



Temperature :	26 ℃	Relative Humidity :	54%
Pressure :	101kPa	Test Voltage :	DC 24V
Test Band :	5.8G	212	

		5.8G		
Test Mode (MHz)		6dB Occupied Bandwidth (MHz)	Limit(KHz)	Result
	5745 16.313	16.313	$\langle \cdot \rangle$	
802.11a	5785	16.306	>500	Pass
	5825	16.323		1
- 50	5745	17.551		
802.11n20	5785	17.308	>500	Pass
	5825	17.554		
000 11- 10	5755	36.315	500	Pass
802.11n40	5795	36.325	- >500	
	5745	17.29		
802.11ac20	5785	17.578	>500	Pass
	5825	17.551		
000 11 10	5755	36.310	. 500	Dest
802.11ac40	5795	36.336	- >500	Pass
802.11ac80	5775	75.067	>500	Pass







5.8G Test plot

(802.11a) 6dB Bandwidth plot on channel 149

Keysight Spectrum Analyzer - Occupied BW R RF S0 Q AC Center Freq 5.745000000	GHz	Center Freg: 5.745000000		03:08:27 PM Dec 01, 202 Radio Std: None
	#IFGain:Low		Avg Hold: 100/100	Radio Device: BTS
Ref Offset 3.66 dl 0 dB/div Ref 23.66 dBn				Mkr3 5.753118 GH -0.63348 dBr
og 3.7 	2 1 Valuaturaturaturaturaturaturaturaturaturatu	where maken	Marsharah	3
(34 6.3 6.3				Manner
С. 3 ууни ЧАРИ (1996) 6.3				and a state of the
6.3				
enter 5.745 GHz Res BW 100 kHz		#VBW 300 kHz		Span 30 MH Sweep 3.333 m
Occupied Bandwidt	^h 5.513 MHz	Total Power	21.5 dBm	
Transmit Freg Error	-38.299 kHz	% of OBW Power	99.00 %	
x dB Bandwidth	16.31 MHz	x dB	-6.00 dB	
a			STATUS	

(802.11a) 6dB Bandwidth plot on channel 157

Keysight Spectrum Analyzer - Occupied BV R R RF 50 Ω AC Center Freq 5.785000000		Center Freq: 5.785000000	GHz Avg Hold: 100/100	03:10:01 PM Dec 01, 20 Radio Std: None Radio Device: BTS
Ref Offset 3.61 d 10 dB/div Ref 23.61 dBr				Mkr3 5.793115 GH 0.0059498 dBr
13.6 .539	2 mmulanda	odrawlana methodowa	+h.	3
15.4 26.4 26.4				Marrison Marrison Constrained
46.4				
56.4 56.4				
Center 5.785 GHz #Res BW 100 kHz		#VBW 300 kHz		Span 30 MH Sweep 3.333 n
Occupied Bandwidt	^h 6.509 MHz	Total Power	22.4 dBm	
Transmit Freq Error	-38.280 kHz	% of OBW Power	99.00 %	
x dB Bandwidth	16.31 MHz	x dB	-6.00 dB	
sG			STATUS	

(802.11a) 6dB Bandwidth plot on channel 165

 Program
 State
 <













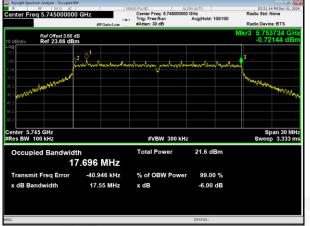






5.8G Test plot

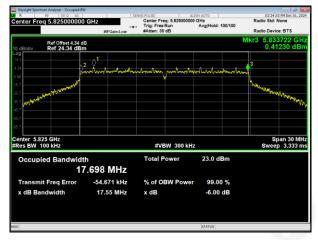
(802.11n20) 6dB Bandwidth plot on channel 149



(802.11n20) 6dB Bandwidth plot on channel 157



(802.11n20) 6dB Bandwidth plot on channel 165

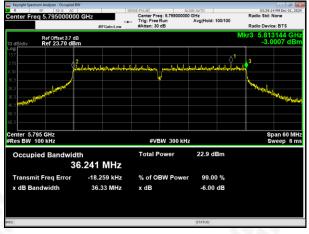


G.

(802.11n40) 6dB Bandwidth plot on channel 151



(802.11n40) 6dB Bandwidth plot on channel 159



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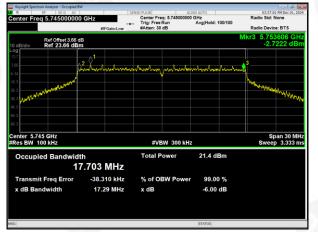






5.8G Test plot

(802.11ac20) 6dB Bandwidth plot on channel 149



03:42:12 PM Der Radio Std: None Ref Offset 3.79 dB Ref 23.79 dBm enter 5.755 GHz les BW 100 kHz Span 60 MH Sweep 6 m #VBW 300 kHz 22.1 dBm Occupied Ban Total Power vidth 36.222 MHz Transmit Freq Er -22.628 kHz % of OBW P 99.00 % -6.00 dB x dB Bandwidth 36.31 MHz x dB

(802.11ac40) PSD plot on channel 151

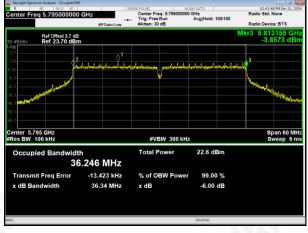
(802.11ac20) 6dB Bandwidth plot on channel 157

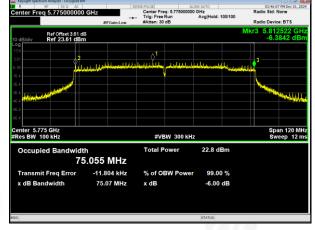


(802.11ac20) 6dB Bandwidth plot on channel 165



(802.11ac40) PSD plot on channel 159





(802.11ac80) PSD plot on channel 155









7.MAXIMUM CONDUCTED OUTPUT POWER

7.1 PPLIED PROCEDURES / LIMIT

According to FCC §15.407

The maximum conduced output power should not exceed:

Frequency Band(MHz)	Limit
5150~5250	250mW
5725~5850	1W

7.2 TEST PROCEDURE

The EUT was directly connected to the Power meter

1. Device Configuration

If possible, configure or modify the operation of the EUT so that it transmits continuously at its maximum power control level (see section II.B.).

a) The intent is to test at 100 percent duty cycle; however a small reduction in duty cycle (to no lower than 98 percent) is permitted if required by the EUT for amplitude control purposes. Manufacturers are expected to provide software to the test lab to permit such continuous operation.

b) If continuous transmission (or at least 98 percent duty cycle) cannot be achieved due to hardware limitations (e.g., overheating), the EUT shall be operated at its maximum power control level with the transmit duration as long as possible and the duty cycle as high as possible.

2. Measurement using a Spectrum Analyzer or EMI Receiver (SA)

Measurement of maximum conducted output power using a spectrum analyzer requires integrating the spectrum across a frequency span that encompasses, at a minimum, either the EBW or the 99-percent occupied bandwidth of the signal.1 However, the EBW must be used to determine bandwidth dependent limits on maximum conducted output power in accordance with § 15.407(a).

a) The test method shall be selected as follows: (i) Method SA-1 or SA-1 Alternative (averaging with the EUT transmitting at full power throughout each sweep) shall be applied if either of the following conditions can be satisfied:

The EUT transmits continuously (or with a duty cycle ≥ 98 percent).

