

## FCC Test Report (BT-LE)

**Report No.:** RF171207E10A-3

**FCC ID:** PPD-QCNFA435

**Test Model:** QCNFA435

**Received Date:** Jan. 03, 2018

**Test Date:** Jan. 26 to Feb. 07, 2018

**Issued Date:** Apr. 19, 2018

**Applicant:** Qualcomm Atheros, Inc.

**Address:** 1700 Technology Dr San Jose California 95110 United States

**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



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### Release Control Record

Issue No.	Description	Date Issued
RF171207E10A-3	Original release.	Apr. 19, 2018

## 1 Certificate of Conformity

**Product:** Single Stream 802.11a/b/g/n/ac + BT 4.1 M.2 Type Card

**Brand:** Qualcomm Atheros

**Test Model:** QCNFA435

**Sample Status:** R&D SAMPLE

**Applicant:** Qualcomm Atheros, Inc.

**Test Date:** Jan. 26 to Feb. 07, 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 :** Wendy Wu, **Date:** Apr. 19, 2018

Wendy Wu / Specialist

**Approved by :** May Chen, **Date:** Apr. 19, 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 & 209 & 15.247(d)	Radiated Emissions & Band Edge Measurement	PASS	Meet the requirement of limit. Minimum passing margin is -6.0dB at 901.739MHz.
15.247(d)	Antenna Port Emission	PASS	Meet the requirement of limit.
15.247(b)	Conducted power	PASS	Meet the requirement of limit.
15.203	Antenna Requirement	PASS	Antenna connector is IPEX and RSMA not a standard connector.

### 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	5.53 dB
Radiated Emissions above 1 GHz	1GHz ~ 6GHz	5.08 dB
	6GHz ~ 18GHz	4.98 dB
	18GHz ~ 40GHz	5.19 dB

### 2.2 Modification Record

There were no modifications required for compliance.

### 3 General Information

#### 3.1 General Description of EUT (BT-LE)

Product	Single Stream 802.11a/b/g/n/ac + BT 4.1 M.2 Type Card
Brand	Qualcomm Atheros
Test Model	QCNFA435
Status of EUT	R&D SAMPLE
Power Supply Rating	3.3Vdc from host equipment
Modulation Type	GFSK
Modulation Technology	DTS
Transfer Rate	Up to 1Mbps
Operating Frequency	2402MHz ~ 2480MHz
Number of Channel	40
Output Power	1.858mW
Antenna Type	Refer to Note
Antenna Connector	Refer to Note
Accessory Device	NA
Data Cable Supplied	NA

## Note:

- This report is prepared for FCC class II permissive change. The difference compared with the Report No.: RF141008E03H-3 as the following:
  - Added new Antennas as following table:

**Original**

Ant. No.	Transmitter Circuit	Brand	Model	Ant. Type	2.4GHz Gain with cable loss (dBi)	5GHz Gain with cable loss (dBi)	2.4GHz Cable Loss (dB)	5GHz Cable Loss (dB)	Connector Type	Cable Length (mm)
1	Chain (0)	WNC	81.EBJ15.005	PIFA	3.00	5.15~5.35GHz: 2.56	1.15	5.15~5.35GHz: 1.70	IPEX	300
						5.47~5.725GHz: 4.76		5.47~5.725GHz: 1.74		
						5.725~5.85GHz: 4.76		5.725~5.85GHz: 1.79		
	Chain (1)	WNC	81.EBJ15.005	PIFA	3.62	5.15~5.35GHz: 3.08	1.15	5.15~5.35GHz: 1.70	IPEX	300
						5.47~5.725GHz: 3.31		5.47~5.725GHz: 1.74		
						5.725~5.85GHz: 2.42		5.725~5.85GHz: 1.79		
2	Chain (0)	WNC	81.ED415.001	PIFA	0.22	5.15~5.35GHz: 5.56	0.96	5.15~5.35GHz: 1.29	IPEX	300
						5.47~5.725GHz: 5.03		5.47~5.725GHz: 1.36		
						5.725~5.85GHz: 3.14		5.725~5.85GHz: 1.38		
	Chain (1)	WNC	81.ED415.001	PIFA	1.48	5.15~5.35GHz: 5.17	0.96	5.15~5.35GHz: 1.29	IPEX	300
						5.47~5.725GHz: 5.34		5.47~5.725GHz: 1.36		
						5.725~5.85GHz: 2.94		5.725~5.85GHz: 1.38		

**Newly**

Ant. No.	Transmitter Circuit	Brand	Model	Ant. Type	2.4GHz Gain with cable loss (dBi)	5GHz Gain with cable loss (dBi)	2.4GHz Cable Loss (dB)	5GHz Cable Loss (dB)	Ant. Connector Type	Cable Connector Type	Cable Length (mm)
3	Chain (0)	HONGBO	290-30641	Dipole	1.64	5.15~5.35GHz: 2.6	0.51	5.15~5.35GHz: 0.78	RSMA	IPEX to RSMA	210
						5.47~5.725GHz: 2.22		5.47~5.725GHz: 0.61			
						5.725~5.85GHz: 2.38		5.725~5.85GHz: 0.81			
	Chain (1)	HONGBO	290-30641	Dipole	1.64	5.15~5.35GHz: 2.6	0.51	5.15~5.35GHz: 0.78	RSMA	IPEX to RSMA	210
						5.47~5.725GHz: 2.22		5.47~5.725GHz: 0.61			
						5.725~5.85GHz: 2.38		5.725~5.85GHz: 0.81			
4	Chain (0)	Speed	F.0G.LS-6008-003-00	Dipole	-1.22	5.15~5.35GHz: 1.17	0.5	5.15~5.35GHz: 0.74	RSMA	IPEX to RSMA	210
	Chain (1)	Speed	F.0G.LS-6008-003-00	Dipole	-1.22	5.47~5.725GHz: 1.48		5.47~5.725GHz: 0.75			
						5.725~5.85GHz: 0.38		5.725~5.85GHz: 0.76			
						5.15~5.35GHz: 1.17	0.5	5.15~5.35GHz: 0.74	RSMA	IPEX to RSMA	210
						5.47~5.725GHz: 1.48		5.47~5.725GHz: 0.75			
						5.725~5.85GHz: 0.38		5.725~5.85GHz: 0.76			

Note: From the above newly antennas, model: **290-30641** 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 test item need to be performed. And all data was verified to meet the requirements.
3. There are Bluetooth technology and WLAN technology used for the EUT.
4. The modular has four variant designs as following table:

Variant No.	Desceiption	Version
SKU #1	2 Antenna connectors	1.0
SKU #2	1 Antenna connector	1.0
SKU #3	2 Antenna connectors	1.1
SKU #4	1 Antenna connect	1.1

Note: From the above Variants, SKU #3 was selected as representative model for the test and its data was recorded in this report.

