

CFR 47 FCC PART 15 SUBPART C
CERTIFICATION TEST REPORT

For

WisLink Module

MODEL NUMBER: RAK5166

FCC ID: 2AF6B-5166

REPORT NUMBER: 4792062441-RF-1

ISSUE DATE: November 7, 2025

Prepared for

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Prepared by

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Revision History

Rev.	Issue Date	Revisions	Revised By
V0	November 7, 2025	Initial Issue	

Summary of Test Results

Test Item	Clause	Limit/Requirement	Result
Antenna Requirement	N/A	FCC Part 15.203	Pass
AC Power Line Conducted Emission	ANSI C63.10-2020, Clause 6.2	FCC Part 15.207	Pass
Conducted Output Power	ANSI C63.10-2020, Clause 11.9.1.2	FCC Part 15.247 (b) (3)	Pass
6dB Bandwidth and 99% Occupied Bandwidth	ANSI C63.10-2020, Clause 11.8.1	FCC Part 15.247 (a) (2)	Pass
Power Spectral Density	ANSI C63.10-2020, Clause 11.10.2	FCC Part 15.247 (e)	Pass
Conducted Band edge and spurious emission	ANSI C63.10-2020, Clause 11.11	FCC Part 15.247 (d)	Pass
Radiated Band edge and Spurious Emission	ANSI C63.10-2020, Clause 11.12	FCC Part 15.247 (d) FCC Part 15.209 FCC Part 15.205	Pass
Duty Cycle	ANSI C63.10-2020, Clause 11.6	None; for reporting purposes only.	Pass

Note:

*This test report is only published to and used by the applicant, and it is not for evidence purpose in China.

*The measurement result for the sample received is <Pass> according to < CFR 47 FCC PART 15 SUBPART C > when <Simple Acceptance> decision rule is applied.

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1. ATTESTATION OF TEST RESULTS

Applicant Information

Company Name: Shenzhen RAKwireless Technology Co.,Ltd.
Address: Room 506, Building B, New Compark, Pingshan First Road,
Taoyuan Street, Nanshan District, Shenzhen, Guangdong, China

Manufacturer Information

Company Name: Shenzhen RAKwireless Technology Co.,Ltd.
Address: Room 506, Building B, New Compark, Pingshan First Road,
Taoyuan Street, Nanshan District, Shenzhen, Guangdong, China

EUT Information

EUT Name: WisLink Module
Model: RAK5166
Brand: RAK
Sample Received Date: September 12, 2025
Sample Status: Normal
Sample ID: 8911733
Date of Tested: September 13, 2025 to November 6, 2025

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
CFR 47 FCC PART 15 SUBPART C	PASS

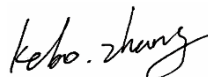
Prepared By:



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Project Engineer

Checked By:



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Operations Leader

Approved By:



Stephen Guo

Operations Manager

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with KDB 558074 D01 15.247 Meas Guidance v05r02, 414788 D01 Radiated Test Site v01r01, CFR 47 FCC Part 2, CFR 47 FCC Part 15, ANSI C63.10-2020.

3. FACILITIES AND ACCREDITATION

Accreditation Certificate	A2LA (Certificate No.: 4102.01) UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch. has been assessed and proved to be in compliance with A2LA. FCC (FCC Designation No.: CN1187) UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch. Has been recognized to perform compliance testing on equipment subject to the Commission's Declaration of Conformity (DoC) and Certification rules. ISED (Company No.: 21320) UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch. has been registered and fully described in a report filed with ISED. The Company Number is 21320 and the test lab Conformity Assessment Body Identifier (CABID) is CN0046. VCCI (Registration No.: C-20202, G-20240, R-20248 and T-20202) UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch. has been assessed and proved to be in compliance with VCCI, the Membership No. is 3793. Facility Name: Chamber E, the VCCI registration No. is G-20240 and R-20248 Shielding Room F, the VCCI registration No. is C-20202 and T-20202
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Note 1:

All tests measurement facilities use to collect the measurement data are located at Room 101, Building 2, No.4, Information Road, Songshan Lake, Dongguan, Guangdong, China.

Note 2:

The test anechoic chamber in UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch had been calibrated and compared to the open field sites and the test anechoic chamber is shown to be equivalent to or worst case from the open field site.

Note 3:

For below 30 MHz, lab had performed measurements at test anechoic chamber and comparing to measurements obtained on an open field site. And these measurements below 30 MHz had been correlated to measurements performed on an OFS.

4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations and is traceable to recognize national standards.

4.2. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

Test Item	Uncertainty
Conduction emission	3.62 dB
Radiated Emission (Included Fundamental Emission) (9 kHz ~ 30 MHz)	2.2 dB
Radiated Emission (Included Fundamental Emission) (30 MHz ~ 1 GHz)	4.00 dB
Radiated Emission (Included Fundamental Emission) (1 GHz to 26 GHz)	5.78 dB (1 GHz ~ 18 GHz)
	5.23 dB (18 GHz ~ 26 GHz)
Duty Cycle	±0.028%
DTS and 99% Occupied Bandwidth	±0.0196%
Maximum Conducted Output Power	±0.686 dB
Maximum Power Spectral Density Level	±0.743 dB
Conducted Band-edge Compliance	±1.328 dB
Conducted Unwanted Emissions In Non-restricted Frequency Bands	±0.746 dB (9 kHz ~ 1 GHz)
	±1.328dB (1 GHz ~ 26 GHz)
Note: This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.	

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

EUT Name	WisLink Module
Model	RAK5166
Transmit Frequency Range	923.3 MHz ~ 927.5 MHz
Modulation	CSS
Radio Technology	Lora (500kHz channel bandwidth)
Data Rates:	SF7-SF12
Normal Test Voltage	DC 3.3 V

5.2. CHANNEL LIST

Lora							
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	923.3	2	924.5	4	925.7	6	926.9
1	923.9	3	925.1	5	926.3	7	927.5

5.3. MAXIMUM OUTPUT POWER

Test Mode	Frequency (MHz)	Channel Number	Maximum Output Power (dBm)
Lora	923.3 – 927.5	8	24.54

5.4. TEST CHANNEL CONFIGURATION

Test Mode	Test Channel	Frequency
Lora	CH 0(Low Channel), CH 3(Mid Channel), CH 7(High Channel)	923.3 MHz, 925.1 MHz, 927.5 MHz

5.5. THE WORSE CASE POWER SETTING PARAMETER

The Worse Case Power Setting Parameter				
Test Software Version		MobaXterm		
Test Mode	Transmit Antenna Number	Test Software Setting Value		
		LCH	MCH	HCH
Lora	1	15	15	15

5.6. WORST-CASE CONFIGURATIONS

The EUT was tested in the following configuration(s):

Controlled in test mode using a software application on the EUT supplied by customer. The application was used to enable a continuous transmission and to select the mode, test channels, bandwidth, data rates as required.

Test channels referring to section 5.4.

Maximum power setting referring to section 5.5.

Worst-case data rates as provided by the client were:

Lora: SF7

Lora: SF12

The measured additional path loss was included in any path loss calculations for all RF cable used during tested.

The EUT has one RF connector which can be attached to five different antennas. The five different antennas are RAKARG15/RAKARG14/RAKARG19/RAKARJ14/RAKARJ16.

When RAKARG15/RAKARG14/RAKARG19 is attached to EUT, cable RPSMA-C-J3/N-C-K316-1-1000m and SLEingC100660088-C01 are used to connect antenna and module, while RAKARJ14/RAKARJ16 is attached to EUT, cable SLEingC100660088-C01 is used to connect antenna and module.

All the antenna port tests were tested for complying the limits for RAKARG15 with the maximum antenna gain.

RADIATED TEST and AC POWER LINE CONDUCTED EMISSION were separately tested with RAKARG15 or RAKARJ14 attached on the EUT.

5.7. DESCRIPTION OF AVAILABLE ANTENNAS AND CABLES

Antenna	Model No.	Frequency (MHz)	Antenna Type	MAX Antenna Gain (dBi)
1	RAKARG15	923.3 – 927.5	Fiber Glass Antenna	8.0
2	RAKARG14	923.3 – 927.5	Fiber Glass Antenna	5.8
3	RAKARG19	923.3 – 927.5	Fiber Glass Antenna	5.1
4	RAKARJ14	923.3 – 927.5	Blade Antenna	2.3
5	RAKARJ16	923.3 – 927.5	Blade Antenna	2.3

Test Mode	Transmit and Receive Mode	Description
Lora	☒ 1TX, 1RX	Antenna 1~5 can be used as transmitting/receiving antenna.

Cable	Model No.	Frequency (MHz)	Cable Loss (dB)
1	RPSMA-C-J3/N-C-K316-1-1000m	923.3 – 927.5	-1
2	SLEingC100660088-C01	923.3 – 927.5	-0.63

Note: 1. The value of the antenna gain and cable loss were declared by customer.

2. All the antenna port tests were tested the conducted emission at the lora ant connector without the cable loss.

5.8. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Item	Equipment	Brand Name	Model Name	Remark
1	PC	Lenovo	E42-80	/
2	AC Adaptor	/	RA040-0503000US	Input: AC 100-240V, 50/60Hz, 0.6A Output: DC 5V,3A,15W

I/O CABLES

Cable No	Port	Connector Type	Cable Type	Cable Length(m)	Remarks
1	Network Cable	/	/	1.0	/

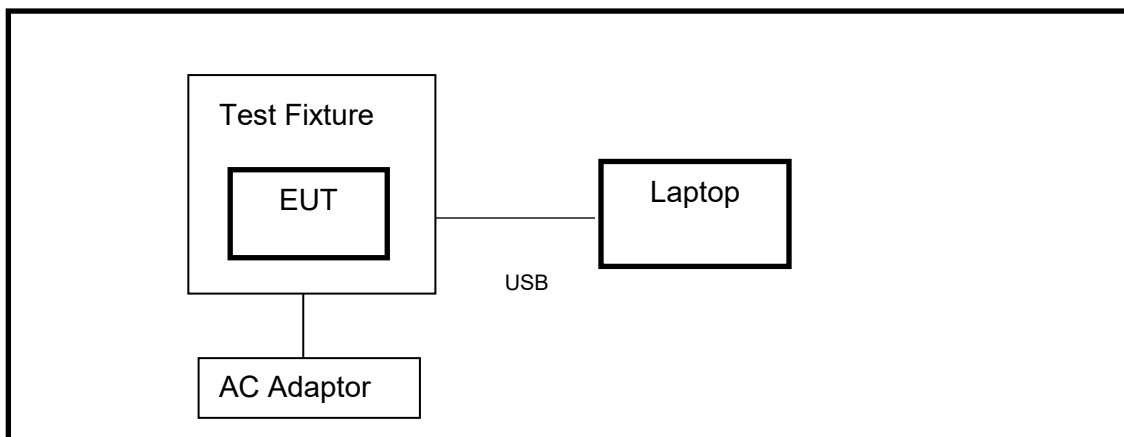
ACCESSORIES

Item	Accessory	Brand Name	Model Name	Description
/	/	/	/	/

TEST SETUP

The EUT can work in engineering mode with a software through a Laptop.

SETUP DIAGRAM FOR TESTS



6. MEASURING INSTRUMENT AND SOFTWARE USED

R&S TS 8997 Test System					
Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Due. Date
Power sensor, Power Meter	R&S	OSP120	100921	Dec.27,2024	Dec.26,2025
Vector Signal Generator	R&S	SMBV100A	261637	Sep.12, 2025	Sep.11, 2026
Signal Generator	R&S	SMB100A	178553	Sep.12, 2025	Sep.11, 2026
Signal Analyzer	R&S	FSV40	101118	Sep.12, 2025	Sep.11, 2026
Software					
Description	Manufacturer		Name		Version
For R&S TS 8997 Test System	Rohde & Schwarz		EMC 32		10.60.10
Tonsend RF Test System					
Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Due. Date
Wireless Connectivity Tester	R&S	CMW270	1201.0002N75-102	Sep.12, 2025	Sep.11, 2026
PXA Signal Analyzer	Keysight	N9030A	MY55410512	Sep.12, 2025	Sep.11, 2026
MXG Vector Signal Generator	Keysight	N5182B	MY56200284	Sep.12, 2025	Sep.11, 2026
MXG Vector Signal Generator	Keysight	N5172B	MY56200301	Sep.12, 2025	Sep.11, 2026
DC power supply	Keysight	E3642A	MY55159130	Sep.12, 2025	Sep.11, 2026
Temperature & Humidity Chamber	SANMOOD	SG-80-CC-2	2088	Sep.12, 2025	Sep.11, 2026
Attenuator	Aglient	8495B	2814a12853	Dec.27,2024	Dec.26,2025
RF Control Unit	Tonscend	JS0806-2	23B80620666	Sep.12, 2025	Sep.11, 2026
Software					
Description	Manufacturer	Name			Version
Tonsend SRD Test System	Tonsend	JS1120-3 RF Test System			V3.2.22

Conducted Emissions					
Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Due Date
EMI Test Receiver	R&S	ESR3	101961	Sep.12, 2025	Sep.11, 2026
Two-Line V-Network	R&S	ENV216	101983	Sep.12, 2025	Sep.11, 2026
Artificial Mains Networks	Schwarzbeck	NSLK 8126	8126465	Sep.12, 2025	Sep.11, 2026
Software					
Description			Manufacturer	Name	Version
Test Software for Conducted Emissions			Farad	EZ-EMC	Ver. UL-3A1

Radiated Emissions					
Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Due Date
MXE EMI Receiver	KESIGHT	N9038A	MY56400036	Sep.12, 2025	Sep.11, 2026
Hybrid Log Periodic Antenna	TDK	HLP-3003C	130960	June 28, 2024	June.27 2027
Preamplifier	HP	8447D	2944A09099	Sep.12, 2025	Sep.11, 2026
EMI Measurement Receiver	R&S	ESR26	101377	Sep.12, 2025	Sep.11, 2026
Horn Antenna	TDK	HRN-0118	130940	Dec.10, 2024	Dec.11, 2027
Preamplifier	TDK	PA-02-0118	TRS-305-00067	Sep.12, 2025	Sep.11, 2026
Horn Antenna	Schwarzbeck	BBHA9170	697	Jun 30, 2024	Jun 29, 2027
Preamplifier	TDK	PA-02-2	TRS-307-00003	Sep.12, 2025	Sep.11, 2026
Preamplifier	TDK	PA-02-3	TRS-308-00002	Sep.12, 2025	Sep.11, 2026
Loop antenna	Schwarzbeck	1519B	00008	Dec.09, 2024	Dec.08, 2027
High Pass Filter	SN	WHKX10-1440-1600-15000-40SS	1	Sep.12, 2025	Sep.11, 2026
Software					
Description			Manufacturer	Name	Version
Test Software for Radiated Emissions			Farad	EZ-EMC	Ver. UL-3A1

Other Instrument						
Equipment	Manufacturer	Model No.	Serial No.	Upper Last Cal.	Last Cal.	Due Date
Temperature humidity probe	OMEGA	ITHX-SD-5	18470007	Oct.8, 2024	Sep.16, 2025	Sep.15, 2026
Barometer	Yiyi	Baro	N/A	Oct.10, 2024	Sep.19, 2025	Sep.18, 2026
Attenuator	Agilent	8495B	2814a12853	/	Sep.12, 2025	Sep.11, 2026

7. ANTENNA PORT TEST RESULTS

7.1. ON TIME AND DUTY CYCLE

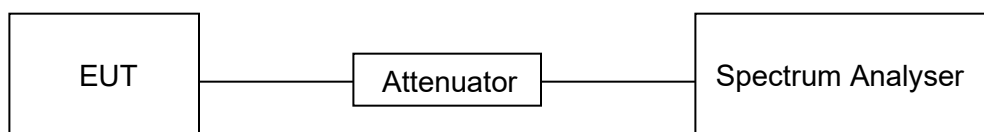
LIMITS

None; for reporting purposes only.

PROCEDURE

Refer to ANSI C63.10-2020 clause 11.6 Zero – Span Spectrum Analyzer method.

TEST SETUP



TEST ENVIRONMENT

Temperature	23.1 °C	Relative Humidity	54 %
Atmosphere Pressure	101 kPa	Test Voltage	DC 3.3 V

TEST DATE / ENGINEER

Test Date	October 20, 2025	Test By	Walker Yuan
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RESULTS

Please refer to appendix G.

7.2. 6 dB DTS BANDWIDTH AND 99 % OCCUPIED BANDWIDTH

LIMITS

CFR 47FCC Part15 (15.247) Subpart C			
Section	Test Item	Limit	Frequency Range (MHz)
CFR 47 FCC 15.247(a)(2)	6 dB Bandwidth	≥ 500 kHz	902-928
/	99 % Occupied Bandwidth	For reporting purposes only.	902-928

TEST PROCEDURE

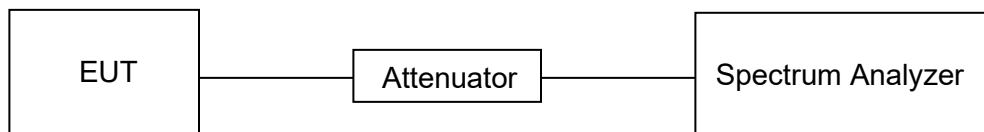
Refer to ANSI C63.10-2020 clause 11.8 for DTS bandwidth and clause 6.9 for Occupied Bandwidth.

Connect the EUT to the spectrum analyzer and use the following settings:

Center Frequency	The center frequency of the channel under test
Frequency Span	For 6 dB Bandwidth: Enough to capture all products of the modulation carrier emission For 99 % Occupied Bandwidth: Between 1.5 times and 5.0 times the OBW
Detector	Peak
RBW	For 6 dB Bandwidth: 1 % to 5 % of the OBW but not less than 100 kHz For 99 % Occupied Bandwidth: 1 % to 5 % of the occupied bandwidth
VBW	For 6 dB Bandwidth: $\geq 3 \times$ RBW For 99 % Occupied Bandwidth: $\geq 3 \times$ RBW
Trace	Max hold
Sweep	Auto couple

a) Use the 99 % power bandwidth function of the instrument, allow the trace to stabilize and report the measured bandwidth.

b) Allow the trace to stabilize and measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

TEST SETUP**TEST ENVIRONMENT**

Temperature	23.1 °C	Relative Humidity	54 %
Atmosphere Pressure	101 kPa	Test Voltage	DC 3.3 V

TEST DATE / ENGINEER

Test Date	October 20, 2025	Test By	Walker Yuan
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RESULTS

Please refer to appendix A & B.

7.3. CONDUCTED OUTPUT POWER

LIMITS

CFR 47 FCC Part15 (15.247) Subpart C			
Section	Test Item	Limit	Frequency Range (MHz)
CFR 47 FCC 15.247(b)(3)	AVG Output Power	1 watt or 30 dBm	902-928

TEST PROCEDURE

Refer to ANSI C63.10-2020 clause 11.9.2.3.1 and 11.9.1.2.

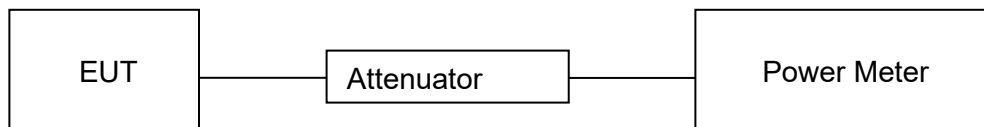
AVG power:

Connect the EUT to a low loss RF cable from the antenna port to the power sensor (video bandwidth is greater than the occupied bandwidth).

Measure peak emission level, the indicated level is the average output power, after any corrections for external attenuators and cables.

The test result in dBm by adding $[10 \log (1 / D)]$, where D is the duty cycle.

TEST SETUP



TEST ENVIRONMENT

Temperature	23.1 °C	Relative Humidity	54 %
Atmosphere Pressure	101 kPa	Test Voltage	DC 3.3 V

TEST DATE / ENGINEER

Test Date	October 20, 2025	Test By	Walker Yuan
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RESULTS

Please refer to appendix C.

7.4. POWER SPECTRAL DENSITY

LIMITS

CFR 47 FCC Part15 (15.247) Subpart C			
Section	Test Item	Limit	Frequency Range (MHz)
CFR 47 FCC §15.247 (e)	Power Spectral Density	8 dBm in any 3 kHz band	902-928

TEST PROCEDURE

Refer to ANSI C63.10-2020 clause 11.10.5.

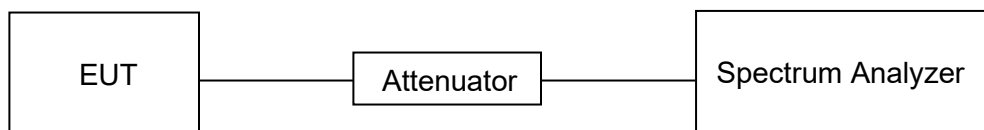
Connect the EUT to the spectrum analyzer and use the following settings:

Center Frequency	The center frequency of the channel under test
Detector	power averaging (rms)
RBW	$3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$
VBW	$\geq 3 \times \text{RBW}$
Span	$> 1.5 \times \text{OBW bandwidth}$
Trace	Employ trace averaging(rms)mode over a minimum of 100 traces
Sweep time	Auto couple
Sweep points	$\geq 2 \times \text{span} / \text{RBW}$.

Allow trace to fully stabilize and use the peak marker function to determine the maximum amplitude level within the RBW.

If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

TEST SETUP



TEST ENVIRONMENT

Temperature	23.1 °C	Relative Humidity	54 %
Atmosphere Pressure	101 kPa	Test Voltage	DC 3.3 V

TEST DATE / ENGINEER

Test Date	October 20, 2025	Test By	Walker Yuan
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RESULTS

Please refer to appendix D.

7.5. CONDUCTED BANDEGE AND SPURIOUS EMISSIONS

LIMITS

CFR 47 FCC Part15 (15.247) Subpart C		
Section	Test Item	Limit
CFR 47 FCC §15.247 (d)	Conducted Bandedge and Spurious Emissions	at least 30 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power

TEST PROCEDURE

Refer to ANSI C63.10-2020 clause 11.11.

Connect the EUT to the spectrum analyzer and use the following settings for reference level measurement:

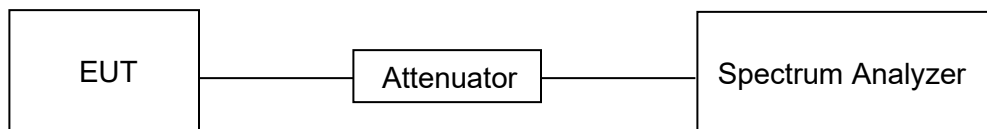
Center Frequency	The center frequency of the channel under test
Detector	Peak
RBW	100 kHz
VBW	$\geq 3 \times \text{RBW}$
Span	$\geq 1.5 \times \text{DTS bandwidth}$
Trace	Max hold
Sweep time	No faster than coupled (auto) time

Allow trace to fully stabilize and use the peak marker function to determine the maximum PSD level.

Change the settings for emission level measurement:

Span	Set the center frequency and span to encompass frequency range to be measured
Detector	Peak
RBW	100 kHz
VBW	$\geq 3 \times \text{RBW}$
measurement points	$\geq \text{span}/\text{RBW}$
Trace	Max hold
Sweep time	No faster than coupled (auto) time

Allow trace to fully stabilize and use the peak marker function to determine the maximum PSD level. Ensure that the amplitude of all unwanted emissions outside of the authorized frequency band (excluding restricted frequency bands) is attenuated by at least the minimum requirements specified in 11.11.

TEST SETUP**TEST ENVIRONMENT**

Temperature	23.1 °C	Relative Humidity	54 %
Atmosphere Pressure	101 kPa	Test Voltage	DC 3.3 V

TEST DATE / ENGINEER

Test Date	October 20, 2025	Test By	Walker Yuan
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RESULTS

Please refer to appendix E&F.

8. RADIATED TEST RESULTS

LIMITS

Please refer to CFR 47 FCC §15.205 and §15.209.

Radiation Disturbance Test Limit for 9 kHz-1 GHz

Emissions radiated outside of the specified frequency bands above 30 MHz			
Frequency Range (MHz)	Field Strength Limit (uV/m) at 3 m	Field Strength Limit (dBuV/m) at 3 m	
		Quasi-Peak	
30 - 88	100	40	
88 - 216	150	43.5	
216 - 960	200	46	
Above 960	500	54	
Above 1000	500	Peak	Average
		74	54

FCC Emissions radiated outside of the specified frequency bands below 30 MHz		
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

FCC Restricted bands of operation refer to FCC §15.205 (a):

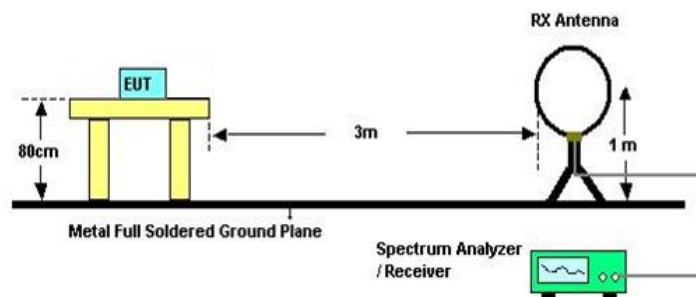
MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
¹ 0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	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			

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

²Above 38.6c

TEST SETUP AND PROCEDURE

Below 30 MHz

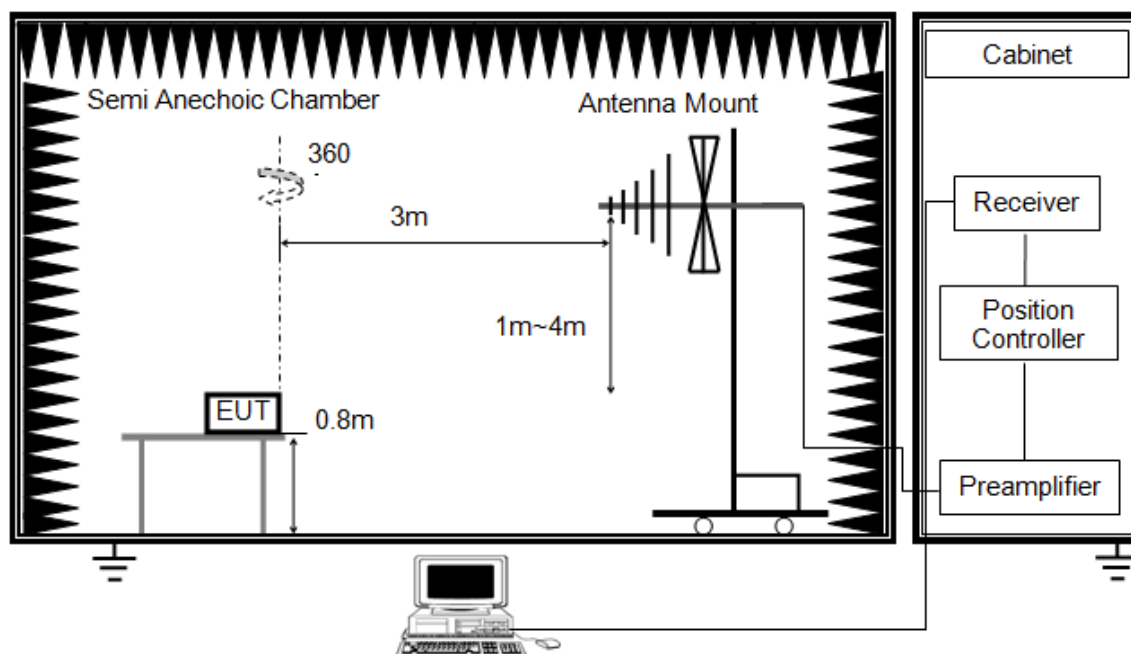


The setting of the spectrum analyser

RBW	200 Hz (From 9 kHz to 0.15 MHz)/ 9 kHz (From 0.15 MHz to 30 MHz)
VBW	200 Hz (From 9 kHz to 0.15 MHz)/ 9 kHz (From 0.15 MHz to 30 MHz)
Sweep	Auto
Trace	Max hold

- The testing follows the guidelines in ANSI C63.10-2020 clause 6.4.
- The EUT was arranged to its worst case and then turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level. Both Horizontal, Face-on and Face-off polarizations of the antenna are set to make the measurement.
- The EUT was placed on a turntable with 80 cm above ground.
- The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a 1 m height antenna tower.
- The radiated emission limits are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.
- For measurement below 1 GHz, the initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak and average detector mode re-measured. If the emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak and average detector and reported.
- Although these tests were performed other than open field site, adequate comparison measurements were confirmed against 30m open field site. Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field site based on KDB 414788.
- The limits in CFR 47, Part 15, Subpart C, paragraph 15.209 (a), are identical to those in RSS-GEN Section 8.9, Table 6, since the measurements are performed in terms of magnetic field strength and converted to electric field strength levels (as reported in the table) using the free space impedance of 377Ω . For example, the measurement frequency X KHz resulted in a level of Y dBuV/m, which is equivalent to $Y-51.5 = Z$ dBuA/m, which has the same margin, W dB, to the corresponding RSS-GEN Table 6 limit as it has to be 15.209(a) limit.

