

FCC Co-Location Test Report

FCC ID : SWX-UDR
Equipment : UniFi Dream Router
Model No. : UDR
Brand Name : UBIQUITI
Applicant : Ubiquiti Inc.
Address : 685 Third Avenue, (27th Floor) New York, New York 10017 USA
Standard : 47 CFR FCC Part 15.247
47 CFR FCC Part 15.407
Received Date : Jun. 08, 2021
Tested Date : Jun. 14 ~ Jul. 14, 2021

We, International Certification Corporation, 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.

Reviewed by:



Along Chen / Assistant Manager

Approved by:



Gary Chang / Manager



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Release Record

Report No.	Version	Description	Issued Date
FR160801CO	Rev. 01	Initial issue	Aug. 05, 2021
FR160801CO	Rev. 02	Antenna information is modify	Oct. 08, 2021

Summary of Test Results

FCC Rules	Test Items	Measured	Result
15.247(d) 15.407(b) 15.209	Radiated Emissions	[dBuV/m at 3m]: 249.22MHz 42.98 (Margin -3.02dB) - PK	Pass

Declaration of Conformity:

The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers.

Comments and Explanations:

The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.

1 General Description

1.1 Information

1.1.1 Specification of the Equipment under Test (EUT)

WLAN	
Operating Frequency	802.11b/g/n/ax: 2412 MHz ~ 2462 MHz 802.11a/n/ac/ax: 5180 MHz ~ 5240 MHz; 5745 MHz ~ 5825 MHz
Modulation Type	802.11b: DBPSK/DQPSK/CCK 802.11a/g/n/ac/ax: BPSK/QPSK/16QAM/64QAM/256QAM/1024QAM
Bluetooth	
Operating Frequency	2402 MHz ~ 2480 MHz
Modulation Type	Bluetooth 5.1 LE: GFSK Bluetooth BR(1Mbps): GFSK Bluetooth EDR (2Mbps): $\pi/4$ -DQPSK Bluetooth EDR (3Mbps): 8-DPSK

1.1.2 Antenna Details

WLAN

Ant. No.	Model	Type	Connector	Gain (dBi) / MHz		
				2412 ~ 2462	5180 ~ 5240	5745 ~ 5825
1	ANT 0	Short-circuited Monopole	I-PEX	3.4	4.3	4.3
2	ANT 1	Short-circuited Monopole	I-PEX	3.4	4.3	4.3
3	ANT 2	Short-circuited Monopole	I-PEX	3.4	4.3	4.3
4	ANT 3	Short-circuited Monopole	I-PEX	3.4	4.3	4.3

BT

Ant. No.	Model	Type	Connector	Gain (dBi)	Remarks
1	ANT 5	Dipole	I-PEX	2.5	---

1.1.3 Power Supply Type of Equipment under Test (EUT)

Power Supply Type	100-240V, 50/60Hz, 1.1A
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1.2 The Equipment List

Test Item	Radiated Emission				
Test Site	966 chamber1 / (03CH01-WS)				
Test Date	Jul. 14, 2021				
Instrument	Brand	Model No.	Serial No.	Calibration Date	Calibration Until
Receiver	R&S	ESR3	101657	Mar. 12, 2021	Mar. 11, 2022
Spectrum Analyzer	R&S	FSV40	101498	Dec. 04, 2020	Dec. 03, 2021
Loop Antenna	R&S	HFH2-Z2	100330	Nov. 17, 2020	Nov. 16, 2021
Bilog Antenna	SCHWARZBECK	VULB9168	VULB9168-522	Jun. 30, 2021	Jun. 29, 2022
Horn Antenna 1G-18G	SCHWARZBECK	BBHA 9120 D	BBHA 9120 D 1096	Dec. 11, 2020	Dec. 10, 2021
Horn Antenna 18G-40G	SCHWARZBECK	BBHA 9170	BBHA 9170517	Nov. 06, 2020	Nov. 05, 2021
Preamplifier	EMC	EMC02325	980225	Jun. 29, 2021	Jun. 28, 2022
Preamplifier	Agilent	83017A	MY39501308	Sep. 26, 2020	Sep. 25, 2021
Preamplifier	EMC	EMC184045B	980192	Jul. 21, 2020	Jul. 20, 2021
Loop Antenna Cable	KOAX KABEL	101354-BW	101354-BW	Oct. 06, 2020	Oct. 05, 2021
LF cable 3M	Woken	CFD400NL-LW	CFD400NL-001	Oct. 06, 2020	Oct. 05, 2021
LF cable 11M	EMC	EMCCFD400-NW-N W-11000	200801	Oct. 06, 2020	Oct. 05, 2021
LF cable 1M	EMC	EMCCFD400-NM-N M-1000	160502	Oct. 06, 2020	Oct. 05, 2021
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16019/4	Oct. 06, 2020	Oct. 05, 2021
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16014/4	Oct. 06, 2020	Oct. 05, 2021
Measurement Software	AUDIX	e3	6.120210g	NA	NA
Note: Calibration Interval of instruments listed above is one year.					

