RADIO TEST REPORT FCC 47 CFR PART 15 SUBPART C CLASS II PERMISSIVE CHANGE

Test Standard	FCC Part 15.247
FCC ID	TX2-RTL8821AU
Product name	802.11a/b/g/n/ac RTL8821AU Combo module
Brand Name	Realtek
Model	RTL8821AU
Test Result	Pass

The test Result was tested by Compliance Certification Services Inc. The test data, data evaluation, test procedures, and equipment configurations shown in this report were given in ANSI C63.10: 2013 and compliance standards.

The test results of this report relate only to the tested sample (EUT) identified in this report.

The test Report of full or partial shall not copy. Without written approval of Compliance Certification Services Inc.(Wugu Laboratory)





Approved by:

Hern Cleany

Sam Chuang Manager

Tested by:

ny Chiang

Jerry Chuang Engineer



Revision History

Rev.	Issue Date	Revisions	Effect Page	Revised By
00	November 13, 2017	Initial Issue	ALL	Allison Chen
01	December 7, 2017	1. Modify section 1.6	page 7, 8	Allison Chen

Compliance Certification Services Inc. FCC ID: TX2-RTL8821AU

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1. GENERAL INFORMATION

1.1 EUT INFORMATION

Applicant	Realtek Semiconductor Corp. No. 2, Innovation Road II, Hsinchu Science Park, Hsinchu, 300 Taiwan
Manufacturer	Realtek Semiconductor Corp. No. 2, Innovation Road II, Hsinchu Science Park, Hsinchu, 300 Taiwan
Equipment	802.11a/b/g/n/ac RTL8821AU Combo module
Model No.	RTL8821AU
Model Discrepancy	N/A
Trade Name	Realtek
Received Date	October 12, 2017
Date of Test	November 29 ~ December 2, 2017
Output Power(W)	IEEE 802.11b mode: 0.0259 (EIRP : 0.0408) IEEE 802.11g mode: 0.1387 (EIRP : 0.2183) IEEE 802.11n HT 20 MHz mode: 0.1309 (EIRP: 0.2061) IEEE 802.11n HT 40 MHz mode: 0.1211 (EIRP: 0.1905)
Power Operation	 Power from host device. (DC 3.8V) Power from Li-ion Polymer Battery. Model: PR-464059G (1ICP5/40/59) Nominal Voltage: 3.8V Rated Capacity: 1630mAh / 6.2Wh Limited Charge voltage: 4.35V
Class II Permissive Change	Applicants add a new appearance of EUT and change the circuit and layout, but the antenna type and module are identical with original.

1.2 EUT CHANNEL INFORMATION

Frequency Range	2412MHz-2462MHz
Modulation Type	 IEEE 802.11b mode: CCK IEEE 802.11g mode: OFDM IEEE 802.11n HT 20 MHz mode: OFDM IEEE 802.11n HT40 MHz mode: OFDM
Bandwidth	 IEEE 802.11b mode: 11 Channels IEEE 802.11g mode: 11 Channels IEEE 802.11n HT 20 MHz mode: 11 Channels IEEE 802.11n HT 20 MHz mode: 9 Channels

Remark:

Refer as ANSI 63.10:2013 clause 5.6.1 Table 4 and RSS-GEN Table A1 for test channels

Number of frequencies to be tested				
Frequency range in which device operates	Number of frequencies	Location in frequency range of operation		
☐ 1 MHz or less	1	Middle		
☐ 1 MHz to 10 MHz	2	1 near top and 1 near bottom		
🛛 More than 10 MHz	3	1 near top, 1 near middle, and 1 near bottom		

1.3 ANTENNA INFORMATION

Antenna Type	PIFA PCB Dipole Coils
Antenna Gain	Gain: 1.97dBi

1.4 MEASUREMENT UNCERTAINTY

PARAMETER	UNCERTAINTY
Semi Anechoic Chamber (966 Chamber_B) / Radiated Emission, 30 to 1000 MHz	+/- 3.97
Semi Anechoic Chamber (966 Chamber_B) / Radiated Emission, 1 to 18GHz	+/- 3.58
Semi Anechoic Chamber (966 Chamber_B) / Radiated Emission, 18 to 26 GHz	+/- 3.59
Semi Anechoic Chamber (966 Chamber_B) / Radiated Emission, 26 to 40 GHz	+/- 3.81
Conducted Emission (Mains Terminals), 9kHz to 30MHz	+/- 2.48

Remark:

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

2. ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report.

1.5 FACILITIES AND TEST LOCATION

All measurement facilities used to collect the measurement data are located at

No.11, Wugong 6th Rd., Wugu Dist., New Taipei City 24891, Taiwan. (R.O.C.)

Test site	Test Engineer	Remark
AC Conduction Room	Jerry Chuang	
Radiation	Jerry Chuang	
RF Conducted	Eric Lee	

Remark: The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 and CISPR Publication 22.

1.6 INSTRUMENT CALIBRATION

AC Conduction Test Room						
Name of EquipmentManufacturerModelSerial NumberCalibration DateCalibration Due						
LISN	R&S	ENV216	101054	05/18/2017	05/17/2018	
LISN	SCHWARZBECK	NSLK 8127	8127-541	02/14/2017	02/13/2018	
EMI Test Receiver	R&S	ESCI	100064	05/17/2017	05/16/2018	

Wugu 966 Chamber A						
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due	
Bilog Antenna	Sunol Sciences	JB3	A030105	06/20/2017	06/19/2018	
EMI Test Receiver	R&S	ESCI	100064	05/17/2017	05/16/2018	
Horn Antenna	ETS LINDGREN	3117	00055165	02/20/2017	02/19/2018	
K Type Cable	Huber+Suhner	SUCOFLEX 102	29406/2	01/10/2017	01/09/2018	
K Type Cable	Huber+Suhner	SUCOFLEX 102	22470/2	01/10/2017	01/09/2018	
Pre-Amplifier	MITEQ	AMF-6F-2604 00-40-8P	985646	01/10/2017	01/09/2018	
Pre-Amplifier	EMCI	EMC 012635	980151	08/01/2017	07/31/2018	
Pre-Amplifier	EMEC	EM330	060609	07/31/2017	07/30/2018	
Spectrum Analyzer	Agilent	E4446A	US42510252	11/27/2017	11/26/2018	
Antenna Tower	CCS	CC-A-1F	N/A	N.C.R	N.C.R	
Controller	CCS	CC-C-1F	N/A	N.C.R	N.C.R	
Turn Table	CCS	CC-T-1F	N/A	N.C.R	N.C.R	
Software	EZ-EMC (CCS-3A1RE)					

Remark:

1. Each piece of equipment is scheduled for calibration once a year and Precision Dipole is scheduled for calibration once three years.

2. N.C.R. = No Calibration Request.

Conducted Test Site						
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due	
Power Meter	Anritsu	ML2495A	1033009	04/11/2017	04/10/2018	
Power Sensor	Anritsu	MA2411B	917072	07/03/2017	07/02/2018	
Spectrum Analyzer	R&S	FSV 40	101073	10/02/2017	10/01/2018	
Thermostatic/Hrgrosati c Chamber	GWINSTEK	GTC-288MH- CC	TH160402	05/23/2017	05/22/2018	
SUCOFLEX Cable	HUBER SUHNER	SUCOFLEX 104PEA	25157	07/31/2017	07/30/2018	
Divider	Solvang Technology	2-18GHz 4Way	STI08-0015	07/26/2017	07/25/2018	
Coupler	Agilent	87301d	MY44350252	07/25/2017	07/24/2018	

1. Each piece of equipment is scheduled for calibration once a year and Precision Dipole is scheduled for calibration once three years.

2. N.C.R. = No Calibration Request.

1.7 SUPPORT AND EUT ACCESSORIES EQUIPMENT

No	Equipment	Brand	Model	Series No.	FCC ID	Data Cable	Power Cord
1	NB(H)	Acer	Aspire 4320 series	R33142	QDS-BRCM1 018	N/A	N/A
2	NB(A)	Dell	PP19L	R33002	CXSMM01BR D02D110	N/A	N/A

1.8 TEST METHODOLOGY AND APPLIED STANDARDS

The test methodology, setups and results comply with all requirements in accordance with ANSI C63.10:2013, FCC Part 2, FCC Part 15.247, KDB 558074 D01 v04.

