4.5 Frequency Stability

Test Procedures

The EUT was placed inside of an environmental chamber as the temperature in the chamber was varied between 0 ℃ and +40 ℃(Declaration by the Manufacturer). The temperature was incremented by 10 ℃(5 ℃) 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.

Temperature (℃)	0	10	20	30	40
Frequency	Measured Frequency Error (kHz)				
5 180 MHz	16.170	6.589	-5.340	-14.326	-19.381
5 200 MHz	16.173	5.589	-5.754	-14.549	-19.589
5 240 MHz	16.276	5.417	-6.054	-14.761	-19.814
5 745 MHz	18.094	6.278	-6.600	-16.138	-21.734
5 785 MHz	18.235	6.266	-6.667	-16.141	-21.853
5 825 MHz	18.686	6.279	-6.676	-16.245	-21.975

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.

4.6 Unwanted Emissions

Test Location

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

Test Procedures

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 rage 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)
CDD Mode	802.11a	0.12
	802.11n_HT20	0.15
	802.11n_HT40	0.28
	802.11ac_VHT20	0.17
	802.11ac_VHT40	0.33
	802.11ac_VHT80	0.50
SDM Mode	802.11n_HT20	0.29
	802.11n_HT40	0.65
	802.11ac_VHT20	0.41
	802.11ac_VHT40	0.60
	802.11ac_VHT80	1.02

Limit

- **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.

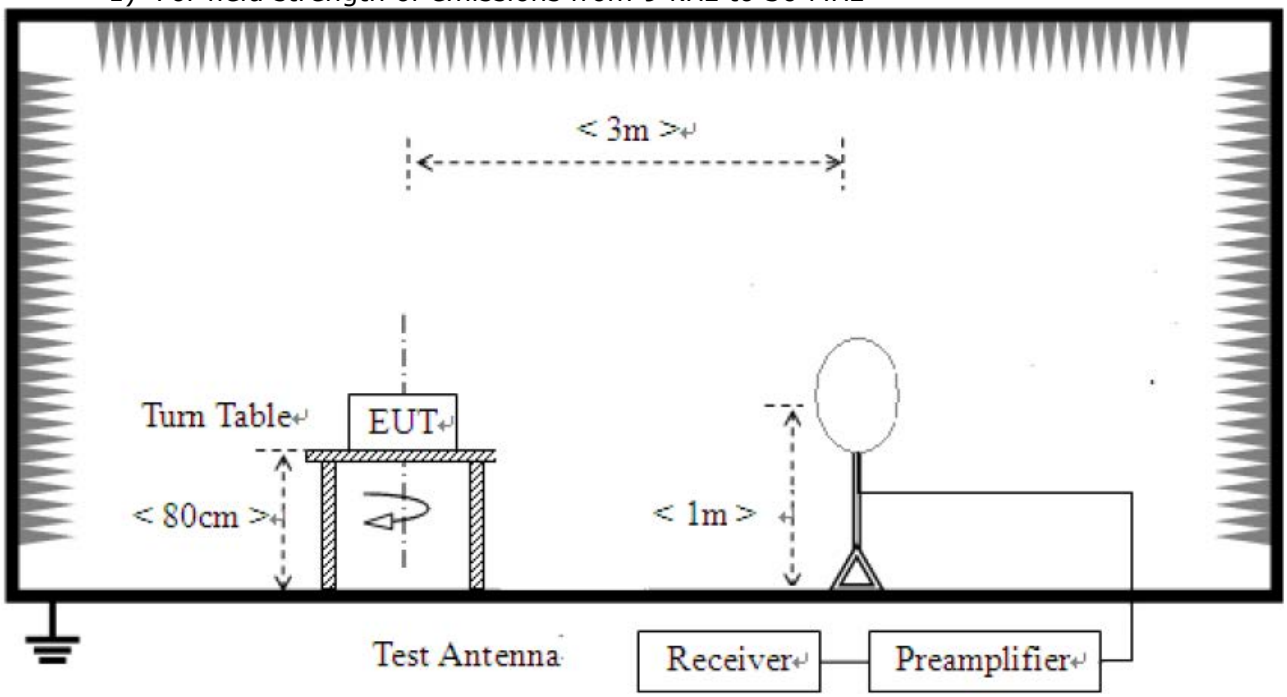
- **15.407, KDB 789033**

E.I.R.P -27 dBm/MHz

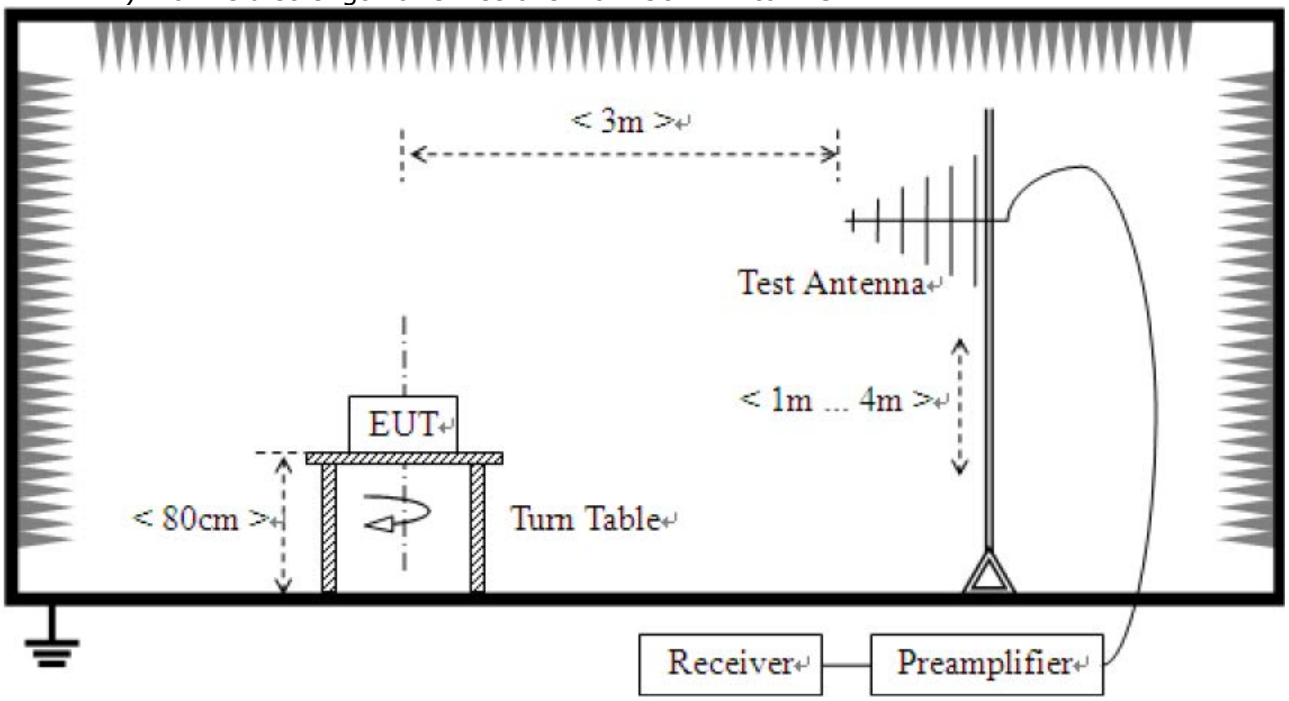
E[dBuV/m] = EIRP[dBm] + 95.2, for d = 3m

Test Setup:

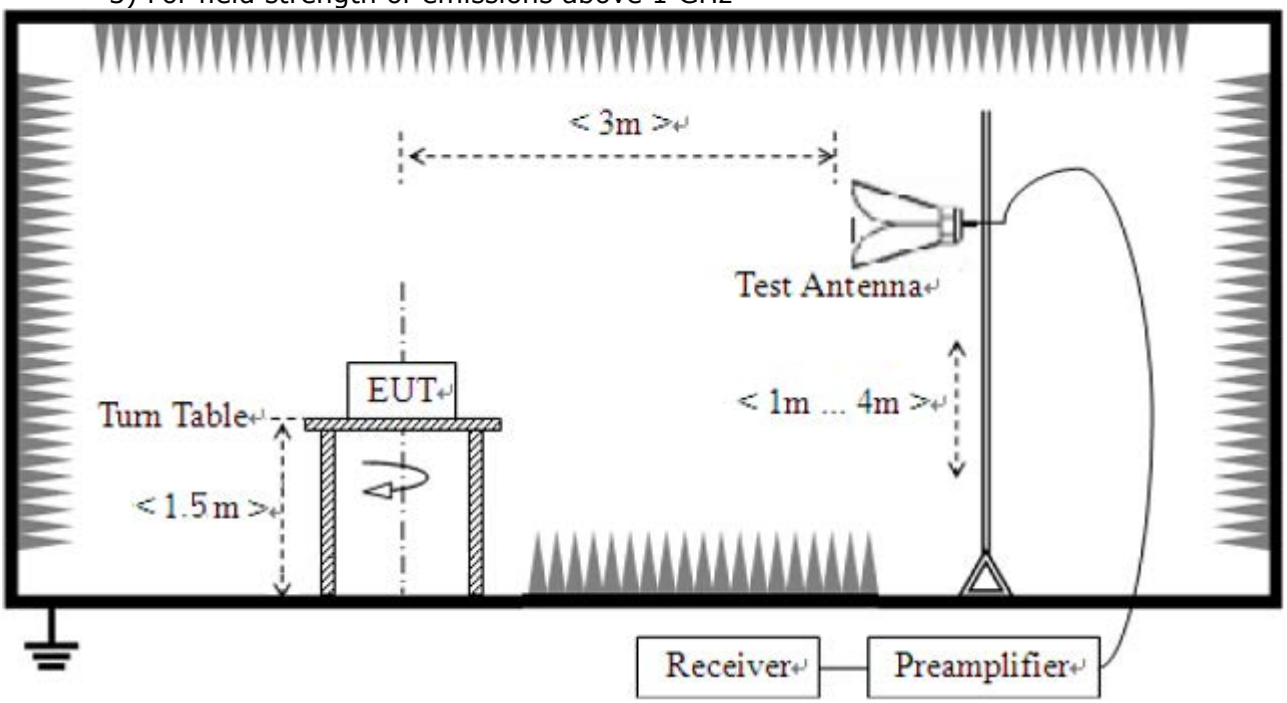
1) For field strength of emissions from 9 kHz to 30 MHz



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.

802.11a mode : ANT1 + ANT2 + ANT3 (MIMO)
802.11n SDM mode : ANT1 + ANT2 + ANT3 (MIMO)
802.11ac SDM mode : ANT1 + ANT2 + ANT3 (MIMO)

So the results are only attached worst cases.