• Sweep triggering or gating can be implemented in a way that the device transmits at the maximum power control level throughout the duration of each of the instrument sweeps to be averaged. This condition can generally be achieved by triggering the instrument's sweep if the duration of the sweep (with the analyzer configured as in Method SA-1, below) is equal to or shorter than the duration T of each transmission from the EUT and if those transmissions exhibit full power throughout their durations.

(ii) Method SA-2 or SA-2 Alternative (averaging across on and off times of the EUT transmissions, followed by duty cycle correction) shall be applied if the conditions of (i) cannot be achieved and the transmissions exhibit a constant duty cycle during the measurement duration. Duty cycle will be considered to be constant if variations are less than ± 2 percent.

(iii) Method SA-3 (RMS detection with max hold) or SA-3 Alternative (reduced VBW with max hold) shall be applied if the conditions of (i) and (ii) cannot be achieved.

b) Method SA-1 (trace averaging with the EUT transmitting at full power throughout each sweep): (i) Set span to encompass the entire emission bandwidth (EBW) (or, alternatively, the entire 99% occupied bandwidth) of the signal.

(ii) Set RBW = 1 MHz.

(iii) Set VBW ≥ 3 MHz.

(iv) Number of points in sweep ≥ 2 Span / RBW. (This ensures that bin-to-bin spacing is \leq RBW/2, so that narrowband signals are not lost between frequency bins.)

(v) Sweep time = auto.

(vi) Detector = RMS (i.e., power averaging), if available. Otherwise, use sample detector mode.

(vii) If transmit duty cycle < 98 percent, use a video trigger with the trigger level set to enable triggering only on full power pulses. Transmitter must operate at maximum power control level for the entire duration of every sweep. If the EUT transmits continuously (i.e., with no off intervals) or at duty cycle ≥ 98 percent, and if each transmission is entirely at the maximum power control level, then the trigger shall be set to "free run". (viii) Trace average at least 100 traces in power averaging (i.e., RMS) mode.

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(ix) Compute power by integrating the spectrum across the EBW (or, alternatively, the entire 99% occupied bandwidth) of the signal using the instrument's band power measurement function with band limits set equal to the EBW (or occupied bandwidth) band edges. If the instrument does not have a band power function, sum the spectrum

7.3 DEVIATION FROM STANDARD

No deviation.

7.4 TEST SETUP



7.5 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.











Temperature :	26 ℃	Relative Humidity :	54%
Pressure :	1012 hPa	Test Voltage :	DC 24V
Test Band :	5.2G		

		802	2.11 a Mode			r
Test Channel	Frequency (MHz)	Output power (dBm)	duty cycle Factor (dB)	Total power (dBm)	Limit (dBm)	Result
CH36	5180	15.046	0.51	15.556	23.98	Pass
CH40	5200	14.865	0.51	15.375	23.98	Pass
CH48	5240	15.479	0.51	15.989	23.98	Pass
	1	802.	11 n20 Mode			-
Test Channel	Frequency (MHz)	Output power (dBm)	duty cycle Factor (dB)	Total power (dBm)	Limit (dBm)	Result
CH36	5180	15.044	0.50	15.544	23.98	Pass
CH40	5200	14.772	0.50	15.272	23.98	Pass
CH48	5240	15.340	0.50	15.84	23.98	Pass
		802.	11 n40 Mode	0.0		
Test Channel	Frequency (MHz)	Output power (dBm)	duty cycle Factor (dB)	Total power (dBm)	Limit (dBm)	Result
CH38	5190	15.044	0.49	15.534	23.98	Pass
CH46	5230	15.403	0.49	15.893	23.98	Pass
0		802.	11 ac20 Mode	· · · · ·		1212
Test Channel	Frequency (MHz)	Output power (dBm)	duty cycle Factor (dB)	Total power (dBm)	Limit (dBm)	Result
CH36	5180	14.891	0.51	15.401	23.98	Pass
CH40	5200	14.617	0.51	15.127	23.98	Pass
CH48	5240	15.196	0.51	15.706	23.98	Pass
		802.1	11 ac40 Mode			
Test Channel	Frequency (MHz)	Output power (dBm)	duty cycle Factor (dB)	Total power (dBm)	Limit (dBm)	Result
CH38	5190	14.866	0.51	15.376	23.98	Pass
CH46	5230	15.151	0.51	15.661	23.98	Pass
		802.	11 ac80 Mode		6	
Test Channel	Frequency (MHz)	Output power (dBm)	duty cycle Factor (dB)	Total power (dBm)	Limit (dBm)	Result
CH42	5210	15.198	0.50	15.698	23.98	Pass

Note: duty cycle Factor see page 86.





Temperature :	26 ℃	Relative Humidity :	54%
Pressure :	1012 hPa	Test Voltage :	DC 24V
Test Band :	5.8G		

		802	2.11 a Mode			
Test Channel	Frequency (MHz)	Output power (dBm)	duty cycle Factor (dB)	Total power (dBm)	Limit (dBm)	Result
CH149	5745	14.961	0.51	15.471	30	Pass
CH157	5785	15.829	0.51	16.339	30	Pass
CH165	5825	16.355	0.51	16.865	30	Pass
	0	802.	11 n20 Mode	· · · ·		
Test Channel	Frequency (MHz)	Output power (dBm)	duty cycle Factor (dB)	Total power (dBm)	Limit (dBm)	Result
CH149	5745	14.946	0.50	15.446	30	Pass
CH157	5785	15.799	0.50	16.299	30	Pass
CH165	5825	16.340	0.50	16.84	30	Pass
		802.	11 n40 Mode			
Test Channel	Frequency (MHz)	Output power (dBm)	duty cycle Factor (dB)	Total power (dBm)	Limit (dBm)	Result
CH151	5755	15.647	0.49	16.137	30	Pass
CH159	5795	15.596	0.49	16.086	30	Pass
20		802.4	11 ac20 Mode		·	
Test Channel	Frequency (MHz)	Output power (dBm)	duty cycle Factor (dB)	Total power (dBm)	Limit (dBm)	Result
CH149	5745	14.716	0.41	15.126	30	Pass
CH157	5785	15.581	0.41	15.991	30	Pass
CH165	5825	16.185	0.41	16.595	30	Pass
		802.7	11 ac40 Mode			
Test Channel	Frequency (MHz)	Output power (dBm)	duty cycle Factor (dB)	Total power (dBm)	Limit (dBm)	Result
CH151	5755	15.431	0.51	15.941	30	Pass
CH159	5795	15.890	0.51	16.400	30	Pass
50		802.4	11 ac80 Mode	· · · ·		
Test Channel	Frequency (MHz)	Output power (dBm)	duty cycle Factor (dB)	Total power (dBm)	Limit (dBm)	Result
CH155	5775	15.828	0.50	16.328	30	Pass

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8.OUT OF BAND EMISSIONS

8.1 APPLICABLE STANDARD

According to FCC §15.407(b)

Undesirable emission limits. Except as shown in paragraph (b)(7) of this section, the maximum emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:

(1) For transmitters operating in the 5.15-5.25 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.

(2)

(i) All emissions shall be limited to a level of −27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.

8.2 TEST PROCEDURE

- 1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
- 2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
- 3. Set RBW of spectrum analyzer to 1 MHz with a convenient frequency span.
- 4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
- 5. Repeat above procedures until all measured frequencies were complete.