2. TEST SUMMERY

FCC Report Standard Section		Test Item	Result
15.203	1.2	Antenna Requirement	Pass
15.207(a)	4.1	AC Conducted Emission	Pass
15.247(b)	4.3	Output Power Measurement	Pass
15.247(d)	4.6	Radiation Band Edge	Pass
15.247(d)	4.6	Radiation Spurious Emission	Pass

3. DESCRIPTION OF TEST MODES

3.1 THE WORST MODE OF OPERATING CONDITION

Operation mode	IEEE 802.11b mode :1Mbps IEEE 802.11g mode :6Mbps IEEE 802.11n HT20 mode :MCS0 IEEE 802.11n HT40 mode: MCS0
Test Channel Frequencies	IEEE 802.11b mode : 1. Lowest Channel : 2412MHz 2. Middle Channel : 2437MHz 3. Highest Channel : 2462MHz IEEE 802.11g mode : 1. Lowest Channel : 2412MHz 2. Middle Channel : 2437MHz 3. Highest Channel : 2462MHz IEEE 802.11n HT20 mode : 1. Lowest Channel : 2412MHz 2. Middle Channel : 2437MHz 3. Highest Channel : 2462MHz IEEE 802.11n HT40 mode : 1. Lowest Channel : 2422MHz 2. Middle Channel : 2422MHz 3. Highest Channel : 2437MHz 3. Highest Channel : 2452MHz
Operation Transmitter	IEEE 802.11b mode :1T1R IEEE 802.11g mode :1T1R IEEE 802.11n HT20 mode :1T1R IEEE 802.11n HT40 mode :1T1R

Remark:

1. EUT pre-scanned data rate of output power for each mode, the worst data rate were recorded in this report.

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3.2 THE WORST MODE OF MEASUREMENT

AC Power Line Conducted Emission				
Test Condition AC Power line conducted emission for line and neutral				
Voltage/Hz	DC 3.8V			
Test Mode	Mode 1: EUT power by Battery.			
Worst Mode	⊠ Mode 1 □ Mode 2 □ Mode 3 □ Mode 4			

Radiated Emission Measurement Above 1G						
Test Condition	Test Condition Band edge, Emission for Unwanted and Fundamental					
Voltage/Hz DC 3.8V						
Test Mode Mode 1: EUT power by Battery.						
Worst Mode	☑ Mode 1					
Worst Position	 Placed in fixed position. Placed in fixed position at X-Plane (E2-Plane) Placed in fixed position at Y-Plane (E1-Plane) Placed in fixed position at Z-Plane (H-Plane) 					
Worst Polarity	Horizontal 🗌 Vertical					

Radiated Emission Measurement Below 1G					
Test Condition Radiated Emission Below 1G					
Voltage/Hz DC 3.8V					
Test Mode Mode 1: EUT power by Battery.					
Worst Mode	☑ Mode 1 □ Mode 2 □ Mode 3 □ Mode 4				

Remark:

1. The worst mode was record in this test report.

2. EUT pre-scanned in three axis, X, Y, Z and two polarity, Horizontal and Vertical for radiated measurement. The worst case (X-Plane and Horizontal) were recorded in this report

3. For below 1G, AC power line conducted emission and radiation emission were performed the EUT transmit at the highest output power channel as worse case.

3.3 EUT DUTY CYCLE

Duty Cycle								
Configuration	TX ON (ms)	TX ALL (ms)	Duty Cycle (%)	Duty Factor(dB)				
802.11b	1.0000	1.0000	100.00%	0.00				
802.11g	1.0000	1.0000	100.00%	0.00				
802.11n HT20	1.0000	1.0000	100.00%	0.00				
802.11n HT40	1.0000	1.0000	100.00%	0.00				



4. TEST RESULT

4.1 AC POWER LINE CONDUCTED EMISSION

4.1.1 Test Limit

According to §15.207(a)(2)

Frequency Range	Limits(dBµV)			
(MHz)	Quasi-peak	Average		
0.15 to 0.50	66 to 56*	56 to 46*		
0.50 to 5	56	46		
5 to 30	60	50		

* Decreases with the logarithm of the frequency.

4.1.2 Test Procedure

Test method Refer as ANSI 63.10:2013 clause 6.2,

- 1. The EUT was placed on a non-conducted table, which is 0.8m above horizontal ground plane and 0.4m above vertical ground plane.
- 2. EUT connected to the line impedance stabilization network (LISN)
- 3. Receiver set RBW of 9kHz and Detector Peak, and note as quasi-peak and average.
- 4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
- 5. Recorded Line for Neutral and Line.

4.1.3 Test Setup



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Test Data

Test Mode:	Mode 1	Temp/Hum	24(°C)/ 50%RH
Test Voltage:	120Vac / 60Hz	Test Date	November 30, 2017
Phase:	Line	Test Engineer	Jerry Chuang



No.	Frequency	QuasiPeak reading	Average reading	Correction factor	QuasiPeak result	Average result	QuasiPeak limit	Average limit	QuasiPeak margin	Average margin
	(MHz)	(dBuV)	(dBuV)	(dB)	(dBuV)	(dBuV)	(dBuV)	(dBuV)	(dB)	(dB)
1	0.1740	48.09	28.13	0.08	48.17	28.21	64.77	54.77	-16.60	-26.56
2	0.1940	49.21	27.27	0.09	49.30	27.36	63.86	53.86	-14.56	-26.50
3	0.2420	41.41	22.93	0.09	41.50	23.02	62.03	52.03	-20.53	-29.01
4	0.4300	34.33	28.15	0.10	34.43	28.25	57.25	47.25	-22.82	-19.00
5	1.8100	30.34	22.48	0.16	30.50	22.64	56.00	46.00	-25.50	-23.36
6	3.6820	31.37	24.21	0.22	31.59	24.43	56.00	46.00	-24.41	-21.57

Test Mode:	Mode 1	Temp/Hum	24(°C)/ 50%RH
Test Voltage:	120Vac / 60Hz	Test Date	November 30, 2017
Phase:	Neutral	Test Engineer	Jerry Chuang



No.	Frequency	QuasiPeak reading	Average reading	Correction factor	QuasiPeak result	Average result	QuasiPeak limit	Average limit	QuasiPeak margin	Average margin
	(MHz)	(dBuV)	(dBuV)	(dB)	(dBuV)	(dBuV)	(dBuV)	(dBuV)	(dB)	(dB)
1	0.1660	47.06	26.64	0.15	47.21	26.79	65.16	55.16	-17.95	-28.37
2	0.2180	38.65	19.64	0.16	38.81	19.80	62.89	52.89	-24.08	-33.09
3	0.2420	41.40	23.63	0.16	41.56	23.79	62.03	52.03	-20.47	-28.24
4	0.2660	33.84	17.12	0.16	34.00	17.28	61.24	51.24	-27.24	-33.96
5	0.7140	29.19	22.29	0.20	29.39	22.49	56.00	46.00	-26.61	-23.51
6	1.4460	31.60	23.09	0.22	31.82	23.31	56.00	46.00	-24.18	-22.69

4.2 OUTPUT POWER MEASUREMENT

4.2.1 Test Limit

According to §15.247(b)

Peak output power :

For systems using digital modulation in the 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt(30 dBm) and the e.i.r.p. shall not exceed 4Watt(36 dBm), base on the use of antennas with directional gain not exceed 6 dBi If transmitting antennas of directional gain greater than 6dBi are used the peak output power the conducted output power from the intentional radiator shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. In case of point-to-point operation, the limit has to be reduced by 1dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

	Antenna not exceed 6 dBi : 30dBm
Limit	Antenna with DG greater than 6 dBi :
	[Limit = 30 - (DG - 6)]
	Point-to-point operation :

Average output power : For reporting purposes only.

4.2.2 Test Procedure

Test method Refer as KDB 558074 D01 v04, Section 9.1.2.