Test Item	RF Conducted				
Test Site	(TH01-WS)				
Test Date	Jun. 14, 2021				
Instrument	Brand	Model No.	Serial No.	Calibration Date	Calibration Until
Spectrum Analyzer	R&S	FSV40	101063	Apr. 19, 2021	Apr. 18, 2022
Power Meter	Anritsu	ML2495A	1241002	Nov. 04, 2020	Nov. 03, 2021
Power Sensor	Anritsu	MA2411B	1207366	Nov. 04, 2020	Nov. 03, 2021
Spectrum Analyzer	R&S	FSV40	101063	Apr. 19, 2021	Apr. 18, 2022
Note: Calibration Interval of instruments listed above is one year.					

1.3 Test Standards

47 CFR FCC Part 15.247
47 CFR FCC Part 15.407
ANSI C63.10-2013

1.4 Reference Guidance

ANSI C63.4-2014
FCC KDB 558074 D01 15.247 Meas Guidance v05r02
FCC KDB 662911 D01 Multiple Transmitter Output v02r01
FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01

1.5 Deviation from Test Standard and Measurement Procedure

None

1.6 Measurement Uncertainty

The measurement uncertainties given below are based on a 95% confidence level (based on a coverage factor ($k=2$)).

Measurement Uncertainty	
Parameters	Uncertainty
Radiated emission \leq 1GHz	± 3.41 dB
Radiated emission $>$ 1GHz	± 4.59 dB

2 Test Configuration

2.1 Testing Facility

Test Laboratory	International Certification Corporation
Test Site	03CH01-WS, TH01-WS
Address of Test Site	No.3-1, Lane 6, Wen San 3rd St., Kwei Shan Dist., Tao Yuan City 33381, Taiwan (R.O.C.)

- FCC Designation No.: TW2732
- FCC site registration No.: 181692
- ISED#: 10807A
- CAB identifier: TW2732

2.2 The Worst Test Modes and Channel Details

Test item	Test Mode
Radiated Emissions	Mode 1: 11b CH11 + 11ax CH165
NOTE : The selected channel is the maximum power channel of wireless mode.	

3 Transmitter Test Results

3.1 Unwanted Emissions into Restricted Frequency Bands

3.1.1 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

Note 2:
 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.