8.3 DEVIATION FROM STANDARD

No deviation.

8.4 TEST SETUP

EUT	

SPECTRUM

ANALYZER

8.5 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.





8.6 TEST RESULTS

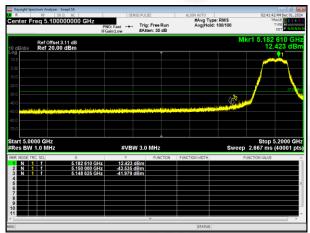
ĺ	Temperature :	26 ℃	Relative Humidity :	54%
	Pressure :	1012 hPa	Test Voltage :	DC 24V
	Test band :	5.2G	Antenna gain :	0.72dBi

5.180~5.240 GHz

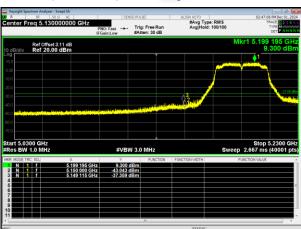
(802.11a) Band Edge, Left Side

Opposition Exposition Control Frag Control Frag</thr

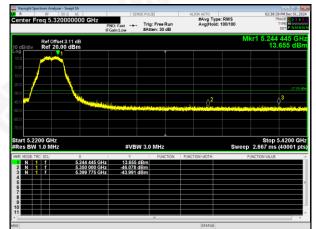
(802.11n20) Band Edge, Left Side

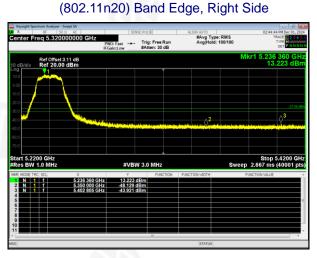


(802.11n40) Band Edge, Left Side



(802.11a) Band Edge, Right Side





(802.11n40) Band Edge, Right Side



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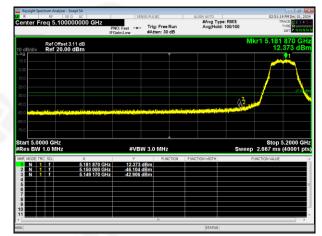
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(802.11ac20) Band Edge, Left Side







(802.11ac40) Band Edge, Left Side

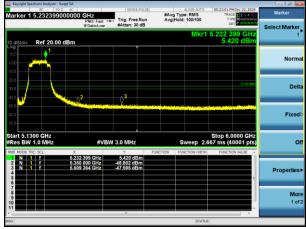
(802.11ac80) Band Edge, Left Side



eq 5.320000000 GHz #Avg Type: RMS Avg|Hold: 100/100 st ---- Trig: Free Run #Atten: 30 dB Ref Offset 3.11 dB Ref 20.00 dBm Stop 5.4200 tart 5.2200 GH Res BW 1.0 M 5.242 180 GHz 12.748 dBm 5.350 000 GHz -48.282 dBm 5.386 150 GHz -44.086 dBm N 1 T N 1 T



(802.11ac80) Band Edge, Right Side



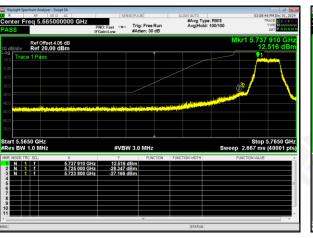






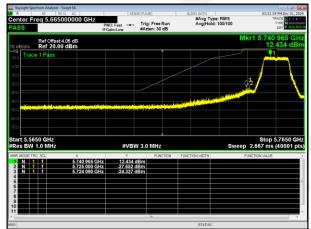
Temperature :	26 ℃	Relative Humidity :	54%
Pressure :	1012 hPa	Test Voltage :	DC 24V
Test band :	5.8G	Antenna gain :	0.56dBi

5.745~5.825 GHz

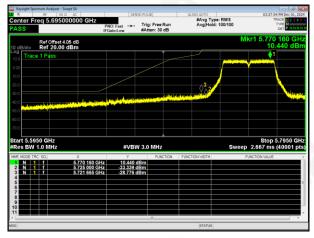


(802.11a) Band Edge, Left Side

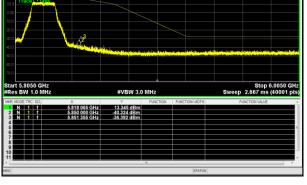
(802.11n20) Band Edge, Left Side



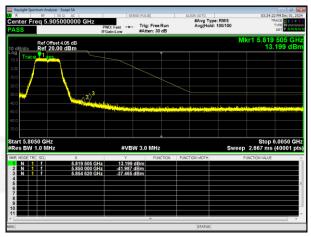
(802.11n40) Band Edge, Left Side







(802.11n20) Band Edge, Right Side



(802.11n40) Band Edge, Right Side



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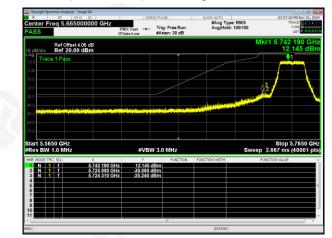
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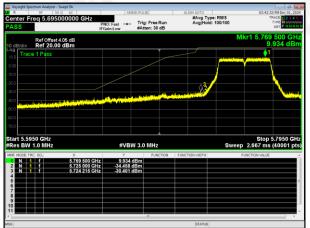


(802.11ac20) Band Edge, Left Side

(802.11ac20) Band Edge, Right Side

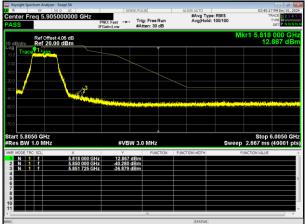






(802.11ac80) Band Edge, Left Side





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(802.11ac40) Band Edge, Right Side





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9.SPURIOUS RF CONDUCTED EMISSIONS

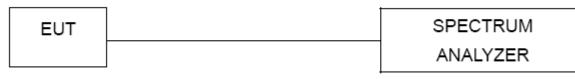
9.1 CONFORMANCE LIMIT

J	
Frequency Band (MHz)	Limit
5150 - 5250	Outside of the 5.15-5.35 GHz band: e.i.r.p27 dBm
5250 - 5350	Outside of the 5.15-5.35 GHz band: e.i.r.p27 dBm
5470 - 5725	Outside of the 5.47-5.725 GHz band: e.i.r.p27 dBm
5725 - 5850	All emissions shall be limited to a level of -27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.

9.2 MEASURING INSTRUMENTS

The Measuring equipment is listed in the section 6.3 of this test report.

9.3 TEST SETUP



9.4 TEST PROCEDURE

The Spurious RF conducted emissions compliance of RF radiated emission should be measured by following the guidance in ANSI C63.10-2013 with respect to maximizing the emission by rotating the EUT, measuring the emission while the EUT is situated in three orthogonal planes (if appropriate), adjusting the measurement antenna height and polarization etc. Set RBW=1MHz and VBW= 3MHz to measure the peak field strength, and measure frequency range from 30MHz to 26.5GHz.

9.5 TEST RESULTS

Temperature :	26 ℃	Relative Humidity :	54%
Pressure :	1012 hPa	Test Voltage :	DC 24V
Test band :	5.2G & 5.8G		
Remark [.]			

The measurement frequency range is from 30MHz to the 10th harmonic of the fundamental frequency. And above 26.5GHz of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported. The lowest, middle and highest channels are tested to verify the spurious emissions and band edge measurement data.





