7. OUTPUT POWER TEST

7.1.Limits

Band 5.15-5.25GHz:

FCC: For mobile and portable client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi.

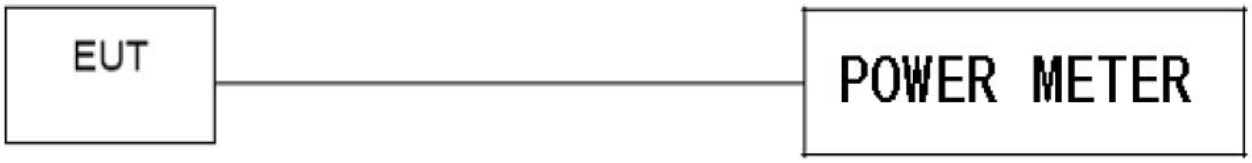
7.2.Test setup

1. The maximum average conducted output power can be measured using Method PM-G (Measurement using a gated RF average power meter):
2. Measurements may be performed using a wideband gated RF power meter provided that the gate parameters are adjusted such that the power is measured only when the EUT is transmitting at its maximum power control level. Since the measurement is made only during the ON time of the transmitter, no duty cycle correction factor is required.

a. The Transmitter output (antenna port) was connected to the power meter.

b. Turn on the EUT and power meter and then record the power value.

c. Repeat above procedures on all channels needed to be tested.



7.3.Test result

	Frequency (MHz)	Average Output Power (dBm)	FCC Limit (dBm)	Result
802.11a	5180	13.09	24	Pass
	5200	13.21	24	Pass
	5240	13.18	24	Pass
802.11n (HT20)	5180	12.62	24	Pass
	5200	12.35	24	Pass
	5240	12.31	24	Pass
802.11n (HT40)	5190	10.41	24	Pass
	5230	10.32	24	Pass
802.11ac (VHT20)	5180	11.06	24	Pass
	5200	11.13	24	Pass
	5240	11.12	24	Pass
802.11ac (VHT40)	5190	10.24	24	Pass
	5230	10.47	24	Pass
802.11ac (VHT80)	5210	9.92	24	Pass

NOTE: During the test the EUT is in 100% duty cycle transmitting.

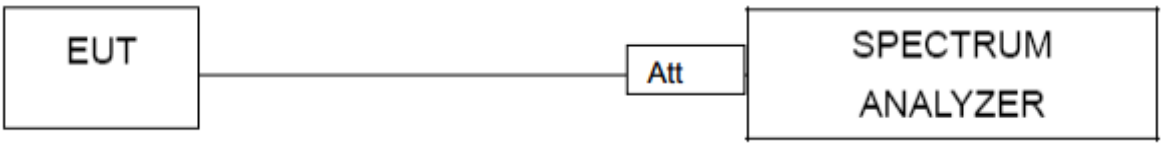
8. DUTY CYCLE

8.1.Test Procedure

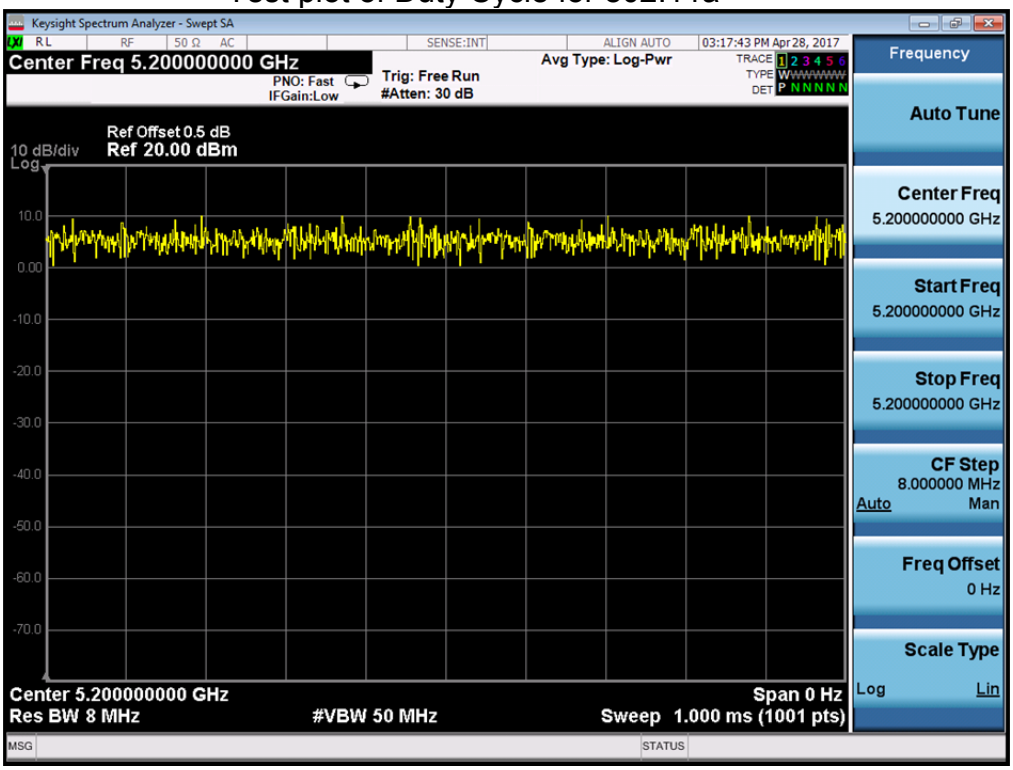
The zero-span mode on a spectrum analyzer or EMI receiver if the response time and spacing between bins on the sweep are sufficient to permit accurate measurements of the on and off times of the transmitted signal. Set the center frequency of the instrument to the center frequency of the transmission. 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)

