RF Test Report
SIGFOX

Report No.	:	RFBVFV-WAY-P20090038
Customer	:	Nexo Technology Group Pty Ltd
Address	:	Level 5, Nexus Building, 4 Columbia Court, Norwest, NSW 2153, Australia
Use of Report	:	Certification
Model Name	:	Nexotrack - Starlight
FCC ID	:	2AW3N-NXTRKV3
Date of Test	:	2020.08.25 to 2020.09.24
Test Method Used	:	FCC 47 CFR PART 15 Subpart C (Section §15.247)
Testing Environment	:	Refer to the Test Condition

Test Result : ☒ **Pass** ☐ **Fail**

ISSUED BY: BV CPS ADT Korea Ltd., EMC/RF Laboratory

ADDRESS: Innoplex No.2 106, Sinwon-ro 306, Yeongtong-gu, Suwon-si, Gyeonggi-do, Korea 16675

TEST LOCATION: HeungAn-daero 49, DongAn-gu, Anyang-si, Gyeonggi-do, Korea, 14119

Tested by

Name : Donghwa Shin (Signature)

Technical Manager

Name : Jongha Choi (Signature)

2020. 09. 25

BV CPS ADT Korea Ltd.

RELEASE CONTROL RECORD

REPORT NO.	REASON FOR CHANGE	DATE ISSUED
RFBVFV-WAY-P20090038	Original release	2020.09.25

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1 Summary of Test Results

The EUT has been tested according to the following specifications

Applied Standard : FCC Part 15, Subpart C 15.247, RSS-247				
FCC Part Section(s)	**Test Description**	**Limit**	**Test Result**	**Reference**
15.247(a)(2)	20 dB Bandwidth and Number of Hopping Frequencies	> 500 kHz	PASS	Section 3.2
15.247 (a)	Time of Occupancy			
15.247(b)(3)	Maximum Conducted Output Power	< 1 Watt	PASS	Section 3.3
15.247(d)	Band Edge / Out-of-Band Emissions (Conducted Spurious Emission)	≥ 20 dBc	PASS	Section 3.5
15.205 15.209	General Field Strength Limits (Restricted Bands and Radiated Emission Limits)	Emissions in Restricted bands must meet the radiated limits detailed in 15.209 (RSS-247 limits)	PASS	Section 3.5
15.207	AC Conducted Emissions (150 kHz – 30 MHz)	< FCC 15.207 limits (RSS-Gen [8.8] limits)	N/A	Section 3.6

NOTES

1) The general test methods used to test on this devices are ANSI C63.10.

2) Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

1.1 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2

Measurement Items	**Frequency Range**	**Expanded Uncertainty U = *k*Uc (*k* = 2)**
Conducted Emissions at main ports	150 kHz – 30 MHz	2.62
Radiated Spurious Emissions	9 kHz – 30 MHz	1.97
	30 MHz – 1 GHz	4.04
	1 GHz – 18 GHz	5.38
	18 GHz – 26.5 GHz	5.46

This uncertainty represents an expanded uncertainty expressed at approximately the 95 % confidence level using a coverage factor of k = 2.

2 General Information

2.1 General Description of EUT

Product	Sigfox IoT Tracker
Brand	-
Model	Nexotrack - Starlight
Identification No. of EUT	-
Series Model	-
Model Difference	-
Power Supply	3.80 V DC By Battery
Modulation Type	DBPSK
Operating Frequency	Low : 902.1375 MHz – 904.6625 MHz High : 920.1375 MHz – 922.6625 MHz
Number of Channel	Low : 54 Channels (9 Macro channels x 6 Micro channels) High : 54 Channels (9 Macro channels x 6 Micro channels)
Output Power	Low : 24.940 dBm (311.89 mW) / High : 25.070 dBm (321.37 mW)
Antenna Type	PCB Antenna
Antenna Connector	Permement
H/W Version	Nexo Track V3.020
S/W Version	Device : Starlight 3.041 Sigfox modem :starlight 3.012

NOTES

1) The above equipment has been tested by **Bureau Veritas Consumer Products Services ADT Korea**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's RF characteristics under the conditions specified in this report.

2) The following antennas were provided to the EUT.

Antenna	Type	Connector	Peak Gain (dBi)
Antenna	Patten Antenna	Internal	-2.0 dBi

3) **List of Accessories**

Accessories	Brand	Model	Manufacturer	Specification
Battery	Nexotech/Starlight	ER18505M	Nexotech/Starlight	Rating: 3.6 Vdc, 3500 mAh,

2.2 Description of Test Mode

[Test Channel of EUT]

<Low band>

Micro Channel 1 (MHz)	Micro Channel 2 (MHz)	Micro Channel 3 (MHz)	Micro Channel 4 (MHz)	Micro Channel 5 (MHz)	Micro Channel 6 (MHz)
902.1375	902.1625	902.1875	902.2125	902.2375	902.2625
902.4375	902.4625	902.4875	902.5125	902.5375	902.5625
902.7375	902.7625	902.7875	902.8125	902.8375	902.8625
903.0375	903.0625	903.0875	903.1125	903.1375	903.1625
903.3375	903.3625	903.3875	903.4125	903.4375	903.4625
903.6375	903.6625	903.6875	903.7125	903.7375	903.7625
903.9375	903.9625	903.9875	904.0125	904.0375	904.0625
904.2375	904.2625	904.2875	904.3125	904.3375	904.3625
904.5375	904.5625	904.5875	904.6125	904.6375	904.6625

<High band>

Micro Channel 1 (MHz)	Micro Channel 2 (MHz)	Micro Channel 3 (MHz)	Micro Channel 4 (MHz)	Micro Channel 5 (MHz)	Micro Channel 6 (MHz)
920,1375	920,1625	920,1875	920,2125	920,2375	920,2625
920,4375	920,4625	920,4875	920,5125	920,5375	920,5625
920,7375	920,7625	920,7875	920,8125	920,8375	920,8625
921,0375	921,0625	921,0875	921,1125	921,1375	921,1625
921,3375	921,3625	921,3875	921,4125	921,4375	921,4625
921,6375	921,6625	921,6875	921,7125	921,7375	921,7625
921,9375	921,9625	921,9875	922,0125	922,0375	922,0625
922,2375	922,2625	922,2875	922,3125	922,3375	922,3625
922,5375	922,5625	922,5875	922,6125	922,6375	922,6625

2.2.1 Test Mode Applicability and Tested Channel Details

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates, XYZ axis and antenna ports. The worst case was found when positioned on X axis for radiated emission. Following channel(s) was(were) selected for the final test as listed below :

Test Band	Applicable to				Description
	RE < 1G	RE ≥ 1G	PLC	APCM	
Low	√	√	√	√	-
High	√	√	√	√	-

Where RE ≥ 1 G : Radiated Emission above 1 GHz & Bandedge Measurement
RE < 1 G : Radiated Emission below 1 GHz
PLC : Power Line Conducted Emission
APCM : Antenna Port Conducted Measurement

Radiated Emission Test (Below 1 GHz)

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, XYZ axis, antenna ports (if EUT with antenna diversity architecture) and data rate.

☒ Following channel(s) was (were) selected for the final test as listed below.

Band	Available Channel	Tested Channel	Modulation Type
Low	0 to 53	53	DBPSK
High	0 to 53	28	DBPSK

Radiated Emission Test (Above 1 GHz)

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, XYZ axis, antenna ports (if EUT with antenna diversity architecture) and data rate.

☒ Following channel(s) was (were) selected for the final test as listed below.

Band	Available Channel	Tested Channel	Modulation Type
Low	0 to 53	0, 28, 53	DBPSK
High	0 to 53	0, 28, 53	DBPSK

Power line Conducted Emission Test

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, XYZ axis, antenna ports (if EUT with antenna diversity architecture) and data rate.

☒ Following channel(s) was (were) selected for the final test as listed below.

Band	Available Channel	Tested Channel	Modulation Type
Low	0 to 53	0, 28, 53	DBPSK
High	0 to 53	0, 28, 53	DBPSK

Antenna Port Conducted Measurement

☒ This item includes all test value of each mode, but only includes spectrum plot of worst value of each mode.

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, antenna ports (if EUT with antenna diversity architecture), and data rate.

☒ Following channel(s) was (were) selected for the final test as listed below.

Band	Available Channel	Tested Channel	Modulation Type
Low	0 to 53	0, 28, 53	DBPSK
High	0 to 53	0, 28, 53	DBPSK

Test Condition

Applicable to	Environmental Conditions	Test Voltage	Tested by
RE < 1G	23 °C, 48 % RH	DC 3.6 V	Donghwa Shin
RE ≥ 1G	22 °C, 49 % RH	DC 3.6 V	Donghwa Shin
PLC	23 °C, 53 % RH	DC 3.6 V	Donghwa Shin
APCM	22 °C, 51 % RH	DC 3.6 V	Donghwa Shin

2.6 General Description of Applied Standards

The EUT is a RF Product. According to the specifications of the manufacturer, it must comply with the requirements of the following standards.

FCC CFR 47 Part 15, Subpart C (§15.247)
KDB 558074 D01 15.247 Meas Guidance v05r02
ANSI C63.10-2013

All test items in this test report have been performed and recorded as per the above standards.

2.7 Test Equipment

Test Equipment is traceable to the National Institute of Standards and Technology (NIST). Measurement antenna used during testing were calibrated in accordance to the requirements of ANSI C63.5-2017.

Manufacturer	Model	Description	Serial Number	Cal Date	Cal Due
R&S	HFH2-Z2E	Active Loop Antenna, 30 MHz	349806	2019.03.27	2021.03.27
Schwarzbeck	VULB 9163	Trilog Antenna, 3 GHz (with 6 dB ATT.)	01199	2019.04.03	2021.04.03
R&S	HF907	Horn Antenna, 18 GHz	102772	2020.01.22	2021.01.22
R&S	SCU08F2	Signal Conditioning Unit, 8 GHz	08400016	2019.12.30	2020.12.30
R&S	SCU-18F	Signal Conditioning Unit, 18 GHz	180111	2019.12.30	2020.12.30
R&S	ESW44	EMI Test Receiver, 44 GHz	101812	2020.02.20	2021.02.20
R&S	FSV30	Spectrum Analyzer, 30 GHz	103017	2019.12.27	2020.12.27
Keysight	N9030B	Spectrum Analyzer, 44 GHz	MY57142476	2019.12.26	2020.12.26
Aeroflex	40AH2W-3	Attenuator, 3 dB	1	2019.12.31	2020.12.31
Mini-Circuits	VAT-10W2+	Attenuator, 10 dB	1531	2020.01.02	2021.01.02
Aeroflex	40AH2W-10	Attenuator, 10 dB	1	2019.12.31	2020.12.31
Wt Microwave	WT-A1698-HS	High Pass Filter 1.2 GHz	WT190313-6-2	2020.01.03	2021.01.03
Keysight Technologies	MP400B	MIMO Power Set Master, 18 GHz	None	2020.01.03	2021.01.03

3 Test Results

3.1 20 dB Bandwidth and Number of Hopping Frequencies

3.1.1 Regulation

FCC Part 15, Subpart C, §15.247 (a) (1)

(i) 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; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.

(ii) Frequency hopping systems operating in the 5725-5850 MHz band shall use at least 75 hopping frequencies. The maximum 20 dB bandwidth of the hopping channel is 1 MHz. The average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 30 second period.

(iii) Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

Additional requirements according to AS/NZS 4268:2017

According to table 1, Frequency hopping transmitters in the frequency range 915-928 MHz shall use a minimum of 20 hopping frequencies.

3.1.2 Test Procedure

The Channel Separation test is performed with hopping on. And the 20 dB Bandwidth test is performed with hopping off.

The Spectrum Analyzer is set to (7.8.2 in ANSI 63.10-2013)

1) Span: Wide enough to capture the peaks of two adjacent channels

2) RBW: Start with the RBW set to approximately 30% of the channel spacing; adjust asnecessary to best identify the center of each individual channel.

3) VBW ≥ RBW

4) Sweep: Auto

5) Detector: Peak

6) Trace: Max hold

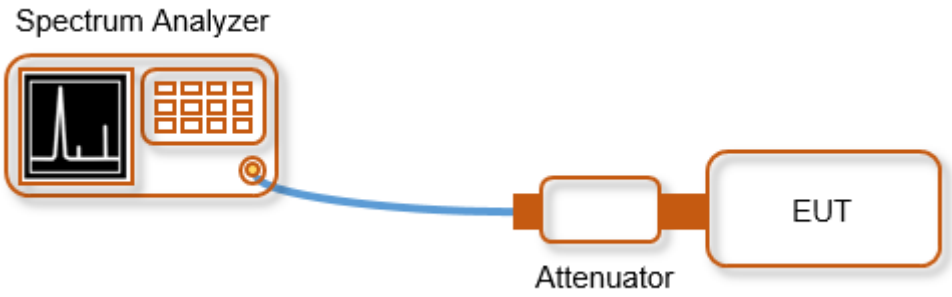
7) All the trace to stabilize.

Use the marker-delta function to determine the separation between the peaks of the adjacent channels. Compliance of an EUT with the appropriate regulatory limit shall be determined. A plot of the data shall be included in the test report.

3.1.3 Deviation from Test Standard

No deviation.

3.1.4 Test Setup



3.1.5 Test Result

3.1.5.1 20 dB Bandwidth

Test Data – Low Band

Frequency	20 dB Bandwidth (kHz)	Limit (kHz)	Test Result
Lowest	1.440	〉500	Pass
Middle	1.468		
Highest	1.489		

Test Data – High Band

Frequency	20 dB Bandwidth (kHz)	Limit (kHz)	Test Result
Lowest	1.491	〉500	Pass
Middle	1.472		
Highest	1.541		

3.1.5.2 Number of hopping frequencies

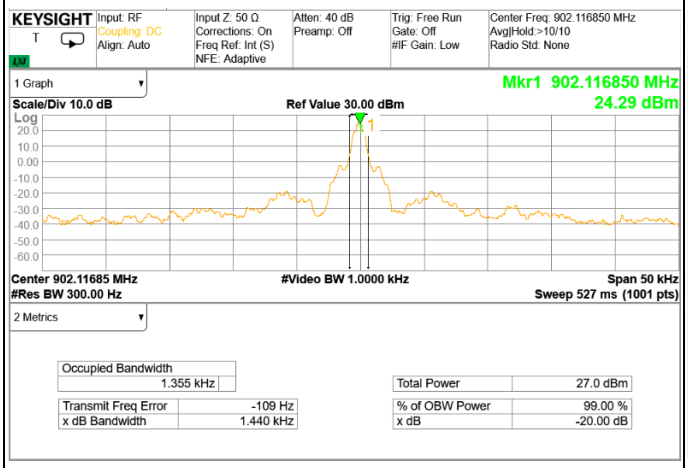
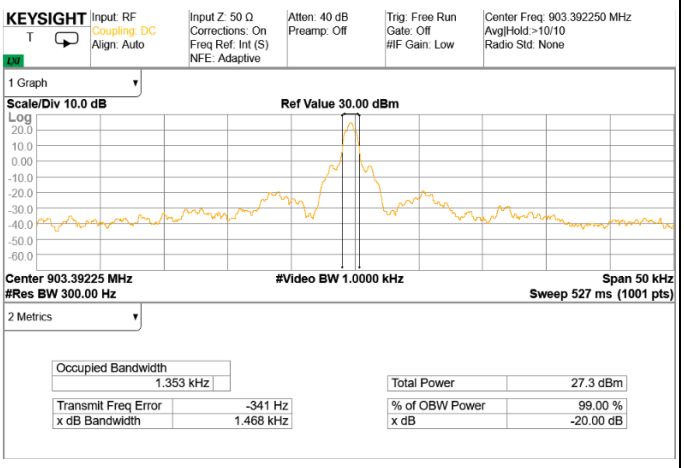
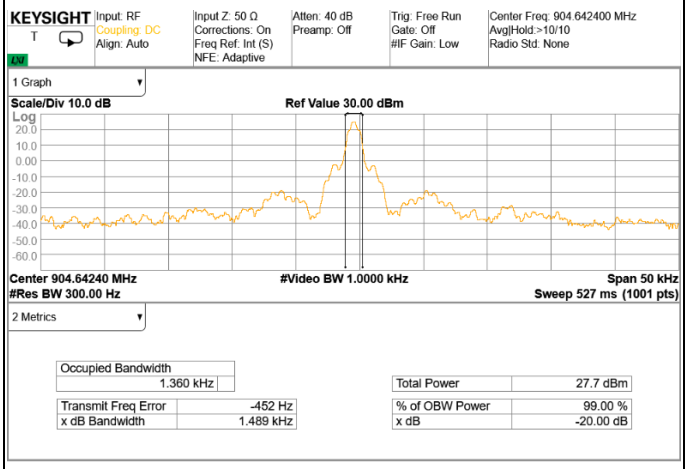
Test Data – Low Band