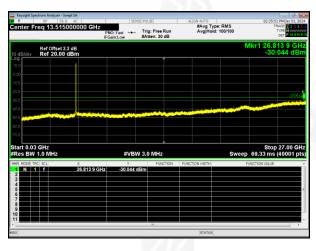
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5.2G Test Plot

802.11a on channel 36



802.11a on channel 40

R RF 50 Ω	AC OLL	SENSE:	PULSE	ALIGN AUTO	pe: RMS	02:37:06 PM Dec 01, 2 TRACE
enter Freq 13.5150	PN	0: Fast →→ 1 ain:Low a	Trig: Free Run Atten: 30 dB	Avg Ho	d: 100/100	TYPE MWW
Ref Offset 3.3 dB/div Ref 20.00 c	i6 dB IBm					Mkr1 26.964 3 G -29.944 dE
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8.0						
0.0						
0.0						
						Stop 27.00 G
						atop 27.00 d
Res BW 1.0 MHz		#VBW 3				p 69.33 ms (40001 p
tart 0.03 GHz Res BW 1.0 MHz	X 26 964 3 GHz	Y	FUNCTION	FUNCTION WIDTH		69.33 ms (40001 p
Res BW 1.0 MHz KR MODE TRC SCL 1 N 1 f 2	× 26.964 3 GHz	#VBW 3 Y -29.944 dBr	FUNCTION	FUNCTION WIDTH		p 69.33 ms (40001 p
Res BW 1.0 MHz KR MODE TRC SCL 1 N 1 f 2 3 4	X 26.964 3 GHz	Y	FUNCTION	FUNCTION WIDTH		p 69.33 ms (40001 p
Res BW 1.0 MHz REMODE TRC SCL 1 N 1 f 2 3 4 5 6	× 26,964 3 GHz	Y	FUNCTION	FUNCTION WIDTH		p 69.33 ms (40001 p
Res BW 1.0 MHz	X 26.964 3 GHz	Y	FUNCTION	FUNCTION WIDTH		p 69.33 ms (40001 p
Res BW 1.0 MHz	х 26,964 3 GHz	Y	FUNCTION	FUNCTION WIDTH		p 69.33 ms (40001 p
Res BW 1.0 MHz RR MODE TRC SCL	X 26,964 3 GHz	Y	FUNCTION	FUNCTION INDTH		p 69.33 ms (40001 p

802.11a on channel 48

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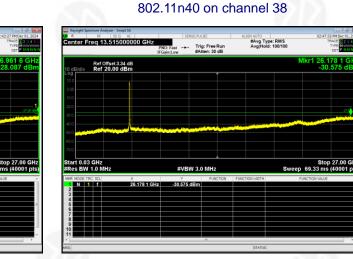
+86-400-000-9970



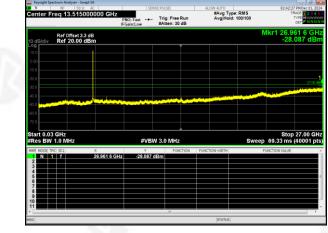




5.2G Test Plot



802.11n20 on channel 36



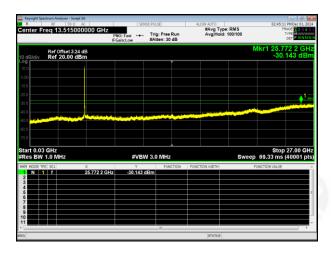
802.11n20 on channel 40

rysight Spe		nalyzer - Swep			1								
nter Fr	RF eq 1	3.51500	AC 00000 GHz	PNO: Fast IFGain:Low		"PULSE Trig: Free I #Atten: 30	Run dB	AL	IGN AUTO #Avg T Avg Ho	ype: RMS ld: 100/10	0	02>	18:58 PM Dec 01, 2 TRACE 2 3 4 TYPE M DET P N N
B/div	Ref Ref	Offset 3.26 20.00 dl	dB Bm								٨	lkr1 26 -2	.184 8 GI 9.927 dB
													-27.0
											-		and the second data
5.00	العن		- Annother	where where	-		-				1100		
لتكفر													
t 0.03 s BW					VBW	3.0 MHz					Sweep	St 69.33 n	op 27.00 G ns (40001 p
NODE TR			×		Y	FUN	TION	FUNCT	TION WIDTH		F	UNCTION VAL	VE
N 1	1		26.184 8 GH	z -29	.927 dE	lm							
									STATUS				

802.11n40 on channel 46

rysight Spectrum Analyzer - Swept SA RF 50 Ω AC	SENSE:PULSE	ALIGN AUTO	02:43:46 PM Dec 01, 2
nter Freq 13.515000000 G	PNO: Fast ++- Trig: Free IFGain:Low #Atten: 30	#Avg Type: RM Run Avg Hold: 100/) dB	S TRACE 2 3 4 100 TYPE M DET PINN
Ref Offset 3.36 dB B/div Ref 20.00 dBm			Mkr1 26.522 6 GI -29.594 dB
			and the second
and the second			
t 0.03 GHz s BW 1.0 MHz	#VBW 3.0 MHz	2	Stop 27.00 G Sweep 69.33 ms (40001 p
MODE TRC SCL X		ICTION FUNCTION WIDTH	FUNCTION VALUE
	0112 20.004 0.011		

802.11n20 on channel 48







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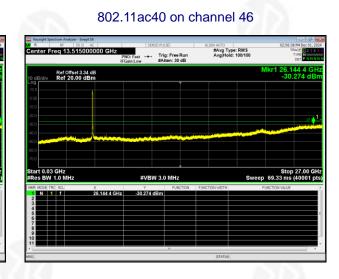


#Avg Type: RMS Avg|Hold: 100/100

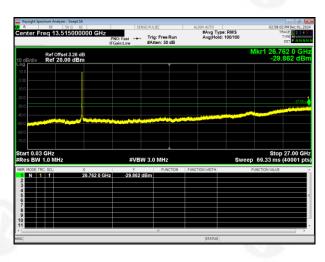
> Stop 27.00 0 Sweep 69.33 ms (4000)



5.2G Test Plot



802.11ac40 on channel 46



Repr Rep Rep Rep Re

802.11ac20 on channel 40

802.11ac20 on channel 36

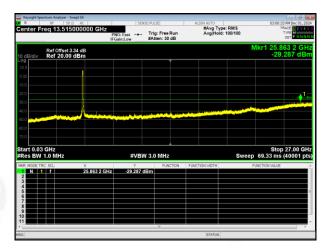
#VBW 3.0 MH

(a) Section Average 5 and a first s

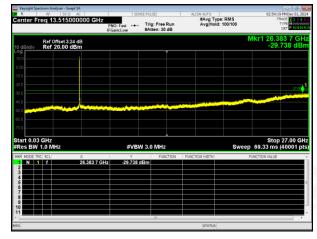
^ 26.795 0 GHz

Ref Offset 3.3 dB Ref 20.00 dBm

802.11ac80 on channel 42



802.11ac20 on channel 48





+86-400-000-9970

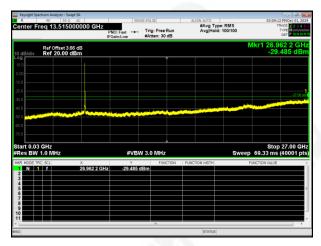






5.8G Test Plot

802.11a on channel 149



802.11a on channel 157

R	am Analyzer - Swept SA RF 50 Ω AC α 13.515000		SENSE	PULSE	ALIGN AUTO	RMS	03:10:36 PM Dec 0: TRACE
enter Pre	q 13.515000	P		Trig: Free Run #Atten: 30 dB	Avg Hold:	100/100	TYPE MW
) dB/div	Ref Offset 3.61 di Ref 20.00 dBn	3				N	/kr1 26.023 0 0 -29.302 d
o.o		1					
.00							
1.0							
1.0							-27
1.0							A LA COMPANY
		-	discust distances				
10							
10							
art 0.03 G	11.1						Ctop 27.00
Res BW 1.			#VBW	3.0 MHz		Sweep	Stop 27.00 69.33 ms (40001
R MODE TRC		x	Y	FUNCTION	FUNCTION WIDTH	F	UNCTION VALUE
1 N 1 2	1	26.023 0 GHz	-29.302 dB	lm			
6							
8							
9							
							_

