

TEST REPORT



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-2020-00939
Page (1) / (30) Pages

1. Client

- Name : SOLUM CO.,LTD.
- Address : 4,5,6th F, 357, Guseong-ro, Giheung-gu, Gyeonggi-do, Yongin-si, Republic of Korea
- Date of Receipt : 2020-02-04

2. Manufacturer

- Name #1 : SOLUM CO.,LTD.
- Address #1 : 4,5,6th F, 357, Guseong-ro, Giheung-gu, Gyeonggi-do, Yongin-si, Republic of Korea
- Name #2 : SOLUM VINA CO., LTD
- Address #2 : Plot B3, Ba Thien 2 Industrial park, Thien Ke Ward, Binh Xuyen District, Vinh Phuc Province, 281200., People's Republic of Vietnam

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

4. Test Sample / Model : ESL Gateway / SLG-EP101S

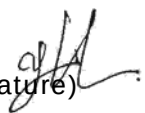
5. Date of Test : 2020-02-08 to 2020-02-25

6. Test Standard(method) used : FCC 47 CFR part 15 subpart C 15.249,
RSS-210, RSS-Gen

7. Testing Environment : Temp.: (23 ± 2) °C, Humidity: (51 ± 3) % R.H.

8. Test Results : Compliance

The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This Test Report cannot be reproduced, except in full.

Affirmation	Tested by	Technical Manager
	Bong-seok Kim: (Signature) 	Young-taek Lee: (Signature) 

2020-02-25

Republic of KOREA **CTK Co., Ltd.**



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-2020-00939
Page (2) / (30) Pages

REPORT REVISION HISTORY

Date	Revision	Page No
2020-02-25	Issued (CTK-2020-00939)	all

This report shall not be reproduced except in full, without the written approval of CTK Co., Ltd. This document may be altered or revised by CTK Co., Ltd. personnel only, and shall be noted in the revision section of the document. Any alteration of this document not carried out by CTK Co., Ltd. will constitute fraud and shall nullify the document.

CONTENTS

1. General Product Description	4
1.1 Client Information	4
1.2 Product Information	4
1.3 Peripheral Devices	4
2. Facility and Accreditations	5
2.1 Test Facility	5
2.2 Laboratory Accreditations and Listings	5
2.3 Calibration Details of Equipment Used for Measurement	5
3. Test Specifications	6
3.1 Standards	6
3.2 Mode of operation during the test	7
3.3 Maximum Measurement Uncertainty	8
4. Technical Characteristic Test	9
4.1 Band Edge	9
4.2 Field strength	12
4.3 AC Conducted Emissions	23
4.4 Occupied bandwidth	28
APPENDIX A – Test Equipment Used For Tests	30

1. General Product Description

1.1 Client Information

Company	SOLUM CO.,LTD.
Contact Point	4,5,6th F, 357, Guseong-ro, Giheung-gu, Gyeonggi-do, Yongin-si, Republic of Korea
Contact Person	Name : YANG CHANG SOO E-mail : cs.yang@solu-m.com Tel : +82-31-8006-7650

1.2 Product Information

FCC ID	2AFWN-SLG-EP101S
IC	22800-SLGEP101S
Product Description	ESL Gateway
Basic Model name	SLG-EP101S
Variant Model name	SLG-EN101S, SLG-ES101S (Variant models have no technical differences with each model except for the model name and color for marketing purposes.)
Operating Frequency	902.4 - 927.6 MHz
RF Output Power	Below 94 dBuV/m @ 3 m
Antenna type	Antenna 1 type : PCB antenna Antenna 2 type : PCB antenna
Antenna gain	Antenna 1 : 3.3 dBi Antenna 2 : 3.3 dBi
Channel Spacing	0.4 MHz
Number of channels	64
Type of Modulation	2-GFSK
Power Source	DC 48 V(PoE), DC 5 V(Adaptor)
Firmware Version Id Number(FVIN)	V1.0

1.3 Peripheral Devices

Device	Manufacturer	Model No.	Serial No.
Notebook Computer	HP	HP Probook 650 G1	5CG5114K13
AC Adapter	HP	PPP012D-S	677777-003
PoE	NEXT NETWORK	NEXT-PEG4806JT	-
AC Adapter	SAMSUNG	ETA-U90KBK	DK4F528TS/B-E

2. Facility and Accreditations

2.1 Test Facility

The measurement facility is located at (Ho-dong), 113, Yejik-ro, Cheoin-gu, Yong-in-si, Gyeonggi-do, Korea.

2.2 Laboratory Accreditations and Listings

Country	Agency	Registration Number
USA	FCC	805871
CANADA	ISED	8737A-2
KOREA	NRRA	KR0025

2.3 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

FCC Part Section(s)	Section in RSS	Requirement(s)	Status (Note 1)
15.249(a)	RSS-210 Annex F.1(a)	Field Strength of emissions from intentional radiators	C
15.249(d)	RSS-210 Annex F.1(b)	Emissions radiated outside of the specified frequency bands	C
15.209	RSS-210 Annex F.1(a)	Radiated Emissions	C
15.207	RSS-Gen 8.8	AC Conducted Emission	C
-	RSS-Gen	Occupied bandwidth	C
<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 sample was tested according to the following specification: FCC Part 15.249, ANSI C63.10-2013. RSS-210 Issue 10, RSS-Gen Issue 5			

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.

Test Frequency

Lowest channel	Middle channel	Highest channel
902.4 MHz	915.2 MHz	927.6 MHz

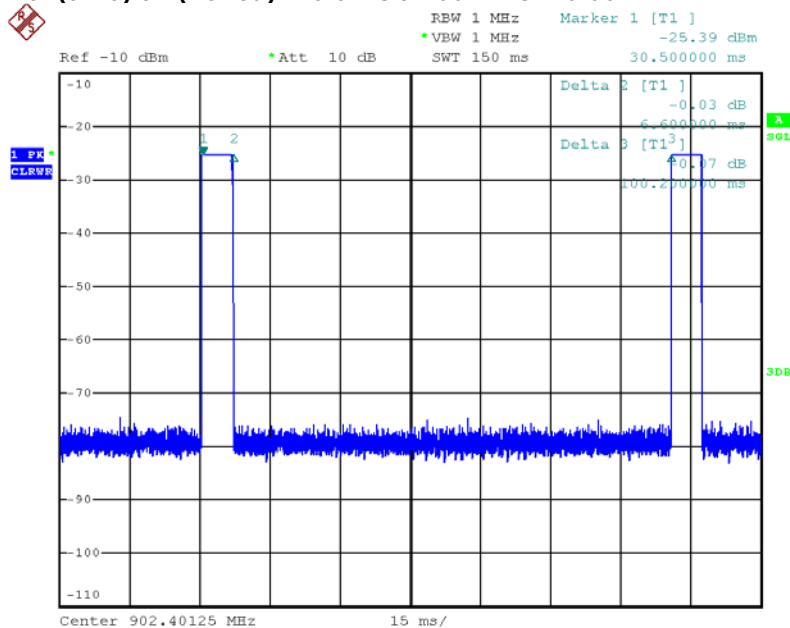
Test antenna

Antenna 1	Antenna 2
ANT1	ANT2

Test mode

TX mode	Duty cycle*
Continuous	0.06 (6%)

*Duty cycle = TX on(time) / T(Period) = 6.6 ms / 100.2 ms = 0.06



Date: 24.FEB.2020 17:13:14

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
Unwanted Emission(conducted)	3.0 dB
Radiated Emissions ($f \leq 1$ GHz)	4.0 dB
Radiated Emissions ($f > 1$ GHz)	5.0 dB

4. Technical Characteristic Test

4.1 Band Edge

Requirement

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

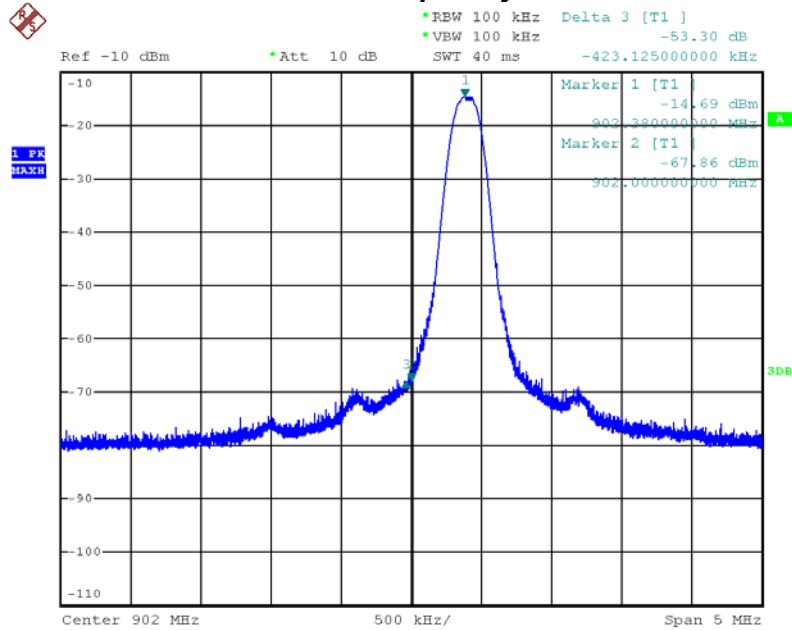
Test Procedures(ANSI C63.10-2013 6.10)

