

4.3 Transmitter Power Spectral Density

Test Procedures

KDB 558074 - Section 8.4
ANSI C63.10-2013 - Section 11.10.2
KDB 662911 D01, D02 (Multiple Transmitter Output)

This procedure shall be used if maximum peak conducted output power was used to demonstrate compliance.

Test Settings:

- Center frequency = the highest, middle and the lowest channels
- a) RBW : $3\text{ kHz} \leq \text{RBW} \leq 100\text{ kHz}$
 - b) VBW $\geq 3 \times \text{RBW}$
 - c) span $\geq 1.5 \times \text{DTS bandwidth}$
 - d) Sweep time = auto couple
 - e) Detector = peak
 - f) Trace mode= max hold
 - g) Allow trace to fully stabilize
 - h) Use the peak marker function to determine the maximum amplitude level within the RBW.

Limit

Operating Mode	Mode	ANT Configuration	ANT Gain (dBi)	Limit (dBm)
SISO	802.11b/g/n	ANT1	2.17	8.00
SISO	802.11b/g/n	ANT2	2.17	8.00
MIMO (2Tx)	802.11n	ANT1 + ANT2	5.18	8.00

Test Data

ANT1

Test Mode	Frequency (MHz)	Measured Power Density (dBm)	Limit (dBm)	Margin(dB)
802.11b	2 412	-4.95	8.00	12.95
	2 437	-6.21	8.00	14.21
	2 462	-5.87	8.00	13.87
802.11g	2 412	-9.38	8.00	17.38
	2 437	-9.96	8.00	17.96
	2 462	-9.83	8.00	17.83
802.11n _HT20	2 412	-11.65	8.00	19.65
	2 437	-9.42	8.00	17.42
	2 462	-11.10	8.00	19.10
802.11n _HT40	2 422	-14.46	8.00	22.46
	2 437	-14.14	8.00	22.14
	2 452	-14.87	8.00	22.87

ANT2

Test Mode	Frequency (MHz)	Measured Power Density (dBm)	Limit (dBm)	Margin(dB)
802.11b	2 412	-4.25	8.00	12.25
	2 437	-2.36	8.00	10.36
	2 462	-4.28	8.00	12.28
802.11g	2 412	-8.26	8.00	16.26
	2 437	-8.66	8.00	16.66
	2 462	-7.64	8.00	15.64
802.11n _HT20	2 412	-8.85	8.00	16.85
	2 437	-7.11	8.00	15.11
	2 462	-7.38	8.00	15.38
802.11n _HT40	2 422	-13.26	8.00	21.26
	2 437	-12.47	8.00	20.47
	2 452	-12.67	8.00	20.67



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ANT1 + ANT2 (MIMO)

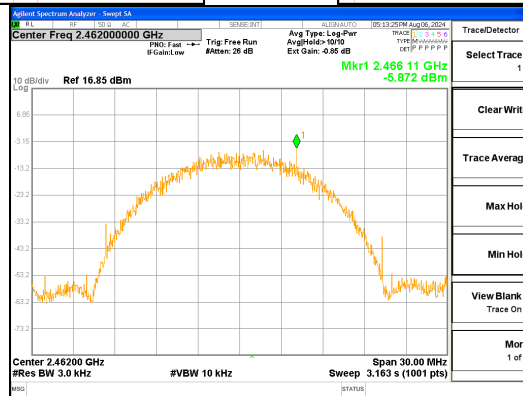
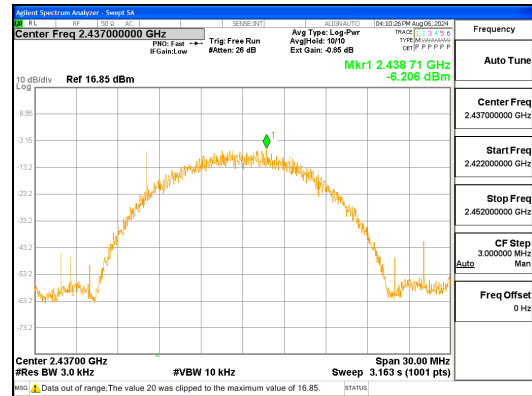
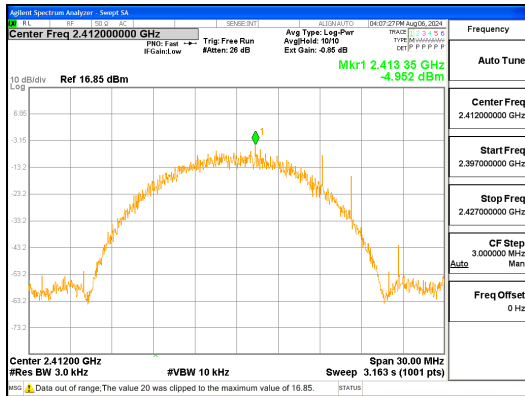
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802.11n _HT20	2 412	-7.02	8.00	15.02
	2 437	-5.10	8.00	13.10
	2 462	-5.84	8.00	13.84
802.11n _HT40	2 422	-10.81	8.00	18.81
	2 437	-10.21	8.00	18.21
	2 452	-10.62	8.00	18.62

See next pages for actual measured spectrum plots.

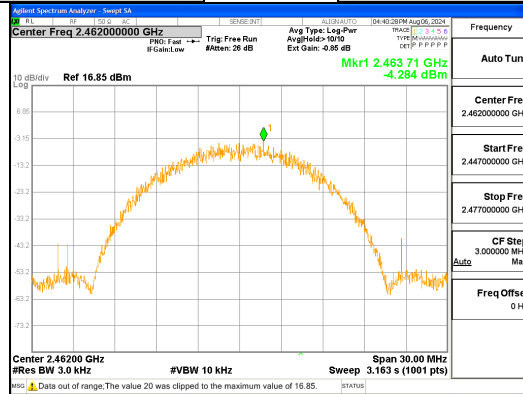
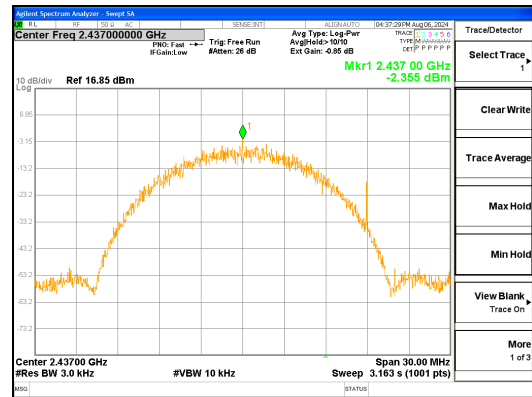
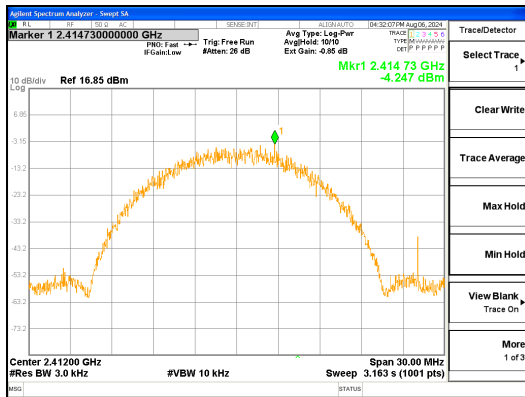


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ANT1, 802.11b

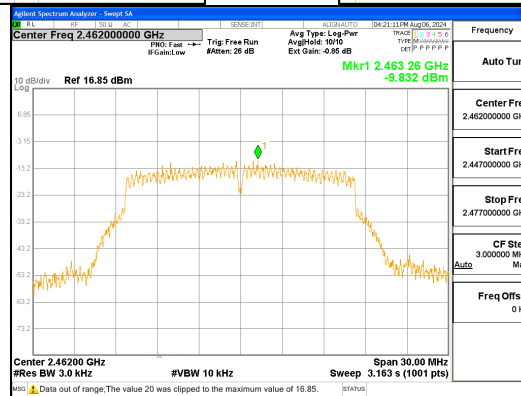
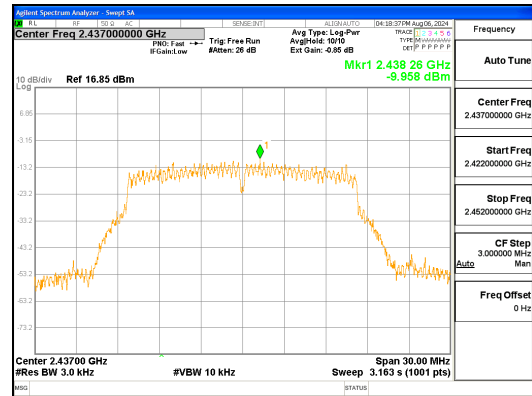
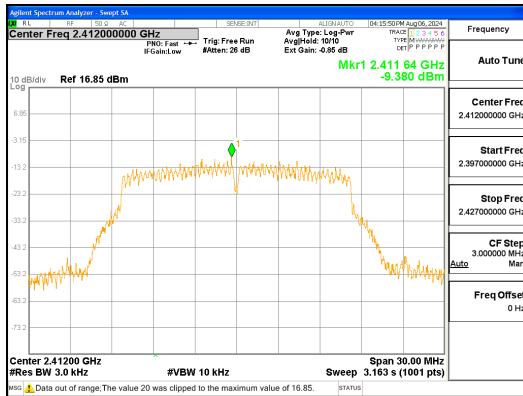


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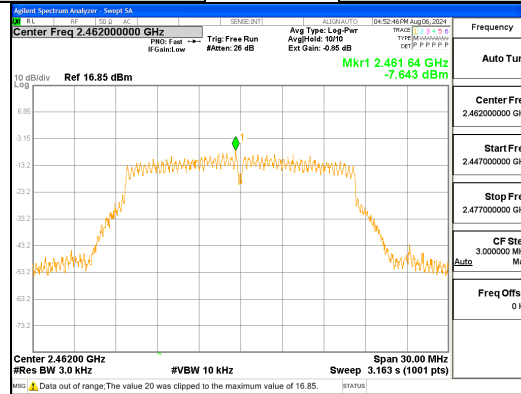
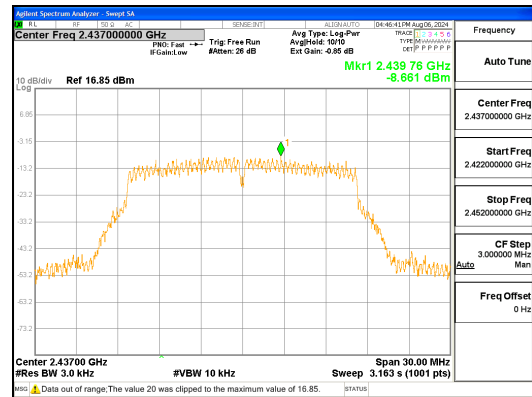
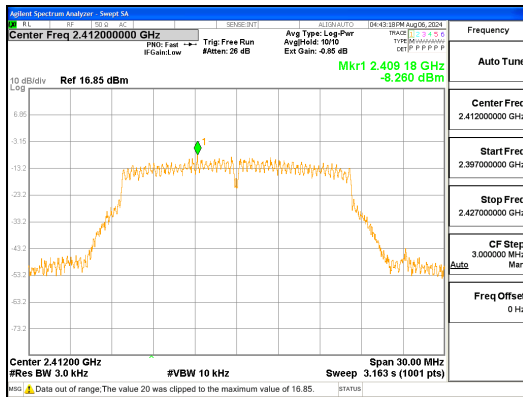


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ANT1, 802.11g

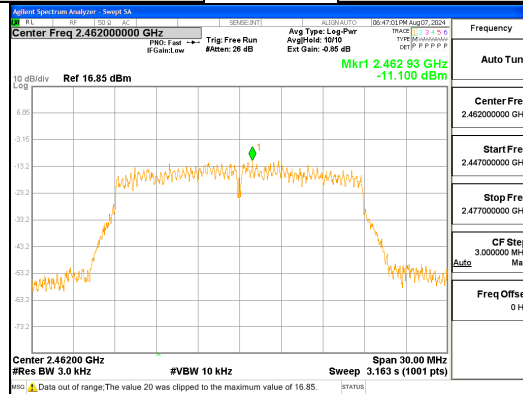
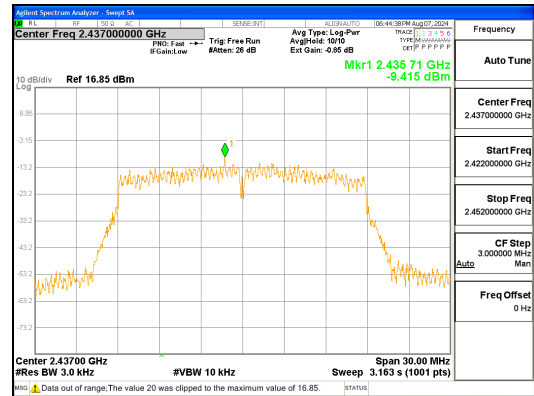
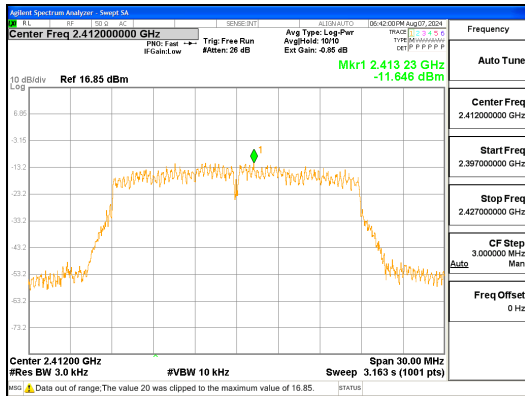


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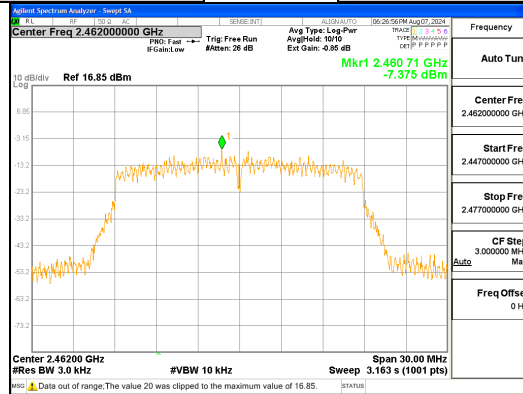
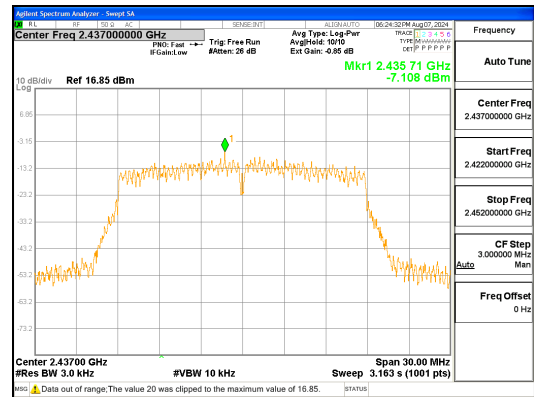
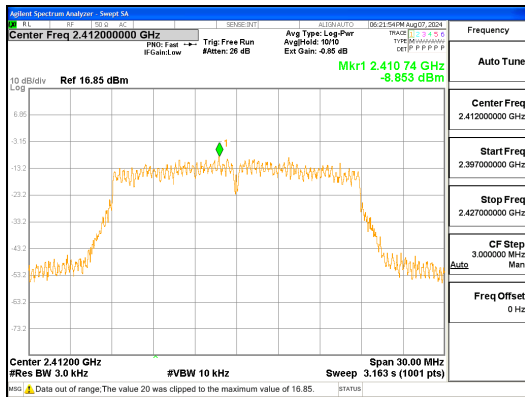


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ANT1, 802.11n_HT20

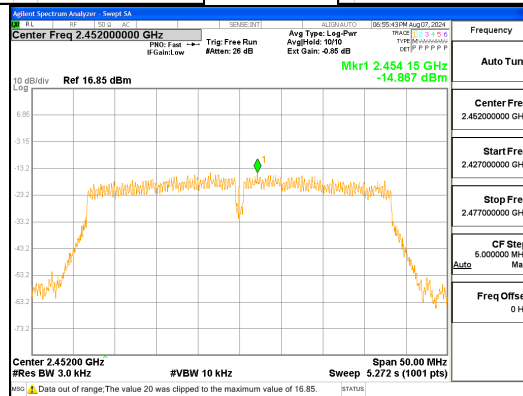
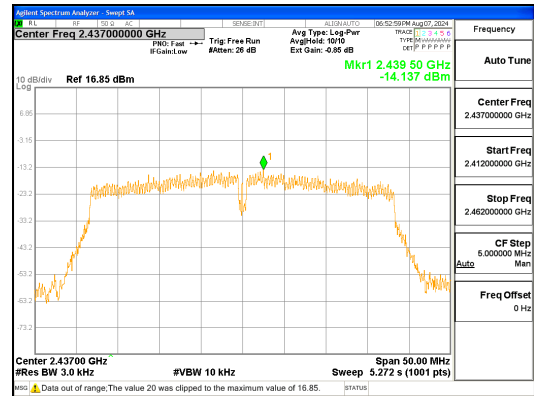
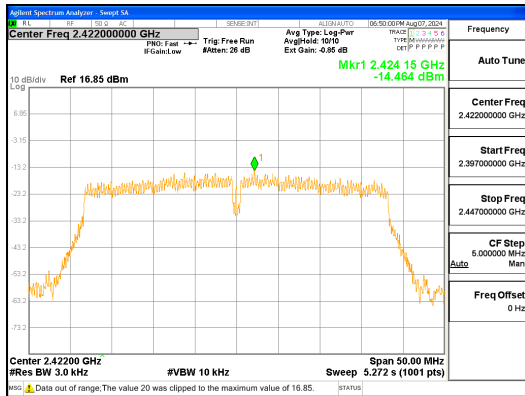