- 1. The EUT RF output connected to the power meter by RF cable.
- 2. Setting maximum power transmit of EUT.
- 3. The path loss was compensated to the results for each measurement.
- 4. Measure and record the result of Peak output power and Average output power. in the test report.

4.2.3 Test Setup



4.2.4 Test Result

Peak output power :

Wifi 2.4G													
Config	2	Freq.	powe	er set	PK Pow	er(dBm)	PK Total	PK Total Power	EIRP PK Total	EIRP PK Total	DG	Limit	EIRP
eeg	GI	(MHz)	chain0	chain1	chain0	chain1	(dBm)	(W)	Power (dBm)	Power (W)	(dBi)	(dBm)	(dBm)
IEEE	Low	2412	30	-	13.82	-	13.82	0.0241	15.79	0.0379			
802.11b Data rate:	Mid	2437	30	-	14.02	-	14.02	0.0252	15.99	0.0397			
1Mbps	High	2462	30	-	14.14	-	14.14	0.0259	16.11	0.0408			
IEEE	Low	2412	46	-	21.02	-	21.02	0.1265	22.99	0.1991			
802.11g Data rate:	Mid	2437	47	-	21.42	-	21.42	0.1387	23.39	0.2183			
6Mbps	High	2462	47	-	21.21	-	21.21	0.1321	23.18	0.2080	1 07	20	36
IEEE 802 11n	Low	2412	47	-	21.14	-	21.14	0.1300	23.11	0.2046	1.97	30	50
HT20	Mid	2437	47	-	21.06	-	21.06	0.1276	23.03	0.2009			
MCS0	High	2462	47	-	21.17	-	21.17	0.1309	23.14	0.2061			
IEEE 802 11n	Low	2422	47	-	20.78	-	20.78	0.1197	22.75	0.1884			
HT40	Mid	2437	47	-	20.83	-	20.83	0.1211	22.80	0.1905	,		
MCS0	High	2452	47	-	20.75	-	20.75	0.1189	22.72	0.1871			

Average output power :

	Wifi 2.4G										
Config		Freq.	AV Pow	AV Total							
comg	СП	(MHz)	chain0	chain1	(dBm)						
IEEE	Low	2412	11.55	-	11.55						
802.11b Data rate:	Mid	2437	11.76	-	11.76						
1Mbps	High	2462	11.92	-	11.92						
IEEE 802.11g Data rate:	Low	2412	12.65	-	12.65						
	Mid	2437	12.85	-	12.85						
6Mbps	High	2462	12.87	-	12.87						
IEEE 802 11n	Low	2412	12.83	-	12.83						
HT20	Mid	2437	12.75	-	12.75						
MCS0	High	2462	12.71	-	12.71						
IEEE 802 11n	Low	2422	12.81	-	12.81						
HT40	Mid	2437	12.76	-	12.76						
MCS0	High	2452	12.83	-	12.83						

4.3 RADIATION BANDEDGE AND SPURIOUS EMISSION

4.3.1 Test Limit

FCC according to §15.247(d), §15.209 and §15.205,

In any 100 kHz bandwidth outside the authorized frequency band, all harmonic and spurious must be least 20 dB below the highest emission level with the authorized frequency band. Radiation emission which fall in the restricted bands must also follow the FCC section 15.209 as below limit in table.

Below 30 MHz

Frequency	Field Strength (microvolts/m)	Magnetic H-Field (microamperes/m)	Measurement Distance (metres)
9-490 kHz	2,400/F (F in kHz)	2,400/F (F in kHz)	300
490-1,705 kHz	24,000/F (F in kHz)	24,000/F (F in kHz)	30
1.705-30 MHz	30	N/A	30

Above 30 MHz

Frequency	Field Strength (microvolts/m)	Measurement Distance (metres)
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

4.3.2 Test Procedure

Test method Refer as KDB 558074 D01 v04, Section 12.1.

1. The EUT is placed on a turntable, Above 1 GHz is 1.5m and below 1 GHz is 0.8m above ground plane. The EUT Configured un accordance with ANSI C63.10, and the EUT set in a continuous mode.

2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level. And EUT is set 3m away from the receiving antenna, which is scanned from 1m to 4m above the ground plane to find out the highest emissions. Measurement are made polarized in both the vertical and the horizontal positions with antenna.

3. Span shall wide enough to full capture the emission measured. The SA from 30MHz to 26.5GHz set to the low, Mid and High channels with the EUT transmit.

Remark:

Although these tests were performed other than open area test site, adequate comparison measurements were confirmed against 30 m open are test site. Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field based on KDB 937606.

4. The SA setting following :

- (1) Below 1G : RBW = 100kHz, VBW ≥ 3 RBW, Sweep = Auto, Detector = Peak, Trace = Max hold.
- (2) Above 1G:
 - (2.1) For Peak measurement : RBW = 1MHz, VBW ≥ 3 RBW, Sweep = Auto, Detector = Peak, Trace = Max hold.
 - (2.2) For Average measurement : RBW = 1MHz, VBW

If Duty Cycle \geq 98%, VBW=10Hz.

If Duty Cycle < 98%, VBW=1/T.

Configuration	Duty Cycle (%)	T(ms)	1/T (kHz)	VBW Setting
802.11b	100%	1.0000	-	300Hz
802.11g	100%	1.0000	-	300Hz
802.11n HT20	100%	1.0000	-	300Hz
802.11n HT40	100%	1.0000	-	300Hz

4.3.3 Test Setup

<u>9kHz ~ 30MHz</u>



<u>30MHz ~ 1GHz</u>



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Above 1 GHz



4.3.4 Test Result

Band Edge Test Data



Test Mode	IEEE	802.11b Lo	w CH	Ten	nperature:	24(°∁)/ 33%RH	
Test Item		Band Edge	;	Т	est Date	Novemb	er 30, 2017
Polarize		Horizontal		Tes	t Engineer	Kev	in Kuo
Detector		Average					
110.0 dBuV/m							
						Limit1: Limit2:	_
						2	
						/	M
70							
70					<u>(</u>		
					/	V	
					$\sqrt{1}$		
				\sim			
30.0	0 0000 40 0			0077.04			
2310.000 2321.2	U 2332.4U 2.	343.60 2354.80	2366.00	2311.20	J 2388.40 239	9.60 24	422.UU MHz
Frequency	Peading	Correct	Post	11+	Limit	Margin	
(MHz)	(dBuV)	Factor (dB/m)	(dBuV	//m)	(dBuV/m)	(dB)	Remark
2386.944	53.29	-2.99	50.3	80	54.00	-3.70	AVG
2411.248	97.74	-2.92	94.8	32	-	-	AVG



Test Mode	IEEE	802.11b Hi	gh CH	Temperature:			24(°∁)/ 33%RH	
Test Item		Band Edge	•	Т	est Dat	ie	Novemb	er 30, 2017
Polarize		Horizontal		Tes	t Engin	neer	Kev	rin Kuo
Detector		Average						
110.0 dBuV/m								
							Limit1: Limit2:	_
70								
	V h	2						
30.0								
2452.000 2462.00	2472.00 24	82.00 2492.00	2502.00	2512.0	0 2522.0	0 2532	2.00 2	552.00 MHz
Frequency F (MHz)	eading dBuV)	Correct Factor (dB/m)	Resu (dBuV	ult //m)	Lir (dBu	nit V/m)	Margin (dB)	Remark
2461.200	97.71	-2.76	94.9	95	-		-	AVG
2525.000	41.96	-2.69	39.2	27	54.	00	-14.73	AVG
· · · ·								

Test	Mode	IEEE 8	IEEE 802.11g Low CH			emp/H	um	24(°∁)/ 33%RH	
Test	Item	E	Band Edge	;	Т	est Da	ate	Noven	nber 30, 2017
Pola	arize		Horizontal		Tes	t Engi	neer	Kevin Kuo	
Dete	ector		Peak						
120.0	dBuV/m								
								Limit1 Limit2	1: — 2: —
								<u> </u>	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
80									
						>	e de la construction de la const	v	
						and the second			
	the market were a set the short resource	warren washing	مرادية المحصور المراد والمدانية المراجع	how when the state of the state	wheel and the second				
40.0	dan a mini a barran a rad								
2310.0	000 2321.20 2	332.40 234	43.60 2354.80	2366.00	2377.2	0 2388	.40 2399	.60	2422.00 MHz
Freque (MHz	ency R z) (eading dBuV)	Correct Factor (dB/m)	Resu (dBuV	ult //m)	Li (dBi	imit uV/m)	Margir (dB)	n Remark
2387.6	616	65.66	-2.98	62.6	68	74	1.00	-11.32	2 peak
2419.0	088 9	99.14	-2.89	96.2	25		-	-	peak
				•				-	