- a) Connect the spectrum analyzer to the EUT using an appropriate RF cable connected to the EUT output. Configure the spectrum analyzer settings as described in step e) (be sure to enter all losses between the unlicensed wireless device output and the spectrum analyzer).
- b) Set the EUT to the lowest frequency channel (for the hopping on test, the hopping sequence shall include the lowest frequency channel).
- c) Set the EUT to operate at maximum output power and 100% duty cycle, or equivalent “normal mode of operation”.
- d) Perform the test as follows:
 - 1) Span : Wide enough to capture the peak level of the emission operating on the channel closest to the band edge, as well as any modulation products that fall outside of the authorized band of operation.
 - 2) RBW : 100 kHz
 - 3) VBW : 300 kHz
 - 4) Detector : Peak
 - 5) Sweep time = Coupled
 - 6) Trace : Max hold
 - 7) Attenuation : Auto(at least 10 dB preferred)
 - 8) Allow trace to fully stabilize
- e) Set the marker on the emission at the band edge, or on the highest modulation product outside of the band, if this level is greater than that at the band edge. Enable the marker-delta function, and then use the marker-to-peak function to move the marker to the peak of the in-band emission.
- f) Set the EUT to the highest frequency channel (for the hopping on test, the hopping sequence shall include the highest frequency channel) and repeat step c) through step d).
- g) The band-edge measurement shall be reported by providing plot(s) of the measuring instrument display; the plot axes and the scale units per division shall be clearly labeled. Tabular data may be reported in addition to the plot(s).

Test results: Complies

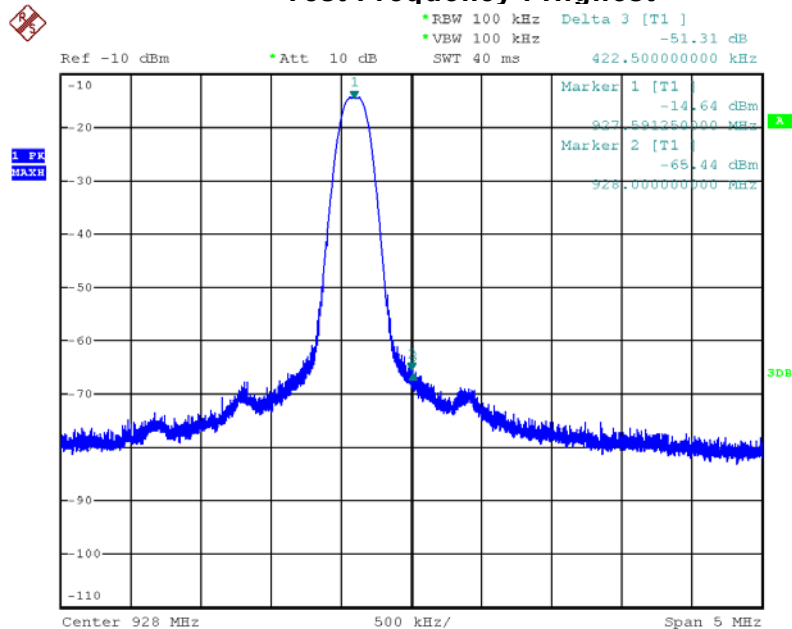
See next pages for actual measured spectrum plots.

Band-edge
Test Mode : ANT1
Test Frequency : Lowest



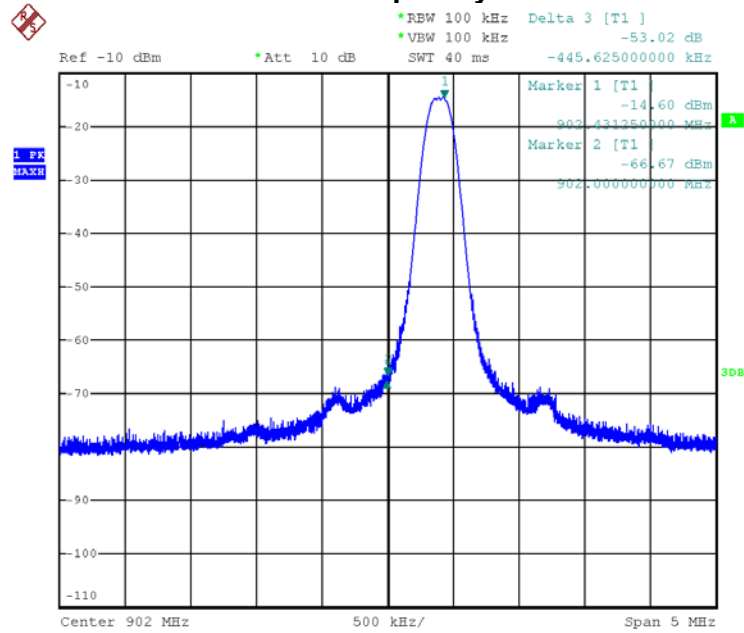
Date: 24.FEB.2020 15:45:36

Test Frequency : Highest



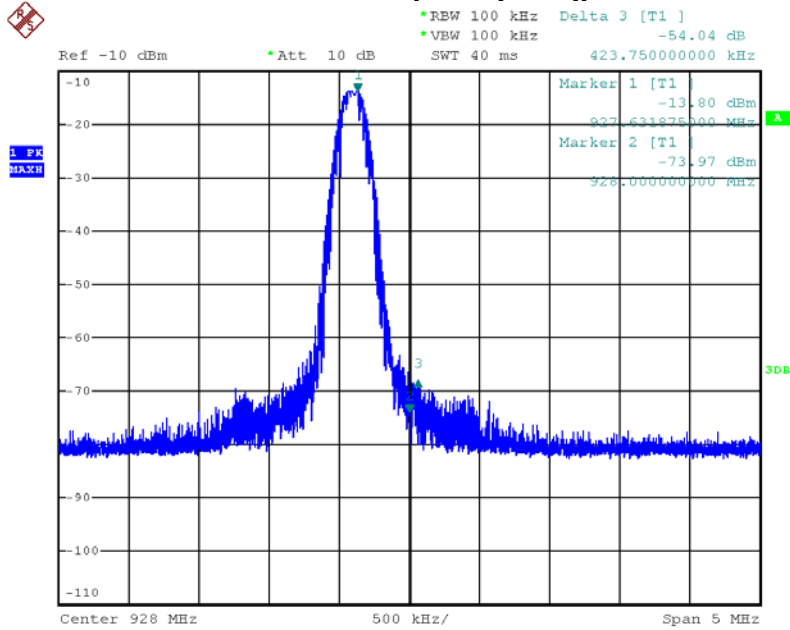
Date: 24.FEB.2020 15:53:22

Test Mode : ANT2
Test Frequency : Lowest



Date: 24.FEB.2020 15:59:09

Test Frequency : Highest



Date: 24.FEB.2020 15:56:38

 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-2020-00939 Page (12) / (30) Pages	
---	--	--	--

4.2 Field strength

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 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 ~ 12.75 GHz (10th harmonic)

- a) RBW = 1 MHz for $f \geq 1$ GHz, 120 kHz for $f < 1$ GHz, 9 kHz for $f < 30$ MHz
- b) VBW $\geq$ RBW
- c) Sweep time = auto couple

Requirement :

The field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Fundamental frequency	Field strength of fundamental	Field strength of harmonics
902-928 MHz	50 mV/m (94 dBuV/m)	500 uV/m (54 dBuV/m)

Field strength limits are specified at a distance of 3 meters.

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

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	Field Strength dBuV / m	Measurement 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)
- 3) Average value = Peak value + Duty cycle correction factor(For pulse timing characteristics such as fundamental and harmonic emissions)

Unwanted emissions that do not fall within the restricted frequency bands of Table 1 shall comply either with the limits specified in the applicable RSS or with those specified in this RSS-Gen.

