FCC C2PC Test Report

FCC ID : SQGBT800

Equipment : BTv4.0 Dual Mode USB Dongle

Model No. : BT820

Brand Name : Laird Technologies

Applicant : Laird Technologies

Address : 11160 Thompson Ave. / Lenexa, Kansas /

66219/USA

Standard : 47 CFR FCC Part 15.247

Received Date : Jun. 25, 2013

Tested Date : Jun. 28 ~ Jul. 01, 2013

We, International Certification Corp., would like to declare that the tested sample has been evaluated and in compliance with the requirement of the above standards. The test results contained in this report refer exclusively to the product. It may be duplicated completely for legal use with the approval of the applicant. It shall not be reproduced except in full without the written approval of our laboratory.

Approved & Reviewed by:

Gary Chang / Manager

Ilac MRA

Testing Laboratory

Report No.: FR362601-01AD Page: 1 of 20

Table of Contents

1	GENERAL DESCRIPTION	5
1.1	Information	
1.2	Test Setup Chart	7
1.3	Local Support Equipment List	
1.4	The Equipment List	8
1.5	Test Standards	
1.6	Measurement Uncertainty	10
2	TEST CONFIGURATION	
2.1	Testing Condition	11
2.2	The Worst Test Modes and Channel Details	11
3	TRANSMITTER TEST RESULTS	12
3.1	AC Power Line Conducted Emissions	
3.2	Unwanted Emissions into Restricted Frequency Bands	15

Report No.: FR362601-01AD

Page: 2 of 20



Release Record

Report No.	Version	Description	Issued Date
FR362601-01AD	Rev. 01	Initialissue	Aug. 09, 2013

Report No.: FR362601-01AD Page: 3 of 20

Tel: 886-3-271-8666 Fax: 886-3-318-0155

Summary of Test Results

FCC Rules	Test Items	Measured	Result
15.207	AC Power Line Conducted Emissions	[dBuV]: 0.182MHz 53.68 (Margin 10.74dB) - QP	Pass
15.247(d)	Radiated Emissions	[dBuV/m at 3m]: 32.14MHz	Pass
15.209		37.55 (Margin 2.45dB) - QP	. 4.66
15.247(d)	Band Edge		N/A
15.247(b)(1)	Conducted Output Power		N/A
15.247(a)(1)(iii)	Number of Hopping Channels		N/A
15.247(a)(1)	Hopping Channel Separation		N/A
15.247(a)(1)(iii)	Dwell Time		N/A
15.203	Antenna Requirement		N/A

Report No.: FR362601-01AD Page: 4 of 20

1 General Description

1.1 Information

1.1.1 Product Details

This report is prepared for FCC class II permissive change. The difference compared with original design is model BT820 adding plastics housing to change type from modular to non-modular. In this report, conducted emission and radiated emission tests of BT820 had been re-tested and only its data was recorded in the following sections.

1.1.2 Specification of the Equipment under Test (EUT)

RF General Information								
Frequency Range (MHz)			Channel Number	Data Rate				
2400-2483.5	BR V2.1	2402-2480	0-78 [79]	1 Mbps				
2400-2483.5	EDR V2.1	2402-2480	0-78 [79]	2 Mbps				
2400-2483.5	EDR V2.1	2402-2480	0-78 [79]	3 Mbps				

Note 1: RF output power specifies that Maximum Peak Conducted Output Power.

Note 2: Bluetooth BR uses a GFSK.

Note 3: Bluetooth EDR uses a combination of $\pi/4$ -DQPSK and 8DPSK.