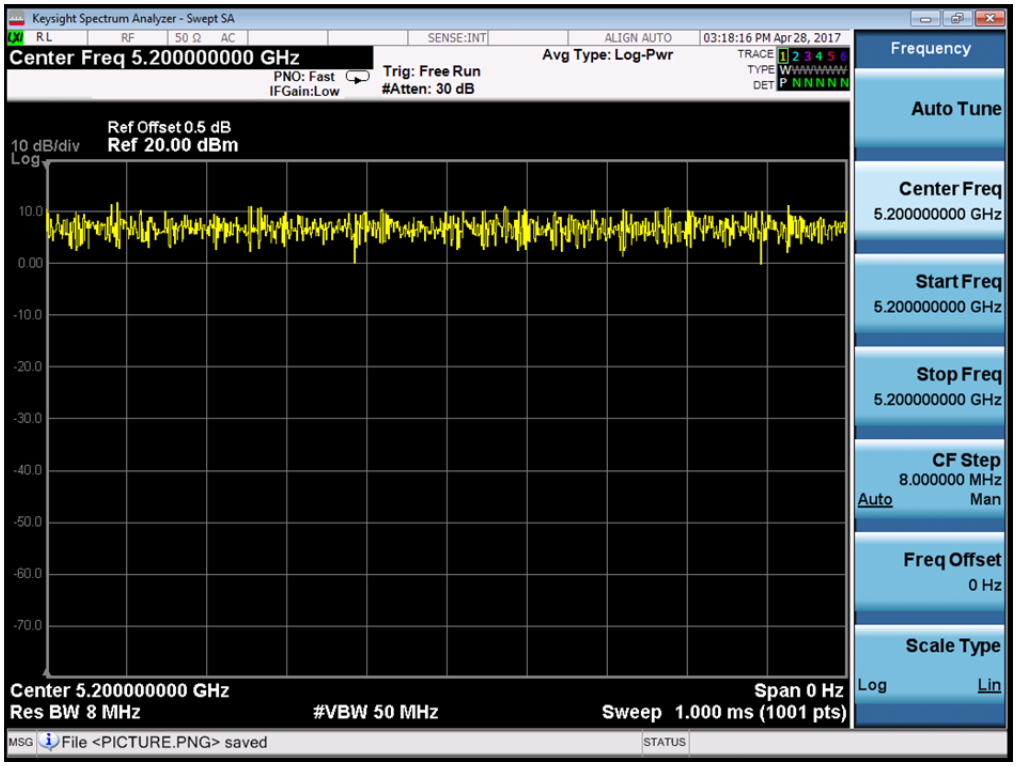
8.2.Test Setup



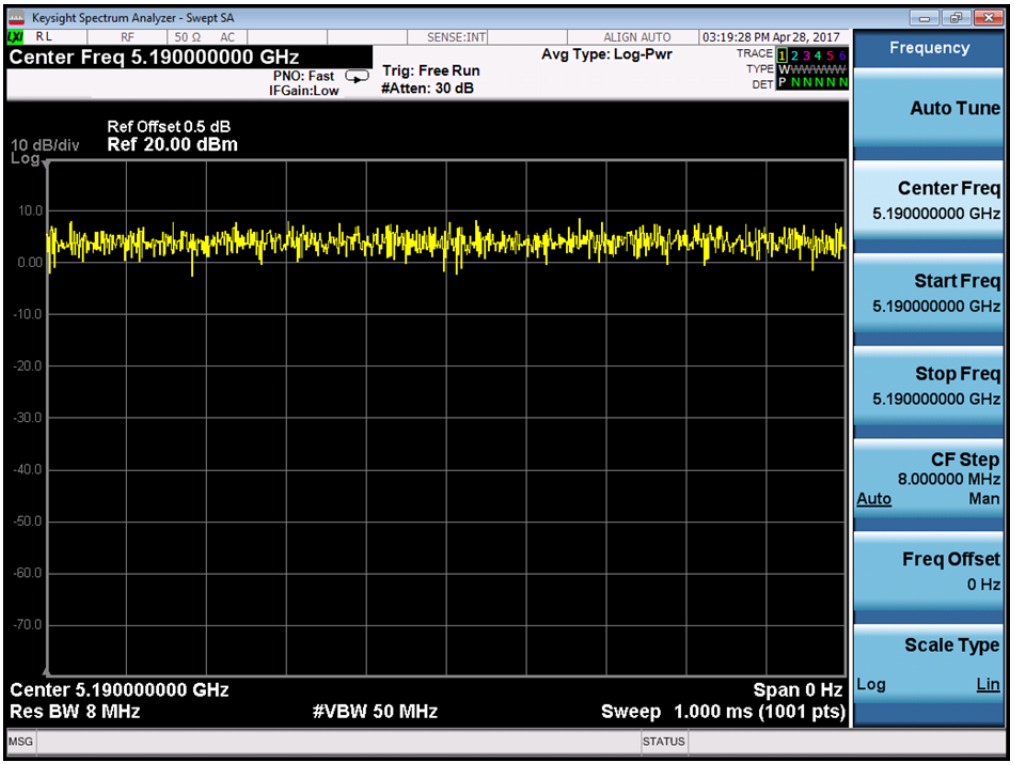
Test plot of Duty Cycle for 802.11a



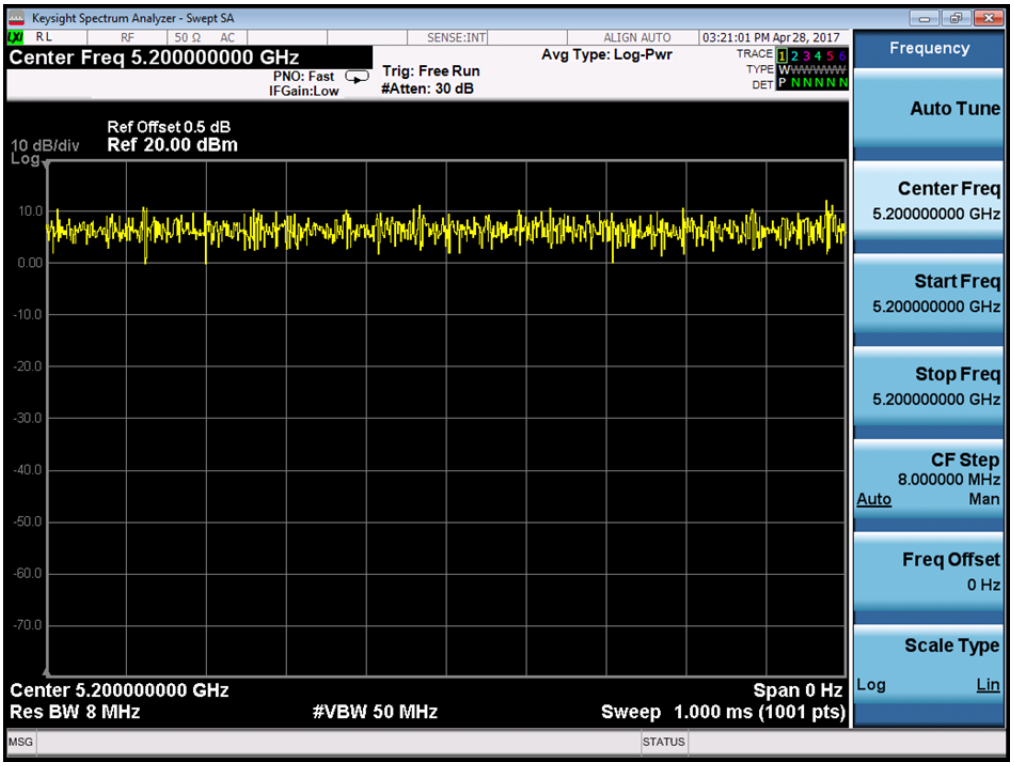
Test plot of Duty Cycle for 802.11n(HT20)