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	

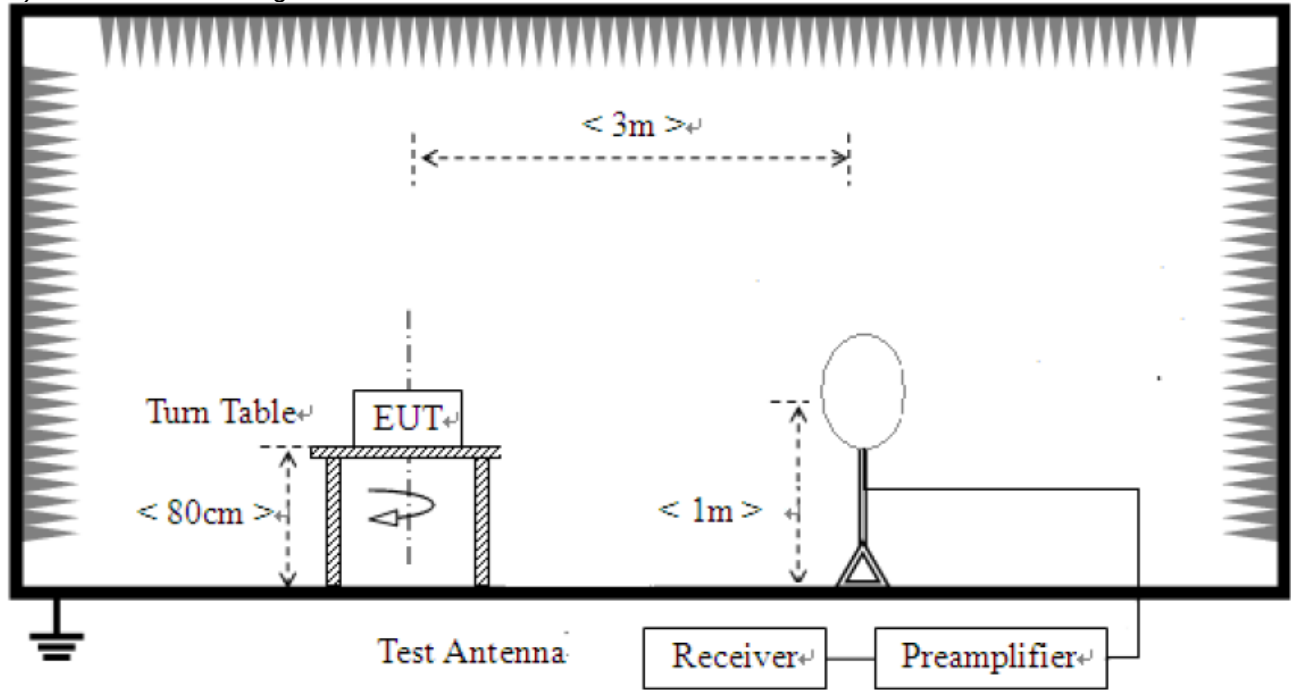
¹ Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

² Above 38.6

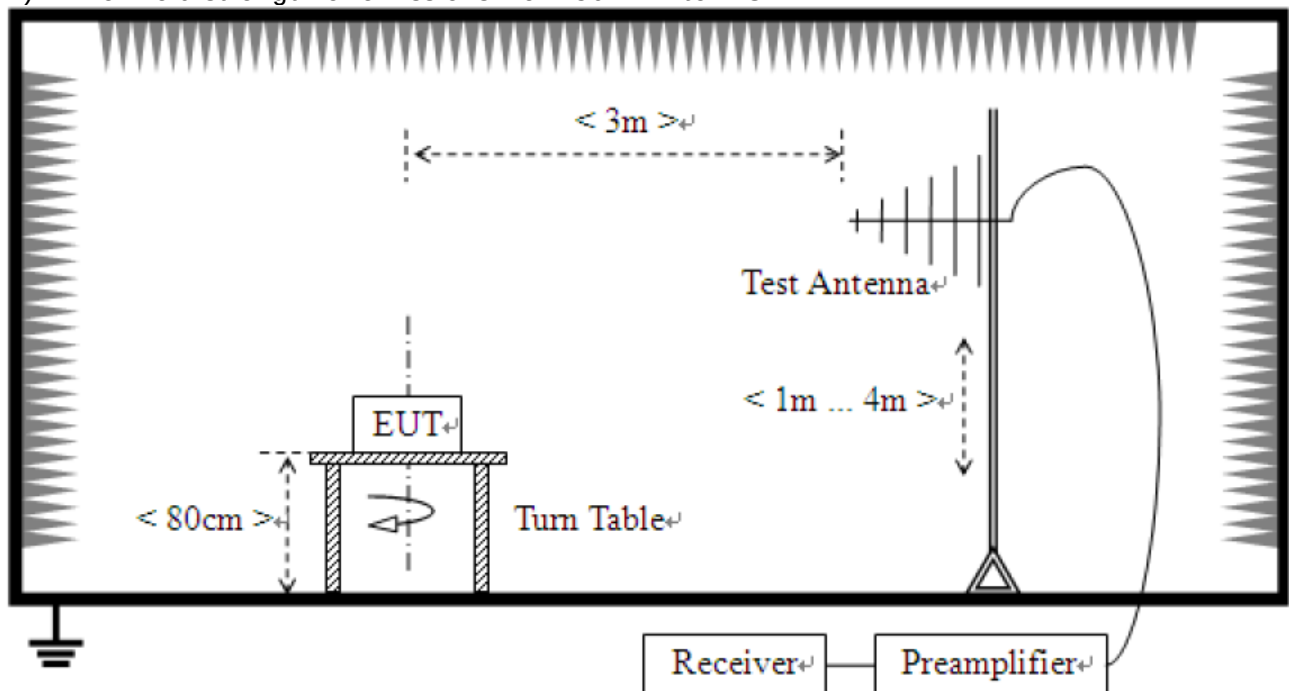
§ 15.205 (b) Except as provided in paragraphs (d) and (e), the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using 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.

Test Setup:

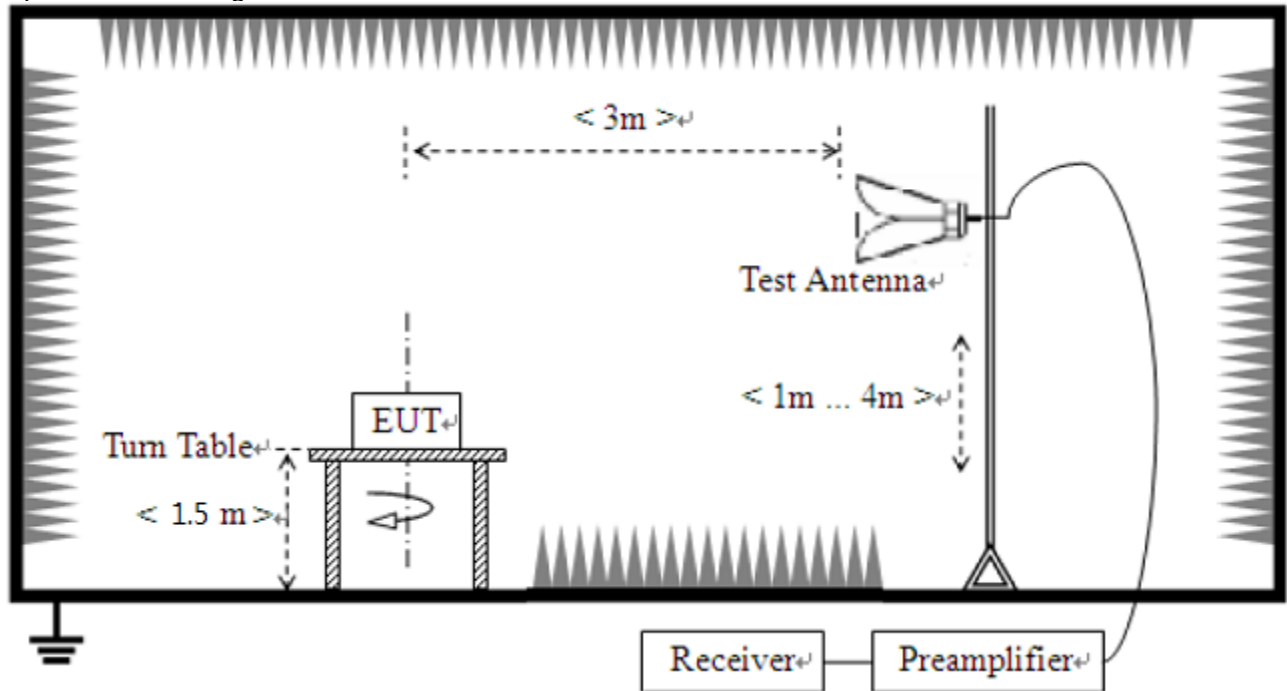
- 1) For field strength of emissions from 9 kHz to 30 MHz