Test Mode	IEEE	802.11g Lo	w CH	Temperature:			24(°∁)/ 33%RH	
Test Item		Band Edge	;	T	est Da	te	Nover	nber 30, 2017
Polarize		Horizontal		Tes	t Engir	neer	Kevin Kuo	
Detector		Average						
110.0 dBuV/m								
							Limit1 Limit2	: —
							\frown	2
70								
						1		
30.0	2222.40 24	040 00 0054 00	2266 00	2277 21	0 2200	40 2200	C0	2422.00 MHz
2310.000 2321.20	2332.4U Z	043.0U Z304.8U	2366.UU	2311.2	U 2388.	40 2399	.00	2422.UU MHZ
Frequency	Reading	Correct Factor	Resu	ult	Li	mit	Margin	Remark
(MHz)	(dBuV)	(dB/m)	(dBuV	//m)	(dBu	ıV/m)	(dB)	Kennark
2390.000	46.95	-2.98	43.9)7	54	.00	-10.03	AVG
2418.304	89.43	-2.90	86.5	53		-	-	AVG

Test Mode	IEEE	802.11g Hi	gh CH	Temp/Hum			24(℃)/ 33%RH	
Test Item		Band Edge	;	T	est Da	te	November 30, 2017	
Polarize		Horizontal		Tes	t Engi	neer	Ke	vin Kuo
Detector		Peak						
120.0 dBuV/m								
							Limit1: Limit2:	_
1	\neg							
80								
	he have	2						
		1×						
40.0		When Hillen War	ndhirishipminihishi	unung milant	an han han han han han han han han han h	nontrational	for mostanthingly inclosed	Nurthingtook
2452.000 2462.00	2472.00 24	82.00 2492.00	2502.00	2512.00	0 2522	.00 2532		2552.00 MHz
Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Resı (dBuV	ult //m)	Li (dBu	mit JV/m)	Margin (dB)	Remark
2455.000	98.89	-2.78	96.1	1		-	-	peak
2525.300	61.50	-2.69	58.8	31	74	.00	-15.19	peak
I							-	

lest Mode	IEEE 8	802.11g Hi	gh CH	Ter	Temperature:		24(°∁)/ 33%RH	
Test Item	E	Band Edge)	T	est Da	ate	November 30, 2017	
Polarize		Horizontal		Tes	t Engi	neer	Ke	evin Kuo
Detector		Average						
110.0 dBu¥/m								
							Limit1: Limit2:	_
*								
70								
		2						
		×						
30.0								
2452.000 2462.00 2	472.00 248	2.00 2492.00	2502.00	2512.00	0 2522	2.00 2532	2.00	2552.00 MHz
Frequency	anding	Correct	Posi	114	1	imit	Margin	
(MHz) (dBuV)	Factor (dB/m)	(dBuV	//m)	(dB	uV/m)	(dB)	Remark
2456.100	39.24	-2.78	86.4	6		-	-	AVG
2483.700	43.71	-2.69	41.0)2	54	1.00	-12.98	AVG

Test Mode	IEEE 802.	11n HT20 L	ow CH	Temp/	Hum	24(℃)/ 33%RH	
Test Item	Ba	and Edge		Test D	Date	November 30, 2017	
Polarize	H	lorizontal		Test Eng	gineer	Kev	in Kuo
Detector		Peak					
120.0 dBuV/m							
						Limit1: Limit2:	_
						~~~~~	-2
80							
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2310 000 2321 2	0 2332 40 23	<b>143 60 2354 80</b>	2366.00	2377 20 23	88 <b>4</b> 0 239	9.60 24	
		2001.00	2000.00				
Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Resı (dBuV	ult '/m) (d	Limit BuV/m)	Margin (dB)	Remark
2388.288	68.82	-2.98	65.8	34	74.00	-8.16	peak
2418.304	99.14	-2.89	96.2	25	-	-	peak

Test Mode	IEEE 802.11n HT20 Low CH			Temperature:			24(°∁)/ 33%RH		
Test Item	Band Edge			Test Date			November 30, 2017		
Polarize	H	orizontal		Test Engineer			Kevin Kuo		
Detector		Average							
110.0 dBu¥/m									
							Limit1: Limit2:	_	
								~~~~	
70									
						1			
30.0									
2310.000 2321.2	0 2332.40 23	43.60 2354.80	2366.00	2377.2	0 2388	.40 2399	.60	2422.00 MHz	
Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Resı (dBuV	ult //m)	Li (dBi	imit uV/m)	Margin (dB)	Remark	
2390.000	48.27	-2.98	45.2	29	54	4.00	-8.71	AVG	
2405.424	89.51	-2.90	86.6	51		-	-	AVG	

Test Mode	IEEE 802.1	1n HT20 Hi	gh CH	Temp/Hum			24(°∁)/ 33%RH		
Test Item	Ba	nd Edge		Te	est Dat	e	November 30, 201		
Polarize	Ho	orizontal		Test Engineer			Kevin Kuo		
Detector		Peak							
120.0 dBuV/m									
							Limit1: Limit2:		
1									
80									
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		Mu -							
		hardbetternet	Month mathematican	victoria	www.	nan lan an a	ulu.mininipaliania.ev	ngennen fin ^{ge} tuine	
40.0									
2452.000 2462	.00 2472.00 24	82.00 2492.00	2502.00	2512.00	) 2522.0	0 2532	2.00	2552.00 MHz	
Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Resı (dBuV	ult //m)	Lin (dBu'	nit V/m)	Margin (dB)	Remark	
2458.600	98.85	-2.78	96.0	7	-		-	peak	
2484.500	64.04	-2.69	61.3	5	74.	00	-12.65	peak	

Test Mode	IEEE 802.1	1n HT20 Hi	Temperature:			24(°∁)/ 33%RH			
Test Item	Ba	nd Edge		T	est Dat	е	November 30, 2017		
Polarize	Ho	orizontal		Test Engineer			Kevin Kuo		
Detector	A	verage							
110.0 dBuV/m									
							Limit1: Limit2:	_	
- <u>+</u>									
70									
		2							
		X							
30.0			~~~~~~						
2452.000 2462	.00 2472.00 24	82.00 2492.00	2502.00	2512.00	0 2522.0	0 2532	2.00 2	2552.00 MHz	
Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Resı (dBuV	ult //m)	Lim (dBu\	nit V/m)	Margin (dB)	Remark	
2456.400	89.33	-2.78	86.5	5	-		-	AVG	
2483.600	45.49	-2.69	42.8	80	54.0	00	-11.20	AVG	

Test Mode	IEEE 802.1	Temp/Hum			<b>24(</b> °(	C)/ 33%RH		
Test Item	Ba	nd Edge	Test Date			Novem	ber 30, 2017	
Polarize	H	orizontal		Test Engineer			Ke	evin Kuo
Detector		Peak						
120.0 dBuV/m								
							Limit1: Limit2:	_
							2	
					$\int$			
80								
				1	NN			
			M	www.har	1 W			
withourselease	hower for the second and the second for second for the second for	Napanal Wanterster Million	phillippid approv					
40.0								
2310.000 2323	.20 2336.40 23	49.60 2362.80	2376.00	2389.20	D 2402.40	2415	.60	2442.00 MHz
Frequency	Reading	Correct	Resi	ılt	Limit	t	Margin	Demark
(MHz)	(dBuV)	(dB/m)	(dBuV	//m)	(dBuV/	m)	(dB)	Remark
2389.596	66.57	-2.98	63.5	59	74.00	)	-10.41	peak
2429.988	95.81	-2.89	92.9	2	-		-	peak

