

FCC Transmit Simultaneously Test Report

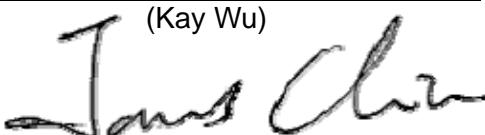
FCC ID: RYK-WNFQ258ACNBT

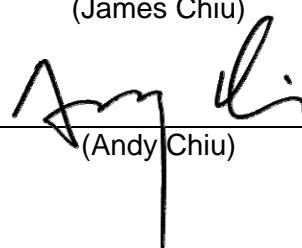
This report concerns (check one): Original Grant Class I Change Class II Change

Project No. : 1708083
Equipment : 802.11ac/b/g/n WiFi + Bluetooth M.2 Card
Test Model : WNFQ-258ACN(BT)
Series Model : N/A
Applicant : SparkLAN Communications, Inc.
Address : 8F., No.257, Sec.2, Tiding-Blvd., Neihu District, Taipei City 11493, Taiwan (R.O.C.)

Date of Receipt : Oct. 24, 2017
Date of Test : Oct. 24, 2017 ~ Oct. 25, 2017
Issued Date : Oct. 26, 2017
Tested by : BTL Inc.

Testing Engineer : 
(Kay Wu)

Technical Manager : 
(James Chiu)

Authorized Signatory : 
(Andy Chiu)

B T L I N C .

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Declaration

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BTL's laboratory quality assurance procedures are in compliance with the **ISO Guide 17025** requirements, and accredited by the conformity assessment authorities listed in this test report.

Limitation

For the use of the authority's logo is limited unless the Test Standard(s)/Scope(s)/Item(s) mentioned in this test report is (are) included in the conformity assessment authorities acceptance respective.

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REPORT ISSUED HISTORY

Issued No.	Description	Issued Date
BTL-FCCP-6-1708083	Original Issue.	Oct. 26, 2017

1. CERTIFICATION

Equipment : 802.11ac/b/g/n WiFi + Bluetooth M.2 Card
Brand Name : Sparklan
Test Model : WNFQ-258ACN(BT)
Series Model : N/A
Applicant : SparkLAN Communications, Inc.
Manufacturer : SparkLAN Communications, Inc.
Address : 8F.,No.257,Sec.2,Tiding-Blvd.,Neihu District,Taipei City 11493,Taiwan
(R.O.C.)
Date of Test : Oct. 24, 2017 ~ Oct. 25, 2017
Test Sample : Engineering Sample
Standard(s) : FCC Part15, Subpart C (15.247)
ANSI C63.10-2013

The above equipment has been tested and found in compliance with the requirement of the relative standards by BTL Inc.

The test data, data evaluation, and equipment configuration contained in our test report (Ref No. BTL-FCCP-6-1708083) were obtained utilizing the test procedures, test instruments, test sites that has been accredited by the Authority of TAF according to the ISO-17025 quality assessment standard and technical standard(s).

Test results included in this report is only for Transmit Simultaneously part.

2. SUMMARY OF TEST RESULTS

Test procedures according to the technical standard(s):

Applied Standard(s): FCC Part15, Subpart C (15.247)			
Standard(s) Section	Test Item	Judgement	Remark
15.247(d) 15.209	Radiated emission	PASS	-----

Note:

- (1)" N/A" denotes test is not applicable in this test report
- (2) Accord to the EUT((Report Number: RF150107E06Z-4 and model: WNFQ-258ACN(BT)) has been certificated, Conducted and Radiated emission were criticized and reconfirmed in this report.
- (3) Compared with the previous report (RF150107E06Z-4), Added two new different type (Dipole) antennas.

2.1 TEST FACILITY

The test facilities used to collect the test data in this report:

Radiated emission Test (Above 1 GHz):

CB15: (FCC RN:674415; FCC DN:TW0659)

No. 68-1, Ln. 169, Sec.2, Datong Rd., Xizhi Dist., New Taipei City 221, Taiwan

2.2 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. The BTL measurement uncertainty is less than the CISPR 16-4-2 U_{cisp} requirement.

The reported uncertainty of measurement $y \pm U$, where expanded uncertainty U is based on a standard uncertainty multiplied by a coverage factor of $k=2$, providing a level of confidence of approximately 95 %.

A. Radiated emission test:

Test Site	Method	Measurement Frequency Range	Ant. H / V	U_{cisp} (dB)
CB15 (3m)	CISPR	1GHz ~ 6GHz	V	4.46
		1GHz ~ 6GHz	H	4.40
		6GHz ~ 18GHz	V	3.88
		6GHz ~ 18GHz	H	4.00

Test Site	Method	Measurement Frequency Range	U_{cisp} (dB)
CB15 (1m)	CISPR	18 ~ 26.5 GHz	4.62
		26.5 ~ 40 GHz	5.12

3. GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

Equipment	802.11ac/b/g/n WiFi + Bluetooth M.2 Card	
Brand Name	Sparklan	
Test Model	WNFQ-258ACN(BT)	
Series Model	N/A	
Model Difference	N/A	
Product Description (BT)	Operation Frequency	2402~2480 MHz
	Modulation Technology	GFSK(1Mbps) $\pi/4$ -DQPSK(2Mbps) 8-DPSK(3Mbps)
	Bit Rate of Transmitter	
Product Description (RLAN)	Operation Frequency	UNII-1: 5150-5250MHz UNII-2A: 5250-5350MHz UNII-2C: 5470-5725MHz UNII-3: 5725-5850MHz
	Modulation Type	OFDM
	Bit Rate of Transmitter	802.11b: up to 11Mbps 802.11a/g: up to 54Mbps 802.11n : up to 300Mbps 802.11ac: up to 866.7Mbps
EUT Power Rating	3.3Vdc form host equipment	
Products Covered	N/A	

Note:

1. For a more detailed features description, please refer to the manufacturer's specifications or the user's manual.

2. BT Channel List:

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
00	2402	27	2429	54	2456
01	2403	28	2430	55	2457
02	2404	29	2431	56	2458
03	2405	30	2432	57	2459
04	2406	31	2433	58	2460
05	2407	32	2434	59	2461
06	2408	33	2435	60	2462
07	2409	34	2436	61	2463
08	2410	35	2437	62	2464
09	2411	36	2438	63	2465
10	2412	37	2439	64	2466
11	2413	38	2440	65	2467
12	2414	39	2441	66	2468
13	2415	40	2442	67	2469
14	2416	41	2443	68	2470
15	2417	42	2444	69	2471
16	2418	43	2445	70	2472
17	2419	44	2446	71	2473
18	2420	45	2447	72	2474
19	2421	46	2448	73	2475
20	2422	47	2449	74	2476
21	2423	48	2450	75	2477
22	2424	49	2451	76	2478
23	2425	50	2452	77	2479
24	2426	51	2453	78	2480
25	2427	52	2454		
26	2428	53	2455		

RLAN Channel List:

802.11a, 802.11n (20 MHz), 802.11ac (20 MHz)		802.11n (40 MHz), 802.11ac (40 MHz)		802.11ac (80 MHz)	
UNII-1		UNII-1		UNII-1	
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
36	5180	38	5190	42	5210
40	5200	46	5230		
44	5220				
48	5240				

802.11a, 802.11n (20 MHz), 802.11ac (20 MHz)		802.11n (40 MHz), 802.11ac (40 MHz)		802.11ac (80 MHz)	
UNII-2A		UNII-2A		UNII-2A	
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
52	5260	54	5270	58	5290
56	5280	62	5310		
60	5300				
64	5320				

802.11a, 802.11n (20 MHz), 802.11ac (20 MHz)		802.11n (40 MHz), 802.11ac (40 MHz)		802.11ac (80 MHz)	
UNII-2C		UNII-2C		UNII-2C	
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
100	5500	102	5510	106	5530
104	5520	110	5550	122	5610
108	5540	118	5590	138	5690
112	5560	126	5630		
116	5580	134	5670		
120	5600	142	5710		
132	5660				
136	5680				
140	5700				
144	5720				

802.11a, 802.11n (20 MHz), 802.11ac (20 MHz)		802.11n (40 MHz), 802.11ac (40 MHz)		802.11ac (80 MHz)	
UNII-3		UNII-3		UNII-3	
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
149	5745	151	5755	155	5775
153	5765	159	5795		
157	5785				
161	5805				
165	5825				

3. Table for Filed Antenna:

Ant.	Brand	Model	Type	Connector	Gain (dBi)				
					2.4 GHz	Band 1	Band 2	Band 3	Band 4
1	Wanshin	R3410110203 WSS003	Dipole	RP-SMA	2.02	1.93	1.93	2.03	2.03
2	Long Cheng	FDE_ACBSMA-BGP	Dipole	RP-SMA	3.27	5.436	5.436	5.436	5.96

3.2 DESCRIPTION OF TEST MODES

To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.

