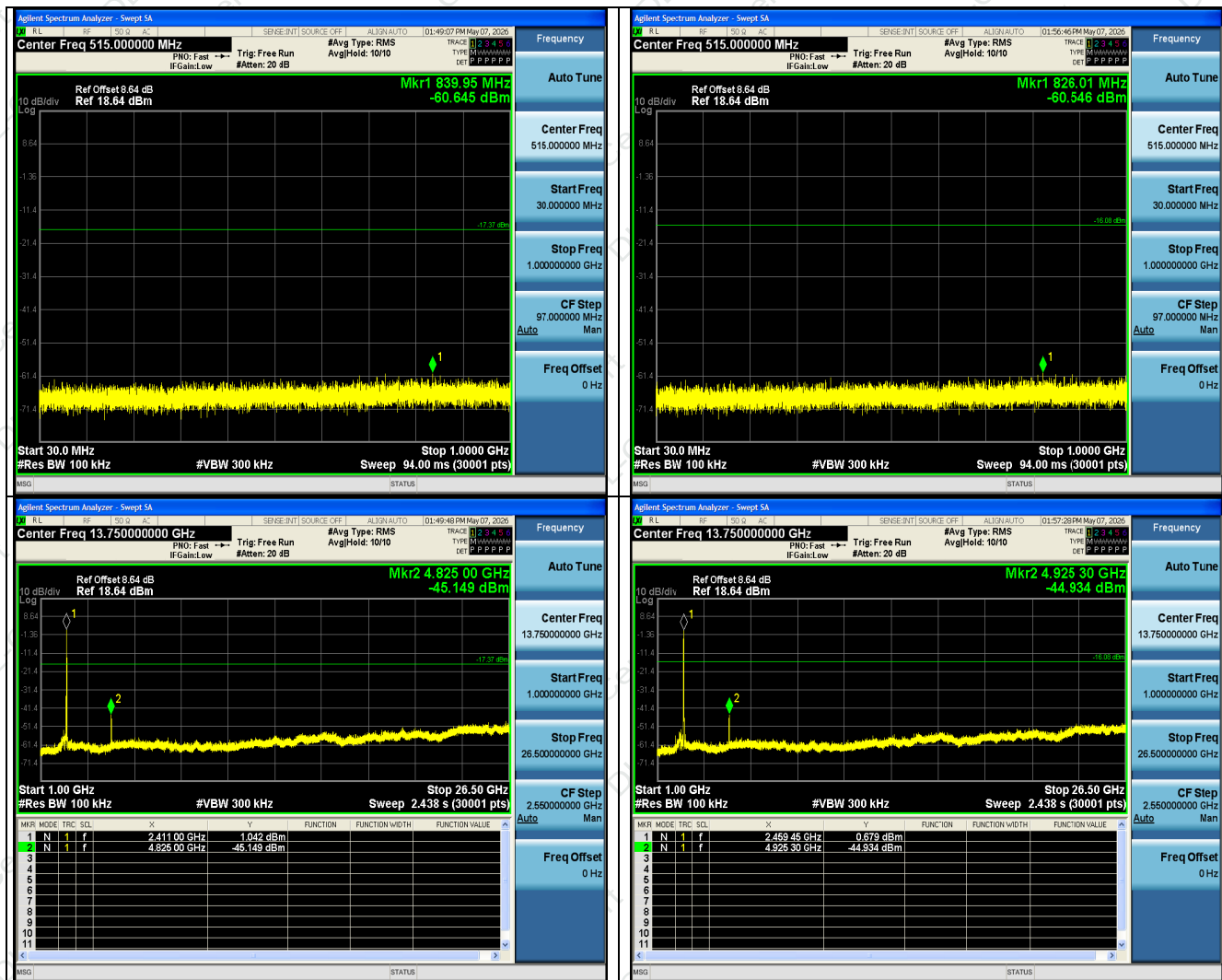




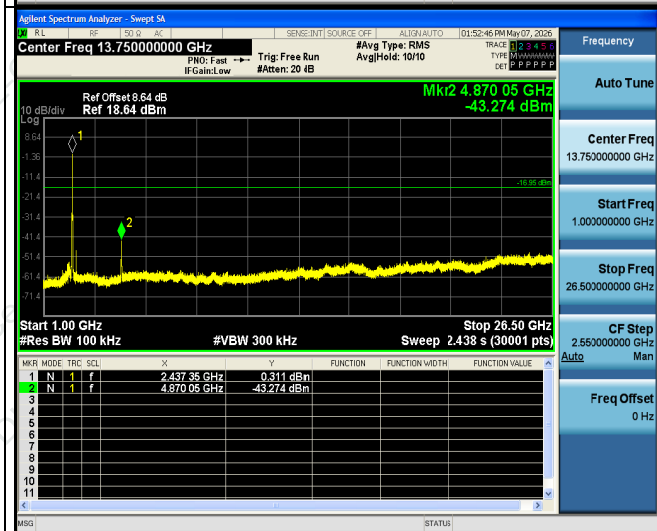
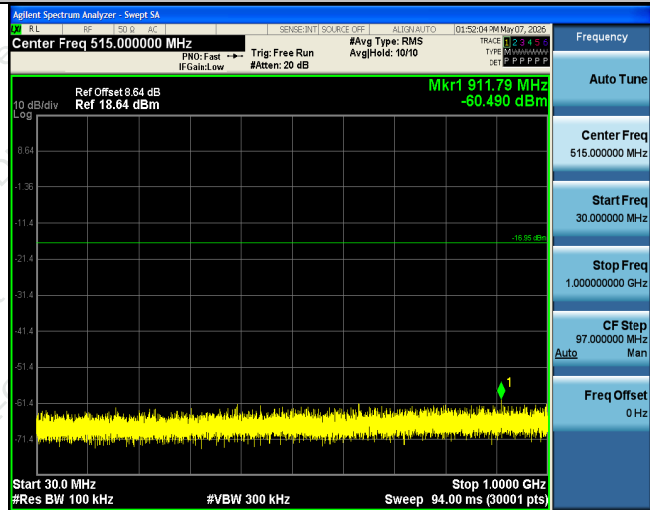
802.11ax (HE20) Modulation