Below 1 GHz and above 30 MHz

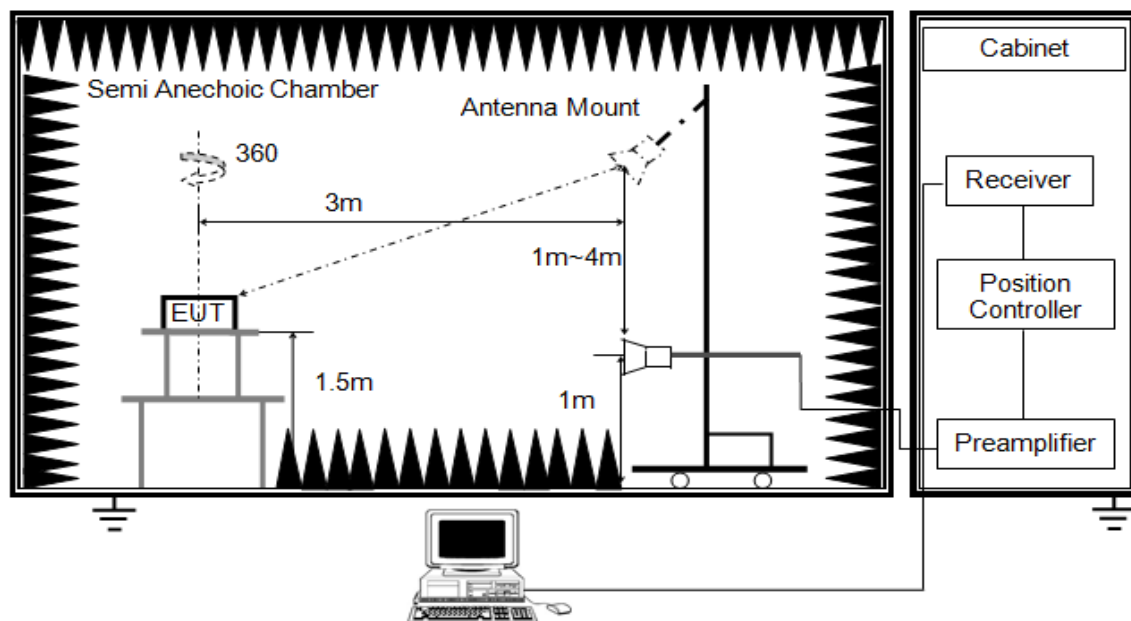


The setting of the spectrum analyser

RBW	120 kHz
VBW	300 kHz
Sweep	Auto
Detector	Peak/QP
Trace	Max hold

1. The testing follows the guidelines in ANSI C63.10-2020 clause 6.5.
2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
3. The EUT was placed on a turntable with 80 cm above ground.
4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
5. For measurement below 1 GHz, the initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured. If the emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.

Above 1GHz

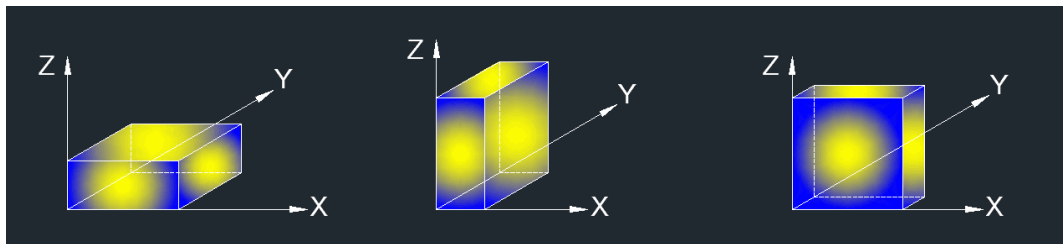


The setting of the spectrum analyser

RBW	1 MHz
VBW	PEAK: 3 MHz AVG: see note 6
Sweep	Auto
Detector	Peak
Trace	Max hold

1. The testing follows the guidelines in ANSI C63.10-2020 clause 6.6.
2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
3. The EUT was placed on a turntable with 1.5 m above ground.
4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
5. For measurement above 1 GHz, the emission measurement will be measured by the peak detector. This peak level, once corrected, must comply with the limit specified in Section 15.209.
6. For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 3 MHz for peak measurements and 1 MHz resolution bandwidth with 1/T video bandwidth with peak detector for average measurements. For the Duty Cycle please refer to clause 7.1.ON TIME AND DUTY CYCLE.

X axis, Y axis, Z axis positions:



Note 1: For all radiated test, EUT in each of three orthogonal axis emissions had been tested, but only the worst case (X axis) data recorded in the report.

Note 2: For the radiated restricted bandedge, a pre-scan was performed, and the result was 20 dB lower than the limit line, the test data was not shown in the report.

TEST ENVIRONMENT

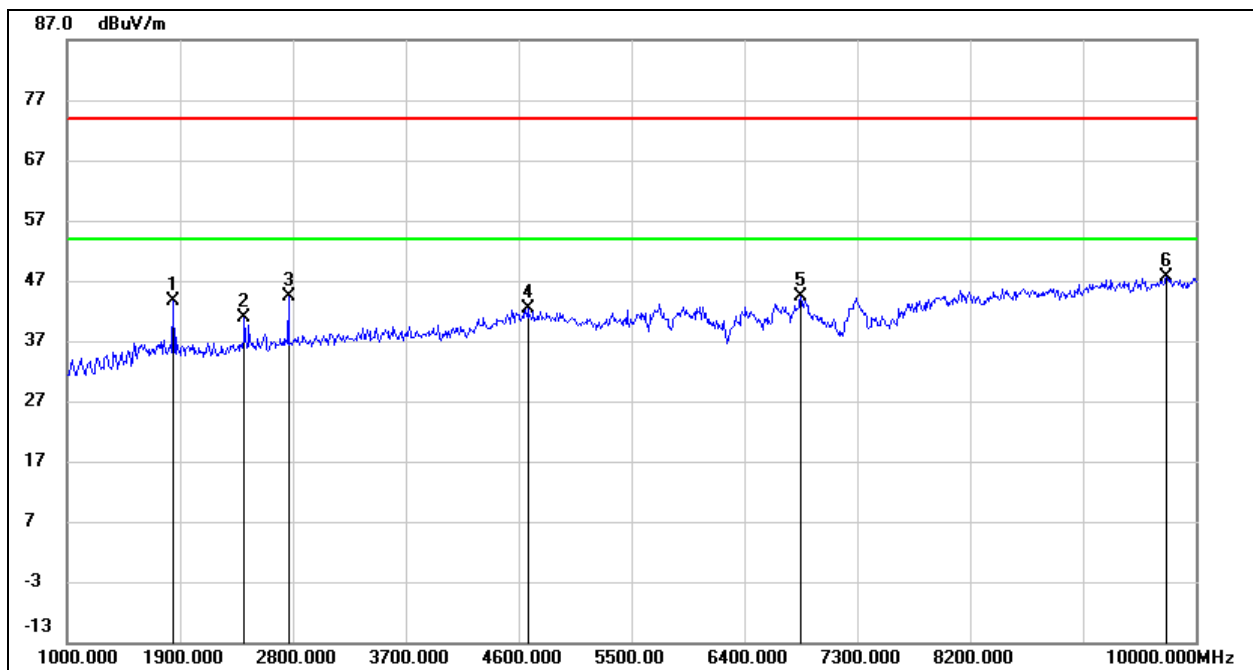
Temperature	23.7 °C	Relative Humidity	59.4 %
Atmosphere Pressure	101 kPa	Test Voltage	DC 3.3 V

RESULTS

8.1. SPURIOUS EMISSIONS (1 GHz ~ 10 GHz)

8.1.1. Lora SF7 with RAKARG15

HARMONICS AND SPURIOUS EMISSIONS (LOW CHANNEL, HORIZONTAL)



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1846.000	53.62	-9.96	43.66	74.00	-30.34	peak
2	2413.000	49.12	-8.16	40.96	74.00	-33.04	peak
3	2764.000	51.37	-6.88	44.49	74.00	-29.51	peak
4	4672.000	42.88	-0.51	42.37	74.00	-31.63	peak
5	6850.000	38.94	5.39	44.33	74.00	-29.67	peak
6	9766.000	35.76	11.94	47.70	74.00	-26.30	peak

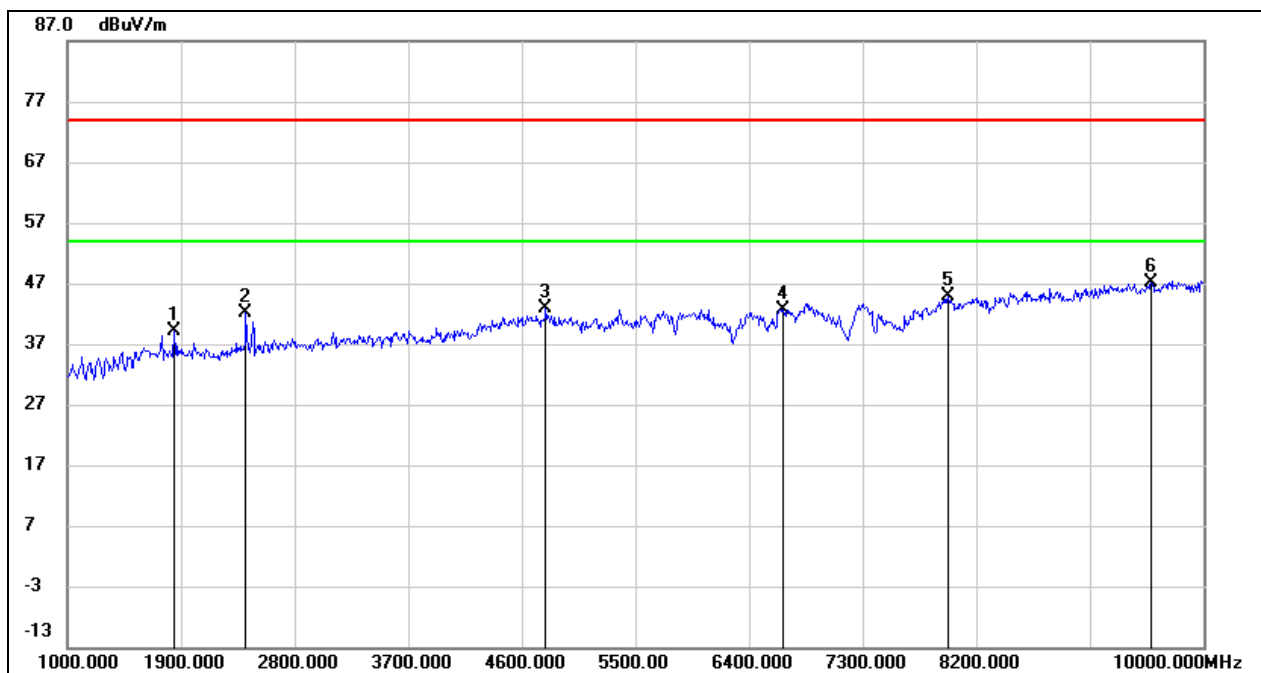
Note: 1. Measurement = Reading Level + Correct Factor.

2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.

3. Peak: Peak detector.

4. Only the worst data was recorded, if it complies with the limit, the other emissions deemed to comply with the limit.

HARMONICS AND SPURIOUS EMISSIONS (LOW CHANNEL, VERTICAL)



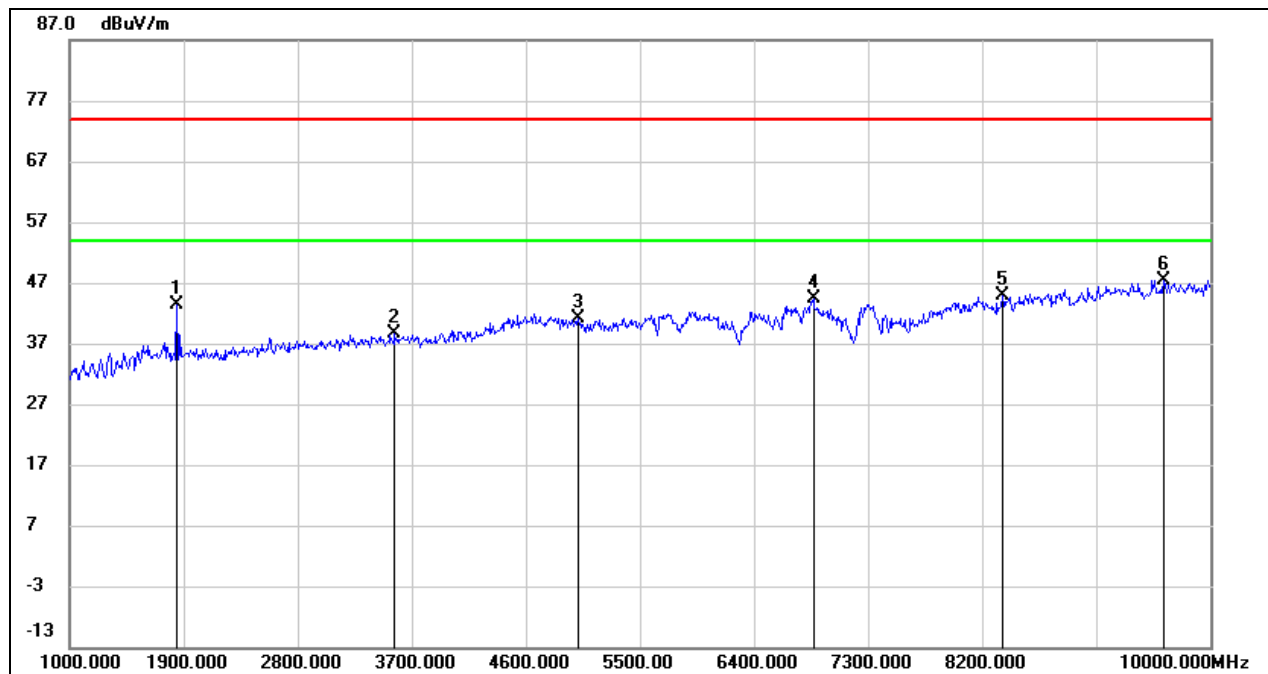
No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1846.000	49.15	-9.96	39.19	74.00	-34.81	peak
2	2413.000	50.31	-8.16	42.15	74.00	-31.85	peak
3	4789.000	43.04	-0.24	42.80	74.00	-31.20	peak
4	6670.000	37.93	4.82	42.75	74.00	-31.25	peak
5	7975.000	36.90	7.91	44.81	74.00	-29.19	peak
6	9586.000	35.78	11.23	47.01	74.00	-26.99	peak

Note: 1. Measurement = Reading Level + Correct Factor.

2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.

3. Peak: Peak detector.

4. Only the worst data was recorded, if it complies with the limit, the other emissions deemed to comply with the limit.

HARMONICS AND SPURIOUS EMISSIONS (MID CHANNEL, HORIZONTAL)


No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1846.000	53.35	-9.96	43.39	74.00	-30.61	peak
2	3565.000	43.06	-4.44	38.62	74.00	-35.38	peak
3	5014.000	40.70	0.44	41.14	74.00	-32.86	peak
4	6868.000	38.92	5.45	44.37	74.00	-29.63	peak
5	8362.000	36.52	8.24	44.76	74.00	-29.24	peak
6	9631.000	35.95	11.40	47.35	74.00	-26.65	peak

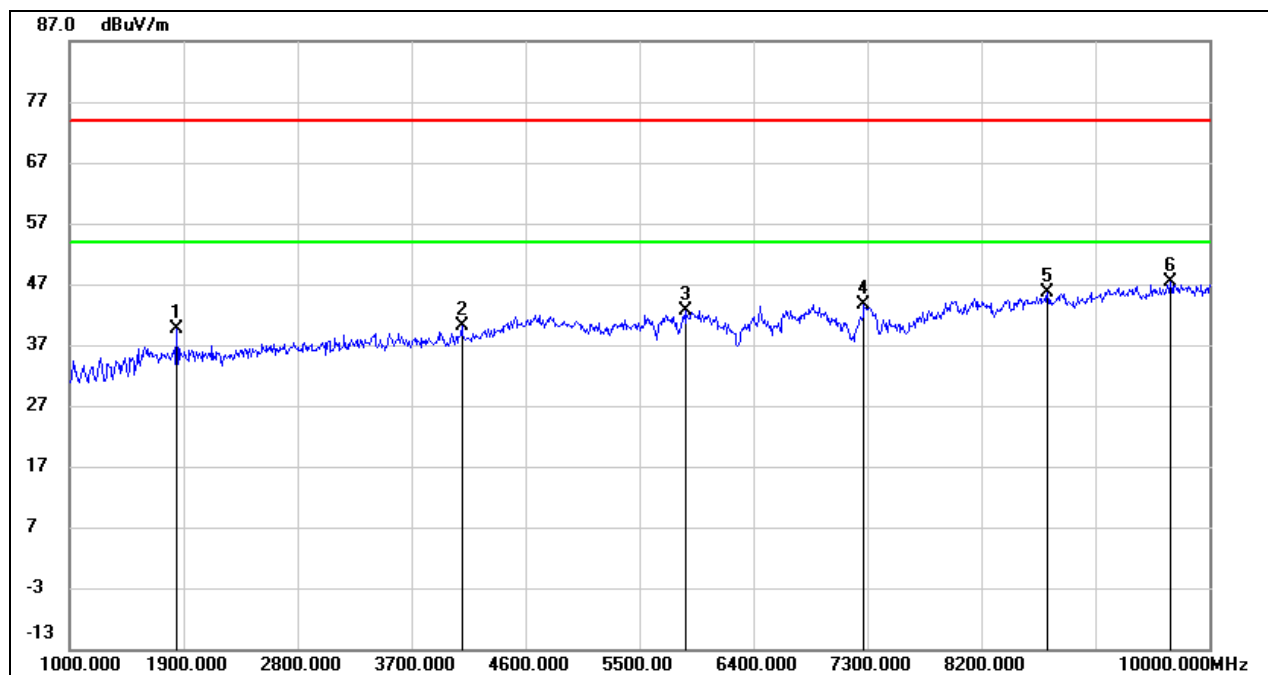
Note: 1. Measurement = Reading Level + Correct Factor.

2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.

3. Peak: Peak detector.

4. Only the worst data was recorded, if it complies with the limit, the other emissions deemed to comply with the limit.

HARMONICS AND SPURIOUS EMISSIONS (MID CHANNEL, VERTICAL)



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1846.000	49.58	-9.96	39.62	74.00	-34.38	peak
2	4096.000	43.47	-3.30	40.17	74.00	-33.83	peak
3	5869.000	40.56	2.12	42.68	74.00	-31.32	peak
4	7273.000	37.08	6.58	43.66	74.00	-30.34	peak
5	8722.000	36.88	8.74	45.62	74.00	-28.38	peak
6	9694.000	35.73	11.65	47.38	74.00	-26.62	peak

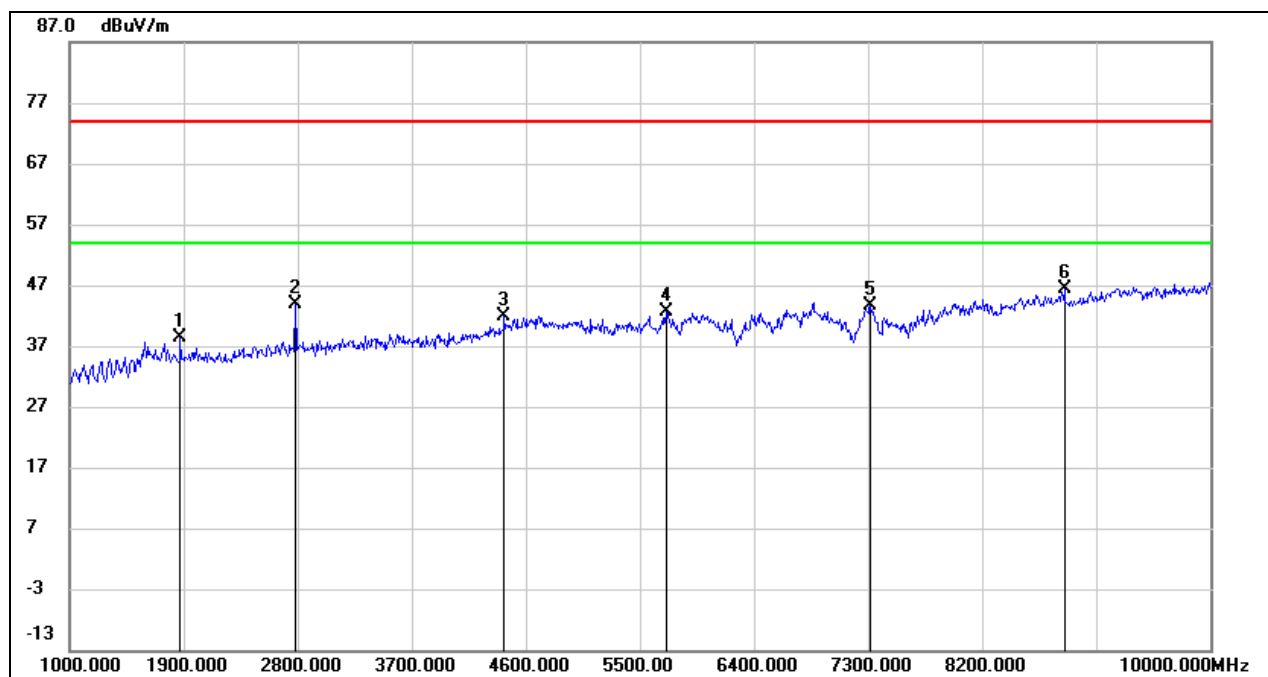
Note: 1. Measurement = Reading Level + Correct Factor.

2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.

3. Peak: Peak detector.

4. Only the worst data was recorded, if it complies with the limit, the other emissions deemed to comply with the limit.

HARMONICS AND SPURIOUS EMISSIONS (HIGH CHANNEL, HORIZONTAL)



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1873.000	48.20	-9.88	38.32	74.00	-35.68	peak
2	2782.000	50.60	-6.83	43.77	74.00	-30.23	peak
3	4429.000	43.40	-1.46	41.94	74.00	-32.06	peak
4	5707.000	40.73	1.81	42.54	74.00	-31.46	peak
5	7318.000	37.06	6.54	43.60	74.00	-30.40	peak
6	8848.000	37.36	8.93	46.29	74.00	-27.71	peak

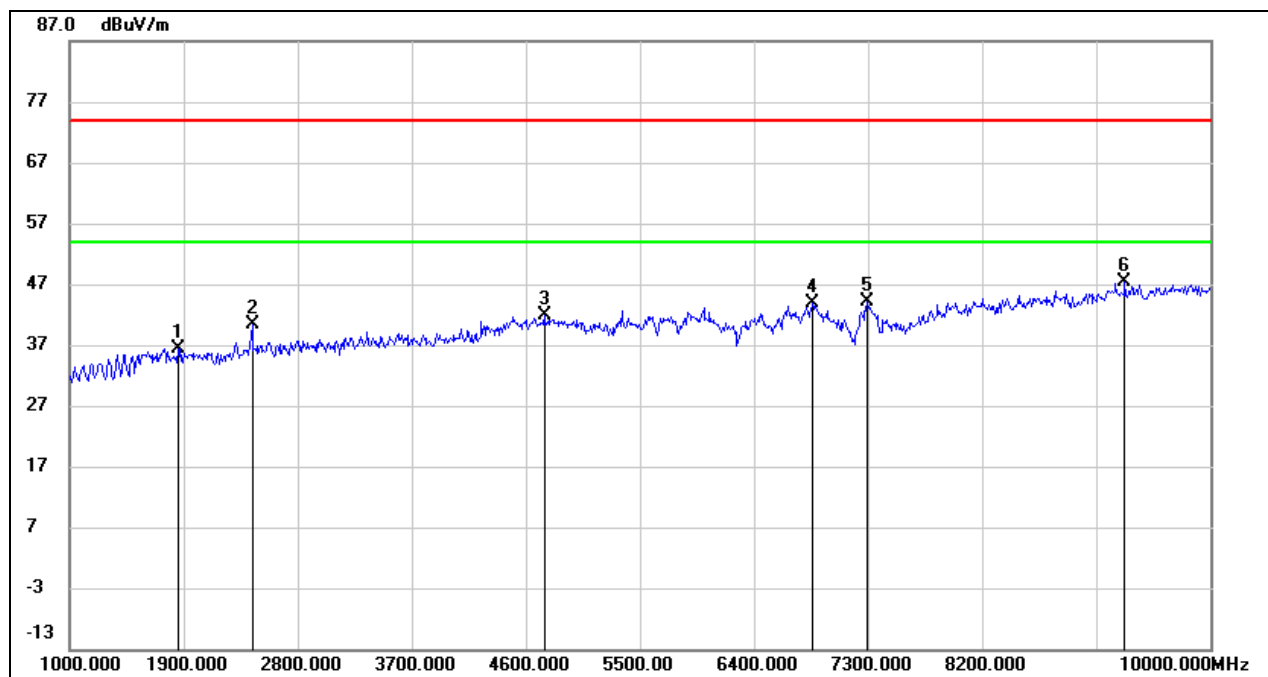
Note: 1. Measurement = Reading Level + Correct Factor.

