TEST REPORT

CTK Co., Ltd.
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Report No.: CTK-2025-01708

1. Applicant

◦ Name : EVERINT Co.,Ltd.

◦ Address : 129, Chungjusandan1-ro, Chungju-si, Chungcheongbuk-do 27326, Republic of Korea

◦ Date of Receipt : 2025-05-26

2. Manufacturer

◦ Name : EVERINT Co.,Ltd.

◦ Address : 129, Chungjusandan1-ro, Chungju-si, Chungcheongbuk-do 27326, Republic of Korea

3. Use of Report : For FCC/ISED Certification

4. Test Sample / Model : UHF RFID Reader Module / RFID-PBA1

5. Date of Test : 2025-06-17 to 2025-06-30

6. Test Standard(method) used : FCC 47 CFR part 15 subpart C 15.247
ISED RSS-247 & RSS-Gen

7. Testing Environment : refer to 6 page

8. Test Results : Compliance

9. Location of Test : ☒ Permanent Testing Lab ☐ On Site Testing
(Address : (Unhak-Dong)5, Dongbu-ro 221beon-gil, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea)

Approval	Tested by Nam-hyoung Kwon: (Signature)	Technical Manager Gwan-yong Kim: (Signature)

2025-07-01

CTK Co., Ltd.

REPORT REVISION HISTORY

Date	Revision	Page No
2025-07-01	Issued (CTK-2025-01708)	all

CONTENTS

1. General Product Description

1.1 Applicant Information

Company	EVERINT Co.,Ltd.
Contact Point	129, Chungjusandan1-ro, Chungju-si, Chungcheongbuk-do 27326 Republic of Korea
Contact Person	Name : Ji-Sung Shin E-mail : jsshin@bixolon.com Tel : +82-31-218-5582 Fax : +82-31-218-5589

1.2 Product Information

FCC ID	2AKMF-RFID-PBA1
IC	22266-RFIDPBA1
Product Description	UHF RFID Reader Module
Basic Model (HVIN)	RFID-PBA1
Variant Model Name	-
Operating Frequency	902.75 MHz - 927.25 MHz
RF Output Power	22.26 dBm (0.168 W)
Antenna Specification	Antenna type : External PCB Antenna Model name : KSA-875MS1008A Peak gain : -8.68 dBi
	Antenna type : External PCB Antenna Model name : KSA-920MS4510A Peak gain : -35.44 dBi
Number of channels	50
Channel Spacing	500 kHz
Type of modulation	ASK
Power Source	DC 3.3 V
Hardware Rev	V002
FVIN	RED4S_BXL_v0.4.0
Test Software(Version)	RED Utility_v4.0.1
RF Power Setting in test SW	27

1.3 Peripheral Devices

Device	Manufacturer	Model No.	Serial No.
Note Computer	DELL	P97G	5YZZ763
AC Adapter	DELL	HA65NM130	CN-OFPC2Y-CH200 -076-41QG-A05
AC Adapter	DONG SHUN INTELLIGENT TECHNOLOGY CO.,LTD.	YC-1U320BX2	-

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

FCC Part Section(s)	ISED Part Section(s)	Requirement(s)	Status (Note 1)	Test Condition
15.247(a)	RSS-247 5.1(b)	Carrier Frequency Separation	C	Conducted
15.247(a)	RSS-247 5.1(d)	Number of Hopping Frequencies	C	
15.247(a)	RSS-247 5.1(a)	20 dB Bandwidth	C	
15.247(a)	RSS-247 5.1(d)	Time of Occupancy (Dwell Time)	C	
15.247(b)	RSS-247 5.4(b)	Maximum Peak Conducted Output Power	C	
15.247(d)	RSS-247 5.5	Unwanted Emission	C	
15.209	RSS-Gen 6.13	Radiated 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, RSS-247 Issue 3, RSS-GEN Issue 5				
Note 4: The tests were performed according to the method of measurements prescribed in ANSI C63.10-2013				

3.2 Testing Environment

Test Item		Test Date	Temperature (℃)	Relative Humidity (%)
Carrier Frequency Separation		2025-06-19	21 to 22	49 to 50
Number of Hopping Frequencies				
20 dB Bandwidth				
Time of Occupancy (Dwell Time)				
Maximum Peak Conducted Output Power				
Unwanted Emission				
Radiated Emission	1) 9 kHz to 30 MHz	2025-06-20	20 to 21	35 to 37
	2) 30 MHz to 1 GHz			
	3) 1 GHz to 10 GHz	2025-06-17	22 to 24	53 to 54
AC Conducted Emission		2025-06-30	20 to 21	35 to 36

3.3 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. The results are only attached worst cases.

Test Frequency

Lowest Channel	Middle Channel	Highest Channel
902.75 MHz	914.75 MHz	927.25 MHz

Worst Case

Antenna Type	Peak Gain	Model
External PCB Antenna	-8.68 dBi	KSA-875MS1008A

Test Duty

Mode	Duty Cycle	Duty Cycle Factor
ASK	78.32 %	1.06 dB

= 10*LOG(1/x), where x is the duty cycle

3.4 Device Modifications

The following modifications were necessary for compliance:

Not applicable

3.5 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)
20 dB Bandwidth Bandwidth	0.1 MHz (C.L.: Approx. 95 %, k = 2)
Unwanted Emission (Conducted)	3.00 dB (C.L.: Approx. 95 %, k = 2)
Radiated Emissions (f ≤ 1 GHz)	4.11 dB (C.L.: Approx. 95 %, k = 2)
Radiated Emissions (f > 1 GHz)	4.48 dB (C.L.: Approx. 95 %, k = 2)
Line Conducted Emission	2.06 dB (C.L.: Approx. 95 %, k = 2)

3.6 Test Software

Automation Program

Conducted Test	Ics Pro Ver. 6.0.3
Radiated Test	EP5RE Ver. 6.0.1.0, ES10 Ver. 2022.04.000
Line Conducted Test	EMC32 Ver. 10.50.00

4. Technical Characteristic Test

4.1 Carrier Frequency Separation

Test Procedures

ANSI C63.10-2013 - Section 7.8.2

The carrier frequency separation was measured with a spectrum analyzer connected to the antenna terminal, while EUT has its hopping function enabled.
After the trace being stable, the reading value between the peaks of the adjacent channels using the marker-delta function was recorded as the measurement results.

Test Settings:

a) Span = 1 MHz (Wide enough to capture the peaks of two adjacent channels)

b) RBW = 100 kHz (Start with the RBW set to approximately 30 % of the channel spacing; adjust as necessary to best identify the center of each individual channel)

c) VBW = 100 kHz (≥ RBW)

d) Sweep = Auto

e) Detector function = Peak

f) Trace = Max hold

g) Allow the trace to stabilize.

Figure 1 : Measurement setup for the carrier frequency separation

Limit :

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

Test Results :

Test Mode : Hopping

Channel	Frequency [MHz]	Adjacent Hopping Channel Separation [kHz]	20 dB Bandwidth [kHz]	Minimum Bandwidth [kHz]	Result
Lowest	902.75	499	104.6	25	Complies
Middle	914.75	502	93.61	25	Complies
Highest	927.25	501	82.57	25	Complies

See next pages for actual measured spectrum plots.

Test Data :


Marker 2 Δ 499.000000 kHz
ΔMkr2 499 kHz
0.006 dB
Ref 40.00 dBm
Start 902.5000 MHz
#Res BW 100 kHz
#VBW 100 kHz
Stop 903.5000 MHz
Sweep 1.000 ms (1001 pts)
1 N 1 f 902.751 MHz 22.284 dBm
2 Δ1 1 f (Δ) 499 kHz (Δ) 0.006 dB
Marker 2 Δ 502.000000 kHz
ΔMkr2 502 kHz
-0.277 dB
Start 914.5000 MHz
Stop 915.5000 MHz
1 N 1 f 914.750 MHz 22.122 dBm
2 Δ1 1 f (Δ) 502 kHz (Δ) -0.277 dB
Marker 2 Δ 501.000000 kHz
ΔMkr2 501 kHz
0.314 dB
Start 926.5000 MHz
Stop 927.5000 MHz
1 N 1 f 926.750 MHz 21.676 dBm
2 Δ1 1 f (Δ) 501 kHz (Δ) 0.314 dB

4.2 Number of Hopping Frequencies

Test Procedures

ANSI C63.10-2013 - Section 7.8.3

The number of hopping frequencies was measured with a spectrum analyzer connected to the antenna terminal, while EUT had its hopping function enabled.

Test Settings:

a) Frequency range : Start = 902 MHz, Stop = 928 MHz

b) RBW = 100 kHz (To identify clearly the individual channels, set the RBW to less than 30 % of the channel spacing or the 20 dB bandwidth, whichever is smaller)

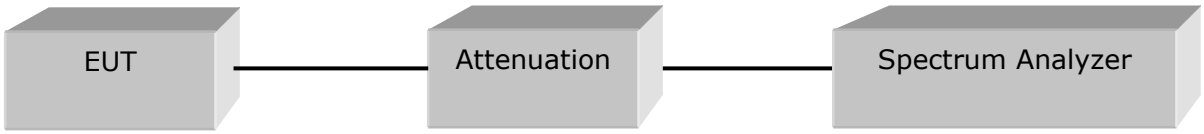
c) VBW = 100 kHz (≥ RBW)

d) Sweep = Auto

e) Detector function = Peak

f) Trace = Max hold

g) Allow the trace to stabilize.



Limit :

For frequency hopping systems operating in the 902-928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies.