802.11a on channel 165

#Avg Type: RMS Avg[Hold: 100/100 a 13.51500 Trig: Free Run Ref Offset 4.34 d Ref 20.00 dBn 27.00 G













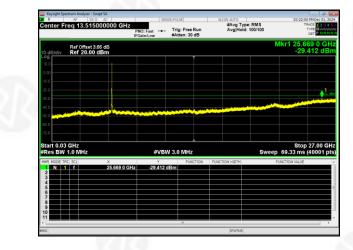


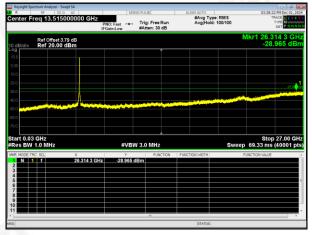




5.8G Test Plot

802.11n20 on channel 149





802.11n40 on channel 151

802.11n40 on channel 159

++- Trig: Free Run #Atten: 30 dB

#VBW 3.0 MHz

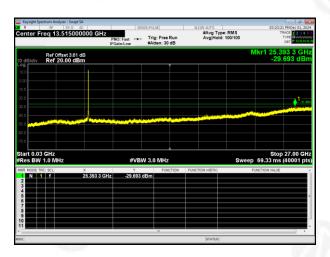
q 13.515000000 GH

26.497 7 G

Ref Offset 3.7 dB Ref 20.00 dBm

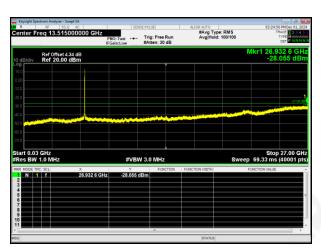
0.03 GHz BW 1.0 MI #Avg Type: RMS AvgiHold: 100/100

p 27.00 G



802.11n20 on channel 157

802.11n20 on channel 165







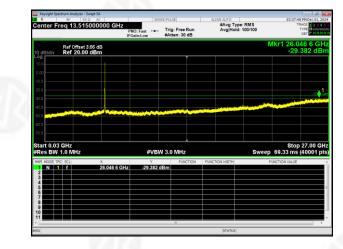






5.8G Test Plot

802.11ac20 on channel 149



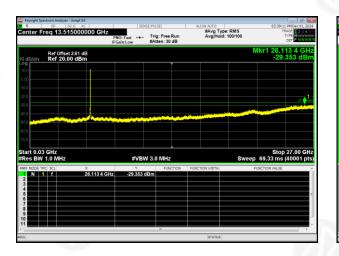
Experiment Angler:-Search Action Experiment Action Action Experiment Action Action Entitler Freq 13.515000000 GHz Integrate Action Action Action Rev Type: RMs Rev Type: RMs

802.11ac40 on channel 151

802.11ac40 on channel 159

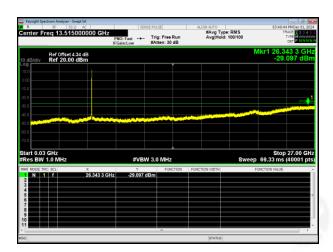
Trig: Free Run #Atten: 30 dB #Avg Type: RMS Avg|Hold: 100/100

ter Freq 13.515000000 GHz



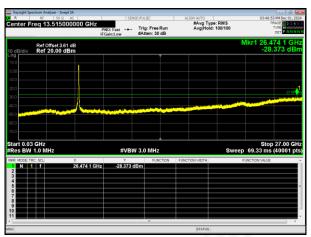
802.11ac20 on channel 157

802.11ac20 on channel 165



Bildly Ref Offset 37 dB Bildly Ref Offset 37 dB Bildly Ref Offset 37 dB Status -2.9.994 dE Image: Status Status

802.11ac80 on channel 155









10.Frequency Stability Measurement

10.1 LIMIT

Manufactures of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the user's manual.

The transmitter center frequency tolerance shall be \pm 20 ppm maximum for the 5 GHz band (IEEE 802.11n specification).

10.2 TEST PROCEDURES

1. The transmitter output (antenna port) was connected to the spectrum analyzer.

2. EUT have transmitted absence of modulation signal and fixed channelize.

- 3. Set the spectrum analyzer span to view the entire absence of modulation emissions bandwidth.
- 4. Set RBW = 10 kHz, VBW = 10 kHz with peak detector and maxhold settings.
- 5. fc is declaring of channel frequency. Then the frequency error formula is $(fc-f)/fc \times 106$ ppm and the limit is less than ± 20 ppm (IEEE 802.11nspecification).
- 6. The test extreme voltage is to change the primary supply voltage from 85 to 115 percent of the nominal value

7. Extreme temperature is -20°C~70°C.

10.3 TEST SETUP LAYOUT

EUT	SPECTRUM
	ANALYZER

10.4 EUT OPERATION DURING TEST

The EUT was programmed to be in continuously un-modulation transmitting mode.

10.5 TEST RESULTS

Temperature :	26 ℃	Relative Humidity :	54%			
Pressure :	1012 hPa	Test Voltage :	DC 24V			
Test Band :	5.2G & 5.8G					
Note: All channels have been tested, and only the worst test data is recorded in this report.						







5.2G:

802	2.11a			
		Reference Frequency	(Middle Channel): 5180MHz	Z
	Environment	Power Supplied	Frequency Measu	re with Time Elapsed
	Temperature (°C)	(VDC)	MCF	Error (ppm)
	50	24	56	0.01002
	40	24	45	0.00766
	30	24	33	0.00616
	20	24	28	0.00459
	10	24	24	0.00427
	0	24	15	0.00279
	-10	24	14	0.00271
	-20	24	24	0.00408
	-30	24	37	0.00630

802.11 n20

02.11120							
Reference Frequency(Middle Channel): 5180 MHz							
Environment	Power Supplied	Frequency Measure with Time Elapsed					
Temperature (°C)	(VDC)	MCF	Error (ppm)				
50	24	62	0.01121				
40	24	52	0.00918				
30	24	42	0.00782				
20	24	32	0.00587				
10	24	23	0.00432				
0	24	26	0.00483				
-10	24	22	0.00414				
-20	24	36	0.00656				
-30	24	40	0.00787				