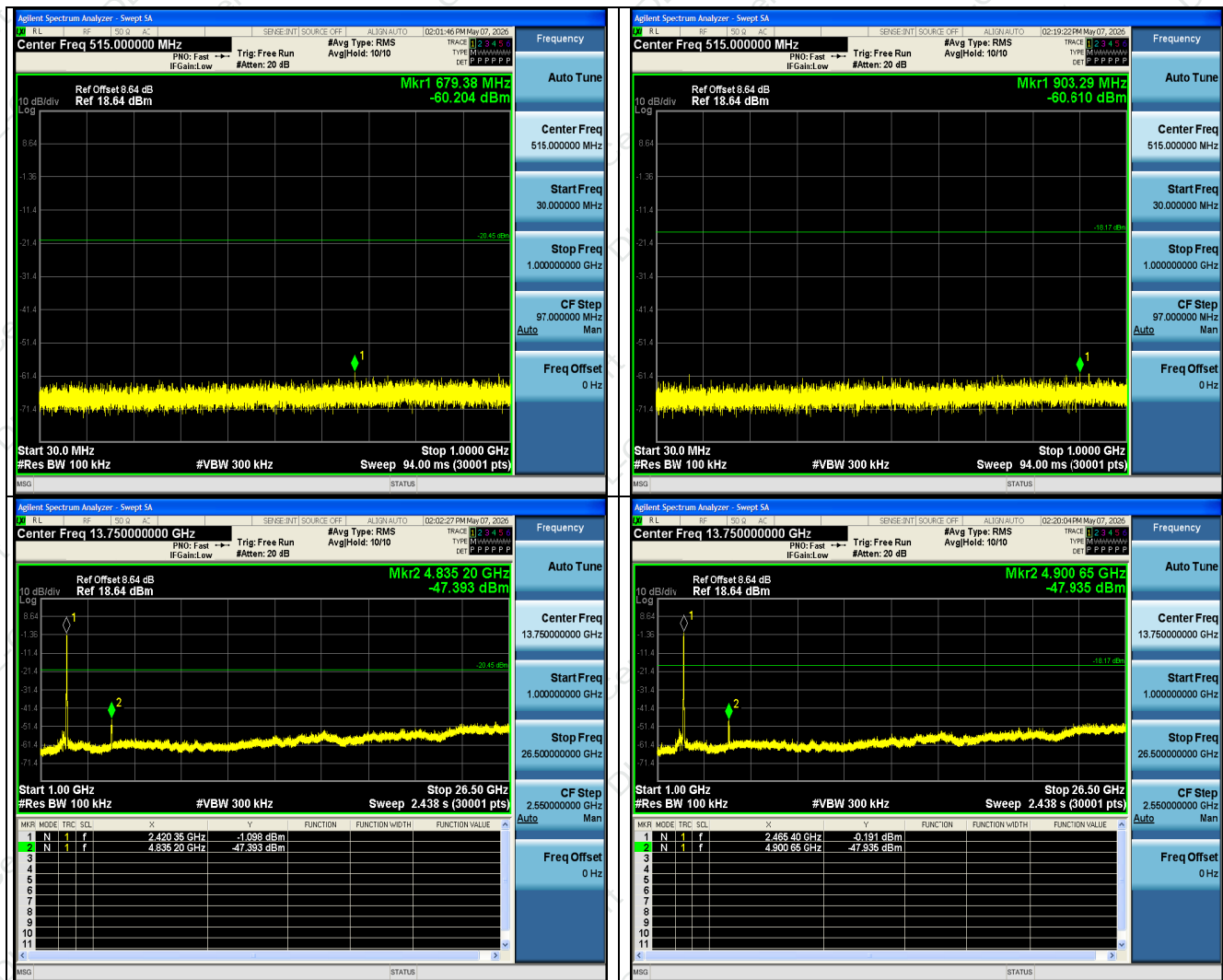
Middle Channel Spurious Emission





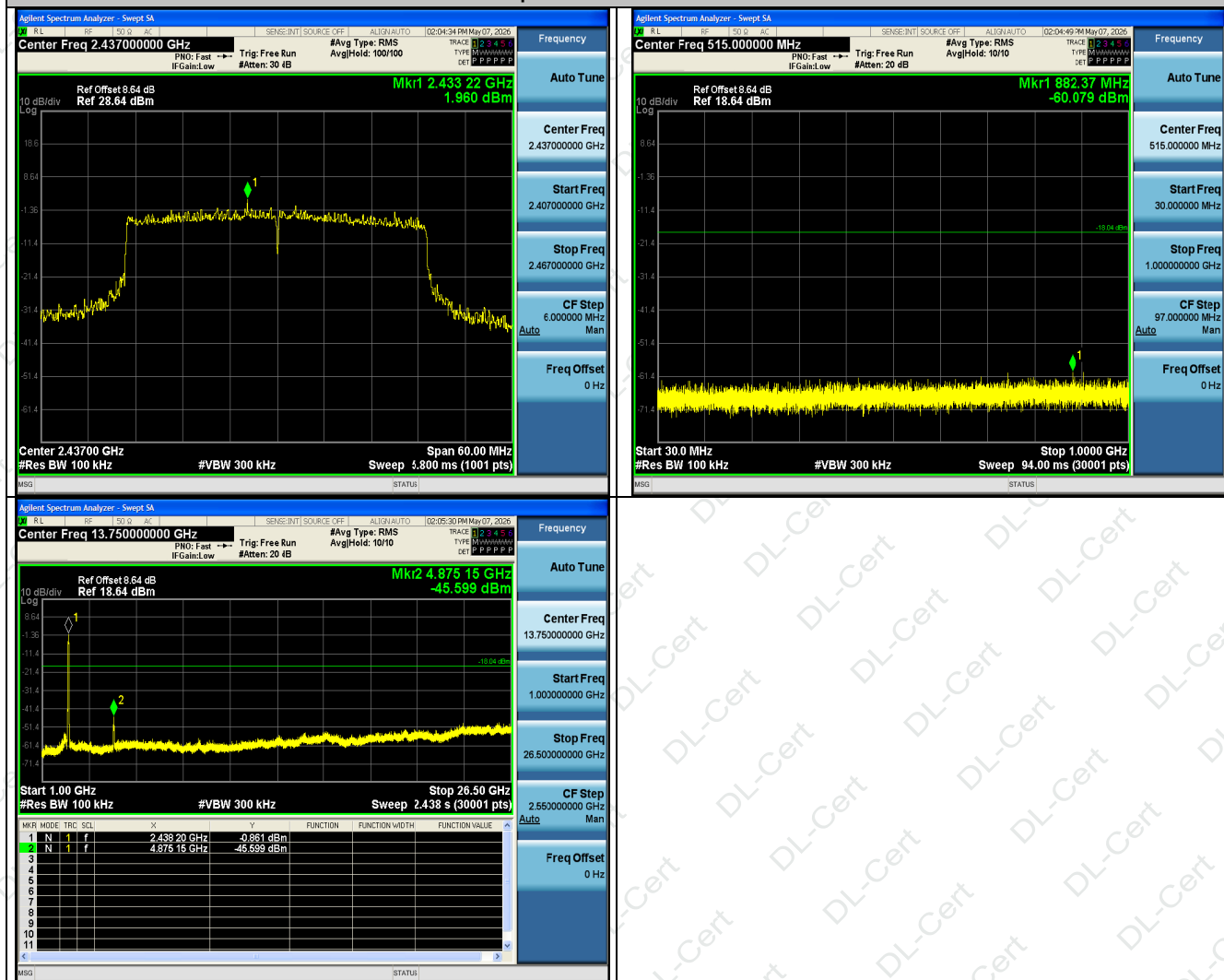
802.11ax (HE40) Modulation







Middle Channel Spurious Emission





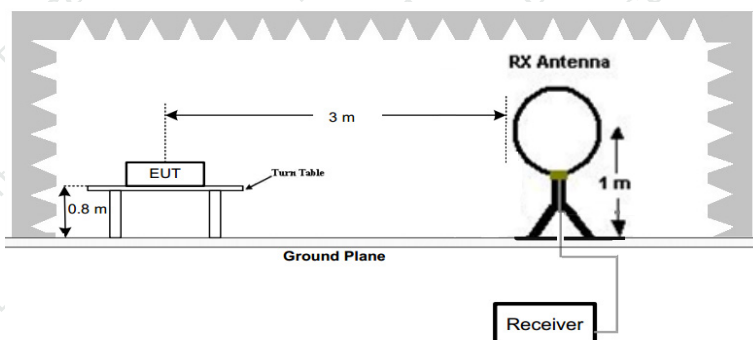
4.6 Radiated Spurious Emission Measurement

4.6.1 Test Specification

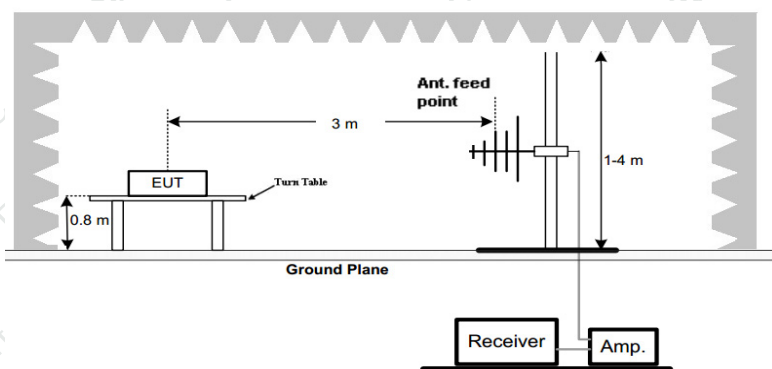
Test Requirement:	FCC Part15 C Section 15.209				
Test Method:	ANSI C63.10: 2020				
Frequency Range:	9 kHz to 26 GHz				
Measurement Distance:	3 m				
Antenna Polarization:	Horizontal & Vertical				
Operation mode:	Transmitting mode with modulation				
Receiver Setup:	Frequency	Detector	RBW	VBW	Remark
	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

