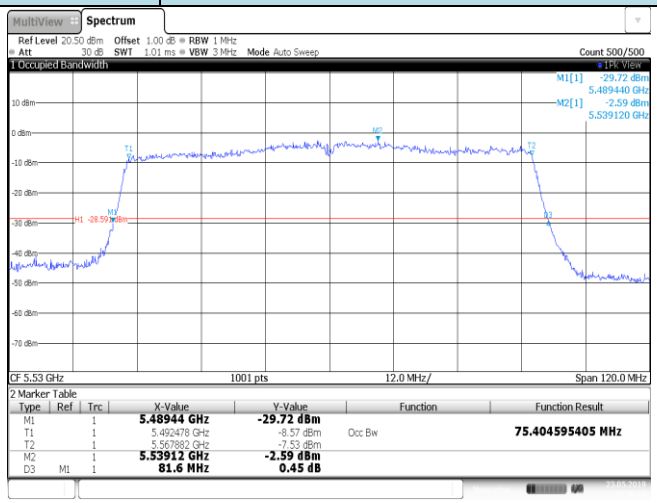
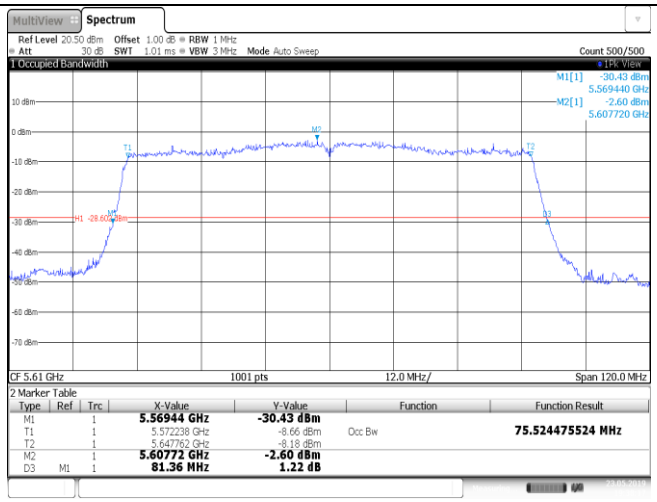
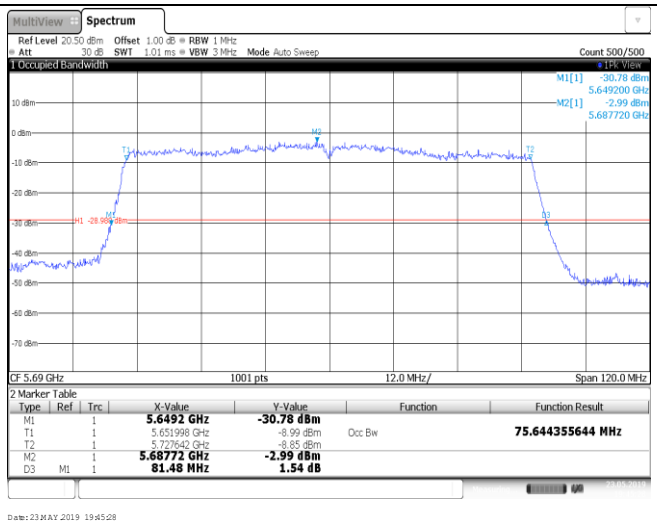
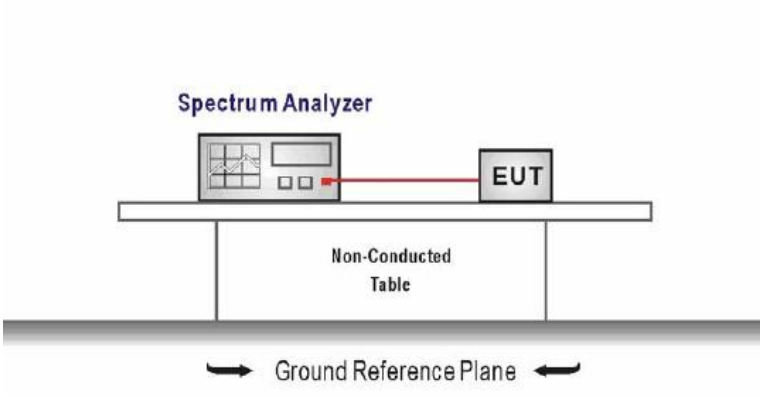
Band III	802.11ac (HT80)
CH_L	
CH_M	
CH_H	

5.6. 6dB Bandwidth

LIMIT

FCC CFR Title 47 Part 15 Subpart E Section 15.407(e)
Within the 5.725-5.85 GHz band, the minimum 6 dB bandwidth of U-NII devices shall be at least 500 kHz

TEST CONFIGURATION



TEST PROCEDURE

1. Connect the antenna port(s) to the spectrum analyzer input.
2. Configure the spectrum analyzer as shown below (enter all losses between the transmitter output and the spectrum analyzer).
   Center Frequency =test channel center frequency
   Span=2 x emission bandwidth
   RBW = 100 kHz, VBW ≥ 3 × RBW
   Sweep time= auto couple
   Detector = Peak
   Trace mode = max hold
3. Place the radio in continuous transmit mode, allow the trace to stabilize, view the transmitter wave form on the spectrum analyzer.
4. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission, and record the pertinent measurements.

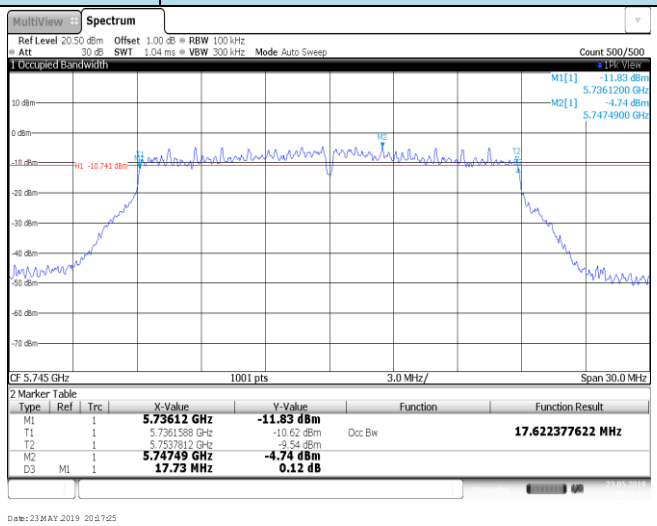
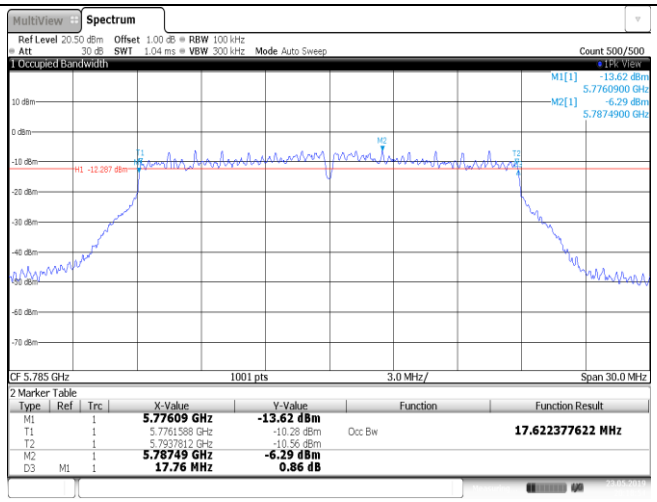
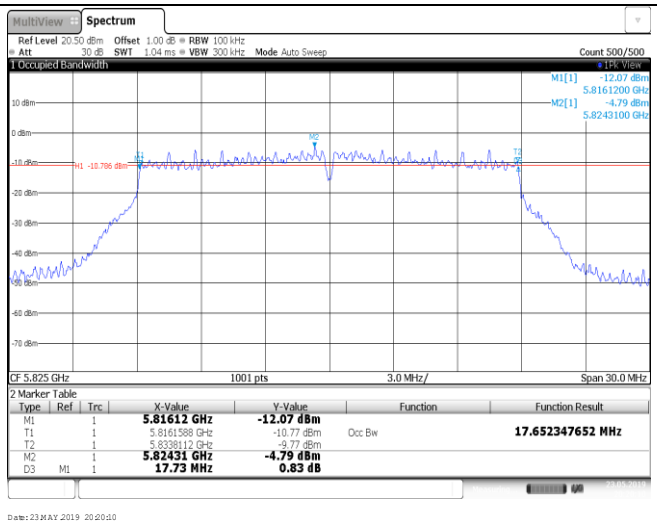
TEST MODE:

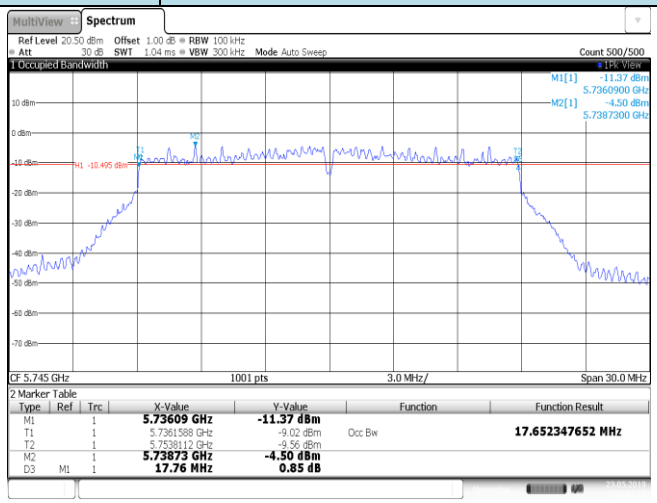
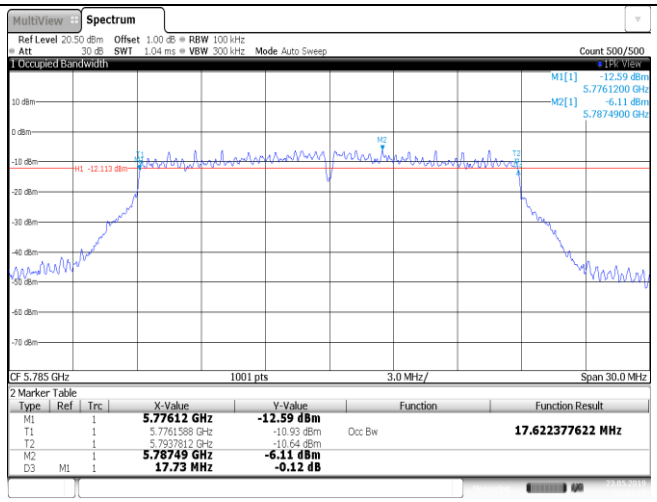
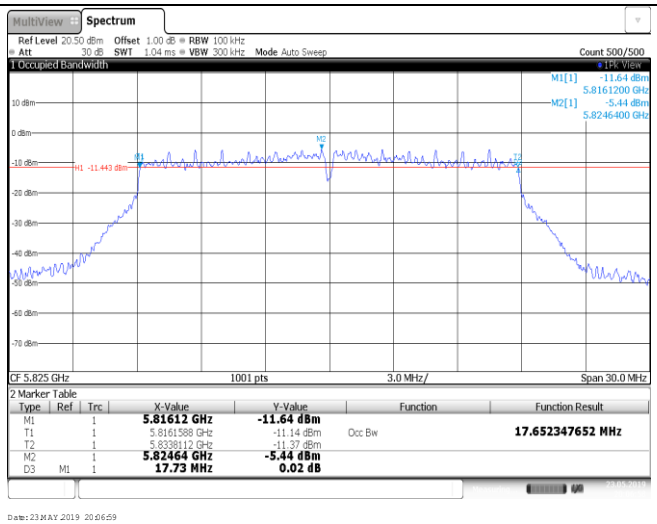
Please refer to the clause 3.3

