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

321AU Combo module

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 Clearing

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 1, 2017	Rev(01)	P.8, P.16, P20, P.21	Allison Chen
02	December 4, 2017	Rev.(02)	P. 21, 39, 40, 65, 66	Angel Cheng

Rev. (01):

1. Modify Applied standards KDB 558074 D01 v03R05 to KDB 558074 D01 v04.

2. Remove radiation bandedge and spurious emission test setup: 9kHz ~ 30MHz.

3. Other information, please refer to the T171012L01 and this test report.

Rev. (02):

1. Added radiation bandedge and spurious emission test setup: 9kHz ~ 30MHz.

2. Added note in below 1GHz test data.

3. Modify test setup photo.

Compliance Certification Services Inc. FCC ID: TX2-RTL8821AU

Table of contents

1.	GENER		4
	1.1	EUT INFORMATION	4
	1.2	EUT CHANNEL INFORMATION	5
	1.3	ANTENNA INFORMATION	5
	1.4	MEASUREMENT UNCERTAINTY	6
	1.5	FACILITIES AND TEST LOCATION	7
	1.6	INSTRUMENT CALIBRATION	7
	1.7	SUPPORT AND EUT ACCESSORIES EQUIPMENT	8
	1.8	TEST METHODOLOGY AND APPLIED STANDARDS	8
2.	TEST S	UMMERY	9
3.	DESCR	IPTION OF TEST MODES1	0
	3.1	THE WORST MODE OF OPERATING CONDITION1	0
	3.2	THE WORST MODE OF MEASUREMENT1	1
	3.3	EUT DUTY CYCLE 1	2
4.	TEST R	ESULT1	3
	4.1	AC POWER LINE CONDUCTED EMISSION 1	3
	4.2	OUTPUT POWER MEASUREMENT1	6
	4.3	RADIATION BANDEDGE AND SPURIOUS EMISSION	9
AP	PENDIX 1	- PHOTOGRAPHS OF EUT	

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 10, 2017
Output Power(W)	IEEE 802.11b mode: 0.0215 (EIRP : 0.0338) IEEE 802.11g mode: 0.1247(EIRP : 0.1963) IEEE 802.11n HT 20 MHz mode: 0.1054 (EIRP : 0.1660) IEEE 802.11n HT 40 MHz mode: 0.1030 (EIRP: 0.1622)
Power Operation	 Power from host device. (DC 5V, 1.5A) 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 inNumber ofLocation in frequencywhich device operatesfrequenciesrange 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 Equipment Manufacturer Model Serial Number Calibration Calibration							
DC LISN	SCHWARZBECK	NNBM 8124	505	03/20/2017	03/19/2018		
DC LISN	SCHWARZBECK	NNBM 8124	504	03/20/2017	03/19/2018		
EMI Test Receiver	R&S	ESCI	W3010659	07/13/2017	07/12/2018		

Wugu 966 Chamber A							
Name of Equipment	Manufacturer	Serial Number	Calibration Date	Calibration Due			
Bilog Antenna	Sunol Sciences	JB3	A030105	06/20/2017	06/19/2018		
Horn Antenna	EMCO	3117	00055165	02/20/2017	02/19/2018		
Pre-Amplifier	EMCI	EMC 012635	980151	08/01/2017	07/31/2018		
Pre-Amplifier	EMEC	EM330	060609	06/07/2017	06/06/2018		
Spectrum Analyzer	Agilent	E4446A	US42510252	12/05/2016	12/04/2017		
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		

Conducted Test Site							
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due		
Power Meter	Anritsu	ML2495A	1012009	07/03/2017	07/02/2018		
Power Sensor	Anritsu	MA2411B	917072	07/03/2017	07/02/2018		
Spectrum Analyzer	R&S	FSV 40	101073	10/05/2017	10/04/2018		
Thermostatic/Hrgrosati c Chamber	GWINSTEK	GTC-288MH- CC	TH160402	05/23/2017	05/22/2018		
Wideband Radio communication Tester	R&S	CMW500	116875	04/25/2017	04/24/2018		

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.

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1.7 SUPPORT AND EUT ACCESSORIES EQUIPMENT

No	Equipment	Brand	Model	Series No.	FCC ID	Data Cable	Power Cord
1	NB(A)	Dell	PP19L	N/A	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.

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2. TEST SUMMERY

FCC Standard Section	Report 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 : 2437MHz 3. Highest Channel : 2437MHz 3. Highest Channel : 2437MHz 4. Middle Channel : 2437MHz 4. M
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.



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 5V						
Test Mode	Mode 1:EUT power by host system.					
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	Voltage/Hz DC 5V						
Test Mode Mode 1:EUT power by host system.							
Worst Mode	🛛 Mode 1 🗌 Mode 2 🗌 Mode 3 🗌 Mode 4						
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	Voltage/Hz DC 5V					
Test Mode	Mode 1:EUT power by host system.					
Worst Mode	☑ Mode 1 ☐ Mode 2 ☐ Mode 3 ☐ Mode 4					

Remark:

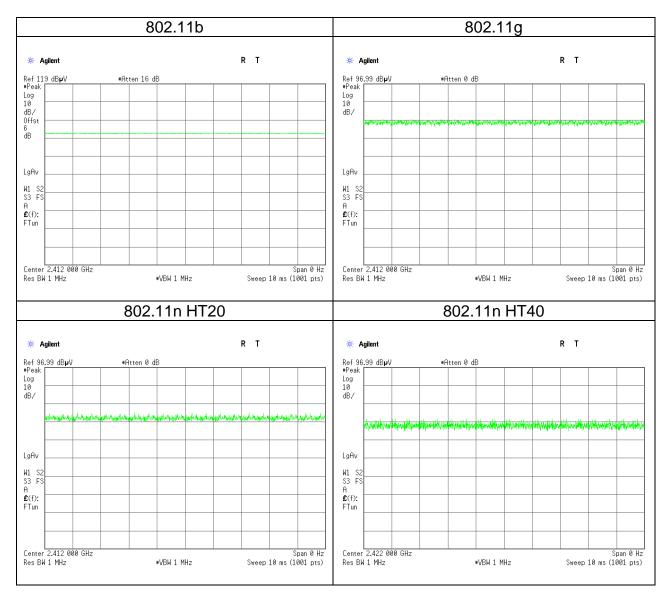
1. The worst mode was record in this test report.

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

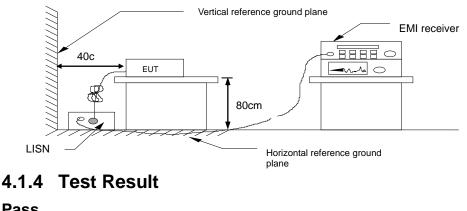
* Decreases with the logarithm of the frequency.

