8. DUTY CYCLE

8.1. Test Procedure

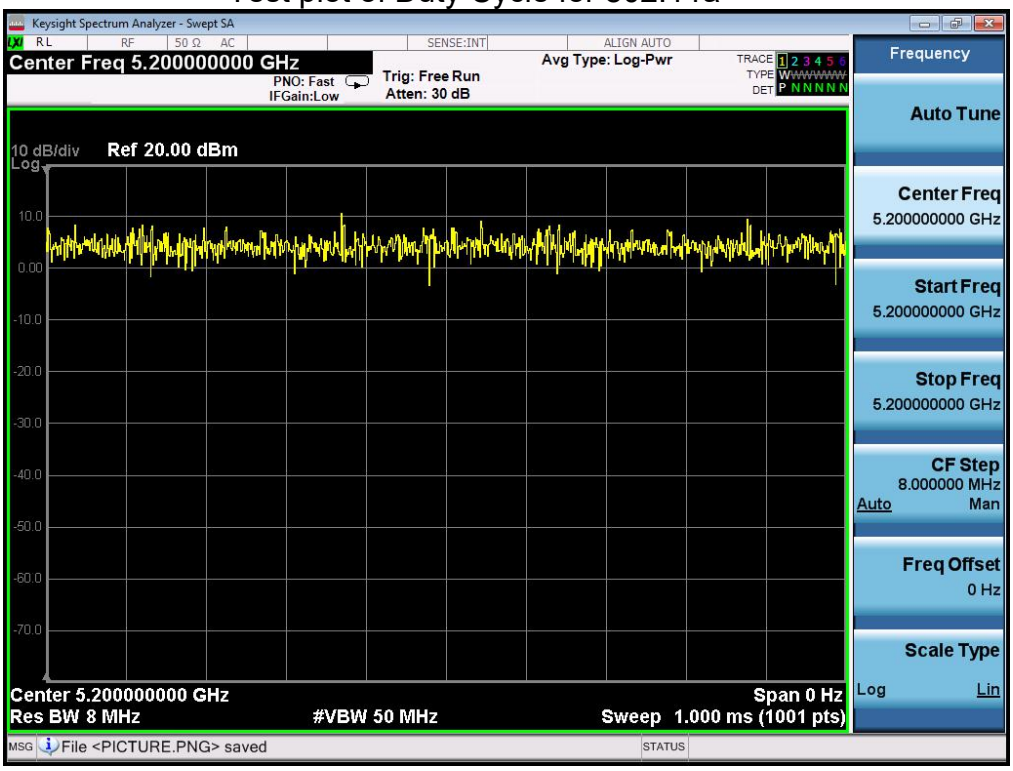
The zero-span mode on a spectrum analyzer or EMI receiver if the response time and spacing between bins on the sweep are sufficient to permit accurate measurements of the on and off times of the transmitted signal. Set the center frequency of the instrument to the center frequency of the transmission. Set RBW ≥ OBW if possible; otherwise, set RBW to the largest available value. Set VBW ≥ RBW. Set detector = peak or average. 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 to3 MHz, then the zero-span method of measuring duty cycle shall not be used if T ≤ 16.7 microseconds.)

The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator.
The path loss was compensated to the results for each measurement.
Set to the maximum power setting and enable the EUT transmit continuously.
The EUT was operating in controlled its channel.
Use the following spectrum analyzer settings:
Span = Zero Span
RBW = 8MHz
VBW = 50MHz
Number of points in Sweep >100
Detector function = peak
Trace = Clear write Measure Ttotal and Ton
Calculate Duty Cycle = Ton / Ttotal and Duty Cycle Factor=10*log(1/Duty Cycle)