CTK Co., Ltd.
(Ho-dong), 113, Yejik-ro, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea
Tel: +82-31-339-9970
Fax: +82-31-624-9501

Test Results

1) 9 kHz to 30 MHz

Test mode : 802.11a, 802.11n, 802.11ac (Worst case)

The requirements are:
☒ Complies

Frequency (MHz)	Measured Data (dBuV/m)	Margin (dB)	Remark
-	-	-	See note

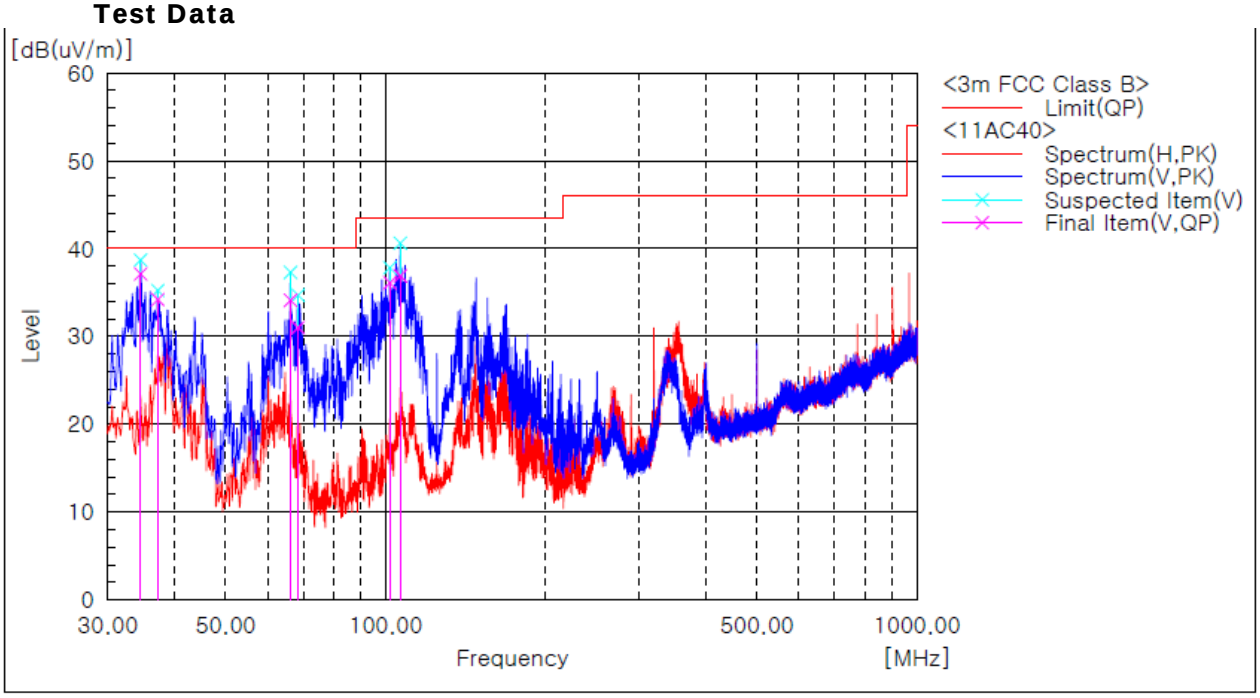
Note :
The amplitude of spurious emissions that are attenuated by more than 20 dB below the permissible value has no need to be reported.
Distance extrapolation factor = 40 log (specific distance / test distance) (dB)

2) 30 MHz to 1 GHz

Test mode : 802.11ac_VHT40(Worst Case)

The requirements are:
☒ Complies

Test Data



Final Result

No.	Frequency [MHz]	(P)	Reading QP [dB(uV)]	c.f [dB(1/m)]	Result QP [dB(uV/m)]	Limit QP [dB(uV/m)]	Margin QP [dB]	Height [cm]	Angle [deg]
1	34.608	V	45.7	-8.6	37.1	40.0	2.9	101.0	188.0
2	37.275	V	44.2	-10.0	34.2	40.0	5.8	101.0	162.0
3	66.254	V	51.9	-17.8	34.1	40.0	5.9	101.0	56.0
4	68.436	V	48.6	-17.6	31.0	40.0	9.0	101.0	56.0
5	101.901	V	49.4	-13.3	36.1	43.5	7.4	101.0	320.0
6	106.630	V	49.5	-12.6	36.9	43.5	6.6	101.0	320.0

Remark :
1. The Unwanted emission was measured in the following position: EUT stand-up position(Z axis), lie-down position(X,Y axis). The worst emission was found in stand=up position(Z axis) and the worst case was recorded.
2. Result = Reading + c.f(Correction factor)
3. Correction factor = Antenna factor + Cable loss + 6 dB attenuator - Amp Gain
4. We have done all test mode. The results are only attached worst cases.

3) above 1 GHz

Test mode : 802.11a

The requirements are:
☒ Complies

Test Data

Ch.36(5 180 MHz)

Frequency [MHz]	(P)	Limit AV [dBuV/m]	Limit PK [dBuV/m]	Result AV [dBuV/m]	Result PK [dBuV/m]	Margin AV [dB]	Margin PK [dB]
10 362.01	H	54.00	74.00	47.62	58.10	6.38	15.90
10 360.50	V	54.00	74.00	42.22	56.30	11.78	17.70
15 536.76	H	54.00	74.00	43.82	57.90	10.18	16.10
15 543.43	V	54.00	74.00	41.12	53.10	12.88	20.90
5 149.43	H	54.00	74.00	50.32	64.90	3.68	9.10
5 143.29	V	54.00	74.00	44.42	58.50	9.58	15.50

Ch.40(5 200 MHz)

Frequency [MHz]	(P)	Limit AV [dBuV/m]	Limit PK [dBuV/m]	Result AV [dBuV/m]	Result PK [dBuV/m]	Margin AV [dB]	Margin PK [dB]
10 402.57	H	54.00	74.00	45.12	57.10	8.88	16.90
10 402.57	V	54.00	74.00	42.02	53.90	11.98	20.10
15 605.66	H	54.00	74.00	43.02	58.10	10.98	15.90
15 598.03	V	54.00	74.00	41.12	52.50	12.88	21.50

Ch.48(5 240 MHz)

Frequency [MHz]	(P)	Limit AV [dBuV/m]	Limit PK [dBuV/m]	Result AV [dBuV/m]	Result PK [dBuV/m]	Margin AV [dB]	Margin PK [dB]
10 480.88	H	54.00	74.00	44.62	56.10	9.38	17.90
10 478.86	V	54.00	74.00	41.82	54.40	12.18	19.60
15 724.09	H	54.00	74.00	42.52	54.70	11.48	19.30

Ch.149(5 745 MHz)

Frequency [MHz]	(P)	Limit AV [dBuV/m]	Limit PK [dBuV/m]	Result AV [dBuV/m]	Result PK [dBuV/m]	Margin AV [dB]	Margin PK [dB]
9 687.89	H	54.00	74.00	41.62	50.80	12.38	23.20
9 687.89	V	54.00	74.00	38.32	48.10	15.68	25.90
11 489.93	H	54.00	74.00	43.92	55.40	10.08	18.60
11 484.88	V	54.00	74.00	44.72	57.80	9.28	16.20
5 633.90	H	-	68.20	-	59.30	-	8.90
5 631.14	V	-	68.20	-	58.60	-	9.60

Ch.157(5 785 MHz)

Frequency [MHz]	(P)	Limit AV [dBuV/m]	Limit PK [dBuV/m]	Result AV [dBuV/m]	Result PK [dBuV/m]	Margin AV [dB]	Margin PK [dB]
9 687.89	H	54.00	74.00	41.52	51.00	12.48	23.00
9 687.89	V	54.00	74.00	38.12	47.80	15.88	26.20
11 569.72	H	54.00	74.00	43.62	55.10	10.38	18.90
11 575.79	V	54.00	74.00	44.42	57.60	9.58	16.40

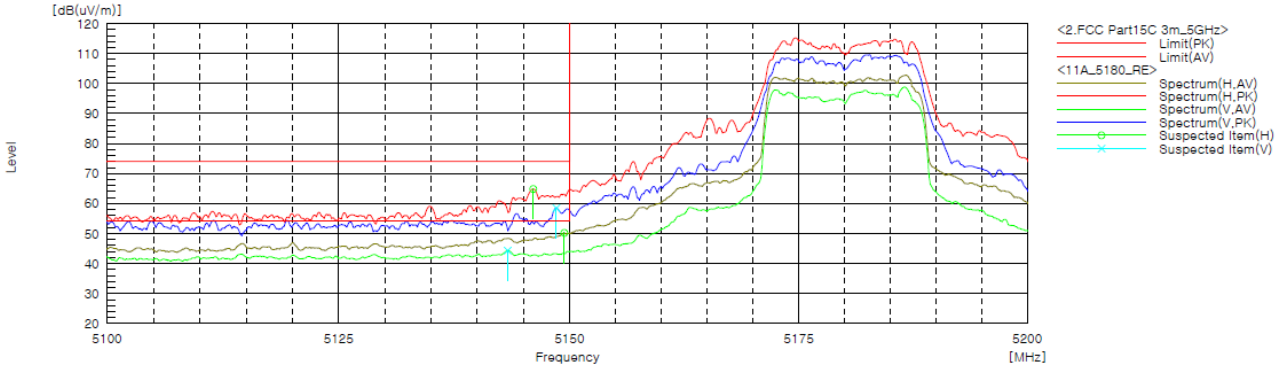
Ch.165(5 825 MHz)

Frequency [MHz]	(P)	Limit AV [dBuV/m]	Limit PK [dBuV/m]	Result AV [dBuV/m]	Result PK [dBuV/m]	Margin AV [dB]	Margin PK [dB]
9 687.89	H	54.00	74.00	41.52	49.70	12.48	24.30
9 687.89	V	54.00	74.00	38.32	48.50	15.68	25.50
11 650.53	H	54.00	74.00	44.22	55.20	9.78	18.80
11 646.49	V	54.00	74.00	44.62	56.90	9.38	17.10
5 934.05	H	-	68.20	-	61.10	-	7.10
5 945.71	V	-	68.20	-	59.70	-	8.50

Remarks

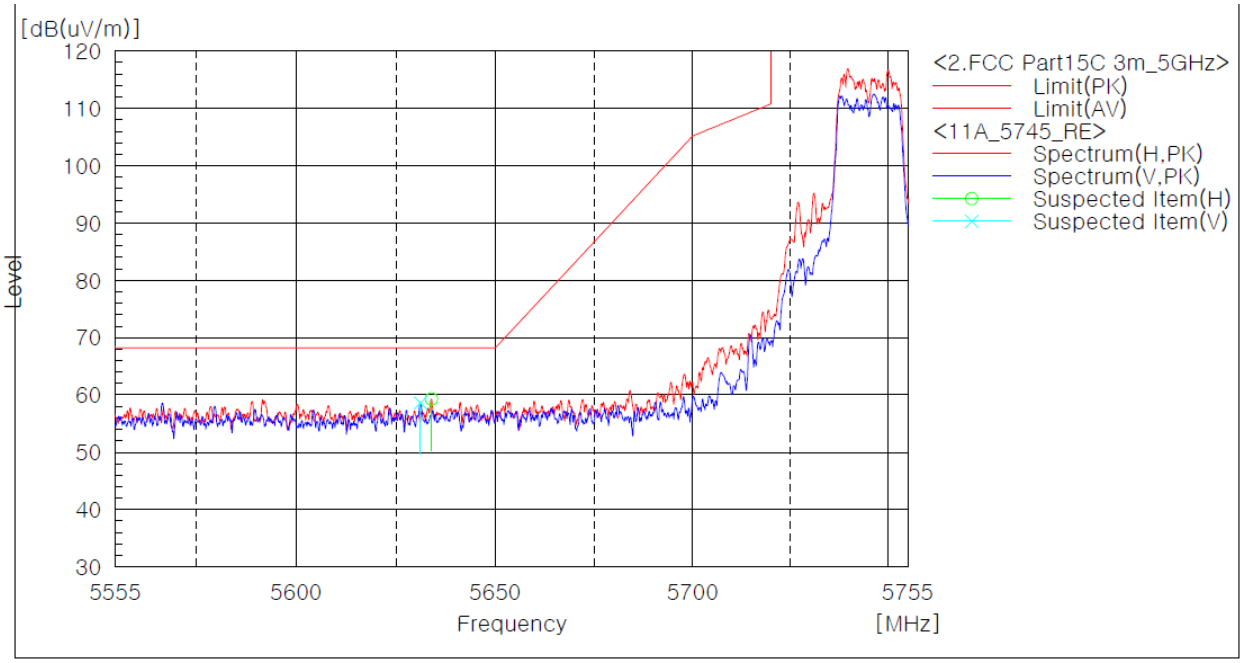
1. The Unwanted emission was measured in the following position: EUT stand-up position(Z axis), lie-down position(X,Y axis). The worst emission was found in stand=up position(Z axis) and the worst case was recorded.
2. Peak Result = Reading + c.f(Correction factor)
   Average Result = Reading + c.f(Correction factor) + Duty cycle factor
3. Correction factor = Antenna factor + Cable loss - Amp Gain