ANT2, 802.11n_HT20

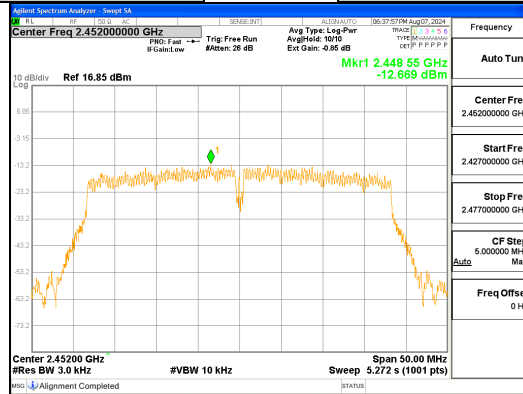
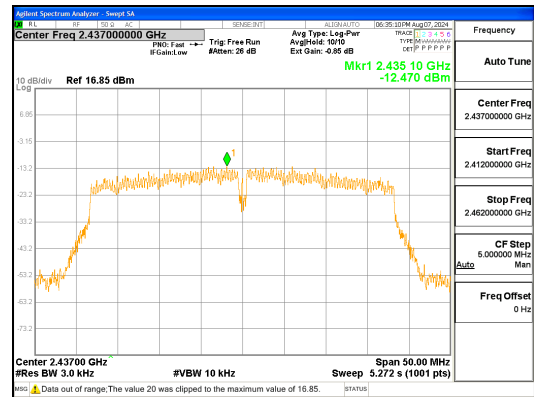
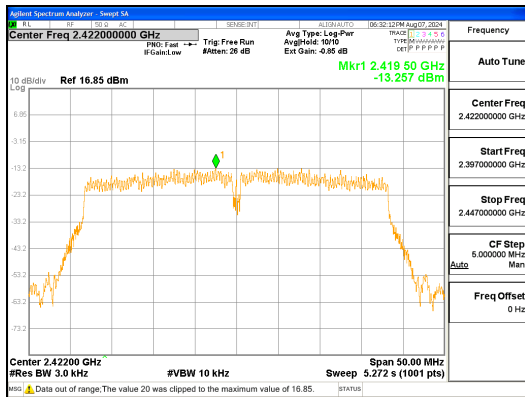


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ANT1, 802.11n_HT40



ANT2, 802.11n_HT40

4.4 Conducted Spurious emission

Test Procedures

KDB 558074 - Section 8.5
ANSI C63.10-2013 - Section 11.11.3
RSS-Gen - Section 6.13

The bandwidth at 20dB down from the highest inband spectral density is measured with a spectrum analyzer connected to the antenna terminal, while EUT is operating in transmission mode at the appropriate frequencies.
After the trace being stable, Use the marker-to-peak function to measure 20 dB down both sides of the intentional emission.

Test Settings:

Center frequency = the highest, middle and the lowest channels

- | | |
|---|-----------------------------|
| a) RBW = 100 kHz | b) VBW $\geq 3 \times$ RBW |
| c) Detector = peak | d) Sweep time = auto couple |
| e) Trace mode= max hold | |
| f) Allow trace to fully stabilize | |
| g) Use the peak marker function to determine the maximum amplitude level. | |

Limit :

Emission level < 30 dBc

Test Data: Complies

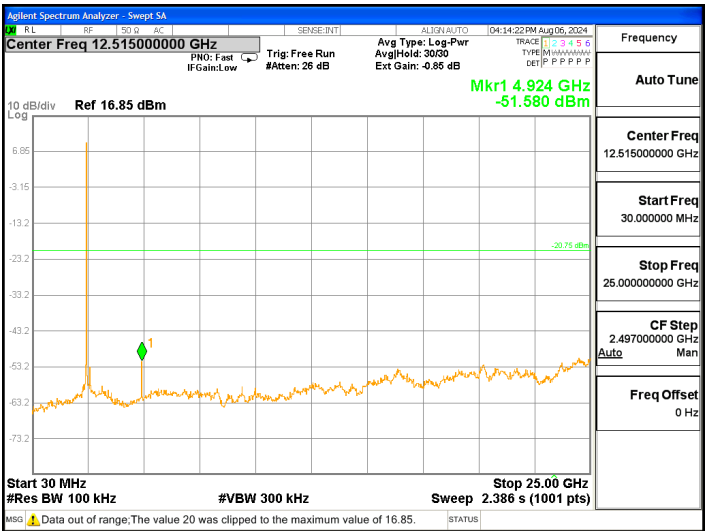
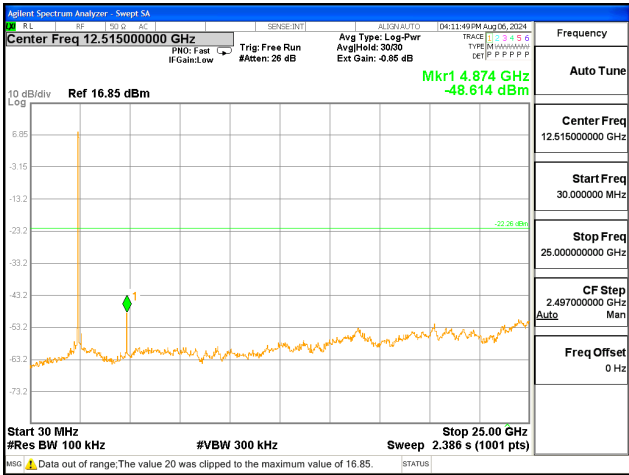
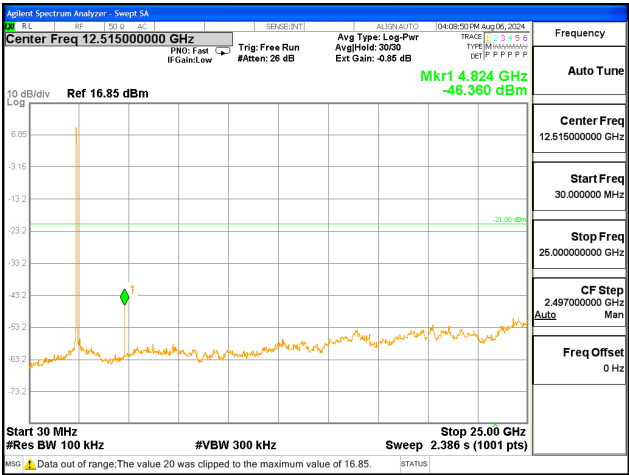
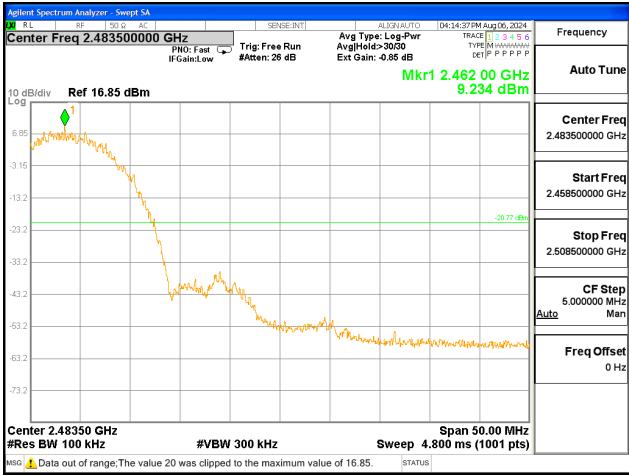
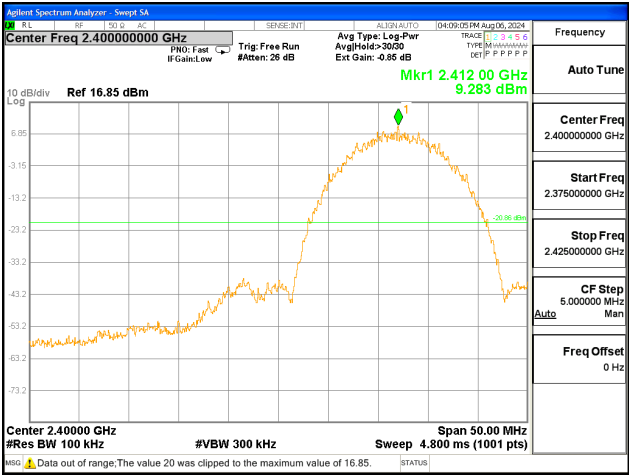
- All conducted emission in any 100 kHz bandwidth outside of the spread spectrum band was at least 30dB lower than the highest inband spectral density. Therefore the applying equipment meets the requirement.

See next pages for actual measured spectrum plots.



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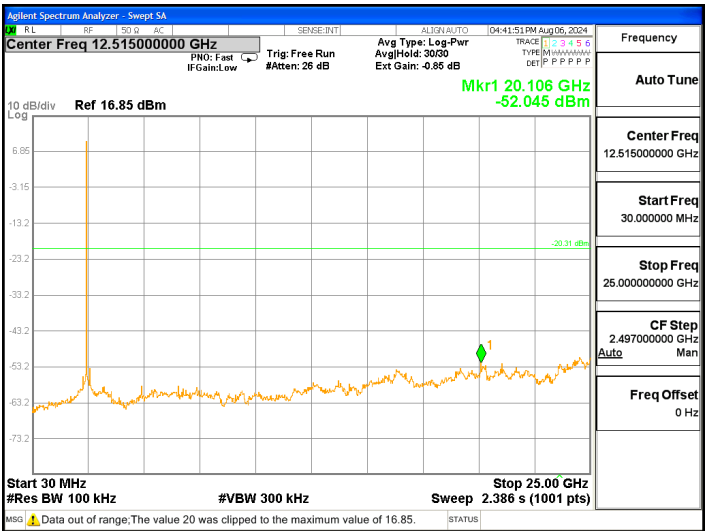
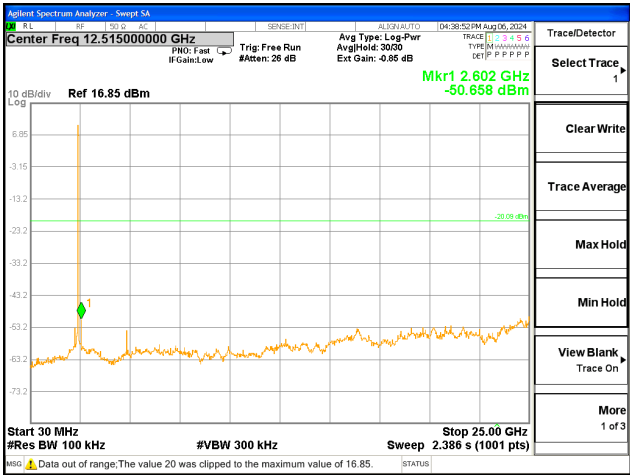
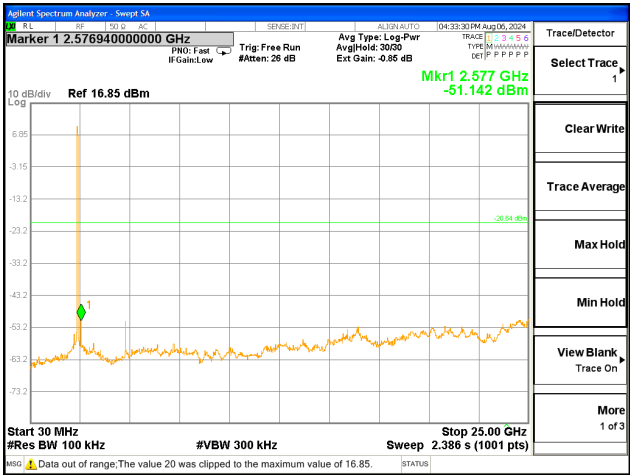
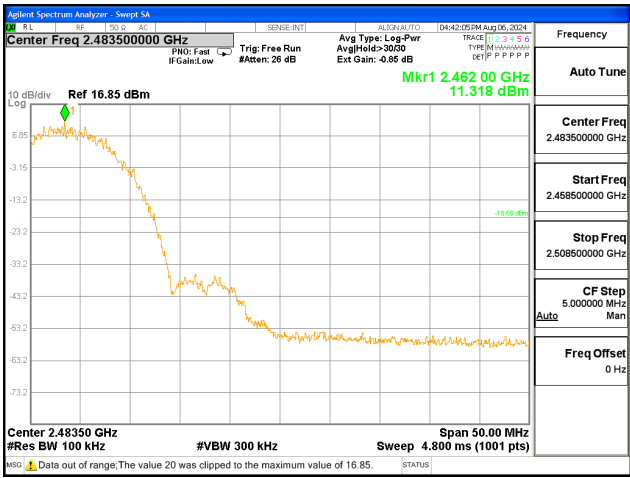
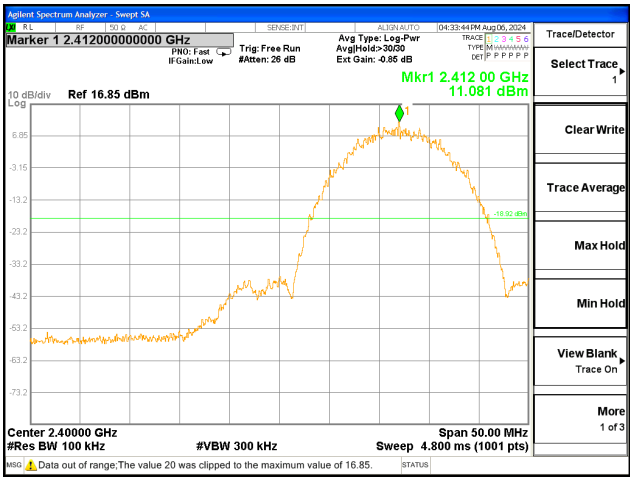


ANT1, 802.11b



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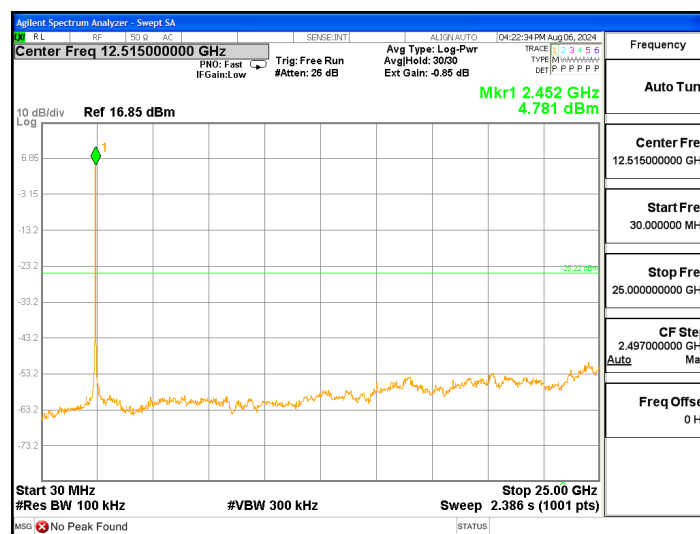
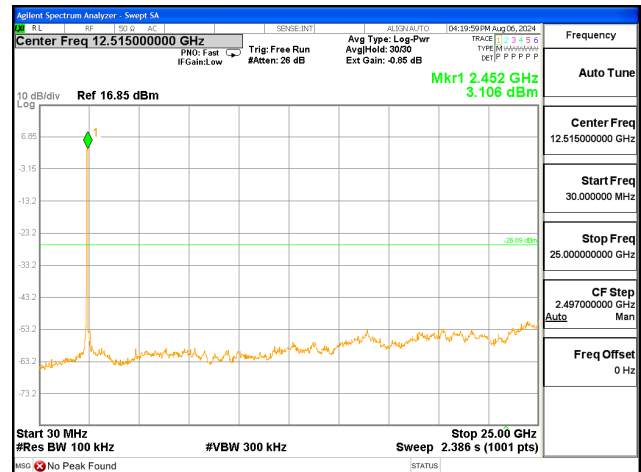
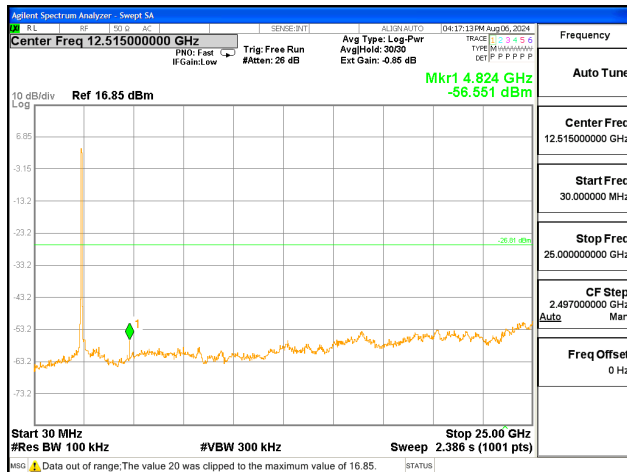
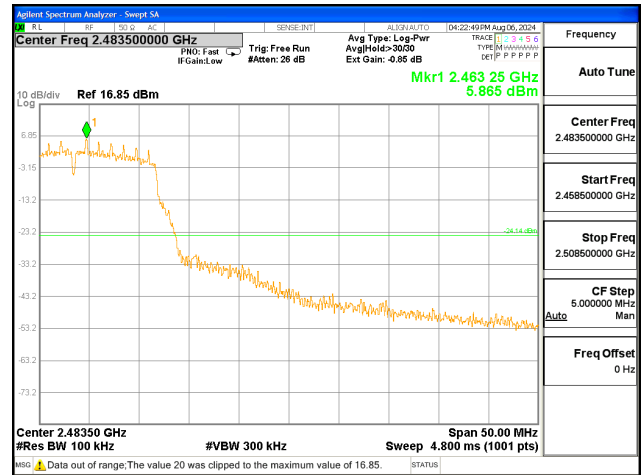
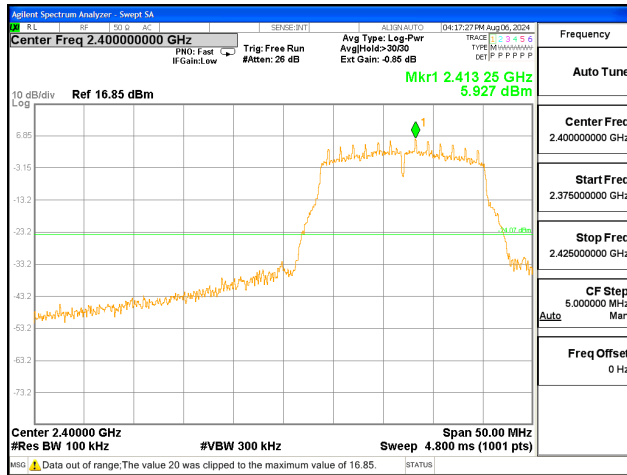