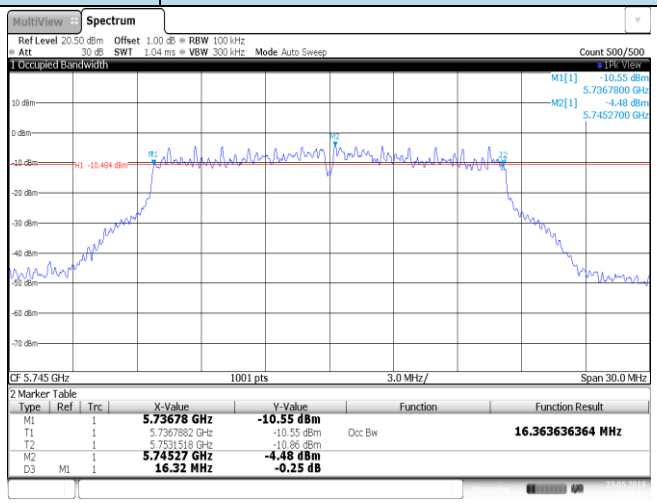
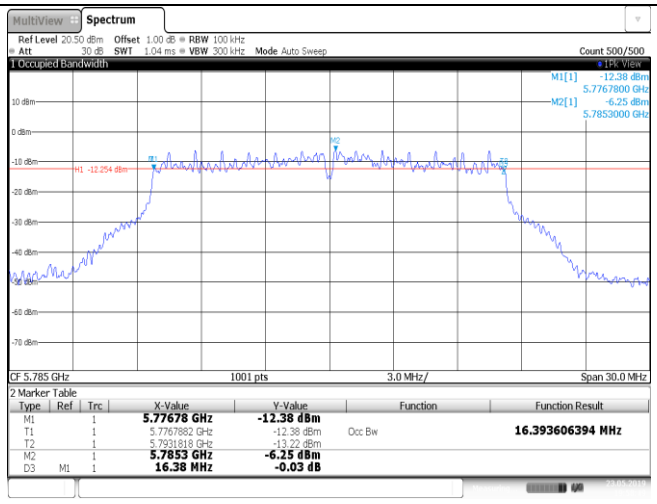
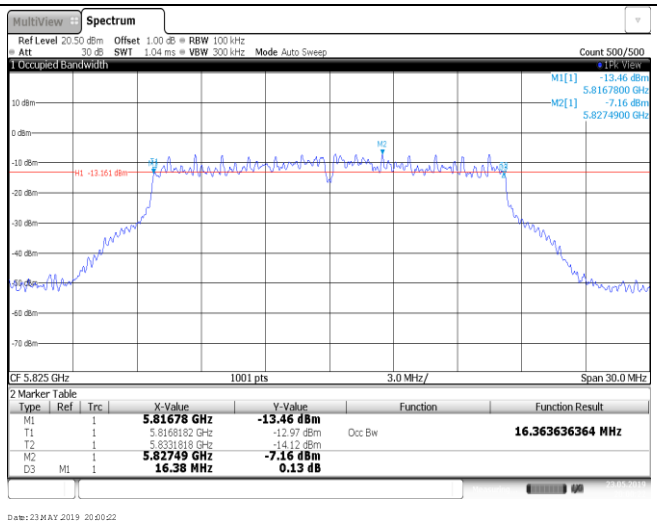
TEST RESULTS

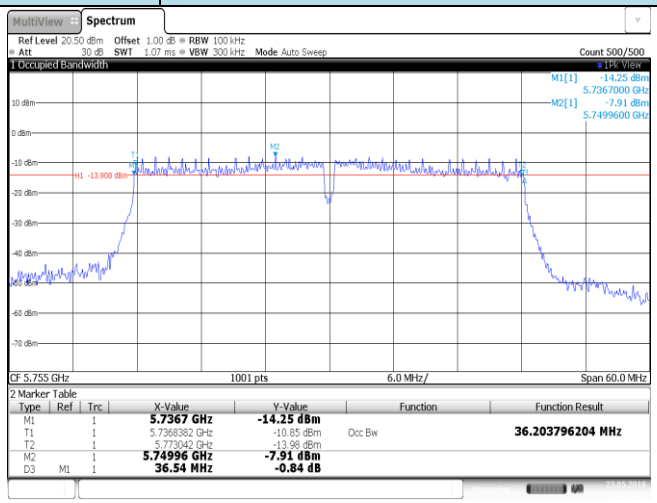
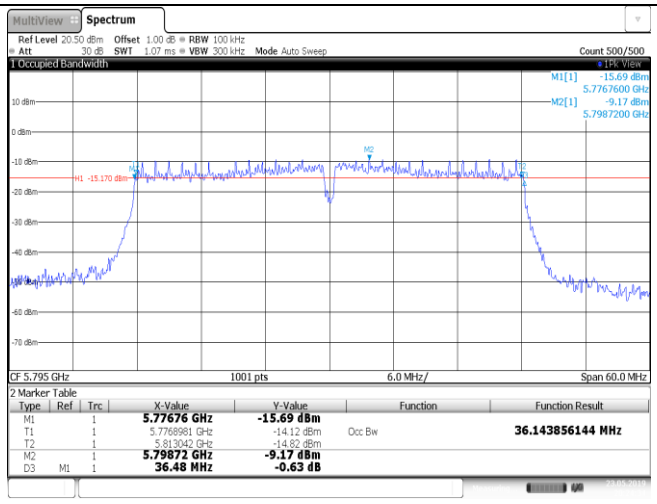
☒ **Passed** ☐ **Not Applicable**

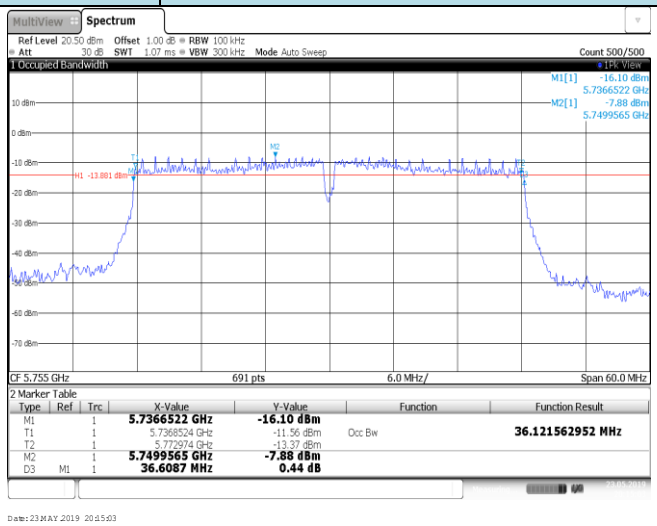
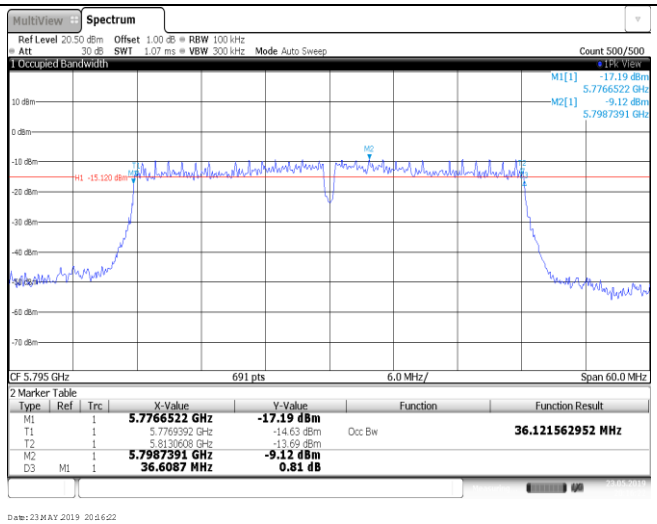
Band	Bandwidth (MHz)	Type	Channel	6dB bandwith (MHz)	99% Occupy bandwith (MHz)	Result
IV	20	802.11ac	CH_L	17.73	17.62	Pass
			CH_M	17.76	17.62	
			CH_H	17.73	17.65	
		802.11n	CH_L	17.76	17.65	Pass
			CH_M	17.73	17.62	
			CH_H	17.73	17.65	
		802.11a	CH_L	16.32	16.36	Pass
			CH_M	16.38	16.39	
			CH_H	16.38	16.36	
	40	802.11ac	CH_L	36.54	36.20	Pass
			CH_H	36.48	36.14	
		802.11n	CH_L	36.61	36.12	Pass
			CH_H	36.61	36.12	
	80	802.11ac	CH_M	76.56	75.40	Pass

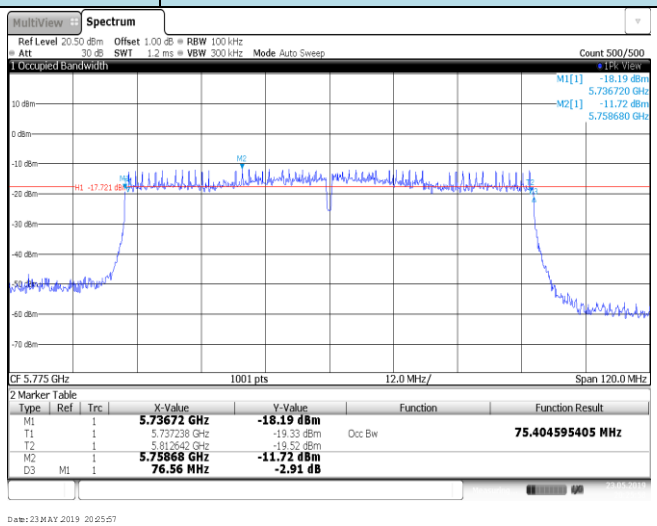
Band IV	802.11ac (HT20)
CH_L	
CH_M	
CH_H	

Band IV	802.11n (HT20)
CH_L	
CH_M	
CH_H	

Band IV	802.11a
CH_L	
CH_M	
CH_H	

Band IV	802.11ac (HT40)
CH_L	
CH_H	

Band IV	802.11n (HT40)
CH_L	
CH_H	

Band IV	802.11ac (HT80)
CH_M	

5.7. Band edge

LIMIT

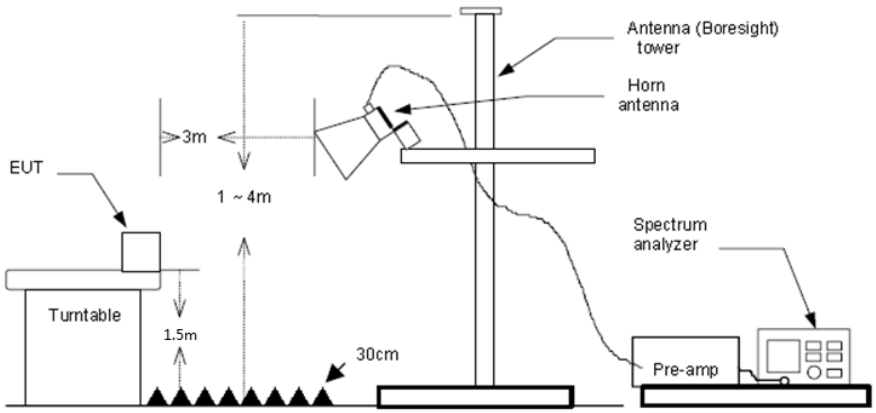
FCC CFR Title 47 Part 15 Subpart E Section 15.407(b)

Un-restricted band emissions above 1GHz			
Operating Band	Frequency	EIRP Limit	Value
5150-5250MHz	Above 1GHz	-27dBm/MHz (68.2dBuV/m@3m)	Peak
5250-5350MHz	Above 1GHz	-27dBm/MHz (68.2dBuV/m@3m)	Peak
5470-5725MHz	Above 1GHz	-27dBm/MHz (68.2dBuV/m@3m)	Peak
5725-5850 MHz	1GHz-5.65GHz	-27dBm/MHz (68.2dBuV/m@3m)	Peak
	5.65GHz-5.7GHz	-27*dBm/MHz to 10dBm/MHz (68.2* dBuV/m to 105.6dBuV/m@3m)	Peak
	5.7GHz-5.72GHz	10*dBm/MHz to 15.6dBm/MHz (105.6*dBuV/m to 110.8dBuV/m@3m)	Peak
	5.72GHz-5.725GHz	15.6*dBm/MHz to 27dBm/MHz (110.8dBuV/m to* 122.2dBuV/m@3m)	Peak
	5.85GHz-5.855GHz	27dBm/MHz to 15.6*dBm/MHz (122.2dBuV/m to110.8* dBuV/m@3m)	Peak
	5.855GHz-5.875GHz	15.6dBm/MHz to 10*dBm/MHz (110.8dBuV/m to 105.6* dBuV/m@3m)	Peak
	5.875GHz-5.925GHz	10dBm/MHz to -27*dBm/MHz (105.6dBuV/m to 68.2* dBuV/m@3m)	Peak
	Above 5.925GHz	-27dBm/MHz (68.2dBuV/m@3m)	Peak

* Increase/Decreases with the linearly of the frequency.