Worst Case Mode :	802.11a
Worst Case Transfer Rate :	6 Mbps
Distance of Measurements :	3 Meters
Operating Frequency :	5 180 MHz
Channel :	36



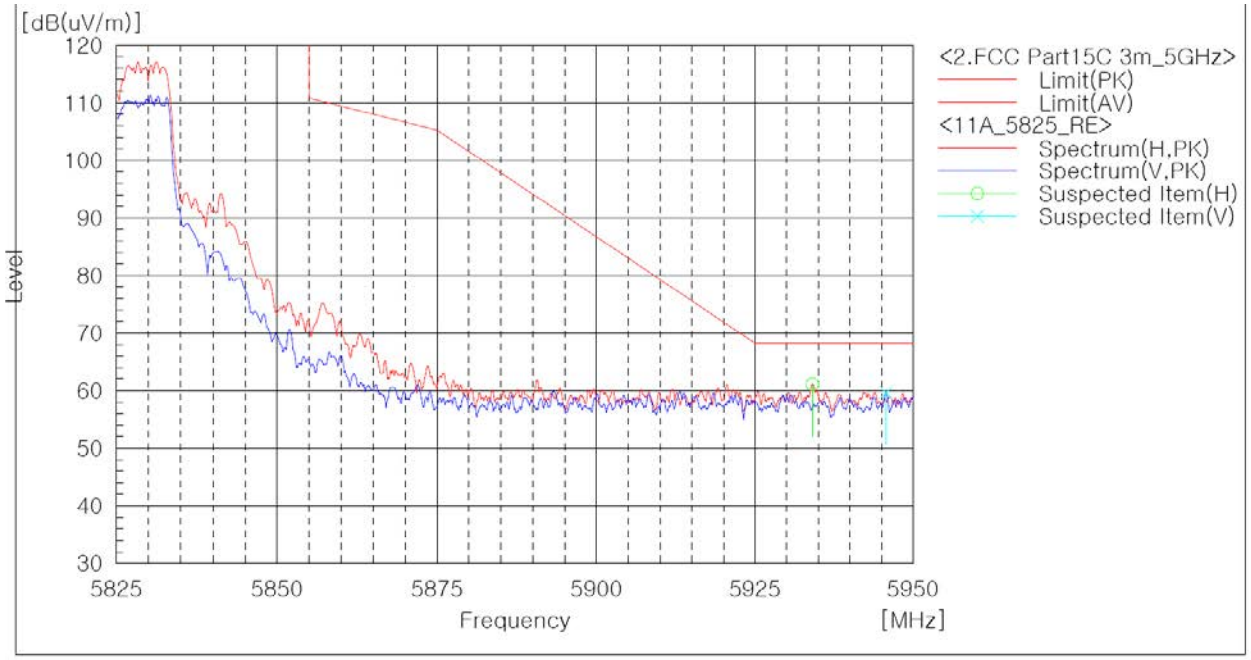
Radiated Restricted Lower Band Edge Plot

Worst Case Mode :	802.11a
Worst Case Transfer Rate :	6 Mbps
Distance of Measurements :	3 Meters
Operating Frequency :	5 745 MHz
Channel :	149



Radiated Restricted Lower Band Edge Plot

Worst Case Mode :	802.11a
Worst Case Transfer Rate :	6 Mbps
Distance of Measurements :	3 Meters
Operating Frequency :	5 825 MHz
Channel :	165



Radiated Restricted Upper Band Edge Plot

Test mode : 802.11n_HT20_SDM Mode

The requirements are:
☒ Complies

Test Data

Ch.36(5 180 MHz)

Frequency [MHz]	(P)	Limit AV [dBuV/m]	Limit PK [dBuV/m]	Result AV [dBuV/m]	Result PK [dBuV/m]	Margin AV [dB]	Margin PK [dB]
10 359.61	H	54.00	74.00	47.99	61.70	6.01	12.30
10 359.61	V	54.00	74.00	43.79	57.80	10.21	16.20
15 544.52	H	54.00	74.00	46.29	61.70	7.71	12.30
15 541.49	V	54.00	74.00	43.29	55.00	10.71	19.00
5 149.99	H	54.00	74.00	51.89	65.10	2.11	8.90
5 149.43	V	54.00	74.00	47.89	62.40	6.11	11.60

Ch.40(5 200 MHz)

Frequency [MHz]	(P)	Limit AV [dBuV/m]	Limit PK [dBuV/m]	Result AV [dBuV/m]	Result PK [dBuV/m]	Margin AV [dB]	Margin PK [dB]
10 399.00	H	54.00	74.00	45.99	59.30	8.01	14.70
10 402.04	V	54.00	74.00	43.09	55.70	10.91	18.30
15 601.08	H	54.00	74.00	45.19	58.90	8.81	15.10
15 754.62	V	54.00	74.00	42.29	53.60	11.71	20.40

Ch.48(5 240 MHz)

Frequency [MHz]	(P)	Limit AV [dBuV/m]	Limit PK [dBuV/m]	Result AV [dBuV/m]	Result PK [dBuV/m]	Margin AV [dB]	Margin PK [dB]
10 481.83	H	54.00	74.00	47.09	59.40	6.91	14.60
10 478.80	V	54.00	74.00	43.59	56.60	10.41	17.40
15 722.30	H	54.00	74.00	43.69	55.70	10.31	18.30

Ch.149(5 745 MHz)

Frequency [MHz]	(P)	Limit AV [dBuV/m]	Limit PK [dBuV/m]	Result AV [dBuV/m]	Result PK [dBuV/m]	Margin AV [dB]	Margin PK [dB]
11 489.93	H	54.00	74.00	48.09	61.10	5.91	12.90
11 490.94	V	54.00	74.00	49.99	61.30	4.01	12.70
5 573.16	H	-	68.20	-	58.90	-	9.30
5 640.93	V	-	68.20	-	58.50	-	9.70

Ch.157(5 785 MHz)

Frequency [MHz]	(P)	Limit AV [dBuV/m]	Limit PK [dBuV/m]	Result AV [dBuV/m]	Result PK [dBuV/m]	Margin AV [dB]	Margin PK [dB]
11 569.72	H	54.00	74.00	47.79	60.90	6.21	13.10
11 571.75	V	54.00	74.00	50.09	60.40	3.91	13.60

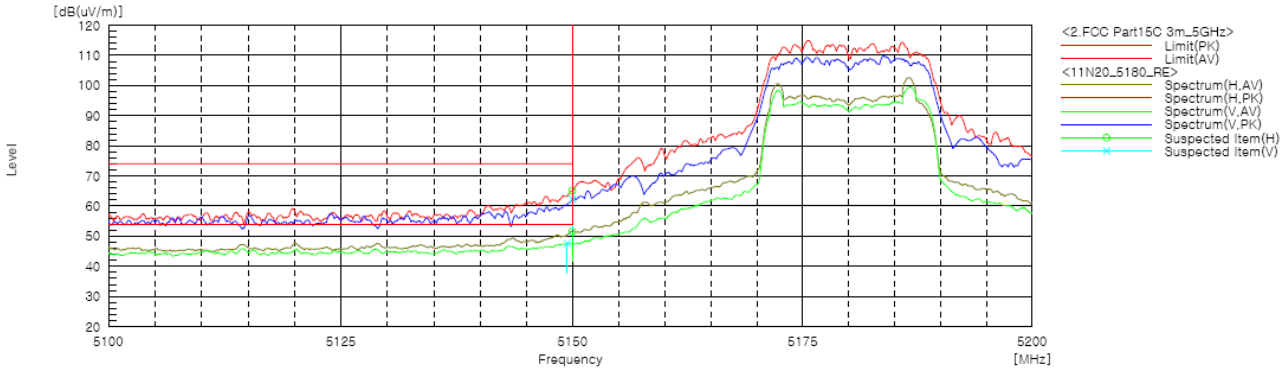
Ch.165(5 825 MHz)

Frequency [MHz]	(P)	Limit AV [dBuV/m]	Limit PK [dBuV/m]	Result AV [dBuV/m]	Result PK [dBuV/m]	Margin AV [dB]	Margin PK [dB]
11 649.52	H	54.00	74.00	49.19	64.10	4.81	9.90
11 650.53	V	54.00	74.00	50.59	62.20	3.41	11.80
5 930.53	H	-	68.20	-	60.80	-	7.40
5 933.97	V	-	68.20	-	60.40	-	7.80

Remarks

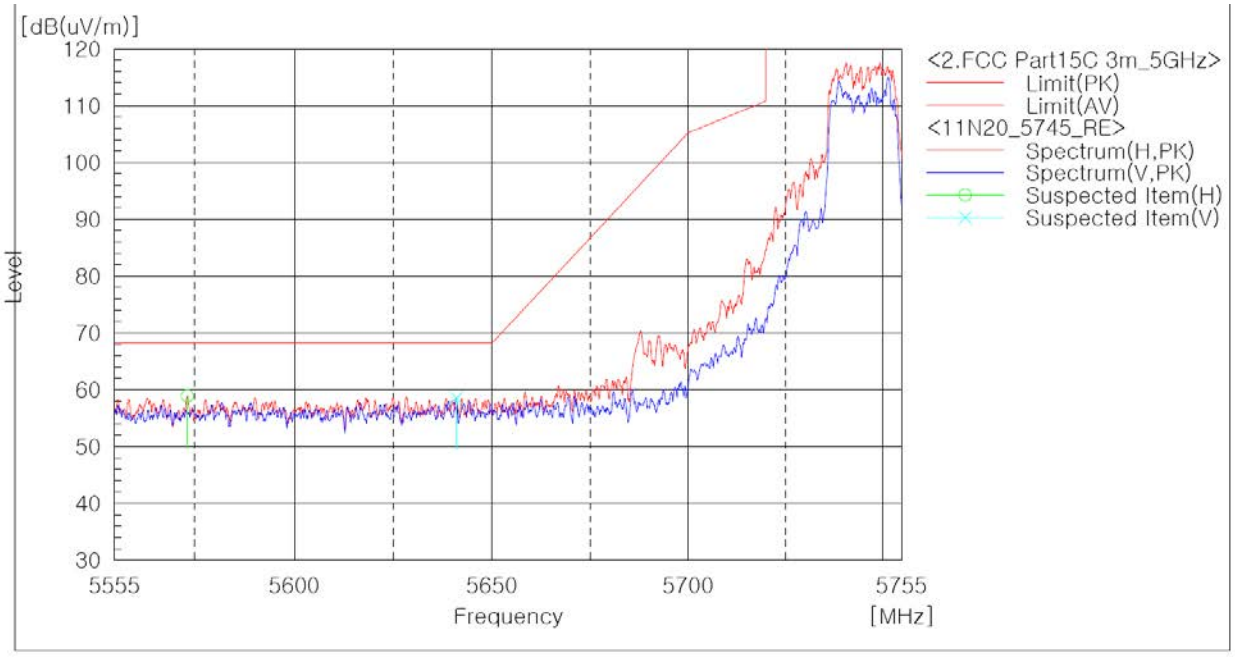
1. The Unwanted emission was measured in the following position: EUT stand-up position(Z axis), lie-down position(X,Y axis). The worst emission was found in stand=up position(Z axis) and the worst case was recorded.
2. Peak Result = Reading + c.f(Correction factor)
   Average Result = Reading + c.f(Correction factor) + Duty cycle factor
3. Correction factor = Antenna factor + Cable loss - Amp Gain