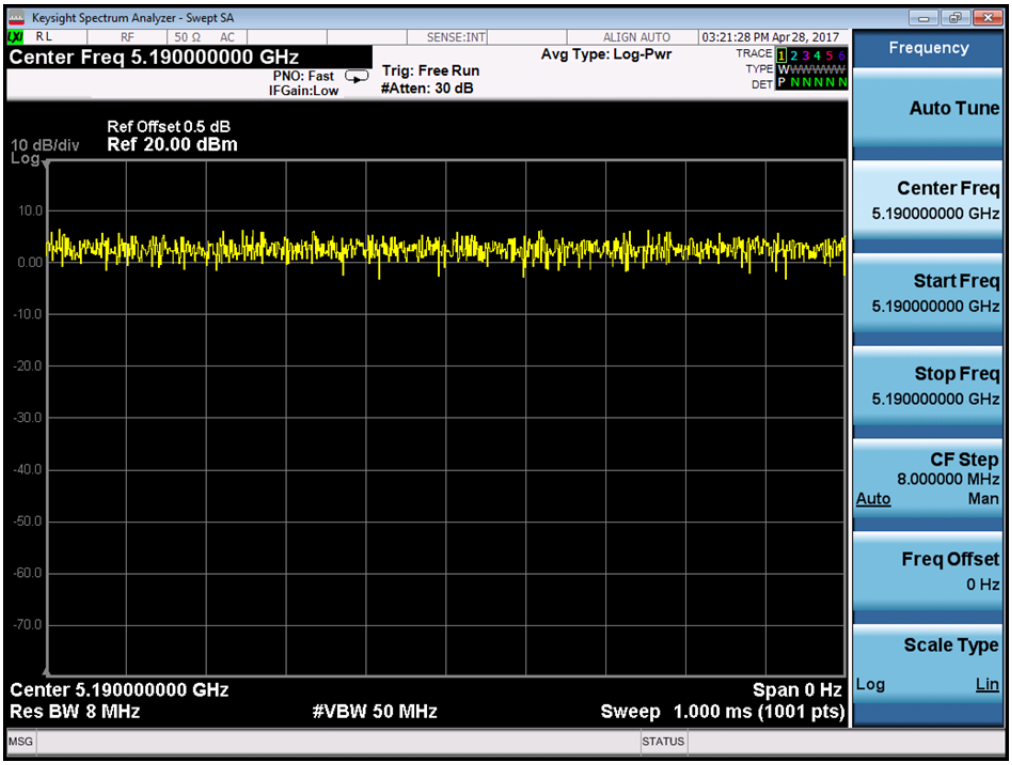
Test plot of Duty Cycle for 802.11n(HT40)



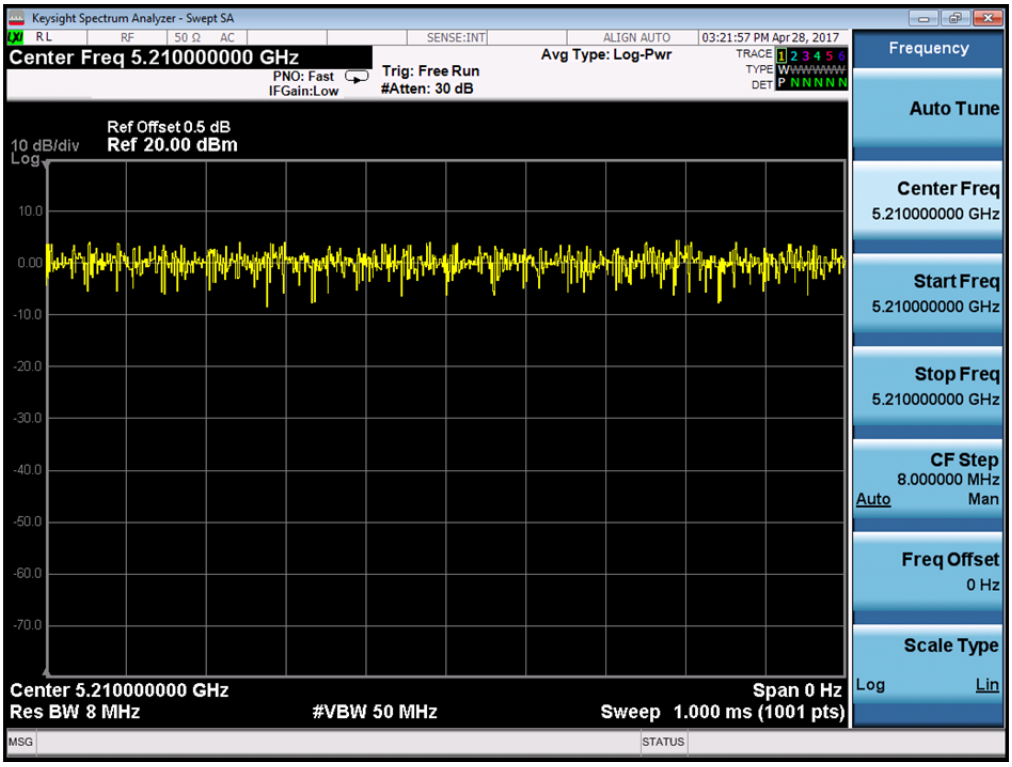
Test plot of Duty Cycle for 802.11ac(VHT20)



Test plot of Duty Cycle for 802.11 ac(VHT40)



Test plot of Duty Cycle for 802.11ac(VHT80)



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

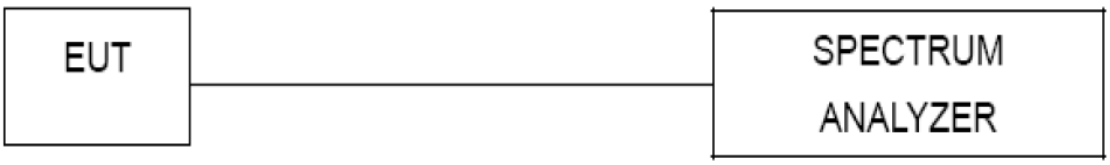
Methods refer to FCC KDB 789033

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

Test data as below

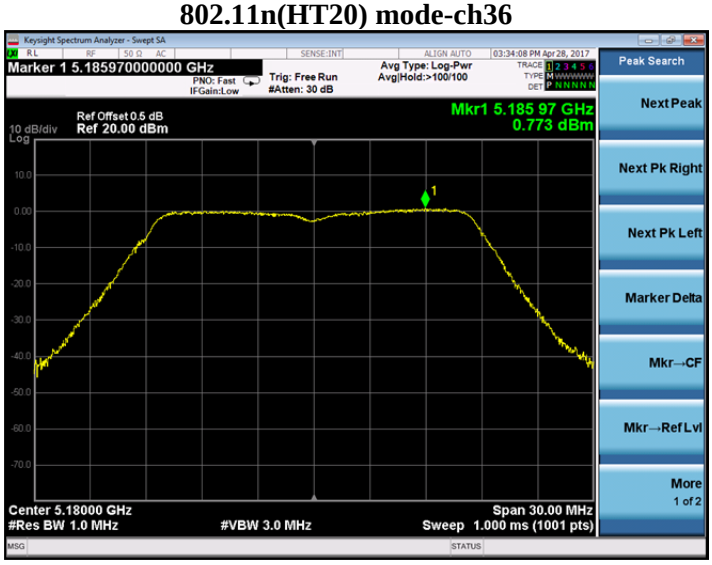
Mode	Frequency (MHz)	Power Density. Antenna (dBm/MHz)	FCC Limit (dBm)
802.11a	5180	-0.521	11
	5200	0.531	11
	5240	1.003	11
802.11n (HT20)	5180	0.773	11
	5200	1.857	11
	5240	1.997	11
802.11n (HT40)	5190	-3.402	11
	5230	-3.099	11
802.11ac (VHT20)	5180	0.778	11
	5200	1.229	11
	5240	1.693	11
802.11ac (VHT40)	5190	-3.434	11
	5230	-2.936	11
802.11ac (VHT80)	5210	-3.063	11

