



REPORT No.: SZ26050049W01

TEST REPORT

APPLICANT : Zhejiang Lierda Internet of Things
Technology Co., Ltd.

PRODUCT NAME : ME26 Series Overseas LoRa
Transparent Transmission Module

MODEL NAME : L-LRNME26-97PN4

BRAND NAME : Lierda

FCC ID : 2AOFD-L-LRNME26

STANDARD(S) : 47 CFR Part 15 Subpart C

RECEIPT DATE : 2026-06-26

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**Notes** **69**

Change History		
Version	Date	Reason for change
1.0	2026-09-08	First edition



1. Summary of Test Result

No.	Section	Description	Test Date	Test Engineer	Result	Remark
1	15.203	Antenna Requirement	N/A	N/A	PASS	/
2	15.247(a) 15.247(h)	Hopping Mechanism	N/A	N/A	PASS	/
3	15.247(a)	Number of Hopping Frequency	Jul. 07, 2025	Su Xiaoxian	PASS	/
4	ANSI C63.10	Duty Cycle	Jul. 07, 2025	Su Xiaoxian	PASS	/
5	15.247(b)	Maximum Peak Conducted Output Power	Jul. 09, 2025	Su Xiaoxian	PASS	/
6	15.247(b)	Maximum Average Conducted Output Power	Jul. 09, 2025	Su Xiaoxian	PASS	/
7	15.247(a)	20dB Bandwidth	Jul. 09, 2025	Su Xiaoxian	PASS	/
8	15.247(a)	Carrier Frequency Separation	Jul. 07, 2025	Su Xiaoxian	PASS	/
9	15.247(a)	Time of Occupancy (Dwell time)	Jul. 07, 2025	Su Xiaoxian	PASS	/
10	15.247(d)	Conducted Spurious Emission	Jul. 09, 2025	Su Xiaoxian	PASS	/
11	15.207	Conducted Emission	Aug. 03, 2026	Wang Yapeng	PASS	/
12	15.209, 15.247(d)	Radiated Emission	Jul. 15, 2026	Li Hanbin	PASS	/

Note 1: The tests were performed according to the method of measurements prescribed in ANSI C63.10-2020, KDB 558074 D01 v05r02 and DA 00-075.

Note 2: Any additions, deviation, or exclusions from the method shall be noted in the "Remark".



1.1. Testing Applied Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- 47 CFR Part 15 Subpart C Radio Frequency Devices



1.2. Test Equipment List

1.2.1 Conducted Test Equipment

Equipment	Serial No.	Type	Manufacturer	Cal. Date	Due Date
EXA Signal Analyzer	MY53470836	N9010A	Agilent	2025.12.23	2026.12.22
RF Cable (30MHz-26GHz)	CB01	RF01	Morlab	N/A	N/A
SMA Connector	CN01	RF03	HUBER-SUHNER	N/A	N/A

1.2.2 Conducted Emission Test Equipment

Equipment	Serial No.	Type	Manufacturer	Cal. Date	Due Date
Receiver	101052	ESPI	R&S	2026.05.07	2027.05.06
LISN	103131	ENV 216	R&S	2026.03.18	2027.03.17
RF Coaxial Cable (DC-100MHz)	EMC-CE-00514	N/A	N/A	2026.05.06	2027.05.05

1.2.3 List of Software Used

Description	Manufacturer	Software Version
Test System	MaiWei	2.0.0.0
JS32-RE	Tonscend	5.0.0
TS+ -[JS32-CE]	Tonscend	2.5.0.0

**1.2.4 Radiated Test Equipment**

Equipment	Serial No.	Type	Manufacturer	Cal. Date	Due Date
Signal Analyzer	MY56060145	N9020A	Agilent	2026.04.28	2027.04.27
Test Antenna - Bi-Log	9163-274	VULB 9163	Schwarzbeck	2026.06.28	2027.06.27
Test Antenna - Loop	1519-022	FMZB1519	Schwarzbeck	2026.05.09	2027.05.08
Test Antenna – Horn	01774	BBHA 9120D	Schwarzbeck	2026.05.30	2027.05.29
Test Antenna – Horn	BBHA9170 #773	BBHA9170	Schwarzbeck	2026.05.30	2027.05.29
Preamplifier (10MHz-6GHz)	46732	S10M100L38 02	LUCIX CORP.	2026.05.07	2027.05.06
Preamplifier (2GHz-18GHz)	61171/61172	S020180L32 03	LUCIX CORP.	2026.05.07	2027.05.06
Preamplifier (18GHz-40GHz)	DS77209	DCLNA0118-40C-S	Decentest	2026.05.07	2027.05.06
RF Coaxial Cable (DC-18GHz)	MRE001	PE330	Pasternack	2025.09.03	2026.09.02
RF Coaxial Cable (DC-18GHz)	MRE002	CLU18	Pasternack	2025.09.03	2026.09.02
RF Coaxial Cable (DC-18GHz)	MRE003	CLU18	Pasternack	2025.09.03	2026.09.02
RF Coaxial Cable (DC-40GHz)	22290045	QA360-40-KK-0.5	Qualwave	2025.09.03	2026.09.02
RF Coaxial Cable (DC-40GHz)	22290046	QA360-40-KKF-2	Qualwave	2025.09.03	2026.09.02
RF Coaxial Cable (DC-18GHz)	22120181	QA500-18-NN-5	Qualwave	2025.09.03	2026.09.02
Notch Filter	N/A	WRCG-2400-2483.5-60SS	Wainwright	N/A	N/A
Anechoic Chamber	N/A	9m*6m*6m	CRT	2025.06.21	2028.06.20
Anechoic Chamber	N/A	9m*6m*6m	CRT	2025.04.19	2028.04.18



1.3. Measurement Uncertainty

Test Items	Uncertainty	Remark
Number of Hopping Frequency	±5%	Confidence levels of 95%
Peak Output Power	±2.22dB	Confidence levels of 95%
Bandwidth	±5%	Confidence levels of 95%
Carrier Frequency Separation	±5%	Confidence levels of 95%
Time of Occupancy (Dwell time)	±5%	Confidence levels of 95%
Conducted Spurious Emission	±2.77dB	Confidence levels of 95%
Restricted Frequency Bands	±5%	Confidence levels of 95%
Radiated Emission	±2.95dB	Confidence levels of 95%
Conducted Emission	±2.44dB	Confidence levels of 95%

1.4. Testing Laboratory

Laboratory Name:	Shenzhen Morlab Communications Technology Co., Ltd.
Laboratory Address:	FL.1-3, Building A, FeiYang Science Park, No.8 LongChang Road, Block 67, BaoAn District, ShenZhen, GuangDong Province, P. R. China
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FCC Designation Number:	CN1192
FCC Test Firm Registration Number:	226174

2. General Description

2.1. Information of Applicant and Manufacturer

Applicant:	Zhejiang Lierda Internet of Things Technology Co., Ltd.
Applicant Address:	Room 1402, Building 1, No.1326, Wenyi West Road, Cangqian street, Yuhang District, Hangzhou, Zhejiang Prov. China
Manufacturer:	Zhejiang Lierda Internet of Things Technology Co., Ltd.
Manufacturer Address:	Room 1402, Building 1, No.1326, Wenyi West Road, Cangqian street, Yuhang District, Hangzhou, Zhejiang Prov. China

2.2. Information of EUT

Product Name:	ME26 Series Overseas LoRa Transparent Transmission Module
Sample No.:	1#, 2#
Hardware Version:	V01
Software Version:	V01
Equipment Type:	FHSS
Modulation Type:	LoRa
Operating Frequency Range:	902. 63MHz–927.43MHz
Antenna Type:	Rod Antenna
Antenna Gain:	4.53dBi

Note 1: The EUT description presented in the report are provided by applicant and/or manufacturer, and the test laboratory is not responsible for the accuracy of the information. For a more detailed description, please refer to Specification or User's Manual supplied by the applicant and/or manufacturer.



2.3.Channel List of EUT

Ch.	Freq. (MHz)	Ch.	Freq. (MHz)	Ch.	Freq. (MHz)	Ch.	Freq. (MHz)
0	902.63	16	909.03	32	915.43	48	921.83
1	903.03	17	909.43	33	915.83	49	922.23
2	903.43	18	909.83	34	916.23	50	922.63
3	903.83	19	910.23	35	916.63	51	923.03
4	904.23	20	910.63	36	917.03	52	923.43
5	904.63	21	911.03	37	917.43	53	923.83
6	905.03	22	911.43	38	917.83	54	924.23
7	905.43	23	911.83	39	918.23	55	924.63
8	905.83	24	912.23	40	918.63	56	925.03
9	906.23	25	912.63	41	919.03	57	925.43
10	906.63	26	913.03	42	919.43	58	925.83
11	907.03	27	913.43	43	919.83	59	926.23
12	907.43	28	913.83	44	920.23	60	926.63
13	907.83	29	914.23	45	920.63	61	927.03
14	908.23	30	914.63	46	921.03	62	927.43
15	908.63	31	915.03	47	921.43		

Note 1: The black bold channels were selected for test.

2.4. Test Configuration of EUT

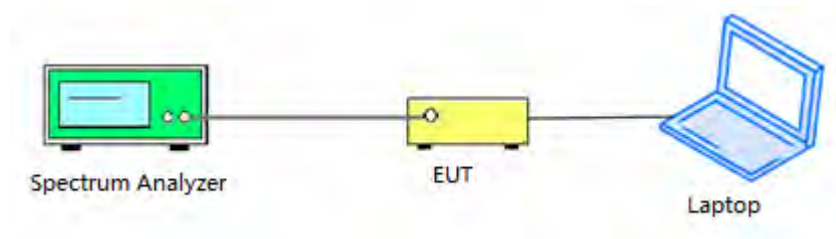
Test mode is used to control the EUT under the maximum power level during test.

2.5. Test Conditions

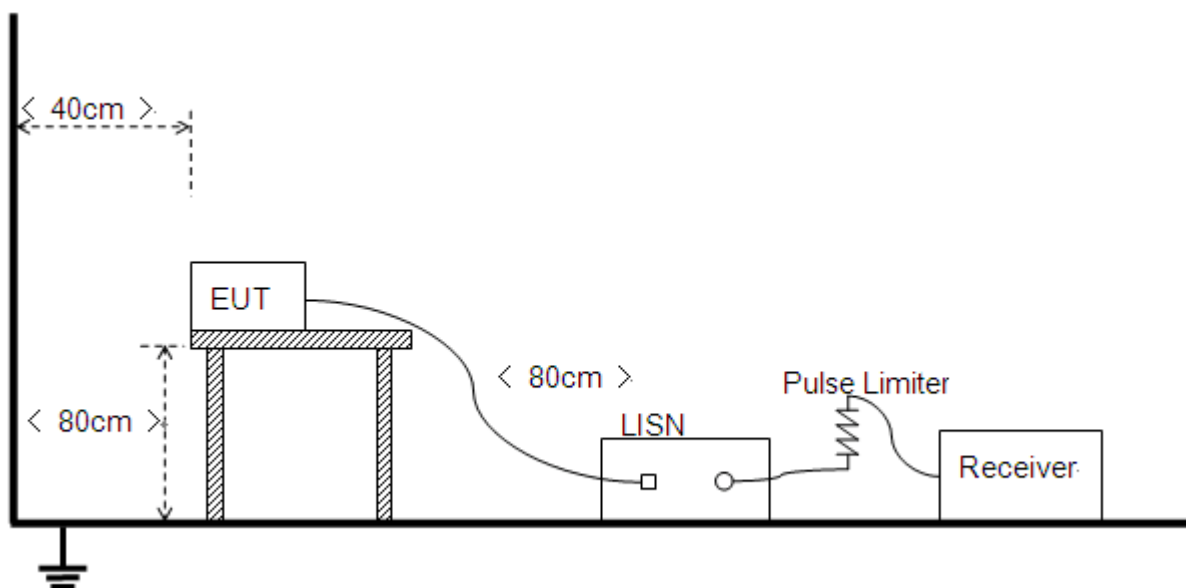
Temperature (°C):	15-35
Relative Humidity (%):	30-60
Atmospheric Pressure (kPa):	86-106

2.6. Test Setup Layout Diagram

2.6.1. Conducted Measurement

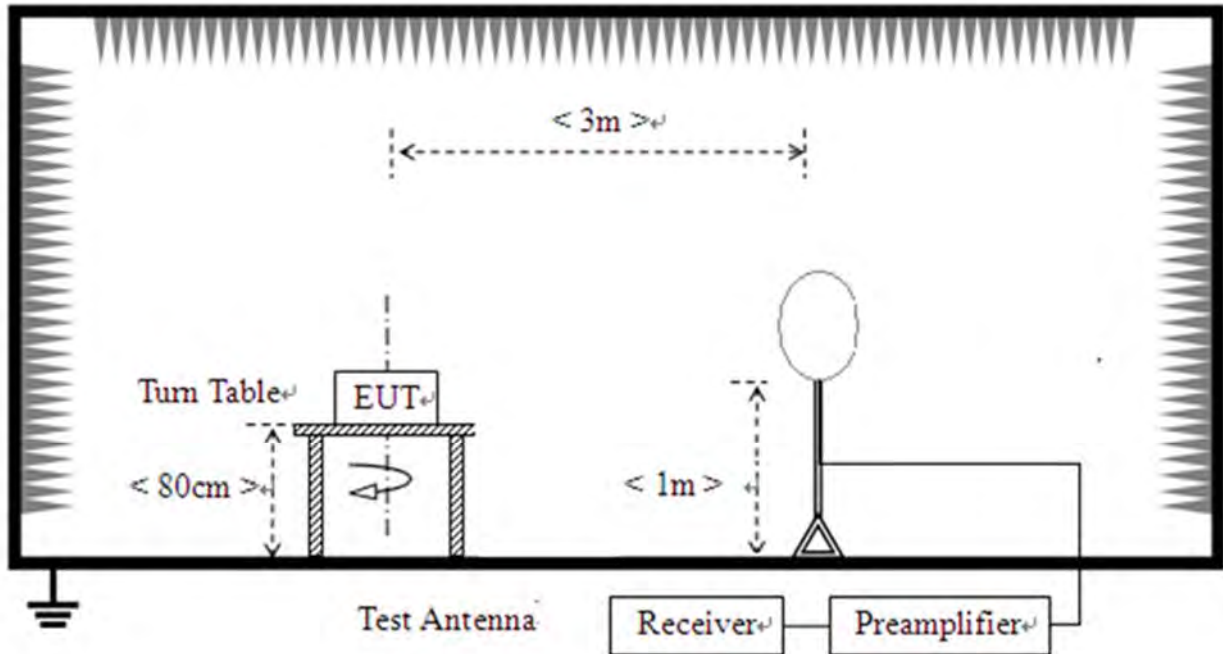


2.6.2. Conducted Emission Measurement

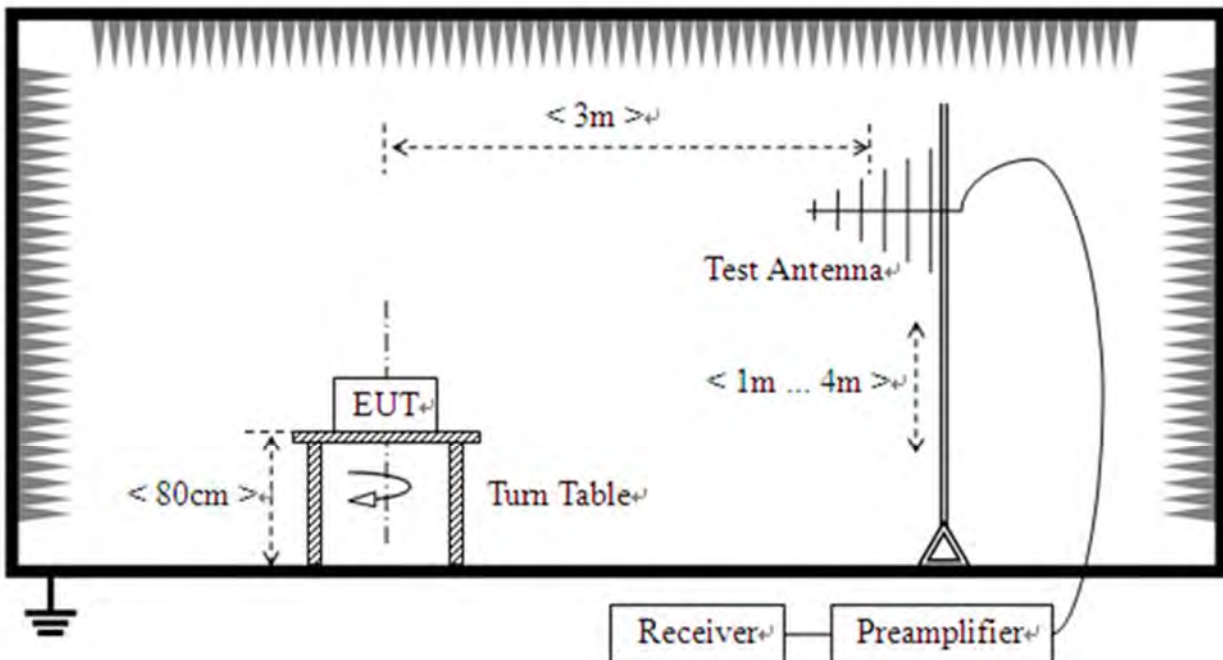


2.6.3.Radiation Measurement

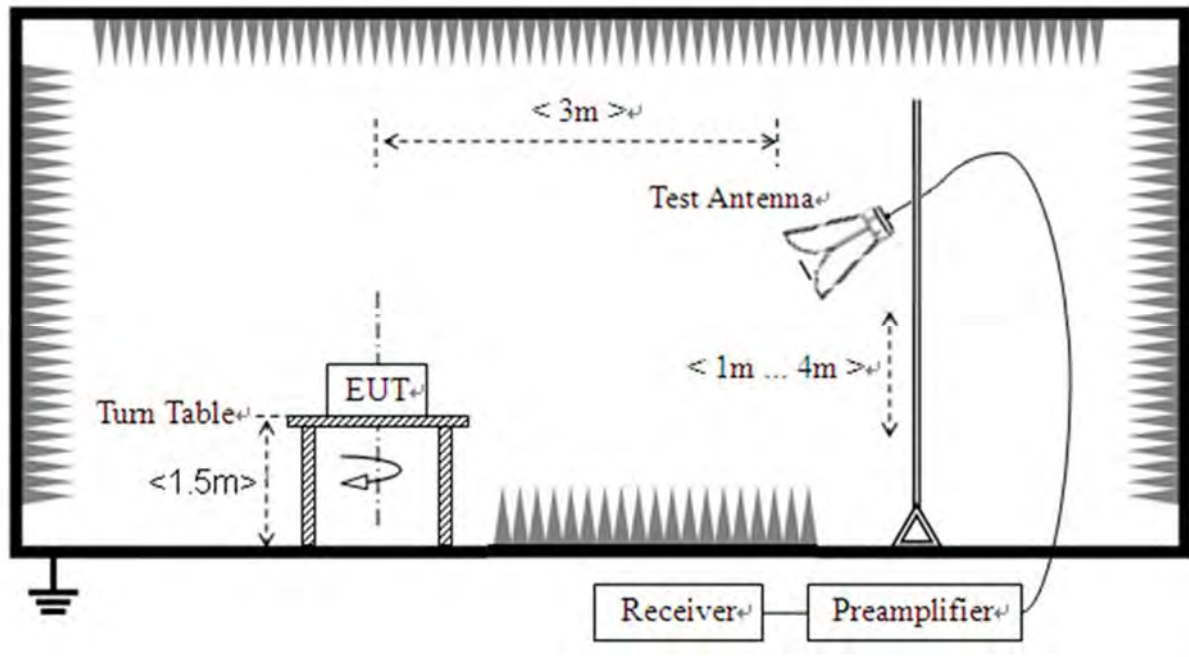
1) For radiated emissions from 9kHz to 30MHz



2) For radiated emissions from 30MHz to 1GHz



3) For radiated emissions above 1GHz





3. Test Results

3.1. Antenna Requirement

3.1.1. Requirement

According to FCC 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

3.1.2. Test Result

The EUT has a permanently and irreplaceable attached antenna. Please refer to the EUT internal photos.

