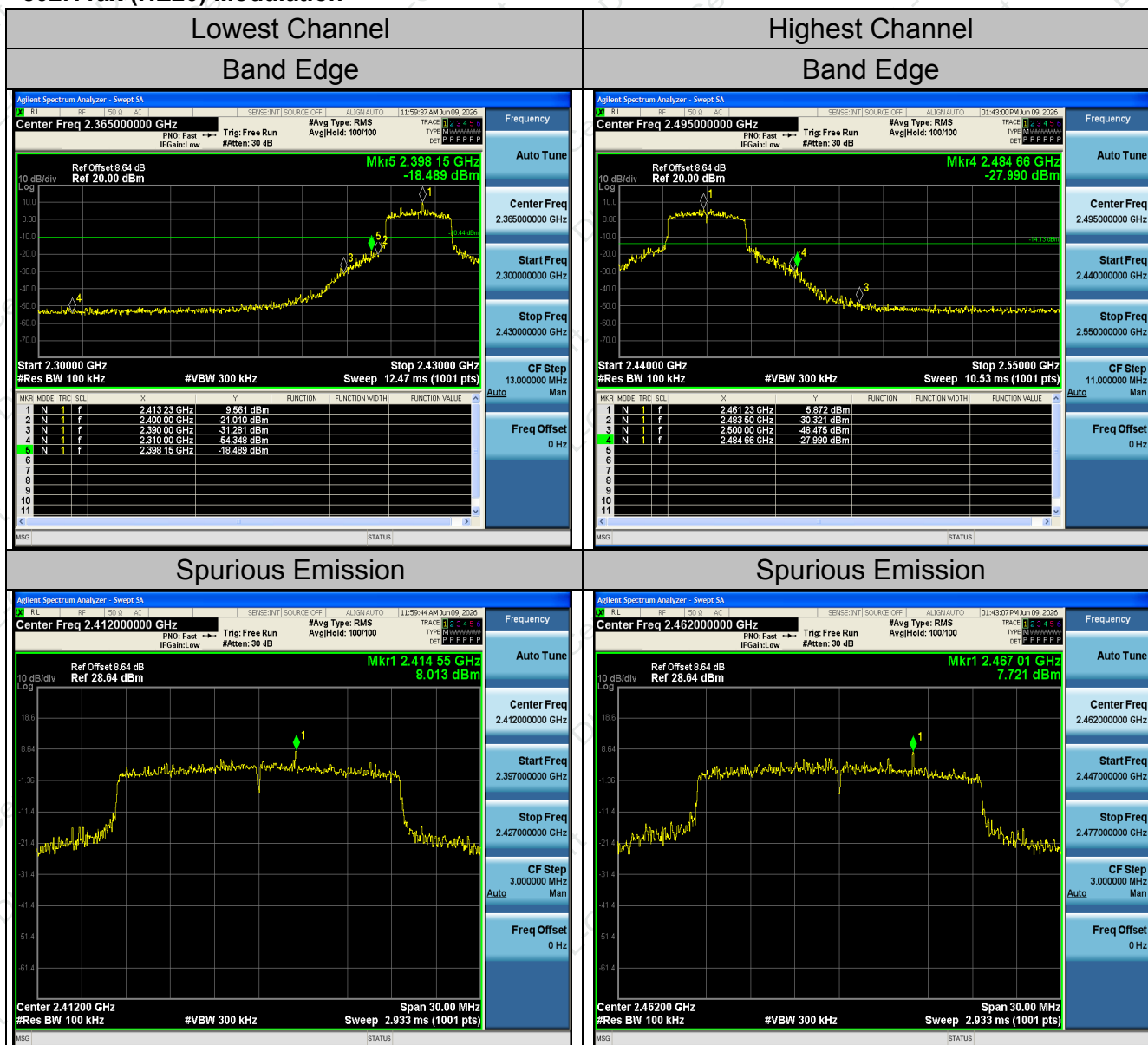