Pretest Mode	Description
Mode 1	TX Mode

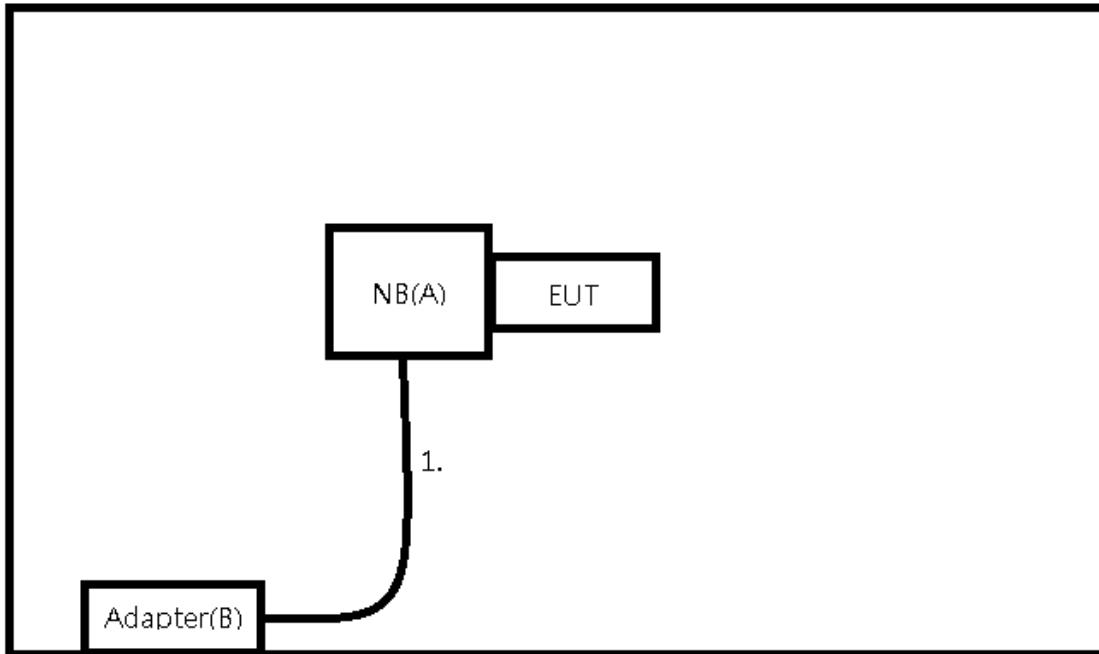
The EUT system operated these modes were found to be the worst case during the pre-scanning test as following:

For Radiated Emission	
Final Test Mode	Description
Mode 1	TX Mode

Note:

- (1) The measurements are performed at the high, middle, low available channels.

3.3 BLOCK DIAGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED



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.

Item	Equipment	Mfr/Brand	Model/Type No.	FCC ID	Series No.
A	NB	Lenovo	P50	N/A	N/A
B	Adapter	Lenovo	ADL170NDC2A	N/A	N/A

Item	Shielded Type	Ferrite Core	Length	Note
1	YES	YES	1.5m	Power Cable

4. EMC EMISSION TEST

4.1 RADIATED EMISSION MEASUREMENT

4.1.1 RADIATED EMISSION LIMITS (Frequency Range 9KHz -1000MHz)

In case the emission fall within the restricted band specified on 15.205(a), then the 15.209(a) limit in the table below has to be followed.

Frequency (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
960~1000	500	3

LIMITS OF RADIATED EMISSION MEASUREMENT (Above 1000MHz)

Frequency (MHz)	(dBuV/m) (at 3 m)	
	PEAK	AVERAGE
Above 1000	74	54

Notes:

- (1) The limit for radiated test was performed according to FCC Part 15, Subpart C.
- (2) The tighter limit applies at the band edges.
- (3) Emission level (dBuV/m)=20log Emission level (uV/m).
- (4) The test result calculated as following:
 Measurement Value = Reading Level + Correct Factor
 Correct Factor = Antenna Factor + Cable Loss - Amplifier Gain(if use)
 Margin Level = Measurement Value - Limit Value

LIMITS OF RADIATED EMISSION MEASUREMENT (Above 1000MHz)

Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	10th carrier harmonic
RBW / VBW (emission in restricted band)	1 MHz / 1 MHz for Peak, 1 MHz / 10Hz for Average

Spectrum Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9KHz ~90KHz for PK/AVG detector
Start ~ Stop Frequency	90KHz ~110KHz for QP detector
Start ~ Stop Frequency	110KHz ~490KHz for PK/AVG detector
Start ~ Stop Frequency	490KHz ~30MHz for QP detector
Start ~ Stop Frequency	30MHz~1000MHz for QP detector

