

## Radio Test Report (BT-EDR)

**Report No.:** RJ150107E07-2

**Test Model:** QCNFA364A

**Received Date:** Jan. 07, 2015

**Test Date:** Feb. 13, 2015

**Issued Date:** Mar. 13, 2015

**Applicant:** Qualcomm Atheros, Inc.

**Address:** 1700 Technology Drive, San Jose, CA 95110

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

**Lab Address:** No. 81-1, Lu Liao Keng, 9th Ling, Wu Lung Tsuen, Chiung Lin Hsiang, Hsin  
Chu Hsien 307, Taiwan R.O.C.

**Test Location (1):** No. 81-1, Lu Liao Keng, 9th Ling, Wu Lung Tsuen, Chiung Lin Hsiang, Hsin  
Chu Hsien 307, 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
RJ150107E07-2	Original release.	Mar. 13, 2015

**1 Certificate of Conformity**

**Product:** 802.11a/b/g/n/ac + BT 4.1 M.2 2230 Type Card

**Brand:** Qualcomm Atheros

**Test Model:** QCNFA364A

**Sample Status:** ENGINEERING SAMPLE

**Applicant:** Qualcomm Atheros, Inc.

**Test Date:** Feb. 13, 2015

**Standards:** ARIB STD-T66 (V3.7), MIC notice 88 Appendix 43

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:** Mar. 13, 2015  
( Elsie Hsu, Specialist )

**Approved by :**  , **Date:** Mar. 13, 2015  
( Hank Chung, Manager )

## 2 Summary of Test Results

The EUT has been tested according to the following specifications:

Notice 88 Appendix 43 Reference	ARIB STD-T66 Ref.	Report Reference	Parameter	Test Results (Note)
<b>General Provisions</b>				
C	3.2 (4)	4.1	Frequency tolerance	C
D	3.2 (7)	4.2	Occupied bandwidth	C
E	3.2 (6)	4.4	Spurious emissions	C
<b>Transmitting Equipment</b>				
F	--	4.5	Antenna power	C
--	--	--	SAR	NA
<b>Transmitting Antenna</b>				
--	--	3.5	Type, configuration, etc. of transmitting antenna	C
--	--	3.5	Direction pattern of transmitting antenna	C
<b>Receiving Equipment</b>				
G	3.3 (1)	4.6	Spurious emissions of receiver	C
--	--	3.5	Refer to all articles for transmitting antenna	C
<b>Operating Frequency 2400 to 2483.5MHz</b>				
--	3.7 (1)	3.4	High Frequency/modulation section cannot be opened easily	C
--	3.1 (1)	3.1	Communication method	C
--	3.2 (1)a	3.1	Modulation method	C
--	3.2 (1)a	3.1	Spread spectrum method	C
--	3.2 (2)	4.5	Antenna power	C
--	3.6 (2)	4.5	Absolute gain of transmitting antenna	C
--	3.6 (2)	--	Angular width of principal radiation (AWPR)	NA
--	3.2 (10)	--	Number of carriers within 1 MHz bandwidth in OFDM	NA
--	3.2 (8)	4.3	Spreading bandwidth	C
--	3.2 (9)	4.3	Spreading factor	C
--	3.2 (11)	--	Frequency retention time (FH employed)	NA
--	3.4.1(1)	4.8	Interference Prevention Function	C
--	3.4.1(3)	--	Carrier Sense Capability	NA
Note:C = Conform NC = Not Conform NT = Not Tested NA = Not Applicable				

## 2.1 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in TR 100 028-1.

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of  $k=2$ .

Parameter	Uncertainty
Occupied Bandwidth	261.60 Hz
Spurious emissions	2.52dB
Output power density	1.37dB
Out of band radiated power	2.52 dB
Frequency Tolerance	261.60 Hz

## 2.2 Modification Record

There were no modifications required for compliance.

### 3 General Information

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

Product	802.11a/b/g/n/ac + BT 4.1 M.2 2230 Type Card
Brand	Qualcomm Atheros
Test Model	QCNFA364A
Status of EUT	ENGINEERING SAMPLE
Nominal Voltage	3.3Vdc form host equipment
Modulation Type	GFSK, $\pi/4$ -DQPSK, 8DPSK
Modulation Technology	FHSS
Transfer Rate	Up to 3Mbps
Operating Frequency	2402 ~ 2480MHz
Number of Channel	79
Rated RF Output Power Density	Refer to Note
Conducted RF Output Power Density	Refer to Note
Radiated RF Output Power Density	Refer to Note
Antenna Type	Refer to section 3.5
Antenna Connector	Refer to section 3.5
Accessory Device	NA
Data Cable Supplied	NA

Note:

1. There are Bluetooth technology and WLAN technology used for the EUT.
2. The EUT support multiple function, therefore the WLAN OFDM will be cover BT OFDM (low power) scenario.
3. WLAN/BT coexistence mode:
  - ◆ 2x2 WLAN + BT:
    - 5GHz 802.11a/an (or 11ac) transmit concurrent with BT.
    - 2.4GHz: timely shared coexistence.
4. 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		

**NOTE 1:** By means of test software (QRCT Version 3.0 33.0) provided by manufacture, the power levels during the tests were set according to the following codes:

Modulation type: GFSK		Modulation type: $\pi/4$ -DQPSK		Modulation type: 8DPSK	
Software measurement Power setting	Conducted Avg. Power(dBm)	Software measurement Power setting	Conducted Avg. Power(dBm)	Software measurement Power setting	Conducted Avg. Power(dBm)
9	11.27	9	7.91	9	7.94

**NOTE 2:** The EUT was tested under following test modes, and the test data was recorded in this report:

Normal mode
GFSK
$\pi/4$ -DQPSK
8DPSK
Enable AFH function
GFSK
$\pi/4$ -DQPSK
8DPSK

\* For AFH function only tested occupied bandwidth, spreading bandwidth, Antenna power and dwell time.



### 3.3 Test Conditions

Test Conditions	Voltage (Vdc)
$V_{normal}$	3.3

Note : The voltage of radio can make sure variation in  $\pm 1\%$  ,that can only use normal voltage to test, if external voltage vary in  $\pm 10\%$ .

### 3.4 Assembly

The EUT is constructed as a 802.11a/b/g/n/ac + BT 4.1 M.2 2230 Type Card. The RF circuit was covered by metal shielding case, and the metal shielding case was soldered on PCB.

### 3.5 Antenna Specifications

#### 3.5.1 Antenna Gain

Transmitter Circuit	Brand	Model	Ant. Type	2.4GHz Gain with cable loss (dBi)	5GHz Gain with cable loss (dBi)	2.4GHz Cable Loss (dBi)	5G Cable Loss (dBi)	Connector Type	Cable Length (mm)
Chain (0)	WNC	81-EBJ15.005	PIFA	3.00	Band 1&2: 2.56	1.15	Band 1&2: 1.70	IPEX	300
					Band 3: 4.76		Band 3: 1.74		
					Band 4: 4.76		Band 4: 1.79		
Chain (1)	WNC	81-EBJ15.005	PIFA	3.62	Band 1&2: 3.08	1.15	Band 1&2: 1.70	IPEX	300
					Band 3: 3.31		Band 3: 1.74		
					Band 4: 2.42		Band 4: 1.79		

#### 3.5.2 Antenna Pattern

Please refer to the attached file (Antenna pattern).

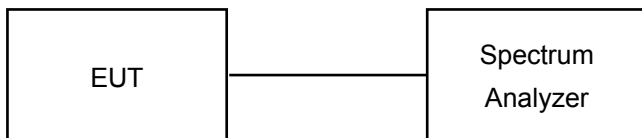
## 4 Test Results

### 4.1 Frequency Tolerance Measurement

#### 4.1.1 Limits of Frequency Tolerance Measurement

Tolerance of frequency shall be +/- 50ppm

#### 4.1.2 Test Setup



#### 4.1.3 Test Results

Modulation: GFSK

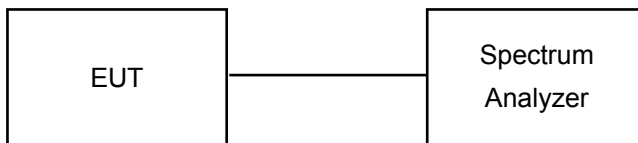
Environmental Conditions			
Channel	Frequency (MHz)	Voltage <sub>normal</sub>	
		Carrier frequency (MHz)	Frequency tolerance (ppm)
0	2402	2401.998560	-0.600
39	2441	2440.996860	-1.286
78	2480	2479.996660	-1.347

## 4.2 Occupied Bandwidth Measurement (99% power bandwidth)

### 4.2.1 Limits of Occupied Bandwidth Measurement

Item	Limit
Occupied bandwidth	<83.5 MHz

### 4.2.2 Test Setup



### 4.2.3 Test Results

Modulation: GFSK

Normal Mode:

Environmental Conditions	25 deg.C, 60% RH
Hopping Mode	$V_{normal}$
	Occupied Bandwidth (MHz)
	78.20

AFH Mode:

Environmental Conditions	25 deg.C, 60% RH
Hopping Mode	$V_{normal}$
	Occupied Bandwidth (MHz)
	19.70