For emission above 1GHz and in restricted band, according to FCC KDB 789033 D02 General UNII Test Procedure, all emission that complies with both the average and peak limits of Section 15.209 is not required to satisfy the -27 dBm/MHz peak emission limit. E[dBμV/m] = EIRP[dBm] + 95.2, for d = 3 meters.

TEST CONFIGURATION



TEST PROCEDURE

1. The EUT was setup and tested according to ANSI C63.10:2013 requirements.
2. The EUT is placed on a turn table which is 1.5 meter above ground. The turn table is rotated 360 degrees to determine the position of the maximum emission level.
3. The EUT waspositioned such that the distance from antenna to the EUT was 3 meters.
4. The antenna is scanned from 1 meter to 4 meters to find out the maximum emission level. Thisis repeated for both horizontal and vertical polarization of the antenna. In order to find themaximum emission, all of the interface cables were manipulated according to ANSI C63.10:2013 on radiated measurement.
5. The receiver set as follow:
   RBW=1MHz, VBW=3MHz PEAK detector for Peak value.
   RBW=1MHz, VBW=3MHz RMS detector for Average value.

TEST MODE:

Please refer to the clause 3.3

TEST RESULTS

☒ **Passed** ☐ **Not Applicable**

Band: I&II			Worst mode: 802.11a			Test channel: CH_L			
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Margin Limit (dB)	Polarization	Test value
5150.00	13.54	31.70	9.79	0.00	55.03	74.00	-18.97	Horizontal	Peak
5150.00	13.48	31.70	9.79	0.00	54.97	74.00	-19.03	Vertical	Peak
5150.00	7.95	31.70	9.79	0.00	49.44	54.00	-4.56	Horizontal	Average
5150.00	7.76	31.70	9.79	0.00	49.25	54.00	-4.75	Vertical	Average

Band: I&II			Worst mode: 802.11a			Test channel: CH_H			
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Margin Limit (dB)	Polarization	Test value
5350.00	14.02	31.40	9.91	0.00	55.33	74.00	-18.67	Horizontal	Peak
5350.00	12.81	31.40	9.91	0.00	54.12	74.00	-19.88	Vertical	Peak
5350.00	7.35	31.40	9.91	0.00	48.66	54.00	-5.34	Horizontal	Average
5350.00	6.83	31.40	9.91	0.00	48.14	54.00	-5.86	Vertical	Average

Remark:

1. *Final Level =Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor*
2. *The emission levels of other frequencies are very lower than the limit and not show in test report.*
3. *Test 802.11a, 802.11n, 802.11ac mode,all modulations have been tested,only worst case is reported*

Band: III				Worst mode: 802.11a			Test channel: CH_L		
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Margin Limit (dB)	Polarization	Test value
5460.00	14.07	31.73	10.47	0.00	56.27	74.00	-17.73	Horizontal	Peak
5460.00	8.44	31.73	10.47	0.00	50.64	74.00	-23.36	Vertical	Peak
5460.00	7.86	31.73	10.47	0.00	50.06	54.00	-3.94	Horizontal	Average
5460.00	4.23	31.73	10.47	0.00	46.43	54.00	-7.57	Vertical	Average

Band: III				Worst mode: 802.11a			Test channel: CH_H		
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Margin Limit (dB)	Polarization	Test value
5725.00	10.74	32.20	10.61	0.00	53.55	74.00	-20.45	Horizontal	Peak
5725.00	10.21	32.20	10.61	0.00	53.02	74.00	-20.98	Vertical	Peak
5725.00	6.15	32.20	10.61	0.00	48.96	54.00	-5.04	Horizontal	Average
5725.00	5.94	32.20	10.61	0.00	48.75	54.00	-5.25	Vertical	Average

Remark:

1. *Final Level =Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor*
2. *The emission levels of other frequencies are very lower than the limit and not show in test report.*
3. *Test 802.11a, 802.11n, 802.11ac mode,all modulations have been tested,only worst case is reported*

Band: IV				Worst mode: 802.11a			Test channel: CH_L		
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Margin Limit (dB)	Polarization	Test value
5725.00	7.07	31.73	10.47	0.00	49.27	74.00	-24.73	Horizontal	Peak
5725.00	10.44	31.73	10.47	0.00	52.64	74.00	-21.36	Vertical	Peak
5725.00	3.86	31.73	10.47	0.00	46.06	54.00	-7.94	Horizontal	Average
5725.00	4.23	31.73	10.47	0.00	46.43	54.00	-7.57	Vertical	Average

Band: IV				Worst mode: 802.11a			Test channel: CH_H		
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Margin Limit (dB)	Polarization	Test value
5850.00	6.74	32.20	10.61	0.00	49.55	74.00	-24.45	Horizontal	Peak
5850.00	12.21	32.20	10.61	0.00	55.02	74.00	-18.98	Vertical	Peak
5850.00	7.15	32.20	10.61	0.00	49.96	54.00	-4.04	Horizontal	Average
5850.00	6.94	32.20	10.61	0.00	49.75	54.00	-4.25	Vertical	Average

Remark:

1. *Final Level =Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor*
2. *The emission levels of other frequencies are very lower than the limit and not show in test report.*
3. *Test 802.11a, 802.11n, 802.11ac mode,all modulations have been tested,only worst case is reported*

5.8. Radiated Spurious Emissions

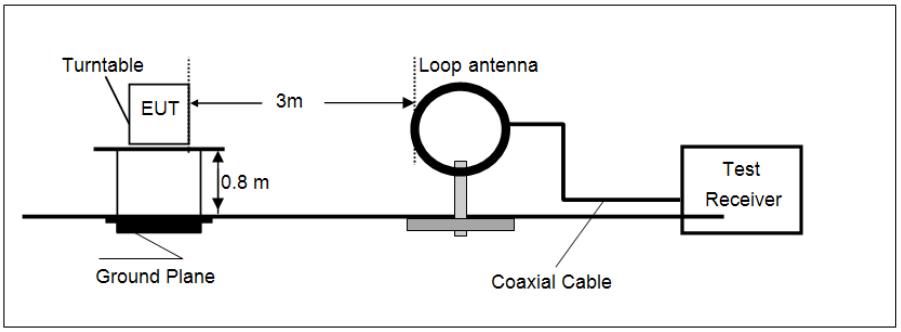
LIMIT

FCC CFR Title 47 Part 15 Subpart C Section 15.209 and Part 15 Subpart E Section 15.407

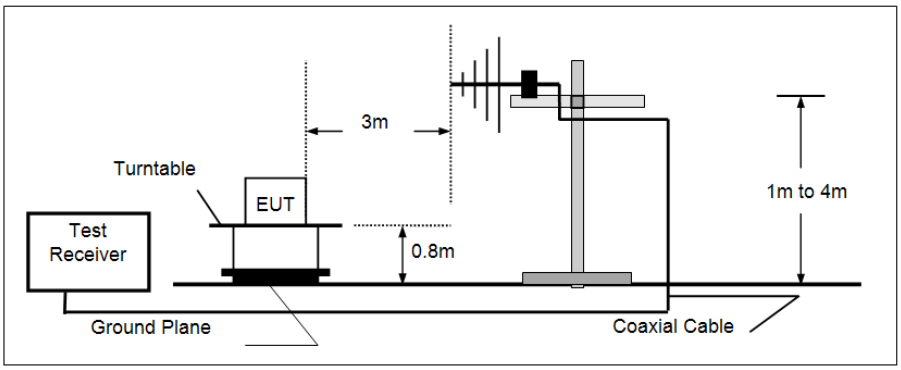
Unwanted emissions below 1GHz and Restricted band emissions above 1GHz		
Frequency	Limit (dBuV/m @3m)	Value
30MHz-88MHz	40.00	Quasi-peak
88MHz-216MHz	43.50	Quasi-peak
216MHz-960MHz	46.00	Quasi-peak
960MHz-1GHz	54.00	Quasi-peak
Above 1GHz	54.00	Average
	74.00	Peak

TEST CONFIGURATION

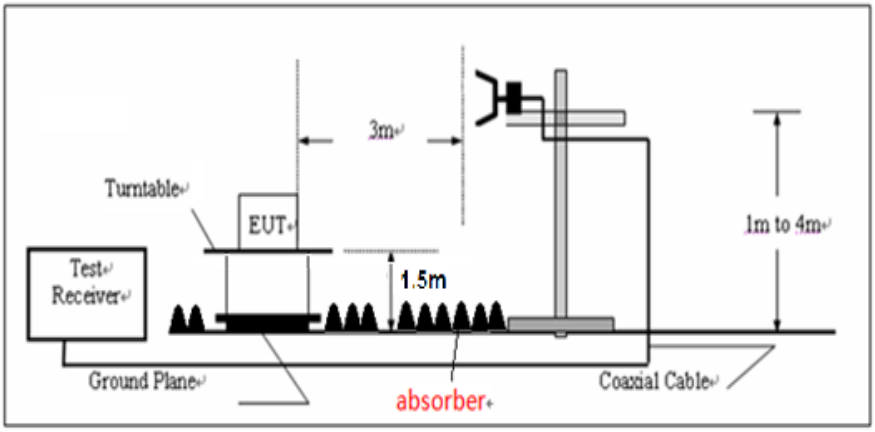
- 9KHz ~30MHz



- 30MHz ~ 1GHz



- Above 1GHz



TEST PROCEDURE

1. The EUT was setup and tested according to ANSI C63.10:2013
2. The EUT is placed on a turn table which is 0.8 meter above ground for below 1 GHz, and 1.5 m for above 1 GHz. The turn table is rotated 360 degrees to determine the position of the maximum emission level.
3. The EUT was set 3 meters from the receiving antenna, which was mounted on the top of a variable height antenna tower.
4. For each suspected emission, the EUT was arranged to its worst case and then tune the Antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level to comply with the guidelines.
5. Set to the maximum power setting and enable the EUT transmit continuously.
6. Use the following spectrum analyzer settings
   (1) Span shall wide enough to fully capture the emission being measured;
   (2) Below 1 GHz:
   RBW=120 kHz, VBW=300 kHz, Sweep=auto, Detector function=peak, Trace=max hold;
   If the emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.
   (3) From 1 GHz to 10^{th} harmonic:
   RBW=1MHz, VBW=3MHz Peak detector for Peak value.
   RBW=1MHz, VBW=3MHz RMS detector for Average value.