**Test Setup:**

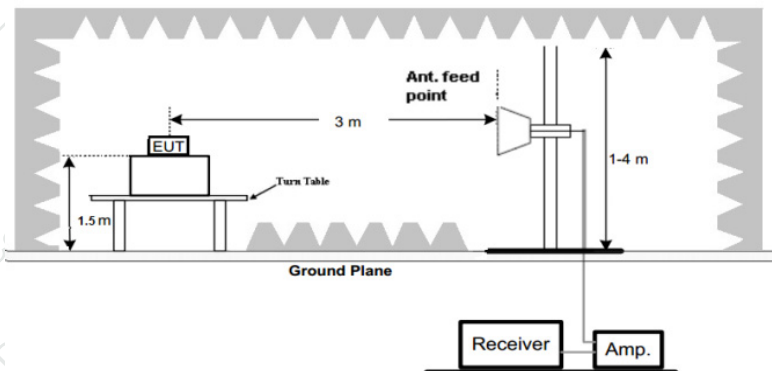
For radiated emissions below 30MHz



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 $f > 1$ 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

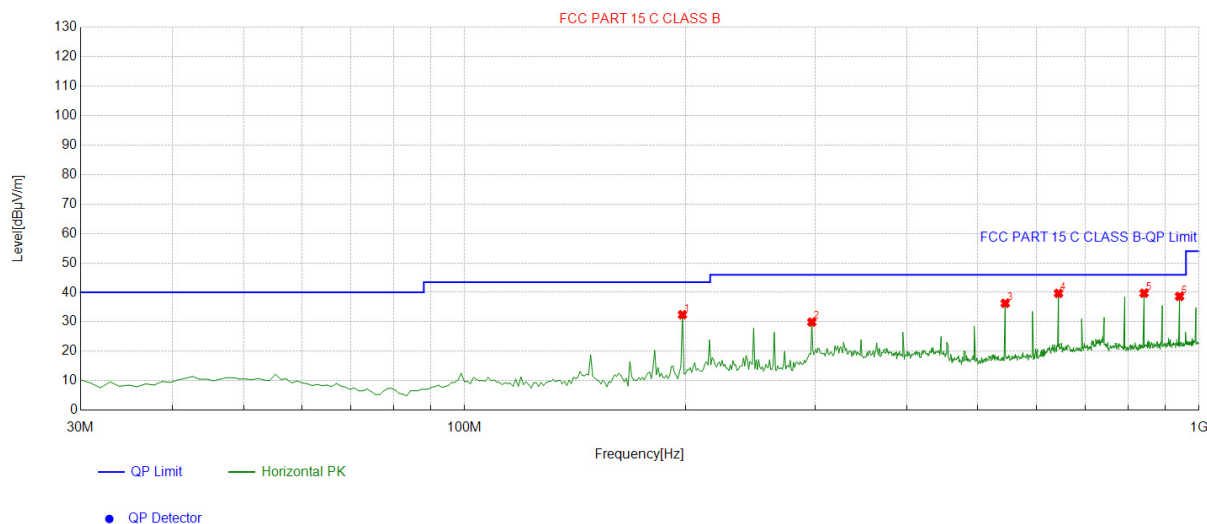


4.6.2 Test Data

Below 1GHz Test Results

All the test modes completed for test. Only the worst mode of 802.11b Low channel TX is reflected.