Worst Case Mode :	802.11n_HT20_SDM Mode
Worst Case Transfer Rate :	MCS 16
Distance of Measurements :	3 Meters
Operating Frequency :	5 180 MHz
Channel :	36



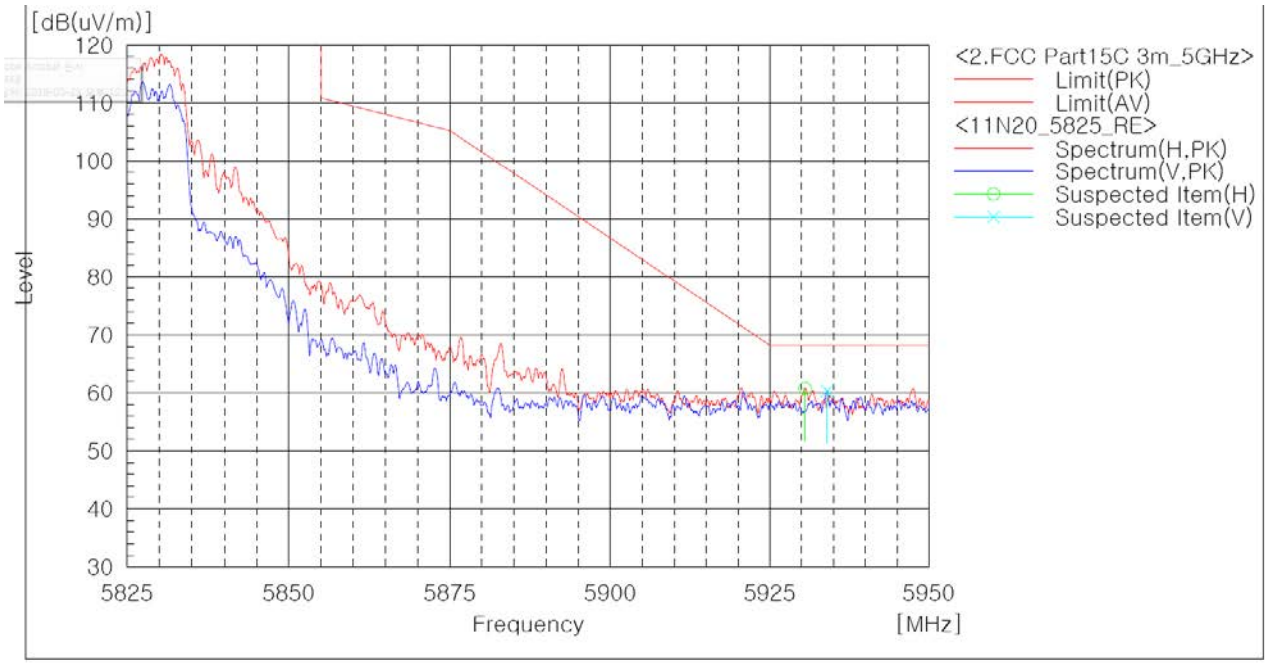
Radiated Restricted Lower Band Edge Plot

Worst Case Mode :	802.11n_HT20_SDM Mode
Worst Case Transfer Rate :	MCS 16
Distance of Measurements :	3 Meters
Operating Frequency :	5 745 MHz
Channel :	149



Radiated Restricted Lower Band Edge Plot

Worst Case Mode :	802.11n_HT20_SDM Mode
Worst Case Transfer Rate :	MCS 16
Distance of Measurements :	3 Meters
Operating Frequency :	5 825 MHz
Channel :	165



Radiated Restricted Upper Band Edge Plot

Test mode : 802.11ac_VHT20_SDM Mode

The requirements are:
☒ Complies

Test Data

Ch.36(5 180 MHz)

Frequency [MHz]	(P)	Limit AV [dBuV/m]	Limit PK [dBuV/m]	Result AV [dBuV/m]	Result PK [dBuV/m]	Margin AV [dB]	Margin PK [dB]
10 360.62	H	54.00	74.00	47.41	59.70	6.59	14.30
10 361.63	V	54.00	74.00	43.81	57.00	10.19	17.00
15 537.45	H	54.00	74.00	45.61	59.80	8.39	14.20
15 541.49	V	54.00	74.00	42.71	56.00	11.29	18.00
5 149.79	H	54.00	74.00	52.41	66.60	1.59	7.40
5 143.38	V	54.00	74.00	47.01	60.80	6.99	13.20

Ch.40(5 200 MHz)

Frequency [MHz]	(P)	Limit AV [dBuV/m]	Limit PK [dBuV/m]	Result AV [dBuV/m]	Result PK [dBuV/m]	Margin AV [dB]	Margin PK [dB]
10 402.04	H	54.00	74.00	46.61	60.70	7.39	13.30
10 399.00	V	54.00	74.00	43.71	56.50	10.29	17.50
15 600.07	H	54.00	74.00	44.71	59.30	9.29	14.70
15 598.05	V	54.00	74.00	42.31	54.80	11.69	19.20

Ch.48(5 240 MHz)

Frequency [MHz]	(P)	Limit AV [dBuV/m]	Limit PK [dBuV/m]	Result AV [dBuV/m]	Result PK [dBuV/m]	Margin AV [dB]	Margin PK [dB]
10 481.83	H	54.00	74.00	48.31	58.90	5.69	15.10
10 478.80	V	54.00	74.00	44.91	55.90	9.09	18.10
15 719.27	H	54.00	74.00	43.61	55.70	10.39	18.30
15 723.31	V	54.00	74.00	42.21	53.60	11.79	20.40

Ch.149(5 745 MHz)

Frequency [MHz]	(P)	Limit AV [dBuV/m]	Limit PK [dBuV/m]	Result AV [dBuV/m]	Result PK [dBuV/m]	Margin AV [dB]	Margin PK [dB]
11 490.94	H	54.00	74.00	47.91	60.40	6.09	13.60
11 492.96	V	54.00	74.00	48.91	60.40	5.09	13.60
5 320.90	H	54.00	74.00	-	58.50	-	9.70
5 603.42	V	54.00	74.00	-	58.20	-	10.00

Ch.157(5 785 MHz)

Frequency [MHz]	(P)	Limit AV [dBuV/m]	Limit PK [dBuV/m]	Result AV [dBuV/m]	Result PK [dBuV/m]	Margin AV [dB]	Margin PK [dB]
11 568.71	H	54.00	74.00	48.91	60.90	5.09	13.10
11 571.75	V	54.00	74.00	51.21	63.50	2.79	10.50

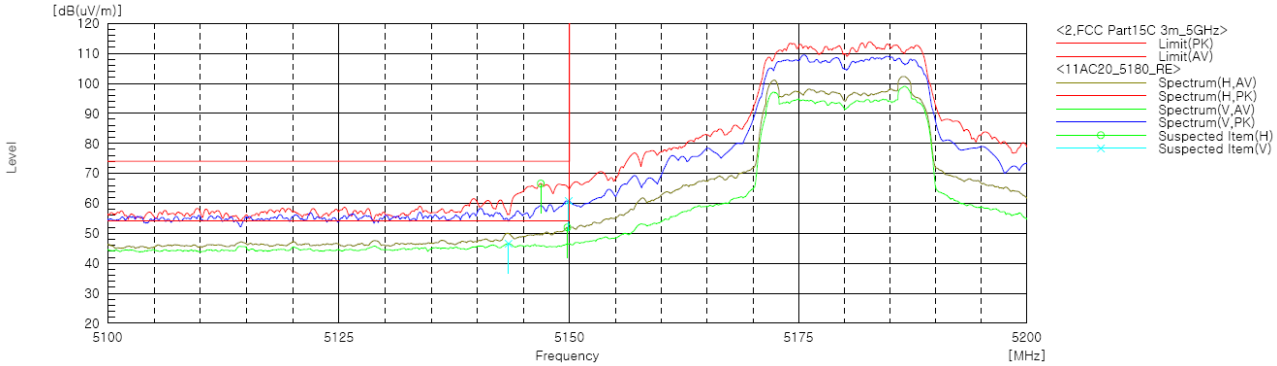
Ch.165(5 825 MHz)

Frequency [MHz]	(P)	Limit AV [dBuV/m]	Limit PK [dBuV/m]	Result AV [dBuV/m]	Result PK [dBuV/m]	Margin AV [dB]	Margin PK [dB]
11 649.52	H	54.00	74.00	49.91	63.20	4.09	10.80
11 652.55	V	54.00	74.00	49.91	62.00	4.09	12.00
5 946.30	H	54.00	74.00	-	61.00	-	7.20
5 945.18	V	54.00	74.00	-	59.00	-	9.20