ANT2, 802.11b



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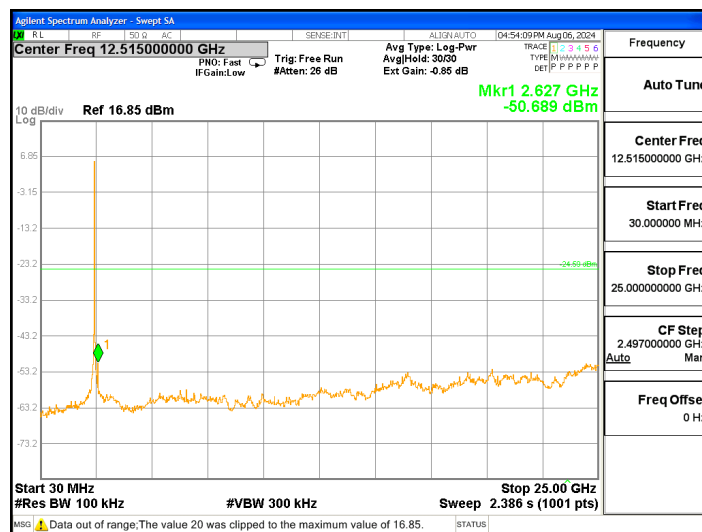
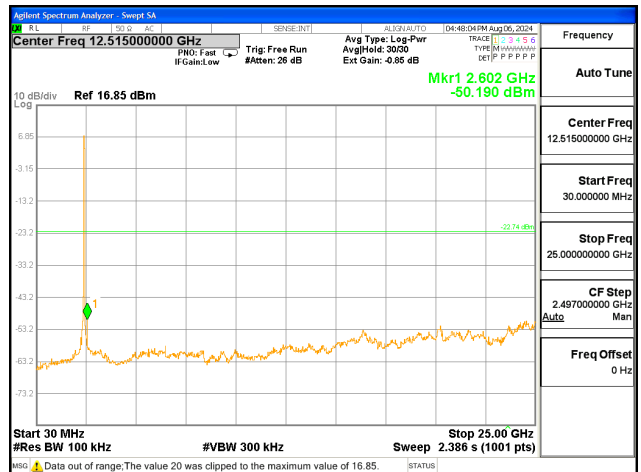
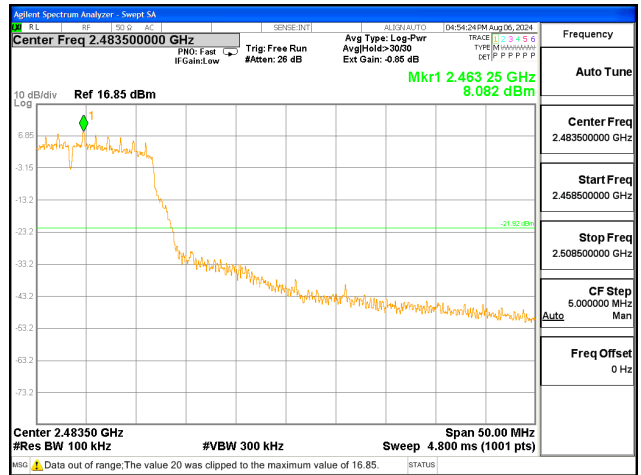
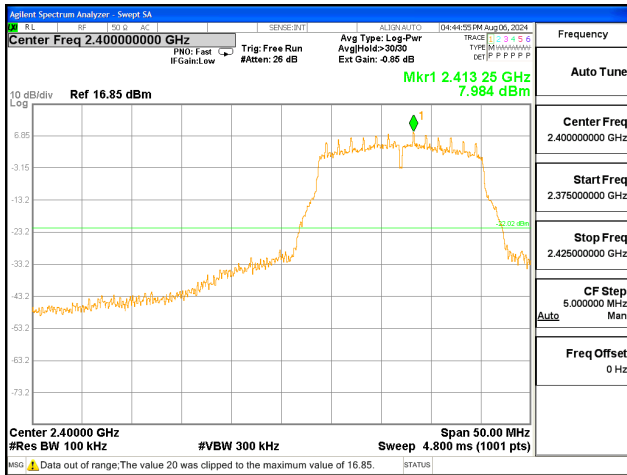


ANT1, 802.11g



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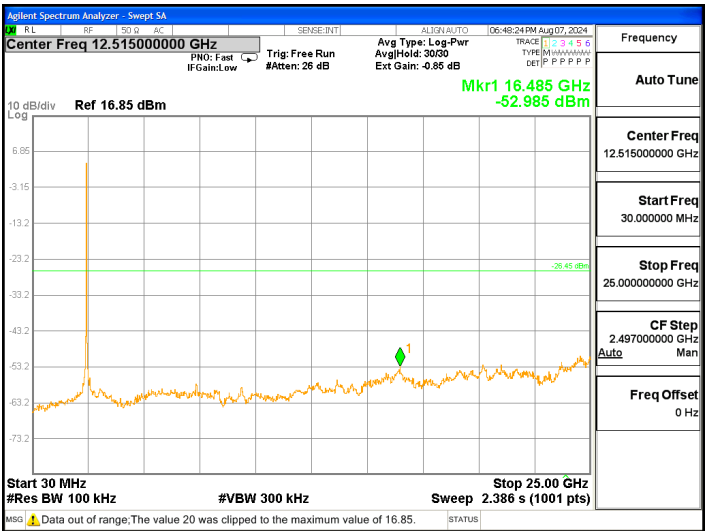
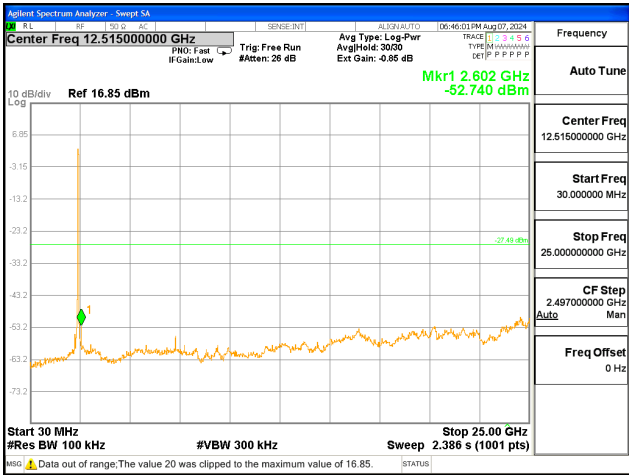
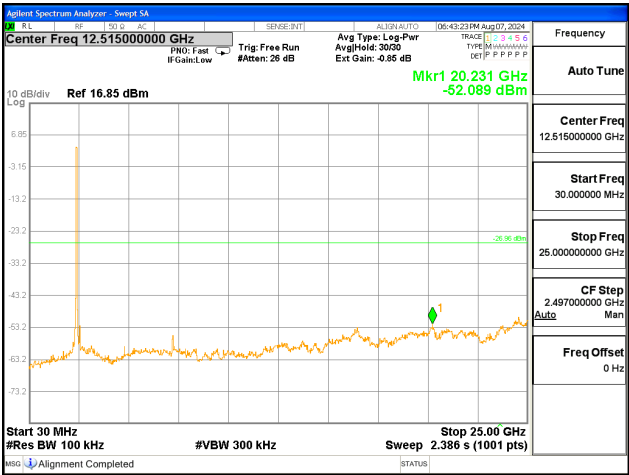
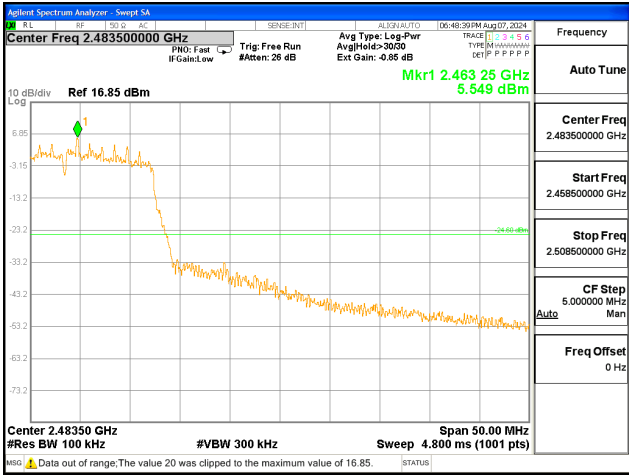
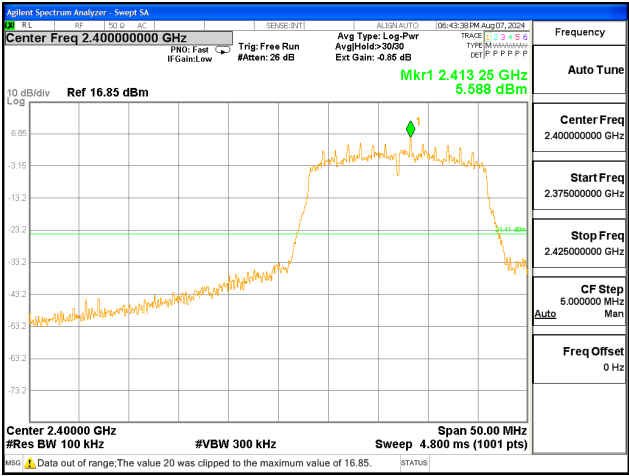


ANT2, 802.11g



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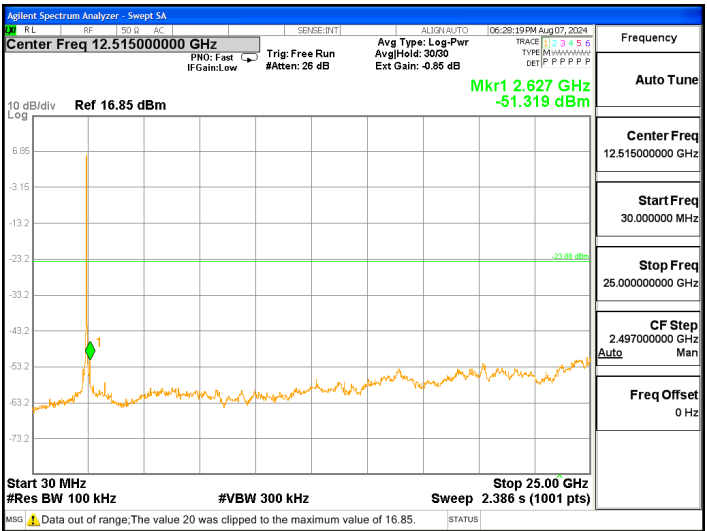
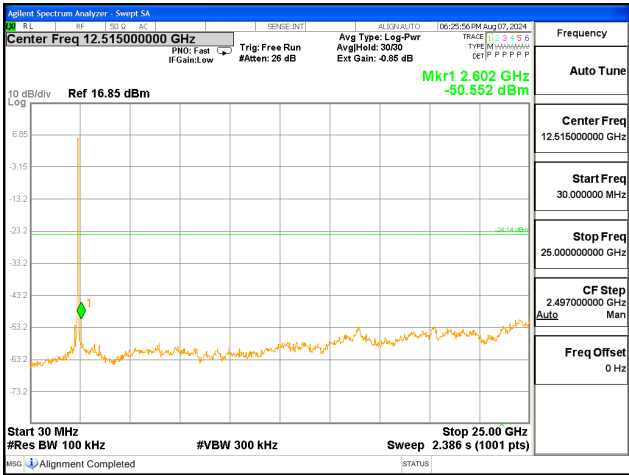
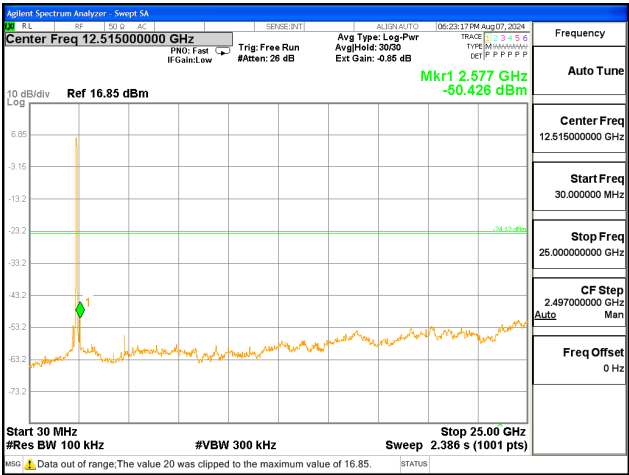
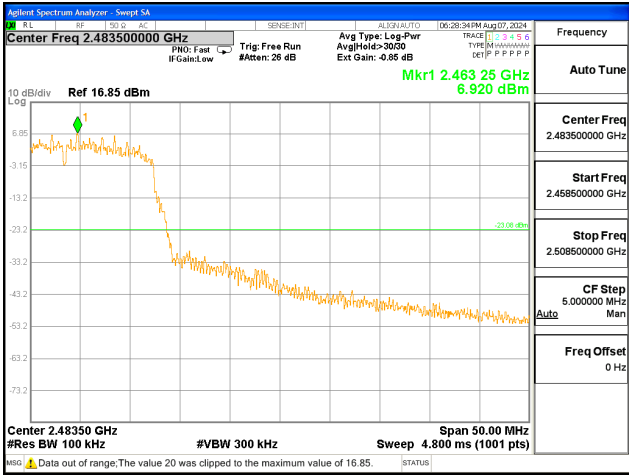
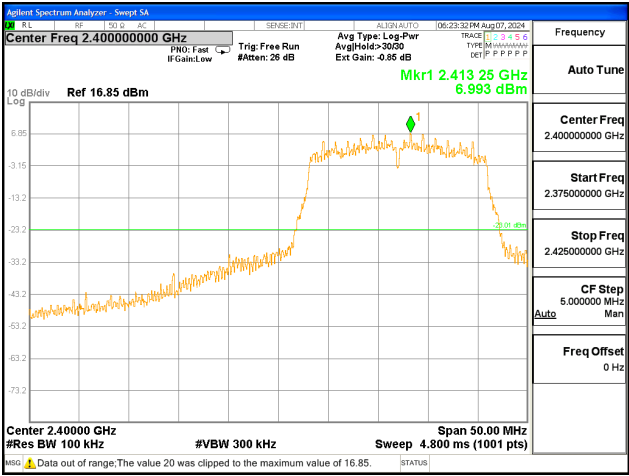


