

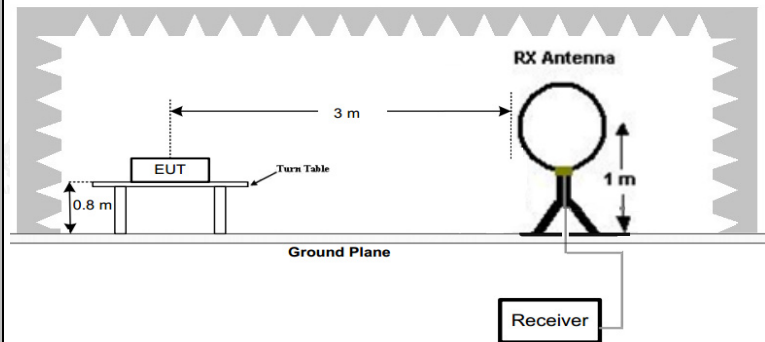
4.6 Spurious Emission

4.6.1 Test Specification

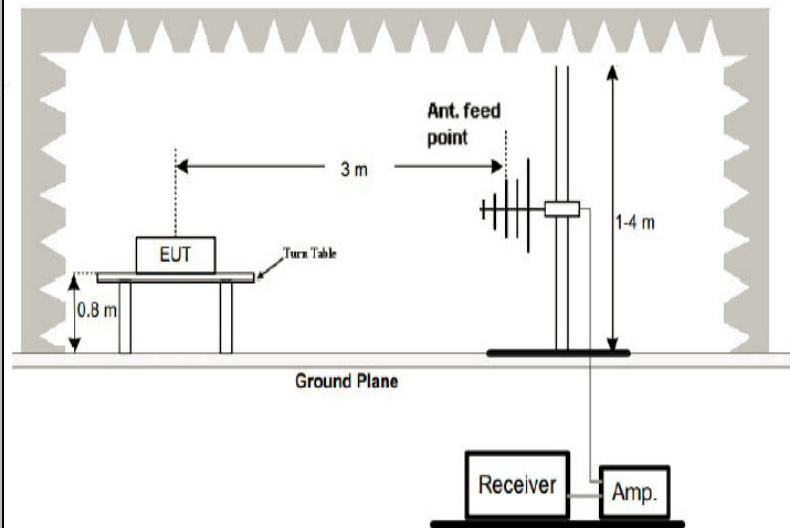
Test Requirement:	FCC CFR47 Part 15 Section 15.407 & 15.209 & 15.205				
Test Method:	KDB 789033 D02 v02r01				
Frequency Range:	9kHz to 40GHz				
Measurement Distance:	3 m				
Antenna Polarization:	Horizontal & Vertical				
Operation Mode:	Transmitting mode with modulation				
Receiver Setup:	Frequency	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:	(1) For transmitters operating in the 5.15-5.25 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz. (2) For transmitters operating in the 5.25-5.35 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz. (3) For transmitters operating in the 5.47-5.725 GHz band: All emissions outside of the 5.47-5.725 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz. (4) For transmitters operating in the 5.725-5.85 GHz band: (i) All emissions shall be limited to a level of -27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge. The limit of frequency below 1GHz and which fall in restricted bands should comply 15.209.				

Test Setup:

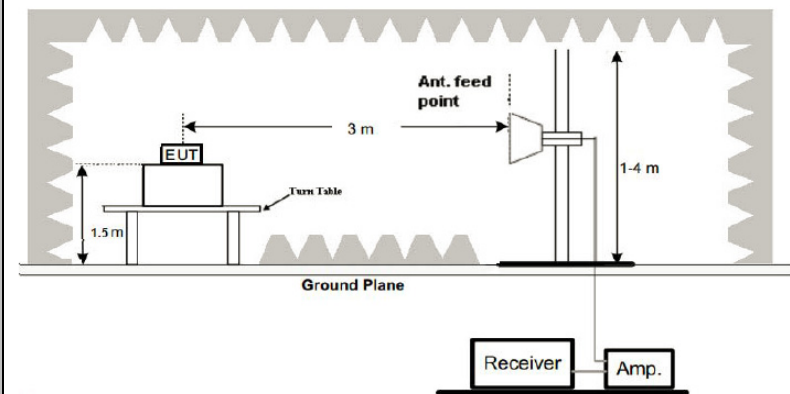
For Radiated Emissions below 30MHz



30MHz to 1GHz



Above 1GHz



Test Procedure:	1. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation. 2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower. 3. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement. 4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable was turned from 0 degrees to 360 degrees to find the maximum reading. 5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. 6. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.
Test Results:	PASS

4.6.2 Test Instruments

Radiated Emission Test Site (966)

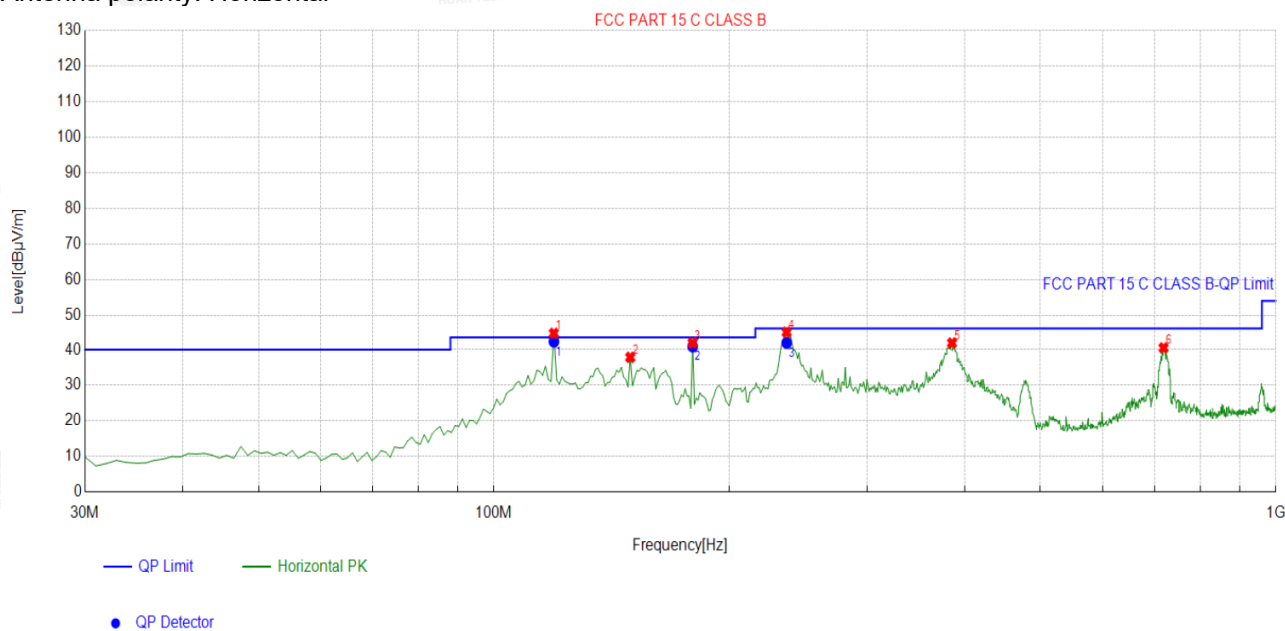
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due
Spectrum analyzer	Agilent	N9020A	HKE-025	Feb. 06, 2026	Feb. 05, 2027
Spectrum analyzer	KEYSIGHT	N9020A	HKE-117	Feb. 06, 2026	Feb. 05, 2027
Spectrum analyzer	R&S	FSV3044	HKE-126	Feb. 06, 2026	Feb. 05, 2027
Preamplifier	Schwarzbeck	EMC051845SE	HKE-006	Feb. 04, 2026	Feb. 03, 2027
Preamplifier	Agilent	83051A	HKE-016	Feb. 04, 2026	Feb. 03, 2027
Preamplifier	QJD	QJD18-40-50	HKE-030	Feb. 05, 2026	Feb. 04, 2027
6dB Attenuator	Pasternack	6dB	HKE-007	Feb. 06, 2026	Feb. 05, 2027
EMI Test Receiver	R&S	ESR-7	HKE-010	Feb. 06, 2026	Feb. 05, 2027
Broadband Antenna	Schwarzbeck	VULB9168	HKE-167	Feb. 06, 2026	Feb. 05, 2028
Loop Antenna	COM-POWER	AL-130R	HKE-014	Feb. 06, 2026	Feb. 05, 2028
Horn Antenna	Schwarzbeck	9120D	HKE-013	Feb. 06, 2026	Feb. 05, 2028
EMI Test Software	Tonscend	JS32-RE 5.0.0	HKE-082	/	/
RSE Test Software	Tonscend	JS36-RSE 5.0.0	HKE-184	/	/