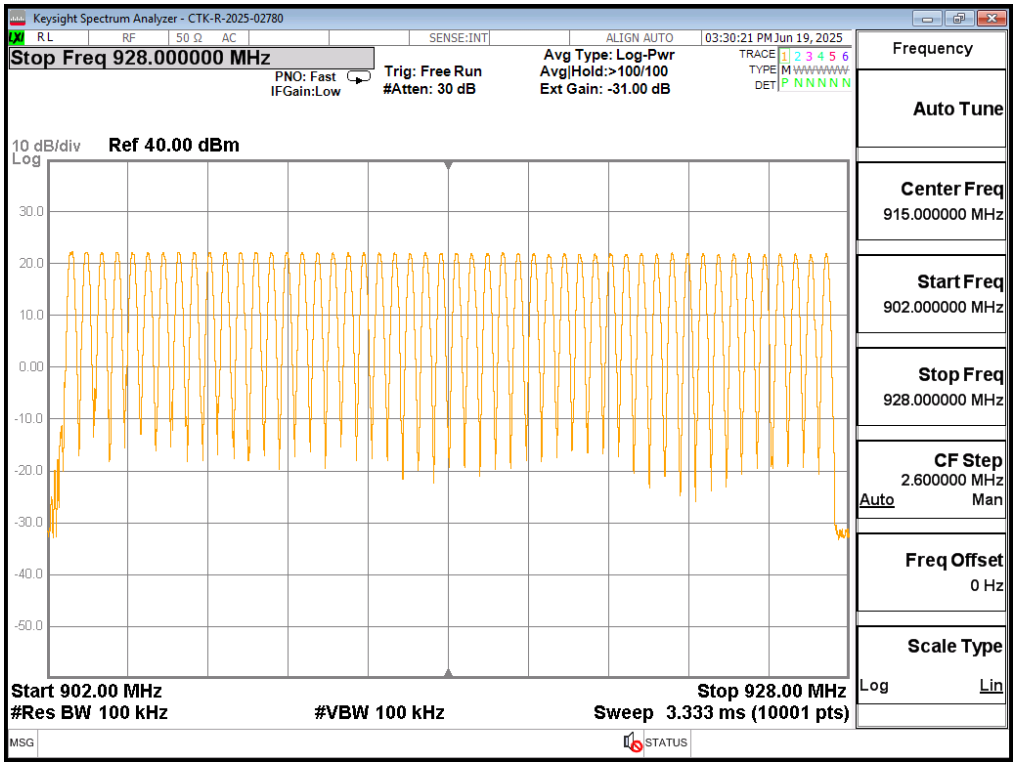
Test Results :

Test Mode : Hopping

Total Number of Hopping Channels	Result
50	Complies

See next pages for actual measured spectrum plots.

Test Data :


Keysight Spectrum Analyzer - CTK-R-2025-02780
RL
RF
50 Ω AC
SENSE:INT
ALIGN AUTO
03:30:21 PM Jun 19, 2025
Stop Freq 928.000000 MHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
Ext Gain: -31.00 dB
TRACE 1 2 3 4 5 6
TYPE M WWWWW
DET P N N N N N
10 dB/div
Log
Ref 40.00 dBm
30.0
20.0
10.0
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
Start 902.00 MHz
#Res BW 100 kHz
#VBW 100 kHz
Stop 928.00 MHz
Sweep 3.333 ms (10001 pts)
MSG
STATUS
Frequency
Auto Tune
Center Freq
915.000000 MHz
Start Freq
902.000000 MHz
Stop Freq
928.000000 MHz
CF Step
2.600000 MHz
Auto
Man
Freq Offset
0 Hz
Scale Type
Log
Lin

4.3 20 dB Bandwidth & 99 % Bandwidth

Test Procedures

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 20 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) Span = 300 kHz (between 2 times and 5 times the OBW)

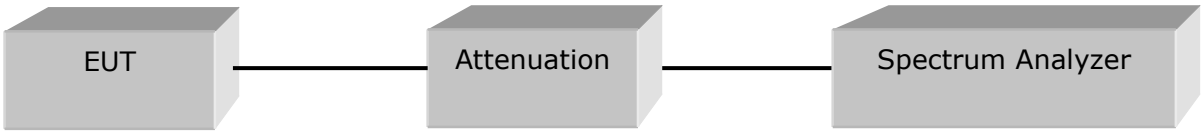
b) RBW = 3 kHz (1 % to 5 % of the OBW)

c) VBW = 9 kHz (approximately 3 times RBW)

d) Sweep = Auto

e) Detector function = Peak

f) Trace = Max hold



Limit :

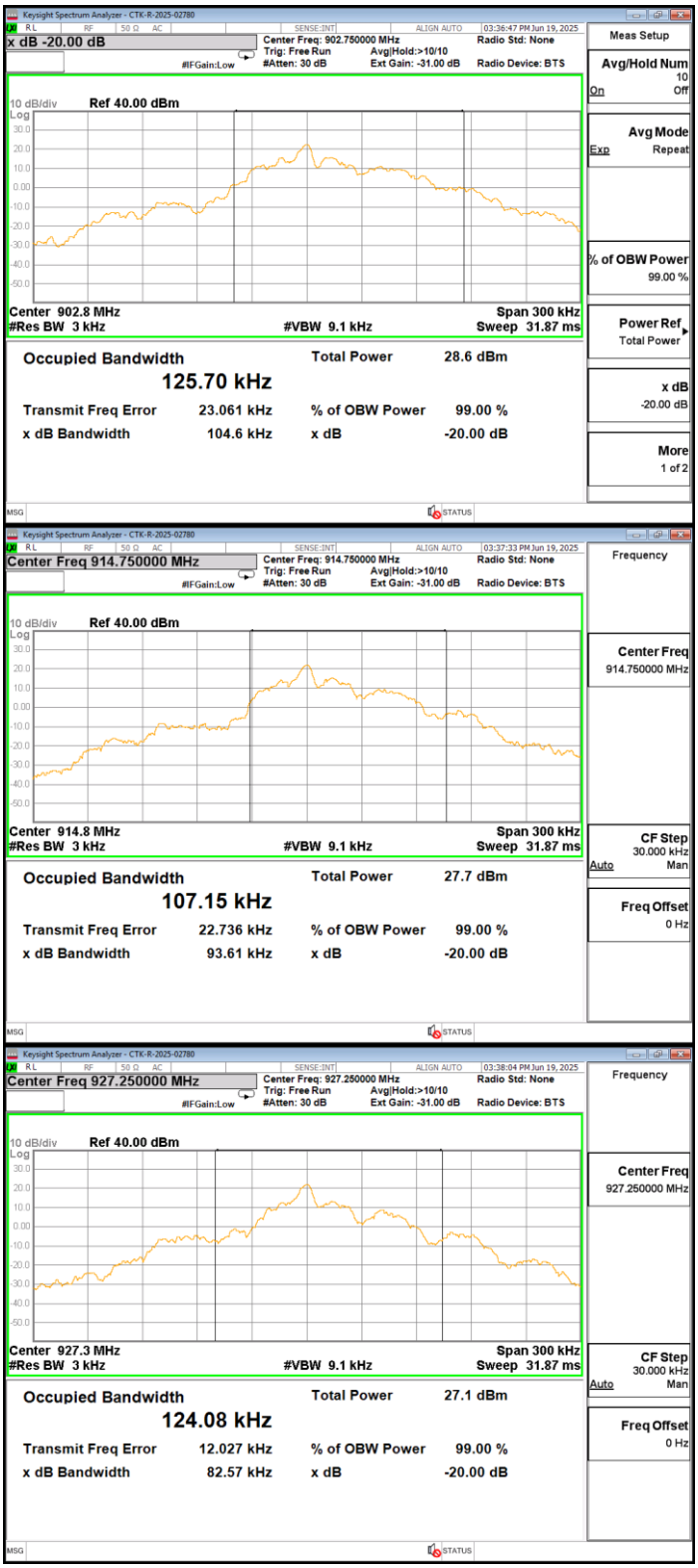
For frequency hopping systems operating in the 902-928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies.

Test Results :

Channel	Frequency [MHz]	20 dB Bandwidth [kHz]	99 % Bandwidth [kHz]	Result
Lowest	902.75	104.6	125.70	Complies
Middle	914.75	93.61	107.15	Complies
Highest	927.25	82.57	124.08	Complies

See next pages for actual measured spectrum plots.

Test Data :


Keysight Spectrum Analyzer - CTK-R-2025-02780
x dB -20.00 dB
Center Freq: 902.750000 MHz
Trig: Free Run
Avg|Hold:>10/10
#Atten: 30 dB
Ext Gain: -31.00 dB
Radio Std: None
Radio Device: BTS
10 dB/div
Ref 40.00 dBm
Center 902.8 MHz
#Res BW 3 kHz
#VBW 9.1 kHz
Span 300 kHz
Sweep 31.87 ms
Occupied Bandwidth
125.70 kHz
Total Power 28.6 dBm
Transmit Freq Error 23.061 kHz
% of OBW Power 99.00 %
x dB Bandwidth 104.6 kHz
x dB -20.00 dB
Meas Setup
Avg/Hold Num
10
Avg Mode
Exp
Repeat
% of OBW Power
99.00 %
Power Ref
Total Power
x dB
-20.00 dB
More
1 of 2
Center Freq 914.750000 MHz
Center Freq: 914.750000 MHz
Center 914.8 MHz
Occupied Bandwidth
107.15 kHz
Total Power 27.7 dBm
Transmit Freq Error 22.736 kHz
% of OBW Power 99.00 %
x dB Bandwidth 93.61 kHz
x dB -20.00 dB
Frequency
Center Freq
914.750000 MHz
CF Step
30.000 kHz
Auto
Man
Freq Offset
0 Hz
Center Freq 927.250000 MHz
Center Freq: 927.250000 MHz
Center 927.3 MHz
Occupied Bandwidth
124.08 kHz
Total Power 27.1 dBm
Transmit Freq Error 12.027 kHz
% of OBW Power 99.00 %
x dB Bandwidth 82.57 kHz
x dB -20.00 dB
927.250000 MHz

4.4 Time of Occupancy

Test Procedures

ANSI C63.10-2013 - Section 7.8.4

The dwell time was measured with a spectrum analyzer connected to the antenna terminal, while EUT has its hopping function enabled.

Test Settings:

a) Span = Zero span (centered on a hopping channel)

b) RBW shall be ≤ channel spacing and where possible RBW should be set >> 1 / T, where T is the expected dwell time per channel

c) Sweep = As necessary to capture the entire dwell time per hopping channel; where possible use a video trigger and trigger delay so that the transmitted signal starts a little to the Earbuds (R) of the start of the plot. The trigger level might need slight adjustment to prevent triggering when the system hops on an adjacent channel; a second plot might be needed with a longer sweep time to show two successive hops on a channel.

d) Detector function = Peak

e) Trace = Max hold

Use the marker-delta function to determine the transmit time per hop. If this value varies with different modes of operation (data rate, modulation format, number of hopping channels, etc.), then repeat this test for each variation in transmit time.

Repeat the measurement using a longer sweep time to determine the number of hops over the period specified in the requirements. The sweep time shall be equal to, or less than, the period specified in the requirements. Determine the number of hops over the sweep time and calculate the total number of hops in the period specified in the requirements, using the following equation:

Number of hops in the period specified in the requirements = (number of hops on spectrum analyzer) × (period specified in the requirements / analyzer sweep time)

Limit :

For frequency hopping systems operating in the 902-928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period. The average time of occupancy is calculated from the transmit time per hop multiplied by the number of hops in the period specified in the requirements.