TEST MODE:

Please refer to the clause 3.3

TEST RESULTS

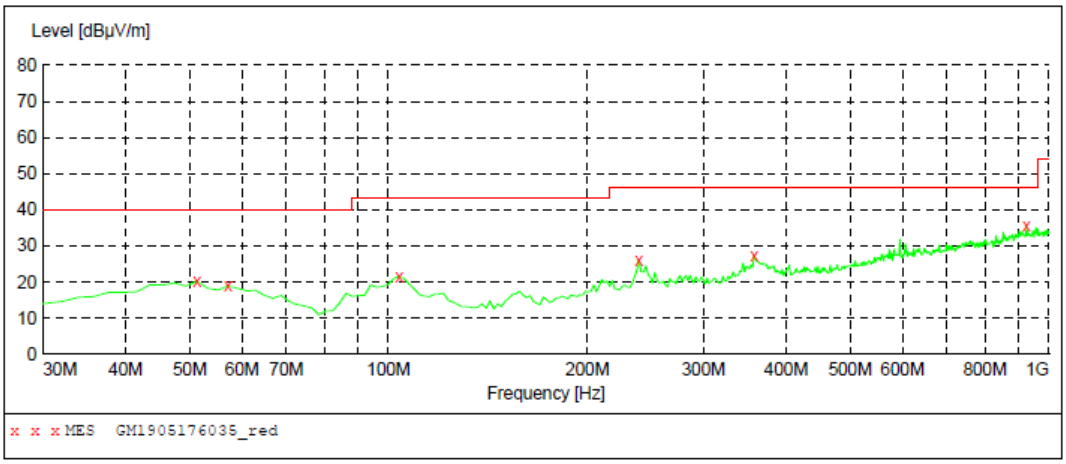
☒ **Passed** ☐ **Not Applicable**

Measurement data:

■ **9kHz ~ 30MHz**

The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line per 15.31(o) was not reported.

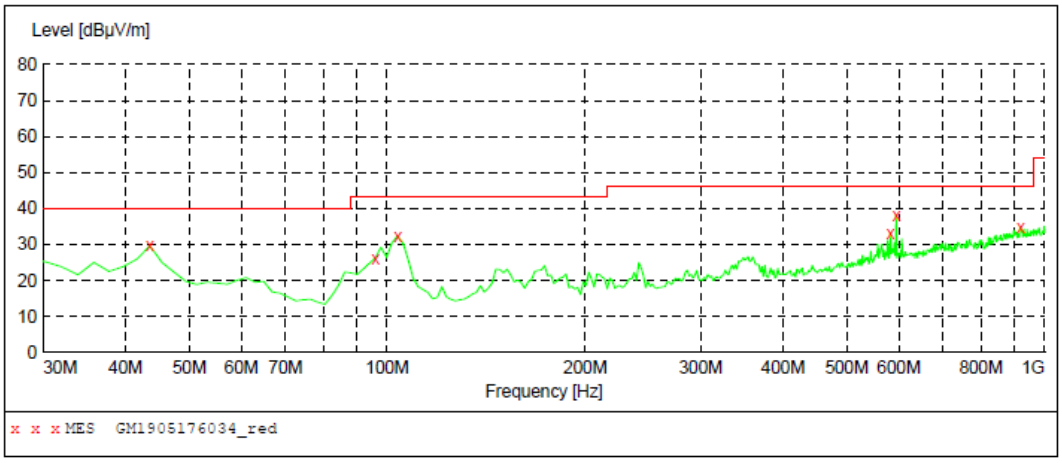
■ **30MHz ~ 1GHz**



MEASUREMENT RESULT: "GM1905176035_red"

5/17/2019 1:27PM

Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
51.340000	20.20	-8.9	40.0	19.8	QP	100.0	286.00	HORIZONTAL
57.160000	18.90	-9.5	40.0	21.1	QP	100.0	39.00	HORIZONTAL
103.720000	21.60	-10.6	43.5	21.9	QP	100.0	0.00	HORIZONTAL
239.520000	26.10	-9.0	46.0	19.9	QP	100.0	261.00	HORIZONTAL
357.860000	27.30	-5.8	46.0	18.7	QP	100.0	169.00	HORIZONTAL
924.340000	35.50	6.7	46.0	10.5	QP	300.0	251.00	HORIZONTAL



MEASUREMENT RESULT: "GM1905176034_red"

5/17/2019 1:23PM

Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
43.580000	29.70	-9.2	40.0	10.3	QP	100.0	0.00	VERTICAL
95.960000	26.20	-11.3	43.5	17.3	QP	100.0	22.00	VERTICAL
103.720000	32.40	-10.6	43.5	11.1	QP	100.0	113.00	VERTICAL
582.900000	33.20	0.1	46.0	12.8	QP	100.0	88.00	VERTICAL
594.540000	38.20	0.7	46.0	7.8	QP	100.0	77.00	VERTICAL
918.520000	34.70	6.7	46.0	11.3	QP	100.0	88.00	VERTICAL

Remark:

Transd=Cable lose+ Antenna factor- Pre-amplifier; Margin=Limit -Level

■ **Above 1GHz**

Band: I				Worst mode: 802.11a			Test channel: CH_L		
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Margin Limit (dB)	Polarization	Test value
1755.16	37.81	25.31	5.87	37.36	31.63	74.00	-42.37	Vertical	Peak
3151.99	36.99	28.80	7.66	37.44	36.01	74.00	-37.99	Vertical	Peak
6544.35	31.14	34.09	11.26	33.64	42.85	74.00	-31.15	Vertical	Peak
9909.80	33.29	39.10	13.59	34.15	51.83	74.00	-22.17	Vertical	Peak
2241.03	-2.79	27.75	6.51	0.00	31.47	74.00	-42.53	Horizontal	Peak
3607.26	-2.95	29.30	8.28	0.00	34.63	74.00	-39.37	Horizontal	Peak
6577.75	-3.83	34.16	11.32	0.00	41.65	74.00	-32.35	Horizontal	Peak
9019.05	-2.37	37.96	13.33	0.00	48.92	74.00	-25.08	Horizontal	Peak

Band: I				Worst mode: 802.11a			Test channel: CH_M		
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Margin Limit (dB)	Polarization	Test value
3018.50	36.07	28.64	7.50	37.56	34.65	74.00	-39.35	Vertical	Peak
4524.47	33.26	30.75	9.34	36.24	37.11	74.00	-36.89	Vertical	Peak
5836.04	30.73	32.17	10.60	34.24	39.26	74.00	-34.74	Vertical	Peak
7063.69	29.41	35.49	11.85	33.77	42.98	74.00	-31.02	Vertical	Peak
3200.50	-0.72	28.80	7.72	0.00	35.80	74.00	-38.20	Horizontal	Peak
3883.62	-2.52	29.68	8.62	0.00	35.78	74.00	-38.22	Horizontal	Peak
7376.08	-2.56	36.30	12.04	0.00	45.78	74.00	-28.22	Horizontal	Peak
9417.91	-2.58	39.01	13.69	0.00	50.12	74.00	-23.88	Horizontal	Peak

Remark:

1. *Final Level =Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor*
2. *The emission levels of other frequencies are very lower than the limit and not show in test report.*
3. *Measuring frequencies from 1 GHz to 40GHz.*
4. *Test 802.11a, 802.11n, 802.11ac mode,all modulations have been tested,only worst case is reported*

Band: I				Worst mode: 802.11a		Test channel: CH_H			
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Margin Limit (dB)	Polarization	Test value
2229.65	35.16	27.68	6.49	37.60	31.73	74.00	-42.27	Vertical	Peak
4267.18	32.69	30.13	9.00	36.50	35.32	74.00	-38.68	Vertical	Peak
5631.73	32.42	31.74	10.32	34.35	40.13	74.00	-33.87	Vertical	Peak
9660.72	29.64	39.09	13.71	33.96	48.48	74.00	-25.52	Vertical	Peak
3445.70	-3.59	28.57	8.03	0.00	33.01	74.00	-40.99	Horizontal	Peak
4366.07	-5.32	30.40	9.10	0.00	34.18	74.00	-39.82	Horizontal	Peak
6219.51	-4.23	32.94	11.01	0.00	39.72	74.00	-34.28	Horizontal	Peak
7227.39	-4.65	36.23	11.89	0.00	43.47	74.00	-30.53	Horizontal	Peak

Band: II				Worst mode: 802.11a		Test channel: CH_L			
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Margin Limit (dB)	Polarization	Test value
3049.39	37.95	28.70	7.54	37.53	36.66	74.00	-37.34	Vertical	Peak
3963.52	37.55	29.70	8.73	36.79	39.19	74.00	-34.81	Vertical	Peak
6172.20	33.65	32.79	10.96	33.96	43.44	74.00	-30.56	Vertical	Peak
7319.96	34.92	36.30	11.99	33.32	49.89	74.00	-24.11	Vertical	Peak
3003.17	37.35	28.61	7.48	37.58	35.86	74.00	-38.14	Horizontal	Peak
5821.21	33.23	32.14	10.60	34.24	41.73	74.00	-32.27	Horizontal	Peak
7547.01	30.89	36.15	12.55	33.02	46.57	74.00	-27.43	Horizontal	Peak
9019.05	31.69	37.96	13.33	33.06	49.92	74.00	-24.08	Horizontal	Peak

Remark:

1. *Final Level =Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor*
2. *The emission levels of other frequencies are very lower than the limit and not show in test report.*
3. *Measuring frequencies from 1 GHz to 40GHz.*
4. *Test 802.11a, 802.11n, 802.11ac mode,all modulations have been tested,only worst case is reported*

Band: II				Worst mode: 802.11a			Test channel: CH_M		
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Margin Limit (dB)	Polarization	Test value
2201.45	-2.67	27.51	6.44	0.00	31.28	74.00	-42.72	Vertical	Peak
3834.51	-2.81	29.63	8.55	0.00	35.37	74.00	-38.63	Vertical	Peak
6267.19	-2.92	33.03	11.00	0.00	41.11	74.00	-32.89	Vertical	Peak
8703.29	-2.92	37.89	13.00	0.00	47.97	74.00	-26.03	Vertical	Peak
1406.50	35.87	25.89	5.02	37.11	29.67	74.00	-44.33	Horizontal	Peak
1755.16	37.81	25.31	5.87	37.36	31.63	74.00	-42.37	Horizontal	Peak
3049.39	35.95	28.70	7.54	37.53	34.66	74.00	-39.34	Horizontal	Peak
4536.00	33.86	30.77	9.35	36.22	37.76	74.00	-36.24	Horizontal	Peak

Band: II				Worst mode: 802.11a			Test channel: CH_H		
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Margin Limit (dB)	Polarization	Test value
3274.67	35.26	28.35	7.81	37.33	34.09	74.00	-39.91	Vertical	Peak
5631.73	32.42	31.74	10.32	34.35	40.13	74.00	-33.87	Vertical	Peak
6974.36	30.89	35.15	11.82	33.87	43.99	74.00	-30.01	Vertical	Peak
8637.08	30.91	37.52	12.93	32.94	48.42	74.00	-25.58	Vertical	Peak
2825.19	-4.79	28.20	7.38	0.00	30.79	74.00	-43.21	Horizontal	Peak
3834.51	-2.81	29.63	8.55	0.00	35.37	74.00	-38.63	Horizontal	Peak
4883.52	-2.55	31.43	9.59	0.00	38.47	74.00	-35.53	Horizontal	Peak
6577.75	-3.83	34.16	11.32	0.00	41.65	74.00	-32.35	Horizontal	Peak

Remark:

1. *Final Level =Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor*
2. *The emission levels of other frequencies are very lower than the limit and not show in test report.*
3. *Measuring frequencies from 1 GHz to 40GHz.*
4. *Test 802.11a, 802.11n, 802.11ac mode,all modulations have been tested,only worst case is reported*