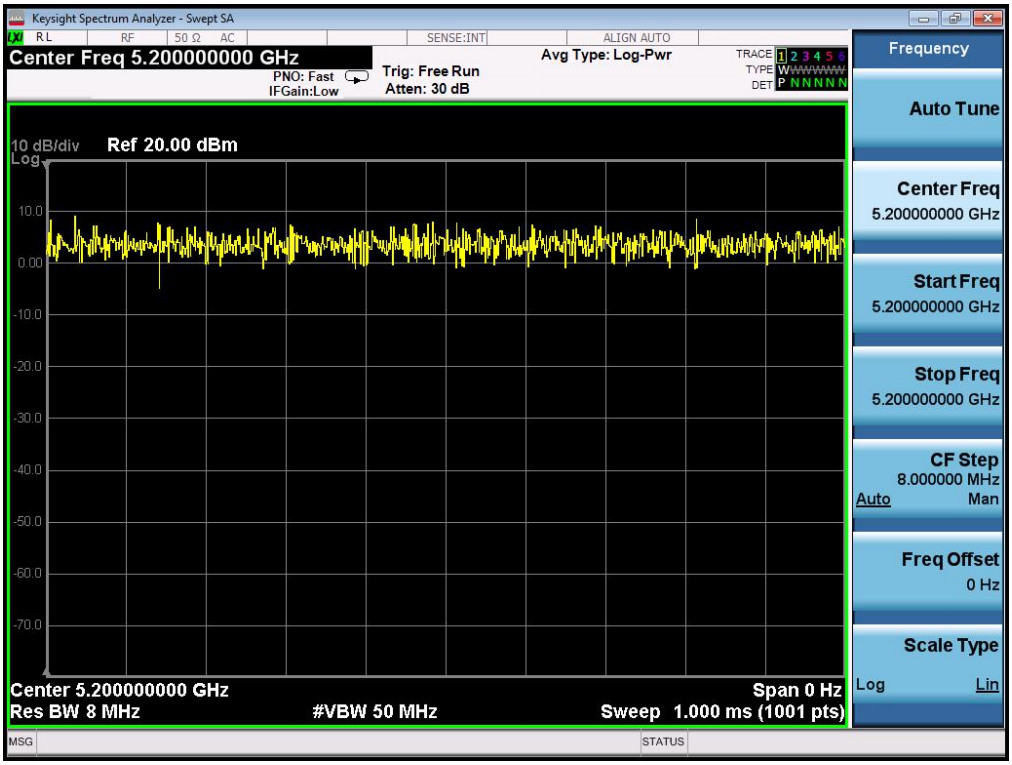
8.2. Test Setup

A Antenna

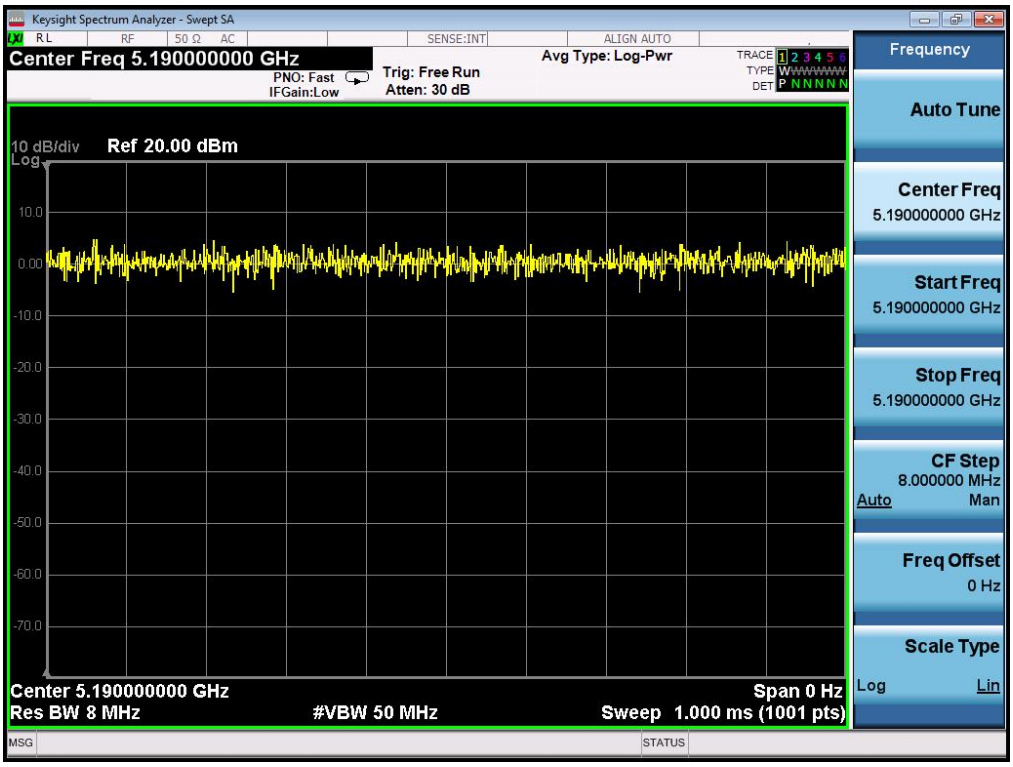
Test plot of Duty Cycle for 802.11a



Test plot of Duty Cycle for 802.11n(HT20)

