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-2022-00059

1. Client

◦ Name : DSGLOBAL CO.,LTD

◦ Address : 107, Gasan digital 2-ro, Geumcheon-gu, Seoul

◦ Date of Receipt : 2021-12-28

2. Manufacturer

◦ Name : DSGLOBAL CO.,LTD

◦ Address : 107, Gasan digital 2-ro, Geumcheon-gu, Seoul

3. Use of Report : For FCC & ISED Certification

4. Test Sample / Model: NAIL POP / NP100

5. Date of Test : 2022-01-06 to 2022-01-17

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

7. Testing Environment: Temp.: (23 ± 1) ℃, Humidity: (48 ± 5) % 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 Gwanyong Kim: (Signature)	Technical Manager Young-taek Lee: (Signature)

2022-01-18

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 REVISION HISTORY

Date	Revision	Page No
2022-01-18	Issued (CTK-2022-00059)	all

CONTENTS

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

1. General Product Description

1.1 Client Information

Company	DSGLOBAL CO.,LTD
Contact Point	107, Gasan digital 2-ro, Geumcheon-gu, Seoul
Contact Person	Name : MINKON KWAK E-mail : kmk@dsgl.net Tel : +82-2-6959-0577 Fax : -

1.2 Product Information

FCC ID	2ARRH-NP100
Certification Number ISED	10690A-NP100
Product Description	NAIL POP
Basic model (HVIN)	NP100
Variant Model name	-
Operating Frequency	2 402 MHz - 2 480 MHz
RF Output Power	9.41 dBm (8.73 mW)
Antenna type	Chip Antenna
Antenna gain	1.8 dBi
Number of channels	40
Channel Spacing	2 MHz
Type of Modulation	GFSK (Bluetooth LE 1 Mbps)
Power Source	DC 7.4 V (Battery)
FVIN	V1.0.0
Test Software	dbgmon
RF Power setting in Test SW	Power Setting "Default"

1.3 Peripheral Devices

Device	Manufacturer	Model No.	Serial No.
Note Computer	HP	15-bs563TU	CND7253R6P
AC/DC Adapter	HP	HSTNN-LA40	7628011101
Bluetooth connectivity tester	TESCOM	TC-3000C	3000C000377

2. Facility and Accreditations

2.1 Test Facility

The measurement facility is located at (Ho-dong), 113, Yejik-ro, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea and 5, Dongbu-ro 221beon-gil, Cheoin-gu, Yongin-si, Gyeonggi-do, 17142 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

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	C	Line Conducted
Note 1: C=Complies NC=Not Complies NT=Not Tested NA=Not Applicable				
Note 2: The data in this test report are traceable to the national or international standards.				
Note 3: The sample was tested according to the following specification: FCC Part 15.247, ANSI C63.10-2013, RSS-247 Issue 2, RSS-GEN Issue 5				
Note 4: The tests were performed according to the method of measurements prescribed in KDB No.558074, ANSI C63.10-2013				

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
2 402 MHz	2 440 MHz	2 480 MHz

Test mode

Mode	Duty Cycle	Duty Cycle Factor
Bluetooth LE 1 Mbps	40.5 %	3.93 dB

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)
Power Spectral Density	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 ≤ 30 MHz)	1.5 dB (C.L. : Approx. 95 %, k = 2)
Radiated Emissions (f ≤ 1 GHz)	4.66 dB (C.L. : Approx. 95 %, k = 2)
Radiated Emissions (f > 1 GHz)	4.76 dB (C.L. : Approx. 95 %, k = 2)
AC Conducted Emission	1.96 dB (C.L. : Approx. 95 %, k = 2)

4. Technical Characteristic Test

4.1 6 dB Bandwidth and 99 % Bandwidth

Test Procedures

KDB 558074 – Section 8.2
ANSI C63.10–2013 – Section 6.9.2
RSS-Gen – Section 6.7

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 – Section 6.9.3
RSS-Gen – Section 6.7

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) RBW = 1 % to 5 % of the OBW (99 % Bandwidth)

c) VBW ≥ 3 x RBW

d) Detector = peak

e) Trace mode = Max hold

f) Sweep = auto couple

g) Allow trace to fully stabilize

h) 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

6 dB Bandwidth > 500 kHz

Limit : 99 % Bandwidth

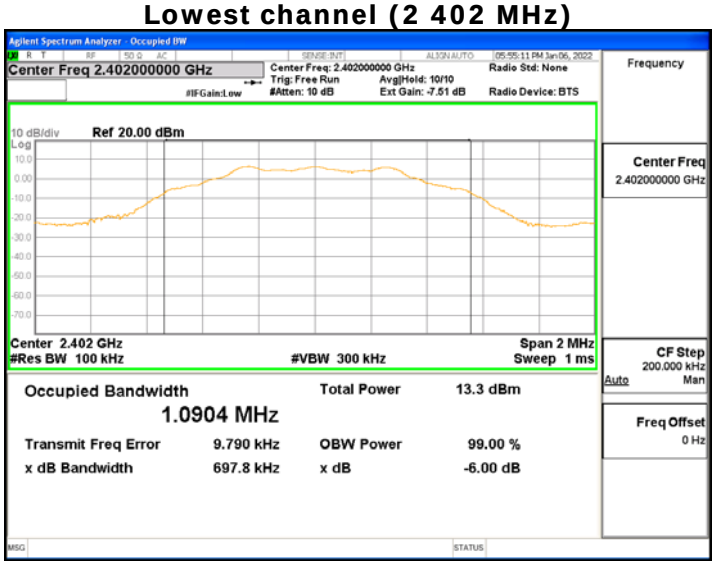
N/A

Test Data :

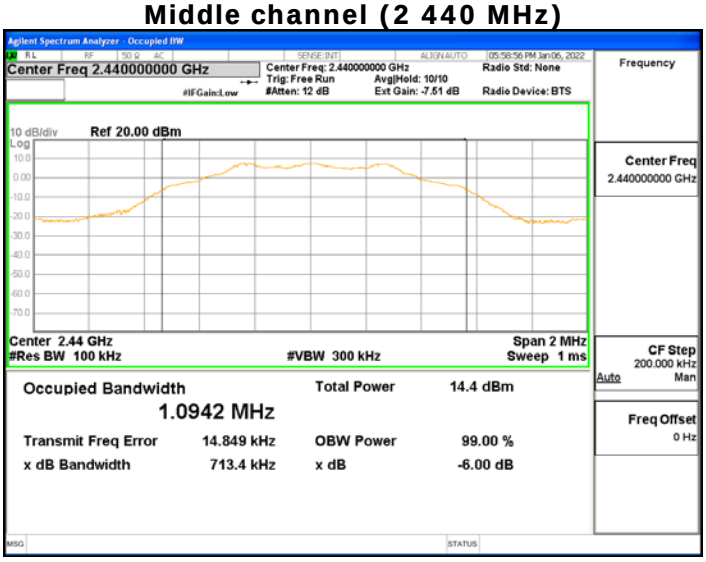
Channel	Frequency [MHz]	6 dB Bandwidth [MHz]	99 % Bandwidth [MHz]	Result
Lowest	2 402	0.698	1.090	Complies
Middle	2 440	0.713	1.094	
Highest	2 480	0.692	1.095	

See next pages for actual measured spectrum plots.

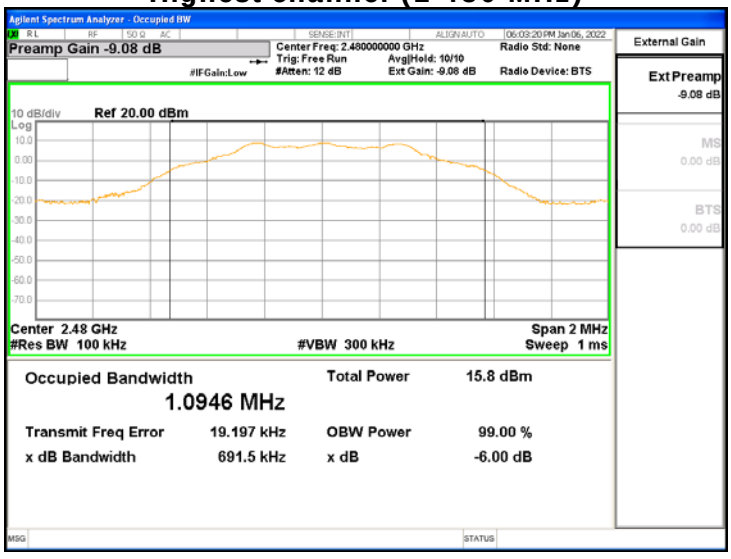
Lowest channel (2 402 MHz)



Middle channel (2 440 MHz)



Highest channel (2 480 MHz)



4.2 Maximum peak Conducted Output Power

Test Procedures

KDB 558074 – Section 8.3.1.1
ANSI C63.10-2013 – Section 11.9.1.1
RSS-Gen – Section 6.12

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

Test Settings :

Center frequency = the highest, middle and the lowest channels

a) RBW ≥ DTS Bandwidth
b) VBW ≥ 3 x RBW
c) span ≥ 3 x 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 :

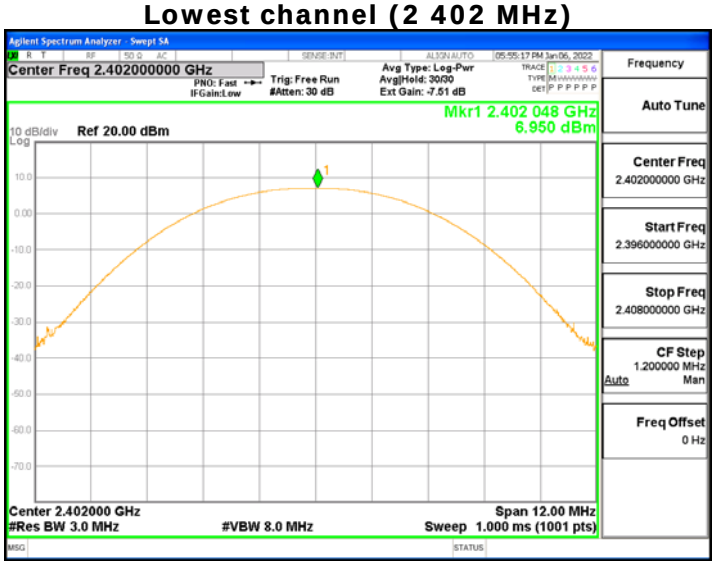
Maximum Output Power < 1 W (30 dBm)

Test Data :

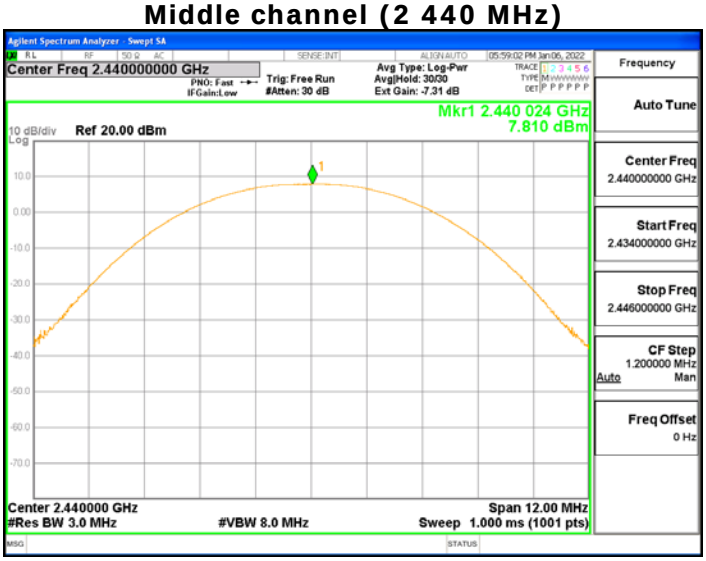
Channel	Frequency [MHz]	Measurement data [dBm]	Limit [dBm]	Result
Lowest	2 402	6.95	30	Complies
Middle	2 440	7.81	30	
Highest	2 480	9.41	30	

See next pages for actual measured spectrum plots.