1.1.3 Antenna Details

An	nt. No.	Brand	Туре	Gain (dBi)	Connector	Model
	1	ACX	Chip	0.5	N/A	AT3216-B2R7HAA_3216

Report No.: FR362601-01AD Page: 5 of 20



1.1.4 EUT Operational Condition

Supply Voltage	AC mains	M	DC (5V)		
Type of DC Source	Internal DC supply		External DC adapter	X	From Host

1.1.5 Accessories

N/A

1.1.6 Channel List

	Frequency	band (MHz)		2400~2483.5			
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (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		

Report No.: FR362601-01AD Page: 6 of 20



Tel: 886-3-271-8666 Fax: 886-3-318-0155

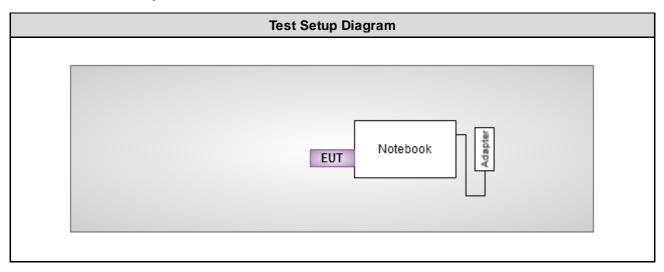
1.1.7 Test Tool

Test tool	Blue Tool V2.5	
-----------	----------------	--

1.1.8 Power Setting

Modulation Mode	Test Frequency (MHz)				
Wodulation Wode	2402	2440	2480		
GFSK/1Mbps	255,63	255,63	255,63		
8DPSK/3Mbps	255,63	255,63	255,63		

1.2 Test Setup Chart



1.3 Local Support Equipment List

	Support Equipment List								
No.	Equipment	Brand	Model	S/N	FCC ID	Length (m)			
1	Notebook	DELL	E6430						

Report No.: FR362601-01AD Page: 7 of 20

The Equipment List 1.4

Test Item	Conducted Emission								
Test Site	Conduction room 1 / (CO01-WS)								
Instrument	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Until				
EMC Receiver	R&S	ESCS 30	100169	Dec. 12, 2012	Dec. 11, 2013				
LISN	SCHWARZBECK MESS-ELEKTRONIK	Schwarzbeck 8127	8127-667	Dec. 04, 2012	Dec. 03, 2013				
LISN (Support Unit)	SCHWARZBECK MESS-ELEKTRONIK	Schwarzbeck 8127	8127-666	Dec. 04, 2012	Dec. 03, 2013				
ISN	TESEQ	ISN T800	34406	Apr. 08, 2013	Apr. 07, 2014				
ISN	TESEQ	ISN T200A	30494	Apr. 09, 2013	Apr. 08, 2014				
ISN	TESEQ	ISN T8-Cat6	27262	Sep. 17, 2012	Sep. 16, 2013				
ISN	TESEQ	ISN ST08	22589	Jan. 24, 2013	Jan. 23, 2014				
RF Current Probe	FCC	F-33-4	121630	Dec. 04, 2012	Dec. 03, 2013				
RF Cable-CON	Woken	CFD200-NL	CFD200-NL-001	Dec. 25, 2012	Dec. 24, 2013				
ESH3-Z6 V-Network(+)	R&S	ESH3-Z6	100920	Nov. 21, 2012	Nov. 20, 2013				
ESH3-Z6 V-Network(-)	R&S	ESH3-Z6	100951	Jan. 03, 2013	Jan. 02, 2014				
Two-Line V-Network	R&S	ENV216	101579	Jan. 07, 2013	Jan. 06, 2014				
50 ohm terminal	NA	50	01	Apr. 22, 2013	Apr. 21, 2014				
50 ohm terminal	NA	50	02	Apr. 22, 2013	Apr. 21, 2014				
50 ohm terminal	NA	50	03	Apr. 22, 2013	Apr. 21, 2014				
50 ohm terminal (Support Unit)	NA	50	04	Apr. 22, 2013	Apr. 21, 2014				