5. The EUT incorporates a 1T1R function.

2.4GHz Band			
MODULATION MODE	DATA RATE (MCS)	TX & RX CONFIGURATION	
<b>802.11b</b>	1 ~ 11Mbps	1TX	1RX
<b>802.11g</b>	6 ~ 54Mbps	1TX	1RX
<b>802.11n (HT20)</b>	MCS 0~7	1TX	1RX
<b>802.11n (HT40)</b>	MCS 0~7	1TX	1RX
<b>VHT20</b>	MCS 0~8, Nss=1	1TX	1RX
<b>VHT40</b>	MCS 0~9, Nss=1	1TX	1RX

5GHz Band			
MODULATION MODE	DATA RATE (MCS)	TX & RX CONFIGURATION	
<b>802.11a</b>	6 ~ 54Mbps	1TX	1RX
<b>802.11n (HT20)</b>	MCS 0~7	1TX	1RX
<b>802.11n (HT40)</b>	MCS 0~7	1TX	1RX
<b>802.11ac (VHT20)</b>	MCS 0~8, Nss=1	1TX	1RX
<b>802.11ac (VHT40)</b>	MCS 0~9, Nss=1	1TX	1RX
<b>802.11ac (VHT80)</b>	MCS 0~9, Nss=1	1TX	1RX

Note: The modulation and bandwidth are similar for 802.11n mode for 20MHz (40MHz) and 802.11ac mode for 20MHz (40MHz), therefore investigated worst case to representative mode in test report. (Final test mode refer section 3.3.1)

6. The EUT was pre-tested under the following modes:

Test Mode	Data rate
Mode A	400ns GI
<b>Mode B</b>	<b>800ns GI</b>

From the above modes, the worst case was found in **Mode B**. Therefore only the test data of the mode was recorded in this report.

7. WLAN/BT coexistence mode:

- ◆ 1x1 WLAN + BT:
  - 5GHz 802.11a/an (or 11ac) transmit concurrent with BT.
  - 2.4GHz: timely shared coexistence.

8. The emission (conducted & radiated emission) of the simultaneous operation (WiFi <5GHz> & Bluetooth) have been evaluated and no non-compliance found. The detail combinations of transmitters / frequencies / modes as below table

Mode	Available Channel	Tested Channel	Modulation Technology
5 GHz (802.11a) + Bluetooth (GFSK)	36 to 165	52	OFDM
	0 to 78	39	FHSS

9. 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	FREQ. (MHz)	CHANNEL	FREQ. (MHz)	CHANNEL	FREQ. (MHz)	CHANNEL	FREQ. (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 RE<1G: Radiated Emission below 1GHz

APCM: Antenna Port Conducted Measurement

Note: The EUT's antenna (Dipole) 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:

- 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:

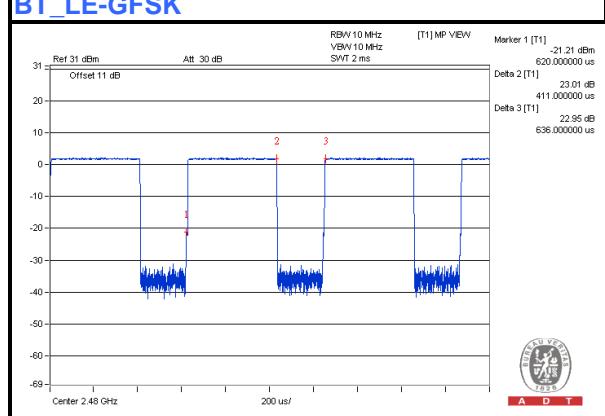
APPLICABLE TO	ENVIRONMENTAL CONDITIONS	INPUT POWER (SYSTEM)	TESTED BY
RE≥1G	23deg. C, 68%RH	120Vac, 60Hz	Andy Ho
RE<1G	23deg. C, 63%RH	120Vac, 60Hz	Rey Chen
APCM	25deg. C, 60%RH	120Vac, 60Hz	Anderson Chen

### 3.3 Duty Cycle of Test Signal

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

Duty cycle = 0.411 ms/0.636 ms = 0.646, Duty factor =  $10 * \log(1/0.646) = 1.9$

BT\_LE-GFSK



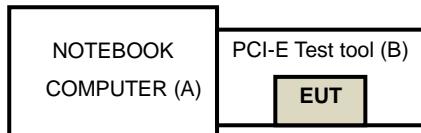
### 3.4 Description of Support Units

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

No.	Product	Brand	Model No.	Serial No.	FCC ID	Remark
A	NOTEBOOK COMPUTER	DELL	E5430	HYV4VY1	FCC DoC	Provided by Lab
B	PCI-E Test tool	Qualcomm Atheros	NA	NA	NA	Supplied by Client

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

#### 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 DTS Meas Guidance v04**  
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 (dB<sub>u</sub>V/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

**For Radiated Emission below 1GHz test:**

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Test Receiver Agilent	N9038A	MY50010156	July 12, 2017	July 11, 2018
Loop Antenna(*) TESEQ	HLA 6121	45745	May 19, 2017	May 18, 2018
Pre-Amplifier Mini-Circuits	ZFL-1000VH2B	AMP-ZFL-05	May 06, 2017	May 05, 2018
Trilog Broadband Antenna SCHWARZBECK	VULB 9168	9168-361	Nov. 29, 2017	Nov. 28, 2018
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. 03, 2017	Oct. 02, 2018
Software	ADT_Radiated_V8.7.08	NA	NA	NA
Antenna Tower & Turn Table Max-Full	MF-7802	MF780208406	NA	NA

**Note:**

1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. \*The 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: Feb. 05, 2018