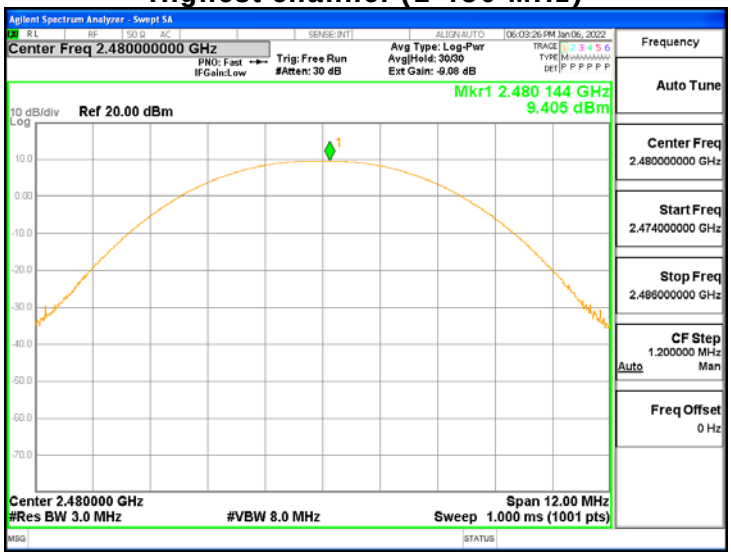
Lowest channel (2 402 MHz)



Middle channel (2 440 MHz)



Highest channel (2 480 MHz)



4.3 Power Spectral Density

Test Procedures

KDB 558074 – Section 8.4
ANSI C63.10–2013 – Section 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 kHz ≤ RBW ≤ 100 kHz
b) VBW ≥ 3 x RBW
c) span ≥ 1.5 x 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 :

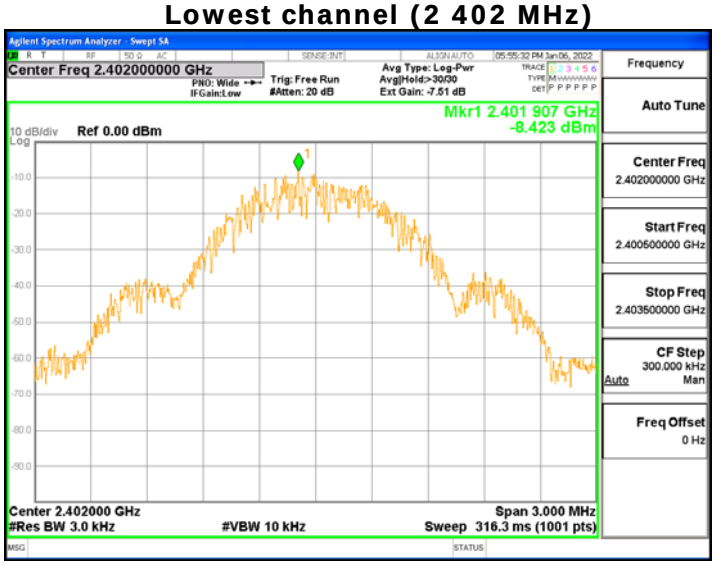
Power Spectral Density < 8 dBm @ 3 kHz BW

Test Data :

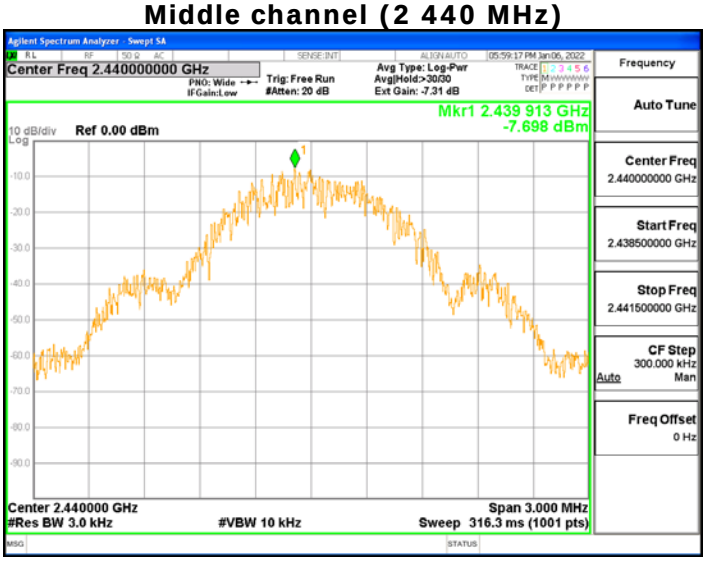
Channel	Frequency [MHz]	Measurement data [dBm]	Limit [dBm]	Result
Lowest	2 402	-8.423	8	Complies
Middle	2 440	-7.698		
Highest	2 480	-6.027		

See next pages for actual measured spectrum plots.

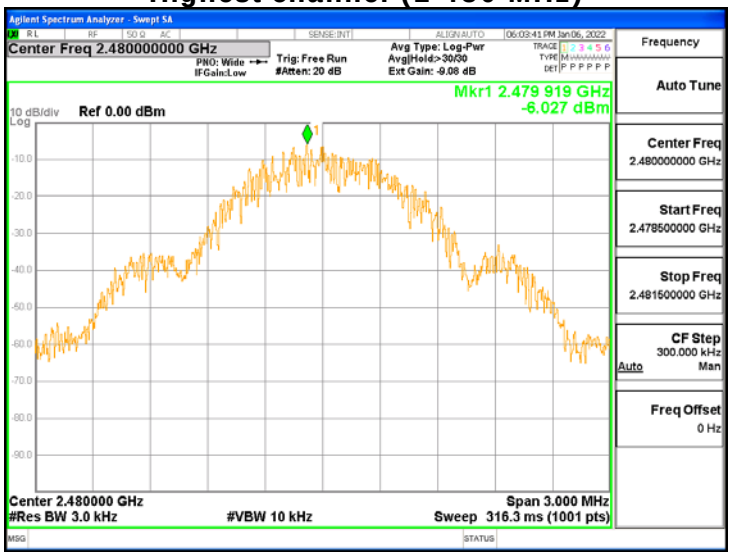
Lowest channel (2 402 MHz)



Middle channel (2 440 MHz)



Highest channel (2 480 MHz)



4.4 Band Edge & Conducted Spurious emission

Test Procedures

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

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(d), 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 ≥ 3 x 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 :

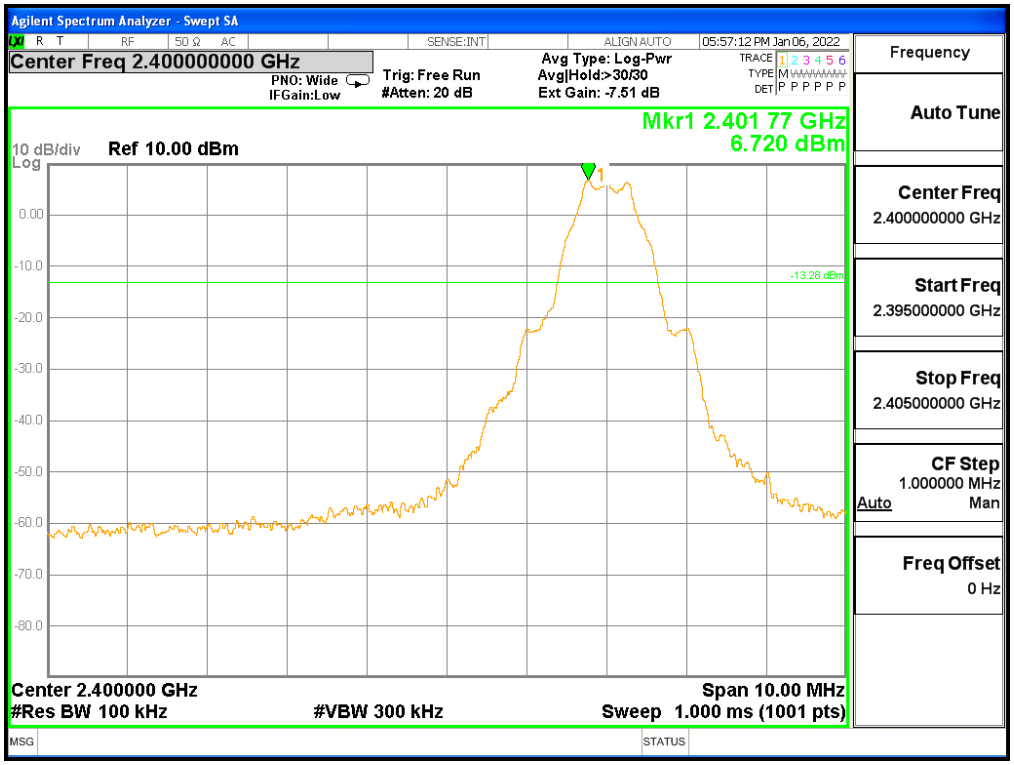
Emission level < 20 dBc

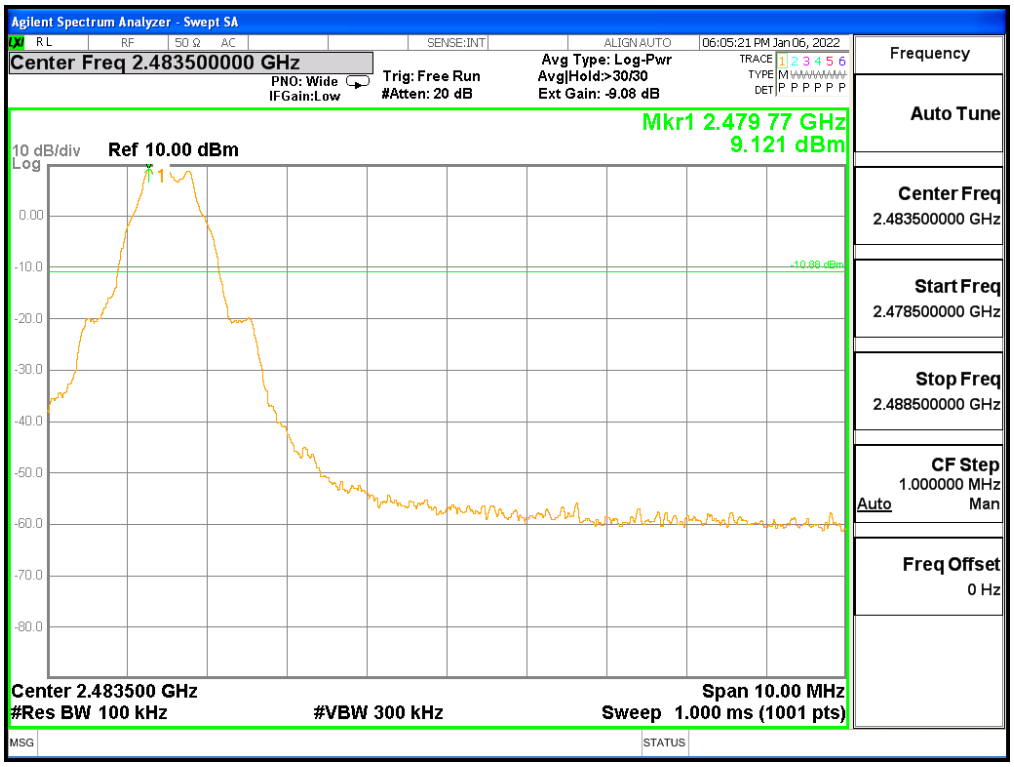
Test results : Complies

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

See next pages for actual measured spectrum plots.