2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.

3. Peak: Peak detector.

4. Only the worst data was recorded, if it complies with the limit, the other emissions deemed to comply with the limit.

HARMONICS AND SPURIOUS EMISSIONS (HIGH CHANNEL, VERTICAL)



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1855.000	46.38	-9.93	36.45	74.00	-37.55	peak
2	2440.000	48.50	-8.04	40.46	74.00	-33.54	peak
3	4744.000	42.16	-0.34	41.82	74.00	-32.18	peak
4	6859.000	38.45	5.42	43.87	74.00	-30.13	peak
5	7291.000	37.65	6.56	44.21	74.00	-29.79	peak
6	9325.000	37.01	10.37	47.38	74.00	-26.62	peak

Note: 1. Measurement = Reading Level + Correct Factor.

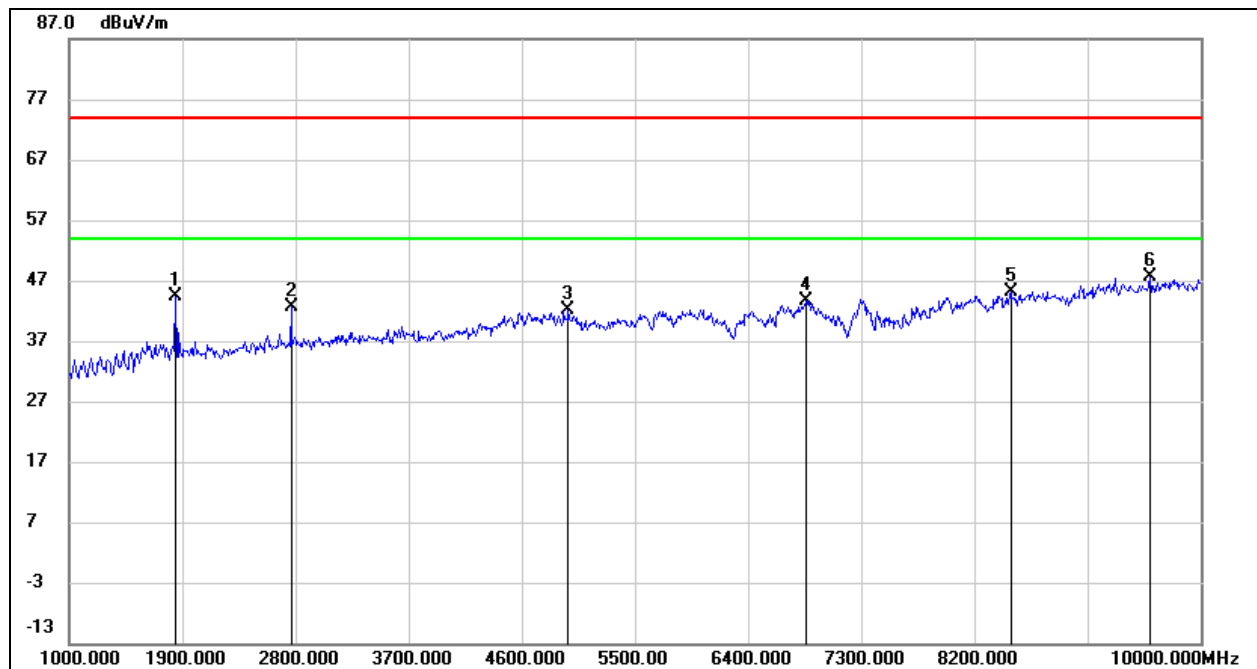
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.

3. Peak: Peak detector.

4. Only the worst data was recorded, if it complies with the limit, the other emissions deemed to comply with the limit.

8.1.2. Lora SF12 with RAKARG15

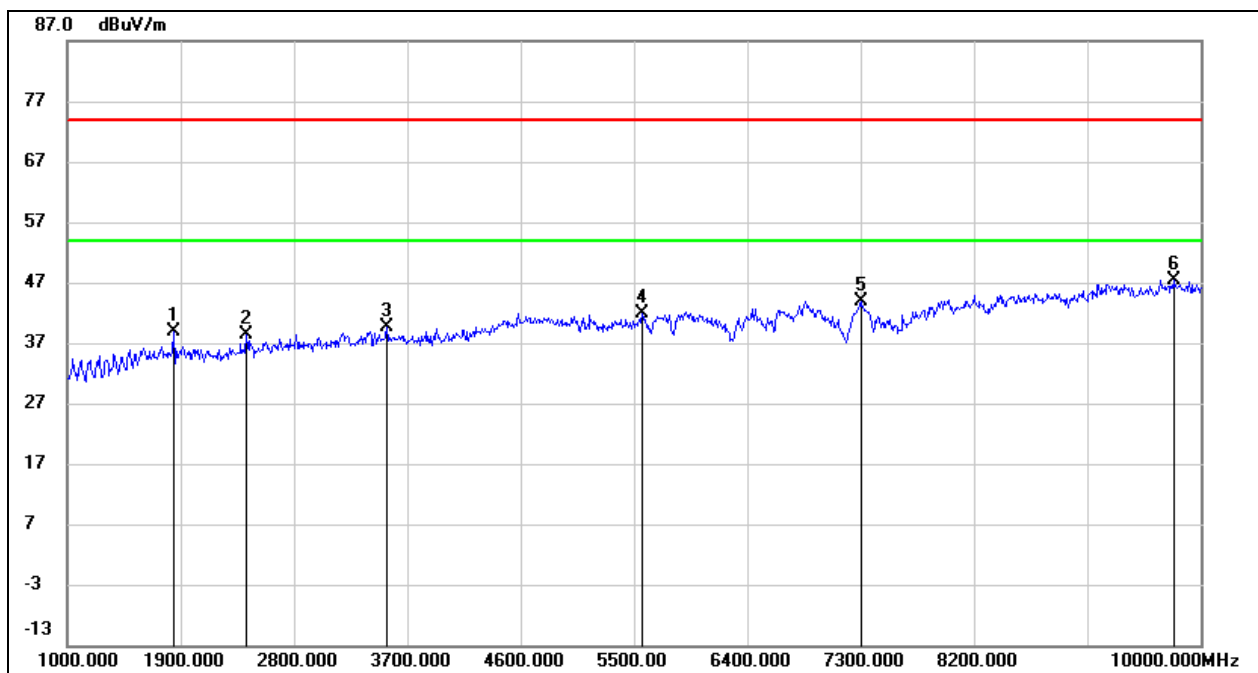
HARMONICS AND SPURIOUS EMISSIONS (LOW CHANNEL, HORIZONTAL)



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1846.000	54.34	-9.96	44.38	74.00	-29.62	peak
2	2764.000	49.52	-6.88	42.64	74.00	-31.36	peak
3	4969.000	41.72	0.32	42.04	74.00	-31.96	peak
4	6859.000	38.18	5.42	43.60	74.00	-30.40	peak
5	8488.000	36.82	8.37	45.19	74.00	-28.81	peak
6	9595.000	36.37	11.26	47.63	74.00	-26.37	peak

Note: 1. Measurement = Reading Level + Correct Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Peak: Peak detector.
4. Only the worst data was recorded, if it complies with the limit, the other emissions deemed to comply with the limit.

HARMONICS AND SPURIOUS EMISSIONS (LOW CHANNEL, VERTICAL)



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1846.000	48.89	-9.96	38.93	74.00	-35.07	peak
2	2422.000	46.44	-8.13	38.31	74.00	-35.69	peak
3	3538.000	44.03	-4.49	39.54	74.00	-34.46	peak
4	5563.000	40.32	1.58	41.90	74.00	-32.10	peak
5	7300.000	37.29	6.56	43.85	74.00	-30.15	peak
6	9784.000	35.45	12.01	47.46	74.00	-26.54	peak

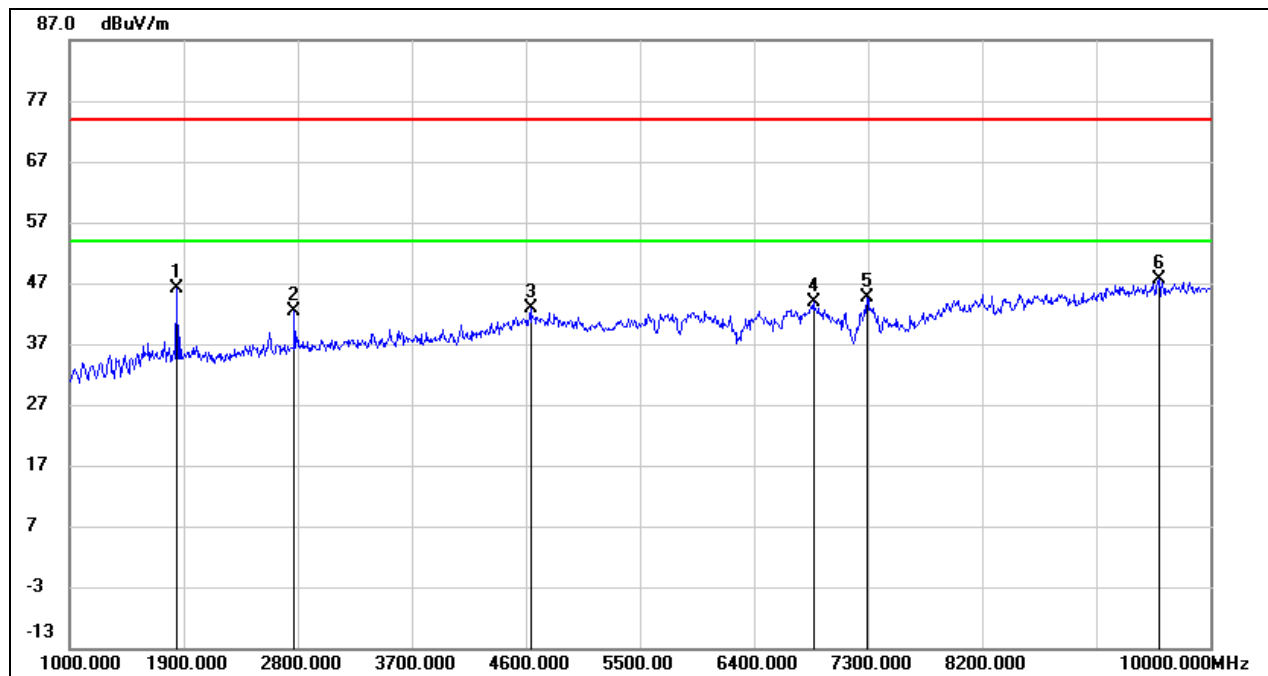
Note: 1. Measurement = Reading Level + Correct Factor.

2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.

3. Peak: Peak detector.

4. Only the worst data was recorded, if it complies with the limit, the other emissions deemed to comply with the limit.

HARMONICS AND SPURIOUS EMISSIONS (MID CHANNEL, HORIZONTAL)



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1846.000	56.03	-9.96	46.07	74.00	-27.93	peak
2	2773.000	49.34	-6.85	42.49	74.00	-31.51	peak
3	4636.000	43.54	-0.59	42.95	74.00	-31.05	peak
4	6868.000	38.41	5.45	43.86	74.00	-30.14	peak
5	7291.000	38.02	6.56	44.58	74.00	-29.42	peak
6	9595.000	36.45	11.26	47.71	74.00	-26.29	peak

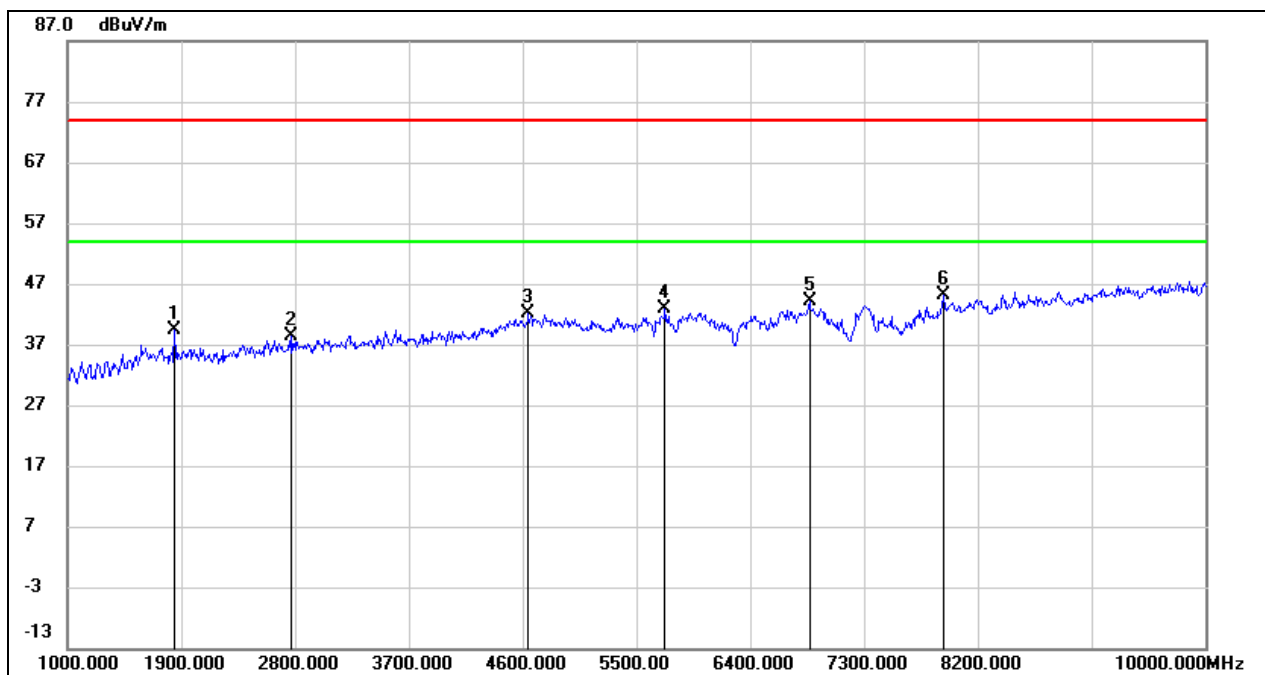
Note: 1. Measurement = Reading Level + Correct Factor.

2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.

3. Peak: Peak detector.

4. Only the worst data was recorded, if it complies with the limit, the other emissions deemed to comply with the limit.

HARMONICS AND SPURIOUS EMISSIONS (MID CHANNEL, VERTICAL)



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1846.000	49.43	-9.96	39.47	74.00	-34.53	peak
2	2773.000	45.13	-6.85	38.28	74.00	-35.72	peak
3	4645.000	42.68	-0.58	42.10	74.00	-31.90	peak
4	5725.000	40.92	1.84	42.76	74.00	-31.24	peak
5	6868.000	38.56	5.45	44.01	74.00	-29.99	peak
6	7930.000	37.30	7.75	45.05	74.00	-28.95	peak

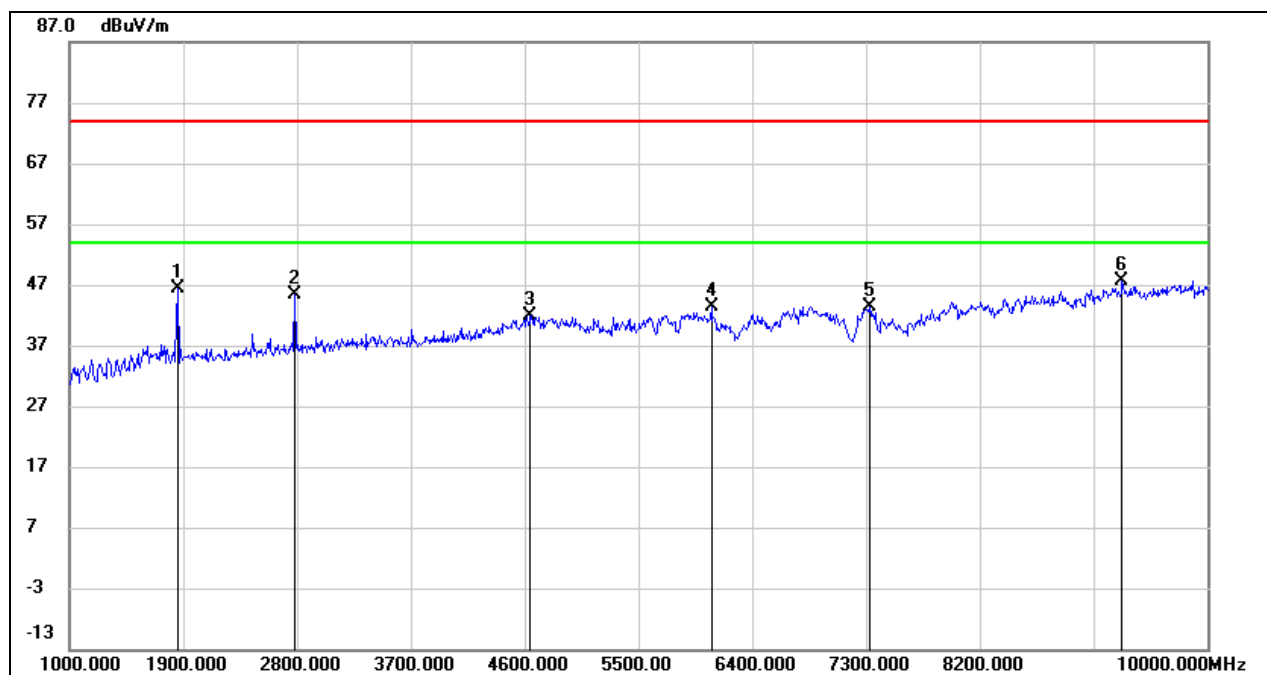
Note: 1. Measurement = Reading Level + Correct Factor.

2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.

3. Peak: Peak detector.

4. Only the worst data was recorded, if it complies with the limit, the other emissions deemed to comply with the limit.

HARMONICS AND SPURIOUS EMISSIONS (HIGH CHANNEL, HORIZONTAL)



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1855.000	56.35	-9.93	46.42	74.00	-27.58	peak
2	2782.000	52.29	-6.83	45.46	74.00	-28.54	peak
3	4645.000	42.49	-0.58	41.91	74.00	-32.09	peak
4	6076.000	40.69	2.67	43.36	74.00	-30.64	peak
5	7327.000	36.73	6.54	43.27	74.00	-30.73	peak
6	9325.000	37.22	10.37	47.59	74.00	-26.41	peak

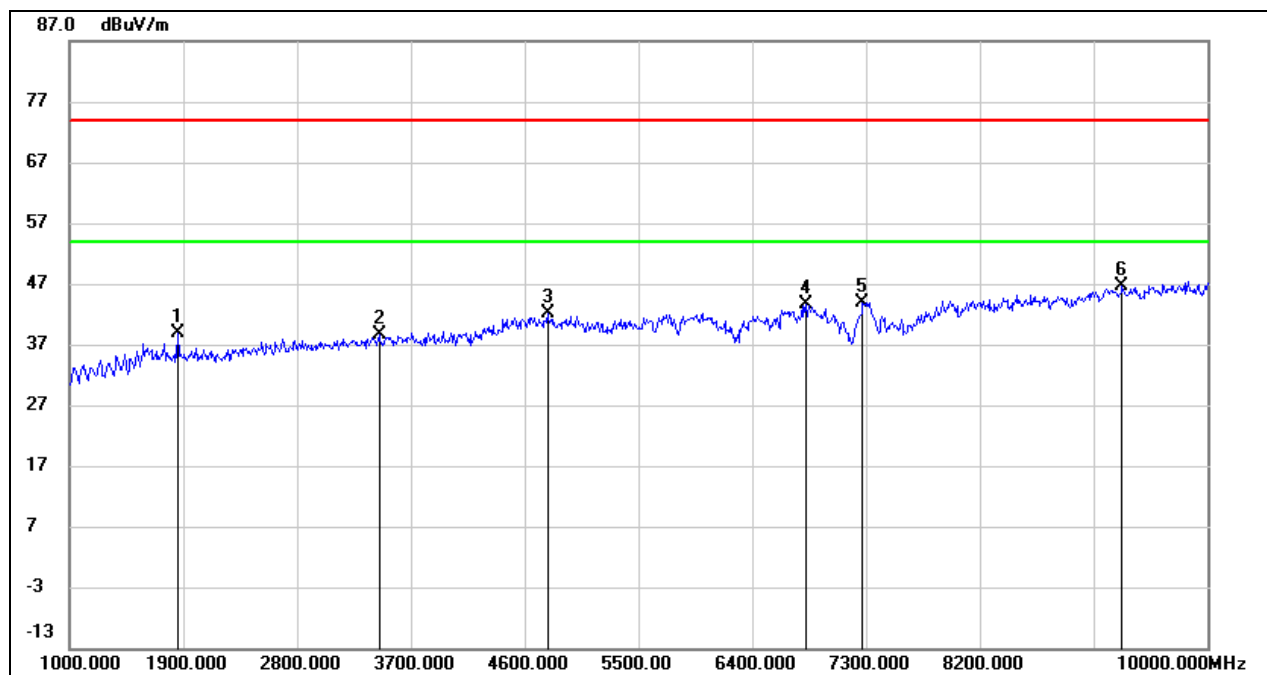
Note: 1. Measurement = Reading Level + Correct Factor.

2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.

3. Peak: Peak detector.

4. Only the worst data was recorded, if it complies with the limit, the other emissions deemed to comply with the limit.

HARMONICS AND SPURIOUS EMISSIONS (HIGH CHANNEL, VERTICAL)



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1855.000	48.90	-9.93	38.97	74.00	-35.03	peak
2	3448.000	43.36	-4.69	38.67	74.00	-35.33	peak
3	4780.000	42.42	-0.26	42.16	74.00	-31.84	peak
4	6823.000	38.24	5.29	43.53	74.00	-30.47	peak
5	7273.000	37.29	6.58	43.87	74.00	-30.13	peak
6	9325.000	36.28	10.37	46.65	74.00	-27.35	peak

Note: 1. Measurement = Reading Level + Correct Factor.

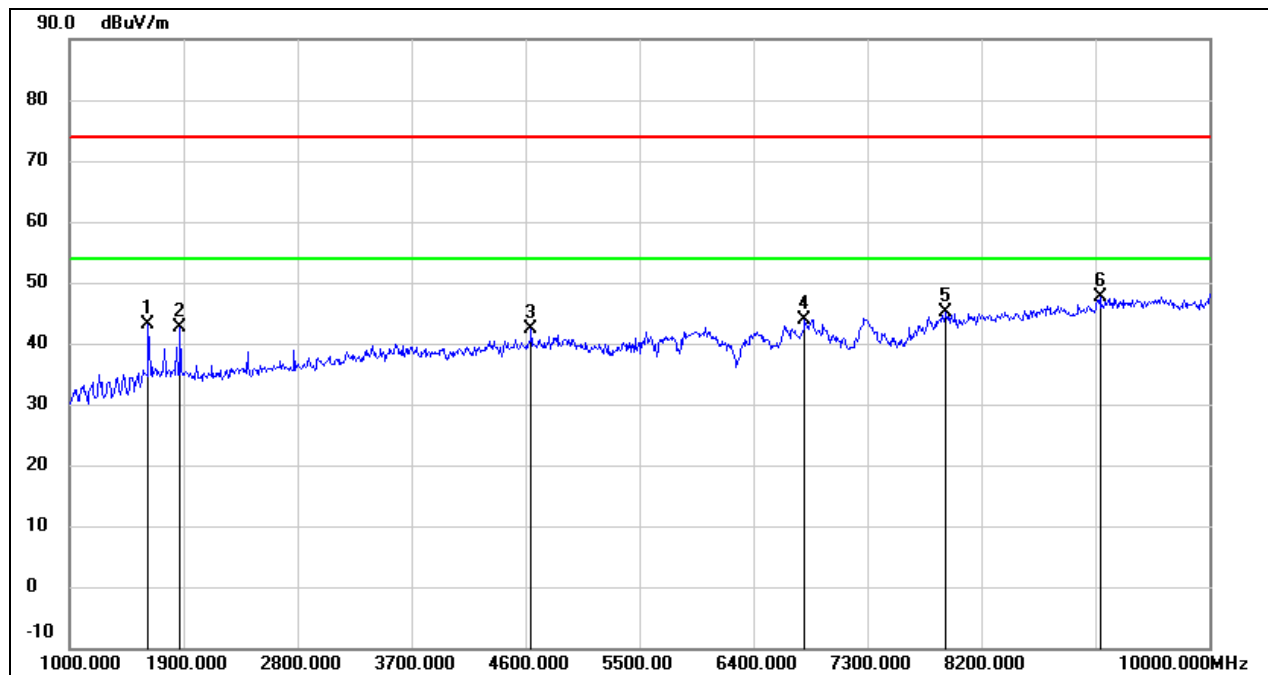
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.

3. Peak: Peak detector.

4. Only the worst data was recorded, if it complies with the limit, the other emissions deemed to comply with the limit.

8.1.3. Lora SF7 with RAKARJ14

HARMONICS AND SPURIOUS EMISSIONS (LOW CHANNEL, HORIZONTAL)



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1621.000	53.39	-10.28	43.11	74.00	-30.89	peak
2	1873.000	52.50	-9.83	42.67	74.00	-31.33	peak
3	4645.000	43.37	-1.02	42.35	74.00	-31.65	peak
4	6805.000	38.55	5.44	43.99	74.00	-30.01	peak
5	7921.000	37.15	7.87	45.02	74.00	-28.98	peak
6	9136.000	36.87	10.83	47.70	74.00	-26.30	peak

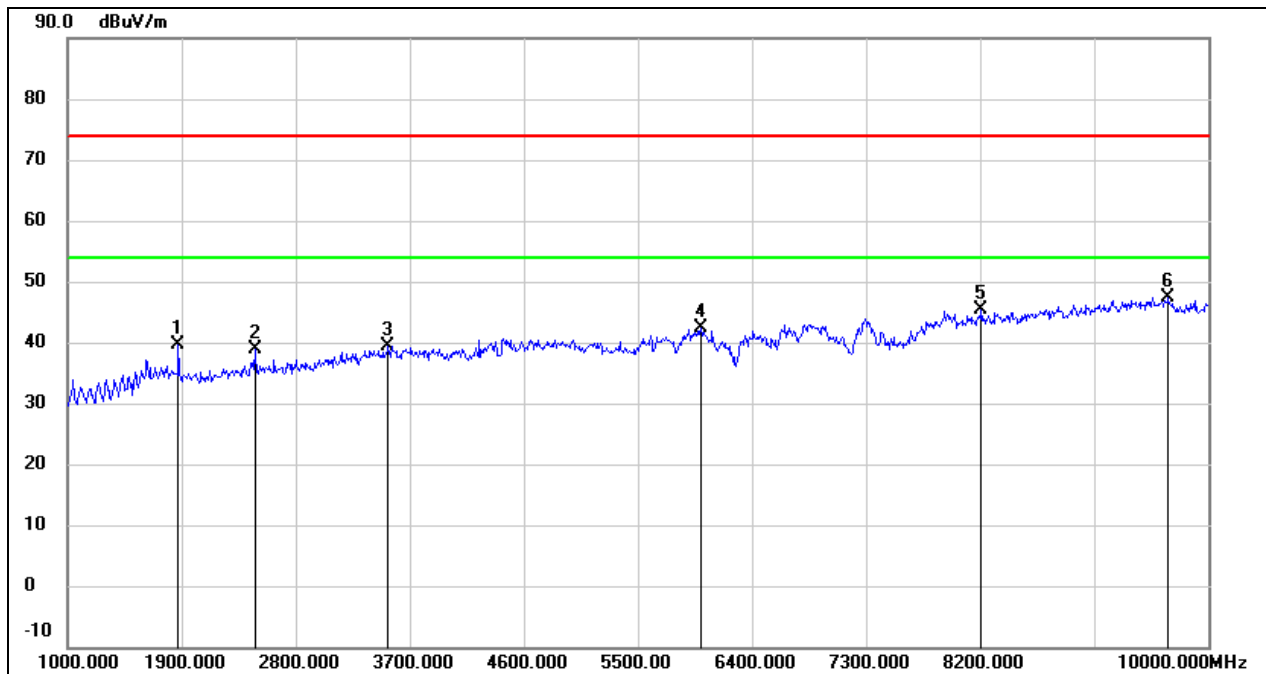
Note: 1. Measurement = Reading Level + Correct Factor.