Antenna polarity: Horizontal

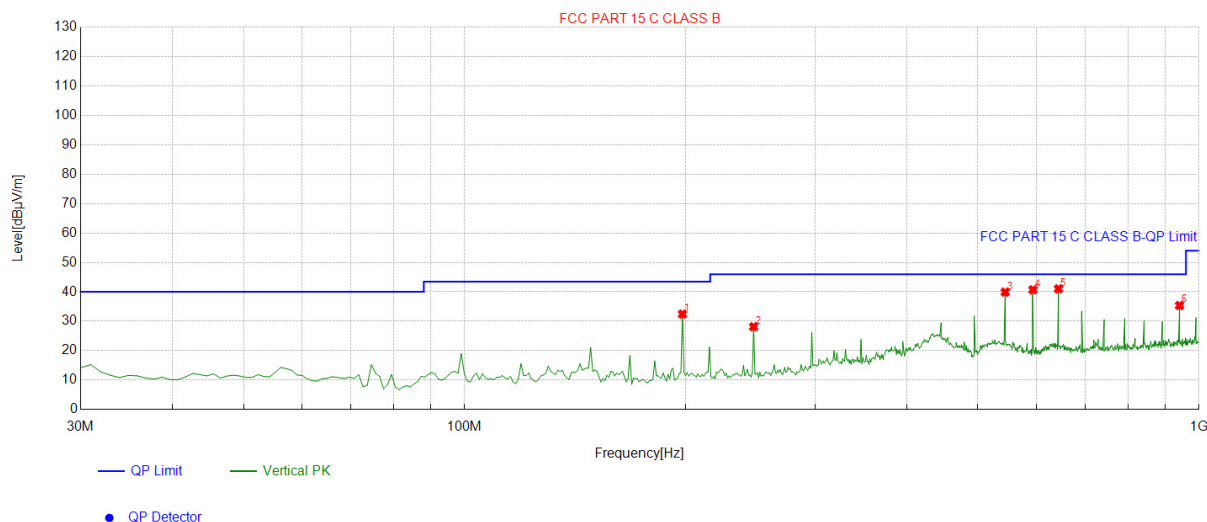


Suspected List									
NO.	Freq. [MHz]	Factor [dB]	Reading [dBμV/m]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	197.978	-14.56	47.00	32.44	43.50	11.06	100	120	Horizontal
2	297.017	-12.08	42.00	29.92	46.00	16.08	100	116	Horizontal
3	544.615	-6.82	43.12	36.30	46.00	9.70	100	354	Horizontal
4	643.654	-4.87	44.55	39.68	46.00	6.32	100	203	Horizontal
5	841.732	-2.20	41.93	39.73	46.00	6.27	100	12	Horizontal
6	940.771	-0.99	39.64	38.65	46.00	7.35	100	301	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	197.978	-14.56	47.00	32.44	43.50	11.06	100	207	Vertical
2	247.497	-13.21	41.34	28.13	46.00	17.87	100	319	Vertical
3	544.615	-6.82	46.73	39.91	46.00	6.09	100	132	Vertical
4	594.134	-5.70	46.40	40.70	46.00	5.30	100	345	Vertical
5	643.654	-4.87	45.89	41.02	46.00	4.98	100	359	Vertical
6	940.771	-0.99	36.35	35.36	46.00	10.64	100	1	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)
--	--	--
--	--	--
--	--	--
--	--	--

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.

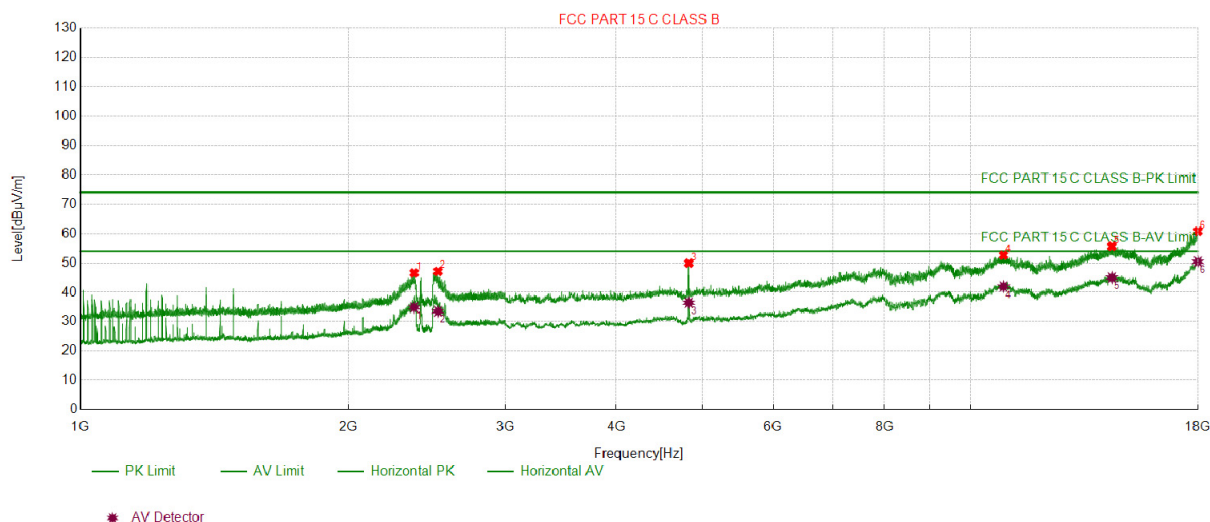


Above 1GHz Test Results

All the test modes completed for test. Only the worst mode of 802.11b Low channel TX is reflected.

For 1GHz to 18GHz

Antenna polarity: Horizontal



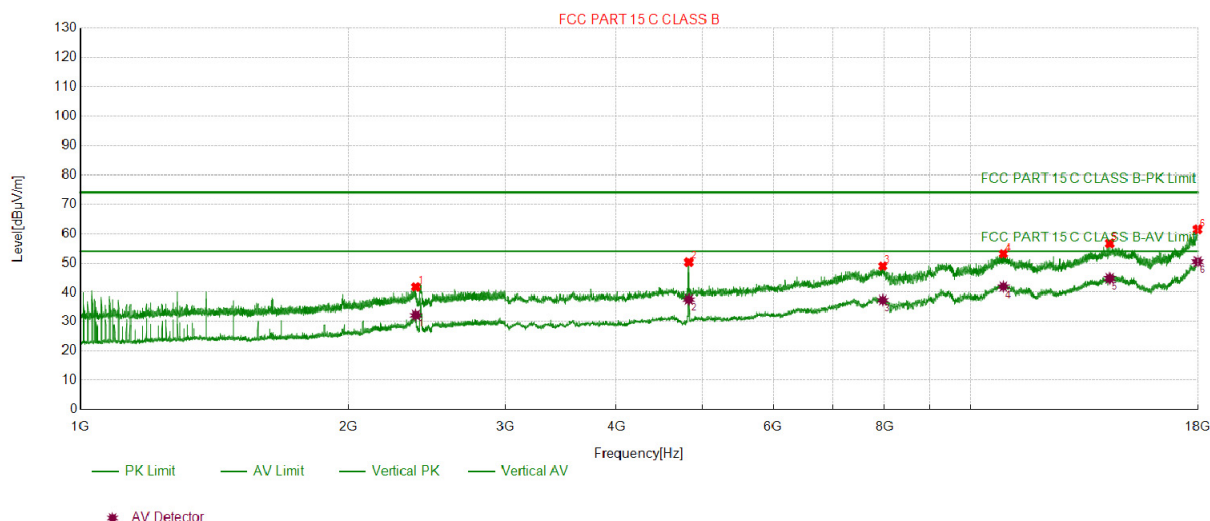
Suspected Data List									
NO.	Freq. [MHz]	Reading [dBμV/m]	PK Level [dBμV/m]	Factor [dB]	PK Limit [dBμV/m]	PK Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2370.737	61.06	46.56	-14.50	74.00	27.44	150	360	Horizontal
2	2521.152	61.45	47.10	-14.35	74.00	26.90	150	22	Horizontal
3	4824.182	59.83	49.91	-9.92	74.00	24.09	150	320	Horizontal
4	10889.289	49.90	52.61	2.71	74.00	21.39	150	356	Horizontal
5	14410.141	47.78	55.63	7.85	74.00	18.37	150	133	Horizontal
6	17998.500	44.22	60.75	16.53	74.00	13.25	150	314	Horizontal