4.1.2 Test Procedure

Test method Refer as ANSI 63.10:2013 clause 6.2,

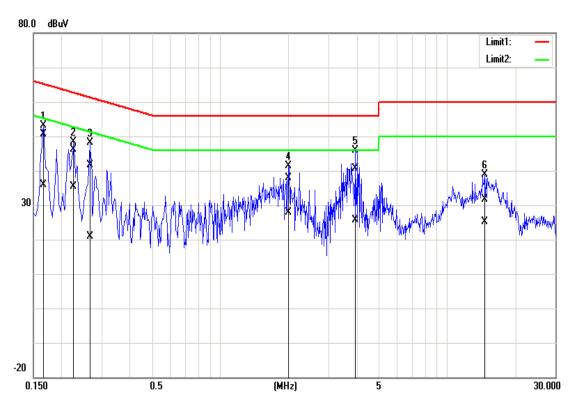
- 1. The EUT was placed on a non-conducted table, which is 0.8m above horizontal ground plane and 0.4m above vertical ground plane.
- 2. EUT connected to the line impedance stabilization network (LISN)
- 3. Receiver set RBW of 9kHz and Detector Peak, and note as quasi-peak and average.
- 4. Maximum procedure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

4.1.3 Test Setup



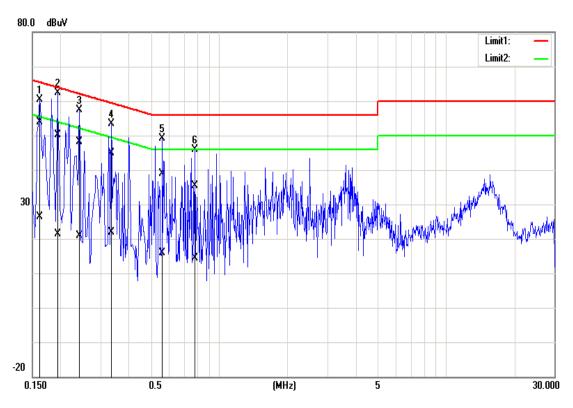
<u>Test Data</u>

Test Mode:	Mode 1	Temp/Hum	24(°C)/ 50%RH
Test Voltage:	120Vac / 60Hz	Test Date	November 10, 2017
Phase:	Line	Test Engineer	Jerry Chuang



No.	Froquency	QuasiPeak	Average	Correction	QuasiPeak	Average	QuasiPeak	Average	QuasiPeak	Average
NO.	Frequency	reading	reading	factor	result	result	limit	limit	margin	margin
	(MHz)	(dBuV)	(dBuV)	(dB)	(dBuV)	(dBuV)	(dBuV)	(dBuV)	(dB)	(dB)
1	0.1660	50.46	35.88	0.05	50.51	35.93	65.16	55.16	-14.65	-19.23
2	0.2260	45.99	35.33	0.05	46.04	35.38	62.60	52.60	-16.56	-17.22
3	0.2660	41.61	20.90	0.05	41.66	20.95	61.24	51.24	-19.58	-30.29
4	2.0100	37.89	27.70	0.09	37.98	27.79	56.00	46.00	-18.02	-18.21
5	3.9580	40.56	25.47	0.13	40.69	25.60	56.00	46.00	-15.31	-20.40
6	14.6580	31.55	24.84	0.18	31.73	25.02	60.00	50.00	-28.27	-24.98

Test Mode:	Mode 1	Temp/Hum	24(°C)/ 50%RH
Test Voltage:	120Vac / 60Hz	Test Date	November 10, 2017
Phase:	Neutral	Test Engineer	Jerry Chuang



No.	Frequency	QuasiPeak	Average	Correction	QuasiPeak	Average	QuasiPeak	Average	QuasiPeak	Average
INO.	Frequency	reading	reading	factor	result	result	limit	limit	margin	margin
	(MHz)	(dBuV)	(dBuV)	(dB)	(dBuV)	(dBuV)	(dBuV)	(dBuV)	(dB)	(dB)
1	0.1620	53.87	26.17	0.12	53.99	26.29	65.36	55.36	-11.37	-29.07
2	0.1940	50.04	21.15	0.12	50.16	21.27	63.86	53.86	-13.70	-32.59
3	0.2420	48.12	20.79	0.12	48.24	20.91	62.03	52.03	-13.79	-31.12
4	0.3340	44.83	21.69	0.13	44.96	21.82	59.35	49.35	-14.39	-27.53
5	0.5620	38.74	15.84	0.14	38.88	15.98	56.00	46.00	-17.12	-30.02
6	0.7820	35.17	14.23	0.14	35.31	14.37	56.00	46.00	-20.69	-31.63

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 :

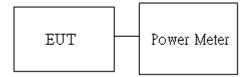
Average output power : For reporting purposes only.

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 :

					V	Vifi 2.	4G						
Config	СН	Freq.		er set	PK Pow	er(dBm)	PK Total Power	PK Total Power	EIRP PK Total	ERP PK Total	DG	Limit	EIRP Limit
comig	0.1	(MHz)	chain0	chain1	chain0	chain1	(dBm)	(W)	Power (dBm)	Power (W)	(dBi)	(dBm)	(dBm)
IEEE	Low	2412	22	-	11.02	-	11.02	0.0126	12.99	0.0199			
802.11b Data rate:	Mid	2437	29	-	13.32	-	13.32	0.0215	15.29	0.0338			
1Mbps	High	2462	29	-	13.28	-	13.28	0.0213	15.25	0.0335			
IEEE	Low	2412	46	-	20.30	-	20.30	0.1072	22.27	0.1687			
802.11g Data rate:	Mid	2437	47	-	20.96	-	20.96	0.1247	22.93	0.1963			
6Mbps	High	2462	47	-	20.45	-	20.45	0.1109	22.42	0.1746	1.97	30	36
IEEE 802.11n	Low	2412	47	-	20.12	-	20.12	0.1028	22.09	0.1618	1.97	30	30
HT20	Mid	2437	47	-	20.23	-	20.23	0.1054	22.20	0.1660			
Data rate: MCS0	High	2462	47	-	20.18	-	20.18	0.1042	22.15	0.1641			
IEEE 802.11n	Low	2422	48	-	19.84	-	19.84	0.0964	21.81	0.1517			
HT40	Mid	2437	48	-	20.13	-	20.13	0.1030	22.10	0.1622			
Data rate: MCS0	High	2452	48	-	20.13	-	20.13	0.1030	22.10	0.1622			

Average output power :

Wifi 2.4G									
Config	СН	Freq.	AV Pow	er(dBm)	AV Total Power				
comg	СП	(MHz)	chain0	chain1	(dBm)				
IEEE 802.11b Data rate: 1Mbps	Low	2412	9.68	-	9.68				
	Mid	2437	10.24	-	10.24				
	High	2462	10.21	-	10.21				
IEEE 802.11g Data rate:	Low	2412	11.97	-	11.97				
	Mid	2437	12.75	-	12.75				
6Mbps	High	2462	12.43	-	12.43				
IEEE 802.11n	Low	2412	12.35	-	12.35				
HT20	Mid	2437	12.47	-	12.47				
Data rate: MCS0	High	2462	12.23	-	12.23				
IEEE 802.11n	Low	2422	12.03	-	12.03				
HT40	Mid	2437	12.11	-	12.11				
Data rate: MCS0	High	2452	12.06	-	12.06				

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.