Test Mode	IEEE 802.1	1n HT20 Lo	Temperature:			24(°∁)/ 33%RH			
Test Item	Ba	ind Edge		Test Date			November 30, 2017		
Polarize	H	orizontal		Test Engineer			Kevin Kuo		
Detector	A	verage							
110.0 dBuV/m									
							Limit1: Limit2:		
					-				
70									
				×					
30.0									
2310.000 232	3.20 2336.40 2	349.60 2362.80	2376.00	2389.20	) 2402.40	2415.	60	2442.00 MHz	
		Correct							
Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Resu (dBuV	ult //m)	Limit (dBuV/r	n)	Margin (dB)	Remark	
2390.000	49.77	-2.98	46.7	'9	54.00		-7.21	AVG	
2436.324	85.92	85.92 -2.87 83.05		)5	-		-	AVG	

Test Mode	IEEE 802.1	1n HT40 Hi	gh CH	Temp/Hum			24(°∁)/ 33%RH	
Test Item	Ba	nd Edge		Test Date			November 30, 201	
Polarize	Ho	orizontal		Test Engineer			Key	vin Kuo
Detector		Peak						
120.0 dBu¥/m								
							Limit1: Limit2:	_
	1							
	~*/~~~~	$\neg$						
80								
		hum	2 X					
		. mud	mill mapping	W				
				- nakel warne	nAh,Mahumman	dustriant dagang	wayadita Ma <mark>bila</mark> buman	abortron muddy
40.0	00 2455 00 24	0.00.00.00	2402.00	2504.00		0 252	2.00	
2432.000 2444	.UU 2456.UU 24	68.00 2480.00	2492.00	2504.00	J 2516.U	JU 2521	3.00 4	2552.UU MHZ
_		Correct	-					
Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Rest (dBuV	ult //m)	Lin (dBu	nit V/m)	Margin (dB)	Remark
2449.640	95.26	-2.79	92.4	7	-		-	peak
2483.500	63.12	-2.67	60.4	5	74.	00	-13.55	peak

Test Mode	IEEE 802.1	1n HT40 Hi	gh CH	Ten	nperature:	24(°∁)/ 33%RH	
Test Item	Ba	nd Edge		Te	est Date	Novemb	er 30, 2017
Polarize	Ho	orizontal		Tes	t Engineer	Kev	in Kuo
Detector	A	verage					
110.0 dBuV/m							
						Limit1: Limit2:	_
	1						
	~ <b>`</b> \						
70							
		+ {					
		2					
				~~~~~	·····	· ·	
30.0							
2432.000 2444	.00 2456.00 24	68.00 2480.00	2492.00	2504.00) 2516.00 25	28.00 25	552.00 MHz
Frequency	Peading	Correct	Posi	.1+	Limit	Margin	
(MHz)	(dBuV)	Factor (dB/m)	(dBuV	/m)	(dBuV/m)	(dB)	Remark
2450.480	85.43	-2.79	82.6	4	-	-	AVG
2483.500	47.98	-2.69	45.2	9	54.00	-8.71	AVG

Below 1G Test Data



Note: No emission found between lowest internal used/generated frequency to 30MHz(9KHz~30MHz)

Test Mode		Mode 1		Te	emp/Hum	24(°C)	/ 33%RH
Test Item	3	30MHz-1GH	łz	Т	est Date	Decemb	per 1, 2017
Polarize		Horizontal		Tes	t Engineer	Kev	in Kuo
Detector		Peak					
80.0 dBuV/m							
						Limit1:	-
						Margin:	_
					8		
		1 3		5	X		
30	>		4 X				
-20	224.00			010.00	700.00 000		
30.000 127.00	224.00 32	21.00 418.00	515.00	612.00	709.00 806.		JUU.UU MHZ
Frequency	Reading	Correct Factor	Resu	lt (m)	Limit	Margin	Remark
(1112)	(ubuv)	(dB/m)	(ubuv/	111)	(uBuv/iii)	(ub)	
304.5100	44.46	-13.97	30.4	9	46.02	-15.53	peak
384.0500	40.97	-11.90	29.0	7	46.02	-16.95	peak
431.5800	40.88	-10.25	30.6	3	46.02	-15.39	peak
500.4500	36.27	-8.48	27.7	9	46.02	-18.23	peak
623.6400	38.38	-6.27	32.1	1	46.02	-13.91	peak
796.3000	40.30	-3.44	36.8	6	46.02	-9.16	peak

Note: No emission found between lowest internal used/generated frequency to 30MHz(9KHz~30MHz)

Above 1G Test Data

Test	Mode		IEEE	802.11b	_ow CH	Temp/Hum			24(°C)/ 33%RH	
Test	Item			Harmoni	С	Т	est Da	ate	December 2, 20	
Pola	arize			Vertical		Test Engineer			Ke	evin Kuo
Dete	ector		Pea	k and Av	erage					
110.0	dBuV/m									
									Limit1: Limit2:	
70										
		1								
		8								
_										
30.0										
1000.	000 3550.0	0 61	00.00 86	50.00 1120).00 13750.00) 16300.	.00 188	50.00 2140	0.00	26500.00 MHz
Freque (MH:	ency z)	Rea (d	ading BuV)	Correct Factor (dB/m)	Res (dBu ^v	ult //m)	L (dB	imit uV/m)	Margin (dB)	Remark
4827.0	000	47	7.98	4.38	52.	36	74	4.00	-21.64	peak
4827.0	000	46	6.42	4.38	50.	80	54	4.00	-3.20	AVG
emark:										
1.	Measu	ırina	freauer	cies fron	n 1 GHz te	o the 1	Oth ha	armonic	of hiahe	st

- fundamental frequency.
- 2. For above 1GHz, the EUT peak value was under average limit, therefore the Average value compliance with the average limit

Test	Mode		IEEE 802.11b Low CH			Н	Temp/Hum			24(°C)	/ 33%RH
Test	tem		Harmonic				Test Date			December 2, 2017	
Pola	arize			Horizon	tal		Test Engineer			Kev	in Kuo
Dete	ector		Pea	ak and Av	/erage	;					
110.0	dBuV/m										
										Limit1: Limit2:	
70											
		1									
		×									
30.0											
1000.0	000 3550.0	0 61	00.00 8	650.00 112	00.00 13	3750.00	16300.	.00 188	50.00 2140	10.00 21	6500.00 MHz
				Correct							
Freque (MHz	ency z)	Re (d	ading BuV)	Factor (dB/m)		Resu (dBuV/	lt ′m)	L (dB	imit uV/m)	Margin (dB)	Remark
4827.0	000	4	7.64	4.38		52.02	2	74	4.00	-21.98	peak
4827.0	000	4	5.96	4.38		50.34	4	54	4.00	-3.66	AVG

- 1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
- 2. For above 1GHz, the EUT peak value was under average limit, therefore the Average value compliance with the average limit

Test Mode	IEEE	802.11b M	id CH	Te	emp/Hu	ım	24(°∁)/ 33%RH		
Test Item		Harmonic			est Da	te	December 2, 2017		
Polarize		Vertical		Test Engineer			Kevin Kuo		
Detector	Pea	ak and Aver	age						
110.0 dBu¥/m									
							Limit1: Limit2:	_	
70									
	1								
30.0									
1000.000 3550.0	0 6100.00 8	650.00 11200.00) 13750.00	16300.0	DO 18850).00 2140	00.00 20	6500.00 MHz	
		Correct							
Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Rest (dBuV	ult //m)	Liı (dBu	mit ıV/m)	Margin (dB)	Remark	
4876.000	49.51	4.47	53.9	98	74	.00	-20.02	peak	
4876.000	47.19	4.47	51.6	6	54	.00	-2.34	AVG	

- Remark:
 - 1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
 - 2. For above 1GHz, the EUT peak value was under average limit, therefore the Average value compliance with the average limit

Test Mode				IEEE 802.11b Mid CH					ł	Temp/Hum				24(℃)/ 33%RH						
Te	est Ite	m			ļ	Harm	noni	С				Tes	t Da	ate		D	ece	mbe	er 2,	2017
Р	olariz	e			ŀ	Horiz	onta	al			Te	est E	Ingi	nee	r		K	levin	n Ku	0
D	etecte	or		F	² eak	(and	l Ave	era	ge											
110.0) dBuV/	/m																		
																	Limit Limit	1: 2:	_	
70																				
			1																	
			Ť																	
30.0																				
10	00.000	3550.00	61	00.00	8650	D.00	11200).00	1375	i0.00	1630	0.00	1885	50.00	214	00.00		2650	00.00 M	IHz
Freq	luency	,	Re	ading	J	Corr Fac	rect ctor		F	lesul	t		L	imit	,	N	largi	n	Re	mark

Remark:	

(MHz)

4876.000

4876.000

(dBuV)

49.43

46.31

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.

