

TEST REPORT

 CTK Co., Ltd. The Prime Leader of Global Regulatory Certification	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	Report No.: CTK-2024-00085-1 Page (1) / (34) Pages	
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1. Applicant

- Name : SOLUM CO., LTD
- Address : 4,5,6th F, 357, Guseong-ro, Giheung-gu, Yongin-si, Gyeonggi-do,
Republic of Korea (Zip 16914)
- Date of Receipt : 2023-12-08

2. Manufacturer

- Name : SOLUM CO., LTD
- Address : 4,5,6th F, 357, Guseong-ro, Giheung-gu, Yongin-si, Gyeonggi-do,
Republic of Korea (Zip 16914)

3. Factory

- Name : SOLUM VINA CO., LTD
- Address : Plot B3, Ba Thien 2 Industrial park, Thien Ke Ward, Binh Xuyen District,
Vinh Phuc Province, 281200., People's Republic of Vietnam

4. Use of Report : For FCC Certification & Canadian Certification

5. Test Sample / Model : ESL Label / EL016F6W4A

6. Date of Test : 2023-12-12 to 2023-12-19

7. Test Standard(method) used : FCC 47 CFR part 15 subpart C 15.247, ANSI C63.10-2013, RSS-247, RSS-Gen

8. Testing Environment : Temp.: (23 ± 1) °C, Humidity: (51 ± 3) % R.H.

9. Test Results : Compliance

10. Location of Test : ☒ Permanent Testing Lab ☐ On Site Testing

(Address : 5, Dongbu-ro 221beon-gil, Cheoin-gu, Yongin-si, Gyeonggi-do, 17141 Korea)

The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This report cannot be reproduced or copied without the written consent of CTK.

Approval	Tested by	Technical Manager
	Seoung-uk Park: (Signature) 	Young-taek Lee: (Signature) 

Remark. This report is not related to KOLAS accreditation and relevant regulation.
2024-01-08

CTK Co., Ltd.

REPORT REVISION HISTORY

Date	Revision	Page No
2024-01-08	Issued (CTK-2024-00085)	all
2024-01-08	Issued (CTK-2024-00085-1) 1. Change the applicant's address 2. Add Variant Model	1 & 4 Page

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 CTK Co., Ltd. The Prime Leader of Global Regulatory Certification	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	Report No.: CTK-2024-00085-1 Page (4) / (34) Pages	
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1. General Product Description

1.1 Applicant Information

Company	SOLUM CO.,LTD.
Contact Point	4,5,6th F, 357, Guseong-ro, Giheung-gu, Yongin-si, Gyeonggi-do, Republic of Korea (Zip 16914)
Contact Person	Name : Ki Dong Lee E-mail : kdlee007@solu-m.com Tel : +82-31-8006-7677

1.2 Product Information

FCC ID	2AFWN-EL016F6W4A
IC	22800-EL016F6W4A
Product Description	ESL Label
Model name	EL016F6W4A
Variant Model name	EL016F6B4A (Variant models have no technical differences with each model except for the model name and color for marketing purposes.)
Operating Frequency	2 401 MHz - 2 480 MHz
RF Output Power	3.757 dBm(2.375 mW)
Antenna Specification	Antenna type : PCB Antenna Peak Gain : -4.64 dBi
Number of channels	80
Channel Spacing	1 MHz
Type of Modulation	GFSK
Power Source	DC 3.0 V(Battery)
FVIN	V29
Test Software(Version)	Tera term (Version 4.8.5)
RF Power setting in Test SW	Power setting input "40"

1.3 Peripheral Devices

-For Conducted Measurement and Radiated Measurement

Device	Manufacturer	Model No.	Serial No.
Notebook	HP Inc.	HP Probook 455 G7	5CD0234DWM
AC Adapter	HP Inc.	PPP012D-S	677777-003

2. Accreditations

2.1 Laboratory Accreditations and Listings

Country	Agency	Registration Number
USA	FCC	805871
CANADA	ISED	CN : 8737A CAB ID : KR0025
KOREA	NRRA	KR0025

2.2 Calibration Details of Equipment Used for Measurement

Test equipment and test accessories are calibrated on regular basis. The maximum time between calibrations is one year or what is recommended by the manufacturer, whichever is less. All test equipment calibrations are traceable to the Korea Research Institute of Standards and Science (KRISS), therefore, all test data recorded in this report is traceable to KRISS.

3. Test Specifications

3.1 Standards

Section in FCC	Section in RSS	Requirement(s)	Status (Note 1)	Test Condition
15.247(a)	RSS-247 5.2(a)	6 dB Bandwidth	C	Conducted
15.247(e)	RSS-247 5.2(b)	Transmitter power spectral density	C	
15.247(b)	RSS-247 5.4(d)	Maximum peak conducted output power	C	
15.247(d)	RSS-247 5.5	Unwanted emission	C	
15.209	RSS-Gen 6.13	Transmitter emission	C	Radiated
15.207(a)	RSS-Gen 8.8	AC Conducted Emission	NA(Note 3)	Line Conducted
<u>Note 1:</u> C=Complies NC=Not Complies NT=Not Tested NA=Not Applicable				
<u>Note 2:</u> The data in this test report are traceable to the national or international standards.				
<u>Note 3:</u> The equipment is operated on battery power only.				
<u>Note 4:</u> The sample was tested according to the following specification: FCC Part 15.247, ANSI C63.10-2013, RSS-247 Issue 3, RSS-Gen Issue 5.				
<u>Note 5:</u> The tests were performed according to the method of measurements prescribed in KDB No.558074.				
<u>Note 6:</u> This equipment has been tested in a 100% duty cycle transmission situation using applicant supplied software.				

3.2 Mode of operation during the test

The EUT is operated in a manner representative of the typical of the equipments.
During at testing, system components were manipulated within the confines of typical usage to maximize each emission. All modulation modes were tests.
The results are only attached worst cases.

There are two types of this equipment, horizontal and vertical, depending on the EPD screen display direction but there are differences not related to RF characteristics, so the conducted test is conducted on the Vertical type, and the radiation test is conducted on the Horizontal and Vertical type.

Test Frequency

Lowest channel	Middle channel	Highest channel
2 401 MHz	2 440 MHz	2 480 MHz

3.3 Maximum Measurement Uncertainty

The value of the measurement uncertainty for the measurement of each parameter.
Coverage factor $k = 2$, Confidence levels of 95 %

Description	Uncertainty
Conducted RF Output Power	1.5 dB (C.L. : Approx. 95%, $k=2$)
Occupied Bandwidth	0.1 MHz (C.L. : Approx. 95%, $k=2$)
Unwanted Emission(conducted)	3.0 dB (C.L. : Approx. 95%, $k=2$)
Radiated Emissions ($f \leq 1$ GHz)	4.0 dB (C.L. : Approx. 95%, $k=2$)
Radiated Emissions ($f > 1$ GHz)	5.0 dB (C.L. : Approx. 95%, $k=2$)

3.4 Test Software

Conducted Test	Ics Pro Ver. 6.0.3
Radiated Test	EP5RE Ver. 6.0.10, ES10 Ver. 2022.04.000
Line Conducted Test	EMC32 Ver. 10.50.00

4. Technical Characteristic Test

4.1 6dB Bandwidth & 99 % Bandwidth

Test Procedures(ANSI C63.10-2013 6.9.2)

Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

Test Procedures(ANSI C63.10-2013 6.9.3)

The occupied bandwidth is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers are each equal to 0.5% of the total mean power of the given emission.

Use the 99% power bandwidth function of the instrument and report the measured bandwidth.

Test Settings :

Center frequency = the highest, middle and the lowest channels

- a) RBW = 100 kHz(6dB Bandwidth), b) VBW $\geq 3 \times$ RBW
30 kHz(99% Bandwidth)
- c) Detector = peak d) Trace mode = Max hold
- e) Sweep = auto couple
- f) Allow trace to fully stabilize
- g) Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

Limit :

6 dB Bandwidth > 500 kHz

Test Data :

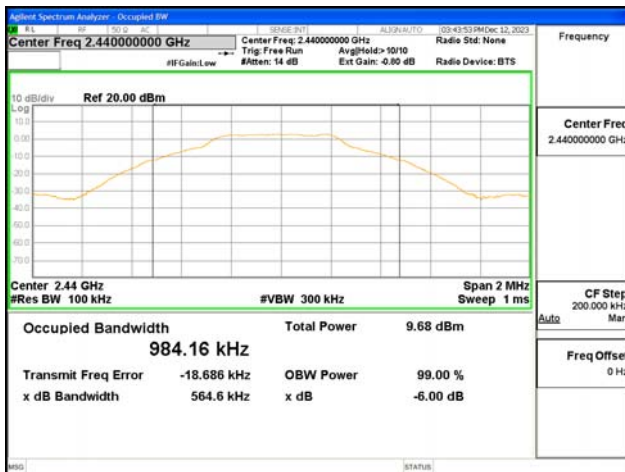
Channel	Frequency [MHz]	6 dB Bandwidth [MHz]	99 % Bandwidth [MHz]	Result
Low	2 401	0.564	0.948	Complies
Middle	2 440	0.565	0.948	Complies
High	2 480	0.563	0.948	Complies

See next pages for actual measured spectrum plots.