Test Results :

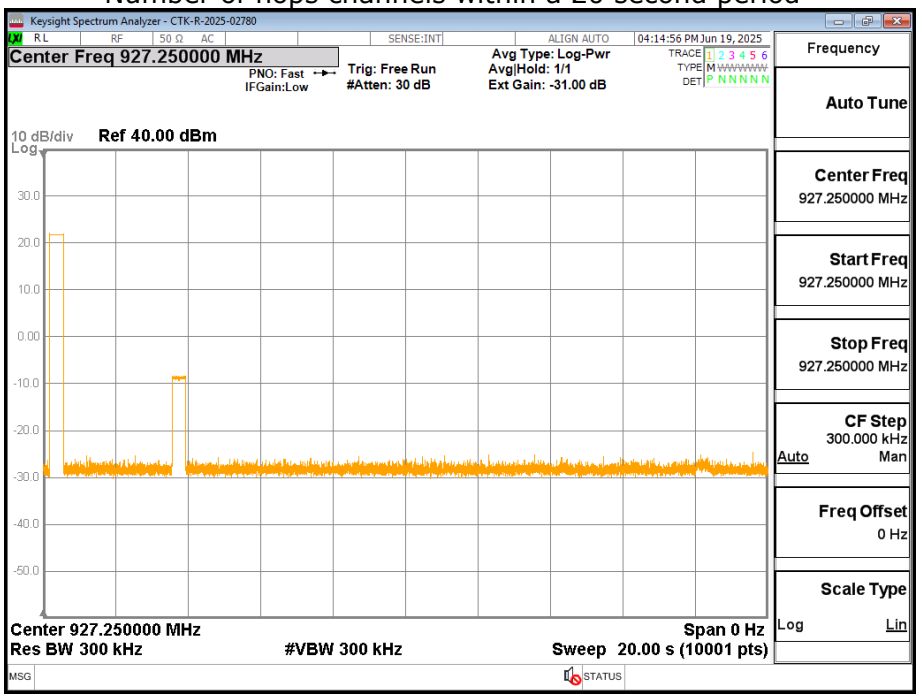
Test Mode : Hopping

Number of hops channels within a 20 second period	Transmit time per hop(ms)	Result (ms)	Limit (ms)
1	377.2	377.2	400

See next pages for actual measured spectrum plots.

Test Data :

Number of hops channels within a 20 second period



Transmit time per hop

4.5 Maximum Peak Conducted Output Power

Test Procedures

ANSI C63.10-2013 - Section 7.8.5

This is an RF-conducted test to evaluate maximum peak output power. Use a direct connection between the antenna port of the unlicensed wireless device and the spectrum analyzer, through suitable attenuation. The hopping shall be disabled for this test.

Test Settings:

Center frequency = The highest, middle and the lowest channels

a) Span = 500 kHz (approximately 5 times of the 20 dB bandwidth)

b) RBW = 150 kHz (greater than the 20 dB bandwidth of the emission being measured)

c) VBW = 300 kHz (≥ RBW)

d) Detector = Peak

e) Trace = Max hold

f) Sweep = Auto

Limit :

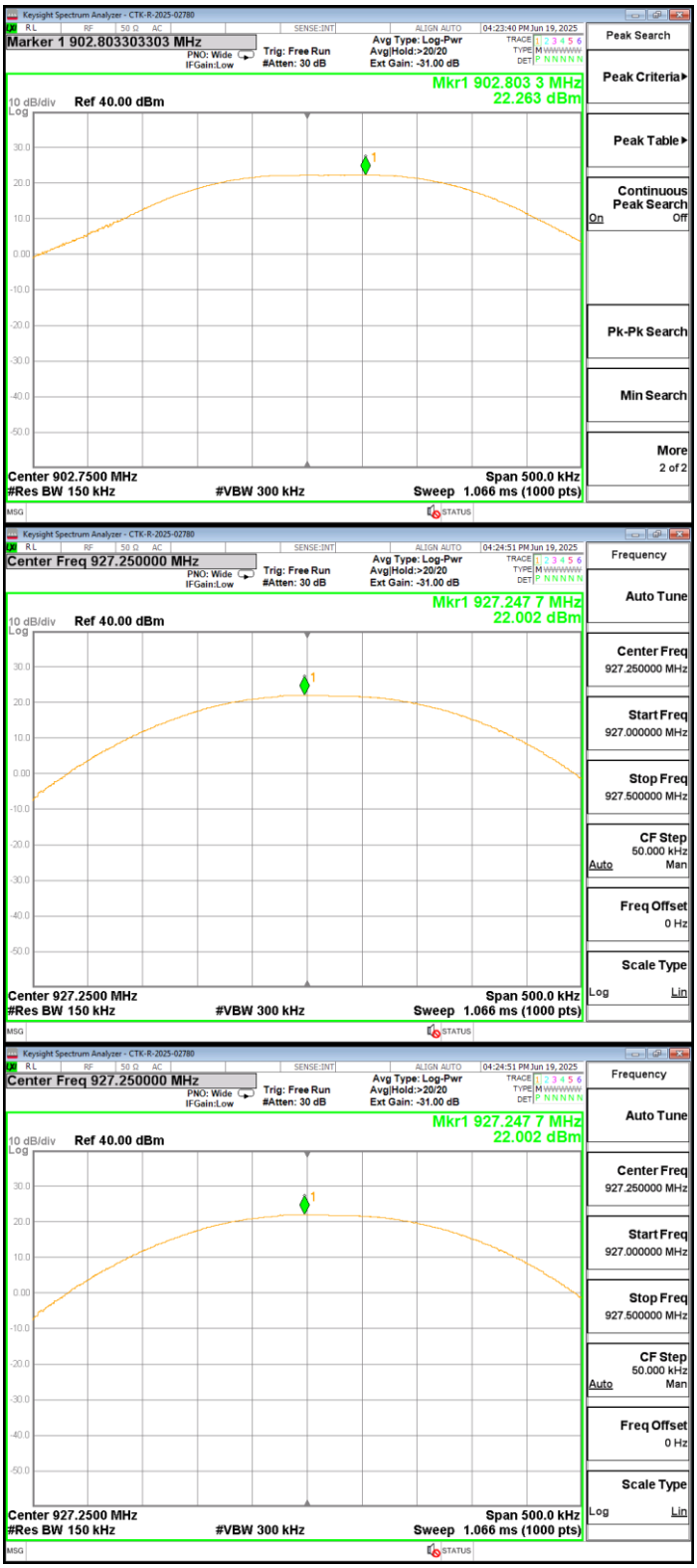
For frequency hopping systems operating in the 902-928 MHz band: 1 watt(30 dBm) for systems employing at least 50 hopping channels.

Test Results

Channel	Frequency [MHz]	Output Power [dBm]	Output Power [mW]	Result
Lowest	902.75	22.26	168.38	Complies
Middle	914.75	22.06	160.73	Complies
Highest	927.25	22.00	158.56	Complies

See next pages for actual measured spectrum plots.

Test Data :


Keysight Spectrum Analyzer - CTK-R-2025-02780
Marker 1 902.803303303 MHz
PNO: Wide
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold:>20/20
Ext Gain: -31.00 dB
04:23:40 PM Jun 19, 2025
Mkr1 902.803 3 MHz
22.263 dBm
10 dB/div
Log
Ref 40.00 dBm
Center 902.7500 MHz
#Res BW 150 kHz
#VBW 300 kHz
Span 500.0 kHz
Sweep 1.066 ms (1000 pts)
Peak Search
Peak Criteria
Peak Table
Continuous Peak Search
On Off
Pk-Pk Search
Min Search
More
2 of 2
Keysight Spectrum Analyzer - CTK-R-2025-02780
Center Freq 927.250000 MHz
PNO: Wide
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold:>20/20
Ext Gain: -31.00 dB
04:24:51 PM Jun 19, 2025
Mkr1 927.247 7 MHz
22.002 dBm
10 dB/div
Log
Ref 40.00 dBm
Center 927.2500 MHz
#Res BW 150 kHz
#VBW 300 kHz
Span 500.0 kHz
Sweep 1.066 ms (1000 pts)
Frequency
Auto Tune
Center Freq
927.250000 MHz
Start Freq
927.000000 MHz
Stop Freq
927.500000 MHz
CF Step
50.000 kHz
Auto Man
Freq Offset
0 Hz
Scale Type
Log Lin
Keysight Spectrum Analyzer - CTK-R-2025-02780
Center Freq 927.250000 MHz
PNO: Wide
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold:>20/20
Ext Gain: -31.00 dB
04:24:51 PM Jun 19, 2025
Mkr1 927.247 7 MHz
22.002 dBm
10 dB/div
Log
Ref 40.00 dBm
Center 927.2500 MHz
#Res BW 150 kHz
#VBW 300 kHz
Span 500.0 kHz
Sweep 1.066 ms (1000 pts)
Frequency
Auto Tune
Center Freq
927.250000 MHz
Start Freq
927.000000 MHz
Stop Freq
927.500000 MHz
CF Step
50.000 kHz
Auto Man
Freq Offset
0 Hz
Scale Type
Log Lin

4.6 Unwanted Emissions (Conducted)

Test Procedures

ANSI C63.10-2013 - Section 7.8.6, 7.8.8

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.

The bandwidth at 20 dB down from the highest inband spectral density was measured with a spectrum analyzer connected to the antenna terminal, while EUT has its hopping function disabled at the highest, middle and the lowest available channels.

Test Settings:

Center frequency = the highest, middle and the lowest channels

a) 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

b) RBW = 100 kHz

c) VBW = 300 kHz (≥ RBW)

d) Detector = Peak

e) Trace = Max hold

f) Sweep = Auto

Limit :

