritas.com
Web Site: www.bureauveritas-adt.com

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

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