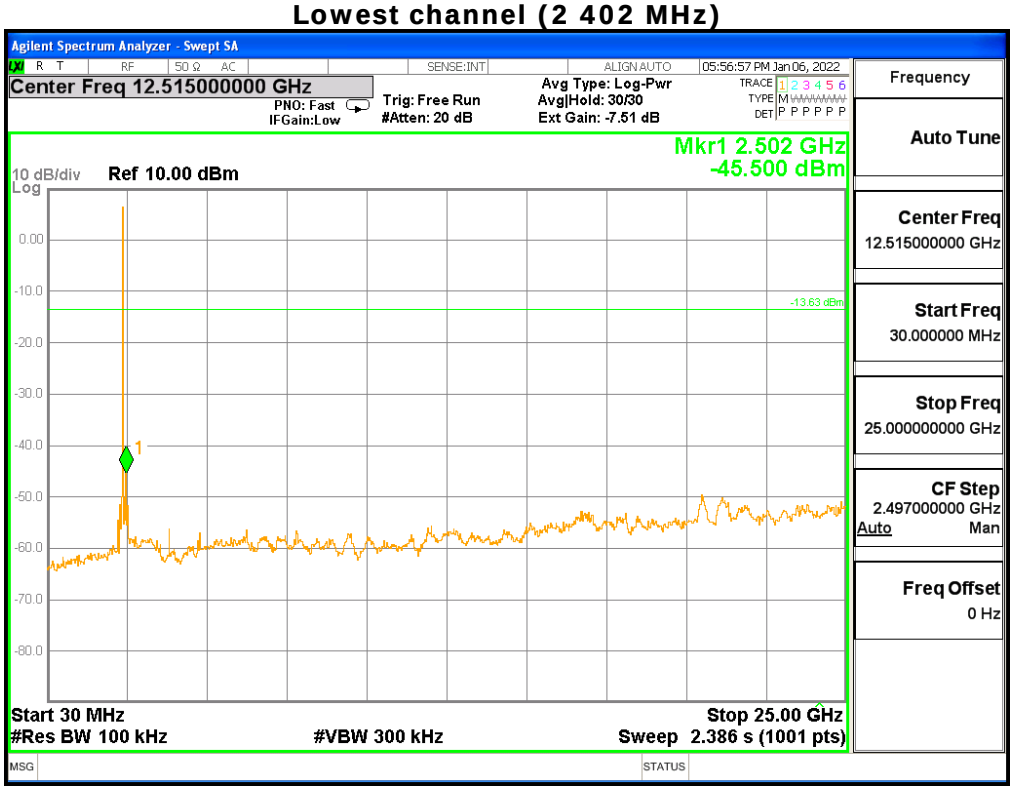
Band-edge


Agilent Spectrum Analyzer - Swept SA
Center Freq 2.400000000 GHz
PNO: Wide
IFGain:Low
Trig: Free Run
#Atten: 20 dB
Avg Type: Log-Pwr
Avg|Hold:>30/30
Ext Gain: -7.51 dB
05:57:12 PM Jan 06, 2022
Mkr1 2.401 77 GHz
6.720 dBm
10 dB/div
Log
Ref 10.00 dBm
-13.28 dBm
Center 2.400000 GHz
#Res BW 100 kHz
#VBW 300 kHz
Span 10.00 MHz
Sweep 1.000 ms (1001 pts)
Frequency
Auto Tune
Center Freq
2.400000000 GHz
Start Freq
2.395000000 GHz
Stop Freq
2.405000000 GHz
CF Step
1.000000 MHz
Auto
Man
Freq Offset
0 Hz

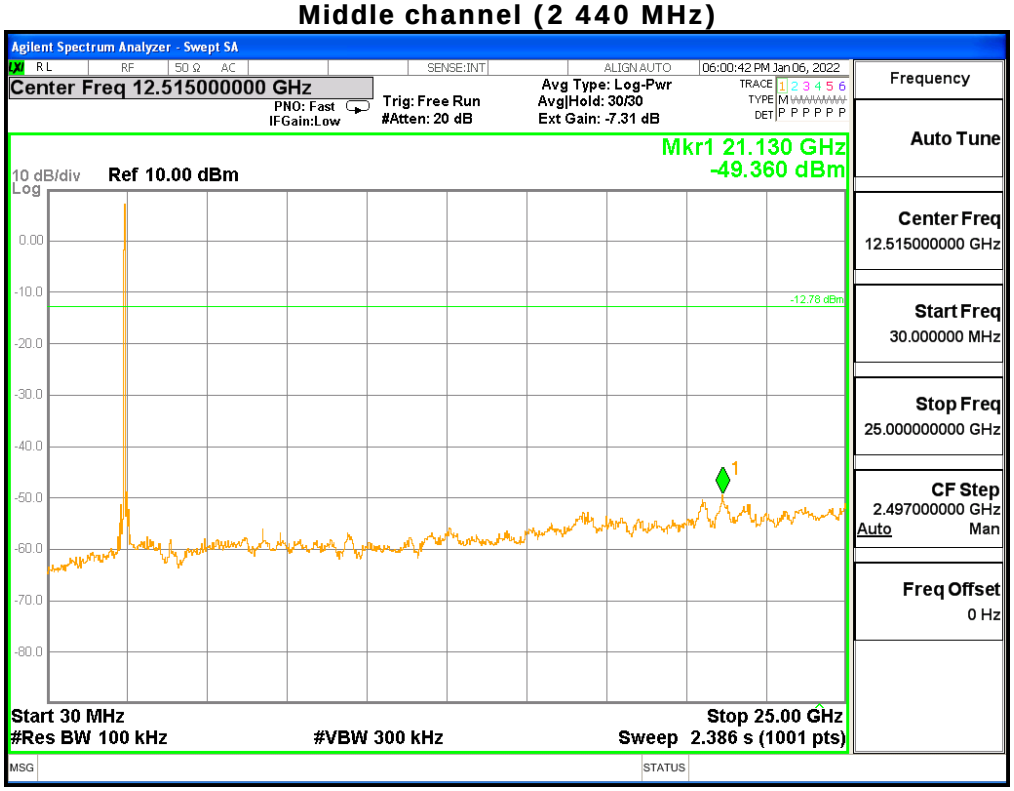

Agilent Spectrum Analyzer - Swept SA
Center Freq 2.483500000 GHz
PNO: Wide
IFGain:Low
Trig: Free Run
#Atten: 20 dB
Avg Type: Log-Pwr
Avg|Hold:>30/30
Ext Gain: -9.08 dB
06:05:21 PM Jan 06, 2022
Mkr1 2.479 77 GHz
9.121 dBm
10 dB/div
Log
Ref 10.00 dBm
-10.88 dBm
Center 2.483500 GHz
#Res BW 100 kHz
#VBW 300 kHz
Span 10.00 MHz
Sweep 1.000 ms (1001 pts)
Frequency
Auto Tune
Center Freq
2.483500000 GHz
Start Freq
2.478500000 GHz
Stop Freq
2.488500000 GHz
CF Step
1.000000 MHz
Auto
Man
Freq Offset
0 Hz

Conducted Spurious emission

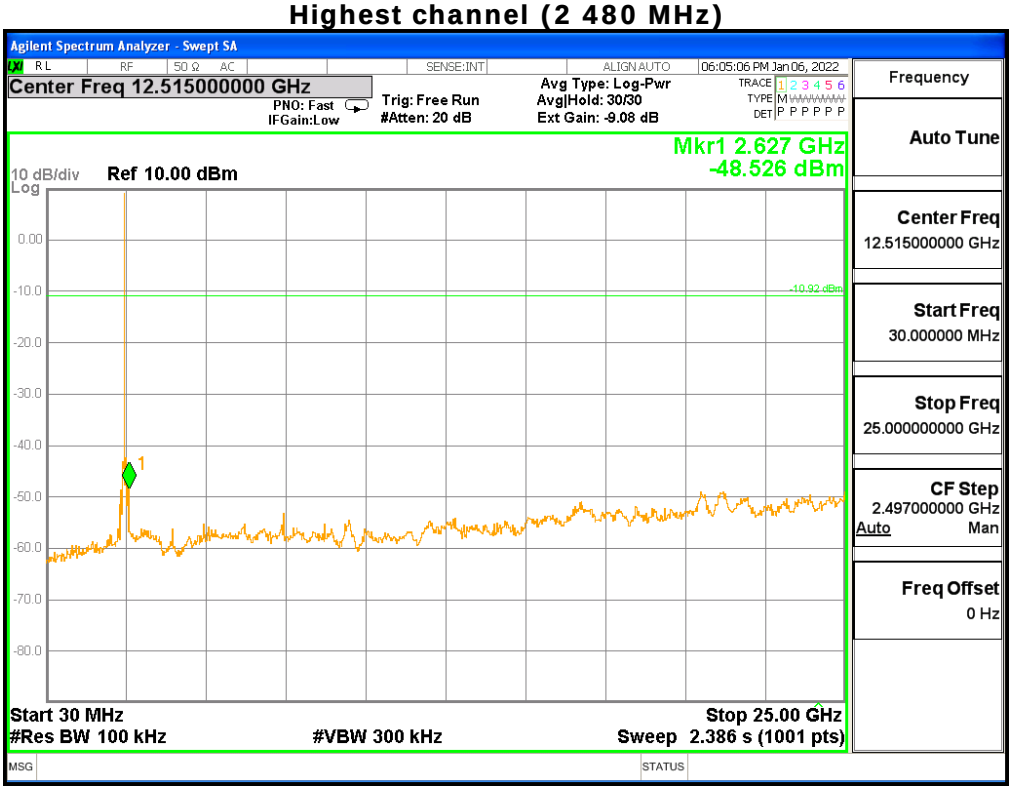
Lowest channel (2 402 MHz)



Middle channel (2 440 MHz)



Highest channel (2 480 MHz)



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 center of the Loop Test Antenna is 1m above the ground. During the measurement the Loop Test Antenna rotates about its vertical axis for maximum response at each azimuth about the EUT.
2) In the frequency rage above 30 MHz, Bi-Log Test Antenna(30 MHz to 1 GHz) and Horn Test Antenna(above 1 GHz) are used. Test Antenna is 3 m away from the EUT. Test Antenna height is carried from 1 m to 4 m 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 ~ 26.5 GHz (2.4 GHz 10^{th} harmonic)

a) RBW = 1 MHz for f ≥ 1 GHz, 100 kHz for f < 1 GHz, 9 kHz for f < 30 MHz,
200 Hz for f < 150 kHz

b) VBW ≥ RBW

c) Sweep time = auto couple

Limit :

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 is Section 15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

*Certain frequency bands listed in Table 1 and in band above 38.6 GHz are designated for licence-exempt applications. These frequency bands and the requirements that apply to the devices are set out in the 200- and 300-series of RSSs, such as RSS-210 and RSS-310, which contain the requirements that apply to licence-exempt radio apparatus

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 2 :

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

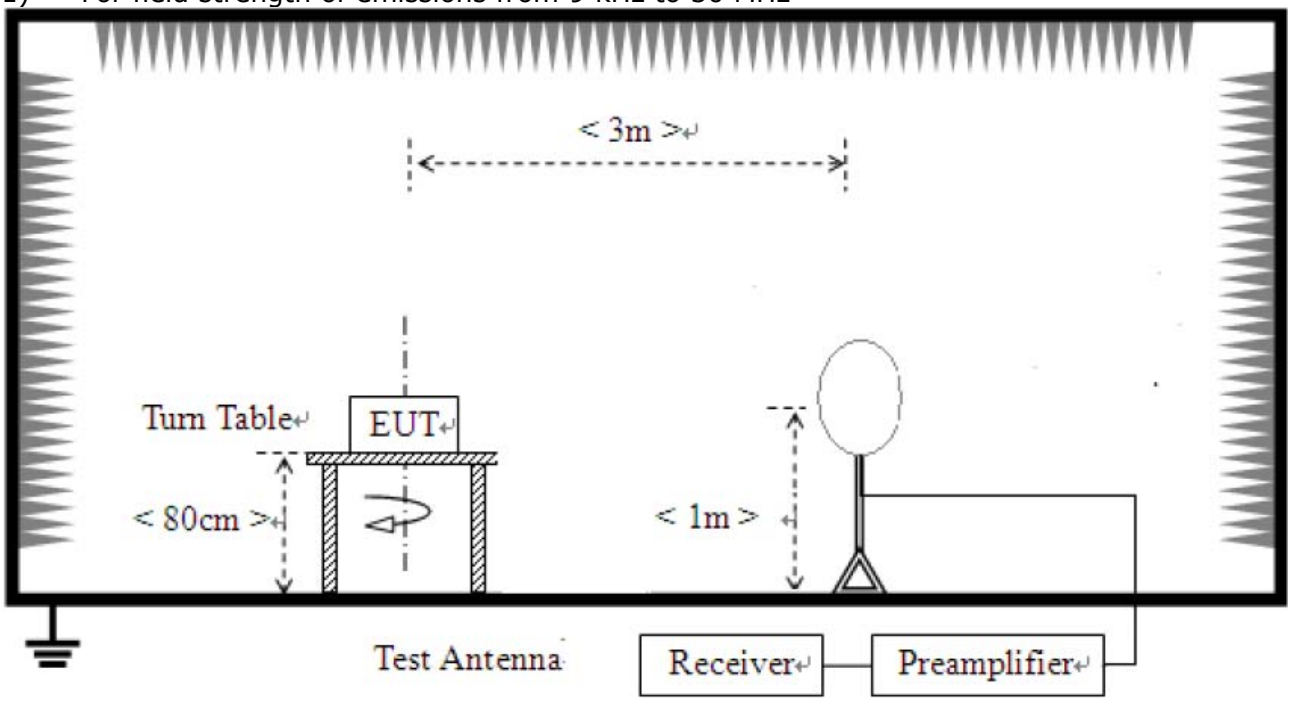
Frequency(MHz)	Field Strength (uV/m)	Field Strength (dBuV/m)	Deasurement Distance (meters)
0.009-0.490	2400/F(kHz)	48.5 – 13.8	300
0.490-1.705	24000/F(kHz)	33.8 – 23	30
1.705-30	30	29.5	30
30-88	100**	40	3
88-216	150**	43.5	3
216-960	200**	46	3
Above 960	500	54	3