4.1.2 TEST PROCEDURE

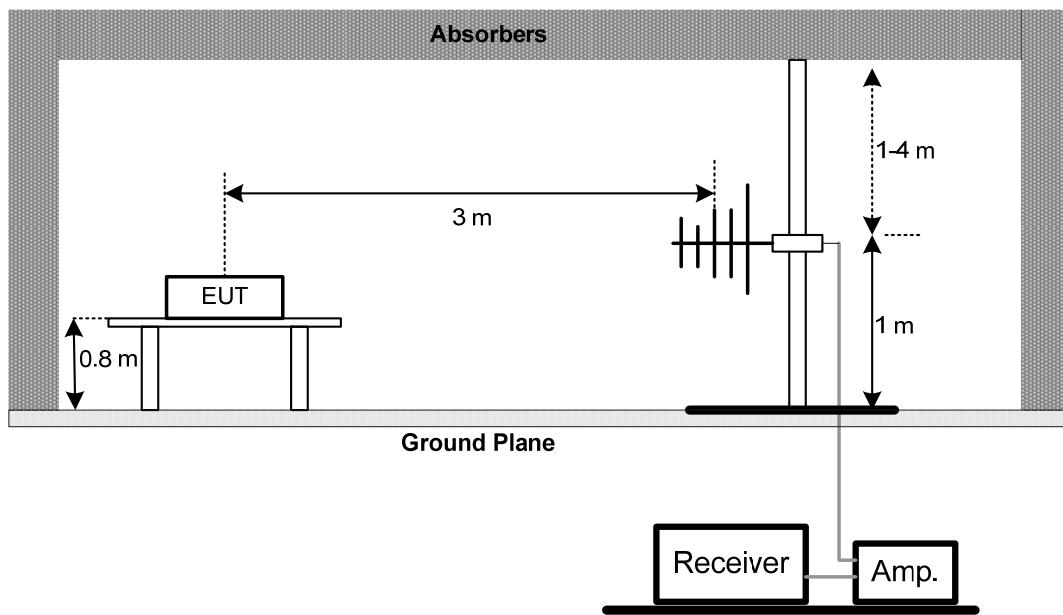
- The measuring distance of 3 m shall be used for measurements. The EUT was placed on the top of a rotating table 0.8 m above the ground at a 3 m semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.(below 1GHz)
- The measuring distance of 3 m shall be used for measurements. The EUT was placed on the top of a rotating table 1.5 m above the ground at a 3 m semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.(above 1GHz)
- The height of the equipment or of the substitution antenna shall be 0.8m or 1.5m; the height of the test antenna shall vary between 1 m to 4 m. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights find the maximum reading (used Bore sight function).
- The receiver system was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1GHz.
- The initial step in collecting radiated emission data is a receiver peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.
- All readings are Peak unless otherwise stated QP in column of Note. Peak denotes that the Peak reading compliance with the QP Limits and then QP Mode measurement didn't perform. (below 1GHz)
- All readings are Peak Mode value unless otherwise stated AVG in column of Note. If the Peak Mode Measured value compliance with the Peak Limits and lower than AVG Limits, the EUT shall be deemed to meet both Peak & AVG Limits and then only Peak Mode was measured, but AVG Mode didn't perform. (above 1GHz)
- For the actual test configuration, please refer to the related Item –EUT Test Photos.

4.1.3 DEVIATION FROM TEST STANDARD

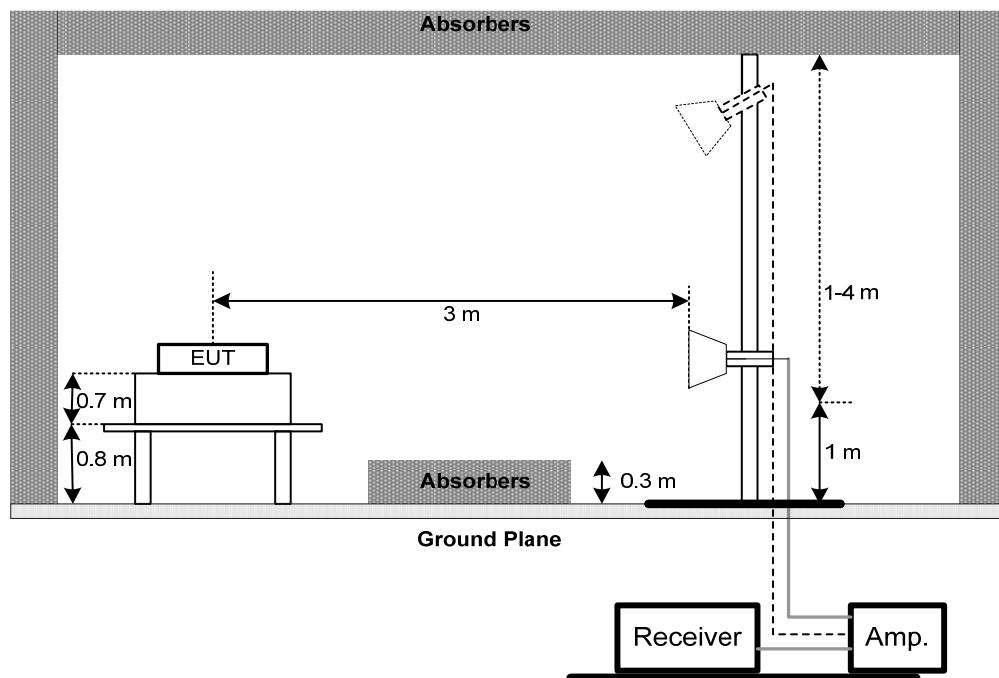
No deviation

4.1.4 TEST SETUP

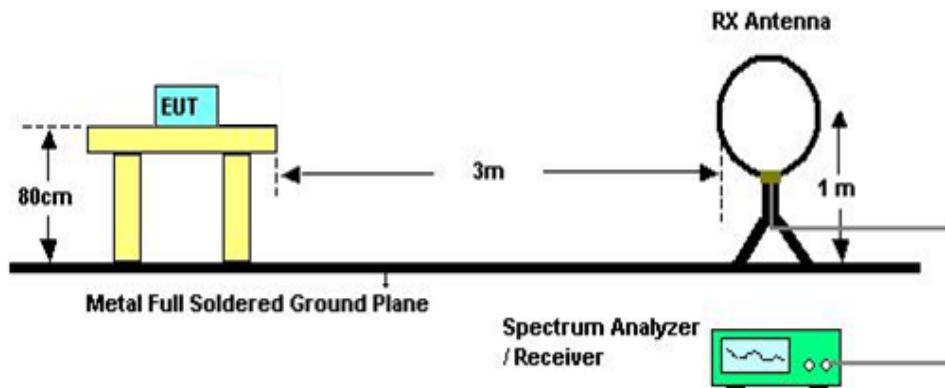
(A) Radiated Emission Test Set-Up Frequency Below 1 GHz



(B) Radiated Emission Test Set-Up Frequency Above 1 GHz



(C) For Radiated Emissions Below 30MHz



4.1.5 EUT OPERATING CONDITIONS

The EUT was programmed to be in continuously transmitting mode.