Band: III				Worst mode: 802.11a			Test channel: CH_L		
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Margin Limit (dB)	Polarization	Test value
3151.99	36.99	28.80	7.66	37.44	36.01	74.00	-37.99	Vertical	Peak
4159.93	36.89	29.96	8.91	36.60	39.16	74.00	-34.84	Vertical	Peak
7413.73	31.62	36.27	12.11	33.16	46.84	74.00	-27.16	Vertical	Peak
9562.85	31.53	39.05	13.73	33.89	50.42	74.00	-23.58	Vertical	Peak
3003.17	-2.23	28.61	7.48	0.00	33.86	74.00	-40.14	Horizontal	Peak
4034.78	-2.92	29.77	8.81	0.00	35.66	74.00	-38.34	Horizontal	Peak
7547.01	-3.13	36.15	12.55	0.00	45.57	74.00	-28.43	Horizontal	Peak
9909.80	-2.36	39.10	13.59	0.00	50.33	74.00	-23.67	Horizontal	Peak

Band: III				Worst mode: 802.11a			Test channel: CH_M		
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Margin Limit (dB)	Polarization	Test value
3151.99	37.99	28.80	7.66	37.44	37.01	74.00	-36.99	Vertical	Peak
4159.93	37.89	29.96	8.91	36.60	40.16	74.00	-33.84	Vertical	Peak
7413.73	32.62	36.27	12.11	33.16	47.84	74.00	-26.16	Vertical	Peak
8996.12	32.22	37.90	13.31	33.03	50.40	74.00	-23.60	Vertical	Peak
2637.54	-2.37	27.91	7.00	0.00	32.54	74.00	-41.46	Horizontal	Peak
3208.66	-1.53	28.75	7.73	0.00	34.95	74.00	-39.05	Horizontal	Peak
4512.97	-2.78	30.73	9.32	0.00	37.27	74.00	-36.73	Horizontal	Peak
8042.90	-1.17	37.06	12.40	0.00	48.29	74.00	-25.71	Horizontal	Peak

Remark:

1. *Final Level =Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor*
2. *The emission levels of other frequencies are very lower than the limit and not show in test report.*
3. *Measuring frequencies from 1 GHz to 40GHz.*
4. *Test 802.11a, 802.11n, 802.11ac mode,all modulations have been tested,only worst case is reported*

Band: III				Worst mode: 802.11a			Test channel: CH_H		
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Margin Limit (dB)	Polarization	Test value
3003.17	-2.23	28.61	7.48	0.00	33.86	74.00	-40.14	Vertical	Peak
4034.78	-2.92	29.77	8.81	0.00	35.66	74.00	-38.34	Vertical	Peak
7376.08	-2.90	36.30	12.04	0.00	45.44	74.00	-28.56	Vertical	Peak
9441.91	-3.53	39.01	13.70	0.00	49.18	74.00	-24.82	Vertical	Peak
3151.99	36.99	28.80	7.66	37.44	36.01	74.00	-37.99	Horizontal	Peak
4159.93	36.89	29.96	8.91	36.60	39.16	74.00	-34.84	Horizontal	Peak
7413.73	31.62	36.27	12.11	33.16	46.84	74.00	-27.16	Horizontal	Peak
9909.80	33.29	39.10	13.59	34.15	51.83	74.00	-22.17	Horizontal	Peak

Band: IV				Worst mode: 802.11a			Test channel: CH_L		
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Margin Limit (dB)	Polarization	Test value
2179.15	36.47	27.34	6.42	37.60	32.63	74.00	-41.37	Vertical	Peak
3472.12	34.45	28.78	8.07	37.16	34.14	74.00	-39.86	Vertical	Peak
5022.19	35.04	31.59	9.69	35.34	40.98	74.00	-33.02	Vertical	Peak
6974.36	30.89	35.15	11.82	33.87	43.99	74.00	-30.01	Vertical	Peak
1668.04	-2.77	25.11	5.70	0.00	28.04	74.00	-45.96	Horizontal	Peak
3208.66	-2.53	28.75	7.73	0.00	33.95	74.00	-40.05	Horizontal	Peak
4377.20	-3.80	30.43	9.11	0.00	35.74	74.00	-38.26	Horizontal	Peak
7282.79	-4.70	36.28	11.95	0.00	43.53	74.00	-30.47	Horizontal	Peak

Remark:

1. *Final Level =Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor*
2. *The emission levels of other frequencies are very lower than the limit and not show in test report.*
3. *Measuring frequencies from 1 GHz to 40GHz.*
4. *Test 802.11a, 802.11n, 802.11ac mode,all modulations have been tested,only worst case is reported*

Band: IV				Worst mode: 802.11a			Test channel: CH_M		
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Margin Limit (dB)	Polarization	Test value
3561.64	36.89	29.19	8.21	37.09	37.20	74.00	-36.80	Vertical	Peak
4712.55	34.63	31.25	9.51	35.89	39.50	74.00	-34.50	Vertical	Peak
6544.35	32.14	34.09	11.26	33.64	43.85	74.00	-30.15	Vertical	Peak
8063.40	31.49	37.04	12.45	33.05	47.93	74.00	-26.07	Vertical	Peak
2637.54	-3.37	27.91	7.00	0.00	31.54	74.00	-42.46	Horizontal	Peak
3834.51	-2.81	29.63	8.55	0.00	35.37	74.00	-38.63	Horizontal	Peak
5821.21	-3.01	32.14	10.60	0.00	39.73	74.00	-34.27	Horizontal	Peak
7172.41	-3.70	36.04	11.86	0.00	44.20	74.00	-29.80	Horizontal	Peak

Band: IV				Worst mode: 802.11a			Test channel: CH_H		
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Margin Limit (dB)	Polarization	Test value
2980.33	35.32	28.58	7.47	37.58	33.79	74.00	-40.21	Vertical	Peak
4223.95	34.53	30.05	8.96	36.54	37.00	74.00	-37.00	Vertical	Peak
6094.14	30.49	32.50	10.83	34.05	39.77	74.00	-34.23	Vertical	Peak
8996.12	31.22	37.90	13.31	33.03	49.40	74.00	-24.60	Vertical	Peak
2241.03	-1.79	27.75	6.51	0.00	32.47	74.00	-41.53	Horizontal	Peak
3208.66	-1.53	28.75	7.73	0.00	34.95	74.00	-39.05	Horizontal	Peak
4034.78	-1.92	29.77	8.81	0.00	36.66	74.00	-37.34	Horizontal	Peak
5821.21	-2.01	32.14	10.60	0.00	40.73	74.00	-33.27	Horizontal	Peak

Remark:

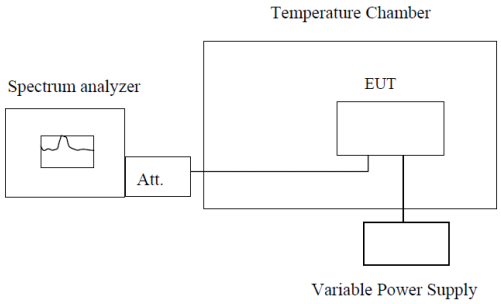
1. *Final Level =Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor*
2. *The emission levels of other frequencies are very lower than the limit and not show in test report.*
3. *Measuring frequencies from 1 GHz to 40GHz.*
4. *Test 802.11a, 802.11n, 802.11ac mode,all modulations have been tested,only worst case is reported*

5.9. Frequency stability

LIMIT

Within Operation Band

TEST CONFIGURATION



Note : Measurement setup for testing on Antenna connector

TEST PROCEDURE

1. The equipment under test was connected to an external power supply.
2. RF output was connected to a frequency counter or spectrum analyzer via feed through attenuators.
3. The EUT was placed inside the temperature chamber.
4. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and measure EUT 25℃ operating frequency as reference frequency.
5. Turn EUT off and set the chamber temperature to –20℃. After the temperature stabilized for approximately 30 minutes recorded the frequency.
6. Repeat step measure with 10℃ increased per stage until the highest temperature of +50℃ reached.

TEST MODE:

Transmitting with unmodulation

TEST RESULTS

☒ **Passed** ☐ **Not Applicable**

Voltage VS Frequency stability

Band: I			Test Frequency: 5180.00MHz	
Temperature (℃)	Voltage (V)	Frequency Deviation (Hz)	Frequency Deviation (ppm)	Result
25	3.3	-21000.00	-4.05405	Pass
25	3.7	-18000.00	-3.47490	Pass
25	4.2	-22000.00	-4.24710	Pass

Band: II			Test Frequency: 5260.00MHz	
Temperature (℃)	Voltage (V)	Frequency Deviation (Hz)	Frequency Deviation (ppm)	Result
25	3.3	-14000.00	-2.66160	Pass
25	3.7	-13000.00	-2.47148	Pass
25	4.2	-14000.00	-2.66160	Pass

Band: III			Test Frequency: 5500.00MHz	
Temperature (℃)	Voltage (V)	Frequency Deviation (Hz)	Frequency Deviation (ppm)	Result
25	3.3	-13000.00	-2.36364	Pass
25	3.7	-11000.00	-2.00000	Pass
25	4.2	-14000.00	-2.54546	Pass

Band: IV			Test Frequency: 5745.00MHz	
Temperature (℃)	Voltage (V)	Frequency Deviation (Hz)	Frequency Deviation (ppm)	Result
25	3.3	-14000.00	-2.43690	Pass
25	3.7	-12000.00	-2.08877	Pass
25	4.2	-13000.00	-2.26284	Pass

Temperature VS Frequency stability

Band: I			Test Frequency: 5180.00MHz	
Voltage (V)	Temperature (℃)	Frequency Deviation (Hz)	Frequency Deviation (ppm)	Result
3.7	-20	-23000.00	-4.44015	Pass
3.7	-10	-23000.00	-4.44015	Pass
3.7	0	-24000.00	-4.63321	Pass
3.7	10	-24000.00	-4.63321	Pass
3.7	20	-24000.00	-4.63321	Pass
3.7	30	-24000.00	-4.63321	Pass
3.7	40	-25000.00	-4.82626	Pass
3.7	50	-25000.00	-4.82626	Pass

Band: II			Test Frequency: 5260.00MHz	
Voltage (V)	Temperature (℃)	Frequency Deviation (Hz)	Frequency Deviation (ppm)	Result
3.7	-20	-15000.00	-2.85171	Pass
3.7	-10	-15000.00	-2.85171	Pass
3.7	0	-15000.00	-2.85171	Pass
3.7	10	-15000.00	-2.85171	Pass
3.7	20	-14000.00	-2.66160	Pass
3.7	30	-15000.00	-2.85171	Pass
3.7	40	-16000.00	-3.04183	Pass
3.7	50	-16000.00	-3.04183	Pass

Band: III			Test Frequency: 5500.00MHz	
Voltage (V)	Temperature (℃)	Frequency Deviation (Hz)	Frequency Deviation (ppm)	Result
3.7	-20	-14000.00	-2.54546	Pass
3.7	-10	-15000.00	-2.72727	Pass
3.7	0	-14000.00	-2.54546	Pass
3.7	10	-15000.00	-2.72727	Pass
3.7	20	-15000.00	-2.72727	Pass
3.7	30	-15000.00	-2.72727	Pass
3.7	40	-15000.00	-2.72727	Pass
3.7	50	-15000.00	-2.72727	Pass

Band: IV			Test Frequency: 5745.00MHz	
Voltage (V)	Temperature (℃)	Frequency Deviation (Hz)	Frequency Deviation (ppm)	Result
3.7	-20	-15000.00	-2.61097	Pass
3.7	-10	-15000.00	-2.61097	Pass
3.7	0	-14000.00	-2.43690	Pass
3.7	10	-16000.00	-2.78503	Pass
3.7	20	-16000.00	-2.78503	Pass
3.7	30	-17000.00	-2.95910	Pass
3.7	40	-16000.00	-2.78503	Pass
3.7	50	-16000.00	-2.78503	Pass

5.10. Dynamic Frequency Selection(DFS)

Requirement

Table 1: Applicability of DFS Requirements Prior to Use of a Channel

Requirement	Operational Mode		
	Master	Client Without Radar Detection	Client With Radar Detection
Non-Occupancy Period	Yes	Not required	Yes
DFS Detection Threshold	Yes	Not required	Yes
Channel Availability Check Time	Yes	Not required	Not required
U-NII Detection Bandwidth	Yes	Not required	Yes

Table 2: Applicability of DFS requirements during normal operation

Requirement	Operational Mode	
	Master Device or Client with Radar Detection	Client Without Radar Detection
DFS Detection Threshold	Yes	Not required
Channel Closing Transmission Time	Yes	Yes
Channel Move Time	Yes	Yes
U-NII Detection Bandwidth	Yes	Not required

Additional requirements for devices with multiple bandwidth modes	Master Device or Client with Radar Detection	Client Without Radar Detection
U-NII Detection Bandwidth and Statistical Performance Check	All BW modes must be tested	Not required
Channel Move Time and Channel Closing Transmission Time	Test using widest BW mode available	Test using the widest BW mode available for the link
All other tests	Any single BW mode	Not required
Note: Frequencies selected for statistical performance check (Section 7.8.4) should include several frequencies within the radar detection bandwidth and frequencies near the edge of the radar detection bandwidth. For 802.11 devices it is suggested to select frequencies in each of the bonded 20 MHz channels and the channel center frequency.		