**For Radiated Emission above 1GHz test:**

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Test Receiver Keysight	N9038A	MY54450088	July 08, 2017	July 07, 2018
Horn_Antenna SCHWARZBECK	BBHA 9120D	9120D-783	Dec. 12, 2017	Dec. 11, 2018
Pre-Amplifier EMCI	EMC12630SE	980385	Jan. 29, 2018	Jan. 28, 2019
RF Cable	EMC104-SM-SM-1200 EMC104-SM-SM-2000 EMC104-SM-SM-5000	160923 150318 150321	Jan. 29, 2018 Jan. 29, 2018 Jan. 29, 2018	Jan. 28, 2019 Jan. 28, 2019 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
Antenna Tower & Turn Table Max-Full	MF-7802	MF780208410	NA	NA
Boresight Antenna Fixture	FBA-01	FBA-SIP02	NA	NA

**Note:**

1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in 966 Chamber No. 4.
3. The CANADA Site Registration No. is 20331-2
4. Tested Date: Feb. 07, 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. 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:

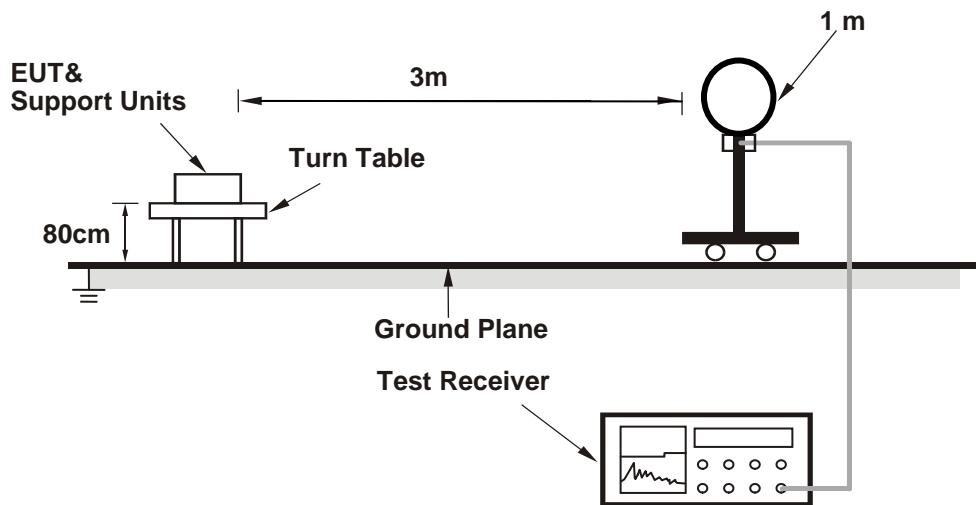
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.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

#### 4.1.4 Deviation from Test Standard

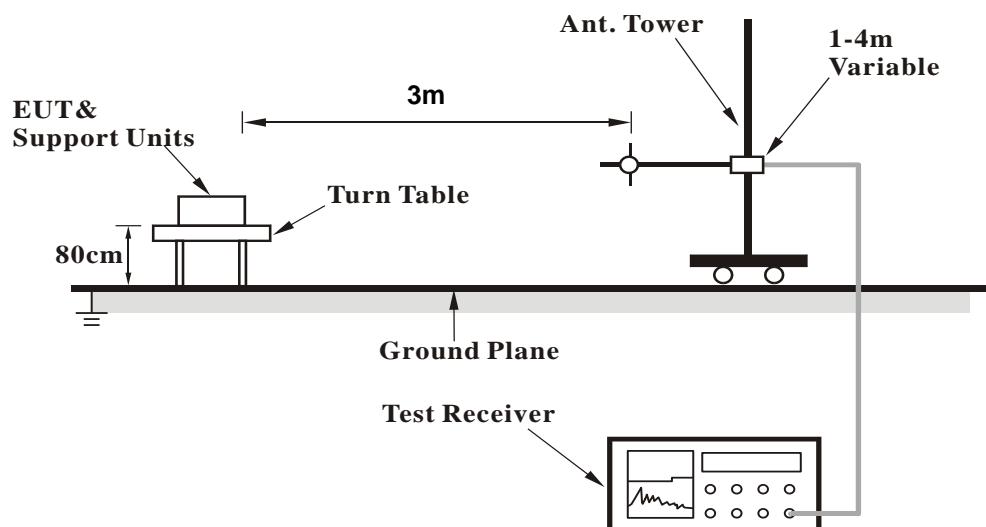
No deviation.

#### 4.1.5 Test Setup

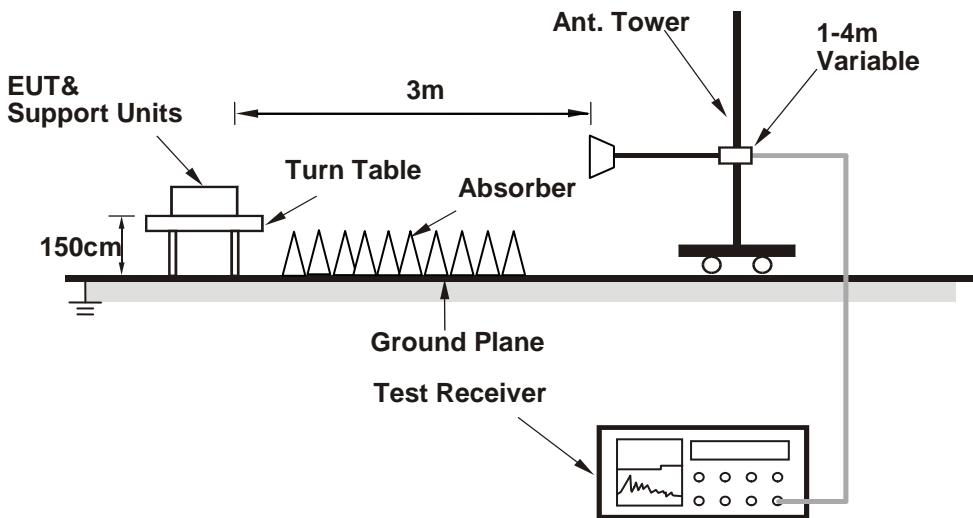
##### For Radiated emission below 30MHz



##### 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

1. Connect the EUT with the support unit A (Notebook Computer) which is placed on a testing table.
2. The communication partner run test program “QCART Version: 3.0.33.0” to enable EUT under transmission/receiving condition continuously at specific channel frequency.