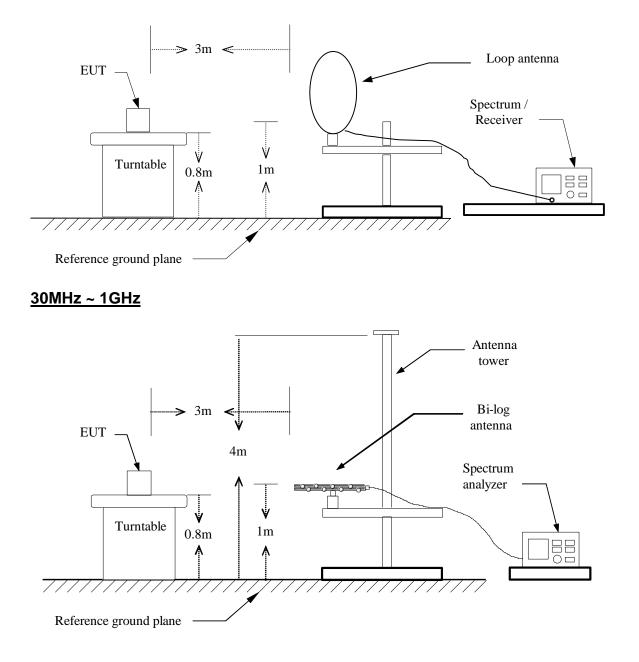
If Duty Cycle < 98%, VBW=1/T.

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



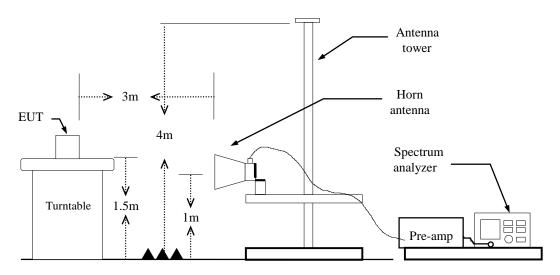
4.3.3 Test Setup

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



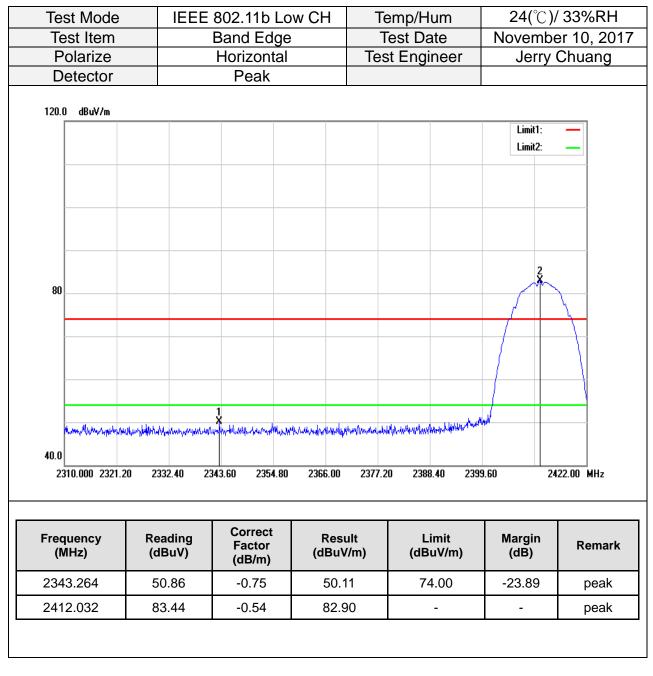
Compliance Certification Services Inc. FCC ID: TX2-RTL8821AU

Above 1 GHz

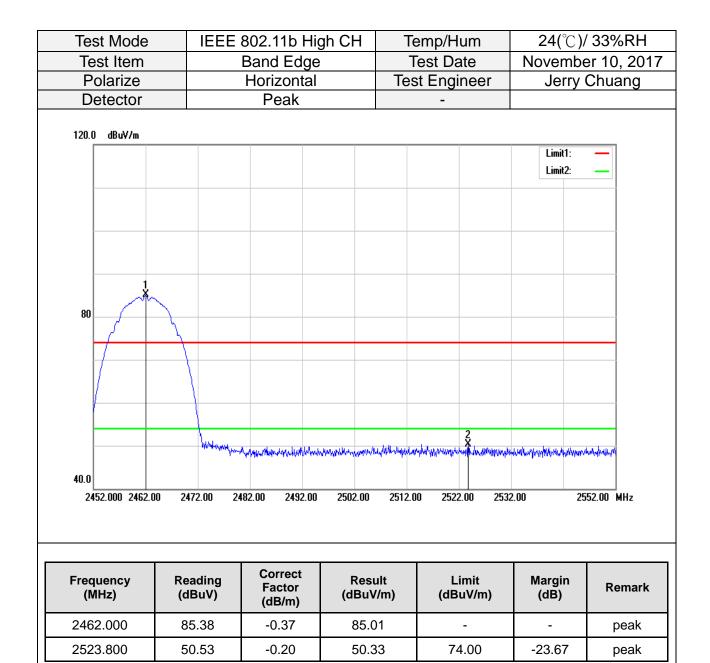


4.3.4 Test Result

Band Edge Test Data



Test Mode	IE	EE 802.11b I	_ow CH	Temperat	ure:	24(°C)/ 33%	6RH	
Test Item		Band Edg	ge	Test Da		November 10, 201		
Polarize		Horizonta	al	Test Engi	neer	Jerry Chua	ang	
Detector		Average)					
110.0 dBuV/m								
						Limit1: — Limit2: —		
						2		
70					,			
						$ \rangle$		
				1				
30.0								
2310.000 2321.2	20 2332.40	2343.60 2354.	80 2366.00	2377.20 2388	.40 2399.60	2422.00	4 Hz	
Frequency (MHz)	Readin (dBuV		Resu (dBuV/			largin (dB) Re	emark	
2386.944	37.26	-0.61	36.6	5 54	- 00	17.35 A	٨VG	
	79.66	-0.54	79.1	<u></u>	-	- 4	٨VG	