**Modulation:  $\pi/4$ -DQPSK**

**Normal Mode:**

<b>Environmental Conditions</b>	<b>25 deg.C, 60% RH</b>
<b>Hopping Mode</b>	<b>V<sub>normal</sub></b>
	<b>Occupied Bandwidth (MHz)</b>
	78.60

**AFH Mode:**

<b>Environmental Conditions</b>	<b>25 deg.C, 60% RH</b>
<b>Hopping Mode</b>	<b>V<sub>normal</sub></b>
	<b>Occupied Bandwidth (MHz)</b>
	20.10

**Modulation: 8DPSK**

**Normal Mode:**

<b>Environmental Conditions</b>	<b>25 deg.C, 60% RH</b>
<b>Hopping Mode</b>	<b>V<sub>normal</sub></b>
	<b>Occupied Bandwidth (MHz)</b>
	78.40

**AFH Mode:**

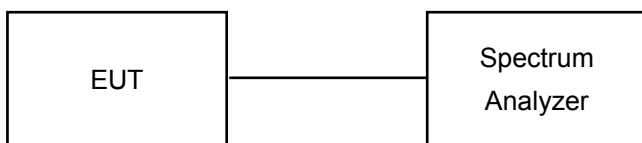
<b>Environmental Conditions</b>	<b>25 deg.C, 60% RH</b>
<b>Hopping Mode</b>	<b>V<sub>normal</sub></b>
	<b>Occupied Bandwidth (MHz)</b>
	20.00

### 4.3 Spreading Bandwidth Measurement (90% power bandwidth)

#### 4.3.1 Limits of Spreading Bandwidth and Spreading Factor Measurement

Item	Limit	Remark
Spreading Bandwidth	$\geq 500\text{kHz}$	(For DSSS, FHSS)
Spreading Factor	$\geq 5$	Operating frequency 2400 to 2483.5MHz

#### 4.3.2 Test Setup



#### 4.3.3 Test Results

**Modulation: GFSK**

**Normal Mode:**

Environmental Conditions	25 deg.C, 60% RH	
Hopping Mode	$V_{\text{normal}}$	
	Occupied Bandwidth (MHz)	Spreading Factor
	70.80	70.80

**NOTE:** Spreading Factor: 90% channel power bandwidth / 1.

**AFH Mode:**

Environmental Conditions	25 deg.C, 60% RH	
Hopping Mode	$V_{\text{normal}}$	
	Occupied Bandwidth (MHz)	Spreading Factor
	18.10	18.10

**NOTE:** Spreading Factor: 90% channel power bandwidth / 1.

**Modulation:  $\pi/4$ -DQPSK**

**Normal Mode:**

<b>Environmental Conditions</b>	<b>25 deg.C, 60% RH</b>	
<b>Hopping Mode</b>	$V_{normal}$	
	<b>Occupied Bandwidth (MHz)</b>	<b>Spreading Factor</b>
	71.60	71.60

**NOTE:** Spreading Factor: 90% channel power bandwidth / 1.

**AFH Mode:**

<b>Environmental Conditions</b>	<b>25 deg.C, 60% RH</b>	
<b>Hopping Mode</b>	$V_{normal}$	
	<b>Occupied Bandwidth (MHz)</b>	<b>Spreading Factor</b>
	18.30	18.30

**NOTE:** Spreading Factor: 90% channel power bandwidth / 1.



**Modulation: 8DPSK**

**Normal Mode:**

<b>Environmental Conditions</b>	<b>25 deg.C, 60% RH</b>	
<b>Hopping Mode</b>	<b>V<sub>normal</sub></b>	
	<b>Occupied Bandwidth (MHz)</b>	<b>Spreading Factor</b>
	71.40	71.40

**NOTE:** Spreading Factor: 90% channel power bandwidth / 1.

**AFH Mode:**

<b>Environmental Conditions</b>	<b>25 deg.C, 60% RH</b>	
<b>Hopping Mode</b>	<b>V<sub>normal</sub></b>	
	<b>Occupied Bandwidth (MHz)</b>	<b>Spreading Factor</b>
	18.00	18.00

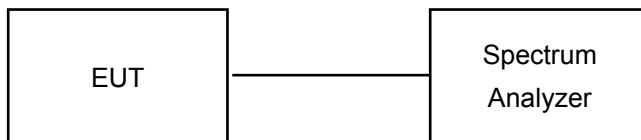
**NOTE:** Spreading Factor: 90% channel power bandwidth / 1.