4.6.3 Test Data

All the test modes completed for test. Only the worst result was reported as below:

Below 1GHz Test Results

Antenna polarity: Horizontal



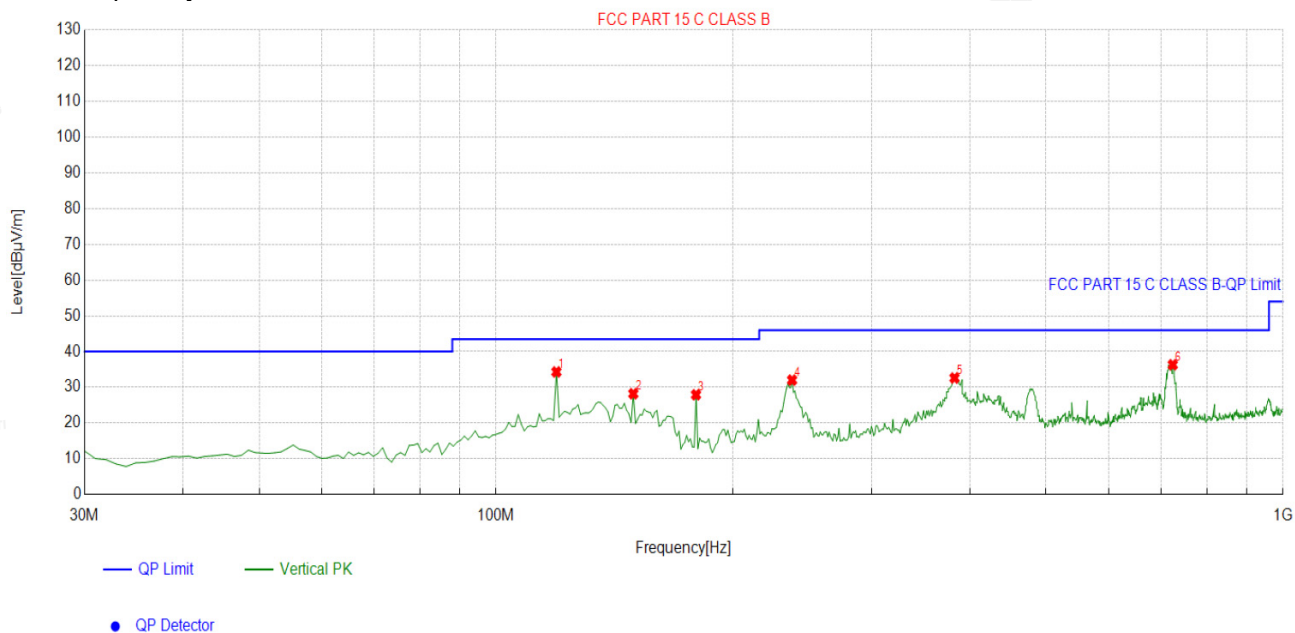
Suspected List									
NO.	Freq. [MHz]	Factor [dB]	Reading [dBμV/m]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	119.329	-16.17	60.78	44.61	43.50	-1.11	100	190	Horizontal
2	149.429	-18.24	56.11	37.87	43.50	5.63	100	182	Horizontal
3	179.530	-16.44	58.35	41.91	43.50	1.59	100	340	Horizontal
4	236.817	-13.60	58.51	44.91	46.00	1.09	100	182	Horizontal
5	385.375	-10.11	52.01	41.90	46.00	4.10	100	1	Horizontal
6	718.418	-3.94	44.46	40.52	46.00	5.48	100	219	Horizontal

Final Data List									
NO.	Freq. [MHz]	Factor [dB]	QP Reading [dBμV/m]	QP Value [dBμV/m]	QP Limit [dBμV/m]	QP Margin [dB]	Height [cm]	Angle [°]	Polarity
1	119.329	-16.17	58.46	42.29	43.50	1.21	100	190	Horizontal
2	179.530	-16.44	57.38	40.94	43.50	2.56	100	340	Horizontal
3	236.817	-13.60	55.54	41.94	46.00	4.06	100	182	Horizontal

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

The results shown in this test report refer only to the sample(s) tested unless otherwise stated and the sample(s) are retained for 15 days only. The document is issued by Shenzhen HUAKE Testing Technology Co., Ltd., this document cannot be reproduced except in full with our prior written permission.

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	119.329	-16.17	50.50	34.33	43.50	9.17	100	255	Vertical
2	149.429	-18.24	46.46	28.22	43.50	15.28	100	237	Vertical
3	179.530	-16.44	44.37	27.93	43.50	15.57	100	240	Vertical
4	237.788	-13.57	45.60	32.03	46.00	13.97	100	270	Vertical
5	382.462	-10.22	42.83	32.61	46.00	13.39	100	237	Vertical
6	724.244	-3.88	40.20	36.32	46.00	9.68	100	233	Vertical

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

Harmonics and Spurious Emissions

Frequency Range (9 kHz-30MHz)

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

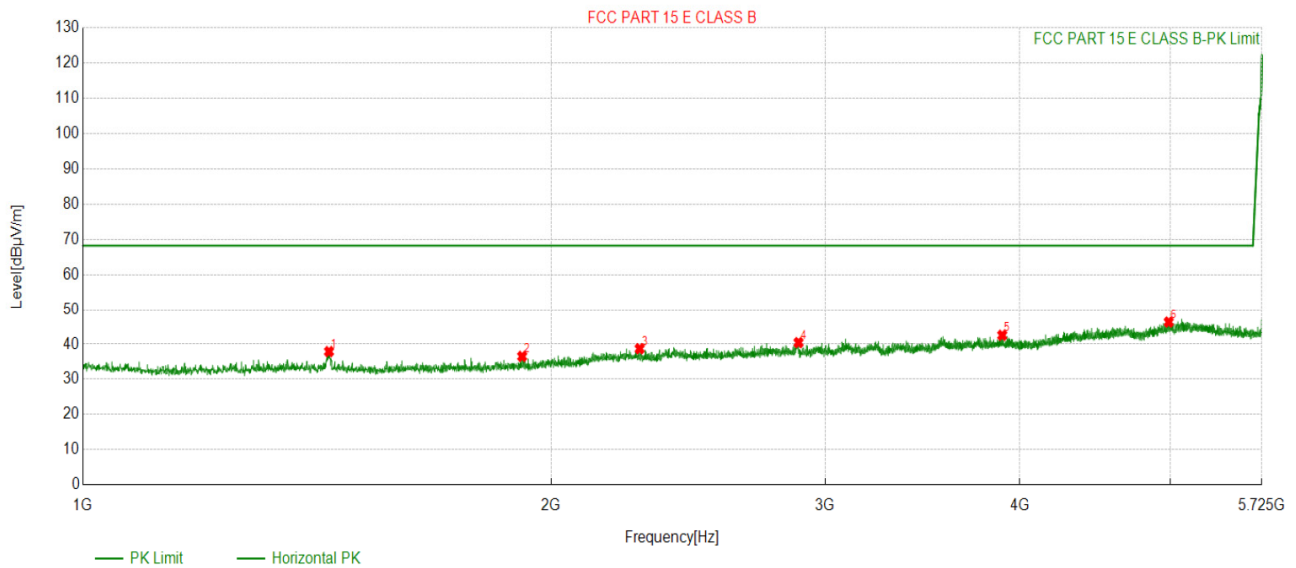
2. The emission levels are 20 dB below the limit value, which are not reported. It is deemed to comply with the requirement