AV Final Data List								
NO	Freq. [MHz]	Factor [dB]	AV Value [dBμV/m]	AV Limit [dBμV/m]	AV Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2370.737	-14.50	34.89	54.00	19.11	150	360	Horizontal
2	2521.152	-14.35	33.52	54.00	20.48	150	22	Horizontal
3	4824.182	-9.92	36.47	54.00	17.53	150	320	Horizontal
4	10889.289	2.71	41.98	54.00	12.02	150	356	Horizontal
5	14410.141	7.85	45.00	54.00	9.00	150	133	Horizontal
6	17998.500	16.53	50.41	54.00	3.59	150	314	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	2380.938	56.34	41.84	-14.50	74.00	32.16	150	5	Vertical
2	4824.182	60.17	50.25	-9.92	74.00	23.75	150	62	Vertical
3	7966.997	51.08	48.97	-2.11	74.00	25.03	150	218	Vertical
4	10886.289	50.39	53.08	2.69	74.00	20.92	150	344	Vertical
5	14327.633	49.20	56.64	7.44	74.00	17.36	150	39	Vertical
6	17987.999	45.10	61.39	16.29	74.00	12.61	150	212	Vertical

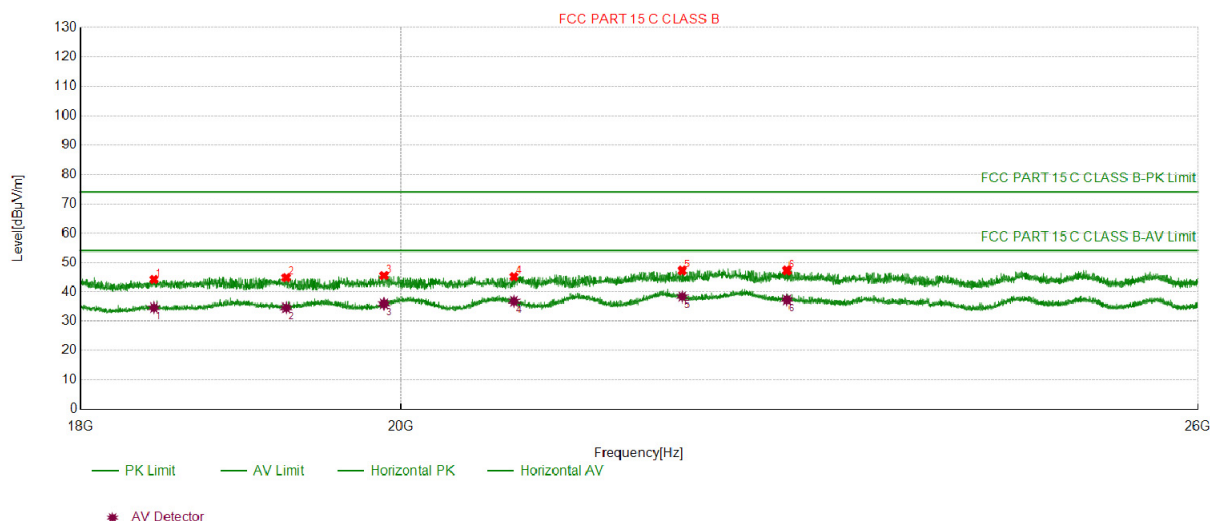
AV Final Data List									
NO	Freq. [MHz]	Factor [dB]	AV Value [dBμV/m]	AV Limit [dBμV/m]	AV Margin [dB]	Height [cm]	Angle [°]	Polarity	
1	2380.938	-14.50	32.22	54.00	21.78	150	5	Vertical	
2	4824.182	-9.92	37.54	54.00	16.46	150	62	Vertical	
3	7966.997	-2.11	37.34	54.00	16.66	150	218	Vertical	
4	10886.289	2.69	41.96	54.00	12.04	150	344	Vertical	
5	14327.633	7.44	44.74	54.00	9.26	150	39	Vertical	
6	17987.999	16.29	50.40	54.00	3.60	150	212	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	18440.044	38.80	44.22	5.42	74.00	29.78	150	120	Horizontal
2	19260.926	38.87	44.86	5.99	74.00	29.14	150	230	Horizontal
3	19890.589	39.42	45.59	6.17	74.00	28.41	150	100	Horizontal
4	20761.076	39.50	45.20	5.70	74.00	28.80	150	120	Horizontal
5	21942.794	41.59	47.28	5.69	74.00	26.72	150	290	Horizontal
6	22710.871	41.74	47.30	5.56	74.00	26.70	150	300	Horizontal