Remarks

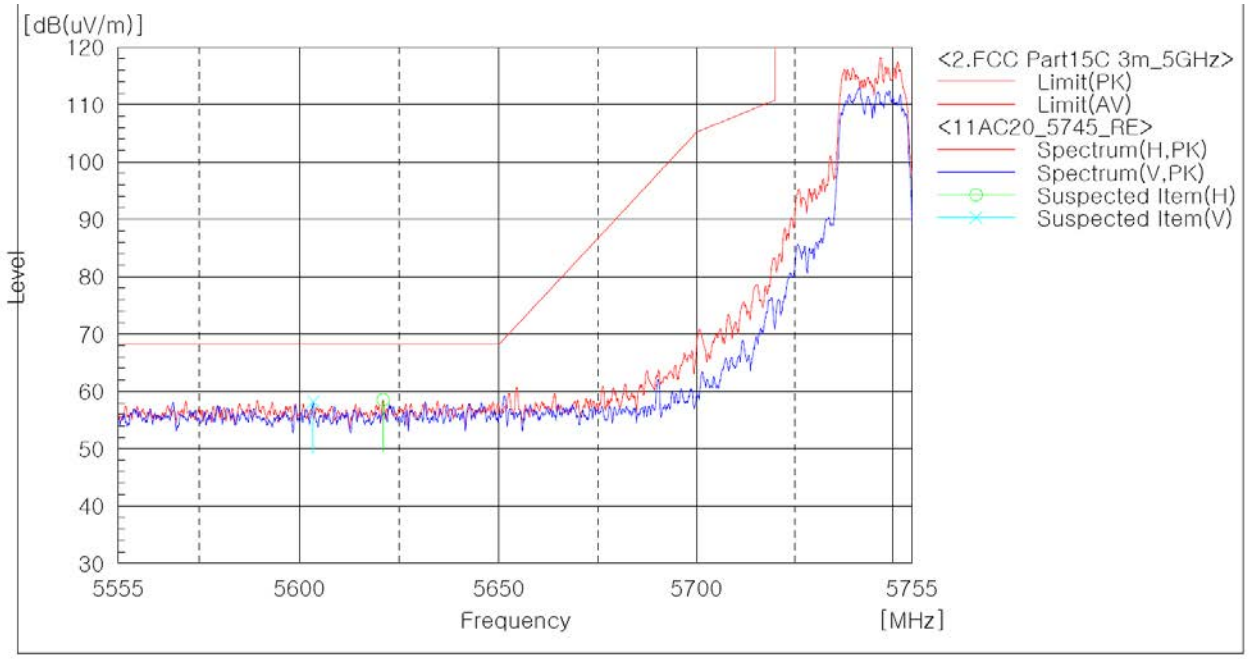
1. The Unwanted emission was measured in the following position: EUT stand-up position(Z axis), lie-down position(X,Y axis). The worst emission was found in stand=up position(Z axis) and the worst case was recorded.
2. Peak Result = Reading + c.f(Correction factor)
   Average Result = Reading + c.f(Correction factor) + Duty cycle factor
3. Correction factor = Antenna factor + Cable loss - Amp Gain

Worst Case Mode :	802.11ac_VHT20_SDM Mode
Worst Case Transfer Rate :	MNSS 0
Distance of Measurements :	3 Meters
Operating Frequency :	5 180 MHz
Channel :	36



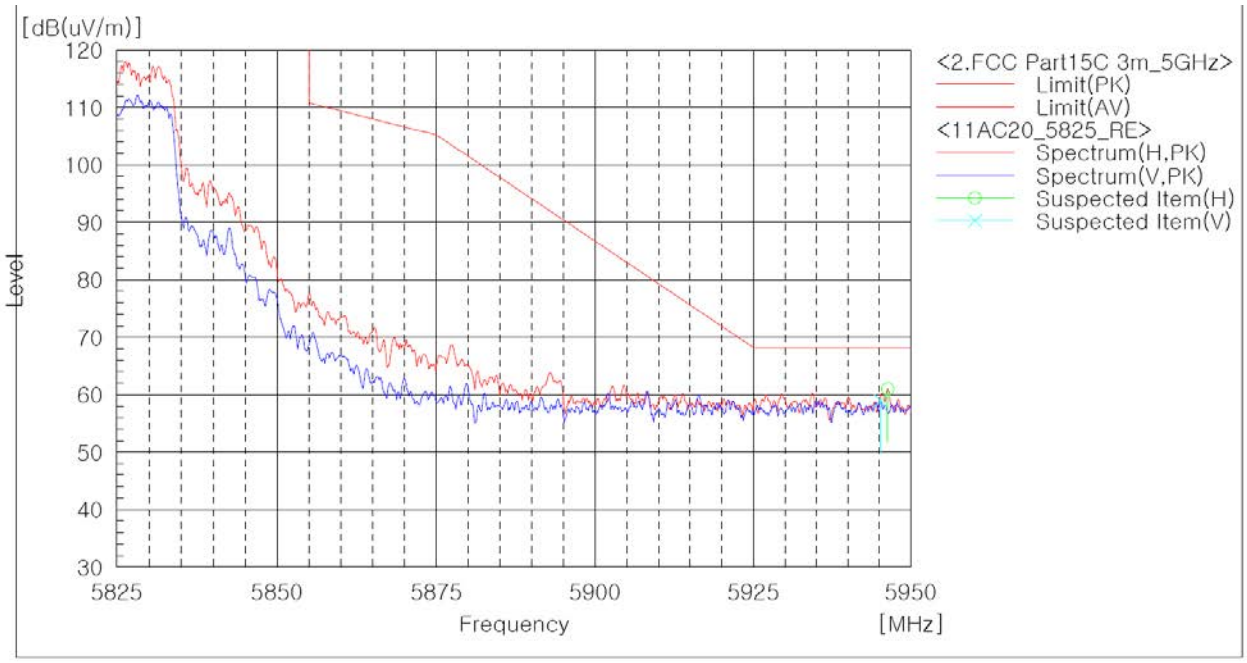
Radiated Restricted Lower Band Edge Plot

Worst Case Mode :	802.11ac_VHT20_SDM Mode
Worst Case Transfer Rate :	MNSS 0
Distance of Measurements :	3 Meters
Operating Frequency :	5 745 MHz
Channel :	149



Radiated Restricted Lower Band Edge Plot

Worst Case Mode :	802.11ac_VHT20_SDM Mode
Worst Case Transfer Rate :	MNSS 0
Distance of Measurements :	3 Meters
Operating Frequency :	5 825 MHz
Channel :	165



Radiated Restricted Upper Band Edge Plot

Test mode : 802.11n_HT40_SDM Mode

The requirements are:
☒ Complies

Test Data

Ch.38(5 190 MHz)

Frequency [MHz]	(P)	Limit AV [dBuV/m]	Limit PK [dBuV/m]	Result AV [dBuV/m]	Result PK [dBuV/m]	Margin AV [dB]	Margin PK [dB]
10 378.80	H	54.00	74.00	44.55	56.60	9.45	17.40
10 377.79	V	54.00	74.00	40.95	54.00	13.05	20.00
15 570.78	H	54.00	74.00	42.95	55.70	11.05	18.30
5 149.99	H	54.00	74.00	52.85	69.90	1.15	4.10
5 148.45	V	54.00	74.00	49.35	63.90	4.65	10.10

Ch.46(5 230 MHz)

Frequency [MHz]	(P)	Limit AV [dBuV/m]	Limit PK [dBuV/m]	Result AV [dBuV/m]	Result PK [dBuV/m]	Margin AV [dB]	Margin PK [dB]
10 462.64	H	54.00	74.00	43.85	55.70	10.15	18.30
10 452.54	V	54.00	74.00	41.95	53.60	12.05	20.40

Ch.151(5 755 MHz)

Frequency [MHz]	(P)	Limit AV [dBuV/m]	Limit PK [dBuV/m]	Result AV [dBuV/m]	Result PK [dBuV/m]	Margin AV [dB]	Margin PK [dB]
11 521.24	H	54.00	74.00	48.25	61.40	5.75	12.60
11 521.24	V	54.00	74.00	50.45	62.20	3.55	11.80
5 601.76	V	-	68.20	-	58.80	-	9.40
5 651.01	H	-	68.90	-	64.90	-	4.00

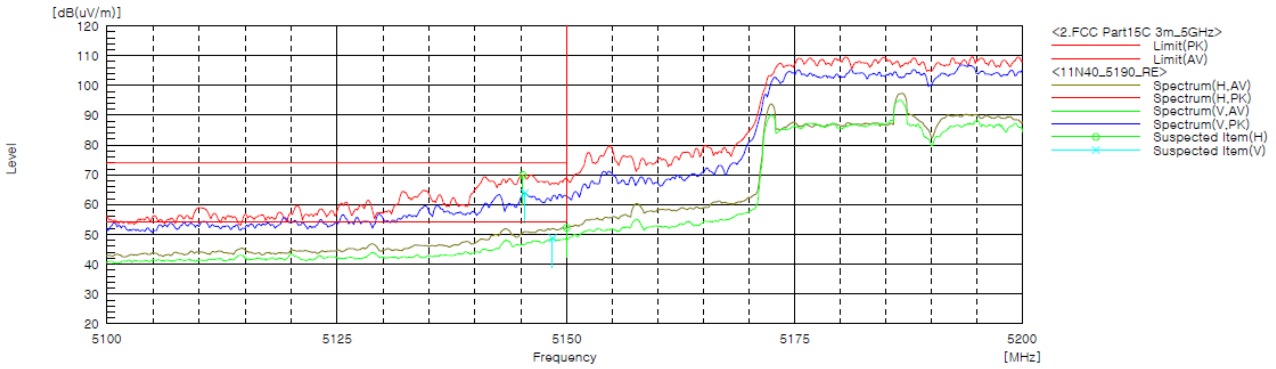
Ch.159(5 795 MHz)

Frequency [MHz]	(P)	Limit AV [dBuV/m]	Limit PK [dBuV/m]	Result AV [dBuV/m]	Result PK [dBuV/m]	Margin AV [dB]	Margin PK [dB]
11 595.99	H	54.00	74.00	48.45	61.10	5.55	12.90
11 588.92	V	54.00	74.00	49.15	62.80	4.85	11.20
5 926.00	H	-	68.20	-	64.40	-	3.80
5 929.07	V	-	68.20	-	59.60	-	8.60

Remarks

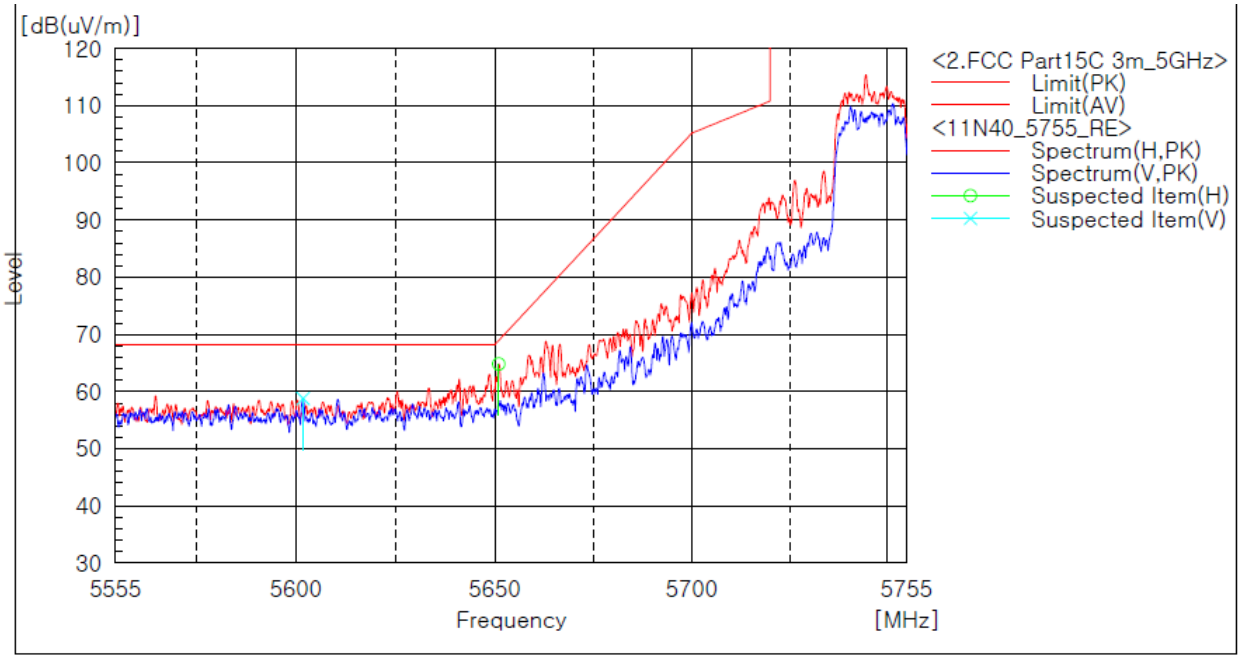
1. The Unwanted emission was measured in the following position: EUT stand-up position(Z axis), lie-down position(X,Y axis). The worst emission was found in stand=up position(Z axis) and the worst case was recorded.
2. Peak Result = Reading + c.f(Correction factor)
   Average Result = Reading + c.f(Correction factor) + Duty cycle factor
3. Correction factor = Antenna factor + Cable loss - Amp Gain