#### 4.4 Spurious Emissions for Transmitter Measurement

##### 4.4.1 Limits of Spurious Emissions

Frequencies (MHz)	Limit
Operating frequency 2400 to 2483.5MHz	
30.0MHz to 1000.0MHz	$\leq 0.25 \mu\text{W}/100\text{kHz}$
1000.0MHz to 2387MHz	$\leq 2.5 \mu\text{W}/\text{MHz}$
2387.0MHz to 2400.0MHz	$\leq 25 \mu\text{W}/\text{MHz}$
2483.5MHz to 2496.5MHz	$\leq 25 \mu\text{W}/\text{MHz}$
2496.5MHz to 12500.0MHz	$\leq 2.5 \mu\text{W}/\text{MHz}$

##### 4.4.2 Test Setup



### 4.4.3 Test Results

Modulation: GFSK

Environmental Conditions		25 deg.C, 60% RH					
Test Channel		CH0 (2402MHz)		CH39 (2441MHz)		Limit	Result
Test Condition	Frequency Range	Frequency (MHz)	Measured Value	Frequency (MHz)	Measured Value		
V <sub>normal</sub>	30.0MHz to 1000.0MHz	83.108	0.023044uW	582.415	0.018825uW	0.25uW	PASS
	1000.0MHz to 2387MHz	2270.145	0.032027uW	2309.328	0.044226uW	2.5uW	PASS
	2387.0MHz to 2400.0MHz	2400.000	19.397911uW	2399.974	0.018482uW	25uW	PASS
	2483.5MHz to 2496.5MHz	2489.945	0.018425uW	2485.479	0.018944uW	25uW	PASS
	2496.5MHz to 12500.0MHz	3124.220	0.023262uW	3666.910	0.022346uW	2.5uW	PASS
Test Channel		CH78 (2480MHz)				Limit	Result
Test Condition	Frequency Range	Frequency (MHz)		Measured Value			
V <sub>normal</sub>	30.0MHz to 1000.0MHz	317.605		0.019423uW		0.25uW	PASS
	1000.0MHz to 2387MHz	2348.164		0.056843uW		2.5uW	PASS
	2387.0MHz to 2400.0MHz	2392.245		0.020675uW		25uW	PASS
	2483.5MHz to 2496.5MHz	2483.500		0.873958uW		25uW	PASS
	2496.5MHz to 12500.0MHz	4137.074		0.022146uW		2.5uW	PASS

**Modulation:  $\pi/4$ -DQPSK**

Environmental Conditions		25 deg.C, 60% RH					
Test Channel		CH0 (2402MHz)		CH39 (2441MHz)		Limit	Result
Test Condition	Frequency Range	Frequency (MHz)	Measured Value	Frequency (MHz)	Measured Value		
$V_{normal}$	30.0MHz to 1000.0MHz	112.692	0.019466uW	92.808	0.01739uW	0.25uW	PASS
	1000.0MHz to 2387MHz	2270.492	0.022365uW	2308.981	0.036505uW	2.5uW	PASS
	2387.0MHz to 2400.0MHz	2400.000	8.956478uW	2397.244	0.014132uW	25uW	PASS
	2483.5MHz to 2496.5MHz	2489.841	0.018055uW	2488.177	0.012837uW	25uW	PASS
	2496.5MHz to 12500.0MHz	7383.210	0.021462uW	3251.764	0.021368uW	2.5uW	PASS
Test Channel		CH78 (2480MHz)				Limit	Result
Test Condition	Frequency Range	Frequency (MHz)		Measured Value			
$V_{normal}$	30.0MHz to 1000.0MHz	695.178		0.018007uW		0.25uW	PASS
	1000.0MHz to 2387MHz	2348.511		0.041634uW		2.5uW	PASS
	2387.0MHz to 2400.0MHz	2391.959		0.017297uW		25uW	PASS
	2483.5MHz to 2496.5MHz	2483.500		0.742618uW		25uW	PASS
	2496.5MHz to 12500.0MHz	3609.389		0.023033uW		2.5uW	PASS

**Modulation: 8DPSK**

Environmental Conditions		25 deg.C, 60% RH					
Test Channel		CH0 (2402MHz)		CH39 (2441MHz)		Limit	Result
Test Condition	Frequency Range	Frequency (MHz)	Measured Value	Frequency (MHz)	Measured Value		
<b>V<sub>normal</sub></b>	<b>30.0MHz to 1000.0MHz</b>	160.222	0.018298uW	307.663	0.018931uW	0.25uW	PASS
	<b>1000.0MHz to 2387MHz</b>	2270.145	0.027354uW	2309.328	0.035419uW	2.5uW	PASS
	<b>2387.0MHz to 2400.0MHz</b>	2400.000	9.556758uW	2399.919	0.013183uW	25uW	PASS
	<b>2483.5MHz to 2496.5MHz</b>	2490.474	0.020105uW	2488.856	0.014508uW	25uW	PASS
	<b>2496.5MHz to 12500.0MHz</b>	3074.202	0.021833uW	6958.061	0.019693uW	2.5uW	PASS
Test Channel		CH78 (2480MHz)				Limit	Result
Test Condition	Frequency Range	Frequency (MHz)	Measured Value				
<b>V<sub>normal</sub></b>	<b>30.0MHz to 1000.0MHz</b>	564.955	0.021274uW		0.25uW	PASS	
	<b>1000.0MHz to 2387MHz</b>	2016.324	0.013819uW		2.5uW	PASS	
	<b>2387.0MHz to 2400.0MHz</b>	2389.759	0.013627uW		25uW	PASS	
	<b>2483.5MHz to 2496.5MHz</b>	2487.384	0.013578uW		25uW	PASS	
	<b>2496.5MHz to 12500.0MHz</b>	7373.206	0.020939uW		2.5uW	PASS	