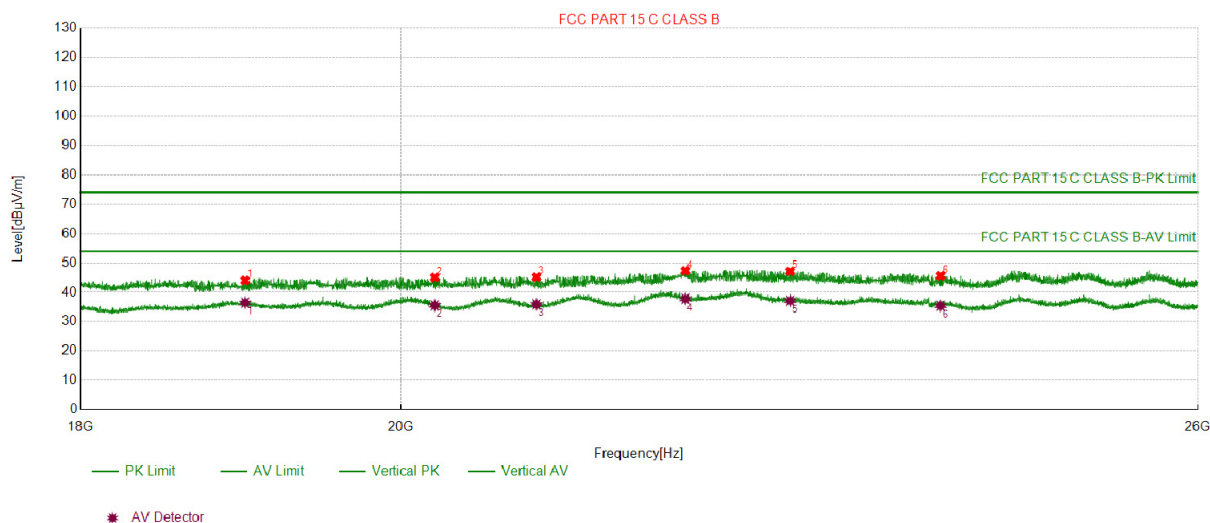
AV Final Data List

NO	Freq. [MHz]	Factor [dB]	AV Value [dBμV/m]	AV Limit [dBμV/m]	AV Margin [dB]	Height [cm]	Angle [°]	Polarity
1	18440.044	5.42	34.63	54.00	19.37	150	120	Horizontal
2	19260.926	5.99	34.58	54.00	19.42	150	230	Horizontal
3	19890.589	6.17	35.94	54.00	18.06	150	100	Horizontal
4	20761.076	5.70	36.83	54.00	17.17	150	120	Horizontal
5	21942.794	5.69	38.38	54.00	15.62	150	290	Horizontal
6	22710.871	5.56	37.32	54.00	16.68	150	300	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	19002.500	38.37	44.05	5.68	74.00	29.95	150	280	Vertical
2	20225.823	39.00	45.06	6.06	74.00	28.94	150	340	Vertical
3	20914.691	39.69	45.17	5.48	74.00	28.83	150	250	Vertical
4	21964.396	41.60	47.31	5.71	74.00	26.69	150	330	Vertical
5	22734.873	41.54	47.09	5.55	74.00	26.91	150	100	Vertical
6	23888.589	40.21	45.62	5.41	74.00	28.38	150	320	Vertical

AV Final Data List									
NO	Freq. [MHz]	Factor [dB]	AV Value [dBμV/m]	AV Limit [dBμV/m]	AV Margin [dB]	Height [cm]	Angle [°]	Polarity	
1	19002.500	5.68	36.47	54.00	17.53	150	280	Vertical	
2	20225.823	6.06	35.56	54.00	18.44	150	340	Vertical	
3	20914.691	5.48	35.90	54.00	18.10	150	250	Vertical	
4	21964.396	5.71	37.76	54.00	16.24	150	330	Vertical	
5	22734.873	5.55	37.14	54.00	16.86	150	100	Vertical	
6	23888.589	5.41	35.41	54.00	18.59	150	320	Vertical	

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



4.7 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.

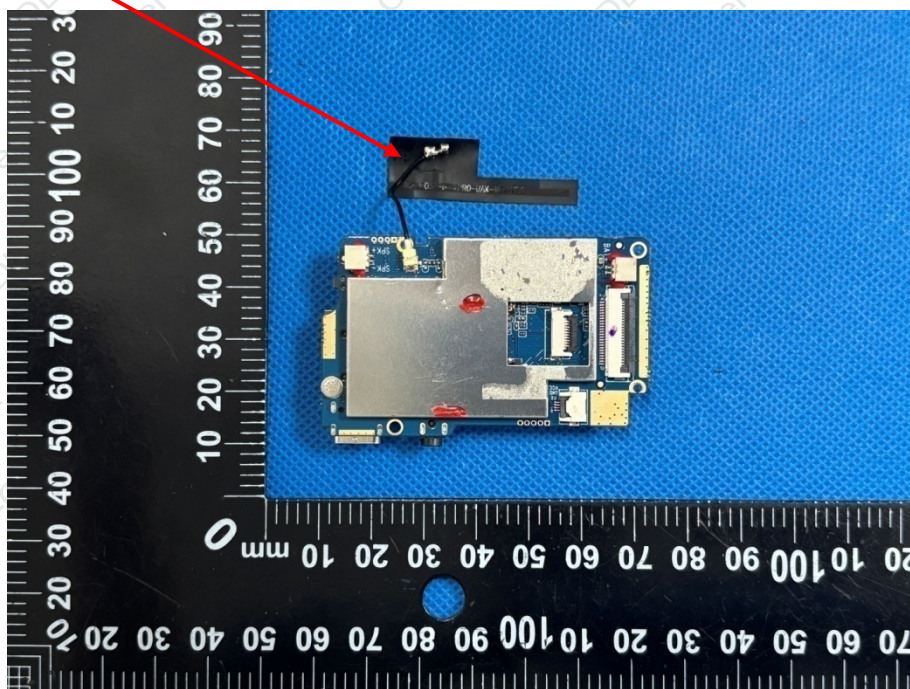
Refer to statement below for compliance.