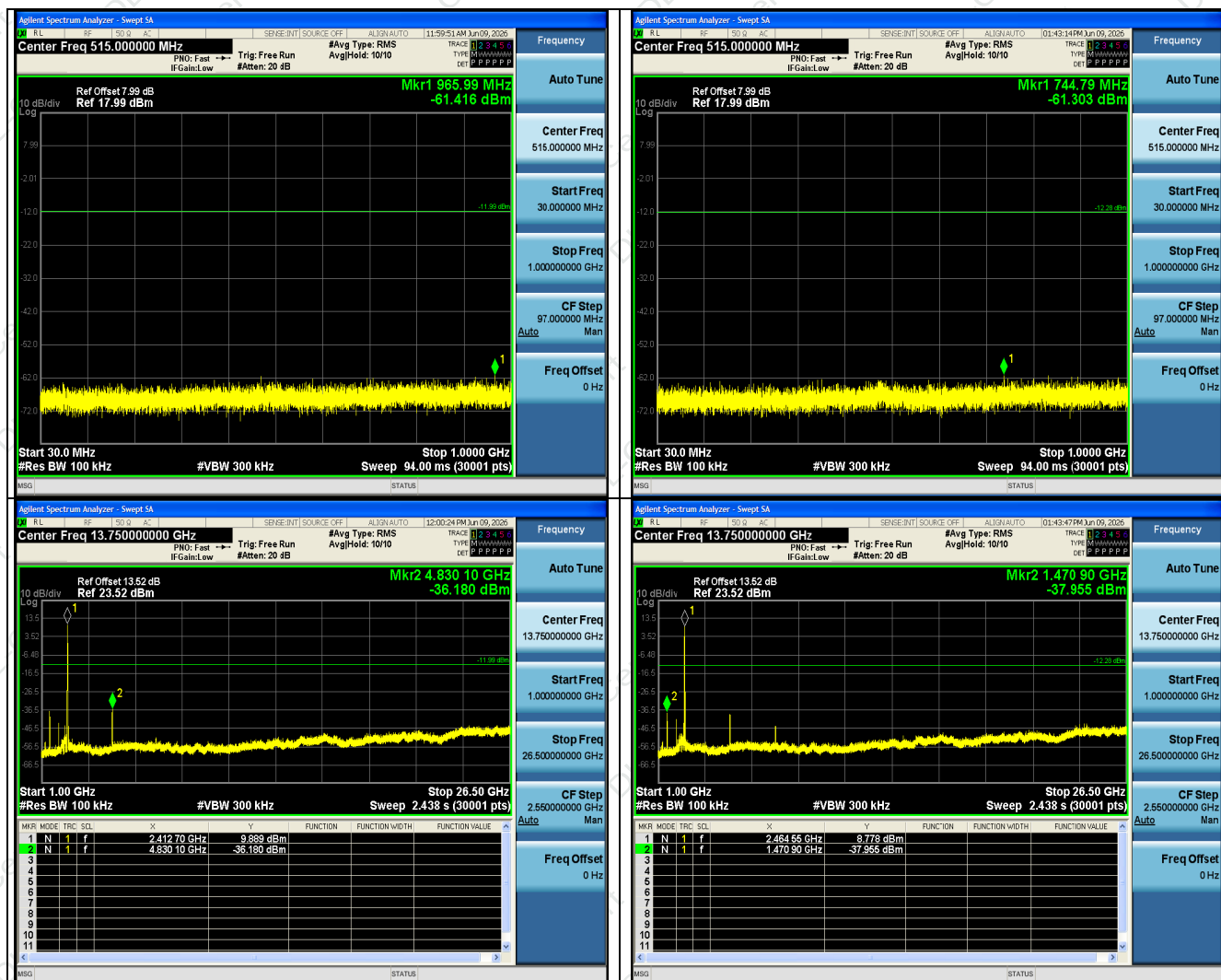