4.1.6 EUT TEST CONDITIONS

Temperature: 23°C Relative Humidity: 45% Test Voltage: AC 120V/60Hz

Remark:

- (1) The amplitude of spurious emissions which are attenuated by more than 20 dB below the permissible value has no need to be reported.
- (2) Distance extrapolation factor = $40 \log (\text{specific distance} / \text{test distance})$ (dB).
- (3) Limit line = specific limits (dB_{uV}) + distance extrapolation factor.

4.1.7 TEST RESULTS

Please refer to the Appendix A.

Remark:

- (1) No limit: This is fundamental signal, the judgment is not applicable.
For fundamental signal judgment was referred to Peak output test.

5. MEASUREMENT INSTRUMENTS LIST

Radiated Emission Measurement					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Preamplifier	EMCI	012645B	980267	Feb. 28, 2018
2	Preamplifier	EMCI	EMC02325	980217	Dec. 29, 2017
3	Preamplifier	EMCI	EMC2654045	980030	Feb. 14, 2018
4	Test Cable	EMCI	EMC104-SM-S M-8000	8m	Jan. 04, 2018
5	Test Cable	EMCI	EMC104-SM-S M-800	150207	Jan. 04, 2018
6	Test Cable	EMCI	EEMC104-SM-S M-3000	151205	Jan. 04, 2018
7	MXE EMI Receiver	Agilent	N9038A	MY55420127	Jan. 09, 2018
8	Signal Analyzer	Agilent	N9010A	MY52220990	Feb. 22, 2018
9	Loop Ant	EMCO	6502	42960	Nov. 24, 2017
10	Horn Ant	SCHWARZBECK	BBHA 9120D	9120D-1342	Feb. 28, 2018
11	Horn Ant	Schwarzbeck	BBHA 9170	187	Dec. 07, 2017
12	Trilog-Broadband Antenna	Schwarzbeck	VULB 9168	9168-548	Jan. 16, 2018
13	5dB Attenuator	EMCI	EMCI-N-6-05	AT-N0623	Jan. 16, 2018

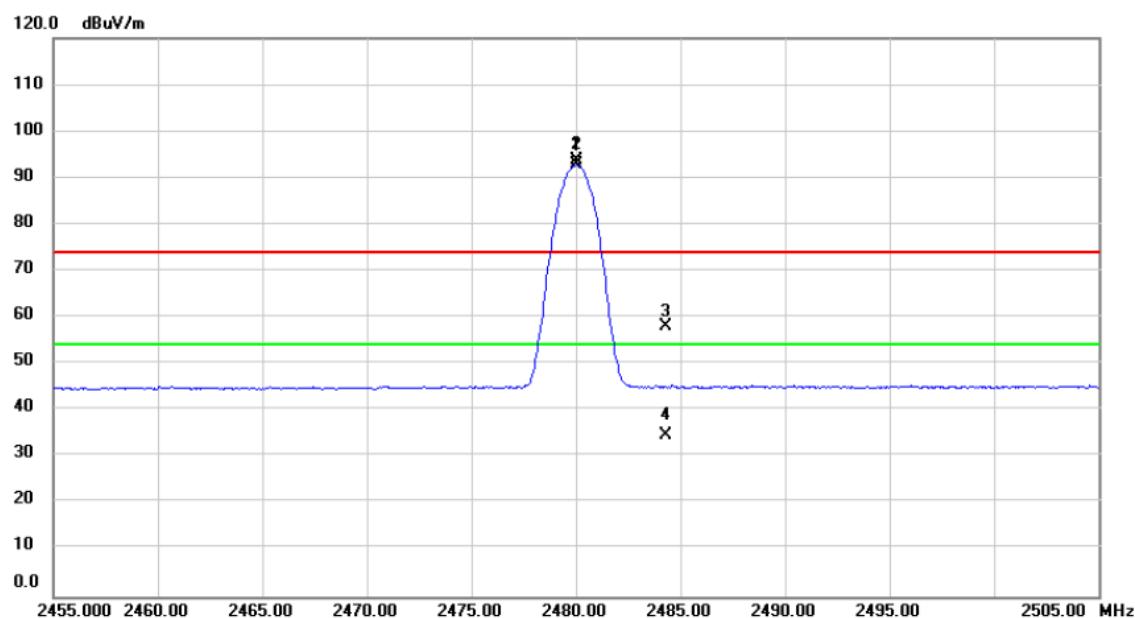
Remark: "N/A" denotes no model name, serial no. or calibration specified.