## 4.5 Antenna Power Measurement

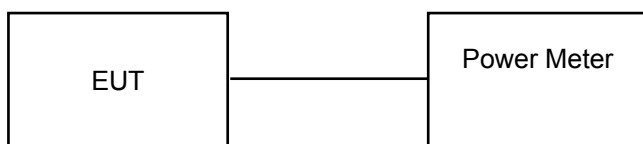
### 4.5.1 Limits of Antenna Power

Modulation System	Frequency Band Used	Antenna Power (Max.)	EIRP (Max.)	
			Omni-Directional Case	Directional Case
DS	2400 – 2483.5 MHz	10 mW/MHz	12.14 dBm/MHz (16.368 mW/MHz)	22.14 dBm/MHz (163.68 mW/MHz)
OFDM (Note 1)	2400 – 2483.5 MHz	10 mW/MHz	12.14 dBm/MHz (16.368 mW/MHz)	22.14 dBm/MHz (163.68 mW/MHz)
OFDM (Note 2)	2400 – 2483.5 MHz	5 mW/MHz	9.14 dBm/MHz (8.20mW/MHz)	19.14 dBm/MHz (82.04 mW/MHz)
FH	2400 – 2483.5 MHz	3 mW/MHz	6.91 dBm/MHz (4.91 mW/MHz)	16.91 dBm/MHz (49.10 mW/MHz)

Note:

1. Occupied bandwidth is less than 26MHz
2. Occupied bandwidth is more that 26MHz and less than 38MHz
3. The half-power beam width for directional antenna shall be 360/A degrees or less, where A is a ratio which causes the EIRP concerned to exceed the omnidirectional EIRP upper limit.
4. Tolerance of antenna power shall be +20% (upper value) and –80% (lower value).

### 4.5.2 Test Setup



### 4.5.3 Test Results

**Modulation: GFSK**

**Normal Mode:**

<b>Environmental Conditions</b>	25 deg.C, 60% RH	
<b>Test Condition</b>	<b>Conducted Rf Output Power Density (mW/MHz)</b>	
	<b>Hopping Mode</b>	<b>Max. Limit (mW/MHz)</b>
<b>V<sub>normal</sub></b>	0.189220	3
<b>Rated Power</b>	0.2	
<b>Tolerance Of Antenna Power</b>	0.04 ~ 0.24	

**PIFA ANTENNA WITH ANTENNA GAIN: 3.62dBi**

<b>Environmental Conditions</b>	25 deg.C, 60% RH	
<b>Test Condition</b>	<b>Radiated Rf Output Power Density (mW/MHz)</b>	
	<b>Hopping Mode</b>	<b>Max. Limit (mW/MHz)</b>
<b>V<sub>normal</sub></b>	0.435479	4.91

**NOTE:** The value of radiated RF output densities are "calculated" values.

**AFH Mode:**

<b>Environmental Conditions</b>	25 deg.C, 60% RH	
<b>Test Condition</b>	<b>Conducted Rf Output Power Density (mW/MHz)</b>	
	<b>Hopping Mode</b>	<b>Max. Limit (mW/MHz)</b>
<b>V<sub>normal</sub></b>	0.740153	3
<b>Rated Power</b>	1	
<b>Tolerance Of Antenna Power</b>	0.2 ~ 1.2	

**PIFA ANTENNA WITH ANTENNA GAIN: 3.62dBi**

<b>Environmental Conditions</b>	25 deg.C, 60% RH	
<b>Test Condition</b>	<b>Radiated Rf Output Power Density (mW/MHz)</b>	
	<b>Hopping Mode</b>	<b>Max. Limit (mW/MHz)</b>
<b>V<sub>normal</sub></b>	1.703419	4.91