Report No.: FR362601-01AD Page: 8 of 20



Test Item	Radiated Emission above 1GHz 966 chamber1 / (03CH01-WS)							
Test Site								
Instrument	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Until			
3m semi-anechoic chamber	CHAMPRO	SAC-03	03CH01-WS	Jan. 04, 2013	Jan. 03, 2014			
Spectrum Analyzer	R&S	FSV40	101498	Jan. 24, 2013	Jan. 23, 2014			
Receiver	ROHDE&SCHWAR Z	ESR3	101658	Jan. 28, 2013	Jan. 27, 2014			
Bilog Antenna	SCHWARZBECK	VULB9168	VULB9168-522	Jan. 11, 2013	Jan. 10, 2014			
Horn Antenna 1G-18G	SCHWARZBECK	BBHA 9120 D	BBHA 9120 D 1096	Feb. 18, 2013	Feb. 17, 2014			
Horn Antenna 18G-40G	SCHWARZBECK	BBHA 9170	BBHA 9170517	Jan. 14, 2013	Jan. 13, 2014			
Amplifier	Burgeon	BPA-530	100219	Nov 28, 2012	Nov. 27, 2013			
Amplifier	Agilent	83017A	MY39501308	Dec. 18, 2012	Dec. 17, 2013			
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16014/4	Dec. 25, 2012	Dec. 24, 2013			
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16019/4	Dec. 25, 2012	Dec. 24, 2013			
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16139/4	Dec. 25, 2012	Dec. 24, 2013			
RF Cable-R03m	Woken	CFD400NL-LW	CFD400NL-001	Dec. 25, 2012	Dec. 24, 2013			
RF Cable-R10m	Woken	CFD400NL-LW	CFD400NL-002	Dec. 25, 2012	Dec. 24, 2013			
control	EM Electronics	EM1000	60612	N/A	N/A			

Loop Antenna	R&S	HFH2-Z2	100330	Nov 15, 2012	Nov 14, 2014
Amplifier	MITEQ	AMF-6F-260400	9121372	Apr. 19, 2013	Apr. 18, 2015
Note: Calibration Interval of instruments listed above is two year.					

1.5 Test Standards

According to the specification of EUT, the EUT must comply with following standards and KDB documents.

47 CFR FCC Part 15.247

FCC Public notice DA 00-705

ANSI C63.10-2009

Note: The EUT has been tested and complied with FCC part 15B requirement. FCC Part 15B test results are issued to another report.

Report No.: FR362601-01AD Page: 9 of 20

1.6 Measurement Uncertainty

ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report. The measurement uncertainties given below are based on a 95% confidence level (based on a coverage factor (k=2)

Measurement Uncertainty			
Parameters	Uncertainty		
AC conducted emission	±2.43 dB		
Radiated emission	±2.49 dB		

Report No.: FR362601-01AD Page: 10 of 20

2 Test Configuration

2.1 Testing Condition

Test Item	Test Site	Ambient Condition	Tested By
AC Conduction	CO01-WS	22°C / 52%	Skys Huang
Radiated Emissions	03CH01-WS	25°C / 65%	Haru Yang

FCC site registration No.: 657002IC site registration No.: 10807A-2

2.2 The Worst Test Modes and Channel Details

Test item	Mode	Test Frequency (MHz)	Data rate (Mbps)	Test Configuration
AC Power Line Conducted Emissions	GFSK	2480	1Mbps	
Radiated Emissions (below 1GHz)	GFSK	2480	1Mbps	
Radiated Emissions (above 1GHz)	GFSK	2480	1Mbps	

Report No.: FR362601-01AD Page: 11 of 20

3 Transmitter Test Results

3.1 AC Power Line Conducted Emissions

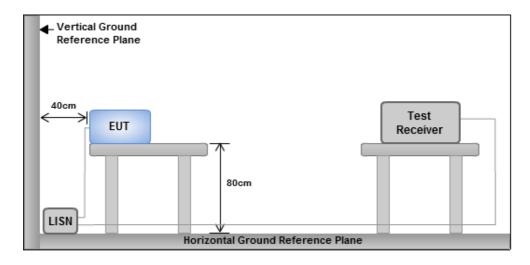
3.1.1 Limit of AC Power Line Conducted Emissions

Conducted Emissions Limit				
Frequency Emission (MHz)	Quasi-Peak	Average		
0.15-0.5	66 - 56 *	56 - 46 *		
0.5-5	56	46		
5-30	60	50		
Note 1: * Decreases with the logarithm of the frequency.				