802.11a mode-ch36

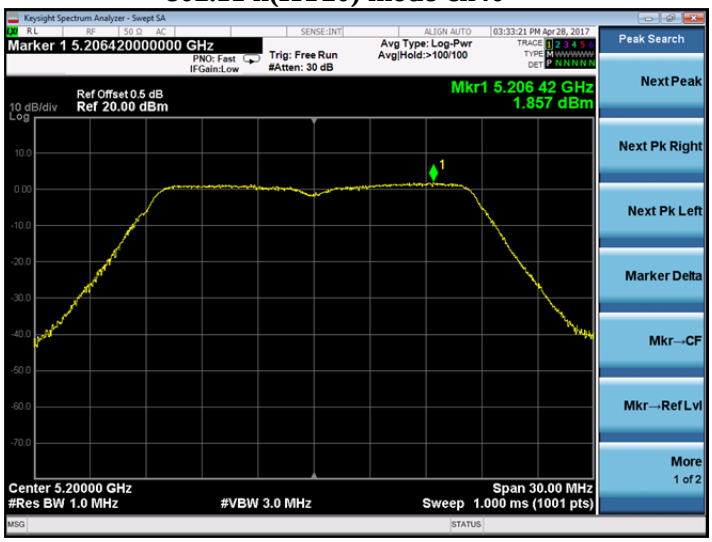
802.11a mode-ch40

802.11a mode-ch48

802.11n(HT20) mode-ch36

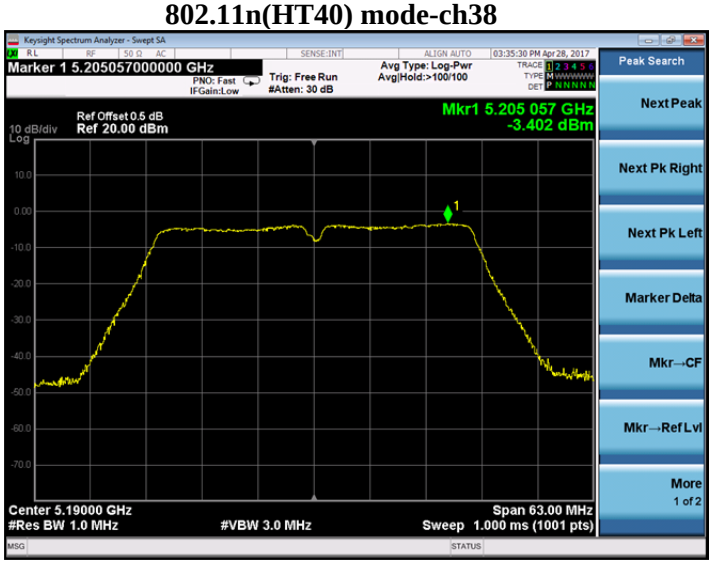


802.11 n(HT20) mode-ch40

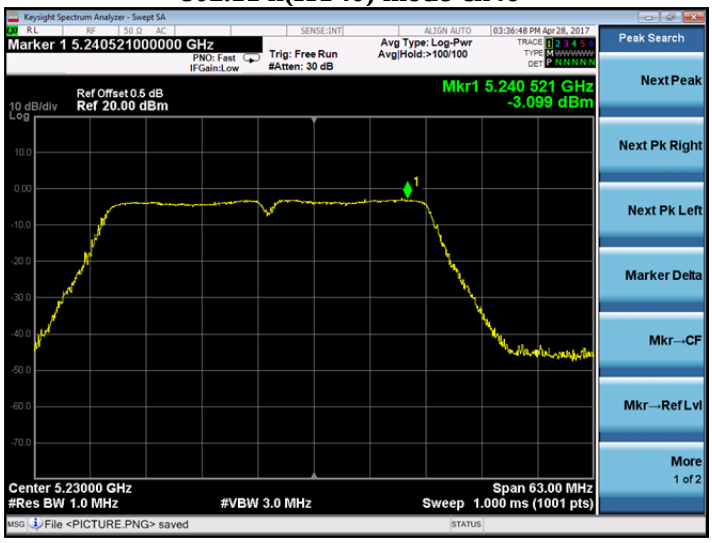


802.11 n(HT20) mode-ch48

802.11n(HT40) mode-ch38

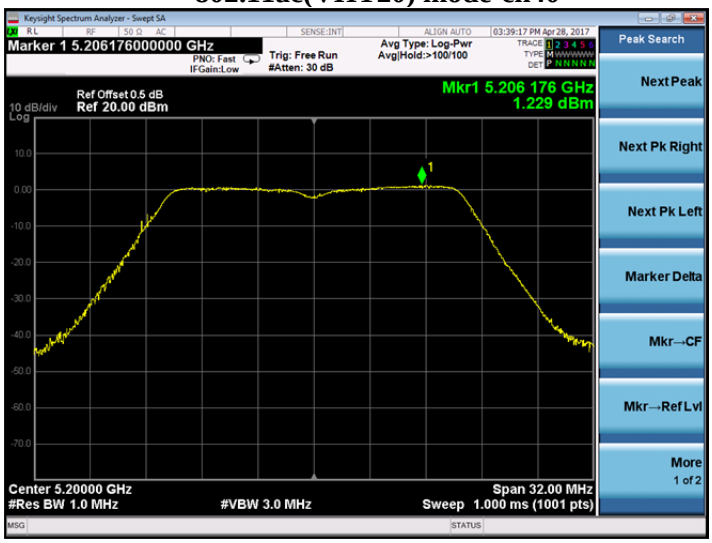


802.11 n(HT40) mode-ch46

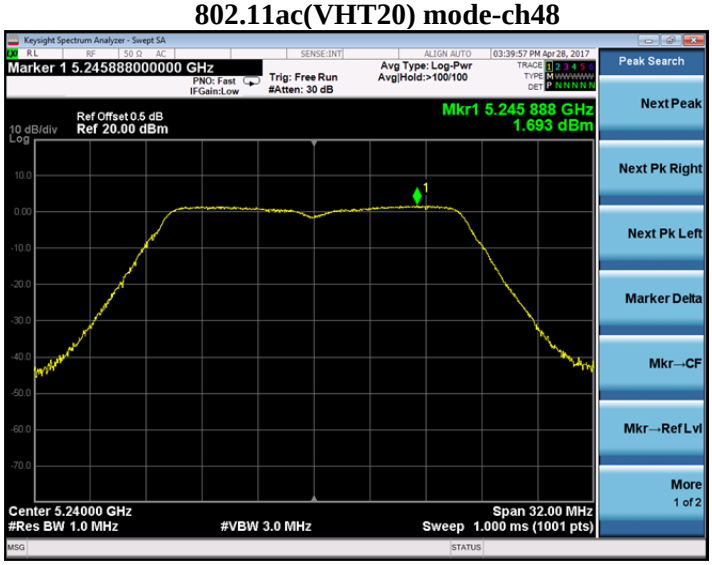


802.11ac(VHT20) mode-ch36

802.11ac(VHT20) mode-ch40

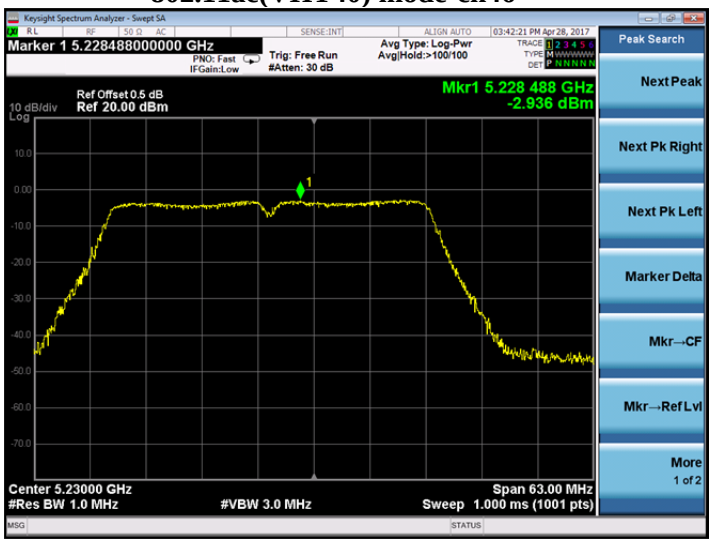


802.11ac(VHT20) mode-ch48

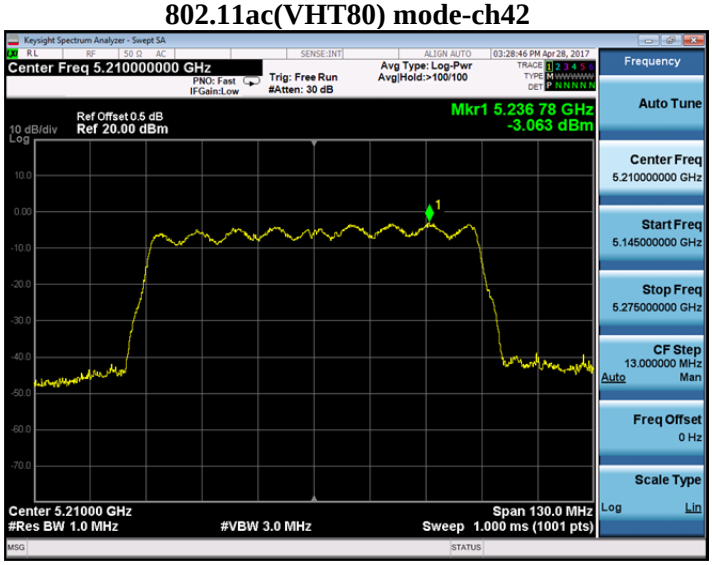


802.11ac(VHT40) mode-ch38

802.11ac(VHT40) mode-ch46



802.11ac(VHT80) mode-ch42

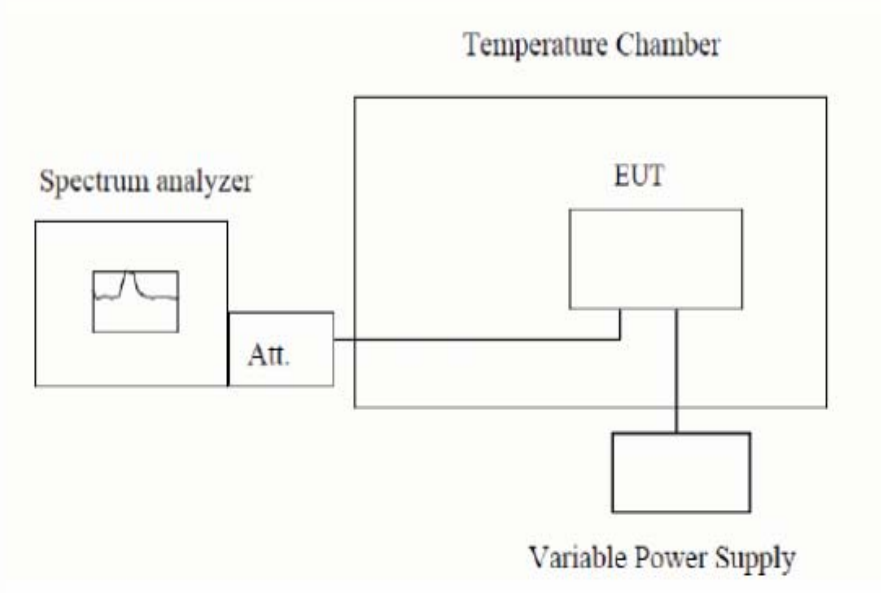


10. FREQUENCY STABILITY TEST

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	5180.0173	3.340
40	120	5180	5180.0211	4.073
30	120	5180	5180.0165	3.185
20	120	5180	5180.0124	2.394
10	120	5180	5180.0127	2.452
0	120	5180	5180.0153	2.954
-10	120	5180	5180.0115	2.220
-20	120	5180	5180.0148	2.857
-30	120	5180	5180.0129	2.490

Frequency Stability under Voltage

Operating Frequency: 5180 MHz			
DC Voltage(V)	Measured Frequency(MHz)	Test Result(MHz)	Max. Deviation(ppm)