Above 1GHz Test Results

All the test modes completed for test. Only the worst result was reported as below:

For 1GHz to 5.725GHz

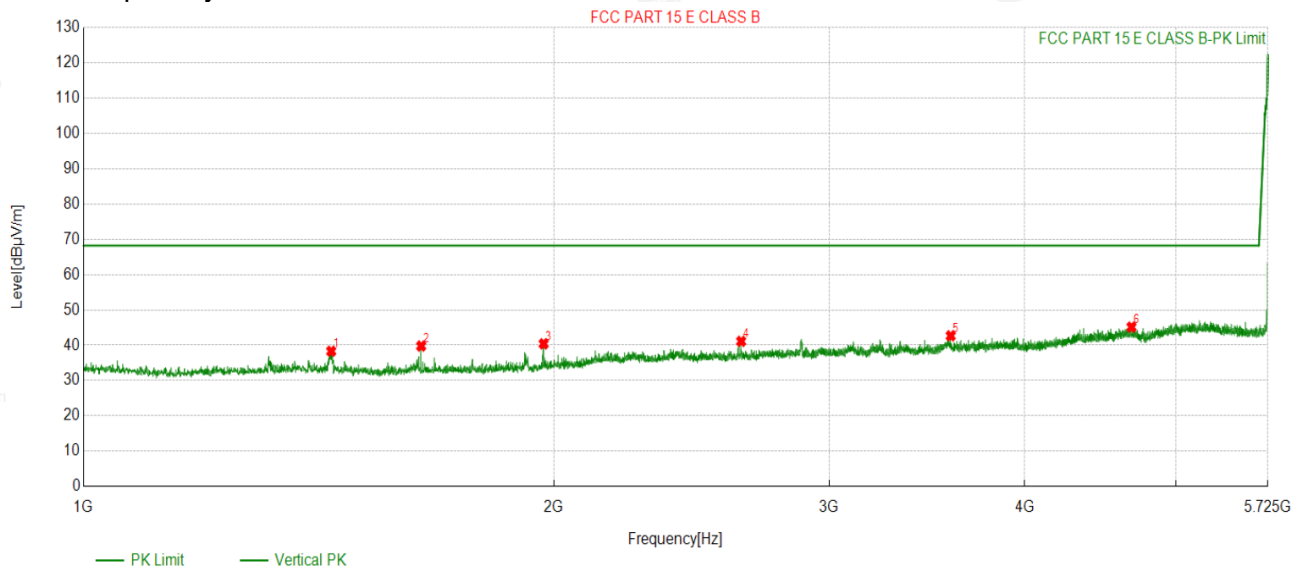
Antenna polarity: Horizontal



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	1439.469	56.07	37.90	-18.17	68.20	30.30	150	354	Horizontal
2	1915.797	53.98	36.53	-17.45	68.20	31.67	150	240	Horizontal
3	2279.658	53.63	38.71	-14.92	68.20	29.49	150	181	Horizontal
4	2884.046	53.83	40.45	-13.38	68.20	27.75	150	221	Horizontal
5	3898.605	52.32	42.53	-9.79	68.20	25.67	150	112	Horizontal
6	4988.299	50.84	46.30	-4.54	68.20	21.90	150	26	Horizontal

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

Antenna polarity: Vertical

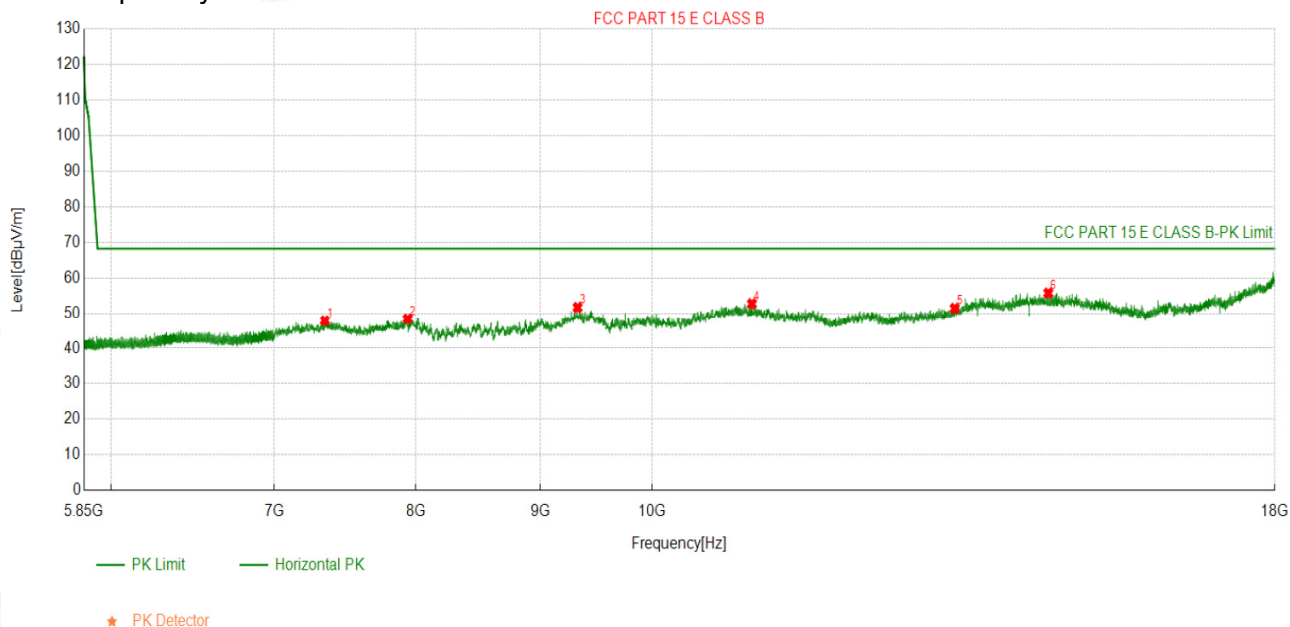


Suspected Data List									
NO.	Freq. [MHz]	Reading [dBμV/m]	PK Level [dBμV/m]	Factor [dB]	PK Limit [dBμV/m]	PK Margin [dB]	Height [cm]	Angle [°]	Polarity
1	1440.414	56.48	38.31	-18.17	68.20	29.89	150	93	Vertical
2	1644.554	58.25	39.78	-18.47	68.20	28.42	150	197	Vertical
3	1969.667	57.53	40.42	-17.11	68.20	27.78	150	66	Vertical
4	2635.014	55.42	41.12	-14.30	68.20	27.08	150	3	Vertical
5	3588.141	53.51	42.67	-10.84	68.20	25.53	150	93	Vertical
6	4683.033	51.52	45.16	-6.36	68.20	23.04	150	202	Vertical