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



3) For field strength of emissions above 1 GHz



Test Data :

1) Field strength of fundamental

The requirements are:

☒ Complies

Test mode : Transmit, ANT1

Frequency [MHz]	Ant. Pol. (V/H)	Reading * [dBuV/m]	C.F [dB/m]	Duty Cycle c.f [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
902.4	V	106.4	5.9	-24.44	87.86	94	6.14	
915.2	V	105.5	6.4	-24.44	87.46	94	6.54	
927.6	V	104.6	7.2	-24.44	87.36	94	6.64	

Test mode : Transmit, ANT2

Frequency [MHz]	Ant. Pol. (V/H)	Reading * [dBuV/m]	C.F [dB/m]	Duty Cycle c.f [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
902.4	V	105.9	5.9	-24.44	87.36	94	6.64	
915.2	V	104.9	6.4	-24.44	86.86	94	7.14	
927.6	V	103.4	7.2	-24.44	86.16	94	7.84	

1. Result = Reading + c.f(correction factor) + Duty cycle c.f
2. Correction factor = Antenna factor + Cable loss + 6 dB attenuator - Amp Gain
3. Duty cycle c.f = $20\log(\text{Duty cycle}) = 20\log(0.06) = -24.44 \text{ dB}$
4. The Unwanted emission was measured in the following position: EUT stand-up position(X, Y axis), lie-down position(Z axis). The worst emission was found in lie-down position(X axis) and the worst case was recorded.

* Reading data is the peak value.

2) Field strength of outside of the specified frequency bands – 9 kHz to 30 MHz

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 = $40 \log (\text{specific distance} / \text{test distance})$ (dB)

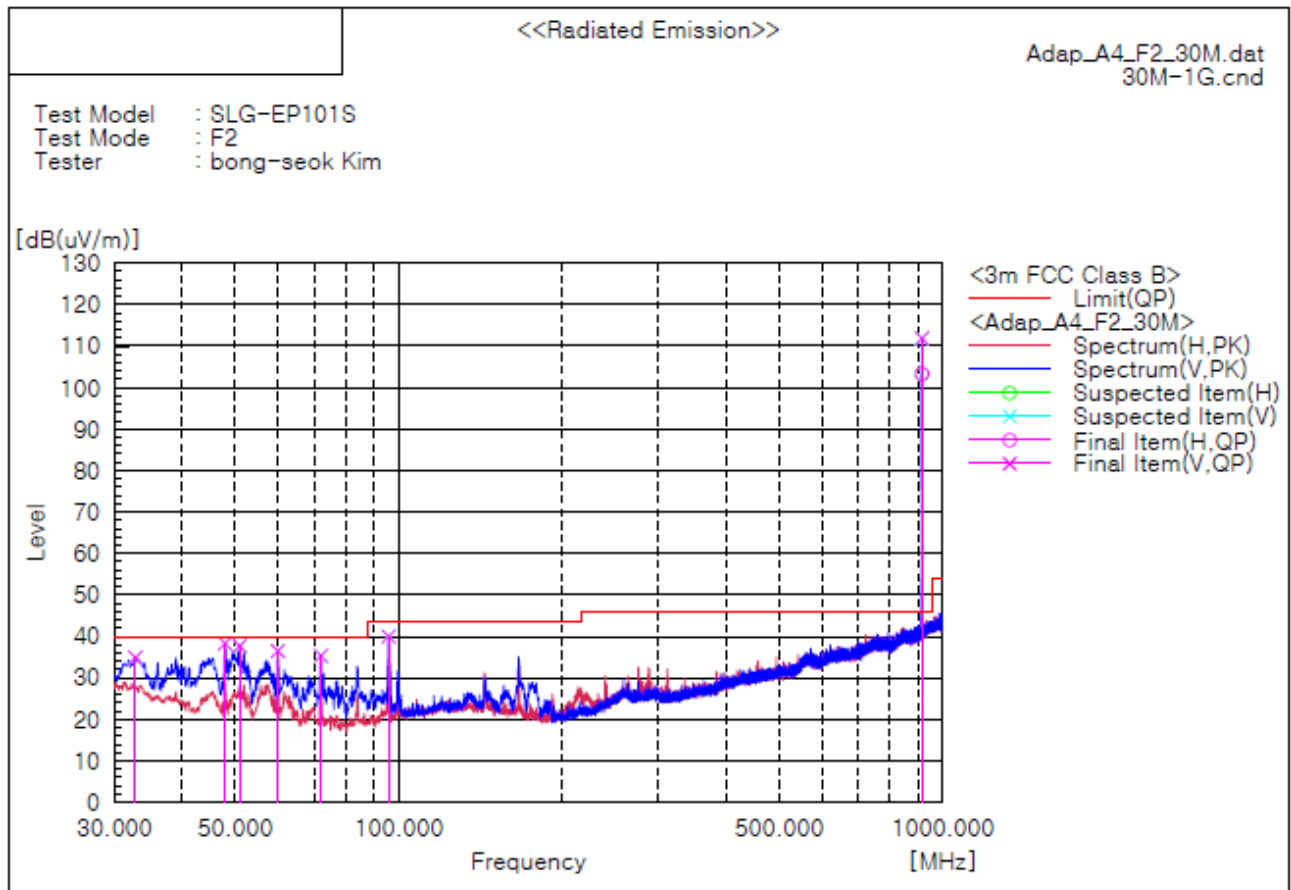
3) Field strength of outside of the specified frequency bands – 30 MHz to 1 GHz

Test mode : Transmit, ANT1

The requirements are:

☒ Complies

Test Frequency : Middle channel(worst case)



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	32.789	V	42.8	-7.9	34.9	40.0	5.1	101.0	263.0
2	47.945	V	53.2	-14.9	38.3	40.0	1.7	101.0	214.0
3	50.976	V	53.9	-16.2	37.7	40.0	2.3	101.0	181.0
4	59.949	V	55.0	-18.5	36.5	40.0	3.5	101.0	267.0
5	71.953	V	52.9	-17.6	35.3	40.0	4.7	101.0	290.0
6	95.839	V	54.4	-14.4	40.0	43.5	3.5	101.0	184.0
7	915.246	V	105.5	6.4	111.9	46.0	-65.9	101.0	15.0
8	915.246	H	96.9	6.4	103.3	46.0	-57.3	101.0	262.0

Remark :