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

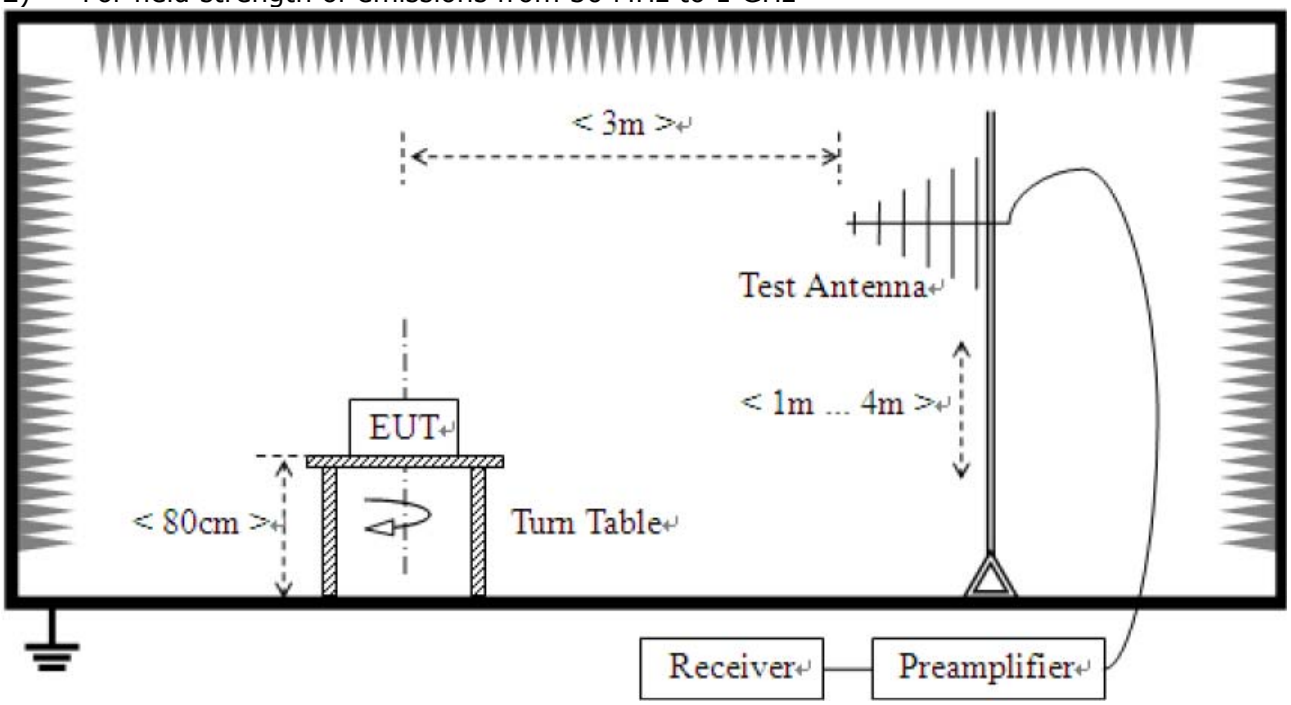
Note :
1) For above 1 GHz, the emission limit in this paragraph is based on measurement instrumentation employing an average detector, measurement using instrumentation with a peak detector function, corresponding to 20 dB above the maximum permitted average limit.
2) For above 1 GHz, limit field strength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

Test Setup:

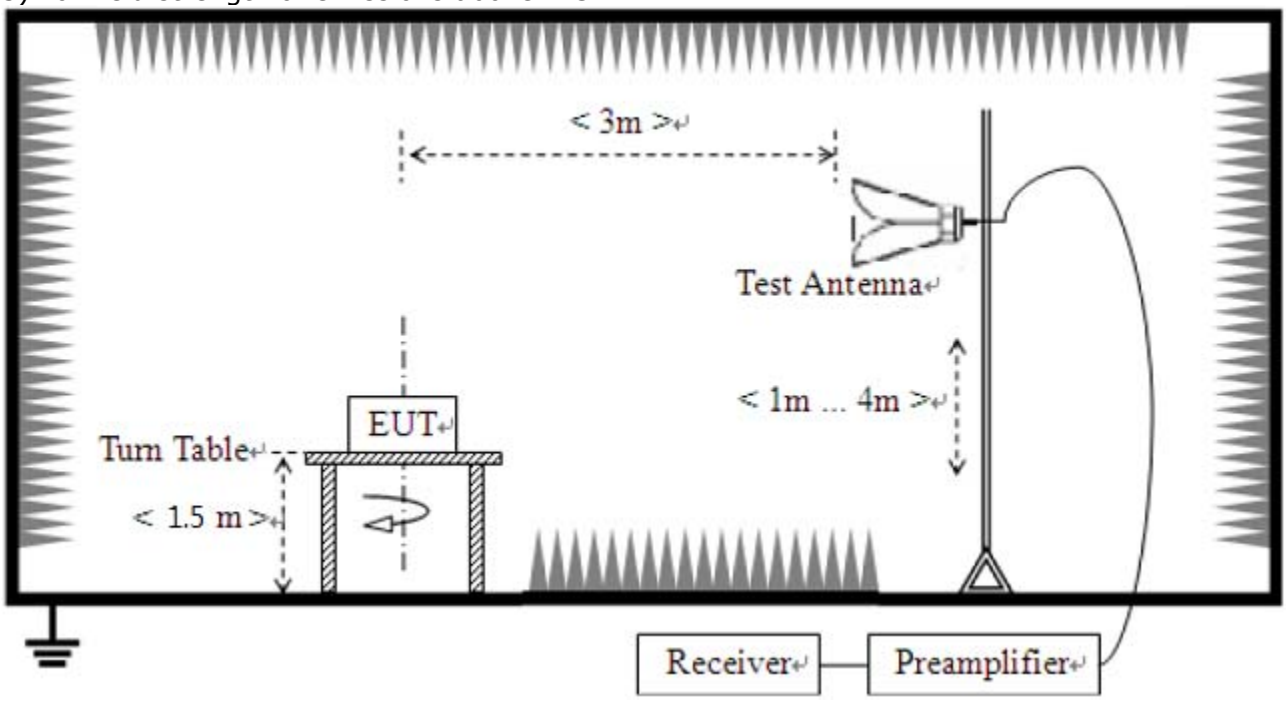
1) For field strength of emissions from 9 kHz to 30 MHz



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



3) For field strength of emissions above 1 GHz



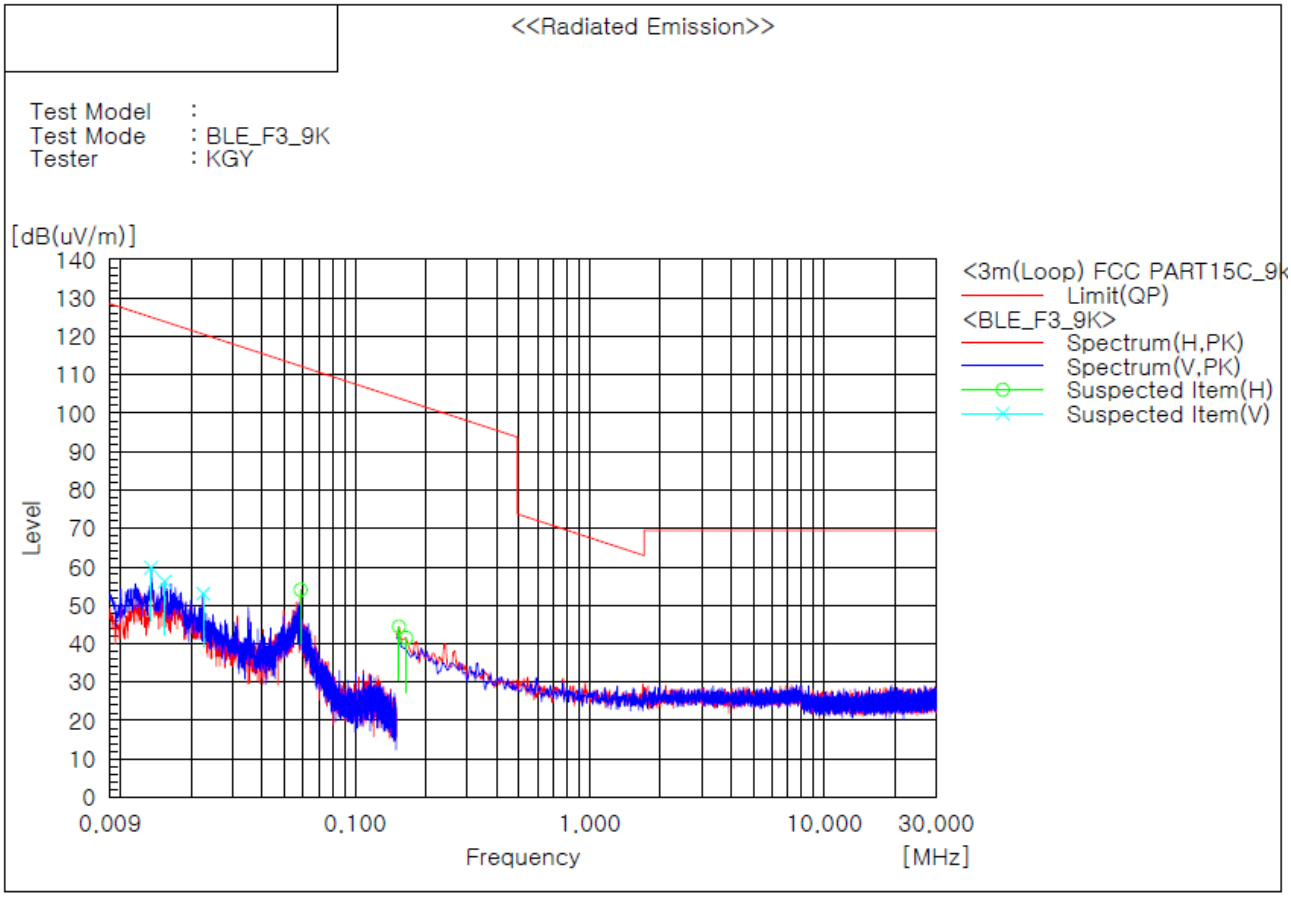
Test results

1) 9 kHz to 30 MHz

Test mode : Transmission status BLE 1 Mbps Highest channel(Worst case)