**NOTE:** The value of radiated RF output densities are "calculated" values.

**Modulation:**  $\pi/4$ -DQPSK

**Normal Mode:**

<b>Environmental Conditions</b>	25 deg.C, 60% RH	
<b>Test Condition</b>	<b>Conducted Rf Output Power Density (mW/MHz)</b>	
	<b>Hopping Mode</b>	<b>Max. Limit (mW/MHz)</b>
<b>V<sub>normal</sub></b>	0.087045	3
<b>Rated Power</b>	0.2	
<b>Tolerance Of Antenna Power</b>	0.04 ~ 0.24	

**PIFA ANTENNA WITH ANTENNA GAIN: 3.62dBi**

<b>Environmental Conditions</b>	25 deg.C, 60% RH	
<b>Test Condition</b>	<b>Radiated Rf Output Power Density (mW/MHz)</b>	
	<b>Hopping Mode</b>	<b>Max. Limit (mW/MHz)</b>
<b>V<sub>normal</sub></b>	0.200329	4.91

**NOTE:** The value of radiated RF output densities are "calculated" values.

**AFH Mode:**

<b>Environmental Conditions</b>	25 deg.C, 60% RH	
<b>Test Condition</b>	<b>Conducted Rf Output Power Density (mW/MHz)</b>	
	<b>Hopping Mode</b>	<b>Max. Limit (mW/MHz)</b>
<b>V<sub>normal</sub></b>	0.337714	3
<b>Rated Power</b>	1	
<b>Tolerance Of Antenna Power</b>	0.2 ~ 1.2	

**PIFA ANTENNA WITH ANTENNA GAIN: 3.62dBi**

<b>Environmental Conditions</b>	25 deg.C, 60% RH	
<b>Test Condition</b>	<b>Radiated Rf Output Power Density (mW/MHz)</b>	
	<b>Hopping Mode</b>	<b>Max. Limit (mW/MHz)</b>
<b>V<sub>normal</sub></b>	0.777229	4.91

**NOTE:** The value of radiated RF output densities are "calculated" values.



**Modulation: 8DPSK**

**Normal Mode:**

<b>Environmental Conditions</b>	25 deg.C, 60% RH	
<b>Test Condition</b>	<b>Conducted Rf Output Power Density (mW/MHz)</b>	
	<b>Hopping Mode</b>	<b>Max. Limit (mW/MHz)</b>
<b>V<sub>normal</sub></b>	0.087648	3
<b>Rated Power</b>	0.2	
<b>Tolerance Of Antenna Power</b>	0.04 ~ 0.24	

**PIFA ANTENNA WITH ANTENNA GAIN: 3.62dBi**

<b>Environmental Conditions</b>	25 deg.C, 60% RH	
<b>Test Condition</b>	<b>Radiated Rf Output Power Density (mW/MHz)</b>	
	<b>Hopping Mode</b>	<b>Max. Limit (mW/MHz)</b>
<b>V<sub>normal</sub></b>	0.201717	4.91

**NOTE:** The value of radiated RF output densities are "calculated" values.

**AFH Mode:**

<b>Environmental Conditions</b>	25 deg.C, 60% RH	
<b>Test Condition</b>	<b>Conducted Rf Output Power Density (mW/MHz)</b>	
	<b>Hopping Mode</b>	<b>Max. Limit (mW/MHz)</b>
<b>V<sub>normal</sub></b>	0.340055	3
<b>Rated Power</b>	1	
<b>Tolerance Of Antenna Power</b>	0.2 ~ 1.2	

**PIFA ANTENNA WITH ANTENNA GAIN: 3.62dBi**

<b>Environmental Conditions</b>	25 deg.C, 60% RH	
<b>Test Condition</b>	<b>Radiated Rf Output Power Density (mW/MHz)</b>	
	<b>Hopping Mode</b>	<b>Max. Limit (mW/MHz)</b>
<b>V<sub>normal</sub></b>	0.782617	4.91

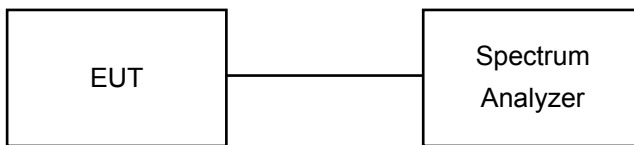
**NOTE:** The value of radiated RF output densities are "calculated" values.

