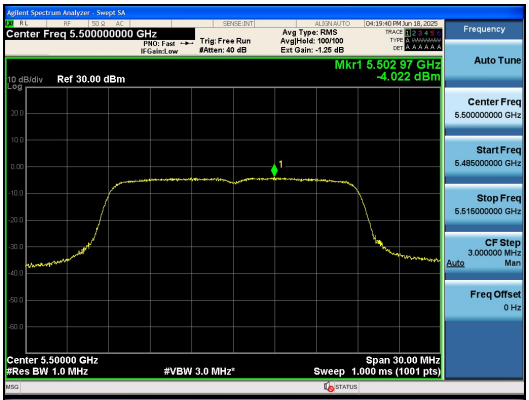
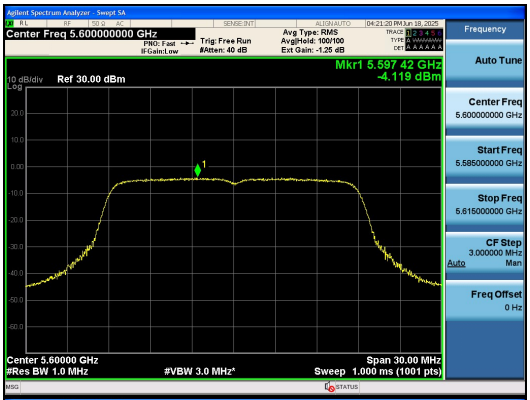
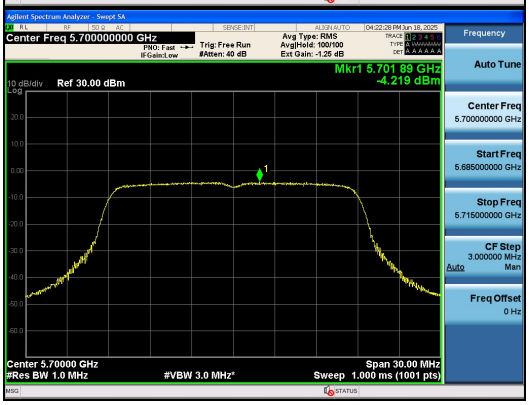
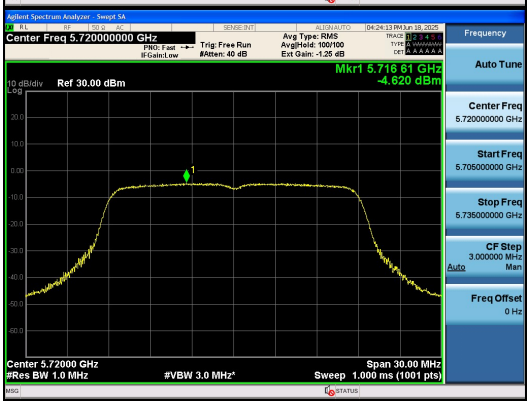








802.11n_HT20_UNII 2C

4.4 Frequency Stability

Test Procedures
KDB 789033 – Section A.3

The EUT was placed inside of an environmental chamber as the temperature in the chamber was varied between -10 ℃ and +50 ℃(Declaration by the Manufacturer). The temperature was incremented by 10 ℃ intervals and the unit was allowed to stabilize at each temperature before each measurement. The center frequency of the transmitting channel was evaluated at each temperature and the frequency deviation from the channel's center frequency was recorded.
Data for the worst case channel is shown below.

Measured Frequency Error (kHz)						
Voltage (VDC)	Temperature (℃)	Test Frequency (MHz)				
		5 180	5 200	5 240	5 260	5 300
12.0	-10	37.645	36.625	37.775	36.730	38.190
12.0	0	31.365	30.680	32.030	31.760	32.635
12.0	10	23.360	21.885	22.930	21.395	22.610
12.0	20(Ref)	-5.516	-7.194	-6.029	-7.774	-6.453
12.0	30	-1.780	-2.335	-1.090	-3.235	-1.940
12.0	40	-18.080	-18.035	-16.770	-18.360	-17.100
12.0	50	-22.325	-23.450	-21.855	-23.355	-23.185
10.2	20(Ref)	-8.848	-8.940	-6.178	-8.530	-6.636
13.8	20(Ref)	-8.815	-9.639	-7.921	-9.362	-8.004