3.1.2 Test Procedures

- 1. The device is placed on a test table, raised 80 cm above the reference ground plane. The vertical conducting plane is located 40 cm to the rear of the device.
- The device is connected to line impedance stabilization network (LISN) and other accessories are connected to other LISN. Measured levels of AC power line conducted emission are across the 50 Ω LISN port.
- 3. AC conducted emission measurements is made over frequency range from 150 kHz to 30 MHz.
- 4. This measurement was performed with AC 120V/60Hz

3.1.3 Test Setup



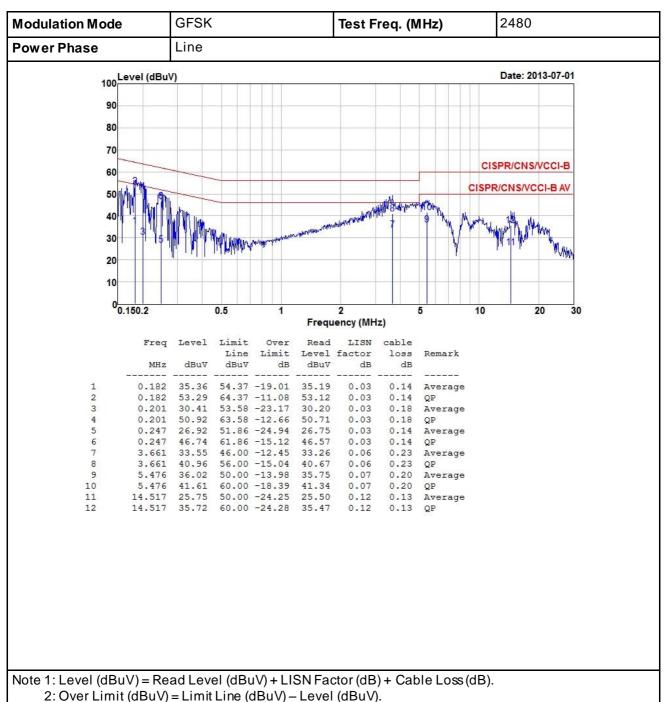
Note: 1. Support units were connected to second LISN.

Both of LISNs (AMN) are 80 cm from EUT and at least 80 cm from other units and other metal planes

