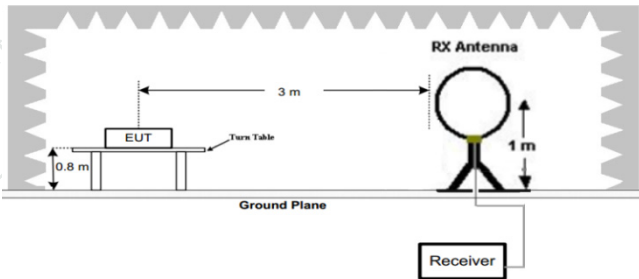




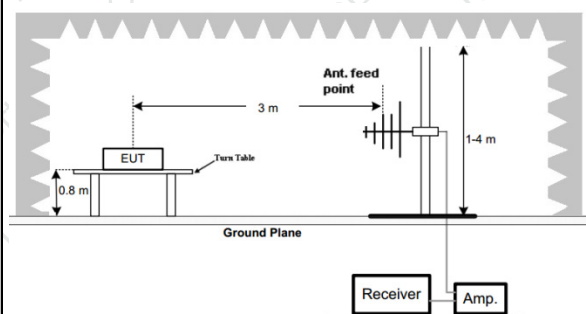
5.6 Radiated Spurious Emission Measurement

Test Specification

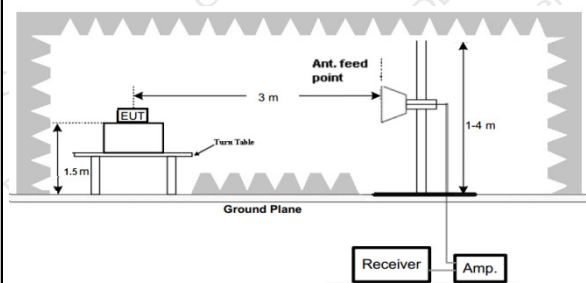
Test Requirement:	FCC Part15 C Section 15.209				
Test Method:	ANSI C63.10: 2020				
Frequency Range:	9 kHz to 26 GHz				
Measurement Distance:	3 m				
Antenna Polarization:	Horizontal & Vertical				
Operation Mode:	Transmitting mode with modulation				
Receiver Setup:	Frequency	Detector	RBW	VBW	Remark
	9kHz- 150kHz	Quasi-peak	200Hz	1kHz	Quasi-peak Value
	150kHz- 30MHz	Quasi-peak	9kHz	30kHz	Quasi-peak Value
	30MHz-1GHz	Quasi-peak	120KHz	300KHz	Quasi-peak Value
	Above 1GHz	Peak	1MHz	3MHz	Peak Value
		Peak	1MHz	10Hz	Average Value
Limit:	Frequency		Field Strength (microvolts/meter)		Measurement Distance (meters)
	0.009-0.490		2400/F(KHz)		300
	0.490-1.705		24000/F(KHz)		30
	1.705-30		30		30
	30-88		100		3
	88-216		150		3
	216-960		200		3
	Above 960		500		3
	Frequency		Field Strength (microvolts/meter)	Measurement Distance (meters)	Detector
	Above 1GHz		500	3	Average
			5000	3	Peak
	For radiated emissions below 30MHz				
					



30MHz to 1GHz



Above 1GHz

**Test Procedure:**

1. For the radiated emission test below 1GHz:
The EUT was placed on a turntable with 0.8 meter above ground. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower. 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.
2. For the radiated emission test above 1GHz:
Place the measurement antenna on a turntable with 1.5 meter above ground, which is away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. The measurement antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal.



	The final measurement antenna elevation shall be that which maximizes the emissions. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane. 3. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level 4. For measurement below 1GHz, 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. 5. Use the following spectrum analyzer settings: (1) Span shall wide enough to fully capture the emission being measured; (2) Set RBW=120 kHz for $f < 1$ GHz; VBW $\geq$ RBW; Sweep = auto; Detector function = peak; Trace = max hold; (3) Set RBW = 1 MHz, VBW= 3MHz for $f \geq 1$ GHz for peak measurement. 6. For average measurement: VBW = 10 Hz, when duty cycle is no less than 98 percent. VBW $\geq 1/T$, when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.
Test Results:	PASS



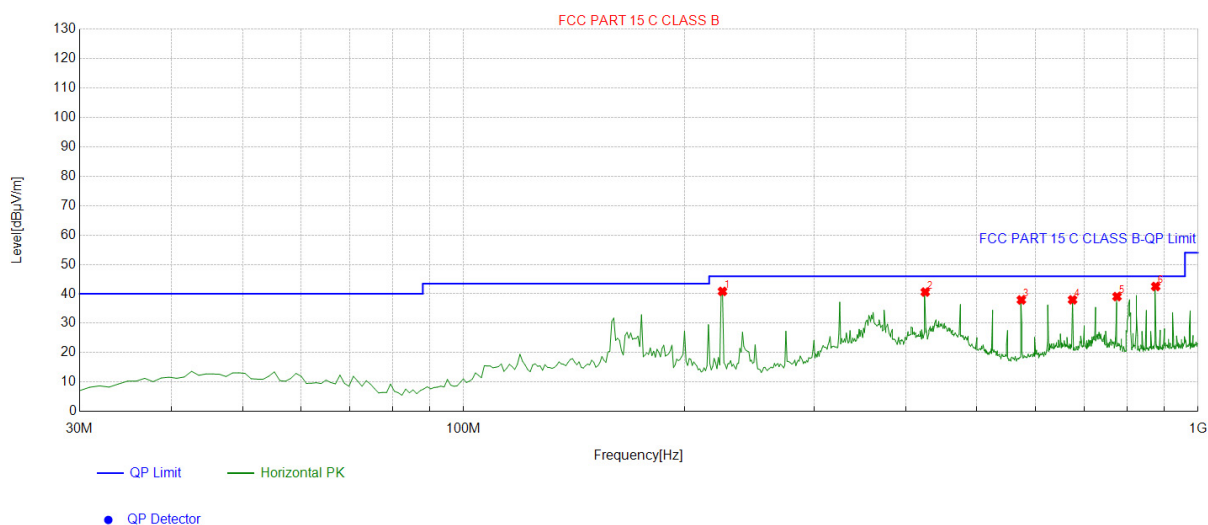
Test Data

Below 1GHz Test Results

All modes have been tested, only the worst mode of 802.11b Low channel TX is reflected.