ANT1, 802.11n_HT20



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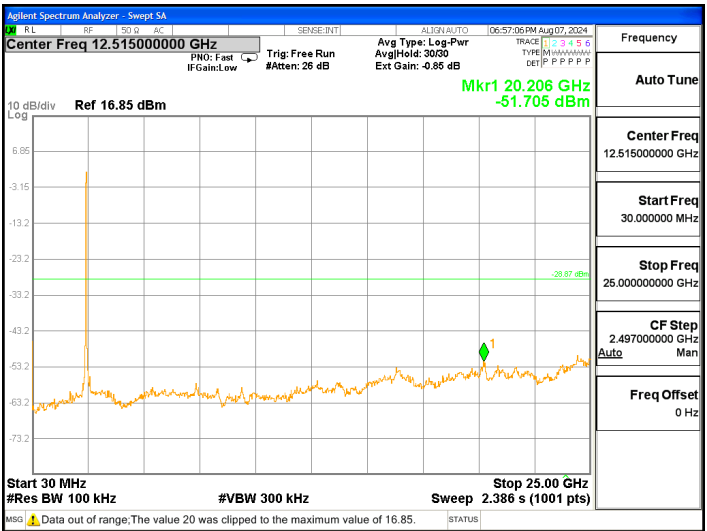
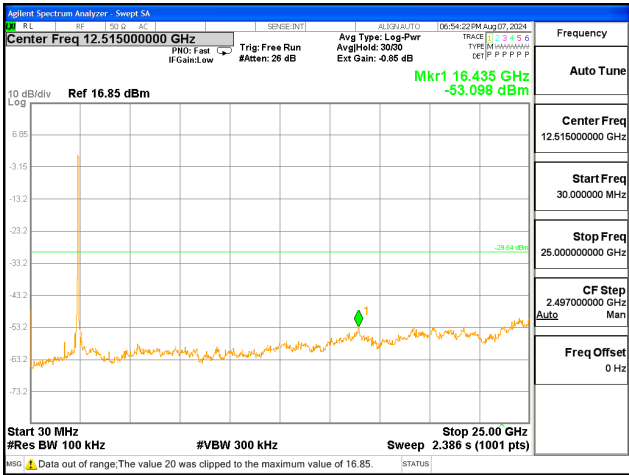
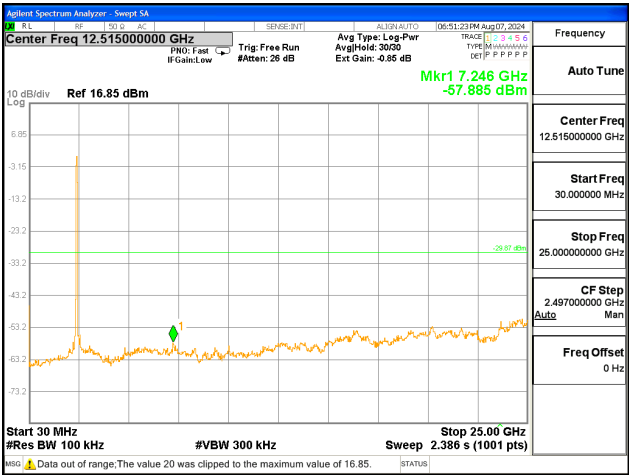
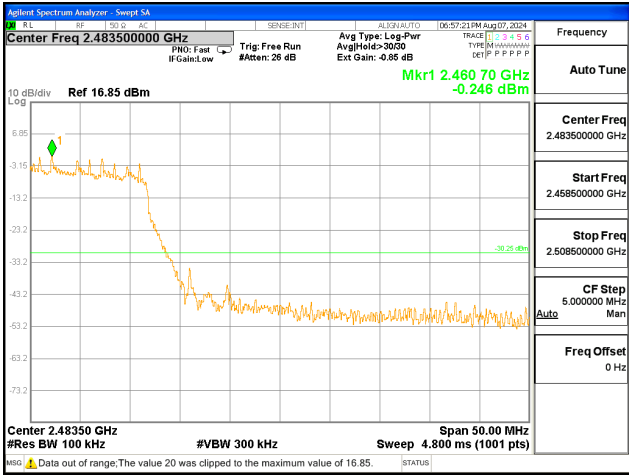
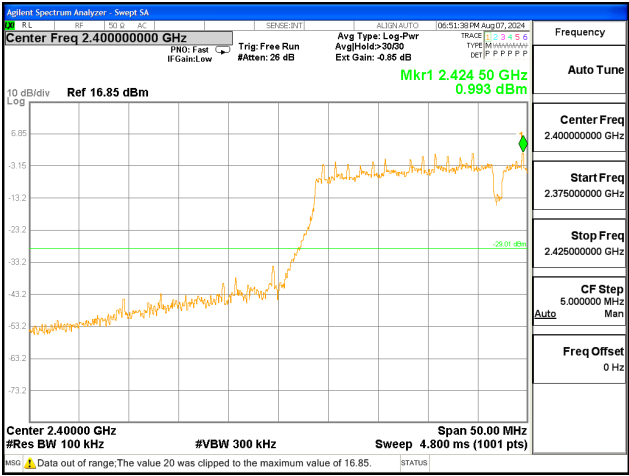


ANT2, 802.11n_HT20



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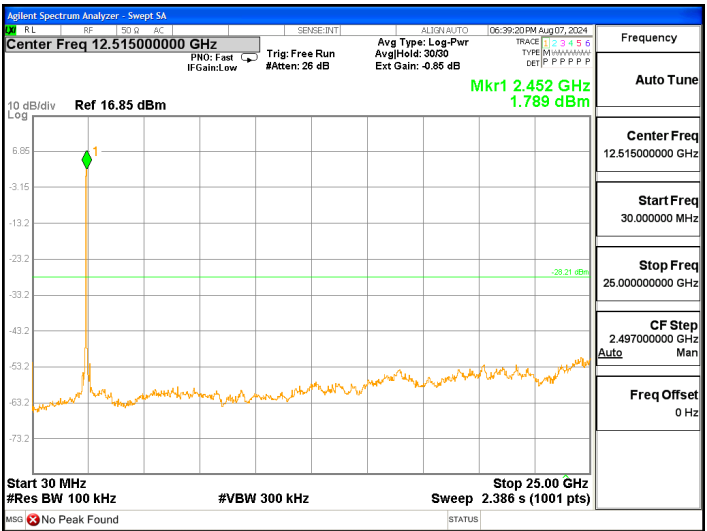
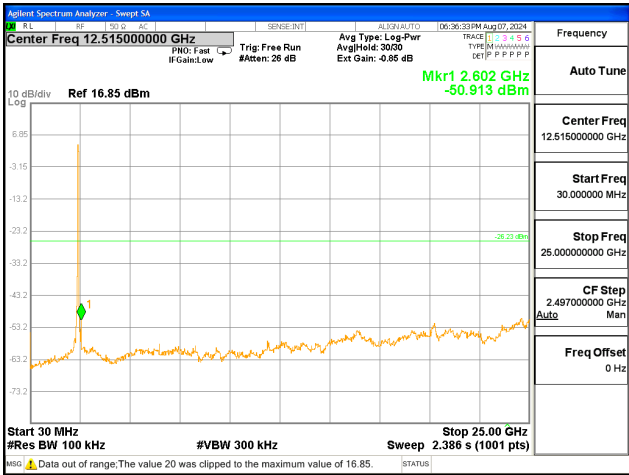
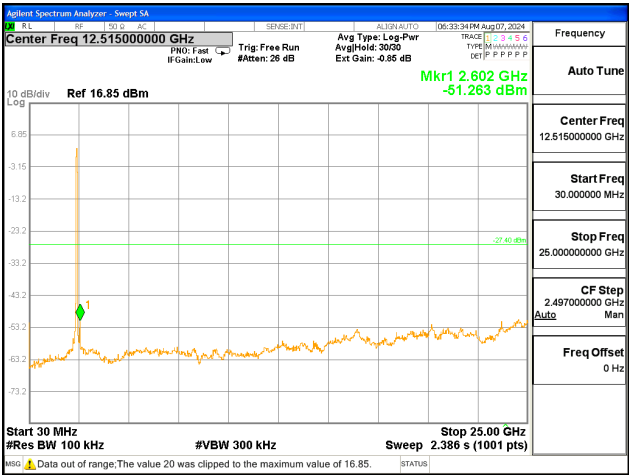
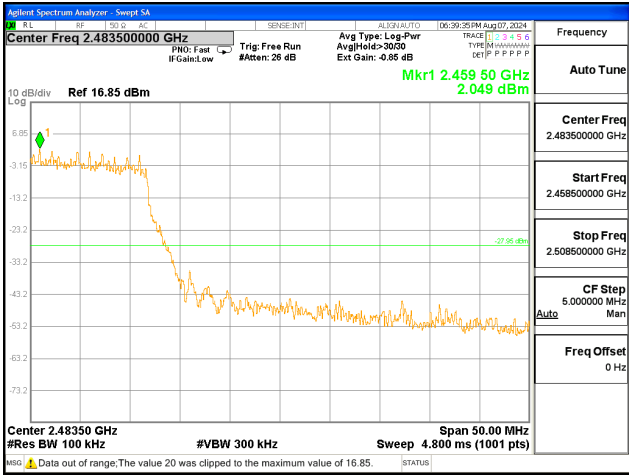
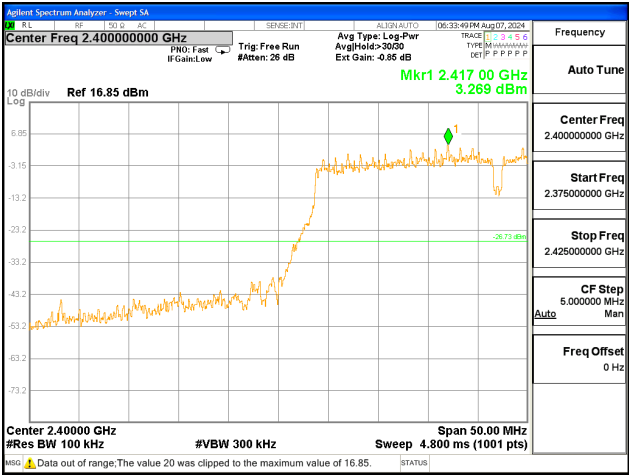


ANT1, 802.11n_HT40



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ANT2, 802.11n_HT40

4.5 Radiated Emission

Test Location

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

Test Procedures

KDB 558074 - Section 8.5, 8.6
ANSI C63.10-2013 - Section 11.11, 11.12
RSS-Gen - Section 6.13

- 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 $\geq$ RBW
c) Detector = CISPR Quasi-peak
d) Sweep time = auto couple

- Peak

Frequency Range = 1 GHz ~ 25 GHz (2.4 GHz 10th harmonic)

- a) RBW = 1 MHz
b) VBW $\geq 3 \times$ RBW
c) Detector = Peak
d) Sweep time = auto
e) Trace mode = max hold

- Average (duty cycle $\geq 98\%$)

Frequency Range = 1 GHz ~ 25 GHz (2.4 GHz 10th harmonic)

- a) RBW = 1 MHz
b) VBW $\geq 3 \times$ 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%, duty cycle variations are less than $\pm 2\%$)

Frequency Range = 1 GHz ~ 25 GHz (2.4 GHz 10th harmonic)

a) RBW = 1 MHz

b) VBW $\geq 3 \times$ RBW

c) Detector = RMS

d) Sweep time = auto

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

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

A correction factor shall be added to the measurement results prior to comparing to the emission limit in order to compute the emission level that would have been measured had the test been performed at 100 % duty cycle.

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
802.11b	0.20 dB
802.11g	0.16 dB
802.11n_HT20	0.17 dB
802.11n_HT40	0.32 dB

Limit :

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 in 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.

FCC Part 15 § 15.209 (a) Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table :

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.

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)

We have done all test mode.

The worst-case antenna configuration and Test mode are determined to be as follows.

802.11b mode : ANT1, ANT2

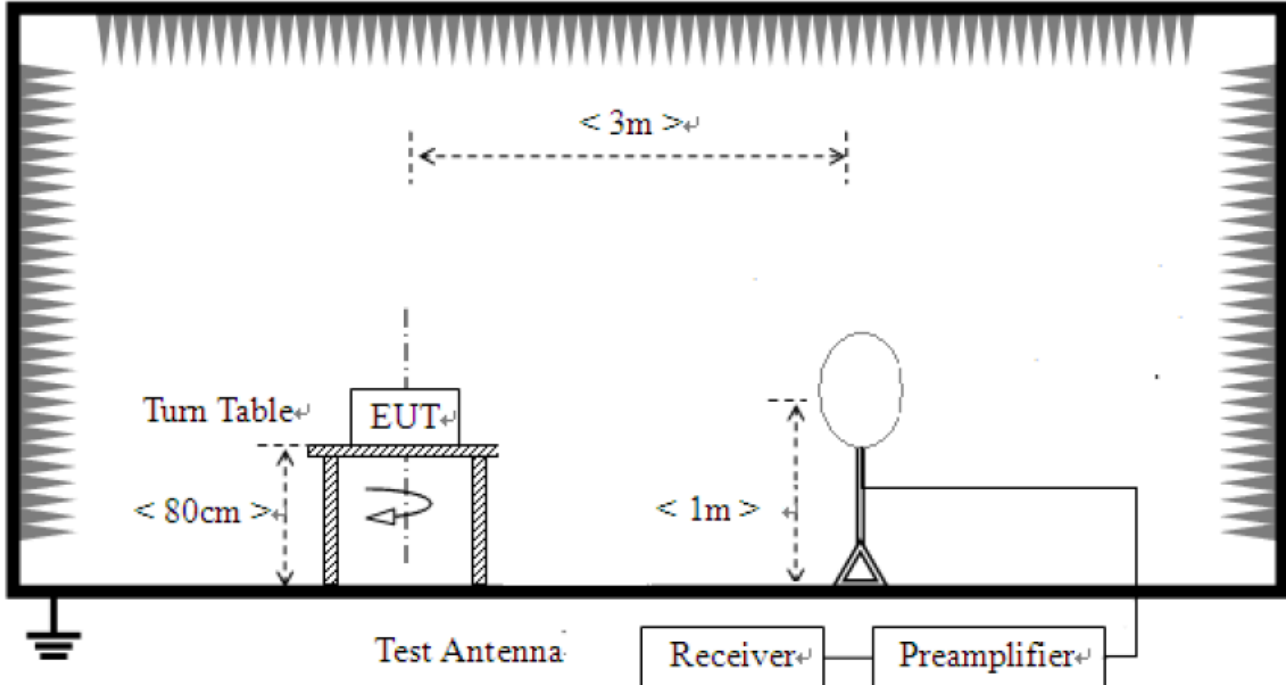
802.11g mode : ANT1, ANT2

802.11n mode : ANT1 + ANT2 (MIMO)

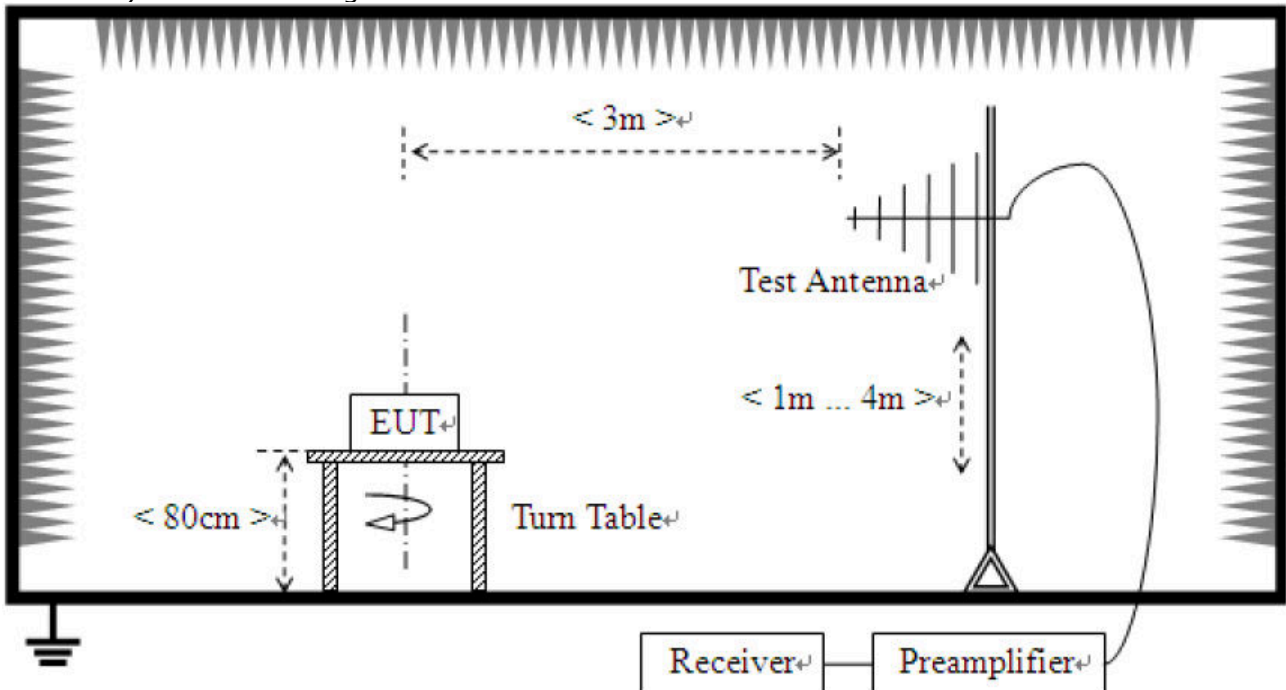
So the results are only attached worst cases.