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 a FPC Antenna, need professional installation, not easy to remove. It conforms to the standard requirements. The directional gains of antenna used for transmitting is 0.47dBi.

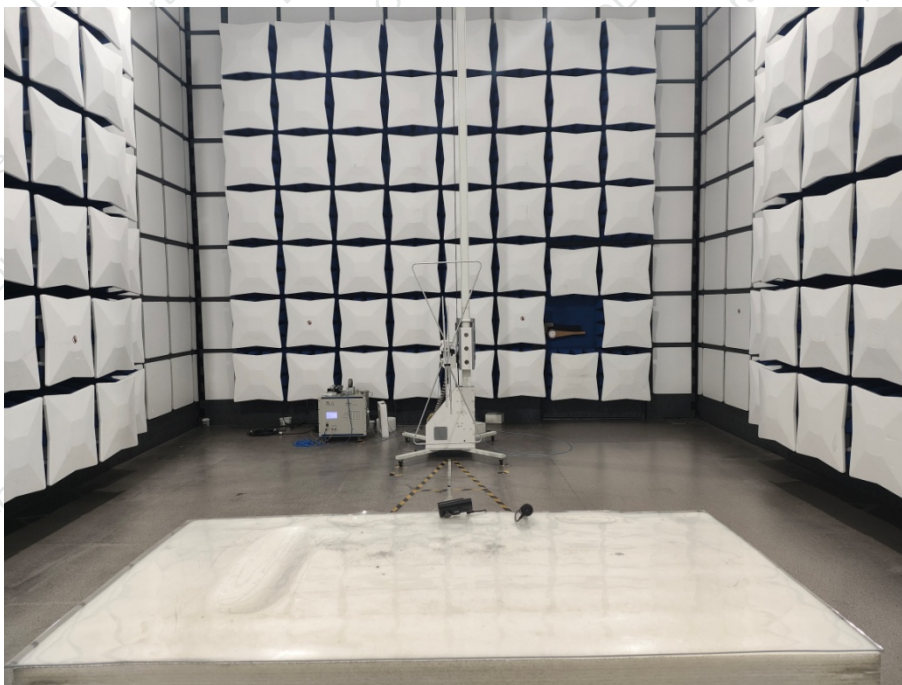
WIFI Antenna





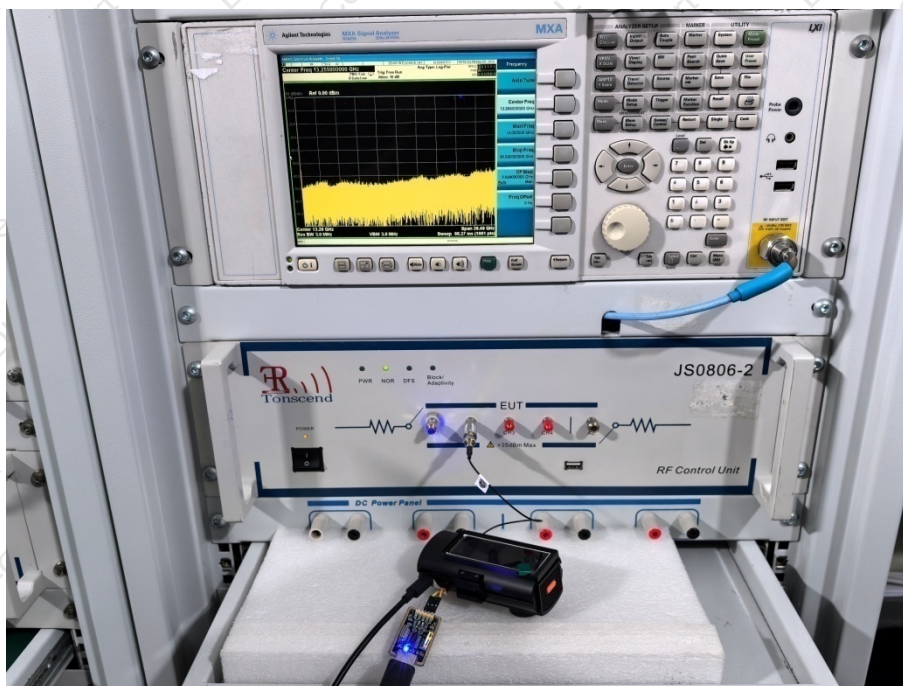
5. Test Setup Photos of the EUT

Radiated Emissions





RF Conducted Emission





6. Photos of the EUT

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

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