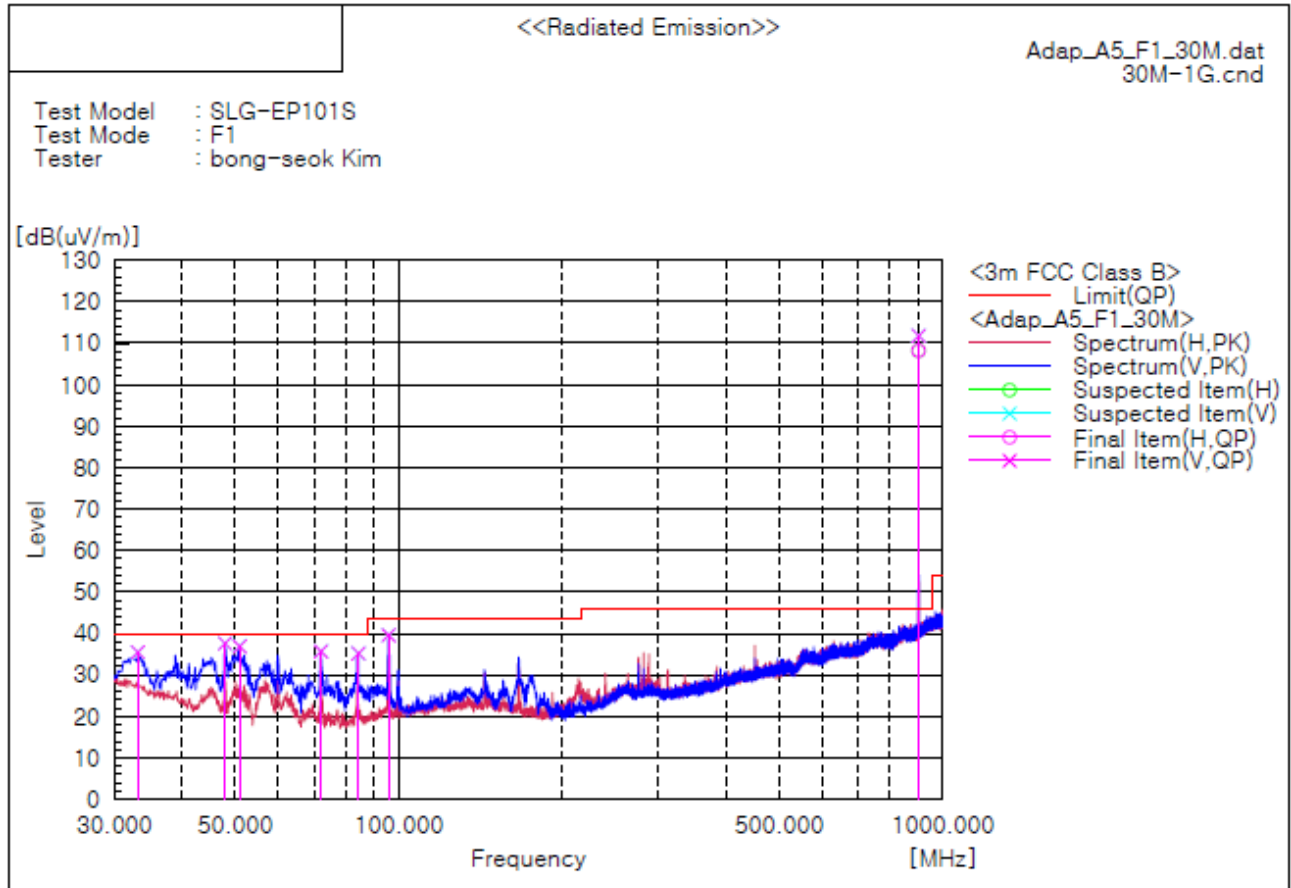
- Result = Reading + c.f(Correction factor)
 - Correction factor = Antenna factor + Cable loss + 6 dB attenuator - Amp Gain
 - No.7 and No.8 are the carrier frequencies.
 - The Unwanted emission was measured in the following position: EUT stand-up position(X, Y axis), lie-down position(Z axis). The worst emission was found in lie-down position(X axis) and the worst case was recorded.
 - Radiation emission was considered in the co-located mode of 2.4 GHz and 900 MHz.
- * Reading data is the peak value.

Test mode : Transmit, ANT2

The requirements are:

☒ Complies

Test Frequency : Low channel(worst case)



Final Result

No.	Frequency (P)	Reading	c.f	Result	Limit	Margin	Height	Angle
	[MHz]	[dB(uV)]	[dB(1/m)]	[dB(uV/m)]	[dB(uV/m)]	[dB]	[cm]	[deg]
1	33.153	V 43.6	-8.1	35.5	40.0	4.5	101.0	254.0
2	47.945	V 52.5	-14.9	37.6	40.0	2.4	101.0	235.0
3	50.976	V 53.1	-16.2	36.9	40.0	3.1	101.0	194.0
4	71.953	V 53.3	-17.6	35.7	40.0	4.3	101.0	251.0
5	84.320	V 51.0	-15.8	35.2	40.0	4.8	205.0	354.0
6	95.839	V 54.0	-14.4	39.6	43.5	3.9	101.0	247.0
7	902.394	V 105.9	5.9	111.8	46.0	-65.8	101.0	170.0
8	902.515	H 102.3	5.9	108.2	46.0	-62.2	101.0	89.0

Remark :

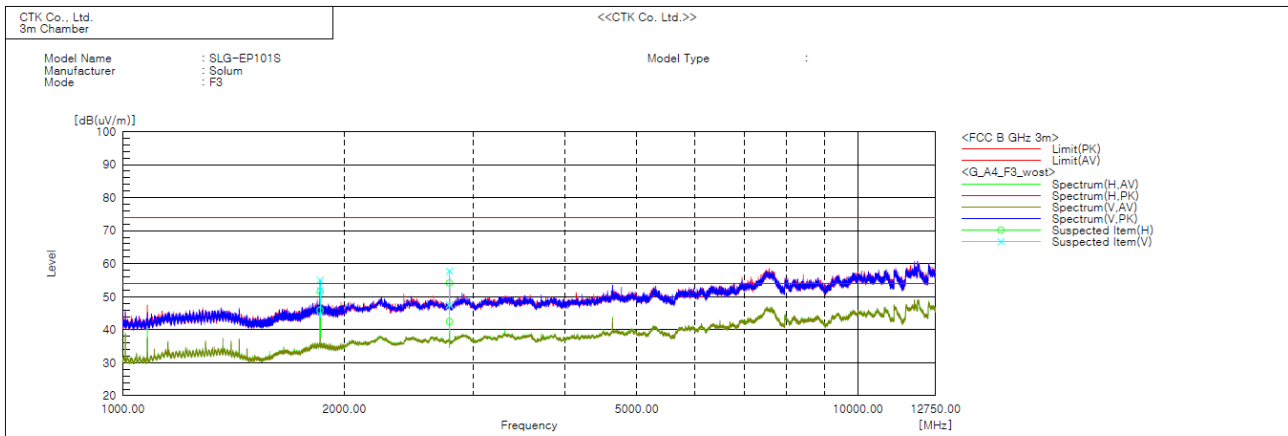
1. Result = Reading + c.f(Correction factor)
 2. Correction factor = Antenna factor + Cable loss + 6 dB attenuator - Amp Gain
 3. No.7 and No.8 are the carrier frequencies.
 4. The Unwanted emission was measured in the following position: EUT stand-up position(X, Y axis), lie-down position(Z axis). The worst emission was found in lie-down position(X axis) and the worst case was recorded.
 5. Radiation emission was considered in the co-located mode of 2.4 GHz and 900 MHz.
- * Reading data is the peak value.

4) Field strength of outside of the specified frequency bands – 1 GHz to 12.75 GHz

The requirements are:

☒ Complies

Test mode : Transmit, ANT1, Highest(Worst case)



Spectrum Selection

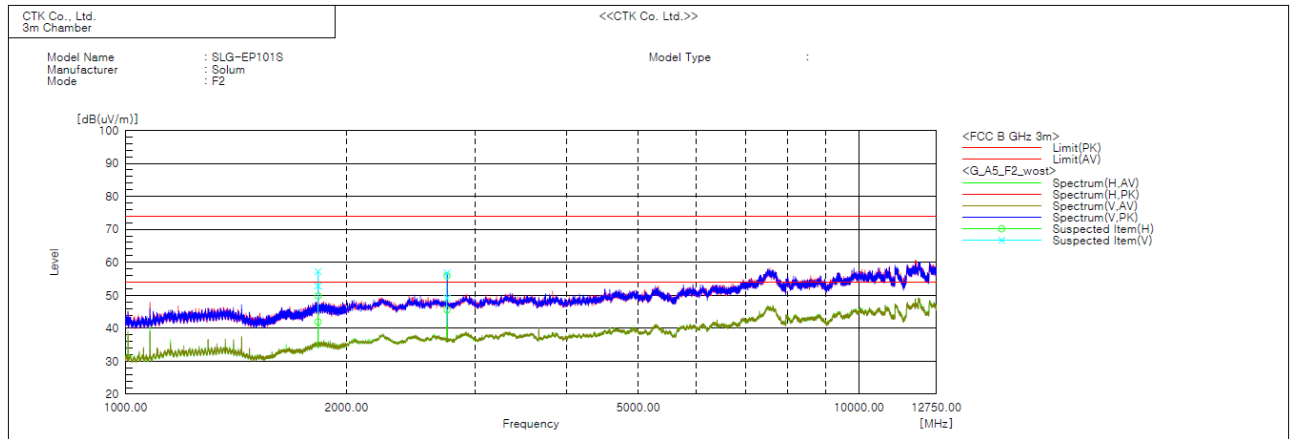
No.	Frequency [MHz]	(P)	Reading [dB(uV)]	c.f [dB(1/m)]	Result PK [dB(uV/m)]	Result AV [dB(uV/m)]	Limit PK [dB(uV/m)]	Limit AV [dB(uV/m)]	Margin PK [dB]	Margin AV [dB]	Height [cm]	Angle [deg]
1	1855.000	H	48.2	3.4	51.6	45.9	74.0	54.0	22.4	8.1	99.8	1.8
2	1855.125	H	42.5	3.4	45.9	45.9	74.0	54.0	19.0	2.1	99.8	0.0
3	1855.375	V	51.6	3.4	55.0	51.9	74.0	54.0	19.0	2.1	345.6	273.0
4	1855.250	V	48.5	3.4	51.9	42.5	74.0	54.0	19.8	11.5	356.2	4.5
5	2782.063	H	48.1	6.1	54.2	42.5	74.0	54.0	19.8	11.5	99.8	196.3
6	2782.063	H	36.4	6.1	42.5	42.5	74.0	54.0	16.2	6.4	464.2	0.0
7	2782.063	V	51.7	6.1	57.8	47.6	74.0	54.0	16.2	6.4	464.2	102.9
8	2782.063	V	41.5	6.1	47.6	47.6	74.0	54.0	16.2	6.4	344.8	46.2