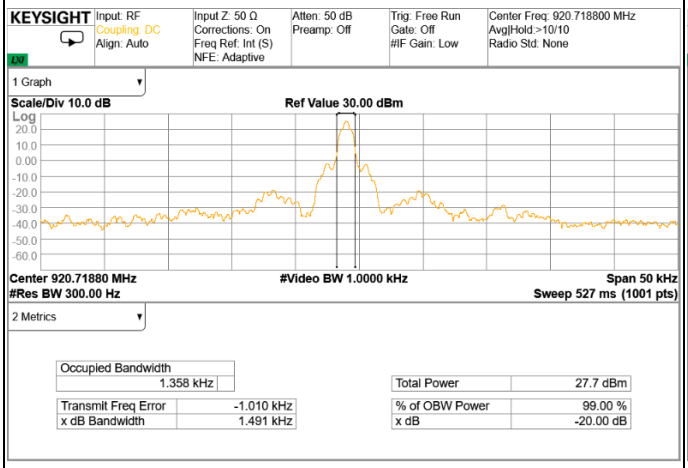
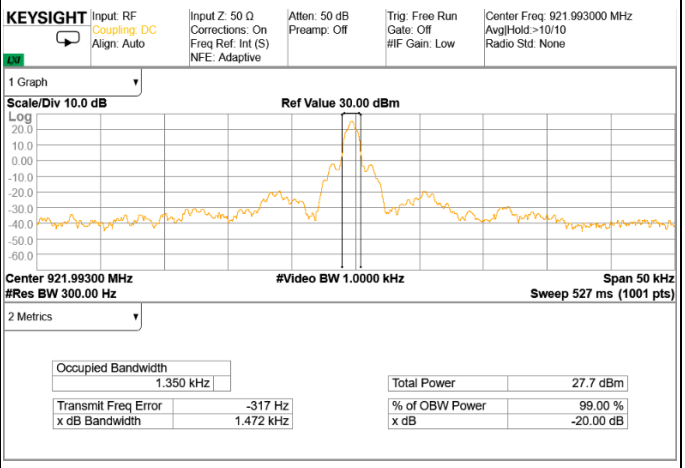
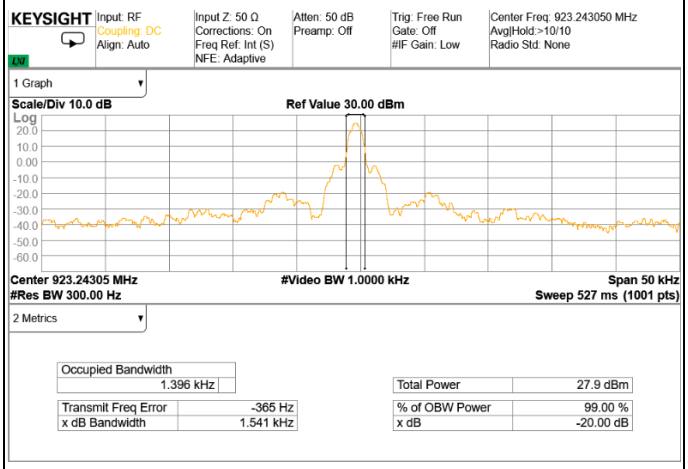
Number of macro channels	Number of micro channels in one macro channel	Total number of hopping frequencies	FCC Minimum requirement	Test Result
9	6	54	50 hopping frequencies	pass

Test Data – High Band

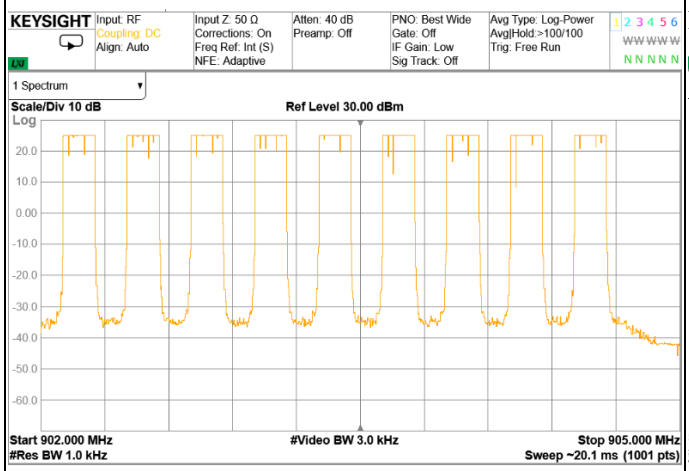
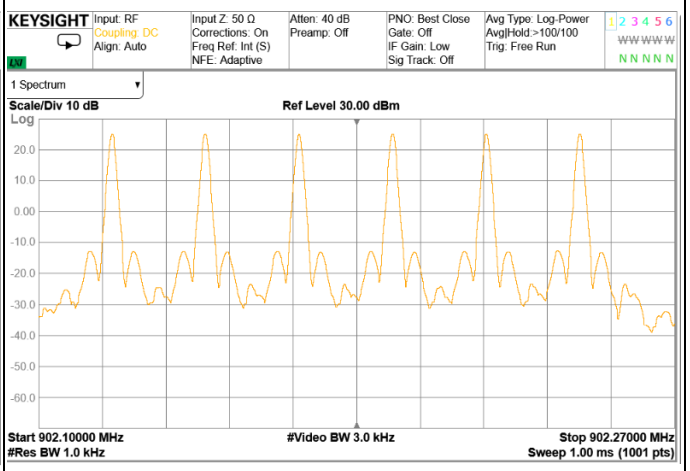
Number of macro channels	Number of micro channels in one macro channel	Total number of hopping frequencies	FCC Minimum requirement	Test Result
9	6	54	50 hopping frequencies	pass

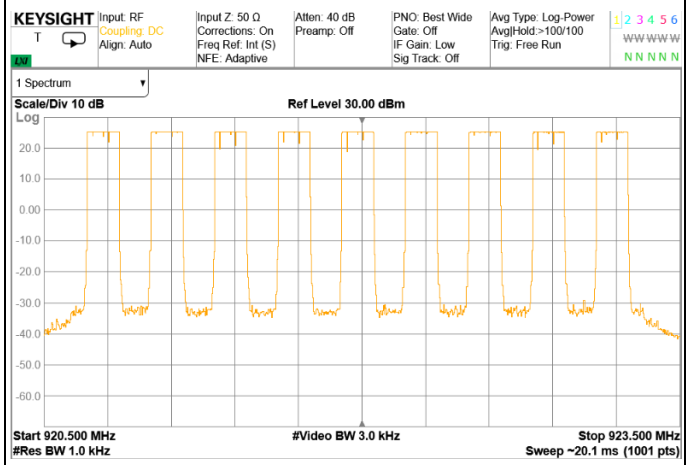
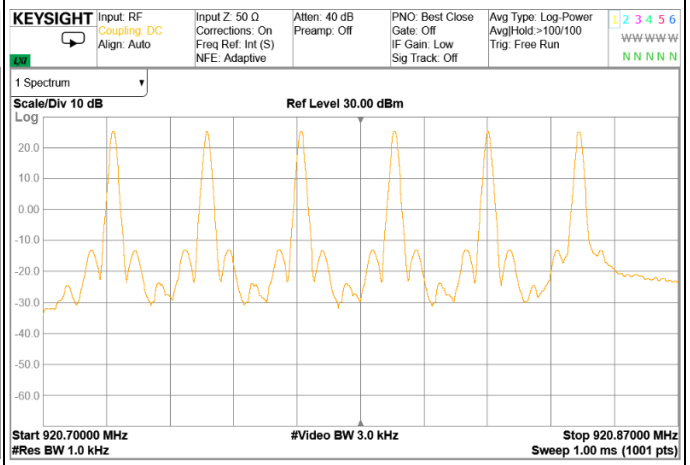
[Test Plot of 20 dB Bandwidth]

Low band - Low	Low band - Middle
	
Low band - High	
	

High band - Low	High band - Middle
	
High band - High	
	

[Test Plot of Number of hopping frequencies]

Low band - macro channels	Low band - micro channels
	

High band - macro channels	High band - micro channels
	

3.2 Time of occupancy

3.3.1 Regulation

The requirements of the average time of occupancy on any frequency are specified in 4.1.1.

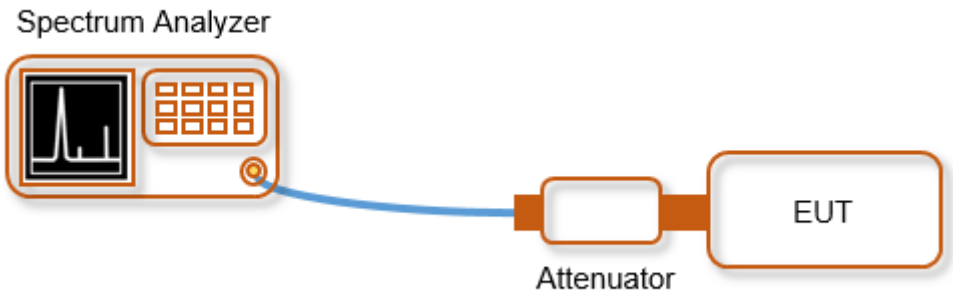
3.3.2 Test Procedure

Conducted method was used to measure the average time of occupancy. The EUT was connected to the spectrum analyzer via a coax cable with a known loss.
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 (20 seconds).

3.3.3 Deviation from Test Standard

No deviation.

3.3.4 Test Setup



3.3.5 Test Result

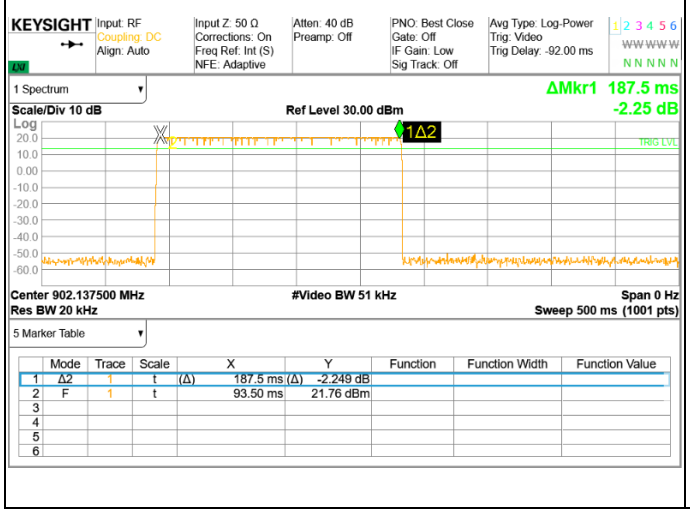
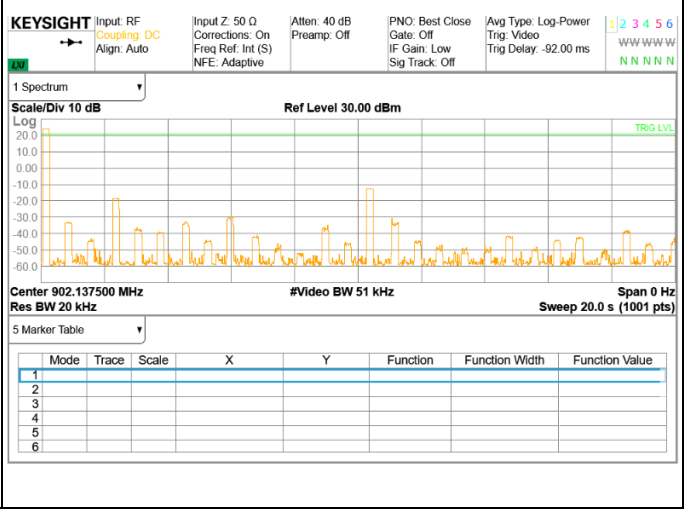
Test Data – Low Band

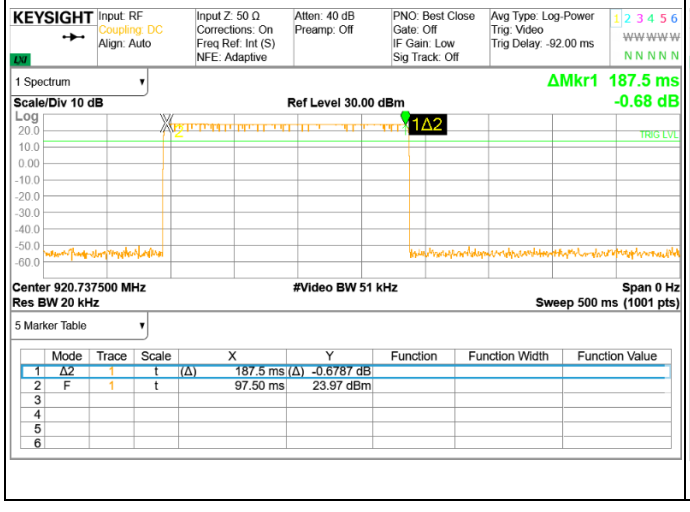
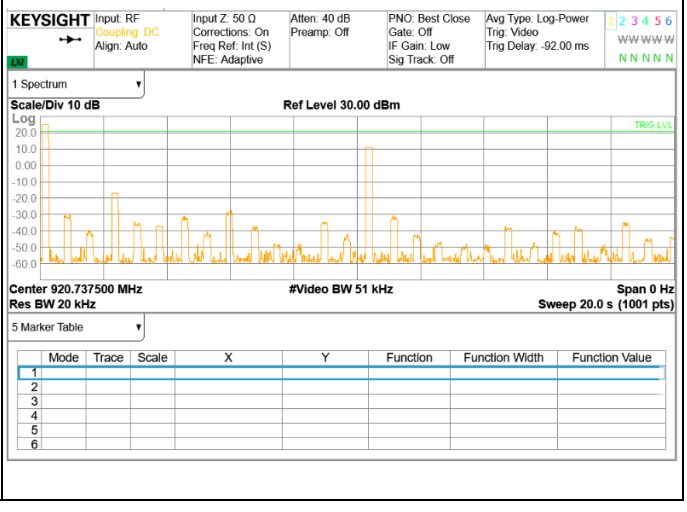
Transmit time per hop	Number of hops in 20 seconds	Average time of occupancy	Limit	Test Result
187.5	1.000	187.5	400 ms	Pass

Test Data – High Band

Transmit time per hop	Number of hops in 20 seconds	Average time of occupancy	Limit	Test Result
187.5	1.000	187.5	400 ms	Pass

[Test Plot of Time of occupancy]

Low band -Transmit time per hop	Low band -Number of hops in 20 seconds
	

High band - Transmit time per hop	High band - Number of hops in 20 seconds
	

3.3 Maximum Peak Output Power

3.3.1 Regulation

The maximum peak output power of the intentional radiator shall not exceed the following:
1. For frequency hopping systems operating in the 902-928 MHz band: 1 watt (30 dBm) for systems employing at least 50 hopping channels; and, 0.25 watts (24 dBm) for systems employing less than 50 hopping channels, but at least 25 hopping channels, as permitted under paragraph (a)(1)(i) of this section.
2. The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi.
3. The e.i.r.p of this module not exceed 4 W because the antenna gain not exceed not 6 dBi.

3.3.2 Test Procedure

The method of measurement used to test this FHSS device is ANSI C63.10-2013.

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.

a) Use the following spectrum analyzer settings:

Peak Power Measurement

1) Span : Approximately five times the 20 dB bandwidth, centered on hopping channel.
2) RBW > 20 dB bandwidth of emission being measured.
3) VBW ≥ RBW.
4) Sweep : Auto.
5) Detector function : Peak.
6) Trace : Max hold.

b) Allow trace to stabilize

c) Use the marker-to-peak function to set the marker to the peak of the emissions

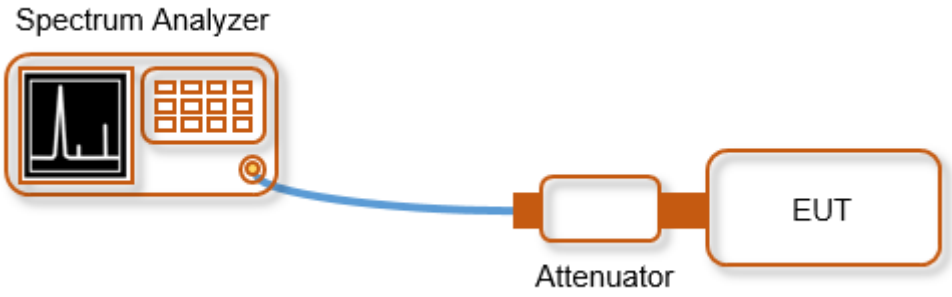
d) The indicated level is the peak output power, after any corrections for external attenuators and cables.

e) A plot of the test results and setup description shall be included in the test report.