Main Test Model: TC112

Antenna polarity: Horizontal



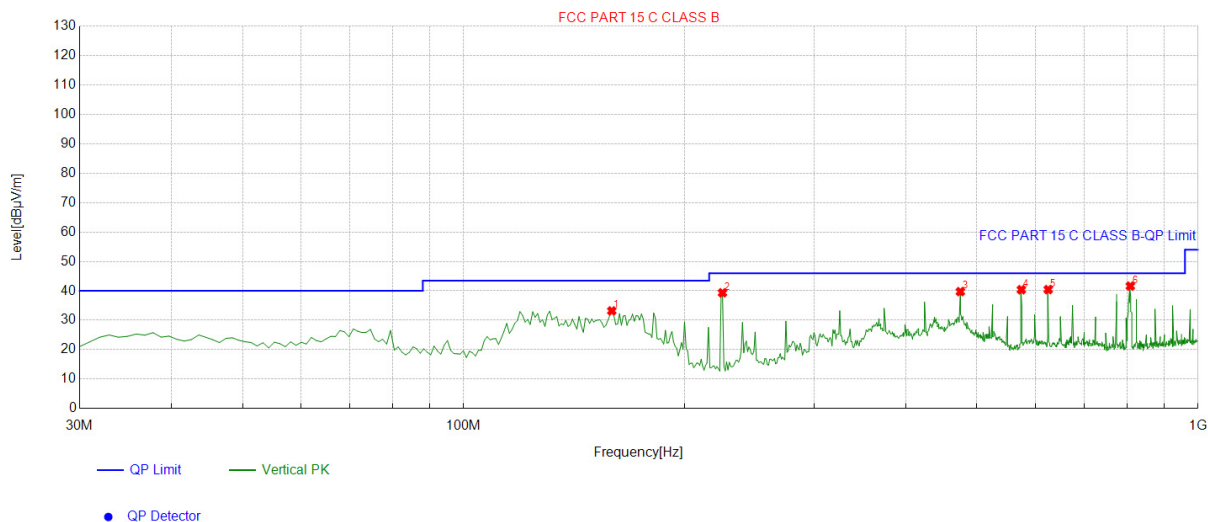
Suspected List

NO.	Freq. [MHz]	Factor [dB]	Reading [dBμV/m]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	225.165	-14.10	54.94	40.84	46.00	5.16	100	115	Horizontal
2	425.185	-9.25	49.86	40.61	46.00	5.39	100	90	Horizontal
3	574.715	-6.27	44.21	37.94	46.00	8.06	100	222	Horizontal
4	674.725	-4.43	42.41	37.98	46.00	8.02	100	126	Horizontal
5	775.706	-2.80	41.88	39.08	46.00	6.92	100	126	Horizontal
6	875.716	-1.60	44.12	42.52	46.00	3.48	100	76	Horizontal

Remark: Factor = Cable loss + Antenna factor + Attenuator – Preamplifier; Level = Reading + Factor; Margin = Limit – Level



Antenna polarity: Vertical



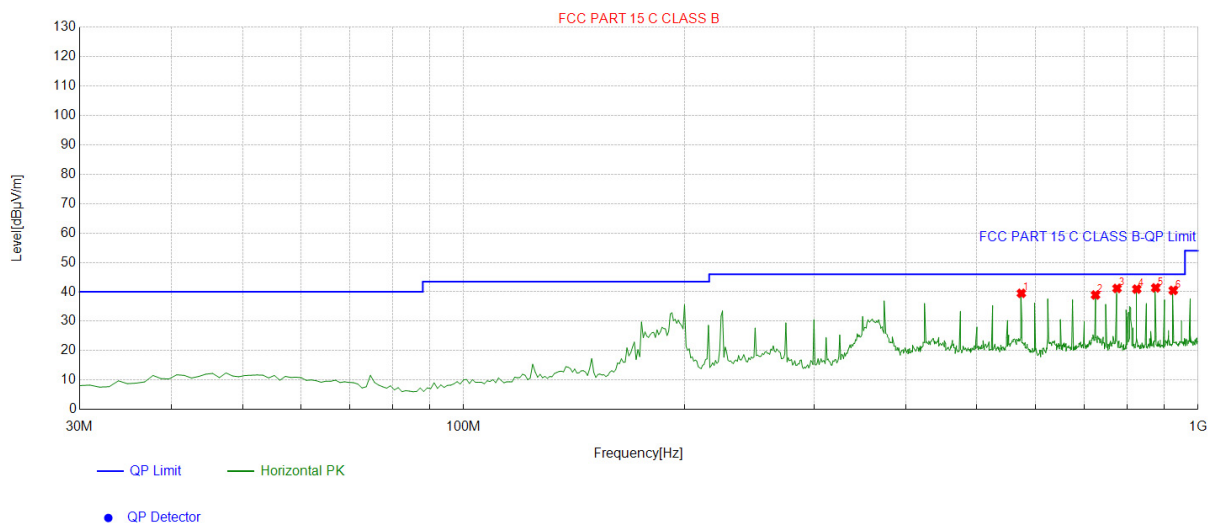
Suspected List									
NO.	Freq. [MHz]	Factor [dB]	Reading [dBμV/m]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	159.139	-17.59	50.78	33.19	43.50	10.31	100	85	Vertical
2	225.165	-14.10	53.44	39.34	46.00	6.66	100	326	Vertical
3	474.705	-8.32	48.06	39.74	46.00	6.26	100	226	Vertical
4	574.715	-6.27	46.66	40.39	46.00	5.61	100	163	Vertical
5	625.205	-5.17	45.61	40.44	46.00	5.56	100	32	Vertical
6	808.719	-2.50	44.13	41.63	46.00	4.37	100	61	Vertical