Worst Case Mode :	802.11n_HT40_SDM Mode
Worst Case Transfer Rate :	MCS 16
Distance of Measurements :	3 Meters
Operating Frequency :	5 190 MHz
Channel :	38



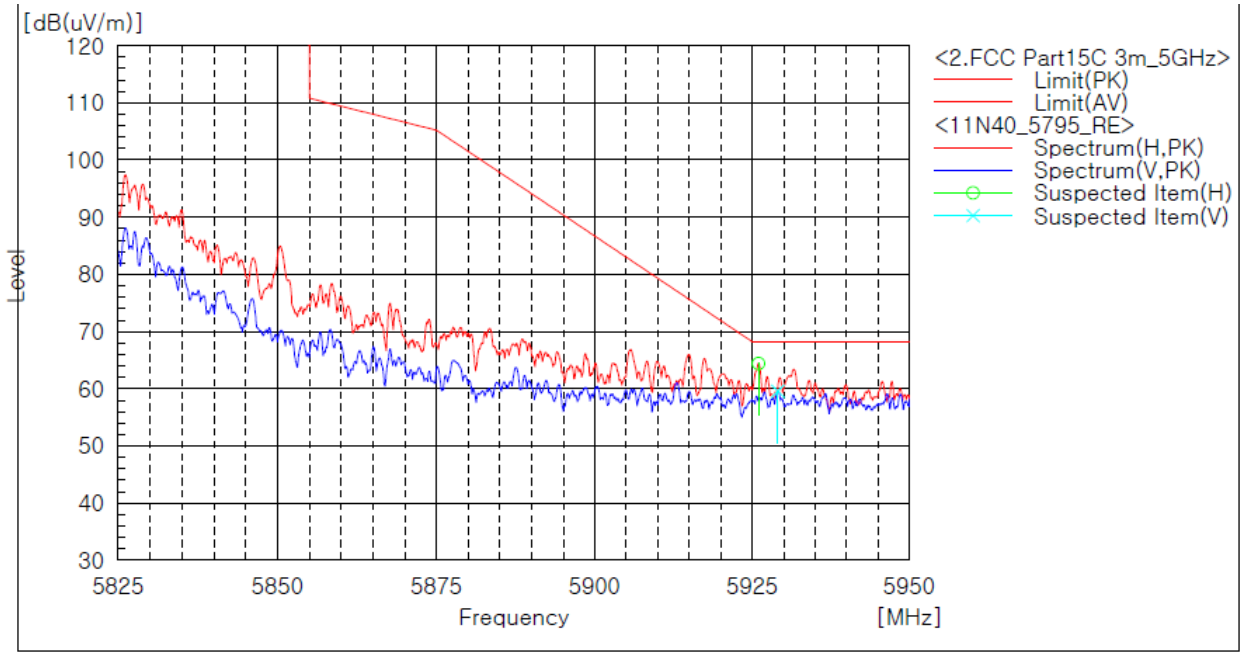
Radiated Restricted Lower Band Edge Plot

Worst Case Mode :	802.11n_HT40_SDM Mode
Worst Case Transfer Rate :	MCS 16
Distance of Measurements :	3 Meters
Operating Frequency :	5 755 MHz
Channel :	151



Radiated Restricted Lower Band Edge Plot

Worst Case Mode :	802.11n_HT40_SDM Mode
Worst Case Transfer Rate :	MCS 16
Distance of Measurements :	3 Meters
Operating Frequency :	5 795 MHz
Channel :	159



Radiated Restricted Upper Band Edge Plot

Test mode : 802.11ac_VHT40_SDM Mode

The requirements are:
☒ Complies

Test Data

Ch.38(5 190 MHz)

Frequency [MHz]	(P)	Limit AV [dBuV/m]	Limit PK [dBuV/m]	Result AV [dBuV/m]	Result PK [dBuV/m]	Margin AV [dB]	Margin PK [dB]
10 378.80	H	54.00	74.00	44.30	57.10	9.70	16.90
10 378.80	V	54.00	74.00	41.50	55.00	12.50	19.00
15 560.68	H	54.00	74.00	42.90	55.60	11.10	18.40
5 149.80	H	54.00	74.00	53.20	71.10	0.80	2.90
5 147.97	V	54.00	74.00	48.70	69.30	5.30	4.70

Ch.46(5 230 MHz)

Frequency [MHz]	(P)	Limit AV [dBuV/m]	Limit PK [dBuV/m]	Result AV [dBuV/m]	Result PK [dBuV/m]	Margin AV [dB]	Margin PK [dB]
10 457.59	H	54.00	74.00	43.50	57.70	10.50	16.30
10 456.58	V	54.00	74.00	41.40	54.20	12.60	19.80

Ch.151(5 755 MHz)

Frequency [MHz]	(P)	Limit AV [dBuV/m]	Limit PK [dBuV/m]	Result AV [dBuV/m]	Result PK [dBuV/m]	Margin AV [dB]	Margin PK [dB]
11 521.24	H	54.00	74.00	47.90	60.90	6.10	13.10
11 513.16	V	54.00	74.00	50.10	62.40	3.90	11.60
5 650.00	H	-	68.20	-	64.90	-	3.30
5 650.00	V	-	68.20	-	59.70	-	8.50
5 659.69	H	-	75.40	-	70.40	-	5.00

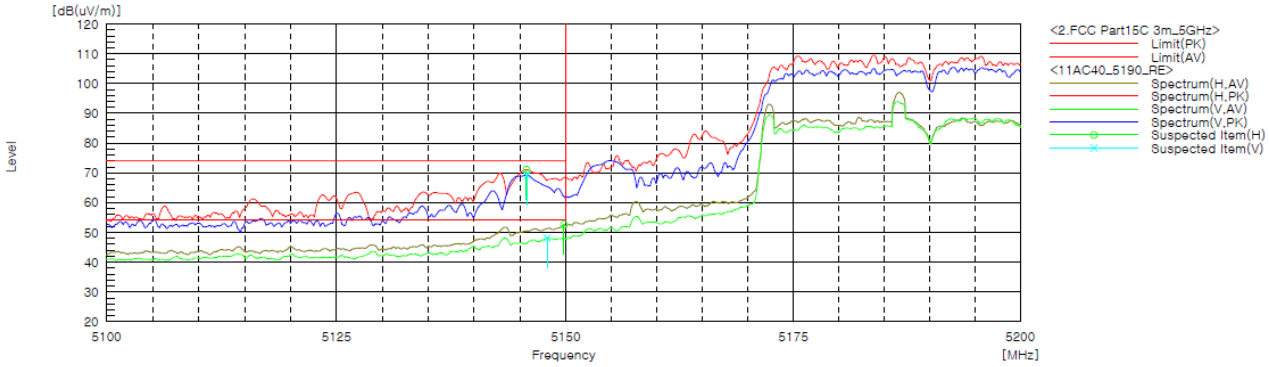
Ch.159(5 795 MHz)

Frequency [MHz]	(P)	Limit AV [dBuV/m]	Limit PK [dBuV/m]	Result AV [dBuV/m]	Result PK [dBuV/m]	Margin AV [dB]	Margin PK [dB]
11 601.04	H	54.00	74.00	48.80	61.60	5.20	12.40
11 601.04	V	54.00	74.00	49.50	62.30	4.50	11.70
5 918.31	H	-	73.20	-	65.40	-	7.80
5 926.57	H	-	68.20	-	63.00	-	5.20
5 929.39	V	-	68.20	-	60.20	-	8.00

Remarks

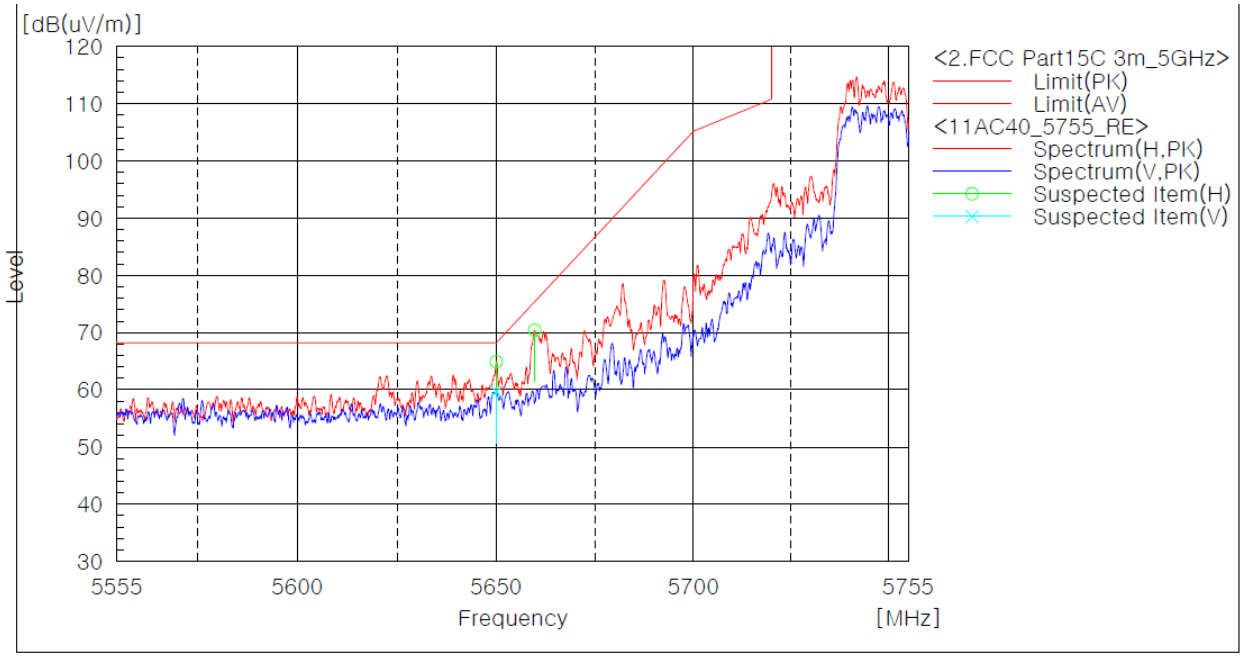
1. The Unwanted emission was measured in the following position: EUT stand-up position(Z axis), lie-down position(X,Y axis). The worst emission was found in stand=up position(Z axis) and the worst case was recorded.
2. Peak Result = Reading + c.f(Correction factor)
   Average Result = Reading + c.f(Correction factor) + Duty cycle factor
3. Correction factor = Antenna factor + Cable loss - Amp Gain

Worst Case Mode :	802.11ac_VHT40_SDM Mode
Worst Case Transfer Rate :	MNSS 0
Distance of Measurements :	3 Meters
Operating Frequency :	5 190 MHz
Channel :	38