3.3.3 Deviation from Test Standard

No deviation.

3.3.4 Test Setup



3.3.5 Test Result

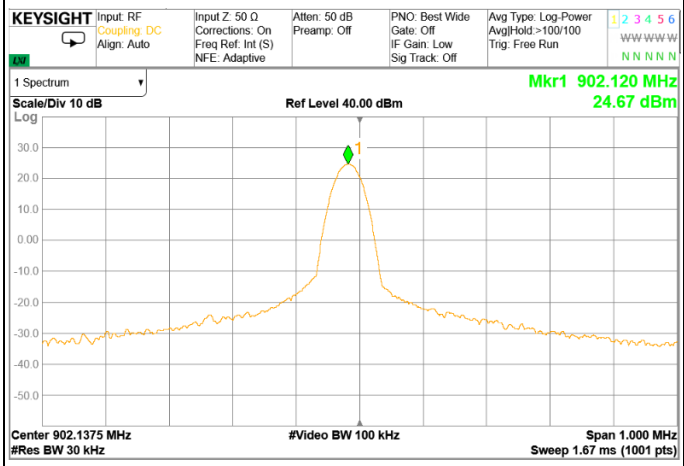
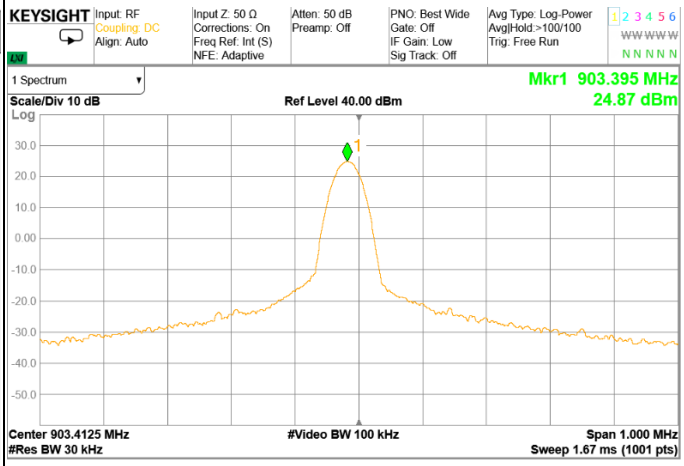
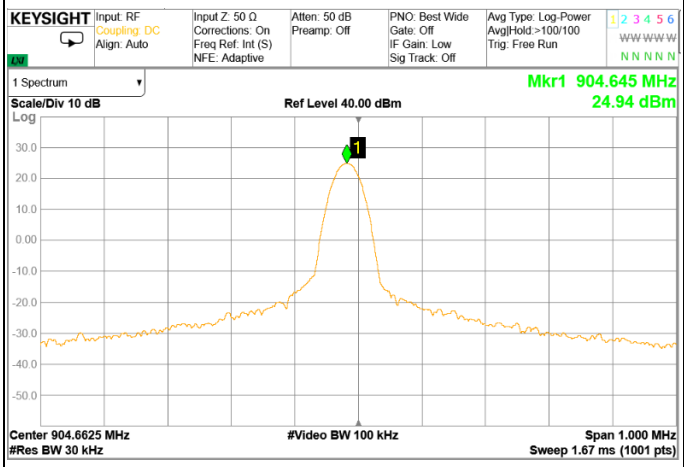
Test Data – Low Band

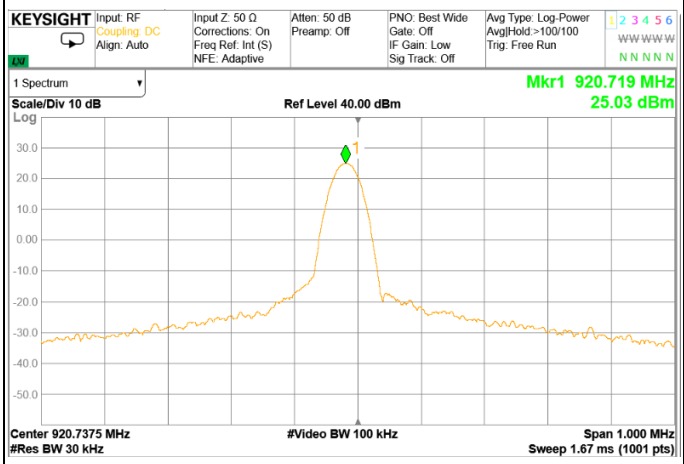
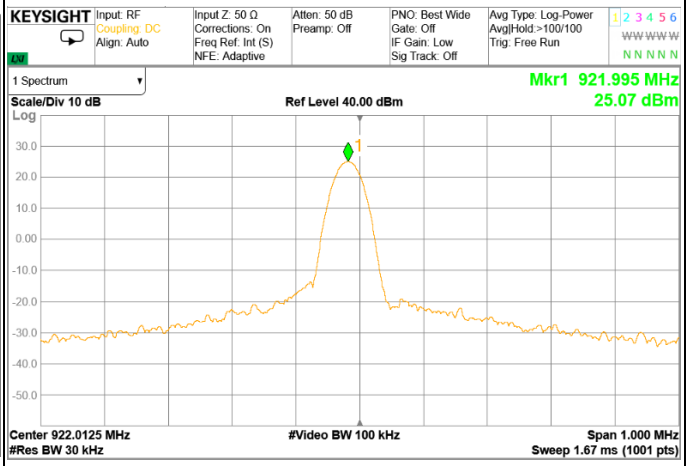
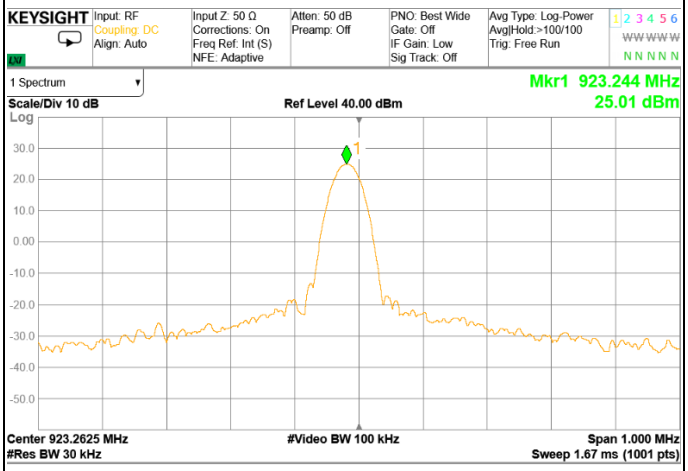
Frequency	Peak conducted output power (dBm)	Limit (dBm)	Margin (dB)	Test Result
Lowest	24.670	30	5.33	Pass
Middle	24.870	30	5.13	
Highest	24.940	30	5.06	

Test Data – High Band

Frequency	Peak conducted output power (dBm)	Limit (dBm)	Margin (dB)	Test Result
Lowest	25.030	30	4.97	Pass
Middle	25.070	30	4.93	
Highest	25.010	30	4.99	

[Test Plot of Peak Power]

Low band – Lowest Channels	Low band – Middle Channels
	
Low band – Highest Channels	
	

High band – Lowest Channels	High band – Middle Channels
	
High band – Highest Channels	
	

3.4 Carrier Frequency Separation

3.4.1 Regulation

FCC Part 15, Subpart C, §15.247 (a) (1)
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. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

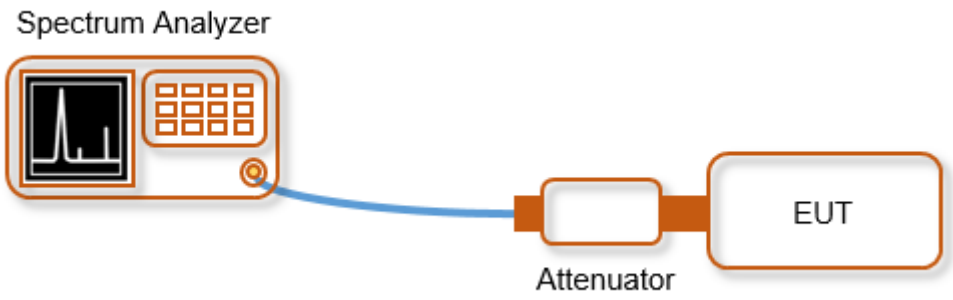
3.4.2 Test Procedure

Conducted method was used to measure the minimum frequency sepration. The EUT was connected to the spectrum analyzer via a coax cable with a known loss

3.4.3 Deviation from Test Standard

No deviation.

3.4.4 Test Setup



3.4.5 Test Result

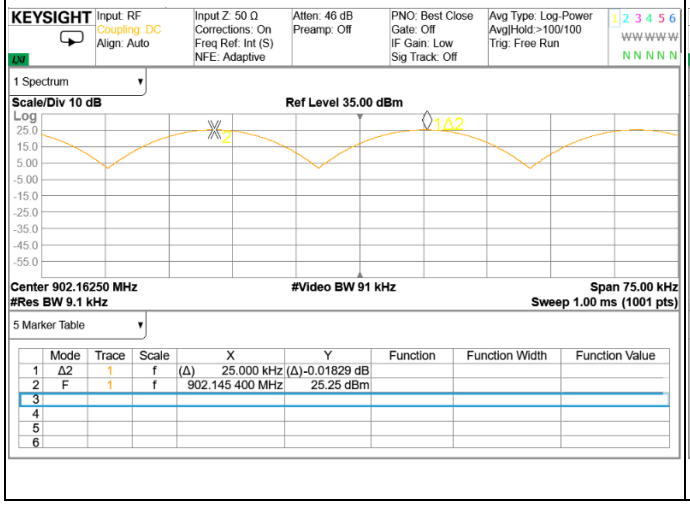
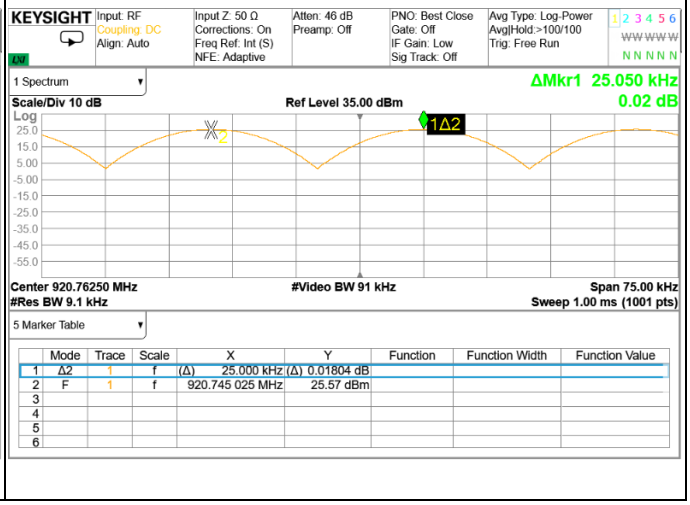
Test Data – Low Band

Channel Separation (kHz)	Minimum requirement (kHz)	Test Result
25	25	Pass

Test Data – High Band

Channel Separation (kHz)	Minimum requirement (kHz)	Test Result
25	25	Pass

[Test Plot of Carrier Frequency Separation]

Low band	High band
	

3.5 BAND EDGES

3.5.1 Regulation

§15.247(d) : In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator 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 the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

§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 (microvolts/meter)	Measurement distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100**	3
88-216	150**	3
216-960	200**	3
Above 960	500	3

**Except as provided in paragraph (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 or 470-806 MHz. However, operation within these frequency bands is permItted under other sections of this part, e.g., §§15.231 and 15.241.

§15.205(a) : Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
[1]0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	([2])
13.36-13.41			

[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) of this section, the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in §15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in §15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in §15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in §15.35 apply to these measurements.

3.5.2 Test Procedure

Band-edge Compliance for RF Conducted Emissions

These procedures are applicable for determining compliance at authorized-band band-edges where the requirements are expressed as a value relative to the in-band signal level. Procedures for determining compliance with field strength limits at or close to the band-edges are given in 6.10.6 (see also Table A.2).

Band-edge tests are typically performed as a conducted test but may be performed as radiated measurements on a test site meeting the specifications in 5.2, at the measurement distances specified in 5.3. The instrumentation shall meet the requirements in 4.1.1 using the bandwidths and detectors specified in 4.1.4.2.

When performing radiated measurements, the measurement antenna(s) shall meet the specifications in 4.3. The EUT shall be connected to an antenna and operated at the highest power settings following procedures in 6.3.

For other than frequency-hopping devices, this test sequence shall be performed once. For devices that support frequency hopping, this test sequence shall be performed twice: once with the hopping function turned OFF and then repeated with the hopping function turned ON. The purpose of the test with the hopping function turned on is to confirm that the RF power remains OFF while the device is changing frequencies, and that the oscillator stabilizes at the new frequency before RF power is turned back ON. Overshoot of any oscillator, including phase-lock-loop stabilized oscillators, can cause the device to be temporarily tuned to frequencies outside the authorized band, and it is important that no transmissions occur during such temporary periods. Particular attention to the hopping sequence requirements specified below is needed in the case of adaptive frequency-hopping devices:

a) Connect the EMI receiver or 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 “normalmode of operation” as specified in 6.10.3.

d) If using the radiated method, then use the applicable procedure(s) of 6.4, 6.5, or 6.6, and orient the EUT and measurement antenna positions to produce the highest emission level.

e) 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) Reference level: As required to keep the signal from exceeding the maximum instrument input mixer level for linear operation. In general, the peak of the spectral envelope shall be more than [10 log (OBW/RBW)] below the reference level. Specific guidance is given in 4.1.5.2.

    3) Attenuation: Auto (at least 10 dB preferred).

    4) Sweep time: Coupled.

    5) Resolution bandwidth: 100 kHz.

    6) Video bandwidth: 300 kHz.

    7) Detector: Peak.

    8) Trace: Max hold.

f) Allow the trace to stabilize. For the test with the hopping function turned ON, this can takeseveral minutes to achieve a reasonable probability of intercepting any emissions due to oscillator overshoot.

g) 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.

h) Repeat step c) through step e) for every applicable modulation.

i) 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).

j) 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).

Spurious RF Conducted Emissions

Conducted spurious emissions shall be measured for the transmit frequency, per 5.5 and 5.6, and at the maximum transmit powers.

Connect the primary antenna port through an attenuator to the spectrum analyzer input; in the results,account for all losses between the unlicensed wireless device output and the spectrum analyzer. The instrument shall span 30 MHz to 10 times the operating frequency in GHz, with a resolution bandwidth of 100 kHz, video bandwidth of 300 kHz, and a coupled sweep time with a peak detector. The band 30 MHz to the highest frequency may be split into smaller spans, as long as the entire spectrum is covered.

Spurious Radiated Emissions

1. The preliminary radiated measurement were performed to determine the frequency producing the maximum emissions in an semi-anechoic chamber at a distance of 3 meters.

2. The EUT was placed on the top of the 0.8-meter height, 1 x 1.5 meter non-metallic table. To find the maximum emission levels, the height of a measuring antenna was changed and the turntable was rotated 360^{o}.

3. The antenna polarization was also changed from vertical to horizontal. The spectrum was scanned from 9 kHz to 30 MHz using the loop antenna, and from 30 to 1000 MHz using the Bi-Log antenna, and from 1000 MHz to 26500 MHz using the horn antenna.

4. To obtain the final measurement data, the EUT was arranged on a turntable situated on a 4 x 4 meter in an semi-anechoic chamber. The EUT was tested at a distance 3 meters.

5. Each frequency found during preliminary measurements was re-examined and investigated. The test-receiver system was set up to average, peak, and quasi-peak detector fuction with specified bandwidth.

6. The 0.8 m height is for below 1 GHz testing, and 1.5 m is for above 1GHz testing.

- Procedure for unwanted emissions measurements below 1 000 MHz

The procedure for unwanted emissions measurements below 1 000 MHz is as follows:

a) Follow the requirements in 12.7.4.

b) Compliance shall be determined using CISPR quasi-peak detection; however, peak detection is permitted as an alternative to quasi-peak detection.