## 4.6 Spurious Emissions for Receiver

### 4.6.1 Limits of Spurious Emissions For Receiver

Frequencies (MHz)	Limit
Below 1GHz	$\leq 4\text{nW} (-54\text{dBm})$
Above 1GHz	$\leq 20\text{nW} (-47\text{dBm})$

### 4.6.2 Test Setup



#### 4.6.3 Test Result

Environmental Conditions		25 deg.C, 60% RH					
Test Channel		Channel 0 (2402MHz)		Channel 39 (2441MHz)		Limit	Result
Test Condition	Frequency Range	Frequency (MHz)	Measured Value	Frequency (MHz)	Measured Value		
$V_{normal}$	Below 1GHz	925.553	0.037199nW	626.065	0.02722nW	4nW	PASS
	Above 1GHz	6959.875	0.1999nW	3147.625	0.221042nW	20nW	PASS
Test Channel		Channel 78 (2480MHz)				Limit	Result
Test Condition	Frequency Range	Frequency (MHz)	Measured Value	Measured Value			
$V_{normal}$	Below 1GHz	245.583		0.026283nW		4nW	PASS
	Above 1GHz	1753.250		0.331947nW		20nW	PASS

## 4.7 Dwell Time

### 4.7.1 Limits of Dwell Time

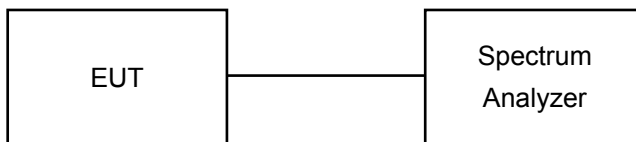
The frequency retention time in the frequency hopping method shall be 0.4 second or less. The total sum of the frequency retention time in any frequency within the time obtained by multiplying the diffusion rate by 0.4 second shall be 0.4 second or shorter.

Formula:

**(Normal mode)** dwell time =  $[\text{diffusion rate} / 79] \times \text{duty-cycle} \times 0.4 \text{ seconds}$

**(AFH mode)** dwell time =  $[\text{diffusion rate} / 20] \times \text{duty-cycle} \times 0.4 \text{ sec}$

### 4.7.2 Test Setup



### 4.7.3 Test Result

Modulation: GFSK

Normal Mode:

Test Condition	Mode	Spreading Rate	[Spreading Rate/79]*0.4	Duty Cycle	Result (msec)	Limit (msec)
$V_{normal}$	DH1	70.80	0.358	0.296	105.968	400
	DH3	70.80	0.358	0.651	233.058	400
	DH5	70.80	0.358	0.768	274.944	400

AFH Mode:

Test Condition	Mode	Spreading Rate	[Spreading Rate/20]*0.4	Duty Cycle	Result (msec)	Limit (msec)
$V_{normal}$	DH1	18.10	0.362	0.296	107.152	400
	DH3	18.10	0.362	0.651	235.662	400
	DH5	18.10	0.362	0.768	278.016	400

Modulation:  $\pi/4$ -DQPSK

Normal Mode:

Test Condition	Mode	Spreading Rate	[Spreading Rate/79]*0.4	Duty Cycle	Result (msec)	Limit (msec)
$V_{normal}$	DH1	71.60	0.363	0.280	101.640	400
	DH3	71.60	0.363	0.611	221.793	400
	DH5	71.60	0.363	0.768	278.784	400

AFH Mode:

Test Condition	Mode	Spreading Rate	[Spreading Rate/20]*0.4	Duty Cycle	Result (msec)	Limit (msec)
$V_{normal}$	DH1	18.30	0.366	0.280	102.480	400
	DH3	18.30	0.366	0.611	223.626	400
	DH5	18.30	0.366	0.768	281.088	400

**Modulation: 8DPSK****Normal Mode:**

Test Condition	Mode	Spreading Rate	[Spreading Rate/79]*0.4	Duty Cycle	Result (msec)	Limit (msec)
<b>V<sub>normal</sub></b>	DH1	71.40	0.362	0.304	110.048	400
	DH3	71.40	0.362	0.651	235.662	400
	DH5	71.40	0.362	0.768	278.016	400

**AFH Mode:**

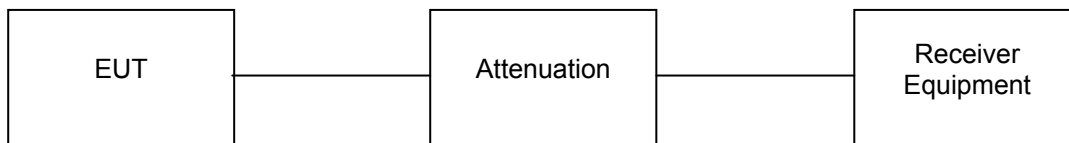
Test Condition	Mode	Spreading Rate	[Spreading Rate/20]*0.4	Duty Cycle	Result (msec)	Limit (msec)
<b>V<sub>normal</sub></b>	DH1	18.00	0.360	0.304	109.440	400
	DH3	18.00	0.360	0.651	234.360	400
	DH5	18.00	0.360	0.768	276.480	400

## 4.8 Interference Prevention Function

### 4.8.1 Limits of Interference Prevention Function

Radio equipment used mainly on the same premises and automatically transmits or receives identification code.