Measured Frequency Error (kHz)						
Voltage (VDC)	Temperature (℃)	Test Frequency (MHz)				
		5 320	5 500	5 600	5 700	5 720
12.0	-10	38.130	35.615	35.700	39.085	38.075
12.0	0	32.420	24.350	27.065	30.770	30.515
12.0	10	22.185	14.680	17.055	19.825	18.945
12.0	20(Ref)	-6.696	-17.781	-14.798	-11.759	-13.318
12.0	30	-2.270	-9.060	-9.690	-7.655	-9.305
12.0	40	-17.295	-20.845	-23.555	-21.010	-22.735
12.0	50	-21.655	-23.010	-26.880	-24.165	-26.125
10.2	20(Ref)	-7.281	-15.496	-14.921	-14.270	-14.811
13.8	20(Ref)	-7.913	-18.483	-17.146	-14.641	-15.131

Note :
Based on the results of the frequency stability test shown above the frequency deviation results measured are very small. As such it is determined that the channels at the band edge would remain in-band when the maximum measured frequency deviation noted during the frequency stability tests is applied. Therefore the device is determined to remain operating in band over the temperature range as tested.

4.5 Unwanted Emissions

Test Location

☒ 10 m SAC (test distance : ☐ 10 m, ☒ 3 m)
☒ 3 m SAC (test distance : 3 m)

Test Procedures

KDB 789033 - Section G
ANSI C63.10-2013 – Section 12.7

1) In the frequency range of 9 kHz to 30 MHz, magnetic field is measured with Loop Antenna. The Test Antenna is positioned with its plane vertical at 1m distance from the EUT. The center of the Loop Test Antenna is 1m above the ground. During the measurement the Loop Test Antenna rotates about its vertical axis for maximum response at each azimuth about the EUT.
2) In the frequency range above 30 MHz, Bi-Log Test Antenna(30 MHz to 1 GHz) and Horn Test Antenna(above 1 GHz) are used. Test Antenna is 3m away from the EUT. Test Antenna height is carried from 1m to 4m above the ground to determine the maximum value of the field strength. The emissions levels at both horizontal and vertical polarizations should be tested.

Test Settings:

Frequency Range = 9 kHz ~ 1 GHz

a) RBW = 100 kHz for f < 1 GHz, 9 kHz for f < 30 MHz

b) VBW ≥ RBW

c) Detector = CISPR Quasi-peak

d) Sweep time = auto couple

- Peak

Frequency Range = 1 GHz ~ 40 GHz

a) RBW = 1 MHz

b) VBW ≥ 3 x RBW

c) Detector = Peak

d) Sweep time = auto

e) Trace mode = max hold

- Average (duty cycle ≥ 98%)

Frequency Range = 1 GHz ~ 40 GHz

a) RBW = 1 MHz

b) VBW ≥ 3 x RBW

c) Detector = RMS

d) Sweep time = auto

e) Averaging type = power (i.e., RMS)

f) Trace mode = average (at least 100 traces)

- Average (duty cycle < 98%)

Frequency Range = 1 GHz ~ 40 GHz

a) RBW = 1 MHz

b) VBW ≥ 3 x RBW

c) Detector = RMS

d) Sweep time = auto

e) Averaging type = power (i.e., RMS)

f) Trace mode = average (at least 100 traces)

If power averaging (RMS) mode, then the applicable correction factor is 10 log(1/x), where x is the duty cycle.

Test mode	Duty Cycle Factor (dB)
802.11a	0.25
802.11n_HT20	0.27

Limit

1. UNII 1, 2A : All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.

2. UNII 2C : All emissions outside of the 5.47-5.725 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.

3. Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in § 15.209.

- 15.209(a)

Frequency(MHz)	Field Strength uV/m@3m	Field Strength dBuV/m@3m	Deasurement 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**	40	3
88-216	150**	43.5	3
216-960	200**	46	3
Above 960	500	54	3

** Except as provided in 15.209(g).fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72MHz, 76-88MHz, 174-216MHz, 470-806MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g.15.231 and 15.241.