The requirements are:
☒ Complies

Test Data



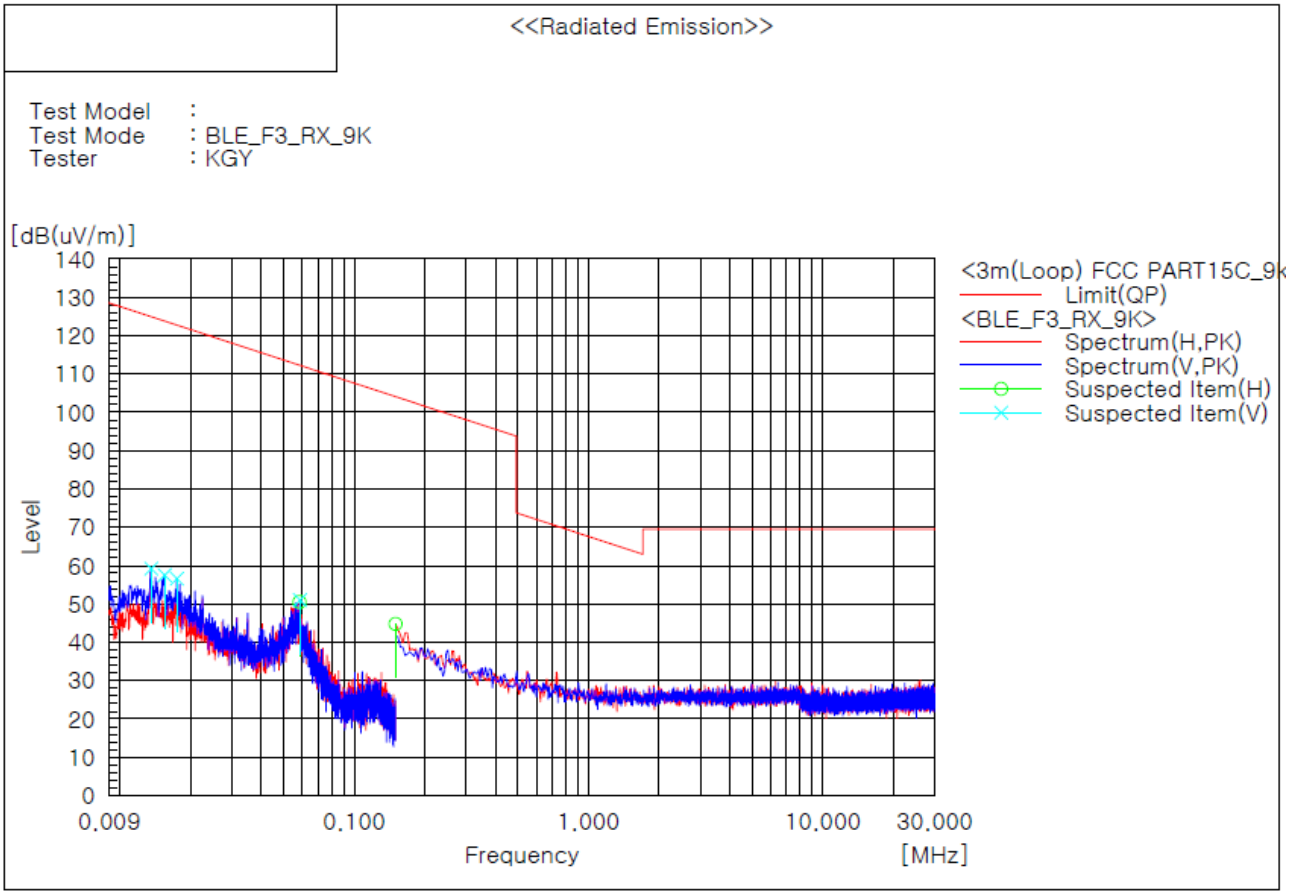
Result : There are more than 20 dB of margin compared to the reference value.

Remark :
1. Measuring position : 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(Y axis) and the worst case was recorded.
2. Result = Reading + c.f(correction factor)
3. Correction factor = Antenna factor + Cable loss + 6 dB attenuator
4. Distance extrapolation factor = 40 log (specific distance / test distance) (dB)
5. This data is the Peak(PK) value.

Test mode : Receiving status BLE 1 Mbps Highest channel(Worst case)

The requirements are:
☒ Complies

Test Data



Result : There are more than 20 dB of margin compared to the reference value.

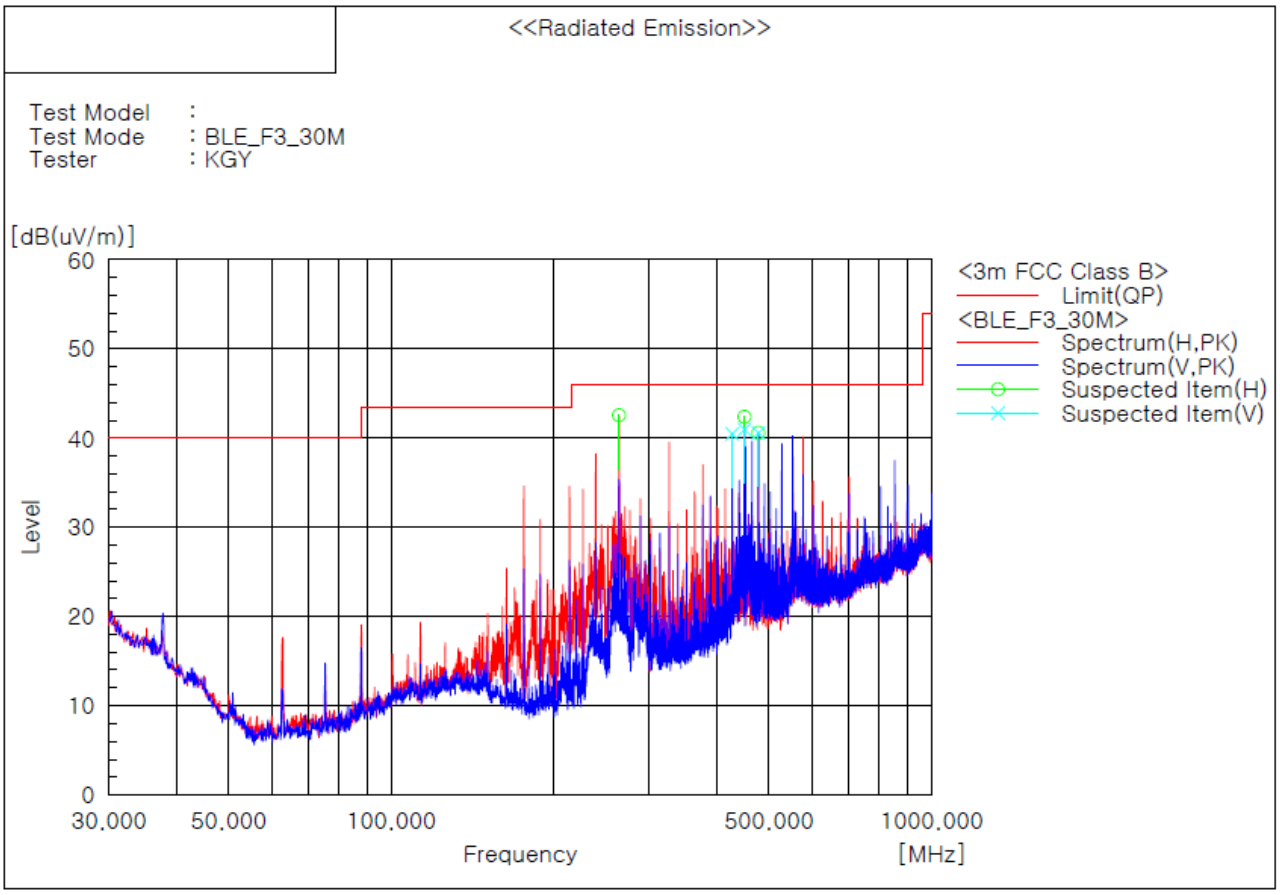
Remark :
1. Measuring position : The Unwanted emission was measured in the following position: EUT stand-up position(Z axis), lie-down position(X,Y axis). The worst emission was found in lie-down position(Y axis) and the worst case was recorded.
2. Result = Reading + c.f(correction factor)
3. Correction factor = Antenna factor + Cable loss + 6 dB attenuator
4. Distance extrapolation factor = 40 log (specific distance / test distance) (dB)
5. This data is the Peak(PK) value.

2) 30 MHz to 1 GHz

Test mode : Transmission status BLE 1 Mbps Highest channel(Worst case)

The requirements are:
☒ Complies

Test Data



Spectrum Selection

No.	Frequency [MHz]	(P)	Reading [dB(uV)]	c.f [dB(1/m)]	Result PK [dB(uV/m)]	Limit QP [dB(uV/m)]	Margin QP [dB]	Height [cm]	Angle [deg]
1	263.891	H	50.8	-8.2	42.6	46.0	3.4	101.0	101.0
2	427.336	V	44.4	-3.9	40.5	46.0	5.5	100.0	174.0
3	450.010	H	45.8	-3.4	42.4	46.0	3.6	207.0	117.0
4	450.010	V	44.4	-3.4	41.0	46.0	5.0	100.0	164.0
5	477.655	V	43.5	-2.9	40.6	46.0	5.4	100.0	180.0
6	477.655	H	43.5	-2.9	40.6	46.0	5.4	207.0	229.0

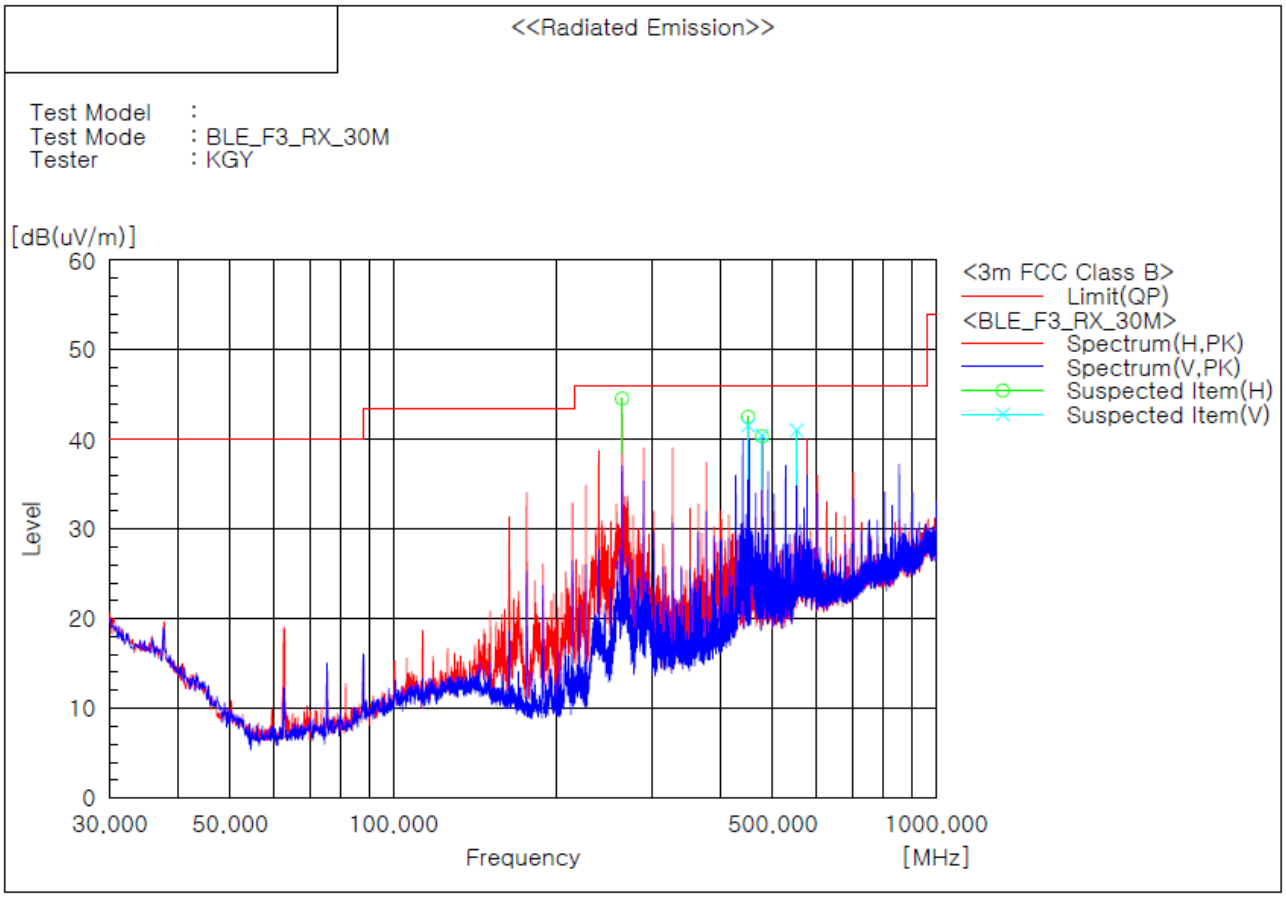
Remark :
1. Measuring position : The Unwanted emission was measured in the following position: EUT stand-up position(Z axis), lie-down position(X,Y axis). The worst emission was found in lie-down position(Y axis) and the worst case was recorded.
2. Result = Reading + c.f(Correction factor)
3. Correction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

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

Test mode : Receiving status BLE 1 Mbps Highest channel(Worst case)

The requirements are:
☒ Complies

Test Data



Spectrum Selection

No.	Frequency [MHz]	(P)	Reading [dB(uV)]	c.f [dB(1/m)]	Result PK [dB(uV/m)]	Limit QP [dB(uV/m)]	Margin QP [dB]	Height [cm]	Angle [deg]
1	263.891	H	52.8	-8.2	44.6	46.0	1.4	101.0	88.0
2	450.010	H	45.9	-3.4	42.5	46.0	3.5	207.0	123.0
3	450.010	V	45.0	-3.4	41.6	46.0	4.4	101.0	157.0
4	477.655	V	43.4	-2.9	40.5	46.0	5.5	101.0	163.0
5	477.655	H	43.3	-2.9	40.4	46.0	5.6	207.0	213.0
6	553.073	V	41.6	-0.6	41.0	46.0	5.0	101.0	167.0