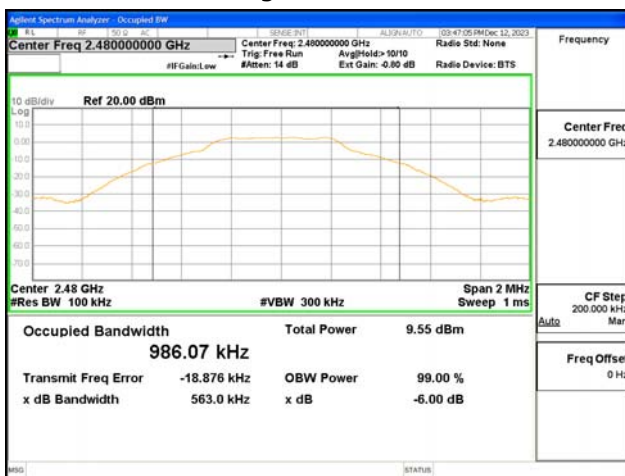
6 dB Bandwidth[MHz]
Low channel



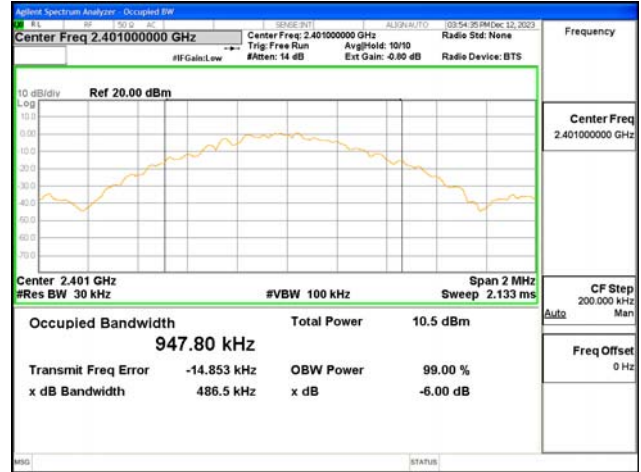
Middle channel



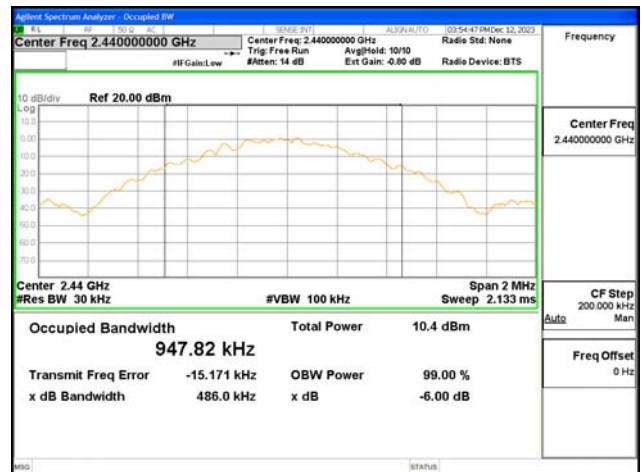
High channel



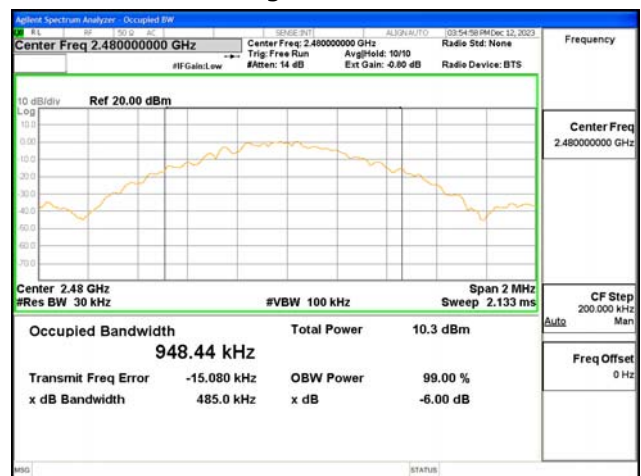
99 % Bandwidth[MHz]
Low channel



Middle channel



High channel



4.2 Maximum peak Conducted Output Power

Test Procedures(ANSI C63.10-2013 11.9.1)

The following procedure can be used when the maximum available RBW of the instrument is less than the DTS bandwidth:

Test Settings:

Center frequency = the highest, middle and the lowest channels

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

Limit :

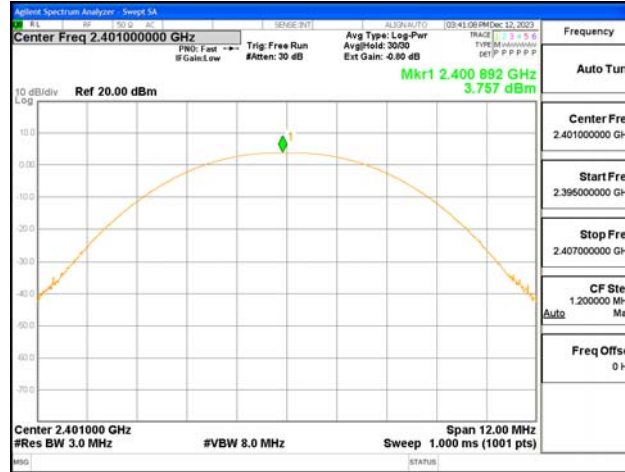
Maximum Output Power < 1 W (30 dBm)

Test Data :

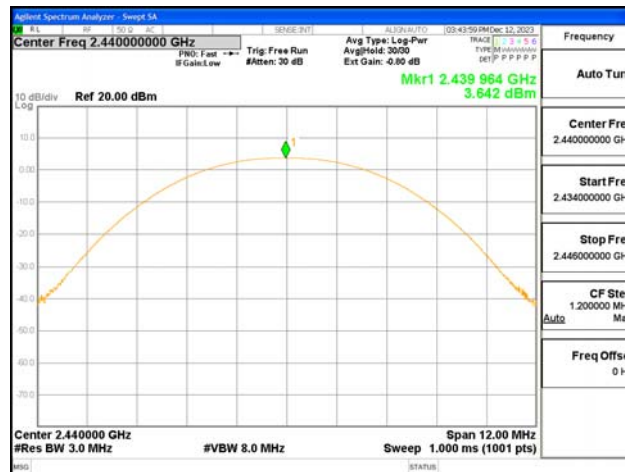
Channel	Frequency [MHz]	Measurement data [dBm]	Limit [dBm]	Result
Low	2 401	3.757	30	Complies
Middle	2 440	3.642	30	Complies
High	2 480	3.565	30	Complies

See next pages for actual measured spectrum plots.

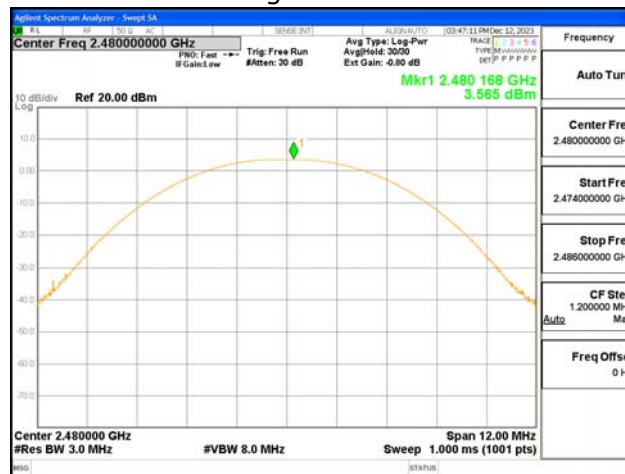
Output Power Low channel



Middle channel



High channel



4.3 Power Spectral Density

Test Procedures(ANSI C63.10-2013 11.10.2)

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 :

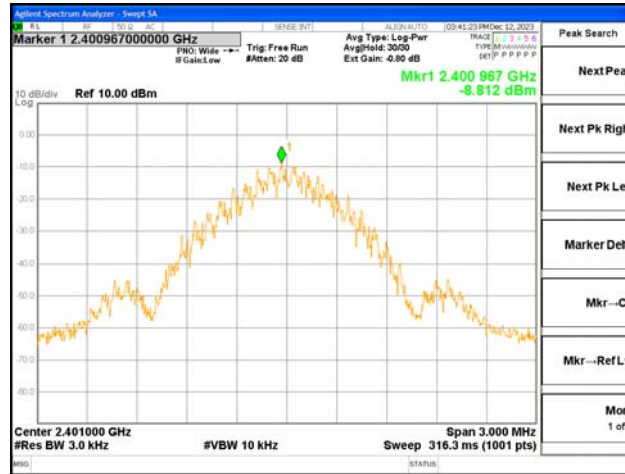
Power Spectral Density < 8 dBm @ 3 kHz BW

Test Data :

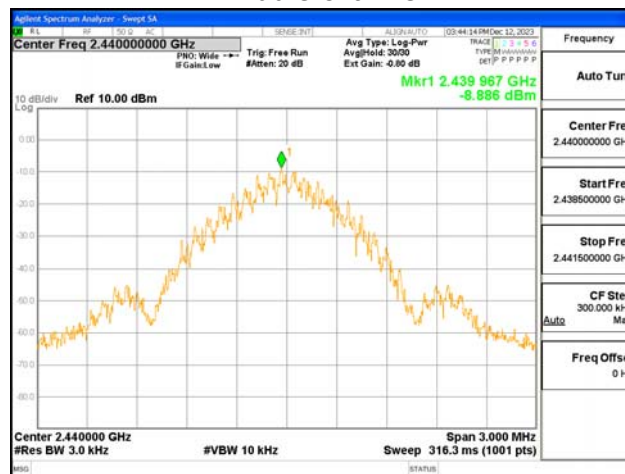
Channel	Frequency [MHz]	Measurement data [dBm]	Limit [dBm]	Result
Low	2 401	-8.812	8	Complies
Middle	2 440	-8.886	8	Complies
High	2 480	-8.981	8	Complies

See next pages for actual measured spectrum plots.

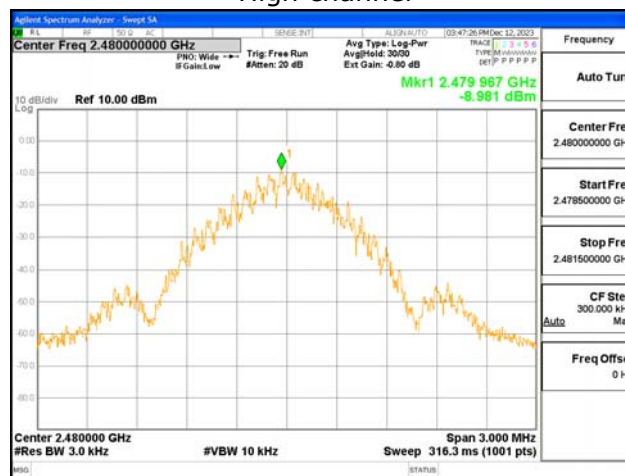
Power Spectral Density Low channel



Middle channel



High channel



4.4 Band Edge & Conducted Spurious emission

Test Procedures(ANSI C63.10-2013 11.11.3)

The Unwanted emission from the EUT were measured according to the dictates PKPSD measurement procedure in section 11.11 of ANSI C63.10-2013.