Remark: Factor = Cable loss + Antenna factor + Attenuator – Preamplifier; Level = Reading + Factor; Margin = Limit – Level



Differential Test Model: TC103

Antenna polarity: Horizontal

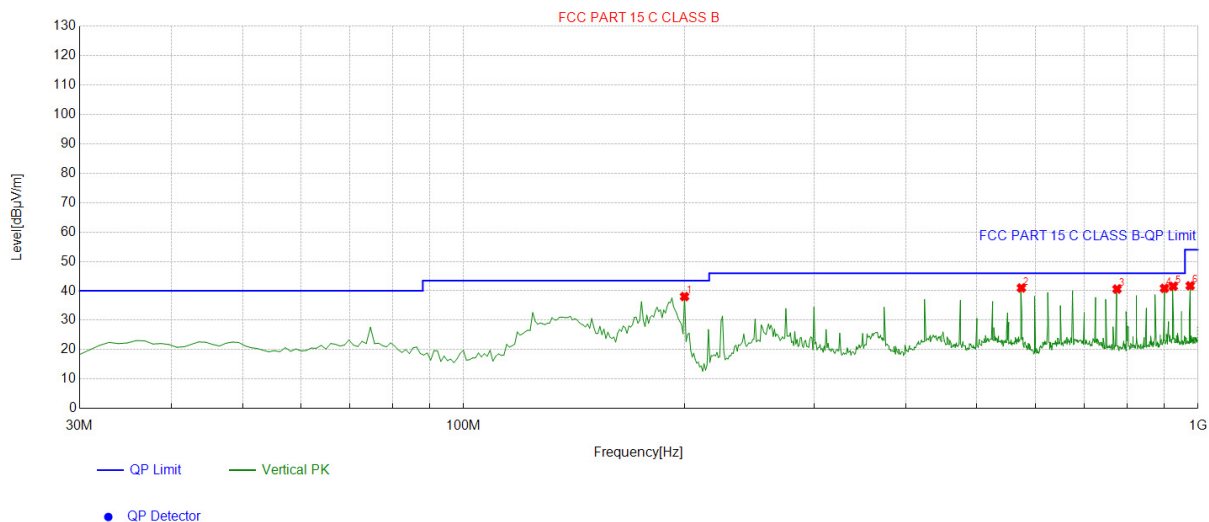


Suspected List									
NO.	Freq. [MHz]	Factor [dB]	Reading [dBμV/m]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	574.715	-6.27	45.78	39.51	46.00	6.49	100	192	Horizontal
2	725.215	-3.86	42.81	38.95	46.00	7.05	100	317	Horizontal
3	775.706	-2.80	43.97	41.17	46.00	4.83	100	128	Horizontal
4	825.225	-2.21	43.15	40.94	46.00	5.06	100	118	Horizontal
5	875.716	-1.60	42.96	41.36	46.00	4.64	100	108	Horizontal
6	925.235	-1.02	41.51	40.49	46.00	5.51	100	108	Horizontal

Remark: Factor = Cable loss + Antenna factor + Attenuator – Preamplifier; Level = Reading + Factor; Margin = Limit – Level



Antenna polarity: Vertical



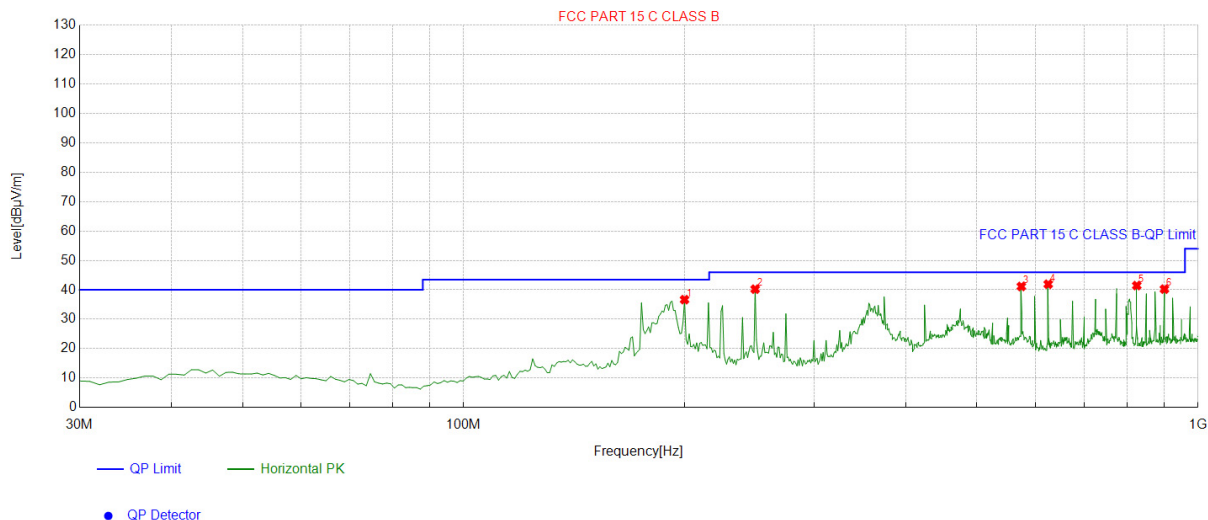
Suspected List									
NO.	Freq. [MHz]	Factor [dB]	Reading [dBμV/m]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	199.920	-14.52	52.58	38.06	43.50	5.44	100	57	Vertical
2	574.715	-6.27	47.26	40.99	46.00	5.01	100	312	Vertical
3	775.706	-2.80	43.41	40.61	46.00	5.39	100	0	Vertical
4	899.990	-1.41	42.28	40.87	46.00	5.13	100	230	Vertical
5	925.235	-1.02	42.57	41.55	46.00	4.45	100	230	Vertical
6	975.726	-0.62	42.35	41.73	54.00	12.27	100	169	Vertical