Antenna location	Antenna Type	Coupling Method
☐ Internal ☒ External	☐ FPC Antenna ☐ Spring Antenna ☐ Ceramic Antenna ☐ Integrated Antenna ☐ Dipole Antenna ☐ PCB Antenna ☐ PIFA Antenna ☒ rod Antenna	☐ I-PEX Connector ☒ SMA Connector ☐ RP-SMA Connector ☐ Metal Shrapnel ☐ Layout



3.2. Hopping Mechanism

3.2.1. Requirement

According to FCC section 15.247(a)(1), a frequency hopping spread spectrum 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.

According to FCC section 15.247(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 hop sets 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.

3.2.2. Test Result

Compliance with the frequency-hopping mechanism requirement shall be determined based on the following operating principle declared by the manufacturer.

The device first transmits a short handshake packet on Channel 62. Depending on the success of communication interaction, a minimum of 1 packet and a maximum of 10 packets are transmitted. Each packet dwells for 6 ms, with a 100 ms interval between short packet transmissions.

After that, it hops to Channel 0 to transmit long packets. The dwell time per long packet is 1–70 ms. After a 75 ms interval, it hops to the next sequential channel (Channel 1) to transmit a long packet. After transmitting on Channel 1 with a dwell time of 1–70 ms, it waits another 75 ms and then hops to the next sequential channel (Channel 2) to transmit a long packet, and so on. Depending on the payload length of the application data, long-packet transmission involves a minimum of 1 hop (1 packet transmitted on 1 channel) and a maximum of 6 hops (6 packets transmitted on 6 channels). After completing the long-packet hops, it hops back to Channel 62 and repeats the same short-packet transmission logic. It then hops to the next sequential channel after the last channel used in the previous long-packet sequence and continues long-packet transmission following the same hopping logic and timing. This process continues until all channels 0–61 have been used in long-packet hopping sequences. After that, the next long-packet hopping sequence restarts from Channel 0.



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For Channels 0–62, the frequency point of each channel is pseudo-randomly interleaved and scrambled using the network ID parameter configured on the device as the seed. Although channel numbers are still used sequentially, the corresponding channel frequencies do not increase monotonically in order of channel number.



3.3. Number of Hopping Frequency

3.3.1. Requirement

According to FCC section 15.247(a)(1)(i), frequency hopping systems operating in the 902MHz to 928MHz bands shall use at least 50 hopping frequencies if the 20dB bandwidth of the hopping channel is less than 250KHz; or at least 25 hopping frequencies if the 20dB bandwidth of the hopping channel is 250KHz or greater.

3.3.2. Test Procedures

The EUT must have its hopping function enabled. Use the following spectrum analyzer settings:

Span = the frequency band of operation

RBW: 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.

VBW $\geq$ RBW

Sweep = auto

Detector function = peak

Trace = max hold

Allow the trace to stabilize

3.3.3. Test Setup Layout

Refer to chapter 2.6.1 in this report.

3.3.4. Test Result

Refer to Annex A.1 in this report.

3.4. Duty Cycle of Test Signal

3.4.1. Requirement

Preferably, all measurements of maximum conducted (average) output power will be performed with the EUT transmitting continuously (i.e., with a duty cycle of greater than or equal to 98%). When continuous operation cannot be realized, then the use of sweep triggering/signal gating techniques can be used to ensure that measurements are made only during transmissions at the maximum power control level. Such sweep triggering/signal gating techniques will require knowledge of the minimum transmission duration (T) over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation. Sweep triggering/signal gating techniques can then be used if the measurement/sweep time of the analyzer can be set such that it does not exceed T at any time that data are being acquired (i.e., no transmitter OFF-time is to be considered).

When continuous transmission cannot be achieved and sweep triggering/signal gating cannot be implemented, alternative procedures are provided that can be used to measure the average power; however, they will require an additional measurement of the transmitter duty cycle (D). Within this sub clause, the duty cycle refers to the fraction of time over which the transmitter is ON and is transmitting at its maximum power control level. The duty cycle is considered to be constant if variations are less than $\pm 2\%$; otherwise, the duty cycle is considered to be non constant.

3.4.2. Test Result

Refer to Annex A.2 in this report.



3.5. Maximum Peak Conducted Output Power

3.5.1. Requirement

According to FCC section 15.247(b)(2), for frequency hopping systems that operates in the 902MHz to 928MHz band employing at least 50 hopping channels, the maximum peak output power of the intentional radiator shall not exceed 1Watt, and 0.25 watts for systems employing less than 50 hopping channels, but at least 25 hopping channels.

3.5.2. Test Procedures

KDB 558074 Section 8.3.1 was used in order to prove compliance.

3.5.3. Test Setup Layout

Refer to chapter 2.6.1 in this report.

3.5.4. Test Result

Refer to Annex A.3 in this report.



3.6. Maximum Average Conducted Output Power

3.6.1. Requirement

According to FCC section 15.247(b)(2), for frequency hopping systems that operates in the 902MHz to 928MHz band employing at least 50 hopping channels, the maximum peak output power of the intentional radiator shall not exceed 1Watt, and 0.25 watts for systems employing less than 50 hopping channels, but at least 25 hopping channels.

3.6.2. Test Procedures

KDB 558074 Section 8.3.2 was used in order to prove compliance.

3.6.3. Test Setup Layout

Refer to chapter 2.6.1 in this report.

3.6.4. Test Result

Refer to Annex A.4 in this report.



3.7.20 dB Bandwidth

3.7.1.Requirement

According to FCC section 15.247(a)(1), the maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.

3.7.1.Test Procedures

Use the following spectrum analyzer settings:

Span = between 2 to 5 times the OBW, centered on the test channel

RBW= 1% to 5% of the OBW

VBW $\geq 3 \times$ RBW

Sweep = auto

Detector function = peak

Trace = max hold

3.7.2.Test Setup Layout

Refer to chapter 2.6.1 in this report.

3.7.3.Test Result

Refer to Annex A.5 in this report.



3.8. Carried Frequency Separation

3.8.1. Requirement

According to FCC section 15.247(a)(1), frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25kHz or of the 20dB bandwidth of the hopping channel, whichever is greater.

3.8.2. Test Procedures

The EUT must have its hopping function enabled. According to DA 00-705, use the following spectrum analyzer settings:

Span = wide enough to capture the peaks of two adjacent channels

Resolution (or IF) Bandwidth (RBW) $\geq 1\%$ of the span

Video (or Average) Bandwidth (VBW) $\geq$ RBW

Sweep = auto

Detector function = peak

Trace = max hold

Allow the trace to stabilize. Use the marker-delta function to determine the separation between the peaks of the adjacent channels.

3.8.3. Test Setup Layout

Refer to chapter 2.6.1 in this report.

3.8.4. Test Result

Refer to Annex A.6 in this report.



3.9. Time of Occupancy (Dwell time)

3.9.1. Requirement

According to FCC §15.247(a) (1) (i), 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.

3.9.2. Test Procedures

The transmitter output is connected to a spectrum analyzer. The span is set to 0 Hz, centered on a single, selected hopping channel. The width of a single pulse is measured in a fast scan. The number of pulses is measured in 10 second scan, to enable resolution of each occurrence.

The average time of occupancy in the specified 20 second period is equal to (# of pulses in 20s) * pulse width.

3.9.3. Test Setup Layout

Refer to chapter 2.6.1 in this report.

3.9.4. Test Result

Refer to Annex A.7 in this report.



3.10. Conducted Spurious Emissions and Band Edge

3.10.1.Requirement

According to FCC section 15.247(d), in any 100kHz 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 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.

3.10.2.Test Procedures

Use the following spectrum analyzer settings:

Span = wide enough to capture the peak level of the in-band emission and all spurious emissions (e.g., harmonics) from the lowest frequency generated in the EUT up through the 10th harmonic. Typically, several plots are required to cover this entire span.

RBW = 100 kHz

VBW $\geq$ RBW

Sweep = auto

Detector function = peak

Trace = max hold

Allow the trace to stabilize.

3.10.3.Test Setup Layout

Refer to chapter 2.6.1 in this report.

3.10.4.Test Result

Refer to Annex A.8 and A.9 in this report.

3.11. Conducted Emission

3.11.1.Requirement

According to FCC section 15.207, 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 within the band 150kHz to 30MHz shall not exceed the limits in the following table, as measured using a 50 μ H/50 Ω line impedance stabilization network (LISN).

Frequency Range (MHz)	Conducted Limit (dB μ V)	
	Quai-peak	Average
0.15 - 0.50	66 to 56	56 to 46
0.50 - 5	56	46
5 - 30	60	50

Note:

- (a) The lower limit shall apply at the band edges.
- (b) The limit decreases linearly with the logarithm of the frequency in the range 0.15 - 0.50MHz.

3.11.2.Test Procedures

The Table-top EUT was placed upon a non-metallic table 0.8m above the horizontal metal reference ground plane. EUT was connected to LISN and LISN was connected to reference Ground Plane. EUT was 80cm from LISN. The set-up and test methods were according to ANSI C63.10.

3.11.3.Test Setup Layout

Refer to chapter 2.6.2 in this report.

3.11.4.Test Result

Refer to Annex A.10 in this report.

3.12. Radiated Emission

3.12.1.Requirement

According to FCC section 15.247(d), radiated emission outside the frequency band attenuation below the general limits specified in FCC section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in FCC section 15.205(a), must also comply with the radiated emission limits specified in FCC section 15.209(a).

According to FCC section 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 ($\mu\text{V/m}$)	Measurement Distance (m)
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

Note1: For above 1000MHz, 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 20dB above the maximum permitted average limit.

Note2:For above 1000MHz, limit field strength of harmonics: 54dBuV/m@3m (AV) and 74dBuV/m@3m (PK).In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), also should comply with the radiated emission limits specified in Section 15.209(a)(above table).



3.12.2. Test Procedures

The EUT is placed on a non-conducting table 80 cm above the ground plane for measurement below 1GHz; 1.5 m above the ground plane for measurement above 1GHz. The antenna to EUT distance is 3 meters. The EUT is configured in accordance with ANSI C63.10. The EUT is set to transmit in a continuous mode.

For measurements below 30MHz, the emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9kHz-90 kHz, 110kHz-490 kHz. Radiated emission limits in these two bands are based on measurements employing an average detector.

For measurements below 1GHz the resolution bandwidth is set to 100kHz for peak detection measurements or 120kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

For measurements above 1GHz the resolution bandwidth is set to 1MHz, the video band width is set to 3MHz for peak measurements and as applicable for average measurements.

The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized in both the vertical and the horizontal positions. For measurements above 1 GHz, keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response.

3.12.3. Test Setup Layout

Refer to chapter 2.6.3 in this report.

3.12.4. Test Result

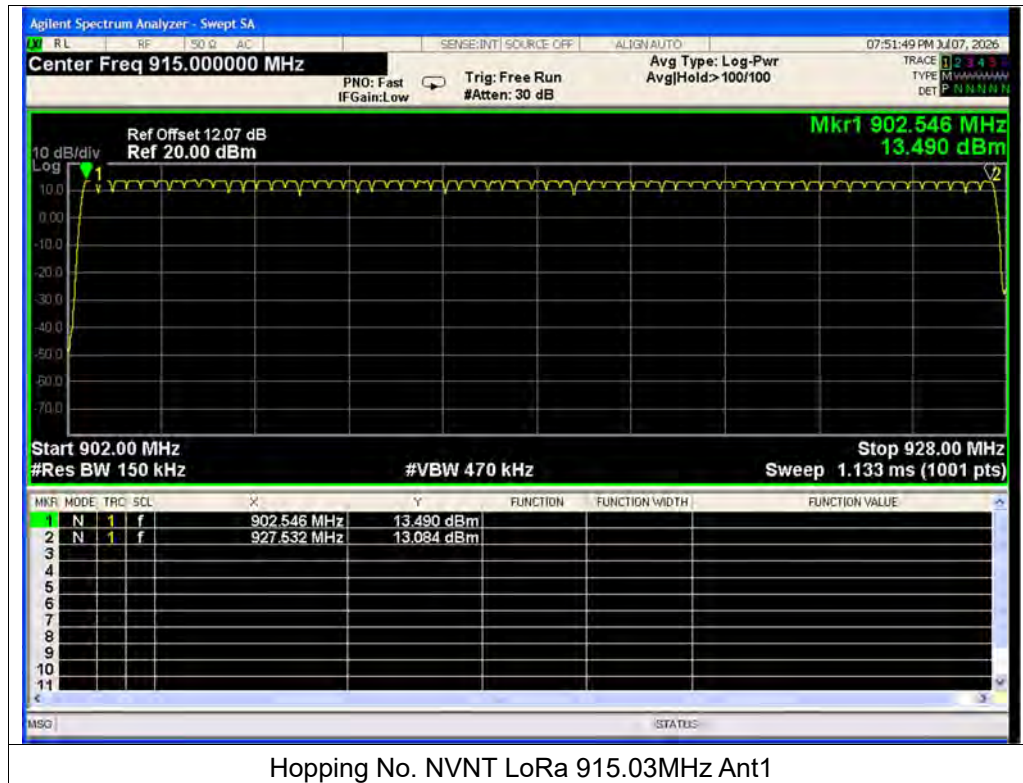
Refer to Annex A.11 in this report.