80<u>2.11n40</u>

		Reference Frequency(Middle Channel): 5190MHz							
	Environment	Power Supplied	Frequency Measure with Time Elapsed						
	Temperature (°C)	(VDC)	MCF	Error (ppm)					
	50	24	61	0.01087					
5	40	24	52	0.00902					
2	30	24	43	0.00779					
	20	24	44	0.00793					
	10	24	34	0.00621					
	0	24	22	0.00414					
	-10	24	36	0.00656					
	-20	24	43	0.00777					
	-30	24	51	0.00914					

802.11ac20

Reference Frequency(Middle Channel): 5180MHz				
Environment	Power Supplied	Frequency Measure with Time Elapsed		
Temperature (°C)	(VDC)	MCF	Error (ppm)	
50	24	57	0.00919	
40	24	43	0.00694	
30	24	31	0.00523	
20	24	25	0.00382	
10	24	24	0.00348	
0	24	13	0.00171	
-10	24	14	0.00193	
-20	24	20	0.00328	
-30	24	33	0.00527	



802.11 ac40

Reference Frequency(Middle Channel): 5190 MHz				
Environment Tomporature Power Supplied	Frequency Measure with Time Elapsed			
Temperature (°C)	(VDC)	MCF	Error (ppm)	
50	24	65	0.01058	
40	24	52	0.00851	
30	24	44	0.00707	
20	24	33	0.00521	
10	24	25	0.00362	
0	24	27	0.00413	
-10	24	23	0.00348	
-20	24	38	0.00591	
-30	24	45	0.00713	

802.11ac80

Reference Frequency(Middle Channel): 5210MHz				
Environment	Power Supplied	Frequency Measure	with Time Elapsed	
Temperature (°C)	(VDC)	MCF	Error (ppm)	
50	24	63	0.01057	
40	24	52	0.00866	
30	24	43	0.00711	
20	24	41	0.00676	
10	24	36	0.00589	
0	24	32	0.0052	
-10	24	34	0.00555	
-20	24	43	0.00711	
-30	24	52	0.00851	



So, Frequency Stability Versus Input Voltage is:

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802.11a

	Reference Frequency(Middle Channel): 5180 MHz			
	Environment	Power Supplied	Frequency Measure with Time Elapsed	
	Temperature (°C)	lemperature	Frequency	Error (ppm)
	50	24	56	0.01002
	40	24	45	0.00766
	-30	24	33	0.00616

802.11n20

Reference Frequency(Middle Channel): 5180 MHz				
Environment	Power Supplied Frequency Measure with		with Time Elapsed	
Temperature (°C)	(VDC)	Frequency	Error (ppm)	
50	24	62	0.01121	
40	24	52	0.00918	
-30	24	42	0.00782	

802.11n40

Reference Frequency(Middle Channel): 5190 MHz					
Environment	Power Supplied	Frequency Measure with Time Elaps			
Temperature (°C)	(VDC)	Frequency	Error (ppm)		
50	24	61	0.01087		
40	24	52	0.00902		
-30	24	51	0.00914		

802.11ac20

Reference Frequency(Middle Channel): 5180 MHz				
Environment	Power Supplied	Frequency Measure with Time Elapsed		
Temperature (°C)	(VDC)	Frequency	Error (ppm)	
50	24	57	0.00919	
40	24	43	0.00694	
-30	24	33	0.00527	





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802.11ac40

	Reference Frequency(Middle Channel): 5190 MHz					
	Environment Temperature Power Supplied		Frequency Measure with Time Elapsed			
	Temperature (°C)	(VDC)	Frequency	Error (ppm)		
	50	24	65	0.01058		
	40	24	52	0.00851		
2	-30	24	45	0.00713		

802.11ac80

Reference Frequency(Middle Channel): 5210 MHz				
Environment	Power Supplied	Frequency Measure with Time Elapsed		
Temperature (°C)	(VDC)	Frequency	Error (ppm)	
50	24	63	0.01057	
40	24	52	0.00866	
-30	24	52	0.00851	



5.8G:

802	2.11a			50	
	Reference Frequency(Middle Channel): 5745MHz				
	Environment	Power Supplied	Frequency Measure	with Time Elapsed	
	Temperature (°C)	(VDC)	MCF	Error (ppm)	
	50	24	46	0.00815	
5	40	24	27	0.00757	
	30	24	36	0.00462	
	20	24	23	0.00419	
	10	24	14	0.00306	
	0	24	16	0.00324	
	-10	24	13	0.00342	
	-20	24	27	0.00443	
	-30	24	38	0.00632	

80<u>2.11n20</u>

Reference Frequency(Middle Channel): 5745MHz				
Environment	Power Supplied	Frequency Measure with Time Elapsed		
Temperature (°C)	(VDC)	MCF	Error (ppm)	
50	24	42	0.00658	
40	24	24	0.00534	
30	24	32	0.00385	
20	24	24	0.00347	
10	24	13	0.00157	
0	24	12	0.00139	
-10	24	13	0.00157	
-20	24	21	0.00295	
-30	24	32	0.00543	







80<u>2.11n40</u>

	Reference Frequency(Middle Channel): 5755MHz			
	Environment	Power Supplied	Frequency Measure	with Time Elapsed
	Temperature (°C)	(VDC)	MCF	Error (ppm)
	50	24	62	0.00953
5	40	24	54	0.00801
	30	24	42	0.00725
	20	24	44	0.00759
	10	24	34	0.00587
	0	24	32	0.00552
	-10	24	34	0.00587
	-20	24	42	0.00725
	-30	24	51	0.00884

802.11ac20

	Reference Frequency(I	Middle Channel): 5745 MHz	
Environment	Power Supplied	Frequency Measure	with Time Elapsed
Temperature (°C)	(VDC)	MCF	Error (ppm)
50	24	43	0.00709
40	24	51	0.00648
30	24	23	0.00375
20	24	26	0.00515
10	24	23	0.00374
0	24	26	0.00415
-10	24	22	0.00346
-20	24	36	0.00588
-30	24	26	0.00462



802.11ac40

		Reference Frequency	(Middle Channel): 5755MHz	
	Environment	Power Supplied	Frequency Measure	with Time Elapsed
	Temperature (°C)	(VDC)	MCF	Error (ppm)
	50	24	60	0.00675
5	40	24	55	0.00614
2	30	24	47	0.00341
	20	24	45	0.00481
	10	24	32	0.0034
	0	24	26	0.00381
	-10	24	38	0.00312
	-20	24	43	0.00554
	-30	24	54	0.00428

802.11ac80

	Reference Frequency(Middle Channel): 5775MHz	
Environment	Power Supplied	Frequency Measure	with Time Elapsed
Temperature (°C)	(VDC)	MCF	Error (ppm)
50	24	52	0.00866
40	24	41	0.00705
30	24	43	0.00711
20	24	41	0.00676
10	24	36	0.00589
0	24	32	0.0052
-10	24	34	0.00555
-20	24	32	0.0052
-30	24	52	0.00866





So, Frequency Stability Versus Input Voltage is:



802.11a

		Reference Frequency(I	Middle Channel): 5745 MHz		
	Environment	Power Supplied	Frequency Measure with Time Elapsed		
	Temperature (°C)	(VDC)	Frequency	Error (ppm)	
λ	50	24	46	0.00815	
	40	24	27	0.00757	
	-30	24	38	0.00632	

802.11n20

	Reference Frequency(Middle Channel): 5745 MHz	
Environment	Power Supplied	Frequency Measure with Time Elapsed	
Temperature (°C)	(VDC)	Frequency	Error (ppm)
50	24	42	0.00658
40	24	24	0.00534
-30	24	32	0.00543