Test Mode	IEEE	802.11b Hig	gh CH	Tempera	ature:	24(°C),	/ 33%RH
Test Item		Band Edge		Test D		Novembe	er 10, 2017
Polarize		Horizontal		Test Eng	gineer	Jerry	Chuang
Detector		Average					
110.0 dBu¥/m							
						Limit1: Limit2:	
1							
70	\rightarrow						
70	_'\						
					2		
	~~~~		<u></u>		¥		·
30.0							
2452.000 2462.00	D 2472.00 24	482.00 2492.00	2502.00	2512.00 25	22.00 2532	2.00 25	52.00 MHz
Frequency	Reading	Correct	Result	t	Limit	Margin	Dement
(MHz)	(dBuV)	Factor (dB/m)	(dBuV/r	n) (dl	BuV/m)	(dB)	Remark
2461.200	81.55	-0.37	81.18		-	-	AVG
	37.46	-0.20	37.26		54.00	-16.74	AVG

Test Mode	IEE	E 802.11g Lo	W CH 1	ſemp/Hum	24(℃)/ 33%RH		
Test Item		Band Edge		Test Date	Novembe		
Polarize		Horizontal	Те	st Engineer	Jerry	Chuang	
Detector		Peak					
120.0 dBuV/m							
					Limit1:		
					Limit2:		
						2	
					m	~1	
80							
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LA Londer HL and defense in	an a	an ann Mhaine An an Inn Mhaile Ann an Mh	Marinaaltanumaatatataka	and Mar Ne. of Mar.			
40.0 2310.000 2321.2		2343.60 2354.80			9.60 24	22.00 MHz	
2310.000 2321.2	20 2332.40	2343.00 2334.00	2300.00 2377	.20 2300.40 233	J.UU 24	22.00 MI12	
			_				
Frequency	Reading	Correct	Result	Limit	Margin		
(MHz)	(dBuV)	Factor (dB/m)	(dBuV/m)	(dBuV/m)	(dB)	Remark	
2387.616	51.42	-0.60	50.82	74.00	-23.18	peak	
2419.088	85.62	-0.51	85.11	-	-	peak	

Test Mode	IEEE	802.11g Lo	W CH Te	emperature:	24(°C)/ 33%RH		
Test Item		Band Edge	•	Test Date	November 10, 2		
Polarize		Horizontal		est Engineer	Jerry	Chuang	
Detector		Average					
110.0 dBuV/m							
					Limit1: Limit2:	_	
					~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	2	
70							
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30.0							
2310.000 2321.2	20 2332.40 2	343.60 2354.80	2366.00 2377	.20 2388.40 239	9.60 24	22.00 MHz	
Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	
2390.000	37.66	-0.60	37.06	54.00	-16.94	AVG	
	76.49	-0.51	75.98	_	_	AVG	

Test Mode	IEEE	802.11g Hig	gh CH	Temp/Hu	ım	24(°C)/	/ 33%RH
Test Item		Band Edge		Test Dat			er 10, 201
Polarize		Horizontal		Test Engir	neer	Jerry	Chuang
Detector		Peak					
120.0 dBuV/m							
						Limit1:	-
						Limit2:	
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40.0							
40.0 2452.000 2462.0	)0 2472.00 24	482.00 2492.00	2502.00	2512.00 2522.	00 2532	0.00 25	i52.00 MHz
2432.000 2402.0	10 2472.00 24	402.00 2432.00	2302.00	2312.00 2322.	00 2332		JZ.00 MIIZ
		-				-	
Frequency	Reading	Correct	Result	Lir	nit	Margin	Dennel
(MHz)	(dBuV)	Factor (dB/m)	(dBuV/n		V/m)	(dB)	Remark
2455.000	86.28	-0.39	85.89		-	-	peak
2400.000							

Test Mode	IEEE	802.11g Hig	gh CH	Tempe	rature:	<b>24(</b> °C)/	33%RH
Test Item		Band Edge		Test	Date	November 10, 2	
Polarize		Horizontal		Test Er	ngineer	Jerry	Chuang
Detector		Average					
110.0 dBuV/m							
						Limit1: Limit2:	_
1							
70							
		2					
30.0							
2452.000 2462.0	10 2472.00 24	182.00 2492.00	2502.00	2512.00 2	2522.00 2532	2 00 25	52.00 MHz
2102.000 2102.0			2002.00		-012.00 200		
_	-	Correct					
Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/r		Limit dBuV/m)	Margin (dB)	Remark
2456.100	76.74	-0.39	76.35		-	-	AVG
		-0.30	37.56		54.00	-16.44	AVG

Test Mode	IEEE 802.	11n HT20 L	ow CH	Temp/Hum	24(°C)/ 33%RH	
Test Item		and Edge		Test Date	Novembe	er 10, 201
Polarize	F	lorizontal	Т	est Engineer	Jerry	Chuang
Detector		Peak				
120.0 dBu¥/m						
					Limit1: Limit2:	_
80					m	3
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den of the second se	androwent-kanthelenation	have non-pro-the holds of the	water and a state of the state	allowedge of the second s		
2310.000 232	.20 2332.40 2	343.60 2354.80	2366.00 237	7.20 2388.40 23	99.60 24	22.00 MHz
Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
	51.92	-0.60	51.32	74.00	-22.68	peak
2388.288			1	1		

Test Mode	IEEE 802.11n HT20 Low CH			emperature:	24(°C)/ 33%RH	
Test Item	Band Edge			Test Date	Novembe	er 10, 2017
Polarize		lorizontal	Te	st Engineer	Jerry	Chuang
Detector		Average				
110.0 dBuV/m						
					Limit1: Limit2:	
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70					~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	
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				¥		
30.0						
2310.000 2321.2	20 2332.40 23	343.60 2354.80	2366.00 2377	.20 2388.40 239	9.60 24	22.00 MHz
Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
2390.000	39.99	-0.60	39.39	54.00	-14.61	AVG
2405.424	77.95	-0.55	77.40			AVG

Test Mode	IEEE 802.11n HT20 High CH			Temp/Hum		24(°C)/ 33%RH	
Test Item	Band Edge			Test Date		November 10, 2017	
Polarize	H	orizontal		Test Eng	ineer	Jerry	Chuang
Detector		Peak					-
120.0 dBuV/m						Limit1: Limit2:	
80		WILZ WANNER WANT			and the set of the set		
40.0 2452.000 2462.		482.00 2492.00	2502.00		2.00 2532		52.00 MHz
Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/n		imit uV/m)	Margin (dB)	Remark
2458.600	86.43	-0.37	86.06		-	-	peak
	52.27	-0.30	51.97	7	4.00	-22.03	peak

Test Mode	IEEE 802.11n HT20 High CH			Temperature:		24(°∁)/ 33%RH		
Test Item	Band Edge			Test Date		November 10, 2017		
Polarize		orizontal		Test	t Engin	eer	Jerry	/ Chuang
Detector	Average							
110.0 dBu∀/m							Limit1: Limit2:	_
70		2						