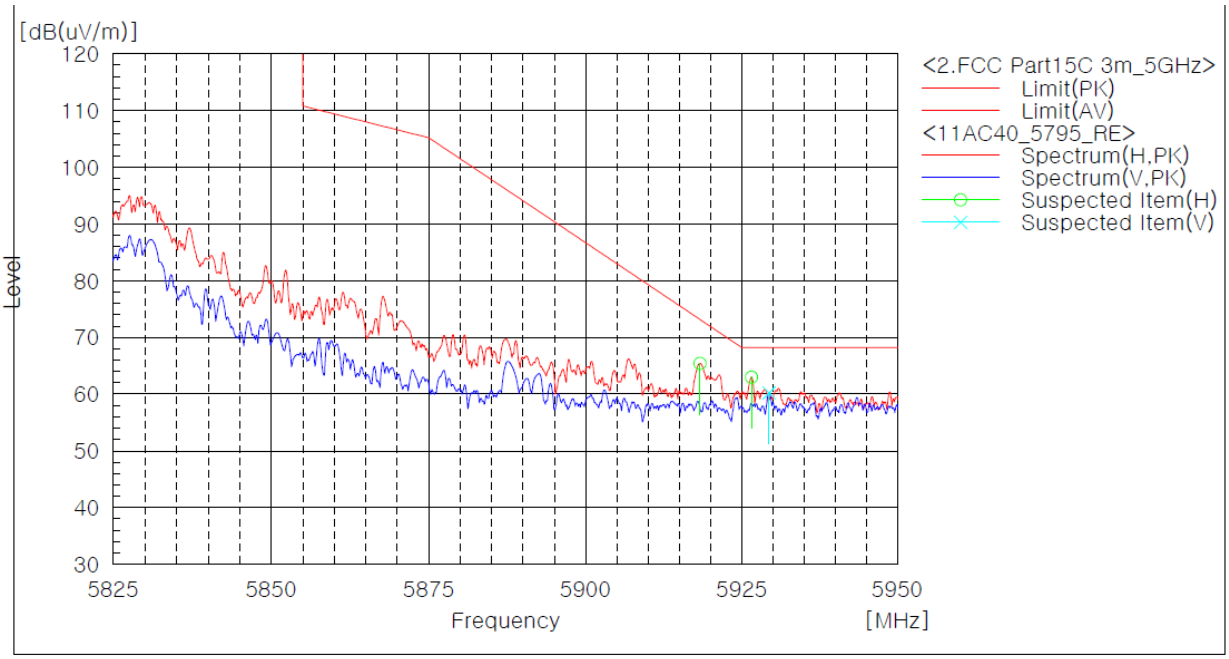
Radiated Restricted Lower Band Edge Plot

Worst Case Mode :	802.11ac_VHT40_SDM Mode
Worst Case Transfer Rate :	MNSS 0
Distance of Measurements :	3 Meters
Operating Frequency :	5 755 MHz
Channel :	151



Radiated Restricted Lower Band Edge Plot

Worst Case Mode :	802.11ac_VHT40_SDM Mode
Worst Case Transfer Rate :	MNSS 0
Distance of Measurements :	3 Meters
Operating Frequency :	5 795 MHz
Channel :	159



Radiated Restricted Upper Band Edge Plot

Test mode : 802.11ac_VHT80_SDM Mode

The requirements are:
☒ Complies

Test Data

Ch.42(5 210 MHz)

Frequency [MHz]	(P)	Limit AV [dBuV/m]	Limit PK [dBuV/m]	Result AV [dBuV/m]	Result PK [dBuV/m]	Margin AV [dB]	Margin PK [dB]
10 453.55	H	54.00	74.00	41.32	53.30	12.68	20.70
10 448.50	V	54.00	74.00	40.32	51.00	13.68	23.00
5 143.31	H	54.00	74.00	53.52	68.40	0.48	5.60
5 143.49	V	54.00	74.00	46.52	59.70	7.48	14.30

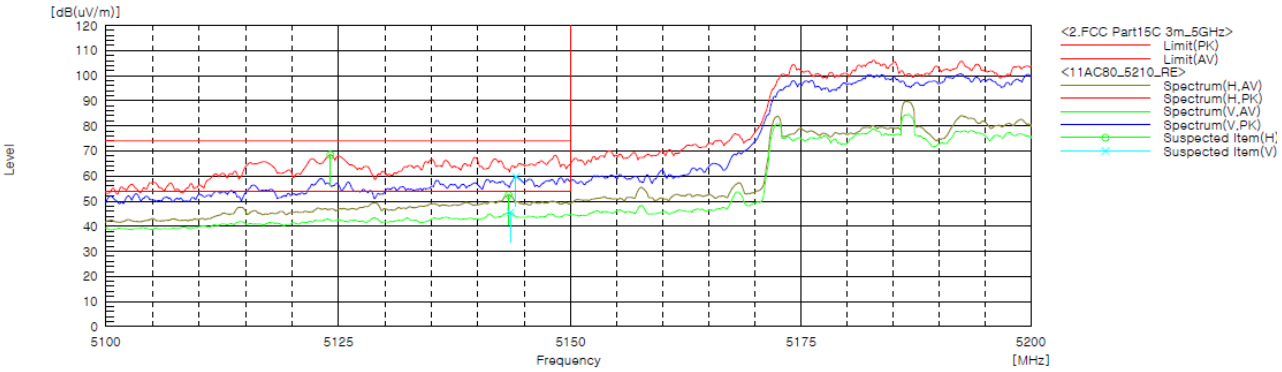
Ch.155(5 775 MHz)

Frequency [MHz]	(P)	Limit AV [dBuV/m]	Limit PK [dBuV/m]	Result AV [dBuV/m]	Result PK [dBuV/m]	Margin AV [dB]	Margin PK [dB]
11 549.52	H	54.00	74.00	44.32	55.50	9.68	18.50
11 557.60	V	54.00	74.00	44.42	56.00	9.58	18.00
5 327.59	H	-	68.20	-	66.10	-	2.10
5 627.89	V	-	68.20	-	61.90	-	6.30
5 654.51	H	-	71.50	-	66.70	-	4.80
5 927.43	H	-	68.20	-	64.70	-	3.50
5 934.01	V	-	68.20	-	60.60	-	7.60

Remarks

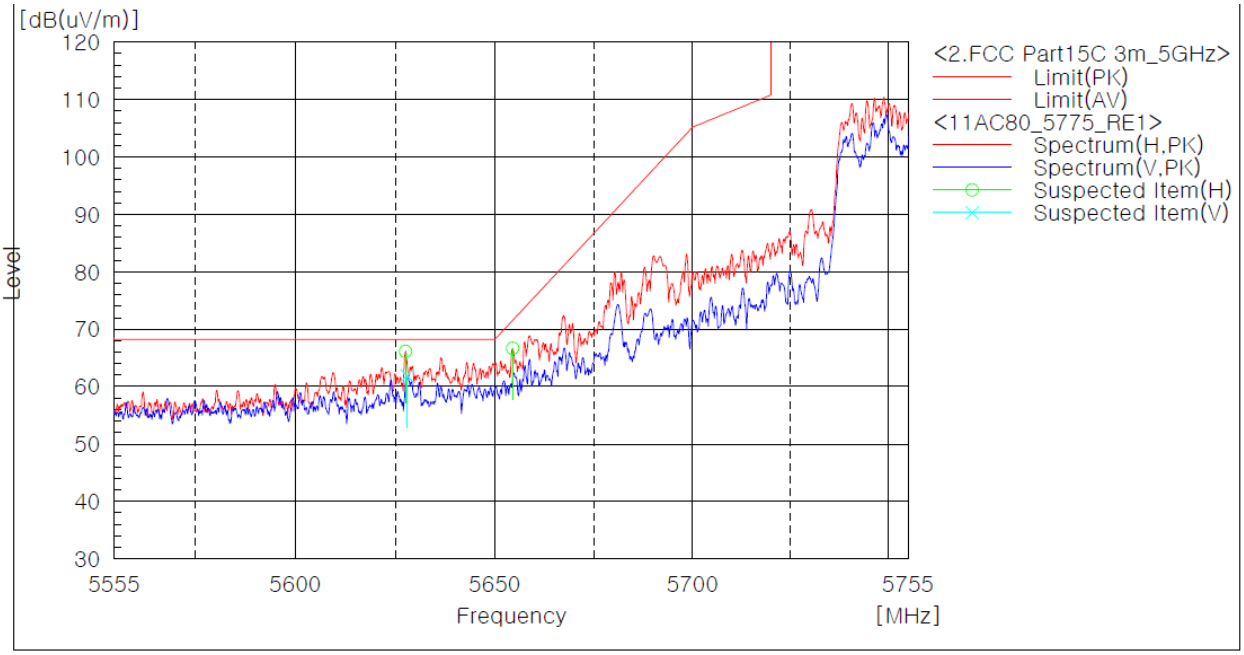
1. The Unwanted emission was measured in the following position: EUT stand-up position(Z axis), lie-down position(X,Y axis). The worst emission was found in stand=up position(Z axis) and the worst case was recorded.
2. Peak Result = Reading + c.f(Correction factor)
   Average Result = Reading + c.f(Correction factor) + Duty cycle factor
3. Correction factor = Antenna factor + Cable loss - Amp Gain

Worst Case Mode :	802.11ac_VHT80_SDM Mode
Worst Case Transfer Rate :	MNSS 0
Distance of Measurements :	3 Meters
Operating Frequency :	5 210 MHz
Channel :	42



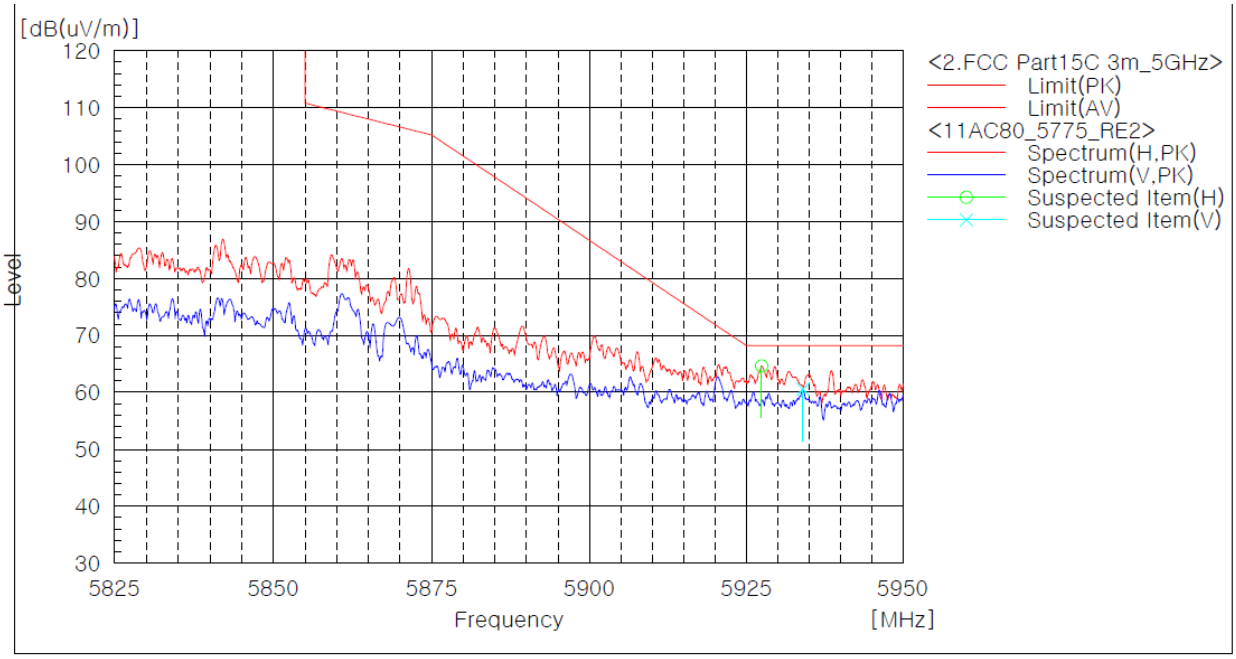
Radiated Restricted Lower Band Edge Plot