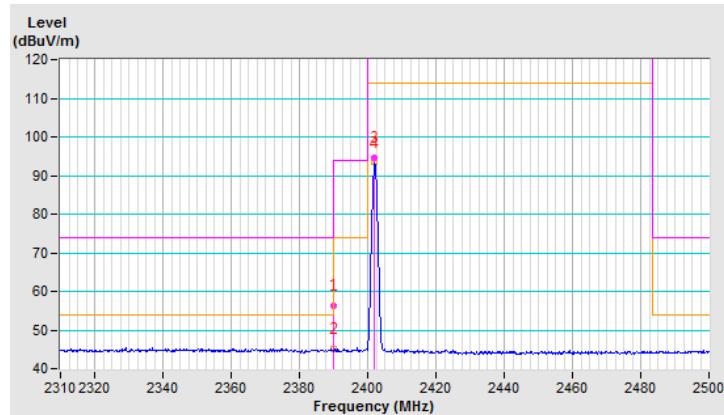
## 4.1.7 Test Results (Bandedge)

<b>CHANNEL</b>	TX Channel 0	<b>DETECTOR FUNCTION</b>	Peak (PK)
<b>FREQUENCY RANGE</b>	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	2.09 H	62	57.4	-1.0
2	2390.00	45.2 AV	54.0	-8.8	2.09 H	62	46.2	-1.0
3	*2402.00	94.5 PK			2.09 H	62	95.5	-1.0
4	*2402.00	93.4 AV			2.09 H	62	94.4	-1.0

**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.

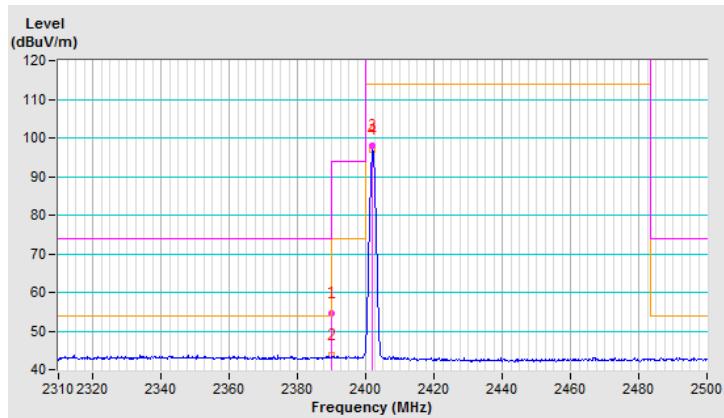


<b>CHANNEL</b>	TX Channel 0	<b>DETECTOR FUNCTION</b>	Peak (PK)
<b>FREQUENCY RANGE</b>	1GHz ~ 25GHz		Average (AV)

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	54.7 PK	74.0	-19.3	1.06 V	119	55.7	-1.0
2	2390.00	43.8 AV	54.0	-10.2	1.06 V	119	44.8	-1.0
3	*2402.00	98.0 PK			1.06 V	119	99.0	-1.0
4	*2402.00	97.0 AV			1.06 V	119	98.0	-1.0

**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.

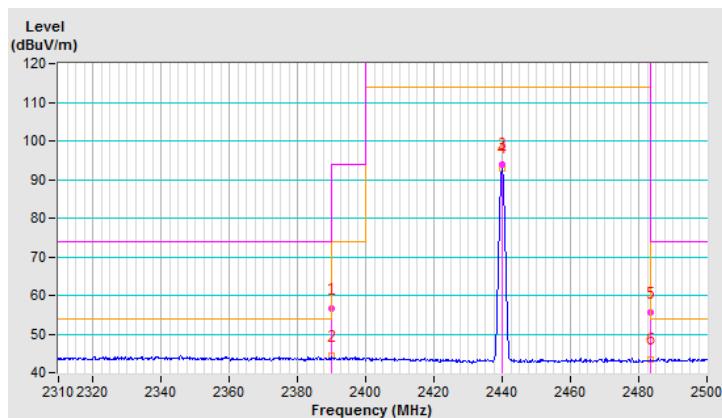


<b>CHANNEL</b>	TX Channel 19	<b>DETECTOR FUNCTION</b>	Peak (PK)
<b>FREQUENCY RANGE</b>	1GHz ~ 25GHz		Average (AV)

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	56.5 PK	74.0	-17.5	2.01 H	61	57.5	-1.0
2	2390.00	44.3 AV	54.0	-9.7	2.01 H	61	45.3	-1.0
3	*2440.00	93.9 PK			2.01 H	61	95.3	-1.4
4	*2440.00	92.8 AV			2.01 H	61	94.2	-1.4
5	2483.50	55.5 PK	74.0	-18.5	2.01 H	61	56.7	-1.2
6	2483.50	43.5 AV	54.0	-10.5	2.01 H	61	44.7	-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. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " \* ": Fundamental frequency.

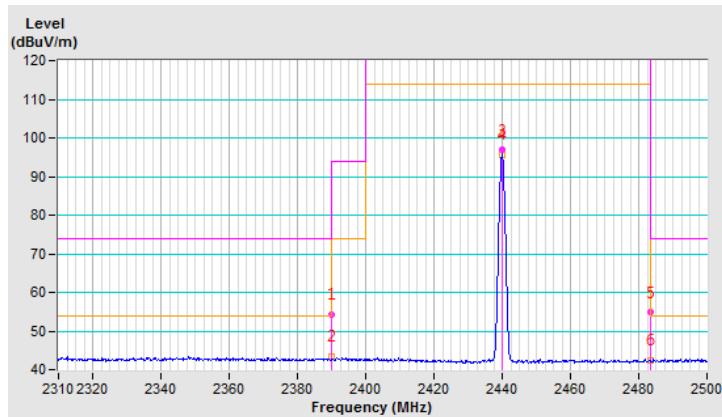


<b>CHANNEL</b>	TX Channel 19	<b>DETECTOR FUNCTION</b>	Peak (PK)
<b>FREQUENCY RANGE</b>	1GHz ~ 25GHz		Average (AV)

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	54.3 PK	74.0	-19.7	1.13 V	119	55.3	-1.0
2	2390.00	43.4 AV	54.0	-10.6	1.13 V	119	44.4	-1.0
3	*2440.00	96.8 PK			1.13 V	119	98.2	-1.4
4	*2440.00	95.7 AV			1.13 V	119	97.1	-1.4
5	2483.50	54.8 PK	74.0	-19.2	1.13 V	119	56.0	-1.2
6	2483.50	42.5 AV	54.0	-11.5	1.13 V	119	43.7	-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. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " \* ": Fundamental frequency.