108	5180	5180.0165	3.185
120	5180	5180.0201	3.880
132	5180	5180.0142	2.741

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	5200.0302	5.808
40	120	5200	5200.0279	5.365
30	120	5200	5200.0311	5.981
20	120	5200	5200.0285	5.481
10	120	5200	5200.0276	5.308
0	120	5200	5200.0258	4.962
-10	120	5200	5200.0302	5.808
-20	120	5200	5200.0269	5.173
-30	120	5200	5200.0322	6.192

Frequency Stability under Voltage

Operating Frequency: 5200 MHz			
DC Voltage(V)	Measured Frequency(MHz)	Test Result(MHz)	Max. Deviation(ppm)
108	5200	5200.0263	5.058
120	5200	5200.0312	6.000
132	5200	5200.0325	6.250

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	5240.0325	6.202
40	120	5240	5240.0338	6.450
30	120	5240	5240.0327	6.240
20	120	5240	5240.0281	5.363
10	120	5240	5240.0295	5.630
0	120	5240	5240.0313	5.973
-10	120	5240	5240.0323	6.164
-20	120	5240	5240.0305	5.821
-30	120	5240	5240.0322	6.145

Frequency Stability under Voltage

Operating Frequency: 5240 MHz			
DC Voltage(V)	Measured Frequency(MHz)	Test Result(MHz)	Max. Deviation(ppm)
108	5240	5240.0317	6.050
120	5240	5240.0286	5.458
132	5240	5240.0301	5.744