2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.

3. Peak: Peak detector.

4. Only the worst data was recorded, if it complies with the limit, the other emissions deemed to comply with the limit.

HARMONICS AND SPURIOUS EMISSIONS (LOW CHANNEL, VERTICAL)



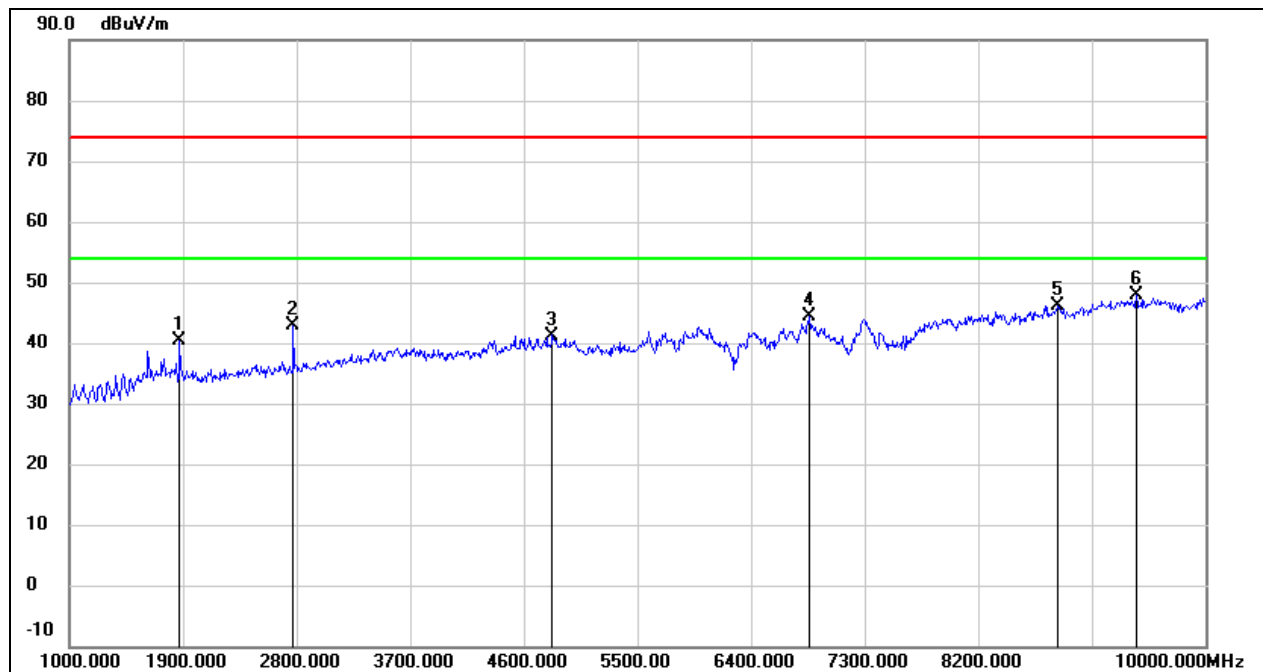
No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1873.000	49.57	-9.83	39.74	74.00	-34.26	peak
2	2476.000	47.15	-8.23	38.92	74.00	-35.08	peak
3	3529.000	42.97	-3.59	39.38	74.00	-34.62	peak
4	5995.000	39.92	2.36	42.28	74.00	-31.72	peak
5	8209.000	37.20	8.26	45.46	74.00	-28.54	peak
6	9685.000	35.38	12.12	47.50	74.00	-26.50	peak

Note: 1. Measurement = Reading Level + Correct Factor.

2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.

3. Peak: Peak detector.

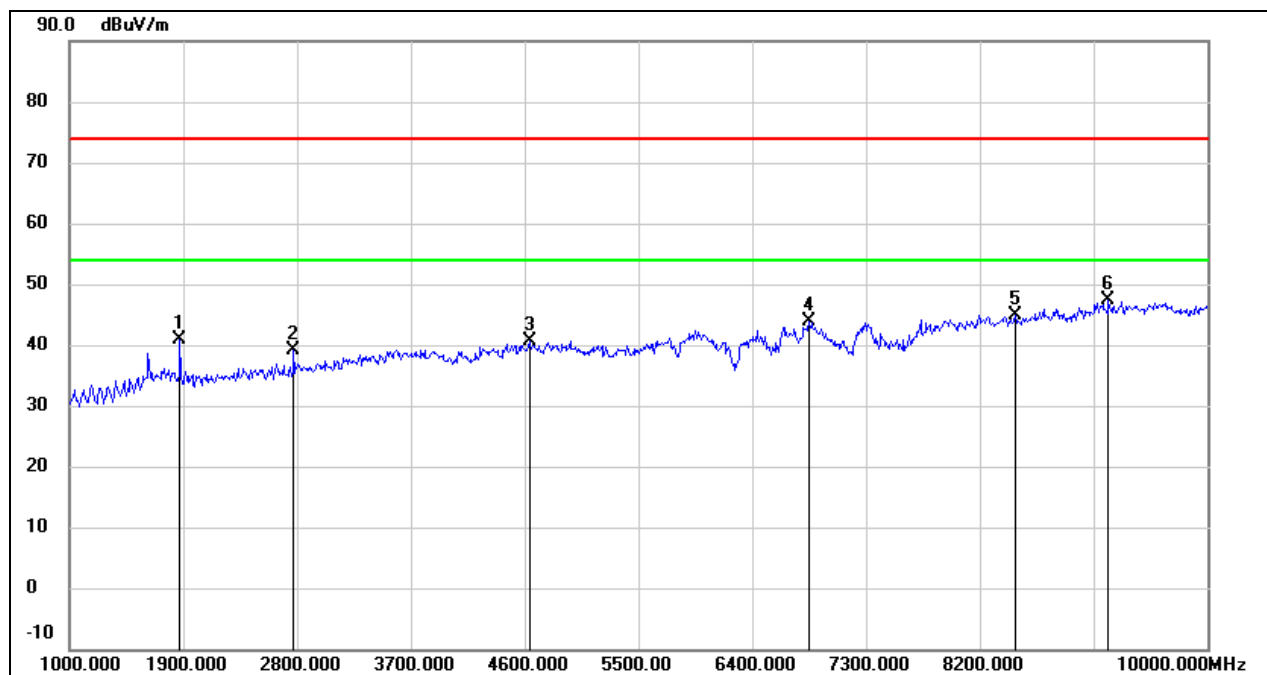
4. Only the worst data was recorded, if it complies with the limit, the other emissions deemed to comply with the limit.

HARMONICS AND SPURIOUS EMISSIONS (MID CHANNEL, HORIZONTAL)


No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1873.000	50.26	-9.83	40.43	74.00	-33.57	peak
2	2773.000	49.95	-7.13	42.82	74.00	-31.18	peak
3	4825.000	41.83	-0.58	41.25	74.00	-32.75	peak
4	6859.000	38.71	5.67	44.38	74.00	-29.62	peak
5	8830.000	36.30	9.86	46.16	74.00	-27.84	peak
6	9451.000	36.31	11.60	47.91	74.00	-26.09	peak

Note: 1. Measurement = Reading Level + Correct Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Peak: Peak detector.
4. Only the worst data was recorded, if it complies with the limit, the other emissions deemed to comply with the limit.

HARMONICS AND SPURIOUS EMISSIONS (MID CHANNEL, VERTICAL)



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1873.000	50.68	-9.83	40.85	74.00	-33.15	peak
2	2773.000	46.28	-7.13	39.15	74.00	-34.85	peak
3	4636.000	41.61	-1.03	40.58	74.00	-33.42	peak
4	6850.000	38.18	5.62	43.80	74.00	-30.20	peak
5	8479.000	36.22	8.76	44.98	74.00	-29.02	peak
6	9217.000	36.34	11.15	47.49	74.00	-26.51	peak

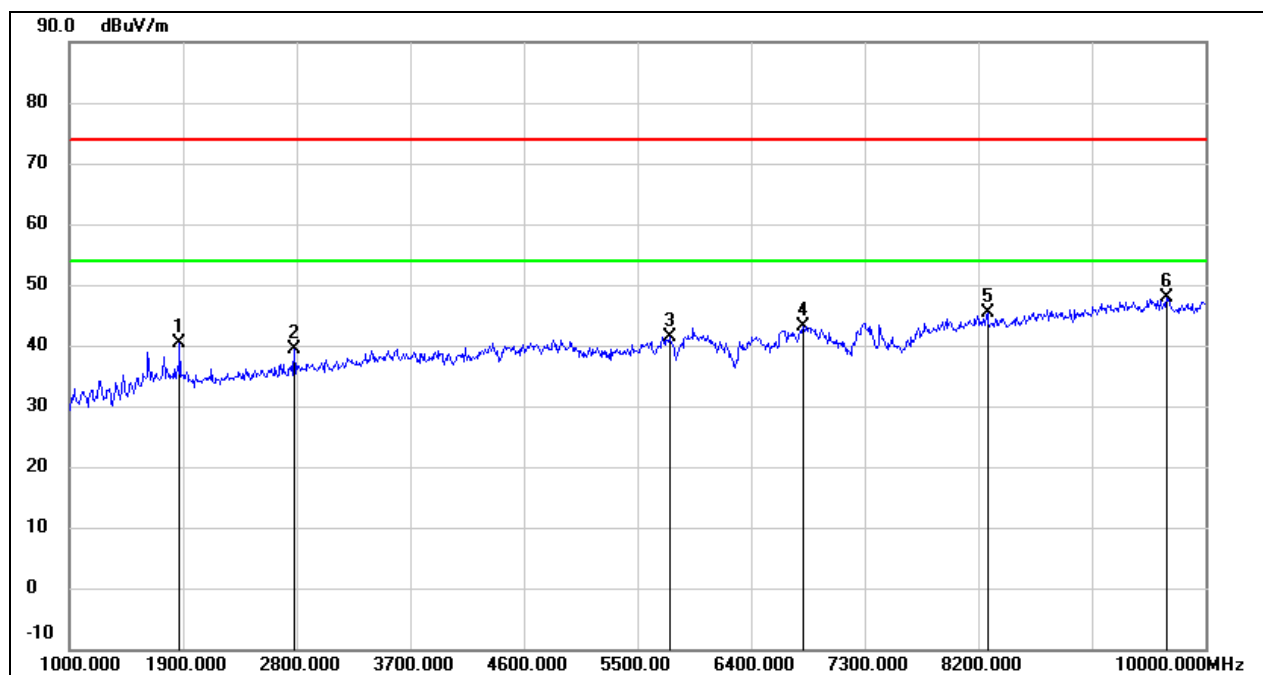
Note: 1. Measurement = Reading Level + Correct Factor.

2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.

3. Peak: Peak detector.

4. Only the worst data was recorded, if it complies with the limit, the other emissions deemed to comply with the limit.

HARMONICS AND SPURIOUS EMISSIONS (HIGH CHANNEL, HORIZONTAL)



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1873.000	50.31	-9.83	40.48	74.00	-33.52	peak
2	2782.000	46.49	-7.09	39.40	74.00	-34.60	peak
3	5752.000	39.74	1.72	41.46	74.00	-32.54	peak
4	6814.000	37.68	5.48	43.16	74.00	-30.84	peak
5	8272.000	36.97	8.38	45.35	74.00	-28.65	peak
6	9694.000	35.73	12.14	47.87	74.00	-26.13	peak

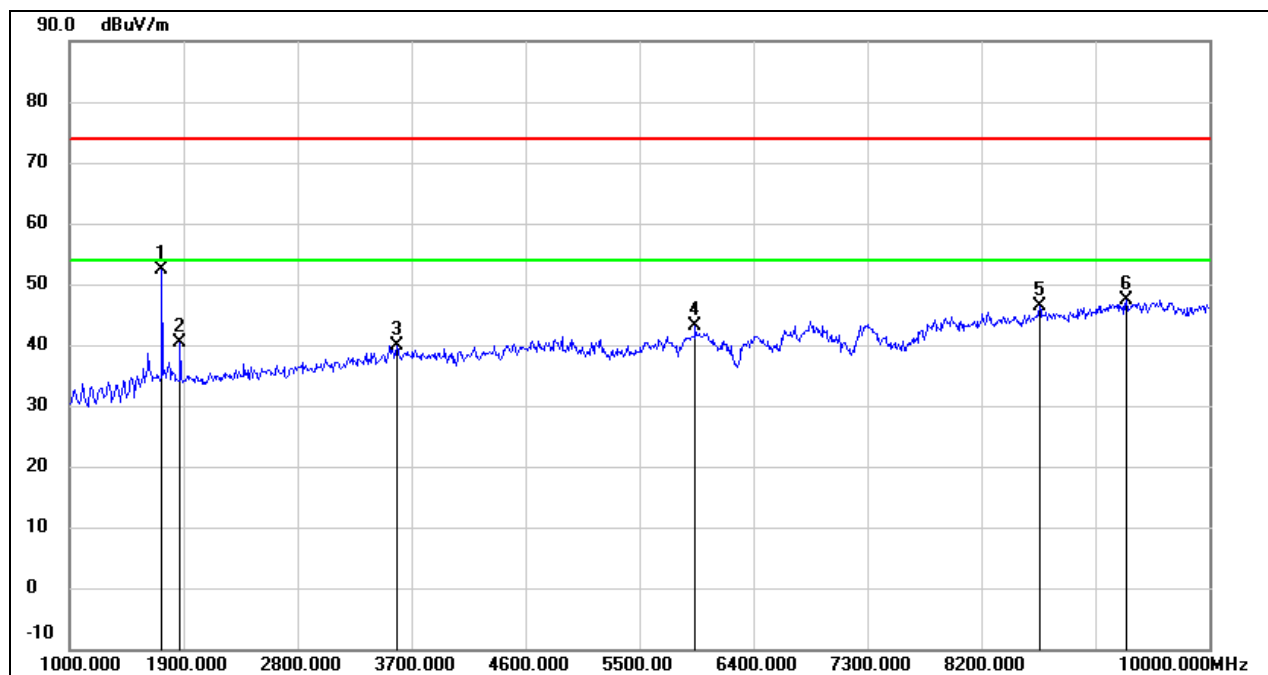
Note: 1. Measurement = Reading Level + Correct Factor.

2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.

3. Peak: Peak detector.

4. Only the worst data was recorded, if it complies with the limit, the other emissions deemed to comply with the limit.

HARMONICS AND SPURIOUS EMISSIONS (HIGH CHANNEL, VERTICAL)



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1729.000	62.33	-9.90	52.43	74.00	-21.57	peak
2	1873.000	50.16	-9.83	40.33	74.00	-33.67	peak
3	3583.000	43.31	-3.37	39.94	74.00	-34.06	peak
4	5941.000	40.79	2.23	43.02	74.00	-30.98	peak
5	8659.000	36.97	9.34	46.31	74.00	-27.69	peak
6	9343.000	35.92	11.39	47.31	74.00	-26.69	peak

Note: 1. Measurement = Reading Level + Correct Factor.

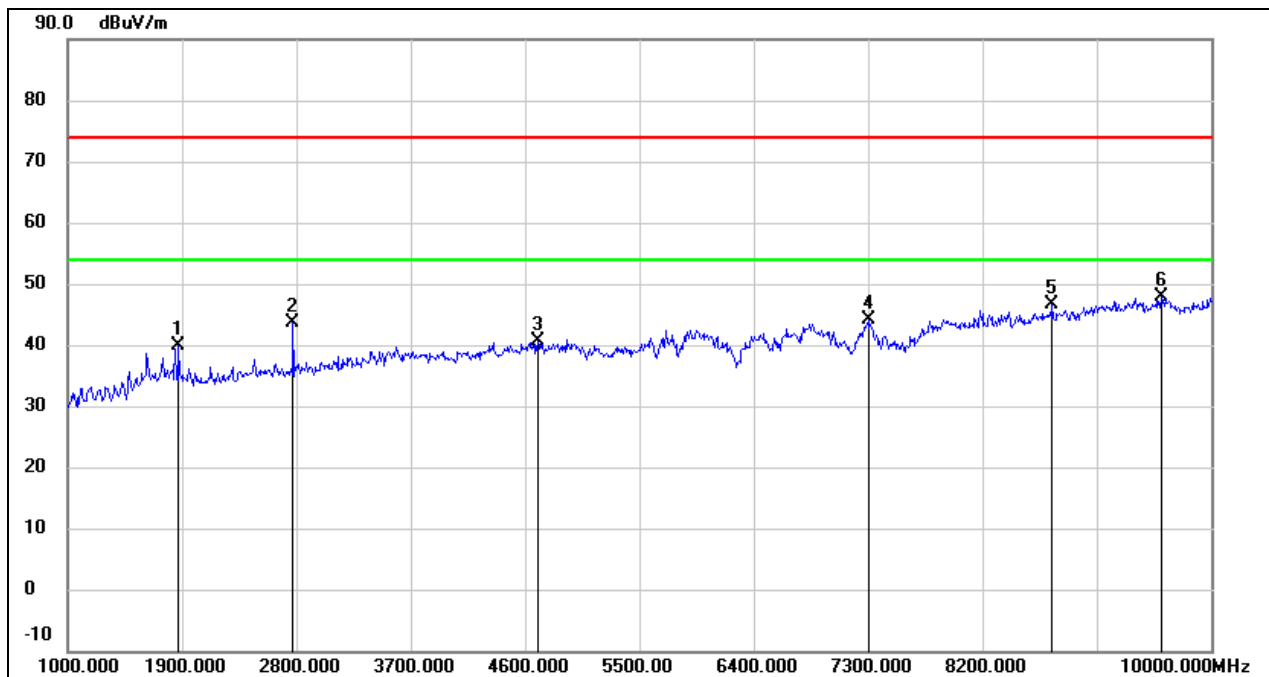
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.

3. Peak: Peak detector.

4. Only the worst data was recorded, if it complies with the limit, the other emissions deemed to comply with the limit.

8.1.4. Lora SF12 with RAKARJ14

HARMONICS AND SPURIOUS EMISSIONS (LOW CHANNEL, HORIZONTAL)



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1873.000	49.67	-9.83	39.84	74.00	-34.16	peak
2	2773.000	50.82	-7.13	43.69	74.00	-30.31	peak
3	4699.000	41.48	-0.89	40.59	74.00	-33.41	peak
4	7300.000	37.44	6.69	44.13	74.00	-29.87	peak
5	8749.000	37.07	9.63	46.70	74.00	-27.30	peak
6	9613.000	35.81	11.95	47.76	74.00	-26.24	peak

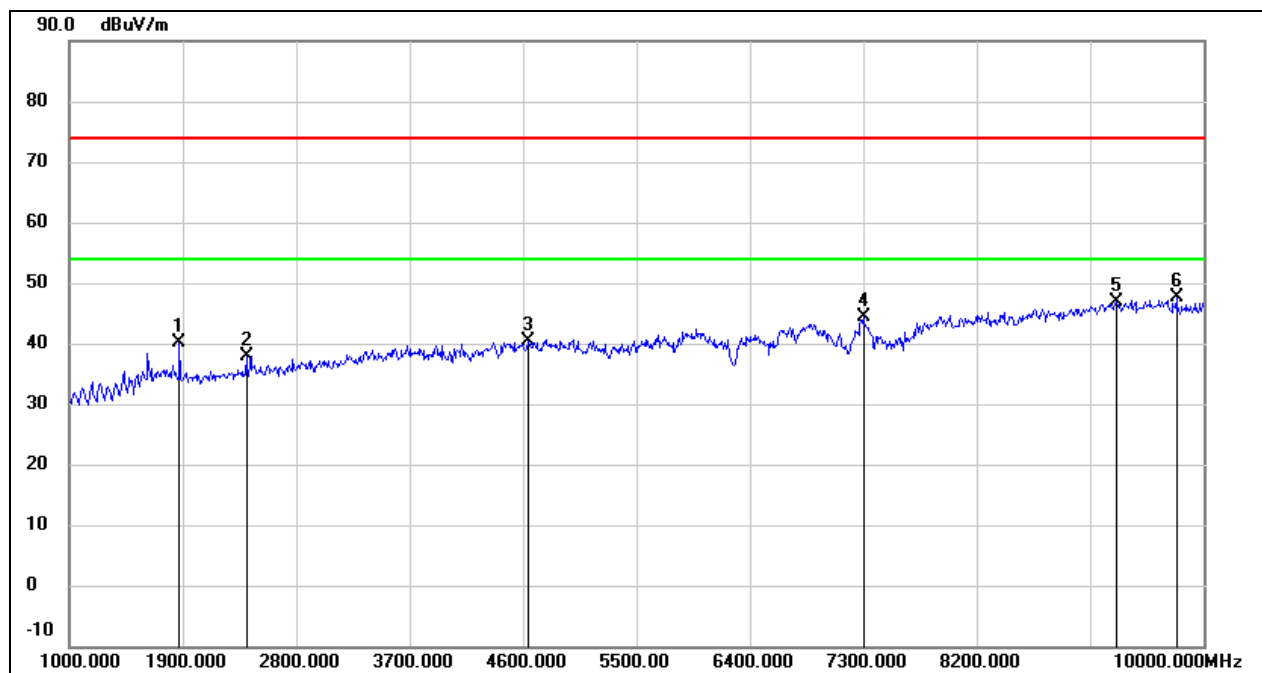
Note: 1. Measurement = Reading Level + Correct Factor.

2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.

3. Peak: Peak detector.

4. Only the worst data was recorded, if it complies with the limit, the other emissions deemed to comply with the limit.

HARMONICS AND SPURIOUS EMISSIONS (LOW CHANNEL, VERTICAL)



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1873.000	49.98	-9.83	40.15	74.00	-33.85	peak
2	2404.000	46.30	-8.49	37.81	74.00	-36.19	peak
3	4645.000	41.47	-1.02	40.45	74.00	-33.55	peak
4	7300.000	37.59	6.69	44.28	74.00	-29.72	peak
5	9307.000	35.52	11.32	46.84	74.00	-27.16	peak
6	9784.000	35.24	12.36	47.60	74.00	-26.40	peak

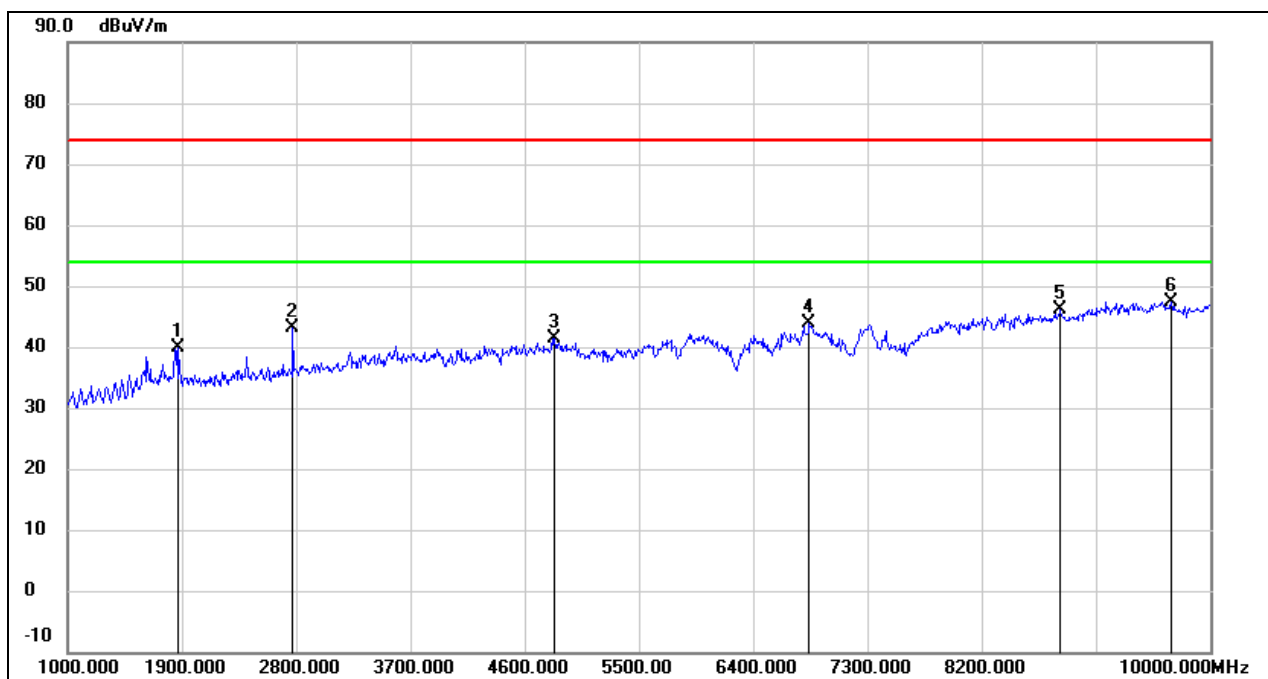
Note: 1. Measurement = Reading Level + Correct Factor.

2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.