5. FCC Part 15 § 15.205 (a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	MHz	MHz	GHz
0.09-0.11	8.37626-8.38675	73-74.6	399.9-410	2690-2900	10.6-12.7
[1]0.495-0.505	8.41425-8.41475	74.8-75.2	608-614	3260-3267	13.25-13.4
2.1735-2.1905	12.29-12.293	108-121.94	960-1240	3332-3339	14.47-14.5
4.125-4.128	12.51975-12.52025	123-138	1300-1427	3345.8-3358	15.35-16.2
4.17725-4.17775	12.57675-12.57725	149.9-150.05	1435-1626.5	3600-4400	17.7-21.4
4.20725-4.20775	13.36-13.41	156.52475-156.52525	1645.5-1646.5	4500-5150	22.01-23.12
6.215-6.218	16.42-16.423	156.7-156.9	1660-1710	5350-5460	23.6-24
6.26775-6.26825	16.69475-16.69525	162.0125-167.17	1718.8-1722.2	7250-7750	31.2-31.8
6.31175-6.31225	16.80425-16.80475	167.72-173.2	2200-2300	8025-8500	36.43-36.5
8.291-8.294	25.5-25.67	240-285	2310-2390	9000-9200	[2]Above 38.6
8.362-8.366	37.5-38.25	322-335.4	2483.5-2500	9300-9500	

[1] Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

[2] Above 38.6

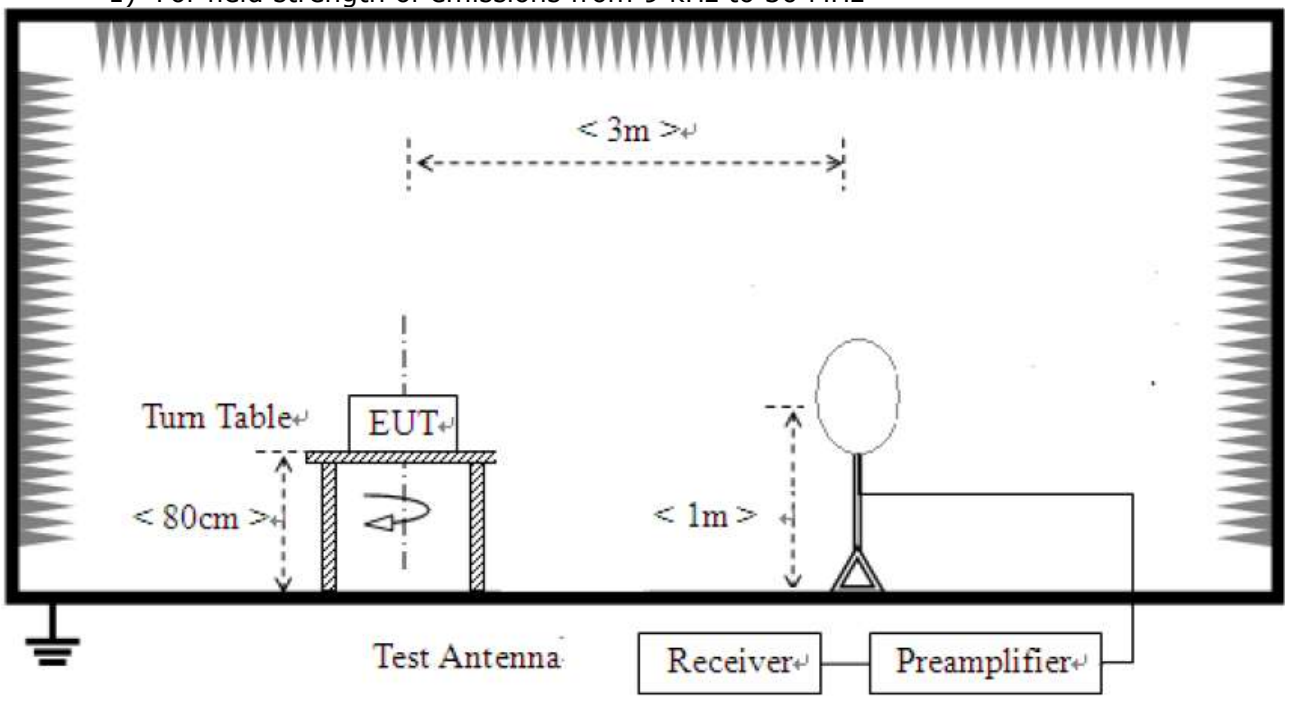
§ 15.205 (b) Except as provided in paragraphs (d) and (e), the field strength of emissions appearing within these frequency bands shall not exceed the limits shown is Section 15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