3.1.2 Test Procedures

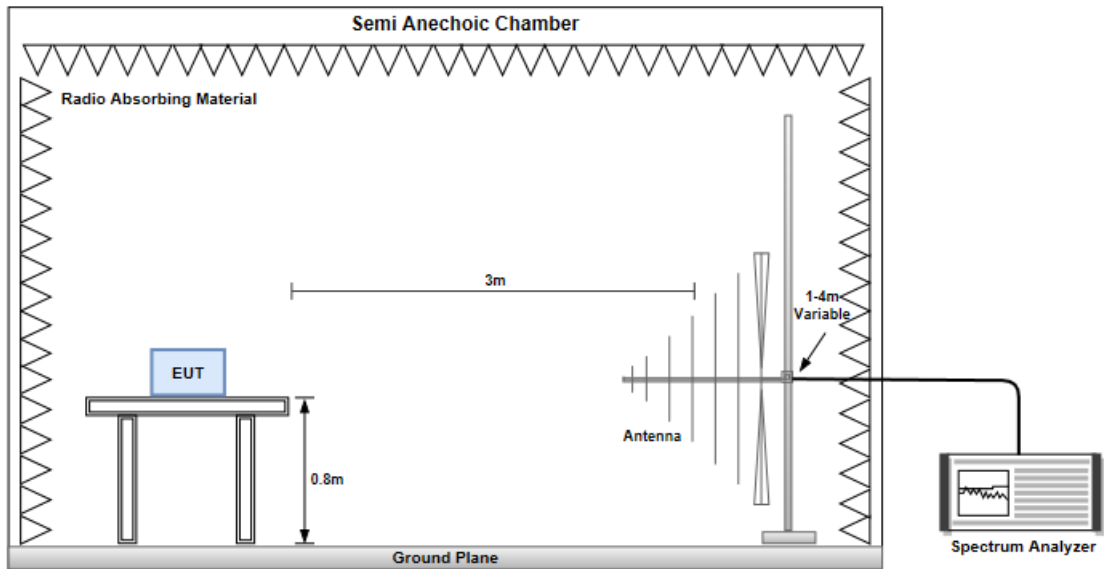
1. Measurement is made at a semi-anechoic chamber that incorporates a turntable allowing a EUT rotation of 360°. A continuously-rotating, remotely-controlled turntable is installed at the test site to support the EUT and facilitate determination of the direction of maximum radiation for each EUT emission frequency. The EUT is placed at test table. For emissions testing at or below 1 GHz, the table height is 80 cm above the reference ground plane. For emission measurements above 1 GHz, the table height is 1.5 m.
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:

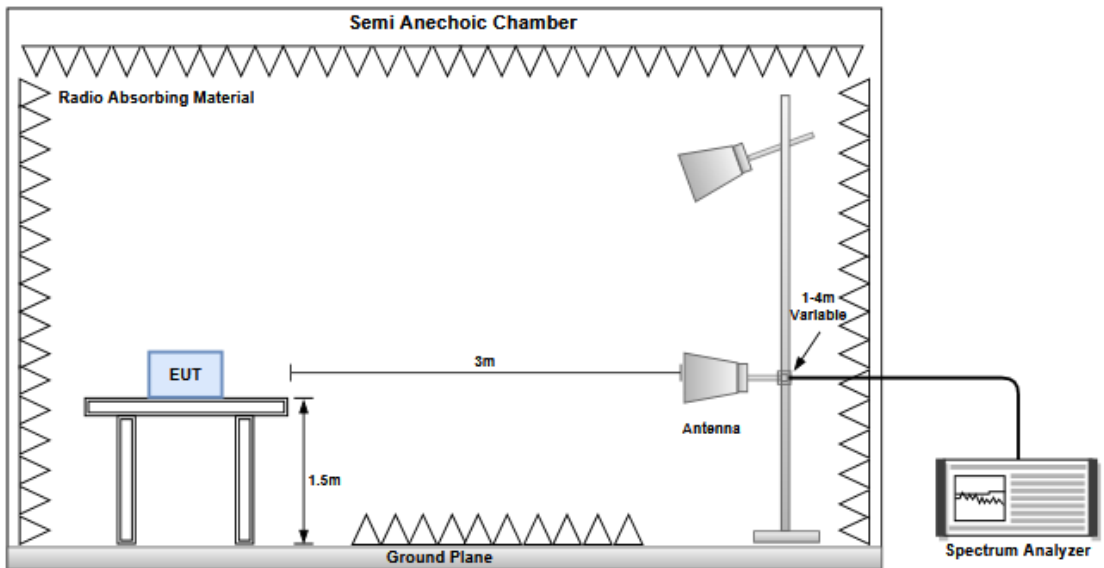
1. 120kHz measurement bandwidth of test receiver and Quasi-peak detector is for radiated emission below 1GHz.
2. RBW=1MHz, VBW=3MHz and Peak detector is for peak measured value of radiated emission above 1GHz.
3. RBW=1MHz, VBW=1/T and Peak detector is for average measured value of radiated emission above 1GHz.