- Procedure for peak unwanted emissions measurements above 1 000 MHz

The procedure for peak unwanted emissions measurements above 1 000 MHz is as follows:

a) Follow the requirements in 12.7.4.

b) Peak emission levels are measured by setting the instrument as follows:

1) RBW = 1 MHz.

2) VBW ≥ [3 × RBW].

3) Detector = peak.

4) Sweep time = auto.

5) Trace mode = max hold.

6) Allow sweeps to continue until the trace stabilizes. Note that if the transmission is not ontinuous, then the time required for the trace to stabilize will increase by a factor of pproximately 1 / D, where D is the duty cycle. For example, at 50 % duty cycle, the easurement time will increase by a factor of two, relative to measurement time for ontinuous transmission.

- Procedure for average unwanted emissions measurements above 1 000 MHz

Method VB-A is averaging using reduced video bandwidth. The procedure for this method is as follows:

a) RBW = 1 MHz.

b) Video bandwidth:

1) If the EUT is configured to transmit with D ≥ 98 %, then set VBW ≤ RBW / 100 (i.e., 10 kHz), but not less than 10 Hz.

2) If the EUT D is < 98%, then set VBW ≥ 1 / T, where T is defined in item a1) of 12.2.

c) Video bandwidth mode or display mode:

1) The instrument shall be set with video filtering applied in the power domain. Typically, this requires setting the detector mode to RMS (power averaging) and setting the average-VBW type to power (rms).

2) As an alternative, the instrument may be set to linear detector mode. Video filtering shall be applied in linear voltage domain (rather than in a log or dB domain). Some instruments require linear display mode to accomplish this. Others have a setting for average-VBW type, which can be set to "voltage" regardless of the display mode.

d) Detector = peak.

e) Sweep time = auto.

f) Trace mode = max hold.

g) Allow max hold to run for at least 50 traces if the transmitted signal is continuous or has at least 98 % duty cycle. For lower duty cycles, increase the minimum number of traces by a factor of 1/x, where D is the duty cycle. For example, use at least 200 traces if the duty cycle is 25 %. (If a specific emission is demonstrated to be continuous—i.e., 100 % duty cycle—then rather than turning ON and OFF with the transmit cycle, at least 50 traces should be averaged.)

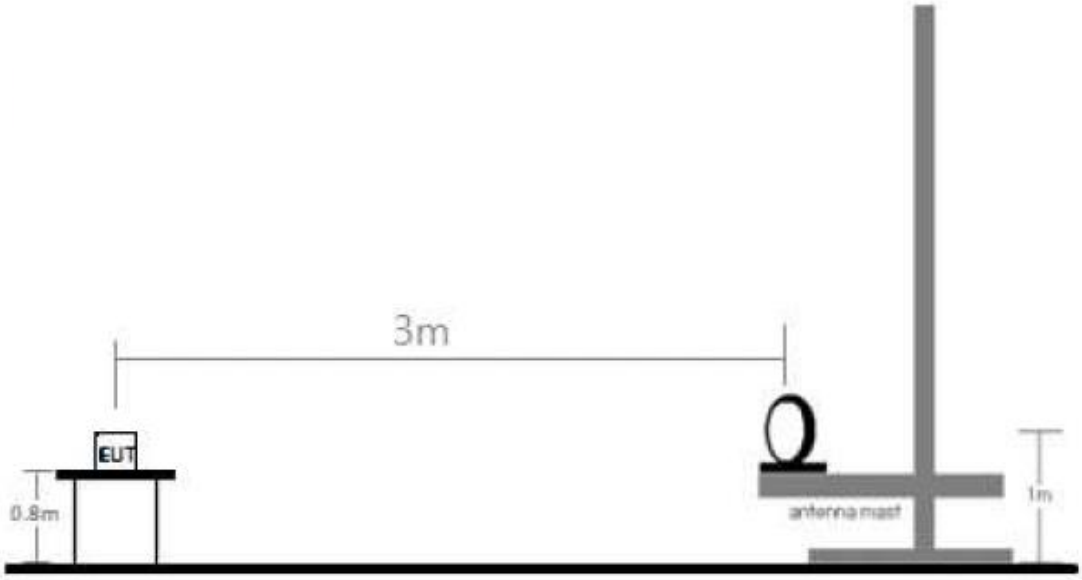
- Sample Calculation

- Field Strength Level [dBµV/m] = Analyzer Level [dBm] + 107 + AFCL [dB/m] + Duty Cycle Correction [dB]
- AFCL [dB/m] = Antenna Factor [dB/m] + Cable loss [dB]
- Margin [dB] = Field Strength Level [dBµV/m] – Limit [dBµV/m]

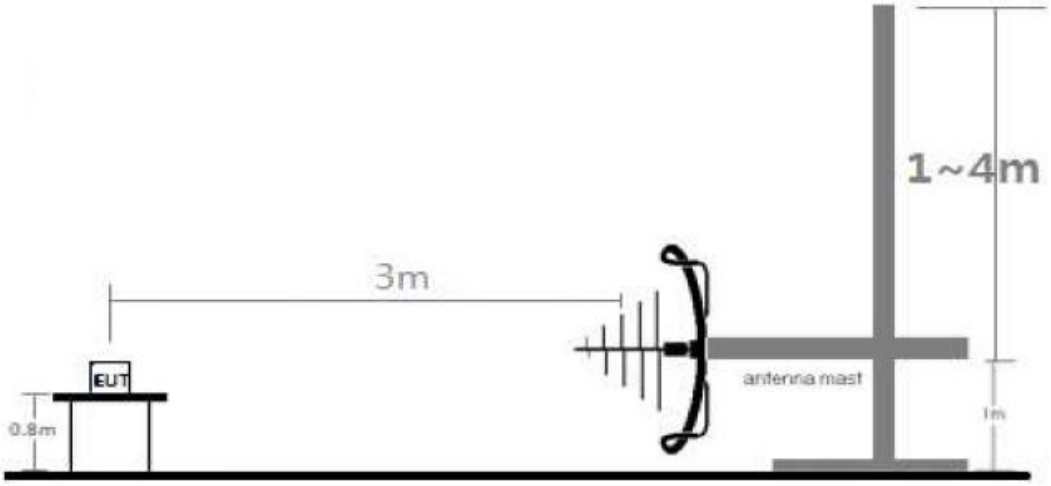
3.5.3 Deviation from Test Standard

No deviation.

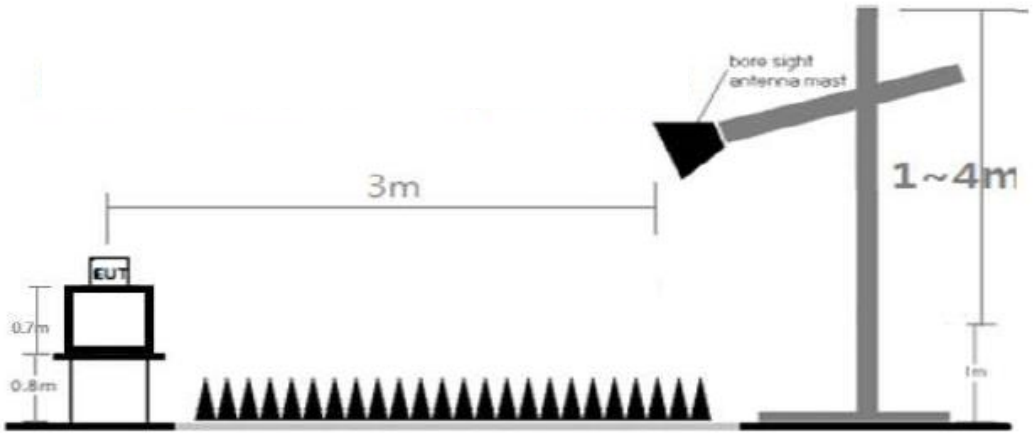
3.5.4 Test Setup

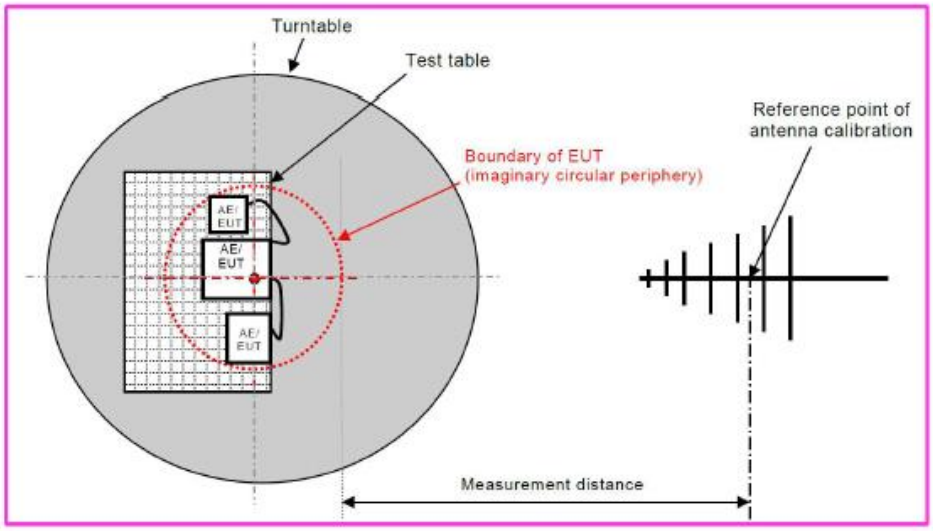


[Radiated Emission Test Setup Below 30 MHz]

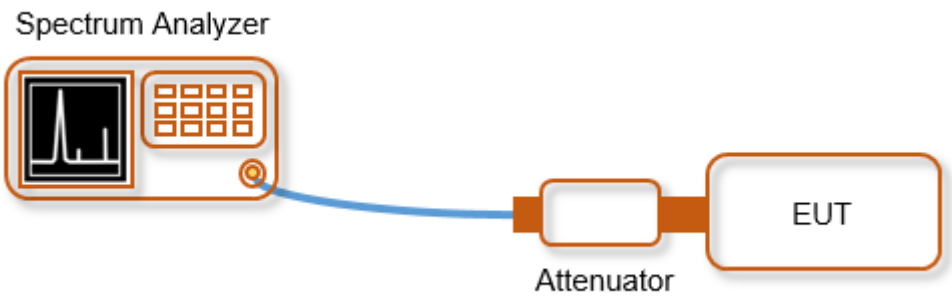


[Radiated Emission Test Setup Below 1 GHz]





[Radiated Emission Test Setup Above 1 GHz]

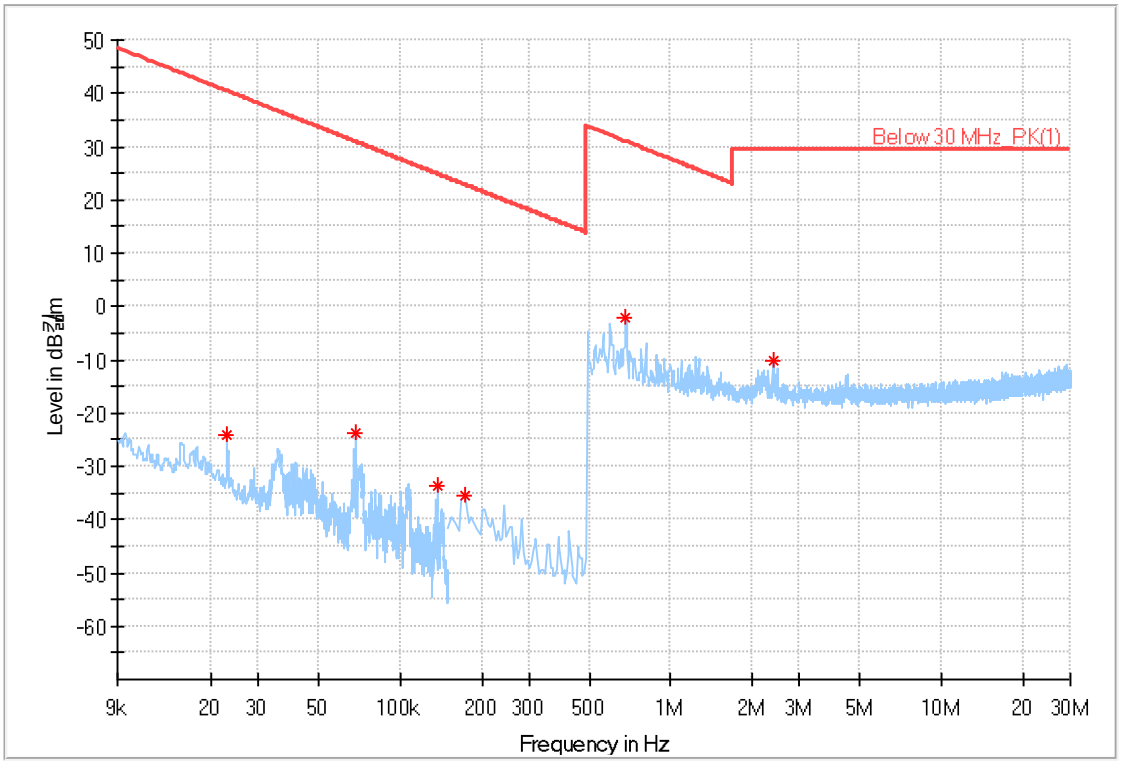


[Conducted Spurious Emission]

3.5.5 Test Result of Radiated Spurious Emission

3.5.5.1 Radiated Emissions (Below 30 MHz)

RSE(Below 30 MHz)_Low band_Highest channel_X

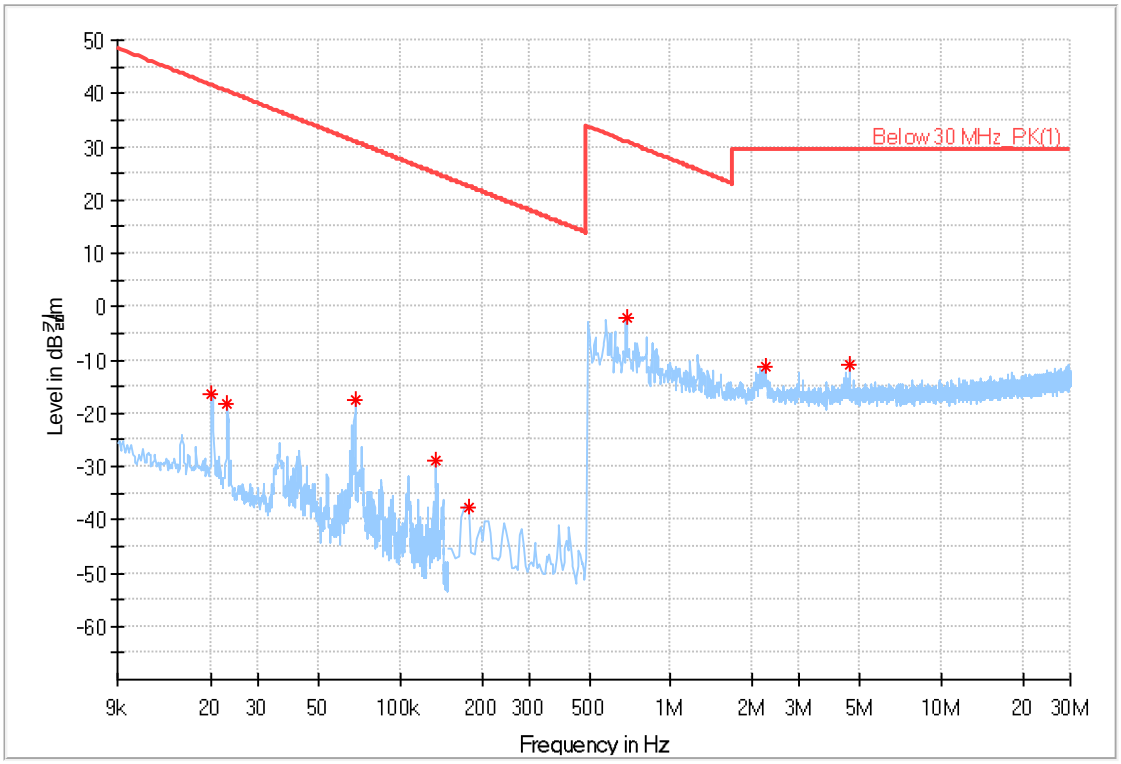


Frequency [MHz]	Peak Reading Value [dBuV/m]	Peak [dBuV/m]	Peak Reading Value [dBuA/m]	Peak [dBuA/m]	Quasi Reading Value [dBuV/m]	Quasi Peak [dBuV/m]	Distance Factor [dB]	Limit [dBuV/m]	Limit [dBuA/m]	Margin [dB]	Height [cm]	Pol	Azimuth [deg]	Correction Factor [dB]
0.02	35.15	-24.25	-16.35	-75.75	–	–	-80.00	40.42	-11.08	64.67	100.00	H	73.00	-59.40
0.07	35.77	-23.83	-15.73	-75.33	–	–	-80.00	30.92	-20.58	54.75	100.00	H	73.00	-59.60
0.14	25.85	-33.75	-25.65	-85.25	–	–	-80.00	24.90	-26.60	58.65	100.00	H	73.00	-59.60
0.17	23.95	-35.65	-27.55	-87.15	–	–	-80.00	22.82	-28.68	58.48	100.00	H	239.00	-59.60
0.68	17.65	-1.95	-33.85	-53.45	–	–	-40.00	30.93	-20.57	32.89	100.00	H	239.00	-19.60
2.38	8.96	-10.34	-42.54	-61.84	–	–	-40.00	29.54	-21.96	39.88	100.00	H	299.00	-19.30