3. Peak: Peak detector.

4. Only the worst data was recorded, if it complies with the limit, the other emissions deemed to comply with the limit.

HARMONICS AND SPURIOUS EMISSIONS (MID CHANNEL, HORIZONTAL)



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1873.000	49.81	-9.83	39.98	74.00	-34.02	peak
2	2773.000	50.27	-7.13	43.14	74.00	-30.86	peak
3	4834.000	41.95	-0.56	41.39	74.00	-32.61	peak
4	6841.000	38.37	5.58	43.95	74.00	-30.05	peak
5	8821.000	36.32	9.84	46.16	74.00	-27.84	peak
6	9694.000	35.28	12.14	47.42	74.00	-26.58	peak

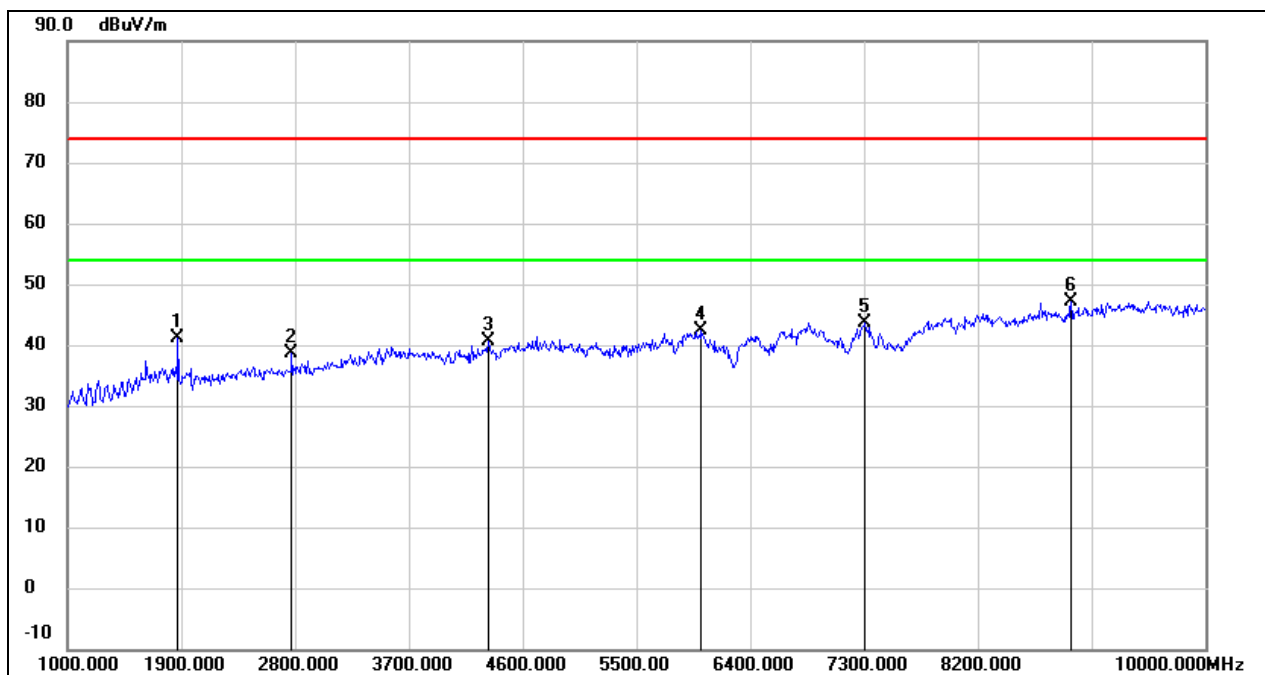
Note: 1. Measurement = Reading Level + Correct Factor.

2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.

3. Peak: Peak detector.

4. Only the worst data was recorded, if it complies with the limit, the other emissions deemed to comply with the limit.

HARMONICS AND SPURIOUS EMISSIONS (MID CHANNEL, VERTICAL)



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1873.000	50.98	-9.83	41.15	74.00	-32.85	peak
2	2773.000	45.70	-7.13	38.57	74.00	-35.43	peak
3	4330.000	42.52	-1.93	40.59	74.00	-33.41	peak
4	6013.000	40.02	2.45	42.47	74.00	-31.53	peak
5	7309.000	36.89	6.70	43.59	74.00	-30.41	peak
6	8938.000	36.98	10.07	47.05	74.00	-26.95	peak

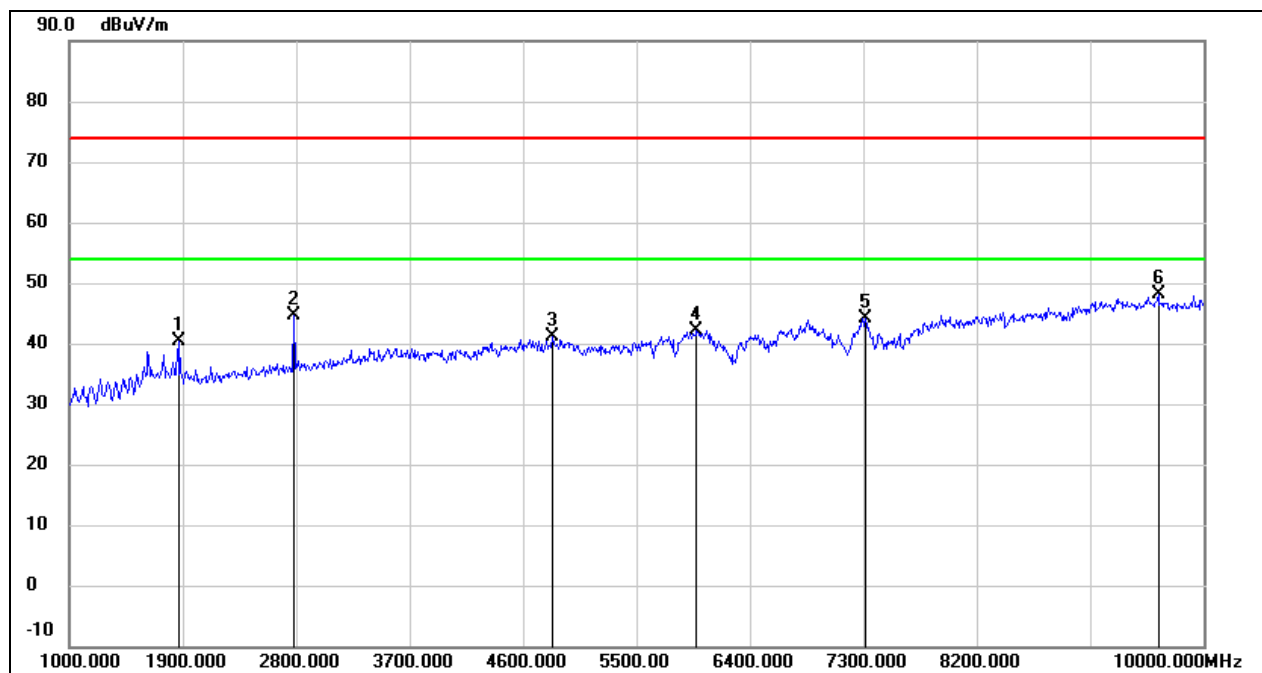
Note: 1. Measurement = Reading Level + Correct Factor.

2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.

3. Peak: Peak detector.

4. Only the worst data was recorded, if it complies with the limit, the other emissions deemed to comply with the limit.

HARMONICS AND SPURIOUS EMISSIONS (HIGH CHANNEL, HORIZONTAL)



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1873.000	50.23	-9.83	40.40	74.00	-33.60	peak
2	2782.000	51.61	-7.09	44.52	74.00	-29.48	peak
3	4834.000	41.60	-0.56	41.04	74.00	-32.96	peak
4	5977.000	39.86	2.33	42.19	74.00	-31.81	peak
5	7318.000	37.55	6.69	44.24	74.00	-29.76	peak
6	9640.000	36.07	12.01	48.08	74.00	-25.92	peak

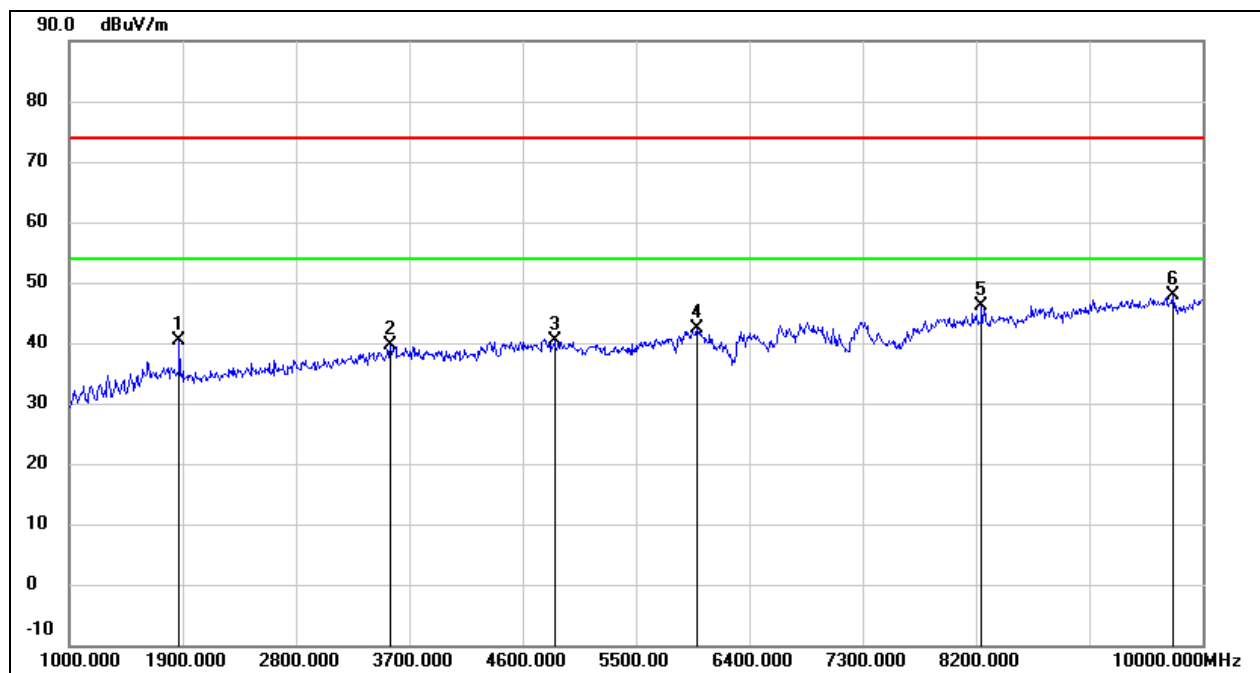
Note: 1. Measurement = Reading Level + Correct Factor.

2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.

3. Peak: Peak detector.

4. Only the worst data was recorded, if it complies with the limit, the other emissions deemed to comply with the limit.

HARMONICS AND SPURIOUS EMISSIONS (HIGH CHANNEL, VERTICAL)



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1873.000	50.21	-9.83	40.38	74.00	-33.62	peak
2	3547.000	43.02	-3.51	39.51	74.00	-34.49	peak
3	4852.000	40.85	-0.51	40.34	74.00	-33.66	peak
4	5986.000	39.94	2.35	42.29	74.00	-31.71	peak
5	8245.000	37.82	8.33	46.15	74.00	-27.85	peak
6	9766.000	35.62	12.32	47.94	74.00	-26.06	peak

Note: 1. Measurement = Reading Level + Correct Factor.

2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.

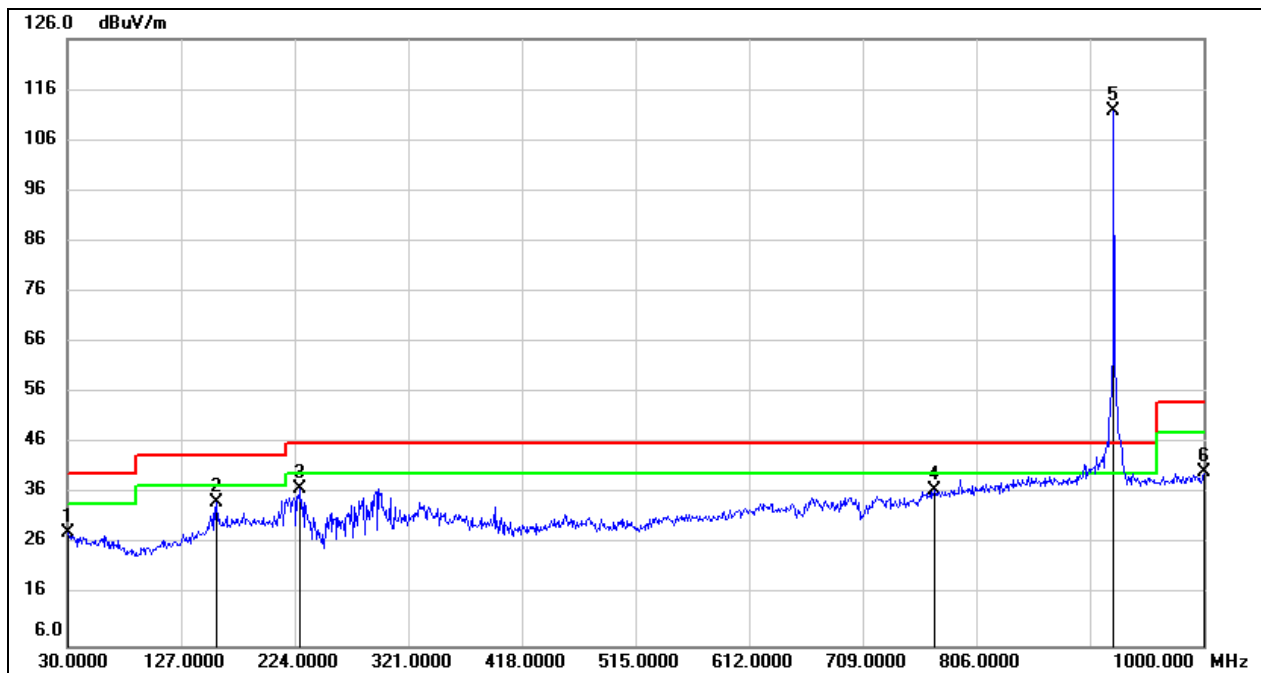
3. Peak: Peak detector.

4. Only the worst data was recorded, if it complies with the limit, the other emissions deemed to comply with the limit.

8.2. SPURIOUS EMISSIONS (30 MHz ~ 1 GHz)

8.2.1. Lora SF7 with RAKARG15

SPURIOUS EMISSIONS (LOW CHANNEL, WORST-CASE CONFIGURATION, HORIZONTAL)



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	30.9700	22.76	5.71	28.47	40.00	-11.53	peak
2	157.0700	27.25	7.02	34.27	43.50	-9.23	peak
3	228.8500	30.37	6.55	36.92	46.00	-9.08	peak
4	770.1100	20.01	16.83	36.84	46.00	-9.16	peak
5	923.3700	92.35	19.38	111.73	/	/	fundamental
6	1000.0000	20.57	19.87	40.44	54.00	-13.56	peak

Note: 1. Result Level = Read Level + Correct Factor.

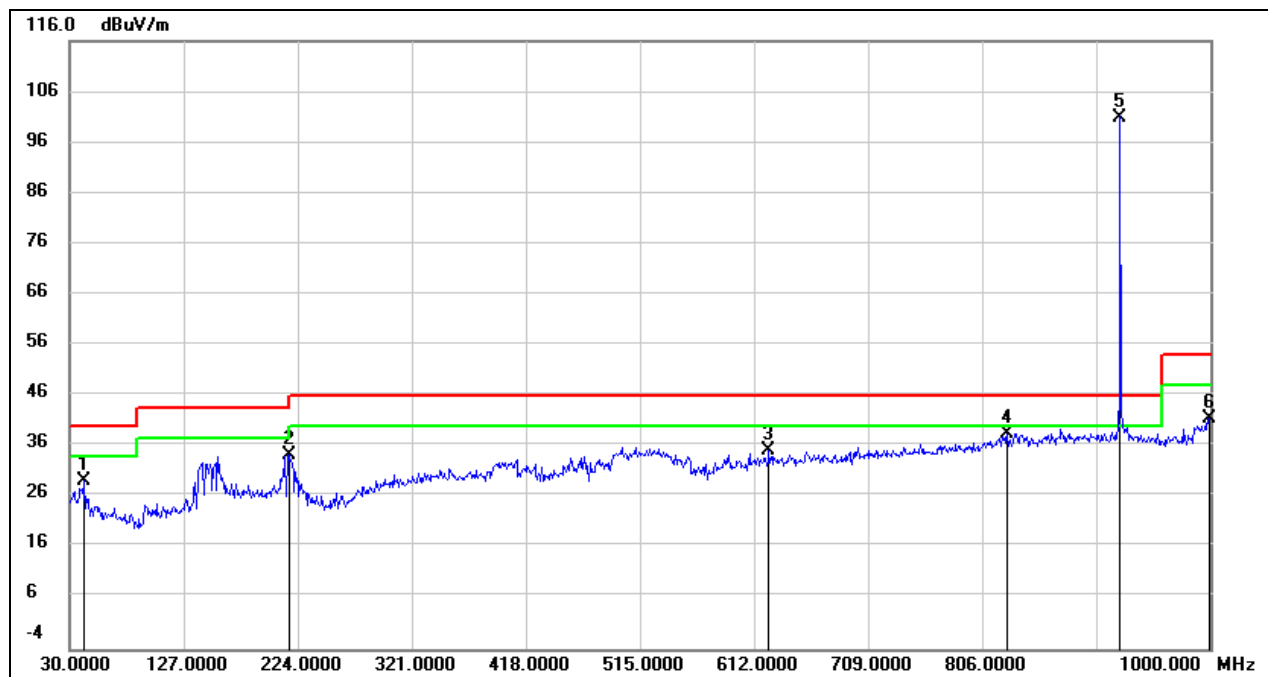
2. If Peak Result complies with QP limit, QP Result is deemed to comply with QP limit.

3. Test setup: RBW: 120 kHz, VBW: 300 kHz, Sweep time: auto

4. Filter losses were only considered in the spurious frequency bands and the authorized band was not corrected for Band reject filter losses.

5. Proper operation of the transmitter prior to adding the filter to the measurement chain.

SPURIOUS EMISSIONS (LOW CHANNEL, WORST-CASE CONFIGURATION, VERTICAL)



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	42.6100	24.07	5.16	29.23	40.00	-10.77	peak
2	216.2400	27.34	7.05	34.39	46.00	-11.61	peak
3	624.6100	20.85	14.33	35.18	46.00	-10.82	peak
4	827.3400	20.36	18.11	38.47	46.00	-7.53	peak
5	923.3700	81.62	19.38	101.00	/	/	fundamental
6	999.0300	21.50	19.85	41.35	54.00	-12.65	peak

Note: 1. Result Level = Read Level + Correct Factor.

2. If Peak Result complies with QP limit, QP Result is deemed to comply with QP limit.

3. Test setup: RBW: 120 kHz, VBW: 300 kHz, Sweep time: auto

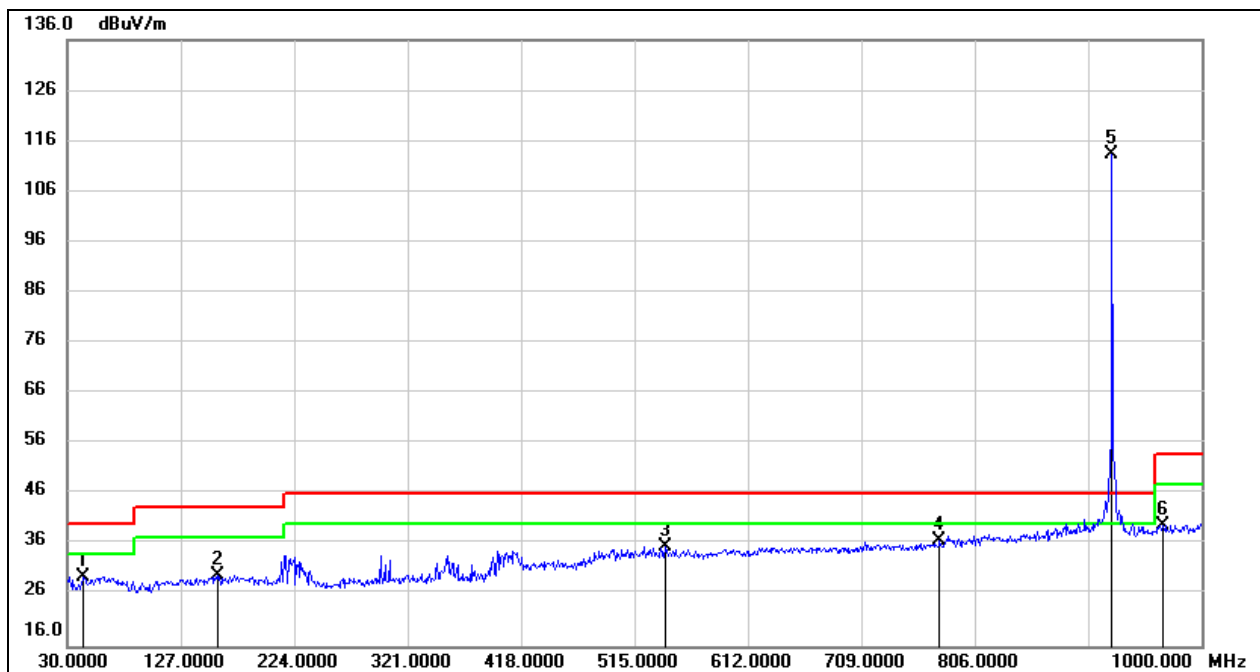
4. Filter losses were only considered in the spurious frequency bands and the authorized band was not corrected for Band reject filter losses.

5. Proper operation of the transmitter prior to adding the filter to the measurement chain.

Note: All the modes and channels have been tested, only the worst data was recorded in the report.

8.2.2. Lora SF7 with RAKARJ14

SPURIOUS EMISSIONS (LOW CHANNEL, WORST-CASE CONFIGURATION, HORIZONTAL)



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	43.5800	24.49	5.12	29.61	40.00	-10.39	peak
2	158.0399	22.98	7.10	30.08	43.50	-13.42	peak
3	541.1900	22.72	12.86	35.58	46.00	-10.42	peak
4	775.9300	20.03	16.93	36.96	46.00	-9.04	peak
5	923.3700	94.02	19.38	113.40	/	/	fundamental
6	967.0200	20.49	19.41	39.90	54.00	-14.10	peak

Note: 1. Result Level = Read Level + Correct Factor.

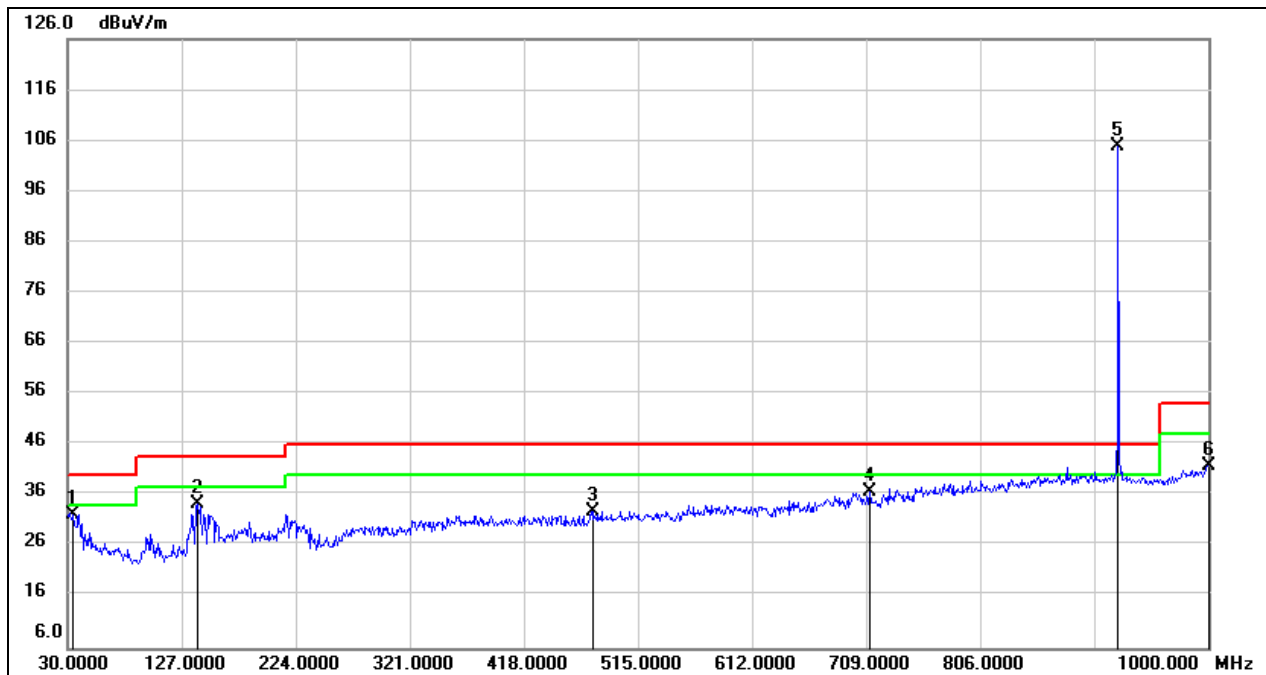
2. If Peak Result complies with QP limit, QP Result is deemed to comply with QP limit.

3. Test setup: RBW: 120 kHz, VBW: 300 kHz, Sweep time: auto

4. Filter losses were only considered in the spurious frequency bands and the authorized band was not corrected for Band reject filter losses.

5. Proper operation of the transmitter prior to adding the filter to the measurement chain.

SPURIOUS EMISSIONS (LOW CHANNEL, WORST-CASE CONFIGURATION, VERTICAL)



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	34.8500	26.73	5.51	32.24	40.00	-7.76	peak
2	140.5800	28.41	6.05	34.46	43.50	-9.04	peak
3	477.1700	20.70	12.11	32.81	46.00	-13.19	peak
4	711.9099	20.86	15.93	36.79	46.00	-9.21	peak
5	923.3700	85.39	19.38	104.77	/	/	fundamental
6	1000.0000	22.08	19.87	41.95	54.00	-12.05	peak

Note: 1. Result Level = Read Level + Correct Factor.

2. If Peak Result complies with QP limit, QP Result is deemed to comply with QP limit.

3. Test setup: RBW: 120 kHz, VBW: 300 kHz, Sweep time: auto

4. Filter losses were only considered in the spurious frequency bands and the authorized band was not corrected for Band reject filter losses.