3.1.3 Test Setup

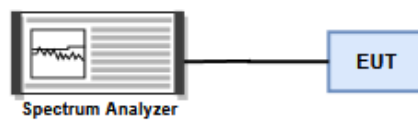
Radiated Emissions below 1 GHz



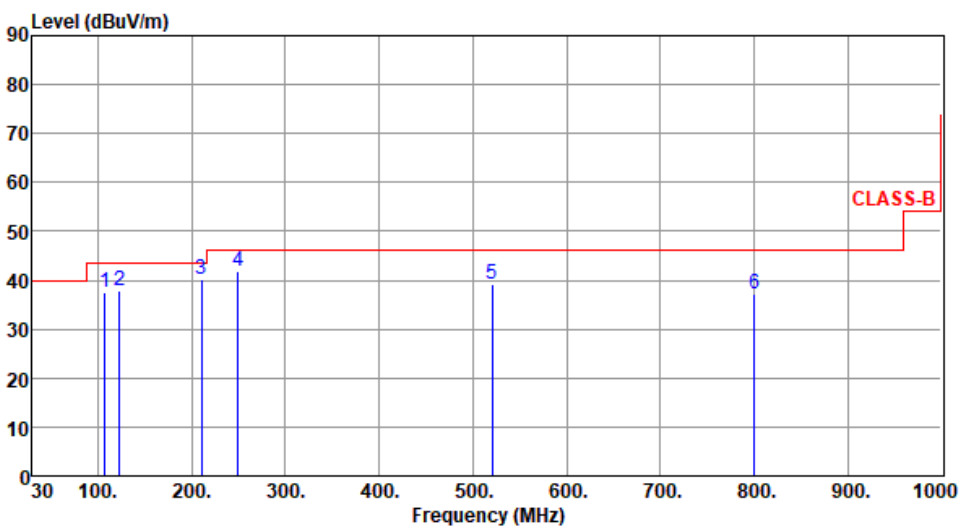
Radiated Emissions above 1 GHz



Transmitter Conducted Unwanted Emissions (30MHz~40GHz)



3.1.4 Transmitter Radiated Unwanted Emissions (Below 1GHz)

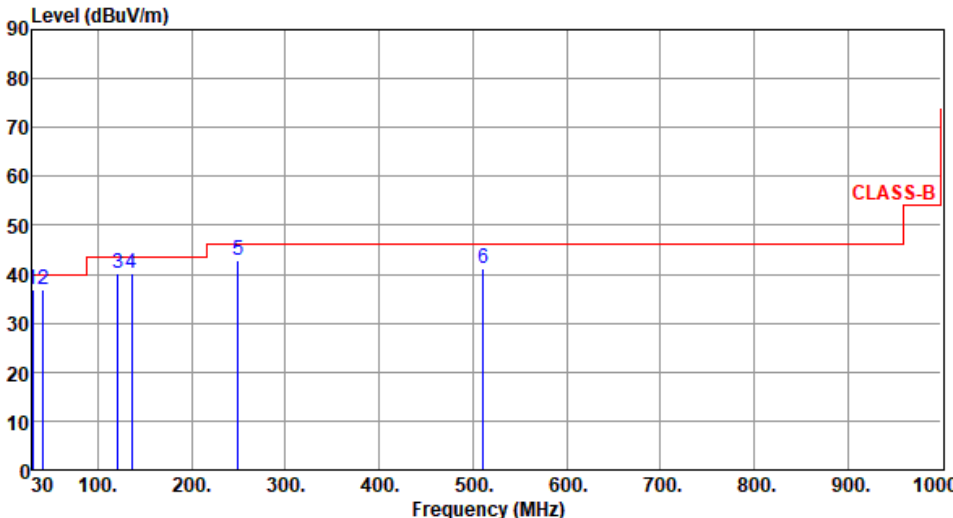
Test Mode	Mode 1: 11b CH11 + 11ax CH165									
Polarization	Horizontal									
Test By : Roger Lu			Temperature(°C): 25			Humidity(%): 63				
 <p>The graph plots Level (dBuV/m) on the y-axis (0 to 90) against Frequency (MHz) on the x-axis (30 to 1000). A red line represents the CLASS-B limit, which is constant at 43.50 dBuV/m from 30 MHz to 1000 MHz. Six peaks are identified with blue vertical lines and labeled 1 through 6. Peak 1 is at 107.60 MHz, peak 2 at 123.12 MHz, peak 3 at 210.42 MHz, peak 4 at 249.22 MHz, peak 5 at 520.82 MHz, and peak 6 at 800.18 MHz. All peaks are below the CLASS-B limit.</p>										
	Freq.	Emission	Limit	Margin	SA	Factor	Remark	ANT	Turn	
	MHz	level	dBuV/m	dB	reading	dB/m		High	Table	
								cm	deg	
1	107.60	37.59	43.50	-5.91	49.77	-12.18	Peak	---	---	
2	123.12	37.83	43.50	-5.67	48.37	-10.54	Peak	---	---	
3	210.42	40.15	43.50	-3.35	52.16	-12.01	Peak	---	---	
4	249.22	41.93	46.00	-4.07	52.09	-10.16	Peak	---	---	
5	520.82	39.14	46.00	-6.86	42.15	-3.01	Peak	---	---	
6	800.18	37.04	46.00	-8.96	35.17	1.87	Peak	---	---	