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

For 5.85GHz to 18GHz

Antenna polarity: Horizontal

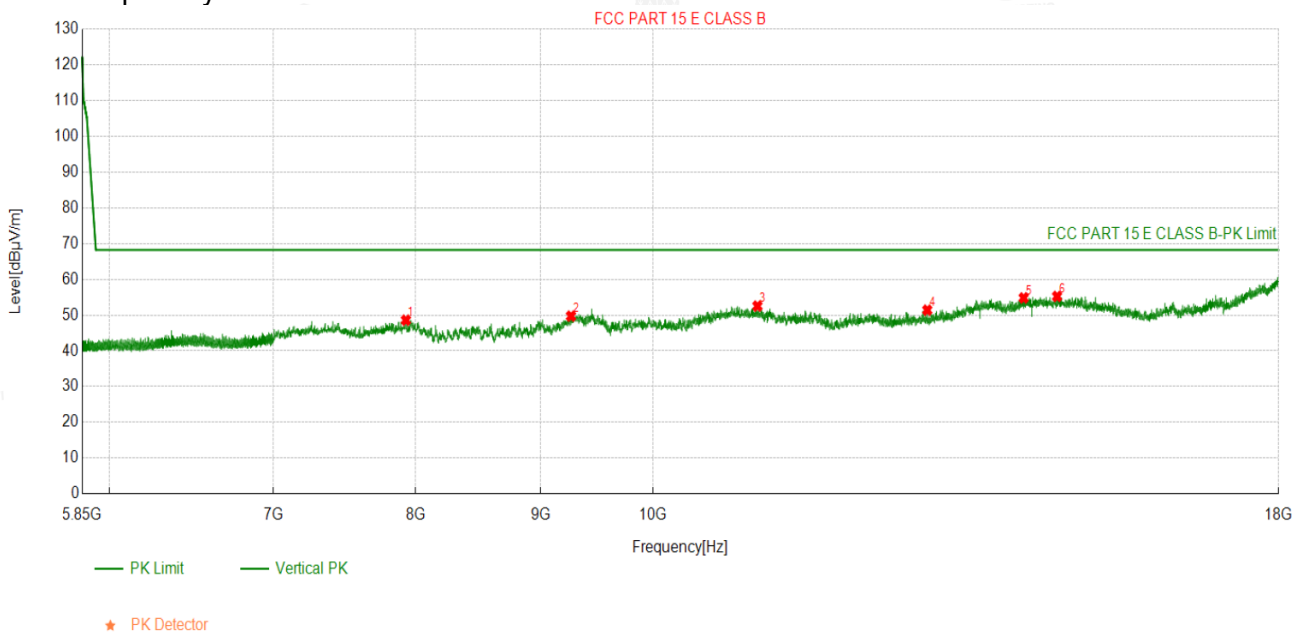


Suspected Data List

NO.	Freq. [MHz]	Reading [dBμV/m]	PK Level [dBμV/m]	Factor [dB]	PK Limit [dBμV/m]	PK Margin [dB]	Height [cm]	Angle [°]	Polarity
1	7343.234	51.00	47.83	-3.17	68.20	20.37	150	197	Horizontal
2	7939.494	50.77	48.37	-2.40	68.20	19.83	150	86	Horizontal
3	9321.232	51.98	51.67	-0.31	68.20	16.53	150	178	Horizontal
4	10987.899	49.96	52.72	2.76	68.20	15.48	150	155	Horizontal
5	13305.831	46.89	51.41	4.52	68.20	16.79	150	183	Horizontal
6	14533.553	48.17	55.73	7.56	68.20	12.47	150	2	Horizontal

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

Antenna polarity: Vertical



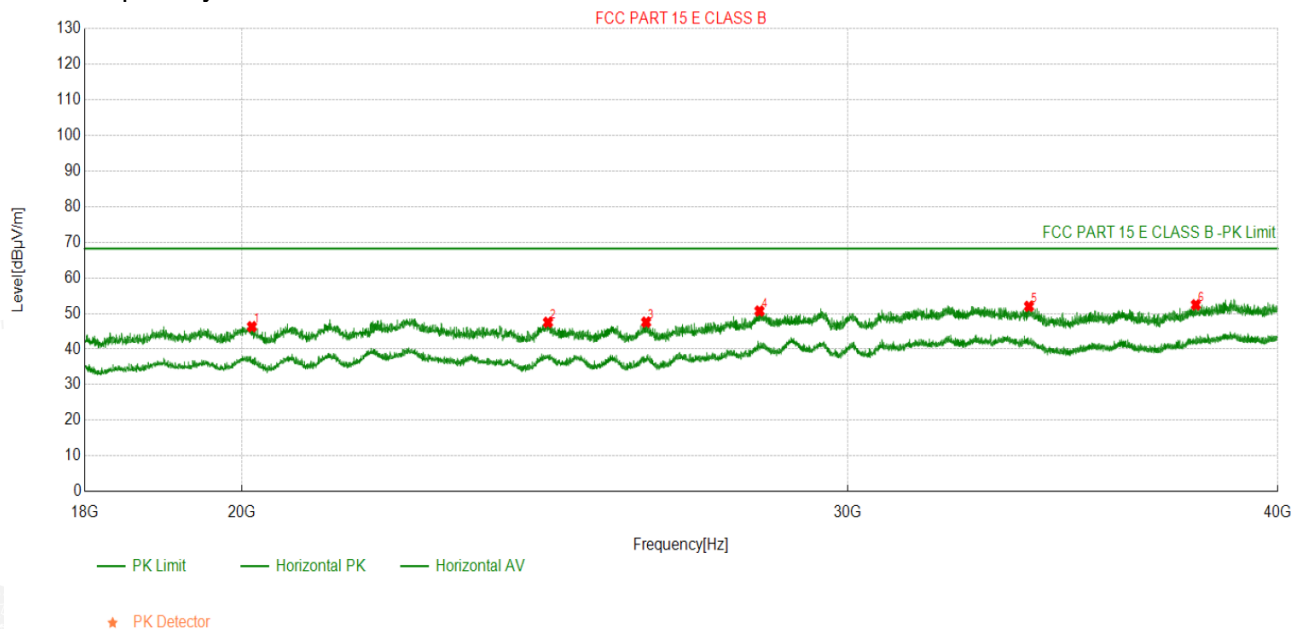
Suspected Data List

NO.	Freq. [MHz]	Reading [dBμV/m]	PK Level [dBμV/m]	Factor [dB]	PK Limit [dBμV/m]	PK Margin [dB]	Height [cm]	Angle [°]	Polarity
1	7928.493	51.11	48.58	-2.53	68.20	19.62	150	272	Vertical
2	9258.526	50.39	49.72	-0.67	68.20	18.48	150	6	Vertical
3	11030.803	49.78	52.53	2.75	68.20	15.67	150	299	Vertical
4	12939.494	48.59	51.40	2.81	68.20	16.80	150	272	Vertical
5	14165.017	47.71	54.81	7.10	68.20	13.39	150	356	Vertical
6	14617.162	47.33	55.23	7.90	68.20	12.97	150	121	Vertical