Test Setup:

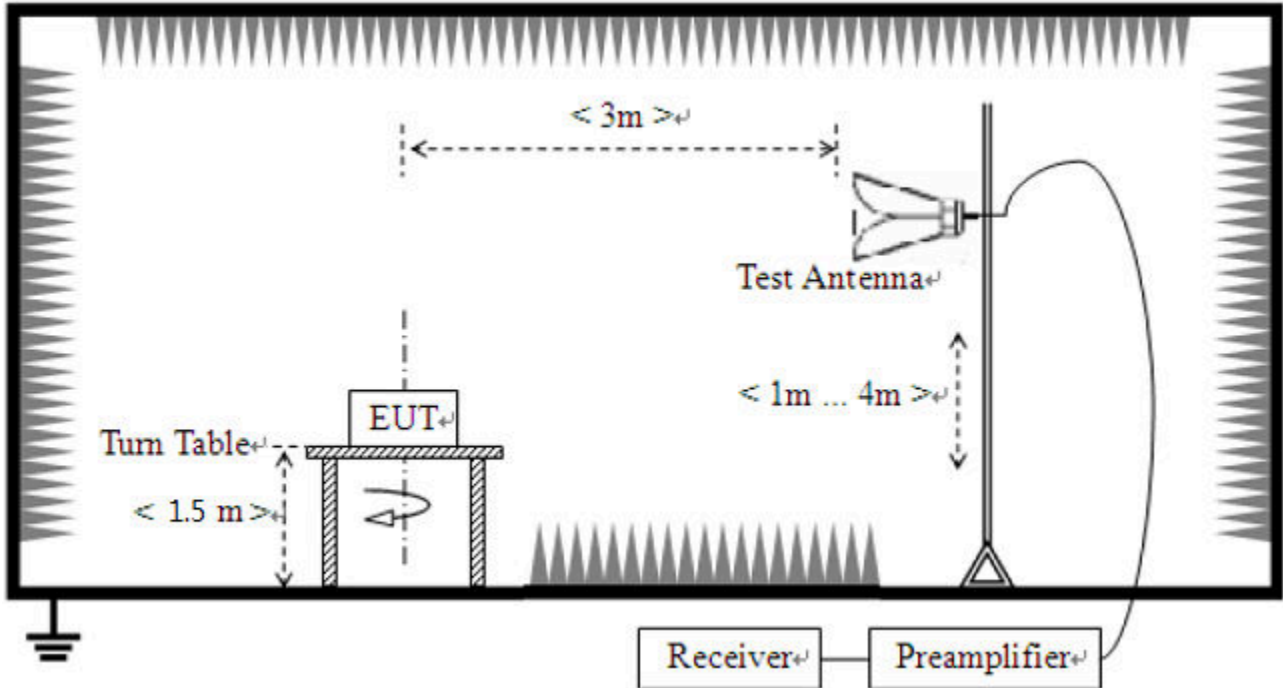
- 1) For field strength of emissions from 9 kHz to 30 MHz



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



3) For field strength of emissions above 1 GHz



Test results

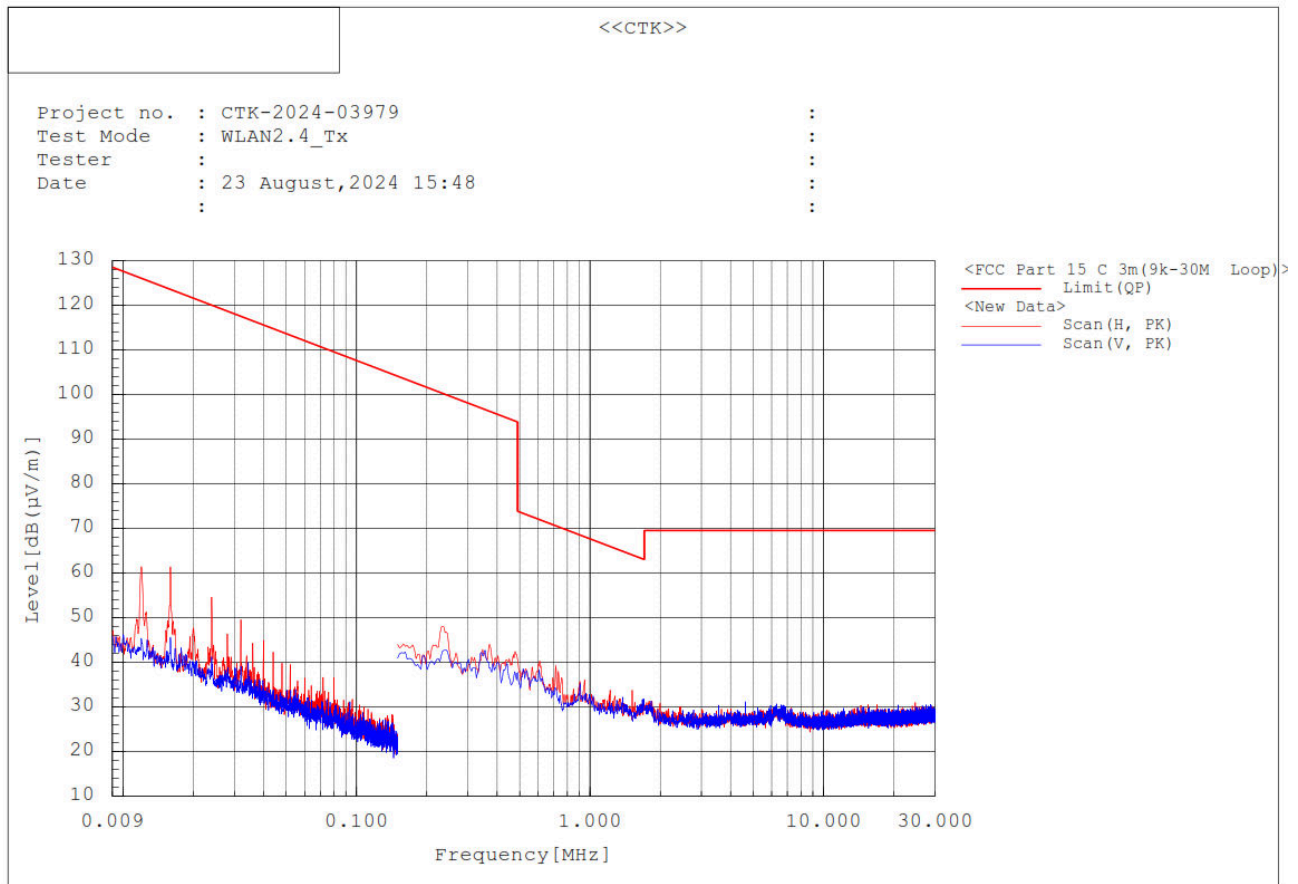
1) 9 kHz to 30 MHz

Test mode : Transmitter (Worst Case)

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 :

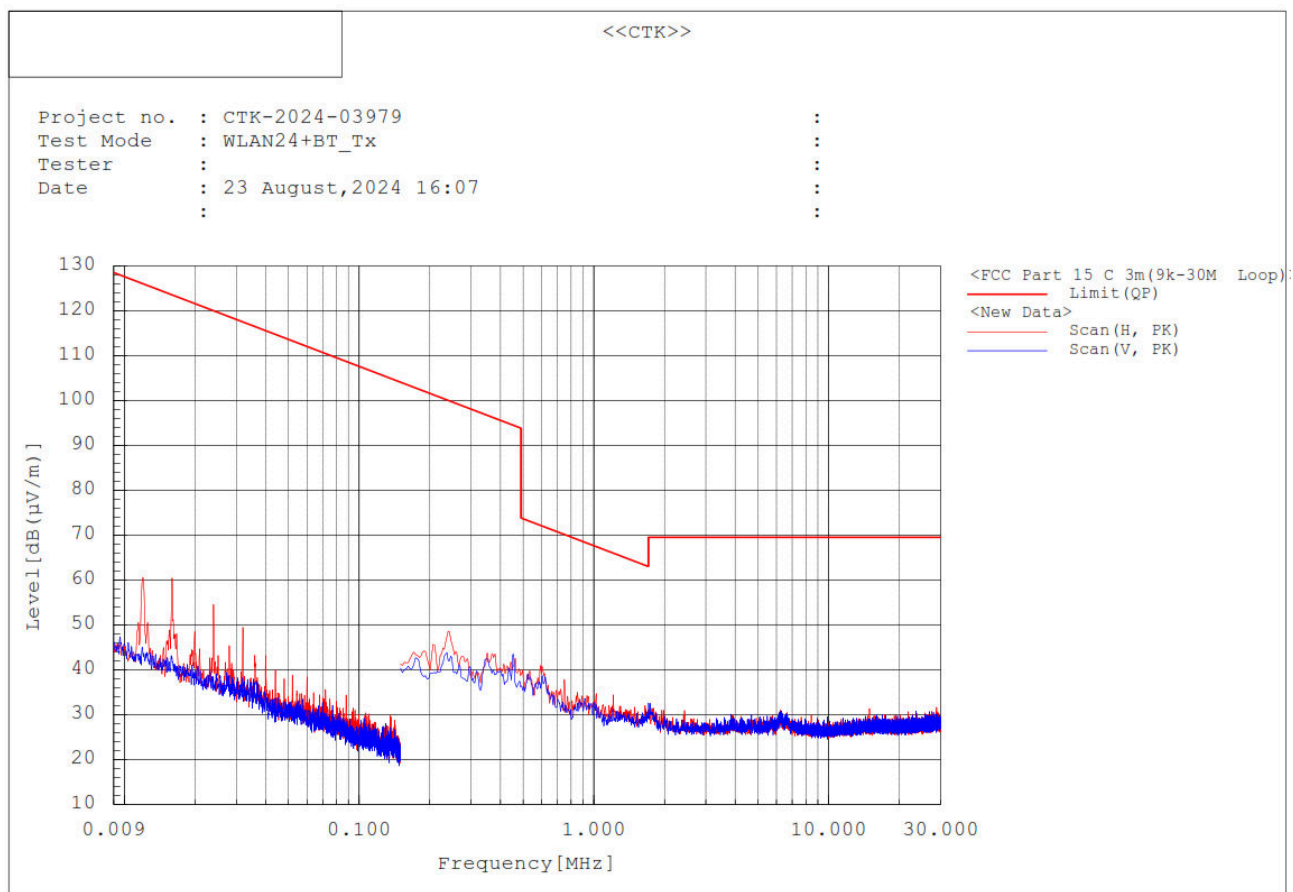
- The unwanted emission was measured in the following position: EUT stand-up position(Z axis), lie-down position(X,Y axis). The worst emission was found in lie-down position(X axis) and the worst case was recorded.
- Result = Reading + c.f(Correction factor)
- Correction factor = Antenna factor + Cable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

Test mode : Transmitter (simultaneous transmissions DSS + DTS)

The requirements are:

☒ Complies

Test Data



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

Remark :

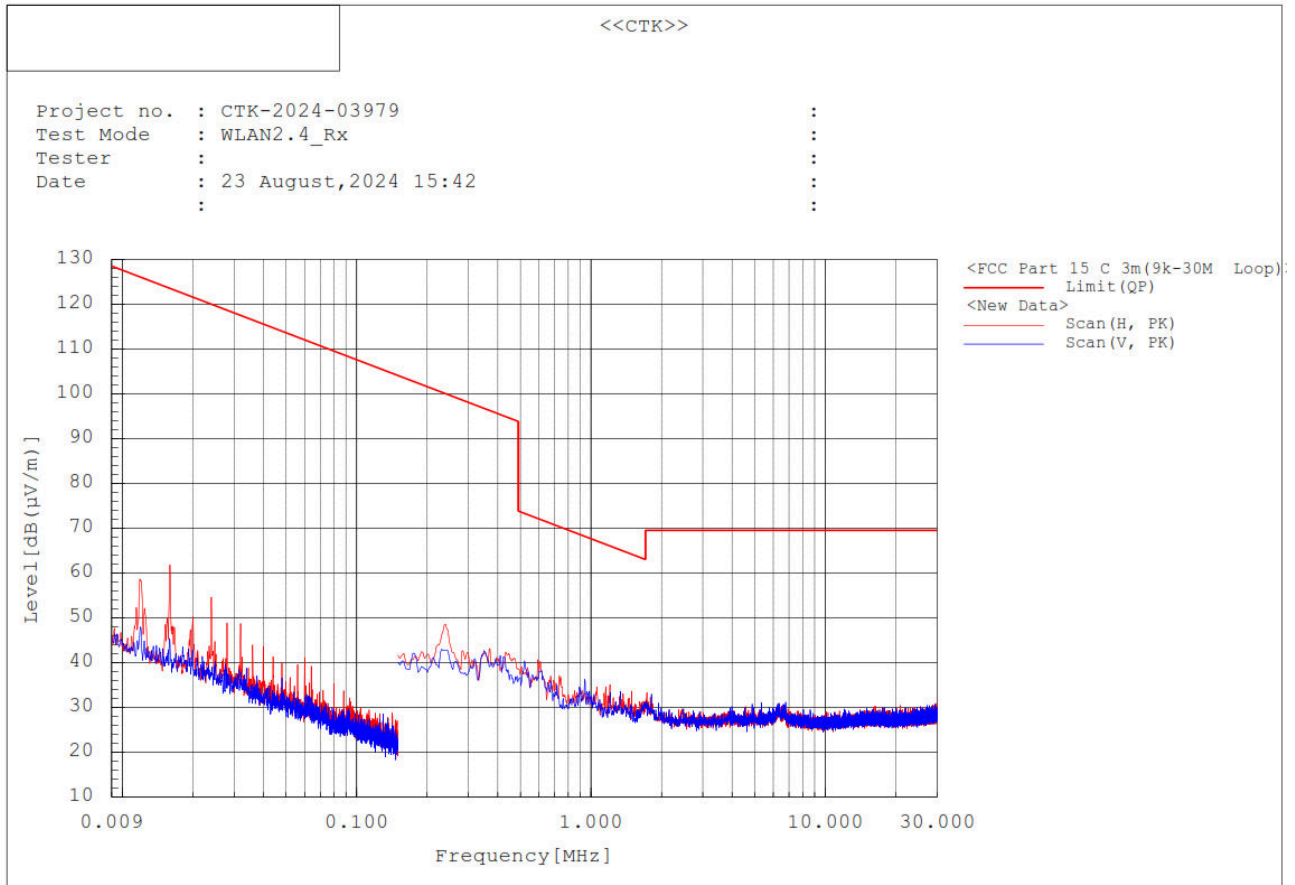
1. The unwanted emission was measured in the following position: EUT stand-up position(Z axis), lie-down position(X,Y axis). The worst emission was found in lie-down position(X axis) and the worst case was recorded.
2. Result = Reading + c.f(Correction factor)
3. Correction factor = Antenna factor +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

Test mode : Receiver (Worst Case)

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 position(X,Y axis). The worst emission was found in lie-down position(X 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. This data is the Peak(PK) value.

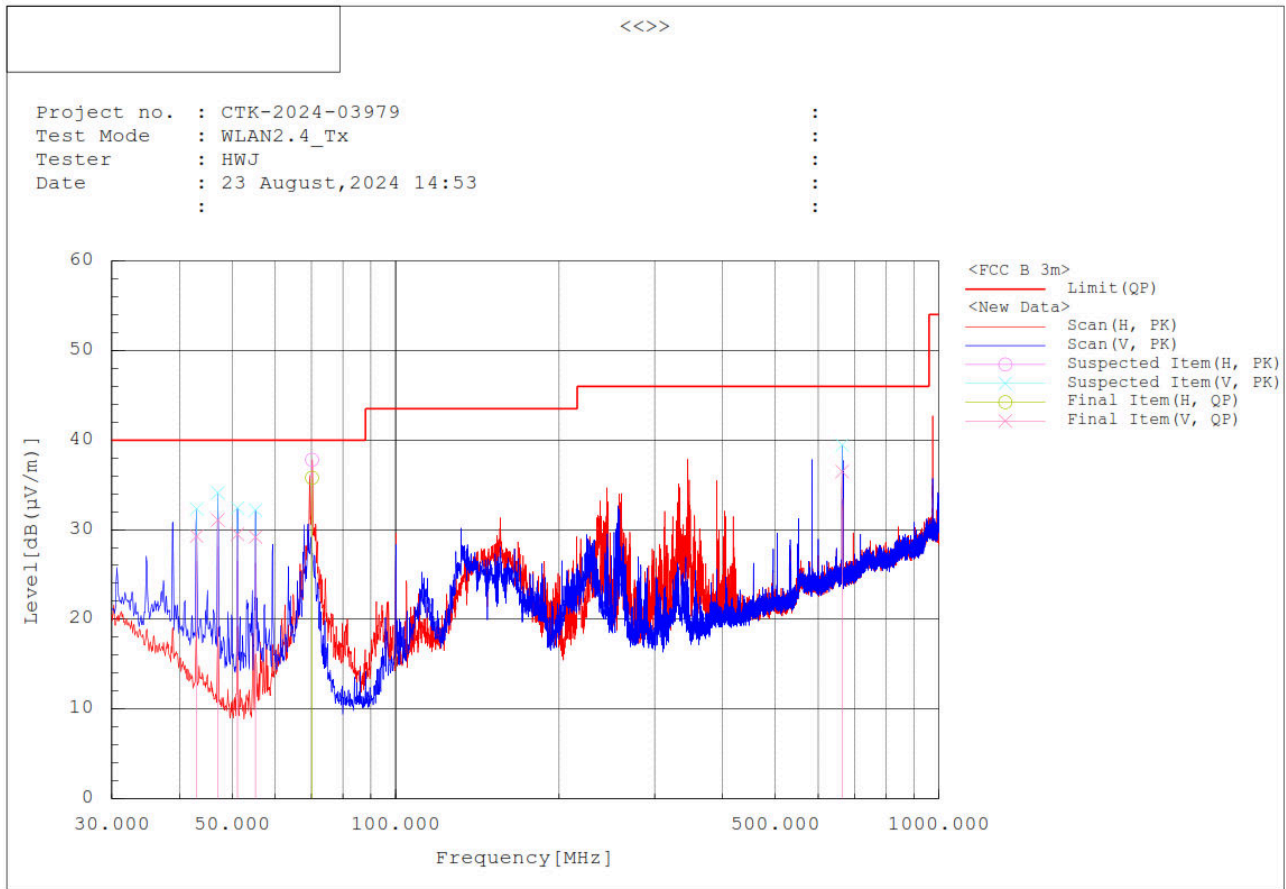
2) 30 MHz to 1 GHz

Test mode : Transmitter (Worst Case)

The requirements are:

☒ Complies

Test Data



Final Result

No.	Frequency [MHz]	Pol	Reading [dB (μV)]	c.f [dB (1/m)]	Result [dB (μV/m)]	Limit [dB (μV/m)]	Margin [dB]	Height [cm]	Angle [deg]
1	42.998	V	42.9	-13.6	29.3	40.0	10.7	100.0	261.8
2	47.072	V	47.1	-16.0	31.1	40.0	8.9	100.0	40.7
3	51.146	V	47.7	-18.2	29.5	40.0	10.5	100.0	2.6
4	55.220	V	48.3	-19.1	29.2	40.0	10.8	100.0	359.5
5	70.158	H	54.4	-18.6	35.8	40.0	4.2	300.0	359.4
6	664.089	V	37.7	-1.2	36.5	46.0	9.5	100.0	231.6

Remark :