80<u>2.11n40</u>

	Reference Frequency(Middle Channel): 5755 MHz	
Environment	Power Supplied	Frequency Measure with Time Elapsed	
Temperature (°C)	(VDC)	Frequency	Error (ppm)
50	24	62	0.00953
40	24	54	0.00801
-30	24	51	0.00884

80<u>2.11ac20</u>

	Reference Frequency(I	Middle Channel): 5745 MHz	
Environment	Power Supplied	Frequency Measure with Time Elapsed	
Temperature (°C)	(VDC)	Frequency	Error (ppm)
50	24	43	0.00709
40	24	51	0.00648
-20	24	36	0.00588









802.11ac40

	Reference Frequency(Middle Channel): 5755 MHz				
	Environment	Power Supplied (VDC)	Frequency Measure with Time Elapsed		
	Temperature (°C)		Frequency	Error (ppm)	
	50	24	60	0.00675	
	40	24	55	0.00614	
2	-20	24	43	0.00554	

802.11ac80

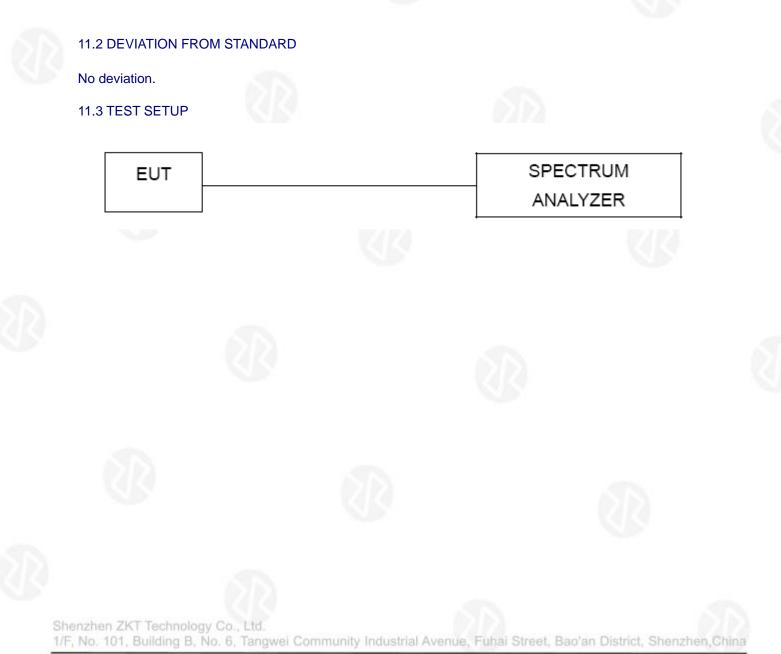
Reference Frequency(Middle Channel): 5775 MHz				
Environment	Power Supplied (VDC)	Frequency Measure with Time Elapsed		
Temperature (°C)		Frequency	Error (ppm)	
50	24	52	0.00866	
40	24	41	0.00705	
-30	24	52	0.00866	



11.1 APPLIED PROCEDURES / LIMIT

Measurements of duty cycle and transmission duration shall be performed using one of the following techniques:

- a) A diode detector and an oscilloscope that together have a sufficiently short response time to permit accurate measurements of the ON and OFF times of the transmitted signal.
- b) The zero-span mode on a spectrum analyzer or EMI receiver if the response time and spacing between bins on the sweep are sufficient to permit accurate measurements of the ON and OFF times of the transmitted signal:
 - 1) Set the center frequency of the instrument to the center frequency of the transmission.
 - 2) Set RBW ≥ OBW if possible; otherwise, set RBW to the largest available value.
 - Set VBW ≥ RBW. Set detector = peak or average.
 - 4) The zero-span measurement method shall not be used unless both RBW and VBW are > 50/T and the number of sweep points across duration *T* exceeds 100. (For example, if VBW and/or RBW are limited to 3 MHz, then the zero-span method of measuring the duty cycle shall not be used if $T \le 16.7 \,\mu s$.)









11.4 TEST RESULTS

		5.20	3	
Mode	Frequency	Duty Cycle	Duty Cycle	Result
	(MHz)	(%)	Correction Factor (dB)	
802.11a	5180	88.89	0.51	Pass
802.11n20	5180	89.13	0.5	Pass
802.11n40	5190	89.36	0.49	Pass
802.11ac20	5180	88.89	0.51	Pass
802.11ac40	5190	88.89	0.51	Pass
802.11ac80	5210	89.13	0.5	Pass

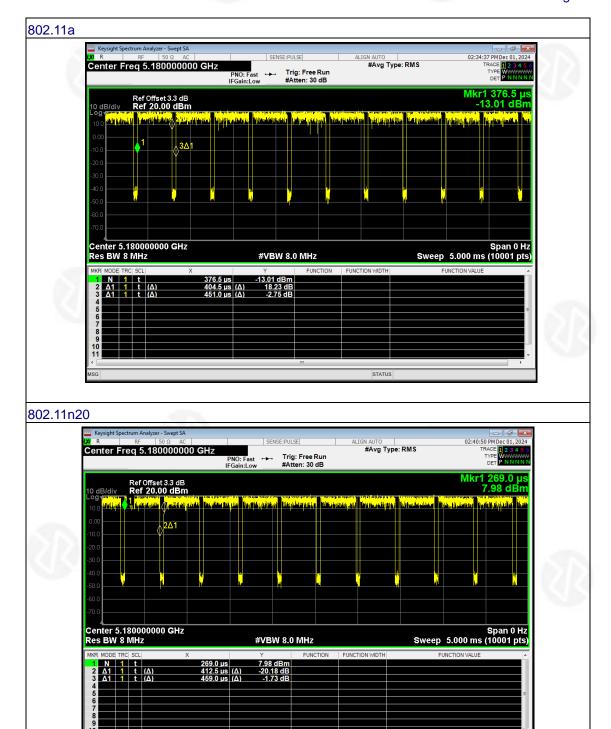
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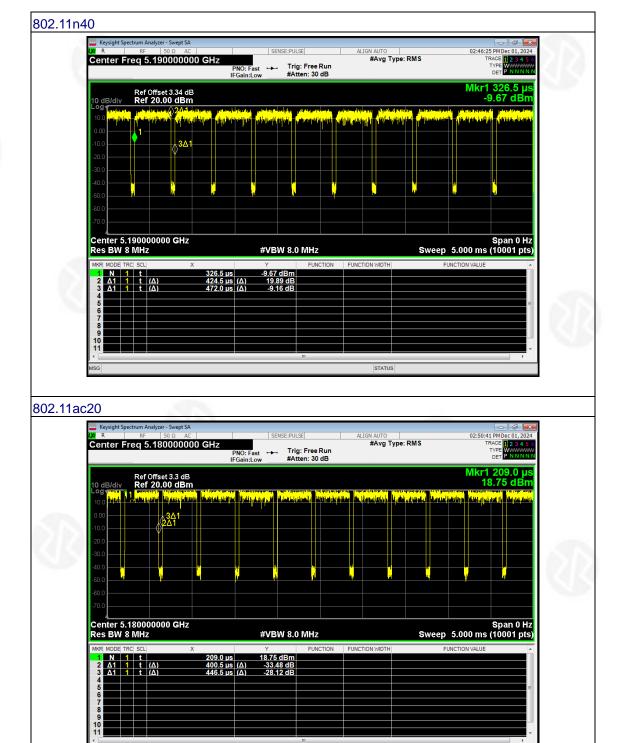