11.ANTENNA REQUIREMENTS

11.1.Limits

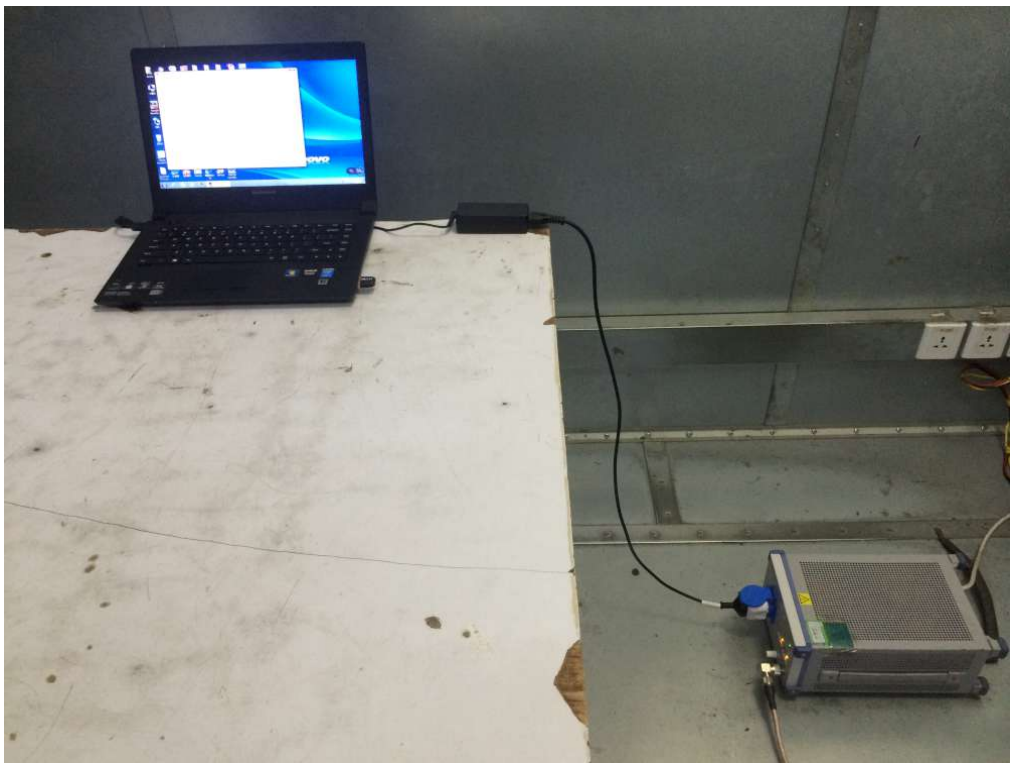
For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. And according to FCC 47 CFR Section 15.247 (b), if transmitting antennas of directional 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

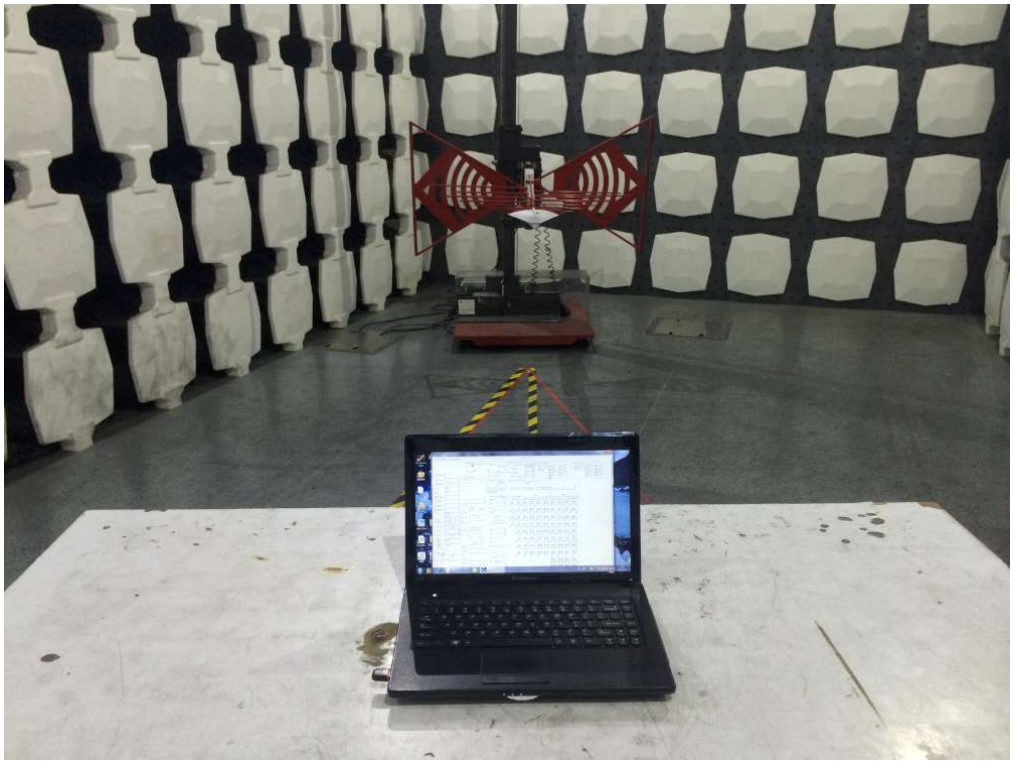
The antenna used for this product is PCB antenna and that no antenna other than that furnished by the responsible party shall be used with the device, the maximum peak gain of the transmit antenna is only 1.8 dBi.