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under Section 5.4(4), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

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 :

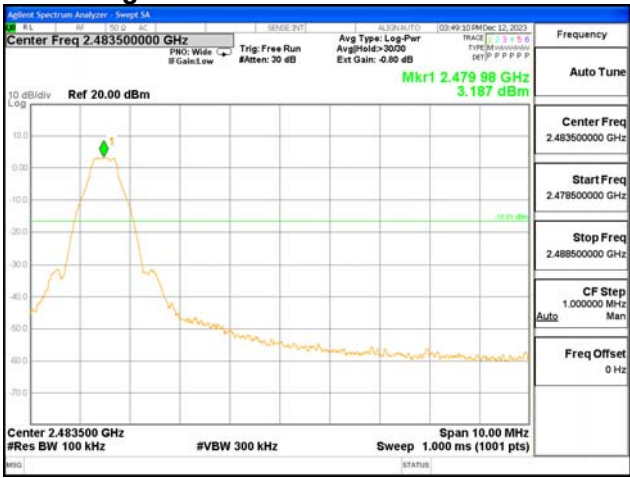
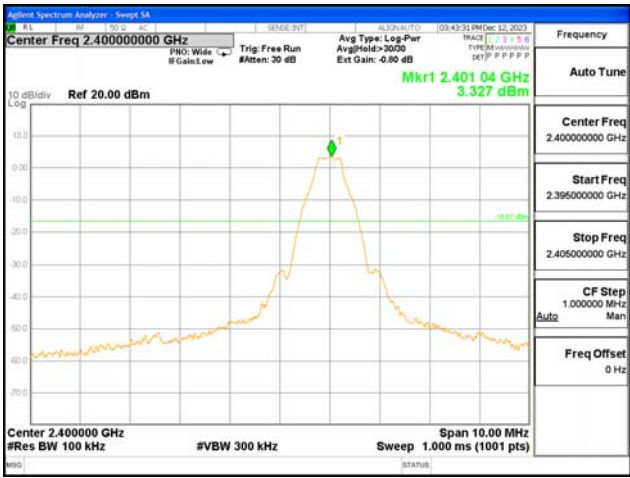
Emission level < 20 dBc

Test results: Complies

- All conducted emission in any 100kHz bandwidth outside of the spread spectrum band was at least 20dB lower than the highest in-band spectral density. Therefore the applying equipment meets the requirement.

See next pages for actual measured spectrum plots.

Conducted Band-Edge

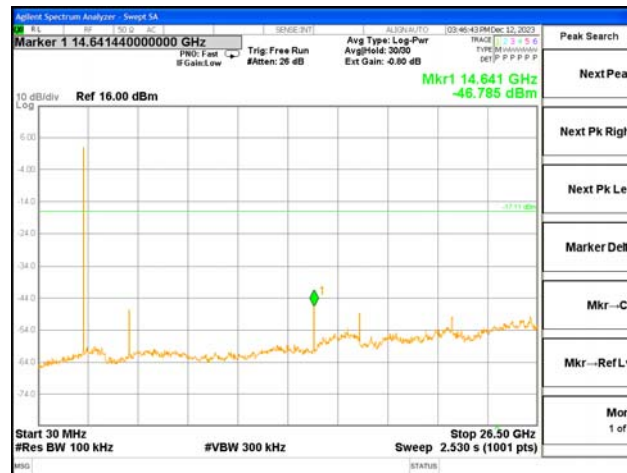


Conducted Spurious Emission

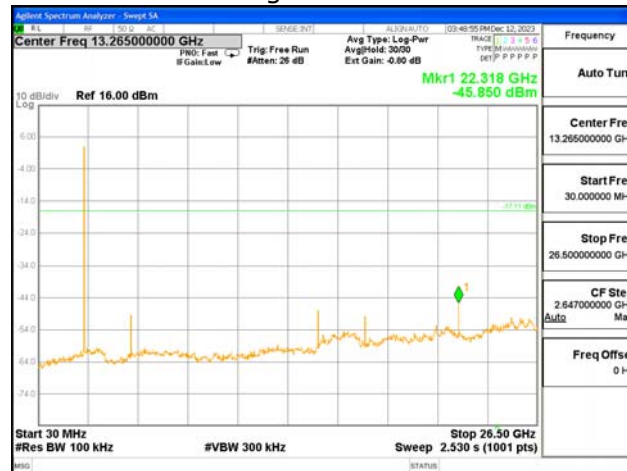
Low channel



Middle channel



High channel



4.5 Radiated Emission

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 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.

Instrument Settings

Frequency Range = 9 kHz ~ 25 GHz (2.4 GHz 10th harmonic)

- a) RBW = 1 MHz for $f \geq 1$ GHz, 100 kHz for $f < 1$ GHz, 9 kHz for $f < 30$ MHz
- b) VBW $\geq$ RBW
- c) Sweep time = auto couple

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:

Table 1. Restricted Frequency Bands

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 :

Except when the requirements applicable to a given device state otherwise, emissions from licence-exempt transmitters shall comply with the field strength limits shown in Table 2. Additionally, the level of any transmitter emission shall not exceed the level of the transmitter's fundamental emission.

Table 2. General Field Strength Limits for Licence-Exempt Transmitters

Frequency(MHz)	Field Strength ($\mu\text{A/m}$)	Field Strength ($\mu\text{V/m}$)	Field Strength (dBuV/m)	Measurement Distance (meters)
0.009-0.490	6.37/F (F in kHz)	2400/F(kHz)	48.5 - 13.8	300
0.490-1.705	63.7/F (F in kHz)	24000/F(kHz)	33.8 - 23	30
1.705-30	0.08	30	29.5	30
30-88	-	100**	40	3
88-216	-	150**	43.5	3
216-960	-	200**	46	3
Above 960	-	500	54	3

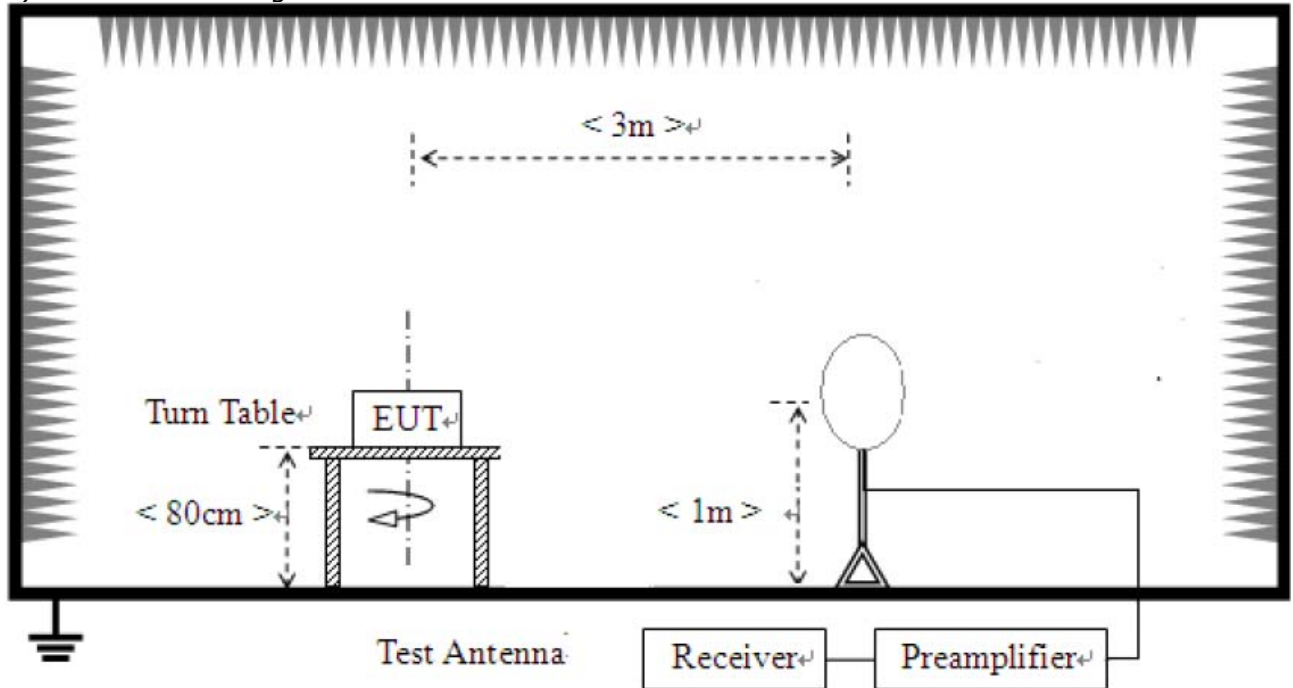
** Except as provided in 15.209(g).fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72MHz, 76-88MHz, 174-216MHz, 470-806MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g.15.231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

Note :

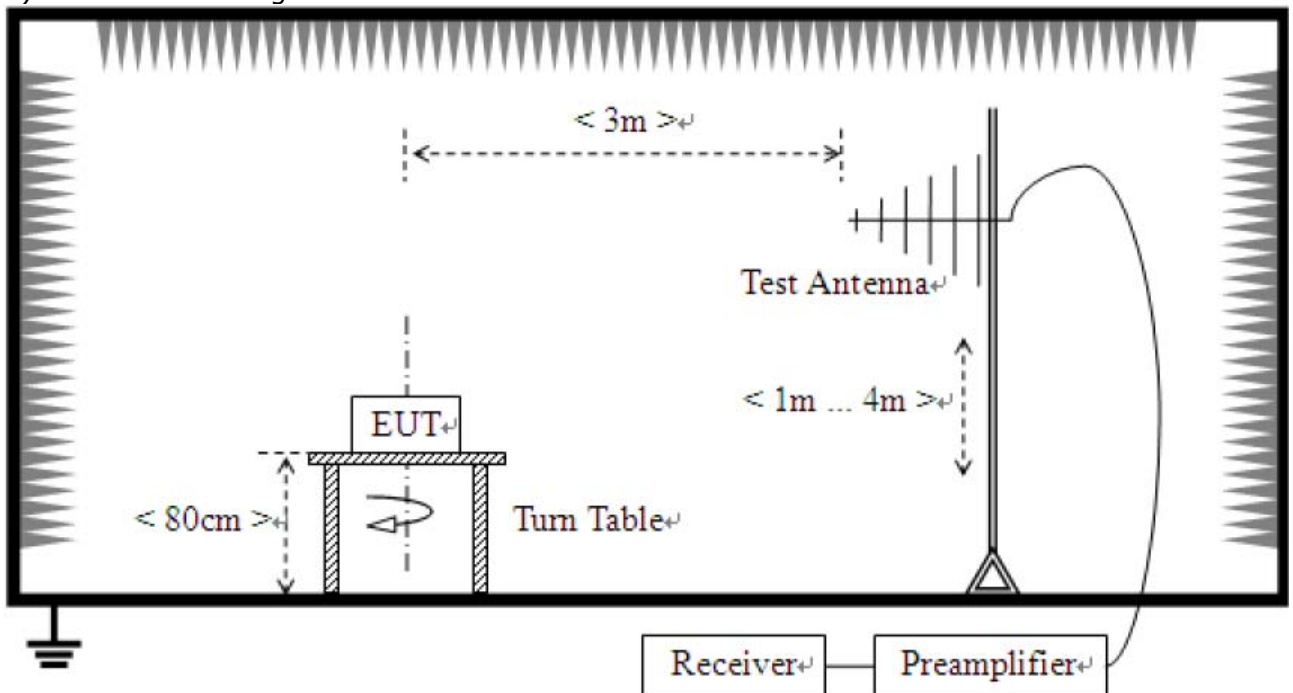
- 1) For above 1 GHz, the emission limit in this paragraph is based on measurement instrumentation employing an average detector, measurement using instrumentation with a peak detector function, corresponding to 20 dB above the maximum permitted average limit.
- 2) For above 1 GHz, limit field strength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

Test Setup:

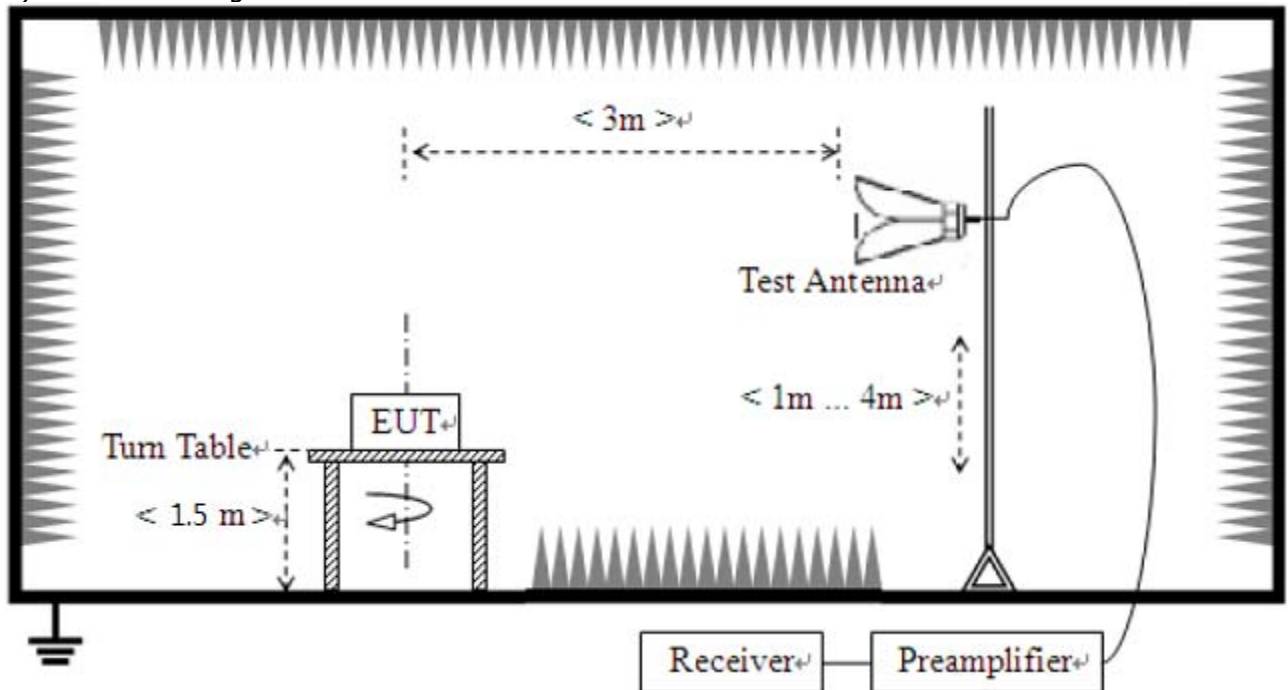
- 1) For field strength of emissions from 9 kHz to 30 MHz



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



3) For field strength of emissions above 1 GHz



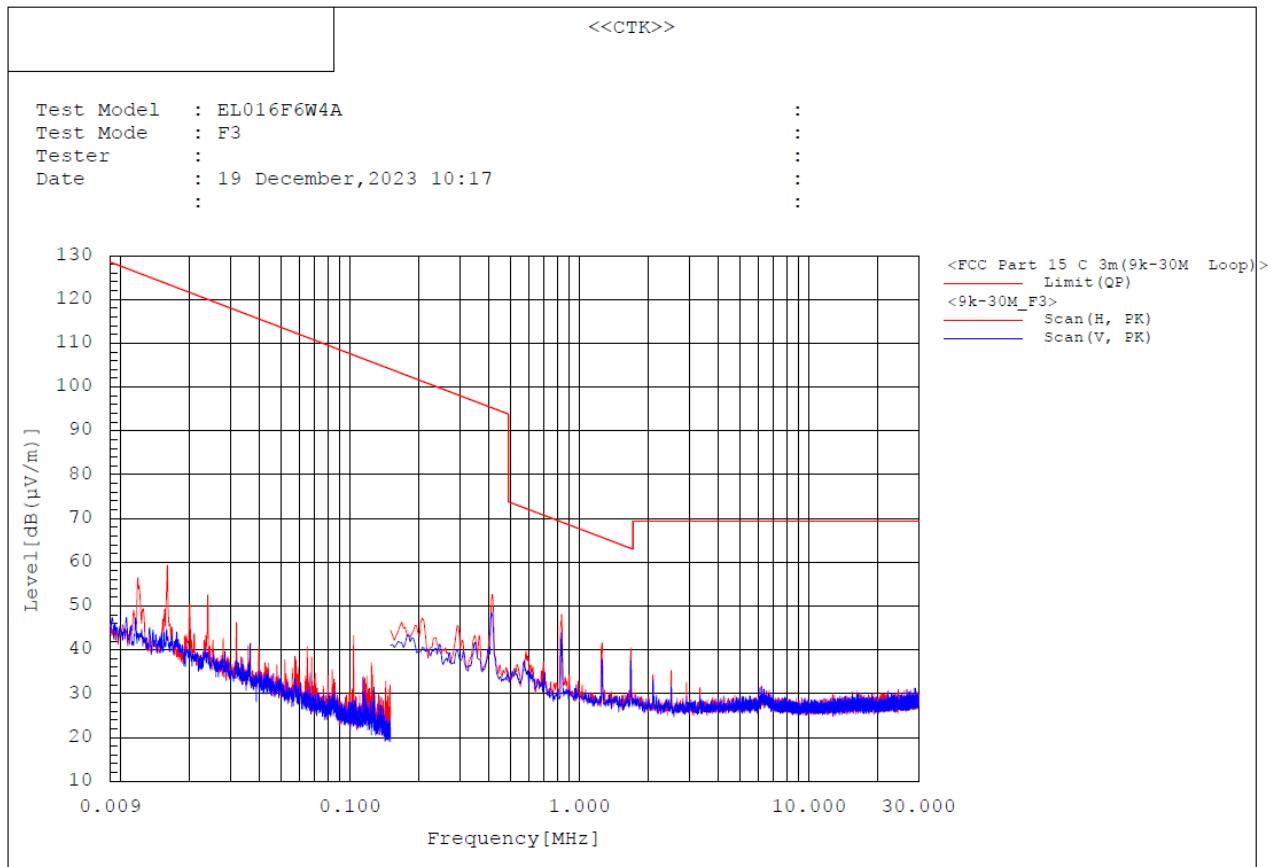
Test results

1. 9 kHz to 30 MHz(Vertical Versions)

Test mode : Transmit, High Channel(Worst case)

The requirements are:

☒ Complies



Note :

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(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

* Reading data is the peak value.

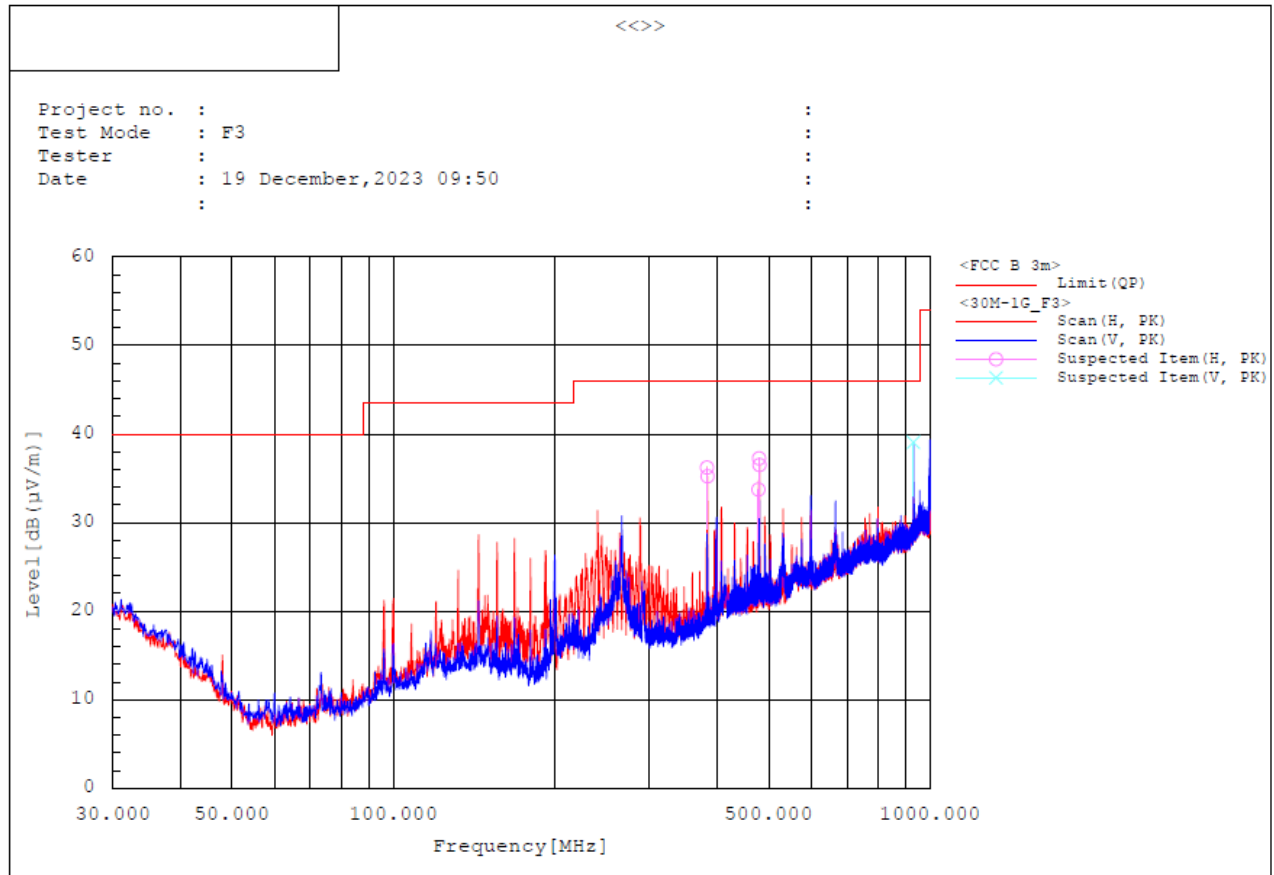
2. 30 MHz to 1 GHz(Vertical Versions)

The requirements are:

☒ Complies

Test mode : Transmit, Low Channel(Worst case)

Test Data



Spectrum Selection

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]	Remark
1	382.856	H	44.0	-7.8	36.2	46.0	9.8	100.0	307.1	
2	384.632	H	43.0	-7.8	35.2	46.0	10.8	100.0	113.9	
3	478.528	H	38.6	-4.9	33.7	46.0	12.3	200.0	317.8	
4	479.789	H	42.1	-4.8	37.3	46.0	8.7	200.0	340.6	
5	480.759	H	41.3	-4.8	36.5	46.0	9.5	200.0	344.8	
6	930.839	V	35.0	-4.1	29.1	46.0	6.9	200.0	185.8	