(dB/m)

4.47

4.47

2. For above 1GHz, the EUT peak value was under average limit, therefore the Average value compliance with the average limit

(dBuV/m)

53.90

50.78

(dBuV/m)

74.00

54.00

(dB)

-20.10

-3.22

peak

AVG

Test Mode	IEEE 802.11	b High CH	Temp/H	łum	24(°C)/ 33%RH	
Test Item	Harmo	onic	Test D	ate	Decemb	er 2, 2017
Polarize	Vertio	cal	Test Eng	ineer	Kevi	n Kuo
Detector	Peak and A	Average				
110.0 dBuV/m						
					Limit1: Limit2:	_
70						
1						
30.0						
1000.000 3550.00	6100.00 8650.00 1	1200.00 13750.00	16300.00 188	50.00 2140	00.00 26	500.00 MHz
Fromuency	Corre	ct Beer	.14	inali	Margin	
(MHz)	(dBuV) Facto (dBuV) (dB/n	n) Kest (dBuV	//m) (dE	BuV/m)	(dB)	Remark
4925.000	49.90 4.55	5 54.4	15 7	4.00	-19.55	peak
4925.000	46.62 4.55	5 51.1	7 5	4.00	-2.83	AVG
		ł				

- 1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
- 2. For above 1GHz, the EUT peak value was under average limit, therefore the Average value compliance with the average limit



FCC ID: TX2-RTL8821AU

Test Mode		IEEE {	302.11b ł	-ligh CH	Te	emp/H	um	24(℃)/ 33%RH		
Test Item			Harmoni	C	T	Fest Da	ate	Dece	mber 2	, 2017
Polarize			Horizonta	al	Tes	st Engi	neer	k	Kevin K	uo
Detector		Pea	k and Av	erage						
110.0 dBuV/m								Limit	:1: — 2: —	
70	1									
30.0 1000.000 3550.	00 61	00.00 86	50.00 11200	0.00 13750.00	16300.	.00 1885	50.00 214	0.00	26500.00	MHz
Frequency (MHz)Reading (dBuV)Correct Factor (dB/m)Result (dBuV/m)Limit (dBuV/m)Margin 										emark
4925.000	4	8.96	4.55	53.5	51	74	4.00	-20.4	9	peak
4925.000	4	6.65	4.55	51.2	20	54	4.00	-2.80)	AVG
e mark: 1. Meas funda	uring	frequen al freque	cies from	n 1 GHz to	o the 1	10th ha	armonic	of high	est	

2. For above 1GHz, the EUT peak value was under average limit, therefore the Average value compliance with the average limit



FCC ID: TX2-RTL8821AU

tem rize ctor uV/m	Pea	Harmonic Vertical k and Aver	age	Te Test	est Date Engineer	Decemb Kev	er 2, 2017 in Kuo
rize ctor wVm	Pea	Vertical ik and Aver	age	Test	Engineer	Kev	in Kuo
ctor uV/m	Pea	ak and Aver	age				
uV/m							
						Limit1:	-
						Limit2:	_
1							
*							
0 3550.00	6100.00 86	50.00 11200.0	0 13750.00	16300.00	0 18850.00 21	400.00 26	500.00 MHz
	, i	Correct			11.14		
Cy F	(dBuV)	Factor (dB/m)	(dBuV	/m)	(dBuV/m)	(dB)	Remark
00	49.43	4.38	53.8	1	74.00	-20.19	peak
00	46.85	4.38	51.2	3	54.00	-2.77	AVG
	1	1 × 0 3550.00 6100.00 86 cy Reading (dBuV) 00 49.43 00 46.85	1 1 <t< td=""><td>1 1 1 1</td><td>1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 0 3550.00 6100.00 8650.00 11200.00 13750.00 16300.00 0 3550.00 6100.00 8650.00 11200.00 13750.00 16300.00 cy Reading (dBuV) Correct Factor (dB/m) Result (dBuV/m) 16300.00 00 49.43 4.38 53.81 10 00 46.85 4.38 51.23 1</td><td>1 1 1 1</td><td>Image: Contract Factor (dB/m) Result (dBuV/m) Limit (dBuV/m) Margin (dB) 00 49.43 4.38 53.81 74.00 -20.19 00 46.85 4.38 51.23 54.00 -21.77</td></t<>	1 1 1 1	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 0 3550.00 6100.00 8650.00 11200.00 13750.00 16300.00 0 3550.00 6100.00 8650.00 11200.00 13750.00 16300.00 cy Reading (dBuV) Correct Factor (dB/m) Result (dBuV/m) 16300.00 00 49.43 4.38 53.81 10 00 46.85 4.38 51.23 1	1 1 1 1	Image: Contract Factor (dB/m) Result (dBuV/m) Limit (dBuV/m) Margin (dB) 00 49.43 4.38 53.81 74.00 -20.19 00 46.85 4.38 51.23 54.00 -21.77

2. For above 1GHz, the EUT peak value was under average limit, therefore the Average value compliance with the average limit

Test Mode	IEEE	802.11g Lo	w CH	Temp/Hum			24(°C	2)/ 33%RH	
Test Item		Harmonic		Т	est Da	te	Decerr	nber 2, 2017	
Polarize		Horizontal		Tes	st Engi	neer	Kevin Kuo		
Detector	Pea	ak and Aver	age						
110.0 dBuV/m									
							Limit1: Limit2:		
70									
1									
Ť									
30.0									
1000.000 3550.00	6100.00 86	650.00 11200.00) 13750.00	16300.	00 1885	0.00 2140	0.00	26500.00 MHz	
Frequency I (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Resu (dBuV	ılt /m)	Limit (dBuV/m)		Margin (dB)	Remark	
4820.000	49.45	4.36	53.8	1	74	.00	-20.19	peak	
4820 000	46.75	4.36	51.1	1	54	.00	-2.89	AVG	

- 1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
- 2. For above 1GHz, the EUT peak value was under average limit, therefore the Average value compliance with the average limit

Test	Mode		IEEE 802.11g Mid CH					emp/Hu	IM	24(℃)/ 33%RH		
Test	Item			Harmo	nic		Т	est Dat	te	Decemb	oer 2, 2017	
Pola	arize			Vertica	al		Tes	t Engin	neer	Kevin Kuo		
Det	ector		Pea	ak and A	verage	;						
110.0	dBuV/m											
										Limit1: Limit2:		
70												
		1 X X										
30.0												
1000.	000 3550.00	0 61	00.00 8	650.00 112	200.00 13	3750.00	16300.	00 18850.	.00 2140	0.00 20	6500.00 MHz	
Freque (MH:	Frequency Re (MHz) (d		ading Correct IBuV) (dB/m) (d		Resu (dBuV/	lt /m)	Lin (dBu	nit V/m)	Margin (dB)	Remark		
4876.0	000	4	9.87	4.47		54.3	4	74.	00	-19.66	peak	
4876.0	4876.000 4		6.74	4.47		51.2	1	54.00		-2.79	AVG	

- 1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
- 2. For above 1GHz, the EUT peak value was under average limit, therefore the Average value compliance with the average limit

Test Mode	IEEE 802.11g M	lid CH Te	emp/Hum	24(°∁)/ 33%RH
Test Item	Harmonic	Т	est Date	December 2, 2017
Polarize	Horizontal	Tes	st Engineer	Kevin Kuo
Detector	Peak and Ave	rage		
110.0 dBuV/m				
				Limit1: — Limit2: —
70				
70				
	1			
	×.			
30.0				
1000.000 3550.00	6100.00 8650.00 11200.0	10 13750.00 16300.1	00 18850.00 2140	0.00 26500.00 MHz
Frequency (MHz)	Reading (dBuV)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB) Remark

7312.000

7312.000

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.