LIMIT

1. DFS Detection Thresholds

Table 3: DFS Detection Thresholds for Master Devices and Client Devices With Radar Detection

Maximum Transmit Power	Value (See Notes 1, 2, and 3)
EIRP ≥ 200 milliwatt	-64 dBm
EIRP < 200 milliwatt and power spectral density < 10 dBm/MHz	-62 dBm
EIRP < 200 milliwatt that do not meet the power spectral density requirement	-64 dBm
Note 1: This is the level at the input of the receiver assuming a 0 dBi receive antenna. Note 2: Throughout these test procedures an additional 1 dB has been added to the amplitude of the test transmission waveforms to account for variations in measurement equipment. This will ensure that the test signal is at or above the detection threshold level to trigger a DFS response. Note3: EIRP is based on the highest antenna gain. For MIMO devices refer to KDB Publication 662911 D01.	

2. DFS Response Requirements

Table 4: DFS Response Requirement Values

Paramenter	Value
Non-occupancy period	Minimum 30 minutes
Channel Availability Check Time	60 seconds
Channel Move Time	10 seconds See Note 1.
Channel Closing Transmission Time	200 milliseconds + an aggregate of 60 milliseconds over remaining 10 second period. See Notes 1 and 2.
U-NII Detection Bandwidth	Minimum 100% of the U-NII 99% transmission power bandwidth. See Note 3.

Note 1: Channel Move Time and the Channel Closing Transmission Time should be performed with Radar Type 0. The measurement timing begins at the end of the Radar Type 0 burst.
Note 2: The Channel Closing Transmission Time is comprised of 200 milliseconds starting at the beginning of the Channel Move Time plus any additional intermittent control signals required facilitating a Channel move (an aggregate of 60 milliseconds) during the remainder of the 10 second period. The aggregate duration of control signals will not count quiet periods in between transmissions.
Note 3: During the U-NII Detection Bandwidth detection test, radar type 0 should be used. For each frequency step the minimum percentage of detection is 90 percent. Measurements are performed with no data traffic.

RADAR TEST WAVEFORMS

This section provides the parameters for required test waveforms, minimum percentage of successful detections, and the minimum number of trials that must be used for determining DFS conformance. Step intervals of 0.1 microsecond for Pulse Width, 1 microsecond for PRI, 1 MHz for chirp width and 1 for the number of pulses will be utilized for the random determination of specific test waveforms.

Table 5 Short Pulse Radar Test Waveforms

Radar Type	Pulse Width (µsec)	PRI (µsec)	Number of Pulses	Minimum Percentage of Successful Detection	Minimum Number of Trials
0	1	1428	18	See Note 1	See Note 1
1	1	Test A: 15 unique PRI values randomly selected from the list of 23 PRI values in Table 5a	$\text{Roundup}\left\{\left(\frac{1}{360}\right)\cdot\left(\frac{19\cdot 10^6}{PRI_{\mu sec}}\right)\right\}$	60%	30
		Test B: 15 unique PRI values randomly selected within the range of 518-3066 µsec, with a minimum increment of 1 µsec, excluding PRI values selected in Test A			
2	1-5	150-230	23-29	60%	30
3	6-10	200-500	16-18	60%	30
4	11-20	200-500	12-16	60%	30
Aggregate (Radar Types 1-4)				80%	120

Note 1: Short Pulse Radar Type 0 should be used for the detection bandwidth test, channel move time, and channel closing time tests.

A minimum of 30 unique waveforms are required for each of the Short Pulse Radar Types 2 through 4. If more than 30 waveforms are used for Short Pulse Radar Types 2 through 4, then each additional waveform must also be unique and not repeated from the previous waveforms. If more than 30 waveforms are used for Short Pulse Radar Type 1, then each additional waveform is generated with Test B and must also be unique and not repeated from the previous waveforms in Tests A or B.

For example if in Short Pulse Radar Type 1 Test B a PRI of 3066 μsec is selected, the number of pulses would be Round up $\left\{\left(\frac{1}{360}\right)\cdot\left(\frac{19\cdot10^{6}}{3066}\right)\right\}$ = Round up {17.2} = 18.

Table 5a - Pulse Repetition Intervals Values for Test A

Pulse Repetition Frequency Number	Pulse Repetition Frequency (Pulses Per Second)	Pulse Repetition Interval (Microseconds)
1	1930.5	518
2	1858.7	538
3	1792.1	558
4	1730.1	578
5	1672.2	598
6	1618.1	618
7	1567.4	638
8	1519.8	658
9	1474.9	678
10	1432.7	698
11	1392.8	718
12	1355	738
13	1319.3	758
14	1285.3	778
15	1253.1	798
16	1222.5	818
17	1193.3	838
18	1165.6	858
19	1139	878
20	1113.6	898
21	1089.3	918
22	1066.1	938
23	326.2	3066

Table 6 – Long Pulse Radar Test Waveform

Radar Type	Pulse Width (µsec)	Chirp Width (MHz)	PRI (µsec)	Number of Pulses per Burst	Number of Bursts	Minimum Percentage of Successful Detection	Minimum Number of Trials
5	50-100	5-20	1000-2000	1-3	8-20	80%	30

The parameters for this waveforms are randomly chosen. Thirty unique waveforms are required for the Long Pulse Radar Type waveforms. If more than 30 waveforms are used for the Long Pulse Radar Type wave forms, then each additional waveform must also be unique and not repeated from the previous waveforms.

Table 7 – Frequency Hopping Radar Test Waveform

Radar Type	Pulse Width (µsec)	PRI (µsec)	Pulses per Hop	Hopping Rate (kHz)	Hopping Sequence Length (msec)	Minimum Percentage of Successful Detection	Minimum Number of Trials
6	1	333	9	0.333	300	70%	30

For the Frequency Hopping Radar Type, the same Burst parameters are used for each wave form. The hopping sequence is different for each wave form and a 100-length segment is selected from the hopping sequence defined by the following algorithm:

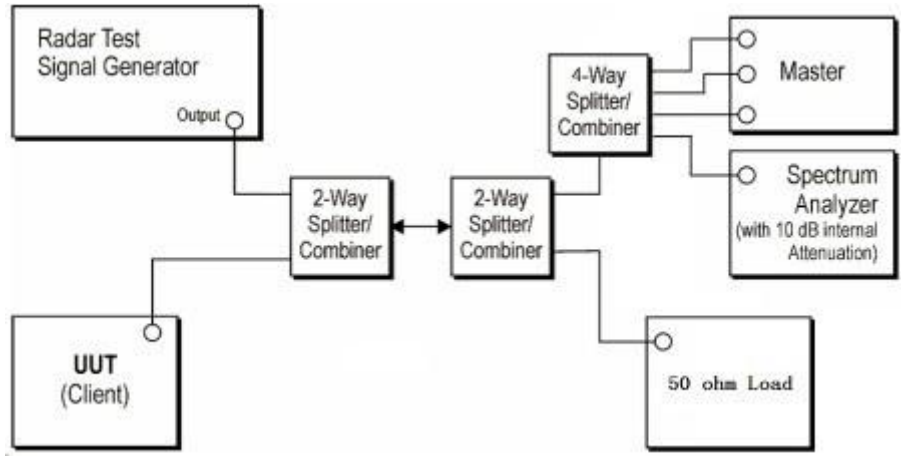
The first frequency in a hopping sequence is selected randomly from the group of 475 integer frequencies from 5250–5724MHz.Next,the frequency that was just chosen is removed from the group and a frequency is randomly selected from the remaining 474 frequencies in the group. This process continues until all 475 frequencies are chosen for the set. For selection of a random frequency, the frequencies remaining within the group are always treated as equally likely.

Calibration of Radar Waveform

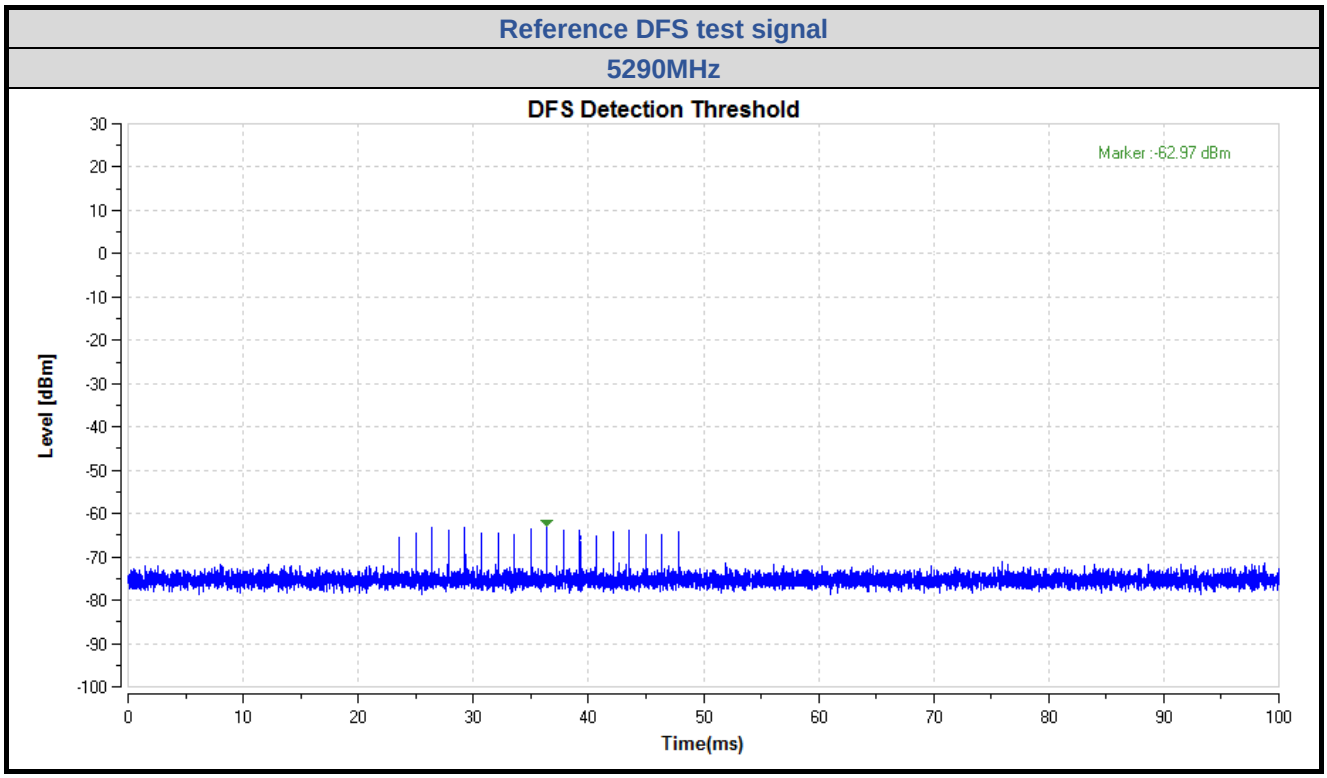
Radar Waveform Calibration Procedure

1) A 50 ohm load is connected in place of the spectrum analyzer, and the spectrum analyzer is connected to place of the master
2) The interference Radar Detection Threshold Level is -62dBm + 0dBi +1dB = -61dBm that had been taken into account the output power range and antenna gain.
3) The following equipment setup was used to calibrate the conducted radar waveform. A vector signal generator was utilized to establish the test signal level for radar type 0. During this process there were no transmissions by either the master or client device. The spectrum analyzer was switched to the zero spans (time domain) at the frequency of the radar waveform generator. Peak detection was used. The spectrum analyzer resolution bandwidth (RBW) and video bandwidth (VBW) were set to 3
   MHz. The spectrum analyzer had offset -1.0dB to compensate RF cable loss 1.0dB.
4) The vector signal generator amplitude was set so that the power level measured at the spectrum analyzer was - -62dBm + 0dBi +1dB = -61dBm. Capture the spectrum analyzer plots on short pulse radar waveform.