Remarks

1. Peak(dBuV/m) = Peak Reading Value(dBµV/m) + Correction Factor(dB) + Distance Factor(dB)
2. Correction Factor(dB) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin(dB) = (Peak) Result (dBµV/m) – (Peak) Limit (dBµV/m)

RSE(Below 30 MHz)_High band_Middle channel_X



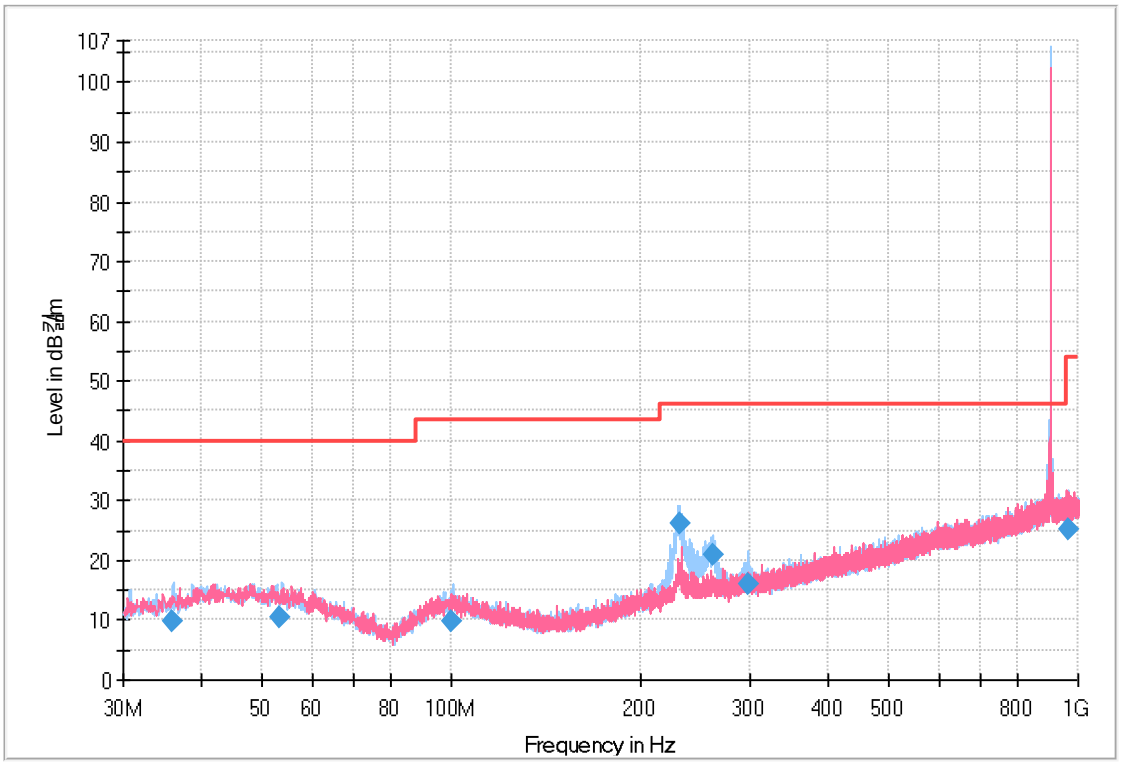
Frequency [MHz]	Peak Reading Value [dBuV/m]	Peak [dBuV/m]	Peak Reading Value [dBuA/m]	Peak [dBuA/m]	Quasi Reading Value [dBuV/m]	Quasi Peak [dBuV/m]	Distance Factor [dB]	Limit [dBuV/m]	Limit [dBuA/m]	Margin [dB]	Height [cm]	Pol	Azimuth [deg]	Correction Factor [dB]
0.02	43.14	-16.26	-8.36	-67.76	–	–	-80.00	41.52	-9.98	57.79	100.00	H	278.00	-59.40
0.02	41.33	-18.17	-10.17	-69.67	–	–	-80.00	40.35	-11.15	58.52	100.00	H	268.00	-59.50
0.07	42.07	-17.53	-9.43	-69.03	–	–	-80.00	30.95	-20.55	48.48	100.00	H	268.00	-59.60
0.14	30.70	-28.90	-20.80	-80.40	–	–	-80.00	24.97	-26.53	53.87	100.00	H	268.00	-59.60
0.18	21.79	-37.81	-29.71	-89.31	–	–	-80.00	22.59	-28.91	60.40	100.00	H	241.00	-59.60
0.69	17.56	-2.04	-33.94	-53.54	–	–	-40.00	30.87	-20.63	32.91	100.00	H	241.00	-19.60
2.23	7.89	-11.41	-43.61	-62.91	–	–	-40.00	29.54	-21.96	40.95	100.00	H	300.00	-19.30
4.59	8.22	-10.88	-43.28	-62.38	–	–	-40.00	29.54	-21.96	40.42	100.00	H	179.00	-19.10

Remarks

1. Peak(dBuV/m) = Peak Reading Value(dBµV/m) + Correction Factor(dB) + Distance Factor(dB)
2. Correction Factor(dB) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin(dB) = (Peak) Result (dBµV/m) – (Peak) Limit (dBµV/m)

3.5.5.2 Radiated Emissions (Below 1 GHz)

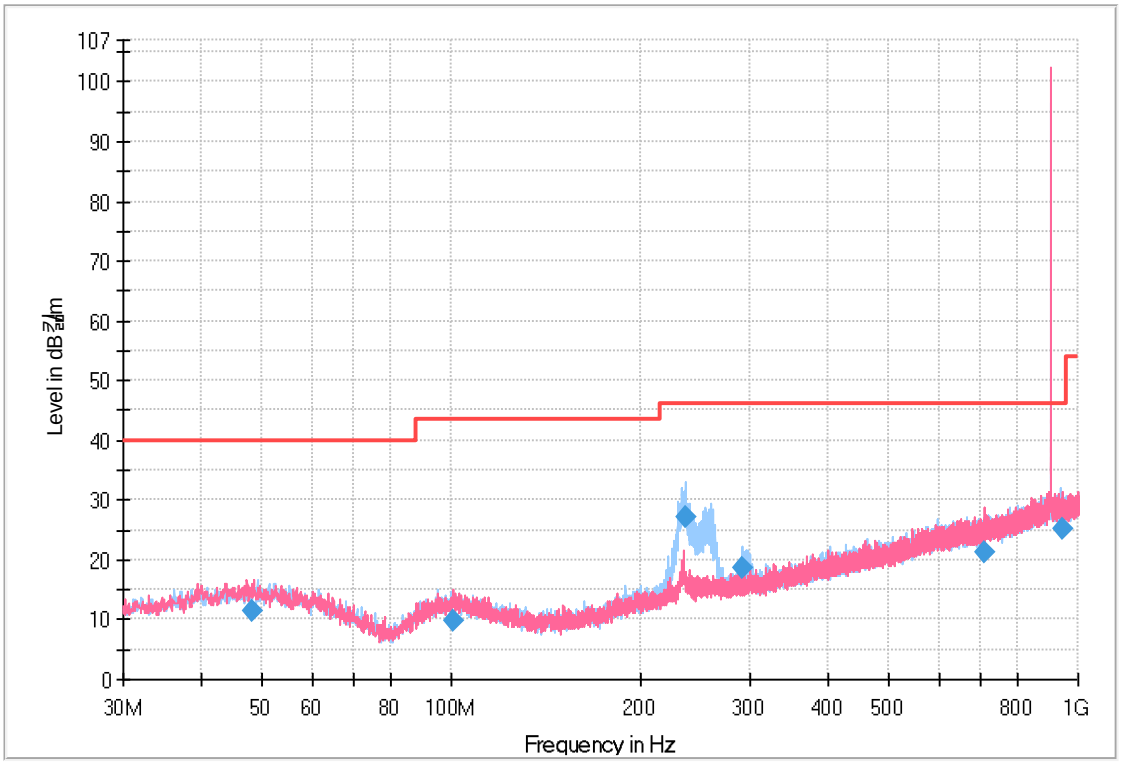
RSE(Below 1 GHz)_ Low band_Lowest channel_X



Frequency [MHz]	Peak Reading Value [dBuV/m]	Peak [dBuV/m]	Quasi Reading Value [dBuV/m]	Quasi Peak [dBuV/m]	Distance Factor [dB]	Limit [dBuV/m]	Limit [dBuA/m]	Margin [dB]	Height [cm]	Pol	Azimuth [deg]	Correction Factor [dB]
35.88	-	-	30.46	9.66	-	40.00	-	30.34	100.0	H	294.00	-20.80
53.25	-	-	30.57	10.57	-	40.00	-	29.43	100.0	H	323.00	-20.00
100.41	-	-	30.98	9.88	-	43.52	-	33.64	100.0	H	310.00	-21.10
231.12	-	-	46.29	26.29	-	46.02	-	19.73	100.0	H	59.00	-20.00
260.79	-	-	40.01	21.01	-	46.02	-	25.01	100.0	H	273.00	-19.00
297.98	-	-	34.19	15.89	-	46.02	-	30.13	100.0	H	100.00	-18.30
964.59	-	-	32.13	25.23	-	53.97	-	28.74	100.0	H	150.00	-6.90

Remarks
1. Peak(dBuV/m) = Peak Reading Value(dBµV/m) + Correction Factor(dB)
2. Correction Factor(dB) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin(dB) = (Peak) Result (dBµV/m) – (Peak) Limit (dBµV/m)

RSE(Below 1 GHz)_ Low band_middle channel_X

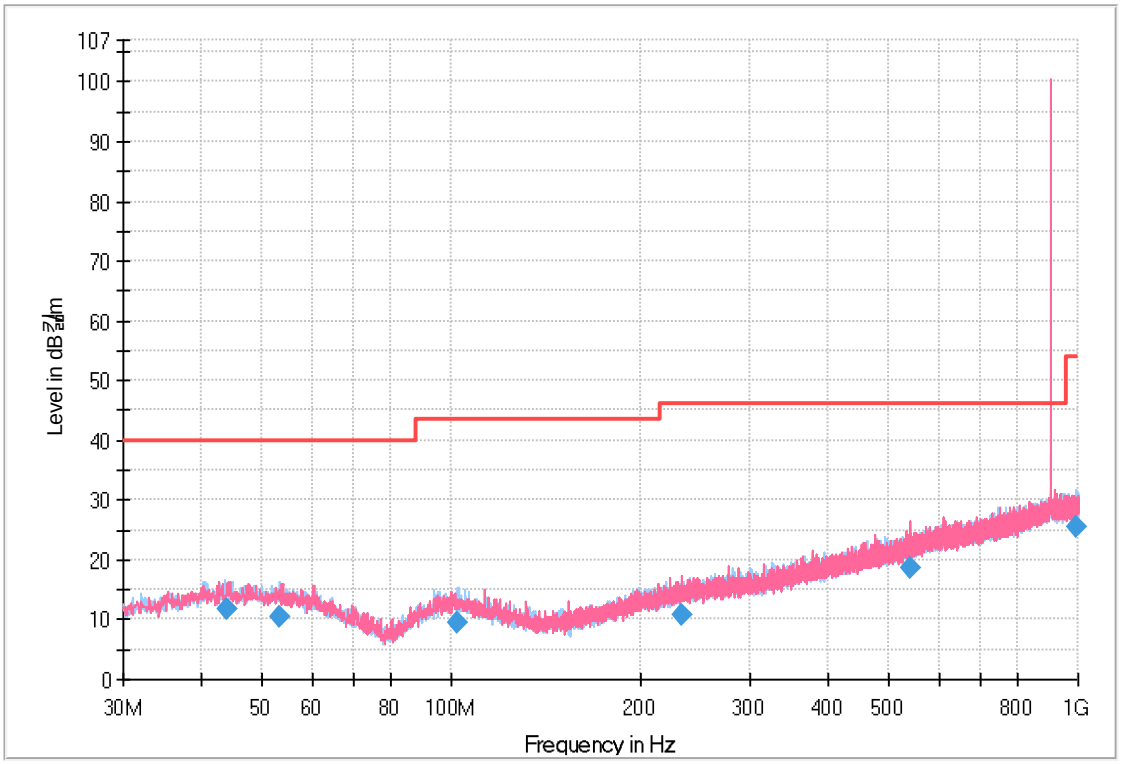


Frequency [MHz]	Peak Reading Value [dBuV/m]	Peak [dBuV/m]	Quasi Reading Value [dBuV/m]	Quasi Peak [dBuV/m]	Distance Factor [dB]	Limit [dBuV/m]	Limit [dBuA/m]	Margin [dB]	Height [cm]	Pol	Azimuth [deg]	Correction Factor [dB]
48.11	-	-	30.89	11.49	-	40.00	-	28.51	400.0	V	240.00	-19.40
100.79	-	-	31.01	9.91	-	43.52	-	33.61	100.0	V	127.00	-21.10
236.52	-	-	47.09	27.29	-	46.02	-	18.73	100.0	H	246.00	-19.80
291.34	-	-	36.97	18.57	-	46.02	-	27.45	100.0	H	287.00	-18.40
710.11	-	-	31.13	21.23	-	46.02	-	24.79	200.0	V	172.00	-9.90
947.56	-	-	32.11	25.11	-	46.02	-	20.91	200.0	V	172.00	-7.00

Remarks

1. Peak(dBuV/m) = Peak Reading Value(dBµV/m) + Correction Factor(dB)
2. Correction Factor(dB) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin(dB) = (Peak) Result (dBµV/m) – (Peak) Limit (dBµV/m)

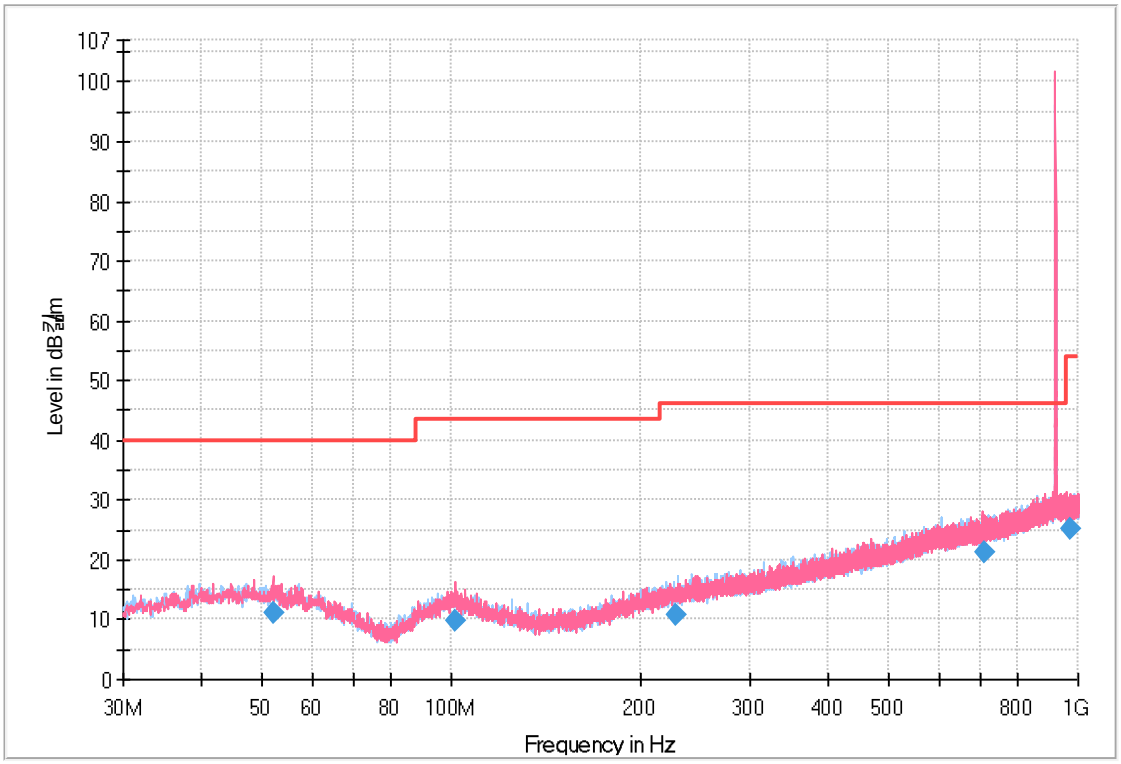
RSE(Below 1 GHz)_ Low band_Highest channel_X