Remark: Factor = Cable loss + Antenna factor + Attenuator – Preamplifier; Level = Reading + Factor; Margin = Limit – Level



Main Test Model: TC110

Antenna polarity: Horizontal



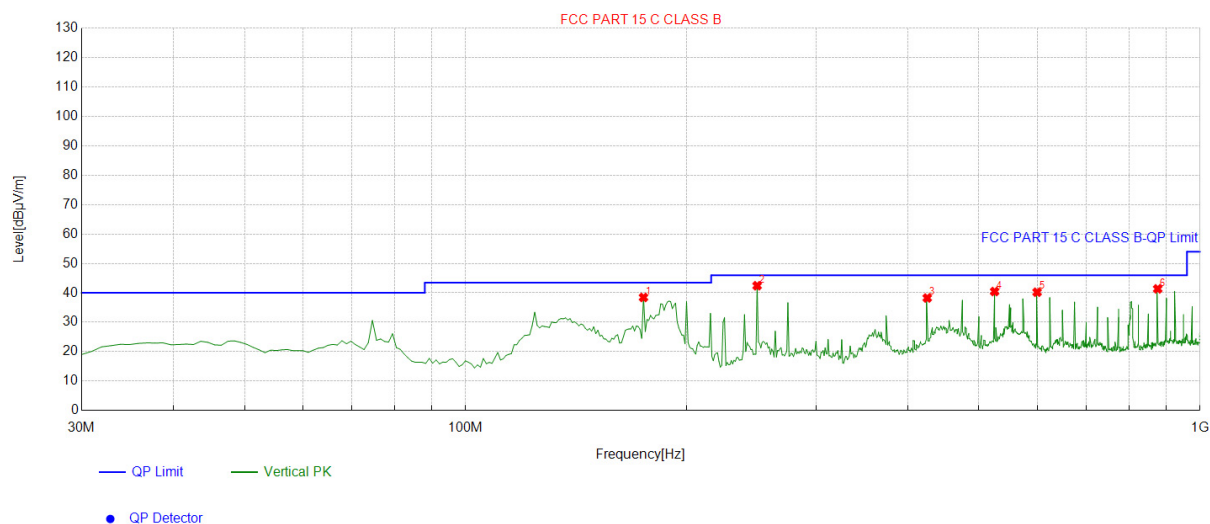
Suspected List

NO.	Freq. [MHz]	Factor [dB]	Reading [dBμV/m]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	199.920	-14.52	51.19	36.67	43.50	6.83	100	203	Horizontal
2	249.439	-13.15	53.39	40.24	46.00	5.76	100	311	Horizontal
3	574.715	-6.27	47.43	41.16	46.00	4.84	100	321	Horizontal
4	625.205	-5.17	47.10	41.93	46.00	4.07	100	336	Horizontal
5	825.225	-2.21	43.67	41.46	46.00	4.54	100	106	Horizontal
6	899.990	-1.41	41.66	40.25	46.00	5.75	100	343	Horizontal

Remark: Factor = Cable loss + Antenna factor + Attenuator – Preamplifier; Level = Reading + Factor;
Margin = Limit – Level



Antenna polarity: Vertical



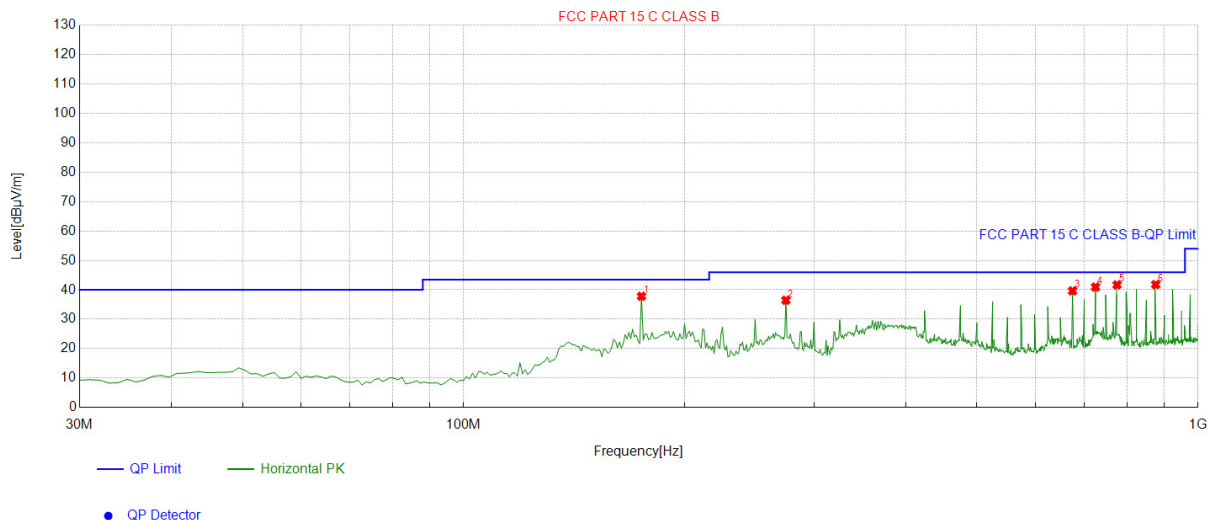
Suspected List									
NO.	Freq. [MHz]	Factor [dB]	Reading [dBμV/m]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	174.675	-16.88	55.33	38.45	43.50	5.05	100	63	Vertical
2	249.439	-13.15	55.58	42.43	46.00	3.57	100	125	Vertical
3	425.185	-9.25	47.50	38.25	46.00	7.75	100	207	Vertical
4	525.195	-7.32	47.78	40.46	46.00	5.54	100	146	Vertical
5	599.960	-5.63	45.85	40.22	46.00	5.78	100	48	Vertical
6	875.716	-1.60	42.96	41.36	46.00	4.64	100	135	Vertical