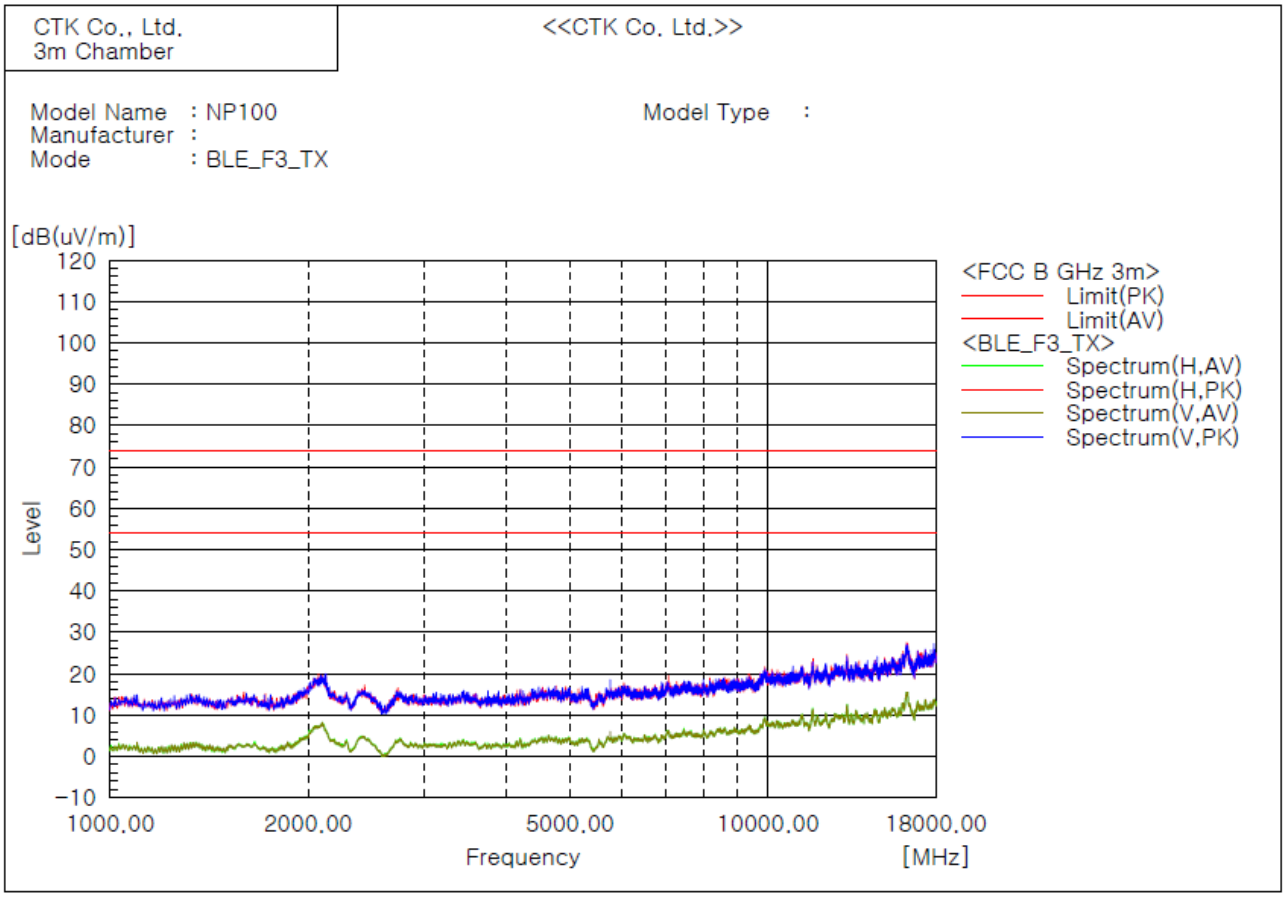
Remark :
1. Measuring position : The Unwanted emission was measured in the following position: EUT stand-up position(Z axis), lie-down position(X,Y axis). The worst emission was found in lie-down position(Y axis) and the worst case was recorded.
2. Result = Reading + c.f(Correction factor)
3. Correction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

3) 1 GHz to 18 GHz

Test mode : Transmission status BLE 1 Mbps Highest channel(Worst case)

The requirements are:
☒ Complies

Test Data



Result : There are more than 20 dB of margin compared to the reference value.

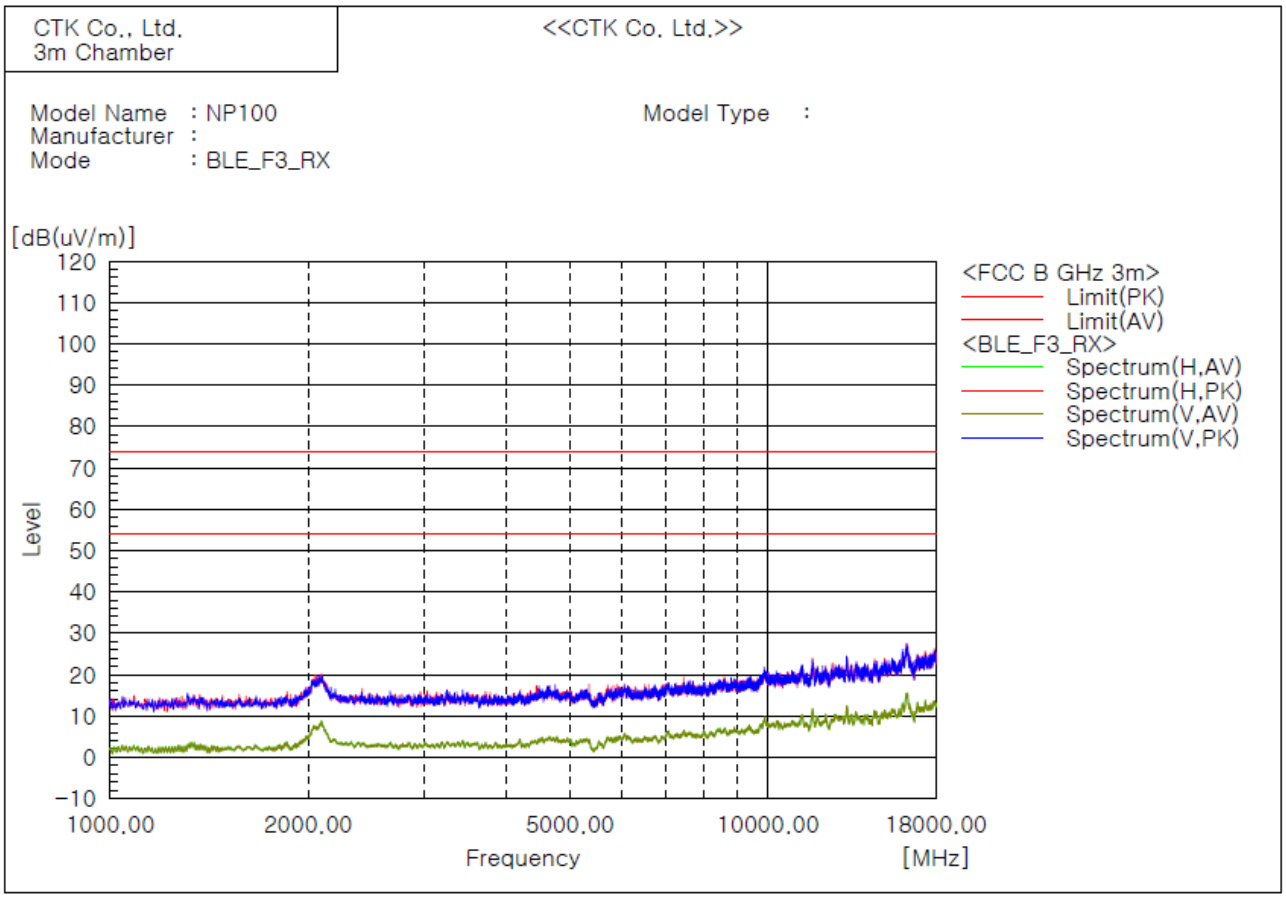
Remarks

1. Measuring position : 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(Y axis) and the worst case was recorded.
2. Result = Reading + c.f(correction factor)
3. Correction factor = Antenna factor + Cable loss - Amp Gain
4. Band reject filter was used from 1 GHz to 18 GHz

Test mode : Receiving status BLE 1 Mbps Highest channel(Worst case)

The requirements are:
☒ Complies

Test Data



Result : There are more than 20 dB of margin compared to the reference value.

Remarks

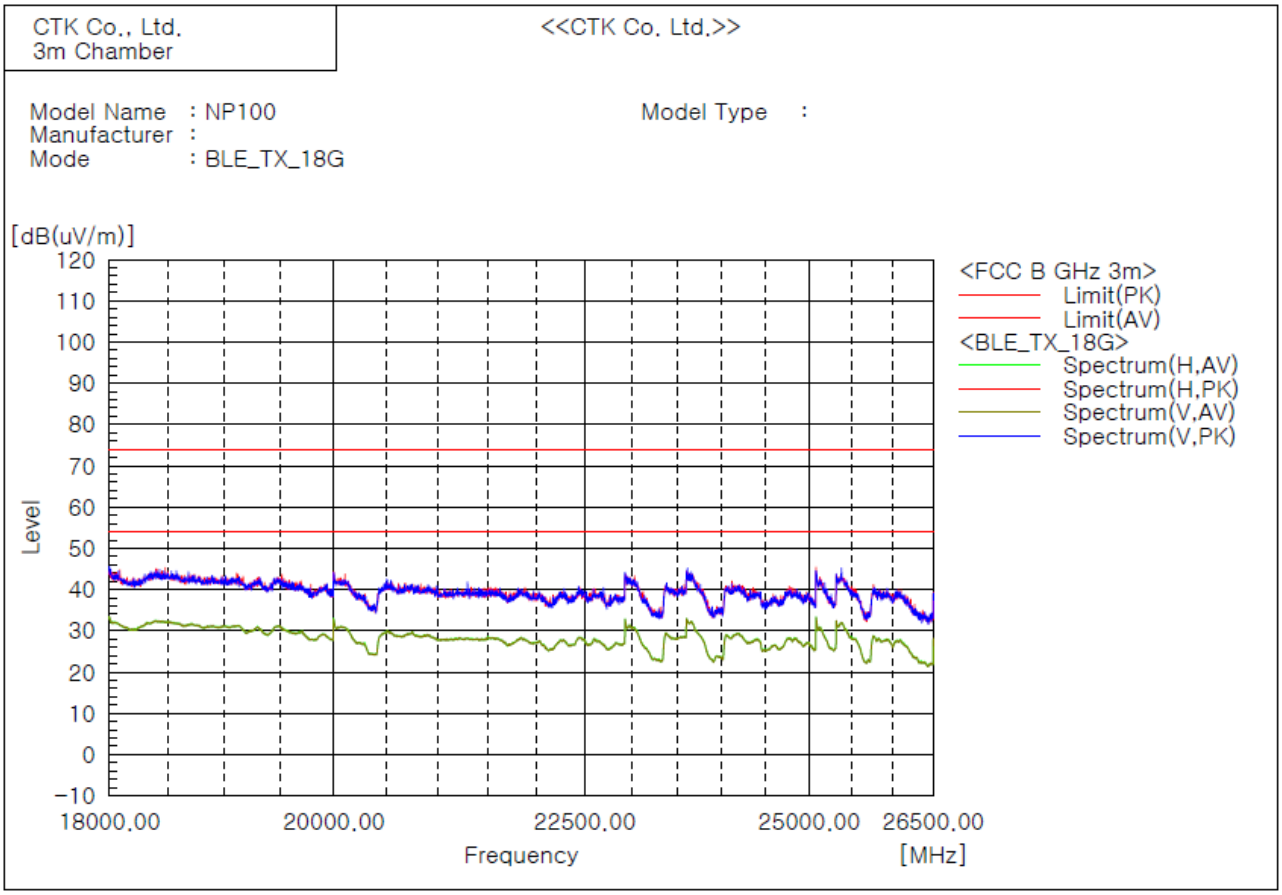
1. Measuring position : The Unwanted emission was measured in the following position: EUT stand-up position(Z axis), lie-down position(X,Y axis). The worst emission was found in lie-down position(Y axis) and the worst case was recorded.
2. Result = Reading + c.f(correction factor)
3. Correction factor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

4) 18 GHz to 26.5 GHz

Test mode : Transmission status BLE 1 Mbps Highest channel(Worst case)

The requirements are:
☒ Complies

Test Data



Result : There are more than 20 dB of margin compared to the reference value.