30.0 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	Reading	Correct	Resu	ılt	Lin	nit	Margin	
(MHz)	(dBuV)	Factor (dB/m)	(dBuV		(dBu		(dB)	Remark
2456.400	76.43	-0.39	76.0	4	-		-	AVG
2483.600	37.78	-0.30	37.4	·8	54.	00	-16.52	AVG

Test Mode	IEEE 802.11n HT40 Low CH			ſemp/Hum	24(°C)/ 33%RH	
Test Item	Band Edge			Test Date	November 10, 201	
Polarize	Ho	orizontal	Te	st Engineer	Jerry (	Chuang
Detector		Peak				
120.0 dBuV/m						
					Limit1:	-
					Limit2:	_
					2	
80				man		$\neg$
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40.0						
2310.000 2323.	20 2336.40 23	49.60 2362.80	2376.00 2389	.20 2402.40 241	5.60 24	42.00 MHz
		•				
Frequency	Reading	Correct Factor	Result	Limit	Margin	Remark
(MHz)	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	Kennark
2389.596	52.23	-0.60	51.63	74.00	-22.37	peak
2429.988	84.35	-0.48	83.87	-	-	peak

Test Mode	IEEE 802.11n HT20 Low CH			emperature:	24(°∁)/ 33%RH	
Test Item	Band Edge			Test Date	November 10, 201	
Polarize	H	orizontal	Те	st Engineer	Jerry	Chuang
Detector	A	verage				
110.0 dBuV/m						
					Limit1:	
					Limit2:	
						2
70					- y	+
				¢		
30.0						
2310.000 2323	.20 2336.40 23	349.60 2362.80	2376.00 2389	.20 2402.40 241	5.60 24	142.00 MHz
_						
Frequency	Reading	Correct Factor	Result	Limit	Margin	Remark
(MHz)	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	Kelliark
2390.000	37.56	-0.60	36.96	54.00	-17.04	AVG
2436.324	73.11	-0.46	72.65	-	-	AVG

Test Mode	IEEE 802.1	1n HT40 Hi	gh CH	Temp/Hu	n	<b>24(</b> °C)/	33%RH
Test Item	Ba	nd Edge		Test Date	Э	Novembe	er 10, 2017
Polarize	H	orizontal		est Engin	eer	Jerry	Chuang
Detector		Peak					
120.0 dBu∀/m							
						Limit1: Limit2:	_
	1						
80		$\neg$					
		"MATLY MAR	Mr. M. Hud Agether March world	nun Mendenschliene	Introduction of	wanter	www.hat
40.0							
2432.000 2444	.00 2456.00 24	468.00 2480.00	2492.00 25	04.00 2516.0	) 2528	.00 25	52.00 MHz
	•			-			
Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Lim (dBu\		Margin (dB)	Remark
2449.640	83.43	-0.41	83.02	74.0	00	9.02	peak
2483.500	51.82	-0.30	51.52	-		-	peak

Test Mode	IEEE 802.1	1n HT40 Hi	gh CH	Ten	nperatu	ire:	<b>24(</b> °C)	/ 33%RH
Test Item	Ba	nd Edge		Т	est Dat	е	Novemb	er 10, 2017
Polarize		orizontal		Tes	t Engin	eer	Jerry	Chuang
Detector	A	verage						
110.0 dBu¥/m							Limit1:	
							Limit1: Limit2:	
	1							
70		-						
		2			<b></b>			
30.0								
2432.000 2444	.00 2456.00 24	168.00 2480.00	2492.00	2504.00	0 2516.0	0 2520	8.00 2	552.00 MHz
-	D I'm	Correct	D			•		
Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Resu (dBuV		Lin (dBu)		Margin (dB)	Remark
2450.480	73.02	-0.40	72.6	2	-		-	AVG
2483.500	38.58	-0.30	38.2	8	54.	00	-15.72	AVG

# Below 1G Test Data

Test Mode		Mode 1		Temp/Hum		′ 33%RH
Test Item	3	30MHz-1GH		Test Date		er 10, 201
Polarize		Vertical	7	lest Engineer	Jerry	Chuang
Detector		Peak				
80.0 dBuV/m					Limit1: Margin:	
-20 30.000 127.00	224.00 3	2 3 2 3 X X 1 1 1 1 1 1 1 1 1 1 1 1 1	515.00 61	5 5 5 7 6 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7		00.00 MHz
Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
63.9500	55.05	-21.60	33.45	40.00	-6.55	peak
384.0500	42.49	-11.90	30.59	46.00	-15.41	peak
399.5700	42.55	-11.40	31.15	46.00	-14.85	peak
527.6100	44.64	-7.97	36.67	46.00	-9.33	peak
600.6400	44.79	-6.27	38.52	46.00	-7.48	peak
623.6400						

Test Mode		Mode 1		Te	emp/Hum	24(℃)/ 33%RH		
Test Item	3	30MHz-1GH	z		est Date		er 10, 20 <i>1</i>	
Polarize		Horizontal		Tes	t Engineer	Jerry	Chuang	
Detector		Peak						
80.0 dBuV/m								
						Limit1:	_	
						Margin:	_	
1	2 X 4				5 X		6 X	
30								
-20								
30.000 127.00	224.00 32	21.00 418.00	515.00	612.00	709.00 80	6.00 1	 D00.00 MHz	
Frequency	Reading	Correct	Resul	t	Limit	Margin	Remark	
(MHz)	(dBuV)	Factor (dB/m)	(dBuV/i	m)	(dBuV/m)	(dB	Remark	
162.8900	45.45	-16.13	29.32	2	43.50	-14.18	peak	
191.9900	46.53	-16.04	30.49	)	43.50	-13.01	peak	
239.5200	48.58	-16.16	32.42	2	46.00	-13.58	peak	
285.1100	43.60	-14.22	29.38	3	46.00	-16.62	peak	
716.7600	38.56	-4.69	33.87	,	46.00	-12.13	peak	
958.2900	32.87	-1.10	31.77	,	46.00	-14.23	peak	
	32.87	-1.10	31.77	,	46.00	-14.23	peak	

# Above 1G Test Data

Test Mode		IEEE 802.11b Low CH				Temp/Hum			24(°∁)/ 33%RH		
Test Item			Harmon			est Da		November 10, 20			
Polarize			Vertica		Tes	Test Engineer			ry Chu	ang	
Detector		Pea	ak and Av	/erage							
110.0 dBuV/m											
								Limit			
								Limit	2:		
										ĺ	
70											
	1									ĺ	
	Ť										
30.0					10000						
1000.000 3550.0	UU 61	100.00 8	650.00 1120	0.00 13750.0	D 16300.	.00 188:	50.00 2140	)0.00	26500.00	MHz	
			Correct					I			
Frequency (MHz)		ading BuV)	Factor	Res (dBu			imit uV/m)	Margii (dB)	n R	emark	
4827.000		7.27	(dB/m) 6.84				4.00	-19.89	, , ,	beak	
4827.000		6.23	6.84	53.			4.00	-0.93		AVG	
4021.000	4	0.23	0.04	53.	07	54	+.00	-0.93		AVG	
emark:											

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

t Mode		IEEE	802.11b	Low CH		emp/H			°C)/ 33%	
st Item			Harmonic					November 10, 2		
larize					Tes	st Engi	neer	Jei	rry Chu	ang
tector		Pea	ik and Av	/erage						
dBuV/m										
	×									
0.000 3550.0	00 6	100.00 86	50.00 1120	0.00 13750.00	) 16300	.00 188	50.00 2140	)0.00	26500.00	MHz