Remark: Factor = Cable loss + Antenna factor + Attenuator – Preamplifier; Level = Reading + Factor; Margin = Limit – Level



Main Test Model: TC111

Antenna polarity: Horizontal



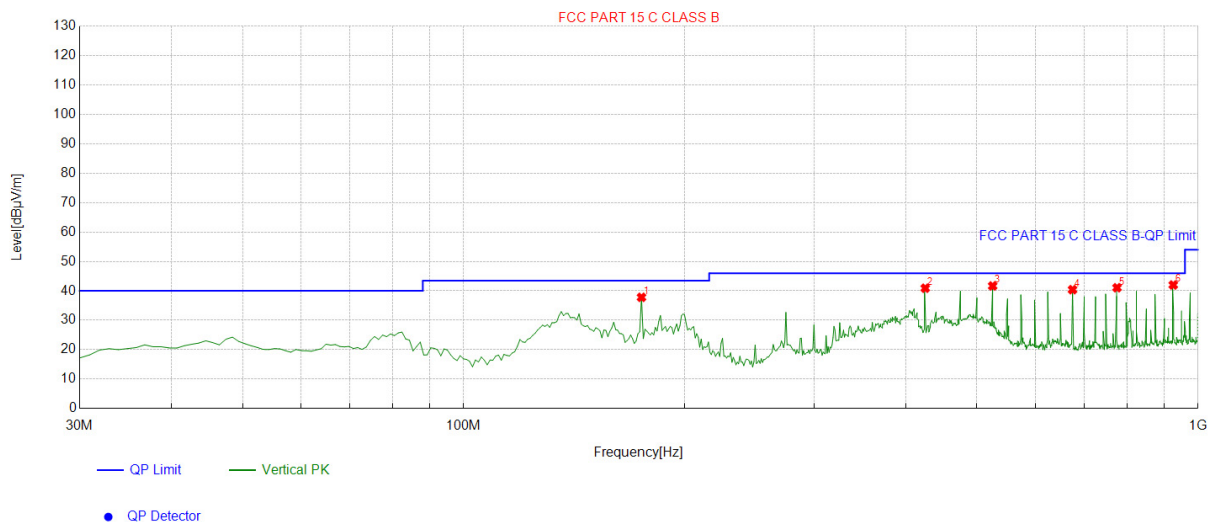
Suspected List

NO.	Freq. [MHz]	Factor [dB]	Reading [dBμV/m]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	174.675	-16.88	54.70	37.82	43.50	5.68	100	86	Horizontal
2	274.685	-12.72	49.19	36.47	46.00	9.53	100	318	Horizontal
3	674.725	-4.43	44.08	39.65	46.00	6.35	100	0	Horizontal
4	725.215	-3.86	44.81	40.95	46.00	5.05	100	125	Horizontal
5	775.706	-2.80	44.51	41.71	46.00	4.29	100	133	Horizontal
6	875.716	-1.60	43.40	41.80	46.00	4.20	100	86	Horizontal

Remark: Factor = Cable loss + Antenna factor + Attenuator – Preamplifier; Level = Reading + Factor; Margin = Limit – Level



Antenna polarity: Vertical



Suspected List									
NO.	Freq. [MHz]	Factor [dB]	Reading [dBμV/m]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	174.675	-16.88	54.69	37.81	43.50	5.69	100	68	Vertical
2	425.185	-9.25	50.15	40.90	46.00	5.10	100	237	Vertical
3	525.195	-7.32	48.99	41.67	46.00	4.33	100	156	Vertical
4	674.725	-4.43	44.84	40.41	46.00	5.59	100	68	Vertical
5	775.706	-2.80	43.86	41.06	46.00	4.94	100	20	Vertical
6	925.235	-1.02	43.03	42.01	46.00	3.99	100	340	Vertical

Remark: Factor = Cable loss + Antenna factor + Attenuator – Preamplifier; Level = Reading + Factor; Margin = Limit – Level

Harmonics and Spurious Emissions

Frequency Range (9kHz-30MHz)

Frequency (MHz)	Level@3m (dBμV/m)	Limit@3m (dBμV/m)
--	--	--
--	--	--
--	--	--
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Note: 1. Emission Level=Reading+ Cable loss-Antenna factor-Amp factor.

2. The emission levels are 20 dB below the limit value, which are not reported. It is deemed to comply with the requirement.