12.PHOTOGRAPHS OF TEST SET-UP

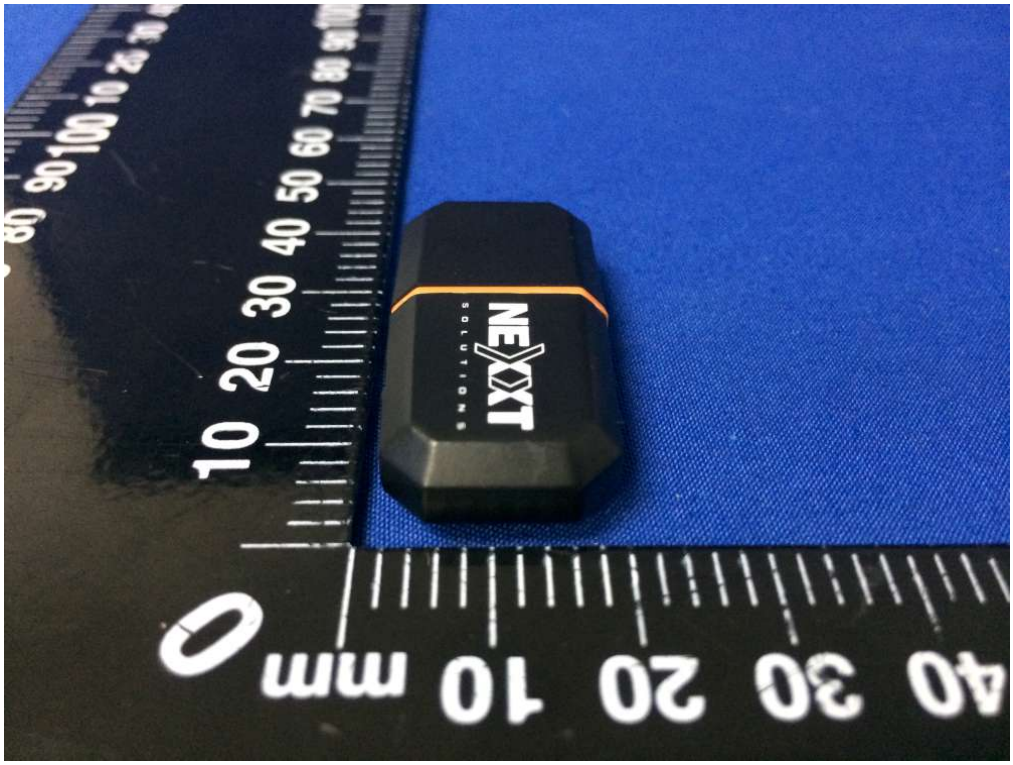
Conducted Emission

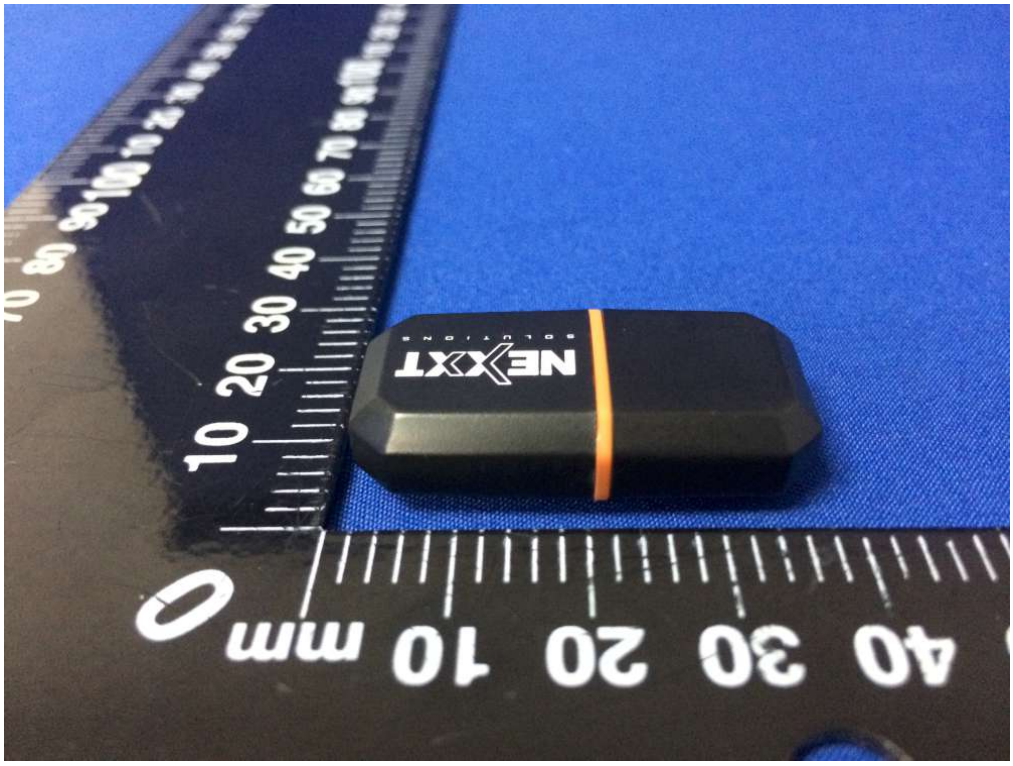


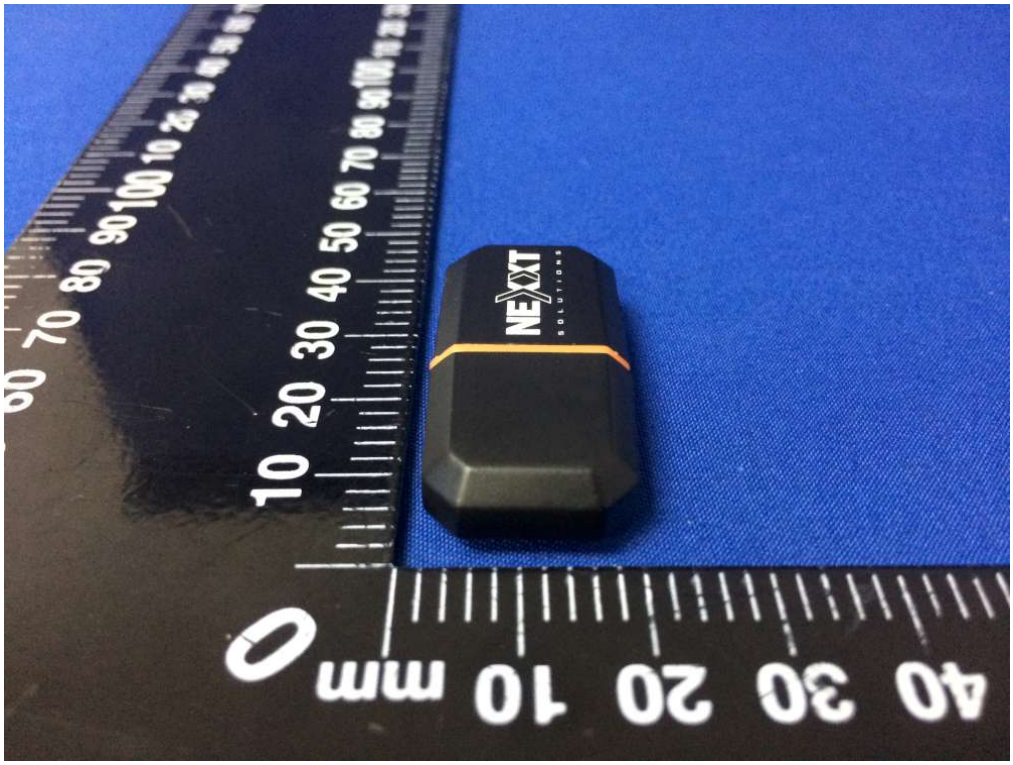
Radiated Emission Test



13.PHOTOGRAPHS OF THE EUT