Annex A Test Data and Result

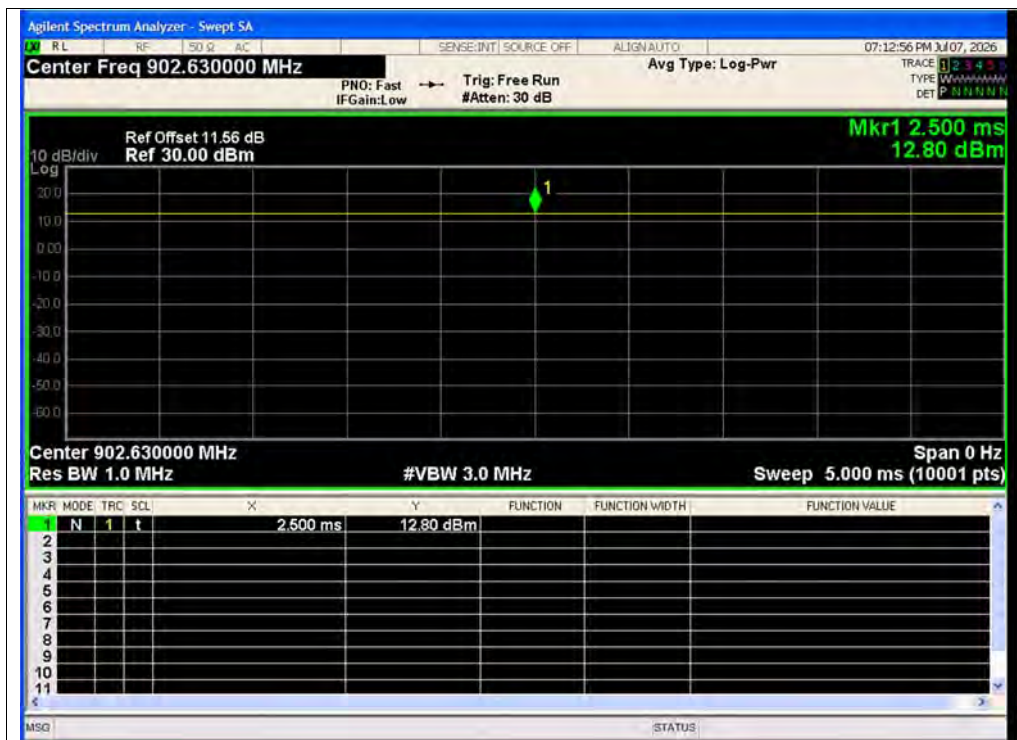
A.1. Number of Hopping Frequency

Condition	Mode	Antenna	Hopping Number	Limit	Verdict
NVNT	LoRa	Ant1	63	50	Pass

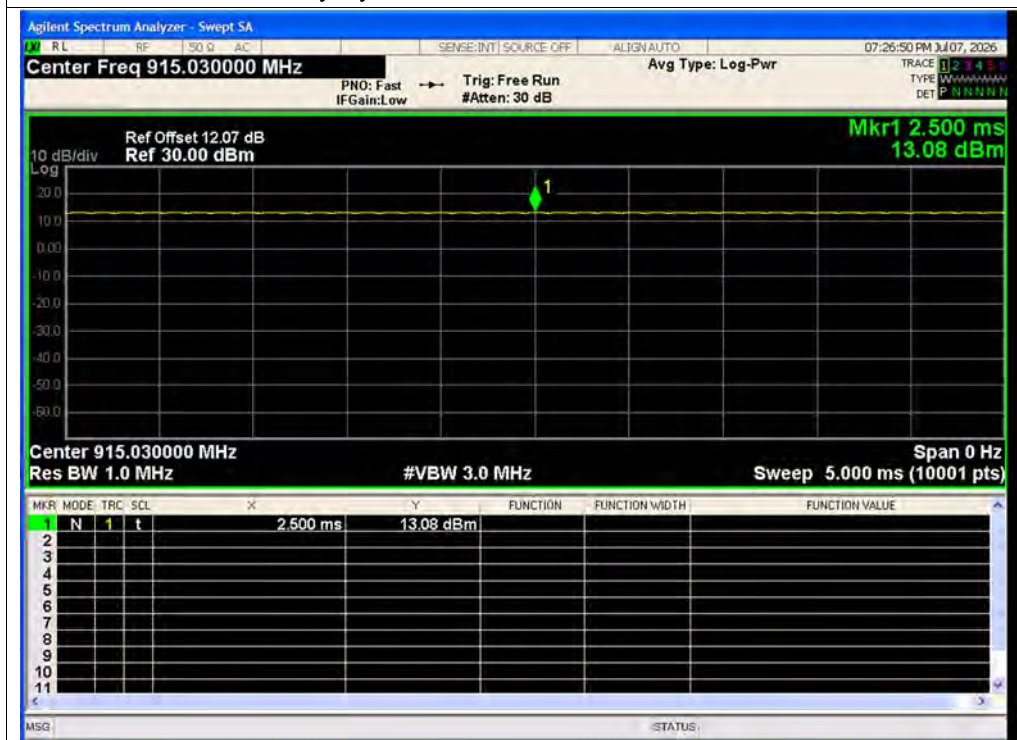


**A.2. Duty Cycle of Test Signal**

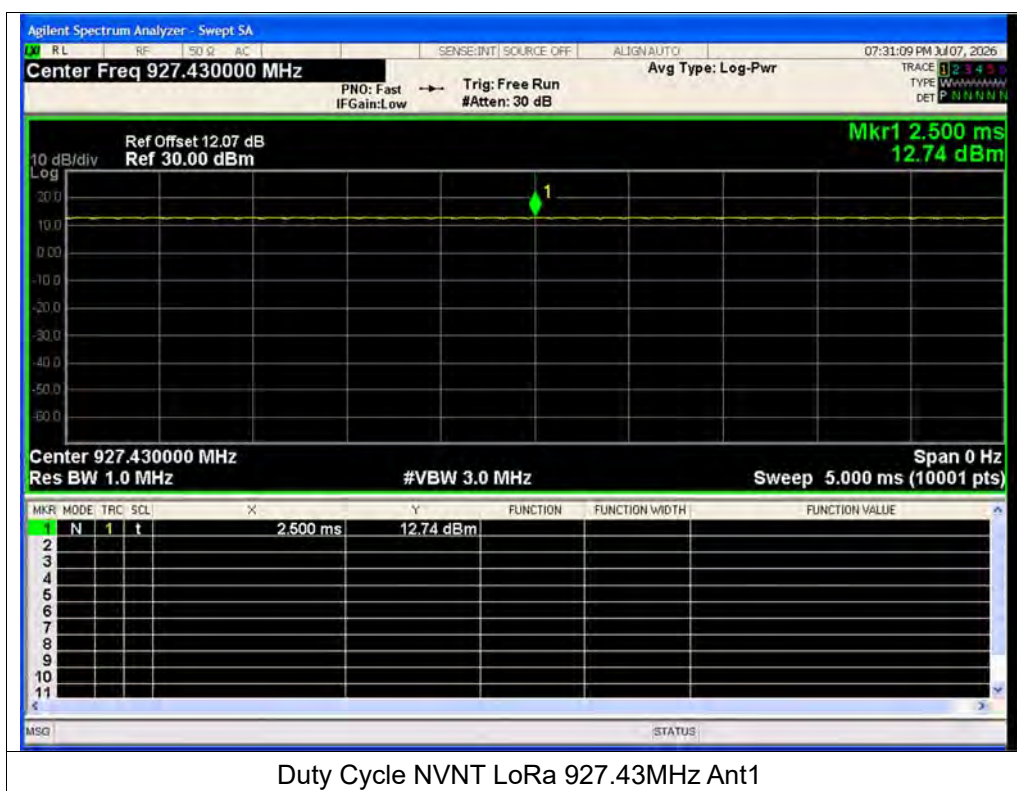
Condition	Mode	Frequency (MHz)	Antenna	Duty Cycle (%)	Correction Factor (dB)	1/T (kHz)
NVNT	LoRa	902.63	Ant1	100	0	0
NVNT	LoRa	915.03	Ant1	100	0	0
NVNT	LoRa	927.43	Ant1	100	0	0



Duty Cycle NVNT LoRa 902.63MHz Ant1



Duty Cycle NVNT LoRa 915.03MHz Ant1

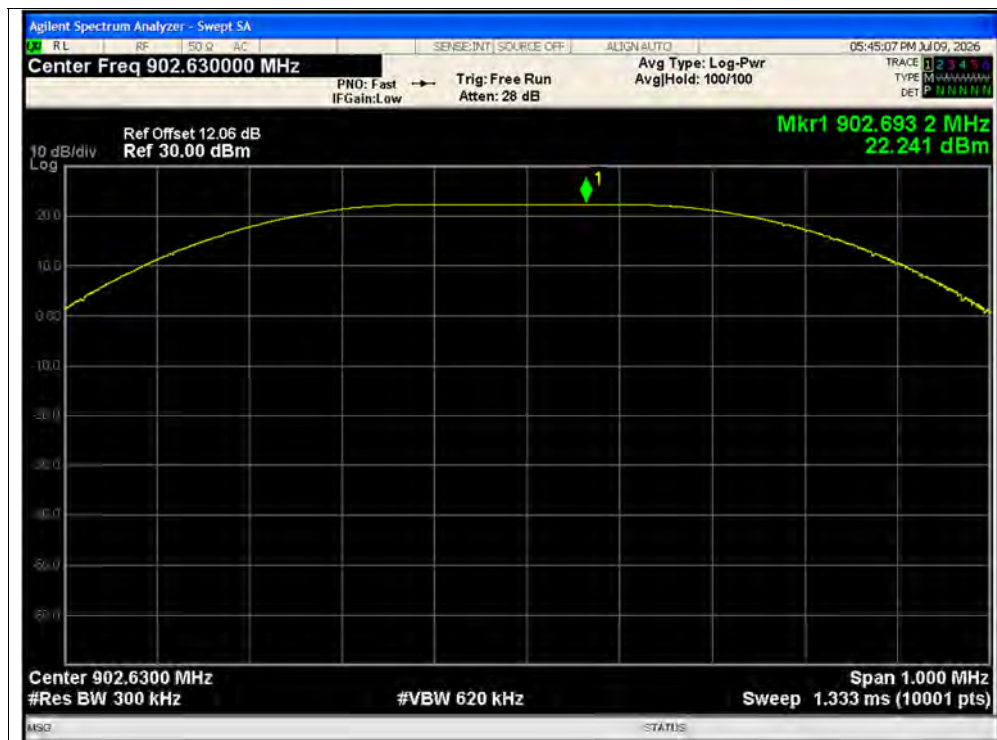




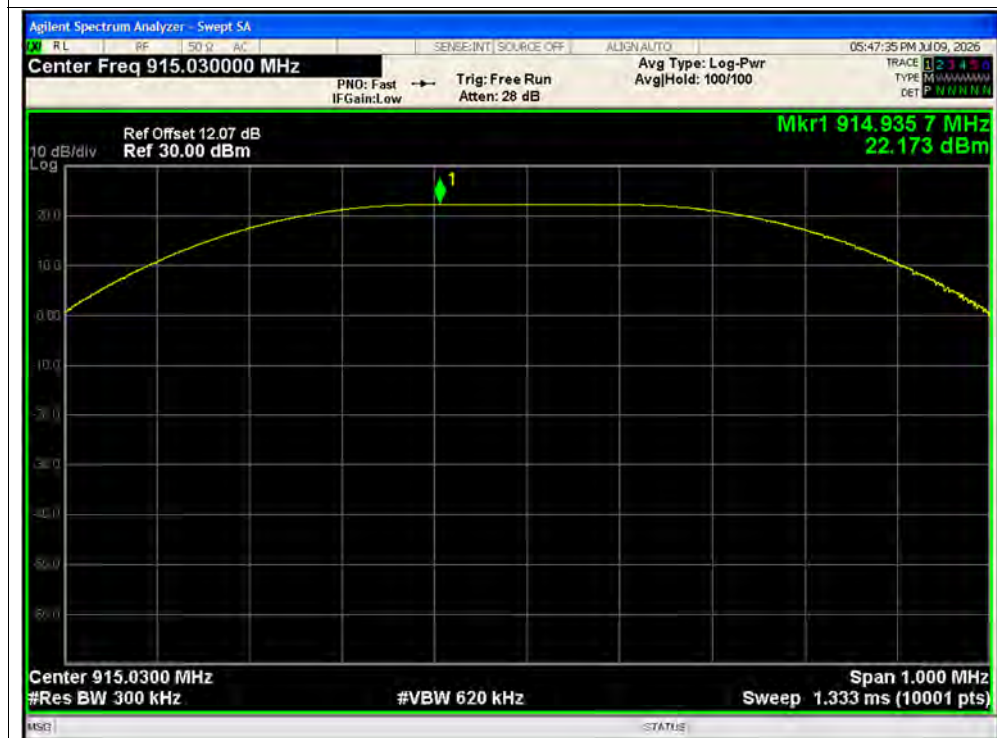
REPORT No.: SZ26050049W01

A.3. Maximum Peak Conducted Output Power

Condition	Mode	Frequency (MHz)	Antenna	Conducted Power (dBm)	Duty Factor (dB)	Total Conducted Power (dBm)	Total Conducted Power (W)	Limit Conducted (dBm)	Verdict
NVNT	LoRa	902.63	Ant1	22.24	0	22.24	0.16749	30	Pass
NVNT	LoRa	915.03	Ant1	22.17	0	22.17	0.16482	30	Pass
NVNT	LoRa	927.43	Ant1	22.01	0	22.01	0.15885	30	Pass



Peak Power NVNT LoRa 902.63MHz Ant1

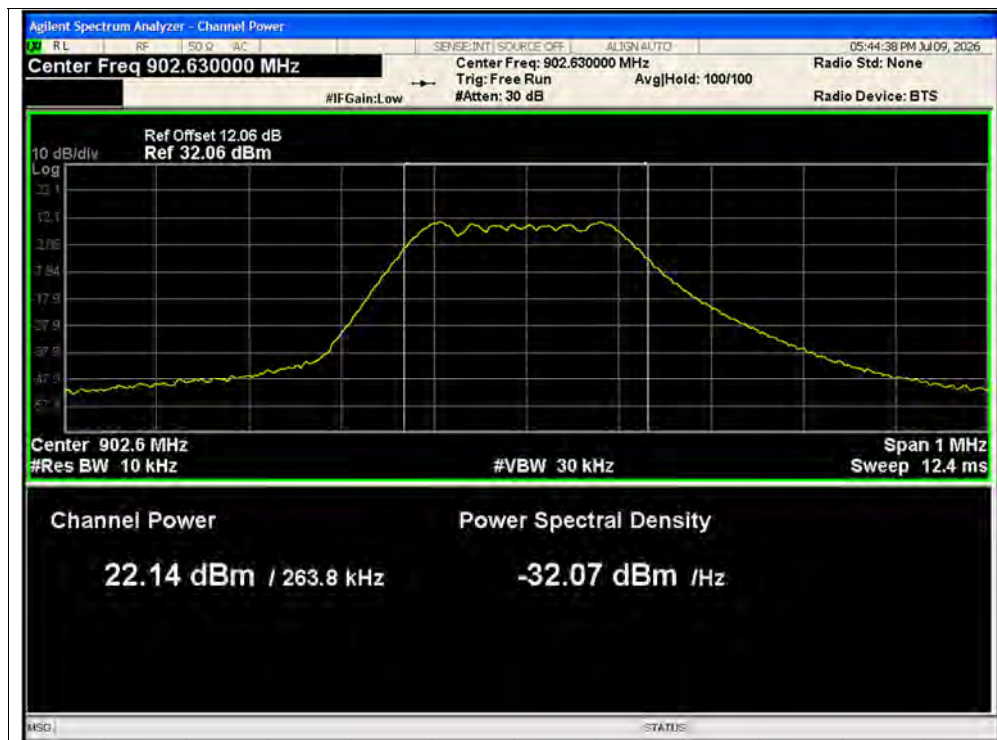


Peak Power NVNT LoRa 915.03MHz Ant1

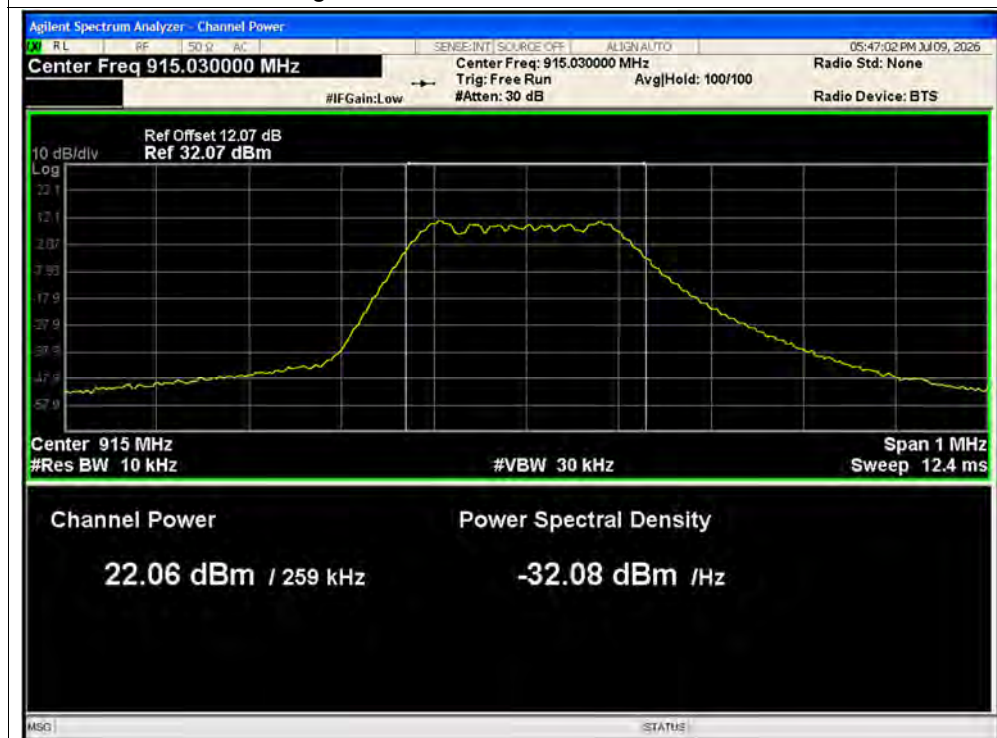


**A.4. Maximum Average Conducted Output Power**

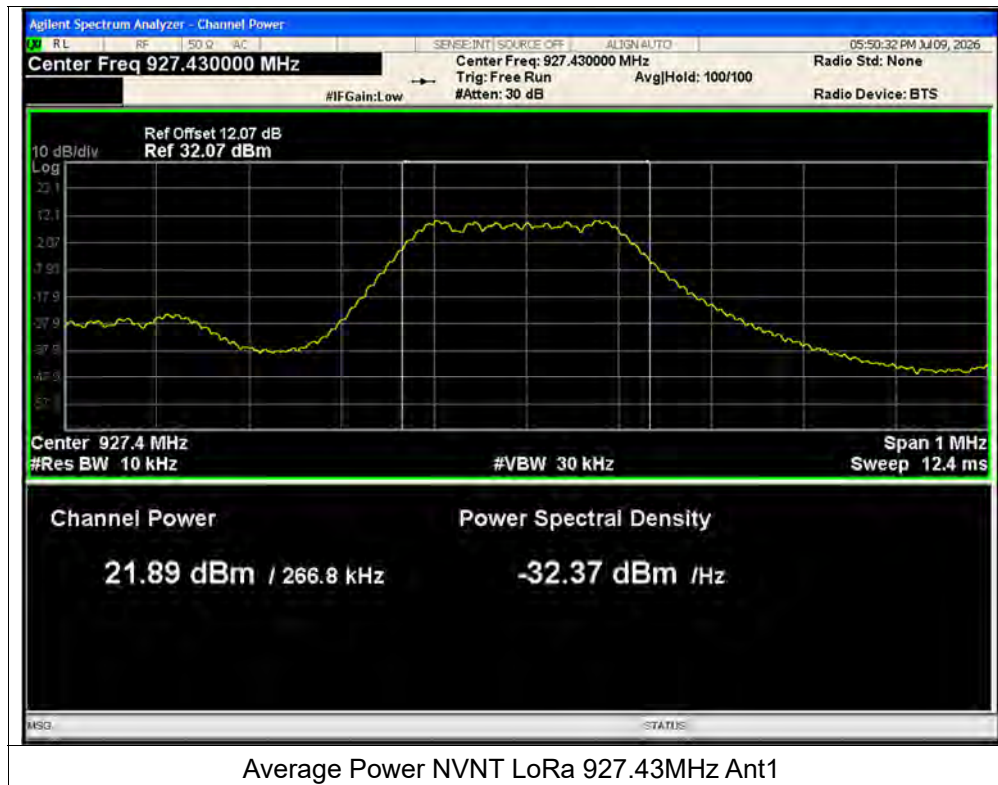
Condition	Mode	Frequency (MHz)	Antenna	Conducted Power (dBm)	Duty Factor (dB)	Total Conducted Power (dBm)	Total Conducted Power (W)	Limit Conducted (dBm)	Verdict
NVNT	LoRa	902.63	Ant1	22.14	0	22.14	0.16368	30	Pass
NVNT	LoRa	915.03	Ant1	22.06	0	22.06	0.16069	30	Pass
NVNT	LoRa	927.43	Ant1	21.89	0	21.89	0.15453	30	Pass