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

For 18GHz to 40GHz

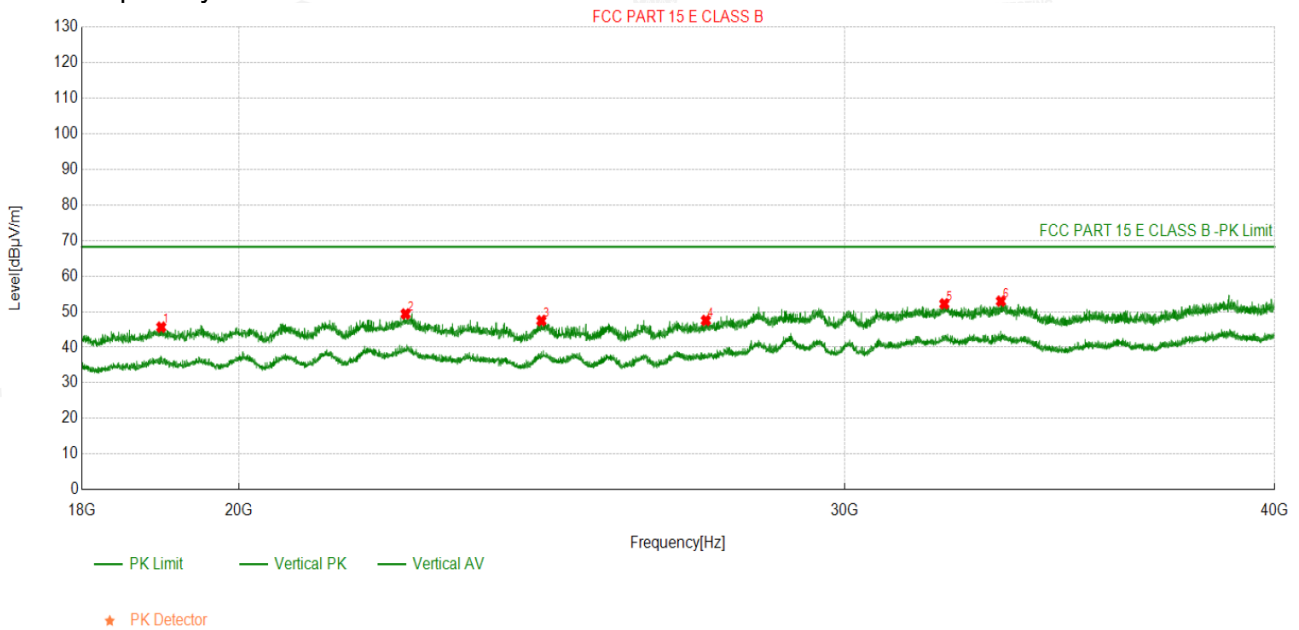
Antenna polarity: Horizontal



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	20132.013	40.17	46.29	6.12	68.20	21.91	150	360	Horizontal
2	24543.454	41.72	47.51	5.79	68.20	20.69	150	290	Horizontal
3	26209.021	40.81	47.55	6.74	68.20	20.65	150	100	Horizontal
4	28275.028	42.04	50.68	8.64	68.20	17.52	150	280	Horizontal
5	33863.586	41.00	51.99	10.99	68.20	16.21	150	150	Horizontal
6	37863.586	42.74	52.43	9.69	68.20	15.77	150	290	Horizontal

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

Antenna polarity: Vertical

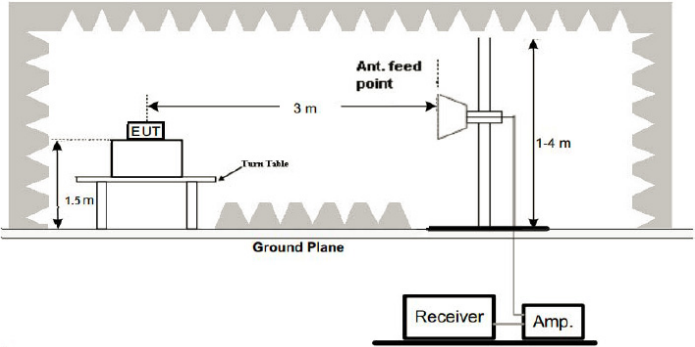


Suspected Data List									
NO.	Freq. [MHz]	Reading [dBμV/m]	PK Level [dBμV/m]	Factor [dB]	PK Limit [dBμV/m]	PK Margin [dB]	Height [cm]	Angle [°]	Polarity
1	18983.498	39.99	45.66	5.67	68.20	22.54	150	70	Vertical
2	22356.436	43.67	49.37	5.70	68.20	18.83	150	30	Vertical
3	24484.048	41.75	47.46	5.71	68.20	20.74	150	260	Vertical
4	27333.333	39.67	47.53	7.86	68.20	20.67	150	230	Vertical
5	32063.806	42.38	52.20	9.82	68.20	16.00	150	120	Vertical
6	33300.330	42.02	52.96	10.94	68.20	15.24	150	40	Vertical

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

4.7 Band Edge

4.7.1 Test Specification

Test Requirement:	FCC CFR47 Part 15E Section 15.407
Test Method:	ANSI C63.10: 2020
Limit:	(1) For transmitters operating in the 5.725-5.85 GHz band: (i) All emissions shall be limited to a level of -27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge. The limit of frequency below 1GHz and which fall in restricted bands should complies 15.209.
Test Setup:	
Test Mode:	Transmitting mode with modulation
Test Procedure:	1. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation. 2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower. 3. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement. 4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rota table was turned from 0 degrees to 360 degrees to find the maximum reading.

	5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. 6. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi peak or average method as specified and then reported in a data sheet.
Test Result:	PASS

4.7.2 Test Instruments

Radiated Emission Test Site (966)

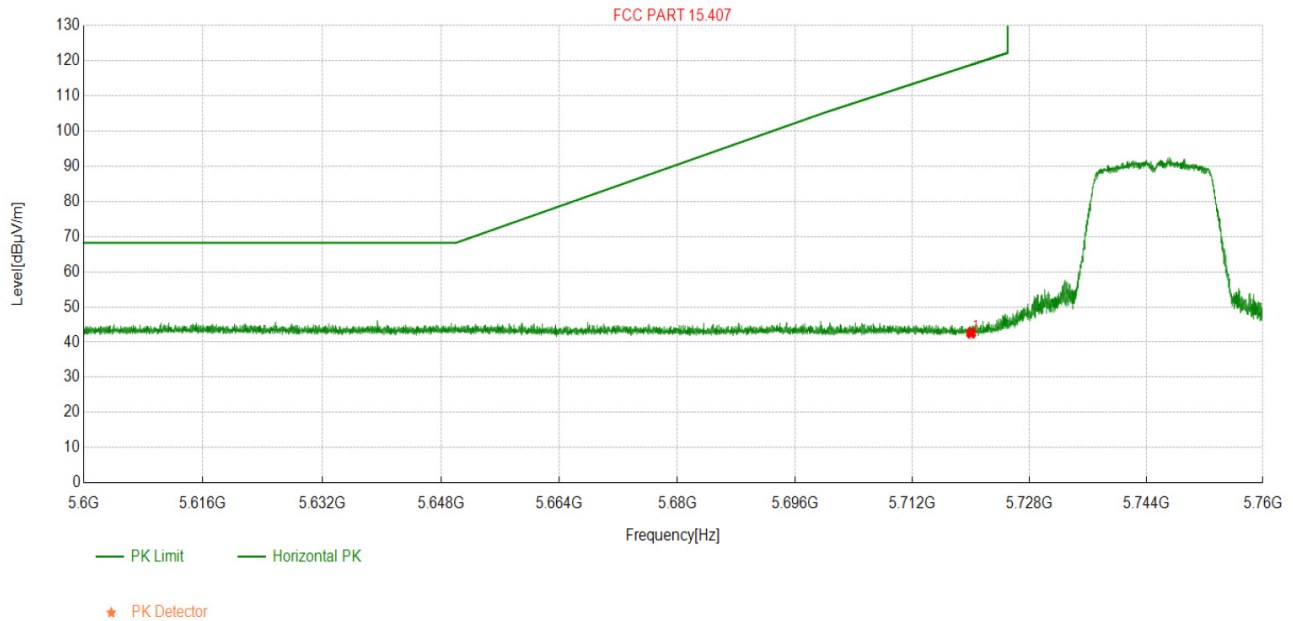
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due
Spectrum analyzer	Agilent	N9020A	HKE-025	Feb. 06, 2026	Feb. 05, 2027
Spectrum analyzer	KEYSIGHT	N9020A	HKE-117	Feb. 06, 2026	Feb. 05, 2027
Spectrum analyzer	R&S	FSV3044	HKE-126	Feb. 06, 2026	Feb. 05, 2027
Preamplifier	Schwarzbeck	EMC051845SE	HKE-006	Feb. 04, 2026	Feb. 03, 2027
Preamplifier	Agilent	83051A	HKE-016	Feb. 04, 2026	Feb. 03, 2027
Preamplifier	QJD	QJD18-40-50	HKE-030	Feb. 05, 2026	Feb. 04, 2027
6dB Attenuator	Pasternack	6dB	HKE-007	Feb. 06, 2026	Feb. 05, 2027
EMI Test Receiver	R&S	ESR-7	HKE-010	Feb. 06, 2026	Feb. 05, 2027
Broadband Antenna	Schwarzbeck	VULB9168	HKE-167	Feb. 06, 2026	Feb. 05, 2028
Loop Antenna	COM-POWER	AL-130R	HKE-014	Feb. 06, 2026	Feb. 05, 2028
Horn Antenna	Schwarzbeck	9120D	HKE-013	Feb. 06, 2026	Feb. 05, 2028
EMI Test Software	Tonscend	JS32-RE 5.0.0	HKE-082	/	/
RSE Test Software	Tonscend	JS36-RSE 5.0.0	HKE-184	/	/