Emission Level > 20 dBc

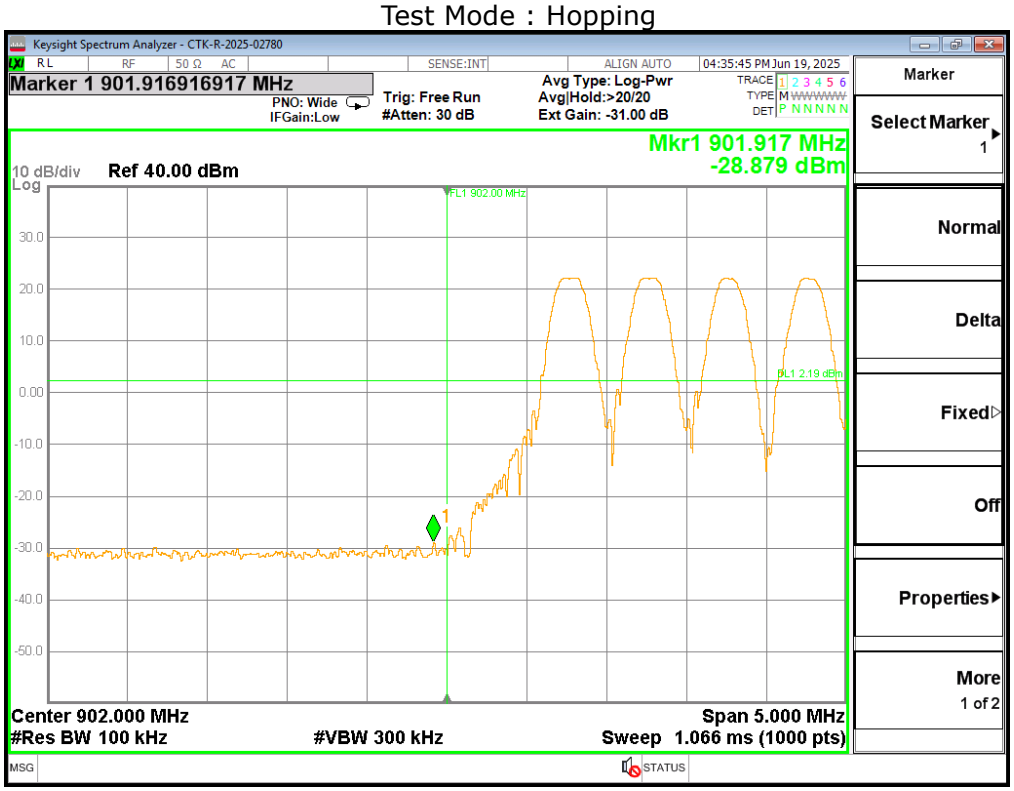
Test Results : Complies

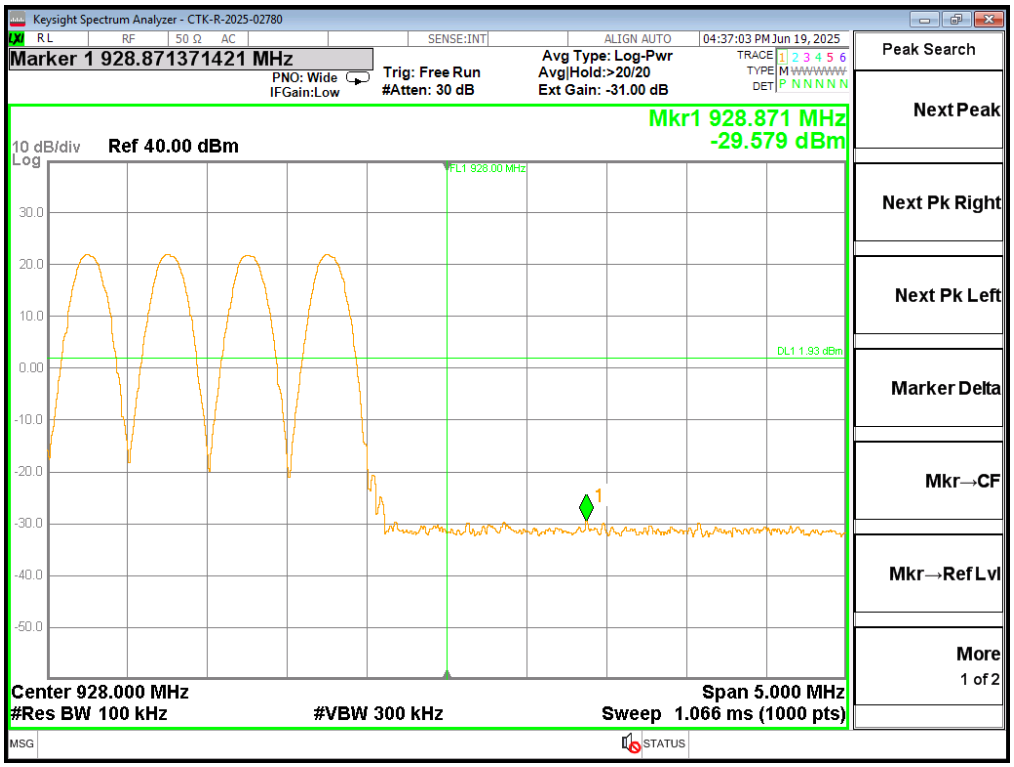
- All conducted emission in any 100 kHz bandwidth outside of the spread spectrum band was at least 20 dB lower than the highest in-band spectral density. Therefore the applying equipment meets the requirement.

See next pages for actual measured spectrum plots.

Band Edge

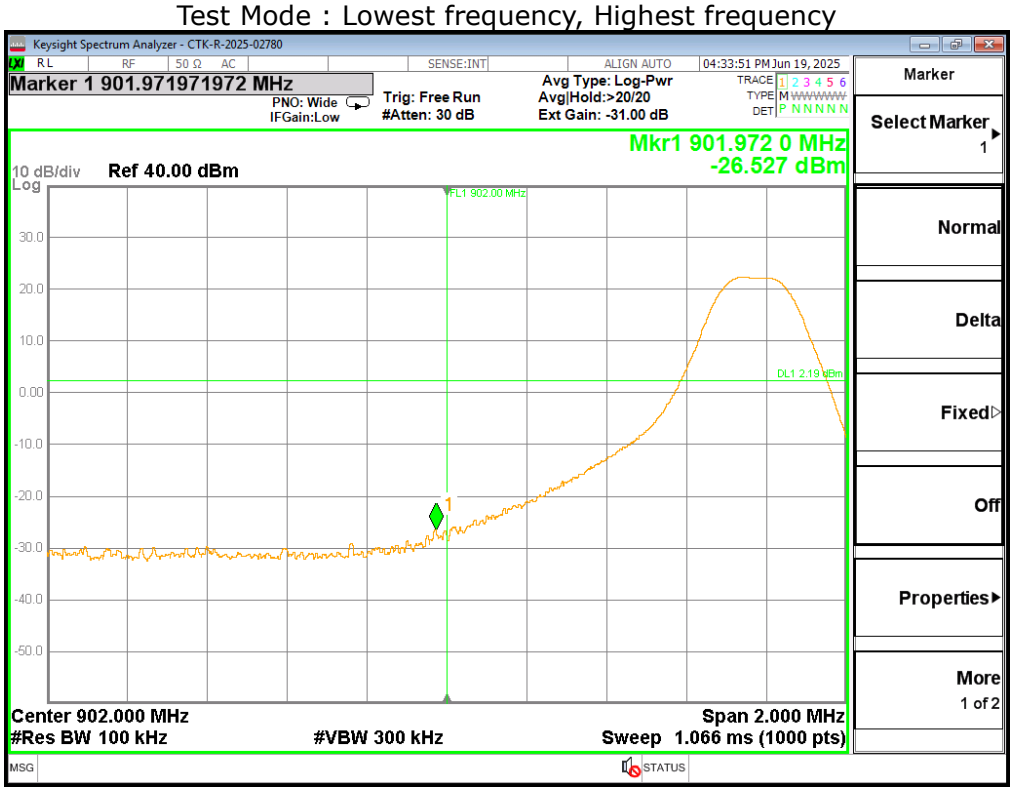
Test Mode : Hopping

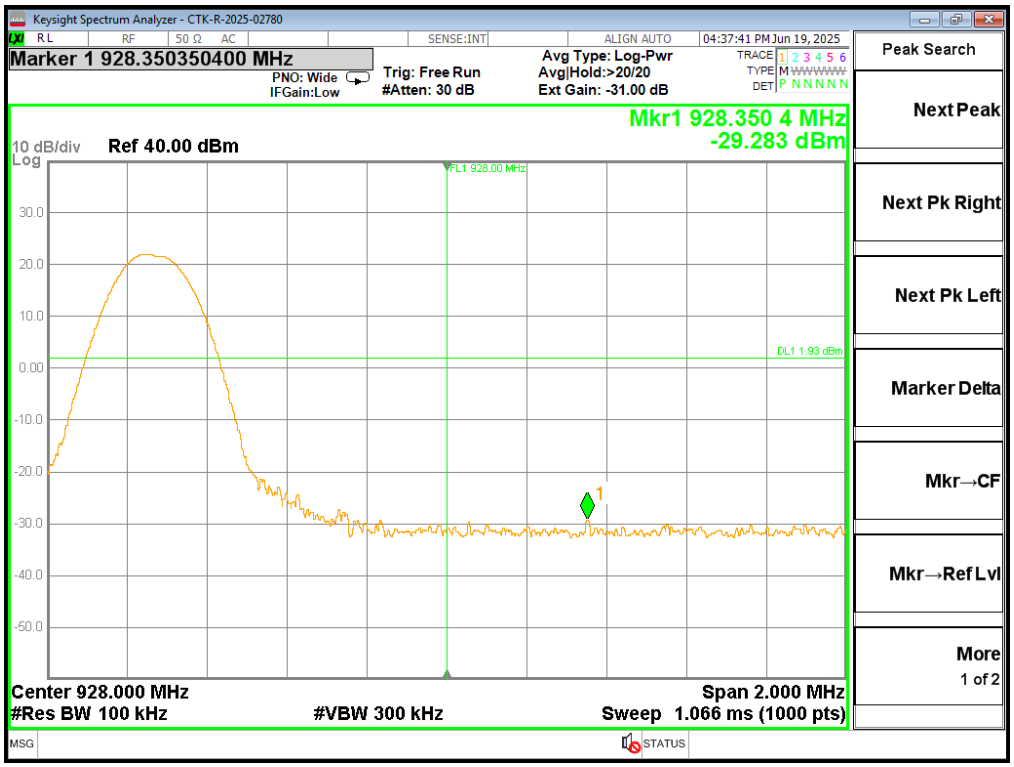




Band Edge

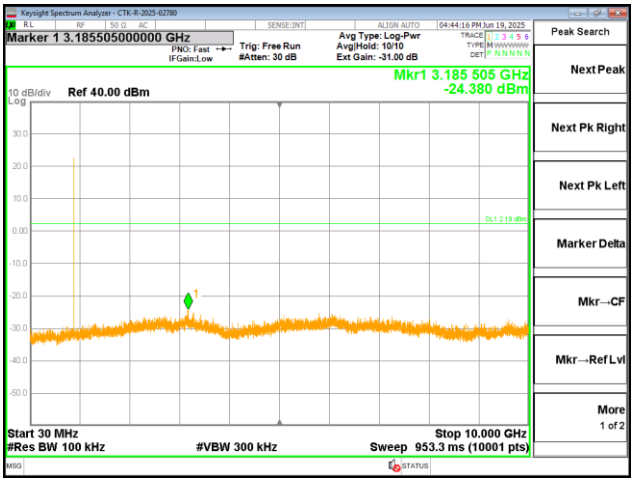
Test Mode : Lowest frequency, Highest frequency