Note :

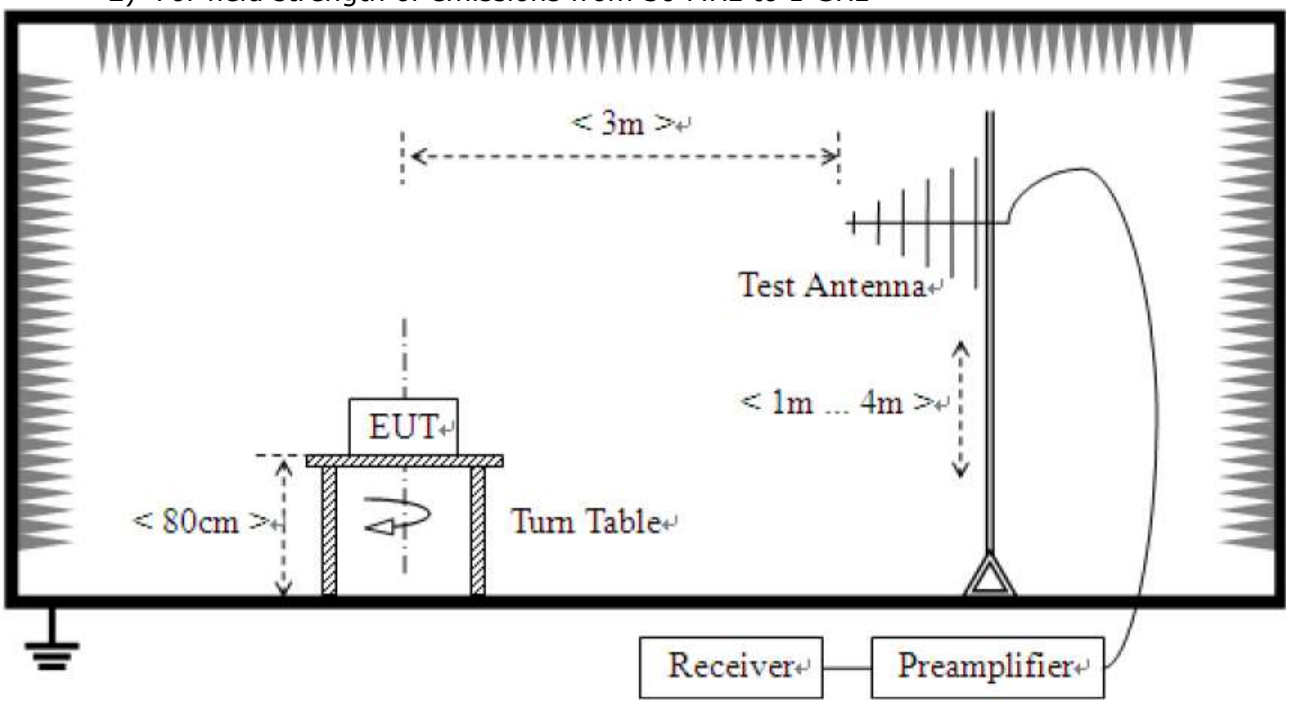
1) For above 1 GHz, the emission limit in this paragraph is based on measurement instrumentation employing an average detector, measurement using instrumentation with a peak detector function, corresponding to 20 dB above the maximum permitted average limit.
2) For above 1 GHz, limit field strength of harmonics : 54 dBuV/m@3m (AV) and 74 dBuV/m@3m (PK)