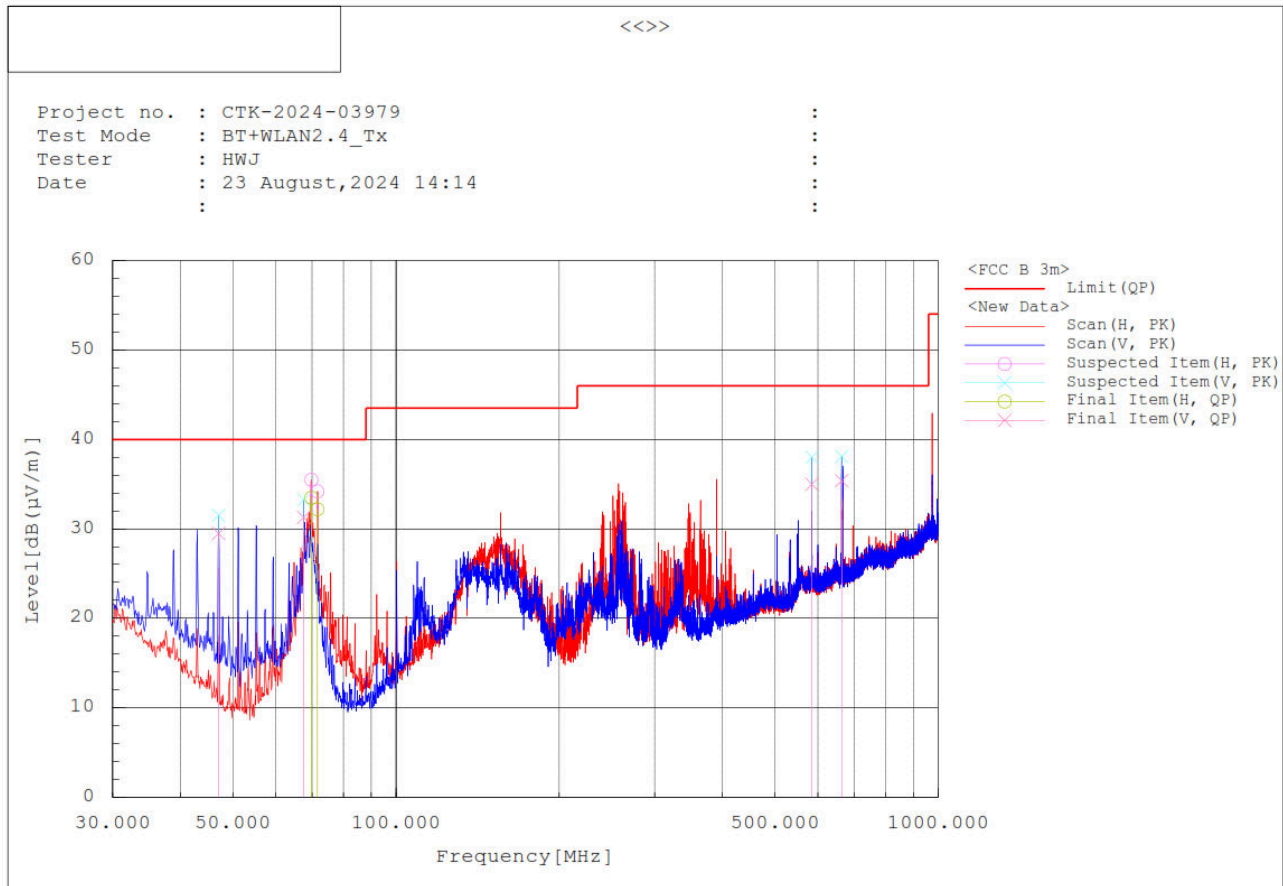
- The unwanted emission was measured in the following position: EUT stand-up position(Z axis), lie-down position(X,Y axis). The worst emission was found in lie-down position(X axis) and the worst case was recorded.
- Result = Reading + c.f(Correction factor)
- Correction factor = Antenna factor + Cable loss + 6 dB attenuator - Amp Gain

Test mode : Transmitter (simultaneous transmissions DSS + DTS)

The requirements are:

☒ Complies

Test Data



Final Result

No.	Frequency [MHz]	Pol	Reading QP [dB (μV)]	c.f [dB (1/m)]	Result QP [dB (μV/m)]	Limit QP [dB (μV/m)]	Margin QP [dB]	Height [cm]	Angle [deg]
1	47.072	V	45.5	-16.0	29.5	40.0	10.5	100.0	0.7
2	67.539	V	50.3	-19.0	31.3	40.0	8.7	100.0	335.7
3	69.770	H	52.2	-18.7	33.5	40.0	6.5	199.9	0.5
4	71.613	H	50.9	-18.7	32.2	40.0	7.8	400.1	236.2
5	585.034	V	37.1	-2.1	35.0	46.0	11.0	100.0	60.6
6	663.798	V	36.6	-1.2	35.4	46.0	10.6	100.0	0.0

Remark :

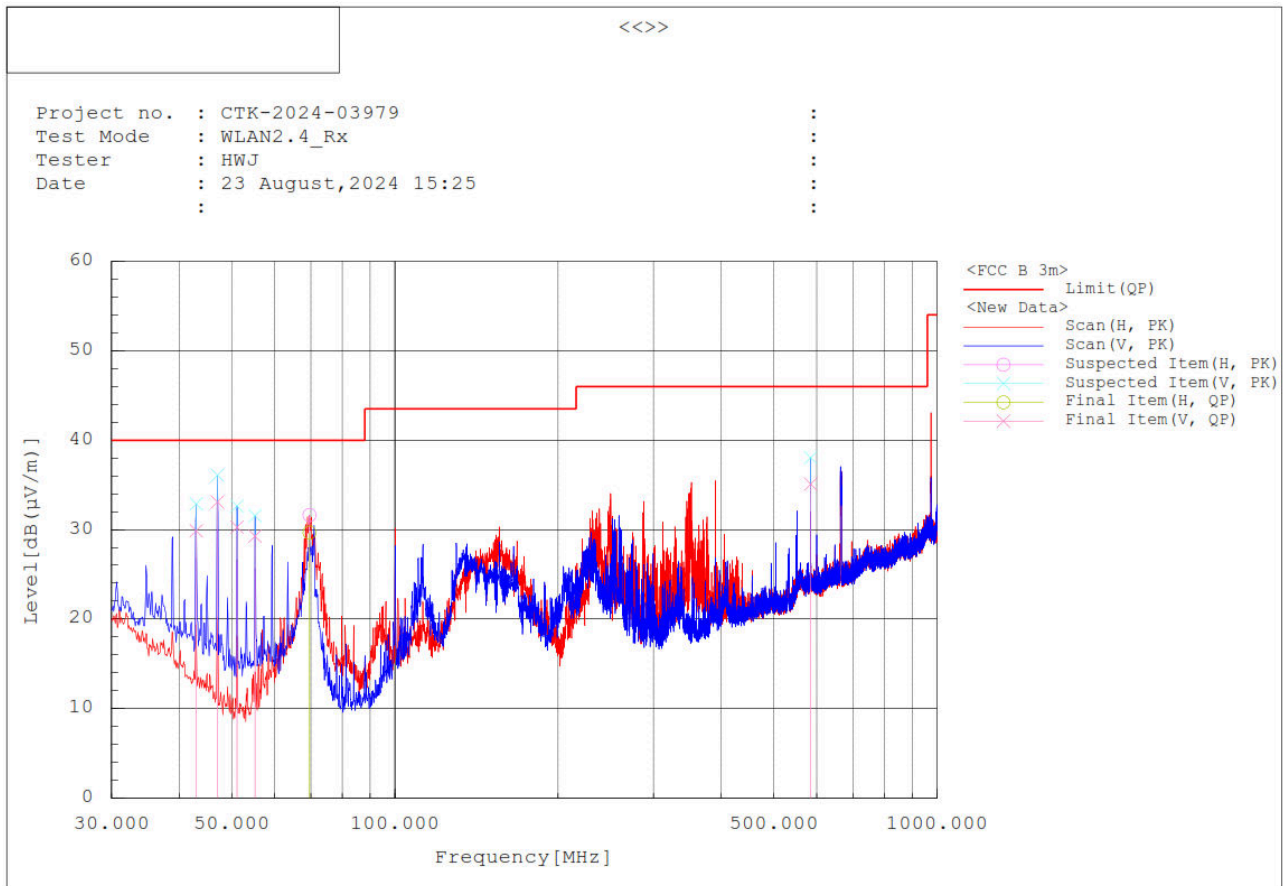
- The unwanted emission was measured in the following position: EUT stand-up position(Z axis), lie-down position(X,Y axis). The worst emission was found in lie-down position(X axis) and the worst case was recorded.
- Result = Reading + c.f(Correction factor)
- Correction factor = Antenna factor + Cable loss + 6 dB attenuator - Amp Gain

Test mode : Receiver (Worst Case)

The requirements are:

☒ Complies

Test Data



Final Result

No.	Frequency [MHz]	Pol	Reading QP [dB (μV)]	c.f [dB (1/m)]	Result QP [dB (μV/m)]	Limit QP [dB (μV/m)]	Margin QP [dB]	Height [cm]	Angle [deg]
1	42.998	V	43.5	-13.6	29.9	40.0	10.1	100.0	1.0
2	47.072	V	49.1	-16.0	33.1	40.0	6.9	100.0	63.0
3	51.146	V	48.5	-18.2	30.3	40.0	9.7	100.0	0.2
4	55.220	V	48.4	-19.1	29.3	40.0	10.7	100.0	1.0
5	69.576	H	48.4	-18.7	29.7	40.0	10.3	399.9	0.8
6	585.034	V	37.2	-2.1	35.1	46.0	10.9	100.0	66.7

Remark :

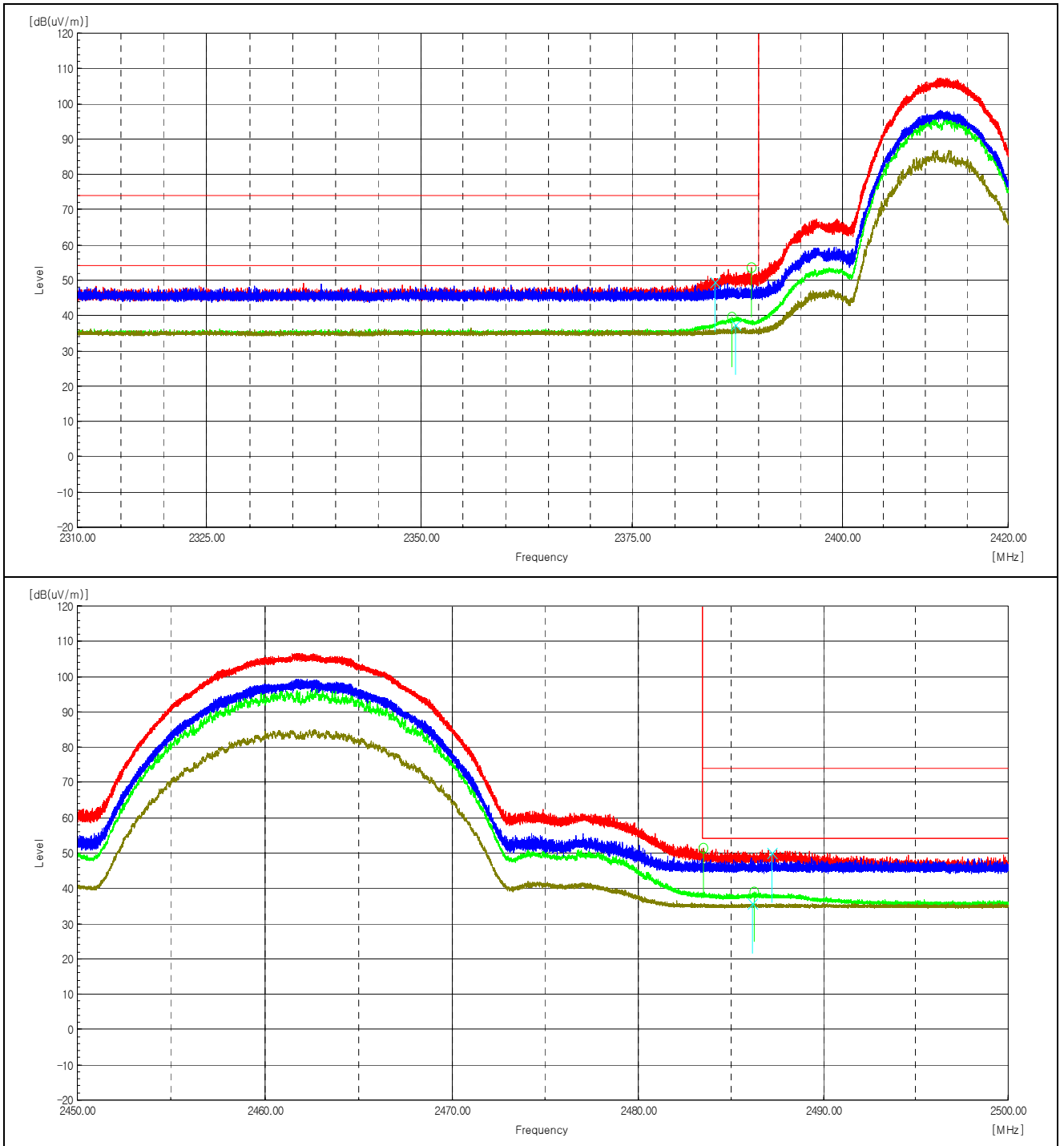
1. The unwanted emission was measured in the following position: EUT stand-up position(Z axis), lie-down position(X,Y axis). The worst emission was found in lie-down position(X axis) and the worst case was recorded.
2. Result = Reading + c.f(Correction factor)
3. Correction factor = Antenna factor +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

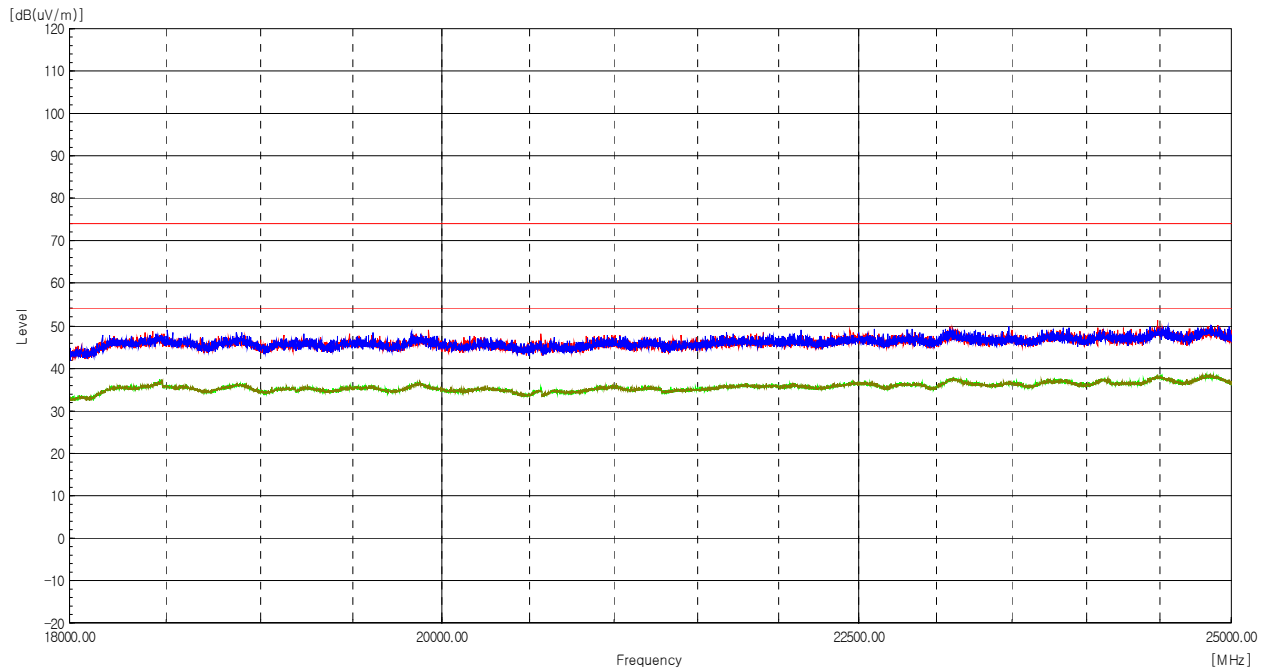
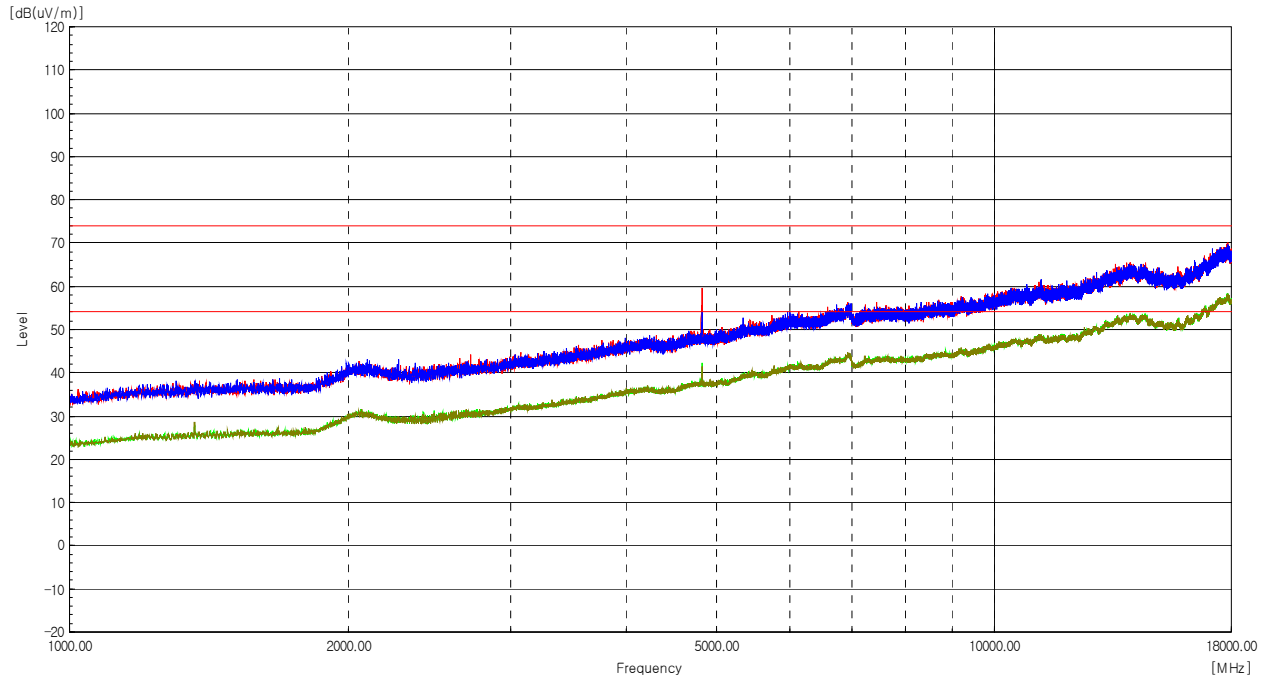
3) above 1 GHz