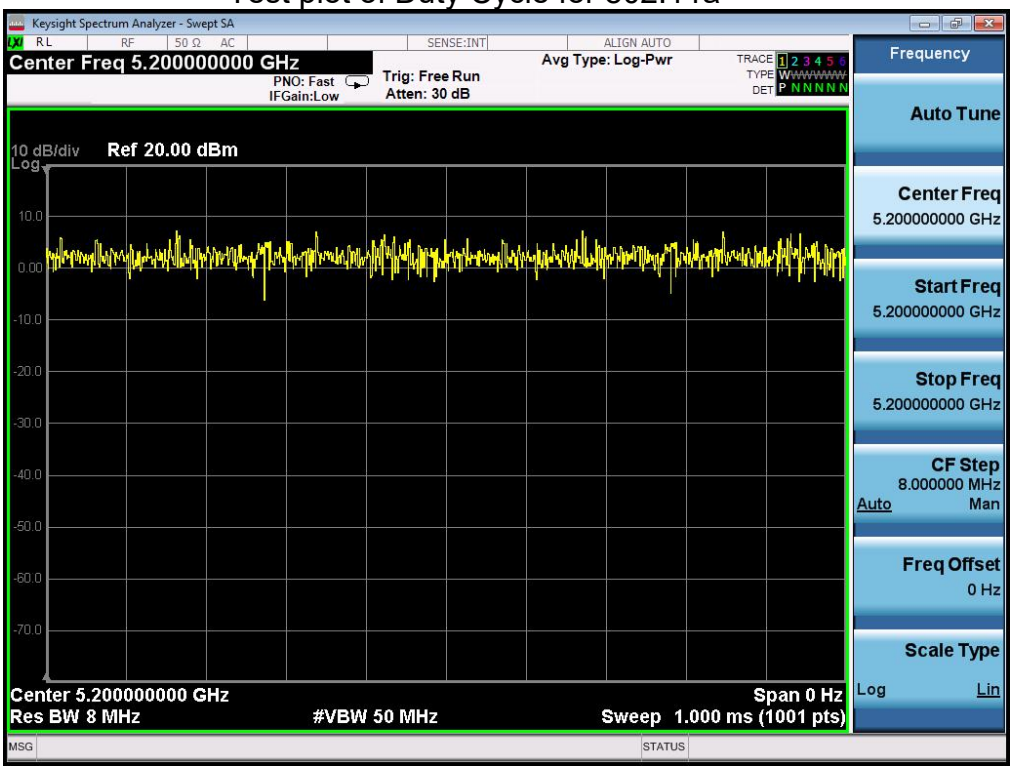


Test plot of Duty Cycle for 802.11n(HT40)