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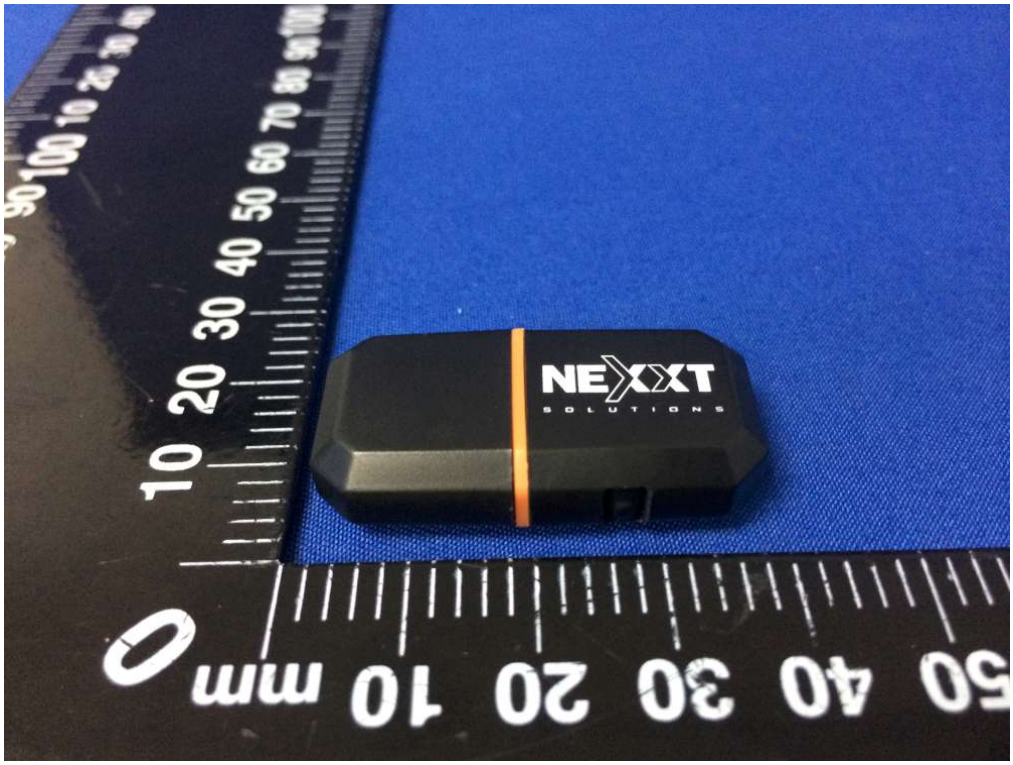
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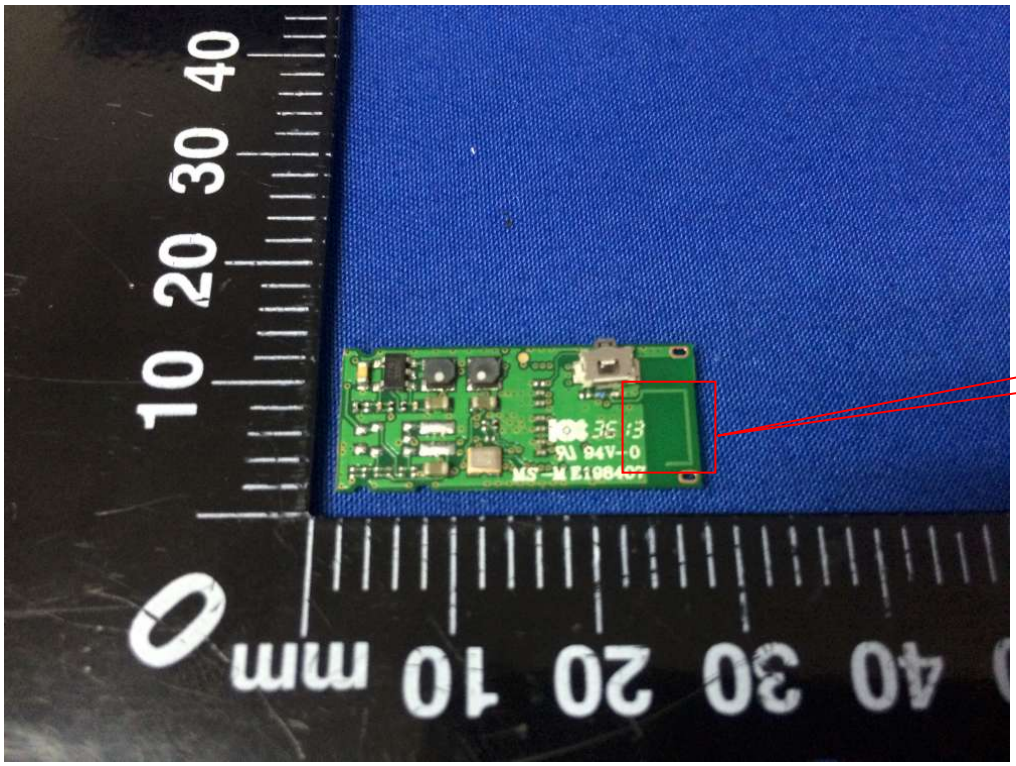
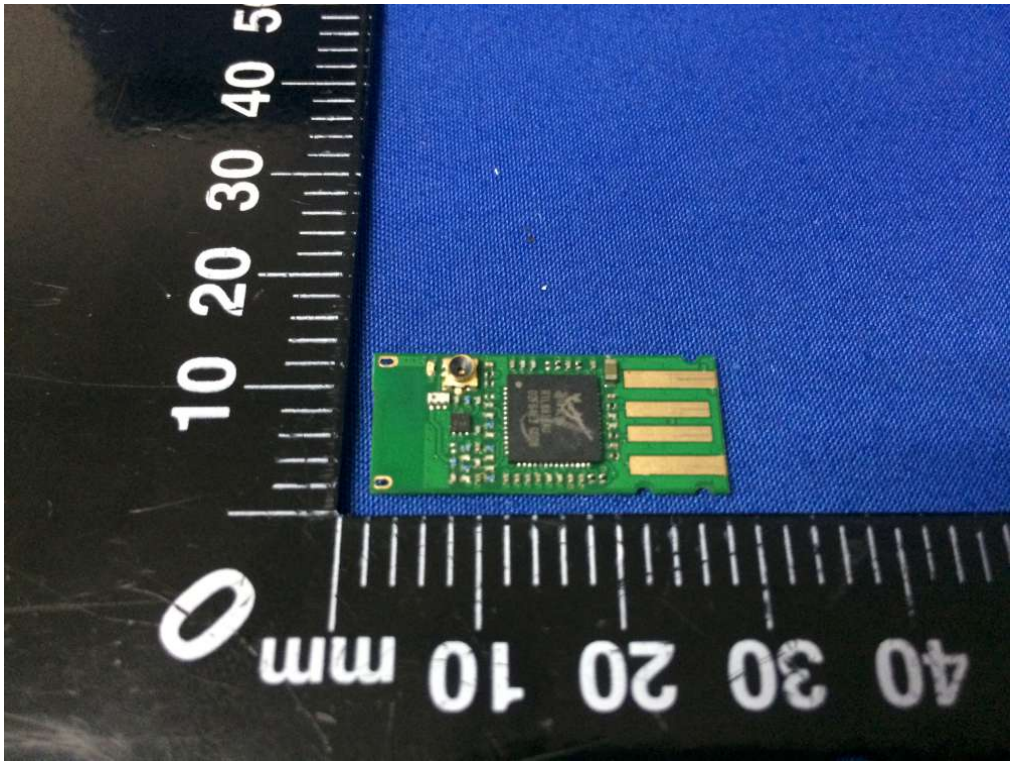
NEXXT
SOLUTIONS





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