Worst Case Mode :	802.11ac_VHT80_SDM Mode
Worst Case Transfer Rate :	MNSS 0
Distance of Measurements :	3 Meters
Operating Frequency :	5 775 MHz
Channel :	155



Radiated Restricted Lower Band Edge Plot

Worst Case Mode :	802.11ac_VHT80_SDM Mode
Worst Case Transfer Rate :	MNSS 0
Distance of Measurements :	3 Meters
Operating Frequency :	5 775 MHz
Channel :	155



Radiated Restricted Upper Band Edge Plot

4.7 AC Conducted Emissions

Test Location
Shielded Room

Frequency Range of Measurement
150 kHz to 30 MHz

Instrument Settings
IF Band Width: 9 kHz

Test Procedures

The EUT was placed on a non-metallic table 0.8m above the metallic, grounded floor and 0.4m from the reference ground plane wall. The distance to other metallic surfaces was at least 0.8m.
Amplitude measurements were performed with a quasi-peak detector and an average detector.

Limit

- **15.207(a)**

Frequency (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15 ~ 0.5	66 to 56*	56 to 46*
0.5 ~ 5	56	46
5 ~ 30	60	50

* Decreases with the logarithm of the frequency.

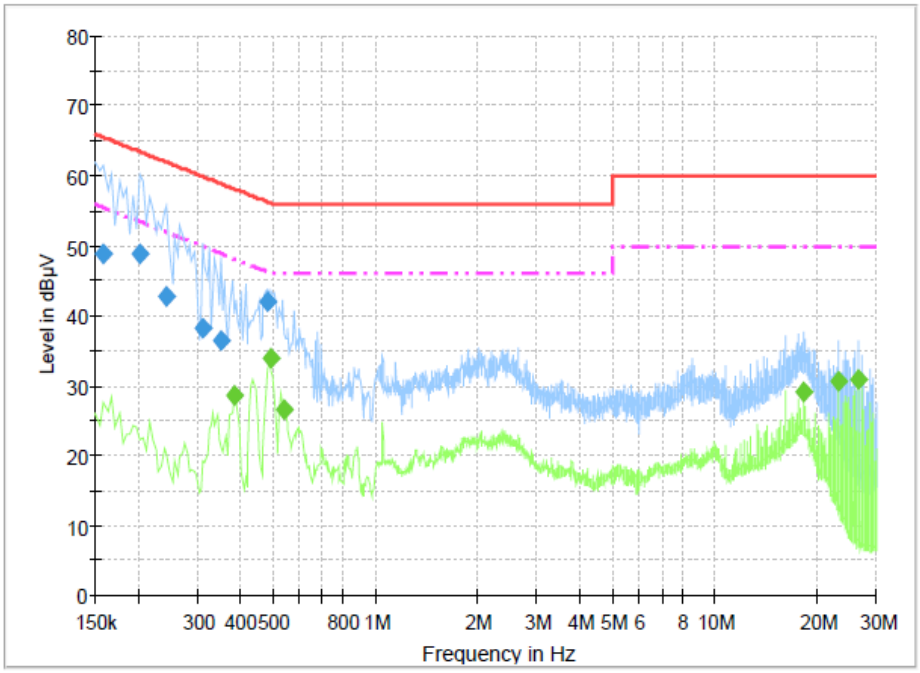
Test Results
The requirements are:

☒ Complies

Test Data

[LINE]

(with EC)3CE_Class B_L1



Final Result 1

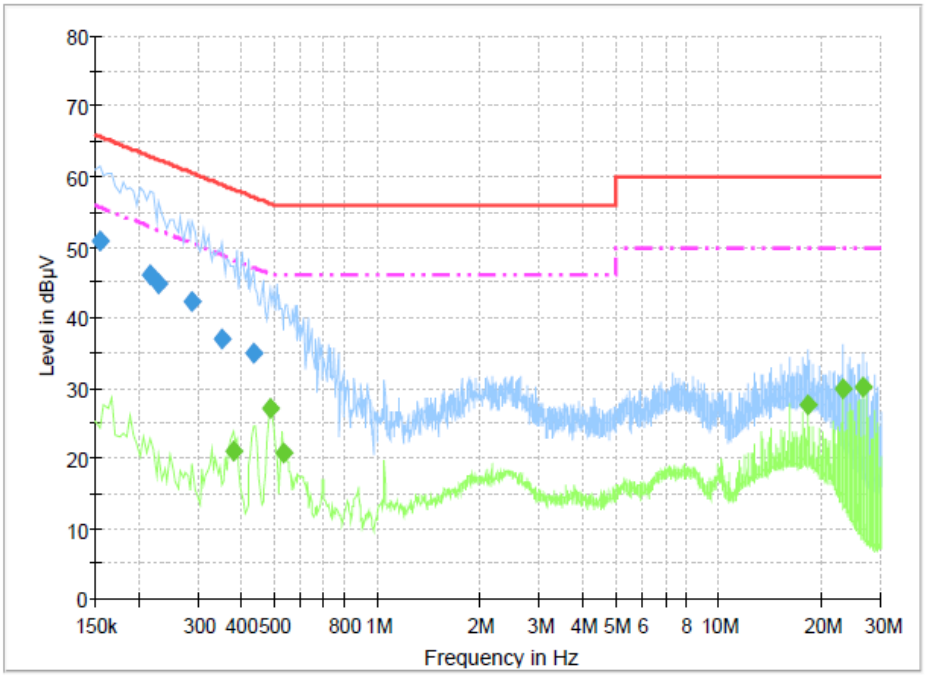
Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.159000	49.0	1000.0	9.000	On	L1	10.2	16.5	65.5
0.204000	48.8	1000.0	9.000	On	L1	10.0	14.7	63.4
0.244500	42.7	1000.0	9.000	On	L1	9.8	19.2	61.9
0.312000	38.4	1000.0	9.000	On	L1	10.0	21.6	59.9
0.352500	36.4	1000.0	9.000	On	L1	10.0	22.5	58.9
0.483000	42.0	1000.0	9.000	On	L1	10.0	14.3	56.3

Final Result 2

Frequency (MHz)	CAverage (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.384000	28.6	1000.0	9.000	On	L1	10.0	19.6	48.2
0.492000	33.9	1000.0	9.000	On	L1	10.0	12.3	46.1
0.541500	26.6	1000.0	9.000	On	L1	10.0	19.4	46.0
18.244500	29.2	1000.0	9.000	On	L1	10.8	20.8	50.0
23.127000	30.7	1000.0	9.000	On	L1	11.0	19.3	50.0
26.610000	30.9	1000.0	9.000	On	L1	11.0	19.1	50.0

[NEUTRAL]

(with EC)3CE_Class B_N



Final Result 1

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.154500	50.9	1000.0	9.000	On	N	10.0	14.9	65.8
0.217500	46.0	1000.0	9.000	On	N	9.9	16.9	62.9
0.231000	44.9	1000.0	9.000	On	N	9.8	17.5	62.4
0.289500	42.4	1000.0	9.000	On	N	9.8	18.2	60.5
0.352500	36.8	1000.0	9.000	On	N	10.0	22.1	58.9
0.438000	34.9	1000.0	9.000	On	N	10.0	22.2	57.1

Final Result 2

Frequency (MHz)	CAverage (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.379500	21.0	1000.0	9.000	On	N	10.0	27.3	48.3
0.487500	27.1	1000.0	9.000	On	N	10.0	19.1	46.2
0.537000	20.8	1000.0	9.000	On	N	10.0	25.2	46.0
18.244500	27.6	1000.0	9.000	On	N	10.8	22.4	50.0
23.127000	29.8	1000.0	9.000	On	N	11.0	20.2	50.0
26.610000	30.1	1000.0	9.000	On	N	11.1	19.9	50.0

APPENDIX A – Test Equipment Used For Tests

	Name of Equipment	Manufacturer	Model No.	Serial No.	Cal Date	Due Date
1	Signal Analyzer	Agilent	N9020A	MY48011598	2018-10-25	2019-10-25
2	Signal Generator	Rohde & Schwarz	SMB100A	175528	2018-10-24	2019-10-24
3	EMI Test Receiver	Rohde & Schwarz	ESCI7	100814	2018-10-25	2019-10-25
4	Bilog Antenna	Schaffner	CBL6111C	2551	2018-05-10	2020-05-10
5	Active Loop Antenna	SCHWARZBECK	FMZB 1513	1513-126	2018-05-27	2020-05-27
6	6dB Attenuator	R&S	DNF	272.4110.50-2	2018-10-25	2019-10-25
7	AMPLIFIER	SONOMA	310	291721	2019-01-28	2020-01-28
8	EMI Test Receiver	Rohde & Schwarz	ESU40	100336	2019-01-29	2020-01-29
9	Preamplifier	Agilent	8449B	3008A02011	2018-12-03	2019-12-03
10	Horn Antenna	ETS-Lindgren	3116	00062504	2017-12-04	2019-12-04
11	Horn Antenna	ETS-Lindgren	3117	00154525	2019-02-22	2021-02-22
12	Band Reject Filter	Micro Tronics	BRM50716	G184	2019-01-28	2020-01-28
13	EMI Test Receiver	R&S	ESCI3	100032	2019-01-29	2020-01-29
14	LISN	Rohde & Schwarz	ENV216	101236	2018-10-29	2019-10-29
15	Singnal Canditioning Unit	R&S	SCU-40	10023	2018-10-24	2019-10-24
16	Temp&Humi Chamber	ESPEC CORP.	SH-242	93008423	2018-09-18	2019-09-18

	Cable	Manufacturer	Model No.	Serial No.	Check Date
1	RF Cable	Canare Corporation	L-5D2W	N/A	2018-12-19
2	RF Cable	Junkosha Inc.	MWX221	1510S087	2019-05-23
3	RF Cable	HUBER+SUHNER	SUCOFLEX 102	MY073/2	2018-12-19
4	RF Cable	HUBER+SUHNER	SUCOFLEX 102	MY4728/2	2018-12-19
5	RF Cable	HUBER+SUHNER	SUCOFLEX 104	MY27558/4	2018-12-19
6	RF Cable	HUBER+SUHNER	SUCOFLEX 104	N/A	2018-12-19
7	RF Cable	HUBER+SUHNER	SUCOFLEX 104	MY27573/4	2018-12-19
8	RF Cable	HUBER+SUHNER	SUCOFLEX 106	N/A	2018-12-19