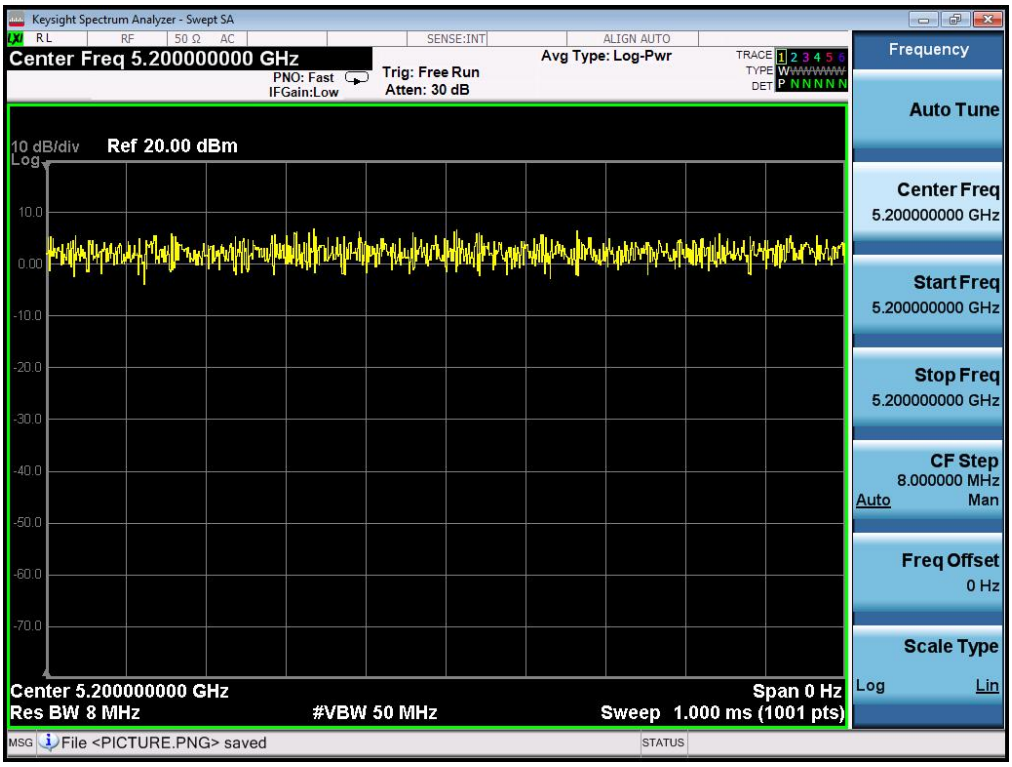


B Antenna

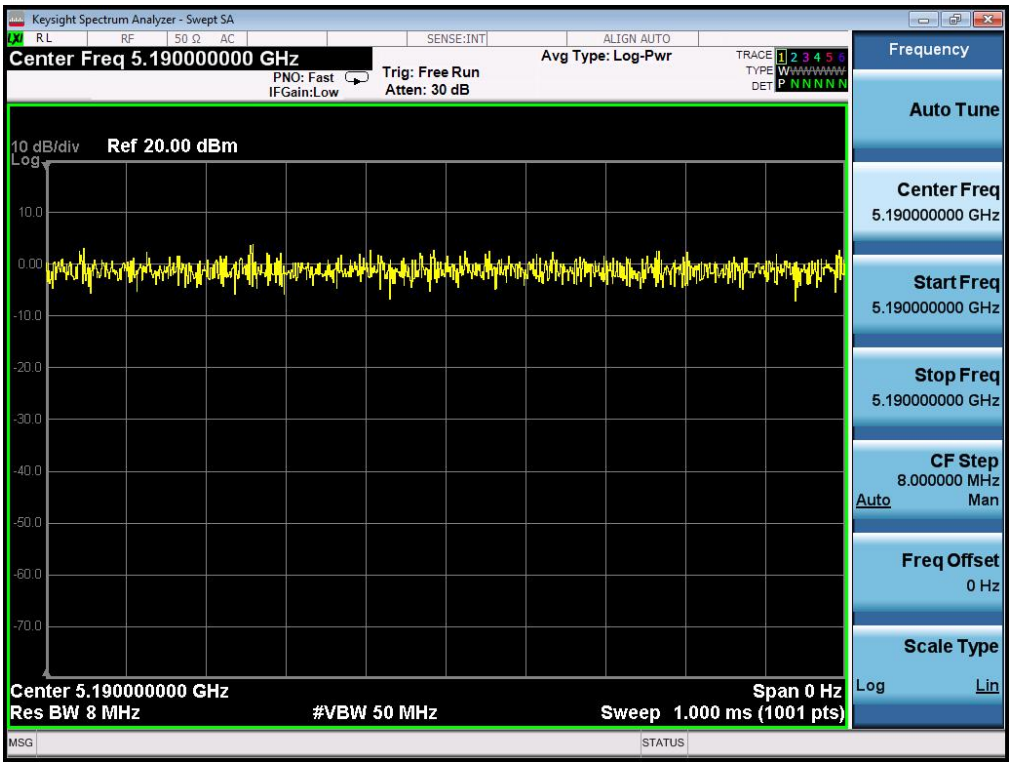
Test plot of Duty Cycle for 802.11a



Test plot of Duty Cycle for 802.11n(HT20)



Test plot of Duty Cycle for 802.11n(HT40)



9. PEAK POWER SPECTRAL DENSITY TEST

9.1.Limits

Band 5.15-5.25GHz:

FCC: In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band.

9.2.Test setup

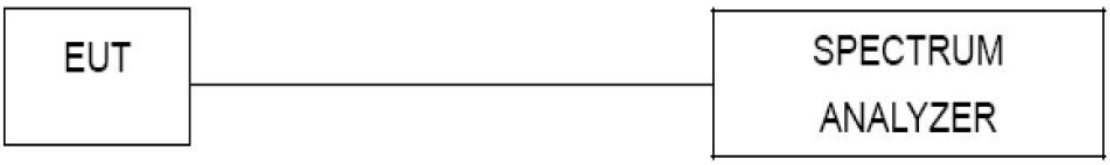
Methods refer to FCC KDB 789033

1) Create an average power spectrum for the EUT operating mode being tested by following the instructions in section E)2) for measuring maximum conducted output power using a spectrum analyzer or EMI receiver: select the appropriate test method (SA-3, or alternatives to each) and apply it up to, but not including, the step labeled, “Compute power…”.