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STATUS







8

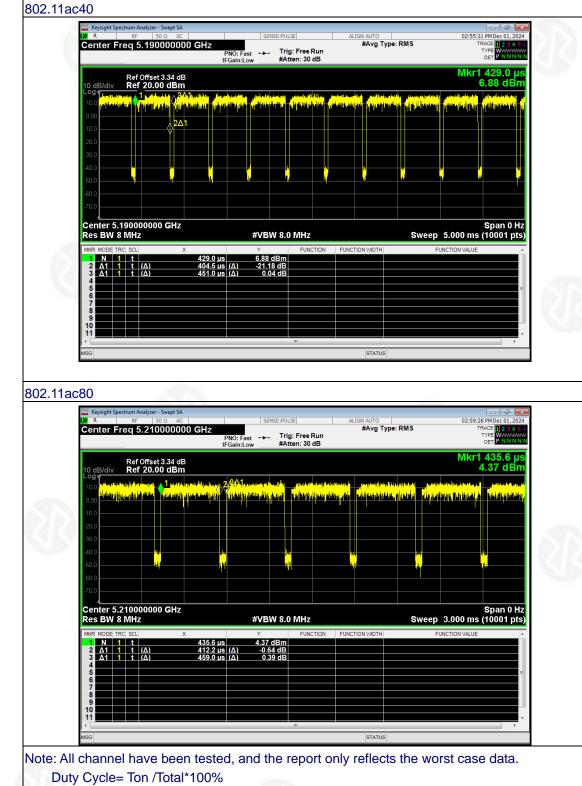
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STATUS





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Duty Cycle Correction Factor = 10log (1/Duty Cycle)

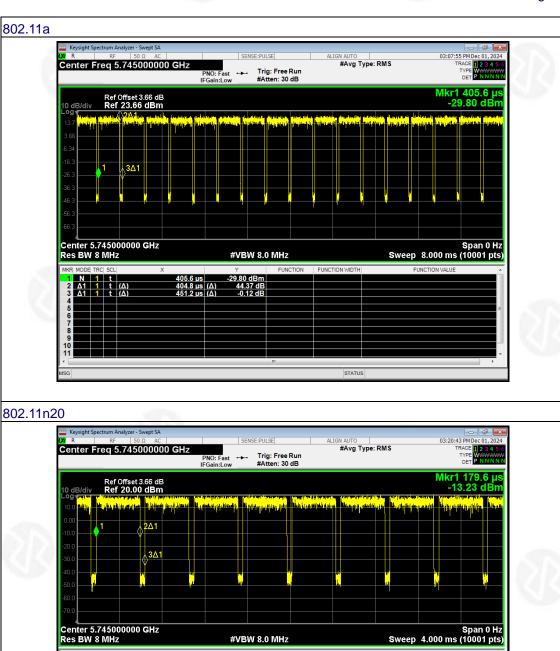




5.8G				
Mode	Frequency (MHz)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)	Result
802.11a	5745	88.89	0.51	Pass
802.11n20	5745	89.13	0.50	Pass
802.11n40	5755	89.36	0.49	Pass
802.11ac20	5745	90.91	0.41	Pass
802.11ac40	5755	88.89	0.51	Pass
802.11ac80	5775	89.13	0.5	Pass



3 5









13.23

-0.02 dB -22.15 dB

179.6 μs 412.8 μs (Δ) 458.8 μs (Δ)

Δ1 1 t (Δ) Δ1 1 t (Δ)

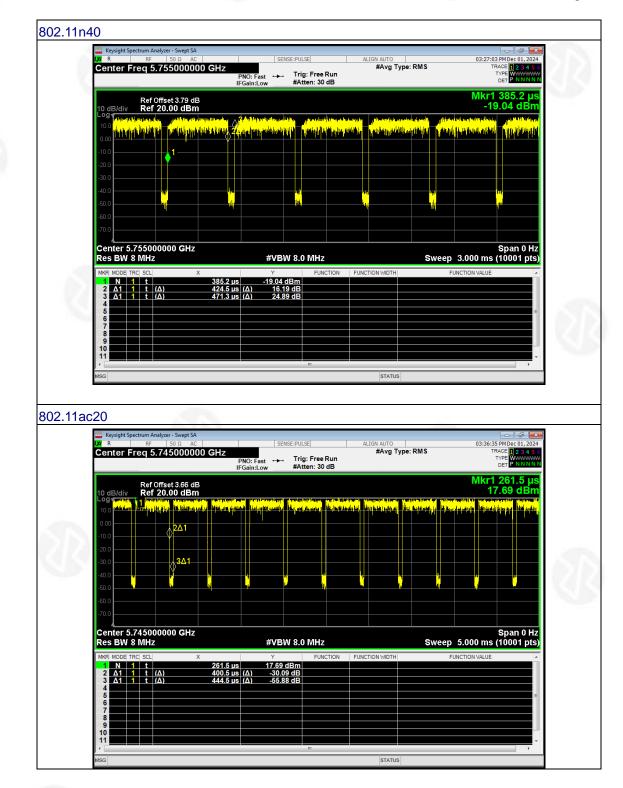


STATUS





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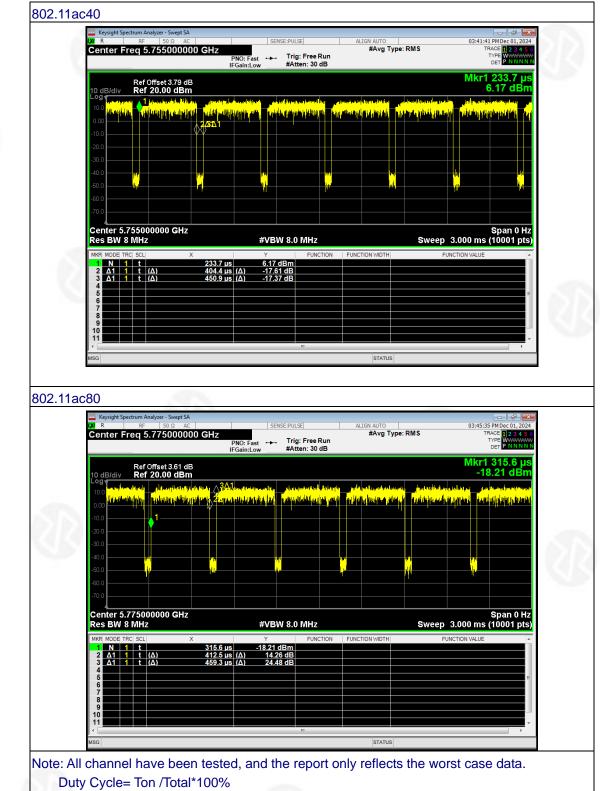


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Duty Cycle Correction Factor = 10log (1/Duty Cycle)



12.ANTENNA REQUIREMENT



Standard requirement:

FCC Part15 C Section 15.203

15.203 requirement:

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

EUT Antenna:

The antenna is PCB Antenna, the best case gain of the antenna is 0.72dBi (Max), reference to the appendix II for details



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13. TEST SETUP PHOTO

Reference to the appendix I for details.

14. EUT CONSTRUCTIONAL DETAILS

Reference to the appendix II for details.

***** END OF REPORT ****