Conducted Calibration Setup

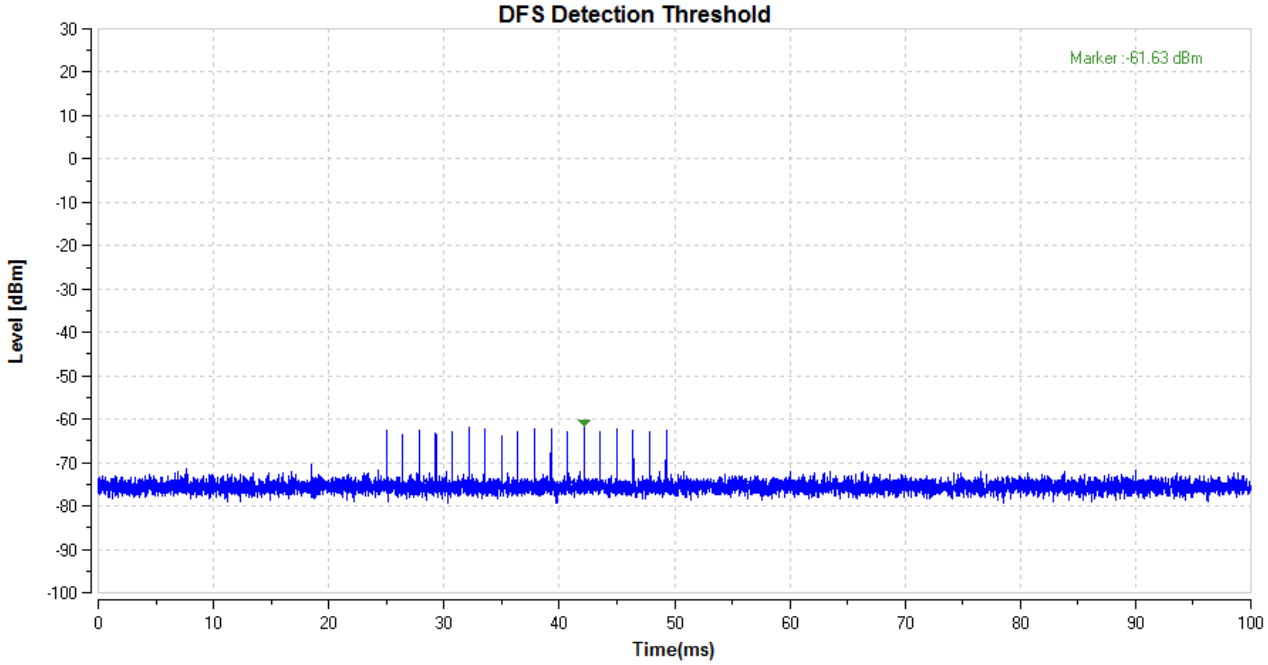


Radar Waveform Calibration Result

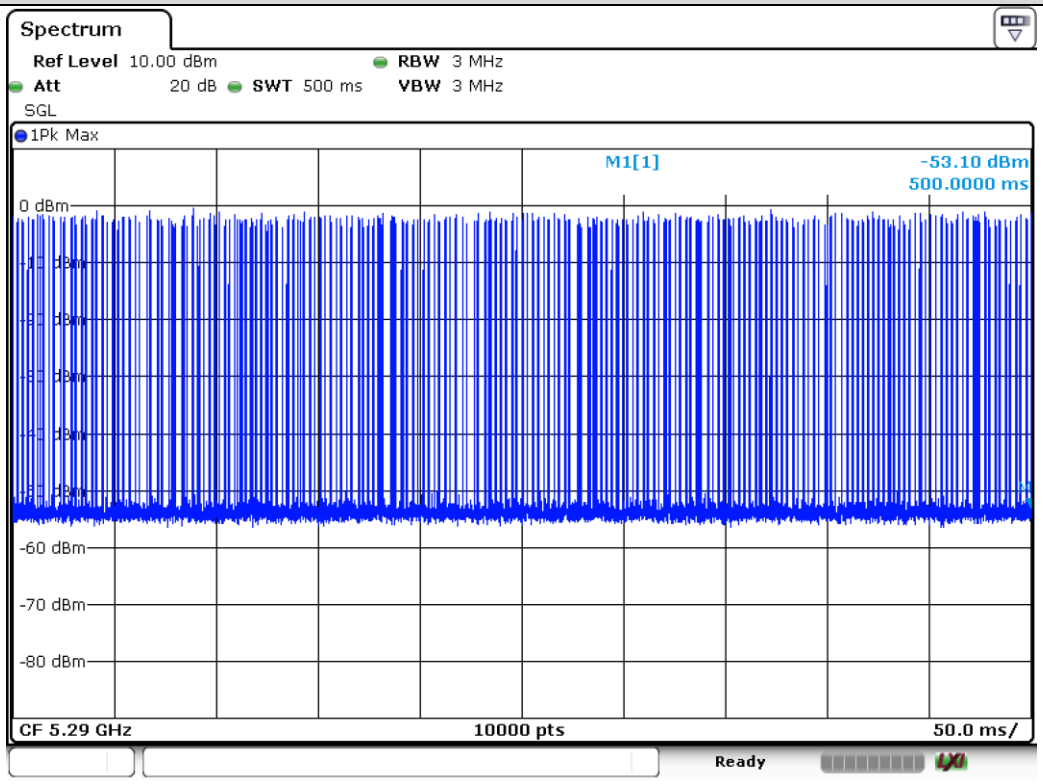


Reference DFS test signal

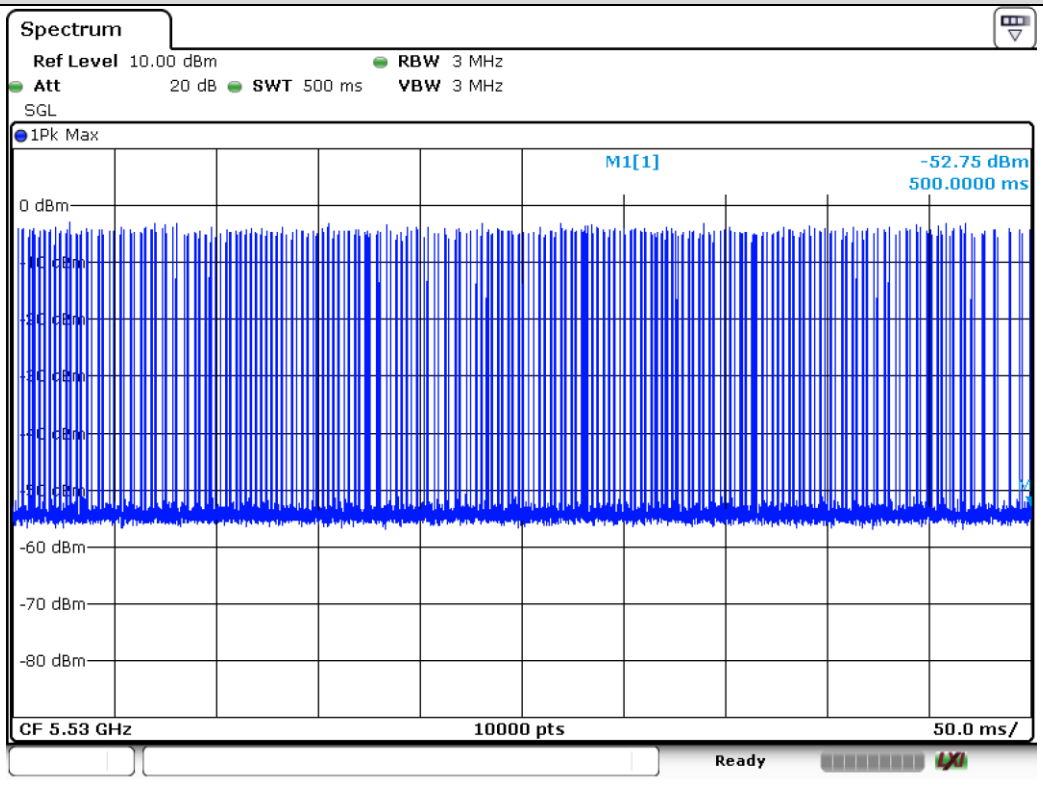
5530 MHz



EUT data traffic (Slave)
5290MHz

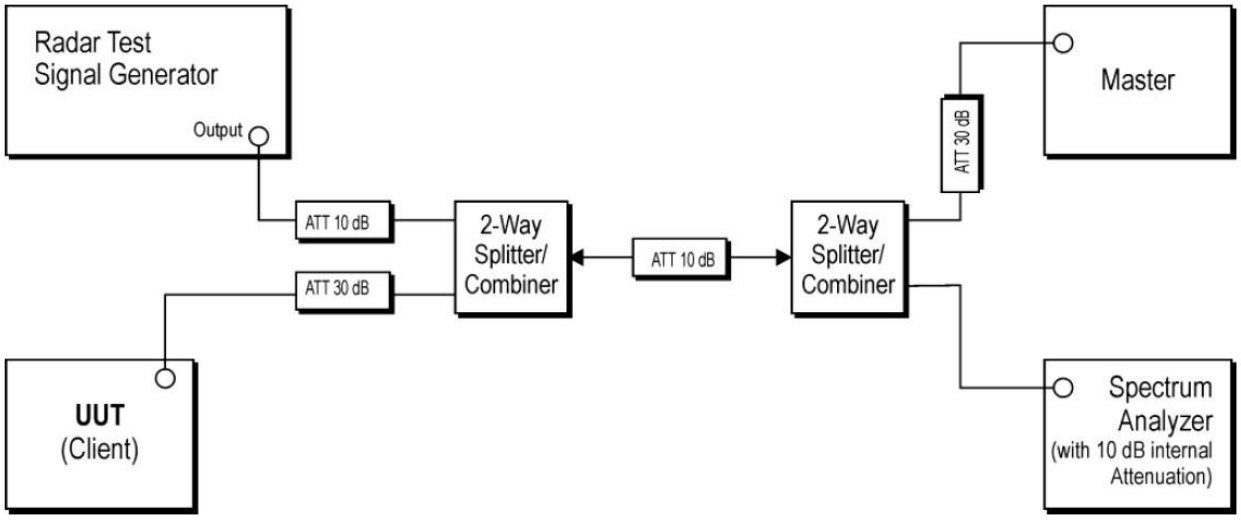


EUT data traffic (Slave)
5530MHz



TEST CONFIGURATION

Setup for Client with injection at the Master



TEST PROCEDURE

1. The radar pulse generator is setup to provide a pulse at frequency that the master and client are operating. A type 0 radar pulse with a 1us pulse width and a 1428us PRI is used for the testing.
2. The vector signal generator is adjusted to provide the radar burst (18 pulses) at the level of approximately -61dBm at the antenna port of the master device
3. A trigger is provided from the pulse generator to the DFS monitoring system in order to capture the traffic and the occurrence of the radar pulse.
4. EUT will associate with the master at channel. The file “iperf.exe” specified by the FCC is streamed from the PC 2 through the master and the client device to the PC 1 and played in full motion video using Media Player Classic Ver. 6.4.8.6 in order to properly load the network for the entire period of the test.
5. When radar burst with a level equal to the DFS Detection Threshold +1dB is generated on the operating channel of the U-NII device. At time T0 the radar waveform generator sends a burst of pulse of the radar waveform at Detection Threshold +1dB.
6. Observe the transmissions of the EUT at the end of the radar Burst on the Operating Channel Measure and record the transmissions from the UUT during the observation time (Channel Move Time). One 15 seconds plot is reported for the Short Pulse Radar Type 0. The plot for the Short Pulse Radar Types start at the end of the radar burst. The Channel Move Time will be calculated based on the zoom in 600ms plot of the Short Pulse Radar Type
7. Measurement of the aggregate duration of the Channel Closed Transmission Time method. With the spectrum analyzer set to zero span tuned to the center frequency of the EUT operating channel at the radar simulated frequency, peak detection, and max hold, the dwell time per bin is given by: Dwell (0.3ms) =S (12000ms) / B (4000); where Dwell is the dwell time per spectrum analyzer sampling bin, S is sweep time and B is the number of spectrum analyzer sampling bins. An upper bound of the aggregate duration of the intermittent control signals of Channel Closing Transmission Time is calculated by: C (ms)= N X Dwell (0.3ms); where C is the Closing Time, N is the number of spectrum

analyzer sampling bins (intermittent control signals) showing a U-NII transmission and Dwell is the dwell time per bin.