4.7.3 Test Data

All the test modes completed for test. Only the worst result was reported as below:

802.11n(HT20)-5745

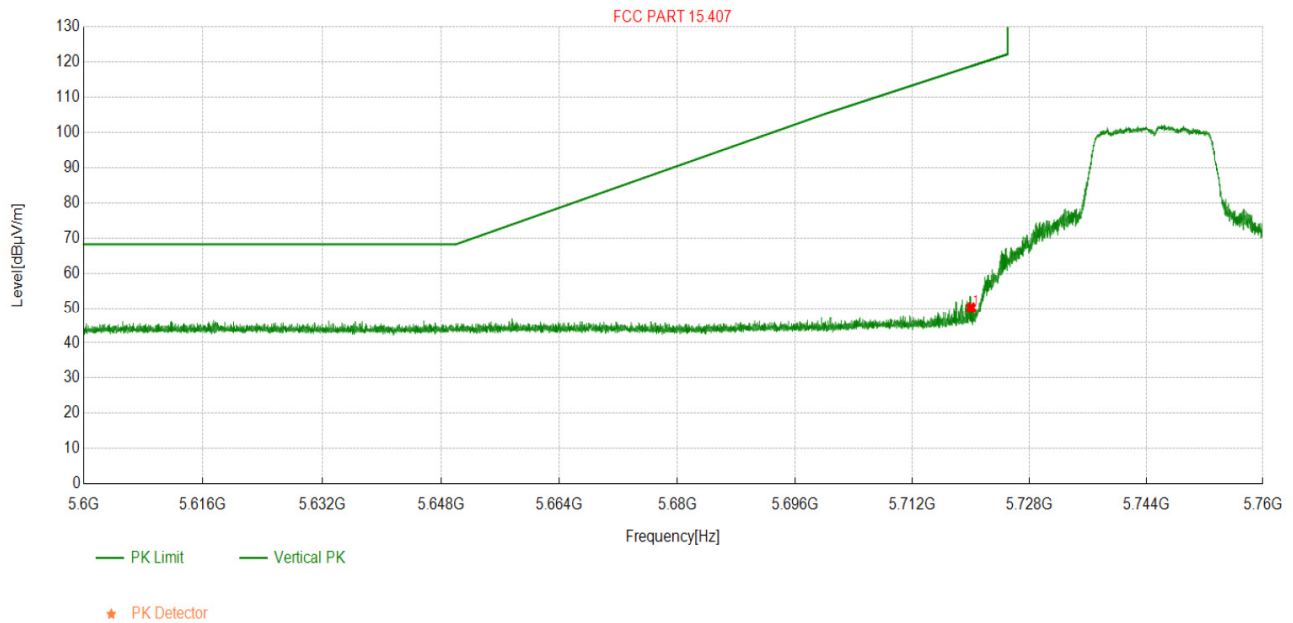
Antenna polarity: Horizontal



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	5720.000	48.66	42.59	-6.07	118.81	76.22	150	220	Horizontal

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

Antenna polarity: Vertical

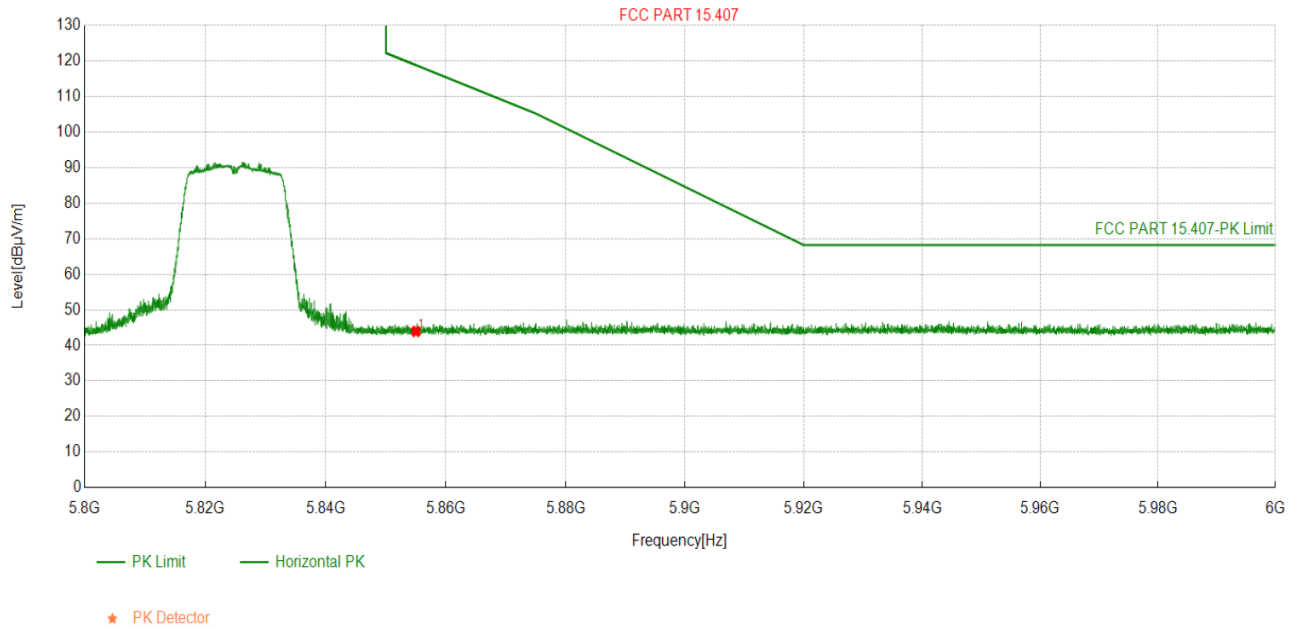


Suspected Data List									
NO.	Freq. [MHz]	Reading [dBμV/m]	PK Level [dBμV/m]	Factor [dB]	PK Limit [dBμV/m]	PK Margin [dB]	Height [cm]	Angle [°]	Polarity
1	5720.000	56.22	50.15	-6.07	118.81	68.66	150	0	Vertical