Remarks

- Result = Reading + c.f(correction factor) + Duty cycle c.f
- Correction factor = Antenna factor + Cable loss + 6 dB attenuator - Amp Gain
- The Unwanted emission was measured in the following position: EUT stand-up position(X, Y axis), lie-down position(Z axis). The worst emission was found in lie-down position(X axis) and the worst case was recorded.
- Radiation emission was considered in the co-located mode of 2.4 GHz and 900 MHz.

* Reading data is the peak value.

Test mode : Transmit, ANT2, Middle (Worst case)



Spectrum Selection

No.	Frequency [MHz]	(P)	Reading [dB(uV)]	c.f [dB(1/m)]	Result PK [dB(uV/m)]	Result AV [dB(uV/m)]	Limit PK [dB(uV/m)]	Limit AV [dB(uV/m)]	Margin PK [dB]	Margin AV [dB]	Height [cm]	Angle [deg]
1	1830.250	V	53.9	3.3	57.2	52.8	74.0	54.0	16.8	1.2	99.8	245.3
2	1830.375	V	49.5	3.3	52.8	52.8	74.0	54.0	21.2	1.2	344.0	0.0
3	1830.625	H	46.5	3.3	49.8	41.9	74.0	54.0	24.2	12.1	236.2	13.4
4	1830.625	H	38.6	3.3	41.9	45.6	74.0	54.0	32.4	8.4	99.8	0.0
5	2744.438	H	39.4	6.2	45.6	49.1	74.0	54.0	28.4	8.4	238.3	8.4
6	2744.438	V	50.6	6.2	56.8	49.1	74.0	54.0	22.2	4.9	464.1	347.2
7	2744.438	V	42.9	6.2	49.1	49.1	74.0	54.0	24.9	4.9	464.1	351.7
8	2744.438	H	49.7	6.2	55.9	49.1	74.0	54.0	20.1	4.9	464.1	324.7

Remarks

1. Result = Reading + c.f(correction factor) + Duty cycle c.f
2. Correction factor = Antenna factor + Cable loss + 6 dB attenuator - Amp Gain
3. The Unwanted emission was measured in the following position: EUT stand-up position(X, Y axis), lie-down position(Z axis). The worst emission was found in lie-down position(X axis) and the worst case was recorded.
4. Radiation emission was considered in the co-located mode of 2.4 GHz and 900 MHz.

* Reading data is the peak value.

4.3 AC Conducted Emissions

A radio apparatus that is designed to be connected to the public utility (AC) power line shall ensure that the radio frequency voltage, which is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz-30 MHz, shall not exceed the limits.

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

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 mode : Transmit, PoE, ANT2, lowest channel(Worst case)

Frequency [MHz]	Measured Data [dBuV]	Margin [dB]	Remark
0.717	44.4	1.6	Average

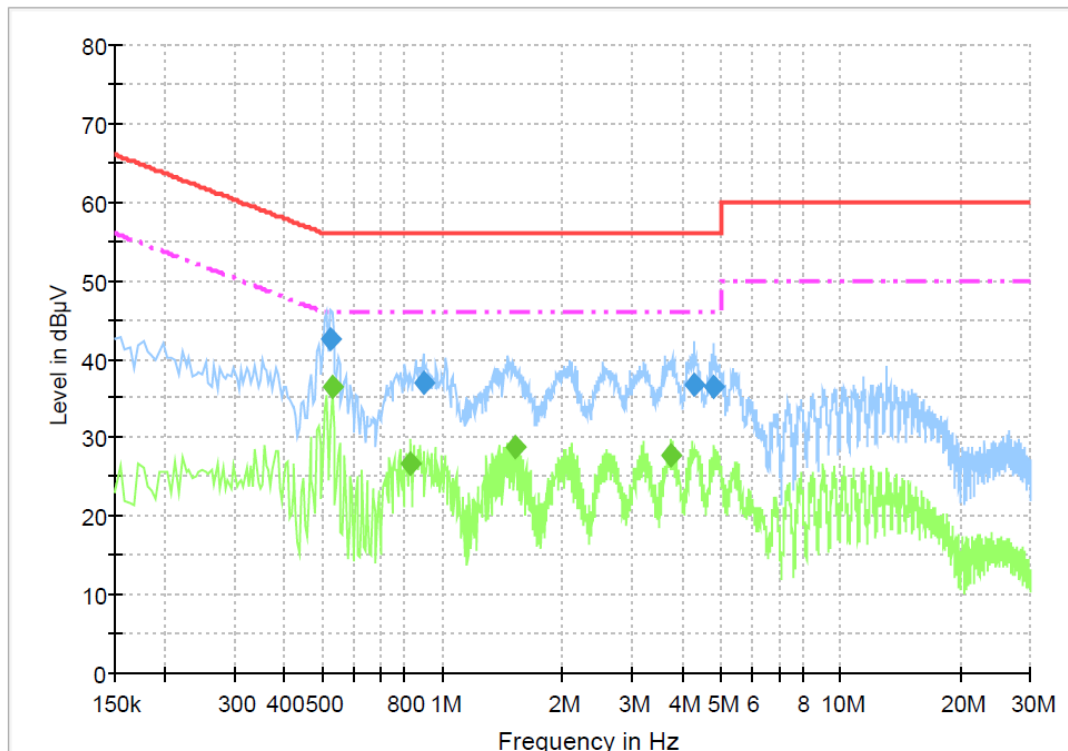
Test Results

The requirements are:

☒ Complies

Test Data

**Test mode : Adaptor, Transmit
[L1]**



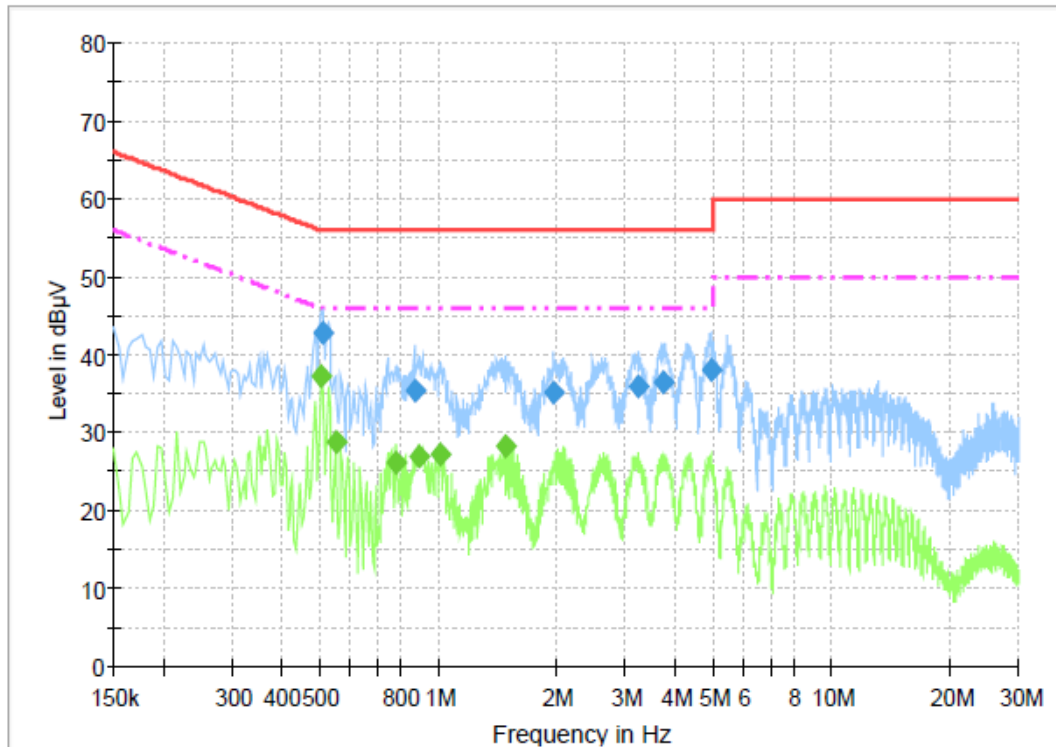
Final Result 1

Frequency (MHz)	QuasiPeak (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.523500	42.6	1000.0	9.000	On	L1	10.0	13.4	56.0
0.892500	36.8	1000.0	9.000	On	L1	9.8	19.2	56.0
4.267500	36.6	1000.0	9.000	On	L1	9.9	19.4	56.0
4.785000	36.4	1000.0	9.000	On	L1	9.9	19.6	56.0