### 4.8.2 Test Setup



### 4.8.3 Test Results

Environmental Conditions	25 deg.C, 68% RH
Link Mode	Test Result
BT	PASS

**5 Test Instruments**

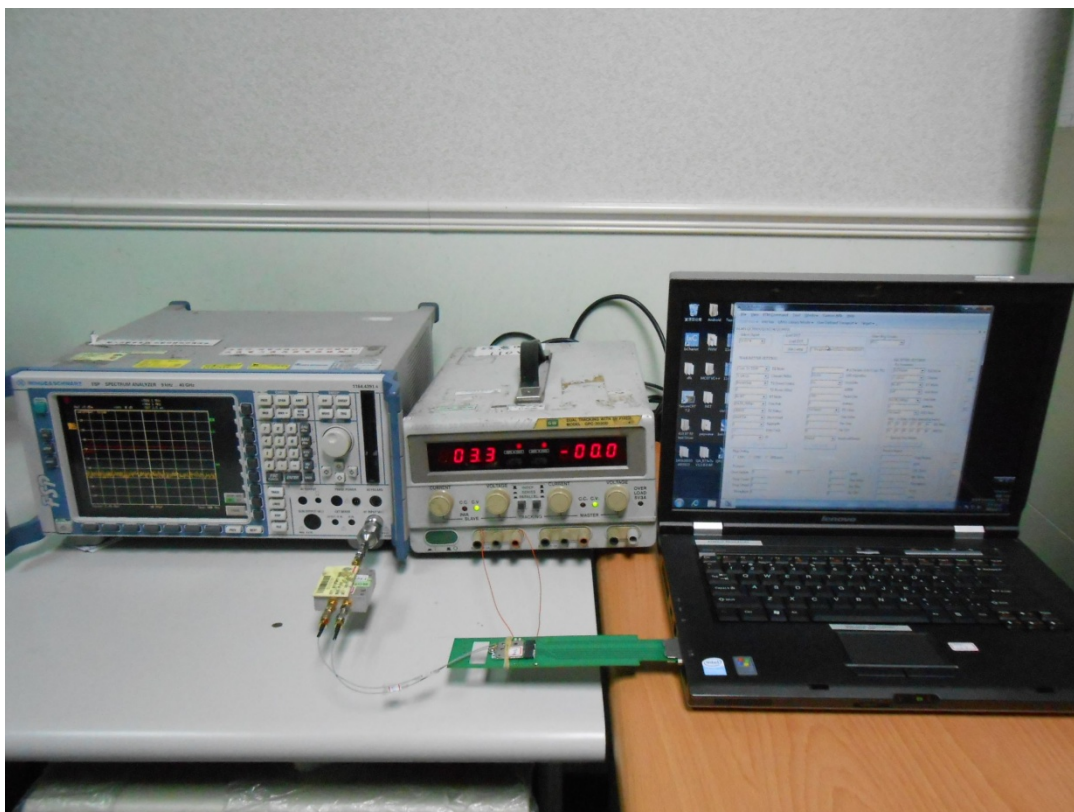
DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL	CALIBRATION AUTHORITY
SPECTRUM ANALYZER R&S	FSP 40	100060	May 08, 2014	May 07, 2015	ETC
SPECTRUM ANALYZER R&S	FSV 40	100964	July 05, 2014	July 04, 2015	R&S
ESG VECTOR SIGNAL GENERATOR AGILENT	E4438C	MY47271330 506 602 UNJ	Apr. 28, 2014	Apr. 27, 2015	ETC
DETECTOR NARDA	4503A	0306	NA	NA	NA
POWER METER ANRITSU	ML2495A	1014008	Apr. 30, 2014	Apr. 29, 2015	ETC
POWER SENSOR ANRITSU	MA2411B	0917122	Apr. 30, 2014	Apr. 29, 2015	ETC
Oscilloscope Tektronix	TDS5104	B051449	Mar. 20, 2014	Mar. 19, 2015	ETC
POWER COMBINER MINI-CIRCUITS	ZFRSC-123-S +	F698501347_02	Mar. 06, 2014	Mar. 05, 2015	BV ADT
POWER COMBINER SIGATEK	SP63409	NA	Dec. 24, 2014	Dec. 23, 2015	BV ADT

**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. Tested Date: Feb. 13, 2015



## 6 Photographs of the Test Configuration



## 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:

**Linko EMC/RF Lab**

Tel: 886-2-26052180

Fax: 886-2-26051924

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

Tel: 886-3-5935343

Fax: 886-3-5935342

**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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