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(Z axis) and the worst case was recorded.
- Result = Reading + c.f(Correction factor)
- Correction factor = Antenna factor + Cable loss + 6 dB attenuator - Amp Gain

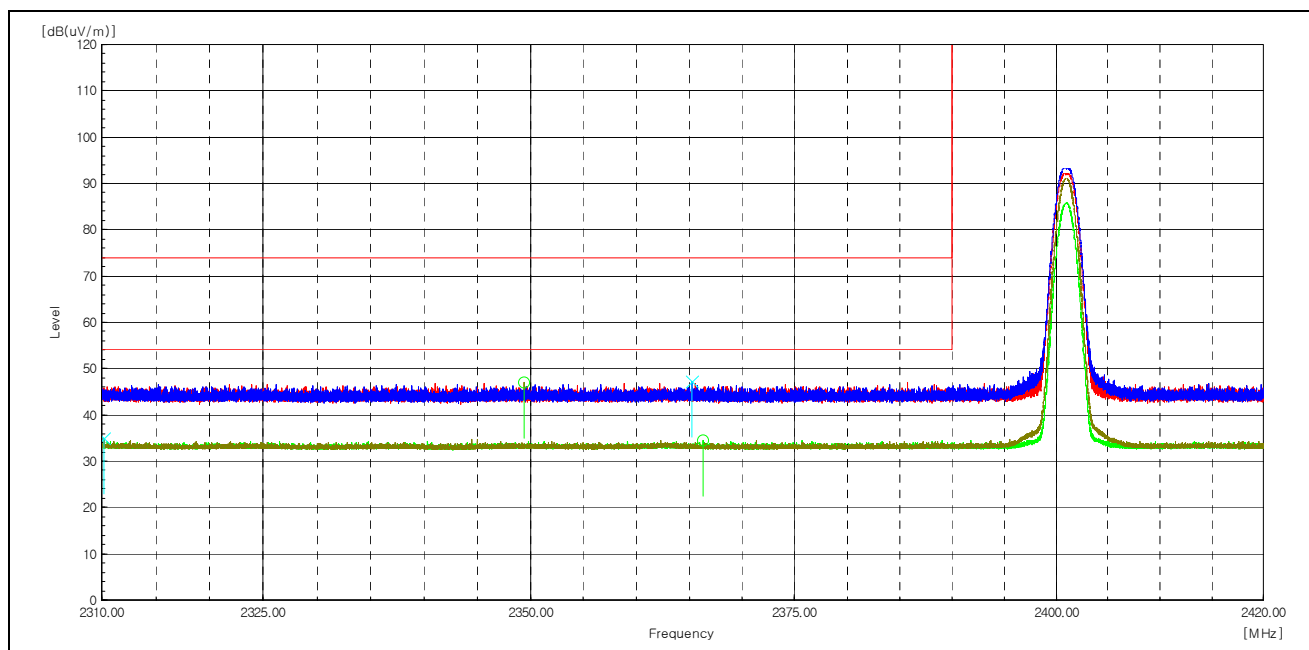
* Reading data is the peak value.

3. 2 310 MHz to 2 390 MHz(Vertical Versions)

The requirements are:

☒ Complies

Test mode : Transmit, Low Channel(Worst case)



Frequency [MHz]	(P)	Reading [dBuV]	c.f [dB(1/m)]	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]	Note
2310.3	V	40.8	-6.0	----	34.8	----	54.0	----	19.2	Average
2349.4	H	53.0	-5.9	47.1	----	74.0	----	26.9	----	Peak
2365.2	V	53.0	-5.9	47.1	----	74.0	----	26.9	----	Peak
2366.3	H	40.4	-5.9	----	34.5	----	54.0	----	19.5	Average

Remarks

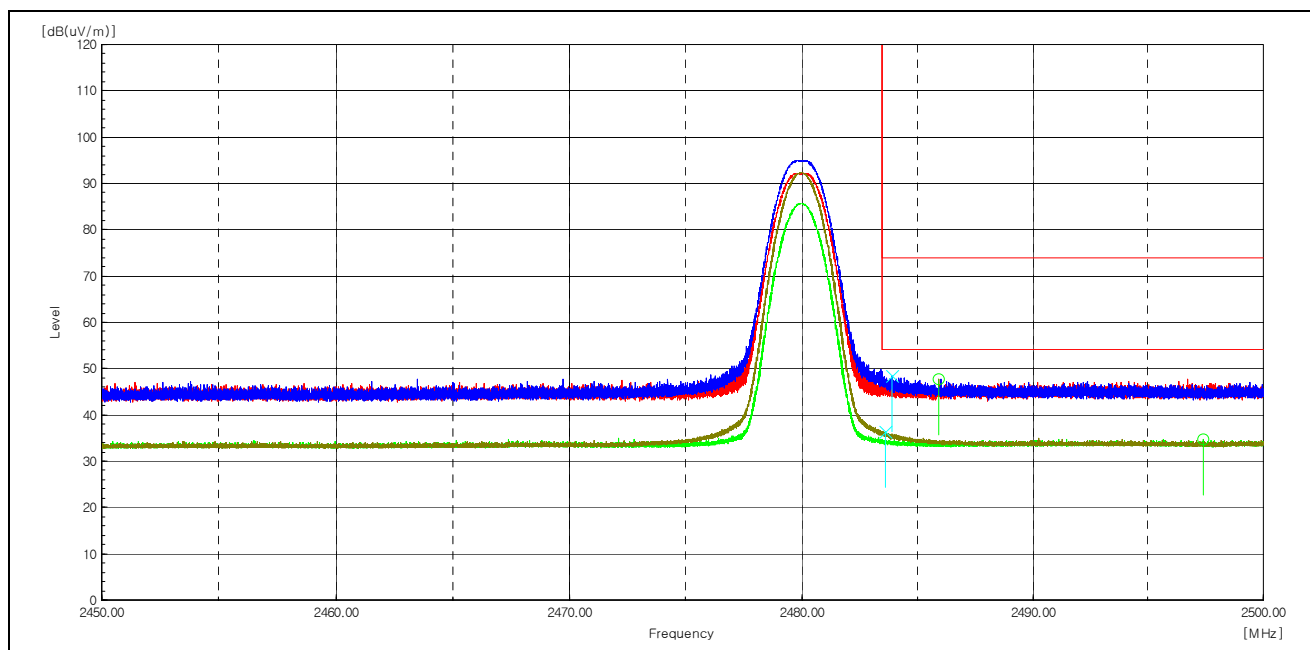
1. The Unwanted emission was measured in the following position: EUT stand-up position(Z axis), lie-down position(X,Y axis). The worst emission was found in lie-down position(X axis) and the worst case was recorded.
2. Result = Reading + c.f(correction factor)
3. Correction factor = Antenna factor + Cable loss - Amp Gain
4. Radiated Emission measured at 100 % duty cycle.

4. 2 483.5 MHz – 2 500 MHz(Vertical Versions)

The requirements are:

☒ Complies

Test mode : Transmit, High Channel(Worst case)



Frequency [MHz]	(P)	Reading [dBuV]	c.f [dB(1/m)]	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]	Note
2483.6	V	41.6	-5.3	-----	36.3	-----	54.0	-----	17.7	Average
2483.9	V	53.6	-5.3	48.3	-----	74.0	-----	25.7	-----	Peak
2485.9	H	53.0	-5.3	47.7	-----	74.0	-----	26.3	-----	Peak
2497.4	H	40.0	-5.2	-----	34.8	-----	54.0	-----	19.2	Average

Remarks

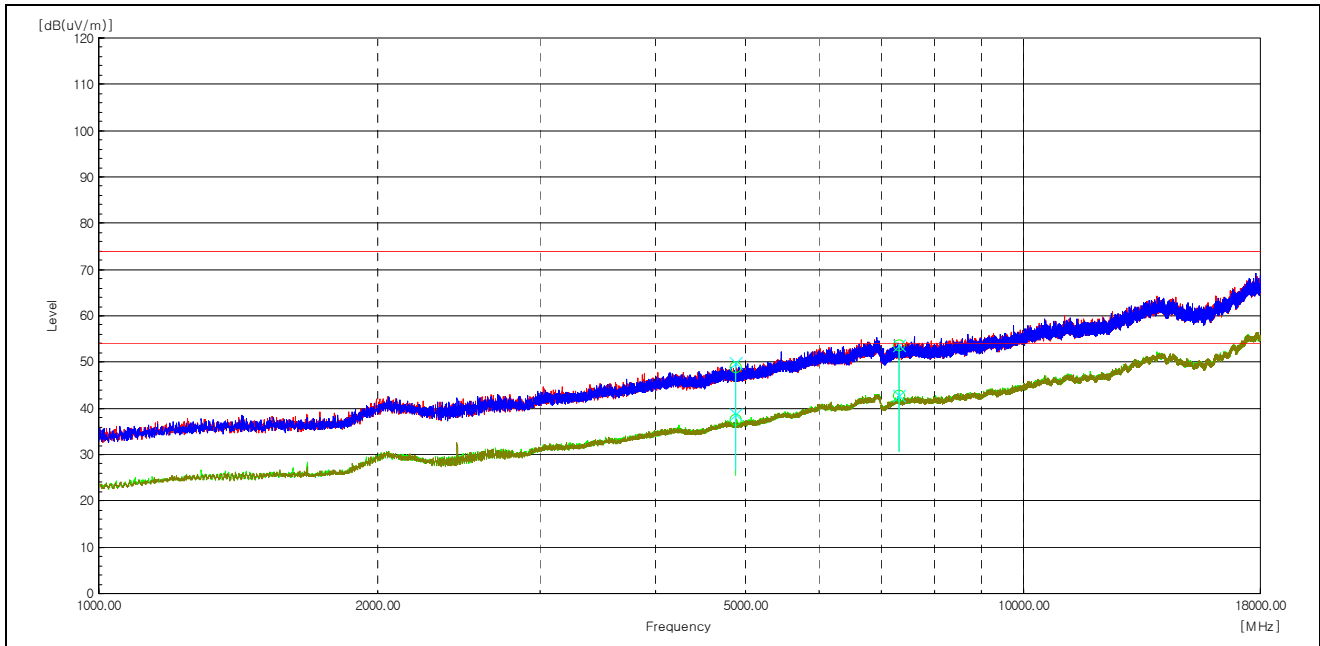
1. The Unwanted emission was measured in the following position: EUT stand-up position(Z axis), lie-down position(X,Y axis). The worst emission was found in lie-down position(X axis) and the worst case was recorded.
2. Result = Reading + c.f(correction factor)
3. Correction factor = Antenna factor + Cable loss - Amp Gain
4. Radiated Emission measured at 100 % duty cycle.