802.11ax (HE20) Modulation



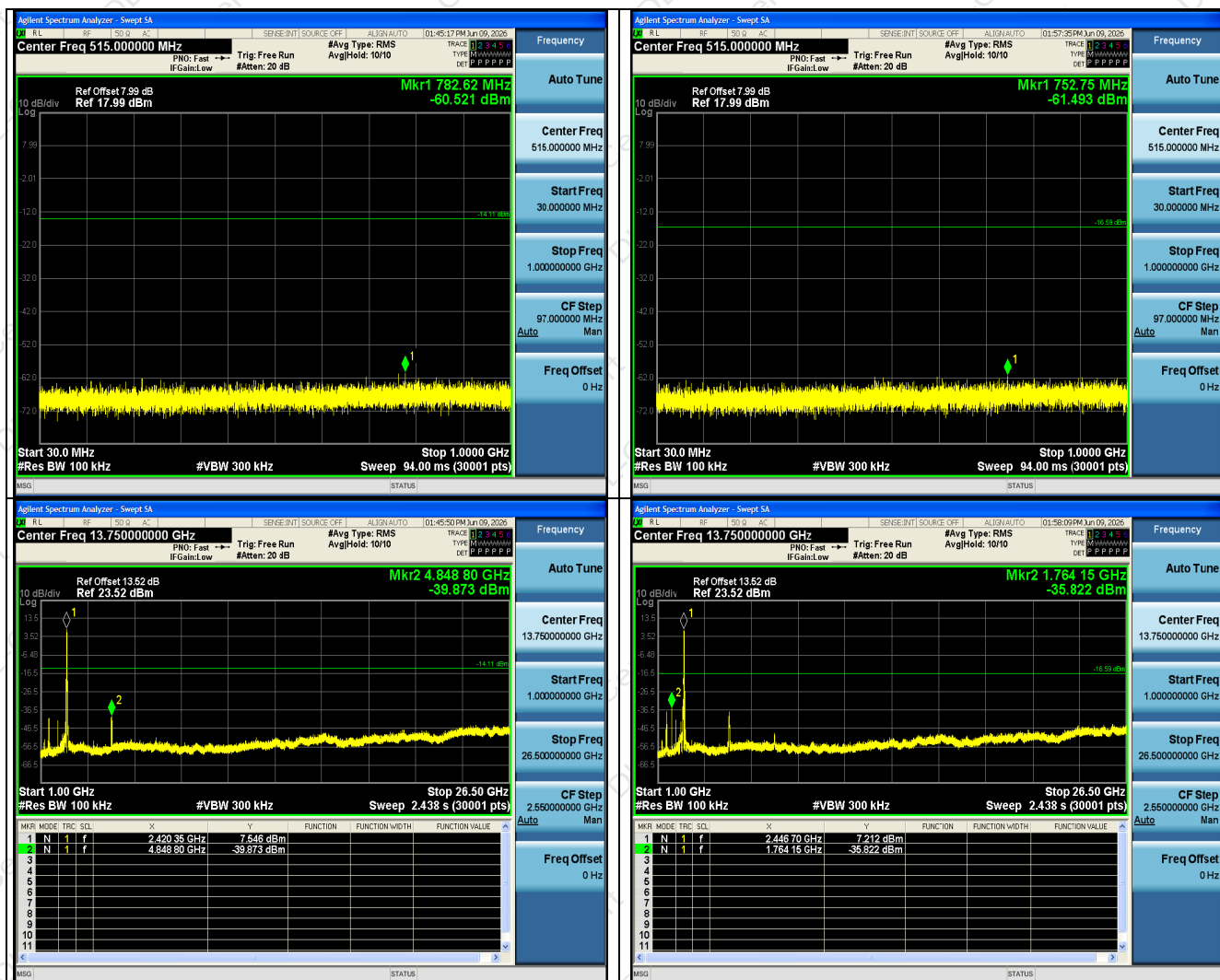


Middle Channel
Spurious Emission



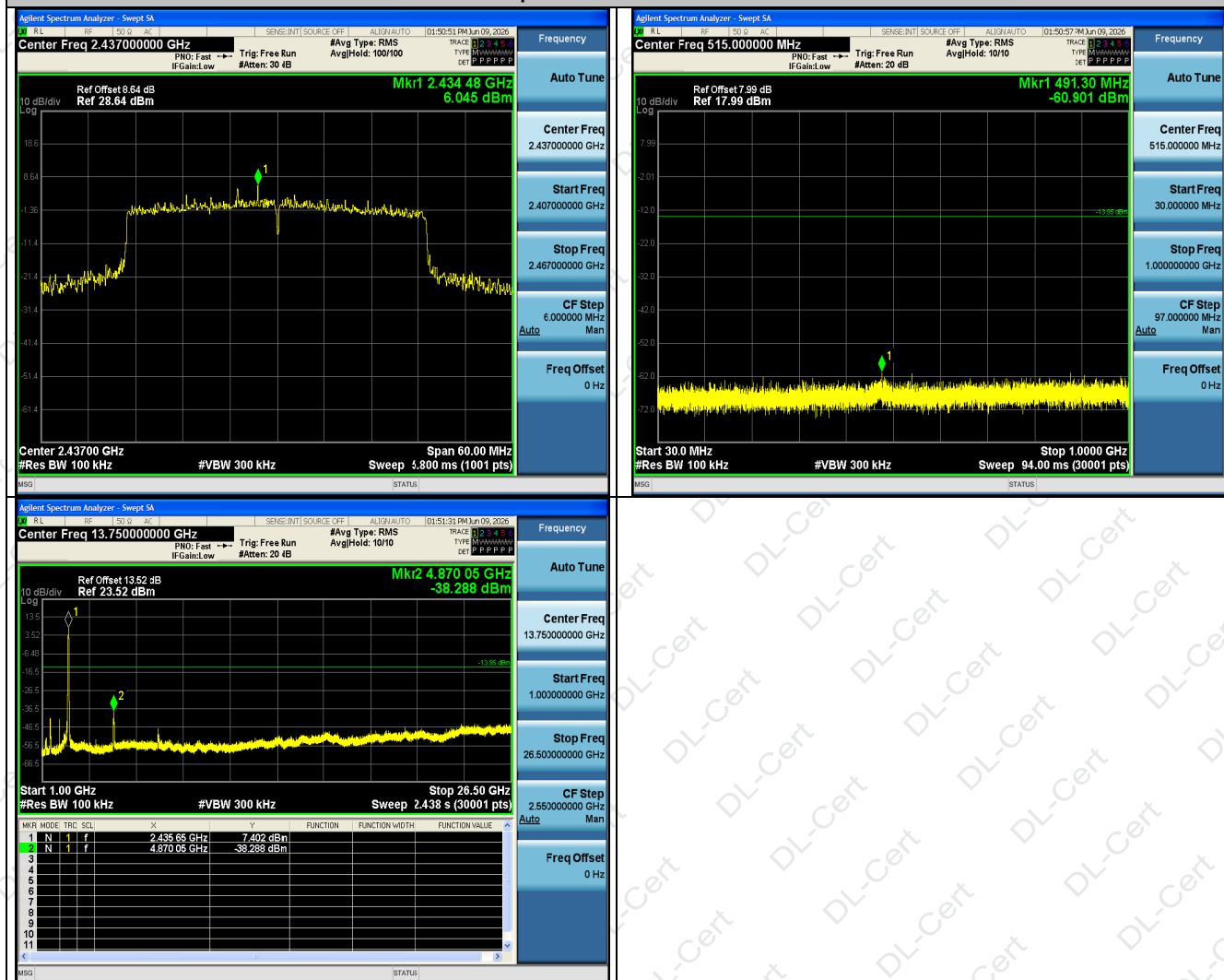
802.11ax (HE40) Modulation







Middle Channel Spurious Emission





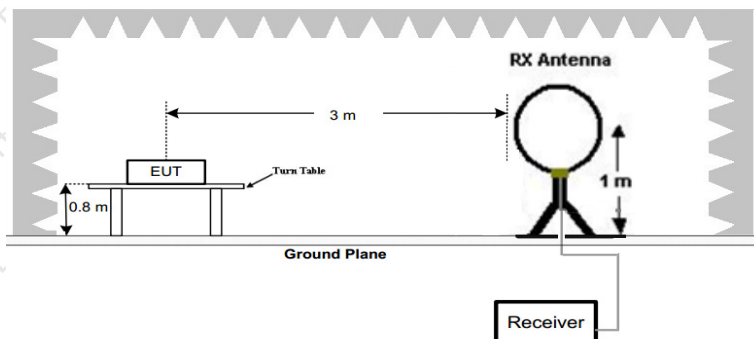
4.6 Radiated Spurious Emission Measurement

4.6.1 Test Specification

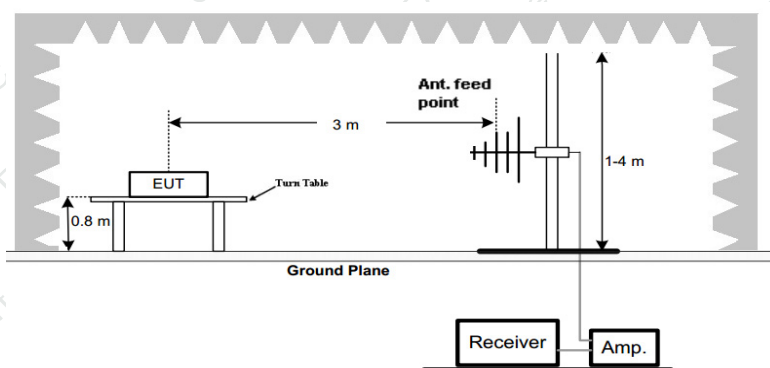
Test Requirement:	FCC Part15 C Section 15.209				
Test Method:	ANSI C63.10: 2020				
Frequency Range:	9 kHz to 26 GHz				
Measurement Distance:	3 m				
Antenna Polarization:	Horizontal & Vertical				
Operation mode:	Transmitting mode with modulation				
Receiver Setup:	Frequency	Detector	RBW	VBW	Remark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