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV) + Factor* (dB/m)

*Factor includes antenna factor , cable loss and amplifier gain

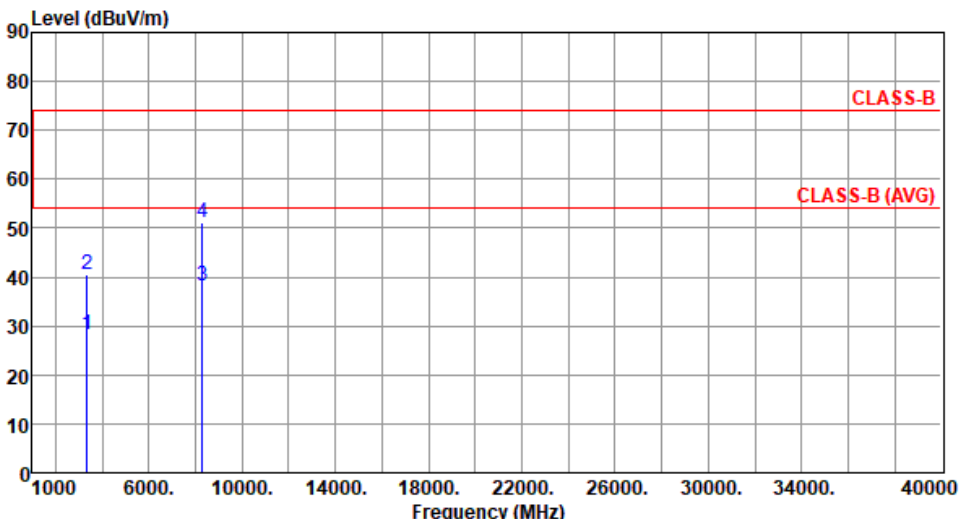
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

Note 3: All spurious emissions below 30MHz are more than 20 dB below the limit.

Test Mode	Mode 1: 11b CH11 + 11ax CH165									
Polarization	Vertical									
Test By :Roger Lu			Temperature(°C):25			Humidity(%):63				
										
	Freq.	Emission	Limit	Margin	SA	Factor	Remark	ANT	Turn	
	MHz	level	dBuV/m	dB	reading	dB/m		High	Table	
		dBuV/m			dBuV			cm	deg	
1	30.54	36.88	40.00	-3.12	46.89	-10.01	QP	100	5	
2	41.89	36.74	40.00	-3.26	45.19	-8.45	QP	100	10	
3	121.18	40.10	43.50	-3.40	50.74	-10.64	Peak	---	---	
4	135.73	40.13	43.50	-3.37	49.64	-9.51	Peak	---	---	
5	249.22	42.98	46.00	-3.02	53.14	-10.16	Peak	---	---	
6	511.12	41.10	46.00	-4.90	44.21	-3.11	Peak	---	---	

Note 1: Emission Level (dBUV/m) = SA Reading (dBUV) + Factor* (dB/m)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBUV/m) – Limit (dBUV/m).
Note 3: All spurious emissions below 30MHz are more than 20 dB below the limit.