Report No.: FR362601-01AD Page: 12 of 20

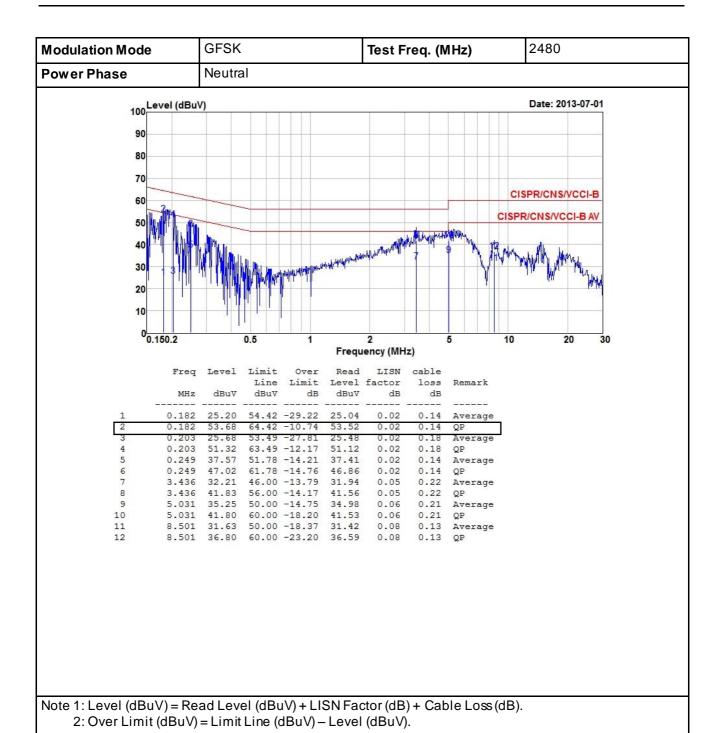
Tel: 886-3-271-8666 Fax: 886-3-318-0155

3.1.4 Test Result of Conducted Emissions



Report No.: FR362601-01AD Page: 13 of 20





Report No.: FR362601-01AD Page: 14 of 20

3.2 Unwanted Emissions into Restricted Frequency Bands

3.2.1 Limit of Unwanted Emissions into Restricted Frequency Bands

Restricted Band Emissions Limit					
Frequency Range (MHz)	Field Strength (uV/m)	Field Strength (dBuV/m)	Measure Distance (m)		
0.009~0.490	2400/F(kHz)	48.5 - 13.8	300		
0.490~1.705	24000/F(kHz)	33.8 - 23	30		
1.705~30.0	30	29	30		
30~88	100	40	3		
88~216	150	43.5	3		
216~960	200	46	3		
Above 960	500	54	3		

Note 1

Qusai-Peak value is measured for frequency below 1GHz except for 9–90 kHz, 110–490 kHz frequency band. Peak and average value are measured for frequency above 1GHz. The limit on average radio frequency emission is as above table. The limit on peak radio frequency emissions is 20 dB above the maximum permitted average emission limit

Measurements may be performed at a distance other than what is specified provided. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor as below, Frequency at or above 30 MHz: 20 dB/decade Frequency below 30 MHz: 40 dB/decade.

3.2.2 Test Procedures

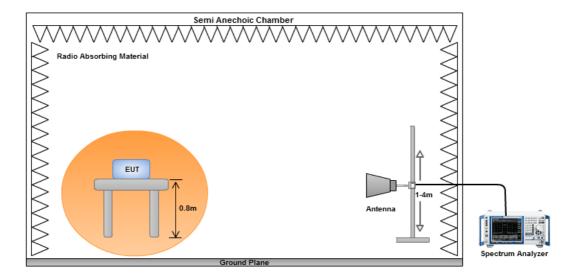
- 1. Measurement is made at a semi-anechoic chamber that incorporates a turntable allowing a EUT rotation of 360°. A continuously-rotating, remotely-controlled turntable is installed at the test site to support the EUT and facilitate determination of the direction of maximum radiation for each EUT emission frequency. The EUT is placed at a height of 0.8 m test table above the ground plane.
- 2. Measurement is made with the antenna positioned in both the horizontal and vertical planes of polarization. The measurement antenna is varied in height (1m ~ 4m) above the reference ground plane to obtain the maximum signal strength. Distance between EUT and antenna is 3 m.
- 3. This investigation is performed with the EUT rotated 360°, the antenna height scanned between 1 m and 4 m, and the antenna rotated to repeat the measurements for both the horizontal and vertical antenna polarizations.

Note:

- 1. 120kHz measurement bandwidth of test receiver and Quasi-peak detector is for radiated emission below 1GHz.
- 2. RBW=1MHz, VBW=3MHz and Peak detector is for peak measured value of radiated emission above 1GHz.
- 3. RBW=1MHz, VBW=10Hz and Peak detector is for average measured value of radiated emission above 1GHz DH5 packet is the worst case since DH5 has more TX slots than other packet types.
- 4. Hopping randomly between 79 channels is 1600 times per second (0.625 ms time slot). The duty factor is 20 * log (0.625 * 5 / 100) = -30.1 dB. Av erage value = Peak reading + duty factor