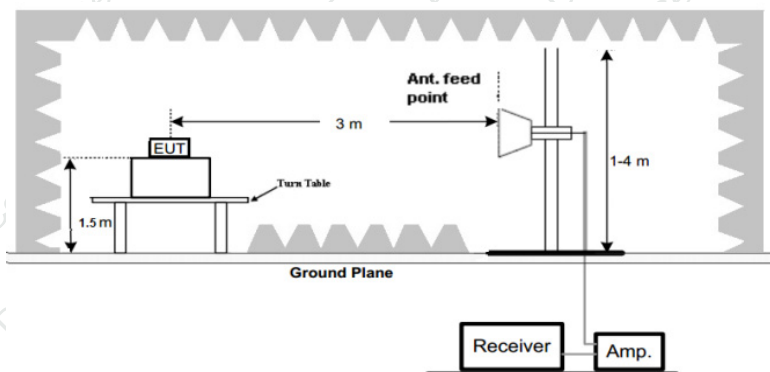
For radiated emissions below 30MHz



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

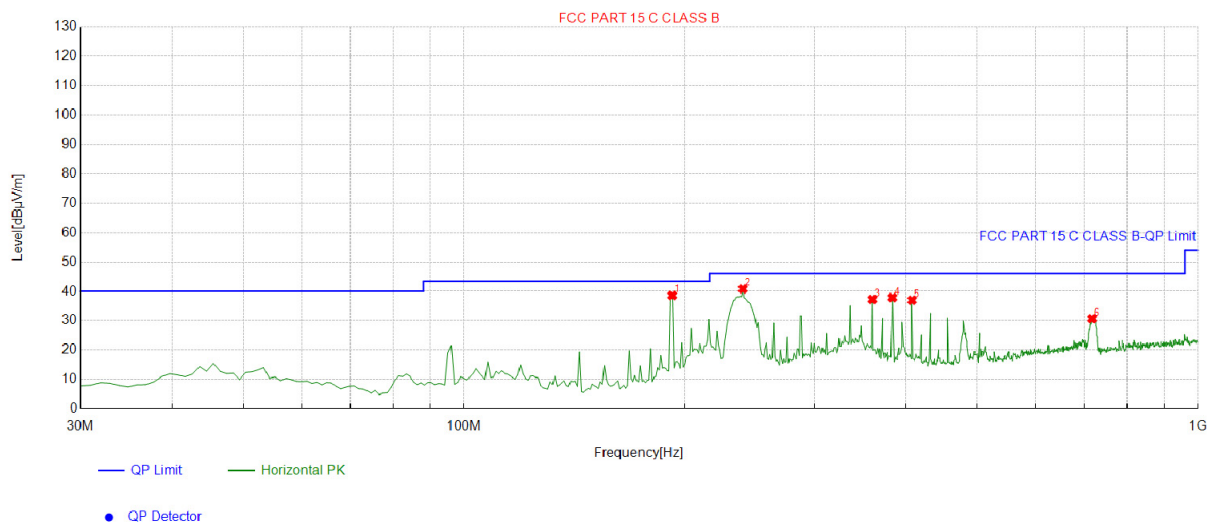


4.6.2 Test Data

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



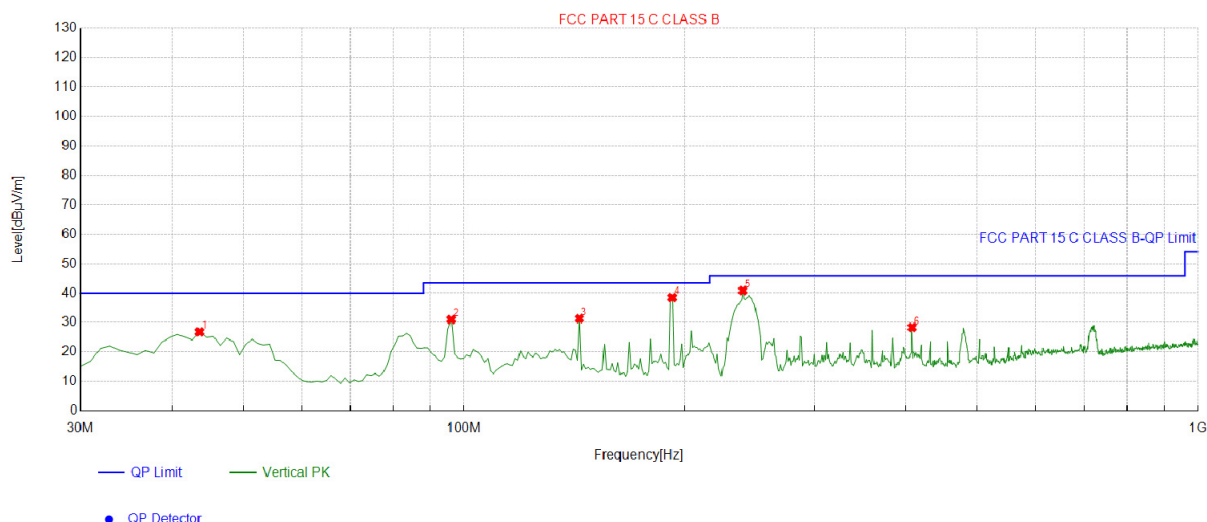
Suspected List

NO.	Freq. [MHz]	Factor [dB]	Reading [dBμV/m]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	192.152	-15.24	53.85	38.61	43.50	4.89	100	159	Horizontal
2	239.730	-13.51	54.34	40.83	46.00	5.17	100	155	Horizontal
3	360.130	-10.47	47.74	37.27	46.00	8.73	100	202	Horizontal
4	383.433	-10.18	48.06	37.88	46.00	8.12	100	187	Horizontal
5	407.708	-9.42	46.41	36.99	46.00	9.01	100	191	Horizontal
6	717.447	-3.92	34.61	30.69	46.00	15.31	100	64	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	43.594	-12.90	39.76	26.86	40.00	13.14	100	248	Vertical
2	96.026	-15.16	46.25	31.09	43.50	12.41	100	112	Vertical
3	143.604	-18.41	49.80	31.39	43.50	12.11	100	101	Vertical
4	192.152	-15.24	53.75	38.51	43.50	4.99	100	358	Vertical
5	239.730	-13.51	54.40	40.89	46.00	5.11	100	112	Vertical
6	407.708	-9.42	37.81	28.39	46.00	17.61	100	262	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.