5. Proper operation of the transmitter prior to adding the filter to the measurement chain.

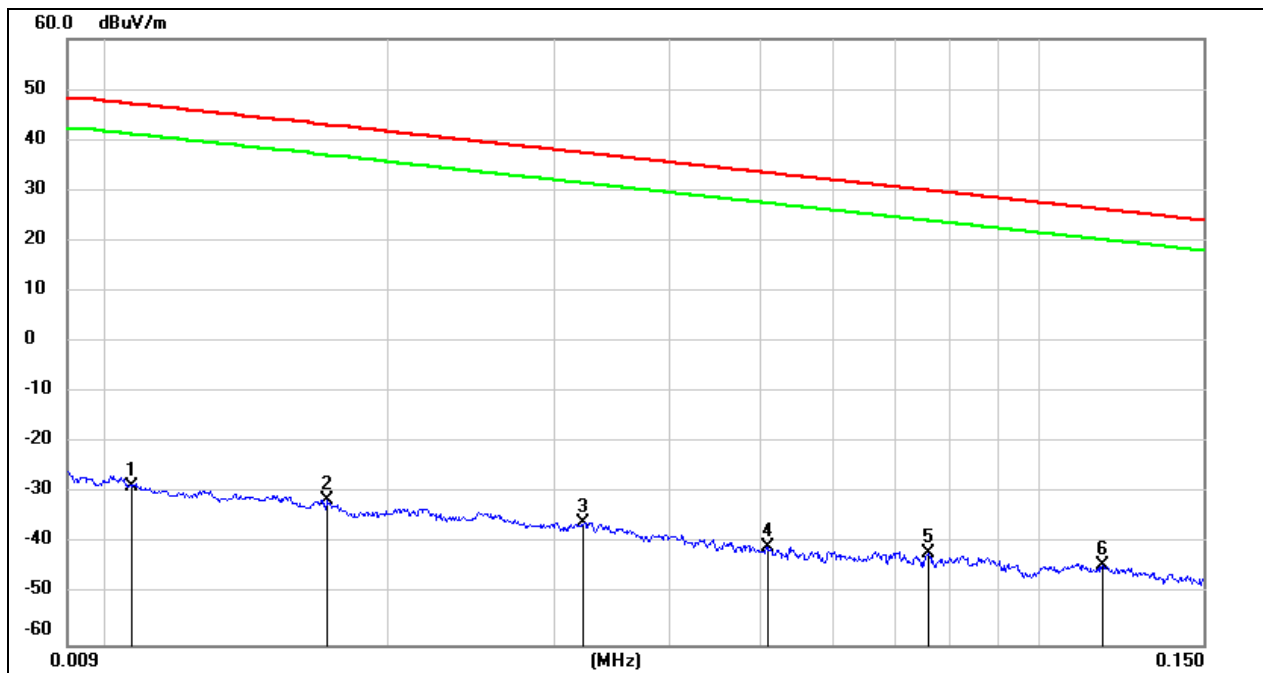
Note: All the modes and channels have been tested, only the worst data was recorded in the report.

8.3. SPURIOUS EMISSIONS BELOW 30 MHz

8.3.1. Lora SF7 with RAKARG15

SPURIOUS EMISSIONS (HIGH CHANNEL, LOOP ANTENNA FACE ON TO THE EUT, WORST-CASE CONFIGURATION)

9 kHz~ 150 kHz



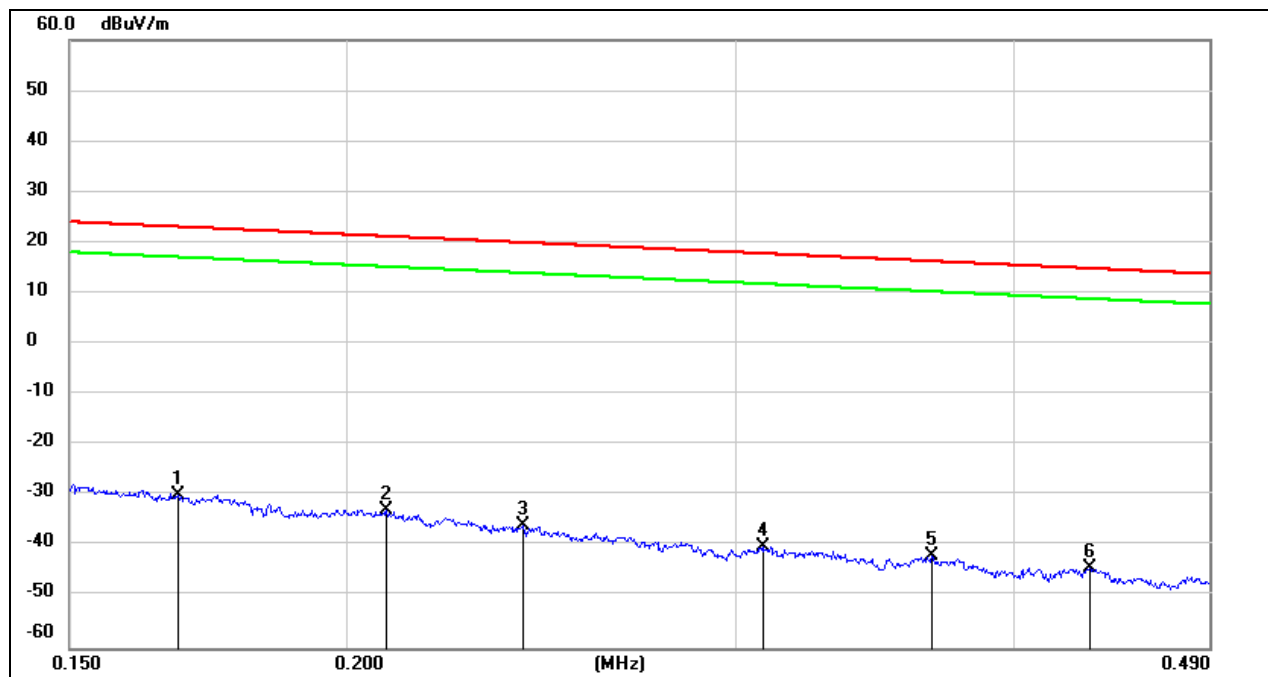
No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	0.0106	72.88	-101.39	-28.51	47.09	-75.60	peak
2	0.0171	69.88	-101.36	-31.48	42.94	-74.42	peak
3	0.0323	65.50	-101.40	-35.90	37.42	-73.32	peak
4	0.0509	60.90	-101.48	-40.58	33.47	-74.05	peak
5	0.0758	59.64	-101.59	-41.95	30.01	-71.96	peak
6	0.1170	57.35	-101.74	-44.39	26.24	-70.63	peak

Note: 1. Measurement = Reading Level + Correct Factor.

2. If Peak Result complies with AV and QP limit, AV and QP Result are deemed to comply with AV limit.

3. All 3 polarizations (Horizontal, Face-on and Face-off) of the loop antenna had been tested, but only the worst data recorded in the report.

150 kHz ~ 490 kHz



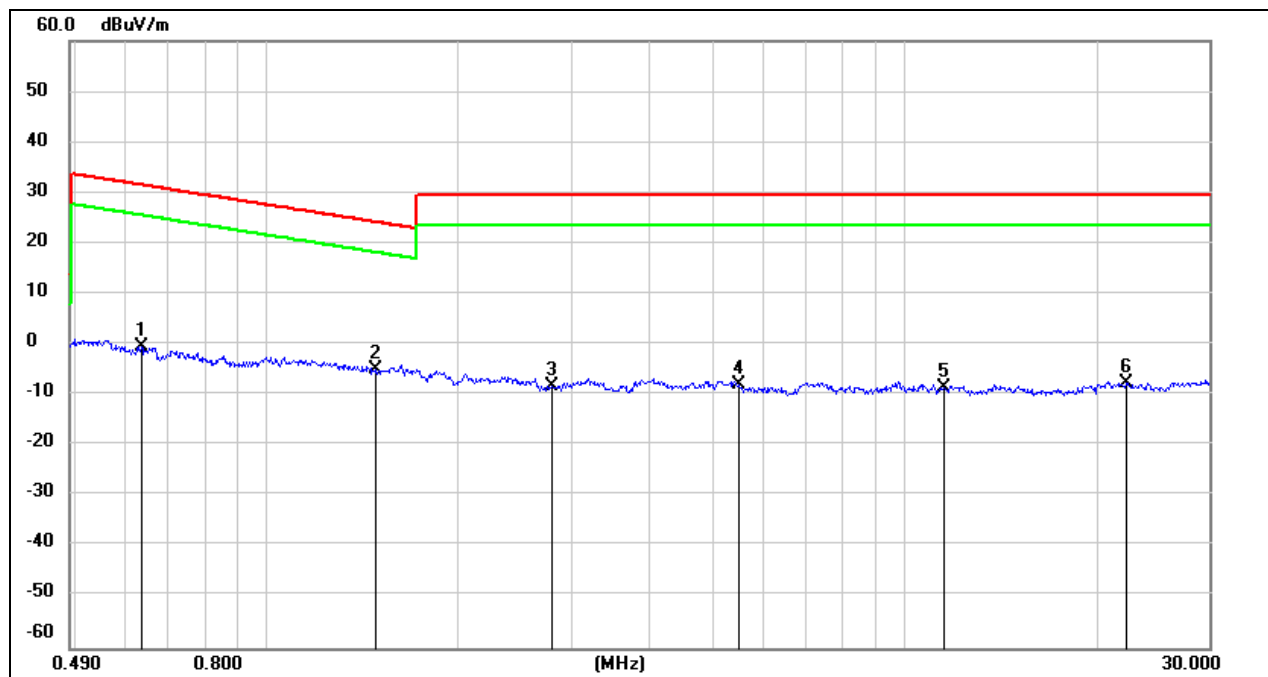
No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	0.1680	71.78	-101.67	-29.89	23.10	-52.99	peak
2	0.2084	68.97	-101.73	-32.76	21.22	-53.98	peak
3	0.2404	65.95	-101.78	-35.83	19.98	-55.81	peak
4	0.3079	61.85	-101.86	-40.01	17.83	-57.84	peak
5	0.3673	60.06	-101.93	-41.87	16.30	-58.17	peak
6	0.4329	57.73	-101.99	-44.26	14.87	-59.13	peak

Note: 1. Measurement = Reading Level + Correct Factor.

2. If Peak Result complies with AV and QP limit, AV and QP Result are deemed to comply with AV limit.

3. All 3 polarizations (Horizontal, Face-on and Face-off) of the loop antenna had been tested, but only the worst data recorded in the report.

490 kHz ~ 30 MHz



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	0.6370	61.75	-62.10	-0.35	31.52	-31.87	peak
2	1.4757	57.00	-62.05	-5.05	24.22	-29.27	peak
3	2.7930	53.44	-61.63	-8.19	29.54	-37.73	peak
4	5.5066	53.39	-61.42	-8.03	29.54	-37.57	peak
5	11.5266	52.42	-60.86	-8.44	29.54	-37.98	peak
6	22.2681	53.00	-60.66	-7.66	29.54	-37.20	peak

Note: 1. Measurement = Reading Level + Correct Factor.

2. If Peak Result complies with AV and QP limit, AV and QP Result are deemed to comply with AV limit.

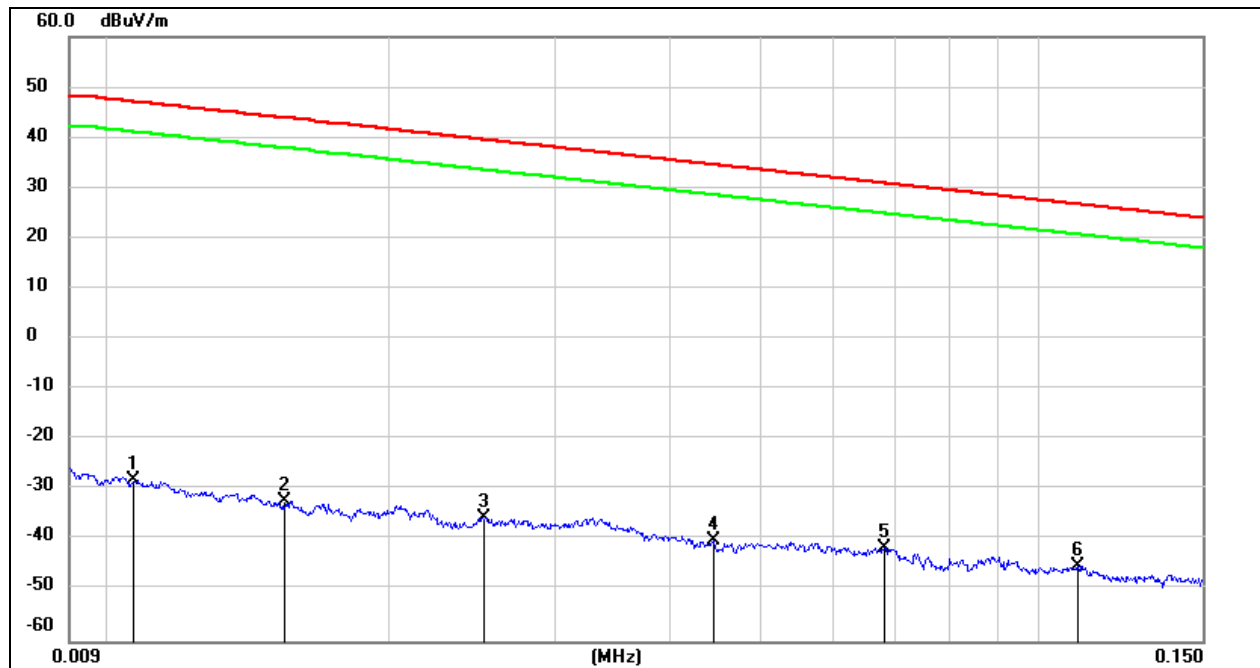
3. All 3 polarizations (Horizontal, Face-on and Face-off) of the loop antenna had been tested, but only the worst data recorded in the report.

Note: All the modes and channels have been tested, only the worst data was recorded in the report.

8.3.2. Lora SF7 with RAKARJ14

SPURIOUS EMISSIONS (HIGH CHANNEL, LOOP ANTENNA FACE ON TO THE EUT, WORST-CASE CONFIGURATION)

9 kHz~ 150 kHz



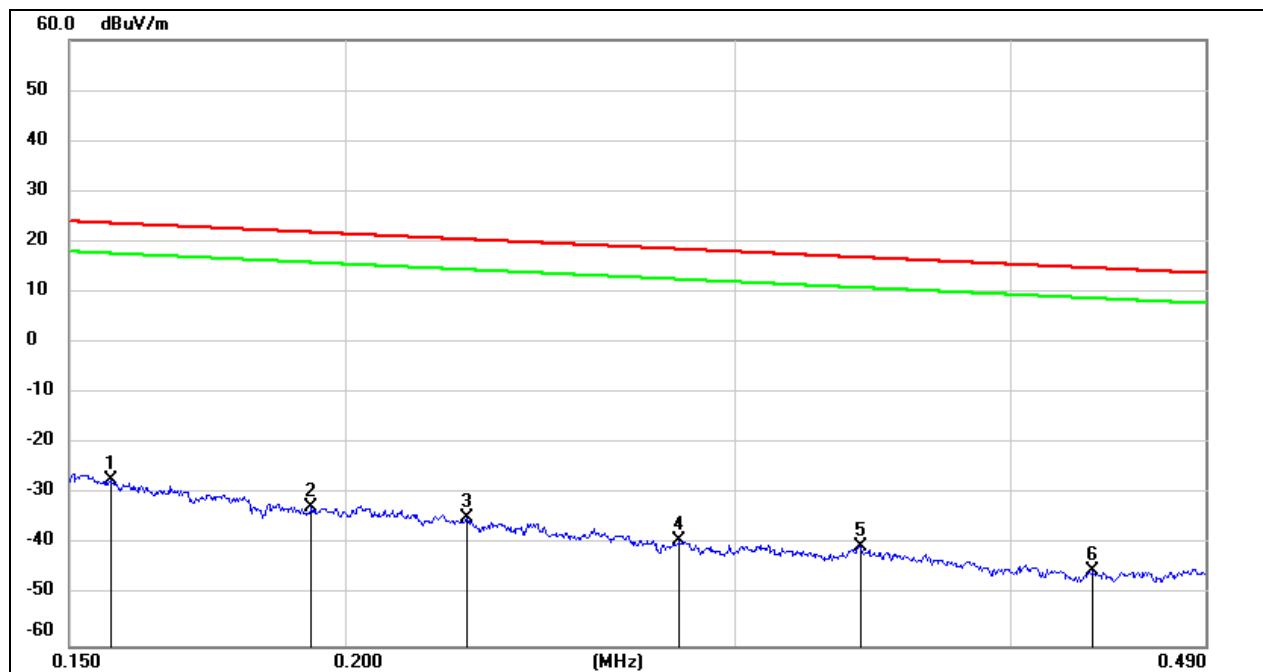
No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	0.0106	73.38	-101.39	-28.01	47.09	-75.10	peak
2	0.0154	68.99	-101.37	-32.38	43.85	-76.23	peak
3	0.0252	65.88	-101.37	-35.49	39.57	-75.06	peak
4	0.0446	61.33	-101.45	-40.12	34.61	-74.73	peak
5	0.0680	60.04	-101.56	-41.52	30.95	-72.47	peak
6	0.1101	56.75	-101.77	-45.02	26.77	-71.79	peak

Note: 1. Measurement = Reading Level + Correct Factor.

2. If Peak Result complies with AV and QP limit, AV and QP Result are deemed to comply with AV limit.

3. All 3 polarizations (Horizontal, Face-on and Face-off) of the loop antenna had been tested, but only the worst data recorded in the report.

150 kHz ~ 490 kHz



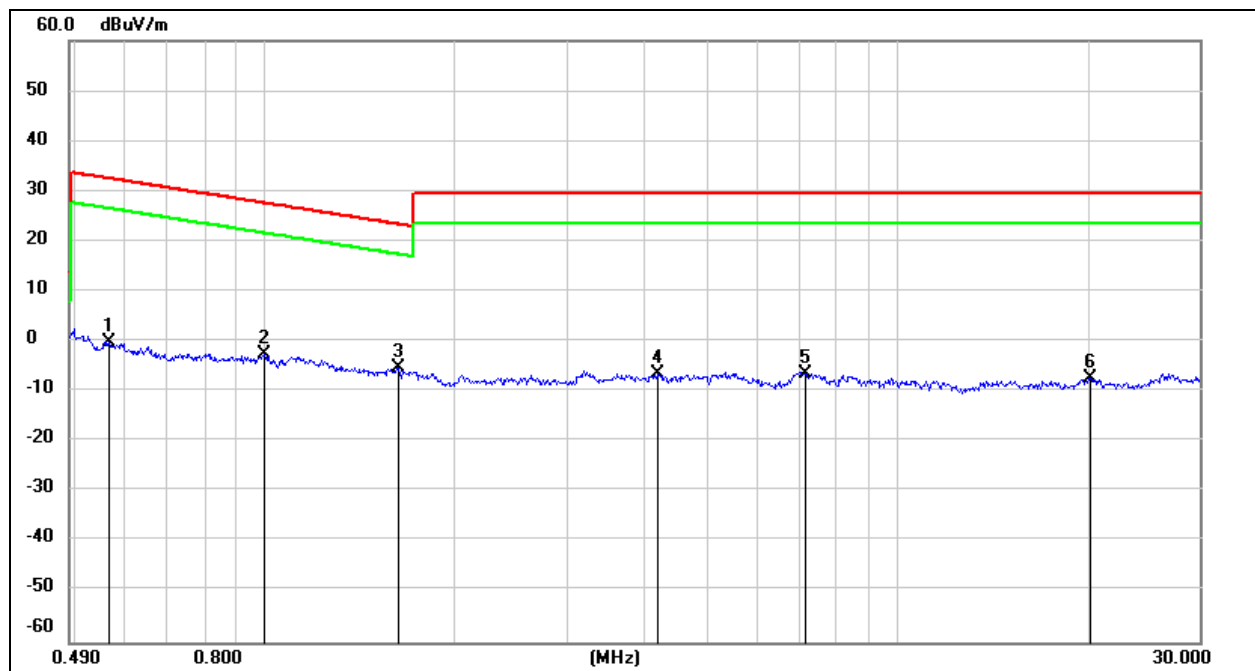
No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	0.1567	74.45	-101.65	-27.20	23.70	-50.90	peak
2	0.1930	69.23	-101.70	-32.47	21.89	-54.36	peak
3	0.2272	67.23	-101.76	-34.53	20.47	-55.00	peak
4	0.2832	62.67	-101.83	-39.16	18.56	-57.72	peak
5	0.3421	61.60	-101.90	-40.30	16.92	-57.22	peak
6	0.4359	56.79	-101.99	-45.20	14.81	-60.01	peak

Note: 1. Measurement = Reading Level + Correct Factor.

2. If Peak Result complies with AV and QP limit, AV and QP Result are deemed to comply with AV limit.

3. All 3 polarizations (Horizontal, Face-on and Face-off) of the loop antenna had been tested, but only the worst data recorded in the report.

490 kHz ~ 30 MHz



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	0.5655	61.86	-62.07	-0.21	32.55	-32.76	peak
2	0.9939	59.74	-62.27	-2.53	27.65	-30.18	peak
3	1.6224	56.87	-61.98	-5.11	23.40	-28.51	peak
4	4.1787	54.78	-61.35	-6.57	29.54	-36.11	peak
5	7.1592	54.86	-61.19	-6.33	29.54	-35.87	peak
6	20.1732	53.48	-60.82	-7.34	29.54	-36.88	peak

Note: 1. Measurement = Reading Level + Correct Factor.

2. If Peak Result complies with AV and QP limit, AV and QP Result are deemed to comply with AV limit.

3. All 3 polarizations (Horizontal, Face-on and Face-off) of the loop antenna had been tested, but only the worst data recorded in the report.

Note: All the modes and channels have been tested, only the worst data was recorded in the report.

9. AC POWER LINE CONDUCTED EMISSION

LIMITS

Please refer to CFR 47 FCC §15.207 (a).

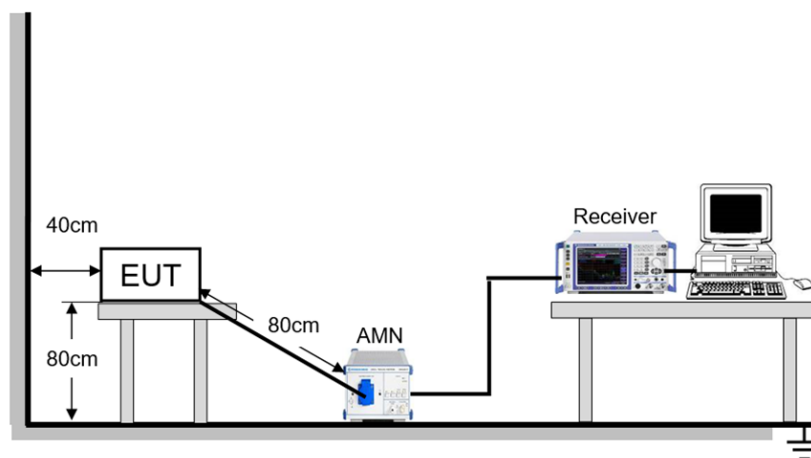
FREQUENCY (MHz)	Quasi-peak	Average
0.15 -0.5	66 - 56 *	56 - 46 *
0.50 -5.0	56.00	46.00
5.0 -30.0	60.00	50.00

TEST PROCEDURE

The EUT is put on a table of non-conducting material that is 80 cm high. The vertical conducting wall of shielding is located 40 cm to the rear of the EUT. The power line of the EUT is connected to the AC mains through a Artificial Mains Network (A.M.N.). A EMI Measurement Receiver (R&S Test Receiver ESR3) is used to test the emissions from both sides of AC line. According to the requirements in Section 6.2 of ANSI C63.10-2020. Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30 MHz using CISPR Quasi-Peak and average detector mode. The bandwidth of EMI test receiver is set at 9 kHz.

The arrangement of the equipment is installed to meet the standards and operating in a manner, which tends to maximize its emission characteristics in a normal application.

TEST SETUP

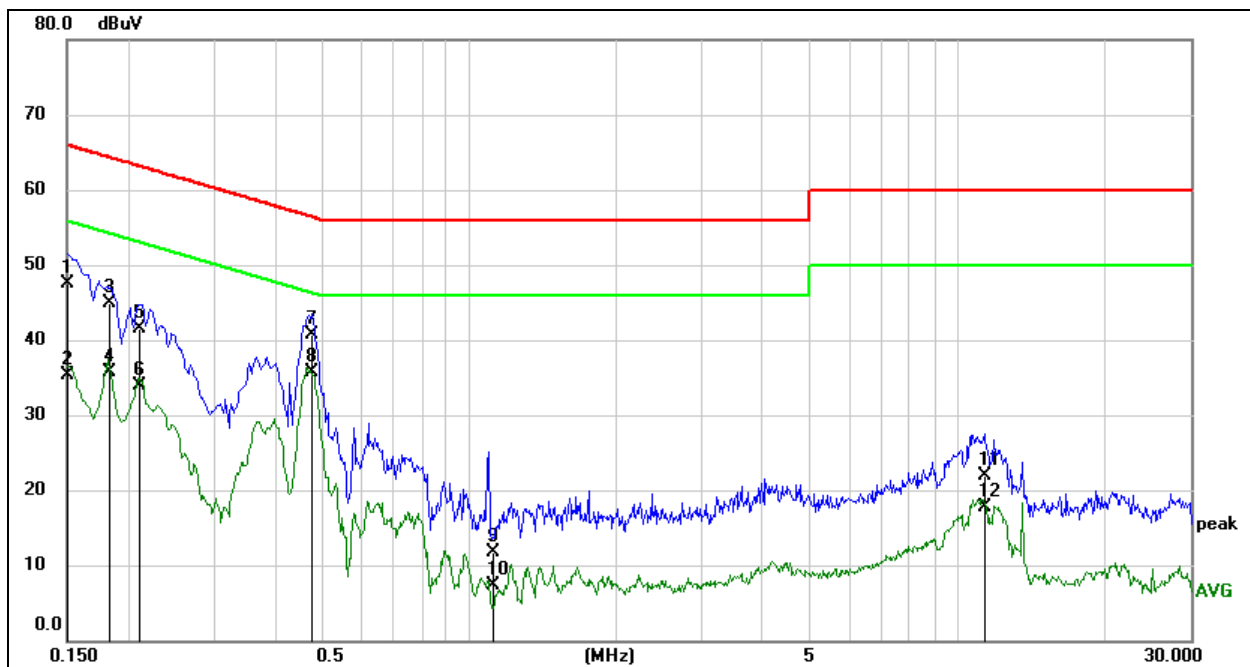


TEST ENVIRONMENT

Temperature	24.1℃	Relative Humidity	59%
Atmosphere Pressure	101kPa	Test Voltage	AC 120 V, 60 Hz

TEST RESULTS

Test Mode:	Lora SF7 with RAKARG15	Channel:	923.3 MHz
Line:	Line	Test Voltage:	AC 120 V, 60 Hz



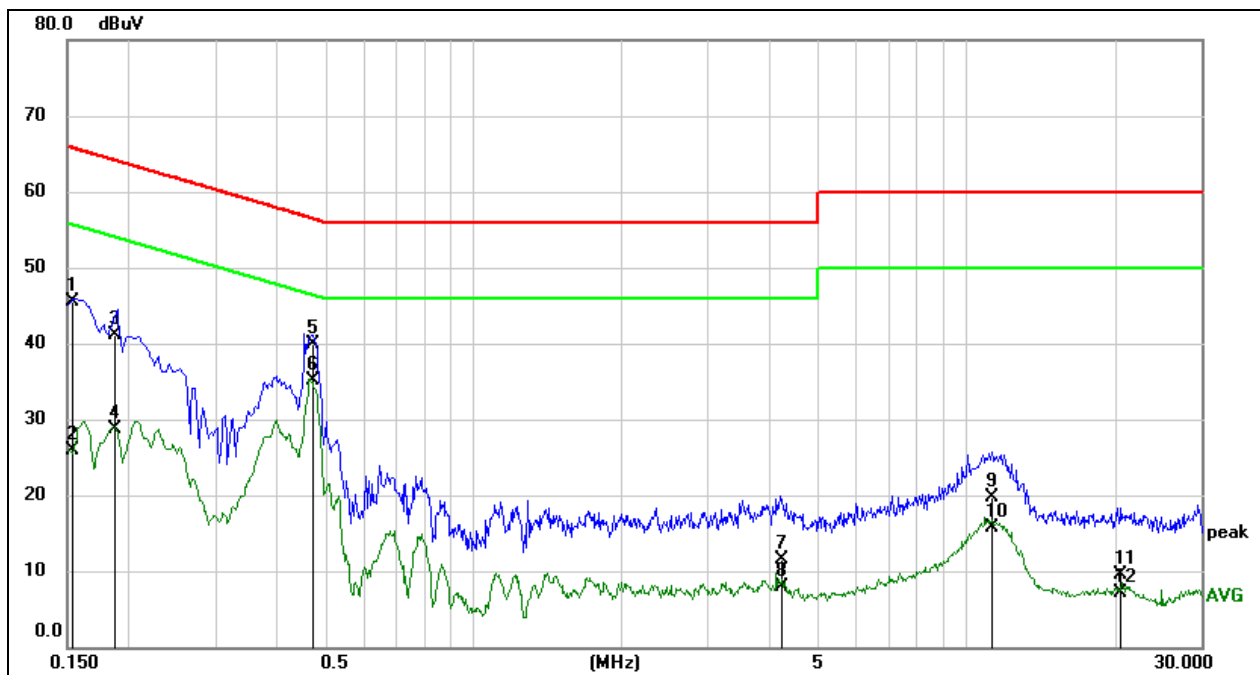
No.	Frequency (MHz)	Reading (dBuV)	Correct (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.1508	37.78	9.74	47.52	65.96	-18.44	QP
2	0.1508	25.64	9.74	35.38	55.96	-20.58	AVG
3	0.1836	35.14	9.67	44.81	64.32	-19.51	QP
4	0.1836	25.95	9.67	35.62	54.32	-18.70	AVG
5	0.2117	31.89	9.64	41.53	63.14	-21.61	QP
6	0.2117	24.19	9.64	33.83	53.14	-19.31	AVG
7	0.4760	31.11	9.64	40.75	56.41	-15.66	QP
8	0.4760	26.02	9.64	35.66	46.41	-10.75	AVG
9	1.1193	2.06	9.64	11.70	56.00	-44.30	QP
10	1.1193	-2.36	9.64	7.28	46.00	-38.72	AVG
11	11.2911	12.22	9.73	21.95	60.00	-38.05	QP
12	11.2911	7.92	9.73	17.65	50.00	-32.35	AVG

Note:

1. Result = Reading + Correct Factor.
2. If QP Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 200 Hz (9 kHz ~ 150 kHz), 9 kHz (150 kHz ~ 30 MHz).
4. Step size: 80 Hz (0.009 MHz ~ 0.15 MHz), 4 kHz (0.15 MHz ~ 30 MHz), Scan time: auto.