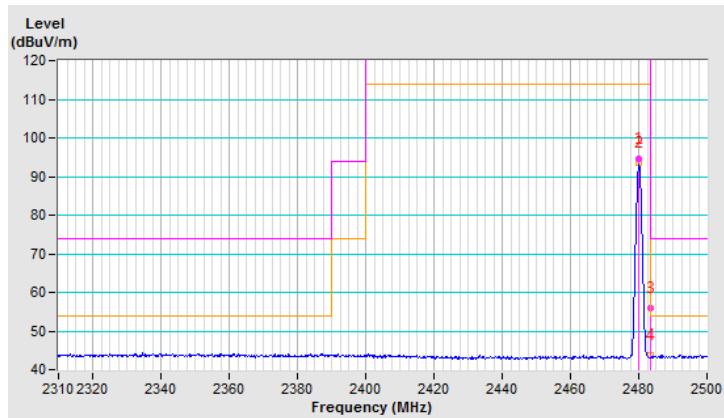


<b>CHANNEL</b>	TX Channel 39	<b>DETECTOR FUNCTION</b>	Peak (PK)
<b>FREQUENCY RANGE</b>	1GHz ~ 25GHz		Average (AV)

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	94.6 PK			2.00 H	62	95.9	-1.3
2	*2480.00	93.5 AV			2.00 H	62	94.8	-1.3
3	2483.50	56.0 PK	74.0	-18.0	2.00 H	62	57.2	-1.2
4	2483.50	43.7 AV	54.0	-10.3	2.00 H	62	44.9	-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. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " \* ": Fundamental frequency.

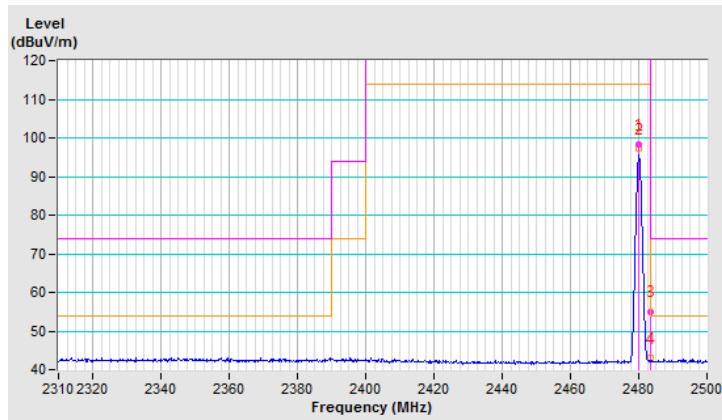


<b>CHANNEL</b>	TX Channel 39	<b>DETECTOR FUNCTION</b>	Peak (PK)
<b>FREQUENCY RANGE</b>	1GHz ~ 25GHz		Average (AV)

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	98.2 PK			1.29 V	116	99.5	-1.3
2	*2480.00	97.2 AV			1.29 V	116	98.5	-1.3
3	2483.50	54.9 PK	74.0	-19.1	1.29 V	116	56.1	-1.2
4	2483.50	42.9 AV	54.0	-11.1	1.29 V	116	44.1	-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. 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 (Spurious emission)

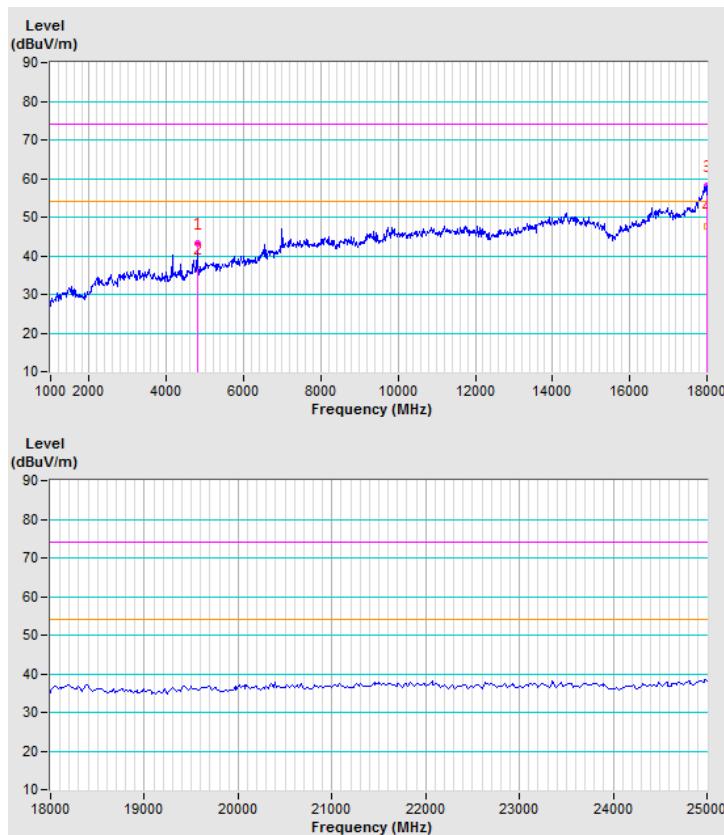
##### Above 1GHz Data:

<b>CHANNEL</b>	TX Channel 0	<b>DETECTOR FUNCTION</b>	Peak (PK)
<b>FREQUENCY RANGE</b>	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	4804.00	43.1 PK	74.0	-30.9	1.48 H	153	40.0	3.1
2	4804.00	36.5 AV	54.0	-17.5	1.48 H	153	33.4	3.1
3	17994.47	58.0 PK	74.0	-16.0	1.48 H	153	33.3	24.7
4	17994.47	47.6 AV	54.0	-6.4	1.48 H	153	22.9	24.7