The requirements are:

☒ Complies

Test Data





Test mode : Transmitter (802.11b, ANT1)

Lowest channel (2 412 MHz)

Frequency [MHz]	(P)	Reading [dBuV]	c.f [dB(1/m)]	Duty Cycle Factor [dB]	Level PK [dB(uV/m)]	Level AV [dB(uV/m)]	Limit PK [dB(uV/m)]	Limit AV [dB(uV/m)]	Margin PK [dB]	Margin AV [dB]
2 389.15	H	59.5	-5.8	-----	53.7	-----	74.0	-----	20.3	-----
2 386.85	H	45.3	-5.8	0.2	-----	39.7	-----	54.0	-----	14.3
2 384.86	V	55.1	-5.8	-----	49.3	-----	74.0	-----	24.7	-----
2 387.28	V	43.0	-5.8	0.2	-----	37.4	-----	54.0	-----	16.6
4 824.14	H	57.7	2.2	-----	59.9	-----	74.0	-----	14.1	-----
4 823.88	H	42.2	2.2	0.2	-----	44.6	-----	54.0	-----	9.4
4 823.91	V	53.9	2.2	-----	56.1	-----	74.0	-----	17.9	-----
4 824.11	V	41.2	2.2	0.2	-----	43.6	-----	54.0	-----	10.4

Middle channel (2 437 MHz)

Frequency [MHz]	(P)	Reading [dBuV]	c.f [dB(1/m)]	Duty Cycle Factor [dB]	Level PK [dB(uV/m)]	Level AV [dB(uV/m)]	Limit PK [dB(uV/m)]	Limit AV [dB(uV/m)]	Margin PK [dB]	Margin AV [dB]
4 874.02	H	54.9	2.4	-----	57.3	-----	74.0	-----	16.7	-----
4 873.70	H	40.5	2.4	0.2	-----	43.1	-----	54.0	-----	10.9
4 873.92	V	53.3	2.4	-----	55.7	-----	74.0	-----	18.3	-----
4 873.99	V	40.4	2.4	0.2	-----	43.0	-----	54.0	-----	11.0

Highest channel (2 462 MHz)

Frequency [MHz]	(P)	Reading [dBuV]	c.f [dB(1/m)]	Duty Cycle Factor [dB]	Level PK [dB(uV/m)]	Level AV [dB(uV/m)]	Limit PK [dB(uV/m)]	Limit AV [dB(uV/m)]	Margin PK [dB]	Margin AV [dB]
2 483.54	H	56.7	-5.3	-----	51.4	-----	74.0	-----	22.6	-----
2 486.26	H	44.1	-5.2	0.2	-----	39.1	-----	54.0	-----	14.9
2 487.21	V	55.2	-5.2	-----	50.0	-----	74.0	-----	24.0	-----
2 486.15	V	41.0	-5.2	0.2	-----	36.0	-----	54.0	-----	18.0
4 923.91	H	51.7	2.7	-----	54.4	-----	74.0	-----	19.6	-----
4 924.03	H	39.8	2.7	0.2	-----	42.7	-----	54.0	-----	11.3
4 923.77	V	52.6	2.7	-----	55.3	-----	74.0	-----	18.7	-----
4 923.82	V	39.5	2.7	0.2	-----	42.4	-----	54.0	-----	11.6

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 lie-down position(X 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

Test mode : Transmitter (802.11b, ANT2)

Lowest channel (2 412 MHz)

Frequency [MHz]	(P)	Reading [dBuV]	c.f [dB(1/m)]	Duty Cycle Factor [dB]	Level PK [dB(uV/m)]	Level AV [dB(uV/m)]	Limit PK [dB(uV/m)]	Limit AV [dB(uV/m)]	Margin PK [dB]	Margin AV [dB]
2 386.32	H	60.9	-5.8	-----	55.1	-----	74.0	-----	18.9	-----
2 387.28	H	47.5	-5.8	0.2	-----	41.9	-----	54.0	-----	12.1
2 386.21	V	56.3	-5.8	-----	50.5	-----	74.0	-----	23.5	-----
2 387.05	V	43.5	-5.8	0.2	-----	37.9	-----	54.0	-----	16.1
4 823.95	H	54.5	2.2	-----	56.7	-----	74.0	-----	17.3	-----
4 823.90	H	40.2	2.2	0.2	-----	42.6	-----	54.0	-----	11.4
4 824.06	V	51.1	2.2	-----	53.3	-----	74.0	-----	20.7	-----
4 823.83	V	39.4	2.2	0.2	-----	41.8	-----	54.0	-----	12.2

Middle channel (2 437 MHz)

Frequency [MHz]	(P)	Reading [dBuV]	c.f [dB(1/m)]	Duty Cycle Factor [dB]	Level PK [dB(uV/m)]	Level AV [dB(uV/m)]	Limit PK [dB(uV/m)]	Limit AV [dB(uV/m)]	Margin PK [dB]	Margin AV [dB]
4 873.85	H	53.8	2.4	-----	56.2	-----	74.0	-----	17.8	-----
4 873.87	H	39.4	2.4	0.2	-----	42.0	-----	54.0	-----	12.0
4 874.08	V	50.5	2.4	-----	52.9	-----	74.0	-----	21.1	-----
4 874.20	V	37.9	2.4	0.2	-----	40.5	-----	54.0	-----	13.5

Highest channel (2 462 MHz)

Frequency [MHz]	(P)	Reading [dBuV]	c.f [dB(1/m)]	Duty Cycle Factor [dB]	Level PK [dB(uV/m)]	Level AV [dB(uV/m)]	Limit PK [dB(uV/m)]	Limit AV [dB(uV/m)]	Margin PK [dB]	Margin AV [dB]
2 484.05	H	56.2	-5.3	-----	50.9	-----	74.0	-----	23.1	-----
2 486.70	H	43.7	-5.2	0.2	-----	38.7	-----	54.0	-----	15.3
2 492.89	V	54.0	-5.2	-----	48.8	-----	74.0	-----	25.2	-----
2 488.00	V	41.5	-5.2	0.2	-----	36.5	-----	54.0	-----	17.5
4 923.72	H	52.8	2.7	-----	55.5	-----	74.0	-----	18.5	-----
4 924.00	H	38.6	2.7	0.2	-----	41.5	-----	54.0	-----	12.5
4 923.85	V	50.1	2.7	-----	52.8	-----	74.0	-----	21.2	-----
4 923.92	V	36.8	2.7	0.2	-----	39.7	-----	54.0	-----	14.3

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 lie-down position(X 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

Test mode : Transmitter (802.11g, ANT1)

Lowest channel (2 412 MHz)

Frequency [MHz]	(P)	Reading [dBuV]	c.f [dB(1/m)]	Duty Cycle Factor [dB]	Level PK [dB(uV/m)]	Level AV [dB(uV/m)]	Limit PK [dB(uV/m)]	Limit AV [dB(uV/m)]	Margin PK [dB]	Margin AV [dB]
2 389.56	H	70.9	-5.8	-----	65.1	-----	74.0	-----	8.9	-----
2 389.86	H	51.6	-5.8	0.2	-----	46.0	-----	54.0	-----	8.0
2 389.89	V	61.1	-5.8	-----	55.3	-----	74.0	-----	18.7	-----
2 389.60	V	45.8	-5.8	0.2	-----	40.2	-----	54.0	-----	13.8
4 825.63	H	55.2	2.2	-----	57.4	-----	74.0	-----	16.6	-----
4 821.36	H	39.5	2.2	0.2	-----	41.9	-----	54.0	-----	12.1
4 824.13	V	51.2	2.2	-----	53.4	-----	74.0	-----	20.6	-----
4 825.62	V	37.4	2.2	0.2	-----	39.8	-----	54.0	-----	14.2

Middle channel (2 437 MHz)

Frequency [MHz]	(P)	Reading [dBuV]	c.f [dB(1/m)]	Duty Cycle Factor [dB]	Level PK [dB(uV/m)]	Level AV [dB(uV/m)]	Limit PK [dB(uV/m)]	Limit AV [dB(uV/m)]	Margin PK [dB]	Margin AV [dB]
4 871.35	H	51.7	2.4	-----	54.1	-----	74.0	-----	19.9	-----
4 871.12	H	37.6	2.4	0.2	-----	40.2	-----	54.0	-----	13.8
4 874.77	V	50.2	2.4	-----	52.6	-----	74.0	-----	21.4	-----
4 879.73	V	37.3	2.5	0.2	-----	40.0	-----	54.0	-----	14.0

Highest channel (2 462 MHz)

Frequency [MHz]	(P)	Reading [dBuV]	c.f [dB(1/m)]	Duty Cycle Factor [dB]	Level PK [dB(uV/m)]	Level AV [dB(uV/m)]	Limit PK [dB(uV/m)]	Limit AV [dB(uV/m)]	Margin PK [dB]	Margin AV [dB]
2 483.82	H	69.7	-5.3	-----	64.4	-----	74.0	-----	9.6	-----
2 483.72	H	51.2	-5.3	0.2	-----	46.1	-----	54.0	-----	7.9
2 484.83	V	63.2	-5.3	-----	57.9	-----	74.0	-----	16.1	-----
2 483.50	V	43.7	-5.3	0.2	-----	38.6	-----	54.0	-----	15.4
4 932.89	H	50.1	2.7	-----	52.8	-----	74.0	-----	21.2	-----
4 921.12	H	36.3	2.7	0.2	-----	39.2	-----	54.0	-----	14.8
4 925.08	V	50.2	2.7	-----	52.9	-----	74.0	-----	21.1	-----
4 926.44	V	37.2	2.7	0.2	-----	40.1	-----	54.0	-----	13.9

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 lie-down position(X 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

Test mode : Transmitter (802.11g, ANT2)

Lowest channel (2 412 MHz)

Frequency [MHz]	(P)	Reading [dBuV]	c.f [dB(1/m)]	Duty Cycle Factor [dB]	Level PK [dB(uV/m)]	Level AV [dB(uV/m)]	Limit PK [dB(uV/m)]	Limit AV [dB(uV/m)]	Margin PK [dB]	Margin AV [dB]
2 388.38	H	76.5	-5.8	-----	70.7	-----	74.0	-----	3.3	-----
2 389.70	H	54.6	-5.8	0.2	-----	49.0	-----	54.0	-----	5.0
2 388.76	V	69.2	-5.8	-----	63.4	-----	74.0	-----	10.6	-----
2 389.86	V	50.0	-5.8	0.2	-----	44.4	-----	54.0	-----	9.6
4 825.63	H	52.9	2.2	-----	55.1	-----	74.0	-----	18.9	-----
4 825.73	H	37.6	2.2	0.2	-----	40.0	-----	54.0	-----	14.0
4 818.51	V	49.0	2.2	-----	51.2	-----	74.0	-----	22.8	-----
4 825.55	V	37.8	2.2	0.2	-----	40.2	-----	54.0	-----	13.8

Middle channel (2 437 MHz)

Frequency [MHz]	(P)	Reading [dBuV]	c.f [dB(1/m)]	Duty Cycle Factor [dB]	Level PK [dB(uV/m)]	Level AV [dB(uV/m)]	Limit PK [dB(uV/m)]	Limit AV [dB(uV/m)]	Margin PK [dB]	Margin AV [dB]
4 880.67	H	52.8	2.5	-----	55.3	-----	74.0	-----	18.7	-----
4 875.69	H	37.3	2.5	0.2	-----	40.0	-----	54.0	-----	14.0
4 874.21	V	49.5	2.4	-----	51.9	-----	74.0	-----	22.1	-----
4 810.67	V	37.0	2.2	0.2	-----	39.4	-----	54.0	-----	14.6

Highest channel (2 462 MHz)

Frequency [MHz]	(P)	Reading [dBuV]	c.f [dB(1/m)]	Duty Cycle Factor [dB]	Level PK [dB(uV/m)]	Level AV [dB(uV/m)]	Limit PK [dB(uV/m)]	Limit AV [dB(uV/m)]	Margin PK [dB]	Margin AV [dB]
2 483.59	H	68.4	-5.3	-----	63.1	-----	74.0	-----	10.9	-----
2 483.60	H	49.7	-5.3	0.2	-----	44.6	-----	54.0	-----	9.4
2 483.55	V	63.5	-5.3	-----	58.2	-----	74.0	-----	15.8	-----
2 483.56	V	44.3	-5.3	0.2	-----	39.2	-----	54.0	-----	14.8
4 922.97	H	54.0	2.7	-----	56.7	-----	74.0	-----	17.3	-----
4 925.80	H	37.5	2.7	0.2	-----	40.4	-----	54.0	-----	13.6
4 919.76	V	49.2	2.7	-----	51.9	-----	74.0	-----	22.1	-----
4 921.76	V	36.5	2.7	0.2	-----	39.4	-----	54.0	-----	14.6

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 lie-down position(X 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

Test mode : Transmitter (802.11n_HT20)

Lowest channel (2 412 MHz)

Frequency [MHz]	(P)	Reading [dBuV]	c.f [dB(1/m)]	Duty Cycle Factor [dB]	Level PK [dB(uV/m)]	Level AV [dB(uV/m)]	Limit PK [dB(uV/m)]	Limit AV [dB(uV/m)]	Margin PK [dB]	Margin AV [dB]
2 389.05	H	74.7	-5.8	-----	68.9	-----	74.0	-----	5.1	-----
2 389.92	H	51.8	-5.8	0.2	-----	46.2	-----	54.0	-----	7.8
2 389.38	V	67.0	-5.8	-----	61.2	-----	74.0	-----	12.8	-----
2 389.76	V	46.9	-5.8	0.2	-----	41.3	-----	54.0	-----	12.7
4 824.47	H	57.3	2.2	-----	59.5	-----	74.0	-----	14.5	-----
4 824.20	H	39.6	2.2	0.2	-----	42.0	-----	54.0	-----	12.0
4 824.37	V	51.9	2.2	-----	54.1	-----	74.0	-----	19.9	-----
4 823.79	V	37.0	2.2	0.2	-----	39.4	-----	54.0	-----	14.6

Middle channel (2 437 MHz)

Frequency [MHz]	(P)	Reading [dBuV]	c.f [dB(1/m)]	Duty Cycle Factor [dB]	Level PK [dB(uV/m)]	Level AV [dB(uV/m)]	Limit PK [dB(uV/m)]	Limit AV [dB(uV/m)]	Margin PK [dB]	Margin AV [dB]
4 869.27	H	54.0	2.4	-----	56.4	-----	74.0	-----	17.6	-----
4 873.91	H	37.7	2.4	0.2	-----	40.3	-----	54.0	-----	13.7
4 871.33	V	50.6	2.4	-----	53.0	-----	74.0	-----	21.0	-----
4 874.28	V	37.5	2.4	0.2	-----	40.1	-----	54.0	-----	13.9

Highest channel (2 462 MHz)

Frequency [MHz]	(P)	Reading [dBuV]	c.f [dB(1/m)]	Duty Cycle Factor [dB]	Level PK [dB(uV/m)]	Level AV [dB(uV/m)]	Limit PK [dB(uV/m)]	Limit AV [dB(uV/m)]	Margin PK [dB]	Margin AV [dB]
2 485.62	H	72.2	-5.2	-----	67.0	-----	74.0	-----	7.0	-----
2 483.59	H	52.5	-5.3	0.2	-----	47.4	-----	54.0	-----	6.6
2 485.43	V	66.2	-5.3	-----	60.9	-----	74.0	-----	13.1	-----
2 483.57	V	44.1	-5.3	0.2	-----	39.0	-----	54.0	-----	15.0
4 918.83	H	50.1	2.7	-----	52.8	-----	74.0	-----	21.2	-----
4 922.09	H	36.6	2.7	0.2	-----	39.5	-----	54.0	-----	14.5
4 919.99	V	50.3	2.7	-----	53.0	-----	74.0	-----	21.0	-----
4 926.23	V	37.0	2.7	0.2	-----	39.9	-----	54.0	-----	14.1

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 lie-down position(X 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

Test mode : Transmitter (802.11n_HT40)

Lowest channel (2 422 MHz)

Frequency [MHz]	(P)	Reading [dBuV]	c.f [dB(1/m)]	Duty Cycle Factor [dB]	Level PK [dB(uV/m)]	Level AV [dB(uV/m)]	Limit PK [dB(uV/m)]	Limit AV [dB(uV/m)]	Margin PK [dB]	Margin AV [dB]
2 389.34	H	75.8	-5.8	-----	70.0	-----	74.0	-----	4.0	-----
2 389.18	H	55.3	-5.8	0.3	-----	49.8	-----	54.0	-----	4.2
2 386.76	V	67.5	-5.8	-----	61.7	-----	74.0	-----	12.3	-----
2 389.30	V	50.8	-5.8	0.3	-----	45.3	-----	54.0	-----	8.7
4 846.72	H	52.9	2.2	-----	55.1	-----	74.0	-----	18.9	-----
4 844.52	H	37.7	2.2	0.3	-----	40.2	-----	54.0	-----	13.8
4 821.90	V	49.3	2.2	-----	51.5	-----	74.0	-----	22.5	-----
4 825.00	V	36.9	2.2	0.3	-----	39.4	-----	54.0	-----	14.6