All calibration period of equipment list is one year.

APPENDIX A – RADIATED EMISSION (Co-location)

Test Mode : BT/TX 2480MHz _1Mbps

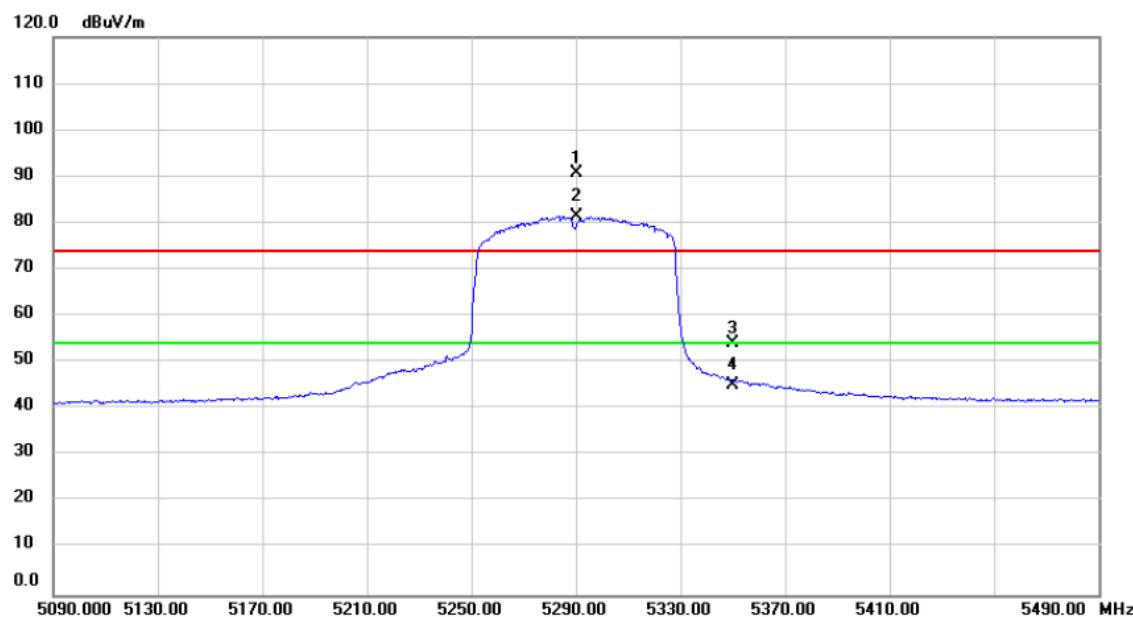
Vertical



No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Over	Detector	Comment
			Level	Factor	ment				
		MHz	dBuV	dB	dBuV/m	dB			
1	X	2480.000	62.26	31.39	93.65	74.00	19.65	peak	No Limit
2	*	2480.000	61.35	31.39	92.74	54.00	38.74	Avg	No Limit
3		2484.311	26.58	31.42	58.00	74.00	-16.00	peak	
4		2484.311	3.37	31.42	34.79	54.00	-19.21	Avg	