Average Power NVNT LoRa 902.63MHz Ant1



Average Power NVNT LoRa 915.03MHz Ant1



**A.5. 20 dB Bandwidth**

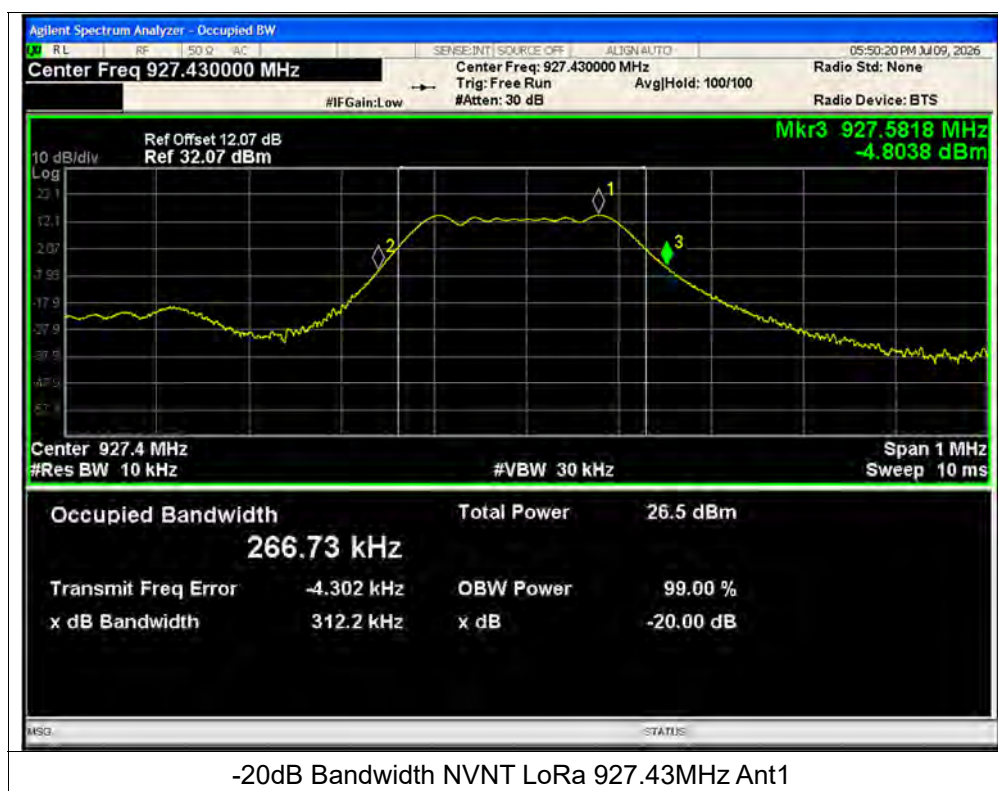
Condition	Mode	Frequency (MHz)	Antenna	-20 dB Bandwidth (MHz)	Limit -20 dB Bandwidth (MHz)	Verdict
NVNT	LoRa	902.63	Ant1	0.3082	0.5	Pass
NVNT	LoRa	915.03	Ant1	0.3004	0.5	Pass
NVNT	LoRa	927.43	Ant1	0.3122	0.5	Pass



-20dB Bandwidth NVNT LoRa 902.63MHz Ant1

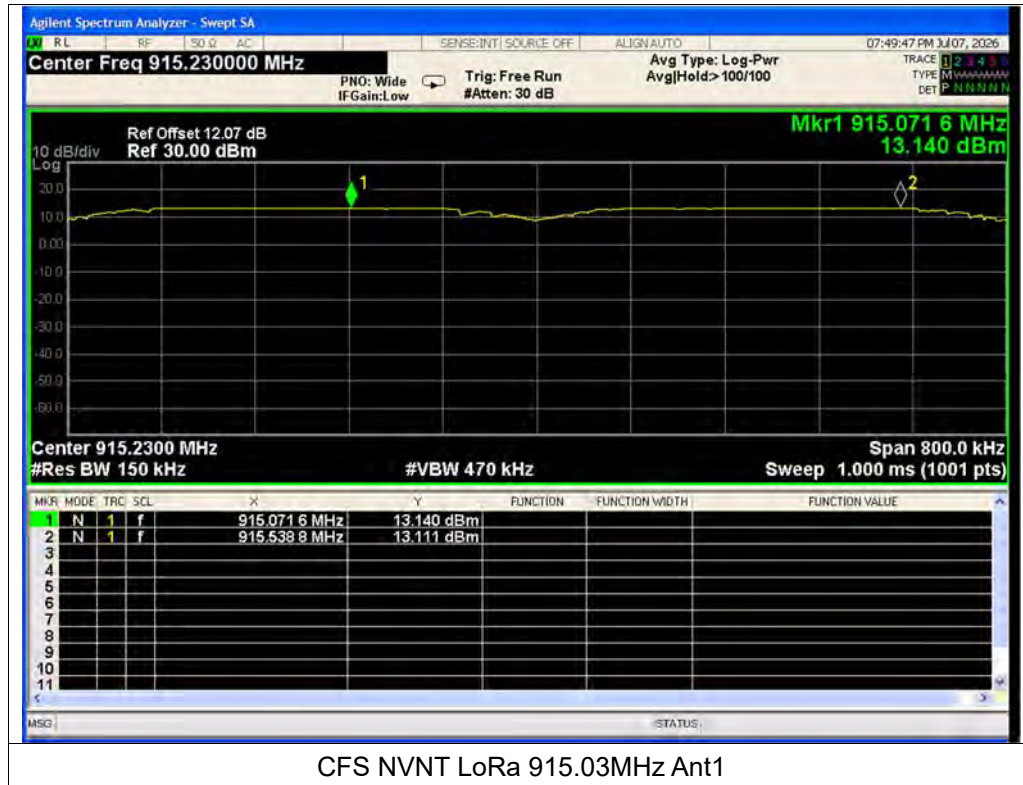


-20dB Bandwidth NVNT LoRa 915.03MHz Ant1



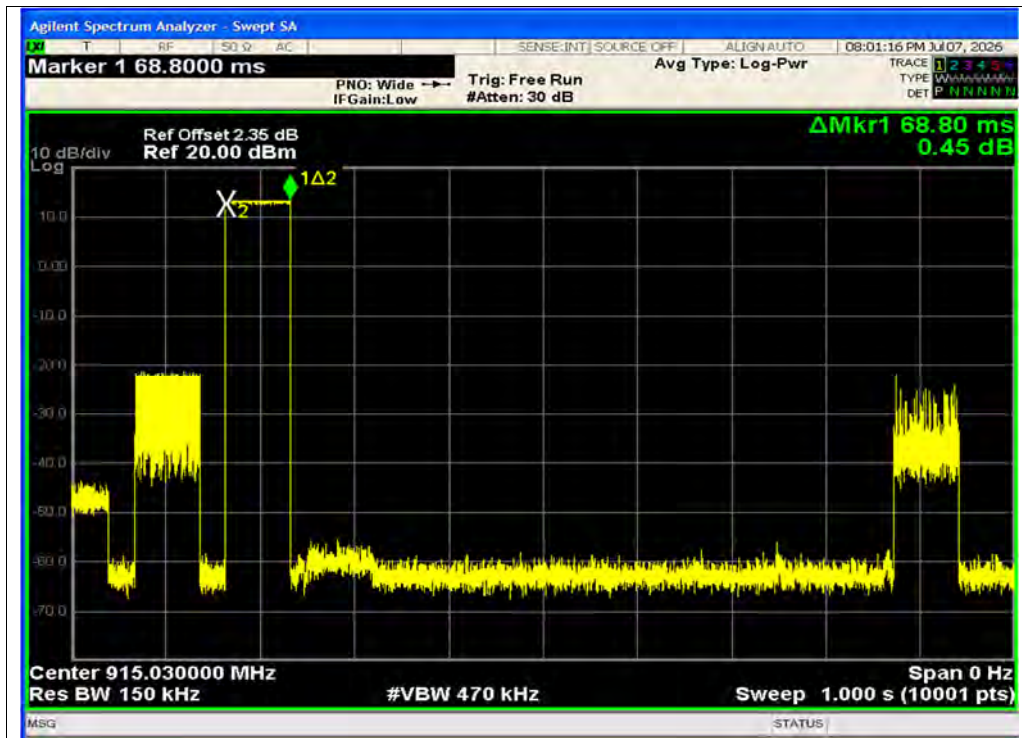
**A.6. Carried Frequency Separation**

Condition	Mode	Antenna	Hopping Freq1 (MHz)	Hopping Freq2 (MHz)	HFS (MHz)	Limit (MHz)	Verdict
NVNT	LoRa	Ant1	915.0716	915.5388	0.4672	0.3122	Pass

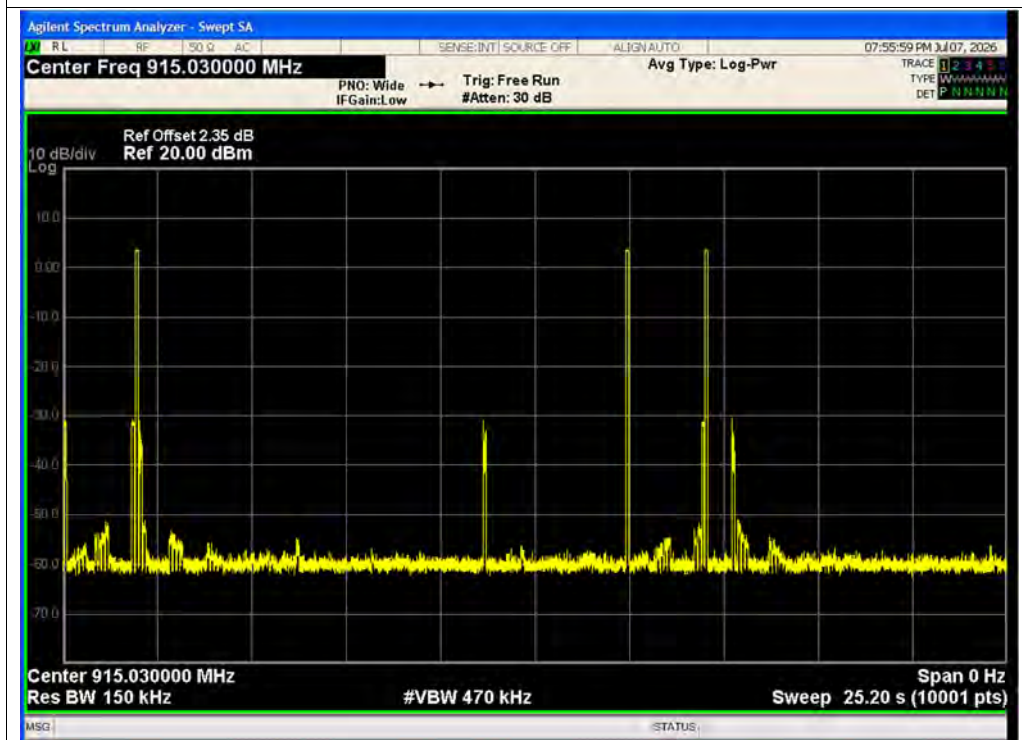


**A.7. Time of Occupancy (Dwell time)**

Condition	Mode	Frequency (MHz)	Antenna	Pulse Time (ms)	Total Dwell Time (ms)	Burst Count	Period Time (ms)	Limit (ms)	Verdict
NVNT	LoRa	915.03	Ant1	68.8	206.4	3	25200	400	Pass



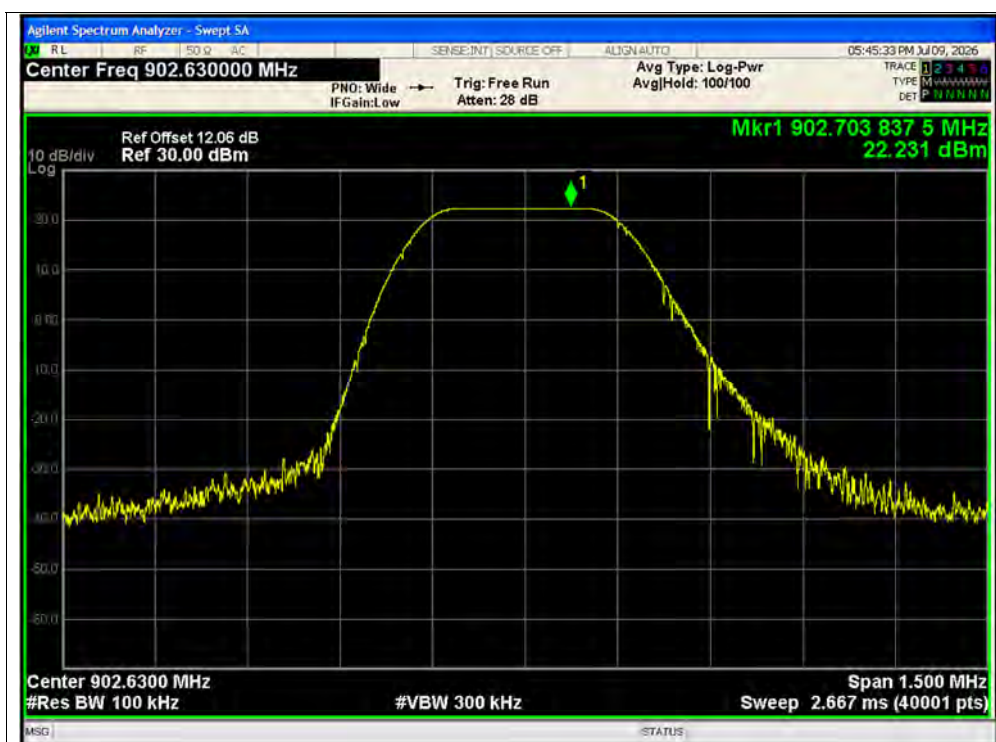
Dwell NVNT LoRa 915.03MHz Ant1 One Burst



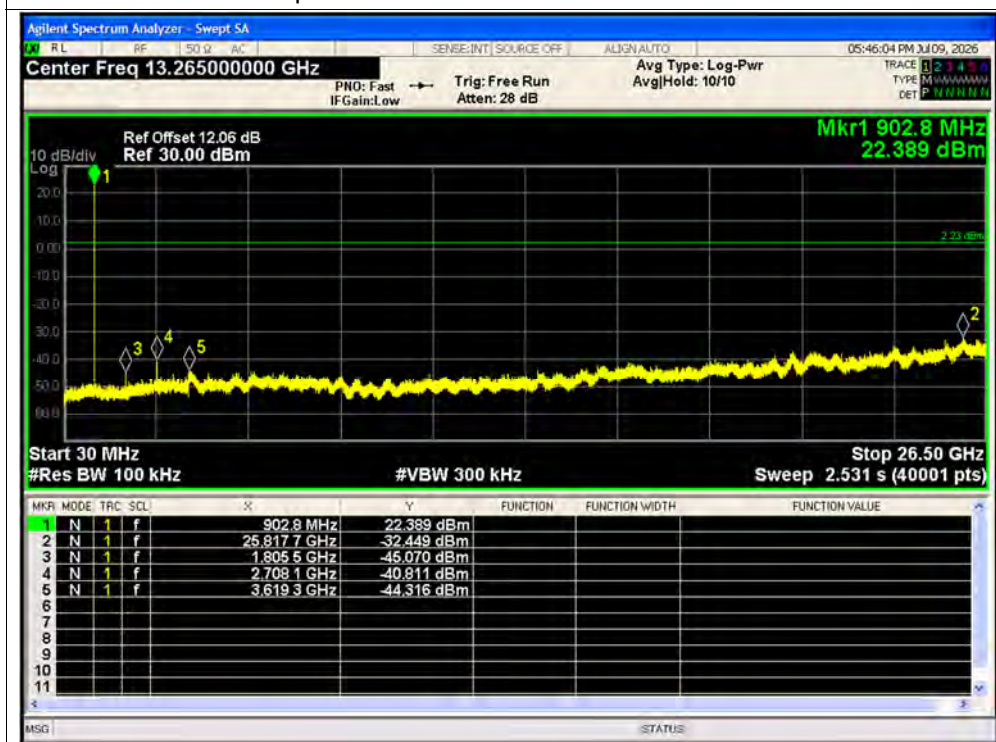
Dwell NVNT LoRa 915.03MHz Ant1 Accumulated