2) Use the peak search function on the instrument to find the peak of the spectrum.

3) The result is the PPSD.

4) The above procedures make use of 1 MHz resolution bandwidth to satisfy the 1 MHz measurement bandwidth specified in the 15.407(a)(5). That rule section also permits use of resolution bandwidths less than 1 MHz “provided that the measured power is integrated to show the total power over the measurement bandwidth” (i.e., 1 MHz). If measurements are performed using a reduced resolution bandwidth and integrated over 1 MHz bandwidth



9.3.Test data

Model	Channel Frequency (MHz)	Power density (dBm/1MHz)		Total PSD	Limit (dBm/1MHz)	Result
		Ant A	Ant B			
802.11a	5180	-1.608	-2.883	-	11.0	Pass
	5200	-0.656	-2.566	-	11.0	Pass
	5240	0.755	-1.303	-	11.0	Pass
802.11n (HT20)	5180	-1.127	-3.142	0.99	8.7	Pass
	5200	-0.631	-2.646	1.49	8.7	Pass
	5240	0.763	-1.170	2.91	8.7	Pass
802.11n (HT40)	5190	-4.622	-6.282	-1.42	8.7	Pass
	5230	-2.781	-5.122	-0.70	8.7	Pass

A Antenna

802.11a 5180MHz

802.11a 5200MHz

802.11a 5240MHz

802.11n(20) 5180MHz

802.11n(HT20) 5200MHz

802.11n(HT20)　5240MHz

802.11n (HT40) 5190MHz

802.11n (HT40) 5230MHz

B Antenna

802.11a 5180MHz

802.11a 5200MHz

802.11a 5240MHz

802.11n(20) 5180MHz

802.11n(HT20) 5200MHz

802.11n(HT20)　5240MHz

802.11n (HT40) 5190MHz

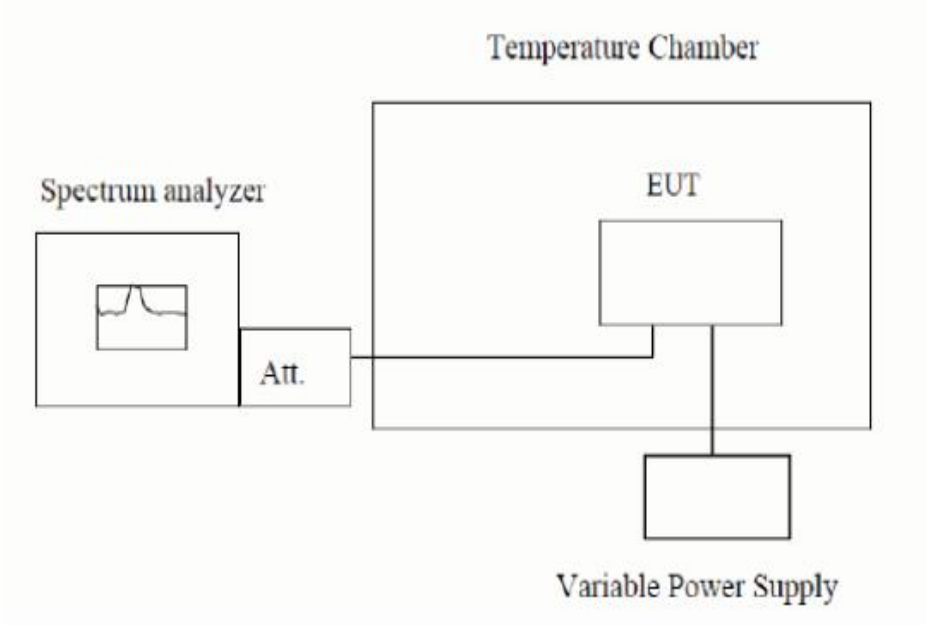
802.11n (HT40) 5230MHz

10. FREQUENCY STABILITY TEST

10.1. Limit

According to §15.407(g), manufacturers 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.

10.2. Test Configuration



10.3. Test Procedure

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 max hold settings.
5. fc is declaring of channel frequency. Then the frequency error formula is (fc-f)/fc × 106 ppm and the limit is less than ±20ppm (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 rule is -30°C~50°C..