Note: All the modes have been tested, only the worst data was recorded in the report.

Test Mode:	Lora SF7 with RAKARG15	Channel:	923.3 MHz
Line:	Neutral	Test Voltage:	AC 120 V, 60 Hz



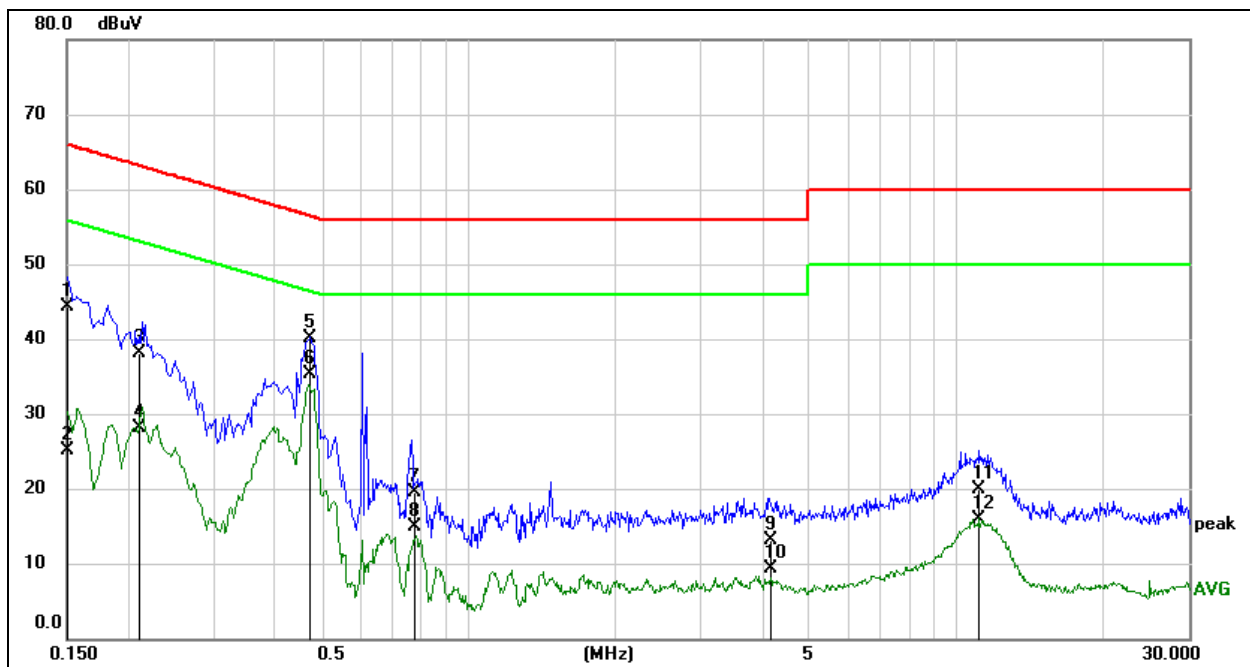
No.	Frequency (MHz)	Reading (dBuV)	Correct (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.1534	35.86	9.64	45.50	65.81	-20.31	QP
2	0.1534	16.17	9.64	25.81	55.81	-30.00	AVG
3	0.1867	31.56	9.64	41.20	64.18	-22.98	QP
4	0.1867	19.04	9.64	28.68	54.18	-25.50	AVG
5	0.4733	30.19	9.64	39.83	56.46	-16.63	QP
6	0.4733	25.38	9.64	35.02	46.46	-11.44	AVG
7	4.2274	1.93	9.64	11.57	56.00	-44.43	QP
8	4.2274	-1.80	9.64	7.84	46.00	-38.16	AVG
9	11.3450	9.98	9.73	19.71	60.00	-40.29	QP
10	11.3450	6.05	9.73	15.78	50.00	-34.22	AVG
11	20.7227	-0.31	9.73	9.42	60.00	-50.58	QP
12	20.7227	-2.70	9.73	7.03	50.00	-42.97	AVG

Note:

1. Result = Reading + Correct Factor.
2. If QP Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 200 Hz (9 kHz ~ 150 kHz), 9 kHz (150 kHz ~ 30 MHz).
4. Step size: 80 Hz (0.009 MHz ~ 0.15 MHz), 4 kHz (0.15 MHz ~ 30 MHz), Scan time: auto.

Note: All the modes have been tested, only the worst data was recorded in the report.

Test Mode:	Lora SF7 with RAKARJ14	Channel:	923.3 MHz
Line:	Line	Test Voltage:	AC 120 V, 60 Hz



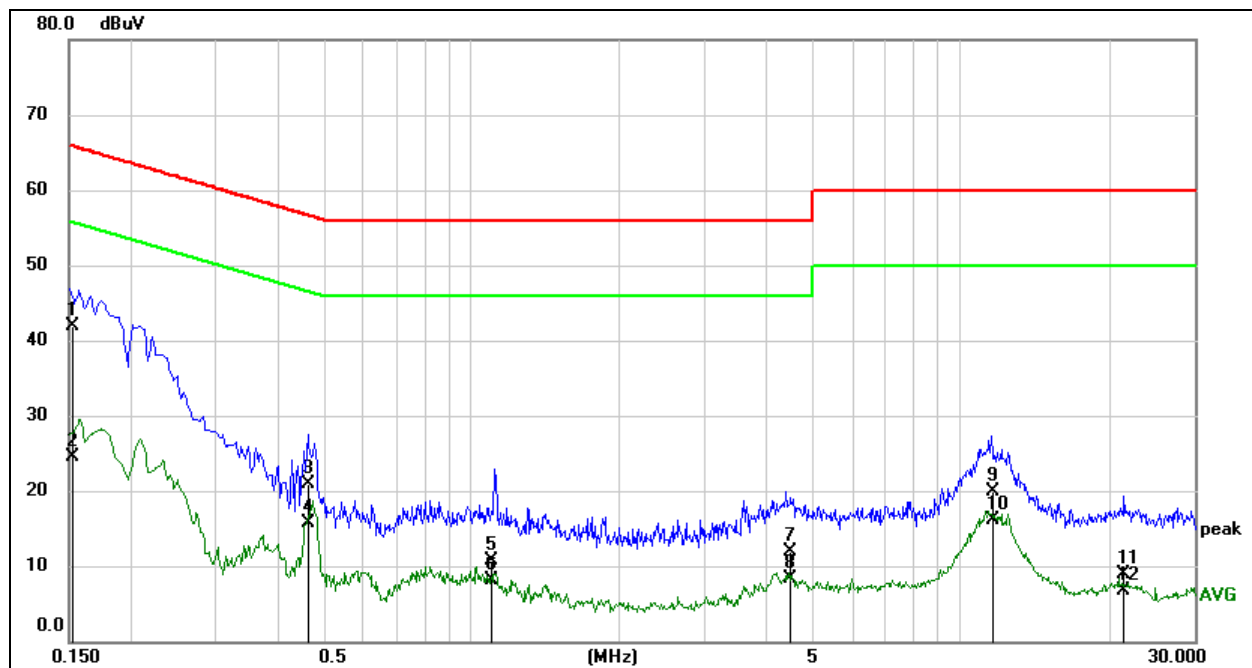
No.	Frequency (MHz)	Reading (dBuV)	Correct (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.1513	34.55	9.74	44.29	65.93	-21.64	QP
2	0.1513	15.39	9.74	25.13	55.93	-30.80	AVG
3	0.2115	28.54	9.64	38.18	63.15	-24.97	QP
4	0.2115	18.41	9.64	28.05	53.15	-25.10	AVG
5	0.4707	30.40	9.64	40.04	56.50	-16.46	QP
6	0.4707	25.71	9.64	35.35	46.50	-11.15	AVG
7	0.7770	9.96	9.63	19.59	56.00	-36.41	QP
8	0.7770	5.29	9.63	14.92	46.00	-31.08	AVG
9	4.1739	3.33	9.73	13.06	56.00	-42.94	QP
10	4.1739	-0.48	9.73	9.25	46.00	-36.75	AVG
11	11.1887	10.26	9.73	19.99	60.00	-40.01	QP
12	11.1887	6.12	9.73	15.85	50.00	-34.15	AVG

Note:

1. Result = Reading + Correct Factor.
2. If QP Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 200 Hz (9 kHz ~ 150 kHz), 9 kHz (150 kHz ~ 30 MHz).
4. Step size: 80 Hz (0.009 MHz ~ 0.15 MHz), 4 kHz (0.15 MHz ~ 30 MHz), Scan time: auto.

Note: All the modes have been tested, only the worst data was recorded in the report.

Test Mode:	Lora SF7 with RAKARJ14	Channel:	923.3 MHz
Line:	Neutral	Test Voltage:	AC 120 V, 60 Hz



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.1524	32.17	9.64	41.81	65.87	-24.06	QP
2	0.1524	14.94	9.64	24.58	55.87	-31.29	AVG
3	0.4620	11.17	9.64	20.81	56.66	-35.85	QP
4	0.4620	5.99	9.64	15.63	46.66	-31.03	AVG
5	1.0975	1.17	9.63	10.80	56.00	-45.20	QP
6	1.0975	-1.62	9.63	8.01	46.00	-37.99	AVG
7	4.4792	2.29	9.65	11.94	56.00	-44.06	QP
8	4.4792	-1.40	9.65	8.25	46.00	-37.75	AVG
9	11.6029	10.26	9.73	19.99	60.00	-40.01	QP
10	11.6029	6.31	9.73	16.04	50.00	-33.96	AVG
11	21.4436	-0.83	9.73	8.90	60.00	-51.10	QP
12	21.4436	-3.07	9.73	6.66	50.00	-43.34	AVG

Note:

1. Result = Reading + Correct Factor.
2. If QP Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 200 Hz (9 kHz ~ 150 kHz), 9 kHz (150 kHz ~ 30 MHz).
4. Step size: 80 Hz (0.009 MHz ~ 0.15 MHz), 4 kHz (0.15 MHz ~ 30 MHz), Scan time: auto.

Note: All the modes have been tested, only the worst data was recorded in the report.

10. ANTENNA REQUIREMENTS

APPLICABLE REQUIREMENTS

Please refer 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. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

Please refer to FCC §15.247(b)(4)

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. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

RESULTS

Complies

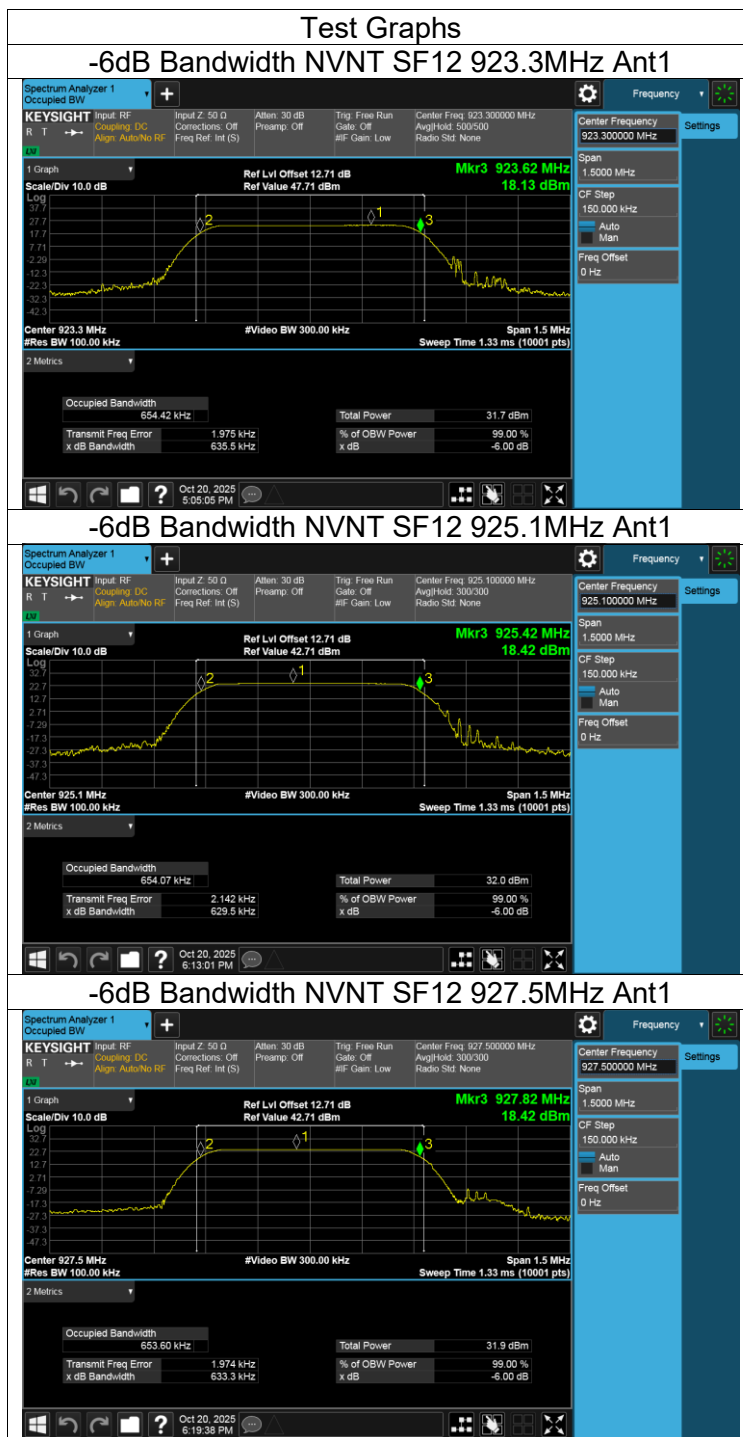
11. Appendix

11.1. Appendix A: DTS Bandwidth

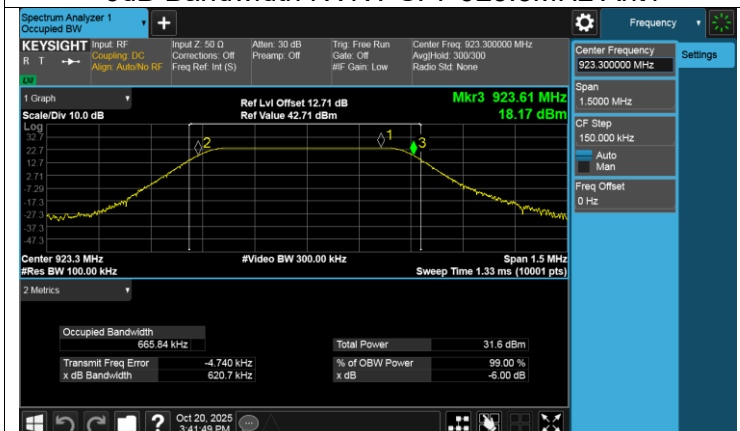
11.1.1. Test Result

Mode	Frequency (MHz)	Antenna	-6 dB Bandwidth (MHz)	Limit -6 dB Bandwidth (MHz)	Verdict
SF12	923.3	Ant1	0.636	≥ 0.5	Pass
SF12	925.1	Ant1	0.63	≥ 0.5	Pass
SF12	927.5	Ant1	0.633	≥ 0.5	Pass
SF7	923.3	Ant1	0.621	≥ 0.5	Pass
SF7	925.1	Ant1	0.62	≥ 0.5	Pass
SF7	927.5	Ant1	0.634	≥ 0.5	Pass

11.1.2. Test Graphs



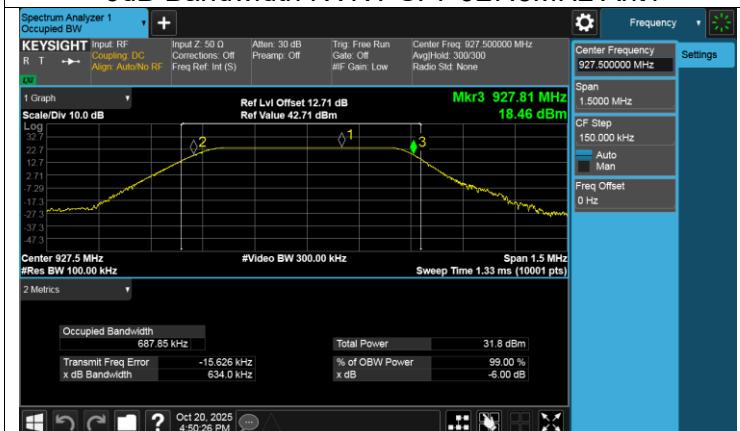
-6dB Bandwidth NVNT SF7 923.3MHz Ant1



-6dB Bandwidth NVNT SF7 925.1MHz Ant1



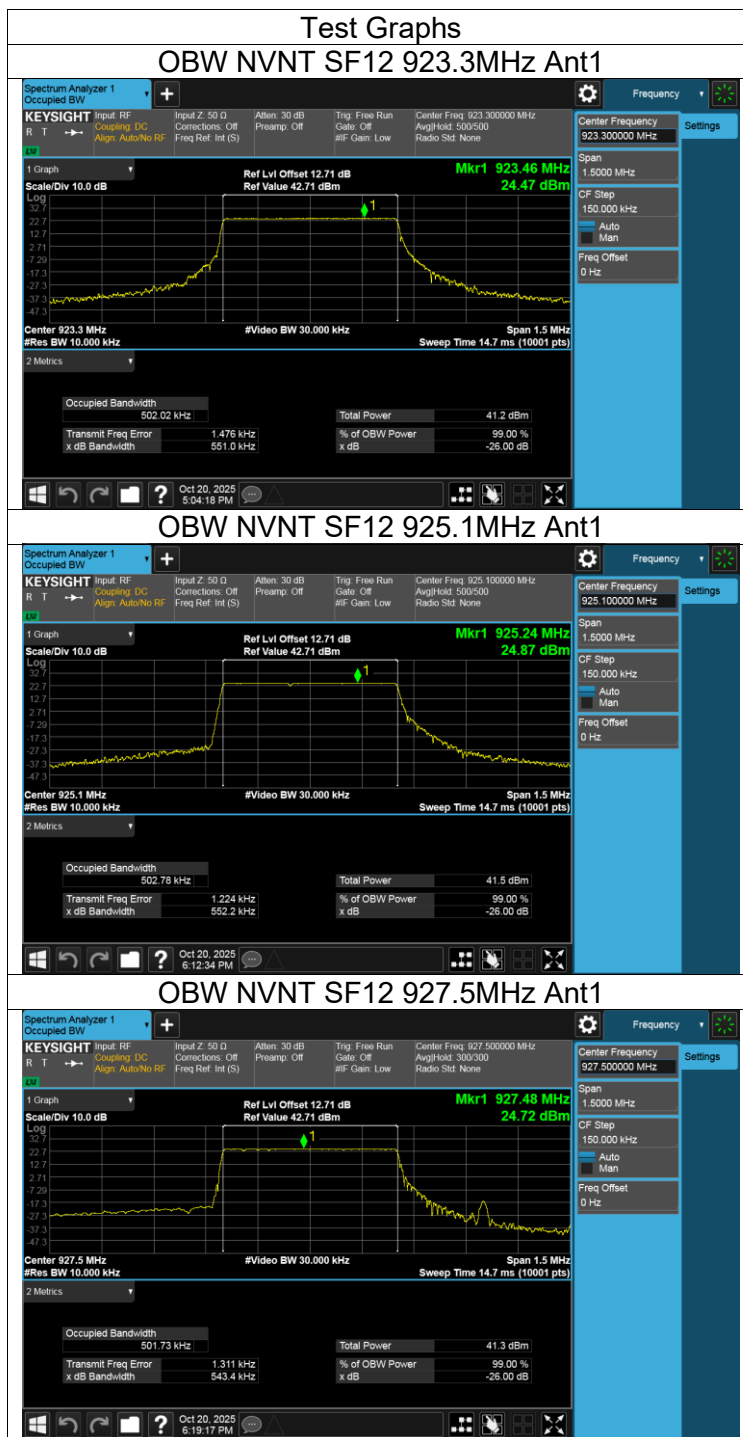
-6dB Bandwidth NVNT SF7 927.5MHz Ant1

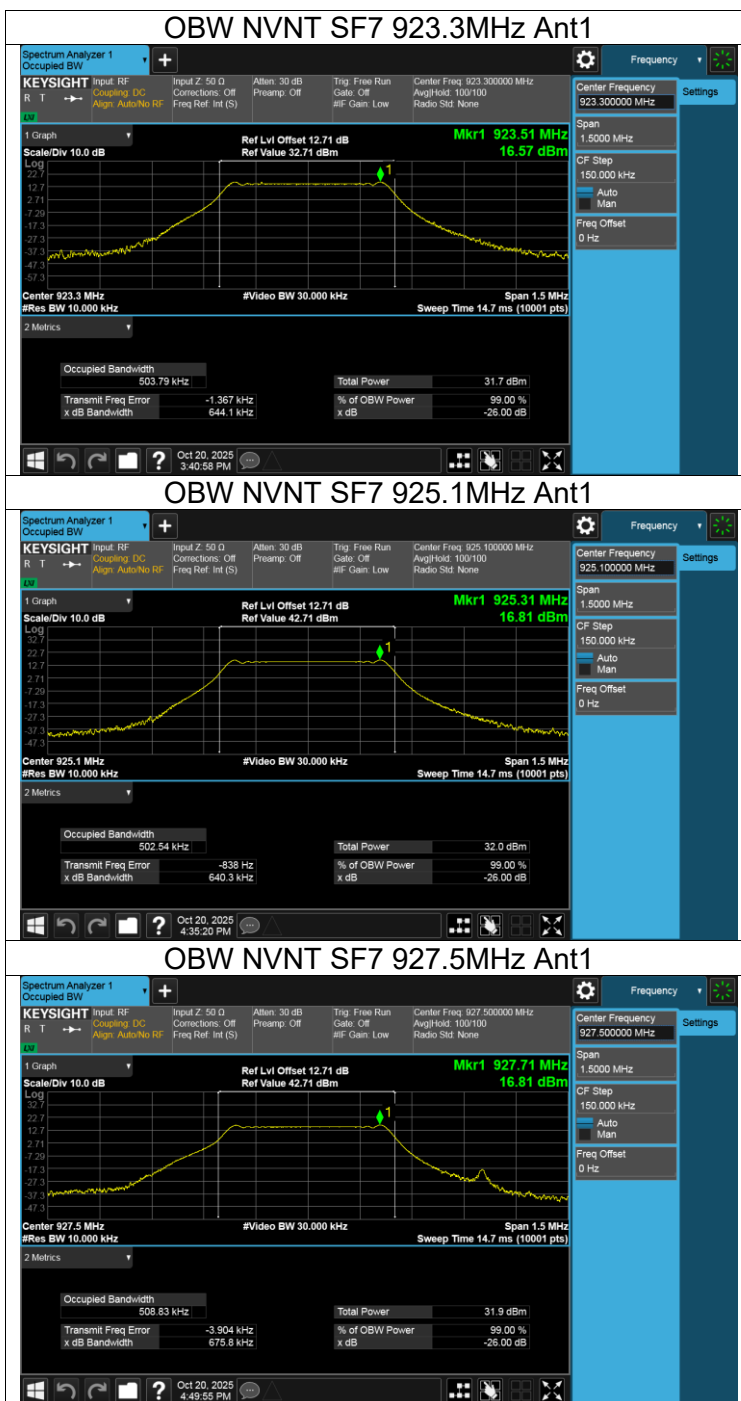


11.2. Appendix B: Occupied Channel Bandwidth**11.2.1. Test Result**

Mode	Frequency (MHz)	Antenna	99% OBW (MHz)
SF12	923.3	Ant1	0.502
SF12	925.1	Ant1	0.503
SF12	927.5	Ant1	0.502
SF7	923.3	Ant1	0.504
SF7	925.1	Ant1	0.503
SF7	927.5	Ant1	0.509