**A.8. Conducted Spurious Emissions**

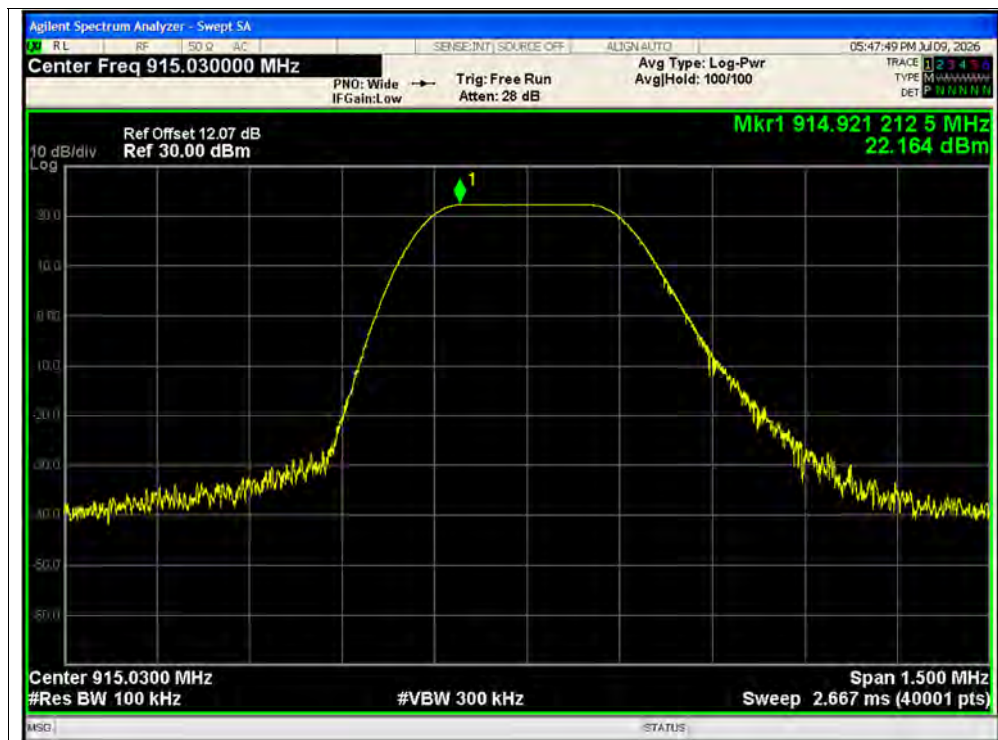
Condition	Mode	Frequency (MHz)	Antenna	Max Value (dBc)	Limit (dBc)	Verdict
NVNT	LoRa	902.63	Ant1	-54.67	-20	Pass
NVNT	LoRa	915.03	Ant1	-53.92	-20	Pass
NVNT	LoRa	927.43	Ant1	-54.44	-20	Pass



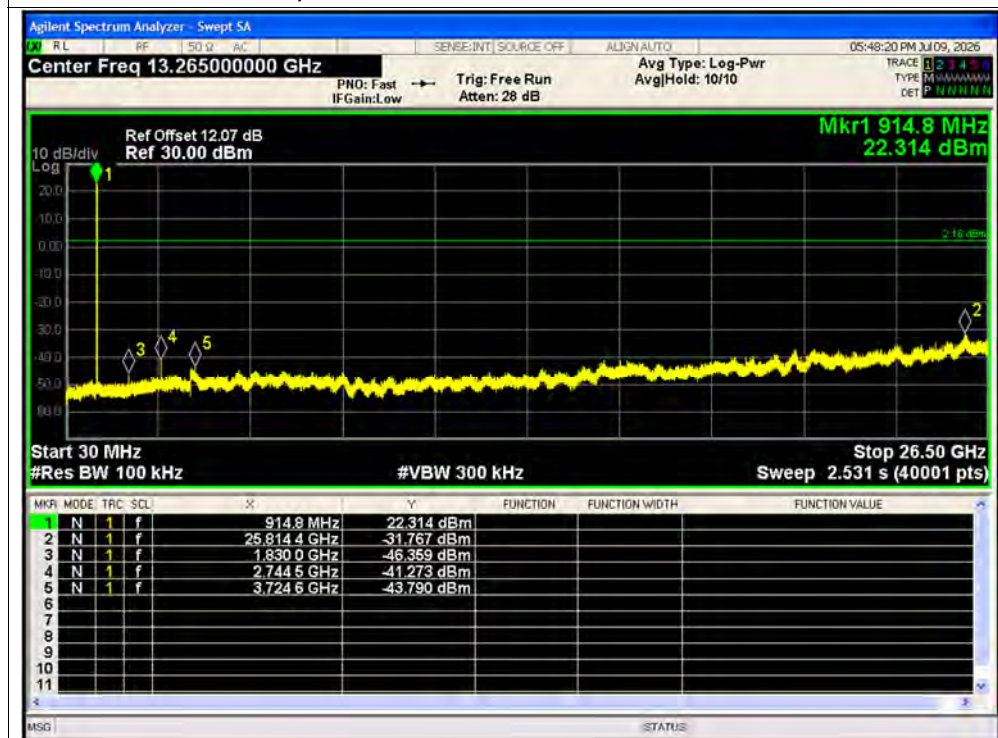
Tx. Spurious NVNT LoRa 902.63MHz Ant1 Ref



Tx. Spurious NVNT LoRa 902.63MHz Ant1 Emission



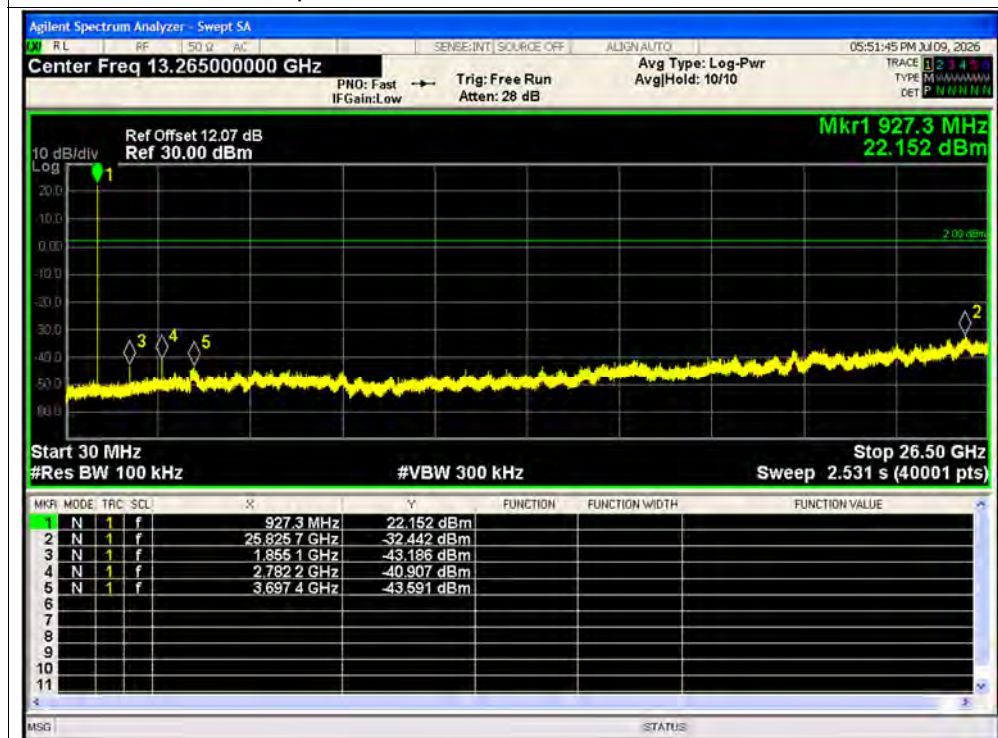
Tx. Spurious NVNT LoRa 915.03MHz Ant1 Ref



Tx. Spurious NVNT LoRa 915.03MHz Ant1 Emission



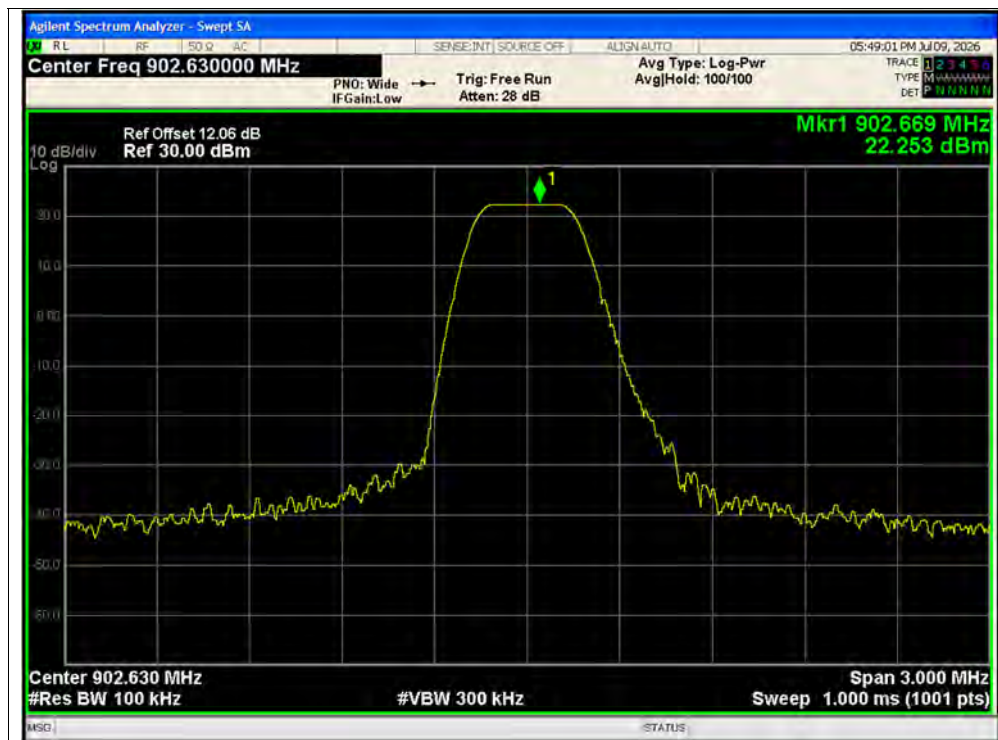
Tx. Spurious NVNT LoRa 927.43MHz Ant1 Ref



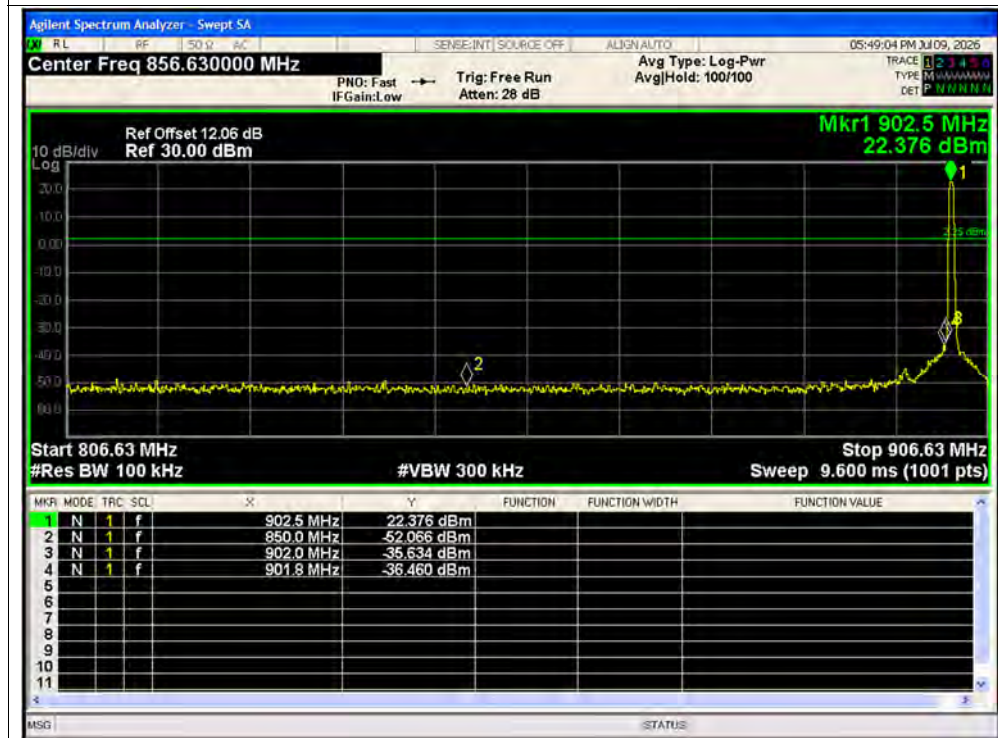
Tx. Spurious NVNT LoRa 927.43MHz Ant1 Emission

**A.9. Band Edge**

Condition	Mode	Frequency (MHz)	Antenna	Hopping Mode	Max Value (dBc)	Limit (dBc)	Verdict
NVNT	LoRa	902.63	Ant1	No-Hopping	-58.71	-20	Pass
NVNT	LoRa	927.43	Ant1	No-Hopping	-31.55	-20	Pass
NVNT	LoRa	902.63	Ant1	Hopping	-61.68	-20	Pass
NVNT	LoRa	927.43	Ant1	Hopping	-31.38	-20	Pass



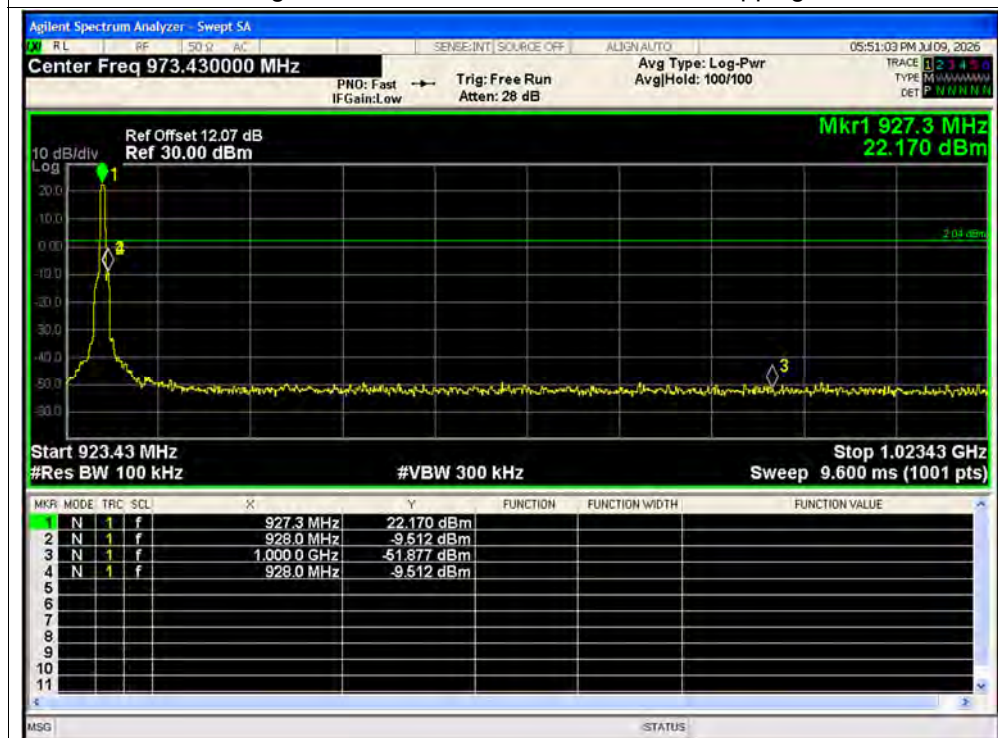
Band Edge NVNT LoRa 902.63MHz Ant1 No-Hopping Ref



Band Edge NVNT LoRa 902.63MHz Ant1 No-Hopping Emission



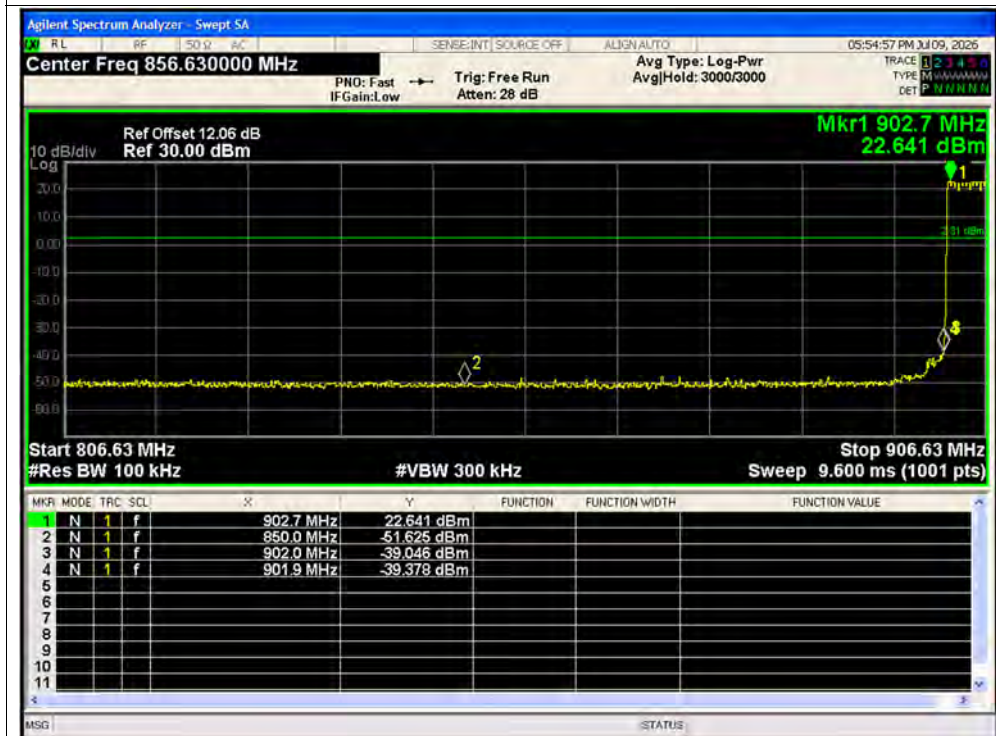
Band Edge NVNT LoRa 927.43MHz Ant1 No-Hopping Ref



Band Edge NVNT LoRa 927.43MHz Ant1 No-Hopping Emission



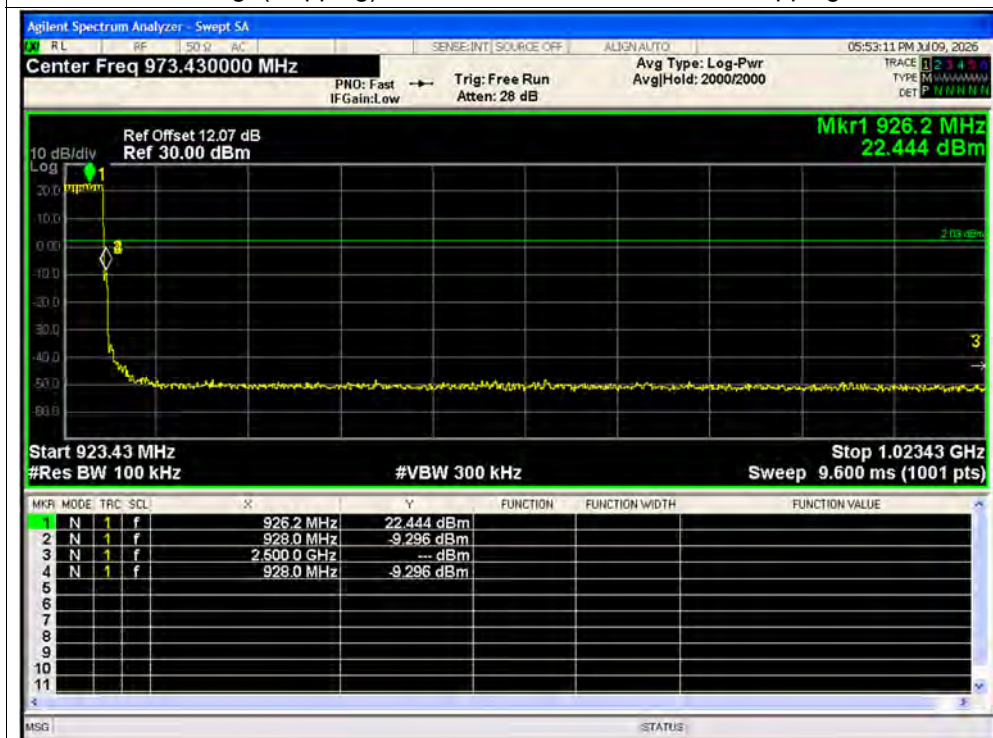
Band Edge(Hopping) NVNT LoRa 902.63MHz Ant1 Hopping Ref



Band Edge(Hopping) NVNT LoRa 902.63MHz Ant1 Hopping Emission



Band Edge(Hopping) NVNT LoRa 927.43MHz Ant1 Hopping Ref



Band Edge(Hopping) NVNT LoRa 927.43MHz Ant1 Hopping Emission



A.10. Conducted Emission

The maximum conducted interference is searched using Peak (PK), if the emission levels more than the AV and QP limits, and that have narrow margins from the AV and QP limits will be re-measured with AV and QP detectors. Tests for both L phase and N phase lines of the power mains connected to the EUT are performed. Set RBW=9kHz, VBW=30kHz. Refer to recorded points and plots below.