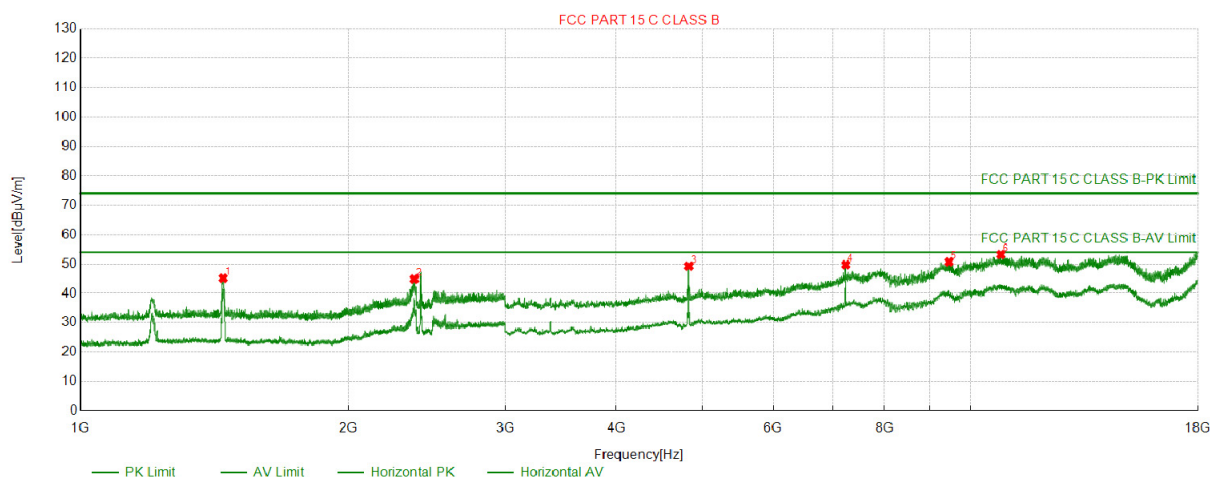


Above 1GHz Test Results

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

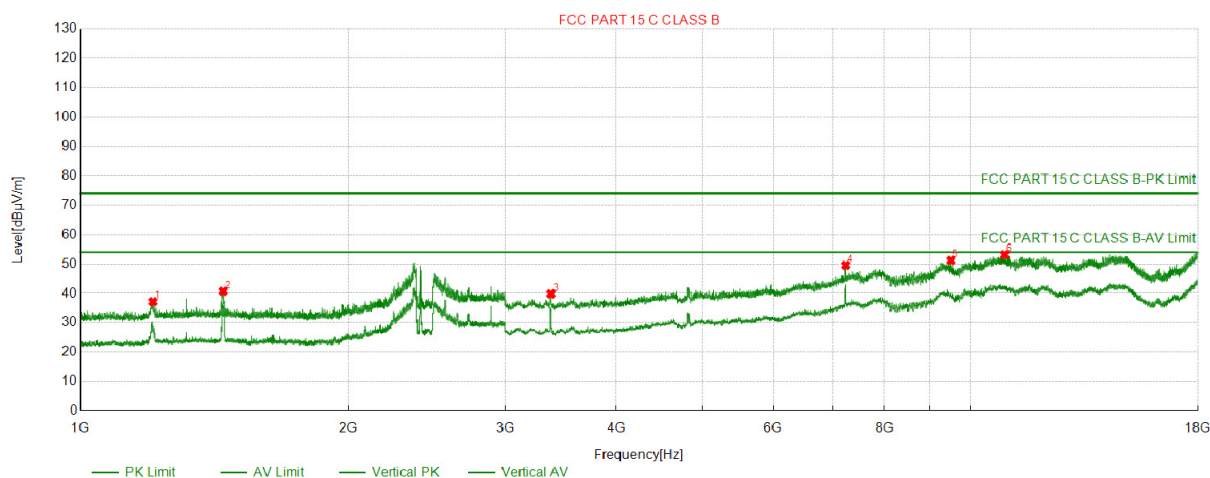


Suspected Data List									
NO.	Freq. [MHz]	Reading [dBμV/m]	PK Level [dBμV/m]	Factor [dB]	PK Limit [dBμV/m]	PK Margin [dB]	Height [cm]	Angle [°]	Polarity
1	1446.245	63.67	45.17	-18.50	74.00	28.83	150	33	Horizontal
2	2371.537	59.38	44.88	-14.50	74.00	29.12	150	250	Horizontal
3	4824.182	60.00	49.27	-10.73	74.00	24.73	150	28	Horizontal
4	7237.924	53.64	49.73	-3.91	74.00	24.27	150	180	Horizontal
5	9455.146	50.48	50.71	0.23	74.00	23.29	150	10	Horizontal
6	10812.781	50.25	53.19	2.94	74.00	20.81	150	204	Horizontal

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



Antenna polarity: Vertical



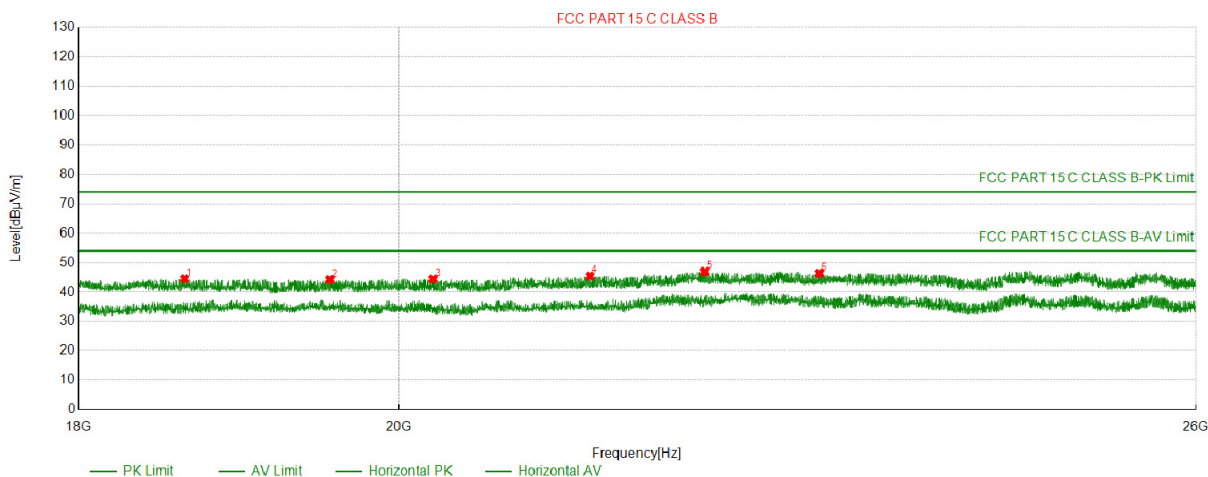
Suspected Data List									
NO.	Freq. [MHz]	Reading [dBμV/m]	PK Level [dBμV/m]	Factor [dB]	PK Limit [dBμV/m]	PK Margin [dB]	Height [cm]	Angle [°]	Polarity
1	1205.821	56.41	37.17	-19.24	74.00	36.83	150	204	Vertical
2	1446.445	59.27	40.77	-18.50	74.00	33.23	150	104	Vertical
3	3376.538	55.06	39.87	-15.19	74.00	34.13	150	355	Vertical
4	7236.424	53.45	49.53	-3.92	74.00	24.47	150	172	Vertical
5	9503.150	50.84	51.21	0.37	74.00	22.79	150	94	Vertical
6	10920.792	50.13	53.12	2.99	74.00	20.88	150	284	Vertical