Test Setup:

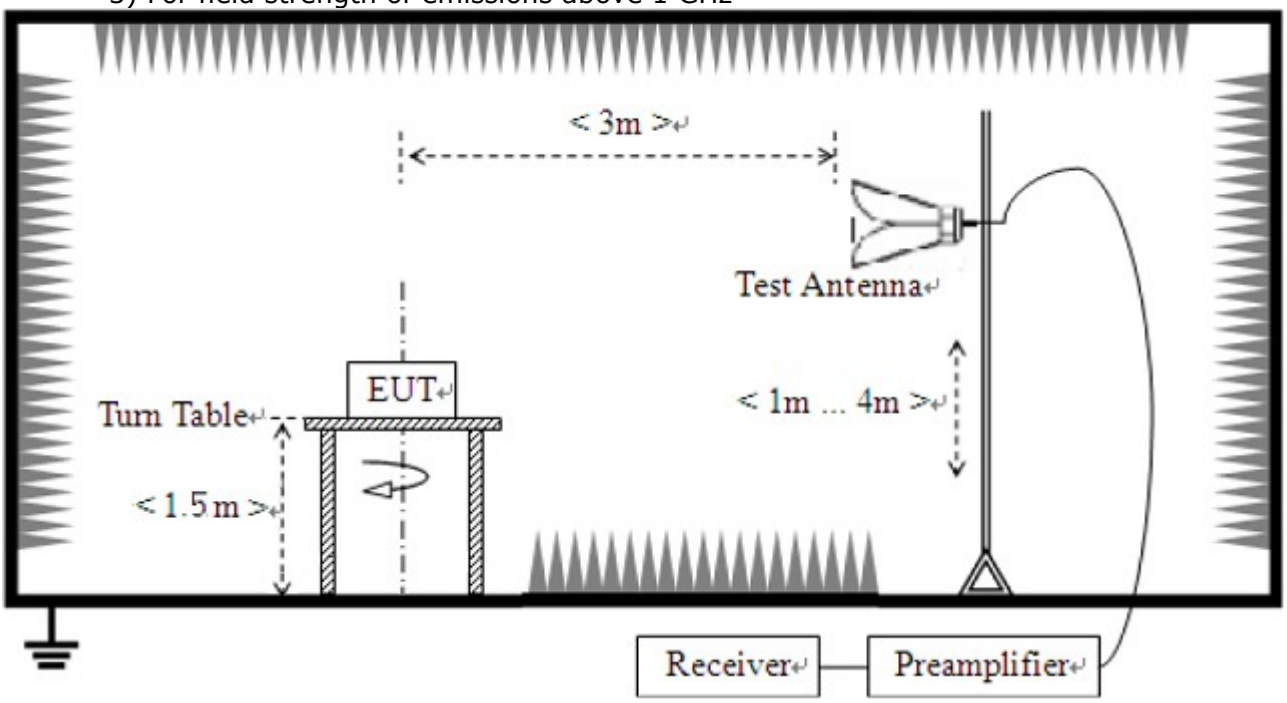
1) For field strength of emissions from 9 kHz to 30 MHz



2) For field strength of emissions from 30 MHz to 1 GHz



3) For field strength of emissions above 1 GHz



Test Mode

We have done all test mode.
The worst case antenna configuration and Test mode are determined to be as follows.

So the results are only attached worst cases.