Note: Both of the test voltage AC 120V/60Hz and AC 230V/50Hz were considered and tested respectively, only the results of the worst case AC 120V/60Hz were recorded in this report.

A. Test Setup:

Test Mode: EUT+Antenna+Notebook+Notebook adapter+Serial port board+LoRa TX

Test voltage: AC 120V/60Hz

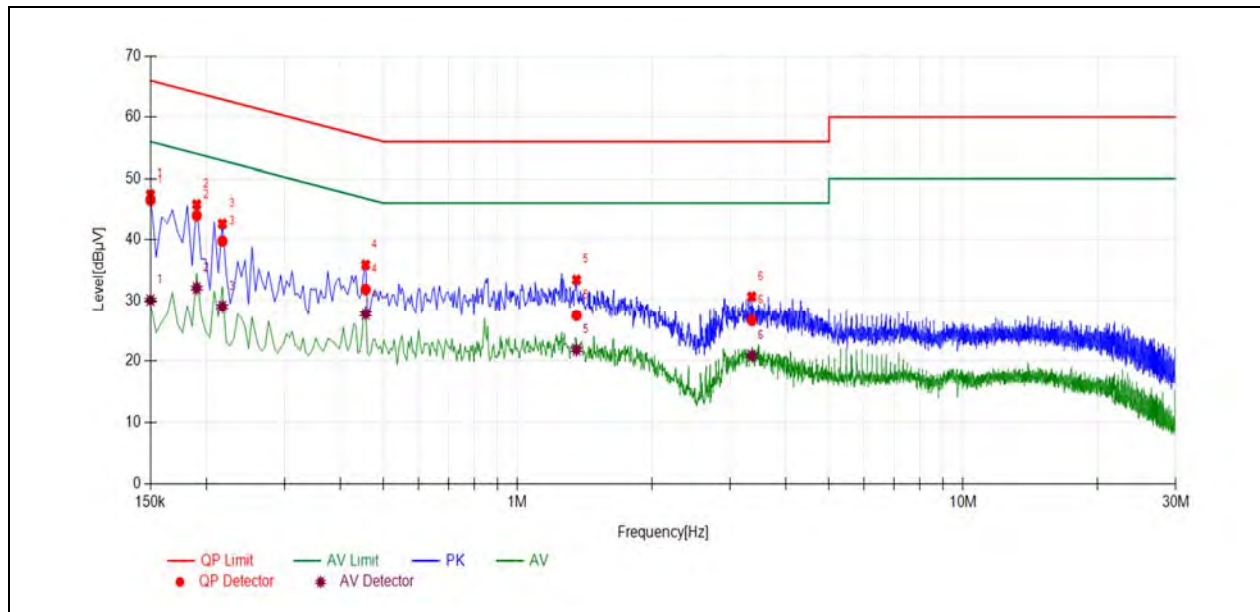
The measurement results are obtained as below:

$$E \text{ [dB}\mu\text{V]} = U_R + L_{\text{Cable loss [dB]} + A_{\text{Factor}}$$

U_R : Receiver Reading

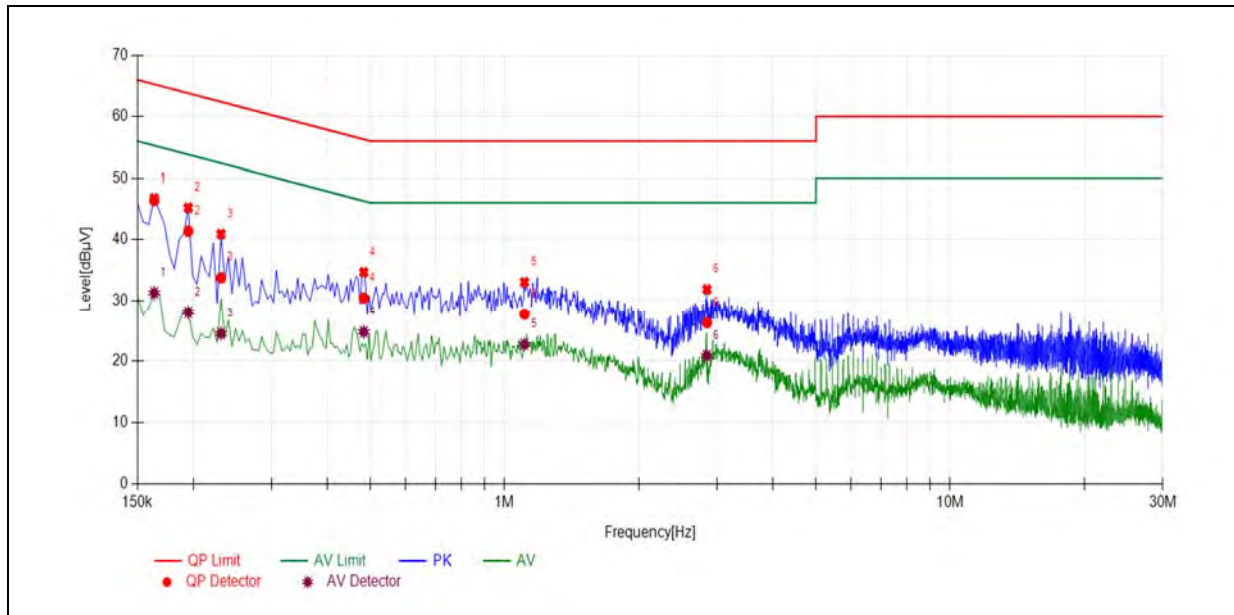
A_{Factor} : Voltage division factor of LISN

B. Test Plot:



(L Phase)

No.	Fre. (MHz)	Emission Level (dBμV)		Limit (dBμV)		Power-line	Verdict
		Quai-peak	Average	Quai-peak	Average		
1	0.1500	46.49	30.08	66.00	56.00	Line	PASS
2	0.1905	43.98	32.08	64.01	54.01		PASS
3	0.2175	39.77	28.98	62.91	52.91		PASS
4	0.4560	31.84	27.72	56.76	46.76		PASS
5	1.3561	27.51	21.84	56.00	46.00		PASS
6	3.3540	26.66	20.86	56.00	46.00		PASS



(N Phase)

No.	Fre. (MHz)	Emission Level (dBμV)		Limit (dBμV)		Power-line	Verdict
		Quai-peak	Average	Quai-peak	Average		
1	0.1635	46.39	31.27	65.28	55.28	Neutral	PASS
2	0.1950	41.38	28.05	63.82	53.82		PASS
3	0.2310	33.75	24.51	62.41	52.41		PASS
4	0.4830	30.42	24.77	56.29	46.29		PASS
5	1.1084	27.74	22.72	56.00	46.00		PASS
6	2.8456	26.31	20.88	56.00	46.00		PASS



A.11. Radiated Emission

According to ANSI C63.10, because of peak detection will yield amplitudes equal to or greater than amplitudes measured with the quasi-peak (or average) detector, the measurement data from a spectrum analyzer peak detector will represent the worst-case results, if the peak measured value complies with the quasi-peak (or average) limit, it is unnecessary to perform an quasi-peak measurement (or average).

The measurement results are obtained as below:

$$E [\text{dB}\mu\text{V/m}] = U_R + A_T + A_{\text{Factor}} [\text{dB}]; A_T = L_{\text{Cable loss}} [\text{dB}] - G_{\text{preamp}} [\text{dB}]$$

A_T : Total correction Factor except Antenna

U_R : Receiver Reading

G_{preamp} : Preamplifier Gain

A_{Factor} : Antenna Factor at 3m

During the test, the total correction Factor A_T and A_{Factor} were built in test software.

Note1: All radiated emission tests were performed in X, Y, Z axis direction. And only the worst axis test condition was recorded in this test report.

Note2: For the frequency, which started from 9kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit was not recorded.

Note3: For the frequency, which started from 18GHz to 10th harmonic of the highest frequency, was pre-scanned and the result which was 20dB lower than the limit was not recorded.

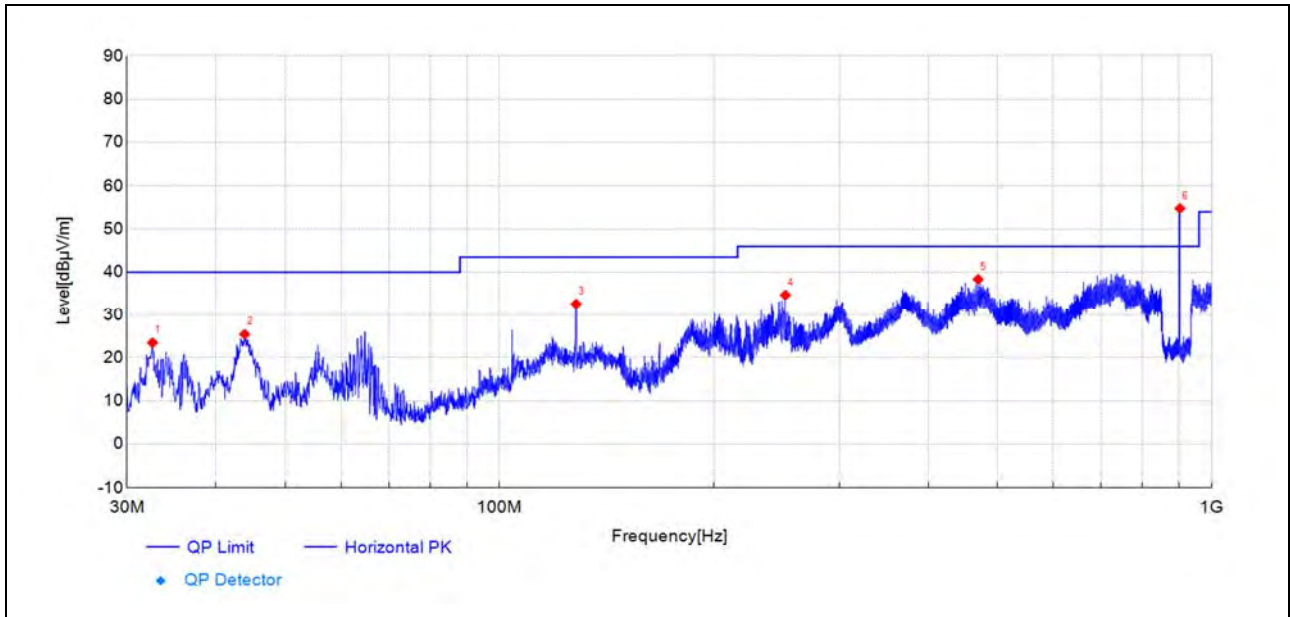
Field strength of fundamental:

Frequency [MHz]	Reading [dB μ V]	Level [dB μ V/m]	Factor [dB/m]	Detector	Polarity
927.32	85.6	113.64	28.010	PK	Horizontal

The field strength(the lowest) of fundamental is more than 20dB higher than the unwanted emissions, in accordance with FCC part 15.215(b).

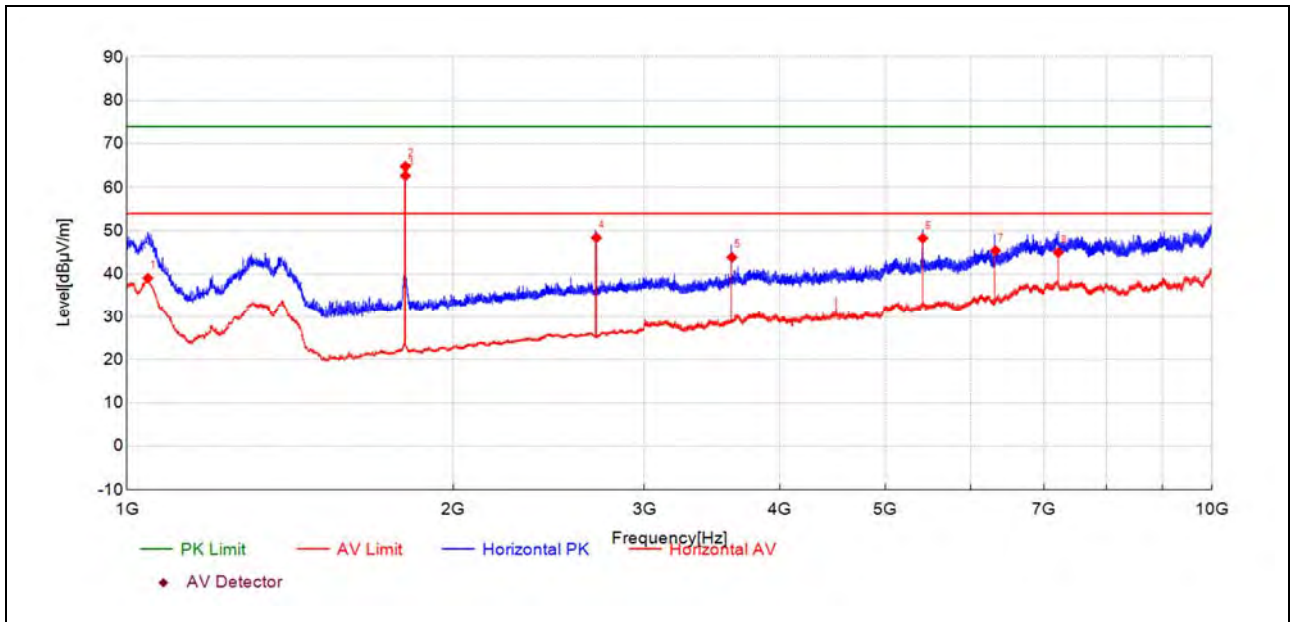


Plot for Channel 0



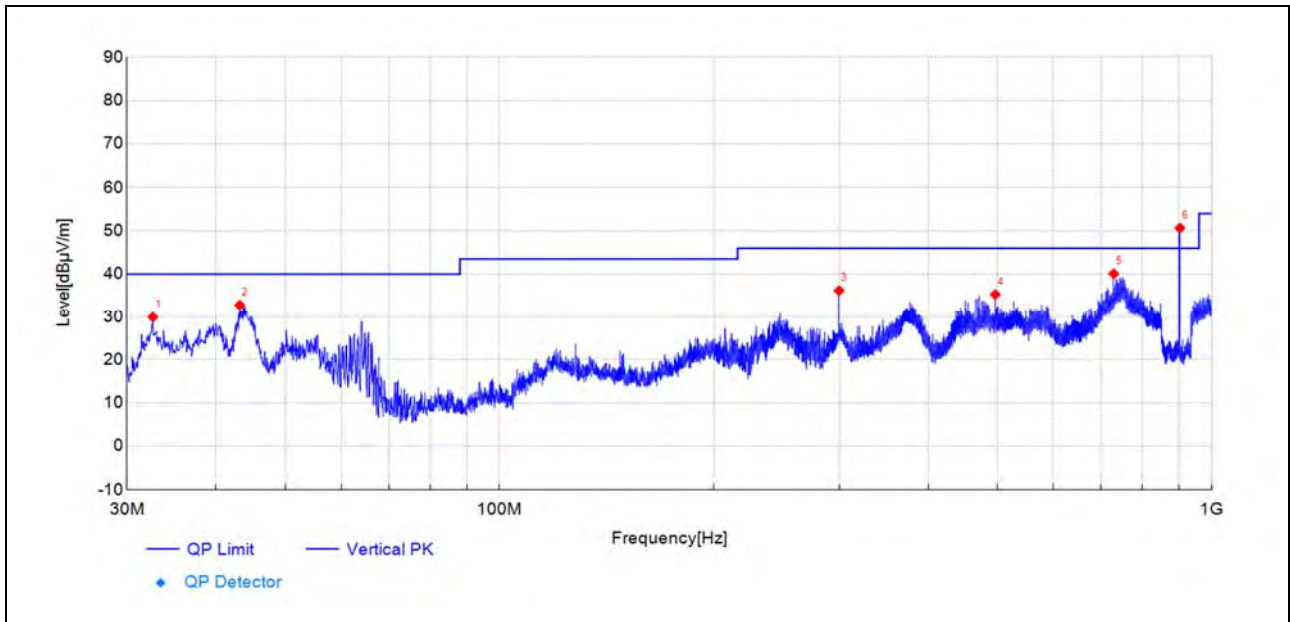
(Antenna Horizontal, 30MHz to 1GHz)