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

802.11n(HT20)-5825

Antenna polarity: Horizontal

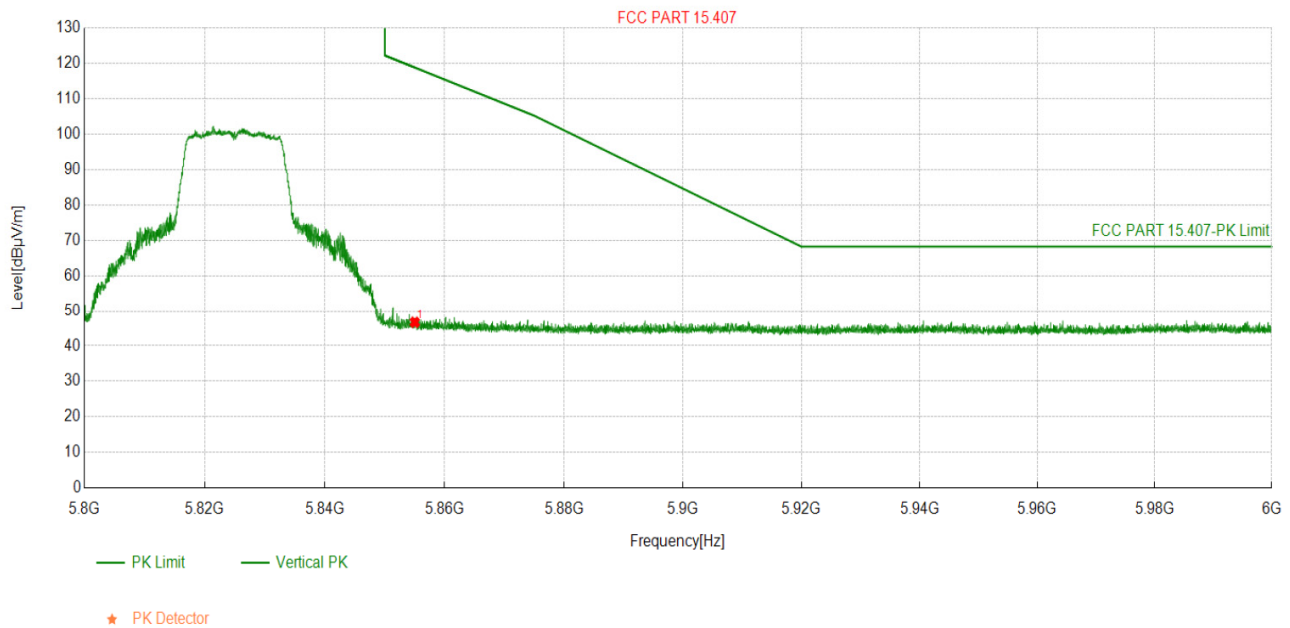


Suspected Data List

NO.	Freq. [MHz]	Reading [dBμV/m]	PK Level [dBμV/m]	Factor [dB]	PK Limit [dBμV/m]	PK Margin [dB]	Height [cm]	Angle [°]	Polarity
1	5855.000	49.72	43.93	-5.79	118.80	74.87	150	112	Horizontal

Remark: Factor = Cable loss + Antenna factor – 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	5855.000	52.39	46.60	-5.79	118.80	72.20	150	296	Vertical

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



4.8 Frequency Stability Measurement

4.8.1 Test Specification

Test Requirement:	FCC Part15 Section 15.407(g)
Test Method:	ANSI C63.10: 2020
Limit:	The frequency tolerance shall be maintained within the band of operation frequency over a temperature variation of 0 degrees to 35 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C.
Test Setup:	<pre>graph LR; SA[Spectrum Analyzer] --- EUT[EUT]; EUT --- TCh[Temperature Chamber]; TCh --- P[AC/DC Power supply];</pre>
Test Procedure:	- The EUT was placed inside the environmental test chamber and powered by nominal AC/DC voltage. - Turn the EUT on and couple its output to a spectrum analyzer. - Turn the EUT off and set the chamber to the highest temperature specified. - Allow sufficient time (approximately 30 min) for the temperature of the chamber to stabilize. - Repeat step 2 and 3 with the temperature chamber set to the lowest temperature. - The test chamber was allowed to stabilize at +20 degree C for a minimum of 30 minutes. The supply voltage was then adjusted on the EUT from 85% to 115% and the frequency record.
Test Result:	PASS
Remark:	N/A

4.8.2 Test Instruments

RF Test Room					
Equipment	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due
Spectrum analyzer	Agilent	N9020A	HKE-025	Feb. 06, 2026	Feb. 05, 2027
Spectrum analyzer	KEYSIGHT	N9020A	HKE-117	Feb. 06, 2026	Feb. 05, 2027
Power meter	KEYSIGHT	E4419B	HKE-144	Feb. 06, 2026	Feb. 05, 2027
Power Sensor	Aglient	E9304A H18	HKE-165	Feb. 06, 2026	Feb. 05, 2027
RF cable	Times	1-40G	/	Feb. 06, 2026	Feb. 05, 2027
RF automatic control unit	Tonscend	JS0806-2	HKE-060	Feb. 06, 2026	Feb. 05, 2027
RF Test Software	Tonscend	JS1120-3 Version 3.5.39	HKE-083	/	/

Note: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).

4.8.3 Test Result

Mode	Voltage (V)	FHL (5745MHz)	Deviation (KHz)	FHH (5825MHz)	Deviation (KHz)
5.8G Band	4.25V	5744.983	-17	5825.026	26
	5.0V	5745.032	32	5825.013	13
	5.75V	5745.013	13	5824.992	-8

Mode	Temperature (°C)	FHL (5745MHz)	Deviation (KHz)	FHH (5825MHz)	Deviation (KHz)
5.8G Band	-30	5744.976	-24	5824.981	-19
	-20	5744.991	-9	5825.031	31
	-10	5744.997	-3	5825.015	15
	0	5745.032	32	5824.971	-29
	10	5745.013	13	5825.036	36
	20	5744.985	-15	5824.972	-28
	30	5745.037	37	5824.983	-17
	40	5745.026	26	5824.975	-25
	50	5744.991	-9	5825.025	25

4.9 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.