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



For 18GHz to 26GHz

Antenna polarity: Horizontal

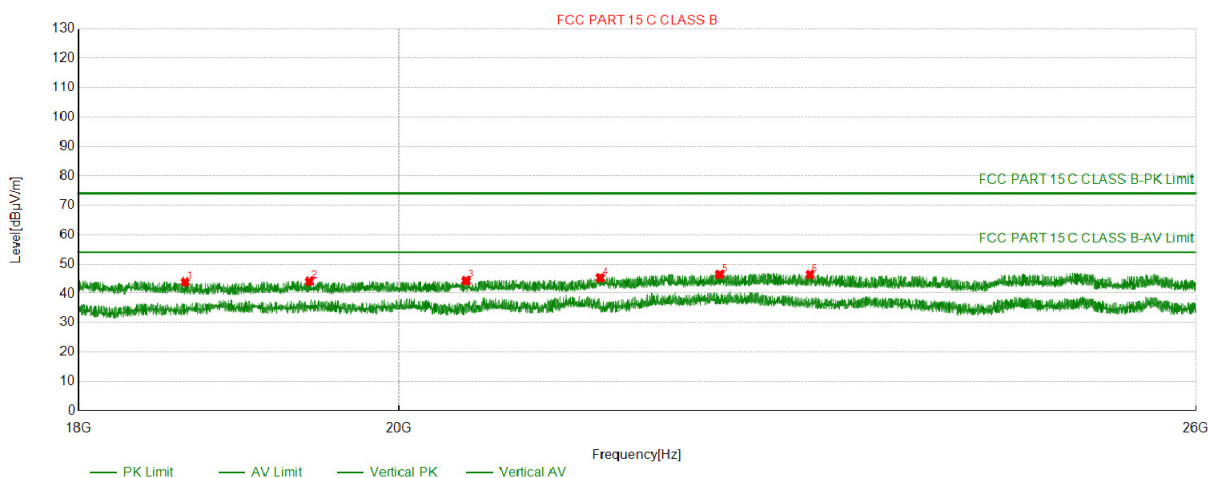


Suspected Data List									
NO.	Freq. [MHz]	Reading [dBμV/m]	PK Level [dBμV/m]	Factor [dB]	PK Limit [dBμV/m]	PK Margin [dB]	Height [cm]	Angle [°]	Polarity
1	18639.264	39.02	44.45	5.43	74.00	29.55	150	60	Horizontal
2	19552.955	38.07	44.17	6.10	74.00	29.83	150	320	Horizontal
3	20228.223	38.29	44.35	6.06	74.00	29.65	150	360	Horizontal
4	21299.530	40.10	45.38	5.28	74.00	28.62	150	40	Horizontal
5	22119.612	41.16	46.90	5.74	74.00	27.10	150	220	Horizontal
6	22970.097	40.82	46.36	5.54	74.00	27.64	150	310	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	18642.464	38.45	43.88	5.43	74.00	30.12	150	300	Vertical
2	19421.742	38.02	44.08	6.06	74.00	29.92	150	80	Vertical
3	20449.045	38.28	44.27	5.99	74.00	29.73	150	70	Vertical
4	21372.337	39.99	45.27	5.28	74.00	28.73	150	220	Vertical
5	22228.423	40.71	46.45	5.74	74.00	27.55	150	280	Vertical
6	22898.090	40.87	46.41	5.54	74.00	27.59	150	90	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 an External Antenna, with non-standard SMA connector, need professional installation. It conforms to the standard requirements. The directional gains of antenna used for transmitting is 2.9dBi.