3.1.5 Transmitter Radiated Unwanted Emissions (Above 1GHz)

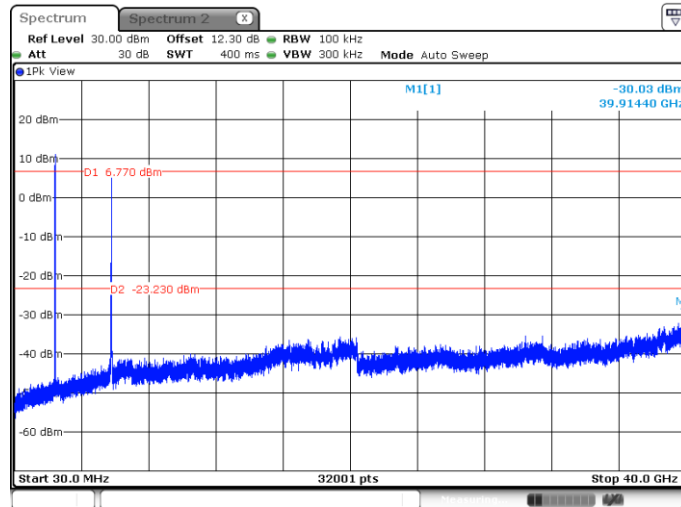
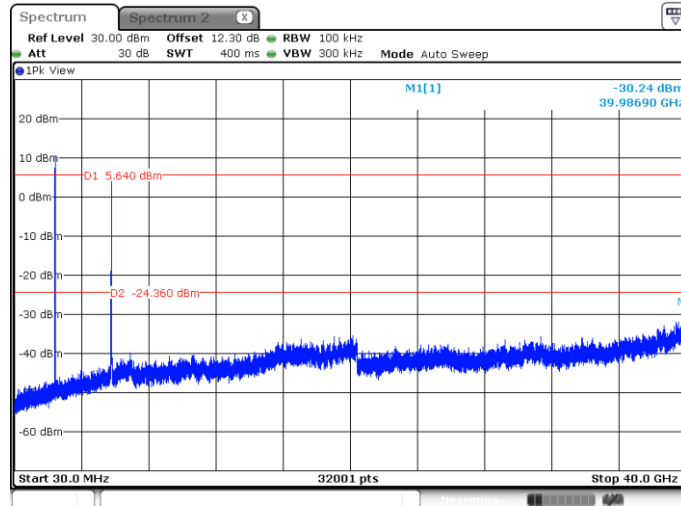
Test Mode	Mode 1: 11b CH11 + 11ax CH165									
Polarization	Horizontal									
Test By : Roger Lu			Temperature(°C): 25			Humidity(%): 63				
 <p>The graph displays the radiated unwanted emission levels. The y-axis represents Level in dBuV/m, ranging from 0 to 90. The x-axis represents Frequency in MHz, ranging from 1000 to 40000. Two horizontal red lines indicate the limits: CLASS-B at approximately 75 dBuV/m and CLASS-B (AVG) at approximately 55 dBuV/m. Two vertical blue lines with arrows point to peaks at 3363.00 MHz (labeled '2') and 8287.00 MHz (labeled '4').</p>										
	Freq.	Emission	Limit	Margin	SA	Factor	Remark	ANT	Turn	
	MHz	level	dBuV/m	dB	reading	dB/m		High	Table	
		dBuV/m			dBuV			cm	deg	
1	3363.00	28.20	54.00	-25.80	29.26	-1.06	Average	100	55	
2	3363.00	40.58	74.00	-33.42	41.64	-1.06	Peak	100	55	
3	8287.00	38.23	54.00	-15.77	28.86	9.37	Average	100	90	
4	8287.00	51.00	74.00	-23.00	41.63	9.37	Peak	100	90	
<p>Note 1: Emission Level (dBuV/m) = SA Reading (dBuV) + Factor* (dB/m) *Factor includes antenna factor , cable loss and amplifier gain Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m). Note 3: All spurious emissions below 30MHz are more than 20 dB below the limit.</p>										

Test Mode	Mode 1: 11b CH11 + 11ax CH165									
Polarization	Vertical									
Test By : Roger Lu			Temperature(°C): 25			Humidity(%): 63				
	Freq.	Emission	Limit	Margin	SA	Factor	Remark	ANT	Turn	
	MHz	level	dBuV/m	dB	reading	dB/m		High	Table	
		dBuV/m			dBuV			cm	deg	
1	3363.00	28.39	54.00	-25.61	29.45	-1.06	Average	100	40	
2	3363.00	40.52	74.00	-33.48	41.58	-1.06	Peak	100	40	
3	8287.00	38.20	54.00	-15.80	28.83	9.37	Average	100	60	
4	8287.00	51.67	74.00	-22.33	42.30	9.37	Peak	100	60	
<p>Note 1: Emission Level (dBuV/m) = SA Reading (dBuV) + Factor* (dB/m) *Factor includes antenna factor , cable loss and amplifier gain Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m). Note 3: All spurious emissions below 30MHz are more than 20 dB below the limit.</p>										