Final Result 2

Frequency (MHz)	CAverage (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.528000	36.5	1000.0	9.000	On	L1	10.0	9.5	46.0
0.829500	26.6	1000.0	9.000	On	L1	9.8	19.4	46.0
1.527000	28.9	1000.0	9.000	On	L1	9.8	17.1	46.0
3.754500	27.8	1000.0	9.000	On	L1	9.9	18.2	46.0

[NEUTRAL]



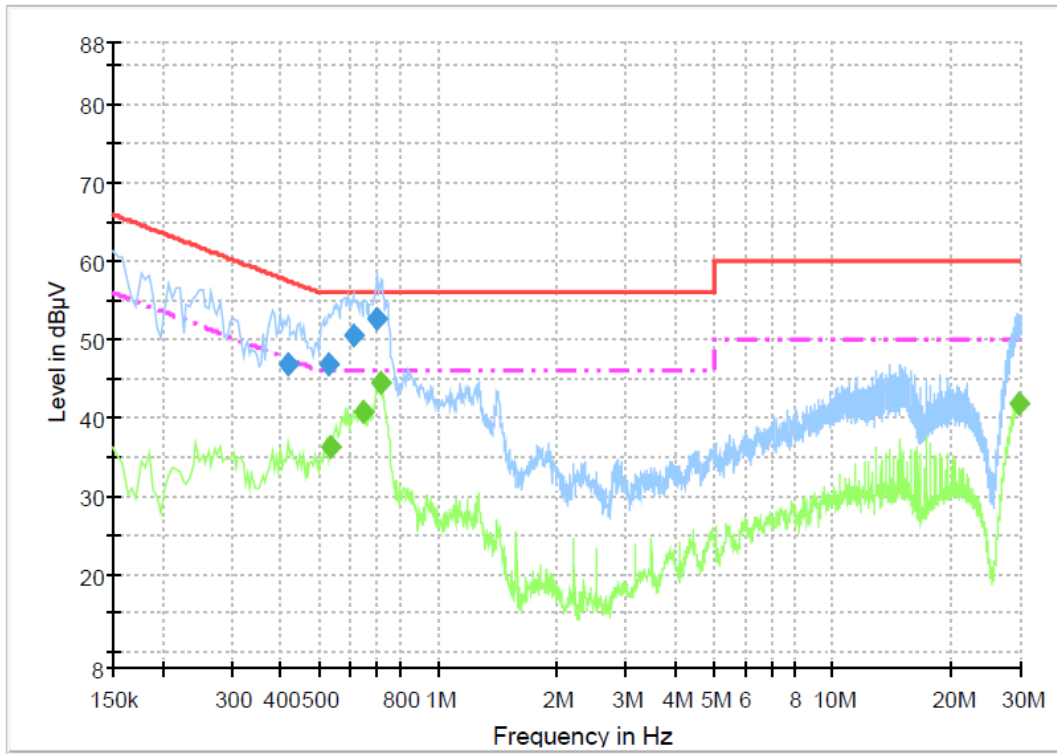
Final Result 1

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.510000	42.7	1000.0	9.000	On	N	10.0	13.3	56.0
0.874500	35.4	1000.0	9.000	On	N	9.8	20.6	56.0
1.972500	35.2	1000.0	9.000	On	N	9.8	20.8	56.0
3.250500	35.9	1000.0	9.000	On	N	9.8	20.1	56.0
3.727500	36.3	1000.0	9.000	On	N	9.9	19.7	56.0
4.933500	37.9	1000.0	9.000	On	N	9.9	18.1	56.0

Final Result 2

Frequency (MHz)	CAverage (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.505500	37.3	1000.0	9.000	On	N	10.0	8.7	46.0
0.550500	28.8	1000.0	9.000	On	N	10.0	17.2	46.0
0.784500	26.2	1000.0	9.000	On	N	9.9	19.8	46.0
0.901500	26.9	1000.0	9.000	On	N	9.8	19.1	46.0
1.018500	27.3	1000.0	9.000	On	N	9.8	18.7	46.0
1.486500	28.4	1000.0	9.000	On	N	9.8	17.6	46.0

Test mode : PoE, Transmit
[L1]



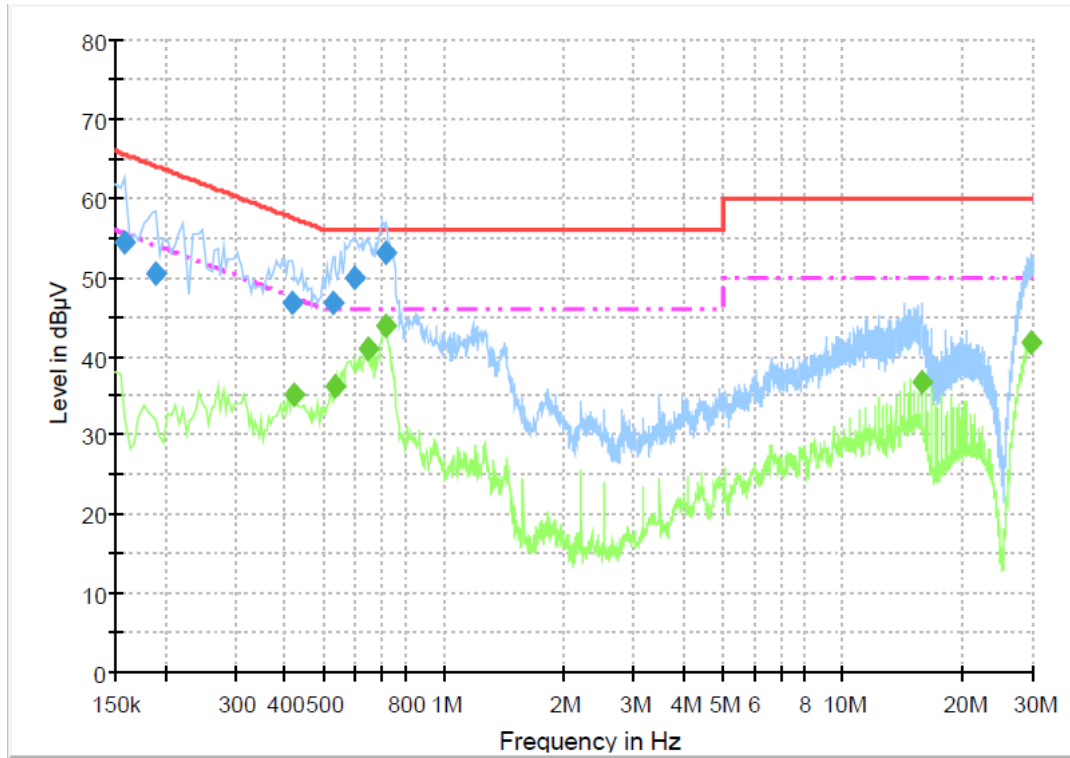
Final Result 1

Frequency (MHz)	QuasiPeak (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.415500	46.8	1000.0	9.000	On	L1	10.0	10.7	57.5
0.528000	46.7	1000.0	9.000	On	L1	10.0	9.3	56.0
0.609000	50.4	1000.0	9.000	On	L1	9.9	5.6	56.0
0.703500	52.6	1000.0	9.000	On	L1	9.9	3.4	56.0

Final Result 2

Frequency (MHz)	CAverage (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.532500	36.4	1000.0	9.000	On	L1	10.0	9.6	46.0
0.649500	40.6	1000.0	9.000	On	L1	9.9	5.4	46.0
0.717000	44.4	1000.0	9.000	On	L1	9.9	1.6	46.0
29.652000	41.8	1000.0	9.000	On	L1	10.1	8.2	50.0

[NEUTRAL]



Final Result 1

Frequency (MHz)	QuasiPeak (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.159000	54.4	1000.0	9.000	On	N	9.8	11.1	65.5
0.190500	50.5	1000.0	9.000	On	N	9.8	13.5	64.0
0.415500	46.6	1000.0	9.000	On	N	10.0	10.9	57.5
0.528000	46.6	1000.0	9.000	On	N	10.0	9.4	56.0
0.595500	49.8	1000.0	9.000	On	N	9.9	6.2	56.0
0.717000	52.9	1000.0	9.000	On	N	9.9	3.1	56.0

Final Result 2

Frequency (MHz)	CAverage (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.424500	35.2	1000.0	9.000	On	N	10.0	12.2	47.4
0.532500	36.3	1000.0	9.000	On	N	10.0	9.7	46.0
0.649500	40.8	1000.0	9.000	On	N	9.9	5.2	46.0
0.717000	43.8	1000.0	9.000	On	N	9.9	2.2	46.0
15.792000	36.7	1000.0	9.000	On	N	10.0	13.3	50.0
29.575500	41.8	1000.0	9.000	On	N	10.2	8.2	50.0

4.4 Occupied bandwidth

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.