Frequency [MHz]	Peak Reading Value [dBuV/m]	Peak [dBuV/m]	Quasi Reading Value [dBuV/m]	Quasi Peak [dBuV/m]	Distance Factor [dB]	Limit [dBuV/m]	Limit [dBuA/m]	Margin [dB]	Height [cm]	Pol	Azimuth [deg]	Correction Factor [dB]
43.93	-	-	31.13	11.73	-	40.00	-	28.27	100.0	H	218.00	-19.40
53.20	-	-	30.51	10.61	-	40.00	-	29.39	200.0	V	14.00	-19.90
102.23	-	-	30.91	9.51	-	43.52	-	34.01	400.0	H	291.00	-21.40
232.72	-	-	30.84	10.94	-	46.02	-	35.08	200.0	V	82.00	-19.90
538.24	-	-	30.84	18.64	-	46.02	-	27.38	100.0	V	0.00	-12.20
995.75	-	-	32.25	25.55	-	53.97	-	28.42	200.0	H	310.00	-6.70

Remarks
1. Peak(dBuV/m) = Peak Reading Value(dBµV/m) + Correction Factor(dB)
2. Correction Factor(dB) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin(dB) = (Peak) Result (dBµV/m) – (Peak) Limit (dBµV/m)

RSE(Below 1 GHz)_High band_Lowest channel_X

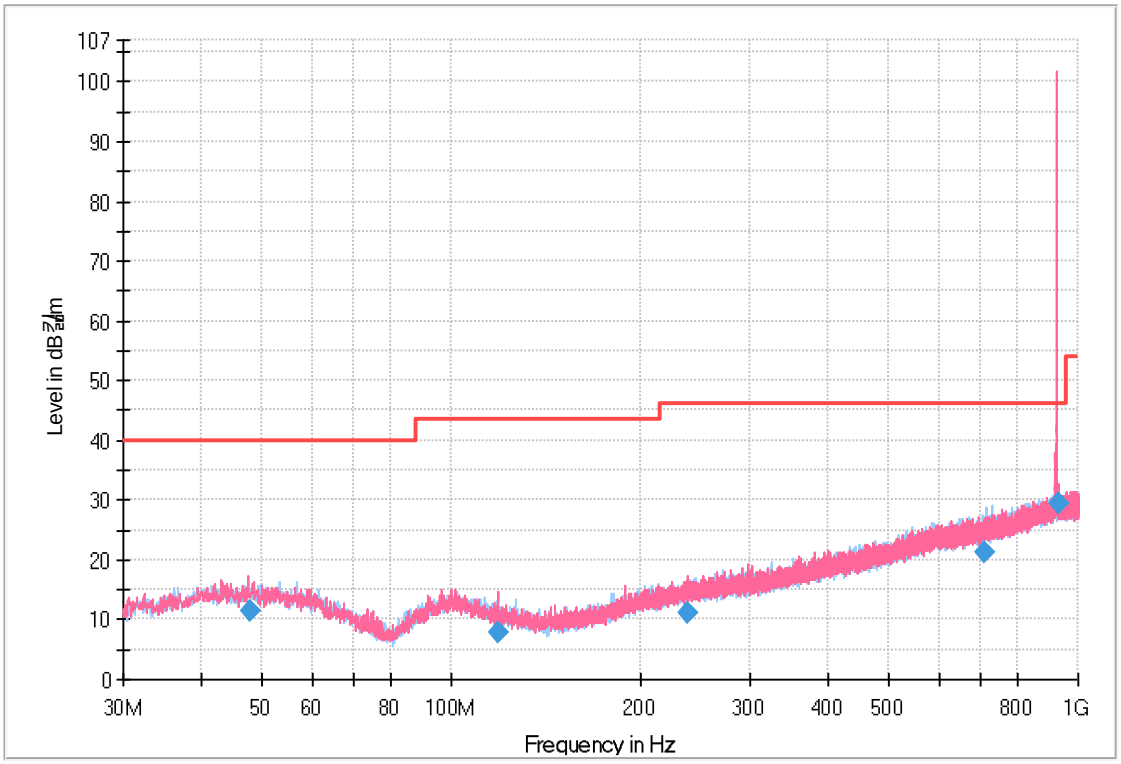


Frequency [MHz]	Peak Reading Value [dBuV/m]	Peak [dBuV/m]	Quasi Reading Value [dBuV/m]	Quasi Peak [dBuV/m]	Distance Factor [dB]	Limit [dBuV/m]	Limit [dBuA/m]	Margin [dB]	Height [cm]	Pol	Azimuth [deg]	Correction Factor [dB]
52.13	-	-	30.76	10.96	-	40.00	-	29.04	100.0	V	111.00	-19.80
101.50	-	-	31.08	9.78	-	43.52	-	33.74	100.0	V	276.00	-21.30
228.74	-	-	30.89	10.79	-	46.02	-	35.23	200.0	H	119.00	-20.10
706.57	-	-	31.19	21.19	-	46.02	-	24.83	100.0	V	86.00	-10.00
969.10	-	-	32.11	25.31	-	53.97	-	28.66	400.0	V	61.00	-6.80

Remarks

1. Peak(dBuV/m) = Peak Reading Value(dBµV/m) + Correction Factor(dB)
2. Correction Factor(dB) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin(dB) = (Peak) Result (dBµV/m) – (Peak) Limit (dBµV/m)

RSE(Below 1 GHz)_High band_Middle channel_X

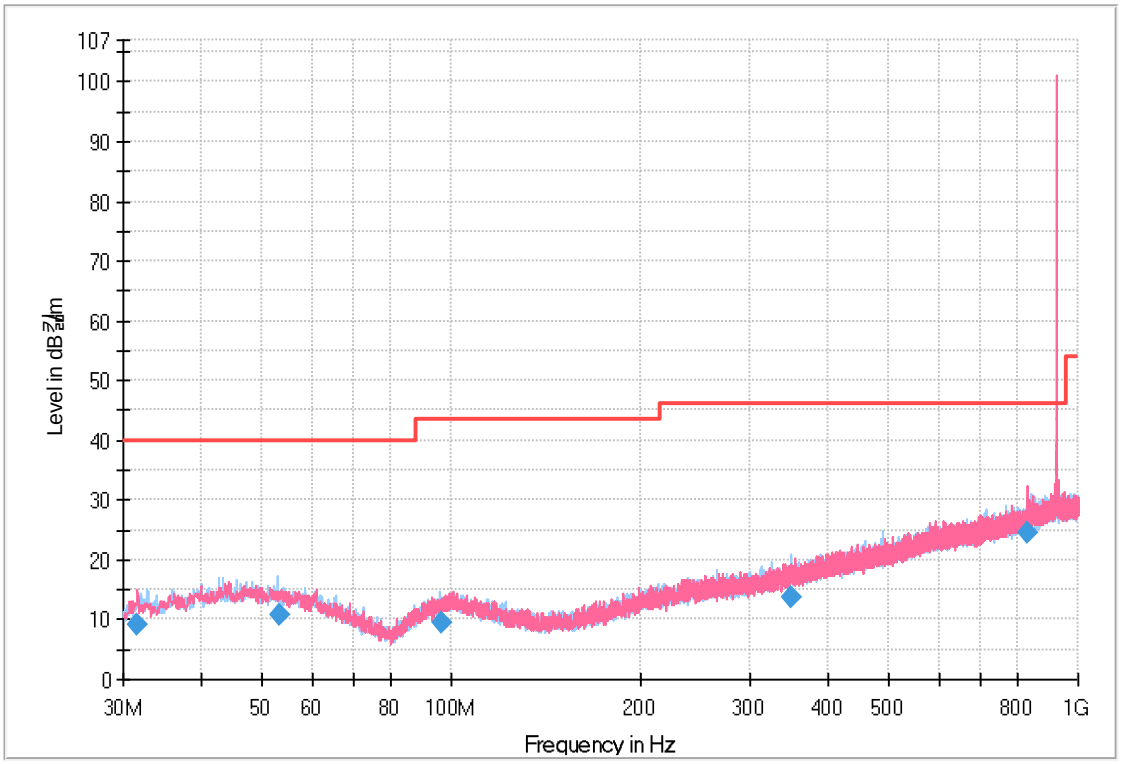


Frequency [MHz]	Peak Reading Value [dBuV/m]	Peak [dBuV/m]	Quasi Reading Value [dBuV/m]	Quasi Peak [dBuV/m]	Distance Factor [dB]	Limit [dBuV/m]	Limit [dBuA/m]	Margin [dB]	Height [cm]	Pol	Azimuth [deg]	Correction Factor [dB]
47.74	-	-	30.92	11.52	-	40.00	-	28.48	400.0	V	70.00	-19.40
118.70	-	-	31.16	7.76	-	43.52	-	35.76	100.0	V	104.00	-23.40
239.10	-	-	30.76	11.06	-	46.02	-	34.96	200.0	V	166.00	-19.70
711.00	-	-	31.18	21.28	-	46.02	-	24.74	100.0	H	61.00	-9.90
933.95	-	-	36.32	29.32	-	46.02	-	16.70	100.0	V	132.00	-7.00

Remarks

1. Peak(dBuV/m) = Peak Reading Value(dBµV/m) + Correction Factor(dB)
2. Correction Factor(dB) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin(dB) = (Peak) Result (dBµV/m) – (Peak) Limit (dBµV/m)

RSE(Below 1 GHz)_High band_Highest channel_X



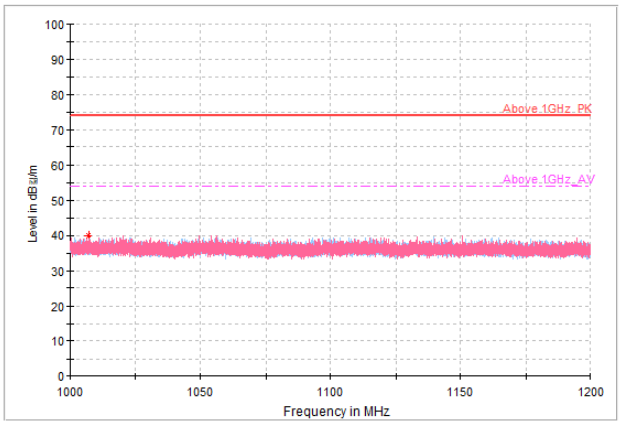
Frequency [MHz]	Peak Reading Value [dBuV/m]	Peak [dBuV/m]	Quasi Reading Value [dBuV/m]	Quasi Peak [dBuV/m]	Distance Factor [dB]	Limit [dBuV/m]	Limit [dBuA/m]	Margin [dB]	Height [cm]	Pol	Azimuth [deg]	Correction Factor [dB]
31.64	-	-	30.84	9.14	-	40.00	-	30.86	400.0	V	303.00	-21.70
53.10	-	-	30.63	10.73	-	40.00	-	29.27	400.0	H	274.00	-19.90
96.48	-	-	31.19	9.49	-	43.52	-	34.03	100.0	H	135.00	-21.70
347.38	-	-	30.63	13.83	-	46.02	-	32.19	100.0	H	276.00	-16.80
831.49	-	-	32.79	24.69	-	46.02	-	21.33	100.0	V	237.00	-8.10

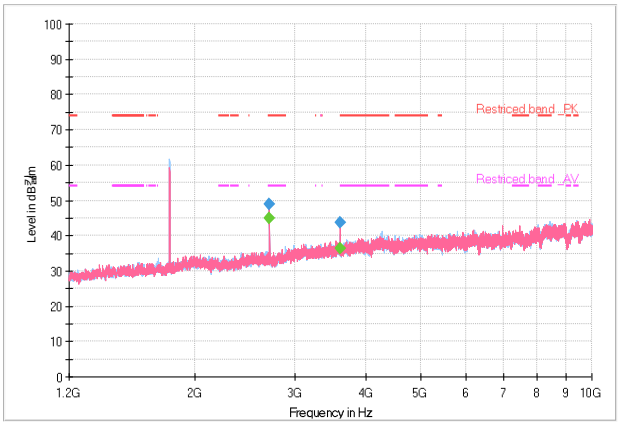
Remarks

1. Peak(dBuV/m) = Peak Reading Value(dBµV/m) + Correction Factor(dB)
2. Correction Factor(dB) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin(dB) = (Peak) Result (dBµV/m) – (Peak) Limit (dBµV/m)

3.5.5.3 Radiated Emissions (Above 1 GHz)

RSE_Low band_Lowest channel_X	
1 GHz - 1.2 GHz	1.2 GHz - 10 GHz

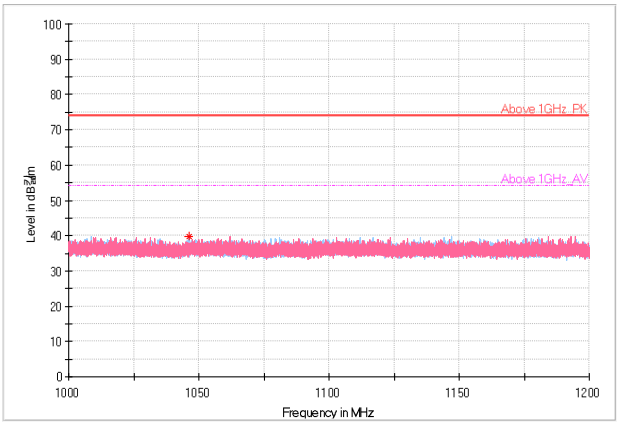
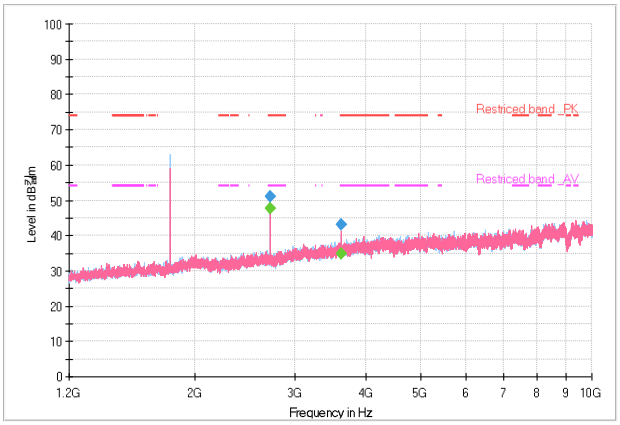




Frequency [MHz]	Peak Reading Value [dBuV/m]	Peak Result [dBuV/m]	AVG Reading Value [dBuV/m]	AVG Result [dBuV/m]	DCCF [dB]	Bandwidth [kHz]	Height [cm]	Pol [H/V]	Azimuth [deg]	Correction Factor [dB/m]	Margin [dB]	Limit [dBuV/m]
1 007.16	41.92	40.02	---	---	---	1 000	100.0	V	288.0	-1.90	33.98	74
2 706.12	55.18	48.88	---	---	---	1 000	298.0	V	98.0	-6.30	25.12	74
2 706.12	---	---	51.24	44.94	---	1 000	298.0	V	98.0	-6.30	9.06	54
3 608.56	45.63	43.73	---	---	---	1 000	155.0	V	109.0	-1.90	30.27	74
3 608.56	---	---	38.18	36.28	---	1 000	155.0	V	109.0	-1.90	17.72	54