##### 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

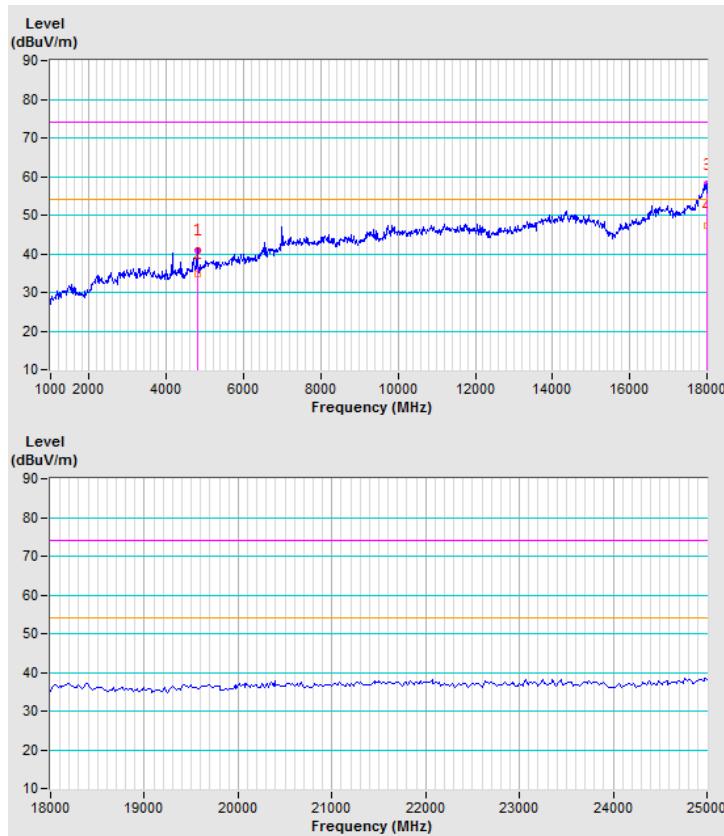


<b>CHANNEL</b>	TX Channel 0	<b>DETECTOR FUNCTION</b>	Peak (PK)
<b>FREQUENCY RANGE</b>	1GHz ~ 25GHz		Average (AV)

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	4804.00	40.9 PK	74.0	-33.1	1.02 V	153	37.8	3.1
2	4804.00	34.7 AV	54.0	-19.3	1.02 V	153	31.6	3.1
3	17994.47	58.0 PK	74.0	-16.0	1.02 V	153	33.3	24.7
4	17994.47	47.4 AV	54.0	-6.6	1.02 V	153	22.7	24.7

**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

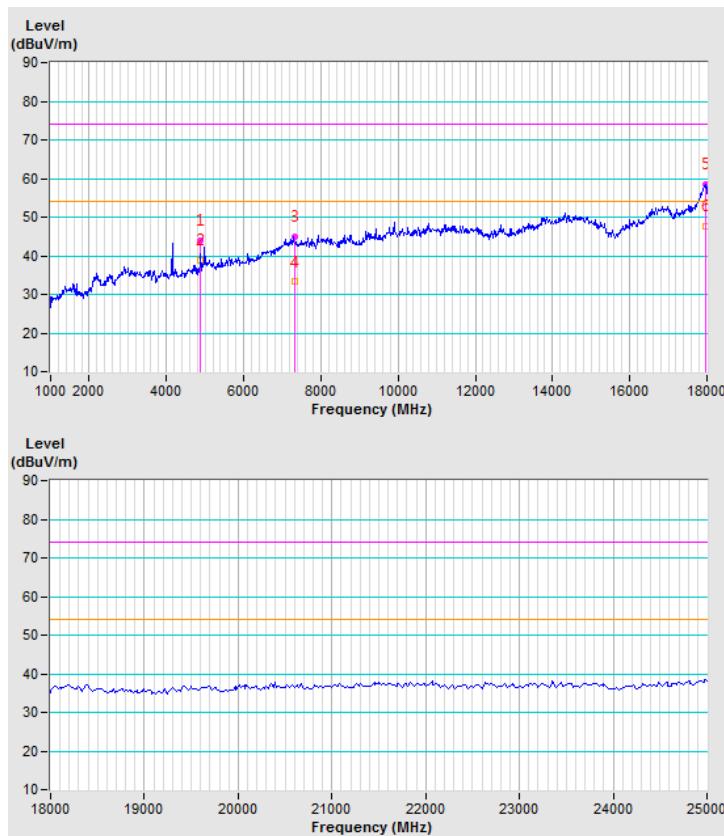


<b>CHANNEL</b>	TX Channel 19	<b>DETECTOR FUNCTION</b>	Peak (PK)
<b>FREQUENCY RANGE</b>	1GHz ~ 25GHz		Average (AV)

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	4880.00	44.0 PK	74.0	-30.0	1.47 H	150	40.7	3.3
2	4880.00	38.8 AV	54.0	-15.2	1.47 H	150	35.5	3.3
3	7320.00	45.0 PK	74.0	-29.0	1.60 H	133	35.0	10.0
4	7320.00	33.3 AV	54.0	-20.7	1.60 H	133	23.3	10.0
5	17966.85	58.6 PK	74.0	-15.4	1.60 H	133	34.4	24.2
6	17966.85	47.6 AV	54.0	-6.4	1.60 H	133	23.4	24.2