5. 1 GHz to 18 GHz(Vertical Versions)

The requirements are:

☒ Complies

Test mode : Transmit, Middle Channel(Worst case)



Frequency [MHz]	(P)	Reading [dBuV]	c.f [dB(1/m)]	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]	Note
4879.6	V	47.3	2.4	49.7	-----	74.0	-----	24.3	-----	Peak
4880.2	H	35.2	2.4	-----	37.6	-----	54.0	-----	16.4	Average
4880.2	V	36.2	2.4	-----	38.6	-----	54.0	-----	15.4	Average
4880.9	H	46.4	2.5	48.9	-----	74.0	-----	25.1	-----	Peak
7320.2	H	35.4	7.3	-----	42.7	-----	54.0	-----	11.3	Average
7320.2	V	35.5	7.3	-----	42.8	-----	54.0	-----	11.2	Average
7320.9	H	46.2	7.3	53.5	-----	74.0	-----	20.5	-----	Peak
7320.9	V	46.4	7.3	53.7	-----	74.0	-----	20.3	-----	Peak

Remarks

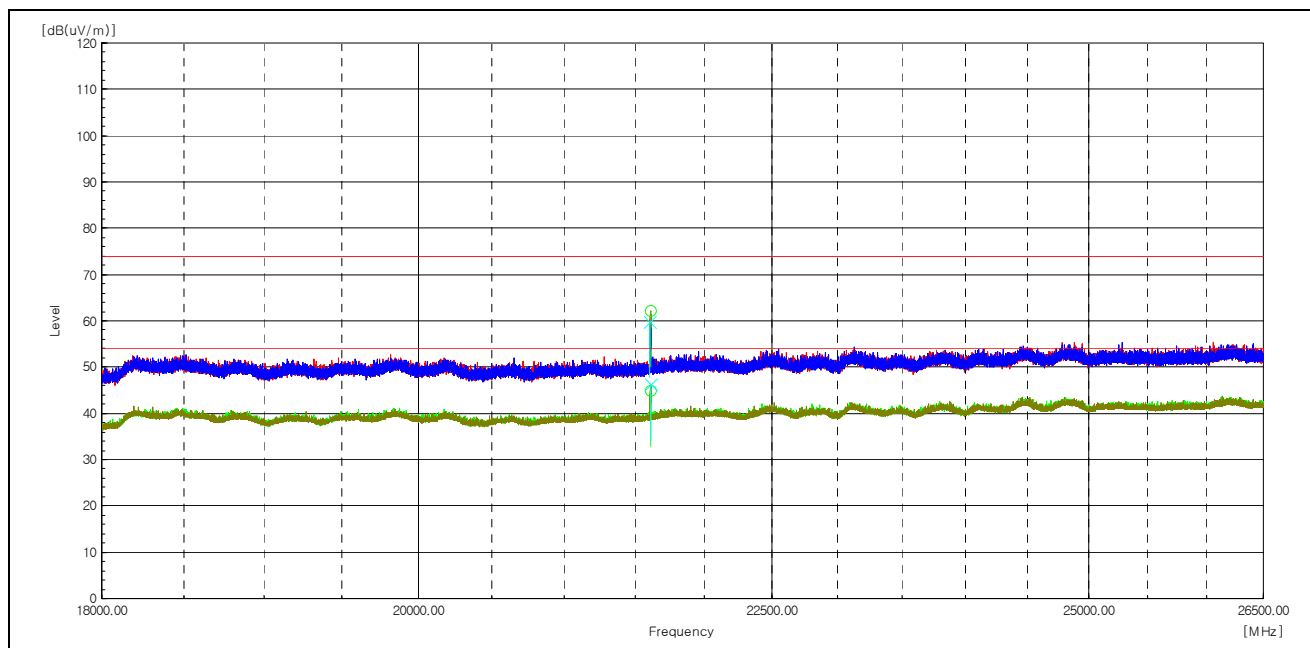
1. The Unwanted emission was measured in the following position: EUT stand-up position(Z axis), lie-down position(X,Y axis). The worst emission was found in lie-down position(X axis) and the worst case was recorded.
2. Result = Reading + c.f(correction factor)
3. Correction factor = Antenna factor + Cable loss - Amp Gain
4. The 18 GHz end had no signal detected. As can be seen from the conducted spurious emission test, no signal was detected in the section.
5. Radiated Emission measured at 100 % duty cycle.

6. 18.0 GHz to 25.0 GHz(Vertical Versions)

Test mode : Transmit, Low Channel(Worst case)

The requirements are:

☒ Complies



Frequency [MHz]	(P)	Reading [dBuV]	c.f [dB(1/m)]	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]	Note
21606.9	V	54.2	5.6	59.8	-----	74.0	-----	14.2	-----	Peak
21607.2	H	56.5	5.6	62.1	-----	74.0	-----	11.9	-----	Peak
21610.3	H	39.2	5.6	-----	44.8	-----	54.0	-----	9.2	Average
21610.3	V	40.8	5.6	-----	46.4	-----	54.0	-----	7.6	Average

Remarks

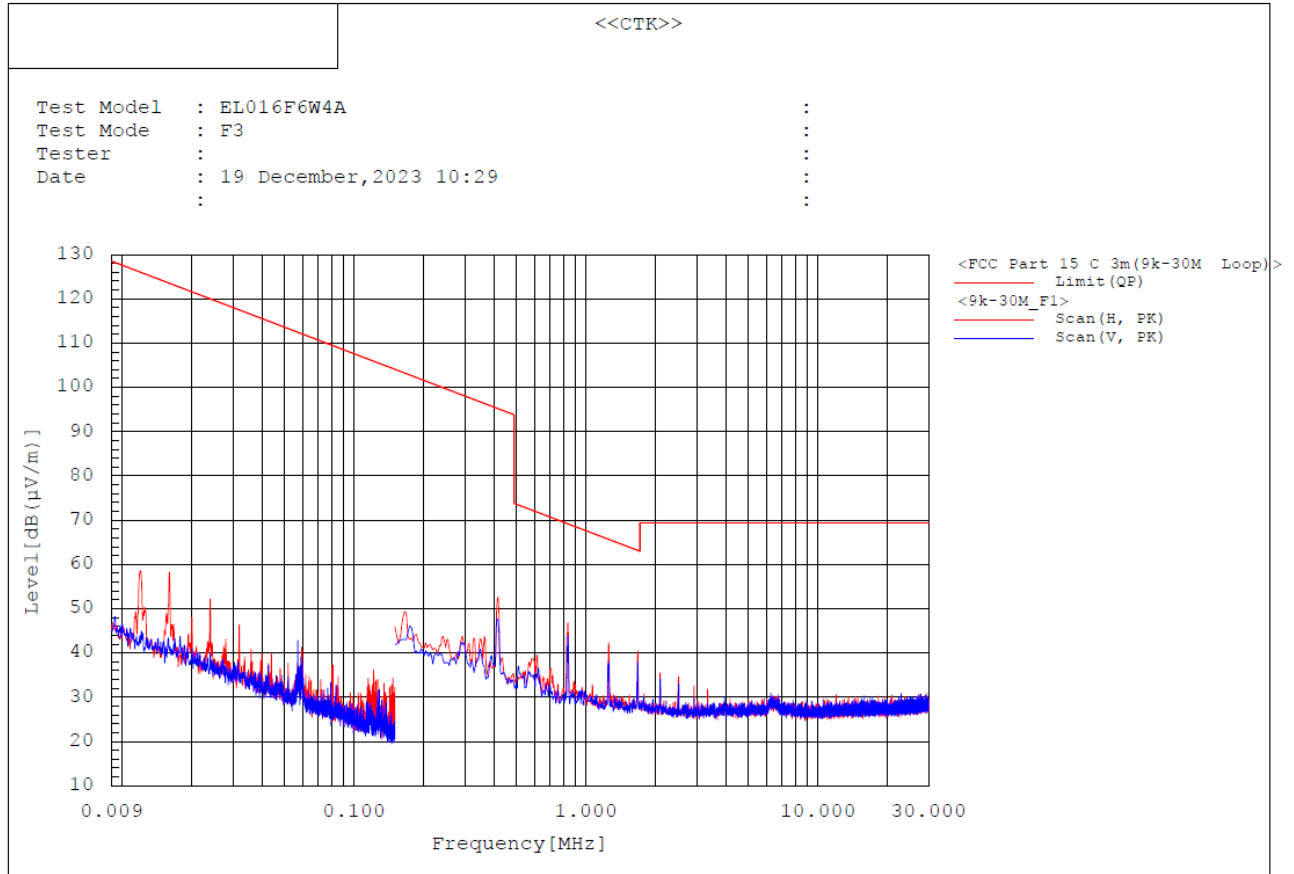
1. The Unwanted emission was measured in the following position: EUT stand-up position(Z axis), lie-down position(X,Y axis). The worst emission was found in lie-down position(X axis) and the worst case was recorded.
2. Result = Reading + c.f(correction factor)
3. Correction factor = Antenna factor + Cable loss - Amp Gain
4. Radiated Emission measured at 100 % duty cycle.

7. 9 kHz to 30 MHz(Horizontal Versions)

Test mode : Transmit, High Channel(Worst case)

The requirements are:

☒ Complies



Note :

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(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

* Reading data is the peak value.