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

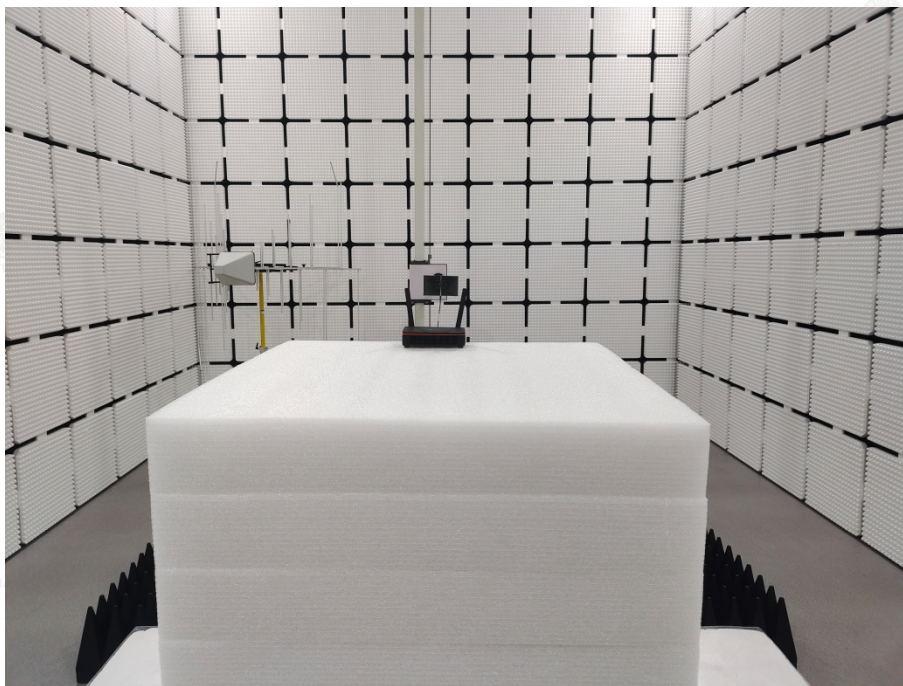
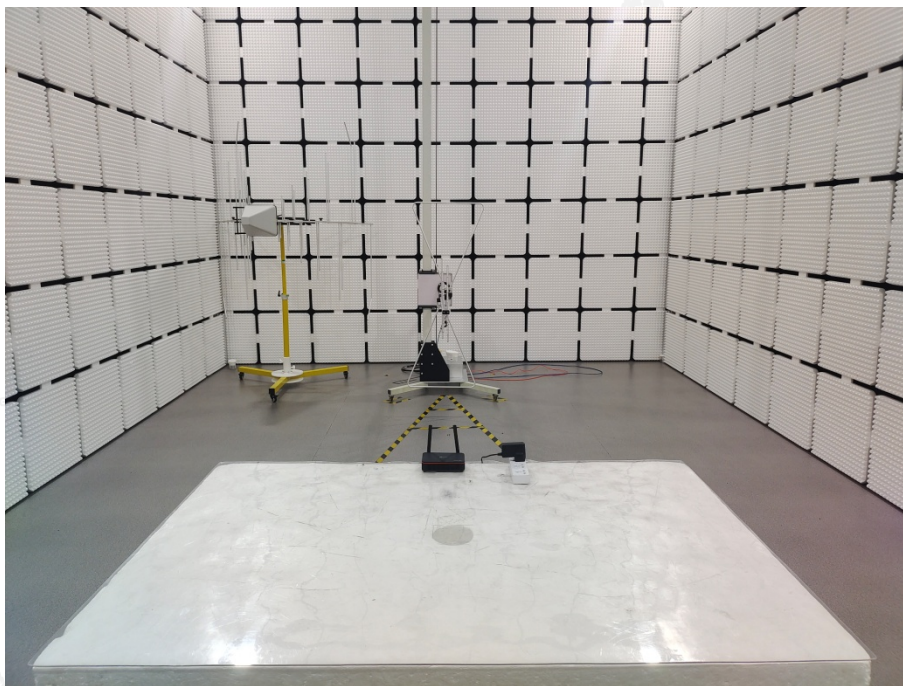
The antenna used in this product is External Antenna, need professional installation, not easy to remove. It conforms to the standard requirements. and the best case gain of the antenna is Antenna port 1: 5.36dBi and Antenna port 2: 5.50dBi.

WIFI ANTENNA



5. Test Setup Photos of the EUT

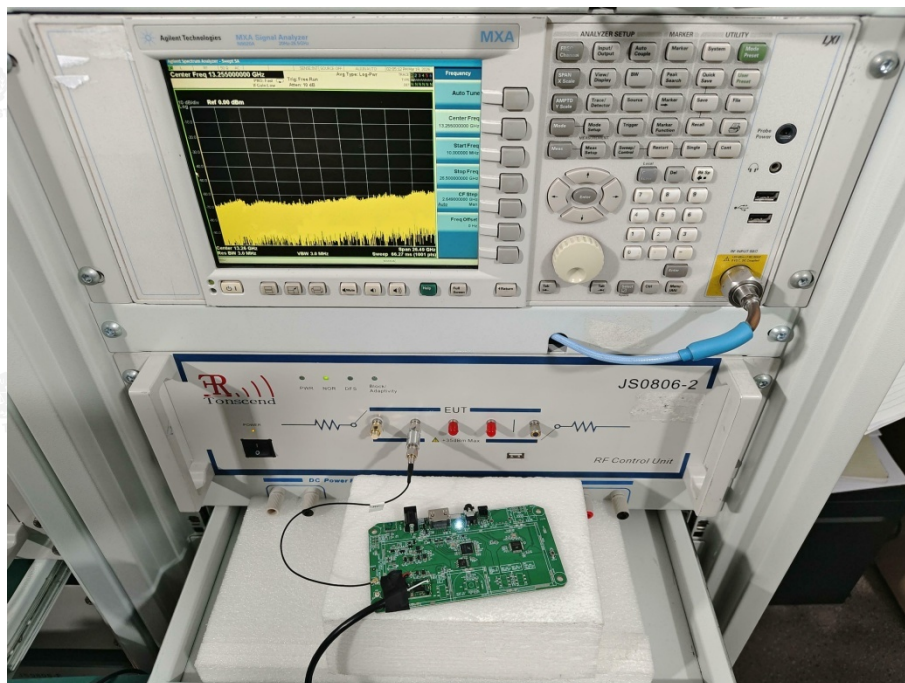
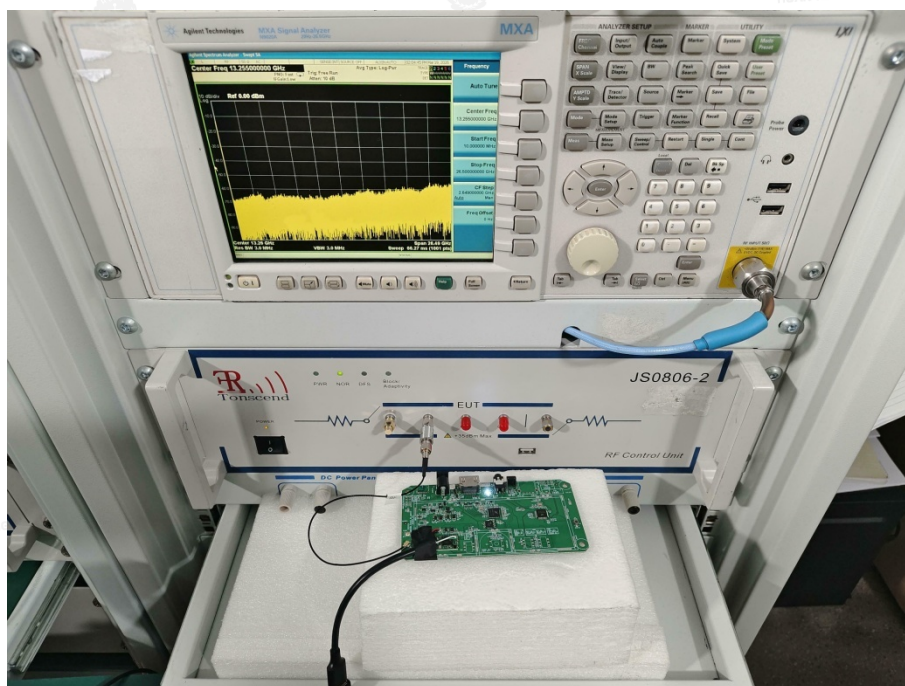
Radiated Emission



AC Conducted Emission



RF Conducted Emission



The results shown in this test report refer only to the sample(s) tested unless otherwise stated and the sample(s) are retained for 15 days only. The document is issued by Shenzhen HUAKE Testing Technology Co., Ltd., this document cannot be reproduced except in full with our prior written permission.

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6. Photos of the EUT

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

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