Test Mode : UNII-2A/TX AC80 Mode 5290MHz

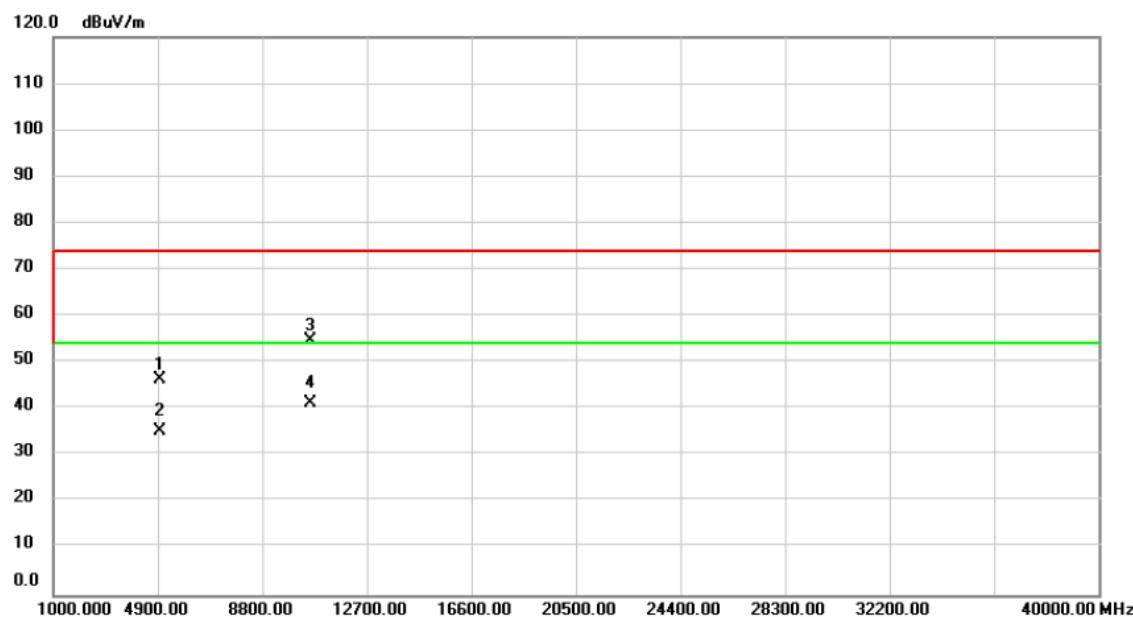
Vertical



No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Over	Detector	Comment
			Level	Factor	ment				
1	X	5290.000	53.12	37.69	90.81	74.00	16.81	peak	No Limit
2	*	5290.000	43.79	37.69	81.48	54.00	27.48	Avg	No Limit
3		5350.140	16.33	37.76	54.09	74.00	-19.91	peak	
4		5350.140	7.47	37.76	45.23	54.00	-8.77	Avg	

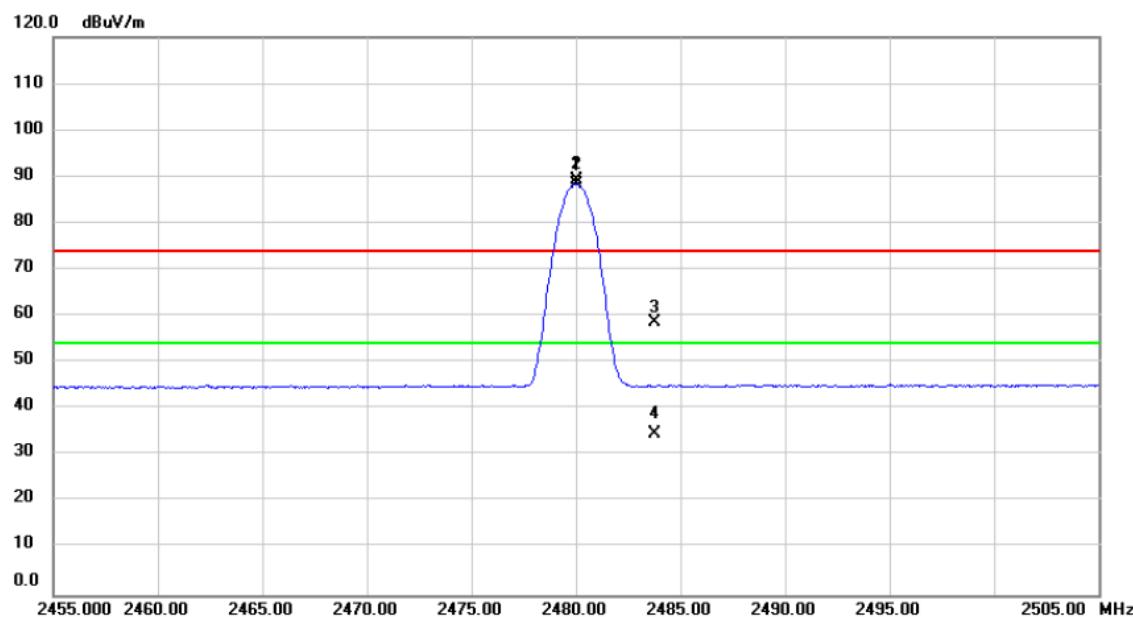
Test Mode : TX 2480MHz _1Mbps & UNII-2A/TX AC80 Mode 5290MHz

Vertical



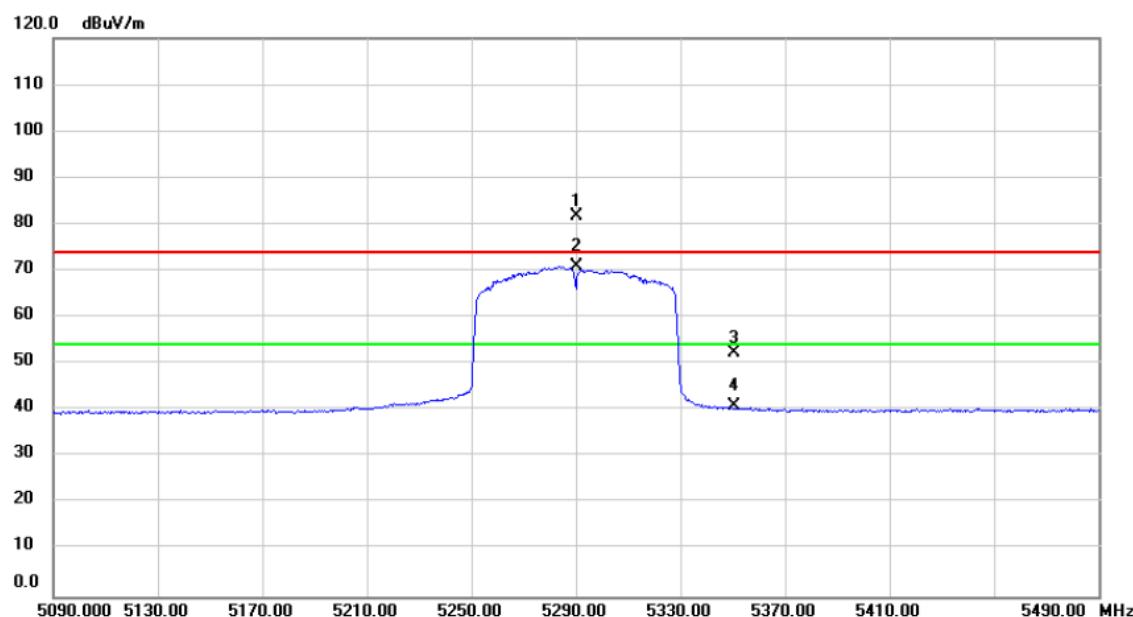
No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Over	Comment	
			Level	Factor	ment				
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		4960.000	57.60	-11.15	46.45	74.00	-27.55	peak	
2		4960.000	46.39	-11.15	35.24	54.00	-18.76	AVG	
3		10580.00	52.61	2.11	54.72	74.00	-19.28	peak	
4	*	10580.00	39.09	2.11	41.20	54.00	-12.80	AVG	