**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

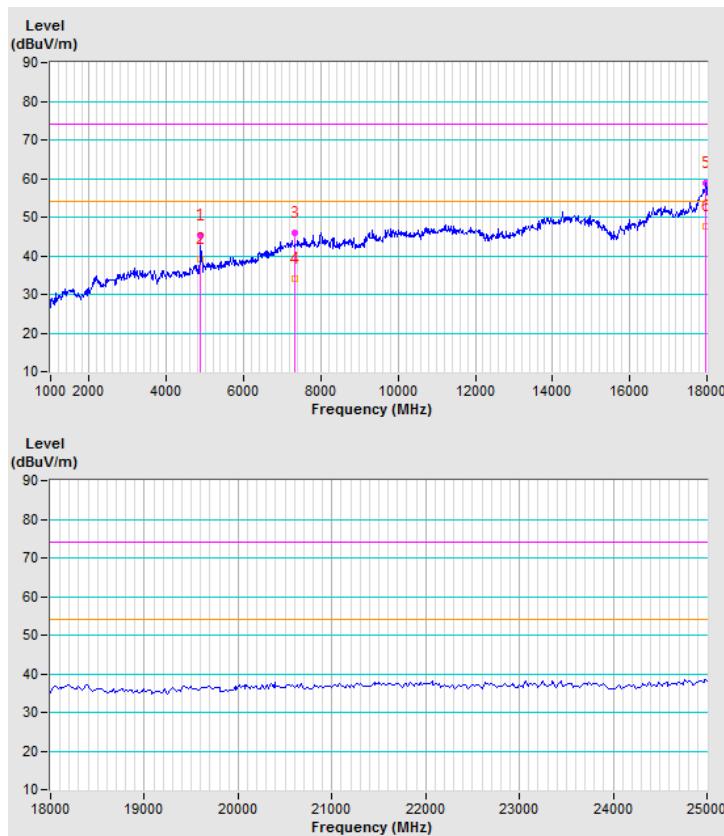


<b>CHANNEL</b>	TX Channel 19	<b>DETECTOR FUNCTION</b>	Peak (PK)
<b>FREQUENCY RANGE</b>	1GHz ~ 25GHz		Average (AV)

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	4880.00	45.4 PK	74.0	-28.6	1.01 V	147	42.1	3.3
2	4880.00	39.2 AV	54.0	-14.8	1.01 V	147	35.9	3.3
3	7320.00	46.1 PK	74.0	-27.9	1.05 V	151	36.1	10.0
4	7320.00	34.2 AV	54.0	-19.8	1.05 V	151	24.2	10.0
5	17974.92	58.8 PK	74.0	-15.2	1.05 V	151	34.4	24.4
6	17974.92	47.6 AV	54.0	-6.4	1.05 V	151	23.2	24.4

**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

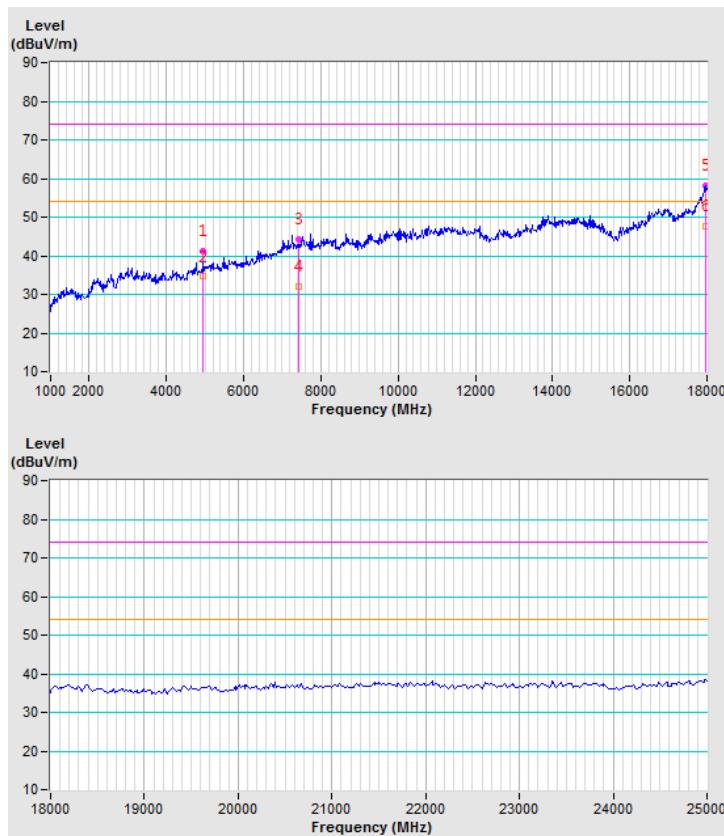


<b>CHANNEL</b>	TX Channel 39	<b>DETECTOR FUNCTION</b>	Peak (PK)
<b>FREQUENCY RANGE</b>	1GHz ~ 25GHz		Average (AV)

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	4960.00	41.2 PK	74.0	-32.8	1.44 H	168	37.7	3.5
2	4960.00	34.6 AV	54.0	-19.4	1.44 H	168	31.1	3.5
3	7440.00	44.3 PK	74.0	-29.7	1.45 H	164	34.2	10.1
4	7440.00	32.0 AV	54.0	-22.0	1.45 H	164	21.9	10.1
5	17976.20	58.1 PK	74.0	-15.9	1.45 H	164	33.7	24.4
6	17976.20	47.6 AV	54.0	-6.4	1.45 H	164	23.2	24.4

**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

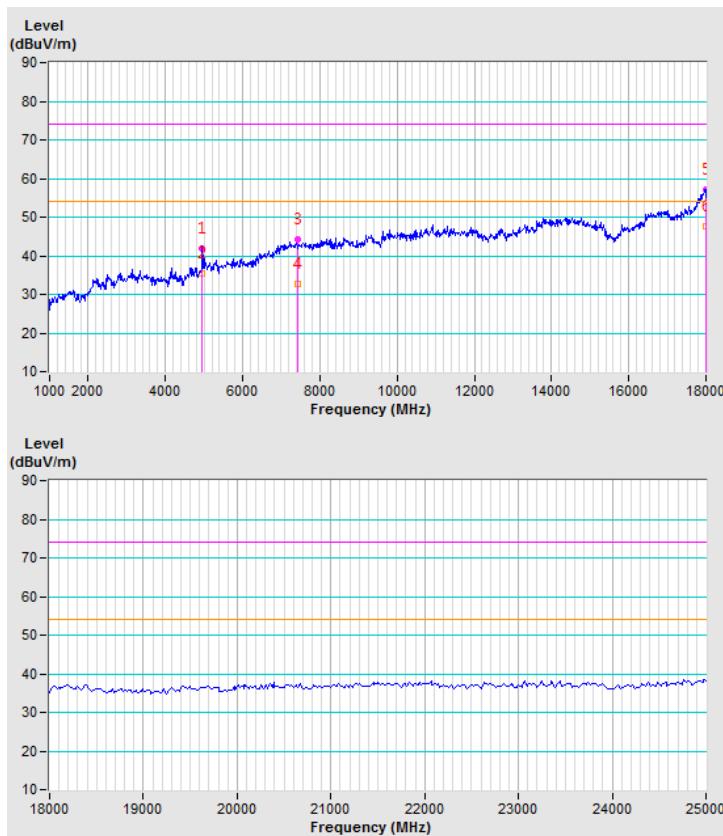


<b>CHANNEL</b>	TX Channel 39	<b>DETECTOR FUNCTION</b>	Peak (PK)
<b>FREQUENCY RANGE</b>	1GHz ~ 25GHz		Average (AV)