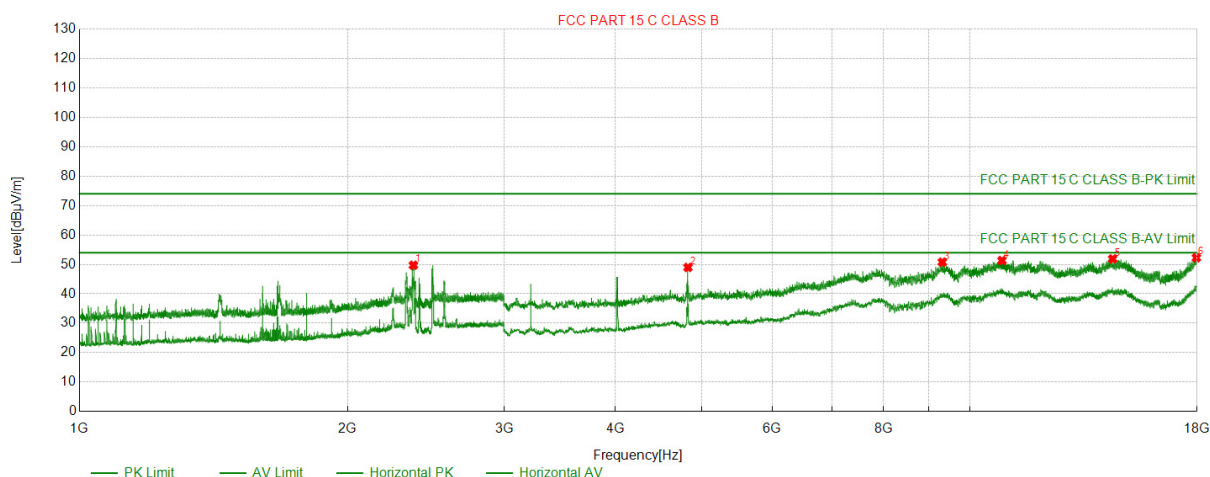


Above 1GHz Test Results

All modes have been tested, only the worst mode of 802.11b Low channel TX is reflected.

For 1GHz to 18GHz

Antenna polarity: Horizontal

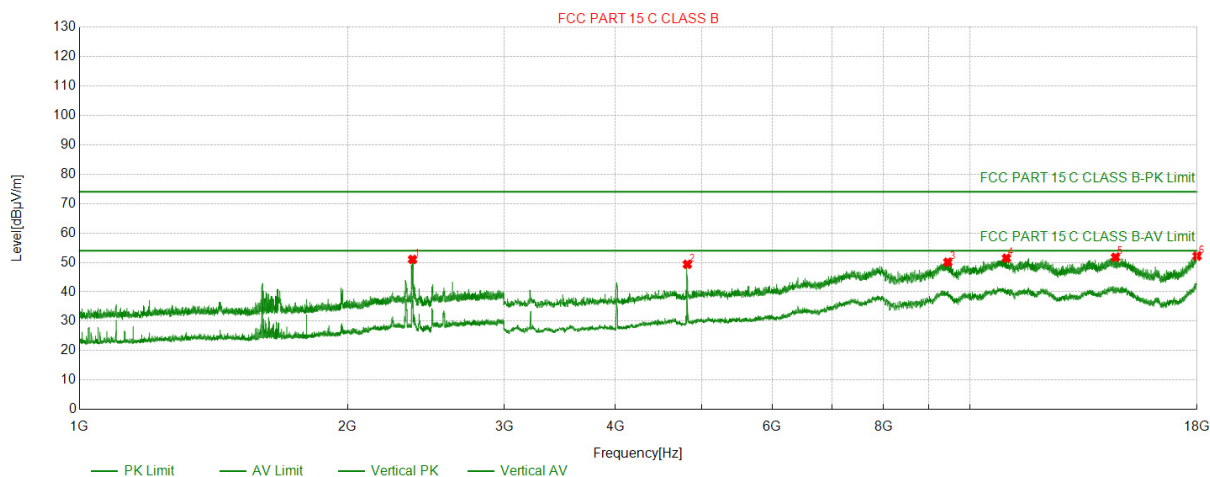


Suspected Data List									
NO.	Freq. [MHz]	Reading [dBμV/m]	PK Level [dBμV/m]	Factor [dB]	PK Limit [dBμV/m]	PK Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2371.737	64.23	49.73	-14.50	74.00	24.27	150	30	Horizontal
2	4824.182	59.72	48.99	-10.73	74.00	25.01	150	39	Horizontal
3	9312.631	51.66	50.78	-0.88	74.00	23.22	150	226	Horizontal
4	10866.787	50.35	51.33	0.98	74.00	22.67	150	278	Horizontal
5	14468.647	48.24	51.88	3.64	74.00	22.12	150	67	Horizontal
6	17968.497	45.25	52.26	7.01	74.00	21.74	150	360	Horizontal

Remark: Factor = Cable loss + Antenna factor + Attenuator – Preamplifier; Level = Reading + Factor; Margin = Limit – Level



Antenna polarity: Vertical



Suspected Data List

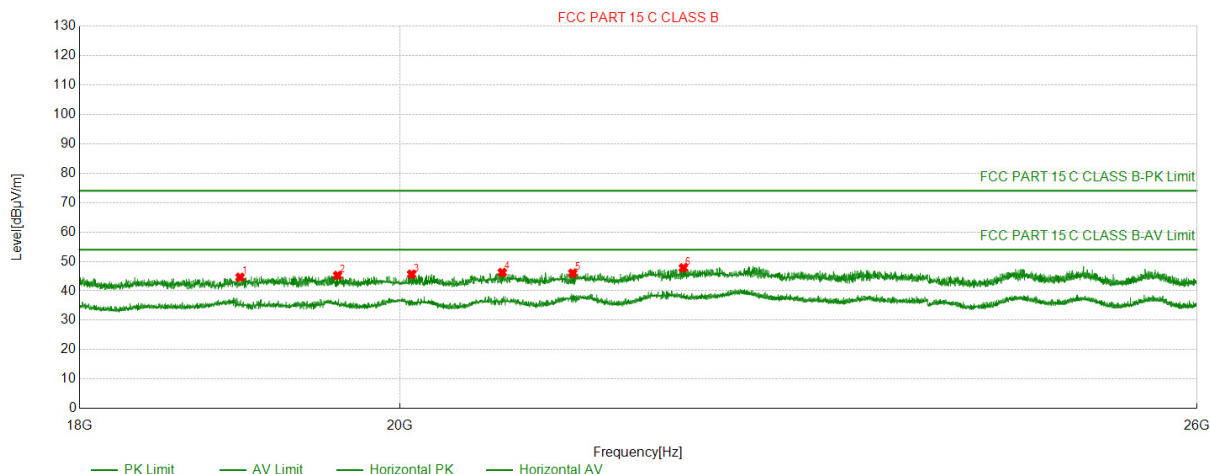
NO.	Freq. [MHz]	Reading [dBμV/m]	PK Level [dBμV/m]	Factor [dB]	PK Limit [dBμV/m]	PK Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2366.337	65.52	51.02	-14.50	74.00	22.98	150	268	Vertical
2	4816.682	60.10	49.36	-10.74	74.00	24.64	150	359	Vertical
3	9446.145	50.76	50.07	-0.69	74.00	23.93	150	63	Vertical
4	10994.299	50.54	51.45	0.91	74.00	22.55	150	208	Vertical
5	14576.658	47.98	51.74	3.76	74.00	22.26	150	2	Vertical
6	18000.000	44.76	52.16	7.40	74.00	21.84	150	21	Vertical