Report No.: FR362601-01AD Page: 15 of 20

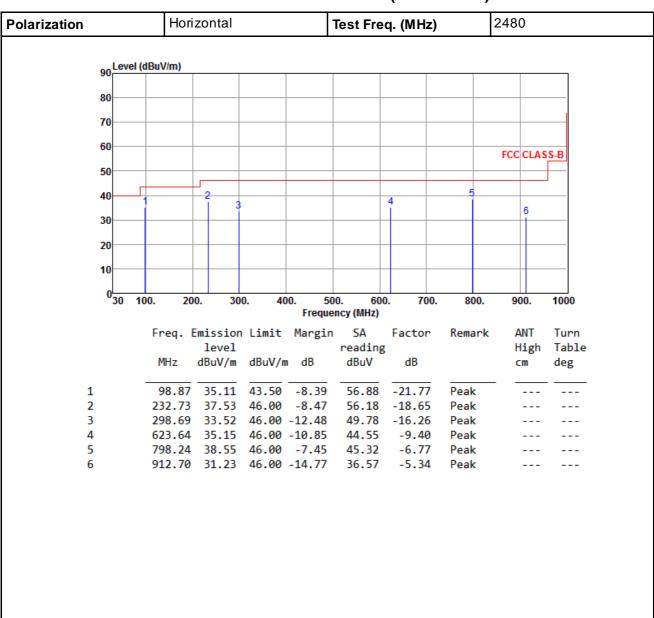
3.2.3 Test Setup



Report No.: FR362601-01AD Page: 16 of 20

Tel: 886-3-271-8666 Fax: 886-3-318-0155

3.2.4 Transmitter Radiated Unwanted Emissions (Below 1GHz)



Note 1: Level (dBuV/m) = Read Level (dBuV/m) + Antenna Factor (dB) + Cable Loss (dB) - Preamp Factor (dB). 2: Over Limit (dBuV/m) = Limit Line (dBuV/m) - Level (dBuV/m).

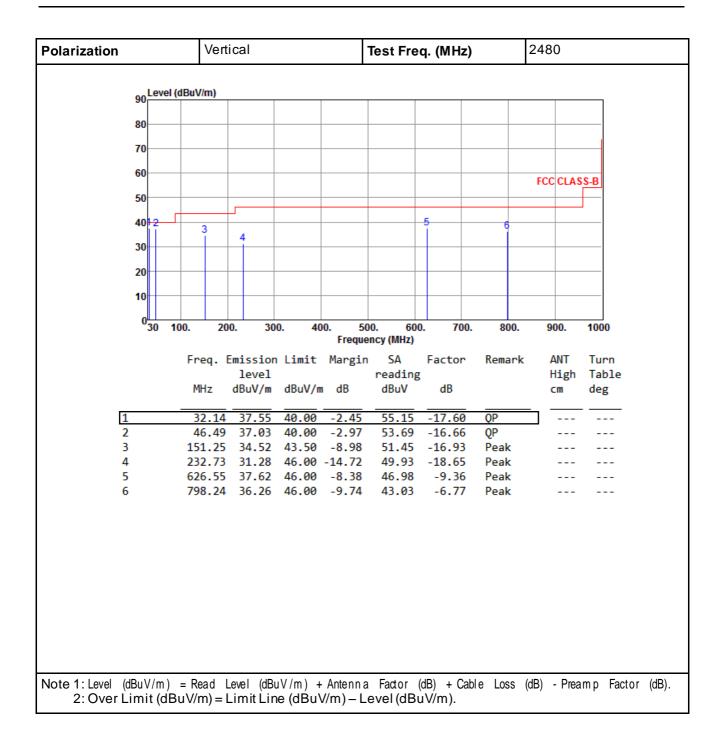
Report No.: FR362601-01AD Page: 17 of 20



International Certification Corp.

No. 3-1, Lane 6, Wen San 3rd St., Kwei Shan Hsiang, Tao Yuan Hsien 333, Taiwan, R.O.C.