		a d'a a	Correct	Des			<b>1</b> 4			
lency Iz)			Factor (dB/m)	Res				(dB)	n R	emark
.000	4	4.71	6.84	51.	55	74	4.00	-22.4	5 4	beak
	larize tector dBuV/m	larize tector dBuV/m 	larize tector Pea dBuV/m dBuV/m abuv/m abuv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m bauv/m ba	Iarize     Horizoni       tector     Peak and Average       dBuV/m     Image: state st	Iarize       Horizontal         tector       Peak and Average         dBuV/m       Image: State of the	Iarize     Horizontal     Test       tector     Peak and Average     Image: State of the state of t	Iarize       Horizontal       Test Engi         dBuV/m       dBuV/m       dBuV/m       dBuV/m         dBuV/m       dBuV/m       dBuV/m       dBuV/m	Iarize     Horizontal     Test Engineer       tector     Peak and Average       dBuV/m       dBuV/m	Iarize     Horizontal     Test Engineer     Jei       d8uV/m     d8uV/m     Imit     Imit     Imit       d8uV/m     Imit     Imit     Imit     Imit       Imit     Imit     Imit     Imit     Imit	Iarize       Horizontal       Test Engineer       Jerry Chua         d8uV/m

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

Test Mode	IEE	IEEE 802.11b Mid CH			emp/Hum	. ,	/ 33%RH
Test Item		Harmonic			est Date		er 10, 201
Polarize		Vertical		Tes	t Engineer	Jerry	Chuang
Detector	P	eak and Ave	age				
110.0 dBuV/m							
						Limit1:	-
						Limit2:	
70							
	1						
	Ĩ.						
30.0							
1000.000 3550.	00 6100.00	8650.00 11200.0	0 13750.00	16300.0	00 18850.00 21	1400.00 26	500.00 MHz
	-			-			
Frequency	Reading	Correct	Result	t	Limit	Margin	
(MHz)	(dBu )	Factor (dB/m)	(dBuV/r		(dBuV/m)	(dB)	Remark
4876.000	47.96	6.97	54.93	5	74.00	-19.07	peak
4876.000	46.82	6.97	53.79	)	54.00	-0.21	AVG
	1	1	1			L	r

- 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 802.11	o Mid CH	Temp/Hum	24(°C)/ 33%RH
Test Item	Harmo		Test Date	November 10, 201
Polarize	Horizor		Test Engineer	Jerry Chuang
Detector	Peak and A	verage		
110.0 dBuV/m				
				Limit1: — Limit2: —
70				
	<u>د</u>			
2				
30.0				
1000.000 3550.00	6100.00 8650.00 11	200.00 13750.00	16300.00 18850.00 21	400.00 26500.00 MHz
Frequency	Reading Correct	I Resi	ult Limit	Margin

Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
4876.000	49.94	6.97	56.91	74.00	-17.09	peak
4876.000	46.33	6.97	53.30	54.00	-0.70	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	High CH		emp/H		,	C)/ 33%RH
Test Item			Harmonic			Test Date		November 10, 20	
Polarize			Vertica		Tes	st Engi	neer	Jer	ry Chuang
Detector		Pea	ak and Av	/erage					
110.0 dBu∀/m									
								Limit1 Limit2	
70									
70									
	1 X								
30.0									
30.0 1000.000 3550.	00 61	100.00 86	50.00 112	00.00 13750.00	16300	.00 1885	i0.00 21 <b>4</b> 0	00.00	26500.00 MHz
<b>F</b>	De	a din a	Correct	Dee			lune lé	Manain	
Frequency (MHz)		eading IBuV)	Factor (dB/m)	Res (dBu)			imit uV/m)	Margin (dB)	Remark
	4	3.12	7.09	50.2	21	74	4.00	-23.79	peak

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 Item			gh CH	Temp/Hum	24(°C)/ 33%R⊦		
Delerier		Harmonic		Test Date	Novembe		
Polarize		Horizontal		est Engineer	Jerry	Chuang	
Detector	Pea	ak and Aver	age				
110.0 dBuV/m							
					Limit1:		
					Limit2:	_	
70							
	1						
	2						
30.0							
1000.000 3550.00	6100.00 86	50.00 11200.00	) 13750.00 163	300.00 18850.00 21	400.00 26	500.00 MHz	
		Correct					
Frequency (MHz)	Reading (dBuV)	Factor	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB	Remark	
(10112)	(ubuv)	(dB/m)	(ubuv/iii)	(ubuv/iii)	(UD		
4925.000	50.28	7.09	57.37	74.00	-16.63	peak	
4925.000	46.04	7.09	53.13	54.00	-0.87	AVG	
4920.000							

- 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	IEEE 802.11g Low CH			np/Hum	24(°C)/ 33%RF		
Test Item		Harmonic			st Date	November 10, 20		
Polarize		Vertical		Test Engineer		Jerry	Chuang	
Detector	Pe	ak and Aver	age					
110.0 dBuV/m								
						Limit1: Limit2:	_	
70								
	1							
	X							
	2							
	×							
30.0								
1000.000 3550.0	00 6100.00 8	3650.00 11200.00	0 13750.00	16300.00	18850.00 21	400.00 26	500.00 MHz	
		_						
Frequency	Deading	Correct	Result		Limit	Margin		
Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	(dBuV/r		(dBuV/m)	Margin (dB)	Remark	
4827.000	47.57	6.84	54.41		74.00	-19.59	peak	
4827.000	36.22	6.84	43.06		54.00	-10.94	AVG	

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

Test Mode	IEE	E 802.11g Lo	w CH	Temp/Hum	· · · ·	′ 33%RH
Test Item		Harmonic		Test Date	November 10, 20	
Polarize		Horizontal		est Engineer	Jerry	Chuang
Detector	Pe	eak and Aver	age			
110.0 dBuV/m						
					Limit1: Limit2:	_
70						
	1					
	×					
	2					
30.0	0.0100.00	0050 00 11000 0		200.00 10050.00 01	400.00 00	500 00 MIL
1000.000 3550.0	DO 6100.00	8650.00 11200.0	0 13750.00 16	300.00 18850.00 21	400.00 26	500.00 MHz
		Correct				
Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Result (BuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
4820.000	51.66	6.82	58.48	74.00	-15.52	peak
4820.000	40.80	6.82	47.62	54.00	-6.38	AVG

- 3. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
- 4. 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	id CH	Temp/Hum	<b>24(°</b> ℃)/	/ 33%RH
Test Item		Harmonic		Test Date	November 10, 2017	