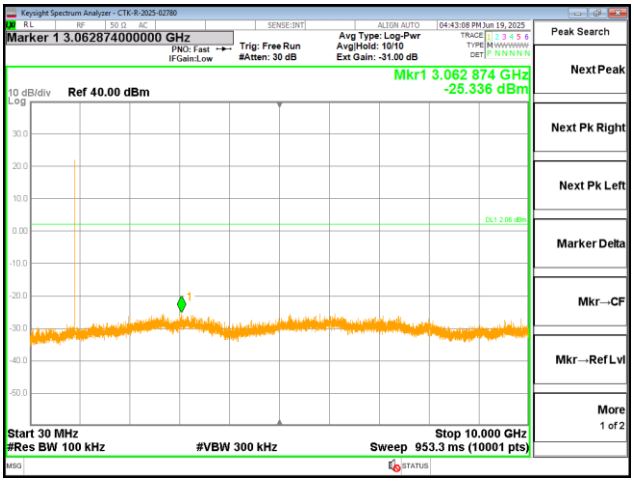


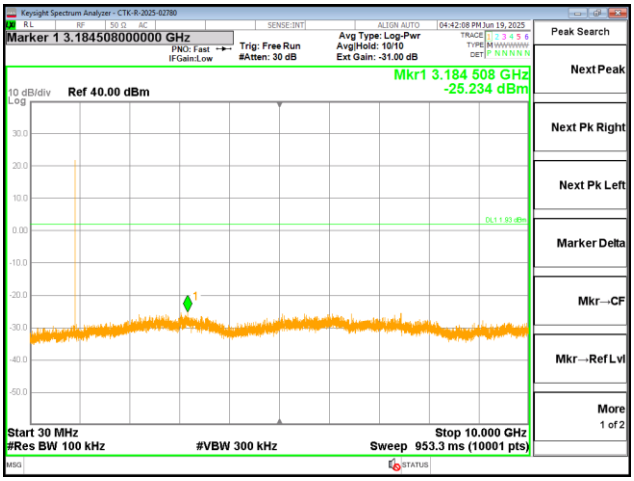


Spurious Emission

Test Mode : Lowest frequency, Middle frequency, Highest frequency







4.7 Radiated Emission

Test Location

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

Test Procedures

ANSI C63.10-2013 - Section 6.5, 6.6

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 1 m 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 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 ~ 10 GHz (900 MHz 10^{th} harmonic)

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

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 (FCC)

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

Table 2. Restricted Frequency Bands (ISED)

MHz	MHz	MHz	MHz	MHz	GHz
0.009 - 0.110	8.362 - 8.366	73 - 74.6	960 – 1 427	3 500 – 4 400	9.0 - 9.2
0.495 - 0.505	8.37625 - 8.38675	74.8 - 75.2	1 435 – 1 626.5	4 500 - 5 150	9.3 - 9.5
2.1735 - 2.1905	8.41425 - 8.41475	108 - 138	1 645.5 – 1 646.5	5 350 - 5 460	10.6 - 12.7
4.125 - 4.128	12.29 - 12.293	149.9 - 150.05	1 660 – 1 710	7 250 - 7 750	13.25 - 13.4
3.020 -3.026	12.51975 - 12.52025	156.52475 - 156.52525	1 718.8 – 1 722.2	8 025 - 8 500	14.47 - 14.5
4.17725 - 4.17775	12.57675 - 12.57725	156.7 - 156.9	2 200 – 2 300		15.35 - 16.2
4.20725 - 4.20775	13.36 - 13.41	162.012 5 - 167.17	2 310 – 2 390		17.7 - 21.4
5.677 - 5.683	16.42 - 16.423	167.72 - 173.2	2 483.5 – 2 500		22.01 - 23.12
6.215 - 6.218	16.69475 - 16.69525	240 - 285	2 655 – 2 900		23.6 - 24.0
6.26775 - 6.26825	16.80425 - 16.80475	322 - 335.4	3 260 – 3 267		31.2 - 31.8
6.31175 - 6.31225	25.5 - 25.67	399.9 - 410	3 332 – 3 339		36.43 - 36.5
8.291 - 8.294	37.5 - 38.25	608 - 614	3 345.8 – 3 358		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.

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 3 :

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 3 Additionally, the level of any transmitter emission shall not exceed the level of the transmitter's fundamental emission.

Table 3. General Field Strength Limits for Licence-Exempt Transmitters (FCC)

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.

Table 4. General field strength limits at frequencies below 30 MHz (ISED)

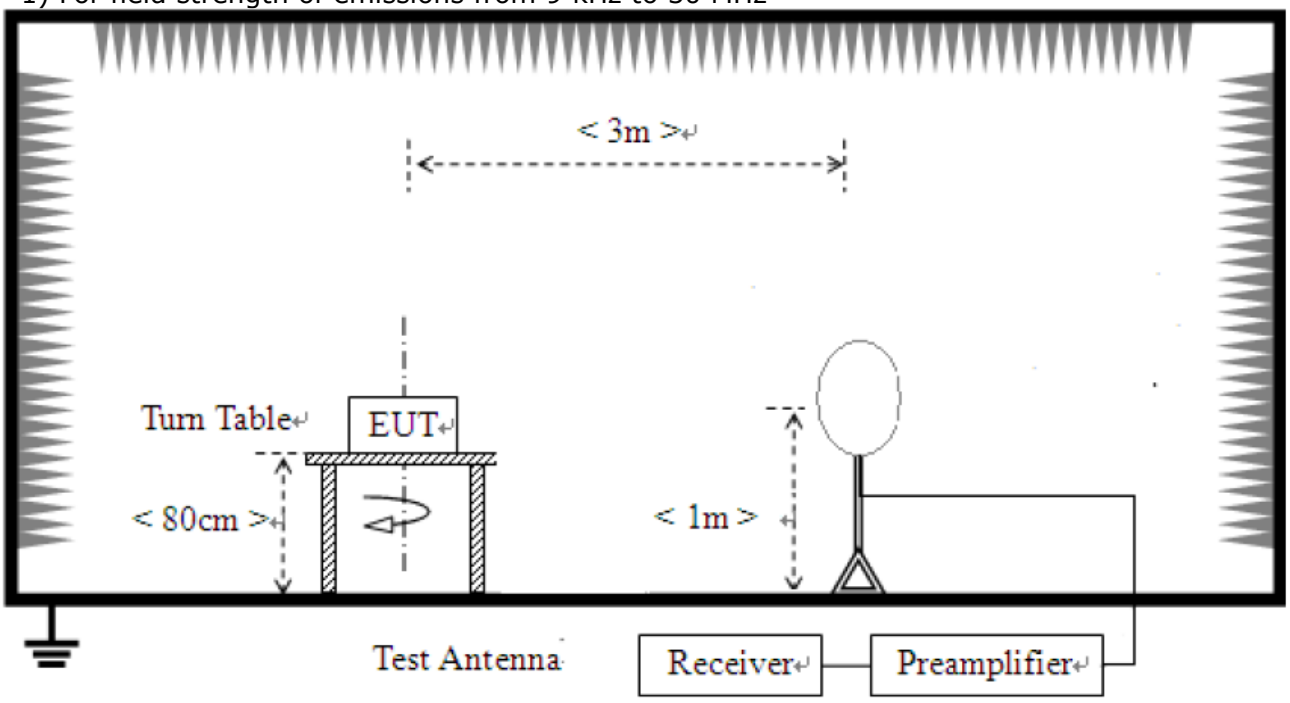
Frequency [kHz]	Magnetic Field Strength [uV/m]	Magnetic Field Strength [dBuA/m]	Field Strength [dBuV/m]**	Deasurement Distance [meters]
9 - 490	6.37/F(kHz)	-3 to -37.7	48.5 to 13.8	300
490 - 1705	63.7/F(kHz)	-17.7 to -28.6	33.8 to 23	30
1.705 - 30	0.08	-21.9	29.5	30

**Field Strength (dBuV/m) : Magnetic Field Strength (dBuA/m) + 51.5 (conversion factor).
The limit of 30 MHz or more is the same as Table 3.

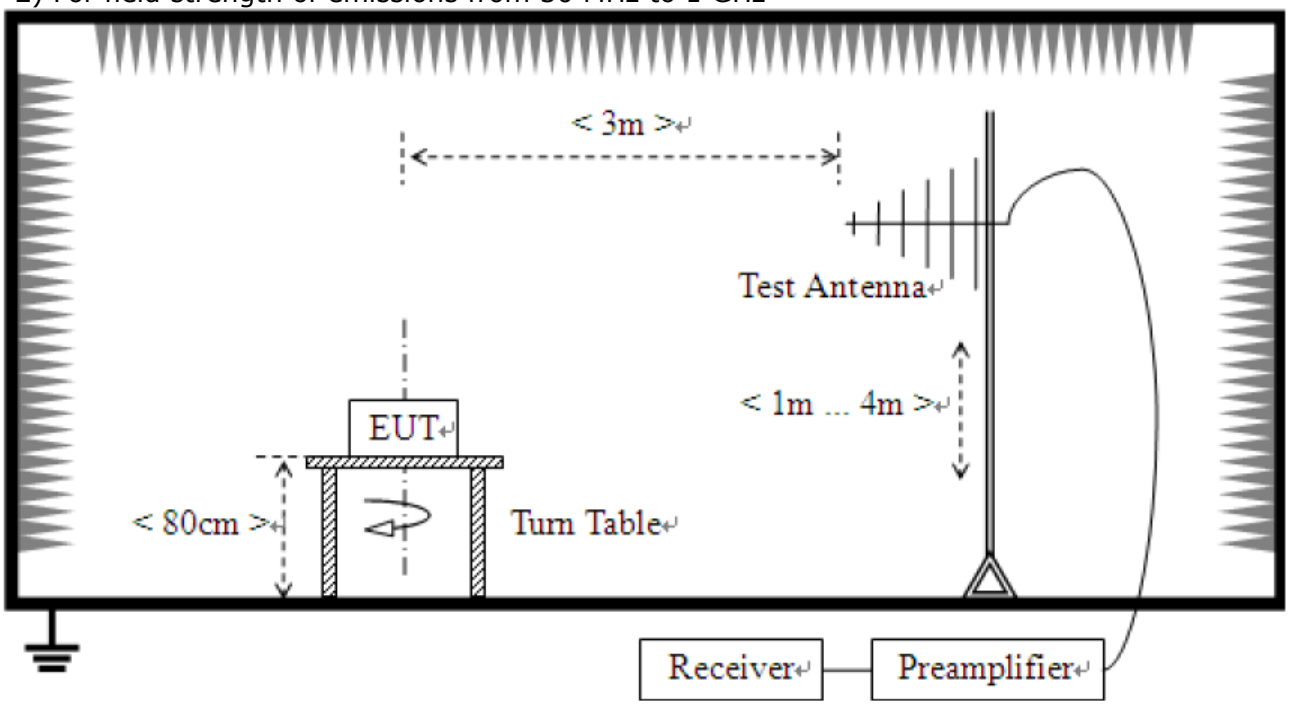
Note :
1) For above 1 GHz, the emission limit in this paragraph is based on measurement instrumentation employing an average detector, measurement using instrumentation with a peak detector function, corresponding to 20 dB above the maximum permitted average limit.
2) For above 1 GHz, limit field strength 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 :