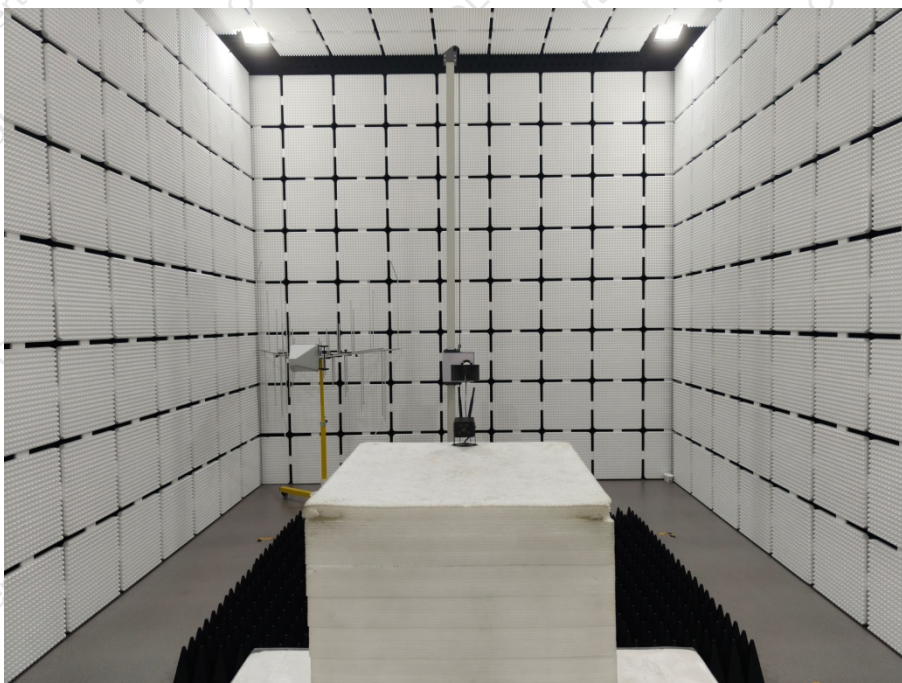
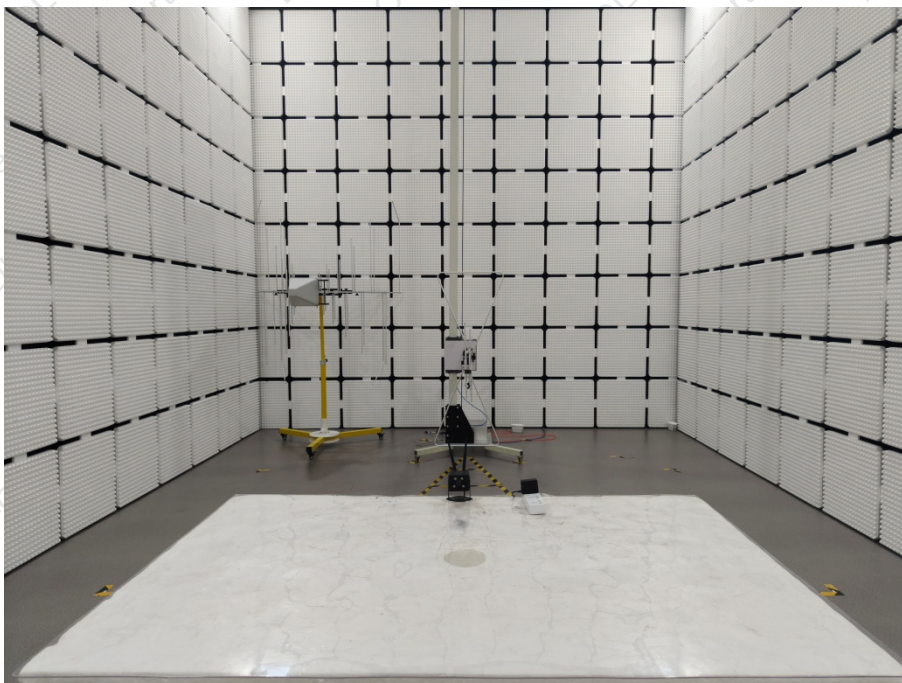
WIFI Antenna





5. Test Setup Photos of the EUT

Radiated Emissions

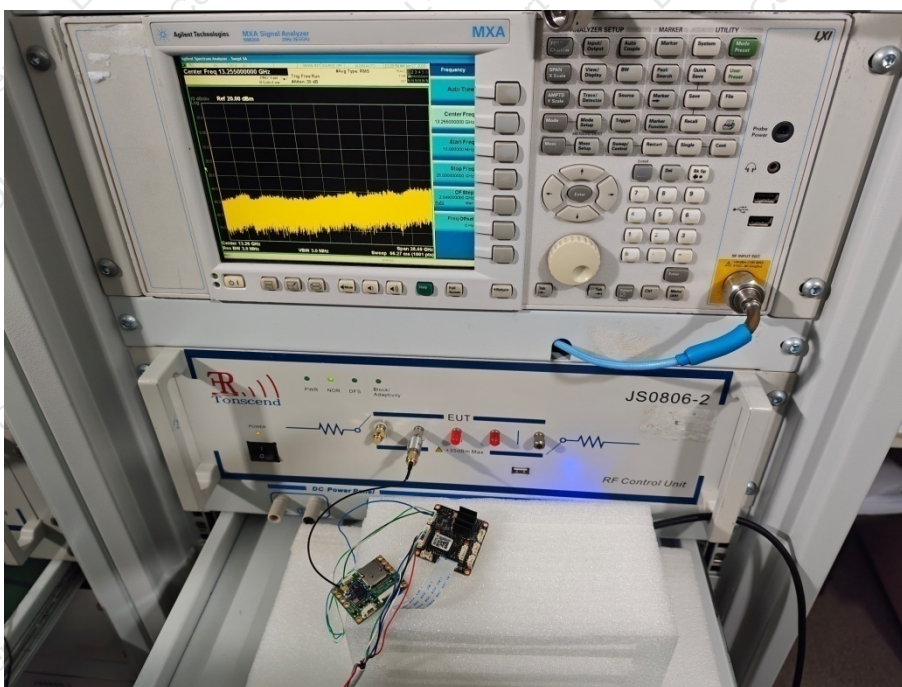




AC Conducted Emission



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-----