Polarize		Vertical		est Engineer	Jerry	Chuang
Detector	Pea	ak and Aver	age			
110.0 dBuV/m						
					Limit1: Limit2:	_
70						
	1 X					
	2					
30.0						
1000.000 3550.0	0 6100.00 8	650.00 11200.00	) 13750.00 163	00.00 18850.00 214	00.00 26	500.00 MHz
Frequency	Reading	Correct Factor	Result	Limit	Margin	Remark
(MHz)	(dBu )	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
			(dBuV/m) 54.73	(dBuV/m) 74.00	(dB) -19.27	peak

- 3. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
- 4. 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	Temp/Hum	24(°∁)/ 33%RH	
Test Item	Harmonic	Test Date	November 10, 201	
Polarize	Horizontal	Test Engineer	Jerry Chuang	
Detector	Peak and Average			
110.0 dBuV/m				
			Limit1: —	
			Limit2: —	
70				
1 ×				
2 X				
30.0				
1000.000 3550.00 6	100.00 8650.00 11200.00 13750.00	16300.00 18850.00 214	00.00 26500.00 MHz	

Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
4876.000	49.20	6.97	56.17	74.00	-17.83	peak
4876.000	38.06	6.97	45.03	54.00	-8.97	AVG

- 3. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
- 4. 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 Hig	gh CH	Temp/Hum		24(°C)/ 33%RH	
Test Item		Harmonic		Test Date		November 10, 201	
Polarize		Vertical		Test E	ngineer	Jerry (	Chuang
Detector	Pea	ak and Aver	age				
110.0 dBuV/m						Limit1:	_
70							
30.0	2	650.00 11200.00	D 13750.00	16300.00	18850.00 2140	00.00 26	500.00 MHz
Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m	)	Limit (dBuV/m)	Margin (dB)	Remark
4925.000	47.86	7.09	54.95		74.00	-19.05	peak
4925.000	35.11	7.09	42.20		54.00	-11.80	AVG

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



FCC ID: TX2-RTL8821AU

ize ctor		Harmonic Horizontal k and Avei			st Date Engineer	Novembe Jerry (	er 10, 20 Chuang
tor				Test E	Engineer	Jerry (	Chuang
	Pea	k and Ave	rage				
W/m							
						Limit1: Limit2:	
×							
2 X							
3550.00 6	100.00 86	50.00 11200.0	0 13750.00	16300.00	18850.00 2140	DO.OO 265	500.00 MHz
		Correct Factor (dB/m)			Limit (dBuV/m)	Margin (dB	Remark
0 4	47.62	7.08	54.7	0	74.00	-19.30	peak
	37.18	7.08	44.20	_	54.00	-9.74	AVG
	0 3550.00 6 cy R(	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	Cy Reading Correct Factor (dBuV)	Q         Reading (dBuV)         Correct Factor (dB/m)         Resu (dBuV/ (dB/m)	Cy         Reading (dBuV)         Correct Factor (dB/m)         Result (dBuV/m)	Cy         Reading (dBuV)         Correct Factor (dB/m)         Result (dBuV/m)         Limit (dBuV/m)	Q         Reading (dBuV)         Correct Factor (dB/m)         Result (dBuV/m)         Limit (dBuV/m)         Margin (dBuV/m)

- fundamental frequency.
- 4. 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 Lc	w CH	Temp/Hum		24(°C)/ 33%RH	
Test Item	H	Harmonic			est Date		er 10, 2017
Polarize	١	/ertical		Tes	t Engineer		Chuang
Detector	Peak a	and Average	Э				
110.0 dBuV/m							
						Limit1: Limit2:	
70							
	1 X						
	2						
30.0							
1000.000 3550.	Reading	50.00 11200.00 Correct Factor	Resul		Limit	Margin	500.00 MHz Remark
(MHz)	(dBuV)	(dB/m)	(dBuV/r	n)	(dBuV/m)	(dB)	
4820.000	48.76	6.82	55.58	3	74.00	-18.42	peak
4820.000	35.50	6.82	42.32	2	54.00	-11.68	AVG
funda 2.  For al	uring frequer mental frequ bove 1GHz,tl	ency.	k value v	vas u	nder averag	-	

Test Mode	IEEE 802.	11n HT20 L	ow CH	Temp/Hum		24(°C)/ 33%RH	
Test Item	F	Harmonic			est Date	November 10, 201	
Polarize		Horizontal			Engineer	Jerry	Chuang
Detector	Peak	and Averag	e				
110.0 dBuV/m							
						Limit1: Limit2:	_
70							
	1 X						
	2						
30.0							
1000.000 3550.	00 6100.00 8	650.00 11200.00	13750.00	16300.00	) 18850.00 214	00.00 26	500.00 MHz
Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Resul (dBuV/r		Limit (dBuV/m)	Margin (dB)	Remark
4820.000	50.03	6.82	56.85	;	74.00	-17.15	peak
4820.000	39.79	6.82	46.61		54.00	-7.39	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.	11n HT20 N	/lid CH	Temp/Hum	<b>24(°</b> ℃)/	33%RH
Test Item	F	larmonic		Test Date		er 10, 2017
Polarize		Vertical	-	Test Engineer	Jerry	Chuang
Detector	Peak	and Averag	je			
110.0 dBuV/m						
					Limit1: Limit2:	_
70						
	1 X					
	2×					
30.0						
1000.000 3550.0	00 6100.00 8	650.00 11200.00	) 13750.00 1	6300.00 18850.00 2	1400.00 26	500.00 MHz
Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
4876.000	50.23	6.97	57.20	74.00	-16.80	peak
4876.000	34.19	6.97	41.16	54.00	-12.84	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		11n HT20 M		emp/Hum	24(°C)/ 33%RH
Test Item Polarize		larmonic orizontal		Fest Date st Engineer	November 10, 2017 Jerry Chuang
Detector		and Average			Jerry Ondarig
110.0 dBuV/i	·				
					Limit1: — Limit2: —
70					
	1				
	2 X				
30.0					
1000.000 3	50.00 6100.00 8	650.00 11200.00	) 13750.00 16300	.00 18850.00 2140	00.00 26500.00 MHz
Frequency	Reading	Correct	Result	Limit	Margin
Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB Remark

4869.000

4869.000

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

(dB/m)

6.95

6.95

50.30

37.55

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

57.25

44.50

74.00

54.00

-16.75

-9.50

peak

AVG



Test Mode	IEEE 802.11	n HT20 Hig	gh CH	Temp/Hum		24(°∁)/ 33%RH	
Test Item		armonic		Test Date		November 10, 2017	