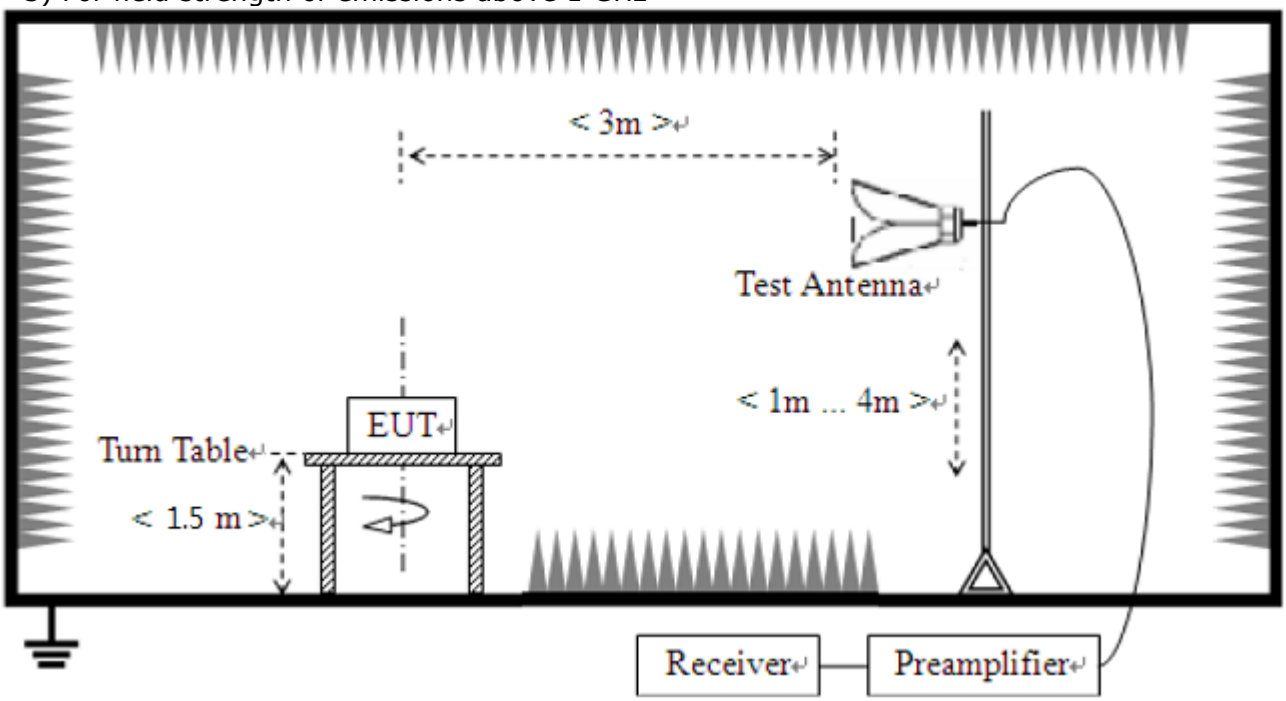
1) For field strength of emissions from 9 kHz to 30 MHz



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



3) For field strength of emissions above 1 GHz



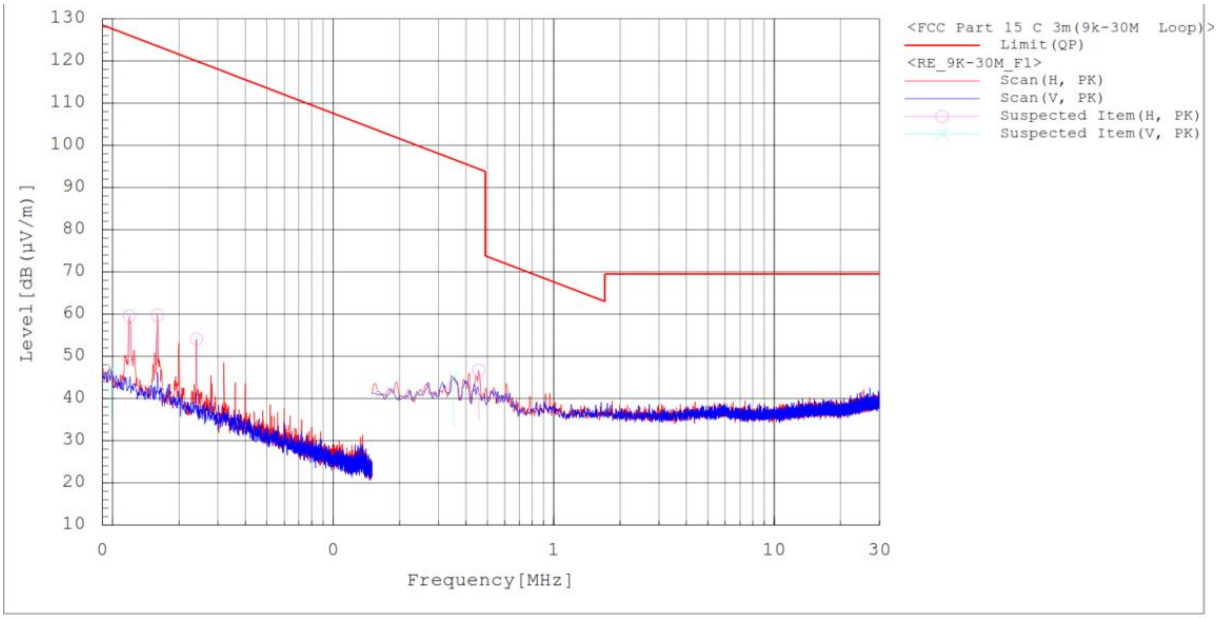
Test Results :

1) 9 kHz to 30 MHz

Test Mode : Lowest Channel of Transmitter (Worst Case)

The requirements are:
☒ Complies

Test Data :



Spectrum Selection

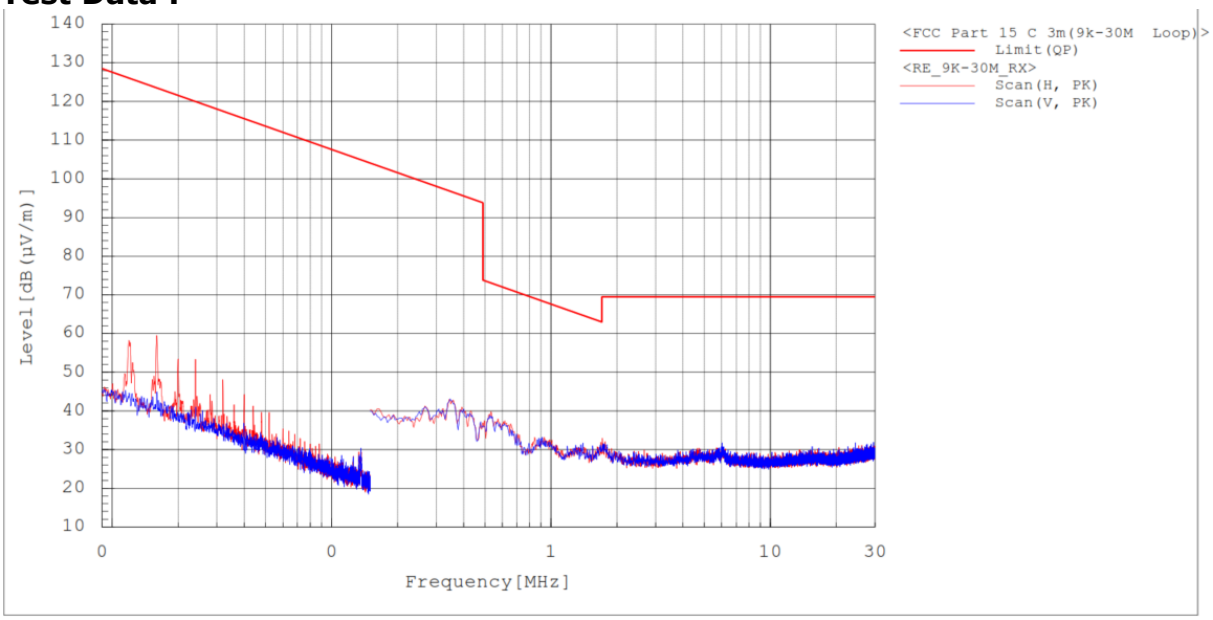
No.	Frequency [MHz]	Pol	Reading PK [dB(μV)]	c.f [dB(1/m)]	Result PK [dB(μV/m)]	Limit QP [dB(μV/m)]	Margin QP-PK [dB]	Height [cm]	Angle [deg]
1	0.010	V	21.8	25.1	46.9	127.7	80.8	100.0	338.6
2	0.012	H	34.5	25.0	59.5	126.1	66.6	100.0	343.1
3	0.016	H	34.8	25.0	59.8	123.5	63.7	100.0	354.7
4	0.024	H	29.1	25.0	54.1	120.0	65.9	100.0	357.2
5	0.353	V	20.2	24.9	45.1	96.6	51.5	100.0	211.6
6	0.457	H	21.8	24.9	46.7	94.4	47.7	100.0	183.7

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 (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
4. Distance extrapolation factor = 40 log (specific distance / test distance) (dB)
5. This data is the Peak (PK) value.

Test Mode : Lowest Channel of Receiver (Worst Case)

The requirements are:
☒ Complies

Test Data :



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

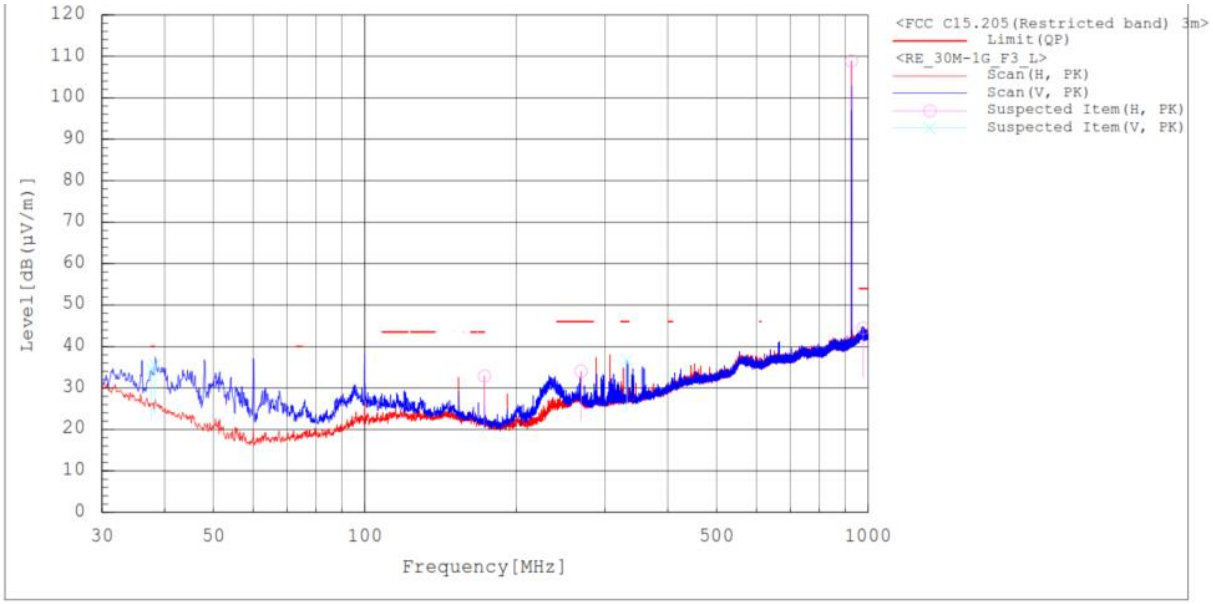
Remark :
1. Measuring position : The Unwanted emission was measured in the following position: EUT stand-up position (Z axis), lie-down position (X,Y axis). The worst emission was found in lie-down position (Z axis) and the worst case was recorded.
2. Result = Reading + c.f (Correction factor)
3. Correction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