10.4. Test result

Measurement Data : (the worst model was 802.11a)

Frequency Stability under Temperature

Operating Frequency: 5180 MHz				
Environment Temperature(oC)	Voltage(V)	Measured Frequency(MHz)	Test Result (MHz)	Max. Deviation (ppm)
50	120	5180	5180.0548	10.579
40	120	5180	5180.0652	12.587
30	120	5180	5180.0519	10.019
20	120	5180	5180.0542	10.463
10	120	5180	5180.0516	9.961
0	120	5180	5180.0653	12.606
-10	120	5180	5180.0545	10.521
-20	120	5180	5180.0672	12.973
-30	120	5180	5180.0548	10.579

Frequency Stability under Voltage

Operating Frequency: 5180 MHz			
DC Voltage(V)	Measured Frequency(MHz)	Test Result(MHz)	Max. Deviation(ppm)
108	5180	5180.0547	10.560
120	5180	5180.0519	10.019
132	5180	5180.0526	10.154

Frequency Stability under Temperature

Operating Frequency: 5200 MHz				
Environment Temperature(oC)	Voltage(V)	Measured Frequency(MHz)	Test Result (MHz)	Max. Deviation (ppm)
50	120	5200	5200.0612	11.769
40	120	5200	5200.0598	11.500
30	120	5200	5200.0586	11.269
20	120	5200	5200.0576	11.077
10	120	5200	5200.0563	10.827
0	120	5200	5200.0543	10.442
-10	120	5200	5200.0601	11.558
-20	120	5200	5200.0594	11.423
-30	120	5200	5200.0585	11.250

Frequency Stability under Voltage

Operating Frequency: 5200 MHz			
DC Voltage(V)	Measured Frequency(MHz)	Test Result(MHz)	Max. Deviation(ppm)
108	5200	5200.0488	9.385
120	5200	5200.0501	9.635
132	5200	5200.0531	10.212

Frequency Stability under Temperature

Operating Frequency: 5240 MHz				
Environment Temperature(oC)	Voltage(V)	Measured Frequency(MHz)	Test Result (MHz)	Max. Deviation (ppm)
50	120	5240	5240.0618	11.794
40	120	5240	5240.0598	11.412
30	120	5240	5240.0576	10.992
20	120	5240	5240.0582	11.107
10	120	5240	5240.0585	11.164
0	120	5240	5240.0607	11.584
-10	120	5240	5240.0623	11.889
-20	120	5240	5240.0605	11.546
-30	120	5240	5240.0597	11.393

Frequency Stability under Voltage

Operating Frequency: 5240 MHz			
DC Voltage(V)	Measured Frequency(MHz)	Test Result(MHz)	Max. Deviation(ppm)
108	5240	5240.0523	9.981
120	5240	5240.0497	9.485
132	5240	5240.0513	9.790

11. ANTENNA REQUIREMENTS

11.1.Limits

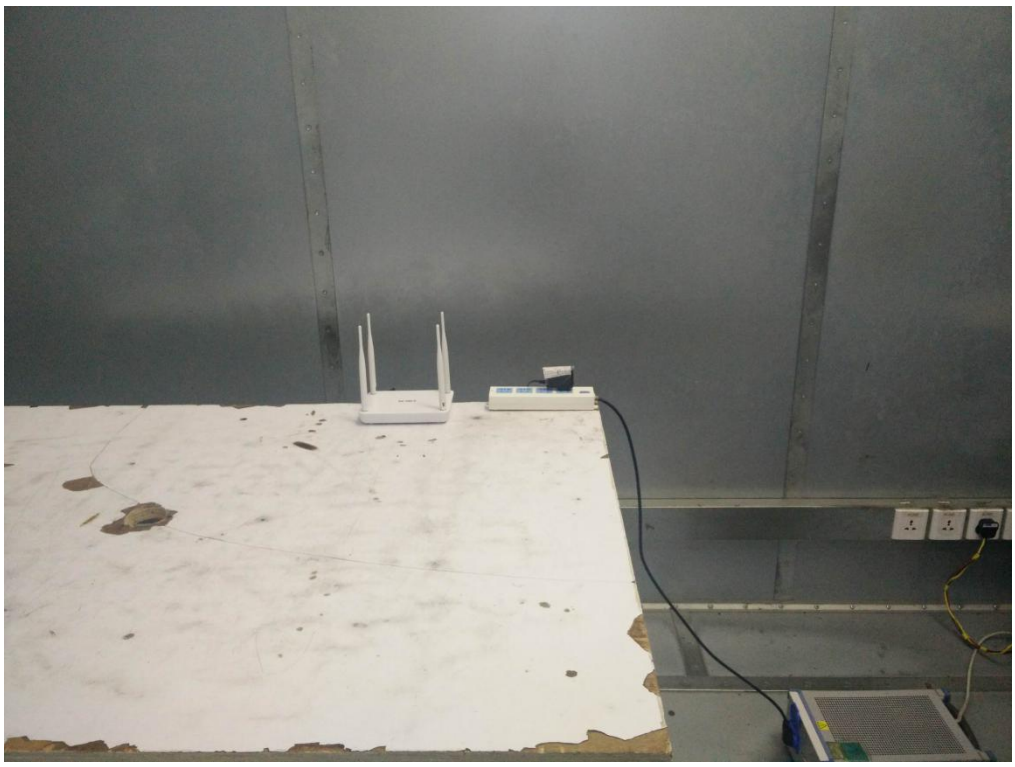
For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. And according to FCC 47 CFR Section 15.247 (b), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