Polarize		ertical		Tes	t Engineer	Jerry	Chuang
Detector	Peak a	ind Average	;				
110.0 dBu∀/m							
						Limit1: Limit2:	
70							
	1 X						
	2						
30.0							
1000.000 35	50.00 6100.00 86	650.00 11200.00	) 13750.00	16300.	00 18850.00 2140	00.00 26	500.00 MHz
Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Resu (dBuV/		Limit (dBuV/m)	Margin (dB)	Remark
4925.000	49.03	7.09	56.1	2	74.00	-17.88	peak
4925.000	32.88	7.09	39.9	7	54.00	-14.03	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 802.11n HT20	High CH	Temp/Hum	24(°C)/ 33%RH	
Test Item	Harmonic		Test Date	November 10, 201	
Polarize	Horizontal		Test Engineer	Jerry Chuang	
Detector	Peak and Avera	age			
110.0 dBu¥/m					
				Limit1: — Limit2: —	
70					
	1 X				
	2				
	*				
30.0					
1000.000 3550	.00 6100.00 8650.00 1120	00.00 13750.00	16300.00 18850.00 21 [,]	400.00 26500.00 MHz	
	Deadling Correct				

Frequency (MHz	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
4932.000	48.69	7.11	55.80	74.00	-18.20	peak
4932.000	38.05	7.11	45.16	54.00	-8.84	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 Lo	w CH	Te	emp/Hu	m	24(	°C)/ 339	%RH
Test Item	H	armonic		Т	est Date	e	November 10, 201		
Polarize	١	/ertical		Tes	t Engin	eer	Je	rry Chu	ang
Detector	Peak a	and Average	e						
110.0 dBu∀/m							Limi	1: —	]
							Limi	t <b>2</b> : —	
70									
	1								
30.0			10750.00	10000	00 10050			00500.00	
1000.000 3550.	00 6100.00 86	50.00 11200.00	) 13750.00	16300.	00 18850.1	UU 214	00.00	26500.00	MHZ
Frequency	Reading	Correct Factor	Resu		Lim		Margi		emark
(MHz)	(dBuV)	(dB/m)	(dBuV	/m)	(dBu\	//m)	(dB)		Cinark
4848.000	45.92	6.90	52.8	2	74.(	00	-21.1	8	peak
N/A									
Remark:								÷	
	uring frequer mental frequ		GHz to	the 1	0th hari	monic	of high	est	
	bove 1GHz,tl	he EUT pea npliance wi				/erage	e limit, ti	herefore	e the

Test Mode	IEEE 802.	11n HT40 L	.ow CH	Te	emp/Hu	Jm	<b>24(</b> °C	)/ 33%RH	
Test Item		Harmonic		Test Date			November 10, 20		
Polarize		Iorizontal		Tes	st Engil	neer	Jerr	y Chuang	
Detector	Peak	and Avera	ge						
110.0 dBuV/m									
							Limit1: Limit2:		
70									
	1.								
	×								
30.0									
1000.000 3550	).00 6100.00 8	650.00 11200.0	0 13750.00	16300.	00 1885	0.00 2140	0.00	26500.00 MHz	
Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Resi (dBuV			mit ıV/m)	Margin (dB)	Remark	
4844.000	43.21	6.88	50.0	)9	74	.00	-23.91	peak	
	suring freque amental frequ		1 GHz to	the 1	0th ha	rmonic	of highes	st	
	above 1GHz,i	•	ak valua	14/201	indor a	woraa	limit the	proforo tho	

Average value compliance with the average limit

Test Mode	IEEE 802.	11n HT40 N	/lid CH	Temp/Hum	<b>24(°</b> ℃)/	33%RH		
Test Item	F	larmonic		Test Date		er 10, 2017		
Polarize		Vertical	Т	Test Engineer Jerry Chuang				
Detector	Peak	and Average	je					
110.0 dBuV/m								
					Limit1: Limit2:	_		
70								
	1 X							
30.0	0 0100.00 00	CO 00 11200 0	10750.00 10		00.00 26	500.00 MHz		
1000.000 3550.0	0 6100.00 80	550.00 11200.00	) 13750.00 163	300.00 18850.00 214	.00.00 26	DUU.UU MHZ		
Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	R mark		
4874.000	45.75	6.97	52.72	74.00	-21.28	peak		
N/A								
					· ·			
Remark:								

- fundamental frequency.
- 4. 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 Mid CH	Temp/Hum 24(°C)/ 33%			
Test Item	Harmonic	Test Date	November 10, 20 [°]		
Polarize	Horizontal	Test Engineer	Jerry Chuang		
Detector	Peak and Average				
110.0 dBuV/m					
			Limit1: —		
			Limit2: —		
70					
~~					
	1 X				
30.0					
1000.000 3550	D.00 6100.00 8650.00 11200.00 13750.00	16300.00 18850.00 214	00.00 26500.00 MHz		

Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB	Remark
4874.000	42.36	6.97	49.33	74.00	-24.67	peak
N/A						

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



Test Mode	IEEE 802.11			emp/Hum	( )	33%RH
Test Item		armonic		Test Date	Novembe	
Polarize		'ertical		st Engineer	Jerry (	Chuang
Detector	Peak a	ind Average				
110.0 dBuV/m					Limit1:	
					Limit2:	_
70						
	1					
	×					
30.0						
1000.000 355	50.00 6100.00 86	650.00 11200.00	13750.00 16300	).00 18850.00 214	00.00 26	500.00 MHz
Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
4904.000	45.74	7.04	52.78	74.00	-21.22	peak
N/A						
	•					

- Remark:
  - 3. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
  - 4. 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	Te	emp/H	um	<b>24(</b> °(	)/ 33%RF	1
Test Item	H	armonic		Т	est Da	ate	Novem	ber 10, 20	17
Polarize		orizontal		Tes	st Engi	neer	Jerr	y Chuang	
Detector	Peaka	and Averag	е						
110.0 dBuV/m									
							Limit1:		
							Limit2:		
70									
	1								
	×								
30.0									
1000.000 3550	.00 6100.00 80	650.00 11200.00	0 13750.00	16300.	00 1885	50.00 2140	0.00	26500.00 MHz	
1000.000 0000		1120.0		10000.	.00 100.	0.00 214		20000.00 1112	
Frequency	Reading	Correct	Res	ult		imit	Margin		
(MHz	(dBuV)	Factor (dB/m)	(dBuV			uV/m)	(dB)	Remar	k
4904.000	41.42	7.04	48.4	16	74	4.00	-25.54	peak	_
Remark:	1	1	1				1		
	suring frequer	ncies from 1	1 GHz to	the 1	0th ha	rmonic	of highe	st	
funda	amental frequ	ency.					-		
4. For a	bove 1GHz,ti	he EUT pea	ak value	was L	under a	averade	e limit. the	erefore the	e

Average value compliance with the average limit