2) 30 MHz to 1 GHz

Test Mode : Highest Channel of Transmitter (Worst Case)

The requirements are:
☒ Complies

Test Data :



Spectrum Selection

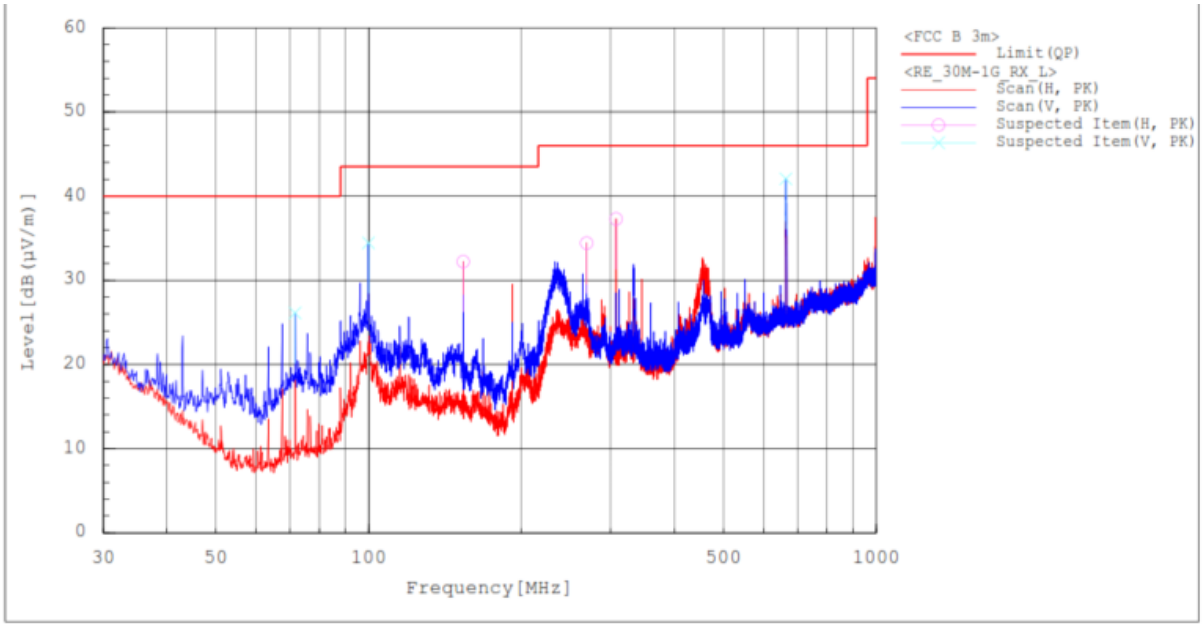
No.	Frequency [MHz]	Pol	Reading PK [dB(μV)]	c.f [dB(1/m)]	Result PK [dB(μV/m)]	Limit QP [dB(μV/m)]	Margin QP-PK [dB]	Height [cm]	Angle [deg]
1	37.663	V	44.7	-10.2	34.5	40.0	5.5	99.9	359.9
2	38.245	V	46.1	-10.5	35.6	40.0	4.4	99.9	57.1
3	172.784	H	47.3	-14.4	32.9	43.5	10.6	200.2	359.9
4	268.814	H	44.1	-10.0	34.1	46.0	11.9	99.9	102.4
5	331.185	V	45.8	-9.1	36.7	46.0	9.3	99.9	77.7
6	927.347	H	104.5	4.4	108.9	----------	--------	99.9	64.5
7	977.884	H	38.2	6.2	44.4	54.0	9.6	200.2	1.0

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 (Z axis) and the worst case was recorded.
2. Result = Reading + c.f (Correction factor)
3. Correction factor = Antenna factor + Cable loss + 6 dB attenuator - Amp gain
4. This data is the Peak (PK) value.

Test Mode : Lowest Channel of Receiver (Worst Case)

The requirements are:
☒ Complies

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]
1	71.613	V	44.2	-18.1	26.1	40.0	13.9	99.9	19.0
2	99.937	V	49.0	-14.6	34.4	43.5	9.1	99.9	305.8
3	153.578	H	45.2	-13.0	32.2	43.5	11.3	199.9	0.0
4	268.814	H	44.4	-10.0	34.4	46.0	11.6	99.9	81.2
5	307.226	H	46.9	-9.6	37.3	46.0	8.7	99.9	87.8
6	663.798	V	42.8	-0.8	42.0	46.0	4.0	99.9	247.1

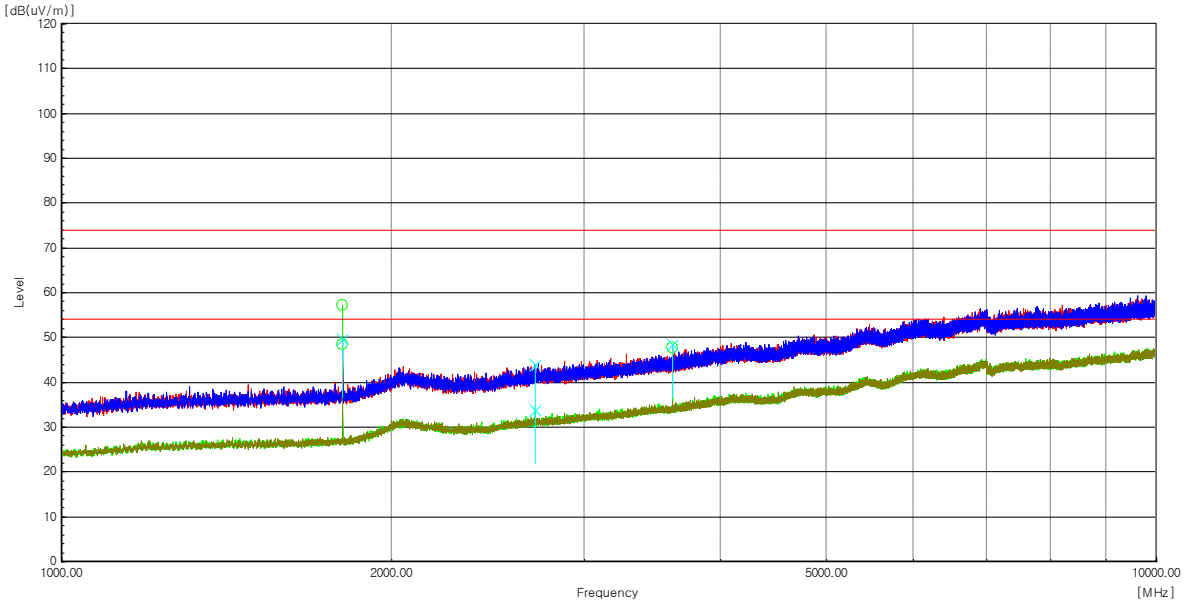
Remark :
1. Measuring position : The Unwanted emission was measured in the following position: EUT stand-up position (Z axis), lie-down position (X,Y axis). The worst emission was found in lie-down position (Z axis) and the worst case was recorded.
2. Result = Reading + c.f (Correction factor)
3. Correction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

3) 1 GHz to 10 GHz

Test Mode : Lowest Channel of Transmitter (Worst Case)

The requirements are:
☒ Complies

Test Data :



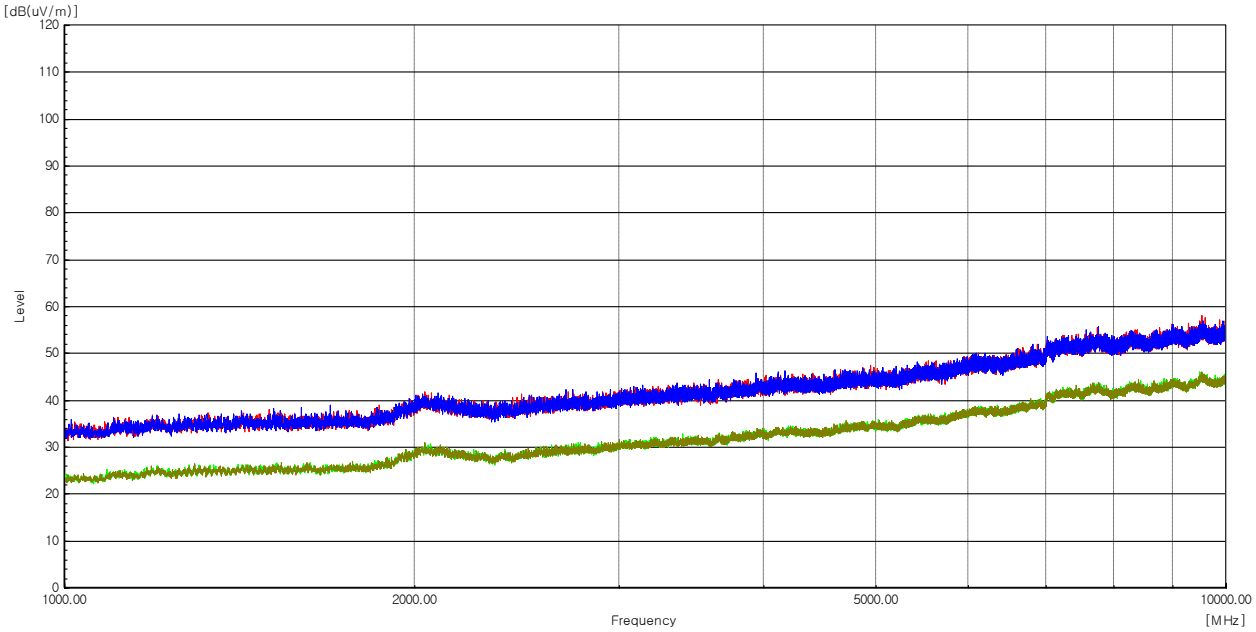
Frequency [MHz]	(P)	Reading [dBuV]	c.f [dB(1/m)]	Duty Cycle Factor [dB]	Level PK [dBuV/m]	Level AV [dBuV/m]	Limit PK [dBuV/m]	Limit AV [dBuV/m]	Margin PK [dB]	Margin AV [dB]	Note
1 805.35	H	56.1	-7.6	1.06	-----	49.6	-----	54.0	-----	4.4	Average
1 805.35	V	57.1	-7.6	-----	49.5	-----	74.0	-----	24.5	-----	Peak
1 805.71	H	64.7	-7.6	-----	57.1	-----	74.0	-----	16.9	-----	Peak
2 708.63	V	46.9	-3.0	-----	43.9	-----	74.0	-----	30.1	-----	Peak
2 708.63	V	36.8	-3.0	1.06	-----	34.9	-----	54.0	-----	19.1	Average
3 611.19	H	48.0	-0.2	-----	47.8	-----	74.0	-----	26.2	-----	Peak
3 611.19	V	48.7	-0.2	-----	48.5	-----	74.0	-----	25.5	-----	Peak