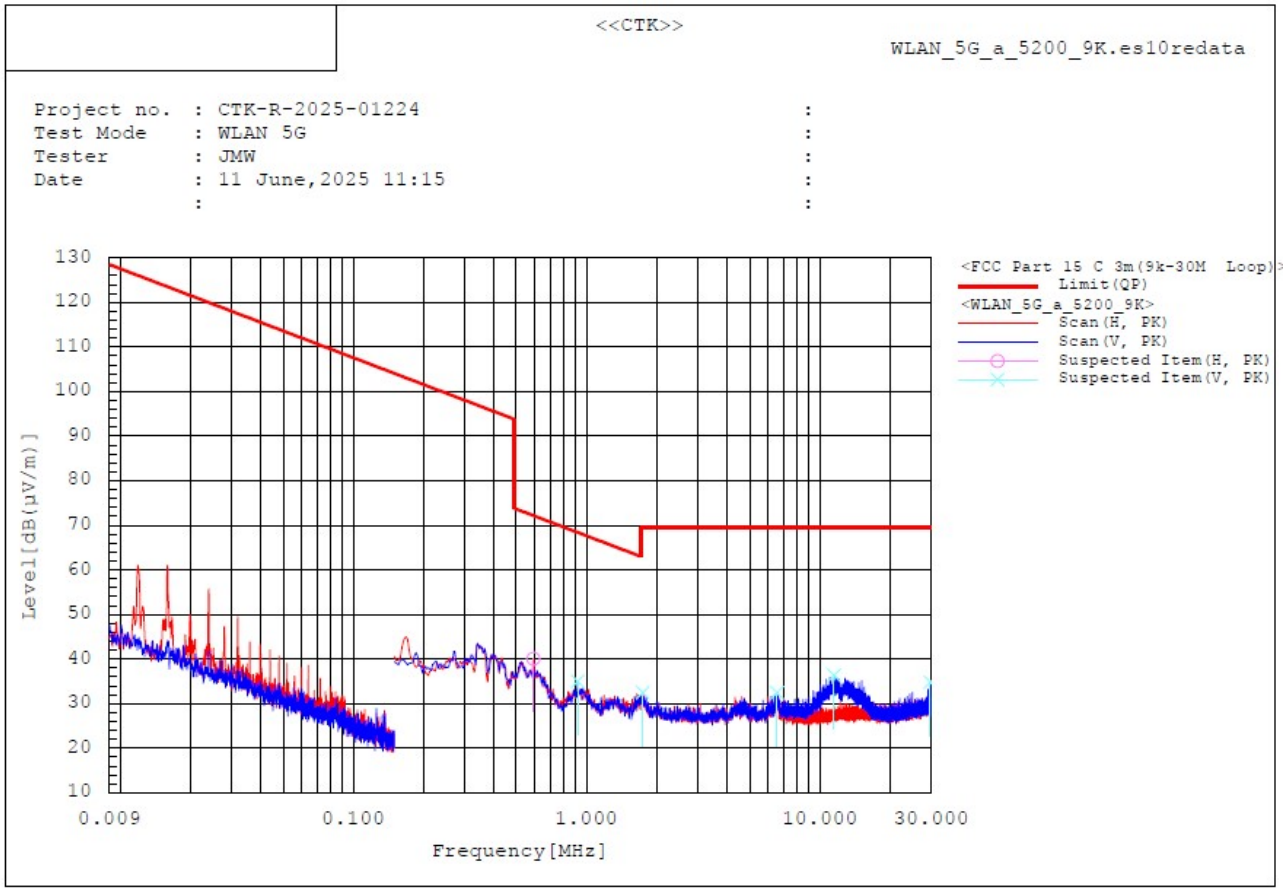
Test Results

1) 9 kHz to 30 MHz

Test mode : Transmitter (Worst Case)_802.11a

The requirements are:
☒ Complies

Test Data



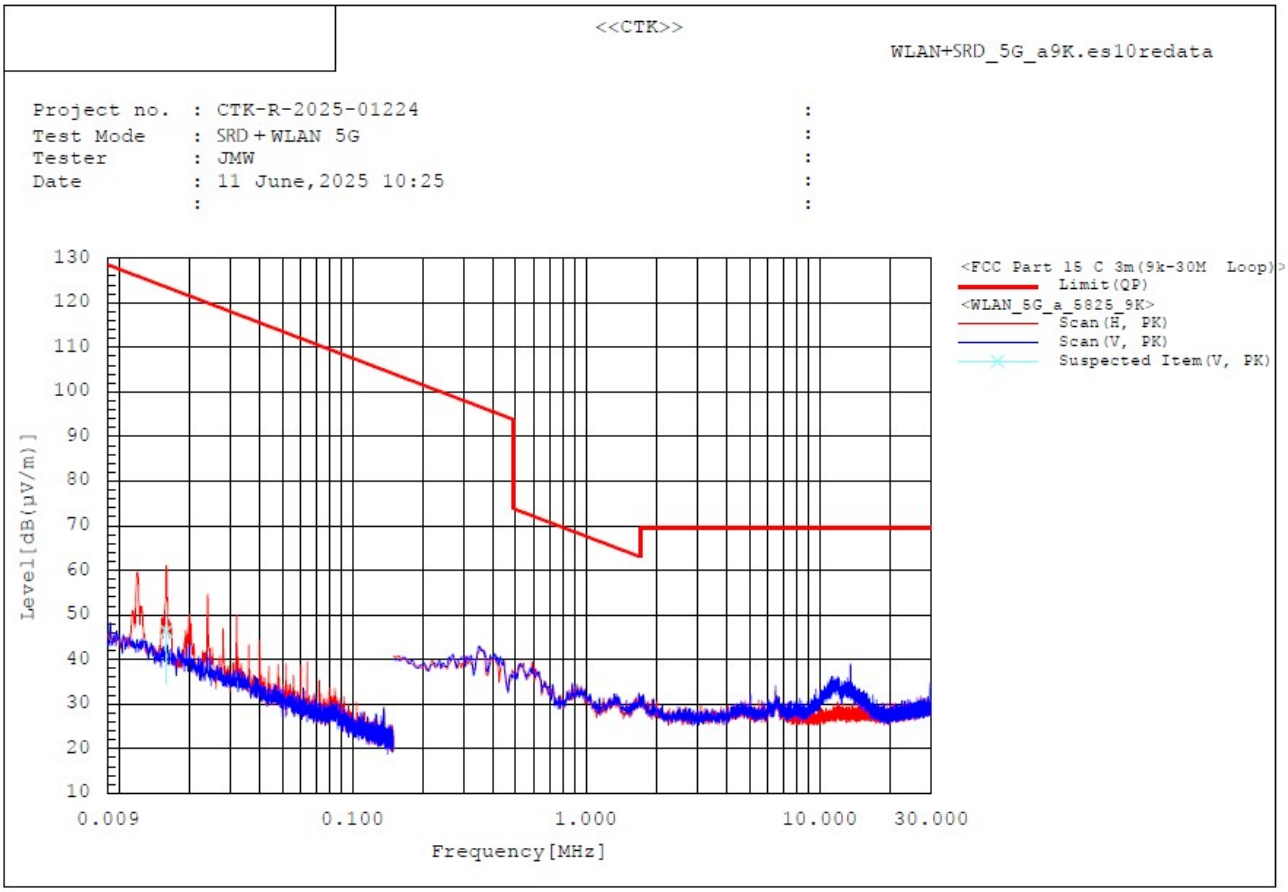
Frequency [MHz]	(P)	Reading [dBuV]	c.f [dB(1/m)]	Level [dB(uV/m)]	Limit [dB(uV/m)]	Margin [dB]
The emissions 9 kHz to 30 MHz were 20 dB lower than the limit.						

Remark :
1. The unwanted emission was measured in the following position: EUT stand-up position(Z axis), lie-down positon(X,Y axis). The worst emission was found in lie-down positon(Y axis) and the worst case was recorded.
2. Result = Reading + c.f(Correction factor)
3. Correction factor = Antenna factor + Cable loss + 6 dB attenuator
4. This data is the Peak(PK) value.

Test mode : Transmitter (simultaneous transmissions DSS+ NII)

The requirements are:
☒ Complies

Test Data



Frequency [MHz]	(P)	Reading [dBuV]	c.f [dB(1/m)]	Level [dB(uV/m)]	Limit [dB(uV/m)]	Margin [dB]
The emissions 9 kHz to 30 MHz were 20 dB lower than the limit.						

Remark :
1. The unwanted emission was measured in the following position: EUT stand-up position(Z axis), lie-down positon(X,Y axis). The worst emission was found in lie-down positon(Y axis) and the worst case was recorded.
2. Result = Reading + c.f(Correction factor)
3. Correction factor = Antenna factor + Cable loss + 6 dB attenuator
4. This data is the Peak(PK) value.