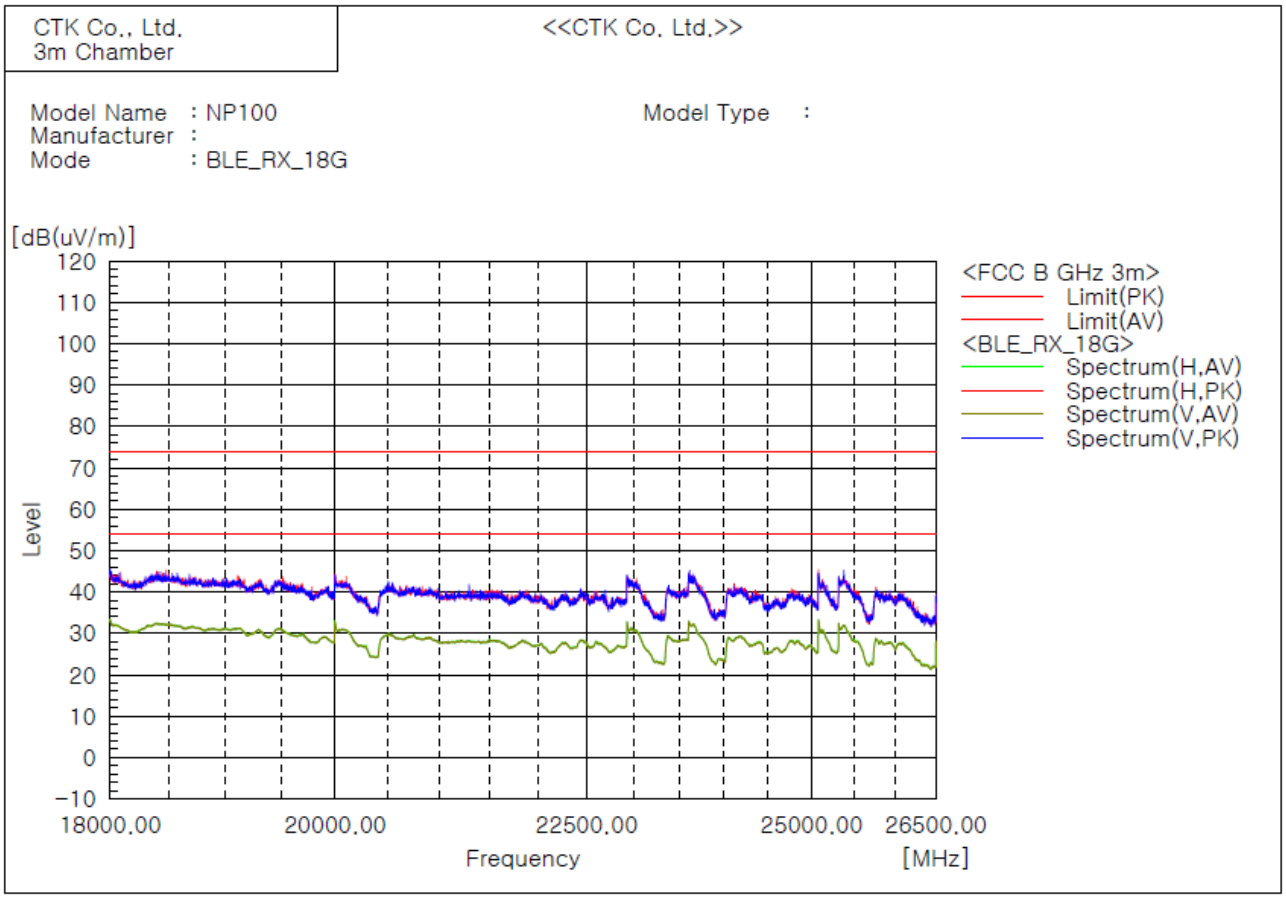
Remarks

1. Measuring position : 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(Y axis) and the worst case was recorded.
2. Result = Reading + c.f(correction factor)
3. Correction factor = Antenna factor + Cable loss - Amp Gain

Test mode : Receiving status BLE 1 Mbps Highest channel(Worst case)

The requirements are:
☒ Complies

Test Data



Result : There are more than 20 dB of margin compared to the reference value.

Remarks

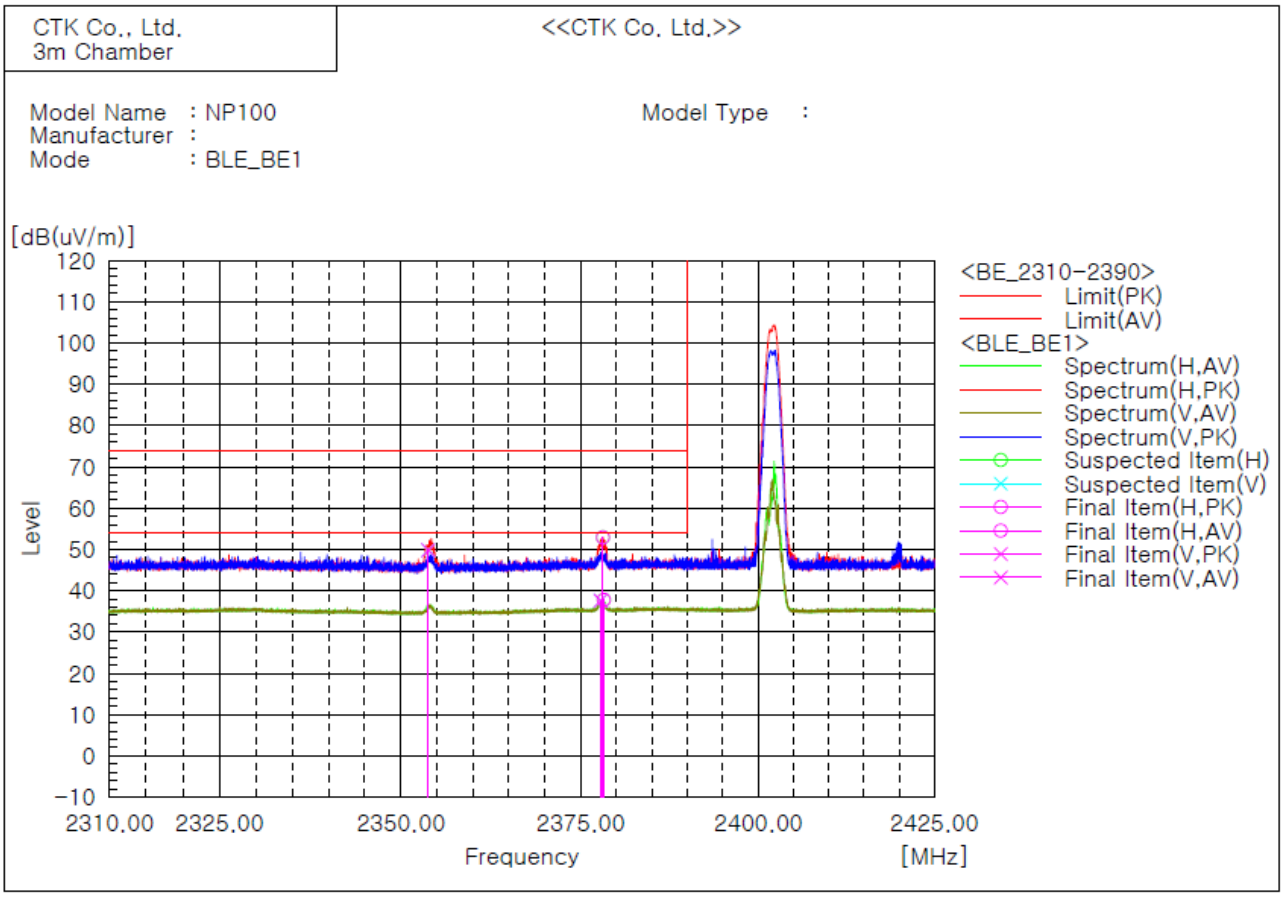
1. Measuring position : The Unwanted emission was measured in the following position: EUT stand-up position(Z axis), lie-down position(X,Y axis). The worst emission was found in lie-down position(Y axis) and the worst case was recorded.
2. Result = Reading + c.f(correction factor)
3. Correction factor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

5) Restricted Frequency Bands

Test mode : Transmission status BLE 1 Mbps Lowest channel
(Test frequency range : 2 310 MHz – 2 390 MHz)

The requirements are:
☒ Complies

Test Data



Final Result

No.	Frequency [MHz]	(P)	Reading PK [dB(uV)]	Reading AV [dB(uV)]	o.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	2378.152	H	46.3	----------	6.6	52.9	----------	74.0	54.0	21.1	----------	99.8	113.6
2	2378.267	H	----------	31.2	6.6	----------	37.8	74.0	54.0	----------	16.2	99.8	94.6
3	2353.787	V	43.6	----------	6.2	49.8	----------	74.0	54.0	24.2	----------	346.4	99.9
4	2377.821	V	----------	31.0	6.6	----------	37.6	74.0	54.0	----------	16.4	99.9	0.1

Remarks

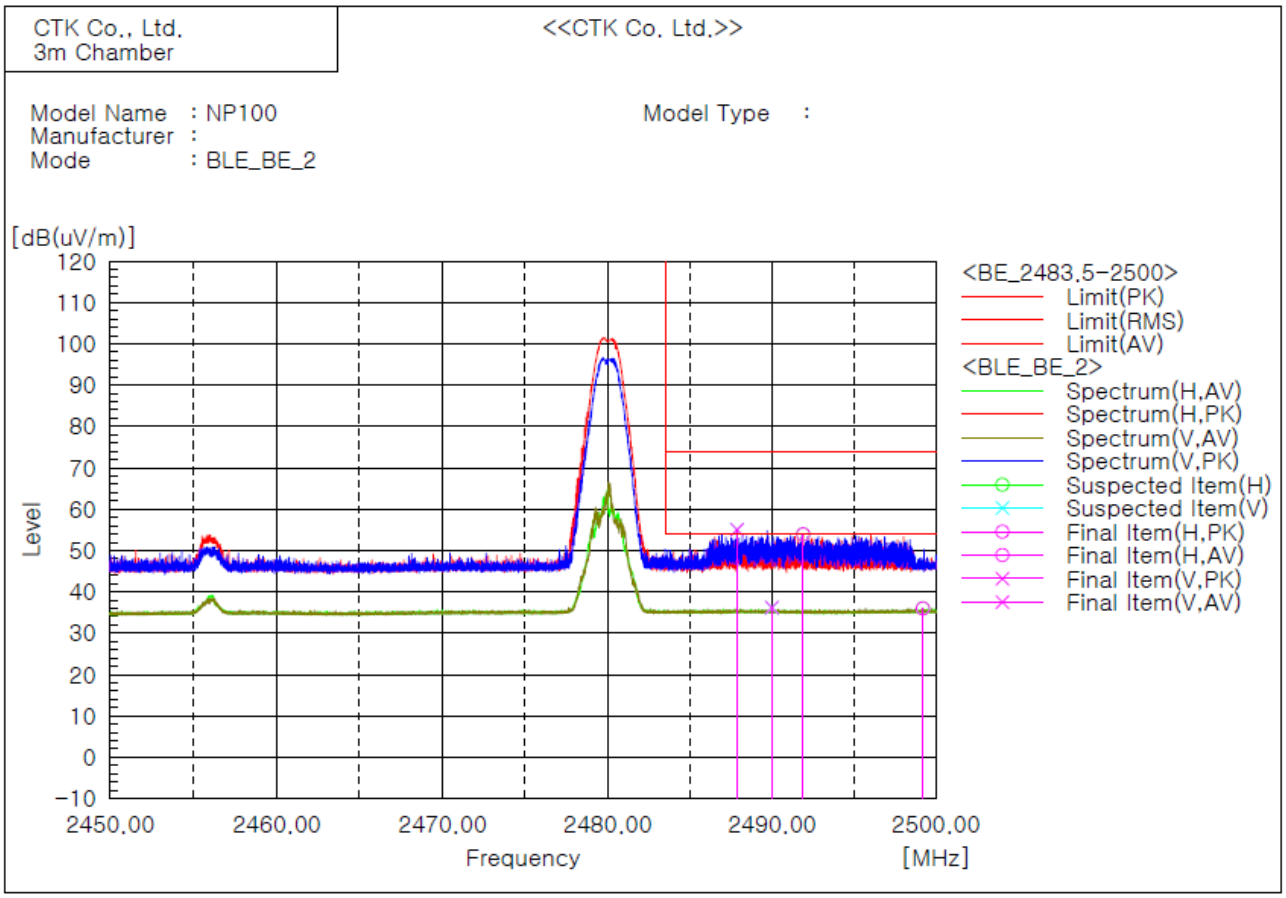
1. Measuring position : The Unwanted emission was measured in the following position: EUT stand-up position(Z axis), lie-down position(X,Y axis). The worst emission was found in lie-down position(Y axis) and the worst case was recorded.
2. Result = Reading + c.f(correction factor)
3. Correction factor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

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

Test mode : Transmission status BLE 1 Mbps Highest channel
(Test frequency range : 2 483.5 MHz – 2 500 MHz)

The requirements are:
☒ Complies

Test Data



Final Result

No.	Frequency [MHz]	(P)	Reading PK [dB(uV)]	Reading AV [dB(uV)]	o.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	2487.869	V	48.3	----------	6.7	55.0	----------	74.0	54.0	19.0	----------	344.5	301.7
2	2489.994	V	----------	29.5	6.7	----------	36.2	74.0	54.0	----------	17.8	100.0	0.1
3	2491.906	H	47.2	----------	6.7	53.9	----------	74.0	54.0	20.1	----------	464.0	267.2
4	2499.212	H	----------	29.3	6.7	----------	36.0	74.0	54.0	----------	18.0	464.0	0.0

Remarks
1. Measuring position : 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(Y axis) and the worst case was recorded.
2. Result = Reading + c.f(correction factor)
3. Correction factor = Antenna factor + Cable loss - Amp Gain

4.6 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

ANSI C63.10-2013 – Section 6.2.2
RSS-Gen – Section 8.8

The EUT was placed on a non-metallic table 0.8 m above the metallic, grounded floor and 0.4 m from the reference ground plane wall. The distance to other metallic surfaces was at least 0.8 m.
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.