(dB/m)

10.44

10.44

43.32

40.92

2. For above 1GHz, the EUT peak value was under average limit, therefore the Average value compliance with the average limit

53.76

51.36

74.00

54.00

-20.24

-2.64

peak

AVG

Test Mode	IEEE	802.11g Hig	gh CH	Temp/Hum			24(°∁)/ 33%RH		
Test Item		Harmonic		Т	est Da	ate	Decen	nber 2, 2017	
Polarize		Vertical		Tes	t Engi	neer	Ke	evin Kuo	
Detector	Pea	ak and Aver	age						
110.0 dBu¥/m									
							Limit1: Limit2:	_	
70									
	1 *								
30.0									
30.0	0 6100.00 8	650.00 11200.00	13750.00	16300	00 1885	0 00 2140	10 00	26500.00 MHz	
1000.000 3330.0	0 0100.00 0	11200.00	, 15150.00	10300.1	00 1003			20300.00 MTZ	
Frequency	Reading	Correct	Resi	ult	L	imit	Margin	_	
(MHz)	(dBuV)	Factor (dB/m)	(dBuV	//m)	(dB	uV/m)	(dB)	Remark	
7389.000	43.90	10.49	54.3	39	74	4.00	-19.61	peak	
7389.000	41.20	10.49	51.6	69	54	4.00	-2.31	AVG	
emark:									

- 1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
- 2. For above 1GHz, the EUT peak value was under average limit, therefore the Average value compliance with the average limit



FCC ID: TX2-RTL8821AU

Test Mode			IEEE	802.11g	High CH	Te	mp/Hum	2	24(℃)/ 33%RH		
Tes	st Item			Harmon	nic	Te	est Date	De	cembe	er 2, 2017	
Pc	olarize			Horizon	tal	Test	Enginee	r	Kevir	i Kuo	
De	etector		Pea	ak and Av	/erage						
110.0	dBuV/m										
Г								L	.imit1:	-	
								L	.imit2:	_	
-											
-									_		
70											
-											
-		¥.									
-		Î									
-											
30.0											
100	0.000 3550.00) 61	00.00 86	50.00 112 ⁰	00.00 13750.00	16300.0	0 18850.00	21400.00	2650)0.00 MHz	
				Correct							
Frequ (M	uency Hz)	Re (d	ading BuV)	Factor (dB/m)	Res (dBu\	ult //m)	Limit (dBuV/m) (d	rgin B)	Remark	
4925	5.000	4	9.25	4.55	53.8	30	74.00	-20	.20	peak	
4925	5.000	4	6.62	4.55	51.1	17	54.00	-2.	83	AVG	
					I						
emarl ₁	K: Moasu	rina	froquor	ncios fror	т 1 СЦ л +/	tha 10)th harma	nic of hir	nhast		
1.	เขเษลรม	1 II Q	neuuer	10165 1101		,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,			ILIESI		

2. For above 1GHz, the EUT peak value was under average limit, therefore the Average value compliance with the average limit



Test Mode	IEEE 802.1	1n HT20 Lo	ow CH	Te	mp/Hum	24(℃)/ 33%RH					
Test Item	Ha	armonic		T	est Date	Decerr	nber 2, 2017				
Polarize	\	/ertical		Tes	t Engineer	Ke	evin Kuo				
Detector	Peak a	and Averag	е								
70						Limit1: Limit2:					
30.0 1000.000 3550	X 2.00 6100.00 86	50.00 11200.0	0 13750.00	16300.0	00 18850.00 214	00.00	26500.00 MHz				
Frequency Reading Correct Result Limit Margin											
(MHZ)	(dBuV)	(dB/m)	(dBuV	/m)	(dBuV/m)	(dB)					
4834.000	50.93	4.39	55.3	32	74.00	-18.68	peak				
4834.000	47.50	4.39	51.8	9	54.00	-2.11	AVG				
Remark: 1. Meas funda 2. For a Aver	suring frequer amental frequ above 1GHz,tl	ncies from 1 ency. he EUT pea	1 GHz to	the 1 was u	0th harmonic Inder averag	e of highes e limit, the	st erefore the				

Test Mode	IEEE 802.2	11n HT20 L	Temp/Hum			24(°∁)/ 33%RH		RH			
Test Item	F	larmonic		Т	est Date		Decer	mber 2,	2017		
Polarize	Н	orizontal		Tes	st Engine	evin Ku	0				
Detector	Peak	and Averag	je								
110.0 dBuV/m	110.0 dBuV/m										
							Limit1 Limit2	:			
70											
	1										
	×										
30.0											
1000.000 3550.0	0 6100.00 86	50.00 11200.00) 13750.00	16300.	00 18850.00) 2140	0.00	26500.00 M	Hz		
		Ocument									
Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Resı (dBuV	ult 7/m)	Limi (dBuV/	t /m)	Margin (dB)	Re	mark		
4827.000	49.31	4.38	53.6	9	74.00		-20.31	р	eak		
4827.000	46.69	4.38	51.0	7	54.0	0	-2.93	A	VG		

- 1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
- 2. For above 1GHz, the EUT peak value was under average limit, therefore the Average value compliance with the average limit

Test Mode	IEEE 802.	11n HT20 M	/lid CH	Tem	np/Hum	24(°C)/	24(°C)/ 33%RH		
Test Item	F	larmonic		Tes	st Date	Decemb	er 2, 2017		
Polarize		Vertical		Test Engineer Kevin k					
Detector	Peak	and Averag	je						
110.0 dBu¥/m									
						Limit1: Limit2:			
70									
	1								
	Š.								
20.0									
30.0 1000.000 3550.0	0 6100.00 8	650.00 11200.00) 13750.00	16300.00	18850.00 2140	DO.OO 26	500.00 MHz		
Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Resul (dBuV/	lt m)	Limit (dBuV/m)	Margin (dB)	Remark		
7312 000	43.12	10.44	53.56	3	74.00	-20.44	peak		
1012.000									

- 1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
- 2. For above 1GHz, the EUT peak value was under average limit, therefore the Average value compliance with the average limit



Test I	Vode	IEEE	IEEE 802.11n HT20 Mid C					mp/H	um	24(℃)/ 33%RH		
Test	Item		Ha	armonic			T	est Da	ate	Dece	ember	2, 2017
Pola	arize		Ho	orizontal			Tes	t Engi	neer	ł	Kevin I	Kuo
Dete	ector		Peak a	and Aver	age							
110.0) dBuV/m											_
										Limi Limi	t1: — t2: —	_
70												-
		1										-
		\$										
												_
30.0												
10	000.000 3550.	00 6100).00 86	50.00 112	DO.OO 13	3750.00	16300.0)0 188	50.00 214	400.00	26500.	00 MHz
				C ome - 1								
Eroc	ulonev	Po2	ding	Correct		Posu	+		imit	Margi	in	

Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
4876.000	49.18	4.47	53.65	74.00	-20.35	peak
4876.000	46.89	4.47	51.36	54.00	-2.64	AVG

- 1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
- 2. For above 1GHz, the EUT peak value was under average limit, therefore the Average value compliance with the average limit



Test Mode	IEEE	IEEE 802.11n HT20 High CH Temp/Hum							24(°C)/ 33%RH	
Test Item		Har	monic		Т	est Da	ite	Deceml	oer 2, 2017	
Polarize		Ve	ertical		Tes	st Engi	neer	Kev	/in Kuo	
Detector		Peak ar	nd Average	е						
110.0 dBu\	/m									
								Limit1: Limit2:	_	
70										
		× ×								
30.0										
1000.000	3550.00 61	00.00 865	0.00 11200.0	0 13750.00	16300.	00 1885	0.00 2140	10.00 2	6500.00 MHz	
Frequency	Rea	ading	Correct Factor	Resu	ılt	Li	mit	Margin	Remark	
(MHz)	(d	BuV)	(dB/m)	(dBuV	/m)	(dBı	uV/m)	(dB)	Kennark	
7382.000	4:	3.66	10.47	54.1	3	74	.00	-19.87	peak	
7382.000	40).84	10.47	51.3	51	54	.00	-2.69	AVG	

- Remark:
 - 1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
 - 2. For above 1GHz, the EUT peak value was under average limit, therefore the Average value compliance with the average limit



Test N	Node	IEEE	802.1	1n HT20	High CH	Te	emp/Hum	24(°C).	/ 33%RH
Test	Item		Н	armonic		Т	est Date	Decemb	per 2, 2017
Pola	rize		H	orizontal		Tes	st Engineer	Kev	in Kuo
Dete	ctor		Peak	and Aver	age				
110.0) dBuV/m								
								Limit1: Limit2:	_
70									
			1 X						
			X						
30.0									
10	00.000 3550	.00 610	0.00 80	650.00 112	00.00 13750.00) 16300.	00 18850.00 2	21400.00 26	500.00 MHz
				Correct	+				
Freq (N	uency IHz)	Rea (dE	ding SuV)	Factor (dB/m)	Res (dBu	ult V/m)	Limit (dBuV/m)	Margin (dB)	Remark

7382.000

7382.000

43.97

40.71

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.