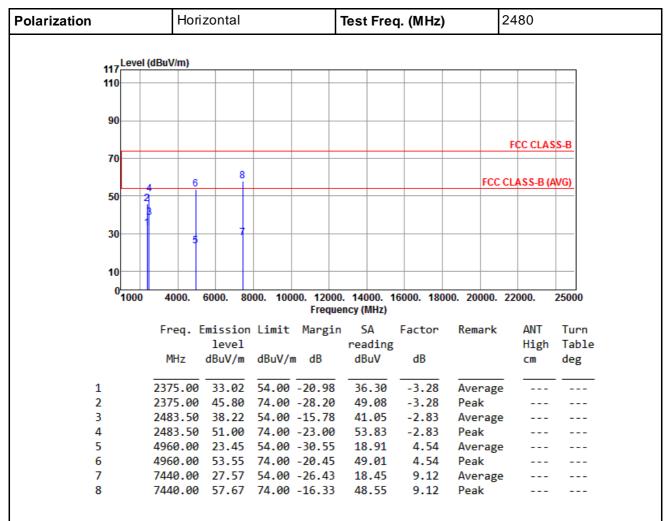
Tel: 886-3-271-8666 Fax: 886-3-318-0155



Report No.: FR362601-01AD Page: 18 of 20

Tel: 886-3-271-8666 Fax: 886-3-318-0155

3.2.5 Transmitter Radiated Unwanted Emissions (Above 1GHz)



Note 1: ">20dB" means spurious emission levels that exceed the level of 20 dB below the applicable limit.

Note 3: For un-restricted bands, unwanted emissions shall be attenuated by at least 20 dB relative to the maximum measured in-band level.

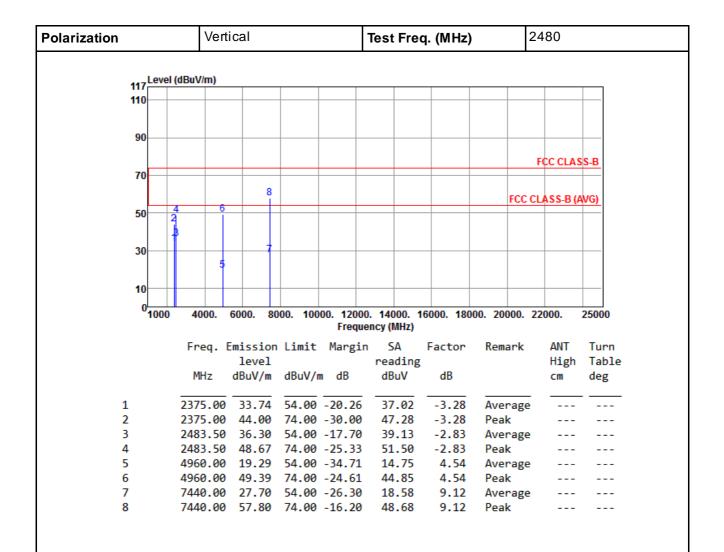
Report No.: FR362601-01AD Page: 19 of 20

Note 2: For restricted bands, the peakmeasurement is fully sufficient, as the max field strength as measured with the Peak-Detector meets the AV-Limit so that the AV level does not need to be reported in addition.



International Certification Corp.

No. 3-1, Lane 6, Wen San 3rd St., Kwei Shan Hsiang, Tao Yuan Hsien 333, Taiwan, R.O.C. Tel: 886-3-271-8666 Fax: 886-3-318-0155



Note 1: ">20dB" means spurious emission levels that exceed the level of 20 dB below the applicable limit. Note 2: For restricted bands, the peak measurement is fully sufficient, as the max field strength as measurement.

Note 2: For restricted bands, the peak measurement is fully sufficient, as the max field strength as measured with the Peak-Detector meets the AV-Limit so that the AV level does not need to be reported in addition.

Note 3: For un-restricted bands, unwanted emissions shall be attenuated by at least 20 dB relative to the maximum measured in-band level.



Report No.: FR362601-01AD Page: 20 of 20