Middle channel (2 437 MHz)

Frequency [MHz]	(P)	Reading [dBuV]	c.f [dB(1/m)]	Duty Cycle Factor [dB]	Level PK [dB(uV/m)]	Level AV [dB(uV/m)]	Limit PK [dB(uV/m)]	Limit AV [dB(uV/m)]	Margin PK [dB]	Margin AV [dB]
4 857.00	H	50.0	2.3	-----	52.3	-----	74.0	-----	21.7	-----
4 886.57	H	36.3	2.6	0.3	-----	39.2	-----	54.0	-----	14.8
4 878.02	V	48.8	2.5	-----	51.3	-----	74.0	-----	22.7	-----
4 891.65	V	36.3	2.6	0.3	-----	39.2	-----	54.0	-----	14.8

Highest channel (2 452 MHz)

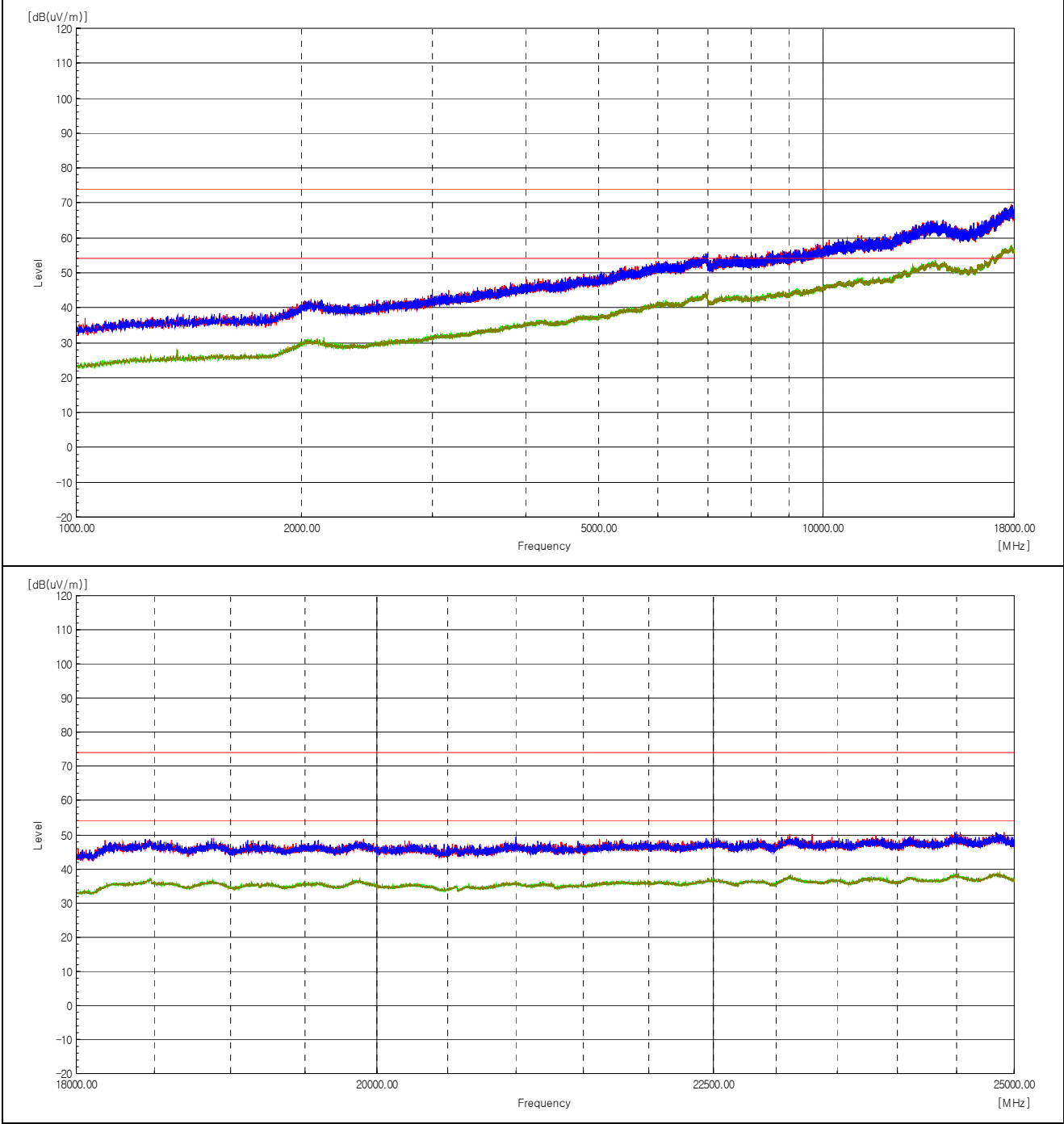
Frequency [MHz]	(P)	Reading [dBuV]	c.f [dB(1/m)]	Duty Cycle Factor [dB]	Level PK [dB(uV/m)]	Level AV [dB(uV/m)]	Limit PK [dB(uV/m)]	Limit AV [dB(uV/m)]	Margin PK [dB]	Margin AV [dB]
2 484.29	H	69.1	-5.3	-----	63.8	-----	74.0	-----	10.2	-----
2 484.19	H	51.0	-5.3	0.3	-----	46.0	-----	54.0	-----	8.0
2 496.26	V	61.2	-5.2	-----	56.0	-----	74.0	-----	18.0	-----
2 483.68	V	43.9	-5.3	0.3	-----	38.9	-----	54.0	-----	15.1
4 902.42	H	49.5	2.7	-----	52.2	-----	74.0	-----	21.8	-----
4 904.67	H	36.3	2.7	0.3	-----	39.3	-----	54.0	-----	14.7
4 906.58	V	48.8	2.7	-----	51.5	-----	74.0	-----	22.5	-----
4 916.83	V	36.4	2.7	0.3	-----	39.4	-----	54.0	-----	14.6

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 lie-down position(X 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

Test mode : Receiver (Worst Case)

Test Data



Frequency [MHz]	(P)	Reading [dBuV]	c.f [dB(1/m)]	Duty Cycle Factor [dB]	Level PK [dB(uV/m)]	Level AV [dB(uV/m)]	Limit PK [dB(uV/m)]	Limit AV [dB(uV/m)]	Margin PK [dB]	Margin AV [dB]
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The emissions above 1 GHz were 20 dB lower than the limit.



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Report No.:
CTK-2024-02546
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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 lie-down position(X 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

4.6 AC Conducted Emissions

Frequency Range of Measurement

150 kHz to 30 MHz

Instrument Settings

IF Band Width: 9 kHz

Test Procedures

ANSI C63.10-2013 - Section 6.2

RSS-Gen - Section 8.8

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

* The level decreases linearly with the logarithm of the frequency.

** A linear average detector is required.

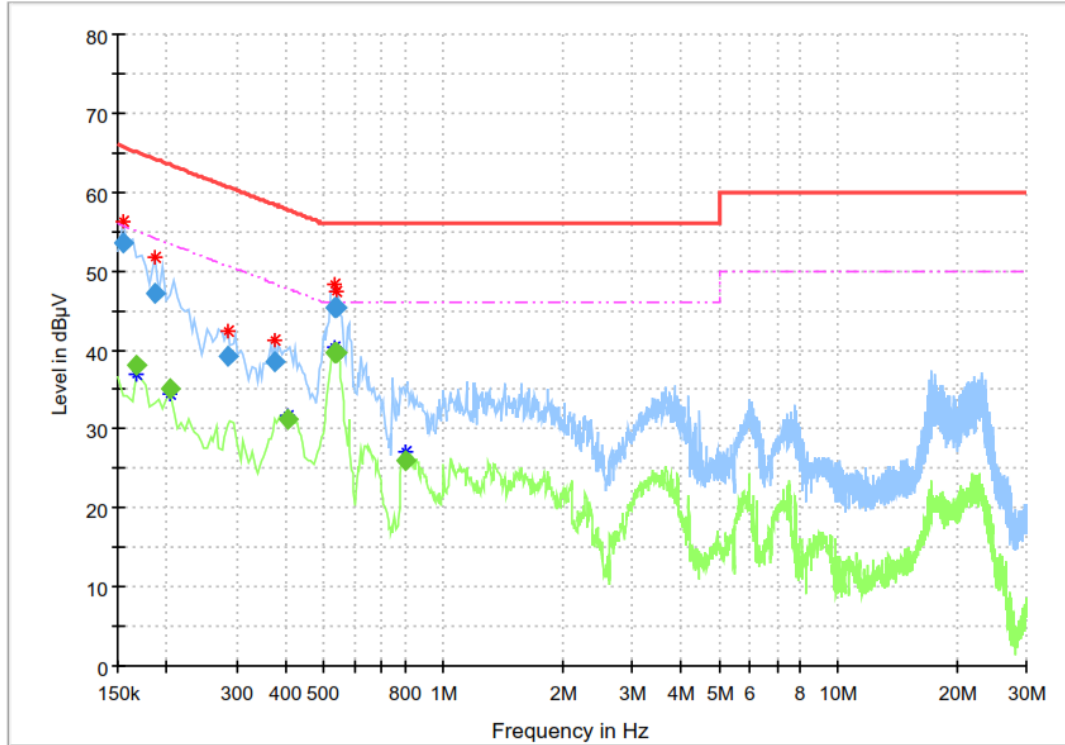
Test Results

The requirements are:

☒ Complies

Test Data

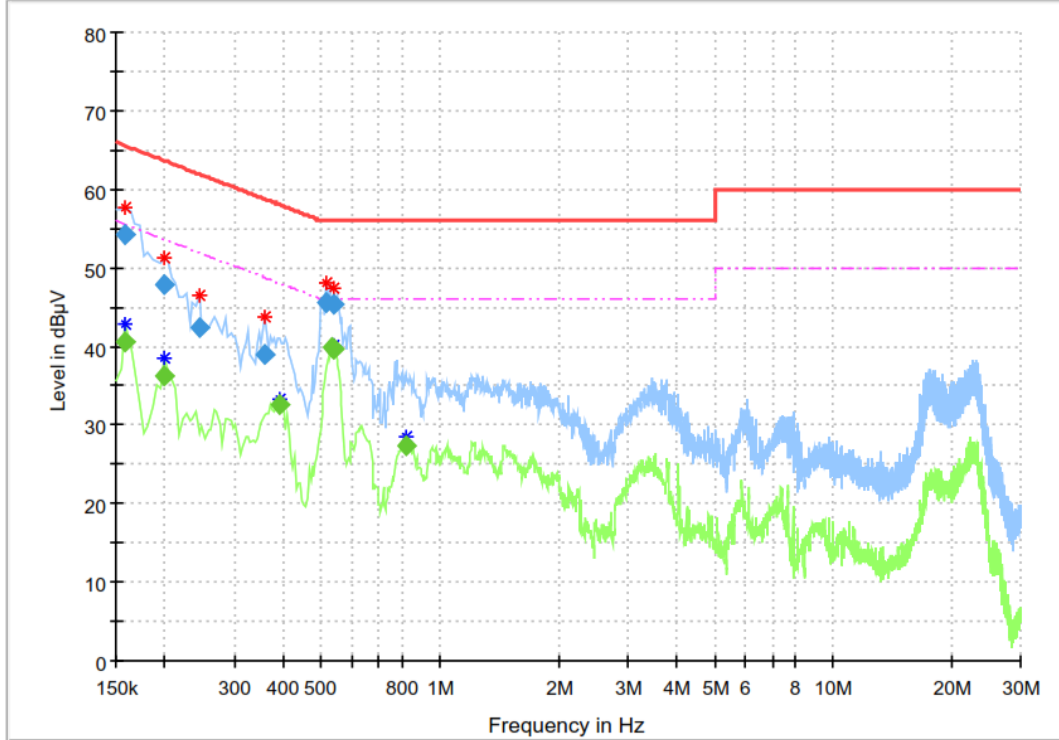
[LINE]



Final Result

Frequency (MHz)	QuasiPeak (dBμV)	CAverage (dBμV)	Limit (dBμV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.154500	53.59	---	65.75	12.17	15000.0	9.000	L1	ON	9.7
0.168000	---	38.02	55.06	17.03	15000.0	9.000	L1	ON	10.0
0.186000	47.17	---	64.21	17.04	15000.0	9.000	L1	ON	10.0
0.204000	---	35.13	53.45	18.32	15000.0	9.000	L1	ON	9.9
0.285000	39.31	---	60.67	21.36	15000.0	9.000	L1	ON	9.8
0.375000	38.42	---	58.39	19.97	15000.0	9.000	L1	ON	9.9
0.406500	---	31.21	47.72	16.51	15000.0	9.000	L1	ON	9.9
0.532500	---	39.70	46.00	6.30	15000.0	9.000	L1	ON	9.9
0.532500	45.44	---	56.00	10.56	15000.0	9.000	L1	ON	9.9
0.537000	---	39.65	46.00	6.35	15000.0	9.000	L1	ON	9.9
0.537000	45.25	---	56.00	10.75	15000.0	9.000	L1	ON	9.9
0.802500	---	26.07	46.00	19.93	15000.0	9.000	L1	ON	9.8

[NEUTRAL]



Final Result

Frequency (MHz)	QuasiPeak (dBμV)	CAverage (dBμV)	Limit (dBμV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.159000	---	40.50	55.52	15.02	15000.0	9.000	N	ON	9.9
0.159000	54.22	---	65.52	11.30	15000.0	9.000	N	ON	9.9
0.199500	---	36.30	53.63	17.33	15000.0	9.000	N	ON	10.0
0.199500	47.83	---	63.63	15.80	15000.0	9.000	N	ON	10.0
0.244500	42.37	---	61.94	19.58	15000.0	9.000	N	ON	9.8
0.357000	39.07	---	58.80	19.73	15000.0	9.000	N	ON	9.9
0.393000	---	32.59	48.00	15.41	15000.0	9.000	N	ON	10.0
0.514500	45.50	---	56.00	10.50	15000.0	9.000	N	ON	9.9
0.532500	---	39.87	46.00	6.13	15000.0	9.000	N	ON	9.9
0.537000	---	39.71	46.00	6.29	15000.0	9.000	N	ON	9.9
0.537000	45.29	---	56.00	10.71	15000.0	9.000	N	ON	9.9
0.825000	---	27.43	46.00	18.57	15000.0	9.000	N	ON	9.8

APPENDIX A – Test Equipment Used For Tests

	Name of Equipment	Manufacturer	Model No.	Serial No.	Date of Calibration	Due Date
1	Signal Analyzer	Agilent	N9020A	MY50510240	2024-07-05	2025-07-05
2	Signal Generator	Rohde & Schwarz	SMB100A	175528	2024-03-21	2025-03-21
3	EMI TEST RECEIVER	Rohde & Schwarz	ESW44	102039	2024-04-29	2025-04-29
4	BILOG ANTENNA	TESEQ	CBL6111D	60654	2023-08-21	2025-08-21
5	Active Loop Antenna	SCHWARZBECK	FMZB 1513	1513-125	2024-04-15	2026-04-15
6	6dB Attenuator	PASTERNAK	PE7AP006-06	L20210504000023	2024-07-31	2025-07-31
7	AMPLIFIER	SONOMA INSTRUMENT	310N	411011	2024-07-31	2025-07-31
8	Signal Analyzer	Rohde & Schwarz	FSV40	101574	2024-01-15	2025-01-15
9	PRE AMPLIFIER	HP	8449B	3008A00620	2024-04-11	2025-04-11
10	Double Ridged Guide Antenna	ETS-Lindgren	3115	00078895	2024-04-16	2025-04-16
11	HORN ANTENNA	SCHWARZBECK	BBHA9170	1153	2023-10-19	2024-10-19
12	LOW NOISE AMPLIFIER	TESTEK	TK-PA1840H	210124-L	2023-10-23	2024-10-23
13	Band Reject Filter	Micro Tronics	BRM50702	G233	2023-12-04	2024-12-04
14	EMI Test Receiver	Rohde & Schwarz	ESR3	102826	2024-04-29	2025-04-29
15	LISN	Rohde & Schwarz	ENV216	102698	2024-04-29	2025-04-29

	Cable	Manufacturer	Model No.	Serial No.	Check Date
1	RF Cable (Conducted)	Junkosha Inc.	MWX221	2008S249	2024-08-02
2	RF Cable (Conducted)	Junkosha Inc.	MWX221	2008S243	2024-08-02
3	RF Cable (Line Conducted)	Canare Corporation	L-5D2W	N/A	2024-03-05
4	RF Cable (9 kHz - 1 GHz Radiated)	HUBER+SUHNER	SUCOFLEX 104	MY27558/4	2024-03-05
5	RF Cable (9 kHz - 1 GHz Radiated)	HUBER+SUHNER	L-5D2W	N/A	2024-03-05
6	RF Cable (1 GHz - 18 GHz Radiated)	Junkosha Inc.	MWX221	2008S246	2023-06-28
7	RF Cable (1 GHz - 18 GHz Radiated)	Junkosha Inc.	MWX221	J0970749	2023-06-28
8	RF Cable (1 GHz - 18 GHz Radiated)	Sensorview Co., LTD	13A26	TPC2204060007	2023-06-28
9	RF Cable (18 GHz - 25 GHz Radiated)	HUBER+SUHNER	SUCOFLEX 102	MY2372/2	2023-06-28
10	RF Cable (18 GHz - 25 GHz Radiated)	HUBER+SUHNER	SUCOFLEX 102	MY2371/2	2023-06-28
11	RF Cable (18 GHz - 25 GHz Radiated)	Sensorview Co., LTD	9A40	TP210713-001	2023-06-28

-END-