10.47

10.47

2. For above 1GHz, the EUT peak value was under average limit, therefore the Average value compliance with the average limit

54.44

51.18

74.00

54.00

-19.56

-2.82

peak

AVG



Test Mode	IEEE 802.1	1n HT40 Lo	ow CH	Te	emp/Hum	24(°C).	/ 33%RH
Test Item	H	armonic		Т	est Date	Decemb	oer 2, 2017
Polarize	۱	/ertical		Tes	t Engineer	Kev	in Kuo
Detector	Peak a	and Average	е				
110.0 dBuV/m						Limit1: Limit2:	
30.0	1 × × 0.00 6100.00 84	50.00 11200.00	0 13750.00	16300.1	00 18850.00 214	00.00 25	5500.00 MHz
Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Resi (dBuV	ult //m)	Limit (dBuV/m)	Margin (dB)	Remark
4841.000	50.36	4.41	54.7	7	74.00	-19.23	peak
4841.000	46.57	4.41	50.9	98	54.00	-3.02	AVG
temark: 1. Meas funda 2. For a Aven	suring frequer amental frequ above 1GHz,tl age value cor	ncies from 1 ency. he EUT pea npliance wi	1 GHz to ak value ith the av	the 1 was u	0th harmonic Inder average Imit	of highest e limit, ther	efore the

Test Mode	IEEE 802.2	11n HT40 L	ow CH	Temp/Hum 24				24(℃)/ 33%RH	
Test Item	F	larmonic		Т	est Da	te	Decen	nber 2, 2017	
Polarize	Н	lorizontal		Tes	st Engii	neer	Ke	evin Kuo	
Detector	Peak	and Averag	je						
110.0 dBuV/m									
							Limit1: Limit2:		
70									
	Ĵ								
	×								
30.0									
1000.000 3550.0	0 6100.00 86	50.00 11200.00) 13750.00	16300.	00 1885	0.00 2140	0.00	26500.00 MHz	
Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Resı (dBuV	ult //m)	Li (dBu	mit ıV/m)	Margin (dB)	Remark	
4848.000	49.40	4.43	53.8	33	74	.00	-20.17	peak	
4848.000	46.54	4.43	50.9)7	54	.00	-3.03	AVG	
Remark: 1. Measuring frequencies from 1 GHz to the 10th harmonic of highest									

fundamental frequency.

2. For above 1GHz, the EUT peak value was under average limit, therefore the Average value compliance with the average limit

Test Mode	IEEE 802	.11n HT40 M	Mid CH	Temp/Hum			24 (°(24(°C)/ 33%RH	
Test Item		Harmonic		Т	est Date	e	Decen	nber 2, 2017	
Polarize		Vertical		Tes	t Engin	eer	Ke	evin Kuo	
Detector	Peak	and Averag	ge						
110.0 dBuV/m									
							Limit1: Limit2:	_	
70									
	1								
	*								
30.0									
1000.000 35	i0.00 6100.00 {	650.00 11200.0	0 13750.00	16300.	00 18850.0	00 2140	00.00	26500.00 MHz	
Frequency	Reading	Correct	Resu	ılt	Lim	it	Margin		
(MHz)	(dBuV)	Factor (dB/m)	(dBuV	//m)	(dBu\	//m)	(dB)	Remark	
4869.000	49.91	4.45	54.3	86	74.(00	-19.64	peak	
4869.000	46.75	4.45	51.2	20	54.0	00	-2.80	AVG	
Remark:									

- 1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
- 2. For above 1GHz, the EUT peak value was under average limit, therefore the Average value compliance with the average limit



Test Mod	le	IEEE	802.1	1n HT40) Mid Cl	H To	emp/Hum	24(°C)/ 33%RH
Test Iten	า		Ha	armonic		7	Fest Date	Decem	ber 2, 2017
Polarize	;		Ho	prizontal		Tes	st Enginee	r Ke	vin Kuo
Detecto	r		Peak a	and Aver	age				
110.0 dB	uV/m								
								Limit1: Limit2:	_
70									
		1 X							
30.0									
1000.000) 3550.00	6100).00 86	50.00 112	00.00 1375	i0.00 16300	.00 18850.00	21400.00	26500.00 MHz
Frequen	cy	Rea	ding	Correct	t F	Result	Limit	Margin	Remark
(MHz)		(dB	uv)	(dD/m)	(dl	BuV/m)	(dBuV/m) (dB)	

4876.000

4876.000

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.

(dB/m)

4.47

4.47

49.78

46.77

2. For above 1GHz, the EUT peak value was under average limit, therefore the Average value compliance with the average limit

54.25

51.24

74.00

54.00

-19.75

-2.76

peak

AVG



Test Mo	de	IEEE 8	302.11r	n HT40 I	High Cł		Temp/Hum			;)/ 33%RH
Test Iter	m		Har	rmonic			Test Da	ate	Decem	ber 2, 2017
Polariz	e		Ve	ertical		Te	est Eng	ineer	Ke	vin Kuo
Detecto	or	F	'eak ar	nd Avera	ige					
110.0	dBuV/m									
									Limit1: Limit2:	
70	70									
		1								
30.0										
1000.0	000 3550.	.00 6100).00 865	i0.00 1120	10.00 1375	50.00 1630	10.00 188	50.00 2140	10.00	26500.00 MHz
				Correct						
Freque (MHz	ncy z)	Read (dB	ding uV)	Factor (dB/m)	F (d	≀esult BuV/m)	L (dB	.imit SuV/m)	Margin (dB)	Remark
4904.0	000	49.	.39	4.51		53.90	7	4.00	-20.10	peak
4904.0	000	46.	.18	4.51	į	50.69	5	4.00	-3.31	AVG

- 1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
- 2. For above 1GHz, the EUT peak value was under average limit, therefore the Average value compliance with the average limit



Test Mode	IEEE 802.1	1n HT40 Hi	gh CH	Temp/Hum			24(°∁)/ 33%RH	
Test Item	H	armonic		Т	est Da	ate	Decem	ber 2, 2017
Polarize	H	orizontal		Tes	st Engi	neer	Ke	vin Kuo
Detector	Peak a	and Average	е					
110.0 dBuV/m								
							Limit1: Limit2:	_
70								
	1 X							
	×							
30.0								
1000.000 3550).00 6100.00 86	50.00 11200.00) 13750.00	16300.	00 1885	0.00 2140	0.00	26500.00 MHz
F	Decilier	Correct	Deer	-14		····· 14		
(MHz)	(dBuV)	Factor (dB/m)	dBuV	//m)	(dB	uV/m)	(dB)	Remark
4897.000	50.04	4.51	54.5	5	74	4.00	-19.45	peak
4897.000 47.20 4.51 51.71				'1	54	4.00	-2.29	AVG
Remark: 1. Meas funda	suring frequer amental frequ	ncies from 1 ency.	I GHz to	the 1	0th ha	rmonic	of highes	t

2. For above 1GHz, the EUT peak value was under average limit, therefore the Average value compliance with the average limit