11.2.Result

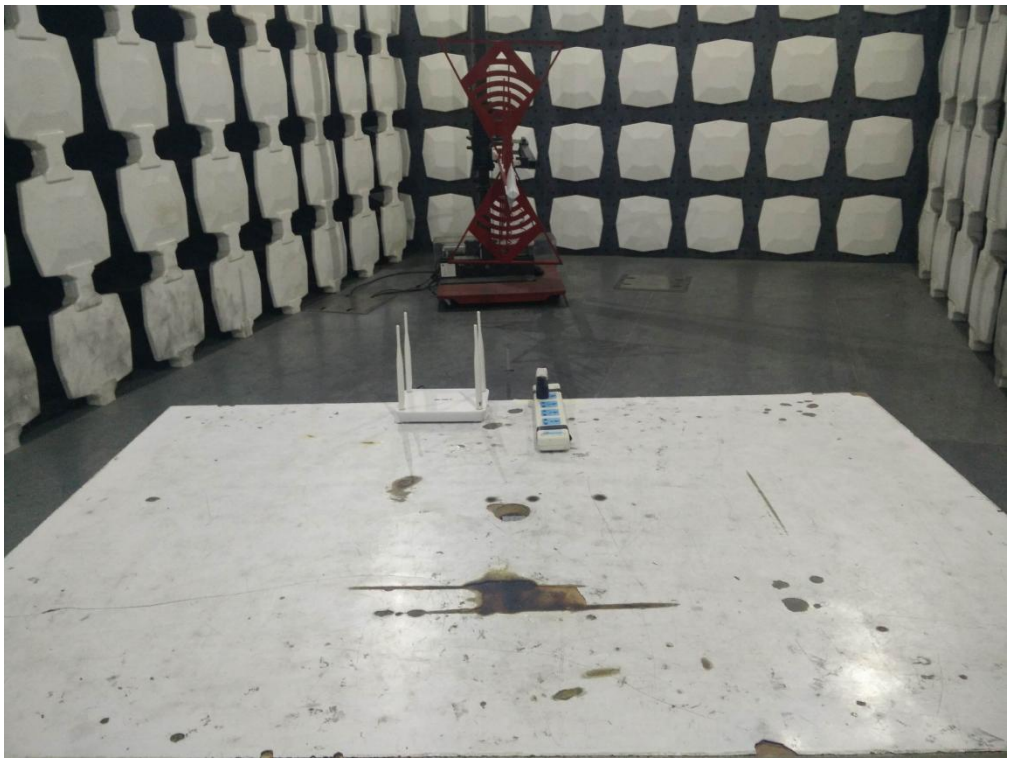
The antenna used for this product is external antenna(Cable antenna type) and that no antenna other than that furnished by the responsible party shall be used with the device, the maximum peak gain of the transmit antenna is only 5.3dBi.