Remark: Factor = Cable loss + Antenna factor + Attenuator – Preamplifier; Level = Reading + Factor;
Margin = Limit – Level



For 18GHz to 26GHz

Antenna polarity: Horizontal

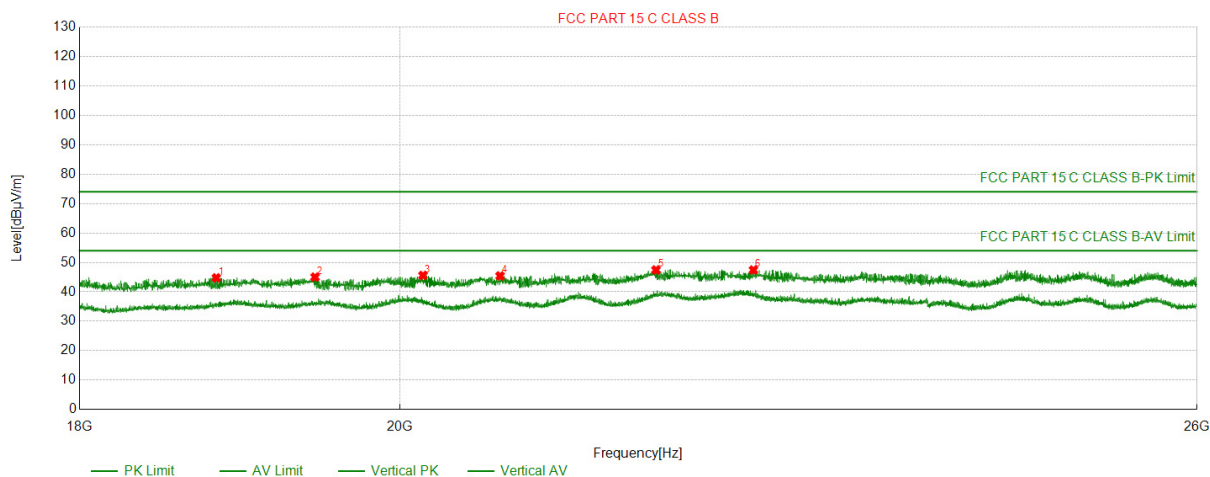


Suspected Data List									
NO.	Freq. [MHz]	Reading [dBμV/m]	PK Level [dBμV/m]	Factor [dB]	PK Limit [dBμV/m]	PK Margin [dB]	Height [cm]	Angle [°]	Polarity
1	18976.898	38.95	44.61	5.66	74.00	29.39	150	350	Horizontal
2	19595.360	39.13	45.23	6.10	74.00	28.77	150	180	Horizontal
3	20078.608	39.49	45.65	6.16	74.00	28.35	150	20	Horizontal
4	20686.669	40.44	46.23	5.79	74.00	27.77	150	270	Horizontal
5	21171.517	40.69	45.99	5.30	74.00	28.01	150	150	Horizontal
6	21956.396	42.11	47.81	5.70	74.00	26.19	150	240	Horizontal

Remark: Factor = Cable loss + Antenna factor + Attenuator – Preamplifier; Level = Reading + Factor; Margin = Limit – Level



Antenna polarity: Vertical



Suspected Data List									
NO.	Freq. [MHz]	Reading [dBμV/m]	PK Level [dBμV/m]	Factor [dB]	PK Limit [dBμV/m]	PK Margin [dB]	Height [cm]	Angle [°]	Polarity
1	18828.883	39.21	44.76	5.55	74.00	29.24	150	250	Vertical
2	19450.545	38.95	45.02	6.07	74.00	28.98	150	100	Vertical
3	20153.815	39.47	45.58	6.11	74.00	28.42	150	330	Vertical
4	20671.467	39.62	45.42	5.80	74.00	28.58	150	210	Vertical
5	21759.576	41.92	47.44	5.52	74.00	26.56	150	170	Vertical
6	22468.447	41.78	47.43	5.65	74.00	26.57	150	290	Vertical

Remark: Factor = Cable loss + Antenna factor + Attenuator – Preamplifier; Level = Reading + Factor;
Margin = Limit – Level



5.7 Antenna Requirement

Standard Applicable

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, 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.

Refer to statement below for compliance.

The manufacturer may design the unit so that the user can replace a broken antenna, but the use of a standard antenna jack or electrical connector is prohibited. Further, this requirement does not apply to intentional radiators that must be professionally installed.

Antenna Connected Construction

The antenna used in this product is an External Antenna, not easy to remove. It conforms to the standard requirements. The gain of antenna used for transmitting is 1.76dBi.