8. Measurement the EUT for more than 30 minutes following the channel move time to verify that no transmission or beacons occur on this channel.

TEST MODE:

Please refer to the clause 3.3

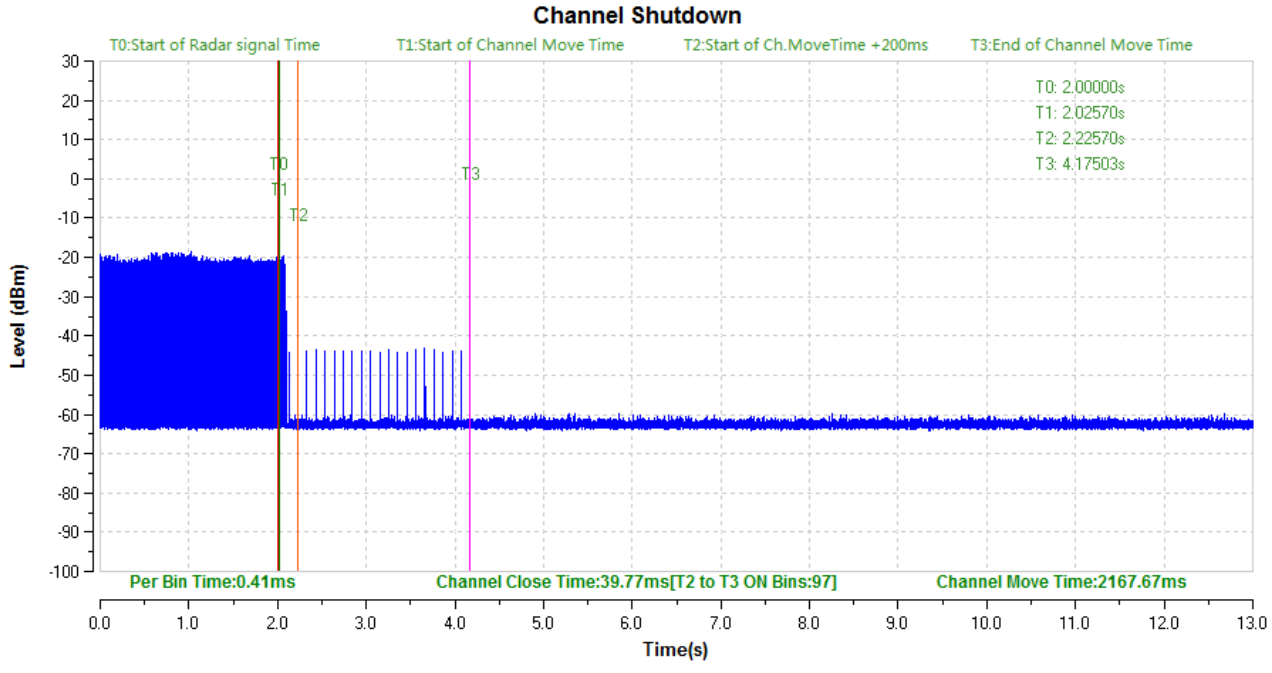
TEST RESULTS

☒ **Passed** ☐ **Not Applicable**

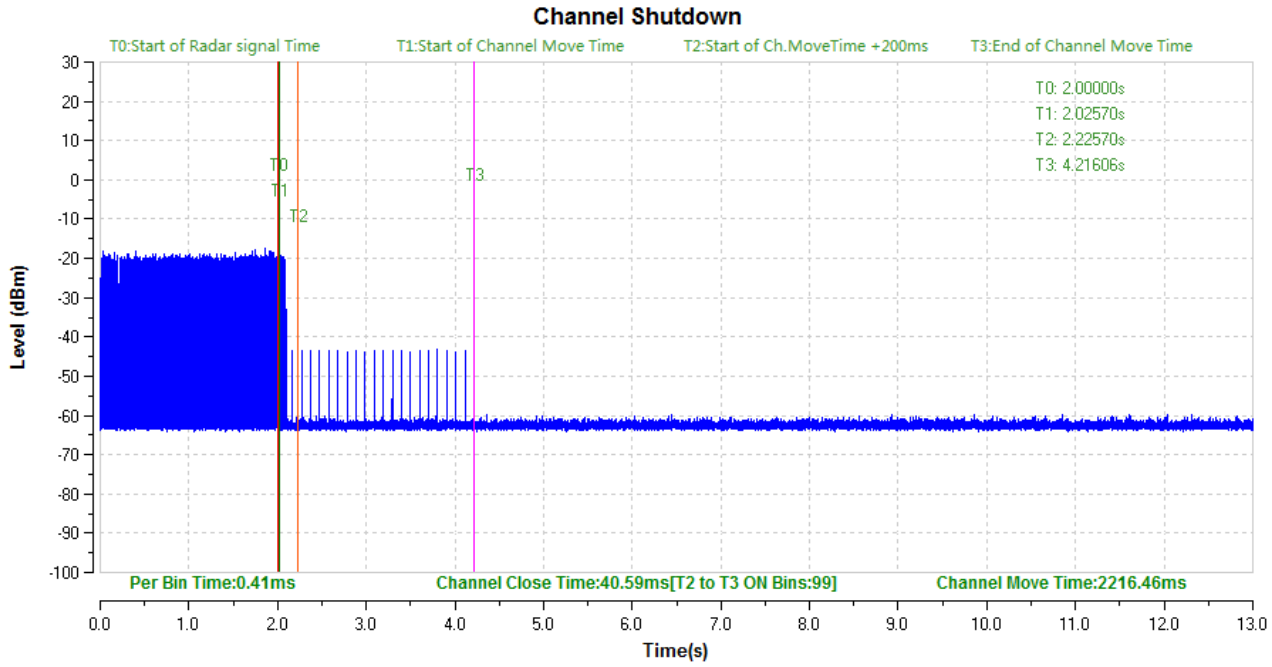
BW/ Channel	Maximum EIRP Power(dBm)	Test Item	Test Result	Limit	Result
80MHz/ 5290MHz	15.91	Channel Move Time	2.168s	<10s	Pass
		Channel Closing Transmission Time	39.77ms	<60ms	Pass
80MHz/ 5530MHz	15.39	Channel Move Time	2.216s	<10s	Pass
		Channel Closing Transmission Time	40.59ms	<60ms	Pass

80MHz/5290MHz

Band II Channel Move Time& Channel Closing Transmission Time

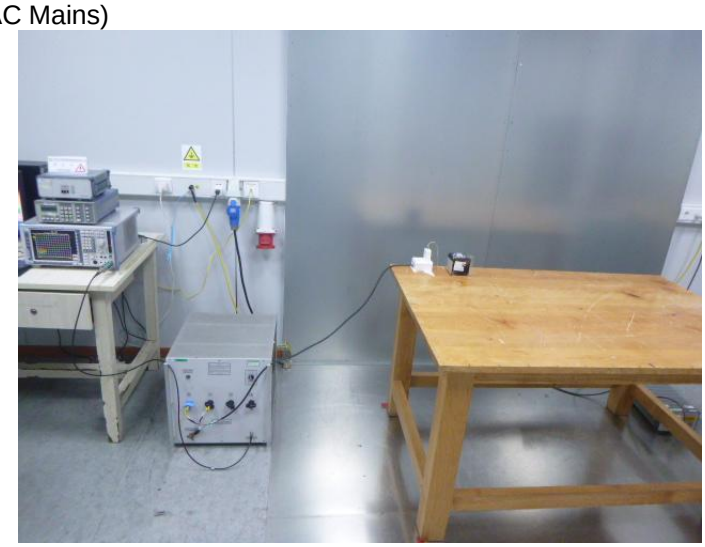


80MHz/5530MHz
Band III Channel Move Time& Channel Closing Transmission Time

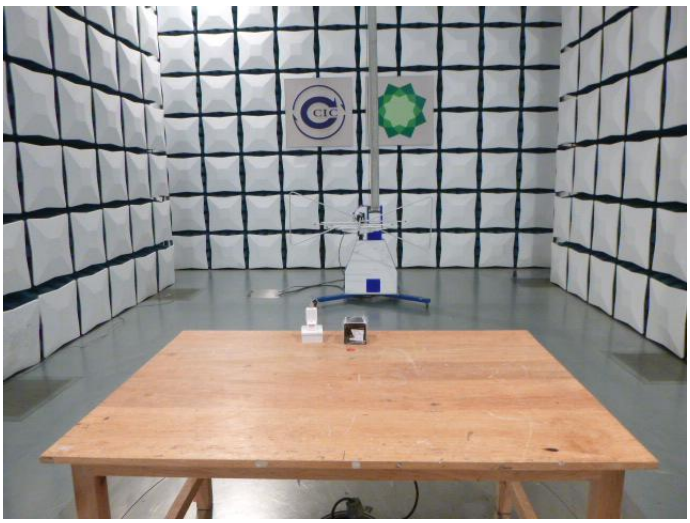


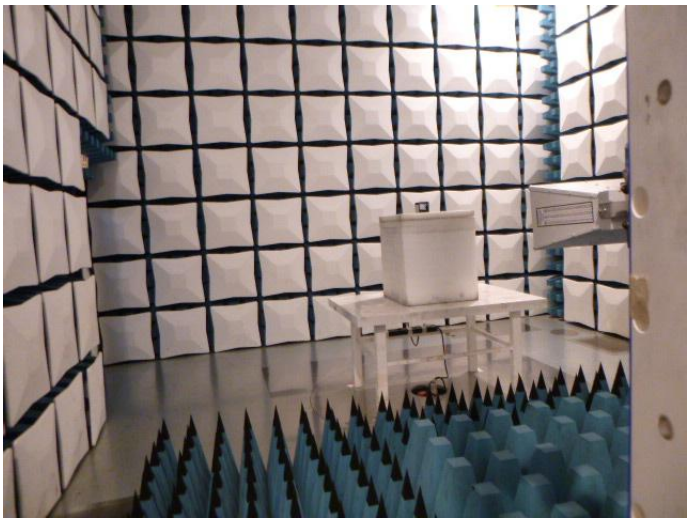
6. Test Setup Photos of the EUT

Conducted Emissions (AC Mains)



Radiated Emissions





DFS

7. External and Internal Photos of the EUT

Reference to the test report No.: CHTEW19050128

----------End of Report----------