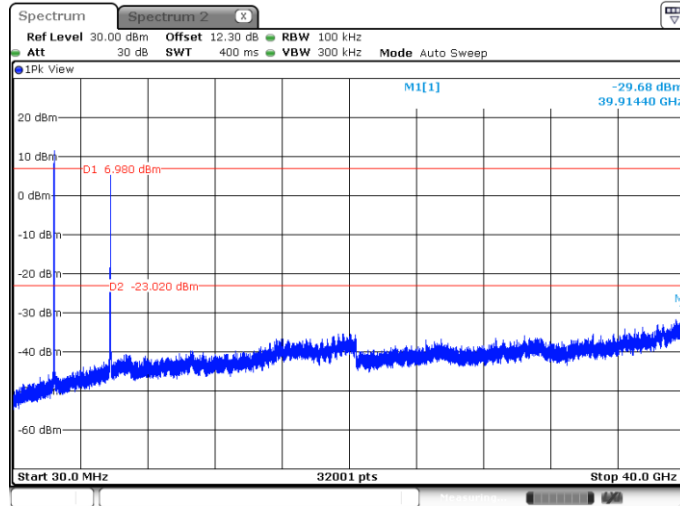
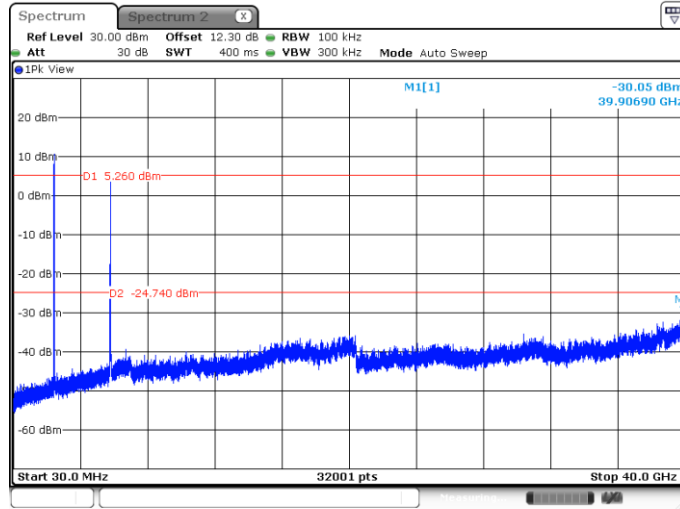
3.1.6 Conducted Emissions (30MHz~40GHz)

Ambient Condition	25°C / 63%	Tested By	Aska Huang
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Mode 1: 11b CH11 + 11ax CH165



Mode 1: 11b CH11 + 11ax CH165



4 Test laboratory information

Established in 2012, ICC provides foremost EMC & RF Testing and advisory consultation services by our skilled engineers and technicians. Our services employ a wide variety of advanced edge test equipment and one of the widest certification extents in the business.

International Certification Corporation (EMC and Wireless Communication Laboratory), it is our definitive objective is to institute long term, trust-based associations with our clients. The expectation we set up with our clients is based on outstanding service, practical expertise and devotion to a certified value structure. Our passion is to grant our clients with best EMC / RF services by oriented knowledgeable and accommodating staff.

Our Test sites are located at Linkou District and Kwei Shan District. Location map can be found on our website <http://www.icertifi.com.tw>.

Linkou

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Kwei Shan

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City 33381, Taiwan (R.O.C.)
No.2-1, Lane 6, Wen San 3rd
St., Kwei Shan Dist., Tao Yuan
City 33381, Taiwan (R.O.C.)

Kwei Shan Site II

Tel: 886-3-271-8640

No.14-1, Lane 19, Wen San 3rd
St., Kwei Shan Dist., Tao Yuan
City 333, Taiwan (R.O.C.)

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Email: ICC_Service@icertifi.com.tw

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