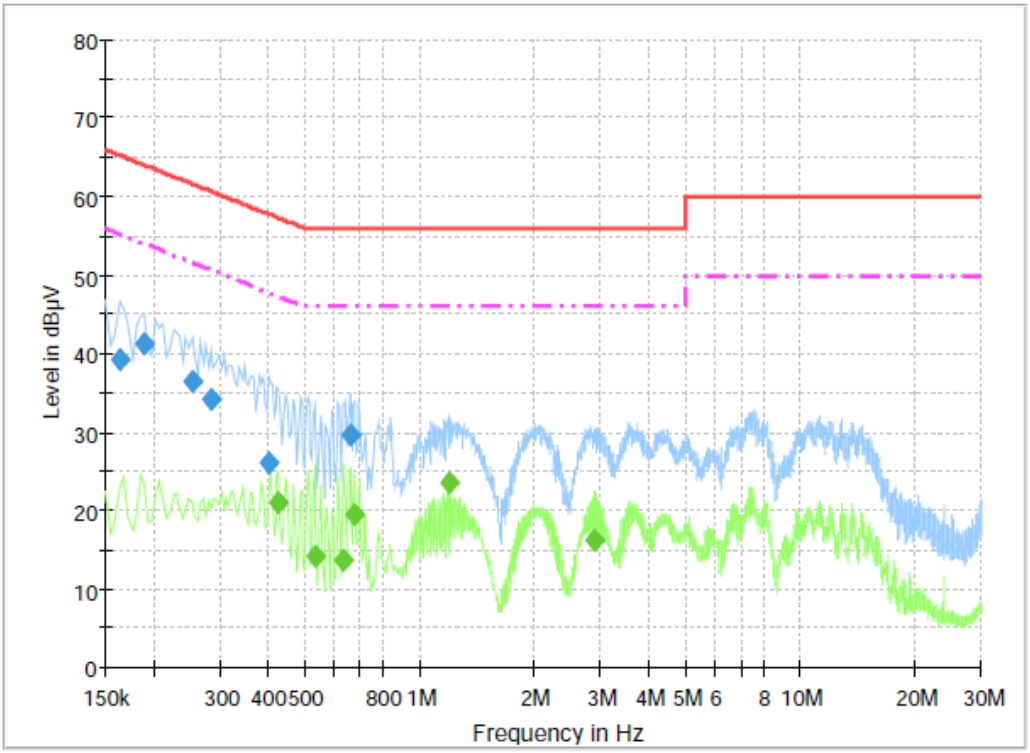
Test Results

The requirements are:
☒ Complies

Test Data

Test mode : BLE 1 Mbps Highest channel(Worst case)

[LINE]



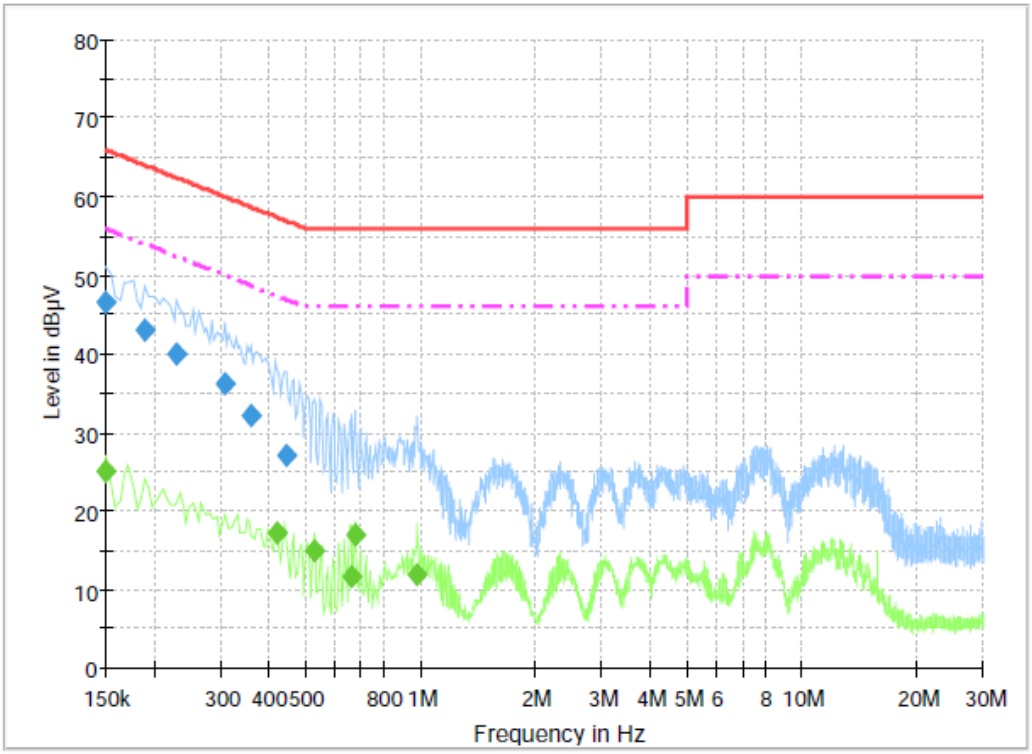
Final Result 1

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.163500	39.2	1000.0	9.000	On	L1	9.9	26.1	65.3
0.190500	41.2	1000.0	9.000	On	L1	10.0	22.8	64.0
0.253500	36.5	1000.0	9.000	On	L1	9.7	25.1	61.6
0.285000	34.1	1000.0	9.000	On	L1	9.8	26.6	60.7
0.402000	26.1	1000.0	9.000	On	L1	10.0	31.7	57.8
0.658500	29.7	1000.0	9.000	On	L1	10.0	26.3	56.0

Final Result 2

Frequency (MHz)	CAverage (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.429000	21.0	1000.0	9.000	On	L1	10.0	26.3	47.3
0.532500	14.2	1000.0	9.000	On	L1	10.0	31.8	46.0
0.636000	13.8	1000.0	9.000	On	L1	10.0	32.2	46.0
0.676500	19.5	1000.0	9.000	On	L1	10.0	26.5	46.0
1.207500	23.5	1000.0	9.000	On	L1	9.9	22.5	46.0
2.881500	16.3	1000.0	9.000	On	L1	9.9	29.7	46.0

[NEUTRAL]



Final Result 1

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.150000	46.6	1000.0	9.000	On	N	9.9	19.4	66.0
0.190500	43.1	1000.0	9.000	On	N	9.9	20.9	64.0
0.231000	40.1	1000.0	9.000	On	N	9.8	22.3	62.4
0.307500	36.2	1000.0	9.000	On	N	9.9	23.9	60.0
0.361500	32.1	1000.0	9.000	On	N	10.1	26.6	58.7
0.447000	27.2	1000.0	9.000	On	N	10.1	29.7	56.9

Final Result 2

Frequency (MHz)	CAverage (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.150000	25.2	1000.0	9.000	On	N	9.9	30.8	56.0
0.420000	17.3	1000.0	9.000	On	N	10.1	30.2	47.4
0.528000	14.8	1000.0	9.000	On	N	10.1	31.2	46.0
0.658500	11.6	1000.0	9.000	On	N	10.0	34.4	46.0
0.676500	17.0	1000.0	9.000	On	N	10.0	29.0	46.0
0.982500	12.0	1000.0	9.000	On	N	9.9	34.0	46.0

5. APPENDIX A – Test Equipment Used For Tests

	Name of Equipment	Manufacturer	Model No.	Serial No.	Cal Date	Due Date
1	Signal Analyzer	Agilent	N9020A	MY46471102	2022-01-13	2023-01-13
2	Signal Generator	Rohde & Schwarz	SMB100A	175528	2021-04-12	2022-04-12
3	EMI Test Receiver	Rohde & Schwarz	ESCI7	100814	2021-10-20	2022-10-20
4	Bilog Antenna	TESEQ	CBL6111D	58490	2021-03-03	2023-03-03
5	Active Loop Antenna	SCHWARZBECK	FMZB 1513	1513-126	2020-05-20	2022-05-20
6	6dB Attenuator	BIRD	5W 6dB	1744	2021-11-18	2022-11-18
7	Attenuator	PASTERNACK	PE7047-6	N/A	2021-02-26	2022-02-26
8	AMPLIFIER	SONOMA	310	291721	2021-01-22	2022-01-22
9	EMI Test Receiver	Rohde & Schwarz	ESU40	100336	2022-01-11	2023-01-11
10	Preamplifier	Agilent	8449B	3008A02011	2021-11-24	2022-11-24
11	Double Ridged Guide Antenna	ETS-Lindgren	3117	00154525	2020-10-21	2022-10-21
12	Horn Antenna	SCHWARZBECK	BBHA9170	00967	2021-05-25	2022-05-25
13	Band Reject Filter	Micro Tronics	BRM50702	G444	2021-10-08	2022-10-08
14	Low Noise Amplifier	TESTEK	TK-PA1840H	200115-L	2021-05-21	2022-05-21
15	LISN	Rohde & Schwarz	ENV216	101236	2021-10-20	2022-10-20
16	EMI Test Receiver	Rohde & Schwarz	ESCI3	100032	2022-01-11	2023-01-11
17	Combiner/Divider	Weinschel	1580	SQ369	2021-10-08	2022-10-08

	Cable	Manufacturer	Model No.	Serial No.	Check Date
1	RF Cable (AC Power Line Emissions)	Canare Corporation	L-5D2W	N/A	2021-10-20
2	Extension cord	N/A	N/A	N/A	2021-10-20
3	RF Cable (Conducted)	Junkosha Inc.	MWX221	2005S321	2022-01-06
4	RF Cable (Conducted)	Junkosha Inc.	MWX221	N/A	2022-01-06
5	RF Cable (Conducted)	Junkosha Inc.	MWX221	N/A	2022-01-06
6	3m Loop Cable (1 GHz below Radiated)	HUBER+SUHNER	N/A	N/A	2021-02-20
7	RF Cable (1 GHz below Radiated)	HUBER+SUHNER	SUCOFLEX 104	MY27558/4	2021-02-20
8	RF Cable (1 GHz below Radiated)	HUBER+SUHNER	SUCOFLEX 104	N/A	2021-02-20
9	RF Cable (1 GHz above Radiated)	HUBER+SUHNER	SUCOFLEX 102	MY2374/2	2021-02-20
10	RF Cable (1 GHz above Radiated)	HUBER+SUHNER	SUCOFLEX 102	MY4728/2	2021-02-20
11	RF Cable (1 GHz above Radiated)	HUBER+SUHNER	SUCOFLEX 106	N/A	2021-02-20
12	RF Cable (1 GHz above Radiated)	HUBER+SUHNER	SUCOFLEX 102	MY4728/2	2021-10-27