Frequency [MHz]	Reading [dBμV]	Level [dBμV/m]	Factor [dB/m]	Limit [dBμV/m]	Margin [dB]	Angle [°]	Detector	Polarity	Verdict
32.57	53.8	23.46	-30.380	40.00	16.54	290	PK	Horizontal	PASS
43.87	53.2	25.40	-27.840	40.00	14.60	46	PK	Horizontal	PASS
128.12	64.3	32.58	-31.670	43.50	10.92	101	PK	Horizontal	PASS
252.00	61.7	34.66	-27.070	46.00	11.34	351	PK	Horizontal	PASS
469.97	59.3	38.33	-21.000	46.00	7.67	101	PK	Horizontal	PASS
902.51	66.7	54.80	-11.870	-	-	96	PK	Horizontal	NA



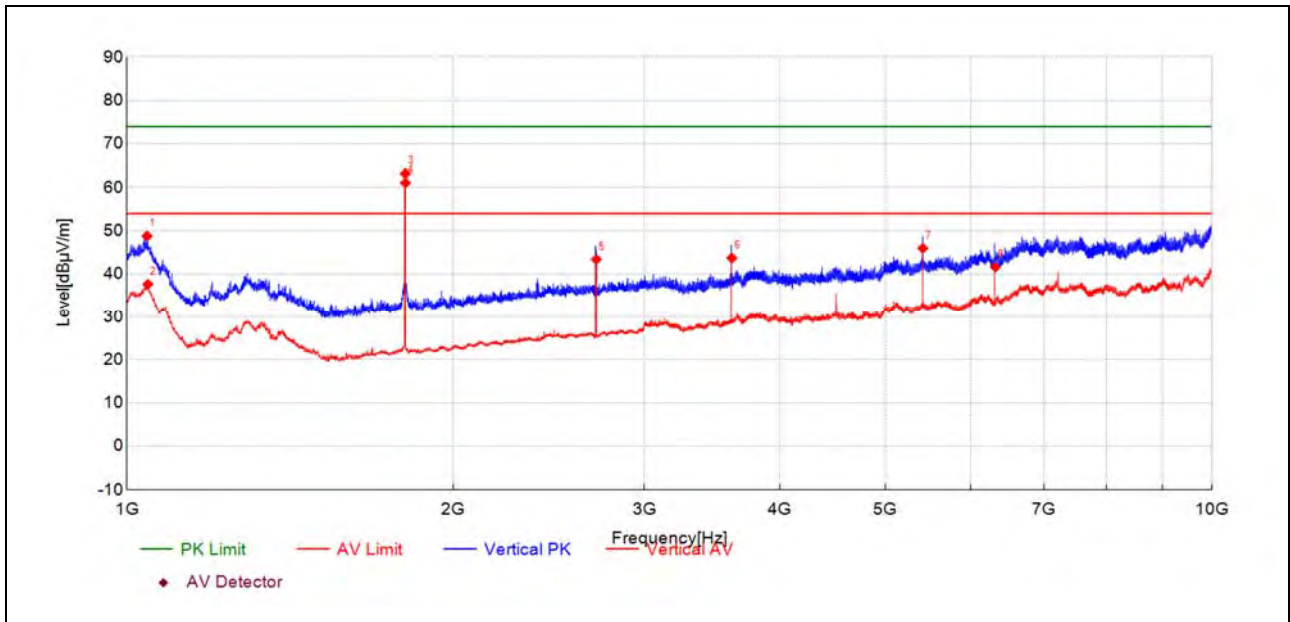
(Antenna Horizontal, 1GHz to 10GHz)

Frequency [MHz]	Reading [dBμV]	Level [dBμV/m]	Factor [dB/m]	Limit [dBμV/m]	Margin [dB]	Angle [°]	Detector	Polarity	Verdict
1045.21	59.0	39.07	-19.930	54.00	14.93	280	AV	Horizontal	PASS
1805.36	83.3	64.79	-18.510	-	-	111	PK	Horizontal	NA
1805.76	81.3	62.77	-18.510	-	-	111	AV	Horizontal	NA
2708.34	61.7	48.42	-13.280	54.00	5.58	89	AV	Horizontal	PASS
3611.37	52.9	43.90	-9.030	54.00	10.10	179	AV	Horizontal	PASS
5415.63	50.0	48.28	-1.760	54.00	5.72	58	AV	Horizontal	PASS
6318.69	44.6	45.45	0.840	54.00	8.55	9	AV	Horizontal	PASS
7220.81	40.2	45.00	4.800	54.00	9.00	356	AV	Horizontal	PASS



(Antenna Vertical, 30MHz to 1GHz)

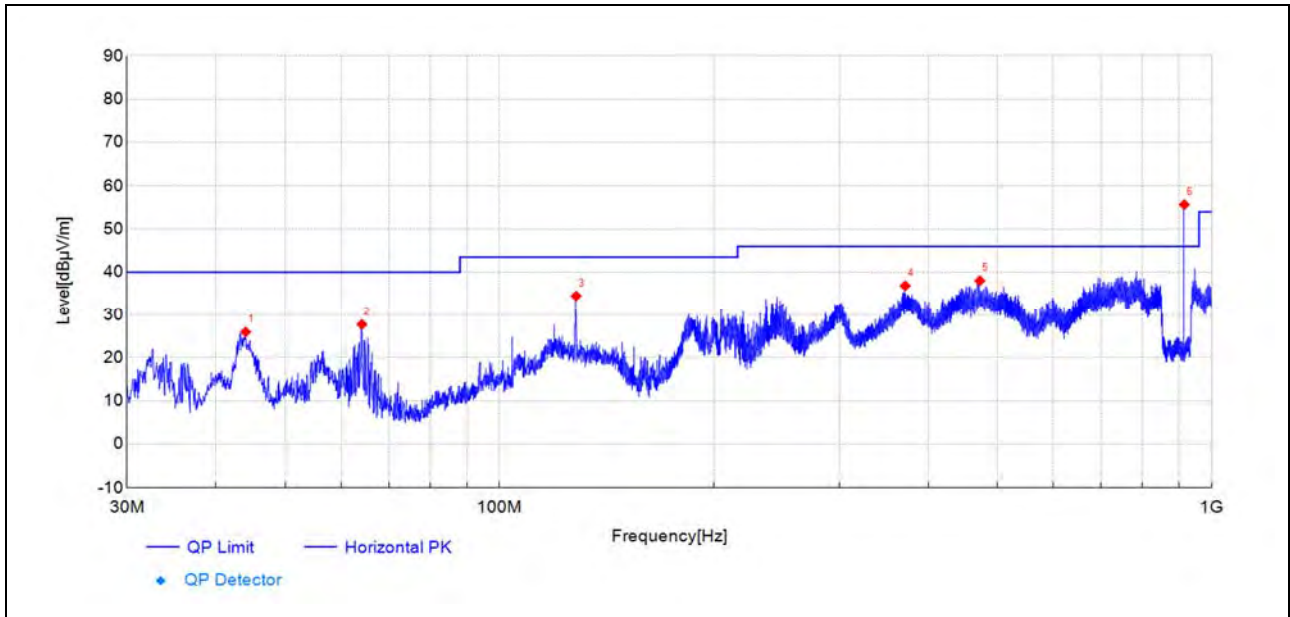
Frequency [MHz]	Reading [dBμV]	Level [dBμV/m]	Factor [dB/m]	Limit [dBμV/m]	Margin [dB]	Angle [°]	Detector	Polarity	Verdict
32.62	60.3	29.90	-30.380	40.00	10.10	359	PK	Vertical	PASS
43.19	60.8	32.79	-27.980	40.00	7.21	322	PK	Vertical	PASS
299.72	61.5	36.18	-25.310	46.00	9.82	66	PK	Vertical	PASS
496.79	55.5	35.27	-20.210	46.00	10.73	86	PK	Vertical	PASS
728.73	55.2	40.09	-15.060	46.00	5.91	153	PK	Vertical	PASS
902.51	62.5	50.65	-11.870	-	-	56	PK	Vertical	NA



(Antenna Vertical, 1GHz to 10GHz)

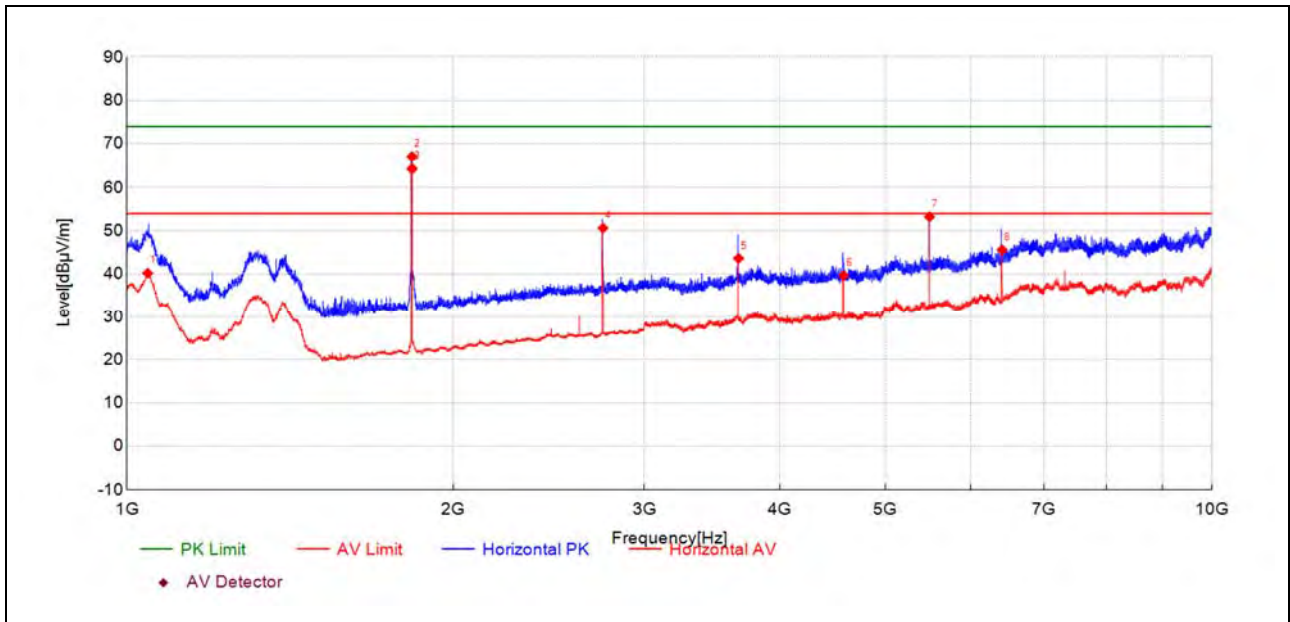
Frequency [MHz]	Reading [dBμV]	Level [dBμV/m]	Factor [dB/m]	Limit [dBμV/m]	Margin [dB]	Angle [°]	Detector	Polarity	Verdict
1043.21	68.7	48.81	-19.920	74.00	25.19	159	PK	Vertical	PASS
1045.21	57.6	37.65	-19.930	54.00	16.35	164	AV	Vertical	PASS
1805.36	81.7	63.21	-18.510	-	-	230	PK	Vertical	NA
1805.76	79.6	61.10	-18.510	-	-	230	AV	Vertical	NA
2708.34	56.7	43.41	-13.280	54.00	10.59	181	AV	Vertical	PASS
3610.91	52.8	43.74	-9.030	54.00	10.26	131	AV	Vertical	PASS
5416.09	47.7	45.98	-1.760	54.00	8.02	73	AV	Vertical	PASS
6318.22	40.8	41.64	0.820	54.00	12.36	114	AV	Vertical	PASS

Plot for Channel 31



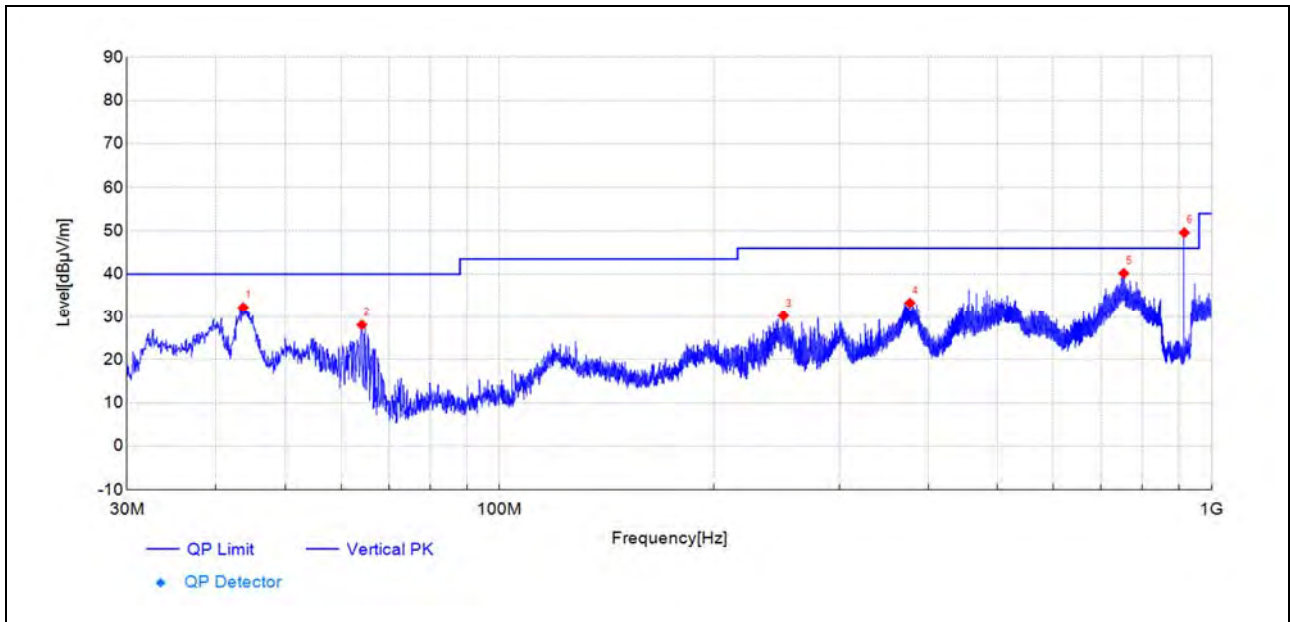
(Antenna Horizontal, 30MHz to 1GHz)

Frequency [MHz]	Reading [dBμV]	Level [dBμV/m]	Factor [dB/m]	Limit [dBμV/m]	Margin [dB]	Angle [°]	Detector	Polarity	Verdict
44.02	53.8	25.95	-27.810	40.00	14.05	0	PK	Horizontal	PASS
64.10	56.8	27.71	-29.120	40.00	12.29	106	PK	Horizontal	PASS
128.12	66.1	34.44	-31.670	43.50	9.06	86	PK	Horizontal	PASS
371.21	59.5	36.81	-22.670	46.00	9.19	111	PK	Horizontal	PASS
472.63	58.9	38.00	-20.900	46.00	8.00	96	PK	Horizontal	PASS
915.31	68.1	55.69	-12.370	-	-	270	PK	Horizontal	NA



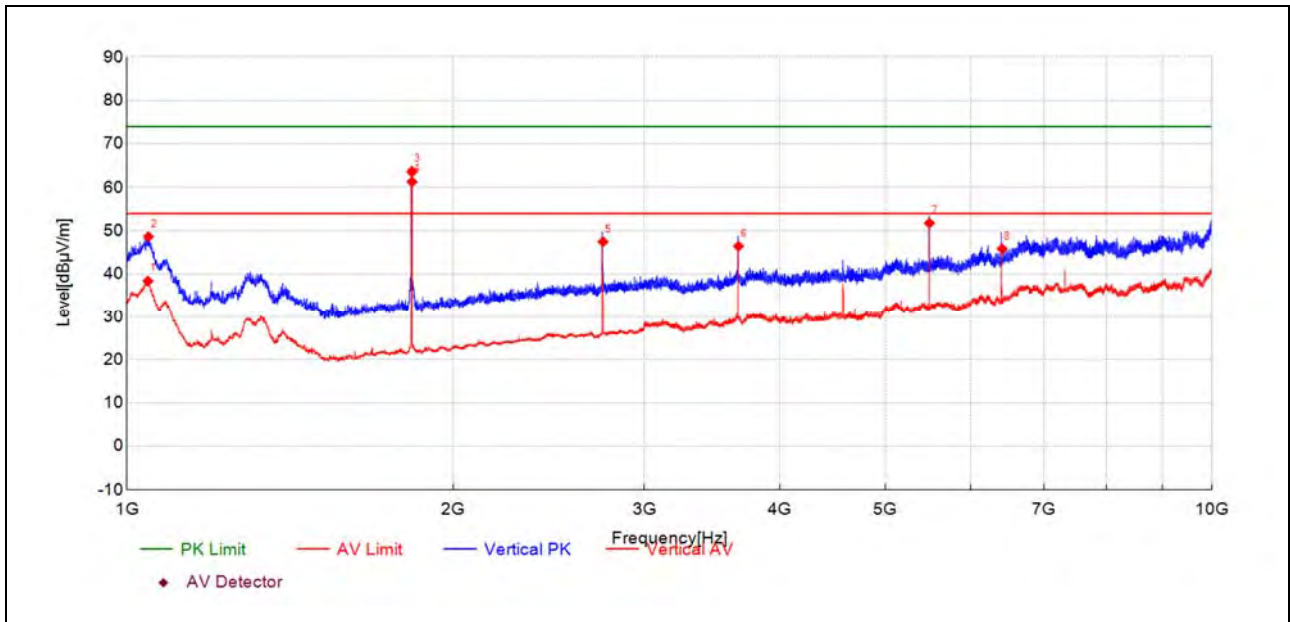
(Antenna Horizontal, 1GHz to 10GHz)