11.2.2. Test Graphs





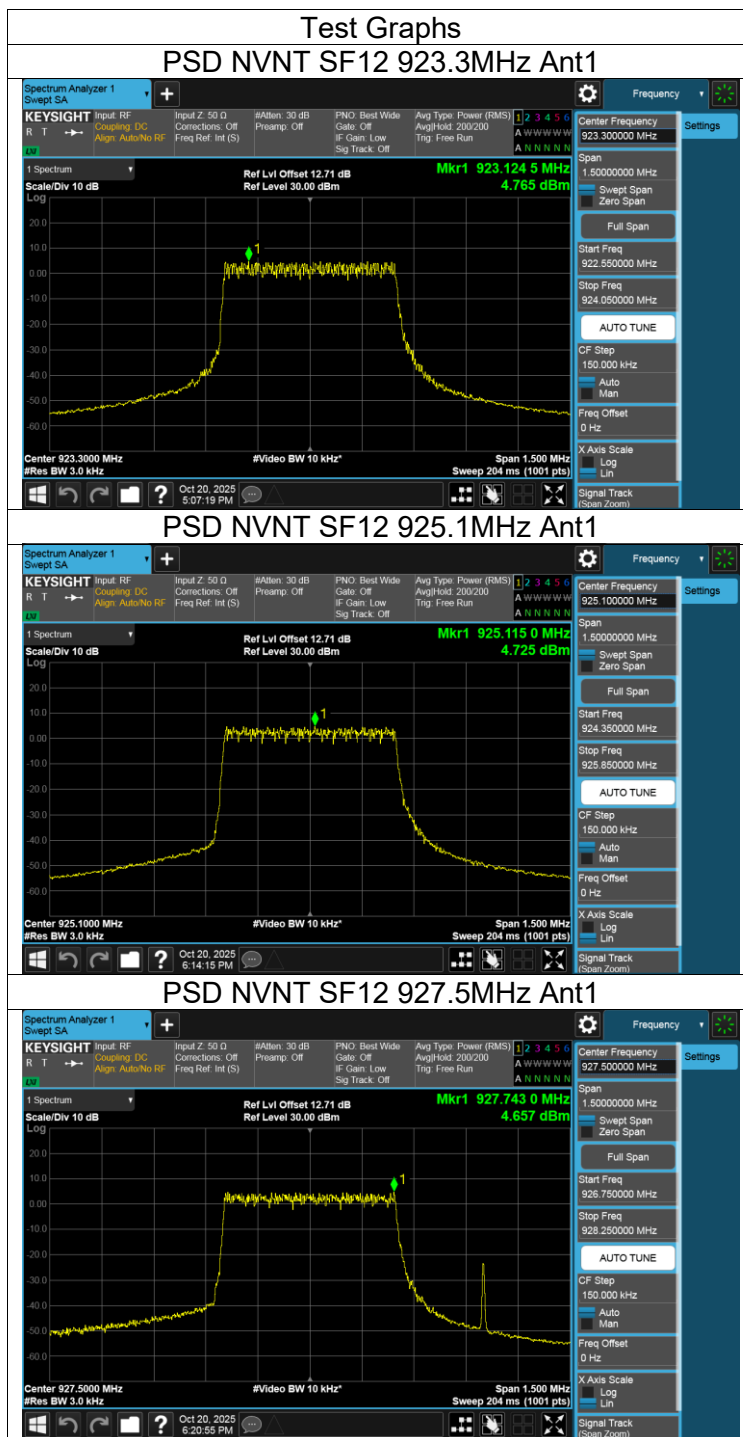
11.3. Appendix C: Maximum conducted output power**11.3.1. Test Result**

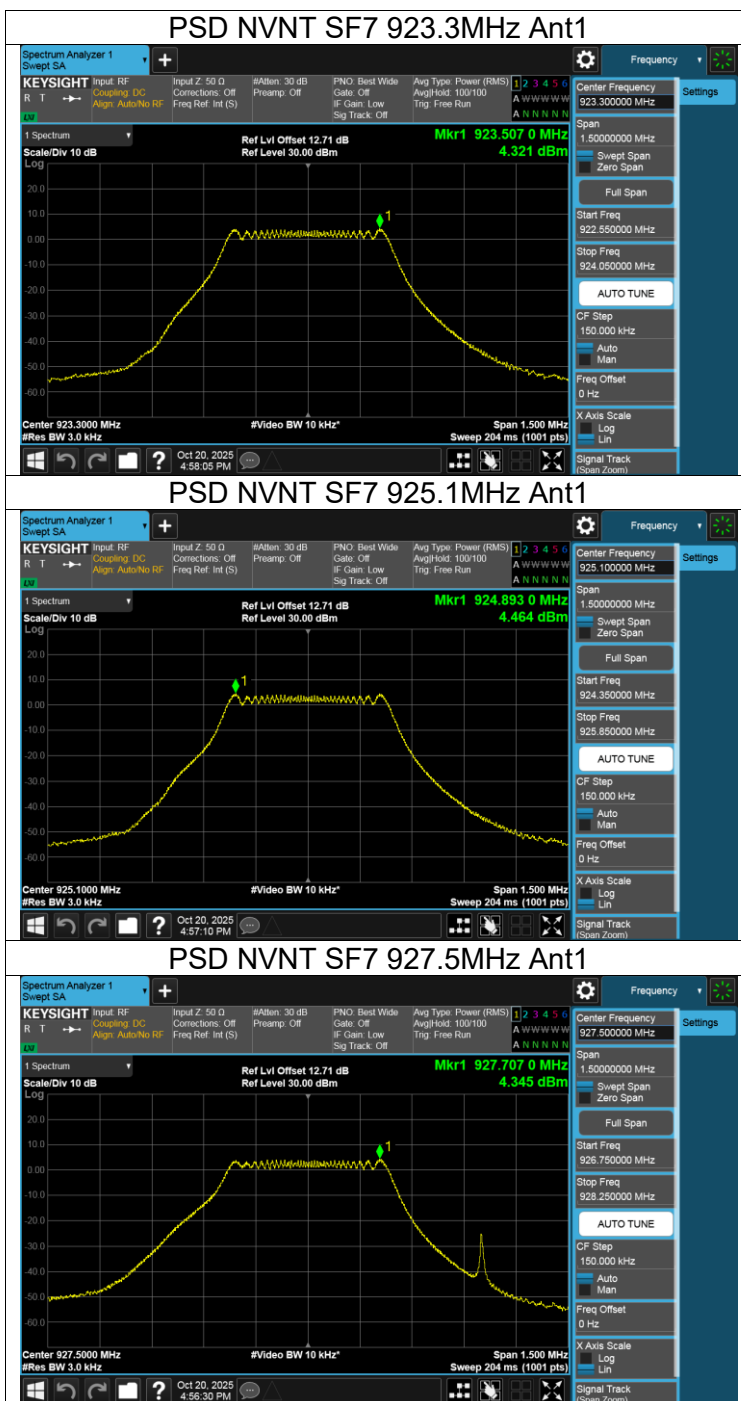
Mode	Frequency (MHz)	Antenna	Total Power (dBm)	Limit (dBm)	Verdict
SF12	923.3	Ant1	24.06	29	Pass
SF12	925.1	Ant1	24.54	29	Pass
SF12	927.5	Ant1	24.35	29	Pass
SF7	923.3	Ant1	24.38	29	Pass
SF7	925.1	Ant1	24.42	29	Pass
SF7	927.5	Ant1	24.47	29	Pass

11.4. Appendix D: Maximum power spectral density**11.4.1. Test Result**

Mode	Frequency (MHz)	Antenna	Total PSD (dBm/3kHz)	Limit (dBm/3kHz)	Verdict
SF12	923.3	Ant1	4.77	7	Pass
SF12	925.1	Ant1	4.73	7	Pass
SF12	927.5	Ant1	4.66	7	Pass
SF7	923.3	Ant1	4.32	7	Pass
SF7	925.1	Ant1	4.46	7	Pass
SF7	927.5	Ant1	4.35	7	Pass

11.4.2. Test Graphs

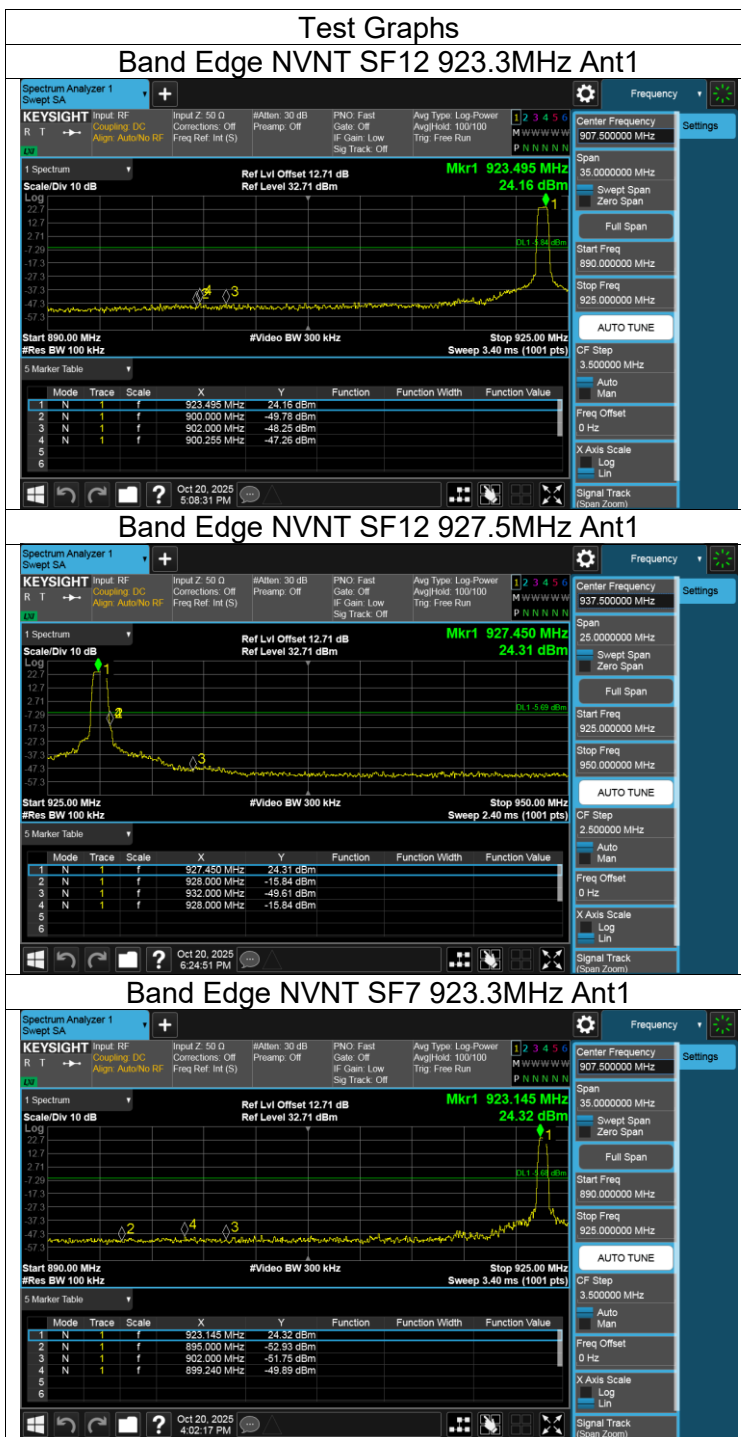


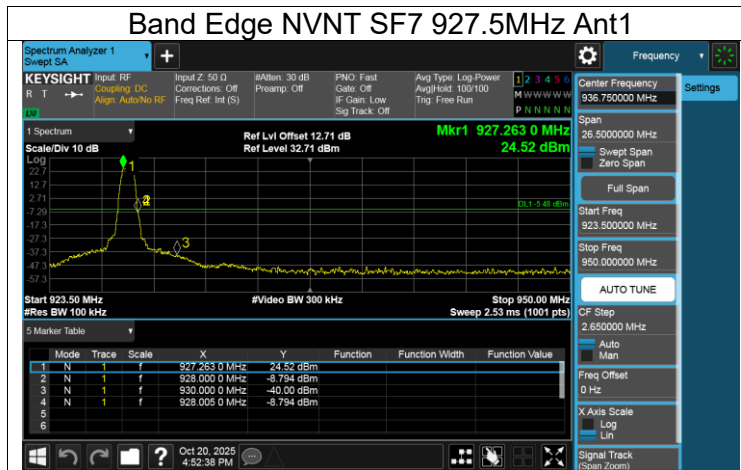


11.5. Appendix E: Band edge measurements**11.5.1. Test Result**

Mode	Frequency (MHz)	Antenna	Verdict
SF12	923.3	Ant1	Pass
SF12	927.5	Ant1	Pass
SF7	923.3	Ant1	Pass
SF7	927.5	Ant1	Pass

11.5.2. Test Graphs

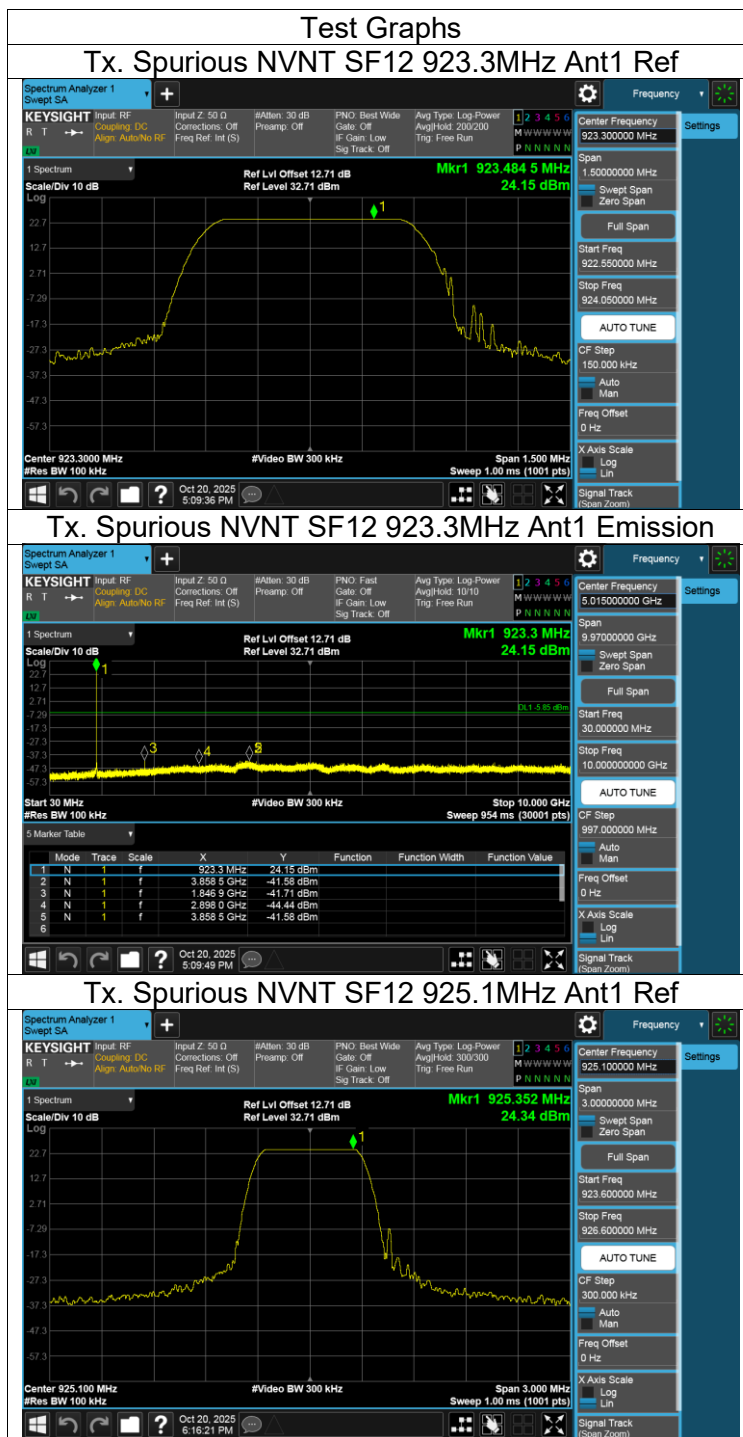




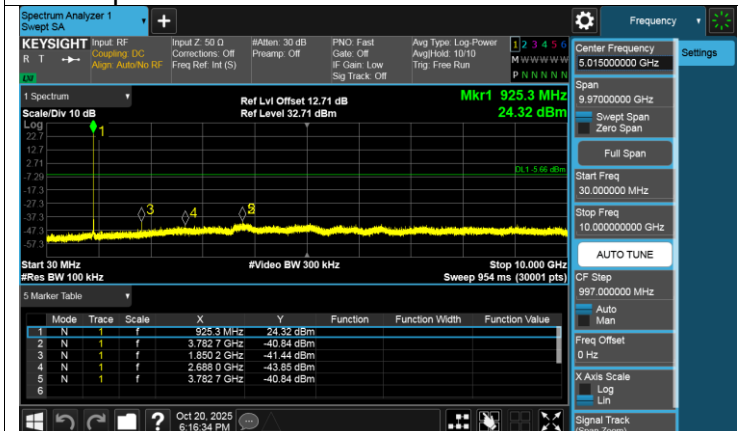
11.6. Appendix F: Conducted Spurious Emission**11.6.1. Test Result**

Mode	Frequency (MHz)	Antenna	Verdict
SF12	923.3	Ant1	Pass
SF12	925.1	Ant1	Pass
SF12	927.5	Ant1	Pass
SF7	923.3	Ant1	Pass
SF7	925.1	Ant1	Pass
SF7	927.5	Ant1	Pass

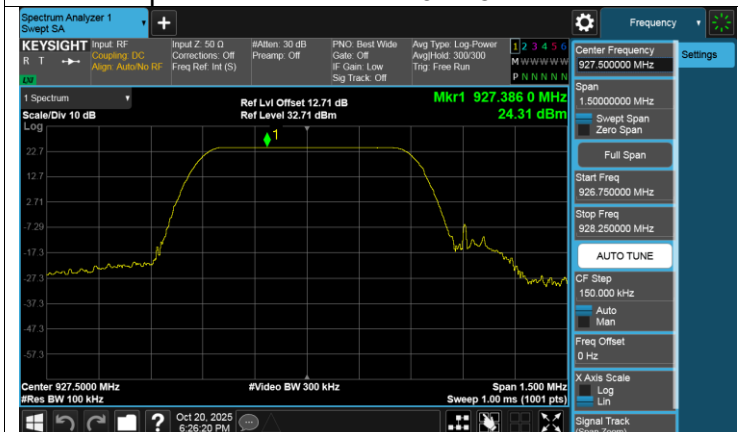
11.6.2. Test Graphs



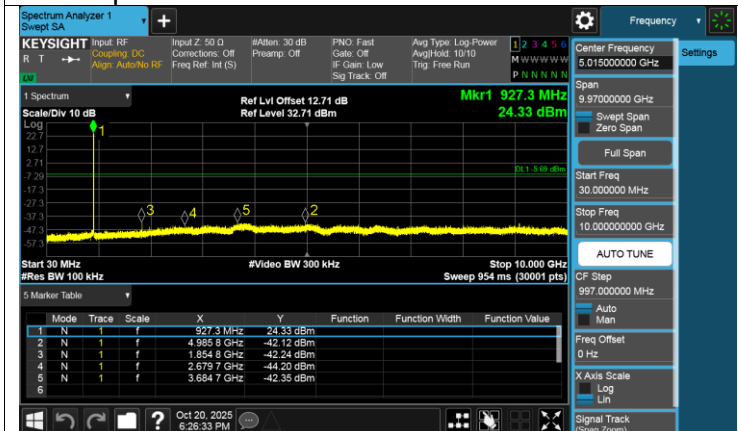
Tx. Spurious NVNT SF12 925.1MHz Ant1 Emission

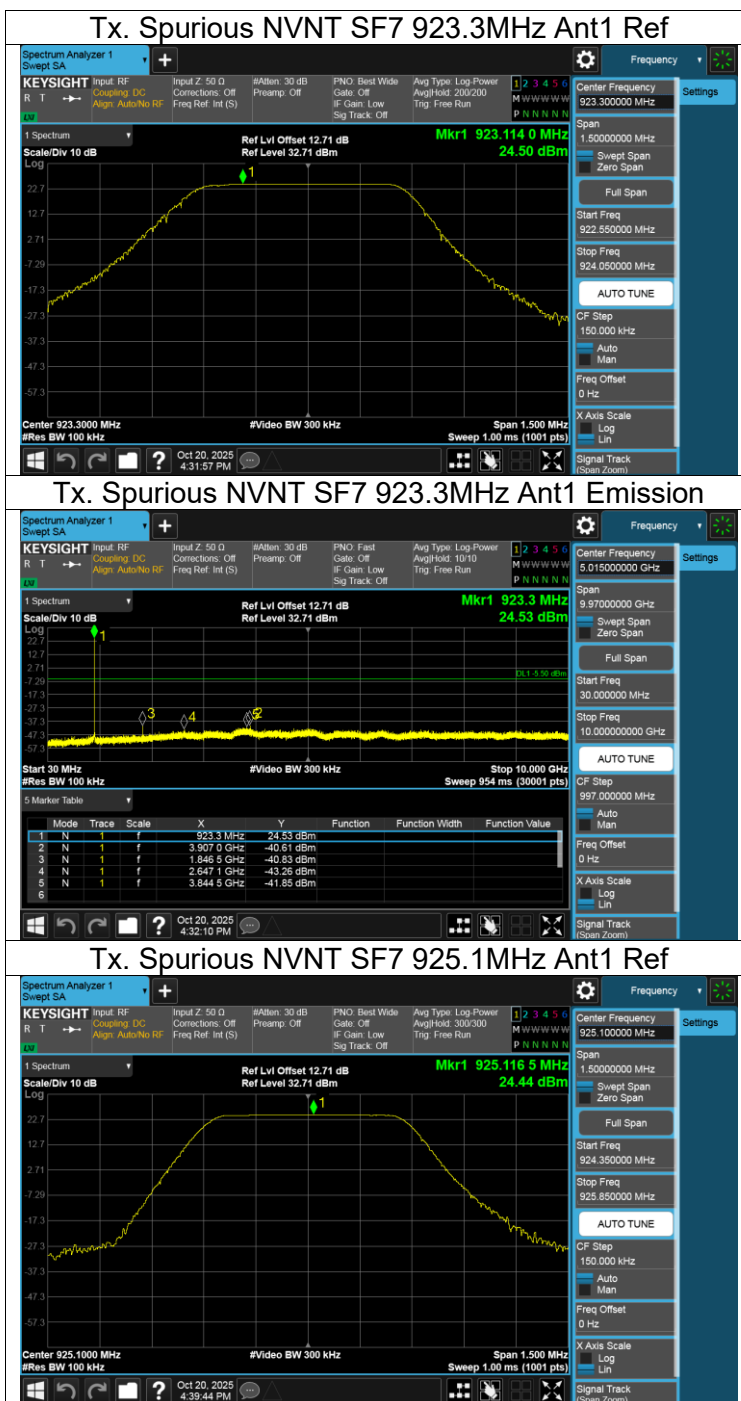


Tx. Spurious NVNT SF12 927.5MHz Ant1 Ref

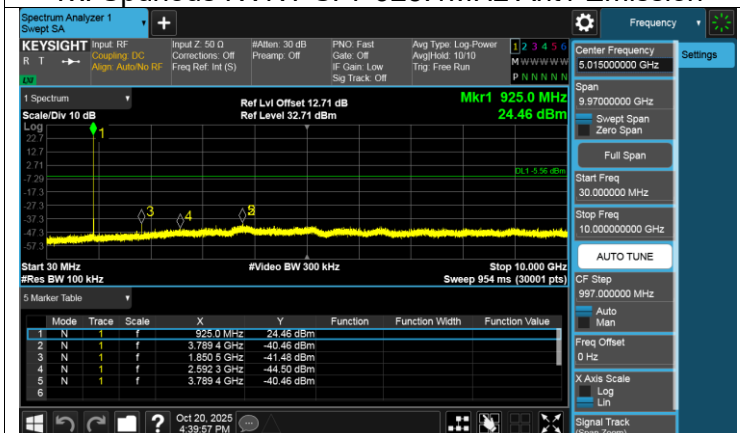


Tx. Spurious NVNT SF12 927.5MHz Ant1 Emission

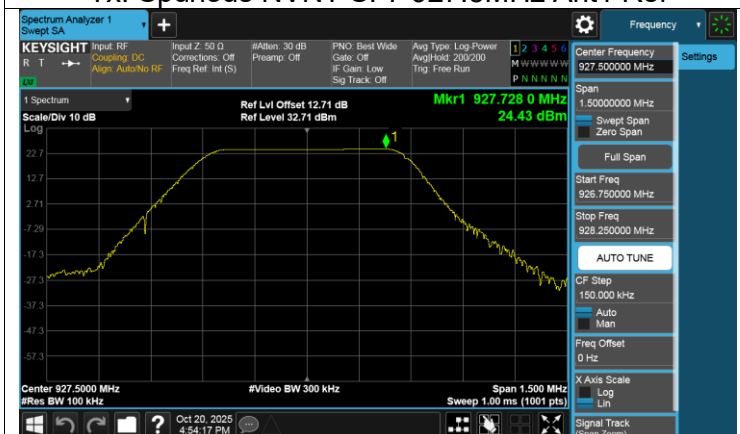




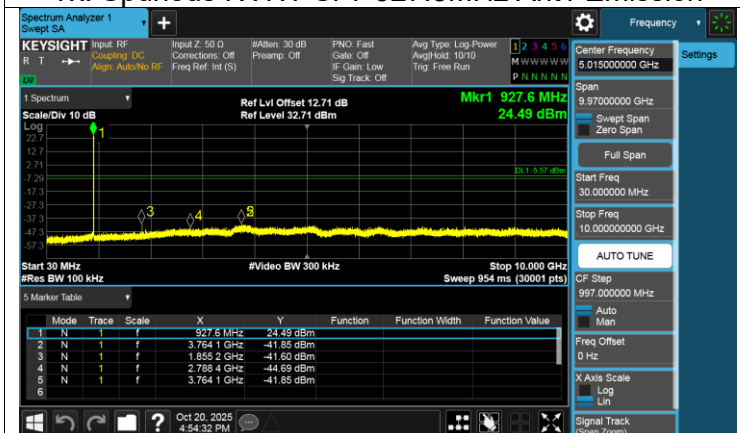
Tx. Spurious NVNT SF7 925.1MHz Ant1 Emission



Tx. Spurious NVNT SF7 927.5MHz Ant1 Ref



Tx. Spurious NVNT SF7 927.5MHz Ant1 Emission



11.7. Appendix G: Duty Cycle**11.7.1. Test Result**

Test Mode	On Time (msec)	Period (msec)	Duty Cycle x (Linear)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)	1/T Minimum VBW (kHz)	Final setting For VBW (kHz)
SF12	100	100	1.0000	100.00	0.00	0.01	0.01
SF7	100	100	1.0000	100.00	0.00	0.01	0.01

Note:

Duty Cycle Correction Factor=10log (1/x).

Where: x is Duty Cycle (Linear)

Where: T is On Time

If that calculated VBW is not available on the analyzer, then the next higher value should be used.

We have verified that duty cycle is constant (variation are less than +/- 2%).

11.7.2. Test Graphs



END OF REPORT