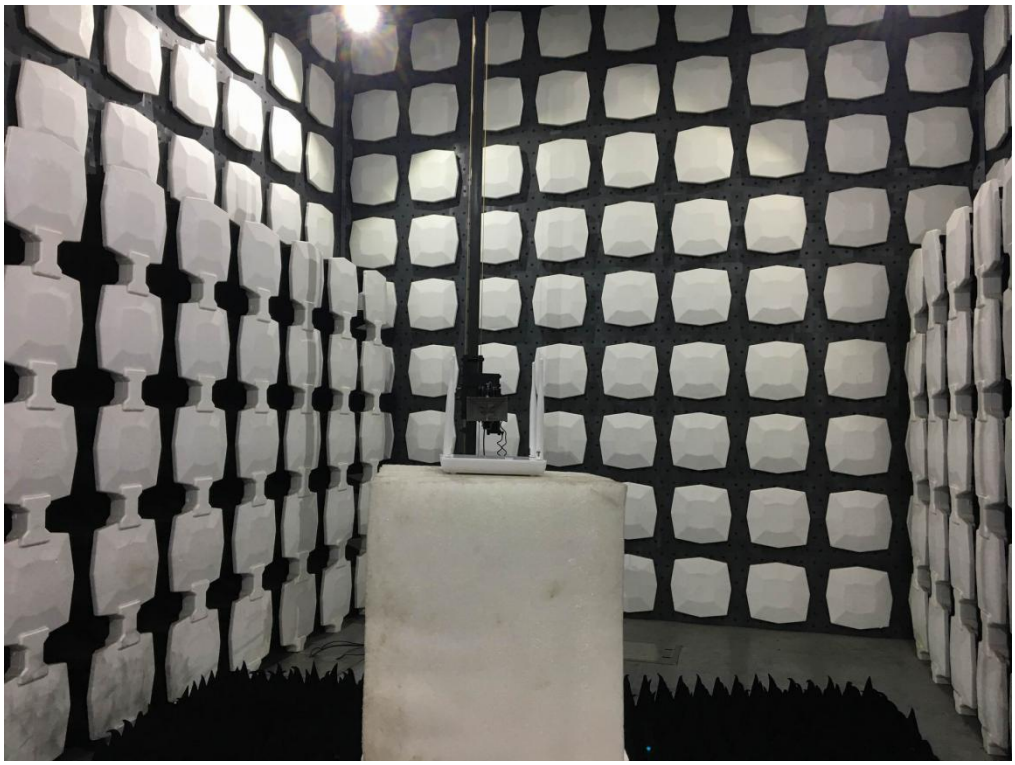
12. PHOTOGRAPHS OF TEST SET-UP

Conducted Emission

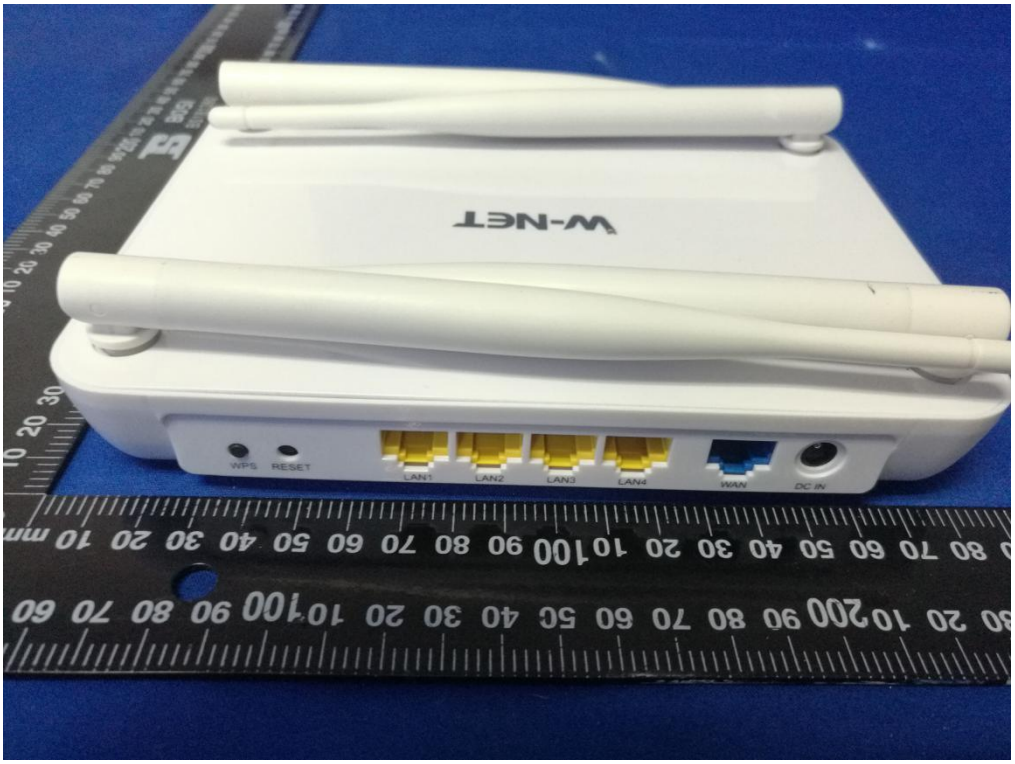


Radiated Emission Test





13. PHOTOGRAPHS OF THE EUT



*** the end of report ***