Frequency [MHz]	Reading [dBμV]	Level [dBμV/m]	Factor [dB/m]	Limit [dBμV/m]	Margin [dB]	Angle [°]	Detector	Polarity	Verdict
1044.81	60.2	40.24	-19.930	54.00	13.76	279	AV	Horizontal	PASS
1830.97	85.4	67.02	-18.380	-	-	109	PK	Horizontal	NA
1831.37	82.7	64.31	-18.380	-	-	109	AV	Horizontal	NA
2746.35	63.4	50.65	-12.770	54.00	3.35	329	AV	Horizontal	PASS
3662.24	52.6	43.64	-8.910	54.00	10.36	179	AV	Horizontal	PASS
4577.91	46.3	39.65	-6.610	54.00	14.35	58	AV	Horizontal	PASS
5492.63	55.2	53.25	-1.990	-	-	171	AV	Horizontal	NA
6408.29	44.6	45.64	1.090	54.00	8.36	18	AV	Horizontal	PASS



(Antenna Vertical, 30MHz to 1GHz)

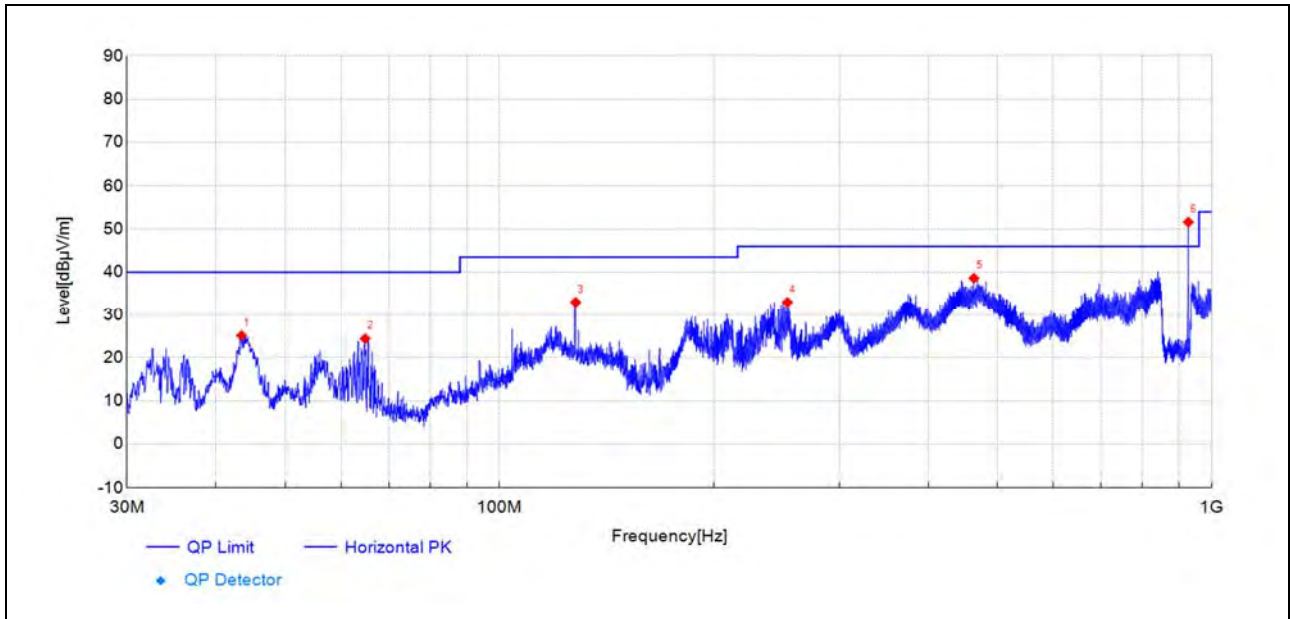
Frequency [MHz]	Reading [dBμV]	Level [dBμV/m]	Factor [dB/m]	Limit [dBμV/m]	Margin [dB]	Angle [°]	Detector	Polarity	Verdict
43.68	60.1	32.21	-27.870	40.00	7.79	357	PK	Vertical	PASS
64.10	57.2	28.07	-29.120	40.00	11.93	188	PK	Vertical	PASS
250.40	57.4	30.21	-27.150	46.00	15.79	271	PK	Vertical	PASS
376.89	56.4	33.28	-23.080	46.00	12.72	9	PK	Vertical	PASS
752.59	54.9	40.19	-14.670	46.00	5.81	157	PK	Vertical	PASS
915.36	62.0	49.60	-12.360	-	-	55	PK	Vertical	NA



(Antenna Vertical, 1GHz to 10GHz)

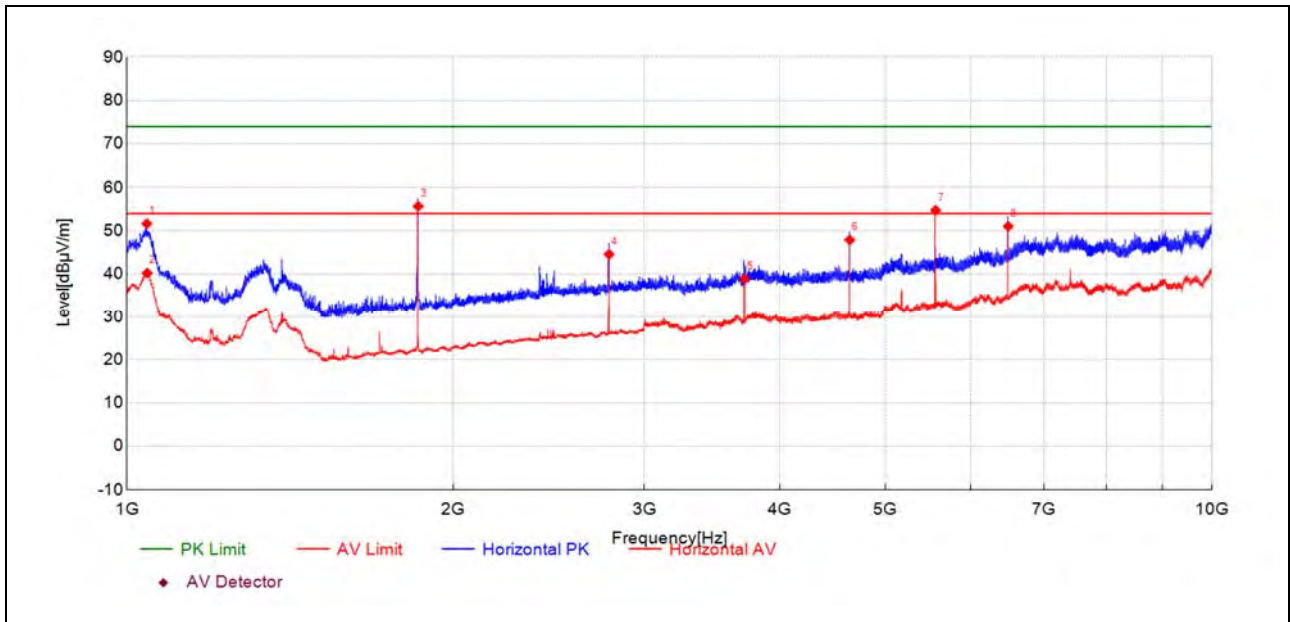
Frequency [MHz]	Reading [dBμV]	Level [dBμV/m]	Factor [dB/m]	Limit [dBμV/m]	Margin [dB]	Angle [°]	Detector	Polarity	Verdict
1045.61	58.4	38.41	-19.940	54.00	15.59	159	AV	Vertical	PASS
1046.41	68.6	48.65	-19.940	74.00	25.35	164	PK	Vertical	PASS
1830.57	82.0	63.64	-18.380	74.00	10.36	236	PK	Vertical	PASS
1831.37	79.7	61.35	-18.380	-	-	230	AV	Vertical	NA
2746.75	60.3	47.49	-12.770	54.00	6.51	98	AV	Vertical	PASS
3662.24	55.4	46.45	-8.910	54.00	7.55	115	AV	Vertical	PASS
5492.63	53.8	51.81	-1.990	-	-	115	AV	Vertical	NA
6408.76	44.8	45.86	1.100	54.00	8.14	106	AV	Vertical	PASS

Plot for Channel 62



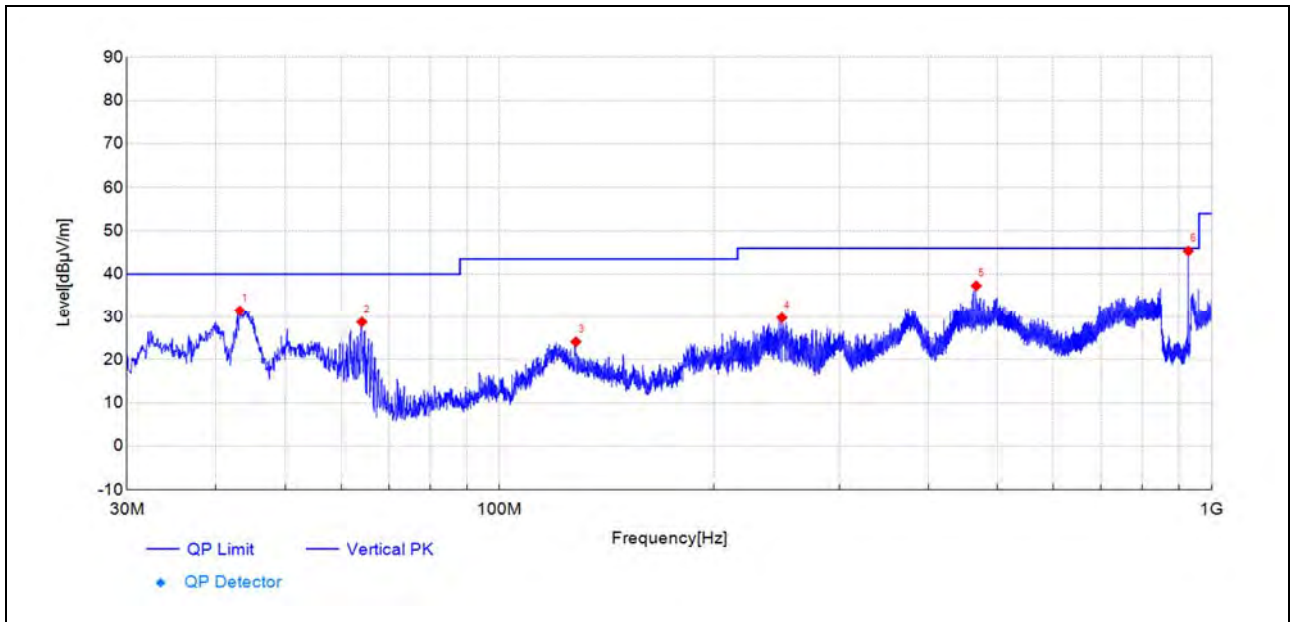
(Antenna Horizontal, 30MHz to 1GHz)

Frequency [MHz]	Reading [dBμV]	Level [dBμV/m]	Factor [dB/m]	Limit [dBμV/m]	Margin [dB]	Angle [°]	Detector	Polarity	Verdict
43.44	53.0	25.10	-27.920	40.00	14.90	20	PK	Horizontal	PASS
64.78	53.5	24.38	-29.110	40.00	15.62	86	PK	Horizontal	PASS
127.93	64.6	32.97	-31.580	43.50	10.53	122	PK	Horizontal	PASS
253.64	60.0	32.96	-26.990	46.00	13.04	341	PK	Horizontal	PASS
463.66	60.3	38.60	-21.680	46.00	7.40	106	PK	Horizontal	PASS
927.29	63.7	51.63	-12.020	-	-	259	PK	Horizontal	NA



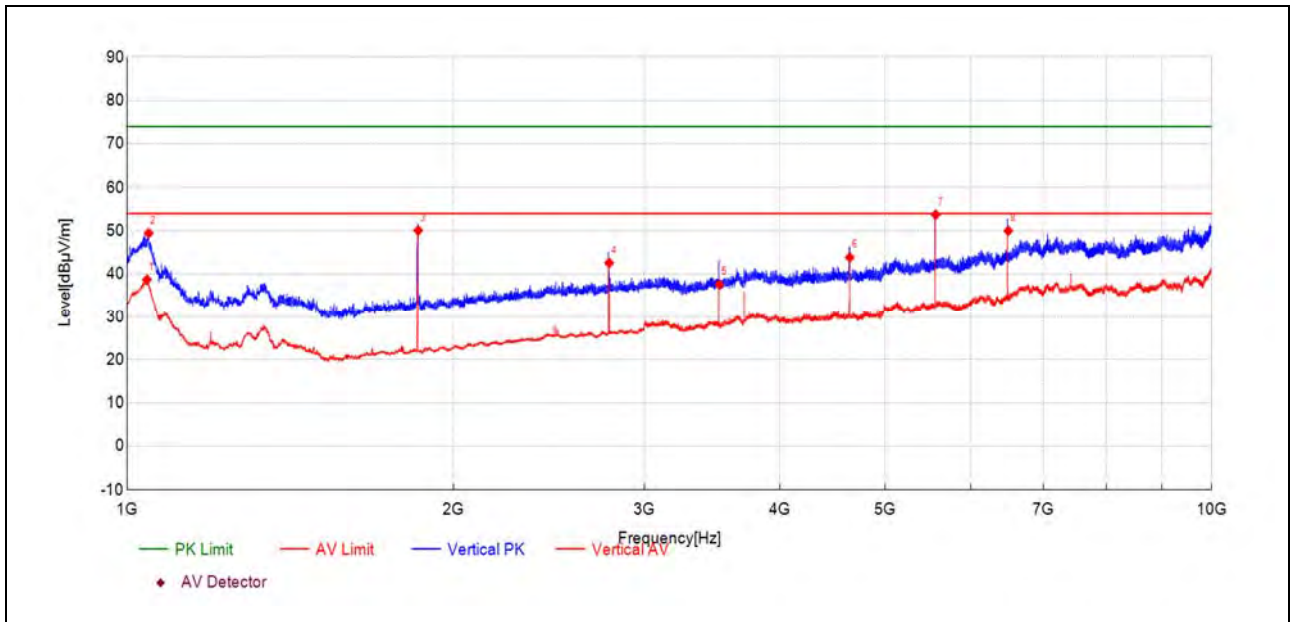
(Antenna Horizontal, 1GHz to 10GHz)

Frequency [MHz]	Reading [dBμV]	Level [dBμV/m]	Factor [dB/m]	Limit [dBμV/m]	Margin [dB]	Angle [°]	Detector	Polarity	Verdict
1042.81	71.6	51.68	-19.920	74.00	22.32	279	PK	Horizontal	PASS
1043.61	60.2	40.26	-19.930	54.00	13.74	279	AV	Horizontal	PASS
1855.37	74.0	55.70	-18.250	-	-	104	AV	Horizontal	NA
2782.76	57.3	44.58	-12.750	54.00	9.42	77	AV	Horizontal	PASS
3710.31	48.0	38.92	-9.120	54.00	15.08	66	AV	Horizontal	PASS
4637.18	54.3	47.92	-6.340	54.00	6.08	212	AV	Horizontal	PASS
5565.44	56.8	54.77	-2.030	-	-	162	AV	Horizontal	NA
6492.30	49.1	51.05	1.910	-	-	42	AV	Horizontal	NA



(Antenna Vertical, 30MHz to 1GHz)

Frequency [MHz]	Reading [dBμV]	Level [dBμV/m]	Factor [dB/m]	Limit [dBμV/m]	Margin [dB]	Angle [°]	Detector	Polarity	Verdict
43.19	59.4	31.43	-27.980	40.00	8.57	342	PK	Vertical	PASS
64.10	57.9	28.74	-29.120	40.00	11.26	137	PK	Vertical	PASS
128.02	55.8	24.14	-31.630	43.50	19.36	188	PK	Vertical	PASS
249.18	56.9	29.74	-27.160	46.00	16.26	281	PK	Vertical	PASS
467.10	58.8	37.27	-21.500	46.00	8.73	101	PK	Vertical	PASS
927.34	57.4	45.33	-12.020	-	-	127	PK	Vertical	NA



(Antenna Vertical, 1GHz to 10GHz)

Frequency [MHz]	Reading [dBμV]	Level [dBμV/m]	Factor [dB/m]	Limit [dBμV/m]	Margin [dB]	Angle [°]	Detector	Polarity	Verdict
1043.21	58.7	38.73	-19.920	54.00	15.27	159	AV	Vertical	PASS
1047.21	69.4	49.49	-19.940	74.00	24.51	159	PK	Vertical	PASS
1855.37	68.4	50.11	-18.250	54.00	3.89	313	AV	Vertical	PASS
2782.76	55.3	42.59	-12.750	54.00	11.41	114	AV	Vertical	PASS
3516.63	47.4	37.60	-9.770	54.00	16.40	163	AV	Vertical	PASS
4637.64	50.2	43.87	-6.340	54.00	10.13	325	AV	Vertical	PASS
5565.44	55.8	53.75	-2.030	-	-	115	AV	Vertical	NA
6492.77	48.1	50.03	1.920	54.00	3.97	82	AV	Vertical	PASS



Notes

1. The report shall have report stamp or our company stamp.
2. The report shall be invalid without all the signatures of the editor and approver.
3. The report shall not be changed.
4. Any objections must be raised to Morlab within 15 days since the date when the report is received. It will not be taken into consideration beyond this limit.
5. Conformity declaration:
 - ☒ Morlab issues a statement of conformity based on the corresponding standards (default)
 - ☐ Morlab issues a statement of conformity based on the applicant requirement
6. Use of uncertainty of measurement for decisions on conformity (decision rule):

No decision rule is specified by the testing standard, when comparing the measurement result with the applicable limit according to the specification in that standard. The decisions on conformity are made without applying the measurement uncertainty ("simple acceptance" decision rule).

————— END OF REPORT —————