Remarks

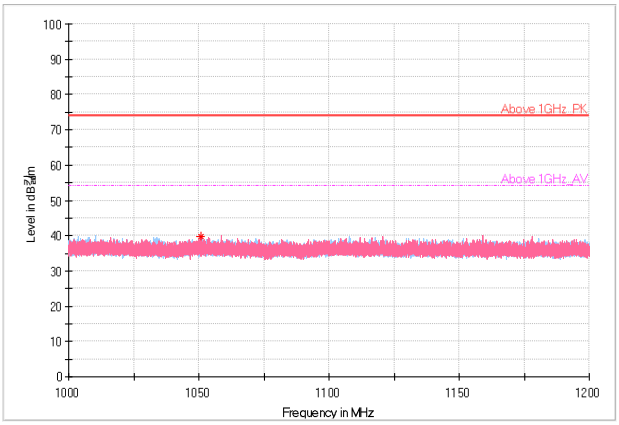
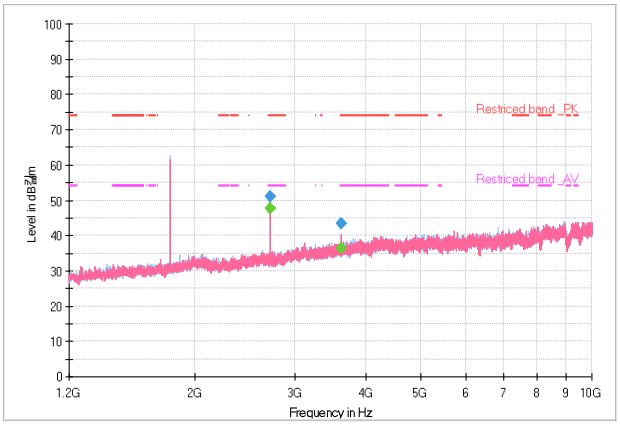
1. Peak Result(dBµV/m) = Peak Reading Value(dBµV/m) + Correction Factor(dB)
2. Average Result(dBµV/m) = Average Reading Value(dBµV/m) + DCCF + Correction Factor(dB)
3. DCCF(Duty Cycle Correction Factor) = 10 x Log(1/Duty Cycle)
4. Correction Factor(dB) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB) + Distance Factor (dB)
5. Margin(dB) = (Peak/Average) Result (dBµV/m) – (Peak/Average) Limit (dBµV/m)

RSE_Low band_middle channel_X	
1 GHz - 1.2 GHz	1.2 GHz - 10 GHz
	

Frequency [MHz]	Peak Reading Value [dBuV/m]	Peak Result [dBuV/m]	AVG Reading Value [dBuV/m]	AVG Result [dBuV/m]	DCCF [dB]	Bandwidth [kHz]	Height [cm]	Pol [H/V]	Azimuth [deg]	Correction Factor [dB/m]	Margin [dB]	Limit [dBuV/m]
1 046.23	41.83	39.83	---	---	---	1 000	100.0	H	239.0	-2.00	34.17	74
2 710.08	57.31	51.01	---	---	---	1 000	341.0	H	132.0	-6.30	22.99	74
2 710.08	---	---	53.87	47.57	---	1 000	341.0	H	132.0	-6.30	6.43	54
3 613.40	44.92	43.02	---	---	---	1 000	142.0	V	118.0	-1.90	30.98	74
3 613.40	---	---	36.74	34.84	---	1 000	142.0	V	118.0	-1.90	19.16	54

Remarks

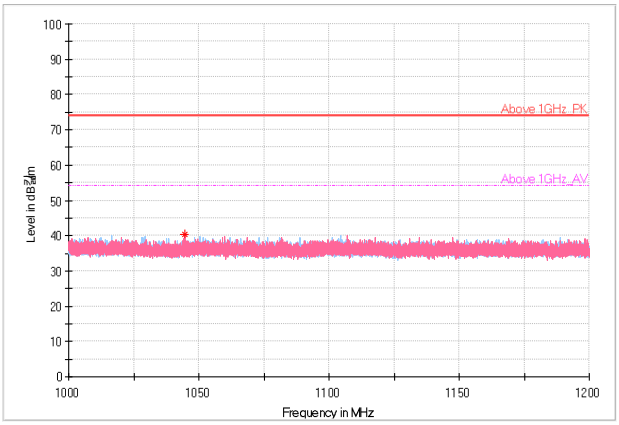
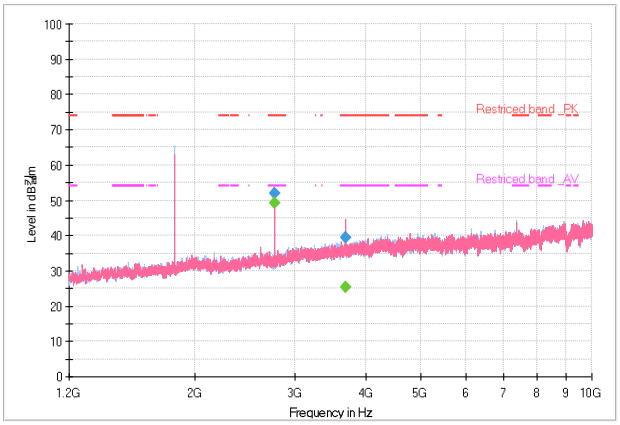
1. Peak Result(dBµV/m) = Peak Reading Value(dBµV/m) + Correction Factor(dB)
2. Average Result(dBµV/m) = Average Reading Value(dBµV/m) + DCCF + Correction Factor(dB)
3. DCCF(Duty Cycle Correction Factor) = 10 x Log(1/Duty Cycle)
4. Correction Factor(dB) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB) + Distance Factor (dB)
5. Margin(dB) = (Peak/Average) Result (dBµV/m) – (Peak/Average) Limit (dBµV/m)

RSE_Low band_highest channel_X	
1 GHz - 1.2 GHz	1.2 GHz - 10 GHz
	

Frequency [MHz]	Peak Reading Value [dBuV/m]	Peak Result [dBuV/m]	AVG Reading Value [dBuV/m]	AVG Result [dBuV/m]	DCCF [dB]	Bandwidth [kHz]	Height [cm]	Pol [H/V]	Azimuth [deg]	Correction Factor [dB/m]	Margin [dB]	Limit [dBuV/m]
1 050.79	41.66	39.66	---	---	---	1 000	100.0	V	358.0	-2.00	34.34	74
2 714.04	57.42	51.12	---	---	---	1 000	288.0	H	135.0	-6.30	22.88	74
2 714.04	---	---	54.12	47.82	---	1 000	288.0	H	135.0	-6.30	6.18	54
3 618.68	45.37	43.47	---	---	---	1 000	350.0	H	50.0	-1.90	30.53	74
3 618.68	---	---	38.20	36.30	---	1 000	350.0	H	50.0	-1.90	17.70	54

Remarks

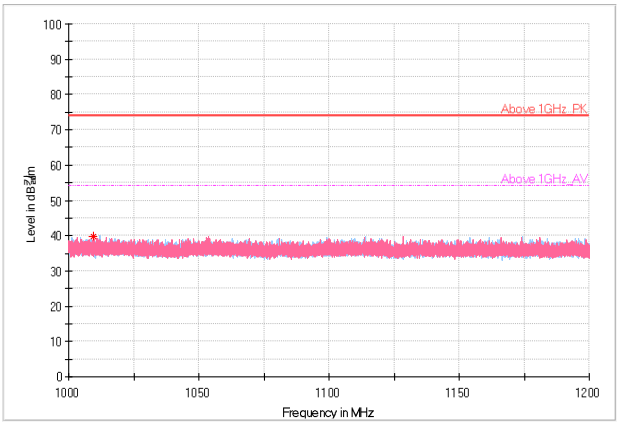
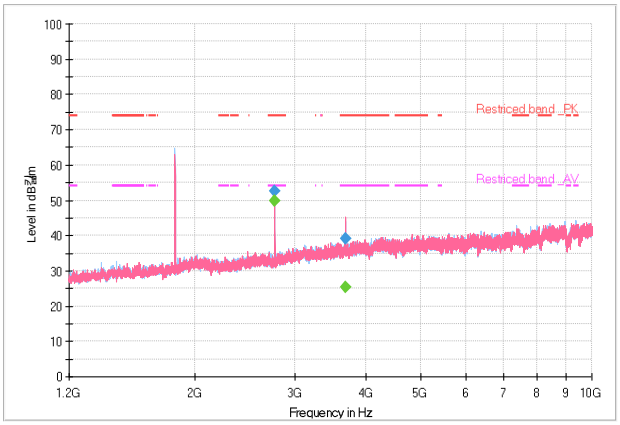
1. Peak Result(dBµV/m) = Peak Reading Value(dBµV/m) + Correction Factor(dB)
2. Average Result(dBµV/m) = Average Reading Value(dBµV/m) + DCCF + Correction Factor(dB)
3. DCCF(Duty Cycle Correction Factor) = 10 x Log(1/Duty Cycle)
4. Correction Factor(dB) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB) + Distance Factor (dB)
5. Margin(dB) = (Peak/Average) Result (dBµV/m) – (Peak/Average) Limit (dBµV/m)

RSE_High band_Lowest channel_X	
1 GHz - 1.2 GHz	1.2 GHz - 10 GHz
	

Frequency [MHz]	Peak Reading Value [dBuV/m]	Peak Result [dBuV/m]	AVG Reading Value [dBuV/m]	AVG Result [dBuV/m]	DCCF [dB]	Bandwidth [kHz]	Height [cm]	Pol [H/V]	Azimuth [deg]	Correction Factor [dB/m]	Margin [dB]	Limit [dBuV/m]
1 044.73	42.37	40.37	---	---	---	1 000	100.0	V	98.0	-2.00	33.63	74
2 762.19	58.38	52.08	---	---	---	1 000	340.0	H	128.0	-6.30	21.92	74
2 762.19	---	---	55.58	49.28	---	1 000	340.0	H	128.0	-6.30	4.72	54
3 687.08	41.10	39.30	---	---	---	1 000	197.0	V	142.0	-1.80	34.70	74
3 687.08	---	---	27.07	25.27	---	1 000	197.0	V	142.0	-1.80	28.73	54

Remarks

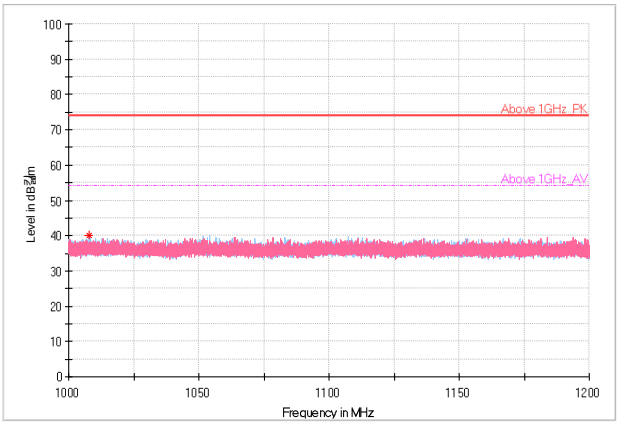
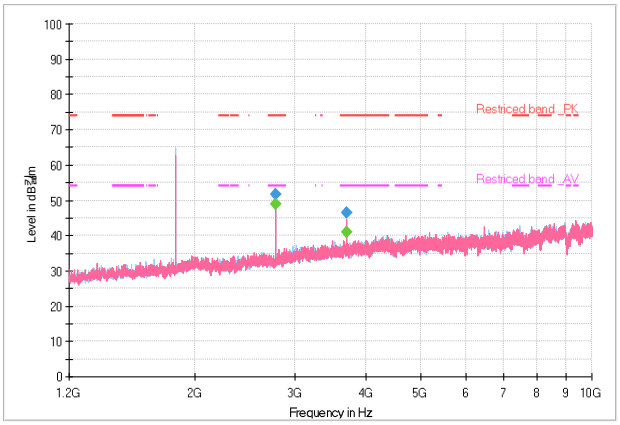
1. Peak Result(dBµV/m) = Peak Reading Value(dBµV/m) + Correction Factor(dB)
2. Average Result(dBµV/m) = Average Reading Value(dBµV/m) + DCCF + Correction Factor(dB)
3. DCCF(Duty Cycle Correction Factor) = 10 x Log(1/Duty Cycle)
4. Correction Factor(dB) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB) + Distance Factor (dB)
5. Margin(dB) = (Peak/Average) Result (dBµV/m) – (Peak/Average) Limit (dBµV/m)

RSE_High band_middle channel_X	
1 GHz - 1.2 GHz	1.2 GHz - 10 GHz
	

Frequency [MHz]	Peak Reading Value [dBuV/m]	Peak Result [dBuV/m]	AVG Reading Value [dBuV/m]	AVG Result [dBuV/m]	DCCF [dB]	Bandwidth [kHz]	Height [cm]	Pol [H/V]	Azimuth [deg]	Correction Factor [dB/m]	Margin [dB]	Limit [dBuV/m]
1 009.57	41.62	39.72	---	---	---	1 000	100.0	V	98.0	-1.90	34.28	74
2 766.03	58.89	52.59	---	---	---	1 000	350.0	V	92.0	-6.30	21.41	74
2 766.03	---	---	56.12	49.82	---	1 000	350.0	V	92.0	-6.30	4.18	54
3 686.13	40.95	39.15	---	---	---	1 000	260.0	V	114.0	-1.80	34.85	74
3 686.13	---	---	27.12	25.32	---	1 000	260.0	V	114.0	-1.80	28.68	54

Remarks

1. Peak Result(dBµV/m) = Peak Reading Value(dBµV/m) + Correction Factor(dB)
2. Average Result(dBµV/m) = Average Reading Value(dBµV/m) + DCCF + Correction Factor(dB)
3. DCCF(Duty Cycle Correction Factor) = 10 x Log(1/Duty Cycle)
4. Correction Factor(dB) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB) + Distance Factor (dB)
5. Margin(dB) = (Peak/Average) Result (dBµV/m) – (Peak/Average) Limit (dBµV/m)

RSE_High band_Highest channel_X	
1 GHz - 1.2 GHz	1.2 GHz - 10 GHz
	

Frequency [MHz]	Peak Reading Value [dBuV/m]	Peak Result [dBuV/m]	AVG Reading Value [dBuV/m]	AVG Result [dBuV/m]	DCCF [dB]	Bandwidth [kHz]	Height [cm]	Pol [H/V]	Azimuth [deg]	Correction Factor [dB/m]	Margin [dB]	Limit [dBuV/m]
1 007.78	41.95	40.05	---	---	---	1 000	100.0	H	13.0	-1.90	33.95	74
2 769.77	58.07	51.77	---	---	---	1 000	286.0	H	131.0	-6.30	22.23	74
2 769.77	---	---	55.17	48.87	---	1 000	286.0	H	131.0	-6.30	5.13	54
3 693.04	48.09	46.39	---	---	---	1 000	250.0	V	68.0	-1.70	27.61	74
3 693.04	---	---	42.65	40.95	---	1 000	250.0	V	68.0	-1.70	13.05	54

Remarks

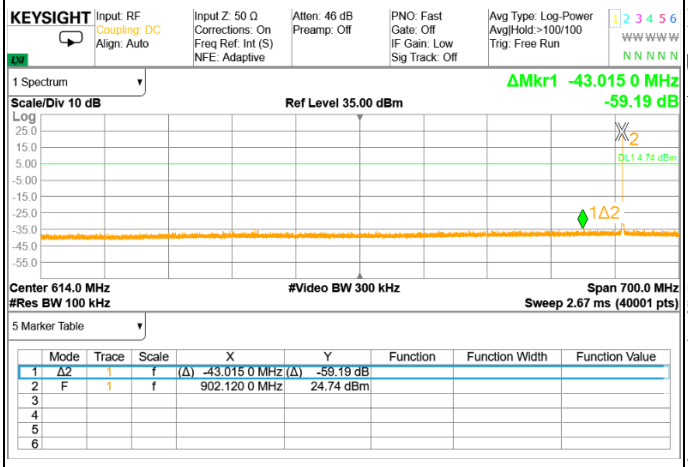
1. Peak Result(dBµV/m) = Peak Reading Value(dBµV/m) + Correction Factor(dB)
2. Average Result(dBµV/m) = Average Reading Value(dBµV/m) + DCCF + Correction Factor(dB)
3. DCCF(Duty Cycle Correction Factor) = 10 x Log(1/Duty Cycle)
4. Correction Factor(dB) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB) + Distance Factor (dB)
5. Margin(dB) = (Peak/Average) Result (dBµV/m) – (Peak/Average) Limit (dBµV/m)