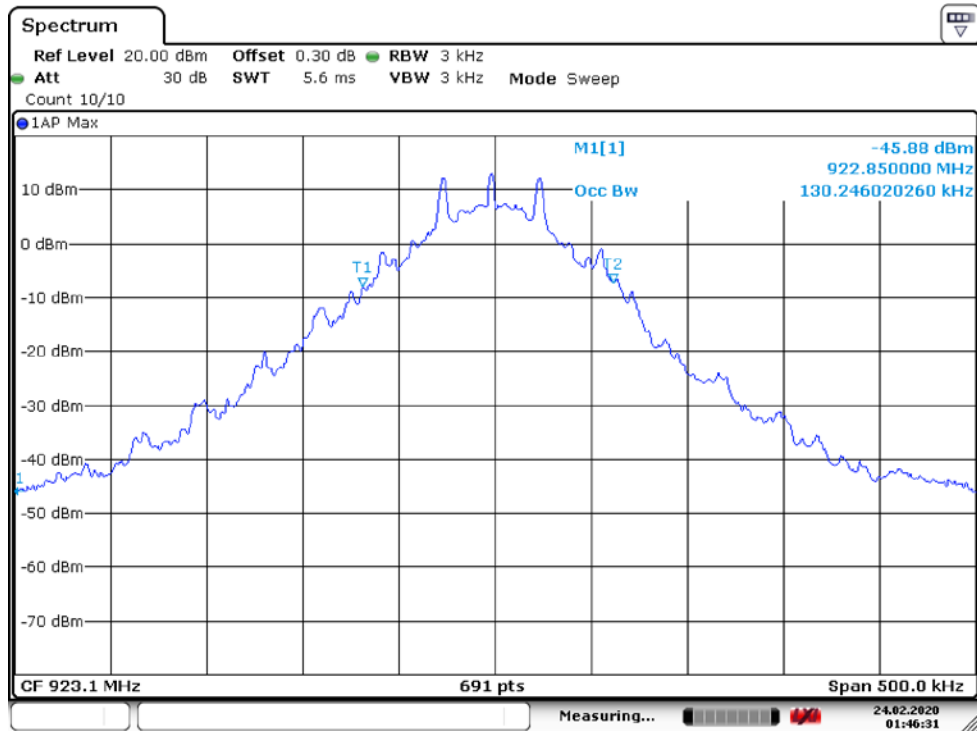
The following procedure shall be used for measuring 99% power bandwidth:

- 1) Center frequency : Nominal EUT channel center frequency
- 2) Frequency span : between 1.5 times and 5.0 times the OBW
- 3) RBW : in the range of 1 % to 5 % of the OBW
- 4) VBW $\geq 3 \times$ RBW
- 5) Detection : Peak
- 6) Use the 99% power bandwidth function of the instrument

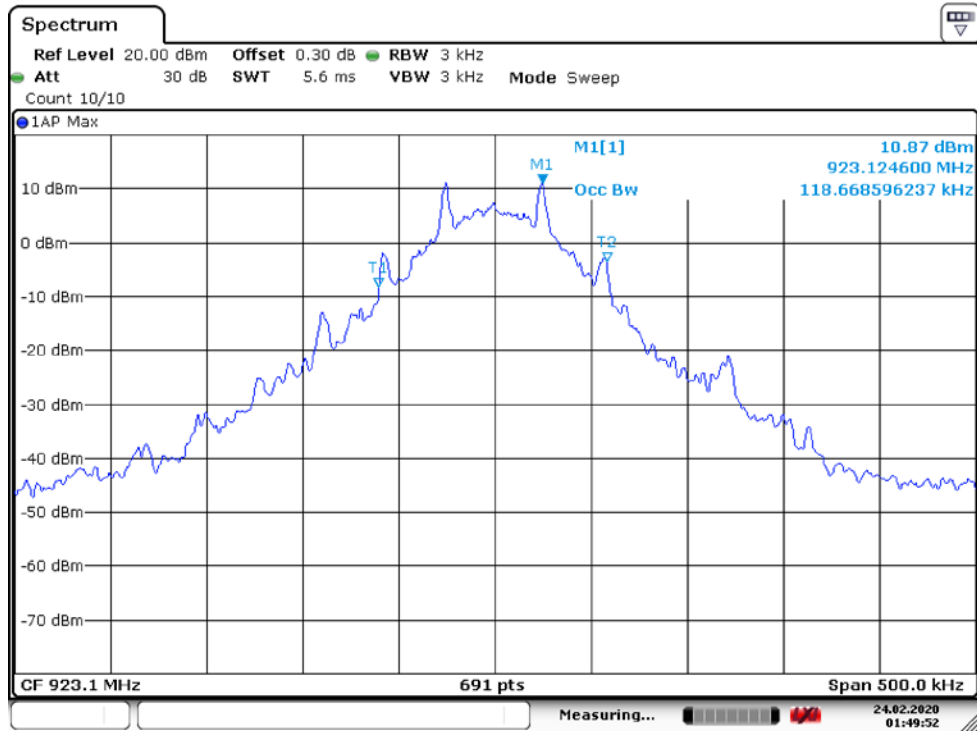
Test data

Mode	Center Frequency [MHz]	OBW [kHz]	Remark
ANT1	923.1	130	-
ANT2	923.1	119	-

Test mode : ANT1



Test mode : ANT2



APPENDIX A – Test Equipment Used For Tests

No.	Name of Equipment	Manufacturer	Model No.	Serial No.	Cal Date	Due Date
1	SPECTRUM ANALYZER	R&S	FSP-30	100994	2019-10-16	2020-10-16
2	EMI Test Receiver	Rohde & Schwarz	ESCI7	100814	2019-10-22	2020-10-22
3	Active Loop Antenna	SCHWARZBECK	FMZB 1513	1513-126	2019-01-17	2021-01-17
4	Bilog Antenna	Schaffner	CBL6111C	2551	2019-04-17	2021-04-17
5	AMPLIFIER	SONOMA	310	291721	2020-01-22	2021-01-22
6	6dB Attenuator	R&S	DNF	272.4110.50-2	2019-10-25	2020-10-25
7	EMI Test Receiver	Rohde & Schwarz	ESU40	100336	2020-01-17	2021-01-17
8	Double Ridged Guide Antenna	ETS-Lindgren	3117	00154525	2019-02-22	2021-02-22
9	Preamplifier	Agilent	8449B	3008A02011	2018-11-25	2020-11-25
10	Signal Generator	R&S	SMB100A	175528	2019-10-16	2020-10-16
11	LISN	Rohde & Schwarz	ENV216	101235	2020-01-17	2021-01-17
12	Signal Analyzer	Rohde & Schwarz	FSV30	100925	2020-01-17	2021-01-17

No.	Name of Equipment	Manufacturer	Model No.	Serial No.	Check Date
1	RF Cable (conducted)	Junkosha Inc.	MWX221	1510S087	2020-02-02
2	RF Cable (Radiated)	HUBER+SUHNER	SUCOFLEX 104	MY27558/4	2020-02-02
3	RF Cable (Radiated)	HUBER+SUHNER	SUCOFLEX 104	N/A (below 1GHz)	2020-02-02
4	RF Cable (Radiated)	HUBER+SUHNER	SUCOFLEX 104	MY27573/4	2019-11-30