Test Mode : BT/TX 2480MHz _1Mbps

Horizontal

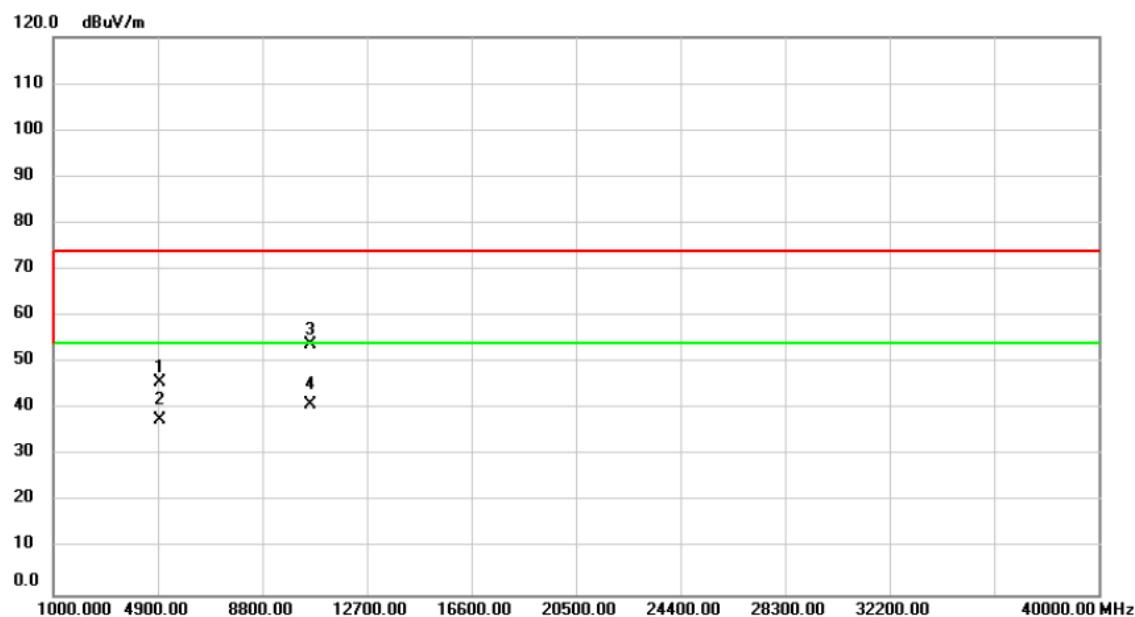
No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Over	Comment
			Level	Factor	ment			
		MHz	dBuV	dB	dBuV/m	dB	Detector	
1	X	2480.000	57.96	31.39	89.35	74.00	15.35	peak No Limit
2	*	2480.000	57.02	31.39	88.41	54.00	34.41	Avg No Limit
3		2483.758	27.33	31.41	58.74	74.00	-15.26	peak
4		2483.758	3.21	31.41	34.62	54.00	-19.38	Avg

Test Mode : UNII-2A/TX AC80 Mode 5290MHz

Horizontal

No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Over	Detector	Comment
			Level	Factor	ment				
1	X	5290.000	43.92	37.69	81.61	74.00	7.61	peak	No Limit
2	*	5290.000	33.25	37.69	70.94	54.00	16.94	Avg	No Limit
3		5350.280	14.66	37.76	52.42	74.00	-21.58	peak	
4		5350.280	3.15	37.76	40.91	54.00	-13.09	Avg	

Test Mode : TX 2480MHz _1Mbps & UNII-2A/TX AC80 Mode 5290MHz

Horizontal

No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Over	Detector	Comment
			Level	Factor	ment				
1		4960.000	56.81	-11.15	45.66	74.00	-28.34	peak	
2		4960.000	48.68	-11.15	37.53	54.00	-16.47	Avg	
3		10580.00	51.82	2.11	53.93	74.00	-20.07	peak	
4	*	10580.00	38.90	2.11	41.01	54.00	-12.99	Avg	