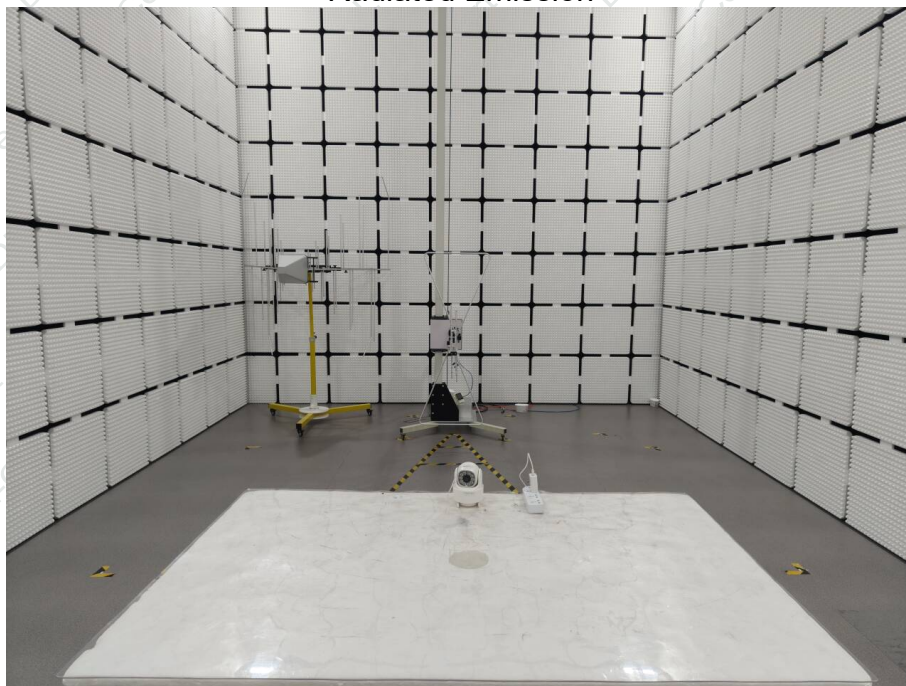
WIFI ANTENNA





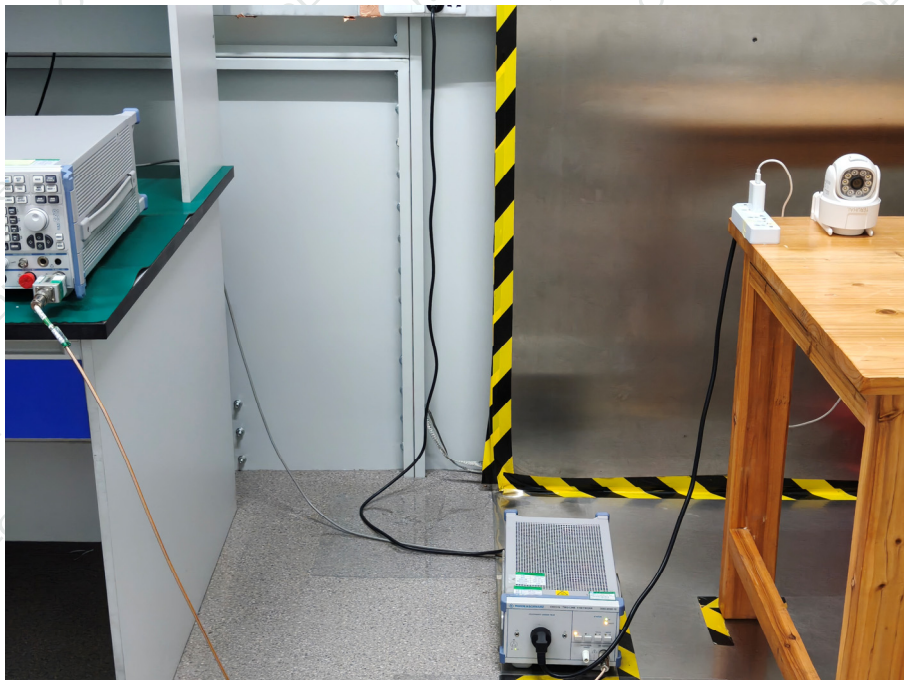
6. Test Setup Photos of the EUT

Radiated Emission

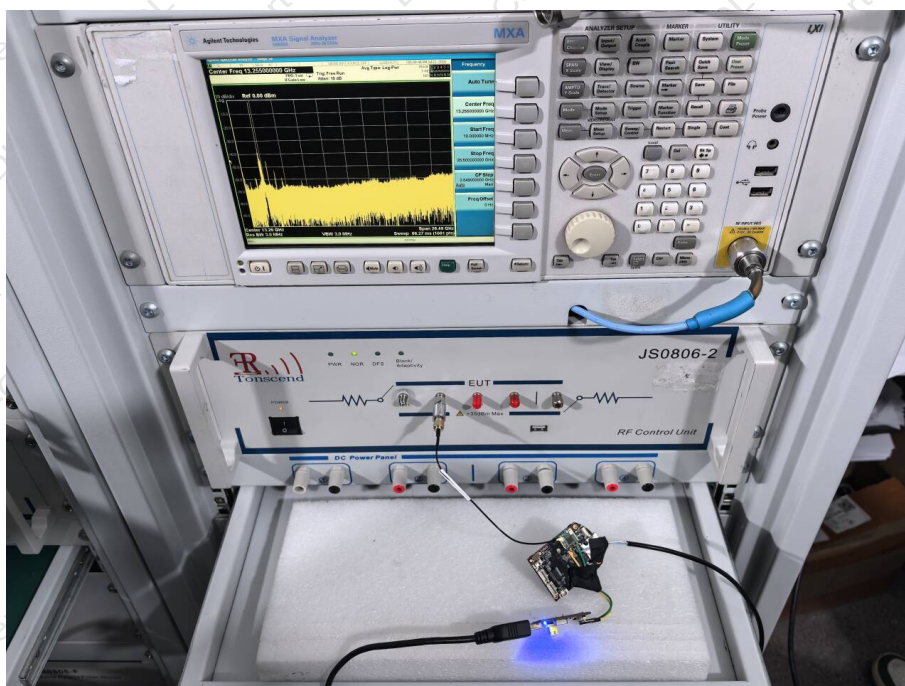




AC Conducted Emission



RF Conducted Emission





7. Photos of the EUT

Reference to the report: ANNEX A of external photos and ANNEX B of internal photos.

-----End of test report-----