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	4960.00	41.8 PK	74.0	-32.2	1.01 V	123	38.3	3.5
2	4960.00	35.4 AV	54.0	-18.6	1.01 V	123	31.9	3.5
3	7440.00	44.2 PK	74.0	-29.8	1.12 V	127	34.1	10.1
4	7440.00	32.8 AV	54.0	-21.2	1.12 V	127	22.7	10.1
5	17989.80	57.1 PK	74.0	-16.9	1.12 V	127	32.5	24.6
6	17989.80	47.6 AV	54.0	-6.4	1.12 V	127	23.0	24.6

**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



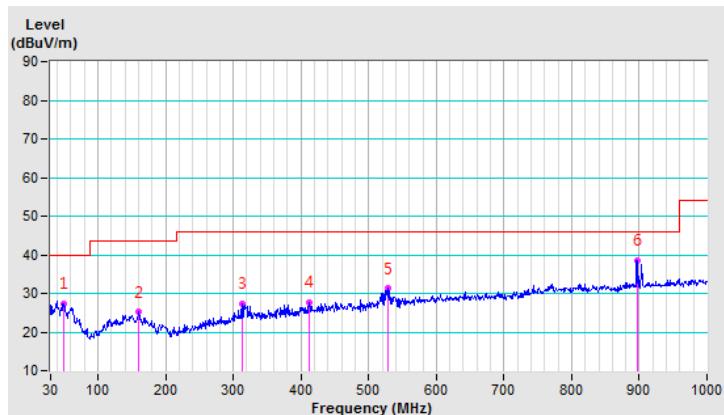
**Below 1GHz Data:**

<b>CHANNEL</b>	TX Channel 39	<b>DETECTOR FUNCTION</b>	Quasi-Peak (QP)
<b>FREQUENCY RANGE</b>	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	50.18	27.3 QP	40.0	-12.7	1.50 H	360	35.2	-7.9
2	160.13	25.1 QP	43.5	-18.4	2.00 H	290	33.2	-8.1
3	313.92	27.4 QP	46.0	-18.6	1.00 H	310	34.2	-6.8
4	412.86	27.8 QP	46.0	-18.2	2.00 H	318	32.5	-4.7
5	528.70	31.2 QP	46.0	-14.8	1.50 H	27	33.4	-2.2
6	897.08	38.6 QP	46.0	-7.4	2.00 H	301	35.1	3.5

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

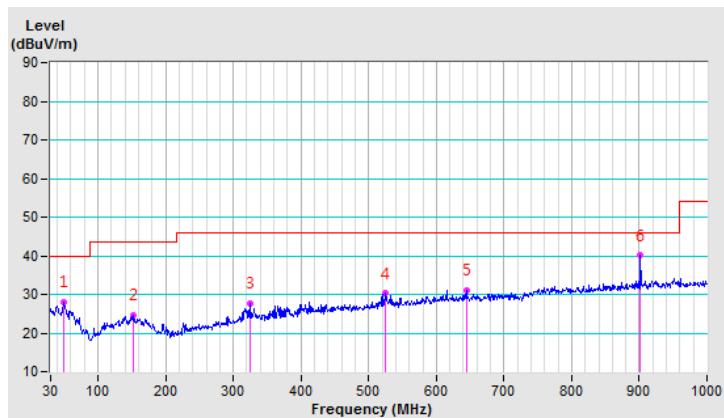


<b>CHANNEL</b>	TX Channel 39	<b>DETECTOR FUNCTION</b>	Quasi-Peak (QP)
<b>FREQUENCY RANGE</b>	9kHz ~ 1GHz		

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	50.18	28.0 QP	40.0	-12.0	1.50 V	357	35.9	-7.9
2	151.93	24.6 QP	43.5	-18.9	2.00 V	32	32.5	-7.9
3	324.37	27.8 QP	46.0	-18.2	1.00 V	21	34.1	-6.3
4	524.80	30.2 QP	46.0	-15.8	1.00 V	71	32.4	-2.2
5	644.37	31.1 QP	46.0	-14.9	2.00 V	3	30.9	0.2
6	901.74	40.0 QP	46.0	-6.0	1.50 V	11	36.4	3.6

**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

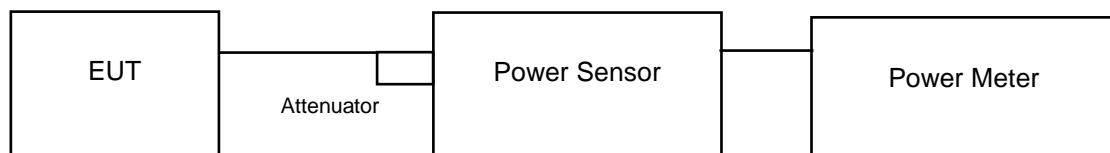


## 4.2 Conducted Output Power Measurement

### 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

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Spectrum Analyzer R&S	FSv40	100964	July 01, 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
Software	ADT_RF Test Software V6.6.5.4	NA	NA	NA

**NOTE:** 1. The test was performed in Oven room 2.  
 2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.  
 3. Tested Date: Jan. 26, 2018

### 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

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)	Peak Power (mW)	Peak Power (dBm)	Limit (dBm)	Pass/Fail
0	2402	1.607	2.06	30	Pass
19	2440	1.762	2.46	30	Pass
39	2480	1.858	2.69	30	Pass

##### FOR AVERAGE POWER

Channel	Frequency (MHz)	Average Power (mW)	Average Power (dBm)
0	2402	1.517	1.81
19	2440	1.667	2.22
39	2480	1.758	2.45

## 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**

Tel: 886-2-26052180  
Fax: 886-2-26051924

### **Hsin Chu EMC/RF/Telecom Lab**

Tel: 886-3-6668565  
Fax: 886-3-6668323

### **Hwa Ya EMC/RF/Safety Lab**

Tel: 886-3-3183232  
Fax: 886-3-3270892

**Email:** [service.adt@tw.bureauveritas.com](mailto:service.adt@tw.bureauveritas.com)

**Web Site:** [www.bureauveritas-adt.com](http://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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