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 (Z axis) and the worst case was recorded.
2. Peak result = Reading + c.f (Correction factor)
   Average result = Reading + c.f (Correction factor) + Duty Cycle Factor
3. Correction factor = Antenna factor + Cable loss - Amp gain
4. High pass filter was used from 1 GHz to 10 GHz

Test Mode : Lowest Channel of Receiver (Worst Case)

The requirements are:
☒ Complies

Test Data :



Frequency [MHz]	(P)	Reading [dBuV]	c.f [dB(1/m)]	Duty Cycle Factor [dB]	Level PK [dBuV/m]	Level AV [dBuV/m]	Limit PK [dBuV/m]	Limit AV [dBuV/m]	Margin PK [dB]	Margin AV [dB]	Note
Peak data was not detected.											

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 (Z axis) and the worst case was recorded.
2. Peak result = Reading + c.f (Correction factor)
   Average result = Reading + c.f (Correction factor) + Duty Cycle Factor
3. Correction factor = Antenna factor + Cable loss - Amp gain

4.8 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.

Frequency Range of measurement
150 kHz to 30 MHz

Instrument Settings
IF Band Width: 9 kHz

Test Procedures

ANSI C63.10-2013 - Section 6.2
RSS-Gen - Section 8.8

The EUT was placed on a non-metallic table 0.8 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)**

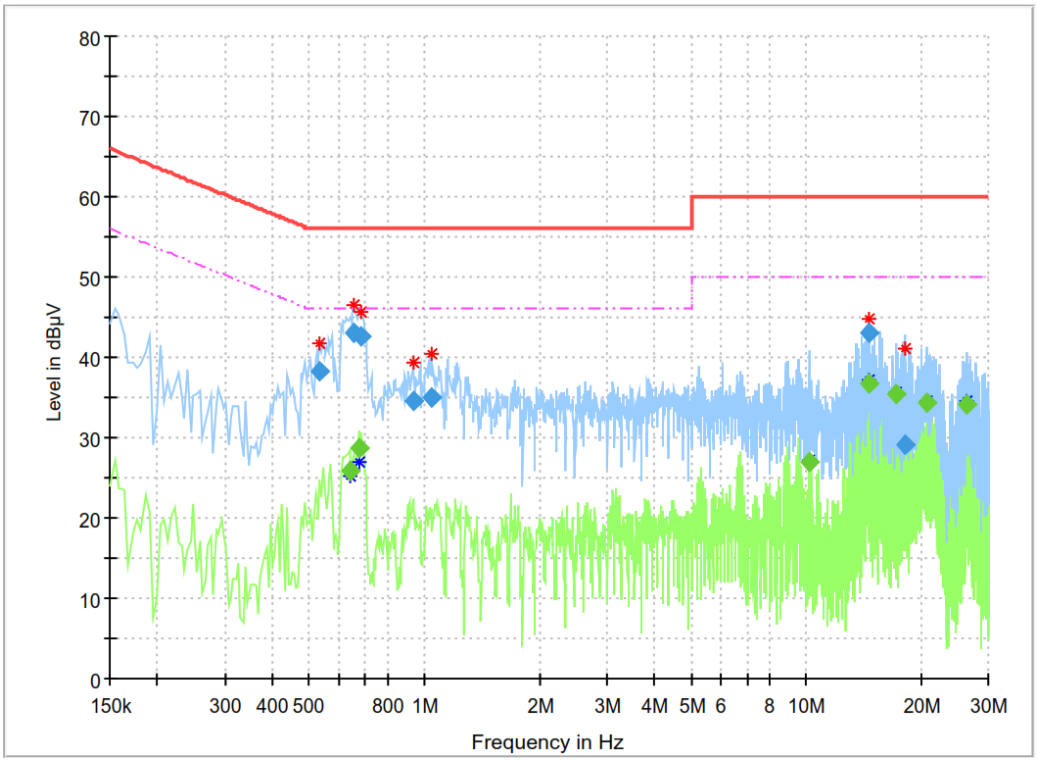
Frequency [MHz]	Conducted Limit [dBuV]	
	Quasi-peak	Average**
0.15 - 0.5	66 to 56*	56 to 46*
0.5 - 5	56	46
5 - 30	60	50

* The level decreases linearly with the logarithm of the frequency.
** A linear average detector is required.

Test Results :

The requirements are:
☒ Complies

Test Data :



Final Result

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.532500	38.19	---	56.00	17.81	15000.0	9.000	N	ON	10.0
0.636000	---	25.90	46.00	20.10	15000.0	9.000	N	ON	9.9
0.654000	42.98	---	56.00	13.02	15000.0	9.000	N	ON	9.9
0.672000	---	28.59	46.00	17.41	15000.0	9.000	N	ON	9.9
0.685500	42.61	---	56.00	13.39	15000.0	9.000	N	ON	9.9
0.933000	34.54	---	56.00	21.46	15000.0	9.000	N	ON	9.9
1.041000	34.96	---	56.00	21.04	15000.0	9.000	N	ON	9.8
10.239000	---	26.88	50.00	23.12	15000.0	9.000	N	ON	9.9
14.559000	43.01	---	60.00	16.99	15000.0	9.000	N	ON	10.1
14.599500	---	36.76	50.00	13.24	15000.0	9.000	N	ON	10.1
17.281500	---	35.51	50.00	14.49	15000.0	9.000	N	ON	10.3
18.127500	29.19	---	60.00	30.81	15000.0	9.000	N	ON	10.3
20.760000	---	34.36	50.00	15.64	15000.0	9.000	N	ON	10.4
26.281500	---	34.23	50.00	15.77	15000.0	9.000	N	ON	10.2

4.9 Frequency Hopping System Requirements

Standard Applicable

According to FCC Part 15.247(a)(1), The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudo randomly ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

(g) Frequency hopping spread spectrum systems are not required to employ all available hopping channels during each transmission. However, the system, consisting of both the transmitter and the receiver, must be designed to comply with all of the regulations in this section should the transmitter be presented with a continuous data (or information) stream. In addition, a system employing short transmission bursts must comply with the definition of a frequency hopping system and must distribute its transmissions over the minimum number of hopping channels specified in this section.

(h) The incorporation of intelligence within a frequency hopping spread spectrum system that permits the system to recognize other users within the spectrum band so that it individually and independently chooses and adapts its hopsets to avoid hopping on occupied channels is permitted. The coordination of frequency hopping systems in any other manner for the express purpose of avoiding the simultaneous occupancy of individual hopping frequencies by multiple transmitters is not permitted.

EUT Pseudo random Frequency Hopping Sequence

Pseudo random Frequency Hopping Sequence Table as below:
Channel:
27,26,2,49,48,4,50,36,34,14,33,31,6,5,46,39,25,9,23,40,18,19,3,13,7,20,8,30,24,10,32,28,16,17,11,45,15,35,29,22,43,12,47,21,44,38,37,41,1,42

The system receiver has input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shift frequencies in synchronization with the transmitted signals

APPENDIX A – Test Equipment Used For Tests

No.	Name of Equipment	Manufacturer	Model No.	Serial No.	Date of Calibration	Due Date
1	Signal Analyzer	Agilent	N9020A	MY52090670	2024-09-19	2025-09-19
2	Signal Generator	Rohde & Schwarz	SMB100A	175528	2025-03-21	2026-03-21
3	Dual-Tracking DC Power Supply	Topward Electric Instruments Co.,Ltd.	6303D	802204	2025-03-13	2026-03-13
4	EMI TEST RECEIVER	Rohde & Schwarz	ESW44	102039	2025-04-28	2026-04-28
5	BILOG ANTENNA	TESEQ	CBL6111D	60654	2023-08-21	2025-08-21
6	Active Loop Antenna	SCHWARZBECK	FMZB 1513	1513-125	2024-04-15	2026-04-15
7	6dB Attenuator	PASTERNACK	PE7AP006-06	L20210504000023	2024-07-31	2025-07-31
8	6dB Attenuator	NONE	6dB	190557	2024-09-19	2025-09-19
9	AMPLIFIER	SONOMA INSTRUMENT	310N	411011	2024-07-31	2025-07-31
10	Spectrum Analyzer	R&S	FSV40	101574	2025-01-10	2026-01-10
11	PRE AMPLIFIER	HP	8449B	3008A00620	2025-03-11	2026-03-11
12	Double Ridged Guide Antenna	ETS-Lindgren	3115	00078895	2025-03-13	2026-03-13
13	30 dB ATTENUATOR	HP	8498A	1801A06913	2024-09-20	2025-09-20
14	EMI TEST RECEIVER	Rohde & Schwarz	ESR3	102826	2025-04-28	2026-04-28
15	LISN	Rohde & Schwarz	ENV216	102698	2025-04-28	2026-04-28
16	HIGH PASS FILTER	K&L MICROWAVE	13SH10-1000/U1000-N/N	00003	2024-07-10	2025-07-10

No.	Cable	Manufacturer	Model No.	Serial No.	Check Date
1	RF Cable (Conducted)	Junkosha Inc.	MWX221	1512S150	2025-06-12
2	RF Cable (Conducted)	Junkosha Inc.	MWX221	J0970753	2025-06-12
3	RF Cable (Line Conducted)	Canare Corporation	L-5D2W	N/A	2025-03-05
4	RF Cable (9 kHz - 1 GHz Radiated)	HUBER+SUHNER	SUCOFLEX 104	MY27558/4	2025-03-05
5	RF Cable (9 kHz - 1 GHz Radiated)	HUBER+SUHNER	L-5D2W	N/A	2025-03-05
6	RF Cable (1 GHz - 18 GHz Radiated)	Junkosha Inc.	MWX221	2008S246	2025-02-21
7	RF Cable (1 GHz - 18 GHz Radiated)	Junkosha Inc.	MWX221	J0970749	2025-02-21
8	RF Cable (1 GHz - 18 GHz Radiated)	Sensorview Co., LTD	13A26	TPC2204060007	2025-02-21

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