3.5.6 Test Result of Conducted Spurious Emission

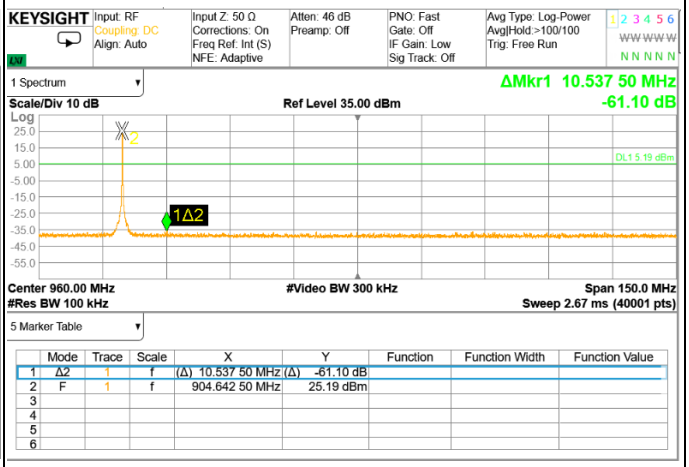
<Band edges>

Without hopping

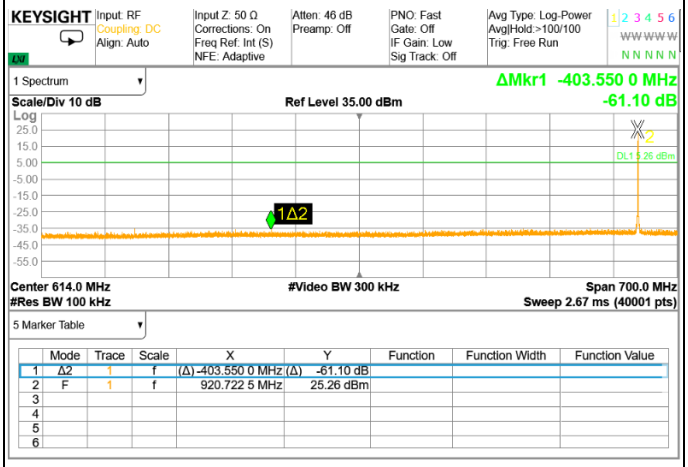
Low band – Lowest Channels



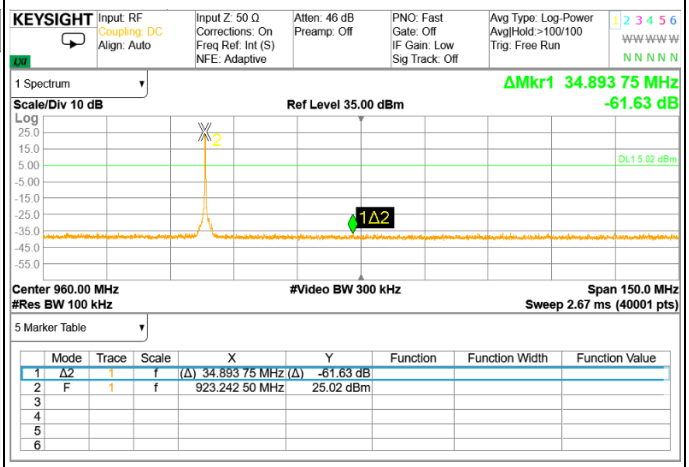
Low band – Highest Channels

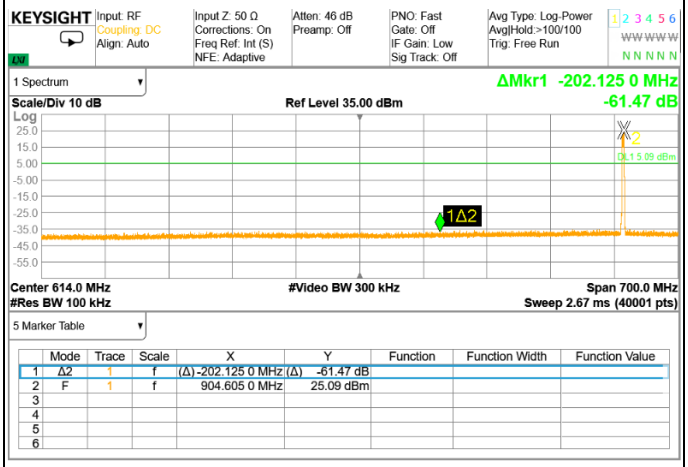
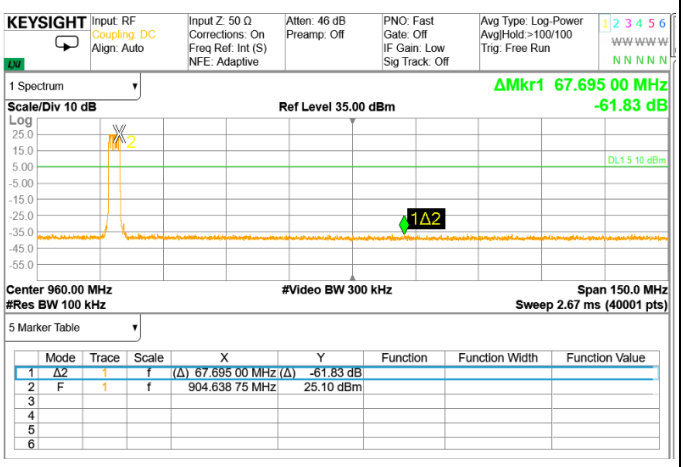
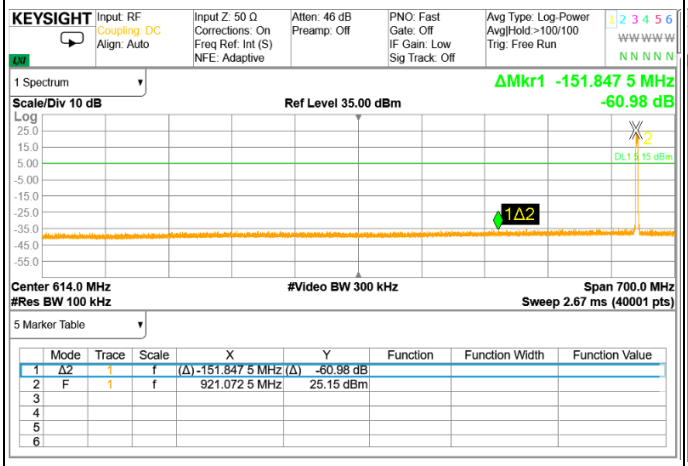
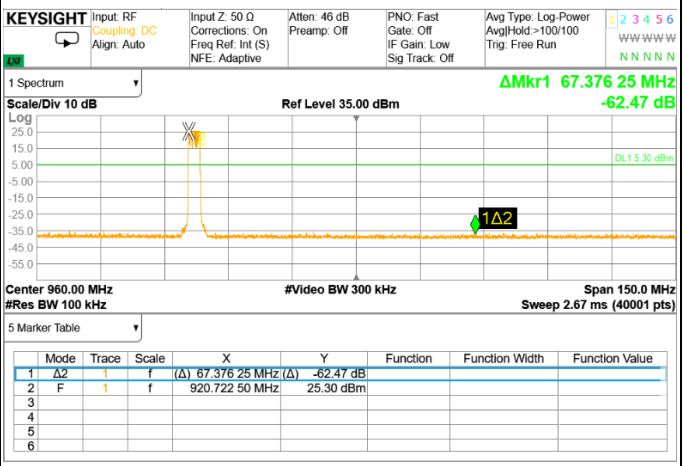


High band – Lowest Channels

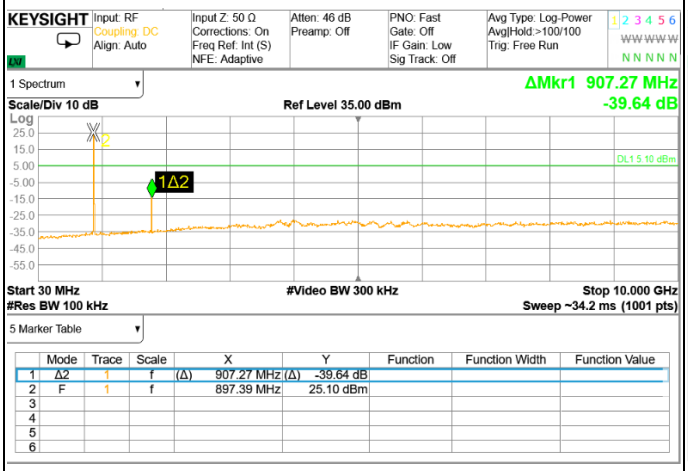
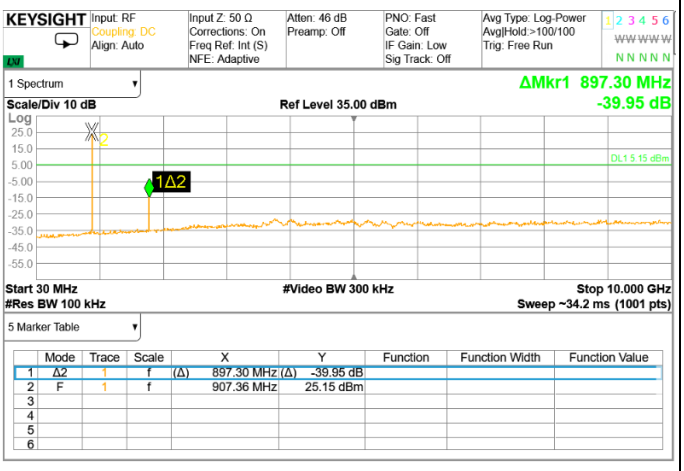
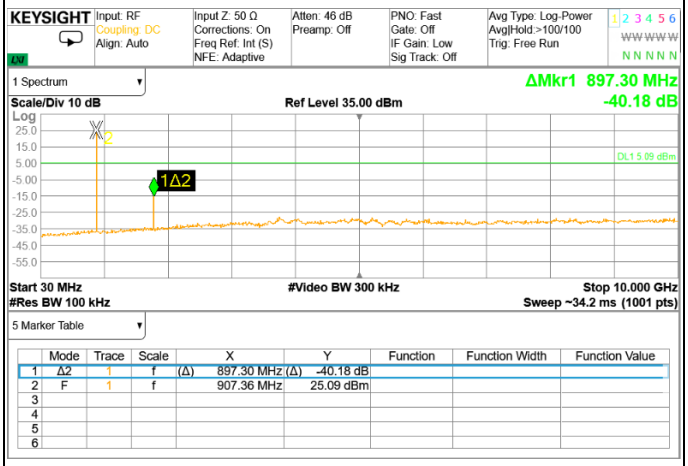


High band – Highest Channels

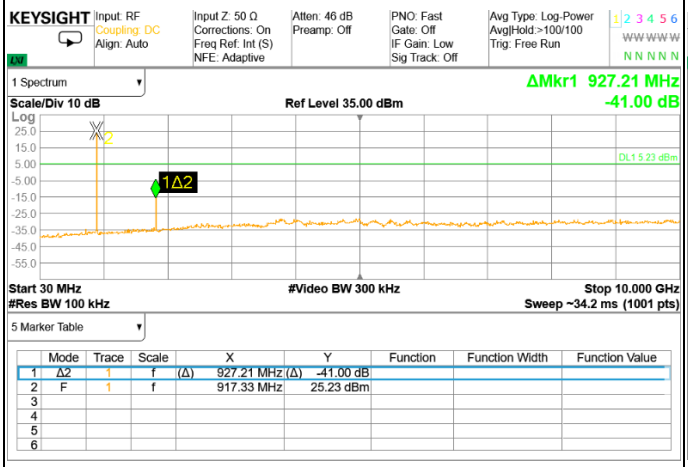


With Hopping	
Low band – Lowest Channels	**Low band – Highest Channels**
	
High band – Lowest Channels	**Hihg band – Highest Channels**
	

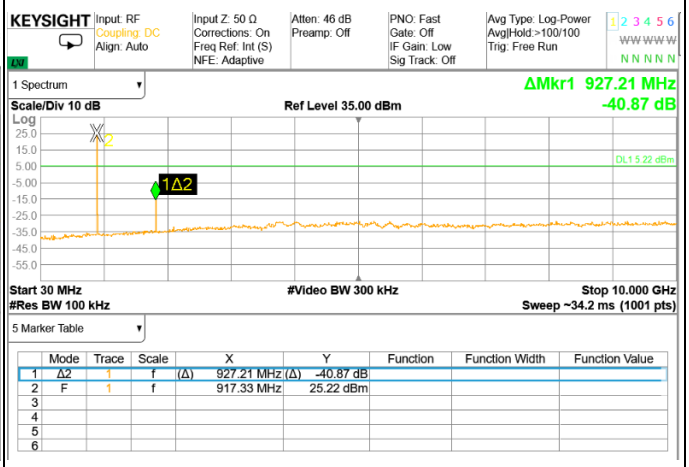
<Spurious>

Low band – Lowest Channels	Low band – Middle Channels
	
Low band – Highest Channels	
	

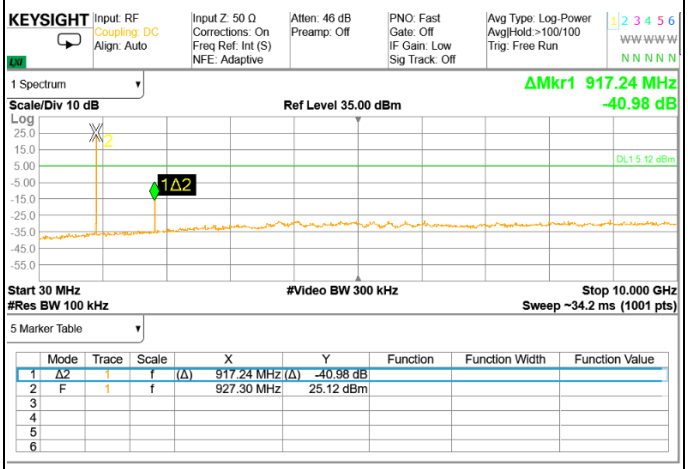
High band – Lowest Channels



High band – Middle Channels



High band – Highest Channels



3.6 AC Conducted Emissions (150 kHz to 30 MHz)

3.6.1 Regulation

§15.207(a) : Except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 µH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

	Conducted limit (dBµV)	
Frequency of emission (MHz)	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency.

3.6.2 Test Procedure

a) The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm / 50 µH of coupling impedance for the measuring instrument.

b) Both lines of the power mains connected to the EUT were checked for maximum conducted interference.

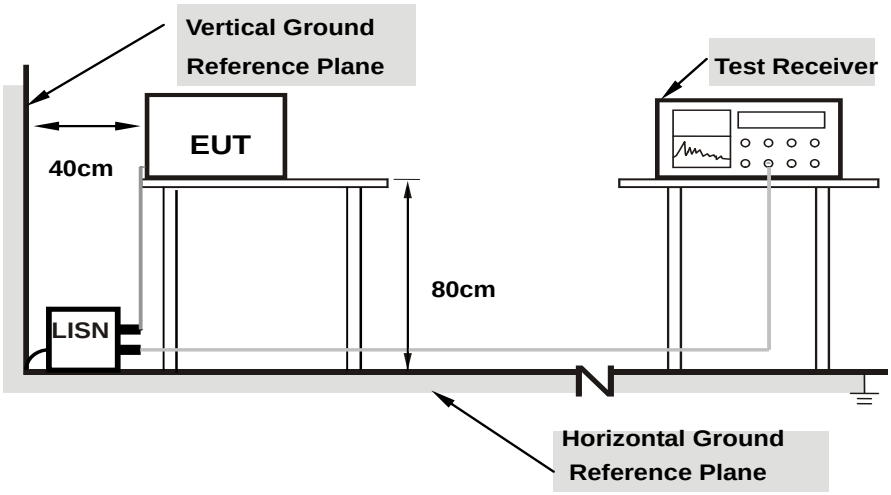
c) The frequency range from 150 kHz to 30 MHz was searched. Emission levels under (Limit – 20 dB) was not recorded.

Remark : The resolution bandwidth and video bandwidth of test receiver is 9 kHz for quasi-peak detection (QP) and average detection (AV) at frequency 0.15 MHz – 30 MHz.

3.6.3 Deviation from Test Standard

No deviation.

3.6.4 Test Setup



3.6.5 Test Result

N/A

Appendix – Information of the Testing Laboratories

We, Bureau Veritas Consumer Products Services Korea. Our laboratories are FCC recognized accredited test firms and accredited and approved according to ISO/IEC 17025.

Test Firm Name : BV CPS ADT Korea Ltd.

Address : Innoplex No.2 106, Sinwon-ro 306, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16675 KOREA

FCC

Designation Number : KR0158
Test Firm Registration Number : 666061

ISED

Designation Number : KR0158
Test Firm Registration Number : 25944

If you have any comments, please feel free to contact us at the following:

Email: Meyer.Shin@bureauveritas.com
Web Site: www.bureauveritas.co.kr/cps/eaw

The address and road map of all our labs can be found in our web site also.

- End of report -