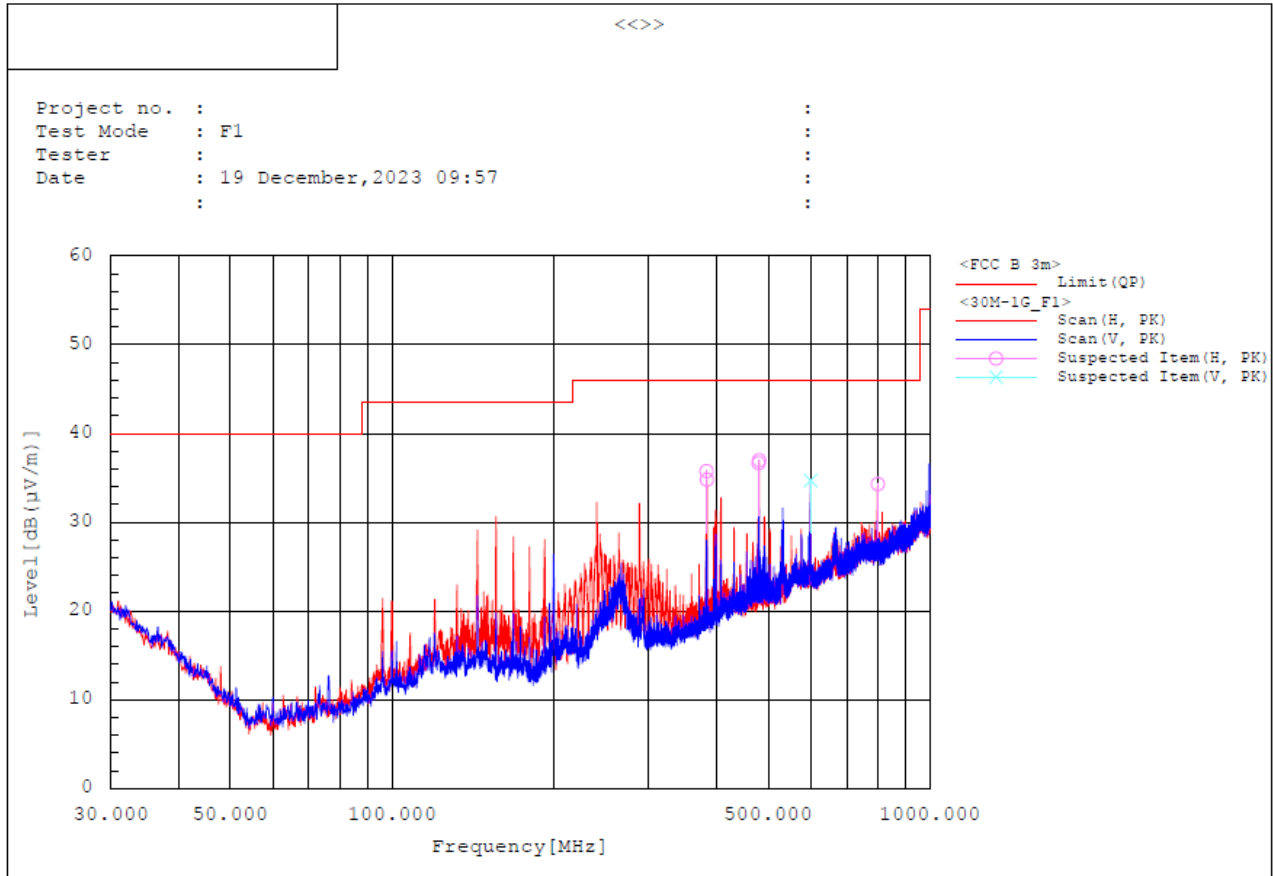
8. 30 MHz to 1 GHz(Horizontal Versions)

The requirements are:

☒ Complies

Test mode : Transmit, Low Channel(Worst case)

Test Data



Spectrum Selection

No.	Frequency [MHz]	Pol	Reading PK [dB(μV)]	c.f [dB(1/m)]	Result PK [dB(μV/m)]	Limit QP [dB(μV/m)]	Margin QP-PK [dB]	Height [cm]	Angle [deg]	Remark
1	383.953	H	42.6	-7.8	35.8	46.0	10.2	100.0	111.5	
2	384.729	H	42.6	-7.8	34.8	46.0	11.2	100.0	107.8	
3	479.886	H	41.8	-4.8	36.7	46.0	9.3	200.0	341.7	
4	480.886	H	41.8	-4.8	37.0	46.0	9.0	200.0	324.3	
5	599.875	V	37.1	-2.4	34.7	46.0	11.3	99.9	187.5	
6	799.404	H	33.2	1.1	34.3	46.0	11.7	100.0	186.4	

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(Z axis) and the worst case was recorded.
- Result = Reading + c.f(Correction factor)
- Correction factor = Antenna factor + Cable loss + 6 dB attenuator - Amp Gain

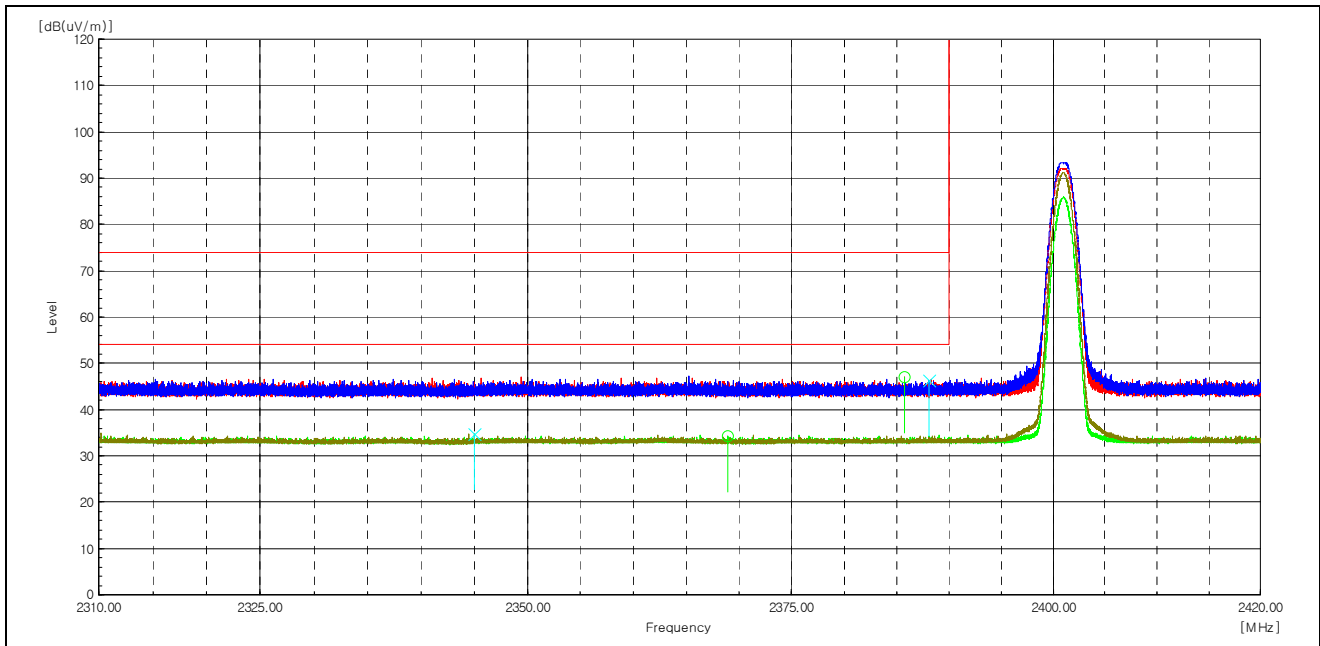
* Reading data is the peak value.

9. 2 310 MHz to 2 390 MHz(Horizontal Versions)

The requirements are:

☒ Complies

Test mode : Transmit, Low Channel(Worst case)



Frequency [MHz]	(P)	Reading [dBuV]	c.f [dB(1/m)]	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]	Note
2345.0	V	40.5	-5.9	-----	34.6	-----	54.0	-----	19.4	Average
2368.9	H	40.2	-5.9	-----	34.3	-----	54.0	-----	19.7	Average
2385.8	H	52.8	-5.8	47.0	-----	74.0	-----	27.0	-----	Peak
2388.1	V	52.1	-5.8	46.3	-----	74.0	-----	27.7	-----	Peak

Remarks

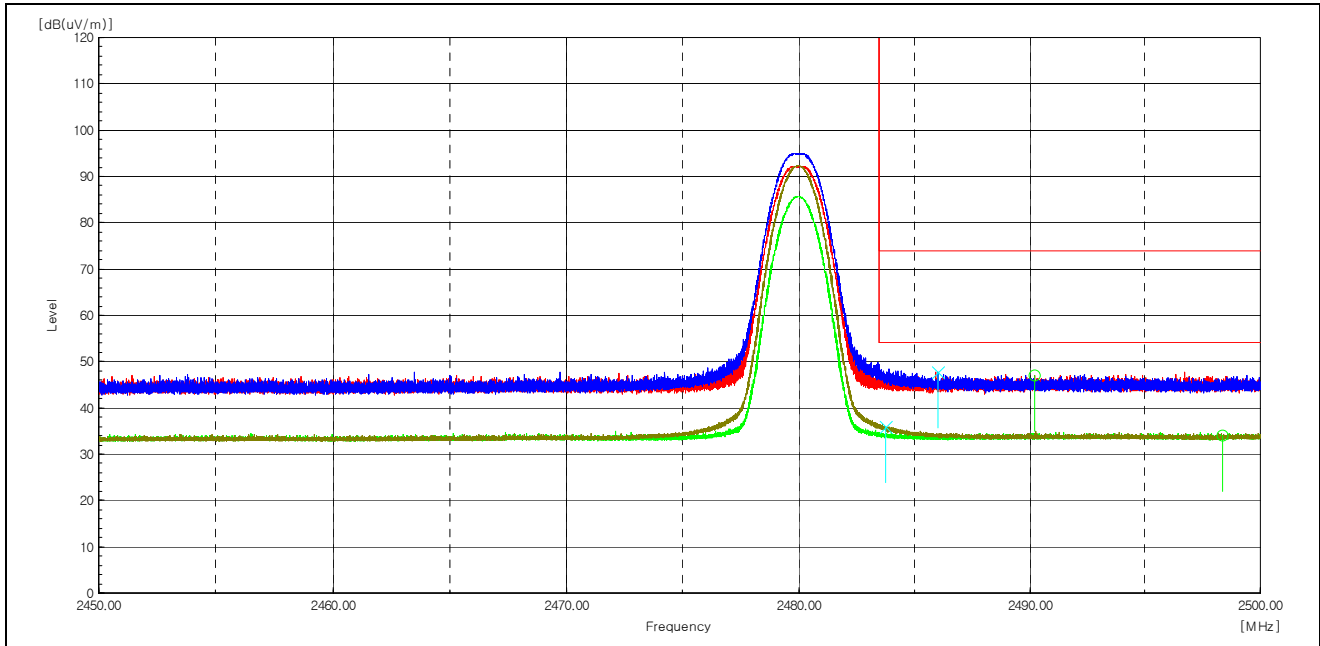
1. The Unwanted emission was measured in the following position: EUT stand-up position(Z axis), lie-down position(X,Y axis). The worst emission was found in lie-down position(X axis) and the worst case was recorded.
2. Result = Reading + c.f(correction factor)
3. Correction factor = Antenna factor + Cable loss - Amp Gain
4. Radiated Emission measured at 100 % duty cycle.

10. 2 483.5 MHz – 2 500 MHz(Horizontal Versions)

The requirements are:

☒ Complies

Test mode : Transmit, High Channel(Worst case)



Frequency [MHz]	(P)	Reading [dBuV]	c.f [dB(1/m)]	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]	Note
2483.7	V	41.3	-5.3	-----	36.0	-----	54.0	-----	18.0	Average
2486.0	V	52.9	-5.3	47.6	-----	74.0	-----	26.4	-----	Peak
2490.2	H	52.3	-5.2	47.1	-----	74.0	-----	26.9	-----	Peak
2498.4	H	39.2	-5.2	-----	34.0	-----	54.0	-----	20.0	Average

Remarks

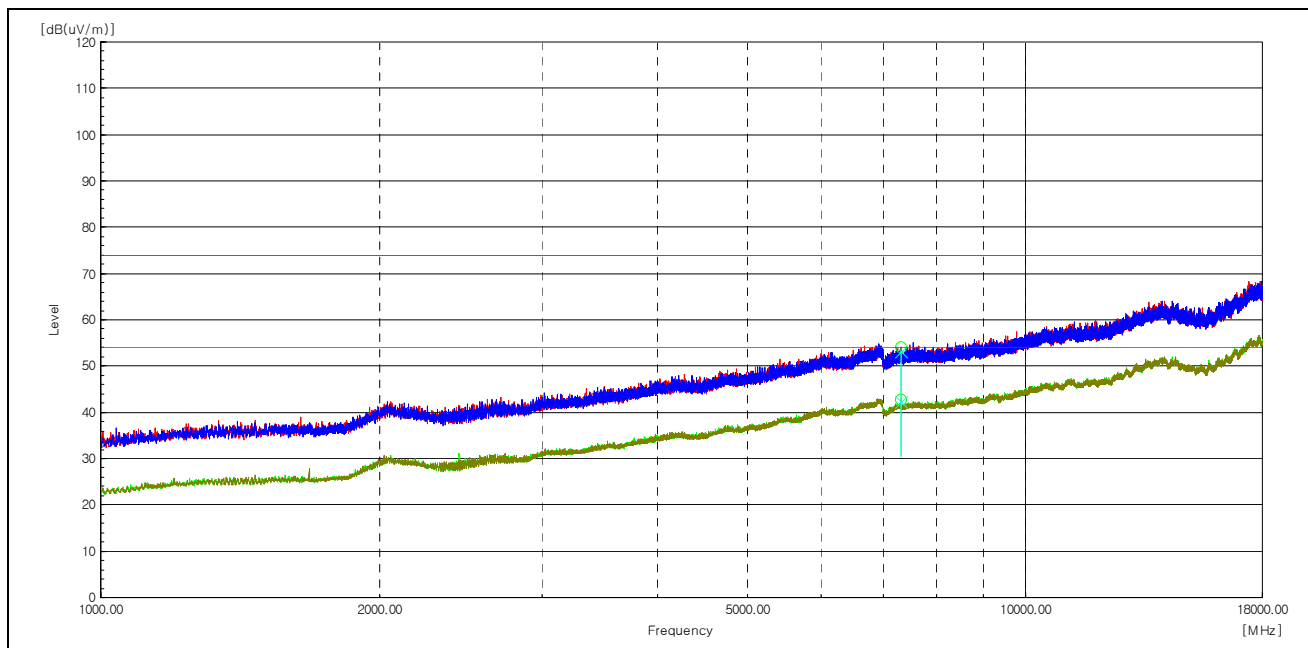
1. The Unwanted emission was measured in the following position: EUT stand-up position(Z axis), lie-down position(X,Y axis). The worst emission was found in lie-down position(X axis) and the worst case was recorded.
2. Result = Reading + c.f(correction factor)
3. Correction factor = Antenna factor + Cable loss - Amp Gain
4. Radiated Emission measured at 100 % duty cycle.

11. 1 GHz to 18 GHz(Horizontal Versions)

The requirements are:

☒ Complies

Test mode : Transmit, Middle Channel(Worst case)



Frequency [MHz]	(P)	Reading [dBuV]	c.f [dB(1/m)]	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]	Note
7319.5	H	46.7	7.3	54.0	-----	74.0	-----	20.0	-----	Peak
7319.5	V	45.9	7.3	53.2	-----	74.0	-----	20.8	-----	Peak
7320.2	H	35.4	7.3	-----	42.7	-----	54.0	-----	11.3	Average
7320.2	V	34.9	7.3	-----	42.2	-----	54.0	-----	11.8	Average

Remarks

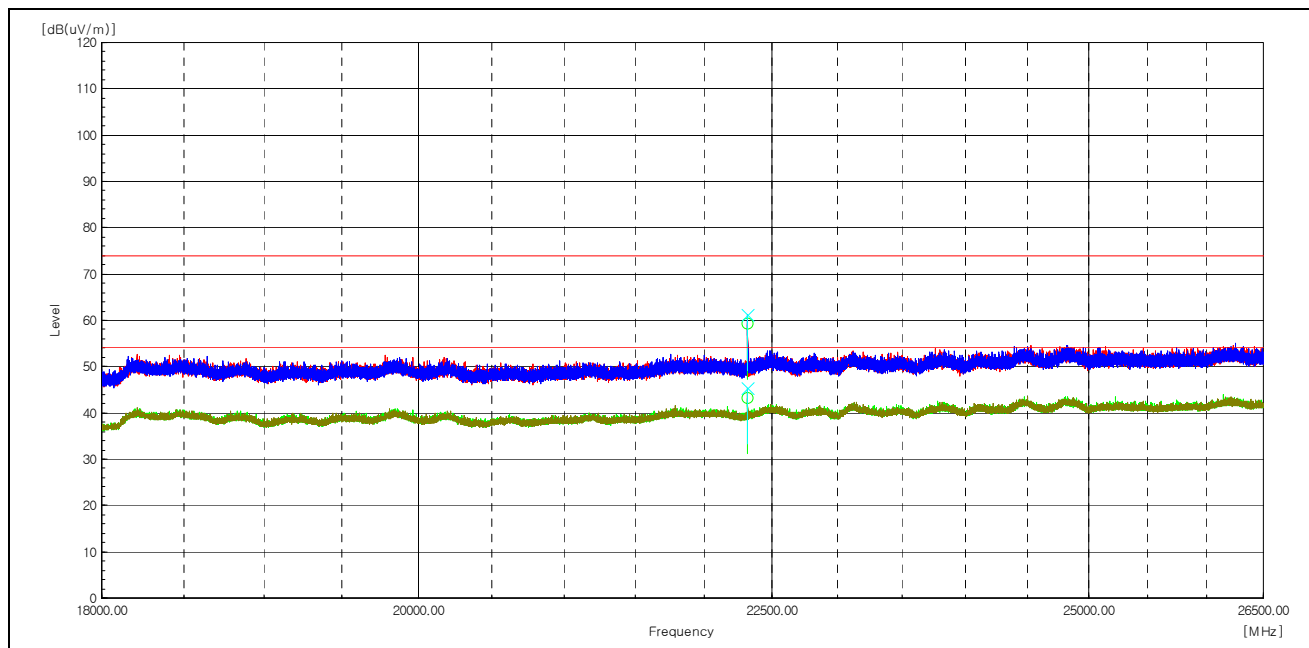
1. The Unwanted emission was measured in the following position: EUT stand-up position(Z axis), lie-down position(X,Y axis). The worst emission was found in lie-down position(X axis) and the worst case was recorded.
2. Result = Reading + c.f(correction factor)
3. Correction factor = Antenna factor + Cable loss - Amp Gain
4. The 18 GHz end had no signal detected. As can be seen from the conducted spurious emission test, no signal was detected in the section.
5. Radiated Emission measured at 100 % duty cycle.

12. 18.0 GHz to 25.0 GHz(Horizontal Versions)

The requirements are:

☒ Complies

Test mode : Transmit, High Channel(Worst case)



Frequency [MHz]	(P)	Reading [dBuV]	c.f [dB(1/m)]	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]	Note
22318.2	H	37.1	6.1	----	43.2	----	54.0	----	10.8	Average
22321.6	H	53.1	6.1	59.2	----	74.0	----	14.8	----	Peak
22321.6	V	55.1	6.1	61.2	----	74.0	----	12.8	----	Peak
22321.6	V	39.3	6.1	----	45.4	----	54.0	----	8.6	Average

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. Result = Reading + c.f(correction factor)
3. Correction factor = Antenna factor + Cable loss - Amp Gain
4. Radiated Emission measured at 100 % duty cycle.

APPENDIX A – Test Equipment Used For Tests

No.	Name of Equipment	Manufacturer	Model No.	Serial No.	Cal Date	Due Date
1	Signal Analyzer	Agilent	N9020A	MY50200512	2023-04-06	2024-04-06
2	Signal Generator	Rohde & Schwarz	SMB100A	175528	2023-03-22	2024-03-22
3	EMI TEST RECEIVER	Rohde & Schwarz	ESW44	102039	2023-05-03	2024-05-03
4	Active Loop Antenna	SCHWARZBECK	FMZB 1513	1513-125	2022-04-15	2024-04-15
5	Bilog Antenna	TESEQ	CBL6111D	60654	2023-08-21	2025-08-21
6	AMPLIFIER	SONOMA INSTRUMENT	310N	411011	2023-08-04	2024-08-04
7	ATTENUATOR	PASTERNAK	PE7AP006-06	L2021050400002 3	2023-08-04	2024-08-04
8	Preamplifier	Agilent	8449B	3008A00620	2023-04-21	2024-04-21
9	Double Ridged Guide Antenna	ETS-Lindgren	3115	00078895	2023-04-13	2024-04-13
10	Horn Antenna	SCHWARZBECK	BBHA9170	01153	2023-10-19	2024-10-19
11	Low Noise Amplifier	TESTEK	TK-PA1840H	210124-L	2023-10-23	2024-10-23
12	Band Reject Filter	Micro Tronics	BRM50702	G233	2023-12-04	2024-12-04
13	Spectrum Analyzer	Rohde & Schwarz	FSV40	101574	2023-01-11	2024-01-11
14	DC Power Supply	Agilent	E3642A	KR93300203	2023-12-01	2024-12-01

No.	Cable	Manufacturer	Model No.	Serial No.	Check Date
1	RF Cable(conducted)	Junkosha Inc.	MWX221	2008S240	2023-12-12
2	RF Cable (9kHz-1GHz Radiated)	Canare Corporation	L-5D2W	N/A	2023-09-15
3	RF Cable (9kHz-1GHz Radiated)	HUBER+SUHNER	SUCOFLEX 104	MY27558/4	2023-09-15
4	RF Cable (1GHz-18GHz Radiated)	Junkosha Inc.	MWX221	2008S246	2023-04-14
5	RF Cable (1GHz-18GHz Radiated)	Rosenberger	NONE	1520.9927.00	2023-04-14
6	RF Cable (1GHz-18GHz Radiated)	Sensorview Co., LTD	9S18	TPC2204060007	2023-04-14
7	RF Cable (18GHz-26.5GHz Radiated)	HUBER+SUHNER	SUCOFLEX 102	MY2372/2	2023-04-14
8	RF Cable (18GHz-26.5GHz Radiated)	HUBER+SUHNER	SUCOFLEX 102	MY073/2	2023-04-14
9	RF Cable (18GHz-26.5GHz Radiated)	Sensorview Co., LTD	9S40	TP210713-001	2023-04-14

-END-